#### **Technical Report** Overview

Report: 2019 Annual Report: Elk Valley Regional and Site-Specific Groundwater Monitoring Programs

Overview: This report presents the 2019 results of the regional groundwater monitoring program and the site-specific programs at Fording River Operations, Greenhills Operations, Line Creek Operations, Elkview Operations, and Coal Mountain Operations required under Permit 107517. This report summarizes the results of groundwater quality in 2019 and compares them to relevant screening values. It also compares groundwater chemistry to nearby surface water chemistry to understand groundwater transport pathways.

This report was prepared for Teck by SNC-Lavalin Inc.

#### For More Information

If you have questions regarding this report, please:

- Phone toll-free to 1.855.806.6854
- Email feedbackteckcoal@teck.com

Future studies will be made available at teck.com/elkvalley



# 2019 Annual Report: Elk Valley Regional and Site-Specific Groundwater Monitoring Programs

Fording River Operations

**Greenhills Operations** 

Line Creek Operations

**Elkview Operations** 

**Coal Mountain Operations** 

Regional Groundwater Monitoring Program

## **VOLUME II OF III**

Prepared for:

**Teck Coal Limited** 

March 31, 2020

Internal Ref: 671557 > Final > V1

# Appendix I

Government Approval Letters



## **ENV Approval Conditions and Previous** Recommendations

The Ministry of Environment & Climate Change Strategy (ENV) assessment letters for the SSGMP updates and annual reports are included in this Appendix. Additionally, the ENV approval letters for the 2017 RGMP and the 2018 SSGMP updates are also included in this Appendix. Recommendations from the assessment letters and relevant recommended approval conditions related to the 2018 Annual reports for each mine site are outlined below. Additionally, recommendations from the annual and update reports are listed below.

### **ENV Recommendations from the Assessment Letters**

#### **FRO SSGMP**

Recommendations provided by ENV regarding the 2018 FRO SSGMP Annual Report are summarized in Table I-A along with the location where comments were addressed.

Table I-A: FRO ENV Recommendations and Associated Location in Report

ENV Recommendation	Where Addressed and/or Comment
The borehole logs of all the wells included in the updated monitoring network should be included as an appendix to the reports.	Appendix IV.
The surface water level data and precipitation rates should be plotted on the groundwater level plots so to facilitate the interpretation of surface water-groundwater interaction.	Figures FR-1 to -3; FR-10 to -13.
Pumping rates should be plotted along with groundwater levels in the pumping wells that are used for monitoring, so to determine when level fluctuations are mainly due to pumping.	Figure FR-9. Groundwater levels in the POTWELLS area currently not available.
Review the groundwater elevation logger data at FR_HMW1S and FR_HMW1D, as the time plots show abrupt changes between August 2016 and October 2017, which may lead to mis-representative vertical gradients. Correct the automated data where appropriate, to be consistent with the groundwater level manual measurements.	Addressed in Teck June 7, 2019 Response.
Outline the watershed divides of all the sub-catchments located in the FRO permitted area.	Drawing 6.
Outline the losing and gaining reaches of the Fording River and tributaries, where these can be inferred, on the map showing groundwater level contours.	Drawing 11.
Add maps showing the potential sources and pathways identified for each sub-catchment.	Drawing 6.



#### Table I-A Cont'd): FRO ENV Recommendations and Associated Location in Report

ENV Recommendation	Where Addressed and/or Comment	
Add well stratigraphy on the cross-sections, so that concordance with the hydrogeological units represented on the cross-sections can be assessed.	Addressed in Teck June 7, 2019 Response.	
Use the Kendall Test to identify trends in the CI concentration time series.	Sections 4.3.2.2 and 4.3.3.2.	
Add former monitoring well FR_HMW4 on the map (labelled differently from the current wells), so that historical data collected from this well can support interpretation.	Drawing 6.	

#### **GHO SSGMP**

Recommendations provided by ENV regarding the 2018 FRO SSGMP Annual Report are summarized in Table I-B along with the location where comments were addressed.

Table I-B: GHO ENV Recommendations and Associated Location in Report

ENV Recommendation	Where Addressed and/or Comment
The surface water level data and precipitation rates should be plotted on the groundwater level plots so to facilitate the interpretation of surface water-groundwater interaction.	Figures GH-1, GH-4, GH-5, GH-11 to -14.
Pumping rates should be plotted along with groundwater levels in the pumping wells that are used for monitoring, so to determine when level fluctuations are mainly due to pumping.	Figure GH-6 (pumping rates only). Groundwater levels in the pumping wells are currently not available.
Outline the watershed divides of all the sub-catchments located in the GHO permitted area.	Drawing 7.
Outline the losing and gaining reaches of the Elk River, Fording River, Greenhills Creek and respective tributaries, where these can be inferred, on the map showing groundwater level contours.	Drawing 11.
Add maps showing the potential sources and pathways identified for each sub-catchment.	Drawing 7.
Add well stratigraphy on the cross-sections, so that concordance with the hydrogeological units represented on the cross-sections can be assessed.	Addressed in Teck June 7, 2019 Response.
Use the Kendall Test to identify trends in the CI concentration time series.	Sections 5.3.2.2, 5.3.3.2 and 5.3.4.2; Appendix VII.

#### LCO SSGMP

Recommendations provided by ENV regarding the 2018 LCO SSGMP Annual Report are summarized in Table I-C along with the location where comments were addressed.



Table I-C: LCO ENV Recommendations and Associated Location in Report

ENV Recommendation	Where Addressed and/or Comment	
The surface water level data and precipitation rates should be plotted on the groundwater level plots so to facilitate the interpretation of surface water-groundwater interaction.	Appendix B of Golder's 2019 SSGMP report included in Appendix II.	
Outline the watershed divides of all the sub-catchments located in the LCO permitted area.	Figure 2-5 of Golder's 2019 SSGMP report included in Appendix II.	
Outline the losing and gaining reaches of the Elk River, Fording River, Line Creek and respective tributaries, where these can be inferred, on the map showing groundwater level contours.	Figures 4-1 and 4-2 of Golder's 2019 SSGMP report included in Appendix II.	
Add well stratigraphy on the cross-sections, so that concordance with the hydrogeological units represented on the cross-sections can be assessed.	Addressed in Teck June 7, 2019 Response.	
Use the Kendall Test to identify trends in the CI concentration time series.	Trend analyses completed for Q1 and Q4 data at four locations and one RGMP location in Study Area 7 in Appendix E.	

#### **EVO SSGMP**

Recommendations provided by ENV regarding the 2018 EVO SSGMP Annual Report are summarized in Table I-D along with the location where comments were addressed.

Table I-D: EVO ENV Recommendations and Associated Location in Report

ENV Recommendation	Where Addressed and/or Comment
The borehole logs and installation diagrams of all the wells included in the updated monitoring network should be included as an appendix to the reports.	Appendix IV.
The surface water level data and precipitation rates should be plotted on the groundwater level plots so to facilitate the interpretation of surface water-groundwater interaction.	Figures 1, 2, 9, 11, 12, 13, 14, 15, 21.
Pumping rates should be plotted along with groundwater levels in the pumping wells that are used for monitoring, so to determine when level fluctuations are mainly due to pumping.	Figure 21.
Outline the watershed divides of all the sub-catchments located in the EVO permitted area.	Drawing 9.
Outline the losing and gaining reaches of the Elk River, Michel Creek and tributaries, where these can be inferred, on the map showing groundwater level contours.	Flow Accretion studies have not been completed. Discussion of gaining and losing reaches is discussed in Section 7.3.6.
Add maps showing the potential sources and pathways identified for each sub-catchment.	Drawing 9.
Add well stratigraphy on the cross-sections, so that concordance with the hydrogeological units represented on the cross-sections can be assessed. Also increase vertical scale to ease visual interpretation. Update cross-section BB' (drawing 653245-004) to include the information from Sparwood Well #4 (replacement of Well #3, also referred to as RG-DW-03-04).	Addressed in Teck June 7, 2019 Response.



#### Table I-D (Cont'd): EVO ENV Recommendations and Associated Location in Report

ENV Recommendation	Where Addressed and/or Comment	
Use the Kendall Test to identify trends in the CI concentration time series.	Sections 7.3.3.2, 7.3.4.2, and 7.3.5.2; Appendix VII.	
Label provincially mapped aquifer 1080 IA on the drawings and include a description of provincially mapped aquifer 1082 IIC in the report.	Drawing 12.	

#### **CMO SSGMP**

Concordance with the recommendations provided by ENV regarding the 2018 CMO SSGMP Annual Report is summarized in Table I-E.

Table I-E: CMO ENV Recommendations and Concordance

ENV Recommendation	Where Addressed and/or Comment	
The surface water level data and precipitation rates should be plotted on the groundwater level plots so to facilitate the interpretation of surface water-groundwater interaction.	Figures CM-1, CM-2, CM-3, CM-10, CM-11, CM-12.	
Outline the watershed divides of all the sub-catchments located in the CMO permitted area.	Drawing 10.	
Outline the extent of the valley bottom sediments along Corbin and Michel Creek.	Drawing 3.	
Outline the losing and gaining reaches of Corbin and Michel Creek, where these can be inferred, on the map showing groundwater level contours.	Vertical hydraulic gradients indicative of groundwater-surface water interaction are discussed in Sections 8.3.3.1 and 8.3.4.1. Gaining and losing reaches will be evaluated following completion of a flow accretion study for Michel Creek planned for completion in 2020.	
Add well stratigraphy on the cross-sections, so that concordance with the hydrogeological units represented on the cross-sections can be assessed.	Addressed in Teck June 7, 2019 Response.	
Replace the groundwater level profile located between the shallow and deep measured levels shown on the cross-sections with a phreatic and potentiometric profile. Also review the groundwater profile on cross-section KK' that suggests a divide at the location of CM_MW7.	Drawings 48, 49, 50, 51, 52, 53, 54 and 55.	
Use the Kendall Test to identify trends in the CI concentration time series.	Sections 8.3.3.2 and 8.3.4.2; Appendix VII.	

#### **RGMP**

The 2018 RGMP Annual report was reviewed and accepted by ENV in an approval letter dated February 19, 2020 included in this Appendix. There were no specific recommendations from the review of the 2017 and 2018 Annual RGMP reports.



### 2018 Annual Report Recommendations by Program

The following recommendations provided for each operation were incorporated or assessed in this this year's annual reports.

#### FRO SSGMP

The following recommendations were developed in the 2018 Annual Report for FRO (SNC-Lavalin, 2019b):

- For nested wells, monitor wells on the same day, one right after the other, and collect manual depth to groundwater measurements for each well prior to purging rather than purging and sampling one well and then moving to the paired well.
- Analyze trip blanks for dissolved organic carbon (DOC) and the same dissolved metals package as site samples.
- When possible, avoid collecting samples in back to back months between quarter (i.e., June of Q2 and July of Q3) and instead evenly space sampling events throughout the year.
- Complete a quality assurance/quality control (QA/QC) on laboratory results as they come in to identify hold-time and other errors that may arise to rectify in the subsequent sampling event.
- Wells FR\_KB-1, FR\_KB-2, and FR\_KB-3A/B, installed in the Kilmarnock alluvial fan in 2018 should be evaluated as a possible replacement for FR TT43.
- Once approved, implement the 2018 SSGMP Update.
- Continue to monitor increases of sulphate and dissolved selenium in reference well FR\_HMW5 and reassess this well as a reference well under the RGMP.

The 2018 FRO SSGMP Update (SNC-Lavalin, 2019g) also identified data and recommendations in the SSGMP program. The following summarizes recommendations to be addressed in the annual SSGMP report:

- Install new background well to replace FR\_HMW5 as a background well. Once this nested well is installed, it should be incorporated into the SSGMP.
- Install a new monitoring well adjacent to surface water station FR\_HC1, downgradient of FR\_HMW1S/D and upgradient of the confluence of Henretta Creek and the Fording River.
- A review of data collected from wells installed as part of other programs (i.e., FR\_TBSSMW-1/2, FR\_TB-1A/B, FR\_TB-2A/B) should be completed as part of the annual report.
- Deployment of dataloggers in FR\_MW-1B, FR\_09-01-A/B, FR\_09-02-A, FR\_09-04-A, FR\_KB-1, FR\_KB-2, and FR\_KB-3A/B and upload of data during quarterly monitoring and sampling.
- Add monitoring wells FR\_GCMW-1B, FR\_GCMW-2, FR\_TBSSMW-1, FR\_TBSSMW-2, FR\_KB-1, FR\_KB-2, FR\_KB-3A/B, and FR\_MW-SK1-A/B to the monitoring and sampling program.
- Install a flow rate meter on the Greenhouse Wells so that pumping rates can be monitored. Collect continuous water level measurements from FR\_GH\_WELL3, or another FR\_GHHW, and incorporated into the program. Assess and select Test Wells in the Potable Wells area for continuous water level measurement. If Test Wells are not suitable, then new monitoring wells are recommended.
- As ongoing programs at FRO are completed, the current monitoring well network and surface water locations for the SSGMP should be re-evaluated and relevant locations should be included.
- Monitoring frequency should be reviewed on an annual basis to assess adequacy to address the seasonal variability and to address whether frequency should be reduced if little to no variability is observed.



#### **GHO SSGMP**

The following recommendations were developed in the 2018 Annual Report for GHO (SNC-Lavalin, 2019d):

- Once approved, implement the 2018 SSGMP Update.
- Complete hydraulic conductivity testing at monitoring wells which have not previously been tested (GH\_MW-RLP-1D and GH\_MW-TD) [Note the 2018 SSGMP Update recommends that GH\_MW-RLP-1D be removed from the program and replaced by a shallow groundwater monitoring well and based on artesian conditions at GH\_MW-TD, hydraulic conductivity testing at this well will not be completed].
- For nested wells, monitor wells on the same day, one right after the other, and collect manual depth to groundwater measurements prior to purging either well rather than purging and sampling one well and then moving to the well pair.
- Implement the new data logger deployment procedures to ensure that continuous water level measurements are properly obtained from select monitoring wells.
- Field filter and preserve groundwater samples for analysis of dissolved metals and dissolved organic carbon (DOC).
- Use trip blanks and analyze for parameters listed in the 2014 SSGMP and the 2018 SSGMP Update once approved.
- Ensure groundwater samples are packed in coolers in such a way to minimize sample loss during transport.
- Continue discussions with the laboratory on the best procedures to minimize hold-time exceedances.
- Complete a QA/QC on laboratory results as they come in to identify hold-time and other errors that may arise to rectify in the subsequent sampling event.
- As recommended in the 2018 SSGMP Update, attempt to re-develop monitoring well GH\_MW-PC. High field turbidity values have been measured in this well in addition to variable field parameter readings. If Teck suspects the integrity of the monitoring well may be compromised, the well should be decommissioned according to the Groundwater Protection Regulation (GWPR) and re-installed in a suitable location.

The 2018 GHO SSGMP Update (SNC-Lavalin, 2019h) also identified data and recommendations in the SSGMP program. The following summarizes recommendations to be addressed in the annual SSGMP report:

- As on-going programs at GHO are completed, the current monitoring well network and surface water locations for the SSGMP should be re-evaluated and relevant locations should be included.
- Collect additional data to adequately assess capture zones of the four GHO supply wells [GH\_POTW09, GH\_POTW10, GH\_POTW15, and GH\_POTW17] to evaluate potential impacts on groundwater quantity as well as confirm the low potential for downward migration of CI from surface water.
- Incorporate data from two nested wells (GH\_MW-MC1S/D and GH\_MW-MC2S/D), completed as part of the CPX2 Project, into in the GHO SSGMP.
- Incorporate additional studies as part of the CPX2 Project to address the absence of deep groundwater data around Leask Pond. It is also recommended to install data loggers in new wells.
- Incorporate additional studies completed as part of the CPX2 Project to address the absence of shallow groundwater data around Wolfram Pond.



- Incorporate information from the groundwater-surface water study for the Elk River Side Channel, completed under the Local Aquifer Effects Monitoring Program (LAEMP), to address the gap at the Elk River side channel and tributaries on the west side of GHO.
- Incorporate results from the Regional Water Quality Model (RWQM) mass balance program to address the unknown geochemical mechanism for the year-round attenuation of selenium and nitrate in the Elk River valley bottom.
- Incorporate results from the RGMP to address the unknown groundwater conditions to the north of GH GA-MW-1.
- Incorporate results from studies associated the CPX2 Project and the groundwater surface water interaction assessment at Greenhills Creek to address the absence of groundwater data to the east of the tailings storage facility (TSF) [Note the CPX2 Project has been split and is now two separate programs: CPX2 and the TSF Permitting Project. This study is part of the TSF Permitting Project].
- Monitoring frequency should be reviewed on an annual basis to assess adequacy to address the seasonal variability and to address whether frequency should be reduced if little to no variability is observed.

#### LCO SSGMP

The following recommendations were developed in the 2018 Annual Report for LCO (Golder, 2019b):

- Pressure transducers to be deployed as deep as possible to maximize submergence time.
- Reduce the sampling frequency from quarterly to bi-annual as seasonal trends become established, with sampling occurring during freshet between May and June when water levels are highest and during winter between November and February when water levels are lowest. Newly installed wells should be sampled quarterly for at least two years to evaluate seasonality.

The 2018 LCO SSGMP Update (Golder, 2019f) also identified data and recommendations in the SSGMP program. The following summarizes recommendations to be considered for improvement of the SSGMP at LCO:

- QA/QC performance to be reviewed so findings may be implemented in next years program for continuous improvement.
- Perform Mann-Kendall analysis on the water quality dataset to inform sampling frequency wells in the monitoring network.
- Continue using the data collection and analytical methods established in 2017 Annual Report (Golder, 2018).
- The number of wells sampled as part of the SSGMP in the Process Plant area should be reduced, with continued monitoring and sampling at LC\_PIZP1103 and LC\_PIZP1104, and continued water level monitoring (without sample collection) at LC\_PIZP1101 and LC\_PIZP1105. Substituting LC\_PIZP1104 for LC\_PIZP1101 in the RGMP should also be considered as concentrations of CI are higher in the latter.
- Installation of nested of monitoring well pairs (shallow and deep completed within overburden) should be considered at the following locations based on the trigger criteria specified below, which were not met in 2018.
- Downgradient of monitoring station LC\_LC4 on the edge of the Fording River floodplain where Line Creek may lose water to ground as it flows over sediments mapped as glaciofluvial within Study Area 5 of the RGMP. To be installed if concentrations of dissolved selenium and at least one other CI in groundwater from RGMP Study Area 7 well RG\_DW-02-20 show increasing trends by Mann-Kendall



analyses that cannot be explained by mixing between the Elk River and the valley-bottom aquifer, which would suggest a down-valley groundwater pathway from the Process Plant and/or Coarse Coal Rejects (CCR).

- Downgradient of the pond south of the Process Plant and CCR along a potential flowpath to the Elk River within its floodplain within Study Area 6 of the RGMP. To be installed if concentrations of dissolved selenium and at least one other CI in groundwater from RGMP Study Area 7 well RG\_DW-02-20 show increasing trends by Mann-Kendall analyses that cannot be explained by mixing between the Elk River and the valley-bottom aquifer, which would suggest a down-valley groundwater pathway from the Process Plant and/or CCR.
- Downgradient of monitoring station LC\_DC1 where Dry Creek flows over glaciofluvial sediments in the Fording River valley bottom, in Study Area 2 of the RGMP. To be installed if regional groundwater monitoring wells GH\_POTW10, GH\_POTW15, GH\_POTW17, and GH\_MW\_RLP-1D collectively show an increase in CI concentrations that cannot be explained by mixing between the Fording River and the valley-bottom aquifer and which suggest a down-valley groundwater pathway from Dry Creek.

#### **EVO SSGMP**

The following recommendations were developed in the 2018 Annual Report for EVO (SNC-Lavalin, 2019c):

- Ensure field and trip blanks are analysed for the same parameters to provide comprehensive comparisons.
- Ensure all parameters stabilize before sampling and avoid sampling if bubbles present in tubing.
- Ensure dataloggers are reinstalled after each sampling event to the specified depth. Reviewing data after each datalogger download would identify errors and allow for timely correction.
- Remove the nested well EV\_ER1gwS/D from the SSGMP and transition to RGMP as indicated in the 2018 SSGMP Update (SNC-Lavalin, 2019i).
- Evaluate whether newly-installed groundwater monitoring wells in the Michel Creek Valley should be included in SSGMP monitoring.
- Once approved, implement the 2018 SSGMP Update.

The 2018 EVO SSGMP Update (SNC-Lavalin, 2019i) also identified data and recommendations in the SSGMP program. The following summarizes recommendations to be addressed in the annual SSGMP report.

- Conduct hydraulic conductivity testing at EV series wells and subsequent data analysis.
- Deployment of data loggers at EV\_MW\_MC2B, EV\_MW\_MC1B, EV\_MW\_GT1B, and EV\_BC1B and upload data during quarterly monitoring and sampling. Conduct data reduction for use in reports.
- Discontinue monitoring and sampling at EV\_MCgwS and EV\_ECgw during Q1 as these locations are frozen.
- To address the gap of shallow groundwater quality in the vicinity of Goddard Creek Sedimentation Pond, complete desktop assessment. This gap was also identified in the RGMP. If necessary, conduct an intrusive investigation downgradient of the pond.
- To address the gap downgradient of the South Pit Sedimentation Pond, complete a desktop assessment. This gap was also identified in the RGMP. If necessary, conduct an intrusive investigation in an accessible area.
- To address the absence of continuous water level data and pumping rates for supply wells, pumping rates will be recorded and continuous water level data from nearby monitoring wells will be evaluated. If they are not suitable, additional monitoring wells may need to be installed adjacent to the supply well.



- As ongoing programs at EVO are completed, the current monitoring well network and surface water locations for the SSGMP should be re-evaluated and relevant locations should be included.
- Monitoring frequency should be reviewed on an annual basis to assess adequacy to address the seasonal variability and to address whether frequency should be reduced if little to no variability is observed.

#### **CMO SSGMP**

The following recommendations were included in the 2018 Annual Report for CMO (SRK, 2019b):

- Continue quarterly monitoring at all groundwater monitoring locations.
- Ensure that one travel blank is included in each sampling survey. This will help distinguish between sample contamination and laboratory error.
- Review sampling procedures to minimize potential contamination.
- Closely monitor parameters that appear to be increasing in certain wells. This includes fluoride in CM\_MW1-SH, barium in CM\_MW1-DP, and selenium in CM\_MW5-SH.

Recommendations included in the 2018 CMO SSGMP Update (SRK, 2018b) that were pertinent to future annual SSGMP reporting included the following:

- Continue monitoring as per the original groundwater monitoring plan (SRK, 2015a), except for the removal of analysis of total metals for groundwater samples.
- Install and monitor an additional shallow monitoring well downgradient of the Main Interceptor Sedimentation Ponds.
- Install and monitor an additional nested monitoring well downgradient of the Middle Mountain CCR.
- Monitor flow and water quality at four additional surface water stations along Michel Creek.

#### **RGMP**

The following recommendations were included in the 2018 Annual RGMP (SNC-Lavalin, 2019e):

- Once approved, implement the 2017 RGMP Update.
- Complete hydraulic conductivity testing at GH\_MW-RLP-1D.
- Monitor pumping rates and water levels in supply wells GH\_POTW09, GH\_POTW10, GH\_POTW15, and GH\_POTW17 at GHO upon completion of an assessment of the feasibility of installing dataloggers.
- A re-survey of the wells at CMO to top of pipe casing should be completed.
- If concentrations of CI at EV\_RCgw remain elevated, additional investigations may be required to determine the possible source and spatial extent of the elevated CI.
- Replace the reference well FR\_HMW5 as a reference well under the RGMP as mining activity may be influencing groundwater chemistry at this location. The installation of a suitable replacement well should follow a holistic review of background monitoring locations in the Elk Valley. In the meantime, FR HMW5 should continue to be monitored.



#### Monitoring and Sampling Procedures:

- When possible, collect samples at least 60 days after the last sampling event.
- For nested wells, monitor wells on the same day, one right after the other, and collect manual depth to groundwater measurements prior to purging either well rather than purging and sampling one well and then moving to the well pair.
- Implement the new data logger deployment procedures to ensure that continuous water level measurements are properly obtained from select monitoring wells.
- > Ensure all parameters stabilize before sampling and avoid sampling if bubbles present in tubing.
- Review sampling procedures to minimize potential contamination when collecting samples and handling field blanks.
- Field filter and preserve groundwater samples for analysis of dissolved metals and dissolved organic carbon (DOC).
- Ensure that one trip blank is included for each sampling event.
- Attempt to collect field and trip blanks from locations associated with both the RGMP and other associated programs (e.g., Site-specific Groundwater Monitoring Program and/or Regional Drinking Water Program).

Sample Submission, Analysis, and Quality Assurance/Quality Control (QA/QC):

- Analyze samples (including duplicates, trip, and field blanks) for parameters listed in the 2017 RGMP Update once approved.
- Continue discussions with the laboratory on the best procedures to minimize hold-time exceedances.
- Complete a QA/QC on laboratory results as they come in to identify hold-time and other errors that may arise in order to rectify them in the subsequent sampling event.

### **ENV Approval Letters**

RGMP and SSGMP updates were accepted with conditions listed in associated approval letters included in this Appendix.

### References

- Golder Associates Ltd., 2019b. *Line Creek Operations Site Specific Groundwater Monitoring: 2018 Annual Report.* Prepared for Teck Coal Limited. Dated March 2019.
- Golder, 2019f Golder Associates Ltd. 2019f. *Line Creek Operations Site Specific Groundwater Monitoring Program 2018 Update*. Prepared for Teck Coal Limited. Dated September 30, 2019.
- SNC-Lavalin Inc. 2019b. 2018 *Site-Specific Groundwater Monitoring Report Fording River Operations*. Prepared for Teck Coal Limited. Dated March 28, 2019.
- SNC-Lavalin Inc. 2019c. 2018 *Site-Specific Groundwater Monitoring Report Elkview Operations*. Prepared for Teck Coal Limited. Dated March 28, 2019.
- SNC-Lavalin Inc. 2019d. 2018 *Site-Specific Groundwater Monitoring Report Greenhills Operations.*Prepared for Teck Coal Limited. Dated March 28, 2019.
- SNC-Lavalin Inc. 2019e. 2018 *Regional Groundwater Monitoring Program Annual Report.* Prepared for Teck Coal Limited. Dated May 16, 2019.



- SNC-Lavalin Inc. 2019g. Fording River Operations Site-Specific Groundwater Monitoring Program 2018 Update. Prepared for Teck Coal Limited. Dated September 30, 2019.
- SNC-Lavalin Inc. 2019h. *Greenhills Operations Site-Specific Groundwater Monitoring Program 2018 Update*. Prepared for Teck Coal Limited. Dated September 30, 2019.
- SNC-Lavalin Inc. 2019i. *Elkview Operations Site-Specific Groundwater Monitoring Program 2018 Update*. Prepared for Teck Coal Limited. Dated September 30, 2019.
- SRK Consulting (Canada) Inc. 2015a. *Coal Mountain Operations Load Balance Model.* Prepared for Teck Coal Limited Coal Mountain Operations. SRK Project No. 1CT017.047. Dated June 2015.
- SRK Consulting (Canada) Inc. 2018b. Recommendations for Specialty Sampling of Teck's Groundwater Monitoring Wells to Support Assessment of Selenium and Nitrate Reduction in Groundwater for the Instream Sinks Program DRAFT. Memorandum prepared for Teck Coal Limited. Dated September 11, 2018.
- SRK Consulting (Canada) Inc. 2019b. 2018 Site Specific Groundwater Monitoring Annual Report: Coal Mountain Operations. Prepared for Teck Coal Limited. SRK Project No. 1CT017.215. Dated March 27, 2019.



## MINISTRY ASSESSMENT REPORT

**Report prepared by:** Sarah Alloisio, Hydrogeologist – Mining Date: April 2, 2019

**Statutory Decision Maker:** Doug Hill, Regional Operations Director - Mining

File:	107517	Tracking Number:	n/a
<b>Application type:</b>	2017 and 2018 Submission to fulfill the requirements of Sections 9.2.2, 9.2.2.1 and		
	10.4 in Permit 107517 – Fording River Operations Site-Specific Groundwater		
	Monitoring Program.		
Applicant:	Teck Coal Limited		

#### 1. Executive Summary

This Ministry Assessment Report describes the review and recommendations provided for the 2018 update of the Fording River Operations Site-Specific Groundwater Monitoring Plan (FRO SSGMP) and the 2017 Annual Report of the FRO SSGMP, which were submitted to fulfill the requirement of the Elk Valley Permit (107517). The requirements related to the 2018 Plan are included in Section 9.2.2 (Site-Specific Groundwater Monitoring) and 9.2.2.1 (Fording River) of PE107517 and in the conditions outlined in the Approval letter of the 2015 FRO SSGMP, dated April 18, 2017. The requirements related to the 2017 Annual report are included in Section 10.4 (Groundwater Reporting Requirements) of PE 107517.

The review concludes that the 2018 Plan does not meet several of the permit requirements and approval letter conditions, whereas the 2017 Annual Report meets the requirements. It is recommended that a revised 2018 Plan should be submitted, which fulfills the requirements and approval conditions where gaps have been identified, as shown in Table 1 and 2.

The data gaps identified and the recommendations provided in the 2018 Plan and the 2017 Annual Report are reasonable and should be implemented. Additional data gaps were identified in this review and additional recommendations are provided to address these gaps.

#### 2. Application Request

Approval of the Fording River Operations Site-Specific Groundwater Monitoring Plan (FRO SSGMP), dated October 31, 2018, and of the 2017 FRO Annual Report, dated March 31, 2018.



#### 3. Background Information

In April 2013, Coal Limited (Teck) submitted a site-wide groundwater Monitoring Plan (now SSGMP) for the Fording River Operations following a request from ENV (then Ministry of Environment). The 2013 plan was approved by ENV and included the requirement that a revised plan must be submitted to the Director for approval October 31, 2015 and every three years subsequently. In November 2014, ENV approved the Elk Valley Water Quality Plan and issued an area-based effluent permit (PE 107517) to Teck. Section 9.2.2 of PE 107517 requires Teck to develop and implement Site-Specific Groundwater Monitoring Programs (SSGMPs) for the five mining operations located within the boundaries of area considered under Permit 107517 – Fording River, Greenhills, Line Creek, Elkview and Coal Mountain. Section 9.2.2.1 includes the requirements related to the SSGMP for the Fording River Operations (FRO SSGMP). The first FRO SSGMP was submitted in October 2015 and ENV issued an Approval letter for the Program on April 18, 2017. The conditions included in the Approval Letter required the completion of a hydrogeological assessment to determine the suitability of the Greenhouse Wells and Potable Wells for monitoring, and to improve the characterization of the groundwater system within the alluvial fan in the Kilmarnock Creek drainage. The assessment was required to be submitted by September 30, 2017, and ENV received it on September 28, 2017. The updated version of the FRO SSGMP was due for submission on October 31, 2018, and ENV received it on that date. The 2017 FRO Annual Report was due for submission on March 31, 2018 and was received on that date.

#### 4. First Nations Consultation and ENV Review

The Ktunaxa Nation Council (KNC) was consulted during the review of the FRO SSGMP. KNC provided ENV with the review comments on the 2018 FRO SSGMP and on the 2017 Annual Report for the FRO SSGMP prepared by their QP (Waterline). The comments provided by KNC were carefully reviewed and accounted for in the preparation of this document.

#### 5. Technical Review

The following reports submitted to ENV by Teck Coal Limited (Teck) were reviewed to prepare this document:

- The approval letter dated April 18, 2017 containing the conditions for the 2018 FRO SSGMP update;
- Hydrogeological Assessment, Fording River Operations, Elkford, BC, dated September 28, 2017;
- The FRO Site-Specific Groundwater Monitoring program (FRO SSGMP) dated October 31, 2018:
- The 2017 FRO Site-Specific Groundwater Monitoring Annual Report, dated March 31, 2018;

The following documents provided by KNC were used to support the review:

 Hydrogeological Review, Fording River Operations Site-Specific Groundwater Monitoring Program, dated March 2019;



 Recommendations for the Elkview (EVO), Coal Mountain (CMO), Fording River (FRO), Green Hills (GHO) and Line Creek Operations (LCO) 2017 Annual Groundwater Reports, dated October 5, 2018.

## 5.1. Concordance of the 2018 FRO SSGMP and the 2017 GHO Annual report with Sections 9.2.2, 9.2.2.1 and 10.4 of Permit 107517

The FRO SSGMP was reviewed to identify whether and to what extent it satisfies the requirements of PE107517, Sections 9.2.2, 9.2.2.1 and 10.4. Concordance to the permit requirements is classified in Table 1 as complete (Y), partially complete (P) or absent (N). No comments are provided in Table 1 for the requirements fulfilled by the Plan.

Table 1 Concordance with PE 107517 requirements

PE 107517 Requirement	Assessment	Concordance
_	Section 9.2.2	
a. The Permittee must develop and implement a comprehensive groundwater monitoring program at each mine site, prepared by a qualified professional. This program must be conducted to the satisfaction of the Director and must include the following:		Y
i. Characterization of the groundwater system, aquifer characteristics (e.g., hydraulic conductivity and storativity), water quality and connectivity to the surface water system;	A characterization of the heterogeneity of the hydraulic properties in the overburden aquifers is missing, as is a description of groundwater-surface water connectivity and interaction (e.g. spatial distribution of gaining and losing reaches).	P
ii. Characterization of seasonal variability in the groundwater system (quality and quantity).		Y
a.3 Provision of a site specific conceptual model and the information necessary to support the development and verification of water quality predictions for the mine site. The site specific conceptual model shall be provided with the		Y



	T	
groundwater monitoring plan update on October 31,		
2018, and updated with		
subsequent revisions to the		
monitoring plan;		
a.4 Site specific numerical	Several numerical groundwater	
groundwater models may be	models have been developed by	
required to support	Qualified Professionals in the	
permitting activities.	field of Hydrogeology in the FRO	
Numerical models, where	area, in support of EA and permit	
required, must consider all	applications. These include the	
available, relevant	following:	
monitoring data (e.g.,	- Swift Pit EA model (Golder,	
groundwater and surface	2012);	
water monitoring, stream	- Turnbull South Pit EA model	
flow, and precipitation data)	(Golder, 2012);	
and be developed by a	- Lake Mountain Pit model	
Qualified Professional to	(Condition 2.13 of PE 424)	
meet the intended modelling	(OHGE, 2015-ongoing);	
purpose.	- Swift and Cataract Creek	Y
	Collection System Seepage	1
	models (AMEC, 2017-	
	ongoing);	
	- FRO AWTF-S intake,	
	Kilmarnock alluvial fan model	
	(Golder, 2018-ongoing).	
	These numerical models require	
	the development of a robust	
	underlying conceptual model to	
	be reliable prediction tools. The	
	conceptual models underlying the	
	existing numerical models would	
	inform the Conceptual Site Model	
	for the FRO area if they were	
	integrated with it.	
	Fording River Operations	<u> </u>
b. Groundwater monitoring		
must be conducted in		
accordance with the		
approved plan, dated April		
4, 2013 with addendum		
dated January 2, 2014. A		
revised plan must be		N/A
submitted to the Director for		
approval October 31, 2015		
and every 3 years		
subsequently. The Permittee		
must respond within 30 days		
to comments/requests made by the Director on the		
by the Director on the		



	submission until the		
	Director is satisfied with the		
	submission.	water Reporting Requirements	
c	A map of monitoring	water Reporting Requirements	
٠.	locations with		
	Environmental Monitoring		Y
	Stations (EMS) and		
	Permittee descriptors;		
d.	Cross-Sections showing well	Well stratigraphy is missing from	
	installation details	the cross-section, so that	
	stratigraphy, groundwater	consistency with the extent of the	
	elevations, and flow. Cross-	hydrogeological units represented	Y/P
	sections should be in the	on the cross-section cannot be	
	direction of groundwater flow and perpendicular to	assessed.	
	groundwater flow;		
e.	Drawings showing locations		
	and water quality data of		* 7
	groundwater sampling		Y
	points;		
f.	A summary of background		
	information on that year's		
	program, including a		Y
	discussion of the program		
	modifications relative to previous years;		
a	A summary of measured		
8.	parameters, including		
	appropriate graphs and		
	comparison of results to		
	Approved and Working		Y
	Water Quality Guidelines, or		
	other criteria and		
	benchmarks as specified by		
,	the Director;		
n.	If applicable, a summary of exceedances of screening		Y
	benchmarks;		I
i.	Evaluation and discussion of		
	spatial patterns and		Y
	temporal trends;		-
j.	A summary of all QA/QC		V
	issues during the year; and,		Y
k.	Recommendations for		
	further study or measures to		Y
	be taken.		



#### 5.2. Concordance of the 2018 FRO SSGMP with the 2017 Approval Conditions

The 2018 FRO SSGMP was reviewed to identify whether and to what extent it satisfies the conditions included in the Approval Letter of April 18, 2017 (conditions a to h in the table below). Concordance to the conditions of the Approval Letter is classified in Table 2 as complete (Y), partially complete (P) or absent (N).

Table 2 – Concordance of 2018 FRO SSGMP with conditions of Approval Letter

	Condition (Approval Letter April 18, 2017)	Assessment	Concordance
a.	An evaluation of the appropriateness and adequacy of the use of the Greenhouse Wells and the Potable Wells in the SWGMP must be completed. The evaluation must include any further work that is required to fill remaining gaps and, if necessary, timelines associated with future drilling and monitoring well installations or other programs needed to fill the gaps.	No individual access point to the Potable Wells is present to allow measurement of groundwater levels and no indication of further work to address this gap is provided.	Y/P
b.	Available additional data from previous drilling programs (including the 2015 Active Water Treatment Plant drilling) must be compiled and reviewed by a Qualified Professional to evaluate if existing studies provide the necessary information to understand groundwater influences from the Kilmarnock Creek drainage. If information gaps remain, a plan (locations, depth, rationale, etc.) for the completion of additional groundwater investigations in the alluvial fan of the Kilmarnock Creek drainages will be included in the review, along with timelines for the completion of the investigations.	An improved characterization of the groundwater system in the Kilmarnock Creek drainage is provided. The characterization is based on the 2017 Hydrogeological Assessment, which integrated the information obtained from all the monitoring wells drilled prior to September 2017, including those completed in 2015 for the Active Wastewater Treatment Facility – South (FRO AWTF-S) Geotechnical Evaluation and Residuals Landfill Drilling, and those included in the FRO SSGMP. The additional hydrogeological investigation and numerical groundwater modelling conducted in 2018 for the relocation of the FRO AWTF-S intake in Kilmarnock Creek has led to a much improved characterization of the groundwater system. This improved understanding has not yet been incorporated in the conceptual model for the Kilmarnock Creek drainage, but work is ongoing.	Y/P
c.	Groundwater samples used for	This requirement is met for most samples. Due	Y/P



the groundwater monitoring program are obtained from individual groundwater monitoring wells with known construction details and screen depths, unless otherwise documented by a Qualified Professional as to how monitoring program objectives are met from other selected sampling wells. Documentation must include supporting rationale and data limitations.	to lack of access to individual wells, composite groundwater samples are collected from the Potable wells (FR_POTWELLS).	
d. A discussion of the effects of FRO's dewatering management strategy may have on on-site transport of contaminants and groundwater flow regimes.	Section 4.10.1 of the 2018 FRO SSRGMP indicates how the water collected in the current pits at FRO will be managed (decanted in ponds, used as make-up water in the Process Plant, treated and/or discharged to the receiving environment). Section 4.10.1.1 states that only the Turnbull South and Swift Pit are expected to act as local groundwater sinks and may have local effects on baseflow in Fording River and tributaries. However, no rationale is provided for considering only the Turnbull and Swift Pit as groundwater sinks. For example, the Lake Mountain Pit will also be excavated below the elevation of the Fording River and the water table, so it would potentially reduce the baseflow in Fording River. Also, no estimates of the maximum groundwater pit inflow and cone of drawdown are provided. No assessment is made on the effect of the pit water management strategy on the on-site transport of contaminants. The only consideration related to changes in water quality resulting from the pit water management strategy is that decanting of pit water in the sedimentation ponds will act as pre-treatment by reducing the Total Suspended Solids (TSS) load.	P
e. A description of on-site contaminant sources along with the potential contaminants of concern. Notation of potentially acid generating wastes is required, since they have more potential to change over time.		Y
f. Identification of key areas for additional groundwater		Y



	monitoring and data gap and uncertainty analysis completed for those key areas.		
g.	Cross section drawings that include well details, and groundwater and surface water levels at an appropriate scale to allow for visual interpretation.	Additional cross-sections should be developed in the Fording River valley bottom north of the South Tailings Pond, in the Kilmarnock Creek and Henretta Creek watersheds (see Table 1, point <i>d</i> .). A larger vertical scale should be used in cross-sections AA' (Drawing 659042-006) and CC' (Drawing 659042-008) and the range of minimum and maximum elevation displayed on the vertical axis of the cross-section should be reduced to be only slightly greater than the interval between the minimum and maximum elevation of the cross-sections.	P
h.	If and where required to inform management trigger response, triggers must be developed using the framework outlined under the Regional Groundwater Monitoring Program.	As stated in Section 6.8 of the 2018 FRO SSGMP, groundwater triggers have not yet been developed within the framework of the RGMP, and triggers applying to FRO will be considered through the ongoing development in the RGMP. As such, this requirement is presently not applicable.	N/A

#### 5.3. Data Gaps

The 2018 FRO SSGMP identifies the areas where additional monitoring activities and installation of new wells are required to address data gaps. An updated proposed groundwater monitoring network for FRO and the rationale for the well selection is summarized in Table U of the 2018 FRO SSGMP.

The review of the data gaps and selected additional wells is summarized in Table 3. No comments are included where the recommendations are considered acceptable.

Table 3 – Review of data gaps and selected existing wells

Study Area	Data Gap (from 2018 FRO	Selected well(s) and	Review comment	
	SSGMP)	rationale		
	Henrett	a Valley		
Background	It is uncertain as to how representative reference monitoring well FR_HMW5 is as a background well. Excluding the anomalous result from Q2 2017, concentrations of dissolved selenium in groundwater at this location were greater than the detection limit for four out of the ten sampling events in the last three years. Concentrations of sulphate have also been increasing suggesting a possible mine influence as the Henretta spoils are approximately 140 m away.	This gap will be filled by continued monitoring to evaluate the significance of this trend. Evaluation of this well as an appropriate reference well should be conducted under the RGMP.	The increasing trend in sulphate concentration over the last three years indicate that this well is likely affected by the mining activities in the Henretta watershed, and is therefore not representative of background conditions.	
	Fording River Valley			
Fording River	Monitor seepage and attenuation	Add wells FR_TBSSMW-1		



valley	downgradient of Turnbull spoil and	and FR_TBSSMW-2 to the	
	Henretta Ridge and provide more	monitoring network.	
	understanding of groundwater-surface		
	water interactions in Fording River valley		
	bottom.		
	Monitor groundwater quality	Add wells FR_GCMW-1B	
	downgradient of Clode Creek and Clode	and FR_GCMW-2	
	Settling Pond as a number of potential		
	sources and transport pathways to		
	groundwater were identified.		
Kilmarnock	Monitoring of the effects of mine-	SNC-Lavalin recommended	
Creek	influenced Kilmarnock Creek on shallow	adding existing monitoring	
	groundwater quality has only just begun.	well FR_TT43 to the	
	Localized groundwater flow regime,	SSGMP in 2017 and	
	including horizontal and vertical	additional wells are being	
	gradients in the fan, is unknown. Deep	drilled. Once these wells are	
	groundwater quality downgradient of the	completed, monitoring and	
	fan in the Fording River valley bottom is	sampling data should be	
	unknown.	reviewed to evaluate if	
		these wells would be	
		suitable for monitoring in	
		the SSGMP to fill the data	
		gap. Additional wells will be	
		drilled between FR_09-01-	
		A/B and FR_GHHW to	
		evaluate deep groundwater	
		quality and vertical	
		gradients downgradient of the alluvial fan. New wells	
		will be evaluated for	
		possible inclusion in the	
		SSGMP to fill data gap.	
Greenhouse	The RGMP identified the spatial extent of	These gaps will be filled	
Wells	the coarse-grained aquifer intercepted at	through additional studies	
(FR_GHHW)	the Greenhouse Wells, as well as the	planned in the RGMP. Once	
(I K_GIIII W)	spatial extent of the down-valley	wells are completed, they	
	groundwater transport of CI in	will be evaluated for	
	Study Area 1, as gaps in the RGMP	possible inclusion	
	program. A down-valley groundwater	in the SSGMP.	
	transport pathway was identified in the		
	Fording River valley bottom to the east of		
	the Fording River.		
PAG Materials	Little recent information is available	This gap will be filled by	
	regarding PAG	FROS ARD/ML	
	material at FRO. An ARD/ML	management plan that is	
	management plan	currently under	
	should be considered in the next FRO	development.	
	SSGMP		
1	annual report.		

Additional data gaps were identified during the review, which are not included in the 2018 Plan. These are as follows:

- Background conditions in Fording River upgradient of mining activities.
- Groundwater pathway downgradient of Henretta Spoils, to confirm whether high CI concentrations are localized in the area of Henretta Spoils and the Henretta backfilled pits.
- Groundwater characterization in Kilmarnock watershed between the toe of the spoils and the confluence with Fording River.



• Groundwater characterization in the Swift and Cataract Creek watersheds.

#### 6. Recommendations

#### 6.1 Permittee's Recommendations

The key recommendations provided in the 2018 FRO SSGMP are described in Table 3, with other recommendations related to monitoring methodology, included in Section 6 of the Plan.

The 2017 Annual Report also includes recommendations, which pertain to the implementation of field practices, such as field filtering of dissolved metals and dissolved organic carbon samples and collection of duplicate samples from the wells with higher CI concentrations instead of the reference well (FR\_HWM5).

These recommendations are helpful to increase the understanding the groundwater pathway in the FRO area and should be implemented in the monitoring program.

#### 6.2 ENV Recommendations

In addition to the recommendations provided by Teck, the following should also be implemented:

#### 2018 FRO SSGMP

The 2018 FRO SSGMP does not meet several of the requirements under PE 107517 and the 2018 Approval Letter. As such, a revised 2018 FRO SSGMP should be submitted, which fulfills the requirements where these are indicated as incomplete on Table 1 and 2. Specifically, the revised Plan should include the following:

- Characterization of heterogeneity of hydraulic properties and spatial differences in surface water groundwater interaction.
- Assessment of the effect of pit dewatering on the groundwater flow pattern, baseflow and movement of contaminants along the groundwater pathway.
- Develop cross-sections in the Fording River valley bottom north of the Tailings South Pond, in the Henretta watershed. Cross-sections should be developed parallel and perpendicular to the main direction of groundwater flow.

The revised 2018 FRO SSGMP should be submitted by September 30, 2019.



#### 2017 Annual Report for the FRO SSGMP

The 2017 Annual Report for the FRO SSGMP meets the permit requirements and no revised version needs to be submitted.

#### 2018 Annual Report for the FRO SSGMP

The 2018 Annual Report should be updated as follows:

- The borehole logs of all the wells included in the updated monitoring network should be included as an appendix to the reports.
- The surface water level data and precipitation rates should be plotted on the groundwater level plots so to facilitate the interpretation of surface water-groundwater interaction.
- Pumping rates should be plotted along with groundwater levels in the pumping wells that are used for monitoring, so to determine when level fluctuations are mainly due to pumping.
- Review the groundwater elevation logger data at FR\_HMW1S and FR\_HMW1D, as the time plots show abrupt changes between August 2016 and October 2017, which may lead to misrepresentative vertical gradients. Correct the automated data where appropriate, to be consistent with the groundwater level manual measurements.
- Outline the watershed divides of all the sub-catchments located in the FRO permitted area.
- Outline the losing and gaining reaches of the Fording River and tributaries, where these can be inferred, on the map showing groundwater level contours.
- Add maps showing the potential sources and pathways identified for each sub-catchment.
- Add well stratigraphy on the cross-sections, so that concordance with the hydrogeological units represented on the cross-sections can be assessed.
- Use the Kendall Test to identify trends in the CI concentration time series.
- Add former monitoring well FR\_HMW4 on the map (labelled differently from the current wells), so that historical data collected from this well can support interpretation.

The 2018 Annual Report should also be accompanied by the delivery of the following:

All the raw groundwater quality and quantity data and metadata presented in the reports in MS
Excel table format. Draft templates for the data tables should be submitted for review and
approval by ENV prior to delivery. The templates should be developed to allow ENV staff to



conduct effectively independent interpretation and analysis (e.g. graphical representation, pivot table generation, determination of statistical indicators).

 Lithological logs and installation diagrams of new monitoring wells should be uploaded to the BC GWELLS database.

#### 2021 FRO SSGMP

#### Field activities

The following field activities should be conducted to support the 2021 update of the FRO SSGMP:

- Install a well upgradient of FR\_HWM5 that is not affected by mining and is suitable to monitor background conditions. The increase in sulphate concentrations observed in FR\_HWM5 indicate that this well is most likely affected by the Henretta spoils, and is therefore not representative of background water quality. This well should be included in both the FRO SSGMP and RGMP.
- Install a well in the Fording River valley bottom upgradient of the confluence with Henretta Creek and of all mining activities, to monitor background conditions for the Fording River. This well should be included in both the FRO SSGMP and RGMP.
- Install a monitoring well between FR\_HWM1S/D and the confluence of Henretta Creek and Fording River to confirm whether the contamination detected in the wells installed in the backfilled pits is localized or is transported downstream.
- Confirm whether the Potable Wells are adequate for monitoring, by determining whether
  groundwater quality at this location may be affected by enhanced leakage from the Fording River
  induced by pumping. If the wells are confirmed to be adequate for monitoring, install a
  monitoring well near the Potable Wells to allow sampling from an individual well instead of
  collecting composite samples from the well cluster.
- Add to the monitoring network one of more wells among those installed in 2018 in the Kilmarnock Creek alluvial fan. Pressure transducers should be installed in the wells indicated in Section 6.2.1, and also in wells in the Kilmarnock watershed.
- Add to the monitoring network one or more wells among those installed in the Swift Creek and Cataract Creek watersheds in relation to the Swift pit project. This would also fulfill Condition 1 of the Approval letter for the Greenhills Operations (GHO) SSGMP dated June 14, 2016.
- Retain the pH lab analysis, as the difference between the field and lab pH is an indication of the corresponding reduction in alkalinity in the sample from the time of collection. This allows the identification of samples where alkalinity is underestimated.



These field activities should be implemented by September 30, 2019, so that the additional six months of monitoring data collected in the extended program can be included and interpreted in the 2019 Annual Report for the FRO SSGMP, which will be submitted by March 31, 2020.

#### Conceptual Model

The 2021 FRO SSGMP should also include an update of the Conceptual Model, by integrating the results of the studies that are currently ongoing, such as the Kilmarnock groundwater study in support of the FRO-South Active Water Treatment Facility intake/outfall application and the in-stream sink studies on groundwater loss conducted in the Kilmarnock watershed.

#### *Integration with the AMP and TMP*

The 2021 FRO SSGMP should integrate with the Adaptive Management Plan (AMP) and the Tributary Management Plan (TMP) as follows:

- Define groundwater triggers for the FRO area based on those that will be developed in the AMP and implemented in the Regional Groundwater Monitoring Plan.
- Incorporate the changes introduced in the 2019 AMP (e.g. consideration of the effect of groundwater discharge to streams on calcite development, according to Main Question 4 in the AMP).
- Consider the installation of additional monitoring wells to support the characterization of surface water groundwater interaction in the tributaries selected in the 2020 TMP that are likely groundwater-fed (e.g. Fish Pond Creek).

The integration of the regional and site-specific groundwater monitoring programs with the AMP and TMP should also be based on the outcome of the upcoming Groundwater Working Group meetings.

#### **Groundwater Working Group Meetings**

The Groundwater Working Group (GWG) established October 2016 should continue to provide guidance for groundwater programs. The Groundwater Working Group will consist of members from Teck Coal Limited (Teck), the Ktunaxa Nation Council (KNC), Ministry of Environment and Climate Change Strategy (ENV) and Interior Health (IH), and may expand to include participants from Ministry of Energy and Mines (MEM) and Ministry of Forest, Lands and Natural Resource Operations (FLNRO). The frequency of GWG meetings should be increased from one to at least two per year, so that discussions and management decisions can respond more readily to the changes in environmental conditions, mine operations and plans occurring in the Elk Valley, including the Fording River Operations.



Should you have any questions about the above, please contact me at 604-582-5277 or Sarah.Alloisio@gov.bc.ca.

Sincerely,

Sarah Alloisio Ph.D, P.Geo.

Hydrogeologist - Mining Operations, ENV

Cc: Jeanien Carmody-Fallows, Section Head, Authorizations, Mining Operations, ENV



## MINISTRY ASSESSMENT REPORT

**Report prepared by:** Sarah Alloisio, Hydrogeologist – Mining Date: April 2, 2019

**Statutory Decision Maker:** Doug Hill, Regional Operations Director - Mining

File:	107517	Tracking Number:	n/a	
Application type:	2017 and 2018 Submission to fulfill the requirements of Sections 9.2.2, 9.2.2.1 and			
	10.4 in Permit 107517 – Greenhills Operations Site-Specific Groundwater			
	Monitoring Program.			
Applicant:	Teck Coal Limited			

#### 1. Executive Summary

This Ministry Assessment Report describes the review and recommendations provided for the 2018 update of the Greenhills Operations Site-Specific Groundwater Monitoring Plan (GHO SSGMP) and the 2017 Annual Report of the fro SSGMP, which were submitted to fulfill the requirement of the Elk Valley Permit (107517). The requirements related to the 2018 Plan are included in Section 9.2.2 (Site-Specific Groundwater Monitoring) and 9.2.2.2 (Greenhills) of PE107517 and in the conditions outlined in the Approval letter of the 2014 GHO SSGMP, dated June 16, 2016. The requirements related to the 2017 Annual report are included in Section 10.4 (Groundwater Reporting Requirements) of PE 107517.

The review concludes that the 2018 Plan does not meet several of the permit requirements and approval letter conditions, whereas the 2017 Annual Report meets the requirements. It is recommended that a revised 2018 Plan should be submitted, which fulfills the requirements and approval conditions where gaps have been identified, as shown in Table 1 and 2.

The data gaps identified and the recommendations provided in the 2018 Plan and the 2017 Annual Report are reasonable and should be implemented. Additional data gaps were identified in this review and additional recommendations are provided to address these gaps.

#### 2. Application Request

Approval of the Greenhills Operations Site-Specific Groundwater Monitoring Plan (GHO SSGMP), dated October 31, 2018 and of the 2017 GHO Annual Report, dated March 31, 2018.

#### 3. Background Information



In May 2014, Coal Limited (Teck) submitted a site-wide groundwater Monitoring Plan (now SSGMP) for the Greenhills Operations following a request from ENV (then Ministry of Environment). The 2014 plan was approved by ENV on June 14, 2016, and included the requirement that a revised plan must be submitted to the Director for approval October 31, 2018 and every three years subsequently. In November 2014, ENV approved the Elk Valley Water Quality Plan and issued an area-based effluent permit (PE 107517) to Teck. Section 9.2.2 of PE 107517 requires Teck to develop and implement Site-Specific Groundwater Monitoring Programs (SSGMPs) for the five mining operations located within the boundaries of area considered under Permit 107517 – Fording River, Greenhills, Line Creek, Elkview and Coal Mountain. Section 9.2.2.2 includes the requirements related to the SSGMP for the Greenhills Operations (GHO SSGMP). The two conditions included in the Approval Letter for the 2014 GHO Plan required (1) completing the well installations described in the letter from Teck to ENV, dated December 5, 2014 with the revisions described in the email from Jim Thorner to ENV, dated December 7, 2015; and (2) include updated cross-sections in the GHO Annual Reports as the drilling program and understanding of hydrogeology advances. The updated version of the GHO SSGMP was due for submission on October 31, 2018, and ENV received it on that date. The 2017 GHO Annual Report was due for submission on March 31, 2018 and was received on that date.

#### 4. First Nations Consultation and ENV Review

The Ktunaxa Nation Council (KNC) was consulted during the review of the GHO SSGMP. KNC provided ENV with the review comments on the 2018 GHO SSGMP and on the 2017 Annual Report for the GHO SSGMP prepared by their QP (Waterline). The comments provided by KNC were carefully reviewed and accounted for in the preparation of this document.

#### 5. <u>Technical Review</u>

The following reports submitted to ENV by Teck Coal Limited (Teck) were reviewed to prepare this document:

- The approval letter dated June 16, 2016 containing the conditions for the 2018 GHO SSGMP update;
- The GHO Site-Specific Groundwater Monitoring program (GHO SSGMP) dated October 31, 2018:
- The 2017 GHO Site-Specific Groundwater Monitoring Annual Report, dated March 31, 2018;

The following documents provided by KNC were used to support the review:

- Hydrogeological Review, Greenhills Operations Site-Specific Groundwater Monitoring Program, dated March 2019;
- Recommendations for the Elkview (EVO), Coal Mountain (CMO), Greenhills (GHO), Fording River (FRO) and Line Creek Operations (LCO) 2017 Annual Groundwater Reports, dated October 5, 2018.



## 5.1. Concordance of the 2018 GHO SSGMP and the 2017 GHO Annual report with Sections 9.2.2, 9.2.2.2 and 10.4 of Permit 107517

The GHO SSGMP was reviewed to identify whether and to what extent it satisfies the requirements of PE107517, Sections 9.2.2, 9.2.2.2 and 10.4. Concordance to the permit requirements is classified in Table 1 as complete (Y), partially complete (P) or absent (N). No comments are provided in Table 1 for the requirements fulfilled by the Plan.

Table 1 Concordance with PE 107517 requirements

PE 107517 Requirement	Assessment	Concordance
	Section 9.2.2	
a. The Permittee must develop and implement a comprehensive groundwater monitoring program at each mine site, prepared by a qualified professional. This program must be conducted to the satisfaction of the Director and must include the following:		Y
i. Characterization of the groundwater system, aquifer characteristics (e.g., hydraulic conductivity and storativity), water quality and connectivity to the surface water system;	A characterization of the heterogeneity of the hydraulic properties in the overburden aquifers based on depositional mechanisms and the hydraulic test results is missing, as is a description of groundwater-surface water connectivity and interaction (e.g. spatial distribution of gaining and losing reaches).	P
ii. Characterization of seasonal variability in the groundwater system (quality and quantity).		Y
iii. Provision of a site specific conceptual model and the information necessary to support the development and verification of water quality predictions for the mine site. The site specific conceptual model shall be provided with the groundwater monitoring plan update on October 31, 2018, and updated with		Y



	1	
subsequent revisions to the		
monitoring plan;		
iv. Site specific numerical	No numerical groundwater	
groundwater models may be	models have been developed to	
required to support	date in the GHO area	
permitting activities.		
Numerical models, where		
required, must consider all		
available, relevant		37/4
monitoring data (e.g.,		N/A
groundwater and surface		
water monitoring, stream		
flow, and precipitation data)		
and be developed by a		
Qualified Professional to		
meet the intended modelling		
purpose.	2 Consequentially One of the	
	2 Greenhills Operations	
Groundwater monitoring must		
be conducted in accordance		
with a plan approved by the		
Director. The Greenhills		
Operations Site Wide		
Groundwater Monitoring		
program has been submitted to the Director. The Permittee		
		N/A
must respond within 30 days to comments/requests made by		N/A
the Director on the submission		
until the Director is satisfied		
with the submission.		
A revised plan must be		
submitted to the Director		
October 31, 2018 and every 3		
years subsequently.		
	lwater Reporting Requirements	
a. A map of monitoring		
locations with		
Environmental Monitoring		Y
Stations (EMS) and		-
Permittee descriptors;		
b. Cross-Sections showing well	Well stratigraphy is missing from	
installation details	the cross-section, so that	
stratigraphy, groundwater	consistency with the extent of the	
elevations, and flow. Cross-	hydrogeological units represented	
sections should be in the	on the cross-section cannot be	Y/P
direction of groundwater	assessed.	
flow and perpendicular to		
groundwater flow;		
c. Drawings showing locations		Y
	i	<u> </u>



	and water quality data of groundwater sampling points;	
d.	A summary of background information on that year's program, including a discussion of the program modifications relative to previous years;	Y
e.	A summary of measured parameters, including appropriate graphs and comparison of results to Approved and Working Water Quality Guidelines, or other criteria and benchmarks as specified by the Director;	Y
f.	If applicable, a summary of exceedances of screening benchmarks;	Y
g.	Evaluation and discussion of spatial patterns and temporal trends;	Y
h.	A summary of all QA/QC issues during the year; and,	Y
i.	Recommendations for further study or measures to be taken.	Y

#### 5.2. Concordance of the 2018 GHO SSGMP with the 2016 Approval Conditions

The 2018 GHO SSGMP was reviewed to identify whether and to what extent it satisfies the conditions included in the Approval Letter of June 14, 2016 (conditions 1 and 2 in Table 2 below). Concordance to the conditions of the Approval Letter is classified in Table 2 as complete (Y), partially complete (P) or absent (N).

Table 2 – Concordance of 2018 GHO SSGMP with conditions of Approval Letter.

Condition (Approval Letter	Assessment	Concordance
June 14, 2016)		
Condition 1		
a. Drill one well below the	Monitoring well GH_MW_TD was installed on	
Tailings Pond (to monitor	November 21, 2014. However, this well was	
groundwater quality	installed under more than 30 m of till and is	P
downgradient of the Tailings	artesian, so it is not adequate to potential	
Pond and identify potential	contamination from seepage in shallow	



	impacts from pond seepage).	permeable deposits acting as a groundwater pathway.	
b.	Drill the West Seep well along Greenhills Creek (to monitor potential impacts from CCR and Plant).	Monitoring well pair GH_MW-GHC-1S/D (screened in silty gravel and bedrock) was installed in 2014.	Y
c.	Drill one well near the confluence of Thompson Creek and Elk River (to allow comparison of groundwater and surface water chemistry and levels with nearby station ER1a).	Monitoring well GH_MW-ERSC-1 (screened at the overburden/bedrock contact) was installed in 2014.	Y
d.	Drill the upper Thompson Creek well (to assess potential impacts from the Rosebowl spoil).	Monitoring well pair GH_MW-UTC-1S/D (1S screened in clay and bedrock and 1D screened in bedrock) was installed in 2016. Both wells were installed in low-conductivity units and are therefore unsuitable for monitoring.	Р
e.	Drill one well near the Rail Loop (to assess potential impact of the coal storage area on the nearby aquifer).	Monitoring well GH_MW-RLP was installed in the Rail Loop area in 2015, and was replaced by well GH_MW-RLP-1D (screened to 80 m bgs) in 2016. However, this well is unsuitable to monitor potential contamination in the shallow sand and gravel unit.	P
f.	Drill the Upper Hawk Spoil well (to assess any potential impacts of the legacy Hawk and east Spoil on groundwater in the upper Greenhills Creek watershed)	The well was not drilled because its proposed location was inaccessible due to a landslide that occurred from the East Spoil in Nov-Dec 2014. It is not known whether this area is currently accessible and another borehole location has been identified.	P
	Drill three wells to the east of the GHO area in the Swift Creek, Cataract Creek and Porter Creek watersheds. (to assess potential impacts of operations at Greenhills on groundwater in the eastern catchments)	Monitoring well GH_MW-PC (screened in sand, silt and bedrock) was installed near Porter Creek Sediment Pond on September 2, 2016. However, this well is likely unsuitable for monitoring since it is screened across the overburden-bedrock interface and the screen extends above the measured groundwater level in the well. No wells have been installed in the Swift Creek and Cataract Creek watersheds.	P
C	ondition 2		N/A
So the	rovide cross-sections to satisfy ection 10.4 of Permit 107517 as ne drilling program and nderstanding of hydrogeology dvances	Well stratigraphy is missing from the cross- section, so that consistency with the extent of the hydrogeological units represented on the cross-section cannot be assessed.	Y/P

### 5.3. Data Gaps



The 2018 GHO SSGMP identifies the areas where additional monitoring activities and installation of new wells are required to address data gaps. An updated proposed groundwater monitoring network for GHO and the rationale for the well selection is summarized in Table T of the 2018 GHO SSGMP.

The review of the data gaps and selected additional wells is summarized in Table 3. No comments are included where the recommendations are considered acceptable.

Table 3 – Review of data gaps and selected existing wells

Study Area	Data Gap (from 2018 GHO	Selected well(s) and	Review comment			
	SSGMP)	rationale				
Elk River Valley						
Mickelson Pond	No groundwater monitoring in the valley bottom downgradient of the pond, which has the potential for mine-contact water to infiltrate to ground.	Groundwater in this area is currently being assessed as part of the GHO Mine Life Extension. A drilling investigation is planned as part of that project. Once wells are completed, data would be reviewed to evaluate which wells would be suitable for monitoring in the SSGMP.				
Leask Pond	No deep groundwater data as GH_GA-MW-4 is a shallow water table well. No continuous water level data exists for this well, which appears to be under the influence of surface water.	Groundwater in this area will be studied in the Elk River Side Channel LAEMP; results from this study would be reviewed to assess whether the data gap for deep groundwater still exists. If so, the gap would be filled by the installation of a deep monitoring well at this location. Data loggers for continuous water levels specified in SSGMP.				
Wolfram Pond	No shallow groundwater data as GH_GA-MW-2 is a deep well with a number of overlying clay units.	Groundwater in this area will be studied in the Elk River Side Channel LAEMP; results from that study would be reviewed to assess whether a gap still exists. If so, the gap should be filled by the installation of a shallow monitoring well at this location.				
Elk River Side Channel	Geochemical mechanism for the year- round 40% attenuation of selenium and nitrate in the Elk River valley bottom is unknown but suspected to be related to attenuation in groundwater.	An in-stream sinks study as part of the RWQM is currently underway.				
North of GH_GA-MW- 1	Groundwater conditions to the north of this location are unknown and will need to be understood to develop and understanding of effects of the GHO Mine Life Extension Project on groundwater.	Baseline studies in this area are currently underway and gaps will be identified as part of these studies. A drilling investigation and monitoring well installation	Well GH_GA-MW-1 is installed in very low-conductivity material and is unsuitable for monitoring. No understanding of groundwater – surface water			



South of Thompson Creek	No groundwater data exist to the west of the Tailings Storage Facility (TSF) area.	is planned as part of the baseline studies. Once wells are completed, data would be reviewed to evaluate which wells would be suitable for monitoring in the SSGMP.  TSF is not a significant source of CI; however, this potential pathway may need to be evaluated for any future developments in this area, and if necessary, through the installation of monitoring wells west of the	interaction at the location of GH_ER2 is possible, since no wells are currently installed near this station.
		TSF.	
		iver Valley	1
Porter Creek drainage	No continuous water level data for GH-MW-PC, a well that appears to be under influence of surface water. High turbidity in this well has been identified as an issue during sampling.	Data logger for continuous water levels specified in SSGMP. The well should be redeveloped to remove fines from the formation; however, if Teck suspects the integrity of the well is compromised, it should be decommissioned and reinstalled in a suitable location.	GH-MW-PC is screened across the overburden-bedrock contact and the measured groundwater level is below the top of the screened interval, so the well is unsuitable for monitoring.
Greenhills Creek	No continuous water level data for GH_MW-TD	Data logger and hydraulic conductivity testing specified in SSGMP.	GH_MW-TD is drilled mostly in till and screened at approximately 30 mbgs, so it is unsuitable to monitor potential impacts from the TSF on the shallow sediments discharging to the Fording River.
Rail Loop	No hydraulic conductivity data for GH_MW-RLP-1D	Hydraulic conductivity testing specified in SSGMP.	GH_MW-RLP-1D is screened below thick layers of clay and till, so it unsuitable to monitor the potential impacts of the Rail Loop Sediment Pond on the shallow sand and gravel sediments discharging to the Fording River.
Fording River	No continuous water level data in supply wells	Data logger for continuous water levels specified in SSGMP.	No pumping rates recorded at the supply wells that are used for monitoring.

Additional data gaps were identified during the review, which are not included in the 2018 Plan. These are as follows:

- No monitoring wells are installed in the provincially mapped Aquifer 1056, which is located in the Elk River valley bottom fluvial sediments and in hydraulic connection with the river.
- No wells are installed in the Swift and Cataract Creek watersheds, to monitor for potential impacts from the North and Connector Spoils.



# 6. Recommendations

# 6.1 Permittee's Recommendations

The key recommendations provided in the 2018 GHO SSGMP are described in Table 3, with other recommendations related to monitoring methodology, included in Section 6 of the Plan.

The 2017 Annual Report also includes recommendations, which pertain to the list of analytes, sampling frequency, hydraulic testing at monitoring wells where these tests have not been carried out.

These recommendations are helpful to increase the understanding the groundwater pathway in the GHO area and should be implemented in the monitoring program.

#### 6.2 ENV Recommendations

In addition to the recommendations provided by Teck, the following should also be implemented:

# 2018 GHO SSGMP

The 2018 GHO SSGMP does not meet several of the requirements under PE 107517 and the 2016 Approval Letter. As such, a revised 2018 GHO SSGMP should be submitted, which fulfills the requirements where these are indicated as incomplete on Table 1 and 2. Specifically, the revised Plan should include the following:

- Characterization of heterogeneity of hydraulic properties and spatial differences in surface water groundwater interaction.
- Replace monitoring well\_GH\_MW\_TD with a well completed in the shallow sediments that is suitable to monitor potential impacts of the Tailings Pond.
- Replace wells\_GH\_MW-UTC-1S/D with a well pair installed in the sand and gravel sediments discharging into Thompson Creek to monitor potential impacts of Rosebowl Spoil.
- Replace well GH\_MW-RLP-1D with a well completed in the shallow sediments to monitor potential impacts from the Rail Loop sediment pond.
- Replace well GH\_MW-PC with a well completed in the shallow sediments and screened below the observed range of groundwater levels.
- Provide an update on the current accessibility of the upper Hawk Spoil and if so, whether a borehole location has been selected.
- Install wells in the Swift Creek and Cataract Creek watersheds, which can be included in both the FRO and GHO SSGMP monitoring networks.



These field activities should be implemented by September 30, 2019, so that the additional six months of monitoring data collected in the extended program can be included and interpreted in the 2019 Annual Report for the GHO SSGMP, which will be submitted by March 31, 2020.

# 2017 Annual Report for the GHO SSGMP

The 2017 Annual report for the GHO SSGMP meets the permit requirements and no revised version needs to be submitted.

# 2018 Annual Report for the GHO SSGMP

The 2018 Annual Report should be updated as follows:

- The surface water level data and precipitation rates should be plotted on the groundwater level plots so to facilitate the interpretation of surface water-groundwater interaction.
- Pumping rates should be plotted along with groundwater levels in the pumping wells that are used for monitoring, so to determine when level fluctuations are mainly due to pumping.
- Outline the watershed divides of all the sub-catchments located in the GHO permitted area.
- Outline the losing and gaining reaches of the Elk River, Fording River, Greenhills Creek and respective tributaries, where these can be inferred, on the map showing groundwater level contours.
- Add maps showing the potential sources and pathways identified for each sub-catchment.
- Add well stratigraphy on the cross-sections, so that concordance with the hydrogeological units represented on the cross-sections can be assessed.
- Use the Kendall Test to identify trends in the CI concentration time series.

The 2018 Annual Report should also be accompanied by the delivery of the following:

- All the raw groundwater quality and quantity data and metadata presented in the reports in MS
  Excel table format. Draft templates for the data tables should be submitted for review and
  approval by ENV prior to delivery. The templates should be developed to allow ENV staff to
  conduct effectively independent interpretation and analysis (e.g. graphical representation, pivot
  table generation, determination of statistical indicators).
- Lithological logs and installation diagrams of new monitoring wells should be uploaded to the BC GWELLS database.



### 2021 GHO SSGMP

#### Field activities

The following field activities should be conducted to support the 2021 update of the GHO SSGMP:

- Replace monitoring well GH\_GA-MW-1 with a well completed in more conductive sediments and near station GH\_ER2, so to assess the interaction between surface water and groundwater. Include this well in the Regional Groundwater Monitoring network.
- Install a monitoring well in the Elk River fluvial sediments of Aquifer 1056 and include this well in the Regional Groundwater Monitoring network.
- Retain the pH lab analysis, as the difference between the field and lab pH is an indication of the corresponding reduction in alkalinity in the sample from the time of collection. This allows the identification of samples where alkalinity is underestimated.
- Record the groundwater levels and pumping rates at all the supply wells that are also used for monitoring.

These field activities should be implemented by the end of 2019, so that the additional monitoring data collected in the extended program can be included and interpreted in the 2019 Annual Report for the GHO SSGMP, which will be submitted by March 31, 2020.

#### Conceptual Model

The 2021 GHO SSGMP should also include an update of the Conceptual Model, by integrating the results of the studies that are currently ongoing, such as the GHO Mine Life Extension Project, Elk River Side Channel LAEMP and the RWQM in-stream sinks program.

*Integration with the AMP and TMP* 

The 2021 GHO SSGMP should integrate with the Adaptive Management Plan (AMP) and the Tributary Management Plan (TMP) as follows:

- Define groundwater triggers for the GHO area based on those that will be developed in the AMP and implemented in the Regional Groundwater Monitoring Plan.
- Incorporate the changes introduced in the 2019 AMP (e.g. consideration of the effect of groundwater discharge to streams on calcite development, according to Main Question 4 in the AMP).



 Consider the installation of additional monitoring wells to support the characterization of surface water – groundwater interaction in the tributaries selected in the 2020 TMP that are likely groundwater-fed.

# **Groundwater Working Group Meetings**

The Groundwater Working Group (GWG) established October 2016 should continue to provide guidance for groundwater programs. The Groundwater Working Group will consist of members from Teck Coal Limited (Teck), the Ktunaxa Nation Council (KNC), Ministry of Environment and Climate Change Strategy (ENV) and Interior Health (IH), and may expand to include participants from Ministry of Energy and Mines (MEM) and Ministry of Forest, Lands and Natural Resource Operations (FLNRO). The frequency of GWG meetings should be increased from one to at least two per year, so that discussions and management decisions can respond more readily to the changes in environmental conditions, mine operations and plans occurring in the Elk Valley, including the Greenhills Operations.

Should you have any questions about the above, please contact me at 604-582-5277 or Sarah.Alloisio@gov.bc.ca.

Sincerely,

Sarah Alloisio Ph.D, P.Geo.

Hydrogeologist - Mining Operations, ENV

Cc: Jeanien Carmody-Fallows, Section Head, Authorizations, Mining Operations, ENV



# MINISTRY ASSESSMENT REPORT

**Report prepared by:** Sarah Alloisio, Hydrogeologist – Mining Date: April 8, 2019

**Statutory Decision Maker:** Doug Hill, Regional Operations Director - Mining

File:	107517	Tracking Number:	n/a
<b>Application type:</b>	2017 and 2018 Submission to fulfill the requirements of Sections 9.2.2, 9.2.2.4 and		
	10.4 in Permit 107517 – Elkview Operations Site-Specific Groundwater		
	Monitoring Program.		
Applicant:	Teck Coal Limited		

### 1. Executive Summary

This Ministry Assessment Report describes the review and recommendations provided for the 2018 update of the Elkview Operations Site-Specific Groundwater Monitoring Plan (EVO SSGMP) and the 2017 Annual Report of the EVO SSGMP, which were submitted by Teck Coal Ltd. (Teck) to fulfill the requirement of the Elk Valley Permit (107517). The requirements related to the 2018 Plan are included in Section 9.2.2 (Site-Specific Groundwater Monitoring) and 9.2.2.4 (Elkview) of PE107517 and in the conditions outlined in the Approval letter of the 2015 EVO SSGMP, dated April 18, 2017. The requirements related to the 2017 Annual report are included in Section 10.4 (Groundwater Reporting Requirements) of PE 107517.

The review concludes that the 2018 Plan does not meet several of the permit requirements and approval letter conditions, whereas the 2017 Annual Report meets the requirements. It is recommended that a revised 2018 Plan should be submitted, which fulfills the requirements and approval conditions where gaps have been identified, as shown in Table 1 and 2.

The data gaps identified and the recommendations provided in the 2018 Plan and the 2017 Annual Report are reasonable and should be implemented. Additional data gaps were identified in this review and additional recommendations are provided to address these gaps.

# 2. Application Request

Approval of the Elkview Operations Site-Specific Groundwater Monitoring Plan (EVO SSGMP), dated October 31, 2018, and of the 2017 EVO Annual Report, dated March 28, 2018.



### 3. Background Information

In November 2014, BC Ministry of Environment and Climate Change Strategy (ENV, then Ministry of Environment) approved the Elk Valley Water Quality Plan and issued an area-based effluent permit (PE 107517) to Teck. Section 9.2.2 of PE 107517 requires Teck to develop and implement Site-Specific Groundwater Monitoring Programs (SSGMPs) for the five mining operations located within the boundaries of area considered under Permit 107517 – Elkview, Greenhills, Line Creek, Elkview and Coal Mountain. Section 9.2.2.4 includes the requirements related to the SSGMP for the Elkview Operations (EVO SSGMP). In March 2015, Teck submitted the first SSGMP for the Elkview Operations to fulfill the requirements of Permit 107517. The 2015 plan was approved by ENV subject to the conditions included in the Approval Letter issued on April 18, 2017. The conditions include the requirement that a revised plan must be submitted to the Director for approval October 31, 2015 and every three years subsequently. Site-specific conditions included in the Approval Letter include the discussion of the effects of EVO's dewatering management strategy on groundwater flow and transport of contaminants, and a discussion of the baseline conditions summarized in Baldy Ridge Expansion (BRE) Annex D - Hydrogeological Baseline Report. The updated version of the EVO SSGMP was due for submission on October 31, 2018, and ENV received it on that date. The 2017 EVO Annual Report was due for submission on March 31, 2018 and was received on March 28, 2018.

## 4. First Nations Consultation and ENV Review

The Ktunaxa Nation Council (KNC) was consulted during the review of the EVO SSGMP. KNC provided ENV with the review comments on the 2018 EVO SSGMP and on the 2017 Annual Report for the EVO SSGMP prepared by their QP (Waterline). The comments provided by KNC were carefully reviewed and accounted for in the preparation of this document.

# 5. Technical Review

The following reports submitted to ENV by Teck were reviewed to prepare this document:

- The approval letter dated April 18, 2017 containing the conditions for the 2018 EVO SSGMP update;
- The EVO Site-Specific Groundwater Monitoring program (EVO SSGMP) dated October 31, 2018:
- The 2017 EVO Site-Specific Groundwater Monitoring Annual Report, dated March 28, 2018;

The following documents provided by KNC were used to support the review:

- Hydrogeological Review, Elkview Operations Site-Specific Groundwater Monitoring Program 2018 Update, dated March 2019;
- Recommendations for the Fording River (FRO), Coal Mountain (CMO), Elkview (EVO), Green Hills (GHO) and Line Creek Operations (LCO) 2017 Annual Groundwater Reports, dated October 5, 2018.



# 5.1. Concordance of the 2018 EVO SSGMP and the 2017 GHO Annual report with Sections 9.2.2, 9.2.2.4 and 10.4 of Permit 107517

The EVO SSGMP was reviewed to identify whether and to what extent it satisfies the requirements of PE107517, Sections 9.2.2, 9.2.2.4 and 10.4. Concordance to the permit requirements is classified in Table 1 as complete (Y), partially complete (P) or absent (N). No comments are provided in Table 1 for the requirements fulfilled by the Plan.

**Table 1 Concordance with PE107517 requirements** 

PE 107517 Requirement	Assessment	Concordance
	Section 9.2.2	
a. The Permittee must develop and implement a comprehensive groundwater monitoring program at each mine site, prepared by a qualified professional. This program must be conducted to the satisfaction of the Director and must include the following:		Y
i. Characterization of the groundwater system, aquifer characteristics (e.g., hydraulic conductivity and storativity), water quality and connectivity to the surface water system;	As stated in Section 5.3 of the 2018 EVO SSGMP, the hydraulic conductivity estimates obtained for some wells do not reflect the subsurface material encountered during drilling and the monitored groundwater level fluctuations. This inconsistency is recognized as a gap.  A characterization of the heterogeneity of the hydraulic properties in the overburden aquifers is also missing, as is a description of groundwater-surface water connectivity and interaction (e.g. spatial distribution of gaining and losing reaches).	P
<ul><li>ii. Characterization of seasonal variability in the groundwater system (quality and quantity).</li></ul>		Y
iii. Provision of a site specific conceptual model and the information necessary to support the development and verification		Y



_			
	of water quality predictions		
	for the mine site. The site		
	specific conceptual model		
	shall be provided with the		
	groundwater monitoring		
	plan update on October 31,		
	2018, and updated with		
	subsequent revisions to the		
	monitoring plan;		
	a.4 Site specific numerical	A numerical groundwater flow	
	groundwater models may be	model was developed to	
	required to support	characterize potential effects of	
	permitting activities.	the Baldy Ridge Extension (BRE)	
	Numerical models, where	project. Integration of the	
	required, must consider all	conceptual model underlying the	
	available, relevant	BRE model would likely improve	
	monitoring data (e.g.,	the LCO area conceptual model.	Y
	groundwater and surface	the Leo area conceptual model.	1
	water monitoring, stream		
	flow, and precipitation data)		
	and be developed by a		
	Qualified Professional to		
	meet the intended modelling		
	purpose.		
,		2.1 Elkview Operations	
b.	Groundwater monitoring		
	must be conducted in		
	accordance with the		
	approved plan, dated April		
	4, 2013 with addendum		
	dated January 2, 2014. A		
	revised plan must be		
	submitted to the Director for		
	approval October 31, 2015		N/A
	and every 3 years		
	subsequently. The Permittee		
	must respond within 30 days		
	to comments/requests made		
	by the Director on the		
	submission until the		
	Director is satisfied with the		
	submission.		
	10.4 Ground	water Reporting Requirements	
c.	A map of monitoring	• • •	
	locations with		
	Environmental Monitoring		Y
	Stations (EMS) and		
	Permittee descriptors;		
d.	Cross-Sections showing well	Well stratigraphy is missing from	
1	installation details	the cross-sections, so that	Y/P
			ı



	stratigraphy, groundwater elevations, and flow. Cross-sections should be in the direction of groundwater flow and perpendicular to groundwater flow;	consistency with the extent of the hydrogeological units represented on the cross-section cannot be assessed. A larger vertical scale would improve readability of cross-sections.  A cross-section along Erickson Creek that includes well EV_ECgw is missing. This cross-section is required to confirm whether this well is adequate to	
		monitor groundwater – surface water interaction. The well location relative to Erickson Creek and the well bottom elevation relative to the streambed elevation represented on the cross-section would help determine whether groundwater chemistry is influenced by surface	
e.	Drawings showing locations and water quality data of groundwater sampling	water at the well location.	Y
f.	points; A summary of background information on that year's program, including a discussion of the program modifications relative to previous years;		Y
g.	A summary of measured parameters, including appropriate graphs and comparison of results to Approved and Working Water Quality Guidelines, or other criteria and benchmarks as specified by the Director;		Y
h.	If applicable, a summary of exceedances of screening benchmarks;		Y
i.	Evaluation and discussion of spatial patterns and temporal trends;		Y
j.	A summary of all QA/QC issues during the year; and,		Y
k.	Recommendations for further study or measures to		Y



be taken.	

# 5.2. Concordance of the 2018 EVO SSGMP with the 2017 Approval Conditions

The 2018 EVO SSGMP was reviewed to identify whether and to what extent it satisfies the conditions included in the Approval Letter of April 18, 2017 (conditions 1a to 1f, 2, 3 and 4 in the table below). Concordance to the conditions of the Approval Letter is classified in Table 2 as complete (Y), partially complete (P) or absent (N).

Table 2 - Concordance of 2018 EVO SSGMP with conditions of Approval Letter

Condition (Approval Letter April 18, 2017)	Assessment	Concordance
1a. A discussion of the effects EVO's dewatering management strategy may have on on-site transport of contaminants and groundwater flow regimes;	While a list of the open pits in the EVO area and an overview of the pit water management strategy is provided (e.g. which pits currently require dewatering, transfer of mine water across pits and discharge into the environment), there is no characterization of the source of mine water (runoff or groundwater), dewatering methods (dewatering wells / drains) and inferred cones of drawdown induced by pit dewatering. An estimate of the extent of current and projected cones of drawdown is needed to assess whether pit dewatering induces enhanced leakage from nearby surface water bodies to groundwater, which may affect groundwater flow patterns and contaminant transport.	P
Ib. An inventory of onsite contaminant sources along with the potential contaminants of concern. Special noting of potentially acid generating wastes is needed, since they have more potential to change over time;		Y
1c. Identification of key areas for additional groundwater monitoring and data gap and uncertainty analysis completed for those key areas;	Additional recommendations are provided in this review.	Y
Id. Discussion of baseline conditions summarized from the BRE Annex D - Hydrogeological Baseline Report;		Y
Ie. Supporting borehole logs and hydraulic testing information; and,	As noted in the Plan, hydraulic testing data are not available for all wells and are therefore a data gap. No lithological logs and installation	Р



If. Cross-section drawings that include well details, and groundwater and surface water levels at an appropriate scale to allow for	diagrams are available for wells EV_HW1, EV_MR2, EV_RCgw, EV_WH50gw and EV_BRgw. (note: Harmer well is referred to as EV_HW1 in the text of the 2018 Plan, and as EV_HM1 on the drawings)  Well stratigraphy is not shown, and the cross-section vertical scale is too small to allow visual interpretation.	P
visual interpretation.  2. If and where required to inform management response, triggers will be developed using the framework outlined under the Regional Groundwater Monitoring Program.	Groundwater triggers will be developed as part of the 2019 AMP.	N/A
3. Groundwater samples used for the groundwater monitoring program are obtained from individual groundwater monitoring wells with known construction details and screen depths, unless otherwise documented by a Qualified Professional as to how monitoring program objectives are met from other selected sampling wells. Documentation will include supporting rationale and data limitations.	The EVO monitoring network includes three supply wells (EV_RCgw, EV_WH50gw and EV_BRgw). The 2018 EVO SSGMP (Section 4.10) indicates that the groundwater withdrawal rates from these wells are negligible except from April to July, when pumping may induce leakage from Michel Creek. The chemistry of groundwater samples collected at the supply may therefore be affected by recharge from contaminated surface water. No discussion on these potential effects is provided to support the use of these supply wells as monitoring wells.	P
4. The seep samples may be removed from the groundwater program going forward, as recommended in the annual report. If further investigation is required in these areas, it is recommended that dedicated groundwater wells be installed.		Y

# 5.3. Data Gaps

The 2018 EVO SSGMP identifies the areas where additional field investigations are required to address data gaps. The data gaps and recommended activities are included in Table S of the 2018 EVO SSGMP.

The review of the data gaps and selected additional wells is summarized in Table 3. No comments are included where the recommendations are considered acceptable.



Table 3 – Review of data gaps and recommended field investigations

Study Area	Data Gap (from 2018 EVO	Recommended	<b>Review comment</b>
	SSGMP)	activities	
	Elk River Pro	ximal to EVO	
Goddard Creek	Groundwater quality in the shallow and	This was considered a gap	
Sedimentation	deep valley-bottom aquifers near to	in the RGMP that is	
Pond	Goddard Creek Sedimentation Pond is	applicable to the SSGMP	
	unknown, and this is an area where mine	monitoring network. The	
	influenced surface water may be losing to	gap would be filled through	
	ground.	additional investigations,	
		and if necessary through the	
		installation of monitoring	
		wells downgradient of the	
		pond.	
	Michel		
Aqueduct	Groundwater quality at the base of Baldy	This was considered a gap	
Creek	Ridge where Aqueduct Creek infiltrates	in the RGMP that is	
	to ground is unknown.	applicable to the SSGMP	
	There are currently no dedicated	monitoring network. A	
	monitoring wells to confirm a suspected	drilling investigation is	
	down-valley groundwater flow direction	planned under the RGMP in	
	of mine-influenced and deep groundwater	the area of Aqueduct Creek.	
	quality, and flow direction is unknown.	Once wells are installed and	
		sampled, data should	
		be reviewed to evaluate	
		which wells would be	
		suitable for monitoring in	
D 1:4	No constitution of the second	the SSGMP.	
Downgradient of Erickson	No groundwater data exist downgradient	This was considered a gap in the RGMP that is	
Creek and the	of Erickson Creek and the South Pit		
South Pit	Decant Pond where surface water elevated in CI is identified to potentially	applicable to the SSGMP monitoring network.	
Decant Pond	infiltrate to ground.	Drilling will be conducted	
Decant I ond	injurate to ground.	in Erickson Creek drainage	
		as part of the EVO	
		AWTF program. Once wells	
		are installed and sampled,	
		data should be reviewed to	
		evaluate if the gap for	
		Erickson Creek is filled. For	
		the South Decant Pond, the	
		gap would be filled through	
		review of existing data to	
		confirm the identified	
		pathway, followed by	
		necessary installation of	
		monitoring wells if	
		necessary.	
Michel Creek	The absence of continuous water level	It is recognized that this is a	
	data and pumping rates for the Harmer	gap better addressed	
	(EV_HM1) and Machine Shop Rebuild	through the RGMP;	
	(EV_MR2) supply wells in the Michel	however, since operations	
	Creek valley bottom is identified as an	are responsible for carrying	
	uncertainty as potential effects on	out monitoring for the	
	groundwater flow regime and surface	RGMP it was included.	
	water interactions may occur between	The gap could be filled by	
	April and June.	the installation of data	
		loggers in these wells and	
		improved monitoring of	



	pump cycling/pumping	
	rates.	

Additional data gaps were identified during the review, which are not included in the 2018 Plan. These are as follows:

- Groundwater conditions are unknown in the Elk River valley bottom upgradient of the EVO mining activities. Groundwater monitoring in this area would allow the contamination potential due to upstream mining to be separated from the effect of the mining activities in the EVO area.
- Baseline groundwater conditions are unknown in the Michel Creek valley bottom upgradient of the EVO mining activities (upgradient of the confluence with Erickson Creek). Groundwater monitoring in this area would allow the effect of upstream conditions in Michel Creek (and the potential future Michel Coal project) to be separated from the contamination related to mining at EVO.
- Wells EV\_MCgwS/D, EV\_GV3gw and EV\_GCgw are completed in low hydraulic conductivity material and are not suitable to monitor contaminant transport in the high hydraulic conductivity deposits representing the main potential groundwater pathway.
- The groundwater conditions in the Brodie, Gate, South Gate alluvial fan and in the Erickson Creek valley deposits are insufficiently characterized to allow an adequate water resource assessment for the planned Active Wastewater Treatment Facility (AWTF) at EVO.

## 6. Recommendations

# 6.1 Permittee's Recommendations

The key recommendations provided in the 2018 EVO SSGMP are described in Table 3, with other recommendations related to hydraulic conductivity testing, logger installation, monitoring methodology and analytes (e.g. replacement of alkalinity with bicarbonate, carbonate and hydroxide), included in Section 6.2 of the Plan.

The 2017 Annual Report also includes recommendations, which pertain to the implementation of field practices, such as calibration of field probes and manual level measurements prior to sampling and deploying or uploading data from level loggers.

These recommendations are helpful to increase the understanding the groundwater pathway in the EVO area and should be implemented in the monitoring program.

#### 6.2 ENV Recommendations

In addition to the recommendations provided by Teck, the following should also be implemented:

#### 2018 EVO SSGMP

The 2018 EVO SSGMP does not meet several of the requirements under PE 107517 and the 2017 Approval Letter. As such, a revised 2018 EVO SSGMP should be submitted, which fulfills the



requirements where these are indicated as incomplete on Table 1 and 2. Specifically, the revised Plan should include the following:

- Review the hydraulic conductivity estimates and characterize heterogeneity of hydraulic properties and spatial differences in surface water groundwater interaction.
- Assess the effect of pit dewatering on the groundwater flow pattern, baseflow and movement of contaminants along the groundwater pathway.
- Develop a cross-section in the area of EV\_ECgw to determine whether this well is representative
  of the aquifer valley bottom and was installed sufficiently deep to monitoring groundwater –
  surface water interaction. Also compare fluctuations in groundwater and surface levels with
  precipitation to determine the main source of recharge to the aquifer at this location.
- Include Harmer well (note: resolve the inconsistent naming EV\_HM1 and EV\_HW1), the Machine Rebuild Shop well (EV\_MR2) in the SSGMP and equip them with data loggers.
- Assess whether pumping from the supply wells EV\_RCgw, EV\_WH50gw and EV\_BRgw induce negligible enhanced leakage from Michel Creek and are therefore suitable for monitoring. If the wells are considered to be suitable for monitoring, include them in the SSGMP and install data loggers.

The revised 2018 EVO SSGMP should be submitted by September 30, 2019.

# 2017 Annual Report for the EVO SSGMP

The 2017 Annual Report for the EVO SSGMP meets the permit requirements and no revised version needs to be submitted.

#### 2018 Annual Report for the EVO SSGMP

The 2018 Annual Report should be updated as follows:

- The borehole logs and installation diagrams of all the wells included in the updated monitoring network should be included as an appendix to the reports.
- The surface water level data and precipitation rates should be plotted on the groundwater level plots so to facilitate the interpretation of surface water-groundwater interaction.
- Pumping rates should be plotted along with groundwater levels in the pumping wells that are used for monitoring, so to determine when level fluctuations are mainly due to pumping.
- Outline the watershed divides of all the sub-catchments located in the EVO permitted area.



- Outline the losing and gaining reaches of the Elk River, Michel Creek and tributaries, where these can be inferred, on the map showing groundwater level contours.
- Add maps showing the potential sources and pathways identified for each sub-catchment.
- Add well stratigraphy on the cross-sections, so that concordance with the hydrogeological units represented on the cross-sections can be assessed. Also increase vertical scale to ease visual interpretation. Update cross-section BB' (drawing 653245-004) to include the information from Sparwood Well #4 (replacement of Well#3, also referred to as RG-DW-03-04).
- Use the Kendall Test to identify trends in the CI concentration time series.
- Label provincially mapped aquifer 1080 IA on the drawings and include a description of provincially mapped aquifer 1082 IIC in the report.

The 2018 Annual Report should also be accompanied by the delivery of the following:

- All the raw groundwater quality and quantity data and metadata presented in the reports in MS
  Excel table format. Draft templates for the data tables should be submitted for review and
  approval by ENV prior to delivery. The templates should be developed to allow ENV staff to
  conduct effectively independent interpretation and analysis (e.g. graphical representation, pivot
  table generation, determination of statistical indicators).
- Lithological logs and installation diagrams of new monitoring wells should be uploaded to the BC GWELLS database.

#### 2021 EVO SSGMP

#### Field activities

The following field activities should be conducted to support the 2021 update of the EVO SSGMP:

- Install a well in high conductivity material at the location of EV\_GV3gw, to monitor the shallower sand gravel deposits that are more vulnerable to contamination.
- Replace well EV\_GCgw, which was completed in a low hydraulic conductivity unit, with a shallow and deep well installed in the high hydraulic conductivity units identified at this location.
- If well EV\_ECgw is found to be unsuitable to monitor the valley bottom deposits along Erickson Creek, replace it with a new monitoring well in the valley bottom.
- Install a baseline monitoring well along Michel Creek valley bottom deposits upgradient of the confluence with Erickson Creek.



- Install a monitoring well in the Elk River valley bottom upgradient of the EVO mining operations, so that the contaminant contributions from upstream mining and EVO mining can be assessed.
- Add an existing monitoring well (or install a new well, if no suitable well currently exist) at the
  confluence of South Gate Creek and Michel Creek, to improve the understanding of the
  groundwater pathway in the alluvial fan at the base of Brodie, Gate and South Gate Creek.
- Replace monitoring wells EV\_MCgwS/D, which are installed in low hydraulic conductivity material, with a well pair (shallow and deep) in higher hydraulic conductivity units.
- Where no logs and diagrams are available (such as in supply wells EV\_RCgw, EV\_WH50gw and EV\_BRgw), conduct downhole camera surveys and downhole geophysics (resistivity, gamma ray) to determine screen intervals and lithologies.
- Use a sealed cap in well in EV\_ECgw, once this is confirmed to be suitable for monitoring the valley bottom aquifer along Erickson Creek.
- Retain the pH lab analysis, as the difference between the field and lab pH is an indication of the corresponding reduction in alkalinity in the sample from the time of collection. This allows the identification of samples where alkalinity is underestimated.

These field activities should be implemented by September 30, 2019, so that the additional six months of monitoring data collected in the extended program can be included and interpreted in the 2019 Annual Report for the EVO SSGMP, which will be submitted by March 31, 2020.

# Conceptual Model

The 2021 EVO SSGMP should also include an update of the Conceptual Model, by integrating the results of the studies that are currently ongoing, such as the Sparwood Area Groundwater Supporting Study and the groundwater study in support of the planned AWTF at EVO.

#### *Integration with the AMP and TMP*

The 2021 EVO SSGMP should integrate with the Adaptive Management Plan (AMP) and the Tributary Management Plan (TMP) as follows:

- Define groundwater triggers for the EVO area based on those that will be developed in the AMP and implemented in the Regional Groundwater Monitoring Plan.
- Incorporate the changes introduced in the 2019 AMP (e.g. consideration of the effect of groundwater discharge to streams on calcite development, according to Main Question 4 in the AMP).



 Consider the installation of additional monitoring wells to support the characterization of surface water – groundwater interaction in the tributaries selected in the 2020 TMP that are likely groundwater-fed.

The integration of the regional and site-specific groundwater monitoring programs with the AMP and TMP should also be based on the outcome of the upcoming Groundwater Working Group meetings.

# **Groundwater Working Group Meetings**

The Groundwater Working Group (GWG) established October 2016 should continue to provide guidance for groundwater programs. The Groundwater Working Group will consist of members from Teck Coal Limited (Teck), the Ktunaxa Nation Council (KNC), Ministry of Environment and Climate Change Strategy (ENV) and Interior Health (IH), and may expand to include participants from Ministry of Energy and Mines (MEM) and Ministry of Forest, Lands and Natural Resource Operations (FLNRO). The frequency of GWG meetings should be increased from one to at least two per year, so that discussions and management decisions can respond more readily to the changes in environmental conditions, mine operations and plans occurring in the Elk Valley, including the Elkview Operations.

Should you have any questions about the above, please contact me at 604-582-5277 or Sarah.Alloisio@gov.bc.ca.

Sincerely,

Sarah Alloisio Ph.D, P.Geo.

Hydrogeologist – Mining Operations, ENV

Cc: Jeanien Carmody-Fallows, Section Head, Authorizations, Mining Operations, ENV



# MINISTRY ASSESSMENT REPORT

**Report prepared by:** Sarah Alloisio, Hydrogeologist – Mining Date: April 8, 2019

**Statutory Decision Maker:** Doug Hill, Regional Operations Director - Mining

File:	107517	Tracking Number:	n/a
<b>Application type:</b>	2018 Plan Submission to fulfill the requirements of Sections 9.2.2, 9.2.2.3 and 10.4		
	in Permit 107517 – Line Creek Operations Site-Specific Groundwater Monitoring		
	Program. 2017 Annual Report submission to fulfill the requirements of Section 5.3		
	of Permit PE-106970 and Condition 3.1.1.3 of Permit PE-5353 (Line Creek Phase I		
	and II)		
Applicant:	Teck Coal Limited		

# 1. Executive Summary

This Ministry Assessment Report describes the review and recommendations provided for the 2018 update of the Line Creek Operations Site-Specific Groundwater Monitoring Plan (LCO SSGMP) and the 2017 Annual Report of the LCO SSGMP, which were submitted to fulfill the requirement of the Elk Valley Permit (107517). The requirements related to the 2018 Plan are included in Section 9.2.2 (Site-Specific Groundwater Monitoring) and 9.2.2.3 (Line Creek) of PE107517 and in the conditions outlined in the Approval letter of the 2013 LCO SSGMP, dated April 4, 2018. The requirements related to the 2017 Annual report are included in Section 10.4 (Groundwater Reporting Requirements) of PE 107517. The 2017 Annual Report was submitted also in accordance with Section 5.3 of Permit PE-106970, dated October 28, 2013, and Condition 3.1.1.3 of Permit PE-5353, as it includes monitoring locations at LCO Phase I and II.

The review concludes that the 2018 Plan does not meet several of the permit requirements and approval letter conditions, whereas the 2017 Annual Report meets the requirements. It is recommended that a revised 2018 Plan should be submitted, which fulfills the requirements and approval conditions where gaps have been identified, as shown in Table 1 and 2.

The data gaps identified and the recommendations provided in the 2018 Plan and the 2017 Annual Report are reasonable and should be implemented, with the modifications indicated in Table 3 and Section 6.1. Additional data gaps were identified in this review and additional recommendations are provided to address these gaps.



# 2. Application Request

Approval of the Line Creek Operations Site-Specific Groundwater Monitoring Plan (LCO SSGMP), dated October 31, 2018 and of the 2017 LCO Annual Report, dated March 31, 2018.

# 3. Background Information

In October 2013, Coal Limited (Teck) submitted a site-wide groundwater Monitoring Plan (now SSGMP) for the Line Creek Operations following a request from ENV (then Ministry of Environment). The 2013 Plan was approved by ENV on April 4, 2018, and included the requirement that a revised plan must be submitted to the Director for approval October 31, 2018 and every three years subsequently. In November 2014, ENV approved the Elk Valley Water Quality Plan and issued an area-based effluent permit (PE 107517) to Teck. Section 9.2.2 of PE 107517 requires Teck to develop and implement Site-Specific Groundwater Monitoring Programs (SSGMPs) for the five mining operations located within the boundaries of area considered under Permit 107517 – Fording River, Line Creek, Line Creek, Elkview and Coal Mountain. Section 9.2.2.3 includes the requirements related to the SSGMP for the Line Creek Operations (LCO SSGMP). The updated version of the LCO SSGMP was due for submission on October 31, 2018, and ENV received it on that date. The 2017 LCO Annual Report was due for submission on March 31, 2018 and was received on March 29, 2018.

# 4. First Nations Consultation and ENV Review

The Ktunaxa Nation Council (KNC) was consulted during the review of the LCO SSGMP. KNC provided ENV with the review comments on the 2018 LCO SSGMP and on the 2017 Annual Report for the LCO SSGMP prepared by their QP (Waterline). The comments provided by KNC were carefully reviewed and accounted for in the preparation of this document.

# 5. Technical Review

The following reports submitted to ENV by Teck Coal Limited (Teck) were reviewed to prepare this document:

- The approval letter dated April 4, 2018 containing the conditions for the 2018 LCO SSGMP update;
- The LCO Site-Specific Groundwater Monitoring program (LCO SSGMP) dated October 2018:
- The 2017 LCO Site-Specific Groundwater Monitoring Annual Report, dated March 2018;

The following documents provided by KNC were used to support the review:

- Hydrogeological Review, Line Creek Operations Site-Specific Groundwater Monitoring Plan 2018 Update, dated March 16, 2019;
- Recommendations for the Elkview (EVO), Coal Mountain (CMO), Line Creek (LCO), Fording River (FRO) and Line Creek Operations (LCO) 2017 Annual Groundwater Reports, dated October 5, 2018.



# 5.1. Concordance of the 2018 LCO SSGMP and the 2017 LCO Annual report with PE 107517, PE 106970 and PE 5353

The LCO SSGMP was reviewed to identify whether and to what extent it satisfies the requirements of PE107517, Sections 9.2.2, 9.2.2.3 and 10.4. The requirements of Section 5.3 in Permit 106970 and Condition 3.1.1.3 in Permit 5353 are also included in this review. Concordance to the permit requirements is classified in Table 1 as complete (Y), partially complete (P) or absent (N). No comments are provided in Table 1 for the requirements fulfilled by the Plan.

Table 1 Concordance with PE 107517 requirements

PE 107517 Requirement	Assessment	Concordance
_	Section 9.2.2	
a. The Permittee must develop and implement a comprehensive groundwater monitoring program at each mine site, prepared by a qualified professional. This program must be conducted to the satisfaction of the Director and must include the following:		Y
i. Characterization of the groundwater system, aquifer characteristics (e.g., hydraulic conductivity and storativity), water quality and connectivity to the surface water system;	A characterization of the heterogeneity of the hydraulic properties in the overburden aquifers based on depositional mechanisms and the hydraulic test results is missing, as is a description of groundwater-surface water connectivity and interaction (e.g. spatial distribution of gaining and losing reaches). The assumed gradient of 0.1 in the overburden is very high and no justification is provided for this value.	P
<ul><li>ii. Characterization of seasonal variability in the groundwater system (quality and quantity).</li></ul>		Y
iii. Provision of a site specific conceptual model and the information necessary to support the development and verification of water quality predictions for the mine site. The site specific conceptual model shall be provided with the groundwater monitoring plan update on October 31, 2018, and updated with subsequent revisions to the monitoring plan;	The conceptual model is described briefly and mostly in generic terms in Section 2. The description is also fragmented, as parts of it are included in Section 5, in relation to the groundwater monitoring program design. A site-specific conceptual model supported by the available data is missing.	P
iv. Site specific numerical	Two numerical groundwater modeling studies	N/A



groundwater models may be required to support permitting activities. Numerical models, where required, must consider all available, relevant monitoring	have been developed to date in the LCO area, in support of the Phase II Baseline and Assessment, and of the Hydrogeologic Investigation for the Dry Creek Water Management System. These numerical models	
data (e.g., groundwater and surface water monitoring, stream	require the development of a robust underlying conceptual model to be reliable prediction	
flow, and precipitation data) and	tools. The conceptual models underlying the	
be developed by a Qualified	existing numerical models would inform the	
Professional to meet the intended	Conceptual Site Model for the LCO area and	
modelling purpose.	likely improve it, if they were integrated with	
9	it. .2.2.3 Line Creek Operations	
Groundwater monitoring must be	2.2.3 Line Creek Operations	
conducted in accordance with a plan		
approved by the Director. The Line		
Creek Operations Site Wide		
Groundwater Monitoring program		
has been submitted to the Director.		
The Permittee must respond within		N/A
30 days to comments/requests made by the Director on the submission		
until the Director is satisfied with the		
submission.		
A revised plan must be submitted to		
the Director October 31, 2018 and		
every 3 years subsequently.		
10.4 Gro	oundwater Reporting Requirements	
a. A map of monitoring locations		
with Environmental Monitoring		Y
Stations (EMS) and Permittee		-
descriptors;		
b. Cross-Sections showing well	Cross-sections AA' and CC' developed for the	
installation details stratigraphy, groundwater elevations, and flow.	LCO area show only the wells located along the cross-section, but not the projection of	
Cross-sections should be in the	nearby wells, where stratigraphy and water	
direction of groundwater flow and	levels are likely representative of the	
perpendicular to groundwater	corresponding locations on the cross-sections.	
flow;	Also, well stratigraphy is missing from the	
	cross-sections, so that consistency with the	
	extent of the hydrogeological units represented	Р
	on the cross-section cannot be assessed.	•
	Ericsson Fault is shown on cross-sections AA'	
	and CC' but not in plan view, on Figure 3 (which shows the cross-sections in plan view)	
	or other maps included in the SSGMP. No	
	cross-section perpendicular to AA' was	
	developed despite the presence of wells.	
	Cross-section BB' is not based on well	
	cross section 22 is not custo on wen	l l



		sufficiently close to be representative of	
		conditions on the cross-section.	
		The location of the cross-sections is not clearly	
		shown on Figure 3 due to the figure scale.	
		(note: Figure 3 is erroneously referred to as	
		Figure 5 in Section 5.0 and 5.1, and well	
		LC_PIZDC1306 is incorrectly labelled as	
		LC_PIZDC1305 on cross-section CC`)	
c.	Drawings showing locations and		
	water quality data of groundwater		Y
	sampling points;		
d.	A summary of background	The report does not state if the SSGMP was	
	information on that year's	modified from the previous year, and no	
	program, including a discussion of	modifications (if present) are discussed.	***/**
	the program modifications relative	The logger data signalling that the transducer	Y/P
	to previous years;	is above the groundwater level are not	
		included.	
e.	A summary of measured		
	parameters, including appropriate		
	graphs and comparison of results		
	to Approved and Working Water		Y
	Quality Guidelines, or other		
	criteria and benchmarks as		
	specified by the Director;		
f.	Evaluation and discussion of		
	spatial patterns and temporal		Y
	trends;		
g.	A summary of all QA/QC issues		Y
	during the year; and,		1
h.	Recommendations for further		Y
	study or measures to be taken.		1
		PE106970 – Section 5.3	
	Requirement	Assessment	Concordance
	he Permittee must develop and		
	nplement a comprehensive		
	roundwater monitoring program		
	or the Line Creek Mine Phase II		
	rea, prepared by a qualified		Y
-	rofessional. This program must be		
	onducted to the satisfaction of the		
	rirector and should achieve the		
	ollowing objectives at a minimum:		
i.	S	A characterization of the heterogeneity of the	
	resource (including water quality,	hydraulic properties in the overburden aquifers	
	quantity, flow characteristics,	based on depositional mechanisms and the	
	hydraulic conductivity of the	hydraulic test results is missing, as is a	p
	affected aquifer(s), and	description of groundwater-surface water	ľ
	1 . 1		
	relationship to surface water	connectivity and interaction (e.g. spatial	
	relationship to surface water system);		



		is very high and no justification is provided for this value.	
ii.	Identify (and if necessary, quantify) impacts to groundwater from mining-related activities;	A description of potential sources, groundwater pathways and receptors is provided where impacts are identified in qualitative terms. No quantitative estimates of impacts based on the available data are included.	Y/P
iii.	Provide the information necessary to support the development and verification of water quality prediction for the mine site (as per Section 5.5)		Y
		PE 5353 – Condition 3.1.1.3	
i c	The most current groundwater monitoring program must be mplemented to satisfy monitoring of the discharge from the ERX Coarse Coal Rejects (ERX/CCR) dump.		Y

# 5.2. Concordance of the 2018 LCO SSGMP with the 2018 Approval Conditions

The 2018 LCO SSGMP was reviewed to identify whether and to what extent it satisfies the conditions included in the Approval Letter of April 4, 2018 listed in Table 2 below. Concordance to the conditions of the Approval Letter is classified in Table 2 as complete (Y), partially complete (P) or absent (N).

Table 2 – Concordance of 2018 LCO SSGMP with conditions of Approval Letter.

Condition (Approval Letter	Assessment	Concordance
<b>April 4, 2018</b> )		
a. A discussion of the effects that	This discussion is missing.	
LCO's dewatering management		
strategy and Dry Creek recapture		N
may have on on-site transport of		IN
contaminants and groundwater		
flow regimes;		
b. An inventory of known or	The seep from the West Line Creek Active	
suspected areas of potential	Wastewater Treatment Facility (AWTF) waste	
contamination along with the	rock pile is not included in the inventory of	
potential contaminants of	(known or suspected) contamination sources	
concern. This should also	listed in Table 4.	P/N
consider the most recent version	The ML/ARD study for LCO has not been	r/IN
of the Metal Leaching/Acid Rock	completed to date, and potential sources of	
Drainage Management Plan,	ML/ARD are those assumed for the 2017	
since there is potential to change	Regional Water Quality Model.	
over time. The known or	(note: Figure 14, which shows the CI sources, is	



suspected areas of potential	erroneously referred to in the body of the Plan	
contamination should be shown	as Figure 9.)	
	as Figure 9.)	
and labelled on the drawings;		
c. Identification of key		
areas for additional		
groundwater monitoring and		Y
data gap and uncertainty		
analysis completed for those		
key areas;		
d. Supporting	Well FR_HW5, which is located in the FRO	
documentation for the	area several kilometers north of the LCO area	
monitoring locations included	and is most likely affected by mining operations	
in the plan, including	in FRO, is used to define background	
supporting borehole logs,	groundwater quality for LCO.	
groundwater flow (vertical and		
horizontal) data, and hydraulic		
testing information. Specific		
information will be included		_
regarding the location of		P
background groundwater		
quality information, and the		
inclusion of wells		
LC_PIZM0903 and		
LC_PIZ_ER1 that are show in		
the December 16, 2015		
assessment but are not		
included in the annual reports;		
e. Cross-section drawings	Cross-sections AA' and CC' developed for the	
that include well details, and	LCO area show only the wells located along the	
	cross-section, but not the projection of nearby	
groundwater and surface water		
levels and details (i.e., size and	wells, where stratigraphy and water levels are	
depth to the bottom of adjacent	likely representative of the corresponding	
settling ponds) at an	locations on the cross-sections. Also, well	
appropriate scale to allow for	stratigraphy is missing from the cross-sections,	
visual interpretation;	so that consistency with the extent of the	
	hydrogeological units represented on the cross-	
	section cannot be assessed.	
	Ericsson Fault is shown on cross-sections AA'	~
	and CC' but not in plan view, on Figure 3	P
	(which shows the cross-sections in plan view)	
	or other maps included in the SSGMP. No	
	cross-section perpendicular to AA' was	
	developed despite the presence of wells.	
	Cross-section BB' is not based on well	
	information, since no wells are located	
	sufficiently close to be representative of	
	conditions on the cross-section.	
	The location of the cross-sections is not clearly	
	shown on Figure 3 due to the figure scale.	
	(note: Figure 3 is erroneously referred to as	
	information, since no wells are located sufficiently close to be representative of conditions on the cross-section.  The location of the cross-sections is not clearly shown on Figure 3 due to the figure scale.	



	Figure 5 in Section 5.0 and 5.1, and well	
	LC_PIZDC1306 is incorrectly labelled as	
	LC_PIZDC1305 on cross-section CC`)	
f. Assessment of elevated		
concentrations of constituent of		
interest in Phase II		
groundwater wells, where		Y
minimal effects are expected		
due to the early stages of		
mining in the area;		
g. Updated contingency and	Triggers will be developed as part of the 2019	
management triggers (as	AMP update and will be based on the outcome	
discussed in the December 15,	of the 2019 GWG meeting.	
2015 memo) with related		N/A
actions, including how the		
triggers will be calculated or		
determined; and,		
h. Identification of	Well FR_HW5, which is located in the FRO	
monitoring locations that	area several kilometers north of the LCO area	
represent background	and is most likely affected by mining operations	N
groundwater concentrations	in FRO, is used to define background	
for the purposes of this project.	groundwater quality for LCO.	

# 5.3. Data Gaps

The 2018 LCO SSGMP identifies the areas where additional monitoring activities and installation of new wells are required to address data gaps. These are summarized in Section 5.3, Section 9.0, highlighted in Table 4 and their indicative location in shown on Figure 16a, b, and c of the 2018 LCO SSGMP.

The review of the data gaps and selected additional wells is summarized in Table 3. No comments are included where the recommendations are considered acceptable.

Table 3 – Review of data gaps and potential well installations

Study Area	Data Gap (from 2018 LCO SSGMP)	Recommendation (from 2018 LCO	Review comment
		SSGMP)	
	Line Creek – P	rocessing Plant	_
Regional Study Area 5 – eastern portion	Groundwater pathway from potential sources in the Phase I of the mine has not been investigate	A well pair (shallow and deep) should be installed in the alluvial fan and glaciofluvial sediments adjacent to Line Creek close to the eastern boundary of Study Area 5, to assess the significance of groundwater as a pathway for contamination from Phase I to Line Creek.	
Regional Study Area 5 –	The groundwater pathway in the valley bottom along Fording River near the	This area expected to be influenced by contact water	The installation of a well pair (shallow and deep) in



western portion	confluence with Elk River has not been investigated.	originating from upstream mines plus potential loading from Line Creek. Hence, the investigation of the western portion of Study Area 5 aligns more with the objectives of the RGMP.	the overburden at the confluence between Fording River and Elk River would be beneficial not only for the RGMP but also to investigate the interaction between groundwater and surface water in this area, which is relevant to characterize contamination pathways near the sources.
Regional Study Area 6 – southern portion	The groundwater pathway from the CCR, Reclaimed CCR and the pond south of the Plant has not been characterized.	While adding monitoring in this area would meet the objective of characterizing groundwater pathways for potential transport to the Elk River, previous monitoring downgradient of CCR and the Process Plant Pond north of the Plant have consistently yielded concentrations of the CI below the primary screening levels.	The installation of a well pair (shallow and deep) in the overburden downgradient of the Plant area would be beneficial not only for the RGMP but also to investigate the interaction between groundwater and surface water in this area, which is relevant to characterize contamination pathways near the sources. It is also not clear what data the "previous monitoring" downgradient of the Plant area mentioned in the 2018 Plan refers to.
	Line Creek		
Regional Study Area 2	Mixing of the Fording River and valley bottom aquifer may or may not be sufficient to explain CI concentrations in GH_POTW10 and other monitoring wells downgradient of the confluence with Dry Creek, and donw-valley groundwater pathway from Dry Creek may be present	Assess future monitoring data for the presence of increasing trend of CI concentration at GH_POTW10 and nearby wells and install a well pair immediately downgradient of the confluence Fording River and Dry Creek, in Study Area 2.	The installation of a well pair in the valley bottom sediments at the confluence between Dry Creek and Fording River would allow the contribution from Phase II to be monitored over time, as the waste rock deposition in the Dry Creek watershed progresses.

# 1. Recommendations

# 6.1 Permittee's Recommendations

The key recommendations provided in the 2018 LCO SSGMP are described in Table 3, with other recommendations related to monitoring methodology, the well network and sampling frequency included in Section 9.0 of the Plan. I concur with these recommendations except for the one whereby sampling frequency would be reduced from quarterly to six-monthly. Sampling frequency should be maintained as quarterly, so that changes in seasonal fluctuations related to climate trends or changes in operations can be more easily detected.

The 2017 Annual Report also includes recommendations, which pertain to the list of analytes and installation of pressure transducers. With regard to the list of analytes, if wells LC\_PIZP1101 and



LC\_PIZP1105 are removed from the monitoring network, the list of analytes recommended in the 2017 Annual Report that apply to these wells should be applied to well LC\_PIZP1104.

#### 6.2 ENV Recommendations

In addition to the recommendations provided by Teck, the following should also be implemented:

#### 2018 LCO SSGMP

The 2018 LCO SSGMP does not meet several of the requirements under PE 107517 and the 2018 Approval Letter. As such, a revised 2018 LCO SSGMP should be submitted, which fulfills the requirements where these are indicated as incomplete on Table 1 and 2. Specifically, the revised Plan should include the following:

- Characterization of heterogeneity of hydraulic properties and spatial differences in surface water groundwater interaction.
- Provide a site-specific conceptual model based on the available information and including a characterization of the geological and hydrogeological setting.
- Update the cross-sections by projecting all nearby wells and the corresponding stratigraphy and develop a cross-section perpendicular to AA`.

The revised 2018 Plan should be submitted by June 30, 2019.

#### 2017 Annual Report for the LCO SSGMP

The 2017 Annual report for the LCO SSGMP meets the permit requirements and no revised version needs to be submitted.

## 2018 Annual Report for the LCO SSGMP

The 2018 Annual Report should be updated as follows:

- The surface water level data and precipitation rates should be plotted on the groundwater level plots so to facilitate the interpretation of surface water-groundwater interaction.
- Outline the watershed divides of all the sub-catchments located in the LCO permitted area.
- Outline the losing and gaining reaches of the Elk River, Fording River, Line Creek Creek and
  respective tributaries, where these can be inferred, on the map showing groundwater level
  contours.



- Add well stratigraphy on the cross-sections, so that concordance with the hydrogeological units represented on the cross-sections can be assessed.
- Use the Kendall Test to identify trends in the CI concentration time series.

The 2018 Annual Report should also be accompanied by the delivery of the following:

- All the raw groundwater quality and quantity data and metadata presented in the reports in MS
  Excel table format. Draft templates for the data tables should be submitted for review and
  approval by ENV prior to delivery. The templates should be developed to allow ENV staff to
  conduct effectively independent interpretation and analysis (e.g. graphical representation, pivot
  table generation, determination of statistical indicators).
- Lithological logs and installation diagrams of new monitoring wells should be uploaded to the BC GWELLS database.

### 2021 LCO SSGMP

#### Field activities

The following field activities should be conducted to support the 2021 update of the LCO SSGMP:

- Install a well pair in the eastern portion of Study Area 5, in the valley bottom at the confluence between Line Creek and Fording River;
- Install a well pair in the western portion of Study Area 5, in the valley bottom at the confluence between Fording River and Elk River;
- Install a well pair in the southern portion of Study Area 6, downgradient of the Plant area;
- Install a well pair in Study Area 2, in the valley bottom at the confluence between Dry Creek and Fording River;
- Reduce the acceptable criteria for turbidity in groundwater samples from 200 NTU to 50 NTU, as indicated in the *BC Water and Air Baseline Monitoring Guidance Document for Mine Proponents and Operators* (<a href="http://www2.gov.bc.ca/assets/gov/environment/waste-management/industrial-waste/industrial-waste/water\_air\_baseline\_monitoring.pdf">http://www2.gov.bc.ca/assets/gov/environment/waste-management/industrial-waste/industrial-waste/water\_air\_baseline\_monitoring.pdf</a>). The Guidance document indicates that "*In order to prevent excessive data loss, a maximum upper bound of turbidity may be established (e.g., 200 NTU) to allow provisional data to be collected from wells that may have justifiably high natural turbidity.*" A justification will therefore needs to be provided if an acceptable criteria higher than 50 NTU is used.



These field activities should be implemented by the end of 2019, so that the additional monitoring data collected in the extended program can be included and interpreted in the 2019 Annual Report for the LCO SSGMP, which will be submitted by March 31, 2020.

# Conceptual Model

The 2021 LCO SSGMP should include an update of the Conceptual Model, by integrating the results of the studies that are currently ongoing.

Integration with the AMP and TMP

The 2021 LCO SSGMP should integrate with the Adaptive Management Plan (AMP) and the Tributary Management Plan (TMP) as follows:

- Define groundwater triggers for the LCO area based on those that will be developed in the AMP and implemented in the Regional Groundwater Monitoring Plan.
- Incorporate the changes introduced in the 2019 AMP (e.g. consideration of the effect of groundwater discharge to streams on calcite development, according to Main Question 4 in the AMP).
- Consider the installation of additional monitoring wells to support the characterization of surface water – groundwater interaction in the tributaries selected in the 2020 TMP that are likely groundwater-fed.

#### Groundwater Working Group Meetings

The Groundwater Working Group (GWG) established October 2016 should continue to provide guidance for groundwater programs. The Groundwater Working Group will consist of members from Teck Coal Limited (Teck), the Ktunaxa Nation Council (KNC), Ministry of Environment and Climate Change Strategy (ENV) and Interior Health (IH), and may expand to include participants from Ministry of Energy and Mines (MEM) and Ministry of Forest, Lands and Natural Resource Operations (FLNRO). The frequency of GWG meetings should be increased from one to at least two per year, so that discussions and management decisions can respond more readily to the changes in environmental conditions, mine operations and plans occurring in the Elk Valley, including the Line Creek Operations.



Should you have any questions about the above, please contact me at 604-582-5277 or Sarah.Alloisio@gov.bc.ca.

Sincerely,

Sarah Alloisio Ph.D, P.Geo.

Hydrogeologist - Mining Operations, ENV

Cc: Jeanien Carmody-Fallows, Section Head, Authorizations, Mining Operations, ENV



# MINISTRY ASSESSMENT REPORT

**Report prepared by:** Sarah Alloisio, Hydrogeologist – Mining Date: April 9, 2019

**Statutory Decision Maker:** Doug Hill, Regional Operations Director - Mining

File:	107517	Tracking Number:	n/a
<b>Application type:</b>	2018 Plan Submission to fulfill the requirements of Sections 9.2.2, 9.2.2.5 in Permit		
	107517 – Coal Mountain Operations Site-Specific Groundwater Monitoring		
	Program. 2017 Annual Report submission to fulfill the requirements of Section		
	10.4 in Permit 107517.		
Applicant:	Teck Coal Limited		

# 1. Executive Summary

This Ministry Assessment Report describes the review and recommendations provided for the 2018 update of the Coal Mountain Operations Site-Specific Groundwater Monitoring Plan (CMO SSGMP) and the 2017 Annual Report of the CMO SSGMP, which were submitted to fulfill the requirement of the Elk Valley Permit (107517). The requirements related to the 2018 Plan are included in Section 9.2.2 (Site-Specific Groundwater Monitoring) and 9.2.2.5 (Coal Mountain) of PE107517. The requirements related to the 2017 Annual report are included in Section 10.4 (Groundwater Reporting Requirements) of PE 107517.

The review concludes that the 2018 Plan and the 2017 Annual Report meet the requirements.

The recommendations provided in the 2018 Plan and the 2017 Annual Report are reasonable and should be implemented. Additional data gaps were identified in this review and additional recommendations are provided to address these gaps.

# 2. Application Request

Approval of the Coal Mountain Operations Site-Specific Groundwater Monitoring Plan (CMO SSGMP) dated October 31, 2018 and of the 2017 CMO Annual Report, dated March 28, 2018.

# 3. Background Information

In November 2014, Teck submitted a Groundwater Monitoring Program for CMO following request by ENV (then MOE). Also in November 2014, ENV approved the Elk Valley Water Quality Plan and



issued an area-based effluent permit (PE 107517) to Teck. Section 9.2.2 of PE 107517 requires Teck to develop and implement Site-Specific Groundwater Monitoring Programs (SSGMPs) for the five mining operations located within the boundaries of the area considered under Permit 107517 – Fording River, Greenhills, Line Creek, Elkview and Coal Mountain. Section 9.2.2.5 includes the requirements related to the SSGMP for the Coal Mountain Operations (CMO SSGMP). Following comments and requests to revise the Plan from ENV, Teck submitted the approved version of the first CMO SSGMP in May 2015. The updated version of the CMO SSGMP was due for submission on October 31, 2018, and ENV received it on that date. The 2017 CMO Annual Report was due for submission on March 31, 2018 and was received on March 28, 2018.

# 4. First Nations Consultation and ENV Review

The Ktunaxa Nation Council (KNC) was consulted during the review of the CMO SSGMP. KNC provided ENV with the review comments on the 2018 CMO SSGMP and on the 2017 Annual Report for the CMO SSGMP prepared by their QP (Waterline). The comments provided by KNC were carefully reviewed and accounted for in the preparation of this document.

### 5. Technical Review

The following reports submitted to ENV by Teck Coal Limited (Teck) were reviewed to prepare this document:

- The CMO Site-Specific Groundwater Monitoring program (CMO SSGMP) dated October 2018:
- The 2017 CMO Site-Specific Groundwater Monitoring Annual Report, dated March 28, 2018;

The following documents provided by KNC were used to support the review:

- Hydrogeological Review, Coal Mountain Operations Site-Specific Groundwater Monitoring Plan 2018 Update, dated March 16, 2019;
- Recommendations for the Elkview (EVO), Greenhills (GHO), Line Creek (LCO), Fording River (FRO) and Coal Mountain Operations (CMO) 2017 Annual Groundwater Reports, dated October 5, 2018.

# 5.1. Concordance of the 2018 CMO SSGMP and the 2017 CMO Annual Report with PE 107517

The 2018 CMO SSGMP and 2017 Annual Report were reviewed to identify whether and to what extent it satisfies the requirements of PE107517, Sections 9.2.2, 9.2.2.5 and 10.4. Concordance to the permit requirements is classified in Table 1 as complete (Y), partially complete (P) or absent (N). No comments are provided in Table 1 for the requirements fulfilled by the Plan.



**Table 1 Concordance with PE 107517 requirements** 

PE 107517 Requirement	Assessment	Concordance	
	Section 9.2.2		
a. The Permittee must develop and			
implement a comprehensive			
groundwater monitoring program			
at each mine site, prepared by a		***	
qualified professional. This		Y	
program must be conducted to the			
satisfaction of the Director and			
must include the following:			
i. Characterization of the			
groundwater system, aquifer			
characteristics (e.g., hydraulic			
conductivity and storativity), water		Y	
quality and connectivity to the			
surface water system;			
ii. Characterization of seasonal			
variability in the groundwater		Y	
system (quality and quantity).		_	
iii. Provision of a site specific			
conceptual model and the			
information necessary to support			
the development and verification of			
water quality predictions for the			
mine site. The site specific			
conceptual model shall be		Y	
provided with the groundwater			
monitoring plan update on			
October 31, 2018, and updated			
with subsequent revisions to the			
monitoring plan;			
iv. Site specific numerical	No numerical models have been developed to		
groundwater models may be	date in the CMO area.		
required to support permitting			
activities. Numerical models,			
where required, must consider all			
available, relevant monitoring		37/4	
data (e.g., groundwater and		N/A	
surface water monitoring, stream			
flow, and precipitation data) and			
be developed by a Qualified			
Professional to meet the intended			
modelling purpose.			
9.2.2.5 Coal Mountain Operations			
iii. Implement drilling requirements			
identified in the qualified 3rd party		Y	
Gap Analysis and Recommendations			



R	eport by July 31, 2015.		
	. Implement the full monitoring		Y
p	rogram by September 15, 2015.		
v.	A revised plan must be submitted	A revised plan was submitted on October 31,	Y
to	the Director October 31, 2018 and	2018.	
$e^{\cdot}$	very 3 years subsequently.		
	10.4 Gro	oundwater Reporting Requirements	
a.	A map of monitoring locations		
	with Environmental Monitoring		Y
	Stations (EMS) and Permittee		1
	descriptors;		
b.	Cross-Sections showing well installation details stratigraphy, groundwater elevations, and flow. Cross-sections should be in the direction of groundwater flow and perpendicular to groundwater	The groundwater table profile shown on cross-section KK' suggests that groundwater flow is to the west but also to the east of CM_MW7. There does not appear a reason why groundwater should flow east along this cross-section.	Y
-	flow;		
c.	Drawings showing locations and water quality data of groundwater sampling points;		Y
d.	A summary of background	The report does not state if the SSGMP was	
	information on that year's	modified from the previous year, and no	
	program, including a discussion of the program modifications relative to previous years;	modifications (if present) are discussed.	Y/P
e.	A summary of measured		
	parameters, including appropriate graphs and comparison of results to Approved and Working Water Quality Guidelines, or other criteria and benchmarks as specified by the Director;		Y
f.	Evaluation and discussion of		
	spatial patterns and temporal		Y
<u></u>	trends;		
g.	A summary of all QA/QC issues		Y
_	during the year; and,		<u>-</u>
h.	Recommendations for further		Y
	study or measures to be taken.		

# 5.2. Data Gaps

The 2018 CMO SSGMP identifies the areas where additional monitoring activities and installation of new wells are required to address data gaps. These are summarized in Section 7 and 8 of the 2018 CMO SSGMP.



The review of the data gaps and selected additional wells is summarized in Table 3. No comments are included where the recommendations are considered acceptable.

Table 3 – Review of data gaps and potential well installations

Study Area	Data Gap (from 2018 CMO SSGMP)	Recommendation (from 2018 CMO SSGMP)	Review comment
Main Interceptor Sedimentation Ponds	No monitoring of the potential overburden groundwater pathway for seepage from the ponds. The loading from the pond seepage to Corbin Creek is unknown, however, the predictions of the water load balance model at Corbin Creek at sensitive to seepage from the ponds.	CM_MW9, a monitoring well installed in the overburden installed downgradient and adjacent to the ponds 9i.e. near CM_MW4), to help assess potential leakage from the ponds.	
Middle Mountain CCR	Review of recent seep monitoring efforts downgradient of Middle Mountain Coarse Coal Reject (CCR) has indicated elevated sulphate in this area.	A monitoring well pair (CM_MW10) installed in the overburden and shallow bedrock downgradient and adjacent to the Middle Mountain CCR, to monitor potential seepage from the CCR.	
Michel Creek valley bottom	The hydraulic gradient observed between 234 Pit and CM_MW7 raises the potential risk of seepage of poor quality water from the pit reaching Michel Creek. Given the heterogeneity and anisotropy of the bedrock hydraulic conductivity, groundwater pathways are difficult to characterize.	Add surface water monitoring stations to allow identification of the areas where seepage may affect Michel Creek. Recommended positions (CM_M4, CM_M5, CM_M6 and CM_M7) are positioned to enable differentiation of seepage from 37 Pit, 34 Pit and 14 Pit. If water quality impacts are detected in Michel Creek, the location of future monitoring wells (if required) will be better constrained by the recommended surface water monitoring stations.	It is recommended that quarterly streamflow monitoring is also conducted at the proposed stations, so to develop a flow accretion profile along Michel Creek. This would allow losing and gaining sections to be defined, thus improving surface water – groundwater characterization of this portion of the Creek.

# 1. Recommendations

# 6.1 Permittee's Recommendations

The key recommendations provided in the 2018 CMO SSGMP are described in Table 3, and described in more detail along with a proposed monitoring schedule in Section 7 and 8 of the Plan. I concur with these recommendations.



The 2017 Annual Report also includes recommendations in Section 6, which pertain to blank and field samples, review of data outliers and review of water quality data at CM\_MW7 to assess the potential seepage from 34 Pit towards Michel Creek.

#### 6.2 ENV Recommendations

In addition to the recommendations provided by Teck, the following should also be implemented:

# 2018 CMO SSGMP

The 2018 CMO SSGMP meets the requirements under PE 107517 and should be approved.

# 2017 Annual Report for the CMO SSGMP

The 2017 Annual report for the CMO SSGMP meets the permit requirements and should be approved.

# 2018 Annual Report for the CMO SSGMP

The 2018 Annual Report should be updated as follows:

- The surface water level data and precipitation rates should be plotted on the groundwater level plots so to facilitate the interpretation of surface water-groundwater interaction.
- Outline the watershed divides of all the sub-catchments located in the CMO permitted area.
- Outline the extent of the valley bottom sediments along Corbin and Michel Creek.
- Outline the losing and gaining reaches of Corbin and Michel Creek, where these can be inferred, on the map showing groundwater level contours.
- Add well stratigraphy on the cross-sections, so that concordance with the hydrogeological units represented on the cross-sections can be assessed.
- Replace the groundwater level profile located between the shallow and deep measured levels shown on the cross-sections with a phreatic and potentiometric profile. Also review the groundwater profile on cross-section KK' that suggests a divide at the location of CM\_MW7.
- Use the Kendall Test to identify trends in the CI concentration time series.

The 2018 Annual Report should also be accompanied by the delivery of the following:

All the raw groundwater quality and quantity data and metadata presented in the reports in MS
 Excel table format. Draft templates for the data tables should be submitted for review and
 approval by ENV prior to delivery. The templates should be developed to allow ENV staff to



conduct effectively independent interpretation and analysis (e.g. graphical representation, pivot table generation, determination of statistical indicators).

 Lithological logs and installation diagrams of new monitoring wells should be uploaded to the BC GWELLS database.

#### 2021 CMO SSGMP

#### Field activities

The following field activities should be conducted to support the 2021 update of the CMO SSGMP:

- Install monitoring wells CM\_MW9 and CM\_MW10S/D as described in Table 3;
- Add surface water stations CM\_M4, CM\_M5, CM-M6 and CM\_M7 as described in Table 3.
   Conduct water sampling and streamflow monitoring at these stations, so to define a flow accretion profile to support the characterization of surface water groundwater interaction. Following the surface water quality assessment at these locations based on one year of monitoring data, up to four monitoring wells should be installed there is evidence of potential seepage from the pits.
- Retain the pH lab analysis, as the difference between the field and lab pH is an indication of the corresponding reduction in alkalinity in the sample from the time of collection. This allows the identification of samples where alkalinity is underestimated.

All field activities should be implemented by the end of 2019, so that the additional monitoring data collected in the extended program can be included and interpreted in the 2019 Annual Report for the CMO SSGMP, which will be submitted by March 31, 2020. The installation of monitoring wells in the Michel Creek valley bottom, if need, should be completed by September 2020.

*Integration with the AMP and TMP* 

The 2021 CMO SSGMP should integrate with the Adaptive Management Plan (AMP) as follows:

- Define groundwater triggers for the CMO area based on those that will be developed in the AMP and implemented in the Regional Groundwater Monitoring Plan.
- Incorporate the changes introduced in the 2019 AMP (e.g. consideration of the effect of groundwater discharge to streams on calcite development, according to Main Question 4 in the AMP).



#### **Groundwater Working Group Meetings**

The Groundwater Working Group (GWG) established October 2016 should continue to provide guidance for groundwater programs. The Groundwater Working Group will consist of members from Teck Coal Limited (Teck), the Ktunaxa Nation Council (KNC), Ministry of Environment and Climate Change Strategy (ENV) and Interior Health (IH), and may expand to include participants from Ministry of Energy and Mines (MEM) and Ministry of Forest, Lands and Natural Resource Operations (FLNRO). The frequency of GWG meetings should be increased from one to at least two per year, so that discussions and management decisions can respond more readily to the changes in environmental conditions, mine operations and plans occurring in the Elk Valley, including the Coal Mountain Operations.

Should you have any questions about the above, please contact me at 604-582-5277 or Sarah.Alloisio@gov.bc.ca.

Sincerely,

Sarah Alloisio Ph.D, P.Geo.

Hydrogeologist - Mining Operations, ENV

Cc: Jeanien Carmody-Fallows, Section Head, Authorizations, Mining Operations, ENV



File: PE107517

March 11, 2020

Mariah Arnold Sr. Lead Environmental Sciences Cam Jaeger Coordinator Environment

Teck Coal Limited 124B Aspen Drive Sparwood, BC VOB 2G0

Dear Mariah and Cam:

#### RE: Elk Valley Site-Specific Groundwater Monitoring Programs (SSGMP) - 2018 Update

The 2018 update of the Site-Specific Groundwater Monitoring Plans (2018 SSGMPs) for Teck's operations in the Elk Valley (Fording River, FRO; Greenhills, GHO; Line Creek, LCO; Elkview, EVO; Coal Mountain, CMO) dated October 31, 2018 were received and reviewed by staff of the Ministry of Environment and Climate Change Strategy (ENV). Ministry Assessments for the 2018 SSGMPs were submitted by ENV to Teck in April 2019, which indicated that four of the five plans (FRO, GHO, LCO and EVO) did not meet the requirements described in Permit 107517. ENV requested a revised version of these plans to be submitted by September 30, 2019. ENV has received and completed the review of the revised submissions.

Pursuant to Section 9.2.2 of Permit PE107517, the 2018 update of the Elk Valley Site-Specific Groundwater Monitoring Plans (2018 SSGMP) for the following operations: Fording River Operations (FRO); Greenhills Operations (GHO); Line Creek Operations (LCO); Elkview Operations (EVO) and Coal Mountain Operations (CMO), are accepted with the following conditions:

- 1. Updated Site-Specific Groundwater Monitoring Plans for FRO, GHO, LCO, EVO and CMO will be submitted to the Director for approval **by October 31, 2021.**
- 2. The 2021 SSGMP updates will include the following:

- a. Expand the site-specific monitoring well network as follows:
  - i. FRO Swift Creek valley bottom. Add a well to the FRO network, to investigate the presence of a potential mine-affected groundwater transport pathway in overburden and/or shallow weathered bedrock in the area downgradient of the Swift Creek sediment management system towards the Fording River valley bottom aquifer.
  - ii. GHO Porter Creek valley bottom. Replace GH\_MW-PC with a well pair installed in unconsolidated sediments and bedrock, to monitor a potential mine-affected groundwater transport pathway and investigate the surface water groundwater interaction upgradient of the confluence with Fording River.
  - iii. LCO Dry Creek. Add to the LCO well network the new well that is planned to be installed in Study Area #2 and added to the RGMP network, as per the Work Plan included in the ENV Acceptance Letter for the 2017 RGMP Update.
  - iv. LCO Confluence of West Line Creek and Line Creek. Add to the LCO well network well AWTF-MW-15-02B and AWTF-Seep, if suitable, and/or a new well pair installed in the area downstream of the confluence of West Line Creek with Line Creek, where the surficial geology mapping indicates the presence of fluvial deposits. The objective of monitoring this well(s) and seep is to investigate the presence of a potential mine-affected groundwater transport pathway by-passing the AWTF intake location.
  - v. LCO Background. Install a well pair (overburden / bedrock) upstream of the LCO mine-affected areas in the area within the Tornado Creek watershed where surficial geology mapping indicates the presence of fluvial deposits. Use this well to characterize background conditions for LCO. If no unconsolidated deposits are found in the area indicated by mapping, install a well in weathered bedrock to characterize background bedrock conditions in LCO.
  - vi. EVO Grave Creek. Install a well in unconsolidated sediments in the Grave Creek valley fill aquifer, at a shallower depth than EV\_GV3gw, to investigate a potential shallow groundwater pathway and the interaction between surface and shallow groundwater.
- b. Update the Conceptual Site Model for each operation, based on the integration of the updated groundwater monitoring data set and relevant information obtained from other groundwater studies supporting site-specific permit applications or regional programs (e.g. Kilmarnock alluvial fan groundwater study conducted in support of the FRO-S Active Wastewater Treatment Plant, groundwater investigations in the Clode Creek watershed, updated modelling and flow accretion survey in Dry Creek as part of the LCO Dry Creek Structured Decision Making process (SDM)).
- c. Update maps for the same themes and in the same format as those included in the revised 2018 SSGMPs. Update the maps for LCO and CMO using the same format and notation of the maps included in FRO, GHO and EVO.

- d. Update hydrogeological cross-sections to reflect the information acquired from new wells (and updated locations in plan view, where cross-sections have been extended to include new wells). Additional cross-sections will be developed for all wells, in directions parallel and perpendicular to the main direction of flow. The cross-sections should show all the wells (including wells drilled for purposes other than monitoring, e.g. geotechnical wells) used to define them, with the following details: well screens location, average groundwater elevation and elevation of nearby surface water bodies. The stratigraphic logs of all the wells used to define the cross-sections will also be provided.
- e. Update the structure of the documents describing the plans for LCO and CMO to be consistent with those prepared for FRO, GHO and EVO.
- f. Update the characterization of the effect of dewatering of the pits that intercept groundwater on the groundwater head, flow pattern and on interaction of groundwater with surface water.

If you have any questions, please contact Sarah Alloisio, Hydrogeologist, at Sarah.Alloisio@gov.bc.ca or at 236-468-2286.

Yours truly,

Liz Freyman

for Director, Environmental Management Act

**Mining Operations** 

C. Freyman

Cc: Jeanien Carmody-Fallows, Section Head, Mining Authorizations, ENV

Heather McMahon, Ktunaxa Nation Council



File: PE107517

February 19, 2020

Mariah Arnold Sr. Lead Environmental Sciences Cam Jaeger Coordinator Environment

Teck Coal Limited 124B Aspen Drive Sparwood, BC VOB 2G0

Dear Mariah and Cam:

#### RE: Elk Valley Regional Groundwater Monitoring Program (RGMP) - 2017 Update

The 2017 update of the Elk Valley Regional Groundwater Monitoring Program (2017 RGMP) dated September 2017 has been received and reviewed by ministry staff, along with the 2017 and 2018 Regional Groundwater Monitoring Program Annual Reports dated March 2018 and March 2019.

Pursuant to Section 9.2.1 of Permit PE107517, I hereby accept the 2017 update of the Elk Valley Regional Groundwater Monitoring Program (2017 RGMP), subject to the following conditions:

- 1. The Groundwater Work Plan will be carried out as written. The Groundwater Work Plan and the accompanying Table of Proposed Drilling Locations (Proposed Drilling Locations), which were discussed during the Groundwater Working Group (GWG) meeting of November 26-27, 2019 and submitted to ENV on January 7, 2020, are included as appendices to this Letter. Specifically, the monitoring wells proposed as part of the ongoing Mass Balance Investigation studies in support of the Regional Water Quality Model will be installed as soon as possible, subject to access and permitting constraints, and added to the Regional Groundwater Monitoring Network. Updates on the implementation of the Work Plan will be provided to the GWG during the Group's meetings and conference calls. All proposed changes to the Work Plan and Proposed Drilling Locations will need to be justified and will require review by the GWG and approval prior to being implemented.
- 2. An update of the RGMP must be submitted to the Director for approval **by September 30, 2020** and will meet in full, all the requirements detailed in point *i* to *vii* Of Section 9.2.1 of Permit PE107517.

Specifically, the 2020 RGMP update will contain the following:

- 2.1 Based on the data acquired from the monitoring between 2017 and December 31, 2019, a "updated description of relevant aquifer characteristics (e.g. hydraulic conductivity, storage properties, transmissivity, etc.), and a description of regional groundwater flow patterns (directions and velocities) and recharge areas, fate, groundwater interactions with surface waters, the effects of groundwater withdrawals on the SW/GW interactions, and the mobility of mine related constituents of interest." (point *vi* of Section 9.2.1).
- 2.2 An updated Conceptual Site Model (CSM), and on a closer integration with the Site-Specific groundwater programs, the Mass Balance Investigation and the Sparwood Area Groundwater Study.
- 2.3 A list of all the hydrogeological studies conducted between 2017 and 2019, in support of other programs included in the Elk Valley Area-Based Management Plan (e.g. Regional Aquatic Effects Assessment, Regional Water Quality Model) or permit applications (e.g. Fording River South water treatment plant intake, Elkview and Fording River North Saturated Rock Fill), with an overview of each study and indication of whether and what information resulting from these studies is relevant to inform the CSM.
- 2.4 In addition to the maps included in the 2017 update, include the following maps:
  - i. Updated maps of the location of the existing groundwater monitoring wells included in the RGMP and proposed new RGMP wells (if applicable). The location of surface water monitoring stations should also be added as a reference.
  - ii. Updated maps allowing the visualization of the main aspects of the Conceptual Site Model (e.g. surface and groundwater pathways, indicative gaining and losing stream reaches, receptors associated with monitoring wells).
  - iii. Maps showing all the locations of the hydrogeological studies referred to in point 2.3 (two maps showing the study locations located in the northern and southern portion of the Elk Valley, respectively).
- 2.5 Updated hydrogeological cross-sections to reflect the information acquired from new wells (and updated locations in plan view, where cross-sections have been extended to include new wells). Additional cross-sections will be developed for all the wells included in the updated regional groundwater monitoring network, in directions parallel and perpendicular to the main direction of flow. The cross-sections should show all the wells (including wells drilled for purposes other than monitoring, e.g. geotechnical wells) used to define them, with the following details: topographic profile, bedrock contact elevation (where this is available or can be inferred), well screens location, average groundwater elevation and elevation of nearby surface water bodies. The stratigraphic logs of all the wells used to define the cross-sections will also be provided.

- 2.6 An update on how the RGMP addresses the changes introduced in the 2018 Adaptive Management Plan (AMP), with reference to Question 4 (effects of groundwater discharge to streams on calcite development) and Question 6 (groundwater triggers).
- 3. Provide a proposed Work Plan for 2020-2023 with proposed well drilling locations to fill in any remaining gaps identified during the update, with a tentative schedule for its implementation, as per condition *iv* of PE107517, Section 9.2.1 "Identify limitations and data gaps and conduct additional studies necessary to refine the hydrogeological conceptual model, determine the location and extent of mine-affected groundwater discharge to surface waters and to evaluate management and mitigation options."

Further, the Director expects the following:

- A minimum of two (2) in-person meetings and two (2) conference calls of the GWG will be held in 2020. The GWG will meet approximately every three months, to maintain continuity in the communication and activities related to the groundwater programs. This will ensure that these programs achieve the objectives of the Elk Valley Area-Based Management Plan (ABMP) to protect groundwater, human health and aquatic ecosystems.

If you have any questions, please contact Sarah Alloisio, Hydrogeologist, at Sarah.Alloisio@gov.bc.ca or at 236-468-2286.

Yours truly,

Liz Freyman, Head, Environmental Impact Assessment Section - Mining

for Director, Environmental Management Act

**Mining Operations** 

C. Freyman

cc: Heather McMahon, Ktunaxa Nation Council (HMcMahon@ktunaxa.org)

# Appendix II



#### **REPORT**

## Site Specific Groundwater Monitoring: 2019 Annual Report

Teck Coal Limited - Line Creek Operations

Submitted to:

#### Carla Froyman-Parker, Water Lead

Teck Coal Limited - Line Creek Operations

Submitted by:

#### Golder Associates Ltd.

102, 2535 - 3rd Avenue S.E., Calgary, Alberta, T2A 7W5, Canada



## **Distribution List**

Electronic Copy - Teck Coal Limited

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### **Executive Summary**

In compliance with requirements of British Columbia Ministry of Environment and Climate Change Strategy (ENV) discharge permit PE106970 and Permit 107517 issued under the *Environmental Management Act*, this report presents the results of the 2019 Line Creek Operations (LCO) Site Specific Groundwater Monitoring Program (SSGMP).

The groundwater monitoring locations were selected in consideration of the conceptual groundwater model and sources, pathways and receptors, targeting areas of higher potential for groundwater quality impacts. In general, groundwater flow in the bedrock and within the colluvium and till included in the overburden in the uplands is limited due to their lower hydraulic conductivity. The main aquifer is within the valley bottom sediments that includes glaciofluvial sediments. These valley bottom aquifers also collect and concentrate groundwater discharge, as they occupy topographically low areas and are characterized by a high degree of surface water-groundwater interaction between the aquifer and surface water bodies that incise into the aquifer.

The monitoring is focused on the valley-bottom sediments in four areas:

- LCO Phase 1 due to proximity to pits and waste rock spoils.
- LCO Process Plant due to proximity process plant ponds and Coarse Coal Reject.
- LCO Dry Creek Area due to recently placed waste rock in this watershed.
- Outside of LCO to evaluate for any down-valley pathways for contact water.

A total of 10 monitoring wells are being monitored for water quality on a quarterly basis and for water levels in a combination of one-time quarterly measurements and continuous measurements. No material quality assurance or quality control concerns were identified regarding Constituents of Interest (CI) for this report, except for one nitrate detection above five times the laboratory detection limit in the trip blank collected during the first quarter (Q1). There were no exceedances of British Columbia Contaminated Sites Regulation (BC CSR) standards for CI at the groundwater locations within the LCO site. Increasing trends were noted for sulphate in LC\_PIZP1105 (Process Plant area) based on a Mann Kendall trend analysis for both Q1 and Q4. Increasing trends were noted for dissolved cadmium in LC\_PIZP1104 and LC\_PIZP1105 during Q4 and Q1, respectively. Dissolved selenium concentrations had increasing trends at LC\_PIZP1104 during Q1 (near the Process Pond) and LC\_PIZDC0901 (Dry Creek area) during Q4. Consistently, there was no clear increasing trend in CI at groundwater monitoring locations downgradient of LCO, which are also included in the Regional Groundwater Monitoring Program (GH POTW10 and RG 02-20).

Local exceedances of non-CI are within the range of previous measurements and are interpreted to be due to naturally-occurring processes (dissolved barium, chloride, cobalt, fluoride, lithium, manganese and molybdenum). Dissolved boron slightly exceeded the irrigation watering standard (500  $\mu$ g/L) at LC\_PIZP1103 during the May 2019 sampling event (concentrations ranged from 480  $\mu$ g/L to 570  $\mu$ g/L), however 2018 concentrations ranged near the standard (480 to 500  $\mu$ g/L). Dissolved cobalt concentrations exceeded drinking water standard (1  $\mu$ g/L) in LC\_PIZP1104 during each sampling event with concentrations ranging from 1.07 to 1.88  $\mu$ g/L. This is well below the cobalt interim background estimate of 20  $\mu$ g/L (BC MOE 2018), however above the 2018 cobalt concentration range of 0.1 to 0.4  $\mu$ g/L



For continuous improvements, recommendations include update of field documentation procedures for deployment of pressure transducers (and specifically the re-deployment of the transducer in LC\_PIZP1001 to below the water table) and review of sampling frequency. The purpose of seasonal monitoring at this time is to collect information in order to reduce sampling frequency in the near future.



## **Table of Contents**

EXE	CUTI	/E SUMMARY	ii		
1.0	INTR	ODUCTION	7		
	1.1	Background	7		
	1.2	Site Specific Groundwater Monitoring Program Objectives	8		
	1.3	Summary of Changes between the 2019 and 2018 Groundwater Monitoring Programs	9		
	1.4	Previous Groundwater Work	9		
	1.5	Integration between Elk Valley Regional Groundwater Monitoring Program and Site Groundwater Monitoring Programs	9		
	1.6	Linkages to the Adaptive Management Plan	10		
2.0	LCO	GROUNDWATER CONCEPTUAL MODEL	12		
	2.1	Groundwater Monitoring Program Design	14		
3.0	APP	LICABLE REGULATORY CRITERIA	16		
	3.1	Primary Screening	16		
	3.2	Secondary Screening	16		
4.0	MON	ITORING AND ANALYSIS METHODS	17		
	4.1	Sampling	17		
	4.2	Data Quality Assurance and Quality Control (QA/QC)	17		
	4.3	Statistical Analysis	20		
5.0	RES	ULTS	22		
	5.1	Line Creek – Process Plant Area	24		
	5.2	Line Creek – Dry Creek Area	28		
	5.3	Outside Line Creek – Offsite Wells (Wells in Regional Program)	31		
	5.4	Check of Conceptual Groundwater Model	32		
6.0	SUM	MARY	33		
7.0	RECOMMENDATIONS FOR 2020				
8.0	) CLOSING35				
REF	EREN	CES	36		



#### **TABLES** (WITHIN TEXT)

Table A: ENV Recommendations and Concordance	7
Table B: Permit Requirement from Section 10.4 of Permit 107517	8
Table C: Dry Creek Diversion Summary	9
Table D: Summary of Sources and Pathways and Monitoring Well Locations	15
Table E: Rationale for Selection of Wells for Mann-Kendall Trend Analysis	21
Table F: Manual (Hand) Water Level Measurements	22
Table G: Temporal and Visual Trends	27
Table H: Vertical Gradient between Dry Creek Area Nested Wells	28

#### **TABLES** (following text)

- Table 1-1: Previous SSGMP Work Summary Table
- Table 2-1: Summary of Groundwater Sampling Locations
- Table 3-1: Field Parameters Collected During LCO Groundwater Sampling
- Table 3-2: Guideline Comparison for Groundwater Sampling Locations
- Table 3-3: Primary Screening Threshold Values
- Table 3-4: Secondary Screening Threshold Values
- Table 4-1: Groundwater Monitoring Locations with Chemistry Data for Process Plant Area and Downgradient Location
- Table 4-2: Groundwater Monitoring Locations with Chemistry Data for Dry Creek Area and Downgradient Location
- Table 5-1: Recommended List of Analytes for the LCO Sitewide Groundwater Monitoring Program
- Table 5-2: Recommended Water Level and Groundwater Monitoring for 2019

#### **FIGURES**

- Figure 1-1: Project Location
- Figure 2-1: Schematic of Surface and Groundwater flow in the Elk Valley Region
- Figure 2-2: Surficial Geology
- Figure 2-3a: Cross-Section A A': Process Plant Area
- Figure 2-3b: Cross-Section B B': Line Creek in Fording Valley Bottom
- Figure 2-3c: Cross-Section C C': Dry Creek
- Figure 2-4a: Schematic for Flow Directions in Valley-Bottom Aquifer
- Figure 2-4b: 3D Visualization of Groundwater and Surface Water Flow



Figure 3: LCO Groundwater Monitoring Network – 2019

Figure 4-1: LCO Process Plant Area Groundwater Monitoring Network in Surficial Sediments

Figure 4-2: LCO Dry Creek Area Groundwater Monitoring Network in Valley Bottom Sediments

Figure 4-3: LCO Process Plant Area: Spatial Distribution of Selected Groundwater Analytical Data

Figure 4-4: LCO Dry Creek Area: Spatial Distribution of Selected Groundwater Analytical Data

Figure 4-5a: Process Plant Area Time Series Plots: Dissolved Sulphate

Figure 4-5b: Process Plant Area Time Series Plots: Dissolved Selenium

Figure 4-5c: Process Plant Area Time Series Plots: Dissolved Nitrate

Figure 4-6a: Dry Creek Area Time Series Plots: Dissolved Sulphate

Figure 4-6b: Dry Creek Area Time Series Plots: Dissolved Selenium

Figure 4-6c: Dry Creek Area Time Series Plots: Dissolved Nitrate

Figure 4-7a: Outside LCO Area Time Series Plots: Dissolved Sulphate

Figure 4-7b: Outside LCO Area Time Series Plots: Total Selenium

Figure 4-7c: Outside LCO Area Time Series Plots: Dissolved Nitrate

Figure 4-8a: Surface Water Stations Time Series Plots: Dissolved Sulphate

Figure 4-8b: Surface Water Stations Time Series Plots: Dissolved Selenium

Figure 4-8c: Surface Water Stations Time Series Plots: Dissolved Nitrate

#### **APPENDICES**

#### **APPENDIX A**

QA/QC of Samples including Duplicates and Field Blanks

#### **APPENDIX B**

**Groundwater Elevations** 

#### **APPENDIX C**

Full Suite of Analytes Compared to British Columbia Contaminated Site Regulation Standards

#### **APPENDIX D**

Dry Creek Area: Additional Hydrogeological Information

#### **APPENDIX E**

Statistical Analysis Results

#### **APPENDIX F**

Borehole Logs

#### **APPENDIX G**

Laboratory Certificates of Analysis

#### **APPENDIX H**

QP Forms



#### 1.0 INTRODUCTION

Teck Coal Limited (Teck) Line Creek Operations (LCO; Figure 1-1) implemented a Site-Specific Groundwater Monitoring Program (SSGMP) and implemented ongoing quarterly monitoring in 2013. This report encompasses site-specific data collected in the 2019 calendar year.

#### 1.1 Background

In 2013, LCO implemented a groundwater monitoring program to meet requirements of British Columbia Ministry of Environment and Climate Change Strategy (ENV) discharge permit PE106970 and Permit 107517 issued under the *Environmental Management Act*. Since November 2014, LCO has been required to meet requirements for the SSGMP set in Permit 107517, which was also issued by ENV under the *Environmental Management Act* and authorizes effluent discharge from the five Teck mines in the Elk Valley.

An initial SSGMP was submitted in 2013 (Golder 2013a). The SSGMP was updated in 2015 (Golder 2015a) and in October 2018 (Golder 2018a) following several significant changes, as summarized below:

- Development and implementation of the Elk Valley Regional Groundwater Monitoring Program (RGMP; SNC-Lavalin 2015a, SNC-Lavalin 2015b and SNC-Lavalin 2017).
- Approval of the SSGMP by the ENV in a draft letter dated November 1, 2017, as described in the initial SSGMP (Golder 2013a) plus the update in the 2015 (Golder 2015a).
- Continued improvement in the conceptual model for groundwater flow in the Elk Valley and at LCO.

The draft approval letter from the ENV included several conditions. Teck also received comments on the SSGMP from the Ktunaxa Nation Council (KNC) in a letter dated November 20, 2017. The approval conditions and comments from the KNC have been addressed in the updated SSGMP (Golder 2018a), in the 2018 annual report (Golder 2019), and in ongoing implementation of the SSGMP. Concordance with the recommendations provided by ENV regarding LCO SSGMP is summarized in Table A.

**Table A: ENV Recommendations and Concordance** 

ENV Recommendation	Where Addressed and/or Comment
	Appendix B (includes precipitation data)
The surface water level data and precipitation rates should be plotted on the groundwater level plots so to facilitate the interpretation of surface water-groundwater interaction.	Figures 4.1 & 4-2 (includes estimated surface water elevations) – surface water elevation data not available
Outline the watershed divides of all the sub-catchments located in the LCO permitted area.	Figure 3
Outline the losing and gaining reaches of the Elk River, Fording River, Line Creek and respective tributaries, where these can be inferred, on the map showing groundwater level contours.	Figures 4-1 and 4-2
Add well stratigraphy on the cross-sections, so that concordance with the hydrogeological units represented on the cross-sections can be assessed.	Addressed in Teck June 7, 2019 Response
Use the Kendall Test to identify trends in the CI concentration time series.	Trend analyses completed for Q1 and Q4 data at four locations and one RGMP location provided in Appendix E



The main changes in the SSGMP between 2013 and 2015 were the initiation of annual reporting and expansion of the monitoring network, with the 2015 annual report (Golder 2016a) including 12 monitoring wells and 2 wells downgradient of LCO. A well in the Line Creek valley-bottom near the Horseshoe Ridge Pit (LC\_PIZM0903) initially included in the SSGMP was removed from the program in 2015. A well in the Coarse Coal Rejects (CCR) area (LC\_PIZ\_ER1) was removed from the program in 2015 due to its location within the permitted CCR area, selenium concentrations below detection (Golder 2015a), and indication of selenium reduction within and under CCR at GHO and other coal mines in Alberta and British Columbia (Kennedy et al. 2015; SRK 2011).

The monitoring network and frequency did not change between 2015 and 2018. The 2018 update of the SSGMP (Golder 2018a) included three potential new monitoring well locations.

The LCO SSGMP is complementary and overlaps with the Elk Valley Regional Groundwater Monitoring Program (RGMP) and the groundwater monitoring program for the Line Creek Active Water Treatment Facility.

#### 1.2 Site Specific Groundwater Monitoring Program Objectives

The objectives for the LCO SSGMP are based on the requirements of the LCO discharge permits (PE106970 and PE5353) and site-specific requirements in Sections 9.2.2 and 10.4 of Permit 107517 which specifies that each site groundwater monitoring program must include:

- Characterization of the groundwater system, aquifer characteristics (e.g., hydraulic conductivity and storativity), water quality, and connectivity to the surface water system.
- Characterization of seasonal variability in the groundwater system (quality and quantity).
- Provision of the information necessary to support the development and verification of water quality predictions for the mine site.

Table B: Permit Requirement from Section 10.4 of Permit 107517

Permit Requirement	Relevant Section in This Report		
i. a map of monitoring locations with EMS and Permittee descriptors;	Figure 3 Tables 2-1, 3-1, 3-2, 3-3, 3-4		
ii. cross-sections showing well installation details, stratigraphy, groundwater elevations and flow. Cross-sections should be in the direction of groundwater flow and perpendicular to groundwater flow;	Figures 2-3a, 2-3b, 2-3c Appendix D Appendix F		
iii. drawings showing locations and water quality data of groundwater sampling points;	Figures 4-3 and 4-4		
iv. a summary of background information on that year's program, including discussion of program modifications relative to previous years; and	Section 4.0		
v. a summary of measured parameters, including appropriate graphs and comparison of results to, applicable standards, or other criteria and benchmarks as specified by the Director;	Appendix C Figures 4-5, 4-6, 4-7, 4-8		
vi. if applicable, a summary of exceedances of screening benchmarks;	Figures 4-3 and 4-4		
vii. evaluation and discussion of spatial patterns and temporal trends;	Section 5.0		
viii. a summary of all QA/QC issues for the year; and	Section 4.2		
ix. recommendations for further study or measures to be taken.	Section 7.0		



#### 1.3 Summary of Changes between the 2019 and 2018 Groundwater Monitoring Programs

There were no changes to the 2019 SSGMP compared with 2018.

#### 1.4 Previous Groundwater Work

Previous work that supports the objectives for the SSGMP are summarized in the Table 1-1.

#### **Dry Creek Diversion Modelling**

In 2013, a local groundwater study was performed in the overburden area within the footprint of the Dry Creek Water Management System (DCWMS) to support the design of the Dry Creek diversion (Golder 2013b). Details about this work and supporting reports are presented in Table C.

**Table C: Dry Creek Diversion Summary** 

Year	Reference	Milestone
2013	Golder 2013b	Installed 10 monitoring wells, water quality sampling, water level monitoring, hydraulic testing and development of a conceptual model. Wells were limited to the east of Dry Creek due to access issues (Figure 3).
2014	Golder 2014a	Two additional wells were drilled on the west side of Dry Creek when access to the diversion structure area became available.
2016	Golder 2016b	Numerical modelling was performed as part of <i>Mines Act</i> permit condition C-129 C.1 (e) from the February 19, 2014 amendment that was rescinded and replaced with the following condition:  The Permittee shall develop a three-dimensional groundwater model to assess uncertainties in, and changes to, the groundwater flow regime in the Dry Creek Valley over life of mine and into closure. The model shall be used to evaluate the design of the DCWMS, the potential for uncontrolled seepage around the diversion structure, and the need for additional monitoring locations and contingency measures. Results of this modelling shall be provided to the Chief Inspector by October 30, 2016 and shall be used to inform the development of options for site performance objectives and instream flow measurements.
		This permit condition was satisfied and the modelling results predicted that for the life of mine, the Site Performance Objectives (SPO) for selenium and cadmium concentrations will be met at the monitoring location downstream of the diversion structure. Therefore, it is recommended that routine monitoring (surface water and groundwater) and facility inspections be completed to confirm model predictions, and, if needed, updating for continuous improvement.

## 1.5 Integration between Elk Valley Regional Groundwater Monitoring Program and Site Groundwater Monitoring Programs

There are three levels of groundwater monitoring programs for Teck at Line Creek, summarized below from regional to local scales:

- The RGMP is focuses on monitoring off-site changes to groundwater in the valley-bottom deposits of the major tributaries (i.e., Fording River, Elk River and Michel Creek).
- The LCO SSGMP is used to identify potential impacts to groundwater quality within the mine permitted area and focuses on monitoring near potential sources (focus of the current report).



■ The West Line Creek Active Water Treatment (WLC AWTF) groundwater program is required under refuse permit PR106789 with the objective of characterizing the local groundwater quality and verify the performance of the lined landfill facility.

Annual reports are prepared for the three programs. If an individual program identifies a gap, trend or pathway of concern, the data from the complementary program can be reviewed to understand the extent of the water quality anomaly (e.g., from local to regional programs) or to understand the source of the water quality anomaly (e.g., from regional to local programs). The programs also provide a basis for continuous improvement by checking the new monitoring data against the current conceptual model and provide means to evaluate the effectiveness of mitigations, such as water treatment, to improve water quality.

The RGMP will focus on fate and transport of constituents of interest (CI) in groundwater in the valley bottom of the main stems, and how they relate to applicable receptors. The main source of CI (selenium, sulphate, nitrate, cadmium and calcite) are waste-rock piles in upland areas of the Line Creek and Dry Creek watersheds. It is anticipated that the majority of the regional groundwater monitoring will be located outside mine operations permitted boundaries.

#### 1.6 Linkages to the Adaptive Management Plan

As required in Permit 107517 Section 11, Teck has developed an Adaptive Management Plan (AMP) to support implementation of the EVWQP to achieve water quality targets including calcite targets, ensure that human health and the environment are protected, and where necessary, restored, and to facilitate continuous improvement of water quality in the Elk Valley. Following an adaptive management framework, the AMP identifies six Management Questions (MQ) that will be re-evaluated at regular intervals as part of AMP updates throughout EVWQP implementation. The AMP also identifies key uncertainties (KU) that need to be reduced to fill gaps in current understanding and support achievement of the EVWQP objectives.

The results presented in this report provide information relevant to five of the six MQs and many of the KUs identified in the AMP. Groundwater quality monitoring data along with data collected from other programs are needed for re-evaluating the answers to MQ 1 ("Will water quality limits and SPOs be met for selenium, nitrate, sulfate and cadmium?"), MQ 2 ("Will the aquatic ecosystem be protected by meeting the long-term SPOs?"), MQ 3 ("Are the combinations of methods for controlling selenium, nitrate, sulfate and cadmium included in the implementation plan the most effective for meeting limits and SPOs?"), MQ 5 ("Does monitoring indicate that mine-related changes in aquatic ecosystem conditions are consistent with expectations?"), and MQ 6 ("Is water quality being managed to be protective of human health?").

Groundwater quality monitoring data assist in reducing KU 1.2 ("How will uncertainty in the Regional Water Quality Model be evaluated to assess future achievement of limits and SPOs?"), KU 2.1 ("How will the science-based benchmarks be validated and updated?"), KU 2.2 ("How will the integrated assessment methodology used to derive area-based SPOs be validated and updated?"), KU 3.4 ("What additional flow and groundwater information do we need to support water quality management?"), KU 6.1. (Is our understanding of local groundwater conditions for current and future drinking water (DW) use sufficient to minimize human exposure to constituents?), KU 6.2 ("Is the spatial extent of mine-influenced groundwater sufficiently characterized to manage water quality in order to support meeting the environmental objectives of the EVWQP?"), and KU (6.3 What are appropriate groundwater-related triggers and how can they be used?). Progress on reducing these KU, and associated learnings, will be described in Annual AMP Reports. Results from this report and other 2019 site-specific groundwater monitoring reports will inform the 2019 Regional Groundwater Monitoring Report, which is the main report for conveying results of work to reduce KU 6.1 and KU 6.2. Groundwater triggers under KU 6.3 will be developed in consultation with the Groundwater Working Group (GWG) and implemented in the appropriate monitoring programs once developed.

The 2019 Regional Groundwater Monitoring Report will also be the main report for conveying DW trigger results under the AMP, informed by the Elk Valley Drinking Water Evaluation and Sampling Program.

Refer to Teck's 2018 AMP for more information on the adaptive management framework, Management Questions, Key Uncertainties, the Response Framework, Continuous Improvement, linkages between the AMP and other EVWQP programs, and AMP reporting.



#### 2.0 LCO GROUNDWATER CONCEPTUAL MODEL

The groundwater conceptual model for LCO is updated with new information for continual improvement, with more significant updates in the SSGMP report (three-year cycle) as compared to the annual reports. Since 2007, detailed hydrogeologic studies as part of environmental assessments for expanding Teck operations in the Elk Valley (Golder 2014b, 2015c, 2015d, 2016b; Teck 2011a, 2011b, 2014a, 2015a, 2015b), including LCO Phase II, have significantly contributed to the understanding of local and regional hydrogeology. Previous work includes summaries of hydraulic test and water quality data, data synthesis including cross-sections, and data maps and numerical groundwater models to predict flow directions and flow velocities. An example of groundwater flow patterns in the Elk Valley is shown in Figure 2-1.

Groundwater flow in the mountainous region of the Elk Valley is topographically-driven and consists of local, intermediate, and regional flow regimes. The local flow system generally forms an unconfined aquifer in the overburden deposits (e.g., discontinuous till and colluvium) and shallow bedrock. Groundwater recharge to these shallow aquifers occurs from local topographic highs and discharge is to the nearest tributary stream, maintaining its perennial flow. At lower elevations the local flow system will discharge to the valley bottom sediments. The local flow system will have shorter flow paths and relatively high groundwater velocities. In intermediate and regional flow systems the groundwater flow paths are significantly longer, and the velocities are relatively low. This is due to decreasing hydraulic conductivities with depth in the Elk Valley bedrock units. These intermediate and regional flow systems discharge at low elevations to valley bottom sediments and often produce upward vertical hydraulic gradients between bedrock and overburden aquifers. Therefore, valley bottom sediments along main-stem rivers are recharged by local to regional groundwater flow systems but also by infiltration from direct precipitation, infiltration along losing reaches of the main-stems, and infiltration from losing reaches of tributaries where they enter the main-stem floodplain.

The valley-bottom deposits are considered the primary aquifer in the Elk Valley, with fluvial and glaciofluvial deposits in the floodplains of the main-stem rivers and larger tributaries forming the largest and most transmissive aquifers (Figure 2-1). At LCO, fluvial and glaciofluvial sediments (shown in light blue and bright green) in Figure 2-2 are present in the valley bottoms of Line Creek, Fording River and Elk River. Fluvial sediments have also been identified in Dry Creek. At the lower elevations of Line Creek, an alluvial fan overlaps the Fording River valley bottom sediments. Although these valley-bottom aquifers can be regional in extent, local groundwater flow patterns often dominate with flow toward and discharging to the surface water body that incise into these sediments or flow parallel along losing or dry stretches before gaining stretch returns downgradient.

Due to the varying degrees of surface-water groundwater interaction, groundwater monitoring primarily occurs in the valley bottom to monitor potential effects from an operation but also to identify the potential for a down-valley pathway and degree of surface water-groundwater interaction in local areas. In most areas of LCO, groundwater flows toward the main-stem rivers and larger tributaries and groundwater quality is expected to be better than surface water due to attenuation mechanisms along the pathway. In areas with strong local surface water-groundwater interaction, groundwater quality is similar to surface water quality. The amount of surface water-groundwater interaction has a high degree of spatial and temporal variability as it depends on the interplay of multiple variables including:

- Relative water levels in the river and groundwater system.
- River morphology and gradient.
- Hydraulic properties and the heterogeneity of the streambed and valley-bottom deposits.



- Distance from river.
- Pumping from wells.

For Line Creek, the groundwater-surface water interactions are dependent on the strata underlying the creek (Figure 2-3b):

- All contact water collects downgradient in Line Creek as flow occurs in a canyon with bedrock exposed in the creek bed.
- Downgradient of the canyon, Line Creek flows on permeable fluvial sediments and infiltration occurs to the Fording River valley bottom aquifer with eventual discharge to the Fording River that is the regional topographic low.
- Local gaining and losing reach, east of LC\_LC4, where Line Creek flows over the alluvial fan and west into the valley bottom in the Fording River (Figure 4-1). Flow is not south into the Process Plant Area.

At Dry Creek, the groundwater-surface interactions are also dependent on the strata underlying the creek. The results of a flow accretion study completed in November 2018 (last page of Appendix D), together with groundwater elevations measured in wells, are outlined below:

- Up gradient of the Dry Creek East Tributary of Dry Creek confluence, field investigations identified lower permeability units in the tributary valley bottom that confine flow paths from the deeper bedrock recharged on the ridge tops and results in upwards hydraulic gradient and gaining reaches. In select wells, upward hydraulic gradients are measured in confined discontinuous gravel lenses overlying bedrock and underlying till (cross-section provided in Appendix D).
- A losing to dry reach has been identified at and downgradient of the confluence that is attributed to higher permeability sediments part of the East Tributary alluvial fan (Figure 4-2) before gaining conditions return approximately between 1 and 1.5 km downgradient of the confluence. Downward gradients have also been measured in wells completed in lower permeability till (cross-section provided in Appendix D; Table H).
- Dry Creek is expected to lose water to infiltration when flowing over the Fording River floodplain that is underlain by permeable fluvial sediments with eventual discharge to the Fording River that is the regional topographic low.

Further flow accretion studies are planned for the LCO area to gather more information on the surface water-groundwater interactions.

In terms of groundwater flow velocities, the groundwater system can be subdivided as follows:

Overburden systems that include valley-bottom sediments, waste rock and CCR from mining operations with hydraulic conductivities for coarse fraction typically in the 10<sup>-2</sup> to 10<sup>-5</sup> m/s range; for a scoping level estimate, assuming a gradient of 0.1 and a porosity of 0.3 (typical values for shallow aquifers), the groundwater velocity is expected to range up to hundreds of m per year.



■ Bedrock systems with typical hydraulic conductivities in the 10<sup>-7</sup> to 10<sup>-9</sup> m/s range; for a scoping level estimate, assuming a gradient of 0.01 and a porosity of 0.01 (typical values for fractured bedrock aquifer), the groundwater velocity is expected to be up to 1 m per year.

Waste rock piles form thick unsaturated zones with thin basal aquifers atop the native ground of valley flanks and bottoms. Groundwater mounds below waste rock piles with the majority discharging as surface water at the toe of the waste rock spoils in combination with shallow groundwater before being directed to the nearest surface water body.

Water quality data from LCO is consistent with the conceptual model for groundwater flow described above. Potential sources, pathways and receptors are discussed in Golder (2018a).

The conceptual models are live tools that are continually checked and updated as needed as new data becomes available.

#### 2.1 Groundwater Monitoring Program Design

The LCO SSGMP began in 2013 and is updated every three years (e.g., 2015, and 2018). This annual report focuses on data collected in 2019 and includes results from 2013 to 2018 for temporal context.

The report includes groundwater quality results, specifically for the CI identified in the provincial Ministerial Order No. 113 (the Order): selenium, cadmium, nitrate, and sulphate (Teck 2014a). LCO and regional monitoring, especially in mine-affected areas, indicate that cadmium concentrations tend to be lower in groundwater than surface water. Hence, this report focuses on selenium, sulphate, and nitrate. These constituents can often help understand the interaction between mine-affected waters, groundwater and surface watercourses.

Groundwater at LCO is divided into four spatial areas for the purpose of the monitoring program (Figure 3):

- LCO Phase I Area is in the upper portion of Line Creek. Groundwater in this area is proximal to pits and waste rock spoils. Surface water in West Line Creek (WLC), which emerges from a rock drain under the WLC Spoil, is treated at the WLC AWTF.
- LCO Process Plant Area is adjacent to the confluences of Line Creek, the Fording River, and the Elk River in the valley-bottom of the Elk River. Proximal to this area are the process plant ponds and CCR, which are potential sources of contact waters. Groundwater near the Fording and Elk Rivers are also prone to receiving mine-affected surface water and groundwater from upstream mine operations.
- LCO Dry Creek Area includes permitted area for the Phase II LCO mining, which includes waste rock storage at the southern portion of the Dry Creek watershed, north of Phase I LCO mining. Contact water effects from recently placed waste rock on groundwater could be detected in this area. Additional information on the hydrogeology in this area is provided in Appendix D, and in Golder (2014a, 2016c).
- Outside LCO Wells currently located downgradient of Dry Creek and the Process Plant Area (part of regional program but considered in this report for context).

Groundwater monitoring in the area of the WLC AWTF is reported separately on an annual basis (Golder 2018b).



The groundwater monitoring network was designed by assessing potential source zones, pathways and receptors, as discussed in Golder (2018a), and summarized in the table below:

Table D: Summary of Sources and Pathways and Monitoring Well Locations

Area	Potential CI Source	Potential Pathway	Groundwater Monitoring Locations <sup>(a)</sup>	
	Process Plant Ponds, Coarse Coal Rejects	Infiltration through fine-grained sediments and 30 m-thick unsaturated zone, groundwater transport to valley- bottom aquifer, Fording River and Elk River	LC_PIZP1101, LC_PIZP1103, LC_PIZP1104, LC_PIZP1105 plus additional wells for groundwater levels	
Process Plant	Line Creek	Infiltration to valley-bottom aquifer, groundwater transport to Fording River (Study Area #5)	Surface water only: LC_LC4, LC_LC5	
	Fording River	Infiltration to valley-bottom aquifer, groundwater transport to Elk River (Study Area #5)	Surface water only: LC_LC5, EV_ER4	
	Reclaimed CCR	Infiltration to valley-bottom aquifer, groundwater transport to Elk River (Study Area #6)	Surface water only: EV_ER4	
	West Line Creek Spoil, North Line Creek Spoil, Burnt Ridge South Spoil, Horseshoe Spoil North Line Creek Pit, Burnt Ridge South Pit, Horseshoe Ridge Pit Ore Handling Area	Surface water transport: minor tributaries to Line Creek	Surface water only due to discharge from terminus of aquifer: LC_LC3, LC_LCDSSLCC, LC_LC4	
		Upland groundwater transport discharging to Line Creek		
Phase I		Upland groundwater transport discharging indirectly to Line Creek through groundwater springs that daylight along the SE slope of the WLC catchment		
Phase II	Dry Creek Spoil	Infiltration through fine-grained sediments to patchy upland aquifer in tributary valley bottom, groundwater transport to Dry Creek	LC_PIZDC1306, LC_PIZDC1307, LC_PIZDC1308, LC_PIZDC1404S, LC_PIZDC1404D, LC_PIZDC0901	
		Surface water infiltration to valley- bottom aquifer and Fording River (Study Area #2)	GH_POTW10 (downgradient of study area and LCO)	

a) Except where noted.

The approach for the LCO site specific annual monitoring was to review time series plots for the areas of interest, compare to surface water trends, assess the spatial distribution relative to hydrogeologic settings and mine operations, and include trends in local water downgradient of LCO footprint boundaries.

#### 3.0 APPLICABLE REGULATORY CRITERIA

#### 3.1 Primary Screening

In BC, environmental matters pertaining to contaminated sites generally fall under the jurisdiction of the ENV, pursuant to the *Environmental Management Act* (EMA, SBC 2003, Chapter 53 assented to 23 October 2003). The key regulation under the EMA that relates to the assessment and remediation of contaminated sites is the Contaminated Sites Regulation (CSR; BC Reg. 375/96, O.C. 1480/96 and M271/2004, as updated [includes amendments up to BC Reg. 13/2019, updated to 24 January 2019]).

The CSR provides numerical standards for the evaluation of soil, groundwater, sediment and soil vapour quality. The following standards are considered applicable to the Site for the purposes of this monitoring program (Table 3-3):

CSR numerical standards applied to analytical groundwater data were based on protection of aquatic life receiving freshwater (AW-F) and DW in accordance with ENV Document Protocol 21 for Contaminated Site: Water Use Determination, dated 31 October 2017. The following water use criteria were considered: aquatic wildlife (AW), irrigation water (IW), water used for livestock and water used for DW. Additionally, an interim background groundwater estimate of 20 μg/L for cobalt was used to screen the data consistent with ENV Technical Bulletin 3 Regional Background Concentrations for Select Inorganic Substances in Groundwater dated 24 September 2018.

#### 3.2 Secondary Screening

Recharge of groundwater from surface water elevated in selenium means that groundwater may be higher than CSR standards. As a result, a secondary screening step consists of comparing the results to Permit 107517 limits and SPOs (Table 3-4) and the Canadian Drinking Water Quality Guidelines (Health Canada 2017).

This approach is consistent with the Elk Valley Regional Groundwater Monitoring Program (SNC-Lavalin 2017).



#### 4.0 MONITORING AND ANALYSIS METHODS

#### 4.1 Sampling

Groundwater sampling at LCO was conducted by Teck's contractor Nupqu Development Corporation (Nupqu)and by Teck LCO technicians, in accordance with the British Columbia Field Sampling Manual for Continuous Monitoring and the Collection of Air, Air-Emission, Water, Wastewater, Soil, Sediment, and Biological Samples (BC MOE 2013). In particular, "Part E: Water and Wastewater Sampling" contains applicable guidance in the "Ambient Freshwater and Effluent" section as well as throughout the "Groundwater Pollution Monitoring" section.

Prior to sample collection, wells were purged using a low-flow pump until in situ water quality readings stabilized. In situ water quality readings were obtained using a YSI Pro-Plus multiparameter instrument. Sample bottles and preservatives were provided by an accredited third-party analytical laboratory, ALS Environmental Laboratories (ALS). Sample bottles were certified clean and nitrile gloves were worn by the field technicians. Samples collected for dissolved parameters (e.g., dissolved metals and dissolved organic carbon) were field-filtered using an in-line filter. Due to field conditions and/or logistics, if samples are not field filtered then samples are shipped to the lab on the same day as sampling to minimize hold time prior to analysis. Samples requiring preservation were preserved accordingly in the field. The methods used for monitoring the field parameters with a YSI Pro-Plus multiparameter instrument are presented in Table 3-1. Calibration records for the multiparameter instrument were maintained by LCO.

#### 4.2 Data Quality Assurance and Quality Control (QA/QC)

Environmental monitoring was conducted by Teck LCO Environment personnel and Nupqu personnel. All personnel were trained, experienced and competent.

Analysis of water samples is conducted by ALS in Calgary, AB, except for analysis of metals (total and dissolved) which were conducted by ALS in Vancouver, British Columbia. ALS Calgary laboratory is accredited by the Canadian Association for Laboratory Accreditation (CALA), for tests listed on their Scope of Accreditation. Water samples were submitted to ALS in Calgary, Alberta instead of ALS in Burnaby, British Columbia to minimize holding time exceedances. The laboratory provided sample bottles and containers, appropriate preservatives, and other necessary supplies (e.g., in-line filters for dissolved metals samples). ALS Limits of Reporting (LOR) for each parameter is included in the summary tables for blanks samples. The LOR is the detection limit (DL) for each analytical method plus a factor of safety to account for the standard error for each analytical method. In this report, the method detection limit (MDL) refers to the DL plus this factor of safety and is equivalent to the LOR. The MDLs for the samples collected in 2019 were below the BC CSR standards.

Groundwater monitoring at LCO in 2019 included the collection of QA/QC samples, including duplicates, field blanks and trip blanks. Acceptability criteria for review of QA/QC samples and the results of the QA/QC review are provided in Appendix A.

For reviewing the results of duplicate samples and the associated parent samples, LCO utilizes the criteria detailed in Part A, Appendix 3 (page 26) of the BC Field Sampling Manual for Continuous Monitoring (BC MOE, 2013), which notes that the Relative Percent Difference (RPD) is expected to be somewhat greater in field duplicates than for laboratory duplicates. Using the example Acceptability Criteria of BC MOE (2013) as a guide, the following Acceptability Criteria were established for review of LCO field duplicate analyses (Appendix A) as noted in Table A1 of Appendix A:

- "Pass" denoted that RPD values for duplicate samples were ≤ 20% or both duplicate values were less than the MDL.
- "Pass-1" denoted that one or both duplicate values were less than five times the MDL. The RPD value was calculated; however, an RPD target was not identified.
- "Pass-2" denoted that both duplicate values were greater than five times the MDL, and the RPD value was >20% and ≤ 50%.
- "Fail" denoted that that both duplicate values were greater than five times the MDL, and the RPD was >50%.

The laboratory RPD is analysis dependent; however, based on the ALS laboratory certificates of analysis (COAs) an internal precision criterion of  $\leq 20\%$  RPD is generally consistent for the parameters provided within this report.

Four sets of field duplicates were collected during the 2019 groundwater sampling program (Appendix A, Table A1). The RPD values for analyzed parameters was calculated in accordance with the BC Field Sampling Manual for Continuous Monitoring (BC MOE 2013). Using the criteria for analysis of the RPD values provided above, 94% of the duplicate analyses were classified as "Pass", 5% of the duplicate analyses were classified as "Pass-1", 0% of the duplicate analyses were classified as "Pass-2", and 1% of the duplicate analyses were classified as "Fail".

A review of the results with RPD greater than 50% indicated that these exceedances were generally not consistent between samples for one or more analytes. Both the original and duplicate samples were included in the 2019 assessment summary tables and screened against the referenced standards for interpretation of the results.

Four field blank samples were collected during the 2019 groundwater sampling program (Appendix A, Table A2). Based on the results, 93% of the analyses were below MDLs); therefore, considered acceptable. The following analytes had reportable concentrations above MDLs and required further review:

- Field blank Sample ID WG\_Q1-2019-MT1:
  - Ammonia concentration of 1.05 mg-N/L, above the MDL (0.010 mg-N/L);
  - Total chromium concentration of 0.0004 mg/L, above the MDL (0.0001 mg/L); and
  - Total Kjeldahl Nitrogen concentration of 4.76 mg/L, above the MDL (0.05 mg/L).
- Field blank Sample ID WG Q3-2019 010:
  - Ammonia concentration of 0.0075 mg-N/L, above the MDL (0.005 mg-N/L); and
  - Total lead concentration of 0.000064 mg/L, above the MDL (0.00005 mg/L).



- Field blank Sample ID WG\_Q4-2019\_004:
  - Dissolved barium concentration of 0.00029 mg/L, above the MDL (0.0001 mg/L);
  - Dissolved calcium concentration of 0.063 mg/L, above the MDL (0.05 mg/L);
  - Total manganese concentration of 0.0001 mg/L at the MDL (0.0001 mg/L);
  - Dissolved silicon concentration of 0.227 mg/L, above the MDL (0.05 mg/L);
  - Dissolved sodium concentration of 0.233 mg/L, above the MDL (0.05 mg/L);
  - Dissolved tin concentration of 0.00075 mg/L, above the MDL (0.0001 mg/L); and
  - Total tin concentration of 0.00012 mg/L, above the MDL (0.0001 mg/L).

Detections of acidity, pH and oxidation-reduction potential in blanks were not included in the list above, as some acidity is expected to be present in de-ionized water. The detected ammonia concentration and Total Kjeldahl concentration in Sample ID WG\_Q1-2019-MT1 and the dissolved tin concentration in Sample ID WG\_Q4-2019\_004 were above 5 × MDL; however, concentrations were below referenced BC CSR standards (1.31 mg-N/L for ammonia, no standard for TKN and 2.5 mg/L for dissolved tin). Some parameters detected in the field blanks, were also detected in the trip blanks, suggesting introduction of these parameters in the field or during shipment and handling.

A trip blank was submitted during each quarterly sampling event (Appendix A, Table A3). The following analytes had reportable concentrations above MDLs and required further review:

- Trip blank Sample ID WG Q1-2019 RD1 MT1:
  - Ammonia concentration of 0.292 mg-N/L, above the MDL (0.005 mg-N/L);
  - Total iron concentration of 0.022 mg/L, above the MDL (0.01 mg/L);
  - Total manganese concentration of 0.00014 mg/L, above the MDL (0.0001 mg/L);
  - Nitrate concentration of 0.125 mg-N/L, above the MDL (0.005 mg/L);
  - Total Kjeldahl Nitrogen concentration of 0.301 mg-N/L, above the MDL (0.05 mg/L); and
  - Phosphorus concentration of 0.0033 mg/L, above the MDL (0.002 mg/L).
- Trip blank Sample ID WG Q2-2019 RD1:
  - Ammonia concentration of 0.0334 mg-N/L, above the MDL (0.005 mg-N/L).
- Trip blank Sample ID WG\_Q4-2019\_006:
  - Ammonia concentration of 0.0069 mg-N/L, above the MDL (0.005 mg-N/L).

Detections of acidity, pH and oxidation-reduction potential in trip blanks were not included in the list above, as some acidity is expected to be present in de-ionized water. The detected ammonia, nitrate, Total Kjeldahl Nitrogen and phosphorus concentrations in the first quarter trip blank were greater than 5 x MDL, suggesting potential cross-contamination related to sample transport and storage conditions. This may have an affect on the interpretation of the results for those parameters, however the parameters are not CI, except for the nitrate detection in the trip blank collected during Q1.

Samples collected as part of the 2019 sampling program had turbidity levels below the Acceptable Criteria of 200 nephelometric turbidity units (NTU) (BC MOE 2016), with the exception of LC\_PIZP1105 collected in March and June 2019 which had field-measured turbidity units of 1072.1 and 370 NTU, respectively (Appendix C). Elevated field-measured turbidity (>50 NTU) was also observed in March at LC\_PIZP1104 (150 NTU), November at LC\_PIP1105 (122.74 NTU) and March at LC\_PIZDC1307 (60 NTU). These elevated field-measured turbidity values (>50) may be attributed to increased surface water infiltration during the first quarter, except for at LC\_PIP1105. Metals concentrations at LC\_PIZP1105 were below the BC CSR standards with the exception of lithium and therefore the elevated turbidity is not expected to have a significant affect on the data conclusions in this report.

Hold time exceedances as provided in the COAs (Appendix G) were reviewed. Exceedances with respect to pH and oxygen-reduction potential were noted for multiple sampling events. The field-measured value is recommended for these parameters. Hold time exceedances with respect to orthophosphate and total suspended solids were also noted for March 2019 events as outlined in the COAs. Hold time exceedances with respect to nitrites and nitrates were noted in July 2019 sampling events and may affect the interpretation of the results. However, long-term trends in nitrate concentrations are assessed within the report.

Overall, the results from the QA/QC program completed in 2019 are considered acceptable for the purposes of this report.

#### 4.3 Statistical Analysis

Statistical analyses were completed using the following two methods to provide an objective assessment of variation in groundwater chemistry data at key locations:

- Control charting to define variation relative to mean values.
- Trend analysis using seasonal Mann-Kendall statistical analysis to assess changes over time. Data from the first quarter (Q1) of each year was utilized, as well as data from the fourth quarter (Q4).

The groundwater wells and the rationale for selecting them for statistical analysis is provided below:

- LC\_PIZP1104 and LC\_PIZD1105: valley-bottom aquifer between the Process Ponds and the Elk River, with higher concentrations of CI than other wells in the Process Plant area (Figure 4-3).
- LC\_PIZDC0901 and LC\_PIZDC1306: tributary valley-bottom sediments between the Phase II spoil and the Fording River, with higher concentrations of CI than other wells in the Dry Creek area (Figure 4-4).



■ RG\_02-20: valley-bottom aquifer in the valley-bottom aquifer downgradient approximately 4.3 km south of the LCO project operational boundary and adjacent to the Elk River, with selenium concentrations periodically exceeding the water quality criteria (Figure 4-3).

Control charting and seasonal trend analysis focused on groundwater quality parameters: dissolved selenium, sulphate, nitrate, and dissolved cadmium for LC\_PIZP1104, LCPIZD\_0901, LC\_PIZP1105 and LC\_PIZP1306. Total selenium and total cadmium concentrations were included in the statistical analysis for RG\_02-20. Total metals, rather than dissolved metals, was analyzed as from RG\_02-20 is used as a source of drinking water..

Control charts are tools that allow graphical investigation of data in a meaningful and transparent manner, while providing control limits (Chapman et al. 2007). Control charts were formulated using the Shewhart charting method (Shewhart 1931). The upper control limited was calculated as the 99.7 percentile of the entire dataset plus the mean of the entire dataset. This is similar to establishing control limits via plus or minus three times the standard deviation (+/- 30), if the data is normally distributed. If lower control limits were found to be negative values, the lower control limits were considered as zero.

To identify and determine temporal trends in groundwater quality parameters, parameters were analyzed using Mann-Kendall trend analysis (Hirsch et al. 1982; Gilbert 1987). Seasonal Mann-Kendall trend analyses were completed for annual results collected during the first quarter (Q1: defined from 1 January to 31 March) (note that for RG\_02-20, one sampling event included for the Q1 analysis was from April since the Q1 sample was not available) and the last quarter (Q4: defined from 1 October to 31 December). Half the detection limit was substituted for data that were reported below the detection limit. The rationale behind the selection of groundwater monitoring wells for the Mann-Kendall trend analysis can be seen in Table E below.

Table E: Rationale for Selection of Wells for Mann-Kendall Trend Analysis

Area	Well Name	Rationale	
Phase I – Process Plant (Ponds)	LC_PIZP1104	Monitor water quality downgradient of Process Plant ponds prior to the Elk River and Fording River confluence to detect	
	LC_PIZP1105	seepage from Process Plant ponds	
Phase II – Dry Creek (Diversion Structure)	LC_PIZDC0901	Monitor water quality near Dry Creek to detect seepage near diversion structure for proposed water treatment plant	
	LC_PIZDC1306		
Non-LCO Monitoring Well (Downgradient of Plant Site)	RG_02-20	Monitor water quality to detect seepage downgradient of LCO Plant Site, Greenhills Operations, and Fording River Operations	



#### 5.0 RESULTS

The results of the 2019 groundwater monitoring program are presented for three general areas (Figure 3):

- LCO Process Plant Area.
- LCO Dry Creek Area.
- Outside LCO Offsite Wells.

Groundwater elevations and contours in the Process Plant and Dry Creek areas are shown on Figures 4-1 and 4-2, respectively. Hand groundwater level measurements collected throughout the 2019 calendar year are summarized in Table F below.

Table F: Manual (Hand) Water Level Measurements

General Area	Well ID	Date (2019)	Manual Water Level Measurement (mbtoc)	Top of Casing Elevation (masl)	Manual Groundwater Elevation (masl)
	LC_PIZDC0901	March 26	4.11	1693	1688.89
		June 5	5.97		1687.03
		September 3	6.72		1686.28
		November 6	7.52		1685.48
		March 25	7.74		1702.3
	LC DIZDC1206	May 29	Artesian	1709.04	N/A
	LC_PIZDC1306	August 15	Artesian	1709.04	N/A
		November 7	2.06		1707.98
	LC_PIZDC1307	March 21	7.15	1691.21	1684.06
		May 29	2.73		1688.48
		August 22	3.26		1687.95
Dw. Crask Area		October 30	3.26		1687.95
Dry Creek Area	LC_PIZDC1308	March 21	3.31	1691.37	1688.06
		May 29	2.08		1689.29
		August 22	2.51		1688.86
		October 30	3.02		1688.35
	LC_PIZDC1404S	March 20	5.71	1706.60	1700.89
		May 23	1.33		1705.27
		August 15	3.23		1703.37
		October 23	4.69		1701.91
	LC_PIZDC1404D	March 20	7.10	1706.86	1699.76
		May 23	3.81		1703.05
		August 15	4.48		1702.38
		October 23	5.68		1701.18



Table F: Manual (Hand) Water Level Measurements

General Area	Well ID	Date (2019)	Manual Water Level Measurement (mbtoc)	Top of Casing Elevation (masl)	Manual Groundwater Elevation (masl)
	LC_PIZP1001	March 14	57.95	1287.83	1229.88
		November 13	49.71		1238.12
		January 22	31.40		1235.66
		April 25	31.03		1236.03
	I C DIZD1101	July 17	30.95	1267.06	1236.11
	LC_PIZP1101	November 21	31.11	1267.06	1235.95
		December 5	30.93		1236.13
		December 16	31.20		1235.86
	LC_PIZP1103	March 13	28.29	1264.54	1236.25
		May 6	28.08		1236.46
		July 9	28.04		1236.50
Process Plant Area		October 10	28.28		1236.26
Process Plant Area	LC_PIZP1104	March 14	35.01	1272.10	1237.09
		March 18	34.45		1237.65
		May 27	34.95		1237.15
		September 6	34.92		1237.18
		September 12	34.96		1237.14
		November 13	34.96		1237.14
		November 14	34.95		1237.15
	LC_PIZP1105	March 31	38.41	1273.86	1235.45
		June 24	38.42		1235.44
		June 25	38.42		1235.44
		September 5	38.40		1235.46
		November 13	38.37		1235.49

Spatial variation in concentrations of dissolved selenium, dissolved cadmium, dissolved sulphate, and nitrate for groundwater locations and select surface water locations are presented on Figures 4-3 and 4-4 (highest concentrations in 2019 at each site are shown for surface water data). For each area, selenium, nitrate, and sulphate concentrations from sampling locations have been plotted on time series plots see Figures 4-5 to 4-8. Groundwater level measurements from a representative well were coupled with chemistry results to aid in the assessment of temporal variations (Figures 4-5a,b,c and 4-6a,b,c). Groundwater levels over time in each well are provided in Appendix B. Concentrations of CI and comparisons to CSR standards are presented in Tables 4-1 and 4-2. The results for a suite of analytes for sampled locations with comparison to BC CSR are presented in Appendix C. Results of the statistical analyses including quality control charts and seasonal Mann-Kendall trend analyses are shown in Appendix E. Borehole logs are provided in Appendix F. Laboratory reports are provided in Appendix G (electronic copy of report only).



#### 5.1 Line Creek - Process Plant Area

#### **Groundwater Levels**

Groundwater levels in monitoring wells in the Process Plant area ranged from approximately 1,235 to 1,268 metres above sea level (masl) (Figure 4-1). Groundwater flow in the valley-bottom aquifer underlying the Process Plant area is directed from the eastern edge of the valley bottom-sediments (East), including recharge from Line Creek and Grave Lake, to the Elk River (West). No vertical hydraulic gradients were calculated for the Process Plant Area due to the lack of nested wells in the area.

#### **Groundwater Quality**

Concentrations of CI were below BC CSR standards at sampled groundwater locations from the Process Plant area in 2019 (Figure 4-3, Table 4-1). Below is a summary of the CI concentrations in groundwater at monitoring wells in the Process Plant area in 2019 (excluding RG 02-20):

- Dissolved selenium concentrations ranged from <0.05 μg/L (LC\_PIZP1101 and LC\_PIZP1103 during multiple sampling events) to 0.704 μg/L (LC\_PIZP1105 on March 29).
- Sulphate concentrations ranged from 2.56 mg/L (LC\_PIZP1101 on January 22) to 102 mg/L (LC\_PIZP1105 during multiple sampling events).
- Nitrate concentrations ranged from <0.005 mg-N/L (LC\_PIZP1101 during multiple sampling events) to 0.605 mg-N/L (LC\_PIZP1105 on June 25).
- Dissolved cadmium concentrations ranged from <0.005 μg/L (LC\_PIZP1101 on July 17) to 0.146 μg/L (LC\_PIZP1104 on March 18).

Localized exceedances of dissolved chloride, boron, cobalt, fluoride, lithium, manganese, and molybdenum concentrations are present in results from wells (LC\_PIZP1101, LC\_PIZP1103, LC\_PIZP1104, and LC\_PIZP1105) in the Process Plant area (Appendix C). This is similar to 2018 results (Golder 2019), except for dissolved boron and cobalt, which were new exceedances in 2019 in the Process Plant area:

- Chloride concentrations exceeded IW (100 mg/L) at LC\_PIZP1104 and LC\_PIZP1105, during each of the 2019 sampling events. Chloride concentrations in these wells ranged from 118 mg/L to 203 mg/L.
- Fluoride concentrations exceeded IW (1 mg/L), water used for livestock (1 mg/L) and DW (1.5 mg/L) at LC PIZP1101 during each of the 2019 sampling events, and from 1.69 mg/L to 1.83 mg/L.
- Dissolved boron exceeded IW (500 μg/L) in LC\_PIZP1103 during the May sampling event. Concentrations measured in 2019 ranged from 480 μg/L to 570 μg/L. They were either marginally above or marginally below IW.
- Dissolved cobalt concentrations exceeded DW (1 μg/L) in LC\_PIZP1104 during each sampling event and 2019 concentrations ranged from 1.07 to 1.88 μg/L. This is well below the cobalt interim background estimate of 20 μg/L (BC MOE 2018), however above the 2018 cobalt concentration range of 0.1 to 0.4 μg/L.
- Concentrations of dissolved lithium exceeded DW (8 μg/L) in each of the four wells during each of the 2019 sampling events. Concentrations ranged from 9 μg/L to 122 μg/L.



Dissolved manganese concentrations exceeded IW (200 μg/L) at LC\_PIZP1101, LC\_PIZP1103 and LC\_PIZP1104 during at least three sampling events in 2019. Dissolved manganese concentrations above IW ranged from 222 μg/L to 1,070 μg/L.

Dissolved molybdenum concentrations were above IW (10 μg/L) at LC\_PIZP1101 and LC\_PIZP1103 during at least two sampling events in 2019. Dissolved molybdenum concentrations above IW ranged from 10.7 μg/L to 12.7 μg/L.

The exceedances listed above could be related to dissolution of naturally occurring sedimentary minerals in the glacial tills in this area and produced by the erosion of carbonate and evaporite minerals from the Wisukitsak Range (Figure 2-2). Other processes affecting groundwater chemistry include reductive dissolution and cation exchange associated with calcite-saturated waters.

The Elk Valley Regional Groundwater Monitoring Program considers irrigation and livestock watering receptors; however, water is not used for irrigation or livestock near the Process Plant. These results are generally consistent with 2018 results.

#### **Surface Water Quality**

Surface water maximum concentrations of dissolved selenium, dissolved cadmium, dissolved sulphate, and nitrate in the Elk River at Order Station 200027 (EV\_ER4), located southwest and generally downgradient of the Process Plant, are shown on Figure 4-3; time series concentrations are shown on Figure 4-5 for comparison to the groundwater results. Surface water concentrations of dissolved selenium and nitrate are one to two orders of magnitude higher than groundwater concentrations; however, sulphate concentrations in groundwater samples from wells LC\_PIZP1104 and LC\_PIZP1105 were comparable to surface water concentrations (Figure 4-5). Dissolved selenium concentrations in surface water were consistently above DW, or marginally below.

#### **Spatial and Temporal Trends**

Time series plots of groundwater levels measured continuously with pressure transducers in five groundwater wells (LC\_PIZP1001, LC\_PIZP1101, LC\_PIZP1103, LC\_PIZP1104 and LC\_PIZP1105) in the Process Plant area during 2019 are provided in Appendix B. The transducer data was corrected by using data from a barologger located at DCPond 1 (Figure 4-2) and further corrected for elevation by utilizing the hand water level measurements, since the depth of logger deployment was not consistently recorded for each logger. At LC\_PIZP1001, the transducer was set at or above the water level in the well throughout its deployment since 2015, however groundwater levels were measured manually.

Groundwater levels measured in LC\_PIZP1101 from December 2014 to December 2019, containing the longest continuous record in the Process Plant area, show a muted response to seasonal variations (Appendix B, Figure B1c). With groundwater levels approximately 30 m below ground level and the water level in the Process Plant ponds, the muted response to seasonal variations is likely due to attenuation of pressure responses by the thick unsaturated zone, as opposed to being controlled by the pond water elevation.



The groundwater level measurements at LC\_PIZP1103 indicated less than 1 m of variation in 2019 in response to the annual snowmelt freshet, and the transducer recorded slow responses to sampling events indicative of low permeability (the well was completed in a thick silt unit with hydraulic conductivity of 7 x  $10^{-8}$  m/s, which overlies bedrock). The groundwater level measurements at LC\_PIZP1104, which was screened across two sand and gravel units and had a hydraulic conductivity of 3 x  $10^{-4}$  m/s, indicate less than 1 m variation during a period including the annual snowmelt freshet.

Low dissolved selenium concentrations in groundwater adjacent to the Process Plant ponds CCR (<1  $\mu$ g/L) from 2013 to 2019 contrasts maximum 2019 dissolved selenium concentrations in nearby permitted surface water monitoring site (LC\_LC4) and Order Stations (GH\_FR1, EV\_ER4). Selenium concentrations were 47.7  $\mu$ g/L in Line Creek (LC\_LC4), 82  $\mu$ g/L in Fording River (GH\_FR1), and 22.8  $\mu$ g/L in the Elk River (200027 or EV\_ER4) (Figures 4-3 and 4-4). Surface water being the primary pathway of transport for contact waters, coupled with the nominal seepage and infiltration of surface water from LCO into valley-bottom aquifers, results in elevated dissolved selenium concentrations in surface water relative to groundwater at the location of the monitoring wells. Statistical and visual trends for CI trends can be seen below in Table G.

Dissolved selenium concentrations are typically lower in drainage from CCR piles as compared to drainage from waste rock piles because oxidation-reduction potential is lower within and under CCR piles. Previous carbon content measurements at mine sites across Alberta and British Columbia (Kennedy et al. 2015; SRK 2011) indicate that elevated carbon content within the CCR piles can provide enough substrate for the establishment of microbial communities capable of reducing oxidized metals (e.g., selenate, nitrate, and ferric iron). In reducing environments, selenium is more stable in the selenide anion, which preferentially forms insoluble selenide minerals rather than mobilizing in the dissolved phase. Statistical and visual trends for CI trends can be seen below in Table G.

There were no visual temporal trends in the CI in the monitoring well with the longest monitoring record (LC\_PIZP1101; Figure 4-5, where concentration in quarterly samples from 2013 to 2018 were generally lower than in other monitoring locations (Table 4-1). Sulphate concentrations in well LC\_PIZP1105 had an increasing trend in the first and fourth quarter (Appendix E and Figure 4-5), however, concentrations remained below the lowest referenced BC CSR standard (DW, 500 mg/L). Statistical and visual trends for CI trends can be seen below in Table G.

Control charting indicated concentrations of CI remained below the Upper Control Limit (Figures E3 and E4 in Appendix E). The calculated upper control limits for nitrate, sulphate, cadmium and selenium decreased from 2018 to 2019, except for a minor increase (<1%) of the selenium upper control limit at RG\_02-20 and a significant (>200%) increase in cadmium at LC\_PIZP1104 (Table E3, Appendix E). The significant change in the cadmium control limit is attributed to the March 2019 concentration of 0.146 µg/L, which is considered an outlier and exceeds the 2018 upper control limit. The March 2019 cadmium concentration should be excluded when calculating the 2020 upper control limits. Statistical and visual trends for CI trends can be seen below in Table G.

Temporal trend analysis (i.e., seasonal Mann-Kendall statistical analysis) suggests that nitrate concentrations at LC\_PIZP1104 and LC\_PIZP1105 have no trend in Q1 and Q4 from 2014 to 2019 (Appendix E). Dissolved selenium concentrations at LC\_PIZP1104 had an increasing trend in Q1 and were considered to have a stable trend in Q4. Maximum dissolved selenium concentration in Q1 (0.188  $\mu$ g/L) was below the lowest referenced BC CSR standard (DW, 10  $\mu$ g/L). Dissolved sulphate concentrations at LC\_PIZP1105 had an increasing trend in Q1 and Q4. Trend analysis for dissolved cadmium at LC\_PIZP1104 for Q1 and Q4 had no trend and probably increasing trend, respectively, and at LC\_PIZP1104 for Q1 and Q4 had an increasing trend and no trend, respectively (Appendix E). Maximum dissolved cadmium concentration for LC\_PIZP1104 in Q4 (0.0257  $\mu$ g/L) and for LC\_PIZP1105 in Q1 (0.0633  $\mu$ g/L) was below the lowest reference BC CSR standard (Aquatic Life [freshwater], 4  $\mu$ g/L). Temporal and Visual trends for CI trends can be seen below in Table G.



**Table G: Temporal and Visual Trends** 

	Sulp	hate	Seler	nium	Niti	rate	Cadr	Stable N/A  No Trend (Q1) and Probably Increasing (Q4)  Increasing (Q1) and No Trend (Q4)  No Trend (Q4)  No Trend (Q1) and Stable (Q4)  Stable Not enough data (Q1) and No Trend (Q4)  Stable N/A	
Well ID	Visual Trend	Mann- Kendall Trend	Visual Trend	Mann- Kendall Trend	Visual Trend	Mann- Kendall Trend		Kendall	
LC_PIZP1001	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
LC_PIZP1002	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
LC_PIZP1003	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
LC_PIZP1101	Decreasing	N/A	Stable	N/A	Stable	N/A	Increasing	N/A	
LC_PIZP1103	Increasing	N/A	Decreasing	N/A	Decreasing	N/A	Increasing	N/A	
LC_PIZP1104	Decreasing	No Trend (Q1) and Decreasing (Q4)	Stable	Increasing (Q1) and Stable (Q4)	Increasing	No Trend (Q1 and Q4)	Stable	(Q1) and Probably Increasing	
LC_PIZP1105	Increasing	Increasing (Q1 and Q4)	Decreasing	No Trend (Q1) and Stable (Q4)	Stable	No Trend (Q1 and Q4)	Increasing	(Q1) and No Trend	
LC_PIZDC0901	Increasing	Stable (Q1) and No Trend (Q4)	Stable	No Trend (Q1) and Increasing (Q4)	Decreasing	No Trend (Q1 and Q4)	Increasing		
LC_PIZDC1306	Stable	Not enough data (Q1) and Stable (Q4)	Stable	Not enough data (Q1) and No Trend (Q4)	Stable	Not enough data (Q1) and No Trend (Q4)	Stable		
LC_PIZDC1307	Stable	N/A	Stable	N/A	Increasing	N/A	Stable	N/A	
LC_PIZDC1308	Stable	N/A	Decreasing	N/A	Decreasing	N/A	Decreasing	N/A	
LC_PIZDC1404D	Stable	N/A	Stable	N/A	Stable	N/A	Increasing	N/A	
LC_PIZDC1404S	Stable	N/A	Stable	N/A	Stable	N/A	Stable	N/A	
RG_02-20	Stable	Increasing (Q1) and No Trend (Q4)	Stable	Stable (Q1 and Q4)	Decreasing	Stable (Q1) and Probably Decreasing (Q4)	Stable	No Trend (Q1) and Probably Decreasing (Q4)	
GH_POTW10	Stable	N/A	Stable	N/A	Stable	N/A	Stable	N/A	

Note: N/A = Analytical or Mann-Kendall data was not available for the groundwater monitoring well.

## 5.2 Line Creek - Dry Creek Area

#### **Groundwater Levels**

Groundwater levels in monitoring wells in the Dry Creek area ranged from approximately 1,685 to 1,707 masl (Figure 4-2). The conceptual understanding of groundwater flows in this area, developed as part of the Structured Decision-Making Process for Dry Creek indicate that above East Tributary confluence, groundwater flow is directed toward and discharges to Dry Creek, consistent with a gaining reach. Near and downgradient of East Tributary confluence, there is a losing to dry reach that is likely associated with coarse sediment of the East Tributary alluvial fan. In the losing to dry reach, groundwater flow is directed parallel to the creek. This is supported by the flow accretion studies that that are currently ongoing as part of the Structured Decision-Making Process.

Vertical gradients indicate the upward or downward flow in aquifers or the flow between adjacent geologic units. This is determined by the change in groundwater elevation of two nested wells over the change in distance between the midpoint of the two well screens ( $\frac{dy}{dx}$ ) where y is the change in groundwater elevation and x is the distance between screen midpoints of the saturated portion of the well screens. The groundwater elevations for the two nested monitoring wells (LC\_PIZDC1404D and LC\_PIZDC1404S; and LC\_PIZDC1307 and LC\_PIZDC1308) in the Dry Creek area had vertical gradients for both 2018 and 2019 indicative of downward flow based on the difference in head pressure. The calculations of the vertical gradient based off the groundwater elevations found on Figure 4-2 are represented in the table below:

Table H: Vertical Gradient between Dry Creek Area Nested Wells

	Monitoring Well	Depth to Top of Screen (masl)	Depth to Base of Screen (masl)	Screen Length (m)	Midpoint of Screen or Saturated Screen (masl)	Groundwater Elevation (masl)	Vertical Gradient	Direction of Vertical Gradient
	LC_PIZDC1404D	1673.15	1670.11	3.04	1671.63	1701.25	0.025	Downwards
19	LC_PIZDC1404S	1695.83	1692.79	3.04	1694.31	1701.82	0.025	Flow
20	LC_PIZDC1307	1657.95	1655.96	1.99	1656.96	1686.51	0.070	Downwards
	LC_PIZDC1308	1684.52	1681.46	3.06	1682.99	1688.35	0.070	Flow
	LC_PIZDC1404D	1673.15	1670.11	3.04	1671.63	1700.5	0.022	Downwards
2018	LC_PIZDC1404S	1695.83	1692.79	3.04	1694.31	1701.0	0.022	Flow
20	LC_PIZDC1307	1657.95	1655.96	1.99	1656.96	1685.3	0.407	Downwards
	LC_PIZDC1308	1684.52	1681.46	3.06	1682.99	1688.1	0.107	Flow

Note: Midpoint of screen lengths used to calculate vertical gradient since well screens were completely saturated based on groundwater elevations. Groundwater elevations utilized from the fourth quarter of 2019.



#### **Groundwater Quality**

Concentrations of CI were below BC CSR standards at sampled groundwater locations near the Head Pond diversion structure (Figure 4-4; Table 4-2) in 2019. Below is a summary of the CI concentrations in groundwater at monitoring wells in the Dry Creek area in 2019 (excluding GH\_POTW10):

- Dissolved selenium concentrations ranged from <0.05 μg/L (LC\_PIZDC1307, LC\_PIZDC1404D and LC\_PIZDC1404S during multiple sampling events) to 4.12 μg/L (LC\_PIZDC1306 on August 15).
- Sulphate concentrations ranged from <0.3 mg/L (LC\_PIZDC1307 and LC\_PIZDC1404D during multiple sampling events) to 20.3 mg/L (LC\_PIZDC0901 on June 5).</p>
- Nitrate concentrations ranged from <0.005 mg-N/L (LC\_PIZDC1307, LC\_PIZDC1308, LC\_PIZDC1404D and LC PIZDC1404S during multiple sampling events) to 0.644 mg-N/L (LC PIZDC0901 on June 5).
- Dissolved cadmium concentrations ranged from <0.005 μg/L (LC\_PIZDC1404S during multiple sampling events) to 0.14 μg/L (LC\_PIZDC1306 on November 7).

Localized exceedances of dissolved barium, cobalt, lithium, and molybdenum concentrations are present in results from wells (LC\_PIZDC1306, LC\_PIZDC1307, LC\_PIZDC1308, LC\_PIZDC1404D, and LC\_PIZDC1404S) near the diversion structure for the DCWMS (Appendix C). This is similar to 2018 results (Golder 2019):

- Dissolved barium exceeded DW (1,000 μg/L) at LC\_PIZDC1307 and LC\_PIZDC1404D during each of the 2019 sampling events. Concentrations in these wells ranged from 1,370 μg/L to 4,450 μg/L.
- Dissolved cobalt exceeded DW (1 μg/L) in LC\_PIZDC1308 during the March sampling event, and was measured at 1.69 μg/L. This is well below the cobalt interim background estimate of 20 μg/L (BC MOE 2018).
- Dissolved lithium exceeded DW (8 μg/L) in LC\_PIZDC1306, LCPIZDC1307, LCPIZDC1308 and LC\_PIZDC1404D during at least three sampling events in 2019. Dissolved lithium concentrations in these wells exceeding DW ranged from 8.3 μg/L to 746 μg/L.
- Dissolved molybdenum concentrations were above IW (10 μg/L) at LCPIZDC1307 and LC\_PIZDC1404D during each of the sampling events in 2019. Dissolved molybdenum concentrations above IW ranged from 19.4 μg/L to 34.2 μg/L.

### **Surface Water Quality**

A summary of concentrations of the CI in Dry Creek surface water station LC\_DC1 (Figure 4-4) were compared to groundwater (Figure 4-6) as follows:

- There was a general increasing trend in sulphate concentrations in surface water (Figure 4-6a), with sulphate concentrations higher in surface water compared to groundwater in 2019.
- There was a general increasing trend in dissolved selenium concentrations in surface water from approximately 2017 (Figure 4-6b), with selenium concentrations higher in surface water compared to groundwater in 2019. Dissolved selenium concentration in surface water were above DW during the majority of the sampling events in 2019.



There was a general increasing trend in nitrate concentration in surface water (Figure 4-6c), with nitrate concentrations generally higher in surface water compared to groundwater in 2019.

Increase in dissolved sulphate, nitrate, and dissolved selenium concentrations at LC\_DC1 appears to be the result from the increase in contact water from the permitted LCO Phase II to the Dry Creek Area.

### **Spatial and Temporal Trends**

Plots of continuous and manual groundwater levels measured over time in the six groundwater wells (LC\_PIZDC1306, LC\_PIZDC1404S, LC\_PIZDC1404D, LC\_PIZDC1308, LC\_PIZDC1307 and LC\_PIZDC0901) in the Dry Creek area during 2019 are provided in Appendix B.

The continuous water level measurements in wells in the Dry Creek area show a seasonal high from April to June related to spring snowmelt and seasonal low in the winter months. Specific observations for water levels in each well are provided below:

- Seasonal variations are more pronounced in wells LC\_PIZDC1306, LC\_PIZDC1404D, LC\_PIZDC1404S, LC\_PIZDC1307 and LC\_PIZDC0901, and the magnitude of the peak groundwater elevations is approximate 5 m or higher.
- The groundwater levels at LC\_PIZDC0901 are generally more variable than seasonal fluctuations and the water level in the monitoring well appears to respond to individual precipitation events.
- Shallow well LC\_PIZDC1308 has a muted response to seasonal variations with magnitudes ranging from approximately 1 to 2 m compared to the associated deep well LC\_PIZDC1307 that has water level changes of 5 m or more.
- Although the continuous groundwater level record for LC\_ PIZDC1306 is shorter (July 2015 to September 2017) than the other monitoring wells in the Dry Creek area, a larger seasonal response is typically visible with elevated groundwater levels in June of each year (wasn't manually measured until November 2019) and magnitude changes typically range between 6 and 8 m as compared to other locations).

Overall, a decreasing trend over time is visible in the groundwater levels at Dry Creek wells (i.e., LC\_PIZDC1404D, LC\_PIZDC1404S, LC\_PIZDC1308, LC\_PIZDC1307 and LC\_PIZDC0901).

The valley bottom in Dry Creek has primarily upward flow directions in both the bedrock and deeper overburden (Appendix D; Golder 2014a, 2016c), upgradient of the East Tributary Confluence. Therefore, the seasonal variation in the groundwater levels appears to represent pressure responses at the watershed scale, with groundwater flux in the bedrock and overburden likely increasing seasonally in response to snowmelt and rainfall.

Dissolved selenium and sulphate concentrations in groundwater in the Dry Creek area during 2019 were generally within historical concentration ranges, consistent with the early stage of mining (Figure 4-6). In 2019, dissolved selenium, nitrate and sulphate concentrations in surface water in the Dry Creek area generally increased during the year.



At LC\_PIZDC0901 (Dry Creek Area), increasing nitrate concentrations were measured from 2013 until June 2015, followed by decreasing concentrations until January 2019 (Figure 4-6 and Table 4-2). This monitoring well was completed in low-permeability till (9 x 10<sup>-9</sup> m/s; Teck 2011a), which suggests that the flux associated with the increased nitrate concentrations would likely be low. Nitrate concentrations measured at sampled monitoring wells in the Dry Creek area during 2019 have returned to or remain generally within historical concentration ranges.

Control charting indicated concentrations of CI remained below the Upper Control Limit (Figures E1 and E2, Appendix E). The percent change of Upper Control Limits was calculated for LC\_PIZDC0901 from 2018 to 2019, and minor increases of the Upper Control Limits were noted for sulphate (<5%) and cadmium (<1%). Refer to Appendix E, Table E4.

At LC\_PIZDC0901, trend analyses (i.e., seasonal Mann-Kendall trend test) showed no trends and/or stable trends for nitrate, sulphate, dissolved selenium, and dissolved cadmium concentrations during Q1 (Appendix E). In comparison, an increasing trend was noted for dissolved selenium concentrations during Q4. Maximum dissolved selenium concentrations in Q4 were 1.57 μg/L, which is below the lowest referenced BC CSR standard (DW standard: 10 μg/L for dissolved selenium). At LC\_PIZDC1306 trend analyses showed no trends and/or stable trends for nitrate, sulphate, dissolved selenium, and dissolved cadmium concentrations during Q4 (Appendix E). However, in Q1 there was insufficient data to support trend analysis for nitrate, sulphate, dissolved selenium, and dissolved cadmium concentrations (Appendix E).

## 5.3 Outside Line Creek – Offsite Wells (Wells in Regional Program)

Two wells downgradient of LCO were reviewed to assess potential pathways on the valley-bottom aquifers and for overlap with the RGMP. These wells are in or near Study Areas (Figure 3) that have been identified in the RGMP to understand constituents in groundwater potentially related to mining.

Total selenium and total cadmium were chosen for offsite wells because total metals analyses are appropriate for water supply wells, as the focus for water supply is on end-use for the water, whereas the focus on monitoring wells is on metal transport though the aquifer. BC CSR Schedule 3.2 standards are generally applicable to only dissolved metals but were conservatively applied to total selenium and total cadmium for wells in the regional program.

#### Fording River Valley-Bottom Downgradient of Dry Creek Confluence

Supply well GH\_POTW10, located at Teck Greenhills Operations and adjacent to the Fording River 4 km downgradient of Dry Creek, is part of the regional program and had CI concentrations below BC CSR standards during 2019 sampling events. This well was sampled in January, April, August and November of 2019 and yielded total selenium concentrations from 2.86 to 4.56  $\mu$ g/L, sulphate concentrations from 187 to 197 mg/L, nitrate concentrations from 0.288 to 0.688 mg-N/L and total cadmium concentrations from 0.0083 to 0.0113  $\mu$ g/L.

Overall, there were no visible increasing or decreasing trends in nitrate, total selenium, sulphate and total cadmium concentrations from this well from June 2012 to November 2019 (Figure 4-7, Table 4-2). Total selenium and nitrate concentrations show a seasonal low from April to June related to spring snowmelt and seasonal high in the winter months.

In comparison to the nearest Order Station # 200378 (GH\_FR1; Figure 4-7), the concentrations in GH\_POTW10 are lower (except for sulphate) and consistent with mixing between the hydraulically-connected groundwater in the valley-fill sediments and the Fording River (see purple and teal flow lines in illustration on Figure 2-4b).



#### Downgradient of Confluence of Line Creek with Fording River, Elk River Valley Fill Sediments

Domestic well RG\_02-20 is within Study Area #7 in a valley-bottom area of the Elk River downgradient of LCO and approximately 5.5 km downgradient of the confluence between the Fording River and the Elk River. This well was sampled in February, May, August and November of 2019 (Figure 4-7; Table 4-1). In 2019, total selenium concentrations ranged from 9.67  $\mu$ g/L 13.7  $\mu$ g/L and exceeded DW (10  $\mu$ g/L) in three of the four sampling events. Total selenium concentrations were below the secondary screening criteria (Table 3-4): the Canadian Drinking Water Quality Guideline of 50  $\mu$ g/L (Health Canada 2017) and LCO permit (PE107517) limit of 50  $\mu$ g/L, and the SPO of 23  $\mu$ g/L (Permit 170517). Sulphate concentrations at RG\_02-20 ranged from 61.6 to 87 mg/L, nitrate concentrations ranged from 2.17 mg-N/L to 2.99 mg-N/L and total cadmium concentrations ranged from 0.0066  $\mu$ g/L to 0.0097  $\mu$ g/L.

In comparison to the nearest Order Station # 200027 (EV\_ER4; Figure 4-7), the concentrations at the monitoring well are similar, consistent with exchanges between groundwater in the valley-bottom and surface water (see purple and teal flow lines in illustration on Figure 2-4b). There appears to be a lag in the seasonal variation in the sulphate, selenium, and nitrate concentrations in groundwater at RG\_02-20, relative to the seasonal variation in the Elk River at EV\_ER4, with annual peaks in groundwater delayed by approximately one to three months. This lag suggests a pathway of surface water flowing to groundwater in this location.

Trend analyses (i.e., seasonal Mann-Kendall statistical analysis) showed that total selenium concentrations at RG\_02-20 had a stable trend from 2014 to 2019 in Q1. There was no trend for total cadmium and stable trend for nitrate concentrations in Q1, respectively. There was an increasing trend in sulphate concentrations from 2014 to 2019 in Q1. Maximum sulphate concentrations in Q1 were 78.9 mg/L, which is below the lowest referenced BC CSR standard (DW standard: 500 mg/L for sulphate). Trend analyses in Q4 from 2014 to 2019 showed a probably decreasing trend for total cadmium and nitrate, and no trend and stable trend for sulphate and total selenium, respectively.

## 5.4 Check of Conceptual Groundwater Model

The Regional and LCO SSGMP are complementary and support the conceptual model:

- The highest concentrations of CI are generally measured in tributaries within mine-influenced areas, consistent with surface water being the primary pathway for transport of contact water as shown in time series plots (Figures 4-5, 4-6 and 4-8). It should be noted that no dewatering took place at LCO during 2019.
- The bedrock water quality shows relatively low concentrations of CI compared to surface water, consistent with low bedrock hydraulic conductivity measured valley-wide (e.g., LC PIZDC1307 and LC PIZDC1404D).
- Distal to operations, the water quality in the valley-bottom aquifers is generally better than or equal to the surface water quality, which suggests different degrees of local surface water-groundwater interaction versus predominance of a down-valley flow component (Figures 4-3 and 4-4).

#### 6.0 SUMMARY

The results from the 2019 annual review of the LCO SSGMP show the following:

No material quality assurance or quality control concerns were identified regarding Constituents of Interest for this report, except for one nitrate detection above five times the MDL in the trip blank collected during the first quarter (Q1).

- There were no exceedances of BC CSR standards for the CIs at sampled groundwater locations within the LCO site (Tables 4-1 and 4-2). Consistently, there was no clear increasing trend in CIs at groundwater monitoring locations downgradient of LCO (GH\_POTW10 and RG\_02-20), which are also included in the regional groundwater monitoring program.
- The Regional and LCO Site Specific programs support the conceptual groundwater discussed in Section 2.0.
- Localized exceedances of dissolved chloride, boron, cobalt, fluoride, lithium, manganese, and molybdenum concentrations are present in results from wells (LC\_PIZP1101, LC\_PIZP1103, LC\_PIZP1104, and LC\_PIZP1105) in the Process Plant area (Appendix C). This is similar to 2018 results (Golder 2019), except for dissolved boron and cobalt. Dissolved boron slightly exceeded the irrigation watering standard (500 μg/L) at LC\_PIZP1103 during the May 2019 sampling event, however 2018 concentrations ranged near the standard. Dissolved cobalt concentrations exceeded drinking water standard (1 μg/L) in LC\_PIZP1104 during each sampling event with concentrations ranging from 1.07 to 1.88 μg/L. This is well below the cobalt interim background estimate of 20 μg/L (BC MOE 2018), however above the 2018 cobalt concentration range of 0.1 to 0.4 μg/L.
- Localized exceedances of dissolved barium, cobalt, lithium, and molybdenum concentrations are present in results from wells (LC\_PIZDC1306, LC\_PIZDC1307, LC\_PIZDC1308, LC\_PIZDC1404D, and LC\_PIZDC1404S) near the diversion structure for the DCWMS (Appendix C). This is similar to 2018 results (Golder 2019).
- Surface water drainage from the permitted LCO Phase II into the Dry Creek Area increased dissolved selenium, nitrate, and dissolved sulphate at the surface water station LC DC1.
- Increasing trends based on Mann Kendall analysis were noted for sulphate in LC\_PIZP1105 (Process Plant area) for both Q1 and Q4 (Figure 4-5a). Increasing trends were noted for dissolved cadmium in LC\_PIZP1104 and LC\_PIZP1105 during Q4 and Q1, respectively. Dissolved selenium concentrations had increasing trends at LC\_PIZP1104 during Q1 (near the Process Pond) and LC\_PIZDC0901 during Q4.
- LC\_PIZDC1307 and LC\_PIZDC1404D were drilled deeper than the remaining wells (>31.8 m versus <16.5 m). The groundwater chemistry pertaining to these wells could indicate a greater degree of influence from the underlying bedrock aquifer system given the upward hydraulic gradient within the bedrock, hence, the localized exceedances of dissolved barium and molybdenum.

#### 7.0 RECOMMENDATIONS FOR 2020

A thorough review of the 2019 groundwater quality data has been completed as requested by Teck LCO. Recommendations are provided below:

- It is recommended to install the pressure transducers as deep as possible to maximize transducer submergence below the fluctuating water level (specifically, the transducer in LC\_PIZP1001 needs to be installed deeper as it is currently above the water level).
- The current groundwater monitoring program should continue, along with continued coordination with the Regional Groundwater Monitoring Program and the West Line Creek Active Water Treatment groundwater program. The recommended list of analytes is shown in Table 5-1. The type of monitoring and frequency recommended for 2020 is shown in Table 5-2 and are consistent with the 2019 program. However, a review of the suggested monitoring sampling frequency provided in the updated SSGMP (Golder 2018a) should be completed and may lead to an adjusted monitoring/sampling schedule.
- The purpose of seasonal monitoring at this time is to collect information in order to reduce sampling frequency in the near future. As seasonal trends are established, reduce frequency of sampling from quarterly to twice per year: May to June during freshet when surface flows, groundwater levels, and dilution will be the highest, and November to February during winter when water levels will be the lowest. For any new wells, perform guarterly sampling for two years to stablish seasonal variations.



## 8.0 CLOSING

We trust the above document meets your present requirements. If you have any questions or require additional details, please contact the undersigned.

Golder Associates Ltd.

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https://golderassociates.sharepoint.com/sites/121433/project files/6 deliverables/2019 annual report/final report/19135981-2020-064-r-rev1-lco site\_specific\_groundwater\_monitoring\_2019\_annual 25mar\_20.docx

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**TABLES** 

Area	Study	Methods	Source		
		Well installations			
	Phase II Baseline and Assessment	Groundwater levels	Teck 2011a and 2011b		
	Thase it baseline and Assessment	Water quality sampling	1760K 2011B dild 2011B		
Site-wide		Numerical flow modelling with particle tracking			
Site-wide		Groundwater levels	Golder 2013a		
	Groundwater Monitoring Program	Water quality sampling	Golder 2015a		
	Groundwater Monitoring Frogram	Establish, review and assess monitoring program	Golder 2018a		
		Lestablish, review and assess monitoring program	Plus annual monitoring reports for 2015, 2016, 2017 and 2018		
		Well installations	Golder 2013b		
	Hydrogeologic Investigation for the Dry Creek	Groundwater levels	Golder 2014a		
Phase II: Dry Creek	Water Management System	Water quality sampling	Golder 2016b		
		Numerical flow modelling with particle tracking, which included assessment of potential seepage bypass	Golder 2016c		
		Well installations	Szmigielski 2015		
	Research on infiltration and unsaturated flow	Groundwater levels	Barbour et al. 2016		
	through waste rock and groundwater flow and	Water quality sampling			
	water quality downgradient of waste-rock pile	Isotopic assessment			
Phase I: West Line Creek		Well installations	SRK 2013		
	Hydrogeologic Investigation for Residuals Landfill for Active Water Treatment Facility	Groundwater levels	Tetra Tech 2015		
	Landin for Active Water Treatment Facility	Water quality sampling			
		Groundwater levels			
	Groundwater Monitoring Program	Water quality sampling	Golder 2016a		
		Establish, review and assess monitoring program			
		Well installations	AMEC 2010		
Process Plant Area	Groundwater assessments fueling areas, a truck wash and ponds at the Process Plant	Groundwater elevations	AMEC 2013		
		Water quality sampling			

	Area	Well Name	Alternate Well Name	ENV EMS1	Easting (m UTM)	Northing (m UTM)	Ground Elevation (masl)	Top of Casing Elevation (masl)	Monitoring Program	Screened Lithology	Hydraulic Conductivity (m/s)	Depth to Screen (mbgs)	Rationale	2018 Sample Frequency	Parameters Reviewed
		LC_PIZP1101	MW11(P)-01	E302410	653956	5528265	1266.06	1267.06	LCO, Regional	Coarse-grained sand	7.E-04	40.5		Quarterly	Se, Cd, NO <sub>3</sub> , SO <sub>4</sub>
Process Plant	Ponds	LC_PIZP1103	MW11(P)-03	none	654250	5528634	1263.49	1264.53	LCO	Clayey silt above bedrock	7.E-08	38.1	Monitor water quality to detect seepage from Process Plant	Quarterly	Se, Cd, NO <sub>3</sub> , SO <sub>4</sub>
		LC_PIZP1104	MW11(P)-04	none	653940	5528165	1271.15	1272.10	LCO	Coarse-grained sand	3.E-04	36.8	ponds	Quarterly	Se, Cd, NO <sub>3</sub> , SO <sub>4</sub>
		LC_PIZP1105	MW11(P)-05	E302411	653984	5528075	1272.94	1273.86	LCO	-	-	38.1		Quarterly	Se, Cd, NO <sub>3</sub> , SO <sub>4</sub>
		LC_PIZDC1306	MW13-3S	none	658278	5541059	1708.15	1709.05	LCO		3.E-05	16.5		Last 3 Quarters	Se, Cd, NO <sub>3</sub> , SO <sub>4</sub>
		LC_PIZDC1307	MW13-1D	none	658169	5541230	1690.51	1691.22	LCO, Regional		1.E-07	34.6	Monitor water quality to detect for seepage near diversion	Quarterly	Se, Cd, NO <sub>3</sub> , SO <sub>4</sub>
Dry Creek	Diversion Structure	LC_PIZDC1308	MW13-1S	none	658168	5541232	1690.42	1691.37	LCO, Regional	Valley-bottom sediments	7.E-07	9		Quarterly	Se, Cd, NO <sub>3</sub> , SO <sub>4</sub>
Dry Creek		LC_PIZDC1404S	MW14-04S LC-PIZDC1402	none	658192	5541069	1705.36	1706.50	LCO	(Quaternary)	4.E-08	12.6		Quarterly	Se, Cd, NO <sub>3</sub> , SO <sub>4</sub>
		LC_PIZDC1404D	MW14-04D LC-PIZDC1401	none	658192	5541069	1705.36	1706.93	LCO		5.E-08	35.3	1	Quarterly	Se, Cd, NO <sub>3</sub> , SO <sub>4</sub>
		LC_PIZDC0901	GA-DC1-A	none	658048	5541500	1690	1693	LCO		9.E-09	9.4		Quarterly	Se, Cd, NO <sub>3</sub> , SO <sub>4</sub>
	Downgradient of Dry Creek	GH_POTW10	-	none	653321	5545426	-	-	Regional	-	-	-	Monitor water quality to detect seepage downgradient of Dry Creek, Greenhills Operations, and Fording River Operations	Quarterly	Se, Cd, NO <sub>3</sub> , SO <sub>4</sub>
Regional Wells	Downgradient of Plant Site	RG_02-20	-	none	Private	Private	-	-	Regional	-	-	-	Monitor water quality to detect seepage downgradient of LCO Plant Site, Greenhills Operations, and Fording River Operations	Quarterly	Se, Cd, NO <sub>3</sub> , SO <sub>4</sub>

Notes.

m UTM = metres on Universal Transverse Mercator projection, zone 11; m/s = metres per second; mbgs = metres below ground surface; Se = selenium, Cd = cadmium, NO3 = nitrate, SO4 = sulphate; - = unknown or not applicable.

ENV EMS = Ministry of Environment and Climate Change Strategy EMS number

LCO = Line Creek Operations

## Table 3-1 Field Parameters Collected During LCO Groundwater Sampling

Parameter	Methodology
Conductivity	2510 B Self-Contained Conductivity Instrument
Dissolved Oxygen	4500 - OG Membrane Electrode Method
Oxidation-Reduction Potential	2580 Oxidation-Reduction Potential (ORP) Method
рН	4500 H <sup>+</sup> B Electrometric Method
Temperature	2500 B Electronic Thermometer
Turbidity	2130 B Nephelometric Method

# **Table 3-2** 191359 **Guideline Comparison for Groundwater Sampling Locations**

Location Name	Guideline	Description
LC_PIZDC1307	BC CSR	LCO and Regional Groundwater Sampling Location
LC_PIZDC1308	BC CSR	LCO and Regional Groundwater Sampling Location
LC_PIZP1101	BC CSR	LCO and Regional Groundwater Sampling Location
GH_POTW10	BC CSR	Regional Groundwater Sampling Location
RG_20-02	BC CSR	Regional Groundwater Sampling Location
LC_PIZDC1404D	BC CSR	LCO Groundwater Sampling Location
LC_PIZDC1404S	BC CSR	LCO Groundwater Sampling Location
LC_PIZDC1306	BC CSR	LCO Groundwater Sampling Location
LC_PIZDC0901	BC CSR	LCO Groundwater Sampling Location
LC_PIZP1103	BC CSR	LCO Groundwater Sampling Location
LC_PIZP1104	BC CSR	LCO Groundwater Sampling Location
LC_PIZP1105	BC CSR	LCO Groundwater Sampling Location
LC_PIZP1001	N/A	Water Level Monitoring Only
LC_PIZP1002	N/A	Water Level Monitoring Only
LC_PIZP1003	N/A	Water Level Monitoring Only

Notes:

BC CSR: British Columbia Contaminated Sites Regulations

N/A = not applicable

LCO = Line Creek Operations

# Table 3-3 Primary Screening Threshold Values

Well Name		C_PIZDC0901, LC_ C1404D, LC_PIZDC LC_PIZ	C1404S, LC_PIZP P1105, GH_POTV	1101, LC_PIZP110 V10, RG_02-20					
Screening Levels	Primary Screening								
Screening Levels	Br	itish Columbia Co	ntaminated Site F	Regulation Guidel	ine Values				
Parameters	Units	Aquatic Life (freshwater)	Irrigation	Livestock	Drinking Water				
Aluminum	μg/L	-	5000	5000	9500				
Ammonia (as N)	mg-N/L	1.31-18.5 <sup>c</sup>	-	-	-				
Antimony	μg/L	90	-	-	6				
Arsenic	μg/L	50	100	25	10				
Barium	μg/L	10000	-	-	1000				
Beryllium	μg/L	1.5	100	100	8				
Boron	μg/L	12000	500	5000	5000				
Bromate	μg/L	-	-	-	10				
Cadmium	μg/L	3.5-10 <sup>a</sup>	5	80	5				
Calcium	mg/L	-	-	1000	-				
Chloride	mg/L	1500	100	600	250				
Chlorine	μg/L	20	1000	-	-				
Chromium	μg/L	10	8	50	50				
Cobalt	μg/L	40	50	1000	1				
Copper	μg/L	80-90 <sup>a</sup>	200	300	1500				
Fluoride	mg/L	3 <sup>a</sup>	1	1	1.5				
Iron	μg/L	-	5000	-	6500				
Lead	μg/L	6-160 <sup>a</sup>	200	100	10				
Lithium	μg/L	-	2500	5000	8				
Manganese	μg/L	-	200	-	1500				
Mercury	μg/L	0.25	1	2	1				
Molybdenum	μg/L	10000	10	50	250				
Nickel	μg/L	1500 <sup>a</sup>	200	1000	80				
Nitrate (as N)	mg/L	400	-	100	10				
Nitrate and Nitrite (as N)	mg/L	400	-	100	10				
Nitrite (as N)	mg/L	0.2-0.8 <sup>b</sup>	-	10	1				
Selenium	μg/L	20	20	30	10				
Silver	μg/L	15 <sup>b</sup>	-	-	20				
Strontium	μg/L	-	-	-	2500				
Sodium	mg/L	-	-	-	200				
Sulphate	mg/L	4290 <sup>b</sup>	-	1,000	500				
- Thallium	μg/L	3	-	-	-				
Tin	μg/L	-	-	-	2500				
Titanium	μg/L	1000	-	-	-				
Uranium	μg/L	85	10	200	20				
Vanadium	μg/L	-	100	100	20				
Zinc	μg/L	900-3150 <sup>b</sup>	5000°	2000	3000				
	r 3' -	300-3130							

Notes:

BC Contaminated Site Regulations: BC MOE (1997) Generic Numerical Water Standards (Criteria). Accessed Feburary 2020.

Chromium Standard is specific to chromium VI.

<sup>&</sup>lt;sup>a</sup> = standard is hardness dependent; <sup>b</sup> = standard is chloride dependent; <sup>c</sup> = standard is pH dependent

<sup>- =</sup> No primary or secondary screening threshold regulations;  $\mu$ g/L = microgram per litre; mg/L = miligram per litre

## **Secondary Screening Threshold Values**

Well Na	Permitted Discharge at LCO Compliance Point		C_PIZDC1404D,	LC_PIZP1101, LC_PIZF LC_PIZP1105		LC_PIZDC0901, LC_PIZDC1306, LC_PIZDC1307, LC_PIZDC1308, LC_PIZDC1404D, LC_PIZDC1404S, LC_PIZP1101, LC_PIZP1103, LC_PIZP1104, LC_PIZP1105, GH_POTW10, RG_02-20
Screening				Permitted Discharge at		Canadian Drinking Water Quality Guidelines
Parameter			Objective (GH_FR1)	LCO Compliance Point	Objective (EV_ER4)	LC_PIZDC1308, LC_PIZDC1404D, LC_PIZDC1404S, LC_PIZP1101, LC_PIZP1103, LC_PIZP1104, LC_PIZP1105, GH_POTW10, RG_02-20  Canadian Drinking Water Quality Guidelines
Selenium	μg/L	50	63	50	23	50

Notes:

μg/L = microgram per litre

LCO = Line Creek Operations

## March 2020 **Groundwater Monitoring Locations with Chemistry Data Process Plant Area and Downgradient Location**

	ea	Well Name	Sample Date 13-Jun-2013	mg/L < 0.0050	μg/L < 2.0	mg/L 3.29	μg/L < 0.200
			26-Aug-2013	< 0.0050	< 0.10	5.41	< 0.010
			20-Dec-2013 12-Mar-2014	0.0115	< 0.10	5.29 4.65	< 0.010
			26-Jun-2014 24-Sep-2014	< 0.0050 < 0.0050	< 0.10 < 0.10	4.31 3.86	<ul> <li>&lt; 0.010</li> <li>&lt; 0.010</li> <li>&lt; 0.010</li> <li>&lt; 0.010</li> <li>&lt; 0.005</li> <li>&lt; 0.005</li> <li>&lt; 0.005</li> <li>&lt; 0.005</li> <li>&lt; 0.025</li> <li>&lt; 0.0050</li> <li>&lt; 0.0010</li> <li>&lt; 0.010</li> <li>&lt; 0.001</li> <li>&lt; 0.005</li> <li>&lt; 0.005</li> <li>&lt; 0.005</li> <li>&lt; 0.005</li> <li>&lt; 0.005</li> <li>&lt; 0.005</li> <li>&lt; 0.0066</li> <li>0.0119</li> <li>&lt; 0.025</li> <li>0.0083</li> <li>0.0214</li> <li>0.0114</li> <li>0.0114</li> <li>0.0119</li> <li>&lt; 0.025</li> <li>0.0083</li> <li>0.0214</li> <li>0.0114</li> <li>0.0115</li> <li>&lt; 0.0050</li> <li>0.0166</li> <li>0.0116</li> <li>0.0219</li> <li>0.0105</li> <li>&lt; 0.0050</li> <li>0.0166</li> <li>0.0121</li> <li>0.023</li> <li>0.0326</li> <li>0.0102</li> <li>0.0188</li> <li>0.0167</li> <li>0.0146</li> <li>&lt; 0.025</li> <li>0.0212</li> <li>0.0121</li> <li>0.0223</li> <li>0.0326</li> <li>0.0133</li> <li>0.0133</li> <li>0.0133</li> <li>0.0130</li> <li>0.0146</li> <li>&lt; 0.025</li> <li>0.0212</li> <li>0.0212</li> <li>0.0221</li> <li>0.0224</li> <li>0.033</li> <li>0.0185</li> <li>0.0257</li> <li>0.041</li> <li>0.026</li> <li>0.033</li> <li>0.0185</li> <li>0.0251</li> <li>0.0291</li> <li>0.0270</li> <li>0.0404</li> <li>0.0511</li> <li>0.0523</li> </ul>
			12-Dec-2014 14-Mar-2015	< 0.0050 0.0072	< 0.10 < 0.10	3.7	
			12-Jun-2015 24-Sep-2015	0.0066 < 0.0050	< 0.050 < 0.050	3.49 3.49	
			18-Dec-2015 15-Mar-2016	< 0.0050 < 0.0050	< 0.050 < 0.050	4.35 3.83	<ul> <li>&lt; 0.010</li> <li>&lt; 0.001</li> <li>&lt; 0.005</li> <li>&lt; 0.0050</li> <li>&lt; 0.0050</li> <li>&lt; 0.0050</li> <li>&lt; 0.0050</li> <li>&lt; 0.0050</li> <li>&lt; 0.00113</li> <li>&lt; 0.0065</li> <li>&lt; 0.0073</li> <li>&lt; 0.0050</li> <li>&lt; 0.0050</li> <li>&lt; 0.0010</li> <li>&lt; 0.010</li> <li>&lt; 0.001</li> <li>&lt; 0.001</li> <li>&lt; 0.005</li> <li>&lt; 0.0066</li> <li>0.0119</li> <li>&lt; 0.025</li> <li>0.0083</li> <li>0.0214</li> <li>0.0140</li> <li>0.0141</li> <li>0.0146</li> <li>0.0146</li> <li>0.0146</li> <li>0.0146</li> <li>0.0146</li> <li>0.0105</li> <li>&lt; 0.0050</li> <li>0.016</li> <li>0.021</li> <li>0.023</li> <li>0.0326</li> <li>0.0102</li> <li>0.0188</li> <li>0.0167</li> <li>0.0146</li> <li>&lt; 0.025</li> <li>0.0212</li> <li>0.0212</li> <li>0.0212</li> <li>0.0124</li> <li>0.0135</li> <li>0.013</li> <li>0.013</li> <li>0.013</li> <li>0.0125</li> <li>0.0212</li> <li>0.0212</li> <li>0.0212</li> <li>0.0212</li> <li>0.0215</li> <li>0.0257</li> <li>0.041</li> <li>0.026</li> <li>0.033</li> <li>0.0185</li> <li>0.0257</li> <li>0.0441</li> <li>0.026</li> <li>0.0291</li> <li>0.0251</li> <li>0.0291</li> <li>0.0251</li> <li>0.0291</li> <li>0.0251</li> <li>0.0291</li> <li>0.0251</li> <li>0.0291</li> <li>0.027</li> <li>0.0404</li> <li>0.051</li> <li>0.0528</li> <li>0.0355</li> <li>0.067</li> <li>0.011 (Total)</li> <li>&lt;0.01 (Total)</li> <li>&lt;0.01 (Total)</li> <li>&lt;0.2 (Total)</li> </ul>
			17-Jun-2016 15-Sep-2016	< 0.0050 < 0.0050	< 0.050 < 0.25	4.14 3.5	<0.005
		LC_PIZP1101	12-Dec-2016 15-Mar-2017	< 0.0050 0.0074	< 0.25 < 0.050	3.62 3.44	<0.025
			13-Jun-2017	< 0.0050	< 0.050	2.97	0.0058
			21-Sep-2017 3-Nov-2017	< 0.0050 < 0.0050	< 0.050 < 0.25	2.7	0.075
			20-Mar-2018 19-Jun-2018	< 0.0050 0.0083	< 0.050 < 0.050	2.61	
			13-Sep-2018 16-Nov-2018	< 0.0050	< 0.050 < 0.050	2.58	
			22-Jan-2019 25-Apr-2019	< 0.0050 0.0143	< 0.050 0.1	2.56 2.64	
			17-Jul-2019 17-Jul-2019 (Dup)	< 0.0050 < 0.0050	< 0.050 < 0.050	3.3 2.83	
			16-Dec-2019 12-Dec-2014	< 0.0050 < 0.050	< 0.050 0.31	3.88 36.7	0.0104
			13-Mar-2015	0.011	0.29	37.5	<ul> <li>&lt; 0.010</li> <li>&lt; 0.010</li> <li>&lt; 0.010</li> <li>&lt; 0.010</li> <li>&lt; 0.005</li> <li>&lt; 0.005</li> <li>&lt; 0.005</li> <li>&lt; 0.005</li> <li>&lt; 0.005</li> <li>&lt; 0.025</li> <li>&lt; 0.0050</li> <li>&lt; 0.0013</li> <li>&lt; 0.0050</li> <li>&lt; 0.005</li> <li>&lt; 0.0066</li> <li>0.0119</li> <li>&lt; 0.021</li> <li>0.0144</li> <li>0.0114</li> <li>0.0114</li> <li>0.0114</li> <li>0.0114</li> <li>0.0114</li> <li>0.0114</li> <li>0.0115</li> <li>&lt; 0.0050</li> <li>0.016</li> <li>0.021</li> <li>0.023</li> <li>0.0326</li> <li>0.0102</li> <li>0.0188</li> <li>0.0167</li> <li>0.0146</li> <li>&lt; 0.025</li> <li>0.0212</li> <li>0.0212</li> <li>0.0212</li> <li>0.0212</li> <li>0.0124</li> <li>0.0135</li> <li>0.013</li> <li>0.0113</li> <li>0.0228</li> <li>0.0257</li> <li>0.041</li> <li>0.026</li> <li>0.0291</li> <li>0.0257</li> <li>0.041</li> <li>0.0251</li> <li>0.0291</li> <li>0.0257</li> <li>0.0404</li> <li>0.051</li> <li>0.0523</li> <li>0.0251</li> <li>0.0291</li> <li>0.0257</li> <li>0.0404</li> <li>0.051</li> <li>0.0523</li> <li>0.028</li> <li>0.0358</li> <li>0.061</li> <li>0.0745</li> <li>0.0633</li> <li>0.0528</li> <li>0.0355</li> <li>0.067</li> <li>0.011 (Total)</li> <li>&lt;001 (Total)</li> <li>&lt;001 (Total)</li> </ul>
			12-Jun-2015 23-Sep-2015	< 0.010 <0.025	0.13 <0.050	33.5 32.9	< 0.005
			14-Dec-2015 15-Mar-2016	< 0.025 < 0.025	0.064 0.059	31.2 31.1	<0.005
			13-Jun-2016 12-Sep-2016	0.036 < 0.025	< 0.050 0.051	33 29.2	Control   Cont
			12-Dec-2016 15-Mar-2017	0.0239 0.062	0.26 < 0.050	32.2 30.5	
		LC_PIZP1103	13-Jun-2017 13-Sep-2017	0.128 0.144	< 0.050 < 0.050	29.3 29.4	
			31-Oct-2017 6-Mar-2018	0.156 0.399	0.073 0.053	29 30.1	
			14-Jun-2018 21-Aug-2018	< 0.40 0.116	0.051	31 27.8	
	Coarse Coal		19-Nov-2018	0.116 0.159 0.124	< 0.050 < 0.050 < 0.050	30 28.8	
	Rejects		13-Mar-2019 6-May-2019	0.0878	< 0.050	28.7	0.0191
			10-Jul-2019 10-Oct-2019	0.144 < 0.0050	< 0.050 0.211	27.9 29.1	
			11-Dec-2014 13-Mar-2015	0.266 0.109	0.16 < 0.10	89.5 58.1	
			11-Jun-2015 24-Sep-2015	0.264 0.128	0.109 < 0.050	92.4 54	
			17-Dec-2015 17-Mar-2016	0.303 0.312	0.101 0.096	89.4 94.1	0.0102
			15-Jun-2016	0.288	0.107 0.137	86.2	< 0.0050
			14-Sep-2016 9-Dec-2016	0.347	0.33	86.2 81.4	
		LC_PIZP1104	23-Mar-2017 13-Jun-2017	0.428 0.431	0.114 0.342	91.8 97.1	
			20-Sep-2017 2-Nov-2017	0.528 0.574	0.109 0.119	96.4 80.6	
			13-Mar-2018 15-Jun-2018	0.472 0.599	0.15 0.235	170 102	
			28-Nov-2018 28-Nov-2018 (Dup)	0.491 0.483	0.113 0.138	85.8 85.7	0.0214 0.0114 0.011 0.0184 0.0146 0.0114 0.0219 0.0561 0.0191 0.0105 < 0.0050 0.016 0.021 0.023 0.0326 0.0102 0.0188 0.0167 0.0146 <0.025 0.0212 0.0212 0.0212 0.0124 0.0135 0.013 0.013 0.013 0.013 0.013 0.013 0.013 0.0146 0.0069 0.0453 0.0228 0.146 0.0069 0.0453 0.0228 0.146 0.0069 0.0453 0.0257 0.041 0.026 0.03 0.0185 0.0215 0.0291 0.0251 0.0291 0.027 0.0404 0.0511 0.0523 0.028
			18-Mar-2019 27-May-2019	0.357 0.165	0.188 0.137	74.7 40.3	
			12-Sep-2019 21-Nov-2019	0.279 0.249	0.155 < 0.050	60.5 36.2	0.0453
			11-Dec-2014 12-Mar-2015	< 0.050 0.044	0.21	49.7 60.4	0.041
			11-Jun-2015	0.065	0.502	58.6	0.021 0.023 0.0326 0.0102 0.0188 0.0167 0.0146 <0.025 0.0212 0.0212 0.0124 0.0135 0.013 0.013 0.013 0.0146 0.0208 0.0228 0.146 0.0069 0.0453 0.0257 0.041 0.026 0.03 0.0185 0.0291
			23-Sep-2015 17-Dec-2015	0.048 0.041	0.434 0.652	60.4 68.4	0.0215
			17-Mar-2016 15-Jun-2016	0.035 0.04	0.657 0.597	75.3 82.6	
			14-Sep-2016 16-Dec-2016	0.034 0.0323	0.773 0.64	83.2 78.1	
		LC_PIZP1105	22-Mar-2017 16-Jun-2017	0.07 0.064	0.521 0.499	80.4 74.9	
			21-Sep-2017	0.074 0.216	0.406 < 0.25	124 81.3	0.0523
			2-Nov-2017 20-Mar-2018	0.027	0.391	82.7	0.0358
			19-Jun-2018 7-Sep-2018	0.083 0.045	0.37 0.411	102 184	0.0745
			29-Mar-2019 25-Jun-2019	0.181 0.605	0.704 0.237	102 87.9	
			5-Sep-2019 14-Nov-2019	0.039 0.051	0.078 0.238	95.2 102	
			26-Mar-2014 24-Apr-2014	3.36 3.36	13.3 (Total) 13.0 (Total)	68.6 71.3	0.011 (Total)
			3-Jul-2014	3.69	14.4 (Total)	81.2	<0.01 (Total)
			24-Nov-2014 10-Mar-2015	2.5	10.0 (Total) 12.0 (Total)	59.6 69.1	<0.2 (Total)
			26-Nov-2015 1-Jun-2016	3.62	9.79 (Total)  12.6 (Total)	60.2 87.60	0.008 (Total)
			28-Jun-2016 14-Sep-2016	3.26 2.12	<b>11.2 (Total)</b> 7.43 (Total)	83.60 59.9	0.0076 (Total)
Non-LCO	Downgradient of	DC 00.00	12-Dec-2016 1-Mar-2017	2.19 2.75	8.54 (Total) 9.5 (Total)	63.3 74.6	· , ,
Monitoring Wells	Plant Site	RG_02-20	29-May-2017 21-Aug-2017	2.97 1.81	<b>10.2 (Total)</b> 7.56 (Total)	74.8 52.8	0.0088 (Total)
			15-Nov-2017 13-Feb-2018	2.05	7.88 (Total)  12.4 (Total)	56.5 75.4	0.0062 (Total)
			25-Apr-2018	2.97	13 (Total) 9.6 (Total)	78.9	0.0125 (Total)
			26-Sep-2018 26-Nov-2018	2.08	9.36 (Total)	58.9 63.9	0.0055 (Total)
			25-Feb-2019 27-May-2019	2.76	12.9 (Total) 13.7 (Total)	77.6 87	0.0077 (Total)
			20-Aug-2019 28-Nov-2019	2.22 2.17	10.1 (Total) 9.67 (Total)	67.1 61.6	
quatic Life (freshv	g: BC CSR Guideli vater)	Maximum		400	20	4,290°	
inking Water vestock		Maximum Maximum		10 100	10 30	500 1,000	5 80
			e Objectives, and Cana		20 <sup>a</sup> , 50 <sup>b</sup>	Niek "	5
anadian Drinking k Valley Effluent I	Permit	Maximum		Not applied	50	Not applied	Not applied
nreshold Values: lischarge at LCO (	Permitted Compliance Point	Monthly Average		7	50	-	0.58
lk Valley Effluent I		Maximum		4	23	429	0.24
bjective at Order		-		<u> </u>			

Concentration greater than BC CSR Livestock guideline Concentration greater than BC CSR Irrigation guideline

Comparisons of groundwater quality to water quality guidelines made for reference purposes only.

BC Contaminated Sites Regulations: BC MOE (1997) Generic Numerical Water Standards (Criteria). Accessed February 2019. Canadian Drinking Water Guidelines: Health Canada (2017). Guidelines for Canadian Drinking Water Quality Summary Table.

Secondary screening applies only when primary screening yields an exceedance. Elk Valley Effluent Permit PE107517. Issued November 19, 2014. LCO = Line Creek Operations

(Dup) = Duplicate sample

μg/L = microgram per litre; mg/L = miligram per litre Sampling Notes:

2018: LC\_PIZP1104 had insufficient water levels for sample collection in Q3 (July to September).
2018: LC\_PIZP1101 missing Nitrate and Sulphate results due to constraints in the field during sampling event (September 13, 2018)

<sup>- =</sup> no guideline.

a = Standard for continuous applications on crops

b = Standard for intermittent application on crops
c = Hardness of 250 mg/L is assumed

# March 2020 Table 4-2 19135981-2020-064-R-Rev0 Groundwater Monitoring Locations with Chemistry Data for Dry Creek Area and Downgradient Location

A	Area	Well Name	Sample Date	Nitrate as N	Selenium (dissolved)	Sulphate	Cadmium (dissolved)
			9-Jun-2015	mg/L 0.176	μg/L 3.24	mg/L 6.53	μg/L 0.113
			22-Sep-2015	0.08	2.96	6.67	0.103
			15-Dec-2015	0.0906	2.15	6.33	0.121
			16-Mar-2016	0.0702	1.53	6.01	0.0233
			10-Jun-2016	0.105	2.23	6.14	0.141
			13-Sep-2016	0.11	2.82	6.47	0.124
			12-Jun-2017	0.2	5.6	6.89	0.124
		LC_PIZDC1306	14-Sep-2017	0.155	3.59	6.52	0.133
			1-Nov-2017	0.135	3.06	6	0.125
		LO_1 12DO 1000	25-Jun-2018	0.228	5.18	8.02	0.124
				0.156	4.23	6.63	0.152
			23-Aug-2018				
			23-Aug-2018 (Dup)	0.154	4.56	6.62	0.393
			26-Nov-2018	0.265	4.13	6.88	0.157
			25-Mar-2019	0.0962	2.1	5.97	0.131
			29-May-2019	0.171	3.05	6.85	0.131
			15-Aug-2019	0.154	4.12	6.97	0.119
			7-Nov-2019	0.114	3.36	6.06	0.14
			9-Dec-2014	< 0.0050	< 0.10	1.71	< 0.010
			10-Mar-2015	0.0073	< 0.10	0.44	< 0.010
			10-Jun-2015	< 0.0050	< 0.050	0.45	< 0.005
			22-Sep-2015	< 0.0050	0.053	< 0.30	< 0.005
			16-Dec-2015	< 0.0050	< 0.050	< 0.30	< 0.005
			16-Mar-2016	< 0.0050	< 0.050	< 0.30	<0.005
			10-Jun-2016	< 0.0050	< 0.050	< 0.30	<0.005
			13-Sep-2016	< 0.0050	< 0.050	< 0.30	<0.005
			13-Sep-2016 13-Dec-2016	< 0.0050	< 0.050	< 0.30	<0.005
		C DIZDC1207	16-Mar-2017	< 0.0050	< 0.050	< 0.30	0.0121
		LC_PIZDC1307	12-Jun-2017	< 0.0050	< 0.050	< 0.30	0.0155
			19-Sep-2017	< 0.0050	< 0.050	< 0.30	< 0.015
			1-Nov-2017	0.0058	0.14	< 0.30	0.0337
			7-Mar-2018	< 0.0050	< 0.050	< 0.30	< 0.015
			13-Jun-2018	< 0.0050	< 0.050	< 0.30	< 0.030
			29-Aug-2018	< 0.0050	< 0.050	< 0.30	< 0.015
			26-Nov-2018	< 0.0050	< 0.050	< 0.30	< 0.010
			21-Mar-2019	< 0.0050	< 0.050	< 0.30	< 0.010
			29-May-2019	0.0104	< 0.050	< 0.30	< 0.015
			22-Aug-2019	< 0.0050	< 0.050	< 0.30	< 0.030
			30-Oct-2019	0.0121	< 0.050	0.38	< 0.010
			9-Dec-2014	0.219	0.73	5.3	0.097
			10-Mar-2015	0.112	0.27	4.78	< 0.010
			10-Jun-2015	0.667	0.686	5.38	0.132
			22-Sep-2015	0.383	0.375	4.24	0.139
			16-Dec-2015	0.107	0.177	4.41	0.125
			16-Mar-2016	0.0082	< 0.050	3.23	< 0.005
			10-Jun-2016	0.258	0.317	5.11	0.161
			13-Sep-2016	0.0326	0.141	4.6	0.095
			13-Dec-2016	0.0432	< 0.25	5.09	0.17
			16-Mar-2017	0.0055	< 0.050	2.5	0.0091
			12-Jun-2017	0.159	0.301	4.74	0.133
		LC_PIZDC1308	19-Sep-2017	< 0.0050	< 0.050	1.92	0.023
		_	1-Nov-2017	0.0627	< 0.050	1.84	0.0361
			7-Mar-2018 (Dup)	0.0052	< 0.050	2.1	< 0.005
			7-Mar-2018	< 0.0050	< 0.050	2.02	< 0.005
			13-Jun-2018	0.181	0.16	5.53	0.116
			29-Aug-2018	0.0383	0.098	5	0.127
			27-Nov-2018	< 0.0050	0.058	5.1	0.0211
			21-Mar-2019	< 0.0050	< 0.050	5.13	0.0059
			21-Mar-2019 (Dup)	< 0.0050	0.072	5.05	0.0055
			29-May-2019	0.115	0.266	5.74	0.126
			29-May-2019 22-Aug-2019	0.115	0.20	5.47	0.126
					†		
			30-Oct-2019	0.0142	0.075	4.2	0.0469
				A A			. A DOD
			30-Oct-2019 (Dup)	0.0156	0.053	4.52	0.039
			30-Oct-2019 (Dup) 9-Dec-2014	< 0.0050	0.053 < 0.10	8.74	< 0.010
			30-Oct-2019 (Dup) 9-Dec-2014 9-Mar-2015	< 0.0050 < 0.0050	0.053 < 0.10 < 0.10	8.74 6.3	< 0.010 < 0.010
Phase II -	Diversion		30-Oct-2019 (Dup) 9-Dec-2014	< 0.0050	0.053 < 0.10	8.74	< 0.010
Phase II - Dry Creek	Structure in Valley		30-Oct-2019 (Dup) 9-Dec-2014 9-Mar-2015	< 0.0050 < 0.0050	0.053 < 0.10 < 0.10	8.74 6.3	< 0.010 < 0.010
			30-Oct-2019 (Dup) 9-Dec-2014 9-Mar-2015 9-Jun-2015	< 0.0050 < 0.0050 < 0.0050	0.053 < 0.10 < 0.10 < 0.050	8.74 6.3 5.79	< 0.010 < 0.010 < 0.005
	Structure in Valley		30-Oct-2019 (Dup) 9-Dec-2014 9-Mar-2015 9-Jun-2015 22-Sep-2015	< 0.0050 < 0.0050 < 0.0050 < 0.0050	0.053 < 0.10 < 0.10 < 0.050 < 0.050	8.74 6.3 5.79 5.5	< 0.010 < 0.010 < 0.005 < 0.005
	Structure in Valley		30-Oct-2019 (Dup) 9-Dec-2014 9-Mar-2015 9-Jun-2015 22-Sep-2015 15-Dec-2015	< 0.0050 < 0.0050 < 0.0050 < 0.0050 < 0.0050	0.053 < 0.10 < 0.10 < 0.050 < 0.050 < 0.050 < 0.050	8.74 6.3 5.79 5.5 5.52	< 0.010 < 0.010 < 0.005 < 0.005 < 0.005
	Structure in Valley		30-Oct-2019 (Dup) 9-Dec-2014 9-Mar-2015 9-Jun-2015 22-Sep-2015 15-Dec-2015 16-Mar-2016 10-Jun-2016	< 0.0050 < 0.0050 < 0.0050 < 0.0050 < 0.0050 < 0.0050 < 0.0050	0.053 < 0.10 < 0.10 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050	8.74 6.3 5.79 5.5 5.52 5.31 5.22	< 0.010 < 0.010 < 0.005 < 0.005 < 0.005 < 0.005 < 0.005
	Structure in Valley		30-Oct-2019 (Dup) 9-Dec-2014 9-Mar-2015 9-Jun-2015 22-Sep-2015 15-Dec-2015 16-Mar-2016 10-Jun-2016 13-Sep-2016	< 0.0050 < 0.0050 < 0.0050 < 0.0050 < 0.0050 < 0.0050 < 0.0050 < 0.0050 0.0134	0.053 < 0.10 < 0.10 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050	8.74 6.3 5.79 5.5 5.52 5.31 5.22 5.85	< 0.010 < 0.010 < 0.005 < 0.005 < 0.005 < 0.005 <0.005 <0.005 <0.005
	Structure in Valley		30-Oct-2019 (Dup) 9-Dec-2014 9-Mar-2015 9-Jun-2015 22-Sep-2015 15-Dec-2015 16-Mar-2016 10-Jun-2016 13-Sep-2016 13-Dec-2016	< 0.0050 < 0.0050 < 0.0050 < 0.0050 < 0.0050 < 0.0050 < 0.0050 0.0134 0.0061	0.053 < 0.10 < 0.10 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050	8.74 6.3 5.79 5.5 5.52 5.31 5.22 5.85 5.36	< 0.010 < 0.010 < 0.005 < 0.005 < 0.005 < 0.005 <0.005 <0.005 <0.005 <0.005
	Structure in Valley		30-Oct-2019 (Dup) 9-Dec-2014 9-Mar-2015 9-Jun-2015 22-Sep-2015 15-Dec-2015 16-Mar-2016 10-Jun-2016 13-Sep-2016 13-Dec-2016 16-Mar-2017	< 0.0050 < 0.0050 < 0.0050 < 0.0050 < 0.0050 < 0.0050 < 0.0050 < 0.0050 0.0134 0.0061 0.0471	0.053 < 0.10 < 0.10 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050	8.74 6.3 5.79 5.5 5.52 5.31 5.22 5.85 5.36 5.28	< 0.010 < 0.010 < 0.005 < 0.005 < 0.005 < 0.005 <0.005 <0.005 <0.005 <0.005 <0.005 <0.005
	Structure in Valley		30-Oct-2019 (Dup) 9-Dec-2014 9-Mar-2015 9-Jun-2015 22-Sep-2015 15-Dec-2015 16-Mar-2016 10-Jun-2016 13-Sep-2016 13-Dec-2016 16-Mar-2017 12-Jun-2017	< 0.0050 < 0.0050 < 0.0050 < 0.0050 < 0.0050 < 0.0050 < 0.0050 < 0.0050 0.0134 0.0061 0.0471 0.0078	0.053 < 0.10 < 0.10 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050	8.74 6.3 5.79 5.5 5.52 5.31 5.22 5.85 5.36 5.28 4.64	< 0.010 < 0.010 < 0.005 < 0.005 < 0.005 < 0.005 <0.005 <0.005 <0.005 <0.005 <0.005 <0.005 <0.0050 <0.0050
	Structure in Valley	LC_PIZDC1404S	30-Oct-2019 (Dup) 9-Dec-2014 9-Mar-2015 9-Jun-2015 22-Sep-2015 15-Dec-2015 16-Mar-2016 10-Jun-2016 13-Sep-2016 13-Dec-2016 16-Mar-2017 12-Jun-2017 14-Sep-2017	< 0.0050 < 0.0050 < 0.0050 < 0.0050 < 0.0050 < 0.0050 < 0.0050 < 0.0050 0.0134 0.0061 0.0471 0.0078 0.0311	0.053 < 0.10 < 0.10 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050	8.74 6.3 5.79 5.5 5.52 5.31 5.22 5.85 5.36 5.28 4.64 4.82	< 0.010 < 0.010 < 0.005 < 0.005 < 0.005 < 0.005 <0.005 <0.005 <0.005 <0.005 <0.005 <0.0050 < 0.0050 < 0.0050
	Structure in Valley	LC_PIZDC1404S	30-Oct-2019 (Dup) 9-Dec-2014 9-Mar-2015 9-Jun-2015 22-Sep-2015 15-Dec-2015 16-Mar-2016 10-Jun-2016 13-Sep-2016 13-Dec-2016 16-Mar-2017 12-Jun-2017 14-Sep-2017	< 0.0050 < 0.0050 < 0.0050 < 0.0050 < 0.0050 < 0.0050 < 0.0050 < 0.0050 0.0134 0.0061 0.0471 0.0078 0.0311 < 0.0050	0.053 < 0.10 < 0.10 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050	8.74 6.3 5.79 5.5 5.52 5.31 5.22 5.85 5.36 5.28 4.64 4.82 4.68	< 0.010 < 0.010 < 0.005 < 0.005 < 0.005 < 0.005 <0.005 <0.005 <0.005 <0.005 <0.005 < 0.0050 < 0.0050 < 0.0050 < 0.0050
	Structure in Valley	LC_PIZDC1404S	30-Oct-2019 (Dup) 9-Dec-2014 9-Mar-2015 9-Jun-2015 22-Sep-2015 15-Dec-2015 16-Mar-2016 10-Jun-2016 13-Sep-2016 13-Dec-2016 16-Mar-2017 12-Jun-2017 14-Sep-2017	< 0.0050 < 0.0050 < 0.0050 < 0.0050 < 0.0050 < 0.0050 < 0.0050 < 0.0050 0.0134 0.0061 0.0471 0.0078 0.0311	0.053 < 0.10 < 0.10 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050	8.74 6.3 5.79 5.5 5.52 5.31 5.22 5.85 5.36 5.28 4.64 4.82	< 0.010 < 0.010 < 0.005 < 0.005 < 0.005 < 0.005 <0.005 <0.005 <0.005 <0.005 <0.005 <0.005 < 0.0050 < 0.0050
	Structure in Valley	LC_PIZDC1404S	30-Oct-2019 (Dup) 9-Dec-2014 9-Mar-2015 9-Jun-2015 22-Sep-2015 15-Dec-2015 16-Mar-2016 10-Jun-2016 13-Sep-2016 13-Dec-2016 16-Mar-2017 12-Jun-2017 14-Sep-2017	< 0.0050 < 0.0050 < 0.0050 < 0.0050 < 0.0050 < 0.0050 < 0.0050 < 0.0050 0.0134 0.0061 0.0471 0.0078 0.0311 < 0.0050	0.053 < 0.10 < 0.10 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050	8.74 6.3 5.79 5.5 5.52 5.31 5.22 5.85 5.36 5.28 4.64 4.82 4.68	< 0.010 < 0.010 < 0.005 < 0.005 < 0.005 < 0.005 <0.005 <0.005 <0.005 <0.005 <0.005 < 0.0050 < 0.0050 < 0.0050 < 0.0050
	Structure in Valley	LC_PIZDC1404S	30-Oct-2019 (Dup) 9-Dec-2014 9-Mar-2015 9-Jun-2015 22-Sep-2015 15-Dec-2015 16-Mar-2016 10-Jun-2016 13-Sep-2016 13-Dec-2016 16-Mar-2017 12-Jun-2017 14-Sep-2017 1-Nov-2017 6-Mar-2018	< 0.0050 < 0.0050 < 0.0050 < 0.0050 < 0.0050 < 0.0050 < 0.0050 < 0.0050 0.0134 0.0061 0.0471 0.0078 0.0311 < 0.0050 < 0.0050	0.053 < 0.10 < 0.10 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050	8.74 6.3 5.79 5.5 5.52 5.31 5.22 5.85 5.36 5.28 4.64 4.82 4.68 4.34	< 0.010 < 0.010 < 0.005 < 0.005 < 0.005 < 0.005 <0.005 <0.005 <0.005 <0.005 <0.005 < 0.0050 < 0.0050 < 0.0050 < 0.0050 < 0.0050
	Structure in Valley	LC_PIZDC1404S	30-Oct-2019 (Dup) 9-Dec-2014 9-Mar-2015 9-Jun-2015 22-Sep-2015 15-Dec-2015 16-Mar-2016 10-Jun-2016 13-Sep-2016 13-Dec-2016 16-Mar-2017 12-Jun-2017 14-Sep-2017 1-Nov-2017 6-Mar-2018 11-Jun-2018 11-Jun-2018 (Dup)	< 0.0050 < 0.0050 < 0.0050 < 0.0050 < 0.0050 < 0.0050 < 0.0050 < 0.0050 0.0134 0.0061 0.0471 0.0078 0.0311 < 0.0050 < 0.0050 < 0.0050 < 0.0050 < 0.0050	0.053 < 0.10 < 0.10 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050	8.74 6.3 5.79 5.5 5.52 5.31 5.22 5.85 5.36 5.28 4.64 4.82 4.68 4.34 < 0.30 < 0.30	< 0.010 < 0.010 < 0.005 < 0.005 < 0.005 < 0.005 < 0.005 < 0.005 < 0.005 < 0.005 < 0.005 < 0.0050 < 0.0050 < 0.0050 < 0.0050 < 0.0050 < 0.0050 < 0.0050 < 0.0050 < 0.0050
	Structure in Valley	LC_PIZDC1404S	30-Oct-2019 (Dup) 9-Dec-2014 9-Mar-2015 9-Jun-2015 22-Sep-2015 15-Dec-2015 16-Mar-2016 10-Jun-2016 13-Sep-2016 13-Dec-2016 16-Mar-2017 12-Jun-2017 14-Sep-2017 1-Nov-2017 6-Mar-2018 11-Jun-2018 11-Jun-2018 (Dup) 20-Aug-2018	< 0.0050 < 0.0050 < 0.0050 < 0.0050 < 0.0050 < 0.0050 < 0.0050 < 0.0050 0.0134 0.0061 0.0471 0.0078 0.0311 < 0.0050 < 0.0050 < 0.0050 < 0.0050 < 0.0050	0.053 < 0.10 < 0.10 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050	8.74 6.3 5.79 5.5 5.52 5.31 5.22 5.85 5.36 5.28 4.64 4.82 4.68 4.34 < 0.30 < 0.30 5.13	< 0.010 < 0.010 < 0.005 < 0.005 < 0.005 < 0.005 <0.005 <0.005 <0.005 <0.005 <0.0050 < 0.0050 < 0.0050 < 0.0050 < 0.0050 < 0.0050 < 0.0050 < 0.0050 < 0.0050 < 0.0050 < 0.0050 < 0.0050
	Structure in Valley	LC_PIZDC1404S	30-Oct-2019 (Dup) 9-Dec-2014 9-Mar-2015 9-Jun-2015 22-Sep-2015 15-Dec-2015 16-Mar-2016 10-Jun-2016 13-Sep-2016 13-Dec-2016 16-Mar-2017 12-Jun-2017 14-Sep-2017 1-Nov-2017 6-Mar-2018 11-Jun-2018 11-Jun-2018 (Dup) 20-Aug-2018 14-Nov-2018	< 0.0050 < 0.0050 < 0.0050 < 0.0050 < 0.0050 < 0.0050 < 0.0050 < 0.0050 0.0134 0.0061 0.0471 0.0078 0.0311 < 0.0050 < 0.0050 < 0.0050 < 0.0050 < 0.0050 < 0.0050 < 0.0050 < 0.0050	0.053 < 0.10 < 0.10 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050	8.74 6.3 5.79 5.5 5.52 5.31 5.22 5.85 5.36 5.28 4.64 4.82 4.68 4.34 < 0.30 < 0.30 5.13 4.95	< 0.010 < 0.010 < 0.005 < 0.005 < 0.005 < 0.005 < 0.005 < 0.005 < 0.005 < 0.005 < 0.0050 < 0.0050 < 0.0050 < 0.0050 < 0.0050 < 0.0050 < 0.0050 < 0.0050 < 0.0050 < 0.0050 < 0.0050 < 0.0050 < 0.0050 < 0.0050
	Structure in Valley	LC_PIZDC1404S	30-Oct-2019 (Dup) 9-Dec-2014 9-Mar-2015 9-Jun-2015 22-Sep-2015 15-Dec-2015 16-Mar-2016 10-Jun-2016 13-Sep-2016 13-Dec-2016 16-Mar-2017 12-Jun-2017 14-Sep-2017 1-Nov-2017 6-Mar-2018 11-Jun-2018 11-Jun-2018 11-Jun-2018 11-Jun-2018 20-Aug-2018 20-Mar-2019	< 0.0050 < 0.0050 < 0.0050 < 0.0050 < 0.0050 < 0.0050 < 0.0050 < 0.0050 0.0134 0.0061 0.0471 0.0078 0.0311 < 0.0050 < 0.0050 < 0.0050 < 0.0050 < 0.0050 < 0.0050 < 0.0050 < 0.0050	0.053 < 0.10 < 0.10 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050	8.74 6.3 5.79 5.5 5.52 5.31 5.22 5.85 5.36 5.28 4.64 4.82 4.68 4.34 < 0.30 < 0.30 < 1.30 4.95 4.88	< 0.010 < 0.010 < 0.005 < 0.005 < 0.005 < 0.005 <0.005 <0.005 <0.005 <0.025 < 0.0050 < 0.0050 < 0.0050 < 0.0050 < 0.0050 < 0.0050 < 0.0050 < 0.0050 < 0.0050 < 0.0050 < 0.0050 < 0.0050 < 0.0050 < 0.0050
	Structure in Valley	LC_PIZDC1404S	30-Oct-2019 (Dup) 9-Dec-2014 9-Mar-2015 9-Jun-2015 22-Sep-2015 15-Dec-2015 16-Mar-2016 10-Jun-2016 13-Sep-2016 13-Dec-2016 16-Mar-2017 12-Jun-2017 14-Sep-2017 1-Nov-2017 6-Mar-2018 11-Jun-2018 11-Jun-2018 (Dup) 20-Aug-2018 14-Nov-2018 20-Mar-2019 23-May-2019	< 0.0050 < 0.0050 < 0.0050 < 0.0050 < 0.0050 < 0.0050 < 0.0050 < 0.0050 0.0134 0.0061 0.0471 0.0078 0.0311 < 0.0050 < 0.0050 < 0.0050 < 0.0050 < 0.0050 < 0.0050 < 0.0050 < 0.0050 < 0.0050	0.053 < 0.10 < 0.10 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050	8.74 6.3 5.79 5.5 5.52 5.31 5.22 5.85 5.36 5.28 4.64 4.82 4.68 4.34 < 0.30 < 0.30 < 0.30 5.13 4.95 4.88 4.8	< 0.010 < 0.010 < 0.005 < 0.005 < 0.005 < 0.005 < 0.005 < 0.005 < 0.005 < 0.0050 < 0.0050 < 0.0050 < 0.0050 < 0.0050 < 0.0050 < 0.0050 < 0.0050 < 0.0050 < 0.0050 < 0.0050 < 0.0050 < 0.0050 < 0.0050 < 0.0050 < 0.0050
	Structure in Valley	LC_PIZDC1404S	30-Oct-2019 (Dup) 9-Dec-2014 9-Mar-2015 9-Jun-2015 22-Sep-2015 15-Dec-2015 16-Mar-2016 10-Jun-2016 13-Sep-2016 13-Dec-2016 16-Mar-2017 12-Jun-2017 14-Sep-2017 1-Nov-2017 6-Mar-2018 11-Jun-2018 11-Jun-2018 (Dup) 20-Aug-2018 14-Nov-2018 20-Mar-2019 23-May-2019 (Dup)	< 0.0050 < 0.0050 < 0.0050 < 0.0050 < 0.0050 < 0.0050 < 0.0050 < 0.0050 0.0134 0.0061 0.0471 0.0078 0.0311 < 0.0050 < 0.0050 < 0.0050 < 0.0050 < 0.0050 < 0.0050 < 0.0050 < 0.0050 < 0.0050 < 0.0050 < 0.0050 < 0.0050 < 0.0050	0.053 < 0.10 < 0.10 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050	8.74 6.3 5.79 5.5 5.52 5.31 5.22 5.85 5.36 5.28 4.64 4.82 4.68 4.34 < 0.30 < 0.30 < 0.30 5.13 4.95 4.88 4.8 4.79	< 0.010 < 0.010 < 0.005 < 0.005 < 0.005 < 0.005 < 0.005 < 0.005 < 0.005 < 0.0050 < 0.0050 < 0.0050 < 0.0050 < 0.0050 < 0.0050 < 0.0050 < 0.0050 < 0.0050 < 0.0050 < 0.0050 < 0.0050 < 0.0050 < 0.0050 < 0.0050 < 0.0050 < 0.0050
	Structure in Valley	LC_PIZDC1404S	30-Oct-2019 (Dup) 9-Dec-2014 9-Mar-2015 9-Jun-2015 22-Sep-2015 15-Dec-2015 16-Mar-2016 10-Jun-2016 13-Sep-2016 13-Dec-2016 16-Mar-2017 12-Jun-2017 14-Sep-2017 1-Nov-2017 6-Mar-2018 11-Jun-2018 11-Jun-2018 (Dup) 20-Aug-2018 14-Nov-2018 20-Mar-2019 23-May-2019	< 0.0050 < 0.0050 < 0.0050 < 0.0050 < 0.0050 < 0.0050 < 0.0050 < 0.0050 0.0134 0.0061 0.0471 0.0078 0.0311 < 0.0050 < 0.0050 < 0.0050 < 0.0050 < 0.0050 < 0.0050 < 0.0050 < 0.0050 < 0.0050	0.053 < 0.10 < 0.10 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050 < 0.050	8.74 6.3 5.79 5.5 5.52 5.31 5.22 5.85 5.36 5.28 4.64 4.82 4.68 4.34 < 0.30 < 0.30 < 0.30 5.13 4.95 4.88 4.8	< 0.010 < 0.010 < 0.005 < 0.005 < 0.005 < 0.005 < 0.005 < 0.005 < 0.005 < 0.0050 < 0.0050 < 0.0050 < 0.0050 < 0.0050 < 0.0050 < 0.0050 < 0.0050 < 0.0050 < 0.0050 < 0.0050 < 0.0050 < 0.0050 < 0.0050 < 0.0050 < 0.0050

## Groundwater Monitoring Locations with Chemistry Data for Dry Creek Area and Downgradient Location

Ar	ea	Well Name	Sample Date	Nitrate as N	Selenium (dissolved)	Sulphate	Cadmium (dissolv
All		- Non Name	The state of the s	mg/L	μg/L < 0.10	mg/L	µg/L < 0.010
			9-Mar-2015 9-Jun-2015	0.01 < 0.010	< 0.10 < 0.050	< 0.60 < 0.60	< 0.010 < 0.005
			22-Sep-2015	< 0.015	< 0.050	< 1.5	< 0.005
			16-Dec-2015	< 0.025	< 0.050	< 1.5	< 0.005
			16-Mar-2016	< 0.025	< 0.050	< 1.5	< 0.005
			10-Jun-2016	< 0.025	< 0.050	< 1.5	0.0071
			13-Sep-2016	< 0.025	< 0.050	< 1.5	<0.005
			13-Dec-2016	< 0.0050	0.41	0.44	<0.025
			16-Mar-2017	< 0.0050	< 0.050	0.5	0.0061
			12-Jun-2017	< 0.0050	< 0.050	< 0.30	0.008
		LC_PIZDC1404D	14-Sep-2017	< 0.0050	< 0.050	< 0.30	< 0.0050
			1-Nov-2017	< 0.0050	< 0.050	< 0.30	0.0064
			6-Mar-2018	< 0.0050	0.11	0.84	0.006
			11-Jun-2018	< 0.0050	< 0.050	4.44	< 0.0050
			23-Aug-2018	< 0.025	< 0.050	< 1.5	0.0184
			14-Nov-2018	< 0.0050	< 0.050	< 0.30	0.0064
			20-Mar-2019	< 0.0050	0.061	< 0.30	0.0157
			23-May-2019	< 0.0050	< 0.050	< 0.30	0.0142
			15-Aug-2019	< 0.0050	< 0.050	< 0.30	< 0.010
			23-Oct-2019	0.0078	< 0.050	< 0.30	< 0.020
			28-Aug-2013	0.213	< 0.50	3.29	0.053
			19-Dec-2013	0.25	0.57	3.5	0.091
			11-Mar-2014	0.0243	0.31	4.87	0.065
			26-Jun-2014	0.298	0.37	3.4	0.066
			23-Sep-2014	0.689	4.76	11.5	0.068
			10-Dec-2014	1.24	0.9	8.31	<0.2 (Total)
			11-Mar-2015	3.9	2.18	12.9	0.047
			10-Jun-2015	8.1	1.76	17.6	0.0791
			22-Sep-2015	4.85	0.275	15.1	0.128
			16-Dec-2015	2.67	1.34	14.2	0.0767
			16-Mar-2016	1.87	1.74	17.8	0.0327
			10-Jun-2016	1.23	1.9	15.7	0.116
		LC_PIZDC0901	13-Sep-2016	0.685	1.85	12.8	0.0395
		20_1 12500001	15-Dec-2016	0.575	0.99	11.9	0.068
			16-Mar-2017	0.189	2.56	10.7	0.0427
			12-Jun-2017	0.39	0.513	10.5	0.0983
			19-Sep-2017	0.166	0.476	12.4	0.107
			7-Mar-2018	0.105	2.46	11.8	0.0777
			18-Jun-2018	0.351	2.29	18.8	0.0633
			23-Aug-2018	0.0751	0.867	17.2	0.106
			18-Dec-2018	0.0165	1.43	18.3	0.139
			26-Mar-2019	0.273	0.894	3.61	0.0757
			5-Jun-2019	0.644	1.01	20.3	0.108
			3-Sep-2019	0.339	0.55	12.3	0.0948
			6-Nov-2019	0.339	1.57	11.7	0.0564
			6-Jun-2012	0.113	2.71 (Total)	180	0.0364 0.01 (Total)
			5-Dec-2012	0.366	3.92 (Total)	187	0.01 (Total)
			9-Oct-2013	0.495	3.95 (Total)	192	0.01 (Total)
			1-May-2014	0.493	5.78 (Total)	194	0.01 (Total)
			8-Oct-2014	0.482	3.95 (Total)	189	0.012 (Total)
				0.405	, , ,	196	0.0054 (Total)
			8-Jun-2015		3.72 (Total)		
			4-Nov-2015 7-Mar-2016	0.493 0.705	3.7 (Total) 4.62 (Total)	190 191	0.0052 (Total) 0.0061 (Total)
			14-Jun-2016	0.445	3.35 (Total)	200	0.0052 (Total)
			16-Aug-2016	0.391	2.93 (Total)	186	0.0032 (Total)
			17-Nov-2016	0.478	3.73 (Total)	185	0.0007 (Total)
Non-LCO	Downgradient of		7-Feb-2017	0.675	4.39 (Total)	182	0.0055 (Total)
nitoring Wells	Dry Creek	GH_POTW10	19-Jun-2017	< 0.025	0.119 (Total)	278	0.0188 (Total)
5	,		25-Sep-2017	0.453	3.06 (Total)	191	0.0085 (Total)
			16-Nov-2017	0.448	3.92 (Total)	195	0.01 (Total)
			6-Mar-2018	0.591	4.56 (Total)	193	0.0062 (Total)
			11-Jun-2018	0.269	2.66 (Total)	198	0.0062 (Total)
			29-Aug-2018 (Dup)	0.294	2.55 (Total)	188	0.0085 (Total)
			29-Aug-2018	0.295	2.69 (Total)	188	0.0096 (Total)
			4-Oct-2018	0.369	2.74 (Total)	191	0.0105 (Total)
			15-Jan-2019	0.539	4.11 (Total)	189	0.0083 (Total)
			24-Apr-2019	0.688	4.56 (Total)	197	0.0099 (Total)
			22-Aug-2019	0.288	2.86 (Total)	187	0.0102 (Total)
			13-Nov-2019	0.445	3.61 (Total)	194	0.0113 (Total)
<u>.                                    </u>		-	<u>.                                      </u>	-	•		, ,,
mary Screening	g: BC CSR Guideli	ines					
atic Life (freshv	vater)	Maximum		400	20	4,290 <sup>c</sup>	4 <sup>c</sup>
nking Water		Maximum		10	10	500	5
estock		Maximum		100	30 30 <sup>a</sup> 50 <sup>b</sup>	1000	80
ation	ning: Dormit Limit	Maximum  Site Performance (	Objectives, and Canad	dian Guidolines	20 <sup>a</sup> , 50 <sup>b</sup>	-	5
		Maximum	objectives, and Canat	Not applied	50	Not applied	Not applied
Valley Effluent		MAAHIMIII		ινοι αμγιισα	<u> </u>	ινοι αρμίτου	i vot applied
eshold Values: I	Permitted	Monthly Average		7	50	-	0.58
charge at LCO ( Valley Effluent						•	·

TALICS
Concentration greater than BC CSR Livestock guideline
Concentration greater than BC CSR Irrigation guideline
Comparisons of groundwater quality to water quality guidelines made for reference purposes only.

BC Contaminated Sites Regulations: BC MOE (1997) Generic Numerical Water Standards (Criteria). Accessed February 2019. Canadian Drinking Water Guidelines: Health Canada (2017). Guidelines for Canadian Drinking Water Quality Summary Table. Secondary screening applies only when primary screening yields an exceedance. Elk Valley Effluent Permit PE107517. Issued November 19, 2014.

LCO = Line Creek Operations

 $\mu$ g/L = microgram per litre; mg/L = miligram per litre Sampling Notes:

2018: LC\_PIZDC1306 could not be sampled in Q1 (January to March) due to frozen conditions.

<sup>- =</sup> no guideline.

<sup>&</sup>lt;sup>a</sup> = Standard for continuous applications on crops

<sup>&</sup>lt;sup>p =</sup> Standard for intermittent application on crops c = Hardness of 250 mg/L is assumed

<sup>(</sup>Dup) = Duplicate sample

## Recommended List of Analytes for the LCO Sitewide Groundwater Monitoring Program

CAS-RN	Parameter
Field Measured pH-F	pH, Field
TEMP-F	Temperature, Field
COND-F	Conductivity, Field
DO-F	Dissolved Oxygen, Field
Physical Parameters	7,3
COND-L	Conductivity
pH-L	рН
TDS	Total Dissolved Solids (Filtered Residue)
TDS(Calc)	Total Dissolved Solids (Calculated)
TSS-L	Total Suspended Solids
TURB-L	Turbidity
Alk-T	Alkalinity, Total as CaCO3
HARD	Hardness
Anions	Bicarbonate
- 16887-00-6	Chloride
14808-79-8	Sulphate
24959-67-9	Bromide
16984-48-8	Fluoride
Nutrients	
14797-55-8	Nitrogen - Nitrate
14797-65-0	Nitrogen - Nitrite
7664-41-7	Nitrogen - Ammonia
TKN	Nitrogen - Total Kjeldahl
14265-44-2-O	Phosphate, Ortho
Dissolved Metals	
7429-90-5	Aluminum
7440-36-0	Antimony
7440-38-2	Arsenic
7440-39-3	Barium
7440-69-9	Bismuth
7440-41-7	Beryllium
7440-42-8	Boron
7440-43-9	Cadmium
7440-70-2	Calcium
7440-47-3	Chromium
7440-48-4	Conner
7440-50-8 7439-89-6	Copper Iron
7439-92-1	Lead
7439-93-2	Lithium
7439-95-4	Magnesium
7439-96-5	Manganese
7439-97-6	Mercury
7439-98-7	Molybdenum
7440-02-0	Nickel
7440-09-7	Potassium
7782-49-2	Selenium
7440-22-4	Silver
7440-23-5	Sodium
7440-24-6	Strontium
7704-34-9	Sulphur
7440-28-0	Thallium
7440-31-5	Tin Titonium
7440-32-6 7440-61-1	Titanium
7440-61-1 7440-62-2	Uranium Vanadium
7440-62-2 7440-66-6	Zinc
	ZIIIC
Organics C-DOC	Dissolved Organic Carbon
C-DOC	Total Organic Carbon
Extractable Hydrocarbo	
-	Extractable Petroleum Hydrocarbons C10-C19
-	Extractable Petroleum Hydrocarbons C19-C32
-	Sum of extractable petroleum hydrocarbons
-	Total extractable hydrocarbons C10 - C30
L	

### **Recommended Water Level and Groundwater Monitoring for 2020**

Location Name	Type of Monitoring		Frequency of Data/Sample Collection		
Location Name	Water Level	Groundwater Sampling	Water Level	Groundwater Sampling	
LC_PIZDC0901	Yes	Yes		Quarterly <sup>c</sup>	
LC_PIZDC1306	Yes	Yes	7	Quarterly <sup>c</sup>	
LC_PIZDC1307	Yes	Yes	7	Quarterly <sup>c</sup>	
LC_PIZDC1308	Yes	Yes	Τ Γ	Quarterly <sup>c</sup>	
LC_PIZDC1404D	Yes	Yes	Τ Γ	Quarterly <sup>c</sup>	
LC_PIZDC1404S	Yes	Yes	Τ Γ	Quarterly <sup>c</sup>	
LC_PIZP1101	Yes	Yes	Continuous <sup>a</sup> /Quarterly	Quarterly <sup>c</sup>	
LC_PIZP1103	Yes	Yes <sup>d</sup>	1	Quarterly <sup>c</sup>	
LC_PIZP1104	Yes	Yes	Τ Γ	Quarterly <sup>c</sup>	
LC_PIZP1105	Yes	Yes <sup>d</sup>	Τ Γ	Quarterly <sup>c</sup>	
LC_PIZP1001	Yes	No	7	N/A	
LC_PIZP1002	Yes	No	Τ Γ	N/A	
LC_PIZP1003	Yes	No	7	N/A	
GH_POTW10 <sup>b</sup>		Covered by	/ Pogional Program		
RG_02-20 <sup>b</sup>	Covered by Regional Program				

#### Notes:

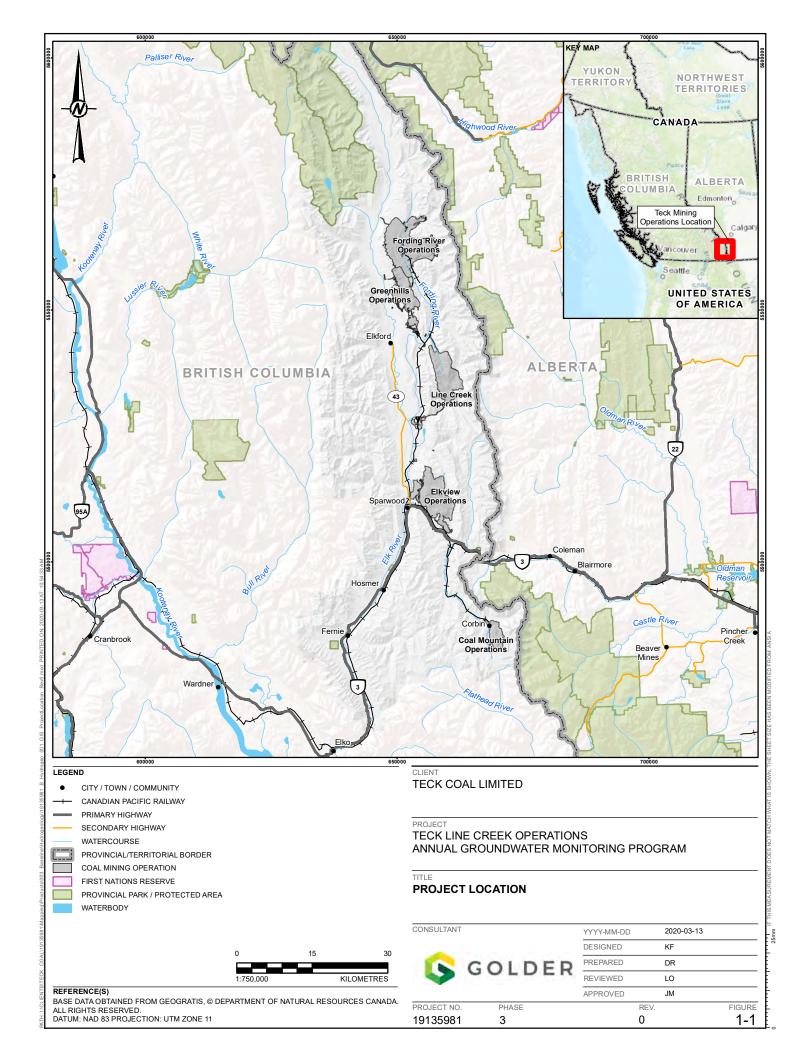
<sup>&</sup>lt;sup>a</sup> = All monitoring wells should have data loggers installed for continuous water level measurements except where low water levels in a well make it unfeasible (LC\_PIZP1105). "Spot" water level measurements taken during each quarterly visit

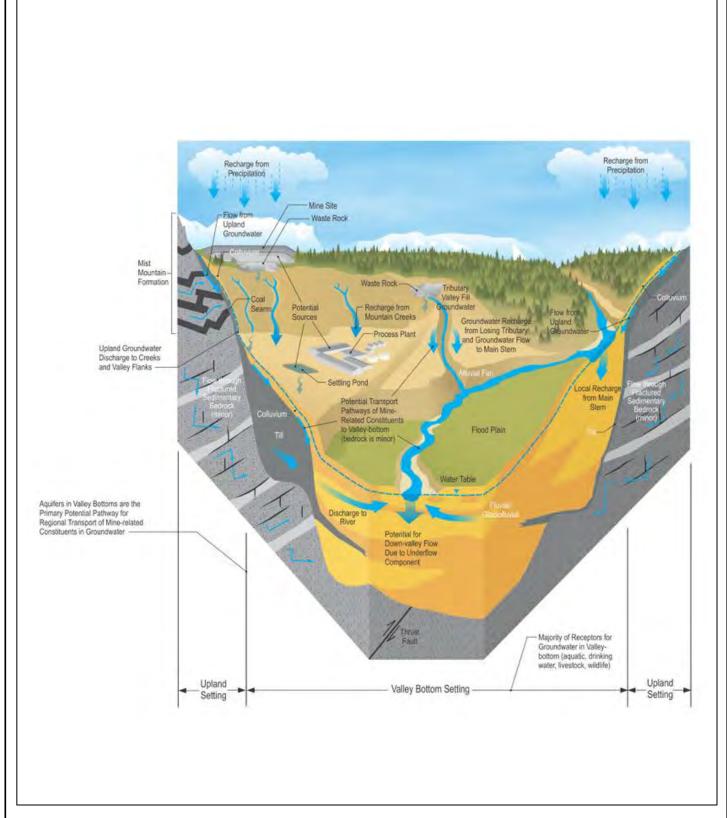
<sup>&</sup>lt;sup>b</sup> = GH\_POTW10 and RG\_02-20 are covered by the Regional Program

<sup>&</sup>lt;sup>c</sup> = If approved by ENV, frequency could be reduced to twice per year, as seasonal variations are established.

<sup>&</sup>lt;sup>d</sup> = If approved by ENV, the number of wells sampled in the Process Plant Area could be reduced.

**FIGURES** 





#### REFERENCE

from SNC-Lavalin 2017

CLIENT

TECK COAL LIMITED

CONSULTANT



YYYY-MM-DD	2020-03-13
PREPARED	KF
DESIGNED	KF
REVIEWED	LO
APPROVED	JM

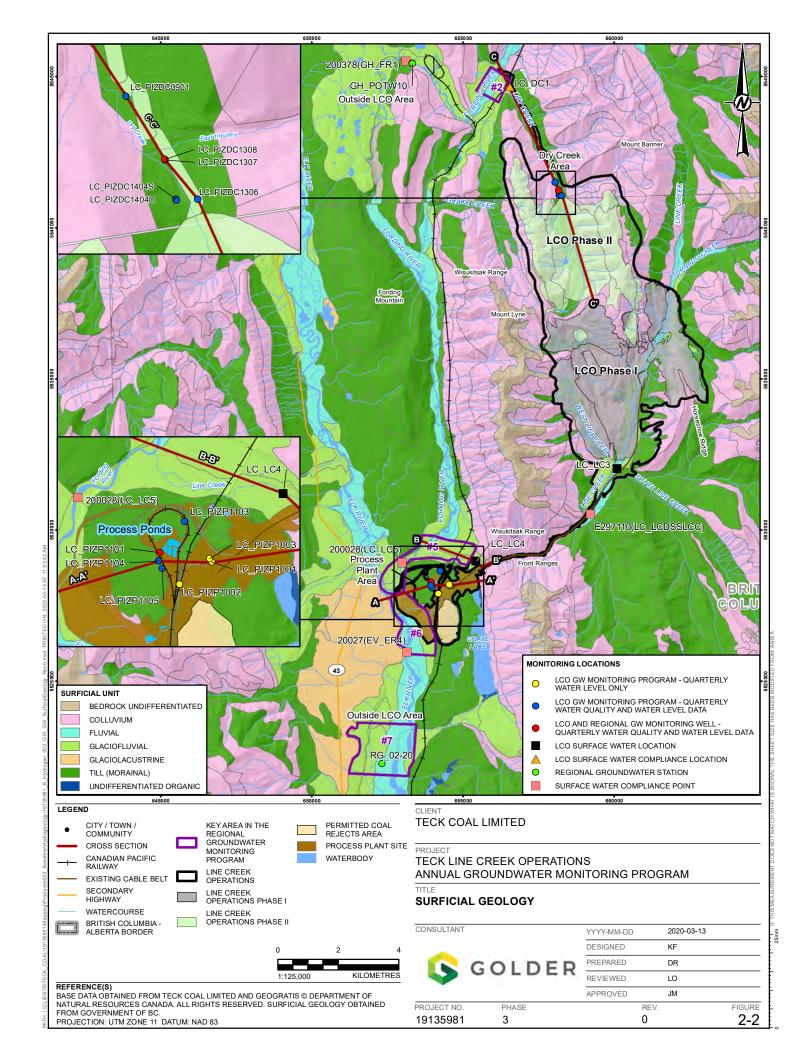
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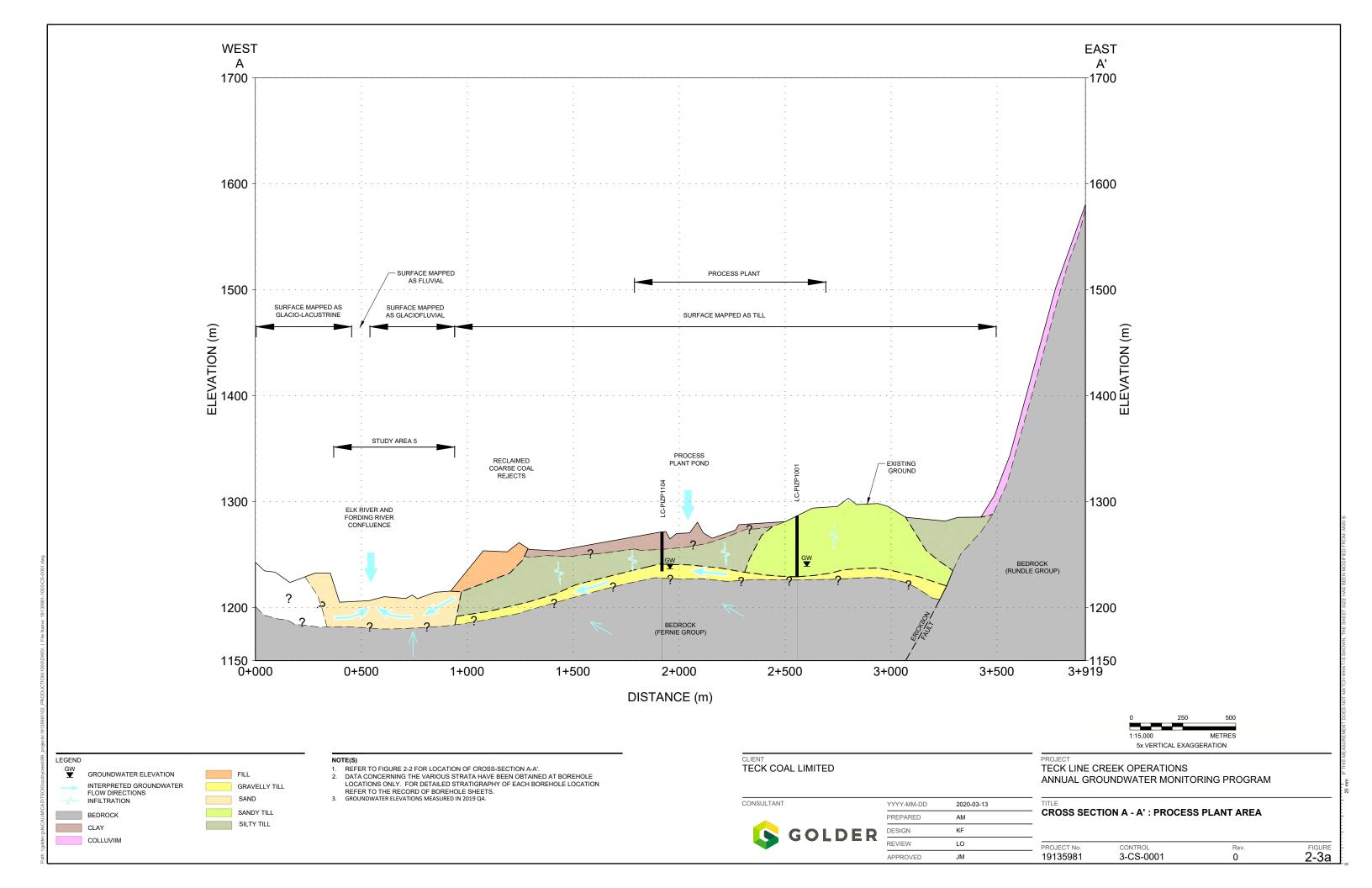
TECK LINE CREEK OPERATIONS
ANNUAL GROUNDWATER MONITORING PROGRAM

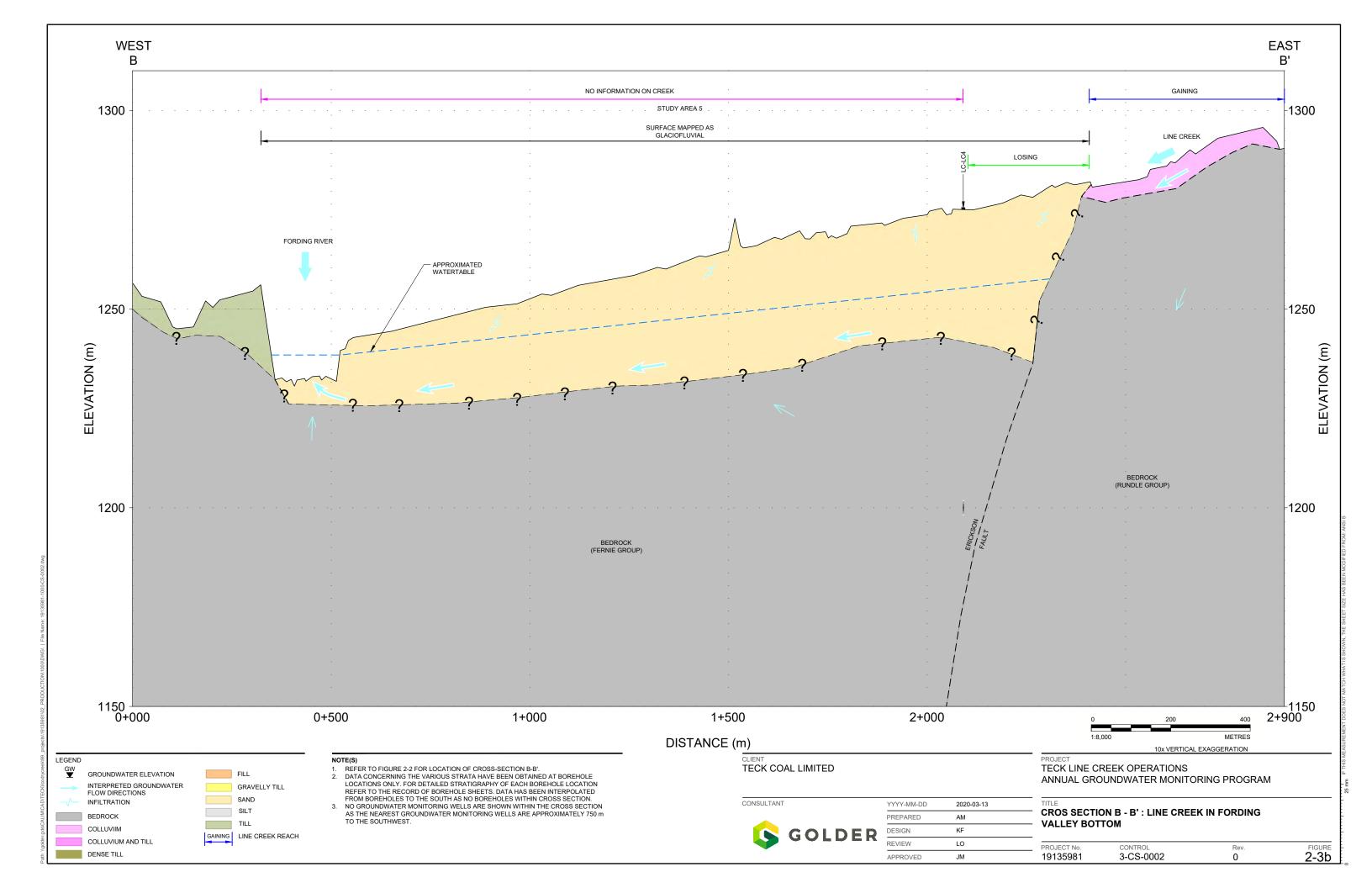
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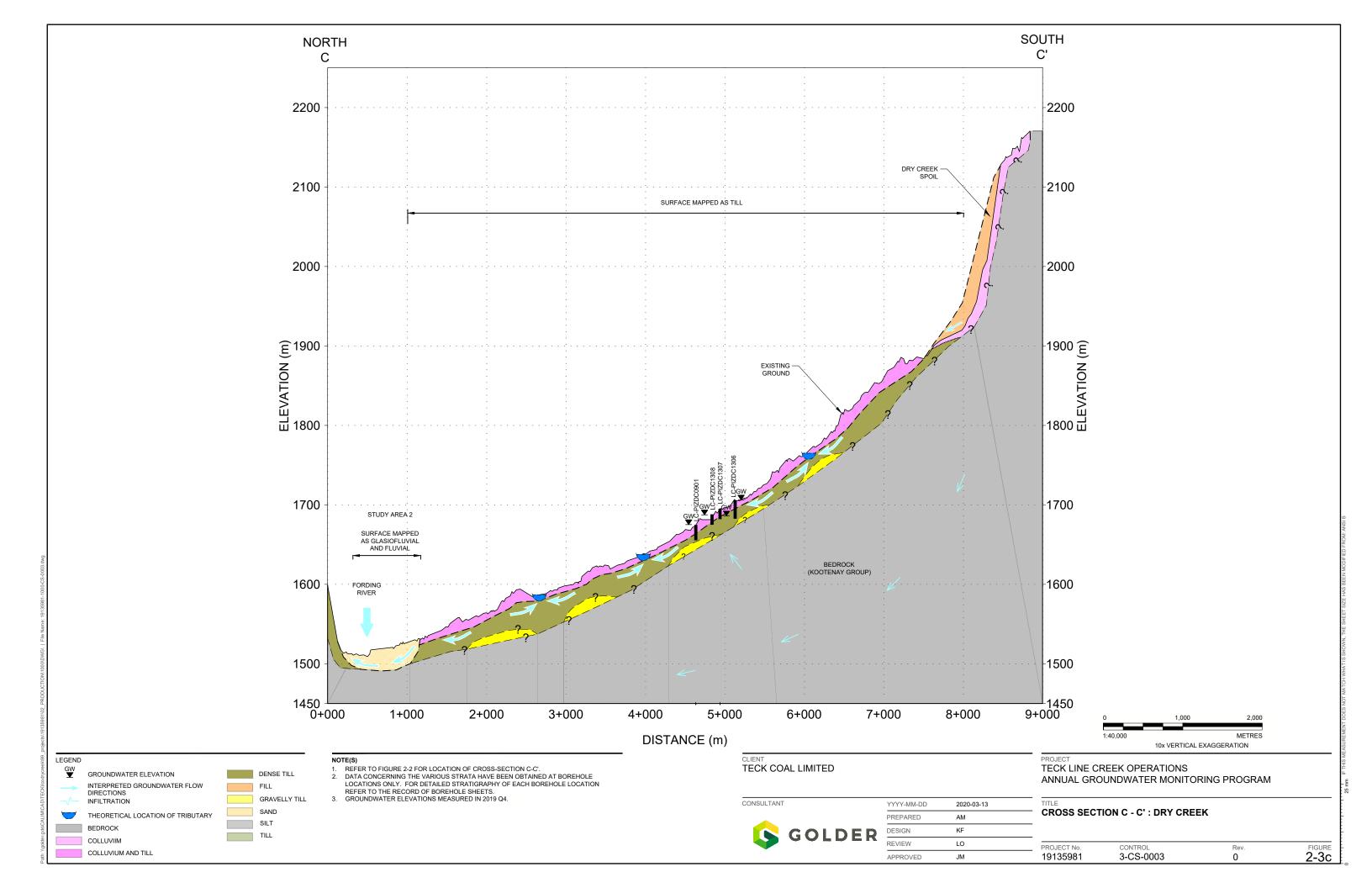
## SCHEMATIC OF SURFACE AND GROUNDWATER FLOW IN THE ELK VALLEY REGION

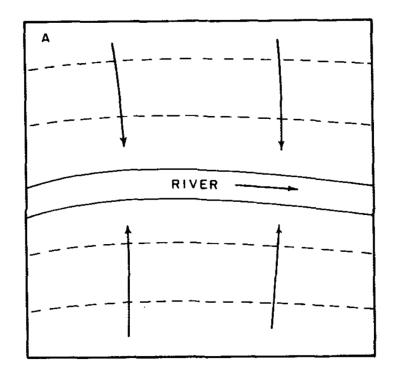
19135981	3	A	2-1	
PROJECT NO.	PHASE	REV.	FIGURE	

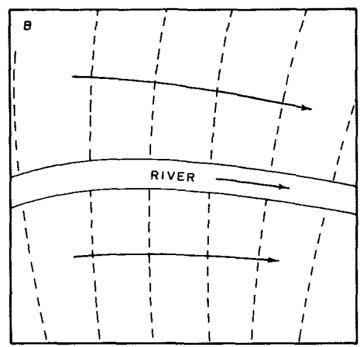












Upper flow sketch is the Baseflow end member and the Lower sketch is the Underflow end member

#### REFERENCE

from Larkin and Sharp 1992

CLIENT

TECK COAL LIMITED

CONSULTANT

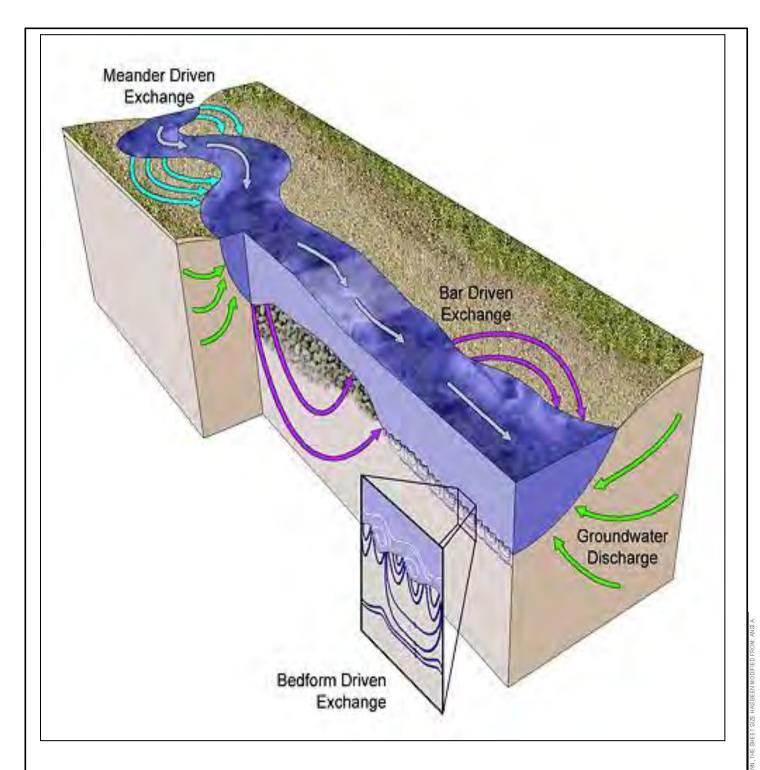


YYYY-MM-DD	2020-03-13	
PREPARED	KF	
DESIGNED	KF	
REVIEWED	LO	
APPROVED	JM	

TECK LINE CREEK OPERATIONS ANNUAL GROUNDWATER MONITORING PROGRAM

SCHEMATIC FOR FLOW DIRECTIONS IN **VALLEY-BOTTOM AQUIFER** 

PROJECT NO. 19135981	PHASE 3	REV.	FIGURE 2-4a
DRO IECT NO	DUACE	DE)/	FIGURE



#### NOTES

Illustration showing the baseflow dominated groundwater flow (green flow lines) directed to the valley-bottom river and smaller scale exchanges between surface water and groundwater (purple, teal and blue flow lines) due to interplay of many variables.

#### SOURCE

http://susa.stonedahl.com/research.html

CLIEN

TECK COAL LIMITED

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YYYY-MM-DD	2020-03-13
PREPARED	KF
DESIGNED	KF
REVIEWED	LO
APPROVED	JM

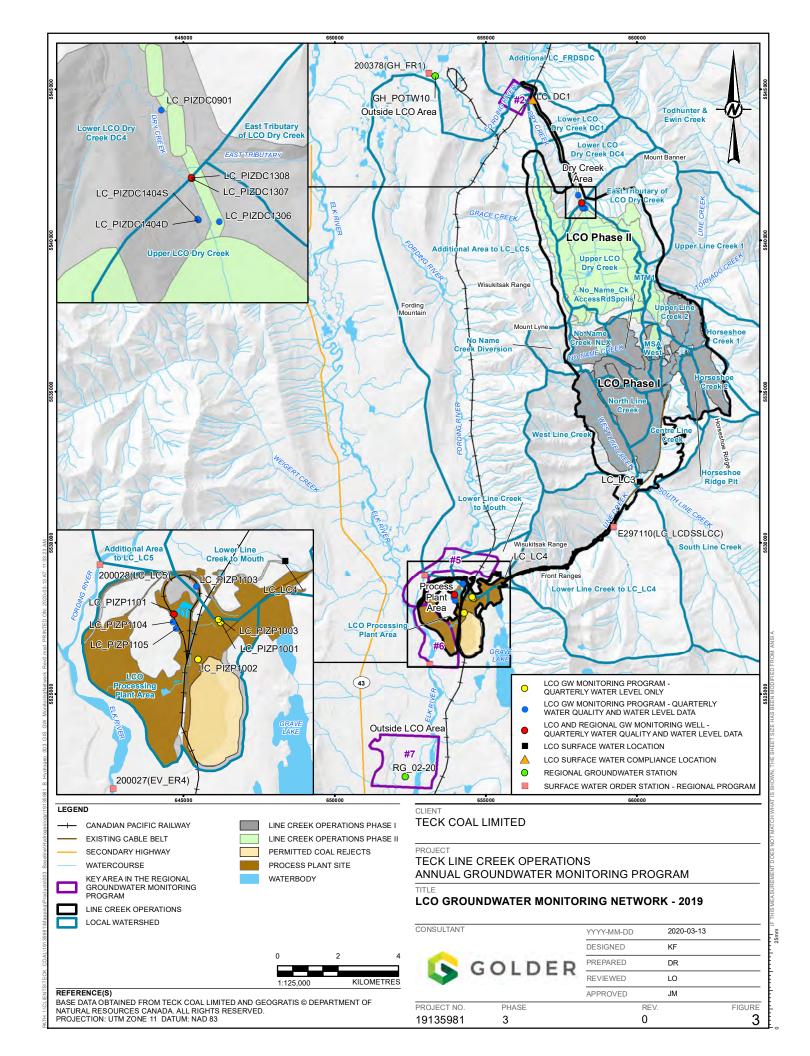
PROJECT

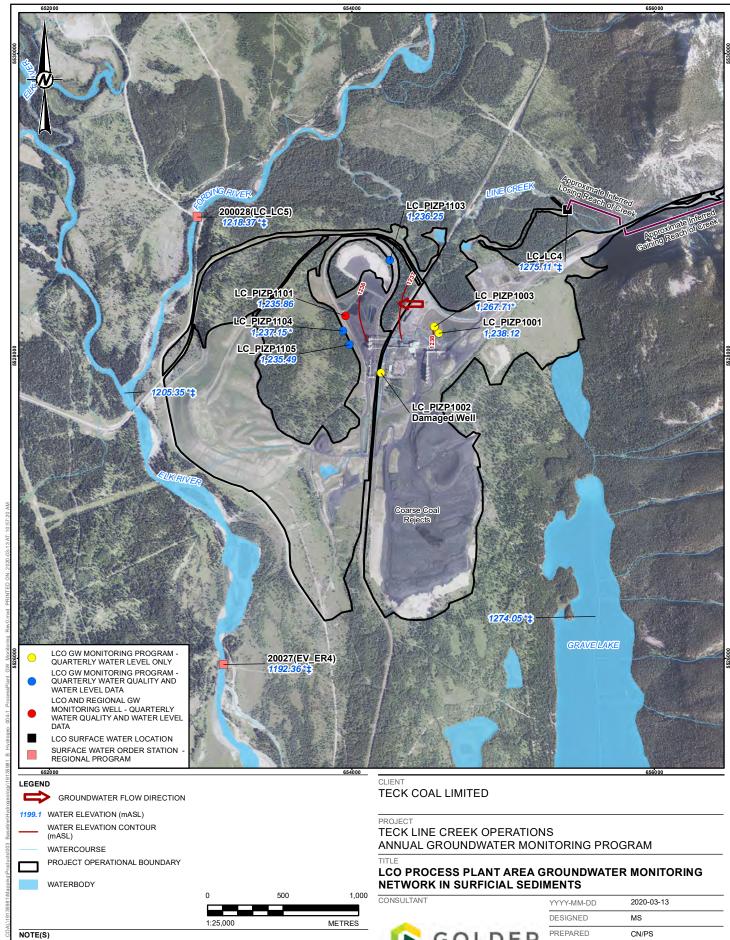
TECK LINE CREEK OPERATIONS
ANNUAL GROUNDWATER MONITORING PROGRAM

ITLE

## 3D VISUALIZATION OF GROUNDWATER AND SURFACE WATER FLOW

PROJECT NO. 19135981	PHASE	REV.	FIGURE 2-4h
10100001		/ \	<u> </u>



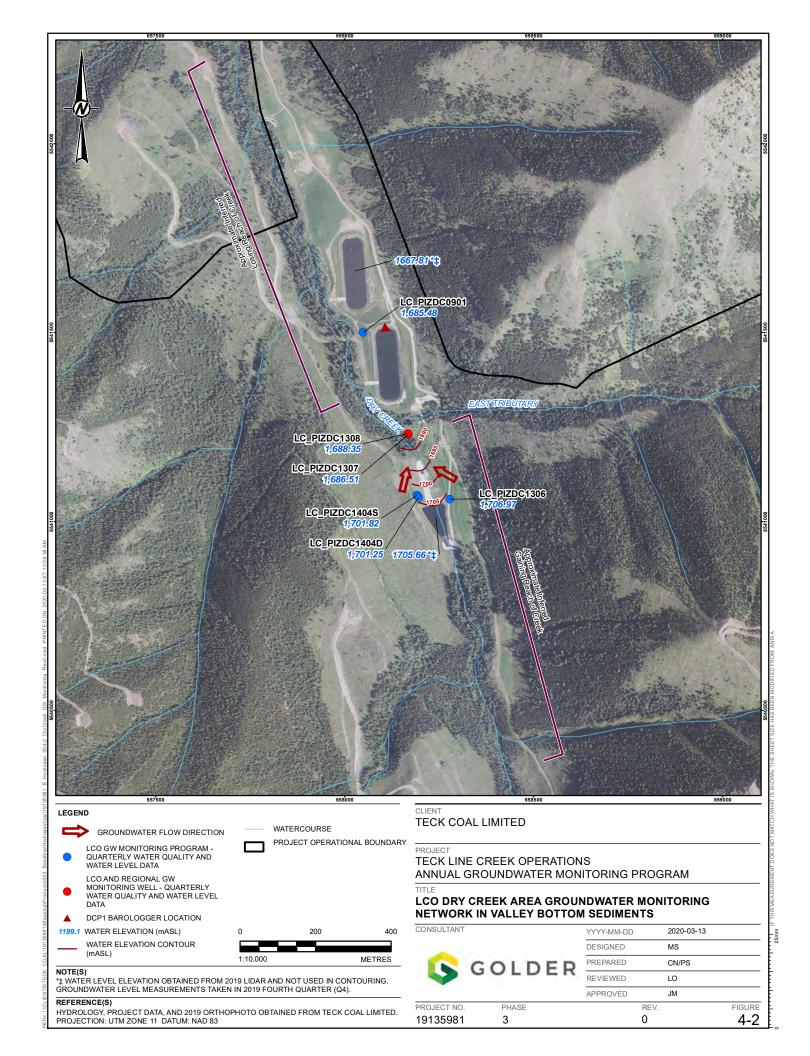


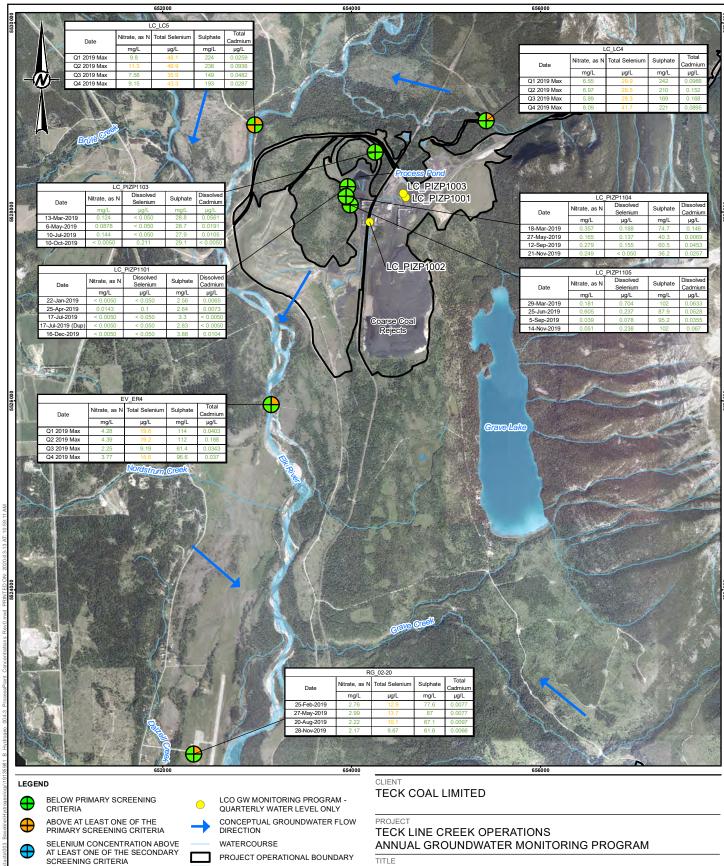
‡ WATER LEVEL ELEVATIONS OBTAINED FROM 2019 LIDAR.
\* WATER ELEVATION NOT USED IN CONTOURING.
GROUNDWATER LEVEL MEASUREMENTS TAKEN IN 2019 FOURTH QUARTER (Q4).

REFERENCE(S)

HYDROLOGY, PROJECT DATA, AND 2019 ORTHOPHOTO OBTAINED FROM TECK COAL LIMITED. PROJECTION: UTM ZONE 11 DATUM: NAD 83  $\,$ 

CONSULTANT		YYYY-MM-DD	2020-03-13	
<b>(\$</b> c	GOLDER	DESIGNED	MS	
		PREPARED	CN/PS	
	COLDER	REVIEWED	LO	
		APPROVED	JM	
PROJECT NO.	PHASE		REV.	FIGURE
19135981	3		0	4-1







PROJECT OPERATIONAL BOUNDARY WATERBODY

> 500 1,000 METRES 1:40.000

SURFACE WATER CONCENTRATIONS WERE COMPARED TO STANDARDS DESCRIBED IN TABLES 3-3 AND 3-4.

#### REFERENCE(S)

HYDROLOGY, PROJECT DATA, AND 2018 ORTHOPHOTO OBTAINED FROM TECK COAL LIMITED. PROJECTION: UTM ZONE 11 DATUM: NAD 83

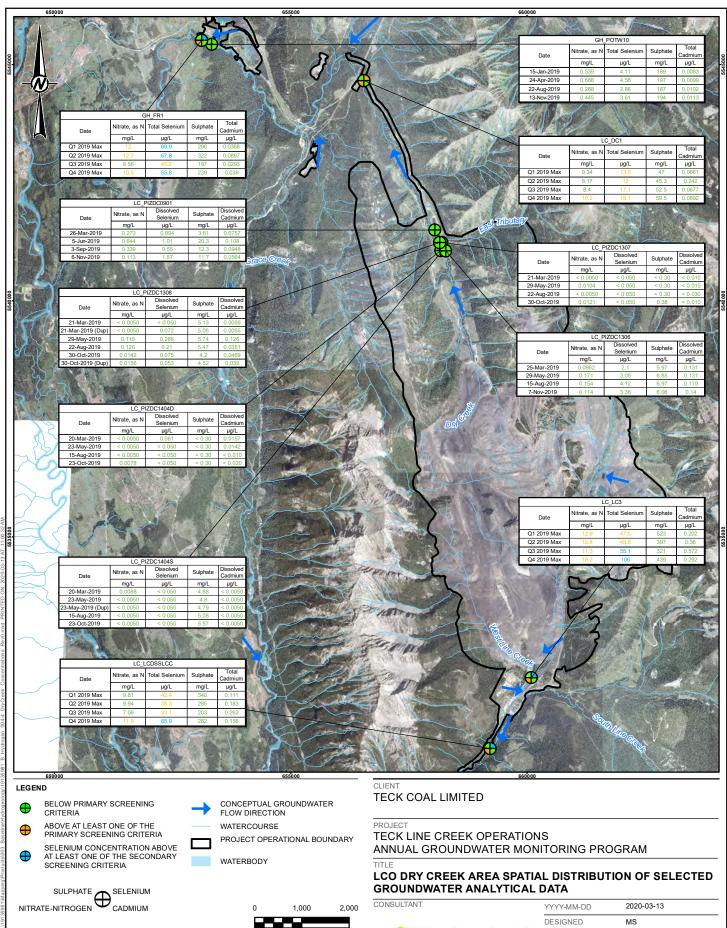
CONSULTANT

### LCO PROCESS PLANT AREA SPATIAL DISTRIBUTION OF SELECTED GROUNDWATER ANALYTICAL DATA

(\$	G	0	L	D	E	R	
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YYYY-MM-DD	2020-03-13
DESIGNED	MS
PREPARED	CN
REVIEWED	LO
APPROVED	JM

PROJECT NO. PHASE FIGURE REV. 19135981 3 0 4-3



NOTE(S)
SURFACE WATER CONCENTRATIONS WERE COMPARED TO STANDARDS DESCRIBED IN TABLES 3-3 AND 3-4.

REFERENCE(S)

HYDROLOGY, PROJECT DATA, AND 2018 ORTHOPHOTO OBTAINED FROM TECK COAL LIMITED. PROJECTION: UTM ZONE 11 DATUM: NAD 83

1:80,000

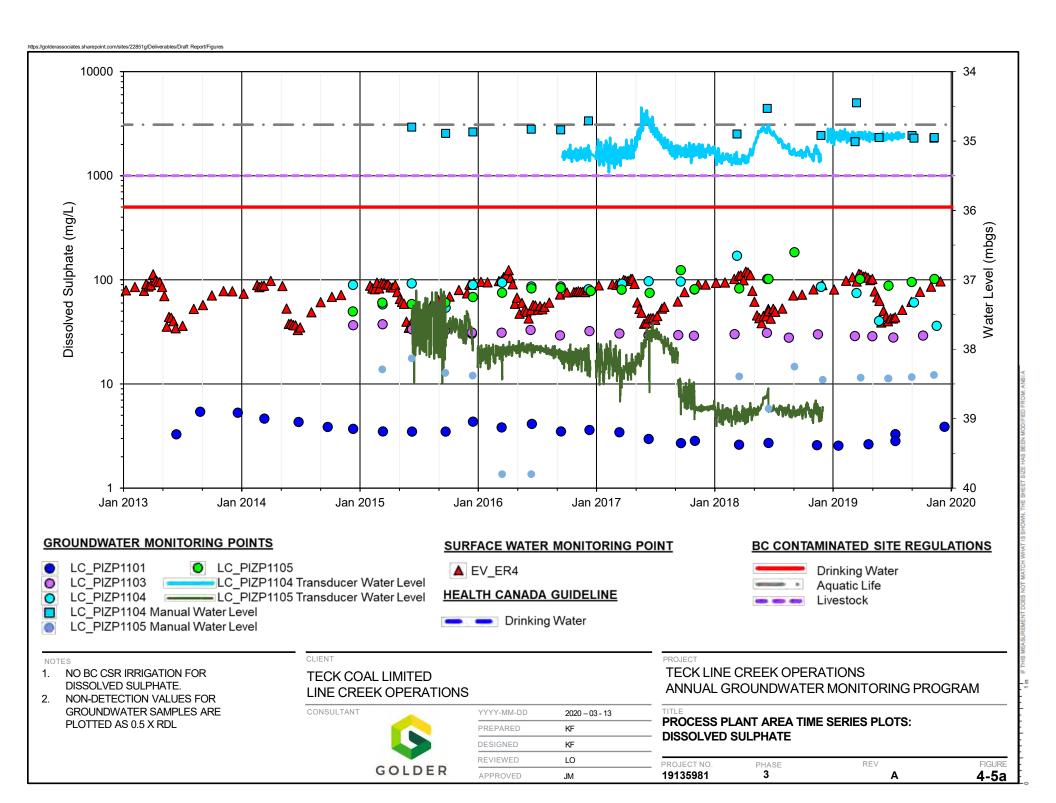
METRES

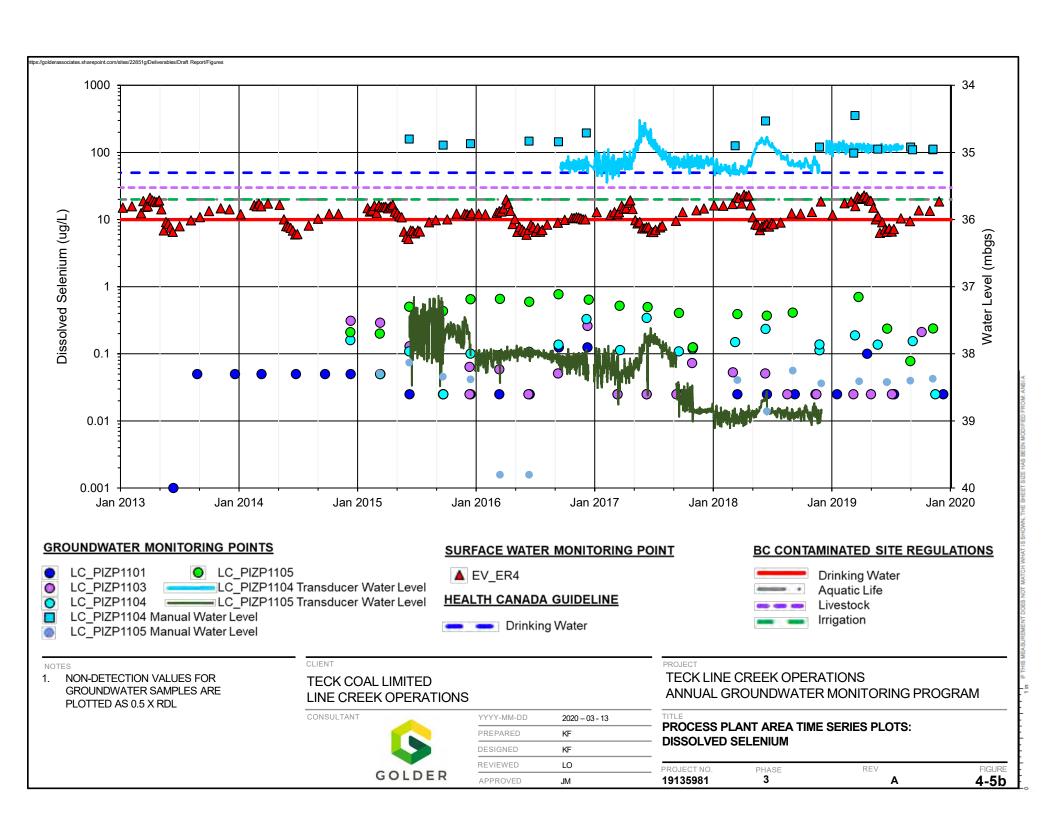
S GOLDER

YYYY-MM-DD	2020-03-13
DESIGNED	MS
PREPARED	CN
REVIEWED	LO
APPROVED	JM

 PROJECT NO.
 PHASE
 REV.
 FIGURE

 19135981
 3
 0
 4-4





DESIGNED

REVIEWED

APPROVED

GOLDER

KF

LO

**DISSOLVED NITRATE** 

PHASE

3

REV

FIGURE

4-5c

PROJECT NO.

19135981

 NO BC CSR IRRIGATION FOR DISSOLVED SULPHATE.

 NON-DETECTION VALUES FOR GROUNDWATER SAMPLES ARE PLOTTED AS 0.5 X RDL

### TECK COAL LIMITED LINE CREEK OPERATIONS

CONSULTANT



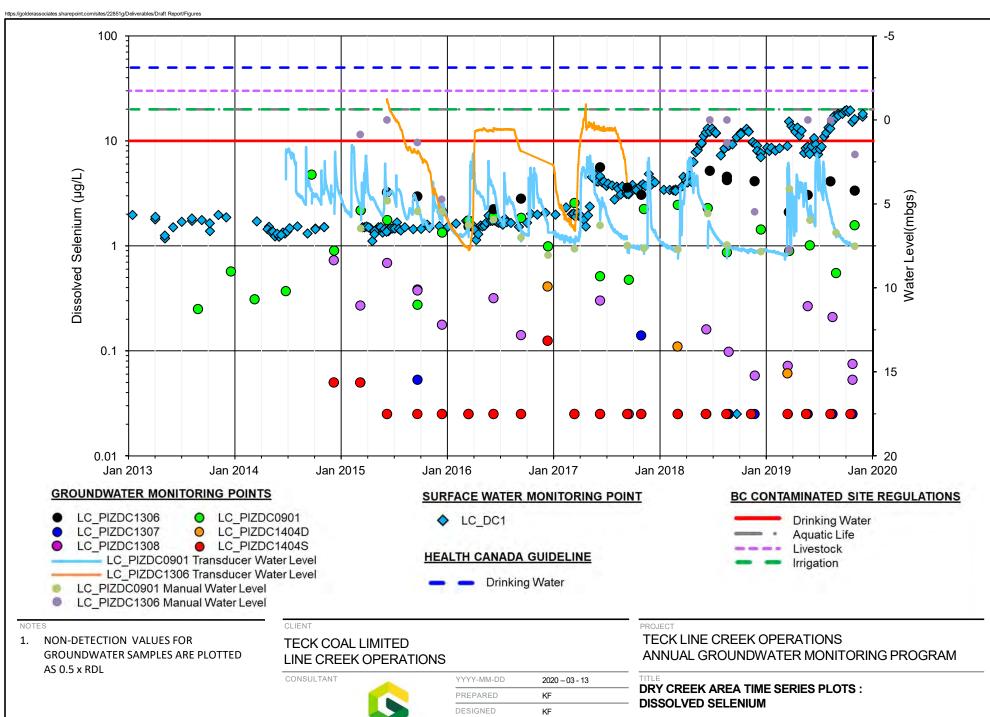
YYYY-MM-DD	2020 - 03 - 13
PREPARED	KF
DESIGNED	KF
REVIEWED	LO
APPROVED	JM

TECK LINE CREEK OPERATIONS
ANNUAL GROUNDWATER MONITORING PROGRAM

ΓITLE

DRY CREEK AREA TIME SERIES PLOTS : DISSOLVED SULPHATE

19135981	3	Α	4-6a
PROJECT NO.	PHASE	REV	FIGURE



REVIEWED

APPROVED

GOLDER

LO

PROJECT NO.

19135981

PHASE

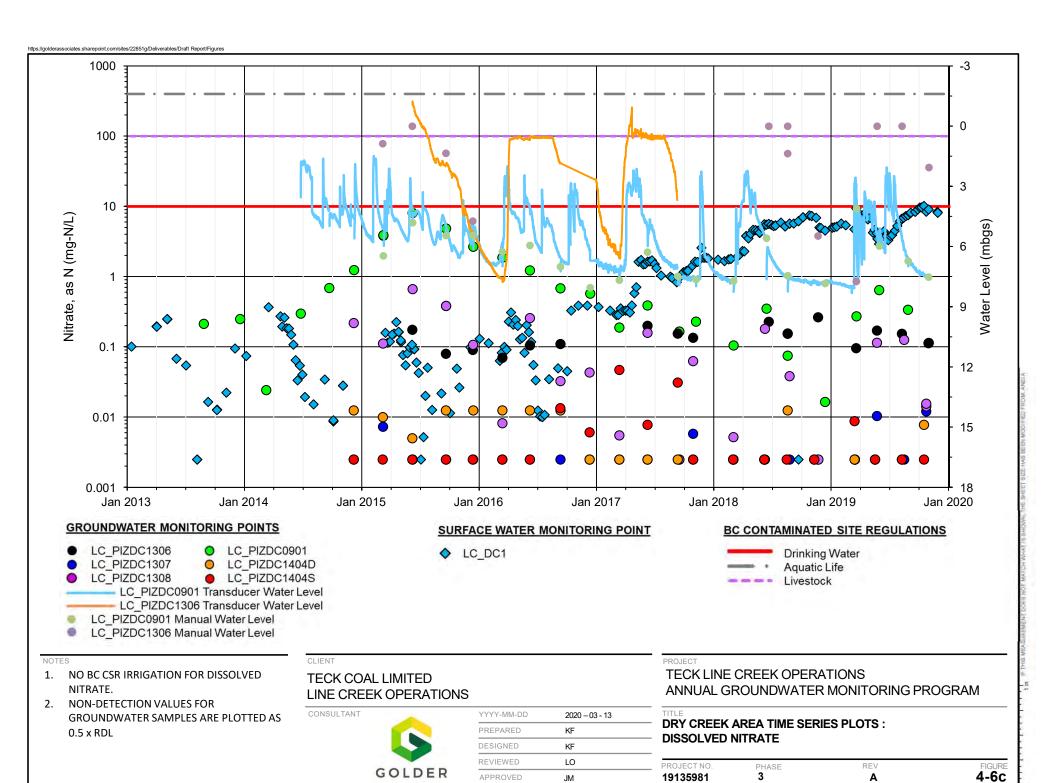
3

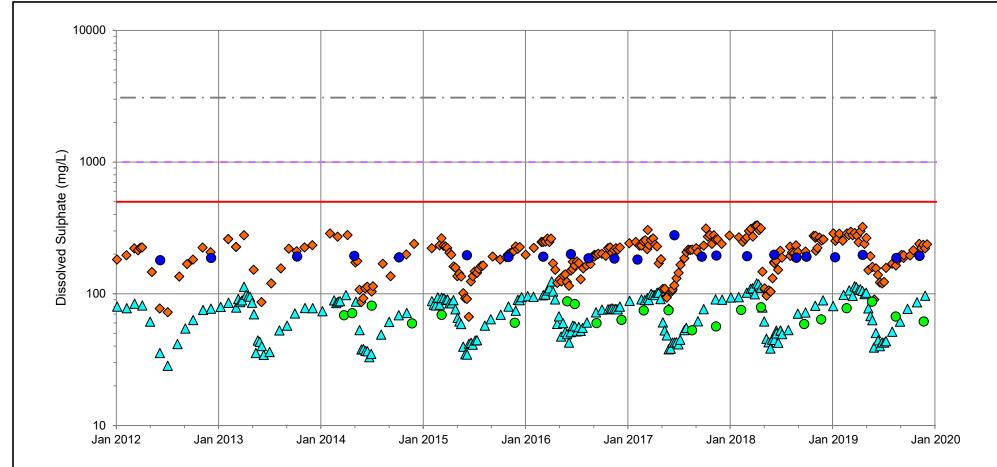
FIGURE

4-6b

REV

Α





### SURFACE WATER MONITORING POINTS

△EV ER4

GH FRI

### **GROUNDWATER MONITORING POINTS**

• GH\_POTW10

1. NO BC CSR IRRIGATION FOR DISSOLVED SULPHATE.

2. NON-DETECTION VALUES FOR GROUNDWATER

SAMPLES ARE PLOTTED AS 0.5 x RDL

RG\_02-20

#### CLIEN

### TECK COAL LIMITED LINE CREEK OPERATIONS

CONSULTANT



YYYY-MM-DD	2020 - 03 - 13
PREPARED	KF
DESIGNED	KF
REVIEWED	LO
APPROVED	JM

### BC CONTAMINATED SITE REGULATIONS

Drinking Water
Aquatic Life
Livestock

PROJEC

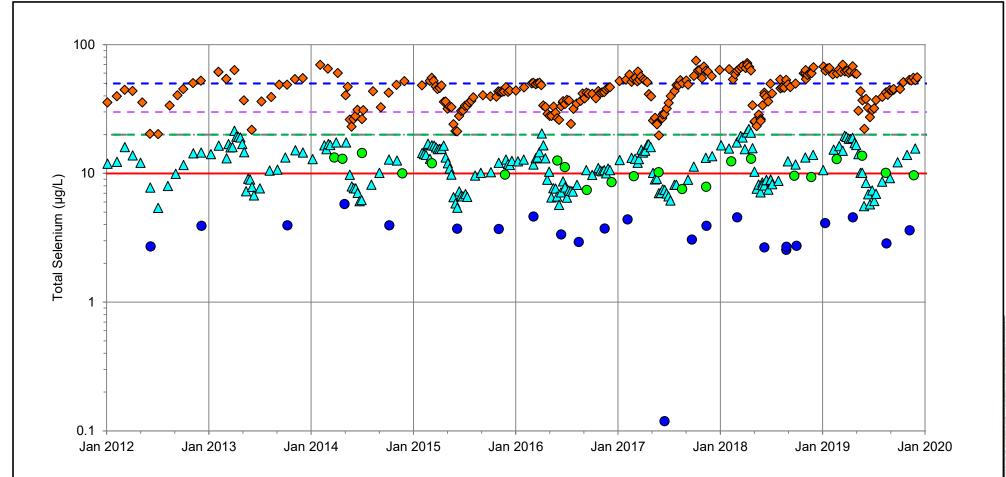
TECK LINE CREEK OPERATIONS
ANNUAL GROUNDWATER MONITORING PROGRAM

TITLE

OUTSIDE LCO AREA TIME SERIES PLOTS : DISSOLVED SULPHATE

19135981 3 A	1 70
PROJECT NO. PHASE REV	FIGURE

REASUREMENT DOES NOT A



### SURFACE WATER MONITORING POINTS

▲EV\_ER4

♦ GH\_FRI

**GROUNDWATER MONITORING POINTS** 

• GH POTW10

RG 02-20

### **HEALTH CANADA GUIDELINE**

Drinking Water

### BC CONTAMINATED SITE REGULATIONS

FIGURE 4-7b

- Irrigation

Drinking Water
Aquatic Life

Livestock

1

TECK LINE CREEK OPERATIONS
ANNUAL GROUNDWATER MONITORING PROGRAM

TITLE

OUTSIDE LCO AREA TIME SERIES PLOTS :

TOTAL SELECTION			
-			
PROJECT NO.	PHASE	REV	
19135981	3	Α	

NOTES

1. NON-DETECTION VALUES FOR GROUNDWATER SAMPLES ARE PLOTTED AS 0.5 x RDL

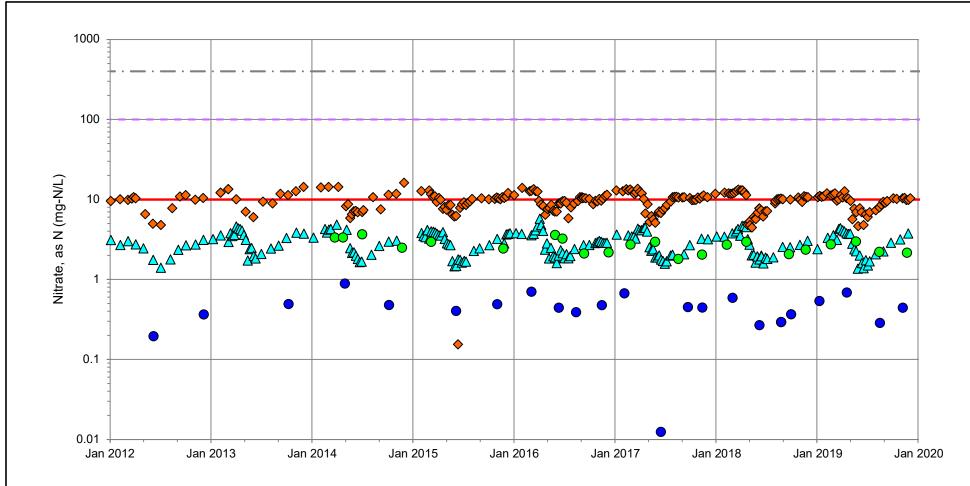
CLIENT

TECK COAL LIMITED LINE CREEK OPERATIONS

CONSULTANT



YYYY-MM-DD	2020 - 03 - 13
PREPARED	KF
DESIGNED	KF
REVIEWED	LO
APPROVED	JM



### SURFACE WATER MONITORING POINTS

▲EV\_ER4

GH FRI

### **GROUNDWATER MONITORING POINTS**

• GH POTW10

o RG 02-20

NOTE:

1. NO BC CSR IRRIGATION FOR DISSOLVED NITRATE.

2. NON-DETECTION VALUES FOR GROUNDWATER SAMPLES ARE PLOTTED AS 0.5 x RDL

#### CLIEN

### TECK COAL LIMITED LINE CREEK OPERATIONS

CONSULTANT



YYYY-MM-DD	2020 - 03 - 13
PREPARED	KF
DESIGNED	KF
REVIEWED	LO
APPROVED	JM

### BC CONTAMINATED SITE REGULATIONS

Drinking Water
Aquatic Life
Livestock

PROJEC

TECK LINE CREEK OPERATIONS
ANNUAL GROUNDWATER MONITORING PROGRAM

TITLE

OUTSITE LCO AREA TIME SERIES PLOTS : DISSOLVED NITRATE

PROJECT NO. PHASE REV FIGU	19135981	3	Α	4-7c
		PHASE	REV	FIGURI

10000 1000 Dissolved Sulphate (mg/L) 0.1 Jan 2012 Jan 2013 Jan 2014 Jan 2015 Jan 2016 Jan 2017 Jan 2018 Jan 2019 Jan 2020 SURFACE WATER MONITORING POINTS BC CONTAMINATED SITE REGULATIONS O GH\_FR1 DC 1 **Drinking Water** O LC\_LC3 EV ER4 Aquatic Life O LC\_LC5 O LC LC4 Livestock LC\_LCDSSLCC CLIENT **TECK LINE CREEK OPERATIONS TECK COAL LIMITED** 1. NO BC CSR IRRIGATION FOR DISSOLVED SULPHATE.

2. NON-DETECTION VALUES FOR GROUNDWATER SAMPLES ARE PLOTTED AS 0.5 x RDL

### LINE CREEK OPERATIONS

CONSULTANT



YYYY-MM-DD	2020 - 03 - 13
PREPARED	KF
DESIGNED	KF
REVIEWED	LO
APPROVED	JM

ANNUAL GROUNDWATER MONITORING PROGRAM

**SURFACE WATER STATIONS TIME SERIES PLOTS: DISSOLVED SULPHATE** 

	19135981	3	Λ	100
_ F	PROJECT NO.	PHASE	REV	FIGURE

PREPARED

DESIGNED

REVIEWED

APPROVED

GOLDER

KF

KF

LO

**DISSOLVED SELENIUM** 

PHASE

3

REV

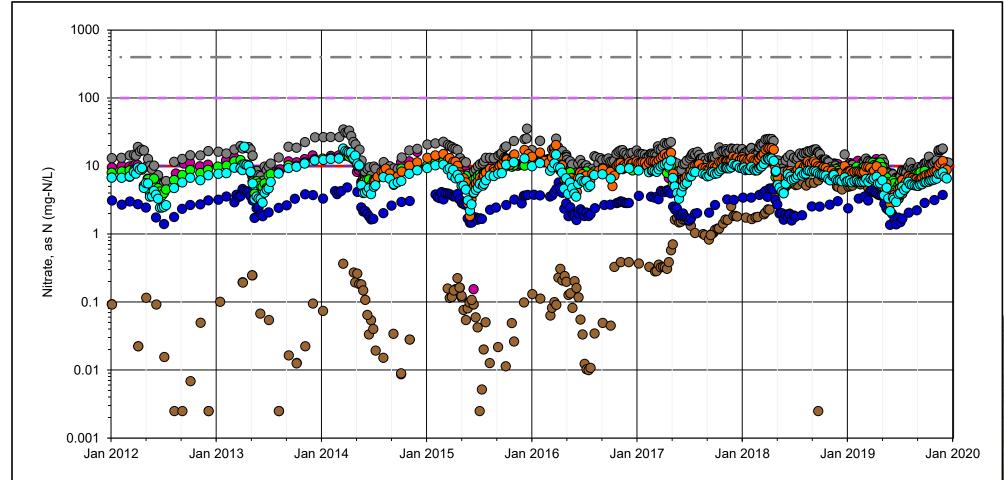
FIGURE

4-8b

PROJECT NO.

19135981

https://golderassociates.sharepoint.com/sites/22851g/Deliverables/Draft Report/Figures



### SURFACE WATER MONITORING POINTS

DC 1

NOTES

EV\_ER4LC LC4

LC\_LCDSSLCC

## GH\_FR1

O LC\_LC5

#### CLI

### 1. NO BC CSR IRRIGATION FOR DISSOLVED NITRATE.

2. NON-DETECTION VALUES FOR GROUNDWATER SAMPLES ARE PLOTTED AS 0.5 x RDL

### CLIENT

## TECK COAL LIMITED LINE CREEK OPERATIONS

CONSULTANT



YYYY-MM-DD	2020 - 03 - 13
PREPARED	KF
DESIGNED	KF
REVIEWED	LO
APPROVED	JM

### **BC CONTAMINATED SITE REGULATIONS**

Drinking Water
Aquatic Life
Livestock

PROJEC<sup>®</sup>

TECK LINE CREEK OPERATIONS
ANNUAL GROUNDWATER MONITORING PROGRAM

TITLE

SURFACE WATER STATIONS TIME SERIES PLOTS: DISSOLVED NITRATE

19135981 3	۸ ۸ ۸ ۸ ۸ ۸ ۸ ۸ ۸ ۸ ۸ ۸ ۸ ۸ ۸ ۸ ۸ ۸ ۸
PROJECT NO. PHASE RE	V FIGURE

13 March 2020 19135981-2020-064-R-Rev0

### **APPENDIX A**

QA/QC of Samples including Duplicates and Field Blanks

Location:

LC\_PIZDC1308

LC\_PIZDC1308

Table A1. Duplicate Samples Collected As Part of LCO 2019 Groundwater Monitoring

Sample ID:			LC_PIZDC1308 LC_PIZDC1308_WG_Q1-2019_NP	WG_Q1-2019_CC1	_CC1			
			ampled: le Type:	2019-03-21 <b>Primary</b>	2019-03-21 Secondary	-		
Analyte	Detection Limit Pri.	Detection Limit Dup.	Units		occordary.	Primary vs. Duplicate	Category1	
ACIDITY TO pH 8.3 (As CaCO3)	1	1	mg/l	4.5	8	56.00%	Pass-1	
ALKALINITY, BICARBONATE (As CaCO3), lab measured.	1	1	mg/l	326	321	1.55%	Pass	
ALKALINITY, CARBONATE (As CaCO3), lab measured.  ALKALINITY, HYDROXIDE (As CaCO3), lab measured.	1 1	1	mg/l mg/l	<1.0 <1.0	<1 <1	0.00%	Pass Pass	
ALKALINITY, TOTAL (As CaCO3), lab measured.	1	1	mg/l	326	321	1.55%	Pass	
ALUMINUM, D	0.003	0.003	mg/l	< 0.0030	< 0.003	0.00%	Pass	
ALUMINUM, T	0.003	0.003	mg/l	0.0483	0.0951	65.27%	Fail	
ANTIMONY, D	0.0001	0.0001	mg/l	<0.00010	<0.0001	0.00%	Pass	
ANTIMONY, T ARSENIC, D	0.0001 0.0001	0.0001 0.0001	mg/l mg/l	<0.00010 0.00038	<0.0001 0.00039	0.00% 2.60%	Pass Pass	
ARSENIC, T	0.0001	0.0001	mg/l	0.00041	0.00044	7.06%	Pass	
BARIUM, D	0.0001	0.0001	mg/l	0.558	0.57	2.13%	Pass	
BARIUM, T	0.0001	0.0001	mg/l	0.573	0.571	0.35%	Pass	
BERYLLIUM, D BERYLLIUM, T	0.00002 0.00002	0.00002 0.00002	mg/l mg/l	<0.000020 <0.000020	<2e-005 <2e-005	0.00% 0.00%	Pass Pass	
BISMUTH, D	0.00002	0.00002	mg/l	<0.00050	<5e-005	0.00%	Pass	
BISMUTH, T	0.00005	0.00005	mg/l	< 0.000050	<5e-005	0.00%	Pass	
BORON, D	0.01	0.01	mq/l	0.012	0.011	8.70%	Pass	
BORON, T	0.01	0.01	mq/l	0.012	0.012	0.00%	Pass	
BROMIDE, D Cadmium, D	0.05 0.000005	0.05 0.000005	mg/l mg/l	<0.050 0.0000059	<0.05 5.5e-006	0.00% 7.02%	Pass Pass	
Cadmium, T	0.000005	0.000005	mg/l	0.0000481	5.87e-005	19.85%	Pass	
CALCIUM, D	0.05	0.05	mg/l	81.5	82.4	1.10%	Pass	
CALCIUM, T	0.05	0.05	mg/l	82.1	84	2.29%	Pass	
CARBON, DISSOLVED ORGANIC, D	0.5	0.5 0.5	mg/l	2.02	1.92 0.72	5.08%	Pass	
CHLORIDE, D CHROMIUM, D	0.5 0.0001	0.5 0.0001	mg/l mg/l	0.74 <0.00010	0.72 <0.0001	2.74% 0.00%	Pass Pass	
CHROMIUM, T	0.0001	0.0001	mg/l	0.00017	0.00024	34.15%	Pass-1	
COBALT, D	0.0001	0.0001	mg/l	0.00167	0.00169	1.19%	Pass	
COBALT, T	0.0001	0.0001	mg/l	0.00170	0.00174	2.33%	Pass	
CONDUCTIVITY, LAB COPPER. D	0.0005	2 0.0005	us/cm mg/l	570 <0.00050	562 <0.0005	1.41% 0.00%	Pass Pass	
COPPER, T	0.0005	0.0005	mg/l	<0.00050	< 0.0005	0.00%	Pass	
FLUORIDE, D	0.02	0.02	mg/l	0.219	0.21	4.20%	Pass	
Hardness, Total or Dissolved CaCO3	0.5	0.5	mg/l	313	320	2.21%	Pass	
ION BALANCE IRON, D	100 0.01	100 0.01	%	98.4 1.44	102 1.45	3.59% 0.69%	Pass	
IRON, T	0.01	0.01	mg/l mg/l	1.44	1.45	2.80%	Pass Pass	
LEAD, D	0.00005	0.00005	mg/l	<0.00050	<5e-005	0.00%	Pass	
LEAD, T	0.00005	0.00005	mg/l	0.000059	8.8e-005	39.46%	Pass-1	
LITHIUM, D	0.001	0.001	mg/l	0.0131	0.0129	1.54%	Pass	
LITHIUM, T MAGNESIUM, D	0.001	0.001 0.1	mg/l mg/l	0.0126 26.6	0.0136 27.8	7.63% 4.41%	Pass Pass	
MAGNESIUM, T	0.1	0.1	mg/l	27.5	27.5	0.00%	Pass	
MAJOR ANION SUM	0	0	meq/l	6.66	6.56	1.51%	Pass	
MAJOR CATION SUM	0	0	meq/l	6.55	6.69	2.11%	Pass	
MANGANESE, D MANGANESE, T	0.0001 0.0001	0.0001 0.0001	mg/l	0.117 0.117	0.12 0.119	2.53% 1.69%	Pass	
MERCURY, D	0.00005	0.00001	mg/l mg/l	<0.000050	<5e-006	0.00%	Pass Pass	
MOLYBDENUM, D	0.00005	0.00005	mg/l	0.00403	0.00397	1.50%	Pass	
MOLYBDENUM, T	0.00005	0.00005	mg/l	0.00387	0.00414	6.74%	Pass	
Nickel, D	0.0005	0.0005	mg/l	0.00330	0.00336	1.80%	Pass	
Nickel, T NITRATE NITROGEN (NO3), AS N	0.0005 0.005	0.0005 0.005	mg/l mg/l	0.00362 <0.0050	0.00369 <0.005	1.92% 0.00%	Pass Pass	
NITRATE NITROGEN (NO2), AS N	0.003	0.003	mg/l	0.0030	0.0016	27.03%	Pass-1	
NITROGEN, AMMONIA (AS N)	0.005	0.005	mg/l	0.0336	0.0132	87.18%	Fail	
ORTHO-PHOSPHATE	0.001	0.001	mg/l	<0.0010	< 0.001	0.00%	Pass	
OXIDATION-REDUCTION POTENTIAL, LAB pH, LAB	1000 0.1	1000 0.1	mv ph units	328 8.00	377 8.06	13.90% 0.75%	Pass Pass	
PHOSPHORUS	0.002	0.002	ph units mg/l	0.0083	0.0077	7.50%	Pass	
POTASSIUM, D	0.05	0.05	mg/l	2.58	2.62	1.54%	Pass	
POTASSIUM, T	0.05	0.05	mg/l	2.59	2.62	1.15%	Pass	
Selenium, D	0.05	0.05	ug/l	<0.050	0.072	36.07%	Pass-1	
Selenium, T SILICON, D	0.05 0.05	0.05 0.05	ug/l mg/l	0.065 4.31	0.097 4.5	39.51% 4.31%	Pass-1 Pass	
SILICON, T	0.03	0.05	mg/l	4.51	4.8	3.82%	Pass	
SILVER, D	0.00001	0.00001	mg/l	<0.00010	<1e-005	0.00%	Pass	
SILVER, T	0.00001	0.00001	mq/l	< 0.000010	<1e-005	0.00%	Pass	
SODIUM, D SODIUM, T	0.05	0.05	mg/l	3.36	3.38	0.59%	Pass	
STRONTIUM, D	0.05 0.0002	0.05 0.0002	mg/l mg/l	3.31 0.120	3.53 0.121	6.43% 0.83%	Pass Pass	
STRONTIUM, T	0.0002	0.0002	mg/l	0.117	0.121	2.53%	Pass	
Sulphate (as SO4), D	0.3	0.3	mg/l	5.13	5.05	1.57%	Pass	
THALLIUM, D	0.00001	0.00001	mg/l	0.000037	3.4e-005	8.45%	Pass	
THALLIUM, T TIN, D	0.00001 0.0001	0.00001 0.0001	mg/l mg/l	0.000040 <0.00010	3.9e-005 <0.0001	2.53% 0.00%	Pass Pass	
TIN, T	0.0001	0.0001	mg/l	<0.00010	<0.0001	0.00%	Pass	
TITANIUM, D	0.01	0.01	mg/l	< 0.010	< 0.01	0.00%	Pass	
TITANIUM, T	0.01	0.01	mg/l	<0.010	< 0.01	0.00%	Pass	
TOTAL DISSOLVED SOLIDS (RESIDUE, FILTERABLE)	20	20	mg/l	301	305	1.32%	Pass	
TOTAL KJELDAHL NITROGEN TOTAL ORGANIC CARBON, T	0.05	0.05 0.5	mg/l mg/l	0.101 1.85	0.107 1.67	5.77% 10.23%	Pass Pass	
TOTAL SUSPENDED SOLIDS, LAB	1	1	mg/l	4.7	5.7	19.23%	Pass	
TURBIDITY, LAB	0.1	0.1	ntu	19.5	19.6	0.51%	Pass	
URANIUM, D	0.00001	0.00001	mg/l	0.00107	0.00111	3.67%	Pass	
URANIUM, T	0.00001	0.00001	mg/l	0.00114	0.00114	0.00%	Pass	
VANADIUM, D VANADIUM, T	0.0005 0.0005	0.0005 0.0005	mg/l mg/l	<0.00050 <0.00050	<0.0005 <0.0005	0.00% 0.00%	Pass Pass	
ZINC, D	0.0003	0.0003	mg/l	0.0030	0.0028	6.90%	Pass	
ZINC, T	0.003	0.003	mg/l	0.0032	0.0033	3.08%	Pass	
RPD Control Limits								

RPD Control Limits
Pass - RPD < 20%
Pass-1 - RPD > 20%, Analysis results < 5 times Detection Limit
Pass-2 - RPD > 20% and RPD < 50%, Analysis results > 5 times Detection Limit
Exceeds RPD Control Limits

LC\_PIZDC1308

LC\_PIZDC1308

Table 1 (continued). Duplicate Samples Collected As Part of LCO 2019 Groundwater Monitoring

Location:
Sample ID: 1.0.

	Sample ID:			LC_PIZDC1308_WG_Q4-2019_NP			
			ampled: ole Type:	2019-10-30 <b>Primary</b>	2019-10-30 Secondary		
Analyte	Detection Limit Pri.		Units	Filliary	3econdary	Primary vs. Duplicate	Category1
ACIDITY TO pH 8.3 (As CaCO3)	1	1	mg/l	<1.0	2.3	78.79%	Pass-1
ALKALINITY, BICARBONATE (As CaCO3), lab measured.	1	1	mg/l	329	324	1.53%	Pass
ALKALINITY, CARBONATE (As CaCO3), lab measured.	1 1	1	mg/l	<1.0 <1.0	<1 <1	0.00% 0.00%	Pass Pass
ALKALINITY, HYDROXIDE (As CaCO3), lab measured.  ALKALINITY, TOTAL (As CaCO3), lab measured.	1	1	mg/l mg/l	329	324	1.53%	Pass
ALUMINUM, D	0.003	0.003	mg/l	<0.0030	< 0.003	0.00%	Pass
ALUMINUM, T	0.003	0.003	mg/l	0.0275	0.0622	77.37%	Fail
ANTIMONY, D	0.0001	0.0001	mg/l	<0.00010	< 0.0001	0.00%	Pass
ANTIMONY, T ARSENIC, D	0.0001 0.0001	0.0001 0.0001	mg/l mg/l	<0.00010 0.00012	<0.0001 0.00014	0.00% 15.38%	Pass Pass
ARSENIC, T	0.0001	0.0001	mg/l	0.00012	0.00014	0.00%	Pass
BARIUM, D	0.0001	0.0001	mg/l	0.385	0.389	1.03%	Pass
BARIUM, T	0.0001	0.0001	mg/l	0.386	0.392	1.54%	Pass
BERYLLIUM, D BERYLLIUM, T	0.00002 0.00002	0.00002 0.00002	mg/l	<0.000020 <0.000020	<2e-005 <2e-005	0.00%	Pass
BISMUTH, D	0.00002	0.00002	mg/l mg/l	<0.000020 <0.000050	<2e-005 <5e-005	0.00%	Pass Pass
BISMUTH, T	0.00005	0.00005	mg/l	<0.00050	<5e-005	0.00%	Pass
BORON, D	0.01	0.01	mq/l	0.013	0.013	0.00%	Pass
BORON, T	0.01	0.01	mq/l	0.014	0.012	15.38%	Pass
BROMIDE, D Cadmium, D	0.05 0.00005	0.05 0.000005	mg/l mg/l	<0.050 0.0000469	<0.05 3.9e-005	0.00% 18.39%	Pass Pass
Cadmium, T	0.000005	0.000005	mg/l	0.000114	0.000123	7.59%	Pass
CALCIUM, D	0.000	0.05	mg/l	69.5	71.9	3.39%	Pass
CALCIUM, T	0.05	0.05	mg/l	81.6	73.1	10.99%	Pass
CARBON, DISSOLVED ORGANIC, D	0.5	0.5	mg/l	2.12	1.9	10.95%	Pass
CHLORIDE, D	0.5	0.5	mg/l	1.03	1.09	5.66%	Pass
CHROMIUM, D CHROMIUM, T	0.0001 0.0001	0.0001 0.0001	mg/l mg/l	<0.00010 0.00012	<0.0001 0.00017	0.00% 34.48%	Pass Pass-1
COBALT, D	0.0001	0.0001	mg/l	0.00012	0.00017	0.00%	Pass-1
COBALT, T	0.0001	0.0001	mg/l	0.00087	0.00088	1.14%	Pass
CONDUCTIVITY, LAB	2	2	us/cm	526	526	0.00%	Pass
COPPER, D	0.0002	0.0002	mg/l	0.00025	0.00022	12.77%	Pass
COPPER, T FLUORIDE, D	0.0005 0.02	0.0005 0.02	mg/l	0.00054 0.235	0.00067 0.202	21.49% 15.10%	Pass-1
Hardness, Total or Dissolved CaCO3	0.02	0.02	mg/l mg/l	286	290	1.39%	Pass Pass
ION BALANCE	100	100	%	89.7	92.2	2.75%	Pass
IRON, D	0.01	0.01	mg/l	0.206	0.203	1.47%	Pass
IRON, T	0.01	0.01	mg/l	0.343	0.355	3.44%	Pass
LEAD, D	0.00005	0.00005	mg/l	<0.000050	<5e-005	0.00%	Pass
LEAD, T LITHIUM, D	0.00005 0.001	0.00005 0.001	mg/l mg/l	0.000149 0.0182	0.000154 0.0183	3.30% 0.55%	Pass Pass
LITHIUM, T	0.001	0.001	mg/l	0.0198	0.0172	14.05%	Pass
MAGNESIUM, D	0.1	0.1	mq/l	27.3	26.9	1.48%	Pass
MAGNESIUM, T	0.1	0.1	mq/l	25.1	24.9	0.80%	Pass
MAJOR ANION SUM	0	0	meq/I	6.70	6.62	1.20%	Pass
MAJOR CATION SUM MANGANESE, D	0.0001	0 0.0001	meq/l mg/l	6.01 0.0804	6.1 0.0812	1.49% 0.99%	Pass Pass
MANGANESE, T	0.0001	0.0001	mg/l	0.0709	0.0704	0.71%	Pass
MERCURY, D	0.000005	0.000005	mg/l	< 0.0000050	<5e-006	0.00%	Pass
MOLYBDENUM, D	0.00005	0.00005	mg/l	0.00630	0.00631	0.16%	Pass
MOLYBDENUM, T	0.00005	0.00005	mg/l	0.00489	0.00444	9.65%	Pass
Nickel, D Nickel, T	0.0005 0.0005	0.0005 0.0005	mg/l mg/l	0.00167 0.00172	0.00168 0.00171	0.60% 0.58%	Pass Pass
NITRATE NITROGEN (NO3), AS N	0.005	0.005	mg/l	0.0172	0.0171	9.40%	Pass
NITRITE NITROGEN (NO2), AS N	0.001	0.001	mg/l	<0.0010	<0.001	0.00%	Pass
NITROGEN, AMMONIA (AS N)	0.005	0.005	mg/l	0.0378	0.0413	8.85%	Pass
ORTHO-PHOSPHATE	0.001	0.001	mg/l	<0.0010	<0.001	0.00%	Pass
OXIDATION-REDUCTION POTENTIAL, LAB pH, LAB	1000 0.1	1000 0.1	mv ph units	439 8.09	276 8.11	45.59% 0.25%	Pass-1 Pass
PHOSPHORUS	0.002	0.002	mg/l	0.0037	0.0034	8.45%	Pass
POTASSIUM, D	0.05	0.05	mg/l	2.69	2.67	0.75%	Pass
POTASSIUM, T	0.05	0.05	mg/l	2.53	2.51	0.79%	Pass
Selenium, D	0.05	0.05	ug/l	0.075	0.053	34.38%	Pass-1
Selenium, T SILICON, D	0.05 0.05	0.05 0.05	ug/l mg/l	0.073 4.45	0.051 4.43	35.48% 0.45%	Pass-1 Pass
SILICON, T	0.03	0.05	mg/l	4.43	4.64	0.86%	Pass
SILVER, D	0.00001	0.00001	mg/l	<0.00010	<1e-005	0.00%	Pass
SILVER, T	0.00001	0.00001	mq/l	0.000014	<1e-005	33.33%	Pass-1
SODIUM, D	0.05	0.05	mg/l	4.97	4.97	0.00%	Pass
SODIUM, T STRONTIUM, D	0.05 0.0002	0.05 0.0002	mg/l mg/l	5.07 0.106	5.04 0.105	0.59% 0.95%	Pass Pass
STRONTIUM, D	0.0002	0.0002	mg/l	0.106	0.0956	8.42%	Pass
Sulphate (as SO4), D	0.3	0.3	mg/l	4.20	4.52	7.34%	Pass
THALLIUM, D	0.00001	0.00001	mg/l	0.000029	2.7e-005	7.14%	Pass
THALLIUM, T	0.00001	0.00001	mg/l	0.000032	3.1e-005	3.17%	Pass
TIN, D TIN, T	0.0001 0.0001	0.0001	mg/l	<0.00010	<0.0001 0.00021	0.00% 70.97%	Pass Pass 1
TITANIUM, D	0.0001	0.0001 0.01	mg/l mg/l	<0.00010 <0.010	<0.01	0.00%	Pass-1 Pass
TITANIUM, T	0.01	0.01	mg/l	<0.010	< 0.01	0.00%	Pass
TOTAL DISSOLVED SOLIDS (RESIDUE, FILTERABLE)	20	20	mg/l	322	324	0.62%	Pass
TOTAL KJELDAHL NITROGEN	0.05	0.05	mg/l	0.092	0.08	13.95%	Pass
TOTAL ORGANIC CARBON, T	0.5	0.5	mg/l	2.06	2.08	0.97%	Pass
TOTAL SUSPENDED SOLIDS, LAB TURBIDITY, LAB	0.1	0.1	mg/l	5.6 7.49	6.5 7.04	14.88% 6.19%	Pass
URANIUM, D	0.00001	0.00001	ntu mg/l	0.000887	0.000884	0.34%	Pass Pass
URANIUM, T	0.00001	0.00001	mg/l	0.00087	0.00084	8.08%	Pass
VANADIUM, D	0.0005	0.0005	mg/l	<0.00050	< 0.0005	0.00%	Pass
VANADIUM, T	0.0005	0.0005	mg/l	<0.00050	0.00055	9.52%	Pass
ZINC, D	0.001	0.001	mg/l	0.0018	0.0018	0.00%	Pass
ZINC, T	0.003	0.003	mg/l	< 0.0030	0.003	0.00%	Pass

RPD Control Limits
Pass - RPD <= 20%
Pass-1 - RPD > 20%, Analysis results < 5 times Detection Limit
Pass-2 - RPD > 20% and RPD <= 50%, Analysis result > 5 times Detection Limit and < 999 times Detection Limit
Exceeds RPD Control Limits

Table 1 (continued). Duplicate Samples Collected As Part of LCO 2019 Groundwater Monitoring

Lc\_PIZDC1404S

LC\_PIZDC1404S

LC\_PIZDC1404S

LC\_PIZDC1404S

LC\_PIZDC1404S

LC\_PIZDC1404S

Location Sample ID				LC_PIZDC1404S LC_PIZDC1404S_WG_Q2-2019_NP	LC_PIZDC1404S WG_Q2-2019_CC1		
	Date Sampled:			2019-05-23	2019-05-23		
			ole Type:	Primary	Secondary		
Analista	Detection Limit Pri.		Units			Deimonico Decilionte	0-11
Analyte ACIDITY TO pH 8.3 (As CaCO3)	1	Detection Limit Dup.	mg/l	1.5	2.4	Primary vs. Duplicate 46.15%	Pass-1
ALKALINITY, BICARBONATE (As CaCO3), lab measured.	1	1	mg/l	206	197	4.47%	Pass
ALKALINITY, CARBONATE (As CaCO3), lab measured.	1	1	mg/l	4.2	5	17.39%	Pass
ALKALINITY, HYDROXIDE (As CaCO3), lab measured.	1	1	mg/l	<1.0	<1	0.00%	Pass
ALKALINITY, TOTAL (As CaCO3), lab measured.	1	1	mg/l	211	202	4.36%	Pass
ALUMINUM, D	0.003	0.003	mg/l	< 0.0030	< 0.003	0.00%	Pass
ALUMINUM, T	0.003	0.003	mg/l	0.0081	0.007	14.57%	Pass
ANTIMONY, D	0.0001	0.0001	mg/l	< 0.00010	< 0.0001	0.00%	Pass
ANTIMONY, T	0.0001	0.0001	mg/l	< 0.00010	< 0.0001	0.00%	Pass
ARSENIC, D	0.0001	0.0001	mg/l	0.00187	0.00188	0.53%	Pass
ARSENIC, T	0.0001	0.0001	mg/l	0.00216	0.00214	0.93%	Pass
BARIUM, D	0.0001	0.0001	mg/l	0.240	0.233	2.96%	Pass
BARIUM, T	0.0001	0.0001	mg/l	0.237	0.238	0.42%	Pass
BERYLLIUM, D	0.00002	0.00002	mg/l	<0.000020	<2e-005	0.00%	Pass
BERYLLIUM, T	0.00002	0.00002	mg/l	<0.000020	<2e-005	0.00%	Pass
BISMUTH, D	0.00005	0.00005	mg/l	<0.00050	<5e-005	0.00%	Pass
BISMUTH, T	0.00005	0.00005	mg/l	<0.00050	<5e-005	0.00%	Pass
BORON, D	0.01	0.01	mq/l	<0.010	< 0.01	0.00%	Pass
BORON, T	0.01	0.01	mq/l	<0.010	< 0.01	0.00%	Pass
BROMIDE, D	0.05	0.05	mq/l	<0.050	< 0.05	0.00%	Pass
Cadmium, D	0.000005	0.000005	mg/l	<0.000050	<5e-006	0.00%	Pass
Cadmium, T	0.000005	0.000005	mg/l	<0.000050	<5e-006	0.00%	Pass
CALCIUM, D	0.05	0.05	mg/l	51.5	51.4	0.19%	Pass
CALCIUM, T	0.05	0.05	mg/l	50.6	49.9	1.39%	Pass 1
CARBON, DISSOLVED ORGANIC, D	0.5	0.5	mg/l	2.12	2.74	25.51%	Pass-1
CHLORIDE, D	0.5	0.5	mg/l	< 0.50	< 0.5	0.00%	Pass
CHROMIUM, D	0.0001	0.0001	mg/l	<0.00010	< 0.0001	0.00%	Pass
CHROMIUM, T	0.0001	0.0001	mg/l	<0.00010	< 0.0001	0.00%	Pass
COBALT, D	0.0001	0.0001	mg/l	0.00030	0.0003	0.00%	Pass
CONDUCTIVITY LAB	0.0001	0.0001	mg/l	0.00038	0.0004	5.13%	Pass
CONDUCTIVITY, LAB	2	2	us/cm	370	369	0.27%	Pass
COPPER, D	0.0005	0.0005	mg/l	<0.00050	< 0.0005	0.00%	Pass
COPPER, T FLUORIDE, D	0.0005	0.0005	mg/l	<0.00050	< 0.0005	0.00%	Pass
	0.02	0.02	mg/l	0.145	0.148	2.05%	Pass
Hardness, Total or Dissolved CaCO3	0.5	0.5	mg/l	209	206	1.45%	Pass
ION BALANCE	100	100	%	99.8	103	3.16%	Pass
IRON, D	0.01	0.01	mg/l	0.919	0.905	1.54%	Pass
IRON, T	0.01	0.01	mg/l	1.20	1.25	4.08%	Pass
LEAD, D	0.00005	0.00005	mg/l	<0.000050	<5e-005	0.00%	Pass
LEAD, T	0.00005	0.00005	mg/l	0.000076	6.9e-005	9.66%	Pass
LITHIUM, D	0.001	0.001	mg/l	0.0053	0.0052	1.90%	Pass
LITHIUM, T	0.001	0.001	mg/l	0.0051	0.005	1.98%	Pass
MAGNESIUM, D	0.1	0.1	mq/l	19.5	18.9	3.13%	Pass
MAGNESIUM, T MAJOR ANION SUM	0.1	0.1	mg/l	18.7 4.32	18.7 4.14	0.00% 4.26%	Pass
MAJOR CATION SUM	0	0	meg/l meg/l	4.32	4.14	1.40%	Pass Pass
MANGANESE, D	0.0001	0.0001	mg/l	0.0294	0.0289	1.72%	Pass
MANGANESE, T	0.0001	0.0001	mg/l	0.0335	0.0269	3.23%	Pass
MERCURY, D	0.00005	0.00005	mg/l	<0.000050	<5e-006	0.00%	Pass
MOLYBDENUM, D	0.00005	0.00005	mg/l	0.00342	0.00322	6.02%	Pass
MOLYBDENUM, T	0.00005	0.00005	mg/l	0.00349	0.00322	2.32%	Pass
Nickel, D	0.0005	0.0005	mg/l	0.00132	0.00126	4.65%	Pass
Nickel, T	0.0005	0.0005	mg/l	0.00132	0.00120	2.26%	Pass
NITRATE NITROGEN (NO3), AS N	0.005	0.005	mg/l	< 0.0050	< 0.005	0.00%	Pass
NITRITE NITROGEN (NO2), AS N	0.001	0.001	mg/l	<0.0010	< 0.001	0.00%	Pass
NITROGEN, AMMONIA (AS N)	0.005	0.005	mg/l	<0.0050	0.0552	166.78%	Pass-1
ORTHO-PHOSPHATE	0.001	0.001	mg/l	<0.0010	0.001	0.00%	Pass
OXIDATION-REDUCTION POTENTIAL, LAB	1000	1000	mv	396	362	8.97%	Pass
pH, LAB	0.1	0.1	ph units	8.41	8.43	0.24%	Pass
PHOSPHORUS	0.002	0.002	mg/l	0.0068	0.0062	9.23%	Pass
POTASSIUM, D	0.05	0.05	mg/l	1.62	1.59	1.87%	Pass
POTASSIUM, T	0.05	0.05	mg/l	1.49	1.49	0.00%	Pass
Selenium, D	0.05	0.05	ug/l	<0.050	< 0.05	0.00%	Pass
Selenium, T	0.05	0.05	ug/l	<0.050	< 0.05	0.00%	Pass
SILICON, D	0.05	0.05	mg/l	3.35	3.33	0.60%	Pass
SILICON, T	0.1	0.1	mg/l	3.57	3.58	0.28%	Pass
SILVER, D	0.00001	0.00001	mg/l	<0.00010	<1e-005	0.00%	Pass
SILVER, T	0.00001	0.00001	mg/l	0.000012	<1e-005	18.18%	Pass
SODIUM, D	0.05	0.05	mg/l	1.02	1	1.98%	Pass
SODIUM, T	0.05	0.05	mq/l	1.08	1.07	0.93%	Pass
STRONTIUM, D	0.0002	0.0002	mg/l	0.0474	0.0482	1.67%	Pass
STRONTIUM, T	0.0002	0.0002	mg/l	0.0470	0.0487	3.55%	Pass
Sulphate (as SO4), D	0.3	0.3	mg/l	4.80	4.79	0.21%	Pass
THALLIUM, D	0.00001	0.00001	mg/l	<0.000010	<1e-005	0.00%	Pass
THALLIUM, T	0.00001	0.00001	mg/l	<0.000010	<1e-005	0.00%	Pass
TIN, D	0.0001	0.0001	mg/l	<0.00010	< 0.0001	0.00%	Pass
TIN, T	0.0001	0.0001	mg/l	<0.00010	< 0.0001	0.00%	Pass
TITANIUM, D	0.01	0.01	mg/l	<0.010	< 0.01	0.00%	Pass
TITANIUM, T	0.01	0.01	mg/l	<0.010	< 0.01	0.00%	Pass
TOTAL DISSOLVED SOLIDS (RESIDUE, FILTERABLE)	20	20	mg/l	182	171	6.23%	Pass
TOTAL KJELDAHL NITROGEN	0.05	0.05	mg/l	<0.050	< 0.05	0.00%	Pass
TOTAL ORGANIC CARBON, T	0.5	0.5	mg/l	2.41	2.65	9.49%	Pass
TOTAL SUSPENDED SOLIDS, LAB	1	1	mg/l	2.6	3.1	17.54%	Pass
TURBIDITY, LAB	0.1	0.1	ntu	10.3	10.7	3.81%	Pass
URANIUM, D	0.00001	0.00001	mg/l	0.000589	0.000585	0.68%	Pass
URANIUM, T	0.00001	0.00001	mg/l	0.000616	0.000608	1.31%	Pass
VANADUM, D	0.0005	0.0005	mg/l	<0.00050	< 0.0005	0.00%	Pass
VANADIUM, T	0.0005	0.0005	mg/l	<0.0050	<0.0005	0.00%	Pass
ZINC, D ZINC, T	0.001 0.003	0.001 0.003	mg/l	<0.0010 <0.0030	<0.001 <0.003	0.00%	Pass Pass
RPD Control Limits	0.003	0.003	mg/l	< 0.0030	< 0.003	0.00%	rass

\( \text{ZINC, T} \) 0.003 0.003 mi \( \text{RPD Control Limits} \) Pass - RPD < 20% Pass-1 - RPD > 20%, Analysis results < 5 times Detection Limit Pass-2 - RPD > 20% and RPD < = 50%, Analysis result > 5 times Detection Limit and < 999 times Detection Limit \( \text{Exceeds RPD Control Limits} \)

			ocation:	LC_PIZP1101	LC_PIZP1101		
			nple ID: ampled:	LC_PIZP1101_WG_Q3-2019_N 2019-07-17	WG_Q3-2019_CC 2019-07-17	1	
			le Type:	Primary	Secondary	j	
Analyte	Detection Limit Pri.	Detection Limit Dup.	Units			Primary vs. Duplicate	
ACIDITY TO pH 8.3 (As CaCO3) ALKALINITY, BICARBONATE (As CaCO3), lab measured.	1 1	1	mg/l mg/l	<1.0 161	<1 156	0.00% 3.15%	Pass Pass
ALKALINITY, CARBONATE (As CaCO3), lab measured.	1	1	mg/l	4.4	5.2	16.67%	Pass
ALKALINITY, HYDROXIDE (As CaCO3), lab measured.	1 1	1	mg/l	<1.0	<1	0.00%	Pass
ALKALINITY, TOTAL (As CaCO3), lab measured. ALUMINUM, D	0.003	0.003	mg/l mg/l	166 <0.0030	161 <0.003	3.06% 0.00%	Pass Pass
ALUMINUM, T	0.003	0.003	mg/l	0.102	0.0994	2.58%	Pass
ANTIMONY, D ANTIMONY, T	0.0001 0.0001	0.0001 0.0001	mg/l mg/l	<0.00010 <0.00010	<0.0001 <0.0001	0.00%	Pass Pass
ARSENIC, D	0.0001	0.0001	mg/l	0.00132	0.00133	0.75%	Pass
ARSENIC, T	0.0001	0.0001	mg/l	0.00153	0.0015	1.98%	Pass
BARIUM, D BARIUM, T	0.0001 0.0001	0.0001 0.0001	mg/l mg/l	0.453 0.474	0.453 0.466	0.00% 1.70%	Pass Pass
BERYLLIUM, D	0.00002	0.00002	mg/l	<0.000020	<2e-005	0.00%	Pass
BERYLLIUM, T BISMUTH, D	0.00002 0.00005	0.00002 0.00005	mg/l mg/l	<0.000020 <0.000050	<2e-005 <5e-005	0.00%	Pass Pass
BISMUTH, T	0.00005	0.00005	mg/l	<0.000050	<5e-005	0.00%	Pass
BORON, D	0.01	0.01	mg/l	0.023	0.022	4.44%	Pass
BORON, T BROMIDE, D	0.01 0.05	0.01 0.05	mg/l mg/l	0.019 0.076	0.02 <0.05	5.13% 41.27%	Pass Pass-1
Cadmium, D	0.000005	0.000005	mg/l	< 0.000050	<5e-006	0.00%	Pass
Cadmium, T CALCIUM, D	0.00005 0.05	0.000005 0.05	mg/l mg/l	0.0000229 26.5	2.13e-005 26.3	7.24% 0.76%	Pass Pass
CALCIUM, T	0.05	0.05	mg/l	28.0	27.8	0.72%	Pass
CARBON, DISSOLVED ORGANIC, D CHLORIDE, D	0.5	0.5	mg/l	< 0.50	<0.5	0.00%	Pass
CHROMIUM, D	0.5 0.0001	0.5 0.0001	mg/l mg/l	0.60 <0.00010	0.5 <0.0001	18.18% 0.00%	Pass Pass
CHROMIUM, T	0.0001	0.0001	mg/l	0.00019	0.00018	5.41%	Pass
COBALT, D COBALT, T	0.0001 0.0001	0.0001 0.0001	mg/l mg/l	0.00020 0.00024	0.0002 0.00024	0.00%	Pass Pass
CONDUCTIVITY, LAB	2	2	us/cm	312	313	0.32%	Pass
COPPER, D	0.0005	0.0005	mg/l	<0.00050	< 0.0005	0.00%	Pass
COPPER, T FLUORIDE, D	0.0005 0.02	0.0005 0.02	mg/l mg/l	0.00058 1.82	<0.0005 1.74	14.81% 4.49%	Pass Pass
Hardness, Total or Dissolved CaCO3	0.5	0.5	mg/l	123	121	1.64%	Pass
ION BALANCE IRON, D	100 0.01	100 0.01	% mg/l	94.4 0.260	96.4 0.252	2.10% 3.13%	Pass Pass
IRON, T	0.01	0.01	mg/l	0.500	0.48	4.08%	Pass
LEAD, D	0.00005	0.00005	mg/l	< 0.000050	<5e-005	0.00%	Pass
LEAD, T LITHIUM, D	0.00005 0.001	0.00005 0.001	mg/l mg/l	0.000193 0.0092	0.000112 0.009	53.11% 2.20%	Pass-1 Pass
LITHIUM, T	0.001	0.001	mg/l	0.0089	0.0089	0.00%	Pass
MAGNESIUM, D MAGNESIUM, T	0.1 0.1	0.1 0.1	mg/l mg/l	13.9 14.5	13.5 14.8	2.92% 2.05%	Pass Pass
MAJOR ANION SUM	0.1	0	meg/l	3.49	3.38	3.20%	Pass
MAJOR CATION SUM	0	0	meg/l	3.30	3.26	1.22%	Pass
MANGANESE, D MANGANESE, T	0.0001 0.0001	0.0001 0.0001	mg/l mg/l	0.227 0.240	0.222 0.24	2.23% 0.00%	Pass Pass
MERCURY, D	0.000005	0.000005	mg/l	< 0.0000050	<5e-006	0.00%	Pass
MERCURY, T MOLYBDENUM, D	0.00005 0.00005	0.00005 0.00005	mg/l mg/l	<0.000050 0.0112	<5e-006 0.0112	0.00%	Pass Pass
MOLYBDENUM, T	0.00005	0.00005	mg/l	0.0105	0.0106	0.95%	Pass
Nickel, D	0.0005	0.0005	mg/l	<0.00050	< 0.0005	0.00%	Pass
Nickel, T NITRATE NITROGEN (NO3), AS N	0.0005 0.005	0.0005 0.005	mg/l mg/l	<0.00050 <0.0050	<0.0005 <0.005	0.00%	Pass Pass
NITRITE NITROGEN (NO2), AS N	0.001	0.001	mg/l	< 0.0010	< 0.001	0.00%	Pass
NITROGEN, AMMONIA (AS N) ORTHO-PHOSPHATE	0.005 0.001	0.005 0.001	mg/l mg/l	0.0169 0.0090	0.0162 0.0095	4.23% 5.41%	Pass Pass
OXIDATION-REDUCTION POTENTIAL, LAB	1000	1000	mv	306	310	1.30%	Pass
pH, LAB	0.1	0.1	ph units	8.42	8.44	0.24%	Pass
PHOSPHORUS POTASSIUM, D	0.002 0.05	0.002 0.05	mg/l mg/l	0.0301 0.749	0.0309 0.72	2.62% 3.95%	Pass Pass
POTASSIUM, T	0.05	0.05	mg/l	0.756	0.776	2.61%	Pass
Selenium, D Selenium, T	0.05 0.05	0.05 0.05	ug/l	<0.050	<0.05 <0.05	0.00%	Pass
SELICON, D	0.05	0.05	ug/l mg/l	<0.050 3.56	<0.05 3.44	3.43%	Pass Pass
SILICON, T	0.1	0.1	mg/l	3.74	3.61	3.54%	Pass
SILVER, D SILVER, T	0.00001 0.00001	0.00001 0.00001	mg/l mg/l	<0.000010 <0.000010	<1e-005 <1e-005	0.00%	Pass Pass
SODIUM, D	0.05	0.05	mq/l	18.2	18.2	0.00%	Pass
SODIUM, T STRONTIUM, D	0.05 0.0002	0.05 0.0002	mg/l mg/l	19.1 0.213	19.3 0.215	1.04% 0.93%	Pass Pass
STRONTIUM, D STRONTIUM, T	0.0002	0.0002	mg/I mg/I	0.213	0.215	0.48%	Pass
Sulphate (as SO4), D	0.3	0.3	mg/l	3.30	2.83	15.33%	Pass
THALLIUM, D THALLIUM, T	0.00001 0.00001	0.00001 0.00001	mg/l mg/l	<0.000010 <0.000010	<1e-005 <1e-005	0.00%	Pass Pass
TIN, D	0.0001	0.0001	mg/l	< 0.00010	< 0.0001	0.00%	Pass
TIN, T TITANIUM, D	0.0001 0.01	0.0001 0.01	mg/l	<0.00010 <0.010	<0.0001 <0.01	0.00% 0.00%	Pass
TITANIUM, D	0.01	0.01	mg/l mg/l	<0.010	<0.01	0.00%	Pass Pass
TOTAL DISSOLVED SOLIDS (RESIDUE, FILTERABLE)	20	20	mg/l	159	158	0.63%	Pass
TOTAL KJELDAHL NITROGEN TOTAL ORGANIC CARBON, T	0.05 0.5	0.05 0.5	mg/l mg/l	<0.050 <0.50	<0.05 <0.5	0.00%	Pass Pass
TOTAL SUSPENDED SOLIDS, LAB	1	1	mg/l	<0.50 6.2	<0.5 5.3	15.65%	Pass
TURBIDITY, LAB	0.1	0.1	ntu	8.45	8.2	3.00%	Pass
URANIUM, D URANIUM, T	0.00001 0.00001	0.00001 0.00001	mg/l mg/l	0.00139 0.00141	0.00142 0.00143	2.14% 1.41%	Pass Pass
VANADIUM, D	0.0005	0.0005	mg/l	< 0.00050	< 0.0005	0.00%	Pass
VANADIUM, T	0.0005	0.0005	mg/l	0.00082	0.00087	5.92%	Pass
ZINC, D ZINC, T	0.001 0.003	0.001 0.003	mg/l mg/l	<0.0010 0.0033	<0.001 <0.003	0.00% 9.52%	Pass Pass

RPD Control Limits
Pass - RPD <= 20%
Pass-1 - RPD > 20%, Analysis results < 5 times Detection Limit
Pass-2 - RPD > 20% and RPD <= 50%, Analysis result > 5 times Detection Limit and < 999 times Detection Limit
Exceeds RPD Control Limits

Table A2. Field Blank Samples Collec	Sam		LC_PIZDC1404D 2019-03-20 WG_Q1-2019_MT1	
		Sample ID: Sample Type:	Field Blank	
Parameter	Fraction	Unit	Result	
Acidity as CaCO3, pH 8.3	N	mg/L	2.1	
Alkalinity, Bicarbonate (HCO3) as CaCO3 Alkalinity, Carbonate (CO3) as CaCO3	N N	mg/L mg/L	< 1.0 < 1.0	
Alkalinity, Carbonate (COS) as CaCOS  Alkalinity, Hydroxide (OH) as CaCO3	N N	mg/L	< 1.0	
Alkalinity, Total as CaCO3	N	mg/L	< 1.0	
Aluminum	D	mg/L	< 0.0030	
Aluminum	T	mg/L	< 0.0030	
Ammonia Nitrogen	N	mg/L	1.05	
Anion Sum	N	meq/L	< 0	
Anion/Cation Ratio Antimony	N D	% mg/L	0 < 0.00010	
Antimony	T	mg/L	< 0.00010	
Arsenic	D	mg/L	< 0.00010	
Arsenic	T	mg/L	< 0.00010	
Barium	D	mg/L	< 0.00010	
Barium	T	mg/L	< 0.00010	
Beryllium	D	mg/L	< 0.000020	
Beryllium	T	mg/L	< 0.000020	
Bismuth Bismuth	D	mg/L	< 0.000050	
Bismuth Boron	T D	mg/L	< 0.000050 < 0.010	
Boron	T	mg/L mg/L	< 0.010	
Bromide	D	mg/L	< 0.050	
Cadmium	D	mg/L	< 0.000050	
Cadmium	T	mg/L	< 0.0000050	
Calcium	D	mg/L	< 0.050	
Calcium	T	mg/L	< 0.050	
Cation Sum	N	meg/L	< 0	
Chloride	D	mg/L	< 0.50	
Chromium Chromium	D T	mg/L	< 0.00010 0.0004	
Cobalt	D	mg/L mg/L	< 0.0004	
Cobalt	T	mg/L	< 0.00010	
Conductivity	N	uS/cm	< 2.0	
Copper	D	mg/L	< 0.00050	
Copper	T	mg/L	< 0.00050	
Dissolved Organic Carbon	D	mg/L	< 0.50	
Fluoride	D	mg/L	< 0.020	
Hardness, Calcium Carbonate	N	mg/L	< 0.50	
Ion Balance	N	%	0	
Iron	D T	mg/L	< 0.010	
Iron Lead	D	mg/L mg/L	< 0.010 < 0.00050	
Lead	Ī	mg/L	< 0.000050	
Lithium	D	mg/L	< 0.0010	
Lithium	T	mg/L	< 0.0010	
Magnesium	D	mg/L	< 0.10	
Magnesium	Т	mg/L	< 0.10	
Manganese	D	mg/L	< 0.00010	
Manganese	T	mg/L	< 0.00010	
Mercury Mercury	D T	mg/L	< 0.000050 < 0.000050	
Molybdenum	D	mg/L mg/L	< 0.000050	
Molybdenum	T	mg/L	< 0.000050	
Nickel	D	mg/L	< 0.00050	
Nickel	T	mg/L	< 0.00050	
Nitrate as N	N	mg/L	< 0.0050	
Nitrite as N	N	mg/L	< 0.0010	
Nitrogen, Kjeldahl	N	mg/L	4.76	
Oxidation-Reduction Potential	N	mV	431	
pH Phoenhorus	N N	pH units	5.48	
Phosphorus Phosphorus, Total Orthophosphate	N N	mg/L mg/L	< 0.0020 < 0.0010	
Potassium	D	mg/L	< 0.050	
Potassium	T	mg/L	< 0.050	
Selenium	D	ug/L	< 0.050	
Selenium	T	ug/L	< 0.050	
Silicon	D	mg/L	< 0.050	
Silicon	T	mg/L	< 0.10	
Silver	D	mg/L	< 0.000010	
Silver	T	mg/L	< 0.000010	
Sodium Sodium	D T	mg/L mg/L	< 0.050 < 0.050	
Strontium	D	mg/L mg/L	< 0.000	
Strontium	T	mg/L	< 0.00020	
Sulfate	D	mg/L	< 0.30	
Thallium	D	mg/L	< 0.000010	
Thallium	Т	mg/L	< 0.000010	
Tin	D	mg/L	< 0.00010	
Tin	T	mg/L	< 0.00010	
Titanium	D	mg/L	< 0.010	
Titanium Tatal Dissahuad Salida	T	mg/L	< 0.010	
Total Dissolved Solids Total Organic Carbon	N T	mg/L	< 10	
Total Organic Carbon Total Suspended Solids	T N	mg/L mg/l	< 0.50 < 1.0	
Turbidity	N N	mg/L NTU	< 0.10	
Uranium	D	mg/L	< 0.00010	
Uranium	T	mg/L	< 0.000010	
Vanadium	D	mg/L	< 0.00050	
Vanadium	T	mg/L	< 0.00050	
Zinc	D	mg/L	< 0.0010	

Table 2 continued. Field Blank Collect	aı	Location:	LC_PIZDC1404D	
		Sample Date:	2019-05-23	
		Sample ID:	WG_Q2-2019_MT1	
Parameter	Fraction	Sample Type: Unit	Field Blank Result	
Acidity as CaCO3, pH 8.3	N	mg/L	1.8	
Alkalinity, Bicarbonate (HCO3) as CaCO3	N	mg/L	< 1.0	
Alkalinity, Carbonate (CO3) as CaCO3	N	mg/L	< 1.0	
Alkalinity, Hydroxide (OH) as CaCO3	N N	mg/L	< 1.0	
Alkalinity, Total as CaCO3 Aluminum	D	mg/L mg/L	< 1.0 < 0.0030	
Aluminum	T	mg/L	< 0.0030	
Ammonia Nitrogen	N	mg/L	< 0.0050	
Anion Sum	N	meq/L	< 0	
Anion/Cation Ratio	N	%	0	
Antimony Antimony	D T	mg/L mg/L	< 0.00010 < 0.00010	
Arsenic	D	mg/L	< 0.00010	
Arsenic	T	mg/L	< 0.00010	
Barium	D	mg/L	< 0.00010	
Barium	T	mg/L	< 0.00010	
Beryllium Dorodlium	D T	mg/L	< 0.000020	
Beryllium Bismuth	D	mg/L mg/L	< 0.000020 < 0.000050	
Bismuth	T	mg/L	< 0.000050	
Boron	D	mg/L	< 0.010	
Boron	T	mg/L	< 0.010	
Bromide	D	mg/L	< 0.050	
Cadmium	D T	mg/L	< 0.0000050	
Cadmium Calcium	T D	mg/L	< 0.000050 < 0.050	
Calcium	T	mg/L mg/L	< 0.050	
Cation Sum	N	meg/L	< 0	
Chloride	D	mg/L	< 0.50	
Chromium	D	mg/L	< 0.00010	
Chromium	T	mg/L	< 0.00010	
Cobalt	D	mg/L	< 0.00010 < 0.00010	
Cobalt Conductivity	T N	mg/L uS/cm	< 0.00010	
Copper	D	mg/L	< 0.00050	
Copper	T	mg/L	< 0.00050	
Dissolved Organic Carbon	D	mg/L	< 0.50	
Fluoride	D	mg/L	< 0.020	
Hardness, Calcium Carbonate	N	mg/L	< 0.50	
Ion Balance Iron	N D	% mg/L	0 < 0.010	
Iron	T	mg/L	< 0.010	
Lead	D	mg/L	< 0.000050	
Lead	T	mg/L	< 0.000050	
Lithium	D	mg/L	< 0.0010	
Lithium Magnesium	T D	mg/L	< 0.0010 < 0.10	
Magnesium	T	mg/L mg/L	< 0.10	
Manganese	D	mg/L	< 0.00010	
Manganese	T	mg/L	< 0.00010	
Mercury	D	mg/L	< 0.0000050	
Mercury	T	mg/L	< 0.0000050	
Molybdenum Molybdenum	D T	mg/L mg/L	< 0.000050 < 0.000050	
Nickel	D	mg/L	< 0.00050	
Nickel	T	mg/L	< 0.00050	
Nitrate as N	N	mg/L	< 0.0050	
Nitrite as N	N	mg/L	< 0.0010	
Nitrogen, Kjeldahl	N	mg/L	< 0.050	
Oxidation-Reduction Potential	N	mV	450 5.14	
pH Phosphorus	N N	pH units mg/L	< 0.0020	
Phosphorus, Total Orthophosphate	N	mg/L	< 0.0020	
Potassium	D	mg/L	< 0.050	
Potassium	T	mg/L	< 0.050	
Selenium	D	ug/L	< 0.050	
Selenium	T	ug/L	< 0.050	
Silicon Silicon	D T	mg/L mg/L	< 0.050 < 0.10	
Silver	D	mg/L	< 0.000010	
Silver	T	mg/L	< 0.000010	
Sodium	D	mg/L	< 0.050	
Sodium	T	mg/L	< 0.050	
Strontium	D T	mg/L	< 0.00020	
Strontium Sulfate	T D	mg/L mg/L	< 0.00020 < 0.30	
Thallium	D	mg/L	< 0.00010	
Thallium	T	mg/L	< 0.000010	
Tin	D	mg/L	< 0.00010	
Tin	T	mg/L	< 0.00010	
Titanium	D	mg/L	< 0.010	
Titanium Total Dissolved Solids	T N	mg/L	< 0.010	
Total Dissolved Solids Total Organic Carbon	T	mg/L mg/L	< 10 < 0.50	
Total Suspended Solids	N	mg/L	< 1.0	
Turbidity	N	NTU	< 0.10	
Uranium	D	mg/L	< 0.000010	
Uranium	T	mg/L	< 0.000010	
Vanadium	D T	mg/L	< 0.00050	
Vanadium Zinc	T D	mg/L mg/L	< 0.00050 < 0.0010	
71		my/L	< 0.0010	

Table 2 continued. Field Blank Colle			
		Location: Sample Date:	LC_PIZDC1404S 2019-08-15
		Sample ID:	WG_Q3-2019_010
		Sample Type:	Field Blank
Parameter	Fraction	Unit	Result
Acidity as CaCO3, pH 8.3	N	mg/L	< 1.0
Alkalinity, Bicarbonate (HCO3) as CaCO3 Alkalinity, Carbonate (CO3) as CaCO3	N N	mg/L mg/L	< 1.0 < 1.0
Alkalinity, Carbonate (COS) as CaCOS  Alkalinity, Hydroxide (OH) as CaCOS	N	mg/L	< 1.0
Alkalinity, Total as CaCO3	N	mg/L	< 1.0
Aluminum	D	mg/L	< 0.0030
Aluminum	T	mg/L	< 0.0030
Ammonia Nitrogen	N N	mg/L	0.0075
Anion Sum Anion/Cation Ratio	N	meq/L %	< 0
Antimony	D	mg/L	< 0.00010
Antimony	T	mg/L	< 0.00010
Arsenic	D	mg/L	< 0.00010
Arsenic	T	mg/L	< 0.00010
Barium Barium	D T	mg/L mg/L	< 0.00010 < 0.00010
Beryllium	D	mg/L	< 0.00010
Beryllium	T	mg/L	< 0.000020
Bismuth	D	mg/L	< 0.000050
Bismuth	T	mg/L	< 0.000050
Boron	D	mg/L	< 0.010
Boron Bromide	T D	mg/L mg/L	< 0.010 < 0.050
Cadmium	D	mg/L	< 0.000050
Cadmium	T	mg/L	< 0.0000050
Calcium	D	mg/L	< 0.050
Calcium	T	mg/L	< 0.050
Cation Sum Chloride	N D	meg/L mg/L	< 0 < 0.50
Chromium	D	mg/L	< 0.00010
Chromium	T	mg/L	< 0.00010
Cobalt	D	mg/L	< 0.00010
Cobalt	T	mg/L	< 0.00010
Conductivity	N	uS/cm	< 2.0
Copper Copper	D T	mg/L mg/L	< 0.00050 < 0.00050
Dissolved Organic Carbon	D	mg/L	< 0.50
Fluoride	D	mg/L	< 0.020
Hardness, Calcium Carbonate	N	mg/L	< 0.50
Ion Balance	N	%	0
Iron	D T	mg/L mg/L	< 0.010 < 0.010
Iron Lead	D	mg/L	< 0.00050
Lead	T	mg/L	0.000064
Lithium	D	mg/L	< 0.0010
Lithium	T	mg/L	< 0.0010
Magnesium	D T	mg/L	< 0.10
Magnesium Manganese	T D	mg/L mg/L	< 0.10 < 0.00010
Manganese	T	mg/L	< 0.00010
Mercury	D	mg/L	< 0.000050
Mercury	T	mg/L	< 0.0000050
Molybdenum	D	mg/L	< 0.000050
Molybdenum Nickel	T D	mg/L	< 0.00050
Nickel	T	mg/L mg/L	< 0.00050 < 0.00050
Nitrate as N	N	mg/L	< 0.0050
Nitrite as N	N	mg/L	< 0.0010
Nitrogen, Kjeldahl	N	mg/L	< 0.050
Oxidation-Reduction Potential	N	mV	503
pH Phosphorus	N N	pH units	5.7
Phosphorus Phosphorus, Total Orthophosphate	N N	mg/L mg/L	< 0.0020 < 0.0010
Potassium	D	mg/L	< 0.050
Potassium	T	mg/L	< 0.050
Selenium	D	ug/L	< 0.050
Selenium	T	ug/L	< 0.050
Silicon Silicon	D T	mg/L mg/L	< 0.050 < 0.10
Silver	D	mg/L	< 0.000010
Silver	Т	mg/L	< 0.000010
Sodium	D	mg/L	< 0.050
Sodium	T	mg/L	< 0.050
Strontium Strontium	D T	mg/L mg/L	< 0.00020 < 0.00020
Sulfate	D	mg/L	< 0.30
Thallium	D	mg/L	< 0.000010
Thallium	T	mg/L	< 0.000010
Tin	D	mg/L	< 0.00010
Tin Titomium	T	mg/L	< 0.00010
Titanium Titanium	D T	mg/L mg/L	< 0.010 < 0.010
Total Dissolved Solids	N	mg/L	< 10
Total Organic Carbon	T	mg/L	< 0.50
Total Suspended Solids	N	mg/L	< 1.0
Turbidity	N	NTU	< 0.10
Uranium	D T	mg/L	< 0.000010
<u>Uranium</u> Vanadium	T D	mg/L mg/l	< 0.000010 < 0.00050
	U	mg/L	< 0.00000
	T	ma/l	< 0.00050
Vanadium Zinc	T D	mg/L mg/L	< 0.00050 < 0.0010

Table 2 continued. Field Blank Collect	cted As Pai	Location:	roundwater Monitoring LC_PIZP1103	
		Sample Date:	2019-10-10	
		Sample ID:	WG_Q4-2019_004	
		Sample Type:	FB	
Parameter Acidity as CaCO3, pH 8.3	Fraction	Unit mg/L	Result 1.5	
Alkalinity, Bicarbonate (HCO3) as CaCO3	N N	mg/L	< 1.0	
Alkalinity, Carbonate (CO3) as CaCO3	N	mg/L	< 1.0	
Alkalinity, Hydroxide (OH) as CaCO3	N	mg/L	< 1.0	
Alkalinity, Total as CaCO3 Aluminum	N D	mg/L mg/L	< 1.0 < 0.0030	
Aluminum	T	mg/L	< 0.0030	
Ammonia Nitrogen	N	mg/L	< 0.0050	
Anion Sum	N	meq/L	< 0	
Anion/Cation Ratio	N	%	0	
Antimony Antimony	D T	mg/L mg/L	< 0.00010 < 0.00010	
Arsenic	D	mg/L	< 0.00010	
Arsenic	T	mg/L	< 0.00010	
Barium	D	mg/L	0.00029	
Barium	T D	mg/L	< 0.00010	
Beryllium Beryllium	T	mg/L mg/L	< 0.000020 < 0.000020	
Bismuth	D	mg/L	< 0.000050	
Bismuth	T	mg/L	< 0.000050	
Boron	D	mg/L	< 0.010	
Boron	T	mg/L	< 0.010	
Bromide Cadmium	D D	mg/L mg/L	< 0.050 < 0.000050	
Cadmium	T	mg/L	< 0.0000050	
Calcium	D	mg/L	0.063	
Calcium	T	mg/L	< 0.050	
Cation Sum	N	meg/L	< 0	
Chloride Chromium	D D	mg/L mg/L	< 0.50 < 0.00010	
Chromium	T	mg/L	< 0.00010	
Cobalt	D	mg/L	< 0.00010	
Cobalt	T	mg/L	< 0.00010	
Conductivity	N	uS/cm	< 2.0	
Copper Copper	D T	mg/L mg/L	< 0.00020 < 0.00050	
Dissolved Organic Carbon	D	mg/L	< 0.50	
Fluoride	D	mg/L	< 0.020	
Hardness, Calcium Carbonate	N	mg/L	< 0.50	
Ion Balance	N	%	0	
Iron Iron	D T	mg/L mg/L	< 0.010 < 0.010	
Lead	D	mg/L	< 0.000050	
Lead	T	mg/L	< 0.000050	
Lithium	D	mg/L	< 0.0010	
Lithium Magnesium	T D	mg/L mg/L	< 0.0010 < 0.10	
Magnesium	T	mg/L	< 0.10	
Manganese	D	mg/L	< 0.00010	
Manganese	Т	mg/L	0.0001	
Mercury	D	mg/L	< 0.0000050	
Mercury Molybdenum	T D	mg/L mg/L	< 0.000050 < 0.000050	
Molybdenum	T	mg/L	< 0.000050	
Nickel	D	mg/L	< 0.00050	
Nickel	T	mg/L	< 0.00050	
Nitrate as N	N	mg/L	< 0.0050	
Nitrite as N Nitrogen, Kjeldahl	N N	mg/L mg/L	< 0.0010 < 0.050	
Oxidation-Reduction Potential	N N	mV	344	
рН	N	pH units	5.62	
Phosphorus	N	mg/L	< 0.0020	
Phosphorus, Total Orthophosphate	N D	mg/L	< 0.0010	
Potassium Potassium	T	mg/L mg/L	< 0.050 < 0.050	
Selenium	D	ug/L	< 0.050	
Selenium	Т	ug/L	< 0.050	
Silicon	D	mg/L	0.227	
Silicon Silver	T D	mg/L mg/L	< 0.10 < 0.000010	
Silver	T	mg/L	< 0.000010	
Sodium	D	mg/L	0.233	
Sodium	T	mg/L	< 0.050	
Strontium	D	mg/L	< 0.00020	
Strontium Sulfate	T D	mg/L mg/L	< 0.00020 < 0.30	
Thallium	D	mg/L	< 0.00010	
Thallium	T	mg/L	< 0.000010	
Tin	D	mg/L	0.00075	
Tin Titonium	T	mg/L	0.00012	
Titanium Titanium	D T	mg/L mg/L	< 0.010 < 0.010	
Total Dissolved Solids	N N	mg/L	< 10	
Total Organic Carbon	T	mg/L	< 0.50	
Total Suspended Solids	N	mg/L	< 1.0	
Turbidity	N	NTU	< 0.10	
Uranium	D T	mg/L	< 0.000010 < 0.000010	
Uranium Vanadium	D	mg/L mg/L	< 0.00010	
Vanadium	T	mg/L	< 0.00050	
Zinc	D	mg/L	< 0.0010	
Zinc	T	mg/L	< 0.0030	

Table A3. Trip Blanks Part of LCO 2019 Groundwater Monitoring

Table A3. Trip Blanks Part of LCO 201	9 Groundy	vater Monitori	
		Location:	LC_TBLANK
		Sample Date:	2019-03-20
		Sample ID:	WG_Q1-2019_RD1
		Sample Type:	TB
Parameter	Fraction	Unit	Result
Acidity as CaCO3, pH 8.3	N	mg/L	2.2
Alkalinity, Bicarbonate (HCO3) as CaCO3	N	mg/L	< 1.0
Alkalinity, Carbonate (CO3) as CaCO3	N	mg/L	< 1.0
Alkalinity, Hydroxide (OH) as CaCO3	N	mg/L	< 1.0
Alkalinity, Total as CaCO3	N	mg/L	< 1.0
Aluminum	T	mg/L	< 0.0030
Ammonia Nitrogen	N	mg/L	0.292
Anion Sum	N	meq/L	< 0
Anion/Cation Ratio	N	%	55
Antimony	T	mg/L	< 0.00010
Arsenic	T	mg/L	< 0.00010
Barium	T	mg/L	< 0.00010
Beryllium	T	mg/L	< 0.000020
Bismuth	T T	mg/L	< 0.000050
Boron		mg/L	< 0.010
Bromide Cadmium	D T	mg/L	< 0.050
Cadmium Calcium	D	mg/L	< 0.000050 < 0.050
Calcium	T T	mg/L mg/L	< 0.050 < 0.050
Cation Sum	N	meg/L	< 0.030
Chloride	D	mg/L	< 0.50
Chromium	T	mg/L	< 0.00010
Cobalt	T	mg/L	< 0.00010
Conductivity	N	uS/cm	2.7
Copper	T	mg/L	< 0.00050
Fluoride	D	mg/L	< 0.020
Hardness, Calcium Carbonate	N	mg/L	< 0.50
Ion Balance	N	%	344
Iron	T	mg/L	0.022
Lead	Ť	mg/L	< 0.000050
Lithium	Ť	mg/L	< 0.0010
Magnesium	D	mg/L	< 0.0050
Magnesium	Т	mg/L	< 0.10
Manganese	Т	mg/L	0.00014
Mercury	Т	mg/L	< 0.000050
Molybdenum	Т	mg/L	< 0.000050
Nickel	Т	mg/L	< 0.00050
Nitrate as N	N	mg/L	0.125
Nitrite as N	N	mg/L	< 0.0010
Nitrogen, Kjeldahl	N	mg/L	0.301
Oxidation-Reduction Potential	N	mV	423
pH	N	pH units	5.01
Phosphorus	N	mg/L	0.0033
Phosphorus, Total Orthophosphate	N	mg/L	< 0.0010
Potassium	D	mg/L	< 0.050
Potassium	T	mg/L	< 0.050
Selenium	T	ug/L	< 0.050
Silicon	Т	mg/L	< 0.10
Silver	Т	mg/L	< 0.000010
Sodium	D	mg/L	< 0.050
Sodium	Т	mg/L	< 0.050
Strontium	Т	mg/L	< 0.00020
Sulfate	D	mg/L	< 0.30
Thallium	T	mg/L	< 0.000010
Tin	T	mg/L	< 0.00010
Titanium	Т	mg/L	< 0.010
Total Dissolved Solids	N	mg/L	< 10
Total Organic Carbon	Т	mg/L	< 0.50
Total Suspended Solids	N	mg/L	< 1.0
Turbidity	N	NTU	< 0.10
Uranium	T	mg/L	< 0.000010
Vanadium	T	mg/L	< 0.00050
Zinc	T	mg/L	< 0.0030

### Site Specific Groundwater Monitoring: 2019 Annual Report Teck Coal Limited - Line Creek Operations Table A3 continued. Trip Blanks Part of LCO 2019 Groundwater Monitoring

Table A3 continued. Trip Blanks Part	of LCO 20		er Monitoring
		Location:	LC_TBLANK
		Sample Date:	2019-05-23
		Sample ID:	WG_Q2-2019_RD1
		Sample Type:	TB
Parameter	Fraction	Unit	Result
Acidity as CaCO3, pH 8.3	N	mg/L	1.2
Alkalinity, Bicarbonate (HCO3) as CaCO3	N	mg/L	< 1.0
Alkalinity, Carbonate (CO3) as CaCO3	N	mg/L	< 1.0
Alkalinity, Hydroxide (OH) as CaCO3	N	mg/L	< 1.0
Alkalinity, Total as CaCO3	N	mg/L	< 1.0
Aluminum	T	mg/L	< 0.0030
Ammonia Nitrogen	N	mg/L	0.0334
Anion Sum	N	meq/L	< 0
Anion/Cation Ratio	N	%	0
Antimony	T	mg/L	< 0.00010
Arsenic	T	mg/L	< 0.00010
Barium	T	mg/L	< 0.00010
Beryllium	T	mg/L	< 0.000020
Bismuth	Т	mg/L	< 0.000050
Boron	T	mg/L	< 0.010
Bromide	D	mg/L	< 0.050
Cadmium	T	mg/L	< 0.000050
Calcium	D	mg/L	< 0.050
Calcium	Т	mg/L	< 0.050
Cation Sum	N	meq/L	< 0
Chloride	D	mg/L	< 0.50
Chromium	T	mg/L	< 0.00010
Cobalt	T	mg/L	< 0.00010
Conductivity	N	uS/cm	< 2.0
Copper	T	mg/L	< 0.00050
Fluoride	D	mg/L	< 0.020
Hardness, Calcium Carbonate	N	mg/L	< 0.50
Ion Balance	N	%	0
Iron	Т	mg/L	< 0.010
Lead	Т	mg/L	< 0.000050
Lithium	T	mg/L	< 0.0010
Magnesium	D	mg/L	< 0.0050
Magnesium	T	mg/L	< 0.10
Manganese	T	mg/L	< 0.00010
Mercury	T	mg/L	< 0.000050
Molybdenum	T	mg/L	< 0.000050
Nickel	T	mg/L	< 0.00050
Nitrate as N	N	mg/L	< 0.0050
Nitrite as N	N	mg/L	< 0.0010
Nitrogen, Kjeldahl	N	mg/L	< 0.050
Oxidation-Reduction Potential	N	mV	407
рН	N	pH units	5.35
Phosphorus	N	mg/L	< 0.0020
Phosphorus, Total Orthophosphate	N	mg/L	< 0.0010
Potassium	D	mg/L	< 0.050
Potassium	T	mg/L	< 0.050
Selenium	Т	ug/L	< 0.050
Silicon	Т	mg/L	< 0.10
Silver	T	mg/L	< 0.000010
Sodium	D	mg/L	< 0.050
Sodium	T	mg/L	< 0.050
Strontium	T	mg/L	< 0.00020
Sulfate	D	mg/L	< 0.30
Thallium	T	mg/L	< 0.000010
Tin	T	mg/L	< 0.00010
Titanium	T	mg/L	< 0.010
Total Dissolved Solids	N	mg/L	< 10
Total Organic Carbon	Т	mg/L	< 0.50
Total Suspended Solids	N	mg/L	< 1.0
Turbidity	N	NTU	< 0.10
Uranium	T	mg/L	< 0.000010
Vanadium	T	mg/L	< 0.00050
Zinc	T	mg/L	< 0.0030

Table A3 continued. Trip Blanks Part of LCO 2019 Groundwater Monitoring

Table A3 continued. Trip Blanks Part	OI LCO 201		
		Location:	LC_TBLANK
		Sample Date:	2019-07-17
		Sample ID:	
Danasatas		Sample Type:	TB
Parameter	Fraction	Unit	Result
Acidity as CaCO3, pH 8.3	N	mg/L	1.6
Alkalinity, Bicarbonate (HCO3) as CaCO3	N	mg/L	< 1.0
Alkalinity, Carbonate (CO3) as CaCO3	N	mg/L	< 1.0
Alkalinity, Hydroxide (OH) as CaCO3	N	mg/L	< 1.0
Alkalinity, Total as CaCO3 Aluminum	N T	mg/L	< 1.0 < 0.0030
Ammonia Nitrogen	N N	mg/L mg/L	< 0.0030
Anion Sum	N		< 0.0050
Anion/Cation Ratio	N	meq/L %	0
Antimony	T	mg/L	< 0.00010
Arsenic	T	mg/L	< 0.00010
Barium	T	mg/L	< 0.00010
Beryllium	Ť	mg/L	< 0.00010
Bismuth	Ť	mg/L	< 0.000050
Boron	Ť	mg/L	< 0.010
Bromide	D	mg/L	< 0.050
Cadmium	T	mg/L	< 0.000050
Calcium	D	mg/L	< 0.050
Calcium	Т	mg/L	< 0.050
Cation Sum	N	meg/L	< 0
Chloride	D	mg/L	< 0.50
Chromium	Т	mg/L	< 0.00010
Cobalt	T	mg/L	< 0.00010
Conductivity	N	uS/cm	< 2.0
Copper	T	mg/L	< 0.00050
Fluoride	D	mg/L	< 0.020
Hardness, Calcium Carbonate	N	mg/L	< 0.50
Ion Balance	N	%	0
Iron	T	mg/L	< 0.010
Lead	T	mg/L	< 0.000050
Lithium	Т	mg/L	< 0.0010
Magnesium	D	mg/L	< 0.0050
Magnesium	Т	mg/L	< 0.10
Manganese	T	mg/L	< 0.00010
Mercury	T	mg/L	< 0.000050
Molybdenum	T	mg/L	< 0.000050
Nickel	Т	mg/L	< 0.00050
Nitrate as N	N	mg/L	< 0.0050
Nitrite as N	N	mg/L	< 0.0010
Nitrogen, Kjeldahl	N	mg/L	< 0.050
Oxidation-Reduction Potential	N	mV	449
pH	N	pH units	5.57
Phosphorus  Tatal Outlean hands to	N	mg/L	< 0.0020
Phosphorus, Total Orthophosphate	N	mg/L	< 0.0010
Potassium	D	mg/L	< 0.050
Potassium	T	mg/L	< 0.050
Selenium		ug/L	< 0.050
Silicon	T	mg/L	< 0.10
Silver	T	mg/L	< 0.000010
Sodium	D T	mg/L	< 0.050
Sodium Strontium	T	mg/L mg/L	< 0.050 < 0.00020
Sulfate	D		< 0.00020
Thallium	T T	mg/L mg/L	< 0.30 < 0.00010
Tin	T	mg/L	< 0.00010
Titanium	T	mg/L	< 0.00010
Total Dissolved Solids	N N	mg/L	< 0.010
	T		< 10 < 0.50
Total Organic Carbon Total Suspended Solids	N N	mg/L	< 0.50 < 1.0
	N N	mg/L NTU	
Turbidity Uranium	T	mg/L	< 0.10 < 0.00010
Vanadium	T		
	T	mg/L	< 0.00050
Zinc		mg/L	< 0.0030

Table A3 continued. Trip Blanks Part of LCO 2019 Groundwater Monitoring

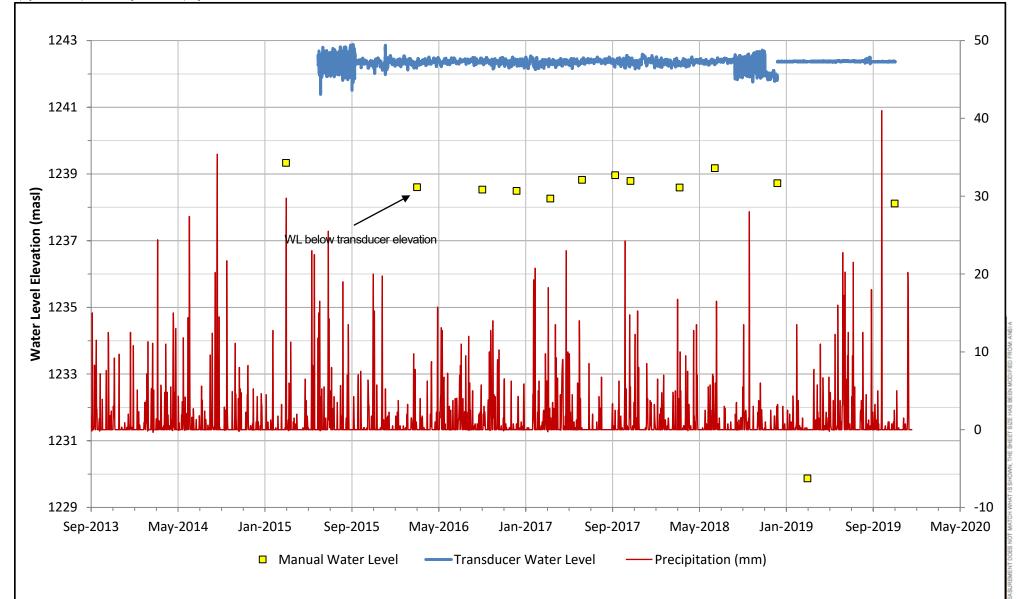
Table A3 continued. Trip Blanks Part	of LCO 201	19 Groundwate	
		Location:	LC_TBLANK
		Sample Date:	2019-11-06
		Sample ID:	WG_Q4-2019_006
		Sample Type:	ТВ
Parameter	Fraction	Unit	Result
Acidity as CaCO3, pH 8.3	N	mg/L	1.5
Alkalinity, Bicarbonate (HCO3) as CaCO3	N	mg/L	< 1.0
Alkalinity, Carbonate (CO3) as CaCO3	N	mg/L	< 1.0
Alkalinity, Hydroxide (OH) as CaCO3	N	mg/L	< 1.0
Alkalinity, Total as CaCO3	N	mg/L	< 1.0
Aluminum	T	mg/L	< 0.0030
Ammonia Nitrogen	N		0.0030
		mg/L	
Anion Sum	N	meq/L	< 0
Anion/Cation Ratio	N	%	0
Antimony	T	mg/L	< 0.00010
Arsenic	Т	mg/L	< 0.00010
Barium	Т	mg/L	< 0.00010
Beryllium	T	mg/L	< 0.000020
Bismuth	T	mg/L	< 0.000050
Boron	Т	mg/L	< 0.010
Bromide	D	mg/L	< 0.050
Cadmium	Т	mg/L	< 0.000050
Calcium	D	mg/L	< 0.050
Calcium	T	mg/L	< 0.050
Cation Sum	N	meg/L	< 0
Chloride	D	mg/L	< 0.50
Chromium	T	mg/L	< 0.00010
Cobalt	T		< 0.00010
		mg/L	
Conductivity	N -	uS/cm	< 2.0
Copper	T	mg/L	< 0.00050
Fluoride	D	mg/L	< 0.020
Hardness, Calcium Carbonate	N	mg/L	< 0.50
Ion Balance	N	%	0
Iron	T	mg/L	< 0.010
Lead	T	mg/L	< 0.000050
Lithium	T	mg/L	< 0.0010
Magnesium	D	mg/L	< 0.0050
Magnesium	Т	mg/L	< 0.10
Manganese	T	mg/L	< 0.00010
Mercury	Т	mg/L	< 0.000050
Molybdenum	Т	mg/L	< 0.000050
Nickel	Т	mg/L	< 0.00050
Nitrate as N	N	mg/L	< 0.0050
Nitrite as N	N	mg/L	< 0.0010
Nitrogen, Kieldahl	N	mg/L	< 0.050
Oxidation-Reduction Potential	N	mV	448
	N	pH units	5.49
pH Dhaanharus			
Phosphorus  Tatal Outlean hands to	N	mg/L	< 0.0020
Phosphorus, Total Orthophosphate	N	mg/L	< 0.0010
Potassium	D	mg/L	< 0.050
Potassium		mg/L	< 0.050
Selenium	T	ug/L	< 0.050
Silicon	T	mg/L	< 0.10
Silver	Т	mg/L	< 0.000010
Sodium	D	mg/L	< 0.050
Sodium	T	mg/L	< 0.050
Strontium	Т	mg/L	< 0.00020
Sulfate	D	mg/L	< 0.30
Thallium	Т	mg/L	< 0.000010
Tin	Ť	mg/L	< 0.00010
Titanium	T	mg/L	< 0.010
Total Dissolved Solids	N	mg/L	< 10
Total Organic Carbon	T		
		mg/L	< 0.50
Total Suspended Solids	N	mg/L	< 1.0
Turbidity	N	NTU	< 0.10
Uranium	T	mg/L	< 0.000010
Vanadium	Т	mg/L	< 0.00050
Zinc	T	mg/L	< 0.0030

13 March 2020 19135981-2020-064-R-Rev0

**APPENDIX B** 

**Groundwater Elevations** 





NOTES

Weather Station

 Transducer is located at or above the water level in the well, no continuous water level data available. Level data plotted at elevation of logger.
 Precipitation data obtained from the LCO Plant CLIENT

### TECK COAL LIMITED

CONSULTANT



YYYY-MM-DD	2020-02-19
PREPARED	SI
DESIGNED	NH
REVIEWED	LO
APPROVED	MJM

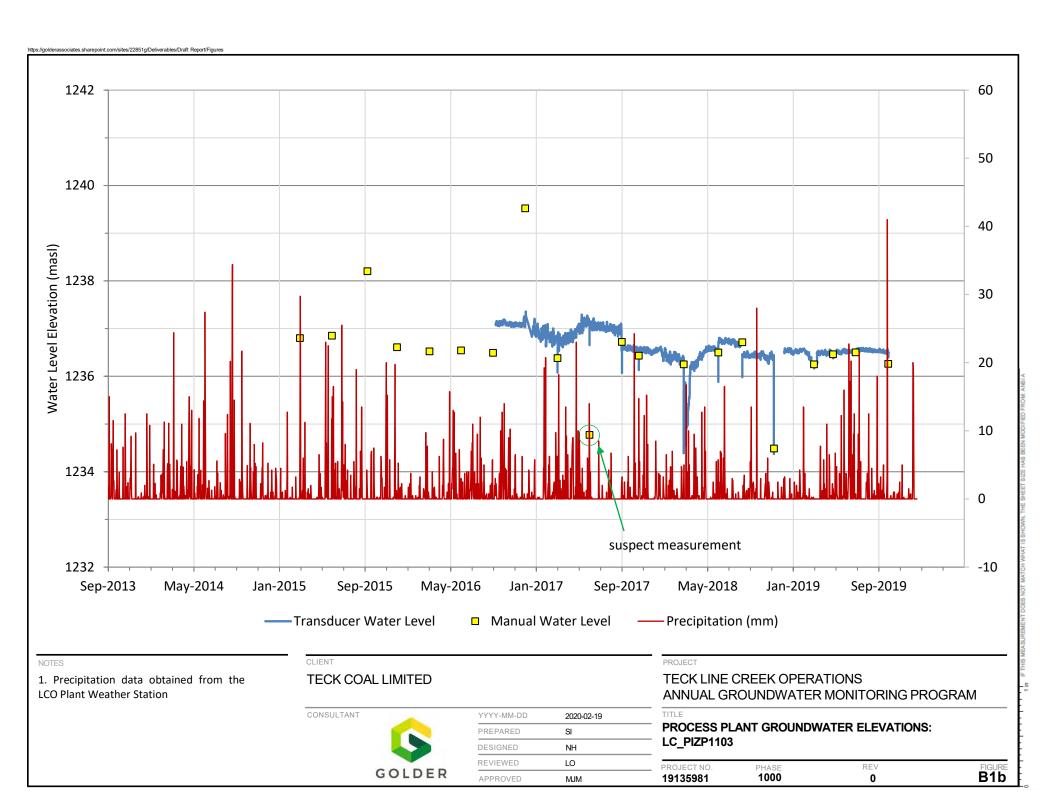
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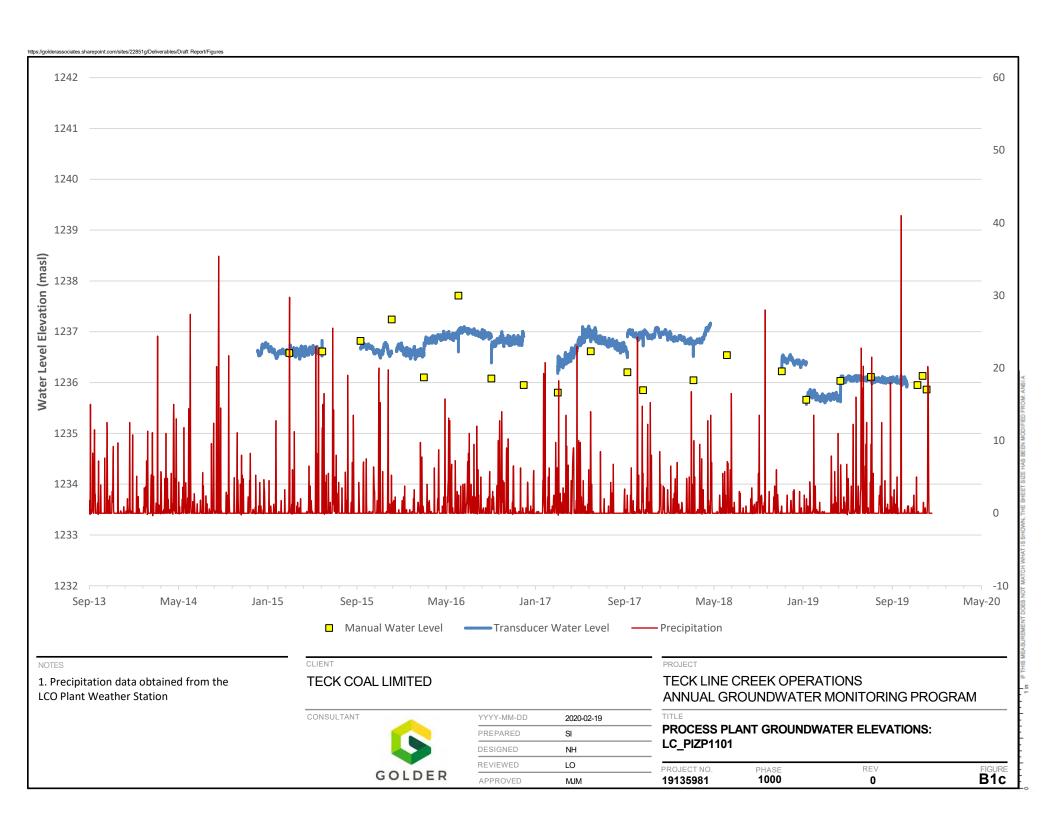
TECK LINE CREEK OPERATIONS
ANNUAL GROUNDWATER MONITORING PROGRAM

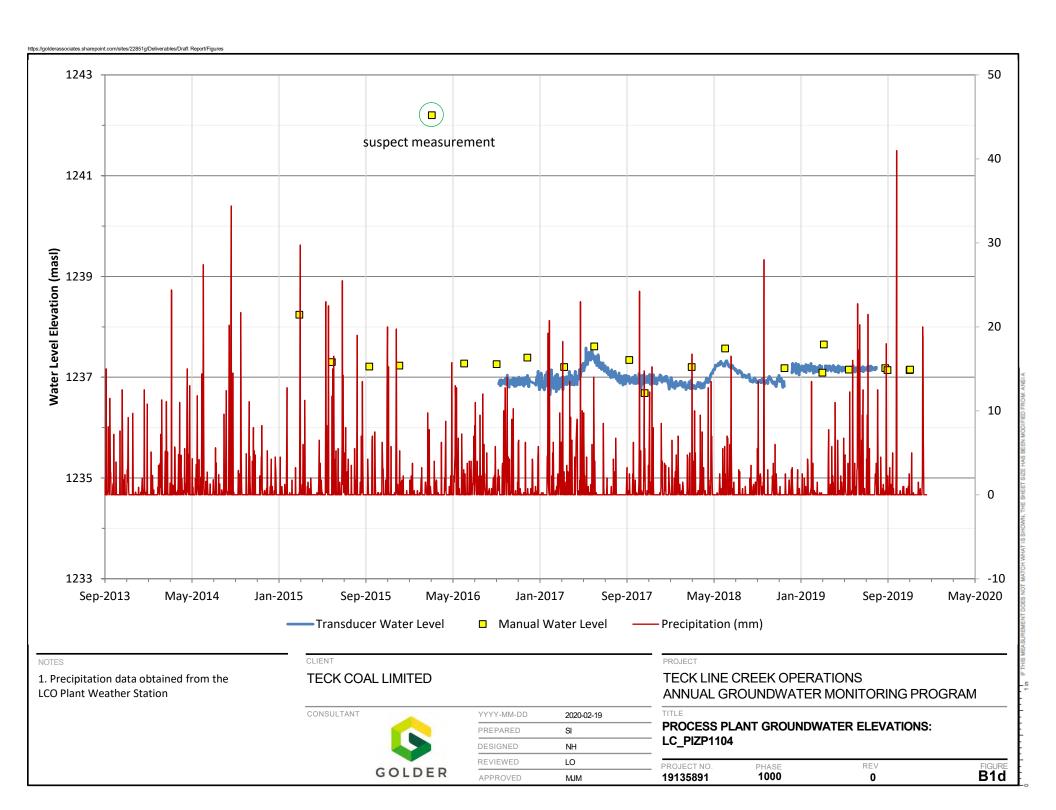
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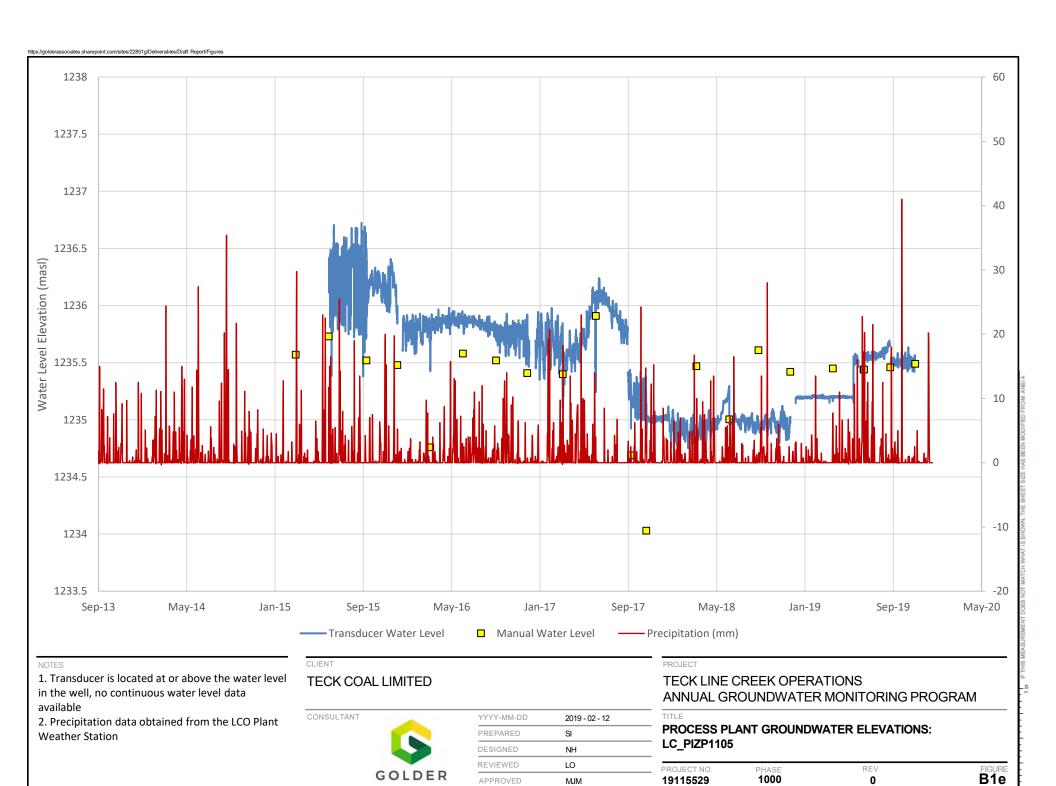
PROCESS PLANT GROUNDWATER ELEVATIONS: LC\_PIZP1001

PROJECT NO. PHASE REV FIG	
DEC LEGIT NO.	URE









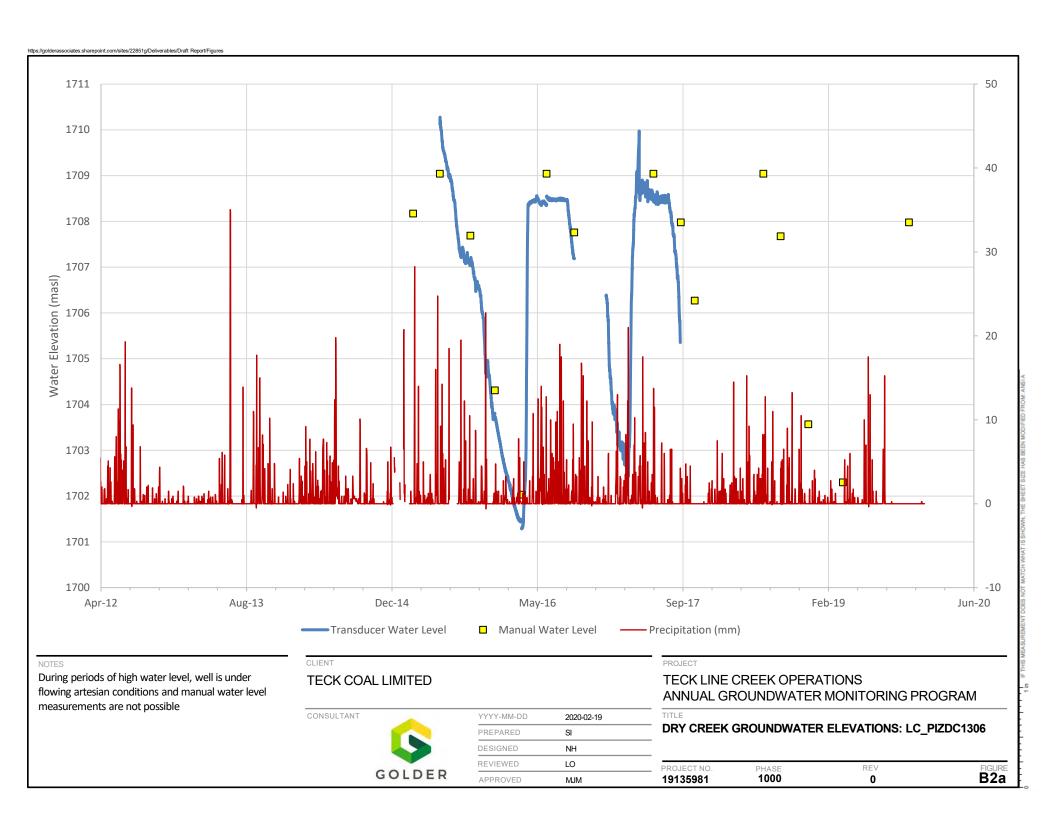
APPROVED

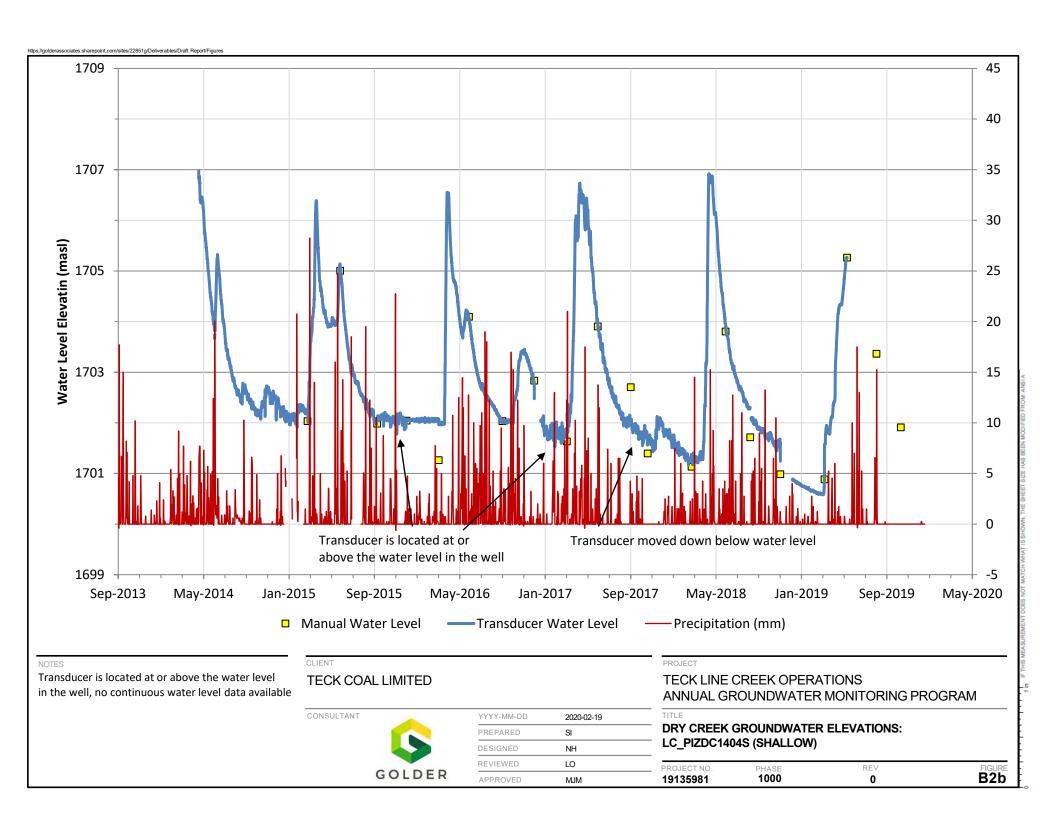
MJM

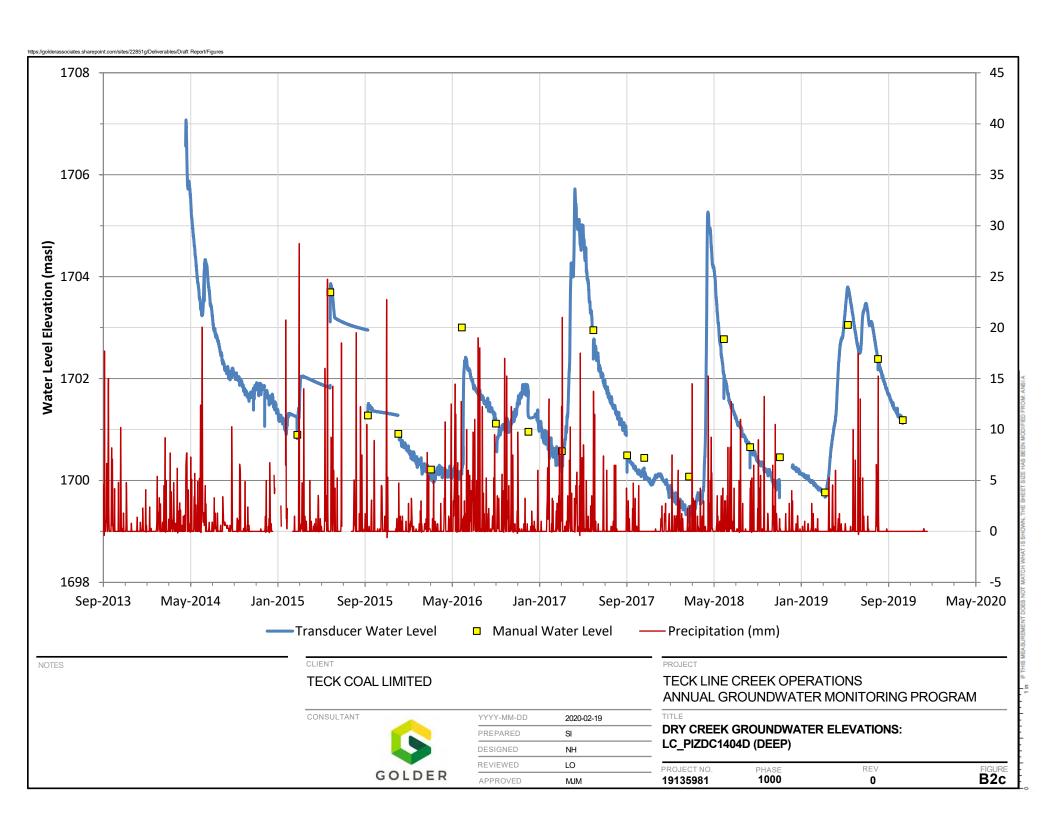
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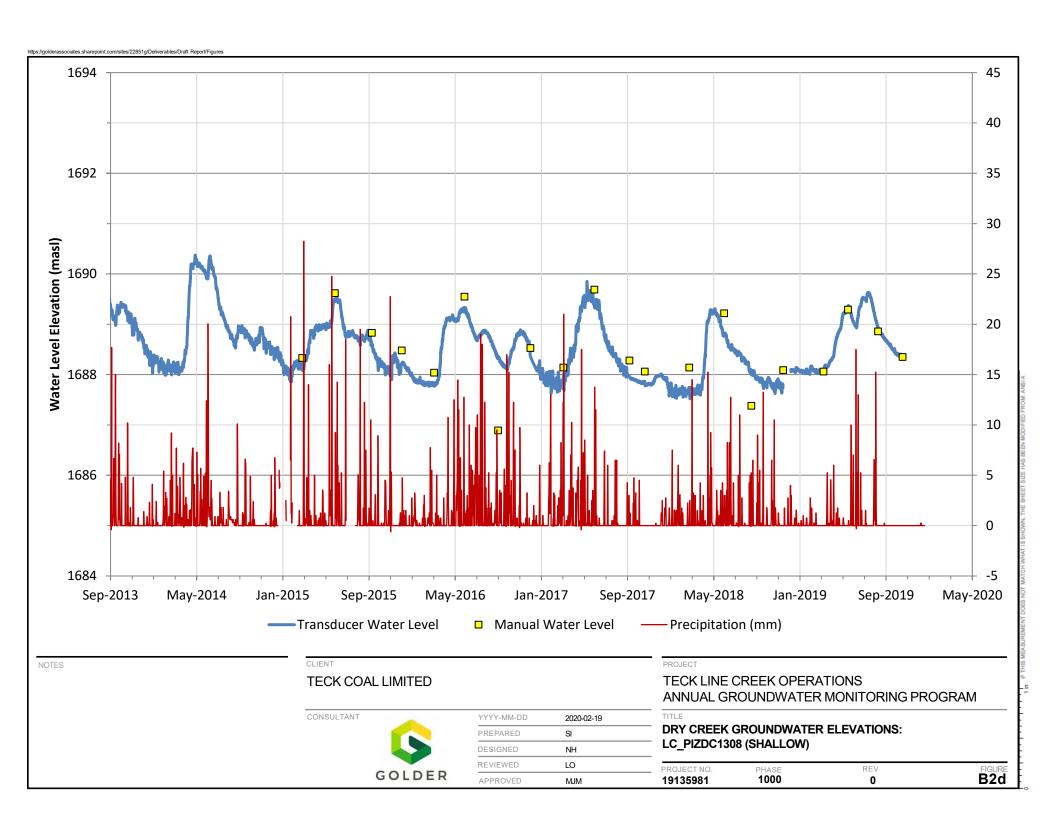
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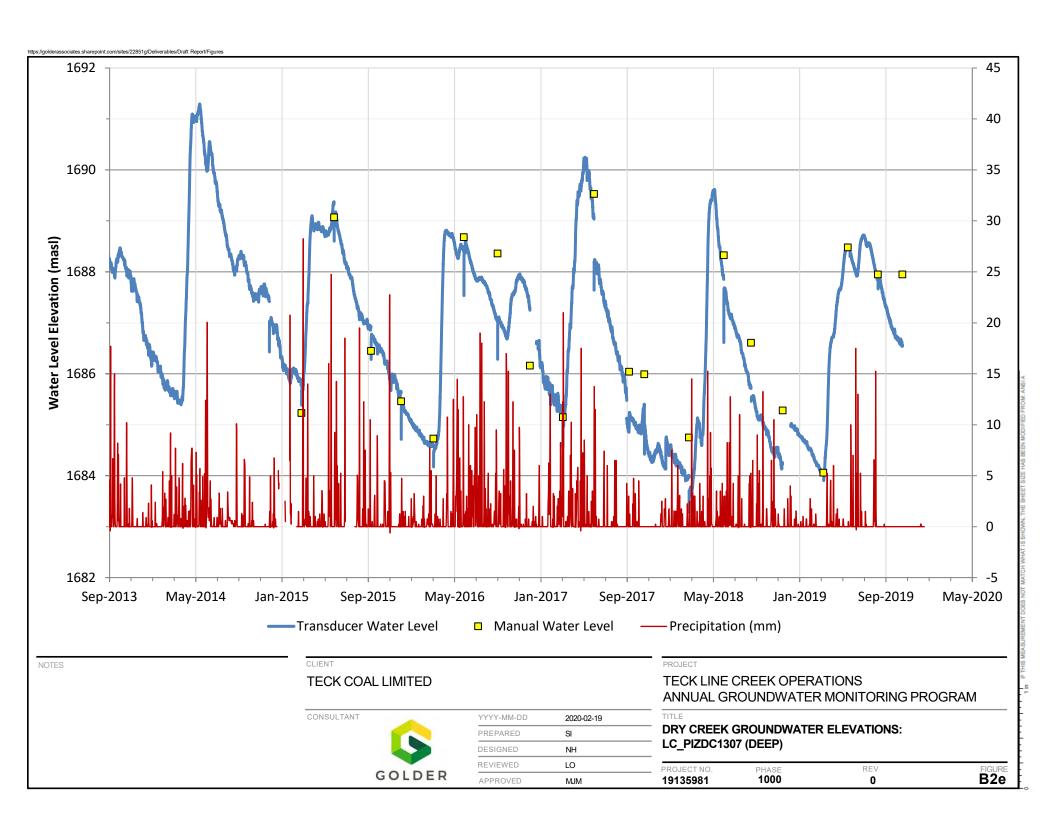
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13 March 2020 19135981-2020-064-R-Rev0

## **APPENDIX C**

Full Suite of Analytes Compared to British Columbia Contaminated Site Regulation Standards

## Appendix C Full Suite of Analytes compared to British Columbia Contaminated Site Regulations Standards

					Location Sample Date	2019-01-22	2019-04-25	LC_PIZP1101 2019-07-17	2019-07-17	2019-12-16
Chemical Name	Unit	BC CSR AW-F	BC CSR DW	BC CSR IW	QA/QC BC CSR LW	ZU 17-U 1-ZZ	2017-04-25	2019-07-17 FDA	2019-07-17 FD	2019-12-16
ield Measured		BC CSR AW-F	BC CSR DW	BC CSR IW	BCCSRLW					
onductivity issolved oxygen	μS/cm mg/L	-	-	-	-	356.4 7.34	296.4 9.34	295.4 1.34	295.4 1.34	314.6 0.6
issolved oxygen saturation H	% -	-	-	-	-	58 8.07	76.9 7.94	11.3 7.55	11.3 7.55	4.6 7.7
edox potential emperature	mV °C	-	-	-	-	-73.5 5.73	102.3	112 8.1	112 8.1	-45.5 4.054
urbidity	NTU	-	-	-	-	7	30	18	18	46.68
onventional Parameters cidity to pH 8.3 (as CaCO3)	mg/L	-	-	-	-	< 1.0	< 1.0	< 1.0	< 1.0	2.9
onductivity issolved organic carbon	μS/cm mg/L	-	-	-	-	293 0.68	297 0.93	312 < 0.50	313 < 0.50	291 < 0.50
ardness, as CaCO3 (N) exidation-reduction potential	mg/L mV	-	-	-	-	129 311	133 303	123 306	121 310	131 282
H	-	-	-	-	-	8.51	8.24	8.42	8.44	8.06
pecific conductivity otal alkalinity, as CaCO3	μS/cm mg/L	-	-	-	-	356.4 168	296.4 226	295.4 166	- 161	314.6 172
otal dissolved solids otal organic carbon	mg/L mg/L	-	-	-	-	197 1.1	165 0.88	159 < 0.50	158 < 0.50	183 2.27
otal suspended solids urbidity	mg/L NTU	-	-	-	-	5.5 14.1	9.8 22.4	6.2 8.45	5.3 8.2	30.1 55.4
lajor Ions		1		I						
nion Sum icarbonate, as CaCO3	meq/L mg/L	-	-	-	-	3.53 161	4.69 226	3.49 161	3.38 156	3.63 172
romide alcium	mg/L mg/L	-	-	-	1000	< 0.050 26.3	< 0.050 28.5	0.076 26.5	< 0.050 26.3	< 0.050 28.6
arbonate, as CaCO3 ation Sum	mg/L meg/L	-	-	-	-	7.8 3.44	< 1.0 3.51	4.4 3.3	5.2 3.26	< 1.0 3.51
ation-anion balance	%	-	-	-	-	-	-	-	-	-
hloride uoride	mg/L mg/L	1500 3	250 1.5	100 1	600 <u>1</u>	0.74 <u>1.69</u>	0.72 <u>1.71</u>	0.6 <u>1.82</u>	0.5 <u>1.74</u>	0.55 <u>1.83</u>
ydroxide, as CaCO3 on balance	mg/L %	-	-		-	< 1.0 97.5	< 1.0 75	< 1.0 94.4	< 1.0 96.4	< 1.0 96.6
agnesium otassium	mg/L mg/L	-	-	-	-	15.3 0.8	14.9 0.727	13.9 0.749	13.5 0.72	14.5 0.849
odium	mg/L	-	200	-	1000	19.2	19.2	18.2	18.2	19.5
ulphate utrients	mg/L	3090-4290 <sup>a</sup>	500	-	1000	2.56	2.64	3.3	2.83	3.88
itrate itrite	mg-N/L mg-N/L	400 0.2-2 <sup>b</sup>	10 1	-	100 10	< 0.0050 < 0.0010	0.0143 < 0.0010	< 0.0050 < 0.0010	< 0.0050 < 0.0010	< 0.0050 < 0.0010
rthophosphate	mg-P/L	-	-	-	-	0.0083	0.0079	0.009	0.0095	0.0099
otal ammonia otal Kjeldahl nitrogen	mg-N/L mg-N/L	1.31-18.5 <sup>c</sup>	-	-	-	0.0339	0.0272 0.054	0.0169 < 0.050	0.0162 < 0.050	0.0182 0.22
otal phosphorus issolved Metals	mg-P/L	-	-	-	-	0.0664	0.023	0.0301	0.0309	0.061
luminum	μg/L	-	9500	5000	5000	< 3.0	< 3.0	< 3.0	< 3.0	7.2
ntimony rsenic	μg/L μg/L	90 50	6 10	100	- 25	< 0.10 0.95	< 0.10 1	< 0.10 1.32	< 0.10 1.33	< 0.10 1.11
arium eryllium	μg/L μg/L	10000 1.5	1000 8	100	100	495 < 0.020	437 < 0.020	453 < 0.020	453 < 0.020	434 < 0.020
ismuth	μg/L	-	-	-	-	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050
oron admium	μg/L μg/L	12000 2.5-4 <sup>a</sup>	5000 5	<u>500</u> 5	5000 80	21 0.0065	31 0.0073	23 < 0.0050	22 < 0.0050	23 0.0104
hromium obalt	μg/L μg/L	10 40	50 1	8 50	50 1000	< 0.10 0.24	< 0.10 0.21	< 0.10 0.2	< 0.10 0.2	< 0.10 0.24
opper	μg/L	50-90 <sup>a</sup>	1500	200	300	< 0.50	< 0.50	< 0.50	< 0.50	1.61
on ead	μg/L μg/L	- 60-160 <sup>a</sup>	6500 10	5000 200	100	< 10 < 0.050	< 10 < 0.050	260 < 0.050	252 < 0.050	148 < 0.050
ithium langanese	μg/L μg/L	-	<i>8</i> 1500	2500 200	5000	<i>9.6</i> 250	<i>10.4</i> 240	<i>9.2</i> 227	<i>9</i> 222	10.5 246
lercury	μg/L	0.25 10000	1	1 10	2 50	< 0.0050	< 0.0050 10.7	< 0.0050 11.2	< 0.0050	< 0.0050 9.84
lolybdenum ickel	μg/L μg/L	1100-1500	250 80	200	1000	<u>12.4</u> < 0.50	< 0.50	< 0.50	<u>11.2</u> < 0.50	< 0.50
elenium ilicon	μg/L μg/L	20	10 -	20 -	30	< 0.050 3560	0.1 3390	< 0.050 3560	< 0.050 3440	< 0.050 4020
ilver trontium	μg/L μg/L	15	20 2500	-	-	< 0.010 236	< 0.010 219	< 0.010 213	< 0.010 215	< 0.010 206
hallium	μg/L	3		-	-	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
in itanium	μg/L μg/L	1000	2500	- -	-	< 0.10 < 10	< 0.10 < 10	< 0.10 < 10	< 0.10 < 10	0.18 < 10
ranium anadium	μg/L μg/L	85	20 20	10 100	200 100	1.44 < 0.50	1.31 < 0.50	1.39 < 0.50	1.42 < 0.50	1.74 < 0.50
inc otal Metals	μg/L	900-3150	3000	5000	2000	< 1.0	< 1.0	< 1.0	< 1.0	4.5
luminum	μg/L	-	-	-	-	779	507	102	99.4	1370
ntimony rsenic	μg/L μg/L	-	-	-	-	0.21 1.32	< 0.10 1.2	< 0.10 1.53	< 0.10 1.5	0.19 1.51
arium eryllium	μg/L μg/L	-	-	-	-	475 0.036	450 < 0.020	474 < 0.020	466 < 0.020	445 0.058
smuth	μg/L	-	-	-	-	< 0.050 22	< 0.050 < 0.050	< 0.050 19	< 0.050 < 0.050	< 0.050 23
oron admium	μg/L μg/L	-	-	-	-	0.0884	0.0494	0.0229	0.0213	0.12
alcium hromium	μg/L μg/L	-	-	-	-	29500 1.1	29400 0.64	28000 0.19	27800 0.18	30300 1.97
obalt opper	μg/L μg/L		-	-	-	0.49 2.22	0.37 1.18	0.24 0.58	0.24 < 0.50	0.64 3.87
on	μg/L	-	-	-	-	825	642	500	480	1250
ead thium	μg/L μg/L	-	-	-	-	0.417 10.2	0.21 9.8	0.193 8.9	0.112 8.9	0.723 11.3
agnesium anganese	μg/L μg/L	-	-	-	-	15700 274	15300 265	14500 240	14800 240	15000 266
ercury olybdenum	μg/L μg/L	-	-	-	-	0.0024 11.5	< 0.0050 10.6	< 0.0050 10.5	< 0.0050 10.6	< 0.0050 9.46
ckel	μg/L	-	-	-	-	1.28	0.77	< 0.50	< 0.50	2.07
otassium Plenium	μg/L μg/L	-	-	-	-	1030 0.165	867 0.112	756 < 0.050	776 < 0.050	1250 0.304
licon Iver	μg/L μg/L	-	-	-	-	5000 0.028	4530 0.017	3740 < 0.010	3610 < 0.010	6970 0.048
odium	μg/L	-	-	-	-	18500	18700	19100	19300	18100
rontium nallium	μg/L μg/L	-	-	-	-	229 0.039	219 0.021	209 < 0.010	210 < 0.010	202 0.061
n Itanium	μg/L μg/L	-	-	-	-	< 0.10 12	< 0.10 < 15	< 0.10 < 10	< 0.10 < 10	0.29 27
ranium	μg/L	-	-	-	-	1.48	1.52	1.41	1.43	1.8
anadium inc	μg/L μg/L	-	-	-	-	2.23 5.1	1.48 < 3.0	0.82 3.3	0.87 < 3.0	3.58 9.8
ydrocarbons xtractable Petroleum	mg/L	5	5	5	5	< 0.25	< 0.25	< 0.25	-	< 0.25
ydrocarbons (C10-C19) xtractable Petroleum	mg/L				-	< 0.25	< 0.25	< 0.25		< 0.25
ydrocarbons (C19-C32)			-	-	_				<u>-</u>	
um of Extractable Petroleum	mg/L	-	-	-	_	< 0.50	< 0.50	< 0.50	-	< 0.50

μS/cm = microSiemen per centimetre; °C = degrees Celcius; mg/L = milligram per litre; mV = millivolt; NTU =

nephelometric turbidity Units; TCU = true colour unit QA/QC = quality assurance/quality control; FDA = Field Duplicate Available; FD = Field Duplicate Standards from the Contaminated Sites Regulation (CSR), enacted in 1997, updated January 2019, and includes B.C.

Regs. 11/2019 and 13/2019 amendments. AW-F = groundwater flow to surface water used by freshwater aquatic life; DW = groundwater used for drinking water, IW = groundwater used for irrigation; LW = groundwater used for livestock watering

An interim background groundwater estimate of 20 µg/L for cobalt was used to screen the data consistent with ENV Technical Bulletin 3 Regional Background Concentrations for Select Inorganic Substances in Groundwater dated 24

September 2018. < Indicates parameter was below laboratory equipment detection limit.

- In results column indicates parameter was not analyzed. In guideline column indicates no guideline. <sup>a</sup> = standard is hardness dependent; <sup>b</sup> = standard is chloride dependent; <sup>c</sup> = standard is pH dependent

<u>Underline</u> - concentration exceeds BC CSR IW

## Full Suite of Analytes compared to British Columbia Contaminated Site Regulations Standards

					Location		LC_PIZ		
					Sample Date QA/QC	2019-03-13	2019-05-06	2019-07-10	2019-10-10
Chemical Name ield Measured	Unit	BC CSR AW-F	BC CSR DW	BC CSR IW	BC CSR LW				
onductivity	μS/cm	-	-	-	-	745.0	759	735	723
issolved oxygen issolved oxygen saturation	mg/L %	-	-	-	-	5.23 40.3	3.16 26.6	2.36 22.4	0.63 4.9
Hedox potential	- mV	-	-	-	-	7.44 274.7	7.5 253	7.44 290	7.42 -103.6
emperature	°C	-	-	-	-	4.3	7.8	12.1	4.63
urbidity onventional Parameters	NTU	-	-	-	-	20	10	34	20
cidity to pH 8.3 (as CaCO3) onductivity	mg/L μS/cm	-	-	-	-	1.5 791	< 1.0 759	< 1.0 759	1.1 720
issolved organic carbon	mg/L	-	-	-	-	1 132	0.61 126	0.83 136	2.62 139
ardness, as CaCO3 (N) xidation-reduction potential	mg/L mV	-	-	-	-	308	379	276	203
H pecific conductivity	- μS/cm	-	-	-	-	8.25 745	8.34 757	8.57 735	8.07 723
otal alkalinity, as CaCO3	mg/L	-	-	-	-	411 480	401	381 430	406 478
otal dissolved solids otal organic carbon	mg/L mg/L	-	-	-	-	0.96	460 0.85	0.86	2.86
otal suspended solids urbidity	mg/L NTU	-	-	-	-	5.5 13.9	2.9 3.36	11.3 12.5	19.9 13.6
lajor lons nion Sum	meq/L					8.95	8.76	8.3	8.82
icarbonate, as CaCO3	mg/L	-	-	-	-	411	396	362	406
romide alcium	mg/L mg/L	-	-	-	1000	0.095 28.4	0.077 26.6	< 0.050 29	0.146 28.9
arbonate, as CaCO3 ation Sum	mg/L meq/L	-	-	-	-	< 1.0 8.83	5.4 8.97	18.8 8.31	< 1.0 8.78
ation-anion balance	%	-	-	-	-	-	1.2	0.1	-
hloride uoride	mg/L mg/L	1500 3	250 1.5	<u>100</u> <u>1</u>	600 <u>1</u>	4.12 0.462	4.28 0.456	2.91 0.425	3.25 0.429
ydroxide, as CaCO3 on balance	mg/L %	-	-	- - -	- -	< 1.0 98.6	< 1.0 102	< 1.0 100	< 1.0 99.6
agnesium	mg/L	-	-	-	-	14.9	14.5	15.3	16.1
otassium odium	mg/L mg/L	-	200	-	-	1.65 141	1.65 147	1.55 128	1.66 137
ulphate	mg/L	3090-4290 <sup>a</sup>	500	-	1000	28.8	28.7	27.9	29.1
utrients itrate	mg-N/L	400	10	-	100	0.124	0.0878	0.144	< 0.0050
itrite rthophosphate	mg-N/L mg-P/L	0.2-2 <sup>b</sup>	1 -	-	10	0.0012 0.036	0.0011 0.0399	0.0033 0.0451	0.0011 0.0132
otal ammonia	mg-N/L	1.31-18.5 <sup>c</sup>	-	-	-	0.109	0.0377	0.0354	0.0132
otal Kjeldahl nitrogen otal phosphorus	mg-N/L mg-P/L	-	-	-	-	0.214 0.0433	0.15 0.039	0.183 0.059	0.298 0.052
issolved Metals	-		ı	ı	l l				
luminum ntimony	μg/L μg/L	90	9500 6	5000	5000	156 0.14	< 3.0 < 0.10	< 3.0 < 0.10	3.6 < 0.10
rsenic arium	μg/L μg/L	50 10000	10 1000	100	25	0.65 66.3	0.76 60.9	0.58 61.6	0.71 68.4
eryllium	μg/L	1.5	8	100	100	< 0.020	< 0.020	< 0.020	< 0.020
ismuth oron	μg/L μg/L	12000	5000	- <u>500</u>	5000	< 0.050 492	< 0.050 <u>570</u>	< 0.050 495	< 0.050 480
admium	μg/L	2.5-4 <sup>a</sup>	5	5	80	0.0561	0.0191	0.0105	< 0.0050
hromium obalt	μg/L μg/L	10 40	50 1	8 50	50 1000	0.32	< 0.10 0.27	< 0.10 < 0.10	0.15 0.91
opper	μg/L	50-90 <sup>a</sup>	1500	200 5000	300	7.27 106	2.74 < 10	4.44 < 10	0.4 77
on ead	μg/L μg/L	- 60-160 <sup>a</sup>	6500 10	200	100	0.627	0.135	0.137	< 0.050
thium langanese	μg/L μg/L	-	<i>8</i> 1500	2500 200	5000	112 242	116 237	<i>122</i> 43.4	<i>117</i> 558
lercury	μg/L	0.25	1	1	2	< 0.0050	< 0.0050	< 0.0050	< 0.0050
lolybdenum ickel	μg/L μg/L	10000 1100-1500	250 80	<u>10</u> 200	50 1000	<u>12.3</u> 2.04	<u>12.7</u> 1.18	9.12 < 0.50	9.93 2.45
elenium ilicon	μg/L μg/L	20	10	20	30	< 0.050 4310	< 0.050 4320	< 0.050 4230	0.211 4450
ilver	μg/L	15	20	-	-	< 0.010	< 0.010	< 0.010	< 0.010
trontium hallium	μg/L μg/L	3	2500	-	-	775 0.023	801 0.014	787 0.013	787 < 0.010
in itanium	μg/L μg/L	1000	2500	-	-	0.35 < 10	< 0.10 < 10	< 0.10 < 10	2.17 < 10
ranium	μg/L	85	20	10	200	1.98	1.99	1.65	1.96
anadium inc	μg/L μg/L	900-3150	20 3000	100 5000	100 2000	0.81 16.1	< 0.50 6.5	< 0.50 5.2	< 0.50 1.3
otal Metals		1	T						
luminum ntimony	μg/L μg/L	-	-	-	-	- -	53.2 < 0.10	415 < 0.10	189 0.25
rsenic arium	μg/L μg/L	-	-	-	-	<u>-</u> -	0.6 60.7	0.66 66.2	0.92 69.8
eryllium	μg/L	-	-	-	-	-	< 0.020	0.02	< 0.020
ismuth oron	μg/L μg/L	-	-	-	-	<u>-</u>	< 0.050 593	< 0.050 464	< 0.050 547
admium alcium	μg/L μg/L	-	-	-	-	-	0.0239 28800	0.0355 28500	0.0317 30100
hromium	μg/L	-	-	-	-	-	0.17	2.56	0.48
obalt opper	μg/L μg/L	-	-	-	-	-	0.31 4.17	0.4 7.56	1.13 2.7
on ead	μg/L μg/L	-	-	-	-	-	50 0.281	259 0.435	313 0.635
thium	μg/L	-	-	-	-	-	126	114	122
agnesium anganese	μg/L μg/L	-	-	-	-	<u>-</u> -	15100 257	14600 235	17100 563
ercury olybdenum	μg/L μg/L	-	-	-	-	-	12.2	9.55	8.92
ickel	μg/L	-	-	-	-	-	1.36	1.56	3.14
otassium elenium	μg/L μg/L	-	-	-	-	<u>-</u> -	1660 < 0.050	1690 < 0.050	1760 < 0.050
licon	μg/L	-	-	-	-	-	4460	5050	4610
lver odium	μg/L μg/L	-	-	-	-	-	< 0.010 147000	0.012 139000	< 0.010 142000
trontium hallium	μg/L μg/L	-	-	-	-	-	778 0.018	810 0.021	822 0.011
in	μg/L	-	-	-	-	-	0.13	0.27	1.25
itanium ranium	μg/L μg/L	-	-	-	-	<u>-</u>	< 10 2.12	15 1.87	< 10 1.47
anadium	μg/L	-	-	-	-	-	< 0.50	1.08	0.56
nc ydrocarbons	μg/L	-	-	-	-	-	8.3	10.3	13.6
	mg/L	5	5	5	5	-	-	-	-
					1			1	
xtractable Petroleum ydrocarbons (C10-C19) xtractable Petroleum	mg/L	-	-	-	-	-	-	-	-
ydrocarbons (C10-C19)	mg/L	-	-	-	-	-	-	-	-

 $\mu$ S/cm = microSiemen per centimetre; °C = degrees Celcius; mg/L = milligram per litre; mV = millivolt; NTU = nephelometric turbidity Units; TCU = true colour unit

QA/QC = quality assurance/quality control; FDA = Field Duplicate Available; FD = Field Duplicate Standards from the Contaminated Sites Regulation (CSR), enacted in 1997, updated January 2019, and includes B.C.

Regs. 11/2019 and 13/2019 amendments. AW-F = groundwater flow to surface water used by freshwater aquatic life; DW = groundwater used for drinking water, IW = groundwater used for irrigation; LW = groundwater used for livestock watering

An interim background groundwater estimate of 20 µg/L for cobalt was used to screen the data consistent with ENV Technical Bulletin 3 *Regional Background Concentrations for Select Inorganic Substances in Groundwater* dated 24

September 2018. < Indicates parameter was below laboratory equipment detection limit.

- In results column indicates parameter was not analyzed. In guideline column indicates no guideline. <sup>a</sup> = standard is hardness dependent; <sup>b</sup> = standard is chloride dependent; <sup>c</sup> = standard is pH dependent

<u>Underline</u> - concentration exceeds BC CSR IW

# Full Suite of Analytes compared to British Columbia Contaminated Site Regulations Standards

					Location Sample Date	2019-03-18	LC_PIZ 2019-05-27	2019-09-12	2019-11-2
Chemical Name	Unit	BC CSR AW-F	BC CSR DW	BC CSR IW	QA/QC BC CSR LW				
ield Measured onductivity	μS/cm	<del>-                                    </del>	-	-	-	1109	1104	1205	1137
issolved oxygen issolved oxygen saturation	mg/L %	-	-	-	-	6.35 50.9	1.54 13.5	3.91 37.9	1.1 8.5
H edox potential	- mV	-	-	-	-	7.25 166.1	7.08 10.3	7.19 123.7	7.24 -11.0
emperature	°C	-	-	-	-	5.7	9	13.3	4.146
urbidity onventional Parameters	NTU	-	-	-	-	150	22	38	39.5
cidity to pH 8.3 (as CaCO3) onductivity	mg/L μS/cm	-	-	-	-	7.8 1180	12.2 1070	12.2 1140	19.5 1060
issolved organic carbon ardness, as CaCO3 (N)	mg/L mg/L	-	-	-	-	1.3 546	1.08 501	< 0.50 552	1.84 508
Oxidation-reduction potential	mV -	-	-	-	-	403 7.96	317 8.1	338 8.03	303 7.56
pecific conductivity otal alkalinity, as CaCO3	μS/cm mg/L	-	-	-	-	1109 245	1064 267	1205 250	1137 265
otal dissolved solids	mg/L	-	-	-	-	819	838	975	705
otal organic carbon otal suspended solids	mg/L mg/L	-	-	-	-	2.36	0.99 17.7	1.24 16.2	1.81 82.6
urbidity <b>Iajor Ion</b> s	NTU	-	-	-	-	176	26.4	21.1	48.8
nion Sum icarbonate, as CaCO3	meq/L mg/L	-	-	-	-	12.2 245	11.3 267	11.9 250	11.4 265
romide alcium	mg/L mg/L	-	-	-	- 1000	2.7 139	2.34 128	2.3 141	2.23 131
arbonate, as CaCO3 ation Sum	mg/L meq/L	-	-	-	-	< 1.0 11.7	< 1.0 10.8	< 1.0 11.8	< 1.0 10.8
ation-anion balance	%	-	-	-	-	-	-	-	-
hloride luoride	mg/L mg/L	1500 3	250 <i>1.5</i>	<u>100</u> <u>1</u>	600 <u>1</u>	<u>203</u> 0.24	<u>181</u> 0.364	<u>198</u> 0.28	<u>187</u> 0.23
ydroxide, as CaCO3 on balance	mg/L %	-	-	-	-	< 1.0 95.8	< 1.0 95.3	< 1.0 99.3	< 1.0 95.3
lagnesium otassium	mg/L mg/L	-	-	-	-	48.3 2.68	44.2 2.51	48.6 2.82	43.7 2.36
odium ulphate	mg/L mg/L	- 3090-4290 <sup>a</sup>	200 500	-	1000	16.3 74.7	13.4 40.3	15.6 60.5	12.2 36.2
lutrients	<del>-</del>				!				
itrate itrite	mg-N/L mg-N/L	400 0.2-2 <sup>b</sup>	10 1	-	100 10	0.357 < 0.0050	0.165 0.0019	0.279 < 0.0050	0.249 < 0.0050
orthophosphate otal ammonia	mg-P/L mg-N/L	- 1.31-18.5 <sup>c</sup>	-	-	-	0.0015 0.013	0.001 0.0151	< 0.0010 < 0.0050	< 0.0010 0.0133
otal Kjeldahl nitrogen otal phosphorus	mg-N/L mg-P/L	-	-	-	-	0.365 0.414	0.134 0.0576	0.149 0.0378	0.206 0.155
issolved Metals	<b>-</b>				<u> </u>				
luminum ntimony	μg/L μg/L	90	9500 6	5000 -	5000	< 3.0 0.12	< 3.0 < 0.10	< 3.0 0.14	< 3.0 0.16
rsenic arium	μg/L μg/L	50 10000	10 1000	100	25	0.37 246	1.21 314	0.32 282	0.84 317
eryllium ismuth	μg/L μg/L	1.5 -	8	100	100	< 0.020 < 0.050	< 0.020 < 0.050	< 0.020 < 0.050	< 0.020 < 0.050
oron admium	μg/L μg/L	12000 2.5-4 <sup>a</sup>	5000 5	<u>500</u> 5	5000 80	26 0.146	24 0.0069	24 0.0453	25 0.0257
hromium	μg/L	10	50	8	50	< 0.10	< 0.10	< 0.10	< 0.10
obalt opper	μg/L μg/L	40 50-90 <sup>a</sup>	<i>1</i> 1500	50 200	1000 300	<i>1.25</i> < 0.50	<i>1.68</i> < 0.50	<i>1.07</i> 0.53	<i>1.88</i> 1.68
ron ead	μg/L μg/L	- 60-160 <sup>a</sup>	6500 10	5000 200	100	< 10 < 0.050	1730 < 0.050	< 10 < 0.050	825 < 0.050
ithium langanese	μg/L μg/L	-	<i>8</i> 1500	2500 200	5000	23.1 580	<i>18.4</i> 1070	22.5 584	<i>16.7</i> 1100
lercury lolybdenum	μg/L μg/L	0.25 10000	1 250	1 10	2 50	< 0.0050 2.25	< 0.0050 2.46	< 0.0050 1.77	< 0.0050 3.02
ickel	μg/L	1100-1500	80	200	1000	2.73	2.56	2.8	3.21
elenium ilicon	μg/L μg/L	20	10 -	20 -	30	0.188 4450	0.137 4980	0.155 4720	< 0.050 4870
ilver trontium	μg/L μg/L	15 -	20 2500	-	-	< 0.010 506	< 0.010 461	< 0.010 473	< 0.010 450
hallium in	μg/L μg/L	3 -	2500	-	-	0.041 < 0.10	< 0.010 < 0.10	0.016 < 0.10	0.028 0.14
itanium ranium	μg/L μg/L	1000 85	20	- 10	200	< 10 3.47	< 10 3.66	< 10 3.66	< 10 4.13
anadium inc	μg/L	900-3150	20 3000	100 5000	100	< 0.50	< 0.50 7.1	< 0.50 10.6	< 0.50 12.3
otal Metals	µg/L			5000					
luminum ntimony	μg/L μg/L	-	-	-	-	2200 0.39	110 < 0.10	210 0.19	601 0.32
rsenic arium	μg/L μg/L	-	-	-	-	2.95 300	1.39 330	0.7 293	1.9 346
eryllium ismuth	μg/L μg/L	-	-	-	-	0.2 < 0.050	< 0.020 < 0.050	< 0.020 < 0.050	0.05 < 0.050
oron admium	μg/L μg/L	-	-	-	-	27 0.532	21 0.0271	26 0.0734	23
alcium	μg/L	-	-	-	-	141000	134000	151000	139000
hromium obalt	μg/L μg/L	-	-	-	-	6.34 3.21	0.8 1.49	0.81 1.15	1.86
opper on	μg/L μg/L	-	-	-	-	11.2 5680	2.97 2530	2.21 945	24.7 3310
ead thium	μg/L μg/L	-	-	-	-	3.01 22.8	0.203 18	0.407 24	1.51 17.5
lagnesium langanese	μg/L μg/L	-	-	-	-	46600 786	45500 883	45500 564	45700 1070
lercury lolybdenum	μg/L	-	-	-	-	2.99	2.08	- 1.58	2.58
ickel	µg/L µg/L	-	-	-	-	9.25	2.67	2.98	4.67
otassium elenium	μg/L μg/L	-	-	-	-	3640 0.459	2390 0.07	2840 0.322	2500 0.145
licon Iver	μg/L μg/L	-	-	-	-	7840 0.078	5020 < 0.010	4950 < 0.010	5860 0.039
odium crontium	μg/L μg/L	-	-	-	-	16800 509	12700 436	14700 477	11600 461
hallium	μg/L μg/L	-	-	-	-	0.132 0.36	0.015 < 0.10	0.023	0.062 0.24
tanium	μg/L	-	-	-	-	18	< 10	< 10	< 10
ranium anadium	μg/L μg/L	-	-	-	-	4.01 8.53	3.87 0.51	3.65 0.85	3.99 2.5
nc ydrocarbons	μg/L	-	-	-	-	35.3	7.6	13.1	28.6
xtractable Petroleum ydrocarbons (C10-C19)	mg/L	5	5	5	5	-	-	-	-
· · · · · · · · · · · · · · · · · · ·	mg/L	-	-	-	-	-	-	-	-
xtractable Petroleum ydrocarbons (C19-C32)	mg/L								

 $\mu$ S/cm = microSiemen per centimetre; °C = degrees Celcius; mg/L = milligram per litre; mV = millivolt; NTU = nephelometric turbidity Units; TCU = true colour unit

QA/QC = quality assurance/quality control; FDA = Field Duplicate Available; FD = Field Duplicate
Standards from the Contaminated Sites Regulation (CSR), enacted in 1997, updated January 2019, and includes B.C. Regs. 11/2019 and 13/2019 amendments.

AW-F = groundwater flow to surface water used by freshwater aquatic life; DW = groundwater used for drinking water, IW = groundwater used for irrigation; LW = groundwater used for livestock watering An interim background groundwater estimate of 20 µg/L for cobalt was used to screen the data consistent with ENV Technical Bulletin 3 *Regional Background Concentrations for Select Inorganic Substances in Groundwater* dated 24

September 2018.

< Indicates parameter was below laboratory equipment detection limit. - In results column indicates parameter was not analyzed. In guideline column indicates no guideline.

<sup>a</sup> = standard is hardness dependent; <sup>b</sup> = standard is chloride dependent; <sup>c</sup> = standard is pH dependent

<u>Underline</u> - concentration exceeds BC CSR IW

					Location Sample Date	2019-03-29	LC_PIZ 2019-06-25	P1105 2019-09-05	2019-11-14
Chemical Name	Unit	BC CSR AW-F	BC CSR DW	BC CSR IW	QA/QC BC CSR LW				
ield Measured onductivity	μS/cm		_	_		1101	1172	1273	1259
issolved oxygen	mg/L	-	-	-	-	4.57	4.24	5.7	5.84
issolved oxygen saturation H	%	-	-	-	-	33.1 6.97	38.8 6.82	50 7.08	47 7.01
edox potential emperature	mV °C	-	-	-	-	277.1 6.01	355.9 11.2	315.2 9.5	161.3 5.7
urbidity onventional Parameters	NTU	-	-	-	-	1072.1	370	-	122.74
cidity to pH 8.3 (as CaCO3) onductivity	mg/L µS/cm	-	-	-	-	78.6 1090	33.8 1120	123 1140	164 1040
issolved organic carbon	mg/L	-	-	-	-	2.27	1.75	0.86	< 0.50
lardness, as CaCO3 (N) Oxidation-reduction potential	mg/L mV	-	-	-	-	597 402	660 427	691 296	645 414
H pecific conductivity	- μS/cm	-	-	-	-	7.51 1101	7.57 1172	7.92 1273	7.65 1259
otal alkalinity, as CaCO3 otal dissolved solids	mg/L mg/L	-	-	-		407 648	416 730	492 869	418 825
otal organic carbon otal suspended solids	mg/L mg/L	-	-	-	-	3.5 4990	8 404	16.9 3270	3.08 283
urbidity	NTU	-	-	-	-	3530	302	3320	338
Major Ions nion Sum	meq/L	-	-	-	-	13.6	13.5	15.4	14.3
icarbonate, as CaCO3 romide	mg/L mg/L		-	-	-	407 1.47	416 1.74	492 1.52	418 1.64
alcium arbonate, as CaCO3	mg/L mg/L	-	-	-	1000	159 < 1.0	174 < 1.0	181 < 1.0	172 < 1.0
ation Sum	meq/L	-	-	-	-	12.6	13.9	14.6	13.6
ation-anion balance hloride	% mg/L	1500	- 250	- <u>100</u>	600	- <u>118</u>	1.2 <u>118</u>	- <u>125</u>	- <u>135</u>
uoride ydroxide, as CaCO3	mg/L mg/L	3 -	1.5 -	<u>1</u> -	<u>1</u>	0.37 < 1.0	< 0.10 < 1.0	0.31 < 1.0	0.32 < 1.0
on balance lagnesium	% mg/L	-	-	-	-	92.3 48.6	103 54.7	94.9 58.1	94.9 52.4
otassium	mg/L	-	-	-	-	1.72	1.85	2.04	1.79
odium ulphate	mg/L mg/L	- 3090-4290 <sup>a</sup>	200 500	-	1000	13.4 102	14.4 87.9	16.3 95.2	14.3 102
utrients itrate	mg-N/L	400	10	_	100	0.181	0.605	0.039	0.051
itrite	mg-N/L	0.2-2 <sup>b</sup>	1	-	10	< 0.0050	< 0.0050	< 0.0050	< 0.0050
rthophosphate otal ammonia	mg-P/L mg-N/L	- 1.31-18.5 <sup>c</sup>	-	-	-	0.0086 0.0558	< 0.0010 < 0.0050	0.0102 0.005	0.0078 < 0.0050
otal Kjeldahl nitrogen otal phosphorus	mg-N/L mg-P/L	-	-	-	-	3.56 5.7	< 0.050 0.534	2.86 4.71	0.266 0.32
issolved Metals		1							
luminum ntimony	μg/L μg/L	90	9500 6	5000 -	5000	< 3.0 0.59	< 3.0 0.38	< 3.0 < 0.10	< 3.0 < 0.10
rsenic arium	μg/L μg/L	50 10000	10 1000	100	25	< 0.10 89.7	< 0.10 89.5	< 0.10 108	0.1 92.8
eryllium ismuth	μg/L μg/L	1.5	8	100	100	< 0.020 < 0.050	< 0.020 < 0.050	< 0.020 < 0.050	< 0.020 < 0.050
oron	μg/L	12000	5000	<u>500</u>	5000	18	22	21	20
admium hromium	μg/L μg/L	2.5-4 <sup>a</sup>	5 50	5 8	80 50	0.0633 < 0.10	0.0528 < 0.10	0.0355 < 0.10	0.067 < 0.10
obalt opper	μg/L μg/L	40 50-90 <sup>a</sup>	<i>1</i> 1500	50 200	1000 300	< 0.10 < 0.50	< 0.10 5.02	< 0.10 < 0.50	0.28 0.42
on	μg/L	-	6500	5000	-	< 10	< 10	< 10	< 10
ead Ithium	μg/L μg/L	60-160 <sup>a</sup>	10 <i>8</i>	200 2500	100 5000	< 0.050 <i>16</i>	0.27 <i>16.8</i>	< 0.050 17.8	< 0.050 17.1
langanese lercury	μg/L μg/L	0.25	1500 1	<u>200</u> 1	2	3.08 < 0.0050	10.8 < 0.0050	2.8 < 0.0050	74.7 < 0.0050
lolybdenum	μg/L	10000	250	<u>10</u>	50	0.338	0.23	0.235	0.331
ickel elenium	μg/L μg/L	1100-1500 20	80 <i>10</i>	200 20	1000 30	1.17 0.704	0.97 0.237	0.67 0.078	1.62 0.238
ilicon ilver	μg/L μg/L	- 15	20	-	-	4680 < 0.010	5180 < 0.010	5130 < 0.010	5150 < 0.010
trontium hallium	μg/L μg/L	- 3	2500	-	-	351 0.031	371 0.021	430 0.022	391 0.03
in	μg/L	-	2500	-	-	< 0.10	1.38	0.44	0.17
itanium ranium	μg/L μg/L	1000 85	20	- 10	200	< 10 0.481	< 10 0.495	< 10 0.558	< 10 0.429
anadium inc	μg/L μg/L	900-3150	20 3000	100 5000	100 2000	< 0.50 1.9	< 0.50 7.5	< 0.50 2.4	< 0.50 5.2
otal Metals Iuminum	μg/L	_	_	_		26900	3160	6050	2670
ntimony	μg/L	-	-	-	-	1.71	0.98	0.64	0.31
rsenic arium	μg/L μg/L	-	-	-	-	16.5 1140	2.62 204	4.79 338	1.92 159
eryllium ismuth	μg/L μg/L	-	-	-	-	2.12 0.5	0.261 < 0.050	0.523 0.072	0.179 < 0.050
oron admium	μg/L μg/L	-	-	-	-	< 50 4.77	26 0.476	29 2.62	27 0.377
alcium	μg/L	-	-	-	-	436000	198000	419000	183000
nromium obalt	μg/L μg/L	-	-	-	-	53.6 35.5	6.08 3.47	11.5 7.79	4.74 1.93
opper on	μg/L μg/L	-	-	-	-	68.3 57600	7.23 6920	11 10800	5.03 4780
ead thium	μg/L μg/L	-	-	-	-	29.8 61.3	3.05 22.2	4.45	2.11
agnesium	μg/L	-	-	-	-	114000	59300	90300	55200
anganese ercury	μg/L μg/L	-	-	-	-	3760 < 0.50	423 < 0.0050	1510 0.259	227 0.0153
olybdenum ckel	μg/L μg/L	-	-	-	-	2.09 73.1	0.885 8.3	1.23 15.1	0.765 6.3
otassium	μg/L	-	-	-	-	6580 2.66	2590 0.412	3510 0.487	2690 0.444
elenium licon	μg/L μg/L	-	-	-	-	36500	8720	14700	9390
lver odium	μg/L μg/L	-	-	-	-	0.943 14300	0.094 14000	0.123 14800	0.065 15000
rontium	μg/L μg/L	-	-	-	-	687	427 0.171	661	385 0.149
n	μg/L	-	-	-	-	1.12	1.12	0.31	0.28
tanium ranium	μg/L μg/L	-	-	-	-	76 3.8	20 0.843	55 0.709	16 0.647
anadium nc	μg/L μg/L		-	-	-	68.8 413	9.57 45.8	16.4 92.7	8.04 38.1
ydrocarbons					· · · · · · · · · · · · · · · · · · ·				
tractable Petroleum ydrocarbons (C10-C19)	mg/L	5	5	5	5	< 0.25	< 0.25	< 0.25	< 0.25
tractable Petroleum ydrocarbons (C19-C32)	mg/L	-	-	1	-	< 0.25	< 0.25	< 0.25	< 0.25
um of Extractable Petroleum	mg/L	-	-	-	-	< 0.50	< 0.50	< 0.50	< 0.50
ydrocarbons									

< 0.25

< 0.25

< 0.25

< 0.25

Total Extractable Petroleum

Hydrocarbons (C10-C30)

μS/cm = microSiemen per centimetre; °C = degrees Celcius; mg/L = milligram per litre; mV = millivolt; NTU =

nephelometric turbidity Units; TCU = true colour unit QA/QC = quality assurance/quality control; FDA = Field Duplicate Available; FD = Field Duplicate Standards from the Contaminated Sites Regulation (CSR), enacted in 1997, updated January 2019, and includes B.C.

Regs. 11/2019 and 13/2019 amendments.

AW-F = groundwater flow to surface water used by freshwater aquatic life; DW = groundwater used for drinking water, IW = groundwater used for irrigation; LW = groundwater used for livestock watering
An interim background groundwater estimate of 20 µg/L for cobalt was used to screen the data consistent with ENV
Technical Bulletin 3 Regional Background Concentrations for Select Inorganic Substances in Groundwater dated 24

September 2018. < Indicates parameter was below laboratory equipment detection limit.

- In results column indicates parameter was not analyzed. In guideline column indicates no guideline. <sup>a</sup> = standard is hardness dependent; <sup>b</sup> = standard is chloride dependent; <sup>c</sup> = standard is pH dependent

<u>Underline</u> - concentration exceeds BC CSR IW

					Location Sample Date	2019-02-25	RG_DV 2019-05-27	V-02-20 2019-08-20	2019-11-28
Chemical Name	Unit	BC CSR AW-F	BC CSR DW	BC CSR IW	QA/QC BC CSR LW				<u> </u>
Field Measured Conductivity	μS/cm	· .	-	_		502.9	515.5	433.4	765
Dissolved oxygen	mg/L	-	-	-	-	8.39	9.13	8.84	8.25
Dissolved oxygen saturation oH	% -	-	-	-	-	66.8 7.7	80.0 7.48	75.7 7.15	71.2 7.56
Redox potential	mV	-	-	-	-	301.8	248	162.1	166.4
emperature Turbidity	°C NTU	-	-	-	-	5.6 -	9.3	8.6	8.8
Conventional Parameters				· -		4.0	0.0		
Acidity to pH 8.3 (as CaCO3) Conductivity	mg/L μS/cm	-	-	-	-	4.0 462	3.8 504	5.0 460	5.5 426
Dissolved organic carbon	mg/L	-	-	-	-	< 0.5 244	< 0.5 257	< 0.5 240	< 0.5
Hardness, as CaCO3 (N)  Dxidation-reduction potential	mg/L mV	-	-	-	-	419	426	380	233 379
oH Specific conductivity	- μS/cm	-	-	-	-	7.98	8.36	8.19	7.89
Total alkalinity, as CaCO3	μ3/cm mg/L	-	-	-	-	172	168	169	166
otal dissolved solids otal organic carbon	mg/L mg/L	-	-	-	-	378 < 0.5	311 < 0.5	280 < 0.5	280 < 0.5
Total suspended solids	mg/L	-	-	-	-	< 1.0	< 1.0	2.8	< 1.0
Turbidity Major Ions	NTU	-	-	-	- 1	2.22	0.84	1.12	2.37
Anion Sum	meq/L	-	-	-	-	5.33	5.48	4.99	4.82
Bicarbonate, as CaCO3 Bromide	mg/L mg/L	-	-	-	-	172 < 0.05	166 < 0.05	169 < 0.05	166 < 0.05
Calcium	mg/L	-	-	-	1000	66.9	69.4	63.0	61.3
Carbonate, as CaCO3	mg/L meq/L	-	-	-	-	< 1.0 5.0	2.4 5.27	< 1.0 4.93	< 1.0 4.77
ation-anion balance	%	-	-	-	-	-3.2	-2.0	-0.5	-0.5
hloride luoride	mg/L mg/L	1500 3	250 1.5	<u>100</u> 1	600	2.58 0.19	3.22 0.181	1.77 0.169	1.84 0.128
lydroxide, as CaCO3	mg/L	-	-	-	-	< 1.0	< 1.0	< 1.0	< 1.0
on balance Nagnesium	% mg/L	-	<u>-</u>	-	-	93.8 18.8	96.1 20.3	98.9 20.2	99.1 19.4
otassium	mg/L	-	-	-	-	0.52	0.629	0.629	0.594
Godium Gulphate	mg/L mg/L	- 3090-4290 <sup>a</sup>	200 500	-	1000	2.4 77.6	2.82 87.0	2.64 67.1	2.38 61.6
lutrients	IIIg/L	3090-4290	300	-	1000	77.0	07.0	07.1	01.0
litrate litrite	mg-N/L mg-N/L	400	10 1	-	100 10	2.76 < 0.001	2.99 < 0.001	2.22 < 0.001	2.17 < 0.001
Orthophosphate	mg-N/L mg-P/L	0.2-2 <sup>b</sup>	- -	-	-	< 0.001 0.0019	< 0.001 0.0015	< 0.001 < 0.001	< 0.001
otal ammonia	mg-N/L	1.31-18.5 <sup>c</sup>	-	-	-	< 0.005	< 0.005	< 0.005	0.0057
otal Kjeldahl nitrogen otal phosphorus	mg-N/L mg-P/L	-	-	-	-	0.303 < 0.002	0.121 < 0.002	0.368 < 0.002	0.137 < 0.002
Dissolved Metals									
luminum ntimony	μg/L μg/L	90	9500 6	5000	5000	< 3 < 0.1	< 3 < 0.1	< 3 < 0.1	< 3 < 0.1
rsenic	μg/L	50	10	100	25	< 0.1	< 0.1	< 0.1	< 0.1
arium eryllium	μg/L μg/L	10000 1.5	1000 8	100	100	80 < 0.02	89.4 < 0.02	85.3 < 0.02	80.7 < 0.02
ismuth	μg/L	-	-	-	-	< 0.05	< 0.05	< 0.05	< 0.05
oron Cadmium	μg/L μg/L	12000 2.5-4 <sup>a</sup>	5000 5	<u>500</u> 5	5000 80	< 10 0.007	< 10 0.0094	< 10 0.0071	< 10 0.0062
Chromium	μg/L	10	50	8	50	0.17	0.18	0.19	0.14
Cobalt Copper	μg/L μg/L	40 50-90 <sup>a</sup>	<i>1</i> 1500	50 200	1000 300	< 0.1 1.14	< 0.1 2.13	< 0.1 5.48	< 0.1 3.56
ron	μg/L	50-90	6500	5000	-	< 10	< 10	< 10	< 10
ead	μg/L	60-160 <sup>a</sup>	10 <i>8</i>	200 2500	100 5000	< 0.05 6.8	< 0.05	0.143 6.7	0.066 6.4
Lithium Manganese	μg/L μg/L	-	1500	200 200	-	0.61	1.82	1.1	0.93
Mercury Molybdenum	μg/L	0.25 10000	1 250	1 10	2 50	< 0.005 1.01	< 0.005 0.972	< 0.005 1.05	< 0.005 1.07
Vickel	μg/L μg/L	1100-1500	80	200	1000	< 0.5	< 0.5	< 0.5	< 0.5
Selenium Silicon	μg/L μg/L	20	10 -	20	30	<i>12.4</i> 2110	<i>14.5</i> 2290	<i>11.5</i> 2360	<i>10.2</i> 2250
Silver	μg/L μg/L	15	20	-	-	< 0.01	< 0.01	< 0.01	< 0.01
Strontium Fhallium	μg/L μg/L	3	2500	-	-	220 < 0.01	245 < 0.01	226 < 0.01	207 < 0.01
in	μg/L μg/L	-	2500	-	-	< 0.01	< 0.1	< 0.1	< 0.01
Titanium Jranium	μg/L μg/L	1000 85	20	- 10	200	< 10 0.998	< 10 1.09	< 10 1.06	< 10 0.968
/anadium	μg/L μg/L	-	20	100	100	< 0.5	< 0.5	< 0.5	< 0.5
inc Total Metals	μg/L	900-3150	3000	5000	2000	5.5	5.6	11.2	8.8
Aluminum	μg/L	-	-	-	-	< 3	< 3	< 3	< 3
Intimony Irsenic	μg/L μg/L	-	-	-	-	< 0.1 0.11	< 0.1 < 0.1	< 0.1 < 0.1	< 0.1 < 0.1
arium	μg/L	-	-	-	-	89.3	93.3	87.5	80.6
eryllium ismuth	μg/L μg/L	-	-	-	-	< 0.02 < 0.05	< 0.02 < 0.05	< 0.02 < 0.05	< 0.02 < 0.05
oron	μg/L	-	-	-	-	< 10	< 10	< 10	< 10
admium alcium	μg/L μg/L	-	-	-	-	0.0077 62900	0.0077 69300	0.0097 66700	0.0066 61800
hromium	μg/L	-	-	-	-	0.26	0.23	0.22	0.22
obalt opper	μg/L μg/L	-	-	-	-	< 0.1 1.4	< 0.1 2.7	< 0.1 6.18	< 0.1 3.14
ron	μg/L	-	-	-	-	176	80	124	170
ead ithium	μg/L μg/L	-	-	-	-	0.051 6.1	0.134 6.6	0.236 7.1	0.096 6.8
itnium Iagnesium	μg/L	-	-	-	-	20500	21600	19300	20200
langanese lercury	μg/L μg/L	-	-	-	-	2.19 < 0.005	2.04 < 0.005	2.64 < 0.005	2.17 < 0.005
lolybdenum	μg/L	-	-	-	-	1.15	1.06	1.11	1.09
lickel otassium	μg/L μg/L	-	-	-	-	< 0.5 565	< 0.5 587	< 0.5 584	< 0.5 617
elenium	μg/L	-	-	-	-	12.9	13.7	10.1	9.67
ilicon ilver	μg/L	-	-	-	-	2240 < 0.01	2450 < 0.01	2340 < 0.01	2410 < 0.01
odium	μg/L μg/L	-	-	-	-	2510	< 0.01 2760	< 0.01 2590	2500
trontium	μg/L	-	-	-	-	246	246	236	220
hallium in	μg/L μg/L	-	- -	-	-	< 0.01 < 0.1	< 0.01 < 0.1	< 0.01 < 0.1	< 0.01 0.15
itanium	μg/L	-	-	-	-	< 10	< 10	< 10	< 10
Iranium 'anadium	μg/L μg/L	-	- -	-	-	1.05 < 0.5	1.14 < 0.5	1.04 < 0.5	0.979 < 0.5
inc	μg/L	-	-	-	-	3.4	6.1	16.2	5.3
lydrocarbons xtractable Petroleum	mg/L	5	5	5	5	-	-	-	-
lydrocarbons (C10-C19)									
extractable Petroleum  Hydrocarbons (C19-C32)	mg/L	-	-	-	-	-	-		-
Sum of Extractable Petroleum	mg/L	-	-	-	-	-	-	-	-
Hydrocarbons Total Extractable Petroleum	mg/L	_	_	-	-	-	-	-	_
Hydrocarbons (C10-C30)	g/ =								

 $\mu$ S/cm = microSiemen per centimetre; °C = degrees Celcius; mg/L = milligram per litre; mV = millivolt; NTU = nephelometric turbidity Units; TCU = true colour unit

QA/QC = quality assurance/quality control; FDA = Field Duplicate Available; FD = Field Duplicate Standards from the Contaminated Sites Regulation (CSR), enacted in 1997, updated January 2019, and includes B.C.

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An interim background groundwater estimate of 20 µg/L for cobalt was used to screen the data consistent with ENV
Technical Bulletin 3 Regional Background Concentrations for Select Inorganic Substances in Groundwater dated 24

September 2018.

< Indicates parameter was below laboratory equipment detection limit. - In results column indicates parameter was not analyzed. In guideline column indicates no guideline.

<sup>a</sup> = standard is hardness dependent; <sup>b</sup> = standard is chloride dependent; <sup>c</sup> = standard is pH dependent

<u>Underline</u> - concentration exceeds BC CSR IW

					Location		LC_PIZ		
					Sample Date QA/QC	2019-03-26	2019-06-05	2019-09-03	2019-11-06
Chemical Name	Unit	BC CSR AW-F	BC CSR DW	BC CSR IW	BC CSR LW				
Field Measured Conductivity	μS/cm	<del>-</del> -	-	-		352.1	652.2	688.4	681
Dissolved oxygen	mg/L	-	-	-	-	8.59	6.42	5.43	5.12
Dissolved oxygen saturation  OH	%	-	-	-	-	70.3 7.61	57.6 6.97	45.2 6.87	39 7.09
Redox potential	mV	-	-	-	-	317.2	295.9	318.4	207.4
emperature	°C	-	-	-	-	6.3	10.2	7.5	3.805
urbidity Conventional Parameters	NTU	-	-	-	-	28	26	0	9.25
Acidity to pH 8.3 (as CaCO3)	mg/L	-	-	-	-	5.4	5.2	12.4	1.7
Conductivity Dissolved organic carbon	μS/cm mg/L	-	-	-	-	355 5.14	672 2.6	650 2.47	587 3.38
Hardness, as CaCO3 (N)	mg/L	-	-	-	-	193	372	377	375
Oxidation-reduction potential	mV	-	-	-	-	419 7.94	340	403 8.27	513
bH Specific conductivity	- μS/cm	-	-	-	-	7.94 352.1	8.37 652.2	688.4	8.21 681
otal alkalinity, as CaCO3	mg/L	-	-	-	-	206	370	377	352
otal dissolved solids otal organic carbon	mg/L mg/L	-	-	-	-	207 4.65	388 3.66	387 2.57	424 4.73
otal suspended solids	mg/L	-	-	-	-	2.5	12	4.2	8
Turbidity	NTU	-	-	-	-	6.69	12.9	3.73	21.3
Major Ions Anion Sum	meg/L	-	-	-	-	4.21	7.89	7.83	7.31
Bicarbonate	mg/L	-	-	-	-	-	-	-	-
Bicarbonate, as CaCO3 Bromide	mg/L mg/L	-	-	-	-	206 < 0.050	356 < 0.050	377 < 0.050	352 < 0.050
Calcium	mg/L	-	-	-	1000	53.8	103	101	104
Carbonate	mg/L	-	-	-	-	- 10	- 14.4	- 10	- 10
Carbonate, as CaCO3 Cation Sum	mg/L meq/L	-	-	-	-	< 1.0 4.13	14.4 7.66	< 1.0 7.71	< 1.0 7.69
Cation-anion balance	%	-	-	-	-	-	-	-	2.5
Chloride Tuoride	mg/L mg/L	1500 3	250 1.5	100 1	600	< 0.50 0.144	0.69 0.107	0.72 0.087	1.07 0.126
łydroxide	mg/L	-	-	-	-	-	-	-	-
Hydroxide, as CaCO3	mg/L	-	-	-	-	< 1.0	< 1.0	< 1.0	< 1.0
on balance Magnesium	% mg/L	-	-	-	-	98.1 14.2	97 27.7	98.5 30.5	105 28
Potassium	mg/L	-	-	-	-	1.13	1.38	1.46	1.61
Sodium Sulphate	mg/L mg/L	4290	200 500	-	1000	5.7 3.61	4.43 20.3	3.45 12.3	3.5 11.7
Nutrients									
litrate Jitrite	mg-N/L mg-N/L	400 0.2-0.8	10 1	-	100 10	0.273 < 0.0010	0.644 < 0.0010	0.339 < 0.0010	0.113 < 0.0010
Orthophosphate	mg-N/L mg-P/L	-	<u> </u>	-	-	0.0172	0.0010	0.011	0.0010
otal ammonia	mg-N/L	1.31-18.5	-	-	-	0.0061	0.0097	0.0066	< 0.0050
otal Kjeldahl nitrogen otal phosphorus	mg-N/L mg-P/L	-	-	-	-	0.309 0.0173	0.242 0.041	0.358 0.0116	0.149 0.0283
Dissolved Metals	IIIg-F7L	-	-	-	-	0.0173	0.041	0.0110	0.0203
Aluminum	μg/L	-	9500	5000	5000	5.4	< 3.0	< 3.0	< 3.0
Antimony Arsenic	μg/L μg/L	90 50	6 10	100	- 25	0.2	0.17 0.3	0.19 0.22	0.39 0.34
Barium	μg/L	10000	1000	-	-	115	178	241	316
Beryllium Bismuth	μg/L μg/L	1.5	-	100	100	< 0.020 < 0.050	< 0.020 < 0.050	< 0.020 < 0.050	< 0.020 < 0.050
Boron	μg/L	12000	5000	500	5000	< 10	< 10	< 10	< 10
Cadmium	μg/L	3.5-10	5	5	80	0.0757	0.108	0.0948	0.0564
Chromium Cobalt	μg/L μg/L	10 40	50 1	8 50	50 1000	0.1 < 0.10	< 0.10 < 0.10	< 0.10 < 0.10	0.12 < 0.10
Copper	μg/L	80-90	1500	200	300	3.08	8.57	0.65	0.6
ron Lead	μg/L μg/L	6-160	6500 10	5000 200	100	< 10 0.079	< 10 0.458	< 10 < 0.050	< 10 < 0.050
Lithium	μg/L μg/L	-	8	2500	5000	1.6	2.3	3	3.3
Manganese	μg/L	- 0.25	1500 1	200	-	0.62	0.57	0.17	0.26
Mercury Molybdenum	μg/L μg/L	0.25 10000	250	<u> </u>	2 50	< 0.0050 1.01	< 0.0050 0.63	< 0.0050 0.545	< 0.0050 0.763
Nickel	μg/L	1500	80	200	1000	1.35	0.85	1.41	1.14
Selenium Silicon	μg/L μg/L	20	10 -	20	30	0.894 3200	1.01 5680	0.55 7010	1.57 6390
Silver	μg/L μg/L	15	20	-	-	< 0.010	< 0.010	< 0.010	< 0.010
Strontium	μg/L	-	2500	-	-	208	251	178	189
<u>Fhallium</u> Tin	μg/L μg/L	3 -	- 2500	-	-	< 0.010 < 0.10	< 0.010 < 0.10	0.011 < 0.10	0.01 0.12
- itanium	μg/L	1000	-	-	-	< 10	< 10	< 10	< 10
Jranium /anadium	μg/L μg/L	85 -	20 20	10 100	200 100	2.88 0.55	3.23 0.83	2.07 < 0.50	2.55 < 0.50
Zinc .	μg/L μg/L	900-2400	3000	5000	2000	4.4	18.4	1.9	1.4
Total Metals							200		07/
Muminum Antimony	μg/L μg/L	-	-	-	-	<u>-</u> -	308 0.29	66.3 0.23	276 0.42
rsenic	μg/L	-	-	-	-	-	0.52	0.27	0.54
Barium Beryllium	μg/L μg/L	-	-	-	-	<u>-</u>	217 < 0.020	257 < 0.020	293 1.92
Bismuth	μg/L	-	-	-	-	<u>-</u>	< 0.050	< 0.050	< 0.050
Soron	μg/L	-	-	-	-	-	< 10	< 10	10
Cadmium Calcium	μg/L μg/L	-	-	-	-	<u>-</u>	0.361 108000	0.152 104000	0.105 95000
Chromium	μg/L	-	-	-	-	-	0.73	0.22	0.68
Cobalt Copper	μg/L μg/L	-	-	-	-	<u>-</u>	0.81 9.64	0.22 0.77	0.39 99.8
ron	μg/L	-	-	-	-	- -	357	112	423
ead ithium	μg/L μg/l	-	-	-	-	<u>-</u>	1.29 2.4	0.115 3.1	0.346 3.2
itnium Nagnesium	μg/L μg/L	-	-	-	-	-	30200	3.1 29700	26700
Manganese	μg/L	-	-	-	-	-	94.8	17.9	10.6
Mercury Molybdenum	μg/L μg/L	-	-	-	-	0.0064	0.64	- 0.538	- 0.798
lickel	μg/L	-	-	-	-	<u>-</u>	2.45	1.78	8.68
otassium	μg/L	-	-	-	-	-	1370	1370	1600
elenium illicon	μg/L μg/L	-	-	-	-	-	0.947 6180	0.471 6590	1.23 6860
ilver	μg/L	-	-	-	-	-	0.016	< 0.010	0.021
odium Strontium	μg/L μg/l	-	-	-	-	<u>-</u>	4670 286	3060 178	3500 186
trontium hallium	μg/L μg/L	-	-	-	-	-	286 0.02	0.016	0.027
- in	μg/L	-	-	-	-	-	< 0.10	0.11	< 0.10
<u>itanium</u> Jranium	μg/L μg/L	-	-	-	-	-	11 3.2	< 10 2.04	< 10 2.72
ranadium	μg/L μg/L	-	-	-	-	-	2.45	0.73	2.27
	µg/L				_	-	23.9	< 3.0	6.2

# Notes:

 $\mu$ S/cm = microSiemen per centimetre; °C = degrees Celcius; mg/L = milligram per litre; mV = millivolt; NTU = nephelometric turbidity Units; TCU = true colour unit

QA/QC = quality assurance/quality control; FDA = Field Duplicate Available; FD = Field Duplicate Standards from the Contaminated Sites Regulation (CSR), enacted in 1997, updated January 2019, and includes B.C.

Regs. 11/2019 and 13/2019 amendments.

AW-F = groundwater flow to surface water used by freshwater aquatic life; DW = groundwater used for drinking water, IW = groundwater used for irrigation; LW = groundwater used for livestock watering
An interim background groundwater estimate of 20 µg/L for cobalt was used to screen the data consistent with ENV Technical Bulletin 3 Regional Background Concentrations for Select Inorganic Substances in Groundwater dated 24

September 2018.

< Indicates parameter was below laboratory equipment detection limit.

- In results column indicates parameter was not analyzed. In guideline column indicates no guideline. <sup>a</sup> = standard is hardness dependent; <sup>b</sup> = standard is chloride dependent; <sup>c</sup> = standard is pH dependent

Underline - concentration exceeds BC CSR IW Italicized - concentration exceeds BC CSR DW Grey Highlight - concentration exceeds one or more guidelines

March	2020

Control feet   Cont						Location		I C DIZ	DC1306	
Company						Sample Date	2019-03-25			2019-11-07
Table   Tabl	Chemical Name	Unit	BC CSR AW-F	BC CSR DW	BC CSR IW					
State	Field Measured		Do con Aur 1	DO CON DVI	D0 00K 111	BO GOLVERY				
Security    Conductivity Dissolved oxygen	<u> </u>	-		-						
Mary London	Dissolved oxygen saturation	%	-		-	+				
Table   Tabl	Redox potential		+		-					
Second Princeton   Second Prin	Temperature		-		-	+				
Section   Sect	Conventional Parameters	NIU	-	-	-	-	12	0	2	8.51
Section of the content of the cont	Acidity to pH 8.3 (as CaCO3)		-	-	-					
Section   Company   Comp					-					
H	Hardness, as CaCO3 (N)	mg/L	-	-	-	-	261	283	261	246
Sect account		mV -	-		-					
Toddson's side   e.g.	Specific conductivity	<u> </u>	-	-	-	-	481.2	456.3	473.4	492.4
Total content   mg			+		-	<del></del>				
Tarley	Total organic carbon	mg/L			-		2.11	1.43	1.82	2.25
Mage close	•		+		-					
Methods	Major Ions	1410								
Besterned and Section   Port	Anion Sum							5.3	5.29	5.34
Section	Bicarbonate, as CaCO3		-		-			253	256	260
Section   1975   1	Bromide	<del>'</del>	-		-	-				
September   Property	Carbonate	<del>' ' ' ' ' ' ' ' ' ' ' ' ' ' ' ' ' ' ' </del>	+							
Cates of abuser   Part	Carbonate, as CaCO3	mg/L	-		-					
Description	Cation Sum Cation-anion balance		-		<u>-</u> -	-				4.99
Highware   Property    Chloride	mg/L						< 0.50	< 0.50		
	Fluoride Hydroxide				•			U.14/ -		0.T28 -
Magnetistan	Hydroxide, as CaCO3	mg/L	+							
Probable		+								
Subtraine	Potassium	mg/L	-		-	-	2.12	2.29	2.05	2.02
Number   N					-					
Note	Nutrients									
Simple					-					
Total problems mg PAL	Orthophosphate	mg-P/L	-	-			0.0021	0.0019	0.0014	0.0023
Toda principations					-					
Manmium										
Marieney   1971   90   6   1   1   1   1   1   1   1   1   1		ua/l		9500	5000	5000	< 3.0	< 3.0	< 2.0	~ 3 0
Seturn   March   Mar	Antimony									
Bergillam	Arsenic				100					
Page   Page   12000   5000   5000   500   11   10   10	Beryllium				100					
Edminum   pg0   35-10   5   5   80   0.131   0.131   0.119   0.14	Bismuth									
Consent   1991	Cadmium									
Copper   1971   88-90   1500   200   300   < 0.95   < 0.80   0.80   2.28	Chromium									
Lead	Copper			-						
Lithum	Iron									
Mercury	Lithium		6-160							
Molysdenum	Manganese	μg/L	- 0.25	1500		-				
Nickel	Molybdenum			250						
Silicon   1924.   -   -   -   2890   2990   3339   2810     Silicon   1924.   15   20   -   -   < 0.010   < 0.010   < 0.010   < 0.010   < 0.010   < 0.010     Strontium   1924.   -   2500   -   -   70.6   71.1	Nickel	μg/L			200					
Silver										
Thallum	Silver	μg/L	15		-	-	< 0.010	< 0.010	< 0.010	< 0.010
Tin	Strontium Thallium									
Uranlum	Tin	μg/L	-				< 0.10	< 0.10	< 0.10	0.13
Vanadium   μg/L   -   20   100   100   0.55   0.6   0.57   0.5   0.5     Example   μg/L   900-2400   3000   5000   2000   3.9   5   2.7   19.5     Total Metals   190/L   -   -   -   -   -   95.7   4.7   3.6   254     Antiniony   μg/L   -   -   -   -   0.23   0.2   0.21   0.22     Arsenic   μg/L   -   -   -   -   0.23   0.2   0.21   0.22     Arsenic   μg/L   -   -   -   -   0.03   0.2   0.21   0.22     Arsenic   μg/L   -   -   -   -   0.03   0.2   0.21   0.22     Arsenic   μg/L   -   -   -   -   174   174   174   162   164     Beryllium   μg/L   -   -   -   -   174   174   174   162   164     Beryllium   μg/L   -   -   -   -   -   0.020   < 0.020   < 0.020   < 0.020     Brown   μg/L   -   -   -   -   -   111   10   111   10     Cadmium   μg/L   -   -   -   -   -   111   10   111   10     Cadmium   μg/L   -   -   -   -   0.52   0.50   < 0.550   < 0.550   < 0.550     Cambium   μg/L   -   -   -   -   0.52   0.50   < 0.550   < 0.550   < 0.550     Cobalt   μg/L   -   -   -   -   0.52   0.50   < 0.550   < 0.550   < 0.550     Cobalt   μg/L   -   -   -   -   0.52   0.50   < 0.550   < 0.550   < 0.550     Cobalt   μg/L   -   -   -   -   0.52   0.50   < 0.550   < 0.550   < 0.550   < 0.550     Lead   μg/L   -   -   -   -   0.52   0.511   0.111   0.11     Limi   μg/L   -   -   -   -   0.52   0.511   0.111   0.17     Cobalt   μg/L   -   -   -   -   0.511   0.79   0.050   0.373     Lithium   μg/L   -   -   -   -   0.511   0.79   0.050   0.373     Lithium   μg/L   -   -   -   -   0.511   0.79   0.050   0.373     Manganesium   μg/L   -   -   -   -   0.511   0.50   0.50   0.50   0.50     Manganesium   μg/L   -   -   -   -   0.510   0.50   0.50   0.50   0.50     Manganesium   μg/L   -   -   -   -   0.511   0.50   0.50   0.50   0.50   0.50     Manganesium   μg/L   -   -   -   -   0.510   0.50   0.50   0.50   0.50   0.50     Manganesium   μg/L   -   -   -   -   0.510   0.50   0.50   0.50   0.50   0.50     Manganesium   μg/L   -   -   -   -   0.510   0.50   0.50   0.50   0.50   0.50   0.50   0.50   0.50   0.50   0.50   0.50   0.50					- 10					
Naminum	Vanadium	μg/L	-	20	100	100	0.55	0.6	0.57	0.5
Aluminum	Zinc Total Metals	μg/L	900-2400	3000	5000	2000	3.9	5	2.7	19.5
Arsenic         μg/L         -          < 0.10         < 0.10         < 0.16         Both         Doth           164         Berlim         μg/L         -         -         174         174         162         164         Berlim         μg/L         -         -         -         -         0.020         < 0.020         < 0.020         < 0.020         < 0.020         < 0.050         < 0.050         < 0.050         < 0.050         < 0.050         < 0.050         < 0.050         < 0.050         < 0.050         < 0.050         < 0.050         < 0.050         < 0.050         < 0.050         < 0.050         < 0.050         < 0.050         < 0.050         < 0.050         < 0.050         < 0.050         < 0.050         < 0.050         < 0.050         < 0.050         < 0.050         < 0.050         < 0.050         < 0.050         < 0.050         < 0.050         < 0.050         < 0.050         < 0.050         < 0.050         < 0.050         < 0.050         < 0.050         < 0.050         < 0.050         < 0.050         < 0.050         < 0.050         < 0.050         < 0.050         < 0.050         < 0.050         < 0.050         < 0.050         < 0.050         < 0.050         < 0.050         < 0.050         < 0.050         <	Aluminum		-	-	-	-				
Barlum         μg/L         .         .         .         .         .         .         174         .         164         Besyllium           Beryllium         μg/L         .	Antimony Arsenic	μg/L	-		-	+				
Beryllim   μg/L   -   -   -   -     -     -       -	Barium	μg/L					174	174	162	164
Boron	Beryllium Bismuth	μg/L	+							
Cadmium         µg/L         -         -         -         0.161         0.121         0.121         0.149           Calcium         µg/L         -         -         -         -         69300         63900         58300         61200           Chromium         µg/L         -         -         -         69300         63900         58300         61200           Chromium         µg/L         -         -         -         0.62         < 0.10         < 0.10         1.7           Cobalt         µg/L         -         -         -         0.15         < 0.10         < 0.10         0.27           Copper         µg/L         -         -         -         0.98         < 0.50         < 0.50         5.42           Iron         µg/L         -         -         -         71         < 10         < 10         159           Lead         µg/L         -         -         -         2.11         1.16         9.3         10.6           Magnesium         µg/L         -         -         -         2.2600         24400         22600         21700           Manganesium         µg/L         -         -	Boron	μg/L	+		<u>-</u>		11	10	11	10
Chromium         μg/L         -         -         0.62         < 0.10         < 0.10         1.7           Cobalt         μg/L         -         -         -         0.15         < 0.10		μg/L	+							
Cobalt         µg/L         -         -         -         0.15         < 0.10         < 0.10         0.27           Copper         µg/L         -         -         -         0.98         < 0.50	Chromium				<u>-</u> -		0.62			
Iron	Cobalt	μg/L	-		-		0.15	< 0.10	< 0.10	0.27
Lead         μg/L         -         -         -         -         0.114         0.079         < 0.050         0.373           Lithium         μg/L         -         -         -         21.1         11.6         9.3         10.6           Magnesium         μg/L         -         -         -         22600         24400         22600         21700           Manganese         μg/L         -         -         -         3.56         0.2         < 0.10	Iron				<u>-</u> -					
Magnesium         µg/L         -         -         -         22600         24400         22600         21700           Manganese         µg/L         -         -         -         3.56         0.2         < 0.10	Lead	μg/L					0.114	0.079	< 0.050	0.373
Manganese         µg/L         -         -         -         3.56         0.2         < 0.10         7.92           Mercury         µg/L         -	Lithium Magnesium									
Molybdenum         μg/L         -         -         -         2.08         2.01         2         2.01           Nickel         μg/L         -         -         -         1.64         1.07         1.08         2.08           Potassium         μg/L         -         -         -         2210         2050         1960         2130           Selenium         μg/L         -         -         -         1.94         2.86         3.83         2.97           Silicon         μg/L         -         -         -         3180         3160         3020         3610           Silver         μg/L         -         -         -         -         0.010         < 0.010	Manganese	μg/L			-	+	3.56	0.2	< 0.10	7.92
Nickel         µg/L         -         -         -         1.64         1.07         1.08         2.08           Potassium         µg/L         -         -         -         2210         2050         1960         2130           Selenium         µg/L         -         -         -         1.94         2.86         3.83         2.97           Silicon         µg/L         -         -         -         3180         3160         3020         3610           Silver         µg/L         -         -         -         -         0.010         < 0.010	Mercury Molybdenum		+		-					
Selenium         μg/L         -         -         -         1.94         2.86         3.83         2.97           Silicon         μg/L         -         -         -         3180         3160         3020         3610           Silver         μg/L         -         -         -         -         0.010         < 0.010	Nickel	μg/L	-	-	-	-	1.64	1.07	1.08	2.08
Silicon         μg/L         -         -         -         3180         3160         3020         3610           Silver         μg/L         -         -         -         -         0.010         < 0.010	Potassium Selenium		-							
Silver         μg/L         -         -         -         -         < 0.010         < 0.010         0.01           Sodium         μg/L         -         -         -         1320         852         743         749           Strontium         μg/L         -         -         -         76         69.2         65.6         66.4           Thallium         μg/L         -         -         -         0.016         < 0.010	Silicon	μg/L	-				3180	3160	3020	3610
Strontium         µg/L         -         -         -         76         69.2         65.6         66.4           Thallium         µg/L         -         -         -         0.016         < 0.010	Silver Sodium		+							
Thallium         μg/L         -         -         -         0.016         < 0.010         < 0.010         0.015           Tin         μg/L         -         -         -         < 0.10	Strontium	μg/L					76	69.2	65.6	66.4
Titanium         µg/L         -         -         -         < 10         < 10         < 10         < 10           Uranium         µg/L         -         -         -         1.01         0.834         0.79         0.878           Vanadium         µg/L         -         -         -         1.18         0.7         0.62         2.18		μg/L	+							
Uranium         μg/L         -         -         -         -         1.01         0.834         0.79         0.878           Vanadium         μg/L         -         -         -         1.18         0.7         0.62         2.18	Titanium		+		<u>-</u>	+				
	Uranium	μg/L						0.834	0.79	0.878
	Zinc Zinc				-	+				

 $\mu$ S/cm = microSiemen per centimetre; °C = degrees Celcius; mg/L = milligram per litre; mV = millivolt; NTU = nephelometric turbidity Units; TCU = true colour unit

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<u>Underline</u> - concentration exceeds BC CSR IW

Italicized - concentration exceeds BC CSR DW Grey Highlight - concentration exceeds one or more guidelines 19135981-2020-064-R-Rev0

Field Measured Conductivity	C CSR AW-F	BC CSR DW	BC CSR IW	Sample Date	379.6 4.56 35.7 7.78 56.2 3 60  2.3 396 1.74 184 441 8.27 379.6 224 207 1.62 23.2 40.2  4.51 - 224 < 0.050 39.3 - < 1.0 4.45 - < 0.50 0.602 - < 1.0 98.7 20.8 5.23 14.7 < 0.30  < 0.0050 0.0018 < 0.0010 0.098 0.284 0.0454	389.7 0.27 2.1 7.9 -117.9 5.6 8  1.1 402 1.6 197 279 8.46 389.9 220 209 1.43 2.5 7.6  4.44 212 < 0.050 42.5 8.2 4.78 3.7 < 0.50 0.575 < 1.0 108 22.2 5.37 14.8 < 0.30  0.0104 < 0.0010 < 0.0010 0.0963 0.117	408.1 0.35 3 7.93 -71.9 7.2 4  1.6 383 1.95 183 345 8.31 408.1 227 198 2.02 3.3 9.55  4.57 - 223 <0.050 38.7 - 3.8 4.46 - <0.50 0.599 - <1.0 97.6 20.9 5.25 14.3 <0.30  <0.0050 <0.0010 0.119 0.143	410.4 2.14 16 8 -7.3 3.204 32.6  < 1.0 355 1.93 182 478 8.31 410.4 223 216 2.97 24 36.2  4.52 - 219 < 0.050 36.3 - 4.4 4.42 - 0.68 0.584 - < 1.0 97.8 22.2 5.33 14.7 0.38
Field Measured Conductivity Consolved oxygen Dissolved Dissolved Dissolved Dissolved Dissolved Oxygen Dissolved Dissolve					4.56 35.7 7.78 56.2 3 60  2.3 396 1.74 184 441 8.27 379.6 224 207 1.62 23.2 40.2  4.51 - 224 < 0.050 39.3 - < 1.0 4.45 - < 0.50 0.602 - < 1.0 98.7 20.8 5.23 14.7 < 0.30  < 0.0050 0.0018 < 0.0010 0.098 0.284	0.27 2.1 7.9 -117.9 5.6 8  1.1 402 1.6 197 279 8.46 389.9 220 209 1.43 2.5 7.6  4.44 212 < 0.050 42.5 8.2 4.78 3.7 < 0.50 0.575 < 1.0 108 22.2 5.37 14.8 < 0.30  0.0104 < 0.0010 < 0.0010 0.0963	0.35 3 7.93 -71.9 7.2 4  1.6 383 1.95 183 345 8.31 408.1 227 198 2.02 3.3 9.55  4.57 - 223 < 0.050 38.7 - 3.8 4.46 - < 0.50 0.599 - < 1.0 97.6 20.9 5.25 14.3 < 0.30  < 0.0050 < 0.0010 < 0.119	2.14 16 8 -7.3 3.204 32.6  < 1.0 355 1.93 182 478 8.31 410.4 223 216 2.97 24 36.2  4.52 - 219 < 0.050 36.3 - 4.4 4.42 - 0.68 0.584 - < 1.0 97.8 22.2 5.33 14.7 0.38  0.0121 < 0.0010 0.001
onductivity					4.56 35.7 7.78 56.2 3 60  2.3 396 1.74 184 441 8.27 379.6 224 207 1.62 23.2 40.2  4.51 - 224 < 0.050 39.3 - < 1.0 4.45 - < 0.50 0.602 - < 1.0 98.7 20.8 5.23 14.7 < 0.30  < 0.0050 0.0018 < 0.0010 0.098 0.284	0.27 2.1 7.9 -117.9 5.6 8  1.1 402 1.6 197 279 8.46 389.9 220 209 1.43 2.5 7.6  4.44 212 < 0.050 42.5 8.2 4.78 3.7 < 0.50 0.575 < 1.0 108 22.2 5.37 14.8 < 0.30  0.0104 < 0.0010 < 0.0010 0.0963	0.35 3 7.93 -71.9 7.2 4  1.6 383 1.95 183 345 8.31 408.1 227 198 2.02 3.3 9.55  4.57 - 223 < 0.050 38.7 - 3.8 4.46 - < 0.50 0.599 - < 1.0 97.6 20.9 5.25 14.3 < 0.30  < 0.0050 < 0.0010 < 0.119	2.14 16 8 -7.3 3.204 32.6  < 1.0 355 1.93 182 478 8.31 410.4 223 216 2.97 24 36.2  4.52 - 219 < 0.050 36.3 - 4.4 4.42 - 0.68 0.584 - < 1.0 97.8 22.2 5.33 14.7 0.38  0.0121 < 0.0010 0.001
issolved oxygen saturation ## H					35.7 7.78 56.2 3 60  2.3 396 1.74 184 441 8.27 379.6 224 207 1.62 23.2 40.2  4.51 - 224 < 0.050 39.3 - < 1.0 4.45 - < 0.50 0.602 - < 1.0 98.7 20.8 5.23 14.7 < 0.30  < 0.0050 0.0018 < 0.0010 0.098 0.284	2.1 7.9 -117.9 5.6 8  1.1 402 1.6 197 279 8.46 389.9 220 209 1.43 2.5 7.6  4.44 212 < 0.050 42.5 8.2 4.78 3.7 < 0.50 0.575 < 1.0 108 22.2 5.37 14.8 < 0.30  0.0104 < 0.0010 < 0.0010 0.0963	3 7.93 7.93 -71.9 7.2 4  1.6 383 1.95 183 345 8.31 408.1 227 198 2.02 3.3 9.55  4.57 - 223 < 0.050 38.7 - 3.8 4.46 - < 0.50 0.599 - < 1.0 97.6 20.9 5.25 14.3 < 0.30  < 0.0050 < 0.0010 < 0.119	16 8 -7.3 3.204 32.6  < 1.0 355 1.93 182 478 8.31 410.4 223 216 2.97 24 36.2  - 219 < 0.050 36.3 - 4.4 4.42 - 0.68 0.584 - < 1.0 97.8 22.2 5.33 14.7 0.38  0.0121 < 0.0010 0.001
edox potential mV emperature °C urbidity NTU onventional Parameters cidity to pH 8.3 (as CaCO3) mg/L ps/cm issolved organic carbon mg/L ardness, as CaCO3 (N) mg/L visidation-reductivity pS/cm otal alkalinity, as CaCO3 mg/L otal dissolved solids mg/L otal dissolved solids mg/L otal organic carbon mg/L otal organic carbon mg/L otal dissolved solids mg/L otal organic carbon mg/L otal organic mg/L o					56.2 3 60  2.3 396 1.74 184 441 8.27 379.6 224 207 1.62 23.2 40.2  4.51 - 224 < 0.050 39.3 - < 1.0 4.45 - < 0.50 0.602 - < 1.0 98.7 20.8 5.23 14.7 < 0.30  < 0.0050 0.0018 < 0.0010 0.098 0.284	-117.9 5.6 8  1.1 402 1.6 197 279 8.46 389.9 220 209 1.43 2.5 7.6  4.44 212 < 0.050 42.5 8.2 4.78 3.7 < 0.50 0.575 < 1.0 108 22.2 5.37 14.8 < 0.30  0.0104 < 0.0010 < 0.0963	-71.9 7.2 4  1.6 383 1.95 183 345 8.31 408.1 227 198 2.02 3.3 9.55  4.57 - 223 < 0.050 38.7 - 3.8 4.46 - < 0.50 0.599 - < 1.0 97.6 20.9 5.25 14.3 < 0.30  < 0.0050 < 0.0010 < 0.0119	-7.3 3.204 32.6  < 1.0 355 1.93 182 478 8.31 410.4 223 216 2.97 24 36.2  - 219 < 0.050 36.3 - 4.4 4.42 - 0.68 0.584 - < 1.0 97.8 22.2 5.33 14.7 0.38  0.0121 < 0.0010 0.001
emperature "C urbidity NTU onventional Parameters cidity to pH 8.3 (as CaCO3) mg/L onductivity µS/cm issolved organic carbon mg/L ardness, as CaCO3 (N) mg/L vidation-reduction potential mV H Peccific conductivity µS/cm otal alkalinity, as CaCO3 mg/L otal dissolved solids mg/L otal organic carbon mg/L organic licarbonate mg/L organic licar					3 60  2.3 396 1.74 184 441 8.27 379.6 224 207 1.62 23.2 40.2  4.51 - 224 < 0.050 39.3 - < 1.0 4.45 - < 0.50 0.602 - < 1.0 98.7 20.8 5.23 14.7 < 0.30  < 0.0050 0.0018 < 0.0010 0.098 0.284	5.6 8  1.1  402  1.6  197  279  8.46  389.9  220  209  1.43  2.5  7.6  4.44   212  < 0.050  42.5   8.2  4.78  3.7  < 0.50  0.575   < 1.0  108  22.2  5.37  14.8  < 0.30  0.0104  < 0.0010  < 0.0010  0.0963	7.2 4  1.6 383 1.95 183 345 8.31 408.1 227 198 2.02 3.3 9.55  4.57 - 223 < 0.050 38.7 - 3.8 4.46 - < 0.50 0.599 - < 1.0 97.6 20.9 5.25 14.3 < 0.30  < 0.0050 < 0.0010 < 0.0119	3.204 32.6  < 1.0 355 1.93 182 478 8.31 410.4 223 216 2.97 24 36.2  4.52 - 219 < 0.050 36.3 - 4.4 4.42 - 0.68 0.584 - < 1.0 97.8 22.2 5.33 14.7 0.38  0.0121 < 0.0010 0.001
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Interior Int	1500 3 - - - - 4290 400 0.2-0.8 - 1.31-18.5 - - 90 50 10000 1.5 -	250 1.5 200 500  10 1 9500 6 10	1	600 1 - - - - 1000 100 10 - - -	0.602 - < 1.0 98.7 20.8 5.23 14.7 < 0.30  < 0.0050 0.0018 < 0.0010 0.098 0.284	< 0.50	< 0.50 0.599 - < 1.0 97.6 20.9 5.25 14.3 < 0.30  < 0.0050 < 0.0010 < 0.0010 0.119	0.584 - < 1.0 97.8 22.2 5.33 14.7 0.38  0.0121 < 0.0010 0.001
ydroxide ygroxide, as CaCO3 mg/L ydroxide, as CaCO3 mg/L on balance % lagnesium mg/L otassium mg/L odium mg/L ulphate mg/L lutrients itrate mg-N/L itrite mg-N/L otal ammonia mg-N/L otal kjeldahl nitrogen mg-N/L otal phosphorus mg-P/L otal phosphorus mg-P/L otal phosphorus mg-P/L otal minum µg/L ntimony µg/L arium µg/L eryllium µg/L ismuth µg/L oron µg/L admium µg/L hromium µg/L hromium µg/L obalt µg/L opper µg/L	- - - - - 4290 400 0.2-0.8 - 1.31-18.5 - - - 90 50 10000 1.5 -	- - - - 200 500 10 1 - - - - - 9500 6	- - - - - - - - - - - - - - - - - - -	- - - - - 1000 100 - - -	- 1.0 98.7 20.8 5.23 14.7 < 0.30 < 0.0050 0.0018 < 0.0010 0.098 0.284	- < 1.0 108 22.2 5.37 14.8 < 0.30 0.0104 < 0.0010 < 0.0010 0.0963	- < 1.0 97.6 20.9 5.25 14.3 < 0.30 < 0.0050 < 0.0010 < 0.0010 0.119	- < 1.0 97.8 22.2 5.33 14.7 0.38 0.0121 < 0.0010 0.001
ydroxide, as CaCO3 mg/L on balance % lagnesium mg/L otassium mg/L odium mg/L ulphate mg/L lutrients itrate mg-N/L itrite mg-N/L otal ammonia mg-N/L otal phosphorus mg-P/L otal phosphorus mg-N/L otal phospho	- - - 4290 400 0.2-0.8 - 1.31-18.5 - - - 90 50 10000 1.5 -	- - 200 500 10 1 - - - - - 9500 6	- - - - - - - - - - - - - - -	- - - - 1000 100 10 - - -	98.7 20.8 5.23 14.7 < 0.30 < 0.0050 0.0018 < 0.0010 0.098 0.284	108 22.2 5.37 14.8 < 0.30 0.0104 < 0.0010 < 0.0010 0.0963	97.6 20.9 5.25 14.3 < 0.30 < 0.0050 < 0.0010 < 0.0010 0.119	97.8 22.2 5.33 14.7 0.38 0.0121 < 0.0010 0.001
lagnesium otassium odium mg/L odium mg/L ulphate mg/L ulphate  litrate litrate mg-N/L otal ammonia otal Kjeldahl nitrogen otal phosphorus mg-P/L otal phosphorus  luminum pissolved Metals luminum pig/L arium preylium perylium perylium pismuth oron padmium pug/L admium pug/L poron padmium pug/L	- - 4290 400 0.2-0.8 - 1.31-18.5 - - - 90 50 10000 1.5 -	- 200 500 10 1 - - - - - - 9500 6	- - - - - - - - - - - - - - -	- 1000 100 10 - - -	20.8 5.23 14.7 < 0.30 < 0.0050 0.0018 < 0.0010 0.098 0.284	22.2 5.37 14.8 < 0.30 0.0104 < 0.0010 < 0.0010 0.0963	20.9 5.25 14.3 < 0.30 < 0.0050 < 0.0010 < 0.0010 0.119	22.2 5.33 14.7 0.38 0.0121 < 0.0010 0.001
odium mg/L ulphate mg/L lutrients itrate mg-N/L itrite mg-N/L otal ammonia mg-N/L otal Kjeldahl nitrogen mg-N/L otal phosphorus mg-P/L otal phosphorus mg-N/L otal phosphorus otal ph	- 4290 400 0.2-0.8 - 1.31-18.5 - - 90 50 10000 1.5 -	200 500 10 1 9500 6 10	- - - - - - - - 5000	- 1000 100 10 - - -	14.7 < 0.30 < 0.0050 0.0018 < 0.0010 0.098 0.284	14.8 < 0.30 0.0104 < 0.0010 < 0.0010 0.0963	14.3 < 0.30 < 0.0050 < 0.0010 < 0.0010 0.119	14.7 0.38 0.0121 < 0.0010 0.001
ulphate Iutrients itrate itrite mg-N/L itrite mg-N/L otal ammonia mg-N/L otal phosphorus mg-P/L itrimony mg/L orenic mg-N/L orenic	4290 400 0.2-0.8 - 1.31-18.5 - - 90 50 10000 1.5 -	500 10 1 - - - - 9500 6 10	- - - - - - - 5000	100 10 - - -	< 0.30 < 0.0050 0.0018 < 0.0010 0.098 0.284	< 0.30 0.0104 < 0.0010 < 0.0010 0.0963	< 0.30 < 0.0050 < 0.0010 < 0.0010 0.119	0.38 0.0121 < 0.0010 0.001
itrate itrite mg-N/L itrite mg-N/L itrite mg-N/L itrite mg-N/L otal ammonia mg-N/L otal Afgeldahl nitrogen otal phosphorus mg-P/L otal ph	0.2-0.8  - 1.31-18.5  90 50 10000 1.5 -	1 - - - - 9500 6 10	- - - - - 5000	10 - - - -	0.0018 < 0.0010 0.098 0.284	< 0.0010 < 0.0010 0.0963	< 0.0010 < 0.0010 0.119	< 0.0010 0.001
itrite mg-N/L orthophosphate mg-P/L otal ammonia mg-N/L otal Kjeldahl nitrogen mg-N/L otal phosphorus mg-P/L otal phosphorus pg/L otal phosphorus pg/L otal phosphorus pg/L otal pg/L otal phosphorus pg/L otal pg/L otal pg/L otal phosphorus pg/L otal pg/L otal phosphorus pg/L otal pg/L otal pg/L otal phosphorus pg/L otal phosphorus pg/L otal pg/L otal phosphorus pg	0.2-0.8  - 1.31-18.5  90 50 10000 1.5 -	1 - - - - 9500 6 10	- - - - 5000	10 - - - -	0.0018 < 0.0010 0.098 0.284	< 0.0010 < 0.0010 0.0963	< 0.0010 < 0.0010 0.119	< 0.0010 0.001
otal ammonia mg-N/L otal Kjeldahl nitrogen mg-N/L otal phosphorus mg-P/L Dissolved Metals luminum µg/L ntimony µg/L arium µg/L eryllium µg/L ismuth µg/L oron µg/L admium µg/L hromium µg/L obalt µg/L opper µg/L on µg/L ead µg/L langanese µg/L langanese lercury lolybdenum µg/L	1.31-18.5 - - - 90 50 10000 1.5 -	- - - 9500 6 10	- - - 5000		0.098 0.284	0.0963	0.119	
otal phosphorus  pissolved Metals  luminum	- 90 50 10000 1.5	9500 6 10	5000	-		0.117	0.142	0.131
Dissolved Metals  Juminum  Iuminum  Iuminum  Iuminum  Iuminum  Iug/L  Iuminum  Iug/L  Iuminum  Iug/L  Iuminum  Iug/L  Iuminum  Iu	- 90 50 10000 1.5 -	9500 6 10	5000		IIII/ID/		0.143	0.218
ntimony µg/L rsenic µg/L arium µg/L eryllium µg/L ismuth µg/L oron µg/L admium µg/L hromium µg/L obalt µg/L opper µg/L on µg/L ead µg/L ithium µg/L langanese µg/L lercury µg/L lolybdenum µg/L	90 50 10000 1.5	6 10	-	E000	0.0404	0.0154	0.0088	0.0387
rsenic	50 10000 1.5 -	10	400	5000	< 3.0 < 0.10	< 3.0 < 0.10	< 3.0 < 0.10	< 3.0 < 0.10
eryllium  ismuth oron  admium  hromium  bhromium  cobalt  copper  con  pg/L	1.5 -	1000	100	25	0.95	1.6	1.52	1.29
ismuth pg/L poron padmium pg/L phromium pbalt popper popper pon pead pead pead pead planganese percury pg/L pg/L pg/L pg/L pg/L pg/L pg/L pg/L	-	8	100	100	<i>1420</i> < 0.020	<i>1550</i> < 0.020	<i>1370</i> < 0.020	<i>1410</i> < 0.020
admium		-	-	-	< 0.050	< 0.050	< 0.050	< 0.050
hromium µg/L obalt µg/L opper µg/L on µg/L ead µg/L thium µg/L langanese µg/L ercury µg/L olybdenum µg/L	12000 3.5-10	5000 5	500 5	5000 80	23 < 0.010	23 < 0.015	24 < 0.030	22 < 0.010
opper	10	50	8	50	< 0.10	< 0.10	< 0.10	< 0.10
ead	40 80-90	<i>1</i> 1500	50 200	1000 300	< 0.10 5.78	< 0.10 1	< 0.10 0.51	< 0.10 0.27
ithium µg/L langanese µg/L lercury µg/L lolybdenum µg/L	- 6-160	6500 10	5000 200	100	124 0.234	874 < 0.050	735 < 0.050	199 < 0.050
1ercury μg/L 1olybdenum μg/L	-	8	2500	5000	<i>75.2</i>	< 0.030 80.2	78.1	73.7
lolybdenum µg/L	0.25	1500 1	200	2	9.27 < 0.0050	9.66 < 0.0050	8.87 < 0.0050	8.6 < 0.0050
lickel µg/L	10000	250	<u>10</u>	50	<u>31.4</u>	<u>31.8</u>	<u>34.2</u>	<u>31.6</u>
elenium µg/L	1500 20	80 10	200 20	1000 30	0.69 < 0.050	1.16 < 0.050	1.01 < 0.050	0.72 < 0.050
ilicon µg/L	-	-	-	-	2680	2820	2920	2820
ilver μg/L trontium μg/L	15 -	20 2500	-	-	< 0.010 137	< 0.010 141	< 0.010 138	< 0.010 135
hallium µg/L	3	-	-	-	< 0.010	< 0.010	< 0.010	< 0.010
in	1000	2500 -	-	-	< 0.10 < 10	< 0.10 < 10	< 0.10 < 10	< 0.10 < 10
ranium µg/L	85	20 20	10 100	200 100	0.056	0.035	0.026 < 0.50	0.027
	900-2400	3000	5000	2000	< 0.50 7.9	< 0.50 7.9	< 0.50 4.6	< 0.50
otal Metals luminum μg/L	_ [	-	_	_	_	21	25	467
ntimony μg/L	-	-	-	-	-	1	< 0.10	< 0.10
rsenic	-	-	-	-	-	1.77 1420	1.52 1390	1.61 1420
eryllium µg/L	-	-	-	-	-	< 0.020	< 0.020	0.029
ismuth µg/L oron µg/L	-	-	-	-	-	< 0.050 23	< 0.050 21	< 0.050 24
admium µg/L	-	-	-	-	-	< 0.020 39300	< 0.020 40300	0.0824 38700
hromium µg/L	-	-	-	-	-	0.37	0.17	0.65
obalt µg/L ppper µg/L	-	-	-	-	-	< 0.10 1.14	< 0.10 0.53	0.14 2.77
on µg/L	-	-	-	-	-	1370	1080	1290
ead µg/L thium µg/L	-		-	-	-	0.18 73.8	0.123 77.4	0.596 81.5
agnesium µg/L	-	-	-	-	-	21200	21000	19500
anganese µg/L ercury µg/L	-	-	-	-	<u>:</u> -	9.97 -	9.47	13
olybdenum µg/L	-	-	-	-	-	32.6	32.6	30.7
ickel µg/L otassium µg/L	-		-	-	-	1.12 5220	1.21 5010	1.4 4980
elenium µg/L		-	-	-	-	< 0.050	< 0.050	< 0.050
ilicon	-	-	-	-	-	3080 < 0.010	2890 0.011	3240 0.041
odium µg/L		_		-	-	14800	13700	13500
trontium µg/L		-	-	•			138 < 0.010	126 0.013
				-	<u>-</u> -	135 < 0.010	< 0.010	3.5
hallium µg/L in µg/L	- - - - -	- - -		-	-	< 0.010 < 0.10	0.13	0.16
hallium µg/L	- - - - -		-	-	-	< 0.010		0.16 < 10 0.077

 $\mu$ S/cm = microSiemen per centimetre; °C = degrees Celcius; mg/L = milligram per litre; mV = millivolt; NTU = nephelometric turbidity Units; TCU = true colour unit

QA/QC = quality assurance/quality control; FDA = Field Duplicate Available; FD = Field Duplicate Standards from the Contaminated Sites Regulation (CSR), enacted in 1997, updated January 2019, and includes B.C.

Regs. 11/2019 and 13/2019 amendments.

AW-F = groundwater flow to surface water used by freshwater aquatic life; DW = groundwater used for drinking water, IW = groundwater used for irrigation; LW = groundwater used for livestock watering
An interim background groundwater estimate of 20 µg/L for cobalt was used to screen the data consistent with ENV Technical Bulletin 3 Regional Background Concentrations for Select Inorganic Substances in Groundwater dated 24

September 2018. < Indicates parameter was below laboratory equipment detection limit.

- In results column indicates parameter was not analyzed. In guideline column indicates no guideline. <sup>a</sup> = standard is hardness dependent; <sup>b</sup> = standard is chloride dependent; <sup>c</sup> = standard is pH dependent

Underline - concentration exceeds BC CSR IW Italicized - concentration exceeds BC CSR DW Grey Highlight - concentration exceeds one or more guidelines

					Location	2010 02 01	2010 02 01		ZDC1308	2010 10 22	2010 10 1
					Sample Date QA/QC	2019-03-21 FDA	2019-03-21 FD	2019-05-29	2019-08-22	2019-10-30 FDA	2019-10-3 FD
Chemical Name	Unit	BC CSR AW-F	BC CSR DW	BC CSR IW	BC CSR LW						
Field Measured Conductivity	μS/cm	-	-	-	-	549.9	549.9	588.9	684.5	511	511
Dissolved oxygen	mg/L	-	-	-	-	0.35	0.35	0.4	0.13	0.22	0.22
Dissolved oxygen saturation  OH	% -	-	-	-	-	2.6 7.08	2.6 7.08	3.1 6.95	0.9 6.97	1.6 7.34	1.6 7.34
Redox potential	mV	-	-	-	-	53.4	53.4	306.6	267.8	6.8	6.8
Temperature Turbidity	°C NTU		-	-	-	2.8	2.8	5.1 10	5.9	3.094 3.25	3.094 3.25
Conventional Parameters	NTO	-	-	-	-	4	4	10	0	3.23	3.23
Acidity to pH 8.3 (as CaCO3)	mg/L	-	-	-	-	4.5	8	5.2	22.9	< 1.0	2.3
Conductivity Dissolved organic carbon	μS/cm mg/L	-	-	-	-	570 2.02	562 1.92	595 2.36	648 3.76	526 2.12	526 1.9
Hardness, as CaCO3 (N)	mg/L	-	-	-	-	313	320	329	374	286	290
Oxidation-reduction potential DH	mV -	-	-	-	-	328 8	377 8.06	422 8.24	358 8.16	439 8.09	276 8.11
Specific conductivity	<u>-</u> μS/cm	-	-	-	-	549.9	-	588.9	267.8	511	- 0.11
Total alkalinity, as CaCO3	mg/L	-	-	-	-	326	321	325	378	329	324
Total dissolved solids Total organic carbon	mg/L mg/L	-	-	-	-	301 1.85	305 1.67	322 2.06	365 3.89	322 2.06	324 2.08
Total suspended solids	mg/L	-	-	-	-	4.7	5.7	1.9	1.6	5.6	6.5
Turbidity	NTU	-	-	-	-	19.5	19.6	3.53	2.6	7.49	7.04
Major Ions Anion Sum	meq/L	<u> </u>	-	-	- 1	6.66	6.56	6.67	7.73	6.7	6.62
Bicarbonate	mg/L	-	-	-	-	-	-	-	-	-	-
Ricarbonate, as CaCO3	mg/L	-	-	-	-	326	321	325	378	329	324
Bromide Calcium	mg/L mg/L	-	-	-	1000	< 0.050 81.5	< 0.050 82.4	< 0.050 85.9	< 0.050 100	< 0.050 69.5	< 0.050 71.9
Carbonate	mg/L	-	-	-	-	-	-	-	-	-	-
arbonate, as CaCO3 ation Sum	mg/L meq/L	-	-	-	-	< 1.0 6.55	< 1.0 6.69	< 1.0 6.69	< 1.0 7.59	< 1.0 6.01	< 1.0 6.1
ation-anion balance	meq/L %	-	-	-	-	-	1	0.1	-	-	-
Chloride	mg/L	1500	250	100	600	0.74	0.72	1.41	1.74	1.03	1.09
luoride lydroxide	mg/L mg/L	3 -	1.5 -	1 -	1 -	0.219	0.21	0.146	0.178	0.235	0.202
ydroxide, as CaCO3	mg/L	-	-	-	-	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
on balance	%	-	-	-	-	98.4	102	100	98.2	89.7	92.2
lagnesium otassium	mg/L mg/L	-	-	-	-	26.6 2.58	27.8 2.62	27.8 1.81	29.9 2.07	27.3 2.69	26.9 2.67
odium	mg/L	-	200	-	-	3.36	3.38	1.63	1.66	4.97	4.97
ulphate	mg/L	4290	500	-	1000	5.13	5.05	5.74	5.47	4.2	4.52
<b>lutrients</b> litrate	mg-N/L	400	10	-	100	< 0.0050	< 0.0050	0.115	0.126	0.0142	0.0156
litrite	mg-N/L	0.2-0.8	1	-	10	0.0021	0.0016	< 0.0010	0.0017	< 0.0010	< 0.0010
orthophosphate	mg-P/L	- 1 21 10 F	-	-	-	< 0.0010	< 0.0010	< 0.0010	0.0018	< 0.0010	< 0.0010
otal ammonia otal Kjeldahl nitrogen	mg-N/L mg-N/L	1.31-18.5	-	-	-	0.0336 0.101	0.0132 0.107	< 0.0050 < 0.050	0.0076 0.141	0.0378 0.092	0.0413 0.08
otal phosphorus	mg-P/L	-	-	-	-	0.0083	0.0077	< 0.0020	0.0033	0.0037	0.0034
Dissolved Metals	ua/l	1	9500	5000	5000	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
lluminum Intimony	μg/L μg/L	90	6	-	-	< 0.10	< 0.10	0.1	0.12	< 0.10	< 0.10
rsenic	μg/L	50	10	100	25	0.38	0.39	0.13	0.16	0.12	0.14
Barium Beryllium	μg/L μg/L	10000 1.5	<i>1000</i> 8	100	100	558 < 0.020	570 < 0.020	303 < 0.020	305 < 0.020	385 < 0.020	389 < 0.020
ismuth	μg/L	-	-	-	-	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050
Boron	μg/L	12000	5000	500	5000	12	11	< 10	11	13	13
Cadmium Chromium	μg/L μg/L	3.5-10 10	5 50	5 8	80 50	0.0059 < 0.10	0.0055 < 0.10	0.126 < 0.10	0.0351 < 0.10	0.0469 < 0.10	0.039 < 0.10
Cobalt	μg/L	40	1	50	1000	1.67	1.69	0.44	0.25	0.9	0.9
copper	μg/L	80-90	1500	200	300	< 0.50	< 0.50	< 0.50	1.7	0.25	0.22
ron ead	μg/L μg/L	6-160	6500 10	5000 200	100	1440 < 0.050	1450 < 0.050	< 10 < 0.050	56 0.092	206 < 0.050	203 < 0.050
ithium	μg/L	-	8	2500	5000	13.1	12.9	7.5	8.3	18.2	18.3
Manganese	μg/L	- 0.25	1500	200	-	117	120	15.2	9.19	80.4	81.2
1ercury 1olybdenum	μg/L μg/L	0.25 10000	250	10 10	2 50	< 0.0050 4.03	< 0.0050 3.97	< 0.0050 1.67	< 0.0050 1.64	< 0.0050 6.3	< 0.0050 6.31
lickel	μg/L	1500	80	200	1000	3.3	3.36	1.44	1.44	1.67	1.68
elenium	μg/L	20	10	20	30	< 0.050	0.072	0.266	0.21	0.075	0.053
ilicon ilver	μg/L μg/L	- 15	20	-	-	4310 < 0.010	4500 < 0.010	4850 < 0.010	5320 < 0.010	4450 < 0.010	4430 < 0.010
trontium	μg/L	-	2500	-	-	120	121	94.6	107	106	105
hallium in	μg/L μg/L	3 -	- 2500	-	-	0.037 < 0.10	0.034 < 0.10	0.025 < 0.10	0.019 < 0.10	0.029 < 0.10	0.027 < 0.10
in itanium	μg/L μg/L	1000		-	-	< 0.10 < 10	< 0.10 < 10	< 0.10 < 10	< 0.10 < 10	< 0.10 < 10	< 0.10
ranium	μg/L	85	20	10	200	1.07	1.11	1.25	1.51	0.887	0.884
anadium inc	μg/L μg/L	900-2400	20 3000	100 5000	100 2000	< 0.50	< 0.50 2.8	< 0.50 2	< 0.50 4.1	< 0.50 1.8	< 0.50 1.8
otal Metals		755 2400	3000	3000	2000						
luminum	μg/L	-	-	-	-	48.3	95.1	27.1	12.3	27.5	62.2
ntimony rsenic	μg/L μg/L	-	-	-	-	< 0.10 0.41	< 0.10 0.44	0.12 0.24	0.17 0.22	< 0.10 0.23	< 0.10 0.23
arium	μg/L	-	-	-	-	573	571	307	298	386	392
eryllium	μg/L	-	-	-	-	< 0.020	< 0.020	< 0.020	< 0.020	< 0.020	< 0.020
ismuth oron	μg/L μg/L	-	-	-	-	< 0.050 12	< 0.050 12	< 0.050 10	< 0.050 10	< 0.050 14	< 0.050 12
admium	μg/L	-	-	-	-	0.0481	0.0587	0.216	0.138	0.114	0.123
alcium hromium	μg/L μg/L	-	-	-	-	82100 0.17	84000 0.24	90600	102000	81600 0.12	73100 0.17
balt	μg/L μg/L	-	-		-	1.7	1.74	0.51	0.27	0.12	0.17
opper	μg/L	-	-	-	-	< 0.50	< 0.50	0.57	0.55	0.54	0.67
on ead	μg/L μg/L	-	-	-	-	1410 0.059	1450 0.088	394 0.138	327 0.3	343 0.149	355 0.154
thium	μg/L μg/L	-	-	-	-	12.6	13.6	7.8	8.4	19.8	17.2
agnesium	μg/L	-	-	-	-	27500	27500	28100	30100	25100	24900
anganese ercury	μg/L μg/L	-	-	-	-	117 -	119 < 0.0050	16.7	9.35	70.9	70.4 < 0.0050
olybdenum	μg/L	-	-	-	-	3.87	4.14	1.74	1.53	4.89	4.44
ckel	μg/L	-	-	-	-	3.62	3.69	1.57	1.51	1.72	1.71
otassium elenium	μg/L μg/L	-	-	-	-	2590 0.065	2620 0.097	1830 0.204	2030 0.142	2530 0.073	2510 0.051
licon	μg/L μg/L	-	-	-	-	4620	4800	5150	5270	4680	4640
lver	μg/L	-	-	-	-	< 0.010	< 0.010	< 0.010	< 0.010	0.014	< 0.010
odium rontium	μg/L μg/L	-	-	-	-	3310 117	3530 120	1700 95.9	1630 105	5070 104	5040 95.6
nallium	μg/L	-	-	-	-	0.04	0.039	0.03	0.023	0.032	0.031
in	μg/L	-	-	-	-	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	0.21
tanium ranium	μg/L μg/L	-	-	-	-	< 10 1.14	< 10 1.14	< 10 1.26	< 10 1.59	< 10 1.03	< 10 0.95
'anadium	μg/L μg/L	-	-	-	-	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	0.55
Zinc	μg/L	_	-			3.2	3.3	3.3	7.8	< 3.0	3

 $\mu$ S/cm = microSiemen per centimetre; °C = degrees Celcius; mg/L = milligram per litre; mV = millivolt; NTU = nephelometric turbidity Units; TCU = true colour unit

QA/QC = quality assurance/quality control; FDA = Field Duplicate Available; FD = Field Duplicate Standards from the Contaminated Sites Regulation (CSR), enacted in 1997, updated January 2019, and includes B.C.

Regs. 11/2019 and 13/2019 amendments.

AW-F = groundwater flow to surface water used by freshwater aquatic life; DW = groundwater used for drinking water, IW = groundwater used for irrigation; LW = groundwater used for livestock watering
An interim background groundwater estimate of 20 µg/L for cobalt was used to screen the data consistent with ENV Technical Bulletin 3 Regional Background Concentrations for Select Inorganic Substances in Groundwater dated 24

September 2018. < Indicates parameter was below laboratory equipment detection limit.

μg/L

- In results column indicates parameter was not analyzed. In guideline column indicates no guideline. <sup>a</sup> = standard is hardness dependent; <sup>b</sup> = standard is chloride dependent; <sup>c</sup> = standard is pH dependent

Underline - concentration exceeds BC CSR IW Italicized - concentration exceeds BC CSR DW Grey Highlight - concentration exceeds one or more guidelines < 3.0

3.3

					Location			C1404D	
					Sample Date QA/QC	2019-03-20	2019-05-23	2019-08-15	2019-10-23
Chemical Name	Unit	BC CSR AW-F	BC CSR DW	BC CSR IW	BC CSR LW				
Field Measured Conductivity	μS/cm	- 1	-	-	-	693.7	770	824	824
Dissolved oxygen	mg/L	-	-	-	-	0.59	0.07	0.08	0.09
Dissolved oxygen saturation pH	%	-	<u>-</u>	-	-	7.83	0.6 7.8	0.7 7.84	7.92
Redox potential	mV	-	-	-	-	127.5	-174.9	-167.9	-164.8
Temperature Turbidity	°C NTU	-	-	<u>-</u>	-	4.9 32	8.3 50	6.7	4.133 38
Conventional Parameters									
Acidity to pH 8.3 (as CaCO3)  Conductivity	mg/L μS/cm	-	-	-	-	2.2 705	2.5 755	1.1 774	< 1.0 724
Dissolved organic carbon	mg/L	-	-	-	-	2.22	2.12	1.91	1.54
Hardness, as CaCO3 (N)	mg/L	-	-	-	-	314	336	336	304
Oxidation-reduction potential pH	mV -	-	<u> </u>	-	-	345 8.29	404 8.34	431 8.29	465 8.39
Specific conductivity	μS/cm	-	-	-	-	693.7	770	824	824
Total alkalinity, as CaCO3  Total dissolved solids	mg/L mg/L	-	-	-	-	413 388	449 403	460 436	449 408
Total organic carbon	mg/L	-	-	-	-	38.1	8.5	1.92	1.65
Total suspended solids Turbidity	mg/L NTU	-	-	-	-	128 119	46.7 58.5	2.5 18.2	47.8 44.3
Major Ions									
Anion Sum Bicarbonate	meq/L mg/L	-	-	-	-	8.27	8.99	9.21	8.98
Bicarbonate, as CaCO3	mg/L	-	-	-	-	413	444	456	435
Bromide	mg/L	-	-	-	-	0.059	< 0.050	< 0.050	< 0.050
Calcium Carbonate	mg/L mg/L	-	-	<u> </u>	1000	63.7	61.8 -	61 -	56.2 -
Carbonate, as CaCO3	mg/L	-	-	-	-	< 1.0	5.4	4.4	14
Cation Sum Cation-anion balance	meq/L %	-	-	-	-	8.52 1.5	9.43 2.4	9.39 1	8.6
Chloride	mg/L	1500	250	100	600	< 0.50	< 0.50	< 0.50	< 0.50
Fluoride Hydroxide	mg/L mg/L	3 -	1.5 -	1 -	<u> </u>	0.187	0.22	0.245	0.21
Hydroxide, as CaCO3	mg/L	-	-	-	-	< 1.0	< 1.0	< 1.0	< 1.0
Ion balance	%	-	-	-	-	103 37.7	105 44.2	102 44.6	95.8 39.9
Magnesium Potassium	mg/L mg/L	-	<u> </u>	-	-	26.7	29.7	27	<u> </u>
Sodium	mg/L	-	200	-	-	33.2	42.3	43.1	40.5
Sulphate Nutrients	mg/L	4290	500	-	1000	< 0.30	< 0.30	< 0.30	< 0.30
Nitrate	mg-N/L	400	10	-	100	< 0.0050	< 0.0050	< 0.0050	0.0078
Nitrite Orthophosphate	mg-N/L mg-P/L	0.2-0.8	<u> </u>	-	10	< 0.0010 < 0.0010	< 0.0010 < 0.0010	< 0.0010 < 0.0010	< 0.0010 0.0011
Total ammonia	mg-N/L	1.31-18.5	-	-	-	2.36	2.61	2.72	2.86
Total Kjeldahl nitrogen Total phosphorus	mg-N/L mg-P/L	-	-	-	-	3.75 0.252	3.24 0.163	2.73 0.0113	2.93 0.0567
Dissolved Metals	IIIg-P/L	-	-	-	-	0.252	0.163	0.0113	0.0567
Aluminum	μg/L	-	9500	5000	5000	< 3.0	< 3.0	< 3.0	< 3.0
Antimony Arsenic	μg/L μg/L	90 50	6 10	100	25	< 0.10 2.15	< 0.10 2.39	< 0.10 2.01	< 0.10 2.38
Barium	μg/L	10000	1000	-	-	4450	4450	4390	4000
Beryllium Bismuth	μg/L μg/L	1.5	- 8	100	100	< 0.020 < 0.050	< 0.020 < 0.050	< 0.020 < 0.050	< 0.020 < 0.050
Boron	μg/L	12000	5000	500	5000	24	23	24	23
Cadmium Chromium	μg/L μg/L	3.5-10 10	5 50	5 8	80 50	0.0157 < 0.10	0.0142 < 0.10	< 0.010 < 0.10	< 0.020 < 0.10
Cobalt	μg/L	40	1	50	1000	0.27	0.18	0.14	0.13
Copper Iron	μg/L μg/L	80-90	1500 6500	200 5000	300	< 0.50 2210	< 0.50 1940	< 0.50 2020	0.8 1870
Lead	μg/L	6-160	10	200	100	< 0.050	< 0.050	< 0.050	< 0.050
Lithium Manganese	μg/L μg/L	-		2500 200	5000	<i>593</i> 21.9	<i>725</i> 18.7	<i>746</i> 18.1	684 18.6
Mercury	μg/L μg/L	0.25	1	1	2	< 0.0050	< 0.0050	< 0.0050	< 0.0050
Molybdenum	μg/L	10000	250	<u>10</u>	50	19.4	24.1	22.5	23.2
Nickel Selenium	μg/L μg/L	1500 20	80 10	200 20	1000 30	1.09 0.061	0.83 < 0.050	< 0.50 < 0.050	0.6 < 0.050
Silicon	μg/L	-	-	-	-	2730	2660	2840	2850
Silver Strontium	μg/L μg/L	15 -	20 2500	-	-	< 0.010 236	< 0.010 263	< 0.010 244	< 0.010 241
Thallium	μg/L	3	-	-	-	< 0.010	< 0.010	< 0.010	< 0.010
<u>Tin</u> Titanium	μg/L μg/L	1000	2500 -	-	-	< 0.10 < 10	< 0.10 < 10	< 0.10 < 10	0.3 < 10
Uranium	μg/L	85	20	10	200	0.154	0.066	0.072	0.069
Vanadium Zinc	μg/L μg/L	900-2400	20 3000	100 5000	100 2000	< 0.50 2.8	< 0.50 3.4	< 0.50 2.8	< 0.50 3.9
Total Metals									
Aluminum Antimony	μg/L μg/L	-	-	-	-	648 0.28	618 0.38	18.4 < 0.10	330 0.17
Arsenic	μg/L	-	-	-	-	2.47	4.03	1.83	3.03
Barium Beryllium	μg/L	-	-	-	-	4190 0.081	4660 0.105	4210 < 0.020	4240 0.067
Beryllium Bismuth	μg/L μg/L	-	-	<u>-</u>	-	< 0.050	< 0.050	< 0.050	0.067 < 0.050
Boron	μg/L	-	-	-	-	26	24	23	24
Cadmium Calcium	μg/L μg/L	-	-	-	-	0.173 58600	0.259 62200	< 0.020 56800	0.178 61400
Chromium	μg/L	-	-	-	-	2.3	2.42	0.2	1.26
Cobalt Copper	μg/L μg/L	-	-	-	-	0.94 5.05	1.06 20.2	0.17 < 0.50	0.61 4.01
Iron	μg/L	-	-	-	-	3510	5750	2250	3970
Lead Lithium	μg/L μg/L	-	-	-	-	1.94 560	3.33 698	0.09 661	2.06 735
Magnesium	μg/L	-	-	-	-	38200	43500	41800	43900
Manganese Mercury	μg/L	-	-	-	-	46.1	50	18.9	37.5
Molybdenum	μg/L μg/L	-	-	-	-	- 18.2	22.8	24	23.3
Nickel	μg/L	-	-	-	-	4.89	4.81	0.8	3.12
Potassium Selenium	μg/L μg/L	-	-	-	-	25300 0.1	26600 < 0.15	25300 < 0.050	26300 0.092
Silicon	μg/L	-	-	-	-	3900	3950	2940	3450
Silver Sodium	μg/L μg/L	-	-	-	-	0.049 35200	0.052 43700	< 0.010 42500	0.028 42500
Strontium	μg/L	-	-	-	-	228	263	250	254
Thallium	μg/L	-	-	-	-	0.036	0.039	< 0.010	0.028
Tin Titanium	μg/L μg/L	-	-	-	-	0.26 14	0.4 10	< 0.10 < 10	0.51 < 10
Uranium	μg/L	-	-	-	-	0.314	0.237	0.075	0.247
Vanadium	μg/L	-	-	-	-	4.75 25.1	5.3 45.4	< 0.50 4.7	3.22 24

 $\mu$ S/cm = microSiemen per centimetre; °C = degrees Celcius; mg/L = milligram per litre; mV = millivolt; NTU = nephelometric turbidity Units; TCU = true colour unit

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<u>Underline</u> - concentration exceeds BC CSR IW

					Location	0010 55 5	0010 ==	LC_PIZDC1404S	0010 07	2015
					Sample Date QA/QC	2019-03-20	2019-05-23 FDA	2019-05-23 FD	2019-08-15	2019-10-23
Chemical Name	Unit	BC CSR AW-F	BC CSR DW	BC CSR IW	BC CSR LW		TDA	10		
ield Measured onductivity	μS/cm	1		1	T - T	357.3	355.1	355.1	373.3	396.8
issolved oxygen	mg/L	-	-	-	-	0.33	0.13	0.13	0.11	0.1
issolved oxygen saturation	%	-	-	-	-	3.1	1.1 7.37	1.1 7.37	0.8	0.8 7.6
H edox potential	mV	-	-	-	-	7.55 -74.7	-23.4	-23.4	7.39	-78.7
emperature	°C	-	-	-	-	4.8	7	7	7	4.826
urbidity onventional Parameters	NTU	-	-	-	-	8	0	0	0	8.22
cidity to pH 8.3 (as CaCO3)	mg/L	-	-	-	-	1.3	1.5	2.4	2.1	< 1.0
onductivity	μS/cm	-	-	-	-	360	370	369	361	330
hissolved organic carbon lardness, as CaCO3 (N)	mg/L mg/L	-	-	-	-	2.7 194	2.12 209	2.74 206	2.53 203	1.88 187
oxidation-reduction potential	mV	-	-	-	-	413	396	362	439	354
H pecific conductivity	<u>-</u> μS/cm	-	<u> </u>	-	-	8.29 357.3	8.41 355.1	8.43	8.18 373.3	8.31 396.8
otal alkalinity, as CaCO3	mg/L	-	-	-	-	201	211	202	200	193
otal dissolved solids otal organic carbon	mg/L	-	-	-	-	199 2.31	182 2.41	171 2.65	197 2.58	201 2.02
otal suspended solids	mg/L mg/L	-	-	-	-	4.2	2.6	3.1	1.5	11
urbidity	NTU	-	-	-	-	7.41	10.3	10.7	7.12	12.9
Major Ions nion Sum	meq/L		_	_	<u> </u>	4.13	4.32	4.14	4.1	3.98
icarbonate	mg/L	-	-	-	-	-	-	-	-	-
icarbonate, as CaCO3	mg/L	-	-	-	-	201 < 0.050	206 < 0.050	197 < 0.050	200 < 0.050	190 < 0.050
romide alcium	mg/L mg/L	-	-	-	1000	< 0.050 48.2	< 0.050 51.5	< 0.050 51.4	< 0.050 50.6	< 0.050 46.5
arbonate	mg/L	-	-	-	-	-	-	-	-	-
arbonate, as CaCO3 ation Sum	mg/L meq/L	-	-	-	-	< 1.0 4.07	4.2 4.31	5 4.25	< 1.0 4.17	3.2 3.88
ation-anion balance	%	-	-	-	-	-	-	1.4	0.9	-
hloride luoride	mg/L	1500 3	250 1.5	100	600	< 0.50 0.153	< 0.50 0.145	< 0.50 0.148	< 0.50 0.157	< 0.50 0.142
uoride ydroxide	mg/L mg/L	-	1.5 -	-	-	U. 153 -	0.145 -	U. 148 -	U. 15/ -	0.142
ydroxide, as CaCO3	mg/L	-	-	-	-	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
on balance lagnesium	% mg/L	-	-	-	-	98.6 17.9	99.8 19.5	103 18.9	102 18.5	97.3 17.2
otassium	mg/L	-	-	-	-	3.83	1.62	1.59	1.53	1.53
odium	mg/L	- 4200	200	-	- 1000	1.52	1.02	1	0.966	1.25
ulphate Iutrients	mg/L	4290	500	-	1000	4.88	4.8	4.79	5.08	5.57
itrate	mg-N/L	400	10	-	100	0.0088	< 0.0050	< 0.0050	< 0.0050	< 0.0050
itrite rthophosphate	mg-N/L mg-P/L	0.2-0.8	1 -	-	10	0.0015 < 0.0010	< 0.0010 < 0.0010	< 0.0010 0.001	< 0.0010 < 0.0010	< 0.0010 0.0013
otal ammonia	mg-N/L	1.31-18.5	-	-	-	0.0146	< 0.0010	0.0552	0.0104	0.011
otal Kjeldahl nitrogen	mg-N/L	-	-	-	-	0.134	< 0.050	< 0.050	0.067	0.137
otal phosphorus Dissolved Metals	mg-P/L	-	-	-	-	0.0097	0.0068	0.0062	0.0049	0.0206
luminum	μg/L	-	9500	5000	5000	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
ntimony	μg/L	90 50	6 10	100	- 25	< 0.10 1.43	< 0.10 1.87	< 0.10 1.88	< 0.10 1.52	< 0.10 1.87
rsenic arium	μg/L μg/L	10000	1000	-	-	226	240	233	214	224
eryllium	μg/L	1.5	8	100	100	< 0.020	< 0.020	< 0.020	< 0.020	< 0.020
ismuth oron	μg/L μg/L	12000	5000	500	5000	< 0.050 < 10	< 0.050 < 10	< 0.050 < 10	< 0.050 < 10	< 0.050 < 10
admium	μg/L	3.5-10	5	5	80	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050
hromium	μg/L	10	50	8	50	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
obalt opper	μg/L μg/L	40 80-90	1500	50 200	1000 300	0.28 1.59	0.3 < 0.50	0.3 < 0.50	0.29 < 0.50	0.32 < 0.20
ron	μg/L	-	6500	5000	-	654	919	905	790	878
ead ithium	μg/L μg/L	6-160	10 8	200 2500	100 5000	0.056 5.7	< 0.050 5.3	< 0.050 5.2	< 0.050 6.4	< 0.050 6
Manganese	μg/L	-	1500	200	-	25.1	29.4	28.9	24.5	28.4
1ercury	μg/L	0.25	1	1	2	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050
lolybdenum lickel	μg/L μg/L	10000 1500	250 80	<u>10</u> 200	50 1000	3.22 1.31	3.42 1.32	3.22 1.26	3.07 1.08	3.26 1.22
elenium	μg/L	20	10	20	30	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050
ilicon	μg/L	- 15	-	-	-	3380	3350	3330	3600	3690
ilver trontium	μg/L μg/L	15	20 2500	-	-	< 0.010 44.5	< 0.010 47.4	< 0.010 48.2	< 0.010 42.4	< 0.010 44.6
hallium	μg/L	3	-	-	-	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
in itanium	μg/L μg/L	1000	2500 -	-	-	< 0.10 < 10	< 0.10 < 10	< 0.10 < 10	< 0.10 < 10	0.2 < 10
ranium	μg/L μg/L	85	20	10	200	0.648	0.589	0.585	0.548	0.57
anadium	μg/L	- 2400	20	100	100	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
nc otal Metals	μg/L	900-2400	3000	5000	2000	3.3	< 1.0	< 1.0	1.4	1
luminum	μg/L	-	-	-	-	14.8	8.1	7	5.6	12.6
ntimony rsenic	μg/L μg/L	-	-	-	-	< 0.10 1.66	< 0.10 2.16	< 0.10 2.14	< 0.10 1.71	< 0.10 1.87
arium	μg/L	-	-	-	-	230	237	238	217	239
eryllium	μg/L	-	-	-	-	< 0.020	< 0.020	< 0.020	< 0.020	< 0.020
ismuth oron	μg/L μg/L	-	-	-	-	< 0.050 < 10	< 0.050 < 10	< 0.050 < 10	< 0.050 < 10	< 0.050 < 10
admium	μg/L	-	-	-	-	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050
alcium hromium	μg/L μg/L	-	-	-	-	49200 0.39	50600 < 0.10	49900 < 0.10	46100 < 0.10	48800 < 0.10
obalt	μg/L μg/L	-	-	-	-	0.32	0.38	0.4	0.33	0.35
opper	μg/L	-	-	-	-	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
on ead	μg/L μg/L	-	-	-	-	800 0.22	1200 0.076	1250 0.069	936 < 0.050	991 < 0.050
thium	μg/L	-	-	-	-	6	5.1	5	5.1	6.4
agnesium	μg/L	-	-	-	-	18300	18700	18700	18000	18500
langanese lercury	μg/L μg/L	-	-	-	-	<u>28</u> -	33.5	34.6	25.4	29.3
olybdenum	μg/L	-	-	-	-	3.4	3.49	3.41	3.45	3.38
ickel otassium	μg/L ug/l	-	-	-	-	1.4 3410	1.34 1490	1.31 1490	1.33 1440	1.35 1540
elenium	μg/L μg/L	-	-	-	-	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050
licon	μg/L	-	-	-	-	3620	3570	3580	3570	3770
lver odium	μg/L μg/L	-	-	-	-	< 0.010 1480	0.012 1080	< 0.010 1070	< 0.010 935	< 0.010 1320
rontium	μg/L	-	-	-	-	46.1	47	48.7	44.8	46.3
nallium	μg/L	-	-	-	-	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
in	μg/L	-		-	-	< 0.10 < 10	< 0.10 < 10	< 0.10 < 10	< 0.10 < 10	0.21 < 10
tanium	[](]/	_		•		- III				
itanium Iranium Iranadium	μg/L μg/L μg/L	-	-	-	-	0.687 < 0.50	0.616	0.608 < 0.50	0.594	0.638

Notes:

μS/cm = microSiemen per centimetre; °C = degrees Celcius; mg/L = milligram per litre; mV = millivolt; NTU = nephelometric

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<u>Underline</u> - concentration exceeds BC CSR IW

					Location		GH_PC	TW10	
					Sample Date QA/QC	2019-01-15	2019-04-24	2019-08-22	2019-11-13
Chemical Name	Unit	BC CSR AW-F	BC CSR DW	BC CSR IW	BC CSR LW				
Field Measured Conductivity	μS/cm	_	-	-	_	697	751	703	693
Dissolved oxygen	mg/L	-	-	-	-	2.72	1.64	6.42	4.57
Dissolved oxygen saturation  H	%	-	-	-	-	22.5 7.49	13.7 7.59	57.4 7.67	37.7 7.15
Redox potential	- mV	-	-	-	-	-23.8	71.2	14.2	-6.9
emperature Turbidity	°C NTU	-	-	-	-	6.9 0.87	8.0 0.56	10.1 0.47	7.0 3.15
Conventional Parameters	NTO	-	-	-	-	0.87	0.30	0.47	3.13
Acidity to pH 8.3 (as CaCO3)	mg/L	-	-	-	-	6.0 726	1.9 706	6.0 692	8.2 641
Conductivity Dissolved organic carbon	μS/cm mg/L	-	-	-	-	< 0.5	< 0.5	< 0.5	< 0.5
Hardness, as CaCO3 (N)	mg/L	-	-	-	-	375	380	391	389
Oxidation-reduction potential DH	mV -	-	-	-	-	308 8.18	353 7.94	364 8.16	318 8.31
Specific conductivity	μS/cm	-	-	-	-	-	-	-	-
Total alkalinity, as CaCO3 Total dissolved solids	mg/L mg/L	-	-	-	-	206 497	238 504	209 474	204 480
otal organic carbon	mg/L	-	-	-	-	< 0.5	< 0.5	< 0.5	< 0.5
Total suspended solids Turbidity	mg/L NTU	-	-	-	-	2.0 11.7	1.7 11.9	1.2 7.16	8.0 26.3
Major Ions									
Anion Sum Bicarbonate	meq/L mg/L	-	-	-	-	8.3 252	9.13	8.3	8.39
Bicarbonate, as CaCO3	mg/L	-	-	-	-	206	238	209	202
Bromide	mg/L	-	-	-	- 1000	< 0.05	< 0.05	< 0.05	< 0.05
Calcium Carbonate	mg/L mg/L	-	-	-	1000	82.8 < 5.0	86.1 -	88.2 -	88.9 -
Carbonate, as CaCO3	mg/L	-	-	-	-	< 1.0	< 1.0	< 1.0	2.4
Cation Sum Cation-anion balance	meq/L %	-	-	-	-	7.78 -3.2	7.89 -7.3	8.11 -1.2	8.06 -2.0
Chloride	mg/L	1500	250	100	600	5.63	6.05	6.04	6.53
·luoride Hydroxide	mg/L mg/L	3 -	1.5 -	<u> </u>	1 -	0.816 < 5.0	0.927	0.808	0.892
lydroxide, as CaCO3	mg/L	-	-	-	-	< 1.0	< 1.0	< 1.0	< 1.0
on balance	% ma/l	-	-	-	-	93.8 40.8	86.3 40.1	97.7 41.5	96.1 40.6
Magnesium Potassium	mg/L mg/L	-	-	-	-	40.8 1.6	1.56	1.69	1.63
Sodium	mg/L	- 4200	200	-	1000	5.05	4.82	5.07	4.92
Sulphate Nutrients	mg/L	4290	500	-	1000	189	197	187	194
Vitrate	mg-N/L	400	10	-	100	0.539	0.688	0.288	0.445
Vitrite Orthophosphate	mg-N/L mg-P/L	0.2-0.8	<u> </u>	-	10	0.0142 < 0.001	0.0156 < 0.001	0.0132 < 0.001	0.0101 < 0.001
otal ammonia	mg-N/L	1.31-18.5	-	-	-	0.0879	0.0547	0.0671	0.0541
otal Kjeldahl nitrogen otal phosphorus	mg-N/L	-	-	-	-	0.148 < 0.002	0.065 0.0049	0.063 < 0.002	0.213 < 0.002
Dissolved Metals	mg-P/L	-	-	-	-	< 0.002	0.0049	< 0.002	< 0.002
Aluminum	μg/L	-	9500	5000	5000	< 3	< 3	< 3	< 3
Antimony Arsenic	μg/L μg/L	90 50	6 10	100	- 25	< 0.1 1.07	< 0.1 1.11	< 0.1 0.99	< 0.1 1.06
Barium	μg/L	10000	1000	-	-	18.4	19.5	19	17.3
Beryllium Bismuth	μg/L μg/L	1.5	8	100	100	< 0.02 < 0.05	< 0.02 < 0.05	< 0.02 < 0.05	< 0.02 < 0.05
Boron	μg/L	12000	5000	500	5000	34	34	36	37
Cadmium Chromium	μg/L μg/L	3.5-10 10	5 50	5 8	80 50	0.0074 < 0.1	0.0108 < 0.1	0.009 < 0.1	0.01 < 0.1
Cobalt	μg/L μg/L	40	1	50	1000	0.16	0.17	0.18	0.18
Copper	μg/L	80-90	1500	200	300	< 0.5	< 0.5	< 0.5	< 0.2
ron .ead	μg/L μg/L	6-160	6500 10	5000 200	100	698 0.067	691 < 0.05	506 0.054	489 0.064
ithium	μg/L	-	8	2500	5000	14.3	15.3	16	15.4
Manganese Mercury	μg/L μg/L	0.25	1500 1	200 1	2	51.2 < 0.005	50.9 < 0.005	52.7 < 0.005	49.5 < 0.005
Nolybdenum	μg/L	10000	250	<u>10</u>	50	2.7	2.87	2.81	3.09
Nickel Selenium	μg/L μg/L	1500 20	80 10	200 20	1000 30	<u> </u>	1.07 4.72	2.93 3.03	3.59 4
Silicon	μg/L μg/L	-	-	-	-	4830	4820	4820	4900
Silver	μg/L	15	20	-	-	< 0.01	< 0.01	< 0.01	< 0.01
Strontium Thallium	μg/L μg/L	3	2500 -	-	-	493 < 0.01	527 < 0.01	500 0.011	543 < 0.01
in	μg/L	-	2500	-	-	< 0.1	< 0.1	< 0.1	< 0.1
Titanium Jranium	μg/L μg/L	1000 85	20	- 10	200	< 10 0.68	< 10 0.677	< 10 0.756	< 10 0.717
/anadium	μg/L	-	20	100	100	< 0.5	< 0.5	< 0.5	< 0.5
Zinc Fotal Metals	μg/L	900-2400	3000	5000	2000	< 1	< 1	1.3	1.2
luminum	μg/L	-	-	-	-	< 3	< 3	< 3	< 3
Antimony Arsenic	μg/L μg/L	-	-	-	-	< 0.1 1.12	< 0.1 1.2	< 0.1 1.15	< 0.1 1.32
arium	μg/L	-	-	-	-	19.1	20.1	19.3	19
Beryllium Bismuth	μg/L μg/L	-	-	-	-	< 0.02 < 0.05	< 0.02 < 0.05	< 0.02 < 0.05	< 0.02 < 0.05
Boron	μg/L μg/L	-	-	-	-	36	34	38	36
admium	μg/L	-	-	-	-	0.0083	0.0099	0.0102	0.0113
alcium Chromium	μg/L μg/L	-	-	-	-	92800 < 0.1	92800 < 0.1	91100 < 0.1	90300
Cobalt	μg/L	-	-	-	-	0.16	0.18	0.19	0.18
copper ron	μg/L μg/L	-	-	-	-	< 0.5 738	< 0.5 773	< 0.5 628	< 0.5 1130
ead	μg/L	-	-	-	-	0.081	< 0.05	0.251	< 0.05
ithium //agnesium	μg/L μg/L	-	-	-	-	16.7 42200	14.5 45200	16.3 41500	16.6 42900
Manganese	μg/L	-	-	-	-	51.8	52.9	52.8	53.7
/lercury	μg/L	-	-	-	-	< 0.005	< 0.005	< 0.005	< 0.0005
Nolybdenum Nickel	μg/L μg/L	-	-	-	-	2.95 1.04	2.79 1.06	3.02 3.37	2.79 2.07
Potassium	μg/L	-	-	-	-	1550	1700	1710	1730
Selenium Silicon	μg/L μg/L	-	-	-	-	4.11 4920	4.56 4620	2.86 4840	3.61 5120
ilver	μg/L	-	-	-	-	< 0.01	< 0.01	< 0.01	< 0.01
Sodium	μg/L	-	-	-	-	5070 527	5410 547	5220 536	5080 516
trontium Thallium	μg/L μg/L	-	-	-	-	527 < 0.01	547 < 0.01	536 < 0.01	516 0.011
⁻in	μg/L	-	-	-	-	< 0.1	< 0.1	< 0.1	< 0.1
Fitanium Jranium	μg/L μg/L	-	-	-	-	< 10 0.701	< 10 0.684	< 10 0.676	< 10 0.749
/anadium	μg/L μg/L	-	-	-	-	< 0.5	< 0.5	< 0.5	< 0.5
	μg/L	_	-	-	_	< 3	< 3	< 3	< 3

 $\mu$ S/cm = microSiemen per centimetre; °C = degrees Celcius; mg/L = milligram per litre; mV = millivolt; NTU = nephelometric turbidity Units; TCU = true colour unit

QA/QC = quality assurance/quality control; FDA = Field Duplicate Available; FD = Field Duplicate Standards from the Contaminated Sites Regulation (CSR), enacted in 1997, updated January 2019, and includes B.C.

Regs. 11/2019 and 13/2019 amendments.

AW-F = groundwater flow to surface water used by freshwater aquatic life; DW = groundwater used for drinking water, IW = groundwater used for irrigation; LW = groundwater used for livestock watering
An interim background groundwater estimate of 20 µg/L for cobalt was used to screen the data consistent with ENV Technical Bulletin 3 Regional Background Concentrations for Select Inorganic Substances in Groundwater dated 24

September 2018.

< Indicates parameter was below laboratory equipment detection limit.

- In results column indicates parameter was not analyzed. In guideline column indicates no guideline. <sup>a</sup> = standard is hardness dependent; <sup>b</sup> = standard is chloride dependent; <sup>c</sup> = standard is pH dependent

Underline - concentration exceeds BC CSR IW

13 March 2020 19135981-2020-064-R-Rev0

## **APPENDIX D**

Dry Creek Area: Additional Hydrogeological Information

## **Monitoring Well Construction Details**

Teck Well Name	Golder Well	Northing	Easting	Ground Elevation	Measuring Point (PVC Stick		Depth to Bottom of	Depth to	Depth to Bottom of	Depth to Top of	Base of	Depth to Top of Highly	Double to Bodood
	Name	[m]	[m]	[masl]	Up) [mbgs]	Borehole [mbgs]	the Well [mbgs]	Sand Pack [mbgs]	Sand Pack [mbgs]	Screen [mbgs]	Screen [mbgs]	Consolidated Till [mbgs]	Depth to Bedrock [mbgs]
LC_PIZDC1401	MW14-04D	5,541,064		1705.36	-1.57	35.36	35.25	30.53	35.36	32.21	35.25	4.00	Not Encountered
LC_PIZDC1402	MW14-04S	5,541,069	658,192	1705.36	-1.14	12.75	12.75	7.72	12.75	9.53	12.57	4.00	Not Encountered
LC_PIZDC1301	MW13-6D	5,540,961	658,302	1710.58	-0.90	28.96	25.31	21.03	25.91	22.20	25.26	10.70	25.91
LC_PIZDC1302	MW13-6S	5,540,963	658,302	1710.56	-0.90	13.72	10.63	8.23	10.67	9.05	10.58	10.70	Not Encountered
LC_PIZDC1303	MW13-5D	5,540,989	658,271	1705.57	-0.90	32.00	31.64	28.65	32.00	28.53	31.59	7.30	Not Encountered
LC_PIZDC1304	MW13-5S	5,540,992	658,272	1705.57	-0.85	16.76	16.69	13.11	16.76	15.11	16.64	7.60	Not Encountered
LC_PIZDC1305	MW13-3D	5,541,056	658,278	1708.17	-0.95	27.43	25.62	23.62	27.43	23.58	25.57	3.00	24.40
LC_PIZDC1306	MW13-3S	5,541,059	658,278	1708.15	-0.90	16.76	16.46	13.72	16.76	14.42	16.41	6.90	Not Encountered
LC_PIZDC1307	MW13-1D	5,541,230	658,169	1690.51	-0.71	35.05	34.60	31.70	35.05	32.56	34.55	6.10	Not Encountered
LC_PIZDC1308	MW13-1S	5,541,232	658,168	1690.42	-0.95	19.81	9.01	4.72	9.45	5.90	8.96	7.60	Not Encountered
LC_PIZDC1309	MW13-2D	5,541,079	658,248	1700.76	-1.20	25.91	24.74	19.35	25.91	19.86	24.59	4.60	25.60
LC_PIZDC1310	MW13-2S	5,541,077	658,249	1700.72	-1.00	12.65	12.58	9.45	12.65	10.54	12.53	4.60	Not Encountered

Note: Coordinates are provided in UTM NAD83.

m - meters

masl - meters above sea level mags - meters above ground surface mbgs - metres below ground surface



## Single Well Analysis Results

Teck Well Name	Golder Well Name	Stick up	Screen Top	Screen Bottom	Screen Length	Water Level	Screened Lithology	Aquifer Type	Method	Flow Model	Approximate Radius of Influence	Assumed Storativity	Skin	Transmissivity	Hydraulic Conductivity	Analysis Figures
		(mbgs)	(mbgs)	(mbgs)	[m]	(mbgs)						Unitless	Unitless	[m <sup>2</sup> /s]	[m/s]	
LC_PIZDC1401	MW14-04D	-1.57	32.21	35.25	3.04	-0.90	CLAYEY SILT, sandy, gravelly to GRAVEL and SAND	Semi-confined	Transient	1 shell	< 10 m	1E-03	-1.0	1.E-07	4.E-08	Appendix V
LC_PIZDC1402	MW14-04S	-1.14	9.53	12.57	3.04	-1.14	CLAYEY SILT, sandy, gravelly	Confined	Transient	1 shell	< 10 m	1E-03	-0.4	2.E-07	5.E-08	Appendix V

Notes: m<sup>2</sup>/s - metres squared/second

m - metres

mbgs - metres below ground surface

n/a - not applicable

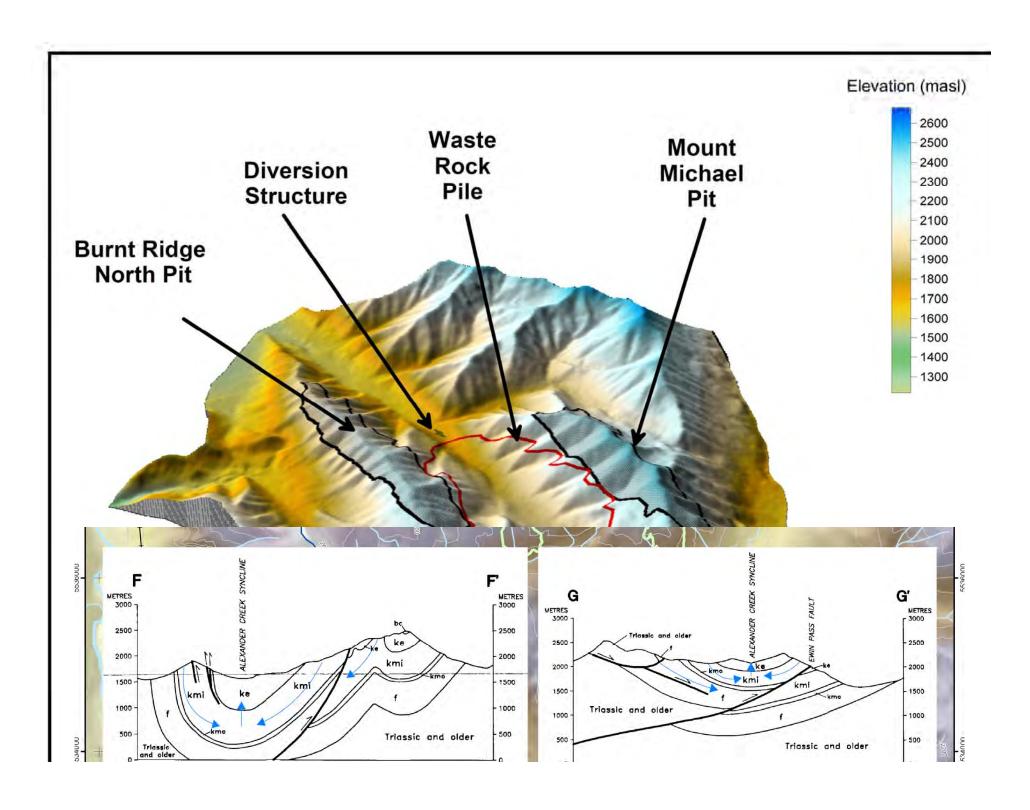
MW14-04S was experiencing artesian conditions and was overflowing the top of the standpipe prior to the start of of testing.

MW14-04D was experiencing artesian conditions and prior to the start of testing, with the static water level above ground level and within the PVC stickup.

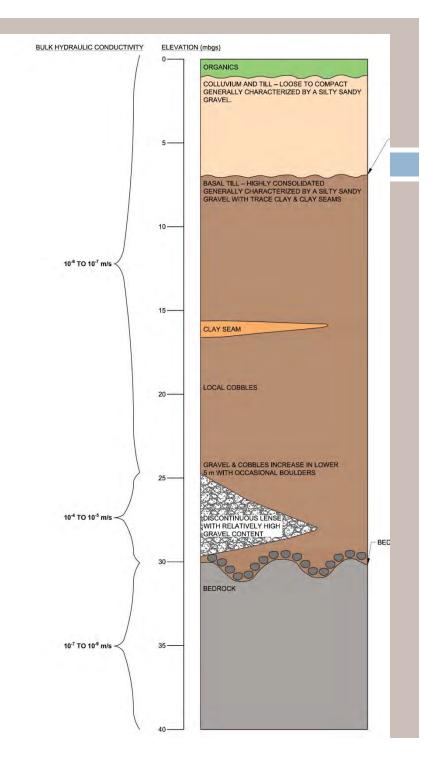


# TECK COAL — DRY CREEK

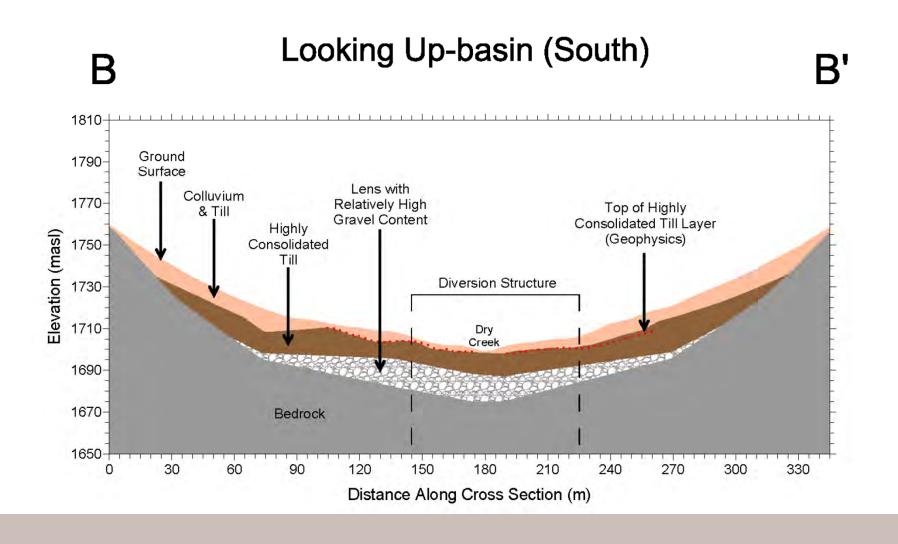
2013 HYDROGEOLOGY PROGRAM UPDATE
6 NOVEMBER 2013



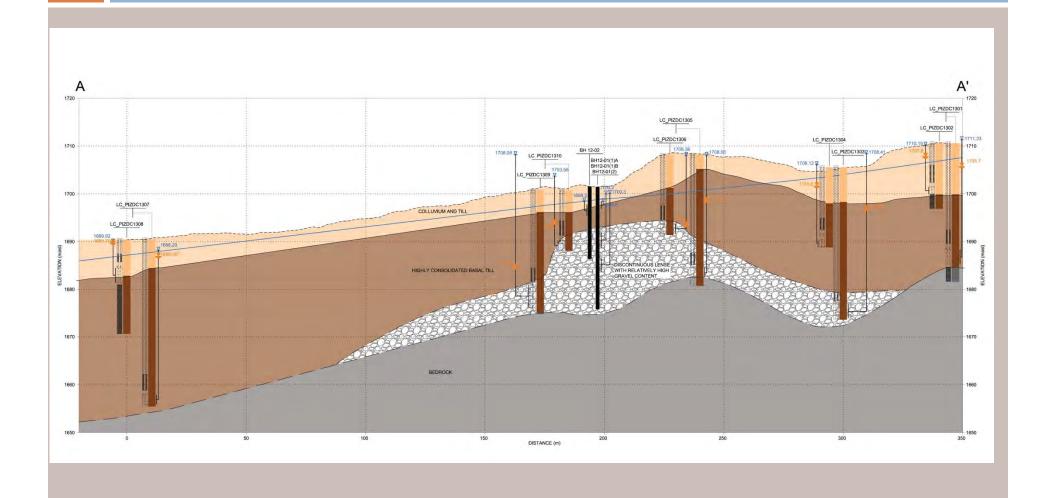
# Hydrostratigraphic Column



# Valley-Transverse Cross-Section



# Valley-Longitudinal Cross-Section



## **DRAFT**

PROJECT

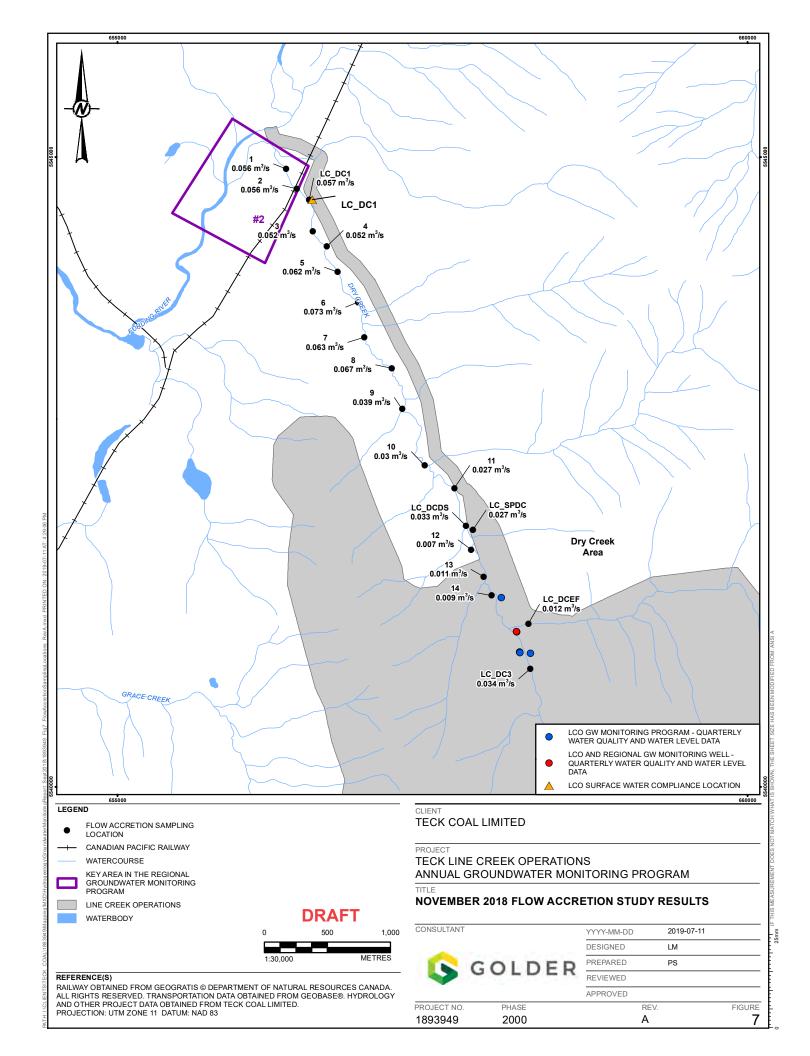
TECK LINE CREEK OPERATIONS
ANNUAL GROUNDWATER MONITORING PROGRAM

TITLE

Conceptual Groundwater Flow Patterns (Cross-Section View)



PROJECT	1	19115529	FILE No.	1911	5529	
DESIGN	NS	03/10/13	SCALE:	AS SHOWN	REV.	0
SURFER						
CHECK			FI	<b>GURE</b>	: 6	
REVIEW						



13 March 2020 19135981-2020-064-R-Rev0

**APPENDIX E** 

Statistical Analysis Results

## Appendix E Site Specific Groundwater Monitoring: 2019 Annual Report Teck Coal Limited - Line Creek Operations

### Table E1. Mann-Kendall Q1 Results Summary

		LC_PIZP110	04	LC_PIZP1105			LC_PIZDC0901			LC_PIZP1306			RG_02-20		
Parameter	Coefficient of Variation	Confidence Factor	Q1 Trend	Coefficient of Variation	Confidence Factor	Q1 Trend	Coefficient of Variation	Confidence Factor	Q1 Trend	Coefficient of Variation Confidence Factor Q1 Trend		Coefficient of Variation	Confidence Factor	Q1 Trend	
Nitrate, as N (mg-N/L)	0.42	88.3%	No Trend	0.89	59.2%	No Trend	1.47	50.0%	No Trend				0.08	82.1%	Stable
Sulphate (mg/L)	0.44	59.2%	No Trend	0.19	99.2%	Increasing	0.51	64.0%	Stable	*insufficient data (<4 data points in Q1)		sinte in O1)	0.06	95.8%	Increasing
Cadmium (µg/L)	1.3	59.2%	No Trend	0.4	95.8%	Increasing	0.33	64.0%	No Trend	ilisuilicielii ua	ita (~4 uata pi	Jilius III Q I )	1.4	75.8%	No Trend
Selenium (µg/L)	0.44	99.2%	Increasing	0.41	75.8%	No Trend	0.54	64.0%	No Trend				0.13	59.2%	Stable

LC\_PIZP1104, LC\_PIZP1105, LC\_PIZDC0901 and LC\_PIZP1306 analyzed for dissolved metals (i.e. cadmium and selenium)

RG\_02-20 analyzed for total metals (i.e. cadmium and selenium)

## Table E2. Mann-Kendall Q4 Results Summary

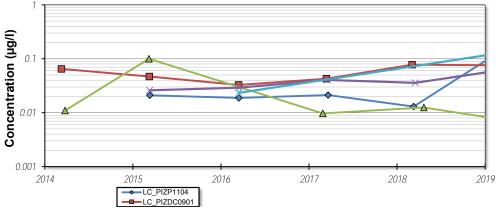
	LC_PIZP1104		104		LC_PIZP1105			LC_PIZDC0901			.C_PIZP1306		RG_02-20		
Parameter	Coefficient of Variation	Confidence Factor	Q4 Trend	Coefficient of Variation	Confidence Factor	Q4 Trend	Coefficient of Variation	Confidence Factor	Q4 Trend	Coefficient of Variation	Confidence Factor	Q4 Trend	Coefficient of Variation	Confidence Factor	Q4 Trend
Nitrate, as N (mg-N/L)	0.35	64.0%	No Trend	1.10	88.3%	No Trend	1.3	76.5%	No Trend	0.5	62.5%	No Trend	0.08	93.2%	Prob. Decreasing
Sulphate (mg/L)	0.26	97.2%	Decreasing	0.25	99.2%	Increasing	0.45	86.4%	No Trend	0.06	37.5%	Stable	0.04	76.5%	No Trend
Cadmium (µg/L)	0.37	93.2%	Prob. Increasing	0.5	75.8%	No Trend	0.36	64.0%	Stable	0.1	83.3%	No Trend	1.6	93.2%	Prob. Decreasing
Selenium (µg/L)	0.7	76.5%	Stable	0.68	59.2%	Stable	0.33	99.2%	Increasing	0.3	83.3%	No Trend	0.09	76.5%	Stable

| Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Color | Colo

# GSI MANN-KENDALL TOOLKIT for Constituent Trend Analysis

Evaluation Date: 18-Feb-20	Job ID:	19135981	
Facility Name: Golder	Constituent:	Cadmium	
Conducted By: Kurt Forsch	Concentration Units:	μg/l	

Samp	oling Point ID:	LC_PIZP1104	LC_PIZDC0901	RG_02-20	LC_PIZP1105	LC_PIZDC1306	
Sampling Event	Sampling Date			CADMIL	IM CONCENTRATI	ON (μg/l)	
1	13-Mar-15	0.021					
2	17-Mar-16	0.0188					
3	23-Mar-17	0.0212					
4	13-Mar-18	0.013					
5	18-Mar-19	0.146					
6	11-Mar-14		0.065				
7	11-Mar-15		0.047				
8	16-Mar-16		0.0327				
9	16-Mar-17		0.0427				
10	7-Mar-18		0.0777				
11	26-Mar-19		0.0757				
12	26-Mar-14			0.011			
13	10-Mar-15			0.1			
14	1-Mar-17			0.0097			
15	25-Apr-18			0.0125			
16	25-Feb-19			0.0077			
17	12-Mar-15				0.026		
18	17-Mar-16				0.0291		
19	22-Mar-17				0.0404		
20	20-Mar-18				0.0358		
21	29-Mar-19				0.0633		
22	16-Mar-16					0.0233	
23	25-Mar-19					0.131	
24							
25	ļ						
	nt of Variation:	1.30	0.33	1.43	0.38	0.99	
	II Statistic (S):	2	3	-4	8	1	
Confi	idence Factor:	59.2%	64.0%	75.8%	95.8%		
Concen	tration Trend:	No Trend	No Trend	No Trend	Increasing		



## Notes:

- 1. At least four independent sampling events per well are required for calculating the trend. Methodology is valid for 4 to 40 samples.
- 2. Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
- 3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

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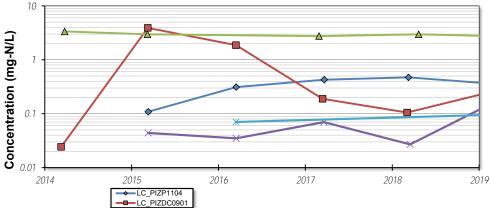
GSI Environmental Inc., www.gsi-net.com

## **GSI MANN-KENDALL TOOLKIT**

for Constituent Trend Analysis

Evaluation Date: 18-Feb-20	Job ID:	19135981
Facility Name: Golder	Constituent:	Nitrate, as N
Conducted By: Kurt Forsch	Concentration Units:	mg-N/L

Samı	oling Point ID:	LC_PIZP1104	LC_PIZDC0901	RG_02-20	LC_PIZP1105	LC_PIZDC1306	
Sampling Event	Sampling Date			NITRATE, AS	S N CONCENTRAT	ION (mg-N/L)	
1	13-Mar-15	0.109					
2	17-Mar-16	0.312					
3	23-Mar-17	0.428					
4	13-Mar-18	0.472					
5	18-Mar-19	0.357					
6	11-Mar-14		0.0243				
7	11-Mar-15		3.9				
8	16-Mar-16		1.87				
9	16-Mar-17		0.189				
10	7-Mar-18		0.105				
11	26-Mar-19		0.273				
12	26-Mar-14			3.36			
13	10-Mar-15			2.97			
14	1-Mar-17			2.75			
15	25-Apr-18			2.97			
16	25-Feb-19			2.76			
17	12-Mar-15				0.044		
18	17-Mar-16				0.035		
19	22-Mar-17				0.07		
20	20-Mar-18				0.027		
21	29-Mar-19				0.181		
22	16-Mar-16					0.0702	
23	25-Mar-19					0.0962	
24							
25							
	nt of Variation:	0.42	1.47	0.08	0.89	0.22	
	II Statistic (S):	6	-1	-5	2	1	
Conf	idence Factor:	88.3%	50.0%	82.1%	59.2%		
Concer	tration Trend:	No Trend	No Trend	Stable	No Trend		



## Notes:

- 1. At least four independent sampling events per well are required for calculating the trend. Methodology is valid for 4 to 40 samples.
- Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing;
   ≥ 90% = Probably Increasing or Probably Decreasing;
   < 90% and S>0 = No Trend;
   < 90%, S≤0, and COV ≥ 1 = No Trend;</li>
   < 90% and COV < 1 = Stable.</li>
- 3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, Ground Water, 41(3):355-367, 2003.

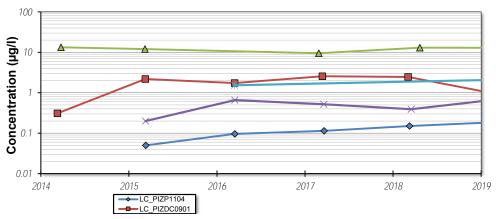
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# GSI MANN-KENDALL TOOLKIT for Constituent Trend Analysis

Evaluation Date: 18-Feb-20	Job ID:	19135981	
Facility Name: Golder	Constituent:	Selenium	
Conducted By: Kurt Forsch	Concentration Units:	μg/l	

Samp	pling Point ID:	LC_PIZP1104	LC_PIZDC0901	RG_02-20	LC_PIZP1105	LC_PIZDC1306	
Sampling Event	Sampling Date			SELENII	JM CONCENTRAT	ION (µg/I)	
1	13-Mar-15	0.05					
2	17-Mar-16	0.096					
3	23-Mar-17	0.114					
4	13-Mar-18	0.15					
5	18-Mar-19	0.188					
6	11-Mar-14		0.31				
7	11-Mar-15		2.18				
8	16-Mar-16		1.74				
9	16-Mar-17		2.56				
10	7-Mar-18		2.46				
11	26-Mar-19		0.894				
12	26-Mar-14			13.3			
13	10-Mar-15			12			
14	1-Mar-17			9.5			
15	25-Apr-18			13			
16	25-Feb-19			12.9			
17	12-Mar-15				0.2		
18	17-Mar-16				0.657		
19	22-Mar-17				0.521		
20	20-Mar-18				0.391		
21	29-Mar-19				0.704		
22	16-Mar-16					1.53	
23	25-Mar-19					2.1	
24							
25							
Coefficier	nt of Variation:	0.44	0.54	0.13	0.41	0.22	
	II Statistic (S):	10	3	-2	4	1	
Confi	idence Factor:	99.2%	64.0%	59.2%	75.8%		
Concer	tration Trend	Increasing	No Trend	Stable	No Trend		



## Notes:

- 1. At least four independent sampling events per well are required for calculating the trend. Methodology is valid for 4 to 40 samples.
- Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing;
   ≥ 90% = Probably Increasing or Probably Decreasing;
   < 90% and S>0 = No Trend;
   < 90%, S≤0, and COV ≥ 1 = No Trend;</li>
   < 90% and COV < 1 = Stable.</li>
- 3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

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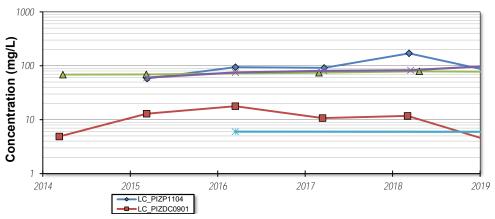
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## **GSI MANN-KENDALL TOOLKIT**

for Constituent Trend Analysis

Evaluation Date: 18-Feb-20	Job ID:	19135981
Facility Name: Golder	Constituent:	Sulphate
Conducted By: Kurt Forsch	Concentration Units:	mg/L

Samp	ling Point ID:	LC_PIZP1104	LC_PIZDC0901	RG_02-20	LC_PIZP1105	LC_PIZDC1306		
Sampling	Sampling	CHI DILATE CONCENTO ATION (2001)						
Event	Date	SULPHATE CONCENTRATION (mg/L)						
1	13-Mar-15	58.1						
2	17-Mar-16	94.1						
3	23-Mar-17	91.8						
4	13-Mar-18	170						
5	18-Mar-19	74.7						
6	11-Mar-14		4.87					
7	11-Mar-15		12.9					
8	16-Mar-16		17.8					
9	16-Mar-17		10.7					
10	7-Mar-18		11.8					
11	26-Mar-19		3.61					
12	26-Mar-14			68.6				
13	10-Mar-15			69.1				
14	1-Mar-17			74.6				
15	25-Apr-18			78.9				
16	25-Feb-19			77.6				
17	12-Mar-15				60.4			
18	17-Mar-16				75.3			
19	22-Mar-17				80.4			
20	20-Mar-18				82.7			
21	29-Mar-19				102			
22	16-Mar-16					6.01		
23	25-Mar-19					5.97		
24								
25		0.44						
	Coefficient of Variation:		0.51	0.06	0.19	0.00		
Mann-Kendal		2	-3	8	10	-1		
Confi	dence Factor:	59.2%	64.0%	95.8%	99.2%			



## Notes:

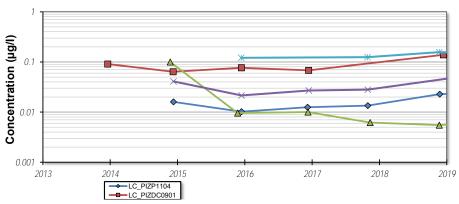
Concentration Trend:

- 1. At least four independent sampling events per well are required for calculating the trend. Methodology is valid for 4 to 40 samples.
- Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing;
   ≥ 90% = Probably Increasing or Probably Decreasing;
   < 90% and S>0 = No Trend;
   < 90%, S≤0, and COV ≥ 1 = No Trend;</li>
   < 90% and COV < 1 = Stable.</li>
- 3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

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### **GSI MANN-KENDALL TOOLKIT** for Constituent Trend Analysis Job ID: 19135981 Evaluation Date: 18-Feb-20 Constituent: Cadmium Facility Name: Golder Concentration Units: µg/I Conducted By: Kurt Forsch Sampling Point ID: LC\_PIZP1104 | LC\_PIZDC0901 | RG\_02-20 | LC\_PIZP1105 | LC\_PIZDC1306 11-Dec-14 0.016 17-Dec-15 0.0102 3 0.0125 2-Nov-17 0.0135 5 28-Nov-18 0.0228 6 19-Dec-13 0.091 8 10-Dec-14 9 16-Dec-15 0.0767 10 15-Dec-16 11 0.139 12 6-Nov-19 13 24-Nov-14 0.1 14 26-Nov-15 15 0.01 16 15-Nov-17 17 26-Nov-18 18 28-Nov-19 19 11-Dec-14 0.041 20 17-Dec-15 0.0215 21 16-Dec-16 0.027 22 23 14-Nov-19 0.067 24 25 1-Nov-17 0.125 26 0.157 27 7-Nov-19 0.14 28 29 30 Coefficient of Variation Mann-Kendall Statistic (S): Confidence Factor: 75.8%



## Notes:

Concentration Trend: Prob. Increasing

- 1. At least four independent sampling events per well are required for calculating the trend. Methodology is valid for 4 to 40 samples.
- 2. Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
- Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, Ground Water, 41(3):355-367, 2003.

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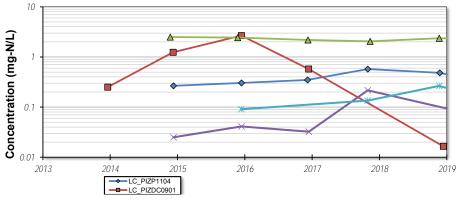
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# GSI MANN-KENDALL TOOLKIT for Constituent Trend Analysis

Evaluation Date: 18-Feb-20	Job ID:	19135981
Facility Name: Golder	Constituent:	Nitrate, as N
Conducted By: Kurt Forsch	Concentration Units:	mg-N/L

Samp	oling Point ID:	LC_PIZP1104	LC_PIZDC0901	RG_02-20	LC_PIZP1105	LC_PIZDC1306		
Sampling Event	Sampling Date	NITRATE, AS N CONCENTRATION (mg-N/L)						
1	11-Dec-14	0.266						
2	17-Dec-15	0.303						
3	9-Dec-16	0.348						
4	2-Nov-17	0.574						
5	28-Nov-18	0.483						
6	21-Nov-19	0.249						
7	19-Dec-13		0.25					
8	10-Dec-14		1.24					
9	16-Dec-15		2.67					
10	15-Dec-16		0.575					
11	18-Dec-18		0.0165					
12	6-Nov-19		0.113					
13	24-Nov-14			2.5				
14	26-Nov-15			2.44				
15	12-Dec-16			2.19				
16	15-Nov-17			2.05				
17	26-Nov-18			2.37				
18	28-Nov-19			2.17				
19	11-Dec-14				0.025			
20	17-Dec-15				0.041			
21	16-Dec-16				0.0323			
22	2-Nov-17				0.216			
23	14-Nov-19				0.051			
24	15-Dec-15					0.0906		
25	1-Nov-17					0.135		
26	26-Nov-18					0.265		
27	7-Nov-19					0.114		
28								
29								
30								
	t of Variation:	0.35	1.25	0.08	1.10	0.52		
Mann-Kendal		3	-5	-9	6	2		
Confi	dence Factor:	64.0%	76.5%	93.2%	88.3%	62.5%		

Prob. Decreasing



## Notes

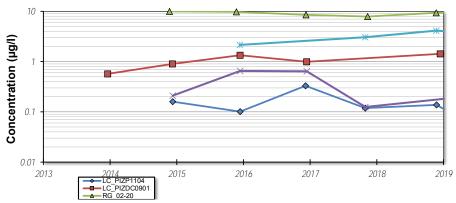
Concentration Trend:

- 1. At least four independent sampling events per well are required for calculating the trend. Methodology is valid for 4 to 40 samples.
- 2. Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
- Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, Ground Water, 41(3):355-367, 2003.

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### **GSI MANN-KENDALL TOOLKIT** for Constituent Trend Analysis Job ID: 19135981 Evaluation Date: 18-Feb-20 Constituent: Selenium Facility Name: Golder Concentration Units: µg/I Conducted By: Kurt Forsch Sampling Point ID: LC\_PIZP1104 LC\_PIZDC0901 11-Dec-14 0.16 17-Dec-15 3 0.33 2-Nov-17 0.119 5 28-Nov-18 0.138 6 19-Dec-13 8 10-Dec-14 9 16-Dec-15 1.34 10 15-Dec-16 11 1.43 12 6-Nov-19 13 24-Nov-14 10 14 26-Nov-15 15 8.54 16 15-Nov-17 17 26-Nov-18 9.36 18 28-Nov-19 9.67 19 11-Dec-14 20 17-Dec-15 21 16-Dec-16 0.64 22 23 14-Nov-19 0.238 24 25 1-Nov-17 3.06 26 4.13 27 7-Nov-19 3.36 28 29 30 Coefficient of Variation Mann-Kendall Statistic (S): Confidence Factor: 76.5% Concentration Trend: 10



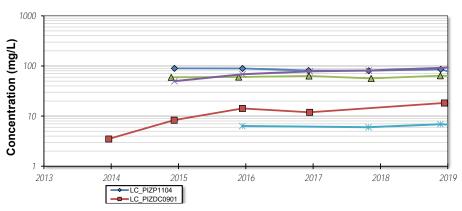
## Notes

- 1. At least four independent sampling events per well are required for calculating the trend. Methodology is valid for 4 to 40 samples.
- 2. Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
- Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, Ground Water, 41(3):355-367, 2003.

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#### **GSI MANN-KENDALL TOOLKIT** for Constituent Trend Analysis Job ID: 19135981 Evaluation Date: 18-Feb-20 Constituent: Sulphate Facility Name: Golder Concentration Units: mg/L Conducted By: Kurt Forsch Sampling Point ID: LC\_PIZP1104 LC\_PIZDC0901 11-Dec-14 89.5 17-Dec-15 89.4 3 81.4 2-Nov-17 5 28-Nov-18 85.7 6 19-Dec-13 8 10-Dec-14 9 16-Dec-15 14.2 10 15-Dec-16 11 18.3 12 6-Nov-19 13 24-Nov-14 59.6 14 26-Nov-15 15 63.3 16 15-Nov-17 17 26-Nov-18 63.9 18 28-Nov-19 19 11-Dec-14 20 17-Dec-15 21 16-Dec-16 78.1 22 23 14-Nov-19 102 24 25 1-Nov-17 26 27 7-Nov-19 6.06 28 29 30 Coefficient of Variation Mann-Kendall Statistic (S): Confidence Factor: 76.5%



#### Notes

Concentration Trend:

- 1. At least four independent sampling events per well are required for calculating the trend. Methodology is valid for 4 to 40 samples.
- 2. Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
- Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, Ground Water, 41(3):355-367, 2003.

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Site Specific Groundwater Monitoring: 2019 Annual Report Teck Coal Limited - Line Creek Operations

Table E3. Upper Control Limit Summary - Process Plant Area & Downgradient Location

Upper Control Limit for RG_02-20		Upper Control Limit for LC_PIZP1104		Upper Control Limit LC_PIZP1105		PIZP1105			
Location Description	Downg	radient of Pla	ant Site	Phas	e I - Process	Plant	Phas	e I - Process I	Plant
Parameter	2018	2019	% Change	2018	2019	% Change	2018	2019	% Change
Nitrate, as N (mg-N/L)	6.457	6.415	-0.7%	0.973	0.951	-2.3%	NC	0.674	NC
Sulphate (mg/L)	655.202	645.258	-1.5%	257.365	249.368	-3.1%	NC	267.235	NC
Cadmium (µg/L)	0.122	0.119	-2.3%	0.0498	0.165	231.3%	NC	0.115	NC
Selenium (µg/L)	24.927	25.116	0.8%	0.484	0.481	-0.6%	NC	1.201	NC

Notes:

 $\label{eq:local_local_local_local} \mbox{LC\_PIZP1104} \ \mbox{and} \ \mbox{LC\_PIZP1105} \ \mbox{analyzed for dissolved metals (i.e. cadmium and Selenium)}$ 

RG\_02-20 analyzed for total metals (i.e. cadmium and selenium)

Highlighted cell shown an increase in the Upper Control Limit from 2018 to 2019

The significant increase in the upper control limit for cadmium at LC\_PIZP1104 is attributed to the elevated March 2019 concentration of 0.146 ug/L; this value should be excluded during calculation of the 2020 upper control limit.

Table E4. Upper Control Limit Summary - Dry Creek Area

	LC_PIZDC0901		LC_PIZDC1306		6		
Location Description	Phase II - Dry Creek		Phase II - Dry Creek Phase I		ase II - Dry Cr	II - Dry Creek	
Parameter	2018 2019 % Change		2018	2019	% Change		
Nitrate, as N (mg-N/L)	9.274	9.274 9.112 -1.7%		NC	0.408	NC	
Sulphate (mg/L)	30.766	32.179	4.6%	NC	14.532	NC	
Cadmium (µg/L)	0.214	0.215	0.7%	NC	0.52	NC	
Selenium (µg/L)	6.102	6.005	-1.6%	NC	8.986	NC	

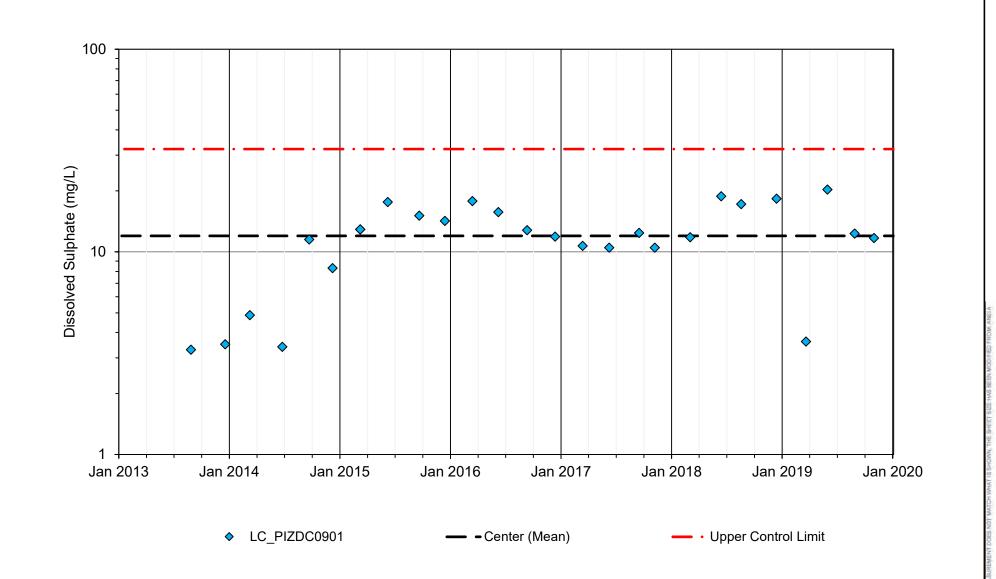
Notes:

LC\_PIZP1104 and LC\_PIZP1105 analyzed for dissolved metals (i.e. cadmium and Selenium)

RG\_02-20 analyzed for total metals (i.e. cadmium and selenium)

NC - not calculated

Highlighted cell shown an increase in the Upper Control Limit from 2018 to 2019



Lower Control Limit = 1.336 mg/L (not shown)

Center concentration is equivalent to Mean Concentration

Upper Control Limit = 32.179 mg/L (99.7 percentile of data set)

CLIENT

### TECK COAL LIMITED

CONSULTANT



YYYY-MM-DD	2020 - 02 - 21
PREPARED	KF
DESIGNED	NH
REVIEWED	LO
APPROVED	MJM

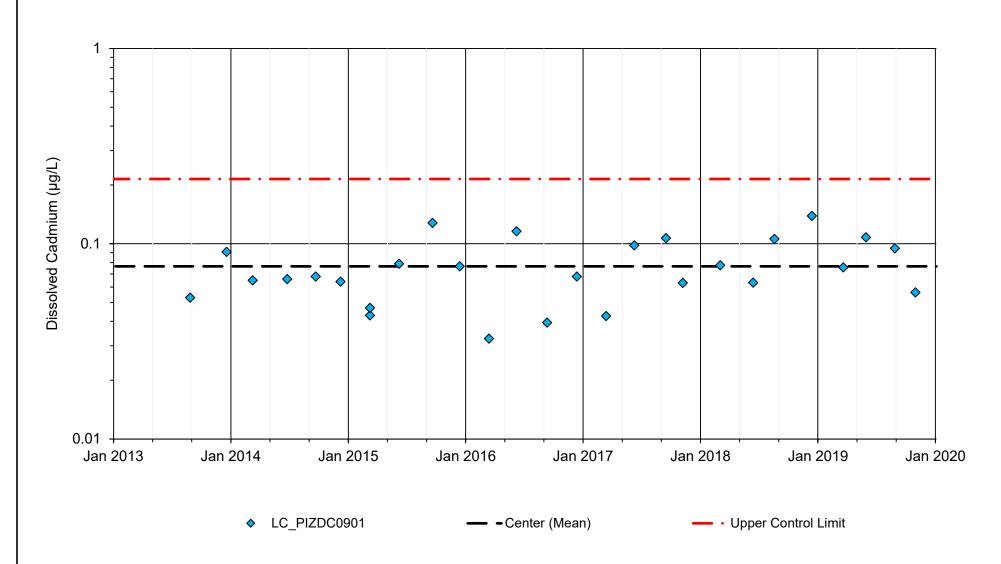
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# TECK LINE CREEK OPERATIONS ANNUAL GROUNDWATER MONITORING PROGRAM

TITLE

LC\_PIZDC0901 Dissolved Sulphate Control Charting

19135981	1000	0	E1a
PROJECT NO.	PHASE	REV	FIGURE



Lower Control Limit = 0.013 mg/L (not shown)

Center concentration is equivalent to Mean Concentration

Upper Control Limit = 0.215 mg/L (99.7 percentile of data set)

CLIENT

TECK COAL LIMITED

CONSULTANT



YYYY-MM-DD	2020 - 02 - 21
PREPARED	KF
DESIGNED	NH
REVIEWED	LO
APPROVED	МЈМ

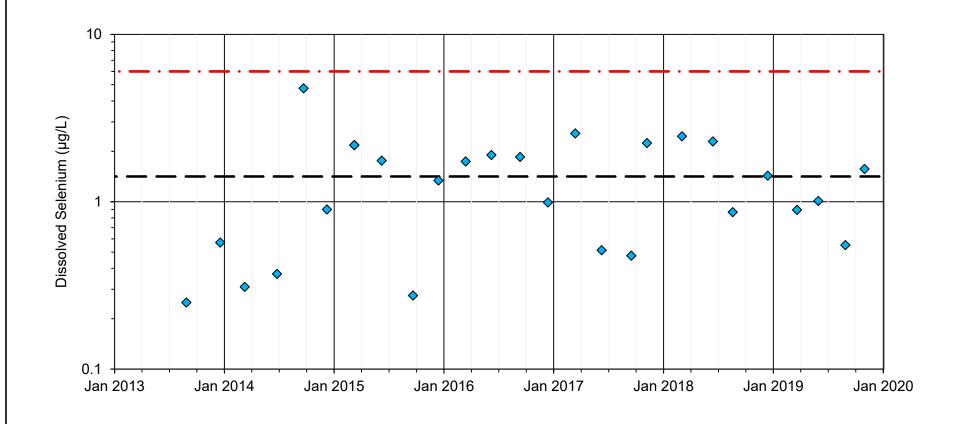
DDO IEC

TECK LINE CREEK OPERATIONS
ANNUAL GROUNDWATER MONITORING PROGRAM

TITLE

LC\_PIZDC0901 Dissolved Cadmium Control Charting

	ロイト
PROJECT NO. PHASE REV	FIGURE



♦ LC\_PIZDC0901

- Center (Mean)

Upper Control Limit

NOTES

Lower Control Limit = 0.609 mg/L (not shown)

Center concentration is equivalent to Mean Concentration

Upper Control Limit = 6.005 mg/L (99.7 percentile of data set)

CLIENT

TECK COAL LIMITED

CONSULTANT



YYYY-MM-DD	2021 - 02 - 21
PREPARED	KF
DESIGNED	NH
REVIEWED	LO
APPROVED	MJM

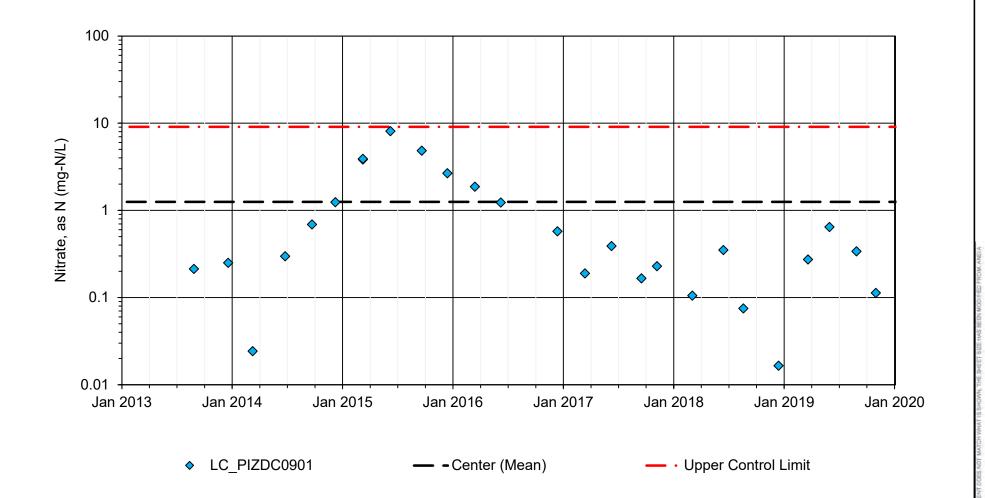
DDO IEC

TECK LINE CREEK OPERATIONS
ANNUAL GROUNDWATER MONITORING PROGRAM

TITLE

LC\_PIZDC0901 Dissolved Selenium Control Charting

PROJECT NO. PHASE REV FIGUR		19135981	1000	0	E1c
	_			REV	FIGUR



Lower Control Limit = 1.034 mg/L (not shown)

Center concentration is equivalent to Mean Concentration

Upper Control Limit = 9.112 mg/L (99.7 percentile of data set)

CLIENT

TECK COAL LIMITED

CONSULTANT



YYYY-MM-DD	2020 - 02 - 21
PREPARED	KF
DESIGNED	NH
REVIEWED	LO
APPROVED	МЈМ

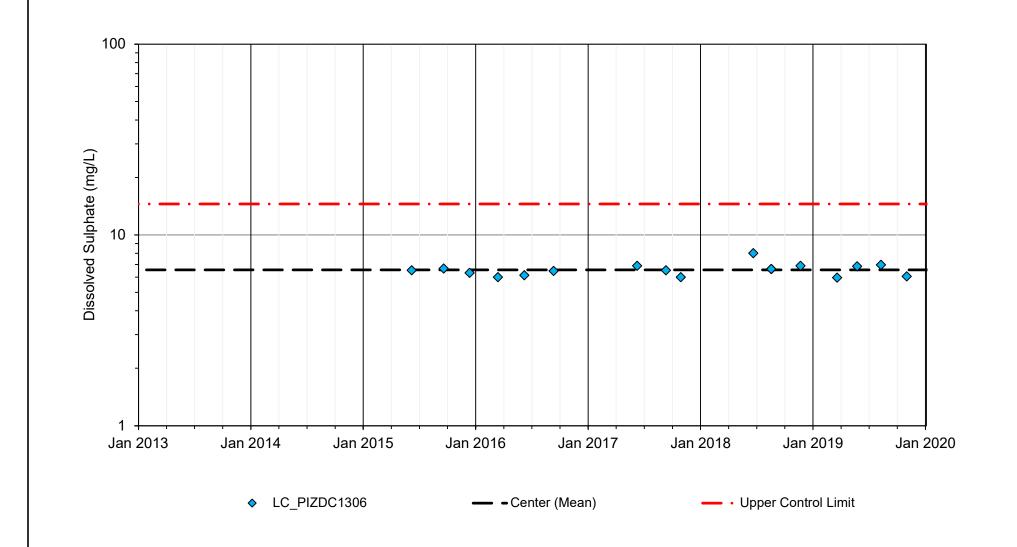
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TECK LINE CREEK OPERATIONS
ANNUAL GROUNDWATER MONITORING PROGRAM

TITLE

LC\_PIZDC0901 Dissolved Nitrate Control Charting

_ TROUGOTRO. FINASE	HOOK
PROJECT NO. PHASE REV	FIGLIRI



Lower Control Limit = 0.270 mg/L (not shown)

Center concentration is equivalent to Mean Concentration

Upper Control Limit = 14.532 mg/L (99.7 percentile of data set)

CLIENT

TECK COAL LIMITED

CONSULTANT



YYYY-MM-DD	2020 - 02 - 21
PREPARED	KF
DESIGNED	NH
REVIEWED	LO
APPROVED	MJM

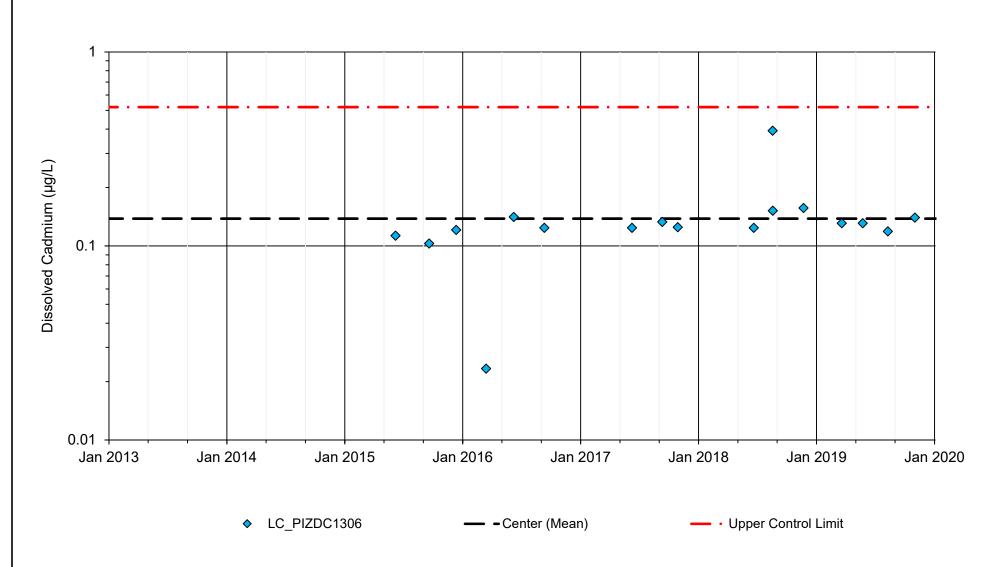
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TECK LINE CREEK OPERATIONS
ANNUAL GROUNDWATER MONITORING PROGRAM

ITLE

LC\_PIZDC1306 Dissolved Sulphate Control Charting

PROJECT NO. PHASE REV FIGURE		19135981	1000	0	E2a
	_			REV	FIGURE



Lower Control Limit = 0.015 mg/L (not shown)

Center concentration is equivalent to Mean Concentration

Upper Control Limit = 0.520 mg/L (99.7 percentile of data set)

CLIENT

TECK COAL LIMITED

CONSULTANT



YYYY-MM-DD	2020 - 02 - 21
PREPARED	KF
DESIGNED	NH
REVIEWED	LO
APPROVED	MJM

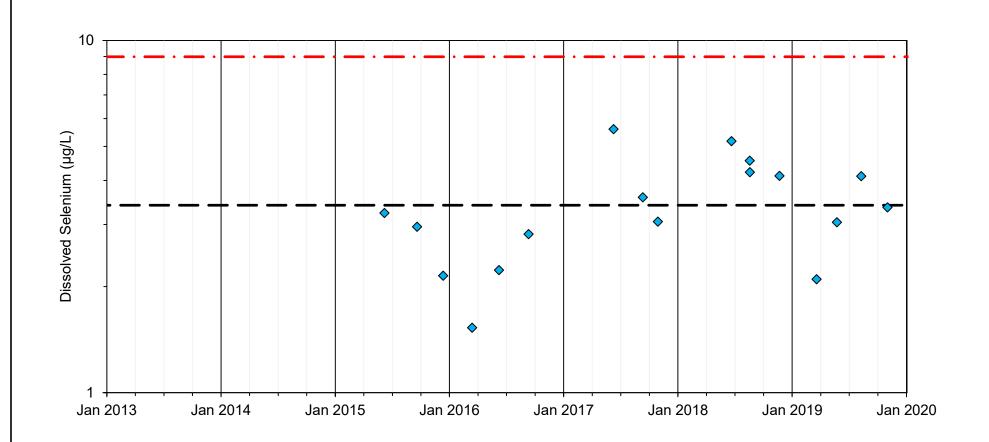
DDO IEC

TECK LINE CREEK OPERATIONS
ANNUAL GROUNDWATER MONITORING PROGRAM

TITLE

LC\_PIZDC1306 Dissolved Cadmium Control Charting

19135981	1000	0	E2b
PROJECT NO.	DUACE	DEV/	FICURE



♦ LC\_PIZDC1306

- Center (Mean)

Upper Control Limit

NOTES

Lower Control Limit = 0.474 mg/L (not shown)

Center concentration is equivalent to Mean Concentration

Upper Control Limit = 8.986 mg/L (99.7 percentile of data set)

CLIENT

TECK COAL LIMITED

CONSULTANT



YYYY-MM-DD	2021 - 02 - 21
PREPARED	KF
DESIGNED	NH
REVIEWED	LO
APPROVED	MJM

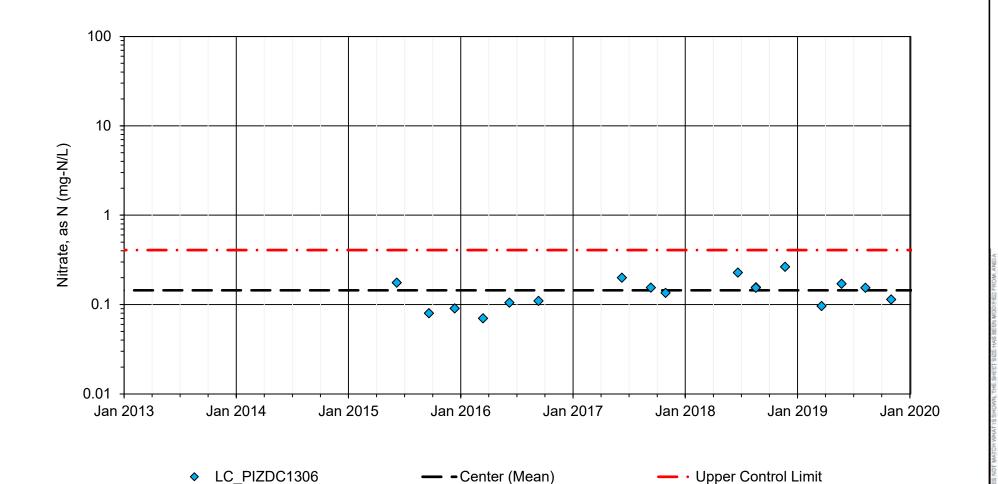
DDO IEC

TECK LINE CREEK OPERATIONS
ANNUAL GROUNDWATER MONITORING PROGRAM

ITLE

LC\_PIZDC1306 Dissolved Selenium Control Charting

PROJECT NO. PHASE REV FIGUR		19135981	1000	0	E2c
	_	PROJECT NO.		REV	FIGURI



Lower Control Limit = 0.036 mg/L (not shown)

Center concentration is equivalent to Mean Concentration

Upper Control Limit = 0.408 mg/L (99.7 percentile of data set)

CLIENT

TECK COAL LIMITED

CONSULTANT



YYYY-MM-DD	2020 - 02 - 21
PREPARED	KF
DESIGNED	NH
REVIEWED	LO
APPROVED	MJM

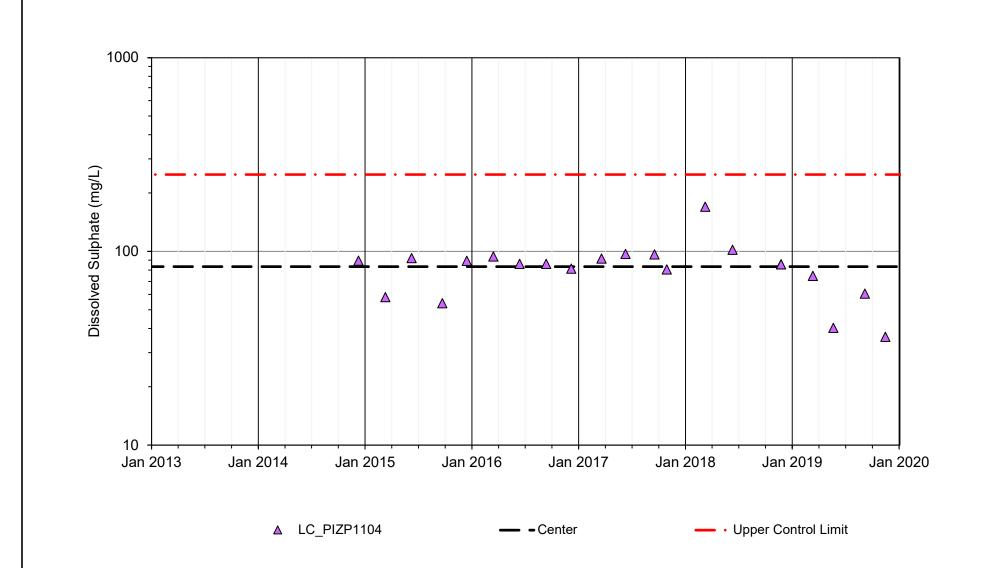
DDO IEC

TECK LINE CREEK OPERATIONS
ANNUAL GROUNDWATER MONITORING PROGRAM

TITLE

LC\_PIZDC1306 Dissolved Nitrate Control Charting

PROJECT NO. PHASE REV FIGUR		19135981	1000	0	E20
	_			REV	FIGUR



Lower Control Limit = 2.848 mg/L (not shown)

Center concentration is equivalent to Mean Concentration

Upper Control Limit = 249.368 mg/L (99.7 percentile of data set)

CLIENT

TECK COAL LIMITED

CONSULTANT



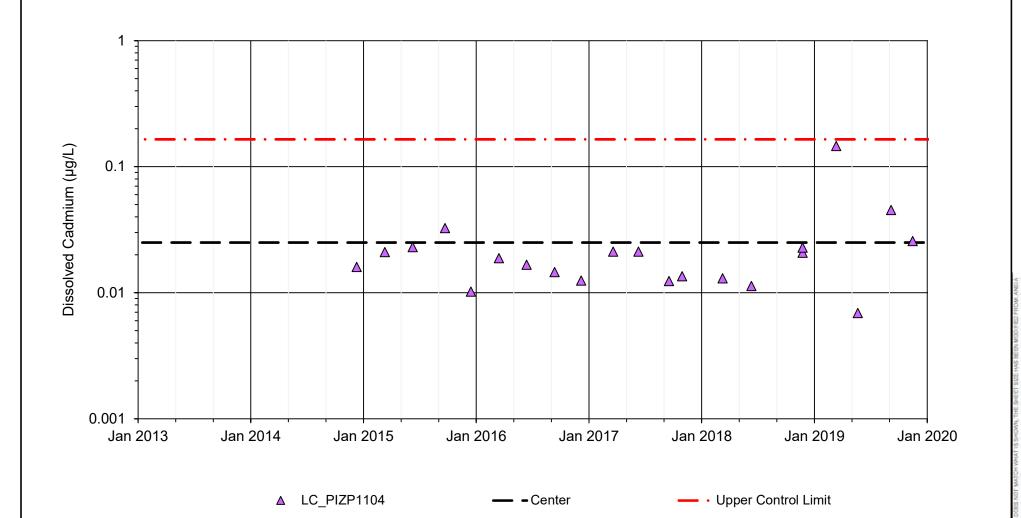
YYYY-MM-DD	2020 - 02 - 21
PREPARED	KF
DESIGNED	NH
REVIEWED	LO
APPROVED	MJM

TECK LINE CREEK OPERATIONS
ANNUAL GROUNDWATER MONITORING PROGRAM

ITLE

LC\_PIZP1104 Dissolved Sulphate Control

19135981 1000 0	E22
PROJECT NO. PHASE REV	FIGURE



Lower Control Limit = 0.012 mg/L (not shown)

Center concentration is equivalent to Mean Concentration

Upper Control Limit = 0.165 mg/L (99.7 percentile of data set)

CLIENT

TECK COAL LIMITED

CONSULTANT



YYYY-MM-DD	2020 - 02 - 21
PREPARED	KF
DESIGNED	NH
REVIEWED	LO
APPROVED	MJM

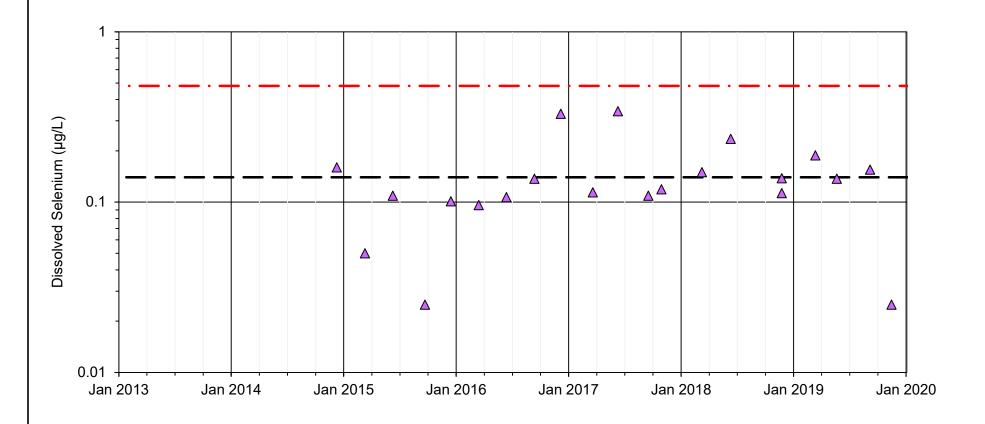
DDO IEC

TECK LINE CREEK OPERATIONS
ANNUAL GROUNDWATER MONITORING PROGRAM

TITLE

LC\_PIZP1104 Dissolved Cadmium Control Charting

PROJECT NO. PHASE REV FI



△ LC\_PIZP1104

- Center

─ · Upper Control Limit

NOTES

Lower Control Limit = 0.031 mg/L (not shown)

Center concentration is equivalent to Mean Concentration

Upper Control Limit = 0.481 mg/L (99.7 percentile of data set)

CLIENT

TECK COAL LIMITED

CONSULTANT



YYYY-MM-DD	2020 - 02 - 21
PREPARED	KF
DESIGNED	NH
REVIEWED	LO
APPROVED	MJM

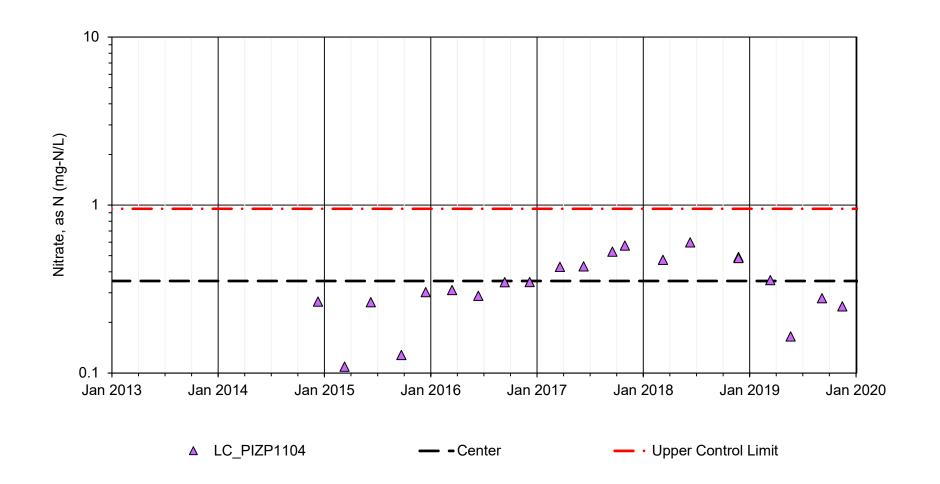
PPO IECT

TECK LINE CREEK OPERATIONS
ANNUAL GROUNDWATER MONITORING PROGRAM

TITLE

LC\_PIZP1104 Dissolved Selenium Control Charting

19135981	1000	A	E3c
PROJECT NO.	PHASE	REV	FIGURE



Lower Control Limit = 0.074 mg/L (not shown)

Center concentration is equivalent to Mean Concentration

Upper Control Limit = 0.951 mg/L (99.7 percentile of data set)

CLIENT

### TECK COAL LIMITED

CONSULTANT



YYYY-MM-DD	2020 - 02 - 21
PREPARED	KF
DESIGNED	NH
REVIEWED	LO
APPROVED	МЈМ

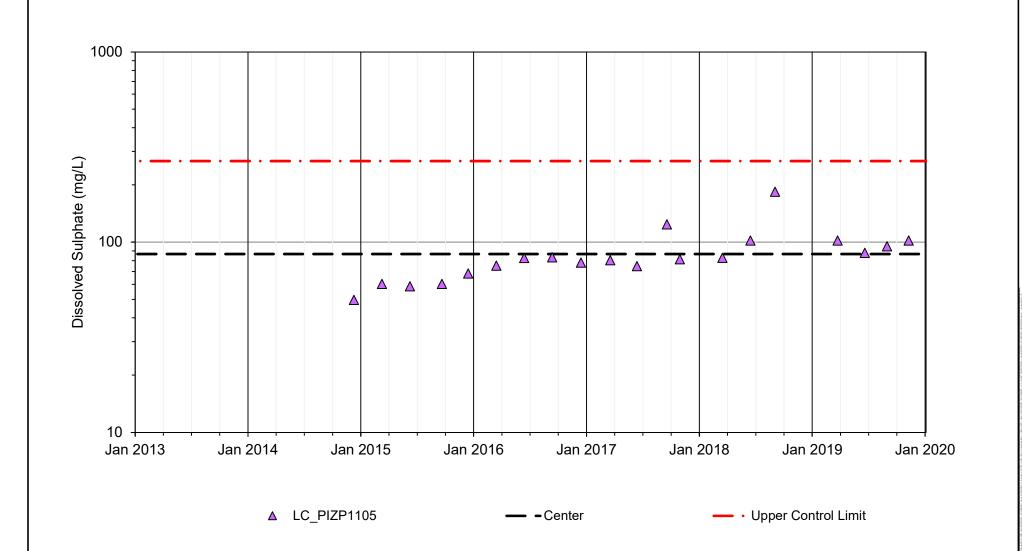
PROJECT

# TECK LINE CREEK OPERATIONS ANNUAL GROUNDWATER MONITORING PROGRAM

TITLE

### LC\_PIZP1104 Dissolved Nitrate Control Charting

19135981 1000 0	E3d
PROJECT NO. PHASE REV	FIGURE



Lower Control Limit = 11.475 mg/L (not shown)

Center concentration is equivalent to Mean Concentration

Upper Control Limit = 267.235 mg/L (99.7 percentile of data set)

CLIENT

### TECK COAL LIMITED

CONSULTANT



YYYY-MM-DD	2020 - 02 - 21
PREPARED	KF
DESIGNED	NH
REVIEWED	LO
APPROVED	MJM

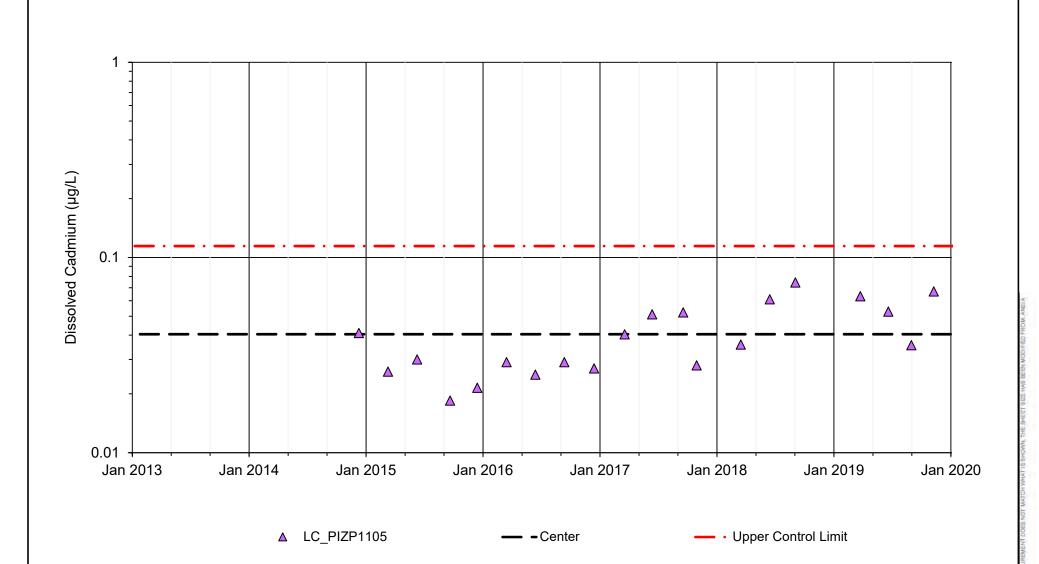
PROJEC

# TECK LINE CREEK OPERATIONS ANNUAL GROUNDWATER MONITORING PROGRAM

TITLE

#### LC\_PIZP1105 Dissolved Sulphate Control

PROJECT NO. PHASE REV	FIGURE



Lower Control Limit = 0.012 mg/L (not shown)

Center concentration is equivalent to Mean Concentration

Upper Control Limit = 0.115 mg/L (99.7 percentile of data set)

CLIENT

TECK COAL LIMITED

CONSULTANT



YYYY-MM-DD	2020 - 02 - 21
PREPARED	KF
DESIGNED	NH
REVIEWED	LO
APPROVED	MJM

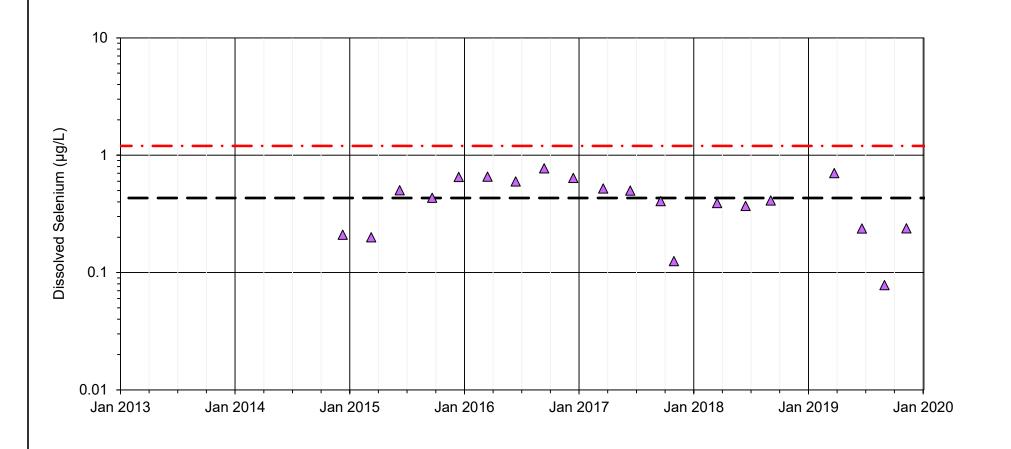
PROJEC

TECK LINE CREEK OPERATIONS
ANNUAL GROUNDWATER MONITORING PROGRAM

TITLE

LC\_PIZP1105 Dissolved Cadmium Control Charting

19135981	1000	0	4D
4040=004	4000	•	1 h
PROJECT NO.	PHASE	REV	FIGURE



△ LC\_PIZP1105

- Center

Upper Control Limit

NOTES

Lower Control Limit = 0.102 mg/L (not shown)

Center concentration is equivalent to Mean Concentration

Upper Control Limit = 1.201 mg/L (99.7 percentile of data set)

CLIENT

TECK COAL LIMITED

CONSULTANT



YYYY-MM-DD	2020 - 02 - 21
PREPARED	KF
DESIGNED	NH
REVIEWED	LO
APPROVED	MJM

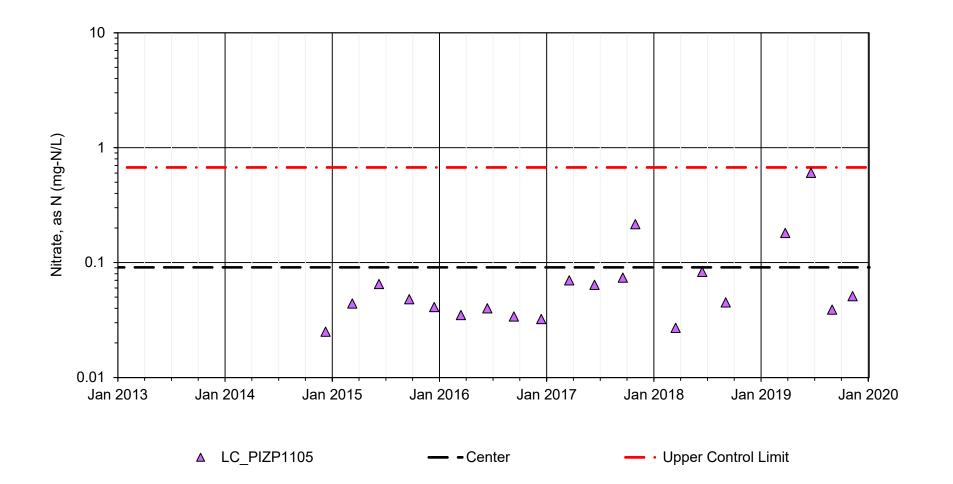
DDO IEC

TECK LINE CREEK OPERATIONS
ANNUAL GROUNDWATER MONITORING PROGRAM

TITLE

LC\_PIZP1105 Dissolved Selenium Control Charting

PROJECT NO.	40
_ PROJECT NO. PHASE REV	10
	FIGURE



Lower Control Limit = 0.051 mg/L (not shown)

Center concentration is equivalent to Mean Concentration

Upper Control Limit = 0.674 mg/L (99.7 percentile of data set)

CLIENT

### TECK COAL LIMITED

CONSULTANT



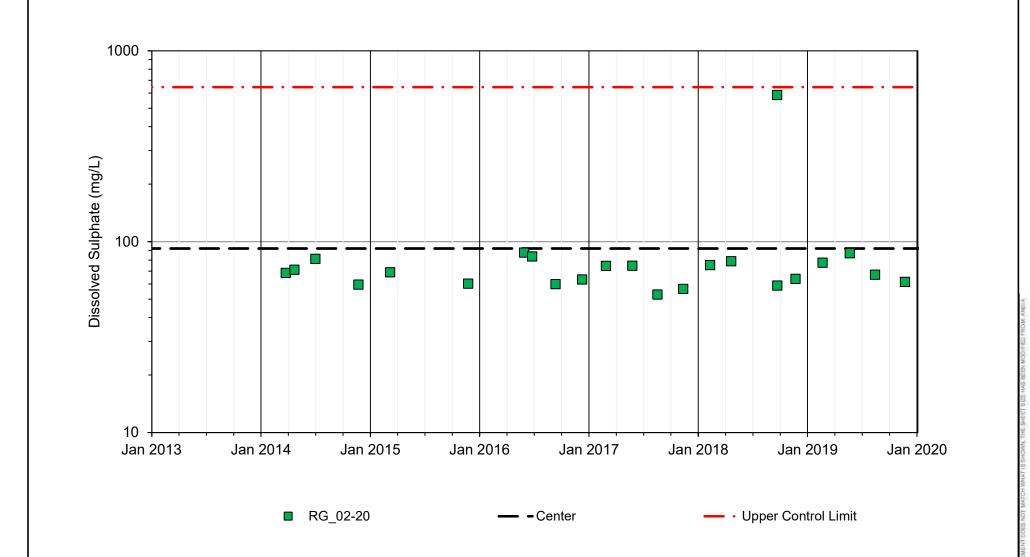
YYYY-MM-DD	2020 - 02 - 21
PREPARED	KF
DESIGNED	NH
REVIEWED	LO
APPROVED	MJM

# TECK LINE CREEK OPERATIONS ANNUAL GROUNDWATER MONITORING PROGRAM

TITLE

#### LC\_PIZP1105 Dissolved Nitrate Control Charting

19135961	1000	U	40
19135981	1000	^	14
_ PROJECT NO.	PHASE	REV	FIGURE



Lower Control Limit = 29.532 mg/L (not shown)

Center concentration is equivalent to Mean Concentration

Upper Control Limit = 645.258 mg/L (99.7 percentile of data set)

CLIENT

### TECK COAL LIMITED

CONSULTANT



YYYY-MM-DD	2020 - 02 - 21
PREPARED	KF
DESIGNED	NH
REVIEWED	LO
APPROVED	MJM

PROJEC

# TECK LINE CREEK OPERATIONS ANNUAL GROUNDWATER MONITORING PROGRAM

TITLE

### RG\_02-20 Dissolved Sulphate Control Charting

19135981 1000 0	
PROJECT NO. PHASE REV	FIGURE

Center concentration is equivalent to Mean Concentration

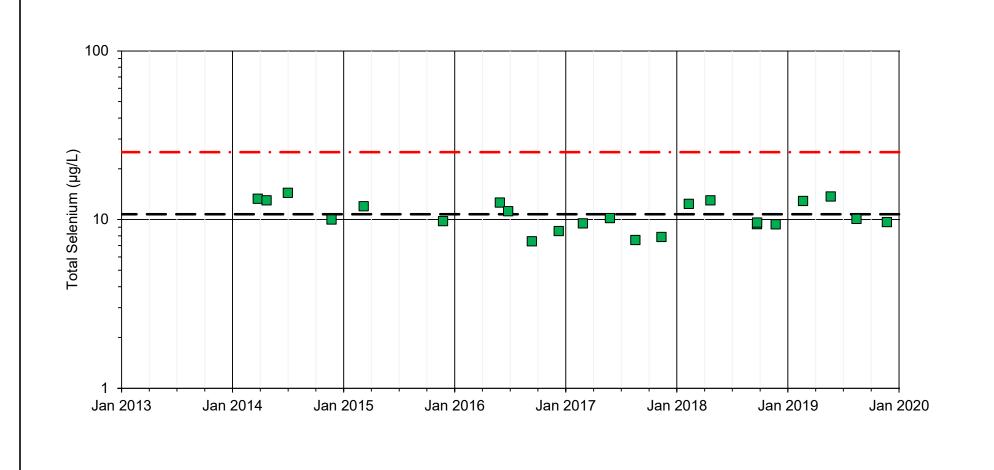
Upper Control Limit = 0.119 mg/L (99.7 percentile of data set)



YYYY-MM-DD	2020 - 02 - 21
PREPARED	KF
DESIGNED	NH
REVIEWED	LO
APPROVED	MJM

### RG\_02-20 Total Cadmium Control Charting

PROJECT NO. PHASE REV FIGUR		19135981	1000	0	ESD
	-			REV	FIGURE E.S.b.



- Center

NOTES

Lower Control Limit = 1.202 mg/L (not shown)

Center concentration is equivalent to Mean Concentration

Upper Control Limit = 25.116 mg/L (99.7 percentile of data set)

CLIENT

■ RG\_02-20

TECK COAL LIMITED

CONSULTANT



YYYY-MM-DD	2020 - 02 - 21
PREPARED	KF
DESIGNED	NH
REVIEWED	LO
APPROVED	MJM

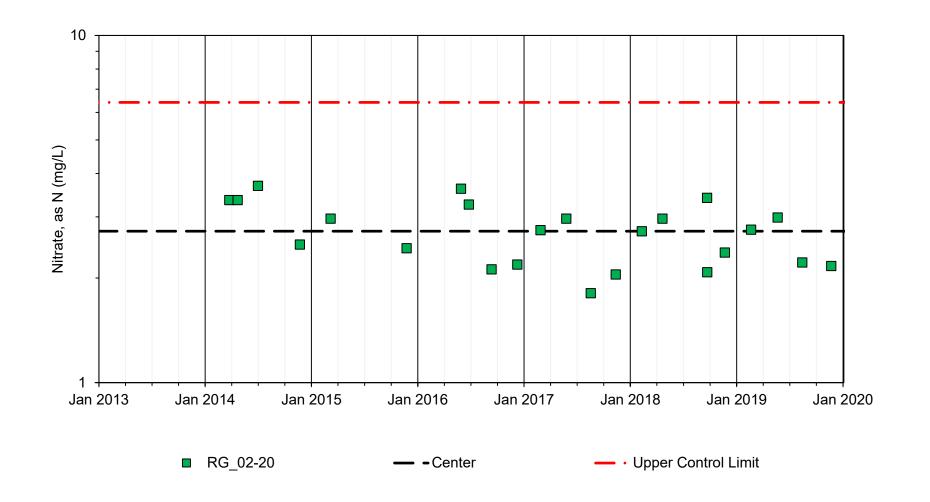
TECK LINE CREEK OPERATIONS
ANNUAL GROUNDWATER MONITORING PROGRAM

TITLE

RG\_02-20 Total Selenium Control Charting

**Upper Control Limit** 

19135981 1000 0	
PROJECT NO. PHASE REV	FIGURE



Lower Control Limit = 0.420 mg/L (not shown)

Center concentration is equivalent to Mean Concentration

Upper Control Limit = 6.415 mg/L (99.7 percentile of data set)

CLIENT

TECK COAL LIMITED

CONSULTANT



YYYY-MM-DD	2020 - 02 - 21
PREPARED	KF
DESIGNED	NH
REVIEWED	LO
APPROVED	MJM

DDO IEC

TECK LINE CREEK OPERATIONS
ANNUAL GROUNDWATER MONITORING PROGRAM

TITLE

RG\_02-20 Dissolved Nitrate Control Charting

19135981 1000 0 E	
PROJECT NO. PHASE REV FI	GURE

13 March 2020 19135981-2020-064-R-Rev0

**APPENDIX F** 

**Borehole Logs** 

## WELL LITHOLOGY & CONSTRUCTION FORM

Well Number: GA-DC1-A

Project Number:	0913490005-1109-1002					
Project Name:	Teck Coal Line Creek Operations					
Location.	Elk Valley, British Columbia, Canada					
Site Area:	Dry Creek					

Completion Date:	31-Oct-09
Drill Contractor:	Beck Drilling
Drilling Method:	ODEX
Personnel:	Tim Crowell

Well 8	ommary Tal	ile	
Northing	658048	NAD83	
Easting	5541500	NAD83	
Ground Elevation	1692	masl	
Top of Casing Elevation	1693	masl	
Water Level Elevation	1690	masl	

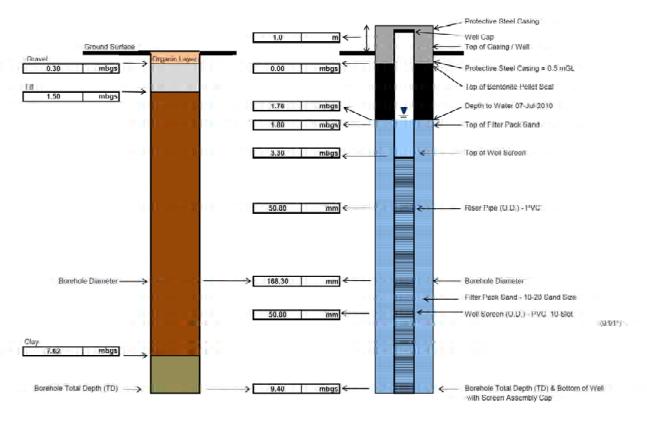
Input Farameters

Datum Reference:
mbgs

Diameter Units:
mm

#### Borehole Lithology

#### Water Monitoring Well



#### Note:

mbgs = metres below ground surface mm = millimetres masl = metres above sea level

PROJECT	LINE CREEK OPERATIONS PHASE II
TITLE	GA-DC1-A - OVERBURDEN MONITORING WELL I ITHOLOGY LOG & WELL CONSTRUCTION DIAGRAM

Teck

DESIGN TC WP TC CHECK GJ	No. 09-	1349-0005	FILE No. Lithology & Co	nstruction		
DESIGN	TC	28 Jul 2010	SCALE AS SHOWN	REV. 0		
WP	TC	28 Jul 2011				
CHECK	GJ	26 Oct 2011	FIGURF: C	7 2-4		
REVIEW	SDL	08 Nov 2011	TIOUNE. C	,		

PIEZOMETERS INSTALLED BY GOLDER IN FALL 2009

DATA ENTRY: VI PROJECT No.: 13-1345-0010 LOCATION: See Location Plan

DEPTH SCALE

1:50

# RECORD OF MONITORING WELL: LC\_PIZDC1306

BORING DATE: August 18, 2013

SHEET 1 OF 2

LOGGED: RQ

CHECKED:

DATUM: UTM Zone 11 (Nad 83)

N: 5541058.793 E: 658278.011 Elev = 1708.15 masl DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m  $\begin{array}{c} \text{HYDRAULIC CONDUCTIVITY,} \\ \text{k, cm/s} \end{array}$ PIEZOMETER SOIL PROFILE SAMPLES BORING METHOD DEPTH SCALE METRES OR STANDPIPE INSTALLATION ADDITIONAL LAB. TESTING STRATA PLOT 80 10<sup>-5</sup> BLOWS/0.3m NUMBER ELEV. TYPE SHEAR STRENGTH nat V. + Q - ● rem V. ⊕ U - O WATER CONTENT PERCENT DESCRIPTION DEPTH OW Wp F (m) Stickup 1708.14 =0.9 m **Ground Surface** Cement WL= SILTY GRAVEL, angular to sub-angular, poorly-graded, some sand, trace clay, low plasticity, w~PL, moist, 0.21 meters above loose to compact ground surface on 21 Aug 2013 Sonic Rig - SR152 Bentonite Plug BH LOGS.GPJ CALGARY.GDT 10/11/13 1701.29 6.86 Gravelly CLAYEY SILT, some angular to sub-angular, poorly-graded gravel, some sand, low to medium plasticity, dark brown to black, w~PL, moist, compact to dense --- Compact below 7.6 m BOREHOLE - EXPANDED ADD. LAB TESTING 13.1345.0010\_ 9 CONTINUED NEXT PAGE

DATA ENTRY: VI PROJECT No.: 13-1345-0010 LOCATION: See Location Plan

#### LC\_PIZDC1306 RECORD OF MONITORING WELL:

BORING DATE: August 18, 2013

SHEET 2 OF 2

DATUM: UTM Zone 11 (Nad 83)

N: 5541058.793 E: 658278.011

L L	НОБ	SOIL PROFILE		$\Box$	SAI	MPLE	S	DYNAMIC P RESISTANC	ENETRAT E, BLOW	ION S/0.3m	1	HYDRAULI k, c	C CONDUCTIVIT m/s	ry, T	-	PIEZOMETE OR
METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	20 SHEAR STF Cu, kPa	ENGTH	nat V. + rem V. €	80 - Q - • - U - O	10 <sup>-6</sup> WATE Wp I—	10 <sup>-5</sup> 10 <sup>-4</sup> R CONTENT PE	10 <sup>-3</sup> L RCENT —I WI 40	ADDITIONAL LAB. TESTING	STANDPIPI INSTALLATIO
10 -		Gravelly CLAYEY SILT, some angular to sub-angular, poorly-graded gravel, some sand, low to medium plasticity, dark brown to black, w-PL, moist, compact to dense (continued)		1697.48 10.67												Bentonite Plug
12	Sonic Ríg - SR152 Boart Long Year Group															Bentonite Seal
14	Sonic F Boart Lor															10/20 Colorado Silica Sand
16		Boulder at 16.8 m														Slotted Screen Section
17		Notes: WL= water level. masl = metres above sea level.														
19																
20 DEF	PTH S	CALE						<b>D</b> A	0-14						LOGGED: I	RQ

PROJECT No.: 13-1345-0010 LOCATION: See Location Plan

1:50

# RECORD OF MONITORING WELL: LC\_PIZDC1307

BORING DATE: August 19, 2013

SHEET 1 OF 4

CHECKED:

DATUM: UTM Zone 11 (Nad 83)

DATA ENTRY: VI N: 5541229.978 E: 658168.873 Elev = 1690.51 masl DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m  $\begin{array}{c} \text{HYDRAULIC CONDUCTIVITY,} \\ \text{k, cm/s} \end{array}$ PIEZOMETER SOIL PROFILE SAMPLES BORING METHOD DEPTH SCALE METRES ADDITIONAL LAB. TESTING STANDPIPE STRATA PLOT 80 BLOWS/0.3m INSTALLATION NUMBER ELEV. TYPE SHEAR STRENGTH nat V. + Q - ● rem V. ⊕ U - O WATER CONTENT PERCENT DESCRIPTION DEPTH OW Wp F (m) Stickup= 0.71 m Ground Surface 1690.50 Cement 1689.74 ORGANIC SOIL, black 0.76 1689.13 GRAVEL and SAND, sub-angular to angular (up to 100 mm in diameter), 1.37 • 0 some silt, w<PL, compact to dense , O \*WL=2.31 mbgs 24 Aug 2013 1687.15 SILTY GRAVEL, sub-rounded to sub-angular (up to 50 mm in diameter), some sand, trace clay, w~PL, wet, compact Sonic Rig - SR152 Bentonite Plug BH LOGS.GPJ CALGARY.GDT 10/11/13 1684.41 SILTY GRAVEL, angular to 6.10 sub-angular, some sand, trace clay, local cobbles, w~PL, moist, very dense BOREHOLE - EXPANDED ADD. LAB TESTING 13.1345.0010\_ 1681.97 GRAVELY SILT, sub-rounded to sub-angular, trace sand, trace clay, w~PL, wet, very dense CONTINUED NEXT PAGE DEPTH SCALE LOGGED: RT

DATA ENTRY: VI RECORD OF MONITORING WELL: LC\_PIZDC1307 PROJECT No.: 13-1345-0010 SHEET 2 OF 4 LOCATION: See Location Plan DATUM: UTM Zone 11 BORING DATE: August 19, 2013 (Nad 83) N: 5541229.978 E: 658168.873 DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m HYDRAULIC CONDUCTIVITY, k, cm/s PIEZOMETER SOIL PROFILE SAMPLES BORING METHOD DEPTH SCALE METRES OR STANDPIPE ADDITIONAL LAB. TESTING STRATA PLOT 80 BLOWS/0.3m INSTALLATION NUMBER ELEV. TYPE SHEAR STRENGTH nat V. + Q - ● rem V. ⊕ U - O WATER CONTENT PERCENT DESCRIPTION DEPTH -0W Wp F (m) GRAVELY SILT, sub-rounded to sub-angular, trace sand, trace clay, w~PL, wet, very dense (continued) 11 12 --- w<PL, moist to dry below 12.2 m 13 1676.79 SILTY GRAVEL, sub-rounded to sub-angular, some sand, trace clay, w<PL, moist, dense 13.72 14 Sonic Rig - SR152 Bentonite Plug BH LOGS.GPJ CALGARY.GDT 10/11/13 16 - Gravel is sub-angular to angular, w~PL, wet below 16.8 m 17 BOREHOLE - EXPANDED ADD. LAB TESTING 13.1345.0010\_ 18 - Gravel is sub-rounded to sub-angular, moist to locally dry, loose below 18.3 m 19

DEPTH SCALE

1:50

CONTINUED NEXT PAGE

20

19.81

LOGGED: RT

CHECKED:

DATA ENTRY: VI RECORD OF MONITORING WELL: LC\_PIZDC1307 PROJECT No.: 13-1345-0010 SHEET 3 OF 4 DATUM: UTM Zone 11 LOCATION: See Location Plan BORING DATE: August 19, 2013 (Nad 83) N: 5541229.978 E: 658168.873 DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m  $\begin{array}{c} \text{HYDRAULIC CONDUCTIVITY,} \\ \text{k, cm/s} \end{array}$ PIEZOMETER SOIL PROFILE SAMPLES BORING METHOD DEPTH SCALE METRES ADDITIONAL LAB. TESTING STANDPIPE STRATA PLOT 80 BLOWS/0.3m INSTALLATION NUMBER ELEV. TYPE SHEAR STRENGTH nat V. Cu, kPa rem V nat V. + Q - ● rem V. ⊕ U - O WATER CONTENT PERCENT DESCRIPTION DEPTH OW Wp F (m) 20 SANDY SILT, some sub-rounded to sub-angular gravel, localized sub-rounded to sub-angular cobbles (up to 150 mm in diameter), brown to dark brown, w-PL, moist, compact to dense, stiff (continued) 21 22 23 1667.34 SANDY GRAVEL, sub-angular to angular (up to 100 mm in diameter), some silt, light brown to grey, w<PL, 1667.04 dry, very loose SANDY SILT, some sub-rounded to sub-angular gravel, localized sub-rounded to sub-angular cobbles (up 24 to 100 mm in diameter), brown to dark brown, w~PL, moist, very dense, stiff Bentonite Plug Sonic Rig - SR152 25 BH LOGS.GPJ CALGARY.GDT 10/11/13 1664.60 SILT, some sand, some sub-rounded to 26 sub-angular gravel (<30 mm in diameter), brown to dark brown, w~PL, wet, compact to dense, firm 27 BOREHOLE - EXPANDED ADD. LAB TESTING 13.1345.0010\_ 28 29 Bentonite

DEPTH SCALE 1:50

CONTINUED NEXT PAGE

LOGGED: RT CHECKED:

DATA ENTRY: VI PROJECT No.: 13-1345-0010 LOCATION: See Location Plan

1:50

# RECORD OF MONITORING WELL: LC\_PIZDC1307

BORING DATE: August 19, 2013

SHEET 4 OF 4

DATUM: UTM Zone 11 (Nad 83)

CHECKED:

N: 5541229.978 E: 658168.873

DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m HYDRAULIC CONDUCTIVITY, k, cm/s PIEZOMETER SOIL PROFILE SAMPLES BORING METHOD DEPTH SCALE METRES OR STANDPIPE ADDITIONAL LAB. TESTING STRATA PLOT 80 BLOWS/0.3m INSTALLATION NUMBER ELEV. TYPE SHEAR STRENGTH nat V. + Q - ● rem V. ⊕ U - O WATER CONTENT PERCENT DESCRIPTION DEPTH -0W Wp F (m) 30 1660.33 30.18 SILTY GRAVEL, sub-rounded to sub-angular (<50 mm in diameter), localized clay, w<PL, dry, very dense, --- Localized zones of increased clay, Bentonite 31 1658.50 32 10/20 SILT, some sand, some sub-angular to Colorado Silica Sand angular gravel, localized boulders, dark brown, w<PL, moist, dense Sonic Rig - SR152 33 Slotted Screen Section 34 1655.45 35.05 35 End of MONITORING WELL. Notes: WL= water level. masl = metres above sea level.
\* WL measured while BH LOGS.GPJ CALGARY.GDT 10/11/13 LC\_PIZDC1309 was flowing at 36 surface. mbgs= metres below ground surface. 37 BOREHOLE - EXPANDED ADD. LAB TESTING 13.1345.0010 38 39 40 DEPTH SCALE LOGGED: RT

DATA ENTRY: VI PROJECT No.: 13-1345-0010 LOCATION: See Location Plan N: 5541232.317 E: 658167.9 BORING METHOD DEPTH SCALE METRES Ground Surface loose

# RECORD OF MONITORING WELL: LC\_PIZDC1308

BORING DATE: August 21, 2013

SHEET 1 OF 2

DATUM: UTM Zone 11 (Nad 83) Elev = 1690.42 masl

DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m HYDRAULIC CONDUCTIVITY, k, cm/s PIEZOMETER SOIL PROFILE SAMPLES ADDITIONAL LAB. TESTING STANDPIPE STRATA PLOT 80 INSTALLATION NUMBER ELEV. TYPE SHEAR STRENGTH nat V. + Q - ● rem V. ⊕ U - ○ BLOWS/0 WATER CONTENT PERCENT DESCRIPTION DEPTH -OW Wp F (m) Stickup= 0.95 m 1690.42 Cement \*WL=0.50 mbgs 24 Aug 2013 1689.65 ORGANIC SOIL, black 0.7 1688.59 1.83 Bentonite SANDY GRAVEL, sub-angular to angular (up to 100 mm in diameter), some silt, w<PL, dry, very loose Plug 1688.28 2.13 SILTY GRAVEL, sub-rounded to sub-angular (up to 50 mm in diameter), some sand, trace clay, w~PL, wet, Bentonite Seal 1685.84 SILTY GRAVEL, angular to Sonic Rig - SR152 sub-angular, some sand, trace clay, local cobbles, w~PL, moist to wet, compact 10/20 Colorado Silica Sand --- Localized dry loose gravel zone (looks like pad fill material, fresh, dry, powdery, likely sloughed into hole) from 5.5 to 5.8 m BH LOGS.GPJ CALGARY.GDT 10/11/13 --- Localized dry loose gravel zone (looks like pad fill material, fresh, dry, powdery, likely sloughed into hole) from 6.6 to 6.7 m Slotted Screen Section 1682.80 GRAVELY SILT, sub-rounded to 7.62 sub-angular, trace sand, trace clay, w~PL, wet, dense to very dense EXPANDED ADD. LAB TESTING 13.1345.0010 -- Decrease in gravel and clay content 9 Bentonite CONTINUED NEXT PAGE DEPTH SCALE LOGGED: RT Golder 1:50 CHECKED:

DATA ENTRY: VI RECORD OF MONITORING WELL: LC\_PIZDC1308 PROJECT No.: 13-1345-0010 LOCATION: See Location Plan BORING DATE: August 21, 2013 N: 5541232.317 E: 658167.9 DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m  $\begin{array}{c} \text{HYDRAULIC CONDUCTIVITY,} \\ \text{k, cm/s} \end{array}$ SOIL PROFILE SAMPLES BORING METHOD DEPTH SCALE METRES STRATA PLOT 80 BLOWS/0.3m NUMBER ELEV. TYPE SHEAR STRENGTH nat V. + Q - ● rem V. ⊕ U - O WATER CONTENT PERCENT DESCRIPTION DEPTH -0W Wp F (m) GRAVELY SILT, sub-rounded to sub-angular, trace sand, trace clay, w~PL, wet, dense to very dense (continued) 12 1678.22 GRAVELY SILT, sub-rounded to sub-angular, trace sand, trace clay, local cobbles, w<PL, moist, very dense 13 1676.70 GRAVELY SILT, sub-rounded to sub-angular, some sand, trace clay, brown to dark brown, w<PL, moist, very 13.72 14 Sonic Rig - SR152 BH LOGS.GPJ CALGARY.GDT 10/11/13 16 SILTY GRAVEL, sub-angular to angular, some sand, trace clay, w~PL, 17 moist, dense

SHEET 2 OF 2 DATUM: UTM Zone 11 (Nad 83) PIEZOMETER ADDITIONAL LAB. TESTING STANDPIPE INSTALLATION Bentonite Seal 1670.60

DEPTH SCALE 1:50

BOREHOLE - EXPANDED ADD. LAB TESTING 13.1345.0010

18

19

20

Notes: WL= water level.

masl = metres above sea level.
\* WL measured while LC PIZDC1309 was flowing at surface. mbgs= metres below ground

End of MONITORING WELL.

LOGGED: RT CHECKED:

DATA ENTRY: IPG PROJECT No.: 13-1345-0010 LOCATION: See Location Plan, West side of Dry Creek

## RECORD OF MONITORING WELL: LC-PIZDC1401

BORING DATE: April 26, 2014

SHEET 1 OF 4

DATUM: Local

LC\_PIZDC1404D

Ground Surface TOPSOIL – (OL) Gravelly ORGANIC SILT, angular, some sand, roots and rootlets, black, moist, loose (ML) SANDY SILT, light brown, moist, compact  TILL – (ML) Sandy gravelly CLAYEY SILT, sub-rounded, contains cobbles, dark brown, cohesive, w <pl, 4.0="" at="" becoming="" firm="" grey,="" m<="" soft="" th="" to="" very=""><th>STRATA PLOT</th><th>ELEV. DEPTH (m) 0.00</th><th>Z</th><th>TYPE</th><th>BLOWS/0.3m</th><th>SHEZCU, k</th><th>20   1   R STRI</th><th>40 NNGTH</th><th>nat V. H</th><th>80 + Q - • 9 U - O</th><th>W</th><th>ATER C</th><th>ONTEN</th><th>T PERCE</th><th>03 L NT WI 40</th><th>ADDITIONAL LAB. TESTING</th><th>OR STANDPIP INSTALLATI Stickup = 1.57 m</th></pl,>	STRATA PLOT	ELEV. DEPTH (m) 0.00	Z	TYPE	BLOWS/0.3m	SHEZCU, k	20   1   R STRI	40 NNGTH	nat V. H	80 + Q - • 9 U - O	W	ATER C	ONTEN	T PERCE	03 L NT WI 40	ADDITIONAL LAB. TESTING	OR STANDPIP INSTALLATI Stickup = 1.57 m
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to soft		0.91						( )									
Becoming grey, firm at 4.0 m						,											
																	Bentonite Grout
Water in cutting starting at 5.5 m  (GP) GRAVEL, fine to coarse-grained, dark grey, wet, dense		6.10															
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w>PL, soft at 8.8 m																	
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DATA ENTRY: IPG PROJECT No.: 13-1345-0010 LOCATION: See Location Plan, West side of Dry Creek

## RECORD OF MONITORING WELL: LC-PIZDC1401

BORING DATE: April 26, 2014

SHEET 2 OF 4

DATUM: Local

LC\_PIZDC1404D

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METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	TH ₹	TYPE	BLOWS/0.3m	SHEAI Cu, kP	20 4 L R STREN a	IO 6 I IGTH r	60 8 L nat V. + em V. ⊕	Q - • U - O	W	0 <sup>-6</sup> 1 LATER C	0 <sup>-5</sup> 1 L ONTENT	PERCE	0 <sup>-3</sup>	ADDITIONAL LAB. TESTING	STANDPIPE INSTALLATION
10		TILL – (ML) Sandy gravelly CLAYEY	67.9%									·	Ĭ					 
11		TILL – (WL) Sarity graveily CLAYEY SILT, sub-rounded, contains cobbles, grey-brown, w>PL, soft (continued)																
12	ry ng Ltd.	(GM) Sandy SILTY GRAVEL, angular, grey, moist, dense		80			<u> </u>											
15	DR-24 – All Rotary Sierra Drilling & Blasting Ltd	TILL – (ML) Sandy gravelly CLAYEY SILT, sub-rounded, contains cobbles, grey-brown, w <pl, soft<="" td=""><td>11</td><td>.24</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>Bentonite Grout</td></pl,>	11	.24														Bentonite Grout
17																		
18		Boulder at 17.7 m																
17 18 18 19 DEP 1 1 : -		CONTINUED NEXT PAGE		- -	†-	-		†										
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DATA ENTRY: IPG PROJECT No.: 13-1345-0010 LOCATION: See Location Plan, West side of Dry Creek

1:50

### RECORD OF MONITORING WELL: LC-PIZDC1401

BORING DATE: April 26, 2014

SHEET 3 OF 4 DATUM: Local

CHECKED: JT

LC\_PIZDC1404D

HYDRAULIC CONDUCTIVITY, k, cm/s DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m PIEZOMETER SOIL PROFILE SAMPLES **BORING METHOD** DEPTH SCALE METRES OR STANDPIPE INSTALLATION ADDITIONAL LAB. TESTING STRATA PLOT 80 BLOWS/0.3m NUMBER ELEV. TYPE SHEAR STRENGTH nat V. + Q - ● rem V. ⊕ U - ○ WATER CONTENT PERCENT DESCRIPTION DEPTH <u>-0₩</u> Wp F (m) 20 TILL – (ML) Sandy gravelly CLAYEY SILT, sub-rounded, contains cobbles, grey-brown, w<PL, soft *(continued)* 21 22 23 Bentonite Grout 24 --- Cobble / boulder content increasing (possible silty gravel layers) at 24.1 m DR-24 - Air Rotary 25 BOREHOLE - EXPANDED ADD. LAB TESTING 13.1345.0010\_ BH LOGS\_APPENDIX.GPJ CALGARY.GDT 10/30/14 --- Cobbles decreasing at 25.9 m 26 27 28 Bentonite Pellet Plug 29 CONTINUED NEXT PAGE DEPTH SCALE LOGGED: DE

DATA ENTRY: IPG PROJECT No.: 13-1345-0010

## RECORD OF MONITORING WELL: LC-PIZDC1401

SHEET 4 OF 4 DATUM: Local

LOCATION: See Location Plan, West side of Dry Creek

BORING DATE: April 26, 2014

LC\_PIZDC1404D

щ	QQ	SOIL PROFILE		SA	MPLE	ES	DYNAMIC PEN RESISTANCE,	NETRAT BLOW	TION S/0.3m	\	HYDRAULIC CONDUCTI' k, cm/s		PIEZOMETER OR		
DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	SHEAR STREI Cu, kPa	40 NGTH 20	nat V. + rem V. ⊕	80 - Q - • 9 U - O	10° 10° 10 WATER CONTENT F Wp   — — — — — — — — — — — — — — — — — —	PERCENT WI	ADDITIONAL LAB. TESTING	STANDPIPE INSTALLATIO
- 30		TILL – (ML) Sandy gravelly CLAYEY SILT, sub-rounded, contains cobbles, grey-brown, w <pl, (continued)<="" soft="" td=""><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>Bentonite Pellet Plug</td></pl,>													Bentonite Pellet Plug
- 32 - 32 - 32 - 33 - 33	DR-24 – Air Rotary Sierra Drilling & Blasting I td	(GP) SANDY GRAVEL, fine to medium-grained, sub-angular with trace sub-rounded, some silt, dark grey, wet, dense		32.31											Colorado Silica Sand
- - - - - - - - - - - - - - - - - - -															Slotted Section
- 36		End of MONITORING WELL.  NOTES: Standpipe installed to 35.3 m.		35.36											Silica Sand
- 37 - 37 															
- - - 38 - - -															
- 39 - 39 															
- - - - - 40															
DEI		SCALE						<b>A</b> G	old	er iates				OGGED: D	

PROJECT No.: 13-1345-0010

1:50

## RECORD OF MONITORING WELL: LC-PIZDC1402

SHEET 1 OF 2

CHECKED: JT

LOCATION: See Location Plan, West side of Dry Creek BORING DATE: April 25, 2014 DATUM: Local

DATA ENTRY: IPG LC\_PIZDC1404S DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m  $\begin{array}{c} \text{HYDRAULIC CONDUCTIVITY,} \\ \text{k, cm/s} \end{array}$ SOIL PROFILE PIEZOMETER SAMPLES BORING METHOD DEPTH SCALE METRES OR STANDPIPE ADDITIONAL LAB. TESTING STRATA PLOT 80 BLOWS/0.3m INSTALLATION NUMBER ELEV. TYPE SHEAR STRENGTH nat V. + Q - ● rem V. ⊕ U - O WATER CONTENT PERCENT DESCRIPTION DEPTH OW Wp F (m) Stickup Ground Surface
TOPSOIL – (OL) Gravelly ORGANIC
SILT, angular, some sand, roots and
rootlets, black, moist, loose = 1.14 m 0.00 0.30 (ML) SANDY SILT, light brown, moist, Bentonite Grout TILL – (MH) Sandy gravelly CLAYEY SILT, sub-rounded, contains cobbles, 0.91 dark brown, cohesive, w<PL, very soft to soft --- Becoming grey, firm at 4.0 m Bentonite DR-24 – Air Rotary 150 mm Casing Pellet Plug BH LOGS\_APPENDIX.GPJ CALGARY.GDT 10/30/14 TILL – (MH) Sandy gravelly CLAYEY SILT, sub-rounded, contains cobbles, grey-brown, cohesive, w<PL, soft to firm BOREHOLE - EXPANDED ADD. LAB TESTING 13.1345.0010\_ Colorado Silica Sand 9 Slotted Section CONTINUED NEXT PAGE DEPTH SCALE LOGGED: DE Golder

## RECORD OF MONITORING WELL: LC-PIZDC1402

		CON PROFILE			CAN	4DL EC	DY	NAMIC PE	NETRATI	ON	_	HYDRAULI	CONDUC	TIVITY.		IZDC1404
DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE  DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	~	TYPE ## 0/8//0/18		NAMIC PE SISTANCE 20 IEAR STRE , kPa	40 NGTH	60 ₹ L nat V. + rem V. ⊕	30 Q - ● U - O	10 <sup>-6</sup>	m/s 10 <sup>-5</sup> 1 R CONTEN <sup>-</sup>	0 <sup>-4</sup> 10 <sup>-3</sup> Γ PERCENT	ADDITIONAL LAB. TESTING	OR STANDPIP INSTALLATI
- 10 -	DR-24 – Air Rotary 150 mm Casing Sierra Drilling & Blasting Ltd.	TILL – (MH) Sandy gravelly CLAYEY SILT, sub-rounded, contains cobbles, grey-brown, cohesive, w <pl, (continued)="" 10.2="" at="" becoming="" firm="" m<="" soft="" stiff="" td="" to=""><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>Slotted Section</td></pl,>														Slotted Section
12	DR-2	(GP-GM) GRAVEL, sub-angular, trace sub-rounded, fine-grained, some silt to silty, dark grey, wet, compact		11.89												Colorado Silica Sand
- 13		End of MONITORING WELL.  NOTES: Standpipe installed to 12.6 m.		12.75												
· 15																
· 16		<						;								
. 18																
- 19																

CLIENT: Te				PROJECT: Soil and					HOLE NO: MW10-01	
DRILLER: .				LOCATION: Line Cre			$\longrightarrow$		JECTNO: BX05973	
····	HOD: Air Rotary			BOREHOLE LOCATI						
SAMPLE TY		helby Tube	☑ No Recove			mple		Split-Pe		
BACKFILL T	TYPE B	entonite	Pea Grave	l Stough	Grout	· · · · · · · · · · · · · · · · · · ·		Drill Cu	rttings Sand	
Dept		© + ≧ & B SOIL SYMBOL		SOIL DESCRIPTIO	) DN	SAMPLE TYPE SAMPLE NO	SPT (N)		OTHER TESTS COMMENTS	ELEVATION (m)
0			Fine-grained Sal brown, moist	nd - trace fines, trace gra	vel, dense, light				Top of Pipe Elevation - 1287.825 m	E
-1			Join, most						50 mm PVC, Schedule 40 Monitoring Well, 10 Stot Well Screen with Steel Stick Up Casing Protector	- 128
-2			4							128
-3			trace coarse-gri	ained sand, slight moistu	re increase				<b>&amp;</b>	-128
-5			some cobbles	R	>	A1				128
6			some gravel, m Sand - some grav brown, moist trace fines, grav	vel, trace cobbles, trace t	ines, dense, medium					- - - - - - - 128
7			no cobbles, med	dium brown						-128
8										127
9										127
10 : :		<u> </u>	·		LOCOTORY		<u> </u>	N K	NO CTION DESTINATION OF THE	<u>E</u>
	ec®	۵ ا	MEC Earth & Er	wironmontal	LOGGED BY: RH REVIEWED BY: RH		+		OMPLETION DEPTH: 56.40 n OMPLETION DATE: 1/20/10	ri .
					I MM MM MAN MAN					

	NT: Teck Coal Ltd.		F	PROJECT: Soil a	nd Groundwa	iter Assessme	ent		BOREHO	LE NO: MW10-01	
	ER: J.R. Drilling			OCATION: Line	***************************************					NO: BX05973	
	/METHOD: Air Rotary			<del></del>					***************************************	ON: 1287.025 m	
SAMP	PLE TYPE Sh	elby Tube	No Recover			Grab Sam	ole		Split-Pen	Core	
BACK	FILL TYPE Bei	ntonite	Pea Gravel	Sloug	h	Grout		$\square$	Drill Cuttings	Sand	
Depth (m)	PLASTIC M.C. LIQUE 20 40 60 8	SOILS		SOIL DESCRIP			SAMPLE TYPE SAMPLE NO	SPT (N)	WELL	OTHER TESTS COMMENTS	(m) NOTTAVIE IE
10	20 40 60 6	0   4 . 7					$\vdash$		<del>h d</del>		+
-11											-12
-12											
-13											
14			<								11.
15											1
16											1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
7											
18											
9		4.4						-			<u> </u>
20		· [4:1] "	cobbley						<u> </u>		-
		A1.4	50 54 <del>4</del> 5 2 5	dvannat-1		D BY: RH				LETION DEPTH: 56.40	n .
a	<u>mec<sup>©</sup></u>	Med Med	EC Earth & Env icine Hat, Albei	ta T1A 8G3		/ED BY: RH	-		COMPL	LETION DATE: 1/20/10	• P
The same of		1			Fig. No:	1			1	Pag	820

CLIENT: Teck Coal Ltd.		PROJECT: Soi	l and Groundwa	ter Assessmer	nt	E	BOREHOL	E NO: MW10-01	
DRILLER: J.R. Drilling			ne Creek Mine, S					NO: BX05973	
DRILL/METHOD: Air Rotar				656.9090,Y - 2	27929.7			N: 1287.025 m	
SAMPLE TYPE		*	PT Test (N)	Grab Sampl	е		plit-Pen	Core	
BACKFILL TYPE	Bentonite Per	Gravel Si	ough	Grout			orill Cuttings	Sand Sand	
E STANDARD PEN (6) 20 40 60  PLASTIC M.C. 20 40 60	SOIL SYMBOL	SOI DESCRII			SAMPLE TYPE SAMPLE NO	SPT (N)	WELL	OTHER TESTS COMMENTS	ELEVATION (m)
20 20 40 60		· · · · · · · · · · · · · · · · · · ·			1		ad		-
-21	trace to s	ome cobbles							- - - 126
-22									- 126
-23		÷							- - - 121
-24	some find	es, increase in moisture							-12
25	decrease	in moisture							12
26	and cobb	les							12
27									-12
28									12
29									-12
30	i i i i i i i i i i i i i i i i i i i								- '
amec <sup>©</sup>	AMEC Earti Medicine Ha	n & Environmental t, Alberta T1A 8G3		BY: AH ED BY: RH				ETION DEPTH: 56.40 ETION DATE: 1/20/10	

	VT: Teck Coal Ltd.			PROJECT: Soil a						E NO: MW10-01	
	ER: J.R. Drilling			LOCATION: Line		•				NO: BX05973	
DRILL	/METHOD: Air Ro	otary		BOREHOLE LOC		1656.9090,Y -	27929.7	'910 E	LEVATIO	N: 1287.025 m	
	PLE TYPE	Shelby Tube	☑No Recov			Grab Samp	ele		plit-Pen	Core	
BACK	FILL TYPE	Bentonite	Pea Grave	1 Sloux	gh	Grout			rill Cuttings	Sand	
Depth (π)	PLASTIC M.C.	SOLSYMBOL		SOIL DESCRIP	TION		SAMPLE TYPE SAMPLE NO	SPT (N)	WELL	OTHER TESTS COMMENTS	(1) NOT 8)
30	20 40 0	xu nu	trace cobbles,	some gravel							-
-31			trace fines, gra	velly, light brown							112
32			some fines								
33			trace fines								عبيب دياء أياب
34											
35				$\vee$							منسسسيسلي
36							,				
37			ivory-white sand no ivory-white s								
18				·		·					
9											
10	<u> </u>	<u> </u>	<del>.</del>		LOGGE	D BY: RH			COMPI	ETION DEPTH: 56.40	m m
	mad		MEC Earth & Er			ED BY: RH				ETION DATE: 1/20/10	
	mec	_ м	edicine Hat, Alb	erta T1A 8G3	Fig. No:				337711 64		je 4

	NT: Teck Coal Ltd.					water Assessme			BOREL	IOLE NO: MW10-01	
	LER: J.R. Drilling	<del></del>				e, Sparwood, B.				CT NO: BX05973	
	L/METHOD: Air Rotary									TION: 1287.025 m	
		elby Tube	No Recove		SPT Test (N)	Grab Sam	ple		Split-Pen		
BACK	(FILL TYPE Be	ntonite	Pea Grave	<u></u>	Blough	Grout			Drill Culti	ngs 🖸 Sarid	<del></del>
Depth (m)	#ISTANDARD PEN (N) #I 20 40 60 8	ν		SC DESCR			SAMPLE TYPE SAMPLE NO	SPT (N)	WELL	OTHER TESTS COMMENTS	ELEVATION (m)
40		1.3			***						十一
- <b>41</b>		4									 1246
-42			÷								1245
-43					(2						1244
-44						>					124
·45											-124
46											
47		**************************************									124
48						·					- - - 1239
49 50											123
	1					SED BY: RH	1	1		IPLETION DEPTH: 56,40	
a	mec		EC Earth & En icine Hat, Albe			EWED BY: RH			COM	IPLETION DATE: 1/20/10	
		ı <b></b>			Fig. N	0: 1			- 1	Pag	je 5 of

	NT: Teck Coal Ltd.			ECT: Soil and Groun	•				LE NO: MW10-01	
	LER: J.R. Drilling			TION: Line Creek Mi	<del></del>				F NO: BX05973	
	L/METHOD: Air Rotary PLE TYPE She	by Tube	······································	HOLE LOCATION:X						
	····· <del></del>		No Recovery	SPT Test (N)	Grab Samp	16		Split-Pen	Core	
BACK	(FILL TYPE Ben	ntonite	Pea Gravel	Slough	<b>∏</b> Grout	<del>1</del>		oriti Cutting	s Sand	· · · · · · · · · · · · · · · · · · ·
Depth (m)	20 40 60 81	SOILS	DE	SOIL SCRIPTION		SAMPLE TYPE SAMPLE NO	SPT (N)	WELL	OTHER TESTS COMMENTS	ELEVATION (m)
50		4 1								F
-51										-123
-52										-123
-53									y e	-123
-54			Coarse-grained Sand - t medium brown, wet	race gravel, some fines	, dense,					-123
-55										-12
56			END OF BOREHOLE AT	56.4 m		A2				-12:
57										-12:
58										122
59										12
60				lior	GED BY: RH			COMP	LETION DEPTH: 56.40	m F
	madi	А	MEC Earth & Environn	nental REV	EWED BY: RH				LETION DATE: 1/20/10	111
	mec	Mo	edicine Hat, Alberta T1		No: 1			1		e 6 of

	VT: Teck Coal Ltd.			PROJECT: Soil and	Groundwater Assessn	nent		BORE	HOLE NO: MW10-02				
	.ER: J.R. Drilling	·			eek Mine, Sparwood, E			PROJ	ECT NO: BX05973				
	/METHOD: Air Rotary				ION: X-54273.7949,Y-	- 27669.2	50 I	ELEV	ATION: 1272.131 m				
SAMP	PLE TYPE She	lby Tube	☑ No Recove	ery SPT Tes	t (N) 🗏 Grab Sar	mple		Split-Pe	en Tore				
BACK	FILL TYPE Ber	itonite	Pea Grave	Slough	Grout		<b>Ø</b>	Drill Cu	ttings 💽 Sand	************			
	◆ GASTECH VAPOUR ◆					L							
Depth (m)	200 400 600 80  STANDARD PEN (N) 20 40 60 8  PLASTIC M.C. LIGUI 20 40 60 8	SOIL SYMBC		SOIL DESCRIPTION	ON	SAMPLE TYPE SAMPLE NO	SPT (N)		OTHER TESTS COMMENTS	ELEVATION (m)			
- 0		4 3	Sand and Grave	l - dense, grey, damp					Top of Pipe Elevation -	-127			
-									1272.931 m				
[-1 [			Sand - some grav	vel, trace fines, dense, r	nedium brown, moist				10 m Stot Stainless Steet Screen.	127			
									200 m Steel Cased Water Well. Steel casing pulled back to	- -			
-2									41.1 m. Surface seal inserted by pouring bentonite powder into	E -127			
<u> </u>			Sift and Clay - so wood inclusions, i	ome gravel, firm, dark bi moist to wet (FILL)	own, concrete and				annulus during last 4.5 m of drilling. Well developed for 30 minutes at 1-2 gallons/minute.	F -			
,									Stick up steet casing protector 1 m above ground surface.	-126 - - -			
4 4										126			
E								8811 1811		-			
- -5			Sand - some grav	/el, trace fines, dense, n	nedium brown, moist					- 126			
	•		noticable hydrod	carbon odour		<b>1</b> 11							
-6							:			E 126			
-7										E E -126			
-	•		faint hudeanata	an adour dame		A2	٠.			+ '4'			
8			faint hydrocarbo	n odour, damp		7.				- 126			
9			moist										
-9	•		no hydrocarbon	odour		A3				126			
-10										-			
-10										- -120			
11			faint hydrocarbo	n odour	LOGGED BY: RH				DMPLETION DEPTH: 43.60 m	E E			
	madi	Ā	MEC Earth & Er	nvironmental	REVIEWED BY: RH	···			OMPLETION DATE: 1/21/10	<u> </u>			
<b>a</b>	mec				Fig. No: 2			<u> </u>	Lot Alberto Tri A COO				

CLIENT: Teck Coal Ltd.		PROJECT: Soil and Ground			REHOLE NO: MW10-02
DRILLER: J.R. Drilling		LOCATION: Line Creek Min	e, Sparwood, B.C.	PR	OJECT NO: BX05973
DRILL/METHOD: Air Rotary		BOREHOLE LOCATION: X	54273.7949,Y- 27669.2	550 ELE	EVATION: 1272.131 m
SAMPLE TYPE She	lby Tube No Reco	very SPT Test (N)	Grab Sample	∭Split	
BACKFILL TYPE Ben	tonite Pea Grav	/el Slough	Grout	Drill	Cuttings Sand
⊕ GASTECH VAPOUR ⊕ 200 400 600 60  ■ STANDARD PEN (N) ■ 20 40 60 8  PLASTIC M.C. LIQU	SOIL SYMBG	SOIL DESCRIPTION	SAMPLE TYPE SAMPLE NO	SPT (N) WELL	OTHER TESTS COMMENTS
20 40 60 8 - 11 : : : : : : :	noticable hyd	rocarbon odour			-12
-12					-12
13			A4		-12
-14	no hydrocarbo	on odour	A5		-12
				WANTED.	- -12 - - -
-16	noticable hydr	Southon adour	A6		- 11 - 12 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1
-17		ocarbon ododi		PROVIDE TO THE PROPERTY OF THE	11 12
-18	some cobbles		A7		-11 -12 
-19	no hydrocarbo	on ogouf			—11 ——12
-20	cobbley				-1: -1: 
-21					1 - 1: - 1: - 2: - 3: - 4: - 4: - 4: - 4: - 4: - 4: - 4: - 4
<u></u>	AMEC Earth &		GED BY: RH		COMPLETION DEPTH: 43.60 m COMPLETION DATE: 1/21/10
-21 -21 -22 <b>amec</b>	Medicine Hat, A	IL	IEWED BY: RH No: 2		Page 2 (

	NT: Teck Coal Ltd.			PROJECT: Soil and						HOLE NO: MW10-02	
	ER: J.R. Drilling			LOCATION: Line C						ECT NO: BX05973	
	/METHOD: Air Rotary		<u></u> -							ATION: 1272.131 m	
		by Tube	✓ No Recove	<u> </u>		Grab Sam	ple		Split-Pe		
BACK		onite	Pea Grave	l MSlough		Grout			Drill Cut	ttings :: Sand	
Depth (m)	◆ GASTECH VAPOUR ◆ 200 400 600 800  ■ STANDARD PEN (N) ■ 20 40 60 60  PLASTIC M.C. LIQUID 20 40 60 80	SYMBC		SOIL DESCRIPT	ION		SAMPLE TYPE	SAMPLE NO	WELL	OTHER TESTS COMMENTS	FI FVATION (m)
- 22	20 40 60 60	:	***				$\vdash$	+			-12
-23	•							18			12
-24											-12
-25			fine-grained sar	nd, some gravel						·	- 12
-26			no hydrocarbon noticable hydro	odour carbon odour							12
-27				B. V	~						
-28											
-29			٠.								1 1 1 1 1
-30											1
-31					•	•					-11
32											11
33		:			LOGGED	BV∙ DU				PMPLETION DEPTH: 43.60	<u></u>
		Α	MEC Earth & Er	nvironmental		ED BY: RH				MPLETION DATE: 1/21/10	iit .
d	mec"	M	edicine Hat, Alb	erta T1A 8G3	Fig. No:				$-+$ $\frac{3}{2}$		e 3 (

CLIEN	NT: Teck Coal Ltd.			PROJECT: Soil and G	roundwater Assessr	nent		BOREHOL	E NO: MW10-02	
	ER: J.R. Drilling			LOCATION: Line Cree	<u>.</u>				NO: BX05973	
	_/METHOD: Air Rotary			BOREHOLE LOCATION					N: 1272.131 m	
		lby Tube	No Recov			mple		Split-Pen	Соте	
BACK	FILL TYPE Ben	tonite	Pea Grave	el ∭Slough	Grout			Drill Cuttings	<b>∑</b> Sand	
Depth (π)	◆ GASTECH VAPOUR ◆ 200 400 600 80  ■ STANDARD PEN (N) ■ 20 40 60 80  PLASTIC M.C. LIQUI 20 40 60 81	SOIL SYMBC		SOIL DESCRIPTIO	N	SAMPLE TYPE SAMPLE NO	SPT (N)	WELL	OTHER TESTS COMMENTS	ELEVATION (m)
- 33	20 40 00 00					11				-1239
-34										1238
35										1237
36						-		7/A/1111/A/A		- 1230
<b>-37</b>										- 123
-38 38			no hydrocarbor	n odour						123
-39 -				) 						123
-40 -										-123
-41 -41		CA de	parse-grained onse, medium b	Sand and Gravel - (angu prown, wet	ar gravel), silty,			111111111111111111111111111111111111111		123
-42 -43 44				j.						123
-43							-			-122
		EN	ID OF BOREH	OLE AT 43.6 m					4	
44	maco	:     AMI	EC Earth & E	nvironmental	LOGGED BY: RH REVIEWED BY: RH				ETION DEPTH: 43.60 ETION DATE: 1/21/10	
d	mec	Med	icine Hat, Alb	erta T1A 8G3	Fig. No: 2					e 4 of

CLIENT:	: Teck Coal Ltd.			PROJECT: Soil and G				BORE	HOLE NO: MW10-03	· ·
	R: J.R. Drilling			LOCATION: Line Cree			_		ECT NO: BX05973	
	METHOD: Air Rotary		·	BOREHOLE LOCATIO						
SAMPLE		by Tube	No Recover	· · · · · · · · · · · · · · · · · · ·		ple		Split-Pe		
BACKFIL	LL TYPE Beni	tonite	Pea Gravel	Slough	Grout	· · · · · · · · · · · · · · · · · · ·		Drill Cu	ttings Sand	,
Depth (m)	20 40 60 80  PLASTIC M.C. LIQUII  20 40 60 80	SOILS		SOIL DESCRIPTIO	N	SAMPLE TYPE SAMPLE NO	SPT (N)		OTHER TESTS COMMENTS	ELEVATION (m)
0		:      S	ilt - trace clay, tr rown, damp	ace gravel, very firm, low	plasticity, medium				Top of Pipe Elevation - 1284.188 m	- 128
1			ine-grained San	id - trace gravel, dense, n	nedium brown, moist				50 mm PVC, Schedule 40 Monitoring Well, 10 Slot Well Screen with Steel Stick Up Casing Protector 200 mm steel casing pulled out to expose 1.32 m of 50 mm	- - - - 128
			-	ained sand, light brown el, trace fines, dense, me	dium brown, maist				to expose 1.32 m of 50 mm PVC screen. Addition extraction of steel casing was not possible after the pipe broke, leaving 200 mm of casing between 27.0 m and 54.4 m	- - - - 12
			ши - эчнь укач	o, mao mio, udiso, ilie	MAIN DIVING HIVE					12
			gravelly	RA	>					11
				V						- - - - - - - -
										1 1 1 1
			some cobbles				-			) 
			faint solvent odd	our		A1				
0										1
	1				LOGGED BY: RH				OMPLETION DEPTH: 55.80 n	1
21	mec <sup>y</sup>	AM Mer	EC Earth & Er licine Hat, Albe	nvironmental erta T1A 8G3	REVIEWED BY: RH			C	OMPLETION DATE: 1/22/10	
<u>UI</u>	11 <b>-</b> -	IVIOL	invitro i iat, Albi	5110, 1 1F1 0 CC	Fig. No: 3				Page	1 (

	IT: Teck Coal Ltd.			PROJECT: Soil and G					E NO: MW10-03	
	ER: J.R. Drilling			OCATION: Line Cree	· · · · · · · · · · · · · · · · · · ·				NO: BX05973	
	/METHOD: Air Rotan			BOREHOLE LOCATION						
		Shelby Tube	No Recovery			nple		Split-Pen	Core	
BACK	FILL TYPE	Bentonite	Pea Gravel	Slough	Grout			Orill Cuttings	<b></b> Sand	
Depth (m)	■ STANDARD PEN (N. 20 40 60 PLASTIC M.C. L. 1	SOIL SYMBOL		SOIL DESCRIPTIO	N	SAMPLE TYPE SAMPLE NO	SPT (N)	WELL	OTHER TESTS COMMENTS	FI EVATION (m)
10		: : : :	and gravel							-12
-11		***	gravelly							-127
-12										
-13										-12
14			some gravel, dan	np						[-\frac{1}{2}
				B 12	>					1.1
15										1
16										
17 ·			trace gravel							1
8			some gravel, moi	st						1
9										
20										-
. حص		Δι	MEC Earth & Env	vironmental	LOGGED BY: RH REVIEWED BY: RH				ETION DEPTH: 55.80 ETION DATE: 1/22/10	m
	<u>mec </u>	l Me	dicine Hat, Albei	rta T1A 8G3	Fig. No: 3	· .	_	JOIVIPL	Pag	

CLIENT: Teck Coal Ltd.			nd Groundwater Assessn		<del></del>	NO: MW10-03	
DRILLER: J.R. Drilling			Creek Mine, Sparwood, E			NO: BX05973	
DRILL/METHOD: Air Rotary			ATION:X - 54627.1430, \				
		Recovery SPT			Split-Pen	Core	
BACKFILL TYPE Bea	ntonite Pea	Gravel Sloug	h 🔀 Grout		Drill Cutlings	<b>⊡</b> Sand	
PLASTIC M.C. LICK	S	SOIL DESCRIP	ΓΙΟΝ	SAMPLE TYPE SAMPLE NO	WELL	OTHER TESTS COMMENTS	ELEVATION (m)
20	4.1						=
-21							-126
-22							126
-23		el, some fines					126
-25		R					-125
-26							12!
27							12
-28	trace fine:					,	-12! 12!
29	some gra	el					129
30			LOGGED BY: RH		COMPLE	TION DEPTH: 55.80 m	
amec	AMEC Earth	& Environmental	REVIEWED BY: RH	<del>`</del>		TION DATE: 1/22/10	
dilict_	Medicine Ha	, Alberta T1A 8G3	Fig. No: 3			Page	3 of

CLIENT: Teck Coal Ltd			PROJECT: Soil and Gr			_		E NO: MW10-03	
DRILLER: J.R. Drilling			LOCATION: Line Creel	· 1************************************				NO: BX05973	
DRILL/METHOD: Air F		<del></del>	BOREHOLE LOCATIO						
SAMPLE TYPE	Shelby Tube	No Recove		-	p!e		iplit-Pen	■ Core	
BACKFILL TYPE	Bentonite	Pea Gravel	Slough	Grout			rill Cuttings	Sand	
E STANDARD 20 40  PLASTIC M.C 20 40	S		SOIL DESCRIPTION	N	SAMPLE TYPE SAMPLE NO	SPT (N)	WELL INSTALLATION	OTHER TESTS COMMENTS	EI EVATION (m)
30 : : : :	1 1 1 1						ad		ŀ
-31	sc	ome cobbles		. ,					112
-32									1:
-33									**************************************
34				>					1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
35	so	ome fines							1.
36									
37	tra	ace fines							1111111111
38									11.11.11
39									1,1,1,1,1,1,1,1
40			· · · · · · · · · · · · · · · · · · ·	LOGGED BY BY				ETION DEDTIL ECO	-1 
	AMEC	C Earth & En	vironmental	LOGGED BY: RH REVIEWED BY: RH		•		ETION DEPTH: 55,80 ETION DATE: 1/22/10	
AMEC Earth & Environmental Medicine Hat, Alberta T1A 8G3  LOGGED BY: RH REVIEWED BY: RH COMPLETION DEPTH: 55.80 m REVIEWED BY: RH Fig. No: 3  Page 4									

DRILL/METHOD: Air Rotary  BOREHOLE LOCATION:X - 54627.1430, Y - 27968.0540 ELET SAMPLE TYPE  SAMPLE TYPE  Shelby Tube  No Recovery  SPT Test (N)  Grab Sample  Split-I  BACKFILL TYPE  Bentonite  Pea Gravel  Drill C	-Pen 🔲 Core
SAMPLE TYPE Shelby Tube No Recovery SPT Test (N) Grab Sample Split-I BACKFILL TYPE Bentonite Pea Gravel Slough Grout Drill C	-Pen 🔲 Core
BACKFILL TYPE Bentonite Pea Gravel Slough Grout Drill C	
	Cuttings Sand
SOIL DESCRIPTION  PLASTIC M.C. LIQUID 20 40 60 80	NOTALLATION  COMMENTS  COMMENTS  COMMENTS
40	-12
-41grey, damp	
medium brown	12 [- ]
42	-12
43	
	-1: -1:
	-1:
6cobbly	
	1
	-1
	-1: -1:
	COMPLETION DEPTH: 55.80 m
	COMPLETION DATE: 1/22/10 Page 5 c

DRILL/I SAMPL		lby Tube tonite		LOCATION: Line Cre BOREHOLE LOCATI y SPT Test	ON:X - 54627.143	0, Y - 2	27968.	54¢ELI	EVATION		
SAMPL BACKF (iii) stated	LE TYPE She FILL TYPE Ber	tonite	☑No Recover		the second secon						
BACKF	Ber	tonite	*****	y SPT Test	(Al) Grah						
Depth (m)	STANDARD PEN (N)		Pag Gravel		*******			∭Spli	-Pen	Core	
- 50	■ STANDARO PEN (N) ■ 20 40 60 8	1.1	L.Ji ca ciavei	[]]] Slough	Grou	ţ		Drill	Cuttings	Sand	
	PLASTIC M.C. LIQU 20 40 60 8	SOILS		SOIL DESCRIPTIO	N	SAMDIE TVDE	SAMPLE NO	SPT (N) WELL	INSTALLATION	OTHER TESTS COMMENTS	ELEVATION (m)
-51	1 1 1 1 1 1	4.1									E
-51											123
:  ·											-123
-52											-123
-53						>					-
-54		4. * Gi	ravel - some san	d, trace fines, dense, m	edium brown, wet	>					-123
		A Co	parse-grained S edium brown, we	and - some gravel, som	e fines, dense,						-122 122
-55											123
·56 ··		EN	ND OF BOREHO	LE AT 57.8 m				<u>Y-1</u>	<u>r</u>		122
.57										• .	
58											-122 -
											- -122
59											-122
60	mec®	<u> </u>	EC Earth & Envicine Hat, Albei	vironmental	LOGGED BY: RH					TION DEPTH: 55.80 TION DATE: 1/22/10	

	CLIENT: Teck Coal Ltd.				PROJECT: GW Assessment - Effluent Ponds BOREHOLE NO: MW11(P)-01								
DRILL	ER: JR Drilling				LOCATION: Teck	-LCO				<del>-}</del>		ΓNO: BX06169	
DRILL	/METHOD: DR-12/ Air R	otary			BOREHOLE LOC	······	er to site plan					ON: 1266.06 m	
SAMF	PLE TYPE Shell	y Tub	9	☑No Recov	- 1		Grab Samp	ple	3~4	Spli		Core	
BACK	FILL TYPE Bent	onite		Pea Grav	rel ∭Slouç	jh	Grout				Cuttings	Sand	
			ر_ ا					ωl.	_		<u>ا</u> ج		<u>ج</u> ا
Œ	STANDARD PEN (N)		SOIL SYMBOL		SOIL			SAMPLE TYPE	SAMPLE NO	2   1	INSTALLATION	OTHER TESTS	ELEVATION (m)
Depth (m)	20 40 60 80		S		DESCRIP	ΓΙ <b>ΩΝ</b> Ι		빌	MPL# N	-   *	ISTA	OTHER TESTS COMMENTS	۱¥
2	PLASTIC M.C. LIQUID	,	텋		DESCRIP	HON			<u>₹</u>   8	<sup>ت</sup> لــ		COMMENTO	ļ Š
	20 40 60 80		(C)					S		1	7		
0 1		;			ne gravel, trace day, l	oose, compact,	medium	_	1		Top	o of casing (TOC) elevation 267,06 mASL.	126
-2				brown, dry gravelly					2			ck-up = 1.0 m.	126
-3				SILT, sandy, sor	me cobbles, some gra	vel, compact, g	rey brown,		3 4				126
-4	<b>★</b>	;		damp					5	$\cdot$			126
-5		;		ļ				H	6		11		126
-6		;	ij.	011 777 0 4 110			J				$\parallel$		126
7				SILIY SAND, SO	ome gravel, compact,	medium brown	, ary				1		125
8								$\Box$	7				125
9				Cli T come col	bles, trace FG sand, t	S	dawa	$\vdash$	8				125
10				SILI, SOME COD	obies, trace FG sand, i	im, mealum bi	own, damp						125
-11									9				125
12		; ;						╟┤╵	10				125
13		;											125
14								1 1					125
15 ,								┝┉┤╶	11				125
16		;											125
17		;											124
18	• i · i · i · i · i · i · i · i · i · i				\			╟╢	12				124
19				-damp		5							124
20				•									124
21 22	<b>•</b>			-dry				Η.	13			•	124
23					)								124
24													124
25		;						H '	14		11		124
													124
26 27 28 29 30 31 32 33 34		;										and the first of the same of	123
28				-damp				$\square$	15		30.	pth to groundwater was 81 m from TOC 23	123
29		;		-								vember 2011 (1236.25	123
30-₹	*************************											.SL).	123
31													123
32													123
33			Ш					] ]	ı		150	) mm steel casing installed n surface to 33.5 m.	123
		;]	0101 0. 0.	SAND AND GRA	AVEL, dense, brown ç	rey, moist (sub	rounded				101	n aunace (0 33,3 fil,	123
35		;	2021	gravel)	e gravel, dense, brown	arov unit facil	rounded	Η.	16				123
36	• • • • • • • • • • • • • • • • • • • •	;		to sub angular)	e graver, dense, brown	ı grey, wet (Sül	, rounded	<u>Ц</u> ,	17				123
37		::::::								•	[•]		122
-38		::;:::										0 mm Schedule 40 slotted	122
39		::}:::		-wet								C screen was installed from 5 m to 40.5 m.	122
40											_1°•1		122
41				END OF HOLE						• 1	<b>-</b> ⊢ K=	: 7.4 x 10⁴m/s	122
4Z .12		;			completion. Monitorin	ig well installed	l.						122
43 .44													122
-35 -36 -37 -38 -39 -40 -41 -42 -43 -44 45		;	<u> </u>										F1222
				AMEC Environm	ent & Infrastructure		D BY: RH					LETION DEPTH: 40.50 m	
7	mec			Medicine Hat, Alt		REVIE	WED BY: LH				COMP	LETION DATE: 11/15/11	
U												Page	1 of

CLIEN.	T: Teck Coal Ltd.		PROJECT: GW Assessment - Effluent Ponds BOREHOLE NO: MW11(P)-03								
DRILLE	ER: JR Drilling			LOCATION: Teck -	LCO				PROJ	ECT NO: BX06169	
DRILL/	/METHOD: DR-12/Air R	otary		<b>BOREHOLE LOCA</b>	TION: Refe	to site plan		ı	ELEV	ATION: 1263.49 m	
SAMPL	LE TYPE Shel	by Tube	✓ No Recove	ery SPT Te	st (N)	Grab Samp	ile		Split-Pe	n Core	
BACKE	FILL TYPE Bent	tonite	Pea Grave	l ∭Slough		Grout			Orill Cut	ttings 🔛 Sand	.,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,
Depth (m)	◆ GASTECH VAPOUR ◆ 200 400 600 800  ■ STANDARD PEN (N) ■ 20 40 60 80  PLASTIC M.C. LIQUIC 1 0 60 80	SOIL SYMBG	CI AY some silt	SOIL DESCRIPTI			SAMPLE TYPE SAMPLE NO	SPT (N)	WELL INSTALLATION	OTHER TESTS COMMENTS Top of casing (TOC) elevation	ELEVATION (m)
- SOKET-OLE 1.037 (3707) 1.057 1.078 (3.04 1.057) 1.007 1.057 (3.04 1.057) 1.007 1.057 (3.04 1.057) 1.007 1.057 (3.04 1.057) 1.007 1.057 (3.04 1.057) 1.007 1.057 (3.04 1.057) 1.007 1.057 (3.04 1.057) 1.007 1.057 (3.04 1.057) 1.007 1.057 1.			GRAVEL, some smoist  SAND & GRAVES Wet SILT, clayey, sand brown, moist  BEDROCK  END OF BOREHO	e gravel, some cobbles e gravel, some cobbles dy, some gravel, some	compact, gre  firm, grey, m  cobbles, medi	orown,  y, damp  oist  ium				is 1264.53 mASL. Stick-up = 1.04 m.  Depth to water was 27.81 m below TOC on 23 November 2011. Groundwater elevation was 1236.72 m ASL.  The 150 mm steel casing terminates at 31.1 m.  A 50 mm Schedule 40 slotted PVC screen installed from 35.1 m to 38.1 m.  K = 7.4 x 10 <sup>4</sup> m/s	henry harris   1227   1225   1224   1223   1224   1223   1221   1220   1221
D	mec <sup>©</sup>		AMEC Environme ledicine Hat, Albe	ent & Infrastructure erta	REVIEW	ED BY: LH			_	OMPLETION DEPTH: 41.20 m OMPLETION DATE: 11/18/11 Page	1 of 1

CLIE	NT: Teck Coal Ltd.			PROJECT: GW Assessment - Effluent Ponds BOREHOLE NO: MW11(P)-04					
DRIL	LER: JR Drilling			LOCATION: Teck - LO	0		PRO	JECTNO: BX06169	
DRIL	L/METHOD: DR-12/Air R	otary		BOREHOLE LOCATION	ON: Refer to site plan		ELE'	VATION: 1271.15 m	
SAMI	PLE TYPE She	by Tube	No Recove	ery SPT Test (I	<u> </u>	ple	∭Split-l	<b></b>	
BACI	KFILL TYPE Ben	tonite	Pea Gravel	l Slough	Grout		Drill C	Cuttings Sand	
Depth (m)	◆ GASTECH VAPOUR ◆ 200 400 600 80  ■ STANDARD PEN (N) ■ 20 40 60 8  PLASTIC M.C. LIQUII  20 40 60 8	SOIL SYMBG		SOIL DESCRIPTIO	N	SAMPLE TYPE SAMPLE NO	SPT (N) WELL	OTHER TESTS COMMENTS	ELEVATION (m)
- BOREHOLE LOGS - SEPTRABER 32.2011.GPJ 12.01/04.03.0 PM (BOREHOLE 10.6)  1	20 40 60 8	SI S	ome reddish-piniobbley (6.7 to 7.  LT, some cobbles ome sand ome sand ome sand ome sand ome sand ome sand of site and of site	ak fragments (fractured cot.3 m) es, some sand, tracy day, es, some sand, trace day, silty, some cobbles, den es, some sand, trace day, silty, some cobbles, den es, some sand, trace day, cobbles, den es, some sand, trace day, silty, some cobbles, den es, some sand, trace day, cobbles, den es, some sand, trace day, cobbles, den es, some sand, trace day, cobbles, den	se, medium brown,  firm, dark brown,  firm, dark brown,			Steel casing terminates at 30.8 m.  Depth to groundwater 34.88 m.  Depth to groundwater 34.88 m.  1 2011 (1237.25 mASL).  A 50 mm Schedute 40 slotted PVC screen installed from 33.4 m to 36.8 m.  K = 3.4 x 10 m/s	1270 1268 1267 1267 1267 1267 1267 1267 1267 1267
ଛା _	mec		EC Environmer icine Hat, Albe	nt & Infrastructure erta	REVIEWED BY: LH			COMPLETION DATE: 11/21/11	e 1 of 1

CLIENT: Teck Coal Ltd.		PROJECT: GW Assessment - Effluent Ponds BOREHOLE NO: MW11(P)-05					
DRILLER: JR Drilling		LOCATION: Teck - LO	0		PROJ	JECT NO: BX06169	
DRILL/METHOD: DR-12/Air Rota	ıry	BOREHOLE LOCATION	ON: Refer to site plan		ELEV	'ATION: 1272.94 m	
SAMPLE TYPE Shelby			<u> </u>	·	∭Split-P€		
BACKFILL TYPE Bentonii	ite Pea Grav	vel Slough	Grout		Drill Cu		_
⊕ GASTECH VAPOUR → 200 400 600 800  ■ STANDARD PEN (N) ■ 20 40 60 80  PLASTIC M.C. LIQUID 20 40 60 80	SOIL SYMBOL	SOIL DESCRIPTIO	<b>N</b>	SAMPLE TYPE SAMPLE NO	WELL WELL INSTALLATION	OTHER TESTS COMMENTS	ELEVATION (m)
### 1	-cobbley  -cobbley  SILT, some coblet damp -30 cm seam of -cobbley, medius  -boulder  -sandy, light brown, damp BEDROCK  END OF BOREH	bles, some sand, tracy day, silty sand, moist m brown	firm, orange brown,			Top of casing (TOC) elevation is 1273.86 mASL. Stick-up = 0.92 m.  A 50 mm Schedule 40 slotted PVC screen was installed from 35.1 m to 38.1 m. Depth to groundwater is 38.35 m from TOC on 23 November 2011 (1235.51 mASL). K - n/a	1272 1271 1270 1271 1266 1267 1268 1267 1268 1267 1268 1267 1268 1267 1268 1267 1268 1267 1268 1267 1268 1267 1268 1267 1268 1268 1267 1268 1268 1268 1268 1268 1268 1268 1268
amec <sup>©</sup>	AMEC Environm Medicine Hat, Alb	ent & Infrastructure erta	LOGGED BY: RH REVIEWED BY: LH			OMPLETION DEPTH: 40.50 m OMPLETION DATE: 11/22/11	1 of 1

13 March 2020 19135981-2020-064-R-Rev0

**APPENDIX G** 

**Laboratory Certificates of Analysis** 

13 March 2020 19135981-2020-064-R-Rev0

Q1 - COAs



TECK COAL LIMITED (LINE CREEK)

ATTN: Chris Blurton

PO BOX 2003

SPARWOOD BC VOB 2G0

Date Received: 24-JAN-19

Report Date: 31-JAN-19 17:11 (MT)

Version: FINAL

Client Phone: 250-425-6111

# Certificate of Analysis

Lab Work Order #: L2224637
Project P.O. #: VP000608129

Job Reference: LINE CREEK OPERATION

C of C Numbers: 20190122 GW

Legal Site Desc:



Lyudmyla Shvets, B.Sc. Account Manager

[This report shall not be reproduced except in full without the written authority of the Laboratory.]

L2224637 CONTD.... PAGE 2 of 7 Version: FINAL

## ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2224637-1 LC_PIZP1101_WG_Q1-2019_N							
Sampled By: KC/DT on 22-JAN-19 @ 13:45							
Matrix: WG							
Miscellaneous Parameters							
Dissolved Organic Carbon	0.68		0.50	mg/L		28-JAN-19	R4474012
Total Kjeldahl Nitrogen	0.059		0.050	mg/L		28-JAN-19	R4472307
Mercury (Hg)-Total	0.00240		0.00050	ug/L		30-JAN-19	R4477027
Total Organic Carbon	0.00=10			Ü		28-JAN-19	R4477027
EPH Testing for teck Coal	1.10		0.50	mg/L		20-JAIN-19	K4474012
EPH (C10-C19) & EPH (C19-C32)							
EPH10-19	<0.25		0.25	mg/L	24-JAN-19	26-JAN-19	R4471449
EPH19-32	<0.25		0.25	mg/L	24-JAN-19	26-JAN-19	R4471449
Surrogate: 2-Bromobenzotrifluoride	87.7		50-150	g/ <b>_</b>	24-JAN-19	26-JAN-19	R4471449
Sum of EPH (10-32)			00 .00	, -			
EPH (C10-C32)	<0.50		0.50	mg/L		28-JAN-19	
TEH (C10-C30)				•			
TEH (C10-C30)	<0.25		0.25	mg/L	24-JAN-19	26-JAN-19	R4471449
Surrogate: 2-Bromobenzotrifluoride	87.7		50-150	%	24-JAN-19	26-JAN-19	R4471449
Dissolved Metals in Water							
Diss. Be (low) in Water by CRC ICPMS							
Beryllium (Be)-Dissolved	<0.020		0.020	ug/L	25-JAN-19	25-JAN-19	R4470687
Dissolved Metals Filtration Location	LAB					25-JAN-19	R4469769
Diss. Mercury in Water by CVAAS or CVAFS							
Mercury (Hg)-Dissolved	<0.0000050		0.0000050	mg/L	28-JAN-19	29-JAN-19	R4474867
Dissolved Mercury Filtration Location	LAB					28-JAN-19	R4473172
Dissolved Metals in Water by CRC ICPMS						05 141140	D 4 400 700
Dissolved Metals Filtration Location	LAB		0.0000		05 141140	25-JAN-19	R4469769
Aluminum (Al)-Dissolved Antimony (Sb)-Dissolved	<0.0030		0.0030	mg/L	25-JAN-19 25-JAN-19	25-JAN-19	R4470687
Arsenic (As)-Dissolved	<0.00010		0.00010 0.00010	mg/L	25-JAN-19 25-JAN-19	25-JAN-19 25-JAN-19	R4470687 R4470687
Barium (Ba)-Dissolved	0.00095 0.495		0.00010	mg/L mg/L	25-JAN-19 25-JAN-19	25-JAN-19 25-JAN-19	R4470687
Bismuth (Bi)-Dissolved	<0.00050		0.00010	mg/L	25-JAN-19 25-JAN-19	25-JAN-19 25-JAN-19	R4470687
Boron (B)-Dissolved	0.021		0.000030	mg/L	25-JAN-19	25-JAN-19	R4470687
Cadmium (Cd)-Dissolved	0.0065		0.010	ug/L	25-JAN-19	25-JAN-19	R4470687
Calcium (Ca)-Dissolved	26.3		0.050	mg/L	25-JAN-19	25-JAN-19	R4470687
Chromium (Cr)-Dissolved	<0.00010		0.00010	mg/L	25-JAN-19	25-JAN-19	R4470687
Cobalt (Co)-Dissolved	0.24		0.10	ug/L	25-JAN-19	25-JAN-19	R4470687
Copper (Cu)-Dissolved	<0.00050		0.00050	mg/L	25-JAN-19	25-JAN-19	R4470687
Iron (Fe)-Dissolved	<0.010		0.010	mg/L	25-JAN-19	25-JAN-19	R4470687
Lead (Pb)-Dissolved	<0.000050		0.000050	mg/L	25-JAN-19	25-JAN-19	R4470687
Lithium (Li)-Dissolved	0.0096		0.0010	mg/L	25-JAN-19	25-JAN-19	R4470687
Magnesium (Mg)-Dissolved	15.3		0.10	mg/L	25-JAN-19	25-JAN-19	R4470687
Manganese (Mn)-Dissolved	0.250		0.00010	mg/L	25-JAN-19	25-JAN-19	R4470687
Molybdenum (Mo)-Dissolved	0.0124		0.000050	mg/L	25-JAN-19	25-JAN-19	R4470687
Nickel (Ni)-Dissolved	<0.00050		0.00050	mg/L	25-JAN-19	25-JAN-19	R4470687
Potassium (K)-Dissolved	0.800		0.050	mg/L	25-JAN-19	25-JAN-19	R4470687
Selenium (Se)-Dissolved	<0.050		0.050	ug/L	25-JAN-19	25-JAN-19	R4470687
Silicon (Si)-Dissolved	3.56		0.050	mg/L	25-JAN-19	25-JAN-19	R4470687
Silver (Ag)-Dissolved	<0.000010		0.000010	mg/L	25-JAN-19	25-JAN-19	R4470687
Sodium (Na)-Dissolved	19.2		0.050	mg/L	25-JAN-19	25-JAN-19	R4470687
Strontium (Sr)-Dissolved	0.236		0.00020	mg/L	25-JAN-19	25-JAN-19	R4470687
Thallium (TI)-Dissolved	<0.000010		0.000010	mg/L	25-JAN-19	25-JAN-19	R4470687
Tin (Sn)-Dissolved	<0.00010		0.00010	mg/L	25-JAN-19	25-JAN-19	R4470687
Titanium (Ti)-Dissolved	<0.010		0.010	mg/L	25-JAN-19	25-JAN-19	R4470687
Uranium (U)-Dissolved	0.00144		0.000010	mg/L	25-JAN-19	25-JAN-19	R4470687

<sup>\*</sup> Refer to Referenced Information for Qualifiers (if any) and Methodology.

L2224637 CONTD.... PAGE 3 of 7 Version: FINAL

## ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier* D.L.	Units	Extracted	Analyzed	Batch
L2224637-1 LC_PIZP1101_WG_Q1-2019_N						
Sampled By: KC/DT on 22-JAN-19 @ 13:45						
Matrix: WG						
Dissolved Metals in Water by CRC ICPMS						
Vanadium (V)-Dissolved	<0.00050	0.00050	mg/L	25-JAN-19	25-JAN-19	R4470687
Zinc (Zn)-Dissolved	<0.0010	0.0010	mg/L	25-JAN-19	25-JAN-19	R4470687
Hardness						
Hardness (as CaCO3)	129	0.50	mg/L		28-JAN-19	
Total Metals in Water						
Total Be (Low) in Water by CRC ICPMS						
Beryllium (Be)-Total	0.036	0.020	ug/L		25-JAN-19	R4470687
Total Metals in Water by CRC ICPMS						
Aluminum (Al)-Total	0.779	0.0030	mg/L		25-JAN-19	R4470687
Antimony (Sb)-Total	0.00021	0.00010	mg/L		25-JAN-19	R4470687
Arsenic (As)-Total	0.00132	0.00010	mg/L		25-JAN-19	R4470687
Barium (Ba)-Total	0.475	0.00010	mg/L		25-JAN-19	R4470687 R4470687
Bismuth (Bi)-Total	<0.000050 0.022	0.000050	mg/L		25-JAN-19 25-JAN-19	
Boron (B)-Total Cadmium (Cd)-Total	0.022	0.010 0.0050	mg/L ug/L		25-JAN-19 25-JAN-19	R4470687 R4470687
Cadmum (Cd)-Total  Calcium (Ca)-Total	29.5	0.0050	mg/L		25-JAN-19 25-JAN-19	R4470687 R4470687
Chromium (Cr)-Total	0.00110	0.00010	mg/L		25-JAN-19	R4470687
Cobalt (Co)-Total	0.49	0.10	ug/L		25-JAN-19	R4470687
Copper (Cu)-Total	0.00222	0.00050	mg/L		25-JAN-19	R4470687
Iron (Fe)-Total	0.825	0.010	mg/L		25-JAN-19	R4470687
Lead (Pb)-Total	0.000417	0.000050	mg/L		25-JAN-19	R4470687
Lithium (Li)-Total	0.0102	0.0010	mg/L		25-JAN-19	R4470687
Magnesium (Mg)-Total	15.7	0.10	mg/L		25-JAN-19	R4470687
Manganese (Mn)-Total	0.274	0.00010	mg/L		25-JAN-19	R4470687
Molybdenum (Mo)-Total	0.0115	0.000050	mg/L		25-JAN-19	R4470687
Nickel (Ni)-Total	0.00128	0.00050	mg/L		25-JAN-19	R4470687
Potassium (K)-Total	1.03	0.050	mg/L		25-JAN-19	R4470687
Selenium (Se)-Total	0.165	0.050	ug/L		25-JAN-19	R4470687
Silicon (Si)-Total	5.00	0.10	mg/L		25-JAN-19	R4470687
Silver (Ag)-Total	0.000028	0.000010	mg/L		28-JAN-19	R4473187
Sodium (Na)-Total	18.5	0.050	mg/L		25-JAN-19	R4470687
Strontium (Sr)-Total	0.229	0.00020	mg/L		25-JAN-19	R4470687
Thallium (TI)-Total	0.000039	0.000010	mg/L		25-JAN-19	R4470687
Tin (Sn)-Total	<0.00010	0.00010	mg/L		25-JAN-19	R4470687
Titanium (Ti)-Total	0.012	0.010	mg/L		25-JAN-19	R4470687
Uranium (U)-Total Vanadium (V)-Total	0.00148	0.000010	mg/L		25-JAN-19	R4470687
vanadium (v)-Total Zinc (Zn)-Total	0.00223 0.0051	0.00050 0.0030	mg/L mg/L		25-JAN-19 25-JAN-19	R4470687 R4470687
Routine for Teck Coal	0.0031	0.0030	IIIg/L		20-0MIN-18	N4470007
Acidity by Automatic Titration						
Acidity by Automatic Intration Acidity (as CaCO3)	<1.0	1.0	mg/L		29-JAN-19	R4476569
Alkalinity (Species) by Manual Titration						
Alkalinity, Bicarbonate (as CaCO3)	161	1.0	mg/L		30-JAN-19	R4477672
Alkalinity, Carbonate (as CaCO3)	7.8	1.0	mg/L		30-JAN-19	R4477672
Alkalinity, Hydroxide (as CaCO3)	<1.0	1.0	mg/L		30-JAN-19	R4477672
Alkalinity, Total (as CaCO3)	168	1.0	mg/L		30-JAN-19	R4477672
Ammonia, Total (as N)						
Ammonia as N	0.0339	0.0050	mg/L		31-JAN-19	R4481150
Bromide in Water by IC (Low Level)						
Bromide (Br)	<0.050	0.050	mg/L		24-JAN-19	R4467957
Chloride in Water by IC Chloride (CI)	0.74	0.50	mg/L		24-JAN-19	R4467957
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<sup>\*</sup> Refer to Referenced Information for Qualifiers (if any) and Methodology.

L2224637 CONTD.... PAGE 4 of 7 Version: FINAL

## ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
   L2224637-1							
Sampled By: KC/DT on 22-JAN-19 @ 13:45							
Matrix: WG							
Electrical Conductivity (EC) Conductivity (@ 25C)	293		2.0	uS/cm		30-JAN-19	R4477672
Fluoride in Water by IC Fluoride (F)	1.69		0.020	mg/L		24-JAN-19	R4467957
Ion Balance Calculation Cation - Anion Balance	-1.3		0.020	g/2 %		30-JAN-19	114407307
Anion Sum	3.53			meq/L		30-JAN-19	
Cation Sum	3.44			meq/L		30-JAN-19	
Ion Balance Calculation Ion Balance	97.5		-100	%		30-JAN-19	
Nitrate in Water by IC (Low Level) Nitrate (as N)	<0.0050		0.0050	mg/L		24-JAN-19	R4467957
Nitrite in Water by IC (Low Level) Nitrite (as N)	<0.0010		0.0010	mg/L		24-JAN-19	R4467957
Orthophosphate-Dissolved (as P) Orthophosphate-Dissolved (as P)	0.0083		0.0010	mg/L		24-JAN-19	R4467047
Oxidation redution potential by elect. ORP	311		-1000	mV		28-JAN-19	R4472149
Phosphorus (P)-Total Phosphorus (P)-Total	0.0664		0.0020	mg/L		29-JAN-19	R4475330
Sulfate in Water by IC Sulfate (SO4)	2.56		0.30	mg/L		24-JAN-19	R4467957
Total Dissolved Solids Total Dissolved Solids	197	DLHC	20	mg/L		28-JAN-19	R4474975
Total Suspended Solids		DLITO		_			
Total Suspended Solids  Turbidity	5.5		1.0	mg/L		28-JAN-19	R4474974
Turbidity	14.1		0.10	NTU		25-JAN-19	R4469547
<b>pH</b> pH	8.51		0.10	pН		30-JAN-19	R4477672

<sup>\*</sup> Refer to Referenced Information for Qualifiers (if any) and Methodology.

LINE CREEK OPERATION L2224637 CONTD....

**Reference Information** 

PAGE 5 of 7 Version: FINAL

Sample Parameter Qualifier Key:

Qualifier	Description
DLHC	Detection Limit Raised: Dilution required due to high concentration of test analyte(s).
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.

**Test Method References:** 

ALS Test Code	Matrix	Test Description	on Method Reference**			
ACIDITY-PCT-CL	Water	Acidity by Automatic Titration	APHA 2310 Acidity			

This analysis is carried out using procedures adapted from APHA Method 2310 "Acidity". Acidity is determined by potentiometric titration to a specified endpoint.

ALK-MAN-CL Water Alkalinity (Species) by Manual Titration APHA 2320 ALKALINITY

This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.

BE-D-L-CCMS-VA Water Diss. Be (low) in Water by CRC ICPMS APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

BE-T-L-CCMS-VA Water Total Be (Low) in Water by CRC ICPMS EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

BR-L-IC-N-CL Water Bromide in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

C-DIS-ORG-LOW-CL Water Dissolved Organic Carbon APHA 5310 B-Instrumental

This method is applicable to the analysis of ground water, wastewater, and surface water samples. The form detected depends upon sample pretreatment: Unfiltered sample = TC, 0.45um filtered = TDC. Samples are injected into a combustion tube containing an oxidation catalyst. The carrier gas containing the combustion product from the combustion tube flows through an inorganic carbon reactor vessel and is then sent through a halogen scrubber into a sample cell set in a non-dispersive infrared gas analyzer (NDIR) where carbon dioxide is detected. For total inorganic carbon and dissolved inorganic carbon, the sample is injected into an IC reactor vessel where only the IC component is decomposed to become carbon dioxide.

The peak area generated by the NDIR indicates the TC/TDC or TIC/DIC as applicable. The total organic carbon content of the sample is calculated by subtracting the TIC from the TC.

TOC = TC-TIC, DOC = TDC-DIC, Particulate = Total - Dissolved.

C-TOT-ORG-LOW-CL Water Total Organic Carbon APHA 5310 TOTAL ORGANIC CARBON (TOC)

This method is applicable to the analysis of ground water, wastewater, and surface water samples. The form detected depends upon sample pretreatment: Unfiltered sample = TC, 0.45um filtered = TDC. Samples are injected into a combustion tube containing an oxidation catalyst. The carrier gas containing the combustion product from the combustion tube flows through an inorganic carbon reactor vessel and is then sent through a halogen scrubber into a sample cell set in a non-dispersive infrared gas analyzer (NDIR) where carbon dioxide is detected. For total inorganic carbon and dissolved inorganic carbon, the sample is injected into an IC reactor vessel where only the IC component is decomposed to become carbon dioxide.

The peak area generated by the NDIR indicates the TC/TDC or TIC/DIC as applicable. The total organic carbon content of the sample is calculated by subtracting the TIC from the TC.

TOC = TC-TIC, DOC = TDC-DIC, Particulate = Total - Dissolved.

CL-IC-N-CL Water Chloride in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

EC-L-PCT-CL Water Electrical Conductivity (EC) APHA 2510B

Conductivity, also known as Electrical Conductivity (EC) or Specific Conductance, is measured by immersion of a conductivity cell with platinum electrodes into a water sample. Conductivity measurements are temperature-compensated to 25C.

EPH(10-32)-CALC-CL Water Sum of EPH (10-32) Sum of EPH - Auto Calculated

The sum of EPH(C10-C19) and EPH(C19-C32)

F-IC-N-CL Water Fluoride in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

HARDNESS-CALC-VA Water Hardness APHA 2340B

Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

HG-D-CVAA-VA Water Diss. Mercury in Water by CVAAS or CVAFS APHA 3030B/EPA 1631E (mod)

#### L2224637 CONTD....

PAGE 6 of 7 Version: FINAL

### Reference Information

Test Method References:

IONBALANCE-BC-CL

**ALS Test Code** Matrix Method Reference\*\* **Test Description** 

Water samples are filtered (0.45 um), preserved with hydrochloric acid, then undergo a cold-oxidation using bromine monochloride prior to reduction

with stannous chloride, and analyzed by CVAAS or CVAFS.

Water

HG-T-U-CVAF-VA Water Total Mercury in Water by CVAFS (Ultra) EPA 1631 REV. E

Ion Balance Calculation

This analysis is carried out using procedures adapted from Method 1631 Rev. E. by the United States Environmental Protection Agency (EPA). The procedure involves a cold-oxidation of the acidified sample using bromine monochloride prior to a purge and trap concentration step and final reduction of the sample with stannous chloride. Instrumental analysis is by cold vapour atomic fluorescence spectrophotometry.

Cation Sum, Anion Sum, and Ion Balance (as % difference) are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Because all aqueous solutions are electrically neutral, the calculated ion balance (% difference of cations minus anions) should be near-zero.

Cation and Anion Sums are the total meg/L concentration of major cations and anions. Dissolved species are used where available. Minor ions are included where data is present. Ion Balance is calculated as:

Ion Balance (%) = [Cation Sum-Anion Sum] / [Cation Sum+Anion Sum]

MET-D-CCMS-VA Water Dissolved Metals in Water by CRC ICPMS APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

MET-T-CCMS-VA Water Total Metals in Water by CRC ICPMS EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

NH3-L-F-CL Water Ammonia, Total (as N) J. ENVIRON. MONIT., 2005, 7, 37-42, RSC

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et

NO2-L-IC-N-CL Water Nitrite in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

NO3-L-IC-N-CL Water Nitrate in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

ORP-CL Oxidation redution potential by elect. Water **ASTM D1498** 

This analysis is carried out in accordance with the procedure described in the "ASTM" method D1498 "Oxidation-Reduction Potential of Water" published by the American Society for Testing and Materials (ASTM). Results are reported as observed oxidation-reduction potential of the platinum metal-reference electrode employed, in mV.

It is recommended that this analysis be conducted in the field.

P-T-L-COL-CL Water Phosphorus (P)-Total APHA 4500-P PHOSPHORUS

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after persulphate digestion of the sample.

APHA 4500 H-Electrode

pH is determined in the laboratory using a pH electrode. All samples analyzed by this method for pH will have exceeded the 15 minute recommended hold time from time of sampling (field analysis is recommended for pH where highly accurate results are needed)

PO4-DO-L-COL-CL Orthophosphate-Dissolved (as P) APHA 4500-P PHOSPHORUS

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.

SO4-IC-N-CL Water Sulfate in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

SOLIDS-TDS-CL Water Total Dissolved Solids APHA 2540 C

A well-mixed sample is filtered through a glass fibre filter paper. The filtrate is then evaporated to dryness in a pre-weighed vial and dried at 180 – 2 °C. The increase in vial weight represents the total dissolved solids (TDS).

TECKCOAL-IONBAL-CL Water Ion Balance Calculation **APHA 1030F**  LINE CREEK OPERATION L2224637 CONTD....

## **Reference Information**

PAGE 7 of 7 Version: FINAL

#### **Test Method References:**

ALS Test Code Matrix Test Description Method Reference\*\*

Cation Sum, Anion Sum, and Ion Balance (as % difference) are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Because all aqueous solutions are electrically neutral, the calculated ion balance (% difference of cations minus anions) should be near-zero.

Cation and Anion Sums are the total meq/L concentration of major cations and anions. Dissolved species are used where available. Minor ions are included where data is present. Ion Balance is calculated as:

Ion Balance (%) = [Cation Sum-Anion Sum] / [Cation Sum+Anion Sum]

TEH-BC-VA-CL Water EPH (C10-C19) & EPH (C19-C32) BCMOE EPH GCFID

Analysis is in accordance with BC MOE Lab Manual method "Extractable Petroleum Hydrocarbons in Water by GC/FID", v2.1, July 1999. Whole water samples are extracted with DCM prior to gas chromatography with flame ionization detection (GC-FID). EPH results include Polycyclic Aromatic Hydrocarbons (PAH) and are therefore not equivalent to Light and Heavy Extractable Petroleum Hydrocarbons (LEPH/HEPH).

TEH-WATER-VA-CL Water TEH (C10-C30) EPA 3510/8000-GC-FID
TKN-L-F-CL Water Total Kjeldahl Nitrogen APHA 4500-NORG (TKN)

This analysis is carried out using procedures adapted from APHA Method 4500-Norg D. "Block Digestion and Flow Injection Analysis". Total Kjeldahl Nitrogen is determined using block digestion followed by Flow-injection analysis with fluorescence detection.

TSS-L-CL Water Total Suspended Solids APHA 2540 D-Gravimetric

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total suspended solids (TSS) are determined by filtering a sample through a glass fibre filter, and by drying the filter at 104 deg. C.

TURBIDITY-CL Water Turbidity APHA 2130 B-Nephelometer

This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.

\*\* ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

<b>Laboratory Definition Code</b>	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA
CL	ALS ENVIRONMENTAL - CALGARY, ALBERTA, CANADA

#### **Chain of Custody Numbers:**

20190122 GW

#### **GLOSSARY OF REPORT TERMS**

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.

 $\mbox{\it mg/kg}$  -  $\mbox{\it milligrams}$  per  $\mbox{\it kilogram}$  based on dry weight of sample

mg/kg wwt - milligrams per kilogram based on wet weight of sample

mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight

mg/L - unit of concentration based on volume, parts per million.

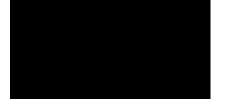
< - Less than.

D.L. - The reporting limit.

N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory. UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.



Workorder: L2224637

Report Date: 31-JAN-19

Page 1 of 11

Client:

TECK COAL LIMITED (LINE CREEK)

PO BOX 2003

SPARWOOD BC V0B 2G0

Contact: Chris Blurton

Test	Matrix	Reference	Result Qualif	ier Units	RPD	Limit	Analyzed
ACIDITY-PCT-CL	Water						
Batch R4476569 WG2979271-14 LCS Acidity (as CaCO3)			97.1	%		85-115	29-JAN-19
<b>WG2979271-13 MB</b> Acidity (as CaCO3)			<1.0	mg/L		2	29-JAN-19
ALK-MAN-CL	Water						
Batch R4477672 WG2979616-8 LCS Alkalinity, Total (as CaC			101.0	%		85-115	30-JAN-19
WG2979616-7 MB Alkalinity, Total (as CaC	CO3)		<1.0	mg/L		1	30-JAN-19
BE-D-L-CCMS-VA	Water						
Batch R4470687 WG2977395-2 LCS Beryllium (Be)-Dissolve			86.9	%		00.400	05 100 40
WG2977395-1 MB Beryllium (Be)-Dissolve		LF	<0.000020	mg/L		80-120 0.00002	25-JAN-19 25-JAN-19
BE-T-L-CCMS-VA	Water						
Batch R4470687							
WG2977359-2 LCS Beryllium (Be)-Total			91.6	%		80-120	25-JAN-19
WG2977359-1 MB Beryllium (Be)-Total			<0.000020	mg/L		0.00002	25-JAN-19
BR-L-IC-N-CL	Water						
Batch R4467957 WG2976931-14 LCS Bromide (Br)			102.3	%		85-115	24-JAN-19
<b>WG2976931-13 MB</b> Bromide (Br)			<0.050	mg/L		0.05	24-JAN-19
C-DIS-ORG-LOW-CL	Water						
Batch R4474012 WG2978867-5 MB Dissolved Organic Carb			<0.50	mg/L		0.5	28-JAN-19

C-TOT-ORG-LOW-CL Water



Workorder: L2224637

Report Date: 31-JAN-19 Page 2 of 11

Test	Matrix	Reference	Result Qual	ifier	Units	RPD	Limit	Analyzed
C-TOT-ORG-LOW-CL	Water							
Batch R4474012 WG2978867-6 LCS Total Organic Carbon			100.8		%		80-120	28-JAN-19
WG2978867-5 MB Total Organic Carbon			<0.50		mg/L		0.5	28-JAN-19
CL-IC-N-CL	Water							
Batch R4467957 WG2976931-14 LCS Chloride (CI)			98.1		%		90-110	24-JAN-19
<b>WG2976931-13 MB</b> Chloride (Cl)			<0.50		mg/L		0.5	24-JAN-19
EC-L-PCT-CL	Water							
Batch R4477672 WG2979616-7 MB Conductivity (@ 25C)			<2.0		uS/cm		2	30-JAN-19
F-IC-N-CL	Water							
Batch R4467957 WG2976931-14 LCS Fluoride (F)			101.7		%		90-110	24-JAN-19
<b>WG2976931-13 MB</b> Fluoride (F)			<0.020		mg/L		0.02	24-JAN-19
HG-D-CVAA-VA	Water							
Batch R4474867 WG2978498-3 DUP Mercury (Hg)-Dissolved		<b>L2224637-1</b> <0.0000050	<0.0000050	RPD-NA	mg/L	N/A	20	29-JAN-19
WG2978498-2 LCS Mercury (Hg)-Dissolved			106.6		%		80-120	29-JAN-19
WG2978498-1 MB Mercury (Hg)-Dissolved		LF	<0.0000050		mg/L		0.000005	29-JAN-19
HG-T-U-CVAF-VA	Water							
Batch R4477027		1 000 4007 4						
WG2979827-3 DUP Mercury (Hg)-Total		<b>L2224637-1</b> 0.00240	0.00238		ug/L	0.8	20	30-JAN-19
WG2979827-2 LCS Mercury (Hg)-Total			99.6		%		80-120	30-JAN-19
WG2979827-1 MB Mercury (Hg)-Total			<0.00050		ug/L		0.0005	30-JAN-19



Page 3 of 11

Workorder: L2224637 Report Date: 31-JAN-19

Limit Test Matrix Reference Result Qualifier Units **RPD** Analyzed MET-D-CCMS-VA Water Batch R4470687 WG2977395-2 LCS Aluminum (Al)-Dissolved 102.2 % 25-JAN-19 80-120 Antimony (Sb)-Dissolved 102.5 % 25-JAN-19 80-120 Arsenic (As)-Dissolved 98.8 % 80-120 25-JAN-19 Barium (Ba)-Dissolved 101.8 % 80-120 25-JAN-19 Bismuth (Bi)-Dissolved 103.8 % 80-120 25-JAN-19 Boron (B)-Dissolved 94.1 % 80-120 25-JAN-19 Cadmium (Cd)-Dissolved 99.5 % 80-120 25-JAN-19 Calcium (Ca)-Dissolved 92.5 % 80-120 25-JAN-19 Chromium (Cr)-Dissolved 104.7 % 80-120 25-JAN-19 Cobalt (Co)-Dissolved % 99.7 80-120 25-JAN-19 Copper (Cu)-Dissolved 97.0 % 80-120 25-JAN-19 Iron (Fe)-Dissolved 89.4 % 80-120 25-JAN-19 Lead (Pb)-Dissolved 104.3 % 80-120 25-JAN-19 Lithium (Li)-Dissolved 88.7 % 80-120 25-JAN-19 Magnesium (Mg)-Dissolved 99.2 % 80-120 25-JAN-19 Manganese (Mn)-Dissolved 96.9 % 80-120 25-JAN-19 Molybdenum (Mo)-Dissolved 99.4 % 80-120 25-JAN-19 Nickel (Ni)-Dissolved 99.2 % 80-120 25-JAN-19 Potassium (K)-Dissolved 103.0 % 80-120 25-JAN-19 Selenium (Se)-Dissolved 96.0 % 80-120 25-JAN-19 Silicon (Si)-Dissolved 99.2 % 60-140 25-JAN-19 Silver (Ag)-Dissolved 97.5 % 80-120 25-JAN-19 Sodium (Na)-Dissolved 101.7 % 80-120 25-JAN-19 Strontium (Sr)-Dissolved 101.3 % 80-120 25-JAN-19 Thallium (TI)-Dissolved 96.2 % 80-120 25-JAN-19 Tin (Sn)-Dissolved 97.3 % 80-120 25-JAN-19 Titanium (Ti)-Dissolved % 96.0 80-120 25-JAN-19 Uranium (U)-Dissolved 107.1 % 80-120 25-JAN-19 Vanadium (V)-Dissolved 102.2 % 25-JAN-19 80-120 Zinc (Zn)-Dissolved 94.5 % 80-120 25-JAN-19 WG2977395-1 LF MB Aluminum (Al)-Dissolved < 0.0010 mg/L 0.001 25-JAN-19 Antimony (Sb)-Dissolved < 0.00010 mg/L 0.0001 25-JAN-19 Arsenic (As)-Dissolved < 0.00010 mg/L 0.0001 25-JAN-19



Workorder: L2224637

Report Date: 31-JAN-19

Page 4 of 11

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA	Water							
Batch R44706	87							
WG2977395-1 MB Barium (Ba)-Dissolve		LF	<0.00010	)	mg/L		0.0001	25-JAN-19
Bismuth (Bi)-Dissolve			<0.00005		mg/L		0.0001	25-JAN-19 25-JAN-19
Boron (B)-Dissolved			<0.010	-	mg/L		0.01	25-JAN-19
Cadmium (Cd)-Dissolved			<0.00000	050	mg/L		0.000005	25-JAN-19
Calcium (Ca)-Dissolv			< 0.050		mg/L		0.05	25-JAN-19
Chromium (Cr)-Disso			<0.00010	)	mg/L		0.0001	25-JAN-19
Cobalt (Co)-Dissolve			<0.00010		mg/L		0.0001	25-JAN-19
Copper (Cu)-Dissolve			<0.00020		mg/L		0.0002	25-JAN-19
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	25-JAN-19
Lead (Pb)-Dissolved			< 0.00005	50	mg/L		0.00005	25-JAN-19
Lithium (Li)-Dissolve	d		<0.0010		mg/L		0.001	25-JAN-19
Magnesium (Mg)-Dis			< 0.0050		mg/L		0.005	25-JAN-19
Manganese (Mn)-Dis	ssolved		<0.00010	)	mg/L		0.0001	25-JAN-19
Molybdenum (Mo)-Di	issolved		<0.00005	50	mg/L		0.00005	25-JAN-19
Nickel (Ni)-Dissolved	I		<0.00050	)	mg/L		0.0005	25-JAN-19
Potassium (K)-Disso	lved		<0.050		mg/L		0.05	25-JAN-19
Selenium (Se)-Disso	lved		<0.00005	50	mg/L		0.00005	25-JAN-19
Silicon (Si)-Dissolved	d		< 0.050		mg/L		0.05	25-JAN-19
Silver (Ag)-Dissolved	i		<0.00001	0	mg/L		0.00001	25-JAN-19
Sodium (Na)-Dissolv	red		<0.050		mg/L		0.05	25-JAN-19
Strontium (Sr)-Disso	lved		<0.00020	)	mg/L		0.0002	25-JAN-19
Thallium (TI)-Dissolv	red		< 0.00001	0	mg/L		0.00001	25-JAN-19
Tin (Sn)-Dissolved			<0.00010	)	mg/L		0.0001	25-JAN-19
Titanium (Ti)-Dissolv	red		<0.00030	)	mg/L		0.0003	25-JAN-19
Uranium (U)-Dissolve	ed		<0.00001	0	mg/L		0.00001	25-JAN-19
Vanadium (V)-Dissol	ved		<0.00050	)	mg/L		0.0005	25-JAN-19
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	25-JAN-19
MET-T-CCMS-VA	Water							
Batch R44706	87							
WG2977359-2 LC3 Aluminum (Al)-Total	s		96.8		%		80-120	25-JAN-19
Antimony (Sb)-Total			106.4		%		80-120	25-JAN-19 25-JAN-19
Arsenic (As)-Total			97.0		%		80-120	25-JAN-19 25-JAN-19
Barium (Ba)-Total			95.2		%		80-120 80-120	
Danum (Da)-10tal			33.∠		/0		00-120	25-JAN-19



Workorder: L2224637

Report Date: 31-JAN-19

Page 5 of 11

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-VA	Water							
Batch R4470687								
WG2977359-2 LCS								
Bismuth (Bi)-Total			95.9		%		80-120	25-JAN-19
Boron (B)-Total			95.0		%		80-120	25-JAN-19
Cadmium (Cd)-Total			95.5		%		80-120	25-JAN-19
Calcium (Ca)-Total			94.3		%		80-120	25-JAN-19
Chromium (Cr)-Total			96.6		%		80-120	25-JAN-19
Cobalt (Co)-Total			94.0		%		80-120	25-JAN-19
Copper (Cu)-Total			93.8		%		80-120	25-JAN-19
Iron (Fe)-Total			91.3		%		80-120	25-JAN-19
Lead (Pb)-Total			101.1		%		80-120	25-JAN-19
Lithium (Li)-Total			92.9		%		80-120	25-JAN-19
Magnesium (Mg)-Total			95.2		%		80-120	25-JAN-19
Manganese (Mn)-Total			93.8		%		80-120	25-JAN-19
Molybdenum (Mo)-Tota	I		101.1		%		80-120	25-JAN-19
Nickel (Ni)-Total			96.1		%		80-120	25-JAN-19
Potassium (K)-Total			99.8		%		80-120	25-JAN-19
Selenium (Se)-Total			95.4		%		80-120	25-JAN-19
Silicon (Si)-Total			100.7		%		80-120	25-JAN-19
Silver (Ag)-Total			97.3		%		80-120	25-JAN-19
Sodium (Na)-Total			103.6		%		80-120	25-JAN-19
Strontium (Sr)-Total			104.0		%		80-120	25-JAN-19
Thallium (TI)-Total			89.8		%		80-120	25-JAN-19
Tin (Sn)-Total			97.2		%		80-120	25-JAN-19
Titanium (Ti)-Total			92.8		%		80-120	25-JAN-19
Uranium (U)-Total			100.8		%		80-120	25-JAN-19
Vanadium (V)-Total			97.4		%		80-120	25-JAN-19
Zinc (Zn)-Total			96.4		%		80-120	25-JAN-19
WG2977359-1 MB							00 .20	20 0/ 11 10
Aluminum (Al)-Total			< 0.0030		mg/L		0.003	25-JAN-19
Antimony (Sb)-Total			<0.00010	)	mg/L		0.0001	25-JAN-19
Arsenic (As)-Total			<0.00010	)	mg/L		0.0001	25-JAN-19
Barium (Ba)-Total			<0.00010	)	mg/L		0.0001	25-JAN-19
Bismuth (Bi)-Total			<0.00005	50	mg/L		0.00005	25-JAN-19
Boron (B)-Total			<0.010		mg/L		0.01	25-JAN-19
Cadmium (Cd)-Total			<0.00000	150	mg/L		0.000005	25-JAN-19



Workorder: L2224637

Report Date: 31-JAN-19 Page 6 of 11

Test	Matrix	Reference	Result Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-VA	Water						
Batch R4470687							
WG2977359-1 MB			0.050	A			
Calcium (Ca)-Total			<0.050	mg/L		0.05	25-JAN-19
Chromium (Cr)-Total			<0.00010	mg/L		0.0001	25-JAN-19
Cobalt (Co)-Total			<0.00010	mg/L		0.0001	25-JAN-19
Copper (Cu)-Total			<0.00050	mg/L		0.0005	25-JAN-19
Iron (Fe)-Total			<0.010	mg/L		0.01	25-JAN-19
Lead (Pb)-Total			<0.000050	mg/L		0.00005	25-JAN-19
Lithium (Li)-Total			<0.0010	mg/L		0.001	25-JAN-19
Magnesium (Mg)-Total			<0.0050	mg/L		0.005	25-JAN-19
Manganese (Mn)-Total			<0.00010	mg/L		0.0001	25-JAN-19
Molybdenum (Mo)-Total			<0.000050	mg/L		0.00005	25-JAN-19
Nickel (Ni)-Total			<0.00050	mg/L		0.0005	25-JAN-19
Potassium (K)-Total			<0.050	mg/L		0.05	25-JAN-19
Selenium (Se)-Total			<0.000050	mg/L		0.00005	25-JAN-19
Silicon (Si)-Total			<0.10	mg/L		0.1	25-JAN-19
Silver (Ag)-Total			<0.000010	mg/L		0.00001	25-JAN-19
Sodium (Na)-Total			<0.050	mg/L		0.05	25-JAN-19
Strontium (Sr)-Total			<0.00020	mg/L		0.0002	25-JAN-19
Thallium (TI)-Total			<0.000010	mg/L		0.00001	25-JAN-19
Tin (Sn)-Total			<0.00010	mg/L		0.0001	25-JAN-19
Titanium (Ti)-Total			<0.00030	mg/L		0.0003	25-JAN-19
Uranium (U)-Total			<0.000010	mg/L		0.00001	25-JAN-19
Vanadium (V)-Total			<0.00050	mg/L		0.0005	25-JAN-19
Zinc (Zn)-Total			<0.0030	mg/L		0.003	25-JAN-19
NH3-L-F-CL	Water						
Batch R4481150							
WG2980995-6 LCS							
Ammonia as N			98.7	%		85-115	31-JAN-19
WG2980995-5 MB Ammonia as N			<0.0050	mg/L		0.005	31-JAN-19
NO2-L-IC-N-CL	Water						
Batch R4467957							
WG2976931-14 LCS Nitrite (as N)			103.5	%		90-110	24-JAN-19
<b>WG2976931-13 MB</b> Nitrite (as N)			<0.0010	mg/L		0.001	24-JAN-19



Workorder: L2224637

Report Date: 31-JAN-19 Page 7 of 11

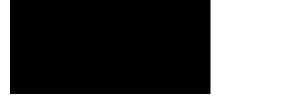
Test	Matrix	Reference	Result	Qualifier Units	s RPD	Limit	Analyzed
NO3-L-IC-N-CL	Water						
<b>Batch</b> R4467957 <b>WG2976931-14</b> LCS Nitrate (as N)			99.0	%		90-110	24-JAN-19
<b>WG2976931-13 MB</b> Nitrate (as N)			<0.0050	mg/L	-	0.005	24-JAN-19
ORP-CL	Water						
<b>Batch R4472149 WG2978334-5 CRM</b> ORP		CL-ORP	222	mV		210-230	28-JAN-19
P-T-L-COL-CL	Water						
Batch R4475330 WG2979247-6 LCS			100.0	%		00.400	00 1411 40
Phosphorus (P)-Total WG2979247-5 MB			100.0	%		80-120	29-JAN-19
Phosphorus (P)-Total			<0.0020	mg/L	-	0.002	29-JAN-19
PH-CL	Water						
Batch R4477672 WG2979616-8 LCS pH			7.03	рН		6.9-7.1	30-JAN-19
PO4-DO-L-COL-CL	Water						
Batch R4467047							
WG2976256-22 LCS Orthophosphate-Dissolv	red (as P)		104.9	%		80-120	24-JAN-19
WG2976256-21 MB Orthophosphate-Dissolv	red (as P)		<0.0010	mg/L	-	0.001	24-JAN-19
SO4-IC-N-CL	Water						
<b>Batch</b> R4467957 <b>WG2976931-14</b> LCS Sulfate (SO4)			98.7	%		90-110	24- IAN-19
WG2976931-13 MB Sulfate (SO4)			<0.30	mg/L	_	90-110 0.3	24-JAN-19 24-JAN-19
SOLIDS-TDS-CL	Water			·			
Batch R4474975							
WG2978410-8 LCS Total Dissolved Solids			103.0	%		85-115	28-JAN-19
WG2978410-7 MB							



Workorder: L2224637

Report Date: 31-JAN-19 Page 8 of 11

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
SOLIDS-TDS-CL	Water							
Batch R4474975 WG2978410-7 MB Total Dissolved Solids			<10		mg/L		10	28-JAN-19
TEH-BC-VA-CL	Water							
Batch R4471449 WG2976233-2 LCS					0.4			
EPH10-19 EPH19-32			104.9 101.7		%		50-150	25-JAN-19
WG2976233-1 MB			101.7		70		50-150	25-JAN-19
EPH10-19			<0.25		mg/L		0.25	25-JAN-19
EPH19-32			<0.25		mg/L		0.25	25-JAN-19
Surrogate: 2-Bromoben	zotrifluoride		88.6		%		50-150	25-JAN-19
TEH-WATER-VA-CL	Water							
Batch R4471449 WG2976233-2 LCS								
TEH (C10-C30)			103.8		%		50-150	25-JAN-19
<b>WG2976233-1 MB</b> TEH (C10-C30)			<0.25		mg/L		0.25	25-JAN-19
Surrogate: 2-Bromoben	zotrifluoride		88.6		%		50-150	25-JAN-19
TKN-L-F-CL	Water							
Batch R4472307								
WG2977134-2 LCS Total Kjeldahl Nitrogen			90.5		%		75-125	28-JAN-19
WG2977134-6 LCS Total Kjeldahl Nitrogen			96.2		%		75-125	28-JAN-19
<b>WG2977134-1 MB</b> Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	28-JAN-19
<b>WG2977134-5 MB</b> Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	28-JAN-19
TSS-L-CL	Water							
Batch R4474974								
WG2978097-4 LCS Total Suspended Solids	;		91.1		%		85-115	28-JAN-19
WG2978097-3 MB Total Suspended Solids	;		<1.0		mg/L		1	28-JAN-19
TURBIDITY-CL	Water							



Workorder: L2224637

Report Date: 31-JAN-19 Page 9 of 11

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
TURBIDITY-CL	Water							
Batch R4469547 WG2977363-12 DUP		L2224637-1						
Turbidity WG2977363-11 LCS		14.1	14.0		NTU	0.7	15	25-JAN-19
Turbidity <b>WG2977363-10 MB</b>			96.5		%		85-115	25-JAN-19
Turbidity			<0.10		NTU		0.1	25-JAN-19

Workorder: L2224637 Report Date: 31-JAN-19 Page 10 of 11

Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

#### **Sample Parameter Qualifier Definitions:**

Qualifier	Description
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

Workorder: L2224637 Report Date: 31-JAN-19 Page 11 of 11

#### **Hold Time Exceedances:**

	Sample						
ALS Product Description	ID <sup>-</sup>	Sampling Date	Date Processed	Rec. HT	Actual HT	Units	Qualifier
Physical Tests							
Oxidation redution potential	by elect.						
	1	22-JAN-19 13:45	28-JAN-19 10:00	0.25	140	hours	EHTR-FM
рН							
	1	22-JAN-19 13:45	30-JAN-19 09:00	0.25	187	hours	EHTR-FM

#### Legend & Qualifier Definitions:

EHTR-FM: Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended.

EHTR: Exceeded ALS recommended hold time prior to sample receipt.

EHTL: Exceeded ALS recommended hold time prior to analysis. Sample was received less than 24 hours prior to expiry.

EHT: Exceeded ALS recommended hold time prior to analysis.

Rec. HT: ALS recommended hold time (see units).

#### Notes\*:

Where actual sampling date is not provided to ALS, the date (& time) of receipt is used for calculation purposes. Where actual sampling time is not provided to ALS, the earlier of 12 noon on the sampling date or the time (& date) of receipt is used for calculation purposes. Samples for L2224637 were received on 24-JAN-19 09:30.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against predetermined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

Client ID:

LC\_PIZP1101\_WG\_Q1-2019\_N

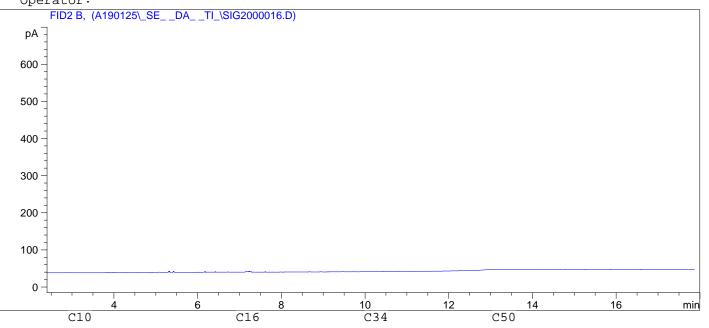
Sample ID: L2224637-1 V4
Injection Date: 1/26/2019
Injection Time: 12:12:28 AM

HP9

ALS

Instrument ID:

Operator:



Boiling Point Distribution Range for Petroleum Based Fuel Products

Carbon#	3	1 4 1	٠,	6	7	8	9	10	11	12	13	1/1	15	16	12	18	19	20	21	22	23	24	25	26	27	28	30
B.P. (°C)	-42	-0.5	36	69	98	126	151	174	196	216	13 235	253	270		302	316	329	343	356		380	391	402	412	422	431	44
B.P. (°F)	-44	31	97	156	209	258	303		384	421	456		519				625				716		756		792	808	84
Gaso		M.&P	. Nap	İ	 Iiner:	al Spi	rits -	-			-	-															
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Adapted from: Drews, A.W., ED. Manual on Hydrocarbon Analysis, 4th ed.; American Society for Testing and Materials: Philadelphia, PA., 1989: p XVIII.

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at line 366 in file C:\CHEM32\CORE\REPORT.MCX:

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L2224637-CC			Hazardous Material (Yes/No)				ANALYSIS	ALS_Package-DOC	VLS_Package-EPH	'AF-VA	'AF-VA	TECKCOAL-MET-D-	TECKCOAL-MET-T.	FECKCOAL-ROUTINE-	Package-TKN/TOC				
Sample ID	Sample Location (sys_loc_code)	Field Matrix	Hazardor Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	jı	ALS_Pac	ALS_Pac	HG-D-CVAF-VA	HG-T-CVAF-VA	TECKCC	TECKCC	TECKCC	ALS_Pac				i
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PLEASE FORWARD METALS'S	NIP DESTONES BURNA ASS	BYFOR		mstra/K.Cam				24-J		AC		I .			17	12	49	3	<u> </u>
SERVICE REQUEST (m)	sh - subject to availability)	- !	ed and white	100	on Promote All Ministers of	4···	L		91	11373.23									
		(default) X	Sampler's	Name		K. C	amp	bell/D. T	ľymstra		Mol	oile#			lene"				
Emergen	cv (1 Business Day) - 100%: Day, ASAP or Weekend - Cor	surcharge	Sampler's Si	gnature							Date	Time			Janu	ary 24, 2	:019	1	



TECK COAL LIMITED (LINE CREEK)

ATTN: Chris Blurton

PO BOX 2003

SPARWOOD BC VOB 2G0

Date Received: 15-MAR-19

Report Date: 23-MAR-19 17:30 (MT)

Version: FINAL

Client Phone: 250-425-6111

# Certificate of Analysis

Lab Work Order #: L2244708
Project P.O. #: VP000608129

Job Reference: LINE CREEK OPERATION

C of C Numbers: 20190314GW

Legal Site Desc:



Lyudmyla Shvets, B.Sc. Account Manager

 $[This\ report\ shall\ not\ be\ reproduced\ except\ in\ full\ without\ the\ written\ authority\ of\ the\ Laboratory.]$ 

L2244708 CONTD.... PAGE 2 of 6 Version: FINAL

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2244708-1 LC_PIZP1103_WG_Q1-2019_NP							
Sampled By: KC/DT on 13-MAR-19 @ 14:40							
Matrix: WG							
Miscellaneous Parameters							
Dissolved Organic Carbon	1.00		0.50	mg/L		22-MAR-19	R4579791
Total Kjeldahl Nitrogen	0.214		0.050	•		18-MAR-19	
Total Organic Carbon	_			mg/L			R4574290
Dissolved Metals in Water	0.96		0.50	mg/L		22-MAR-19	R4579791
Diss. Be (low) in Water by CRC ICPMS							
Beryllium (Be)-Dissolved	<0.020		0.020	ug/L	20-MAR-19	20-MAR-19	R4573617
Dissolved Metals Filtration Location	FIELD		0.020	ug/L	20 107 11 10	20-MAR-19	R4573166
Diss. Mercury in Water by CVAAS or CVAFS	I ILLD					20-101/413	114373100
Mercury (Hg)-Dissolved	<0.000050		0.0000050	mg/L	20-MAR-19	20-MAR-19	R4572627
Dissolved Mercury Filtration Location	FIELD		0.0000000	mg/ =	20 1111 110	20-MAR-19	R4573789
Dissolved Metals in Water by CRC ICPMS	I ILLD					20 1111 110	114070700
Dissolved Metals III Water by CRC ICFMS  Dissolved Metals Filtration Location	FIELD					20-MAR-19	R4573166
Aluminum (Al)-Dissolved	0.156		0.0030	mg/L	20-MAR-19	20-MAR-19	R4573617
Antimony (Sb)-Dissolved	0.00014		0.00010	mg/L	20-MAR-19	20-MAR-19	R4573617
Arsenic (As)-Dissolved	0.00065		0.00010	mg/L	20-MAR-19	20-MAR-19	R4573617
Barium (Ba)-Dissolved	0.0663		0.00010	mg/L	20-MAR-19	20-MAR-19	R4573617
Bismuth (Bi)-Dissolved	<0.00050		0.000050	mg/L	20-MAR-19	20-MAR-19	R4573617
Boron (B)-Dissolved	0.492		0.010	mg/L	20-MAR-19	20-MAR-19	R4573617
Cadmium (Cd)-Dissolved	0.0561		0.0050	ug/L	20-MAR-19	20-MAR-19	R4573617
Calcium (Ca)-Dissolved	28.4		0.050	mg/L	20-MAR-19	20-MAR-19	R4573617
Chromium (Cr)-Dissolved	0.00032		0.00010	mg/L	20-MAR-19	20-MAR-19	R4573617
Cobalt (Co)-Dissolved	0.37		0.10	ug/L	20-MAR-19	20-MAR-19	R4573617
Copper (Cu)-Dissolved	0.00727		0.00050	mg/L	20-MAR-19	20-MAR-19	R4573617
Iron (Fe)-Dissolved	0.106		0.010	mg/L	20-MAR-19	20-MAR-19	R4573617
Lead (Pb)-Dissolved	0.000627		0.000050	mg/L	20-MAR-19	20-MAR-19	R4573617
Lithium (Li)-Dissolved	0.112		0.0010	mg/L	20-MAR-19	20-MAR-19	R4573617
Magnesium (Mg)-Dissolved	14.9		0.10	mg/L	20-MAR-19	20-MAR-19	R4573617
Manganese (Mn)-Dissolved	0.242		0.00010	mg/L	20-MAR-19	20-MAR-19	R4573617
Molybdenum (Mo)-Dissolved	0.0123		0.000050	mg/L	20-MAR-19	20-MAR-19	R4573617
Nickel (Ni)-Dissolved	0.00204		0.00050	mg/L	20-MAR-19	20-MAR-19	R4573617
Potassium (K)-Dissolved	1.65		0.050	mg/L	20-MAR-19	20-MAR-19	R4573617
Selenium (Se)-Dissolved	<0.050		0.050	ug/L	20-MAR-19	20-MAR-19	R4573617
Silicon (Si)-Dissolved	4.31		0.050	mg/L	20-MAR-19	20-MAR-19	R4573617
Silver (Ag)-Dissolved	<0.000010		0.000010	mg/L	20-MAR-19	20-MAR-19	R4573617
Sodium (Na)-Dissolved	141		0.050	mg/L	20-MAR-19	20-MAR-19	R4573617
Strontium (Sr)-Dissolved	0.775		0.00020	mg/L	20-MAR-19	20-MAR-19	R4573617
Thallium (TI)-Dissolved	0.000023		0.000010	mg/L	20-MAR-19	20-MAR-19	R4573617
Tin (Sn)-Dissolved	0.00035		0.00010	mg/L	20-MAR-19	20-MAR-19	R4573617
Titanium (Ti)-Dissolved	<0.010		0.010	mg/L	20-MAR-19	20-MAR-19	R4573617
Uranium (U)-Dissolved	0.00198		0.000010	mg/L	20-MAR-19	20-MAR-19	R4573617
Vanadium (V)-Dissolved	0.00081		0.00050	mg/L	20-MAR-19	20-MAR-19	R4573617
Zinc (Zn)-Dissolved	0.0161		0.0010	mg/L	20-MAR-19	20-MAR-19	R4573617
Hardness	100		0.50	wa = /1		20 MAD 40	
Hardness (as CaCO3)	132		0.50	mg/L		20-MAR-19	
Routine for Teck Coal							
Acidity by Automatic Titration Acidity (as CaCO3)	1.5		1.0	ma/l		20-MAR-19	D4572472
	1.5		1.0	mg/L		20-MAR-19	R4573472
Alkalinity (Species) by Manual Titration Alkalinity, Bicarbonate (as CaCO3)	411		1.0	mg/L		18-MAR-19	R4568644
Alkalinity, Carbonate (as CaCO3)	<1.0		1.0	mg/L		18-MAR-19	R4568644
Alkalinity, Hydroxide (as CaCO3)	<1.0		1.0	mg/L		18-MAR-19	R4568644
Amamily, riguidalde (as CaCOS)	<1.0		1.0	mg/L		10-101/10-19	114300044

<sup>\*</sup> Refer to Referenced Information for Qualifiers (if any) and Methodology.

L2244708 CONTD.... PAGE 3 of 6 Version: FINAL

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2244708-1 LC_PIZP1103_WG_Q1-2019_NP							
Sampled By: KC/DT on 13-MAR-19 @ 14:40							
Matrix: WG							
Alkalinity (Species) by Manual Titration Alkalinity, Total (as CaCO3)	411		1.0	mg/L		18-MAR-19	R4568644
Ammonia, Total (as N) Ammonia as N	0.109		0.0050	mg/L		22-MAR-19	R4578388
Bromide in Water by IC (Low Level) Bromide (Br)	0.095		0.050	mg/L		15-MAR-19	R4568169
Chloride in Water by IC Chloride (CI)	4.12		0.50	mg/L		15-MAR-19	R4568169
Electrical Conductivity (EC) Conductivity (@ 25C)	791		2.0	uS/cm		18-MAR-19	R4568644
Fluoride in Water by IC Fluoride (F)	0.462		0.020	mg/L		15-MAR-19	R4568169
Ion Balance Calculation Ion Balance	98.6		-100	%		21-MAR-19	
Ion Balance Calculation Cation - Anion Balance	-0.7			%		21-MAR-19	
Anion Sum	8.95			meq/L		21-MAR-19	
Cation Sum  Nitrate in Water by IC (Low Level)	8.83			meq/L		21-MAR-19	
Nitrate (as N)  Nitrite in Water by IC (Low Level)	0.124		0.0050	mg/L		15-MAR-19	R4568169
Nitrite (as N)  Orthophosphate-Dissolved (as P)	0.0012		0.0010	mg/L		15-MAR-19	R4568169
Orthophosphate-Dissolved (as P) Orthophosphate-Dissolved (as P) Oxidation redution potential by elect.	0.0360		0.0010	mg/L		15-MAR-19	R4567831
ORP	308		-1000	mV		19-MAR-19	R4571747
Phosphorus (P)-Total Phosphorus (P)-Total	0.0433		0.0020	mg/L		17-MAR-19	R4568177
Sulfate in Water by IC Sulfate (SO4)	28.8		0.30	mg/L		15-MAR-19	R4568169
Total Dissolved Solids Total Dissolved Solids	480		20	mg/L		20-MAR-19	R4576969
Total Suspended Solids Total Suspended Solids	5.5		1.0	mg/L		19-MAR-19	R4573311
Turbidity Turbidity	13.9		0.10	NTU		15-MAR-19	R4567851
pH pH	8.25		0.10	рН		18-MAR-19	R4568644

<sup>\*</sup> Refer to Referenced Information for Qualifiers (if any) and Methodology.

Reference Information

L2244708 CONTD....
PAGE 4 of 6
Version: FINAL

Test Method References:

ALS Test Code Matrix Test Description Method Reference\*\*

ACIDITY-PCT-CL Water Acidity by Automatic Titration APHA 2310 Acidity

This analysis is carried out using procedures adapted from APHA Method 2310 "Acidity". Acidity is determined by potentiometric titration to a specified

endpoint.

ALK-MAN-CL Water Alkalinity (Species) by Manual Titration APHA 2320 ALKALINITY

This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a

pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.

BE-D-L-CCMS-VA Water Diss. Be (low) in Water by CRC ICPMS APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

BR-L-IC-N-CL Water Bromide in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

C-DIS-ORG-LOW-CL Water Dissolved Organic Carbon APHA 5310 B-Instrumental

This method is applicable to the analysis of ground water, wastewater, and surface water samples. The form detected depends upon sample pretreatment: Unfiltered sample = TC, 0.45um filtered = TDC. Samples are injected into a combustion tube containing an oxidation catalyst. The carrier gas containing the combustion product from the combustion tube flows through an inorganic carbon reactor vessel and is then sent through a halogen scrubber into a sample cell set in a non-dispersive infrared gas analyzer (NDIR) where carbon dioxide is detected. For total inorganic carbon and dissolved inorganic carbon, the sample is injected into an IC reactor vessel where only the IC component is decomposed to become carbon dioxide.

The peak area generated by the NDIR indicates the TC/TDC or TIC/DIC as applicable. The total organic carbon content of the sample is calculated by subtracting the TIC from the TC.

TOC = TC-TIC, DOC = TDC-DIC, Particulate = Total - Dissolved.

C-TOT-ORG-LOW-CL Water Total Organic Carbon APHA 5310 TOTAL ORGANIC CARBON (TOC)

This method is applicable to the analysis of ground water, wastewater, and surface water samples. The form detected depends upon sample pretreatment: Unfiltered sample = TC, 0.45um filtered = TDC. Samples are injected into a combustion tube containing an oxidation catalyst. The carrier gas containing the combustion product from the combustion tube flows through an inorganic carbon reactor vessel and is then sent through a halogen scrubber into a sample cell set in a non-dispersive infrared gas analyzer (NDIR) where carbon dioxide is detected. For total inorganic carbon and dissolved inorganic carbon, the sample is injected into an IC reactor vessel where only the IC component is decomposed to become carbon dioxide.

The peak area generated by the NDIR indicates the TC/TDC or TIC/DIC as applicable. The total organic carbon content of the sample is calculated by subtracting the TIC from the TC.

TOC = TC-TIC, DOC = TDC-DIC, Particulate = Total - Dissolved.

CL-IC-N-CL Water Chloride in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

EC-L-PCT-CL Water Electrical Conductivity (EC) APHA 2510E

Conductivity, also known as Electrical Conductivity (EC) or Specific Conductance, is measured by immersion of a conductivity cell with platinum electrodes into a water sample. Conductivity measurements are temperature-compensated to 25C.

F-IC-N-CL Water Fluoride in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

HARDNESS-CALC-VA Water Hardness APHA 2340B

Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO3 equivalents.

Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

HG-D-CVAA-VA Water Diss. Mercury in Water by CVAAS or CVAFS APHA 3030B/EPA 1631E (mod)

Water samples are filtered (0.45 um), preserved with hydrochloric acid, then undergo a cold-oxidation using bromine monochloride prior to reduction

with stannous chloride, and analyzed by CVAAS or CVAFS.

IONBALANCE-BC-CL Water Ion Balance Calculation APHA 1030E

Cation Sum, Anion Sum, and Ion Balance (as % difference) are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Because all aqueous solutions are electrically neutral, the calculated ion balance (% difference of cations minus anions) should be near-zero.

Cation and Anion Sums are the total meq/L concentration of major cations and anions. Dissolved species are used where available. Minor ions are included where data is present. Ion Balance is calculated as:

Ion Balance (%) = [Cation Sum-Anion Sum] / [Cation Sum+Anion Sum]

MET-D-CCMS-VA Water Dissolved Metals in Water by CRC ICPMS APHA 3030B/6020A (mod)

LINE CREEK OPERATION L2244708 CONTD....

#### **Reference Information**

PAGE 5 of 6 Version: FINAL

Test Method References:

**ALS Test Code** Matrix Method Reference\*\* **Test Description** 

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

NH3-L-F-CL J. ENVIRON. MONIT., 2005, 7, 37-42, RSC Water Ammonia, Total (as N)

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et

NO2-L-IC-N-CL Water

Nitrite in Water by IC (Low Level)

EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

NO3-L-IC-N-CL

Water

Nitrate in Water by IC (Low Level)

EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

ORP-CL

Water

Oxidation redution potential by elect.

**ASTM D1498** 

This analysis is carried out in accordance with the procedure described in the "ASTM" method D1498 "Oxidation-Reduction Potential of Water" published by the American Society for Testing and Materials (ASTM). Results are reported as observed oxidation-reduction potential of the platinum metal-reference electrode employed, in mV.

It is recommended that this analysis be conducted in the field.

P-T-L-COL-CL

Water

Phosphorus (P)-Total

APHA 4500-P PHOSPHORUS

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after persulphate digestion of the sample.

PH-CI

Water

APHA 4500 H-Flectrode

pH is determined in the laboratory using a pH electrode. All samples analyzed by this method for pH will have exceeded the 15 minute recommended hold time from time of sampling (field analysis is recommended for pH where highly accurate results are needed)

PO4-DO-L-COL-CL

Water

Orthophosphate-Dissolved (as P)

APHA 4500-P PHOSPHORUS

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.

SO4-IC-N-CL

Water

Sulfate in Water by IC

EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

SOLIDS-TDS-CL

Water

Total Dissolved Solids

APHA 2540 C

A well-mixed sample is filtered through a glass fibre filter paper. The filtrate is then evaporated to dryness in a pre-weighed vial and dried at 180 – 2 °C. The increase in vial weight represents the total dissolved solids (TDS).

TECKCOAL-IONBAL-CL

Water

Ion Balance Calculation

**APHA 1030E** 

Cation Sum, Anion Sum, and Ion Balance (as % difference) are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Because all aqueous solutions are electrically neutral, the calculated ion balance (% difference of cations minus anions) should be near-zero.

Cation and Anion Sums are the total meg/L concentration of major cations and anions. Dissolved species are used where available. Minor ions are included where data is present. Ion Balance is calculated as:

Ion Balance (%) = [Cation Sum-Anion Sum] / [Cation Sum+Anion Sum]

TKN-L-F-CL

Total Kieldahl Nitrogen

APHA 4500-NORG (TKN)

This analysis is carried out using procedures adapted from APHA Method 4500-Norg D. "Block Digestion and Flow Injection Analysis". Total Kjeldahl Nitrogen is determined using block digestion followed by Flow-injection analysis with fluorescence detection.

**Total Suspended Solids** 

APHA 2540 D-Gravimetric

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total suspended solids (TSS) are determined by filtering a sample through a glass fibre filter, and by drying the filter at 104 deg. C.

**TURBIDITY-CL** 

Water

**Turbidity** 

APHA 2130 B-Nephelometer

This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.

<sup>\*\*</sup> ALS test methods may incorporate modifications from specified reference methods to improve performance.

LINE CREEK OPERATION L2244708 CONTD....

**Reference Information** 

PAGE 6 of 6 Version: FINAL

#### **Test Method References:**

ALS Test Code Matrix Test Description Method Reference\*\*

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

 Laboratory Definition Code
 Laboratory Location

 VA
 ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

 CL
 ALS ENVIRONMENTAL - CALGARY, ALBERTA, CANADA

#### **Chain of Custody Numbers:**

20190314GW

#### **GLOSSARY OF REPORT TERMS**

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.

mg/kg - milligrams per kilogram based on dry weight of sample

mg/kg wwt - milligrams per kilogram based on wet weight of sample

mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight

mg/L - unit of concentration based on volume, parts per million.

< - Less than.

D.L. - The reporting limit.

N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.



Workorder: L2244708

Report Date: 23-MAR-19

Page 1 of 9

Client:

TECK COAL LIMITED (LINE CREEK)

PO BOX 2003

SPARWOOD BC V0B 2G0

Contact: Chris Blurton

Test	Matrix	Reference	Result Q	ualifier	Units	RPD	Limit	Analyzed
ACIDITY-PCT-CL	Water							
Batch R4573472								
WG3010407-16 LCS Acidity (as CaCO3)			103.0		%		85-115	20-MAR-19
WG3010407-15 MB Acidity (as CaCO3)			1.9		mg/L		2	20-MAR-19
ALK-MAN-CL	Water							
Batch R4568644 WG3008501-8 LCS Alkalinity, Total (as CaC	O3)		94.8		%		85-115	18-MAR-19
WG3008501-7 MB Alkalinity, Total (as CaC	O3)		<1.0		mg/L		1	18-MAR-19
BE-D-L-CCMS-VA	Water							
Batch R4573617								
WG3010225-3 DUP Beryllium (Be)-Dissolved	d	<b>L2244708-1</b> <0.000020	<0.000020	RPD-NA	mg/L	N/A	20	20-MAR-19
WG3010225-2 LCS Beryllium (Be)-Dissolved	d		97.6		%		80-120	20-MAR-19
WG3010225-1 MB Beryllium (Be)-Dissolved	d	NP	<0.000020		mg/L		0.00002	20-MAR-19
BR-L-IC-N-CL	Water							
Batch R4568169								
WG3007985-6 LCS Bromide (Br)			101.2		%		85-115	15-MAR-19
WG3007985-5 MB Bromide (Br)			<0.050		mg/L		0.05	15-MAR-19
C-DIS-ORG-LOW-CL	Water							
Batch R4579791								
WG3012539-14 LCS Dissolved Organic Carb	on		87.3		%		80-120	22-MAR-19
WG3012539-13 MB								-
Dissolved Organic Carb	on		<0.50		mg/L		0.5	22-MAR-19
C-TOT-ORG-LOW-CL	Water							
Batch R4579791 WG3012539-14 LCS								
Total Organic Carbon			88.5		%		80-120	22-MAR-19
WG3012539-13 MB Total Organic Carbon			<0.50		mg/L		0.5	22-MAR-19
CL-IC-N-CL	Water							



Workorder: L2244708

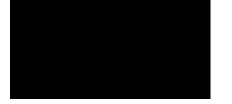
Report Date: 23-MAR-19 Page 2 of 9

Test	Matrix	Reference	Result Qu	alifier Units	RPD	Limit	Analyzed
CL-IC-N-CL	Water						
Batch R4568169 WG3007985-6 LCS Chloride (CI)			100.0	%		90-110	15-MAR-19
<b>WG3007985-5 MB</b> Chloride (Cl)			<0.50	mg/L		0.5	15-MAR-19
EC-L-PCT-CL	Water						
Batch R4568644 WG3008501-8 LCS Conductivity (@ 25C)			100.7	%		90-110	18-MAR-19
<b>WG3008501-7 MB</b> Conductivity (@ 25C)			<2.0	uS/ci	m	2	18-MAR-19
F-IC-N-CL	Water						
Batch R4568169							
<b>WG3007985-6 LCS</b> Fluoride (F)			105.8	%		90-110	15-MAR-19
<b>WG3007985-5 MB</b> Fluoride (F)			<0.020	mg/L		0.02	15-MAR-19
HG-D-CVAA-VA	Water						
Batch R4572627 WG3010527-2 LCS Mercury (Hg)-Dissolved			101.5	%		80-120	20-MAR-19
WG3010527-1 MB Mercury (Hg)-Dissolved		NP	<0.000050	mg/L		0.000005	20-MAR-19
WG3010527-4 MS Mercury (Hg)-Dissolved		L2244708-1	98.3	%		70-130	20-MAR-19
MET-D-CCMS-VA	Water						
Batch R4573617 WG3010225-3 DUP		L2244708-1					
Aluminum (Al)-Dissolved	d	0.156	0.158	mg/L	1.3	20	20-MAR-19
Antimony (Sb)-Dissolved	d	0.00014	0.00014	mg/L	1.5	20	20-MAR-19
Arsenic (As)-Dissolved		0.00065	0.00064	mg/L	. 1.9	20	20-MAR-19
Barium (Ba)-Dissolved		0.0663	0.0646	mg/L	2.5	20	20-MAR-19
Bismuth (Bi)-Dissolved		<0.000050	<0.000050	RPD-NA mg/L	N/A	20	20-MAR-19
Boron (B)-Dissolved		0.492	0.497	mg/L	. 1.1	20	20-MAR-19
Cadmium (Cd)-Dissolve	ed	0.0000561	0.0000578	mg/L	3.0	20	20-MAR-19
Calcium (Ca)-Dissolved		28.4	28.0	mg/L	1.2	20	20-MAR-19
Chromium (Cr)-Dissolve	ed	0.00032	0.00031	mg/L	4.5	20	20-MAR-19



Workorder: L2244708 Report Date: 23-MAR-19 Page 3 of 9

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA	Water							
Batch R4573617								
WG3010225-3 DUP		L2244708-1						
Cobalt (Co)-Dissolved		0.00037	0.00037		mg/L	1.1	20	20-MAR-19
Copper (Cu)-Dissolved		0.00727	0.00709		mg/L	2.6	20	20-MAR-19
Iron (Fe)-Dissolved		0.106	0.105		mg/L	0.9	20	20-MAR-19
Lead (Pb)-Dissolved		0.000627	0.000632		mg/L	0.8	20	20-MAR-19
Lithium (Li)-Dissolved		0.112	0.114		mg/L	1.9	20	20-MAR-19
Magnesium (Mg)-Disso		14.9	14.6		mg/L	1.8	20	20-MAR-19
Manganese (Mn)-Disso		0.242	0.239		mg/L	1.4	20	20-MAR-19
Molybdenum (Mo)-Disse	olved	0.0123	0.0119		mg/L	3.0	20	20-MAR-19
Nickel (Ni)-Dissolved		0.00204	0.00201		mg/L	1.3	20	20-MAR-19
Potassium (K)-Dissolve	d	1.65	1.63		mg/L	1.1	20	20-MAR-19
Selenium (Se)-Dissolve	d	<0.000050	0.000059	RPD-NA	mg/L	N/A	20	20-MAR-19
Silicon (Si)-Dissolved		4.31	4.30		mg/L	0.2	20	20-MAR-19
Silver (Ag)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	20-MAR-19
Sodium (Na)-Dissolved		141	143		mg/L	1.7	20	20-MAR-19
Strontium (Sr)-Dissolve	d	0.775	0.777		mg/L	0.3	20	20-MAR-19
Thallium (TI)-Dissolved		0.000023	0.000020		mg/L	14	20	20-MAR-19
Tin (Sn)-Dissolved		0.00035	0.00035		mg/L	1.4	20	20-MAR-19
Titanium (Ti)-Dissolved		<0.010	<0.010	RPD-NA	mg/L	N/A	20	20-MAR-19
Uranium (U)-Dissolved		0.00198	0.00203		mg/L	2.5	20	20-MAR-19
Vanadium (V)-Dissolved	d	0.00081	0.00094		mg/L	15	20	20-MAR-19
Zinc (Zn)-Dissolved		0.0161	0.0159		mg/L	1.2	20	20-MAR-19
WG3010225-2 LCS								
Aluminum (Al)-Dissolve			100.4		%		80-120	20-MAR-19
Antimony (Sb)-Dissolve	d		97.2		%		80-120	20-MAR-19
Arsenic (As)-Dissolved			95.5		%		80-120	20-MAR-19
Barium (Ba)-Dissolved			97.7		%		80-120	20-MAR-19
Bismuth (Bi)-Dissolved			96.6		%		80-120	20-MAR-19
Boron (B)-Dissolved			91.2		%		80-120	20-MAR-19
Cadmium (Cd)-Dissolve	ed		95.9		%		80-120	20-MAR-19
Calcium (Ca)-Dissolved	I		97.4		%		80-120	20-MAR-19
Chromium (Cr)-Dissolve	ed		96.6		%		80-120	20-MAR-19
Cobalt (Co)-Dissolved			97.1		%		80-120	20-MAR-19
Copper (Cu)-Dissolved			96.0		%		80-120	20-MAR-19
Iron (Fe)-Dissolved			90.3		%		80-120	20-MAR-19



Workorder: L2244708 Report Date: 23-MAR-19 Page 4 of 9

Reference Result Qualifier Units RPD Limit Analyzed

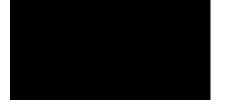
Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA	Water							
Batch R45736	17							
WG3010225-2 LC								
Lead (Pb)-Dissolved			95.8		%		80-120	20-MAR-19
Lithium (Li)-Dissolve			93.6		%		80-120	20-MAR-19
Magnesium (Mg)-Dis			105.5		%		80-120	20-MAR-19
Manganese (Mn)-Dis			96.4		%		80-120	20-MAR-19
Molybdenum (Mo)-D			100.4		%		80-120	20-MAR-19
Nickel (Ni)-Dissolved			97.5		%		80-120	20-MAR-19
Potassium (K)-Disso	lved		95.3		%		80-120	20-MAR-19
Selenium (Se)-Disso	lved		89.9		%		80-120	20-MAR-19
Silicon (Si)-Dissolved	d		93.9		%		60-140	20-MAR-19
Silver (Ag)-Dissolved	t		99.6		%		80-120	20-MAR-19
Sodium (Na)-Dissolv	red		100.7		%		80-120	20-MAR-19
Strontium (Sr)-Disso	lved		95.7		%		80-120	20-MAR-19
Thallium (TI)-Dissolv	red		95.7		%		80-120	20-MAR-19
Tin (Sn)-Dissolved			96.7		%		80-120	20-MAR-19
Titanium (Ti)-Dissolv	red .		96.4		%		80-120	20-MAR-19
Uranium (U)-Dissolv	ed		97.8		%		80-120	20-MAR-19
Vanadium (V)-Dissol	lved		99.5		%		80-120	20-MAR-19
Zinc (Zn)-Dissolved			97.4		%		80-120	20-MAR-19
WG3010225-1 MB	3	NP						
Aluminum (Al)-Disso	lved		<0.0010		mg/L		0.001	20-MAR-19
Antimony (Sb)-Disso	lved		<0.00010		mg/L		0.0001	20-MAR-19
Arsenic (As)-Dissolv	ed		<0.00010		mg/L		0.0001	20-MAR-19
Barium (Ba)-Dissolve	ed		<0.00010		mg/L		0.0001	20-MAR-19
Bismuth (Bi)-Dissolv	ed		<0.000050	)	mg/L		0.00005	20-MAR-19
Boron (B)-Dissolved			<0.010		mg/L		0.01	20-MAR-19
Cadmium (Cd)-Disso	olved		<0.000005	SC .	mg/L		0.000005	20-MAR-19
Calcium (Ca)-Dissolv	ved		< 0.050		mg/L		0.05	20-MAR-19
Chromium (Cr)-Disse	olved		<0.00010		mg/L		0.0001	20-MAR-19
Cobalt (Co)-Dissolve	ed		<0.00010		mg/L		0.0001	20-MAR-19
Copper (Cu)-Dissolv	ed		<0.00020		mg/L		0.0002	20-MAR-19
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	20-MAR-19
Lead (Pb)-Dissolved			<0.000050	)	mg/L		0.00005	20-MAR-19
Lithium (Li)-Dissolve	d		<0.0010		mg/L		0.001	20-MAR-19
Magnesium (Mg)-Dis	ssolved		<0.0050		mg/L		0.005	20-MAR-19



Workorder: L2244708

Report Date: 23-MAR-19 Page 5 of 9

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA	Water							
Batch R4573617								
WG3010225-1 MB		NP						
Manganese (Mn)-Dissolve			<0.00010		mg/L		0.0001	20-MAR-19
Molybdenum (Mo)-Dissolv	red		<0.000050	)	mg/L		0.00005	20-MAR-19
Nickel (Ni)-Dissolved			<0.00050		mg/L		0.0005	20-MAR-19
Potassium (K)-Dissolved			<0.050		mg/L		0.05	20-MAR-19
Selenium (Se)-Dissolved			<0.000050	)	mg/L		0.00005	20-MAR-19
Silicon (Si)-Dissolved			< 0.050		mg/L		0.05	20-MAR-19
Silver (Ag)-Dissolved			<0.000010	)	mg/L		0.00001	20-MAR-19
Sodium (Na)-Dissolved			< 0.050		mg/L		0.05	20-MAR-19
Strontium (Sr)-Dissolved			<0.00020		mg/L		0.0002	20-MAR-19
Thallium (TI)-Dissolved			<0.000010	)	mg/L		0.00001	20-MAR-19
Tin (Sn)-Dissolved			<0.00010		mg/L		0.0001	20-MAR-19
Titanium (Ti)-Dissolved			<0.00030		mg/L		0.0003	20-MAR-19
Uranium (U)-Dissolved			<0.000010	)	mg/L		0.00001	20-MAR-19
Vanadium (V)-Dissolved			<0.00050		mg/L		0.0005	20-MAR-19
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	20-MAR-19
NH3-L-F-CL	Water							
Batch R4578388								
WG3012133-6 LCS Ammonia as N			107.3		%		85-115	21-MAR-19
WG3012133-5 MB Ammonia as N			<0.0050		mg/L		0.005	21-MAR-19
NO2-L-IC-N-CL	Water							
Batch R4568169								
WG3007985-6 LCS			104.4		%		00 110	45 MAD 40
Nitrite (as N)			104.4		70		90-110	15-MAR-19
WG3007985-5 MB Nitrite (as N)			<0.0010		mg/L		0.001	15-MAR-19
NO3-L-IC-N-CL	Water							
Batch R4568169								
WG3007985-6 LCS Nitrate (as N)			99.3		%		90-110	15-MAR-19
WG3007985-5 MB Nitrate (as N)			<0.0050		mg/L		0.005	15-MAR-19
	Water				-			-



Workorder: L2244708

Report Date: 23-MAR-19 Page 6 of 9

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
ORP-CL	Water							
<b>Batch R4571747</b> <b>WG3009715-5 CRM</b> ORP		CL-ORP	223		mV		210-230	19-MAR-19
P-T-L-COL-CL	Water							
Batch R4568177 WG3008005-6 LCS Phosphorus (P)-Total			97.7		%		80-120	17-MAR-19
WG3008005-5 MB Phosphorus (P)-Total			<0.0020		mg/L		0.002	17-MAR-19
PH-CL	Water							
<b>Batch R4568644</b> <b>WG3008501-8 LCS</b> pH			7.03		рН		6.9-7.1	18-MAR-19
PO4-DO-L-COL-CL	Water							
Batch R4567831 WG3007345-6 LCS Orthophosphate-Dissolv	ved (as P)		103.1		%		80-120	15-MAR-19
WG3007345-5 MB Orthophosphate-Dissol	ved (as P)		<0.0010		mg/L		0.001	15-MAR-19
SO4-IC-N-CL	Water							
Batch R4568169 WG3007985-6 LCS								
Sulfate (SO4)  WG3007985-5 MB			101.1		%		90-110	15-MAR-19
Sulfate (SO4)			<0.30		mg/L		0.3	15-MAR-19
SOLIDS-TDS-CL  Batch R4576969	Water							
WG3010105-2 LCS Total Dissolved Solids			105.5		%		85-115	20-MAR-19
WG3010105-1 MB Total Dissolved Solids			<10		mg/L		10	20-MAR-19
TKN-L-F-CL	Water							
Batch R4574290 WG3010655-10 LCS Total Kjeldahl Nitrogen WG3010655-2 LCS			101.1		%		75-125	18-MAR-19



Workorder: L2244708

Report Date: 23-MAR-19 Page 7 of 9

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
TKN-L-F-CL	Water							
Batch R4574290 WG3010655-2 LCS Total Kjeldahl Nitrogen			98.4		%		75-125	18-MAR-19
WG3010655-6 LCS Total Kjeldahl Nitrogen			100.6		%		75-125	18-MAR-19
WG3010655-1 MB Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	18-MAR-19
WG3010655-5 MB Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	18-MAR-19
<b>WG3010655-9 MB</b> Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	18-MAR-19
TSS-L-CL	Water							
Batch R4573311								
WG3009094-11 LCS Total Suspended Solids			95.7		%		85-115	19-MAR-19
WG3009094-10 MB Total Suspended Solids			<1.0		mg/L		1	19-MAR-19
TURBIDITY-CL	Water							
Batch R4567851								
WG3007620-5 LCS Turbidity			95.5		%		85-115	15-MAR-19
WG3007620-4 MB Turbidity			<0.10		NTU		0.1	15-MAR-19

Workorder: L2244708 Report Date: 23-MAR-19 Page 8 of 9

Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

#### **Sample Parameter Qualifier Definitions:**

Qualifier	Description
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

Workorder: L2244708 Report Date: 23-MAR-19 Page 9 of 9

#### **Hold Time Exceedances:**

	Sample						
ALS Product Description	ID	Sampling Date	Date Processed	Rec. HT	Actual HT	Units	Qualifier
Physical Tests							
Oxidation redution potential	l by elect.						
	1	13-MAR-19 14:40	19-MAR-19 10:00	0.25	139	hours	EHTR-FM
рН							
	1	13-MAR-19 14:40	18-MAR-19 09:00	0.25	114	hours	EHTR-FM

#### Legend & Qualifier Definitions:

EHTR-FM: Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended.

EHTR: Exceeded ALS recommended hold time prior to sample receipt.

EHTL: Exceeded ALS recommended hold time prior to analysis. Sample was received less than 24 hours prior to expiry.

EHT: Exceeded ALS recommended hold time prior to analysis.

Rec. HT: ALS recommended hold time (see units).

#### Notes\*:

Where actual sampling date is not provided to ALS, the date (& time) of receipt is used for calculation purposes. Where actual sampling time is not provided to ALS, the earlier of 12 noon on the sampling date or the time (& date) of receipt is used for calculation purposes. Samples for L2244708 were received on 15-MAR-19 09:00.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against predetermined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

Teck COC ID: 20190314 GW TURNAROUND TIME: RUSH: PROJECT/CLIENT INFO LABORATORY OTHER INFO Facility Name / Job# Line Creek Operation Lab Name ALS Calgary Report Format / Distribution Excel PDF |EDD Project Manager Chris Blurton Lab Contact Lyndinyla Shvets Email 1: chris.blurton@teck.com Email Chris.Blurton@teck.com Email Lyndmyla.Shvets@ALSGlobal.com Email 2: teckcoal@equisonline.cor Address 2559 29 Street NE Address Box 2003 Email 3: drake.tymstra@teck.com 15km North Hwy 43 Email 4: kirsten.campbell@teck.com City Sparwood Province BC City Calgary AB 11/1/10688124 Province PO number V0B 2G0 Postal Code T1Y 7B5 Canada Postal Code Country Canada Country Phone Number 250-425-3196 Phone Number 403 407 1794 SAMPLE DETAILS ANALYSIS REQUESTED Filtered - F: Field, L: Lab, Ft.: Field & Lab, N: Non NONE NONE NONE HNQ3 NONE H2SO4 Hazardous Material (Yes/No) L2244708-COFC ALS\_Package-TKN/TOC FECKCOAL-ROUTINE VA FECKCOAL-MET-D. FECKCOAL-MET-T. ALS\_Package-DOC HG-D-CVAF-VA Sample Location Field G=Grab #Of Time ×. Sample ID (sys\_loc\_code) Matrix Date (24hr) C=Comp. Cont. LC PIZP1103 LC\_PIZP1103 WG\_Q1-2019 NP WG 2019/03/13 14:40 G 5 ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS RELINQUISHED BY/AFFILIATION DATE/TIME ACCEPTED BY/AVFILIATION DATE/TIME PERSON OF THE PROPERTY OF THE D.Tymstra/K.Campbell 14-Mar SERVICE REQUEST (rush subject to availability)

K. Campbell/D. Tymstra

Mobile #

Date/Time

Regular (default) X

Priority (2-3 business days) - 50% surcharge Emergency (1 Business Day) - 100% surcharge

For Emergency <1 Day, ASAP or Weekend - Contact ALS

Sampler's Name

Sampler's Signature

2 8° (

March 14, 2019



TECK COAL LIMITED (LINE CREEK)

ATTN: Chris Blurton

PO BOX 2003

SPARWOOD BC VOB 2G0

Date Received: 19-MAR-19

Report Date: 26-MAR-19 16:49 (MT)

Version: FINAL

Client Phone: 250-425-3196

# Certificate of Analysis

Lab Work Order #: L2246028
Project P.O. #: VP000608129

Job Reference: LINE CREEK OPERATION

C of C Numbers: 20190318 GW

Legal Site Desc:



Lyudmyla Shvets, B.Sc. Account Manager

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L2246028 CONTD.... PAGE 2 of 7 Version: FINAL

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
   L2246028-1							
Sampled By: K. CAMPBELL/D. TYMST on 18-MAR-19	0 0 14:10						
' '	9 (4.10						
Matrix: WG Miscellaneous Parameters							
	4.00		0.50			25 MAD 40	D4500440
Dissolved Organic Carbon	1.30		0.50	mg/L		25-MAR-19	R4583410
Total Kjeldahl Nitrogen	0.365		0.050	mg/L		22-MAR-19	R4579707
Total Organic Carbon	2.36		0.50	mg/L		25-MAR-19	R4583410
Dissolved Metals in Water							
Diss. Be (low) in Water by CRC ICPMS					00 144 5 40	00 144 5 40	
Beryllium (Be)-Dissolved	<0.020		0.020	ug/L	20-MAR-19	20-MAR-19	R4575455
Dissolved Metals Filtration Location	LAB					20-MAR-19	R4574188
Diss. Mercury in Water by CVAAS or CVAFS	0.0000050		0.0000050	/1	00 MAD 40	00 MAD 40	D 4570007
Mercury (Hg)-Dissolved	<0.000050		0.0000050	mg/L	20-MAR-19	20-MAR-19	R4572627
Dissolved Mercury Filtration Location	LAB					20-MAR-19	R4574371
Dissolved Metals in Water by CRC ICPMS Dissolved Metals Filtration Location	LAB					20-MAR-19	R4574188
Aluminum (AI)-Dissolved	<0.0030		0.0030	mg/L	20-MAR-19	20-MAR-19	R4575455
Antimony (Sb)-Dissolved	0.00012		0.00010	mg/L	20-MAR-19	20-MAR-19	R4575455
Arsenic (As)-Dissolved	0.00037		0.00010	mg/L	20-MAR-19	20-MAR-19	R4575455
Barium (Ba)-Dissolved	0.246		0.00010	mg/L	20-MAR-19	20-MAR-19	R4575455
Bismuth (Bi)-Dissolved	<0.000050		0.000050	mg/L	20-MAR-19	20-MAR-19	R4575455
Boron (B)-Dissolved	0.026		0.010	mg/L	20-MAR-19	20-MAR-19	R4575455
Cadmium (Cd)-Dissolved	0.146		0.0050	ug/L	20-MAR-19	20-MAR-19	R4575455
Calcium (Ca)-Dissolved	139		0.050	mg/L	20-MAR-19	20-MAR-19	R4575455
Chromium (Cr)-Dissolved	<0.00010		0.00010	mg/L	20-MAR-19	20-MAR-19	R4575455
Cobalt (Co)-Dissolved	1.25		0.10	ug/L	20-MAR-19	20-MAR-19	R4575455
Copper (Cu)-Dissolved	<0.00050		0.00050	mg/L	20-MAR-19	20-MAR-19	R4575455
Iron (Fe)-Dissolved	<0.010		0.010	mg/L	20-MAR-19	20-MAR-19	R4575455
Lead (Pb)-Dissolved	<0.00050		0.000050	mg/L	20-MAR-19	20-MAR-19	R4575455
Lithium (Li)-Dissolved	0.0231		0.0010	mg/L	20-MAR-19	20-MAR-19	R4575455
Magnesium (Mg)-Dissolved	48.3		0.10	mg/L	20-MAR-19	20-MAR-19	R4575455
Manganese (Mn)-Dissolved	0.580		0.00010	mg/L	20-MAR-19	20-MAR-19	R4575455
Molybdenum (Mo)-Dissolved	0.00225		0.000050	mg/L	20-MAR-19	20-MAR-19	R4575455
Nickel (Ni)-Dissolved	0.00273		0.00050	mg/L	20-MAR-19	20-MAR-19	R4575455
Potassium (K)-Dissolved	2.68		0.050	mg/L	20-MAR-19	20-MAR-19	R4575455
Selenium (Se)-Dissolved	0.188		0.050	ug/L	20-MAR-19	20-MAR-19	R4575455
Silicon (Si)-Dissolved	4.45		0.050	mg/L	20-MAR-19	20-MAR-19	R4575455
Silver (Ag)-Dissolved	<0.000010		0.00010	mg/L	20-MAR-19	20-MAR-19	R4575455
Sodium (Na)-Dissolved	16.3		0.050	mg/L	20-MAR-19	20-MAR-19	R4575455
Strontium (Sr)-Dissolved	0.506		0.00020	mg/L	20-MAR-19	20-MAR-19	R4575455
Thallium (TI)-Dissolved	0.000041		0.00020	mg/L	20-MAR-19	20-MAR-19	R4575455
Tin (Sn)-Dissolved	<0.00010		0.00010	mg/L	20-MAR-19	20-MAR-19	R4575455
Titanium (Ti)-Dissolved	<0.010		0.00010	mg/L	20-MAR-19	20-MAR-19	R4575455
Uranium (U)-Dissolved	0.00347		0.00010	mg/L	20-MAR-19	20-MAR-19	R4575455
Vanadium (V)-Dissolved	<0.0050		0.00050	mg/L	20-MAR-19	20-MAR-19	R4575455
Zinc (Zn)-Dissolved	0.0031		0.00030	mg/L	20-MAR-19	20-MAR-19	R4575455
Hardness	0.5051		0.0010	9/ ⊏	20 117 11 10		114070400
Hardness (as CaCO3)	546		0.50	mg/L		21-MAR-19	
Total Metals in Water							
Total Be (Low) in Water by CRC ICPMS	0.000		0.020	a/I		20 MAD 40	D4676640
Beryllium (Be)-Total	0.200		0.020	ug/L		20-MAR-19	R4575549
Total Metals in Water by CRC ICPMS	2 20		0.0020	ma/l		20-MAR-19	D4575540
Aluminum (Al)-Total	2.20		0.0030	mg/L		20-MAR-19 20-MAR-19	R4575549
Antimony (Sb)-Total	0.00039		0.00010	mg/L			R4575549
Arsenic (As)-Total	0.00295		0.00010	mg/L		20-MAR-19	R4575549

<sup>\*</sup> Refer to Referenced Information for Qualifiers (if any) and Methodology.

L2246028 CONTD.... PAGE 3 of 7 Version: FINAL

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2246028-1 LC_PIZP1104_WG_Q1-2019_NP							
	@ 44.40						
	14.10						
Matrix: WG							
Total Metals in Water by CRC ICPMS Barium (Ba)-Total	0.200		0.00010	ma/l		20-MAR-19	D4575540
Bismuth (Bi)-Total	0.300 <0.000050		0.00010 0.000050	mg/L mg/L		20-MAR-19	R4575549 R4575549
Boron (B)-Total	0.027		0.00030	mg/L		20-MAR-19	R4575549
Cadmium (Cd)-Total	0.532		0.010	ug/L		20-MAR-19	R4575549
Calcium (Ca)-Total	141		0.050	mg/L		20-MAR-19	R4575549
Chromium (Cr)-Total	0.00634		0.00010	mg/L		20-MAR-19	R4575549
Cobalt (Co)-Total	3.21		0.10	ug/L		20-MAR-19	R4575549
Copper (Cu)-Total	0.0112		0.00050	mg/L		20-MAR-19	R4575549
Iron (Fe)-Total	5.68		0.010	mg/L		20-MAR-19	R4575549
Lead (Pb)-Total	0.00301		0.000050	mg/L		20-MAR-19	R4575549
Lithium (Li)-Total	0.0228		0.0010	mg/L		20-MAR-19	R4575549
Magnesium (Mg)-Total	46.6		0.10	mg/L		20-MAR-19	R4575549
Manganese (Mn)-Total	0.786		0.00010	mg/L		20-MAR-19	R4575549
Molybdenum (Mo)-Total	0.00299		0.000050	mg/L		20-MAR-19	R4575549
Nickel (Ni)-Total	0.00925		0.00050	mg/L		20-MAR-19	R4575549
Potassium (K)-Total	3.64		0.050	mg/L		20-MAR-19	R4575549
Selenium (Se)-Total	0.459		0.050	ug/L		20-MAR-19	R4575549
Silicon (Si)-Total	7.84		0.10	mg/L		20-MAR-19	R4575549
Silver (Ag)-Total	0.000078		0.000010	mg/L		20-MAR-19	R4575549
Sodium (Na)-Total	16.8		0.050	mg/L		20-MAR-19	R4575549
Strontium (Sr)-Total	0.509		0.00020	mg/L		20-MAR-19	R4575549
Thallium (TI)-Total	0.000132		0.000010	mg/L		20-MAR-19	R4575549
Tin (Sn)-Total	0.00036		0.00010	mg/L		20-MAR-19	R4575549
Titanium (Ti)-Total	0.018		0.010	mg/L		20-MAR-19	R4575549
Uranium (U)-Total	0.00401		0.000010	mg/L		20-MAR-19	R4575549
Vanadium (V)-Total	0.00853		0.00050	mg/L		20-MAR-19	R4575549
Zinc (Zn)-Total	0.0353		0.0030	mg/L		20-MAR-19	R4575549
Routine for Teck Coal							
Acidity by Automatic Titration	7.0		4.0			24 MAD 40	D4577050
Acidity (as CaCO3)	7.8		1.0	mg/L		21-MAR-19	R4577053
Alkalinity (Species) by Manual Titration Alkalinity, Bicarbonate (as CaCO3)	245		1.0	mg/L		21-MAR-19	R4576808
Alkalinity, Carbonate (as CaCO3)	<1.0		1.0	mg/L		21-MAR-19	R4576808
Alkalinity, Hydroxide (as CaCO3)	<1.0		1.0	mg/L		21-MAR-19	R4576808
Alkalinity, Total (as CaCO3)	245		1.0	mg/L		21-MAR-19	R4576808
Ammonia, Total (as N)	240		1.0	g/ <b>_</b>		21 100 110	114070000
Ammonia as N	0.0130		0.0050	mg/L		26-MAR-19	R4583214
Bromide in Water by IC (Low Level)				J			
Bromide (Br)	2.70	DLHC	0.25	mg/L		20-MAR-19	R4573050
Chloride in Water by IC				_			
Chloride (CI)	203	DLHC	2.5	mg/L		20-MAR-19	R4573050
Electrical Conductivity (EC)							
Conductivity (@ 25C)	1180		2.0	uS/cm		21-MAR-19	R4576808
Fluoride in Water by IC							
Fluoride (F)	0.24	DLHC	0.10	mg/L		20-MAR-19	R4573050
Ion Balance Calculation				0.4		05.445.5	
Ion Balance	95.8		-100	%		25-MAR-19	
Ion Balance Calculation	0.4			0/		05 MAD 40	
Cation - Anion Balance Anion Sum	-2.1			% mag/l		25-MAR-19 25-MAR-19	
Cation Sum	12.2 11.7			meq/L meq/L		25-MAR-19 25-MAR-19	
	11.7			meq/L		20-WAR-19	
Nitrate in Water by IC (Low Level)							

<sup>\*</sup> Refer to Referenced Information for Qualifiers (if any) and Methodology.

L2246028 CONTD.... PAGE 4 of 7 Version: FINAL

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2246028-1 LC_PIZP1104_WG_Q1-2019_NP							
Sampled By: K. CAMPBELL/D. TYMST on 18-MAR-19	@ 14:10						
Matrix: WG							
Nitrate in Water by IC (Low Level) Nitrate (as N)	0.357	DLHC	0.025	mg/L		20-MAR-19	R4573050
Nitrite in Water by IC (Low Level) Nitrite (as N)	<0.0050	DLHC	0.0050	mg/L		20-MAR-19	R4573050
Orthophosphate-Dissolved (as P) Orthophosphate-Dissolved (as P)	0.0015		0.0010	mg/L		19-MAR-19	R4573068
Oxidation redution potential by elect. ORP	403		-1000	mV		22-MAR-19	R4580133
Phosphorus (P)-Total Phosphorus (P)-Total	0.414	DLHC	0.025	mg/L		20-MAR-19	R4573249
Sulfate in Water by IC Sulfate (SO4)	74.7	DLHC	1.5	mg/L		20-MAR-19	R4573050
Total Dissolved Solids Total Dissolved Solids	819	DLHC	20	mg/L		22-MAR-19	R4580198
<b>Total Suspended Solids</b> Total Suspended Solids	304		1.0	mg/L		24-MAR-19	R4581413
Turbidity Turbidity	176		0.10	NTU		19-MAR-19	R4572968
<b>pH</b> pH	7.96		0.10	рН		21-MAR-19	R4576808

<sup>\*</sup> Refer to Referenced Information for Qualifiers (if any) and Methodology.

LINE CREEK OPERATION L2246028 CONTD....

**Reference Information** 

PAGE 5 of 7 Version: FINAL

**Qualifiers for Sample Submission Listed:** 

 Qualifier
 Description

 SFPL
 DOC/D-METAL/D-HG FILTERED AND PRESERVED AT THE LAB - Sample was Filtered and Preserved at the laboratory

Sample Parameter Qualifier Key:

 Qualifier
 Description

 DLHC
 Detection Limit Raised: Dilution required due to high concentration of test analyte(s).

 MS-B
 Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.

**Test Method References:** 

ALS Test Code Matrix Test Description Method Reference\*\*

ACIDITY-PCT-CL Water Acidity by Automatic Titration APHA 2310 Acidity

This analysis is carried out using procedures adapted from APHA Method 2310 "Acidity". Acidity is determined by potentiometric titration to a specified endpoint.

ALK-MAN-CL Water Alkalinity (Species) by Manual Titration APHA 2320 ALKALINITY

This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.

BE-D-L-CCMS-VA Water Diss. Be (low) in Water by CRC ICPMS APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS

BE-T-L-CCMS-VA Water Total Be (Low) in Water by CRC ICPMS EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

BR-L-IC-N-CL Water Bromide in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

C-DIS-ORG-LOW-CL Water Dissolved Organic Carbon APHA 5310 B-Instrumental

This method is applicable to the analysis of ground water, wastewater, and surface water samples. The form detected depends upon sample pretreatment: Unfiltered sample = TC, 0.45um filtered = TDC. Samples are injected into a combustion tube containing an oxidation catalyst. The carrier gas containing the combustion product from the combustion tube flows through an inorganic carbon reactor vessel and is then sent through a halogen scrubber into a sample cell set in a non-dispersive infrared gas analyzer (NDIR) where carbon dioxide is detected. For total inorganic carbon and dissolved inorganic carbon, the sample is injected into an IC reactor vessel where only the IC component is decomposed to become carbon dioxide.

The peak area generated by the NDIR indicates the TC/TDC or TIC/DIC as applicable. The total organic carbon content of the sample is calculated by subtracting the TIC from the TC.

TOC = TC-TIC, DOC = TDC-DIC, Particulate = Total - Dissolved.

C-TOT-ORG-LOW-CL Water Total Organic Carbon APHA 5310 TOTAL ORGANIC CARBON (TOC)

This method is applicable to the analysis of ground water, wastewater, and surface water samples. The form detected depends upon sample pretreatment: Unfiltered sample = TC, 0.45um filtered = TDC. Samples are injected into a combustion tube containing an oxidation catalyst. The carrier gas containing the combustion product from the combustion tube flows through an inorganic carbon reactor vessel and is then sent through a halogen scrubber into a sample cell set in a non-dispersive infrared gas analyzer (NDIR) where carbon dioxide is detected. For total inorganic carbon and dissolved inorganic carbon, the sample is injected into an IC reactor vessel where only the IC component is decomposed to become carbon dioxide.

The peak area generated by the NDIR indicates the TC/TDC or TIC/DIC as applicable. The total organic carbon content of the sample is calculated by subtracting the TIC from the TC.

TOC = TC-TIC, DOC = TDC-DIC, Particulate = Total - Dissolved.

CL-IC-N-CL Water Chloride in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

EC-L-PCT-CL Water Electrical Conductivity (EC) APHA 2510B

Conductivity, also known as Electrical Conductivity (EC) or Specific Conductance, is measured by immersion of a conductivity cell with platinum electrodes into a water sample. Conductivity measurements are temperature-compensated to 25C.

F-IC-N-CL Water Fluoride in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

HARDNESS-CALC-VA Water Hardness APHA 2340B

Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO3 equivalents.

#### L2246028 CONTD....

PAGE 6 of 7 Version: FINAL

#### **Reference Information**

**Test Method References:** 

**ALS Test Code** Matrix Method Reference\*\* **Test Description** 

Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

HG-D-CVAA-VA

Water

Diss. Mercury in Water by CVAAS or CVAFS APHA 3030B/EPA 1631E (mod)

Water samples are filtered (0.45 um), preserved with hydrochloric acid, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

IONBALANCE-BC-CL

Water

Ion Balance Calculation

**APHA 1030E** 

Cation Sum, Anion Sum, and Ion Balance (as % difference) are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Because all aqueous solutions are electrically neutral, the calculated ion balance (% difference of cations minus anions) should be near-zero.

Cation and Anion Sums are the total meg/L concentration of major cations and anions. Dissolved species are used where available. Minor ions are included where data is present. Ion Balance is calculated as:

Ion Balance (%) = [Cation Sum-Anion Sum] / [Cation Sum+Anion Sum]

MET-D-CCMS-VA

Water

Dissolved Metals in Water by CRC ICPMS

APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

MET-T-CCMS-VA

Water

Total Metals in Water by CRC ICPMS

EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

NH3-L-F-CL

Water

Ammonia, Total (as N)

J. ENVIRON. MONIT., 2005, 7, 37-42, RSC

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et

NO2-L-IC-N-CL

Water

Nitrite in Water by IC (Low Level)

EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

NO3-L-IC-N-CL

Water

Nitrate in Water by IC (Low Level)

EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

ORP-CI

Water

Oxidation redution potential by elect.

**ASTM D1498** 

This analysis is carried out in accordance with the procedure described in the "ASTM" method D1498 "Oxidation-Reduction Potential of Water" published by the American Society for Testing and Materials (ASTM). Results are reported as observed oxidation-reduction potential of the platinum metal-reference electrode employed, in mV.

It is recommended that this analysis be conducted in the field.

P-T-L-COL-CL

Water

Phosphorus (P)-Total

APHA 4500-P PHOSPHORUS

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after persulphate digestion of the sample.

APHA 4500 H-Electrode

pH is determined in the laboratory using a pH electrode. All samples analyzed by this method for pH will have exceeded the 15 minute recommended hold time from time of sampling (field analysis is recommended for pH where highly accurate results are needed)

Orthophosphate-Dissolved (as P)

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.

SO4-IC-N-CL

Water

Sulfate in Water by IC

EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

SOLIDS-TDS-CL

Water

**Total Dissolved Solids** 

APHA 2540 C

A well-mixed sample is filtered through a glass fibre filter paper. The filtrate is then evaporated to dryness in a pre-weighed vial and dried at 180 – 2 °C. The increase in vial weight represents the total dissolved solids (TDS).

TECKCOAL-IONBAL-CL Water

Ion Balance Calculation

**APHA 1030E** 

Cation Sum, Anion Sum, and Ion Balance (as % difference) are calculated based on guidance from APHA Standard Methods (1030E Checking

#### LINE CREEK OPERATION L2246028 CONTD....

**Reference Information** 

PAGE 7 of 7 Version: FINAL

**Test Method References:** 

**ALS Test Code** Matrix Method Reference\*\* **Test Description** 

Correctness of Analysis). Because all aqueous solutions are electrically neutral, the calculated ion balance (% difference of cations minus anions) should be near-zero.

Cation and Anion Sums are the total meg/L concentration of major cations and anions. Dissolved species are used where available. Minor ions are included where data is present. Ion Balance is calculated as:

Ion Balance (%) = [Cation Sum-Anion Sum] / [Cation Sum+Anion Sum]

Water

TKN-L-F-CL Total Kjeldahl Nitrogen APHA 4500-NORG (TKN) Water

This analysis is carried out using procedures adapted from APHA Method 4500-Norg D. "Block Digestion and Flow Injection Analysis". Total Kjeldahl

Nitrogen is determined using block digestion followed by Flow-injection analysis with fluorescence detection. **Total Suspended Solids** 

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total suspended solids (TSS) are determined by filtering a sample through a glass fibre filter, and by drying the filter at 104 deg. C.

APHA 2540 D-Gravimetric

**TURBIDITY-CL** Water Turbidity APHA 2130 B-Nephelometer

This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.

ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

<b>Laboratory Definition Code</b>	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA
CL	ALS ENVIRONMENTAL - CALGARY, ALBERTA, CANADA

#### **Chain of Custody Numbers:**

20190318 GW

TSS-L-CL

#### **GLOSSARY OF REPORT TERMS**

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.

mg/kg - milligrams per kilogram based on dry weight of sample

mg/kg wwt - milligrams per kilogram based on wet weight of sample

mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight

mg/L - unit of concentration based on volume, parts per million.

< - Less than.

D.L. - The reporting limit.

N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory. UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.



Workorder: L2246028

Report Date: 26-MAR-19

Page 1 of 11

Client:

TECK COAL LIMITED (LINE CREEK)

PO BOX 2003

SPARWOOD BC V0B 2G0

Contact: Chris Blurton

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
ACIDITY-PCT-CL	Water							
Batch R4577053								
WG3011635-5 LCS Acidity (as CaCO3)			108.0		%		85-115	21-MAR-19
WG3011635-4 MB Acidity (as CaCO3)			2.0		mg/L		2	21-MAR-19
ALK-MAN-CL	Water							
Batch R4576808 WG3011311-14 LCS Alkalinity, Total (as CaCo	O3)		96.1		%		85-115	21-MAR-19
WG3011311-13 MB Alkalinity, Total (as CaCo	O3)		<1.0		mg/L		1	21-MAR-19
BE-D-L-CCMS-VA	Water							
Batch R4575455								
WG3010577-2 LCS Beryllium (Be)-Dissolved	I		97.6		%		80-120	20-MAR-19
WG3010577-1 MB Beryllium (Be)-Dissolved	I	LF	<0.000020	)	mg/L		0.00002	20-MAR-19
BE-T-L-CCMS-VA	Water							
Batch R4575549								
WG3010482-2 LCS Beryllium (Be)-Total			90.5		%		80-120	20-MAR-19
WG3010482-1 MB Beryllium (Be)-Total			<0.00002	)	mg/L		0.00002	20-MAR-19
BR-L-IC-N-CL	Water							
Batch R4573050								
WG3010231-10 LCS Bromide (Br)			98.3		%		85-115	20-MAR-19
WG3010231-2 LCS Bromide (Br)			105.5		%		85-115	20-MAR-19
WG3010231-6 LCS Bromide (Br)			100.2		%		85-115	20-MAR-19
<b>WG3010231-1 MB</b> Bromide (Br)			<0.050		mg/L		0.05	20-MAR-19
<b>WG3010231-5 MB</b> Bromide (Br)			<0.050		mg/L		0.05	20-MAR-19
<b>WG3010231-9 MB</b> Bromide (Br)			<0.050		mg/L		0.05	20-MAR-19
C-DIS-ORG-LOW-CL	Water							



Workorder: L2246028

Report Date: 26-MAR-19 Page 2 of 11

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
C-DIS-ORG-LOW-CL	Water							
Batch R4583410 WG3014296-3 DUP Dissolved Organic Carbo	on	<b>L2246028-1</b> 1.30	1.38		mg/L	5.6	20	25-MAR-19
WG3014296-2 LCS Dissolved Organic Carbo	on		98.9		%		80-120	25-MAR-19
WG3014296-1 MB Dissolved Organic Carbo	on		<0.50		mg/L		0.5	25-MAR-19
C-TOT-ORG-LOW-CL	Water							
Batch R4583410								
WG3014296-3 DUP Total Organic Carbon		<b>L2246028-1</b> 2.36	2.60		mg/L	9.5	20	25-MAR-19
WG3014296-2 LCS Total Organic Carbon			102.9		%		80-120	25-MAR-19
WG3014296-1 MB Total Organic Carbon			<0.50		mg/L		0.5	25-MAR-19
CL-IC-N-CL	Water							
Batch R4573050 WG3010231-10 LCS								
Chloride (CI)			96.8		%		90-110	20-MAR-19
WG3010231-2 LCS Chloride (CI)			102.2		%		90-110	20-MAR-19
<b>WG3010231-6 LCS</b> Chloride (CI)			96.8		%		90-110	20-MAR-19
<b>WG3010231-1 MB</b> Chloride (Cl)			<0.50		mg/L		0.5	20-MAR-19
<b>WG3010231-5 MB</b> Chloride (CI)			<0.50		mg/L		0.5	20-MAR-19
<b>WG3010231-9 MB</b> Chloride (CI)			<0.50		mg/L		0.5	20-MAR-19
EC-L-PCT-CL	Water							
Batch R4576808								
WG3011311-14 LCS Conductivity (@ 25C)			102.2		%		90-110	21-MAR-19
WG3011311-13 MB Conductivity (@ 25C)			<2.0		uS/cm		2	21-MAR-19
F-IC-N-CL	Water							



Workorder: L2246028

Report Date: 26-MAR-19 Page 3 of 11

Test	Matrix	Reference	Result Qualifier	Units RPD	Limit	Analyzed
F-IC-N-CL	Water					
Batch R4573050 WG3010231-10 LCS Fluoride (F)			103.2	%	90-110	20-MAR-19
<b>WG3010231-2 LCS</b> Fluoride (F)			107.7	%	90-110	20-MAR-19
<b>WG3010231-6 LCS</b> Fluoride (F)			99.5	%	90-110	20-MAR-19
<b>WG3010231-1 MB</b> Fluoride (F)			<0.020	mg/L	0.02	20-MAR-19
<b>WG3010231-5 MB</b> Fluoride (F)			<0.020	mg/L	0.02	20-MAR-19
<b>WG3010231-9 MB</b> Fluoride (F)			<0.020	mg/L	0.02	20-MAR-19
HG-D-CVAA-VA	Water					
Batch R4572627						
WG3010678-2 LCS Mercury (Hg)-Dissolved			101.1	%	80-120	20-MAR-19
WG3010678-1 MB Mercury (Hg)-Dissolved		LF	<0.0000050	mg/L	0.000005	20-MAR-19
MET-D-CCMS-VA	Water					
Batch R4575455						
WG3010577-2 LCS Aluminum (Al)-Dissolved	I		101.9	%	80-120	20-MAR-19
Antimony (Sb)-Dissolved			96.5	%	80-120	20-MAR-19
Arsenic (As)-Dissolved			94.1	%	80-120	20-MAR-19
Barium (Ba)-Dissolved			99.4	%	80-120	20-MAR-19
Bismuth (Bi)-Dissolved			104.3	%	80-120	20-MAR-19
Boron (B)-Dissolved			94.6	%	80-120	20-MAR-19
Cadmium (Cd)-Dissolved	d		96.4	%	80-120	20-MAR-19
Calcium (Ca)-Dissolved			100.3	%	80-120	20-MAR-19
Chromium (Cr)-Dissolved	d		101.6	%	80-120	20-MAR-19
Cobalt (Co)-Dissolved			101.6	%	80-120	20-MAR-19
Copper (Cu)-Dissolved			99.2	%	80-120	20-MAR-19
Iron (Fe)-Dissolved			98.7	%	80-120	20-MAR-19
Lead (Pb)-Dissolved			98.5	%	80-120	20-MAR-19
Lithium (Li)-Dissolved			98.2	%	80-120	20-MAR-19
Magnesium (Mg)-Dissolv	ved .		102.4	%	80-120	20-MAR-19
Manganese (Mn)-Dissolv	ved		103.2	%	80-120	20-MAR-19



Workorder: L2246028 Report Date: 26-MAR-19 Page 4 of 11

Test Matri	ix Reference	Result Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA Water	er					
Batch R4575455						
WG3010577-2 LCS		00.0	0.4			
Molybdenum (Mo)-Dissolved		98.6	%		80-120	20-MAR-19
Nickel (Ni)-Dissolved		99.9	%		80-120	20-MAR-19
Potassium (K)-Dissolved		96.9	%		80-120	20-MAR-19
Selenium (Se)-Dissolved		95.2	%		80-120	20-MAR-19
Silicon (Si)-Dissolved		94.2	%		60-140	20-MAR-19
Silver (Ag)-Dissolved		99.1	%		80-120	20-MAR-19
Sodium (Na)-Dissolved		109.0	%		80-120	20-MAR-19
Strontium (Sr)-Dissolved		100.5	%		80-120	20-MAR-19
Thallium (TI)-Dissolved		101.0	%		80-120	20-MAR-19
Tin (Sn)-Dissolved		92.1	%		80-120	20-MAR-19
Titanium (Ti)-Dissolved		95.2	%		80-120	20-MAR-19
Uranium (U)-Dissolved		102.2	%		80-120	20-MAR-19
Vanadium (V)-Dissolved		103.6	%		80-120	20-MAR-19
Zinc (Zn)-Dissolved		101.4	%		80-120	20-MAR-19
WG3010577-1 MB	LF					
Aluminum (Al)-Dissolved		<0.0010	mg/L		0.001	20-MAR-19
Antimony (Sb)-Dissolved		<0.00010	mg/L		0.0001	20-MAR-19
Arsenic (As)-Dissolved		<0.00010	mg/L		0.0001	20-MAR-19
Barium (Ba)-Dissolved		<0.00010	mg/L		0.0001	20-MAR-19
Bismuth (Bi)-Dissolved		<0.000050	mg/L		0.00005	20-MAR-19
Boron (B)-Dissolved		<0.010	mg/L		0.01	20-MAR-19
Cadmium (Cd)-Dissolved		<0.000050	mg/L		0.000005	20-MAR-19
Calcium (Ca)-Dissolved		<0.050	mg/L		0.05	20-MAR-19
Chromium (Cr)-Dissolved		<0.00010	mg/L		0.0001	20-MAR-19
Cobalt (Co)-Dissolved		<0.00010	mg/L		0.0001	20-MAR-19
Copper (Cu)-Dissolved		<0.00020	mg/L		0.0002	20-MAR-19
Iron (Fe)-Dissolved		<0.010	mg/L		0.01	20-MAR-19
Lead (Pb)-Dissolved		<0.000050	mg/L		0.00005	20-MAR-19
Lithium (Li)-Dissolved		<0.0010	mg/L		0.001	20-MAR-19
Magnesium (Mg)-Dissolved		<0.0050	mg/L		0.005	20-MAR-19
Manganese (Mn)-Dissolved		<0.00010	mg/L		0.0001	20-MAR-19
Molybdenum (Mo)-Dissolved		<0.000050	mg/L		0.00005	20-MAR-19
Nickel (Ni)-Dissolved		<0.00050	mg/L		0.0005	20-MAR-19
Potassium (K)-Dissolved		<0.050	mg/L		0.0003	20-1VI/(1X-13



Workorder: L2246028

Report Date: 26-MAR-19

Page 5 of 11

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA	Water							
Batch R4575455								
WG3010577-1 MB Selenium (Se)-Dissolved	i	LF	<0.000050	)	mg/L		0.00005	20-MAR-19
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	20-MAR-19
Silver (Ag)-Dissolved			<0.000010	)	mg/L		0.00001	20-MAR-19
Sodium (Na)-Dissolved			<0.050		mg/L		0.05	20-MAR-19
Strontium (Sr)-Dissolved	1		<0.00020		mg/L		0.0002	20-MAR-19
Thallium (TI)-Dissolved			<0.000010	)	mg/L		0.00001	20-MAR-19
Tin (Sn)-Dissolved			<0.00010		mg/L		0.0001	20-MAR-19
Titanium (Ti)-Dissolved			<0.00030		mg/L		0.0003	20-MAR-19
Uranium (U)-Dissolved			<0.000010	)	mg/L		0.00001	20-MAR-19
Vanadium (V)-Dissolved			<0.00050		mg/L		0.0005	20-MAR-19
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	20-MAR-19
MET-T-CCMS-VA	Water							
Batch R4575549								
WG3010482-2 LCS Aluminum (Al)-Total			105.6		%		80-120	20-MAR-19
Antimony (Sb)-Total			102.1		%		80-120	20-MAR-19
Arsenic (As)-Total			100.1		%		80-120	20-MAR-19
Barium (Ba)-Total			102.0		%		80-120	20-MAR-19
Bismuth (Bi)-Total			97.2		%		80-120	20-MAR-19
Boron (B)-Total			92.7		%		80-120	20-MAR-19
Cadmium (Cd)-Total			102.4		%		80-120	20-MAR-19
Calcium (Ca)-Total			93.7		%		80-120	20-MAR-19
Chromium (Cr)-Total			101.4		%		80-120	20-MAR-19
Cobalt (Co)-Total			103.3		%		80-120	20-MAR-19
Copper (Cu)-Total			99.9		%		80-120	20-MAR-19
Iron (Fe)-Total			99.0		%		80-120	20-MAR-19
Lead (Pb)-Total			100.1		%		80-120	20-MAR-19
Lithium (Li)-Total			90.4		%		80-120	20-MAR-19
Magnesium (Mg)-Total			101.1		%		80-120	20-MAR-19
Manganese (Mn)-Total			98.4		%		80-120	20-MAR-19
Molybdenum (Mo)-Total			104.2		%		80-120	20-MAR-19
Nickel (Ni)-Total			99.9		%		80-120	20-MAR-19
Potassium (K)-Total			99.6		%		80-120	20-MAR-19
` '								



Workorder: L2246028

Report Date: 26-MAR-19

Page 6 of 11

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-VA	Water							
Batch R4575549								
WG3010482-2 LCS Silicon (Si)-Total			100.1		%		80-120	20-MAR-19
Silver (Ag)-Total			99.9		%		80-120	20-MAR-19
Sodium (Na)-Total			112.1		%		80-120	20-MAR-19
Strontium (Sr)-Total			104.7		%		80-120	20-MAR-19
Thallium (TI)-Total			96.5		%		80-120	20-MAR-19
Tin (Sn)-Total			100.5		%		80-120	20-MAR-19
Titanium (Ti)-Total			96.0		%		80-120	20-MAR-19
Uranium (U)-Total			108.4		%		80-120	20-MAR-19
Vanadium (V)-Total			103.1		%		80-120	20-MAR-19
Zinc (Zn)-Total			93.4		%		80-120	20-MAR-19
WG3010482-1 MB								
Aluminum (Al)-Total			<0.0030		mg/L		0.003	20-MAR-19
Antimony (Sb)-Total			<0.00010	)	mg/L		0.0001	20-MAR-19
Arsenic (As)-Total			<0.00010	)	mg/L		0.0001	20-MAR-19
Barium (Ba)-Total			<0.00010	)	mg/L		0.0001	20-MAR-19
Bismuth (Bi)-Total			< 0.00005	50	mg/L		0.00005	20-MAR-19
Boron (B)-Total			<0.010		mg/L		0.01	20-MAR-19
Cadmium (Cd)-Total			<0.00000	)5C	mg/L		0.000005	20-MAR-19
Calcium (Ca)-Total			< 0.050		mg/L		0.05	20-MAR-19
Chromium (Cr)-Total			<0.00010	)	mg/L		0.0001	20-MAR-19
Cobalt (Co)-Total			<0.00010	)	mg/L		0.0001	20-MAR-19
Copper (Cu)-Total			<0.00050	)	mg/L		0.0005	20-MAR-19
Iron (Fe)-Total			<0.010		mg/L		0.01	20-MAR-19
Lead (Pb)-Total			<0.00005	50	mg/L		0.00005	20-MAR-19
Lithium (Li)-Total			<0.0010		mg/L		0.001	20-MAR-19
Magnesium (Mg)-Total			< 0.0050		mg/L		0.005	20-MAR-19
Manganese (Mn)-Total			<0.00010	)	mg/L		0.0001	20-MAR-19
Molybdenum (Mo)-Total			<0.00005	50	mg/L		0.00005	20-MAR-19
Nickel (Ni)-Total			<0.00050	)	mg/L		0.0005	20-MAR-19
Potassium (K)-Total			<0.050		mg/L		0.05	20-MAR-19
Selenium (Se)-Total			<0.00005	50	mg/L		0.00005	20-MAR-19
Silicon (Si)-Total			<0.10		mg/L		0.1	20-MAR-19
Silver (Ag)-Total			<0.00001	10	mg/L		0.00001	20-MAR-19
Sodium (Na)-Total			< 0.050		mg/L		0.05	20-MAR-19



Workorder: L2246028

Report Date: 26-MAR-19

Page 7 of 11

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-VA	Water							
Batch R4575549								
WG3010482-1 MB Strontium (Sr)-Total			<0.00020		mg/L		0.0002	20-MAR-19
Thallium (TI)-Total			<0.00001	0	mg/L		0.00001	20-MAR-19
Tin (Sn)-Total			<0.00010		mg/L		0.0001	20-MAR-19
Titanium (Ti)-Total			<0.00030		mg/L		0.0003	20-MAR-19
Uranium (U)-Total			<0.00001	0	mg/L		0.00001	20-MAR-19
Vanadium (V)-Total			<0.00050		mg/L		0.0005	20-MAR-19
Zinc (Zn)-Total			<0.0030		mg/L		0.003	20-MAR-19
NH3-L-F-CL	Water							
Batch R4583214								
WG3014241-6 LCS Ammonia as N			99.7		%		85-115	25-MAR-19
WG3014241-5 MB Ammonia as N			<0.0050		mg/L		0.005	25-MAR-19
NO2-L-IC-N-CL	Water							
Batch R4573050								
WG3010231-10 LCS Nitrite (as N)			103.8		%		90-110	20-MAR-19
WG3010231-2 LCS Nitrite (as N)			106.5		%		90-110	20-MAR-19
WG3010231-6 LCS Nitrite (as N)			103.8		%		90-110	20-MAR-19
WG3010231-1 MB Nitrite (as N)			<0.0010		mg/L		0.001	20-MAR-19
WG3010231-5 MB Nitrite (as N)			<0.0010		mg/L		0.001	20-MAR-19
WG3010231-9 MB			<0.0010		mg/L		0.001	20-MAR-19
Nitrite (as N)			<0.0010		mg/L		0.001	20-MAR-19
NO3-L-IC-N-CL	Water							
Batch R4573050								
WG3010231-10 LCS Nitrate (as N)			97.2		%		90-110	20-MAR-19
WG3010231-2 LCS Nitrate (as N)			102.6		%		90-110	20-MAR-19
WG3010231-6 LCS Nitrate (as N)			96.9		%		90-110	20-MAR-19
WG3010231-1 MB			-				33 110	20 10

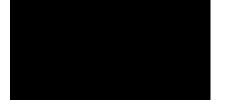


Workorder: L2246028

Report Date: 26-MAR-19

Page 8 of 11

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
NO3-L-IC-N-CL	Water							
Batch R4573050 WG3010231-1 MB Nitrate (as N)			<0.0050		mg/L		0.005	20-MAR-19
WG3010231-5 MB Nitrate (as N)			<0.0050		mg/L		0.005	20-MAR-19
<b>WG3010231-9 MB</b> Nitrate (as N)			<0.0050		mg/L		0.005	20-MAR-19
ORP-CL	Water							
Batch R4580133 WG3012840-11 CRM ORP		CL-ORP	227		mV		210-230	22-MAR-19
P-T-L-COL-CL	Water							
Batch R4573249 WG3010318-6 LCS								
Phosphorus (P)-Total			104.5		%		80-120	20-MAR-19
WG3010318-5 MB Phosphorus (P)-Total			<0.0020		mg/L		0.002	20-MAR-19
PH-CL	Water							
Batch R4576808 WG3011311-14 LCS pH			7.01		рН		6.9-7.1	21-MAR-19
PO4-DO-L-COL-CL	Water							
Batch R4573068 WG3009685-9 DUP Orthophosphate-Dissolve	ad (as P)	<b>L2246028-1</b> 0.0015	0.0018		mg/L	16	20	10 MAP 10
WG3009685-4 LCS Orthophosphate-Dissolve	, ,	0.0013	101.0		₩ %	10	80-120	19-MAR-19 19-MAR-19
WG3009685-3 MB Orthophosphate-Dissolve	ed (as P)		<0.0010		mg/L		0.001	19-MAR-19
SO4-IC-N-CL	Water							
Batch R4573050								
<b>WG3010231-10 LCS</b> Sulfate (SO4)			98.4		%		90-110	20-MAR-19
<b>WG3010231-2 LCS</b> Sulfate (SO4)			103.3		%		90-110	20-MAR-19
WG3010231-6 LCS								



Workorder: L2246028

Report Date: 26-MAR-19 Page 9 of 11

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
SO4-IC-N-CL	Water							
Batch R4573050 WG3010231-6 LCS Sulfate (SO4)			98.3		%		90-110	20-MAR-19
<b>WG3010231-1 MB</b> Sulfate (SO4)			<0.30		mg/L		0.3	20-MAR-19
<b>WG3010231-5 MB</b> Sulfate (SO4)			<0.30		mg/L		0.3	20-MAR-19
<b>WG3010231-9 MB</b> Sulfate (SO4)			<0.30		mg/L		0.3	20-MAR-19
SOLIDS-TDS-CL	Water							
Batch R4580198 WG3012112-5 LCS Total Dissolved Solids			100.6		%		85-115	22-MAR-19
WG3012112-4 MB Total Dissolved Solids			<10		mg/L		10	22-MAR-19
TKN-L-F-CL	Water							
Batch R4579707 WG3011627-2 LCS Total Kjeldahl Nitrogen			100.3		%		75-125	22-MAR-19
WG3011627-1 MB Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	22-MAR-19
TSS-L-CL	Water							
Batch R4581413 WG3013127-2 LCS Total Suspended Solids			93.6		%		85-115	24-MAR-19
WG3013127-1 MB Total Suspended Solids			<1.0		mg/L		1	24-MAR-19
TURBIDITY-CL	Water							
Batch R4572968 WG3009726-8 LCS			05.0		0/			
Turbidity WG3009726-7 MB			95.0		%		85-115	19-MAR-19
WG3009726-7 MB Turbidity			<0.10		NTU		0.1	19-MAR-19

Report Date: 26-MAR-19 Workorder: L2246028 Page 10 of 11

#### Legend:

ALS Control Limit (Data Quality Objectives) Limit

DUP Duplicate

Relative Percent Difference RPD

N/A Not Available

LCS Laboratory Control Sample Standard Reference Material SRM

MS Matrix Spike

MSD

Matrix Spike Duplicate
Average Desorption Efficiency ADE

Method Blank MB

Internal Reference Material IRM Certified Reference Material CRM Continuing Calibration Verification CCV CVS Calibration Verification Standard LCSD Laboratory Control Sample Duplicate

Workorder: L2246028 Report Date: 26-MAR-19 Page 11 of 11

#### **Hold Time Exceedances:**

	Sample						
ALS Product Description	ID	Sampling Date	Date Processed	Rec. HT	Actual HT	Units	Qualifier
Physical Tests							
Oxidation redution potentia	I by elect.						
	1	18-MAR-19 14:10	22-MAR-19 13:30	0.25	95	hours	EHTR-FM
рН							
	1	18-MAR-19 14:10	21-MAR-19 14:00	0.25	72	hours	EHTR-FM
Laward & Ovalities Definitie							

#### Legend & Qualifier Definitions:

EHTR-FM: Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended.

EHTR: Exceeded ALS recommended hold time prior to sample receipt.

EHTL: Exceeded ALS recommended hold time prior to analysis. Sample was received less than 24 hours prior to expiry.

EHT: Exceeded ALS recommended hold time prior to analysis.

Rec. HT: ALS recommended hold time (see units).

#### Notes\*:

Where actual sampling date is not provided to ALS, the date (& time) of receipt is used for calculation purposes. Where actual sampling time is not provided to ALS, the earlier of 12 noon on the sampling date or the time (& date) of receipt is used for calculation purposes. Samples for L2246028 were received on 19-MAR-19 09:00.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against predetermined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

Teck

COC ID: 20190318 GW TURNAROUND TIME:

PROJECT/CLENTUNEO

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TECK COAL LIMITED (LINE CREEK)

ATTN: Chris Blurton

PO BOX 2003

SPARWOOD BC VOB 2G0

Date Received: 22-MAR-19

Report Date: 04-APR-19 08:27 (MT)

Version: FINAL

Client Phone: 250-425-3196

# Certificate of Analysis

Lab Work Order #: L2247956
Project P.O. #: VP000608129

Job Reference: LINE CREEK OPERATION
C of C Numbers: 20190320 DC GW

Legal Site Desc:



Lyudmyla Shvets, B.Sc. Account Manager

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L2247956 CONTD.... PAGE 2 of 21 Version: FINAL

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2247956-1 LC_PIZDC1404D_WG_Q1-2019_NP							
Sampled By: K. CAMPBELL/D.TYMSTA on 20-MAR-1	0 @ 12·35						
' '	0 @ 12.00						
Matrix: WG Miscellaneous Parameters							
	0.00		0.50	a/I		24 MAD 40	D4507050
Dissolved Organic Carbon	2.22		0.50	mg/L		31-MAR-19	R4587852
Total Kjeldahl Nitrogen	3.75		0.050	mg/L		27-MAR-19	R4586513
Total Organic Carbon	38.1		5.0	mg/L		31-MAR-19	R4587852
Dissolved Metals in Water							
Diss. Be (low) in Water by CRC ICPMS				//	07.144.5.40	07.141.5.40	
Beryllium (Be)-Dissolved	<0.020		0.020	ug/L	27-MAR-19	27-MAR-19	R4585680
Dissolved Metals Filtration Location	FIELD					27-MAR-19	R4585748
Dissolved Metals Filtration Location	FIELD					26-MAR-19	R4585074
Diss. Mercury in Water by CVAAS or CVAFS Mercury (Hg)-Dissolved	0.0000050		0.0000000	∞ a/l	27-MAR-19	27-MAR-19	D4505404
	<0.000050		0.0000050	mg/L	21-WAR-19	_	R4585481
Dissolved Mercury Filtration Location	FIELD					27-MAR-19	R4585281
Dissolved Metals in Water by CRC ICPMS Dissolved Metals Filtration Location	FIELD					27-MAR-19	R4585748
Dissolved Metals Filtration Location	FIELD					26-MAR-19	R4585074
Aluminum (Al)-Dissolved	<0.0030		0.0030	mg/L	27-MAR-19	27-MAR-19	R4585680
Antimony (Sb)-Dissolved	<0.0030		0.0030	mg/L	27-MAR-19	27-MAR-19	R4585680
Arsenic (As)-Dissolved	0.00215		0.00010	mg/L	27-MAR-19	27-MAR-19	R4585680
Barium (Ba)-Dissolved	4.45		0.00010	mg/L	27-MAR-19	27-MAR-19	R4585680
Bismuth (Bi)-Dissolved	<0.00050		0.00010	mg/L	27-MAR-19	27-MAR-19	R4585680
Boron (B)-Dissolved	0.000		0.000030	mg/L	27-MAR-19	27-MAR-19	R4585680
Cadmium (Cd)-Dissolved	0.024		0.010	ug/L	27-MAR-19	27-MAR-19	R4585680
Calcium (Ca)-Dissolved	63.7		0.050	mg/L	27-MAR-19	27-MAR-19	R4585680
Chromium (Cr)-Dissolved	<0.00010		0.00010	mg/L	27-MAR-19	27-MAR-19	R4585680
Cobalt (Co)-Dissolved	0.27		0.00010	ug/L	27-MAR-19	27-MAR-19	R4585680
Copper (Cu)-Dissolved	<0.00050		0.00050	mg/L	27-MAR-19	27-MAR-19	R4585680
Iron (Fe)-Dissolved	2.21		0.0000	mg/L	27-MAR-19	27-MAR-19	R4585680
Lead (Pb)-Dissolved	<0.00050		0.000050	mg/L	27-MAR-19	27-MAR-19	R4585680
Lithium (Li)-Dissolved	0.593		0.00000	mg/L	27-MAR-19	27-MAR-19	R4585680
Magnesium (Mg)-Dissolved	37.7		0.10	mg/L	27-MAR-19	27-MAR-19	R4585680
Manganese (Mn)-Dissolved	0.0219		0.00010	mg/L	27-MAR-19	27-MAR-19	R4585680
Molybdenum (Mo)-Dissolved	0.0194		0.000010	mg/L	27-MAR-19	27-MAR-19	R4585680
Nickel (Ni)-Dissolved	0.00109		0.00050	mg/L	27-MAR-19	27-MAR-19	R4585680
Potassium (K)-Dissolved	26.7		0.050	mg/L	27-MAR-19	27-MAR-19	R4585680
Selenium (Se)-Dissolved	0.061		0.050	ug/L	27-MAR-19	27-MAR-19	R4585680
Silicon (Si)-Dissolved	2.73		0.050	mg/L	27-MAR-19	27-MAR-19	R4585680
Silver (Ag)-Dissolved	<0.000010		0.000010	mg/L	27-MAR-19	27-MAR-19	R4585680
Sodium (Na)-Dissolved	33.2		0.050	mg/L	27-MAR-19	27-MAR-19	R4585680
Strontium (Sr)-Dissolved	0.236		0.00020	mg/L	27-MAR-19	27-MAR-19	R4585680
Thallium (TI)-Dissolved	<0.000010		0.000010	mg/L	27-MAR-19	27-MAR-19	R4585680
Tin (Sn)-Dissolved	<0.00010		0.00010	mg/L	27-MAR-19	27-MAR-19	R4585680
Titanium (Ti)-Dissolved	<0.010		0.010	mg/L	27-MAR-19	27-MAR-19	R4585680
Uranium (U)-Dissolved	0.000154		0.000010	mg/L	27-MAR-19	27-MAR-19	R4585680
Vanadium (V)-Dissolved	<0.00050		0.00050	mg/L	27-MAR-19	27-MAR-19	R4585680
Zinc (Zn)-Dissolved	0.0028		0.0010	mg/L	27-MAR-19	27-MAR-19	R4585680
Hardness				-			
Hardness (as CaCO3)	314		0.50	mg/L		27-MAR-19	
Total Metals in Water				•			
Total Be (Low) in Water by CRC ICPMS Beryllium (Be)-Total	0.081		0.020	ug/L		26-MAR-19	R4585048
Total Metals in Water by CRC ICPMS				J			
Aluminum (Al)-Total	0.648		0.0030	mg/L		26-MAR-19	R4585048
		<u>                                       </u>					

<sup>\*</sup> Refer to Referenced Information for Qualifiers (if any) and Methodology.

L2247956 CONTD.... PAGE 3 of 21 Version: FINAL

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2247956-1 LC PIZDC1404D WG Q1-2019 NP							
Sampled By: K. CAMPBELL/D.TYMSTA on 20-MAR-1	0 @ 12:25						
	9 @ 12.33						
Matrix: WG							
Total Metals in Water by CRC ICPMS Antimony (Sb)-Total	0.00000		0.00040			26 MAD 40	D4505040
Arsenic (As)-Total	0.00028 0.00247		0.00010 0.00010	mg/L		26-MAR-19 26-MAR-19	R4585048 R4585048
Barium (Ba)-Total	4.19		0.00010	mg/L mg/L		26-MAR-19	R4585048
Bismuth (Bi)-Total	<0.000050		0.00010	mg/L		26-MAR-19	R4585048
Boron (B)-Total	0.026		0.000	mg/L		26-MAR-19	R4585048
Cadmium (Cd)-Total	0.173		0.0050	ug/L		26-MAR-19	R4585048
Calcium (Ca)-Total	58.6		0.050	mg/L		26-MAR-19	R4585048
Chromium (Cr)-Total	0.00230		0.00010	mg/L		26-MAR-19	R4585048
Cobalt (Co)-Total	0.94		0.10	ug/L		26-MAR-19	R4585048
Copper (Cu)-Total	0.00505		0.00050	mg/L		26-MAR-19	R4585048
Iron (Fe)-Total	3.51		0.010	mg/L		26-MAR-19	R4585048
Lead (Pb)-Total	0.00194		0.000050	mg/L		26-MAR-19	R4585048
Lithium (Li)-Total	0.560		0.0010	mg/L		26-MAR-19	R4585048
Magnesium (Mg)-Total	38.2		0.10	mg/L		26-MAR-19	R4585048
Manganese (Mn)-Total	0.0461		0.00010	mg/L		26-MAR-19	R4585048
Molybdenum (Mo)-Total	0.0182		0.000050	mg/L		26-MAR-19	R4585048
Nickel (Ni)-Total	0.00489		0.00050	mg/L		26-MAR-19	R4585048
Potassium (K)-Total	25.3		0.050	mg/L		26-MAR-19	R4585048
Selenium (Se)-Total	0.100		0.050	ug/L		26-MAR-19	R4585048
Silicon (Si)-Total	3.90		0.10	mg/L		26-MAR-19	R4585048
Silver (Ag)-Total	0.000049		0.000010	mg/L		26-MAR-19	R4585048
Sodium (Na)-Total	35.2		0.050	mg/L		26-MAR-19	R4585048
Strontium (Sr)-Total	0.228		0.00020	mg/L		26-MAR-19	R4585048
Thallium (TI)-Total	0.000036		0.000010	mg/L		26-MAR-19	R4585048
Tin (Sn)-Total	0.00026		0.00010	mg/L		26-MAR-19	R4585048
Titanium (Ti)-Total	0.014		0.010	mg/L		26-MAR-19	R4585048
Uranium (U)-Total	0.000314		0.000010	mg/L		26-MAR-19	R4585048
Vanadium (V)-Total Zinc (Zn)-Total	0.00475		0.00050	mg/L		26-MAR-19	R4585048
Routine for Teck Coal	0.0251		0.0030	mg/L		26-MAR-19	R4585048
Acidity by Automatic Titration							
Acidity (as CaCO3)	2.2		1.0	mg/L		27-MAR-19	R4586355
Alkalinity (Species) by Manual Titration							
Alkalinity, Bicarbonate (as CaCO3)	413		1.0	mg/L		27-MAR-19	R4585726
Alkalinity, Carbonate (as CaCO3)	<1.0		1.0	mg/L		27-MAR-19	R4585726
Alkalinity, Hydroxide (as CaCO3)	<1.0		1.0	mg/L		27-MAR-19	R4585726
Alkalinity, Total (as CaCO3)	413		1.0	mg/L		27-MAR-19	R4585726
Ammonia, Total (as N) Ammonia as N	2.36	DLHC	0.050	mg/L		28-MAR-19	R4586901
Bromide in Water by IC (Low Level)	2.00		0.500	∌, ⊑			
Bromide (Br)	0.059		0.050	mg/L		22-MAR-19	R4580126
Chloride in Water by IC							
Chloride (CI)	<0.50		0.50	mg/L		22-MAR-19	R4580126
Electrical Conductivity (EC)	705		2.0	uS/cm		27-MAR-19	D4595706
Conductivity (@ 25C)	705		2.0	uo/CIII		21-IVIAR-19	R4585726
Fluoride in Water by IC Fluoride (F)	0.187		0.020	mg/L		22-MAR-19	R4580126
Ion Balance Calculation				J			
Ion Balance	103		-100	%		28-MAR-19	
Ion Balance Calculation							
Cation - Anion Balance	1.5			%		28-MAR-19	
Anion Sum	8.27			meq/L		28-MAR-19	

<sup>\*</sup> Refer to Referenced Information for Qualifiers (if any) and Methodology.

L2247956 CONTD.... PAGE 4 of 21 Version: FINAL

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2247956-1 LC_PIZDC1404D_WG_Q1-2019_NP							
Sampled By: K. CAMPBELL/D.TYMSTA on 20-MAR-1	n @ 12·35						
Matrix: WG	12.55						
Ion Balance Calculation Cation Sum	8.52			meq/L		28-MAR-19	
Nitrate in Water by IC (Low Level) Nitrate (as N)	<0.0050		0.0050	mg/L		22-MAR-19	R4580126
Nitrite in Water by IC (Low Level) Nitrite (as N)	<0.0010		0.0010	mg/L		22-MAR-19	R4580126
Orthophosphate-Dissolved (as P)							
Orthophosphate-Dissolved (as P)  Oxidation redution potential by elect.	<0.0010		0.0010	mg/L		22-MAR-19	R4580026
ORP Phosphorus (P)-Total	345		-1000	mV		26-MAR-19	R4585058
Phosphorus (P)-Total	0.252	DLHC	0.025	mg/L		27-MAR-19	R4584910
Sulfate in Water by IC Sulfate (SO4)	<0.30		0.30	mg/L		22-MAR-19	R4580126
<b>Total Dissolved Solids</b> Total Dissolved Solids	388	DLHC	20	mg/L		27-MAR-19	R4586266
<b>Total Suspended Solids</b> Total Suspended Solids	128		1.0	mg/L		26-MAR-19	R4585537
Turbidity							
Turbidity <b>pH</b>	119		0.10	NTU		22-MAR-19	R4580128
рН	8.29		0.10	рН		27-MAR-19	R4585726
L2247956-2 LC_PIZDC1404S_WG_Q1-2019_NP							
Sampled By: K. CAMPBELL/D.TYMSTA on 20-MAR-1	9 @ 13:05						
Matrix: WG							
Miscellaneous Parameters							
Dissolved Organic Carbon	2.70		0.50	mg/L		31-MAR-19	R4587852
Total Kjeldahl Nitrogen	0.134		0.050	mg/L		27-MAR-19	R4586513
Total Organic Carbon	2.31		0.50	mg/L		29-MAR-19	R4587742
Dissolved Metals in Water							
Diss. Be (low) in Water by CRC ICPMS							
Beryllium (Be)-Dissolved	<0.020		0.020	ug/L	26-MAR-19	26-MAR-19	R4585048
Dissolved Metals Filtration Location	FIELD					26-MAR-19	R4582794
Diss. Mercury in Water by CVAAS or CVAFS	0.0000050		0.0000050	e-/I	07 MAD 40	07 MAD 40	D 4505 404
Mercury (Hg)-Dissolved Dissolved Mercury Filtration Location	<0.000050 FIELD		0.0000050	mg/L	27-MAR-19	27-MAR-19 27-MAR-19	R4585481 R4585281
Dissolved Metals in Water by CRC ICPMS	FILLD					27-101/213-19	K4303201
Dissolved Metals Filtration Location	FIELD					26-MAR-19	R4582794
Dissolved Metals Filtration Location	FIELD					27-MAR-19	R4585563
Aluminum (Al)-Dissolved	<0.0030		0.0030	mg/L	26-MAR-19	26-MAR-19	R4585048
Antimony (Sb)-Dissolved	<0.00010		0.00010	mg/L	26-MAR-19	26-MAR-19	R4585048
Arsenic (As)-Dissolved	0.00143		0.00010	mg/L	26-MAR-19	26-MAR-19	R4585048
Barium (Ba)-Dissolved	0.226		0.00010	mg/L	26-MAR-19	26-MAR-19	R4585048
Bismuth (Bi)-Dissolved	<0.000050		0.000050	mg/L	26-MAR-19	26-MAR-19	R4585048
Boron (B)-Dissolved	<0.010		0.010	mg/L	26-MAR-19	26-MAR-19	R4585048
Cadmium (Cd)-Dissolved	<0.0050		0.0050	ug/L	26-MAR-19	26-MAR-19	R4585048
Calcium (Ca)-Dissolved	48.2		0.050	mg/L	26-MAR-19	26-MAR-19	R4585048
Chromium (Cr)-Dissolved	<0.00010		0.00010	mg/L	26-MAR-19	26-MAR-19	R4585048
Cobalt (Co)-Dissolved	0.28		0.10	ug/L	26-MAR-19	26-MAR-19	R4585048
Copper (Cu)-Dissolved	0.00159	DTC	0.00050	mg/L	27-MAR-19	27-MAR-19	R4585893
Iron (Fe)-Dissolved	0.654		0.010	mg/L	26-MAR-19	26-MAR-19	R4585048
Lead (Pb)-Dissolved				-			1

<sup>\*</sup> Refer to Referenced Information for Qualifiers (if any) and Methodology.

L2247956 CONTD.... PAGE 5 of 21 Version: FINAL

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
   L2247956-2							
Sampled By: K. CAMPBELL/D.TYMSTA on 20-MAR-1	n @ 13·05						
Matrix: WG	J = 10.00						
Dissolved Metals in Water by CRC ICPMS Lithium (Li)-Dissolved	0.0057		0.0010	mg/L	26-MAR-19	26-MAR-19	R4585048
Magnesium (Mg)-Dissolved	17.9		0.10	mg/L	26-MAR-19	26-MAR-19	R4585048
Manganese (Mn)-Dissolved	0.0251		0.00010	mg/L	26-MAR-19	26-MAR-19	R4585048
Molybdenum (Mo)-Dissolved	0.00322		0.000050	mg/L	26-MAR-19	26-MAR-19	R4585048
Nickel (Ni)-Dissolved	0.00131		0.00050	mg/L	26-MAR-19	26-MAR-19	R4585048
Potassium (K)-Dissolved	3.83		0.050	mg/L	26-MAR-19	26-MAR-19	R4585048
Selenium (Se)-Dissolved	<0.050		0.050	ug/L	26-MAR-19	26-MAR-19	R4585048
Silicon (Si)-Dissolved	3.38		0.050	mg/L	26-MAR-19	26-MAR-19	R4585048
Silver (Ag)-Dissolved	<0.000010		0.000010	mg/L	26-MAR-19	26-MAR-19	R4585048
Sodium (Na)-Dissolved	1.52		0.050	mg/L	26-MAR-19	26-MAR-19	R4585048
Strontium (Sr)-Dissolved	0.0445		0.00020	mg/L	26-MAR-19	26-MAR-19	R4585048
Thallium (TI)-Dissolved	<0.000010		0.000010	mg/L	26-MAR-19	26-MAR-19	R4585048
Tin (Sn)-Dissolved	<0.00010		0.00010	mg/L	26-MAR-19	26-MAR-19	R4585048
Titanium (Ti)-Dissolved	<0.010		0.010	mg/L	26-MAR-19	26-MAR-19	R4585048
Uranium (U)-Dissolved	0.000648		0.000010	mg/L	26-MAR-19	26-MAR-19	R4585048
Vanadium (V)-Dissolved	<0.00050		0.00050	mg/L	26-MAR-19	26-MAR-19	R4585048
Zinc (Zn)-Dissolved	0.0033		0.0010	mg/L	26-MAR-19	26-MAR-19	R4585048
Hardness Hardness (as CaCO3)	104		0.50	ma/l		27-MAR-19	
Total Metals in Water	194		0.50	mg/L		27-WAK-19	
Total Be (Low) in Water by CRC ICPMS							
Beryllium (Be)-Total	<0.020		0.020	ug/L		26-MAR-19	R4585048
Total Metals in Water by CRC ICPMS	10.020		0.020	~g/ <b>=</b>			111000010
Aluminum (Al)-Total	0.0148		0.0030	mg/L		26-MAR-19	R4585048
Antimony (Sb)-Total	<0.00010		0.00010	mg/L		26-MAR-19	R4585048
Arsenic (As)-Total	0.00166		0.00010	mg/L		26-MAR-19	R4585048
Barium (Ba)-Total	0.230		0.00010	mg/L		26-MAR-19	R4585048
Bismuth (Bi)-Total	<0.000050		0.000050	mg/L		26-MAR-19	R4585048
Boron (B)-Total	<0.010		0.010	mg/L		26-MAR-19	R4585048
Cadmium (Cd)-Total	<0.0050		0.0050	ug/L		26-MAR-19	R4585048
Calcium (Ca)-Total	49.2		0.050	mg/L		26-MAR-19	R4585048
Chromium (Cr)-Total	0.00039		0.00010	mg/L		26-MAR-19	R4585048
Cobalt (Co)-Total	0.32		0.10	ug/L		26-MAR-19	R4585048
Copper (Cu)-Total	<0.00050		0.00050	mg/L		26-MAR-19	R4585048
Iron (Fe)-Total	0.800		0.010	mg/L		26-MAR-19	R4585048
Lead (Pb)-Total	0.000220		0.000050	mg/L		26-MAR-19	R4585048
Lithium (Li)-Total	0.0060		0.0010	mg/L		26-MAR-19	R4585048
Magnesium (Mg)-Total Manganese (Mn)-Total	18.3		0.10	mg/L		26-MAR-19	R4585048
Molybdenum (Mo)-Total	0.0280 0.00340		0.00010 0.000050	mg/L mg/L		26-MAR-19 26-MAR-19	R4585048 R4585048
Nickel (Ni)-Total	0.00340		0.00050	mg/L		26-MAR-19	R4585048
Potassium (K)-Total	3.41		0.00050	mg/L		26-MAR-19	R4585048
Selenium (Se)-Total	<0.050		0.050	ug/L		26-MAR-19	R4585048
Silicon (Si)-Total	3.62		0.030	mg/L		26-MAR-19	R4585048
Silver (Ag)-Total	<0.00010		0.000010	mg/L		26-MAR-19	R4585048
Sodium (Na)-Total	1.48		0.050	mg/L		26-MAR-19	R4585048
Strontium (Sr)-Total	0.0461		0.00020	mg/L		26-MAR-19	R4585048
Thallium (TI)-Total	<0.000010		0.000010	mg/L		26-MAR-19	R4585048
Tin (Sn)-Total	<0.00010		0.00010	mg/L		26-MAR-19	R4585048
Titanium (Ti)-Total	<0.010		0.010	mg/L		26-MAR-19	R4585048
Uranium (U)-Total	0.000687		0.000010	mg/L		26-MAR-19	R4585048
Vanadium (V)-Total	<0.00050		0.00050	mg/L		26-MAR-19	R4585048

<sup>\*</sup> Refer to Referenced Information for Qualifiers (if any) and Methodology.

L2247956 CONTD.... PAGE 6 of 21 Version: FINAL

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2247956-2 LC_PIZDC1404S_WG_Q1-2019_NP							
Sampled By: K. CAMPBELL/D.TYMSTA on 20-MAR-1	a @ 13·05						
Matrix: WG	10.00						
Total Metals in Water by CRC ICPMS Zinc (Zn)-Total	<0.0030		0.0030	mg/L		26-MAR-19	R4585048
Routine for Teck Coal	10.0000		0.000				
Acidity by Automatic Titration							
Acidity (as CaCO3)	1.3		1.0	mg/L		27-MAR-19	R4586355
Alkalinity (Species) by Manual Titration							
Alkalinity, Bicarbonate (as CaCO3)	201		1.0	mg/L		27-MAR-19	R4585726
Alkalinity, Carbonate (as CaCO3)	<1.0		1.0	mg/L		27-MAR-19	R4585726
Alkalinity, Hydroxide (as CaCO3) Alkalinity, Total (as CaCO3)	<1.0 201		1.0 1.0	mg/L mg/L		27-MAR-19 27-MAR-19	R4585726 R4585726
Ammonia, Total (as N)	201		1.0	IIIg/L		27-WAK-19	R4565726
Ammonia as N	0.0146		0.0050	mg/L		28-MAR-19	R4586901
Bromide in Water by IC (Low Level)							
Bromide (Br)	<0.050		0.050	mg/L		22-MAR-19	R4580126
Chloride in Water by IC							
Chloride (CI)	<0.50		0.50	mg/L		22-MAR-19	R4580126
Electrical Conductivity (EC)	200		0.0	110/0		27 1410 40	D4505700
Conductivity (@ 25C)	360		2.0	uS/cm		27-MAR-19	R4585726
Fluoride in Water by IC Fluoride (F)	0.153		0.020	mg/L		22-MAR-19	R4580126
Ion Balance Calculation	0.100		0.020	g, <u>_</u>		22 1111 11 10	114000120
Cation - Anion Balance	-0.7			%		28-MAR-19	
Anion Sum	4.13			meq/L		28-MAR-19	
Cation Sum	4.07			meq/L		28-MAR-19	
Ion Balance Calculation							
Ion Balance	98.6		-100	%		28-MAR-19	
Nitrate in Water by IC (Low Level)	0.0000		0.0050	ma/l		22-MAR-19	D4500406
Nitrate (as N) Nitrite in Water by IC (Low Level)	0.0088		0.0050	mg/L		22-WAR-19	R4580126
Nitrite (as N)	0.0015		0.0010	mg/L		22-MAR-19	R4580126
Orthophosphate-Dissolved (as P)	0.0010		0.0010	9/ =			111000120
Orthophosphate-Dissolved (as P)	<0.0010		0.0010	mg/L		22-MAR-19	R4580026
Oxidation redution potential by elect.							
ORP	413		-1000	mV		26-MAR-19	R4585058
Phosphorus (P)-Total	0.0007		0.0000	n		07 MAD 40	D4504040
Phosphorus (P)-Total	0.0097		0.0020	mg/L		27-MAR-19	R4584910
Sulfate in Water by IC Sulfate (SO4)	4.88		0.30	mg/L		22-MAR-19	R4580126
Total Dissolved Solids	7.00		0.00	y/ L		WIN (13	114000120
Total Dissolved Solids	199	DLHC	20	mg/L		27-MAR-19	R4586266
Total Suspended Solids				-			
Total Suspended Solids	4.2		1.0	mg/L		26-MAR-19	R4585537
Turbidity	<b>_</b>			N 1 1		00 1445 45	D 4500 155
Turbidity	7.41		0.10	NTU		22-MAR-19	R4580128
<b>рН</b> рН	8.29		0.10	рН		27-MAR-19	R4585726
L2247956-3 WG_Q1-2019_MT1	0.20		3.10	ρ			
Sampled By: K. CAMPBELL/D.TYMSTA on 20-MAR-1	9 @ 12-40						
Matrix: WG	0 3 12.70						
Miscellaneous Parameters							
Dissolved Organic Carbon	<0.50		0.50	mg/L		29-MAR-19	R4587742
Total Kjeldahl Nitrogen	4.76		0.050	mg/L		27-MAR-19	R4586513
Total Organic Carbon	<0.50		0.50	mg/L		29-MAR-19	R4587742
. San Organio Garbon	\0.50	1	0.50	my/∟		NI/\I\-\I\	117001142

<sup>\*</sup> Refer to Referenced Information for Qualifiers (if any) and Methodology.

L2247956 CONTD.... PAGE 7 of 21 Version: FINAL

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2247956-3 WG Q1-2019 MT1							
Sampled By: K. CAMPBELL/D.TYMSTA on 20-MAR-1	n @ 12:40						
' '	9 @ 12.40						
Matrix: WG Dissolved Metals in Water							
Diss. Be (low) in Water by CRC ICPMS Beryllium (Be)-Dissolved	<0.020		0.020	ug/L	01-APR-19	01-APR-19	R4588535
Dissolved Metals Filtration Location	LAB		0.020	ug/L	01741113	01-APR-19	R4588563
Diss. Mercury in Water by CVAAS or CVAFS	2,10					017111110	114000000
Mercury (Hg)-Dissolved	<0.000050		0.0000050	mg/L	01-APR-19	01-APR-19	R4588409
Dissolved Mercury Filtration Location	LAB			3		01-APR-19	R4588563
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	LAB					01-APR-19	R4588563
Aluminum (AI)-Dissolved	<0.0030		0.0030	mg/L	01-APR-19	01-APR-19	R4588535
Antimony (Sb)-Dissolved	<0.00010		0.00010	mg/L	01-APR-19	01-APR-19	R4588535
Arsenic (As)-Dissolved	<0.00010		0.00010	mg/L	01-APR-19	01-APR-19	R4588535
Barium (Ba)-Dissolved	<0.00010		0.00010	mg/L	01-APR-19	01-APR-19	R4588535
Bismuth (Bi)-Dissolved	<0.000050		0.000050	mg/L	01-APR-19	01-APR-19	R4588535
Boron (B)-Dissolved	<0.010		0.010	mg/L	01-APR-19	01-APR-19	R4588535
Cadmium (Cd)-Dissolved	<0.0050		0.0050	ug/L	01-APR-19	01-APR-19	R4588535
Calcium (Ca)-Dissolved	<0.050		0.050	mg/L	01-APR-19	01-APR-19	R4588535
Chromium (Cr)-Dissolved	<0.00010		0.00010	mg/L	01-APR-19	01-APR-19	R4588535
Cobalt (Co)-Dissolved	<0.10		0.10	ug/L	01-APR-19	01-APR-19	R4588535
Copper (Cu)-Dissolved	<0.00050		0.00050	mg/L	01-APR-19	01-APR-19	R4588535
Iron (Fe)-Dissolved	<0.010		0.010	mg/L	01-APR-19	01-APR-19	R4588535
Lead (Pb)-Dissolved	<0.000050		0.000050	mg/L	01-APR-19	01-APR-19	R4588535
Lithium (Li)-Dissolved	<0.0010		0.0010	mg/L	01-APR-19	01-APR-19	R4588535
Magnesium (Mg)-Dissolved  Manganese (Mn)-Dissolved	<0.10		0.10	mg/L	01-APR-19	01-APR-19	R4588535
Molybdenum (Mo)-Dissolved	<0.00010		0.00010	mg/L	01-APR-19 01-APR-19	01-APR-19 01-APR-19	R4588535
Nickel (Ni)-Dissolved	<0.00050 <0.00050		0.000050 0.00050	mg/L mg/L	01-APR-19 01-APR-19	01-APR-19 01-APR-19	R4588535 R4588535
Potassium (K)-Dissolved	<0.050		0.00030	mg/L	01-AFR-19 01-APR-19	01-AFR-19 01-APR-19	R4588535
Selenium (Se)-Dissolved	<0.050		0.050	ug/L	01-AFR-19	01-AFR-19	R4588535
Silicon (Si)-Dissolved	<0.050		0.050	mg/L	01-APR-19	01-APR-19	R4588535
Silver (Ag)-Dissolved	<0.00010		0.000010	mg/L	01-APR-19	01-APR-19	R4588535
Sodium (Na)-Dissolved	<0.050		0.050	mg/L	01-APR-19	01-APR-19	R4588535
Strontium (Sr)-Dissolved	<0.00020		0.00020	mg/L	01-APR-19	01-APR-19	R4588535
Thallium (TI)-Dissolved	<0.000010		0.000010	mg/L	01-APR-19	01-APR-19	R4588535
Tin (Sn)-Dissolved	<0.00010		0.00010	mg/L	01-APR-19	01-APR-19	R4588535
Titanium (Ti)-Dissolved	<0.010		0.010	mg/L	01-APR-19	01-APR-19	R4588535
Uranium (U)-Dissolved	<0.00010		0.000010	mg/L	01-APR-19	01-APR-19	R4588535
Vanadium (V)-Dissolved	<0.00050		0.00050	mg/L	01-APR-19	01-APR-19	R4588535
Zinc (Zn)-Dissolved	<0.0010		0.0010	mg/L	01-APR-19	01-APR-19	R4588535
Hardness							
Hardness (as CaCO3)	<0.50		0.50	mg/L		02-APR-19	
Total Metals in Water							
Total Be (Low) in Water by CRC ICPMS Beryllium (Be)-Total	<0.020		0.020	ug/L		26-MAR-19	R4585048
Total Mercury in Water by CVAAS or CVAFS	10.020		0.020	~g/ <b>-</b>			
Mercury (Hg)-Total	<0.000050		0.0000050	mg/L		26-MAR-19	R4583050
Total Metals in Water by CRC ICPMS				-			
Aluminum (Al)-Total	<0.0030		0.0030	mg/L		26-MAR-19	R4585048
Antimony (Sb)-Total	<0.00010		0.00010	mg/L		26-MAR-19	R4585048
Arsenic (As)-Total	<0.00010		0.00010	mg/L		26-MAR-19	R4585048
Barium (Ba)-Total	<0.00010		0.00010	mg/L		26-MAR-19	R4585048
Bismuth (Bi)-Total	<0.000050		0.000050	mg/L		26-MAR-19	R4585048
Boron (B)-Total	<0.010		0.010	mg/L		26-MAR-19	R4585048

<sup>\*</sup> Refer to Referenced Information for Qualifiers (if any) and Methodology.

L2247956 CONTD.... PAGE 8 of 21 Version: FINAL

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
   L2247956-3   WG_Q1-2019_MT1							
Sampled By: K. CAMPBELL/D.TYMSTA on 20-MAR-1	9 @ 12·40						
Matrix: WG	0 @ 12.40						
Total Metals in Water by CRC ICPMS Cadmium (Cd)-Total	<0.0050		0.0050	ug/L		26-MAR-19	R4585048
Calcium (Ca)-Total	<0.050		0.050	mg/L		26-MAR-19	R4585048
Chromium (Cr)-Total	0.00040	RRV	0.00010	mg/L		27-MAR-19	R4585464
Cobalt (Co)-Total	<0.10		0.10	ug/L		26-MAR-19	R4585048
Copper (Cu)-Total	<0.00050		0.00050	mg/L		26-MAR-19	R4585048
Iron (Fe)-Total	<0.010		0.010	mg/L		26-MAR-19	R4585048
Lead (Pb)-Total	<0.000050		0.000050	mg/L		26-MAR-19	R4585048
Lithium (Li)-Total	<0.0010		0.0010	mg/L		26-MAR-19	R4585048
Magnesium (Mg)-Total	<0.10		0.10	mg/L		26-MAR-19	R4585048
Manganese (Mn)-Total	<0.00010		0.00010	mg/L		26-MAR-19	R4585048
Molybdenum (Mo)-Total	<0.000050		0.000050	mg/L		26-MAR-19	R4585048
Nickel (Ni)-Total	<0.00050		0.00050	mg/L		26-MAR-19	R4585048
Potassium (K)-Total	<0.050		0.050	mg/L		26-MAR-19	R4585048
Selenium (Se)-Total	<0.050		0.050	ug/L		26-MAR-19	R4585048
Silicon (Si)-Total	<0.10		0.10	mg/L		26-MAR-19	R4585048
Silver (Ag)-Total	<0.000010		0.000010	mg/L		26-MAR-19	R4585048
Sodium (Na)-Total	<0.050		0.050	mg/L		26-MAR-19	R4585048
Strontium (Sr)-Total	<0.00020		0.00020	mg/L		26-MAR-19	R4585048
Thallium (TI)-Total	<0.000010		0.000010	mg/L		26-MAR-19	R4585048
Tin (Sn)-Total	<0.00010		0.00010	mg/L		26-MAR-19	R4585048
Titanium (Ti)-Total Uranium (U)-Total	<0.010		0.010	mg/L		26-MAR-19	R4585048
Vanadium (V)-Total	<0.000010 <0.00050		0.000010 0.00050	mg/L mg/L		26-MAR-19 26-MAR-19	R4585048 R4585048
Zinc (Zn)-Total	<0.0030		0.00030	mg/L		26-MAR-19	R4585048
Routine for Teck Coal	<0.0030		0.0030	mg/L		20-101/413	114303040
Acidity by Automatic Titration							
Acidity (as CaCO3)	2.1		1.0	mg/L		27-MAR-19	R4586355
Alkalinity (Species) by Manual Titration				Ü			
Alkalinity, Bicarbonate (as CaCO3)	<1.0		1.0	mg/L		27-MAR-19	R4585726
Alkalinity, Carbonate (as CaCO3)	<1.0		1.0	mg/L		27-MAR-19	R4585726
Alkalinity, Hydroxide (as CaCO3)	<1.0		1.0	mg/L		27-MAR-19	R4585726
Alkalinity, Total (as CaCO3)	<1.0		1.0	mg/L		27-MAR-19	R4585726
Ammonia, Total (as N)							
Ammonia as N	1.05	RRV	0.010	mg/L		28-MAR-19	R4586901
Bromide in Water by IC (Low Level)							<u> </u>
Bromide (Br)	<0.050		0.050	mg/L		22-MAR-19	R4580126
Chloride in Water by IC	0.50		0.50	m c /l		22 MAD 42	D4500400
Chloride (CI)	<0.50		0.50	mg/L		22-MAR-19	R4580126
Electrical Conductivity (EC) Conductivity (@ 25C)	<2.0		2.0	uS/cm		27-MAR-19	R4585726
Fluoride in Water by IC	<2.0		2.0	uO/UIII		Z1-1VIAIX-13	114303720
Fluoride in Water by IC  Fluoride (F)	<0.020		0.020	mg/L		22-MAR-19	R4580126
Ion Balance Calculation	10.020		5.520	g, =			
Ion Balance	0.0		-100	%		02-APR-19	
Ion Balance Calculation			- 1				
Cation - Anion Balance	0.0			%		02-APR-19	
Anion Sum	<0.10			meq/L		02-APR-19	
Cation Sum	<0.10			meq/L		02-APR-19	
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	<0.0050		0.0050	mg/L		22-MAR-19	R4580126
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	<0.0010		0.0010	mg/L		22-MAR-19	R4580126

<sup>\*</sup> Refer to Referenced Information for Qualifiers (if any) and Methodology.

L2247956 CONTD.... PAGE 9 of 21 Version: FINAL

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2247956-3 WG_Q1-2019_MT1							
Sampled By: K. CAMPBELL/D.TYMSTA on 20-MAR-1	9 @ 12·40						
Matrix: WG	12.10						
Orthophosphate-Dissolved (as P)							
Orthophosphate-Dissolved (as P)	<0.0010		0.0010	mg/L		22-MAR-19	R4580026
Oxidation redution potential by elect.	40.0010		0.0010	9/ =			11.000020
ORP	431		-1000	mV		26-MAR-19	R4585058
Phosphorus (P)-Total							
Phosphorus (P)-Total	<0.0020		0.0020	mg/L		27-MAR-19	R4584910
Sulfate in Water by IC							
Sulfate (SO4)	<0.30		0.30	mg/L		22-MAR-19	R4580126
Total Dissolved Solids				"		07.144.5.40	
Total Dissolved Solids	<10		10	mg/L		27-MAR-19	R4586266
<b>Total Suspended Solids</b> Total Suspended Solids	<1.0		1.0	mg/L		26-MAR-19	R4585537
Turbidity	<1.0		1.0	mg/L		20-101/413-19	K4363337
Turbidity	<0.10		0.10	NTU		22-MAR-19	R4580128
pH	3						
pH	5.48		0.10	рН		27-MAR-19	R4585726
L2247956-4 WG Q1-2019 RD1		1					
Sampled By: K. CAMPBELL/D.TYMSTA on 20-MAR-1	9 @ 15:30						
Matrix: WG							
Miscellaneous Parameters							
Hardness (as CaCO3)	<0.50		0.50	mg/L		29-MAR-19	
Total Kjeldahl Nitrogen	0.301		0.050	mg/L		27-MAR-19	R4586513
Total Organic Carbon	<0.50		0.50	mg/L		29-MAR-19	R4587742
Total Metals in Water	10.00		0.00	9/ =		20 1111 117 10	11.007712
Total Be (Low) in Water by CRC ICPMS							
Beryllium (Be)-Total	<0.020		0.020	ug/L		26-MAR-19	R4585048
Total Mercury in Water by CVAAS or CVAFS							
Mercury (Hg)-Total	<0.000050		0.0000050	mg/L		26-MAR-19	R4583050
Total Metals in Water by CRC ICPMS							
Aluminum (Al)-Total	<0.0030		0.0030	mg/L		27-MAR-19	R4585464
Antimony (Sb)-Total	<0.00010		0.00010	mg/L		26-MAR-19	R4585048
Arsenic (As)-Total	<0.00010		0.00010	mg/L		26-MAR-19	R4585048
Barium (Ba)-Total Bismuth (Bi)-Total	<0.00010 <0.000050		0.00010 0.000050	mg/L mg/L		26-MAR-19 26-MAR-19	R4585048 R4585048
Boron (B)-Total	<0.00050		0.00050	mg/L		26-MAR-19	R4585048
Cadmium (Cd)-Total	<0.0050		0.0050	ug/L		26-MAR-19	R4585048
Calcium (Ca)-Total	<0.050		0.050	mg/L		26-MAR-19	R4585048
Chromium (Cr)-Total	<0.00010		0.00010	mg/L		26-MAR-19	R4585048
Cobalt (Co)-Total	<0.10		0.10	ug/L		26-MAR-19	R4585048
Copper (Cu)-Total	<0.00050		0.00050	mg/L		26-MAR-19	R4585048
Iron (Fe)-Total	0.022	RRV	0.010	mg/L		27-MAR-19	R4585464
Lead (Pb)-Total	<0.000050		0.000050	mg/L		26-MAR-19	R4585048
Lithium (Li)-Total	<0.0010		0.0010	mg/L		26-MAR-19	R4585048
Magnesium (Mg)-Total	<0.10		0.10	mg/L		26-MAR-19	R4585048
Manganese (Mn)-Total	0.00014	RRV	0.00010	mg/L		27-MAR-19	R4585464
Molybdenum (Mo)-Total	<0.000050		0.000050	mg/L		26-MAR-19	R4585048
Nickel (Ni)-Total	<0.00050		0.00050	mg/L		26-MAR-19	R4585048
Potassium (K)-Total	<0.050		0.050	mg/L		26-MAR-19	R4585048
Selenium (Se)-Total	<0.050		0.050	ug/L		26-MAR-19	R4585048
Silicon (Si)-Total Silver (Ag)-Total	<0.10		0.10	mg/L		26-MAR-19 26-MAR-19	R4585048
Silver (Ag)-Total Sodium (Na)-Total	<0.000010 <0.050		0.000010 0.050	mg/L mg/l		26-MAR-19 26-MAR-19	R4585048 R4585048
Joulum (Na)-Total	<0.050		0.050	mg/L		20-IVIAR-19	74000047 74000047

<sup>\*</sup> Refer to Referenced Information for Qualifiers (if any) and Methodology.

L2247956 CONTD.... PAGE 10 of 21 Version: FINAL

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2247956-4 WG_Q1-2019_RD1							
Sampled By: K. CAMPBELL/D.TYMSTA on 20-MAR-1	9 @ 15:30						
Matrix: WG	10.00						
Total Metals in Water by CRC ICPMS							
Strontium (Sr)-Total	<0.00020		0.00020	mg/L		26-MAR-19	R4585048
Thallium (TI)-Total	<0.000010		0.000010	mg/L		26-MAR-19	R4585048
Tin (Sn)-Total	<0.00010		0.00010	mg/L		26-MAR-19	R4585048
Titanium (Ti)-Total	<0.010		0.010	mg/L		26-MAR-19	R4585048
Uranium (U)-Total	<0.000010		0.000010	mg/L		26-MAR-19	R4585048
Vanadium (V)-Total	<0.00050		0.00050	mg/L		26-MAR-19	R4585048
Zinc (Zn)-Total	<0.0030		0.0030	mg/L		26-MAR-19	R4585048
Routine for Teck Coal							
Acidity by Automatic Titration Acidity (as CaCO3)	2.2		1.0	mg/L		27-MAR-19	R4586355
Alkalinity (Species) by Manual Titration							
Alkalinity, Bicarbonate (as CaCO3)	<1.0		1.0	mg/L		27-MAR-19	R4585726
Alkalinity, Carbonate (as CaCO3)	<1.0		1.0	mg/L		27-MAR-19	R4585726
Alkalinity, Hydroxide (as CaCO3)	<1.0		1.0	mg/L		27-MAR-19	R4585726
Alkalinity, Total (as CaCO3)	<1.0		1.0	mg/L		27-MAR-19	R4585726
Ammonia, Total (as N) Ammonia as N	0.000	RRV	0.0050	m c /l		20 MAD 40	D4506004
	0.292	KKV	0.0050	mg/L		28-MAR-19	R4586901
Bromide in Water by IC (Low Level) Bromide (Br)	<0.050		0.050	mg/L		22-MAR-19	R4580126
Chloride in Water by IC	<b>VO.000</b>		0.000	9/ =		22 100 110	114000120
Chloride (CI)	<0.50		0.50	mg/L		22-MAR-19	R4580126
Dissolved Metals in Water by CRC ICPMS				· ·			
Dissolved Metals Filtration Location	LAB					28-MAR-19	R4586824
Calcium (Ca)-Dissolved	<0.050		0.050	mg/L		28-MAR-19	R4586986
Magnesium (Mg)-Dissolved	<0.0050		0.0050	mg/L		28-MAR-19	R4586986
Potassium (K)-Dissolved	<0.050		0.050	mg/L		28-MAR-19	R4586986
Sodium (Na)-Dissolved	<0.050		0.050	mg/L		28-MAR-19	R4586986
Electrical Conductivity (EC) Conductivity (@ 25C)	2.7		2.0	uS/cm		27-MAR-19	R4585726
Fluoride in Water by IC	2.1		2.0	do/ciii		ZI-WAR-13	114303720
Fluoride (F)	<0.020		0.020	mg/L		22-MAR-19	R4580126
Ion Balance Calculation							
Cation - Anion Balance	55.0			%		29-MAR-19	
Anion Sum	<0.10			meq/L		29-MAR-19	
Cation Sum	<0.10			meq/L		29-MAR-19	
Ion Balance Calculation Ion Balance	244	RRV	100	%		29-MAR-19	
Nitrate in Water by IC (Low Level)	344	IXIXV	-100	7/0		29-IVIAK-19	
Nitrate in water by ic (Low Level) Nitrate (as N)	0.125	RRV	0.0050	mg/L		22-MAR-19	R4580126
Nitrite in Water by IC (Low Level)	325		2.2000	·· <i>-</i>			
Nitrite (as N)	<0.0010		0.0010	mg/L		22-MAR-19	R4580126
Orthophosphate-Dissolved (as P)							
Orthophosphate-Dissolved (as P)	<0.0010		0.0010	mg/L		22-MAR-19	R4580026
Oxidation redution potential by elect.	400		4000	ma\ /		26 MAD 40	D4505050
ORP	423		-1000	mV		26-MAR-19	R4585058
Phosphorus (P)-Total Phosphorus (P)-Total	0.0033		0.0020	mg/L		27-MAR-19	R4584910
Sulfate in Water by IC	0.0000		0.0020	9/ ⊏			1.4004010
Sulfate (SO4)	<0.30		0.30	mg/L		22-MAR-19	R4580126
Total Dissolved Solids							
Total Dissolved Solids	<10		10	mg/L		27-MAR-19	R4586266
Total Suspended Solids							

<sup>\*</sup> Refer to Referenced Information for Qualifiers (if any) and Methodology.

L2247956 CONTD.... PAGE 11 of 21 Version: FINAL

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2247956-4 WG Q1-2019 RD1							
Sampled By: K. CAMPBELL/D.TYMSTA on 20-MAR-1	9 @ 15:30						
Matrix: WG	0 @ 10.00						
<b>Total Suspended Solids</b> Total Suspended Solids	<1.0		1.0	mg/L		26-MAR-19	R4585537
<b>Turbidity</b> Turbidity	<0.10		0.10	NTU		22-MAR-19	R4580128
pH	<0.10		0.10	INTO		22-101/(10-19	N4300120
рН	5.01		0.10	рН		27-MAR-19	R4585726
L2247956-5 LC_PIZDC1307_WG_Q1-2019_NP							
Sampled By: K. CAMPBELL/D.TYMSTA on 21-MAR-1	9 @ 15:15						
Matrix: WG							
Miscellaneous Parameters							
Dissolved Organic Carbon	1.74		0.50	mg/L		29-MAR-19	R4587742
Total Kjeldahl Nitrogen	0.284		0.050	mg/L		27-MAR-19	R4586513
Total Organic Carbon	1.62		0.50	mg/L		29-MAR-19	R4587742
Dissolved Metals in Water				<u> </u>			
Diss. Be (low) in Water by CRC ICPMS							
Beryllium (Be)-Dissolved	<0.020		0.020	ug/L	26-MAR-19	26-MAR-19	R4585048
Dissolved Metals Filtration Location	FIELD					26-MAR-19	R4582794
Diss. Mercury in Water by CVAAS or CVAFS							
Mercury (Hg)-Dissolved	<0.000050		0.0000050	mg/L	27-MAR-19	27-MAR-19	R4585481
Dissolved Mercury Filtration Location	FIELD					27-MAR-19	R4585281
Dissolved Metals in Water by CRC ICPMS	5151.5					00 144 D 40	D 4500704
Dissolved Metals Filtration Location	FIELD		0.0000	/1	00 MAD 40	26-MAR-19	R4582794
Aluminum (AI)-Dissolved Antimony (Sb)-Dissolved	<0.0030 <0.00010		0.0030 0.00010	mg/L	26-MAR-19 26-MAR-19	26-MAR-19 26-MAR-19	R4585048 R4585048
Arsenic (As)-Dissolved	0.00010		0.00010	mg/L mg/L	26-MAR-19	26-MAR-19	R4585048
Barium (Ba)-Dissolved	1.42		0.00010	mg/L	26-MAR-19	26-MAR-19	R4585048
Bismuth (Bi)-Dissolved	<0.000050		0.00010	mg/L	26-MAR-19	26-MAR-19	R4585048
Boron (B)-Dissolved	0.023		0.010	mg/L	26-MAR-19	26-MAR-19	R4585048
Cadmium (Cd)-Dissolved	<0.010	DLM	0.010	ug/L	26-MAR-19	26-MAR-19	R4585048
Calcium (Ca)-Dissolved	39.3		0.050	mg/L	26-MAR-19	26-MAR-19	R4585048
Chromium (Cr)-Dissolved	<0.00010		0.00010	mg/L	26-MAR-19	26-MAR-19	R4585048
Cobalt (Co)-Dissolved	<0.10		0.10	ug/L	26-MAR-19	26-MAR-19	R4585048
Copper (Cu)-Dissolved	0.00578		0.00050	mg/L	26-MAR-19	26-MAR-19	R4585048
Iron (Fe)-Dissolved	0.124		0.010	mg/L	26-MAR-19	26-MAR-19	R4585048
Lead (Pb)-Dissolved	0.000234		0.000050	mg/L	26-MAR-19	26-MAR-19	R4585048
Lithium (Li)-Dissolved	0.0752		0.0010	mg/L	26-MAR-19	26-MAR-19	R4585048
Magnesium (Mg)-Dissolved	20.8		0.10	mg/L	26-MAR-19	26-MAR-19	R4585048
Manganese (Mn)-Dissolved	0.00927		0.00010	mg/L	26-MAR-19	26-MAR-19	R4585048
Molybdenum (Mo)-Dissolved	0.0314		0.000050	mg/L	26-MAR-19	26-MAR-19	R4585048
Nickel (Ni)-Dissolved	0.00069		0.00050	mg/L	26-MAR-19	26-MAR-19	R4585048
Potassium (K)-Dissolved	5.23		0.050	mg/L	26-MAR-19	26-MAR-19	R4585048
Selenium (Se)-Dissolved	<0.050		0.050	ug/L	26-MAR-19	26-MAR-19	R4585048
Silicon (Si)-Dissolved	2.68		0.050	mg/L	26-MAR-19	26-MAR-19	R4585048
Silver (Ag)-Dissolved	<0.000010		0.000010	mg/L	26-MAR-19	26-MAR-19	R4585048
Sodium (Na)-Dissolved Strontium (Sr)-Dissolved	14.7		0.050	mg/L	26-MAR-19 26-MAR-19	26-MAR-19 26-MAR-19	R4585048
Thallium (TI)-Dissolved	0.137 <0.000010		0.00020 0.000010	mg/L	26-MAR-19 26-MAR-19	26-MAR-19 26-MAR-19	R4585048
Tin (Sn)-Dissolved	<0.00010		0.000010	mg/L mg/L	26-MAR-19	26-MAR-19	R4585048 R4585048
Titanium (Ti)-Dissolved	<0.010		0.00010	mg/L	26-MAR-19	26-MAR-19	R4585048
Uranium (U)-Dissolved	0.000056		0.010	mg/L	26-MAR-19	26-MAR-19	R4585048
Vanadium (V)-Dissolved	<0.00050		0.00050	mg/L	26-MAR-19	26-MAR-19	R4585048
Zinc (Zn)-Dissolved	0.0079		0.00030	mg/L	26-MAR-19	26-MAR-19	R4585048

<sup>\*</sup> Refer to Referenced Information for Qualifiers (if any) and Methodology.

L2247956 CONTD.... PAGE 12 of 21 Version: FINAL

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
   L2247956-5							
Sampled By: K. CAMPBELL/D.TYMSTA on 21-MAR-1	9 @ 15:15						
Matrix: WG							
Hardness	404		0.50			27-MAR-19	
Hardness (as CaCO3)  Total Metals in Water	184		0.50	mg/L		27-MAK-19	
Routine for Teck Coal							
Acidity by Automatic Titration Acidity (as CaCO3)	2.3		1.0	mg/L		27-MAR-19	R4586355
Alkalinity (Species) by Manual Titration				,,		07.144.5.40	
Alkalinity, Bicarbonate (as CaCO3) Alkalinity, Carbonate (as CaCO3)	224 <1.0		1.0 1.0	mg/L mg/L		27-MAR-19 27-MAR-19	R4585726 R4585726
Alkalinity, Hydroxide (as CaCO3)	<1.0		1.0	mg/L		27-MAR-19	R4585726
Alkalinity, Total (as CaCO3)	224		1.0	mg/L		27-MAR-19	R4585726
Ammonia, Total (as N) Ammonia as N	0.0000		0.0050	/1		00 MAD 40	D 4500004
Bromide in Water by IC (Low Level)	0.0980		0.0050	mg/L		28-MAR-19	R4586901
Bromide (Br)	<0.050		0.050	mg/L		22-MAR-19	R4580126
Chloride in Water by IC Chloride (Cl)	<0.50		0.50	mg/L		22-MAR-19	R4580126
Electrical Conductivity (EC)	10.00		0.00	y/ =			13-000120
Conductivity (@ 25C)	396		2.0	uS/cm		27-MAR-19	R4585726
Fluoride in Water by IC Fluoride (F)	0.602		0.020	mg/L		22-MAR-19	R4580126
Ion Balance Calculation	0.002		0.020	9/=			1.1000120
Cation - Anion Balance	-0.6			%		28-MAR-19	
Anion Sum Cation Sum	4.51			meq/L		28-MAR-19 28-MAR-19	
Ion Balance Calculation	4.45			meq/L		20-IVIAR-19	
Ion Balance	98.7		-100	%		28-MAR-19	
Nitrate in Water by IC (Low Level) Nitrate (as N)	<0.0050		0.0050	mg/L		22-MAR-19	R4580126
Nitrite in Water by IC (Low Level) Nitrite (as N)	0.0018		0.0010	mg/L		22-MAR-19	R4580126
Orthophosphate-Dissolved (as P)	0.0018		0.0010	IIIg/L		22-WAIX-13	K4500120
Orthophosphate-Dissolved (as P)	<0.0010		0.0010	mg/L		22-MAR-19	R4580026
Oxidation redution potential by elect. ORP	444		4000	m\/		26 MAD 40	DAESESS
Phosphorus (P)-Total	441		-1000	mV		26-MAR-19	R4585058
Phosphorus (P)-Total	0.0454		0.0020	mg/L		27-MAR-19	R4584910
Sulfate in Water by IC Sulfate (SO4)	<0.30		0.30	mg/L		22-MAR-19	R4580126
Total Dissolved Solids Total Dissolved Solids	207	DLHC	20	mg/L		27-MAR-19	R4586266
Total Suspended Solids	201		20				
Total Suspended Solids	23.2		1.0	mg/L		28-MAR-19	R4587072
<b>Turbidity</b> Turbidity	40.2		0.10	NTU		22-MAR-19	R4580128
<b>pH</b> pH	8.27		0.10	рН		27-MAR-19	R4585726
L2247956-6 LC_PIZDC1308_WG_Q1-2019_NP							
Sampled By: K. CAMPBELL/D.TYMSTA on 21-MAR-1	9 @ 12:30						
Matrix: WG Miscellaneous Parameters							
Dissolved Organic Carbon	2.02		0.50	mg/L		29-MAR-19	R4587742
Total Kjeldahl Nitrogen	0.101		0.050	mg/L		27-MAR-19	R4586513
. S.a. Hjordam (Mrogon	0.101		0.000	g/L			117000010

<sup>\*</sup> Refer to Referenced Information for Qualifiers (if any) and Methodology.

L2247956 CONTD.... PAGE 13 of 21 Version: FINAL

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2247956-6 LC PIZDC1308 WG Q1-2019 NP							
Sampled By: K. CAMPBELL/D.TYMSTA on 21-MAR-1	n @ 12·30						
' '	9 @ 12.50						
Matrix: WG							
Total Organic Carbon	1.85		0.50	mg/L		29-MAR-19	R4587742
Dissolved Metals in Water							
Diss. Be (low) in Water by CRC ICPMS				//	00 144 5 40	00 144 5 40	
Beryllium (Be)-Dissolved	<0.020		0.020	ug/L	26-MAR-19	26-MAR-19	R4585048
Dissolved Metals Filtration Location	FIELD					26-MAR-19	R4582794
Diss. Mercury in Water by CVAAS or CVAFS Mercury (Hg)-Dissolved	0.0000050		0.0000000	a/I	27 MAD 40	07 MAD 40	D4505404
Dissolved Mercury Filtration Location	<0.000050 FIELD		0.0000050	mg/L	27-MAR-19	27-MAR-19 27-MAR-19	R4585481
•	FIELD					27-WAK-19	R4585281
Dissolved Metals in Water by CRC ICPMS Dissolved Metals Filtration Location	FIELD					26-MAR-19	R4582794
Aluminum (Al)-Dissolved	<0.0030		0.0030	mg/L	26-MAR-19	26-MAR-19	R4585048
Antimony (Sb)-Dissolved	<0.00010		0.00010	mg/L	26-MAR-19	26-MAR-19	R4585048
Arsenic (As)-Dissolved	0.00038		0.00010	mg/L	26-MAR-19	26-MAR-19	R4585048
Barium (Ba)-Dissolved	0.558		0.00010	mg/L	26-MAR-19	26-MAR-19	R4585048
Bismuth (Bi)-Dissolved	<0.00050		0.000050	mg/L	26-MAR-19	26-MAR-19	R4585048
Boron (B)-Dissolved	0.012		0.010	mg/L	26-MAR-19	26-MAR-19	R4585048
Cadmium (Cd)-Dissolved	0.0059		0.0050	ug/L	26-MAR-19	26-MAR-19	R4585048
Calcium (Ca)-Dissolved	81.5		0.050	mg/L	26-MAR-19	26-MAR-19	R4585048
Chromium (Cr)-Dissolved	<0.00010		0.00010	mg/L	26-MAR-19	26-MAR-19	R4585048
Cobalt (Co)-Dissolved	1.67		0.10	ug/L	26-MAR-19	26-MAR-19	R4585048
Copper (Cu)-Dissolved	<0.00050		0.00050	mg/L	26-MAR-19	26-MAR-19	R4585048
Iron (Fe)-Dissolved	1.44		0.010	mg/L	26-MAR-19	26-MAR-19	R4585048
Lead (Pb)-Dissolved	<0.000050		0.000050	mg/L	26-MAR-19	26-MAR-19	R4585048
Lithium (Li)-Dissolved	0.0131		0.0010	mg/L	26-MAR-19	26-MAR-19	R4585048
Magnesium (Mg)-Dissolved	26.6		0.10	mg/L	26-MAR-19	26-MAR-19	R4585048
Manganese (Mn)-Dissolved	0.117		0.00010	mg/L	26-MAR-19	26-MAR-19	R4585048
Molybdenum (Mo)-Dissolved	0.00403		0.000050	mg/L	26-MAR-19	26-MAR-19	R4585048
Nickel (Ni)-Dissolved	0.00330		0.00050	mg/L	26-MAR-19	26-MAR-19	R4585048
Potassium (K)-Dissolved	2.58		0.050	mg/L	26-MAR-19	26-MAR-19	R4585048
Selenium (Se)-Dissolved	<0.050		0.050	ug/L	26-MAR-19	26-MAR-19	R4585048
Silicon (Si)-Dissolved	4.31		0.050	mg/L	26-MAR-19	26-MAR-19	R4585048
Silver (Ag)-Dissolved	<0.000010		0.000010	mg/L	26-MAR-19	26-MAR-19	R4585048
Sodium (Na)-Dissolved	3.36		0.050	mg/L	26-MAR-19	26-MAR-19	R4585048
Strontium (Sr)-Dissolved	0.120		0.00020	mg/L	26-MAR-19	26-MAR-19	R4585048
Thallium (TI)-Dissolved	0.000037		0.000010	mg/L	26-MAR-19	26-MAR-19	R4585048
Tin (Sn)-Dissolved	<0.00010		0.00010	mg/L	26-MAR-19	26-MAR-19 26-MAR-19	R4585048
Titanium (Ti)-Dissolved	<0.010		0.010	mg/L	26-MAR-19		R4585048
Uranium (U)-Dissolved Vanadium (V)-Dissolved	0.00107		0.000010 0.00050	mg/L	26-MAR-19 26-MAR-19	26-MAR-19 26-MAR-19	R4585048
Zinc (Zn)-Dissolved	<0.00050 0.0030		0.00050	mg/L mg/L	26-MAR-19	26-MAR-19	R4585048 R4585048
Hardness	0.0030		0.0010	mg/L	20-IVIAIN-19	20-IVIAIX-19	114505040
Hardness (as CaCO3)	313		0.50	mg/L		27-MAR-19	
Total Metals in Water			0.50	∌, ⊏			
Total Be (Low) in Water by CRC ICPMS							
Beryllium (Be)-Total	<0.020		0.020	ug/L		26-MAR-19	R4585048
Total Metals in Water by CRC ICPMS	0.0400		0.0000	m e:/l		26 MAD 40	D4505040
Aluminum (Al)-Total	0.0483		0.0030	mg/L		26-MAR-19	R4585048
Antimony (Sb)-Total Arsenic (As)-Total	<0.00010		0.00010	mg/L		26-MAR-19	R4585048
Barium (Ba)-Total	0.00041		0.00010	mg/L		26-MAR-19	R4585048
Bismuth (Bi)-Total	0.573		0.00010	mg/L		26-MAR-19 26-MAR-19	R4585048
Boron (B)-Total	<0.000050 0.012		0.000050 0.010	mg/L mg/L		26-MAR-19	R4585048 R4585048
Cadmium (Cd)-Total	0.0481		0.010	ug/L		26-MAR-19	R4585048
Gaumum (Gu)-10lai	U.U46T	1	UCUU.U	ug/L		20-WAR-19	174000048

<sup>\*</sup> Refer to Referenced Information for Qualifiers (if any) and Methodology.

L2247956 CONTD.... PAGE 14 of 21 Version: FINAL

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2247956-6 LC_PIZDC1308_WG_Q1-2019_NP							
Sampled By: K. CAMPBELL/D.TYMSTA on 21-MAR-1	9 @ 12:30						
Matrix: WG	0 @ 12.00						
Total Metals in Water by CRC ICPMS							
Calcium (Ca)-Total	82.1		0.050	mg/L		26-MAR-19	R4585048
Chromium (Cr)-Total	0.00017		0.00010	mg/L		26-MAR-19	R4585048
Cobalt (Co)-Total	1.70		0.10	ug/L		26-MAR-19	R4585048
Copper (Cu)-Total	<0.00050		0.00050	mg/L		26-MAR-19	R4585048
Iron (Fe)-Total	1.41		0.010	mg/L		26-MAR-19	R4585048
Lead (Pb)-Total	0.000059		0.000050	mg/L		26-MAR-19	R4585048
Lithium (Li)-Total	0.0126		0.0010	mg/L		26-MAR-19	R4585048
Magnesium (Mg)-Total	27.5		0.10	mg/L		26-MAR-19	R4585048
Manganese (Mn)-Total	0.117		0.00010	mg/L		26-MAR-19	R4585048
Molybdenum (Mo)-Total	0.00387		0.000050	mg/L		26-MAR-19	R4585048
Nickel (Ni)-Total	0.00362		0.00050	mg/L		26-MAR-19	R4585048
Potassium (K)-Total	2.59		0.050	mg/L		26-MAR-19	R4585048
Selenium (Se)-Total	0.065		0.050	ug/L		26-MAR-19	R4585048
Silicon (Si)-Total	4.62		0.10	mg/L		26-MAR-19	R4585048
Silver (Ag)-Total	<0.000010		0.000010	mg/L		26-MAR-19	R4585048
Sodium (Na)-Total	3.31		0.050	mg/L		26-MAR-19	R4585048
Strontium (Sr)-Total	0.117		0.00020	mg/L		26-MAR-19	R4585048
Thallium (TI)-Total	0.000040		0.000010	mg/L		26-MAR-19	R4585048
Tin (Sn)-Total Titanium (Ti)-Total	<0.00010		0.00010	mg/L		26-MAR-19	R4585048
Uranium (U)-Total	<0.010		0.010	mg/L		26-MAR-19 26-MAR-19	R4585048
Vanadium (V)-Total	0.00114 <0.00050		0.000010 0.00050	mg/L mg/L		26-MAR-19	R4585048 R4585048
Zinc (Zn)-Total	0.0032		0.00030	mg/L		26-MAR-19	R4585048
Routine for Teck Coal	0.0032		0.0030	IIIg/L		20-WAR-19	K4363046
Acidity by Automatic Titration							
Acidity (as CaCO3)	4.5		1.0	mg/L		27-MAR-19	R4586355
Alkalinity (Species) by Manual Titration Alkalinity, Bicarbonate (as CaCO3)	220		4.0	m a/l		27 MAD 40	D4505700
Alkalinity, Carbonate (as CaCO3)	326 <1.0		1.0 1.0	mg/L		27-MAR-19 27-MAR-19	R4585726
Alkalinity, Garbonate (as CaCO3)  Alkalinity, Hydroxide (as CaCO3)	<1.0		1.0	mg/L mg/L		27-MAR-19	R4585726 R4585726
Alkalinity, Trydroxide (as CaCO3)  Alkalinity, Total (as CaCO3)	326		1.0	mg/L		27-MAR-19	R4585726
Ammonia, Total (as N)	320		1.0	mg/L		Z7 WART	114303720
Ammonia as N	0.0336		0.0050	mg/L		28-MAR-19	R4586901
Bromide in Water by IC (Low Level)	0.0000		0.000				
Bromide (Br)	<0.050		0.050	mg/L		22-MAR-19	R4580126
Chloride in Water by IC							
Chloride (CI)	0.74		0.50	mg/L		22-MAR-19	R4580126
Electrical Conductivity (EC) Conductivity (@ 25C)	570		2.0	uS/cm		27-MAR-19	R4585726
Fluoride in Water by IC	370		2.0	45/0111		2. 707.413	11-000120
Fluoride (F)	0.219		0.020	mg/L		22-MAR-19	R4580126
Ion Balance Calculation Ion Balance	98.4		-100	%		28-MAR-19	
Ion Balance Calculation	30.4		100	,0			
Cation - Anion Balance	-0.8			%		28-MAR-19	
Anion Sum	6.66			meq/L		28-MAR-19	
Cation Sum	6.55			meq/L		28-MAR-19	
Nitrate in Water by IC (Low Level) Nitrate (as N)	<0.0050		0.0050	mg/L		22-MAR-19	R4580126
Nitrite in Water by IC (Low Level)	<0.0050		0.0050	ilig/L		22-IVIAIX-19	114000120
Nitrite (as N)	0.0021		0.0010	mg/L		22-MAR-19	R4580126
Orthophosphate-Dissolved (as P)							

<sup>\*</sup> Refer to Referenced Information for Qualifiers (if any) and Methodology.

L2247956 CONTD.... PAGE 15 of 21 Version: FINAL

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2247956-6 LC_PIZDC1308_WG_Q1-2019_NP							
Sampled By: K. CAMPBELL/D.TYMSTA on 21-MAR-1	9 @ 12:30						
Matrix: WG	12.00						
Orthophosphate-Dissolved (as P) Orthophosphate-Dissolved (as P)	<0.0010		0.0010	mg/L		22-MAR-19	R4580026
Oxidation redution potential by elect.	<0.0010		0.0010	mg/L		22 107 (1 ( 1 )	114300020
ORP	328		-1000	mV		26-MAR-19	R4585058
Phosphorus (P)-Total							
Phosphorus (P)-Total	0.0083		0.0020	mg/L		27-MAR-19	R4584910
Sulfate in Water by IC							
Sulfate (SO4)	5.13		0.30	mg/L		22-MAR-19	R4580126
Total Dissolved Solids							
Total Dissolved Solids	301	DLHC	20	mg/L		27-MAR-19	R4586266
Total Suspended Solids	4.7		4.0	/1		00 MAD 40	D 4507070
Total Suspended Solids	4.7		1.0	mg/L		28-MAR-19	R4587072
<b>Turbidity</b> Turbidity	19.5		0.10	NTU		22-MAR-19	R4580128
pH	19.0		0.10	1410		22 W/AIX-19	114000120
pH	8.00		0.10	рН		27-MAR-19	R4585726
L2247956-7 WG_Q1-2019_CC1				1.77			
Sampled By: K. CAMPBELL/D.TYMSTA on 21-MAR-1	n @ 12·35						
, ,	9 @ 12.33						
Matrix: WG Miscellaneous Parameters							
Dissolved Organic Carbon	4.00		0.50	ma/l		29-MAR-19	R4587742
C	1.92		0.50	mg/L			
Total Kjeldahl Nitrogen	0.107		0.050	mg/L		27-MAR-19	R4586513
Total Organic Carbon  Dissolved Metals in Water	1.67		0.50	mg/L		29-MAR-19	R4587742
Diss. Be (low) in Water by CRC ICPMS Beryllium (Be)-Dissolved	<0.020		0.020	ug/L	26-MAR-19	26-MAR-19	R4585048
Dissolved Metals Filtration Location	FIELD		0.020	ug/ L	20 101/11 10	26-MAR-19	R4582794
Diss. Mercury in Water by CVAAS or CVAFS	11220					20 100 110	114002704
Mercury (Hg)-Dissolved	<0.000050		0.0000050	mg/L	27-MAR-19	27-MAR-19	R4585481
Dissolved Mercury Filtration Location	FIELD			Ü		27-MAR-19	R4585281
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	FIELD					26-MAR-19	R4582794
Aluminum (AI)-Dissolved	<0.0030		0.0030	mg/L	26-MAR-19	26-MAR-19	R4585048
Antimony (Sb)-Dissolved	<0.00010		0.00010	mg/L	26-MAR-19	26-MAR-19	R4585048
Arsenic (As)-Dissolved	0.00039		0.00010	mg/L	26-MAR-19	26-MAR-19	R4585048
Barium (Ba)-Dissolved	0.570		0.00010	mg/L	26-MAR-19	26-MAR-19	R4585048
Bismuth (Bi)-Dissolved	<0.000050		0.000050	mg/L	26-MAR-19	26-MAR-19	R4585048
Boron (B)-Dissolved	0.011		0.010	mg/L	26-MAR-19	26-MAR-19	R4585048
Cadmium (Cd)-Dissolved	0.0055		0.0050	ug/L	26-MAR-19	26-MAR-19	R4585048
Calcium (Ca)-Dissolved	82.4		0.050	mg/L	26-MAR-19	26-MAR-19	R4585048
Chromium (Cr)-Dissolved	<0.00010		0.00010	mg/L	26-MAR-19	26-MAR-19	R4585048
Cobalt (Co)-Dissolved	1.69		0.10	ug/L	26-MAR-19	26-MAR-19	R4585048
Copper (Cu)-Dissolved	<0.00050		0.00050	mg/L	26-MAR-19 26-MAR-19	26-MAR-19 26-MAR-19	R4585048
Iron (Fe)-Dissolved Lead (Pb)-Dissolved	1.45 <0.000050		0.010 0.000050	mg/L mg/l	26-MAR-19 26-MAR-19	26-MAR-19 26-MAR-19	R4585048 R4585048
Lithium (Li)-Dissolved	0.0129		0.000050	mg/L mg/L	26-MAR-19	26-MAR-19	R4585048
Magnesium (Mg)-Dissolved	27.8		0.0010	mg/L	26-MAR-19	26-MAR-19	R4585048
Manganese (Mn)-Dissolved	0.120		0.00010	mg/L	26-MAR-19	26-MAR-19	R4585048
Molybdenum (Mo)-Dissolved	0.00397		0.00010	mg/L	26-MAR-19	26-MAR-19	R4585048
Nickel (Ni)-Dissolved	0.00336		0.00050	mg/L	26-MAR-19	26-MAR-19	R4585048
Potassium (K)-Dissolved	2.62		0.050	mg/L	26-MAR-19	26-MAR-19	R4585048

<sup>\*</sup> Refer to Referenced Information for Qualifiers (if any) and Methodology.

L2247956 CONTD.... PAGE 16 of 21 Version: FINAL

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2247956-7 WG_Q1-2019_CC1							
Sampled By: K. CAMPBELL/D.TYMSTA on 21-MAR-1	19 @ 12:35						
Matrix: WG	.5 3 .2.66						
Dissolved Metals in Water by CRC ICPMS							
Silicon (Si)-Dissolved	4.50		0.050	mg/L	26-MAR-19	26-MAR-19	R4585048
Silver (Ag)-Dissolved	<0.000010		0.000010	mg/L	26-MAR-19	26-MAR-19	R4585048
Sodium (Na)-Dissolved	3.38		0.050	mg/L	26-MAR-19	26-MAR-19	R4585048
Strontium (Sr)-Dissolved	0.121		0.00020	mg/L	26-MAR-19	26-MAR-19	R4585048
Thallium (TI)-Dissolved	0.000034		0.000010	mg/L	26-MAR-19	26-MAR-19	R4585048
Tin (Sn)-Dissolved	<0.00010		0.00010	mg/L	26-MAR-19	26-MAR-19	R4585048
Titanium (Ti)-Dissolved	<0.010		0.010	mg/L	26-MAR-19	26-MAR-19	R4585048
Uranium (U)-Dissolved	0.00111		0.000010	mg/L	26-MAR-19	26-MAR-19	R4585048
Vanadium (V)-Dissolved	<0.00050		0.00050	mg/L	26-MAR-19	26-MAR-19	R4585048
Zinc (Zn)-Dissolved	0.0028		0.0010	mg/L	26-MAR-19	26-MAR-19	R4585048
Hardness							
Hardness (as CaCO3)	320		0.50	mg/L		27-MAR-19	
Total Metals in Water							
Total Be (Low) in Water by CRC ICPMS	-0.000		0.000	ue/I		26 MAD 40	D4505040
Beryllium (Be)-Total	<0.020		0.020	ug/L		26-MAR-19	R4585048
Total Mercury in Water by CVAAS or CVAFS Mercury (Hg)-Total	<0.000050		0.0000050	mg/L		26-MAR-19	R4583050
Total Metals in Water by CRC ICPMS	<0.0000030		0.0000000	mg/L		20 WAR 13	114303030
Aluminum (Al)-Total	0.0951		0.0030	mg/L		26-MAR-19	R4585048
Antimony (Sb)-Total	<0.00010		0.00010	mg/L		26-MAR-19	R4585048
Arsenic (As)-Total	0.00044		0.00010	mg/L		26-MAR-19	R4585048
Barium (Ba)-Total	0.571		0.00010	mg/L		26-MAR-19	R4585048
Bismuth (Bi)-Total	<0.000050		0.000050	mg/L		26-MAR-19	R4585048
Boron (B)-Total	0.012		0.010	mg/L		26-MAR-19	R4585048
Cadmium (Cd)-Total	0.0587		0.0050	ug/L		26-MAR-19	R4585048
Calcium (Ca)-Total	84.0		0.050	mg/L		26-MAR-19	R4585048
Chromium (Cr)-Total	0.00024		0.00010	mg/L		26-MAR-19	R4585048
Cobalt (Co)-Total	1.74		0.10	ug/L		26-MAR-19	R4585048
Copper (Cu)-Total	<0.00050		0.00050	mg/L		26-MAR-19	R4585048
Iron (Fe)-Total	1.45		0.010	mg/L		26-MAR-19	R4585048
Lead (Pb)-Total	0.000088		0.000050	mg/L		26-MAR-19	R4585048
Lithium (Li)-Total	0.0136		0.0010	mg/L		26-MAR-19	R4585048
Magnesium (Mg)-Total	27.5		0.10	mg/L		26-MAR-19	R4585048
Manganese (Mn)-Total	0.119		0.00010	mg/L		26-MAR-19	R4585048
Molybdenum (Mo)-Total	0.00414		0.000050	mg/L		26-MAR-19 26-MAR-19	R4585048
Nickel (Ni)-Total Potassium (K)-Total	0.00369 2.62		0.00050 0.050	mg/L mg/L		26-MAR-19	R4585048 R4585048
Selenium (Se)-Total	0.097		0.050	ug/L		26-MAR-19	R4585048
Silicon (Si)-Total	4.80		0.030	mg/L		26-MAR-19	R4585048
Silver (Ag)-Total	<0.000010		0.000010	mg/L		26-MAR-19	R4585048
Sodium (Na)-Total	3.53		0.050	mg/L		26-MAR-19	R4585048
Strontium (Sr)-Total	0.120		0.00020	mg/L		26-MAR-19	R4585048
Thallium (TI)-Total	0.000039		0.000010	mg/L		26-MAR-19	R4585048
Tin (Sn)-Total	<0.00010		0.00010	mg/L		26-MAR-19	R4585048
Titanium (Ti)-Total	<0.010		0.010	mg/L		26-MAR-19	R4585048
Uranium (U)-Total	0.00114		0.000010	mg/L		26-MAR-19	R4585048
Vanadium (V)-Total	<0.00050		0.00050	mg/L		26-MAR-19	R4585048
Zinc (Zn)-Total	0.0033		0.0030	mg/L		26-MAR-19	R4585048
Routine for Teck Coal							
Acidity by Automatic Titration Acidity (as CaCO3)	8.0		1.0	mg/L		27-MAR-19	R4586355
Alkalinity (Species) by Manual Titration							

<sup>\*</sup> Refer to Referenced Information for Qualifiers (if any) and Methodology.

L2247956 CONTD.... PAGE 17 of 21 Version: FINAL

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2247956-7 WG_Q1-2019_CC1							
Sampled By: K. CAMPBELL/D.TYMSTA on 21-MAR-1	9 @ 12:35						
Matrix: WG							
Alkalinity (Species) by Manual Titration							
Alkalinity, Bicarbonate (as CaCO3)	321		1.0	mg/L		27-MAR-19	R4585726
Alkalinity, Carbonate (as CaCO3)	<1.0		1.0	mg/L		27-MAR-19	R4585726
Alkalinity, Hydroxide (as CaCO3) Alkalinity, Total (as CaCO3)	<1.0 321		1.0 1.0	mg/L mg/L		27-MAR-19 27-MAR-19	R4585726 R4585726
Ammonia, Total (as N)	321		1.0	IIIg/L		27-WAK-19	K4363720
Ammonia as N	0.0132		0.0050	mg/L		28-MAR-19	R4586901
Bromide in Water by IC (Low Level)	0.050		0.050			00 MAD 40	D.4500400
Bromide (Br) Chloride in Water by IC	<0.050		0.050	mg/L		22-MAR-19	R4580126
Chloride (Cl)	0.72		0.50	mg/L		22-MAR-19	R4580126
Electrical Conductivity (EC)							
Conductivity (@ 25C)	562		2.0	uS/cm		27-MAR-19	R4585726
Fluoride in Water by IC	0.240		0.020	ma/l		22 MAD 40	D4500406
Fluoride (F) Ion Balance Calculation	0.210		0.020	mg/L		22-MAR-19	R4580126
Ion Balance	102		-100	%		28-MAR-19	
Ion Balance Calculation				2.		00.1115	
Cation - Anion Balance Anion Sum	1.0 6.56			% meg/L		28-MAR-19 28-MAR-19	
Cation Sum	6.69			meq/L		28-MAR-19	
Nitrate in Water by IC (Low Level)	0.00					20	
Nitrate (as N)	<0.0050		0.0050	mg/L		22-MAR-19	R4580126
Nitrite in Water by IC (Low Level) Nitrite (as N)	0.0016		0.0010	mg/L		22-MAR-19	R4580126
Orthophosphate-Dissolved (as P) Orthophosphate-Dissolved (as P)	<0.0010		0.0010	mg/L		22-MAR-19	R4580026
Oxidation redution potential by elect. ORP	377		-1000	mV		26-MAR-19	R4585058
Phosphorus (P)-Total Phosphorus (P)-Total	0.0077		0.0020	mg/L		27-MAR-19	R4584910
Sulfate in Water by IC Sulfate (SO4)	5.05		0.30	mg/L		22-MAR-19	R4580126
Total Dissolved Solids	205	Dillo	22	w P		07.144.5.46	D.4500000
Total Dissolved Solids  Total Suspended Solids	305	DLHC	20	mg/L		27-MAR-19	R4586266
Total Suspended Solids Total Suspended Solids	5.7		1.0	mg/L		28-MAR-19	R4587072
Turbidity	40.0		0.40	NIT!!		00 MAD 40	D4500400
Turbidity <b>pH</b>	19.6		0.10	NTU		22-MAR-19	R4580128
рН рН	8.06		0.10	pН		27-MAR-19	R4585726

<sup>\*</sup> Refer to Referenced Information for Qualifiers (if any) and Methodology.

**Reference Information** 

PAGE 18 of 21 Version: FINAL

#### **Qualifiers for Sample Submission Listed:**

Qualifier	Description
LPML	ALL T-METAL SUBSAMPLED AND PRESERVED AT THE LAB DUE TO SAMPLES NOT RECEIVED - Lab-Preserved for Total Metals. Sample received with pH > 2 and preserved at the lab. Total Metals results may be biased low.
SFPL	-3 DOC/DMETAL/DHG FITLERED AND PRESERVED AT THE LAB; -4 D CATIONS FITLERED AND PRESERVED AT THE LAB Sample was Filtered and Preserved at the laboratory

#### **Qualifiers for Individual Samples Listed:**

Sample Numbe	Client ID	Qualifier	Description
L2247956-3	WG_Q1-2019_MT1	WSMD	Water sample(s) for dissolved mercury analysis was not submitted in glass or PTFE container with HCl preservative. Results may be biased low.

#### Sample Parameter Qualifier Key:

Qualifier	Description
DLHC	Detection Limit Raised: Dilution required due to high concentration of test analyte(s).
DLM	Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).
DTC	Dissolved concentration exceeds total. Results were confirmed by re-analysis.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RRV	Reported Result Verified By Repeat Analysis

#### **Test Method References:**

ALS Test Code	Matrix	Test Description	Method Reference**
ACIDITY-PCT-CL	Water	Acidity by Automatic Titration	APHA 2310 Acidity

This analysis is carried out using procedures adapted from APHA Method 2310 "Acidity". Acidity is determined by potentiometric titration to a specified endpoint.

ALK-MAN-CL Water Alkalinity (Species) by Manual Titration APHA 2320 ALKALINITY

This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.

BE-D-L-CCMS-VA Water Diss. Be (low) in Water by CRC ICPMS APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

BE-T-L-CCMS-VA Water Total Be (Low) in Water by CRC ICPMS EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

BR-L-IC-N-CL Water Bromide in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

C-DIS-ORG-LOW-CL Water Dissolved Organic Carbon APHA 5310 B-Instrumental

This method is applicable to the analysis of ground water, wastewater, and surface water samples. The form detected depends upon sample pretreatment: Unfiltered sample = TC, 0.45um filtered = TDC. Samples are injected into a combustion tube containing an oxidation catalyst. The carrier gas containing the combustion product from the combustion tube flows through an inorganic carbon reactor vessel and is then sent through a halogen scrubber into a sample cell set in a non-dispersive infrared gas analyzer (NDIR) where carbon dioxide is detected. For total inorganic carbon and dissolved inorganic carbon, the sample is injected into an IC reactor vessel where only the IC component is decomposed to become carbon dioxide.

The peak area generated by the NDIR indicates the TC/TDC or TIC/DIC as applicable. The total organic carbon content of the sample is calculated by subtracting the TIC from the TC.

TOC = TC-TIC, DOC = TDC-DIC, Particulate = Total - Dissolved.

C-TOT-ORG-LOW-CL Water Total Organic Carbon APHA 5310 TOTAL ORGANIC CARBON (TOC)

This method is applicable to the analysis of ground water, wastewater, and surface water samples. The form detected depends upon sample pretreatment: Unfiltered sample = TC, 0.45um filtered = TDC. Samples are injected into a combustion tube containing an oxidation catalyst. The carrier gas containing the combustion product from the combustion tube flows through an inorganic carbon reactor vessel and is then sent through a halogen scrubber into a sample cell set in a non-dispersive infrared gas analyzer (NDIR) where carbon dioxide is detected. For total inorganic carbon and dissolved inorganic carbon, the sample is injected into an IC reactor vessel where only the IC component is decomposed to become carbon dioxide.

The peak area generated by the NDIR indicates the TC/TDC or TIC/DIC as applicable. The total organic carbon content of the sample is calculated by subtracting the TIC from the TC.

TOC = TC-TIC, DOC = TDC-DIC, Particulate = Total - Dissolved.

LINE CREEK OPERATION L2247956 CONTD....

**Reference Information** 

PAGE 19 of 21 Version: FINAL

**Test Method References:** 

ALS Test Code Matrix Test Description Method Reference\*\*

CL-IC-N-CL Water Chloride in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

EC-L-PCT-CL Water Electrical Conductivity (EC) APHA 2510B

Conductivity, also known as Electrical Conductivity (EC) or Specific Conductance, is measured by immersion of a conductivity cell with platinum

electrodes into a water sample. Conductivity measurements are temperature-compensated to 25C.

F-IC-N-CL Water Fluoride in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

HARDNESS-CALC-VA Water Hardness APHA 2340B

Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO3 equivalents.

Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

HG-D-CVAA-VA Water Diss. Mercury in Water by CVAAS or CVAFS APHA 3030B/EPA 1631E (mod)

Water samples are filtered (0.45 um), preserved with hydrochloric acid, then undergo a cold-oxidation using bromine monochloride prior to reduction

with stannous chloride, and analyzed by CVAAS or CVAFS.

HG-T-CVAA-VA Water Total Mercury in Water by CVAAS or CVAFS EPA 1631E (mod)

Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

IONBALANCE-BC-CL Water Ion Balance Calculation APHA 1030E

Cation Sum, Anion Sum, and Ion Balance (as % difference) are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Because all aqueous solutions are electrically neutral, the calculated ion balance (% difference of cations minus anions) should be near-zero.

Cation and Anion Sums are the total meq/L concentration of major cations and anions. Dissolved species are used where available. Minor ions are included where data is present. Ion Balance is calculated as:

Ion Balance (%) = [Cation Sum-Anion Sum] / [Cation Sum+Anion Sum]

MET-D-CCMS-CL Water Dissolved Metals in Water by CRC ICPMS APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

MET-D-CCMS-VA Water Dissolved Metals in Water by CRC ICPMS APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

MET-T-CCMS-VA Water Total Metals in Water by CRC ICPMS EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

NH3-L-F-CL Water Ammonia, Total (as N) J. ENVIRON. MONIT., 2005, 7, 37-42, RSC

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.

NO2-L-IC-N-CL Water Nitrite in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

NO3-L-IC-N-CL Water Nitrate in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

ORP-CL Water Oxidation redution potential by elect. ASTM D1498

This analysis is carried out in accordance with the procedure described in the "ASTM" method D1498 "Oxidation-Reduction Potential of Water" published by the American Society for Testing and Materials (ASTM). Results are reported as observed oxidation-reduction potential of the platinum metal-reference electrode employed, in mV.

It is recommended that this analysis be conducted in the field.

P-T-L-COL-CL Water Phosphorus (P)-Total APHA 4500-P PHOSPHORUS

LINE CREEK OPERATION L2247956 CONTD....

**Reference Information** 

PAGE 20 of 21 Version: FINAL

**Test Method References:** 

**ALS Test Code** Matrix Method Reference\*\* **Test Description** 

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after persulphate digestion of the sample.

PH-CI Water APHA 4500 H-Electrode pΗ

pH is determined in the laboratory using a pH electrode. All samples analyzed by this method for pH will have exceeded the 15 minute recommended

hold time from time of sampling (field analysis is recommended for pH where highly accurate results are needed)

PO4-DO-L-COL-CL Orthophosphate-Dissolved (as P) APHA 4500-P PHOSPHORUS

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined

colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter. Sulfate in Water by IC

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

SOLIDS-TDS-CL Water **Total Dissolved Solids** APHA 2540 C

A well-mixed sample is filtered through a glass fibre filter paper. The filtrate is then evaporated to dryness in a pre-weighed vial and dried at 180 – 2 °C.

EPA 300.1 (mod)

The increase in vial weight represents the total dissolved solids (TDS).

TECKCOAL-IONBAL-CL Water Ion Balance Calculation **APHA 1030E** 

Cation Sum, Anion Sum, and Ion Balance (as % difference) are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Because all aqueous solutions are electrically neutral, the calculated ion balance (% difference of cations minus anions) should be near-zero.

Cation and Anion Sums are the total meg/L concentration of major cations and anions. Dissolved species are used where available. Minor ions are included where data is present. Ion Balance is calculated as:

Ion Balance (%) = [Cation Sum-Anion Sum] / [Cation Sum+Anion Sum]

TKN-L-F-CL Total Kieldahl Nitrogen APHA 4500-NORG (TKN)

This analysis is carried out using procedures adapted from APHA Method 4500-Norg D. "Block Digestion and Flow Injection Analysis". Total Kjeldahl Nitrogen is determined using block digestion followed by Flow-injection analysis with fluorescence detection.

**Total Suspended Solids** APHA 2540 D-Gravimetric

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total suspended solids

(TSS) are determined by filtering a sample through a glass fibre filter, and by drying the filter at 104 deg. C.

**TURBIDITY-CL Turbidity** APHA 2130 B-Nephelometer

This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.

\*\* ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

**Laboratory Definition Code Laboratory Location** ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA V/A CL ALS ENVIRONMENTAL - CALGARY, ALBERTA, CANADA

**Chain of Custody Numbers:** 

20190320 DC GW

LINE CREEK OPERATION L2247956 CONTD....

**Reference Information** 

PAGE 21 of 21 Version: FINAL

#### **Test Method References:**

**ALS Test Code** Matrix Method Reference\*\* **Test Description** 

#### **GLOSSARY OF REPORT TERMS**

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.

mg/kg - milligrams per kilogram based on dry weight of sample

mg/kg wwt - milligrams per kilogram based on wet weight of sample

mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight

mg/L - unit of concentration based on volume, parts per million.

< - Less than.

D.L. - The reporting limit.

N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.



Workorder: L2247956 Report Date: 04-APR-19

Page 1 of 24

Client: TECK COAL LIMITED (LINE CREEK)

PO BOX 2003

SPARWOOD BC V0B 2G0

Contact: Chris Blurton

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
ACIDITY-PCT-CL	Water							
<b>Batch R4586355 WG3015263-6 DUP</b> Acidity (as CaCO3)		<b>L2247956-6</b> 4.5	5.9	J	mg/L	1.4	2	27-MAR-19
WG3015263-2 LCS Acidity (as CaCO3)			99.8		%		85-115	27-MAR-19
WG3015263-5 LCS Acidity (as CaCO3)			100.2		%		85-115	27-MAR-19
WG3015263-1 MB Acidity (as CaCO3)			1.9		mg/L		2	27-MAR-19
WG3015263-4 MB Acidity (as CaCO3)			1.9		mg/L		2	27-MAR-19
ALK-MAN-CL	Water							
Batch R4585726 WG3015272-10 LCS Alkalinity, Total (as CaCC	D3)		96.7		%		85-115	27-MAR-19
WG3015272-3 MB Alkalinity, Total (as CaCC			<1.0		mg/L		1	27-MAR-19
BE-D-L-CCMS-VA	Water							
Batch R4585048 WG3014029-10 LCS Beryllium (Be)-Dissolved			98.3		%		80-120	26-MAR-19
WG3014029-9 MB Beryllium (Be)-Dissolved		NP	<0.00002	0	mg/L		0.00002	26-MAR-19
Batch R4585680 WG3015553-2 LCS								
Beryllium (Be)-Dissolved			97.0		%		80-120	27-MAR-19
WG3015553-1 MB Beryllium (Be)-Dissolved		NP	<0.00002	0	mg/L		0.00002	27-MAR-19
Batch R4588535 WG3018795-3 DUP Beryllium (Be)-Dissolved		<b>L2247956-3</b> <0.000020	<0.00002	0 RPD-NA	mg/L	N/A	20	01-APR-19
WG3018795-2 LCS Beryllium (Be)-Dissolved			96.6		%		80-120	01-APR-19
WG3018795-1 MB Beryllium (Be)-Dissolved		LF	<0.00002	0	mg/L		0.00002	01-APR-19
BE-T-L-CCMS-VA	Water							



Workorder: L2247956

Report Date: 04-APR-19

Page 2 of 24

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
BE-T-L-CCMS-VA	Water							
Batch R4585048 WG3014083-3 DUP Beryllium (Be)-Total		<b>L2247956-3</b> <0.000020	<0.000020	) RPD-NA	mg/L	N/A	20	26-MAR-19
WG3014083-2 LCS Beryllium (Be)-Total			93.5		%		80-120	26-MAR-19
WG3014083-1 MB Beryllium (Be)-Total			<0.000020	)	mg/L		0.00002	26-MAR-19
WG3014083-4 MS Beryllium (Be)-Total		L2247956-2	97.7		%		70-130	26-MAR-19
BR-L-IC-N-CL	Water							
Batch R4580126								
WG3012854-11 DUP Bromide (Br)		<b>L2247956-4</b> <0.050	<0.050	RPD-NA	mg/L	N/A	20	22-MAR-19
WG3012854-10 LCS Bromide (Br)			94.4		%		85-115	22-MAR-19
WG3012854-6 LCS Bromide (Br)			103.1		%		85-115	22-MAR-19
WG3012854-9 MB Bromide (Br)			<0.050		mg/L		0.05	22-MAR-19
C-DIS-ORG-LOW-CL	Water							
Batch R4587742 WG3017967-2 LCS Dissolved Organic Carbo	on		94.8		%		80-120	29-MAR-19
WG3017967-1 MB Dissolved Organic Carbo	on		<0.50		mg/L		0.5	29-MAR-19
Batch R4587852 WG3018065-2 LCS								
Dissolved Organic Carbo	on		92.0		%		80-120	31-MAR-19
WG3018065-1 MB Dissolved Organic Carbo	on		<0.50		mg/L		0.5	31-MAR-19
C-TOT-ORG-LOW-CL	Water							
Batch R4587742 WG3017967-2 LCS Total Organic Carbon			96.8		%		80-120	29-MAR-19
WG3017967-1 MB Total Organic Carbon			<0.50		mg/L		0.5	29-MAR-19



Workorder: L2247956

Report Date: 04-APR-19 Page 3 of 24

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
C-TOT-ORG-LOW-CL Batch R4587852	Water							
WG3018065-2 LCS Total Organic Carbon			94.0		%		80-120	31-MAR-19
WG3018065-1 MB Total Organic Carbon			<0.50		mg/L		0.5	31-MAR-19
CL-IC-N-CL	Water							
<b>Batch</b> R4580126 <b>WG3012854-11 DUP</b> Chloride (CI)		<b>L2247956-4</b> <0.50	<0.50	RPD-NA	mg/L	N/A	20	22-MAR-19
<b>WG3012854-10 LCS</b> Chloride (CI)			101.4		%		90-110	22-MAR-19
WG3012854-6 LCS Chloride (CI)			100.6		%		90-110	22-MAR-19
WG3012854-5 MB Chloride (Cl)			<0.50		mg/L		0.5	22-MAR-19
WG3012854-9 MB Chloride (Cl)			<0.50		mg/L		0.5	22-MAR-19
EC-L-PCT-CL	Water							
Batch R4585726 WG3015272-10 LCS Conductivity (@ 25C)			101.9		%		90-110	27-MAR-19
WG3015272-3 MB Conductivity (@ 25C)			<2.0		uS/cm		2	27-MAR-19
F-IC-N-CL	Water							
Batch R4580126								
WG3012854-11 DUP Fluoride (F)		<b>L2247956-4</b> <0.020	<0.020	RPD-NA	mg/L	N/A	20	22-MAR-19
WG3012854-10 LCS Fluoride (F)			108.1		%		90-110	22-MAR-19
WG3012854-6 LCS Fluoride (F)			107.3		%		90-110	22-MAR-19
<b>WG3012854-5 MB</b> Fluoride (F)			<0.020		mg/L		0.02	22-MAR-19
<b>WG3012854-9 MB</b> Fluoride (F)			<0.020		mg/L		0.02	22-MAR-19
HG-D-CVAA-VA	Water							



Workorder: L2247956

Report Date: 04-APR-19

Page 4 of 24

Test Matrix	Reference	Result Qualifier	Units	RPD	Limit	Analyzed
HG-D-CVAA-VA Water						
Batch R4585481						
WG3015166-2 LCS Mercury (Hg)-Dissolved		100.5	%		00.400	07 MAD 40
WG3015166-1 MB	NP	100.5	/0		80-120	27-MAR-19
Mercury (Hg)-Dissolved	NP	<0.0000050	mg/L		0.000005	27-MAR-19
Batch R4588409						
WG3018795-2 LCS						
Mercury (Hg)-Dissolved		97.5	%		80-120	01-APR-19
WG3018795-1 MB	LF	0.0000056				
Mercury (Hg)-Dissolved		<0.0000050	mg/L		0.000005	01-APR-19
HG-T-CVAA-VA Water						
Batch R4583050						
WG3014115-2 LCS Mercury (Hg)-Total		99.5	%		80-120	26-MAR-19
WG3014115-1 MB		00.0			00 120	20 WAR 13
Mercury (Hg)-Total		<0.000050	mg/L		0.000005	26-MAR-19
MET-D-CCMS-CL Water						
Batch R4586986						
WG3016985-10 LCS	TMRM					
Calcium (Ca)-Dissolved		101.3	%		80-120	28-MAR-19
Magnesium (Mg)-Dissolved		101.1	%		80-120	28-MAR-19
Potassium (K)-Dissolved		100.5	%		80-120	28-MAR-19
Sodium (Na)-Dissolved		99.2	%		80-120	28-MAR-19
WG3016985-14 LCS	TMRM	40E 0	%		00.400	00 144 5 40
Calcium (Ca)-Dissolved		105.2 96.4	%		80-120	28-MAR-19
Magnesium (Mg)-Dissolved Potassium (K)-Dissolved		98.8	%		80-120	28-MAR-19
Sodium (Na)-Dissolved		99.5	%		80-120	28-MAR-19
		99.3	/0		80-120	28-MAR-19
WG3016985-13 MB Calcium (Ca)-Dissolved		<0.050	mg/L		0.05	28-MAR-19
Magnesium (Mg)-Dissolved		<0.0050	mg/L		0.005	28-MAR-19
Potassium (K)-Dissolved		<0.050	mg/L		0.05	28-MAR-19
Sodium (Na)-Dissolved		<0.050	mg/L		0.05	28-MAR-19
WG3016985-9 MB						
Calcium (Ca)-Dissolved		<0.050	mg/L		0.05	28-MAR-19
Magnesium (Mg)-Dissolved		<0.0050	mg/L		0.005	28-MAR-19
Potassium (K)-Dissolved		<0.050	mg/L		0.05	28-MAR-19
Sodium (Na)-Dissolved		<0.050	mg/L		0.05	28-MAR-19



Report Date: 04-APR-19 Page 5 of 24 Workorder: L2247956

est N	/latrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
IET-D-CCMS-VA	Water							
Batch R4585048								
WG3014029-10 LCS			00.0		0.4			
Aluminum (Al)-Dissolved			98.8		%		80-120	26-MAR-19
Antimony (Sb)-Dissolved			92.5		%		80-120	26-MAR-19
Arsenic (As)-Dissolved			97.7		%		80-120	26-MAR-19
Barium (Ba)-Dissolved			99.8		%		80-120	26-MAR-19
Bismuth (Bi)-Dissolved			98.6		%		80-120	26-MAR-19
Boron (B)-Dissolved			91.2		%		80-120	26-MAR-19
Cadmium (Cd)-Dissolved			99.7		%		80-120	26-MAR-19
Calcium (Ca)-Dissolved			95.9		%		80-120	26-MAR-19
Chromium (Cr)-Dissolved			101.8		%		80-120	26-MAR-19
Cobalt (Co)-Dissolved			96.6		%		80-120	26-MAR-19
Copper (Cu)-Dissolved			97.4		%		80-120	26-MAR-19
Iron (Fe)-Dissolved			94.4		%		80-120	26-MAR-19
Lead (Pb)-Dissolved			97.5		%		80-120	26-MAR-19
Lithium (Li)-Dissolved			97.0		%		80-120	26-MAR-19
Magnesium (Mg)-Dissolve	d		100.1		%		80-120	26-MAR-19
Manganese (Mn)-Dissolve	d		102.0		%		80-120	26-MAR-19
Molybdenum (Mo)-Dissolve	ed		95.2		%		80-120	26-MAR-19
Nickel (Ni)-Dissolved			99.4		%		80-120	26-MAR-19
Potassium (K)-Dissolved			96.5		%		80-120	26-MAR-19
Selenium (Se)-Dissolved			88.8		%		80-120	26-MAR-19
Silicon (Si)-Dissolved			95.7		%		60-140	26-MAR-19
Silver (Ag)-Dissolved			92.0		%		80-120	26-MAR-19
Sodium (Na)-Dissolved			102.8		%		80-120	26-MAR-19
Strontium (Sr)-Dissolved			101.3		%		80-120	26-MAR-19
Thallium (TI)-Dissolved			97.6		%		80-120	26-MAR-19
Tin (Sn)-Dissolved			92.8		%		80-120	26-MAR-19
Titanium (Ti)-Dissolved			91.0		%		80-120	26-MAR-19
Uranium (U)-Dissolved			100.8		%		80-120	26-MAR-19
Vanadium (V)-Dissolved			100.2		%		80-120	26-MAR-19
Zinc (Zn)-Dissolved			102.0		%		80-120	26-MAR-19
WG3014029-9 MB		NP						
Aluminum (Al)-Dissolved			<0.0010		mg/L		0.001	26-MAR-19
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	26-MAR-19
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	26-MAR-19



Bismuth (Bi)-Dissolved

#### **Quality Control Report**

Page 6 of 24

Workorder: L2247956 Report Date: 04-APR-19

Test Matrix Reference Result Qualifier Units **RPD** Limit Analyzed MET-D-CCMS-VA Water Batch R4585048 WG3014029-9 MB NP Barium (Ba)-Dissolved < 0.00010 mg/L 0.0001 26-MAR-19 Bismuth (Bi)-Dissolved < 0.000050 mg/L 0.00005 26-MAR-19 Boron (B)-Dissolved < 0.010 mg/L 0.01 26-MAR-19 Cadmium (Cd)-Dissolved < 0.0000050 mg/L 0.000005 26-MAR-19 < 0.050 Calcium (Ca)-Dissolved mg/L 0.05 26-MAR-19 Chromium (Cr)-Dissolved < 0.00010 mg/L 0.0001 26-MAR-19 Cobalt (Co)-Dissolved < 0.00010 mg/L 0.0001 26-MAR-19 Copper (Cu)-Dissolved < 0.00020 mg/L 0.0002 26-MAR-19 Iron (Fe)-Dissolved < 0.010 mg/L 0.01 26-MAR-19 Lead (Pb)-Dissolved < 0.000050 mg/L 0.00005 26-MAR-19 Lithium (Li)-Dissolved < 0.0010 mg/L 0.001 26-MAR-19 Magnesium (Mg)-Dissolved <0.0050 mg/L 0.005 26-MAR-19 Manganese (Mn)-Dissolved < 0.00010 mg/L 0.0001 26-MAR-19 Molybdenum (Mo)-Dissolved < 0.000050 mg/L 0.00005 26-MAR-19 Nickel (Ni)-Dissolved < 0.00050 mg/L 0.0005 26-MAR-19 < 0.050 Potassium (K)-Dissolved mg/L 0.05 26-MAR-19 Selenium (Se)-Dissolved < 0.000050 mg/L 0.00005 26-MAR-19 Silicon (Si)-Dissolved < 0.050 mg/L 0.05 26-MAR-19 Silver (Ag)-Dissolved < 0.000010 mg/L 0.00001 26-MAR-19 Sodium (Na)-Dissolved < 0.050 mg/L 0.05 26-MAR-19 Strontium (Sr)-Dissolved < 0.00020 mg/L 0.0002 26-MAR-19 < 0.000010 Thallium (TI)-Dissolved mg/L 0.00001 26-MAR-19 Tin (Sn)-Dissolved < 0.00010 mg/L 0.0001 26-MAR-19 Titanium (Ti)-Dissolved mg/L < 0.00030 0.0003 26-MAR-19 Uranium (U)-Dissolved < 0.000010 mg/L 0.00001 26-MAR-19 Vanadium (V)-Dissolved < 0.00050 mg/L 0.0005 26-MAR-19 Zinc (Zn)-Dissolved <0.0010 mg/L 0.001 26-MAR-19 Batch R4585680 WG3015553-2 LCS % Aluminum (Al)-Dissolved 101.1 80-120 27-MAR-19 Antimony (Sb)-Dissolved 96.4 % 80-120 27-MAR-19 Arsenic (As)-Dissolved 98.9 % 80-120 27-MAR-19 Barium (Ba)-Dissolved 98.0 % 80-120 27-MAR-19

99.1

%

80-120

27-MAR-19



Workorder: L2247956 Report Date: 04-APR-19 Page 7 of 24

Mater   R488686   R48868	Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
WG315553-2 LCS   Boron (B)-Dissolved   90.7   %   80-120   27-MAR-19   Cadmium (Cal)-Dissolved   100.0   %   80-120   27-MAR-19   Calcium (Cal)-Dissolved   98.8   %   80-120   27-MAR-19   Chromium (Cr)-Dissolved   99.8   %   80-120   27-MAR-19   Cobalt (Co)-Dissolved   99.8   %   80-120   27-MAR-19   Cobalt (Co)-Dissolved   97.7   %   80-120   27-MAR-19   Coper (Cu)-Dissolved   98.3   %   80-120   27-MAR-19   Iron (Fe)-Dissolved   96.1   %   80-120   27-MAR-19   Iron (Fe)-Dissolved   96.6   %   80-120   27-MAR-19   Iron (Fe)-Dissolved   95.9   %   80-120   27-MAR-19   Iron (Fe)-Dissolved   95.9   %   80-120   27-MAR-19   Iron (Fe)-Dissolved   95.9   %   80-120   27-MAR-19   Iron (Fe)-Dissolved   99.6   %   80-120   27-MAR-19   Iron (Fe)-Dissolved   99.6   %   80-120   27-MAR-19   Iron (Fe)-Dissolved   99.6   %   80-120   27-MAR-19   Iron (Fe)-Dissolved   99.6   %   80-120   27-MAR-19   Iron (Fe)-Dissolved   99.6   %   80-120   27-MAR-19   Iron (Fe)-Dissolved   99.6   %   80-120   27-MAR-19   Iron (Fe)-Dissolved   99.4   %   80-120   27-MAR-19   Iron (Fe)-Dissolved   99.4   %   80-120   27-MAR-19   Iron (Fe)-Dissolved   99.4   %   80-120   27-MAR-19   Iron (Fe)-Dissolved   99.4   %   80-120   27-MAR-19   Iron (Fe)-Dissolved   99.3   %   80-120   27-MAR-19   Iron (Fe)-Dissolved   99.3   %   80-120   27-MAR-19   Iron (Fe)-Dissolved   99.3   %   80-120   27-MAR-19   Iron (Fe)-Dissolved   99.3   %   80-120   27-MAR-19   Iron (Fe)-Dissolved   97.6   %   80-120   27-MAR-19   Iron (Fe)-Dissolved   97.6   %   80-120   27-MAR-19   Iron (Fe)-Dissolved   97.6   %   80-120   27-MAR-19   Iron (Fe)-Dissolved   97.6   %   80-120   27-MAR-19   Iron (Fe)-Dissolved   97.1   %   80-120   27-MAR-19   Iron (Fe)-Dissolved   97.1   %   80-120   27-MAR-19   Iron (Fe)-Dissolved   97.1   %   80-120   27-MAR-19   Iron (Fe)-Dissolved   97.1   %   80-120   27-MAR-19   Iron (Fe)-Dissolved   97.1   %   80-120   27-MAR-19   Iron (Fe)-Dissolved   97.1   %   80-120   27-MAR-19   Iron (Fe)-Dissolved   97.1   %   80-120   27-MAR-19   Iron (Fe)-D	MET-D-CCMS-VA	Water							
Boron (B)-Dissolved	Batch R45856	680							
Cadmium (Cd)-Dissolved         100.0         %         80-120         27-MAR-19           Calcium (Ca)-Dissolved         98.8         %         80-120         27-MAR-19           Crbmium (Cr)-Dissolved         99.8         %         80-120         27-MAR-19           Cobalt (Co-Dissolved         97.7         %         80-120         27-MAR-19           Copper (Cu)-Dissolved         98.3         %         80-120         27-MAR-19           Iton (Fe)-Dissolved         96.1         %         80-120         27-MAR-19           Lead (Pb)-Dissolved         96.6         %         80-120         27-MAR-19           Magnesium (Mg)-Dissolved         96.6         %         80-120         27-MAR-19           Magnesium (Mg)-Dissolved         96.6         %         80-120         27-MAR-19           Manganese (Mn)-Dissolved         99.6         %         80-120         27-MAR-19           Molybdenum (Mg)-Dissolved         97.1         %         80-120         27-MAR-19           Mickel (Ni)-Dissolved         99.4         %         80-120         27-MAR-19           Potassium (K)-Dissolved         99.4         %         80-120         27-MAR-19           Silicon (Si)-Dissolved         96.4         <				00.7		0/			
Calcium (Ca)-Dissolved 98.8 % 80-120 27-MAR-19 Chromium (Cr)-Dissolved 99.8 % 80-120 27-MAR-19 Cobait (Ca)-Dissolved 99.8 % 80-120 27-MAR-19 Cobait (Ca)-Dissolved 97.7 % 80-120 27-MAR-19 Copper (Cu)-Dissolved 98.3 % 80-120 27-MAR-19 Lead (Pb)-Dissolved 96.1 % 80-120 27-MAR-19 Lead (Pb)-Dissolved 96.6 % 80-120 27-MAR-19 Lead (Pb)-Dissolved 95.9 % 80-120 27-MAR-19 Lithium (Li)-Dissolved 95.9 % 80-120 27-MAR-19 Marganese (Mn)-Dissolved 99.6 % 80-120 27-MAR-19 Marganese (Mn)-Dissolved 99.6 % 80-120 27-MAR-19 Molybdenum (Mo)-Dissolved 99.6 % 80-120 27-MAR-19 Molybdenum (Mo)-Dissolved 99.6 % 80-120 27-MAR-19 Molybdenum (Mo)-Dissolved 99.4 % 80-120 27-MAR-19 Molybdenum (Mo)-Dissolved 99.4 % 80-120 27-MAR-19 Molybdenum (Mo)-Dissolved 99.4 % 80-120 27-MAR-19 Silicon (Si)-Dissolved 99.4 % 80-120 27-MAR-19 Silicon (Si)-Dissolved 99.4 % 80-120 27-MAR-19 Silicon (Si)-Dissolved 99.3 % 80-120 27-MAR-19 Silicon (Si)-Dissolved 99.3 % 80-120 27-MAR-19 Silicon (Si)-Dissolved 99.3 % 80-120 27-MAR-19 Silicon (Si)-Dissolved 99.3 % 80-120 27-MAR-19 Silicon (Si)-Dissolved 99.4 % 80-120 27-MAR-19 Silicon (Si)-Dissolved 99.4 % 80-120 27-MAR-19 Silicon (Si)-Dissolved 99.4 % 80-120 27-MAR-19 Silicon (Si)-Dissolved 99.4 % 80-120 27-MAR-19 Silicon (Si)-Dissolved 99.3 % 80-120 27-MAR-19 Silicon (Si)-Dissolved 99.3 % 80-120 27-MAR-19 Silicon (Si)-Dissolved 99.4 % 80-120 27-MAR-19 Silicon (Si)-Dissolved 94.6 % 80-120 27-MAR-19 Silicon (Si)-Dissolved 94.6 % 80-120 27-MAR-19 Silicon (Si)-Dissolved 94.8 % 80-120 27-MAR-19 Silicon (Si)-Dissolved 94.8 % 80-120 27-MAR-19 Silicon (Si)-Dissolved 97.1 % 80-120 27-MAR-19 Silicon (Si)-Dissolved 97.1 % 80-120 27-MAR-19 Silicon (Si)-Dissolved 97.1 % 80-120 27-MAR-19 Silicon (Si)-Dissolved 97.1 % 80-120 27-MAR-19 Silicon (Si)-Dissolved 97.1 % 80-120 27-MAR-19 Silicon (Si)-Dissolved 97.1 % 80-120 27-MAR-19 Silicon (Si)-Dissolved 97.1 % 80-120 27-MAR-19 Silicon (Si)-Dissolved 97.1 % 80-120 27-MAR-19 Silicon (Si)-Dissolved 97.1 % 80-120 27-MAR-19 Silicon (Si)-Dissolved 97.1 % 80-120 27-MAR-19 Silicon (Si)-Diss									
Chromium (Cr)-Dissolved 99.8 % 80-120 27-MAR-19 Cobalt (Co)-Dissolved 97.7 % 80-120 27-MAR-19 Copper (Cu)-Dissolved 98.3 % 80-120 27-MAR-19 Iron (Fe)-Dissolved 98.3 % 80-120 27-MAR-19 Lead (Pb)-Dissolved 96.1 % 80-120 27-MAR-19 Lead (Pb)-Dissolved 95.9 % 80-120 27-MAR-19 Lithium (Li)-Dissolved 95.9 % 80-120 27-MAR-19 Lithium (Li)-Dissolved 95.9 % 80-120 27-MAR-19 Manganese (Mn)-Dissolved 99.6 % 80-120 27-MAR-19 Manganese (Mn)-Dissolved 99.6 % 80-120 27-MAR-19 Molybdenum (Mo)-Dissolved 99.6 % 80-120 27-MAR-19 Nickel (Ni)-Dissolved 99.4 % 80-120 27-MAR-19 Nickel (Ni)-Dissolved 99.4 % 80-120 27-MAR-19 Silcon (Si)-Dissolved 96.4 % 80-120 27-MAR-19 Selenium (Se)-Dissolved 99.3 % 80-120 27-MAR-19 Silicon (Si)-Dissolved 98.4 % 80-120 27-MAR-19 Silver (Ag)-Dissolved 98.4 % 80-120 27-MAR-19 Silver (Ag)-Dissolved 99.3 % 80-120 27-MAR-19 Silver (Ag)-Dissolved 99.3 % 80-120 27-MAR-19 Transium (Ti)-Dissolved 99.8 % 80-120 27-MAR-19 Transium (Ti)-Dissolved 99.8 % 80-120 27-MAR-19 Transium (Ti)-Dissolved 94.6 % 80-120 27-MAR-19 Transium (Ti)-Dissolved 94.6 % 80-120 27-MAR-19 Transium (Ti)-Dissolved 97.6 % 80-120 27-MAR-19 Transium (Ti)-Dissolved 97.6 % 80-120 27-MAR-19 Transium (Ti)-Dissolved 97.6 % 80-120 27-MAR-19 Transium (Ti)-Dissolved 97.6 % 80-120 27-MAR-19 Transium (Ti)-Dissolved 97.6 % 80-120 27-MAR-19 Transium (Ti)-Dissolved 97.1 % 80-120 27-MAR-19 Transium (Ti)-Dissolved 97.1 % 80-120 27-MAR-19 Transium (Ti)-Dissolved 97.1 % 80-120 27-MAR-19 Transium (Ti)-Dissolved 97.1 % 80-120 27-MAR-19 Transium (Ti)-Dissolved 97.1 % 80-120 27-MAR-19 Transium (Ti)-Dissolved 97.1 % 80-120 27-MAR-19 Transium (Ti)-Dissolved 97.1 % 80-120 27-MAR-19 Transium (Ti)-Dissolved 97.0 % 80-120 27-MAR-19 Transium (Ti)-Dissolved 97.1 % 80-120 27-MAR-19 Transium (Ti)-Dissolved 97.0 % 80-120 27-MAR-19 Transium (Ti)-Dissolved 97.0 % 80-120 27-MAR-19 Transium (Ti)-Dissolved 97.0 % 80-120 27-MAR-19 Transium (Ti)-Dissolved 97.0 % 80-120 27-MAR-19 Transium (Ti)-Dissolved 97.0 % 80-120 27-MAR-19 Transium (Ti)-Dissolved 97.0 % 80-120 27-MAR-19 Transium	` ,								
Cobalt (Co)-Dissolved         97.7         %         80-120         27-MAR-19           Copper (Cu)-Dissolved         98.3         %         80-120         27-MAR-19           Iron (Fe)-Dissolved         96.1         %         80-120         27-MAR-19           Lead (Pb)-Dissolved         96.6         %         80-120         27-MAR-19           Lithium (Li)-Dissolved         95.9         %         80-120         27-MAR-19           Magnesium (Mg)-Dissolved         106.7         %         80-120         27-MAR-19           Manganese (Mm)-Dissolved         99.6         %         80-120         27-MAR-19           Molydenum (Mo)-Dissolved         97.1         %         80-120         27-MAR-19           Mickel (Ni)-Dissolved         99.4         %         80-120         27-MAR-19           Potassium (K)-Dissolved         96.4         %         80-120         27-MAR-19           Selenium (Se)-Dissolved         98.4         %         80-120         27-MAR-19           Selenium (Se)-Dissolved         93.1         %         80-120         27-MAR-19           Silver (Ag)-Dissolved         98.4         %         80-120         27-MAR-19           Silver (Ag)-Dissolved         99.3 <td< td=""><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></td<>									
Copper (Cu)-Dissolved 98.3 % 80-120 27-MAR-19 Iron (Fe)-Dissolved 96.1 % 80-120 27-MAR-19 Lead (Pb)-Dissolved 96.6 % 80-120 27-MAR-19 Lithium (Li)-Dissolved 95.9 % 80-120 27-MAR-19 Lithium (Li)-Dissolved 106.7 % 80-120 27-MAR-19 Magnesium (Mg)-Dissolved 106.7 % 80-120 27-MAR-19 Magnesium (Mg)-Dissolved 99.6 % 80-120 27-MAR-19 Molybdenum (Mo)-Dissolved 99.6 % 80-120 27-MAR-19 Molybdenum (Mo)-Dissolved 99.4 % 80-120 27-MAR-19 Nickel (Ni)-Dissolved 99.4 % 80-120 27-MAR-19 Potassium (K)-Dissolved 99.4 % 80-120 27-MAR-19 Selenium (Se)-Dissolved 96.4 % 80-120 27-MAR-19 Silicon (Si)-Dissolved 103.7 % 80-120 27-MAR-19 Silicon (Si)-Dissolved 99.3 % 80-120 27-MAR-19 Silver (Ag)-Dissolved 99.3 % 80-120 27-MAR-19 Silver (Ag)-Dissolved 99.3 % 80-120 27-MAR-19 Silver (Ag)-Dissolved 99.3 % 80-120 27-MAR-19 Strontium (Sr)-Dissolved 96.1 % 80-120 27-MAR-19 Thallium (Ti)-Dissolved 92.8 % 80-120 27-MAR-19 Thallium (Ti)-Dissolved 94.6 % 80-120 27-MAR-19 Tira (Sn)-Dissolved 97.6 % 80-120 27-MAR-19 Uranium (U)-Dissolved 97.6 % 80-120 27-MAR-19 Uranium (U)-Dissolved 97.1 % 80-120 27-MAR-19 Uranium (U)-Dissolved 97.1 % 80-120 27-MAR-19 Almium (Ti)-Dissolved 97.1 % 80-120 27-MAR-19 Uranium (D)-Dissolved 97.1 % 80-120 27-MAR-19 Almium (Ti)-Dissolved 97.00010 mg/L 0.0001 27-MAR-19 Almium (Bi)-Dissolved 90.00010 mg/L 0.0001 27-MAR-19 Bismuth (Bi)-Dissolved 90.00010 mg/L 0.0001 27-MAR-19 Bismuth (Bi)-Dissolved 90.00010 mg/L 0.0001 27-MAR-19 Bismuth (Bi)-Dissolved 90.00010 mg/L 0.0001 27-MAR-19 Bismuth (Bi)-Dissolved 90.00010 mg/L 0.0001 27-MAR-19 Bismuth (Bi)-Dissolved 90.00010 mg/L 0.0001 27-MAR-19 Bismuth (Bi)-Dissolved 90.00010 mg/L 0.0001 27-MAR-19 Bismuth (Bi)-Dissolved 90.00010 mg/L 0.0001 27-MAR-19 Bismuth (Bi)-Dissolved 90.000050 mg/L 0.00005 27-MAR-19									
Iron (Fe)-Dissolved   96.1	` ,								
Lead (Pb)-Dissolved         96.6         %         80-120         27-MAR-19           Lithium (Li)-Dissolved         95.9         %         80-120         27-MAR-19           Magnesium (Mg)-Dissolved         106.7         %         80-120         27-MAR-19           Manganese (Mn)-Dissolved         99.6         %         80-120         27-MAR-19           Molybdenum (Mo)-Dissolved         97.1         %         80-120         27-MAR-19           Nickel (Ni)-Dissolved         99.4         %         80-120         27-MAR-19           Potassium (K)-Dissolved         96.4         %         80-120         27-MAR-19           Selenium (Se)-Dissolved         93.1         %         80-120         27-MAR-19           Silicon (Si)-Dissolved         93.1         %         80-120         27-MAR-19           Silver (Ag)-Dissolved         98.4         %         80-120         27-MAR-19           Sodium (Na)-Dissolved         98.4         %         80-120         27-MAR-19           Strontium (Sr)-Dissolved         96.1         %         80-120         27-MAR-19           Thallium (Tl)-Dissolved         96.1         %         80-120         27-MAR-19           Tin (Sn)-Dissolved         94.6		/ed						80-120	
Lithium (Li)-Dissolved         95.9         %         80.120         27-MAR-19           Magnesium (Mg)-Dissolved         106.7         %         80-120         27-MAR-19           Manganese (Mn)-Dissolved         99.6         %         80-120         27-MAR-19           Molybdenum (Mo)-Dissolved         97.1         %         80-120         27-MAR-19           Nickel (Ni)-Dissolved         99.4         %         80-120         27-MAR-19           Potassium (K)-Dissolved         96.4         %         80-120         27-MAR-19           Selenium (Se)-Dissolved         103.7         %         80-120         27-MAR-19           Silicon (Si)-Dissolved         93.1         %         80-120         27-MAR-19           Silver (Ag)-Dissolved         98.4         %         80-120         27-MAR-19           Silver (Ag)-Dissolved         99.3         %         80-120         27-MAR-19           Strontium (Sr)-Dissolved         99.3         %         80-120         27-MAR-19           Strontium (Sr)-Dissolved         96.1         %         80-120         27-MAR-19           Thallium (Ti)-Dissolved         94.6         %         80-120         27-MAR-19           Tinc (Sr)-Dissolved         97.6	, ,							80-120	27-MAR-19
Magnesium (Mg)-Dissolved         106.7         %         80-120         27-MAR-19           Manganese (Mn)-Dissolved         99.6         %         80-120         27-MAR-19           Molybdenum (Mo)-Dissolved         97.1         %         80-120         27-MAR-19           Nickel (Ni)-Dissolved         99.4         %         80-120         27-MAR-19           Potassium (K)-Dissolved         96.4         %         80-120         27-MAR-19           Selenium (Se)-Dissolved         103.7         %         80-120         27-MAR-19           Silicor (Si)-Dissolved         93.1         %         80-120         27-MAR-19           Silicor (Ag)-Dissolved         98.4         %         80-120         27-MAR-19           Silver (Ag)-Dissolved         98.4         %         80-120         27-MAR-19           Sodium (Na)-Dissolved         99.3         %         80-120         27-MAR-19           Strontium (Sr)-Dissolved         96.1         %         80-120         27-MAR-19           Thallium (Ti)-Dissolved         94.6         %         80-120         27-MAR-19           Tinalium (Ti)-Dissolved         97.6         %         80-120         27-MAR-19           Vanadium (V)-Dissolved         97.3 <td>` ,</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>80-120</td> <td>27-MAR-19</td>	` ,							80-120	27-MAR-19
Manganese (Mn)-Dissolved         99.6         %         80-120         27-MAR-19           Molybdenum (Mo)-Dissolved         97.1         %         80-120         27-MAR-19           Nickel (Ni)-Dissolved         99.4         %         80-120         27-MAR-19           Potassium (K)-Dissolved         96.4         %         80-120         27-MAR-19           Selenium (Se)-Dissolved         103.7         %         80-120         27-MAR-19           Silicon (Si)-Dissolved         93.1         %         60-140         27-MAR-19           Silicon (Si)-Dissolved         98.4         %         80-120         27-MAR-19           Silver (Ag)-Dissolved         99.3         %         80-120         27-MAR-19           Strontium (Sr)-Dissolved         99.3         %         80-120         27-MAR-19           Strontium (Sr)-Dissolved         96.1         %         80-120         27-MAR-19           Strontium (Sr)-Dissolved         92.8         %         80-120         27-MAR-19           Tin (Sn)-Dissolved         94.6         %         80-120         27-MAR-19           Itanium (Ti)-Dissolved         97.6         %         80-120         27-MAR-19           Vanadium (V)-Dissolved         97.1	Lithium (Li)-Dissolve	ed						80-120	27-MAR-19
Molybdenum (Mo)-Dissolved         97.1         %         80-120         27-MAR-19           Nickel (Ni)-Dissolved         99.4         %         80-120         27-MAR-19           Potassium (K)-Dissolved         96.4         %         80-120         27-MAR-19           Selenium (Se)-Dissolved         103.7         %         80-120         27-MAR-19           Silicon (Si)-Dissolved         93.1         %         60-140         27-MAR-19           Siliver (Ag)-Dissolved         98.4         %         80-120         27-MAR-19           Sodium (Na)-Dissolved         99.3         %         80-120         27-MAR-19           Strontium (Sr)-Dissolved         96.1         %         80-120         27-MAR-19           Strontium (Sr)-Dissolved         96.1         %         80-120         27-MAR-19           Tin (Sn)-Dissolved         94.6         %         80-120         27-MAR-19           Tin (Sn)-Dissolved         97.6         %         80-120         27-MAR-19           Uranium (U)-Dissolved         94.3         %         80-120         27-MAR-19           Vanadium (V)-Dissolved         97.1         %         80-120         27-MAR-19           Vanadium (V)-Dissolved         97.1 <td< td=""><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>80-120</td><td>27-MAR-19</td></td<>								80-120	27-MAR-19
Nickel (Ni)-Dissolved         99.4         %         80-120         27-MAR-19           Potassium (K)-Dissolved         96.4         %         80-120         27-MAR-19           Selenium (Se)-Dissolved         103.7         %         80-120         27-MAR-19           Silicon (Si)-Dissolved         93.1         %         60-140         27-MAR-19           Silver (Ag)-Dissolved         98.4         %         80-120         27-MAR-19           Sodium (Na)-Dissolved         99.3         %         80-120         27-MAR-19           Strontium (Sr)-Dissolved         96.1         %         80-120         27-MAR-19           Thallium (TI)-Dissolved         92.8         %         80-120         27-MAR-19           Tin (Sn)-Dissolved         94.6         %         80-120         27-MAR-19           Titanium (Ti)-Dissolved         97.6         %         80-120         27-MAR-19           Uranium (U)-Dissolved         94.3         %         80-120         27-MAR-19           Vanadium (V)-Dissolved         97.1         %         80-120         27-MAR-19           Zinc (Zn)-Dissolved         97.1         %         80-120         27-MAR-19           WG3015553-1         MB         NP	Manganese (Mn)-Di	ssolved		99.6		%		80-120	27-MAR-19
Potassium (K)-Dissolved         96.4         %         80-120         27-MAR-19           Selenium (Se)-Dissolved         103.7         %         80-120         27-MAR-19           Silicon (Si)-Dissolved         93.1         %         60-140         27-MAR-19           Silver (Ag)-Dissolved         98.4         %         80-120         27-MAR-19           Sodium (Na)-Dissolved         99.3         %         80-120         27-MAR-19           Strontium (Sr)-Dissolved         96.1         %         80-120         27-MAR-19           Thallium (Ti)-Dissolved         92.8         %         80-120         27-MAR-19           Tin (Sn)-Dissolved         94.6         %         80-120         27-MAR-19           Titanium (Ti)-Dissolved         97.6         %         80-120         27-MAR-19           Uranium (U)-Dissolved         94.3         %         80-120         27-MAR-19           Vanadium (V)-Dissolved         97.1         %         80-120         27-MAR-19           Varioum (V)-Dissolved         97.1         %         80-120         27-MAR-19           WG3015553-1         MB         NP         NP         NP         NP         NP         NP         NP         NP         NP<	Molybdenum (Mo)-D	Dissolved		97.1		%		80-120	27-MAR-19
Selenium (Se)-Dissolved       103.7       %       80-120       27-MAR-19         Silicon (Si)-Dissolved       93.1       %       60-140       27-MAR-19         Silver (Ag)-Dissolved       98.4       %       80-120       27-MAR-19         Sodium (Na)-Dissolved       99.3       %       80-120       27-MAR-19         Strontium (Sr)-Dissolved       96.1       %       80-120       27-MAR-19         Thallium (Tl)-Dissolved       92.8       %       80-120       27-MAR-19         Tin (Sn)-Dissolved       94.6       %       80-120       27-MAR-19         Titanium (Ti)-Dissolved       97.6       %       80-120       27-MAR-19         Uranium (U)-Dissolved       94.3       %       80-120       27-MAR-19         Vanadium (V)-Dissolved       97.1       %       80-120       27-MAR-19         Zinc (Zn)-Dissolved       97.1       %       80-120       27-MAR-19         WG3015553-1       MB       NP         Aluminum (Al)-Dissolved       <0.0010	Nickel (Ni)-Dissolved	d		99.4		%		80-120	27-MAR-19
Silicon (Si)-Dissolved       93.1       %       60-140       27-MAR-19         Silver (Ag)-Dissolved       98.4       %       80-120       27-MAR-19         Sodium (Na)-Dissolved       99.3       %       80-120       27-MAR-19         Strontium (Sr)-Dissolved       96.1       %       80-120       27-MAR-19         Thallium (Tl)-Dissolved       92.8       %       80-120       27-MAR-19         Tin (Sn)-Dissolved       94.6       %       80-120       27-MAR-19         Titanium (Tl)-Dissolved       97.6       %       80-120       27-MAR-19         Uranium (U)-Dissolved       94.3       %       80-120       27-MAR-19         Vanadium (V)-Dissolved       97.1       %       80-120       27-MAR-19         Zinc (Zn)-Dissolved       97.1       %       80-120       27-MAR-19         WG3015553-1       MB       NP         Aluminum (Al)-Dissolved       <0.0010	Potassium (K)-Disso	olved		96.4		%		80-120	27-MAR-19
Silver (Ag)-Dissolved       98.4       %       80-120       27-MAR-19         Sodium (Na)-Dissolved       99.3       %       80-120       27-MAR-19         Strontium (Sr)-Dissolved       96.1       %       80-120       27-MAR-19         Thallium (TI)-Dissolved       92.8       %       80-120       27-MAR-19         Tin (Sn)-Dissolved       94.6       %       80-120       27-MAR-19         Titanium (Ti)-Dissolved       97.6       %       80-120       27-MAR-19         Uranium (U)-Dissolved       94.3       %       80-120       27-MAR-19         Vanadium (V)-Dissolved       97.1       %       80-120       27-MAR-19         Zinc (Zn)-Dissolved       97.1       %       80-120       27-MAR-19         WG3015553-1       MB       NP         Aluminum (Al)-Dissolved       <0.0010	Selenium (Se)-Disso	olved		103.7		%		80-120	27-MAR-19
Sodium (Na)-Dissolved         99.3         %         80-120         27-MAR-19           Strontium (Sr)-Dissolved         96.1         %         80-120         27-MAR-19           Thallium (Tl)-Dissolved         92.8         %         80-120         27-MAR-19           Tin (Sn)-Dissolved         94.6         %         80-120         27-MAR-19           Titanium (Ti)-Dissolved         97.6         %         80-120         27-MAR-19           Uranium (U)-Dissolved         94.3         %         80-120         27-MAR-19           Vanadium (V)-Dissolved         100.3         %         80-120         27-MAR-19           Zinc (Zn)-Dissolved         97.1         %         80-120         27-MAR-19           WG3015553-1         MB         NP         NP         NP         NP         NP           Aluminum (Al)-Dissolved         <0.0010	Silicon (Si)-Dissolve	d		93.1		%		60-140	27-MAR-19
Strontium (Sr)-Dissolved         96.1         %         80-120         27-MAR-19           Thallium (TI)-Dissolved         92.8         %         80-120         27-MAR-19           Tin (Sn)-Dissolved         94.6         %         80-120         27-MAR-19           Titanium (Ti)-Dissolved         97.6         %         80-120         27-MAR-19           Uranium (U)-Dissolved         94.3         %         80-120         27-MAR-19           Vanadium (V)-Dissolved         100.3         %         80-120         27-MAR-19           Zinc (Zn)-Dissolved         97.1         %         80-120         27-MAR-19           WG3015553-1         MB         NP           Aluminum (Al)-Dissolved         <0.0010	Silver (Ag)-Dissolved	d		98.4		%		80-120	27-MAR-19
Thallium (TI)-Dissolved         92.8         %         80-120         27-MAR-19           Tin (Sn)-Dissolved         94.6         %         80-120         27-MAR-19           Titanium (Ti)-Dissolved         97.6         %         80-120         27-MAR-19           Uranium (U)-Dissolved         94.3         %         80-120         27-MAR-19           Vanadium (V)-Dissolved         100.3         %         80-120         27-MAR-19           Zinc (Zn)-Dissolved         97.1         %         80-120         27-MAR-19           WG3015553-1         MB         NP         NP         NP         NP         Aluminum (Al)-Dissolved         <0.0010	Sodium (Na)-Dissolv	ved		99.3		%		80-120	27-MAR-19
Tin (Sn)-Dissolved       94.6       %       80-120       27-MAR-19         Titanium (Ti)-Dissolved       97.6       %       80-120       27-MAR-19         Uranium (U)-Dissolved       94.3       %       80-120       27-MAR-19         Vanadium (V)-Dissolved       100.3       %       80-120       27-MAR-19         Zinc (Zn)-Dissolved       97.1       %       80-120       27-MAR-19         WG3015553-1       MB       NP         Aluminum (Al)-Dissolved       <0.0010	Strontium (Sr)-Disso	olved		96.1		%		80-120	27-MAR-19
Titanium (Ti)-Dissolved       97.6       %       80-120       27-MAR-19         Uranium (U)-Dissolved       94.3       %       80-120       27-MAR-19         Vanadium (V)-Dissolved       100.3       %       80-120       27-MAR-19         Zinc (Zn)-Dissolved       97.1       %       80-120       27-MAR-19         WG3015553-1       MB       NP         Aluminum (Al)-Dissolved       <0.0010	Thallium (TI)-Dissolv	ved .		92.8		%		80-120	27-MAR-19
Uranium (U)-Dissolved       94.3       %       80-120       27-MAR-19         Vanadium (V)-Dissolved       100.3       %       80-120       27-MAR-19         Zinc (Zn)-Dissolved       97.1       %       80-120       27-MAR-19         WG3015553-1       MB       NP         Aluminum (Al)-Dissolved       <0.0010	Tin (Sn)-Dissolved			94.6		%		80-120	27-MAR-19
Vanadium (V)-Dissolved       100.3       %       80-120       27-MAR-19         Zinc (Zn)-Dissolved       97.1       %       80-120       27-MAR-19         WG3015553-1       MB       NP         Aluminum (Al)-Dissolved       <0.0010	Titanium (Ti)-Dissolv	ved		97.6		%		80-120	27-MAR-19
Zinc (Zn)-Dissolved       97.1       %       80-120       27-MAR-19         WG3015553-1 MB NP         Aluminum (Al)-Dissolved       <0.0010       mg/L       0.001       27-MAR-19         Antimony (Sb)-Dissolved       <0.00010	Uranium (U)-Dissolv	ved .		94.3		%		80-120	27-MAR-19
WG3015553-1         MB         NP           Aluminum (Al)-Dissolved         <0.0010	Vanadium (V)-Disso	lved		100.3		%		80-120	27-MAR-19
Aluminum (Al)-Dissolved       <0.0010	Zinc (Zn)-Dissolved			97.1		%		80-120	27-MAR-19
Antimony (Sb)-Dissolved <0.00010 mg/L 0.0001 27-MAR-19 Arsenic (As)-Dissolved <0.00010 mg/L 0.0001 27-MAR-19 Barium (Ba)-Dissolved <0.00010 mg/L 0.0001 27-MAR-19 Bismuth (Bi)-Dissolved <0.000050 mg/L 0.00005 27-MAR-19 Boron (B)-Dissolved <0.010 mg/L 0.01 27-MAR-19 Cadmium (Cd)-Dissolved <0.000050 mg/L 0.00005 27-MAR-19	WG3015553-1 ME	3	NP						
Arsenic (As)-Dissolved       <0.00010	Aluminum (Al)-Disso	olved		<0.0010		mg/L		0.001	27-MAR-19
Barium (Ba)-Dissolved       <0.00010	Antimony (Sb)-Disso	olved		<0.00010		mg/L		0.0001	27-MAR-19
Bismuth (Bi)-Dissolved       <0.000050	Arsenic (As)-Dissolv	red .		<0.00010		mg/L		0.0001	27-MAR-19
Boron (B)-Dissolved <0.010 mg/L 0.01 27-MAR-19 Cadmium (Cd)-Dissolved <0.00005C mg/L 0.00005 27-MAR-19	Barium (Ba)-Dissolv	red		<0.00010		mg/L		0.0001	27-MAR-19
Cadmium (Cd)-Dissolved <0.000005C mg/L 0.000005 27-MAR-19	Bismuth (Bi)-Dissolv	red		<0.00005	0	mg/L		0.00005	27-MAR-19
	Boron (B)-Dissolved	l		<0.010		mg/L		0.01	27-MAR-19
Calcium (Ca)-Dissolved         <0.050         mg/L         0.05         27-MAR-19	Cadmium (Cd)-Disse	olved		<0.00000	<b>5</b> C	mg/L		0.000005	27-MAR-19
	Calcium (Ca)-Dissol	ved		<0.050		mg/L		0.05	27-MAR-19



Workorder: L2247956

Report Date: 04-APR-19

Page 8 of 24

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA	Water							
Batch R4585680	0							
WG3015553-1 MB	1	NP	0.00040					
Chromium (Cr)-Dissolv			<0.00010		mg/L		0.0001	27-MAR-19
Cobalt (Co)-Dissolved			<0.00010		mg/L		0.0001	27-MAR-19
Copper (Cu)-Dissolved			<0.00020		mg/L		0.0002	27-MAR-19
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	27-MAR-19
Lead (Pb)-Dissolved			<0.00005	0	mg/L		0.00005	27-MAR-19
Lithium (Li)-Dissolved			<0.0010		mg/L		0.001	27-MAR-19
Magnesium (Mg)-Disso			<0.0050		mg/L		0.005	27-MAR-19
Manganese (Mn)-Disse			<0.00010		mg/L		0.0001	27-MAR-19
Molybdenum (Mo)-Diss	solved		<0.00005	0	mg/L		0.00005	27-MAR-19
Nickel (Ni)-Dissolved			<0.00050		mg/L		0.0005	27-MAR-19
Potassium (K)-Dissolve	ed		<0.050		mg/L		0.05	27-MAR-19
Selenium (Se)-Dissolve	ed		<0.00005	0	mg/L		0.00005	27-MAR-19
Silicon (Si)-Dissolved			< 0.050		mg/L		0.05	27-MAR-19
Silver (Ag)-Dissolved			<0.00001	0	mg/L		0.00001	27-MAR-19
Sodium (Na)-Dissolved	d		< 0.050		mg/L		0.05	27-MAR-19
Strontium (Sr)-Dissolve	ed		<0.00020		mg/L		0.0002	27-MAR-19
Thallium (TI)-Dissolved	d		<0.00001	0	mg/L		0.00001	27-MAR-19
Tin (Sn)-Dissolved			<0.00010		mg/L		0.0001	27-MAR-19
Titanium (Ti)-Dissolved	d		<0.00030		mg/L		0.0003	27-MAR-19
Uranium (U)-Dissolved	t		<0.00001	0	mg/L		0.00001	27-MAR-19
Vanadium (V)-Dissolve	ed		<0.00050		mg/L		0.0005	27-MAR-19
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	27-MAR-19
Batch R4585893	3							
WG3015435-2 LCS								
Aluminum (Al)-Dissolve			99.3		%		80-120	27-MAR-19
Antimony (Sb)-Dissolve			90.9		%		80-120	27-MAR-19
Arsenic (As)-Dissolved	d		96.3		%		80-120	27-MAR-19
Barium (Ba)-Dissolved	l		93.4		%		80-120	27-MAR-19
Bismuth (Bi)-Dissolved	t		95.1		%		80-120	27-MAR-19
Boron (B)-Dissolved			92.2		%		80-120	27-MAR-19
Cadmium (Cd)-Dissolv	/ed		96.5		%		80-120	27-MAR-19
Calcium (Ca)-Dissolve	ed		93.4		%		80-120	27-MAR-19
Chromium (Cr)-Dissolv	ved		97.5		%		80-120	27-MAR-19
Cobalt (Co)-Dissolved			95.8		%		80-120	27-MAR-19



Workorder: L2247956

Report Date: 04-APR-19

Page 9 of 24

MET-D-CCMS-VA  Batch R4585893  WG3015435-2 LCS Copper (Cu)-Dissolved Iron (Fe)-Dissolved Lead (Pb)-Dissolved Lithium (Li)-Dissolved Magnesium (Mg)-Dissolved Manganese (Mn)-Dissolved Molybdenum (Mo)-Dissolved Nickel (Ni)-Dissolved Potassium (K)-Dissolved Selenium (Se)-Dissolved Silicon (Si)-Dissolved	Water						
WG3015435-2 LCS Copper (Cu)-Dissolved Iron (Fe)-Dissolved Lead (Pb)-Dissolved Lithium (Li)-Dissolved Magnesium (Mg)-Dissolve Manganese (Mn)-Dissolve Molybdenum (Mo)-Dissolve Nickel (Ni)-Dissolved Potassium (K)-Dissolved Selenium (Se)-Dissolved Silicon (Si)-Dissolved							
Copper (Cu)-Dissolved Iron (Fe)-Dissolved Lead (Pb)-Dissolved Lithium (Li)-Dissolved Magnesium (Mg)-Dissolve Manganese (Mn)-Dissolve Molybdenum (Mo)-Dissolve Nickel (Ni)-Dissolved Potassium (K)-Dissolved Selenium (Se)-Dissolved Silicon (Si)-Dissolved							
Iron (Fe)-Dissolved Lead (Pb)-Dissolved Lithium (Li)-Dissolved Magnesium (Mg)-Dissolve Manganese (Mn)-Dissolve Molybdenum (Mo)-Dissolve Nickel (Ni)-Dissolved Potassium (K)-Dissolved Selenium (Se)-Dissolved Silicon (Si)-Dissolved							
Lead (Pb)-Dissolved Lithium (Li)-Dissolved Magnesium (Mg)-Dissolve Manganese (Mn)-Dissolve Molybdenum (Mo)-Dissolve Nickel (Ni)-Dissolved Potassium (K)-Dissolved Selenium (Se)-Dissolved Silicon (Si)-Dissolved			94.9		%	80-120	27-MAR-19
Lithium (Li)-Dissolved Magnesium (Mg)-Dissolved Manganese (Mn)-Dissolved Molybdenum (Mo)-Dissolved Nickel (Ni)-Dissolved Potassium (K)-Dissolved Selenium (Se)-Dissolved Silicon (Si)-Dissolved			97.3		%	80-120	27-MAR-19
Magnesium (Mg)-Dissolved Manganese (Mn)-Dissolved Molybdenum (Mo)-Dissolved Nickel (Ni)-Dissolved Potassium (K)-Dissolved Selenium (Se)-Dissolved Silicon (Si)-Dissolved			95.9		%	80-120	27-MAR-19
Manganese (Mn)-Dissolved Molybdenum (Mo)-Dissolved Nickel (Ni)-Dissolved Potassium (K)-Dissolved Selenium (Se)-Dissolved Silicon (Si)-Dissolved			90.8		%	80-120	27-MAR-19
Molybdenum (Mo)-Dissolved Nickel (Ni)-Dissolved Potassium (K)-Dissolved Selenium (Se)-Dissolved Silicon (Si)-Dissolved			100.9		%	80-120	27-MAR-19
Nickel (Ni)-Dissolved Potassium (K)-Dissolved Selenium (Se)-Dissolved Silicon (Si)-Dissolved			98.1		%	80-120	27-MAR-19
Potassium (K)-Dissolved Selenium (Se)-Dissolved Silicon (Si)-Dissolved	/ed		92.1		%	80-120	27-MAR-19
Selenium (Se)-Dissolved Silicon (Si)-Dissolved			95.4		%	80-120	27-MAR-19
Silicon (Si)-Dissolved			97.0		%	80-120	27-MAR-19
` '			97.6		%	80-120	27-MAR-19
Silver (Ag)-Dissolved			94.2		%	60-140	27-MAR-19
			88.7		%	80-120	27-MAR-19
Sodium (Na)-Dissolved			100.1		%	80-120	27-MAR-19
Strontium (Sr)-Dissolved			100.3		%	80-120	27-MAR-19
Thallium (TI)-Dissolved			94.4		%	80-120	27-MAR-19
Tin (Sn)-Dissolved			91.8		%	80-120	27-MAR-19
Titanium (Ti)-Dissolved			88.1		%	80-120	27-MAR-19
Uranium (U)-Dissolved			97.3		%	80-120	27-MAR-19
Vanadium (V)-Dissolved			97.6		%	80-120	27-MAR-19
Zinc (Zn)-Dissolved			91.8		%	80-120	27-MAR-19
WG3015435-1 MB		NP					
Aluminum (Al)-Dissolved			<0.0010		mg/L	0.001	27-MAR-19
Antimony (Sb)-Dissolved			<0.00010		mg/L	0.0001	27-MAR-19
Arsenic (As)-Dissolved			<0.00010		mg/L	0.0001	27-MAR-19
Barium (Ba)-Dissolved			<0.00010		mg/L	0.0001	27-MAR-19
Bismuth (Bi)-Dissolved			<0.000050	)	mg/L	0.00005	27-MAR-19
Boron (B)-Dissolved			<0.010		mg/L	0.01	27-MAR-19
Cadmium (Cd)-Dissolved			<0.000005	5C	mg/L	0.000005	27-MAR-19
Calcium (Ca)-Dissolved			<0.050		mg/L	0.05	27-MAR-19
Chromium (Cr)-Dissolved			<0.00010		mg/L	0.0001	27-MAR-19
Cobalt (Co)-Dissolved			<0.00010		mg/L	0.0001	27-MAR-19
Copper (Cu)-Dissolved			<0.00020		mg/L	0.0002	27-MAR-19
Iron (Fe)-Dissolved			<0.010		mg/L	0.01	27-MAR-19
Lead (Pb)-Dissolved			<0.000050	)	mg/L	0.00005	27-MAR-19



Workorder: L2247956 Report Date: 04-APR-19 Page 10 of 24

Test M	atrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA W	/ater							
Batch R4585893								
WG3015435-1 MB		NP						
Lithium (Li)-Dissolved			<0.0010		mg/L		0.001	27-MAR-19
Magnesium (Mg)-Dissolved			<0.0050		mg/L		0.005	27-MAR-19
Manganese (Mn)-Dissolved			<0.00010		mg/L		0.0001	27-MAR-19
Molybdenum (Mo)-Dissolve	d		<0.000050		mg/L		0.00005	27-MAR-19
Nickel (Ni)-Dissolved			<0.00050		mg/L		0.0005	27-MAR-19
Potassium (K)-Dissolved			< 0.050		mg/L		0.05	27-MAR-19
Selenium (Se)-Dissolved			<0.000050		mg/L		0.00005	27-MAR-19
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	27-MAR-19
Silver (Ag)-Dissolved			<0.000010		mg/L		0.00001	27-MAR-19
Sodium (Na)-Dissolved			< 0.050		mg/L		0.05	27-MAR-19
Strontium (Sr)-Dissolved			<0.00020		mg/L		0.0002	27-MAR-19
Thallium (TI)-Dissolved			<0.000010		mg/L		0.00001	27-MAR-19
Tin (Sn)-Dissolved			<0.00010		mg/L		0.0001	27-MAR-19
Titanium (Ti)-Dissolved			<0.00030		mg/L		0.0003	27-MAR-19
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	27-MAR-19
Vanadium (V)-Dissolved			<0.00050		mg/L		0.0005	27-MAR-19
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	27-MAR-19
Batch R4588535								
WG3018795-3 DUP		L2247956-3						
Aluminum (Al)-Dissolved		<0.0030	<0.0030	RPD-NA	mg/L	N/A	20	01-APR-19
Antimony (Sb)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	01-APR-19
Arsenic (As)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	01-APR-19
Barium (Ba)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	01-APR-19
Bismuth (Bi)-Dissolved		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	01-APR-19
Boron (B)-Dissolved		<0.010	<0.010	RPD-NA	mg/L	N/A	20	01-APR-19
Cadmium (Cd)-Dissolved		<0.0000050	<0.0000050	RPD-NA	mg/L	N/A	20	01-APR-19
Calcium (Ca)-Dissolved		< 0.050	<0.050	RPD-NA	mg/L	N/A	20	01-APR-19
Chromium (Cr)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	01-APR-19
Cobalt (Co)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	01-APR-19
Copper (Cu)-Dissolved		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	01-APR-19
Iron (Fe)-Dissolved		<0.010	<0.010	RPD-NA	mg/L	N/A	20	01-APR-19
Lead (Pb)-Dissolved		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	01-APR-19
Lithium (Li)-Dissolved		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	01-APR-19
Magnesium (Mg)-Dissolved		<0.10	<0.10	RPD-NA	mg/L	N/A	20	01-APR-19



Workorder: L2247956 Report Date: 04-APR-19 Page 11 of 24

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA	Water							
Batch R4588535								
WG3018795-3 DUP	t d	L2247956-3	0.00040					
Manganese (Mn)-Disso		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	01-APR-19
Molybdenum (Mo)-Diss	olved	<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	01-APR-19
Nickel (Ni)-Dissolved		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	01-APR-19
Potassium (K)-Dissolve		<0.050	<0.050	RPD-NA	mg/L	N/A	20	01-APR-19
Selenium (Se)-Dissolve	d	<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	01-APR-19
Silicon (Si)-Dissolved		<0.050	<0.050	RPD-NA	mg/L	N/A	20	01-APR-19
Silver (Ag)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	01-APR-19
Sodium (Na)-Dissolved		<0.050	<0.050	RPD-NA	mg/L	N/A	20	01-APR-19
Strontium (Sr)-Dissolve	d	<0.00020	<0.00020	RPD-NA	mg/L	N/A	20	01-APR-19
Thallium (TI)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	01-APR-19
Tin (Sn)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	01-APR-19
Titanium (Ti)-Dissolved		<0.010	<0.010	RPD-NA	mg/L	N/A	20	01-APR-19
Uranium (U)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	01-APR-19
Vanadium (V)-Dissolved	d	<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	01-APR-19
Zinc (Zn)-Dissolved		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	01-APR-19
WG3018795-2 LCS Aluminum (Al)-Dissolve	d		98.9		%		80-120	01-APR-19
Antimony (Sb)-Dissolve	d		96.8		%		80-120	01-APR-19
Arsenic (As)-Dissolved			96.2		%		80-120	01-APR-19
Barium (Ba)-Dissolved			96.8		%		80-120	01-APR-19
Bismuth (Bi)-Dissolved			105.9		%		80-120	01-APR-19
Boron (B)-Dissolved			94.3		%		80-120	01-APR-19
Cadmium (Cd)-Dissolve	ed		98.5		%		80-120	01-APR-19
Calcium (Ca)-Dissolved	I		96.1		%		80-120	01-APR-19
Chromium (Cr)-Dissolve	ed		99.5		%		80-120	01-APR-19
Cobalt (Co)-Dissolved			97.6		%		80-120	01-APR-19
Copper (Cu)-Dissolved			98.0		%		80-120	01-APR-19
Iron (Fe)-Dissolved			93.3		%		80-120	01-APR-19
Lead (Pb)-Dissolved			101.2		%		80-120	01-APR-19
Lithium (Li)-Dissolved			92.1		%		80-120	01-APR-19
Magnesium (Mg)-Disso	lved		97.4		%		80-120	01-APR-19
Manganese (Mn)-Disso			99.7		%		80-120	01-APR-19
Molybdenum (Mo)-Disse			99.3		%		80-120	01-APR-19
Nickel (Ni)-Dissolved			98.1		%		80-120	01-APR-19



Workorder: L2247956 Report Date: 04-APR-19 Page 12 of 24

Test N	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA	Water							
Batch R4588535								
WG3018795-2 LCS			05.0		0/			
Potassium (K)-Dissolved			95.8		%		80-120	01-APR-19
Selenium (Se)-Dissolved			104.2		%		80-120	01-APR-19
Silicon (Si)-Dissolved			99.1		%		60-140	01-APR-19
Silver (Ag)-Dissolved			99.1		%		80-120	01-APR-19
Sodium (Na)-Dissolved			103.6		%		80-120	01-APR-19
Strontium (Sr)-Dissolved			95.8		%		80-120	01-APR-19
Thallium (TI)-Dissolved			102.8		%		80-120	01-APR-19
Tin (Sn)-Dissolved			96.3		%		80-120	01-APR-19
Titanium (Ti)-Dissolved			90.8		%		80-120	01-APR-19
Uranium (U)-Dissolved			98.3		%		80-120	01-APR-19
Vanadium (V)-Dissolved			99.4		%		80-120	01-APR-19
Zinc (Zn)-Dissolved			98.6		%		80-120	01-APR-19
WG3018795-1 MB		LF	-0.0010				0.004	04 ADD 40
Aluminum (Al)-Dissolved			<0.0010		mg/L		0.001	01-APR-19
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	01-APR-19
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	01-APR-19
Barium (Ba)-Dissolved			<0.00010		mg/L		0.0001	01-APR-19
Bismuth (Bi)-Dissolved			<0.000050	)	mg/L		0.00005	01-APR-19
Boron (B)-Dissolved			<0.010		mg/L		0.01	01-APR-19
Cadmium (Cd)-Dissolved			<0.000005	5C	mg/L		0.000005	01-APR-19
Calcium (Ca)-Dissolved			<0.050		mg/L		0.05	01-APR-19
Chromium (Cr)-Dissolved			<0.00010		mg/L		0.0001	01-APR-19
Cobalt (Co)-Dissolved			<0.00010		mg/L		0.0001	01-APR-19
Copper (Cu)-Dissolved			<0.00020		mg/L		0.0002	01-APR-19
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	01-APR-19
Lead (Pb)-Dissolved			<0.000050	)	mg/L		0.00005	01-APR-19
Lithium (Li)-Dissolved			<0.0010		mg/L		0.001	01-APR-19
Magnesium (Mg)-Dissolve	d		< 0.0050		mg/L		0.005	01-APR-19
Manganese (Mn)-Dissolve	d		<0.00010		mg/L		0.0001	01-APR-19
Molybdenum (Mo)-Dissolve	ed		<0.000050	)	mg/L		0.00005	01-APR-19
Nickel (Ni)-Dissolved			<0.00050		mg/L		0.0005	01-APR-19
Potassium (K)-Dissolved			<0.050		mg/L		0.05	01-APR-19
Selenium (Se)-Dissolved			<0.000050	)	mg/L		0.00005	01-APR-19
Silicon (Si)-Dissolved			< 0.050		mg/L		0.05	01-APR-19



Workorder: L2247956 Report Date: 04-APR-19 Page 13 of 24

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA	Water							
Batch R4588535								
WG3018795-1 MB		LF						
Silver (Ag)-Dissolved			<0.000010		mg/L		0.00001	01-APR-19
Sodium (Na)-Dissolved			<0.050		mg/L		0.05	01-APR-19
Strontium (Sr)-Dissolve			<0.00020		mg/L		0.0002	01-APR-19
Thallium (TI)-Dissolved			<0.000010		mg/L		0.00001	01-APR-19
Tin (Sn)-Dissolved			<0.00010		mg/L		0.0001	01-APR-19
Titanium (Ti)-Dissolved			<0.00030		mg/L		0.0003	01-APR-19
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	01-APR-19
Vanadium (V)-Dissolved	d		<0.00050		mg/L		0.0005	01-APR-19
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	01-APR-19
MET-T-CCMS-VA	Water							
Batch R4585048								
WG3014083-3 DUP		L2247956-3	-0.0020	DDD MA	m a/l	N1/A	00	00 MAD 40
Aluminum (Al)-Total		<0.0030	<0.0030	RPD-NA	mg/L	N/A	20	26-MAR-19
Antimony (Sb)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	26-MAR-19
Arsenic (As)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	26-MAR-19
Barium (Ba)-Total Bismuth (Bi)-Total		<0.00010 <0.000050	<0.00010	RPD-NA	mg/L	N/A	20	26-MAR-19
` '			<0.000050	RPD-NA	mg/L	N/A	20	26-MAR-19
Boron (B)-Total		<0.010	<0.010	RPD-NA	mg/L	N/A	20	26-MAR-19
Cadmium (Cd)-Total		<0.000050	<0.0000050	=	mg/L	N/A	20	26-MAR-19
Calcium (Ca)-Total		<0.050	<0.050	RPD-NA	mg/L	N/A	20	26-MAR-19
Cobalt (Co)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	26-MAR-19
Copper (Cu)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	26-MAR-19
Iron (Fe)-Total		<0.010	<0.010	RPD-NA	mg/L	N/A	20	26-MAR-19
Lead (Pb)-Total		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	26-MAR-19
Lithium (Li)-Total  Magnesium (Mg)-Total		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	26-MAR-19
3 ( 3/		<0.10	<0.10 <0.00010	RPD-NA	mg/L	N/A	20	26-MAR-19
Manganese (Mn)-Total	ı	<0.00010		RPD-NA	mg/L	N/A	20	26-MAR-19
Molybdenum (Mo)-Total	l	<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	26-MAR-19
Nickel (Ni)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	26-MAR-19
Potassium (K)-Total		<0.050 <0.00050	<0.050 <0.000050	RPD-NA	mg/L	N/A	20	26-MAR-19
Selenium (Se)-Total			<0.000	RPD-NA	mg/L	N/A	20	26-MAR-19
Silicon (Si)-Total		<0.10 <0.000010		RPD-NA	mg/L	N/A	20	26-MAR-19
Silver (Ag)-Total Sodium (Na)-Total		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	26-MAR-19
Socium (Na)-Total		<0.000	<0.050	RPD-NA	mg/L	N/A	20	26-MAR-19



Workorder: L2247956 Report Date: 04-APR-19 Page 14 of 24

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-VA	Water							
Batch R4585048								
WG3014083-3 DUP Strontium (Sr)-Total		<b>L2247956-3</b> < 0.00020	<0.00020	RPD-NA	mg/L	N/A	20	26-MAR-19
Thallium (TI)-Total		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	26-MAR-19
Tin (Sn)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	26-MAR-19
Titanium (Ti)-Total		<0.010	<0.010	RPD-NA	mg/L	N/A	20	26-MAR-19
Uranium (U)-Total		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	26-MAR-19
Vanadium (V)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	26-MAR-19
Zinc (Zn)-Total		<0.0030	<0.0030	RPD-NA	mg/L	N/A	20	26-MAR-19
WG3014083-2 LCS Aluminum (Al)-Total			104.0		%		80-120	26-MAR-19
Antimony (Sb)-Total			99.8		%		80-120	26-MAR-19
Arsenic (As)-Total			95.6		%		80-120	26-MAR-19
Barium (Ba)-Total			101.7		%		80-120	26-MAR-19
Bismuth (Bi)-Total			97.2		%		80-120	26-MAR-19
Boron (B)-Total			91.8		%		80-120	26-MAR-19
Cadmium (Cd)-Total			99.0		%		80-120	26-MAR-19
Calcium (Ca)-Total			94.3		%		80-120	26-MAR-19
Chromium (Cr)-Total			99.9		%		80-120	26-MAR-19
Cobalt (Co)-Total			96.8		%		80-120	26-MAR-19
Copper (Cu)-Total			95.6		%		80-120	26-MAR-19
Iron (Fe)-Total			94.3		%		80-120	26-MAR-19
Lead (Pb)-Total			96.3		%		80-120	26-MAR-19
Lithium (Li)-Total			93.3		%		80-120	26-MAR-19
Magnesium (Mg)-Total			98.8		%		80-120	26-MAR-19
Manganese (Mn)-Total			101.2		%		80-120	26-MAR-19
Molybdenum (Mo)-Total			92.2		%		80-120	26-MAR-19
Nickel (Ni)-Total			96.4		%		80-120	26-MAR-19
Potassium (K)-Total			98.5		%		80-120	26-MAR-19
Selenium (Se)-Total			91.5		%		80-120	26-MAR-19
Silicon (Si)-Total			97.2		%		80-120	26-MAR-19
Silver (Ag)-Total			97.1		%		80-120	26-MAR-19
Sodium (Na)-Total			101.7		%		80-120	26-MAR-19
Strontium (Sr)-Total			99.4		%		80-120	26-MAR-19
Thallium (TI)-Total			97.3		%		80-120	26-MAR-19
Tin (Sn)-Total			97.4		%		80-120	26-MAR-19



Workorder: L2247956

Report Date: 04-APR-19 Page 15 of 24

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-VA	Water							
Batch R4585048								
WG3014083-2 LCS			96.2		0/		00.400	00.1445.40
Titanium (Ti)-Total			102.0		% %		80-120	26-MAR-19
Uranium (U)-Total Vanadium (V)-Total			98.4		%		80-120	26-MAR-19
Zinc (Zn)-Total							80-120	26-MAR-19
,			100.5		%		80-120	26-MAR-19
WG3014083-1 MB Aluminum (Al)-Total			<0.0030		mg/L		0.003	26-MAR-19
Antimony (Sb)-Total			<0.00010		mg/L		0.0001	26-MAR-19
Arsenic (As)-Total			<0.00010		mg/L		0.0001	26-MAR-19
Barium (Ba)-Total			<0.00010		mg/L		0.0001	26-MAR-19
Bismuth (Bi)-Total			<0.000050		mg/L		0.00005	26-MAR-19
Boron (B)-Total			<0.010		mg/L		0.01	26-MAR-19
Cadmium (Cd)-Total			<0.00000	5C	mg/L		0.000005	26-MAR-19
Calcium (Ca)-Total			<0.050		mg/L		0.05	26-MAR-19
Chromium (Cr)-Total			<0.00010		mg/L		0.0001	26-MAR-19
Cobalt (Co)-Total			<0.00010		mg/L		0.0001	26-MAR-19
Copper (Cu)-Total			<0.00050		mg/L		0.0005	26-MAR-19
Iron (Fe)-Total			<0.010		mg/L		0.01	26-MAR-19
Lead (Pb)-Total			<0.00005	0	mg/L		0.00005	26-MAR-19
Lithium (Li)-Total			<0.0010		mg/L		0.001	26-MAR-19
Magnesium (Mg)-Total			<0.0050		mg/L		0.005	26-MAR-19
Manganese (Mn)-Total			<0.00010		mg/L		0.0001	26-MAR-19
Molybdenum (Mo)-Total			<0.000050	0	mg/L		0.00005	26-MAR-19
Nickel (Ni)-Total			<0.00050		mg/L		0.0005	26-MAR-19
Potassium (K)-Total			<0.050		mg/L		0.05	26-MAR-19
Selenium (Se)-Total			<0.00005	0	mg/L		0.00005	26-MAR-19
Silicon (Si)-Total			<0.10		mg/L		0.1	26-MAR-19
Silver (Ag)-Total			<0.000010	0	mg/L		0.00001	26-MAR-19
Sodium (Na)-Total			<0.050		mg/L		0.05	26-MAR-19
Strontium (Sr)-Total			<0.00020		mg/L		0.0002	26-MAR-19
Thallium (TI)-Total			<0.000010	0	mg/L		0.00001	26-MAR-19
Tin (Sn)-Total			<0.00010		mg/L		0.0001	26-MAR-19
Titanium (Ti)-Total			<0.00030		mg/L		0.0003	26-MAR-19
Uranium (U)-Total			<0.000010	0	mg/L		0.00001	26-MAR-19
Vanadium (V)-Total			<0.00050		mg/L		0.0005	26-MAR-19



Workorder: L2247956

Report Date: 04-APR-19

Page 16 of 24

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-VA	Water							
Batch R4585048								
WG3014083-1 MB			0.0000		//			
Zinc (Zn)-Total			<0.0030		mg/L		0.003	26-MAR-19
WG3014083-4 MS Aluminum (Al)-Total		L2247956-2	98.0		%		70-130	26-MAR-19
Antimony (Sb)-Total			98.8		%		70-130	26-MAR-19
Arsenic (As)-Total			100.1		%		70-130	26-MAR-19
Barium (Ba)-Total			N/A	MS-B	%		-	26-MAR-19
Bismuth (Bi)-Total			99.2		%		70-130	26-MAR-19
Boron (B)-Total			102.3		%		70-130	26-MAR-19
Cadmium (Cd)-Total			101.4		%		70-130	26-MAR-19
Calcium (Ca)-Total			N/A	MS-B	%		-	26-MAR-19
Chromium (Cr)-Total			102.9		%		70-130	26-MAR-19
Cobalt (Co)-Total			95.0		%		70-130	26-MAR-19
Copper (Cu)-Total			96.7		%		70-130	26-MAR-19
Iron (Fe)-Total			96.4		%		70-130	26-MAR-19
Lead (Pb)-Total			97.4		%		70-130	26-MAR-19
Lithium (Li)-Total			94.9		%		70-130	26-MAR-19
Magnesium (Mg)-Total			N/A	MS-B	%		-	26-MAR-19
Manganese (Mn)-Total			N/A	MS-B	%		-	26-MAR-19
Molybdenum (Mo)-Total			95.1		%		70-130	26-MAR-19
Nickel (Ni)-Total			98.2		%		70-130	26-MAR-19
Potassium (K)-Total			95.7		%		70-130	26-MAR-19
Selenium (Se)-Total			99.6		%		70-130	26-MAR-19
Silicon (Si)-Total			90.8		%		70-130	26-MAR-19
Silver (Ag)-Total			101.9		%		70-130	26-MAR-19
Sodium (Na)-Total			96.8		%		70-130	26-MAR-19
Strontium (Sr)-Total			N/A	MS-B	%		-	26-MAR-19
Thallium (TI)-Total			98.0		%		70-130	26-MAR-19
Tin (Sn)-Total			98.7		%		70-130	26-MAR-19
Titanium (Ti)-Total			97.7		%		70-130	26-MAR-19
Uranium (U)-Total			104.4		%		70-130	26-MAR-19
Vanadium (V)-Total			103.8		%		70-130	26-MAR-19
Zinc (Zn)-Total			98.7		%		70-130	26-MAR-19



Workorder: L2247956 Report Date: 04-APR-19 Page 17 of 24

lest lest	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-VA	Water							
Batch R4585464								
WG3014886-3 DUP		L2247956-4	.0.0000	DDD 114	/1	<b>N</b> 1/A	22	
Aluminum (Al)-Total		<0.0030	<0.0030	RPD-NA	mg/L	N/A	20	27-MAR-19
Antimony (Sb)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	27-MAR-19
Arsenic (As)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	27-MAR-19
Barium (Ba)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	27-MAR-19
Bismuth (Bi)-Total		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	27-MAR-19
Boron (B)-Total		<0.010	<0.010	RPD-NA	mg/L	N/A	20	27-MAR-19
Cadmium (Cd)-Total		<0.0000050	<0.0000050	RPD-NA	mg/L	N/A	20	27-MAR-19
Calcium (Ca)-Total		<0.050	<0.050	RPD-NA	mg/L	N/A	20	27-MAR-19
Chromium (Cr)-Total		<0.00010	0.00010	RPD-NA	mg/L	N/A	20	27-MAR-19
Cobalt (Co)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	27-MAR-19
Copper (Cu)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	27-MAR-19
Iron (Fe)-Total		0.022	0.024		mg/L	9.0	20	27-MAR-19
Lead (Pb)-Total		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	27-MAR-19
Lithium (Li)-Total		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	27-MAR-19
Magnesium (Mg)-Total		<0.10	<0.10	RPD-NA	mg/L	N/A	20	27-MAR-19
Manganese (Mn)-Total		0.00014	0.00016		mg/L	14	20	27-MAR-19
Molybdenum (Mo)-Total		< 0.000050	<0.000050	RPD-NA	mg/L	N/A	20	27-MAR-19
Nickel (Ni)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	27-MAR-19
Potassium (K)-Total		< 0.050	<0.050	RPD-NA	mg/L	N/A	20	27-MAR-19
Selenium (Se)-Total		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	27-MAR-19
Silicon (Si)-Total		<0.10	<0.10	RPD-NA	mg/L	N/A	20	27-MAR-19
Silver (Ag)-Total		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	27-MAR-19
Sodium (Na)-Total		<0.050	<0.050	RPD-NA	mg/L	N/A	20	27-MAR-19
Strontium (Sr)-Total		<0.00020	<0.00020	RPD-NA	mg/L	N/A	20	27-MAR-19
Thallium (TI)-Total		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	27-MAR-19
Tin (Sn)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	27-MAR-19
Titanium (Ti)-Total		<0.010	<0.010	RPD-NA	mg/L	N/A	20	27-MAR-19
Uranium (U)-Total		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	27-MAR-19
Vanadium (V)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	27-MAR-19
Zinc (Zn)-Total		<0.0030	<0.0030	RPD-NA	mg/L	N/A	20	27-MAR-19
WG3014886-2 LCS				· = · · ·	-		-	
Aluminum (Al)-Total			100.1		%		80-120	27-MAR-19
Antimony (Sb)-Total			101.3		%		80-120	27-MAR-19
Arsenic (As)-Total			96.5		%		80-120	27-MAR-19



Workorder: L2247956

Report Date: 04-APR-19

Page 18 of 24

est	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-VA	Water							
Batch R4585464								
WG3014886-2 LCS Barium (Ba)-Total			104.8		%		00.400	07.144.0.40
Bismuth (Bi)-Total			104.8		%		80-120	27-MAR-19
` '					%		80-120	27-MAR-19
Boron (B)-Total			95.6 99.6				80-120	27-MAR-19
Cadmium (Cd)-Total					%		80-120	27-MAR-19
Calcium (Ca)-Total			98.8		%		80-120	27-MAR-19
Chromium (Cr)-Total			96.2		%		80-120	27-MAR-19
Cobalt (Co)-Total			97.8		%		80-120	27-MAR-19
Copper (Cu)-Total			97.7		%		80-120	27-MAR-19
Iron (Fe)-Total			92.3		%		80-120	27-MAR-19
Lead (Pb)-Total			103.8		%		80-120	27-MAR-19
Lithium (Li)-Total			94.7		%		80-120	27-MAR-19
Magnesium (Mg)-Total			103.2		%		80-120	27-MAR-19
Manganese (Mn)-Total			99.4		%		80-120	27-MAR-19
Molybdenum (Mo)-Total			100.7		%		80-120	27-MAR-19
Nickel (Ni)-Total			99.4		%		80-120	27-MAR-19
Potassium (K)-Total			94.3		%		80-120	27-MAR-19
Selenium (Se)-Total			94.5		%		80-120	27-MAR-19
Silicon (Si)-Total			96.4		%		80-120	27-MAR-19
Silver (Ag)-Total			100.2		%		80-120	27-MAR-19
Sodium (Na)-Total			98.7		%		80-120	27-MAR-19
Strontium (Sr)-Total			97.9		%		80-120	27-MAR-19
Thallium (TI)-Total			104.6		%		80-120	27-MAR-19
Tin (Sn)-Total			97.2		%		80-120	27-MAR-19
Titanium (Ti)-Total			94.9		%		80-120	27-MAR-19
Uranium (U)-Total			101.8		%		80-120	27-MAR-19
Vanadium (V)-Total			99.0		%		80-120	27-MAR-19
Zinc (Zn)-Total			98.1		%		80-120	27-MAR-19
WG3014886-1 MB							00 .20	27 100 41 10
Aluminum (Al)-Total			<0.0030		mg/L		0.003	27-MAR-19
Antimony (Sb)-Total			<0.00010		mg/L		0.0001	27-MAR-19
Arsenic (As)-Total			<0.00010		mg/L		0.0001	27-MAR-19
Barium (Ba)-Total			<0.00010		mg/L		0.0001	27-MAR-19
Bismuth (Bi)-Total			<0.00005		mg/L		0.00005	27-MAR-19
Boron (B)-Total			<0.010		mg/L		0.01	27-MAR-19



		Workorder:	L224795	6	Report Date: (	)4-APR-19	Page 19 of 24		
est	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed	
MET-T-CCMS-VA	Water								
Batch R4585464									
WG3014886-1 MB Cadmium (Cd)-Total			<0.00000	5C	mg/L		0.000005	27-MAR-19	
Calcium (Ca)-Total			< 0.050		mg/L		0.05	27-MAR-19	
Chromium (Cr)-Total			<0.00010		mg/L		0.0001	27-MAR-19	
Cobalt (Co)-Total			<0.00010		mg/L		0.0001	27-MAR-19	
Copper (Cu)-Total			<0.00050		mg/L		0.0005	27-MAR-19	
Iron (Fe)-Total			<0.010		mg/L		0.01	27-MAR-19	
Lead (Pb)-Total			<0.00005	0	mg/L		0.00005	27-MAR-19	
Lithium (Li)-Total			<0.0010		mg/L		0.001	27-MAR-19	
Magnesium (Mg)-Total			<0.0050		mg/L		0.005	27-MAR-19	
Manganese (Mn)-Total			<0.00010		mg/L		0.0001	27-MAR-19	
Molybdenum (Mo)-Total			<0.00005	0	mg/L		0.00005	27-MAR-19	
Nickel (Ni)-Total			<0.00050		mg/L		0.0005	27-MAR-19	
Potassium (K)-Total			<0.050		mg/L		0.05	27-MAR-19	
Selenium (Se)-Total			<0.00005	0	mg/L		0.00005	27-MAR-19	
Silicon (Si)-Total			<0.10		mg/L		0.1	27-MAR-19	
Silver (Ag)-Total			<0.00001	0	mg/L		0.00001	27-MAR-19	
Sodium (Na)-Total			<0.050		mg/L		0.05	27-MAR-19	
Strontium (Sr)-Total			<0.00020		mg/L		0.0002	27-MAR-19	
Thallium (TI)-Total			<0.00001	0	mg/L		0.00001	27-MAR-19	
Tin (Sn)-Total			<0.00010		mg/L		0.0001	27-MAR-19	
Titanium (Ti)-Total			<0.00030		mg/L		0.0003	27-MAR-19	
Uranium (U)-Total			<0.00001	0	mg/L		0.00001	27-MAR-19	
Vanadium (V)-Total			<0.00050		mg/L		0.0005	27-MAR-19	
Zinc (Zn)-Total			<0.0030		mg/L		0.003	27-MAR-19	
IH3-L-F-CL	Water								
Batch R4586901									
WG3017089-2 LCS Ammonia as N			108.3		%		85-115	28-MAR-19	
WG3017089-1 MB Ammonia as N			<0.0050		mg/L		0.005	28-MAR-19	
IO2-L-IC-N-CL	Water								
Batch R4580126 WG3012854-11 DUP Nitrite (as N)		<b>L2247956-4</b> < 0.0010	<0.0010	RPD-N	IA mg/L	N/A	20	22-MAR-19	
WG3012854-10 LCS				2 ,	<u> </u>				

Water

## **Quality Control Report**

Workorder: L2247956

Report Date: 04-APR-19

Page 20 of 24

Test		Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
NO2-L-IC-N-CL		Water							
<b>Batch</b> R4: <b>WG3012854-10</b> Nitrite (as N)	580126 LCS			105.6		%		90-110	22-MAR-19
WG3012854-6 Nitrite (as N)	LCS			104.0		%		90-110	22-MAR-19
<b>WG3012854-5</b> Nitrite (as N)	MB			<0.0010		mg/L		0.001	22-MAR-19
WG3012854-9 Nitrite (as N)	MB			<0.0010		mg/L		0.001	22-MAR-19
NO3-L-IC-N-CL		Water							
Batch R4	580126								
<b>WG3012854-11</b> Nitrate (as N)	DUP		<b>L2247956-4</b> 0.125	0.136		mg/L	8.9	20	22-MAR-19
<b>WG3012854-10</b> Nitrate (as N)	LCS			99.5		%		90-110	22-MAR-19
<b>WG3012854-6</b> Nitrate (as N)	LCS			99.5		%		90-110	22-MAR-19
WG3012854-5 Nitrate (as N)	MB			<0.0050		mg/L		0.005	22-MAR-19
WG3012854-9 Nitrate (as N)	MB			<0.0050		mg/L		0.005	22-MAR-19
ORP-CL		Water							
Batch R4	585058								
<b>WG3014746-17</b> ORP	CRM		CL-ORP	222		mV		210-230	26-MAR-19
<b>WG3014746-18</b> ORP	DUP		<b>L2247956-3</b> 431	439	J	mV	7.6	15	26-MAR-19
P-T-L-COL-CL		Water							
WG3014693-30									
Phosphorus (P)				97.1		%		80-120	27-MAR-19
WG3014693-29 Phosphorus (P)				<0.0020		mg/L		0.002	27-MAR-19
PH-CL		Water							
<b>Batch R4</b> : <b>WG3015272-10</b> pH	585726 LCS			7.05		рН		6.9-7.1	27-MAR-19
•						·			



Workorder: L2247956

Report Date: 04-APR-19 Page 21 of 24

Test Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PO4-DO-L-COL-CL Water	r						
Batch R4580026							
WG3012698-14 LCS Orthophosphate-Dissolved (as F	P)	100.6		%		80-120	22-MAR-19
WG3012698-18 LCS Orthophosphate-Dissolved (as F	P)	102.1		%		80-120	22-MAR-19
WG3012698-13 MB Orthophosphate-Dissolved (as F	P)	<0.0010		mg/L		0.001	22-MAR-19
WG3012698-17 MB Orthophosphate-Dissolved (as F	P)	<0.0010		mg/L		0.001	22-MAR-19
SO4-IC-N-CL Water	r						
Batch R4580126							
<b>WG3012854-11 DUP</b> Sulfate (SO4)	<b>L2247956-4</b> <0.30	<0.30	RPD-NA	mg/L	N/A	20	22-MAR-19
<b>WG3012854-10 LCS</b> Sulfate (SO4)		103.9		%		90-110	22-MAR-19
<b>WG3012854-6 LCS</b> Sulfate (SO4)		102.0		%		90-110	22-MAR-19
<b>WG3012854-5 MB</b> Sulfate (SO4)		<0.30		mg/L		0.3	22-MAR-19
<b>WG3012854-9 MB</b> Sulfate (SO4)		<0.30		mg/L		0.3	22-MAR-19
SOLIDS-TDS-CL Water	r						
Batch R4586266							
WG3014764-6 DUP Total Dissolved Solids	<b>L2247956-7</b> 305	323		mg/L	5.9	20	27-MAR-19
WG3014764-5 LCS Total Dissolved Solids		103.4		%		85-115	27-MAR-19
WG3014764-4 MB Total Dissolved Solids		<10		mg/L		10	27-MAR-19
TKN-L-F-CL Water	r						
Batch R4586513							
WG3016508-2 LCS Total Kjeldahl Nitrogen		93.7		%		75-125	27-MAR-19
WG3016508-6 LCS Total Kjeldahl Nitrogen		93.3		%		75-125	27-MAR-19
<b>WG3016508-1 MB</b> Total Kjeldahl Nitrogen		<0.050		mg/L		0.05	27-MAR-19
<b>WG3016508-5 MB</b> Total Kjeldahl Nitrogen		<0.050		mg/L		0.05	27-MAR-19



Workorder: L2247956

Report Date: 04-APR-19 Page 22 of 24

Test .	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
TSS-L-CL	Water							
Batch R4585537								
WG3015159-6 LCS Total Suspended Solids	3		94.6		%		85-115	26-MAR-19
WG3015159-5 MB Total Suspended Solids	S		<1.0		mg/L		1	26-MAR-19
Batch R4587072 WG3016295-2 LCS								
Total Suspended Solids	5		93.9		%		85-115	28-MAR-19
WG3016295-1 MB Total Suspended Solids	3		<1.0		mg/L		1	28-MAR-19
TURBIDITY-CL	Water							
Batch R4580128								
WG3012842-9 DUP Turbidity		<b>L2247956-7</b> 19.6	19.2		NTU	2.1	15	22-MAR-19
WG3012842-5 LCS Turbidity			94.0		%		85-115	22-MAR-19
WG3012842-8 LCS Turbidity			95.5		%		85-115	22-MAR-19
WG3012842-4 MB Turbidity			<0.10		NTU		0.1	22-MAR-19
WG3012842-7 MB Turbidity			<0.10		NTU		0.1	22-MAR-19

Workorder: L2247956 Report Date: 04-APR-19 Page 23 of 24

### Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

### **Sample Parameter Qualifier Definitions:**

Qualifier	Description
J	Duplicate results and limits are expressed in terms of absolute difference.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

Workorder: L2247956 Report Date: 04-APR-19 Page 24 of 24

#### **Hold Time Exceedances:**

	Sample						
ALS Product Description	ID	Sampling Date	Date Processed	Rec. HT	Actual HT	Units	Qualifier
Physical Tests							
Oxidation redution potentia	l by elect.						
	1	20-MAR-19 12:35	26-MAR-19 09:45	0.25	141	hours	EHTR-FM
	2	20-MAR-19 13:05	26-MAR-19 09:45	0.25	141	hours	EHTR-FM
	3	20-MAR-19 12:40	26-MAR-19 09:45	0.25	141	hours	EHTR-FM
	4	20-MAR-19 15:30	26-MAR-19 09:45	0.25	138	hours	EHTR-FM
	5	21-MAR-19 15:15	26-MAR-19 09:45	0.25	114	hours	EHTR-FN
	6	21-MAR-19 12:30	26-MAR-19 09:45	0.25	117	hours	EHTR-FN
	7	21-MAR-19 12:35	26-MAR-19 09:45	0.25	117	hours	EHTR-FM
рН							
	1	20-MAR-19 12:35	27-MAR-19 09:00	0.25	164	hours	EHTR-FM
	2	20-MAR-19 13:05	27-MAR-19 09:00	0.25	164	hours	EHTR-FM
	3	20-MAR-19 12:40	27-MAR-19 09:00	0.25	164	hours	EHTR-FM
	4	20-MAR-19 15:30	27-MAR-19 09:00	0.25	162	hours	EHTR-FN
	5	21-MAR-19 15:15	27-MAR-19 09:00	0.25	138	hours	EHTR-FN
	6	21-MAR-19 12:30	27-MAR-19 09:00	0.25	140	hours	EHTR-FN
	7	21-MAR-19 12:35	27-MAR-19 09:00	0.25	140	hours	EHTR-FN

### Legend & Qualifier Definitions:

EHTR-FM: Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended.

EHTR: Exceeded ALS recommended hold time prior to sample receipt.

EHTL: Exceeded ALS recommended hold time prior to analysis. Sample was received less than 24 hours prior to expiry.

EHT: Exceeded ALS recommended hold time prior to analysis.

Rec. HT: ALS recommended hold time (see units).

#### Notes\*:

Where actual sampling date is not provided to ALS, the date (& time) of receipt is used for calculation purposes. Where actual sampling time is not provided to ALS, the earlier of 12 noon on the sampling date or the time (& date) of receipt is used for calculation purposes. Samples for L2247956 were received on 22-MAR-19 09:00.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against predetermined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

**Teck** 

TURNAROUND TIME: 20190320 DC GW RUSH: COC ID: LABORATORY OTHER INFO PROJECT/CLIENTINFO Facility Name / Job# Line Creek Operation Lab Name ALS Calgary PDF EDD Report Format / Distribution Excel Lab Contact Lyudinyla Shvets Project Manager Chris Blurton Email 1; chris.blurton@teck.com . x Email Chris.Blurton@teck.com Email Lyudmyla.Shvets@ALSGlobal.com teckcoal@equisonline.con Email 2: drake.tymstra@teck.com Address Box 2003 Address 2559 29 Street NE Email 3: kirsten.campbell@teck.com 15km North Hwy 43 Email 4: City Sparwood Province BC City Calgary Province AB PO number (\*) \$ \$ VPO00608129 Postal Code T1Y 7B5 V0B 2G0 Postal Code Country Canada Country Canada Phone Number 250-425-3196 Phone Number 403 407 1794 SAMPLE DETAILS -ANALYSIS REQUESTED NONE C H2SO4 . ∤HCL IINO3 NONE NONE NONE Hazardous Material (Yes/No) ALS\_Package-TKN/TOC TECKCOAL-ROUTINE. VA FECKCOAL-MET-D. FECKCOAL-MET-T Ļ ALS\_Package-DOC HG-D-CVAF-VA HG-T-CVAF-VA Field Sample Location Time G=Grab # Of Ş Sample ID (sys loc code) Matrix Date (24hr) C=Comp Cont. LC\_P1ZDC1404D\_WG\_Q1-2019\_NP LC PIZDC1404D WG 2019/03/20 12:35 G 6 1 1 1 1 LC PIZDC1404S WG Q1-2019 NP LC PIZDC1404S WG 2019/03/20 13:05  $\mathbf{G}$ 6 1 1 1 1 WG\_Q1-2019\_MT1 LC\_PIZDC1404D WG 2019/03/20 12:40 G 7 1 1 1 1 1 1 WG WG\_Q1-2019\_RD1 LC\_TBLANK 2019/03/20 15:30 G 4 1 1 1 1 LC\_PIZDC1307\_WG\_Q1-2019\_NP LC\_PIZDC1307 WG 2019/03/21 13:15  $\mathbf{G}$ 6 1 1 1 1 1 LC\_PIZDC1308\_WG\_Q1-2019\_NP LC\_PIZDC1308 WG 2019/03/21 12:30  $\mathbf{G}$ 6 1 1 1 1 WG\_Q1-2019\_CC1 LC\_PIZDC1308 WG 2019/03/21 12:35 G 7 ì, 1 1 ADDITIONAL COMMENTS/SPECIALINSTRUCTIONS RELINQUISHED BY/AFFILIATION DATE/TIME :: EACCEPTED BY/AFFILIATION : THE THE BUILDING TO A SHELL WAS TO A SHELL WAS THE D.Tymstra/K.Campbell 0-Jan **MONTH OF SERVICE** SERVICE REQUEST (rush subject to availability) \$1.55 Regular (default) X Sampler's Name K. Campbell/D. Tymstra Mobile # Priority (2-3 business days) - 50% surcharge Emergency (1 Business Day) - 100% surcharge Sampler's Signature Date/Time For Emergency <1 Day, ASAP or Weekend - Contact ALS



TECK COAL LIMITED (LINE CREEK)

ATTN: Chris Blurton

PO BOX 2003

SPARWOOD BC VOB 2G0

Date Received: 26-MAR-19

Report Date: 02-APR-19 19:28 (MT)

Version: FINAL

Client Phone: 250-425-6111

# Certificate of Analysis

Lab Work Order #: L2249288
Project P.O. #: VP000608129

Job Reference: LINE CREEK OPERATION
C of C Numbers: 20190325 DC GW

Legal Site Desc:



Lyudmyla Shvets, B.Sc. Account Manager

 $[This\ report\ shall\ not\ be\ reproduced\ except\ in\ full\ without\ the\ written\ authority\ of\ the\ Laboratory.]$ 

L2249288 CONTD.... PAGE 2 of 7 Version: FINAL

### ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	* D.L.	Units	Extracted	Analyzed	Batch
L2249288-1 LC_PIZDC1306_WG_Q1-2019_NP							
Sampled By: KC/DT on 25-MAR-19 @ 13:35							
Matrix: WG Miscellaneous Parameters							
	4.04	DTC	0.50	/I		04 ADD 40	D.4500000
Dissolved Organic Carbon	4.24	DTC	0.50	mg/L		01-APR-19	R4588903
Total Kjeldahl Nitrogen	0.212	D.T.O.	0.050	mg/L		01-APR-19	R4588920
Total Organic Carbon	2.11	DTC	0.50	mg/L		01-APR-19	R4588903
Dissolved Metals in Water							
Diss. Be (low) in Water by CRC ICPMS	0.000		0.000	/1	20 MAD 40	20 MAD 40	D4500000
Beryllium (Be)-Dissolved Dissolved Metals Filtration Location	<0.020 FIELD		0.020	ug/L	28-MAR-19	28-MAR-19 28-MAR-19	R4586690 R4585946
	LIELD					20-IVIAR-19	K4363946
Diss. Mercury in Water by CVAAS or CVAFS Mercury (Hg)-Dissolved	<0.000050		0.0000050	mg/L	28-MAR-19	29-MAR-19	R4586910
Dissolved Mercury Filtration Location	FIELD		0.0000030	IIIg/L	20-WAK-19	28-MAR-19	R4586498
Dissolved Metals in Water by CRC ICPMS	FILLD					20-101/213	K4360496
Dissolved Metals in water by CRC ICPMS  Dissolved Metals Filtration Location	FIELD					28-MAR-19	R4585946
Aluminum (Al)-Dissolved	< 0.0030		0.0030	mg/L	28-MAR-19	28-MAR-19	R4586690
Antimony (Sb)-Dissolved	0.00020		0.0000	mg/L	28-MAR-19	28-MAR-19	R4586690
Arsenic (As)-Dissolved	<0.00010		0.00010	mg/L	28-MAR-19	28-MAR-19	R4586690
Barium (Ba)-Dissolved	0.176		0.00010	mg/L	28-MAR-19	28-MAR-19	R4586690
Bismuth (Bi)-Dissolved	<0.000050		0.000050	mg/L	28-MAR-19	28-MAR-19	R4586690
Boron (B)-Dissolved	0.011		0.010	mg/L	28-MAR-19	28-MAR-19	R4586690
Cadmium (Cd)-Dissolved	0.131		0.0050	ug/L	28-MAR-19	28-MAR-19	R4586690
Calcium (Ca)-Dissolved	66.3		0.050	mg/L	28-MAR-19	28-MAR-19	R4586690
Chromium (Cr)-Dissolved	<0.00010		0.00010	mg/L	28-MAR-19	28-MAR-19	R4586690
Cobalt (Co)-Dissolved	<0.10		0.10	ug/L	28-MAR-19	28-MAR-19	R4586690
Copper (Cu)-Dissolved	<0.00050		0.00050	mg/L	28-MAR-19	28-MAR-19	R4586690
Iron (Fe)-Dissolved	<0.010		0.010	mg/L	28-MAR-19	28-MAR-19	R4586690
Lead (Pb)-Dissolved	<0.000050		0.000050	mg/L	28-MAR-19	28-MAR-19	R4586690
Lithium (Li)-Dissolved	0.0198		0.0010	mg/L	28-MAR-19	28-MAR-19	R4586690
Magnesium (Mg)-Dissolved	23.2		0.10	mg/L	28-MAR-19	28-MAR-19	R4586690
Manganese (Mn)-Dissolved	0.00044		0.00010	mg/L	28-MAR-19	28-MAR-19	R4586696
Molybdenum (Mo)-Dissolved	0.00192		0.000050	mg/L	28-MAR-19	28-MAR-19	R4586690
Nickel (Ni)-Dissolved	0.00117		0.00050	mg/L	28-MAR-19	28-MAR-19	R4586690
Potassium (K)-Dissolved	2.12		0.050	mg/L	28-MAR-19	28-MAR-19	R4586690
Selenium (Se)-Dissolved	2.10		0.050	ug/L	28-MAR-19	28-MAR-19	R4586690
Silicon (Si)-Dissolved	2.89		0.050	mg/L	28-MAR-19	28-MAR-19	R4586690
Silver (Ag)-Dissolved	<0.000010		0.000010	mg/L	28-MAR-19	28-MAR-19	R4586690
Sodium (Na)-Dissolved	1.29		0.050	mg/L	28-MAR-19	28-MAR-19	R4586690
Strontium (Sr)-Dissolved	0.0706		0.00020	mg/L	28-MAR-19	28-MAR-19	R4586690
Thallium (TI)-Dissolved	<0.000010		0.000010	mg/L	28-MAR-19	28-MAR-19	R4586690
Tin (Sn)-Dissolved	<0.00010		0.00010	mg/L	28-MAR-19	28-MAR-19	R4586690
Titanium (Ti)-Dissolved	<0.010		0.010	mg/L	28-MAR-19	28-MAR-19	R4586690
Uranium (U)-Dissolved	0.000922		0.000010	mg/L	28-MAR-19	28-MAR-19	R4586690
Vanadium (V)-Dissolved	0.00055		0.00050	mg/L	28-MAR-19	28-MAR-19	R4586690
Zinc (Zn)-Dissolved	0.0039		0.0010	mg/L	28-MAR-19	28-MAR-19	R4586690
Hardness				•			
Hardness (as CaCO3)	261		0.50	mg/L		29-MAR-19	
Total Metals in Water							
Total Be (Low) in Water by CRC ICPMS							
Beryllium (Be)-Total	<0.020		0.020	ug/L		28-MAR-19	R4586645
Total Metals in Water by CRC ICPMS							
Aluminum (AI)-Total	0.0957		0.0030	mg/L		28-MAR-19	R4586645
Antimony (Sb)-Total	0.00023		0.00010	mg/L		28-MAR-19	R4586645
	<0.00010	1	0.00010	mg/L	1	28-MAR-19	R4586645

<sup>\*</sup> Refer to Referenced Information for Qualifiers (if any) and Methodology.

L2249288 CONTD.... PAGE 3 of 7 Version: FINAL

### ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2249288-1 LC_PIZDC1306_WG_Q1-2019_NP							
Sampled By: KC/DT on 25-MAR-19 @ 13:35							
Matrix: WG							
Total Metals in Water by CRC ICPMS Barium (Ba)-Total	0.174		0.00010	mg/L		28-MAR-19	R4586645
Bismuth (Bi)-Total	<0.000050		0.000050	mg/L		28-MAR-19	R4586645
Boron (B)-Total	0.011		0.010	mg/L		28-MAR-19	R4586645
Cadmium (Cd)-Total	0.161		0.0050	ug/L		28-MAR-19	R4586645
Calcium (Ca)-Total	69.3		0.050	mg/L		28-MAR-19	R4586645
Chromium (Cr)-Total	0.00062		0.00010	mg/L		28-MAR-19	R4586645
Cobalt (Co)-Total	0.15		0.10	ug/L		28-MAR-19	R4586645
Copper (Cu)-Total	0.00098		0.00050	mg/L		28-MAR-19	R4586645
Iron (Fe)-Total	0.071		0.010	mg/L		28-MAR-19	R4586645
Lead (Pb)-Total	0.000114	C	0.000050	mg/L		28-MAR-19	R4586645
Lithium (Li)-Total	0.0211		0.0010	mg/L		28-MAR-19	R4586645
Magnesium (Mg)-Total	22.6		0.10	mg/L		28-MAR-19	R4586645
Manganese (Mn)-Total	0.00356		0.00010	mg/L		28-MAR-19	R4586645
Molybdenum (Mo)-Total	0.00208	C	0.000050	mg/L		28-MAR-19	R4586645
Nickel (Ni)-Total	0.00164		0.00050	mg/L		28-MAR-19	R4586645
Potassium (K)-Total	2.21		0.050	mg/L		28-MAR-19	R4586645
Selenium (Se)-Total	1.94		0.050	ug/L		28-MAR-19	R4586645
Silicon (Si)-Total	3.18		0.10	mg/L		28-MAR-19	R4586645
Silver (Ag)-Total	<0.000010	C	0.000010	mg/L		28-MAR-19	R4586645
Sodium (Na)-Total	1.32		0.050	mg/L		28-MAR-19	R4586645
Strontium (Sr)-Total	0.0760		0.00020	mg/L		28-MAR-19	R4586645
Thallium (TI)-Total	0.000016		0.000010	mg/L		28-MAR-19	R4586645
Tin (Sn)-Total	<0.00010		0.00010	mg/L		28-MAR-19	R4586645
Titanium (Ti)-Total	<0.010		0.010	mg/L		28-MAR-19	R4586645
Uranium (U)-Total	0.00101		0.000010	mg/L		28-MAR-19	R4586645
Vanadium (V)-Total Zinc (Zn)-Total	0.00118 0.0043		0.00050 0.0030	mg/L mg/L		28-MAR-19 28-MAR-19	R4586645 R4586645
Routine for Teck Coal	0.0043		0.0030	IIIg/L		20-WAK-19	K4300043
Acidity by Automatic Titration							
Acidity (as CaCO3)	3.6		1.0	mg/L		01-APR-19	R4588356
Alkalinity (Species) by Manual Titration	0.0		1.0	9/ =		01711	11.000000
Alkalinity, Bicarbonate (as CaCO3)	278		1.0	mg/L		29-MAR-19	R4587296
Alkalinity, Carbonate (as CaCO3)	<1.0		1.0	mg/L		29-MAR-19	R4587296
Alkalinity, Hydroxide (as CaCO3)	<1.0		1.0	mg/L		29-MAR-19	R4587296
Alkalinity, Total (as CaCO3)	278		1.0	mg/L		29-MAR-19	R4587296
Ammonia, Total (as N)							
Ammonia as N	0.0177		0.0050	mg/L		01-APR-19	R4588516
Bromide in Water by IC (Low Level)							
Bromide (Br)	<0.050		0.050	mg/L		28-MAR-19	R4587103
Chloride in Water by IC							_
Chloride (CI)	<0.50		0.50	mg/L		28-MAR-19	R4587103
Electrical Conductivity (EC)	470		0.0			20 MAD 40	D4507000
Conductivity (@ 25C)	476		2.0	uS/cm		29-MAR-19	R4587296
Fluoride in Water by IC Fluoride (F)	0.187		0.020	mg/L		28-MAR-19	R4587103
lon Balance Calculation	U.107		0.020	mg/L		20-IVIAR-19	N4301 103
Cation - Anion Balance	-3.3			%		01-APR-19	
Anion Sum	5.70			meg/L		01-AFR-19	
Cation Sum	5.33			meg/L		01-APR-19	
Ion Balance Calculation	0.00			04/ ⊑		517.1110	
Ion Balance	93.5		-100	%		01-APR-19	
Nitrate in Water by IC (Low Level)							
, ( : : : : )	L				l		

<sup>\*</sup> Refer to Referenced Information for Qualifiers (if any) and Methodology.

L2249288 CONTD.... PAGE 4 of 7 Version: FINAL

### ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2249288-1 LC_PIZDC1306_WG_Q1-2019_NP Sampled By: KC/DT on 25-MAR-19 @ 13:35 Matrix: WG							
Nitrate in Water by IC (Low Level) Nitrate (as N)	0.0962		0.0050	mg/L		28-MAR-19	R4587103
Nitrite in Water by IC (Low Level) Nitrite (as N)	<0.0010		0.0010	mg/L		28-MAR-19	R4587103
Orthophosphate-Dissolved (as P) Orthophosphate-Dissolved (as P)	0.0021		0.0010	mg/L		27-MAR-19	R4586141
Oxidation redution potential by elect. ORP	379		-1000	mV		29-MAR-19	R4587545
Phosphorus (P)-Total Phosphorus (P)-Total	0.0131		0.0020	mg/L		02-APR-19	R4589156
Sulfate in Water by IC Sulfate (SO4)	5.97		0.30	mg/L		28-MAR-19	R4587103
Total Dissolved Solids Total Dissolved Solids	287	DLHC	20	mg/L		01-APR-19	
Total Suspended Solids		DLITO					R4589098
Total Suspended Solids  Turbidity	4.6		1.0	mg/L		01-APR-19	R4588984
Turbidity pH	2.04		0.10	NTU 		27-MAR-19	R4586139
pH	7.85		0.10	pН		29-MAR-19	R4587296

<sup>\*</sup> Refer to Referenced Information for Qualifiers (if any) and Methodology.

LINE CREEK OPERATION

L2249288 CONTD....

PAGE 5 of 7 Version: FINAL

### **Reference Information**

**Qualifiers for Sample Submission Listed:** 

 Qualifier
 Description

 LPML
 Lab-Preserved for Total Metals. Sample received with pH > 2 and preserved at the lab. Total Metals results may be biased low.

Sample Parameter Qualifier Key:

Qualifier	Description
DLHC	Detection Limit Raised: Dilution required due to high concentration of test analyte(s).
DTC	Dissolved concentration exceeds total. Results were confirmed by re-analysis.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.

**Test Method References:** 

ALS Test Code Matrix Test Description Method Reference\*\*

ACIDITY-PCT-CL Water Acidity by Automatic Titration APHA 2310 Acidity

This analysis is carried out using procedures adapted from APHA Method 2310 "Acidity". Acidity is determined by potentiometric titration to a specified endpoint.

ALK-MAN-CL Water Alkalinity (Species) by Manual Titration APHA 2320 ALKALINITY

This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.

BE-D-L-CCMS-VA Water Diss. Be (low) in Water by CRC ICPMS APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

BE-T-L-CCMS-VA Water Total Be (Low) in Water by CRC ICPMS EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

BR-L-IC-N-CL Water Bromide in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

C-DIS-ORG-LOW-CL Water Dissolved Organic Carbon APHA 5310 B-Instrumental

This method is applicable to the analysis of ground water, wastewater, and surface water samples. The form detected depends upon sample pretreatment: Unfiltered sample = TC, 0.45um filtered = TDC. Samples are injected into a combustion tube containing an oxidation catalyst. The carrier gas containing the combustion product from the combustion tube flows through an inorganic carbon reactor vessel and is then sent through a halogen scrubber into a sample cell set in a non-dispersive infrared gas analyzer (NDIR) where carbon dioxide is detected. For total inorganic carbon and dissolved inorganic carbon, the sample is injected into an IC reactor vessel where only the IC component is decomposed to become carbon dioxide.

The peak area generated by the NDIR indicates the TC/TDC or TIC/DIC as applicable. The total organic carbon content of the sample is calculated by subtracting the TIC from the TC.

TOC = TC-TIC, DOC = TDC-DIC, Particulate = Total - Dissolved.

C-TOT-ORG-LOW-CL Water Total Organic Carbon APHA 5310 TOTAL ORGANIC CARBON (TOC)

This method is applicable to the analysis of ground water, wastewater, and surface water samples. The form detected depends upon sample pretreatment: Unfiltered sample = TC, 0.45um filtered = TDC. Samples are injected into a combustion tube containing an oxidation catalyst. The carrier gas containing the combustion product from the combustion tube flows through an inorganic carbon reactor vessel and is then sent through a halogen scrubber into a sample cell set in a non-dispersive infrared gas analyzer (NDIR) where carbon dioxide is detected. For total inorganic carbon and dissolved inorganic carbon, the sample is injected into an IC reactor vessel where only the IC component is decomposed to become carbon dioxide.

The peak area generated by the NDIR indicates the TC/TDC or TIC/DIC as applicable. The total organic carbon content of the sample is calculated by subtracting the TIC from the TC.

TOC = TC-TIC, DOC = TDC-DIC, Particulate = Total - Dissolved.

CL-IC-N-CL Water Chloride in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

EC-L-PCT-CL Water Electrical Conductivity (EC) APHA 2510B

Conductivity, also known as Electrical Conductivity (EC) or Specific Conductance, is measured by immersion of a conductivity cell with platinum electrodes into a water sample. Conductivity measurements are temperature-compensated to 25C.

F-IC-N-CL Water Fluoride in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

HARDNESS-CALC-VA Water Hardness APHA 2340B

HG-D-CVAA-VA

L2249288 CONTD....

**Reference Information** 

PAGE 6 of 7 Version: FINAL

**Test Method References:** 

**ALS Test Code** Matrix Method Reference\*\* **Test Description** 

Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO3 equivalents,

Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

Water samples are filtered (0.45 um), preserved with hydrochloric acid, then undergo a cold-oxidation using bromine monochloride prior to reduction

Diss. Mercury in Water by CVAAS or CVAFS APHA 3030B/EPA 1631E (mod)

with stannous chloride, and analyzed by CVAAS or CVAFS.

IONBALANCE-BC-CL Ion Balance Calculation **APHA 1030E** Water

Cation Sum, Anion Sum, and Ion Balance (as % difference) are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Because all aqueous solutions are electrically neutral, the calculated ion balance (% difference of cations minus anions) should be near-zero.

Cation and Anion Sums are the total meg/L concentration of major cations and anions. Dissolved species are used where available. Minor ions are included where data is present. Ion Balance is calculated as:

Ion Balance (%) = [Cation Sum-Anion Sum] / [Cation Sum+Anion Sum]

Water

MET-D-CCMS-VA Dissolved Metals in Water by CRC ICPMS APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

MET-T-CCMS-VA Water Total Metals in Water by CRC ICPMS EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

NH3-L-F-CL Water Ammonia, Total (as N) J. ENVIRON. MONIT., 2005, 7, 37-42, RSC

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et

NO2-L-IC-N-CL Water Nitrite in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

NO3-L-IC-N-CL Nitrate in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

ORP-CL Water **ASTM D1498** Oxidation redution potential by elect.

This analysis is carried out in accordance with the procedure described in the "ASTM" method D1498 "Oxidation-Reduction Potential of Water" published by the American Society for Testing and Materials (ASTM). Results are reported as observed oxidation-reduction potential of the platinum metal-reference electrode employed, in mV.

It is recommended that this analysis be conducted in the field.

P-T-L-COL-CL Phosphorus (P)-Total APHA 4500-P PHOSPHORUS Water

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after persulphate digestion of the sample.

APHA 4500 H-Electrode PH-CI Water Ha

pH is determined in the laboratory using a pH electrode. All samples analyzed by this method for pH will have exceeded the 15 minute recommended hold time from time of sampling (field analysis is recommended for pH where highly accurate results are needed)

PO4-DO-L-COL-CL Water Orthophosphate-Dissolved (as P) APHA 4500-P PHOSPHORUS

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.

SO4-IC-N-CL Sulfate in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

SOLIDS-TDS-CL Water **Total Dissolved Solids** APHA 2540 C

A well-mixed sample is filtered through a glass fibre filter paper. The filtrate is then evaporated to dryness in a pre-weighed vial and dried at 180 – 2 °C. The increase in vial weight represents the total dissolved solids (TDS).

TECKCOAL-IONBAL-CL Ion Balance Calculation **APHA 1030E**  LINE CREEK OPERATION L2249288 CONTD....

### **Reference Information**

PAGE 7 of 7 Version: FINAL

#### **Test Method References:**

ALS Test Code Matrix Test Description Method Reference\*\*

Cation Sum, Anion Sum, and Ion Balance (as % difference) are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Because all aqueous solutions are electrically neutral, the calculated ion balance (% difference of cations minus anions) should be near-zero.

Cation and Anion Sums are the total meq/L concentration of major cations and anions. Dissolved species are used where available. Minor ions are included where data is present. Ion Balance is calculated as:

Ion Balance (%) = [Cation Sum-Anion Sum] / [Cation Sum+Anion Sum]

TKN-L-F-CL Water Total Kjeldahl Nitrogen APHA 4500-NORG (TKN)

This analysis is carried out using procedures adapted from APHA Method 4500-Norg D. "Block Digestion and Flow Injection Analysis". Total Kjeldahl Nitrogen is determined using block digestion followed by Flow-injection analysis with fluorescence detection.

TSS-L-CL Water Total Suspended Solids APHA 2540 D-Gravimetric

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total suspended solids (TSS) are determined by filtering a sample through a glass fibre filter, and by drying the filter at 104 deg. C.

TURBIDITY-CL Water Turbidity APHA 2130 B-Nephelometer

This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.

\*\* ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

<b>Laboratory Definition Code</b>	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA
CL	ALS ENVIRONMENTAL - CALGARY, ALBERTA, CANADA

#### **Chain of Custody Numbers:**

20190325 DC GW

#### **GLOSSARY OF REPORT TERMS**

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.

mg/kg - milligrams per kilogram based on dry weight of sample

mg/kg wwt - milligrams per kilogram based on wet weight of sample

mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight

mg/L - unit of concentration based on volume, parts per million.

< - Less than.

D.L. - The reporting limit.

N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory. UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.



Workorder: L2249288

Report Date: 02-APR-19

Page 1 of 10

Client:

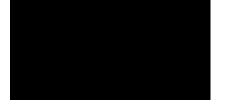
TECK COAL LIMITED (LINE CREEK)

PO BOX 2003

SPARWOOD BC V0B 2G0

Contact: Chris Blurton

est M	latrix Reference	Result Qualifier	Units RPD	Limit	Analyzed
ACIDITY-PCT-CL V	Vater				
<b>Batch</b> R4588356 <b>WG3018528-5</b> LCS Acidity (as CaCO3)		94.4	%	85-115	01-APR-19
<b>WG3018528-4 MB</b> Acidity (as CaCO3)		2.0	mg/L	2	01-APR-19
ALK-MAN-CL V	Vater				
Batch R4587296 WG3017301-11 LCS Alkalinity, Total (as CaCO3	)	95.8	%	85-115	29-MAR-19
WG3017301-10 MB Alkalinity, Total (as CaCO3)	)	<1.0	mg/L	1	29-MAR-19
BE-D-L-CCMS-VA V	Vater				
Batch R4586690 WG3015865-2 LCS Beryllium (Be)-Dissolved		96.7	%	80-120	28-MAR-19
WG3015865-1 MB Beryllium (Be)-Dissolved	NP	<0.000020	mg/L	0.00002	28-MAR-19
BE-T-L-CCMS-VA V	Vater				
Batch R4586645 WG3015886-2 LCS		405.4	0/		
Beryllium (Be)-Total  WG3015886-1 MB  Beryllium (Be)-Total		105.4 <0.000020	% mg/L	80-120 0.00002	28-MAR-19 28-MAR-19
	Vater		J	0.0000	20 100 110
Batch R4587103 WG3017245-2 LCS					
Bromide (Br)  WG3017245-1 MB  Bromide (Br)		99.1	% mg/L	85-115 0.05	28-MAR-19 28-MAR-19
	Vater	10.000	9/ _	0.00	20-MAIX-19
Batch R4588903 WG3019137-2 LCS	1460.				
Dissolved Organic Carbon		97.1	%	80-120	01-APR-19
WG3019137-1 MB Dissolved Organic Carbon		<0.50	mg/L	0.5	01-APR-19
WG3019137-4 MS Dissolved Organic Carbon	L2249288-1	92.6	%	70-130	01-APR-19
-TOT-ORG-LOW-CL V	Vater				



Workorder: L2249288

Report Date: 02-APR-19

Page 2 of 10

Test	Matrix	Reference	Result Quali	fier Units	RPD	Limit	Analyzed
C-TOT-ORG-LOW-CL	Water						
Batch R4588903 WG3019137-2 LCS Total Organic Carbon			99.2	%		80-120	01-APR-19
WG3019137-1 MB Total Organic Carbon			<0.50	mg/L		0.5	01-APR-19
WG3019137-4 MS Total Organic Carbon		L2249288-1	93.1	%		70-130	01-APR-19
CL-IC-N-CL	Water						
Batch R4587103 WG3017245-2 LCS Chloride (CI)			98.2	%		90-110	28-MAR-19
WG3017245-1 MB Chloride (Cl)			<0.50	mg/L		0.5	28-MAR-19
EC-L-PCT-CL	Water						
Batch R4587296 WG3017301-11 LCS Conductivity (@ 25C)			100.7	%		90-110	29-MAR-19
WG3017301-10 MB Conductivity (@ 25C)			<2.0	uS/cm		2	29-MAR-19
F-IC-N-CL	Water						
<b>Batch</b> R4587103 <b>WG3017245-2</b> LCS Fluoride (F)			99.97	%		90-110	28-MAR-19
<b>WG3017245-1 MB</b> Fluoride (F)			<0.020	mg/L		0.02	28-MAR-19
HG-D-CVAA-VA	Water						
Batch R4586910							
WG3016524-2 LCS Mercury (Hg)-Dissolved			96.5	%		80-120	29-MAR-19
WG3016524-1 MB Mercury (Hg)-Dissolved		NP	<0.0000050	mg/L		0.000005	29-MAR-19
MET-D-CCMS-VA	Water						
Batch R4586690 WG3015865-2 LCS	1		100.7	0/		00.455	00.144.7
Aluminum (Al)-Dissolved			100.7 96.2	%		80-120	28-MAR-19
Antimony (Sb)-Dissolved  Arsenic (As)-Dissolved	ı		96.2 100.7	% %		80-120	28-MAR-19
Barium (Ba)-Dissolved			100.7	%		80-120 80-120	28-MAR-19 28-MAR-19
Daniam (Da) Dissolved			101.1	70		00-120	70-INIWK-13



Workorder: L2249288 Report Date: 02-APR-19

Page 3 of 10

MET-D-CCMS-VA	Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
Bismuth (Bi)-Dissolved   98.5   % 80-120   28-MAR-19     Borno (B)-Dissolved   91.3   % 80-120   28-MAR-19     Cadmium (Cd)-Dissolved   103.1   % 80-120   28-MAR-19     Calcium (Ca)-Dissolved   98.1   % 80-120   28-MAR-19     Chromium (Cr)-Dissolved   98.1   % 80-120   28-MAR-19     Chobalt (Co)-Dissolved   98.1   % 80-120   28-MAR-19     Cobalt (Co)-Dissolved   100.2   % 80-120   28-MAR-19     Copper (Cu)-Dissolved   100.2   % 80-120   28-MAR-19     Iron (Fe)-Dissolved   100.2   % 80-120   28-MAR-19     Iron (Fe)-Dissolved   99.6   % 80-120   28-MAR-19     Lead (Pb)-Dissolved   99.8   % 80-120   28-MAR-19     Lithium (Li)-Dissolved   99.8   % 80-120   28-MAR-19     Magnaese (Mn)-Dissolved   99.8   % 80-120   28-MAR-19     Magnaese (Mn)-Dissolved   97.5   % 80-120   28-MAR-19     Manganese (Mn)-Dissolved   97.1   % 80-120   28-MAR-19     Nickel (Ni)-Dissolved   97.1   % 80-120   28-MAR-19     Nickel (Ni)-Dissolved   97.1   % 80-120   28-MAR-19     Silicon (Si)-Dissolved   96.6   % 80-120   28-MAR-19     Selenium (Se)-Dissolved   96.6   % 80-120   28-MAR-19     Silicon (Si)-Dissolved   96.6   % 80-120   28-MAR-19     Silicon (Si)-Dissolved   96.6   % 80-120   28-MAR-19     Silicon (Si)-Dissolved   97.8   % 80-120   28-MAR-19     Sitrontium (Gr)-Dissolved   97.8   % 80-120   28-MAR-19     Titalium (Ti)-Dissolved   101.7   % 80-120   28-MAR-19     Titalium (Ti)-Dissolved   103.6   % 80-120   28-MAR-19     Titalium (Ti)-Dissolved   103.6   % 80-120   28-MAR-19     Titalium (Ti)-Dissolved   103.6   % 80-120   28-MAR-19     Titalium (Ti)-Dissolved   103.6   % 80-120   28-MAR-19     Titalium (Ti)-Dissolved   103.6   % 80-120   28-MAR-19     Titalium (Ti)-Dissolved   103.6   % 80-120   28-MAR-19     Titalium (Ti)-Dissolved   103.6   % 80-120   28-MAR-19     Titalium (Ti)-Dissolved   103.6   % 80-120   28-MAR-19     Titalium (Ti)-Dissolved   103.6   % 80-120   28-MAR-19     Titalium (Ti)-Dissolved   103.6   % 80-120   28-MAR-19     Titalium (Ti)-Dissolved   103.6   % 80-120   28-MAR-19     Titalium (Ti)-Dissolved   10	MET-D-CCMS-VA	Water							
Bismuth (Bi)-Dissolved   98.5   % 80-120   28-MAR-19	Batch R45866	690							
Boron (B)-Dissolved									
Cadmium (Cd)-Dissolved         103.1         %         80.120         28-MAR-19           Calcium (Ca)-Dissolved         98.1         %         80-120         28-MAR-19           Chromium (Cr)-Dissolved         102.0         %         80-120         28-MAR-19           Cobalt (Co)-Dissolved         98.1         %         80-120         28-MAR-19           Copper (Cu)-Dissolved         100.2         %         80-120         28-MAR-19           Iron (Fe)-Dissolved         99.6         %         80-120         28-MAR-19           Lead (Pb)-Dissolved         102.4         %         80-120         28-MAR-19           Lithium (Li)-Dissolved         99.8         %         80-120         28-MAR-19           Manganesium (Mg)-Dissolved         97.5         %         80-120         28-MAR-19           Manganese (Mn)-Dissolved         97.5         %         80-120         28-MAR-19           Nickel (Ni)-Dissolved         94.8         %         80-120         28-MAR-19           Nickel (Ni)-Dissolved         97.1         %         80-120         28-MAR-19           Nickel (Ni)-Dissolved         96.6         %         80-120         28-MAR-19           Selenium (K)-Dissolved         96.6 <t< td=""><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></t<>									
Calcium (Ca)-Dissolved         98.1         %         80-120         28-MAR-19           Chromium (Cr)-Dissolved         102.0         %         80-120         28-MAR-19           Cobalt (Co)-Dissolved         98.1         %         80-120         28-MAR-19           Copper (Cu)-Dissolved         100.2         %         80-120         28-MAR-19           Iron (Fe)-Dissolved         99.6         %         80-120         28-MAR-19           Iron (Fe)-Dissolved         102.4         %         80-120         28-MAR-19           Lithium (Li)-Dissolved         99.8         %         80-120         28-MAR-19           Lithium (Li)-Dissolved         97.5         %         80-120         28-MAR-19           Manganese (Mn)-Dissolved         97.5         %         80-120         28-MAR-19           Molybdenum (Mo)-Dissolved         94.8         %         80-120         28-MAR-19           Nickel (Ni)-Dissolved         97.1         %         80-120         28-MAR-19           Nickel (Ni)-Dissolved         97.1         %         80-120         28-MAR-19           Selenium (Se)-Dissolved         96.6         %         80-120         28-MAR-19           Silicon (Si)-Dissolved         96.6 <t< td=""><td>,</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></t<>	,								
Chromium (Cr)-Dissolved         102.0         %         80-120         28-MAR-19           Cobalt (Co)-Dissolved         98.1         %         80-120         28-MAR-19           Copper (Cu)-Dissolved         100.2         %         80-120         28-MAR-19           Iron (Fe)-Dissolved         99.6         %         80-120         28-MAR-19           Lead (Pb)-Dissolved         102.4         %         80-120         28-MAR-19           Lithium (Li)-Dissolved         99.8         %         80-120         28-MAR-19           Magnesium (Mg)-Dissolved         97.5         %         80-120         28-MAR-19           Manganese (Mn)-Dissolved         94.8         %         80-120         28-MAR-19           Molybdenum (Mo)-Dissolved         94.8         %         80-120         28-MAR-19           Nickel (Ni)-Dissolved         97.1         %         80-120         28-MAR-19           Potassium (K)-Dissolved         97.1         %         80-120         28-MAR-19           Selenium (Se)-Dissolved         96.6         %         80-120         28-MAR-19           Silicon (Si)-Dissolved         96.6         %         80-120         28-MAR-19           Silicon (Si)-Dissolved         96.6	` ,								
Cobalt (Co)-Dissolved         98.1         %         80-120         28-MAR-19           Copper (Cu)-Dissolved         100.2         %         80-120         28-MAR-19           Iron (Fe)-Dissolved         99.6         %         80-120         28-MAR-19           Lead (Pb)-Dissolved         102.4         %         80-120         28-MAR-19           Lithium (Li)-Dissolved         99.8         %         80-120         28-MAR-19           Manganesium (Mg)-Dissolved         97.5         %         80-120         28-MAR-19           Manganese (Mn)-Dissolved         94.8         %         80-120         28-MAR-19           Nickel (Ni)-Dissolved         97.1         %         80-120         28-MAR-19           Nickel (Ni)-Dissolved         97.1         %         80-120         28-MAR-19           Potassium (K)-Dissolved         96.6         %         80-120         28-MAR-19           Selenium (Se)-Dissolved         93.2         %         60-140         28-MAR-19           Silvor (Ag)-Dissolved         93.2         %         80-120         28-MAR-19           Silvor (Ag)-Dissolved         96.6         %         80-120         28-MAR-19           Silvor (Ag)-Dissolved         101.7									
Copper (Cu)-Dissolved         100.2         %         80.120         28-MAR-19           Iron (Fe)-Dissolved         99.6         %         80.120         28-MAR-19           Lead (Pb)-Dissolved         102.4         %         80.120         28-MAR-19           Lithium (Li)-Dissolved         99.8         %         80.120         28-MAR-19           Magnesium (Mg)-Dissolved         97.5         %         80.120         28-MAR-19           Manganese (Mn)-Dissolved         101.9         %         80.120         28-MAR-19           Molybdenum (Mo)-Dissolved         94.8         %         80.120         28-MAR-19           Nickel (Ni)-Dissolved         97.1         %         80.120         28-MAR-19           Potassium (K)-Dissolved         100.5         %         80.120         28-MAR-19           Selenium (Se)-Dissolved         96.6         %         80.120         28-MAR-19           Silicon (Si)-Dissolved         93.2         %         60.140         28-MAR-19           Silicon (Si)-Dissolved         96.6         %         80.120         28-MAR-19           Silicon (Si)-Dissolved         96.6         %         80.120         28-MAR-19           Silicon (Si)-Dissolved         97.8	` '							80-120	28-MAR-19
Iron (Fe)-Dissolved       99.6       %       80-120       28-MAR-19         Lead (Pb)-Dissolved       102.4       %       80-120       28-MAR-19         Lithium (Li)-Dissolved       99.8       %       80-120       28-MAR-19         Magnesium (Mg)-Dissolved       97.5       %       80-120       28-MAR-19         Manganese (Mn)-Dissolved       101.9       %       80-120       28-MAR-19         Molybdenum (Mo)-Dissolved       94.8       %       80-120       28-MAR-19         Nickel (Ni)-Dissolved       97.1       %       80-120       28-MAR-19         Potassium (K)-Dissolved       97.1       %       80-120       28-MAR-19         Selenium (Se)-Dissolved       96.6       %       80-120       28-MAR-19         Silicon (Si)-Dissolved       93.2       %       60-140       28-MAR-19         Silicon (Si)-Dissolved       96.6       %       80-120       28-MAR-19         Silicon (Si)-Dissolved       96.6       %       80-120       28-MAR-19         Silicon (Si)-Dissolved       96.6       %       80-120       28-MAR-19         Silicon (Si)-Dissolved       97.8       80-120       28-MAR-19         Strontium (Sr)-Dissolved       98.6	, ,							80-120	28-MAR-19
Lead (Pb)-Dissolved       102.4       %       80-120       28-MAR-19         Lithium (Li)-Dissolved       99.8       %       80-120       28-MAR-19         Magnesium (Mg)-Dissolved       97.5       %       80-120       28-MAR-19         Manganese (Mn)-Dissolved       101.9       %       80-120       28-MAR-19         Molybdenum (Mo)-Dissolved       94.8       %       80-120       28-MAR-19         Nickel (Ni)-Dissolved       97.1       %       80-120       28-MAR-19         Potassium (K)-Dissolved       100.5       %       80-120       28-MAR-19         Selenium (Se)-Dissolved       96.6       %       80-120       28-MAR-19         Silicon (Si)-Dissolved       96.6       %       80-120       28-MAR-19         Silver (Ag)-Dissolved       96.6       %       80-120       28-MAR-19         Sodium (Na)-Dissolved       102.9       %       80-120       28-MAR-19         Sortium (Ti)-Dissolved       101.7       %       80-120       28-MAR-19         Translium (Ti)-Dissolved       98.6       %       80-120       28-MAR-19         Tiral (Sn)-Dissolved       96.9       %       80-120       28-MAR-19         Vanadium (V)-Dissolved	Copper (Cu)-Dissolv	ved						80-120	28-MAR-19
Lithium (Li)-Dissolved 99.8 % 80-120 28-MAR-19 Magnesium (Mg)-Dissolved 97.5 % 80-120 28-MAR-19 Manganese (Mn)-Dissolved 101.9 % 80-120 28-MAR-19 Molybdenum (Mo)-Dissolved 94.8 % 80-120 28-MAR-19 Nickel (Ni)-Dissolved 97.1 % 80-120 28-MAR-19 Potassium (K)-Dissolved 100.5 % 80-120 28-MAR-19 Potassium (S)-Dissolved 96.6 % 80-120 28-MAR-19 Silicon (Si)-Dissolved 93.2 % 60-140 28-MAR-19 Silver (Ag)-Dissolved 96.6 % 80-120 28-MAR-19 Sodium (Na)-Dissolved 102.9 % 80-120 28-MAR-19 Sotium (Sr)-Dissolved 101.7 % 80-120 28-MAR-19 Strontium (Sr)-Dissolved 101.7 % 80-120 28-MAR-19 Thallium (Ti)-Dissolved 98.6 % 80-120 28-MAR-19 Tin (Sn)-Dissolved 97.8 % 80-120 28-MAR-19 Titanium (Ti)-Dissolved 103.6 % 80-120 28-MAR-19 Vanadium (V)-Dissolved 103.6 % 80-120 28-MAR-19 Vanadium (V)-Dissolved 102.2 % 80-120 28-MAR-19 Vanadium (V)-Dissolved 107.5 % 80-120 28-MAR-19 Vanadium (V)-Dissolved 107.5 % 80-120 28-MAR-19 Vanadium (V)-Dissolved 107.5 % 80-120 28-MAR-19 Vanadium (V)-Dissolved 107.5 % 80-120 28-MAR-19 Vanadium (V)-Dissolved 107.5 % 80-120 28-MAR-19 Vanadium (V)-Dissolved 107.5 % 80-120 28-MAR-19 Vanadium (V)-Dissolved 107.5 % 80-120 28-MAR-19 Vanadium (V)-Dissolved 107.5 % 80-120 28-MAR-19 Vanadium (V)-Dissolved 107.5 % 80-120 28-MAR-19 Vanadium (V)-Dissolved 107.5 % 80-120 28-MAR-19 Vanadium (V)-Dissolved 107.5 % 80-120 28-MAR-19 Vanadium (V)-Dissolved 107.5 % 80-120 28-MAR-19 Vanadium (V)-Dissolved 107.5 % 80-120 28-MAR-19 Vanadium (V)-Dissolved 107.5 % 80-120 28-MAR-19 Vanadium (V)-Dissolved 107.5 % 80-120 28-MAR-19	Iron (Fe)-Dissolved			99.6		%		80-120	28-MAR-19
Magnesium (Mg)-Dissolved         97.5         %         80.120         28-MAR-19           Manganese (Mn)-Dissolved         101.9         %         80.120         28-MAR-19           Molybdenum (Mo)-Dissolved         94.8         %         80.120         28-MAR-19           Nickel (Ni)-Dissolved         97.1         %         80.120         28-MAR-19           Potassium (K)-Dissolved         100.5         %         80.120         28-MAR-19           Selenium (Se)-Dissolved         96.6         %         80.120         28-MAR-19           Silicon (Si)-Dissolved         93.2         %         60.140         28-MAR-19           Silver (Ag)-Dissolved         96.6         %         80.120         28-MAR-19           Sodium (Na)-Dissolved         96.6         %         80.120         28-MAR-19           Strontium (Sr)-Dissolved         102.9         %         80.120         28-MAR-19           Strontium (Sr)-Dissolved         98.6         %         80.120         28-MAR-19           Tin (Sn)-Dissolved         97.8         %         80.120         28-MAR-19           Titanium (Ti)-Dissolved         96.9         %         80.120         28-MAR-19           Vanadium (V)-Dissolved         103.6	Lead (Pb)-Dissolved	d		102.4		%		80-120	28-MAR-19
Manganese (Mn)-Dissolved       101.9       %       80-120       28-MAR-19         Molybdenum (Mo)-Dissolved       94.8       %       80-120       28-MAR-19         Nickel (Ni)-Dissolved       97.1       %       80-120       28-MAR-19         Potassium (K)-Dissolved       100.5       %       80-120       28-MAR-19         Selenium (Se)-Dissolved       96.6       %       80-120       28-MAR-19         Silicon (Si)-Dissolved       93.2       %       60-140       28-MAR-19         Silver (Ag)-Dissolved       96.6       %       80-120       28-MAR-19         Sodium (Na)-Dissolved       102.9       %       80-120       28-MAR-19         Strontium (Sr)-Dissolved       101.7       %       80-120       28-MAR-19         Thallium (Ti)-Dissolved       98.6       %       80-120       28-MAR-19         Tin (Sn)-Dissolved       97.8       %       80-120       28-MAR-19         Titanium (Ti)-Dissolved       96.9       %       80-120       28-MAR-19         Uranium (U)-Dissolved       103.6       %       80-120       28-MAR-19         Vanadium (V)-Dissolved       107.5       %       80-120       28-MAR-19         WG3015865-1       MB <td>Lithium (Li)-Dissolve</td> <td>ed</td> <td></td> <td>99.8</td> <td></td> <td>%</td> <td></td> <td>80-120</td> <td>28-MAR-19</td>	Lithium (Li)-Dissolve	ed		99.8		%		80-120	28-MAR-19
Molybdenum (Mo)-Dissolved       94.8       %       80-120       28-MAR-19         Nickel (Ni)-Dissolved       97.1       %       80-120       28-MAR-19         Potassium (K)-Dissolved       100.5       %       80-120       28-MAR-19         Selenium (Se)-Dissolved       96.6       %       80-120       28-MAR-19         Silicon (Si)-Dissolved       93.2       %       60-140       28-MAR-19         Silver (Ag)-Dissolved       96.6       %       80-120       28-MAR-19         Sodium (Na)-Dissolved       102.9       %       80-120       28-MAR-19         Strontium (Sr)-Dissolved       101.7       %       80-120       28-MAR-19         Thallium (Tl)-Dissolved       98.6       %       80-120       28-MAR-19         Tin (Sn)-Dissolved       97.8       %       80-120       28-MAR-19         Titanium (Ti)-Dissolved       96.9       %       80-120       28-MAR-19         Vanadium (V)-Dissolved       103.6       %       80-120       28-MAR-19         Vanadium (V)-Dissolved       107.5       %       80-120       28-MAR-19         WG3015865-1       MB       NP         Aluminum (Al)-Dissolved       <0.0010	Magnesium (Mg)-Di	ssolved		97.5		%		80-120	28-MAR-19
Nickel (Ni)-Dissolved         97.1         %         80-120         28-MAR-19           Potassium (K)-Dissolved         100.5         %         80-120         28-MAR-19           Selenium (Se)-Dissolved         96.6         %         80-120         28-MAR-19           Silicon (Si)-Dissolved         93.2         %         60-140         28-MAR-19           Silver (Ag)-Dissolved         96.6         %         80-120         28-MAR-19           Sodium (Na)-Dissolved         102.9         %         80-120         28-MAR-19           Strontium (Sr)-Dissolved         101.7         %         80-120         28-MAR-19           Thallium (Tl)-Dissolved         98.6         %         80-120         28-MAR-19           Tin (Sn)-Dissolved         97.8         %         80-120         28-MAR-19           Titanium (Ti)-Dissolved         96.9         %         80-120         28-MAR-19           Vanadium (V)-Dissolved         103.6         %         80-120         28-MAR-19           Vanadium (V)-Dissolved         107.5         %         80-120         28-MAR-19           WG3015865-1         MB         NP           Aluminum (Al)-Dissolved         <0.0010	Manganese (Mn)-Di	issolved		101.9		%		80-120	28-MAR-19
Potassium (K)-Dissolved       100.5       %       80-120       28-MAR-19         Selenium (Se)-Dissolved       96.6       %       80-120       28-MAR-19         Silicon (Si)-Dissolved       93.2       %       60-140       28-MAR-19         Silver (Ag)-Dissolved       96.6       %       80-120       28-MAR-19         Sodium (Na)-Dissolved       102.9       %       80-120       28-MAR-19         Strontium (Sr)-Dissolved       101.7       %       80-120       28-MAR-19         Thallium (Tl)-Dissolved       98.6       %       80-120       28-MAR-19         Titanium (Ti)-Dissolved       97.8       %       80-120       28-MAR-19         Titanium (Ti)-Dissolved       96.9       %       80-120       28-MAR-19         Vanadium (V)-Dissolved       103.6       %       80-120       28-MAR-19         Vanadium (V)-Dissolved       107.5       %       80-120       28-MAR-19         WG3015865-1       MB       NP         Aluminum (Al)-Dissolved       <0.0010	Molybdenum (Mo)-D	Dissolved		94.8		%		80-120	28-MAR-19
Selenium (Se)-Dissolved       96.6       %       80-120       28-MAR-19         Silicon (Si)-Dissolved       93.2       %       60-140       28-MAR-19         Silver (Ag)-Dissolved       96.6       %       80-120       28-MAR-19         Sodium (Na)-Dissolved       102.9       %       80-120       28-MAR-19         Strontium (Sr)-Dissolved       101.7       %       80-120       28-MAR-19         Thallium (Tl)-Dissolved       98.6       %       80-120       28-MAR-19         Tin (Sn)-Dissolved       97.8       %       80-120       28-MAR-19         Titanium (Ti)-Dissolved       96.9       %       80-120       28-MAR-19         Uranium (U)-Dissolved       103.6       %       80-120       28-MAR-19         Vanadium (V)-Dissolved       102.2       %       80-120       28-MAR-19         Zinc (Zn)-Dissolved       107.5       %       80-120       28-MAR-19         WG3015865-1       MB       NP         Aluminum (Al)-Dissolved       <0.0010	Nickel (Ni)-Dissolve	d		97.1		%		80-120	28-MAR-19
Silicon (Si)-Dissolved       93.2       %       60-140       28-MAR-19         Silver (Ag)-Dissolved       96.6       %       80-120       28-MAR-19         Sodium (Na)-Dissolved       102.9       %       80-120       28-MAR-19         Strontium (Sr)-Dissolved       101.7       %       80-120       28-MAR-19         Thallium (Ti)-Dissolved       98.6       %       80-120       28-MAR-19         Tin (Sn)-Dissolved       97.8       %       80-120       28-MAR-19         Titanium (Ti)-Dissolved       96.9       %       80-120       28-MAR-19         Uranium (U)-Dissolved       103.6       %       80-120       28-MAR-19         Vanadium (V)-Dissolved       102.2       %       80-120       28-MAR-19         Zinc (Zn)-Dissolved       107.5       %       80-120       28-MAR-19         WG3015865-1       MB       NP         Aluminum (Al)-Dissolved       <0.0010	Potassium (K)-Disso	olved		100.5		%		80-120	28-MAR-19
Silver (Ag)-Dissolved       96.6       %       80-120       28-MAR-19         Sodium (Na)-Dissolved       102.9       %       80-120       28-MAR-19         Strontium (Sr)-Dissolved       101.7       %       80-120       28-MAR-19         Thallium (TI)-Dissolved       98.6       %       80-120       28-MAR-19         Tin (Sn)-Dissolved       97.8       %       80-120       28-MAR-19         Titanium (Ti)-Dissolved       96.9       %       80-120       28-MAR-19         Uranium (U)-Dissolved       103.6       %       80-120       28-MAR-19         Vanadium (V)-Dissolved       102.2       %       80-120       28-MAR-19         Zinc (Zn)-Dissolved       107.5       %       80-120       28-MAR-19         WG3015865-1       MB       NP         Aluminum (Al)-Dissolved       <0.0010	Selenium (Se)-Disso	olved		96.6		%		80-120	28-MAR-19
Sodium (Na)-Dissolved       102.9       %       80-120       28-MAR-19         Strontium (Sr)-Dissolved       101.7       %       80-120       28-MAR-19         Thallium (Ti)-Dissolved       98.6       %       80-120       28-MAR-19         Tin (Sn)-Dissolved       97.8       %       80-120       28-MAR-19         Titanium (Ti)-Dissolved       96.9       %       80-120       28-MAR-19         Uranium (U)-Dissolved       103.6       %       80-120       28-MAR-19         Vanadium (V)-Dissolved       102.2       %       80-120       28-MAR-19         Zinc (Zn)-Dissolved       107.5       %       80-120       28-MAR-19         WG3015865-1       MB       NP         Aluminum (Al)-Dissolved       <0.0010	Silicon (Si)-Dissolve	ed		93.2		%		60-140	28-MAR-19
Strontium (Sr)-Dissolved       101.7       %       80-120       28-MAR-19         Thallium (TI)-Dissolved       98.6       %       80-120       28-MAR-19         Tin (Sn)-Dissolved       97.8       %       80-120       28-MAR-19         Titanium (Ti)-Dissolved       96.9       %       80-120       28-MAR-19         Uranium (U)-Dissolved       103.6       %       80-120       28-MAR-19         Vanadium (V)-Dissolved       102.2       %       80-120       28-MAR-19         Zinc (Zn)-Dissolved       107.5       %       80-120       28-MAR-19         WG3015865-1       MB       NP         Aluminum (Al)-Dissolved       <0.0010	Silver (Ag)-Dissolve	d		96.6		%		80-120	28-MAR-19
Thallium (TI)-Dissolved       98.6       %       80-120       28-MAR-19         Tin (Sn)-Dissolved       97.8       %       80-120       28-MAR-19         Titanium (Ti)-Dissolved       96.9       %       80-120       28-MAR-19         Uranium (U)-Dissolved       103.6       %       80-120       28-MAR-19         Vanadium (V)-Dissolved       102.2       %       80-120       28-MAR-19         Zinc (Zn)-Dissolved       107.5       %       80-120       28-MAR-19         WG3015865-1       MB       NP         Aluminum (Al)-Dissolved       <0.0010	Sodium (Na)-Dissolv	ved		102.9		%		80-120	28-MAR-19
Tin (Sn)-Dissolved       97.8       %       80-120       28-MAR-19         Titanium (Ti)-Dissolved       96.9       %       80-120       28-MAR-19         Uranium (U)-Dissolved       103.6       %       80-120       28-MAR-19         Vanadium (V)-Dissolved       102.2       %       80-120       28-MAR-19         Zinc (Zn)-Dissolved       107.5       %       80-120       28-MAR-19         WG3015865-1       MB       NP         Aluminum (Al)-Dissolved       <0.0010	Strontium (Sr)-Disso	olved		101.7		%		80-120	28-MAR-19
Titanium (Ti)-Dissolved       96.9       %       80-120       28-MAR-19         Uranium (U)-Dissolved       103.6       %       80-120       28-MAR-19         Vanadium (V)-Dissolved       102.2       %       80-120       28-MAR-19         Zinc (Zn)-Dissolved       107.5       %       80-120       28-MAR-19         WG3015865-1       MB       NP         Aluminum (Al)-Dissolved       <0.0010	Thallium (TI)-Dissolv	ved		98.6		%		80-120	28-MAR-19
Uranium (U)-Dissolved       103.6       %       80-120       28-MAR-19         Vanadium (V)-Dissolved       102.2       %       80-120       28-MAR-19         Zinc (Zn)-Dissolved       107.5       %       80-120       28-MAR-19         WG3015865-1       MB       NP         Aluminum (Al)-Dissolved       <0.0010	Tin (Sn)-Dissolved			97.8		%		80-120	28-MAR-19
Vanadium (V)-Dissolved       102.2       %       80-120       28-MAR-19         Zinc (Zn)-Dissolved       107.5       %       80-120       28-MAR-19         WG3015865-1       MB       NP         Aluminum (Al)-Dissolved       <0.0010	Titanium (Ti)-Dissol	ved		96.9		%		80-120	28-MAR-19
Zinc (Zn)-Dissolved       107.5       %       80-120       28-MAR-19         WG3015865-1       MB       NP         Aluminum (Al)-Dissolved       <0.0010	Uranium (U)-Dissolv	ved		103.6		%		80-120	28-MAR-19
WG3015865-1         MB         NP           Aluminum (Al)-Dissolved         <0.0010	Vanadium (V)-Disso	olved		102.2		%		80-120	28-MAR-19
Aluminum (Al)-Dissolved       <0.0010	Zinc (Zn)-Dissolved			107.5		%		80-120	28-MAR-19
Antimony (Sb)-Dissolved <0.00010 mg/L 0.0001 28-MAR-19	WG3015865-1 ME	В	NP						
, , , , , , , , , , , , , , , , , , ,	Aluminum (Al)-Disso	olved		<0.0010		mg/L		0.001	28-MAR-19
Arsenic (As)-Dissolved <0.00010 mg/l 0.0001 28_MAR_10	Antimony (Sb)-Disso	olved		<0.00010	)	mg/L		0.0001	28-MAR-19
7.100110 (16) 2.00011 20-10/A(1-1-3	Arsenic (As)-Dissolv	ved .		<0.00010	)	mg/L		0.0001	28-MAR-19
Barium (Ba)-Dissolved <0.00010 mg/L 0.0001 28-MAR-19	Barium (Ba)-Dissolv	ved .		<0.00010	)	mg/L		0.0001	28-MAR-19
Bismuth (Bi)-Dissolved <0.000050 mg/L 0.00005 28-MAR-19	Bismuth (Bi)-Dissolv	/ed		< 0.00005	50	mg/L		0.00005	28-MAR-19
Boron (B)-Dissolved <0.010 mg/L 0.01 28-MAR-19	Boron (B)-Dissolved	i		<0.010		mg/L		0.01	28-MAR-19
Cadmium (Cd)-Dissolved <0.0000050 mg/L 0.000005 28-MAR-19	Cadmium (Cd)-Diss	solved		<0.00000	05C	mg/L		0.000005	28-MAR-19



Workorder: L2249288

Report Date: 02-APR-19

Page 4 of 10

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA	Water							
Batch R4586690								
WG3015865-1 MB		NP						
Calcium (Ca)-Dissolved			<0.050		mg/L		0.05	28-MAR-19
Chromium (Cr)-Dissolve	ed		<0.00010		mg/L		0.0001	28-MAR-19
Cobalt (Co)-Dissolved			<0.00010		mg/L		0.0001	28-MAR-19
Copper (Cu)-Dissolved			<0.00020		mg/L		0.0002	28-MAR-19
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	28-MAR-19
Lead (Pb)-Dissolved			<0.000050	)	mg/L		0.00005	28-MAR-19
Lithium (Li)-Dissolved			<0.0010		mg/L		0.001	28-MAR-19
Magnesium (Mg)-Disso	lved		<0.0050		mg/L		0.005	28-MAR-19
Manganese (Mn)-Disso	lved		<0.00010		mg/L		0.0001	28-MAR-19
Molybdenum (Mo)-Disse	olved		<0.000050	)	mg/L		0.00005	28-MAR-19
Nickel (Ni)-Dissolved			<0.00050		mg/L		0.0005	28-MAR-19
Potassium (K)-Dissolve	d		< 0.050		mg/L		0.05	28-MAR-19
Selenium (Se)-Dissolve	d		<0.000050	)	mg/L		0.00005	28-MAR-19
Silicon (Si)-Dissolved			< 0.050		mg/L		0.05	28-MAR-19
Silver (Ag)-Dissolved			<0.000010	)	mg/L		0.00001	28-MAR-19
Sodium (Na)-Dissolved			< 0.050		mg/L		0.05	28-MAR-19
Strontium (Sr)-Dissolve	d		<0.00020		mg/L		0.0002	28-MAR-19
Thallium (TI)-Dissolved			<0.000010	)	mg/L		0.00001	28-MAR-19
Tin (Sn)-Dissolved			<0.00010		mg/L		0.0001	28-MAR-19
Titanium (Ti)-Dissolved			<0.00030		mg/L		0.0003	28-MAR-19
Uranium (U)-Dissolved			<0.000010	)	mg/L		0.00001	28-MAR-19
Vanadium (V)-Dissolved	b		<0.00050		mg/L		0.0005	28-MAR-19
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	28-MAR-19
MET-T-CCMS-VA	Water							
Batch R4586645								
WG3015886-2 LCS								
Aluminum (AI)-Total			104.6		%		80-120	28-MAR-19
Antimony (Sb)-Total			105.3		%		80-120	28-MAR-19
Arsenic (As)-Total			99.8		%		80-120	28-MAR-19
Barium (Ba)-Total			103.2		%		80-120	28-MAR-19
Bismuth (Bi)-Total			102.7		%		80-120	28-MAR-19
Boron (B)-Total			104.2		%		80-120	28-MAR-19
Cadmium (Cd)-Total			98.8		%		80-120	28-MAR-19
Calcium (Ca)-Total			104.6		%		80-120	28-MAR-19



Workorder: L2249288

Report Date: 02-APR-19 Page 5 of 10

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-VA	Water							
Batch R4586645								
WG3015886-2 LCS			103.3		0/		00.400	00 MAD 40
Chromium (Cr)-Total			103.3		%		80-120	28-MAR-19
Cobalt (Co)-Total			99.3		%		80-120	28-MAR-19
Copper (Cu)-Total							80-120	28-MAR-19
Iron (Fe)-Total			104.3		%		80-120	28-MAR-19
Lead (Pb)-Total			103.5		%		80-120	28-MAR-19
Lithium (Li)-Total			107.9		%		80-120	28-MAR-19
Magnesium (Mg)-Total			98.6		%		80-120	28-MAR-19
Manganese (Mn)-Total			102.3		%		80-120	28-MAR-19
Molybdenum (Mo)-Total			96.3		%		80-120	28-MAR-19
Nickel (Ni)-Total			101.7		%		80-120	28-MAR-19
Potassium (K)-Total			102.0		%		80-120	28-MAR-19
Selenium (Se)-Total			99.7		%		80-120	28-MAR-19
Silicon (Si)-Total			100.5		%		80-120	28-MAR-19
Silver (Ag)-Total			94.8		%		80-120	28-MAR-19
Sodium (Na)-Total			104.8		%		80-120	28-MAR-19
Strontium (Sr)-Total			104.2		%		80-120	28-MAR-19
Thallium (TI)-Total			101.7		%		80-120	28-MAR-19
Tin (Sn)-Total			93.7		%		80-120	28-MAR-19
Titanium (Ti)-Total			95.7		%		80-120	28-MAR-19
Uranium (U)-Total			106.1		%		80-120	28-MAR-19
Vanadium (V)-Total			102.8		%		80-120	28-MAR-19
Zinc (Zn)-Total			100.2		%		80-120	28-MAR-19
WG3015886-1 MB								
Aluminum (Al)-Total			<0.0030		mg/L		0.003	28-MAR-19
Antimony (Sb)-Total			<0.00010		mg/L		0.0001	28-MAR-19
Arsenic (As)-Total			<0.00010		mg/L		0.0001	28-MAR-19
Barium (Ba)-Total			<0.00010		mg/L		0.0001	28-MAR-19
Bismuth (Bi)-Total			<0.000050		mg/L		0.00005	28-MAR-19
Boron (B)-Total			<0.010		mg/L		0.01	28-MAR-19
Cadmium (Cd)-Total			<0.000005	С	mg/L		0.000005	28-MAR-19
Calcium (Ca)-Total			<0.050		mg/L		0.05	28-MAR-19
Chromium (Cr)-Total			<0.00010		mg/L		0.0001	28-MAR-19
Cobalt (Co)-Total			<0.00010		mg/L		0.0001	28-MAR-19
Copper (Cu)-Total			<0.00050		mg/L		0.0005	28-MAR-19



Workorder: L2249288

Report Date: 02-APR-19 Page 6 of 10

Test	Matrix	Reference	Result Qu	alifier Units	RPD	Limit	Analyzed
MET-T-CCMS-VA	Water						
Batch R4586645							
WG3015886-1 MB			0.040	· · · · · · · · · · · · · · · · · · ·			
Iron (Fe)-Total			<0.010	mg/L		0.01	28-MAR-19
Lead (Pb)-Total			<0.000050	mg/L		0.00005	28-MAR-19
Lithium (Li)-Total			<0.0010	mg/L		0.001	28-MAR-19
Magnesium (Mg)-Total			<0.0050	mg/L		0.005	28-MAR-19
Manganese (Mn)-Total			<0.00010	mg/L		0.0001	28-MAR-19
Molybdenum (Mo)-Total			<0.000050	mg/L		0.00005	28-MAR-19
Nickel (Ni)-Total			<0.00050	mg/L		0.0005	28-MAR-19
Potassium (K)-Total			< 0.050	mg/L		0.05	28-MAR-19
Selenium (Se)-Total			<0.000050	mg/L		0.00005	28-MAR-19
Silicon (Si)-Total			<0.10	mg/L		0.1	28-MAR-19
Silver (Ag)-Total			<0.000010	mg/L		0.00001	28-MAR-19
Sodium (Na)-Total			<0.050	mg/L		0.05	28-MAR-19
Strontium (Sr)-Total			<0.00020	mg/L		0.0002	28-MAR-19
Thallium (TI)-Total			<0.000010	mg/L		0.00001	28-MAR-19
Tin (Sn)-Total			<0.00010	mg/L		0.0001	28-MAR-19
Titanium (Ti)-Total			<0.00030	mg/L		0.0003	28-MAR-19
Uranium (U)-Total			<0.000010	mg/L		0.00001	28-MAR-19
Vanadium (V)-Total			<0.00050	mg/L		0.0005	28-MAR-19
Zinc (Zn)-Total			<0.0030	mg/L		0.003	28-MAR-19
NH3-L-F-CL	Water						
Batch R4588516							
WG3018743-6 LCS							
Ammonia as N			103.8	%		85-115	01-APR-19
WG3018743-5 MB							
Ammonia as N			<0.0050	mg/L		0.005	01-APR-19
NO2-L-IC-N-CL	Water						
Batch R4587103							
WG3017245-2 LCS							
Nitrite (as N)			104.4	%		90-110	28-MAR-19
WG3017245-1 MB			0.0040	/I		0.001	
Nitrite (as N)			<0.0010	mg/L		0.001	28-MAR-19
NO3-L-IC-N-CL	Water						



Workorder: L2249288

Report Date: 02-APR-19 Page 7 of 10

Test	Matrix	Reference	Result Qualif	ier Units	RPD	Limit	Analyzed
NO3-L-IC-N-CL	Water						
Batch R4587103 WG3017245-2 LCS Nitrate (as N)			98.6	%		90-110	28-MAR-19
WG3017245-1 MB Nitrate (as N)			<0.0050	mg/L		0.005	28-MAR-19
ORP-CL	Water						
<b>Batch R4587545</b> <b>WG3017615-3 CRM</b> ORP		CL-ORP	221	mV		210-230	29-MAR-19
P-T-L-COL-CL	Water						
Batch R4589156 WG3019346-2 LCS							
Phosphorus (P)-Total			112.1	%		80-120	02-APR-19
WG3019346-1 MB Phosphorus (P)-Total			<0.0020	mg/L		0.002	02-APR-19
PH-CL	Water						
Batch R4587296 WG3017301-11 LCS pH			7.02	рН		6.9-7.1	29-MAR-19
PO4-DO-L-COL-CL	Water						
Batch R4586141							
WG3016148-6 LCS Orthophosphate-Dissolv	ed (as P)		102.6	%		80-120	27-MAR-19
WG3016148-5 MB Orthophosphate-Dissolv	ed (as P)		<0.0010	mg/L		0.001	27-MAR-19
SO4-IC-N-CL	Water						
Batch R4587103 WG3017245-2 LCS							
Sulfate (SO4)			98.1	%		90-110	28-MAR-19
<b>WG3017245-1 MB</b> Sulfate (SO4)			<0.30	mg/L		0.3	28-MAR-19
SOLIDS-TDS-CL	Water						
Batch R4589098 WG3018235-5 LCS Total Dissolved Solids			101.1	%		85-115	01-APR-19
WG3018235-4 MB							



Workorder: L2249288

Report Date: 02-APR-19

Page 8 of 10

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
SOLIDS-TDS-CL	Water							
Batch R4589098 WG3018235-4 MB Total Dissolved Solids			<10		mg/L		10	01-APR-19
TKN-L-F-CL	Water							
Batch R4588920 WG3019217-10 LCS Total Kjeldahl Nitrogen			92.5		%		75-125	01-APR-19
WG3019217-14 LCS Total Kjeldahl Nitrogen			99.4		%		75-125	01-APR-19
WG3019217-17 LCS Total Kjeldahl Nitrogen			96.1		%		75-125	01-APR-19
WG3019217-2 LCS Total Kjeldahl Nitrogen			95.1		%		75-125	01-APR-19
WG3019217-6 LCS Total Kjeldahl Nitrogen			92.8		%		75-125	01-APR-19
<b>WG3019217-1 MB</b> Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	01-APR-19
<b>WG3019217-13 MB</b> Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	01-APR-19
WG3019217-16 MB Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	01-APR-19
WG3019217-5 MB Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	01-APR-19
WG3019217-9 MB Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	01-APR-19
TSS-L-CL	Water							
Batch R4588984 WG3018262-16 LCS								
Total Suspended Solids			95.4		%		85-115	01-APR-19
WG3018262-15 MB Total Suspended Solids			<1.0		mg/L		1	01-APR-19
TURBIDITY-CL	Water							
Batch R4586139 WG3015732-8 LCS Turbidity			96.5		%		85-115	27-MAR-19
WG3015732-7 MB Turbidity			<0.10		∕° NTU		0.1	27-MAR-19
•			-				<del>-</del>	

Report Date: 02-APR-19 Workorder: L2249288 Page 9 of 10

### Legend:

ALS Control Limit (Data Quality Objectives) Limit

DUP Duplicate

Relative Percent Difference RPD

N/A Not Available

Laboratory Control Sample LCS Standard Reference Material SRM

MS Matrix Spike

MSD

Matrix Spike Duplicate
Average Desorption Efficiency
Method Blank ADE

MB

Internal Reference Material IRM Certified Reference Material CRM Continuing Calibration Verification CCV CVS Calibration Verification Standard LCSD Laboratory Control Sample Duplicate

Workorder: L2249288 Report Date: 02-APR-19 Page 10 of 10

#### **Hold Time Exceedances:**

	Sample						
ALS Product Description	ID	Sampling Date	Date Processed	Rec. HT	Actual HT	Units	Qualifier
Physical Tests							
Oxidation redution potentia	I by elect.						
	1	25-MAR-19 13:35	29-MAR-19 14:20	0.25	97	hours	EHTR-FM
pН							
	1	25-MAR-19 13:35	29-MAR-19 14:00	0.25	96	hours	EHTR-FM
Lagand & Qualifiar Definition							

#### **Legend & Qualifier Definitions:**

EHTR-FM: Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended.

EHTR: Exceeded ALS recommended hold time prior to sample receipt.

EHTL: Exceeded ALS recommended hold time prior to analysis. Sample was received less than 24 hours prior to expiry.

EHT: Exceeded ALS recommended hold time prior to analysis.

Rec. HT: ALS recommended hold time (see units).

#### Notes\*:

Where actual sampling date is not provided to ALS, the date (& time) of receipt is used for calculation purposes. Where actual sampling time is not provided to ALS, the earlier of 12 noon on the sampling date or the time (& date) of receipt is used for calculation purposes. Samples for L2249288 were received on 26-MAR-19 09:00.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against predetermined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

|--|

20190325 DC GW TURNAROUND TIME: RUSH: COC ID: OTHER INFO PROJECT/CLIENT INFO LABORATORY\_ Facility Name / Job# Line Creek Operation Lab Name ALS Calgary Report Format / Distribution Excel PDF EDD Lab Contact Lyudmyla Shvets Email 1: Project Manager Chris Blurton chris.blurton@teck.com A 1954.61 Email Lyudmyla.Shvets@ALSGlobal.com Email Chris.Blurton@teck.com Email 2: teckcoal@equisonline.com Address 2559 29 Street NE Address Box 2003 Email 3: drake.tymstra@teck.com kirsten campbeli@teck.com 15km North Hwy 43 Email 4: BC City Calgary City Sparwood Province Province AB PO number Postal Code V0B 2G0 Country Canada Postal Code T1Y 7B5 Country Canada Phone Number 250-425-3196 Phone Number 403 407 1794 ANALYSIS REQUESTED Transfer of the Fire Field, 1; Lat., Fl.; Field & Lat., N; Nun SAMPLE DETAILS NONE Hazardous Material (Yes/No) FECKCOAL-MET-D-VA FECKCOAL-MET-T-VA FECKCOAL-ROUTINE ALS\_Package-TKN/TOC L2249288-COFC ALS\_Package-DOC HG-D-CVAF-VA Field G=Grab #Of Sample Location Time Matrix (24hr) C=Comp Cont. Sample ID (sys\_loc\_code) Date 2019/03/25 LC\_P1ZDC1306\_WG\_Q1-2019\_NP LC\_PIZDC1306 WG 13:35 6 7 ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS RELINQUISHED BY/APPILIATION \_\_\_\_\_ DATE/TIME \_\_\_\_ ACCEPTED BY/AFFILIATION \_\_\_\_ THE WAY WOUND AND MENTALES SAMES BY TO TREE THE PARTY OF THE PROPERTY OF THE P D.Tymstra/K.Campbell 25-Mar 03/03/03/S SERVICE REQUEST (rush subject to availability). the Manager of the Control of the Co Regular (default) X Sampler's Name K. Campbell/D. Tymstra Mobile # Priority (2-3 business days) - 50% surcharge Emergency (1 Business Day) - 100% surcharge Sampler's Signature Date/Time March 25, 2019 For Emergency <1 Day, ASAP or Weekend - Contact ALS



TECK COAL LIMITED (LINE CREEK)

ATTN: Chris Blurton

PO BOX 2003

SPARWOOD BC VOB 2G0

Date Received: 27-MAR-19

Report Date: 04-APR-19 14:31 (MT)

Version: FINAL

Client Phone: 250-425-6111

## Certificate of Analysis

Lab Work Order #: L2249785
Project P.O. #: VP000608129

Job Reference: LINE CREEK OPERATION
C of C Numbers: PIZDC0901-03-26

Legal Site Desc:



Lyudmyla Shvets, B.Sc. Account Manager

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L2249785 CONTD.... PAGE 2 of 6 Version: FINAL

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
   L2249785-1							
Sampled By: KC/DT on 26-MAR-19 @ 14:30							
Matrix: WG							
Miscellaneous Parameters							
Dissolved Organic Carbon	5.14		0.50	mg/L		02-APR-19	R4589160
Total Kjeldahl Nitrogen	0.309		0.050	mg/L		01-APR-19	R4588920
Mercury (Hg)-Total	0.0000064		0.000050	mg/L		29-MAR-19	R4587492
Total Organic Carbon				J		02-APR-19	
Dissolved Metals in Water	4.65		0.50	mg/L		02-AFK-19	R4589160
Diss. Be (low) in Water by CRC ICPMS							
Beryllium (Be)-Dissolved	<0.020		0.020	ug/L	29-MAR-19	29-MAR-19	R4587845
Dissolved Metals Filtration Location	LAB		0.020	ug/ =	20 1111 110	29-MAR-19	R4587055
Diss. Mercury in Water by CVAAS or CVAFS	2,13						111007000
Mercury (Hg)-Dissolved	<0.0000050		0.0000050	mg/L	29-MAR-19	29-MAR-19	R4587492
Dissolved Mercury Filtration Location	LAB			J		29-MAR-19	R4587335
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	LAB					29-MAR-19	R4587055
Aluminum (AI)-Dissolved	0.0054		0.0030	mg/L	29-MAR-19	29-MAR-19	R4587845
Antimony (Sb)-Dissolved	0.00020		0.00010	mg/L	29-MAR-19	29-MAR-19	R4587845
Arsenic (As)-Dissolved	0.00033		0.00010	mg/L	29-MAR-19	29-MAR-19	R4587845
Barium (Ba)-Dissolved	0.115		0.00010	mg/L	29-MAR-19	29-MAR-19	R4587845
Bismuth (Bi)-Dissolved	<0.000050		0.000050	mg/L	29-MAR-19	29-MAR-19	R4587845
Boron (B)-Dissolved	<0.010		0.010	mg/L	29-MAR-19	29-MAR-19	R4587845
Cadmium (Cd)-Dissolved	0.0757		0.0050	ug/L	29-MAR-19	29-MAR-19	R4587845
Calcium (Ca)-Dissolved	53.8		0.050	mg/L	29-MAR-19	29-MAR-19	R4587845
Chromium (Cr)-Dissolved	0.00010		0.00010	mg/L	29-MAR-19	29-MAR-19	R4587845
Cobalt (Co)-Dissolved	<0.10		0.10	ug/L	29-MAR-19	29-MAR-19	R4587845
Copper (Cu)-Dissolved	0.00308		0.00050	mg/L	29-MAR-19	29-MAR-19	R4587845
Iron (Fe)-Dissolved	<0.010		0.010	mg/L	29-MAR-19	29-MAR-19	R4587845
Lead (Pb)-Dissolved	0.000079		0.000050	mg/L	29-MAR-19	29-MAR-19	R4587845
Lithium (Li)-Dissolved	0.0016		0.0010	mg/L	29-MAR-19	29-MAR-19	R4587845
Magnesium (Mg)-Dissolved	14.2		0.10	mg/L	29-MAR-19	29-MAR-19	R4587845
Manganese (Mn)-Dissolved	0.00062		0.00010	mg/L	29-MAR-19	29-MAR-19	R4587845
Molybdenum (Mo)-Dissolved	0.00101		0.000050	mg/L	29-MAR-19	29-MAR-19	R4587845
Nickel (Ni)-Dissolved	0.00135		0.00050	mg/L	29-MAR-19	29-MAR-19	R4587845
Potassium (K)-Dissolved	1.13		0.050	mg/L	29-MAR-19	29-MAR-19	R4587845
Selenium (Se)-Dissolved	0.894		0.050	ug/L	29-MAR-19	29-MAR-19	R4587845
Silicon (Si)-Dissolved	3.20		0.050	mg/L	29-MAR-19	29-MAR-19	R4587845
Silver (Ag)-Dissolved	<0.000010		0.000010	mg/L	29-MAR-19	29-MAR-19	R4587845
Sodium (Na)-Dissolved	5.70		0.050	mg/L	29-MAR-19	29-MAR-19	R4587845
Strontium (Sr)-Dissolved	0.208		0.00020	mg/L	29-MAR-19	29-MAR-19	R4587845
Thallium (TI)-Dissolved	<0.000010		0.000010	mg/L	29-MAR-19	29-MAR-19	R4587845
Tin (Sn)-Dissolved	<0.00010		0.00010	mg/L	29-MAR-19	29-MAR-19	R4587845
Titanium (Ti)-Dissolved	<0.010		0.010	mg/L	29-MAR-19	29-MAR-19	R4587845
Uranium (U)-Dissolved Vanadium (V)-Dissolved	0.00288		0.000010	mg/L	29-MAR-19	29-MAR-19	R4587845
Vanadium (V)-Dissolved Zinc (Zn)-Dissolved	0.00055		0.00050	mg/L	29-MAR-19 29-MAR-19	29-MAR-19	R4587845
` '	0.0044		0.0010	mg/L	29-IVIAK-19	29-MAR-19	R4587845
Hardness Hardness (as CaCO3)	193		0.50	mg/L		01-APR-19	
Routine for Teck Coal	193		0.30	mg/L		31-ALK-19	
Acidity by Automatic Titration							
Acidity (as CaCO3)	5.4		1.0	mg/L		02-APR-19	R4589092
Alkalinity (Species) by Manual Titration				g, =		/	
Alkalinity, Bicarbonate (as CaCO3)	206		1.0	mg/L		01-APR-19	R4588394
Alkalinity, Carbonate (as CaCO3)	<1.0		1.0	mg/L		01-APR-19	R4588394
	11.0						

<sup>\*</sup> Refer to Referenced Information for Qualifiers (if any) and Methodology.

L2249785 CONTD.... PAGE 3 of 6 Version: FINAL

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2249785-1 LC_PIZDC0901_WG_Q1-2019_NP							
Sampled By: KC/DT on 26-MAR-19 @ 14:30							
Matrix: WG							
Alkalinity (Species) by Manual Titration Alkalinity, Hydroxide (as CaCO3)	<1.0		1.0	mg/L		01-APR-19	R4588394
Alkalinity, Total (as CaCO3)	206		1.0	mg/L		01-APR-19	R4588394
Ammonia, Total (as N) Ammonia as N	0.0061		0.0050	mg/L		02-APR-19	R4589133
Bromide in Water by IC (Low Level) Bromide (Br)	<0.050		0.050	mg/L		29-MAR-19	R4587103
Chloride in Water by IC							
Chloride (CI)  Electrical Conductivity (EC)	<0.50		0.50	mg/L		29-MAR-19	R4587103
Conductivity (@ 25C)	355		2.0	uS/cm		01-APR-19	R4588394
Fluoride in Water by IC Fluoride (F)	0.144		0.020	mg/L		29-MAR-19	R4587103
Ion Balance Calculation	4.0			0,		00 400 40	
Cation - Anion Balance Anion Sum	-1.0			% mog/l		03-APR-19 03-APR-19	
Cation Sum	4.21 4.13			meq/L meq/L		03-APR-19 03-APR-19	
Ion Balance Calculation				-			
lon Balance Nitrate in Water by IC (Low Level)	98.1		-100	%		03-APR-19	
Nitrate (as N)	0.273		0.0050	mg/L		29-MAR-19	R4587103
Nitrite in Water by IC (Low Level) Nitrite (as N)	<0.0010		0.0010	mg/L		29-MAR-19	R4587103
Orthophosphate-Dissolved (as P) Orthophosphate-Dissolved (as P)	0.0172	HTD	0.0050	mg/L		01-APR-19	R4586807
Oxidation redution potential by elect. ORP	419		-1000	mV		01-APR-19	R4588349
Phosphorus (P)-Total Phosphorus (P)-Total	0.0173		0.0020	mg/L		01-APR-19	R4588866
Sulfate in Water by IC Sulfate (SO4)	3.61		0.30	mg/L		29-MAR-19	R4587103
Total Dissolved Solids Total Dissolved Solids	207	DLHC	20	mg/L		02-APR-19	R4589842
Total Suspended Solids	201		20	y/ L		3271010	1.4000042
Total Suspended Solids  Turbidity	2.5	HTD	1.0	mg/L		03-APR-19	R4590295
Turbidity	6.69		0.10	NTU		28-MAR-19	R4586678
pH pH	7.94		0.10	рН		01-APR-19	R4588394

<sup>\*</sup> Refer to Referenced Information for Qualifiers (if any) and Methodology.

L2249785 CONTD....

PAGE 4 of 6 Version: FINAL

### **Reference Information**

**Qualifiers for Individual Samples Listed:** 

Sample Numbe	Client ID	Qualifier	Description
L2249785-1	LC_PIZDC0901_WG_Q1-201	SFPL	DOC, DISSOLVED METALS LAB FILTER/PRESERVE - Sample was Filtered and Preserved at the laboratory

Sample Parameter Qualifier Key:

Qualifier	Description
DLHC	Detection Limit Raised: Dilution required due to high concentration of test analyte(s).
HTD	Hold time exceeded for re-analysis or dilution, but initial testing was conducted within hold time.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.

**Test Method References:** 

ALS Test Code	Matrix	Test Description	Method Reference**
ACIDITY-PCT-CL	Water	Acidity by Automatic Titration	APHA 2310 Acidity

This analysis is carried out using procedures adapted from APHA Method 2310 "Acidity". Acidity is determined by potentiometric titration to a specified endpoint.

ALK-MAN-CL Water Alkalinity (Species) by Manual Titration APHA 2320 ALKALINITY

This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.

BE-D-L-CCMS-VA Water Diss. Be (low) in Water by CRC ICPMS APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

BR-L-IC-N-CL Water Bromide in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

C-DIS-ORG-LOW-CL Water Dissolved Organic Carbon APHA 5310 B-Instrumental

This method is applicable to the analysis of ground water, wastewater, and surface water samples. The form detected depends upon sample pretreatment: Unfiltered sample = TC, 0.45um filtered = TDC. Samples are injected into a combustion tube containing an oxidation catalyst. The carrier gas containing the combustion product from the combustion tube flows through an inorganic carbon reactor vessel and is then sent through a halogen scrubber into a sample cell set in a non-dispersive infrared gas analyzer (NDIR) where carbon dioxide is detected. For total inorganic carbon and dissolved inorganic carbon, the sample is injected into an IC reactor vessel where only the IC component is decomposed to become carbon dioxide.

The peak area generated by the NDIR indicates the TC/TDC or TIC/DIC as applicable. The total organic carbon content of the sample is calculated by subtracting the TIC from the TC.

TOC = TC-TIC, DOC = TDC-DIC, Particulate = Total - Dissolved.

C-TOT-ORG-LOW-CL Water Total Organic Carbon APHA 5310 TOTAL ORGANIC CARBON (TOC)

This method is applicable to the analysis of ground water, wastewater, and surface water samples. The form detected depends upon sample pretreatment: Unfiltered sample = TC, 0.45um filtered = TDC. Samples are injected into a combustion tube containing an oxidation catalyst. The carrier gas containing the combustion product from the combustion tube flows through an inorganic carbon reactor vessel and is then sent through a halogen scrubber into a sample cell set in a non-dispersive infrared gas analyzer (NDIR) where carbon dioxide is detected. For total inorganic carbon and dissolved inorganic carbon, the sample is injected into an IC reactor vessel where only the IC component is decomposed to become carbon dioxide.

The peak area generated by the NDIR indicates the TC/TDC or TIC/DIC as applicable. The total organic carbon content of the sample is calculated by subtracting the TIC from the TC.

TOC = TC-TIC, DOC = TDC-DIC, Particulate = Total - Dissolved.

CL-IC-N-CL Water Chloride in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

EC-L-PCT-CL Water Electrical Conductivity (EC) APHA 2510B

Conductivity, also known as Electrical Conductivity (EC) or Specific Conductance, is measured by immersion of a conductivity cell with platinum electrodes into a water sample. Conductivity measurements are temperature-compensated to 25C.

F-IC-N-CL Water Fluoride in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

HARDNESS-CALC-VA Water Hardness APHA 2340B

Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

HG-D-CVAA-VA Water Diss. Mercury in Water by CVAAS or CVAFS APHA 3030B/EPA 1631E (mod)

LINE CREEK OPERATION L2249785 CONTD....

**Reference Information** 

PAGE 5 of 6 Version: FINAL

Test Method References:

ALS Test Code Matrix Test Description Method Reference\*\*

Water samples are filtered (0.45 um), preserved with hydrochloric acid, then undergo a cold-oxidation using bromine monochloride prior to reduction

with stannous chloride, and analyzed by CVAAS or CVAFS.

HG-T-CVAA-VA Water Total Mercury in Water by CVAAS or CVAFS EPA 1631E (mod)

Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

IONBALANCE-BC-CL Water Ion Balance Calculation APHA 1030E

Cation Sum, Anion Sum, and Ion Balance (as % difference) are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Because all aqueous solutions are electrically neutral, the calculated ion balance (% difference of cations minus anions) should be near-zero.

Cation and Anion Sums are the total meq/L concentration of major cations and anions. Dissolved species are used where available. Minor ions are included where data is present. Ion Balance is calculated as:

Ion Balance (%) = [Cation Sum-Anion Sum] / [Cation Sum+Anion Sum]

MET-D-CCMS-VA Water Dissolved Metals in Water by CRC ICPMS APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

NH3-L-F-CL Water Ammonia, Total (as N) J. ENVIRON. MONIT., 2005, 7, 37-42, RSC

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et

NO2-L-IC-N-CL Water Nitrite in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

NO3-L-IC-N-CL Water Nitrate in Water by IC (Low Level) EPA 300.1 (mod

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

ORP-CL Water Oxidation redution potential by elect. ASTM D1498

This analysis is carried out in accordance with the procedure described in the "ASTM" method D1498 "Oxidation-Reduction Potential of Water" published by the American Society for Testing and Materials (ASTM). Results are reported as observed oxidation-reduction potential of the platinum metal-reference electrode employed, in mV.

It is recommended that this analysis be conducted in the field.

P-T-L-COL-CL Water Phosphorus (P)-Total APHA 4500-P PHOSPHORUS

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after persulphate digestion of the sample.

PH-CL Water pH APHA 4500 H-Electrode

pH is determined in the laboratory using a pH electrode. All samples analyzed by this method for pH will have exceeded the 15 minute recommended hold time from time of sampling (field analysis is recommended for pH where highly accurate results are needed)

PO4-DO-L-COL-CL Water Orthophosphate-Dissolved (as P) APHA 4500-P PHOSPHORUS

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.

SO4-IC-N-CL Water Sulfate in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

SOLIDS-TDS-CL Water Total Dissolved Solids APHA 2540 C

A well-mixed sample is filtered through a glass fibre filter paper. The filtrate is then evaporated to dryness in a pre-weighed vial and dried at 180 – 2 °C. The increase in vial weight represents the total dissolved solids (TDS).

TECKCOAL-IONBAL-CL Water Ion Balance Calculation APHA 1030E

Cation Sum, Anion Sum, and Ion Balance (as % difference) are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Because all aqueous solutions are electrically neutral, the calculated ion balance (% difference of cations minus anions) should be near-zero.

Cation and Anion Sums are the total meq/L concentration of major cations and anions. Dissolved species are used where available. Minor ions are included where data is present. Ion Balance is calculated as:

LINE CREEK OPERATION L2249785 CONTD....

### **Reference Information**

PAGE 6 of 6 Version: FINAL

#### **Test Method References:**

ALS Test Code Matrix Test Description Method Reference\*\*

Ion Balance (%) = [Cation Sum-Anion Sum] / [Cation Sum+Anion Sum]

TKN-L-F-CL Water Total Kjeldahl Nitrogen APHA 4500-NORG (TKN)

This analysis is carried out using procedures adapted from APHA Method 4500-Norg D. "Block Digestion and Flow Injection Analysis". Total Kjeldahl Nitrogen is determined using block digestion followed by Flow-injection analysis with fluorescence detection.

TSS-L-CL Water Total Suspended Solids APHA 2540 D-Gravimetric

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total suspended solids (TSS) are determined by filtering a sample through a glass fibre filter, and by drying the filter at 104 deg. C.

TURBIDITY-CL Water Turbidity APHA 2130 B-Nephelometer

This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.

\* ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

<b>Laboratory Definition Code</b>	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA
CL	ALS ENVIRONMENTAL - CALGARY, ALBERTA, CANADA

#### **Chain of Custody Numbers:**

PIZDC0901-03-26

#### **GLOSSARY OF REPORT TERMS**

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.

mg/kg - milligrams per kilogram based on dry weight of sample

mg/kg wwt - milligrams per kilogram based on wet weight of sample

mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight

mg/L - unit of concentration based on volume, parts per million.

< - Less than.

D.L. - The reporting limit.

N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory. UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.



Workorder: L2249785 Rep

Report Date: 04-APR-19

Page 1 of 9

Client:

TECK COAL LIMITED (LINE CREEK)

PO BOX 2003

SPARWOOD BC V0B 2G0

Contact: Chris Blurton

Test	Matrix	Reference	Result Qu	ıalifier	Units	RPD	Limit	Analyzed
ACIDITY-PCT-CL	Water							
<b>Batch R4589092 WG3019383-11 LCS</b> Acidity (as CaCO3)			104.4		%		85-115	02-APR-19
<b>WG3019383-10 MB</b> Acidity (as CaCO3)			1.8		mg/L		2	02-APR-19
ALK-MAN-CL	Water							
Batch R4588394 WG3018523-14 LCS Alkalinity, Total (as CaCo	O3)		93.2		%		85-115	01-APR-19
WG3018523-13 MB Alkalinity, Total (as CaCo	O3)		<1.0		mg/L		1	01-APR-19
BE-D-L-CCMS-VA	Water							
Batch R4587845 WG3017114-3 DUP Beryllium (Be)-Dissolved		<b>L2249785-1</b> <0.000020	<0.000020	RPD-NA	mg/L	N/A	20	29-MAR-19
WG3017114-2 LCS Beryllium (Be)-Dissolved	l		94.0		%		80-120	29-MAR-19
WG3017114-1 MB Beryllium (Be)-Dissolved	I	LF	<0.000020		mg/L		0.00002	29-MAR-19
BR-L-IC-N-CL	Water							
Batch R4587103 WG3017245-21 LCS Bromide (Br)			98.7		%		85-115	29-MAR-19
<b>WG3017245-20 MB</b> Bromide (Br)			<0.050		mg/L		0.05	29-MAR-19
C-DIS-ORG-LOW-CL	Water							
Batch R4589160 WG3019580-2 LCS Dissolved Organic Carbo	nn		100.4		%		90 120	02-APR-19
WG3019580-1 MB Dissolved Organic Carbo			<0.50		mg/L		80-120 0.5	02-APR-19
C-TOT-ORG-LOW-CL	Water							
Batch R4589160								
WG3019580-2 LCS Total Organic Carbon			104.5		%		80-120	02-APR-19
WG3019580-1 MB Total Organic Carbon			<0.50		mg/L		0.5	02-APR-19
CL-IC-N-CL	Water							



Workorder: L2249785

Report Date: 04-APR-19

Page 2 of 9

Test	Matrix	Reference	Result Qu	ıalifier	Units	RPD	Limit	Analyzed
CL-IC-N-CL	Water							
Batch R4587103								
<b>WG3017245-21 LCS</b> Chloride (CI)			101.2		%		90-110	29-MAR-19
<b>WG3017245-20 MB</b> Chloride (CI)			<0.50		mg/L		0.5	29-MAR-19
EC-L-PCT-CL	Water							
Batch R4588394								
WG3018523-14 LCS Conductivity (@ 25C)			101.4		%		90-110	01-APR-19
WG3018523-13 MB Conductivity (@ 25C)			<2.0		uS/cm		2	01-APR-19
F-IC-N-CL	Water							
Batch R4587103								
WG3017245-21 LCS								
Fluoride (F)			103.6		%		90-110	29-MAR-19
<b>WG3017245-20 MB</b> Fluoride (F)			<0.020		mg/L		0.02	29-MAR-19
HG-D-CVAA-VA	Water							
Batch R4587492 WG3017504-2 LCS Mercury (Hg)-Dissolved			98.9		%		80-120	29-MAR-19
WG3017504-1 MB		NP	90.9		70		6U-12U	29-MAR-19
Mercury (Hg)-Dissolved		NP	<0.0000050		mg/L		0.000005	29-MAR-19
HG-T-CVAA-VA	Water							
Batch R4587492								
WG3017644-2 LCS								
Mercury (Hg)-Total			101.7		%		80-120	29-MAR-19
WG3017644-1 MB Mercury (Hg)-Total			<0.0000050		mg/L		0.000005	29-MAR-19
MET-D-CCMS-VA	Water							
Batch R4587845								
WG3017114-3 DUP		L2249785-1	0.004:		4			
Aluminum (Al)-Dissolved		0.0054	0.0044	J	mg/L	0.0011	0.006	29-MAR-19
Antimony (Sb)-Dissolved		0.00020	0.00020		mg/L	3.6	20	29-MAR-19
Arsenic (As)-Dissolved		0.00033	0.00033		mg/L	1.7	20	29-MAR-19
Barium (Ba)-Dissolved		0.115	0.119		mg/L	3.5	20	29-MAR-19
Bismuth (Bi)-Dissolved		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	29-MAR-19
Boron (B)-Dissolved		<0.010	<0.010	RPD-NA	mg/L	N/A	20	29-MAR-19



Workorder: L2249785 Report Date: 04-APR-19 Page 3 of 9

MET-D-CCMS-VA   Water	Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
No.3017114-3   DUP   Cadinium (Cgl-Dissolved   53.8   52.9   mg/L   1.8   20   29-MAR-19   Calcium (Cgl-Dissolved   53.8   52.9   mg/L   1.8   20   29-MAR-19   Chromium (Cgl-Dissolved   0.00010   0.00011   mg/L   8.8   20   29-MAR-19   Chromium (Cgl-Dissolved   0.00010   0.00011   mg/L   N/A   20   29-MAR-19   Coball (Col-Dissolved   0.00308   0.00313   mg/L   1.6   20   29-MAR-19   Coball (Col-Dissolved   0.00308   0.00313   mg/L   1.6   20   29-MAR-19   Lead (Pb)-Dissolved   0.000079   0.000079   mg/L   0.1   20   29-MAR-19   Lead (Pb)-Dissolved   0.000079   0.000079   mg/L   0.1   20   29-MAR-19   Libium (Li)-Dissolved   0.0016   0.0016   mg/L   0.2   20   29-MAR-19   Magnesium (Mg)-Dissolved   14.2   14.7   mg/L   3.9   20   29-MAR-19   Magnesium (Mg)-Dissolved   0.00062   0.00067   mg/L   0.8   20   29-MAR-19   Molybdenum (Mo)-Dissolved   0.00135   0.00136   mg/L   2.1   20   29-MAR-19   Nickel (N)-Dissolved   0.00135   0.00138   mg/L   2.1   20   29-MAR-19   Siloton (Sh)-Dissolved   1.13   1.16   mg/L   2.7   20   29-MAR-19   Siloton (Sh)-Dissolved   3.20   3.30   mg/L   3.9   20   29-MAR-19   Siloton (Sh)-Dissolved   3.20   3.30   mg/L   3.9   20   29-MAR-19   Siloton (Sh)-Dissolved   3.20   3.30   mg/L   3.0   20   29-MAR-19   Siloton (Sh)-Dissolved   5.70   5.87   mg/L   3.0   20   29-MAR-19   Siloton (Sh)-Dissolved   0.00084   0.000010   0.000010   RPD-NA   mg/L   N/A   20   29-MAR-19   Siloton (Sh)-Dissolved   0.0088   0.213   mg/L   2.4   20   29-MAR-19   Siloton (Ms)-Dissolved   0.00088   0.000010   RPD-NA   mg/L   N/A   20   29-MAR-19   Tin (Sh)-Dissolved   0.00010   0.000010   RPD-NA   mg/L   N/A   20   29-MAR-19   Tin (Sh)-Dissolved   0.00088   0.00095   mg/L   4.3   20   29-MAR-19   Tin (Sh)-Dissolved   0.00088   0.00095   mg/L   4.3   20   29-MAR-19   Tin (Sh)-Dissolved   0.00088   0.00095   mg/L   4.3   20   29-MAR-19   Tin (Sh)-Dissolved   0.00088   0.00095   mg/L   4.3   20   29-MAR-19   Uranium (U)-Dissolved   0.0004   0.000010   RPD-NA   mg/L   N/A   20   29-MAR-19   Uranium (U)-Dissolv	MET-D-CCMS-VA	Water							
Cadmium (Cd)-Dissolved	Batch R458	7845							
Chromium (Cr)-Dissolved		-		0.0000666		mg/L	13	20	29-MAR-19
Cobalt (Co)-Dissolved	Calcium (Ca)-Diss	olved	53.8	52.9		mg/L	1.8	20	29-MAR-19
Copper (Cu)-Dissolved         0.00308         0.00313         mg/L         1.6         20         29-MAR-19           Iron (Fe)-Dissolved         <0.010	Chromium (Cr)-Dis	ssolved	0.00010	0.00011		mg/L	8.8	20	29-MAR-19
Iron (Fe)-Dissolved	Cobalt (Co)-Dissol	ved	<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	29-MAR-19
Lead (Pb)-Dissolved         0.000079         0.000079         mg/L         0.1         20         29-MAR-19           Lithium (Li)-Dissolved         0.0016         0.0016         mg/L         0.2         20         29-MAR-19           Magnesium (Mg)-Dissolved         14.2         14.7         mg/L         3.9         20         29-MAR-19           Manganese (Mn)-Dissolved         0.00062         0.00067         mg/L         7.2         20         29-MAR-19           Molyddenum (Mo)-Dissolved         0.00101         0.00100         mg/L         0.8         20         29-MAR-19           Nikel (Ni)-Dissolved         0.00135         0.00138         mg/L         2.1         20         29-MAR-19           Potassium (K)-Dissolved         0.00135         0.00138         mg/L         2.7         20         29-MAR-19           Selenium (Se)-Dissolved         0.000894         0.000859         mg/L         3.9         20         29-MAR-19           Siliver (Ag)-Dissolved         0.000010         0.000010         RPD-NA         mg/L         N/A         20         29-MAR-19           Strontium (Sr)-Dissolved         0.208         0.213         mg/L         N/A         20         29-MAR-19           Tin (Sn)-	Copper (Cu)-Disso	olved	0.00308	0.00313		mg/L	1.6	20	29-MAR-19
Lithium (Li)-Dissolved         0.0016         0.0016         mg/L         0.2         20         29-MAR-19           Magnesium (Mg)-Dissolved         14.2         14.7         mg/L         3.9         20         29-MAR-19           Manganese (Mn)-Dissolved         0.00062         0.00067         mg/L         7.2         20         29-MAR-19           Molybdenum (Mo)-Dissolved         0.00101         0.00100         mg/L         0.8         20         29-MAR-19           Nickel (Ni)-Dissolved         0.00135         0.00138         mg/L         2.1         20         29-MAR-19           Potassium (K)-Dissolved         1.13         1.16         mg/L         2.7         20         29-MAR-19           Selenium (Se)-Dissolved         0.000894         0.000859         mg/L         3.9         20         29-MAR-19           Silicon (Si)-Dissolved         3.20         3.30         mg/L         3.0         20         29-MAR-19           Silicon (Si)-Dissolved         4.0000010         <0.000010	Iron (Fe)-Dissolved	d	<0.010	<0.010	RPD-NA	mg/L	N/A	20	29-MAR-19
Magnesium (Mg)-Dissolved         14.2         14.7         mg/L         3.9         20         29-MAR-19           Manganese (Mn)-Dissolved         0.00062         0.00067         mg/L         7.2         20         29-MAR-19           Molybdenum (Mo)-Dissolved         0.00101         0.00100         mg/L         0.8         20         29-MAR-19           Nickel (Ni)-Dissolved         0.00135         0.00138         mg/L         2.1         20         29-MAR-19           Potassium (Ky)-Dissolved         1.13         1.16         mg/L         2.7         20         29-MAR-19           Selenium (Se)-Dissolved         0.000894         0.000859         mg/L         3.9         20         29-MAR-19           Silicon (Si)-Dissolved         3.20         3.30         mg/L         3.0         20         29-MAR-19           Siliver (Ag)-Dissolved         40.000010         <0.000010	Lead (Pb)-Dissolve	ed	0.000079	0.000079		mg/L	0.1	20	29-MAR-19
Manganese (Mm)-Dissolved         0.00062         0.00067         mg/L         7.2         20         29-MAR-19           Molybdenum (Mo)-Dissolved         0.00101         0.00100         mg/L         0.8         20         29-MAR-19           Nickel (Ni)-Dissolved         0.00135         0.00138         mg/L         2.1         20         29-MAR-19           Potassium (K)-Dissolved         1.13         1.16         mg/L         2.7         20         29-MAR-19           Selenium (Se)-Dissolved         0.000894         0.000859         mg/L         3.9         20         29-MAR-19           Silicon (Si)-Dissolved         3.20         3.30         mg/L         3.0         20         29-MAR-19           Silicon (Si)-Dissolved         3.20         3.30         mg/L         N/A         20         29-MAR-19           Silver (Ag)-Dissolved         5.70         5.87         mg/L         N/A         20         29-MAR-19           Strontium (Si)-Dissolved         5.70         5.87         mg/L         1.4         20         29-MAR-19           Thallium (Ti)-Dissolved         0.208         0.213         mg/L         N/A         20         29-MAR-19           Tin (Sn)-Dissolved         0.00010	Lithium (Li)-Dissol	ved	0.0016	0.0016		mg/L	0.2	20	29-MAR-19
Molybdenum (Mo)-Dissolved         0.00101         0.00100         mg/L         0.8         20         29-MAR-19           Nickel (Ni)-Dissolved         0.00135         0.00138         mg/L         2.1         20         29-MAR-19           Potassium (K)-Dissolved         1.13         1.16         mg/L         2.7         20         29-MAR-19           Selenium (Se)-Dissolved         0.000894         0.000859         mg/L         3.9         20         29-MAR-19           Siliver (Ag)-Dissolved         3.20         3.30         mg/L         3.0         20         29-MAR-19           Siliver (Ag)-Dissolved         <0.000010	Magnesium (Mg)-[	Dissolved	14.2	14.7		mg/L	3.9	20	29-MAR-19
Nickel (Ni)-Dissolved	Manganese (Mn)-[	Dissolved	0.00062	0.00067		mg/L	7.2	20	29-MAR-19
Potassium (K)-Dissolved         1.13         1.16         mg/L         2.7         20         29-MAR-19           Selenium (Se)-Dissolved         0.000894         0.000859         mg/L         3.9         20         29-MAR-19           Silicon (Si)-Dissolved         3.20         3.30         mg/L         3.0         20         29-MAR-19           Silver (Ag)-Dissolved         <0.000010	Molybdenum (Mo)-	-Dissolved	0.00101	0.00100		mg/L	0.8	20	29-MAR-19
Selenium (Se)-Dissolved         0.000894         0.000859         mg/L         3.9         20         29-MAR-19           Silicon (Si)-Dissolved         3.20         3.30         mg/L         3.0         20         29-MAR-19           Silver (Ag)-Dissolved         <0.000010	Nickel (Ni)-Dissolv	red	0.00135	0.00138		mg/L	2.1	20	29-MAR-19
Silicon (Si)-Dissolved         3.20         3.30         mg/L         3.0         20         29-MAR-19           Silver (Ag)-Dissolved         <0.000010	Potassium (K)-Dis	solved	1.13	1.16		mg/L	2.7	20	29-MAR-19
Silver (Ag)-Dissolved         <0.000010         <0.000010         RPD-NA         mg/L         N/A         20         29-MAR-19           Sodium (Na)-Dissolved         5.70         5.87         mg/L         3.0         20         29-MAR-19           Strontium (Sr)-Dissolved         0.208         0.213         mg/L         2.4         20         29-MAR-19           Thallium (TI)-Dissolved         <0.000010	Selenium (Se)-Dis	solved	0.000894	0.000859		mg/L	3.9	20	29-MAR-19
Sodium (Na)-Dissolved         5.70         5.87         mg/L         3.0         20         29-MAR-19           Strontium (Sr)-Dissolved         0.208         0.213         mg/L         2.4         20         29-MAR-19           Thallium (Ti)-Dissolved         <0.000010	Silicon (Si)-Dissolv	/ed	3.20	3.30		mg/L	3.0	20	29-MAR-19
Strontium (Sr)-Dissolved         0.208         0.213         mg/L         2.4         20         29-MAR-19           Thallium (TI)-Dissolved         <0.000010	Silver (Ag)-Dissolv	red	<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	29-MAR-19
Thallium (TI)-Dissolved	Sodium (Na)-Disso	olved	5.70	5.87		mg/L	3.0	20	29-MAR-19
Tin (Sn)-Dissolved         <0.00010         <0.00010         RPD-NA         mg/L         N/A         20         29-MAR-19           Titanium (Ti)-Dissolved         <0.010	Strontium (Sr)-Disa	solved	0.208	0.213		mg/L	2.4	20	29-MAR-19
Titanium (Ti)-Dissolved         <0.010         <0.010         RPD-NA         mg/L         N/A         20         29-MAR-19           Uranium (U)-Dissolved         0.00288         0.00295         mg/L         2.3         20         29-MAR-19           Vanadium (V)-Dissolved         0.00055         0.00058         mg/L         4.3         20         29-MAR-19           Zinc (Zn)-Dissolved         0.0044         0.0042         mg/L         5.1         20         29-MAR-19           WG3017114-2         LCS           Aluminum (Al)-Dissolved         97.9         %         80-120         29-MAR-19           Antimony (Sb)-Dissolved         93.0         %         80-120         29-MAR-19           Arsenic (As)-Dissolved         99.3         %         80-120         29-MAR-19           Barium (Ba)-Dissolved         99.1         %         80-120         29-MAR-19           Bismuth (Bi)-Dissolved         96.4         %         80-120         29-MAR-19           Boron (B)-Dissolved         92.4         %         80-120         29-MAR-19           Cadmium (Cd)-Dissolved         97.9         %         80-120         29-MAR-19           Calcium (Ca)-Dissolved         96.1         %         80-12	Thallium (TI)-Disso	olved	<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	29-MAR-19
Uranium (U)-Dissolved         0.00288         0.00295         mg/L         2.3         20         29-MAR-19           Vanadium (V)-Dissolved         0.00055         0.00058         mg/L         4.3         20         29-MAR-19           Zinc (Zn)-Dissolved         0.0044         0.0042         mg/L         5.1         20         29-MAR-19           WG3017114-2         LCS         LCS         Aluminum (Al)-Dissolved         97.9         %         80-120         29-MAR-19           Antimony (Sb)-Dissolved         93.0         %         80-120         29-MAR-19           Arsenic (As)-Dissolved         99.3         %         80-120         29-MAR-19           Barium (Ba)-Dissolved         99.1         %         80-120         29-MAR-19           Bismuth (Bi)-Dissolved         96.4         %         80-120         29-MAR-19           Boron (B)-Dissolved         92.4         %         80-120         29-MAR-19           Cadmium (Cd)-Dissolved         97.9         %         80-120         29-MAR-19           Calcium (Ca)-Dissolved         96.1         %         80-120         29-MAR-19	Tin (Sn)-Dissolved	I	<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	29-MAR-19
Vanadium (V)-Dissolved       0.00055       0.00058       mg/L       4.3       20       29-MAR-19         Zinc (Zn)-Dissolved       0.0044       0.0042       mg/L       5.1       20       29-MAR-19         WG3017114-2       LCS         Aluminum (Al)-Dissolved       97.9       %       80-120       29-MAR-19         Antimony (Sb)-Dissolved       93.0       %       80-120       29-MAR-19         Arsenic (As)-Dissolved       99.3       %       80-120       29-MAR-19         Barium (Ba)-Dissolved       99.1       %       80-120       29-MAR-19         Bismuth (Bi)-Dissolved       96.4       %       80-120       29-MAR-19         Boron (B)-Dissolved       92.4       %       80-120       29-MAR-19         Cadmium (Cd)-Dissolved       97.9       %       80-120       29-MAR-19         Calcium (Ca)-Dissolved       96.1       %       80-120       29-MAR-19	Titanium (Ti)-Disso	olved	<0.010	<0.010	RPD-NA	mg/L	N/A	20	29-MAR-19
Zinc (Zn)-Dissolved       0.0044       0.0042       mg/L       5.1       20       29-MAR-19         WG3017114-2 LCS         Aluminum (Al)-Dissolved       97.9       %       80-120       29-MAR-19         Antimony (Sb)-Dissolved       93.0       %       80-120       29-MAR-19         Arsenic (As)-Dissolved       99.3       %       80-120       29-MAR-19         Barium (Ba)-Dissolved       99.1       %       80-120       29-MAR-19         Bismuth (Bi)-Dissolved       96.4       %       80-120       29-MAR-19         Boron (B)-Dissolved       92.4       %       80-120       29-MAR-19         Cadmium (Cd)-Dissolved       97.9       %       80-120       29-MAR-19         Calcium (Ca)-Dissolved       96.1       %       80-120       29-MAR-19	Uranium (U)-Disso	olved	0.00288	0.00295		mg/L	2.3	20	29-MAR-19
WG3017114-2       LCS         Aluminum (Al)-Dissolved       97.9       %       80-120       29-MAR-19         Antimony (Sb)-Dissolved       93.0       %       80-120       29-MAR-19         Arsenic (As)-Dissolved       99.3       %       80-120       29-MAR-19         Barium (Ba)-Dissolved       99.1       %       80-120       29-MAR-19         Bismuth (Bi)-Dissolved       96.4       %       80-120       29-MAR-19         Boron (B)-Dissolved       92.4       %       80-120       29-MAR-19         Cadmium (Cd)-Dissolved       97.9       %       80-120       29-MAR-19         Calcium (Ca)-Dissolved       96.1       %       80-120       29-MAR-19	Vanadium (V)-Diss	solved	0.00055	0.00058		mg/L	4.3	20	29-MAR-19
Aluminum (Al)-Dissolved       97.9       %       80-120       29-MAR-19         Antimony (Sb)-Dissolved       93.0       %       80-120       29-MAR-19         Arsenic (As)-Dissolved       99.3       %       80-120       29-MAR-19         Barium (Ba)-Dissolved       99.1       %       80-120       29-MAR-19         Bismuth (Bi)-Dissolved       96.4       %       80-120       29-MAR-19         Boron (B)-Dissolved       92.4       %       80-120       29-MAR-19         Cadmium (Cd)-Dissolved       97.9       %       80-120       29-MAR-19         Calcium (Ca)-Dissolved       96.1       %       80-120       29-MAR-19	Zinc (Zn)-Dissolve	d	0.0044	0.0042		mg/L	5.1	20	29-MAR-19
Arsenic (As)-Dissolved       99.3       %       80-120       29-MAR-19         Barium (Ba)-Dissolved       99.1       %       80-120       29-MAR-19         Bismuth (Bi)-Dissolved       96.4       %       80-120       29-MAR-19         Boron (B)-Dissolved       92.4       %       80-120       29-MAR-19         Cadmium (Cd)-Dissolved       97.9       %       80-120       29-MAR-19         Calcium (Ca)-Dissolved       96.1       %       80-120       29-MAR-19				97.9		%		80-120	29-MAR-19
Barium (Ba)-Dissolved       99.1       %       80-120       29-MAR-19         Bismuth (Bi)-Dissolved       96.4       %       80-120       29-MAR-19         Boron (B)-Dissolved       92.4       %       80-120       29-MAR-19         Cadmium (Cd)-Dissolved       97.9       %       80-120       29-MAR-19         Calcium (Ca)-Dissolved       96.1       %       80-120       29-MAR-19	Antimony (Sb)-Dis	solved		93.0		%		80-120	29-MAR-19
Bismuth (Bi)-Dissolved       96.4       %       80-120       29-MAR-19         Boron (B)-Dissolved       92.4       %       80-120       29-MAR-19         Cadmium (Cd)-Dissolved       97.9       %       80-120       29-MAR-19         Calcium (Ca)-Dissolved       96.1       %       80-120       29-MAR-19	Arsenic (As)-Disso	olved		99.3		%		80-120	29-MAR-19
Bismuth (Bi)-Dissolved       96.4       %       80-120       29-MAR-19         Boron (B)-Dissolved       92.4       %       80-120       29-MAR-19         Cadmium (Cd)-Dissolved       97.9       %       80-120       29-MAR-19         Calcium (Ca)-Dissolved       96.1       %       80-120       29-MAR-19	Barium (Ba)-Disso	lved		99.1		%		80-120	29-MAR-19
Cadmium (Cd)-Dissolved         97.9         %         80-120         29-MAR-19           Calcium (Ca)-Dissolved         96.1         %         80-120         29-MAR-19	Bismuth (Bi)-Disso	olved		96.4		%		80-120	
Calcium (Ca)-Dissolved 96.1 % 80-120 29-MAR-19	Boron (B)-Dissolve	ed		92.4		%		80-120	29-MAR-19
	Cadmium (Cd)-Dis	ssolved		97.9		%		80-120	29-MAR-19
Chromium (Cr)-Dissolved 98.8 % 80-120 29-MAR-19	Calcium (Ca)-Diss	olved		96.1		%		80-120	29-MAR-19
	Chromium (Cr)-Dis	ssolved		98.8		%		80-120	29-MAR-19



Workorder: L2249785

Report Date: 04-APR-19

Page 4 of 9

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA	Water							
Batch R458784	15							
WG3017114-2 LCS								
Cobalt (Co)-Dissolved			97.8		%		80-120	29-MAR-19
Copper (Cu)-Dissolve	d		96.6		%		80-120	29-MAR-19
Iron (Fe)-Dissolved			101.2		%		80-120	29-MAR-19
Lead (Pb)-Dissolved			97.8		%		80-120	29-MAR-19
Lithium (Li)-Dissolved			96.8		%		80-120	29-MAR-19
Magnesium (Mg)-Diss			99.2		%		80-120	29-MAR-19
Manganese (Mn)-Diss	solved		98.6		%		80-120	29-MAR-19
Molybdenum (Mo)-Dis	ssolved		96.9		%		80-120	29-MAR-19
Nickel (Ni)-Dissolved			98.2		%		80-120	29-MAR-19
Potassium (K)-Dissolv	ved		99.1		%		80-120	29-MAR-19
Selenium (Se)-Dissolv	ved		101.6		%		80-120	29-MAR-19
Silicon (Si)-Dissolved			104.5		%		60-140	29-MAR-19
Silver (Ag)-Dissolved			97.2		%		80-120	29-MAR-19
Sodium (Na)-Dissolve	ed		102.5		%		80-120	29-MAR-19
Strontium (Sr)-Dissolv	/ed		97.7		%		80-120	29-MAR-19
Thallium (TI)-Dissolve	ed		94.4		%		80-120	29-MAR-19
Tin (Sn)-Dissolved			96.8		%		80-120	29-MAR-19
Titanium (Ti)-Dissolve	ed		95.6		%		80-120	29-MAR-19
Uranium (U)-Dissolve	d		104.0		%		80-120	29-MAR-19
Vanadium (V)-Dissolv	ved .		99.4		%		80-120	29-MAR-19
Zinc (Zn)-Dissolved			90.3		%		80-120	29-MAR-19
WG3017114-1 MB		LF						
Aluminum (Al)-Dissolv	ved		<0.0010		mg/L		0.001	29-MAR-19
Antimony (Sb)-Dissolv	ved		<0.00010		mg/L		0.0001	29-MAR-19
Arsenic (As)-Dissolve	d		<0.00010		mg/L		0.0001	29-MAR-19
Barium (Ba)-Dissolve	d		<0.00010		mg/L		0.0001	29-MAR-19
Bismuth (Bi)-Dissolve	d		<0.000050		mg/L		0.00005	29-MAR-19
Boron (B)-Dissolved			<0.010		mg/L		0.01	29-MAR-19
Cadmium (Cd)-Dissol	ved		<0.000005	С	mg/L		0.000005	29-MAR-19
Calcium (Ca)-Dissolve	ed		< 0.050		mg/L		0.05	29-MAR-19
Chromium (Cr)-Dissol	lved		<0.00010		mg/L		0.0001	29-MAR-19
Cobalt (Co)-Dissolved	d		<0.00010		mg/L		0.0001	29-MAR-19
Copper (Cu)-Dissolve	d		<0.00020		mg/L		0.0002	29-MAR-19
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	29-MAR-19



Workorder: L2249785

Report Date: 04-APR-19

Page 5 of 9

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA	Water							
Batch R458784	15							
WG3017114-1 MB Lead (Pb)-Dissolved		LF	<0.000050	)	mg/L		0.00005	29-MAR-19
Lithium (Li)-Dissolved	I		<0.0010		mg/L		0.001	29-MAR-19
Magnesium (Mg)-Diss	solved		<0.0050		mg/L		0.005	29-MAR-19
Manganese (Mn)-Disa	solved		<0.00010		mg/L		0.0001	29-MAR-19
Molybdenum (Mo)-Dis	ssolved		<0.000050	)	mg/L		0.00005	29-MAR-19
Nickel (Ni)-Dissolved			<0.00050		mg/L		0.0005	29-MAR-19
Potassium (K)-Dissol	ved		<0.050		mg/L		0.05	29-MAR-19
Selenium (Se)-Dissol	ved		<0.000050	)	mg/L		0.00005	29-MAR-19
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	29-MAR-19
Silver (Ag)-Dissolved			<0.000010	)	mg/L		0.00001	29-MAR-19
Sodium (Na)-Dissolve	ed		<0.050		mg/L		0.05	29-MAR-19
Strontium (Sr)-Dissolv	ved		<0.00020		mg/L		0.0002	29-MAR-19
Thallium (TI)-Dissolve	ed		<0.000010	)	mg/L		0.00001	29-MAR-19
Tin (Sn)-Dissolved			<0.00010		mg/L		0.0001	29-MAR-19
Titanium (Ti)-Dissolve	ed		<0.00030		mg/L		0.0003	29-MAR-19
Uranium (U)-Dissolve	ed		<0.000010	)	mg/L		0.00001	29-MAR-19
Vanadium (V)-Dissolv	/ed		<0.00050		mg/L		0.0005	29-MAR-19
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	29-MAR-19
NH3-L-F-CL	Water							
Batch R458913	33							
WG3019552-2 LCS Ammonia as N	3		112.3		%		85-115	02-APR-19
WG3019552-1 MB Ammonia as N			<0.0050		mg/L		0.005	02-APR-19
NO2-L-IC-N-CL	Water							
Batch R458710	)3							
WG3017245-21 LCS Nitrite (as N)	<b>3</b>		106.7		%		90-110	29-MAR-19
<b>WG3017245-20 MB</b> Nitrite (as N)			<0.0010		mg/L		0.001	29-MAR-19
NO3-L-IC-N-CL	Water							
Batch R458710	)3							
WG3017245-21 LCS Nitrate (as N)	<b>3</b>		100.9		%		90-110	29-MAR-19
WG3017245-20 MB								

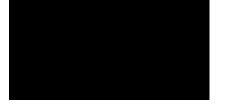


Workorder: L2249785

Report Date: 04-APR-19

Page 6 of 9

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
NO3-L-IC-N-CL	Water							
Batch R4587103 WG3017245-20 MB Nitrate (as N)			<0.0050		mg/L		0.005	29-MAR-19
ORP-CL	Water							
<b>Batch R4588349</b> <b>WG3018610-7 CRM</b> ORP		CL-ORP	225		mV		210-230	01-APR-19
PH-CL	Water							
Batch R4588394 WG3018523-14 LCS pH			7.00		рН		6.9-7.1	01-APR-19
PO4-DO-L-COL-CL	Water							
Batch R4586807 WG3016552-6 LCS Orthophosphate-Dissolv	ved (as P)		100.2		%		80-120	28-MAR-19
WG3016552-5 MB Orthophosphate-Dissolv			<0.0010		mg/L		0.001	28-MAR-19
SO4-IC-N-CL	Water							
<b>Batch</b> R4587103 <b>WG3017245-21</b> LCS Sulfate (SO4)			102.3		%		90-110	29-MAR-19
<b>WG3017245-20 MB</b> Sulfate (SO4)			<0.30		mg/L		0.3	29-MAR-19
SOLIDS-TDS-CL	Water							
Batch R4589842 WG3019407-2 LCS Total Dissolved Solids			96.2		%		85-115	02-APR-19
WG3019407-1 MB Total Dissolved Solids			<10		mg/L		10	02-APR-19
TKN-L-F-CL	Water							
Batch R4588920 WG3019217-10 LCS			00.5		0/		<b></b> /	04.485.75
Total Kjeldahl Nitrogen WG3019217-14 LCS			92.5		%		75-125	01-APR-19
Total Kjeldahl Nitrogen			99.4		%		75-125	01-APR-19



Workorder: L2249785

Report Date: 04-APR-19 Page 7 of 9

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
TKN-L-F-CL	Water							
Batch R4588920								
WG3019217-17 LCS Total Kjeldahl Nitrogen			96.1		%		75-125	01-APR-19
WG3019217-2 LCS Total Kjeldahl Nitrogen			95.1		%		75-125	01-APR-19
WG3019217-6 LCS Total Kjeldahl Nitrogen			92.8		%		75-125	01-APR-19
<b>WG3019217-1 MB</b> Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	01-APR-19
WG3019217-13 MB Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	01-APR-19
<b>WG3019217-16 MB</b> Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	01-APR-19
<b>WG3019217-5 MB</b> Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	01-APR-19
<b>WG3019217-9 MB</b> Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	01-APR-19
TSS-L-CL	Water							
Batch R4590295								
WG3019060-4 LCS Total Suspended Solids			94.9		%		85-115	03-APR-19
WG3019060-3 MB Total Suspended Solids			<1.0		mg/L		1	03-APR-19
TURBIDITY-CL	Water							
Batch R4586678								
WG3016737-9 DUP Turbidity		<b>L2249785-1</b> 6.69	6.74		NTU	0.7	15	28-MAR-19
WG3016737-8 LCS Turbidity			96.5		%		85-115	28-MAR-19
WG3016737-7 MB Turbidity			<0.10		NTU		0.1	28-MAR-19

Workorder: L2249785 Report Date: 04-APR-19 Page 8 of 9

### Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

### **Sample Parameter Qualifier Definitions:**

Qualifier	Description
J	Duplicate results and limits are expressed in terms of absolute difference.
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

Workorder: L2249785 Report Date: 04-APR-19 Page 9 of 9

#### **Hold Time Exceedances:**

	Sample						
ALS Product Description	ID	Sampling Date	Date Processed	Rec. HT	Actual HT	Units	Qualifier
Physical Tests							
Oxidation redution potentia	l by elect.						
	1	26-MAR-19 14:30	01-APR-19 09:15	0.25	139	hours	EHTR-FM
Total Suspended Solids							
	1	26-MAR-19 14:30	03-APR-19 15:10	7	8	days	EHT
рН							
	1	26-MAR-19 14:30	01-APR-19 09:00	0.25	138	hours	EHTR-FN
Anions and Nutrients							
Orthophosphate-Dissolved	(as P)						
	1	26-MAR-19 14:30	01-APR-19 10:00	3	6	days	EHT
egend & Qualifier Definitio	ns:						

#### Legend & Qualifier Definitions

EHTR-FM: Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended.

EHTR: Exceeded ALS recommended hold time prior to sample receipt.

EHTL: Exceeded ALS recommended hold time prior to analysis. Sample was received less than 24 hours prior to expiry.

EHT: Exceeded ALS recommended hold time prior to analysis.

Rec. HT: ALS recommended hold time (see units).

#### Notes\*:

Where actual sampling date is not provided to ALS, the date (& time) of receipt is used for calculation purposes. Where actual sampling time is not provided to ALS, the earlier of 12 noon on the sampling date or the time (& date) of receipt is used for calculation purposes. Samples for L2249785 were received on 27-MAR-19 11:00.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against predetermined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

Т	_	_	L
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TURNAROUND TIME: PIZDC0901-03-26 RUSH: COC ID: LABORATORY OTHER INFO PROJECT/CLIENT INFO Facility Name / Job# Line Creek Operation Lab Name ALS Calgary PDF EDD Report Format / Distribution Excel Project Manager Chris Blurton Lab Contact Lyudmyla Shvets Email 1: chris.blurton@teck.com Email Chris.Blurton@teck.com Email Lyudmyla Shvets@ALSGlobal.com Email 2: teckcoal@equisonline.com Address 2559 29 Street NE Address Box 2003 Email 3: drake.tymstra@teck.com 15km North Hwy 43 Email 4: VPO00608129 Sparwood вс City Calgary Province AB PO number City Province Postal Code T1Y 7B5 Postal Code V0B 2G0 Country Canada Country Canada Phone Number 403 407 1794 Phone Number 250-425-3196 SAMPLE DETAILS \*ANALYSIS REQUESTED Filtered - F. Field, L. Lab, FL: Field & Lab, N: None 똪 N N NONE NONE NONE HNO3 NONE H2SO4 Hazardous Material (Yes/No) L2249785-COFC TECKCOAL-ROUTINE-VA ALS\_Package-TKN/TOC FECKCOAL-MET-D-ECKCOAL-MET-T. ALS\_Package-DOC HG-D-CVAF-VA Sample Location Field G=Grab # 00 Time Sample ID \* (sys loc code) Matrix Date (24hr) C=Comp Cont. WG 2019/02/26 LC\_PIZDC0901\_WG\_Q1-2019\_NP LC\_PIZDC0901 14:30 G 6 ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS RELINQUISHED BY/AFFILIATION DATE/TIME .. ACCEPTED BY/AFTILIATION DATE/TIME PLEASE FORWARD METALS SAMELIS TO A 18 BURNABY FOR D.Tvmstra/K.Campbell 0-Jan SERVICE REQUEST (rush - subject to availability) Regular (default) X K. Campbell/D. Tymstra Mobile # Sampler's Name Priority (2-3 business days) - 50% surcharge Emergency (1 Business Day) - 100% surcharge Date/Time Sampler's Signature For Emergency <1, Day, ASAP or Weekend - Contact ALS



TECK COAL LIMITED (LINE CREEK)

ATTN: Chris Blurton

PO BOX 2003

SPARWOOD BC VOB 2G0

Date Received: 02-APR-19

Report Date: 12-APR-19 15:17 (MT)

Version: FINAL

Client Phone: 250-425-3196

# Certificate of Analysis

Lab Work Order #: L2252304
Project P.O. #: VP000608129

Job Reference: LINE CREEK OPERATION C of C Numbers: 20190331-GW1105

Legal Site Desc:

Comments: TSS expired on L2252304-1.



Lyudmyla Shvets, B.Sc. Account Manager

[This report shall not be reproduced except in full without the written authority of the Laboratory.]

L2252304 CONTD.... PAGE 2 of 9 Version: FINAL

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2252304-1 LC PIZP1105 WG Q1-2019 N							
Sampled By: K.Campbell/D.Tymstra on 31-MAR-19 @	12:10						
Matrix: WG							
Miscellaneous Parameters							
Dissolved Organic Carbon	2.27		0.50	mg/L		07-APR-19	R4592050
Total Kjeldahl Nitrogen	3.56	DLHC	0.25	mg/L		09-APR-19	R4593207
Total Organic Carbon	3.5	DLM	2.5	mg/L		07-APR-19	R4593207
EPH Testing for teck Coal	3.5	DEIVI	2.5	IIIg/L		07-AFK-19	K4592050
EPH (C10-C19) & EPH (C19-C32)							
EPH10-19	<0.25		0.25	mg/L	04-APR-19	05-APR-19	R4590695
EPH19-32	<0.25		0.25	mg/L	04-APR-19	05-APR-19	R4590695
Surrogate: 2-Bromobenzotrifluoride	81.1		60-140	%	04-APR-19	05-APR-19	R4590695
Sum of EPH (10-32)							
EPH (C10-C32)	<0.50		0.50	mg/L		08-APR-19	
TEH (C10-C30)							
TEH (C10-C30)	<0.25		0.25	mg/L	04-APR-19	05-APR-19	R4590695
Surrogate: 2-Bromobenzotrifluoride	81.1		60-140	%	04-APR-19	05-APR-19	R4590695
Dissolved Metals in Water							
Diss. Be (low) in Water by CRC ICPMS							
Beryllium (Be)-Dissolved	<0.020		0.020	ug/L	04-APR-19	04-APR-19	R4590585
Dissolved Metals Filtration Location	LAB					04-APR-19	R4590085
Diss. Mercury in Water by CVAAS or CVAFS							
Mercury (Hg)-Dissolved	<0.000050		0.0000050	mg/L	03-APR-19	04-APR-19	R4590205
Dissolved Mercury Filtration Location	LAB					03-APR-19	R4589970
Dissolved Metals in Water by CRC ICPMS Dissolved Metals Filtration Location	LAB					04-APR-19	D4500005
Aluminum (Al)-Dissolved	<0.0030		0.0030	mg/L	04-APR-19	04-APR-19	R4590085 R4590585
Antimony (Sb)-Dissolved	0.00059		0.0030	mg/L	04-APR-19	04-APR-19	R4590585
Arsenic (As)-Dissolved	<0.00039		0.00010	mg/L	04-AFR-19	04-AFR-19	R4590585
Barium (Ba)-Dissolved	0.0897		0.00010	mg/L	04-APR-19	04-APR-19	R4590585
Bismuth (Bi)-Dissolved	<0.00050		0.00010	mg/L	04-APR-19	04-APR-19	R4590585
Boron (B)-Dissolved	0.018		0.010	mg/L	04-APR-19	04-APR-19	R4590585
Cadmium (Cd)-Dissolved	0.0633		0.0050	ug/L	04-APR-19	04-APR-19	R4590585
Calcium (Ca)-Dissolved	159		0.050	mg/L	04-APR-19	04-APR-19	R4590585
Chromium (Cr)-Dissolved	<0.00010		0.00010	mg/L	04-APR-19	04-APR-19	R4590585
Cobalt (Co)-Dissolved	<0.10		0.10	ug/L	04-APR-19	04-APR-19	R4590585
Copper (Cu)-Dissolved	<0.00050		0.00050	mg/L	04-APR-19	04-APR-19	R4590585
Iron (Fe)-Dissolved	<0.010		0.010	mg/L	04-APR-19	04-APR-19	R4590585
Lead (Pb)-Dissolved	<0.000050		0.000050	mg/L	04-APR-19	04-APR-19	R4590585
Lithium (Li)-Dissolved	0.0160		0.0010	mg/L	04-APR-19	04-APR-19	R4590585
Magnesium (Mg)-Dissolved	48.6		0.10	mg/L	04-APR-19	04-APR-19	R4590585
Manganese (Mn)-Dissolved	0.00308		0.00010	mg/L	04-APR-19	04-APR-19	R4590585
Molybdenum (Mo)-Dissolved	0.000338		0.000050	mg/L	04-APR-19	04-APR-19	R4590585
Nickel (Ni)-Dissolved	0.00117		0.00050	mg/L	04-APR-19	04-APR-19	R4590585
Potassium (K)-Dissolved	1.72		0.050	mg/L	04-APR-19	04-APR-19	R4590585
Selenium (Se)-Dissolved	0.704		0.050	ug/L	04-APR-19	04-APR-19	R4590585
Silicon (Si)-Dissolved	4.68		0.050	mg/L	04-APR-19	04-APR-19	R4590585
Silver (Ag)-Dissolved	<0.000010		0.000010	mg/L	04-APR-19	04-APR-19	R4590585
Sodium (Na)-Dissolved	13.4		0.050	mg/L	04-APR-19	04-APR-19	R4590585
Strontium (Sr)-Dissolved	0.351		0.00020	mg/L	04-APR-19	04-APR-19	R4590585
Thallium (TI)-Dissolved	0.000031		0.000010	mg/L	04-APR-19	04-APR-19	R4590585
Tin (Sn)-Dissolved	<0.00010		0.00010	mg/L	04-APR-19	04-APR-19	R4590585
Titanium (Ti)-Dissolved	<0.010		0.010	mg/L	04-APR-19	04-APR-19	R4590585
Uranium (U)-Dissolved	0.000481		0.000010	mg/L	04-APR-19	04-APR-19	R4590585
Vanadium (V)-Dissolved	<0.00050		0.00050	mg/L	04-APR-19	04-APR-19	R4590585

<sup>\*</sup> Refer to Referenced Information for Qualifiers (if any) and Methodology.

L2252304 CONTD.... PAGE 3 of 9 Version: FINAL

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
   L2252304-1							
Sampled By: K.Campbell/D.Tymstra on 31-MAR-19 @	12:10						
Matrix: WG	12.10						
Dissolved Metals in Water by CRC ICPMS Zinc (Zn)-Dissolved	0.0019		0.0010	mg/L	04-APR-19	04-APR-19	R4590585
Total Metals in Water	0.0013		0.0010	1119/ =	047411110	047411110	114330303
Hardness							
Hardness (as CaCO3)	597		0.50	mg/L		04-APR-19	
Total Be (Low) in Water by CRC ICPMS				_			
Beryllium (Be)-Total	2.12		0.10	ug/L		03-APR-19	R4590053
Total Mercury in Water by CVAAS or CVAFS							
Mercury (Hg)-Total	<0.00050	DLM	0.00050	mg/L		04-APR-19	R4590205
Total Metals in Water by CRC ICPMS	00.0		0.045			00 ADD 40	D 4500050
Aluminum (Al)-Total	26.9		0.015	mg/L		03-APR-19	R4590053
Antimony (Sb)-Total Arsenic (As)-Total	0.00171 0.0165		0.00050	mg/L		03-APR-19 03-APR-19	R4590053 R4590053
Barium (Ba)-Total	0.0165		0.00050 0.00050	mg/L mg/L		03-APR-19 03-APR-19	R4590053 R4590053
Bismuth (Bi)-Total	0.00050		0.00050	mg/L		03-APR-19 03-APR-19	R4590053 R4590053
Boron (B)-Total	<0.050	DLA	0.00025	mg/L		03-AFR-19	R4590053
Cadmium (Cd)-Total	4.77		0.030	ug/L		03-APR-19	R4590053
Calcium (Ca)-Total	436		0.25	mg/L		03-APR-19	R4590053
Chromium (Cr)-Total	0.0536		0.00050	mg/L		03-APR-19	R4590053
Cobalt (Co)-Total	35.5		0.50	ug/L		03-APR-19	R4590053
Copper (Cu)-Total	0.0683		0.0025	mg/L		03-APR-19	R4590053
Iron (Fe)-Total	57.6		0.050	mg/L		03-APR-19	R4590053
Lead (Pb)-Total	0.0298		0.00025	mg/L		03-APR-19	R4590053
Lithium (Li)-Total	0.0613		0.0050	mg/L		03-APR-19	R4590053
Magnesium (Mg)-Total	114		0.10	mg/L		03-APR-19	R4590053
Manganese (Mn)-Total	3.76		0.00050	mg/L		03-APR-19	R4590053
Molybdenum (Mo)-Total	0.00209		0.00025	mg/L		03-APR-19	R4590053
Nickel (Ni)-Total	0.0731		0.0025	mg/L		03-APR-19	R4590053
Potassium (K)-Total	6.58		0.25	mg/L		03-APR-19	R4590053
Selenium (Se)-Total Silicon (Si)-Total	2.66		0.25	ug/L		03-APR-19	R4590053
Silver (Ag)-Total	36.5 0.000943		0.50 0.000050	mg/L mg/L		03-APR-19 03-APR-19	R4590053 R4590053
Sodium (Na)-Total	14.3		0.00030	mg/L		03-AFR-19	R4590053
Strontium (Sr)-Total	0.687		0.23	mg/L		03-APR-19	R4590053
Thallium (TI)-Total	0.00143		0.000050	mg/L		03-APR-19	R4590053
Tin (Sn)-Total	0.00112		0.00050	mg/L		03-APR-19	R4590053
Titanium (Ti)-Total	0.076		0.010	mg/L		03-APR-19	R4590053
Uranium (U)-Total	0.00380		0.000050	mg/L		03-APR-19	R4590053
Vanadium (V)-Total	0.0688		0.0025	mg/L		03-APR-19	R4590053
Zinc (Zn)-Total	0.413		0.015	mg/L		03-APR-19	R4590053
Routine for Teck Coal							
Acidity by Automatic Titration Acidity (as CaCO3)	78.6		1.0	mg/L		04-APR-19	R4591262
Alkalinity (Species) by Manual Titration							
Alkalinity, Bicarbonate (as CaCO3)	407		1.0	mg/L		04-APR-19	R4590642
Alkalinity, Carbonate (as CaCO3)	<1.0		1.0	mg/L		04-APR-19	R4590642
Alkalinity, Hydroxide (as CaCO3)	<1.0		1.0	mg/L		04-APR-19	R4590642
Alkalinity, Total (as CaCO3)	407		1.0	mg/L		04-APR-19	R4590642
<b>Ammonia, Total (as N)</b> Ammonia as N	0.0558		0.0050	mg/L		08-APR-19	R4593180
Bromide in Water by IC (Low Level) Bromide (Br)	1.47	DLHC	0.25	mg/L		02-APR-19	R4589962
Chloride in Water by IC			5.25	···• ' <b>-</b>			
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<sup>\*</sup> Refer to Referenced Information for Qualifiers (if any) and Methodology.

L2252304 CONTD.... PAGE 4 of 9 Version: FINAL

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2252304-1 LC_PIZP1105_WG_Q1-2019_N							
Sampled By: K.Campbell/D.Tymstra on 31-MAR-19 @	12:10						
Matrix: WG							
Chloride in Water by IC							
Chloride (CI)	118	DLHC	2.5	mg/L		02-APR-19	R4589962
Electrical Conductivity (EC)							
Conductivity (@ 25C)	1090		2.0	uS/cm		04-APR-19	R4590642
Fluoride in Water by IC Fluoride (F)	0.37	DLHC	0.10	mg/L		02-APR-19	R4589962
Ion Balance Calculation							
Cation - Anion Balance	-4.0			%		05-APR-19	
Anion Sum	13.6			meq/L		05-APR-19	
Cation Sum Ion Balance Calculation	12.6			meq/L		05-APR-19	
Ion Balance Calculation	92.3		-100	%		05-APR-19	
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	0.181	DLHC	0.025	mg/L		02-APR-19	R4589962
Nitrite in Water by IC (Low Level) Nitrite (as N)	<0.0050	DLHC	0.0050	mg/L		02-APR-19	R4589962
Orthophosphate-Dissolved (as P)	\U.UU3U	55.10	0.0030	illy/L		02-71 IV-19	11700000
Orthophosphate-Dissolved (as P)	0.0086		0.0010	mg/L		02-APR-19	R4589516
Oxidation redution potential by elect.							
ORP (D) T ( )	402		-1000	mV		08-APR-19	R4592437
Phosphorus (P)-Total Phosphorus (P)-Total	5.70	DLM	0.20	mg/L		10-APR-19	R4594666
Sulfate in Water by IC	55		0.20				
Sulfate (SO4)	102	DLHC	1.5	mg/L		02-APR-19	R4589962
Total Dissolved Solids Total Dissolved Solids	0.40	DLHC	00	/1		0F ADD 40	D4504744
Total Suspended Solids Total Suspended Solids	648	DLHC	20	mg/L		05-APR-19	R4591741
Total Suspended Solids	4990	DLHC	10	mg/L		08-APR-19	R4593055
Turbidity							
Turbidity	3530		0.10	NTU		02-APR-19	R4589370
pH pH	7.51		0.10	pН		04-APR-19	R4590642
L2252304-2 LC_PIZP1105_WG_Q1-2019_NP	7.51		0.10	рп		047(11/10	114330042
Sampled By: K.Campbell/D.Tymstra on 31-MAR-19 @	12:10						
Matrix: WG							
Miscellaneous Parameters							
Hardness (as CaCO3)	606		0.50	mg/L		04-APR-19	
Sulfate (SO4)	99.1	DLHC	1.5	mg/L		02-APR-19	R4589962
Turbidity	>4000		0.10	NTU		02-APR-19	R4589370
pH Alkalinity (Species) by Manual Titration	7.58		0.10	рН		04-APR-19	R4590642
Alkalinity (Species) by Manual Titration Alkalinity, Bicarbonate (as CaCO3)	406		1.0	mg/L		04-APR-19	R4590642
Alkalinity, Carbonate (as CaCO3)	<1.0		1.0	mg/L		04-APR-19	R4590642
Alkalinity, Hydroxide (as CaCO3)	<1.0		1.0	mg/L		04-APR-19	R4590642
Alkalinity, Total (as CaCO3)	406		1.0	mg/L		04-APR-19	R4590642
Dissolved Metals in Water Diss. Be (low) in Water by CRC ICPMS							
Beryllium (Be)-Dissolved	<0.020		0.020	ug/L	04-APR-19	04-APR-19	R4590585
Dissolved Metals Filtration Location	LAB			9		04-APR-19	R4590085
Dissolved Metals in Water by CRC ICPMS	_						
Dissolved Metals Filtration Location	LAB		0.0000	m c /l	04 ADD 40	04-APR-19	R4590085
Aluminum (Al)-Dissolved	<0.0030		0.0030	mg/L	04-APR-19	04-APR-19	R4590585

<sup>\*</sup> Refer to Referenced Information for Qualifiers (if any) and Methodology.

L2252304 CONTD.... PAGE 5 of 9 Version: FINAL

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2252304-2 LC_PIZP1105_WG_Q1-2019_NP							
Sampled By: K.Campbell/D.Tymstra on 31-MAR-19 @	12:10						
Matrix: WG	12.10						
Dissolved Metals in Water by CRC ICPMS							
Antimony (Sb)-Dissolved	0.00059		0.00010	mg/L	04-APR-19	04-APR-19	R4590585
Arsenic (As)-Dissolved	<0.00010		0.00010	mg/L	04-APR-19	04-APR-19	R4590585
Barium (Ba)-Dissolved	0.0913		0.00010	mg/L	04-APR-19	04-APR-19	R4590585
Bismuth (Bi)-Dissolved	<0.000050		0.000050	mg/L	04-APR-19	04-APR-19	R4590585
Boron (B)-Dissolved	0.018		0.010	mg/L	04-APR-19	04-APR-19	R4590585
Cadmium (Cd)-Dissolved	0.0736		0.0050	ug/L	04-APR-19	04-APR-19	R4590585
Calcium (Ca)-Dissolved	164		0.050	mg/L	04-APR-19	04-APR-19	R4590585
Chromium (Cr)-Dissolved	<0.00010		0.00010	mg/L	04-APR-19	04-APR-19	R4590585
Cobalt (Co)-Dissolved Copper (Cu)-Dissolved	<0.10 <0.00050		0.10 0.00050	ug/L	04-APR-19 04-APR-19	04-APR-19 04-APR-19	R4590585
Iron (Fe)-Dissolved	<0.00050		0.00050	mg/L mg/L	04-APR-19	04-APR-19 04-APR-19	R4590585 R4590585
Lead (Pb)-Dissolved	<0.010		0.010	mg/L	04-APR-19	04-APR-19	R4590585
Lithium (Li)-Dissolved	0.0163		0.000030	mg/L	04-APR-19	04-APR-19	R4590585
Magnesium (Mg)-Dissolved	47.9		0.10	mg/L	04-APR-19	04-APR-19	R4590585
Manganese (Mn)-Dissolved	0.00383		0.00010	mg/L	04-APR-19	04-APR-19	R4590585
Molybdenum (Mo)-Dissolved	0.000330		0.000050	mg/L	04-APR-19	04-APR-19	R4590585
Nickel (Ni)-Dissolved	0.00124		0.00050	mg/L	04-APR-19	04-APR-19	R4590585
Potassium (K)-Dissolved	1.73		0.050	mg/L	04-APR-19	04-APR-19	R4590585
Selenium (Se)-Dissolved	0.616		0.050	ug/L	04-APR-19	04-APR-19	R4590585
Silicon (Si)-Dissolved	4.76		0.050	mg/L	04-APR-19	04-APR-19	R4590585
Silver (Ag)-Dissolved	<0.000010		0.000010	mg/L	04-APR-19	04-APR-19	R4590585
Sodium (Na)-Dissolved	13.5		0.050	mg/L	04-APR-19	04-APR-19	R4590585
Strontium (Sr)-Dissolved Thallium (TI)-Dissolved	0.338		0.00020	mg/L	04-APR-19	04-APR-19	R4590585
Tin (Sn)-Dissolved	0.000031 <0.00010		0.000010 0.00010	mg/L mg/L	04-APR-19 04-APR-19	04-APR-19 04-APR-19	R4590585 R4590585
Titanium (Ti)-Dissolved	<0.00010		0.00010	mg/L	04-AFR-19	04-AFR-19 04-APR-19	R4590585
Uranium (U)-Dissolved	0.000486		0.00010	mg/L	04-APR-19	04-APR-19	R4590585
Vanadium (V)-Dissolved	<0.00050		0.00050	mg/L	04-APR-19	04-APR-19	R4590585
Zinc (Zn)-Dissolved	0.0022		0.0010	mg/L	04-APR-19	04-APR-19	R4590585

<sup>\*</sup> Refer to Referenced Information for Qualifiers (if any) and Methodology.

LINE CREEK OPERATION

**Reference Information** 

L2252304 CONTD....
PAGE 6 of 9
Version: FINAL

#### **Qualifiers for Sample Submission Listed:**

Qualifier	Description
SFPL	DOC/D-METAL/D-HG FILTERED AND PRESERVED AT THE LAB - Sample was Filtered and Preserved at the laboratory

#### Sample Parameter Qualifier Key:

Qualifier	Description
DLA	Detection Limit adjusted for required dilution
DLHC	Detection Limit Raised: Dilution required due to high concentration of test analyte(s).
DLM	Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.

#### **Test Method References:**

ALS Test Code	Matrix	Test Description	Method Reference**
ACIDITY-PCT-CL	Water	Acidity by Automatic Titration	APHA 2310 Acidity

This analysis is carried out using procedures adapted from APHA Method 2310 "Acidity". Acidity is determined by potentiometric titration to a specified endpoint.

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ALK-MAN-CL Water Alkalinity (Species) by Manual Titration APHA 2320 ALKALINITY

This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.

BE-D-L-CCMS-VA Water Diss. Be (low) in Water by CRC ICPMS APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

BE-T-L-CCMS-VA Water Total Be (Low) in Water by CRC ICPMS EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

BR-L-IC-N-CL Water Bromide in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

C-DIS-ORG-LOW-CL Water Dissolved Organic Carbon APHA 5310 B-Instrumental

This method is applicable to the analysis of ground water, wastewater, and surface water samples. The form detected depends upon sample pretreatment: Unfiltered sample = TC, 0.45um filtered = TDC. Samples are injected into a combustion tube containing an oxidation catalyst. The carrier gas containing the combustion product from the combustion tube flows through an inorganic carbon reactor vessel and is then sent through a halogen scrubber into a sample cell set in a non-dispersive infrared gas analyzer (NDIR) where carbon dioxide is detected. For total inorganic carbon and dissolved inorganic carbon, the sample is injected into an IC reactor vessel where only the IC component is decomposed to become carbon dioxide.

The peak area generated by the NDIR indicates the TC/TDC or TIC/DIC as applicable. The total organic carbon content of the sample is calculated by subtracting the TIC from the TC.

TOC = TC-TIC, DOC = TDC-DIC, Particulate = Total - Dissolved.

C-TOT-ORG-LOW-CL Water Total Organic Carbon APHA 5310 TOTAL ORGANIC CARBON (TOC)

This method is applicable to the analysis of ground water, wastewater, and surface water samples. The form detected depends upon sample pretreatment: Unfiltered sample = TC, 0.45um filtered = TDC. Samples are injected into a combustion tube containing an oxidation catalyst. The carrier gas containing the combustion product from the combustion tube flows through an inorganic carbon reactor vessel and is then sent through a halogen scrubber into a sample cell set in a non-dispersive infrared gas analyzer (NDIR) where carbon dioxide is detected. For total inorganic carbon and dissolved inorganic carbon, the sample is injected into an IC reactor vessel where only the IC component is decomposed to become carbon dioxide.

The peak area generated by the NDIR indicates the TC/TDC or TIC/DIC as applicable. The total organic carbon content of the sample is calculated by subtracting the TIC from the TC.

TOC = TC-TIC, DOC = TDC-DIC, Particulate = Total - Dissolved.

CL-IC-N-CL Water Chloride in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

EC-L-PCT-CL Water Electrical Conductivity (EC) APHA 2510B

Conductivity, also known as Electrical Conductivity (EC) or Specific Conductance, is measured by immersion of a conductivity cell with platinum electrodes into a water sample. Conductivity measurements are temperature-compensated to 25C.

EPH(10-32)-CALC-CL Water Sum of EPH (10-32) Sum of EPH - Auto Calculated

The sum of EPH(C10-C19) and EPH(C19-C32)

LINE CREEK OPERATION L2252304 CONTD....

**Reference Information** 

PAGE 7 of 9 Version: FINAL

Test Method References:

ALS Test Code Matrix Test Description Method Reference\*\*

F-IC-N-CL Water Fluoride in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

HARDNESS-CALC-VA Water Hardness APHA 2340B

Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO3 equivalents.

Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

HG-D-CVAA-VA Water Diss. Mercury in Water by CVAAS or CVAFS APHA 3030B/EPA 1631E (mod)

Water samples are filtered (0.45 um), preserved with hydrochloric acid, then undergo a cold-oxidation using bromine monochloride prior to reduction

with stannous chloride, and analyzed by CVAAS or CVAFS.

HG-T-CVAA-VA Water Total Mercury in Water by CVAAS or CVAFS EPA 1631E (mod)

Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

IONBALANCE-BC-CL Water Ion Balance Calculation APHA 1030E

Cation Sum, Anion Sum, and Ion Balance (as % difference) are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Because all aqueous solutions are electrically neutral, the calculated ion balance (% difference of cations minus anions) should be near-zero.

Cation and Anion Sums are the total meq/L concentration of major cations and anions. Dissolved species are used where available. Minor ions are included where data is present. Ion Balance is calculated as:

Ion Balance (%) = [Cation Sum-Anion Sum] / [Cation Sum+Anion Sum]

MET-D-CCMS-VA Water Dissolved Metals in Water by CRC ICPMS APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

MET-T-CCMS-VA Water Total Metals in Water by CRC ICPMS EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

NH3-L-F-CL Water Ammonia, Total (as N) J. ENVIRON. MONIT., 2005, 7, 37-42, RSC

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.

NO2-L-IC-N-CL Water Nitrite in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

NO3-L-IC-N-CL Water Nitrate in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

ORP-CL Water Oxidation redution potential by elect. ASTM D1498

This analysis is carried out in accordance with the procedure described in the "ASTM" method D1498 "Oxidation-Reduction Potential of Water" published by the American Society for Testing and Materials (ASTM). Results are reported as observed oxidation-reduction potential of the platinum metal-reference electrode employed, in mV.

It is recommended that this analysis be conducted in the field.

P-T-L-COL-CL Water Phosphorus (P)-Total APHA 4500-P PHOSPHORUS

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after persulphate digestion of the sample.

PH-CL Water pH APHA 4500 H-Electrode

pH is determined in the laboratory using a pH electrode. All samples analyzed by this method for pH will have exceeded the 15 minute recommended hold time from time of sampling (field analysis is recommended for pH where highly accurate results are needed)

PO4-DO-L-COL-CL Water Orthophosphate-Dissolved (as P) APHA 4500-P PHOSPHORUS

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.

SO4-IC-N-CL Water Sulfate in Water by IC EPA 300.1 (mod)

LINE CREEK OPERATION L2252304 CONTD....

### **Reference Information**

PAGE 8 of 9 Version: FINAL

**Test Method References:** 

**ALS Test Code** Matrix Method Reference\*\* **Test Description** 

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

SOLIDS-TDS-CL Water **Total Dissolved Solids** APHA 2540 C

A well-mixed sample is filtered through a glass fibre filter paper. The filtrate is then evaporated to dryness in a pre-weighed vial and dried at 180 – 2 °C.

The increase in vial weight represents the total dissolved solids (TDS).

TECKCOAL-IONBAL-CL Water Ion Balance Calculation **APHA 1030E** 

Cation Sum, Anion Sum, and Ion Balance (as % difference) are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Because all aqueous solutions are electrically neutral, the calculated ion balance (% difference of cations minus anions) should be near-zero.

Cation and Anion Sums are the total meg/L concentration of major cations and anions. Dissolved species are used where available. Minor ions are included where data is present. Ion Balance is calculated as:

Ion Balance (%) = [Cation Sum-Anion Sum] / [Cation Sum+Anion Sum]

EPH (C10-C19) & EPH (C19-C32) TEH-BC-VA-CL Water BCMOE EPH GCFID

Analysis is in accordance with BC MOE Lab Manual method "Extractable Petroleum Hydrocarbons in Water by GC/FID", v2.1, July 1999. Whole water samples are extracted with DCM prior to gas chromatography with flame ionization detection (GC-FID). EPH results include Polycyclic Aromatic Hydrocarbons (PAH) and are therefore not equivalent to Light and Heavy Extractable Petroleum Hydrocarbons (LEPH/HEPH).

TEH-WATER-VA-CL Water TEH (C10-C30) BC Lab Manual

Water samples are spiked with 2-BBTF surrogate, and extracted by reciprocal action shaker for 1 hour using a single micro-extraction with hexane. After extraction, the hexane layer is drawn off and analyzed on a gas chromatograph equipped with a flame ionization detector.

TKN-L-F-CL Total Kieldahl Nitrogen APHA 4500-NORG (TKN)

This analysis is carried out using procedures adapted from APHA Method 4500-Norg D. "Block Digestion and Flow Injection Analysis". Total Kjeldahl Nitrogen is determined using block digestion followed by Flow-injection analysis with fluorescence detection.

TSS-L-CL Water **Total Suspended Solids** APHA 2540 D-Gravimetric

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total suspended solids (TSS) are determined by filtering a sample through a glass fibre filter, and by drying the filter at 104 deg. C.

**TURBIDITY-CL** Water **Turbidity** APHA 2130 B-Nephelometer

This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.

\*\* ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

<b>Laboratory Definition Code</b>	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA
CL	ALS ENVIRONMENTAL - CALGARY, ALBERTA, CANADA

**Chain of Custody Numbers:** 

20190331-GW1105

LINE CREEK OPERATION L2252304 CONTD....

**Reference Information** 

PAGE 9 of 9 Version: FINAL

#### **Test Method References:**

**ALS Test Code** Matrix Method Reference\*\* **Test Description** 

#### **GLOSSARY OF REPORT TERMS**

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.

mg/kg - milligrams per kilogram based on dry weight of sample

mg/kg wwt - milligrams per kilogram based on wet weight of sample mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight

mg/L - unit of concentration based on volume, parts per million.

< - Less than.

D.L. - The reporting limit.

N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.



Workorder: L2252304

Report Date: 12-APR-19

Page 1 of 13

Client:

TECK COAL LIMITED (LINE CREEK)

PO BOX 2003

SPARWOOD BC V0B 2G0

Contact: Chris Blurton

Test	Matrix	Reference	Result (	Qualifier U	nits RPD	Limit	Analyzed
ACIDITY-PCT-CL	Water						
Batch R4591262							
WG3020902-14 LCS Acidity (as CaCO3)			103.1	%	6	85-115	04-APR-19
WG3020902-13 MB Acidity (as CaCO3)			1.9	m	ng/L	2	04-APR-19
ALK-MAN-CL	Water						
Batch R4590642 WG3020908-8 LCS Alkalinity, Total (as CaC			95.9	%	6	85-115	04-APR-19
WG3020908-7 MB Alkalinity, Total (as CaC	O3)		<1.0	m	ng/L	1	04-APR-19
BE-D-L-CCMS-VA	Water						
Batch R4590585							
WG3020629-2 LCS Beryllium (Be)-Dissolved	d		101.2	%	6	80-120	04-APR-19
WG3020629-1 MB Beryllium (Be)-Dissolved	d	LF	<0.000020	m	ng/L	0.00002	04-APR-19
BE-T-L-CCMS-VA	Water						
Batch R4590053							
WG3020527-2 LCS Beryllium (Be)-Total			102.9	%	ó	80-120	03-APR-19
WG3020527-1 MB Beryllium (Be)-Total			<0.000020	m	ng/L	0.00002	03-APR-19
BR-L-IC-N-CL	Water						
Batch R4589962							
WG3020459-10 LCS Bromide (Br)			103.7	%	ó	85-115	02-APR-19
WG3020459-14 LCS Bromide (Br)			102.0	%	6	85-115	02-APR-19
<b>WG3020459-2 LCS</b> Bromide (Br)			100.1	%	6	85-115	02-APR-19
<b>WG3020459-6 LCS</b> Bromide (Br)			105.7	%	ó	85-115	02-APR-19
<b>WG3020459-1 MB</b> Bromide (Br)			<0.050	m	ng/L	0.05	02-APR-19
<b>WG3020459-13 MB</b> Bromide (Br)			<0.050	m	ng/L	0.05	02-APR-19
WG3020459-5 MB							



Workorder: L2252304

Report Date: 12-APR-19 Page 2 of 13

est	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
BR-L-IC-N-CL	Water							
<b>Batch</b> R4589962 <b>WG3020459-5 MB</b> Bromide (Br)			<0.050		mg/L		0.05	02-APR-19
<b>WG3020459-9 MB</b> Bromide (Br)			<0.050		mg/L		0.05	02-APR-19
C-DIS-ORG-LOW-CL	Water							
Batch R4592050 WG3022932-6 LCS Dissolved Organic Carb	on		102.4		%		80-120	07-APR-19
WG3022932-5 MB Dissolved Organic Carb	on		<0.50		mg/L		0.5	07-APR-19
C-TOT-ORG-LOW-CL	Water							
Batch R4592050 WG3022932-6 LCS Total Organic Carbon			102.4		%		80-120	07-APR-19
WG3022932-5 MB Total Organic Carbon			<0.50		mg/L		0.5	07-APR-19
CL-IC-N-CL	Water							
Batch R4589962 WG3020459-10 LCS Chloride (CI)			102.9		%		90-110	02-APR-19
<b>WG3020459-14 LCS</b> Chloride (CI)			102.4		%		90-110	02-APR-19
WG3020459-2 LCS Chloride (CI)			100.9		%		90-110	02-APR-19
<b>WG3020459-6 LCS</b> Chloride (CI)			102.0		%		90-110	02-APR-19
WG3020459-1 MB Chloride (CI)			<0.50		mg/L		0.5	02-APR-19
<b>WG3020459-13 MB</b> Chloride (CI)			<0.50		mg/L		0.5	02-APR-19
WG3020459-5 MB Chloride (CI)			<0.50		mg/L		0.5	02-APR-19
<b>WG3020459-9 MB</b> Chloride (CI)			<0.50		mg/L		0.5	02-APR-19
EC-L-PCT-CL	Water							



Workorder: L2252304

Report Date: 12-APR-19 Page 3 of 13

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
EC-L-PCT-CL	Water							
Batch R4590642 WG3020908-8 LCS Conductivity (@ 25C)			102.8		%		90-110	04-APR-19
<b>WG3020908-7 MB</b> Conductivity (@ 25C)			<2.0		uS/cm		2	04-APR-19
F-IC-N-CL	Water							
Batch R4589962								
<b>WG3020459-10 LCS</b> Fluoride (F)			108.3		%		90-110	02-APR-19
<b>WG3020459-14 LCS</b> Fluoride (F)			107.5		%		90-110	02-APR-19
<b>WG3020459-2 LCS</b> Fluoride (F)			106.7		%		90-110	02-APR-19
WG3020459-6 LCS Fluoride (F)			106.6		%		90-110	02-APR-19
WG3020459-1 MB Fluoride (F)			<0.020		mg/L		0.02	02-APR-19
<b>WG3020459-13 MB</b> Fluoride (F)			<0.020		mg/L		0.02	02-APR-19
<b>WG3020459-5 MB</b> Fluoride (F)			<0.020		mg/L		0.02	02-APR-19
<b>WG3020459-9 MB</b> Fluoride (F)			<0.020		mg/L		0.02	02-APR-19
HG-D-CVAA-VA	Water							
Batch R4590205								
WG3020481-6 LCS Mercury (Hg)-Dissolved			100.3		%		80-120	04-APR-19
WG3020481-5 MB Mercury (Hg)-Dissolved		LF	<0.000005	5C	mg/L		0.000005	04-APR-19
WG3020481-8 MS Mercury (Hg)-Dissolved		L2252304-1	81.5		%		70-130	04-APR-19
HG-T-CVAA-VA	Water							
Batch R4590205								
WG3020636-6 LCS Mercury (Hg)-Total			100.3		%		80-120	04-APR-19
WG3020636-5 MB Mercury (Hg)-Total			<0.000005	5C	mg/L		0.000005	04-APR-19
MET-D-CCMS-VA	Water							



Workorder: L2252304 Report Date: 12-APR-19 Page 4 of 13

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA	Water							
Batch R45905	85							
WG3020629-2 LC	_							
Aluminum (Al)-Disso			107.3		%		80-120	04-APR-19
Antimony (Sb)-Disso			93.2		%		80-120	04-APR-19
Arsenic (As)-Dissolve			104.1		%		80-120	04-APR-19
Barium (Ba)-Dissolve			106.4		%		80-120	04-APR-19
Bismuth (Bi)-Dissolve	ed		98.8		%		80-120	04-APR-19
Boron (B)-Dissolved			97.3		%		80-120	04-APR-19
Cadmium (Cd)-Disso	olved		103.4		%		80-120	04-APR-19
Calcium (Ca)-Dissolv	/ed		102.2		%		80-120	04-APR-19
Chromium (Cr)-Disso	olved		103.2		%		80-120	04-APR-19
Cobalt (Co)-Dissolve	d		102.8		%		80-120	04-APR-19
Copper (Cu)-Dissolve	ed		102.0		%		80-120	04-APR-19
Iron (Fe)-Dissolved			104.8		%		80-120	04-APR-19
Lead (Pb)-Dissolved			99.96		%		80-120	04-APR-19
Lithium (Li)-Dissolved	d		100.7		%		80-120	04-APR-19
Magnesium (Mg)-Dis	ssolved		101.4		%		80-120	04-APR-19
Manganese (Mn)-Dis	ssolved		99.2		%		80-120	04-APR-19
Molybdenum (Mo)-Di	issolved		100.7		%		80-120	04-APR-19
Nickel (Ni)-Dissolved	I		102.0		%		80-120	04-APR-19
Potassium (K)-Disso	lved		103.8		%		80-120	04-APR-19
Selenium (Se)-Disso	lved		99.9		%		80-120	04-APR-19
Silicon (Si)-Dissolved	d		99.1		%		60-140	04-APR-19
Silver (Ag)-Dissolved	I		97.3		%		80-120	04-APR-19
Sodium (Na)-Dissolv	ed		104.5		%		80-120	04-APR-19
Strontium (Sr)-Disso	lved		96.3		%		80-120	04-APR-19
Thallium (TI)-Dissolv	ed		100.6		%		80-120	04-APR-19
Tin (Sn)-Dissolved			96.4		%		80-120	04-APR-19
Titanium (Ti)-Dissolv	red		96.1		%		80-120	04-APR-19
Uranium (U)-Dissolve	ed		100.3		%		80-120	04-APR-19
Vanadium (V)-Dissol	ved		103.8		%		80-120	04-APR-19
Zinc (Zn)-Dissolved			100.5		%		80-120	04-APR-19
WG3020629-1 MB	<b>,</b>	LF						
Aluminum (Al)-Disso	lved		<0.0010		mg/L		0.001	04-APR-19
Antimony (Sb)-Disso	lved		<0.00010	)	mg/L		0.0001	04-APR-19
Arsenic (As)-Dissolve	ed		<0.00010	1	mg/L		0.0001	04-APR-19



Workorder: L2252304

Report Date: 12-APR-19 Page 5 of 13

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA	Water							
Batch R45	90585							
	MB	LF	0.00040					
Barium (Ba)-Diss			<0.00010		mg/L		0.0001	04-APR-19
Bismuth (Bi)-Diss			<0.00005	0	mg/L		0.00005	04-APR-19
Boron (B)-Dissolv			<0.010		mg/L		0.01	04-APR-19
Cadmium (Cd)-D			<0.00000	50	mg/L		0.000005	04-APR-19
Calcium (Ca)-Dis			<0.050		mg/L		0.05	04-APR-19
Chromium (Cr)-D			<0.00010		mg/L		0.0001	04-APR-19
Cobalt (Co)-Disse			<0.00010		mg/L		0.0001	04-APR-19
Copper (Cu)-Diss			<0.00020		mg/L		0.0002	04-APR-19
Iron (Fe)-Dissolve			<0.010		mg/L		0.01	04-APR-19
Lead (Pb)-Dissol			<0.00005	0	mg/L		0.00005	04-APR-19
Lithium (Li)-Disso	olved		<0.0010		mg/L		0.001	04-APR-19
Magnesium (Mg)			<0.0050		mg/L		0.005	04-APR-19
Manganese (Mn)	-Dissolved		<0.00010		mg/L		0.0001	04-APR-19
Molybdenum (Mo	o)-Dissolved		<0.00005	0	mg/L		0.00005	04-APR-19
Nickel (Ni)-Disso	lved		<0.00050		mg/L		0.0005	04-APR-19
Potassium (K)-Di	issolved		< 0.050		mg/L		0.05	04-APR-19
Selenium (Se)-Di	issolved		<0.00005	0	mg/L		0.00005	04-APR-19
Silicon (Si)-Disso	olved		< 0.050		mg/L		0.05	04-APR-19
Silver (Ag)-Disso	lved		<0.00001	0	mg/L		0.00001	04-APR-19
Sodium (Na)-Dis	solved		< 0.050		mg/L		0.05	04-APR-19
Strontium (Sr)-Di	issolved		<0.00020		mg/L		0.0002	04-APR-19
Thallium (TI)-Diss	solved		<0.00001	0	mg/L		0.00001	04-APR-19
Tin (Sn)-Dissolve	ed		<0.00010		mg/L		0.0001	04-APR-19
Titanium (Ti)-Dis	solved		<0.00030		mg/L		0.0003	04-APR-19
Uranium (U)-Diss	solved		<0.00001	0	mg/L		0.00001	04-APR-19
Vanadium (V)-Dis	ssolved		<0.00050		mg/L		0.0005	04-APR-19
Zinc (Zn)-Dissolv	ved .		<0.0010		mg/L		0.001	04-APR-19
MET-T-CCMS-VA	Water							
Batch R45	90053							
<b>WG3020527-2</b> Aluminum (Al)-To			101.5		%		80-120	03-APR-19
Antimony (Sb)-To			101.5		%		80-120	03-APR-19 03-APR-19
								03-APR-19 03-APR-19
Arsenic (As)-Tota Barium (Ba)-Tota			101.5 107.1		%			80-120 80-120



Workorder: L2252304

Report Date: 12-APR-19

Page 6 of 13

MET-T-CCMS-VA	Water					
Batch R4590053						
WG3020527-2 LCS						
Bismuth (Bi)-Total		101.9		%	80-120	03-APR-19
Boron (B)-Total		96.1		%	80-120	03-APR-19
Cadmium (Cd)-Total		102.3		%	80-120	03-APR-19
Calcium (Ca)-Total		102.1		%	80-120	03-APR-19
Chromium (Cr)-Total		97.8		%	80-120	03-APR-19
Cobalt (Co)-Total		101.6		%	80-120	03-APR-19
Copper (Cu)-Total		100.0		%	80-120	03-APR-19
Iron (Fe)-Total		97.6		%	80-120	03-APR-19
Lead (Pb)-Total		108.0		%	80-120	03-APR-19
Lithium (Li)-Total		98.8		%	80-120	03-APR-19
Magnesium (Mg)-Total		100.8		%	80-120	03-APR-19
Manganese (Mn)-Total		101.5		%	80-120	03-APR-19
Molybdenum (Mo)-Total		104.2		%	80-120	03-APR-19
Nickel (Ni)-Total		100.9		%	80-120	03-APR-19
Potassium (K)-Total		99.7		%	80-120	03-APR-19
Selenium (Se)-Total		102.2		%	80-120	03-APR-19
Silicon (Si)-Total		102.3		%	80-120	03-APR-19
Silver (Ag)-Total		101.8		%	80-120	03-APR-19
Sodium (Na)-Total		104.1		%	80-120	03-APR-19
Strontium (Sr)-Total		104.5		%	80-120	03-APR-19
Thallium (TI)-Total		107.3		%	80-120	03-APR-19
Tin (Sn)-Total		99.3		%	80-120	03-APR-19
Titanium (Ti)-Total		94.8		%	80-120	03-APR-19
Uranium (U)-Total		108.8		%	80-120	03-APR-19
Vanadium (V)-Total		103.0		%	80-120	03-APR-19
Zinc (Zn)-Total		99.6		%	80-120	03-APR-19
WG3020527-1 MB						
Aluminum (Al)-Total		<0.0030		mg/L	0.003	03-APR-19
Antimony (Sb)-Total		<0.00010		mg/L	0.0001	03-APR-19
Arsenic (As)-Total		<0.00010		mg/L	0.0001	03-APR-19
Barium (Ba)-Total		<0.00010		mg/L	0.0001	03-APR-19
Bismuth (Bi)-Total		<0.00005	0	mg/L	0.00005	03-APR-19
Boron (B)-Total		<0.010		mg/L	0.01	03-APR-19
Cadmium (Cd)-Total		<0.00000	5C	mg/L	0.000005	03-APR-19



Workorder: L2252304

Report Date: 12-APR-19 Page 7 of 13

Test	Matrix	Reference	Result Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-VA	Water						
Batch R4590053							
WG3020527-1 MB			0.050			0.05	
Calcium (Ca)-Total			<0.050	mg/L		0.05	03-APR-19
Chromium (Cr)-Total			<0.00010	mg/L		0.0001	03-APR-19
Cobalt (Co)-Total			<0.00010	mg/L		0.0001	03-APR-19
Copper (Cu)-Total			<0.00050	mg/L		0.0005	03-APR-19
Iron (Fe)-Total			<0.010	mg/L		0.01	03-APR-19
Lead (Pb)-Total			<0.000050	mg/L		0.00005	03-APR-19
Lithium (Li)-Total			<0.0010	mg/L		0.001	03-APR-19
Magnesium (Mg)-Total			<0.0050	mg/L		0.005	03-APR-19
Manganese (Mn)-Total			<0.00010	mg/L		0.0001	03-APR-19
Molybdenum (Mo)-Total			<0.000050	mg/L		0.00005	03-APR-19
Nickel (Ni)-Total			<0.00050	mg/L		0.0005	03-APR-19
Potassium (K)-Total			<0.050	mg/L		0.05	03-APR-19
Selenium (Se)-Total			<0.000050	mg/L		0.00005	03-APR-19
Silicon (Si)-Total			<0.10	mg/L		0.1	03-APR-19
Silver (Ag)-Total			<0.000010	mg/L		0.00001	03-APR-19
Sodium (Na)-Total			<0.050	mg/L		0.05	03-APR-19
Strontium (Sr)-Total			<0.00020	mg/L		0.0002	03-APR-19
Thallium (TI)-Total			<0.000010	mg/L		0.00001	03-APR-19
Tin (Sn)-Total			<0.00010	mg/L		0.0001	03-APR-19
Titanium (Ti)-Total			<0.00030	mg/L		0.0003	03-APR-19
Uranium (U)-Total			<0.000010	mg/L		0.00001	03-APR-19
Vanadium (V)-Total			<0.00050	mg/L		0.0005	03-APR-19
Zinc (Zn)-Total			<0.0030	mg/L		0.003	03-APR-19
NH3-L-F-CL	Water						
Batch R4593180							
WG3023842-6 LCS							
Ammonia as N			102.3	%		85-115	08-APR-19
WG3023842-5 MB Ammonia as N			<0.0050	mg/L		0.005	08-APR-19
NO2-L-IC-N-CL	Water						
Batch R4589962							
WG3020459-10 LCS Nitrite (as N)			105.7	%		90-110	02-APR-19
<b>WG3020459-14 LCS</b> Nitrite (as N)			102.3	%		90-110	02-APR-19

Workorder: L2252304

Report Date: 12-APR-19 Page 8 of 13

Test		Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
NO2-L-IC-N-CL		Water							
Batch R4 WG3020459-2 Nitrite (as N)	589962 LCS			104.1		%		90-110	02-APR-19
<b>WG3020459-6</b> Nitrite (as N)	LCS			104.8		%		90-110	02-APR-19
<b>WG3020459-1</b> Nitrite (as N)	МВ			<0.0010		mg/L		0.001	02-APR-19
<b>WG3020459-13</b> Nitrite (as N)	МВ			<0.0010		mg/L		0.001	02-APR-19
<b>WG3020459-5</b> Nitrite (as N)	МВ			<0.0010		mg/L		0.001	02-APR-19
<b>WG3020459-9</b> Nitrite (as N)	MB			<0.0010		mg/L		0.001	02-APR-19
NO3-L-IC-N-CL		Water							
Batch R4	589962								
<b>WG3020459-10</b> Nitrate (as N)	LCS			103.0		%		90-110	02-APR-19
WG3020459-14 Nitrate (as N)	LCS			103.0		%		90-110	02-APR-19
<b>WG3020459-2</b> Nitrate (as N)	LCS			101.1		%		90-110	02-APR-19
<b>WG3020459-6</b> Nitrate (as N)	LCS			102.2		%		90-110	02-APR-19
<b>WG3020459-1</b> Nitrate (as N)	MB			<0.0050		mg/L		0.005	02-APR-19
<b>WG3020459-13</b> Nitrate (as N)	MB			<0.0050		mg/L		0.005	02-APR-19
<b>WG3020459-5</b> Nitrate (as N)	MB			<0.0050		mg/L		0.005	02-APR-19
<b>WG3020459-9</b> Nitrate (as N)	MB			<0.0050		mg/L		0.005	02-APR-19
ORP-CL		Water							
Batch R4	592437								
<b>WG3023310-5</b> ORP	CRM		CL-ORP	223		mV		210-230	08-APR-19

P-T-L-COL-CL Water



Workorder: L2252304

Report Date: 12-APR-19 Page 9 of 13

Test Matr	rix Reference	Result Qualifier	Units RPD	Limit	Analyzed
P-T-L-COL-CL Wat	er				
Batch R4594666 WG3025174-6 LCS Phosphorus (P)-Total		113.9	%	80-120	10-APR-19
WG3025174-5 MB Phosphorus (P)-Total		<0.0020	mg/L	0.002	10-APR-19
PH-CL Wat	er				
Batch R4590642 WG3020908-8 LCS pH		6.99	рН	6.9-7.1	04-APR-19
PO4-DO-L-COL-CL Wat	er				
Batch R4589516					
WG3020018-10 LCS Orthophosphate-Dissolved (as WG3020018-9 MB	s P)	101.6	%	80-120	02-APR-19
WG3020018-9 MB Orthophosphate-Dissolved (as	s P)	<0.0010	mg/L	0.001	02-APR-19
SO4-IC-N-CL Wat	er				
Batch R4589962					
<b>WG3020459-10 LCS</b> Sulfate (SO4)		103.9	%	90-110	02-APR-19
<b>WG3020459-14 LCS</b> Sulfate (SO4)		103.4	%	90-110	02-APR-19
<b>WG3020459-2 LCS</b> Sulfate (SO4)		101.8	%	90-110	02-APR-19
<b>WG3020459-6 LCS</b> Sulfate (SO4)		102.9	%	90-110	02-APR-19
<b>WG3020459-1 MB</b> Sulfate (SO4)		<0.30	mg/L	0.3	02-APR-19
<b>WG3020459-13 MB</b> Sulfate (SO4)		<0.30	mg/L	0.3	02-APR-19
<b>WG3020459-5 MB</b> Sulfate (SO4)		<0.30	mg/L	0.3	02-APR-19
<b>WG3020459-9 MB</b> Sulfate (SO4)		<0.30	mg/L	0.3	02-APR-19
SOLIDS-TDS-CL Wat	er				
Batch R4591741 WG3022140-2 LCS Total Dissolved Solids		98.1	%	85-115	05-APR-19
WG3022140-1 MB					



Workorder: L2252304

Report Date: 12-APR-19 Page 10 of 13

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
SOLIDS-TDS-CL	Water							
Batch R459174 WG3022140-1 MB Total Dissolved Solids			<10		mg/L		10	05-APR-19
TEH-BC-VA-CL	Water							
Batch R459069	5							
<b>WG3021286-2 LCS</b> EPH10-19			109.0		%		70-130	03-APR-19
EPH19-32			105.2		%		70-130	03-APR-19
<b>WG3021286-4 LCS</b> EPH10-19			105.9		%		70-130	05-APR-19
EPH19-32			99.9		%		70-130	05-APR-19
WG3021286-6 LCS								007.11.10
EPH10-19			117.4		%		70-130	07-APR-19
EPH19-32			113.4		%		70-130	07-APR-19
<b>WG3021286-1 MB</b> EPH10-19			<0.25		mg/L		0.25	03-APR-19
EPH19-32			<0.25		mg/L		0.25	03-APR-19
Surrogate: 2-Bromobe	nzotrifluoride		84.4		%		60-140	03-APR-19
<b>WG3021286-3 MB</b> EPH10-19			<0.25		mg/L		0.25	0F ADD 40
EPH19-32			<0.25		mg/L		0.25 0.25	05-APR-19 05-APR-19
Surrogate: 2-Bromobe	nzotrifluoride		81.7		%		60-140	05-APR-19
WG3021286-5 MB							000	0071111
EPH10-19			<0.25		mg/L		0.25	07-APR-19
EPH19-32			<0.25		mg/L		0.25	07-APR-19
Surrogate: 2-Bromobe	nzotrifluoride		83.5		%		60-140	07-APR-19
TEH-WATER-VA-CL	Water							
Batch R459069	5							
<b>WG3021286-2 LCS</b> TEH (C10-C30)			108.3		%		70-130	03-APR-19
<b>WG3021286-4</b> LCS TEH (C10-C30)			104.6		%		70-130	05-APR-19
<b>WG3021286-6</b> LCS TEH (C10-C30)			116.4		%		70-130	07-APR-19
<b>WG3021286-1 MB</b> TEH (C10-C30)			<0.25		mg/L		0.25	03-APR-19
Surrogate: 2-Bromobe	nzotrifluoride		84.4		%		60-140	03-APR-19



Workorder: L2252304

Report Date: 12-APR-19 Page 11 of 13

Batch R4590695 WG3021286-3 MB TEH (C10-C30) Surrogate: 2-Bromobenzotrifl WG3021286-5 MB TEH (C10-C30) Surrogate: 2-Bromobenzotrifl		<0.25 81.7 <0.25 83.5	mg/L % mg/L %		0.25 60-140 0.25 60-140	05-APR-19 05-APR-19 07-APR-19
WG3021286-3 MB TEH (C10-C30) Surrogate: 2-Bromobenzotrifl WG3021286-5 MB TEH (C10-C30) Surrogate: 2-Bromobenzotrifl  TKN-L-F-CL Wa Batch R4593207	luoride	81.7 <0.25	% mg/L		60-140 0.25	05-APR-19
Surrogate: 2-Bromobenzotrifle WG3021286-5 MB TEH (C10-C30) Surrogate: 2-Bromobenzotrifle TKN-L-F-CL Water Management	luoride	81.7 <0.25	% mg/L		60-140 0.25	05-APR-19
TEH (C10-C30) Surrogate: 2-Bromobenzotrifl  TKN-L-F-CL Wa  Batch R4593207						07-APR-19
TKN-L-F-CL Was		83.5	%		60-140	
Batch R4593207	ater					07-APR-19
Total Kjeldahl Nitrogen		110.0	%		75-125	09-APR-19
WG3024281-5 LCS Total Kjeldahl Nitrogen		104.3	%		75-125 75-125	09-APR-19
WG3024281-8 LCS Total Kjeldahl Nitrogen		111.6	%		75-125	09-APR-19
WG3024281-1 MB Total Kjeldahl Nitrogen		<0.050	mg/L		0.05	09-APR-19
WG3024281-4 MB Total Kjeldahl Nitrogen		<0.050	mg/L		0.05	09-APR-19
WG3024281-7 MB Total Kjeldahl Nitrogen		<0.050	mg/L		0.05	09-APR-19
	ater					
Batch R4593055 WG3022914-6 LCS Total Suspended Solids		95.5	%		85-115	08-APR-19
WG3022914-5 MB Total Suspended Solids		<1.0	mg/L		1	08-APR-19
TURBIDITY-CL Wa	ater					
Batch R4589370 WG3019545-28 DUP	L2252304-1					
Turbidity WG3019545-11 LCS	3530	3530 96.5	NTU %	0.1	15	02-APR-19
Turbidity WG3019545-10 MB Turbidity		<0.10	% NTU		85-115 0.1	02-APR-19 02-APR-19

Report Date: 12-APR-19 Workorder: L2252304 Page 12 of 13

### Legend:

ALS Control Limit (Data Quality Objectives) Limit

DUP Duplicate

Relative Percent Difference RPD

N/A Not Available

LCS Laboratory Control Sample Standard Reference Material SRM

MS Matrix Spike

MSD

Matrix Spike Duplicate
Average Desorption Efficiency ADE

Method Blank MB

Internal Reference Material IRM Certified Reference Material CRM Continuing Calibration Verification CCV CVS Calibration Verification Standard LCSD Laboratory Control Sample Duplicate

Workorder: L2252304 Report Date: 12-APR-19 Page 13 of 13

#### **Hold Time Exceedances:**

	Sample						
ALS Product Description	ID	Sampling Date	Date Processed	Rec. HT	Actual HT	Units	Qualifier
Physical Tests							
Oxidation redution potentia	al by elect.						
	1	31-MAR-19 12:10	08-APR-19 11:35	0.25	192	hours	EHTR-FM
Total Suspended Solids							
	1	31-MAR-19 12:10	08-APR-19 07:30	7	8	days	EHT
рН							
	1	31-MAR-19 12:10	04-APR-19 09:00	0.25	93	hours	EHTR-FM
	2	31-MAR-19 12:10	04-APR-19 09:00	0.25	93	hours	EHTR-FM
Lagand & Qualifier Definition	ne:						

#### Legend & Qualifier Definitions:

EHTR-FM: Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended.

EHTR: Exceeded ALS recommended hold time prior to sample receipt.

EHTL: Exceeded ALS recommended hold time prior to analysis. Sample was received less than 24 hours prior to expiry.

EHT: Exceeded ALS recommended hold time prior to analysis.

Rec. HT: ALS recommended hold time (see units).

#### Notes\*:

Where actual sampling date is not provided to ALS, the date (& time) of receipt is used for calculation purposes. Where actual sampling time is not provided to ALS, the earlier of 12 noon on the sampling date or the time (& date) of receipt is used for calculation purposes. Samples for L2252304 were received on 02-APR-19 09:10.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against predetermined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

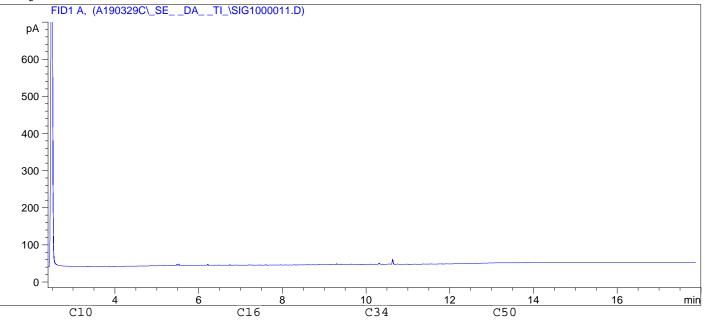
Sample ID: L2252304-1 V4

Injection Date: 4/5/2019
Injection Time: 4:21:48 PM

Instrument ID: HP9

Operator:





Boiling Point Distribution Range for Petroleum Based Fuel Products

arbon#	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	30
3.P. (°C)	-42	-0.5	36	69	98	126	151	174	196	216	235	253	270	287	302	316	329	343	356	369	380	391	402	412	422	431	
3.P. (°F)	-44	31	97	156	209	258	303	345	384	421	456	488	519	548	575	601	625	649	674	695	716	736	756	774	792	808	84
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Adapted from: Drews, A.W., ED. Manual on Hydrocarbon Analysis, 4th ed.; American Society for Testing and Materials: Philadelphia, PA., 1989: p XVIII.

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Fi	nal Summ	ned Pea	aks I	Report			
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Project Manager	Chris Blurton			, j		Lal	Contact						Ema	il 1:	chris.blu			x	<i>z</i>	1.5
Email	Chris.Blutton@teck.com						Email	Lyudn	nyla.Sh	rets@AL	SGlobal.com					@equiso	nline.con			, <del>,</del>
Address	Box 2003						Address	2559 2	29 Stree	t NE			Email 3: drake.tym			mstra@te	ck.com	x .	<u> </u>	
	15km North Hwy 43												Ema	il 4:	kirsten.car	mpbell@te	ck.com		X Same	Ä
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-10200 ;			Hazardous Material (Yes/No)			ı		T.YSTS	ALS_Package-DOC	F-VA	TECKCOAL-MET-D	TECKCOAL-MET-T VA	TECKCOAL-ROUTINE VA	ALS_Package-TKN/TOC	ALS_package-EPH	**Routine Bottle (pH, ALK-T, Turb, Sulphate)				
			rdous					Ŷ.	Packn	HG-D-CVAF-VA	COA	VCO4	ÇCO4	Packa	packa	tine B T, Tur				
Sample ID	Sample Location (sys loc code)	Field Matrix	Haza	Date	Time (24hr)	G=Grab C=Comp			ALS	<u></u>	TECH	TECH	TEC!	ALS_	ALS_	**Rou				
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SERVICE REQUEST (ru	sh - subject to availability)	(default) X											<u> </u>							
Priorit Priorit	ty (2-3 business days) - 50% surcharge				ļ	K. Ca	mpbe	11/D. T	ymstra		1	Mobile #		· ·						
For Emergency < 1 D	ay, ASAP or Weekend - Con	ASAP or Weekend - Contact ALS Sampler's Signature				Date/I				te/Time March 31, 2019										

13 March 2020 19135981-2020-064-R-Rev0

Q2 - COAs



TECK COAL LIMITED (LINE CREEK)

ATTN: Chris Blurton

PO BOX 2003

SPARWOOD BC VOB 2G0

Date Received: 26-APR-19

Report Date: 03-MAY-19 16:22 (MT)

Version: FINAL

Client Phone: 250-425-3196

# Certificate of Analysis

Lab Work Order #: L2263743
Project P.O. #: VP000608129

Job Reference: LINE CREEK OPERATION
C of C Numbers: 20190425 Q2 GW

Legal Site Desc:



Lyudmyla Shvets, B.Sc. Account Manager

 $[This\ report\ shall\ not\ be\ reproduced\ except\ in\ full\ without\ the\ written\ authority\ of\ the\ Laboratory.]$ 

L2263743 CONTD.... PAGE 2 of 7 Version: FINAL

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2263743-1 LC_PIZP1101_WG_Q2-2019_N							
Sampled By: K.Campbell/D.Tymstra on 25-APR-19 @	15:00						
Matrix: WG	10.00						
Miscellaneous Parameters							
Dissolved Organic Carbon	0.93		0.50	mg/L		02-MAY-19	R4621972
Total Kjeldahl Nitrogen	0.054		0.050	mg/L		03-MAY-19	R4622466
Total Organic Carbon				_			
EPH Testing for teck Coal	0.88		0.50	mg/L		02-MAY-19	R4621972
EPH (C10-C19) & EPH (C19-C32)							
EPH10-19	<0.25		0.25	mg/L	29-APR-19	30-APR-19	R4621551
EPH19-32	<0.25		0.25	mg/L	29-APR-19	30-APR-19	R4621551
Surrogate: 2-Bromobenzotrifluoride	87.4		60-140	g/ <b>_</b>	29-APR-19	30-APR-19	R4621551
Sum of EPH (10-32)	0		00	7.0	207	00710	11.02.00.
EPH (C10-C32)	<0.50		0.50	mg/L		02-MAY-19	
TEH (C10-C30)				Ü			
TEH (C10-C30)	<0.25		0.25	mg/L	29-APR-19	30-APR-19	R4621551
Surrogate: 2-Bromobenzotrifluoride	87.4		60-140	%	29-APR-19	30-APR-19	R4621551
Dissolved Metals in Water							
Diss. Be (low) in Water by CRC ICPMS							
Beryllium (Be)-Dissolved	<0.020		0.020	ug/L	29-APR-19	29-APR-19	R4617288
Dissolved Metals Filtration Location	LAB					29-APR-19	R4616015
Diss. Mercury in Water by CVAAS or CVAFS							
Mercury (Hg)-Dissolved	<0.0000050		0.0000050	mg/L	29-APR-19	29-APR-19	R4616373
Dissolved Mercury Filtration Location	LAB					29-APR-19	R4615387
Dissolved Metals in Water by CRC ICPMS						04 144 1/4 40	D.4040000
Dissolved Metals Filtration Location	LAB		0.0000		00 ADD 40	01-MAY-19	R4618698
Aluminum (Al)-Dissolved	<0.0030		0.0030	mg/L	29-APR-19	29-APR-19	R4617288
Antimony (Sb)-Dissolved	<0.00010		0.00010	mg/L	29-APR-19	29-APR-19	R4617288
Arsenic (As)-Dissolved	0.00100		0.00010	mg/L	29-APR-19	29-APR-19	R4617288
Barium (Ba)-Dissolved	0.437		0.00010	mg/L	29-APR-19	29-APR-19	R4617288
Bismuth (Bi)-Dissolved Boron (B)-Dissolved	<0.000050		0.000050	mg/L	29-APR-19 29-APR-19	29-APR-19 29-APR-19	R4617288
Cadmium (Cd)-Dissolved	0.031 0.0073		0.010	mg/L	29-APR-19 29-APR-19	29-APR-19 29-APR-19	R4617288
Calcium (Ca)-Dissolved  Calcium (Ca)-Dissolved			0.0050	ug/L	29-APR-19 29-APR-19	29-APR-19 29-APR-19	R4617288
Chromium (Cr)-Dissolved	28.5 <0.00010		0.050 0.00010	mg/L mg/L	29-APR-19 29-APR-19	29-APR-19 29-APR-19	R4617288 R4617288
Cobalt (Co)-Dissolved	0.21		0.00010	ug/L	29-APR-19 29-APR-19	29-APR-19 29-APR-19	R4617288
Copper (Cu)-Dissolved	<0.00050		0.00050	mg/L	29-APR-19	29-APR-19	R4617288
Iron (Fe)-Dissolved	<0.010		0.00030	mg/L	29-APR-19	29-APR-19	l _
Lead (Pb)-Dissolved	<0.00050		0.010	mg/L	29-APR-19	29-APR-19	R4617288 R4617288
Lithium (Li)-Dissolved	0.0104		0.000030	mg/L	29-APR-19	29-APR-19	R4617288
Magnesium (Mg)-Dissolved	14.9		0.0010	mg/L	29-APR-19	29-APR-19	R4617288
Manganese (Mn)-Dissolved	0.240		0.00010	mg/L	29-APR-19	29-APR-19	R4617288
Molybdenum (Mo)-Dissolved	0.0107		0.00010	mg/L	29-APR-19	29-APR-19	R4617288
Nickel (Ni)-Dissolved	<0.00050		0.00050	mg/L	29-APR-19	29-APR-19	R4617288
Potassium (K)-Dissolved	0.727		0.050	mg/L	29-APR-19	29-APR-19	R4617288
Selenium (Se)-Dissolved	0.10		0.050	ug/L	01-MAY-19	01-MAY-19	R4619723
Silicon (Si)-Dissolved	3.39		0.050	mg/L	29-APR-19	29-APR-19	R4617288
Silver (Ag)-Dissolved	<0.000010		0.00010	mg/L	29-APR-19	29-APR-19	R4617288
Sodium (Na)-Dissolved	19.2		0.050	mg/L	29-APR-19	29-APR-19	R4617288
Strontium (Sr)-Dissolved	0.219		0.00020	mg/L	29-APR-19	29-APR-19	R4617288
Thallium (TI)-Dissolved	<0.000010		0.00020	mg/L	29-APR-19	29-APR-19	R4617288
Tin (Sn)-Dissolved	<0.00010		0.00010	mg/L	29-APR-19	29-APR-19	R4617288
Titanium (Ti)-Dissolved	<0.010		0.00010	mg/L	29-APR-19	29-APR-19	R4617288
Uranium (U)-Dissolved	0.00131		0.00010	mg/L	29-APR-19	29-APR-19	R4617288
Vanadium (V)-Dissolved	<0.00050		0.00050	mg/L	29-APR-19	29-APR-19	R4617288
Tanadam (T) Diodoroa	30.0000		0.00000	9/ ⊏	207.111.10		1.4017200

<sup>\*</sup> Refer to Referenced Information for Qualifiers (if any) and Methodology.

L2263743 CONTD.... PAGE 3 of 7 Version: FINAL

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2263743-1 LC_PIZP1101_WG_Q2-2019_N							
Sampled By: K.Campbell/D.Tymstra on 25-APR-19 @	15:00						
Matrix: WG	13.00						
Dissolved Metals in Water by CRC ICPMS Zinc (Zn)-Dissolved	<0.0010		0.0010	mg/L	29-APR-19	29-APR-19	R4617288
Hardness				3			
Hardness (as CaCO3)	133		0.50	mg/L		01-MAY-19	
Total Metals in Water							
Total Be (Low) in Water by CRC ICPMS							
Beryllium (Be)-Total	<0.020		0.020	ug/L		30-APR-19	R4618346
Total Mercury in Water by CVAAS or CVAFS	0.0000050		0.0000050	/1		20 ADD 40	D 4040007
Mercury (Hg)-Total	<0.000050		0.0000050	mg/L		30-APR-19	R4618027
Total Metals in Water by CRC ICPMS Aluminum (Al)-Total	0.507		0.0030	mg/L		30-APR-19	R4618346
Antimony (Sb)-Total	<0.00010		0.0030	mg/L		30-APR-19	R4618346
Arsenic (As)-Total	0.00120		0.00010	mg/L		30-APR-19	R4618346
Barium (Ba)-Total	0.450		0.00010	mg/L		30-APR-19	R4618346
Bismuth (Bi)-Total	<0.00050		0.000050	mg/L		30-APR-19	R4618346
Boron (B)-Total	0.021		0.010	mg/L		30-APR-19	R4618346
Cadmium (Cd)-Total	0.0494		0.0050	ug/L		30-APR-19	R4618346
Calcium (Ca)-Total	29.4		0.050	mg/L		30-APR-19	R4618346
Chromium (Cr)-Total	0.00064		0.00010	mg/L		30-APR-19	R4618346
Cobalt (Co)-Total	0.37		0.10	ug/L		30-APR-19	R4618346
Copper (Cu)-Total	0.00118		0.00050	mg/L		30-APR-19	R4618346
Iron (Fe)-Total	0.642		0.010	mg/L		30-APR-19	R4618346
Lead (Pb)-Total	0.000210		0.000050	mg/L		30-APR-19	R4618346
Lithium (Li)-Total	0.0098		0.0010	mg/L		30-APR-19	R4618346
Magnesium (Mg)-Total	15.3		0.10	mg/L		30-APR-19	R4618346
Manganese (Mn)-Total Molybdenum (Mo)-Total	0.265 0.0106		0.00010 0.000050	mg/L		30-APR-19 30-APR-19	R4618346 R4618346
Nickel (Ni)-Total	0.00077		0.00050	mg/L mg/L		30-APR-19	R4618346
Potassium (K)-Total	0.867		0.0000	mg/L		30-APR-19	R4618346
Selenium (Se)-Total	0.112		0.050	ug/L		30-APR-19	R4618346
Silicon (Si)-Total	4.53		0.10	mg/L		30-APR-19	R4618346
Silver (Ag)-Total	0.000017		0.000010	mg/L		01-MAY-19	R4618641
Sodium (Na)-Total	18.7		0.050	mg/L		30-APR-19	R4618346
Strontium (Sr)-Total	0.219		0.00020	mg/L		30-APR-19	R4618346
Thallium (TI)-Total	0.000021		0.000010	mg/L		30-APR-19	R4618346
Tin (Sn)-Total	<0.00010		0.00010	mg/L		30-APR-19	R4618346
Titanium (Ti)-Total	<0.015	DLM	0.015	mg/L		30-APR-19	R4618346
Uranium (U)-Total	0.00152		0.000010	mg/L		30-APR-19	R4618346
Vanadium (V)-Total	0.00148		0.00050	mg/L		30-APR-19	R4618346
Zinc (Zn)-Total  Routine for Teck Coal	<0.0030		0.0030	mg/L		30-APR-19	R4618346
Acidity by Automatic Titration							
Acidity dy Automatic Titration Acidity (as CaCO3)	<1.0		1.0	mg/L		01-MAY-19	R4621368
Alkalinity (Species) by Manual Titration						_	
Alkalinity, Bicarbonate (as CaCO3)	226		1.0	mg/L		01-MAY-19	R4621319
Alkalinity, Carbonate (as CaCO3)	<1.0		1.0	mg/L		01-MAY-19	R4621319
Alkalinity, Hydroxide (as CaCO3)	<1.0		1.0	mg/L		01-MAY-19	R4621319
Alkalinity, Total (as CaCO3)	226		1.0	mg/L		01-MAY-19	R4621319
Ammonia, Total (as N) Ammonia as N	0.0272		0.0050	mg/L		02-MAY-19	R4622394
Bromide in Water by IC (Low Level)	3.02.12		0.0000	9, ⊏		0_ ///// 10	
Bromide (Br)	<0.050		0.050	mg/L		26-APR-19	R4614460
Chloride in Water by IC				J			
·							

<sup>\*</sup> Refer to Referenced Information for Qualifiers (if any) and Methodology.

L2263743 CONTD.... PAGE 4 of 7 Version: FINAL

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
   L2263743-1   LC_PIZP1101_WG_Q2-2019_N							
Sampled By: K.Campbell/D.Tymstra on 25-APR-19 @	15:00						
Matrix: WG							
Chloride in Water by IC Chloride (Cl)	0.72		0.50	mg/L		26-APR-19	R4614460
Electrical Conductivity (EC) Conductivity (@ 25C)	297		2.0	uS/cm		01-MAY-19	R4621319
Fluoride in Water by IC Fluoride (F)	1.71		0.020	mg/L		26-APR-19	R4614460
Ion Balance Calculation Cation - Anion Balance	-14.3			%		02-MAY-19	
Anion Sum	4.69			meq/L		02-MAY-19	
Cation Sum	3.51			meq/L		02-MAY-19	
Ion Balance Calculation Ion Balance	75.0		-100	%		03-MAY-19	
Nitrate in Water by IC (Low Level) Nitrate (as N)	0.0143		0.0050	mg/L		26-APR-19	R4614460
Nitrite in Water by IC (Low Level) Nitrite (as N)	<0.0010		0.0010	mg/L		26-APR-19	R4614460
Orthophosphate-Dissolved (as P) Orthophosphate-Dissolved (as P)	0.0079		0.0010	mg/L		27-APR-19	R4616689
Oxidation redution potential by elect. ORP	303		-1000	mV		01-MAY-19	R4619972
Phosphorus (P)-Total Phosphorus (P)-Total	0.0230		0.0020	mg/L		02-MAY-19	R4621768
Sulfate in Water by IC Sulfate (SO4)	2.64		0.30	mg/L		26-APR-19	R4614460
Total Dissolved Solids Total Dissolved Solids	165	DLHC	20	mg/L		01-MAY-19	R4621312
Total Suspended Solids Total Suspended Solids	9.8		1.0	mg/L		01-MAY-19	R4620566
Turbidity Turbidity	22.4		0.10	NTU		26-APR-19	R4615246
pH pH	8.24		0.10	рН		01-MAY-19	R4621319
	0.24		0.10	ρπ		OT-WAT-13	14021319

<sup>\*</sup> Refer to Referenced Information for Qualifiers (if any) and Methodology.

LINE CREEK OPERATION

Reference Information

L2263743 CONTD....
PAGE 5 of 7
Version: FINAL

**Qualifiers for Sample Submission Listed:** 

 Qualifier
 Description

 SFPL
 DOC/D-METAL/D-HG FILTERED AND PRESERVED AT THE LAB - Sample was Filtered and Preserved at the laboratory

Sample Parameter Qualifier Key:

Qualifier	Description
DLHC	Detection Limit Raised: Dilution required due to high concentration of test analyte(s).
DLM	Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.

**Test Method References:** 

ALS Test Code	Matrix	Test Description	Method Reference**	
ACIDITY-PCT-CL	Water	Acidity by Automatic Titration	APHA 2310 Acidity	

This analysis is carried out using procedures adapted from APHA Method 2310 "Acidity". Acidity is determined by potentiometric titration to a specified endpoint.

ALK-MAN-CL Water Alkalinity (Species) by Manual Titration APHA 2320 ALKALINITY

This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.

BE-D-L-CCMS-VA Water Diss. Be (low) in Water by CRC ICPMS APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

BE-T-L-CCMS-VA Water Total Be (Low) in Water by CRC ICPMS EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

BR-L-IC-N-CL Water Bromide in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

C-DIS-ORG-LOW-CL Water Dissolved Organic Carbon APHA 5310 B-Instrumental

This method is applicable to the analysis of ground water, wastewater, and surface water samples. The form detected depends upon sample pretreatment: Unfiltered sample = TC, 0.45um filtered = TDC. Samples are injected into a combustion tube containing an oxidation catalyst. The carrier gas containing the combustion product from the combustion tube flows through an inorganic carbon reactor vessel and is then sent through a halogen scrubber into a sample cell set in a non-dispersive infrared gas analyzer (NDIR) where carbon dioxide is detected. For total inorganic carbon and dissolved inorganic carbon, the sample is injected into an IC reactor vessel where only the IC component is decomposed to become carbon dioxide.

The peak area generated by the NDIR indicates the TC/TDC or TIC/DIC as applicable. The total organic carbon content of the sample is calculated by subtracting the TIC from the TC.

TOC = TC-TIC, DOC = TDC-DIC, Particulate = Total - Dissolved.

C-TOT-ORG-LOW-CL Water Total Organic Carbon APHA 5310 TOTAL ORGANIC CARBON (TOC)

This method is applicable to the analysis of ground water, wastewater, and surface water samples. The form detected depends upon sample pretreatment: Unfiltered sample = TC, 0.45um filtered = TDC. Samples are injected into a combustion tube containing an oxidation catalyst. The carrier gas containing the combustion product from the combustion tube flows through an inorganic carbon reactor vessel and is then sent through a halogen scrubber into a sample cell set in a non-dispersive infrared gas analyzer (NDIR) where carbon dioxide is detected. For total inorganic carbon and dissolved inorganic carbon, the sample is injected into an IC reactor vessel where only the IC component is decomposed to become carbon dioxide.

The peak area generated by the NDIR indicates the TC/TDC or TIC/DIC as applicable. The total organic carbon content of the sample is calculated by subtracting the TIC from the TC.

TOC = TC-TIC, DOC = TDC-DIC, Particulate = Total - Dissolved.

CL-IC-N-CL Water Chloride in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

EC-L-PCT-CL Water Electrical Conductivity (EC) APHA 2510B

Conductivity, also known as Electrical Conductivity (EC) or Specific Conductance, is measured by immersion of a conductivity cell with platinum electrodes into a water sample. Conductivity measurements are temperature-compensated to 25C.

EPH(10-32)-CALC-CL Water Sum of EPH (10-32) Sum of EPH - Auto Calculated

The sum of EPH(C10-C19) and EPH(C19-C32)

F-IC-N-CL Water Fluoride in Water by IC EPA 300.1 (mod)

L2263743 CONTD....

PAGE 6 of 7 Version: FINAL

#### Reference Information

**Test Method References:** 

**ALS Test Code** Matrix Method Reference\*\* **Test Description** 

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

HARDNESS-CALC-VA Water Hardness **APHA 2340B** 

Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO3 equivalents.

Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

Diss. Mercury in Water by CVAAS or CVAFS APHA 3030B/EPA 1631E (mod)

Water samples are filtered (0.45 um), preserved with hydrochloric acid, then undergo a cold-oxidation using bromine monochloride prior to reduction

with stannous chloride, and analyzed by CVAAS or CVAFS.

HG-T-CVAA-VA Total Mercury in Water by CVAAS or CVAFS EPA 1631E (mod)

Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

IONBALANCE-BC-CL Water Ion Balance Calculation **APHA 1030E** 

Cation Sum, Anion Sum, and Ion Balance (as % difference) are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Because all aqueous solutions are electrically neutral, the calculated ion balance (% difference of cations minus anions) should be near-zero.

Cation and Anion Sums are the total meg/L concentration of major cations and anions. Dissolved species are used where available. Minor ions are included where data is present. Ion Balance is calculated as:

Ion Balance (%) = [Cation Sum-Anion Sum] / [Cation Sum+Anion Sum]

MET-D-CCMS-VA Dissolved Metals in Water by CRC ICPMS APHA 3030B/6020A (mod) Water

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

MET-T-CCMS-VA Water Total Metals in Water by CRC ICPMS EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

NH3-L-F-CL Ammonia, Total (as N) J. ENVIRON. MONIT., 2005, 7, 37-42, RSC

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et

Water NO2-L-IC-N-CL Nitrite in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

NO3-L-IC-N-CL Nitrate in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

ORP-CL Water Oxidation redution potential by elect. **ASTM D1498** 

This analysis is carried out in accordance with the procedure described in the "ASTM" method D1498 "Oxidation-Reduction Potential of Water" published by the American Society for Testing and Materials (ASTM). Results are reported as observed oxidation-reduction potential of the platinum metal-reference electrode employed, in mV.

It is recommended that this analysis be conducted in the field.

P-T-L-COL-CL Phosphorus (P)-Total APHA 4500-P PHOSPHORUS

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after persulphate digestion of the sample.

PH-CL APHA 4500 H-Electrode Water

pH is determined in the laboratory using a pH electrode. All samples analyzed by this method for pH will have exceeded the 15 minute recommended hold time from time of sampling (field analysis is recommended for pH where highly accurate results are needed)

PO4-DO-L-COL-CL Water Orthophosphate-Dissolved (as P) APHA 4500-P PHOSPHORUS

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.

Sulfate in Water by IC SO4-IC-N-CL FPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

LINE CREEK OPERATION L2263743 CONTD....

**Reference Information** 

PAGE 7 of 7 Version: FINAL

Test Method References:

ALS Test Code Matrix Test Description Method Reference\*\*

SOLIDS-TDS-CL Water Total Dissolved Solids APHA 2540 C

A well-mixed sample is filtered through a glass fibre filter paper. The filtrate is then evaporated to dryness in a pre-weighed vial and dried at 180 - 2 °C. The increase in vial weight represents the total dissolved solids (TDS).

TECKCOAL-IONBAL-CL Water Ion Balance Calculation APHA 1030E

Cation Sum, Anion Sum, and Ion Balance (as % difference) are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Because all aqueous solutions are electrically neutral, the calculated ion balance (% difference of cations minus anions) should be near-zero.

Cation and Anion Sums are the total meq/L concentration of major cations and anions. Dissolved species are used where available. Minor ions are included where data is present. Ion Balance is calculated as:

Ion Balance (%) = [Cation Sum-Anion Sum] / [Cation Sum+Anion Sum]

TEH-BC-VA-CL Water EPH (C10-C19) & EPH (C19-C32) BCMOE EPH GCFID

Analysis is in accordance with BC MOE Lab Manual method "Extractable Petroleum Hydrocarbons in Water by GC/FID", v2.1, July 1999. Whole water samples are extracted with DCM prior to gas chromatography with flame ionization detection (GC-FID). EPH results include Polycyclic Aromatic Hydrocarbons (PAH) and are therefore not equivalent to Light and Heavy Extractable Petroleum Hydrocarbons (LEPH/HEPH).

TEH-WATER-VA-CL Water TEH (C10-C30) BC Lab Manual

Water samples are spiked with 2-BBTF surrogate, and extracted by reciprocal action shaker for 1 hour using a single micro-extraction with hexane. After extraction, the hexane layer is drawn off and analyzed on a gas chromatograph equipped with a flame ionization detector.

TKN-L-F-CL Water Total Kjeldahl Nitrogen APHA 4500-NORG (TKN)

This analysis is carried out using procedures adapted from APHA Method 4500-Norg D. "Block Digestion and Flow Injection Analysis". Total Kjeldahl Nitrogen is determined using block digestion followed by Flow-injection analysis with fluorescence detection.

TSS-L-CL Water Total Suspended Solids APHA 2540 D-Gravimetric

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total suspended solids (TSS) are determined by filtering a sample through a glass fibre filter, and by drying the filter at 104 deg. C.

TURBIDITY-CL Water Turbidity APHA 2130 B-Nephelometer

This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.

\*\* ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

<b>Laboratory Definition Code</b>	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA
CL	ALS ENVIRONMENTAL - CALGARY, ALBERTA, CANADA

#### **Chain of Custody Numbers:**

20190425 Q2 GW

#### **GLOSSARY OF REPORT TERMS**

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.

mg/kg - milligrams per kilogram based on dry weight of sample

mg/kg wwt - milligrams per kilogram based on wet weight of sample

mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight

mg/L - unit of concentration based on volume, parts per million.

< - Less than.

D.L. - The reporting limit.

N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory. UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.



Workorder: L2263743

Report Date: 03-MAY-19

Page 1 of 13

Client:

TECK COAL LIMITED (LINE CREEK)

PO BOX 2003

SPARWOOD BC V0B 2G0

Contact: Chris Blurton

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
ACIDITY-PCT-CL	Water							
Batch R4621368								
WG3039891-11 LCS Acidity (as CaCO3)			104.7		%		85-115	01-MAY-19
<b>WG3039891-10 MB</b> Acidity (as CaCO3)			<1.0		mg/L		2	01-MAY-19
ALK-MAN-CL	Water							
Batch R4621319								
WG3039864-14 LCS Alkalinity, Total (as CaCo	O3)		103.9		%		85-115	01-MAY-19
BE-D-L-CCMS-VA	Water							
Batch R4617288								
WG3037123-2 LCS Beryllium (Be)-Dissolved			98.3		%		80-120	29-APR-19
WG3037123-1 MB Beryllium (Be)-Dissolved		LF	<0.000020		mg/L		0.00002	29-APR-19
BE-T-L-CCMS-VA	Water							
Batch R4618346								
WG3037775-2 LCS Beryllium (Be)-Total			99.7		%		80-120	30-APR-19
WG3037775-1 MB Beryllium (Be)-Total			<0.000020		mg/L		0.00002	30-APR-19
BR-L-IC-N-CL	Water							
Batch R4614460								
WG3036288-2 LCS Bromide (Br)			102.8		%		85-115	26-APR-19
<b>WG3036288-1 MB</b> Bromide (Br)			<0.050		mg/L		0.05	26-APR-19
C-DIS-ORG-LOW-CL	Water							
Batch R4621972 WG3040853-2 LCS								
Dissolved Organic Carbo	on		103.0		%		80-120	03-MAY-19
WG3040853-1 MB Dissolved Organic Carbo	on		<0.50		mg/L		0.5	02-MAY-19
C-TOT-ORG-LOW-CL	Water							



Workorder: L2263743

Report Date: 03-MAY-19 Page 2 of 13

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
C-TOT-ORG-LOW-CL  Batch R4621972  WG3040853-2 LCS	Water							
Total Organic Carbon WG3040853-1 MB Total Organic Carbon			96.3		% mg/L		80-120 0.5	02-MAY-19 02-MAY-19
CL-IC-N-CL	Water							
Batch R4614460 WG3036288-2 LCS Chloride (CI)			101.2		%		90-110	26-APR-19
WG3036288-1 MB Chloride (CI)			<0.50		mg/L		0.5	26-APR-19
EC-L-PCT-CL	Water							
<b>Batch R4621319 WG3039864-14 LCS</b> Conductivity (@ 25C)			98.0		%		90-110	01-MAY-19
F-IC-N-CL	Water							
Batch R4614460 WG3036288-2 LCS Fluoride (F)			106.7		%		90-110	26-APR-19
<b>WG3036288-1 MB</b> Fluoride (F)			<0.020		mg/L		0.02	26-APR-19
HG-D-CVAA-VA	Water							
Batch R4616373 WG3037077-6 LCS Mercury (Hg)-Dissolved			97.0		%		80-120	29-APR-19
<b>WG3037077-5 MB</b> Mercury (Hg)-Dissolved		LF	<0.000005	SC .	mg/L		0.000005	29-APR-19
HG-T-CVAA-VA	Water							
Batch R4618027 WG3037671-2 LCS Mercury (Hg)-Total			99.1		%		80-120	30-APR-19
WG3037671-1 MB Mercury (Hg)-Total			<0.000005	SC .	mg/L		0.000005	30-APR-19
MET-D-CCMS-VA	Water							



Workorder: L2263743 Report Date: 03-MAY-19 Page 3 of 13

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA	Water							
Batch R4617	288							
WG3037123-2 L0			407.7		0/			
Aluminum (Al)-Diss			107.7		%		80-120	29-APR-19
Antimony (Sb)-Diss			94.7		%		80-120	29-APR-19
Arsenic (As)-Dissol			99.1		%		80-120	29-APR-19
Barium (Ba)-Dissol			95.8		%		80-120	29-APR-19
Bismuth (Bi)-Dissol			92.8		%		80-120	29-APR-19
Boron (B)-Dissolve			93.0		%		80-120	29-APR-19
Cadmium (Cd)-Diss			94.3		%		80-120	29-APR-19
Calcium (Ca)-Disso			98.0		%		80-120	29-APR-19
Chromium (Cr)-Dis			103.4		%		80-120	29-APR-19
Cobalt (Co)-Dissolv			101.1		%		80-120	29-APR-19
Copper (Cu)-Dissol			100.3		%		80-120	29-APR-19
Iron (Fe)-Dissolved			93.6		%		80-120	29-APR-19
Lead (Pb)-Dissolve	d		92.4		%		80-120	29-APR-19
Lithium (Li)-Dissolv	ed		99.5		%		80-120	29-APR-19
Magnesium (Mg)-D	issolved		108.6		%		80-120	29-APR-19
Manganese (Mn)-D	issolved		102.9		%		80-120	29-APR-19
Molybdenum (Mo)-l	Dissolved		96.2		%		80-120	29-APR-19
Nickel (Ni)-Dissolve	ed		101.4		%		80-120	29-APR-19
Potassium (K)-Diss	olved		99.2		%		80-120	29-APR-19
Silicon (Si)-Dissolve	ed		98.9		%		60-140	29-APR-19
Silver (Ag)-Dissolve	ed		93.6		%		80-120	29-APR-19
Sodium (Na)-Disso	lved		111.2		%		80-120	29-APR-19
Strontium (Sr)-Diss	olved		101.5		%		80-120	29-APR-19
Thallium (TI)-Dissol	lved		93.2		%		80-120	29-APR-19
Tin (Sn)-Dissolved			93.4		%		80-120	29-APR-19
Titanium (Ti)-Disso	lved		98.0		%		80-120	29-APR-19
Uranium (U)-Dissol	ved		95.5		%		80-120	29-APR-19
Vanadium (V)-Disse	olved		103.0		%		80-120	29-APR-19
Zinc (Zn)-Dissolved	I		101.3		%		80-120	29-APR-19
WG3037123-1 M Aluminum (Al)-Diss		LF	<0.0010		mg/L		0.001	29-APR-19
Antimony (Sb)-Diss			<0.00010		mg/L		0.001	29-AFR-19 29-APR-19
Arsenic (As)-Dissol			<0.00010		mg/L		0.0001	29-APR-19 29-APR-19
Barium (Ba)-Dissol			<0.00010		mg/L		0.0001	
Danum (Da)-D18801	vou		<b>\0.00010</b>		mg/L		0.0001	29-APR-19



Workorder: L2263743 Report Date: 03-MAY-19 Page 4 of 13

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA	Water							
Batch R4617288	}							
WG3037123-1 MB		LF						
Bismuth (Bi)-Dissolved			<0.000050		mg/L		0.00005	29-APR-19
Boron (B)-Dissolved			<0.010		mg/L		0.01	29-APR-19
Cadmium (Cd)-Dissolv			<0.000005	С	mg/L		0.000005	29-APR-19
Calcium (Ca)-Dissolved	d		<0.050		mg/L		0.05	29-APR-19
Chromium (Cr)-Dissolv	ed		<0.00010		mg/L		0.0001	29-APR-19
Cobalt (Co)-Dissolved			<0.00010		mg/L		0.0001	29-APR-19
Copper (Cu)-Dissolved			<0.00020		mg/L		0.0002	29-APR-19
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	29-APR-19
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	29-APR-19
Lithium (Li)-Dissolved			<0.0010		mg/L		0.001	29-APR-19
Magnesium (Mg)-Disso	olved		<0.0050		mg/L		0.005	29-APR-19
Manganese (Mn)-Disso	olved		<0.00010		mg/L		0.0001	29-APR-19
Molybdenum (Mo)-Diss	solved		<0.000050		mg/L		0.00005	29-APR-19
Nickel (Ni)-Dissolved			<0.00050		mg/L		0.0005	29-APR-19
Potassium (K)-Dissolve	ed		<0.050		mg/L		0.05	29-APR-19
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	29-APR-19
Silver (Ag)-Dissolved			<0.000010		mg/L		0.00001	29-APR-19
Sodium (Na)-Dissolved			<0.050		mg/L		0.05	29-APR-19
Strontium (Sr)-Dissolve	ed		<0.00020		mg/L		0.0002	29-APR-19
Thallium (TI)-Dissolved			<0.000010		mg/L		0.00001	29-APR-19
Tin (Sn)-Dissolved			<0.00010		mg/L		0.0001	29-APR-19
Titanium (Ti)-Dissolved	I		<0.00030		mg/L		0.0003	29-APR-19
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	29-APR-19
Vanadium (V)-Dissolve	d		<0.00050		mg/L		0.0005	29-APR-19
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	29-APR-19
Batch R4619723	}							
WG3038619-3 DUP		L2263743-1						
Aluminum (Al)-Dissolve	ed	<0.0030	<0.0030	RPD-NA	mg/L	N/A	20	01-MAY-19
Antimony (Sb)-Dissolve	ed	<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	01-MAY-19
Arsenic (As)-Dissolved		0.00100	0.00094		mg/L	0.6	20	01-MAY-19
Barium (Ba)-Dissolved		0.437	0.452		mg/L	2.4	20	01-MAY-19
Bismuth (Bi)-Dissolved		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	01-MAY-19
Boron (B)-Dissolved		0.031	0.022		mg/L	2.2	20	01-MAY-19
Cadmium (Cd)-Dissolv	ed	0.0000073	0.0000094		mg/L	14	20	01-MAY-19



Workorder: L2263743 Report Date: 03-MAY-19 Page 5 of 13

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA	Water							
Batch R46197	23							
WG3038619-3 DU		L2263743-1						
Calcium (Ca)-Dissol		28.5	26.8		mg/L	3.6	20	01-MAY-19
Chromium (Cr)-Diss		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	01-MAY-19
Cobalt (Co)-Dissolve		0.00021	0.00021		mg/L	5.0	20	01-MAY-19
Copper (Cu)-Dissolv	ed	<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	01-MAY-19
Iron (Fe)-Dissolved		<0.010	<0.010	RPD-NA	mg/L	N/A	20	01-MAY-19
Lead (Pb)-Dissolved		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	01-MAY-19
Lithium (Li)-Dissolve		0.0104	0.0101		mg/L	2.9	20	01-MAY-19
Magnesium (Mg)-Dis		14.9	14.7		mg/L	0.3	20	01-MAY-19
Manganese (Mn)-Dis		0.240	0.235		mg/L	0.3	20	01-MAY-19
Molybdenum (Mo)-D	issolved	0.0107	0.0116		mg/L	2.4	20	01-MAY-19
Nickel (Ni)-Dissolved	d	<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	01-MAY-19
Potassium (K)-Disso		0.727	0.721		mg/L	0.6	20	01-MAY-19
Selenium (Se)-Disso	lved	0.000100	0.000051	J	mg/L	0.000049	0.0001	01-MAY-19
Silver (Ag)-Dissolved	d	<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	01-MAY-19
Sodium (Na)-Dissolv	red	19.2	19.0		mg/L	0.5	20	01-MAY-19
Strontium (Sr)-Disso	lved	0.219	0.222		mg/L	3.0	20	01-MAY-19
Thallium (TI)-Dissolv	red	<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	01-MAY-19
Tin (Sn)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	01-MAY-19
Titanium (Ti)-Dissolv	red	<0.010	<0.010	RPD-NA	mg/L	N/A	20	01-MAY-19
Uranium (U)-Dissolv	ed	0.00131	0.00140		mg/L	1.3	20	01-MAY-19
Vanadium (V)-Disso	lved	<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	01-MAY-19
Zinc (Zn)-Dissolved		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	01-MAY-19
WG3038619-2 LC	-							
Aluminum (Al)-Disso			109.5		%		80-120	01-MAY-19
Antimony (Sb)-Disso			97.6		%		80-120	01-MAY-19
Arsenic (As)-Dissolv			105.4		%		80-120	01-MAY-19
Barium (Ba)-Dissolve			110.0		%		80-120	01-MAY-19
Bismuth (Bi)-Dissolv	ed		98.1		%		80-120	01-MAY-19
Boron (B)-Dissolved			99.1		%		80-120	01-MAY-19
Cadmium (Cd)-Disso	olved		105.7		%		80-120	01-MAY-19
Calcium (Ca)-Dissol	ved		99.9		%		80-120	01-MAY-19
Chromium (Cr)-Disse	olved		104.0		%		80-120	01-MAY-19
Cobalt (Co)-Dissolve	ed		103.9		%		80-120	01-MAY-19
Copper (Cu)-Dissolv	ed		102.4		%		80-120	01-MAY-19



Workorder: L2263743 Report Date: 03-MAY-19 Page 6 of 13

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA	Water							
Batch R461972	23							
WG3038619-2 LCS	3							
Iron (Fe)-Dissolved			100.4		%		80-120	01-MAY-19
Lead (Pb)-Dissolved			97.7		%		80-120	01-MAY-19
Lithium (Li)-Dissolved			98.0		%		80-120	01-MAY-19
Magnesium (Mg)-Dis			107.6		%		80-120	01-MAY-19
Manganese (Mn)-Dis			105.1		%		80-120	01-MAY-19
Molybdenum (Mo)-Di	ssolved		98.2		%		80-120	01-MAY-19
Nickel (Ni)-Dissolved			104.3		%		80-120	01-MAY-19
Potassium (K)-Dissol	ved		100.8		%		80-120	01-MAY-19
Selenium (Se)-Dissol	ved		101.7		%		80-120	01-MAY-19
Silicon (Si)-Dissolved			101.3		%		60-140	01-MAY-19
Silver (Ag)-Dissolved			96.2		%		80-120	01-MAY-19
Sodium (Na)-Dissolve	ed		109.7		%		80-120	01-MAY-19
Strontium (Sr)-Dissol	ved		101.9		%		80-120	01-MAY-19
Thallium (TI)-Dissolve	ed		97.7		%		80-120	01-MAY-19
Tin (Sn)-Dissolved			97.0		%		80-120	01-MAY-19
Titanium (Ti)-Dissolve	ed		103.6		%		80-120	01-MAY-19
Uranium (U)-Dissolve	ed		99.8		%		80-120	01-MAY-19
Vanadium (V)-Dissolv	ved		106.6		%		80-120	01-MAY-19
Zinc (Zn)-Dissolved			106.6		%		80-120	01-MAY-19
WG3038619-1 MB		LF						
Aluminum (Al)-Dissol	ved		<0.0010		mg/L		0.001	01-MAY-19
Antimony (Sb)-Dissol	ved		<0.00010		mg/L		0.0001	01-MAY-19
Arsenic (As)-Dissolve	ed		<0.00010		mg/L		0.0001	01-MAY-19
Barium (Ba)-Dissolve	ed		<0.00010		mg/L		0.0001	01-MAY-19
Bismuth (Bi)-Dissolve	ed		<0.000050	)	mg/L		0.00005	01-MAY-19
Boron (B)-Dissolved			<0.010		mg/L		0.01	01-MAY-19
Cadmium (Cd)-Disso	lved		<0.000005	5C	mg/L		0.000005	01-MAY-19
Calcium (Ca)-Dissolv	red		<0.050		mg/L		0.05	01-MAY-19
Chromium (Cr)-Disso	lved		<0.00010		mg/L		0.0001	01-MAY-19
Cobalt (Co)-Dissolved	d		<0.00010		mg/L		0.0001	01-MAY-19
Copper (Cu)-Dissolve	ed		<0.00020		mg/L		0.0002	01-MAY-19
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	01-MAY-19
Lead (Pb)-Dissolved			<0.000050	)	mg/L		0.00005	01-MAY-19
Lithium (Li)-Dissolved	t		<0.0010		mg/L		0.001	01-MAY-19



Workorder: L2263743

Report Date: 03-MAY-19 Page 7 of 13

Test Matr	ix Reference	Result Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA Wat	er					
Batch R4619723						
WG3038619-1 MB	LF		_			
Magnesium (Mg)-Dissolved		<0.0050	mg/L		0.005	01-MAY-19
Manganese (Mn)-Dissolved		<0.00010	mg/L		0.0001	01-MAY-19
Molybdenum (Mo)-Dissolved		<0.000050	mg/L		0.00005	01-MAY-19
Nickel (Ni)-Dissolved		<0.00050	mg/L		0.0005	01-MAY-19
Potassium (K)-Dissolved		<0.050	mg/L		0.05	01-MAY-19
Selenium (Se)-Dissolved		<0.000050	mg/L		0.00005	01-MAY-19
Silicon (Si)-Dissolved		<0.050	mg/L		0.05	01-MAY-19
Silver (Ag)-Dissolved		<0.000010	mg/L		0.00001	01-MAY-19
Sodium (Na)-Dissolved		<0.050	mg/L		0.05	01-MAY-19
Strontium (Sr)-Dissolved		<0.00020	mg/L		0.0002	01-MAY-19
Thallium (TI)-Dissolved		<0.000010	mg/L		0.00001	01-MAY-19
Tin (Sn)-Dissolved		<0.00010	mg/L		0.0001	01-MAY-19
Titanium (Ti)-Dissolved		<0.00030	mg/L		0.0003	01-MAY-19
Uranium (U)-Dissolved		<0.000010	mg/L		0.00001	01-MAY-19
Vanadium (V)-Dissolved		<0.00050	mg/L		0.0005	01-MAY-19
Zinc (Zn)-Dissolved		<0.0010	mg/L		0.001	01-MAY-19
MET-T-CCMS-VA Wat	er					
Batch R4618346						
WG3037775-2 LCS		99.8	%		00.400	00 ADD 40
Antimony (Sh) Total		104.1	%		80-120	30-APR-19
Antimony (Sb)-Total		100.6	%		80-120	30-APR-19
Arsenic (As)-Total					80-120	30-APR-19
Barium (Ba)-Total		102.8	%		80-120	30-APR-19
Bismuth (Bi)-Total		96.4	%		80-120	30-APR-19
Boron (B)-Total		95.7	%		80-120	30-APR-19
Cadmium (Cd)-Total		100.8	%		80-120	30-APR-19
Calcium (Ca)-Total		102.0	%		80-120	30-APR-19
Chromium (Cr)-Total		100.4	%		80-120	30-APR-19
Cobalt (Co)-Total		98.7	%		80-120	30-APR-19
Copper (Cu)-Total		98.3	%		80-120	30-APR-19
Iron (Fe)-Total		101.2	%		80-120	30-APR-19
Lead (Pb)-Total		97.8	%		80-120	30-APR-19
Lithium (Li)-Total		97.6	%		80-120	30-APR-19
Magnesium (Mg)-Total		100.4	%		80-120	30-APR-19



Workorder: L2263743 Rep

Report Date: 03-MAY-19

Page 8 of 13

Test Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-VA	Water							
Batch R4618346								
WG3037775-2 LCS Manganese (Mn)-Total			103.3		%		80-120	30-APR-19
Molybdenum (Mo)-Total			100.3		%		80-120	30-APR-19
Nickel (Ni)-Total			97.8		%		80-120	30-APR-19
Potassium (K)-Total			98.4		%		80-120	30-APR-19
Selenium (Se)-Total			101.6		%		80-120	30-APR-19
Silicon (Si)-Total			99.1		%		80-120	30-APR-19
Silver (Ag)-Total			104.0		%		80-120	30-APR-19
Sodium (Na)-Total			101.0		%		80-120	30-APR-19
Strontium (Sr)-Total			102.5		%		80-120	30-APR-19
Thallium (TI)-Total			99.0		%		80-120	30-APR-19
Tin (Sn)-Total			98.2		%		80-120	30-APR-19
Titanium (Ti)-Total			92.6		%		80-120	30-APR-19
Uranium (U)-Total			103.4		%		80-120	30-APR-19
Vanadium (V)-Total			102.7		%		80-120	30-APR-19
Zinc (Zn)-Total			99.2		%		80-120	30-APR-19
WG3037775-1 MB								
Aluminum (Al)-Total			<0.0030		mg/L		0.003	30-APR-19
Antimony (Sb)-Total			<0.00010		mg/L		0.0001	30-APR-19
Arsenic (As)-Total			<0.00010		mg/L		0.0001	30-APR-19
Barium (Ba)-Total			<0.00010		mg/L		0.0001	30-APR-19
Bismuth (Bi)-Total			<0.000050	1	mg/L		0.00005	30-APR-19
Boron (B)-Total			<0.010		mg/L		0.01	30-APR-19
Cadmium (Cd)-Total			<0.000005	C	mg/L		0.000005	30-APR-19
Calcium (Ca)-Total			< 0.050		mg/L		0.05	30-APR-19
Chromium (Cr)-Total			<0.00010		mg/L		0.0001	30-APR-19
Cobalt (Co)-Total			<0.00010		mg/L		0.0001	30-APR-19
Copper (Cu)-Total			<0.00050		mg/L		0.0005	30-APR-19
Iron (Fe)-Total			<0.010		mg/L		0.01	30-APR-19
Lead (Pb)-Total			<0.000050	1	mg/L		0.00005	30-APR-19
Lithium (Li)-Total			<0.0010		mg/L		0.001	30-APR-19
Magnesium (Mg)-Total			<0.0050		mg/L		0.005	30-APR-19
Manganese (Mn)-Total			<0.00010		mg/L		0.0001	30-APR-19
Molybdenum (Mo)-Total	I		<0.000050	)	mg/L		0.00005	30-APR-19
Nickel (Ni)-Total			<0.00050		mg/L		0.0005	30-APR-19



Workorder: L2263743

Report Date: 03-MAY-19 Page 9 of 13

Test	Matrix	Reference	Result Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-VA	Water						
Batch R4618346							
WG3037775-1 MB Potassium (K)-Total			<0.050	ma/l		0.05	00 APP 40
Selenium (Se)-Total			<0.000	mg/L		0.05 0.00005	30-APR-19
Silicon (Si)-Total			<0.10	mg/L			30-APR-19
Silver (Ag)-Total			<0.10	mg/L mg/L		0.1	30-APR-19
Sodium (Na)-Total			<0.050	mg/L		0.00001 0.05	30-APR-19
Strontium (Sr)-Total			<0.00020	mg/L			30-APR-19
Thallium (TI)-Total			<0.00020	mg/L		0.0002 0.00001	30-APR-19
Tin (Sn)-Total			<0.00010	mg/L		0.00001	30-APR-19 30-APR-19
Titanium (Ti)-Total			<0.00030	mg/L		0.0001	30-APR-19 30-APR-19
Uranium (U)-Total			<0.00000	mg/L		0.0003	30-APR-19 30-APR-19
Vanadium (V)-Total			<0.00050	mg/L		0.0005	30-APR-19 30-APR-19
Zinc (Zn)-Total			<0.0030	mg/L		0.0003	30-APR-19 30-APR-19
, ,			<0.0000	mg/L		0.003	30-AFK-19
NH3-L-F-CL	Water						
Batch R4622394							
WG3040909-6 LCS Ammonia as N			91.2	%		85-115	02-MAY-19
WG3040909-5 MB				,-		00 110	02 100 (1 10
Ammonia as N			<0.0050	mg/L		0.005	02-MAY-19
NO2-L-IC-N-CL	Water						
Batch R4614460							
WG3036288-2 LCS							
Nitrite (as N)			105.3	%		90-110	26-APR-19
WG3036288-1 MB			0.0040				
Nitrite (as N)			<0.0010	mg/L		0.001	26-APR-19
NO3-L-IC-N-CL	Water						
Batch R4614460							
WG3036288-2 LCS Nitrate (as N)			100.9	0/		00.440	00 APP 40
			100.8	%		90-110	26-APR-19
WG3036288-1 MB Nitrate (as N)			<0.0050	mg/L		0.005	26-APR-19
ORP-CL	Water						
Batch R4619972							
WG3039361-3 CRM		CL-ORP					
ORP			225	mV		210-230	01-MAY-19



Workorder: L2263743

Report Date: 03-MAY-19 Page 10 of 13

est	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
P-T-L-COL-CL	Water							
Batch R4621768								
WG3040492-14 LCS Phosphorus (P)-Total			101.5		%		80-120	02-MAY-19
WG3040492-13 MB			0.0000		a. /l		0.000	
Phosphorus (P)-Total			<0.0020		mg/L		0.002	02-MAY-19
PH-CL	Water							
Batch R4621319								
WG3039864-14 LCS pH			6.99		рН		6.9-7.1	01-MAY-19
•					·		0.0	01111111111
O4-DO-L-COL-CL	Water							
Batch R4616689								
WG3036341-6 LCS	1 ( <b> )</b> \		400.0		0/			
Orthophosphate-Dissolv	ea (as P)		100.2		%		80-120	27-APR-19
WG3036341-5 MB Orthophosphate-Dissolve	ed (as P)		<0.0010		mg/L		0.001	27-APR-19
			10.0010		9, ⊏		0.001	21-AFN-18
O4-IC-N-CL Batch R4614460	Water							
WG3036288-2 LCS								
Sulfate (SO4)			101.4		%		90-110	26-APR-19
WG3036288-1 MB								
Sulfate (SO4)			<0.30		mg/L		0.3	26-APR-19
OLIDS-TDS-CL	Water							
Batch R4621312								
WG3038811-5 LCS Total Dissolved Solids			05.0		0/		05.445	04.1434
			95.6		%		85-115	01-MAY-19
WG3038811-4 MB Total Dissolved Solids			<10		mg/L		10	01-MAY-19
EH-BC-VA-CL	Water				-		-	21
Batch R4621551	Tratei							
WG3037288-2 LCS								
EPH10-19			119.3		%		70-130	02-MAY-19
EPH19-32			119.5		%		70-130	02-MAY-19
<b>WG3037288-1 MB</b> EPH10-19			<0.25		mg/L		0.25	02-MAY-19
EPH19-32			<0.25		mg/L		0.25	02-MAY-19
Surrogate: 2-Bromobenz	otrifluoride		80.3		%		60-140	02-MAY-19
- u gu.u D. 0111000112			55.5		, .		00 170	02 WIT 1318



Workorder: L2263743

Report Date: 03-MAY-19 Page 11 of 13

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
TEH-WATER-VA-CL	Water							
Batch R4621551 WG3037288-2 LCS TEH (C10-C30)			119.1		%		70-130	02-MAY-19
<b>WG3037288-1 MB</b> TEH (C10-C30)			<0.25		mg/L		0.25	02-MAY-19
Surrogate: 2-Bromobenz	otrifluoride		80.3		%		60-140	02-MAY-19
TKN-L-F-CL	Water							
Batch R4622466 WG3041319-3 DUP Total Kjeldahl Nitrogen		<b>L2263743-1</b> 0.054	<0.050	RPD-NA	mg/L	N/A	20	03-MAY-19
WG3041319-10 LCS Total Kjeldahl Nitrogen			97.7		%		75-125	03-MAY-19
WG3041319-2 LCS Total Kjeldahl Nitrogen			104.8		%		75-125	03-MAY-19
WG3041319-6 LCS Total Kjeldahl Nitrogen			102.5		%		75-125	03-MAY-19
<b>WG3041319-1 MB</b> Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	03-MAY-19
<b>WG3041319-5 MB</b> Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	03-MAY-19
WG3041319-9 MB Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	03-MAY-19
TSS-L-CL	Water							
Batch R4620566 WG3038792-5 LCS Total Suspended Solids			104.5		%		85-115	01-MAY-19
WG3038792-4 MB Total Suspended Solids			<1.0		mg/L		1	01-MAY-19
TURBIDITY-CL	Water				J			
Batch R4615246								
WG3036085-18 DUP Turbidity		<b>L2263743-1</b> 22.4	22.7		NTU	1.3	15	26-APR-19
WG3036085-17 LCS Turbidity			97.0		%		85-115	26-APR-19
WG3036085-16 MB Turbidity			<0.10		NTU		0.1	26-APR-19

Workorder: L2263743 Report Date: 03-MAY-19 Page 12 of 13

Legend:

ALS Control Limit (Data Quality Objectives)
Duplicate
Relative Percent Difference
Not Available
Laboratory Control Sample
Standard Reference Material
Matrix Spike
Matrix Spike Duplicate
Average Desorption Efficiency
Method Blank
Internal Reference Material
Certified Reference Material
Continuing Calibration Verification
Calibration Verification Standard
Laboratory Control Sample Duplicate

#### **Sample Parameter Qualifier Definitions:**

Qualifier	Description
J	Duplicate results and limits are expressed in terms of absolute difference.
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

Workorder: L2263743 Report Date: 03-MAY-19 Page 13 of 13

#### **Hold Time Exceedances:**

	Sample						
ALS Product Description	ID	Sampling Date	Date Processed	Rec. HT	Actual HT	Units	Qualifier
Physical Tests							
Oxidation redution potentia	I by elect.						
	1	25-APR-19 15:00	01-MAY-19 10:45	0.25	140	hours	EHTR-FM
рН							
	1	25-APR-19 15:00	01-MAY-19 10:00	0.25	139	hours	EHTR-FM
Lamand & Ovalitian Definition							

#### Legend & Qualifier Definitions:

EHTR-FM: Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended.

EHTR: Exceeded ALS recommended hold time prior to sample receipt.

EHTL: Exceeded ALS recommended hold time prior to analysis. Sample was received less than 24 hours prior to expiry.

EHT: Exceeded ALS recommended hold time prior to analysis.

Rec. HT: ALS recommended hold time (see units).

#### Notes\*:

Where actual sampling date is not provided to ALS, the date (& time) of receipt is used for calculation purposes. Where actual sampling time is not provided to ALS, the earlier of 12 noon on the sampling date or the time (& date) of receipt is used for calculation purposes. Samples for L2263743 were received on 26-APR-19 09:00.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against predetermined data quality objectives to provide confidence in the accuracy of associated test results.

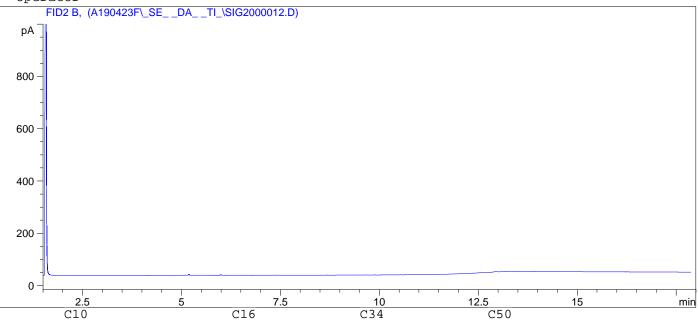
Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

Sample ID: L2263743-1 V4
Injection Date: 4/30/2019
Injection Time: 9:54:57 PM

Instrument ID: HP9

Operator:





Boiling Point Distribution Range for Petroleum Based Fuel Products

Carbon#	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	30
B.P. (°C)	-42	-0.5	36	69	98	126	151	174	196	216	235	253	270	287	302	316	329	343	356		380	391	402	412	422	431	449
B.P. (°F)	-44	31	97	156	209	258	303	345	384	421	456	488	519	548	575	601	625	649	674	695	716	736	756	774	792	808	840
		M.&P	. Napi			ıl Spir	rits	-			-	-															
Gaso	шпе				#.	l Die		Pies	el -			_				-	-										
							JP5,	Jet A		ı	leavy	Diese	1	<b>-</b>	-												
					Gas	Oil,	Fuel (	)il →	-	_																_	-
								Lu	brica	ting C	ils -	-														<u>.</u>	-

Adapted from: Drews, A.W., ED. Manual on Hydrocarbon Analysis, 4th ed.; American Society for Testing and Materials: Philadelphia, PA., 1989: p XVIII.

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8.



TECK COAL LIMITED (LINE CREEK)

ATTN: Chris Blurton

PO BOX 2003

SPARWOOD BC VOB 2G0

Date Received: 07-MAY-19

Report Date: 16-MAY-19 15:53 (MT)

Version: FINAL

Client Phone: 250-425-6111

# Certificate of Analysis

Lab Work Order #: L2268822 Project P.O. #: VP000608129

Job Reference: LINE CREEK OPERATION

C of C Numbers: 20190506 LC GW

Legal Site Desc:



Lyudmyla Shvets, B.Sc. Account Manager

[This report shall not be reproduced except in full without the written authority of the Laboratory.]

L2268822 CONTD.... PAGE 2 of 7 Version: FINAL

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2268822-1 LC_PIZP1103_WG_Q2-2019_NP							
Sampled By: KC/DT on 06-MAY-19 @ 14:55							
Matrix: WG							
Miscellaneous Parameters							
Dissolved Organic Carbon	0.61		0.50	ma/l		11-MAY-19	D4624422
			0.50	mg/L		_	R4631433
Total Kjeldahl Nitrogen	0.150		0.050	mg/L		13-MAY-19	R4634306
Total Organic Carbon	0.85		0.50	mg/L		11-MAY-19	R4631433
Dissolved Metals in Water							
Diss. Be (low) in Water by CRC ICPMS	0.000		0.000	/1	00 MAY 40	00 MANY 40	D 4000500
Beryllium (Be)-Dissolved Dissolved Metals Filtration Location	<0.020 FIELD		0.020	ug/L	09-MAY-19	09-MAY-19	R4629586
	FIELD					09-MAY-19	R4628847
Diss. Mercury in Water by CVAAS or CVAFS Mercury (Hg)-Dissolved	-0.0000050		0.0000050	ma/l	09-MAY-19	10-MAY-19	D4620750
1 1 -1	<0.000050		0.0000050	mg/L	09-IVIA 1 - 19	09-MAY-19	R4630750
Dissolved Mercury Filtration Location	FIELD					09-IVIA 1-19	R4629707
Dissolved Metals in Water by CRC ICPMS Dissolved Metals Filtration Location	FIELD					09-MAY-19	R4628847
Aluminum (Al)-Dissolved	<0.0030		0.0030	mg/L	09-MAY-19	09-MAY-19	R4628847 R4629586
Antimony (Sb)-Dissolved	<0.0030		0.0030	mg/L	09-MAY-19	09-MAY-19	R4629586
Arsenic (As)-Dissolved	0.00076		0.00010	mg/L	09-MAY-19	09-MAY-19	R4629586
Barium (Ba)-Dissolved	0.00076		0.00010	mg/L	09-MAY-19	09-MAY-19	R4629586
Bismuth (Bi)-Dissolved	<0.0009		0.00010	mg/L	09-MAY-19	09-MAY-19	R4629586
Boron (B)-Dissolved	<0.000050 0.570		0.00050	mg/L	09-MAY-19	09-MAY-19	R4629586 R4629586
Cadmium (Cd)-Dissolved	0.570		0.010	ug/L	09-MAY-19	09-MAY-19	R4629586 R4629586
Calcium (Ca)-Dissolved	26.6		0.0050	mg/L	09-MAY-19	09-MAY-19	R4629586
Chromium (Cr)-Dissolved	<0.00010		0.00010	mg/L	09-MAY-19	09-MAY-19	R4629586
Cobalt (Co)-Dissolved	0.27		0.00010	ug/L	09-MAY-19	09-MAY-19	R4629586
Copper (Cu)-Dissolved	0.27		0.00050	mg/L	09-MAY-19	09-MAY-19	R4629586
Iron (Fe)-Dissolved	<0.00274		0.00030	mg/L	09-MAY-19	09-MAY-19	R4629586
Lead (Pb)-Dissolved	0.000135		0.00050	mg/L	09-MAY-19	09-MAY-19	R4629586
Lithium (Li)-Dissolved	0.000133		0.000030	mg/L	09-MAY-19	09-MAY-19	R4629586
Magnesium (Mg)-Dissolved	14.5		0.0010	mg/L	09-MAY-19	09-MAY-19	R4629586
Manganese (Mn)-Dissolved	0.237		0.00010	mg/L	09-MAY-19	09-MAY-19	R4629586
Molybdenum (Mo)-Dissolved	0.0127		0.00010	mg/L	09-MAY-19	09-MAY-19	R4629586
Nickel (Ni)-Dissolved	0.00127		0.00050	mg/L	09-MAY-19	09-MAY-19	R4629586
Potassium (K)-Dissolved	1.65		0.00030	mg/L	09-MAY-19	09-MAY-19	R4629586
Selenium (Se)-Dissolved	<0.050		0.050	ug/L	09-MAY-19	09-MAY-19	R4629586
Silicon (Si)-Dissolved	4.32		0.050	mg/L	09-MAY-19	09-MAY-19	R4629586
Silver (Ag)-Dissolved	<0.000010		0.00010	mg/L	09-MAY-19	09-MAY-19	R4629586
Sodium (Na)-Dissolved	147		0.000010	mg/L	09-MAY-19	09-MAY-19	R4629586
Strontium (Sr)-Dissolved	0.801		0.00020	mg/L	09-MAY-19	09-MAY-19	R4629586
Thallium (TI)-Dissolved	0.000014		0.00020	mg/L	09-MAY-19	09-MAY-19	R4629586
Tin (Sn)-Dissolved	<0.00014		0.00010	mg/L	09-MAY-19	09-MAY-19	R4629586
Titanium (Ti)-Dissolved	<0.010		0.00010	mg/L	09-MAY-19	09-MAY-19	R4629586
Uranium (U)-Dissolved	0.00199		0.00010	mg/L	09-MAY-19	09-MAY-19	R4629586
Vanadium (V)-Dissolved	<0.00050		0.00050	mg/L	09-MAY-19	09-MAY-19	R4629586
Zinc (Zn)-Dissolved	0.0065		0.00030	mg/L	09-MAY-19	09-MAY-19	R4629586
Hardness	0.0003		0.0010	my/L	00 WAT-19	00 MIA 1-19	117023300
Hardness (as CaCO3)	126		0.50	mg/L		09-MAY-19	
Total Metals in Water	120		3.00	9, ⊏		33 //// 10	
Total Be (Low) in Water by CRC ICPMS							
Beryllium (Be)-Total	<0.020		0.020	ug/L		09-MAY-19	R4629586
Total Metals in Water by CRC ICPMS	15.020		0.020	g/ <b>-</b> -			
Aluminum (Al)-Total	0.0532		0.0030	mg/L		09-MAY-19	R4629586
Antimony (Sb)-Total	<0.00010		0.00010	mg/L		09-MAY-19	R4629586
Arsenic (As)-Total	0.00060		0.00010	mg/L		09-MAY-19	R4629586
	3.00000		0.00010	9, ⊏		33 //// 10	1.1323300

<sup>\*</sup> Refer to Referenced Information for Qualifiers (if any) and Methodology.

L2268822 CONTD.... PAGE 3 of 7 Version: FINAL

Sample Details/Parameters	Result	Qualifier* D.L.	Units	Extracted	Analyzed	Batch
   L2268822-1						
Sampled By: KC/DT on 06-MAY-19 @ 14:55						
Matrix: WG						
Total Metals in Water by CRC ICPMS Barium (Ba)-Total	0.0607	0.00010	mg/L		09-MAY-19	R4629586
Bismuth (Bi)-Total	<0.0007	0.00010			09-MAY-19	R4629586
Boron (B)-Total	0.593	0.00030	mg/L		09-MAY-19	R4629586
Cadmium (Cd)-Total	0.0239	0.0050	ug/L		09-MAY-19	R4629586
Calcium (Ca)-Total	28.8	0.050	mg/L		09-MAY-19	R4629586
Chromium (Cr)-Total	0.00017	0.00010	mg/L		09-MAY-19	R4629586
Cobalt (Co)-Total	0.31	0.10	ug/L		09-MAY-19	R4629586
Copper (Cu)-Total	0.00417	0.00050	mg/L		09-MAY-19	R4629586
Iron (Fe)-Total	0.050	0.010	mg/L		09-MAY-19	R4629586
Lead (Pb)-Total	0.000281	0.000050	_		09-MAY-19	R4629586
Lithium (Li)-Total	0.126	0.0010	mg/L		09-MAY-19	R4629586
Magnesium (Mg)-Total	15.1	0.10	mg/L		09-MAY-19	R4629586
Manganese (Mn)-Total	0.257	0.00010	mg/L		09-MAY-19	R4629586
Molybdenum (Mo)-Total	0.0122	0.000050	mg/L		09-MAY-19	R4629586
Nickel (Ni)-Total	0.00136	0.00050	mg/L		09-MAY-19	R4629586
Potassium (K)-Total	1.66	0.050	mg/L		09-MAY-19	R4629586
Selenium (Se)-Total	<0.050	0.050	ug/L		09-MAY-19	R4629586
Silicon (Si)-Total	4.46	0.10	mg/L		09-MAY-19	R4629586
Silver (Ag)-Total	<0.000010	0.000010			09-MAY-19	R4629586
Sodium (Na)-Total	147	0.050	mg/L		09-MAY-19	R4629586
Strontium (Sr)-Total	0.778	0.00020	mg/L		09-MAY-19	R4629586
Thallium (TI)-Total	0.000018	0.000010			09-MAY-19	R4629586
Tin (Sn)-Total	0.00013	0.00010	mg/L		09-MAY-19	R4629586
Titanium (Ti)-Total	<0.010	0.010	mg/L		09-MAY-19	R4629586
Uranium (U)-Total	0.00212	0.000010			09-MAY-19	R4629586
Vanadium (V)-Total Zinc (Zn)-Total	<0.00050	0.00050	mg/L		09-MAY-19	R4629586
Routine for Teck Coal	0.0083	0.0030	mg/L		09-MAY-19	R4629586
Acidity by Automatic Titration						
Acidity by Automatic Titration Acidity (as CaCO3)	<1.0	1.0	mg/L		10-MAY-19	R4630886
Alkalinity (Species) by Manual Titration	<b>\(\)</b>	1.0	IIIg/L		10 10 10	114030000
Alkalinity, Bicarbonate (as CaCO3)	396	1.0	mg/L		14-MAY-19	R4633250
Alkalinity, Carbonate (as CaCO3)	5.4	1.0	mg/L		14-MAY-19	R4633250
Alkalinity, Hydroxide (as CaCO3)	<1.0	1.0	mg/L		14-MAY-19	R4633250
Alkalinity, Total (as CaCO3)	401	1.0	mg/L		14-MAY-19	R4633250
Ammonia, Total (as N)						
Ammonia as N	0.0974	0.0050	mg/L		12-MAY-19	R4631441
Bromide in Water by IC (Low Level)						
Bromide (Br)	0.077	0.050	mg/L		07-MAY-19	R4628106
Chloride in Water by IC						
Chloride (CI)	4.28	0.50	mg/L		07-MAY-19	R4628106
Electrical Conductivity (EC)	750		.:0/:		40 14437 42	D.40000==
Conductivity (@ 25C)	759	2.0	uS/cm		10-MAY-19	R4633250
Fluoride in Water by IC	0.450	0.000	ma/I		07 MAV 40	D4600400
Fluoride (F)	0.456	0.020	mg/L		07-MAY-19	R4628106
Ion Balance Calculation Cation - Anion Balance	1.2		%		14-MAY-19	
Anion Sum	8.76		meg/L		14-MAY-19	
Cation Sum	8.97		meq/L		14-MAY-19	
Ion Balance Calculation	0.37		mcq/L		I T IVIA I TIJ	
Ion Balance	102	-100	%		14-MAY-19	
Nitrate in Water by IC (Low Level)						
		1	1			

<sup>\*</sup> Refer to Referenced Information for Qualifiers (if any) and Methodology.

L2268822 CONTD.... PAGE 4 of 7 Version: FINAL

Nitrite in Water by IC (Low Level)         0.0011         0.0010         mg/L         07-MAY-19         R           Orthophosphate-Dissolved (as P)         0.0399         0.0010         mg/L         08-MAY-19         R           Oxidation redution potential by elect.         379         -1000         mV         10-MAY-19         R           Phosphorus (P)-Total         0.0390         0.0020         mg/L         13-MAY-19         R           Sulfate in Water by IC         28.7         0.30         mg/L         07-MAY-19         R           Total Dissolved Solids         460         DLHC         20         mg/L         09-MAY-19         R           Total Suspended Solids         2.9         1.0         mg/L         09-MAY-19         R	R4628106 R4628106 R4629111 R4630830 R4633090 R4628106 R4630819 R4630822
Matrix:         WG           Nitrate in Water by IC (Low Level)         0.0878         0.0050         mg/L         07-MAY-19         R           Nitrite in Water by IC (Low Level)         0.0011         0.0010         mg/L         07-MAY-19         R           Orthophosphate-Dissolved (as P)         0.0399         0.0010         mg/L         08-MAY-19         R           Oxidation redution potential by elect.         379         -1000         mV         10-MAY-19         R           Phosphorus (P)-Total         0.0390         0.0020         mg/L         13-MAY-19         R           Sulfate in Water by IC         28.7         0.30         mg/L         07-MAY-19         R           Total Dissolved Solids         460         DLHC         20         mg/L         09-MAY-19         R           Total Suspended Solids         2.9         1.0         mg/L         09-MAY-19         R	R4628106 R4629111 R4630830 R4633090 R4628106 R4630819 R4630822
Nitrate in Water by IC (Low Level)         0.0878         0.0050         mg/L         07-MAY-19         R           Nitrite in Water by IC (Low Level)         0.0011         0.0010         mg/L         07-MAY-19         R           Orthophosphate-Dissolved (as P)         0.0011         0.0010         mg/L         08-MAY-19         R           Oxidation redution potential by elect.         0.0399         0.0010         mg/L         08-MAY-19         R           Phosphorus (P)-Total         379         -1000         mV         10-MAY-19         R           Phosphorus (P)-Total         0.0390         0.0020         mg/L         13-MAY-19         R           Sulfate in Water by IC         28.7         0.30         mg/L         07-MAY-19         R           Total Dissolved Solids         460         DLHC         20         mg/L         09-MAY-19         R           Total Suspended Solids         2.9         1.0         mg/L         09-MAY-19         R	R4628106 R4629111 R4630830 R4633090 R4628106 R4630819 R4630822
Nitrate (as N)	R4628106 R4629111 R4630830 R4633090 R4628106 R4630819 R4630822
Nitrite (as N)         0.0011         0.0010         mg/L         07-MAY-19         R           Orthophosphate-Dissolved (as P)         0.0399         0.0399         0.0010         mg/L         08-MAY-19         R           Oxidation redution potential by elect.         379         -1000         mV         10-MAY-19         R           Phosphorus (P)-Total         0.0390         0.0020         mg/L         13-MAY-19         R           Sulfate in Water by IC         28.7         0.30         mg/L         07-MAY-19         R           Total Dissolved Solids         460         DLHC         20         mg/L         09-MAY-19         R           Total Suspended Solids         2.9         1.0         mg/L         09-MAY-19         R	R4629111 R4630830 R4633090 R4628106 R4630819 R4630822
Orthophosphate-Dissolved (as P)         0.0399         0.0010         mg/L         08-MAY-19         R           Oxidation redution potential by elect.         379         -1000         mV         10-MAY-19         R           Phosphorus (P)-Total         0.0390         0.0020         mg/L         13-MAY-19         R           Sulfate in Water by IC         28.7         0.30         mg/L         07-MAY-19         R           Total Dissolved Solids         460         DLHC         20         mg/L         09-MAY-19         R           Total Suspended Solids         2.9         1.0         mg/L         09-MAY-19         R	R4630830 R4633090 R4628106 R4630819 R4630822
ORP         379         -1000         mV         10-MAY-19         R           Phosphorus (P)-Total         0.0390         0.0020         mg/L         13-MAY-19         R           Sulfate in Water by IC         28.7         0.30         mg/L         07-MAY-19         R           Total Dissolved Solids         460         DLHC         20         mg/L         09-MAY-19         R           Total Suspended Solids         2.9         1.0         mg/L         09-MAY-19         R	R4633090 R4628106 R4630819 R4630822
Phosphorus (P)-Total         0.0390         0.0020         mg/L         13-MAY-19         R           Sulfate in Water by IC         28.7         0.30         mg/L         07-MAY-19         R           Total Dissolved Solids         460         DLHC         20         mg/L         09-MAY-19         R           Total Suspended Solids         2.9         1.0         mg/L         09-MAY-19         R	R4633090 R4628106 R4630819 R4630822
Sulfate in Water by IC Sulfate (SO4)  Total Dissolved Solids Total Dissolved Solids Total Suspended Solids Total Suspended Solids Total Suspended Solids  Total Suspended Solids Total Suspended Solids Total Suspended Solids Total Suspended Solids Total Suspended Solids Total Suspended Solids Total Suspended Solids Total Suspended Solids Total Suspended Solids Total Suspended Solids Total Suspended Solids Total Suspended Solids Total Suspended Solids Total Suspended Solids Total Suspended Solids Total Suspended Solids Total Suspended Solids Total Suspended Solids	R4628106 R4630819 R4630822
Total Dissolved Solids Total Dissolved Solids Total Suspended Solids Total Suspended Solids Total Suspended Solids 2.9 Total Suspended Solids Total Suspended Solids	R4630819 R4630822
Total Suspended Solids Total Suspended Solids 2.9 1.0 mg/L 09-MAY-19	R4630822
Turbidity         3.36         0.10         NTU         08-MAY-19         R	RANDXUNU I
pH	R4628909
pH 8.34 0.10 pH 14-MAY-19 R	R4633250

<sup>\*</sup> Refer to Referenced Information for Qualifiers (if any) and Methodology.

LINE CREEK OPERATION L2268822 CONTD....

**Reference Information** 

PAGE 5 of 7 Version: FINAL

Sample Parameter Qualifier Key:

Qualifier	Description
DLHC	Detection Limit Raised: Dilution required due to high concentration of test analyte(s).
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.

#### **Test Method References:**

ALS Test Code	Matrix	Test Description	Method Reference**	
ACIDITY-PCT-CL	Water	Acidity by Automatic Titration	APHA 2310 Acidity	

This analysis is carried out using procedures adapted from APHA Method 2310 "Acidity". Acidity is determined by potentiometric titration to a specified endpoint.

ALK-MAN-CL Water APHA 2320 ALKALINITY Alkalinity (Species) by Manual Titration

This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.

BE-D-L-CCMS-VA Water Diss. Be (low) in Water by CRC ICPMS APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

BE-T-L-CCMS-VA Water Total Be (Low) in Water by CRC ICPMS EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

BR-L-IC-N-CL Water Bromide in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

C-DIS-ORG-LOW-CL Water Dissolved Organic Carbon APHA 5310 B-Instrumental

This method is applicable to the analysis of ground water, wastewater, and surface water samples. The form detected depends upon sample pretreatment: Unfiltered sample = TC, 0.45um filtered = TDC. Samples are injected into a combustion tube containing an oxidation catalyst. The carrier gas containing the combustion product from the combustion tube flows through an inorganic carbon reactor vessel and is then sent through a halogen scrubber into a sample cell set in a non-dispersive infrared gas analyzer (NDIR) where carbon dioxide is detected. For total inorganic carbon and dissolved inorganic carbon, the sample is injected into an IC reactor vessel where only the IC component is decomposed to become carbon dioxide.

The peak area generated by the NDIR indicates the TC/TDC or TIC/DIC as applicable. The total organic carbon content of the sample is calculated by subtracting the TIC from the TC.

TOC = TC-TIC, DOC = TDC-DIC, Particulate = Total - Dissolved.

C-TOT-ORG-LOW-CL Water **Total Organic Carbon** APHA 5310 TOTAL ORGANIC CARBON (TOC)

This method is applicable to the analysis of ground water, wastewater, and surface water samples. The form detected depends upon sample pretreatment: Unfiltered sample = TC, 0.45um filtered = TDC. Samples are injected into a combustion tube containing an oxidation catalyst. The carrier gas containing the combustion product from the combustion tube flows through an inorganic carbon reactor vessel and is then sent through a halogen scrubber into a sample cell set in a non-dispersive infrared gas analyzer (NDIR) where carbon dioxide is detected. For total inorganic carbon and dissolved inorganic carbon, the sample is injected into an IC reactor vessel where only the IC component is decomposed to become carbon dioxide.

The peak area generated by the NDIR indicates the TC/TDC or TIC/DIC as applicable. The total organic carbon content of the sample is calculated by subtracting the TIC from the TC

TOC = TC-TIC, DOC = TDC-DIC, Particulate = Total - Dissolved.

CL-IC-N-CL Water Chloride in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

EC-L-PCT-CL **APHA 2510B** Electrical Conductivity (EC)

Conductivity, also known as Electrical Conductivity (EC) or Specific Conductance, is measured by immersion of a conductivity cell with platinum electrodes into a water sample. Conductivity measurements are temperature-compensated to 25C.

Fluoride in Water by IC F-IC-N-CL EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

HARDNESS-CALC-VA Water Hardness **APHA 2340B** 

Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

HG-D-CVAA-VA Water Diss. Mercury in Water by CVAAS or CVAFS APHA 3030B/EPA 1631E (mod)

Water samples are filtered (0.45 um), preserved with hydrochloric acid, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

LINE CREEK OPERATION L2268822 CONTD....

**Reference Information** 

PAGE 6 of 7 Version: FINAL

**Test Method References:** 

ALS Test Code Matrix Test Description Method Reference\*\*

IONBALANCE-BC-CL Water Ion Balance Calculation APHA 1030E

Cation Sum, Anion Sum, and Ion Balance (as % difference) are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Because all aqueous solutions are electrically neutral, the calculated ion balance (% difference of cations minus anions) should be near-zero.

Cation and Anion Sums are the total meq/L concentration of major cations and anions. Dissolved species are used where available. Minor ions are included where data is present. Ion Balance is calculated as:

Ion Balance (%) = [Cation Sum-Anion Sum] / [Cation Sum+Anion Sum]

MET-D-CCMS-VA Water Dissolved Metals in Water by CRC ICPMS APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

MET-T-CCMS-VA Water Total Metals in Water by CRC ICPMS EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

NH3-L-F-CL Water Ammonia, Total (as N) J. ENVIRON. MONIT., 2005, 7, 37-42, RSC

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.

NO2-L-IC-N-CL Water Nitrite in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

NO3-L-IC-N-CL Water Nitrate in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

ORP-CL Water Oxidation redution potential by elect. ASTM D1498

This analysis is carried out in accordance with the procedure described in the "ASTM" method D1498 "Oxidation-Reduction Potential of Water" published by the American Society for Testing and Materials (ASTM). Results are reported as observed oxidation-reduction potential of the platinum metal-reference electrode employed, in mV.

It is recommended that this analysis be conducted in the field.

P-T-L-COL-CL Water Phosphorus (P)-Total APHA 4500-P PHOSPHORUS

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after persulphate digestion of the sample.

PH-CL Water pH APHA 4500 H-Electrode

pH is determined in the laboratory using a pH electrode. All samples analyzed by this method for pH will have exceeded the 15 minute recommended hold time from time of sampling (field analysis is recommended for pH where highly accurate results are needed)

PO4-DO-L-COL-CL Water Orthophosphate-Dissolved (as P) APHA 4500-P PHOSPHORUS

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.

SO4-IC-N-CL Water Sulfate in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

SOLIDS-TDS-CL Water Total Dissolved Solids APHA 2540 C

A well-mixed sample is filtered through a glass fibre filter paper. The filtrate is then evaporated to dryness in a pre-weighed vial and dried at 180 – 2 °C. The increase in vial weight represents the total dissolved solids (TDS).

TECKCOAL-IONBAL-CL Water Ion Balance Calculation APHA 1030E

Cation Sum, Anion Sum, and Ion Balance (as % difference) are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Because all aqueous solutions are electrically neutral, the calculated ion balance (% difference of cations minus anions) should be near-zero.

Cation and Anion Sums are the total meq/L concentration of major cations and anions. Dissolved species are used where available. Minor ions are included where data is present. Ion Balance is calculated as:

LINE CREEK OPERATION L2268822 CONTD....

**Reference Information** 

PAGE 7 of 7 Version: FINAL

**Test Method References:** 

ALS Test Code Matrix Test Description Method Reference\*\*

Ion Balance (%) = [Cation Sum-Anion Sum] / [Cation Sum+Anion Sum]

TKN-L-F-CL Water Total Kjeldahl Nitrogen APHA 4500-NORG (TKN)

This analysis is carried out using procedures adapted from APHA Method 4500-Norg D. "Block Digestion and Flow Injection Analysis". Total Kjeldahl

Nitrogen is determined using block digestion followed by Flow-injection analysis with fluorescence detection.

TSS-L-CL Water Total Suspended Solids APHA 2540 D-Gravimetric

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total suspended solids (TSS) are determined by filtering a sample through a glass fibre filter, and by drying the filter at 104 deg. C.

TURBIDITY-CL Water Turbidity APHA 2130 B-Nephelometer

This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.

\* ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

<b>Laboratory Definition Code</b>	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA
CL	ALS ENVIRONMENTAL - CALGARY, ALBERTA, CANADA

#### **Chain of Custody Numbers:**

20190506 LC GW

#### **GLOSSARY OF REPORT TERMS**

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.

mg/kg - milligrams per kilogram based on dry weight of sample

mg/kg wwt - milligrams per kilogram based on wet weight of sample

mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight

mg/L - unit of concentration based on volume, parts per million.

< - Less than.

D.L. - The reporting limit.

N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory. UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.



Workorder: L2268822 Report Date: 16-MAY-19 Page 1 of 10

Client: TECK COAL LIMITED (LINE CREEK)

PO BOX 2003

SPARWOOD BC V0B 2G0

Contact: Chris Blurton

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
ACIDITY-PCT-CL	Water							
Batch R4630886 WG3046959-3 DUP		L2268822-1						
Acidity (as CaCO3)		<1.0	<1.0	RPD-NA	mg/L	N/A	20	10-MAY-19
WG3046959-2 LCS Acidity (as CaCO3)			100.6		%		85-115	10-MAY-19
<b>WG3046959-1 MB</b> Acidity (as CaCO3)			1.7		mg/L		2	10-MAY-19
ALK-MAN-CL	Water							
Batch R4633250								
WG3047929-11 LCS Alkalinity, Total (as CaCC	D3)		99.7		%		85-115	10-MAY-19
WG3047929-10 MB Alkalinity, Total (as CaCC	03)		<1.0		mg/L		1	10-MAY-19
BE-D-L-CCMS-VA	Water							
Batch R4629586								
WG3045024-2 LCS Beryllium (Be)-Dissolved			99.0		%		80-120	09-MAY-19
WG3045024-1 MB Beryllium (Be)-Dissolved		NP	<0.000020	0	mg/L		0.00002	09-MAY-19
BE-T-L-CCMS-VA	Water							
Batch R4629586								
WG3045013-2 LCS Beryllium (Be)-Total			98.8		%		80-120	09-MAY-19
WG3045013-1 MB Beryllium (Be)-Total			<0.000020	0	mg/L		0.00002	09-MAY-19
BR-L-IC-N-CL	Water							
Batch R4628106								
WG3044326-14 LCS Bromide (Br)			104.8		%		85-115	07-MAY-19
WG3044326-13 MB Bromide (Br)			<0.050		mg/L		0.05	07-MAY-19
C-DIS-ORG-LOW-CL	Water							
Batch R4631433								
WG3047619-6 LCS Dissolved Organic Carbo	n		99.8		%		80-120	11-MAY-19
WG3047619-5 MB Dissolved Organic Carbo	n		<0.50		mg/L		0.5	11-MAY-19
C-TOT-ORG-LOW-CL	Water							



Workorder: L2268822

Report Date: 16-MAY-19 Page 2 of 10

Test	Matrix	Reference	Result Qualifier	Units RPD	Limit Analyzed
C-TOT-ORG-LOW-CL	Water				
Batch R4631433 WG3047619-6 LCS Total Organic Carbon			106.0	%	80-120 11-MAY-19
WG3047619-5 MB Total Organic Carbon			<0.50	mg/L	0.5 11-MAY-19
CL-IC-N-CL	Water				
Batch R4628106 WG3044326-14 LCS Chloride (CI)			103.8	%	90-110 07-MAY-19
<b>WG3044326-13 MB</b> Chloride (Cl)			<0.50	mg/L	0.5 07-MAY-19
EC-L-PCT-CL	Water				
Batch R4633250 WG3047929-11 LCS					
Conductivity (@ 25C)			101.6	%	90-110 10-MAY-19
WG3047929-10 MB Conductivity (@ 25C)			<2.0	uS/cm	2 10-MAY-19
F-IC-N-CL	Water				
Batch R4628106 WG3044326-14 LCS Fluoride (F)			107.9	%	90-110 07-MAY-19
<b>WG3044326-13 MB</b> Fluoride (F)			<0.020	mg/L	0.02 07-MAY-19
HG-D-CVAA-VA	Water				
Batch R4630750					
WG3045837-2 LCS Mercury (Hg)-Dissolved			106.7	%	80-120 10-MAY-19
WG3045837-1 MB Mercury (Hg)-Dissolved			<0.0000050	mg/L	0.000005 10-MAY-19
MET-D-CCMS-VA	Water				
Batch R4629586 WG3045024-2 LCS					
Aluminum (AI)-Dissolved			102.6	%	80-120 09-MAY-19
Antimony (Sb)-Dissolved	i		100.6	%	80-120 09-MAY-19
Arsenic (As)-Dissolved			98.7	%	80-120 09-MAY-19
Barium (Ba)-Dissolved			100.1	%	80-120 09-MAY-19
Bismuth (Bi)-Dissolved			94.9	%	80-120 09-MAY-19
Boron (B)-Dissolved			100.5	%	80-120 09-MAY-19



Workorder: L2268822 Report Date: 16-MAY-19 Page 3 of 10

Test Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA Water	r						
Batch R4629586							
WG3045024-2 LCS							
Cadmium (Cd)-Dissolved		98.4		%		80-120	09-MAY-19
Calcium (Ca)-Dissolved		96.6		%		80-120	09-MAY-19
Chromium (Cr)-Dissolved		103.8		%		80-120	09-MAY-19
Cobalt (Co)-Dissolved		99.2		%		80-120	09-MAY-19
Copper (Cu)-Dissolved		98.3		%		80-120	09-MAY-19
Iron (Fe)-Dissolved		96.4		%		80-120	09-MAY-19
Lead (Pb)-Dissolved		94.4		%		80-120	09-MAY-19
Lithium (Li)-Dissolved		96.6		%		80-120	09-MAY-19
Magnesium (Mg)-Dissolved		99.2		%		80-120	09-MAY-19
Manganese (Mn)-Dissolved		99.6		%		80-120	09-MAY-19
Molybdenum (Mo)-Dissolved		99.9		%		80-120	09-MAY-19
Nickel (Ni)-Dissolved		97.9		%		80-120	09-MAY-19
Potassium (K)-Dissolved		99.96		%		80-120	09-MAY-19
Selenium (Se)-Dissolved		98.7		%		80-120	09-MAY-19
Silicon (Si)-Dissolved		104.4		%		60-140	09-MAY-19
Silver (Ag)-Dissolved		96.5		%		80-120	09-MAY-19
Sodium (Na)-Dissolved		102.3		%		80-120	09-MAY-19
Strontium (Sr)-Dissolved		97.9		%		80-120	09-MAY-19
Thallium (TI)-Dissolved		96.5		%		80-120	09-MAY-19
Tin (Sn)-Dissolved		96.0		%		80-120	09-MAY-19
Titanium (Ti)-Dissolved		101.3		%		80-120	09-MAY-19
Uranium (U)-Dissolved		97.8		%		80-120	09-MAY-19
Vanadium (V)-Dissolved		102.6		%		80-120	09-MAY-19
Zinc (Zn)-Dissolved		101.5		%		80-120	09-MAY-19
WG3045024-1 MB Aluminum (Al)-Dissolved	NP	<0.0010		mg/L		0.001	09-MAY-19
Antimony (Sb)-Dissolved		<0.00010		mg/L		0.001	09-MAY-19
Arsenic (As)-Dissolved		<0.00010		mg/L		0.0001	09-MAY-19
Barium (Ba)-Dissolved		<0.00010		mg/L		0.0001	09-MAY-19
Bismuth (Bi)-Dissolved		<0.00010		mg/L		0.0001	09-MAY-19
Boron (B)-Dissolved		<0.010		mg/L		0.00005	09-MAY-19
Cadmium (Cd)-Dissolved		<0.0000050	7	mg/L		0.000005	09-MAY-19
Calcium (Ca)-Dissolved		<0.050	<b>u</b>	mg/L		0.00	
Chromium (Cr)-Dissolved		<0.00010		mg/L		0.001	09-MAY-19



Workorder: L2268822

Report Date: 16-MAY-19 Page 4 of 10

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA	Water							
Batch R4629586								
WG3045024-1 MB		NP						
Cobalt (Co)-Dissolved			<0.00010		mg/L		0.0001	09-MAY-19
Copper (Cu)-Dissolved			<0.00020		mg/L		0.0002	09-MAY-19
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	09-MAY-19
Lead (Pb)-Dissolved			<0.000050	)	mg/L		0.00005	09-MAY-19
Lithium (Li)-Dissolved			<0.0010		mg/L		0.001	09-MAY-19
Magnesium (Mg)-Dissolve	ed		<0.0050		mg/L		0.005	09-MAY-19
Manganese (Mn)-Dissolve	ed		<0.00010		mg/L		0.0001	09-MAY-19
Molybdenum (Mo)-Dissolv	ved		<0.000050	)	mg/L		0.00005	09-MAY-19
Nickel (Ni)-Dissolved			<0.00050		mg/L		0.0005	09-MAY-19
Potassium (K)-Dissolved			< 0.050		mg/L		0.05	09-MAY-19
Selenium (Se)-Dissolved			<0.000050	)	mg/L		0.00005	09-MAY-19
Silicon (Si)-Dissolved			< 0.050		mg/L		0.05	09-MAY-19
Silver (Ag)-Dissolved			<0.000010	)	mg/L		0.00001	09-MAY-19
Sodium (Na)-Dissolved			< 0.050		mg/L		0.05	09-MAY-19
Strontium (Sr)-Dissolved			<0.00020		mg/L		0.0002	09-MAY-19
Thallium (TI)-Dissolved			<0.000010	)	mg/L		0.00001	09-MAY-19
Tin (Sn)-Dissolved			<0.00010		mg/L		0.0001	09-MAY-19
Titanium (Ti)-Dissolved			<0.00030		mg/L		0.0003	09-MAY-19
Uranium (U)-Dissolved			<0.000010	)	mg/L		0.00001	09-MAY-19
Vanadium (V)-Dissolved			<0.00050		mg/L		0.0005	09-MAY-19
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	09-MAY-19
MET-T-CCMS-VA	Water							
Batch R4629586								
WG3045013-2 LCS								
Aluminum (Al)-Total			99.4		%		80-120	09-MAY-19
Antimony (Sb)-Total			99.3		%		80-120	09-MAY-19
Arsenic (As)-Total			96.1		%		80-120	09-MAY-19
Barium (Ba)-Total			98.2		%		80-120	09-MAY-19
Bismuth (Bi)-Total			93.2		%		80-120	09-MAY-19
Boron (B)-Total			99.98		%		80-120	09-MAY-19
Cadmium (Cd)-Total			96.3		%		80-120	09-MAY-19
Calcium (Ca)-Total			98.2		%		80-120	09-MAY-19
Chromium (Cr)-Total			99.2		%		80-120	09-MAY-19
Cobalt (Co)-Total			97.2		%		80-120	09-MAY-19



Workorder: L2268822 Report Date: 16-MAY-19 Page 5 of 10

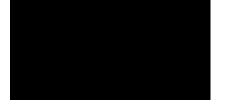
Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-VA	Water							
Batch R4629586								
WG3045013-2 LCS			07.0		0/			
Copper (Cu)-Total			97.3		%		80-120	09-MAY-19
Iron (Fe)-Total			93.9		%		80-120	09-MAY-19
Lead (Pb)-Total			94.8		%		80-120	09-MAY-19
Lithium (Li)-Total			97.8		%		80-120	09-MAY-19
Magnesium (Mg)-Total			99.5		%		80-120	09-MAY-19
Manganese (Mn)-Total			96.4		%		80-120	09-MAY-19
Molybdenum (Mo)-Total			98.8		%		80-120	09-MAY-19
Nickel (Ni)-Total			96.5		%		80-120	09-MAY-19
Potassium (K)-Total			97.7		%		80-120	09-MAY-19
Selenium (Se)-Total			97.5		%		80-120	09-MAY-19
Silicon (Si)-Total			99.5		%		80-120	09-MAY-19
Silver (Ag)-Total			95.9		%		80-120	09-MAY-19
Sodium (Na)-Total			101.7		%		80-120	09-MAY-19
Strontium (Sr)-Total			97.7		%		80-120	09-MAY-19
Thallium (TI)-Total			94.6		%		80-120	09-MAY-19
Tin (Sn)-Total			96.5		%		80-120	09-MAY-19
Titanium (Ti)-Total			93.8		%		80-120	09-MAY-19
Uranium (U)-Total			96.7		%		80-120	09-MAY-19
Vanadium (V)-Total			100.5		%		80-120	09-MAY-19
Zinc (Zn)-Total			102.4		%		80-120	09-MAY-19
WG3045013-1 MB								
Aluminum (AI)-Total			<0.0030		mg/L		0.003	09-MAY-19
Antimony (Sb)-Total			<0.00010		mg/L		0.0001	09-MAY-19
Arsenic (As)-Total			<0.00010		mg/L		0.0001	09-MAY-19
Barium (Ba)-Total			<0.00010		mg/L		0.0001	09-MAY-19
Bismuth (Bi)-Total			<0.00005	0	mg/L		0.00005	09-MAY-19
Boron (B)-Total			<0.010		mg/L		0.01	09-MAY-19
Cadmium (Cd)-Total			<0.00000	5C	mg/L		0.000005	09-MAY-19
Calcium (Ca)-Total			<0.050		mg/L		0.05	09-MAY-19
Chromium (Cr)-Total			<0.00010		mg/L		0.0001	09-MAY-19
Cobalt (Co)-Total			<0.00010		mg/L		0.0001	09-MAY-19
Copper (Cu)-Total			<0.00050		mg/L		0.0005	09-MAY-19
Iron (Fe)-Total			<0.010		mg/L		0.01	09-MAY-19
Lead (Pb)-Total			<0.00005	0	mg/L		0.00005	09-MAY-19



Workorder: L2268822

Report Date: 16-MAY-19 Page 6 of 10

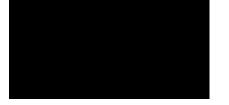
Test	Matrix	Reference	Result Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-VA	Water						
Batch R4629586							
WG3045013-1 MB Lithium (Li)-Total			<0.0010	mg/L		0.001	09-MAY-19
Magnesium (Mg)-Total			<0.0050	mg/L		0.005	09-MAY-19
Manganese (Mn)-Total			<0.00010	mg/L		0.0001	09-MAY-19
Molybdenum (Mo)-Total			<0.000050	mg/L		0.00005	09-MAY-19
Nickel (Ni)-Total			<0.00050	mg/L		0.0005	09-MAY-19
Potassium (K)-Total			<0.050	mg/L		0.05	09-MAY-19
Selenium (Se)-Total			<0.000050	mg/L		0.00005	09-MAY-19
Silicon (Si)-Total			<0.10	mg/L		0.1	09-MAY-19
Silver (Ag)-Total			<0.000010	mg/L		0.00001	09-MAY-19
Sodium (Na)-Total			<0.050	mg/L		0.05	09-MAY-19
Strontium (Sr)-Total			<0.00020	mg/L		0.0002	09-MAY-19
Thallium (TI)-Total			<0.000010	mg/L		0.00001	09-MAY-19
Tin (Sn)-Total			<0.00010	mg/L		0.0001	09-MAY-19
Titanium (Ti)-Total			<0.00030	mg/L		0.0003	09-MAY-19
Uranium (U)-Total			<0.000010	mg/L		0.00001	09-MAY-19
Vanadium (V)-Total			<0.00050	mg/L		0.0005	09-MAY-19
Zinc (Zn)-Total			<0.0030	mg/L		0.003	09-MAY-19
NH3-L-F-CL	Water						
Batch R4631441							
WG3047629-6 LCS Ammonia as N			103.7	%		85-115	12-MAY-19
WG3047629-5 MB							
Ammonia as N			<0.0050	mg/L		0.005	12-MAY-19
NO2-L-IC-N-CL	Water						
Batch R4628106							
WG3044326-14 LCS Nitrite (as N)			107.8	%		90-110	07-MAY-19
<b>WG3044326-13 MB</b> Nitrite (as N)			<0.0010	mg/L		0.001	07-MAY-19
NO3-L-IC-N-CL	Water						
Batch R4628106							
WG3044326-14 LCS Nitrate (as N)			103.1	%		90-110	07-MAY-19
<b>WG3044326-13 MB</b> Nitrate (as N)			<0.0050	mg/L		0.005	07-MAY-19



Workorder: L2268822

Report Date: 16-MAY-19 Page 7 of 10

Test N	/latrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
ORP-CL V	Nater							
Batch R4630830 WG3046888-1 CRM ORP		CL-ORP	227		mV		210-230	10-MAY-19
<b>WG3046888-2 DUP</b> ORP		<b>L2268822-1</b> 379	369	J	mV	9.4	15	10-MAY-19
P-T-L-COL-CL V	Nater							
Batch R4633090 WG3048451-26 LCS Phosphorus (P)-Total			101.4		%		80-120	13-MAY-19
WG3048451-25 MB Phosphorus (P)-Total			<0.0020		mg/L		0.002	13-MAY-19
PH-CL V	Nater							
Batch R4633250 WG3047929-11 LCS pH			7.01		рН		6.9-7.1	10-MAY-19
PO4-DO-L-COL-CL V	Nater							
Batch R4629111 WG3044829-14 LCS Orthophosphate-Dissolved	(as P)		99.5		%		80-120	08-MAY-19
WG3044829-13 MB Orthophosphate-Dissolved			<0.0010		mg/L		0.001	08-MAY-19
SO4-IC-N-CL V	Nater							
Batch R4628106 WG3044326-14 LCS								
Sulfate (SO4)			104.7		%		90-110	07-MAY-19
<b>WG3044326-13 MB</b> Sulfate (SO4)			<0.30		mg/L		0.3	07-MAY-19
SOLIDS-TDS-CL V	Nater							
Batch R4630819 WG3045301-11 LCS								
Total Dissolved Solids			95.2		%		85-115	09-MAY-19
WG3045301-10 MB Total Dissolved Solids			<10		mg/L		10	09-MAY-19
TKN-L-F-CL V	Nater							



Workorder: L2268822

Report Date: 16-MAY-19 Page 8 of 10

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Test .	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed			
TKN-L-F-CL	Water										
Batch R4634306 WG3048885-10 LCS Total Kjeldahl Nitrogen			93.1		%		75-125	13-MAY-19			
WG3048885-2 LCS Total Kjeldahl Nitrogen			93.2		%		75-125	13-MAY-19			
WG3048885-6 LCS Total Kjeldahl Nitrogen			93.9		%		75-125	13-MAY-19			
WG3048885-1 MB Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	13-MAY-19			
WG3048885-5 MB Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	13-MAY-19			
WG3048885-9 MB Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	13-MAY-19			
rss-l-cl	Water										
Batch R4630822 WG3045205-2 LCS Total Suspended Solids			91.2		%		85-115	09-MAY-19			
WG3045205-1 MB Total Suspended Solids			<1.0		mg/L		1	09-MAY-19			
URBIDITY-CL	Water										
Batch R4628909 WG3044789-11 LCS Turbidity			94.5		%		85-115	08-MAY-19			
WG3044789-10 MB Turbidity			<0.10		NTU		0.1	08-MAY-19			

Workorder: L2268822 Report Date: 16-MAY-19 Page 9 of 10

#### Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

#### **Sample Parameter Qualifier Definitions:**

Qualifier	Description
J	Duplicate results and limits are expressed in terms of absolute difference.
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

Workorder: L2268822 Report Date: 16-MAY-19 Page 10 of 10

#### **Hold Time Exceedances:**

	Sample						
ALS Product Description	ID	Sampling Date	Date Processed	Rec. HT	Actual HT	Units	Qualifier
Physical Tests							
Oxidation redution potentia	l by elect.						
	1	06-MAY-19 14:55	10-MAY-19 09:55	0.25	91	hours	EHTR-FM
рН							
	1	06-MAY-19 14:55	14-MAY-19 09:00	0.25	186	hours	EHTR-FM
amand 9 Ovalities Definities							

#### Legend & Qualifier Definitions:

EHTR-FM: Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended.

EHTR: Exceeded ALS recommended hold time prior to sample receipt.

EHTL: Exceeded ALS recommended hold time prior to analysis. Sample was received less than 24 hours prior to expiry.

EHT: Exceeded ALS recommended hold time prior to analysis.

Rec. HT: ALS recommended hold time (see units).

#### Notes\*:

Where actual sampling date is not provided to ALS, the date (& time) of receipt is used for calculation purposes. Where actual sampling time is not provided to ALS, the earlier of 12 noon on the sampling date or the time (& date) of receipt is used for calculation purposes. Samples for L2268822 were received on 07-MAY-19 09:10.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against predetermined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

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Email	Chris.Blurton@teck.com							Email	Lyudmyla.Sl	ivets@AL	.SGlobal.com		Em	ail 2:	teckcoal	@equiso	online.co	n		×
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TECK COAL LIMITED (LINE CREEK)

ATTN: Chris Blurton

PO BOX 2003

SPARWOOD BC VOB 2G0

Date Received: 24-MAY-19

Report Date: 04-JUN-19 15:43 (MT)

Version: FINAL

Client Phone: 250-425-3196

# Certificate of Analysis

Lab Work Order #: L2278988
Project P.O. #: VP000608129

Job Reference: LINE CREEK OPERATION
C of C Numbers: 20190523 DC GW

Legal Site Desc:



Lyudmyla Shvets, B.Sc. Account Manager

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L2278988 CONTD.... PAGE 2 of 16 Version: FINAL

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2278988-1 LC_PIZDC1404D_WG_Q2-2019_NP							
Sampled By: K.Campbell/D.Tymstra on 23-MAY-19 @	12:35						
	12.00						
Matrix: WG Miscellaneous Parameters							
	0.40		0.50	a/I		20 MAY 10	D4054074
Dissolved Organic Carbon	2.12		0.50	mg/L		29-MAY-19	R4651071
Total Kjeldahl Nitrogen	3.24		0.050	mg/L		30-MAY-19	R4651431
Total Organic Carbon	8.50		0.50	mg/L		29-MAY-19	R4651071
Dissolved Metals in Water							
Diss. Be (low) in Water by CRC ICPMS				//	07.141)/ 40	07.1411/40	
Beryllium (Be)-Dissolved	<0.020		0.020	ug/L	27-MAY-19	27-MAY-19	R4645515
Dissolved Metals Filtration Location	FIELD					27-MAY-19	R4644591
Diss. Mercury in Water by CVAAS or CVAFS	0.0000050		0.0000050	a:/I	20 MAY 40	00 MAY 40	D 40 47070
Mercury (Hg)-Dissolved	<0.0000050		0.0000050	mg/L	29-MAY-19	29-MAY-19	R4647372
Dissolved Mercury Filtration Location	FIELD					29-MAY-19	R4646871
Dissolved Metals in Water by CRC ICPMS Dissolved Metals Filtration Location	FIELD					27-MAY-19	R4644591
Aluminum (Al)-Dissolved			0.0020	ma/l	27-MAY-19	27-MAY-19 27-MAY-19	
Antimony (Sb)-Dissolved	<0.0030 <0.00010		0.0030 0.00010	mg/L mg/L	27-MAY-19	27-MAY-19	R4645515 R4645515
Arsenic (As)-Dissolved				_	27-MAY-19		
Barium (Ba)-Dissolved	0.00239 4.45		0.00010 0.00010	mg/L	27-MAY-19 27-MAY-19	27-MAY-19 27-MAY-19	R4645515 R4645515
Bismuth (Bi)-Dissolved	4.45 <0.00050		0.00010	mg/L mg/L	27-MAY-19	27-MAY-19	R4645515
Boron (B)-Dissolved	0.023		0.000030	mg/L	27-MAY-19	27-MAY-19	R4645515
Cadmium (Cd)-Dissolved	0.023		0.010	_	27-MAY-19	27-MAY-19	
Calcium (Ca)-Dissolved	61.8		0.0050	ug/L mg/L	27-MAY-19	27-MAY-19	R4645515
Chromium (Cr)-Dissolved	<0.00010		0.00010		27-MAY-19	27-MAY-19	R4645515
Cobalt (Co)-Dissolved	0.18		0.00010	mg/L ug/L	27-MAY-19	27-MAY-19	R4645515 R4645515
Copper (Cu)-Dissolved	<0.00050		0.00050	mg/L	27-MAY-19	27-MAY-19	R4645515
Iron (Fe)-Dissolved	1.94		0.00030	mg/L	27-MAY-19	27-MAY-19	R4645515
Lead (Pb)-Dissolved	<0.00050		0.00050	mg/L	27-MAY-19	27-MAY-19	R4645515
Lithium (Li)-Dissolved	0.725		0.000030	mg/L	27-MAY-19	27-MAY-19	R4645515
Magnesium (Mg)-Dissolved	44.2		0.0010	mg/L	27-MAY-19	27-MAY-19	R4645515
Manganese (Mn)-Dissolved	0.0187		0.00010	mg/L	27-MAY-19	27-MAY-19	R4645515
Molybdenum (Mo)-Dissolved	0.0107		0.00010	mg/L	27-MAY-19	27-MAY-19	R4645515
Nickel (Ni)-Dissolved	0.00083		0.00050	mg/L	27-MAY-19	27-MAY-19	R4645515
Potassium (K)-Dissolved	29.7		0.050	mg/L	27-MAY-19	27-MAY-19	R4645515
Selenium (Se)-Dissolved	<0.050		0.050	ug/L	27-MAY-19	27-MAY-19	R4645515
Silicon (Si)-Dissolved	2.66		0.050	mg/L	27-MAY-19	27-MAY-19	R4645515
Silver (Ag)-Dissolved	<0.00010		0.00010	mg/L	27-MAY-19	27-MAY-19	R4645515
Sodium (Na)-Dissolved	42.3		0.050	mg/L	27-MAY-19	27-MAY-19	R4645515
Strontium (Sr)-Dissolved	0.263		0.00020	mg/L	27-MAY-19	27-MAY-19	R4645515
Thallium (TI)-Dissolved	<0.00010		0.00020	mg/L	27-MAY-19	27-MAY-19	R4645515
Tin (Sn)-Dissolved	<0.00010		0.000010	mg/L	27-MAY-19	27-MAY-19	R4645515
Titanium (Ti)-Dissolved	<0.010		0.010	mg/L	27-MAY-19	27-MAY-19	R4645515
Uranium (U)-Dissolved	0.000066		0.00010	mg/L	27-MAY-19	27-MAY-19	R4645515
Vanadium (V)-Dissolved	<0.00050		0.00050	mg/L	27-MAY-19	27-MAY-19	R4645515
Zinc (Zn)-Dissolved	0.0034		0.0000	mg/L	27-MAY-19	27-MAY-19	R4645515
Hardness	0.0004		0.0010	9/ ⊏			114040010
Hardness (as CaCO3)	336		0.50	mg/L		28-MAY-19	
Total Metals in Water			5.55	⊎, ⊑		==	
Total Be (Low) in Water by CRC ICPMS							
Beryllium (Be)-Total	0.105		0.020	ug/L		27-MAY-19	R4645127
Total Metals in Water by CRC ICPMS				J			
Aluminum (Al)-Total	0.618		0.0030	mg/L		27-MAY-19	R4645127
Antimony (Sb)-Total	0.00038		0.00010	mg/L		27-MAY-19	R4645127
Arsenic (As)-Total	0.00403		0.00010	mg/L		27-MAY-19	R4645127
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<sup>\*</sup> Refer to Referenced Information for Qualifiers (if any) and Methodology.

L2278988 CONTD.... PAGE 3 of 16 Version: FINAL

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2278988-1 LC_PIZDC1404D_WG_Q2-2019_NP							
	12:25						
. ,	12.33						
Matrix: WG							
Total Metals in Water by CRC ICPMS Barium (Ba)-Total	4.66		0.00010	mg/L		27-MAY-19	R4645127
Bismuth (Bi)-Total	<0.00050		0.00010	mg/L		27-MAY-19	R4645127
Boron (B)-Total	0.024		0.010	mg/L		27-MAY-19	R4645127
Cadmium (Cd)-Total	0.259		0.0050	ug/L		27-MAY-19	R4645127
Calcium (Ca)-Total	62.2		0.050	mg/L		27-MAY-19	R4645127
Chromium (Cr)-Total	0.00242		0.00010	mg/L		27-MAY-19	R4645127
Cobalt (Co)-Total	1.06		0.10	ug/L		27-MAY-19	R4645127
Copper (Cu)-Total	0.0202		0.00050	mg/L		27-MAY-19	R4645127
Iron (Fe)-Total	5.75		0.010	mg/L		27-MAY-19	R4645127
Lead (Pb)-Total	0.00333		0.000050	mg/L		27-MAY-19	R4645127
Lithium (Li)-Total	0.698		0.0010	mg/L		27-MAY-19	R4645127
Magnesium (Mg)-Total	43.5		0.10	mg/L		27-MAY-19	R4645127
Manganese (Mn)-Total	0.0500		0.00010	mg/L		27-MAY-19	R4645127
Molybdenum (Mo)-Total	0.0228		0.000050	mg/L		27-MAY-19	R4645127
Nickel (Ni)-Total	0.00481		0.00050	mg/L		27-MAY-19	R4645127
Potassium (K)-Total	26.6		0.050	mg/L		27-MAY-19	R4645127
Selenium (Se)-Total	<0.15	DLB	0.15	ug/L		27-MAY-19	R4645127
Silicon (Si)-Total	3.95		0.10	mg/L		27-MAY-19	R4645127
Silver (Ag)-Total	0.000052		0.000010	mg/L		27-MAY-19	R4645127
Sodium (Na)-Total	43.7		0.050	mg/L		27-MAY-19	R4645127
Strontium (Sr)-Total	0.263		0.00020	mg/L		27-MAY-19	R4645127
Thallium (TI)-Total	0.000039		0.000010	mg/L		27-MAY-19	R4645127
Tin (Sn)-Total Titanium (Ti)-Total	0.00040		0.00010	mg/L		27-MAY-19	R4645127
Uranium (U)-Total	0.010 0.000237		0.010 0.000010	mg/L		27-MAY-19 27-MAY-19	R4645127
Vanadium (V)-Total	0.000237		0.00050	mg/L mg/L		27-MAY-19	R4645127 R4645127
Zinc (Zn)-Total	0.00530		0.00030	mg/L		27-MAY-19	R4645127
Routine for Teck Coal	0.0454		0.0030	IIIg/L		27-1017-19	K4045127
Acidity by Automatic Titration							
Acidity (as CaCO3)	2.5		1.0	mg/L		30-MAY-19	R4653065
Alkalinity (Species) by Manual Titration							
Alkalinity, Bicarbonate (as CaCO3)	444		1.0	mg/L		30-MAY-19	R4653055
Alkalinity, Carbonate (as CaCO3)	5.4		1.0	mg/L		30-MAY-19	R4653055
Alkalinity, Hydroxide (as CaCO3)	<1.0		1.0	mg/L		30-MAY-19	R4653055
Alkalinity, Total (as CaCO3)	449		1.0	mg/L		30-MAY-19	R4653055
Ammonia, Total (as N)							
Ammonia as N	2.61	DLHC	0.050	mg/L		01-JUN-19	R4653519
Bromide in Water by IC (Low Level)				,,			<u>-</u>
Bromide (Br)	<0.050		0.050	mg/L		24-MAY-19	R4644755
Chloride in Water by IC Chloride (Cl)	0.50		0.50	po a /I		24 144 1/40	D4644755
\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \	<0.50		0.50	mg/L		24-MAY-19	R4644755
Electrical Conductivity (EC) Conductivity (@ 25C)	755		2.0	uS/cm		30-MAY-19	R4653055
Fluoride in Water by IC	7.55		2.0	uo/ciii		30-WA1-19	114000000
Fluoride (F)	0.220		0.020	mg/L		24-MAY-19	R4644755
Ion Balance Calculation	3.220		0.020	··· · · · · · ·			
Ion Balance	105		-100	%		31-MAY-19	
Ion Balance Calculation							
Cation - Anion Balance	2.4			%		31-MAY-19	
Anion Sum	8.99			meq/L		31-MAY-19	
Cation Sum	9.43			meq/L		31-MAY-19	
Nitrate in Water by IC (Low Level)							

<sup>\*</sup> Refer to Referenced Information for Qualifiers (if any) and Methodology.

L2278988 CONTD.... PAGE 4 of 16 Version: FINAL

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2278988-1 LC_PIZDC1404D_WG_Q2-2019_NP							
Sampled By: K.Campbell/D.Tymstra on 23-MAY-19 @	12:35						
Matrix: WG	12.55						
Nitrate in Water by IC (Low Level) Nitrate (as N)	<0.0050		0.0050	mg/L		24-MAY-19	R4644755
Nitrite in Water by IC (Low Level) Nitrite (as N)	<0.0010		0.0010	mg/L		24-MAY-19	R4644755
Orthophosphate-Dissolved (as P) Orthophosphate-Dissolved (as P)	<0.0010		0.0010	mg/L		25-MAY-19	R4644179
Oxidation redution potential by elect. ORP	404		-1000	mV		29-MAY-19	R4648826
Phosphorus (P)-Total		DILIC					
Phosphorus (P)-Total  Sulfate in Water by IC	0.163	DLHC	0.010	mg/L		30-MAY-19	R4651380
Sulfate (SO4) Total Dissolved Solids	<0.30		0.30	mg/L		24-MAY-19	R4644755
Total Dissolved Solids	403	DLHC	20	mg/L		29-MAY-19	R4651218
<b>Total Suspended Solids</b> Total Suspended Solids	46.7		1.0	mg/L		30-MAY-19	R4652806
<b>Turbidity</b> Turbidity	58.5		0.10	NTU		24-MAY-19	R4643908
<b>pH</b> pH	8.34		0.10	рН		30-MAY-19	R4653055
L2278988-2 LC_PIZDC1404S_WG_Q2-2019_NP							
Sampled By: K.Campbell/D.Tymstra on 23-MAY-19 @	11:20						
Matrix: WG							
Miscellaneous Parameters							
Dissolved Organic Carbon	2.12		0.50	mg/L		30-MAY-19	R4651987
Total Kjeldahl Nitrogen	<0.050		0.050	mg/L		31-MAY-19	R4651431
Total Organic Carbon	2.41		0.50	mg/L		30-MAY-19	R4651987
Dissolved Metals in Water				, and			
Diss. Be (low) in Water by CRC ICPMS Beryllium (Be)-Dissolved	<0.020		0.020	ug/L	27-MAY-19	27-MAY-19	R4645515
Dissolved Metals Filtration Location	FIELD			J		27-MAY-19	R4644591
Diss. Mercury in Water by CVAAS or CVAFS Mercury (Hg)-Dissolved	<0.000050		0.0000050	mg/L	29-MAY-19	29-MAY-19	R4647372
Dissolved Mercury Filtration Location	FIELD		0.0000000	1119/ =	20 1017(1-10	29-MAY-19	R4646871
Dissolved Metals in Water by CRC ICPMS	11225					20 10.711	114040071
Dissolved Metals Filtration Location	FIELD					27-MAY-19	R4644591
Aluminum (AI)-Dissolved	<0.0030		0.0030	mg/L	27-MAY-19	27-MAY-19	R4645515
Antimony (Sb)-Dissolved	<0.00010		0.00010	mg/L	27-MAY-19	27-MAY-19	R4645515
Arsenic (As)-Dissolved	0.00187		0.00010	mg/L	27-MAY-19	27-MAY-19	R4645515
Barium (Ba)-Dissolved	0.240		0.00010	mg/L	27-MAY-19	27-MAY-19	R4645515
Bismuth (Bi)-Dissolved	<0.000050		0.000050	mg/L	27-MAY-19	27-MAY-19	R4645515
Boron (B)-Dissolved	<0.010		0.010	mg/L	27-MAY-19	27-MAY-19	R4645515
Cadmium (Cd)-Dissolved	<0.0050		0.0050	ug/L	27-MAY-19	27-MAY-19	R4645515
Calcium (Ca)-Dissolved	51.5		0.050	mg/L	27-MAY-19	27-MAY-19	R4645515
Chromium (Cr)-Dissolved	<0.00010		0.00010	mg/L	27-MAY-19	27-MAY-19	R4645515
Cobalt (Co)-Dissolved	0.30		0.10	ug/L	27-MAY-19	27-MAY-19	R4645515
Copper (Cu)-Dissolved	<0.00050		0.00050	mg/L	27-MAY-19	27-MAY-19	R4645515
Iron (Fe)-Dissolved	0.919		0.010	mg/L	27-MAY-19	27-MAY-19	R4645515
Lead (Pb)-Dissolved	<0.000050		0.000050	mg/L	27-MAY-19	27-MAY-19	R4645515
Lithium (Li)-Dissolved	0.0053		0.0010	mg/L	27-MAY-19	27-MAY-19	R4645515
Magnesium (Mg)-Dissolved	19.5		0.10	mg/L	27-MAY-19	27-MAY-19	R4645515
Manganese (Mn)-Dissolved	0.0294		0.00010	mg/L	27-MAY-19	27-MAY-19	R4645515

<sup>\*</sup> Refer to Referenced Information for Qualifiers (if any) and Methodology.

L2278988 CONTD.... PAGE 5 of 16 Version: FINAL

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
1 2270000 2							
L2278988-2 LC_PIZDC1404S_WG_Q2-2019_NP	11.20						
Sampled By: K.Campbell/D.Tymstra on 23-MAY-19 @	11:20						
Matrix: WG							
Dissolved Metals in Water by CRC ICPMS				,,			
Molybdenum (Mo)-Dissolved	0.00342		0.000050	mg/L	27-MAY-19	27-MAY-19	R4645515
Nickel (Ni)-Dissolved	0.00132		0.00050	mg/L	27-MAY-19	27-MAY-19	R4645515
Potassium (K)-Dissolved	1.62		0.050	mg/L	27-MAY-19	27-MAY-19	R4645515
Selenium (Se)-Dissolved Silicon (Si)-Dissolved	<0.050		0.050	ug/L	27-MAY-19	27-MAY-19 27-MAY-19	R4645515
Silver (Ag)-Dissolved	3.35 <0.000010		0.050	mg/L	27-MAY-19 27-MAY-19	27-MAY-19	R4645515 R4645515
Sodium (Na)-Dissolved	1.02		0.000010 0.050	mg/L mg/L	27-MAY-19	27-MAY-19	R4645515
Strontium (Sr)-Dissolved	0.0474		0.00020	mg/L	27-MAY-19	27-MAY-19	R4645515
Thallium (TI)-Dissolved	<0.00010		0.00020	mg/L	27-MAY-19	27-MAY-19	R4645515
Tin (Sn)-Dissolved	<0.00010		0.00010	mg/L	27-MAY-19	27-MAY-19	R4645515
Titanium (Ti)-Dissolved	<0.010		0.00010	mg/L	27-MAY-19	27-MAY-19	R4645515
Uranium (U)-Dissolved	0.000589		0.00010	mg/L	27-MAY-19	27-MAY-19	R4645515
Vanadium (V)-Dissolved	<0.00050		0.00050	mg/L	27-MAY-19	27-MAY-19	R4645515
Zinc (Zn)-Dissolved	<0.0010		0.0010	mg/L	27-MAY-19	27-MAY-19	R4645515
Hardness				J			
Hardness (as CaCO3)	209		0.50	mg/L		28-MAY-19	
Total Metals in Water							
Total Be (Low) in Water by CRC ICPMS							
Beryllium (Be)-Total	<0.020		0.020	ug/L		27-MAY-19	R4645127
Total Metals in Water by CRC ICPMS							
Aluminum (Al)-Total	0.0081		0.0030	mg/L		27-MAY-19	R4645127
Antimony (Sb)-Total	<0.00010		0.00010	mg/L		27-MAY-19	R4645127
Arsenic (As)-Total	0.00216		0.00010	mg/L		27-MAY-19	R4645127
Barium (Ba)-Total	0.237		0.00010	mg/L		27-MAY-19	R4645127
Bismuth (Bi)-Total	<0.000050		0.000050	mg/L		27-MAY-19	R4645127
Boron (B)-Total	<0.010		0.010	mg/L		27-MAY-19	R4645127
Cadmium (Cd)-Total	<0.0050		0.0050	ug/L		27-MAY-19	R4645127
Calcium (Ca)-Total Chromium (Cr)-Total	50.6		0.050	mg/L		27-MAY-19 27-MAY-19	R4645127
Cobalt (Co)-Total	<0.00010 0.38		0.00010 0.10	mg/L ug/L		27-MAY-19	R4645127 R4645127
Copper (Cu)-Total	<0.00050		0.00050	mg/L		27-MAY-19	R4645127
Iron (Fe)-Total	1.20		0.00030	mg/L		27-MAY-19	R4645127
Lead (Pb)-Total	0.000076		0.00050	mg/L		27-MAY-19	R4645127
Lithium (Li)-Total	0.0051		0.0010	mg/L		27-MAY-19	R4645127
Magnesium (Mg)-Total	18.7		0.10	mg/L		27-MAY-19	R4645127
Manganese (Mn)-Total	0.0335		0.00010	mg/L		27-MAY-19	R4645127
Molybdenum (Mo)-Total	0.00349		0.000050	mg/L		27-MAY-19	R4645127
Nickel (Ni)-Total	0.00134		0.00050	mg/L		27-MAY-19	R4645127
Potassium (K)-Total	1.49		0.050	mg/L		27-MAY-19	R4645127
Selenium (Se)-Total	<0.050		0.050	ug/L		27-MAY-19	R4645127
Silicon (Si)-Total	3.57		0.10	mg/L		27-MAY-19	R4645127
Silver (Ag)-Total	0.000012		0.000010	mg/L		27-MAY-19	R4645127
Sodium (Na)-Total	1.08		0.050	mg/L		27-MAY-19	R4645127
Strontium (Sr)-Total	0.0470		0.00020	mg/L		27-MAY-19	R4645127
Thallium (TI)-Total	<0.000010		0.000010	mg/L		27-MAY-19	R4645127
Tin (Sn)-Total	<0.00010		0.00010	mg/L		27-MAY-19	R4645127
Titanium (Ti)-Total	<0.010		0.010	mg/L		27-MAY-19	R4645127
Uranium (U)-Total	0.000616		0.000010	mg/L		27-MAY-19	R4645127
Vanadium (V)-Total	<0.00050		0.00050	mg/L		27-MAY-19	R4645127
Zinc (Zn)-Total	<0.0030		0.0030	mg/L		27-MAY-19	R4645127
Routine for Teck Coal							
Acidity by Automatic Titration	l						

<sup>\*</sup> Refer to Referenced Information for Qualifiers (if any) and Methodology.

L2278988 CONTD.... PAGE 6 of 16 Version: FINAL

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2278988-2 LC PIZDC1404S WG Q2-2019 NP							
Sampled By: K.Campbell/D.Tymstra on 23-MAY-19 @	11.20						
Matrix: WG	11.20						
Acidity by Automatic Titration							
Acidity by Automatic Titration Acidity (as CaCO3)	1.5		1.0	mg/L		30-MAY-19	R4653065
Alkalinity (Species) by Manual Titration							
Alkalinity, Bicarbonate (as CaCO3)	206		1.0	mg/L		30-MAY-19	R4653055
Alkalinity, Carbonate (as CaCO3)	4.2		1.0	mg/L		30-MAY-19	R4653055
Alkalinity, Hydroxide (as CaCO3)	<1.0		1.0	mg/L		30-MAY-19	R4653055
Alkalinity, Total (as CaCO3)	211		1.0	mg/L		30-MAY-19	R4653055
Ammonia, Total (as N)	0.0050		0.0050			04 11 15 1 40	D 4050540
Ammonia as N	<0.0050		0.0050	mg/L		01-JUN-19	R4653519
Bromide in Water by IC (Low Level) Bromide (Br)	<0.050		0.050	mg/L		24-MAY-19	R4644755
Chloride in Water by IC	<b>\0.030</b>		0.000	mg/L		27 W/\ 1-13	114044733
Chloride (Cl)	<0.50		0.50	mg/L		24-MAY-19	R4644755
Electrical Conductivity (EC)							
Conductivity (@ 25C)	370		2.0	uS/cm		30-MAY-19	R4653055
Fluoride in Water by IC							
Fluoride (F)	0.145		0.020	mg/L		24-MAY-19	R4644755
Ion Balance Calculation Ion Balance	00.0		400	0/		24 144 1/40	
	99.8		-100	%		31-MAY-19	
Ion Balance Calculation Cation - Anion Balance	-0.1			%		31-MAY-19	
Anion Sum	4.32			meg/L		31-MAY-19	
Cation Sum	4.31			meq/L		31-MAY-19	
Nitrate in Water by IC (Low Level)				- 1			
Nitrate (as N)	<0.0050		0.0050	mg/L		24-MAY-19	R4644755
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	<0.0010		0.0010	mg/L		24-MAY-19	R4644755
Orthophosphate-Dissolved (as P) Orthophosphate-Dissolved (as P)	0.0040		0.0040			25 MAY 10	D4044470
Oxidation redution potential by elect.	<0.0010		0.0010	mg/L		25-MAY-19	R4644179
ORP	396		-1000	mV		29-MAY-19	R4648826
Phosphorus (P)-Total							
Phosphorus (P)-Total	0.0068		0.0020	mg/L		30-MAY-19	R4651380
Sulfate in Water by IC							
Sulfate (SO4)	4.80		0.30	mg/L		24-MAY-19	R4644755
Total Dissolved Solids	400	DLHC	00	n		00 MAN/ 40	D 4054343
Total Dissolved Solids  Total Suspended Solids	182	DLUC	20	mg/L		29-MAY-19	R4651218
Total Suspended Solids Total Suspended Solids	2.6		1.0	mg/L		30-MAY-19	R4652806
Turbidity			***	<i>3</i> –			
Turbidity	10.3		0.10	NTU		24-MAY-19	R4643908
рН							
pH	8.41		0.10	рН		30-MAY-19	R4653055
L2278988-3 WG_Q2-2019_RD1							
Sampled By: K.Campbell/D.Tymstra on 23-MAY-19 @	14:00						
Matrix: WG							
Miscellaneous Parameters			0.50	"		00 MAN/ 45	
Hardness (as CaCO3)	<0.50		0.50	mg/L		30-MAY-19	D 4054 151
Total Kjeldahl Nitrogen	<0.050		0.050	mg/L		30-MAY-19	R4651431
Total Organic Carbon	<0.50		0.50	mg/L		29-MAY-19	R4651071
Total Re (Low) in Water by CPC ICPMS							
Total Be (Low) in Water by CRC ICPMS Beryllium (Be)-Total	<0.020		0.020	ug/L		27-MAY-19	R4645127
	10.020	-	0.020	~9/ =			

<sup>\*</sup> Refer to Referenced Information for Qualifiers (if any) and Methodology.

L2278988 CONTD.... PAGE 7 of 16 Version: FINAL

L2278988-3 WG_Q2-2019_RD1						
L2210300-3 WG_Q2-2018_RD1						
Sampled By: K.Campbell/D.Tymstra on 23-MAY-19 @	14:00					
Matrix: WG	14.00					
Total Mercury in Water by CVAAS or CVAFS Mercury (Hg)-Total	<0.000050		0.0000050	mg/L	29-MAY-19	R4647372
Total Metals in Water by CRC ICPMS						
Aluminum (Al)-Total	< 0.0030		0.0030	mg/L	27-MAY-19	R4645127
Antimony (Sb)-Total	<0.00010		0.00010	mg/L	27-MAY-19	R4645127
Arsenic (As)-Total	<0.00010		0.00010	mg/L	27-MAY-19	R4645127
Barium (Ba)-Total	<0.00010		0.00010	mg/L	27-MAY-19	R4645127
Bismuth (Bi)-Total	<0.000050		0.000050	mg/L	27-MAY-19	R4645127
Boron (B)-Total	<0.010		0.010	mg/L	27-MAY-19	R4645127
Cadmium (Cd)-Total Calcium (Ca)-Total	<0.0050		0.0050	ug/L	27-MAY-19	R4645127
Chromium (Cr)-Total	<0.050 <0.00010		0.050	mg/L	27-MAY-19 27-MAY-19	R4645127
Cobalt (Co)-Total	<0.00010 <0.10		0.00010	mg/L ug/L	27-MAY-19	R4645127 R4645127
Copper (Cu)-Total	<0.10		0.00050	mg/L	27-MAY-19	R4645127
Iron (Fe)-Total	<0.00030		0.00030	mg/L	27-MAY-19	R4645127
Lead (Pb)-Total	<0.00050		0.000050	mg/L	27-MAY-19	R4645127
Lithium (Li)-Total	<0.0010		0.0010	mg/L	27-MAY-19	R4645127
Magnesium (Mg)-Total	<0.10		0.10	mg/L	27-MAY-19	R4645127
Manganese (Mn)-Total	<0.00010		0.00010	mg/L	27-MAY-19	R4645127
Molybdenum (Mo)-Total	< 0.000050		0.000050	mg/L	27-MAY-19	R4645127
Nickel (Ni)-Total	< 0.00050		0.00050	mg/L	27-MAY-19	R4645127
Potassium (K)-Total	< 0.050		0.050	mg/L	27-MAY-19	R4645127
Selenium (Se)-Total	< 0.050		0.050	ug/L	27-MAY-19	R4645127
Silicon (Si)-Total	<0.10		0.10	mg/L	27-MAY-19	R4645127
Silver (Ag)-Total	<0.000010		0.000010	mg/L	27-MAY-19	R4645127
Sodium (Na)-Total	< 0.050		0.050	mg/L	27-MAY-19	R4645127
Strontium (Sr)-Total	<0.00020		0.00020	mg/L	27-MAY-19	R4645127
Thallium (TI)-Total	<0.000010		0.000010	mg/L	27-MAY-19	R4645127
Tin (Sn)-Total	<0.00010		0.00010	mg/L	27-MAY-19	R4645127
Titanium (Ti)-Total	<0.010		0.010	mg/L	27-MAY-19	R4645127
Uranium (U)-Total	<0.000010		0.000010	mg/L	27-MAY-19	R4645127
Vanadium (V)-Total	<0.00050		0.00050	mg/L	27-MAY-19	R4645127
Zinc (Zn)-Total  Routine for Teck Coal	<0.0030		0.0030	mg/L	27-MAY-19	R4645127
Acidity by Automatic Titration Acidity (as CaCO3)	1.2		1.0	mg/L	30-MAY-19	R4653065
Alkalinity (Species) by Manual Titration	· · <u>-</u>			·		
Alkalinity, Bicarbonate (as CaCO3)	<1.0		1.0	mg/L	30-MAY-19	R4653055
Alkalinity, Carbonate (as CaCO3)	<1.0		1.0	mg/L	30-MAY-19	R4653055
Alkalinity, Hydroxide (as CaCO3)	<1.0		1.0	mg/L	30-MAY-19	R4653055
Alkalinity, Total (as CaCO3)	<1.0		1.0	mg/L	30-MAY-19	R4653055
Ammonia, Total (as N) Ammonia as N	0.0004	RRV	0.0050	a/I	04       10	D4050540
	0.0334	KKV	0.0050	mg/L	01-JUN-19	R4653519
Bromide in Water by IC (Low Level) Bromide (Br)	<0.050		0.050	mg/L	24-MAY-19	R4644755
Chloride in Water by IC				-		
Chloride (CI)	<0.50		0.50	mg/L	24-MAY-19	R4644755
Dissolved Metals in Water by CRC ICPMS Dissolved Metals Filtration Location	LAB				29-MAY-19	R4648570
Calcium (Ca)-Dissolved	<0.050		0.050	mg/L	29-MAY-19	R4648827
Magnesium (Mg)-Dissolved	<0.050		0.050	mg/L	29-MAY-19	R4648827
Potassium (K)-Dissolved	<0.050		0.050	mg/L	29-MAY-19	R4648827
Sodium (Na)-Dissolved	<0.050		0.050	mg/L	29-MAY-19	R4648827

<sup>\*</sup> Refer to Referenced Information for Qualifiers (if any) and Methodology.

L2278988 CONTD.... PAGE 8 of 16 Version: FINAL

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2278988-3 WG_Q2-2019_RD1							
Sampled By: K.Campbell/D.Tymstra on 23-MAY-19 @	14:00						
Matrix: WG							
Electrical Conductivity (EC)							
Conductivity (@ 25C)	<2.0		2.0	uS/cm		30-MAY-19	R4653055
Fluoride in Water by IC							
Fluoride (F)	<0.020		0.020	mg/L		24-MAY-19	R4644755
Ion Balance Calculation Ion Balance	0.0		-100	%		31-MAY-19	
Ion Balance Calculation	0.0		-100	/0		31-10141-19	
Cation - Anion Balance	0.0			%		31-MAY-19	
Anion Sum	<0.10			meq/L		31-MAY-19	
Cation Sum	<0.10			meq/L		31-MAY-19	
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	<0.0050		0.0050	mg/L		24-MAY-19	R4644755
Nitrite in Water by IC (Low Level) Nitrite (as N)	<0.0010		0.0010	mg/L		24-MAY-19	R4644755
Orthophosphate-Dissolved (as P)	\0.0010		0.0010	g/∟		∠→ WIC(1-13	117077100
Orthophosphate-Dissolved (as P)	<0.0010		0.0010	mg/L		25-MAY-19	R4644179
Oxidation redution potential by elect.				•			
ORP	407		-1000	mV		29-MAY-19	R4648826
Phosphorus (P)-Total						00.1411/.40	B 40-4000
Phosphorus (P)-Total	<0.0020		0.0020	mg/L		30-MAY-19	R4651380
Sulfate in Water by IC Sulfate (SO4)	<0.30		0.30	mg/L		24-MAY-19	R4644755
Total Dissolved Solids	10.00		0.00	9. =			
Total Dissolved Solids	<10		10	mg/L		29-MAY-19	R4651218
Total Suspended Solids							
Total Suspended Solids	<1.0		1.0	mg/L		30-MAY-19	R4652806
<b>Turbidity</b> Turbidity	<0.10		0.10	NTU		24-MAY-19	R4643908
pH	40.10		0.10	1110		2111111111	114040000
pH	5.35		0.10	рН		30-MAY-19	R4653055
L2278988-4 WG_Q2-2019_CC1							
Sampled By: K.Campbell/D.Tymstra on 23-MAY-19 @	11:25						
Matrix: WG							
Miscellaneous Parameters							
Dissolved Organic Carbon	2.74		0.50	mg/L		29-MAY-19	R4651071
Total Kjeldahl Nitrogen	<0.050		0.050	mg/L		30-MAY-19	R4651431
Total Organic Carbon	2.65		0.50	mg/L		29-MAY-19	R4651071
Dissolved Metals in Water							
Diss. Be (Iow) in Water by CRC ICPMS Beryllium (Be)-Dissolved	<0.020		0.020	ug/L	27-MAY-19	27-MAY-19	R4645515
Dissolved Metals Filtration Location	FIELD		3.320	g, <b>-</b> -		27-MAY-19	R4644591
Diss. Mercury in Water by CVAAS or CVAFS							
Mercury (Hg)-Dissolved	<0.000050		0.0000050	mg/L	29-MAY-19	29-MAY-19	R4647372
Dissolved Mercury Filtration Location	FIELD					29-MAY-19	R4646871
Dissolved Metals in Water by CRC ICPMS Dissolved Metals Filtration Location	FIELD					27-MAY-19	R4644591
Aluminum (Al)-Dissolved	<0.0030		0.0030	mg/L	27-MAY-19	27-MAY-19	R4645515
Antimony (Sb)-Dissolved	<0.00010		0.0030	mg/L	27-MAY-19	27-MAY-19	R4645515
Arsenic (As)-Dissolved	0.00188		0.00010	mg/L	27-MAY-19	27-MAY-19	R4645515
Barium (Ba)-Dissolved	0.233		0.00010	mg/L	27-MAY-19	27-MAY-19	R4645515
Bismuth (Bi)-Dissolved	<0.000050		0.000050	mg/L	27-MAY-19	27-MAY-19	R4645515
Boron (B)-Dissolved	<0.010		0.010	mg/L	27-MAY-19	27-MAY-19	R4645515

<sup>\*</sup> Refer to Referenced Information for Qualifiers (if any) and Methodology.

L2278988 CONTD.... PAGE 9 of 16 Version: FINAL

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2278988-4 WG_Q2-2019_CC1							
Sampled By: K.Campbell/D.Tymstra on 23-MAY-19 @	11.25						
Matrix: WG	11.20						
Dissolved Metals in Water by CRC ICPMS Cadmium (Cd)-Dissolved	<0.0050		0.0050	ug/L	27-MAY-19	27-MAY-19	R4645515
Calcium (Ca)-Dissolved	51.4		0.050	mg/L	27-MAY-19	27-MAY-19	R4645515
Chromium (Cr)-Dissolved	<0.00010		0.00010	mg/L	27-MAY-19	27-MAY-19	R4645515
Cobalt (Co)-Dissolved	0.30		0.10	ug/L	27-MAY-19	27-MAY-19	R4645515
Copper (Cu)-Dissolved	<0.00050		0.00050	mg/L	27-MAY-19	27-MAY-19	R4645515
Iron (Fe)-Dissolved	0.905		0.010	mg/L	27-MAY-19	27-MAY-19	R4645515
Lead (Pb)-Dissolved	<0.000050		0.000050	mg/L	27-MAY-19	27-MAY-19	R4645515
Lithium (Li)-Dissolved	0.0052		0.0010	mg/L	27-MAY-19	27-MAY-19	R4645515
Magnesium (Mg)-Dissolved	18.9		0.10	mg/L	27-MAY-19	27-MAY-19	R4645515
Manganese (Mn)-Dissolved	0.0289		0.00010	mg/L	27-MAY-19	27-MAY-19	R4645515
Molybdenum (Mo)-Dissolved	0.00322		0.000050	mg/L	27-MAY-19	27-MAY-19	R4645515
Nickel (Ni)-Dissolved	0.00126		0.00050	mg/L	27-MAY-19	27-MAY-19	R4645515
Potassium (K)-Dissolved	1.59		0.050	mg/L	27-MAY-19	27-MAY-19	R4645515
Selenium (Se)-Dissolved	<0.050		0.050	ug/L	27-MAY-19	27-MAY-19	R4645515
Silicon (Si)-Dissolved	3.33		0.050	mg/L	27-MAY-19	27-MAY-19	R4645515
Silver (Ag)-Dissolved	<0.000010		0.000010	mg/L	27-MAY-19	27-MAY-19	R4645515
Sodium (Na)-Dissolved	1.00		0.050	mg/L	27-MAY-19	27-MAY-19	R4645515
Strontium (Sr)-Dissolved Thallium (TI)-Dissolved	0.0482		0.00020	mg/L	27-MAY-19	27-MAY-19	R4645515
Tin (Sn)-Dissolved	<0.00010		0.000010	mg/L	27-MAY-19 27-MAY-19	27-MAY-19 27-MAY-19	R4645515
Titanium (Ti)-Dissolved	<0.00010 <0.010		0.00010 0.010	mg/L mg/L	27-MAY-19	27-MAY-19	R4645515 R4645515
Uranium (U)-Dissolved	0.000585		0.010	mg/L	27-MAY-19	27-MAY-19	R4645515
Vanadium (V)-Dissolved	<0.00050		0.00050	mg/L	27-MAY-19	27-MAY-19	R4645515
Zinc (Zn)-Dissolved	<0.0010		0.00030	mg/L	27-MAY-19	27-MAY-19	R4645515
Hardness	10.0010		0.0010	9/ =			111010010
Hardness (as CaCO3)	206		0.50	mg/L		28-MAY-19	
Total Metals in Water				J			
Total Be (Low) in Water by CRC ICPMS							
Beryllium (Be)-Total	<0.020		0.020	ug/L		27-MAY-19	R4645127
Total Metals in Water by CRC ICPMS							
Aluminum (AI)-Total	0.0070		0.0030	mg/L		27-MAY-19	R4645127
Antimony (Sb)-Total	<0.00010		0.00010	mg/L		27-MAY-19	R4645127
Arsenic (As)-Total	0.00214		0.00010	mg/L		27-MAY-19	R4645127
Barium (Ba)-Total	0.238		0.00010	mg/L		27-MAY-19	R4645127
Bismuth (Bi)-Total	<0.000050		0.000050	mg/L		27-MAY-19	R4645127
Boron (B)-Total	<0.010		0.010	mg/L		27-MAY-19	R4645127
Cadmium (Cd)-Total	<0.0050		0.0050	ug/L		27-MAY-19	R4645127
Calcium (Ca)-Total	49.9		0.050	mg/L		27-MAY-19 27-MAY-19	R4645127
Chromium (Cr)-Total Cobalt (Co)-Total	<0.00010 0.40		0.00010 0.10	mg/L ug/L		27-MAY-19 27-MAY-19	R4645127 R4645127
Copper (Cu)-Total	<0.00050		0.10	ug/L mg/L		27-MAY-19	R4645127 R4645127
Iron (Fe)-Total	1.25		0.00050	mg/L		27-MAY-19	R4645127
Lead (Pb)-Total	0.000069		0.010	mg/L		27-MAY-19	R4645127
Lithium (Li)-Total	0.0050		0.000030	mg/L		27-MAY-19	R4645127
Magnesium (Mg)-Total	18.7		0.0010	mg/L		27-MAY-19	R4645127
Manganese (Mn)-Total	0.0346		0.00010	mg/L		27-MAY-19	R4645127
Molybdenum (Mo)-Total	0.00341		0.00010	mg/L		27-MAY-19	R4645127
Nickel (Ni)-Total	0.00131		0.00050	mg/L		27-MAY-19	R4645127
Potassium (K)-Total	1.49		0.050	mg/L		27-MAY-19	R4645127
Selenium (Se)-Total	<0.050		0.050	ug/L		27-MAY-19	R4645127
Silicon (Si)-Total	3.58		0.10	mg/L		27-MAY-19	R4645127
Silver (Ag)-Total	<0.000010		0.000010	mg/L		27-MAY-19	R4645127

<sup>\*</sup> Refer to Referenced Information for Qualifiers (if any) and Methodology.

L2278988 CONTD.... PAGE 10 of 16 Version: FINAL

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2278988-4 WG Q2-2019 CC1							
Sampled By: K.Campbell/D.Tymstra on 23-MAY-19 @	11:25						
Matrix: WG							
Total Metals in Water by CRC ICPMS				,,		07.141)/ 40	<b>-</b>
Sodium (Na)-Total Strontium (Sr)-Total	1.07 0.0487		0.050 0.00020	mg/L mg/L		27-MAY-19 27-MAY-19	R4645127 R4645127
Thallium (TI)-Total	<0.00010		0.00020	mg/L		27-MAY-19	R4645127
Tin (Sn)-Total	<0.00010		0.00010	mg/L		27-MAY-19	R4645127
Titanium (Ti)-Total	<0.010		0.010	mg/L		27-MAY-19	R4645127
Uranium (U)-Total	0.000608		0.000010	mg/L		27-MAY-19	R4645127
Vanadium (V)-Total	<0.00050		0.00050	mg/L		27-MAY-19	R4645127
Zinc (Zn)-Total	<0.0030		0.0030	mg/L		27-MAY-19	R4645127
Routine for Teck Coal							
Acidity by Automatic Titration Acidity (as CaCO3)	2.4		1.0	mg/L		30-MAY-19	R4653065
Alkalinity (Species) by Manual Titration							
Alkalinity, Bicarbonate (as CaCO3)	197		1.0	mg/L		30-MAY-19	R4653055
Alkalinity, Carbonate (as CaCO3)	5.0		1.0	mg/L		30-MAY-19	R4653055
Alkalinity, Hydroxide (as CaCO3)	<1.0		1.0	mg/L		30-MAY-19	R4653055
Alkalinity, Total (as CaCO3)  Ammonia, Total (as N)	202		1.0	mg/L		30-MAY-19	R4653055
Ammonia as N	0.0552		0.0050	mg/L		01-JUN-19	R4653519
Bromide in Water by IC (Low Level) Bromide (Br)	<0.050		0.050	mg/L		24-MAY-19	R4644755
Chloride in Water by IC	10.000		0.000	9. =			
Chloride (CI)	<0.50		0.50	mg/L		24-MAY-19	R4644755
Electrical Conductivity (EC) Conductivity (@ 25C)	369		2.0	uS/cm		30-MAY-19	R4653055
Fluoride in Water by IC Fluoride (F)	0.148		0.020	mg/L		24-MAY-19	R4644755
Ion Balance Calculation				0.4		04.84837.40	
Cation - Anion Balance Anion Sum	1.4			% meg/L		31-MAY-19 31-MAY-19	
Cation Sum	4.14			meq/L		31-MAY-19	
Ion Balance Calculation	4.25			mcq/L		31-WAT-13	
Ion Balance	103		-100	%		31-MAY-19	
Nitrate in Water by IC (Low Level)	0.0050		0.0050	m c://		24 MAY 40	D4044755
Nitrate (as N)	<0.0050		0.0050	mg/L		24-MAY-19	R4644755
Nitrite in Water by IC (Low Level) Nitrite (as N)	<0.0010		0.0010	mg/L		24-MAY-19	R4644755
Orthophosphate-Dissolved (as P) Orthophosphate-Dissolved (as P)	0.0010		0.0010	mg/L		25-MAY-19	R4644179
Oxidation redution potential by elect. ORP	362		-1000	mV		29-MAY-19	R4648826
Phosphorus (P)-Total							
Phosphorus (P)-Total Sulfate in Water by IC	0.0062		0.0020	mg/L		30-MAY-19	R4651380
Sulfate (SO4)	4.79		0.30	mg/L		24-MAY-19	R4644755
<b>Total Dissolved Solids</b> Total Dissolved Solids	171	DLHC	20	mg/L		29-MAY-19	R4651218
<b>Total Suspended Solids</b> Total Suspended Solids	3.1		1.0	mg/L		30-MAY-19	R4652806
<b>Turbidity</b> Turbidity	10.7		0.10	NTU		24-MAY-19	R4643908
рН							
рН	8.43		0.10	рН		30-MAY-19	R4653055

<sup>\*</sup> Refer to Referenced Information for Qualifiers (if any) and Methodology.

L2278988 CONTD.... PAGE 11 of 16 Version: FINAL

Total Kjeldahl Nitrogen	ample Details/Parameters		Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
Sampled By: K. Campoel/U.Tymstra on 23-MAY-19 @ 11-25   WG   U2-27898-5   WG   Q2-2019_MT1   Sampled By: K. Campoel/U.Tymstra on 23-MAY-19 @ 12-40   Matrix: WG   WG   WG   WG   WG   WG   WG   WG	2278088-4 - WG O2 2040 C								
Matrix: WG		tra on 23-MAV-10 @ 11:24	-						
L2278988-5   WG_Q2-2019_MT1   Sampled By: K.Campbell/D.Tymstra on 23-MAY-19 @ 12:40   Matrix: WG   Miscellaneous Parameters   Sisoolved Organic Carbon   <0.50   0.50   mg/L   29-MAY-19   R.   Total Kjeldahi Nitrogen   <0.050   0.50   mg/L   29-MAY-19   R.   2		Sila Oli 23-WA1-19 @ 11.20	,						
Sampled By: K. Campbell/D.Tymstra on 23-MAY-19 @ 12:40   Matrix: WG   Miscellaneous Parameters									
Matrix:         WG         Miscolaneous Parameters         0.50         0.50         mg/L         29-MAY-19         Revious Revious Revision           Total Kjeldahi Nitrogen         -0.050         0.050         mg/L         29-MAY-19         Revious Revision           Dissolved Metals in Water         Dissolved Metals in Water by CRC ICPMS         0.020         0.020         ug/L         26-MAY-19         Revision Revision         Revision Revision Revision         Revision Revision Revision         Revision Revision Revision         Revision Revision Revision         Revision Revision Revision         Revision Revision Revision         Revision Revision Revision         Revision Revision Revision Revision         Revision Revision Revision         LAB         0.000050         mg/L         26-MAY-19         Revision		1 00 MAY 40 @ 40 40							
Dissolved Corganic Carbon		stra on 23-MAY-19 @ 12:40	)						
Dissolved Organic Carbon									
Total Kjeldahl Nitrogen						"		00.1417/ 40	- · · · · · · ·
Total Organic Carbon   Color   Dissolved Metals in Water   Diss. Be (row) in Water by CRC ICPMS   Evryllium (Be)-Dissolved   Color	· ·					•			R4651071
Dissolved Metals in Water   Diss. Be (low) in Water by CRC ICPMS   Beryllium (lep-) Dissolved   Co.0000   Co.0000050   Diss. Mercury in Water by CVAAS or CVAFS   Mercury (Hg)-Dissolved   Co.0000050   Diss. Mercury in Water by CRC ICPMS   Dissolved Metals in Water by CRC ICPMS   Dissolved Metals in Water by CRC ICPMS   Dissolved Metals in Water by CRC ICPMS   Dissolved Metals in Water by CRC ICPMS   Dissolved Metals in Water by CRC ICPMS   Dissolved Metals in Water by CRC ICPMS   Dissolved Metals in Water by CRC ICPMS   Dissolved Metals in Water by CRC ICPMS   Dissolved Metals in Water by CRC ICPMS   Dissolved Metals in Water by CRC ICPMS   Dissolved   Co.00010   Co.00010   mg/L   26-MAY-19   R.4 Aurimorum (Al)-Dissolved   Co.00010   Co.00010   mg/L   26-MAY-19   R.4 Aurimorum (Al)-Dissolved   Co.000010   Co.00010   mg/L   26-MAY-19   R.4 Aurimorum (Al)-Dissolved   Co.000010   Co.00010   mg/L   26-MAY-19   28-MAY-19   R.4 Aurimorum (Cal)-Dissolved   Co.000050   Co.00050   Co.00050   Mg/L   26-MAY-19   28-MAY-19   R.4 Aurimorum (Cal)-Dissolved   Co.00050   Co.00050   Co.00050   Ug/L   26-MAY-19   28-MAY-19   R.4 Aurimorum (Cal)-Dissolved   Co.00050   Co.00050   Ug/L   26-MAY-19   28-MAY-19   R.4 Aurimorum (Cal)-Dissolved   Co.00050   Co.00050   Ug/L   26-MAY-19   28-MAY-19   R.4 Aurimorum (Cal)-Dissolved   Co.00050   Co.00050   Ug/L   26-MAY-19   28-MAY-19   R.4 Aurimorum (Cal)-Dissolved   Co.000050   Co.00050   Ug/L   2	, ,					_			R4651431
Diss.   Diss.   Dissolved   Dissolved   Dissolved   Dissolved Metals Filtration Location   LAB   Dissolved Metals Filtration Location   LAB   Dissolved Metals Filtration Location   LAB   Dissolved Metals Filtration Location   LAB   Dissolved Metals Filtration Location   LAB   Dissolved Metals Filtration Location   LAB   Dissolved Metals Filtration Location   LAB   Dissolved Metals Filtration Location   LAB   Dissolved Metals Filtration Location   LAB   Dissolved Metals Filtration Location   LAB   Dissolved Metals Filtration Location   Aluminum (Al)-Dissolved   <0.0030   0.00030   mg/L   26-MAY-19   R.4	•		<0.50		0.50	mg/L		29-MAY-19	R4651071
Beryllium (Be)-Dissolved   Cab   C									
Dissolved Metals Filtration Location   LAB   Diss. Mercury (Fig.) Dissolved Mercury Filtration Location   LAB   Dissolved Mercury Filtration Location   LAB   Dissolved Mercury Filtration Location   LAB   Dissolved Metals Filtration Location   LAB   Dissolved Metals Filtration Location   LAB   Dissolved Metals Filtration Location   LAB   Antimony (St)-Dissolved   <0.0030   0.00000   mg/L   26-MAY-19   R.	` ,	ICPMS	-0.020		0.000	ua/l	26 MAV 10	20 MAV 10	D4646500
Diss. Mercury in Water by CVAAS or CVAFS   Mercury (Hg)-Dissolved   So-MAY-19   Residual		nn e			0.020	ug/L	20-IVIA 1 - 19		R4646589 R4644293
Mercury (Hg)-Dissolved   Sol-MaY-19   Robinsolved Mercury Filtration Location   LAB   LAB   Sol-MaY-19   Robinsolved Metals Filtration Location   LAB   LAB   Sol-MaY-19   Robinsolved Metals Filtration Location   LAB   LAB   Sol-MaY-19   Robinsolved Metals Filtration Location   LAB   Sol-MaY-19   Robinsolved Metals Filtration Location   LAB   Sol-MaY-19   Robinsolved   Col-00010   Col-0010			LAD					20-IVIA 1-19	K4044293
Dissolved Metaury Filtration Location   LAB   Dissolved Metals in Water by CRC ICPMS   Dissolved Metals Filtration Location   LAB   Aluminum (Al)-Dissolved   <0.00030   <0.0030   mg/L   26-MAY-19   28-MAY-19   R. Arsenic (As)-Dissolved   <0.00010   0.00010   mg/L   26-MAY-19   28-MAY-19   R. Arsenic (As)-Dissolved   <0.00010   0.00010   mg/L   26-MAY-19   28-MAY-19   R. Arsenic (As)-Dissolved   <0.00010   0.00010   mg/L   26-MAY-19   28-MAY-19   R. Arsenic (As)-Dissolved   <0.000010   0.00010   mg/L   26-MAY-19   28-MAY-19   R. Arsenic (As)-Dissolved   <0.000050   0.000050   mg/L   26-MAY-19   28-MAY-19   R. Arsenic (As)-Dissolved   <0.010   0.000050   mg/L   26-MAY-19   28-MAY-19   R. Arsenic (As)-Dissolved   <0.0050   0.0050   mg/L   26-MAY-19   28-MAY-19   R. Arsenic (As)-Dissolved   <0.00010   0.00010   mg/L   26-MAY-19   28-MAY-19   R. Arsenic (As)-Dissolved   <0.00010   0.00010   mg/L   26-MAY-19   28-MAY-19   R. Arsenic (As)-Dissolved   <0.00050   0.00050   mg/L   26-MAY-19   28-MAY-19   R. Arsenic (As)-Dissolved   <0.00050   mg/L   26-MAY-19   28-MAY-19   R. Arsenic (As)-Dissolved   <0			0.0000050		0.0000050	mg/l	30-MAY-19	30-MAY-19	R4650432
Dissolved Metals in Water by CRC ICPMS   Dissolved Metals Filtration Location   LAB   Aluminum (Al)-Dissolved   <0,0030   0,0030   mg/L   26-MAY-19   28-MAY-19   R. Aluminum (Al)-Dissolved   <0,00010   0,00010   mg/L   26-MAY-19   28-MAY-19   R. Arsenic (As)-Dissolved   <0,00010   0,00010   mg/L   26-MAY-19   28-MAY-19   R. Arsenic (As)-Dissolved   <0,00010   0,00010   mg/L   26-MAY-19   28-MAY-19   R. Birum (Ba)-Dissolved   <0,00010   0,00010   mg/L   26-MAY-19   28-MAY-19   R. Birum (Ba)-Dissolved   <0,00050   0,00050   mg/L   26-MAY-19   28-MAY-19   R. Cadmium (Cd)-Dissolved   <0,0050   0,00050   ug/L   26-MAY-19   28-MAY-19   R. Cadmium (Cd)-Dissolved   <0,0050   0,050   ug/L   26-MAY-19   28-MAY-19   R. Cadmium (Cd)-Dissolved   <0,0050   0,050   ug/L   26-MAY-19   28-MAY-19   R. Cadmium (Cd)-Dissolved   <0,0050   0,050   ug/L   26-MAY-19   28-MAY-19   R. Cadmium (Cd)-Dissolved   <0,0050   0,050   ug/L   26-MAY-19   28-MAY-19   R. Cadmium (Cd)-Dissolved   <0,00010   0,00010   ug/L   26-MAY-19   28-MAY-19   R. Cadmium (Cd)-Dissolved   <0,00010   0,00010   ug/L   26-MAY-19   28-MAY-19   R. Cadmium (Cd)-Dissolved   <0,00050   0,00050   ug/L   26-MAY-19   28-MAY-19   R. Cadmium (Cd)-Dissolved   <0,00050   0,00050   ug/L   26-MAY-19   28-MAY-19   R. Cadmium (Cd)-Dissolved   <0,00050   ug/L   26-MAY-19   28-MAY-19   R. Cadmium (Cd)-Dissolved   <0,00050   ug/L   26-MAY-19   28-MAY-19   R. Cadmium (Cd)-Dissolved   <0,00050   ug/L   26-MAY-19   28-MAY-19   R. Cadmium (Cd)-Dissolved   <0,00010   0,00050   ug/L   26-MAY-19   28-MAY-19   R. Cadmium (Cd)-Dissolved   <0,00010   0,00050   ug/L   26-MAY-19   28-MAY-19   R. Cadmium (Cd)-Dissolved   <0,00010   0,00050   ug/L   26-MAY-19   28-MAY-19   R. Cadmium (Cd)-Dissolved   <0,00050   ug/L   26-MAY-19   28-MAY-19   R. Cadmium (Cd)-Dissolved   <0,00050   ug/L   26-MAY-19   28-MAY-19   R. Cadmium (Cd)-Dissolved   <0,000010   0,000010   ug/L   26-MAY-19   28-MAY-19   R. Cadmium (Cd)-Dissolved   <0,000010   0,000010   ug/L   26-MAY-19   28-MAY-19   R. Cadmium (Cd)-Dissolve					5.0000000	9/ ⊏	33 1417 (1 - 13		R4650746
Dissolved Metals Filtration Location   LAB   Aluminum (A)-Dissolved   <0.0030   <0.0030   mg/L   26-MAY-19   R. Antimory (Sb)-Dissolved   <0.00010   0.00010   mg/L   26-MAY-19   28-MAY-19   R. Arsenic (As)-Dissolved   <0.000050   0.000050   mg/L   26-MAY-19   28-MAY-19   R. Arsenic (As)-Dissolved   <0.00050   0.000050   mg/L   26-MAY-19   28-MAY-19   R. Arsenic (As)-Dissolved   <0.0050   0.00050   0.0050   0.0050   0.0050   0.0050   0.0050   0.0050   0.00050   0.00050   0.00050   0.00050   0.00	-								
Aluminum (Al)-Dissolved			LAB					29-MAY-19	R4646735
Antimony (Sb)-Dissolved Arsenic (As)-Dissolved  Aluminum (AI)-Dissolved				0.0030	mg/L	26-MAY-19		R4646589	
Arsenic (As)-Dissolved					0.00010	•	26-MAY-19	28-MAY-19	R4646589
Barium (Ba)-Dissolved			<0.00010		0.00010	•	26-MAY-19	28-MAY-19	R4646589
Boron (B)-Dissolved	Barium (Ba)-Dissolved		<0.00010		0.00010	-	26-MAY-19	28-MAY-19	R4646589
Cadmium (Cd)-Dissolved         <0.0050	Bismuth (Bi)-Dissolved		<0.00050		0.000050	mg/L	26-MAY-19	28-MAY-19	R4646589
Calcium (Ca)-Dissolved         <0.050         mg/L         26-MAY-19         28-MAY-19         RACTOR           Chromium (Cr)-Dissolved         <0.00010			<0.010		0.010	mg/L	26-MAY-19	28-MAY-19	R4646589
Chromium (Cr)-Dissolved         <0.00010	Cadmium (Cd)-Dissolved		<0.0050		0.0050	ug/L	26-MAY-19	28-MAY-19	R4646589
Cobalt (Co)-Dissolved         <0.10         0.10         ug/L         26-MAY-19         28-MAY-19         Refore (Copper (Cu)-Dissolved           Iron (Fe)-Dissolved         <0.00050			< 0.050		0.050	mg/L	26-MAY-19	28-MAY-19	R4646589
Copper (Cu)-Dissolved Iron (Fe)-Dissolved Iron (Fe)-Dissolved         <0.00050         0.00050         mg/L         29-MAY-19         29-MAY-19         Reference of the process of the	` '		<0.00010		0.00010	mg/L	26-MAY-19	28-MAY-19	R4646589
Iron (Fe)-Dissolved	` '		<0.10		0.10	•	26-MAY-19	28-MAY-19	R4646589
Lead (Pb)-Dissolved         <0.000050			<0.00050			-			R4647134
Lithium (Li)-Dissolved	* *					-			R4646589
Magnesium (Mg)-Dissolved         <0.10	` '	•				-			R4646589
Manganese (Mn)-Dissolved         <0.00010	• •					•			R4646589
Molybdenum (Mo)-Dissolved         <0.000050						•			R4646589
Nickel (Ni)-Dissolved         <0.00050         mg/L         26-MAY-19         28-MAY-19         Reportance           Potassium (K)-Dissolved         <0.050						•			R4646589
Potassium (K)-Dissolved         <0.050						•			R4646589
Selenium (Se)-Dissolved         <0.050	` '					Ü			R4646589 R4646589
Silicon (Si)-Dissolved         <0.050	` '					-			R4646589
Silver (Ag)-Dissolved         <0.000010	` '					-			R4646589
Sodium (Na)-Dissolved         <0.050	` ,					-			R4646589
Strontium (Sr)-Dissolved         <0.00020	·					•			R4646589
Thallium (TI)-Dissolved         <0.000010	• •					-			R4646589
Tin (Sn)-Dissolved         <0.00010	* *					-			R4646589
Titanium (Ti)-Dissolved         <0.010	( )					-			R4646589
Uranium (U)-Dissolved       <0.000010						•			R4646589
Vanadium (V)-Dissolved       <0.00050						-		28-MAY-19	R4646589
Zinc (Zn)-Dissolved <0.0010 0.0010 mg/L 26-MAY-19 R4  Hardness	· /				0.00050	-	26-MAY-19	28-MAY-19	R4646589
	Zinc (Zn)-Dissolved		<0.0010		0.0010	-	26-MAY-19	28-MAY-19	R4646589
Hardness (as CaCO3)         <0.50									
			<0.50		0.50	mg/L		29-MAY-19	
Total Metals in Water									
Total Be (Low) in Water by CRC ICPMS         < 0.020         ug/L         27-MAY-19         R4		CICPMS	<0.020		0.020	ug/l		27-MAY-19	R4645127
Total Mercury in Water by CVAAS or CVAFS		AS or CVAES	\U.UZU		0.020	ug/L		∠ i Wi/\ i - 1∂	117040121

<sup>\*</sup> Refer to Referenced Information for Qualifiers (if any) and Methodology.

L2278988 CONTD.... PAGE 12 of 16 Version: FINAL

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2278988-5 WG_Q2-2019_MT1							
	12:40						
	12.40						
Matrix: WG							
Total Mercury in Water by CVAAS or CVAFS Mercury (Hg)-Total	<0.0000050		0.0000050	mg/L		29-MAY-19	R4647372
Total Metals in Water by CRC ICPMS							
Aluminum (AI)-Total	<0.0030		0.0030	mg/L		27-MAY-19	R4645127
Antimony (Sb)-Total	<0.00010		0.00010	mg/L		27-MAY-19	R4645127
Arsenic (As)-Total	<0.00010		0.00010	mg/L		27-MAY-19	R4645127
Barium (Ba)-Total	<0.00010		0.00010	mg/L		27-MAY-19	R4645127
Bismuth (Bi)-Total	<0.000050		0.000050	mg/L		27-MAY-19	R4645127
Boron (B)-Total	<0.010		0.010	mg/L		27-MAY-19	R4645127
Cadmium (Cd)-Total	<0.0050		0.0050	ug/L		27-MAY-19	R4645127
Calcium (Ca)-Total	<0.050		0.050	mg/L		27-MAY-19	R4645127
Chromium (Cr)-Total	<0.00010		0.00010	mg/L		27-MAY-19	R4645127
Cobalt (Co)-Total	<0.10		0.10	ug/L		27-MAY-19	R4645127
Copper (Cu)-Total	<0.00050		0.00050	mg/L		27-MAY-19	R4645127
Iron (Fe)-Total	<0.010		0.010	mg/L		27-MAY-19	R4645127
Lead (Pb)-Total	<0.000050		0.000050	mg/L		27-MAY-19	R4645127
Lithium (Li)-Total	<0.0010		0.0010	mg/L		27-MAY-19	R4645127
Magnesium (Mg)-Total	<0.10		0.10	mg/L		27-MAY-19	R4645127
Manganese (Mn)-Total	<0.00010		0.00010	mg/L		27-MAY-19	R4645127
Molybdenum (Mo)-Total	<0.000050		0.000050	mg/L		27-MAY-19	R4645127
Nickel (Ni)-Total	<0.00050		0.00050	mg/L		27-MAY-19	R4645127
Potassium (K)-Total	<0.050		0.050	mg/L		27-MAY-19	R4645127
Selenium (Se)-Total	<0.050		0.050	ug/L		27-MAY-19	R4645127
Silicon (Si)-Total Silver (Ag)-Total	<0.10		0.10	mg/L		27-MAY-19	R4645127
Sodium (Na)-Total	<0.000010		0.000010	mg/L		27-MAY-19	R4645127
Strontium (Sr)-Total	<0.050 <0.00020		0.050 0.00020	mg/L		27-MAY-19 27-MAY-19	R4645127
Thallium (TI)-Total	<0.00020		0.00020	mg/L mg/L		27-MAY-19	R4645127 R4645127
Tin (Sn)-Total	<0.00010		0.000010	mg/L		27-MAY-19	R4645127
Titanium (Ti)-Total	<0.00010		0.00010	mg/L		27-MAY-19	R4645127
Uranium (U)-Total	<0.00010		0.000010	mg/L		27-MAY-19	R4645127
Vanadium (V)-Total	<0.00050		0.00050	mg/L		27-MAY-19	R4645127
Zinc (Zn)-Total	<0.0030		0.0030	mg/L		27-MAY-19	R4645127
Routine for Teck Coal	<0.0030		0.0030	mg/L		27-1012-13	114043127
Acidity by Automatic Titration							
Acidity (as CaCO3)	1.8		1.0	mg/L		30-MAY-19	R4653065
Alkalinity (Species) by Manual Titration				-			
Alkalinity, Bicarbonate (as CaCO3)	<1.0		1.0	mg/L		30-MAY-19	R4653055
Alkalinity, Carbonate (as CaCO3)	<1.0		1.0	mg/L		30-MAY-19	R4653055
Alkalinity, Hydroxide (as CaCO3)	<1.0		1.0	mg/L		30-MAY-19	R4653055
Alkalinity, Total (as CaCO3)	<1.0		1.0	mg/L		30-MAY-19	R4653055
Ammonia, Total (as N) Ammonia as N	<0.0050		0.0050	mg/L		01-JUN-19	R4653519
Bromide in Water by IC (Low Level)	\0.0000		0.0000	g/∟		31 0011-19	114000019
Bromide (Br)	<0.050		0.050	mg/L		24-MAY-19	R4644755
Chloride in Water by IC Chloride (Cl)	<0.50		0.50	mg/L		24-MAY-19	R4644755
Electrical Conductivity (EC) Conductivity (@ 25C)	<2.0		2.0	uS/cm		30-MAY-19	R4653055
Fluoride in Water by IC							
Fluoride (F) Ion Balance Calculation	<0.020		0.020	mg/L		24-MAY-19	R4644755
Cation - Anion Balance	0.0			%		31-MAY-19	

<sup>\*</sup> Refer to Referenced Information for Qualifiers (if any) and Methodology.

L2278988 CONTD.... PAGE 13 of 16 Version: FINAL

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
   L2278988-5   WG_Q2-2019_MT1							
Sampled By: K.Campbell/D.Tymstra on 23-MAY-19 @	12:40						
Matrix: WG							
Ion Balance Calculation Anion Sum	<0.10			meq/L		31-MAY-19	
Cation Sum	<0.10			meq/L		31-MAY-19	
Ion Balance Calculation			400	0,		04 144 1/4 40	
lon Balance Nitrate in Water by IC (Low Level)	0.0		-100	%		31-MAY-19	
Nitrate (as N)	<0.0050		0.0050	mg/L		24-MAY-19	R4644755
Nitrite in Water by IC (Low Level) Nitrite (as N)	<0.0010		0.0010	mg/L		24-MAY-19	R4644755
Orthophosphate-Dissolved (as P)	<0.0010		0.0010	IIIg/L		Z4-W/A1-15	114044733
Orthophosphate-Dissolved (as P)	<0.0010		0.0010	mg/L		25-MAY-19	R4644179
Oxidation redution potential by elect. ORP	450		-1000	mV		29-MAY-19	R4648826
Phosphorus (P)-Total							
Phosphorus (P)-Total Sulfate in Water by IC	<0.0020		0.0020	mg/L		30-MAY-19	R4651380
Sulfate (SO4)	<0.30		0.30	mg/L		24-MAY-19	R4644755
Total Dissolved Solids Total Dissolved Solids	-40		10	ma/l		20 MAV 10	D4651040
Total Suspended Solids Total Suspended Solids	<10		10	mg/L		29-MAY-19	R4651218
Total Suspended Solids	<1.0		1.0	mg/L		30-MAY-19	R4652806
<b>Turbidity</b> Turbidity	<0.10		0.10	NTU		24-MAY-19	R4643908
рН			0.10	11.0		21111111111	114040000
pH	5.14		0.10	pН		30-MAY-19	R4653055

<sup>\*</sup> Refer to Referenced Information for Qualifiers (if any) and Methodology.

LINE CREEK OPERATION

L2278988 CONTD....

PAGE 14 of 16 Version: FINAL

#### **Reference Information**

**Qualifiers for Sample Submission Listed:** 

 Qualifier
 Description

 SFPL
 -5 DOC/D-METAL/D-HG FILTERED AND PRESERVED AT THE LAB - Sample was Filtered and Preserved at the laboratory

Sample Parameter Qualifier Key:

Qualifier	Description
DLB	Detection Limit Raised. Analyte detected at comparable level in Method Blank.
DLHC	Detection Limit Raised: Dilution required due to high concentration of test analyte(s).
MB-LOR	Method Blank exceeds ALS DQO. Limits of Reporting have been adjusted for samples with positive hits below 5x blank level.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RRV	Reported Result Verified By Repeat Analysis

#### **Test Method References:**

ALS Test Code	Matrix	Test Description	Method Reference**	
ACIDITY-PCT-CL	Water	Acidity by Automatic Titration	APHA 2310 Acidity	

This analysis is carried out using procedures adapted from APHA Method 2310 "Acidity". Acidity is determined by potentiometric titration to a specified endpoint.

ALK-MAN-CL Water Alkalinity (Species) by Manual Titration APHA 2320 ALKALINITY

This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.

BE-D-L-CCMS-VA Water Diss. Be (low) in Water by CRC ICPMS APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

BE-T-L-CCMS-VA Water Total Be (Low) in Water by CRC ICPMS EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

BR-L-IC-N-CL Water Bromide in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

C-DIS-ORG-LOW-CL Water Dissolved Organic Carbon APHA 5310 B-Instrumental

This method is applicable to the analysis of ground water, wastewater, and surface water samples. The form detected depends upon sample pretreatment: Unfiltered sample = TC, 0.45um filtered = TDC. Samples are injected into a combustion tube containing an oxidation catalyst. The carrier gas containing the combustion product from the combustion tube flows through an inorganic carbon reactor vessel and is then sent through a halogen scrubber into a sample cell set in a non-dispersive infrared gas analyzer (NDIR) where carbon dioxide is detected. For total inorganic carbon and dissolved inorganic carbon, the sample is injected into an IC reactor vessel where only the IC component is decomposed to become carbon dioxide.

The peak area generated by the NDIR indicates the TC/TDC or TIC/DIC as applicable. The total organic carbon content of the sample is calculated by subtracting the TIC from the TC.

TOC = TC-TIC, DOC = TDC-DIC, Particulate = Total - Dissolved.

C-TOT-ORG-LOW-CL Water Total Organic Carbon APHA 5310 TOTAL ORGANIC CARBON (TOC)

This method is applicable to the analysis of ground water, wastewater, and surface water samples. The form detected depends upon sample pretreatment: Unfiltered sample = TC, 0.45um filtered = TDC. Samples are injected into a combustion tube containing an oxidation catalyst. The carrier gas containing the combustion product from the combustion tube flows through an inorganic carbon reactor vessel and is then sent through a halogen scrubber into a sample cell set in a non-dispersive infrared gas analyzer (NDIR) where carbon dioxide is detected. For total inorganic carbon and dissolved inorganic carbon, the sample is injected into an IC reactor vessel where only the IC component is decomposed to become carbon dioxide.

The peak area generated by the NDIR indicates the TC/TDC or TIC/DIC as applicable. The total organic carbon content of the sample is calculated by subtracting the TIC from the TC.

TOC = TC-TIC, DOC = TDC-DIC, Particulate = Total - Dissolved.

CL-IC-N-CL Water Chloride in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

EC-L-PCT-CL Water Electrical Conductivity (EC) APHA 2510B

Conductivity, also known as Electrical Conductivity (EC) or Specific Conductance, is measured by immersion of a conductivity cell with platinum electrodes into a water sample. Conductivity measurements are temperature-compensated to 25C.

F-IC-N-CL Water Fluoride in Water by IC EPA 300.1 (mod)

#### L2278988 CONTD....

PAGE 15 of 16 Version: FINAL

#### **Reference Information**

**Test Method References:** 

ALS Test Code Matrix Test Description Method Reference\*\*

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

HARDNESS-CALC-VA Water Hardness APHA 2340B

Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO3 equivalents.

Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

HG-D-CVAA-VA Water Diss. Mercury in Water by CVAAS or CVAFS APHA 3030B/EPA 1631E (mod)

Water samples are filtered (0.45 um), preserved with hydrochloric acid, then undergo a cold-oxidation using bromine monochloride prior to reduction with steppens ableride, and englished by CVAAS or CVAAS

with stannous chloride, and analyzed by CVAAS or CVAFS.

HG-T-CVAA-VA Water Total Mercury in Water by CVAAS or CVAFS EPA 1631E (mod)

Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

IONBALANCE-BC-CL Water Ion Balance Calculation APHA 1030E

Cation Sum, Anion Sum, and Ion Balance (as % difference) are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Because all aqueous solutions are electrically neutral, the calculated ion balance (% difference of cations minus anions) should be near-zero.

Cation and Anion Sums are the total meq/L concentration of major cations and anions. Dissolved species are used where available. Minor ions are included where data is present. Ion Balance is calculated as:

Ion Balance (%) = [Cation Sum-Anion Sum] / [Cation Sum+Anion Sum]

MET-D-CCMS-CL Water Dissolved Metals in Water by CRC ICPMS APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

MET-D-CCMS-VA Water Dissolved Metals in Water by CRC ICPMS APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

MET-T-CCMS-VA Water Total Metals in Water by CRC ICPMS EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

NH3-L-F-CL Water Ammonia, Total (as N) J. ENVIRON. MONIT., 2005, 7, 37-42, RSC

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et

NO2-L-IC-N-CL Water Nitrite in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

NO3-L-IC-N-CL Water Nitrate in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

ORP-CL Water Oxidation redution potential by elect. ASTM D1498

This analysis is carried out in accordance with the procedure described in the "ASTM" method D1498 "Oxidation-Reduction Potential of Water" published by the American Society for Testing and Materials (ASTM). Results are reported as observed oxidation-reduction potential of the platinum metal-reference electrode employed, in mV.

It is recommended that this analysis be conducted in the field.

P-T-L-COL-CL Water Phosphorus (P)-Total APHA 4500-P PHOSPHORUS

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after persulphate digestion of the sample.

PH-CL Water pH APHA 4500 H-Electrode

pH is determined in the laboratory using a pH electrode. All samples analyzed by this method for pH will have exceeded the 15 minute recommended hold time from time of sampling (field analysis is recommended for pH where highly accurate results are needed)

PO4-DO-L-COL-CL Water Orthophosphate-Dissolved (as P) APHA 4500-P PHOSPHORUS

LINE CREEK OPERATION

L2278988 CONTD....

PAGE 16 of 16 Version: FINAL

#### **Reference Information**

**Test Method References:** 

ALS Test Code Matrix Test Description Method Reference\*\*

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.

SO4-IC-N-CL Water Sulfate in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

SOLIDS-TDS-CL Water Total Dissolved Solids APHA 2540 C

A well-mixed sample is filtered through a glass fibre filter paper. The filtrate is then evaporated to dryness in a pre-weighed vial and dried at 180 – 2 °C.

The increase in vial weight represents the total dissolved solids (TDS).

TECKCOAL-IONBAL-CL Water Ion Balance Calculation APHA 1030E

Cation Sum, Anion Sum, and Ion Balance (as % difference) are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Because all aqueous solutions are electrically neutral, the calculated ion balance (% difference of cations minus anions) should be near-zero.

Cation and Anion Sums are the total meq/L concentration of major cations and anions. Dissolved species are used where available. Minor ions are included where data is present. Ion Balance is calculated as:

Ion Balance (%) = [Cation Sum-Anion Sum] / [Cation Sum+Anion Sum]

TKN-L-F-CL Water Total Kjeldahl Nitrogen APHA 4500-NORG (TKN)

This analysis is carried out using procedures adapted from APHA Method 4500-Norg D. "Block Digestion and Flow Injection Analysis". Total Kjeldahl Nitrogen is determined using block digestion followed by Flow-injection analysis with fluorescence detection.

TSS-L-CL Water Total Suspended Solids APHA 2540 D-Gravimetric

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total suspended solids (TSS) are determined by filtering a sample through a glass fibre filter, and by drying the filter at 104 deg. C.

TURBIDITY-CL Water Turbidity APHA 2130 B-Nephelometer

This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.

\*\* ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

<b>Laboratory Definition Code</b>	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA
CL	ALS ENVIRONMENTAL - CALGARY, ALBERTA, CANADA

#### **Chain of Custody Numbers:**

20190523 DC GW

#### **GLOSSARY OF REPORT TERMS**

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.

mg/kg - milligrams per kilogram based on dry weight of sample

mg/kg wwt - milligrams per kilogram based on wet weight of sample

mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight

mg/L - unit of concentration based on volume, parts per million.

< - Less than.

D.L. - The reporting limit.

N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory. UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.



Workorder: L2278988 Report Date: 04-JUN-19 Page 1 of 19

Client: TECK COAL LIMITED (LINE CREEK)

PO BOX 2003

SPARWOOD BC V0B 2G0

Contact: Chris Blurton

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
ACIDITY-PCT-CL	Water							
Batch R4653065	i							
WG3063812-11 LCS Acidity (as CaCO3)			106.0		%		85-115	30-MAY-19
WG3063812-8 LCS Acidity (as CaCO3)			104.2		%		85-115	30-MAY-19
<b>WG3063812-10 MB</b> Acidity (as CaCO3)			<1.0		mg/L		2	30-MAY-19
WG3063812-7 MB Acidity (as CaCO3)			1.1		mg/L		2	30-MAY-19
ALK-MAN-CL	Water							
Batch R4653055	;							
WG3063840-15 DUP Alkalinity, Total (as Ca0	CO3)	<b>L2278988-1</b> 449	438		mg/L	2.6	20	30-MAY-19
WG3063840-14 LCS Alkalinity, Total (as Ca0	CO3)		97.5		%		85-115	30-MAY-19
WG3063840-13 MB Alkalinity, Total (as Ca0	CO3)		<1.0		mg/L		1	30-MAY-19
BE-D-L-CCMS-VA	Water							
Batch R4645515	i							
WG3059149-3 DUP Beryllium (Be)-Dissolve	ed	<b>L2278988-2</b> <0.000020	<0.000020	RPD-NA	mg/L	N/A	20	27-MAY-19
WG3059149-2 LCS Beryllium (Be)-Dissolve	ed		98.2		%		80-120	27-MAY-19
WG3059149-1 MB Beryllium (Be)-Dissolve	ed	NP	<0.000020	)	mg/L		0.00002	27-MAY-19
WG3059149-4 MS Beryllium (Be)-Dissolve	ed	L2278988-1	99.9		%		70-130	27-MAY-19
Batch R4646589	)							
WG3058816-2 LCS								
Beryllium (Be)-Dissolve	ed		98.1		%		80-120	28-MAY-19
WG3058816-1 MB Beryllium (Be)-Dissolve	ed	LF	<0.000020	)	mg/L		0.00002	28-MAY-19
BE-T-L-CCMS-VA	Water							
Batch R4645127	•							
WG3058750-3 DUP Beryllium (Be)-Total		<b>L2278988-1</b> 0.000105	0.000105		mg/L	0.0	20	27-MAY-19
WG3058750-2 LCS Beryllium (Be)-Total			101.3		%		80-120	27-MAY-19
WG3058750-1 MB								



Workorder: L2278988

Report Date: 04-JUN-19 Page 2 of 19

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
BE-T-L-CCMS-VA	Water							
Batch R4645127 WG3058750-1 MB Beryllium (Be)-Total			<0.00002	0	mg/L		0.00002	27-MAY-19
WG3058750-4 MS Beryllium (Be)-Total		L2278988-2	96.3		%		70-130	27-MAY-19
BR-L-IC-N-CL	Water							
<b>Batch R4644755 WG3059401-11 DUP</b> Bromide (Br)		<b>L2278988-3</b> <0.050	<0.050	RPD-NA	mg/L	N/A	20	24-MAY-19
<b>WG3059401-10 LCS</b> Bromide (Br)			99.2		%		85-115	24-MAY-19
<b>WG3059401-9 MB</b> Bromide (Br)			<0.050		mg/L		0.05	24-MAY-19
WG3059401-12 MS Bromide (Br)		L2278988-3	98.8		%		75-125	24-MAY-19
C-DIS-ORG-LOW-CL	Water							
Batch R4651071 WG3062916-2 LCS Dissolved Organic Carbon	n		91.1		%		80-120	29-MAY-19
WG3062916-1 MB Dissolved Organic Carbon	n		<0.50		mg/L		0.5	29-MAY-19
Batch R4651987 WG3063861-2 LCS Dissolved Organic Carbon	n		99.2		%		80-120	30-MAY-19
WG3063861-1 MB Dissolved Organic Carbon			<0.50		mg/L		0.5	30-MAY-19
C-TOT-ORG-LOW-CL	Water							
Batch R4651071 WG3062916-2 LCS					0.4			
Total Organic Carbon  WG3062916-1 MB  Total Organic Carbon			95.4		% ma/l		80-120	29-MAY-19
Total Organic Carbon			<0.50		mg/L		0.5	29-MAY-19
Batch R4651987 WG3063861-2 LCS Total Organic Carbon			100.5		%		80-120	30-MAY-19
WG3063861-1 MB Total Organic Carbon			<0.50		mg/L		0.5	30-MAY-19
CL-IC-N-CL	Water							



Workorder: L2278988

Report Date: 04-JUN-19

Page 3 of 19

CLIC-N-CL	Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
NG3059401-11   DUP	CL-IC-N-CL	Water							
Chloride (Cl)	Batch R4644755								
Chloride (Cl)				<0.50	RPD-NA	mg/L	N/A	20	24-MAY-19
Chloride (Cl)				99.2		%		90-110	24-MAY-19
ECIL-PCT-CL Water  Batch R4653055 WG3063840-14 LCS Conductivity (@ 25C) 755 751 US/cm 0.5 10 30-MAY-19 WG3063840-14 LCS Conductivity (@ 25C) 755 751 US/cm 0.5 10 30-MAY-19 WG3063840-14 MB Conductivity (@ 25C) 755 751 US/cm 0.5 10 30-MAY-19 WG3063840-14 MB Conductivity (@ 25C) 755 751 US/cm 0.5 10 30-MAY-19 WG3063840-14 MB Conductivity (@ 25C) 755 751 US/cm 0.5 10 30-MAY-19 WG3053840-14 MB Conductivity (@ 25C) 755 751 US/cm 0.5 10 30-MAY-19 WG3053840-14 MB Conductivity (@ 25C) 755 751 US/cm 0.5 10 US/cm 0.5 10 US/cm 10 U				<0.50		mg/L		0.5	24-MAY-19
Batch R4653055 WG306340-15 DUP Conductivity (@ 25C) 755 751 uS/cm 0.5 10 30-MAY-19 WG3063340-14 LCS Conductivity (@ 25C) 104.6 % 90-110 30-MAY-19 WG3063340-13 MB Conductivity (@ 25C) 104.6 % 90-110 30-MAY-19 WG3063340-13 MB Conductivity (@ 25C) 25C) 104.6 % 90-110 30-MAY-19 WG306340-13 MB Conductivity (@ 25C) 25C) 25C 25C 25C 25C 25C 25C 25C 25C 25C 25C			L2278988-3	98.9		%		75-125	24-MAY-19
MG3063840-15   DUP   Conductivity (@ 25C)   755   751   US/cm   0.5   10   30-MAY-19	EC-L-PCT-CL	Water							
Conductivity (@ 25C) 755 751 uS/cm 0.5 10 30-MAY-19  W33083840-14 LCS Conductivity (@ 25C) 104.6 % 90-110 30-MAY-19  W33083840-13 MB Conductivity (@ 25C) 25C) 2-2.0 uS/cm 2 30-MAY-19  FIC-N-CL Water  Batch R464755 W33059401-11 DUP L2278988-3 Fluoride (F) 40.020 <0.020 RPD-NA mg/L N/A 20 24-MAY-19  W33059401-10 LCS Fluoride (F) 70-20 7	Batch R4653055								
Conductivity (@ 25C)				751		uS/cm	0.5	10	30-MAY-19
File-N-CL Water  Batch R4644755 WG3059401-11 DUP L2278988-3 Fluoride (F) 0.020 <0.020 RPD-NA mg/L N/A 20 24-MAY-19 WG3059401-10 LCS Fluoride (F) 0.020 0.020 RPD-NA mg/L N/A 20 24-MAY-19 WG3059401-10 LCS Fluoride (F) 0.020 0.020 mg/L 0.02 24-MAY-19 WG3059401-12 MS Fluoride (F) 0.02 24-MAY-19 WG3059401-12 MS Fluoride (F) 0.02 24-MAY-19 WG3059401-12 MS Fluoride (F) 0.02 24-MAY-19 WG3059401-12 MS Fluoride (F) 0.02 24-MAY-19 WG3059401-12 MS Fluoride (F) 0.02 24-MAY-19 WG3059401-12 MS Fluoride (F) 0.02 24-MAY-19 WG3059401-12 MS Fluoride (F) 0.02 24-MAY-19 WG3061239-2 LCS Mercury (Hg)-Dissolved 0.000005 0.				104.6		%		90-110	30-MAY-19
Batch R4644755 WG3059401-11 DUP Fluoride (F) < <0.020  <0.020  RPD-NA  mg/L  N/A  20  24-MAY-19 WG3059401-10 LCS Fluoride (F)				<2.0		uS/cm		2	30-MAY-19
WG3059401-11   DUP	F-IC-N-CL	Water							
Fluoride (F)	Batch R4644755								
Fluoride (F)				<0.020	RPD-NA	mg/L	N/A	20	24-MAY-19
Fluoride (F)				102.3		%		90-110	24-MAY-19
Fluoride (F) 102.8 % 75-125 24-MAY-19  HG-D-CVAA-VA Water  Batch R4647372 WG3061239-2 LCS Mercury (Hg)-Dissolved 101.1 % 80-120 29-MAY-19  WG3061239-1 MB NP Mercury (Hg)-Dissolved < 0.000005C mg/L 0.00005 29-MAY-19  Batch R4650432 WG3062778-6 LCS Mercury (Hg)-Dissolved 100.7 % 80-120 30-MAY-19  WG3062778-5 MB Mercury (Hg)-Dissolved < 0.000005C mg/L 0.00005 30-MAY-19				<0.020		mg/L		0.02	24-MAY-19
Batch R4647372 WG3061239-2 LCS Mercury (Hg)-Dissolved 101.1 % 80-120 29-MAY-19 WG3061239-1 MB NP Mercury (Hg)-Dissolved <0.000005C mg/L 0.00005 29-MAY-19  Batch R4650432 WG3062778-6 LCS Mercury (Hg)-Dissolved 100.7 % 80-120 30-MAY-19  WG3062778-5 MB Mercury (Hg)-Dissolved <0.000005C mg/L 0.00005 30-MAY-19			L2278988-3	102.8		%		75-125	24-MAY-19
WG3061239-2 LCS       Mercury (Hg)-Dissolved       101.1       %       80-120       29-MAY-19         WG3061239-1 MB Mercury (Hg)-Dissolved       NP       mg/L       0.000005       29-MAY-19         Batch R4650432 WG3062778-6 LCS Mercury (Hg)-Dissolved       100.7       %       80-120       30-MAY-19         WG3062778-5 MB Mercury (Hg)-Dissolved       <0.000005C	HG-D-CVAA-VA	Water							
Mercury (Hg)-Dissolved         101.1         %         80-120         29-MAY-19           WG3061239-1         MB         NP         Mercury (Hg)-Dissolved         <0.000005C         mg/L         0.000005         29-MAY-19           Batch         R4650432         R4650	Batch R4647372								
Mercury (Hg)-Dissolved       <0.000005C				101.1		%		80-120	29-MAY-19
WG3062778-6         LCS           Mercury (Hg)-Dissolved         100.7         %         80-120         30-MAY-19           WG3062778-5         MB           Mercury (Hg)-Dissolved         <0.000005C			NP	<0.000005	C	mg/L		0.000005	29-MAY-19
WG3062778-6         LCS           Mercury (Hg)-Dissolved         100.7         %         80-120         30-MAY-19           WG3062778-5         MB           Mercury (Hg)-Dissolved         <0.000005C	Batch R4650432								
Mercury (Hg)-Dissolved <0.000005C mg/L 0.000005 30-MAY-19	WG3062778-6 LCS			100.7		%		80-120	30-MAY-19
HG-T-CVAA-VA Water				<0.000005	C	mg/L		0.000005	30-MAY-19
	HG-T-CVAA-VA	Water							



Workorder: L2278988 Report Date: 04-JUN-19 Page 4 of 19

HG-T-CVAA-VA   Water	Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
Morecury (Hg)-Total	HG-T-CVAA-VA	Water							
Mercury (Hg)-Total   100.9   mg/L   29-MAY-19   100.00005   29-MAY-19   100.0001   29-MAY-19   100.0001   29-MAY-19   100.0001   29-MAY-19   100.0001   29-MAY-19   100.0001   29-MAY-19   100.0001   29-MAY-19   100.0001   29-MAY-19   100.0001   29-MAY-19   100.0001   29-MAY-19   100.0001   29-MAY-19   100.0001   29-MAY-19   100.0001   29-MAY-19   29-MAY-19   29-MAY-19   20-MAY-19   20-M	Batch R464737	<b>72</b>							
WG3061243-1 MB Mercury (Hg)-Total         colspan="6">cols		•		100.0		0/		00.400	00.1441/.40
Mercury (Hg)-Total   Water   Water   Section   Meta   Section   Meta   Section   Meta   Section   Meta   Section   Meta   Section   Meta   Section   Meta   Section   Meta   Section   Meta   Section   Meta   Meta   Section   Meta   Meta   Section   Meta				100.9		%		80-120	29-MAY-19
Metr-D-CCMs-VA   Water   Batch   R4645515   R4645515   WG3059149-3   DUP   L2278988-2   Alluminum (A)-Dissolved   <0.0030   <0.0030   RPD-NA   mg/L   N/A   20   27-MAY-19   Antimony (Sb)-Dissolved   <0.00010   <0.00010   RPD-NA   mg/L   N/A   20   27-MAY-19   Arsenic (As)-Dissolved   <0.00016   0.00018   mg/L   3.4   20   27-MAY-19   Barium (Ba)-Dissolved   <0.00016   <0.000050   RPD-NA   mg/L   N/A   20   27-MAY-19   Response (As)-Dissolved   <0.000050   <0.000050   RPD-NA   mg/L   N/A   20   27-MAY-19   Response (As)-Dissolved   <0.000050   <0.000050   RPD-NA   mg/L   N/A   20   27-MAY-19   Response (As)-Dissolved   <0.010   <0.010   RPD-NA   mg/L   N/A   20   27-MAY-19   Response (As)-Dissolved   <0.010   <0.010   RPD-NA   mg/L   N/A   20   27-MAY-19   Response (As)-Dissolved   <0.000050   <0.0000050   RPD-NA   mg/L   N/A   20   27-MAY-19   Response (As)-Dissolved   <0.00010   <0.00010   RPD-NA   mg/L   N/A   20   27-MAY-19   Response (As)-Dissolved   <0.00010   <0.00010   RPD-NA   mg/L   N/A   20   27-MAY-19   Response (As)-Dissolved   <0.00010   <0.00010   RPD-NA   mg/L   N/A   20   27-MAY-19   Response (As)-Dissolved   <0.00010   <0.00010   RPD-NA   mg/L   N/A   20   27-MAY-19   Response (As)-Dissolved   <0.00050   <0.00050   RPD-NA   mg/L   N/A   20   27-MAY-19   Response (As)-Dissolved   <0.00050   <0.00050   RPD-NA   mg/L   N/A   20   27-MAY-19   Response (Mn)-Dissolved   <0.00050   <0.00050   RPD-NA   mg/L   N/A   20   27-MAY-19   Response (Mn)-Dissolved   <0.00050   <0.00050   RPD-NA   mg/L   N/A   20   27-MAY-19   Response (Mn)-Dissolved   <0.00050   <0.00050   RPD-NA   mg/L   N/A   20   27-MAY-19   Response (Mn)-Dissolved   <0.00050   <0.00050   RPD-NA   mg/L   N/A   20   27-MAY-19   Response (Mn)-Dissolved   <0.00010   <0.00010   RPD-NA   mg/L   N/A   20   27-MAY-19   Response (Mn)-Dissolved   <0.00042   <0.00050   RPD-NA   mg/L   N/A   20   27-MAY-19   Response (Mn)-Dissolved   <0.00010   <0.00010   RPD-NA   mg/L   N/A   20   27-MAY-19   Response (Mn)-Dissolved   <0.00010   <0.00010   RPD-NA				<0.000005	3	mg/L		0.000005	29-MAY-19
Batch R4645515           WG3059149-3 DUP         L227898-2           Aluminum (Al)-Dissolved         <0.0030         <0.0030         RPD-NA         mg/L         N/A         20         27-MAY-19           Antimory (Sb)-Dissolved         <0.00010         <0.00010         RPD-NA         mg/L         2.2         20         27-MAY-19           Arsenic (As)-Dissolved         <0.00187         <0.00183         mg/L         2.2         20         27-MAY-19           Barium (Ba)-Dissolved         <0.240         <0.232         mg/L         3.4         20         27-MAY-19           Bismuth (Bi)-Dissolved         <0.000050         <0.000050         RPD-NA         mg/L         N/A         20         27-MAY-19           Boron (B)-Dissolved         <0.010         <0.010         RPD-NA         mg/L         N/A         20         27-MAY-19           Cadrimum (Cd)-Dissolved         <0.000050         <0.0000050         RPD-NA         mg/L         N/A         20         27-MAY-19           Calcium (Ca)-Dissolved         <0.000010         <0.000010         RPD-NA         mg/L         N/A         20         27-MAY-19           Chromium (Cr)-Dissolved         <0.00030         <0.00031         RPD-NA         mg/L		Water				3		0.000000	20 10.711 10
NG3059149-3 DUP									
Aluminum (Al)-Dissolved         <0.0030         <0.0030         RPD-NA         mg/L         N/A         20         27-MAY-19           Antimory (Sb)-Dissolved         <0.00010			I 2278988-2						
Arsenic (As)-Dissolved         0.00187         0.00183         mg/L         2.2         20         27-MAY-19           Barium (Ba)-Dissolved         0.240         0.232         mg/L         3.4         20         27-MAY-19           Bismuth (Bi)-Dissolved         <0.000050				<0.0030	RPD-NA	mg/L	N/A	20	27-MAY-19
Barium (Ba)-Dissolved         0.240         0.232         mg/L         3.4         20         27-MAY-19           Bismuth (Bi)-Dissolved         <0.000050	Antimony (Sb)-Dissolv	ved	<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	27-MAY-19
Bismuth (Bi)-Dissolved         <0.000050         <0.000050         RPD-NA         mg/L         N/A         20         27-MAY-19           Boron (B)-Dissolved         <0.010	Arsenic (As)-Dissolved	d	0.00187	0.00183		mg/L	2.2	20	27-MAY-19
Boron (B)-Dissolved	Barium (Ba)-Dissolved	d	0.240	0.232		mg/L	3.4	20	27-MAY-19
Cadmium (Cd)-Dissolved         <0.0000050         <0.000005C         RPD-NA         mg/L         N/A         20         27-MAY-19           Calcium (Ca)-Dissolved         51.5         53.3         mg/L         3.5         20         27-MAY-19           Chromium (Cr)-Dissolved         <0.00010	Bismuth (Bi)-Dissolved	d	<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	27-MAY-19
Calcium (Ca)-Dissolved         51.5         53.3         mg/L         3.5         20         27-MAY-19           Chromium (Cr)-Dissolved         <0.00010	Boron (B)-Dissolved		<0.010	<0.010	RPD-NA	mg/L	N/A	20	27-MAY-19
Chromium (Cr)-Dissolved         <0.00010         <0.00010         RPD-NA         mg/L         N/A         20         27-MAY-19           Cobalt (Co)-Dissolved         0.00030         0.00031         mg/L         4.6         20         27-MAY-19           Copper (Cu)-Dissolved         <0.00050	Cadmium (Cd)-Dissol	ved	<0.0000050	<0.000005	RPD-NA	mg/L	N/A	20	27-MAY-19
Cobalt (Co)-Dissolved         0.00030         0.00031         mg/L         4.6         20         27-MAY-19           Copper (Cu)-Dissolved         <0.00050	Calcium (Ca)-Dissolve	ed	51.5	53.3		mg/L	3.5	20	27-MAY-19
Copper (Cu)-Dissolved         <0.00050         <0.00050         RPD-NA         mg/L         N/A         20         27-MAY-19           Iron (Fe)-Dissolved         0.919         0.911         mg/L         0.8         20         27-MAY-19           Lead (Pb)-Dissolved         <0.000050	Chromium (Cr)-Dissol	lved	<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	27-MAY-19
Iron (Fe)-Dissolved         0.919         0.911         mg/L         0.8         20         27-MAY-19           Lead (Pb)-Dissolved         <0.000050	Cobalt (Co)-Dissolved	i	0.00030	0.00031		mg/L	4.6	20	27-MAY-19
Lead (Pb)-Dissolved         <0.000050         <0.000050         RPD-NA         mg/L         N/A         20         27-MAY-19           Lithium (Li)-Dissolved         0.0053         0.0052         mg/L         2.3         20         27-MAY-19           Magnesium (Mg)-Dissolved         19.5         18.8         mg/L         3.5         20         27-MAY-19           Manganese (Mn)-Dissolved         0.0294         0.0290         mg/L         1.7         20         27-MAY-19           Molybdenum (Mo)-Dissolved         0.00342         0.00326         mg/L         4.7         20         27-MAY-19           Nickel (Ni)-Dissolved         0.00132         0.00121         mg/L         9.1         20         27-MAY-19           Potassium (K)-Dissolved         1.62         1.59         mg/L         1.9         20         27-MAY-19           Selenium (Se)-Dissolved         <0.000050	Copper (Cu)-Dissolve	d	<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	27-MAY-19
Lithium (Li)-Dissolved       0.0053       0.0052       mg/L       2.3       20       27-MAY-19         Magnesium (Mg)-Dissolved       19.5       18.8       mg/L       3.5       20       27-MAY-19         Manganese (Mn)-Dissolved       0.0294       0.0290       mg/L       1.7       20       27-MAY-19         Molybdenum (Mo)-Dissolved       0.00342       0.00326       mg/L       4.7       20       27-MAY-19         Nickel (Ni)-Dissolved       0.00132       0.00121       mg/L       9.1       20       27-MAY-19         Potassium (K)-Dissolved       1.62       1.59       mg/L       1.9       20       27-MAY-19         Selenium (Se)-Dissolved       <0.000050	Iron (Fe)-Dissolved		0.919	0.911		mg/L	8.0	20	27-MAY-19
Magnesium (Mg)-Dissolved         19.5         18.8         mg/L         3.5         20         27-MAY-19           Manganese (Mn)-Dissolved         0.0294         0.0290         mg/L         1.7         20         27-MAY-19           Molybdenum (Mo)-Dissolved         0.00342         0.00326         mg/L         4.7         20         27-MAY-19           Nickel (Ni)-Dissolved         0.00132         0.00121         mg/L         9.1         20         27-MAY-19           Potassium (K)-Dissolved         1.62         1.59         mg/L         1.9         20         27-MAY-19           Selenium (Se)-Dissolved         <0.000050	Lead (Pb)-Dissolved		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	27-MAY-19
Manganese (Mn)-Dissolved         0.0294         0.0290         mg/L         1.7         20         27-MAY-19           Molybdenum (Mo)-Dissolved         0.00342         0.00326         mg/L         4.7         20         27-MAY-19           Nickel (Ni)-Dissolved         0.00132         0.00121         mg/L         9.1         20         27-MAY-19           Potassium (K)-Dissolved         1.62         1.59         mg/L         1.9         20         27-MAY-19           Selenium (Se)-Dissolved         <0.000050	Lithium (Li)-Dissolved		0.0053	0.0052		mg/L	2.3	20	27-MAY-19
Molybdenum (Mo)-Dissolved         0.00342         0.00326         mg/L         4.7         20         27-MAY-19           Nickel (Ni)-Dissolved         0.00132         0.00121         mg/L         9.1         20         27-MAY-19           Potassium (K)-Dissolved         1.62         1.59         mg/L         1.9         20         27-MAY-19           Selenium (Se)-Dissolved         <0.000050	Magnesium (Mg)-Diss	solved	19.5	18.8		mg/L	3.5	20	27-MAY-19
Nickel (Ni)-Dissolved         0.00132         0.00121         mg/L         9.1         20         27-MAY-19           Potassium (K)-Dissolved         1.62         1.59         mg/L         1.9         20         27-MAY-19           Selenium (Se)-Dissolved         <0.000050	Manganese (Mn)-Diss	solved	0.0294	0.0290		mg/L	1.7	20	27-MAY-19
Potassium (K)-Dissolved         1.62         1.59         mg/L         1.9         20         27-MAY-19           Selenium (Se)-Dissolved         <0.000050	Molybdenum (Mo)-Dis	ssolved	0.00342	0.00326		mg/L	4.7	20	27-MAY-19
Selenium (Se)-Dissolved         <0.000050         <0.000050         RPD-NA         mg/L         N/A         20         27-MAY-19           Silicon (Si)-Dissolved         3.35         3.34         mg/L         0.4         20         27-MAY-19           Silver (Ag)-Dissolved         <0.000010	Nickel (Ni)-Dissolved		0.00132	0.00121		mg/L	9.1	20	27-MAY-19
Silicon (Si)-Dissolved       3.35       3.34       mg/L       0.4       20       27-MAY-19         Silver (Ag)-Dissolved       <0.000010	Potassium (K)-Dissolv	ved	1.62	1.59		mg/L	1.9	20	27-MAY-19
Silver (Ag)-Dissolved       <0.000010       <0.000010       RPD-NA       mg/L       N/A       20       27-MAY-19         Sodium (Na)-Dissolved       1.02       0.985       mg/L       3.2       20       27-MAY-19         Strontium (Sr)-Dissolved       0.0474       0.0471       mg/L       0.7       20       27-MAY-19         Thallium (Tl)-Dissolved       <0.000010	Selenium (Se)-Dissolv	ved	<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	27-MAY-19
Sodium (Na)-Dissolved       1.02       0.985       mg/L       3.2       20       27-MAY-19         Strontium (Sr)-Dissolved       0.0474       0.0471       mg/L       0.7       20       27-MAY-19         Thallium (TI)-Dissolved       <0.000010	Silicon (Si)-Dissolved		3.35	3.34		mg/L	0.4	20	27-MAY-19
Strontium (Sr)-Dissolved         0.0474         0.0471         mg/L         0.7         20         27-MAY-19           Thallium (TI)-Dissolved         <0.000010	Silver (Ag)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	27-MAY-19
Thallium (TI)-Dissolved       <0.000010       <0.000010       RPD-NA       mg/L       N/A       20       27-MAY-19         Tin (Sn)-Dissolved       <0.00010	Sodium (Na)-Dissolve	ed	1.02	0.985		mg/L	3.2	20	27-MAY-19
Tin (Sn)-Dissolved       <0.00010       <0.00010       RPD-NA       mg/L       N/A       20       27-MAY-19         Titanium (Ti)-Dissolved       <0.010	Strontium (Sr)-Dissolv	/ed	0.0474	0.0471		mg/L	0.7	20	27-MAY-19
Titanium (Ti)-Dissolved <0.010 <0.010 RPD-NA mg/L N/A 20 27-MAY-19	Thallium (TI)-Dissolve	ed	<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	27-MAY-19
	Tin (Sn)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	27-MAY-19
Uranium (U)-Dissolved 0.000589 0.000583 mg/L 1.0 20 27-MAY-19	Titanium (Ti)-Dissolve	ed	<0.010	<0.010	RPD-NA	mg/L	N/A	20	27-MAY-19
	Uranium (U)-Dissolve	d	0.000589	0.000583		mg/L	1.0	20	27-MAY-19



Workorder: L2278988 Report Date: 04-JUN-19 Page 5 of 19

Test N	latrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA V	Vater							
Batch R4645515								
WG3059149-3 DUP		L2278988-2						
Vanadium (V)-Dissolved		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	27-MAY-19
Zinc (Zn)-Dissolved		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	27-MAY-19
WG3059149-2 LCS Aluminum (Al)-Dissolved			105.9		%		00.400	07 MAY 40
Antimony (Sb)-Dissolved			102.3		%		80-120	27-MAY-19
Arsenic (As)-Dissolved			102.3		%		80-120	27-MAY-19
Barium (Ba)-Dissolved			103.8		%		80-120	27-MAY-19
Bismuth (Bi)-Dissolved			103.8		%		80-120	27-MAY-19
Boron (B)-Dissolved			98.9		%		80-120	27-MAY-19
( )							80-120	27-MAY-19
Cadmium (Cd)-Dissolved Calcium (Ca)-Dissolved			104.7 99.2		%		80-120	27-MAY-19
,							80-120	27-MAY-19
Chromium (Cr)-Dissolved			105.3		%		80-120	27-MAY-19
Cobalt (Co)-Dissolved			102.9		%		80-120	27-MAY-19
Copper (Cu)-Dissolved			101.2		%		80-120	27-MAY-19
Iron (Fe)-Dissolved			96.7		%		80-120	27-MAY-19
Lead (Pb)-Dissolved			99.1				80-120	27-MAY-19
Lithium (Li)-Dissolved			98.1		%		80-120	27-MAY-19
Magnesium (Mg)-Dissolved			109.1		%		80-120	27-MAY-19
Manganese (Mn)-Dissolved			106.9		%		80-120	27-MAY-19
Molybdenum (Mo)-Dissolve	eu		108.6		%		80-120	27-MAY-19
Nickel (Ni)-Dissolved			103.6		%		80-120	27-MAY-19
Potassium (K)-Dissolved			105.5		%		80-120	27-MAY-19
Selenium (Se)-Dissolved			99.4		%		80-120	27-MAY-19
Silicon (Si)-Dissolved			104.4		%		60-140	27-MAY-19
Silver (Ag)-Dissolved			107.5		%		80-120	27-MAY-19
Sodium (Na)-Dissolved			104.1		%		80-120	27-MAY-19
Strontium (Sr)-Dissolved			105.3		%		80-120	27-MAY-19
Thallium (TI)-Dissolved			100.1		%		80-120	27-MAY-19
Tin (Sn)-Dissolved			103.3		%		80-120	27-MAY-19
Titanium (Ti)-Dissolved			97.6		%		80-120	27-MAY-19
Uranium (U)-Dissolved			97.7		%		80-120	27-MAY-19
Vanadium (V)-Dissolved			105.0		%		80-120	27-MAY-19
Zinc (Zn)-Dissolved			99.4		%		80-120	27-MAY-19
WG3059149-1 MB Aluminum (Al)-Dissolved		NP	<0.0010		mg/L		0.001	27-MAY-19



Workorder: L2278988

Report Date: 04-JUN-19

Page 6 of 19

est	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
ET-D-CCMS-VA	Water							
Batch R4645515								
WG3059149-1 MB		NP						
Antimony (Sb)-Dissolve	d		<0.00010		mg/L		0.0001	27-MAY-19
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	27-MAY-19
Barium (Ba)-Dissolved			<0.00010		mg/L		0.0001	27-MAY-19
Bismuth (Bi)-Dissolved			<0.000050	)	mg/L		0.00005	27-MAY-19
Boron (B)-Dissolved			<0.010		mg/L		0.01	27-MAY-19
Cadmium (Cd)-Dissolve	d		<0.000005	5C	mg/L		0.000005	27-MAY-19
Calcium (Ca)-Dissolved			< 0.050		mg/L		0.05	27-MAY-19
Chromium (Cr)-Dissolve	ed		<0.00010		mg/L		0.0001	27-MAY-19
Cobalt (Co)-Dissolved			<0.00010		mg/L		0.0001	27-MAY-19
Copper (Cu)-Dissolved			<0.00020		mg/L		0.0002	27-MAY-19
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	27-MAY-19
Lead (Pb)-Dissolved			<0.000050	)	mg/L		0.00005	27-MAY-19
Lithium (Li)-Dissolved			<0.0010		mg/L		0.001	27-MAY-19
Magnesium (Mg)-Dissol	ved		< 0.0050		mg/L		0.005	27-MAY-19
Manganese (Mn)-Dissol	ved		<0.00010		mg/L		0.0001	27-MAY-19
Molybdenum (Mo)-Disso	olved		<0.000050	)	mg/L		0.00005	27-MAY-19
Nickel (Ni)-Dissolved			<0.00050		mg/L		0.0005	27-MAY-19
Potassium (K)-Dissolve	d		<0.050		mg/L		0.05	27-MAY-19
Selenium (Se)-Dissolve	d		<0.000050	)	mg/L		0.00005	27-MAY-19
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	27-MAY-19
Silver (Ag)-Dissolved			<0.000010	)	mg/L		0.00001	27-MAY-19
Sodium (Na)-Dissolved			<0.050		mg/L		0.05	27-MAY-19
Strontium (Sr)-Dissolved	d		<0.00020		mg/L		0.0002	27-MAY-19
Thallium (TI)-Dissolved			<0.000010	)	mg/L		0.00001	27-MAY-19
Tin (Sn)-Dissolved			<0.00010		mg/L		0.0001	27-MAY-19
Titanium (Ti)-Dissolved			<0.00030		mg/L		0.0003	27-MAY-19
Uranium (U)-Dissolved			<0.000010	)	mg/L		0.00001	27-MAY-19
Vanadium (V)-Dissolved	i		<0.00050		mg/L		0.0005	27-MAY-19
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	27-MAY-19
WG3059149-4 MS Aluminum (Al)-Dissolved	d	L2278988-1	98.9		%		70-130	27-MAY-19
Antimony (Sb)-Dissolved			102.6		%		70-130	27-MAY-19
Arsenic (As)-Dissolved	<b>-</b>		102.0		%			27-MAY-19 27-MAY-19
Barium (Ba)-Dissolved			N/A	MS-B	%		70-130 -	27-MAY-19 27-MAY-19



Workorder: L2278988

Report Date: 04-JUN-19

Page 7 of 19

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA	Water							
Batch R4645515								
WG3059149-4 MS		L2278988-1						
Bismuth (Bi)-Dissolved			83.7		%		70-130	27-MAY-19
Boron (B)-Dissolved			97.8		%		70-130	27-MAY-19
Cadmium (Cd)-Dissolve			101.0		%		70-130	27-MAY-19
Calcium (Ca)-Dissolved			N/A	MS-B	%		-	27-MAY-19
Chromium (Cr)-Dissolve	ed		98.7		%		70-130	27-MAY-19
Cobalt (Co)-Dissolved			95.4		%		70-130	27-MAY-19
Copper (Cu)-Dissolved			92.5		%		70-130	27-MAY-19
Iron (Fe)-Dissolved			97.8		%		70-130	27-MAY-19
Lead (Pb)-Dissolved			93.3		%		70-130	27-MAY-19
Lithium (Li)-Dissolved			N/A	MS-B	%		-	27-MAY-19
Magnesium (Mg)-Dissol	ved		N/A	MS-B	%		-	27-MAY-19
Manganese (Mn)-Dissol	ved		97.0		%		70-130	27-MAY-19
Molybdenum (Mo)-Disso	olved		N/A	MS-B	%		-	27-MAY-19
Nickel (Ni)-Dissolved			93.9		%		70-130	27-MAY-19
Potassium (K)-Dissolved	d		N/A	MS-B	%		-	27-MAY-19
Selenium (Se)-Dissolved	d		97.6		%		70-130	27-MAY-19
Silicon (Si)-Dissolved			90.5		%		70-130	27-MAY-19
Silver (Ag)-Dissolved			99.6		%		70-130	27-MAY-19
Sodium (Na)-Dissolved			N/A	MS-B	%		-	27-MAY-19
Strontium (Sr)-Dissolved	b		N/A	MS-B	%		-	27-MAY-19
Thallium (TI)-Dissolved			92.8		%		70-130	27-MAY-19
Tin (Sn)-Dissolved			100.4		%		70-130	27-MAY-19
Titanium (Ti)-Dissolved			96.5		%		70-130	27-MAY-19
Uranium (U)-Dissolved			95.7		%		70-130	27-MAY-19
Vanadium (V)-Dissolved	i		101.8		%		70-130	27-MAY-19
Zinc (Zn)-Dissolved			96.8		%		70-130	27-MAY-19
Batch R4646589								
WG3058816-2 LCS								
Aluminum (Al)-Dissolved	d		107.7		%		80-120	28-MAY-19
Antimony (Sb)-Dissolved	d		95.7		%		80-120	28-MAY-19
Arsenic (As)-Dissolved			100.7		%		80-120	28-MAY-19
Barium (Ba)-Dissolved			107.3		%		80-120	28-MAY-19
Bismuth (Bi)-Dissolved			101.5		%		80-120	28-MAY-19
Boron (B)-Dissolved			94.1		%		80-120	28-MAY-19



Workorder: L2278988

Report Date: 04-JUN-19

Page 8 of 19

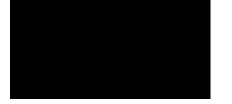
Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA	Water							
Batch R46465	89							
WG3058816-2 LC								
Cadmium (Cd)-Disso			102.1		%		80-120	28-MAY-19
Calcium (Ca)-Dissolv			97.7		%		80-120	28-MAY-19
Chromium (Cr)-Disso			103.0		%		80-120	28-MAY-19
Cobalt (Co)-Dissolve	d		101.6		%		80-120	28-MAY-19
Iron (Fe)-Dissolved			99.96		%		80-120	28-MAY-19
Lead (Pb)-Dissolved			102.9		%		80-120	28-MAY-19
Lithium (Li)-Dissolved	d		95.9		%		80-120	28-MAY-19
Magnesium (Mg)-Dis	ssolved		97.6		%		80-120	28-MAY-19
Manganese (Mn)-Dis	ssolved		105.3		%		80-120	28-MAY-19
Molybdenum (Mo)-Di	issolved		99.0		%		80-120	28-MAY-19
Nickel (Ni)-Dissolved	I		100.8		%		80-120	28-MAY-19
Potassium (K)-Disso	lved		110.4		%		80-120	28-MAY-19
Selenium (Se)-Disso	lved		100.3		%		80-120	28-MAY-19
Silicon (Si)-Dissolved	t		108.7		%		60-140	28-MAY-19
Silver (Ag)-Dissolved	I		98.8		%		80-120	28-MAY-19
Sodium (Na)-Dissolv	ed		106.4		%		80-120	28-MAY-19
Strontium (Sr)-Dissol	lved		98.0		%		80-120	28-MAY-19
Thallium (TI)-Dissolve	ed		101.7		%		80-120	28-MAY-19
Tin (Sn)-Dissolved			98.9		%		80-120	28-MAY-19
Titanium (Ti)-Dissolv	red		99.97		%		80-120	28-MAY-19
Uranium (U)-Dissolve	ed		100.9		%		80-120	28-MAY-19
Vanadium (V)-Dissol	ved		102.6		%		80-120	28-MAY-19
Zinc (Zn)-Dissolved			101.3		%		80-120	28-MAY-19
WG3058816-1 MB		LF						
Aluminum (AI)-Disso	lved		<0.0010		mg/L		0.001	28-MAY-19
Antimony (Sb)-Disso	lved		<0.00010		mg/L		0.0001	28-MAY-19
Arsenic (As)-Dissolve	ed		<0.00010		mg/L		0.0001	28-MAY-19
Barium (Ba)-Dissolve	ed		<0.00010		mg/L		0.0001	28-MAY-19
Bismuth (Bi)-Dissolve	ed		<0.000050		mg/L		0.00005	28-MAY-19
Boron (B)-Dissolved			<0.010		mg/L		0.01	28-MAY-19
Cadmium (Cd)-Disso	olved		<0.000005	С	mg/L		0.000005	28-MAY-19
Calcium (Ca)-Dissolv	/ed		<0.050		mg/L		0.05	28-MAY-19
Chromium (Cr)-Disso			<0.00010		mg/L		0.0001	28-MAY-19
Cobalt (Co)-Dissolve	d		<0.00010		mg/L		0.0001	28-MAY-19



Workorder: L2278988

Report Date: 04-JUN-19 Page 9 of 19

Test I	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA	Water							
Batch R4646589								
WG3058816-1 MB		LF			_			
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	28-MAY-19
Lead (Pb)-Dissolved			<0.00005	0	mg/L		0.00005	28-MAY-19
Lithium (Li)-Dissolved			<0.0010		mg/L		0.001	28-MAY-19
Magnesium (Mg)-Dissolve			<0.0050		mg/L		0.005	28-MAY-19
Manganese (Mn)-Dissolve			<0.00010		mg/L		0.0001	28-MAY-19
Molybdenum (Mo)-Dissolv	red		<0.00005	0	mg/L		0.00005	28-MAY-19
Nickel (Ni)-Dissolved			<0.00050		mg/L		0.0005	28-MAY-19
Potassium (K)-Dissolved			< 0.050		mg/L		0.05	28-MAY-19
Selenium (Se)-Dissolved			<0.00005	0	mg/L		0.00005	28-MAY-19
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	28-MAY-19
Silver (Ag)-Dissolved			<0.00001	0	mg/L		0.00001	28-MAY-19
Sodium (Na)-Dissolved			< 0.050		mg/L		0.05	28-MAY-19
Strontium (Sr)-Dissolved			<0.00020		mg/L		0.0002	28-MAY-19
Thallium (TI)-Dissolved			<0.00001	0	mg/L		0.00001	28-MAY-19
Tin (Sn)-Dissolved			<0.00010		mg/L		0.0001	28-MAY-19
Titanium (Ti)-Dissolved			<0.00030		mg/L		0.0003	28-MAY-19
Uranium (U)-Dissolved			<0.00001	0	mg/L		0.00001	28-MAY-19
Vanadium (V)-Dissolved			<0.00050		mg/L		0.0005	28-MAY-19
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	28-MAY-19
Batch R4647134								
WG3061071-2 LCS								
Aluminum (Al)-Dissolved			102.8		%		80-120	29-MAY-19
Antimony (Sb)-Dissolved			95.3		%		80-120	29-MAY-19
Arsenic (As)-Dissolved			101.8		%		80-120	29-MAY-19
Barium (Ba)-Dissolved			113.2		%		80-120	29-MAY-19
Bismuth (Bi)-Dissolved			108.6		%		80-120	29-MAY-19
Boron (B)-Dissolved			98.5		%		80-120	29-MAY-19
Cadmium (Cd)-Dissolved			104.2		%		80-120	29-MAY-19
Calcium (Ca)-Dissolved			103.9		%		80-120	29-MAY-19
Chromium (Cr)-Dissolved			105.4		%		80-120	29-MAY-19
Cobalt (Co)-Dissolved			103.3		%		80-120	29-MAY-19
Copper (Cu)-Dissolved			101.3		%		80-120	29-MAY-19
Iron (Fe)-Dissolved			96.2		%		80-120	29-MAY-19
Lead (Pb)-Dissolved			101.5		%		80-120	29-MAY-19



Workorder: L2278988 Report Date: 04-JUN-19 Page 10 of 19

MET-D-CCMS-VA   Water	Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
WG3061071-2 LCS	MET-D-CCMS-VA	Water							
Lithium (Li)-Dissolved   100.0 % 80-120 29-MAY-19	Batch R464713	4							
Magnesium (Mg)-Dissolved         102.2         %         80-120         29-MAY-19           Manganese (Mn)-Dissolved         103.7         %         80-120         29-MAY-19           Molybdenum (Mo)-Dissolved         104.4         %         80-120         29-MAY-19           Nickel (Ni)-Dissolved         101.7         %         80-120         29-MAY-19           Potassium (K)-Dissolved         106.3         %         80-120         29-MAY-19           Selienium (Se)-Dissolved         101.4         %         80-120         29-MAY-19           Sillor (Sj)-Dissolved         104.7         %         80-120         29-MAY-19           Silver (Ag)-Dissolved         102.6         %         80-120         29-MAY-19           Sodium (Na)-Dissolved         107.0         %         80-120         29-MAY-19           Strontium (Sj)-Dissolved         101.6         %         80-120         29-MAY-19           Tin (Sn)-Dissolved         101.5         %         80-120         29-MAY-19           Tin (Sn)-Dissolved         101.5         %         80-120         29-MAY-19           Titanium (Ti)-Dissolved         101.5         %         80-120         29-MAY-19           Vanadium (V)-Dissolved         95.2 </td <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>									
Manganese (Mn)-Dissolved         103.7         %         80-120         29-MAY-19           Molybdenum (Mo)-Dissolved         104.4         %         80-120         29-MAY-19           Nickel (Ni)-Dissolved         101.7         %         80-120         29-MAY-19           Selienium (Se)-Dissolved         106.3         %         80-120         29-MAY-19           Selienium (Se)-Dissolved         101.4         %         80-120         29-MAY-19           Silicon (Si)-Dissolved         104.7         %         60-140         29-MAY-19           Silver (Ag)-Dissolved         102.6         %         80-120         29-MAY-19           Sodium (Na)-Dissolved         107.0         %         80-120         29-MAY-19           Strontium (Sr)-Dissolved         101.5         %         80-120         29-MAY-19           Thallium (Ti)-Dissolved         101.5         %         80-120         29-MAY-19           Tira (Sr)-Dissolved         101.5         %         80-120         29-MAY-19           Uranium (U)-Dissolved         105.2         %         80-120         29-MAY-19           Vanadium (V)-Dissolved         107.1         %         80-120         29-MAY-19           Vanadium (V)-Dissolved         10									
Molybdenum (Mo)-Dissolved									
Nickel (Ni)-Dissolved	-								
Potassium (K)-Dissolved 106.3 % 80-120 29-MAY-19 Selenium (Se)-Dissolved 101.4 % 80-120 29-MAY-19 Silicon (Si)-Dissolved 104.7 % 60-140 29-MAY-19 Silicon (Si)-Dissolved 104.7 % 80-120 29-MAY-19 Silicon (Si)-Dissolved 102.6 % 80-120 29-MAY-19 Silicon (Na)-Dissolved 107.0 % 80-120 29-MAY-19 Strontium (Sr)-Dissolved 101.6 % 80-120 29-MAY-19 Thallium (Ti)-Dissolved 101.5 % 80-120 29-MAY-19 Thallium (Ti)-Dissolved 100.5 % 80-120 29-MAY-19 Tin (Sn)-Dissolved 100.5 % 80-120 29-MAY-19 Uranium (U)-Dissolved 101.5 % 80-120 29-MAY-19 Uranium (U)-Dissolved 95.2 % 80-120 29-MAY-19 Uranium (U)-Dissolved 107.1 % 80-120 29-MAY-19 Zinc (Zn)-Dissolved 100.9 % 80-120 29-MAY-19 Zinc (Zn)-Dissolved 100.9 % 80-120 29-MAY-19 WG3061071-1 MB LF Aluminum (Al)-Dissolved 0.00010 mg/L 0.001 29-MAY-19 Arsenic (As)-Dissolved 0.00010 mg/L 0.0001 29-MAY-19 Barium (Ba)-Dissolved 0.00010 mg/L 0.0001 29-MAY-19 Barium (Ba)-Dissolved 0.00010 mg/L 0.0001 29-MAY-19 Bismuth (Bi)-Dissolved 0.000050 mg/L 0.00005 29-MAY-19 Cadmium (Cq)-Dissolved 0.000050 mg/L 0.00005 29-MAY-19 Cadmium (Cq)-Dissolved 0.00010 mg/L 0.000 29-MAY-19 Calcium (Cq)-Dissolved 0.00010 mg/L 0.000 29-MAY-19 Chromium (Cq)-Dissolved 0.000050 mg/L 0.0000 29-MAY-19 Cobalt (Co)-Dissolved 0.00010 mg/L 0.000 29-MAY-19 Cobalt (Co)-Dissolved 0.000050 mg/L 0.0000 29-MAY-19 Cobalt (Co)-Dissolved 0.0000050 mg/L 0.0000 29-MAY-19 Cobalt (Co)-Dissolved 0.000050 mg/L 0.0000 29-MAY-19 Liatium (Li)-Dissolved 0.00010 mg/L 0.0001 29-MAY-19 Liatium (Li)-Dissolved 0.00010 mg/L 0.0001 29-MAY-19 Liatium (Li)-Dissolved 0.00010 mg/L 0.0001 29-MAY-19 Liatium (Li)-Dissolved 0.00010 mg/L 0.0005 29-MAY-19 Liatium (Li)-Dissolved 0.00010 mg/L 0.0005 29-MAY-19 Liatium (Li)-Dissolved 0.00050 mg/L 0.0005 29-MAY-19		solved						80-120	29-MAY-19
Selenium (Se)-Dissolved         101.4         %         80-120         29-MAY-19           Silicon (Si)-Dissolved         104.7         %         60-140         29-MAY-19           Silver (Ag)-Dissolved         102.6         %         80-120         29-MAY-19           Sodium (Na)-Dissolved         107.0         %         80-120         29-MAY-19           Strontium (Sr)-Dissolved         101.6         %         80-120         29-MAY-19           Thallium (Ti)-Dissolved         101.5         %         80-120         29-MAY-19           Tin (Sn)-Dissolved         100.5         %         80-120         29-MAY-19           Tinalium (Ti)-Dissolved         101.5         %         80-120         29-MAY-19           Uranium (U)-Dissolved         95.2         %         80-120         29-MAY-19           Vanadium (V)-Dissolved         107.1         %         80-120         29-MAY-19           Vanadium (Al)-Dissolved         100.9         %         80-120         29-MAY-19           WG306107-1         MB         LF         Aluminum (Al)-Dissolved         <0.0010	` ,							80-120	29-MAY-19
Silicon (S)-Dissolved         104.7         %         60.140         29-MAY-19           Silver (Ag)-Dissolved         102.6         %         80-120         29-MAY-19           Sodium (Na)-Dissolved         107.0         %         80-120         29-MAY-19           Strontium (Sr)-Dissolved         101.6         %         80-120         29-MAY-19           Thallium (Ti)-Dissolved         101.5         %         80-120         29-MAY-19           Tin (Sn)-Dissolved         100.5         %         80-120         29-MAY-19           Titanium (Ti)-Dissolved         101.5         %         80-120         29-MAY-19           Uranium (U)-Dissolved         95.2         %         80-120         29-MAY-19           Vanadium (V)-Dissolved         107.1         %         80-120         29-MAY-19           Vanadium (V)-Dissolved         100.9         %         80-120         29-MAY-19           WG3061071-1         MB         LF         Aluminum (Al)-Dissolved         <0.0010	Potassium (K)-Dissolv	ed		106.3				80-120	29-MAY-19
Silver (Ag)-Dissolved         102.6         %         80.120         29-MAY-19           Sodium (Na)-Dissolved         107.0         %         80-120         29-MAY-19           Strontium (Sr)-Dissolved         101.6         %         80-120         29-MAY-19           Thallium (Ti)-Dissolved         101.5         %         80-120         29-MAY-19           Tin (Sn)-Dissolved         100.5         %         80-120         29-MAY-19           Titanium (Ti)-Dissolved         101.5         %         80-120         29-MAY-19           Uranium (U)-Dissolved         95.2         %         80-120         29-MAY-19           Vanadium (V)-Dissolved         107.1         %         80-120         29-MAY-19           Vanadium (V)-Dissolved         100.9         %         80-120         29-MAY-19           WG3061071-1         MB         LF         Aluminum (Al)-Dissolved         <0.0010	Selenium (Se)-Dissolv	ed		101.4		%		80-120	29-MAY-19
Sodium (Na)-Dissolved         107.0         %         80-120         29-MAY-19           Strontium (Sr)-Dissolved         101.6         %         80-120         29-MAY-19           Thallium (TI)-Dissolved         101.5         %         80-120         29-MAY-19           Tin (Sn)-Dissolved         100.5         %         80-120         29-MAY-19           Titanium (Ti)-Dissolved         101.5         %         80-120         29-MAY-19           Uranium (U)-Dissolved         95.2         %         80-120         29-MAY-19           Vanadium (V)-Dissolved         107.1         %         80-120         29-MAY-19           Zinc (Zn)-Dissolved         100.9         %         80-120         29-MAY-19           WG3061071-1         MB         LF         Aluminum (Al)-Dissolved         <0.0010	Silicon (Si)-Dissolved			104.7		%		60-140	29-MAY-19
Strontium (Sr)-Dissolved         101.6         %         80-120         29-MAY-19           Thallium (TI)-Dissolved         101.5         %         80-120         29-MAY-19           Tin (Sn)-Dissolved         100.5         %         80-120         29-MAY-19           Titanium (Ti)-Dissolved         101.5         %         80-120         29-MAY-19           Uranium (U)-Dissolved         95.2         %         80-120         29-MAY-19           Vanadium (V)-Dissolved         100.9         %         80-120         29-MAY-19           Zinc (Zn)-Dissolved         100.9         %         80-120         29-MAY-19           WG3061071-1         MB         LF         LF         Aluminum (AI)-Dissolved         <0.0010	Silver (Ag)-Dissolved			102.6		%		80-120	29-MAY-19
Thallium (TI)-Dissolved         101.5         %         80-120         29-MAY-19           Tin (Sn)-Dissolved         100.5         %         80-120         29-MAY-19           Titanium (TI)-Dissolved         101.5         %         80-120         29-MAY-19           Uranium (U)-Dissolved         95.2         %         80-120         29-MAY-19           Vanadium (V)-Dissolved         100.9         %         80-120         29-MAY-19           Zinc (Zn)-Dissolved         100.9         %         80-120         29-MAY-19           WG3061071-1         MB         LF         LF         Aluminum (Al)-Dissolved         <0.0010	Sodium (Na)-Dissolve	d		107.0		%		80-120	29-MAY-19
Tin (Sn)-Dissolved         100.5         %         80-120         29-MAY-19           Titanium (Ti)-Dissolved         101.5         %         80-120         29-MAY-19           Uranium (U)-Dissolved         95.2         %         80-120         29-MAY-19           Vanadium (V)-Dissolved         100.9         %         80-120         29-MAY-19           Zinc (Zn)-Dissolved         100.9         %         80-120         29-MAY-19           WG3061071-1         MB         LF         Name of the control of the contr	Strontium (Sr)-Dissolv	ed		101.6		%		80-120	29-MAY-19
Titanium (Ti)-Dissolved         101.5         %         80-120         29-MAY-19           Uranium (U)-Dissolved         95.2         %         80-120         29-MAY-19           Vanadium (V)-Dissolved         107.1         %         80-120         29-MAY-19           Zinc (Zn)-Dissolved         100.9         %         80-120         29-MAY-19           WG3061071-1         MB         LF         LF         Aluminum (Al)-Dissolved         0.0010         mg/L         0.001         29-MAY-19           Antimony (Sb)-Dissolved         <0.00010	Thallium (TI)-Dissolved	d		101.5		%		80-120	29-MAY-19
Uranium (U)-Dissolved         95.2         %         80-120         29-MAY-19           Vanadium (V)-Dissolved         107.1         %         80-120         29-MAY-19           Zinc (Zn)-Dissolved         100.9         %         80-120         29-MAY-19           WG3061071-1         MB         LF           Aluminum (Al)-Dissolved         <0.0010	Tin (Sn)-Dissolved			100.5		%		80-120	29-MAY-19
Vanadium (V)-Dissolved         107.1         %         80-120         29-MAY-19           Zinc (Zn)-Dissolved         100.9         %         80-120         29-MAY-19           WG3061071-1         MB         LF           Aluminum (Al)-Dissolved         <0.0010	Titanium (Ti)-Dissolve	d		101.5		%		80-120	29-MAY-19
Zinc (Zn)-Dissolved         100.9         %         80-120         29-MAY-19           WG3061071-1         MB         LF           Aluminum (Al)-Dissolved         <0.0010	Uranium (U)-Dissolved	t		95.2		%		80-120	29-MAY-19
WG3061071-1         MB         LF           Aluminum (Al)-Dissolved         <0.0010	Vanadium (V)-Dissolve	ed		107.1		%		80-120	29-MAY-19
Aluminum (Al)-Dissolved       <0.0010	Zinc (Zn)-Dissolved			100.9		%		80-120	29-MAY-19
Antimony (Sb)-Dissolved       <0.00010	WG3061071-1 MB		LF						
Arsenic (As)-Dissolved       <0.00010	Aluminum (Al)-Dissolv	ed		<0.0010		mg/L		0.001	29-MAY-19
Barium (Ba)-Dissolved         <0.00010         mg/L         0.0001         29-MAY-19           Bismuth (Bi)-Dissolved         <0.000050	Antimony (Sb)-Dissolv	ed		<0.00010		mg/L		0.0001	29-MAY-19
Bismuth (Bi)-Dissolved         <0.000050         mg/L         0.00005         29-MAY-19           Boron (B)-Dissolved         <0.010	` '			<0.00010		mg/L		0.0001	29-MAY-19
Boron (B)-Dissolved         <0.010         mg/L         0.01         29-MAY-19           Cadmium (Cd)-Dissolved         <0.000005C	Barium (Ba)-Dissolved	I		<0.00010		mg/L		0.0001	29-MAY-19
Cadmium (Cd)-Dissolved       <0.000005C       mg/L       0.000005       29-MAY-19         Calcium (Ca)-Dissolved       <0.050	Bismuth (Bi)-Dissolved	d		<0.000050	)	mg/L		0.00005	29-MAY-19
Calcium (Ca)-Dissolved       <0.050	Boron (B)-Dissolved			<0.010		mg/L		0.01	29-MAY-19
Chromium (Cr)-Dissolved       <0.00010	Cadmium (Cd)-Dissolv	/ed		<0.000005	5C	mg/L		0.000005	29-MAY-19
Cobalt (Co)-Dissolved         <0.00010	Calcium (Ca)-Dissolve	ed		< 0.050		mg/L		0.05	29-MAY-19
Copper (Cu)-Dissolved         <0.00020         mg/L         0.0002         29-MAY-19           Iron (Fe)-Dissolved         <0.010	Chromium (Cr)-Dissol	ved		<0.00010		mg/L		0.0001	29-MAY-19
Iron (Fe)-Dissolved       <0.010	Cobalt (Co)-Dissolved			<0.00010		mg/L		0.0001	29-MAY-19
Lead (Pb)-Dissolved       <0.000050       mg/L       0.00005       29-MAY-19         Lithium (Li)-Dissolved       <0.0010	Copper (Cu)-Dissolved	d		<0.00020		mg/L		0.0002	29-MAY-19
Lithium (Li)-Dissolved       <0.0010	Iron (Fe)-Dissolved			<0.010		mg/L		0.01	29-MAY-19
Magnesium (Mg)-Dissolved <0.0050 mg/L 0.005 29-MAY-19	Lead (Pb)-Dissolved			<0.000050	)	mg/L		0.00005	29-MAY-19
5 ( 6)	Lithium (Li)-Dissolved			<0.0010		mg/L		0.001	29-MAY-19
Manganese (Mn)-Dissolved <0.00010 mg/L 0.0001 29-MAY-19	Magnesium (Mg)-Diss	olved		<0.0050		mg/L		0.005	29-MAY-19
	Manganese (Mn)-Diss	olved		<0.00010		mg/L		0.0001	29-MAY-19



Workorder: L2278988

Report Date: 04-JUN-19 Page 11 of 19

Test M	latrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA V	Vater							
Batch R4647134								
WG3061071-1 MB Molybdenum (Mo)-Dissolve	ed	LF	<0.000050		mg/L		0.00005	29-MAY-19
Nickel (Ni)-Dissolved			<0.00050		mg/L		0.0005	29-MAY-19
Potassium (K)-Dissolved			<0.050		mg/L		0.05	29-MAY-19
Selenium (Se)-Dissolved			<0.000050		mg/L		0.00005	29-MAY-19
Silicon (Si)-Dissolved			< 0.050		mg/L		0.05	29-MAY-19
Silver (Ag)-Dissolved			<0.000010		mg/L		0.00001	29-MAY-19
Sodium (Na)-Dissolved			< 0.050		mg/L		0.05	29-MAY-19
Strontium (Sr)-Dissolved			<0.00020		mg/L		0.0002	29-MAY-19
Thallium (TI)-Dissolved			<0.000010		mg/L		0.00001	29-MAY-19
Tin (Sn)-Dissolved			<0.00010		mg/L		0.0001	29-MAY-19
Titanium (Ti)-Dissolved			<0.00030		mg/L		0.0003	29-MAY-19
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	29-MAY-19
Vanadium (V)-Dissolved			<0.00050		mg/L		0.0005	29-MAY-19
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	29-MAY-19
MET-T-CCMS-VA V	Vater							
Batch R4645127								
WG3058750-3 DUP Aluminum (Al)-Total		<b>L2278988-1</b> 0.618	0.627		mg/L	1.5	20	27-MAY-19
Antimony (Sb)-Total		0.00038	0.00039		mg/L	3.4	20	27-MAY-19
Arsenic (As)-Total		0.00403	0.00400		mg/L	0.8	20	27-MAY-19
Barium (Ba)-Total		4.66	4.56		mg/L	2.1	20	27-MAY-19
Bismuth (Bi)-Total		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	27-MAY-19
Boron (B)-Total		0.024	0.024	2	mg/L	1.1	20	27-MAY-19
Cadmium (Cd)-Total		0.000259	0.000243		mg/L	6.3	20	27-MAY-19
Calcium (Ca)-Total		62.2	62.3		mg/L	0.2	20	27-MAY-19
Chromium (Cr)-Total		0.00242	0.00243		mg/L	0.5	20	27-MAY-19
Cobalt (Co)-Total		0.00106	0.00110		mg/L	3.8	20	27-MAY-19
Copper (Cu)-Total		0.0202	0.0202		mg/L	0.3	20	27-MAY-19
Iron (Fe)-Total		5.75	5.80		mg/L	0.9	20	27-MAY-19
Lead (Pb)-Total		0.00333	0.00328		mg/L	1.5	20	27-MAY-19
Lithium (Li)-Total		0.698	0.711		mg/L	1.9	20	27-MAY-19
Magnesium (Mg)-Total		43.5	43.5		mg/L	0.0	20	27-MAY-19
Manganese (Mn)-Total		0.0500	0.0510		mg/L	1.9	20	27-MAY-19
Molybdenum (Mo)-Total		0.0228	0.0230		mg/L	0.7	20	27-MAY-19



Page 12 of 19

Workorder: L2278988 Report Date: 04-JUN-19

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-VA	Water							
Batch R4645127	7							
WG3058750-3 DUP Nickel (Ni)-Total		<b>L2278988-1</b> 0.00481	0.00486		mg/L	1.1	20	27-MAY-19
Potassium (K)-Total		26.6	26.6		mg/L	0.0	20	27-MAY-19
Selenium (Se)-Total		<0.00015	<0.00015	RPD-NA	mg/L	N/A	20	27-MAY-19
Silicon (Si)-Total		3.95	3.93		mg/L	0.5	20	27-MAY-19
Silver (Ag)-Total		0.000052	0.000055		mg/L	6.9	20	27-MAY-19
Sodium (Na)-Total		43.7	44.8		mg/L	2.6	20	27-MAY-19
Strontium (Sr)-Total		0.263	0.265		mg/L	0.8	20	27-MAY-19
Thallium (TI)-Total		0.000039	0.000043		mg/L	10	20	27-MAY-19
Tin (Sn)-Total		0.00040	0.00038		mg/L	3.2	20	27-MAY-19
Titanium (Ti)-Total		0.010	0.010		mg/L	0.7	20	27-MAY-19
Uranium (U)-Total		0.000237	0.000243		mg/L	2.7	20	27-MAY-19
Vanadium (V)-Total		0.00530	0.00527		mg/L	0.5	20	27-MAY-19
Zinc (Zn)-Total		0.0454	0.0452		mg/L	0.5	20	27-MAY-19
WG3058750-2 LCS Aluminum (Al)-Total			101.2		%		80-120	27-MAY-19
Antimony (Sb)-Total			101.9		%		80-120	27-MAY-19
Arsenic (As)-Total			99.4		%		80-120	27-MAY-19 27-MAY-19
Barium (Ba)-Total			103.8		%		80-120	27-MAY-19
Bismuth (Bi)-Total			103.1		%		80-120	27-MAY-19
Boron (B)-Total			99.5		%		80-120	27-MAY-19
Cadmium (Cd)-Total			99.3		%		80-120	27-MAY-19
Calcium (Ca)-Total			99.5		%		80-120	27-MAY-19
Chromium (Cr)-Total			99.8		%		80-120	27-MAY-19
Cobalt (Co)-Total			99.8		%		80-120	27-MAY-19
Copper (Cu)-Total			100.6		%		80-120	27-MAY-19
Iron (Fe)-Total			92.6		%		80-120	27-MAY-19
Lead (Pb)-Total			99.5		%		80-120	27-MAY-19
Lithium (Li)-Total			95.5		%		80-120	27-MAY-19
Magnesium (Mg)-Total	I		100.2		%		80-120	27-MAY-19
Manganese (Mn)-Total			99.7		%		80-120	27-MAY-19
Molybdenum (Mo)-Tota	al		104.8		%		80-120	27-MAY-19
Nickel (Ni)-Total			99.3		%		80-120	27-MAY-19
Potassium (K)-Total			96.8		%		80-120	27-MAY-19
Selenium (Se)-Total			96.7		%		80-120	27-MAY-19



Workorder: L2278988 Report Date: 04-JUN-19 Page 13 of 19

MET-T-CCMS-VA	Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
WG3088750-2 LCS   Silicon (Si)-Total   100.1   %   80-120   27-MAY-19   Silver (Ag)-Total   100.0   %   80-120   27-MAY-19   Sodium (Na)-Total   110.3   %   80-120   27-MAY-19   Sodium (Na)-Total   101.0   %   80-120   27-MAY-19   Strontium (Sr)-Total   101.0   %   80-120   27-MAY-19   Thallium (TI)-Total   199.2   %   80-120   27-MAY-19   Thallium (TI)-Total   199.2   %   80-120   27-MAY-19   Tillanium (TI)-Total   102.6   %   80-120   27-MAY-19   Tillanium (TI)-Total   99.9   %   80-120   27-MAY-19   Tillanium (TI)-Total   99.9   %   80-120   27-MAY-19   Yanadium (V)-Total   101.6   %   80-120   27-MAY-19   Yanadium (V)-Total   101.7   %   80-120   27-MAY-19   Yanadium (V)-Total   101.7   %   80-120   27-MAY-19   Yanadium (V)-Total   101.7   %   80-120   27-MAY-19   Yanadium (V)-Total   101.7   %   80-120   27-MAY-19   Yanadium (V)-Total   101.7   %   80-120   27-MAY-19   Yanadium (V)-Total   101.7   %   80-120   27-MAY-19   Yanadium (V)-Total   40.00010   mg/L   0.0001   27-MAY-19   Yanadium (V)-Total   40.00010   mg/L   0.0001   27-MAY-19   Yanadium (V)-Total   40.00010   mg/L   0.0001   27-MAY-19   Yanadium (V)-Total   40.00010   mg/L   0.0001   27-MAY-19   Yanadium (V)-Total   40.00050   mg/L   0.00050   27-MAY-19   Yanadium (V)-Total   40.00010   mg/L   0.001   27-MAY-19   Yanadium (V)-Total   40.00010   mg/L   0.000   27-MAY-19   Yanadium (V)-Total   40.00010   mg/L   0.0001   27-MAY-19   Yanadium (V)-Total   40.00010   mg/L   0.0001   27-MAY-19   Yanadium (V)-Total   40.00050   mg/L   0.0005   27-MAY-19   Yanadium (V)-Total   40.00050   mg/L   0.0005   27-MAY-19   Yanadium (V)-Total   40.00050   mg/L   0.0005   27-MAY-19   Yanadium (V)-Total   40.00050   mg/L   0.0005   27-MAY-19   Yanadium (M)-Total   40.	MET-T-CCMS-VA	Water							
Silcon (Si)-Total	Batch R4645127	7							
Silver (Ag)-Total         100.0         %         80-120         27-MAY-19           Sodium (Na)-Total         110.3         %         80-120         27-MAY-19           Strontium (Sr)-Total         101.0         %         80-120         27-MAY-19           Thallium (TI)-Total         99.2         %         80-120         27-MAY-19           Tin (Sn)-Total         102.5         %         80-120         27-MAY-19           Tinalium (TI)-Total         97.1         %         80-120         27-MAY-19           Uranium (U)-Total         99.98         %         80-120         27-MAY-19           Vanadium (V)-Total         101.6         %         80-120         27-MAY-19           Zinc (Zn)-Total         101.7         %         80-120         27-MAY-19           WG3058750-1         MB         Maluminum (Qh)-Total          0.0030         mg/L         0.003         27-MAY-19           Altimony (Sb)-Total         <0.00010				400.4		0/			
Sodium (Na)-Total         110.3         %         80-120         27-MAY-19           Strontium (Sr)-Total         101.0         %         80-120         27-MAY-19           Thallium (Tr)-Total         99.2         %         80-120         27-MAY-19           Tin (Sn)-Total         102.5         %         80-120         27-MAY-19           Tilanium (Tr)-Total         97.1         %         80-120         27-MAY-19           Uranium (U)-Total         99.98         %         80-120         27-MAY-19           Vanadium (V)-Total         101.6         %         80-120         27-MAY-19           WG308750-1         MB         Auminum (A)-Total         0.003         mg/L         0.003         27-MAY-19           Auminum (A)-Total         <0.0030									
Strontium (Sr)-Total   101.0	, ,,								
Thallium (TI)-Total 99.2 % 80-120 27-MAY-19 Tin (Sn)-Total 102.5 % 80-120 27-MAY-19 Titanium (Ti)-Total 97.1 % 80-120 27-MAY-19 Titanium (Ti)-Total 99.98 % 80-120 27-MAY-19 Uranium (U)-Total 99.98 % 80-120 27-MAY-19 Uranium (U)-Total 101.6 % 80-120 27-MAY-19 Zinc (Zn)-Total 101.7 % 80-120 27-MAY-19 Zinc (Zn)-Total 101.7 % 80-120 27-MAY-19  WG3068750-1 MB Alumirum (Al)-Total									
Tin (Sn)-Total 102.5 % 80-120 27-MAY-19 Titanium (Ti)-Total 97.1 % 80-120 27-MAY-19 Uranium (U)-Total 99.88 % 80-120 27-MAY-19 Vanadium (V)-Total 101.6 % 80-120 27-MAY-19 Vanadium (V)-Total 101.6 % 80-120 27-MAY-19 Vinc (Zn)-Total 101.7 % 80-120 27-MAY-19 WG3085750-1 MB Aluminum (Al)-Total	` '								
Titanium (Ti)-Total         97.1         %         80-120         27-MAY-19           Uranium (U)-Total         99.98         %         80-120         27-MAY-19           Vanadium (V)-Total         101.6         %         80-120         27-MAY-19           Zinc (Zn)-Total         101.7         %         80-120         27-MAY-19           WG3058750-1         MB         Name         Name         Name           Aluminum (Al)-Total         <0.00010	` '								
Uranium (U)-Total         99.98         %         80-120         27-MAY-19           Vanadium (V)-Total         101.6         %         80-120         27-MAY-19           Zinc (Zn)-Total         101.7         %         80-120         27-MAY-19           WG3058750-1         MB         Aluminum (Al)-Total         <0.0030									
Vanadium (V)-Total         101.6         %         80-120         27-MAY-19           Zinc (Zn)-Total         101.7         %         80-120         27-MAY-19           WG3058750-1         MB         Namarian (Al)-Total         0.0030         mg/L         0.003         27-MAY-19           Antimony (Sb)-Total         <0.00010	, ,							80-120	27-MAY-19
Zinc (Zn)-Total         101.7         %         80-120         27-MAY-19           WG3058750-1         MB         Aluminum (Al)-Total         <0.0030         mg/L         0.003         27-MAY-19           Antimony (Sb)-Total         <0.00010         mg/L         0.0001         27-MAY-19           Arsenic (As)-Total         <0.00010         mg/L         0.0001         27-MAY-19           Barlum (Ba)-Total         <0.00010         mg/L         0.00005         27-MAY-19           Bismuth (Bi)-Total         <0.000050         mg/L         0.00005         27-MAY-19           Boron (B)-Total         <0.010         mg/L         0.00005         27-MAY-19           Cadmium (Cd)-Total         <0.010         mg/L         0.00005         27-MAY-19           Calcium (Ca)-Total         <0.050         mg/L         0.00         27-MAY-19           Chromium (Cr)-Total         <0.050         mg/L         0.001         27-MAY-19           Cobalt (Co)-Total         <0.00010         mg/L         0.0001         27-MAY-19           Copper (Cu)-Total         <0.00050         mg/L         0.001         27-MAY-19           Lead (Pb)-Total         <0.0005         mg/L         0.00         27-MAY-19 <th< td=""><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>80-120</td><td>27-MAY-19</td></th<>								80-120	27-MAY-19
WG3058750-1 MB         Aluminum (Al)-Total         <0.0030         mg/L         0.003         27-MAY-19           Antimony (Sb)-Total         <0.00010	` '							80-120	27-MAY-19
Aluminum (Al)-Total         <0.0030	Zinc (Zn)-Total			101.7		%		80-120	27-MAY-19
Antimony (Sb)-Total				0.0000					
Arsenic (As)-Total         <0.00010	` ,					•			
Barium (Ba)-Total	• , ,					•			
Bismuth (Bi)-Total         <0.000050	, ,					•			
Boron (B)-Total         <0.010	` '					•			
Cadmium (Cd)-Total         <0.000005C	` ,								27-MAY-19
Calcium (Ca)-Total         <0.050         mg/L         0.05         27-MAY-19           Chromium (Cr)-Total         <0.00010	` '					•			27-MAY-19
Chromium (Cr)-Total         <0.00010	` ,			<0.0000050	C	mg/L		0.000005	27-MAY-19
Cobalt (Co)-Total         <0.00010	Calcium (Ca)-Total			<0.050		mg/L		0.05	27-MAY-19
Copper (Cu)-Total         <0.00050         mg/L         0.0005         27-MAY-19           Iron (Fe)-Total         <0.010	` '			<0.00010		mg/L		0.0001	27-MAY-19
Iron (Fe)-Total       <0.010	Cobalt (Co)-Total			<0.00010		mg/L		0.0001	27-MAY-19
Lead (Pb)-Total       <0.000050	Copper (Cu)-Total			<0.00050		mg/L		0.0005	27-MAY-19
Lithium (Li)-Total       <0.0010	Iron (Fe)-Total			<0.010		mg/L		0.01	27-MAY-19
Magnesium (Mg)-Total       <0.0050	Lead (Pb)-Total			<0.000050		mg/L		0.00005	27-MAY-19
Manganese (Mn)-Total       <0.00010	Lithium (Li)-Total			<0.0010		mg/L		0.001	27-MAY-19
Molybdenum (Mo)-Total       <0.000050	Magnesium (Mg)-Total			<0.0050		mg/L		0.005	27-MAY-19
Nickel (Ni)-Total       <0.00050       mg/L       0.0005       27-MAY-19         Potassium (K)-Total       <0.050	Manganese (Mn)-Total			<0.00010		mg/L		0.0001	27-MAY-19
Potassium (K)-Total         <0.050         mg/L         0.05         27-MAY-19           Selenium (Se)-Total         0.000073         MB-LOR         mg/L         0.00005         27-MAY-19           Silicon (Si)-Total         <0.10	Molybdenum (Mo)-Tota	al		<0.000050		mg/L		0.00005	27-MAY-19
Selenium (Se)-Total       0.000073       MB-LOR mg/L       0.00005       27-MAY-19         Silicon (Si)-Total       <0.10	Nickel (Ni)-Total			<0.00050		mg/L		0.0005	27-MAY-19
Silicon (Si)-Total         <0.10         mg/L         0.1         27-MAY-19           Silver (Ag)-Total         <0.000010	Potassium (K)-Total			<0.050		mg/L		0.05	27-MAY-19
Silver (Ag)-Total <0.000010 mg/L 0.00001 27-MAY-19	Selenium (Se)-Total			0.000073	MB-LOR	mg/L		0.00005	27-MAY-19
	Silicon (Si)-Total			<0.10		mg/L		0.1	27-MAY-19
	Silver (Ag)-Total			<0.000010		mg/L		0.00001	27-MAY-19
	Sodium (Na)-Total			<0.050		mg/L		0.05	27-MAY-19



Workorder: L2278988

Report Date: 04-JUN-19

Page 14 of 19

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-VA	Water							
Batch R4645127								
WG3058750-1 MB			0.0000		4			
Strontium (Sr)-Total			<0.00020		mg/L		0.0002	27-MAY-19
Thallium (TI)-Total			<0.00001		mg/L		0.00001	27-MAY-19
Tin (Sn)-Total			<0.00010		mg/L		0.0001	27-MAY-19
Titanium (Ti)-Total			<0.00030		mg/L		0.0003	27-MAY-19
Uranium (U)-Total			<0.00001		mg/L		0.00001	27-MAY-19
Vanadium (V)-Total			<0.00050		mg/L		0.0005	27-MAY-19
Zinc (Zn)-Total			<0.0030		mg/L		0.003	27-MAY-19
WG3058750-4 MS Aluminum (Al)-Total		L2278988-2	98.3		%		70-130	27 MAY 40
Antimony (Sb)-Total			97.0		%			27-MAY-19 27-MAY-19
Arsenic (As)-Total			99.9		%		70-130 70-130	27-MAY-19 27-MAY-19
Barium (Ba)-Total			N/A	MS-B	%		70-130	27-MAY-19
Bismuth (Bi)-Total			90.1	WO B	%		- 70-130	27-MAY-19
Boron (B)-Total			99.0		%		70-130	27-MAY-19
Cadmium (Cd)-Total			106.8		%		70-130 70-130	27-MAY-19 27-MAY-19
Calcium (Ca)-Total			N/A	MS-B	%		70-130	27-MAY-19
Chromium (Cr)-Total			95.5	WO B	%		- 70-130	27-MAY-19
Cobalt (Co)-Total			92.5		%		70-130	27-MAY-19
Copper (Cu)-Total			92.8		%		70-130	27-MAY-19
Iron (Fe)-Total			92.9		%		70-130	27-MAY-19
Lead (Pb)-Total			91.5		%		70-130	27-MAY-19
Lithium (Li)-Total			92.3		%		70-130	27-MAY-19
Magnesium (Mg)-Total			N/A	MS-B	%		70-130	27-MAY-19
Manganese (Mn)-Total			N/A	MS-B	%			27-MAY-19
Molybdenum (Mo)-Total			98.0	o B	%		70-130	27-MAY-19
Nickel (Ni)-Total			93.7		%		70-130	27-MAY-19
Potassium (K)-Total			101.0		%		70-130	27-MAY-19
Selenium (Se)-Total			98.4		%		70-130	27-MAY-19
Silicon (Si)-Total			91.5		%		70-130	27-MAY-19
Silver (Ag)-Total			94.0		%		70-130	27-MAY-19
Sodium (Na)-Total			105.8		%		70-130	27-MAY-19
Strontium (Sr)-Total			N/A	MS-B	%		-	27-MAY-19
Thallium (TI)-Total			92.5	5	%		70-130	27-MAY-19
Tin (Sn)-Total			99.2		%		70-130	27-MAY-19

P-T-L-COL-CL

Water

## **Quality Control Report**

Workorder: L2278988

Report Date: 04-JUN-19

Page 15 of 19

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-VA	Water							
Batch R4645127								
WG3058750-4 MS Titanium (Ti)-Total		L2278988-2	99.3		%		70-130	27-MAY-19
Uranium (U)-Total			92.0		%		70-130	27-MAY-19
Vanadium (V)-Total			98.3		%		70-130	27-MAY-19
Zinc (Zn)-Total			96.1		%		70-130	27-MAY-19
NH3-L-F-CL	Water							
Batch R4653519 WG3065030-10 LCS								
Ammonia as N			95.2		%		85-115	01-JUN-19
WG3065030-9 MB Ammonia as N			<0.0050		mg/L		0.005	01-JUN-19
NO2-L-IC-N-CL	Water							
Batch R4644755 WG3059401-11 DUP Nitrite (as N)		<b>L2278988-3</b> <0.0010	<0.0010	RPD-NA	mg/L	N/A	20	24-MAY-19
WG3059401-10 LCS Nitrite (as N)			102.1		%	. 47.	90-110	24-MAY-19
<b>WG3059401-9 MB</b> Nitrite (as N)			<0.0010		mg/L		0.001	24-MAY-19
<b>WG3059401-12 MS</b> Nitrite (as N)		L2278988-3	101.6		%		75-125	24-MAY-19
NO3-L-IC-N-CL	Water							
Batch R4644755								
WG3059401-11 DUP Nitrate (as N)		<b>L2278988-3</b> <0.0050	<0.0050	RPD-NA	mg/L	N/A	20	24-MAY-19
WG3059401-10 LCS Nitrate (as N)			99.4		%		90-110	24-MAY-19
WG3059401-9 MB Nitrate (as N)			<0.0050		mg/L		0.005	24-MAY-19
<b>WG3059401-12 MS</b> Nitrate (as N)		L2278988-3	99.0		%		75-125	24-MAY-19
ORP-CL	Water							
Batch R4648826								
<b>WG3061974-5 CRM</b> ORP		CL-ORP	226		mV		210-230	29-MAY-19



Workorder: L2278988

Report Date: 04-JUN-19

Page 16 of 19

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
P-T-L-COL-CL	Water							
Batch R4651380 WG3063247-6 LCS Phosphorus (P)-Total			107.6		%		80-120	30-MAY-19
WG3063247-5 MB Phosphorus (P)-Total			<0.0020		mg/L		0.002	30-MAY-19
PH-CL	Water							
Batch R4653055 WG3063840-15 DUP pH		<b>L2278988-1</b> 8.34	8.34	J	рН	0.00	0.2	30-MAY-19
<b>WG3063840-14 LCS</b> pH			7.01		рН		6.9-7.1	30-MAY-19
PO4-DO-L-COL-CL	Water							
Batch R4644179 WG3058443-14 DUP Orthophosphate-Dissolve	ed (as P)	<b>L2278988-5</b> <0.0010	<0.0010	RPD-NA	mg/L	N/A	20	25-MAY-19
WG3058443-10 LCS Orthophosphate-Dissolve	ed (as P)		100.0		%		80-120	25-MAY-19
WG3058443-13 LCS Orthophosphate-Dissolve	ed (as P)		100.0		%		80-120	25-MAY-19
WG3058443-2 MB Orthophosphate-Dissolve	ed (as P)		<0.0010		mg/L		0.001	25-MAY-19
WG3058443-3 MB Orthophosphate-Dissolve	ed (as P)		<0.0010		mg/L		0.001	25-MAY-19
SO4-IC-N-CL	Water							
<b>Batch R4644755 WG3059401-11 DUP</b> Sulfate (SO4)		<b>L2278988-3</b> <0.30	<0.30	RPD-NA	mg/L	N/A	20	24-MAY-19
<b>WG3059401-10 LCS</b> Sulfate (SO4)			99.7		%		90-110	24-MAY-19
<b>WG3059401-9 MB</b> Sulfate (SO4)			<0.30		mg/L		0.3	24-MAY-19
<b>WG3059401-12 MS</b> Sulfate (SO4)		L2278988-3	99.0		%		75-125	24-MAY-19
SOLIDS-TDS-CL	Water							
Batch R4651218 WG3061435-8 LCS Total Dissolved Solids WG3061435-7 MB			94.9		%		85-115	29-MAY-19



Workorder: L2278988

Report Date: 04-JUN-19 Page 17 of 19

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
SOLIDS-TDS-CL  Batch R4651218  WG3061435-7 MB  Total Dissolved Solids	Water		<10		mg/L		10	29-MAY-19
TKN-L-F-CL Batch R4651431	Water							
WG3063294-8 DUP Total Kjeldahl Nitrogen		<b>L2278988-2</b> <0.050	<0.050	RPD-NA	mg/L	N/A	20	31-MAY-19
WG3063294-2 LCS Total Kjeldahl Nitrogen			95.2		%		75-125	30-MAY-19
WG3063294-5 LCS Total Kjeldahl Nitrogen			96.7		%		75-125	30-MAY-19
WG3063294-7 LCS Total Kjeldahl Nitrogen			93.0		%		75-125	30-MAY-19
WG3063294-1 MB Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	30-MAY-19
WG3063294-4 MB Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	30-MAY-19
WG3063294-6 MB Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	30-MAY-19
WG3063294-9 MS Total Kjeldahl Nitrogen		L2278988-2	95.6		%		70-130	31-MAY-19
TSS-L-CL	Water							
Batch R4652806 WG3063292-4 LCS Total Suspended Solids			96.6		%		85-115	30-MAY-19
WG3063292-6 LCS Total Suspended Solids			94.8		%		85-115	30-MAY-19
WG3063292-3 MB Total Suspended Solids			<1.0		mg/L		1	30-MAY-19
WG3063292-5 MB Total Suspended Solids			<1.0		mg/L		1	30-MAY-19
TURBIDITY-CL	Water							
Batch R4643908 WG3058386-14 LCS Turbidity			98.5		%		85-115	24-MAY-19
WG3058386-13 MB Turbidity			<0.10		NTU		0.1	24-MAY-19

Workorder: L2278988 Report Date: 04-JUN-19 Page 18 of 19

#### Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

#### **Sample Parameter Qualifier Definitions:**

Qualifier	Description
J	Duplicate results and limits are expressed in terms of absolute difference.
MB-LOR	Method Blank exceeds ALS DQO. Limits of Reporting have been adjusted for samples with positive hits below 5x blank level.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

Workorder: L2278988 Report Date: 04-JUN-19 Page 19 of 19

#### **Hold Time Exceedances:**

	Sample						
ALS Product Description	ID	Sampling Date	Date Processed	Rec. HT	Actual HT	Units	Qualifier
Physical Tests							
Oxidation redution potentia	al by elect.						
	1	23-MAY-19 12:35	29-MAY-19 15:10	0.25	147	hours	EHTR-FM
	2	23-MAY-19 11:20	29-MAY-19 15:10	0.25	148	hours	EHTR-FM
	3	23-MAY-19 14:00	29-MAY-19 15:10	0.25	145	hours	EHTR-FM
	4	23-MAY-19 11:25	29-MAY-19 15:10	0.25	148	hours	EHTR-FM
	5	23-MAY-19 12:40	29-MAY-19 15:10	0.25	146	hours	EHTR-FM
рН							
	1	23-MAY-19 12:35	30-MAY-19 16:00	0.25	171	hours	EHTR-FM
	2	23-MAY-19 11:20	30-MAY-19 16:00	0.25	173	hours	EHTR-FM
	3	23-MAY-19 14:00	30-MAY-19 16:00	0.25	170	hours	EHTR-FM
	4	23-MAY-19 11:25	30-MAY-19 16:00	0.25	173	hours	EHTR-FM
	5	23-MAY-19 12:40	30-MAY-19 16:00	0.25	171	hours	EHTR-FM

#### Legend & Qualifier Definitions:

EHTR-FM: Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended.

EHTR: Exceeded ALS recommended hold time prior to sample receipt.

EHTL: Exceeded ALS recommended hold time prior to analysis. Sample was received less than 24 hours prior to expiry.

EHT: Exceeded ALS recommended hold time prior to analysis.

Rec. HT: ALS recommended hold time (see units).

#### Notes\*:

Where actual sampling date is not provided to ALS, the date (& time) of receipt is used for calculation purposes. Where actual sampling time is not provided to ALS, the earlier of 12 noon on the sampling date or the time (& date) of receipt is used for calculation purposes. Samples for L2278988 were received on 24-MAY-19 09:00.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against predetermined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

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LC_PIZUC1404D_WG_Q2-2019_NP	LC_PIZDC1404D	WG	_	2019/05/23	12:35	G	6		1	V	1	<del>  -  </del>	1	1	<u> </u>					1
LC_PIZDC1404S_WG_Q2-2019_NP	LC_PIZDC1404S	WG		2019/05/23	11:20	G	6		1	1	1	1	1	ı	<u>.</u>					1
WG_Q2-2019_RD1	LC_TBLANK	WG		2019/05/23	14:00	G/	4			_		1	1	1	1					
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TECK COAL LIMITED (LINE CREEK)

ATTN: Chris Blurton

PO BOX 2003

SPARWOOD BC VOB 2G0

Date Received: 28-MAY-19

Report Date: 04-JUN-19 16:38 (MT)

Version: FINAL

Client Phone: 250-425-3196

# Certificate of Analysis

Lab Work Order #: L2280642 Project P.O. #: VP000608129

Job Reference: LINE CREEK OPERATION C of C Numbers: 20190527 PIZP 1104

Legal Site Desc:



Lyudmyla Shvets, B.Sc. Account Manager

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L2280642 CONTD.... PAGE 2 of 7 Version: FINAL

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2280642-1 LC_PIZP1104_WG_Q2-2019_NP							
Sampled By: K.Campbell/D.Tymstra on 27-MAY-19 @	11.50						
	11.00						
Matrix: WG Miscellaneous Parameters							
	4.00		0.50	a/I		20 MAY 10	D 4050070
Dissolved Organic Carbon	1.08		0.50	mg/L		29-MAY-19	R4653370
Total Kjeldahl Nitrogen	0.134		0.050	mg/L		02-JUN-19	R4653955
Total Organic Carbon	0.99		0.50	mg/L		29-MAY-19	R4653370
Dissolved Metals in Water							
Diss. Be (low) in Water by CRC ICPMS				,,			
Beryllium (Be)-Dissolved	<0.020		0.020	ug/L	31-MAY-19	31-MAY-19	R4652862
Dissolved Metals Filtration Location	FIELD					31-MAY-19	R4651587
Diss. Mercury in Water by CVAAS or CVAFS	2 222225				00 144)/ 40	04 11 15 140	D 4050004
Mercury (Hg)-Dissolved	<0.000050		0.0000050	mg/L	30-MAY-19	01-JUN-19	R4653301
Dissolved Mercury Filtration Location	FIELD					30-MAY-19	R4651538
Dissolved Metals in Water by CRC ICPMS Dissolved Metals Filtration Location	FIELD					31-MAY-19	R4651587
Aluminum (Al)-Dissolved	<0.0030		0.0030	mg/L	31-MAY-19	31-MAY-19	R4652862
Antimony (Sb)-Dissolved	<0.0030		0.0030	mg/L	31-MAY-19	31-MAY-19	R4652862
Arsenic (As)-Dissolved	0.00121		0.00010	mg/L	31-MAY-19	31-MAY-19	R4652862
Barium (Ba)-Dissolved	0.00121		0.00010	mg/L	31-MAY-19	31-MAY-19	R4652862
Bismuth (Bi)-Dissolved	<0.00050		0.00010	mg/L	31-MAY-19	31-MAY-19	R4652862
Boron (B)-Dissolved	0.024		0.000030	mg/L	31-MAY-19	31-MAY-19	R4652862
Cadmium (Cd)-Dissolved	0.0069		0.010	ug/L	31-MAY-19	31-MAY-19	R4652862
Calcium (Ca)-Dissolved	128		0.050	mg/L	31-MAY-19	31-MAY-19	R4652862
Chromium (Cr)-Dissolved	<0.00010		0.00010	mg/L	31-MAY-19	31-MAY-19	R4652862
Cobalt (Co)-Dissolved	1.68		0.00010	ug/L	31-MAY-19	31-MAY-19	R4652862
Copper (Cu)-Dissolved	<0.00050		0.00050	mg/L	31-MAY-19	31-MAY-19	R4652862
Iron (Fe)-Dissolved	1.73		0.00030	mg/L	31-MAY-19	31-MAY-19	R4652862
Lead (Pb)-Dissolved	<0.00050		0.00050	mg/L	31-MAY-19	31-MAY-19	R4652862
Lithium (Li)-Dissolved	0.0184		0.000030	mg/L	31-MAY-19	31-MAY-19	R4652862
Magnesium (Mg)-Dissolved	44.2		0.0010	mg/L	31-MAY-19	31-MAY-19	R4652862
Manganese (Mn)-Dissolved	1.07		0.00010	mg/L	31-MAY-19	31-MAY-19	R4652862
Molybdenum (Mo)-Dissolved	0.00246		0.00010	mg/L	31-MAY-19	31-MAY-19	R4652862
Nickel (Ni)-Dissolved	0.00246		0.00050	mg/L	31-MAY-19	31-MAY-19	R4652862
Potassium (K)-Dissolved	2.51		0.00030	mg/L	31-MAY-19	31-MAY-19	R4652862
Selenium (Se)-Dissolved	0.137		0.050	ug/L	31-MAY-19	31-MAY-19	R4652862
Silicon (Si)-Dissolved	4.98		0.050	mg/L	31-MAY-19	31-MAY-19	R4652862
Silver (Ag)-Dissolved	<0.000010		0.00010	-	31-MAY-19	31-MAY-19	
Sodium (Na)-Dissolved	13.4		0.000010	mg/L mg/L	31-MAY-19	31-MAY-19	R4652862 R4652862
Strontium (Sr)-Dissolved	0.461		0.00020	•	31-MAY-19	31-MAY-19	R4652862
Thallium (TI)-Dissolved	<0.00010		0.00020	mg/L mg/L	31-MAY-19	31-MAY-19	R4652862 R4652862
Tin (Sn)-Dissolved				•	31-MAY-19	31-MAY-19	R4652862
Titanium (Ti)-Dissolved	<0.00010		0.00010 0.010	mg/L	31-MAY-19	31-MAY-19	
Uranium (U)-Dissolved	<0.010 0.00366		0.010	mg/L mg/L	31-MAY-19 31-MAY-19	31-MAY-19 31-MAY-19	R4652862 R4652862
Vanadium (V)-Dissolved				•			
Zinc (Zn)-Dissolved	<0.00050 0.0071		0.00050	mg/L	31-MAY-19 31-MAY-19	31-MAY-19 31-MAY-19	R4652862 R4652862
Total Metals in Water	0.0071		0.0010	mg/L	31-IVIA 1-19	31-WAT-19	14002002
Hardness Hardness (as CaCO3)	501		0.50	mg/L		03-JUN-19	
Total Be (Low) in Water by CRC ICPMS				3			
Beryllium (Be)-Total	<0.020		0.020	ug/L		31-MAY-19	R4653185
Total Metals in Water by CRC ICPMS				="			
Aluminum (Al)-Total	0.110		0.0030	mg/L		31-MAY-19	R4653185
	<0.00010		0.00010	mg/L		31-MAY-19	R4653185
Antimony (Sb)-Total	<0.00010		0.000.0			_	

<sup>\*</sup> Refer to Referenced Information for Qualifiers (if any) and Methodology.

L2280642 CONTD.... PAGE 3 of 7 Version: FINAL

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2280642-1 LC_PIZP1104_WG_Q2-2019_NP							
Sampled By: K.Campbell/D.Tymstra on 27-MAY-19 @	11:50						
	11.50						
Matrix: WG							
Total Metals in Water by CRC ICPMS Barium (Ba)-Total	0.330		0.00010	mg/L		31-MAY-19	R4653185
Bismuth (Bi)-Total	<0.000050		0.00010	mg/L		31-MAY-19	R4653185
Boron (B)-Total	0.021		0.000030	mg/L		31-MAY-19	R4653185
Cadmium (Cd)-Total	0.021		0.0050	ug/L		31-MAY-19	R4653185
Calcium (Ca)-Total	134		0.050	mg/L		31-MAY-19	R4653185
Chromium (Cr)-Total	0.00080		0.00010	mg/L		31-MAY-19	R4653185
Cobalt (Co)-Total	1.49		0.10	ug/L		31-MAY-19	R4653185
Copper (Cu)-Total	0.00297		0.00050	mg/L		31-MAY-19	R4653185
Iron (Fe)-Total	2.53		0.010	mg/L		31-MAY-19	R4653185
Lead (Pb)-Total	0.000203		0.000050	mg/L		31-MAY-19	R4653185
Lithium (Li)-Total	0.0180		0.0010	mg/L		31-MAY-19	R4653185
Magnesium (Mg)-Total	45.5		0.10	mg/L		31-MAY-19	R4653185
Manganese (Mn)-Total	0.883		0.00010	mg/L		31-MAY-19	R4653185
Molybdenum (Mo)-Total	0.00208		0.000050	mg/L		31-MAY-19	R4653185
Nickel (Ni)-Total	0.00267		0.00050	mg/L		31-MAY-19	R4653185
Potassium (K)-Total	2.39		0.050	mg/L		31-MAY-19	R4653185
Selenium (Se)-Total	0.070		0.050	ug/L		31-MAY-19	R4653185
Silicon (Si)-Total	5.02		0.10	mg/L		31-MAY-19	R4653185
Silver (Ag)-Total	<0.000010		0.000010	mg/L		31-MAY-19	R4653185
Sodium (Na)-Total	12.7		0.050	mg/L		31-MAY-19	R4653185
Strontium (Sr)-Total	0.436		0.00020	mg/L		31-MAY-19	R4653185
Thallium (TI)-Total	0.000015		0.000010	mg/L		31-MAY-19	R4653185
Tin (Sn)-Total	<0.00010		0.00010	mg/L		31-MAY-19	R4653185
Titanium (Ti)-Total	<0.010		0.010	mg/L		31-MAY-19	R4653185
Uranium (U)-Total	0.00387		0.000010	mg/L		31-MAY-19	R4653185
Vanadium (V)-Total	0.00051		0.00050	mg/L		31-MAY-19	R4653185
Zinc (Zn)-Total	0.0076		0.0030	mg/L		31-MAY-19	R4653185
Routine for Teck Coal							
Acidity by Automatic Titration Acidity (as CaCO3)	12.2		1.0	mg/L		03-JUN-19	R4656522
Alkalinity (Species) by Manual Titration	12.2		1.0	IIIg/L		03-3011-19	K4030322
Alkalinity, Bicarbonate (as CaCO3)	267		1.0	mg/L		03-JUN-19	R4656666
Alkalinity, Carbonate (as CaCO3)	<1.0		1.0	mg/L		03-JUN-19	R4656666
Alkalinity, Hydroxide (as CaCO3)	<1.0		1.0	mg/L		03-JUN-19	R4656666
Alkalinity, Total (as CaCO3)	267		1.0	mg/L		03-JUN-19	R4656666
Ammonia, Total (as N)			-	J			
Ammonia as N	0.0151		0.0050	mg/L		03-JUN-19	R4656091
Bromide in Water by IC (Low Level)							
Bromide (Br)	2.34		0.050	mg/L		29-MAY-19	R4650451
Chloride in Water by IC							
Chloride (CI)	181		0.50	mg/L		29-MAY-19	R4650451
Electrical Conductivity (EC)	4.5=5		0.5	0/		00 11 11 16	D 4050555
Conductivity (@ 25C)	1070		2.0	uS/cm		03-JUN-19	R4656666
Fluoride in Water by IC Fluoride (F)	0.364		0.020	mg/L		29-MAY-19	R4650451
Ion Balance Calculation	0.304		0.020	ilig/L		29-IVIA 1-19	N4000451
Cation - Anion Balance	-2.4			%		04-JUN-19	
Anion Sum	11.3			meg/L		04-JUN-19	
Cation Sum	10.8			meg/L		04-JUN-19	
Ion Balance Calculation				y =			
Ion Balance	95.3		-100	%		04-JUN-19	
Nitrate in Water by IC (Low Level)							
· · · · · · · · · · · · · · · · · · ·	f				1	1	-

<sup>\*</sup> Refer to Referenced Information for Qualifiers (if any) and Methodology.

L2280642 CONTD.... PAGE 4 of 7 Version: FINAL

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2280642-1 LC_PIZP1104_WG_Q2-2019_NP							
Sampled By: K.Campbell/D.Tymstra on 27-MAY-19 @	11:50						
Matrix: WG							
Nitrate in Water by IC (Low Level) Nitrate (as N)	0.165		0.0050	mg/L		29-MAY-19	R4650451
Nitrite in Water by IC (Low Level) Nitrite (as N)	0.0019		0.0010	mg/L		29-MAY-19	R4650451
Orthophosphate-Dissolved (as P) Orthophosphate-Dissolved (as P)	0.0010		0.0010	mg/L		29-MAY-19	R4651439
Oxidation redution potential by elect. ORP	317		-1000	mV		03-JUN-19	R4655009
Phosphorus (P)-Total Phosphorus (P)-Total	0.0576		0.0020	mg/L		31-MAY-19	R4654027
Sulfate in Water by IC Sulfate (SO4)	40.3		0.30	mg/L		29-MAY-19	R4650451
Total Dissolved Solids Total Dissolved Solids	838	DLHC	20	mg/L		01-JUN-19	R4654421
Total Suspended Solids Total Suspended Solids	17.7		1.0	mg/L		03-JUN-19	R4655806
<b>Turbidity</b> Turbidity	26.4		0.10	NTU		30-MAY-19	R4652366
<b>pH</b> pH	8.10		0.10	рН		03-JUN-19	R4656666

<sup>\*</sup> Refer to Referenced Information for Qualifiers (if any) and Methodology.

LINE CREEK OPERATION L2280642 CONTD....

**Reference Information** 

PAGE 5 of 7 Version: FINAL

Sample Parameter Qualifier Key:

Qualifier	Description
DLHC	Detection Limit Raised: Dilution required due to high concentration of test analyte(s).
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.

#### **Test Method References:**

ALS Test Code Matrix		Test Description	Method Reference**	
ACIDITY-PCT-CL	Water	Acidity by Automatic Titration	APHA 2310 Acidity	

This analysis is carried out using procedures adapted from APHA Method 2310 "Acidity". Acidity is determined by potentiometric titration to a specified endpoint.

ALK-MAN-CL Water Alkalinity (Species) by Manual Titration APHA 2320 ALKALINITY

This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.

BE-D-L-CCMS-VA Water Diss. Be (low) in Water by CRC ICPMS APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

BE-T-L-CCMS-VA Water Total Be (Low) in Water by CRC ICPMS EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

BR-L-IC-N-CL Water Bromide in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

C-DIS-ORG-LOW-CL Water Dissolved Organic Carbon APHA 5310 B-Instrumental

This method is applicable to the analysis of ground water, wastewater, and surface water samples. The form detected depends upon sample pretreatment: Unfiltered sample = TC, 0.45um filtered = TDC. Samples are injected into a combustion tube containing an oxidation catalyst. The carrier gas containing the combustion product from the combustion tube flows through an inorganic carbon reactor vessel and is then sent through a halogen scrubber into a sample cell set in a non-dispersive infrared gas analyzer (NDIR) where carbon dioxide is detected. For total inorganic carbon and dissolved inorganic carbon, the sample is injected into an IC reactor vessel where only the IC component is decomposed to become carbon dioxide.

The peak area generated by the NDIR indicates the TC/TDC or TIC/DIC as applicable. The total organic carbon content of the sample is calculated by subtracting the TIC from the TC.

TOC = TC-TIC, DOC = TDC-DIC, Particulate = Total - Dissolved.

C-TOT-ORG-LOW-CL Water Total Organic Carbon APHA 5310 TOTAL ORGANIC CARBON (TOC)

This method is applicable to the analysis of ground water, wastewater, and surface water samples. The form detected depends upon sample pretreatment: Unfiltered sample = TC, 0.45um filtered = TDC. Samples are injected into a combustion tube containing an oxidation catalyst. The carrier gas containing the combustion product from the combustion tube flows through an inorganic carbon reactor vessel and is then sent through a halogen scrubber into a sample cell set in a non-dispersive infrared gas analyzer (NDIR) where carbon dioxide is detected. For total inorganic carbon and dissolved inorganic carbon, the sample is injected into an IC reactor vessel where only the IC component is decomposed to become carbon dioxide.

The peak area generated by the NDIR indicates the TC/TDC or TIC/DIC as applicable. The total organic carbon content of the sample is calculated by subtracting the TIC from the TC.

TOC = TC-TIC, DOC = TDC-DIC, Particulate = Total - Dissolved.

CL-IC-N-CL Water Chloride in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

EC-L-PCT-CL Water Electrical Conductivity (EC) APHA 2510B

Conductivity, also known as Electrical Conductivity (EC) or Specific Conductance, is measured by immersion of a conductivity cell with platinum electrodes into a water sample. Conductivity measurements are temperature-compensated to 25C.

F-IC-N-CL Water Fluoride in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

HARDNESS-CALC-VA Water Hardness APHA 2340B

Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

HG-D-CVAA-VA Water Diss. Mercury in Water by CVAAS or CVAFS APHA 3030B/EPA 1631E (mod)

Water samples are filtered (0.45 um), preserved with hydrochloric acid, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

**Reference Information** 

L2280642 CONTD....
PAGE 6 of 7
Version: FINAL

**Test Method References:** 

ALS Test Code Matrix Test Description Method Reference\*\*

IONBALANCE-BC-CL Water Ion Balance Calculation APHA 1030E

Cation Sum, Anion Sum, and Ion Balance (as % difference) are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Because all aqueous solutions are electrically neutral, the calculated ion balance (% difference of cations minus anions) should be near-zero.

Cation and Anion Sums are the total meq/L concentration of major cations and anions. Dissolved species are used where available. Minor ions are included where data is present. Ion Balance is calculated as:

Ion Balance (%) = [Cation Sum-Anion Sum] / [Cation Sum+Anion Sum]

MET-D-CCMS-VA Water Dissolved Metals in Water by CRC ICPMS APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

MET-T-CCMS-VA Water Total Metals in Water by CRC ICPMS EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

NH3-L-F-CL Water Ammonia, Total (as N) J. ENVIRON. MONIT., 2005, 7, 37-42, RSC

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.

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NO2-L-IC-N-CL Water Nitrite in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

NO3-L-IC-N-CL Water Nitrate in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

ORP-CL Water Oxidation redution potential by elect. ASTM D1498

This analysis is carried out in accordance with the procedure described in the "ASTM" method D1498 "Oxidation-Reduction Potential of Water" published by the American Society for Testing and Materials (ASTM). Results are reported as observed oxidation-reduction potential of the platinum metal-reference electrode employed, in mV.

It is recommended that this analysis be conducted in the field.

P-T-L-COL-CL Water Phosphorus (P)-Total APHA 4500-P PHOSPHORUS

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after persulphate digestion of the sample.

PH-CL Water pH APHA 4500 H-Electrode

pH is determined in the laboratory using a pH electrode. All samples analyzed by this method for pH will have exceeded the 15 minute recommended hold time from time of sampling (field analysis is recommended for pH where highly accurate results are needed)

PO4-DO-L-COL-CL Water Orthophosphate-Dissolved (as P) APHA 4500-P PHOSPHORUS

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.

SO4-IC-N-CL Water Sulfate in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

SOLIDS-TDS-CL Water Total Dissolved Solids APHA 2540 C

A well-mixed sample is filtered through a glass fibre filter paper. The filtrate is then evaporated to dryness in a pre-weighed vial and dried at 180 - 2 °C. The increase in vial weight represents the total dissolved solids (TDS).

TECKCOAL-IONBAL-CL Water Ion Balance Calculation APHA 1030E

Cation Sum, Anion Sum, and Ion Balance (as % difference) are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Because all aqueous solutions are electrically neutral, the calculated ion balance (% difference of cations minus anions) should be near-zero.

Cation and Anion Sums are the total meq/L concentration of major cations and anions. Dissolved species are used where available. Minor ions are included where data is present. Ion Balance is calculated as:

LINE CREEK OPERATION L2280642 CONTD....

**Reference Information** 

PAGE 7 of 7 Version: FINAL

#### **Test Method References:**

**ALS Test Code** Matrix Method Reference\*\* **Test Description** 

Ion Balance (%) = [Cation Sum-Anion Sum] / [Cation Sum+Anion Sum]

Water

TKN-L-F-CL Water Total Kieldahl Nitrogen APHA 4500-NORG (TKN)

This analysis is carried out using procedures adapted from APHA Method 4500-Norg D. "Block Digestion and Flow Injection Analysis". Total Kjeldahl

APHA 2540 D-Gravimetric

Nitrogen is determined using block digestion followed by Flow-injection analysis with fluorescence detection. **Total Suspended Solids** 

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total suspended solids

(TSS) are determined by filtering a sample through a glass fibre filter, and by drying the filter at 104 deg. C.

TURBIDITY-CL Water **Turbidity** APHA 2130 B-Nephelometer

This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.

ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

<b>Laboratory Definition Code</b>	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA
CL	ALS ENVIRONMENTAL - CALGARY, ALBERTA, CANADA

#### **Chain of Custody Numbers:**

20190527 PIZP 1104

#### **GLOSSARY OF REPORT TERMS**

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.

ma/ka - milligrams per kilogram based on dry weight of sample

mg/kg wwt - milligrams per kilogram based on wet weight of sample

mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight

mg/L - unit of concentration based on volume, parts per million.

< - Less than.

D.L. - The reporting limit.

N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory. UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.



Workorder: L2280642

Report Date: 04-JUN-19

Page 1 of 10

Client:

TECK COAL LIMITED (LINE CREEK)

PO BOX 2003

SPARWOOD BC V0B 2G0

Contact: Chris Blurton

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
ACIDITY-PCT-CL	Water							
Batch R4656522								
WG3066693-5 LCS Acidity (as CaCO3)			104.2		%		85-115	03-JUN-19
WG3066693-4 MB Acidity (as CaCO3)			1.0		mg/L		2	03-JUN-19
ALK-MAN-CL	Water							
Batch R4656666								
WG3066728-2 LCS Alkalinity, Total (as CaCo	O3)		102.1		%		85-115	03-JUN-19
WG3066728-1 MB Alkalinity, Total (as CaCo	O3)		<1.0		mg/L		1	03-JUN-19
BE-D-L-CCMS-VA	Water							
Batch R4652862								
WG3063547-2 LCS Beryllium (Be)-Dissolved			106.4		%		80-120	31-MAY-19
WG3063547-1 MB Beryllium (Be)-Dissolved		NP	<0.000020	)	mg/L		0.00002	31-MAY-19
BE-T-L-CCMS-VA	Water							
Batch R4653185								
WG3063362-2 LCS Beryllium (Be)-Total			95.1		%		80-120	31-MAY-19
WG3063362-1 MB			-0.00000	,			0.00000	04 144 1/40
Beryllium (Be)-Total			<0.000020	J	mg/L		0.00002	31-MAY-19
BR-L-IC-N-CL Batch R4650451	Water							
Batch R4650451 WG3062671-2 LCS								
Bromide (Br)			101.3		%		85-115	29-MAY-19
WG3062671-1 MB Bromide (Br)			<0.050		mg/L		0.05	29-MAY-19
C-DIS-ORG-LOW-CL	Water							
Batch R4653370								
WG3064875-2 LCS Dissolved Organic Carbo	on		102.5		%		80-120	31-MAY-19
WG3064875-1 MB Dissolved Organic Carbo	on		<0.50		mg/L		0.5	31-MAY-19
C-TOT-ORG-LOW-CL	Water							



Workorder: L2280642

Report Date: 04-JUN-19 Page 2 of 10

Test	Matrix	Reference	Result Qualifier	Units	RPD	Limit	Analyzed
C-TOT-ORG-LOW-CL	Water						
Batch R4653370							
WG3064875-2 LCS Total Organic Carbon			105.5	%		80-120	31-MAY-19
WG3064875-1 MB Total Organic Carbon			<0.50	mg/L		0.5	31-MAY-19
CL-IC-N-CL	Water						
Batch R4650451 WG3062671-2 LCS Chloride (CI)			99.9	%		90-110	29-MAY-19
WG3062671-1 MB Chloride (CI)			<0.50	mg/L		0.5	29-MAY-19
EC-L-PCT-CL	Water						
Batch R4656666							
WG3066728-2 LCS Conductivity (@ 25C)			100.5	%		90-110	03-JUN-19
WG3066728-1 MB Conductivity (@ 25C)			<2.0	uS/cm		2	03-JUN-19
F-IC-N-CL	Water						
Batch R4650451							
WG3062671-2 LCS Fluoride (F)			104.9	%		90-110	29-MAY-19
<b>WG3062671-1 MB</b> Fluoride (F)			<0.020	mg/L		0.02	29-MAY-19
HG-D-CVAA-VA	Water						
Batch R4653301							
WG3063459-6 LCS Mercury (Hg)-Dissolved			104.1	%		80-120	01-JUN-19
WG3063459-5 MB Mercury (Hg)-Dissolved			<0.0000050	mg/L		0.000005	01-JUN-19
MET-D-CCMS-VA	Water						
Batch R4652862							
WG3063547-2 LCS Aluminum (Al)-Dissolved	ı		106.8	%		00.400	24 MAY 40
Antimony (Sb)-Dissolved			99.9	%		80-120 80-120	31-MAY-19
Arsenic (As)-Dissolved	•		103.8	%		80-120	31-MAY-19 31-MAY-19
Barium (Ba)-Dissolved			100.2	%		80-120	31-MAY-19
Bismuth (Bi)-Dissolved			103.6	%		80-120	31-MAY-19
2.0 (21) 210001700			102.6	%		00-120	O I - IVIA I - I O



Workorder: L2280642 Report Date: 04-JUN-19 Page 3 of 10

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA	Water							
Batch R46528	62							
WG3063547-2 LCS								
Cadmium (Cd)-Disso			105.4		%		80-120	31-MAY-19
Calcium (Ca)-Dissolv			102.0		%		80-120	31-MAY-19
Chromium (Cr)-Disso			104.2		%		80-120	31-MAY-19
Cobalt (Co)-Dissolve			105.3		%		80-120	31-MAY-19
Copper (Cu)-Dissolve	ed		102.8		%		80-120	31-MAY-19
Iron (Fe)-Dissolved			104.8		%		80-120	31-MAY-19
Lead (Pb)-Dissolved			105.3		%		80-120	31-MAY-19
Lithium (Li)-Dissolved	d		103.6		%		80-120	31-MAY-19
Magnesium (Mg)-Dis	solved		102.2		%		80-120	31-MAY-19
Manganese (Mn)-Dis			108.7		%		80-120	31-MAY-19
Molybdenum (Mo)-Di	ssolved		104.0		%		80-120	31-MAY-19
Nickel (Ni)-Dissolved			105.5		%		80-120	31-MAY-19
Potassium (K)-Dissol	ved		105.0		%		80-120	31-MAY-19
Selenium (Se)-Dissol	lved		98.7		%		80-120	31-MAY-19
Silicon (Si)-Dissolved	I		103.8		%		60-140	31-MAY-19
Silver (Ag)-Dissolved			103.1		%		80-120	31-MAY-19
Sodium (Na)-Dissolve	ed		105.8		%		80-120	31-MAY-19
Strontium (Sr)-Dissol	ved		105.2		%		80-120	31-MAY-19
Thallium (TI)-Dissolve	ed		107.9		%		80-120	31-MAY-19
Tin (Sn)-Dissolved			100.8		%		80-120	31-MAY-19
Titanium (Ti)-Dissolve	ed		100.4		%		80-120	31-MAY-19
Uranium (U)-Dissolve	ed		106.9		%		80-120	31-MAY-19
Vanadium (V)-Dissol	ved		105.8		%		80-120	31-MAY-19
Zinc (Zn)-Dissolved			107.7		%		80-120	31-MAY-19
WG3063547-1 MB	lyad	NP	0.0040				0.004	
Aluminum (Al)-Dissol			<0.0010		mg/L		0.001	31-MAY-19
Antimony (Sb)-Dissol			<0.00010		mg/L		0.0001	31-MAY-19
Arsenic (As)-Dissolve			<0.00010		mg/L		0.0001	31-MAY-19
Barium (Ba)-Dissolve			<0.00010		mg/L		0.0001	31-MAY-19
Bismuth (Bi)-Dissolve	ea		<0.00005	U	mg/L		0.00005	31-MAY-19
Boron (B)-Dissolved			<0.010		mg/L		0.01	31-MAY-19
Cadmium (Cd)-Disso			<0.00000	5C	mg/L		0.000005	31-MAY-19
Calcium (Ca)-Dissolv			<0.050		mg/L		0.05	31-MAY-19
Chromium (Cr)-Disso	olved		<0.00010		mg/L		0.0001	31-MAY-19



Workorder: L2280642

Report Date: 04-JUN-19

Page 4 of 10

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA	Water							
Batch R4652	862							
WG3063547-1 M Cobalt (Co)-Dissolv		NP	<0.00010		mg/L		0.0001	31-MAY-19
Copper (Cu)-Dissol			<0.00020		mg/L		0.0002	31-MAY-19
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	31-MAY-19
Lead (Pb)-Dissolve			<0.00005	0	mg/L		0.00005	31-MAY-19
Lithium (Li)-Dissolve			<0.0010		mg/L		0.001	31-MAY-19
Magnesium (Mg)-D			<0.0050		mg/L		0.005	31-MAY-19
Manganese (Mn)-D			<0.00010		mg/L		0.0001	31-MAY-19
Molybdenum (Mo)-I			<0.00005		mg/L		0.00005	31-MAY-19
Nickel (Ni)-Dissolve			<0.00050		mg/L		0.0005	31-MAY-19
Potassium (K)-Diss			<0.050		mg/L		0.05	31-MAY-19
Selenium (Se)-Diss			<0.00005	0	mg/L		0.00005	31-MAY-19
Silicon (Si)-Dissolve			<0.050		mg/L		0.05	31-MAY-19
Silver (Ag)-Dissolve	ed		<0.00001	0	mg/L		0.00001	31-MAY-19
Sodium (Na)-Dissol			< 0.050		mg/L		0.05	31-MAY-19
Strontium (Sr)-Diss	olved		<0.00020		mg/L		0.0002	31-MAY-19
Thallium (TI)-Dissol	lved		<0.00001	0	mg/L		0.00001	31-MAY-19
Tin (Sn)-Dissolved			<0.00010		mg/L		0.0001	31-MAY-19
Titanium (Ti)-Dissol	lved		<0.00030		mg/L		0.0003	31-MAY-19
Uranium (U)-Dissol	ved		<0.00001	0	mg/L		0.00001	31-MAY-19
Vanadium (V)-Disso	olved		<0.00050		mg/L		0.0005	31-MAY-19
Zinc (Zn)-Dissolved	I		<0.0010		mg/L		0.001	31-MAY-19
MET-T-CCMS-VA	Water							
Batch R4653	185							
	cs				0/			
Aluminum (Al)-Tota			100.9		%		80-120	31-MAY-19
Antimony (Sb)-Tota	ll .		113.0		%		80-120	31-MAY-19
Arsenic (As)-Total			102.9		%		80-120	31-MAY-19
Barium (Ba)-Total			108.6		%		80-120	31-MAY-19
Bismuth (Bi)-Total			107.8		%		80-120	31-MAY-19
Boron (B)-Total			93.2		%		80-120	31-MAY-19
Cadmium (Cd)-Tota			104.2		%		80-120	31-MAY-19
Calcium (Ca)-Total			98.0		%		80-120	31-MAY-19
Chromium (Cr)-Tota	al		103.0		%		80-120	31-MAY-19
Cobalt (Co)-Total			103.9		%		80-120	31-MAY-19



Workorder: L2280642 Report Date: 04-JUN-19

Page 5 of 10

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-VA	Water							
Batch R4653185								
WG3063362-2 LCS Copper (Cu)-Total			102.2		%		80-120	31-MAY-19
Iron (Fe)-Total			95.4		%		80-120	31-MAY-19
Lead (Pb)-Total			105.8		%		80-120	31-MAY-19
Lithium (Li)-Total			94.1		%		80-120	31-MAY-19
Magnesium (Mg)-Total			102.7		%		80-120	31-MAY-19
Manganese (Mn)-Total			103.5		%		80-120	31-MAY-19
Molybdenum (Mo)-Total			102.3		%		80-120	31-MAY-19
Nickel (Ni)-Total			103.8		%		80-120	31-MAY-19
Potassium (K)-Total			102.6		%		80-120	31-MAY-19
Selenium (Se)-Total			99.9		%		80-120	31-MAY-19
Silicon (Si)-Total			107.1		%		80-120	31-MAY-19
Silver (Ag)-Total			102.8		%		80-120	31-MAY-19
Sodium (Na)-Total			106.3		%		80-120	31-MAY-19
Strontium (Sr)-Total			97.9		%		80-120	31-MAY-19
Thallium (Tl)-Total			108.2		%		80-120	31-MAY-19
Tin (Sn)-Total			99.7		%		80-120	31-MAY-19
Titanium (Ti)-Total			104.1		%		80-120	31-MAY-19
Uranium (U)-Total			105.5		%		80-120	31-MAY-19
Vanadium (V)-Total			103.2		%		80-120	31-MAY-19
Zinc (Zn)-Total			105.0		%		80-120	31-MAY-19
WG3063362-1 MB								
Aluminum (Al)-Total			<0.0030		mg/L		0.003	31-MAY-19
Antimony (Sb)-Total			<0.00010	)	mg/L		0.0001	31-MAY-19
Arsenic (As)-Total			<0.00010	)	mg/L		0.0001	31-MAY-19
Barium (Ba)-Total			<0.00010	)	mg/L		0.0001	31-MAY-19
Bismuth (Bi)-Total			<0.00005	50	mg/L		0.00005	31-MAY-19
Boron (B)-Total			<0.010		mg/L		0.01	31-MAY-19
Cadmium (Cd)-Total			<0.00000	050	mg/L		0.000005	31-MAY-19
Calcium (Ca)-Total			<0.050		mg/L		0.05	31-MAY-19
Chromium (Cr)-Total			<0.00010	)	mg/L		0.0001	31-MAY-19
Cobalt (Co)-Total			<0.00010	)	mg/L		0.0001	31-MAY-19
Copper (Cu)-Total			<0.00050	)	mg/L		0.0005	31-MAY-19
Iron (Fe)-Total			<0.010		mg/L		0.01	31-MAY-19
Lead (Pb)-Total			<0.00005	50	mg/L		0.00005	31-MAY-19



Workorder: L2280642

Report Date: 04-JUN-19 Page 6 of 10

MET-T-CCMS-VA  Batch R4653185  WG3063362-1 MB  Lithium (Li)-Total	Water				 	
WG3063362-1 MB						
		<0.0010		mg/L	0.001	31-MAY-19
Magnesium (Mg)-Total		<0.0050		mg/L	0.005	31-MAY-19
Manganese (Mn)-Total		<0.00010		mg/L	0.0001	31-MAY-19
Molybdenum (Mo)-Total		<0.000050	)	mg/L	0.00005	31-MAY-19
Nickel (Ni)-Total		<0.00050		mg/L	0.0005	31-MAY-19
Potassium (K)-Total		< 0.050		mg/L	0.05	31-MAY-19
Selenium (Se)-Total		<0.000050	)	mg/L	0.00005	31-MAY-19
Silicon (Si)-Total		<0.10		mg/L	0.1	31-MAY-19
Silver (Ag)-Total		<0.000010	)	mg/L	0.00001	31-MAY-19
Sodium (Na)-Total		< 0.050		mg/L	0.05	31-MAY-19
Strontium (Sr)-Total		<0.00020		mg/L	0.0002	31-MAY-19
Thallium (TI)-Total		<0.000010	1	mg/L	0.00001	31-MAY-19
Tin (Sn)-Total		<0.00010		mg/L	0.0001	31-MAY-19
Titanium (Ti)-Total		<0.00030		mg/L	0.0003	31-MAY-19
Uranium (U)-Total		<0.000010	)	mg/L	0.00001	31-MAY-19
Vanadium (V)-Total		<0.00050		mg/L	0.0005	31-MAY-19
Zinc (Zn)-Total		<0.0030		mg/L	0.003	31-MAY-19
NH3-L-F-CL	Water					
Batch R4656091						
WG3067027-10 LCS Ammonia as N		94.8		%	85-115	03-JUN-19
WG3067027-9 MB						
Ammonia as N		<0.0050		mg/L	0.005	03-JUN-19
NO2-L-IC-N-CL	Water					
Batch R4650451						
WG3062671-2 LCS Nitrite (as N)		102.8		%	90-110	29-MAY-19
WG3062671-1 MB Nitrite (as N)		<0.0010		mg/L	0.001	29-MAY-19
NO3-L-IC-N-CL	Water					
Batch R4650451						
WG3062671-2 LCS Nitrate (as N)		100.0		%	90-110	29-MAY-19
<b>WG3062671-1 MB</b> Nitrate (as N)		<0.0050		mg/L	0.005	29-MAY-19



Workorder: L2280642

Report Date: 04-JUN-19 Page 7 of 10

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
ORP-CL	Water							
<b>Batch R4655009</b> <b>WG3066587-7 CRM</b> ORP		CL-ORP	221		mV		210-230	03-JUN-19
P-T-L-COL-CL	Water							
Batch R4654027 WG3065686-26 LCS Phosphorus (P)-Total			107.2		%		80-120	31-MAY-19
WG3065686-25 MB Phosphorus (P)-Total			<0.0020		mg/L		0.002	31-MAY-19
PH-CL	Water							
Batch R4656666 WG3066728-2 LCS pH			7.00		рН		6.9-7.1	03-JUN-19
PO4-DO-L-COL-CL	Water							
Batch R4651439 WG3062056-22 LCS Orthophosphate-Dissolv	ed (as P)		101.4		%		80-120	29-MAY-19
WG3062056-21 MB Orthophosphate-Dissolv			<0.0010		mg/L		0.001	29-MAY-19
SO4-IC-N-CL	Water							
Batch R4650451 WG3062671-2 LCS			100.7		%		00.440	
Sulfate (SO4)  WG3062671-1 MB  Sulfate (SO4)			<0.30		76 mg/L		90-110 0.3	29-MAY-19 29-MAY-19
SOLIDS-TDS-CL	Water							
Batch R4654421 WG3064813-14 LCS			00.0		0/			
Total Dissolved Solids WG3064813-13 MB Total Dissolved Solids			96.6		% mg/L		85-115 10	01-JUN-19 01-JUN-19
TKN-L-F-CL	Water				···· <b>g</b> . =			51 00N-10
Batch R4653955								
WG3065563-11 LCS Total Kjeldahl Nitrogen			92.0		%		75-125	02-JUN-19
WG3065563-14 LCS								



Workorder: L2280642

Report Date: 04-JUN-19 Page 8 of 10

Test	Matrix F	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
TKN-L-F-CL	Water							
Batch R4653955								
WG3065563-14 LCS Total Kjeldahl Nitrogen			90.8		%		75-125	02-JUN-19
WG3065563-2 LCS Total Kjeldahl Nitrogen			90.9		%		75-125	02-JUN-19
WG3065563-5 LCS Total Kjeldahl Nitrogen			91.8		%		75-125	02-JUN-19
WG3065563-8 LCS Total Kjeldahl Nitrogen			90.7		%		75-125	02-JUN-19
<b>WG3065563-1 MB</b> Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	02-JUN-19
WG3065563-10 MB Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	02-JUN-19
WG3065563-13 MB Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	02-JUN-19
WG3065563-4 MB Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	02-JUN-19
WG3065563-7 MB Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	02-JUN-19
TSS-L-CL	Water							
Batch R4655806								
WG3066198-5 LCS Total Suspended Solids			104.0		%		85-115	03-JUN-19
WG3066198-4 MB Total Suspended Solids			<1.0		mg/L		1	03-JUN-19
TURBIDITY-CL	Water							
Batch R4652366								
WG3063857-8 LCS Turbidity			99.5		%		85-115	30-MAY-19
WG3063857-7 MB Turbidity			<0.10		NTU		0.1	30-MAY-19

Report Date: 04-JUN-19 Workorder: L2280642 Page 9 of 10

#### Legend:

ALS Control Limit (Data Quality Objectives) Limit

DUP Duplicate

Relative Percent Difference RPD

N/A Not Available

Laboratory Control Sample LCS Standard Reference Material SRM

MS Matrix Spike

MSD

Matrix Spike Duplicate
Average Desorption Efficiency ADE

Method Blank MB

Internal Reference Material IRM Certified Reference Material CRM Continuing Calibration Verification CCV CVS Calibration Verification Standard LCSD Laboratory Control Sample Duplicate

Workorder: L2280642 Report Date: 04-JUN-19 Page 10 of 10

#### **Hold Time Exceedances:**

	Sample						
ALS Product Description	ID <sup>-</sup>	Sampling Date	Date Processed	Rec. HT	Actual HT	Units	Qualifier
Physical Tests							
Oxidation redution potential	by elect.						
	1	27-MAY-19 11:50	03-JUN-19 14:30	0.25	171	hours	EHTR-FM
рН							
	1	27-MAY-19 11:50	03-JUN-19 09:00	0.25	165	hours	EHTR-FM

#### **Legend & Qualifier Definitions:**

EHTR-FM: Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended.

EHTR: Exceeded ALS recommended hold time prior to sample receipt.

EHTL: Exceeded ALS recommended hold time prior to analysis. Sample was received less than 24 hours prior to expiry.

EHT: Exceeded ALS recommended hold time prior to analysis.

Rec. HT: ALS recommended hold time (see units).

#### Notes\*:

Where actual sampling date is not provided to ALS, the date (& time) of receipt is used for calculation purposes. Where actual sampling time is not provided to ALS, the earlier of 12 noon on the sampling date or the time (& date) of receipt is used for calculation purposes. Samples for L2280642 were received on 28-MAY-19 09:15.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against predetermined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

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TECK COAL LIMITED (LINE CREEK)

ATTN: Chris Blurton

PO BOX 2003

SPARWOOD BC VOB 2G0

Date Received: 30-MAY-19

Report Date: 13-JUN-19 16:53 (MT)

Version: FINAL

Client Phone: 250-425-3196

# Certificate of Analysis

Lab Work Order #: L2282430
Project P.O. #: VP000608129

Job Reference: LINE CREEK OPERATION
C of C Numbers: 20190529 DC GW

Legal Site Desc:



Lyudmyla Shvets, B.Sc. Account Manager

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L2282430 CONTD.... PAGE 2 of 12 Version: FINAL

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2282430-1 LC_PIZDC1306_WG_Q2-2019_NP							
L2282430-1 LC_PIZDC1306_WG_Q2-2019_NP Sampled By: K.Campbell/D.Tymstra on 29-MAY-19 @	13:00						
	13.00						
Matrix: WG Miscellaneous Parameters							
Dissolved Organic Carbon	1.35		0.50	mg/L		03-JUN-19	R4656949
Total Kjeldahl Nitrogen	<0.050		0.050	•		05-JUN-19	
				mg/L		05-JUN-19 04-JUN-19	R4659365
Total Organic Carbon  Dissolved Metals in Water	1.43		0.50	mg/L		04-JUN-19	R4656949
Diss. Be (low) in Water by CRC ICPMS							
Beryllium (Be)-Dissolved	<0.020		0.020	ug/L	03-JUN-19	04-JUN-19	R4655992
Dissolved Metals Filtration Location	FIELD		0.020	ug/ =	00 0011 10	03-JUN-19	R4654109
Diss. Mercury in Water by CVAAS or CVAFS							
Mercury (Hg)-Dissolved	<0.000050		0.0000050	mg/L	03-JUN-19	04-JUN-19	R4655189
Dissolved Mercury Filtration Location	FIELD			, and the second		03-JUN-19	R4654427
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	FIELD					03-JUN-19	R4654109
Aluminum (AI)-Dissolved	<0.0030		0.0030	mg/L	03-JUN-19	04-JUN-19	R4655992
Antimony (Sb)-Dissolved	0.00021		0.00010	mg/L	03-JUN-19	04-JUN-19	R4655992
Arsenic (As)-Dissolved	<0.00010		0.00010	mg/L	03-JUN-19	04-JUN-19	R4655992
Barium (Ba)-Dissolved	0.187		0.00010	mg/L	03-JUN-19	04-JUN-19	R4655992
Bismuth (Bi)-Dissolved	<0.000050		0.000050	mg/L	03-JUN-19	04-JUN-19	R4655992
Boron (B)-Dissolved	0.010		0.010	mg/L	03-JUN-19	04-JUN-19	R4655992
Cadmium (Cd)-Dissolved	0.131		0.0050	ug/L	03-JUN-19	04-JUN-19	R4655992
Calcium (Ca)-Dissolved	70.9		0.050	mg/L	03-JUN-19	04-JUN-19	R4655992
Chromium (Cr)-Dissolved	<0.00010		0.00010	mg/L	03-JUN-19	04-JUN-19	R4655992
Cobalt (Co)-Dissolved	<0.10		0.10	ug/L	03-JUN-19	04-JUN-19	R4655992
Copper (Cu)-Dissolved	<0.00050		0.00050	mg/L	03-JUN-19	04-JUN-19	R4655992
Iron (Fe)-Dissolved Lead (Pb)-Dissolved	<0.010		0.010	mg/L	03-JUN-19	04-JUN-19	R4655992
Lithium (Li)-Dissolved	<0.000050		0.000050	mg/L	03-JUN-19 03-JUN-19	04-JUN-19 04-JUN-19	R4655992
Magnesium (Mg)-Dissolved	0.0130 25.8		0.0010 0.10	mg/L mg/L	03-JUN-19 03-JUN-19	04-JUN-19 04-JUN-19	R4655992 R4655992
Manganese (Mn)-Dissolved	<0.00010		0.00010	mg/L	03-JUN-19	04-JUN-19	R4655992
Molybdenum (Mo)-Dissolved	0.00197		0.00010	mg/L	03-JUN-19	04-JUN-19	R4655992
Nickel (Ni)-Dissolved	0.00137		0.00050	mg/L	03-JUN-19	04-JUN-19	R4655992
Potassium (K)-Dissolved	2.29		0.050	mg/L	03-JUN-19	04-JUN-19	R4655992
Selenium (Se)-Dissolved	3.05		0.050	ug/L	03-JUN-19	04-JUN-19	R4655992
Silicon (Si)-Dissolved	2.99		0.050	mg/L	03-JUN-19	04-JUN-19	R4655992
Silver (Ag)-Dissolved	<0.000010		0.000010	mg/L	03-JUN-19	04-JUN-19	R4655992
Sodium (Na)-Dissolved	0.892		0.050	mg/L	03-JUN-19	04-JUN-19	R4655992
Strontium (Sr)-Dissolved	0.0711		0.00020	mg/L	03-JUN-19	04-JUN-19	R4655992
Thallium (TI)-Dissolved	<0.000010		0.000010	mg/L	03-JUN-19	04-JUN-19	R4655992
Tin (Sn)-Dissolved	<0.00010		0.00010	mg/L	03-JUN-19	04-JUN-19	R4655992
Titanium (Ti)-Dissolved	<0.010		0.010	mg/L	03-JUN-19	04-JUN-19	R4655992
Uranium (U)-Dissolved	0.000900		0.000010	mg/L	03-JUN-19	04-JUN-19	R4655992
Vanadium (V)-Dissolved	0.00060		0.00050	mg/L	03-JUN-19	04-JUN-19	R4655992
Zinc (Zn)-Dissolved	0.0050		0.0010	mg/L	03-JUN-19	04-JUN-19	R4655992
Hardness							
Hardness (as CaCO3)	283		0.50	mg/L		04-JUN-19	
Total Metals in Water							
Total Be (Low) in Water by CRC ICPMS	0.000		0.000	, . ~ /I		02 1111 40	D4654444
Beryllium (Be)-Total	<0.020		0.020	ug/L		03-JUN-19	R4654414
Total Metals in Water by CRC ICPMS Aluminum (AI)-Total	0.0047		0.0030	mg/L		03-JUN-19	R4654414
Antimony (Sb)-Total	0.0047		0.0030	mg/L		03-JUN-19 03-JUN-19	R4654414
Arsenic (As)-Total	<0.00020		0.00010	mg/L		03-JUN-19 03-JUN-19	R4654414
, asomo (10) Total	\0.00010		0.00010	1119/L		00 0014-19	117004414

<sup>\*</sup> Refer to Referenced Information for Qualifiers (if any) and Methodology.

L2282430 CONTD.... PAGE 3 of 12 Version: FINAL

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2282430-1 LC_PIZDC1306_WG_Q2-2019_NP							
Sampled By: K.Campbell/D.Tymstra on 29-MAY-19 @	12:00						
	13.00						
Matrix: WG							
Total Metals in Water by CRC ICPMS Barium (Ba)-Total	0.174		0.00010	mg/L		03-JUN-19	R4654414
Bismuth (Bi)-Total	<0.000050		0.00010	mg/L		03-JUN-19	R4654414
Boron (B)-Total	0.010		0.010	mg/L		03-JUN-19	R4654414
Cadmium (Cd)-Total	0.121		0.0050	ug/L		03-JUN-19	R4654414
Calcium (Ca)-Total	63.9		0.050	mg/L		03-JUN-19	R4654414
Chromium (Cr)-Total	<0.00010		0.00010	mg/L		03-JUN-19	R4654414
Cobalt (Co)-Total	<0.10		0.10	ug/L		03-JUN-19	R4654414
Copper (Cu)-Total	<0.00050		0.00050	mg/L		03-JUN-19	R4654414
Iron (Fe)-Total	<0.010		0.010	mg/L		03-JUN-19	R4654414
Lead (Pb)-Total	0.000079		0.000050	mg/L		03-JUN-19	R4654414
Lithium (Li)-Total	0.0116		0.0010	mg/L		03-JUN-19	R4654414
Magnesium (Mg)-Total	24.4		0.10	mg/L		03-JUN-19	R4654414
Manganese (Mn)-Total	0.00020		0.00010	mg/L		03-JUN-19	R4654414
Molybdenum (Mo)-Total	0.00201		0.000050	mg/L		03-JUN-19	R4654414
Nickel (Ni)-Total	0.00107		0.00050	mg/L		03-JUN-19	R4654414
Potassium (K)-Total	2.05		0.050	mg/L		03-JUN-19	R4654414
Selenium (Se)-Total	2.86		0.050	ug/L		03-JUN-19	R4654414
Silicon (Si)-Total	3.16		0.10	mg/L		03-JUN-19	R4654414
Silver (Ag)-Total	<0.000010		0.000010	mg/L		03-JUN-19	R4654414
Sodium (Na)-Total	0.852		0.050	mg/L		03-JUN-19	R4654414
Strontium (Sr)-Total	0.0692		0.00020	mg/L		03-JUN-19	R4654414
Thallium (TI)-Total	<0.000010		0.000010	mg/L		03-JUN-19	R4654414
Tin (Sn)-Total	<0.00010		0.00010	mg/L		03-JUN-19	R4654414
Titanium (Ti)-Total	<0.010		0.010	mg/L		03-JUN-19	R4654414
Uranium (U)-Total	0.000834		0.000010	mg/L		03-JUN-19	R4654414
Vanadium (V)-Total Zinc (Zn)-Total	0.00070		0.00050	mg/L		03-JUN-19	R4654414
Routine for Teck Coal	<0.0030		0.0030	mg/L		03-JUN-19	R4654414
Acidity by Automatic Titration							
Acidity (as CaCO3)	4.9		1.0	mg/L		06-JUN-19	R4660564
Alkalinity (Species) by Manual Titration	4.9		1.0	mg/L		00 001113	114000304
Alkalinity, Bicarbonate (as CaCO3)	253		1.0	mg/L		06-JUN-19	R4661465
Alkalinity, Carbonate (as CaCO3)	4.4		1.0	mg/L		06-JUN-19	R4661465
Alkalinity, Hydroxide (as CaCO3)	<1.0		1.0	mg/L		06-JUN-19	R4661465
Alkalinity, Total (as CaCO3)	257		1.0	mg/L		06-JUN-19	R4661465
Ammonia, Total (as N)				<u>-</u>			
Ammonia as N	<0.0050		0.0050	mg/L		05-JUN-19	R4660309
Bromide in Water by IC (Low Level)							
Bromide (Br)	<0.050		0.050	mg/L		31-MAY-19	R4654463
Chloride in Water by IC							
Chloride (CI)	<0.50		0.50	mg/L		31-MAY-19	R4654463
Electrical Conductivity (EC)						00 ""	D 400 4 4 5 5
Conductivity (@ 25C)	480		2.0	uS/cm		06-JUN-19	R4661465
Fluoride in Water by IC Fluoride (F)	0.447		0.000	ma/l		31-MAY-19	D4654400
	0.147		0.020	mg/L		31-IVIA Y-19	R4654463
Ion Balance Calculation Ion Balance	109		-100	%		07-JUN-19	
Ion Balance Calculation	109		-100	70		07-3014-19	
Cation - Anion Balance	4.1			%		07-JUN-19	
Anion Sum	5.30			meg/L		07-JUN-19	
Cation Sum	5.76			meg/L		07-JUN-19	
Nitrate in Water by IC (Low Level)				· / -			
ato in trato. by to (Lott Lovel)							

<sup>\*</sup> Refer to Referenced Information for Qualifiers (if any) and Methodology.

L2282430 CONTD.... PAGE 4 of 12 Version: FINAL

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2282430-1 LC_PIZDC1306_WG_Q2-2019_NP							
Sampled By: K.Campbell/D.Tymstra on 29-MAY-19 @	13:00						
Matrix: WG	10.00						
2							
Nitrate in Water by IC (Low Level) Nitrate (as N)	0.171		0.0050	mg/L		31-MAY-19	R4654463
Nitrite in Water by IC (Low Level) Nitrite (as N)	<0.0010		0.0010	mg/L		31-MAY-19	R4654463
Orthophosphate-Dissolved (as P) Orthophosphate-Dissolved (as P)	0.0019		0.0010	mg/L		31-MAY-19	R4653118
Oxidation redution potential by elect. ORP	384		-1000	mV		05-JUN-19	R4659791
Phosphorus (P)-Total							
Phosphorus (P)-Total  Sulfate in Water by IC	0.0022		0.0020	mg/L		04-JUN-19	R4658959
Sulfate (SO4) Total Dissolved Solids	6.85		0.30	mg/L		31-MAY-19	R4654463
Total Dissolved Solids  Total Suspended Solids	247	DLHC	20	mg/L		04-JUN-19	R4659889
Total Suspended Solids	1.2		1.0	mg/L		05-JUN-19	R4660306
<b>Turbidity</b> Turbidity	0.44		0.10	NTU		31-MAY-19	R4653349
<b>pH</b> pH	8.36		0.10	рН		06-JUN-19	R4661465
L2282430-2 LC_PIZDC1307_WG_Q2-2019_NP							
Sampled By: K.Campbell/D.Tymstra on 29-MAY-19 @	11:20						
Matrix: WG							
Miscellaneous Parameters							
Dissolved Organic Carbon	1.60		0.50	mg/L		03-JUN-19	R4656949
Total Kjeldahl Nitrogen	0.117		0.050	mg/L		05-JUN-19	R4659365
Total Organic Carbon	1.43		0.50	mg/L		04-JUN-19	R4656949
Dissolved Metals in Water							
Diss. Be (low) in Water by CRC ICPMS Beryllium (Be)-Dissolved	<0.020		0.020	ug/L	03-JUN-19	04-JUN-19	R4655992
Dissolved Metals Filtration Location	FIELD					03-JUN-19	R4654109
Diss. Mercury in Water by CVAAS or CVAFS Mercury (Hg)-Dissolved	<0.000050		0.0000050	mg/L	03-JUN-19	04-JUN-19	R4655189
Dissolved Mercury Filtration Location	FIELD			· ·		03-JUN-19	R4654427
Dissolved Metals in Water by CRC ICPMS Dissolved Metals Filtration Location	FIELD					03-JUN-19	R4654109
Aluminum (Al)-Dissolved	<0.0030		0.0030	mg/L	03-JUN-19	04-JUN-19	R4655992
Antimony (Sb)-Dissolved	<0.00010		0.00010	mg/L	03-JUN-19	04-JUN-19	R4655992
Arsenic (As)-Dissolved	0.00160		0.00010	mg/L	03-JUN-19	04-JUN-19	R4655992
Barium (Ba)-Dissolved	1.55		0.00010	mg/L	03-JUN-19	04-JUN-19	R4655992
Bismuth (Bi)-Dissolved	<0.000050		0.000050	mg/L	03-JUN-19	04-JUN-19	R4655992
Boron (B)-Dissolved	0.023		0.010	mg/L	03-JUN-19	04-JUN-19	R4655992
Cadmium (Cd)-Dissolved	<0.015	DLM	0.015	ug/L	03-JUN-19	04-JUN-19	R4655992
Calcium (Ca)-Dissolved	42.5		0.050	mg/L	03-JUN-19	04-JUN-19	R4655992
Chromium (Cr)-Dissolved	<0.00010		0.00010	mg/L	03-JUN-19	04-JUN-19	R4655992
Cobalt (Co)-Dissolved	<0.10		0.10	ug/L	03-JUN-19	04-JUN-19	R4655992
Copper (Cu)-Dissolved	0.00100		0.00050	mg/L	03-JUN-19	04-JUN-19	R4655992
Iron (Fe)-Dissolved	0.874		0.010	mg/L	03-JUN-19	04-JUN-19	R4655992
Lead (Pb)-Dissolved	<0.000050		0.000050	mg/L	03-JUN-19	04-JUN-19	R4655992
Lithium (Li)-Dissolved Magnesium (Mg)-Dissolved	0.0802		0.0010	mg/L	03-JUN-19	04-JUN-19	R4655992
Magnesium (Mg)-Dissolved Manganese (Mn)-Dissolved	22.2		0.10	mg/L	03-JUN-19	04-JUN-19	R4655992
ווואון) אווואטוועמוופטר (ווווון) ווואוועמוועמוועמוועמווע	0.00966		0.00010	mg/L	03-JUN-19	04-JUN-19	R4655992

<sup>\*</sup> Refer to Referenced Information for Qualifiers (if any) and Methodology.

L2282430 CONTD.... PAGE 5 of 12 Version: FINAL

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
   L2282430-2							
Sampled By: K.Campbell/D.Tymstra on 29-MAY-19 @	11:20						
	11.20						
Matrix: WG							
Dissolved Metals in Water by CRC ICPMS Molybdenum (Mo)-Dissolved	0.0318		0.000050	mg/L	03-JUN-19	04-JUN-19	R4655992
Nickel (Ni)-Dissolved	0.00116		0.00050	mg/L	03-JUN-19	04-JUN-19	R4655992
Potassium (K)-Dissolved	5.37		0.050	mg/L	03-JUN-19	04-JUN-19	R4655992
Selenium (Se)-Dissolved	<0.050		0.050	ug/L	03-JUN-19	04-JUN-19	R4655992
Silicon (Si)-Dissolved	2.82		0.050	mg/L	03-JUN-19	04-JUN-19	R4655992
Silver (Ag)-Dissolved	<0.000010		0.000010	mg/L	03-JUN-19	04-JUN-19	R4655992
Sodium (Na)-Dissolved	14.8		0.050	mg/L	03-JUN-19	04-JUN-19	R4655992
Strontium (Sr)-Dissolved	0.141		0.00020	mg/L	03-JUN-19	04-JUN-19	R4655992
Thallium (TI)-Dissolved	<0.000010		0.000010	mg/L	03-JUN-19	04-JUN-19	R4655992
Tin (Sn)-Dissolved	<0.00010		0.00010	mg/L	03-JUN-19	04-JUN-19	R4655992
Titanium (Ti)-Dissolved	<0.010		0.010	mg/L	03-JUN-19	04-JUN-19	R4655992
Uranium (U)-Dissolved	0.000035		0.000010	mg/L	03-JUN-19	04-JUN-19	R4655992
Vanadium (V)-Dissolved	<0.00050		0.00050	mg/L	03-JUN-19	04-JUN-19	R4655992
Zinc (Zn)-Dissolved	0.0079		0.0010	mg/L	03-JUN-19	04-JUN-19	R4655992
Hardness							
Hardness (as CaCO3)	197		0.50	mg/L		04-JUN-19	
Total Metals in Water							
Total Be (Low) in Water by CRC ICPMS	0.000		0.000			00 11 15 1 40	D 405 444 4
Beryllium (Be)-Total	<0.020		0.020	ug/L		03-JUN-19	R4654414
Total Metals in Water by CRC ICPMS Aluminum (Al)-Total	0.0210		0.0030	mg/L		03-JUN-19	R4654414
Antimony (Sb)-Total	0.0210		0.0030	mg/L		03-JUN-19	R4654414
Arsenic (As)-Total	0.00100		0.00010	mg/L		03-JUN-19	R4654414
Barium (Ba)-Total	1.42		0.00010	mg/L		03-JUN-19	R4654414
Bismuth (Bi)-Total	<0.000050		0.000050	mg/L		03-JUN-19	R4654414
Boron (B)-Total	0.023		0.010	mg/L		03-JUN-19	R4654414
Cadmium (Cd)-Total	<0.020	DLM	0.020	ug/L		03-JUN-19	R4654414
Calcium (Ca)-Total	39.3		0.050	mg/L		03-JUN-19	R4654414
Chromium (Cr)-Total	0.00037		0.00010	mg/L		03-JUN-19	R4654414
Cobalt (Co)-Total	<0.10		0.10	ug/L		03-JUN-19	R4654414
Copper (Cu)-Total	0.00114		0.00050	mg/L		03-JUN-19	R4654414
Iron (Fe)-Total	1.37		0.010	mg/L		03-JUN-19	R4654414
Lead (Pb)-Total	0.000180		0.000050	mg/L		03-JUN-19	R4654414
Lithium (Li)-Total	0.0738		0.0010	mg/L		03-JUN-19	R4654414
Magnesium (Mg)-Total	21.2		0.10	mg/L		03-JUN-19	R4654414
Manganese (Mn)-Total	0.00997		0.00010	mg/L		03-JUN-19	R4654414
Molybdenum (Mo)-Total	0.0326		0.000050	mg/L		03-JUN-19	R4654414
Nickel (Ni)-Total	0.00112		0.00050	mg/L		03-JUN-19	R4654414
Potassium (K)-Total	5.22		0.050	mg/L		03-JUN-19	R4654414
Selenium (Se)-Total	<0.050		0.050	ug/L		03-JUN-19	R4654414
Silicon (Si)-Total	3.08		0.10	mg/L		03-JUN-19	R4654414
Silver (Ag)-Total	<0.000010		0.000010	mg/L		03-JUN-19	R4654414
Sodium (Na)-Total	14.8		0.050	mg/L		03-JUN-19	R4654414
Strontium (Sr)-Total	0.135		0.00020	mg/L		03-JUN-19	R4654414
Thallium (TI)-Total Tin (Sn)-Total	<0.000010		0.000010 0.00010	mg/L		03-JUN-19 03-JUN-19	R4654414
Tin (5n)-Total Titanium (Ti)-Total	<0.00010		0.00010	mg/L		03-JUN-19 03-JUN-19	R4654414 R4654414
Uranium (U)-Total	<0.010 0.000039		0.00010	mg/L mg/L		03-JUN-19 03-JUN-19	R4654414
Vanadium (V)-Total	<0.00050		0.00050	mg/L		03-JUN-19 03-JUN-19	R4654414
Zinc (Zn)-Total	0.0095		0.00030	mg/L		03-JUN-19	R4654414
Routine for Teck Coal	3.0033		0.0000	y, L		00 00 N-10	1,4004414
Acidity by Automatic Titration							
Actually by Automatic Hillation	1	-			1	1	-

<sup>\*</sup> Refer to Referenced Information for Qualifiers (if any) and Methodology.

L2282430 CONTD.... PAGE 6 of 12 Version: FINAL

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2282430-2 LC_PIZDC1307_WG_Q2-2019_NP							
Sampled By: K.Campbell/D.Tymstra on 29-MAY-19 @	11.20						
Matrix: WG	11.20						
Acidity by Automatic Titration							
Acidity (as CaCO3)	1.1		1.0	mg/L		06-JUN-19	R4660564
Alkalinity (Species) by Manual Titration							
Alkalinity, Bicarbonate (as CaCO3)	212		1.0	mg/L		06-JUN-19	R4661465
Alkalinity, Carbonate (as CaCO3)	8.2		1.0	mg/L		06-JUN-19	R4661465
Alkalinity, Hydroxide (as CaCO3)	<1.0		1.0	mg/L		06-JUN-19	R4661465
Alkalinity, Total (as CaCO3)	220		1.0	mg/L		06-JUN-19	R4661465
Ammonia, Total (as N) Ammonia as N	0.0963		0.0050	mg/L		05-JUN-19	R4660309
Bromide in Water by IC (Low Level)	0.0000		0.0000	9/=		33 33.1 13	11.000000
Bromide (Br)	<0.050		0.050	mg/L		31-MAY-19	R4654463
Chloride in Water by IC							
Chloride (CI)	<0.50		0.50	mg/L		31-MAY-19	R4654463
Electrical Conductivity (EC)	400		2.0	118/200		06 1114 40	D4664405
Conductivity (@ 25C) Fluoride in Water by IC	402		2.0	uS/cm		06-JUN-19	R4661465
Fluoride in water by iC	0.575		0.020	mg/L		31-MAY-19	R4654463
Ion Balance Calculation							
Ion Balance	108		-100	%		07-JUN-19	
Ion Balance Calculation							
Cation - Anion Balance	3.7			%		07-JUN-19	
Anion Sum Cation Sum	4.44			meq/L		07-JUN-19	
Nitrate in Water by IC (Low Level)	4.78			meq/L		07-JUN-19	
Nitrate (as N)	0.0104		0.0050	mg/L		31-MAY-19	R4654463
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	<0.0010		0.0010	mg/L		31-MAY-19	R4654463
Orthophosphate-Dissolved (as P)							
Orthophosphate-Dissolved (as P)	<0.0010		0.0010	mg/L		31-MAY-19	R4653118
Oxidation redution potential by elect. ORP	279		-1000	mV		05-JUN-19	R4659791
Phosphorus (P)-Total	270		1000	111 V		00 0011 10	144000701
Phosphorus (P)-Total	0.0154		0.0020	mg/L		04-JUN-19	R4658959
Sulfate in Water by IC							
Sulfate (SO4)	<0.30		0.30	mg/L		31-MAY-19	R4654463
Total Dissolved Solids Total Dissolved Solids	200	DLHC	00	ro ~ /!		04 11 18 40	DAGEOGGG
Total Suspended Solids Total Suspended Solids	209	DLTC	20	mg/L		04-JUN-19	R4659889
Total Suspended Solids Total Suspended Solids	2.5		1.0	mg/L		05-JUN-19	R4660306
Turbidity			-				
Turbidity	7.60		0.10	NTU		31-MAY-19	R4653349
pH			٠			00 "":	
pH	8.46		0.10	pН		06-JUN-19	R4661465
L2282430-3 LC_PIZDC1308_WG_Q2-2019_NP	10.50						
Sampled By: K.Campbell/D.Tymstra on 29-MAY-19 @	10:50						
Matrix: WG							
Miscellaneous Parameters Dissolved Organic Carbon	2.36		0.50	mg/L		03-JUN-19	R4656949
Total Kjeldahl Nitrogen	<0.050		0.050	mg/L		05-JUN-19 05-JUN-19	R4659365
Total Organic Carbon	2.06		0.50	mg/L		03-JUN-19	R4656949
Dissolved Metals in Water	2.00		0.00	ilig/L		00 0014-13	117000343
Diss. Be (low) in Water by CRC ICPMS							
Beryllium (Be)-Dissolved	<0.020		0.020	ug/L	12-JUN-19	13-JUN-19	R4667451

<sup>\*</sup> Refer to Referenced Information for Qualifiers (if any) and Methodology.

L2282430 CONTD.... PAGE 7 of 12 Version: FINAL

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2282430-3 LC_PIZDC1308_WG_Q2-2019_NP							
	10.50						
Sampled By: K.Campbell/D.Tymstra on 29-MAY-19 @	10.50						
Matrix: WG							
Diss. Be (low) in Water by CRC ICPMS Dissolved Metals Filtration Location	LAB					12-JUN-19	R4666746
Diss. Mercury in Water by CVAAS or CVAFS				,,			<u>-</u>
Mercury (Hg)-Dissolved	<0.000050		0.0000050	mg/L	03-JUN-19	04-JUN-19	R4655189
Dissolved Mercury Filtration Location	FIELD					03-JUN-19	R4654427
Dissolved Metals in Water by CRC ICPMS Dissolved Metals Filtration Location	LAB					12-JUN-19	R4666746
Aluminum (AI)-Dissolved	<0.0030		0.0030	mg/L	12-JUN-19	13-JUN-19	R4667451
Antimony (Sb)-Dissolved	0.00010		0.00010	mg/L	12-JUN-19	13-JUN-19	R4667451
Arsenic (As)-Dissolved	0.00013		0.00010	mg/L	12-JUN-19	13-JUN-19	R4667451
Barium (Ba)-Dissolved	0.303		0.00010	mg/L	12-JUN-19	13-JUN-19	R4667451
Bismuth (Bi)-Dissolved	<0.000050		0.000050	mg/L	12-JUN-19	13-JUN-19	R4667451
Boron (B)-Dissolved	<0.010		0.010	mg/L	12-JUN-19	13-JUN-19	R4667451
Cadmium (Cd)-Dissolved	0.126		0.0050	ug/L	12-JUN-19	13-JUN-19	R4667451
Calcium (Ca)-Dissolved	85.9		0.050	mg/L	12-JUN-19	13-JUN-19	R4667451
Chromium (Cr)-Dissolved Cobalt (Co)-Dissolved	<0.00010 0.44		0.00010 0.10	mg/L	12-JUN-19 12-JUN-19	13-JUN-19 13-JUN-19	R4667451
Copper (Cu)-Dissolved	<0.0050		0.00050	ug/L mg/L	12-JUN-19 12-JUN-19	13-JUN-19 13-JUN-19	R4667451 R4667451
Iron (Fe)-Dissolved	<0.0050		0.00050	mg/L	12-JUN-19 12-JUN-19	13-JUN-19 13-JUN-19	R4667451
Lead (Pb)-Dissolved	<0.00050		0.00050	mg/L	12-JUN-19	13-JUN-19	R4667451
Lithium (Li)-Dissolved	0.0075		0.000030	mg/L	12-JUN-19	13-JUN-19	R4667451
Magnesium (Mg)-Dissolved	27.8		0.10	mg/L	12-JUN-19	13-JUN-19	R4667451
Manganese (Mn)-Dissolved	0.0152		0.00010	mg/L	12-JUN-19	13-JUN-19	R4667451
Molybdenum (Mo)-Dissolved	0.00167		0.000050	mg/L	12-JUN-19	13-JUN-19	R4667451
Nickel (Ni)-Dissolved	0.00144		0.00050	mg/L	12-JUN-19	13-JUN-19	R4667451
Potassium (K)-Dissolved	1.81		0.050	mg/L	12-JUN-19	13-JUN-19	R4667451
Selenium (Se)-Dissolved	0.266		0.050	ug/L	12-JUN-19	13-JUN-19	R4667451
Silicon (Si)-Dissolved	4.85		0.050	mg/L	12-JUN-19	13-JUN-19	R4667451
Silver (Ag)-Dissolved	<0.00010		0.000010	mg/L	12-JUN-19	13-JUN-19	R4667451
Sodium (Na)-Dissolved	1.63		0.050	mg/L	12-JUN-19	13-JUN-19	R4667451
Strontium (Sr)-Dissolved	0.0946		0.00020	mg/L	12-JUN-19	13-JUN-19	R4667451
Thallium (TI)-Dissolved	0.000025		0.000010	mg/L	12-JUN-19	13-JUN-19	R4667451
Tin (Sn)-Dissolved	<0.00010		0.00010	mg/L	12-JUN-19	13-JUN-19	R4667451
Titanium (Ti)-Dissolved	<0.010		0.010	mg/L	12-JUN-19	13-JUN-19	R4667451
Uranium (U)-Dissolved	0.00125		0.000010	mg/L	12-JUN-19	13-JUN-19	R4667451
Vanadium (V)-Dissolved	<0.00050		0.00050	mg/L	12-JUN-19	13-JUN-19	R4667451
Zinc (Zn)-Dissolved	0.0020		0.0010	mg/L	12-JUN-19	13-JUN-19	R4667451
Hardness			_	**			
Hardness (as CaCO3)	329		0.50	mg/L		13-JUN-19	
Total Metals in Water							
Total Be (Low) in Water by CRC ICPMS Beryllium (Be)-Total	<0.020		0.020	ug/L		03-JUN-19	R4654414
Total Metals in Water by CRC ICPMS							
Aluminum (AI)-Total	0.0271		0.0030	mg/L		03-JUN-19	R4654414
Antimony (Sb)-Total	0.00012		0.00010	mg/L		03-JUN-19	R4654414
Arsenic (As)-Total	0.00024		0.00010	mg/L		03-JUN-19	R4654414
Barium (Ba)-Total	0.307		0.00010	mg/L		03-JUN-19	R4654414
Bismuth (Bi)-Total	<0.000050		0.000050	mg/L		03-JUN-19	R4654414
Boron (B)-Total	0.010		0.010	mg/L		03-JUN-19	R4654414
Cadmium (Cd)-Total	0.216		0.0050	ug/L		03-JUN-19	R4654414
Calcium (Ca)-Total	90.6		0.050	mg/L		03-JUN-19	R4654414
Chromium (Cr)-Total	<0.00010		0.00010	mg/L		03-JUN-19	R4654414
Cobalt (Co)-Total	0.51		0.10	ug/L	L	03-JUN-19	R4654414

<sup>\*</sup> Refer to Referenced Information for Qualifiers (if any) and Methodology.

L2282430 CONTD.... PAGE 8 of 12 Version: FINAL

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
   L2282430-3							
Sampled By: K.Campbell/D.Tymstra on 29-MAY-19 @	10:50						
Matrix: WG							
Total Metals in Water by CRC ICPMS							
Copper (Cu)-Total	0.00057	0	0.00050	mg/L		03-JUN-19	R4654414
Iron (Fe)-Total	0.394		0.010	mg/L		03-JUN-19	R4654414
Lead (Pb)-Total	0.000138	0.	.000050	mg/L		03-JUN-19	R4654414
Lithium (Li)-Total	0.0078		0.0010	mg/L		03-JUN-19	R4654414
Magnesium (Mg)-Total	28.1		0.10	mg/L		03-JUN-19	R4654414
Manganese (Mn)-Total	0.0167	0	0.00010	mg/L		03-JUN-19	R4654414
Molybdenum (Mo)-Total	0.00174		.000050	mg/L		03-JUN-19	R4654414
Nickel (Ni)-Total	0.00157		0.00050	mg/L		03-JUN-19	R4654414
Potassium (K)-Total	1.83		0.050	mg/L		03-JUN-19	R4654414
Selenium (Se)-Total	0.204		0.050	ug/L		03-JUN-19	R4654414
Silicon (Si)-Total	5.15		0.10	mg/L		03-JUN-19	R4654414
Silver (Ag)-Total	<0.000010		.000010	mg/L		03-JUN-19	R4654414
Sodium (Na)-Total Strontium (Sr)-Total	1.70 0.0959		0.050	mg/L		03-JUN-19 03-JUN-19	R4654414 R4654414
Thallium (TI)-Total	0.0959		0.00020	mg/L mg/L		03-JUN-19 03-JUN-19	R4654414
Tin (Sn)-Total	<0.00030		0.00010	mg/L		03-JUN-19 03-JUN-19	R4654414
Titanium (Ti)-Total	<0.010		0.010	mg/L		03-JUN-19	R4654414
Uranium (U)-Total	0.00126		.000010	mg/L		03-JUN-19	R4654414
Vanadium (V)-Total	<0.00050		0.00050	mg/L		03-JUN-19	R4654414
Zinc (Zn)-Total	0.0033		0.0030	mg/L		03-JUN-19	R4654414
Routine for Teck Coal				· ·			
Acidity by Automatic Titration							
Acidity (as CaCO3)	5.2		1.0	mg/L		06-JUN-19	R4660564
Alkalinity (Species) by Manual Titration							
Alkalinity, Bicarbonate (as CaCO3)	325		1.0	mg/L		06-JUN-19	R4661465
Alkalinity, Carbonate (as CaCO3)	<1.0		1.0	mg/L		06-JUN-19	R4661465
Alkalinity, Hydroxide (as CaCO3)	<1.0		1.0	mg/L		06-JUN-19	R4661465
Alkalinity, Total (as CaCO3)	325		1.0	mg/L		06-JUN-19	R4661465
<b>Ammonia, Total (as N)</b> Ammonia as N	<0.0050		0.0050	mg/L		05-JUN-19	R4660309
Bromide in Water by IC (Low Level)	<0.0050	'	0.0030	mg/L		03 3011 13	114000309
Bromide (Br)	<0.050		0.050	mg/L		31-MAY-19	R4654463
Chloride in Water by IC				J			
Chloride (CI)	1.41		0.50	mg/L		31-MAY-19	R4654463
Electrical Conductivity (EC)							
Conductivity (@ 25C)	595		2.0	uS/cm		06-JUN-19	R4661465
Fluoride in Water by IC							
Fluoride (F)	0.146		0.020	mg/L		31-MAY-19	R4654463
Ion Balance Calculation	0.4			0/		12 11 11 10	
Cation - Anion Balance Anion Sum	0.1			% mog/l		13-JUN-19 13-JUN-19	
Cation Sum	6.67 6.69			meq/L meq/L		13-JUN-19 13-JUN-19	
Ion Balance Calculation	0.09			meq/L		10 0011-13	
Ion Balance	100		-100	%		13-JUN-19	
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	0.115		0.0050	mg/L		31-MAY-19	R4654463
Nitrite in Water by IC (Low Level)				=			
Nitrite (as N)	<0.0010		0.0010	mg/L		31-MAY-19	R4654463
Orthophosphate-Dissolved (as P)							
Orthophosphate-Dissolved (as P)	<0.0010		0.0010	mg/L		31-MAY-19	R4653118
Oxidation redution potential by elect.	400		4000			05    11   10	D 405075 :
ORP	422		-1000	mV		05-JUN-19	R4659791

<sup>\*</sup> Refer to Referenced Information for Qualifiers (if any) and Methodology.

L2282430 CONTD.... PAGE 9 of 12 Version: FINAL

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2282430-3 LC_PIZDC1308_WG_Q2-2019_NP							
Sampled By: K.Campbell/D.Tymstra on 29-MAY-19 @	10:50						
Matrix: WG							
Phosphorus (P)-Total Phosphorus (P)-Total	<0.0020		0.0020	mg/L		04-JUN-19	R4658959
Sulfate in Water by IC Sulfate (SO4)	5.74		0.30	mg/L		31-MAY-19	R4654463
Total Dissolved Solids Total Dissolved Solids	322	DLHC	20	mg/L		04-JUN-19	R4659889
Total Suspended Solids Total Suspended Solids	1.9		1.0	mg/L		05-JUN-19	R4660306
Turbidity Turbidity	3.53		0.10	NTU		31-MAY-19	R4653349
pH pH	8.24		0.10	рН		06-JUN-19	R4661465

<sup>\*</sup> Refer to Referenced Information for Qualifiers (if any) and Methodology.

L2282430 CONTD....

PAGE 10 of 12
Version: FINAL

#### **Reference Information**

**Qualifiers for Sample Submission Listed:** 

 Qualifier
 Description

 EXTEMP10
 13C - Samples Received with temperature >10 Degrees C

Sample Parameter Qualifier Key:

Qualifier	Description
DLHC	Detection Limit Raised: Dilution required due to high concentration of test analyte(s).
DLM	Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.

**Test Method References:** 

ALS Test Code Matrix		Test Description	Method Reference**	
ACIDITY-PCT-CL	Water	Acidity by Automatic Titration	APHA 2310 Acidity	

This analysis is carried out using procedures adapted from APHA Method 2310 "Acidity". Acidity is determined by potentiometric titration to a specified endpoint.

ALK-MAN-CL Water Alkalinity (Species) by Manual Titration APHA 2320 ALKALINITY

This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.

BE-D-L-CCMS-VA Water Diss. Be (low) in Water by CRC ICPMS APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

BE-T-L-CCMS-VA Water Total Be (Low) in Water by CRC ICPMS EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

BR-L-IC-N-CL Water Bromide in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

C-DIS-ORG-LOW-CL Water Dissolved Organic Carbon APHA 5310 B-Instrumental

This method is applicable to the analysis of ground water, wastewater, and surface water samples. The form detected depends upon sample pretreatment: Unfiltered sample = TC, 0.45um filtered = TDC. Samples are injected into a combustion tube containing an oxidation catalyst. The carrier gas containing the combustion product from the combustion tube flows through an inorganic carbon reactor vessel and is then sent through a halogen scrubber into a sample cell set in a non-dispersive infrared gas analyzer (NDIR) where carbon dioxide is detected. For total inorganic carbon and dissolved inorganic carbon, the sample is injected into an IC reactor vessel where only the IC component is decomposed to become carbon dioxide.

The peak area generated by the NDIR indicates the TC/TDC or TIC/DIC as applicable. The total organic carbon content of the sample is calculated by subtracting the TIC from the TC.

TOC = TC-TIC, DOC = TDC-DIC, Particulate = Total - Dissolved.

C-TOT-ORG-LOW-CL Water Total Organic Carbon APHA 5310 TOTAL ORGANIC CARBON (TOC)

This method is applicable to the analysis of ground water, wastewater, and surface water samples. The form detected depends upon sample pretreatment: Unfiltered sample = TC, 0.45um filtered = TDC. Samples are injected into a combustion tube containing an oxidation catalyst. The carrier gas containing the combustion product from the combustion tube flows through an inorganic carbon reactor vessel and is then sent through a halogen scrubber into a sample cell set in a non-dispersive infrared gas analyzer (NDIR) where carbon dioxide is detected. For total inorganic carbon and dissolved inorganic carbon, the sample is injected into an IC reactor vessel where only the IC component is decomposed to become carbon dioxide.

The peak area generated by the NDIR indicates the TC/TDC or TIC/DIC as applicable. The total organic carbon content of the sample is calculated by subtracting the TIC from the TC.

TOC = TC-TIC, DOC = TDC-DIC, Particulate = Total - Dissolved.

CL-IC-N-CL Water Chloride in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

EC-L-PCT-CL Water Electrical Conductivity (EC) APHA 2510B

Conductivity, also known as Electrical Conductivity (EC) or Specific Conductance, is measured by immersion of a conductivity cell with platinum electrodes into a water sample. Conductivity measurements are temperature-compensated to 25C.

F-IC-N-CL Water Fluoride in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

HARDNESS-CALC-VA Water Hardness APHA 2340B

#### L2282430 CONTD....

PAGE 11 of 12 Version: FINAL

### **Reference Information**

**Test Method References:** 

**ALS Test Code** Matrix Method Reference\*\* **Test Description** 

Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO3 equivalents,

Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

Water samples are filtered (0.45 um), preserved with hydrochloric acid, then undergo a cold-oxidation using bromine monochloride prior to reduction

Diss. Mercury in Water by CVAAS or CVAFS APHA 3030B/EPA 1631E (mod)

with stannous chloride, and analyzed by CVAAS or CVAFS.

Water

IONBALANCE-BC-CL Ion Balance Calculation **APHA 1030E** Water

Cation Sum, Anion Sum, and Ion Balance (as % difference) are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Because all aqueous solutions are electrically neutral, the calculated ion balance (% difference of cations minus anions)

should be near-zero.

HG-D-CVAA-VA

Cation and Anion Sums are the total meg/L concentration of major cations and anions. Dissolved species are used where available. Minor ions are

included where data is present. Ion Balance is calculated as:

Ion Balance (%) = [Cation Sum-Anion Sum] / [Cation Sum+Anion Sum]

MET-D-CCMS-VA Dissolved Metals in Water by CRC ICPMS APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

MET-T-CCMS-VA Water Total Metals in Water by CRC ICPMS EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

NH3-L-F-CL Water Ammonia, Total (as N) J. ENVIRON. MONIT., 2005, 7, 37-42, RSC

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et

NO2-L-IC-N-CL Water Nitrite in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

NO3-L-IC-N-CL Nitrate in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

ORP-CL Water **ASTM D1498** Oxidation redution potential by elect.

This analysis is carried out in accordance with the procedure described in the "ASTM" method D1498 "Oxidation-Reduction Potential of Water" published by the American Society for Testing and Materials (ASTM). Results are reported as observed oxidation-reduction potential of the platinum metal-reference electrode employed, in mV.

It is recommended that this analysis be conducted in the field.

P-T-L-COL-CL Phosphorus (P)-Total APHA 4500-P PHOSPHORUS Water

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after

persulphate digestion of the sample.

APHA 4500 H-Electrode PH-CI Water Ha

pH is determined in the laboratory using a pH electrode. All samples analyzed by this method for pH will have exceeded the 15 minute recommended

hold time from time of sampling (field analysis is recommended for pH where highly accurate results are needed)

PO4-DO-L-COL-CL Water Orthophosphate-Dissolved (as P) APHA 4500-P PHOSPHORUS

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined

colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.

SO4-IC-N-CL Sulfate in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

SOLIDS-TDS-CL Water **Total Dissolved Solids** APHA 2540 C

A well-mixed sample is filtered through a glass fibre filter paper. The filtrate is then evaporated to dryness in a pre-weighed vial and dried at 180 – 2 °C.

The increase in vial weight represents the total dissolved solids (TDS).

TECKCOAL-IONBAL-CL Ion Balance Calculation **APHA 1030E** 

#### LINE CREEK OPERATION

L2282430 CONTD.... PAGE 12 of 12 Version: FINAL

### **Reference Information**

**Test Method References:** 

ALS Test Code Matrix Test Description Method Reference\*\*

Cation Sum, Anion Sum, and Ion Balance (as % difference) are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Because all aqueous solutions are electrically neutral, the calculated ion balance (% difference of cations minus anions) should be near-zero.

Cation and Anion Sums are the total meq/L concentration of major cations and anions. Dissolved species are used where available. Minor ions are included where data is present. Ion Balance is calculated as:

Ion Balance (%) = [Cation Sum-Anion Sum] / [Cation Sum+Anion Sum]

TKN-L-F-CL Water Total Kjeldahl Nitrogen APHA 4500-NORG (TKN)

This analysis is carried out using procedures adapted from APHA Method 4500-Norg D. "Block Digestion and Flow Injection Analysis". Total Kjeldahl Nitrogen is determined using block digestion followed by Flow-injection analysis with fluorescence detection.

TSS-L-CL Water Total Suspended Solids APHA 2540 D-Gravimetric

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total suspended solids (TSS) are determined by filtering a sample through a glass fibre filter, and by drying the filter at 104 deg. C.

TURBIDITY-CL Water Turbidity APHA 2130 B-Nephelometer

This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.

\*\* ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

<b>Laboratory Definition Code</b>	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA
CL	ALS ENVIRONMENTAL - CALGARY, ALBERTA, CANADA

#### **Chain of Custody Numbers:**

20190529 DC GW

#### **GLOSSARY OF REPORT TERMS**

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.

mg/kg - milligrams per kilogram based on dry weight of sample

mg/kg wwt - milligrams per kilogram based on wet weight of sample

mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight

mg/L - unit of concentration based on volume, parts per million.

< - Less than.

D.L. - The reporting limit.

N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory. UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.



Workorder: L2282430 Report Date: 13-JUN-19 Page 1 of 16

Client: TECK COAL LIMITED (LINE CREEK)

PO BOX 2003

SPARWOOD BC V0B 2G0

Contact: Chris Blurton

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
ACIDITY-PCT-CL  Batch R4660564  WG3070034-5 LCS	Water							
Acidity (as CaCO3)			100.4		%		85-115	06-JUN-19
WG3070034-4 MB Acidity (as CaCO3)			<1.0		mg/L		2	06-JUN-19
ALK-MAN-CL	Water							
Batch R4661465 WG3070902-8 LCS Alkalinity, Total (as CaC	O3)		99.4		%		85-115	06-JUN-19
WG3070902-7 MB Alkalinity, Total (as CaC	O3)		<1.0		mg/L		1	06-JUN-19
BE-D-L-CCMS-VA	Water							
Batch R4655992								
WG3065732-3 DUP Beryllium (Be)-Dissolved	I	<b>L2282430-2</b> <0.000020	<0.000020	RPD-NA	mg/L	N/A	20	04-JUN-19
WG3065732-2 LCS Beryllium (Be)-Dissolved	I		102.5		%		80-120	04-JUN-19
WG3065732-1 MB Beryllium (Be)-Dissolved	I	NP	<0.000020	)	mg/L		0.00002	04-JUN-19
WG3065732-4 MS Beryllium (Be)-Dissolved	I	L2282430-1	104.5		%		70-130	04-JUN-19
Batch R4667451 WG3075593-3 DUP		L2282430-3						
Beryllium (Be)-Dissolved	I	<0.000020	<0.000020	RPD-NA	mg/L	N/A	20	13-JUN-19
WG3075593-2 LCS Beryllium (Be)-Dissolved	I		98.2		%		80-120	13-JUN-19
WG3075593-1 MB Beryllium (Be)-Dissolved	I	LF	<0.000020	)	mg/L		0.00002	13-JUN-19
BE-T-L-CCMS-VA	Water							
Batch R4654414 WG3065193-2 LCS Beryllium (Be)-Total			98.6		%		80-120	03-JUN-19
WG3065193-1 MB Beryllium (Be)-Total			<0.000020	)	mg/L		0.00002	03-JUN-19
BR-L-IC-N-CL	Water							



Workorder: L2282430

Report Date: 13-JUN-19

Page 2 of 16

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
BR-L-IC-N-CL	Water							
Batch R4654463								
WG3066229-2 LCS Bromide (Br)			101.9		%		85-115	31-MAY-19
WG3066229-1 MB Bromide (Br)			<0.050		mg/L		0.05	31-MAY-19
C-DIS-ORG-LOW-CL	Water							
Batch R4656949								
WG3067080-2 LCS Dissolved Organic Carbo	on		95.7		%		80-120	03-JUN-19
WG3067080-1 MB Dissolved Organic Carbo	on		<0.50		mg/L		0.5	03-JUN-19
C-TOT-ORG-LOW-CL	Water							
Batch R4656949								
WG3067080-2 LCS Total Organic Carbon			98.5		%		80-120	03-JUN-19
WG3067080-1 MB Total Organic Carbon			<0.50		mg/L		0.5	03-JUN-19
CL-IC-N-CL	Water							
Batch R4654463								
WG3066229-2 LCS Chloride (CI)			100.7		%		90-110	31-MAY-19
<b>WG3066229-1 MB</b> Chloride (Cl)			<0.50		mg/L		0.5	31-MAY-19
EC-L-PCT-CL	Water							
Batch R4661465								
WG3070902-8 LCS Conductivity (@ 25C)			103.9		%		90-110	06-JUN-19
WG3070902-7 MB Conductivity (@ 25C)			<2.0		uS/cm		2	06-JUN-19
F-IC-N-CL	Water							
Batch R4654463								
<b>WG3066229-2 LCS</b> Fluoride (F)			103.6		%		90-110	31-MAY-19
<b>WG3066229-1 MB</b> Fluoride (F)			<0.020		mg/L		0.02	31-MAY-19
HG-D-CVAA-VA	Water							



Workorder: L2282430 Report Date: 13-JUN-19 Page 3 of 16

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
HG-D-CVAA-VA	Water							
Batch R465518 WG3066173-2 LCS Mercury (Hg)-Dissolve			102.6		%		80-120	04-JUN-19
WG3066173-1 MB Mercury (Hg)-Dissolve	ed	NP	<0.000005	GC C	mg/L		0.000005	04-JUN-19
MET-D-CCMS-VA	Water							
Batch R465599	2							
WG3065732-3 DUP Aluminum (Al)-Dissolv		<b>L2282430-2</b> < 0.0030	<0.0030	RPD-NA	mg/L	N/A	20	04-JUN-19
Antimony (Sb)-Dissolv	/ed	<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	04-JUN-19
Arsenic (As)-Dissolve		0.00160	0.00161		mg/L	0.6	20	04-JUN-19
Barium (Ba)-Dissolved	d	1.55	1.51		mg/L	2.6	20	04-JUN-19
Bismuth (Bi)-Dissolve	d	<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	04-JUN-19
Boron (B)-Dissolved		0.023	0.023		mg/L	0.4	20	04-JUN-19
Cadmium (Cd)-Dissol	ved	<0.000015	<0.000015	RPD-NA	mg/L	N/A	20	04-JUN-19
Calcium (Ca)-Dissolve	ed	42.5	41.7		mg/L	1.7	20	04-JUN-19
Chromium (Cr)-Dissol	ved	<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	04-JUN-19
Cobalt (Co)-Dissolved	l	<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	04-JUN-19
Copper (Cu)-Dissolve	d	0.00100	0.00097		mg/L	3.3	20	04-JUN-19
Iron (Fe)-Dissolved		0.874	0.869		mg/L	0.6	20	04-JUN-19
Lead (Pb)-Dissolved		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	04-JUN-19
Lithium (Li)-Dissolved		0.0802	0.0790		mg/L	1.5	20	04-JUN-19
Magnesium (Mg)-Diss	solved	22.2	21.7		mg/L	2.4	20	04-JUN-19
Manganese (Mn)-Diss	solved	0.00966	0.00980		mg/L	1.4	20	04-JUN-19
Molybdenum (Mo)-Dis	ssolved	0.0318	0.0308		mg/L	3.2	20	04-JUN-19
Nickel (Ni)-Dissolved		0.00116	0.00109		mg/L	6.3	20	04-JUN-19
Potassium (K)-Dissolv	ved .	5.37	5.31		mg/L	1.1	20	04-JUN-19
Selenium (Se)-Dissolv	/ed	<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	04-JUN-19
Silicon (Si)-Dissolved		2.82	2.79		mg/L	1.2	20	04-JUN-19
Silver (Ag)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	04-JUN-19
Sodium (Na)-Dissolve	d	14.8	14.6		mg/L	1.0	20	04-JUN-19
Strontium (Sr)-Dissolv	red	0.141	0.137		mg/L	2.7	20	04-JUN-19
Thallium (TI)-Dissolve	d	<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	04-JUN-19
Tin (Sn)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	04-JUN-19
Titanium (Ti)-Dissolve	d	<0.010	<0.010	RPD-NA	mg/L	N/A	20	04-JUN-19
Uranium (U)-Dissolve	d	0.000035	0.000035		mg/L	0.3	20	04-JUN-19



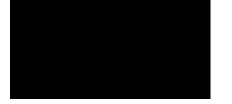
Workorder: L2282430 Report Date: 13-JUN-19 Page 4 of 16

est N	// Atrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA	Water							
Batch R4655992								
WG3065732-3 DUP Vanadium (V)-Dissolved		<b>L2282430-2</b> <0.00050	<0.00050	RPD-NA	mg/L	N/A	20	04-JUN-19
Zinc (Zn)-Dissolved		0.0079	0.0076		mg/L	4.7	20	04-JUN-19
WG3065732-2 LCS Aluminum (Al)-Dissolved			104.1		%		80-120	04-JUN-19
Antimony (Sb)-Dissolved			94.6		%		80-120	04-JUN-19
Arsenic (As)-Dissolved			104.0		%		80-120	04-JUN-19
Barium (Ba)-Dissolved			102.9		%		80-120	04-JUN-19
Bismuth (Bi)-Dissolved			100.1		%		80-120	04-JUN-19
Boron (B)-Dissolved			100.5		%		80-120	04-JUN-19
Cadmium (Cd)-Dissolved			101.7		%		80-120	04-JUN-19
Calcium (Ca)-Dissolved			102.9		%		80-120	04-JUN-19
Chromium (Cr)-Dissolved			102.1		%		80-120	04-JUN-19
Cobalt (Co)-Dissolved			101.1		%		80-120	04-JUN-19
Copper (Cu)-Dissolved			101.3		%		80-120	04-JUN-19
Iron (Fe)-Dissolved			96.8		%		80-120	04-JUN-19
Lead (Pb)-Dissolved			103.3		%		80-120	04-JUN-19
Lithium (Li)-Dissolved			101.6		%		80-120	04-JUN-19
Magnesium (Mg)-Dissolve	d		102.5		%		80-120	04-JUN-19
Manganese (Mn)-Dissolve	d		105.5		%		80-120	04-JUN-19
Molybdenum (Mo)-Dissolv	ed		95.9		%		80-120	04-JUN-19
Nickel (Ni)-Dissolved			104.6		%		80-120	04-JUN-19
Potassium (K)-Dissolved			102.2		%		80-120	04-JUN-19
Selenium (Se)-Dissolved			97.7		%		80-120	04-JUN-19
Silicon (Si)-Dissolved			101.1		%		60-140	04-JUN-19
Silver (Ag)-Dissolved			98.2		%		80-120	04-JUN-19
Sodium (Na)-Dissolved			103.3		%		80-120	04-JUN-19
Strontium (Sr)-Dissolved			94.1		%		80-120	04-JUN-19
Thallium (TI)-Dissolved			101.1		%		80-120	04-JUN-19
Tin (Sn)-Dissolved			97.2		%		80-120	04-JUN-19
Titanium (Ti)-Dissolved			98.6		%		80-120	04-JUN-19
Uranium (U)-Dissolved			104.3		%		80-120	04-JUN-19
Vanadium (V)-Dissolved			103.7		%		80-120	04-JUN-19
Zinc (Zn)-Dissolved			101.0		%		80-120	04-JUN-19
WG3065732-1 MB Aluminum (Al)-Dissolved		NP	<0.0010		mg/L		0.001	04-JUN-19



Workorder: L2282430 Report Date: 13-JUN-19 Page 5 of 16

Test	Matrix	Reference	Result	Qualifie	r Units	RPD	Limit	Analyzed
MET-D-CCMS-VA	Water							
Batch R465599	92							
WG3065732-1 MB		NP						
Antimony (Sb)-Dissol			<0.00010		mg/L		0.0001	04-JUN-19
Arsenic (As)-Dissolve			<0.00010		mg/L		0.0001	04-JUN-19
Barium (Ba)-Dissolve			<0.00010		mg/L		0.0001	04-JUN-19
Bismuth (Bi)-Dissolve	ed		<0.00005	0	mg/L		0.00005	04-JUN-19
Boron (B)-Dissolved			<0.010		mg/L		0.01	04-JUN-19
Cadmium (Cd)-Disso			<0.00000	<b>5</b> C	mg/L		0.000005	04-JUN-19
Calcium (Ca)-Dissolv			<0.050		mg/L		0.05	04-JUN-19
Chromium (Cr)-Disso	lved		<0.00010		mg/L		0.0001	04-JUN-19
Cobalt (Co)-Dissolved	d		<0.00010		mg/L		0.0001	04-JUN-19
Copper (Cu)-Dissolve	ed		<0.00020		mg/L		0.0002	04-JUN-19
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	04-JUN-19
Lead (Pb)-Dissolved			<0.00005	0	mg/L		0.00005	04-JUN-19
Lithium (Li)-Dissolved	d		<0.0010		mg/L		0.001	04-JUN-19
Magnesium (Mg)-Dis	solved		<0.0050		mg/L		0.005	04-JUN-19
Manganese (Mn)-Dis	solved		<0.00010		mg/L		0.0001	04-JUN-19
Molybdenum (Mo)-Di	ssolved		<0.00005	0	mg/L		0.00005	04-JUN-19
Nickel (Ni)-Dissolved			<0.00050		mg/L		0.0005	04-JUN-19
Potassium (K)-Dissol	ved		< 0.050		mg/L		0.05	04-JUN-19
Selenium (Se)-Dissol	ved		<0.00005	0	mg/L		0.00005	04-JUN-19
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	04-JUN-19
Silver (Ag)-Dissolved			<0.00001	0	mg/L		0.00001	04-JUN-19
Sodium (Na)-Dissolve	ed		<0.050		mg/L		0.05	04-JUN-19
Strontium (Sr)-Dissol	ved		<0.00020		mg/L		0.0002	04-JUN-19
Thallium (TI)-Dissolve	ed		<0.00001	0	mg/L		0.00001	04-JUN-19
Tin (Sn)-Dissolved			<0.00010		mg/L		0.0001	04-JUN-19
Titanium (Ti)-Dissolve	ed		<0.00030		mg/L		0.0003	04-JUN-19
Uranium (U)-Dissolve	ed		<0.00001	0	mg/L		0.00001	04-JUN-19
Vanadium (V)-Dissolv	ved		<0.00050		mg/L		0.0005	04-JUN-19
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	04-JUN-19
WG3065732-4 MS		L2282430-1	404 -					
Aluminum (Al)-Dissol			101.2		%		70-130	04-JUN-19
Antimony (Sb)-Dissol			96.6		%		70-130	04-JUN-19
Arsenic (As)-Dissolve			104.6		%		70-130	04-JUN-19
Barium (Ba)-Dissolve	d		N/A	MS	S-B %		-	04-JUN-19



Workorder: L2282430 Report Date: 13-JUN-19 Page 6 of 16

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA	Water							
Batch R46559	92							
WG3065732-4 MS Bismuth (Bi)-Dissolve	, d	L2282430-1	90.3		0/		70.400	04 11111 40
` '	eu		89.3		%		70-130	04-JUN-19
Boron (B)-Dissolved	h ca al		98.4		%		70-130	04-JUN-19
Cadmium (Cd)-Disso			99.8	MO D	%		70-130	04-JUN-19
Calcium (Ca)-Dissolv			N/A	MS-B	%		=	04-JUN-19
Chromium (Cr)-Disso			97.4		%		70-130	04-JUN-19
Cobalt (Co)-Dissolve			96.2		%		70-130	04-JUN-19
Copper (Cu)-Dissolve	ed		95.4		%		70-130	04-JUN-19
Iron (Fe)-Dissolved			98.7		%		70-130	04-JUN-19
Lead (Pb)-Dissolved			96.8		%		70-130	04-JUN-19
Lithium (Li)-Dissolved			100.4		%		70-130	04-JUN-19
Magnesium (Mg)-Dis			N/A	MS-B	%		-	04-JUN-19
Manganese (Mn)-Dis			96.7		%		70-130	04-JUN-19
Molybdenum (Mo)-Di			93.2		%		70-130	04-JUN-19
Nickel (Ni)-Dissolved			99.7		%		70-130	04-JUN-19
Potassium (K)-Dissol			93.9		%		70-130	04-JUN-19
Selenium (Se)-Disso	lved		101.6		%		70-130	04-JUN-19
Silicon (Si)-Dissolved	I		94.5		%		70-130	04-JUN-19
Silver (Ag)-Dissolved			97.7		%		70-130	04-JUN-19
Sodium (Na)-Dissolve			96.2		%		70-130	04-JUN-19
Strontium (Sr)-Dissol	ved		N/A	MS-B	%		-	04-JUN-19
Thallium (TI)-Dissolve	ed		95.2		%		70-130	04-JUN-19
Tin (Sn)-Dissolved			96.1		%		70-130	04-JUN-19
Titanium (Ti)-Dissolv	ed		95.2		%		70-130	04-JUN-19
Uranium (U)-Dissolve	ed		97.1		%		70-130	04-JUN-19
Vanadium (V)-Dissol	ved		102.7		%		70-130	04-JUN-19
Zinc (Zn)-Dissolved			99.3		%		70-130	04-JUN-19
Batch R46674	51							
WG3075593-3 DUI		L2282430-3						
Aluminum (Al)-Dissol		<0.0030	<0.0030	RPD-NA	mg/L	N/A	20	13-JUN-19
Antimony (Sb)-Dissol		0.00010	0.00010		mg/L	1.0	20	13-JUN-19
Arsenic (As)-Dissolve		0.00013	0.00012		mg/L	10	20	13-JUN-19
Barium (Ba)-Dissolve	ed	0.303	0.301		mg/L	0.5	20	13-JUN-19
Bismuth (Bi)-Dissolve	ed	<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	13-JUN-19
Boron (B)-Dissolved		<0.010	<0.010	RPD-NA	mg/L	N/A	20	13-JUN-19



Workorder: L2282430 Report Date: 13-JUN-19 Page 7 of 16

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA	Water							
Batch R4667451								
WG3075593-3 DUP		L2282430-3						
Cadmium (Cd)-Dissolved		0.000126	0.000128		mg/L	1.8	20	13-JUN-19
Calcium (Ca)-Dissolved		85.9	84.9		mg/L	1.1	20	13-JUN-19
Chromium (Cr)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	13-JUN-19
Cobalt (Co)-Dissolved		0.00044	0.00041		mg/L	5.2	20	13-JUN-19
Copper (Cu)-Dissolved		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	13-JUN-19
Iron (Fe)-Dissolved		<0.010	<0.010	RPD-NA	mg/L	N/A	20	13-JUN-19
Lead (Pb)-Dissolved		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	13-JUN-19
Lithium (Li)-Dissolved		0.0075	0.0077		mg/L	2.1	20	13-JUN-19
Magnesium (Mg)-Dissolve	ed	27.8	27.2		mg/L	2.2	20	13-JUN-19
Manganese (Mn)-Dissolve	ed	0.0152	0.0151		mg/L	0.7	20	13-JUN-19
Molybdenum (Mo)-Dissolv	red	0.00167	0.00170		mg/L	1.5	20	13-JUN-19
Nickel (Ni)-Dissolved		0.00144	0.00144		mg/L	0.4	20	13-JUN-19
Potassium (K)-Dissolved		1.81	1.84		mg/L	1.5	20	13-JUN-19
Selenium (Se)-Dissolved		0.000266	0.000259		mg/L	2.9	20	13-JUN-19
Silicon (Si)-Dissolved		4.85	4.92		mg/L	1.4	20	13-JUN-19
Silver (Ag)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	13-JUN-19
Sodium (Na)-Dissolved		1.63	1.59		mg/L	2.5	20	13-JUN-19
Strontium (Sr)-Dissolved		0.0946	0.0969		mg/L	2.4	20	13-JUN-19
Thallium (TI)-Dissolved		0.000025	0.000028		mg/L	10	20	13-JUN-19
Tin (Sn)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	13-JUN-19
Titanium (Ti)-Dissolved		<0.010	<0.010	RPD-NA	mg/L	N/A	20	13-JUN-19
Uranium (U)-Dissolved		0.00125	0.00131		mg/L	4.7	20	13-JUN-19
Vanadium (V)-Dissolved		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	13-JUN-19
Zinc (Zn)-Dissolved		0.0020	0.0021		mg/L	6.1	20	13-JUN-19
WG3075593-2 LCS								
Aluminum (Al)-Dissolved			101.8		%		80-120	13-JUN-19
Antimony (Sb)-Dissolved			97.8		%		80-120	13-JUN-19
Arsenic (As)-Dissolved			100.3		%		80-120	13-JUN-19
Barium (Ba)-Dissolved			99.8		%		80-120	13-JUN-19
Bismuth (Bi)-Dissolved			91.6		%		80-120	13-JUN-19
Boron (B)-Dissolved			96.8		%		80-120	13-JUN-19
Cadmium (Cd)-Dissolved			99.9		%		80-120	13-JUN-19
Calcium (Ca)-Dissolved			96.1		%		80-120	13-JUN-19
Chromium (Cr)-Dissolved			98.3		%		80-120	13-JUN-19



Workorder: L2282430 Report Date: 13-JUN-19 Page 8 of 16

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA	Water							
Batch R466745	31							
WG3075593-2 LCS Cobalt (Co)-Dissolved			96.9		%		80-120	13-JUN-19
Copper (Cu)-Dissolve			97.2		%		80-120	13-JUN-19
Iron (Fe)-Dissolved			93.4		%		80-120	13-JUN-19
Lead (Pb)-Dissolved			93.9		%		80-120	13-JUN-19
Lithium (Li)-Dissolved			97.5		%		80-120	13-JUN-19
Magnesium (Mg)-Diss	solved		106.4		%		80-120	13-JUN-19
Manganese (Mn)-Diss	solved		100.7		%		80-120	13-JUN-19
Molybdenum (Mo)-Dis	ssolved		100.2		%		80-120	13-JUN-19
Nickel (Ni)-Dissolved			97.1		%		80-120	13-JUN-19
Potassium (K)-Dissolv	/ed		95.9		%		80-120	13-JUN-19
Selenium (Se)-Dissolv	ved .		106.0		%		80-120	13-JUN-19
Silicon (Si)-Dissolved			103.1		%		60-140	13-JUN-19
Silver (Ag)-Dissolved			95.6		%		80-120	13-JUN-19
Sodium (Na)-Dissolve	ed		99.9		%		80-120	13-JUN-19
Strontium (Sr)-Dissolv	ved		100.7		%		80-120	13-JUN-19
Thallium (TI)-Dissolve	d		89.3		%		80-120	13-JUN-19
Tin (Sn)-Dissolved			97.9		%		80-120	13-JUN-19
Titanium (Ti)-Dissolve	ed		99.1		%		80-120	13-JUN-19
Uranium (U)-Dissolve	d		95.8		%		80-120	13-JUN-19
Vanadium (V)-Dissolv	red		99.5		%		80-120	13-JUN-19
Zinc (Zn)-Dissolved			102.8		%		80-120	13-JUN-19
WG3075593-1 MB		LF						
Aluminum (AI)-Dissolv	/ed		<0.0010		mg/L		0.001	13-JUN-19
Antimony (Sb)-Dissolv	/ed		<0.00010		mg/L		0.0001	13-JUN-19
Arsenic (As)-Dissolved	d		<0.00010		mg/L		0.0001	13-JUN-19
Barium (Ba)-Dissolved	b		<0.00010		mg/L		0.0001	13-JUN-19
Bismuth (Bi)-Dissolved	d		<0.00005	0	mg/L		0.00005	13-JUN-19
Boron (B)-Dissolved			<0.010		mg/L		0.01	13-JUN-19
Cadmium (Cd)-Dissol	ved		<0.00000	5C	mg/L		0.000005	13-JUN-19
Calcium (Ca)-Dissolve	ed		< 0.050		mg/L		0.05	13-JUN-19
Chromium (Cr)-Dissol	ved		<0.00010		mg/L		0.0001	13-JUN-19
Cobalt (Co)-Dissolved	I		<0.00010		mg/L		0.0001	13-JUN-19
Copper (Cu)-Dissolve	d		<0.00020		mg/L		0.0002	13-JUN-19
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	13-JUN-19



Workorder: L2282430

Report Date: 13-JUN-19 Page 9 of 16

Test M	atrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA W	Vater							
Batch R4667451								
WG3075593-1 MB		LF						
Lead (Pb)-Dissolved			<0.00005	0	mg/L		0.00005	13-JUN-19
Lithium (Li)-Dissolved			<0.0010		mg/L		0.001	13-JUN-19
Magnesium (Mg)-Dissolved			<0.0050		mg/L		0.005	13-JUN-19
Manganese (Mn)-Dissolved			<0.00010		mg/L		0.0001	13-JUN-19
Molybdenum (Mo)-Dissolve	d		<0.00005	0	mg/L		0.00005	13-JUN-19
Nickel (Ni)-Dissolved			<0.00050		mg/L		0.0005	13-JUN-19
Potassium (K)-Dissolved			<0.050		mg/L		0.05	13-JUN-19
Selenium (Se)-Dissolved			<0.00005	0	mg/L		0.00005	13-JUN-19
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	13-JUN-19
Silver (Ag)-Dissolved			<0.00001	0	mg/L		0.00001	13-JUN-19
Sodium (Na)-Dissolved			< 0.050		mg/L		0.05	13-JUN-19
Strontium (Sr)-Dissolved			<0.00020		mg/L		0.0002	13-JUN-19
Thallium (TI)-Dissolved			<0.00001	0	mg/L		0.00001	13-JUN-19
Tin (Sn)-Dissolved			<0.00010		mg/L		0.0001	13-JUN-19
Titanium (Ti)-Dissolved			<0.00030		mg/L		0.0003	13-JUN-19
Uranium (U)-Dissolved			<0.00001	0	mg/L		0.00001	13-JUN-19
Vanadium (V)-Dissolved			<0.00050		mg/L		0.0005	13-JUN-19
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	13-JUN-19
MET-T-CCMS-VA	Vater							
Batch R4654414								
WG3065193-2 LCS			400.0		0/			
Aluminum (Al)-Total			102.9		%		80-120	03-JUN-19
Antimony (Sb)-Total			103.8		%		80-120	03-JUN-19
Arsenic (As)-Total			99.7		%		80-120	03-JUN-19
Barium (Ba)-Total			103.4		%		80-120	03-JUN-19
Bismuth (Bi)-Total			102.6		%		80-120	03-JUN-19
Boron (B)-Total			91.8		%		80-120	03-JUN-19
Cadmium (Cd)-Total			102.9		%		80-120	03-JUN-19
Calcium (Ca)-Total			97.8		%		80-120	03-JUN-19
Chromium (Cr)-Total			101.8		%		80-120	03-JUN-19
Cobalt (Co)-Total			100.5		%		80-120	03-JUN-19
Copper (Cu)-Total			100.6		%		80-120	03-JUN-19
Iron (Fe)-Total			97.7		%		80-120	03-JUN-19
Lead (Pb)-Total			100.7		%		80-120	03-JUN-19



Workorder: L2282430 Report Date: 13-JUN-19 Page 10 of 16

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-VA	Water							
Batch R4654414	1							
WG3065193-2 LCS			05.4		0.4			
Lithium (Li)-Total			95.4		%		80-120	03-JUN-19
Magnesium (Mg)-Total			107.9		%		80-120	03-JUN-19
Manganese (Mn)-Total			102.3		%		80-120	03-JUN-19
Molybdenum (Mo)-Tota	al		103.5		%		80-120	03-JUN-19
Nickel (Ni)-Total			101.7		%		80-120	03-JUN-19
Potassium (K)-Total			99.6		%		80-120	03-JUN-19
Selenium (Se)-Total			99.4		%		80-120	03-JUN-19
Silicon (Si)-Total			107.5		%		80-120	03-JUN-19
Silver (Ag)-Total			98.2		%		80-120	03-JUN-19
Sodium (Na)-Total			105.1		%		80-120	03-JUN-19
Strontium (Sr)-Total			101.6		%		80-120	03-JUN-19
Thallium (TI)-Total			101.0		%		80-120	03-JUN-19
Tin (Sn)-Total			99.8		%		80-120	03-JUN-19
Titanium (Ti)-Total			102.0		%		80-120	03-JUN-19
Uranium (U)-Total			97.7		%		80-120	03-JUN-19
Vanadium (V)-Total			103.3		%		80-120	03-JUN-19
Zinc (Zn)-Total			96.0		%		80-120	03-JUN-19
WG3065193-1 MB								
Aluminum (Al)-Total			<0.0030		mg/L		0.003	03-JUN-19
Antimony (Sb)-Total			<0.00010		mg/L		0.0001	03-JUN-19
Arsenic (As)-Total			<0.00010		mg/L		0.0001	03-JUN-19
Barium (Ba)-Total			<0.00010		mg/L		0.0001	03-JUN-19
Bismuth (Bi)-Total			< 0.00005	0	mg/L		0.00005	03-JUN-19
Boron (B)-Total			<0.010		mg/L		0.01	03-JUN-19
Cadmium (Cd)-Total			<0.00000	5C	mg/L		0.000005	03-JUN-19
Calcium (Ca)-Total			<0.050		mg/L		0.05	03-JUN-19
Chromium (Cr)-Total			<0.00010		mg/L		0.0001	03-JUN-19
Cobalt (Co)-Total			<0.00010		mg/L		0.0001	03-JUN-19
Copper (Cu)-Total			<0.00050		mg/L		0.0005	03-JUN-19
Iron (Fe)-Total			<0.010		mg/L		0.01	03-JUN-19
Lead (Pb)-Total			<0.00005	0	mg/L		0.00005	03-JUN-19
Lithium (Li)-Total			<0.0010		mg/L		0.001	03-JUN-19
Magnesium (Mg)-Total			<0.0050		mg/L		0.005	03-JUN-19
Manganese (Mn)-Total			<0.00010		mg/L		0.0001	03-JUN-19



Workorder: L2282430

Report Date: 13-JUN-19

Page 11 of 16

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-VA	Water							
Batch R4654414								
WG3065193-1 MB			0.00005		4			
Molybdenum (Mo)-Total			<0.000050	)	mg/L		0.00005	03-JUN-19
Nickel (Ni)-Total			<0.00050		mg/L		0.0005	03-JUN-19
Potassium (K)-Total			<0.050	_	mg/L		0.05	03-JUN-19
Selenium (Se)-Total			<0.000050	)	mg/L		0.00005	03-JUN-19
Silicon (Si)-Total			<0.10		mg/L		0.1	03-JUN-19
Silver (Ag)-Total			<0.000010	)	mg/L		0.00001	03-JUN-19
Sodium (Na)-Total			<0.050		mg/L		0.05	03-JUN-19
Strontium (Sr)-Total			<0.00020		mg/L		0.0002	03-JUN-19
Thallium (TI)-Total			<0.000010	)	mg/L		0.00001	03-JUN-19
Tin (Sn)-Total			<0.00010		mg/L		0.0001	03-JUN-19
Titanium (Ti)-Total			<0.00030		mg/L		0.0003	03-JUN-19
Uranium (U)-Total			<0.000010	)	mg/L		0.00001	03-JUN-19
Vanadium (V)-Total			<0.00050		mg/L		0.0005	03-JUN-19
Zinc (Zn)-Total			<0.0030		mg/L		0.003	03-JUN-19
NH3-L-F-CL	Water							
Batch R4660309								
WG3069488-14 LCS Ammonia as N			97.9		%		85-115	05-JUN-19
WG3069488-13 MB					_			
Ammonia as N			<0.0050		mg/L		0.005	05-JUN-19
NO2-L-IC-N-CL	Water							
Batch R4654463								
WG3066229-2 LCS								
Nitrite (as N)			100.7		%		90-110	31-MAY-19
WG3066229-1 MB Nitrite (as N)			<0.0010		mg/L		0.001	31-MAY-19
NO3-L-IC-N-CL	Water							
Batch R4654463 WG3066229-2 LCS								
Nitrate (as N)			100.4		%		90-110	31-MAY-19
WG3066229-1 MB Nitrate (as N)			<0.0050		mg/L		0.005	31-MAY-19
ORP-CL	Water							



Workorder: L2282430

Report Date: 13-JUN-19

Page 12 of 16

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
ORP-CL	Water							
Batch R4659791 WG3069181-9 CRM ORP		CL-ORP	225		mV		210-230	05-JUN-19
P-T-L-COL-CL	Water							
Batch R4658959 WG3067258-47 LCS Phosphorus (P)-Total			113.3		%		80-120	04-JUN-19
WG3067258-12 MB Phosphorus (P)-Total			<0.0020		mg/L		0.002	04-JUN-19
PH-CL	Water							
Batch R4661465 WG3070902-8 LCS pH			7.01		рН		6.9-7.1	06-JUN-19
PO4-DO-L-COL-CL	Water							
Batch R4653118 WG3064405-2 LCS Orthophosphate-Dissolved	d (as P)		100.6		%		80-120	31-MAY-19
WG3064405-26 LCS Orthophosphate-Dissolved	d (as P)		104.0		%		80-120	31-MAY-19
WG3064405-1 MB Orthophosphate-Dissolved	d (as P)		<0.0010		mg/L		0.001	31-MAY-19
WG3064405-25 MB Orthophosphate-Dissolved	d (as P)		<0.0010		mg/L		0.001	31-MAY-19
WG3064405-4 MS Orthophosphate-Dissolved	d (as P)	L2282430-1	96.4		%		70-130	31-MAY-19
SO4-IC-N-CL	Water							
Batch R4654463 WG3066229-2 LCS Sulfate (SO4)			101.8		%		90-110	31-MAY-19
<b>WG3066229-1 MB</b> Sulfate (SO4)			<0.30		mg/L		0.3	31-MAY-19
SOLIDS-TDS-CL	Water							
Batch R4659889 WG3067059-9 DUP Total Dissolved Solids		<b>L2282430-2</b> 209	208		mg/L	0.5	20	04-JUN-19
WG3067059-11 LCS								



Workorder: L2282430

Report Date: 13-JUN-19 Page 13 of 16

Test	Matrix	Reference	Result Qu	ualifier Units	RPD	Limit	Analyzed
SOLIDS-TDS-CL	Water						
Batch R4659889 WG3067059-11 LCS Total Dissolved Solids			95.0	%		85-115	04-JUN-19
WG3067059-8 LCS Total Dissolved Solids			95.4	%		85-115	04-JUN-19
WG3067059-10 MB Total Dissolved Solids			<10	mg/L		10	04-JUN-19
WG3067059-7 MB Total Dissolved Solids			<10	mg/L		10	04-JUN-19
TKN-L-F-CL	Water						
Batch R4659365							
WG3068573-10 LCS Total Kjeldahl Nitrogen			96.4	%		75-125	05-JUN-19
WG3068573-14 LCS Total Kjeldahl Nitrogen			94.5	%		75-125	05-JUN-19
WG3068573-17 LCS Total Kjeldahl Nitrogen			96.1	%		75-125	05-JUN-19
WG3068573-2 LCS Total Kjeldahl Nitrogen			98.1	%		75-125	05-JUN-19
WG3068573-6 LCS Total Kjeldahl Nitrogen			98.7	%		75-125	05-JUN-19
WG3068573-1 MB Total Kjeldahl Nitrogen			<0.050	mg/L		0.05	05-JUN-19
WG3068573-13 MB Total Kjeldahl Nitrogen			<0.050	mg/L		0.05	05-JUN-19
WG3068573-16 MB Total Kjeldahl Nitrogen			<0.050	mg/L		0.05	05-JUN-19
WG3068573-5 MB Total Kjeldahl Nitrogen			<0.050	mg/L		0.05	05-JUN-19
WG3068573-9 MB Total Kjeldahl Nitrogen			<0.050	mg/L		0.05	05-JUN-19
TSS-L-CL	Water			-			
Batch R4660306							
WG3068648-11 LCS Total Suspended Solids			96.0	%		85-115	05-JUN-19
WG3068648-10 MB Total Suspended Solids			<1.0	mg/L		1	05-JUN-19
TURBIDITY-CL	Water						



Workorder: L2282430

Report Date: 13-JUN-19 Page 14 of 16

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
TURBIDITY-CL	Water							
Batch R46 WG3064559-20 Turbidity	653349 LCS		95.0		%		85-115	31-MAY-19
<b>WG3064559-23</b> Turbidity	LCS		96.5		%		85-115	31-MAY-19
<b>WG3064559-19</b> Turbidity	МВ		<0.10		NTU		0.1	31-MAY-19
WG3064559-22 Turbidity	МВ		<0.10		NTU		0.1	31-MAY-19

Workorder: L2282430 Report Date: 13-JUN-19 Page 15 of 16

### Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

### **Sample Parameter Qualifier Definitions:**

Qualifier	Description
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

Workorder: L2282430 Report Date: 13-JUN-19 Page 16 of 16

#### **Hold Time Exceedances:**

	Sample						
ALS Product Description	ID	Sampling Date	Date Processed	Rec. HT	Actual HT	Units	Qualifier
Physical Tests							
Oxidation redution potential	by elect.						
	1	29-MAY-19 13:00	05-JUN-19 14:00	0.25	169	hours	EHTR-FM
	2	29-MAY-19 11:20	05-JUN-19 14:00	0.25	171	hours	EHTR-FM
	3	29-MAY-19 10:50	05-JUN-19 14:00	0.25	171	hours	EHTR-FM
рН							
	1	29-MAY-19 13:00	06-JUN-19 15:00	0.25	194	hours	EHTR-FM
	2	29-MAY-19 11:20	06-JUN-19 15:00	0.25	196	hours	EHTR-FM
	3	29-MAY-19 10:50	06-JUN-19 15:00	0.25	196	hours	EHTR-FM

### Legend & Qualifier Definitions:

EHTR-FM: Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended.

EHTR: Exceeded ALS recommended hold time prior to sample receipt.

EHTL: Exceeded ALS recommended hold time prior to analysis. Sample was received less than 24 hours prior to expiry.

EHT: Exceeded ALS recommended hold time prior to analysis.

Rec. HT: ALS recommended hold time (see units).

#### Notes\*:

Where actual sampling date is not provided to ALS, the date (& time) of receipt is used for calculation purposes. Where actual sampling time is not provided to ALS, the earlier of 12 noon on the sampling date or the time (& date) of receipt is used for calculation purposes. Samples for L2282430 were received on 30-MAY-19 09:15.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against predetermined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

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LC_PIZDC1307_WG_Q2-2019_NP	LC_PIZDC1307	WG	2019/0	5/29 11:20	G	6	1	1	1	1	1	1						
LC_PIZDC1308_WG_Q2-2019_NP	LC_PIZDC1308		2019/0	5/29 10:50	G	6	1	1	1	1	1	1						
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Page

1 of



TECK COAL LIMITED (LINE CREEK)

ATTN: Chris Blurton

PO BOX 2003

SPARWOOD BC VOB 2G0

Date Received: 07-JUN-19

Report Date: 17-JUN-19 11:37 (MT)

Version: FINAL

Client Phone: 250-425-6111

# Certificate of Analysis

Lab Work Order #: L2287498
Project P.O. #: VP000608129

Job Reference: LINE CREEK OPERATION
C of C Numbers: 20190605 PIZDC0901

Legal Site Desc:



Lyudmyla Shvets, B.Sc. Account Manager

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L2287498 CONTD.... PAGE 2 of 7 Version: FINAL

### ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2287498-1 LC_PIZDC0901_WG_Q2-2019_NP							
Sampled By: KC/DT on 05-JUN-19 @ 11:30							
Matrix: WG Miscellaneous Parameters							
	0.00		0.50	a/I		12 11 11 10	D 4070000
Dissolved Organic Carbon	2.60		0.50	mg/L		13-JUN-19	R4670030
Total Kjeldahl Nitrogen	0.242		0.050	mg/L		16-JUN-19	R4671467
Total Organic Carbon	3.66		0.50	mg/L		13-JUN-19	R4670030
Dissolved Metals in Water							
Diss. Be (low) in Water by CRC ICPMS				"	00 11 11 10	00 11111 40	
Beryllium (Be)-Dissolved	<0.020		0.020	ug/L	09-JUN-19	09-JUN-19	R4662987
Dissolved Metals Filtration Location	LAB					09-JUN-19	R4662133
Diss. Mercury in Water by CVAAS or CVAFS	0.0000050		0000050	a/I	11-JUN-19	11-JUN-19	D 4000000
Mercury (Hg)-Dissolved	<0.0000050		0.0000050	mg/L	11-JUN-19		R4663363
Dissolved Mercury Filtration Location	LAB					11-JUN-19	R4663219
Dissolved Metals in Water by CRC ICPMS Dissolved Metals Filtration Location	LAB					09-JUN-19	R4662133
Aluminum (Al)-Dissolved	<0.0030		0.0030	mg/L	09-JUN-19	09-JUN-19	R4662987
Antimony (Sb)-Dissolved	0.00017		0.00010	mg/L	09-JUN-19	09-JUN-19	R4662987
Arsenic (As)-Dissolved	0.00030		0.00010	mg/L	09-JUN-19	09-JUN-19	R4662987
Barium (Ba)-Dissolved	0.178		0.00010	mg/L	09-JUN-19	09-JUN-19	R4662987
Bismuth (Bi)-Dissolved	<0.000050		0.000050	mg/L	09-JUN-19	09-JUN-19	R4662987
Boron (B)-Dissolved	<0.010		0.010	mg/L	09-JUN-19	09-JUN-19	R4662987
Cadmium (Cd)-Dissolved	0.108		0.0050	ug/L	09-JUN-19	09-JUN-19	R4662987
Calcium (Ca)-Dissolved	103		0.050	mg/L	09-JUN-19	09-JUN-19	R4662987
Chromium (Cr)-Dissolved	<0.00010		0.00010	mg/L	09-JUN-19	09-JUN-19	R4662987
Cobalt (Co)-Dissolved	<0.10		0.10	ug/L	09-JUN-19	09-JUN-19	R4662987
Copper (Cu)-Dissolved	0.00857		0.00050	mg/L	09-JUN-19	09-JUN-19	R4662987
Iron (Fe)-Dissolved	<0.010		0.010	mg/L	09-JUN-19	09-JUN-19	R4662987
Lead (Pb)-Dissolved	0.000458		0.000050	mg/L	09-JUN-19	09-JUN-19	R4662987
Lithium (Li)-Dissolved	0.0023		0.0010	mg/L	09-JUN-19	09-JUN-19	R4662987
Magnesium (Mg)-Dissolved	27.7		0.10	mg/L	09-JUN-19	09-JUN-19	R4662987
Manganese (Mn)-Dissolved	0.00057		0.00010	mg/L	09-JUN-19	09-JUN-19	R4662987
Molybdenum (Mo)-Dissolved	0.000630		0.000050	mg/L	09-JUN-19	09-JUN-19	R4662987
Nickel (Ni)-Dissolved	0.00085		0.00050	mg/L	09-JUN-19	09-JUN-19	R4662987
Potassium (K)-Dissolved	1.38		0.050	mg/L	09-JUN-19	09-JUN-19	R4662987
Selenium (Se)-Dissolved	1.01		0.050	ug/L	09-JUN-19	09-JUN-19	R4662987
Silicon (Si)-Dissolved	5.68		0.050	mg/L	09-JUN-19	09-JUN-19	R4662987
Silver (Ag)-Dissolved	<0.000010		0.000010	mg/L	09-JUN-19	09-JUN-19	R4662987
Sodium (Na)-Dissolved	4.43		0.050	mg/L	09-JUN-19	09-JUN-19	R4662987
Strontium (Sr)-Dissolved	0.251		0.00020	mg/L	09-JUN-19	09-JUN-19	R4662987
Thallium (TI)-Dissolved	<0.000010		0.000010	mg/L	09-JUN-19	09-JUN-19	R4662987
Tin (Sn)-Dissolved	<0.00010		0.00010	mg/L	09-JUN-19	09-JUN-19	R4662987
Titanium (Ti)-Dissolved	<0.010		0.010	mg/L	09-JUN-19	09-JUN-19	R4662987
Uranium (U)-Dissolved	0.00323		0.000010	mg/L	09-JUN-19	09-JUN-19	R4662987
Vanadium (V)-Dissolved	0.00083		0.00050	mg/L	09-JUN-19	09-JUN-19	R4662987
Zinc (Zn)-Dissolved	0.0184		0.0010	mg/L	09-JUN-19	09-JUN-19	R4662987
Total Metals in Water				•			
Hardness							
Hardness (as CaCO3)	372		0.50	mg/L		11-JUN-19	
Total Be (Low) in Water by CRC ICPMS							
Beryllium (Be)-Total	<0.020		0.020	ug/L		11-JUN-19	R4663601
Total Metals in Water by CRC ICPMS							
Aluminum (Al)-Total	0.308		0.0030	mg/L		11-JUN-19	R4663601
Antimony (Sb)-Total	0.00029		0.00010	mg/L		11-JUN-19	R4663601
Arsenic (As)-Total	0.00052		0.00010	mg/L		11-JUN-19	R4663601

<sup>\*</sup> Refer to Referenced Information for Qualifiers (if any) and Methodology.

L2287498 CONTD.... PAGE 3 of 7 Version: FINAL

### ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier* I	D.L.	Units	Extracted	Analyzed	Batch
L2287498-1 LC PIZDC0901 WG Q2-2019 NP							
Sampled By: KC/DT on 05-JUN-19 @ 11:30							
Matrix: WG							
Total Metals in Water by CRC ICPMS Barium (Ba)-Total	0.217	0	.00010	mg/L		11-JUN-19	R4663601
Bismuth (Bi)-Total	<0.00050		000050	mg/L		11-JUN-19	R4663601
Boron (B)-Total	<0.010		0.010	mg/L		11-JUN-19	R4663601
Cadmium (Cd)-Total	0.361		.0050	ug/L		11-JUN-19	R4663601
Calcium (Ca)-Total	108		0.050	mg/L		11-JUN-19	R4663601
Chromium (Cr)-Total	0.00073	0.	.00010	mg/L		11-JUN-19	R4663601
Cobalt (Co)-Total	0.81		0.10	ug/L		11-JUN-19	R4663601
Copper (Cu)-Total	0.00964	0.	.00050	mg/L		11-JUN-19	R4663601
Iron (Fe)-Total	0.357		0.010	mg/L		11-JUN-19	R4663601
Lead (Pb)-Total	0.00129	0.0	000050	mg/L		11-JUN-19	R4663601
Lithium (Li)-Total	0.0024	0	.0010	mg/L		11-JUN-19	R4663601
Magnesium (Mg)-Total	30.2		0.10	mg/L		11-JUN-19	R4663601
Manganese (Mn)-Total	0.0948	0.	.00010	mg/L		11-JUN-19	R4663601
Molybdenum (Mo)-Total	0.000640		000050	mg/L		11-JUN-19	R4663601
Nickel (Ni)-Total	0.00245		.00050	mg/L		11-JUN-19	R4663601
Potassium (K)-Total	1.37		0.050	mg/L		11-JUN-19	R4663601
Selenium (Se)-Total	0.947		0.050	ug/L		11-JUN-19	R4663601
Silicon (Si)-Total	6.18		0.10	mg/L		11-JUN-19	R4663601
Silver (Ag)-Total	0.000016		000010	mg/L		11-JUN-19	R4663601
Sodium (Na)-Total	4.67		0.050	mg/L		11-JUN-19	R4663601
Strontium (Sr)-Total	0.286		.00020	mg/L		11-JUN-19	R4663601
Thallium (TI)-Total	0.000020		000010	mg/L		11-JUN-19	R4663601
Tin (Sn)-Total Titanium (Ti)-Total	<0.00010		.00010	mg/L		11-JUN-19	R4663601
Uranium (U)-Total	0.011		0.010	mg/L		11-JUN-19 11-JUN-19	R4663601
Vanadium (V)-Total	0.00320 0.00245		.00050	mg/L mg/L		11-JUN-19 11-JUN-19	R4663601 R4663601
Zinc (Zn)-Total	0.00245		.0030	mg/L		11-JUN-19	R4663601
Routine for Teck Coal	0.0239		.0030	mg/L		11-3011-19	K4003001
Acidity by Automatic Titration							
Acidity (as CaCO3)	5.2		1.0	mg/L		13-JUN-19	R4670146
Alkalinity (Species) by Manual Titration	0.0			3			
Alkalinity, Bicarbonate (as CaCO3)	356		1.0	mg/L		13-JUN-19	R4670171
Alkalinity, Carbonate (as CaCO3)	14.4		1.0	mg/L		13-JUN-19	R4670171
Alkalinity, Hydroxide (as CaCO3)	<1.0		1.0	mg/L		13-JUN-19	R4670171
Alkalinity, Total (as CaCO3)	370		1.0	mg/L		13-JUN-19	R4670171
Ammonia, Total (as N)							
Ammonia as N	0.0097	0	.0050	mg/L		13-JUN-19	R4670451
Bromide in Water by IC (Low Level)							
Bromide (Br)	<0.050		0.050	mg/L		07-JUN-19	R4663920
Chloride in Water by IC						07 11 11 15	B. 1005
Chloride (CI)	0.69		0.50	mg/L		07-JUN-19	R4663920
Electrical Conductivity (EC)	670		2.0	uS/cm		12 11 11 10	D4670474
Conductivity (@ 25C)	672		2.0	u3/CIII		13-JUN-19	R4670171
Fluoride in Water by IC Fluoride (F)	0.107		0.020	mg/L		07-JUN-19	R4663920
lon Balance Calculation	0.107		5.020	mg/L		01-301 <b>1-</b> 13	114003820
Ion Balance Calculation	97.0		-100	%		14-JUN-19	
Ion Balance Calculation	37.0		.00	,0		5511 15	
Cation - Anion Balance	-1.5			%		14-JUN-19	
Anion Sum	7.89			meg/L		14-JUN-19	
Cation Sum	7.66			meq/L		14-JUN-19	
Nitrate in Water by IC (Low Level)				r			
ato in trator by to (Eon Eorol)	l						

<sup>\*</sup> Refer to Referenced Information for Qualifiers (if any) and Methodology.

L2287498 CONTD.... PAGE 4 of 7 Version: FINAL

### ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2287498-1 LC_PIZDC0901_WG_Q2-2019_NP							
Sampled By: KC/DT on 05-JUN-19 @ 11:30  Matrix: WG							
Nitrate in Water by IC (Low Level)							
Nitrate (as N)  Nitrite in Water by IC (Low Level)	0.644		0.0050	mg/L		07-JUN-19	R4663920
Nitrite (as N)	<0.0010		0.0010	mg/L		07-JUN-19	R4663920
Orthophosphate-Dissolved (as P) Orthophosphate-Dissolved (as P)	0.0169		0.0010	mg/L		08-JUN-19	R4661969
Oxidation redution potential by elect. ORP	340		-1000	mV		12-JUN-19	R4667329
Phosphorus (P)-Total Phosphorus (P)-Total	0.041	DLM	0.020	mg/L		12-JUN-19	R4666206
Sulfate in Water by IC		DEW		-			
Sulfate (SO4)  Total Dissolved Solids	20.3		0.30	mg/L		07-JUN-19	R4663920
Total Dissolved Solids  Total Suspended Solids	388	DLHC	20	mg/L		11-JUN-19	R4667930
Total Suspended Solids	12.0		1.0	mg/L		11-JUN-19	R4665072
Turbidity Turbidity	12.9		0.10	NTU		08-JUN-19	R4662406
<b>pH</b> pH	8.37		0.10	рН		13-JUN-19	R4670171

<sup>\*</sup> Refer to Referenced Information for Qualifiers (if any) and Methodology.

LINE CREEK OPERATION

L2287498 CONTD....

PAGE 5 of 7

Forence Information Version: FINAL

### **Reference Information**

**Qualifiers for Individual Samples Listed:** 

Lab Sample ID	Client Sample ID	Qualifier	Description
L2287498-1	LC_PIZDC0901_WG_Q2-2019	SFPL	DOC/DIS METALS LAB FILTER/PRESERVE - Sample was Filtered and Preserved at the laboratory

Sample Parameter Qualifier Key:

Qualifier	Description
DLHC	Detection Limit Raised: Dilution required due to high concentration of test analyte(s).
DLM	Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.

**Test Method References:** 

ALS Test Code	Matrix	Test Description	Method Reference**
ACIDITY-PCT-CL	Water	Acidity by Automatic Titration	APHA 2310 Acidity

This analysis is carried out using procedures adapted from APHA Method 2310 "Acidity". Acidity is determined by potentiometric titration to a specified endpoint.

ALK-MAN-CL Water Alkalinity (Species) by Manual Titration APHA 2320 ALKALINITY

This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.

BE-D-L-CCMS-VA Water Diss. Be (low) in Water by CRC ICPMS APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

BE-T-L-CCMS-VA Water Total Be (Low) in Water by CRC ICPMS EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

BR-L-IC-N-CL Water Bromide in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

C-DIS-ORG-LOW-CL Water Dissolved Organic Carbon APHA 5310 B-Instrumental

This method is applicable to the analysis of ground water, wastewater, and surface water samples. The form detected depends upon sample pretreatment: Unfiltered sample = TC, 0.45um filtered = TDC. Samples are injected into a combustion tube containing an oxidation catalyst. The carrier gas containing the combustion product from the combustion tube flows through an inorganic carbon reactor vessel and is then sent through a halogen scrubber into a sample cell set in a non-dispersive infrared gas analyzer (NDIR) where carbon dioxide is detected. For total inorganic carbon and dissolved inorganic carbon, the sample is injected into an IC reactor vessel where only the IC component is decomposed to become carbon dioxide.

The peak area generated by the NDIR indicates the TC/TDC or TIC/DIC as applicable. The total organic carbon content of the sample is calculated by subtracting the TIC from the TC.

TOC = TC-TIC, DOC = TDC-DIC, Particulate = Total - Dissolved.

C-TOT-ORG-LOW-CL Water Total Organic Carbon APHA 5310 TOTAL ORGANIC CARBON (TOC)

This method is applicable to the analysis of ground water, wastewater, and surface water samples. The form detected depends upon sample pretreatment: Unfiltered sample = TC, 0.45um filtered = TDC. Samples are injected into a combustion tube containing an oxidation catalyst. The carrier gas containing the combustion product from the combustion tube flows through an inorganic carbon reactor vessel and is then sent through a halogen scrubber into a sample cell set in a non-dispersive infrared gas analyzer (NDIR) where carbon dioxide is detected. For total inorganic carbon and dissolved inorganic carbon, the sample is injected into an IC reactor vessel where only the IC component is decomposed to become carbon dioxide.

The peak area generated by the NDIR indicates the TC/TDC or TIC/DIC as applicable. The total organic carbon content of the sample is calculated by subtracting the TIC from the TC.

TOC = TC-TIC, DOC = TDC-DIC, Particulate = Total - Dissolved.

CL-IC-N-CL Water Chloride in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

EC-L-PCT-CL Water Electrical Conductivity (EC) APHA 2510B

Conductivity, also known as Electrical Conductivity (EC) or Specific Conductance, is measured by immersion of a conductivity cell with platinum electrodes into a water sample. Conductivity measurements are temperature-compensated to 25C.

F-IC-N-CL Water Fluoride in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

HARDNESS-CALC-VA Water Hardness APHA 2340B

LINE CREEK OPERATION

HG-D-CVAA-VA

L2287498 CONTD....

PAGE 6 of 7 Version: FINAL

### **Reference Information**

**Test Method References:** 

**ALS Test Code** Matrix Method Reference\*\* **Test Description** 

Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO3 equivalents,

Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

Water samples are filtered (0.45 um), preserved with hydrochloric acid, then undergo a cold-oxidation using bromine monochloride prior to reduction

Diss. Mercury in Water by CVAAS or CVAFS APHA 3030B/EPA 1631E (mod)

with stannous chloride, and analyzed by CVAAS or CVAFS.

IONBALANCE-BC-CL Ion Balance Calculation **APHA 1030E** Water

Cation Sum, Anion Sum, and Ion Balance (as % difference) are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Because all aqueous solutions are electrically neutral, the calculated ion balance (% difference of cations minus anions) should be near-zero.

Cation and Anion Sums are the total meg/L concentration of major cations and anions. Dissolved species are used where available. Minor ions are included where data is present. Ion Balance is calculated as:

Ion Balance (%) = [Cation Sum-Anion Sum] / [Cation Sum+Anion Sum]

Water

MET-D-CCMS-VA Dissolved Metals in Water by CRC ICPMS APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

MET-T-CCMS-VA Water Total Metals in Water by CRC ICPMS EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

NH3-L-F-CL Water Ammonia, Total (as N) J. ENVIRON. MONIT., 2005, 7, 37-42, RSC

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et

NO2-L-IC-N-CL Water Nitrite in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

NO3-L-IC-N-CL Nitrate in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

ORP-CL Water **ASTM D1498** Oxidation redution potential by elect.

This analysis is carried out in accordance with the procedure described in the "ASTM" method D1498 "Oxidation-Reduction Potential of Water" published by the American Society for Testing and Materials (ASTM). Results are reported as observed oxidation-reduction potential of the platinum metal-reference electrode employed, in mV.

It is recommended that this analysis be conducted in the field.

P-T-L-COL-CL Phosphorus (P)-Total APHA 4500-P PHOSPHORUS Water

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after persulphate digestion of the sample.

APHA 4500 H-Electrode PH-CI Water Ha

pH is determined in the laboratory using a pH electrode. All samples analyzed by this method for pH will have exceeded the 15 minute recommended hold time from time of sampling (field analysis is recommended for pH where highly accurate results are needed)

PO4-DO-L-COL-CL Water Orthophosphate-Dissolved (as P) APHA 4500-P PHOSPHORUS

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.

SO4-IC-N-CL Sulfate in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

SOLIDS-TDS-CL Water **Total Dissolved Solids** APHA 2540 C

A well-mixed sample is filtered through a glass fibre filter paper. The filtrate is then evaporated to dryness in a pre-weighed vial and dried at 180 – 2 °C. The increase in vial weight represents the total dissolved solids (TDS).

TECKCOAL-IONBAL-CL Ion Balance Calculation **APHA 1030E**  LINE CREEK OPERATION L2287498 CONTD....

### **Reference Information**

PAGE 7 of 7 Version: FINAL

#### **Test Method References:**

ALS Test Code Matrix Test Description Method Reference\*\*

Cation Sum, Anion Sum, and Ion Balance (as % difference) are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Because all aqueous solutions are electrically neutral, the calculated ion balance (% difference of cations minus anions) should be near-zero.

Cation and Anion Sums are the total meq/L concentration of major cations and anions. Dissolved species are used where available. Minor ions are included where data is present. Ion Balance is calculated as:

Ion Balance (%) = [Cation Sum-Anion Sum] / [Cation Sum+Anion Sum]

TKN-L-F-CL Water Total Kjeldahl Nitrogen APHA 4500-NORG (TKN)

This analysis is carried out using procedures adapted from APHA Method 4500-Norg D. "Block Digestion and Flow Injection Analysis". Total Kjeldahl Nitrogen is determined using block digestion followed by Flow-injection analysis with fluorescence detection.

TSS-L-CL Water Total Suspended Solids APHA 2540 D-Gravimetric

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total suspended solids (TSS) are determined by filtering a sample through a glass fibre filter, and by drying the filter at 104 deg. C.

TURBIDITY-CL Water Turbidity APHA 2130 B-Nephelometer

This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.

\*\* ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

<b>Laboratory Definition Code</b>	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA
CL	ALS ENVIRONMENTAL - CALGARY, ALBERTA, CANADA

#### **Chain of Custody Numbers:**

20190605 PIZDC0901

#### **GLOSSARY OF REPORT TERMS**

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.

mg/kg - milligrams per kilogram based on dry weight of sample

mg/kg wwt - milligrams per kilogram based on wet weight of sample

mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight

mg/L - unit of concentration based on volume, parts per million.

< - Less than.

D.L. - The reporting limit.

N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory. UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.



Workorder: L2287498

Report Date: 17-JUN-19

Page 1 of 11

Client:

TECK COAL LIMITED (LINE CREEK)

PO BOX 2003

SPARWOOD BC V0B 2G0

Contact: Chris Blurton

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
ACIDITY-PCT-CL	Water							
Batch R4670146								
WG3077278-8 LCS Acidity (as CaCO3)			98.6		%		85-115	13-JUN-19
WG3077278-7 MB Acidity (as CaCO3)			<1.0		mg/L		2	13-JUN-19
ALK-MAN-CL	Water							
Batch R4670171 WG3077251-5 LCS Alkalinity, Total (as CaCo	O3)		101.8		%		85-115	13-JUN-19
WG3077251-4 MB Alkalinity, Total (as CaCo	O3)		<1.0		mg/L		1	13-JUN-19
BE-D-L-CCMS-VA	Water							
Batch R4662987								
WG3071987-2 LCS Beryllium (Be)-Dissolved			98.6		%		80-120	09-JUN-19
WG3071987-1 MB Beryllium (Be)-Dissolved		LF	<0.000020	)	mg/L		0.00002	09-JUN-19
BE-T-L-CCMS-VA	Water							
Batch R4663601								
WG3072892-2 LCS Beryllium (Be)-Total			101.6		%		80-120	11-JUN-19
WG3072892-1 MB Beryllium (Be)-Total			<0.000020	)	mg/L		0.00002	11-JUN-19
BR-L-IC-N-CL	Water							
Batch R4663920								
WG3074230-14 LCS Bromide (Br)			103.8		%		85-115	07-JUN-19
WG3074230-13 MB Bromide (Br)			<0.050		mg/L		0.05	07-JUN-19
C-DIS-ORG-LOW-CL	Water							
Batch R4670030								
WG3077463-3 DUP Dissolved Organic Carbo	on	<b>L2287498-1</b> 2.60	2.57		mg/L	0.9	20	13-JUN-19
WG3077463-2 LCS Dissolved Organic Carbo	on		94.8		%		80-120	13-JUN-19
WG3077463-1 MB Dissolved Organic Carbo	on		<0.50		mg/L		0.5	13-JUN-19
C-TOT-ORG-LOW-CL	Water							



Workorder: L2287498

Report Date: 17-JUN-19 Page 2 of 11

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
C-TOT-ORG-LOW-CL	Water							
Batch R4670030 WG3077463-3 DUP		L2287498-1						
Total Organic Carbon		3.66	3.89		mg/L	6.2	20	13-JUN-19
WG3077463-2 LCS Total Organic Carbon			98.1		%		80-120	13-JUN-19
WG3077463-1 MB Total Organic Carbon			<0.50		mg/L		0.5	13-JUN-19
CL-IC-N-CL	Water							
Batch R4663920 WG3074230-14 LCS Chloride (CI)			102.7		%		00.440	07 1111 40
WG3074230-13 MB			102.7		70		90-110	07-JUN-19
Chloride (CI)			<0.50		mg/L		0.5	07-JUN-19
EC-L-PCT-CL	Water							
Batch R4670171 WG3077251-5 LCS			102.2		%		00.440	40 1111 40
Conductivity (@ 25C)  WG3077251-4 MB			102.2		70		90-110	13-JUN-19
Conductivity (@ 25C)			<2.0		uS/cm		2	13-JUN-19
F-IC-N-CL	Water							
Batch R4663920 WG3074230-14 LCS								
Fluoride (F)			105.1		%		90-110	07-JUN-19
<b>WG3074230-13 MB</b> Fluoride (F)			<0.020		mg/L		0.02	07-JUN-19
HG-D-CVAA-VA	Water							
Batch R4663363								
WG3073328-2 LCS Mercury (Hg)-Dissolved			97.9		%		80-120	11-JUN-19
WG3073328-1 MB Mercury (Hg)-Dissolved			<0.00000	5C	mg/L		0.000005	11-JUN-19
MET-D-CCMS-VA	Water							
Batch R4662987 WG3071987-2 LCS								
Aluminum (Al)-Dissolved			107.0		%		80-120	09-JUN-19
Antimony (Sb)-Dissolved			99.7		%		80-120	09-JUN-19
Arsenic (As)-Dissolved			101.2		%		80-120	09-JUN-19
Barium (Ba)-Dissolved			104.4		%		80-120	09-JUN-19



Workorder: L2287498 Report Date: 17-JUN-19 Page 3 of 11

Test Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA Water							
Batch R4662987							
WG3071987-2 LCS							
Bismuth (Bi)-Dissolved		97.7		%		80-120	09-JUN-19
Boron (B)-Dissolved		93.8		%		80-120	09-JUN-19
Cadmium (Cd)-Dissolved		104.0		%		80-120	09-JUN-19
Calcium (Ca)-Dissolved		103.8		%		80-120	09-JUN-19
Chromium (Cr)-Dissolved		103.1		%		80-120	09-JUN-19
Cobalt (Co)-Dissolved		102.9		%		80-120	09-JUN-19
Copper (Cu)-Dissolved		100.9		%		80-120	09-JUN-19
Iron (Fe)-Dissolved		105.9		%		80-120	09-JUN-19
Lead (Pb)-Dissolved		99.5		%		80-120	09-JUN-19
Lithium (Li)-Dissolved		100.8		%		80-120	09-JUN-19
Magnesium (Mg)-Dissolved		102.0		%		80-120	09-JUN-19
Manganese (Mn)-Dissolved		101.7		%		80-120	09-JUN-19
Molybdenum (Mo)-Dissolved		101.2		%		80-120	09-JUN-19
Nickel (Ni)-Dissolved		102.3		%		80-120	09-JUN-19
Potassium (K)-Dissolved		108.9		%		80-120	09-JUN-19
Selenium (Se)-Dissolved		101.8		%		80-120	09-JUN-19
Silicon (Si)-Dissolved		108.4		%		60-140	09-JUN-19
Silver (Ag)-Dissolved		98.7		%		80-120	09-JUN-19
Sodium (Na)-Dissolved		105.5		%		80-120	09-JUN-19
Strontium (Sr)-Dissolved		99.0		%		80-120	09-JUN-19
Thallium (TI)-Dissolved		97.5		%		80-120	09-JUN-19
Tin (Sn)-Dissolved		100.2		%		80-120	09-JUN-19
Titanium (Ti)-Dissolved		102.9		%		80-120	09-JUN-19
Uranium (U)-Dissolved		99.0		%		80-120	09-JUN-19
Vanadium (V)-Dissolved		105.0		%		80-120	09-JUN-19
Zinc (Zn)-Dissolved		102.2		%		80-120	09-JUN-19
WG3071987-1 MB	LF						
Aluminum (Al)-Dissolved		<0.0010		mg/L		0.001	09-JUN-19
Antimony (Sb)-Dissolved		<0.00010		mg/L		0.0001	09-JUN-19
Arsenic (As)-Dissolved		<0.00010		mg/L		0.0001	09-JUN-19
Barium (Ba)-Dissolved		<0.00010		mg/L		0.0001	09-JUN-19
Bismuth (Bi)-Dissolved		<0.000050	)	mg/L		0.00005	09-JUN-19
Boron (B)-Dissolved		<0.010		mg/L		0.01	09-JUN-19
Cadmium (Cd)-Dissolved		<0.000005	5C	mg/L		0.000005	09-JUN-19



Workorder: L2287498

Report Date: 17-JUN-19

Page 4 of 11

Chromium (Cr)-Dissolved         <0.00010         mg/L         0.0001         09-JUN           Cobalt (Co)-Dissolved         <0.00010         mg/L         0.0001         09-JUN           Copper (Cu)-Dissolved         <0.00020         mg/L         0.001         09-JUN           Iron (Fe)-Dissolved         <0.00050         mg/L         0.0005         09-JUN           Lead (Pb)-Dissolved         <0.0010         mg/L         0.001         09-JUN           Magnesium (Mg)-Dissolved         <0.0050         mg/L         0.005         09-JUN           Mangnesium (Mg)-Dissolved         <0.0050         mg/L         0.0001         09-JUN           Molybdenum (Mo)-Dissolved         <0.000050         mg/L         0.0001         09-JUN           Nickel (Ni)-Dissolved         <0.00050         mg/L         0.0005         09-JUN           Potassium (K)-Dissolved         <0.0050         mg/L         0.05         09-JUN           Selenium (Se)-Dissolved         <0.000050         mg/L         0.05         09-JUN           Silier (Ag)-Dissolved         <0.000010         mg/L         0.000         09-JUN           Solium (Na)-Dissolved         <0.00001         mg/L         0.0001         09-JUN           Strontium (Sr)-Di	Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
Calcium (Ca)-Dissolved	MET-D-CCMS-VA	Water							
Calcium (Ca)-Dissolved         <0.050	Batch R46629	987							
Chromium (Cr)-Dissolved			LF			_			
Cobalt (Co)-Dissolved	` ,					•			09-JUN-19
Copper (Cu)-Dissolved	` ,					•		0.0001	09-JUN-19
Iron (Fe)-Dissolved						<u>-</u>			09-JUN-19
Lead (Pb)-Dissolved	Copper (Cu)-Dissolv	red .				•		0.0002	09-JUN-19
Lithium (Li)-Dissolved	` ,					•		0.01	09-JUN-19
Magnesium (Mg)-Dissolved         <0.0050				<0.00005	0	•		0.00005	09-JUN-19
Manganese (Mn)-Dissolved         <0.00010	Lithium (Li)-Dissolve	ed		<0.0010		mg/L		0.001	09-JUN-19
Molybdenum (Mo)-Dissolved         <0.000050	Magnesium (Mg)-Dis	ssolved		<0.0050		mg/L		0.005	09-JUN-19
Nickel (Ni)-Dissolved	Manganese (Mn)-Dis	ssolved		<0.00010		mg/L		0.0001	09-JUN-19
Potassium (K)-Dissolved	Molybdenum (Mo)-D	oissolved		<0.00005	0	mg/L		0.00005	09-JUN-19
Selenium (Se)-Dissolved         <0.000050	Nickel (Ni)-Dissolved	d		<0.00050		mg/L		0.0005	09-JUN-19
Silicon (Si)-Dissolved       <0.050	Potassium (K)-Disso	olved		<0.050		mg/L		0.05	09-JUN-19
Silver (Ag)-Dissolved       <0.000010	Selenium (Se)-Disso	olved		< 0.00005	0	mg/L		0.00005	09-JUN-19
Sodium (Na)-Dissolved         <0.050	Silicon (Si)-Dissolve	d		< 0.050		mg/L		0.05	09-JUN-19
Strontium (Sr)-Dissolved       <0.00020	Silver (Ag)-Dissolved	d		<0.00001	0	mg/L		0.00001	09-JUN-19
Thallium (Tl)-Dissolved       <0.000010	Sodium (Na)-Dissolv	/ed		< 0.050		mg/L		0.05	09-JUN-19
Tin (Sn)-Dissolved <0.00010 mg/L 0.0001 09-JUN-Titanium (Ti)-Dissolved <0.00030 mg/L 0.0003 09-JUN-Uranium (U)-Dissolved <0.000010 mg/L 0.00001 09-JUN-Uranium (V)-Dissolved <0.00050 mg/L 0.0005 09-JUN-Uranium (V)-Dissolved <0.00050 mg/L 0.0005 09-JUN-Uranium (V)-Dissolved <0.0010 mg/L 0.001 09-JUN-Uranium (V)-Dissolved <0.0010 mg/L 0.001 09-JUN-Uranium (V)-Dissolved <0.0010 mg/L 0.001 09-JUN-Uranium (V)-Dissolved <0.0010 mg/L 0.001 09-JUN-Uranium (V)-Dissolved <0.0010 mg/L 0.001 09-JUN-Uranium (V)-Dissolved <0.0010 mg/L 0.001 09-JUN-Uranium (V)-Dissolved <0.0010 mg/L 0.001 09-JUN-Uranium (V)-Dissolved <0.0010 mg/L 0.001 09-JUN-Uranium (V)-Dissolved <0.0010 mg/L 0.0005 09-JUN-Uranium (V)-Dissolved <0.0010 mg/L 0.0005 09-JUN-Uranium (V)-Dissolved <0.0010 mg/L 0.0005 09-JUN-Uranium (V)-Dissolved <0.0010 mg/L 0.0005 09-JUN-Uranium (V)-Dissolved <0.0010 mg/L 0.0005 09-JUN-Uranium (V)-Dissolved <0.0010 mg/L 0.0005 09-JUN-Uranium (V)-Dissolved <0.0010 mg/L 0.0005 09-JUN-Uranium (V)-Dissolved <0.0010 mg/L 0.0005 09-JUN-Uranium (V)-Dissolved <0.0010 mg/L 0.0005 09-JUN-Uranium (V)-Dissolved <0.00050 mg/L 0.0005 09-JUN-Uranium (V)-Dissolved <0.00050 mg/L 0.0005 09-JUN-Uranium (V)-Dissolved <0.00050 mg/L 0.0005 09-JUN-Uranium (V)-Dissolved <0.00050 mg/L 0.0005 09-JUN-Uranium (V)-Dissolved <0.00050 mg/L 0.0005 09-JUN-Uranium (V)-Dissolved <0.00050 mg/L 0.0005 09-JUN-Uranium (V)-Dissolved <0.00050 mg/L 0.0005 09-JUN-Uranium (V)-Dissolved <0.00050 mg/L 0.0005 09-JUN-Uranium (V)-Dissolved <0.00050 mg/L 0.0005 09-JUN-Uranium (V)-Dissolved <0.00050 mg/L 0.0005 09-JUN-Uranium (V)-Dissolved <0.00050 mg/L 0.0005 09-JUN-Uranium (V)-Dissolved <0.00050 mg/L 0.0005 09-JUN-Uranium (V)-Dissolved <0.00050 mg/L 0.0005 09-JUN-Uranium (V)-Dissolved <0.00050 mg/L 0.0005 09-JUN-Uranium (V)-Dissolved <0.00050 mg/L 0.0005 09-JUN-Uranium (V)-Dissolved <0.00050 mg/L 0.0005 09-JUN-Uranium (V)-Dissolved <0.00050 mg/L 0.0005 09-JUN-Uranium (V)-Dissolved <0.00050 mg/L 0.0005 09-JUN-Uranium (V)-Dissolved <0.00050 mg/L 0.0005 09-JUN-Uranium (V)-Dissolve	Strontium (Sr)-Disso	olved		<0.00020		mg/L		0.0002	09-JUN-19
Titanium (Ti)-Dissolved       <0.00030	Thallium (TI)-Dissolv	/ed		<0.00001	0	mg/L		0.00001	09-JUN-19
Uranium (U)-Dissolved       <0.000010	Tin (Sn)-Dissolved			<0.00010		mg/L		0.0001	09-JUN-19
Vanadium (V)-Dissolved       <0.00050	Titanium (Ti)-Dissolv	ved		<0.00030		mg/L		0.0003	09-JUN-19
Zinc (Zn)-Dissolved       <0.0010       mg/L       0.001       09-JUN-DISSOLVED         MET-T-CCMS-VA Water         Batch R4663601         WG3072892-2 LCS       Valuation (Al)-Total       106.5       %       80-120       11-JUN-DISSOLVED         Antimony (Sb)-Total       107.2       %       80-120       11-JUN-DISSOLVED         Arsenic (As)-Total       105.9       %       80-120       11-JUN-DISSOLVED         Barium (Ba)-Total       109.8       %       80-120       11-JUN-DISSOLVED	Uranium (U)-Dissolv	red		<0.00001	0	mg/L		0.00001	09-JUN-19
MET-T-CCMS-VA         Water           Batch R4663601           WG3072892-2 LCS           Aluminum (Al)-Total         106.5         %         80-120         11-JUN-11	Vanadium (V)-Disso	lved		<0.00050		mg/L		0.0005	09-JUN-19
Batch R4663601         WG3072892-2 LCS         Aluminum (Al)-Total       106.5       %       80-120       11-JUN-10-10-10-10-10-10-10-10-10-10-10-10-10-	Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	09-JUN-19
WG3072892-2 LCS         Aluminum (Al)-Total       106.5       %       80-120       11-JUN-         Antimony (Sb)-Total       107.2       %       80-120       11-JUN-         Arsenic (As)-Total       105.9       %       80-120       11-JUN-         Barium (Ba)-Total       109.8       %       80-120       11-JUN-	MET-T-CCMS-VA	Water							
Aluminum (Al)-Total       106.5       %       80-120       11-JUN-         Antimony (Sb)-Total       107.2       %       80-120       11-JUN-         Arsenic (As)-Total       105.9       %       80-120       11-JUN-         Barium (Ba)-Total       109.8       %       80-120       11-JUN-	Batch R46636	501							
Antimony (Sb)-Total 107.2 % 80-120 11-JUN- Arsenic (As)-Total 105.9 % 80-120 11-JUN- Barium (Ba)-Total 109.8 % 80-120 11-JUN-									
Arsenic (As)-Total       105.9       %       80-120       11-JUN-         Barium (Ba)-Total       109.8       %       80-120       11-JUN-	` ,								11-JUN-19
Barium (Ba)-Total 109.8 % 80-120 11-JUN-									11-JUN-19
								80-120	11-JUN-19
Bismuth (Bi)-Total 106.2 % 80-120 11-JUN-									11-JUN-19
								80-120	11-JUN-19
	` ,							80-120	11-JUN-19
Cadmium (Cd)-Total 107.0 % 80-120 11-JUN-	Cadmium (Cd)-Total	I		107.0		%		80-120	11-JUN-19
Calcium (Ca)-Total 102.0 % 80-120 11-JUN-	Calcium (Ca)-Total			102.0		%		80-120	11-JUN-19



Workorder: L2287498

Report Date: 17-JUN-19

Page 5 of 11

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-VA	Water							
Batch R4663601								
WG3072892-2 LCS			407.0		0/			
Chromium (Cr)-Total			107.6		%		80-120	11-JUN-19
Cobalt (Co)-Total			106.9		%		80-120	11-JUN-19
Copper (Cu)-Total			107.2		%		80-120	11-JUN-19
Iron (Fe)-Total			91.5		%		80-120	11-JUN-19
Lead (Pb)-Total			98.9		%		80-120	11-JUN-19
Lithium (Li)-Total			100.2		%		80-120	11-JUN-19
Magnesium (Mg)-Total			107.9		%		80-120	11-JUN-19
Manganese (Mn)-Total			110.3		%		80-120	11-JUN-19
Molybdenum (Mo)-Tota	al		102.6		%		80-120	11-JUN-19
Nickel (Ni)-Total			106.9		%		80-120	11-JUN-19
Potassium (K)-Total			102.9		%		80-120	11-JUN-19
Selenium (Se)-Total			103.0		%		80-120	11-JUN-19
Silicon (Si)-Total			105.4		%		80-120	11-JUN-19
Silver (Ag)-Total			99.0		%		80-120	11-JUN-19
Sodium (Na)-Total			113.6		%		80-120	11-JUN-19
Strontium (Sr)-Total			98.7		%		80-120	11-JUN-19
Thallium (TI)-Total			99.98		%		80-120	11-JUN-19
Tin (Sn)-Total			100.5		%		80-120	11-JUN-19
Titanium (Ti)-Total			101.3		%		80-120	11-JUN-19
Uranium (U)-Total			101.2		%		80-120	11-JUN-19
Vanadium (V)-Total			108.7		%		80-120	11-JUN-19
Zinc (Zn)-Total			110.8		%		80-120	11-JUN-19
WG3072892-1 MB								
Aluminum (AI)-Total			< 0.0030		mg/L		0.003	11-JUN-19
Antimony (Sb)-Total			<0.00010		mg/L		0.0001	11-JUN-19
Arsenic (As)-Total			<0.00010		mg/L		0.0001	11-JUN-19
Barium (Ba)-Total			<0.00010		mg/L		0.0001	11-JUN-19
Bismuth (Bi)-Total			<0.00005	0	mg/L		0.00005	11-JUN-19
Boron (B)-Total			<0.010		mg/L		0.01	11-JUN-19
Cadmium (Cd)-Total			<0.00000	50	mg/L		0.000005	11-JUN-19
Calcium (Ca)-Total			< 0.050		mg/L		0.05	11-JUN-19
Chromium (Cr)-Total			<0.00010		mg/L		0.0001	11-JUN-19
Cobalt (Co)-Total			<0.00010		mg/L		0.0001	11-JUN-19
Copper (Cu)-Total			<0.00050		mg/L		0.0005	11-JUN-19



Workorder: L2287498

Report Date: 17-JUN-19 Page 6 of 11

lest est	Matrix	Reference	Result Qualific	er Units	RPD	Limit	Analyzed
MET-T-CCMS-VA	Water						
Batch R4663601							
WG3072892-1 MB			0.040			0.04	
Iron (Fe)-Total			<0.010	mg/L		0.01	11-JUN-19
Lead (Pb)-Total			<0.000050	mg/L		0.00005	11-JUN-19
Lithium (Li)-Total			<0.0010	mg/L		0.001	11-JUN-19
Magnesium (Mg)-Total			<0.0050	mg/L		0.005	11-JUN-19
Manganese (Mn)-Total			<0.00010	mg/L		0.0001	11-JUN-19
Molybdenum (Mo)-Total			<0.000050	mg/L		0.00005	11-JUN-19
Nickel (Ni)-Total			<0.00050	mg/L		0.0005	11-JUN-19
Potassium (K)-Total			<0.050	mg/L		0.05	11-JUN-19
Selenium (Se)-Total			<0.000050	mg/L		0.00005	11-JUN-19
Silicon (Si)-Total			<0.10	mg/L		0.1	11-JUN-19
Silver (Ag)-Total			<0.000010	mg/L		0.00001	11-JUN-19
Sodium (Na)-Total			<0.050	mg/L		0.05	11-JUN-19
Strontium (Sr)-Total			<0.00020	mg/L		0.0002	11-JUN-19
Thallium (TI)-Total			<0.000010	mg/L		0.00001	11-JUN-19
Tin (Sn)-Total			<0.00010	mg/L		0.0001	11-JUN-19
Titanium (Ti)-Total			<0.00030	mg/L		0.0003	11-JUN-19
Uranium (U)-Total			<0.000010	mg/L		0.00001	11-JUN-19
Vanadium (V)-Total			<0.00050	mg/L		0.0005	11-JUN-19
Zinc (Zn)-Total			<0.0030	mg/L		0.003	11-JUN-19
NH3-L-F-CL	Water						
Batch R4670451							
WG3077545-10 LCS							
Ammonia as N			98.9	%		85-115	13-JUN-19
WG3077545-9 MB Ammonia as N			0.0050	a. /l		0.005	
Ammonia as N			<0.0050	mg/L		0.005	13-JUN-19
NO2-L-IC-N-CL	Water						
Batch R4663920							
WG3074230-14 LCS			105.4	%		00.440	07 11 11 12
Nitrite (as N)			105.4	7/0		90-110	07-JUN-19
WG3074230-13 MB Nitrite (as N)			<0.0010	mg/L		0.001	07-JUN-19
, ,			<0.0010	mg/L		0.001	07-JUN-19
NO3-L-IC-N-CL	Water						



Workorder: L2287498

Report Date: 17-JUN-19 Page 7 of 11

Test	Matrix	Reference	Result (	Qualifier	Units	RPD	Limit	Analyzed
NO3-L-IC-N-CL	Water							
<b>Batch</b> R4663920 <b>WG3074230-14</b> LCS Nitrate (as N)			103.2		%		90-110	07-JUN-19
<b>WG3074230-13 MB</b> Nitrate (as N)			<0.0050		mg/L		0.005	07-JUN-19
ORP-CL	Water							
<b>Batch R4667329</b> <b>WG3075443-5 CRM</b> ORP		CL-ORP	228		mV		210-230	12-JUN-19
P-T-L-COL-CL	Water							
Batch R4666206 WG3075446-6 LCS			404.7		0/			
Phosphorus (P)-Total WG3075446-5 MB			101.7		%		80-120	12-JUN-19
Phosphorus (P)-Total			<0.0020		mg/L		0.002	12-JUN-19
PH-CL	Water							
Batch R4670171 WG3077251-5 LCS pH			7.01		рН		6.9-7.1	13-JUN-19
PO4-DO-L-COL-CL	Water							
Batch R4661969								
WG3071832-8 LCS Orthophosphate-Dissolv	ved (as P)		99.96		%		80-120	08-JUN-19
WG3071832-2 MB Orthophosphate-Dissolv	red (as P)		<0.0010		mg/L		0.001	08-JUN-19
SO4-IC-N-CL	Water							
Batch R4663920 WG3074230-14 LCS			402.0		0/			
Sulfate (SO4)			103.9		%		90-110	07-JUN-19
<b>WG3074230-13 MB</b> Sulfate (SO4)			<0.30		mg/L		0.3	07-JUN-19
SOLIDS-TDS-CL	Water							
Batch R4667930 WG3073552-12 DUP Total Dissolved Solids		<b>L2287498-1</b> 388	382		mg/L	1.6	20	11-JUN-19
WG3073552-11 LCS					J	-	-	



Workorder: L2287498

Report Date: 17-JUN-19 Page 8 of 11

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
SOLIDS-TDS-CL	Water							
Batch R4667930 WG3073552-11 LCS Total Dissolved Solids			96.4		%		85-115	11-JUN-19
WG3073552-10 MB Total Dissolved Solids			<10		mg/L		10	11-JUN-19
TKN-L-F-CL	Water							
Batch R4671467 WG3079095-10 LCS Total Kjeldahl Nitrogen			101.7		%		75-125	16-JUN-19
WG3079095-14 LCS Total Kjeldahl Nitrogen			100.2		%		75-125	16-JUN-19
WG3079095-17 LCS Total Kjeldahl Nitrogen			98.6		%		75-125	16-JUN-19
WG3079095-2 LCS Total Kjeldahl Nitrogen			101.5		%		75-125	16-JUN-19
WG3079095-21 LCS Total Kjeldahl Nitrogen			102.2		%		75-125	16-JUN-19
WG3079095-25 LCS Total Kjeldahl Nitrogen			98.7		%		75-125	16-JUN-19
WG3079095-6 LCS Total Kjeldahl Nitrogen			102.0		%		75-125	16-JUN-19
WG3079095-1 MB Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	16-JUN-19
WG3079095-13 MB Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	16-JUN-19
WG3079095-16 MB Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	16-JUN-19
WG3079095-24 MB Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	16-JUN-19
WG3079095-5 MB Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	16-JUN-19
WG3079095-9 MB Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	16-JUN-19
TSS-L-CL	Water							
Batch R4665072								
WG3073472-14 LCS Total Suspended Solids			95.4		%		85-115	11-JUN-19
WG3073472-13 MB Total Suspended Solids			<1.0		mg/L		1	11-JUN-19

Workorder: L2287498

Report Date: 17-JUN-19 Page 9 of 11

Test		Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
TURBIDITY-CL		Water							
Batch R4	1662406								
WG3071711-6 Turbidity	DUP		<b>L2287498-1</b> 12.9	12.8		NTU	0.8	15	08-JUN-19
<b>WG3071711-5</b> Turbidity	LCS			96.5		%		85-115	08-JUN-19
<b>WG3071711-4</b> Turbidity	МВ			<0.10		NTU		0.1	08-JUN-19

Report Date: 17-JUN-19 Workorder: L2287498 Page 10 of 11

### Legend:

ALS Control Limit (Data Quality Objectives) Limit

DUP Duplicate

Relative Percent Difference RPD

N/A Not Available

LCS Laboratory Control Sample Standard Reference Material SRM

MS Matrix Spike

MSD

Matrix Spike Duplicate
Average Desorption Efficiency ADE

Method Blank MB

Internal Reference Material IRM Certified Reference Material CRM Continuing Calibration Verification CCV CVS Calibration Verification Standard LCSD Laboratory Control Sample Duplicate

Workorder: L2287498 Report Date: 17-JUN-19 Page 11 of 11

#### **Hold Time Exceedances:**

	Sample						
ALS Product Description	ID <sup>.</sup>	Sampling Date	Date Processed	Rec. HT	Actual HT	Units	Qualifier
Physical Tests							
Oxidation redution potential	l by elect.						
	1	05-JUN-19 11:30	12-JUN-19 13:45	0.25	170	hours	EHTR-FM
рН							
	1	05-JUN-19 11:30	13-JUN-19 17:00	0.25	198	hours	EHTR-FM

#### Legend & Qualifier Definitions:

EHTR-FM: Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended.

EHTR: Exceeded ALS recommended hold time prior to sample receipt.

EHTL: Exceeded ALS recommended hold time prior to analysis. Sample was received less than 24 hours prior to expiry.

EHT: Exceeded ALS recommended hold time prior to analysis.

Rec. HT: ALS recommended hold time (see units).

#### Notes\*:

Where actual sampling date is not provided to ALS, the date (& time) of receipt is used for calculation purposes. Where actual sampling time is not provided to ALS, the earlier of 12 noon on the sampling date or the time (& date) of receipt is used for calculation purposes. Samples for L2287498 were received on 07-JUN-19 08:45.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against predetermined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

Teck

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Page 1 of

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12°C



TECK COAL LIMITED (LINE CREEK)

ATTN: Chris Blurton

PO BOX 2003

SPARWOOD BC V0B 2G0

Date Received: 26-JUN-19

Report Date: 29-JUN-19 17:01 (MT)

Version: FINAL

Client Phone: 250-425-6111

# **Certificate of Analysis**

Lab Work Order #: L2299337

Project P.O. #: VPO00608129

Job Reference: LINE CREEK OPERATION

C of C Numbers: 20190625 PIZP1105

Legal Site Desc:



Lyudmyla Shvets, B.Sc. Account Manager

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L2299337 CONTD.... PAGE 2 of 7 Version: FINAL

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2299337-1 LC_PIZP1105_WG_Q2-2019_N							
Sampled By: KC/DT on 25-JUN-19 @ 12:55							
Matrix: WG							
Miscellaneous Parameters							
Dissolved Organic Carbon	1.75		0.50	mg/L		27-JUN-19	R4690146
Total Kjeldahl Nitrogen	<0.050	TKNI	0.050	mg/L		29-JUN-19	R4691176
Total Organic Carbon		TIXINI		_			
EPH Testing for teck Coal	8.00		0.50	mg/L		27-JUN-19	R4690146
EPH (C10-C19) & EPH (C19-C32)							
EPH10-19	<0.25		0.25	mg/L	27-JUN-19	27-JUN-19	R4690683
EPH19-32	<0.25		0.25	mg/L	27-JUN-19	27-JUN-19	R4690683
Surrogate: 2-Bromobenzotrifluoride	101.4		60-140	g/ <b>_</b>	27-JUN-19	27-JUN-19	R4690683
Sum of EPH (10-32)				7.0			
EPH (C10-C32)	<0.50		0.50	mg/L		28-JUN-19	
TEH (C10-C30)				Ü			
TEH (C10-C30)	<0.25		0.25	mg/L	27-JUN-19	27-JUN-19	R4690683
Surrogate: 2-Bromobenzotrifluoride	101.4		60-140	%	27-JUN-19	27-JUN-19	R4690683
Dissolved Metals in Water							
Diss. Be (low) in Water by CRC ICPMS							
Beryllium (Be)-Dissolved	<0.020		0.020	ug/L	27-JUN-19	28-JUN-19	R4690521
Dissolved Metals Filtration Location	LAB					27-JUN-19	R4689740
Diss. Mercury in Water by CVAAS or CVAFS							
Mercury (Hg)-Dissolved	<0.000050		0.0000050	mg/L	28-JUN-19	29-JUN-19	R4691014
Dissolved Mercury Filtration Location	LAB					28-JUN-19	R4690603
Dissolved Metals in Water by CRC ICPMS	1.40					07	D 4000740
Dissolved Metals Filtration Location Aluminum (Al)-Dissolved	LAB <0.0030		0.0030	ma/l	27-JUN-19	27-JUN-19 28-JUN-19	R4689740 R4690521
Antimony (Sb)-Dissolved	0.0038		0.0030	mg/L mg/L	27-JUN-19 27-JUN-19	28-JUN-19	R4690521
Arsenic (As)-Dissolved	<0.00038		0.00010	mg/L	27-JUN-19	28-JUN-19	R4690521
Barium (Ba)-Dissolved	0.0895		0.00010	mg/L	27-JUN-19	28-JUN-19	R4690521
Bismuth (Bi)-Dissolved	<0.00050		0.00010	mg/L	27-JUN-19	28-JUN-19	R4690521
Boron (B)-Dissolved	0.022		0.00000	mg/L	27-JUN-19	28-JUN-19	R4690521
Cadmium (Cd)-Dissolved	0.0528		0.0050	ug/L	27-JUN-19	28-JUN-19	R4690521
Calcium (Ca)-Dissolved	174		0.050	mg/L	27-JUN-19	28-JUN-19	R4690521
Chromium (Cr)-Dissolved	<0.00010		0.00010	mg/L	27-JUN-19	28-JUN-19	R4690521
Cobalt (Co)-Dissolved	<0.10		0.10	ug/L	27-JUN-19	28-JUN-19	R4690521
Copper (Cu)-Dissolved	0.00502		0.00050	mg/L	27-JUN-19	28-JUN-19	R4690521
Iron (Fe)-Dissolved	<0.010		0.010	mg/L	27-JUN-19	28-JUN-19	R4690521
Lead (Pb)-Dissolved	0.000270		0.000050	mg/L	27-JUN-19	28-JUN-19	R4690521
Lithium (Li)-Dissolved	0.0168		0.0010	mg/L	27-JUN-19	28-JUN-19	R4690521
Magnesium (Mg)-Dissolved	54.7		0.10	mg/L	27-JUN-19	28-JUN-19	R4690521
Manganese (Mn)-Dissolved	0.0108		0.00010	mg/L	27-JUN-19	28-JUN-19	R4690521
Molybdenum (Mo)-Dissolved	0.000230		0.000050	mg/L	27-JUN-19	28-JUN-19	R4690521
Nickel (Ni)-Dissolved	0.00097		0.00050	mg/L	27-JUN-19	28-JUN-19	R4690521
Potassium (K)-Dissolved	1.85		0.050	mg/L	27-JUN-19	28-JUN-19	R4690521
Selenium (Se)-Dissolved	0.237		0.050	ug/L	27-JUN-19	28-JUN-19	R4690521
Silicon (Si)-Dissolved	5.18		0.050	mg/L	27-JUN-19	28-JUN-19	R4690521
Silver (Ag)-Dissolved	<0.000010		0.000010	mg/L	27-JUN-19	28-JUN-19	R4690521
Sodium (Na)-Dissolved	14.4		0.050	mg/L	27-JUN-19	28-JUN-19	R4690521
Strontium (Sr)-Dissolved	0.371		0.00020	mg/L	27-JUN-19	28-JUN-19	R4690521
Thallium (TI)-Dissolved	0.000021		0.000010	mg/L	27-JUN-19	28-JUN-19	R4690521
Tin (Sn)-Dissolved	0.00138		0.00010	mg/L	27-JUN-19	28-JUN-19	R4690521
Titanium (Ti)-Dissolved	<0.010		0.010	mg/L	27-JUN-19	28-JUN-19	R4690521
Uranium (U)-Dissolved	0.000495		0.000010	mg/L	27-JUN-19	28-JUN-19	R4690521
Vanadium (V)-Dissolved	<0.00050		0.00050	mg/L	27-JUN-19	28-JUN-19	R4690521

<sup>\*</sup> Refer to Referenced Information for Qualifiers (if any) and Methodology.

L2299337 CONTD.... PAGE 3 of 7 Version: FINAL

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2299337-1 LC_PIZP1105_WG_Q2-2019_N							
Sampled By: KC/DT on 25-JUN-19 @ 12:55							
•							
Matrix: WG							
Dissolved Metals in Water by CRC ICPMS Zinc (Zn)-Dissolved	0.0075		0.0010	mg/L	27-JUN-19	28-JUN-19	R4690521
Hardness	0.0075		0.0010	IIIg/L	27-30N-19	20-3011-19	K4090521
Hardness (as CaCO3)	660		0.50	mg/L		28-JUN-19	
Total Metals in Water	000		0.50	mg/ L		20 0011 10	
Total Be (Low) in Water by CRC ICPMS							
Beryllium (Be)-Total	0.261		0.020	ug/L		28-JUN-19	R4690272
Total Mercury in Water by CVAAS or CVAFS							
Mercury (Hg)-Total	<0.000050		0.0000050	mg/L		28-JUN-19	R4690685
Total Metals in Water by CRC ICPMS							
Aluminum (Al)-Total	3.16		0.0030	mg/L		28-JUN-19	R4690272
Antimony (Sb)-Total	0.00098		0.00010	mg/L		28-JUN-19	R4690272
Arsenic (As)-Total	0.00262		0.00010	mg/L		28-JUN-19	R4690272
Barium (Ba)-Total	0.204		0.00010	mg/L		28-JUN-19	R4690272
Bismuth (Bi)-Total	<0.000050		0.000050	mg/L		28-JUN-19	R4690272
Boron (B)-Total	0.026		0.010	mg/L		28-JUN-19	R4690272
Cadmium (Cd)-Total Calcium (Ca)-Total	0.476 198		0.0050 0.050	ug/L mg/L		28-JUN-19 28-JUN-19	R4690272 R4690272
Chromium (Cr)-Total	0.00608		0.00010	mg/L		28-JUN-19 28-JUN-19	R4690272
Cobalt (Co)-Total	3.47		0.00010	ug/L		28-JUN-19	R4690272
Copper (Cu)-Total	0.00723		0.00050	mg/L		28-JUN-19	R4690272
Iron (Fe)-Total	6.92		0.010	mg/L		28-JUN-19	R4690272
Lead (Pb)-Total	0.00305		0.000050	mg/L		28-JUN-19	R4690272
Lithium (Li)-Total	0.0222		0.0010	mg/L		28-JUN-19	R4690272
Magnesium (Mg)-Total	59.3		0.10	mg/L		28-JUN-19	R4690272
Manganese (Mn)-Total	0.423		0.00010	mg/L		28-JUN-19	R4690272
Molybdenum (Mo)-Total	0.000885		0.000050	mg/L		28-JUN-19	R4690272
Nickel (Ni)-Total	0.00830		0.00050	mg/L		28-JUN-19	R4690272
Potassium (K)-Total	2.59		0.050	mg/L		28-JUN-19	R4690272
Selenium (Se)-Total	0.412		0.050	ug/L		28-JUN-19	R4690272
Silicon (Si)-Total	8.72		0.10	mg/L		28-JUN-19	R4690272
Silver (Ag)-Total	0.000094		0.000010	mg/L		28-JUN-19	R4690272
Sodium (Na)-Total	14.0		0.050	mg/L		28-JUN-19	R4690272
Strontium (Sr)-Total	0.427		0.00020	mg/L		28-JUN-19	R4690272
Thallium (TI)-Total	0.000171		0.000010	mg/L		28-JUN-19	R4690272
Tin (Sn)-Total	0.00112		0.00010	mg/L		28-JUN-19	R4690272
Titanium (Ti)-Total	0.020		0.010	mg/L		28-JUN-19	R4690272
Uranium (U)-Total	0.000843		0.000010	mg/L		28-JUN-19	R4690272
Vanadium (V)-Total Zinc (Zn)-Total	0.00957		0.00050	mg/L		28-JUN-19	R4690272
,	0.0458		0.0030	mg/L		28-JUN-19	R4690272
Routine for Teck Coal							
Acidity by Automatic Titration Acidity (as CaCO3)	33.8		1.0	mg/L		29-JUN-19	R4691195
Alkalinity (Species) by Manual Titration	33.3		1.0	g, L		20 0014-10	117001100
Alkalinity, Bicarbonate (as CaCO3)	416		1.0	mg/L		28-JUN-19	R4690699
Alkalinity, Carbonate (as CaCO3)	<1.0		1.0	mg/L		28-JUN-19	R4690699
Alkalinity, Hydroxide (as CaCO3)	<1.0		1.0	mg/L		28-JUN-19	R4690699
Alkalinity, Total (as CaCO3)	416		1.0	mg/L		28-JUN-19	R4690699
Ammonia, Total (as N)				-			
Ammonia as N	<0.0050		0.0050	mg/L		26-JUN-19	R4690275
Bromide in Water by IC (Low Level)							
Bromide (Br)	1.74	DLHC	0.25	mg/L		26-JUN-19	R4689274
Chloride in Water by IC							

<sup>\*</sup> Refer to Referenced Information for Qualifiers (if any) and Methodology.

L2299337 CONTD.... PAGE 4 of 7 Version: FINAL

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2299337-1 LC_PIZP1105_WG_Q2-2019_N							
Sampled By: KC/DT on 25-JUN-19 @ 12:55							
Matrix: WG							
Chloride in Water by IC Chloride (CI)	118	DLHC	2.5	mg/L		26-JUN-19	R4689274
Electrical Conductivity (EC) Conductivity (@ 25C)	1120		2.0	uS/cm		28-JUN-19	R4690699
Fluoride in Water by IC Fluoride (F)	<0.10	DLHC	0.10	mg/L		26-JUN-19	R4689274
Ion Balance Calculation Cation - Anion Balance	1.2			%		29-JUN-19	
Anion Sum	13.5			meq/L		29-JUN-19	
Cation Sum	13.9			meq/L		29-JUN-19	
Ion Balance Calculation Ion Balance	103		-100	%		29-JUN-19	
Nitrate in Water by IC (Low Level) Nitrate (as N)	0.605	DLHC	0.025	mg/L		26-JUN-19	R4689274
Nitrite in Water by IC (Low Level) Nitrite (as N)	<0.0050	DLHC	0.0050	mg/L		26-JUN-19	R4689274
Orthophosphate-Dissolved (as P) Orthophosphate-Dissolved (as P)	<0.0010		0.0010	mg/L		27-JUN-19	R4690046
Oxidation redution potential by elect. ORP	427		-1000	mV		29-JUN-19	R4691029
Phosphorus (P)-Total Phosphorus (P)-Total	0.534	DLHC	0.050	mg/L		28-JUN-19	R4690636
Sulfate in Water by IC Sulfate (SO4)	87.9	DLHC	1.5	mg/L		26-JUN-19	R4689274
Total Dissolved Solids Total Dissolved Solids	730	DLHC	20	mg/L		27-JUN-19	R4690723
Total Suspended Solids Total Suspended Solids	404	DLHC	2.0	mg/L		27-JUN-19	R4690217
<b>Turbidity</b> Turbidity	302		0.10	NTU		27-JUN-19	R4690672
<b>pH</b> pH	7.57		0.10	рН		28-JUN-19	R4690699

<sup>\*</sup> Refer to Referenced Information for Qualifiers (if any) and Methodology.

Reference Information

L2299337 CONTD....
PAGE 5 of 7
Version: FINAL

Sample Parameter Qualifier Kev:

Qualifier	Description
DLHC	Detection Limit Raised: Dilution required due to high concentration of test analyte(s).
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
TKNI	TKN result may be biased low due to Nitrate interference. Nitrate-N is > 10x TKN.

#### **Test Method References:**

TOOL MICHIGA TROTOLONG	· · ·		
ALS Test Code	Matrix	Test Description	Method Reference**
ACIDITY-PCT-CL	Water	Acidity by Automatic Titration	APHA 2310 Acidity

This analysis is carried out using procedures adapted from APHA Method 2310 "Acidity". Acidity is determined by potentiometric titration to a specified endpoint.

ALK-MAN-CL Water Alkalinity (Species) by Manual Titration APHA 2320 ALKALINITY

This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.

BE-D-L-CCMS-VA Water Diss. Be (low) in Water by CRC ICPMS APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

BE-T-L-CCMS-VA Water Total Be (Low) in Water by CRC ICPMS EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

BR-L-IC-N-CL Water Bromide in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

C-DIS-ORG-LOW-CL Water Dissolved Organic Carbon APHA 5310 B-Instrumental

This method is applicable to the analysis of ground water, wastewater, and surface water samples. The form detected depends upon sample pretreatment: Unfiltered sample = TC, 0.45um filtered = TDC. Samples are injected into a combustion tube containing an oxidation catalyst. The carrier gas containing the combustion product from the combustion tube flows through an inorganic carbon reactor vessel and is then sent through a halogen scrubber into a sample cell set in a non-dispersive infrared gas analyzer (NDIR) where carbon dioxide is detected. For total inorganic carbon and dissolved inorganic carbon, the sample is injected into an IC reactor vessel where only the IC component is decomposed to become carbon dioxide.

The peak area generated by the NDIR indicates the TC/TDC or TIC/DIC as applicable. The total organic carbon content of the sample is calculated by subtracting the TIC from the TC.

TOC = TC-TIC, DOC = TDC-DIC, Particulate = Total - Dissolved.

C-TOT-ORG-LOW-CL Water Total Organic Carbon APHA 5310 TOTAL ORGANIC CARBON (TOC)

This method is applicable to the analysis of ground water, wastewater, and surface water samples. The form detected depends upon sample pretreatment: Unfiltered sample = TC, 0.45um filtered = TDC. Samples are injected into a combustion tube containing an oxidation catalyst. The carrier gas containing the combustion product from the combustion tube flows through an inorganic carbon reactor vessel and is then sent through a halogen scrubber into a sample cell set in a non-dispersive infrared gas analyzer (NDIR) where carbon dioxide is detected. For total inorganic carbon and dissolved inorganic carbon, the sample is injected into an IC reactor vessel where only the IC component is decomposed to become carbon dioxide.

The peak area generated by the NDIR indicates the TC/TDC or TIC/DIC as applicable. The total organic carbon content of the sample is calculated by subtracting the TIC from the TC.

TOC = TC-TIC, DOC = TDC-DIC, Particulate = Total - Dissolved.

CL-IC-N-CL Water Chloride in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

EC-L-PCT-CL Water Electrical Conductivity (EC) APHA 2510E

Conductivity, also known as Electrical Conductivity (EC) or Specific Conductance, is measured by immersion of a conductivity cell with platinum electrodes into a water sample. Conductivity measurements are temperature-compensated to 25C.

EPH(10-32)-CALC-CL Water Sum of EPH (10-32) Sum of EPH - Auto Calculated

The sum of EPH(C10-C19) and EPH(C19-C32)

F-IC-N-CL Water Fluoride in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

HARDNESS-CALC-VA Water Hardness APHA 2340B

Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

L2299337 CONTD....

PAGE 6 of 7 Version: FINAL

### **Reference Information**

**Test Method References:** 

**ALS Test Code** Matrix Method Reference\*\* **Test Description** 

Diss. Mercury in Water by CVAAS or CVAFS APHA 3030B/EPA 1631E (mod) HG-D-CVAA-VA Water

Water samples are filtered (0.45 um), preserved with hydrochloric acid, then undergo a cold-oxidation using bromine monochloride prior to reduction

with stannous chloride, and analyzed by CVAAS or CVAFS.

HG-T-CVAA-VA Total Mercury in Water by CVAAS or CVAFS EPA 1631E (mod)

Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

IONBALANCE-BC-CL Water Ion Balance Calculation **APHA 1030E** 

Cation Sum, Anion Sum, and Ion Balance (as % difference) are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Because all aqueous solutions are electrically neutral, the calculated ion balance (% difference of cations minus anions) should be near-zero.

Cation and Anion Sums are the total meg/L concentration of major cations and anions. Dissolved species are used where available. Minor ions are included where data is present. Ion Balance is calculated as:

Ion Balance (%) = [Cation Sum-Anion Sum] / [Cation Sum+Anion Sum]

MET-D-CCMS-VA Dissolved Metals in Water by CRC ICPMS APHA 3030B/6020A (mod) Water

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

MET-T-CCMS-VA Water Total Metals in Water by CRC ICPMS EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

NH3-L-F-CL Ammonia, Total (as N) J. ENVIRON. MONIT., 2005, 7, 37-42, RSC

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et

Water NO2-L-IC-N-CL Nitrite in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

NO3-L-IC-N-CL Nitrate in Water by IC (Low Level)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

ORP-CL Water Oxidation redution potential by elect. **ASTM D1498** 

This analysis is carried out in accordance with the procedure described in the "ASTM" method D1498 "Oxidation-Reduction Potential of Water" published by the American Society for Testing and Materials (ASTM). Results are reported as observed oxidation-reduction potential of the platinum metal-reference electrode employed, in mV.

It is recommended that this analysis be conducted in the field.

P-T-L-COL-CL Phosphorus (P)-Total APHA 4500-P PHOSPHORUS

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after

persulphate digestion of the sample.

PH-CI APHA 4500 H-Electrode Water Ha

pH is determined in the laboratory using a pH electrode. All samples analyzed by this method for pH will have exceeded the 15 minute recommended hold time from time of sampling (field analysis is recommended for pH where highly accurate results are needed)

PO4-DO-L-COL-CL Orthophosphate-Dissolved (as P) APHA 4500-P PHOSPHORUS Water

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.

SO4-IC-N-CL Sulfate in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

SOLIDS-TDS-CL **Total Dissolved Solids** APHA 2540 C

A well-mixed sample is filtered through a glass fibre filter paper. The filtrate is then evaporated to dryness in a pre-weighed vial and dried at 180 – 2 °C. The increase in vial weight represents the total dissolved solids (TDS).

TECKCOAL-IONBAL-CL Water Ion Balance Calculation **APHA 1030E**  LINE CREEK OPERATION L2299337 CONTD....

**Reference Information** 

PAGE 7 of 7 Version: FINAL

**Test Method References:** 

ALS Test Code Matrix Test Description Method Reference\*\*

Cation Sum, Anion Sum, and Ion Balance (as % difference) are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Because all aqueous solutions are electrically neutral, the calculated ion balance (% difference of cations minus anions) should be near-zero.

Cation and Anion Sums are the total meq/L concentration of major cations and anions. Dissolved species are used where available. Minor ions are included where data is present. Ion Balance is calculated as:

Ion Balance (%) = [Cation Sum-Anion Sum] / [Cation Sum+Anion Sum]

TEH-BC-VA-CL Water EPH (C10-C19) & EPH (C19-C32) BCMOE EPH GCFID

Analysis is in accordance with BC MOE Lab Manual method "Extractable Petroleum Hydrocarbons in Water by GC/FID", v2.1, July 1999. Whole water samples are extracted with DCM prior to gas chromatography with flame ionization detection (GC-FID). EPH results include Polycyclic Aromatic Hydrocarbons (PAH) and are therefore not equivalent to Light and Heavy Extractable Petroleum Hydrocarbons (LEPH/HEPH).

TEH-WATER-VA-CL Water TEH (C10-C30) BC Lab Manual

Water samples are spiked with 2-BBTF surrogate, and extracted by reciprocal action shaker for 1 hour using a single micro-extraction with hexane. After extraction, the hexane layer is drawn off and analyzed on a gas chromatograph equipped with a flame ionization detector.

TKN-L-F-CL Water Total Kjeldahl Nitrogen APHA 4500-NORG (TKN)

This analysis is carried out using procedures adapted from APHA Method 4500-Norg D. "Block Digestion and Flow Injection Analysis". Total Kjeldahl Nitrogen is determined using block digestion followed by Flow-injection analysis with fluorescence detection.

TSS-L-CL Water Total Suspended Solids APHA 2540 D-Gravimetric

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total suspended solids (TSS) are determined by filtering a sample through a glass fibre filter, and by drying the filter at 104 deg. C.

TURBIDITY-CL Water Turbidity APHA 2130 B-Nephelometer

This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.

\*\* ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

<b>Laboratory Definition Code</b>	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA
CL	ALS ENVIRONMENTAL - CALGARY, ALBERTA, CANADA

#### **Chain of Custody Numbers:**

20190625 PIZP1105

#### **GLOSSARY OF REPORT TERMS**

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.

mg/kg - milligrams per kilogram based on dry weight of sample

mg/kg wwt - milligrams per kilogram based on wet weight of sample

mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight

mg/L - unit of concentration based on volume, parts per million.

< - Less than.

D.L. - The reporting limit.

N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory. UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.



Workorder: L2299337

Report Date: 29-JUN-19

Page 1 of 11

Client:

TECK COAL LIMITED (LINE CREEK)

PO BOX 2003

SPARWOOD BC V0B 2G0

Contact: Chris Blurton

Test	Matrix	Reference	Result Qualifier	Units RF	D Limit	Analyzed
ACIDITY-PCT-CL	Water					
Batch R4691195 WG3092424-5 LCS Acidity (as CaCO3)			106.0	%	85-115	29-JUN-19
WG3092424-4 MB Acidity (as CaCO3)			<1.0	mg/L	2	29-JUN-19
ALK-MAN-CL	Water					
Batch R4690699 WG3091910-5 LCS Alkalinity, Total (as CaC	O3)		101.6	%	85-115	28-JUN-19
WG3091910-4 MB Alkalinity, Total (as CaC	O3)		<1.0	mg/L	1	28-JUN-19
BE-D-L-CCMS-VA	Water					
Batch R4690121 WG3090770-2 LCS Beryllium (Be)-Dissolved	1		97.0	%	80-120	27-JUN-19
WG3090770-1 MB Beryllium (Be)-Dissolved		LF	<0.000020	mg/L	0.00002	27-JUN-19
BE-T-L-CCMS-VA	Water					
Batch R4690272 WG3090764-2 LCS Beryllium (Be)-Total			105.3	%	80-120	28-JUN-19
WG3090764-1 MB Beryllium (Be)-Total			<0.000020	mg/L	0.00002	28-JUN-19
BR-L-IC-N-CL	Water					
Batch R4689274 WG3090221-10 LCS Bromide (Br)			96.9	%	85-115	26-JUN-19
WG3090221-9 MB Bromide (Br)			<0.050	mg/L	0.05	26-JUN-19
C-DIS-ORG-LOW-CL	Water					
Batch R4690146 WG3091367-6 LCS Dissolved Organic Carbo	on		103.9	%	80-120	27-JUN-19
WG3091367-5 MB Dissolved Organic Carbo			<0.50	mg/L	0.5	27-JUN-19
WG3091367-8 MS Dissolved Organic Carbo	on	L2299337-1	96.3	%	70-130	27-JUN-19
C-TOT-ORG-LOW-CL	Water					



Workorder: L2299337

Report Date: 29-JUN-19 Page 2 of 11

Test	Matrix	Reference	Result Qualifier	Units RPD	Limit	Analyzed
C-TOT-ORG-LOW-CL	Water					
Batch R4690146 WG3091367-6 LCS Total Organic Carbon			109.0	%	80-120	27-JUN-19
WG3091367-5 MB Total Organic Carbon			<0.50	mg/L	0.5	27-JUN-19
WG3091367-8 MS Total Organic Carbon		L2299337-1	86.2	%	70-130	27-JUN-19
CL-IC-N-CL	Water					
Batch R4689274						
WG3090221-10 LCS Chloride (CI)			99.7	%	90-110	26-JUN-19
WG3090221-9 MB Chloride (CI)			<0.50	mg/L	0.5	26-JUN-19
EC-L-PCT-CL	Water					
Batch R4690699						
WG3091910-5 LCS Conductivity (@ 25C)			92.5	%	90-110	28-JUN-19
WG3091910-4 MB Conductivity (@ 25C)			<2.0	uS/cm	2	28-JUN-19
F-IC-N-CL	Water					
Batch R4689274						
<b>WG3090221-10 LCS</b> Fluoride (F)			101.5	%	90-110	26-JUN-19
<b>WG3090221-9 MB</b> Fluoride (F)			<0.020	mg/L	0.02	26-JUN-19
HG-D-CVAA-VA	Water					
Batch R4691014						
WG3091802-10 LCS Mercury (Hg)-Dissolved			98.3	%	80-120	29-JUN-19
WG3091802-9 MB Mercury (Hg)-Dissolved		LF	<0.0000050	mg/L	0.000005	29-JUN-19
WG3091802-12 MS Mercury (Hg)-Dissolved		L2299337-1	99.6	%	70-130	29-JUN-19
HG-T-CVAA-VA	Water					
Batch R4690685						
WG3091852-2 LCS Mercury (Hg)-Total			102.9	%	80-120	28-JUN-19
WG3091852-1 MB						



Workorder: L2299337

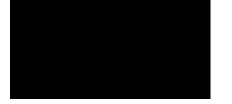
Report Date: 29-JUN-19 Page 3 of 11

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
HG-T-CVAA-VA	Water							
Batch R4690 WG3091852-1 Mi Mercury (Hg)-Total			<0.00000	5C	mg/L		0.000005	28-JUN-19
MET-D-CCMS-VA	Water							
Batch R4690								
WG3090770-2 LC Aluminum (Al)-Diss			104.5		%		80-120	27-JUN-19
Antimony (Sb)-Diss	olved		89.2		%		80-120	27-JUN-19
Arsenic (As)-Dissol	ved		97.4		%		80-120	27-JUN-19
Barium (Ba)-Dissolv	/ed		100.0		%		80-120	27-JUN-19
Bismuth (Bi)-Dissolv	ved		104.9		%		80-120	27-JUN-19
Boron (B)-Dissolved	t		101.1		%		80-120	27-JUN-19
Cadmium (Cd)-Diss	solved		99.6		%		80-120	27-JUN-19
Calcium (Ca)-Disso	lved		99.7		%		80-120	27-JUN-19
Chromium (Cr)-Diss	solved		99.4		%		80-120	27-JUN-19
Cobalt (Co)-Dissolv	ed		99.1		%		80-120	27-JUN-19
Copper (Cu)-Dissol	ved		99.98		%		80-120	27-JUN-19
Iron (Fe)-Dissolved			98.4		%		80-120	27-JUN-19
Lead (Pb)-Dissolved	d		100.4		%		80-120	27-JUN-19
Lithium (Li)-Dissolve	ed		96.4		%		80-120	27-JUN-19
Magnesium (Mg)-Di	issolved		103.8		%		80-120	27-JUN-19
Manganese (Mn)-D	issolved		100.3		%		80-120	27-JUN-19
Molybdenum (Mo)-	Dissolved		91.3		%		80-120	27-JUN-19
Nickel (Ni)-Dissolve	ed		97.7		%		80-120	27-JUN-19
Potassium (K)-Diss	olved		98.0		%		80-120	27-JUN-19
Selenium (Se)-Diss	olved		98.6		%		80-120	27-JUN-19
Silicon (Si)-Dissolve	ed		103.6		%		60-140	27-JUN-19
Silver (Ag)-Dissolve	ed		89.6		%		80-120	27-JUN-19
Sodium (Na)-Dissol	ved		101.6		%		80-120	27-JUN-19
Strontium (Sr)-Disse	olved		93.3		%		80-120	27-JUN-19
Thallium (TI)-Dissol	ved		100.0		%		80-120	27-JUN-19
Tin (Sn)-Dissolved			91.6		%		80-120	27-JUN-19
Titanium (Ti)-Dissol	ved		98.6		%		80-120	27-JUN-19
Uranium (U)-Dissol	ved		100.8		%		80-120	27-JUN-19
Vanadium (V)-Disso	olved		99.5		%		80-120	27-JUN-19

Workorder: L2299337 Re

Report Date: 29-JUN-19 Page 4 of 11

est	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
IET-D-CCMS-VA	Water							
Batch R46901	21							
WG3090770-2 LC	8							
Zinc (Zn)-Dissolved			97.8		%		80-120	27-JUN-19
WG3090770-1 MB Aluminum (Al)-Disso		LF	<0.0010		mg/L		0.001	27-JUN-19
Antimony (Sb)-Disso			<0.0010		mg/L		0.001	27-JUN-19 27-JUN-19
Arsenic (As)-Dissolve			<0.00010		mg/L		0.0001	27-JUN-19 27-JUN-19
Barium (Ba)-Dissolve			<0.00010		mg/L		0.0001	27-JUN-19 27-JUN-19
Bismuth (Bi)-Dissolve			<0.00010	)	mg/L		0.0001	27-JUN-19 27-JUN-19
Boron (B)-Dissolved			<0.010	,	mg/L		0.00003	27-JUN-19 27-JUN-19
Cadmium (Cd)-Disso	lved		<0.00000	50	mg/L		0.000005	27-JUN-19
Calcium (Ca)-Dissolv			<0.050		mg/L		0.000003	27-JUN-19 27-JUN-19
Chromium (Cr)-Disso			<0.00010		mg/L		0.0001	27-JUN-19
Cobalt (Co)-Dissolve			<0.00010		mg/L		0.0001	27-JUN-19
Copper (Cu)-Dissolve			<0.00010		mg/L		0.0001	27-JUN-19
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	27-JUN-19
Lead (Pb)-Dissolved			<0.000050	)	mg/L		0.00005	27-JUN-19
Lithium (Li)-Dissolve	d		<0.0010		mg/L		0.001	27-JUN-19
Magnesium (Mg)-Dis	solved		<0.0050		mg/L		0.005	27-JUN-19
Manganese (Mn)-Dis	solved		<0.00010		mg/L		0.0001	27-JUN-19
Molybdenum (Mo)-Di			<0.000050	)	mg/L		0.00005	27-JUN-19
Nickel (Ni)-Dissolved			<0.00050		mg/L		0.0005	27-JUN-19
Potassium (K)-Disso	lved		<0.050		mg/L		0.05	27-JUN-19
Selenium (Se)-Disso	lved		<0.000050	)	mg/L		0.00005	27-JUN-19
Silicon (Si)-Dissolved	I		<0.050		mg/L		0.05	27-JUN-19
Silver (Ag)-Dissolved			<0.000010	)	mg/L		0.00001	27-JUN-19
Sodium (Na)-Dissolv	ed		<0.050		mg/L		0.05	27-JUN-19
Strontium (Sr)-Disso	ved		<0.00020		mg/L		0.0002	27-JUN-19
Thallium (TI)-Dissolv	ed		<0.000010	)	mg/L		0.00001	27-JUN-19
Tin (Sn)-Dissolved			<0.00010		mg/L		0.0001	27-JUN-19
Titanium (Ti)-Dissolv	ed		<0.00030		mg/L		0.0003	27-JUN-19
Uranium (U)-Dissolve	ed		<0.000010	)	mg/L		0.00001	27-JUN-19
Vanadium (V)-Dissol	ved		<0.00050		mg/L		0.0005	27-JUN-19
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	27-JUN-19



Workorder: L2299337

Report Date: 29-JUN-19

Page 5 of 11

est	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-VA	Water							
Batch R4690272								
WG3090764-2 LCS			400.0		0.4			
Aluminum (Al)-Total			100.9		%		80-120	28-JUN-19
Antimony (Sb)-Total			108.7		%		80-120	28-JUN-19
Arsenic (As)-Total			98.4		%		80-120	28-JUN-19
Barium (Ba)-Total			97.7		%		80-120	28-JUN-19
Bismuth (Bi)-Total			105.2		%		80-120	28-JUN-19
Boron (B)-Total			103.1		%		80-120	28-JUN-19
Cadmium (Cd)-Total			98.0		%		80-120	28-JUN-19
Calcium (Ca)-Total			102.5		%		80-120	28-JUN-19
Chromium (Cr)-Total			100.8		%		80-120	28-JUN-19
Cobalt (Co)-Total			99.5		%		80-120	28-JUN-19
Copper (Cu)-Total			98.4		%		80-120	28-JUN-19
Iron (Fe)-Total			98.1		%		80-120	28-JUN-19
Lead (Pb)-Total			100.3		%		80-120	28-JUN-19
Lithium (Li)-Total			103.0		%		80-120	28-JUN-19
Magnesium (Mg)-Total			106.2		%		80-120	28-JUN-19
Manganese (Mn)-Total			101.0		%		80-120	28-JUN-19
Molybdenum (Mo)-Total			101.7		%		80-120	28-JUN-19
Nickel (Ni)-Total			98.4		%		80-120	28-JUN-19
Potassium (K)-Total			98.6		%		80-120	28-JUN-19
Selenium (Se)-Total			95.3		%		80-120	28-JUN-19
Silicon (Si)-Total			99.2		%		80-120	28-JUN-19
Silver (Ag)-Total			99.3		%		80-120	28-JUN-19
Sodium (Na)-Total			104.8		%		80-120	28-JUN-19
Strontium (Sr)-Total			105.7		%		80-120	28-JUN-19
Thallium (TI)-Total			101.0		%		80-120	28-JUN-19
Tin (Sn)-Total			100.3		%		80-120	28-JUN-19
Titanium (Ti)-Total			98.9		%		80-120	28-JUN-19
Uranium (U)-Total			108.8		%		80-120	28-JUN-19
Vanadium (V)-Total			102.0		%		80-120	28-JUN-19
Zinc (Zn)-Total			99.9		%		80-120	28-JUN-19
WG3090764-1 MB								
Aluminum (Al)-Total			<0.0030		mg/L		0.003	28-JUN-19
Antimony (Sb)-Total			<0.00010		mg/L		0.0001	28-JUN-19
Arsenic (As)-Total			<0.00010		mg/L		0.0001	28-JUN-19



Workorder: L2299337

Report Date: 29-JUN-19 Page 6 of 11

Test	Matrix	Reference	Result Qualific	er Units	RPD	Limit	Analyzed
MET-T-CCMS-VA	Water						
Batch R4690272							
WG3090764-1 MB			0.00040	/I			
Barium (Ba)-Total			<0.00010	mg/L		0.0001	28-JUN-19
Bismuth (Bi)-Total			<0.000050	mg/L		0.00005	28-JUN-19
Boron (B)-Total			<0.010	mg/L		0.01	28-JUN-19
Cadmium (Cd)-Total			<0.0000050	mg/L		0.000005	28-JUN-19
Calcium (Ca)-Total			<0.050	mg/L		0.05	28-JUN-19
Chromium (Cr)-Total			<0.00010	mg/L		0.0001	28-JUN-19
Cobalt (Co)-Total			<0.00010	mg/L		0.0001	28-JUN-19
Copper (Cu)-Total			<0.00050	mg/L		0.0005	28-JUN-19
Iron (Fe)-Total			<0.010	mg/L		0.01	28-JUN-19
Lead (Pb)-Total			<0.000050	mg/L		0.00005	28-JUN-19
Lithium (Li)-Total			<0.0010	mg/L		0.001	28-JUN-19
Magnesium (Mg)-Total			<0.0050	mg/L		0.005	28-JUN-19
Manganese (Mn)-Total			<0.00010	mg/L		0.0001	28-JUN-19
Molybdenum (Mo)-Total			<0.000050	mg/L		0.00005	28-JUN-19
Nickel (Ni)-Total			<0.00050	mg/L		0.0005	28-JUN-19
Potassium (K)-Total			<0.050	mg/L		0.05	28-JUN-19
Selenium (Se)-Total			<0.000050	mg/L		0.00005	28-JUN-19
Silicon (Si)-Total			<0.10	mg/L		0.1	28-JUN-19
Silver (Ag)-Total			<0.000010	mg/L		0.00001	28-JUN-19
Sodium (Na)-Total			<0.050	mg/L		0.05	28-JUN-19
Strontium (Sr)-Total			<0.00020	mg/L		0.0002	28-JUN-19
Thallium (TI)-Total			<0.000010	mg/L		0.00001	28-JUN-19
Tin (Sn)-Total			<0.00010	mg/L		0.0001	28-JUN-19
Titanium (Ti)-Total			<0.00030	mg/L		0.0003	28-JUN-19
Uranium (U)-Total			<0.000010	mg/L		0.00001	28-JUN-19
Vanadium (V)-Total			<0.00050	mg/L		0.0005	28-JUN-19
Zinc (Zn)-Total			<0.0030	mg/L		0.003	28-JUN-19
NH3-L-F-CL	Water						
Batch R4690275							
WG3089974-26 LCS Ammonia as N			90.9	%		85-115	26-JUN-19
WG3089974-25 MB Ammonia as N			<0.0050	mg/L		0.005	26-JUN-19
NO2-L-IC-N-CL	Water						



Workorder: L2299337

Report Date: 29-JUN-19 Page 7 of 11

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
NO2-L-IC-N-CL	Water							
Batch R4689274 WG3090221-10 LCS Nitrite (as N)			100.7		%		90-110	26-JUN-19
<b>WG3090221-9 MB</b> Nitrite (as N)			<0.0010		mg/L		0.001	26-JUN-19
NO3-L-IC-N-CL	Water							
Batch R4689274 WG3090221-10 LCS Nitrate (as N)			99.1		%		90-110	26-JUN-19
WG3090221-9 MB Nitrate (as N)			<0.0050		mg/L		0.005	26-JUN-19
ORP-CL	Water							
Batch R4691029 WG3092345-10 CRM ORP		CL-ORP	226		mV		210-230	29-JUN-19
<b>WG3092345-6 DUP</b> ORP		<b>L2299337-1</b> 427	429	J	mV	2.8	15	29-JUN-19
P-T-L-COL-CL	Water							
Batch R4690636 WG3091825-6 LCS Phosphorus (P)-Total			97.8		%		80-120	28-JUN-19
WG3091825-5 MB Phosphorus (P)-Total			<0.0020		mg/L		0.002	28-JUN-19
PH-CL	Water							
Batch R4690699 WG3091910-5 LCS pH			7.03		рН		6.9-7.1	28-JUN-19
PO4-DO-L-COL-CL	Water							
Batch R4690046 WG3090479-52 LCS Orthophosphate-Dissolv	ved (as P)		105.2		%		80-120	27-JUN-19
WG3090479-13 MB Orthophosphate-Dissolv			<0.0010		mg/L		0.001	27-JUN-19
SO4-IC-N-CL	Water							



Workorder: L2299337

Report Date: 29-JUN-19 Page 8 of 11

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
SO4-IC-N-CL	Water							
Batch R4689274 WG3090221-10 LCS Sulfate (SO4)			98.7		%		90-110	26-JUN-19
<b>WG3090221-9 MB</b> Sulfate (SO4)			<0.30		mg/L		0.3	26-JUN-19
SOLIDS-TDS-CL	Water							
Batch R4690723 WG3090084-8 LCS Total Dissolved Solids			95.7		%		85-115	27-JUN-19
WG3090084-7 MB Total Dissolved Solids			<10		mg/L		10	27-JUN-19
TEH-BC-VA-CL	Water							
Batch R4690683 WG3091895-2 LCS			400 E		0/		70.400	07    11   40
EPH10-19 EPH19-32			123.5 128.2		%		70-130	27-JUN-19
<b>WG3091895-1 MB</b> EPH10-19			<0.25		mg/L		70-130 0.25	27-JUN-19 27-JUN-19
EPH19-32			<0.25		mg/L		0.25	27-JUN-19 27-JUN-19
Surrogate: 2-Bromobenz	otrifluoride		77.1		%		60-140	27-JUN-19
TEH-WATER-VA-CL	Water							
Batch R4690683 WG3091895-2 LCS								
TEH (C10-C30)			124.7		%		70-130	27-JUN-19
<b>WG3091895-1 MB</b> TEH (C10-C30)			<0.25		mg/L		0.25	27-JUN-19
Surrogate: 2-Bromobenz	otrifluoride		77.1		%		60-140	27-JUN-19
TKN-L-F-CL	Water							
Batch R4691176 WG3092420-13 LCS								
Total Kjeldahl Nitrogen			85.3		%		75-125	29-JUN-19
WG3092420-17 LCS Total Kjeldahl Nitrogen			95.5		%		75-125	29-JUN-19
WG3092420-2 LCS Total Kjeldahl Nitrogen			90.3		%		75-125	29-JUN-19
WG3092420-5 LCS Total Kjeldahl Nitrogen			87.5		%		75-125	29-JUN-19
WG3092420-9 LCS								



Workorder: L2299337

Report Date: 29-JUN-19 Page 9 of 11

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
TKN-L-F-CL	Water							
Batch R4691176								
WG3092420-9 LCS Total Kjeldahl Nitrogen			85.9		%		75-125	29-JUN-19
WG3092420-1 MB Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	29-JUN-19
WG3092420-12 MB Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	29-JUN-19
WG3092420-16 MB Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	29-JUN-19
WG3092420-4 MB Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	29-JUN-19
WG3092420-8 MB Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	29-JUN-19
TSS-L-CL	Water							
Batch R4690217								
WG3090604-10 LCS Total Suspended Solids			103.1		%		85-115	27-JUN-19
WG3090604-9 MB Total Suspended Solids			<1.0		mg/L		1	27-JUN-19
TURBIDITY-CL	Water							
Batch R4690672								
WG3090633-23 LCS Turbidity			95.0		%		85-115	27-JUN-19
WG3090633-22 MB Turbidity			<0.10		NTU		0.1	27-JUN-19

Workorder: L2299337 Report Date: 29-JUN-19 Page 10 of 11

### Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

### **Sample Parameter Qualifier Definitions:**

Qualifier	Description
J	Duplicate results and limits are expressed in terms of absolute difference.
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

Workorder: L2299337 Report Date: 29-JUN-19 Page 11 of 11

#### **Hold Time Exceedances:**

	Sample						
ALS Product Description	ID	Sampling Date	Date Processed	Rec. HT	Actual HT	Units	Qualifier
Physical Tests							
Oxidation redution potential	l by elect.						
	1	25-JUN-19 12:55	29-JUN-19 09:00	0.25	92	hours	EHTR-FM
рН							
	1	25-JUN-19 12:55	28-JUN-19 11:00	0.25	70	hours	EHTR-FM
Lamand & Ovalitian Definition							

#### Legend & Qualifier Definitions:

EHTR-FM: Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended.

EHTR: Exceeded ALS recommended hold time prior to sample receipt.

EHTL: Exceeded ALS recommended hold time prior to analysis. Sample was received less than 24 hours prior to expiry.

EHT: Exceeded ALS recommended hold time prior to analysis.

Rec. HT: ALS recommended hold time (see units).

#### Notes\*:

Where actual sampling date is not provided to ALS, the date (& time) of receipt is used for calculation purposes. Where actual sampling time is not provided to ALS, the earlier of 12 noon on the sampling date or the time (& date) of receipt is used for calculation purposes. Samples for L2299337 were received on 26-JUN-19 08:55.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against predetermined data quality objectives to provide confidence in the accuracy of associated test results.

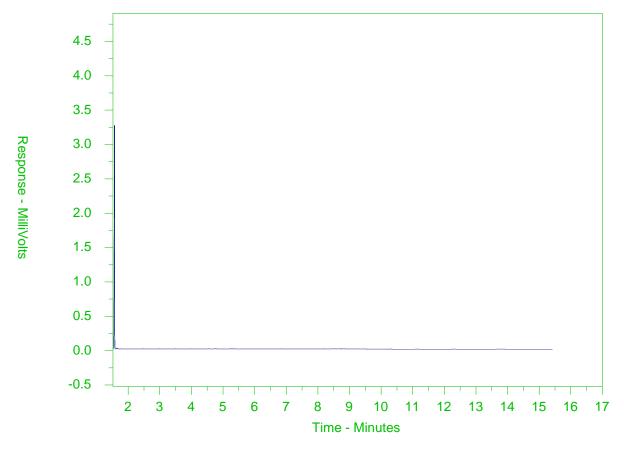
Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

### CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT



ALS Sample ID: L2299337-1

Client Sample ID: LC\_PIZP1105\_WG\_Q2-2019\_N



<b>←</b> F2	F3 —		F4	
nC10	nC16	nC34	nC50	
174°C	287°C	481°C	575°C	
346'F	549'F	898'F	1067'F	
← Gasoli	ne →	←	Motor Oils/ Lube Oils/ Grease	
<del></del>	Diesel/ Jet Fuels			

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at <a href="https://www.alsglobal.com">www.alsglobal.com</a>.

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13 March 2020 19135981-2020-064-R-Rev0

Q3 - COAs



TECK COAL LIMITED (LINE CREEK)

ATTN: Chris Blurton

PO BOX 2003

SPARWOOD BC VOB 2G0

Date Received: 18-JUL-19

Report Date: 26-JUL-19 12:27 (MT)

Version: FINAL

Client Phone: 250-425-6111

## Certificate of Analysis

Lab Work Order #: L2312625
Project P.O. #: VP000608129

Job Reference: LINE CREEK OPERATION
C of C Numbers: 20190717 PIZP1101

Legal Site Desc:



Lyudmyla Shvets, B.Sc. Account Manager

[This report shall not be reproduced except in full without the written authority of the Laboratory.]

L2312625 CONTD.... PAGE 2 of 12 Version: FINAL

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2312625-1 LC_PIZP1101_WG_Q3-2019_N							
Sampled By: KC/DT on 17-JUL-19 @ 12:50							
' '							
Matrix: WG Miscellaneous Parameters							
Dissolved Organic Carbon	<0.50		0.50	mg/L		20-JUL-19	R4719877
<u> </u>		TKNI		•		20-30L-19 23-JUL-19	
Total Organia Carbon	<0.050	I KINI	0.050	mg/L			R4720840
Total Organic Carbon	<0.50		0.50	mg/L		20-JUL-19	R4719877
EPH Testing for teck Coal EPH (C10-C19) & EPH (C19-C32)							
EPH10-19	<0.25		0.25	mg/L	20-JUL-19	20-JUL-19	R4714615
EPH19-32	<0.25		0.25	mg/L	20-JUL-19	20-JUL-19	R4714615
Surrogate: 2-Bromobenzotrifluoride	85.8		60-140	%	20-JUL-19	20-JUL-19	R4714615
Sum of EPH (10-32)	00.0		00 140	70	20 002 10	20 002 10	1147 14010
EPH (C10-C32)	<0.50		0.50	mg/L		21-JUL-19	
TEH (C10-C30)				J			
TEH (C10-C30)	<0.25		0.25	mg/L	20-JUL-19	20-JUL-19	R4714615
Surrogate: 2-Bromobenzotrifluoride	85.8		60-140	%	20-JUL-19	20-JUL-19	R4714615
Dissolved Metals in Water							
Diss. Be (low) in Water by CRC ICPMS							
Beryllium (Be)-Dissolved	<0.020		0.020	ug/L	19-JUL-19	20-JUL-19	R4719796
Dissolved Metals Filtration Location	FIELD					19-JUL-19	R4718548
Diss. Mercury in Water by CVAAS or CVAFS							
Mercury (Hg)-Dissolved	<0.0000050		0.0000050	mg/L	21-JUL-19	22-JUL-19	R4720276
Dissolved Mercury Filtration Location	FIELD					21-JUL-19	R4719406
Dissolved Metals in Water by CRC ICPMS						40 1111 40	5
Dissolved Metals Filtration Location	FIELD		0.0000	/1	40 1111 40	19-JUL-19	R4718548
Aluminum (Al)-Dissolved	<0.0030		0.0030	mg/L	19-JUL-19 19-JUL-19	20-JUL-19	R4719796
Antimony (Sb)-Dissolved	<0.00010		0.00010	mg/L	19-JUL-19	20-JUL-19	R4719796
Arsenic (As)-Dissolved Barium (Ba)-Dissolved	0.00132 0.453		0.00010 0.00010	mg/L mg/L	19-JUL-19	20-JUL-19 20-JUL-19	R4719796 R4719796
Bismuth (Bi)-Dissolved	<0.000050		0.00010	mg/L	19-JUL-19	20-JUL-19 20-JUL-19	R4719796 R4719796
Boron (B)-Dissolved	0.023		0.000030	mg/L	19-JUL-19	20-JUL-19	R4719796
Cadmium (Cd)-Dissolved	<0.0050		0.010	ug/L	19-JUL-19	20-JUL-19	R4719796
Calcium (Ca)-Dissolved	26.5		0.050	mg/L	19-JUL-19	20-JUL-19	R4719796
Chromium (Cr)-Dissolved	<0.00010		0.00010	mg/L	19-JUL-19	20-JUL-19	R4719796
Cobalt (Co)-Dissolved	0.20		0.10	ug/L	19-JUL-19	20-JUL-19	R4719796
Copper (Cu)-Dissolved	<0.00050		0.00050	mg/L	19-JUL-19	20-JUL-19	R4719796
Iron (Fe)-Dissolved	0.260		0.010	mg/L	19-JUL-19	20-JUL-19	R4719796
Lead (Pb)-Dissolved	<0.000050		0.000050	mg/L	19-JUL-19	20-JUL-19	R4719796
Lithium (Li)-Dissolved	0.0092		0.0010	mg/L	19-JUL-19	20-JUL-19	R4719796
Magnesium (Mg)-Dissolved	13.9		0.10	mg/L	19-JUL-19	20-JUL-19	R4719796
Manganese (Mn)-Dissolved	0.227		0.00010	mg/L	19-JUL-19	20-JUL-19	R4719796
Molybdenum (Mo)-Dissolved	0.0112		0.000050	mg/L	19-JUL-19	20-JUL-19	R4719796
Nickel (Ni)-Dissolved	<0.00050		0.00050	mg/L	19-JUL-19	20-JUL-19	R4719796
Potassium (K)-Dissolved	0.749		0.050	mg/L	19-JUL-19	20-JUL-19	R4719796
Selenium (Se)-Dissolved	<0.050		0.050	ug/L	19-JUL-19	20-JUL-19	R4719796
Silicon (Si)-Dissolved	3.56		0.050	mg/L	19-JUL-19	20-JUL-19	R4719796
Silver (Ag)-Dissolved	<0.000010		0.000010	mg/L	19-JUL-19	20-JUL-19	R4719796
Sodium (Na)-Dissolved	18.2		0.050	mg/L	19-JUL-19	20-JUL-19	R4719796
Strontium (Sr)-Dissolved	0.213		0.00020	mg/L	19-JUL-19	20-JUL-19	R4719796
Thallium (TI)-Dissolved	<0.000010		0.000010	mg/L	19-JUL-19	20-JUL-19	R4719796
Tin (Sn)-Dissolved	<0.00010		0.00010	mg/L	19-JUL-19	20-JUL-19	R4719796
Titanium (Ti)-Dissolved	<0.010		0.010	mg/L	19-JUL-19	20-JUL-19	R4719796
Uranium (U)-Dissolved	0.00139		0.000010	mg/L	19-JUL-19	20-JUL-19	R4719796
Vanadium (V)-Dissolved	<0.00050		0.00050	mg/L	19-JUL-19	20-JUL-19	R4719796

<sup>\*</sup> Refer to Referenced Information for Qualifiers (if any) and Methodology.

L2312625 CONTD.... PAGE 3 of 12 Version: FINAL

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2312625-1 LC_PIZP1101_WG_Q3-2019_N			Ţ				
Sampled By: KC/DT on 17-JUL-19 @ 12:50							
Matrix: WG							
Dissolved Metals in Water by CRC ICPMS							
Zinc (Zn)-Dissolved	<0.0010	0	0.0010	mg/L	19-JUL-19	20-JUL-19	R4719796
Total Metals in Water	<del>-</del>			J		-	
Hardness							
Hardness (as CaCO3)	123		0.50	mg/L		23-JUL-19	
Total Be (Low) in Water by CRC ICPMS	_						
Beryllium (Be)-Total	<0.020		0.020	ug/L		22-JUL-19	R4720253
Total Mercury in Water by CVAAS or CVAFS Mercury (Hg)-Total	<0.000050	0.0	0000050	mg/L		21-JUL-19	R4719457
Total Metals in Water by CRC ICPMS	~0.0000000	0.0	,500000	mg/L		21 JOL-13	10401
Aluminum (Al)-Total	0.102		0.0030	mg/L		22-JUL-19	R4720253
Antimony (Sb)-Total	<0.00010		.00010	mg/L		22-JUL-19	R4720253
Arsenic (As)-Total	0.00153		.00010	mg/L		22-JUL-19	R4720253
Barium (Ba)-Total	0.474		.00010	mg/L		22-JUL-19	R4720253
Bismuth (Bi)-Total	<0.000050	_	000050	mg/L		22-JUL-19	R4720253
Boron (B)-Total	0.019		0.010	mg/L		22-JUL-19	R4720253
Cadmium (Cd)-Total Calcium (Ca)-Total	0.0229		0.0050	ug/L		22-JUL-19	R4720253
Chromium (Cr)-Total	28.0 0.00019		0.050	mg/L mg/L		22-JUL-19 22-JUL-19	R4720253 R4720253
Cobalt (Co)-Total	0.00019		0.10	ug/L		22-JUL-19 22-JUL-19	R4720253
Copper (Cu)-Total	0.00058		.00050	mg/L		22-JUL-19	R4720253
Iron (Fe)-Total	0.500		0.010	mg/L		22-JUL-19	R4720253
Lead (Pb)-Total	0.000193		000050	mg/L		22-JUL-19	R4720253
Lithium (Li)-Total	0.0089		0.0010	mg/L		22-JUL-19	R4720253
Magnesium (Mg)-Total	14.5		0.10	mg/L		22-JUL-19	R4720253
Manganese (Mn)-Total	0.240	1	.00010	mg/L		22-JUL-19	R4720253
Molybdenum (Mo)-Total	0.0105		000050	mg/L		22-JUL-19	R4720253
Nickel (Ni)-Total	<0.00050	1	.00050	mg/L		22-JUL-19	R4720253
Potassium (K)-Total	0.756		0.050	mg/L		22-JUL-19 22-JUL-19	R4720253
Selenium (Se)-Total Silicon (Si)-Total	<0.050 3.74	1	0.050 0.10	ug/L mg/L		22-JUL-19 22-JUL-19	R4720253 R4720253
Silver (Ag)-Total	<0.00010		0.10	mg/L		22-JUL-19 22-JUL-19	R4720253 R4720253
Sodium (Na)-Total	19.1	1	0.050	mg/L		22-JUL-19	R4720253
Strontium (Sr)-Total	0.209	1	.00020	mg/L		22-JUL-19	R4720253
Thallium (TI)-Total	<0.000010		000010	mg/L		22-JUL-19	R4720253
Tin (Sn)-Total	<0.00010	0.	.00010	mg/L		22-JUL-19	R4720253
Titanium (Ti)-Total	<0.010		0.010	mg/L		22-JUL-19	R4720253
Uranium (U)-Total	0.00141	1	000010	mg/L		22-JUL-19	R4720253
Vanadium (V)-Total	0.00082		.00050	mg/L		22-JUL-19	R4720253
Zinc (Zn)-Total	0.0033	0	0.0030	mg/L		22-JUL-19	R4720253
Routine for Teck Coal							
Acidity by Automatic Titration Acidity (as CaCO3)	<1.0		1.0	mg/L		23-JUL-19	R4723855
Alkalinity (Species) by Manual Titration Alkalinity, Bicarbonate (as CaCO3)	161		1.0	mg/L		23-JUL-19	R4723837
Alkalinity, Carbonate (as CaCO3)	4.4		1.0	mg/L		23-JUL-19	R4723837
Alkalinity, Hydroxide (as CaCO3)	<1.0		1.0	mg/L		23-JUL-19	R4723837
Alkalinity, Total (as CaCO3)	166		1.0	mg/L		23-JUL-19	R4723837
Ammonia, Total (as N) Ammonia as N	0.0169		0.0050	mg/L		23-JUL-19	R4723816
Bromide in Water by IC (Low Level)	0.0100		5550	9/ ⊏		10 00L 10	1.4720010
Bromide (Br)	0.076		0.050	mg/L		18-JUL-19	R4718872
Chloride in Water by IC							

<sup>\*</sup> Refer to Referenced Information for Qualifiers (if any) and Methodology.

L2312625 CONTD.... PAGE 4 of 12 Version: FINAL

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
   L2312625-1							
Sampled By: KC/DT on 17-JUL-19 @ 12:50							
Matrix: WG							
Chloride in Water by IC							
Chloride (Cl)	0.60		0.50	mg/L		25-JUL-19	R4718872
Electrical Conductivity (EC)							
Conductivity (@ 25C)	312		2.0	uS/cm		23-JUL-19	R4723837
Fluoride in Water by IC Fluoride (F)	1.82		0.020	mg/L		25-JUL-19	R4718872
Ion Balance Calculation	1.02		0.020	mg/L		25 501 15	10072
Ion Balance	94.4		-100	%		25-JUL-19	
Ion Balance Calculation							
Cation - Anion Balance	-2.9			%		25-JUL-19	
Anion Sum Cation Sum	3.49 3.30			meq/L meq/L		25-JUL-19 25-JUL-19	
Nitrate in Water by IC (Low Level)	3.30			meq/L		20-JUL-18	
Nitrate (as N)	<0.0050	HTD	0.0050	mg/L		25-JUL-19	R4718872
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	<0.0010	HTD	0.0010	mg/L		25-JUL-19	R4718872
Orthophosphate-Dissolved (as P) Orthophosphate-Dissolved (as P)	0.0090		0.0010	mg/L		18-JUL-19	R4718231
Oxidation redution potential by elect.	0.0090		0.0010	mg/L		10.001.13	10231
ORP	306		-1000	mV		22-JUL-19	R4720463
Phosphorus (P)-Total							
Phosphorus (P)-Total	0.0301		0.0020	mg/L		22-JUL-19	R4720267
Sulfate in Water by IC Sulfate (SO4)	3.30		0.30	mg/L		25-JUL-19	R4718872
Total Dissolved Solids	0.50		0.50	1119/ =		20 002 10	10072
Total Dissolved Solids	159	DLHC	20	mg/L		23-JUL-19	R4723901
Total Suspended Solids							
Total Suspended Solids	6.2		1.0	mg/L		24-JUL-19	R4726150
Turbidity Turbidity	8.45		0.10	NTU		18-JUL-19	R4715512
pH	0.10		0.10			10 002 10	111110012
pH	8.42		0.10	рН		23-JUL-19	R4723837
L2312625-2 WG_Q3-2019_CC							
Sampled By: KC/DT on 17-JUL-19 @ 12:55							
Matrix: WG							
Miscellaneous Parameters	0.50		0.50	ma ==/1		20 11 11 42	D 47400
Dissolved Organic Carbon Total Kjeldahl Nitrogen	<0.50 <0.050		0.50 0.050	mg/L mg/L		20-JUL-19 23-JUL-19	R4719877 R4720840
Total Organic Carbon	<0.050		0.050	mg/L		23-JUL-19 20-JUL-19	R4720840 R4719877
Dissolved Metals in Water	\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\		0.50	9/∟		20 001-10	117113011
Diss. Be (low) in Water by CRC ICPMS							
Beryllium (Be)-Dissolved	<0.020		0.020	ug/L	19-JUL-19	20-JUL-19	R4719796
Dissolved Metals Filtration Location	FIELD					19-JUL-19	R4718548
Diss. Mercury in Water by CVAAS or CVAFS Mercury (Hg)-Dissolved	<0.000050		0.0000050	mg/L	21-JUL-19	22-JUL-19	R4720276
Dissolved Mercury Filtration Location	FIELD		3.0000000	g/∟	2.001-13	21-JUL-19	R4720276 R4719406
Dissolved Metals in Water by CRC ICPMS	_						
Dissolved Metals Filtration Location	FIELD					19-JUL-19	R4718548
Aluminum (Al)-Dissolved	<0.0030		0.0030	mg/L	19-JUL-19	20-JUL-19	R4719796
Antimony (Sb)-Dissolved Arsenic (As)-Dissolved	<0.00010 0.00133		0.00010 0.00010	mg/L mg/L	19-JUL-19 19-JUL-19	20-JUL-19 20-JUL-19	R4719796 R4719796
Barium (Ba)-Dissolved	0.00133		0.00010	mg/L	19-JUL-19	20-JUL-19 20-JUL-19	R4719796 R4719796
. , .,	000		2.30010	· <del></del>			

<sup>\*</sup> Refer to Referenced Information for Qualifiers (if any) and Methodology.

L2312625 CONTD.... PAGE 5 of 12 Version: FINAL

Sample Details/Parameters	Result	Qualifier* D.L.	Units	Extracted	Analyzed	Batch
L2312625-2 WG Q3-2019 CC						
Sampled By: KC/DT on 17-JUL-19 @ 12:55						
Dissolved Metals in Water by CRC ICPMS Bismuth (Bi)-Dissolved	<0.000050	0.00005	0 mg/L	19-JUL-19	20-JUL-19	R4719796
Boron (B)-Dissolved	0.022	0.010	mg/L	19-JUL-19	20-JUL-19	R4719796
Cadmium (Cd)-Dissolved	< 0.0050	0.0050		19-JUL-19	20-JUL-19	R4719796
Calcium (Ca)-Dissolved	26.3	0.050	mg/L	19-JUL-19	20-JUL-19	R4719796
Chromium (Cr)-Dissolved	<0.00010	0.00010		19-JUL-19	20-JUL-19	R4719796
Cobalt (Co)-Dissolved	0.20	0.10	ug/L	19-JUL-19	20-JUL-19	R4719796
Copper (Cu)-Dissolved	<0.00050	0.00050	1 -	19-JUL-19	20-JUL-19	R4719796
Iron (Fe)-Dissolved	0.252	0.010	mg/L	19-JUL-19	20-JUL-19	R4719796
Lead (Pb)-Dissolved	< 0.000050	0.00005	0 mg/L	19-JUL-19	20-JUL-19	R4719796
Lithium (Li)-Dissolved	0.0090	0.0010	mg/L	19-JUL-19	20-JUL-19	R4719796
Magnesium (Mg)-Dissolved	13.5	0.10	mg/L	19-JUL-19	20-JUL-19	R4719796
Manganese (Mn)-Dissolved	0.222	0.00010	) mg/L	19-JUL-19	20-JUL-19	R4719796
Molybdenum (Mo)-Dissolved	0.0112	0.00005		19-JUL-19	20-JUL-19	R4719796
Nickel (Ni)-Dissolved	<0.00050	0.00050		19-JUL-19	20-JUL-19	R4719796
Potassium (K)-Dissolved	0.720	0.050	mg/L	19-JUL-19	20-JUL-19	R4719796
Selenium (Se)-Dissolved	<0.050	0.050	ug/L	19-JUL-19	20-JUL-19	R4719796
Silicon (Si)-Dissolved	3.44	0.050	mg/L	19-JUL-19	20-JUL-19	R4719796
Silver (Ag)-Dissolved	<0.000010	0.00001		19-JUL-19	20-JUL-19	R4719796
Sodium (Na)-Dissolved	18.2	0.050	mg/L	19-JUL-19	20-JUL-19	R4719796
Strontium (Sr)-Dissolved	0.215	0.00020		19-JUL-19	20-JUL-19	R4719796
Thallium (TI)-Dissolved	<0.000010	0.00001		19-JUL-19	20-JUL-19	R4719796
Tin (Sn)-Dissolved Titanium (Ti)-Dissolved	<0.00010	0.00010		19-JUL-19 19-JUL-19	20-JUL-19 20-JUL-19	R4719796
Uranium (U)-Dissolved	<0.010 0.00142	0.010	mg/L	19-JUL-19 19-JUL-19	20-JUL-19 20-JUL-19	R4719796
Vanadium (V)-Dissolved	<0.00142	0.00001		19-JUL-19	20-JUL-19 20-JUL-19	R4719796 R4719796
Zinc (Zn)-Dissolved	<0.0010	0.00030		19-JUL-19	20-JUL-19	R4719796
Total Metals in Water	<0.0010	0.0010	1119/	15 002 15	20 302 13	1147 197 90
Hardness						
Hardness (as CaCO3)	121	0.50	mg/L		23-JUL-19	
Total Be (Low) in Water by CRC ICPMS						
Beryllium (Be)-Total	<0.020	0.020	ug/L		22-JUL-19	R4720253
Total Mercury in Water by CVAAS or CVAFS						
Mercury (Hg)-Total	<0.000050	0.000005	i0 mg/L		21-JUL-19	R4719457
Total Metals in Water by CRC ICPMS						
Aluminum (AI)-Total	0.0994	0.0030			22-JUL-19	R4720253
Antimony (Sb)-Total	<0.00010	0.00010			22-JUL-19	R4720253
Arsenic (As)-Total	0.00150	0.00010			22-JUL-19	R4720253
Barium (Ba)-Total	0.466	0.00010			22-JUL-19	R4720253
Bismuth (Bi)-Total	<0.000050	0.00005	-		22-JUL-19	R4720253
Boron (B)-Total	0.020	0.010	mg/L		22-JUL-19	R4720253
Cadmium (Cd)-Total	0.0213	0.0050	-		22-JUL-19	R4720253
Calcium (Ca)-Total	27.8	0.050	mg/L		22-JUL-19	R4720253
Chromium (Cr)-Total Cobalt (Co)-Total	0.00018 0.24	0.00010			22-JUL-19 22-JUL-19	R4720253
Copper (Cu)-Total	<0.0050	0.10	ug/L mg/L		22-JUL-19 22-JUL-19	R4720253 R4720253
Iron (Fe)-Total	<0.00050 0.480	0.00050	mg/L		22-JUL-19 22-JUL-19	R4720253 R4720253
Lead (Pb)-Total	0.460	0.0005	_		22-JUL-19 22-JUL-19	R4720253 R4720253
Lithium (Li)-Total	0.0089	0.00003	Ū		22-JUL-19 22-JUL-19	R4720253 R4720253
Magnesium (Mg)-Total	14.8	0.10	mg/L		22-JUL-19	R4720253
Manganese (Mn)-Total	0.240	0.00010	_		22-JUL-19	R4720253
Molybdenum (Mo)-Total	0.0106	0.00005	_		22-JUL-19	R4720253
Nickel (Ni)-Total	<0.00050	0.00050			22-JUL-19	R4720253

<sup>\*</sup> Refer to Referenced Information for Qualifiers (if any) and Methodology.

L2312625 CONTD.... PAGE 6 of 12 Version: FINAL

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2312625-2 WG_Q3-2019_CC							
Sampled By: KC/DT on 17-JUL-19 @ 12:55							
Matrix: WG							
Total Metals in Water by CRC ICPMS							
Potassium (K)-Total	0.776		0.050	mg/L		22-JUL-19	R4720253
Selenium (Se)-Total	< 0.050		0.050	ug/L		22-JUL-19	R4720253
Silicon (Si)-Total	3.61		0.10	mg/L		22-JUL-19	R4720253
Silver (Ag)-Total	<0.000010		0.000010	mg/L		22-JUL-19	R4720253
Sodium (Na)-Total	19.3		0.050	mg/L		22-JUL-19	R4720253
Strontium (Sr)-Total Thallium (TI)-Total	0.210		0.00020	mg/L		22-JUL-19	R4720253
Tin (Sn)-Total	<0.00010 <0.00010		0.000010 0.00010	mg/L mg/L		22-JUL-19 22-JUL-19	R4720253 R4720253
Titanium (Ti)-Total	<0.00010		0.00010	mg/L		22-JUL-19 22-JUL-19	R4720253
Uranium (U)-Total	0.00143		0.00010	mg/L		22-JUL-19	R4720253
Vanadium (V)-Total	0.00087		0.00050	mg/L		22-JUL-19	R4720253
Zinc (Zn)-Total	<0.0030		0.0030	mg/L		22-JUL-19	R4720253
Routine for Teck Coal				3			
Acidity by Automatic Titration							
Acidity (as CaCO3)	<1.0		1.0	mg/L		23-JUL-19	R4723855
Alkalinity (Species) by Manual Titration							
Alkalinity, Bicarbonate (as CaCO3)	156		1.0	mg/L		23-JUL-19	R4723837
Alkalinity, Carbonate (as CaCO3)	5.2		1.0	mg/L		23-JUL-19	R4723837
Alkalinity, Hydroxide (as CaCO3)	<1.0		1.0	mg/L		23-JUL-19	R4723837
Alkalinity, Total (as CaCO3)	161		1.0	mg/L		23-JUL-19	R4723837
Ammonia, Total (as N) Ammonia as N	0.0162		0.0050	mg/L		23-JUL-19	R4723816
Bromide in Water by IC (Low Level)	0.0102		0.0030	IIIg/L		23-30L-19	K4723010
Bromide (Br)	<0.050		0.050	mg/L		18-JUL-19	R4718872
Chloride in Water by IC	10.000		0.000	9/ =			
Chloride (CI)	0.50		0.50	mg/L		18-JUL-19	R4718872
Electrical Conductivity (EC)							
Conductivity (@ 25C)	313		2.0	uS/cm		23-JUL-19	R4723837
Fluoride in Water by IC							
Fluoride (F)	1.74		0.020	mg/L		18-JUL-19	R4718872
Ion Balance Calculation	4.0			0/		04 1111 40	
Cation - Anion Balance Anion Sum	-1.9			% ====/l		24-JUL-19 24-JUL-19	
Cation Sum	3.38 3.26			meq/L meq/L		24-JUL-19 24-JUL-19	
Ion Balance Calculation	3.20			meq/L		24-JUL-19	
Ion Balance Calculation	96.4		-100	%		24-JUL-19	
Nitrate in Water by IC (Low Level)	33.7			, •			
Nitrate (as N)	<0.0050		0.0050	mg/L		18-JUL-19	R4718872
Nitrite in Water by IC (Low Level)				=			
Nitrite (as N)	<0.0010		0.0010	mg/L		18-JUL-19	R4718872
Orthophosphate-Dissolved (as P)							
Orthophosphate-Dissolved (as P)	0.0095		0.0010	mg/L		18-JUL-19	R4718231
Oxidation redution potential by elect.	240		4000			00 !!!! 10	D 4700 (00
ORP	310		-1000	mV		22-JUL-19	R4720463
Phosphorus (P)-Total Phosphorus (P)-Total	0.0309		0.0020	mg/L		22-JUL-19	R4720267
Sulfate in Water by IC	0.0309		0.0020	mg/L		22-30L-19	114120201
Sulfate (SO4)	2.83		0.30	mg/L		18-JUL-19	R4718872
Total Dissolved Solids			0.50	··· <i>y</i> =			
Total Dissolved Solids	158	DLHC	20	mg/L		23-JUL-19	R4723901
Total Suspended Solids				J			
Total Suspended Solids	5.3		1.0	mg/L		24-JUL-19	R4726150

<sup>\*</sup> Refer to Referenced Information for Qualifiers (if any) and Methodology.

L2312625 CONTD.... PAGE 7 of 12 Version: FINAL

Sample Details	s/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2312625-2	WG_Q3-2019_CC							
Sampled By:	KC/DT on 17-JUL-19 @ 12:55							
Matrix:	WG							
Turbidity	***							
Turbidity		8.20		0.10	NTU		18-JUL-19	R4715512
рH								
pH		8.44		0.10	рН		23-JUL-19	R4723837
L2312625-3	WG_Q3-2019_RD							
Sampled By:	KC/DT on 17-JUL-19 @ 13:20							
Matrix:	WG							
Miscellaneo	ous Parameters							
Total Kjeldal	hl Nitrogen	<0.050		0.050	mg/L		23-JUL-19	R4720840
Total Organi	_	<0.50		0.50	mg/L		20-JUL-19	R4719877
Total Metals i					3			
Hardness								
Hardness (a	s CaCO3)	<0.50		0.50	mg/L		24-JUL-19	
	ow) in Water by CRC ICPMS							
Beryllium (B	•	<0.020		0.020	ug/L		22-JUL-19	R4720253
	iry in Water by CVAAS or CVAFS							
Mercury (Hg	•	<0.000050		0.0000050	mg/L		21-JUL-19	R4719457
	s in Water by CRC ICPMS						00 1111 40	5
Aluminum (A	•	<0.0030		0.0030	mg/L		22-JUL-19	R4720253
Antimony (S		<0.00010		0.00010	mg/L		22-JUL-19	R4720253
Arsenic (As) Barium (Ba)		<0.00010 <0.00010		0.00010	mg/L		22-JUL-19 22-JUL-19	R4720253 R4720253
Bismuth (Bi)		<0.00010		0.00010 0.000050	mg/L mg/L		22-JUL-19 22-JUL-19	R4720253 R4720253
Boron (B)-To		<0.00030		0.00030	mg/L		22-JUL-19 22-JUL-19	R4720253
Cadmium (C		<0.010		0.0050	ug/L		22-JUL-19	R4720253
Calcium (Ca	•	<0.050		0.050	mg/L		22-JUL-19	R4720253
Chromium (	•	<0.00010		0.00010	mg/L		22-JUL-19	R4720253
Cobalt (Co)-	,	<0.10		0.10	ug/L		22-JUL-19	R4720253
Copper (Cu)		<0.00050		0.00050	mg/L		22-JUL-19	R4720253
Iron (Fe)-To	tal	<0.010		0.010	mg/L		22-JUL-19	R4720253
Lead (Pb)-To	otal	<0.000050		0.000050	mg/L		22-JUL-19	R4720253
Lithium (Li)-	Total	<0.0010		0.0010	mg/L		22-JUL-19	R4720253
Magnesium	(Mg)-Total	<0.10		0.10	mg/L		22-JUL-19	R4720253
Manganese		<0.00010		0.00010	mg/L		22-JUL-19	R4720253
Molybdenum		<0.000050		0.000050	mg/L		22-JUL-19	R4720253
Nickel (Ni)-T		<0.00050		0.00050	mg/L		22-JUL-19	R4720253
Potassium (	•	<0.050		0.050	mg/L		22-JUL-19	R4720253
Selenium (S		<0.050		0.050	ug/L		22-JUL-19	R4720253
Silicon (Si)-7		<0.10		0.10	mg/L		22-JUL-19	R4720253
Silver (Ag)-T		<0.000010		0.000010	mg/L		22-JUL-19	R4720253
Sodium (Na)	•	<0.050		0.050	mg/L		22-JUL-19	R4720253
Strontium (S	•	<0.00020		0.00020	mg/L		22-JUL-19 22-JUL-19	R4720253 R4720253
Thallium (TI) Tin (Sn)-Tota		<0.00010 <0.00010		0.000010 0.00010	mg/L mg/L		24-JUL-19 24-JUL-19	R4720253 R4723949
Titanium (Ti		<0.00010		0.00010	mg/L		24-JUL-19 22-JUL-19	R4723949 R4720253
Uranium (U)		<0.010		0.00010	mg/L		22-JUL-19 22-JUL-19	R4720253 R4720253
` ,	Vanadium (V)-Total			0.00050	mg/L		22-JUL-19	R4720253
Zinc (Zn)-To	,	<0.00050 <0.0030		0.0030	mg/L		22-JUL-19	R4720253
Routine for T		10.0000		0.0000	9, ⊏		552 .5	1.1.20200
	Automatic Titration							
Acidity (as C		1.6		1.0	mg/L		23-JUL-19	R4723855
• ,	Species) by Manual Titration				-			

<sup>\*</sup> Refer to Referenced Information for Qualifiers (if any) and Methodology.

L2312625 CONTD.... PAGE 8 of 12 Version: FINAL

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2312625-3 WG_Q3-2019_RD							
Sampled By: KC/DT on 17-JUL-19 @ 13:20							
Matrix: WG							
Alkalinity (Species) by Manual Titration Alkalinity, Bicarbonate (as CaCO3)	<1.0		1.0	mg/L		23-JUL-19	R4723837
Alkalinity, Carbonate (as CaCO3)	<1.0		1.0	mg/L		23-JUL-19	R4723837
Alkalinity, Hydroxide (as CaCO3)	<1.0		1.0	mg/L		23-JUL-19	R4723837
Alkalinity, Total (as CaCO3)	<1.0		1.0	mg/L		23-JUL-19	R4723837
Ammonia, Total (as N) Ammonia as N	<0.0050		0.0050	mg/L		23-JUL-19	R4723816
Bromide in Water by IC (Low Level) Bromide (Br)	<0.050		0.050	mg/L		18-JUL-19	R4718872
Chloride in Water by IC Chloride (Cl)	<0.50		0.50	mg/L		18-JUL-19	R4718872
Dissolved Metals in Water by CRC ICPMS Dissolved Metals Filtration Location	LAB			-		18-JUL-19	R4715573
Calcium (Ca)-Dissolved	<0.050		0.050	mg/L		18-JUL-19	R4714794
Magnesium (Mg)-Dissolved	<0.0050		0.0050	mg/L		18-JUL-19	R4714794
Potassium (K)-Dissolved	<0.050		0.050	mg/L		18-JUL-19	R4714794
Sodium (Na)-Dissolved	<0.050		0.050	mg/L		18-JUL-19	R4714794
Electrical Conductivity (EC) Conductivity (@ 25C)	<2.0		2.0	uS/cm		23-JUL-19	R4723837
Fluoride in Water by IC Fluoride (F)	<0.020		0.020	mg/L		18-JUL-19	R4718872
Ion Balance Calculation Ion Balance	0.0		-100	%		24-JUL-19	
Ion Balance Calculation							
Cation - Anion Balance	0.0			%		24-JUL-19	
Anion Sum Cation Sum	<0.10			meq/L		24-JUL-19	
	<0.10			meq/L		24-JUL-19	
Nitrate in Water by IC (Low Level) Nitrate (as N)	<0.0050		0.0050	mg/L		18-JUL-19	R4718872
Nitrite in Water by IC (Low Level) Nitrite (as N)	<0.0010		0.0010	mg/L		18-JUL-19	R4718872
Orthophosphate-Dissolved (as P) Orthophosphate-Dissolved (as P)	<0.0010		0.0010	mg/L		18-JUL-19	R4718231
Oxidation redution potential by elect. ORP	449		-1000	mV		22-JUL-19	R4720463
Phosphorus (P)-Total Phosphorus (P)-Total	<0.0020		0.0020	mg/L		22-JUL-19	R4720267
Sulfate in Water by IC Sulfate (SO4)	<0.30		0.30	mg/L		18-JUL-19	R4718872
Total Dissolved Solids Total Dissolved Solids	<10		10	mg/L		23-JUL-19	R4723901
Total Suspended Solids							
Total Suspended Solids  Turbidity	<1.0		1.0	mg/L		24-JUL-19	R4726150
Turbidity pH	<0.10		0.10	NTU		18-JUL-19	R4715512
pH	5.57		0.10	рН		23-JUL-19	R4723837

<sup>\*</sup> Refer to Referenced Information for Qualifiers (if any) and Methodology.

L2312625 CONTD....

PAGE 9 of 12 Version: FINAL

### **Reference Information**

Sample Parameter Qualifier Key:

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Qualifier	Description
DLHC	Detection Limit Raised: Dilution required due to high concentration of test analyte(s).
HTD	Hold time exceeded for re-analysis or dilution, but initial testing was conducted within hold time.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
TKNI	TKN result may be biased low due to Nitrate interference. Nitrate-N is > 10x TKN.

#### **Test Method References:**

ALS Test Code	Matrix	Test Description	Method Reference**	
ACIDITY-PCT-CL	Water	Acidity by Automatic Titration	APHA 2310 Acidity	

This analysis is carried out using procedures adapted from APHA Method 2310 "Acidity". Acidity is determined by potentiometric titration to a specified endpoint.

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ALK-MAN-CL Water Alkalinity (Species) by Manual Titration APHA 2320 ALKALINITY

This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.

BE-D-L-CCMS-VA Water Diss. Be (low) in Water by CRC ICPMS APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

BE-T-L-CCMS-VA Water Total Be (Low) in Water by CRC ICPMS EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

BR-L-IC-N-CL Water Bromide in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

C-DIS-ORG-LOW-CL Water Dissolved Organic Carbon APHA 5310 B-Instrumental

This method is applicable to the analysis of ground water, wastewater, and surface water samples. The form detected depends upon sample pretreatment: Unfiltered sample = TC, 0.45um filtered = TDC. Samples are injected into a combustion tube containing an oxidation catalyst. The carrier gas containing the combustion product from the combustion tube flows through an inorganic carbon reactor vessel and is then sent through a halogen scrubber into a sample cell set in a non-dispersive infrared gas analyzer (NDIR) where carbon dioxide is detected. For total inorganic carbon and dissolved inorganic carbon, the sample is injected into an IC reactor vessel where only the IC component is decomposed to become carbon dioxide.

The peak area generated by the NDIR indicates the TC/TDC or TIC/DIC as applicable. The total organic carbon content of the sample is calculated by subtracting the TIC from the TC.

TOC = TC-TIC, DOC = TDC-DIC, Particulate = Total - Dissolved.

C-TOT-ORG-LOW-CL Water Total Organic Carbon APHA 5310 TOTAL ORGANIC CARBON (TOC)

This method is applicable to the analysis of ground water, wastewater, and surface water samples. The form detected depends upon sample pretreatment: Unfiltered sample = TC, 0.45um filtered = TDC. Samples are injected into a combustion tube containing an oxidation catalyst. The carrier gas containing the combustion product from the combustion tube flows through an inorganic carbon reactor vessel and is then sent through a halogen scrubber into a sample cell set in a non-dispersive infrared gas analyzer (NDIR) where carbon dioxide is detected. For total inorganic carbon and dissolved inorganic carbon, the sample is injected into an IC reactor vessel where only the IC component is decomposed to become carbon dioxide.

The peak area generated by the NDIR indicates the TC/TDC or TIC/DIC as applicable. The total organic carbon content of the sample is calculated by subtracting the TIC from the TC.

TOC = TC-TIC, DOC = TDC-DIC, Particulate = Total - Dissolved.

CL-IC-N-CL Water Chloride in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

EC-L-PCT-CL Water Electrical Conductivity (EC) APHA 2510B

Conductivity, also known as Electrical Conductivity (EC) or Specific Conductance, is measured by immersion of a conductivity cell with platinum electrodes into a water sample. Conductivity measurements are temperature-compensated to 25C.

EPH(10-32)-CALC-CL Water Sum of EPH (10-32) Sum of EPH - Auto Calculated

The sum of EPH(C10-C19) and EPH(C19-C32)

F-IC-N-CL Water Fluoride in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

HARDNESS-CALC-VA Water Hardness APHA 2340B

HG-D-CVAA-VA

#### L2312625 CONTD....

PAGE 10 of 12 Version: FINAL

### **Reference Information**

Test Method References:

**ALS Test Code** Matrix Method Reference\*\* **Test Description** 

Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO3 equivalents.

Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

Water samples are filtered (0.45 um), preserved with hydrochloric acid, then undergo a cold-oxidation using bromine monochloride prior to reduction

Diss. Mercury in Water by CVAAS or CVAFS APHA 3030B/EPA 1631E (mod)

with stannous chloride, and analyzed by CVAAS or CVAFS.

Water

Total Mercury in Water by CVAAS or CVAFS EPA 1631E (mod) HG-T-CVAA-VA Water

Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

IONBALANCE-BC-CL Ion Balance Calculation **APHA 1030E** 

Cation Sum, Anion Sum, and Ion Balance (as % difference) are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Because all aqueous solutions are electrically neutral, the calculated ion balance (% difference of cations minus anions) should be near-zero.

Cation and Anion Sums are the total meg/L concentration of major cations and anions. Dissolved species are used where available. Minor ions are included where data is present. Ion Balance is calculated as:

Ion Balance (%) = [Cation Sum-Anion Sum] / [Cation Sum+Anion Sum]

MET-D-CCMS-CL Water Dissolved Metals in Water by CRC ICPMS APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

MET-D-CCMS-VA Water Dissolved Metals in Water by CRC ICPMS APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

MET-T-CCMS-VA Water Total Metals in Water by CRC ICPMS EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

NH3-L-F-CL J. ENVIRON. MONIT., 2005, 7, 37-42, RSC Water Ammonia, Total (as N)

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et

Water Nitrite in Water by IC (Low Level) NO2-L-IC-N-CL EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

NO3-L-IC-N-CL Water Nitrate in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

ORP-CL Water **ASTM D1498** Oxidation redution potential by elect.

This analysis is carried out in accordance with the procedure described in the "ASTM" method D1498 "Oxidation-Reduction Potential of Water" published by the American Society for Testing and Materials (ASTM). Results are reported as observed oxidation-reduction potential of the platinum metal-reference electrode employed, in mV.

It is recommended that this analysis be conducted in the field.

P-T-I -COI -CI Phosphorus (P)-Total APHA 4500-P PHOSPHORUS Water

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after persulphate digestion of the sample.

APHA 4500 H-Electrode

pH is determined in the laboratory using a pH electrode. All samples analyzed by this method for pH will have exceeded the 15 minute recommended hold time from time of sampling (field analysis is recommended for pH where highly accurate results are needed)

PO4-DO-L-COL-CL Orthophosphate-Dissolved (as P) APHA 4500-P PHOSPHORUS

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.

SO4-IC-N-CI Water Sulfate in Water by IC EPA 300.1 (mod) LINE CREEK OPERATION L2312625 CONTD....

### **Reference Information**

PAGE 11 of 12 Version: FINAL

**Test Method References:** 

ALS Test Code Matrix Test Description Method Reference\*\*

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

SOLIDS-TDS-CL Water Total Dissolved Solids APHA 2540 C

A well-mixed sample is filtered through a glass fibre filter paper. The filtrate is then evaporated to dryness in a pre-weighed vial and dried at 180 - 2 °C. The increase in vial weight represents the total dissolved solids (TDS).

The more does in that weight represente the total discovered series (120)

TECKCOAL-IONBAL-CL Water Ion Balance Calculation APHA 1030E

Cation Sum, Anion Sum, and Ion Balance (as % difference) are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Because all aqueous solutions are electrically neutral, the calculated ion balance (% difference of cations minus anions) should be near-zero.

Cation and Anion Sums are the total meq/L concentration of major cations and anions. Dissolved species are used where available. Minor ions are included where data is present. Ion Balance is calculated as:

Ion Balance (%) = [Cation Sum-Anion Sum] / [Cation Sum+Anion Sum]

TEH-BC-VA-CL Water EPH (C10-C19) & EPH (C19-C32) BCMOE EPH GCFID

Analysis is in accordance with BC MOE Lab Manual method "Extractable Petroleum Hydrocarbons in Water by GC/FID", v2.1, July 1999. Whole water samples are extracted with DCM prior to gas chromatography with flame ionization detection (GC-FID). EPH results include Polycyclic Aromatic Hydrocarbons (PAH) and are therefore not equivalent to Light and Heavy Extractable Petroleum Hydrocarbons (LEPH/HEPH).

TEH-WATER-VA-CL Water TEH (C10-C30) BC Lab Manual

Water samples are spiked with 2-BBTF surrogate, and extracted by reciprocal action shaker for 1 hour using a single micro-extraction with hexane. After extraction, the hexane layer is drawn off and analyzed on a gas chromatograph equipped with a flame ionization detector.

TKN-L-F-CL Water Total Kjeldahl Nitrogen APHA 4500-NORG (TKN)

This analysis is carried out using procedures adapted from APHA Method 4500-Norg D. "Block Digestion and Flow Injection Analysis". Total Kjeldahl Nitrogen is determined using block digestion followed by Flow-injection analysis with fluorescence detection.

TSS-L-CL Water Total Suspended Solids APHA 2540 D-Gravimetric

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total suspended solids (TSS) are determined by filtering a sample through a glass fibre filter, and by drying the filter at 104 deg. C.

TURBIDITY-CL Water Turbidity APHA 2130 B-Nephelometer

This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.

\*\* ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

<b>Laboratory Definition Code</b>	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA
CL	ALS ENVIRONMENTAL - CALGARY, ALBERTA, CANADA

**Chain of Custody Numbers:** 

20190717 PIZP1101

LINE CREEK OPERATION L2312625 CONTD....

**Reference Information** 

PAGE 12 of 12 Version: FINAL

#### **Test Method References:**

**ALS Test Code** Matrix Method Reference\*\* **Test Description** 

#### **GLOSSARY OF REPORT TERMS**

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.

mg/kg - milligrams per kilogram based on dry weight of sample

mg/kg wwt - milligrams per kilogram based on wet weight of sample

mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight

mg/L - unit of concentration based on volume, parts per million.

< - Less than.

D.L. - The reporting limit.

N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.



Workorder: L2312625

Report Date: 26-JUL-19

Page 1 of 14

Client:

TECK COAL LIMITED (LINE CREEK)

PO BOX 2003

SPARWOOD BC V0B 2G0

Contact: Chris Blurton

Test	Matrix	Reference	Result Qualifier	Units RPD	Limit Analy	zed
ACIDITY-PCT-CL	Water					
Batch R4723855						
WG3113907-11 LCS Acidity (as CaCO3)			97.3	%	85-115 23-JL	JL-19
<b>WG3113907-14 LCS</b> Acidity (as CaCO3)			98.5	%	85-115 23-JL	JL-19
<b>WG3113907-10 MB</b> Acidity (as CaCO3)			1.6	mg/L	2 23-Jl	JL-19
<b>WG3113907-13 MB</b> Acidity (as CaCO3)			1.6	mg/L	2 23-Jl	JL-19
ALK-MAN-CL	Water					
Batch R4723837						
WG3113843-20 LCS Alkalinity, Total (as CaCC	03)		101.2	%	85-115 23-Jl	JL-19
WG3113843-19 MB Alkalinity, Total (as CaCC	D3)		<1.0	mg/L	1 23-JL	JL-19
BE-D-L-CCMS-VA	Water					
Batch R4719796 WG3110420-2 LCS Beryllium (Be)-Dissolved			99.7	%	80-120 20-Jl	JL-19
WG3110420-1 MB		NP	39.1	70	60-120 20-JC	JL-19
Beryllium (Be)-Dissolved		N	<0.000020	mg/L	0.00002 20-JL	JL-19
BE-T-L-CCMS-VA	Water					
Batch R4720253 WG3110273-2 LCS						
Beryllium (Be)-Total			89.6	%	80-120 22-JL	JL-19
WG3110273-1 MB Beryllium (Be)-Total			<0.000020	mg/L	0.00002 22-JL	JL-19
BR-L-IC-N-CL	Water					
Batch R4718872						
WG3110543-10 LCS Bromide (Br)			91.9	%	85-115 18-JL	JL-19
WG3110543-9 MB Bromide (Br)			<0.050	mg/L	0.05 18-JL	JL-19
C-DIS-ORG-LOW-CL	Water					
Batch R4719877						
WG3111750-10 LCS Dissolved Organic Carbo	n		97.8	%	80-120 20-JL	JL-19
WG3111750-9 MB						



Workorder: L2312625

Report Date: 26-JUL-19 Page 2 of 14

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
C-DIS-ORG-LOW-CL  Batch R4719877  WG3111750-9 MB  Dissolved Organic Carbo	<b>Water</b> on		<0.50		mg/L		0.5	20-JUL-19
C-TOT-ORG-LOW-CL	Water							
Batch R4719877 WG3111750-10 LCS Total Organic Carbon			99.2		%		80-120	20-JUL-19
WG3111750-9 MB Total Organic Carbon			<0.50		mg/L		0.5	20-JUL-19
CL-IC-N-CL	Water							
Batch R4718872 WG3110543-10 LCS Chloride (CI)			95.0		%		90-110	18-JUL-19
<b>WG3110543-9 MB</b> Chloride (CI)			<0.50		mg/L		0.5	18-JUL-19
EC-L-PCT-CL	Water							
Batch R4723837 WG3113843-20 LCS Conductivity (@ 25C)			103.7		%		90-110	23-JUL-19
WG3113843-19 MB Conductivity (@ 25C)			<2.0		uS/cm		2	23-JUL-19
F-IC-N-CL	Water							
<b>Batch</b> R4718872 <b>WG3110543-10</b> LCS Fluoride (F)			94.4		%		90-110	18-JUL-19
<b>WG3110543-9 MB</b> Fluoride (F)			<0.020		mg/L		0.02	18-JUL-19
HG-D-CVAA-VA	Water							
Batch R4720276 WG3111236-6 LCS Mercury (Hg)-Dissolved			101.4		%		80-120	22-JUL-19
WG3111236-5 MB Mercury (Hg)-Dissolved			<0.0000050		mg/L		0.000005	22-JUL-19
HG-T-CVAA-VA	Water							



Workorder: L2312625

Report Date: 26-JUL-19 Page 3 of 14

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
HG-T-CVAA-VA	Water							
Batch R471945 WG3111270-2 LCS Mercury (Hg)-Total			93.6		%		80-120	21-JUL-19
WG3111270-1 MB Mercury (Hg)-Total			<0.0000050		mg/L		0.000005	21-JUL-19
MET-D-CCMS-CL	Water							
Batch R471479	94							
WG3109072-2 LCS Calcium (Ca)-Dissolve		TMRM	98.9		%		80-120	18-JUL-19
Magnesium (Mg)-Diss	solved		96.9		%		80-120	18-JUL-19
Potassium (K)-Dissolv			110.7		%		80-120	18-JUL-19
Sodium (Na)-Dissolve			96.2		%		80-120	18-JUL-19
WG3109072-1 MB Calcium (Ca)-Dissolve	ed		<0.050		mg/L		0.05	18-JUL-19
Magnesium (Mg)-Diss			<0.0050		mg/L		0.005	18-JUL-19
Potassium (K)-Dissolv			<0.050		mg/L		0.05	18-JUL-19
Sodium (Na)-Dissolve			<0.050		mg/L		0.05	18-JUL-19
MET-D-CCMS-VA	Water							
Batch R471979	96							
WG3110420-2 LCS								
Aluminum (AI)-Dissolv	ved		99.7		%		80-120	20-JUL-19
Antimony (Sb)-Dissolv	ved		93.8		%		80-120	20-JUL-19
Arsenic (As)-Dissolve	d		101.1		%		80-120	20-JUL-19
Barium (Ba)-Dissolve	d		102.8		%		80-120	20-JUL-19
Bismuth (Bi)-Dissolve	d		101.4		%		80-120	20-JUL-19
Boron (B)-Dissolved			92.2		%		80-120	20-JUL-19
Cadmium (Cd)-Dissol	ved		99.5		%		80-120	20-JUL-19
Calcium (Ca)-Dissolve	ed		95.9		%		80-120	20-JUL-19
Chromium (Cr)-Disso	lved		98.0		%		80-120	20-JUL-19
Cobalt (Co)-Dissolved	d		101.2		%		80-120	20-JUL-19
Copper (Cu)-Dissolve	ed		98.5		%		80-120	20-JUL-19
Iron (Fe)-Dissolved			96.4		%		80-120	20-JUL-19
Lead (Pb)-Dissolved			101.4		%		80-120	20-JUL-19
Lithium (Li)-Dissolved			96.9		%		80-120	20-JUL-19
Magnesium (Mg)-Diss	solved		97.6		%		80-120	20-JUL-19
Manganese (Mn)-Diss			101.1		%		80-120	20-JUL-19
Molybdenum (Mo)-Dis	and and		97.3		%		80-120	20-JUL-19



Workorder: L2312625 Report Date: 26-JUL-19 Page 4 of 14

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA	Water							
Batch R4719796								
WG3110420-2 LCS								
Nickel (Ni)-Dissolved			102.1		%		80-120	20-JUL-19
Potassium (K)-Dissolve			106.9		%		80-120	20-JUL-19
Selenium (Se)-Dissolve	d		98.6		%		80-120	20-JUL-19
Silicon (Si)-Dissolved			103.0		%		60-140	20-JUL-19
Silver (Ag)-Dissolved			98.8		%		80-120	20-JUL-19
Sodium (Na)-Dissolved			106.0		%		80-120	20-JUL-19
Strontium (Sr)-Dissolved	d		95.6		%		80-120	20-JUL-19
Thallium (TI)-Dissolved			97.7		%		80-120	20-JUL-19
Tin (Sn)-Dissolved			96.1		%		80-120	20-JUL-19
Titanium (Ti)-Dissolved			97.3		%		80-120	20-JUL-19
Uranium (U)-Dissolved			94.6		%		80-120	20-JUL-19
Vanadium (V)-Dissolved	t		101.6		%		80-120	20-JUL-19
Zinc (Zn)-Dissolved			97.4		%		80-120	20-JUL-19
WG3110420-1 MB		NP						
Aluminum (Al)-Dissolved			<0.0010		mg/L		0.001	20-JUL-19
Antimony (Sb)-Dissolve	d		<0.00010	)	mg/L		0.0001	20-JUL-19
Arsenic (As)-Dissolved			<0.00010	)	mg/L		0.0001	20-JUL-19
Barium (Ba)-Dissolved			<0.00010	)	mg/L		0.0001	20-JUL-19
Bismuth (Bi)-Dissolved			<0.00005	50	mg/L		0.00005	20-JUL-19
Boron (B)-Dissolved			<0.010		mg/L		0.01	20-JUL-19
Cadmium (Cd)-Dissolve	ed		<0.00000	)5C	mg/L		0.000005	20-JUL-19
Calcium (Ca)-Dissolved			< 0.050		mg/L		0.05	20-JUL-19
Chromium (Cr)-Dissolve	ed		<0.00010	)	mg/L		0.0001	20-JUL-19
Cobalt (Co)-Dissolved			<0.00010	)	mg/L		0.0001	20-JUL-19
Copper (Cu)-Dissolved			<0.00020	)	mg/L		0.0002	20-JUL-19
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	20-JUL-19
Lead (Pb)-Dissolved			< 0.00005	50	mg/L		0.00005	20-JUL-19
Lithium (Li)-Dissolved			<0.0010		mg/L		0.001	20-JUL-19
Magnesium (Mg)-Dissol	lved		<0.0050		mg/L		0.005	20-JUL-19
Manganese (Mn)-Dissol	lved		<0.00010	)	mg/L		0.0001	20-JUL-19
Molybdenum (Mo)-Disso	olved		< 0.00005	50	mg/L		0.00005	20-JUL-19
Nickel (Ni)-Dissolved			<0.00050	)	mg/L		0.0005	20-JUL-19
Potassium (K)-Dissolve	d		< 0.050		mg/L		0.05	20-JUL-19
Selenium (Se)-Dissolve	d		<0.00005	50	mg/L		0.00005	20-JUL-19



Workorder: L2312625

Report Date: 26-JUL-19 Page 5 of 14

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA	Water							
Batch R4719796								
WG3110420-1 MB Silicon (Si)-Dissolved		NP	<0.050		mg/L		0.05	20-JUL-19
Silver (Ag)-Dissolved			<0.000010		mg/L		0.00001	20-JUL-19
Sodium (Na)-Dissolved			< 0.050		mg/L		0.05	20-JUL-19
Strontium (Sr)-Dissolved	I		<0.00020		mg/L		0.0002	20-JUL-19
Thallium (TI)-Dissolved			<0.000010		mg/L		0.00001	20-JUL-19
Tin (Sn)-Dissolved			<0.00010		mg/L		0.0001	20-JUL-19
Titanium (Ti)-Dissolved			<0.00030		mg/L		0.0003	20-JUL-19
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	20-JUL-19
Vanadium (V)-Dissolved			<0.00050		mg/L		0.0005	20-JUL-19
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	20-JUL-19
MET-T-CCMS-VA	Water							
Batch R4720253								
WG3110273-2 LCS								
Aluminum (AI)-Total			103.2		%		80-120	22-JUL-19
Antimony (Sb)-Total			105.2		%		80-120	22-JUL-19
Arsenic (As)-Total			99.4		%		80-120	22-JUL-19
Barium (Ba)-Total			97.4		%		80-120	22-JUL-19
Bismuth (Bi)-Total			111.4		%		80-120	22-JUL-19
Boron (B)-Total			92.3		%		80-120	22-JUL-19
Cadmium (Cd)-Total			97.9		%		80-120	22-JUL-19
Calcium (Ca)-Total			97.8		%		80-120	22-JUL-19
Chromium (Cr)-Total			100.3		%		80-120	22-JUL-19
Cobalt (Co)-Total			99.9		%		80-120	22-JUL-19
Copper (Cu)-Total			93.0		%		80-120	22-JUL-19
Iron (Fe)-Total			91.6		%		80-120	22-JUL-19
Lead (Pb)-Total			106.5		%		80-120	22-JUL-19
Lithium (Li)-Total			93.9		%		80-120	22-JUL-19
Magnesium (Mg)-Total			98.2		%		80-120	22-JUL-19
Manganese (Mn)-Total			99.0		%		80-120	22-JUL-19
Molybdenum (Mo)-Total			96.9		%		80-120	22-JUL-19
Nickel (Ni)-Total			96.6		%		80-120	22-JUL-19
Potassium (K)-Total			103.3		%		80-120	22-JUL-19
Selenium (Se)-Total			98.4		%		80-120	22-JUL-19
Silicon (Si)-Total			98.1		%		80-120	22-JUL-19



Workorder: L2312625

Report Date: 26-JUL-19 Page 6 of 14

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-VA	Water							
Batch R4720253	3							
WG3110273-2 LCS								
Silver (Ag)-Total			103.1		%		80-120	22-JUL-19
Sodium (Na)-Total			107.2		%		80-120	22-JUL-19
Strontium (Sr)-Total			98.9		%		80-120	22-JUL-19
Thallium (TI)-Total			105.8		%		80-120	22-JUL-19
Tin (Sn)-Total			99.3		%		80-120	22-JUL-19
Titanium (Ti)-Total			100.7		%		80-120	22-JUL-19
Uranium (U)-Total			105.3		%		80-120	22-JUL-19
Vanadium (V)-Total			99.7		%		80-120	22-JUL-19
Zinc (Zn)-Total			100.1		%		80-120	22-JUL-19
WG3110273-1 MB								
Aluminum (Al)-Total			<0.0030		mg/L		0.003	22-JUL-19
Antimony (Sb)-Total			<0.00010		mg/L		0.0001	22-JUL-19
Arsenic (As)-Total			<0.00010		mg/L		0.0001	22-JUL-19
Barium (Ba)-Total			<0.00010		mg/L		0.0001	22-JUL-19
Bismuth (Bi)-Total			<0.000050		mg/L		0.00005	22-JUL-19
Boron (B)-Total			<0.010		mg/L		0.01	22-JUL-19
Cadmium (Cd)-Total			<0.0000050		mg/L		0.000005	22-JUL-19
Calcium (Ca)-Total			<0.050		mg/L		0.05	22-JUL-19
Chromium (Cr)-Total			<0.00010		mg/L		0.0001	22-JUL-19
Cobalt (Co)-Total			<0.00010		mg/L		0.0001	22-JUL-19
Copper (Cu)-Total			<0.00050		mg/L		0.0005	22-JUL-19
Iron (Fe)-Total			<0.010		mg/L		0.01	22-JUL-19
Lead (Pb)-Total			<0.000050		mg/L		0.00005	22-JUL-19
Lithium (Li)-Total			<0.0010		mg/L		0.001	22-JUL-19
Magnesium (Mg)-Total			<0.0050		mg/L		0.005	22-JUL-19
Manganese (Mn)-Total			<0.00010		mg/L		0.0001	22-JUL-19
Molybdenum (Mo)-Tota	al		<0.000050		mg/L		0.00005	22-JUL-19
Nickel (Ni)-Total			<0.00050		mg/L		0.0005	22-JUL-19
Potassium (K)-Total			<0.050		mg/L		0.05	22-JUL-19
Selenium (Se)-Total			<0.000050		mg/L		0.00005	22-JUL-19
Silicon (Si)-Total			<0.10		mg/L		0.1	22-JUL-19
Silver (Ag)-Total			<0.000010		mg/L		0.00001	22-JUL-19
Sodium (Na)-Total			<0.050		mg/L		0.05	22-JUL-19
Strontium (Sr)-Total			<0.00020		mg/L		0.0002	22-JUL-19



Workorder: L2312625

Report Date: 26-JUL-19 Page 7 of 14

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-VA	Water							
Batch R4720253								
<b>WG3110273-1 MB</b> Thallium (TI)-Total			<0.00001	0	mg/L		0.00001	22-JUL-19
Tin (Sn)-Total			<0.00010		mg/L		0.0001	22-JUL-19
Titanium (Ti)-Total			<0.00030		mg/L		0.0003	22-JUL-19
Uranium (U)-Total			<0.00001	0	mg/L		0.00001	22-JUL-19
Vanadium (V)-Total			<0.00050		mg/L		0.0005	22-JUL-19
Zinc (Zn)-Total			<0.0030		mg/L		0.003	22-JUL-19
Batch R4723949								
WG3113409-2 LCS Aluminum (Al)-Total			100.2		%		80-120	24-JUL-19
Antimony (Sb)-Total			98.5		%		80-120	24-JUL-19
Arsenic (As)-Total			99.8		%		80-120	24-JUL-19
Barium (Ba)-Total			102.6		%		80-120	24-JUL-19
Bismuth (Bi)-Total			102.5		%		80-120	24-JUL-19
Boron (B)-Total			99.7		%		80-120	24-JUL-19
Cadmium (Cd)-Total			101.2		%		80-120	24-JUL-19
Calcium (Ca)-Total			103.8		%		80-120	24-JUL-19
Chromium (Cr)-Total			101.1		%		80-120	24-JUL-19
Cobalt (Co)-Total			99.3		%		80-120	24-JUL-19
Copper (Cu)-Total			98.5		%		80-120	24-JUL-19
Iron (Fe)-Total			98.8		%		80-120	24-JUL-19
Lead (Pb)-Total			98.6		%		80-120	24-JUL-19
Lithium (Li)-Total			98.4		%		80-120	24-JUL-19
Magnesium (Mg)-Total			107.3		%		80-120	24-JUL-19
Manganese (Mn)-Total			102.7		%		80-120	24-JUL-19
Molybdenum (Mo)-Tota	I		97.8		%		80-120	24-JUL-19
Nickel (Ni)-Total			100.2		%		80-120	24-JUL-19
Potassium (K)-Total			106.7		%		80-120	24-JUL-19
Selenium (Se)-Total			99.8		%		80-120	24-JUL-19
Silicon (Si)-Total			107.7		%		80-120	24-JUL-19
Silver (Ag)-Total			99.7		%		80-120	24-JUL-19
Sodium (Na)-Total			109.9		%		80-120	24-JUL-19
Strontium (Sr)-Total			96.8		%		80-120	24-JUL-19
Thallium (TI)-Total			99.0		%		80-120	24-JUL-19
Tin (Sn)-Total			97.4		%		80-120	24-JUL-19



Workorder: L2312625

Report Date: 26-JUL-19

Page 8 of 14

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-VA	Water							
Batch R4723949								
WG3113409-2 LCS			404.0		0.4			
Titanium (Ti)-Total			101.2		%		80-120	24-JUL-19
Uranium (U)-Total			104.6		%		80-120	24-JUL-19
Vanadium (V)-Total			103.2		%		80-120	24-JUL-19
Zinc (Zn)-Total			101.4		%		80-120	24-JUL-19
WG3113409-1 MB Aluminum (Al)-Total			<0.0030		mg/L		0.003	24-JUL-19
Antimony (Sb)-Total			<0.00010	)	mg/L		0.0001	24-JUL-19
Arsenic (As)-Total			<0.00010	)	mg/L		0.0001	24-JUL-19
Barium (Ba)-Total			<0.00010	)	mg/L		0.0001	24-JUL-19
Bismuth (Bi)-Total			< 0.00005	50	mg/L		0.00005	24-JUL-19
Boron (B)-Total			<0.010		mg/L		0.01	24-JUL-19
Cadmium (Cd)-Total			<0.00000	)5C	mg/L		0.000005	24-JUL-19
Calcium (Ca)-Total			< 0.050		mg/L		0.05	24-JUL-19
Chromium (Cr)-Total			<0.00010	)	mg/L		0.0001	24-JUL-19
Cobalt (Co)-Total			<0.00010	)	mg/L		0.0001	24-JUL-19
Copper (Cu)-Total			<0.00050	)	mg/L		0.0005	24-JUL-19
Iron (Fe)-Total			<0.010		mg/L		0.01	24-JUL-19
Lead (Pb)-Total			< 0.00005	50	mg/L		0.00005	24-JUL-19
Lithium (Li)-Total			<0.0010		mg/L		0.001	24-JUL-19
Magnesium (Mg)-Total			<0.0050		mg/L		0.005	24-JUL-19
Manganese (Mn)-Total			<0.00010	)	mg/L		0.0001	24-JUL-19
Molybdenum (Mo)-Total			< 0.00005	50	mg/L		0.00005	24-JUL-19
Nickel (Ni)-Total			<0.00050	)	mg/L		0.0005	24-JUL-19
Potassium (K)-Total			< 0.050		mg/L		0.05	24-JUL-19
Selenium (Se)-Total			<0.00005	50	mg/L		0.00005	24-JUL-19
Silicon (Si)-Total			<0.10		mg/L		0.1	24-JUL-19
Silver (Ag)-Total			<0.00001	10	mg/L		0.00001	24-JUL-19
Sodium (Na)-Total			< 0.050		mg/L		0.05	24-JUL-19
Strontium (Sr)-Total			<0.00020	)	mg/L		0.0002	24-JUL-19
Thallium (TI)-Total			<0.00001	10	mg/L		0.00001	24-JUL-19
Tin (Sn)-Total			<0.00010	)	mg/L		0.0001	24-JUL-19
Titanium (Ti)-Total			<0.00030	)	mg/L		0.0003	24-JUL-19
Uranium (U)-Total			<0.00001	10	mg/L		0.00001	24-JUL-19
Vanadium (V)-Total			<0.00050	)	mg/L		0.0005	24-JUL-19



Workorder: L2312625

Report Date: 26-JUL-19 Page 9 of 14

Test	Matrix	Reference	Result Qua	alifier Units	RPD	Limit	Analyzed
MET-T-CCMS-VA  Batch R4723949  WG3113409-1 MB  Zinc (Zn)-Total	Water		<0.0030	mg/L		0.003	24-JUL-19
NH3-L-F-CL Batch R4723816 WG3113380-10 LCS	Water						
Ammonia as N  WG3113380-9 MB			106.4	%		85-115	23-JUL-19
Ammonia as N NO2-L-IC-N-CL	Water		<0.0050	mg/L		0.005	23-JUL-19
Batch R4718872 WG3110543-10 LCS Nitrite (as N)			98.2	%		90-110	18-JUL-19
<b>WG3110543-9 MB</b> Nitrite (as N)			<0.0010	mg/L		0.001	18-JUL-19
NO3-L-IC-N-CL  Batch R4718872  WG3110543-10 LCS  Nitrate (as N)	Water		96.5	%		90-110	18-JUL-19
WG3110543-9 MB Nitrate (as N)			<0.0050	mg/L		0.005	18-JUL-19
ORP-CL  Batch R4720463  WG3112467-5 CRM  ORP	Water	CL-ORP	227	mV		210-230	22-JUL-19
P-T-L-COL-CL  Batch R4720267  WG3112048-17 LCS	Water						
Phosphorus (P)-Total WG3112048-4 MB			108.0	%		80-120	22-JUL-19
Phosphorus (P)-Total  PH-CL  Batch R4723837	Water		<0.0020	mg/L		0.002	22-JUL-19
<b>WG3113843-20 LCS</b> pH			7.03	рН		6.9-7.1	23-JUL-19



Workorder: L2312625

Report Date: 26-JUL-19 Page 10 of 14

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PO4-DO-L-COL-CL	Water							
Batch R4718231 WG3109249-10 LCS Orthophosphate-Dissolve	d (as P)		103.8		%		80-120	18-JUL-19
WG3109249-9 MB Orthophosphate-Dissolve	, ,		<0.0010		mg/L		0.001	18-JUL-19
SO4-IC-N-CL	Water							
Batch R4718872 WG3110543-10 LCS Sulfate (SO4)			96.5		%		90-110	18-JUL-19
<b>WG3110543-9 MB</b> Sulfate (SO4)			<0.30		mg/L		0.3	18-JUL-19
SOLIDS-TDS-CL	Water							
Batch R4723901								
WG3112552-5 LCS Total Dissolved Solids			94.8		%		85-115	23-JUL-19
WG3112552-8 LCS Total Dissolved Solids			101.2		%		85-115	23-JUL-19
WG3112552-4 MB Total Dissolved Solids			<10		mg/L		10	23-JUL-19
WG3112552-7 MB Total Dissolved Solids			<10		mg/L		10	23-JUL-19
TEH-BC-VA-CL	Water							
Batch R4714615 WG3108827-16 LCS								
EPH10-19			94.3		%		70-130	20-JUL-19
EPH19-32			96.1		%		70-130	20-JUL-19
<b>WG3108827-4 LCS</b> EPH10-19			87.9		%		70-130	18-JUL-19
EPH19-32			86.3		%		70-130	18-JUL-19
<b>WG3108827-15 MB</b> EPH10-19			<0.25		mg/L			
EPH19-32			<0.25		mg/L		0.25 0.25	20-JUL-19 20-JUL-19
Surrogate: 2-Bromobenzo	trifluoride		72.7		%		60-140	20-JUL-19 20-JUL-19
<b>WG3108827-3 MB</b> EPH10-19								
EPH10-19 EPH19-32			<0.25 <0.25		mg/L mg/L		0.25 0.25	18-JUL-19 18-JUL-19
Surrogate: 2-Bromobenzo	trifluoride		82.0		//////////////////////////////////////		60-140	18-JUL-19
-	Water				, -		00 140	10 00L-10



Workorder: L2312625

Report Date: 26-JUL-19 Page 11 of 14

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
TEH-WATER-VA-CL	Water							
Batch R4714615								
<b>WG3108827-16 LCS</b> TEH (C10-C30)			94.7		%		70-130	20-JUL-19
<b>WG3108827-4 LCS</b> TEH (C10-C30)			87.5		%		70-130	18-JUL-19
WG3108827-15 MB			01.0		70		70-130	10-302-19
TEH (C10-C30)			<0.25		mg/L		0.25	20-JUL-19
Surrogate: 2-Bromoben	zotrifluoride		72.7		%		60-140	20-JUL-19
<b>WG3108827-3 MB</b> TEH (C10-C30)			<0.25		mg/L		0.25	18-JUL-19
Surrogate: 2-Bromoben	zotrifluoride		82.0		%		60-140	18-JUL-19
TKN-L-F-CL	Water							
Batch R4720840								
WG3112859-10 LCS Total Kjeldahl Nitrogen			97.1		%		75-125	23-JUL-19
WG3112859-14 LCS Total Kjeldahl Nitrogen			98.9		%		75-125	23-JUL-19
WG3112859-18 LCS Total Kjeldahl Nitrogen			98.9		%		75-125	23-JUL-19
WG3112859-2 LCS Total Kjeldahl Nitrogen			102.9		%		75-125	23-JUL-19
WG3112859-22 LCS Total Kjeldahl Nitrogen			98.4		%		75-125	23-JUL-19
WG3112859-26 LCS Total Kjeldahl Nitrogen			103.7		%		75-125	23-JUL-19
WG3112859-6 LCS Total Kjeldahl Nitrogen			99.0		%		75-125	23-JUL-19
<b>WG3112859-1 MB</b> Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	23-JUL-19
WG3112859-13 MB Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	23-JUL-19
WG3112859-17 MB Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	23-JUL-19
WG3112859-21 MB Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	
WG3112859-25 MB								23-JUL-19
Total Kjeldahl Nitrogen WG3112859-5 MB			<0.050		mg/L		0.05	23-JUL-19
Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	23-JUL-19



Workorder: L2312625

Report Date: 26-JUL-19 Page 12 of 14

Test	Matrix	Reference	Result	Qualifier Unit	s RPD	Limit	Analyzed
TKN-L-F-CL	Water						
Batch R4720840 WG3112859-9 MB Total Kjeldahl Nitrogen			<0.050	mg/	L	0.05	23-JUL-19
TSS-L-CL	Water						
Batch R4726150 WG3112600-8 LCS Total Suspended Solids			96.1	%		85-115	24-JUL-19
WG3112600-7 MB Total Suspended Solids			<1.0	mg/	L	1	24-JUL-19
TURBIDITY-CL	Water						
Batch R4715512 WG3108836-11 LCS Turbidity			95.0	%		85-115	18-JUL-19
WG3108836-10 MB Turbidity			<0.10	NTU	J	0.1	18-JUL-19

Workorder: L2312625 Report Date: 26-JUL-19 Page 13 of 14

Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard

#### **Sample Parameter Qualifier Definitions:**

LCSD Laboratory Control Sample Duplicate

Qualifier	Description
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

Workorder: L2312625 Report Date: 26-JUL-19 Page 14 of 14

#### **Hold Time Exceedances:**

	Sample				-		-
ALS Product Description	ID	Sampling Date	Date Processed	Rec. HT	Actual HT	Units	Qualifier
Physical Tests							
Oxidation redution potential	l by elect.						
	1	17-JUL-19 12:50	22-JUL-19 12:10	0.25	119	hours	EHTR-FM
	2	17-JUL-19 12:55	22-JUL-19 12:10	0.25	119	hours	EHTR-FN
	3	17-JUL-19 13:20	22-JUL-19 12:10	0.25	119	hours	EHTR-FM
рН							
	1	17-JUL-19 12:50	23-JUL-19 09:00	0.25	140	hours	EHTR-FM
	2	17-JUL-19 12:55	23-JUL-19 09:00	0.25	140	hours	EHTR-FM
	3	17-JUL-19 13:20	23-JUL-19 09:00	0.25	140	hours	EHTR-FM
Anions and Nutrients							
Nitrate in Water by IC (Low	Level)						
	1	17-JUL-19 12:50	25-JUL-19 09:44	3	8	days	EHT
Nitrite in Water by IC (Low	Level)						
	1	17-JUL-19 12:50	25-JUL-19 09:44	3	8	days	EHT
Logand & Qualifier Definition	201						

#### Legend & Qualifier Definitions:

EHTR-FM: Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended.

EHTR: Exceeded ALS recommended hold time prior to sample receipt.

EHTL: Exceeded ALS recommended hold time prior to analysis. Sample was received less than 24 hours prior to expiry.

EHT: Exceeded ALS recommended hold time prior to analysis.

Rec. HT: ALS recommended hold time (see units).

#### Notes\*:

Where actual sampling date is not provided to ALS, the date (& time) of receipt is used for calculation purposes. Where actual sampling time is not provided to ALS, the earlier of 12 noon on the sampling date or the time (& date) of receipt is used for calculation purposes. Samples for L2312625 were received on 18-JUL-19 09:00.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against predetermined data quality objectives to provide confidence in the accuracy of associated test results.

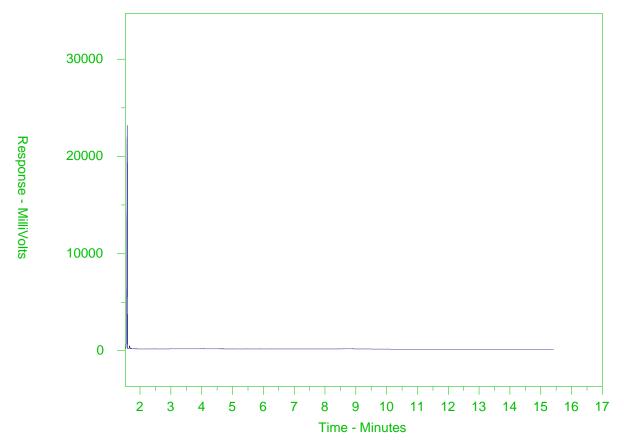
Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

#### CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT



ALS Sample ID: L2312625-1

Client Sample ID: LC\_PIZP1101\_WG\_Q3-2019\_N



<b>←</b> F2	F3 —		F4	
nC10	nC16	nC34	nC50	
174°C	287°C	481°C	575°C	
346'F	549'F	898'F	1067'F	
← Gasoli	ne ->	←	Motor Oils/ Lube Oils/ Grease	
<del></del>	Diesel/ Jet Fuels			

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at <a href="https://www.alsglobal.com">www.alsglobal.com</a>.

Teck

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Project Manage						Lab	Contact							ւմ		urton@tec		*	x	
	Chris.Blurton@teck.com			<u> </u>					-	-	SGlobal.com	1	Em:	ul 2:		l@equiso			20 2 3	, t
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<u></u>	15km North Hwy 43													ail 4:	kirsten.ca	mpbell@te		x	<b>x</b>	
City	· · · · · · · · · · · · · · · · · · ·			Province BC			City	-			Province	AB	POn	umber	į <u> </u>		VPO00	608129		
Postal Code		60		Country Can	ada		stal Code				Country	Canada					_			
	250-425-3196					Phone	Number	403	407 1794											
	SAMPLE	DETAILS					Alexandra		· · . ·	AN	ALYSIS RE	QUESTE			0.00		Filteral - Fil	rield, L.: Lab	F12 Field &	Lan, ?
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	Sample Location	Field	Hazardous Material (Yes/No)		Time	G=Grab	#Of	SISTEMA .	ALS_Package-DOC	ALS_Package-EPH	HG-D-CVAF-VA	HG-T-CVAF-VA	TECKCOAL-MET-D-VA	TECKCOAL-MET-T-VA	TECKCOAL-ROUTINE- VA	ALS_Package-TKN/TOC				
Sample 1D	(sys loc code)	Matrix	Haz	Date	(24hr)	C=Comp			Ĭ	💥	보	≗	E	Ξ	₹ ₹	5				
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	ncy (1 Business Day) - 100%			Sampler's Signat								+	Time	<del> </del>	_	<u> </u>	ıly 17, 20			



TECK COAL LIMITED (LINE CREEK)

ATTN: Carla Froyman Parker

PO BOX 2003

SPARWOOD BC VOB 2G0

Date Received: 16-AUG-19

Report Date: 24-AUG-19 13:01 (MT)

Version: FINAL

Client Phone: 250-425-6111

# Certificate of Analysis

Lab Work Order #: L2330360
Project P.O. #: VP000608129

Job Reference: LINE CREEK OPERATION
C of C Numbers: 20190815- DC GROUND

Legal Site Desc:



Lyudmyla Shvets, B.Sc. Account Manager

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L2330360 CONTD.... PAGE 2 of 14 Version: FINAL

1.96 <0.050 1.82 <0.020 FIELD		0.50 0.050 0.50	mg/L mg/L mg/L		17-AUG-19 23-AUG-19 17-AUG-19	R4758969 R4767149
<0.050 1.82 <0.020		0.050	mg/L		23-AUG-19	R4767149
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<0.050 1.82 <0.020		0.050	mg/L		23-AUG-19	R4767149
1.82			_			
<0.020		0.50	mg/L		17-AUG-19	
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FIELD		0.020	ug/L	18-AUG-19	18-AUG-19	R4759365 R4758455
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FIELD					18-AUG-19	R4758455
<0.0030		0.0030	mg/L	18-AUG-19	19-AUG-19	R4759365
0.00021		0.00010	mg/L	18-AUG-19	19-AUG-19	R4759365
<0.00010		0.00010	mg/L	18-AUG-19	19-AUG-19	R4759365
0.167		0.00010	mg/L	18-AUG-19	19-AUG-19	R4759365
<0.000050		0.000050	mg/L	18-AUG-19	19-AUG-19	R4759365
0.010		0.010	mg/L	18-AUG-19	19-AUG-19	R4759365
0.119		0.0050	ug/L	18-AUG-19	19-AUG-19	R4759365
65.0		0.050	mg/L	18-AUG-19	19-AUG-19	R4759365
<0.00010		0.00010	mg/L	18-AUG-19	19-AUG-19	R4759365
<0.10		0.10	ug/L	18-AUG-19	19-AUG-19	R4759365
<0.00050		0.00050	mg/L	18-AUG-19	19-AUG-19	R4759365
<0.010		0.010	mg/L	18-AUG-19	19-AUG-19	R4759365
<0.000050		0.000050	mg/L	18-AUG-19	19-AUG-19	R4759365
0.0106		0.0010	mg/L	18-AUG-19	19-AUG-19	R4759365
23.9		0.10	mg/L	18-AUG-19	19-AUG-19	R4759365
		0.00010	mg/L	18-AUG-19	19-AUG-19	R4759365
		0.000050	-			R4759365
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261		0.50	mg/L		20-AUG-19	
			J		-	
<0.020		0.020	ug/L		19-AUG-19	R4761148
0.0036		0.0030	mg/L		19-AUG-19	R4761148
0.00021		0.00010	mg/L		19-AUG-19	R4761148
<0.00010		0.00010	mg/L		19-AUG-19	R4761148
	<0.0030 0.00021 <0.00010 0.167 <0.000050 0.010 0.119 65.0 <0.00010 <0.00050 0.010 <0.00050 0.0106 23.9 <0.00010 0.00178 0.00088 2.05 4.12 3.03 <0.000010 0.762 0.0643 <0.000010 <0.00010 <0.00010 <0.00010 <0.00010 <0.00010 <0.00010 <0.00010 <0.00010 <0.000756 0.00057 0.00027 261 <0.0036 0.00021	FIELD  FIELD  <0.0030 0.00021 <0.00010 0.167 <0.000050 0.010 0.119 65.0 <0.00010 <0.10 <0.00050 <0.010 <0.00050 0.0106 23.9 <0.00010 0.00178 0.00088 2.05 4.12 3.03 <0.000010 0.762 0.0643 <0.00010 <0.00010 <0.00010 <0.00010 <0.00010 <0.00010 <0.00010 <0.000756 0.00057 0.00027  261  <0.0020 0.0036 0.00021	FIELD  FIELD  <0.0030 0.00021 0.00010 0.167 0.00010 0.167 0.000050 0.010 0.119 0.0050 65.0 0.00010 0.10 0.10 0.10 0.00050 0.010 0.00050 0.010 0.00050 0.010 0.00050 0.010 0.00050 0.010 0.00050 0.0106 23.9 0.10 0.00010 0.00010 0.00010 0.00018 0.00010 0.00018 0.00050 0.00050 0.00050 0.00050 0.00050 0.00050 0.00050 0.00010 0.00010 0.00010 0.00010 0.00010 0.00010 0.00010 0.00010 0.000010 0.000010 0.000010 0.000010 0.000010 0.000010 0.000010 0.00010 0.000010	FIELD  FIELD  <0.0030 0.00021 0.00010 0.167 0.00010 0.167 0.000050 0.010 0.119 0.0050 0.0001 0.00010 0.00010 0.0119 0.00010 0.00010 0.010 0.010 0.010 0.00010 0.00010 0.00010 0.00010 0.00010 0.00050 0.00050 0.00050 0.00050 0.00050 0.00050 0.00050 0.00050 0.00060 0.0010 0.0010 0.0010 0.000010 0.	FIELD  FIELD  <0.0030 0.00021 0.00010 mg/L 0.00010 0.00010 mg/L 18-AUG-19 0.167 0.00010 0.00010 mg/L 18-AUG-19 0.167 0.000050 0.00050 mg/L 18-AUG-19 0.119 0.010 0.119 0.0050 0.0050 mg/L 18-AUG-19 0.119 0.0050 mg/L 18-AUG-19 0.00010 mg/L 18-AUG-19 0.00010 0.00010 mg/L 18-AUG-19 0.00010 0.00010 mg/L 18-AUG-19 0.10 0.10 0.10 0.10 0.10 0.10 0.00050 mg/L 18-AUG-19 0.00050 0.00050 mg/L 18-AUG-19 0.00050 0.00050 mg/L 18-AUG-19 0.010 0.010 mg/L 18-AUG-19 0.00050 0.000050 mg/L 18-AUG-19 0.00050 0.000050 mg/L 18-AUG-19 0.00010 mg/L 18-AUG-19 0.00010 mg/L 18-AUG-19 0.00010 mg/L 18-AUG-19 0.00010 mg/L 18-AUG-19 0.00010 mg/L 18-AUG-19 0.00088 0.00050 mg/L 18-AUG-19 18-AUG-19 0.00088 0.00050 mg/L 18-AUG-19 0.00088 0.00050 mg/L 18-AUG-19 0.00088 0.00050 mg/L 18-AUG-19 0.00643 0.000010 0.000010 mg/L 18-AUG-19 0.0643 0.000010 0.000010 mg/L 18-AUG-19 0.0643 0.000010 0.000010 mg/L 18-AUG-19 0.00643 0.000010 0.000010 mg/L 18-AUG-19 0.00643 0.000010 0.000010 mg/L 18-AUG-19 0.00643 0.000010 0.000010 mg/L 18-AUG-19 0.00057 0.000010 mg/L 18-AUG-19 0.000756 0.000010 mg/L 18-AUG-19 0.000756 0.000010 mg/L 18-AUG-19 0.000756 0.000010 mg/L 18-AUG-19 0.000756 0.000010 mg/L 18-AUG-19 0.000756 0.000010 mg/L 18-AUG-19 0.000756 0.000010 mg/L 18-AUG-19 0.000756 0.000010 mg/L 18-AUG-19 0.000756 0.000010 mg/L 18-AUG-19 0.000756 0.000010 mg/L 18-AUG-19 0.000756 0.000010 mg/L 18-AUG-19 0.000756 0.000010 mg/L 18-AUG-19 0.000756 0.000010 mg/L 18-AUG-19 0.000756 0.000010 mg/L 18-AUG-19 0.000756 0.000010 mg/L 18-AUG-19 0.000756 0.000010 mg/L 18-AUG-19 0.000756 0.000010 mg/L 18-AUG-19 0.000756 0.000010 mg/L 18-AUG-19 0.000756 0.000010 mg/L 18-AUG-19 0.000766 0.000010 mg/L 18-AUG-19 0.000766 0.000010 mg/L 18-AUG-19 0.000010 mg/L 18-AUG-19 0.000010 mg/L 18-AUG-19 0.000010 mg/L 18-AUG-19 0.000010 mg/L 18-AUG-19 0.000010 mg/L 18-AUG-19 0.000010 mg/L 18-AUG-19 0.000010 mg/L 18-AUG-19 0.000010 mg/L 18-AUG-19 0.000010 mg/L 18-AUG-19 0.000010 mg/L 18-AUG-19 0.000010 mg/L 18-AUG-19 0.000010 mg/L 18-AUG-19 0.000010 mg/L 18-AUG-19 0.000010 mg/L 18-AUG-19 0.000010 m	FIELD  FIELD  CO.0030  CO.0030  CO.00021  CO.00010  CO.00010  CO.00010  CO.00010  CO.00010  CO.00010  CO.00010  CO.000050  CO.0050  CO.0

<sup>\*</sup> Refer to Referenced Information for Qualifiers (if any) and Methodology.

L2330360 CONTD.... PAGE 3 of 14 Version: FINAL

Sample Details/Parameters	Result	Qualifier* D.	L. Units	Extracted	Analyzed	Batch
L2330360-1 LC_PIZDC1306_WG_Q3-2019_NP						
Sampled By: KC/DT on 15-AUG-19 @ 11:55						
Matrix: WG						
Total Metals in Water by CRC ICPMS Barium (Ba)-Total	0.162	0.00	0010 mg/L		19-AUG-19	R4761148
Bismuth (Bi)-Total	<0.000050		0050 mg/L		19-AUG-19	R4761148
Boron (B)-Total	0.011		)10 mg/L		19-AUG-19	R4761148
Cadmium (Cd)-Total	0.121		050 ug/L		19-AUG-19	R4761148
Calcium (Ca)-Total	58.3		)50 mg/L		19-AUG-19	R4761148
Chromium (Cr)-Total	<0.00010	0.00	0010 mg/L		19-AUG-19	R4761148
Cobalt (Co)-Total	<0.10	0.	10 ug/L		19-AUG-19	R4761148
Copper (Cu)-Total	<0.00050	0.00	0050 mg/L		19-AUG-19	R4761148
Iron (Fe)-Total	<0.010	0.0	)10 mg/L		19-AUG-19	R4761148
Lead (Pb)-Total	<0.000050	0.00	0050 mg/L		19-AUG-19	R4761148
Lithium (Li)-Total	0.0093	0.0	010 mg/L		19-AUG-19	R4761148
Magnesium (Mg)-Total	22.6	0.	10 mg/L		19-AUG-19	R4761148
Manganese (Mn)-Total	<0.00010	0.00	0010 mg/L		19-AUG-19	R4761148
Molybdenum (Mo)-Total	0.00200		0050 mg/L		19-AUG-19	R4761148
Nickel (Ni)-Total	0.00108		0050 mg/L		19-AUG-19	R4761148
Potassium (K)-Total	1.96		)50 mg/L		19-AUG-19	R4761148
Selenium (Se)-Total	3.83		)50 ug/L		19-AUG-19	R4761148
Silicon (Si)-Total	3.02		10 mg/L		19-AUG-19	R4761148
Silver (Ag)-Total	<0.000010		0010 mg/L		19-AUG-19	R4761148
Sodium (Na)-Total	0.743		050 mg/L		19-AUG-19	R4761148
Strontium (Sr)-Total	0.0656		0020 mg/L		19-AUG-19	R4761148
Thallium (TI)-Total	<0.000010		0010 mg/L		19-AUG-19	R4761148
Tin (Sn)-Total Titanium (Ti)-Total	<0.00010		0010 mg/L		19-AUG-19	R4761148
Uranium (U)-Total	<0.010 0.000790		010 mg/L 0010 mg/L		19-AUG-19 19-AUG-19	R4761148
Vanadium (V)-Total	0.000790		0010 mg/L 0050 mg/L		19-AUG-19	R4761148 R4761148
Zinc (Zn)-Total	0.00082		030 mg/L		19-AUG-19	R4761148
Routine for Teck Coal	0.0036	0.0	030   1119/L		19-400-19	K4701146
Acidity by Automatic Titration						
Acidity (as CaCO3)	8.7	1	.0 mg/L		16-AUG-19	R4758799
Alkalinity (Species) by Manual Titration	J.,					
Alkalinity, Bicarbonate (as CaCO3)	256	1	.0 mg/L		19-AUG-19	R4759679
Alkalinity, Carbonate (as CaCO3)	<1.0	1	.0 mg/L		19-AUG-19	R4759679
Alkalinity, Hydroxide (as CaCO3)	<1.0	1	.0 mg/L		19-AUG-19	R4759679
Alkalinity, Total (as CaCO3)	256	1	.0 mg/L		19-AUG-19	R4759679
Ammonia, Total (as N)						
Ammonia as N	<0.0050	0.0	050 mg/L		21-AUG-19	R4763232
Bromide in Water by IC (Low Level)						
Bromide (Br)	<0.050	0.0	)50 mg/L		17-AUG-19	R4758315
Chloride in Water by IC					47 41.0	
Chloride (CI)	<0.50	0.	50 mg/L		17-AUG-19	R4758315
Electrical Conductivity (EC)	460		.0 uS/cm		10 110 10	D4750670
Conductivity (@ 25C)	462	2	.0 uS/cm		19-AUG-19	R4759679
Fluoride in Water by IC Fluoride (F)	0.184		)20 mg/L		17-AUG-19	R4758315
Ion Balance Calculation	0.104	0.0	,20 IIIg/L		17-700-19	1147 303 13
Ion Balance Calculation	100	_1	00 %		20-AUG-19	
Ion Balance Calculation		'	,,,			
Cation - Anion Balance	0.0		%		20-AUG-19	
Anion Sum	5.29		meq/L		20-AUG-19	
Cation Sum	5.29		meq/L		20-AUG-19	
Nitrate in Water by IC (Low Level)			·			
	l					

<sup>\*</sup> Refer to Referenced Information for Qualifiers (if any) and Methodology.

L2330360 CONTD.... PAGE 4 of 14 Version: FINAL

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2330360-1 LC PIZDC1306 WG Q3-2019 NP							
Sampled By: KC/DT on 15-AUG-19 @ 11:55							
Matrix: WG							
Nitrate in Water by IC (Low Level) Nitrate (as N)	0.154		0.0050	mg/L		17-AUG-19	R4758315
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	<0.0010		0.0010	mg/L		17-AUG-19	R4758315
Orthophosphate-Dissolved (as P) Orthophosphate-Dissolved (as P)	0.0014		0.0010	mg/L		17-AUG-19	R4758793
Oxidation redution potential by elect.	0.0014		0.0010	mg/L		17-400-13	114730793
ORP	403		-1000	mV		22-AUG-19	R4765275
Phosphorus (P)-Total							
Phosphorus (P)-Total	<0.0020		0.0020	mg/L		21-AUG-19	R4762516
Sulfate in Water by IC Sulfate (SO4)	6.97		0.30	mg/L		17-AUG-19	R4758315
Total Dissolved Solids				3			
Total Dissolved Solids	243	DLHC	20	mg/L		22-AUG-19	R4766512
Total Suspended Solids Total Suspended Solids	-4.0		4.0	ma/l		22-AUG-19	D4767407
Turbidity	<1.0		1.0	mg/L		22-AUG-19	R4767427
Turbidity	0.13		0.10	NTU		16-AUG-19	R4757865
pH							
pH	8.13		0.10	рН		19-AUG-19	R4759679
L2330360-2 LC_PIZDC1404D_WG_Q3-2019_NP							
Sampled By: KC/DT on 15-AUG-19 @ 12:20							
Matrix: WG							
Miscellaneous Parameters	4.04		0.50			47 4110 40	D 4750000
Dissolved Organic Carbon	1.91		0.50	mg/L		17-AUG-19	R4758969
Total Kjeldahl Nitrogen	2.73		0.050	mg/L		23-AUG-19 17-AUG-19	R4767149
Total Organic Carbon  Dissolved Metals in Water	1.92		0.50	mg/L		17-AUG-19	R4758969
Diss. Be (low) in Water by CRC ICPMS							
Beryllium (Be)-Dissolved	<0.020		0.020	ug/L	18-AUG-19	19-AUG-19	R4759365
Dissolved Metals Filtration Location	FIELD					18-AUG-19	R4758455
Diss. Mercury in Water by CVAAS or CVAFS						<b>_</b>	
Mercury (Hg)-Dissolved Dissolved Mercury Filtration Location	<0.000050 FIELD		0.0000050	mg/L	22-AUG-19	22-AUG-19 22-AUG-19	R4763368 R4765151
Dissolved Metals in Water by CRC ICPMS	FIELD					22-AUG-19	K4/05151
Dissolved Metals Filtration Location	FIELD					18-AUG-19	R4758455
Aluminum (AI)-Dissolved	<0.0030		0.0030	mg/L	18-AUG-19	19-AUG-19	R4759365
Antimony (Sb)-Dissolved	<0.00010		0.00010	mg/L	18-AUG-19	19-AUG-19	R4759365
Arsenic (As)-Dissolved	0.00201		0.00010	mg/L	18-AUG-19	19-AUG-19	R4759365
Barium (Ba)-Dissolved	4.39		0.00010	mg/L	18-AUG-19	19-AUG-19	R4759365
Bismuth (Bi)-Dissolved Boron (B)-Dissolved	<0.000050		0.000050	mg/L	18-AUG-19 18-AUG-19	19-AUG-19 19-AUG-19	R4759365
Cadmium (Cd)-Dissolved	0.024 <0.010	DLM	0.010 0.010	mg/L ug/L	18-AUG-19 18-AUG-19	19-AUG-19 19-AUG-19	R4759365 R4759365
Calcium (Ca)-Dissolved	61.0		0.010	mg/L	18-AUG-19	19-AUG-19	R4759365
Chromium (Cr)-Dissolved	<0.00010		0.00010	mg/L	18-AUG-19	19-AUG-19	R4759365
Cobalt (Co)-Dissolved	0.14		0.10	ug/L	18-AUG-19	19-AUG-19	R4759365
Copper (Cu)-Dissolved	<0.00050		0.00050	mg/L	18-AUG-19	19-AUG-19	R4759365
Iron (Fe)-Dissolved	2.02		0.010	mg/L	18-AUG-19	19-AUG-19	R4759365
Lead (Pb)-Dissolved	<0.000050		0.000050	mg/L	18-AUG-19	19-AUG-19	R4759365
Lithium (Li)-Dissolved Magnesium (Mg)-Dissolved	0.746		0.0010	mg/L	18-AUG-19	19-AUG-19	R4759365
Manganese (Mn)-Dissolved	44.6 0.0181		0.10 0.00010	mg/L mg/L	18-AUG-19 18-AUG-19	19-AUG-19 19-AUG-19	R4759365 R4759365
	3.0101		0.00010	g, L	107100-10	107100-10	11710000

<sup>\*</sup> Refer to Referenced Information for Qualifiers (if any) and Methodology.

L2330360 CONTD.... PAGE 5 of 14 Version: FINAL

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2330360-2 LC_PIZDC1404D_WG_Q3-2019_NP							
Sampled By: KC/DT on 15-AUG-19 @ 12:20							
' '							
Matrix: WG							
Dissolved Metals in Water by CRC ICPMS Molybdenum (Mo)-Dissolved	0.0225		0.000050	mg/L	18-AUG-19	19-AUG-19	R4759365
Nickel (Ni)-Dissolved	<0.0050		0.00050	mg/L	18-AUG-19	19-AUG-19	R4759365
Potassium (K)-Dissolved	27.0		0.0000	mg/L	18-AUG-19	19-AUG-19	R4759365
Selenium (Se)-Dissolved	<0.050		0.050	ug/L	18-AUG-19	19-AUG-19	R4759365
Silicon (Si)-Dissolved	2.84		0.050	mg/L	18-AUG-19	19-AUG-19	R4759365
Silver (Ag)-Dissolved	<0.00010		0.000010	mg/L	18-AUG-19	19-AUG-19	R4759365
Sodium (Na)-Dissolved	43.1		0.050	mg/L	18-AUG-19	19-AUG-19	R4759365
Strontium (Sr)-Dissolved	0.244		0.00020	mg/L	18-AUG-19	19-AUG-19	R4759365
Thallium (TI)-Dissolved	<0.00010		0.000010	mg/L	18-AUG-19	19-AUG-19	R4759365
Tin (Sn)-Dissolved	<0.00010		0.00010	mg/L	18-AUG-19	19-AUG-19	R4759365
Titanium (Ti)-Dissolved	<0.010		0.010	mg/L	18-AUG-19	19-AUG-19	R4759365
Uranium (U)-Dissolved	0.000072		0.000010	mg/L	18-AUG-19	19-AUG-19	R4759365
Vanadium (V)-Dissolved	<0.00050		0.00050	mg/L	18-AUG-19	19-AUG-19	R4759365
Zinc (Zn)-Dissolved	0.0028		0.0010	mg/L	18-AUG-19	19-AUG-19	R4759365
Hardness							
Hardness (as CaCO3)	336		0.50	mg/L		20-AUG-19	
Total Metals in Water							
Total Be (Low) in Water by CRC ICPMS							
Beryllium (Be)-Total	<0.020		0.020	ug/L		19-AUG-19	R4761148
Total Metals in Water by CRC ICPMS	0.0404		0.0000			10 110 10	D 4704440
Aluminum (Al)-Total	0.0184 <0.00010		0.0030	mg/L		19-AUG-19 19-AUG-19	R4761148
Antimony (Sb)-Total Arsenic (As)-Total	0.00010		0.00010 0.00010	mg/L mg/L		19-AUG-19	R4761148 R4761148
Barium (Ba)-Total	4.21		0.00010	mg/L		19-AUG-19	R4761148
Bismuth (Bi)-Total	<0.000050		0.00010	mg/L		19-AUG-19	R4761148
Boron (B)-Total	0.023		0.010	mg/L		19-AUG-19	R4761148
Cadmium (Cd)-Total	<0.020	DLM	0.010	ug/L		19-AUG-19	R4761148
Calcium (Ca)-Total	56.8		0.050	mg/L		19-AUG-19	R4761148
Chromium (Cr)-Total	0.00020		0.00010	mg/L		19-AUG-19	R4761148
Cobalt (Co)-Total	0.17		0.10	ug/L		19-AUG-19	R4761148
Copper (Cu)-Total	<0.00050		0.00050	mg/L		19-AUG-19	R4761148
Iron (Fe)-Total	2.25		0.010	mg/L		19-AUG-19	R4761148
Lead (Pb)-Total	0.000090		0.000050	mg/L		19-AUG-19	R4761148
Lithium (Li)-Total	0.661		0.0010	mg/L		19-AUG-19	R4761148
Magnesium (Mg)-Total	41.8		0.10	mg/L		19-AUG-19	R4761148
Manganese (Mn)-Total	0.0189		0.00010	mg/L		19-AUG-19	R4761148
Molybdenum (Mo)-Total	0.0240		0.000050	mg/L		19-AUG-19	R4761148
Nickel (Ni)-Total	0.00080		0.00050	mg/L		19-AUG-19	R4761148
Potassium (K)-Total	25.3		0.050	mg/L		19-AUG-19	R4761148
Selenium (Se)-Total	<0.050		0.050	ug/L		19-AUG-19	R4761148
Silicon (Si)-Total	2.94		0.10	mg/L		19-AUG-19	R4761148
Silver (Ag)-Total	<0.000010		0.000010	mg/L		19-AUG-19	R4761148
Sodium (Na)-Total	42.5		0.050	mg/L		19-AUG-19	R4761148
Strontium (Sr)-Total	0.250		0.00020	mg/L		19-AUG-19	R4761148
Thallium (TI)-Total	<0.000010		0.000010	mg/L		19-AUG-19	R4761148
Tin (Sn)-Total	<0.00010		0.00010	mg/L		19-AUG-19	R4761148
Titanium (Ti)-Total	<0.010		0.010	mg/L		19-AUG-19	R4761148
Uranium (U)-Total	0.000075		0.000010	mg/L		19-AUG-19	R4761148
Vanadium (V)-Total	<0.00050		0.00050	mg/L		19-AUG-19 19-AUG-19	R4761148
Zinc (Zn)-Total  Routine for Teck Coal	0.0047		0.0030	mg/L		19-400-19	R4761148
Acidity by Automatic Titration							

<sup>\*</sup> Refer to Referenced Information for Qualifiers (if any) and Methodology.

L2330360 CONTD.... PAGE 6 of 14 Version: FINAL

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2330360-2 LC_PIZDC1404D_WG_Q3-2019_NP							
Sampled By: KC/DT on 15-AUG-19 @ 12:20							
Matrix: WG							
Acidity by Automatic Titration							
Acidity (as CaCO3)	1.1		1.0	mg/L		16-AUG-19	R4758799
Alkalinity (Species) by Manual Titration							
Alkalinity, Bicarbonate (as CaCO3)	456		1.0	mg/L		19-AUG-19	R4759679
Alkalinity, Carbonate (as CaCO3) Alkalinity, Hydroxide (as CaCO3)	4.4		1.0	mg/L		19-AUG-19 19-AUG-19	R4759679
Alkalinity, Total (as CaCO3)	<1.0 460		1.0 1.0	mg/L mg/L		19-AUG-19	R4759679 R4759679
Ammonia, Total (as N)	400		1.0	IIIg/ L		107.00 10	114733073
Ammonia as N	2.72	DLHC	0.050	mg/L		21-AUG-19	R4763232
Bromide in Water by IC (Low Level)							
Bromide (Br)	<0.050		0.050	mg/L		17-AUG-19	R4758315
Chloride in Water by IC Chloride (CI)	<0.50		0.50	mg/L		17-AUG-19	R4758315
Electrical Conductivity (EC)	<b>~0.50</b>		5.50	g, L		1.7.00-10	11770010
Conductivity (@ 25C)	774		2.0	uS/cm		19-AUG-19	R4759679
Fluoride in Water by IC							
Fluoride (F)	0.245		0.020	mg/L		17-AUG-19	R4758315
Ion Balance Calculation Cation - Anion Balance	1.0			%		20-AUG-19	
Anion Sum	9.21			meg/L		20-AUG-19 20-AUG-19	
Cation Sum	9.39			meq/L		20-AUG-19	
Ion Balance Calculation							
Ion Balance	102		-100	%		20-AUG-19	
Nitrate in Water by IC (Low Level) Nitrate (as N)	<0.0050		0.0050	mg/L		17-AUG-19	R4758315
Nitrite in Water by IC (Low Level)	<0.0050		0.0050	IIIg/L		17-400-19	K4750315
Nitrite (as N)	<0.0010		0.0010	mg/L		17-AUG-19	R4758315
Orthophosphate-Dissolved (as P)							
Orthophosphate-Dissolved (as P)	<0.0010		0.0010	mg/L		17-AUG-19	R4758793
Oxidation redution potential by elect. ORP	431		-1000	mV		22-AUG-19	R4765275
Phosphorus (P)-Total	431		-1000	IIIV		22-400-19	K4703273
Phosphorus (P)-Total	0.0113		0.0020	mg/L		21-AUG-19	R4762516
Sulfate in Water by IC				_			
Sulfate (SO4)	<0.30		0.30	mg/L		17-AUG-19	R4758315
Total Dissolved Solids Total Dissolved Solids	426	DLHC	20	ma/l		22-AUG-19	D4766540
Total Suspended Solids	436		20	mg/L		22-400-19	R4766512
Total Suspended Solids	2.5		1.0	mg/L		22-AUG-19	R4767427
Turbidity							
Turbidity	18.2		0.10	NTU		16-AUG-19	R4757865
<b>pH</b> pH	8.29		0.10	рH		19-AUG-19	R4759679
L2330360-3 LC_PIZDC1404S_WG_Q3-2019_NP	0.23		0.10	Pil		10 /100-19	1100013
Sampled By: KC/DT on 15-AUG-19 @ 10:15							
Matrix: WG							
Miscellaneous Parameters							
Dissolved Organic Carbon	2.53		0.50	mg/L		17-AUG-19	R4758969
Total Kjeldahl Nitrogen	0.067		0.050	mg/L		23-AUG-19	R4767149
Total Organic Carbon	2.58		0.50	mg/L		17-AUG-19	R4758969
Dissolved Metals in Water							
Diss. Be (low) in Water by CRC ICPMS Beryllium (Be)-Dissolved	<0.020		0.020	ug/L	18-AUG-19	19-AUG-19	R4759365
Doryman (Do) Dissolved	<0.020	1	0.020	⊥ ug/∟	10-400-19	19-400-19	1741 29202

<sup>\*</sup> Refer to Referenced Information for Qualifiers (if any) and Methodology.

L2330360 CONTD.... PAGE 7 of 14 Version: FINAL

Sample Details/Parameters	Result	Qualifier* D.L.	Units	Extracted	Analyzed	Batch
L2330360-3 LC_PIZDC1404S_WG_Q3-2019_NP						
Sampled By: KC/DT on 15-AUG-19 @ 10:15						
Matrix: WG						
Diss. Be (low) in Water by CRC ICPMS Dissolved Metals Filtration Location	FIELD				18-AUG-19	R4758455
Diss. Mercury in Water by CVAAS or CVAFS						
Mercury (Hg)-Dissolved	<0.000050	0.000050	mg/L	22-AUG-19	22-AUG-19	R4763368
Dissolved Mercury Filtration Location	FIELD				22-AUG-19	R4765151
Dissolved Metals in Water by CRC ICPMS Dissolved Metals Filtration Location	FIELD				18-AUG-19	R4758455
Aluminum (AI)-Dissolved	<0.0030	0.0030	mg/L	18-AUG-19	19-AUG-19	R4759365
Antimony (Sb)-Dissolved	<0.00010	0.00010	mg/L	18-AUG-19	19-AUG-19	R4759365
Arsenic (As)-Dissolved	0.00152	0.00010	mg/L	18-AUG-19	19-AUG-19	R4759365
Barium (Ba)-Dissolved	0.214	0.00010	mg/L	18-AUG-19	19-AUG-19	R4759365
Bismuth (Bi)-Dissolved	<0.000050	0.000050	mg/L	18-AUG-19	19-AUG-19	R4759365
Boron (B)-Dissolved	<0.010	0.010	mg/L	18-AUG-19	19-AUG-19	R4759365
Cadmium (Cd)-Dissolved	<0.0050	0.0050	ug/L	18-AUG-19	19-AUG-19	R4759365
Calcium (Ca)-Dissolved	50.6	0.050	mg/L	18-AUG-19	19-AUG-19	R4759365
Chromium (Cr)-Dissolved	<0.00010	0.00010	mg/L	18-AUG-19	19-AUG-19	R4759365
Cobalt (Co)-Dissolved	0.29	0.10	ug/L	18-AUG-19	19-AUG-19	R4759365
Copper (Cu)-Dissolved	<0.00050	0.00050	mg/L	18-AUG-19	19-AUG-19	R4759365
Iron (Fe)-Dissolved	0.790	0.010	mg/L	18-AUG-19	19-AUG-19 19-AUG-19	R4759365
Lead (Pb)-Dissolved Lithium (Li)-Dissolved	<0.000050	0.000050	mg/L	18-AUG-19 18-AUG-19	19-AUG-19	R4759365
Magnesium (Mg)-Dissolved	0.0064 18.5	0.0010	mg/L	18-AUG-19	19-AUG-19	R4759365 R4759365
Manganese (Mn)-Dissolved	0.0245	0.00010	mg/L mg/L	18-AUG-19	19-AUG-19	R4759365 R4759365
Molybdenum (Mo)-Dissolved	0.00307	0.00010	mg/L	18-AUG-19	19-AUG-19	R4759365
Nickel (Ni)-Dissolved	0.00307	0.00050	mg/L	18-AUG-19	19-AUG-19	R4759365
Potassium (K)-Dissolved	1.53	0.050	mg/L	18-AUG-19	19-AUG-19	R4759365
Selenium (Se)-Dissolved	<0.050	0.050	ug/L	18-AUG-19	19-AUG-19	R4759365
Silicon (Si)-Dissolved	3.60	0.050	mg/L	18-AUG-19	19-AUG-19	R4759365
Silver (Ag)-Dissolved	<0.000010	0.000010	mg/L	18-AUG-19	19-AUG-19	R4759365
Sodium (Na)-Dissolved	0.966	0.050	mg/L	18-AUG-19	19-AUG-19	R4759365
Strontium (Sr)-Dissolved	0.0424	0.00020	mg/L	18-AUG-19	19-AUG-19	R4759365
Thallium (TI)-Dissolved	<0.000010	0.000010	mg/L	18-AUG-19	19-AUG-19	R4759365
Tin (Sn)-Dissolved	<0.00010	0.00010	mg/L	18-AUG-19	19-AUG-19	R4759365
Titanium (Ti)-Dissolved	<0.010	0.010	mg/L	18-AUG-19	19-AUG-19	R4759365
Uranium (U)-Dissolved	0.000548	0.000010	mg/L	18-AUG-19	19-AUG-19	R4759365
Vanadium (V)-Dissolved	<0.00050	0.00050	mg/L	18-AUG-19	19-AUG-19	R4759365
Zinc (Zn)-Dissolved	0.0014	0.0010	mg/L	18-AUG-19	19-AUG-19	R4759365
Hardness						
Hardness (as CaCO3)	203	0.50	mg/L		20-AUG-19	
Total Metals in Water						
Total Be (Low) in Water by CRC ICPMS Beryllium (Be)-Total	<0.020	0.020	ug/L		19-AUG-19	R4761148
Total Metals in Water by CRC ICPMS			<b>J</b> .			
Aluminum (Al)-Total	0.0056	0.0030	mg/L		19-AUG-19	R4761148
Antimony (Sb)-Total	<0.00010	0.00010	mg/L		19-AUG-19	R4761148
Arsenic (As)-Total	0.00171	0.00010	mg/L		19-AUG-19	R4761148
Barium (Ba)-Total	0.217	0.00010	mg/L		19-AUG-19	R4761148
Bismuth (Bi)-Total	<0.000050	0.000050	mg/L		19-AUG-19	R4761148
Boron (B)-Total	<0.010	0.010	mg/L		19-AUG-19	R4761148
Cadmium (Cd)-Total	<0.0050	0.0050	ug/L		19-AUG-19	R4761148
Calcium (Ca)-Total	46.1	0.050	mg/L		19-AUG-19	R4761148
Chromium (Cr)-Total	<0.00010	0.00010	mg/L		19-AUG-19	R4761148
Cobalt (Co)-Total	0.33	0.10	ug/L		19-AUG-19	R4761148

<sup>\*</sup> Refer to Referenced Information for Qualifiers (if any) and Methodology.

L2330360 CONTD.... PAGE 8 of 14 Version: FINAL

Sample Details/Parameters	Result	Qualifier* D.L.	Units	Extracted	Analyzed	Batch
   L2330360-3   LC_PIZDC1404S_WG_Q3-2019_NP						
Sampled By: KC/DT on 15-AUG-19 @ 10:15						
Matrix: WG						
Total Metals in Water by CRC ICPMS						
Copper (Cu)-Total	<0.00050	0.000	50 mg/L		19-AUG-19	R4761148
Iron (Fe)-Total	0.936	0.010			19-AUG-19	R4761148
Lead (Pb)-Total	<0.00050	0.0000			19-AUG-19	R4761148
Lithium (Li)-Total	0.0051	0.001	1 -		19-AUG-19	R4761148
Magnesium (Mg)-Total	18.0	0.10	1 -		19-AUG-19	R4761148
Manganese (Mn)-Total	0.0254	0.000	10 mg/L		19-AUG-19	R4761148
Molybdenum (Mo)-Total	0.00345	0.0000	50 mg/L		19-AUG-19	R4761148
Nickel (Ni)-Total	0.00133	0.000	50 mg/L		19-AUG-19	R4761148
Potassium (K)-Total	1.44	0.050	) mg/L		19-AUG-19	R4761148
Selenium (Se)-Total	<0.050	0.05	) ug/L		19-AUG-19	R4761148
Silicon (Si)-Total	3.57	0.10			19-AUG-19	R4761148
Silver (Ag)-Total	<0.000010	0.0000	"		19-AUG-19	R4761148
Sodium (Na)-Total	0.935	0.050			19-AUG-19	R4761148
Strontium (Sr)-Total	0.0448	0.000	0		19-AUG-19	R4761148
Thallium (TI)-Total	<0.000010	0.0000			19-AUG-19	R4761148
Tin (Sn)-Total	<0.00010	0.000			19-AUG-19	R4761148
Titanium (Ti)-Total	<0.010	0.010			19-AUG-19	R4761148
Uranium (U)-Total	0.000594	0.0000			19-AUG-19	R4761148
Vanadium (V)-Total Zinc (Zn)-Total	<0.00050	0.000			19-AUG-19	R4761148
Routine for Teck Coal	<0.0030	0.003	0 mg/L		19-AUG-19	R4761148
Acidity by Automatic Titration						
Acidity (as CaCO3)	2.1	1.0	mg/L		16-AUG-19	R4758799
Alkalinity (Species) by Manual Titration						
Alkalinity, Bicarbonate (as CaCO3)	200	1.0	mg/L		19-AUG-19	R4759679
Alkalinity, Carbonate (as CaCO3)	<1.0	1.0	mg/L		19-AUG-19	R4759679
Alkalinity, Hydroxide (as CaCO3) Alkalinity, Total (as CaCO3)	<1.0 200	1.0	mg/L		19-AUG-19 19-AUG-19	R4759679
Ammonia, Total (as N)	200	1.0	mg/L		19-AUG-19	R4759679
Ammonia as N	0.0104	0.005	0 mg/L		21-AUG-19	R4763232
Bromide in Water by IC (Low Level)	0.0104	0.000	1119/2		217.00 10	114703232
Bromide (Br)	<0.050	0.050	mg/L		17-AUG-19	R4758315
Chloride in Water by IC						
Chloride (CI)	<0.50	0.50	mg/L		17-AUG-19	R4758315
Electrical Conductivity (EC)						
Conductivity (@ 25C)	361	2.0	uS/cm		19-AUG-19	R4759679
Fluoride in Water by IC						
Fluoride (F)	0.157	0.020	) mg/L		17-AUG-19	R4758315
Ion Balance Calculation						
Ion Balance	102	-100	%		20-AUG-19	
Ion Balance Calculation					00 1110 15	
Cation - Anion Balance	0.9		%		20-AUG-19	
Anion Sum	4.10		meq/L		20-AUG-19	
Cation Sum	4.17		meq/L		20-AUG-19	
Nitrate in Water by IC (Low Level) Nitrate (as N)	<0.0050	0.005	mg/L		17-AUG-19	R4758315
Nitrite in Water by IC (Low Level) Nitrite (as N)	<0.0010	0.001	0 mg/L		17-AUG-19	R4758315
Orthophosphate-Dissolved (as P)						
Orthophosphate-Dissolved (as P)	<0.0010	0.001	0 mg/L		17-AUG-19	R4758793
Oxidation redution potential by elect. ORP	439	-100	) mV		22-AUG-19	R4765275
ON	438	-100	1111		22-700-19	114703273

<sup>\*</sup> Refer to Referenced Information for Qualifiers (if any) and Methodology.

L2330360 CONTD.... PAGE 9 of 14 Version: FINAL

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
   L2330360-3							
Sampled By: KC/DT on 15-AUG-19 @ 10:15							
Matrix: WG							
Phosphorus (P)-Total							
Phosphorus (P)-Total	0.0049		0.0020	mg/L		21-AUG-19	R4762516
Sulfate in Water by IC							
Sulfate (SO4)	5.08		0.30	mg/L		17-AUG-19	R4758315
Total Dissolved Solids Total Dissolved Solids	197	DLHC	20	mg/L		22-AUG-19	R4766512
Total Suspended Solids	197	BEITO	20	mg/L		22 700 15	114700312
Total Suspended Solids	1.5		1.0	mg/L		22-AUG-19	R4767427
Turbidity				•			
Turbidity	7.12		0.10	NTU		16-AUG-19	R4757865
pH							
pH	8.18		0.10	рН		19-AUG-19	R4759679
L2330360-4 WG_Q3-2019_010							
Sampled By: KC/DT on 15-AUG-19 @ 10:20							
Matrix: WG							
Miscellaneous Parameters	0.50		0.50	/1		47 4110 40	D 4750000
Dissolved Organic Carbon	<0.50		0.50	mg/L		17-AUG-19	R4758969
Total Kjeldahl Nitrogen	<0.050		0.050	mg/L		23-AUG-19	R4767149
Total Organic Carbon  Dissolved Metals in Water	<0.50		0.50	mg/L		17-AUG-19	R4758969
Diss. Be (low) in Water by CRC ICPMS							
Beryllium (Be)-Dissolved	<0.020		0.020	ug/L	18-AUG-19	19-AUG-19	R4759365
Dissolved Metals Filtration Location	LAB			Ü		18-AUG-19	R4758455
Diss. Mercury in Water by CVAAS or CVAFS							
Mercury (Hg)-Dissolved	<0.000050		0.0000050	mg/L	22-AUG-19	22-AUG-19	R4763368
Dissolved Mercury Filtration Location	LAB					22-AUG-19	R4765151
Dissolved Metals in Water by CRC ICPMS Dissolved Metals Filtration Location	LAB					18-AUG-19	R4758455
Aluminum (Al)-Dissolved	<0.0030		0.0030	mg/L	18-AUG-19	19-AUG-19	R4759365
Antimony (Sb)-Dissolved	<0.00010		0.00010	mg/L	18-AUG-19	19-AUG-19	R4759365
Arsenic (As)-Dissolved	<0.00010		0.00010	mg/L	18-AUG-19	19-AUG-19	R4759365
Barium (Ba)-Dissolved	<0.00010		0.00010	mg/L	18-AUG-19	19-AUG-19	R4761588
Bismuth (Bi)-Dissolved	<0.000050		0.000050	mg/L	18-AUG-19	19-AUG-19	R4759365
Boron (B)-Dissolved	<0.010		0.010	mg/L	18-AUG-19	19-AUG-19	R4759365
Cadmium (Cd)-Dissolved	<0.0050		0.0050	ug/L	18-AUG-19	19-AUG-19	R4759365
Calcium (Ca)-Dissolved Chromium (Cr)-Dissolved	<0.050 <0.00010		0.050 0.00010	mg/L mg/L	18-AUG-19 18-AUG-19	19-AUG-19 19-AUG-19	R4759365 R4759365
Cobalt (Co)-Dissolved	<0.00010		0.00010	ug/L	18-AUG-19	19-AUG-19	R4759365 R4759365
Copper (Cu)-Dissolved	<0.0050		0.00050	mg/L	18-AUG-19	19-AUG-19	R4759365
Iron (Fe)-Dissolved	<0.010		0.010	mg/L	18-AUG-19	19-AUG-19	R4759365
Lead (Pb)-Dissolved	<0.000050		0.000050	mg/L	18-AUG-19	19-AUG-19	R4759365
Lithium (Li)-Dissolved	<0.0010		0.0010	mg/L	18-AUG-19	19-AUG-19	R4759365
Magnesium (Mg)-Dissolved	<0.10		0.10	mg/L	18-AUG-19	19-AUG-19	R4759365
Manganese (Mn)-Dissolved	<0.00010		0.00010	mg/L	18-AUG-19	19-AUG-19	R4759365
Molybdenum (Mo)-Dissolved Nickel (Ni)-Dissolved	<0.00050		0.000050	mg/L	18-AUG-19 18-AUG-19	19-AUG-19 19-AUG-19	R4759365
Potassium (K)-Dissolved	<0.00050 <0.050		0.00050 0.050	mg/L mg/L	18-AUG-19 18-AUG-19	19-AUG-19 19-AUG-19	R4759365 R4759365
Selenium (Se)-Dissolved	<0.050		0.050	ug/L	18-AUG-19	19-AUG-19	R4759365
Silicon (Si)-Dissolved	<0.050		0.050	mg/L	18-AUG-19	19-AUG-19	R4759365
Silver (Ag)-Dissolved	<0.000010		0.000010	mg/L	18-AUG-19	19-AUG-19	R4759365
Sodium (Na)-Dissolved	<0.050		0.050	mg/L	18-AUG-19	19-AUG-19	R4759365
Strontium (Sr)-Dissolved	<0.00020		0.00020	mg/L	18-AUG-19	19-AUG-19	R4759365

<sup>\*</sup> Refer to Referenced Information for Qualifiers (if any) and Methodology.

L2330360 CONTD.... PAGE 10 of 14 Version: FINAL

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2330360-4 WG_Q3-2019_010							
Sampled By: KC/DT on 15-AUG-19 @ 10:20							
Matrix: WG							
Dissolved Metals in Water by CRC ICPMS Thallium (TI)-Dissolved	<0.000010		0.000010	mg/L	18-AUG-19	19-AUG-19	R4759365
Tin (Sn)-Dissolved	<0.00010		0.00010	mg/L	18-AUG-19	19-AUG-19	R4759365
Titanium (Ti)-Dissolved	<0.010		0.010	mg/L	18-AUG-19	19-AUG-19	R4759365
Uranium (U)-Dissolved	<0.000010		0.000010	mg/L	18-AUG-19	19-AUG-19	R4759365
Vanadium (V)-Dissolved	<0.00050		0.00050	mg/L	18-AUG-19	19-AUG-19	R4759365
Zinc (Zn)-Dissolved	<0.0010		0.0010	mg/L	18-AUG-19	19-AUG-19	R4759365
Hardness							
Hardness (as CaCO3)	<0.50		0.50	mg/L		21-AUG-19	
Total Metals in Water							
Total Be (Low) in Water by CRC ICPMS							
Beryllium (Be)-Total	<0.020		0.020	ug/L		19-AUG-19	R4761148
Total Mercury in Water by CVAAS or CVAFS	-0.0000050		0.0000050	m c/l		24 ALIC 40	D4762000
Mercury (Hg)-Total	<0.000050		0.0000050	mg/L		21-AUG-19	R4762020
Total Metals in Water by CRC ICPMS Aluminum (AI)-Total	<0.0030		0.0030	mg/L		19-AUG-19	R4761148
Antimony (Sb)-Total	<0.0030		0.0030	mg/L		19-AUG-19	R4761148
Artimony (35)-Total  Arsenic (As)-Total	<0.00010		0.00010	mg/L		19-AUG-19	R4761148
Barium (Ba)-Total	<0.00010		0.00010	mg/L		19-AUG-19	R4761148
Bismuth (Bi)-Total	<0.00050		0.000050	mg/L		19-AUG-19	R4761148
Boron (B)-Total	<0.010		0.010	mg/L		19-AUG-19	R4761148
Cadmium (Cd)-Total	<0.0050		0.0050	ug/L		19-AUG-19	R4761148
Calcium (Ca)-Total	<0.050		0.050	mg/L		19-AUG-19	R4761148
Chromium (Cr)-Total	<0.00010		0.00010	mg/L		19-AUG-19	R4761148
Cobalt (Co)-Total	<0.10		0.10	ug/L		19-AUG-19	R4761148
Copper (Cu)-Total	<0.00050		0.00050	mg/L		19-AUG-19	R4761148
Iron (Fe)-Total	<0.010		0.010	mg/L		19-AUG-19	R4761148
Lead (Pb)-Total	0.000064	RRV	0.000050	mg/L		21-AUG-19	R4762202
Lithium (Li)-Total	<0.0010		0.0010	mg/L		19-AUG-19	R4761148
Magnesium (Mg)-Total	<0.10		0.10	mg/L		19-AUG-19	R4761148
Manganese (Mn)-Total	<0.00010		0.00010	mg/L		19-AUG-19	R4761148
Molybdenum (Mo)-Total	<0.000050		0.000050	mg/L		19-AUG-19	R4761148
Nickel (Ni)-Total	<0.00050		0.00050	mg/L		19-AUG-19	R4761148
Potassium (K)-Total Selenium (Se)-Total	<0.050		0.050	mg/L		19-AUG-19 19-AUG-19	R4761148
Silicon (Si)-Total	<0.050 <0.10		0.050 0.10	ug/L mg/L		19-AUG-19 19-AUG-19	R4761148 R4761148
Silver (Ag)-Total	<0.10		0.000010	mg/L		19-AUG-19 19-AUG-19	R4761148 R4761148
Sodium (Na)-Total	<0.050		0.000010	mg/L		19-AUG-19	R4761148
Strontium (Sr)-Total	<0.00020		0.00020	mg/L		19-AUG-19	R4761148
Thallium (TI)-Total	<0.00010		0.00020	mg/L		19-AUG-19	R4761148
Tin (Sn)-Total	<0.00010		0.00010	mg/L		19-AUG-19	R4761148
Titanium (Ti)-Total	<0.010		0.010	mg/L		19-AUG-19	R4761148
Uranium (U)-Total	<0.000010		0.000010	mg/L		19-AUG-19	R4761148
Vanadium (V)-Total	<0.00050		0.00050	mg/L		19-AUG-19	R4761148
Zinc (Zn)-Total	<0.0030		0.0030	mg/L		19-AUG-19	R4761148
Routine for Teck Coal				•			
Acidity by Automatic Titration Acidity (as CaCO3)	<1.0		1.0	mg/L		16-AUG-19	R4758799
Alkalinity (Species) by Manual Titration				-			
Alkalinity, Bicarbonate (as CaCO3) Alkalinity, Carbonate (as CaCO3)	<1.0		1.0	mg/L		19-AUG-19	R4759679
Alkalinity, Hydroxide (as CaCO3)  Alkalinity, Hydroxide (as CaCO3)	<1.0		1.0	mg/L		19-AUG-19 19-AUG-19	R4759679
Alkalinity, Total (as CaCO3)	<1.0		1.0	mg/L mg/l		19-AUG-19 19-AUG-19	R4759679
Airaililly, Tulai (as CaCO3)	<1.0		1.0	mg/L		19-AUG-19	R4759679

<sup>\*</sup> Refer to Referenced Information for Qualifiers (if any) and Methodology.

L2330360 CONTD.... PAGE 11 of 14 Version: FINAL

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2330360-4 WG_Q3-2019_010							
Sampled By: KC/DT on 15-AUG-19 @ 10:20							
Matrix: WG							
Ammonia, Total (as N)		DD)/		,		04 4110 40	
Ammonia as N  Bromide in Water by IC (Low Level)	0.0075	RRV	0.0050	mg/L		21-AUG-19	R4763232
Bromide (Br)	<0.050		0.050	mg/L		17-AUG-19	R4758315
Chloride in Water by IC Chloride (Cl)	<0.50		0.50	mg/L		17-AUG-19	R4758315
Electrical Conductivity (EC) Conductivity (@ 25C)	<2.0		2.0	uS/cm		19-AUG-19	R4759679
Fluoride in Water by IC							
Fluoride (F) Ion Balance Calculation	<0.020		0.020	mg/L		17-AUG-19	R4758315
Cation - Anion Balance	0.0			%		21-AUG-19	
Anion Sum	<0.10			meq/L		21-AUG-19	
Cation Sum	<0.10			meq/L		21-AUG-19	
Ion Balance Calculation Ion Balance	0.0		-100	%		21-AUG-19	
Nitrate in Water by IC (Low Level) Nitrate (as N)	<0.0050		0.0050	mg/L		17-AUG-19	R4758315
Nitrite in Water by IC (Low Level)						17-AUG-19	
Nitrite (as N)  Orthophosphate-Dissolved (as P)	<0.0010		0.0010	mg/L			R4758315
Orthophosphate-Dissolved (as P)  Oxidation redution potential by elect.	<0.0010		0.0010	mg/L		17-AUG-19	R4758793
ORP	503		-1000	mV		22-AUG-19	R4765275
Phosphorus (P)-Total Phosphorus (P)-Total	<0.0020		0.0020	mg/L		21-AUG-19	R4762516
Sulfate in Water by IC Sulfate (SO4)	<0.30		0.30	mg/L		17-AUG-19	R4758315
Total Dissolved Solids Total Dissolved Solids	<10		10	mg/L		22-AUG-19	R4766512
Total Suspended Solids Total Suspended Solids	<1.0		1.0	mg/L		22-AUG-19	R4767427
<b>Turbidity</b> Turbidity	<0.10		0.10	NTU		16-AUG-19	R4757865
pH	<0.10		0.10	NIO		10-400-19	K4757605
pH	5.70		0.10	рН		19-AUG-19	R4759679

<sup>\*</sup> Refer to Referenced Information for Qualifiers (if any) and Methodology.

L2330360 CONTD....

PAGE 12 of 14
Version: FINAL

### Reference Information

#### **Qualifiers for Individual Samples Listed:**

Lab Sample ID	Client Sample ID	Qualifier	Description
L2330360-4	WG_Q3-2019_010	SFPL	Sample was Filtered and Preserved at the laboratory

#### Sample Parameter Qualifier Key:

Sample Param	eter Qualifier Rey.
Qualifier	Description
DLHC	Detection Limit Raised: Dilution required due to high concentration of test analyte(s).
DLM	Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RRV	Reported Result Verified By Repeat Analysis

#### **Test Method References:**

ALS Test Code	Matrix	Test Description	Method Reference**
ACIDITY-PCT-CL	Water	Acidity by Automatic Titration	APHA 2310 Acidity

This analysis is carried out using procedures adapted from APHA Method 2310 "Acidity". Acidity is determined by potentiometric titration to a specified endpoint.

ALK-MAN-CL Water Alkalinity (Species) by Manual Titration APHA 2320 ALKALINITY

This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.

BE-D-L-CCMS-VA Water Diss. Be (low) in Water by CRC ICPMS APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

BE-T-L-CCMS-VA Water Total Be (Low) in Water by CRC ICPMS EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

BR-L-IC-N-CL Water Bromide in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

C-DIS-ORG-LOW-CL Water Dissolved Organic Carbon APHA 5310 B-Instrumental

This method is applicable to the analysis of ground water, wastewater, and surface water samples. The form detected depends upon sample pretreatment: Unfiltered sample = TC, 0.45um filtered = TDC. Samples are injected into a combustion tube containing an oxidation catalyst. The carrier gas containing the combustion product from the combustion tube flows through an inorganic carbon reactor vessel and is then sent through a halogen scrubber into a sample cell set in a non-dispersive infrared gas analyzer (NDIR) where carbon dioxide is detected. For total inorganic carbon and dissolved inorganic carbon, the sample is injected into an IC reactor vessel where only the IC component is decomposed to become carbon dioxide.

The peak area generated by the NDIR indicates the TC/TDC or TIC/DIC as applicable. The total organic carbon content of the sample is calculated by subtracting the TIC from the TC.

TOC = TC-TIC, DOC = TDC-DIC, Particulate = Total - Dissolved.

C-TOT-ORG-LOW-CL Water Total Organic Carbon APHA 5310 TOTAL ORGANIC CARBON (TOC)

This method is applicable to the analysis of ground water, wastewater, and surface water samples. The form detected depends upon sample pretreatment: Unfiltered sample = TC, 0.45um filtered = TDC. Samples are injected into a combustion tube containing an oxidation catalyst. The carrier gas containing the combustion product from the combustion tube flows through an inorganic carbon reactor vessel and is then sent through a halogen scrubber into a sample cell set in a non-dispersive infrared gas analyzer (NDIR) where carbon dioxide is detected. For total inorganic carbon and dissolved inorganic carbon, the sample is injected into an IC reactor vessel where only the IC component is decomposed to become carbon dioxide.

The peak area generated by the NDIR indicates the TC/TDC or TIC/DIC as applicable. The total organic carbon content of the sample is calculated by subtracting the TIC from the TC.

TOC = TC-TIC, DOC = TDC-DIC, Particulate = Total - Dissolved.

CL-IC-N-CL Water Chloride in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

EC-L-PCT-CL Water Electrical Conductivity (EC) APHA 2510B

Conductivity, also known as Electrical Conductivity (EC) or Specific Conductance, is measured by immersion of a conductivity cell with platinum electrodes into a water sample. Conductivity measurements are temperature-compensated to 25C.

F-IC-N-CL Water Fluoride in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

#### L2330360 CONTD....

PAGE 13 of 14 Version: FINAL

#### **Reference Information**

Test Method References:

ALS Test Code Matrix Test Description Method Reference\*\*

HARDNESS-CALC-VA Water Hardness APHA 2340B

Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO3 equivalents.

Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

HG-D-CVAA-VA Water Diss. Mercury in Water by CVAAS or CVAFS APHA 3030B/EPA 1631E (mod)

Water samples are filtered (0.45 um), preserved with hydrochloric acid, then undergo a cold-oxidation using bromine monochloride prior to reduction

with stannous chloride, and analyzed by CVAAS or CVAFS.

HG-T-CVAA-VA Water Total Mercury in Water by CVAAS or CVAFS EPA 1631E (mod)

Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

IONBALANCE-BC-CL Water Ion Balance Calculation APHA 1030E

Cation Sum, Anion Sum, and Ion Balance (as % difference) are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Because all aqueous solutions are electrically neutral, the calculated ion balance (% difference of cations minus anions) should be pear-zero.

Cation and Anion Sums are the total meq/L concentration of major cations and anions. Dissolved species are used where available. Minor ions are included where data is present. Ion Balance is calculated as:

Ion Balance (%) = [Cation Sum-Anion Sum] / [Cation Sum+Anion Sum]

MET-D-CCMS-VA Water Dissolved Metals in Water by CRC ICPMS APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

MET-T-CCMS-VA Water Total Metals in Water by CRC ICPMS EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

NH3-L-F-CL Water Ammonia, Total (as N) J. ENVIRON. MONIT., 2005, 7, 37-42, RSC

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et

NO2-L-IC-N-CL Water Nitrite in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

NO3-L-IC-N-CL Water Nitrate in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

ORP-CL Water Oxidation redution potential by elect. ASTM D1498

This analysis is carried out in accordance with the procedure described in the "ASTM" method D1498 "Oxidation-Reduction Potential of Water" published by the American Society for Testing and Materials (ASTM). Results are reported as observed oxidation-reduction potential of the platinum metal-reference electrode employed, in mV.

It is recommended that this analysis be conducted in the field.

P-T-L-COL-CL Water Phosphorus (P)-Total APHA 4500-P PHOSPHORUS

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after

persulphate digestion of the sample.

PH-CL Water pH APHA 4500 H-Electrode

pH is determined in the laboratory using a pH electrode. All samples analyzed by this method for pH will have exceeded the 15 minute recommended

hold time from time of sampling (field analysis is recommended for pH where highly accurate results are needed)

PO4-DO-L-COL-CL Water Orthophosphate-Dissolved (as P) APHA 4500-P PHOSPHORUS

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.

SO4-IC-N-CL Water Sulfate in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

SOLIDS-TDS-CL Water Total Dissolved Solids APHA 2540 C

#### LINE CREEK OPERATION

L2330360 CONTD....

**APHA 1030E** 

PAGE 14 of 14 Version: FINAL

#### **Reference Information**

**Test Method References:** 

ALS Test Code Matrix Test Description Method Reference\*\*

A well-mixed sample is filtered through a glass fibre filter paper. The filtrate is then evaporated to dryness in a pre-weighed vial and dried at 180 – 2 °C. The increase in vial weight represents the total dissolved solids (TDS).

TECKCOAL-IONBAL-CL Water Ion Balance Calculation

Cation Sum, Anion Sum, and Ion Balance (as % difference) are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Because all aqueous solutions are electrically neutral, the calculated ion balance (% difference of cations minus anions) should be near-zero.

Cation and Anion Sums are the total meq/L concentration of major cations and anions. Dissolved species are used where available. Minor ions are included where data is present. Ion Balance is calculated as:

Ion Balance (%) = [Cation Sum-Anion Sum] / [Cation Sum+Anion Sum]

TKN-L-F-CL Water Total Kjeldahl Nitrogen APHA 4500-NORG (TKN)

This analysis is carried out using procedures adapted from APHA Method 4500-Norg D. "Block Digestion and Flow Injection Analysis". Total Kjeldahl Nitrogen is determined using block digestion followed by Flow-injection analysis with fluorescence detection.

TSS-L-CL Water Total Suspended Solids APHA 2540 D-Gravimetric

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total suspended solids (TSS) are determined by filtering a sample through a glass fibre filter, and by drying the filter at 104 deg. C.

TURBIDITY-CL Water Turbidity APHA 2130 B-Nephelometer

This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.

\*\* ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA
CL	ALS ENVIRONMENTAL - CALGARY, ALBERTA, CANADA

#### **Chain of Custody Numbers:**

20190815- DC GROUND

#### **GLOSSARY OF REPORT TERMS**

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.

mg/kg - milligrams per kilogram based on dry weight of sample

mg/kg wwt - milligrams per kilogram based on wet weight of sample

mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight

mg/L - unit of concentration based on volume, parts per million.

< - Less than.

D.L. - The reporting limit.

N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory. UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.



Workorder: L2330360

Report Date: 24-AUG-19

Page 1 of 13

Client:

TECK COAL LIMITED (LINE CREEK)

PO BOX 2003

SPARWOOD BC V0B 2G0

Contact: Carla Froyman Parker

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
ACIDITY-PCT-CL	Water							
Batch R4758799								
WG3136554-17 LCS Acidity (as CaCO3)			101.4		%		85-115	16-AUG-19
<b>WG3136554-16 MB</b> Acidity (as CaCO3)			<1.0		mg/L		2	16-AUG-19
ALK-MAN-CL	Water							
Batch R4759679 WG3137615-11 LCS Alkalinity, Total (as CaC	CO3)		100.7		%		85-115	19-AUG-19
WG3137615-10 MB Alkalinity, Total (as CaC	O3)		<1.0		mg/L		1	19-AUG-19
BE-D-L-CCMS-VA	Water							
Batch R4759365								
WG3136269-2 LCS Beryllium (Be)-Dissolve	d		100.8		%		80-120	19-AUG-19
WG3136269-1 MB Beryllium (Be)-Dissolve	d	NP	<0.00002	0	mg/L		0.00002	19-AUG-19
BE-T-L-CCMS-VA	Water							
Batch R4761148								
WG3136729-2 LCS Beryllium (Be)-Total			97.3		%		80-120	19-AUG-19
WG3136729-1 MB Beryllium (Be)-Total			<0.00002	0	mg/L		0.00002	19-AUG-19
BR-L-IC-N-CL	Water							
Batch R4758315								
WG3135964-3 DUP Bromide (Br)		<b>L2330360-1</b> <0.050	<0.050	RPD-NA	mg/L	N/A	20	17-AUG-19
<b>WG3135964-2 LCS</b> Bromide (Br)			102.8		%		85-115	17-AUG-19
<b>WG3135964-1 MB</b> Bromide (Br)			<0.050		mg/L		0.05	17-AUG-19
<b>WG3135964-4 MS</b> Bromide (Br)		L2330360-1	116.9		%		75-125	17-AUG-19
C-DIS-ORG-LOW-CL	Water							
Batch R4758969								
WG3136485-10 LCS Dissolved Organic Carb	on		108.8		%		80-120	17-AUG-19
WG3136485-9 MB								



Workorder: L2330360

Report Date: 24-AUG-19

Page 2 of 13

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
C-DIS-ORG-LOW-CL  Batch R4758969  WG3136485-9 MB	Water							
Dissolved Organic Carl	oon		<0.50		mg/L		0.5	17-AUG-19
C-TOT-ORG-LOW-CL	Water							
Batch R4758969 WG3136485-10 LCS Total Organic Carbon	)		112.0		%		80-120	17-AUG-19
WG3136485-9 MB Total Organic Carbon			<0.50		mg/L		0.5	17-AUG-19
CL-IC-N-CL	Water							
Batch R4758315 WG3135964-3 DUP	i	1 222222 4						
Chloride (CI)		<b>L2330360-1</b> <0.50	<0.50	RPD-NA	mg/L	N/A	20	17-AUG-19
WG3135964-2 LCS Chloride (CI)			104.0		%		90-110	17-AUG-19
<b>WG3135964-1 MB</b> Chloride (CI)			<0.50		mg/L		0.5	17-AUG-19
WG3135964-4 MS Chloride (CI)		L2330360-1	112.5		%		75-125	17-AUG-19
EC-L-PCT-CL	Water							
Batch R4759679	)							
WG3137615-11 LCS Conductivity (@ 25C)			101.5		%		90-110	19-AUG-19
WG3137615-10 MB Conductivity (@ 25C)			<2.0		uS/cm		2	19-AUG-19
F-IC-N-CL	Water							
Batch R4758315	;							
WG3135964-3 DUP Fluoride (F)		<b>L2330360-1</b> 0.184	0.186		mg/L	0.6	20	17-AUG-19
<b>WG3135964-2 LCS</b> Fluoride (F)			108.6		%		90-110	17-AUG-19
<b>WG3135964-1 MB</b> Fluoride (F)			<0.020		mg/L		0.02	17-AUG-19
<b>WG3135964-4 MS</b> Fluoride (F)		L2330360-1	120.4		%		75-125	17-AUG-19
HG-D-CVAA-VA	Water							



Workorder: L2330360 Report Date: 24-AUG-19 Page 3 of 13

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
HG-D-CVAA-VA	Water							
Batch R4763368								
WG3140308-7 DUP Mercury (Hg)-Dissolved		<b>L2330360-4</b> <0.000050	<0.000005	5C RPD-NA	mg/L	N/A	20	22-AUG-19
WG3140308-2 LCS Mercury (Hg)-Dissolved			97.5		%		80-120	22-AUG-19
WG3140308-6 LCS Mercury (Hg)-Dissolved			97.1		%		80-120	22-AUG-19
WG3140308-1 MB Mercury (Hg)-Dissolved			<0.000005	5C	mg/L		0.000005	22-AUG-19
WG3140308-5 MB Mercury (Hg)-Dissolved			<0.000005	5C	mg/L		0.000005	22-AUG-19
WG3140308-8 MS Mercury (Hg)-Dissolved		L2330360-3	95.4		%		70-130	22-AUG-19
HG-T-CVAA-VA	Water							
Batch R4762020								
WG3138690-34 DUP Mercury (Hg)-Total		<b>L2330360-4</b> <0.000050	<0.000005	5C RPD-NA	mg/L	N/A	20	21-AUG-19
WG3138690-2 LCS Mercury (Hg)-Total			98.6		%		80-120	21-AUG-19
WG3138690-1 MB Mercury (Hg)-Total			<0.000005	5C	mg/L		0.000005	21-AUG-19
MET-D-CCMS-VA	Water							
Batch R4759365								
WG3136269-2 LCS								
Aluminum (Al)-Dissolved			100.1		%		80-120	19-AUG-19
Antimony (Sb)-Dissolved			94.0		%		80-120	19-AUG-19
Arsenic (As)-Dissolved			97.6		%		80-120	19-AUG-19
Barium (Ba)-Dissolved			99.1		%		80-120	19-AUG-19
Bismuth (Bi)-Dissolved			96.0		%		80-120	19-AUG-19
Boron (B)-Dissolved			100.6		%		80-120	19-AUG-19
Cadmium (Cd)-Dissolved			98.6		%		80-120	19-AUG-19
Calcium (Ca)-Dissolved			105.5		%		80-120	19-AUG-19
Chromium (Cr)-Dissolved	d		101.5		%		80-120	19-AUG-19
Cobalt (Co)-Dissolved			99.4		%		80-120	19-AUG-19
Copper (Cu)-Dissolved			97.9		%		80-120	19-AUG-19
Iron (Fe)-Dissolved			97.1		%		80-120	19-AUG-19
Lead (Pb)-Dissolved			94.8		%		80-120	19-AUG-19
Lithium (Li)-Dissolved			102.1		%		80-120	19-AUG-19



Workorder: L2330360 Report Date: 24-AUG-19 Page 4 of 13

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA	Water							
Batch R4759365								
WG3136269-2 LCS								
Magnesium (Mg)-Dissolve			105.0		%		80-120	19-AUG-19
Manganese (Mn)-Dissolv			96.1		%		80-120	19-AUG-19
Molybdenum (Mo)-Dissol	ved		95.0		%		80-120	19-AUG-19
Nickel (Ni)-Dissolved			98.7		%		80-120	19-AUG-19
Potassium (K)-Dissolved			102.6		%		80-120	19-AUG-19
Selenium (Se)-Dissolved			104.6		%		80-120	19-AUG-19
Silicon (Si)-Dissolved			103.9		%		60-140	19-AUG-19
Silver (Ag)-Dissolved			94.2		%		80-120	19-AUG-19
Sodium (Na)-Dissolved			104.8		%		80-120	19-AUG-19
Strontium (Sr)-Dissolved			96.5		%		80-120	19-AUG-19
Thallium (TI)-Dissolved			90.8		%		80-120	19-AUG-19
Tin (Sn)-Dissolved			95.5		%		80-120	19-AUG-19
Titanium (Ti)-Dissolved			104.9		%		80-120	19-AUG-19
Uranium (U)-Dissolved			91.5		%		80-120	19-AUG-19
Vanadium (V)-Dissolved			100.8		%		80-120	19-AUG-19
Zinc (Zn)-Dissolved			98.6		%		80-120	19-AUG-19
WG3136269-1 MB		NP						
Aluminum (Al)-Dissolved			<0.0010		mg/L		0.001	19-AUG-19
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	19-AUG-19
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	19-AUG-19
Barium (Ba)-Dissolved			<0.00010		mg/L		0.0001	19-AUG-19
Bismuth (Bi)-Dissolved			<0.000050		mg/L		0.00005	19-AUG-19
Boron (B)-Dissolved			<0.010		mg/L		0.01	19-AUG-19
Cadmium (Cd)-Dissolved			<0.000005	C	mg/L		0.000005	19-AUG-19
Calcium (Ca)-Dissolved			<0.050		mg/L		0.05	19-AUG-19
Chromium (Cr)-Dissolved	l		<0.00010		mg/L		0.0001	19-AUG-19
Cobalt (Co)-Dissolved			<0.00010		mg/L		0.0001	19-AUG-19
Copper (Cu)-Dissolved			<0.00020		mg/L		0.0002	19-AUG-19
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	19-AUG-19
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	19-AUG-19
Lithium (Li)-Dissolved			<0.0010		mg/L		0.001	19-AUG-19
Magnesium (Mg)-Dissolve	ed		<0.0050		mg/L		0.005	19-AUG-19
Manganese (Mn)-Dissolve			<0.00010		mg/L		0.0001	19-AUG-19
Molybdenum (Mo)-Dissol			<0.000050		mg/L		0.00005	19-AUG-19



Workorder: L2330360

Report Date: 24-AUG-19

Page 5 of 13

Test	Matrix	Reference	Result Q	ualifier Units	RPD	Limit	Analyzed
MET-D-CCMS-VA	Water						
Batch R4759365							
WG3136269-1 MB		NP					
Nickel (Ni)-Dissolved			<0.00050	mg/L		0.0005	19-AUG-19
Potassium (K)-Dissolved			<0.050	mg/L		0.05	19-AUG-19
Selenium (Se)-Dissolved	d		<0.000050	mg/L		0.00005	19-AUG-19
Silicon (Si)-Dissolved			<0.050	mg/L		0.05	19-AUG-19
Silver (Ag)-Dissolved			<0.000010	mg/L		0.00001	19-AUG-19
Sodium (Na)-Dissolved			<0.050	mg/L		0.05	19-AUG-19
Strontium (Sr)-Dissolved	t		<0.00020	mg/L		0.0002	19-AUG-19
Thallium (TI)-Dissolved			<0.000010	mg/L		0.00001	19-AUG-19
Tin (Sn)-Dissolved			<0.00010	mg/L		0.0001	19-AUG-19
Titanium (Ti)-Dissolved			<0.00030	mg/L		0.0003	19-AUG-19
Uranium (U)-Dissolved			<0.000010	mg/L		0.00001	19-AUG-19
Vanadium (V)-Dissolved	I		<0.00050	mg/L		0.0005	19-AUG-19
Zinc (Zn)-Dissolved			<0.0010	mg/L		0.001	19-AUG-19
MET-T-CCMS-VA	Water						
Batch R4761148							
WG3136729-2 LCS			102.2	0/		00.400	40 4110 40
Aluminum (Al)-Total				%		80-120	19-AUG-19
Antimony (Sb)-Total			104.8	%		80-120	19-AUG-19
Arsenic (As)-Total			99.6	%		80-120	19-AUG-19
Barium (Ba)-Total			101.2	%		80-120	19-AUG-19
Bismuth (Bi)-Total			97.6	%		80-120	19-AUG-19
Boron (B)-Total			94.3	%		80-120	19-AUG-19
Cadmium (Cd)-Total			101.8	%		80-120	19-AUG-19
Calcium (Ca)-Total			97.5	%		80-120	19-AUG-19
Chromium (Cr)-Total			98.9	%		80-120	19-AUG-19
Cobalt (Co)-Total			99.2	%		80-120	19-AUG-19
Copper (Cu)-Total			98.4	%		80-120	19-AUG-19
Iron (Fe)-Total			95.7	%		80-120	19-AUG-19
Lead (Pb)-Total			100.5	%		80-120	19-AUG-19
Lithium (Li)-Total			92.9	%		80-120	19-AUG-19
Magnesium (Mg)-Total			101.3	%		80-120	19-AUG-19
Manganese (Mn)-Total			98.5	%		80-120	19-AUG-19
Molybdenum (Mo)-Total			104.8	%		80-120	19-AUG-19
Nickel (Ni)-Total			96.9	%		80-120	19-AUG-19



Workorder: L2330360

Report Date: 24-AUG-19

Page 6 of 13

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-VA	Water							
Batch R4761148								
WG3136729-2 LCS			00.0		0/			
Potassium (K)-Total			98.9		%		80-120	19-AUG-19
Selenium (Se)-Total			95.1		%		80-120	19-AUG-19
Silicon (Si)-Total			104.8		%		80-120	19-AUG-19
Silver (Ag)-Total			99.4		%		80-120	19-AUG-19
Sodium (Na)-Total			105.7		%		80-120	19-AUG-19
Strontium (Sr)-Total			104.1		%		80-120	19-AUG-19
Thallium (TI)-Total			100.0		%		80-120	19-AUG-19
Tin (Sn)-Total			101.8		%		80-120	19-AUG-19
Titanium (Ti)-Total			97.6		%		80-120	19-AUG-19
Uranium (U)-Total			99.4		%		80-120	19-AUG-19
Vanadium (V)-Total			102.3		%		80-120	19-AUG-19
Zinc (Zn)-Total			103.3		%		80-120	19-AUG-19
WG3136729-1 MB			0.0000					
Aluminum (Al)-Total			<0.0030		mg/L		0.003	19-AUG-19
Antimony (Sb)-Total			<0.00010		mg/L		0.0001	19-AUG-19
Arsenic (As)-Total			<0.00010		mg/L		0.0001	19-AUG-19
Barium (Ba)-Total			<0.00010		mg/L		0.0001	19-AUG-19
Bismuth (Bi)-Total			<0.00005	50	mg/L		0.00005	19-AUG-19
Boron (B)-Total			<0.010		mg/L		0.01	19-AUG-19
Cadmium (Cd)-Total			<0.00000	)5C	mg/L		0.000005	19-AUG-19
Calcium (Ca)-Total			<0.050		mg/L		0.05	19-AUG-19
Chromium (Cr)-Total			<0.00010	)	mg/L		0.0001	19-AUG-19
Cobalt (Co)-Total			<0.00010	)	mg/L		0.0001	19-AUG-19
Copper (Cu)-Total			<0.00050	)	mg/L		0.0005	19-AUG-19
Iron (Fe)-Total			<0.010		mg/L		0.01	19-AUG-19
Lead (Pb)-Total			< 0.00005	50	mg/L		0.00005	19-AUG-19
Lithium (Li)-Total			<0.0010		mg/L		0.001	19-AUG-19
Magnesium (Mg)-Total			<0.0050		mg/L		0.005	19-AUG-19
Manganese (Mn)-Total			<0.00010	)	mg/L		0.0001	19-AUG-19
Molybdenum (Mo)-Tota	I		<0.00005	50	mg/L		0.00005	19-AUG-19
Nickel (Ni)-Total			<0.00050	)	mg/L		0.0005	19-AUG-19
Potassium (K)-Total			<0.050		mg/L		0.05	19-AUG-19
Selenium (Se)-Total			<0.00005	50	mg/L		0.00005	19-AUG-19
Silicon (Si)-Total			<0.10		mg/L		0.1	19-AUG-19



Workorder: L2330360

Report Date: 24-AUG-19 Page 7 of 13

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-VA	Water							
Batch R4761148	3							
WG3136729-1 MB			0.000040					
Silver (Ag)-Total			<0.000010	1	mg/L		0.00001	19-AUG-19
Sodium (Na)-Total			<0.050		mg/L		0.05	19-AUG-19
Strontium (Sr)-Total			<0.00020		mg/L		0.0002	19-AUG-19
Thallium (TI)-Total			<0.000010		mg/L		0.00001	19-AUG-19
Tin (Sn)-Total			<0.00010		mg/L		0.0001	19-AUG-19
Titanium (Ti)-Total			<0.00030		mg/L		0.0003	19-AUG-19
Uranium (U)-Total			<0.000010		mg/L		0.00001	19-AUG-19
Vanadium (V)-Total			<0.00050		mg/L		0.0005	19-AUG-19
Zinc (Zn)-Total			< 0.0030		mg/L		0.003	19-AUG-19
Batch R4762202	2							
WG3138607-2 LCS								
Aluminum (Al)-Total			98.5		%		80-120	21-AUG-19
Antimony (Sb)-Total			103.2		%		80-120	21-AUG-19
Arsenic (As)-Total			99.4		%		80-120	21-AUG-19
Barium (Ba)-Total			103.5		%		80-120	21-AUG-19
Bismuth (Bi)-Total			101.4		%		80-120	21-AUG-19
Boron (B)-Total			95.1		%		80-120	21-AUG-19
Cadmium (Cd)-Total			98.4		%		80-120	21-AUG-19
Calcium (Ca)-Total			98.0		%		80-120	21-AUG-19
Chromium (Cr)-Total			98.8		%		80-120	21-AUG-19
Cobalt (Co)-Total			98.5		%		80-120	21-AUG-19
Copper (Cu)-Total			100.2		%		80-120	21-AUG-19
Iron (Fe)-Total	Iron (Fe)-Total		92.0		%		80-120	21-AUG-19
Lead (Pb)-Total			101.1		%		80-120	21-AUG-19
Lithium (Li)-Total			92.1		%		80-120	21-AUG-19
Magnesium (Mg)-Total			103.8		%		80-120	21-AUG-19
Manganese (Mn)-Total	Manganese (Mn)-Total		97.6		%		80-120	21-AUG-19
Molybdenum (Mo)-Tota	Molybdenum (Mo)-Total		104.3		%		80-120	21-AUG-19
Nickel (Ni)-Total			100.0		%		80-120	21-AUG-19
Potassium (K)-Total			103.1		%		80-120	21-AUG-19
Selenium (Se)-Total			99.2		%		80-120	21-AUG-19
Silicon (Si)-Total			107.5		%		80-120	21-AUG-19
Silver (Ag)-Total			99.6		%		80-120	21-AUG-19
Sodium (Na)-Total			97.5		%		80-120	21-AUG-19 21-AUG-19



Workorder: L2330360

Report Date: 24-AUG-19

Page 8 of 13

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-VA	Water							
Batch R4762202								
WG3138607-2 LCS								
Strontium (Sr)-Total			99.2		%		80-120	21-AUG-19
Thallium (TI)-Total			101.3		%		80-120	21-AUG-19
Tin (Sn)-Total			100.9		%		80-120	21-AUG-19
Titanium (Ti)-Total			96.8		%		80-120	21-AUG-19
Uranium (U)-Total			93.1		%		80-120	21-AUG-19
Vanadium (V)-Total			100.2		%		80-120	21-AUG-19
Zinc (Zn)-Total			98.0		%		80-120	21-AUG-19
WG3138607-1 MB			0.0000		m a /I		0.000	
Aluminum (Al)-Total			<0.0030	`	mg/L		0.003	21-AUG-19
Antimony (Sb)-Total			<0.00010		mg/L		0.0001	21-AUG-19
Arsenic (As)-Total			<0.00010		mg/L		0.0001	21-AUG-19
Barium (Ba)-Total			<0.00010		mg/L		0.0001	21-AUG-19
Bismuth (Bi)-Total			<0.00005	50	mg/L		0.00005	21-AUG-19
Boron (B)-Total			<0.010	NEC	mg/L		0.01	21-AUG-19
Cadmium (Cd)-Total			<0.00000	)5C	mg/L		0.000005	21-AUG-19
Calcium (Ca)-Total			<0.050		mg/L		0.05	21-AUG-19
Chromium (Cr)-Total			<0.00010		mg/L		0.0001	21-AUG-19
Cobalt (Co)-Total			<0.00010		mg/L		0.0001	21-AUG-19
Copper (Cu)-Total			<0.00050	)	mg/L		0.0005	21-AUG-19
Iron (Fe)-Total			<0.010		mg/L		0.01	21-AUG-19
Lead (Pb)-Total			<0.00005	50	mg/L		0.00005	21-AUG-19
Lithium (Li)-Total			<0.0010		mg/L		0.001	21-AUG-19
Magnesium (Mg)-Total			<0.0050		mg/L		0.005	21-AUG-19
Manganese (Mn)-Total			<0.00010		mg/L		0.0001	21-AUG-19
Molybdenum (Mo)-Total			< 0.00005	50	mg/L		0.00005	21-AUG-19
Nickel (Ni)-Total			<0.00050	)	mg/L		0.0005	21-AUG-19
Potassium (K)-Total			< 0.050		mg/L		0.05	21-AUG-19
Selenium (Se)-Total			<0.00005	50	mg/L		0.00005	21-AUG-19
Silicon (Si)-Total			<0.10		mg/L		0.1	21-AUG-19
Silver (Ag)-Total			<0.00001	10	mg/L		0.00001	21-AUG-19
Sodium (Na)-Total			<0.050		mg/L		0.05	21-AUG-19
Strontium (Sr)-Total			<0.00020	)	mg/L		0.0002	21-AUG-19
Thallium (TI)-Total			<0.00001	10	mg/L		0.00001	21-AUG-19
Tin (Sn)-Total			<0.00010	)	mg/L		0.0001	21-AUG-19

Workorder: L2330360

Report Date: 24-AUG-19 Page 9 of 13

Test	Matrix	Reference	Result Q	ualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-VA	Water							
Batch R476220 WG3138607-1 MB Titanium (Ti)-Total	)2		<0.00030		mg/L		0.0003	04 AUG 40
Uranium (U)-Total			<0.00030		mg/L		0.0003	21-AUG-19 21-AUG-19
Vanadium (V)-Total			<0.00050		mg/L		0.0005	21-AUG-19 21-AUG-19
Zinc (Zn)-Total			<0.0030		mg/L		0.003	21-AUG-19
NH3-L-F-CL	Water							
Batch R476323 WG3140078-18 LCS Ammonia as N			104.7		%		85-115	21-AUG-19
WG3140078-17 MB Ammonia as N			<0.0050		mg/L		0.005	21-AUG-19 21-AUG-19
NO2-L-IC-N-CL	Water							
Batch R47583 <sup>-</sup> WG3135964-3 DUF Nitrite (as N)		<b>L2330360-1</b> <0.0010	<0.0010	RPD-NA	mg/L	N/A	20	17-AUG-19
WG3135964-2 LCS Nitrite (as N)	<b>3</b>		105.6	2	%		90-110	17-AUG-19
WG3135964-1 MB Nitrite (as N)			<0.0010		mg/L		0.001	17-AUG-19
WG3135964-4 MS Nitrite (as N)		L2330360-1	115.2		%		75-125	17-AUG-19
NO3-L-IC-N-CL	Water							
Batch R47583' WG3135964-3 DUF Nitrate (as N)		<b>L2330360-1</b> 0.154	0.156		mg/L	0.9	20	17-AUG-19
WG3135964-2 LCS Nitrate (as N)	3		104.8		%		90-110	17-AUG-19
<b>WG3135964-1 MB</b> Nitrate (as N)			<0.0050		mg/L		0.005	17-AUG-19
WG3135964-4 MS Nitrate (as N)		L2330360-1	112.6		%		75-125	17-AUG-19
ORP-CL	Water							
<b>Batch R47652</b> 2 <b>WG3140983-1 CRI</b> ORP		CL-ORP	224		mV		210-230	22-AUG-19

Water P-T-L-COL-CL



Workorder: L2330360

Report Date: 24-AUG-19 Page 10 of 13

Test	Matrix	Reference	Result (	Qualifier	Units	RPD	Limit	Analyzed
P-T-L-COL-CL	Water							
Batch R4762516 WG3139338-18 LCS Phosphorus (P)-Total			101.8		%		80-120	21-AUG-19
WG3139338-17 MB Phosphorus (P)-Total			<0.0020		mg/L		0.002	21-AUG-19
PH-CL	Water							
Batch R4759679 WG3137615-11 LCS pH			7.01		рН		6.9-7.1	19-AUG-19
PO4-DO-L-COL-CL	Water							
Batch R4758793 WG3135788-2 LCS Orthophosphate-Dissolv	ed (as P)		100.8		%		80-120	17-AUG-19
WG3135788-1 MB Orthophosphate-Dissolv			<0.0010		mg/L		0.001	17-AUG-19
SO4-IC-N-CL	Water							
Batch R4758315								
<b>WG3135964-3 DUP</b> Sulfate (SO4)		<b>L2330360-1</b> 6.97	6.99		mg/L	0.3	20	17-AUG-19
<b>WG3135964-2 LCS</b> Sulfate (SO4)			104.8		%		90-110	17-AUG-19
<b>WG3135964-1 MB</b> Sulfate (SO4)			<0.30		mg/L		0.3	17-AUG-19
<b>WG3135964-4 MS</b> Sulfate (SO4)		L2330360-1	111.3		%		75-125	17-AUG-19
SOLIDS-TDS-CL	Water							
Batch R4766512								
WG3140081-5 LCS Total Dissolved Solids			102.7		%		85-115	22-AUG-19
WG3140081-4 MB Total Dissolved Solids			<10		mg/L		10	22-AUG-19
TKN-L-F-CL	Water							
Batch R4767149								
WG3141709-18 LCS Total Kjeldahl Nitrogen			107.1		%		75-125	23-AUG-19
WG3141709-22 LCS Total Kjeldahl Nitrogen			99.5		%		75-125	23-AUG-19



Workorder: L2330360

Report Date: 24-AUG-19 Page 11 of 13

est	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
TKN-L-F-CL	Water							
Batch R4767149								
WG3141709-26 LCS Total Kjeldahl Nitrogen			106.7		%		75-125	23-AUG-19
WG3141709-30 LCS Total Kjeldahl Nitrogen			99.6		%		75-125	23-AUG-19
WG3141709-17 MB Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	23-AUG-19
WG3141709-21 MB Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	23-AUG-19
WG3141709-25 MB Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	23-AUG-19
WG3141709-29 MB Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	23-AUG-19
SS-L-CL	Water							
Batch R4767427								
WG3140528-2 LCS Total Suspended Solids			95.0		%		85-115	22-AUG-19
WG3140528-1 MB Total Suspended Solids			<1.0		mg/L		1	22-AUG-19
URBIDITY-CL	Water							
Batch R4757865								
WG3135342-17 LCS Turbidity			96.0		%		85-115	16-AUG-19
WG3135342-16 MB Turbidity			<0.10		NTU		0.1	16-AUG-19

Workorder: L2330360 Report Date: 24-AUG-19 Page 12 of 13

Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

#### **Sample Parameter Qualifier Definitions:**

Qualifier	Description
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

Workorder: L2330360 Report Date: 24-AUG-19 Page 13 of 13

#### **Hold Time Exceedances:**

	Sample						
ALS Product Description	ID	Sampling Date	Date Processed	Rec. HT	Actual HT	Units	Qualifier
Physical Tests							
Oxidation redution potential	l by elect.						
	1	15-AUG-19 11:55	22-AUG-19 13:30	0.25	170	hours	EHTR-FM
	2	15-AUG-19 12:20	22-AUG-19 13:30	0.25	169	hours	EHTR-FM
	3	15-AUG-19 10:15	22-AUG-19 13:30	0.25	171	hours	EHTR-FN
	4	15-AUG-19 10:20	22-AUG-19 13:30	0.25	171	hours	EHTR-FM
рН							
	1	15-AUG-19 11:55	19-AUG-19 12:00	0.25	96	hours	EHTR-FM
	2	15-AUG-19 12:20	19-AUG-19 12:00	0.25	96	hours	EHTR-FM
	3	15-AUG-19 10:15	19-AUG-19 12:00	0.25	98	hours	EHTR-FN
	4	15-AUG-19 10:20	19-AUG-19 12:00	0.25	98	hours	EHTR-FM

#### Legend & Qualifier Definitions:

EHTR-FM: Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended.

EHTR: Exceeded ALS recommended hold time prior to sample receipt.

EHTL: Exceeded ALS recommended hold time prior to analysis. Sample was received less than 24 hours prior to expiry.

EHT: Exceeded ALS recommended hold time prior to analysis.

Rec. HT: ALS recommended hold time (see units).

#### Notes\*:

Where actual sampling date is not provided to ALS, the date (& time) of receipt is used for calculation purposes. Where actual sampling time is not provided to ALS, the earlier of 12 noon on the sampling date or the time (& date) of receipt is used for calculation purposes. Samples for L2330360 were received on 16-AUG-19 08:30.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against predetermined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

**Teck** 

20190815- DC GROUND WATER TURNAROUND TIME: RUSH: COC ID: OTHER INFO PROJECT/CLIENT INFO LABORATORY Lab Name ALS Calgary Excel PDF Facility Name / Job# Line Creek Operation EDD Report Format / Distribution Lab Contact Lyudmyla Shvets Project Manager Carla Froyman Parker Email 1: carla.froymanparker@teck.com Email Carla FroymanParker@teck.com Email Lyudmyla.Shvets@ALSGlobal.com Email 2: teckcoal@equisonline.cor Address 2559 29 Street NE Address Box 2003 Email 3: drake.tymstra@teck.com 15km North Hwy 43 Email 4: kirsten.campbell@teck.com City Sparwood Province BC City Calgary Province AΒ Email 5: ennedy.allen@teck.com Postal Code V0B 2G0 Country Canada Postal Code TIY 7B5 Country Canada PO number VPO00608129 Phone Number 250-425-3196 Phone Number 403 407 1794 SAMPLE DETAILS ANALYSIS REQUESTED Filtered - F: Field, L: Lab, Fl., Field & Lab, N: Nove 녆 N H2SO4 HC1 HNO3 HNO3 NONE H2SO4 HCL Hazardous Material (Yes/No) ALS\_Package-TKN/TOC *PECKCOAL-ROUTINE* TECKCOAL-MET-D-VA TECKCOAL-MET-T-VA L2330360-COFC ALS\_Package-DOC HG-D-CVAF-VA HG-T-CVAE-VA Sample Location Field Time G=Grab #Of C=Comp Cont. Sample ID Matrix Date (24hr) (sys loc code) LC\_PIZDC1306\_WG\_Q3-2019\_NP LC\_PIZDC1306 WG 2019/08/15 11:55 G 6 1 LC PIZDC1404D LC PIZDC1404D WG Q3-2019 NP WG 2019/08/15  $\mathbf{G}$ 12:20 6 1 1 1 LC\_PIZDC1404S\_WG\_Q3-2019\_NP LC PIZDC1404S WG 2019/08/15  $\mathbf{G}$ 10:15 6 1 1 1 1 1 LC PIZDC1404S  $\mathbf{W}\mathbf{G}$ G WG\_Q3-2019\_010 2019/08/15 10:20 7 1 1 1 1 ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS RELINQUISHED BY/AFFILIATION DATE/TIME ACCEPTED BY/AFFILIATION DATE/TIME THE SEE BORNARD THE DESIGNATION OF THE SECRETARIES AND D.Tymstra/K.Campbell 15-Aug ARM DESIGN. SERVICE REQUEST (rush - subject to availability) Regular (default) X Sampler's Name K. Campbell/D. Tymstra Mobile # Priority (2-3 business days) - 50% surcharge Emergency (1 Business Day) - 100% surcharge Sampler's Signature Date/Time August 15, 2019 For Emergency <1 Day, ASAP or Weekend - Contact ALS



TECK COAL LIMITED (LINE CREEK)

ATTN: Carla Froyman Parker

PO BOX 2003

SPARWOOD BC VOB 2G0

Date Received: 24-AUG-19

Report Date: 03-SEP-19 17:34 (MT)

Version: FINAL

Client Phone: 250-425-6111

# Certificate of Analysis

Lab Work Order #: L2335330
Project P.O. #: VP000608129

Job Reference: LINE CREEK OPERATION
C of C Numbers: 20190822- DC GROUND

Legal Site Desc:



Lyudmyla Shvets, B.Sc. Account Manager

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L2335330 CONTD.... PAGE 2 of 9 Version: FINAL

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2335330-1 LC_PIZDC1307_WG_Q3-2019_NP							
Sampled By: KC/DT on 22-AUG-19 @ 11:42							
Matrix: WG Miscellaneous Parameters							
	4.05		0.50			00 4110 40	D 4700500
Dissolved Organic Carbon	1.95		0.50	mg/L		26-AUG-19	R4769509
Total Kjeldahl Nitrogen	0.143		0.050	mg/L		31-AUG-19	R4779015
Total Organic Carbon	2.02		0.50	mg/L		26-AUG-19	R4769509
Dissolved Metals in Water							
Diss. Be (low) in Water by CRC ICPMS						<u>-</u>	
Beryllium (Be)-Dissolved	<0.020		0.020	ug/L	28-AUG-19	29-AUG-19	R4777713
Dissolved Metals Filtration Location	FIELD					28-AUG-19	R4773492
Diss. Mercury in Water by CVAAS or CVAFS				/1	00 4110 40	04 4110 40	<b>D</b>
Mercury (Hg)-Dissolved	<0.000050		0.0000050	mg/L	30-AUG-19	31-AUG-19	R4778864
Dissolved Mercury Filtration Location	FIELD					30-AUG-19	R4778073
Dissolved Metals in Water by CRC ICPMS Dissolved Metals Filtration Location	FIELD					28-AUG-19	R4773492
Aluminum (Al)-Dissolved	<0.0030		0.0030	mg/L	28-AUG-19	29-AUG-19	R4777713
Antimony (Sb)-Dissolved	<0.00010		0.00010	mg/L	28-AUG-19	29-AUG-19	R4777713
Arsenic (As)-Dissolved	0.00152		0.00010	mg/L	28-AUG-19	29-AUG-19	R4777713
Barium (Ba)-Dissolved	1.37		0.00010	mg/L	28-AUG-19	29-AUG-19	R4777713
Bismuth (Bi)-Dissolved	<0.000050		0.000050	mg/L	28-AUG-19	29-AUG-19	R4777713
Boron (B)-Dissolved	0.024		0.010	mg/L	28-AUG-19	29-AUG-19	R4777713
Cadmium (Cd)-Dissolved	<0.030	DLM	0.030	ug/L	28-AUG-19	29-AUG-19	R4777713
Calcium (Ca)-Dissolved	38.7		0.050	mg/L	28-AUG-19	29-AUG-19	R4777713
Chromium (Cr)-Dissolved	<0.00010		0.00010	mg/L	28-AUG-19	29-AUG-19	R4777713
Cobalt (Co)-Dissolved	<0.10		0.10	ug/L	28-AUG-19	29-AUG-19	R4777713
Copper (Cu)-Dissolved	0.00051		0.00050	mg/L	28-AUG-19	29-AUG-19	R4777713
Iron (Fe)-Dissolved	0.735		0.010	mg/L	28-AUG-19	29-AUG-19	R4777713
Lead (Pb)-Dissolved	<0.000050		0.000050	mg/L	28-AUG-19	29-AUG-19	R4777713
Lithium (Li)-Dissolved	0.0781		0.0010	mg/L	28-AUG-19	29-AUG-19	R4777713
Magnesium (Mg)-Dissolved	20.9		0.10	mg/L	28-AUG-19	29-AUG-19	R4777713
Manganese (Mn)-Dissolved	0.00887		0.00010	mg/L	28-AUG-19	29-AUG-19	R4777713
Molybdenum (Mo)-Dissolved	0.0342		0.000050	mg/L	28-AUG-19	29-AUG-19	R4777713
Nickel (Ni)-Dissolved	0.00101		0.00050	mg/L	28-AUG-19	29-AUG-19	R4777713
Potassium (K)-Dissolved	5.25		0.050	mg/L	28-AUG-19	29-AUG-19	R4777713
Selenium (Se)-Dissolved	<0.050		0.050	ug/L	28-AUG-19	29-AUG-19	R4777713
Silicon (Si)-Dissolved	2.92		0.050	mg/L	28-AUG-19	29-AUG-19	R4777713
Silver (Ag)-Dissolved	<0.000010		0.000010	mg/L	28-AUG-19	29-AUG-19	R4777713
Sodium (Na)-Dissolved	14.3		0.050	mg/L	28-AUG-19	29-AUG-19	R4777713
Strontium (Sr)-Dissolved	0.138		0.00020	mg/L	28-AUG-19	29-AUG-19	R4777713
Thallium (TI)-Dissolved	<0.000010		0.000010	mg/L	28-AUG-19	29-AUG-19	R4777713
Tin (Sn)-Dissolved	<0.00010		0.00010	mg/L	28-AUG-19	29-AUG-19	R4777713
Titanium (Ti)-Dissolved	<0.010		0.010	mg/L	28-AUG-19	29-AUG-19	R4777713
Uranium (U)-Dissolved	0.000026		0.000010	mg/L	28-AUG-19	29-AUG-19	R4777713
Vanadium (V)-Dissolved	<0.00050		0.00050	mg/L	28-AUG-19	29-AUG-19	R4777713
Zinc (Zn)-Dissolved	0.0046		0.0010	mg/L	28-AUG-19	29-AUG-19	R4777713
Hardness				-			
Hardness (as CaCO3)	183		0.50	mg/L		29-AUG-19	
Total Metals in Water							
Total Be (Low) in Water by CRC ICPMS	0.000		0.000			00 4110 40	D 4770044
Beryllium (Be)-Total	<0.020		0.020	ug/L		29-AUG-19	R4776911
Total Metals in Water by CRC ICPMS	0.0050		0.0000	P		00 4110 45	D 47700 : :
Aluminum (Al)-Total	0.0250		0.0030	mg/L		29-AUG-19	R4776911
Antimony (Sb)-Total	<0.00010		0.00010	mg/L		29-AUG-19	R4776911
Arsenic (As)-Total	0.00152		0.00010	mg/L		29-AUG-19	R4776911

<sup>\*</sup> Refer to Referenced Information for Qualifiers (if any) and Methodology.

L2335330 CONTD.... PAGE 3 of 9 Version: FINAL

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
1 2225220 4							
L2335330-1 LC_PIZDC1307_WG_Q3-2019_NP							
Sampled By: KC/DT on 22-AUG-19 @ 11:42							
Matrix: WG							
Total Metals in Water by CRC ICPMS Barium (Ba)-Total	1.39		0.00010	mg/L		29-AUG-19	R4776911
Bismuth (Bi)-Total	<0.00050		0.00010	mg/L		29-AUG-19	R4776911
Boron (B)-Total	0.021		0.010	mg/L		29-AUG-19	R4776911
Cadmium (Cd)-Total	<0.020	DLM	0.020	ug/L		29-AUG-19	R4776911
Calcium (Ca)-Total	40.3		0.050	mg/L		29-AUG-19	R4776911
Chromium (Cr)-Total	0.00017		0.00010	mg/L		29-AUG-19	R4776911
Cobalt (Co)-Total	<0.10		0.10	ug/L		29-AUG-19	R4776911
Copper (Cu)-Total	0.00053		0.00050	mg/L		29-AUG-19	R4776911
Iron (Fe)-Total	1.08		0.010	mg/L		29-AUG-19	R4776911
Lead (Pb)-Total	0.000123		0.000050	mg/L		29-AUG-19	R4776911
Lithium (Li)-Total	0.0774		0.0010	mg/L		29-AUG-19	R4776911
Magnesium (Mg)-Total	21.0		0.10	mg/L		29-AUG-19	R4776911
Manganese (Mn)-Total	0.00947		0.00010	mg/L		29-AUG-19	R4776911
Molybdenum (Mo)-Total	0.0326		0.000050	mg/L		29-AUG-19	R4776911
Nickel (Ni)-Total	0.00121		0.00050	mg/L		29-AUG-19	R4776911
Potassium (K)-Total	5.01		0.050	mg/L		29-AUG-19	R4776911
Selenium (Se)-Total	<0.050		0.050	ug/L		29-AUG-19	R4776911
Silicon (Si)-Total	2.89		0.10	mg/L		29-AUG-19	R4776911
Silver (Ag)-Total	0.000011		0.000010	mg/L		29-AUG-19	R4776911
Sodium (Na)-Total	13.7		0.050	mg/L		29-AUG-19	R4776911
Strontium (Sr)-Total	0.138		0.00020	mg/L		29-AUG-19	R4776911
Thallium (TI)-Total	<0.000010		0.000010	mg/L		29-AUG-19	R4776911
Tin (Sn)-Total Titanium (Ti)-Total	0.00013		0.00010	mg/L		29-AUG-19	R4776911
Uranium (U)-Total	<0.010 0.000028		0.010 0.000010	mg/L		29-AUG-19 29-AUG-19	R4776911 R4776911
Vanadium (V)-Total	<0.00050		0.00050	mg/L mg/L		29-AUG-19 29-AUG-19	R4776911
Zinc (Zn)-Total	0.0098		0.00030	mg/L		29-AUG-19 29-AUG-19	R4776911
Routine for Teck Coal	0.0098		0.0030	IIIg/L		29-400-19	K4770911
Acidity by Automatic Titration							
Acidity (as CaCO3)	1.6		1.0	mg/L		26-AUG-19	R4769704
Alkalinity (Species) by Manual Titration							
Alkalinity, Bicarbonate (as CaCO3)	223		1.0	mg/L		27-AUG-19	R4771848
Alkalinity, Carbonate (as CaCO3)	3.8		1.0	mg/L		27-AUG-19	R4771848
Alkalinity, Hydroxide (as CaCO3)	<1.0		1.0	mg/L		27-AUG-19	R4771848
Alkalinity, Total (as CaCO3)	227		1.0	mg/L		27-AUG-19	R4771848
Ammonia, Total (as N)							
Ammonia as N	0.119		0.0050	mg/L		28-AUG-19	R4776248
Bromide in Water by IC (Low Level)							
Bromide (Br)	<0.050		0.050	mg/L		24-AUG-19	R4772848
Chloride in Water by IC				,,		04 41:0 :-	
Chloride (Cl)	<0.50		0.50	mg/L		24-AUG-19	R4772848
Electrical Conductivity (EC)	202		2.0	uS/cm		27-AUG-19	D/774040
Conductivity (@ 25C)	383		2.0	u3/UII		21-400-19	R4771848
Fluoride in Water by IC Fluoride (F)	0.599		0.020	mg/L		24-AUG-19	R4772848
Ion Balance Calculation	0.009		0.020	g, L		2.7.00-19	117772040
Cation - Anion Balance	-1.2			%		29-AUG-19	
Anion Sum	4.57			meg/L		29-AUG-19	
Cation Sum	4.46			meq/L		29-AUG-19	
Ion Balance Calculation	-			•			
Ion Balance	97.6		-100	%		29-AUG-19	
Nitrate in Water by IC (Low Level)							

<sup>\*</sup> Refer to Referenced Information for Qualifiers (if any) and Methodology.

L2335330 CONTD.... PAGE 4 of 9 Version: FINAL

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2335330-1 LC_PIZDC1307_WG_Q3-2019_NP							
Sampled By: KC/DT on 22-AUG-19 @ 11:42							
Matrix: WG							
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	<0.0050		0.0050	mg/L		24-AUG-19	R4772848
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	<0.0010		0.0010	mg/L		24-AUG-19	R4772848
Orthophosphate-Dissolved (as P)	0.0040		0.0040	/1		04 4110 40	D 4707070
Orthophosphate-Dissolved (as P)	<0.0010		0.0010	mg/L		24-AUG-19	R4767870
Oxidation redution potential by elect. ORP	345		-1000	mV		28-AUG-19	R4775407
Phosphorus (P)-Total	040		1000	****		207.00 10	114770407
Phosphorus (P)-Total	0.0088		0.0020	mg/L		25-AUG-19	R4768451
Sulfate in Water by IC							
Sulfate (SO4)	<0.30		0.30	mg/L		24-AUG-19	R4772848
Total Dissolved Solids	400	DITIC	00	ma == /1		20 410 42	D 4777450
Total Supponded Solids	198	DLHC	20	mg/L		28-AUG-19	R4777452
<b>Total Suspended Solids</b> Total Suspended Solids	3.3		1.0	mg/L		28-AUG-19	R4777613
Turbidity	3.0			y <b>-</b>			
Turbidity	9.55		0.10	NTU		24-AUG-19	R4768077
рН							
рН	8.31		0.10	pН		27-AUG-19	R4771848
L2335330-2 LC_PIZDC1308_WG_Q3-2019_NP							
Sampled By: KC/DT on 22-AUG-19 @ 10:43							
Matrix: WG							
Miscellaneous Parameters			_	<i>,</i> -		00 1116 11	B. (=====
Dissolved Organic Carbon	3.76		0.50	mg/L		26-AUG-19	R4769509
Total Carania Carlor	0.141		0.050	mg/L		31-AUG-19	R4779015
Total Organic Carbon	3.89		0.50	mg/L		26-AUG-19	R4769509
Dissolved Metals in Water Diss. Be (low) in Water by CRC ICPMS							
Beryllium (Be)-Dissolved	<0.020		0.020	ug/L	28-AUG-19	29-AUG-19	R4777713
Dissolved Metals Filtration Location	FIELD		•	3		28-AUG-19	R4773492
Diss. Mercury in Water by CVAAS or CVAFS							
Mercury (Hg)-Dissolved	<0.000050		0.0000050	mg/L	30-AUG-19	31-AUG-19	R4778864
Dissolved Mercury Filtration Location	FIELD					30-AUG-19	R4778073
Dissolved Metals in Water by CRC ICPMS Dissolved Metals Filtration Location	רובו ה					30 ALIC 40	D4777070
Aluminum (Al)-Dissolved	FIELD <0.0030		0.0030	mg/L	28-AUG-19	30-AUG-19 29-AUG-19	R4777879 R4777713
Antimony (Sb)-Dissolved	0.00012		0.0030	mg/L	28-AUG-19	29-AUG-19 29-AUG-19	R4777713
Arsenic (As)-Dissolved	0.00012		0.00010	mg/L	28-AUG-19	29-AUG-19	R4777713
Barium (Ba)-Dissolved	0.305		0.00010	mg/L	28-AUG-19	29-AUG-19	R4777713
Bismuth (Bi)-Dissolved	<0.000050		0.000050	mg/L	28-AUG-19	29-AUG-19	R4777713
Boron (B)-Dissolved	0.011		0.010	mg/L	28-AUG-19	29-AUG-19	R4777713
Cadmium (Cd)-Dissolved	0.0351		0.0050	ug/L	28-AUG-19	29-AUG-19	R4777713
Calcium (Ca)-Dissolved	100		0.050	mg/L	28-AUG-19	29-AUG-19	R4777713
Chromium (Cr)-Dissolved Cobalt (Co)-Dissolved	<0.00010 0.25		0.00010 0.10	mg/L	28-AUG-19 28-AUG-19	29-AUG-19 29-AUG-19	R4777713 R4777713
Copper (Cu)-Dissolved	0.25	DTC	0.00050	ug/L mg/L	30-AUG-19	30-AUG-19	R477713 R4778439
Iron (Fe)-Dissolved	0.056		0.00030	mg/L	28-AUG-19	29-AUG-19	R4777713
Lead (Pb)-Dissolved	0.000092		0.000050	mg/L	28-AUG-19	29-AUG-19	R4777713
Lithium (Li)-Dissolved	0.0083		0.0010	mg/L	28-AUG-19	29-AUG-19	R4777713
Magnesium (Mg)-Dissolved	29.9		0.10	mg/L	28-AUG-19	29-AUG-19	R4777713
Manganese (Mn)-Dissolved	0.00919		0.00010	mg/L	28-AUG-19	29-AUG-19	R4777713

<sup>\*</sup> Refer to Referenced Information for Qualifiers (if any) and Methodology.

L2335330 CONTD.... PAGE 5 of 9 Version: FINAL

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2335330-2 LC_PIZDC1308_WG_Q3-2019_NP							
Sampled By: KC/DT on 22-AUG-19 @ 10:43							
' '							
Matrix: WG							
Dissolved Metals in Water by CRC ICPMS Molybdenum (Mo)-Dissolved	0.00164		0.000050	mg/L	28-AUG-19	29-AUG-19	R4777713
Nickel (Ni)-Dissolved	0.00164		0.00050	mg/L	28-AUG-19	29-AUG-19 29-AUG-19	R4777713
Potassium (K)-Dissolved	2.07		0.00030	mg/L	28-AUG-19	29-AUG-19	R4777713
Selenium (Se)-Dissolved	0.210	DTSE	0.050	ug/L	28-AUG-19	29-AUG-19	R4777713
Silicon (Si)-Dissolved	5.32	2.02	0.050	mg/L	28-AUG-19	29-AUG-19	R4777713
Silver (Ag)-Dissolved	<0.000010		0.000010	mg/L	28-AUG-19	29-AUG-19	R4777713
Sodium (Na)-Dissolved	1.66		0.050	mg/L	28-AUG-19	29-AUG-19	R4777713
Strontium (Sr)-Dissolved	0.107		0.00020	mg/L	28-AUG-19	29-AUG-19	R4777713
Thallium (TI)-Dissolved	0.000019		0.000010	mg/L	28-AUG-19	29-AUG-19	R4777713
Tin (Sn)-Dissolved	<0.00010		0.00010	mg/L	28-AUG-19	29-AUG-19	R4777713
Titanium (Ti)-Dissolved	<0.010		0.010	mg/L	28-AUG-19	29-AUG-19	R4777713
Uranium (U)-Dissolved	0.00151		0.000010	mg/L	28-AUG-19	29-AUG-19	R4777713
Vanadium (V)-Dissolved	<0.00050		0.00050	mg/L	28-AUG-19	29-AUG-19	R4777713
Zinc (Zn)-Dissolved	0.0041		0.0010	mg/L	28-AUG-19	29-AUG-19	R4777713
Hardness							
Hardness (as CaCO3)	374		0.50	mg/L		30-AUG-19	
Total Metals in Water							
Total Be (Low) in Water by CRC ICPMS							
Beryllium (Be)-Total	<0.020		0.020	ug/L		29-AUG-19	R4776911
Total Metals in Water by CRC ICPMS				,,		00 4110 40	D
Aluminum (Al)-Total	0.0123		0.0030	mg/L		30-AUG-19	R4777995
Antimony (Sb)-Total	0.00017		0.00010	mg/L		29-AUG-19	R4776911
Arsenic (As)-Total	0.00022		0.00010	mg/L		29-AUG-19	R4776911
Barium (Ba)-Total	0.298		0.00010	mg/L		29-AUG-19	R4776911
Bismuth (Bi)-Total Boron (B)-Total	<0.000050 0.010		0.000050	mg/L		29-AUG-19 29-AUG-19	R4776911 R4776911
Cadmium (Cd)-Total	0.010		0.010 0.0050	mg/L ug/L		29-AUG-19 29-AUG-19	R4776911 R4776911
Calcium (Ca)-Total	102		0.050	mg/L		29-AUG-19	R4776911
Chromium (Cr)-Total	<0.00010		0.00010	mg/L		29-AUG-19	R4776911
Cobalt (Co)-Total	0.27		0.00010	ug/L		29-AUG-19	R4776911
Copper (Cu)-Total	0.00055		0.00050	mg/L		29-AUG-19	R4776911
Iron (Fe)-Total	0.327		0.010	mg/L		29-AUG-19	R4776911
Lead (Pb)-Total	0.000300		0.000050	mg/L		29-AUG-19	R4776911
Lithium (Li)-Total	0.0084		0.0010	mg/L		29-AUG-19	R4776911
Magnesium (Mg)-Total	30.1		0.10	mg/L		29-AUG-19	R4776911
Manganese (Mn)-Total	0.00935		0.00010	mg/L		29-AUG-19	R4776911
Molybdenum (Mo)-Total	0.00153		0.000050	mg/L		29-AUG-19	R4776911
Nickel (Ni)-Total	0.00151		0.00050	mg/L		29-AUG-19	R4776911
Potassium (K)-Total	2.03		0.050	mg/L		29-AUG-19	R4776911
Selenium (Se)-Total	0.142		0.050	ug/L		29-AUG-19	R4776911
Silicon (Si)-Total	5.27		0.10	mg/L		29-AUG-19	R4776911
Silver (Ag)-Total	<0.000010		0.000010	mg/L		29-AUG-19	R4776911
Sodium (Na)-Total	1.63		0.050	mg/L		29-AUG-19	R4776911
Strontium (Sr)-Total	0.105		0.00020	mg/L		29-AUG-19	R4776911
Thallium (TI)-Total	0.000023		0.000010	mg/L		29-AUG-19	R4776911
Tin (Sn)-Total	<0.00010		0.00010	mg/L		30-AUG-19	R4777995
Titanium (Ti)-Total	<0.010		0.010	mg/L		29-AUG-19	R4776911
Uranium (U)-Total	0.00159		0.000010	mg/L		29-AUG-19	R4776911
Vanadium (V)-Total	<0.00050		0.00050	mg/L		29-AUG-19	R4776911
Zinc (Zn)-Total	0.0078		0.0030	mg/L		29-AUG-19	R4776911
Routine for Teck Coal							
Acidity by Automatic Titration	1				1	<u> </u>	

<sup>\*</sup> Refer to Referenced Information for Qualifiers (if any) and Methodology.

L2335330 CONTD.... PAGE 6 of 9 Version: FINAL

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2335330-2 LC_PIZDC1308_WG_Q3-2019_NP							
Sampled By: KC/DT on 22-AUG-19 @ 10:43							
Matrix: WG							
Acidity by Automatic Titration							
Acidity (as CaCO3)	22.9		1.0	mg/L		26-AUG-19	R4769704
Alkalinity (Species) by Manual Titration							
Alkalinity, Bicarbonate (as CaCO3)	378		1.0	mg/L		27-AUG-19	R4771848
Alkalinity, Carbonate (as CaCO3)	<1.0		1.0	mg/L		27-AUG-19	R4771848
Alkalinity, Hydroxide (as CaCO3)	<1.0		1.0	mg/L		27-AUG-19	R4771848
Alkalinity, Total (as CaCO3)	378		1.0	mg/L		27-AUG-19	R4771848
Ammonia, Total (as N) Ammonia as N	0.0076		0.0050	mg/L		28-AUG-19	R4776248
Bromide in Water by IC (Low Level)				3			
Bromide (Br)	< 0.050		0.050	mg/L		24-AUG-19	R4772848
Chloride in Water by IC							
Chloride (CI)	1.74		0.50	mg/L		24-AUG-19	R4772848
Electrical Conductivity (EC) Conductivity (@ 25C)	648		2.0	uS/cm		27-AUG-19	R4771848
Fluoride in Water by IC	040		۷.0	40/011		21-700-18	174111040
Fluoride (F)	0.178		0.020	mg/L		24-AUG-19	R4772848
Ion Balance Calculation				-			
Ion Balance	98.2		-100	%		30-AUG-19	
Ion Balance Calculation	0.0			0,		00 4110 40	
Cation - Anion Balance Anion Sum	-0.9 7.73			% meg/L		30-AUG-19 30-AUG-19	
Cation Sum	7.73 7.59			meq/L		30-AUG-19 30-AUG-19	
Nitrate in Water by IC (Low Level)	7.00			11104/2		00710010	
Nitrate (as N)	0.126		0.0050	mg/L		24-AUG-19	R4772848
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	0.0017		0.0010	mg/L		24-AUG-19	R4772848
Orthophosphate-Dissolved (as P) Orthophosphate-Dissolved (as P)	0.0018		0.0010	mg/L		24-AUG-19	R4767870
Oxidation redution potential by elect.	0.0018		0.0010	IIIg/L		24-A00-19	K4707070
ORP Potential by slotti	358		-1000	mV		28-AUG-19	R4775407
Phosphorus (P)-Total							
Phosphorus (P)-Total	0.0033		0.0020	mg/L		25-AUG-19	R4768451
Sulfate in Water by IC	F 47		0.00	/1		04 4110 40	D 4770040
Sulfate (SO4) Total Dissolved Solids	5.47		0.30	mg/L		24-AUG-19	R4772848
Total Dissolved Solids Total Dissolved Solids	365	DLHC	20	mg/L		28-AUG-19	R4777452
Total Suspended Solids			-				
Total Suspended Solids	1.6		1.0	mg/L		28-AUG-19	R4777613
Turbidity	0.00		0.40	k1 <del>T</del> 1 '		04 4110 40	D 4700077
Turbidity	2.60		0.10	NTU		24-AUG-19	R4768077
pH pH	8.16		0.10	pН		27-AUG-19	R4771848
·				'			
				l	L		

<sup>\*</sup> Refer to Referenced Information for Qualifiers (if any) and Methodology.

#### L2335330 CONTD....

PAGE 7 of 9 Version: FINAL

#### **Reference Information**

Sample Parameter Qualifier Key:

Qualifier	Description
DLHC	Detection Limit Raised: Dilution required due to high concentration of test analyte(s).
DLM	Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).
DTC	Dissolved concentration exceeds total. Results were confirmed by re-analysis.
DTSE	Dissolved Se concentration exceeds total. Positive bias on D-Se suspected due to signal enhancement from volatile selenium species. Contact ALS if an alternative test to address this interference is needed.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.

#### **Test Method References:**

ALS Test Code	Matrix	Test Description	Method Reference**
ACIDITY-PCT-CL	Water	Acidity by Automatic Titration	APHA 2310 Acidity
This analysis is carried endpoint.	dout using proce	edures adapted from APHA Method 2310 "A	cidity". Acidity is determined by potentiometric titration to a specified

ALK-MAN-CL Water Alkalinity (Species) by Manual Titration APHA 2320 ALKALINITY

This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.

BE-D-L-CCMS-VA Water Diss. Be (low) in Water by CRC ICPMS APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

BE-T-L-CCMS-VA Water Total Be (Low) in Water by CRC ICPMS EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

BR-L-IC-N-CL Water Bromide in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

C-DIS-ORG-LOW-CL Water Dissolved Organic Carbon APHA 5310 B-Instrumental

This method is applicable to the analysis of ground water, wastewater, and surface water samples. The form detected depends upon sample pretreatment: Unfiltered sample = TC, 0.45um filtered = TDC. Samples are injected into a combustion tube containing an oxidation catalyst. The carrier gas containing the combustion product from the combustion tube flows through an inorganic carbon reactor vessel and is then sent through a halogen scrubber into a sample cell set in a non-dispersive infrared gas analyzer (NDIR) where carbon dioxide is detected. For total inorganic carbon and dissolved inorganic carbon, the sample is injected into an IC reactor vessel where only the IC component is decomposed to become carbon dioxide.

The peak area generated by the NDIR indicates the TC/TDC or TIC/DIC as applicable. The total organic carbon content of the sample is calculated by subtracting the TIC from the TC.

TOC = TC-TIC, DOC = TDC-DIC, Particulate = Total - Dissolved.

C-TOT-ORG-LOW-CL Water Total Organic Carbon APHA 5310 TOTAL ORGANIC CARBON (TOC)

This method is applicable to the analysis of ground water, wastewater, and surface water samples. The form detected depends upon sample pretreatment: Unfiltered sample = TC, 0.45um filtered = TDC. Samples are injected into a combustion tube containing an oxidation catalyst. The carrier gas containing the combustion product from the combustion tube flows through an inorganic carbon reactor vessel and is then sent through a halogen scrubber into a sample cell set in a non-dispersive infrared gas analyzer (NDIR) where carbon dioxide is detected. For total inorganic carbon and dissolved inorganic carbon, the sample is injected into an IC reactor vessel where only the IC component is decomposed to become carbon dioxide.

The peak area generated by the NDIR indicates the TC/TDC or TIC/DIC as applicable. The total organic carbon content of the sample is calculated by subtracting the TIC from the TC.

TOC = TC-TIC, DOC = TDC-DIC, Particulate = Total - Dissolved.

CL-IC-N-CL Water Chloride in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

EC-L-PCT-CL Water Electrical Conductivity (EC) APHA 2510B

Conductivity, also known as Electrical Conductivity (EC) or Specific Conductance, is measured by immersion of a conductivity cell with platinum electrodes into a water sample. Conductivity measurements are temperature-compensated to 25C.

F-IC-N-CL Water Fluoride in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

HARDNESS-CALC-VA Water Hardness APHA 2340B

Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

L2335330 CONTD....

PAGE 8 of 9 Version: FINAL

#### **Reference Information**

**Test Method References:** 

ALS Test Code Matrix Test Description Method Reference\*\*

HG-D-CVAA-VA Water Diss. Mercury in Water by CVAAS or CVAFS APHA 3030B/EPA 1631E (mod)

Water samples are filtered (0.45 um), preserved with hydrochloric acid, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

IONBALANCE-BC-CL Water Ion Balance Calculation APHA 1030

Cation Sum, Anion Sum, and Ion Balance (as % difference) are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Because all aqueous solutions are electrically neutral, the calculated ion balance (% difference of cations minus anions) should be near-zero.

Cation and Anion Sums are the total meq/L concentration of major cations and anions. Dissolved species are used where available. Minor ions are included where data is present. Ion Balance is calculated as:

Ion Balance (%) = [Cation Sum-Anion Sum] / [Cation Sum+Anion Sum]

MET-D-CCMS-VA Water Dissolved Metals in Water by CRC ICPMS APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

MET-T-CCMS-VA Water Total Metals in Water by CRC ICPMS EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

NH3-L-F-CL Water Ammonia, Total (as N) J. ENVIRON. MONIT., 2005, 7, 37-42, RSC

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.

NO2-L-IC-N-CL Water Nitrite in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

NO3-L-IC-N-CL Water Nitrate in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

ORP-CL Water Oxidation redution potential by elect. ASTM D1498

This analysis is carried out in accordance with the procedure described in the "ASTM" method D1498 "Oxidation-Reduction Potential of Water" published by the American Society for Testing and Materials (ASTM). Results are reported as observed oxidation-reduction potential of the platinum metal-reference electrode employed, in mV.

It is recommended that this analysis be conducted in the field.

P-T-L-COL-CL Water Phosphorus (P)-Total APHA 4500-P PHOSPHORUS

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after persulphate digestion of the sample.

PH-CL Water pH APHA 4500 H-Electrode

pH is determined in the laboratory using a pH electrode. All samples analyzed by this method for pH will have exceeded the 15 minute recommended hold time from time of sampling (field analysis is recommended for pH where highly accurate results are needed)

PO4-DO-L-COL-CL Water Orthophosphate-Dissolved (as P) APHA 4500-P PHOSPHORUS

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.

SO4-IC-N-CL Water Sulfate in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

SOLIDS-TDS-CL Water Total Dissolved Solids APHA 2540 C

A well-mixed sample is filtered through a glass fibre filter paper. The filtrate is then evaporated to dryness in a pre-weighed vial and dried at 180 - 2 °C. The increase in vial weight represents the total dissolved solids (TDS).

TECKCOAL-IONBAL-CL Water Ion Balance Calculation APHA 1030E

Cation Sum, Anion Sum, and Ion Balance (as % difference) are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Because all aqueous solutions are electrically neutral, the calculated ion balance (% difference of cations minus anions) should be near-zero.

#### LINE CREEK OPERATION

L2335330 CONTD.... PAGE 9 of 9 Version: FINAL

#### **Reference Information**

**Test Method References:** 

TSS-L-CL

**ALS Test Code** Matrix Method Reference\*\* **Test Description** 

Cation and Anion Sums are the total meg/L concentration of major cations and anions. Dissolved species are used where available. Minor ions are included where data is present. Ion Balance is calculated as:

Ion Balance (%) = [Cation Sum-Anion Sum] / [Cation Sum+Anion Sum]

Water

TKN-L-F-CL Total Kieldahl Nitrogen APHA 4500-NORG (TKN)

This analysis is carried out using procedures adapted from APHA Method 4500-Norg D. "Block Digestion and Flow Injection Analysis". Total Kjeldahl

Nitrogen is determined using block digestion followed by Flow-injection analysis with fluorescence detection. **Total Suspended Solids** 

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined grayimetrically. Total suspended solids (TSS) are determined by filtering a sample through a glass fibre filter, and by drying the filter at 104 deg. C.

APHA 2540 D-Gravimetric

TURBIDITY-CL Water APHA 2130 B-Nephelometer

This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.

\*\* ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

<b>Laboratory Definition Code</b>	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA
CL	ALS ENVIRONMENTAL - CALGARY, ALBERTA, CANADA

#### **Chain of Custody Numbers:**

20190822- DC GROUND

#### **GLOSSARY OF REPORT TERMS**

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.

mg/kg - milligrams per kilogram based on dry weight of sample

mg/kg wwt - milligrams per kilogram based on wet weight of sample

mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight

mg/L - unit of concentration based on volume, parts per million.

< - Less than.

D.L. - The reporting limit.

N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory. UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.



Workorder: L2335330

Report Date: 03-SEP-19

Page 1 of 17

Client:

TECK COAL LIMITED (LINE CREEK)

PO BOX 2003

SPARWOOD BC V0B 2G0

Contact: Carla Froyman Parker

Test	Matrix	Reference	Result Qu	alifier	Units	RPD	Limit	Analyzed
ACIDITY-PCT-CL	Water							
Batch R4769704 WG3144261-8 LCS Acidity (as CaCO3)			106.2		%		85-115	26-AUG-19
WG3144261-7 MB Acidity (as CaCO3)			<1.0		mg/L		2	26-AUG-19
ALK-MAN-CL	Water							
Batch R4771848 WG3145505-8 LCS Alkalinity, Total (as CaC	O3)		100.3		%		85-115	27-AUG-19
WG3145505-7 MB Alkalinity, Total (as CaC	O3)		<1.0		mg/L		1	27-AUG-19
BE-D-L-CCMS-VA	Water							
Batch R4777713 WG3146226-2 LCS Beryllium (Be)-Dissolved	I		102.6		%		80-120	29-AUG-19
WG3146226-1 MB Beryllium (Be)-Dissolved		NP	<0.000020		mg/L		0.00002	29-AUG-19
BE-T-L-CCMS-VA	Water							
Batch R4776911								
WG3146677-3 DUP Beryllium (Be)-Total		<b>L2335330-2</b> <0.000020	<0.000020	RPD-NA	mg/L	N/A	20	29-AUG-19
WG3146677-2 LCS Beryllium (Be)-Total			98.7		%		80-120	29-AUG-19
WG3146677-1 MB Beryllium (Be)-Total			<0.000020		mg/L		0.00002	29-AUG-19
WG3146677-4 MS Beryllium (Be)-Total		L2335330-1	96.5		%		70-130	29-AUG-19
BR-L-IC-N-CL	Water							
Batch R4772848 WG3146055-2 LCS Bromide (Br)			103.4		%		85-115	24-AUG-19
WG3146055-1 MB Bromide (Br)			<0.050		mg/L		0.05	24-AUG-19
C-DIS-ORG-LOW-CL	Water							
Batch R4769509								
WG3144493-2 LCS Dissolved Organic Carbo	on		101.4		%		80-120	26-AUG-19
WG3144493-1 MB								



Workorder: L2335330

Report Date: 03-SEP-19 Page 2 of 17

Test	Matrix	Reference	Result Qualifier	Units RPD	Limit	Analyzed
C-DIS-ORG-LOW-CL  Batch R4769509  WG3144493-1 MB  Dissolved Organic Carbo	<b>Water</b> on		<0.50	mg/L	0.5	26-AUG-19
C-TOT-ORG-LOW-CL Batch R4769509 WG3144493-2 LCS	Water					
Total Organic Carbon WG3144493-1 MB Total Organic Carbon			103.9 <0.50	% mg/L	80-120 0.5	26-AUG-19 26-AUG-19
CL-IC-N-CL  Batch R4772848  WG3146055-2 LCS	Water					
Chloride (CI)  WG3146055-1 MB  Chloride (CI)			<0.50	% mg/L	90-110 0.5	24-AUG-19 24-AUG-19
EC-L-PCT-CL Batch R4771848 WG3145505-8 LCS	Water					
Conductivity (@ 25C) WG3145505-7 MB Conductivity (@ 25C)			99.4	% uS/cm	90-110	27-AUG-19 27-AUG-19
F-IC-N-CL Batch R4772848	Water					
WG3146055-2 LCS Fluoride (F)  WG3146055-1 MB Fluoride (F)			107.5 <0.020	% mg/L	90-110 0.02	24-AUG-19 24-AUG-19
HG-D-CVAA-VA Batch R4777943	Water		0.020		0.02	24-700-19
WG3148445-2 LCS Mercury (Hg)-Dissolved WG3148445-1 MB Mercury (Hg)-Dissolved		NP	97.6 <0.000005C	% mg/l	80-120	31-AUG-19
Batch R4778864 WG3148445-4 MS Mercury (Hg)-Dissolved		L2335330-2	92.1	mg/L %	0.000005 70-130	31-AUG-19 31-AUG-19



Workorder: L2335330

Report Date: 03-SEP-19

Page 3 of 17

est	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA	Water							
Batch R47777	<b>7</b> 13							
WG3146226-2 LC			404.0		0/			
Aluminum (Al)-Disso			101.6		%		80-120	29-AUG-19
Antimony (Sb)-Disso			103.7		%		80-120	29-AUG-19
Arsenic (As)-Dissolve			98.9		%		80-120	29-AUG-19
Barium (Ba)-Dissolve			99.6		%		80-120	29-AUG-19
Bismuth (Bi)-Dissolve			104.3		%		80-120	29-AUG-19
Boron (B)-Dissolved			101.4		%		80-120	29-AUG-19
Cadmium (Cd)-Disso			96.1		%		80-120	29-AUG-19
Calcium (Ca)-Dissolv			102.1		%		80-120	29-AUG-19
Chromium (Cr)-Disso			99.98		%		80-120	29-AUG-19
Cobalt (Co)-Dissolve			100.1		%		80-120	29-AUG-19
Copper (Cu)-Dissolv	red		99.6		%		80-120	29-AUG-19
Iron (Fe)-Dissolved			96.8		%		80-120	29-AUG-19
Lead (Pb)-Dissolved			101.8		%		80-120	29-AUG-19
Lithium (Li)-Dissolve	d		101.1		%		80-120	29-AUG-19
Magnesium (Mg)-Dis	ssolved		107.1		%		80-120	29-AUG-19
Manganese (Mn)-Dis	ssolved		99.8		%		80-120	29-AUG-19
Molybdenum (Mo)-D	issolved		104.4		%		80-120	29-AUG-19
Nickel (Ni)-Dissolved	t		100.2		%		80-120	29-AUG-19
Potassium (K)-Disso	lved		105.6		%		80-120	29-AUG-19
Selenium (Se)-Disso	olved		99.2		%		80-120	29-AUG-19
Silicon (Si)-Dissolved	d		111.8		%		60-140	29-AUG-19
Silver (Ag)-Dissolved	t		101.3		%		80-120	29-AUG-19
Sodium (Na)-Dissolv	ved		104.2		%		80-120	29-AUG-19
Strontium (Sr)-Disso	lved		103.8		%		80-120	29-AUG-19
Thallium (TI)-Dissolv	ved .		103.4		%		80-120	29-AUG-19
Tin (Sn)-Dissolved			97.1		%		80-120	29-AUG-19
Titanium (Ti)-Dissolv	/ed		99.0		%		80-120	29-AUG-19
Uranium (U)-Dissolve	ed		109.2		%		80-120	29-AUG-19
Vanadium (V)-Dissol	lved		99.6		%		80-120	29-AUG-19
Zinc (Zn)-Dissolved			97.6		%		80-120	29-AUG-19
WG3146226-1 MB	3	NP						
Aluminum (Al)-Disso			<0.0010		mg/L		0.001	29-AUG-19
Antimony (Sb)-Disso	lved		<0.00010	)	mg/L		0.0001	29-AUG-19
Arsenic (As)-Dissolve	ed		<0.00010	)	mg/L		0.0001	29-AUG-19



Workorder: L2335330

Report Date: 03-SEP-19

Page 4 of 17

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA	Water							
Batch R477771	13							
WG3146226-1 MB		NP			,,			
Barium (Ba)-Dissolve			<0.00010		mg/L		0.0001	29-AUG-19
Bismuth (Bi)-Dissolve	ed		<0.00005	50	mg/L		0.00005	29-AUG-19
Boron (B)-Dissolved			<0.010		mg/L		0.01	29-AUG-19
Cadmium (Cd)-Disso			<0.00000	050	mg/L		0.000005	29-AUG-19
Calcium (Ca)-Dissolv			<0.050		mg/L		0.05	29-AUG-19
Chromium (Cr)-Disso			<0.00010		mg/L		0.0001	29-AUG-19
Cobalt (Co)-Dissolved	d		<0.00010	)	mg/L		0.0001	29-AUG-19
Copper (Cu)-Dissolve	ed		<0.00020	)	mg/L		0.0002	29-AUG-19
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	29-AUG-19
Lead (Pb)-Dissolved			<0.00005	50	mg/L		0.00005	29-AUG-19
Lithium (Li)-Dissolved	I		<0.0010		mg/L		0.001	29-AUG-19
Magnesium (Mg)-Diss	solved		<0.0050		mg/L		0.005	29-AUG-19
Manganese (Mn)-Diss	solved		<0.00010	)	mg/L		0.0001	29-AUG-19
Molybdenum (Mo)-Dis	ssolved		< 0.00005	50	mg/L		0.00005	29-AUG-19
Nickel (Ni)-Dissolved			<0.00050	)	mg/L		0.0005	29-AUG-19
Potassium (K)-Dissol	ved		<0.050		mg/L		0.05	29-AUG-19
Selenium (Se)-Dissol	ved		< 0.00005	50	mg/L		0.00005	29-AUG-19
Silicon (Si)-Dissolved			< 0.050		mg/L		0.05	29-AUG-19
Silver (Ag)-Dissolved			< 0.00001	10	mg/L		0.00001	29-AUG-19
Sodium (Na)-Dissolve	ed		< 0.050		mg/L		0.05	29-AUG-19
Strontium (Sr)-Dissolv	ved		<0.00020	)	mg/L		0.0002	29-AUG-19
Thallium (TI)-Dissolve	ed		< 0.00001	10	mg/L		0.00001	29-AUG-19
Tin (Sn)-Dissolved			<0.00010	)	mg/L		0.0001	29-AUG-19
Titanium (Ti)-Dissolve	ed		< 0.00030	)	mg/L		0.0003	29-AUG-19
Uranium (U)-Dissolve	ed		< 0.00001	10	mg/L		0.00001	29-AUG-19
Vanadium (V)-Dissolv	/ed		<0.00050	)	mg/L		0.0005	29-AUG-19
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	29-AUG-19
Batch R477843	39							
WG3148072-2 LCS	3		405.4		0/		00.155	
Aluminum (Al)-Dissol			105.1		%		80-120	30-AUG-19
Antimony (Sb)-Dissol			94.8		%		80-120	30-AUG-19
Arsenic (As)-Dissolve			97.6		%		80-120	30-AUG-19
Barium (Ba)-Dissolve			103.4		%		80-120	30-AUG-19
Bismuth (Bi)-Dissolve	ed		98.8		%		80-120	30-AUG-19



Workorder: L2335330 Report Date: 03-SEP-19 Page 5 of 17

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA	Water							
Batch R4778439								
WG3148072-2 LCS Boron (B)-Dissolved			101.6		%		80-120	30-AUG-19
Cadmium (Cd)-Dissolved	1		97.5		%		80-120	30-AUG-19
Calcium (Ca)-Dissolved			102.4		%		80-120	30-AUG-19
Chromium (Cr)-Dissolved	d		101.0		%		80-120	30-AUG-19
Cobalt (Co)-Dissolved			100.0		%		80-120	30-AUG-19
Copper (Cu)-Dissolved			99.6		%		80-120	30-AUG-19
Iron (Fe)-Dissolved			102.6		%		80-120	30-AUG-19
Lead (Pb)-Dissolved			97.6		%		80-120	30-AUG-19
Lithium (Li)-Dissolved			106.3		%		80-120	30-AUG-19
Magnesium (Mg)-Dissolv	ed		103.9		%		80-120	30-AUG-19
Manganese (Mn)-Dissolv	ed		102.8		%		80-120	30-AUG-19
Molybdenum (Mo)-Dissol			99.9		%		80-120	30-AUG-19
Nickel (Ni)-Dissolved			99.5		%		80-120	30-AUG-19
Potassium (K)-Dissolved			102.2		%		80-120	30-AUG-19
Selenium (Se)-Dissolved			102.4		%		80-120	30-AUG-19
Silicon (Si)-Dissolved			105.3		%		60-140	30-AUG-19
Silver (Ag)-Dissolved			95.1		%		80-120	30-AUG-19
Sodium (Na)-Dissolved			107.6		%		80-120	30-AUG-19
Strontium (Sr)-Dissolved			102.4		%		80-120	30-AUG-19
Thallium (TI)-Dissolved			99.8		%		80-120	30-AUG-19
Tin (Sn)-Dissolved			95.5		%		80-120	30-AUG-19
Titanium (Ti)-Dissolved			98.3		%		80-120	30-AUG-19
Uranium (U)-Dissolved			99.96		%		80-120	30-AUG-19
Vanadium (V)-Dissolved			101.6		%		80-120	30-AUG-19
Zinc (Zn)-Dissolved			96.9		%		80-120	30-AUG-19
WG3148072-1 MB		NP						
Aluminum (AI)-Dissolved			<0.0010		mg/L		0.001	30-AUG-19
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	30-AUG-19
Arsenic (As)-Dissolved			<0.00010	1	mg/L		0.0001	30-AUG-19
Barium (Ba)-Dissolved			<0.00010		mg/L		0.0001	30-AUG-19
Bismuth (Bi)-Dissolved			<0.00005	0	mg/L		0.00005	30-AUG-19
Boron (B)-Dissolved			<0.010		mg/L		0.01	30-AUG-19
Cadmium (Cd)-Dissolved	l		<0.00000	50	mg/L		0.000005	30-AUG-19
Calcium (Ca)-Dissolved			<0.050		mg/L		0.05	30-AUG-19



Workorder: L2335330

Report Date: 03-SEP-19

Page 6 of 17

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA	Water							
Batch R47784	139							
WG3148072-1 MB		NP	0.00040		/I			
Chromium (Cr)-Disso			<0.00010		mg/L		0.0001	30-AUG-19
Cobalt (Co)-Dissolve			<0.00010		mg/L		0.0001	30-AUG-19
Copper (Cu)-Dissolv	red		<0.00020		mg/L		0.0002	30-AUG-19
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	30-AUG-19
Lead (Pb)-Dissolved			<0.000050	)	mg/L		0.00005	30-AUG-19
Lithium (Li)-Dissolve	d		<0.0010		mg/L		0.001	30-AUG-19
Magnesium (Mg)-Dis	ssolved		<0.0050		mg/L		0.005	30-AUG-19
Manganese (Mn)-Dis			<0.00010		mg/L		0.0001	30-AUG-19
Molybdenum (Mo)-D	issolved		<0.000050	)	mg/L		0.00005	30-AUG-19
Nickel (Ni)-Dissolved	t		<0.00050		mg/L		0.0005	30-AUG-19
Potassium (K)-Disso	lved		< 0.050		mg/L		0.05	30-AUG-19
Selenium (Se)-Disso	lved		<0.000050	)	mg/L		0.00005	30-AUG-19
Silicon (Si)-Dissolved	d		< 0.050		mg/L		0.05	30-AUG-19
Silver (Ag)-Dissolved	d		<0.000010	)	mg/L		0.00001	30-AUG-19
Sodium (Na)-Dissolv	ved .		< 0.050		mg/L		0.05	30-AUG-19
Strontium (Sr)-Disso	lved		<0.00020		mg/L		0.0002	30-AUG-19
Thallium (TI)-Dissolv	red		<0.000010	)	mg/L		0.00001	30-AUG-19
Tin (Sn)-Dissolved			<0.00010		mg/L		0.0001	30-AUG-19
Titanium (Ti)-Dissolv	/ed		<0.00030		mg/L		0.0003	30-AUG-19
Uranium (U)-Dissolv	ed		<0.000010	)	mg/L		0.00001	30-AUG-19
Vanadium (V)-Dissol	lved		<0.00050		mg/L		0.0005	30-AUG-19
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	30-AUG-19
MET-T-CCMS-VA	Water							
Batch R47769	)11							
WG3146677-3 DU Antimony (Sb)-Total	P	<b>L2335330-2</b> 0.00017	0.00018		mg/L	2.2	20	20 AUC 10
Arsenic (As)-Total		0.00017	0.00010		mg/L	6.4	20	29-AUG-19 29-AUG-19
Barium (Ba)-Total		0.298	0.294		mg/L			
Bismuth (Bi)-Total		<0.000050		) DDD NA		1.3	20	29-AUG-19
			<0.000050	RPD-NA	mg/L	N/A	20	29-AUG-19
Boron (B)-Total		0.010 0.000138	0.011		mg/L	2.2	20	29-AUG-19
Cadmium (Cd)-Total			0.000131		mg/L	5.8	20	29-AUG-19
Calcium (Ca)-Total	1	102	103	DDD 1	mg/L	1.3	20	29-AUG-19
Chromium (Cr)-Total	ı	<0.00010	0.00018	RPD-NA		N/A	20	29-AUG-19
Cobalt (Co)-Total		0.00027	0.00028		mg/L	3.3	20	29-AUG-19



Workorder: L2335330

Report Date: 03-SEP-19

Page 7 of 17

Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
Water							
	<b>L2335330-2</b> 0.00055	0.00064		mg/L	15	20	29-AUG-19
	0.327	0.332		mg/L	1.4	20	29-AUG-19
	0.000300	0.000302		mg/L	0.7	20	29-AUG-19
	0.0084	0.0086		mg/L	1.3	20	29-AUG-19
	30.1	29.5		mg/L	2.0	20	29-AUG-19
	0.00935	0.00942		mg/L	0.7	20	29-AUG-19
ıl	0.00153	0.00156		mg/L	2.1	20	29-AUG-19
	0.00151	0.00154		mg/L	1.8	20	29-AUG-19
	2.03	2.02		mg/L	0.7	20	29-AUG-19
	0.000142	0.000139		mg/L	2.1	20	29-AUG-19
	5.27	5.39		mg/L	2.3	20	29-AUG-19
	<0.00010	<0.000010	RPD-NA	mg/L	N/A	20	29-AUG-19
	1.63	1.65		mg/L	1.1	20	29-AUG-19
	0.105	0.105		mg/L	0.5	20	29-AUG-19
	0.000023	0.000024		mg/L	6.4	20	29-AUG-19
	<0.010	<0.010	RPD-NA	mg/L	N/A	20	29-AUG-19
	0.00159	0.00160		mg/L	0.6	20	29-AUG-19
	<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	29-AUG-19
	0.0078	0.0090		mg/L	14	20	29-AUG-19
		104.2		0/		00.400	00 ALIC 40
							29-AUG-19
							29-AUG-19
							29-AUG-19
							29-AUG-19
							29-AUG-19
							29-AUG-19
							29-AUG-19
							29-AUG-19
							29-AUG-19
							29-AUG-19
							29-AUG-19
							29-AUG-19
		96.7 97.5				80-120 80-120	29-AUG-19 29-AUG-19
	Water	Water  L2335330-2 0.00055 0.327 0.000300 0.0084 30.1 0.00935 0.00153 0.00151 2.03 0.000142 5.27 <0.000010 1.63 0.105 0.000023 <0.010 0.00159 <0.00050	L2335330-2	L2335330-2	L2335330-2	L2335330-2	L2335330-2

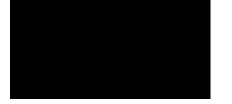


Workorder: L2335330

Report Date: 03-SEP-19

Page 8 of 17

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-VA	Water							
Batch R4776911								
WG3146677-2 LCS			00.5		0/			
Magnesium (Mg)-Total			98.5		%		80-120	29-AUG-19
Manganese (Mn)-Total			96.6		%		80-120	29-AUG-19
Molybdenum (Mo)-Tota	I		94.4		%		80-120	29-AUG-19
Nickel (Ni)-Total			96.4		%		80-120	29-AUG-19
Potassium (K)-Total			98.0		%		80-120	29-AUG-19
Selenium (Se)-Total			92.9		%		80-120	29-AUG-19
Silicon (Si)-Total			103.8		%		80-120	29-AUG-19
Silver (Ag)-Total			94.0		%		80-120	29-AUG-19
Sodium (Na)-Total			99.1		%		80-120	29-AUG-19
Strontium (Sr)-Total			99.7		%		80-120	29-AUG-19
Thallium (TI)-Total			95.0		%		80-120	29-AUG-19
Tin (Sn)-Total			94.3		%		80-120	29-AUG-19
Titanium (Ti)-Total			96.8		%		80-120	29-AUG-19
Uranium (U)-Total			96.7		%		80-120	29-AUG-19
Vanadium (V)-Total			98.7		%		80-120	29-AUG-19
Zinc (Zn)-Total			97.4		%		80-120	29-AUG-19
WG3146677-1 MB								
Aluminum (AI)-Total			<0.0030		mg/L		0.003	29-AUG-19
Antimony (Sb)-Total			<0.00010	)	mg/L		0.0001	29-AUG-19
Arsenic (As)-Total			<0.00010	)	mg/L		0.0001	29-AUG-19
Barium (Ba)-Total			<0.00010	)	mg/L		0.0001	29-AUG-19
Bismuth (Bi)-Total			<0.00005	50	mg/L		0.00005	29-AUG-19
Boron (B)-Total			<0.010		mg/L		0.01	29-AUG-19
Cadmium (Cd)-Total			<0.00000	)5C	mg/L		0.000005	29-AUG-19
Calcium (Ca)-Total			< 0.050		mg/L		0.05	29-AUG-19
Chromium (Cr)-Total			<0.00010	)	mg/L		0.0001	29-AUG-19
Cobalt (Co)-Total			<0.00010	)	mg/L		0.0001	29-AUG-19
Copper (Cu)-Total			< 0.00050	)	mg/L		0.0005	29-AUG-19
Iron (Fe)-Total			<0.010		mg/L		0.01	29-AUG-19
Lead (Pb)-Total			<0.00005	50	mg/L		0.00005	29-AUG-19
Lithium (Li)-Total			<0.0010		mg/L		0.001	29-AUG-19
Magnesium (Mg)-Total			<0.0050		mg/L		0.005	29-AUG-19
Manganese (Mn)-Total			<0.00010	)	mg/L		0.0001	29-AUG-19
Molybdenum (Mo)-Tota	ıl		<0.00005	50	mg/L		0.00005	29-AUG-19



Workorder: L2335330

Report Date: 03-SEP-19

Page 9 of 17

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-VA	Water							
Batch R4776911 WG3146677-1 MB								
Nickel (Ni)-Total			<0.00050		mg/L		0.0005	29-AUG-19
Potassium (K)-Total			<0.050		mg/L		0.05	29-AUG-19
Selenium (Se)-Total			<0.00005	0	mg/L		0.00005	29-AUG-19
Silicon (Si)-Total			<0.10		mg/L		0.1	29-AUG-19
Silver (Ag)-Total			<0.000010	0	mg/L		0.00001	29-AUG-19
Sodium (Na)-Total			< 0.050		mg/L		0.05	29-AUG-19
Strontium (Sr)-Total			<0.00020		mg/L		0.0002	29-AUG-19
Thallium (TI)-Total			<0.00001	0	mg/L		0.00001	29-AUG-19
Tin (Sn)-Total			<0.00010		mg/L		0.0001	29-AUG-19
Titanium (Ti)-Total			<0.00030		mg/L		0.0003	29-AUG-19
Uranium (U)-Total			<0.000010	0	mg/L		0.00001	29-AUG-19
Vanadium (V)-Total			<0.00050		mg/L		0.0005	29-AUG-19
Zinc (Zn)-Total			<0.0030		mg/L		0.003	29-AUG-19
WG3146677-4 MS Aluminum (Al)-Total		L2335330-1	97.5		%		70-130	29-AUG-19
Antimony (Sb)-Total			96.5		%		70-130	29-AUG-19
Arsenic (As)-Total			98.5		%		70-130	29-AUG-19
Barium (Ba)-Total			N/A	MS-B	%		-	29-AUG-19
Bismuth (Bi)-Total			95.3		%		70-130	29-AUG-19
Boron (B)-Total			84.1		%		70-130	29-AUG-19
Cadmium (Cd)-Total			98.2		%		70-130	29-AUG-19
Calcium (Ca)-Total			N/A	MS-B	%		-	29-AUG-19
Chromium (Cr)-Total			97.7		%		70-130	29-AUG-19
Cobalt (Co)-Total			95.9		%		70-130	29-AUG-19
Copper (Cu)-Total			95.1		%		70-130	29-AUG-19
Iron (Fe)-Total			93.9		%		70-130	29-AUG-19
Lead (Pb)-Total			97.0		%		70-130	29-AUG-19
Lithium (Li)-Total			87.4		%		70-130	29-AUG-19
Magnesium (Mg)-Total			N/A	MS-B	%		-	29-AUG-19
Manganese (Mn)-Total			94.8		%		70-130	29-AUG-19
Molybdenum (Mo)-Total			N/A	MS-B	%		<del>-</del>	29-AUG-19
Nickel (Ni)-Total			94.5		%		70-130	29-AUG-19
Potassium (K)-Total			N/A	MS-B	%		-	29-AUG-19
							70-130	
Selenium (Se)-Total			97.8	2	%		70-130	29-AUG-19



Workorder: L2335330 Report Date: 03-SEP-19 Page 10 of 17

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-VA	Water							
Batch R477691 WG3146677-4 MS Silicon (Si)-Total	1	L2335330-1	91.8		%		70-130	29-AUG-19
Silver (Ag)-Total			96.4		%		70-130	29-AUG-19 29-AUG-19
Sodium (Na)-Total			N/A	MS-B	%		-	29-AUG-19
Strontium (Sr)-Total			N/A	MS-B	%		_	29-AUG-19
Thallium (TI)-Total			96.1	2	%		70-130	29-AUG-19
Tin (Sn)-Total			94.4		%		70-130	29-AUG-19
Titanium (Ti)-Total			98.5		%		70-130	29-AUG-19
Uranium (U)-Total			98.7		%		70-130	29-AUG-19
Vanadium (V)-Total			99.7		%		70-130	29-AUG-19
Zinc (Zn)-Total			97.1		%		70-130	29-AUG-19
Batch R477799	<b>5</b>							
WG3147976-3 DUP	<b>J</b>	L2335330-2						
Aluminum (Al)-Total		0.0123	0.0131		mg/L	6.2	20	30-AUG-19
Antimony (Sb)-Total		0.00017	0.00014		mg/L	3.0	20	30-AUG-19
Arsenic (As)-Total		0.00022	0.00022		mg/L	3.0	20	30-AUG-19
Barium (Ba)-Total		0.298	0.301		mg/L	3.2	20	30-AUG-19
Bismuth (Bi)-Total		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	30-AUG-19
Boron (B)-Total		0.010	0.011		mg/L	0.1	20	30-AUG-19
Cadmium (Cd)-Total		0.000138	0.000136		mg/L	2.9	20	30-AUG-19
Calcium (Ca)-Total		102	101		mg/L	0.3	20	30-AUG-19
Chromium (Cr)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	30-AUG-19
Cobalt (Co)-Total		0.00027	0.00028		mg/L	2.1	20	30-AUG-19
Copper (Cu)-Total		0.00055	0.00051	RPD-NA	mg/L	N/A	20	30-AUG-19
Iron (Fe)-Total		0.327	0.313		mg/L	0.2	20	30-AUG-19
Lead (Pb)-Total		0.000300	0.000278		mg/L	0.2	20	30-AUG-19
Lithium (Li)-Total		0.0084	0.0084		mg/L	0.3	20	30-AUG-19
Magnesium (Mg)-Total	Į	30.1	28.2		mg/L	0.3	20	30-AUG-19
Manganese (Mn)-Tota	l	0.00935	0.00932		mg/L	2.3	20	30-AUG-19
Molybdenum (Mo)-Tota	al	0.00153	0.00143		mg/L	2.8	20	30-AUG-19
Nickel (Ni)-Total		0.00151	0.00151		mg/L	8.2	20	30-AUG-19
Potassium (K)-Total		2.03	2.03		mg/L	0.2	20	30-AUG-19
Silicon (Si)-Total		5.27	5.32		mg/L	0.2	20	30-AUG-19
Silver (Ag)-Total		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	30-AUG-19
Sodium (Na)-Total		1.63	1.63		mg/L	0.2	20	30-AUG-19



Page 11 of 17

Workorder: L2335330 Report Date: 03-SEP-19

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-VA	Water							
Batch R4777995								
WG3147976-3 DUP Strontium (Sr)-Total		<b>L2335330-2</b> 0.105	0.101		mg/L	2.6	20	30-AUG-19
Thallium (TI)-Total		0.000023	0.000023		mg/L	1.6	20	30-AUG-19
Tin (Sn)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	30-AUG-19
Titanium (Ti)-Total		<0.010	<0.010	RPD-NA	mg/L	N/A	20	30-AUG-19
Uranium (U)-Total		0.00159	0.00170		mg/L	1.4	20	30-AUG-19
Vanadium (V)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	30-AUG-19
Zinc (Zn)-Total		0.0078	0.0073		mg/L	3.1	20	30-AUG-19
WG3147976-2 LCS Aluminum (Al)-Total			112.7		%		80-120	30-AUG-19
Antimony (Sb)-Total			100.9		%		80-120	30-AUG-19
Arsenic (As)-Total			104.2		%		80-120	30-AUG-19
Barium (Ba)-Total			108.8		%		80-120	30-AUG-19
Bismuth (Bi)-Total			102.4		%		80-120	30-AUG-19
Boron (B)-Total			96.0		%		80-120	30-AUG-19
Cadmium (Cd)-Total			105.5		%		80-120	30-AUG-19
Calcium (Ca)-Total			101.4		%		80-120	30-AUG-19
Chromium (Cr)-Total			108.5		%		80-120	30-AUG-19
Cobalt (Co)-Total			108.5		%		80-120	30-AUG-19
Copper (Cu)-Total			104.3		%		80-120	30-AUG-19
Iron (Fe)-Total			106.6		%		80-120	30-AUG-19
Lead (Pb)-Total			103.9		%		80-120	30-AUG-19
Lithium (Li)-Total			102.1		%		80-120	30-AUG-19
Magnesium (Mg)-Total			104.3		%		80-120	30-AUG-19
Manganese (Mn)-Total			106.1		%		80-120	30-AUG-19
Molybdenum (Mo)-Total	l		100.2		%		80-120	30-AUG-19
Nickel (Ni)-Total			105.1		%		80-120	30-AUG-19
Potassium (K)-Total			105.6		%		80-120	30-AUG-19
Selenium (Se)-Total			108.4		%		80-120	30-AUG-19
Silicon (Si)-Total			109.0		%		80-120	30-AUG-19
Silver (Ag)-Total			99.5		%		80-120	30-AUG-19
Sodium (Na)-Total			103.8		%		80-120	30-AUG-19
Strontium (Sr)-Total			102.3		%		80-120	30-AUG-19
Thallium (TI)-Total			101.9		%		80-120	30-AUG-19
Tin (Sn)-Total			99.7		%		80-120	30-AUG-19



Workorder: L2335330

Report Date: 03-SEP-19 Page 12 of 17

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-VA	Water							
Batch R4777995								
WG3147976-2 LCS			400.4		0/			
Titanium (Ti)-Total			100.1		%		80-120	30-AUG-19
Uranium (U)-Total			108.2		%		80-120	30-AUG-19
Vanadium (V)-Total			109.2		%		80-120	30-AUG-19
Zinc (Zn)-Total			107.3		%		80-120	30-AUG-19
WG3147976-1 MB Aluminum (Al)-Total			<0.0030		mg/L		0.003	30-AUG-19
Antimony (Sb)-Total			<0.00010		mg/L		0.0001	30-AUG-19
Arsenic (As)-Total			<0.00010		mg/L		0.0001	30-AUG-19
Barium (Ba)-Total			<0.00010		mg/L		0.0001	30-AUG-19
Bismuth (Bi)-Total			<0.00005	0	mg/L		0.00005	30-AUG-19
Boron (B)-Total			<0.010		mg/L		0.01	30-AUG-19
Cadmium (Cd)-Total			<0.00000	5C	mg/L		0.000005	30-AUG-19
Calcium (Ca)-Total			<0.050		mg/L		0.05	30-AUG-19
Chromium (Cr)-Total			<0.00010		mg/L		0.0001	30-AUG-19
Cobalt (Co)-Total			<0.00010		mg/L		0.0001	30-AUG-19
Copper (Cu)-Total			<0.00050		mg/L		0.0005	30-AUG-19
Iron (Fe)-Total			<0.010		mg/L		0.01	30-AUG-19
Lead (Pb)-Total			< 0.00005	0	mg/L		0.00005	30-AUG-19
Lithium (Li)-Total			<0.0010		mg/L		0.001	30-AUG-19
Magnesium (Mg)-Total			< 0.0050		mg/L		0.005	30-AUG-19
Manganese (Mn)-Total			<0.00010		mg/L		0.0001	30-AUG-19
Molybdenum (Mo)-Total			< 0.00005	0	mg/L		0.00005	30-AUG-19
Nickel (Ni)-Total			<0.00050		mg/L		0.0005	30-AUG-19
Potassium (K)-Total			< 0.050		mg/L		0.05	30-AUG-19
Selenium (Se)-Total			<0.00005	0	mg/L		0.00005	30-AUG-19
Silicon (Si)-Total			<0.10		mg/L		0.1	30-AUG-19
Silver (Ag)-Total			<0.00001	0	mg/L		0.00001	30-AUG-19
Sodium (Na)-Total			< 0.050		mg/L		0.05	30-AUG-19
Strontium (Sr)-Total			<0.00020		mg/L		0.0002	30-AUG-19
Thallium (TI)-Total			<0.00001	0	mg/L		0.00001	30-AUG-19
Tin (Sn)-Total			<0.00010		mg/L		0.0001	30-AUG-19
Titanium (Ti)-Total			<0.00030		mg/L		0.0003	30-AUG-19
Uranium (U)-Total			<0.00001	0	mg/L		0.00001	30-AUG-19
Vanadium (V)-Total			<0.00050		mg/L		0.0005	30-AUG-19



Workorder: L2335330

Report Date: 03-SEP-19 Page 13 of 17

Test	Matrix	Reference	Result C	tualifier Units	RPD	Limit	Analyzed
MET-T-CCMS-VA	Water						
Batch R477 WG3147976-1 N Zinc (Zn)-Total	7995 //B		<0.0030	mg/L		0.003	30-AUG-19
NH3-L-F-CL	Water						
Batch R477 WG3145855-42 L Ammonia as N			104.8	%		85-115	28-AUG-19
<b>WG3145855-41 N</b> Ammonia as N	ИВ		<0.0050	mg/L		0.005	28-AUG-19
NO2-L-IC-N-CL	Water						
Batch R477 WG3146055-2 L	2848 .CS						
Nitrite (as N)	.03		106.0	%		90-110	24-AUG-19
<b>WG3146055-1</b> Nitrite (as N)	ИВ		<0.0010	mg/L		0.001	24-AUG-19
NO3-L-IC-N-CL	Water						
Batch R477 WG3146055-2 L Nitrate (as N)	2848 .CS		103.0	%		90-110	24-AUG-19
	ИВ		<0.0050	mg/L		0.005	24-AUG-19
ORP-CL	Water						
Batch R477	5407						
<b>WG3146400-3 O</b> ORP	CRM	CL-ORP	228	mV		210-230	28-AUG-19
P-T-L-COL-CL	Water						
Batch R476	8451						
WG3142895-14 L Phosphorus (P)-To			112.5	%		80-120	25-AUG-19
WG3142895-13 N Phosphorus (P)-To			<0.0020	mg/L		0.002	25-AUG-19
PH-CL	Water						
	1848 .CS						
рН			7.00	рН		6.9-7.1	27-AUG-19



Workorder: L2335330

Report Date: 03-SEP-19 Page 14 of 17

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PO4-DO-L-COL-CL	Water							
Batch R4767870 WG3142434-8 LCS Orthophosphate-Dissolve	ed (as P)		100.3		%		80-120	24-AUG-19
WG3142434-7 MB Orthophosphate-Dissolve	ed (as P)		<0.0010		mg/L		0.001	24-AUG-19
SO4-IC-N-CL	Water							
<b>Batch R4772848 WG3146055-2 LCS</b> Sulfate (SO4)			102.6		%		90-110	24-AUG-19
<b>WG3146055-1 MB</b> Sulfate (SO4)			<0.30		mg/L		0.3	24-AUG-19
SOLIDS-TDS-CL	Water							
Batch R4777452 WG3145045-8 LCS Total Dissolved Solids			99.1		%		85-115	28-AUG-19
WG3145045-7 MB Total Dissolved Solids			<10		mg/L		10	28-AUG-19
TKN-L-F-CL	Water							
Batch R4779015 WG3149449-11 DUP Total Kjeldahl Nitrogen		<b>L2335330-1</b> 0.143	0.144		mg/L	0.4	20	31-AUG-19
WG3149449-10 LCS Total Kjeldahl Nitrogen			91.4		%		75-125	31-AUG-19
WG3149449-14 LCS Total Kjeldahl Nitrogen			92.0		%		75-125	31-AUG-19
WG3149449-18 LCS Total Kjeldahl Nitrogen			97.6		%		75-125	31-AUG-19
WG3149449-2 LCS Total Kjeldahl Nitrogen			92.3		%		75-125	31-AUG-19
WG3149449-22 LCS Total Kjeldahl Nitrogen			97.6		%		75-125	31-AUG-19
WG3149449-6 LCS Total Kjeldahl Nitrogen			91.8		%		75-125	31-AUG-19
<b>WG3149449-1 MB</b> Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	31-AUG-19
WG3149449-13 MB Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	31-AUG-19
WG3149449-17 MB Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	31-AUG-19



Workorder: L2335330

Report Date: 03-SEP-19 Page 15 of 17

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
TKN-L-F-CL	Water							
Batch R4779015 WG3149449-21 MB Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	31-AUG-19
WG3149449-5 MB Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	31-AUG-19
<b>WG3149449-9 MB</b> Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	31-AUG-19
WG3149449-12 MS Total Kjeldahl Nitrogen		L2335330-1	102.5		%		70-130	31-AUG-19
TSS-L-CL	Water							
Batch R4777613								
WG3144790-8 LCS Total Suspended Solids			91.0		%		85-115	28-AUG-19
WG3144790-7 MB Total Suspended Solids			<1.0		mg/L		1	28-AUG-19
TURBIDITY-CL	Water							
Batch R4768077 WG3142660-11 LCS Turbidity			95.0		%		85-115	24-AUG-19
WG3142660-10 MB Turbidity			<0.10		NTU		0.1	24-AUG-19

Workorder: L2335330 Report Date: 03-SEP-19 Page 16 of 17

Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Description Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard

#### **Sample Parameter Qualifier Definitions:**

LCSD Laboratory Control Sample Duplicate

Qualifier	Description
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

Workorder: L2335330 Report Date: 03-SEP-19 Page 17 of 17

#### **Hold Time Exceedances:**

	Sample						-
ALS Product Description	ID	Sampling Date	Date Processed	Rec. HT	Actual HT	Units	Qualifier
Physical Tests							
Oxidation redution potential	by elect.						
	1	22-AUG-19 11:42	28-AUG-19 10:45	0.25	143	hours	EHTR-FM
	2	22-AUG-19 10:43	28-AUG-19 10:45	0.25	144	hours	EHTR-FM
рН							
	1	22-AUG-19 11:42	27-AUG-19 12:00	0.25	120	hours	EHTR-FM
	2	22-AUG-19 10:43	27-AUG-19 12:00	0.25	121	hours	EHTR-FM

#### Legend & Qualifier Definitions:

EHTR-FM: Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended.

EHTR: Exceeded ALS recommended hold time prior to sample receipt.

EHTL: Exceeded ALS recommended hold time prior to analysis. Sample was received less than 24 hours prior to expiry.

EHT: Exceeded ALS recommended hold time prior to analysis.

Rec. HT: ALS recommended hold time (see units).

#### Notes\*:

Where actual sampling date is not provided to ALS, the date (& time) of receipt is used for calculation purposes. Where actual sampling time is not provided to ALS, the earlier of 12 noon on the sampling date or the time (& date) of receipt is used for calculation purposes. Samples for L2335330 were received on 24-AUG-19 08:10.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against predetermined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

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	Sample Location	Field	Zan	į	Time	G=Grab	# Of		S.F	4	8	8	8	S	1					
Sample 1D	(sys_loc_code)	Matrix	Ha	Date	(24hr)	C=Comp			Y	HC	YA V	TE	YA	7	HG					
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LC_PIZDC1308_WG_Q3-2019_NP	LC_PIZDC1308	wG		8/22/2019	10:43	G	6		1	1	1	1	1	1		_				
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TECK COAL LIMITED (LINE CREEK)

ATTN: Carla Froyman Parker

PO BOX 2003

SPARWOOD BC VOB 2G0

Date Received: 04-SEP-19

Report Date: 11-SEP-19 17:13 (MT)

Version: FINAL

Client Phone: 250-425-6111

# Certificate of Analysis

Lab Work Order #: L2341172
Project P.O. #: VP000608129

Job Reference: LINE CREEK OPERATION
C of C Numbers: 20190903 PIZDC0901

Legal Site Desc:



Lyudmyla Shvets, B.Sc. Account Manager

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L2341172 CONTD.... PAGE 2 of 7 Version: FINAL

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2341172-1 LC_PIZDC0901_WG_Q3-2019_NP							
Sampled By: KC/DT on 03-SEP-19 @ 11:35							
Matrix: WG							
Miscellaneous Parameters							
Dissolved Organic Carbon	2.47		0.50	mg/L		09-SEP-19	R4790198
•				•			
Total Kjeldahl Nitrogen	0.358		0.050	mg/L		06-SEP-19	R4784825
Total Organic Carbon	2.57		0.50	mg/L		09-SEP-19	R4790198
Dissolved Metals in Water							
Diss. Be (low) in Water by CRC ICPMS				//	00.055.40	07.050.40	
Beryllium (Be)-Dissolved	<0.020		0.020	ug/L	06-SEP-19	07-SEP-19	R4784963
Dissolved Metals Filtration Location	FIELD					06-SEP-19	R4784374
Diss. Mercury in Water by CVAAS or CVAFS	0.0000050		0.0000050	o-/I	00.050.40	00 055 40	D 4700000
Mercury (Hg)-Dissolved	<0.000050		0.0000050	mg/L	08-SEP-19	09-SEP-19	R4790938
Dissolved Mercury Filtration Location	FIELD					08-SEP-19	R4787929
Dissolved Metals in Water by CRC ICPMS Dissolved Metals Filtration Location	FIELD					06-SEP-19	R4784374
Aluminum (Al)-Dissolved	<0.0030		0.0030	mg/L	06-SEP-19	07-SEP-19	R4784963
Antimony (Sb)-Dissolved	0.00019		0.00010	mg/L	06-SEP-19	07-SEP-19	R4784963
Arsenic (As)-Dissolved	0.00022		0.00010	mg/L	06-SEP-19	07-SEP-19	R4784963
Barium (Ba)-Dissolved	0.241		0.00010	mg/L	06-SEP-19	07-SEP-19	R4784963
Bismuth (Bi)-Dissolved	<0.000050		0.000050	mg/L	06-SEP-19	07-SEP-19	R4784963
Boron (B)-Dissolved	<0.010		0.000	mg/L	06-SEP-19	07-SEP-19	R4784963
Cadmium (Cd)-Dissolved	0.0948		0.0050	ug/L	06-SEP-19	07-SEP-19	R4784963
Calcium (Ca)-Dissolved	101		0.050	mg/L	06-SEP-19	07-SEP-19	R4784963
Chromium (Cr)-Dissolved	<0.00010		0.00010	mg/L	06-SEP-19	07-SEP-19	R4784963
Cobalt (Co)-Dissolved	<0.10		0.10	ug/L	06-SEP-19	07-SEP-19	R4784963
Copper (Cu)-Dissolved	0.00065		0.00050	mg/L	06-SEP-19	07-SEP-19	R4784963
Iron (Fe)-Dissolved	<0.010		0.0000	mg/L	06-SEP-19	07-SEP-19	R4784963
Lead (Pb)-Dissolved	<0.00050		0.000050	mg/L	06-SEP-19	07-SEP-19	R4784963
Lithium (Li)-Dissolved	0.0030		0.0010	mg/L	06-SEP-19	07-SEP-19	R4784963
Magnesium (Mg)-Dissolved	30.5		0.0010	mg/L	06-SEP-19	07-SEP-19	R4784963
Manganese (Mn)-Dissolved	0.00017		0.00010	mg/L	06-SEP-19	07-SEP-19	R4784963
Molybdenum (Mo)-Dissolved	0.00017		0.00010	mg/L	06-SEP-19	07-SET-19	R4784963
Nickel (Ni)-Dissolved	0.000343		0.00050	mg/L	06-SEP-19	07-SET-19	R4784963
Potassium (K)-Dissolved	1.46		0.00030	_	06-SEP-19	07-SEP-19	
Selenium (Se)-Dissolved				mg/L	06-SEP-19	07-SEP-19 07-SEP-19	R4784963
Silicon (Si)-Dissolved	0.550 7.01		0.050	ug/L	06-SEP-19	07-SEP-19 07-SEP-19	R4784963 R4784963
Silver (Ag)-Dissolved	<0.000010		0.050	mg/L	06-SEP-19	07-SEP-19 07-SEP-19	
Sodium (Na)-Dissolved	<0.000010 3.45		0.000010 0.050	mg/L mg/L	06-SEP-19 06-SEP-19	07-SEP-19 07-SEP-19	R4784963 R4784963
Strontium (Sr)-Dissolved				_			
Thallium (TI)-Dissolved	0.178 0.000011		0.00020 0.000010	mg/L mg/L	06-SEP-19 06-SEP-19	07-SEP-19 07-SEP-19	R4784963 R4784963
				_			
Tin (Sn)-Dissolved Titanium (Ti)-Dissolved	<0.00010		0.00010	mg/L	06-SEP-19	07-SEP-19	R4784963
Uranium (11)-Dissolved Uranium (U)-Dissolved	<0.010		0.010	mg/L	06-SEP-19	07-SEP-19	R4784963
` '	0.00207		0.000010	mg/L	06-SEP-19	07-SEP-19	R4784963
Vanadium (V)-Dissolved	<0.00050		0.00050	mg/L	06-SEP-19	07-SEP-19	R4784963
Zinc (Zn)-Dissolved  Hardness	0.0019		0.0010	mg/L	06-SEP-19	07-SEP-19	R4784963
Hardness (as CaCO3)	377		0.50	mg/L		08-SEP-19	
Total Metals in Water			3.30	<i>g</i> , <b>–</b>			
Total Be (Low) in Water by CRC ICPMS							
Beryllium (Be)-Total	<0.020		0.020	ug/L		07-SEP-19	R4786437
Total Metals in Water by CRC ICPMS							
Aluminum (Al)-Total	0.0663		0.0030	mg/L		07-SEP-19	R4786437
Antimony (Sb)-Total	0.00023		0.00010	mg/L		07-SEP-19	R4786437
	1		0.00010	mg/L	1	07-SEP-19	R4786437

<sup>\*</sup> Refer to Referenced Information for Qualifiers (if any) and Methodology.

L2341172 CONTD.... PAGE 3 of 7 Version: FINAL

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
   L2341172-1							
Sampled By: KC/DT on 03-SEP-19 @ 11:35							
Matrix: WG							
Total Metals in Water by CRC ICPMS Barium (Ba)-Total	0.257		0.00010	mg/L		07-SEP-19	R4786437
Bismuth (Bi)-Total	<0.000050		0.000050	mg/L		07-SEP-19	R4786437
Boron (B)-Total	<0.010		0.010	mg/L		07-SEP-19	R4786437
Cadmium (Cd)-Total	0.152		0.0050	ug/L		07-SEP-19	R4786437
Calcium (Ca)-Total	104		0.050	mg/L		07-SEP-19	R4786437
Chromium (Cr)-Total	0.00022		0.00010	mg/L		07-SEP-19	R4786437
Cobalt (Co)-Total	0.22		0.10	ug/L		07-SEP-19	R4786437
Copper (Cu)-Total	0.00077		0.00050	mg/L		07-SEP-19	R4786437
Iron (Fe)-Total	0.112		0.010	mg/L		07-SEP-19	R4786437
Lead (Pb)-Total	0.000115		0.000050	mg/L		07-SEP-19	R4786437
Lithium (Li)-Total	0.0031		0.0010	mg/L		07-SEP-19	R4786437
Magnesium (Mg)-Total	29.7		0.10	mg/L		07-SEP-19	R4786437
Manganese (Mn)-Total	0.0179		0.00010	mg/L		07-SEP-19	R4786437
Molybdenum (Mo)-Total	0.000538		0.000050	mg/L		07-SEP-19	R4786437
Nickel (Ni)-Total	0.00178		0.00050	mg/L		07-SEP-19	R4786437
Potassium (K)-Total	1.37		0.050	mg/L		07-SEP-19	R4786437
Selenium (Se)-Total	0.471		0.050	ug/L		07-SEP-19	R4786437
Silicon (Si)-Total	6.59		0.10	mg/L		07-SEP-19	R4786437
Silver (Ag)-Total	<0.000010		0.000010	mg/L		07-SEP-19	R4786437
Sodium (Na)-Total	3.06		0.050	mg/L		07-SEP-19	R4786437
Strontium (Sr)-Total	0.178		0.00020	mg/L		07-SEP-19	R4786437
Thallium (TI)-Total	0.000016		0.000010	mg/L		07-SEP-19	R4786437
Tin (Sn)-Total	0.00011		0.00010	mg/L		07-SEP-19	R4786437
Titanium (Ti)-Total	<0.010		0.010	mg/L		07-SEP-19	R4786437
Uranium (U)-Total	0.00204		0.000010	mg/L		07-SEP-19	R4786437
Vanadium (V)-Total	0.00073		0.00050	mg/L		07-SEP-19	R4786437
Zinc (Zn)-Total	<0.0030		0.0030	mg/L		07-SEP-19	R4786437
Routine for Teck Coal							
Acidity by Automatic Titration		DD)/		"		05.050.40	5
Acidity (as CaCO3)	12.4	RRV	1.0	mg/L		05-SEP-19	R4785468
Alkalinity (Species) by Manual Titration Alkalinity, Bicarbonate (as CaCO3)	377		4.0	m a/l		05-SEP-19	D 470 4075
Alkalinity, Carbonate (as CaCO3)	<1.0		1.0 1.0	mg/L mg/L		05-SEP-19 05-SEP-19	R4784875 R4784875
Alkalinity, Garbonate (as CaCO3)  Alkalinity, Hydroxide (as CaCO3)						05-SEP-19	
Alkalinity, Trydroxide (as CaCO3)  Alkalinity, Total (as CaCO3)	<1.0 377		1.0 1.0	mg/L mg/L		05-SEP-19 05-SEP-19	R4784875 R4784875
Ammonia, Total (as N)	311		1.0	mg/L		33 321 - 19	14104013
Ammonia as N	0.0066		0.0050	mg/L		06-SEP-19	R4786970
Bromide in Water by IC (Low Level)	0.0000			3			
Bromide (Br)	<0.050		0.050	mg/L		04-SEP-19	R4785017
Chloride in Water by IC				· ·			
Chloride (CI)	0.72		0.50	mg/L		04-SEP-19	R4785017
Electrical Conductivity (EC)							
Conductivity (@ 25C)	650		2.0	uS/cm		05-SEP-19	R4784875
Fluoride in Water by IC							
Fluoride (F)	0.087		0.020	mg/L		04-SEP-19	R4785017
Ion Balance Calculation							
Cation - Anion Balance	-0.8			%		08-SEP-19	
Anion Sum	7.83			meq/L		08-SEP-19	
Cation Sum	7.71			meq/L		08-SEP-19	
Ion Balance Calculation Ion Balance	98.5		-100	%		08-SEP-19	
Nitrate in Water by IC (Low Level)	30.5		100	70		55 521 -15	
Miliale III Walei by IC (LOW Level)							

<sup>\*</sup> Refer to Referenced Information for Qualifiers (if any) and Methodology.

L2341172 CONTD.... PAGE 4 of 7 Version: FINAL

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2341172-1 LC_PIZDC0901_WG_Q3-2019_NP							
Sampled By: KC/DT on 03-SEP-19 @ 11:35							
Matrix: WG Nitrate in Water by IC (Low Level)							
Nitrate (as N)  Nitrite in Water by IC (Low Level)	0.339		0.0050	mg/L		04-SEP-19	R4785017
Nitrite (as N)	<0.0010		0.0010	mg/L		04-SEP-19	R4785017
Orthophosphate-Dissolved (as P) Orthophosphate-Dissolved (as P)	0.0110		0.0010	mg/L		04-SEP-19	R4783210
Oxidation redution potential by elect. ORP	403		-1000	mV		04-SEP-19	R4783621
Phosphorus (P)-Total Phosphorus (P)-Total	0.0116		0.0020	mg/L		07-SEP-19	R4787208
Sulfate in Water by IC				-			
Sulfate (SO4)  Total Dissolved Solids	12.3		0.30	mg/L		04-SEP-19	R4785017
Total Dissolved Solids  Total Suspended Solids	387	DLHC	20	mg/L		04-SEP-19	R4783683
Total Suspended Solids  Turbidity	4.2		1.0	mg/L		09-SEP-19	R4793008
Turbidity	3.73		0.10	NTU		04-SEP-19	R4783219
<b>pH</b> pH	8.27		0.10	рН		05-SEP-19	R4784875

<sup>\*</sup> Refer to Referenced Information for Qualifiers (if any) and Methodology.

**Reference Information** 

L2341172 CONTD....
PAGE 5 of 7
Version: FINAL

Sample Parameter Qualifier Key:

Qualifier	Description
DLHC	Detection Limit Raised: Dilution required due to high concentration of test analyte(s).
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RRV	Reported Result Verified By Repeat Analysis

#### **Test Method References:**

ALS Test Code	Matrix	Test Description	Method Reference**	
ACIDITY-PCT-CL	Water	Acidity by Automatic Titration	APHA 2310 Acidity	

This analysis is carried out using procedures adapted from APHA Method 2310 "Acidity". Acidity is determined by potentiometric titration to a specified endpoint.

ALK-MAN-CL Water Alkalinity (Species) by Manual Titration APHA 2320 ALKALINITY

This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.

BE-D-L-CCMS-VA Water Diss. Be (low) in Water by CRC ICPMS APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

BE-T-L-CCMS-VA Water Total Be (Low) in Water by CRC ICPMS EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

BR-L-IC-N-CL Water Bromide in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

C-DIS-ORG-LOW-CL Water Dissolved Organic Carbon APHA 5310 B-Instrumental

This method is applicable to the analysis of ground water, wastewater, and surface water samples. The form detected depends upon sample pretreatment: Unfiltered sample = TC, 0.45um filtered = TDC. Samples are injected into a combustion tube containing an oxidation catalyst. The carrier gas containing the combustion product from the combustion tube flows through an inorganic carbon reactor vessel and is then sent through a halogen scrubber into a sample cell set in a non-dispersive infrared gas analyzer (NDIR) where carbon dioxide is detected. For total inorganic carbon and dissolved inorganic carbon, the sample is injected into an IC reactor vessel where only the IC component is decomposed to become carbon dioxide.

The peak area generated by the NDIR indicates the TC/TDC or TIC/DIC as applicable. The total organic carbon content of the sample is calculated by subtracting the TIC from the TC.

TOC = TC-TIC, DOC = TDC-DIC, Particulate = Total - Dissolved.

C-TOT-ORG-LOW-CL Water Total Organic Carbon APHA 5310 TOTAL ORGANIC CARBON (TOC)

This method is applicable to the analysis of ground water, wastewater, and surface water samples. The form detected depends upon sample pretreatment: Unfiltered sample = TC, 0.45um filtered = TDC. Samples are injected into a combustion tube containing an oxidation catalyst. The carrier gas containing the combustion product from the combustion tube flows through an inorganic carbon reactor vessel and is then sent through a halogen scrubber into a sample cell set in a non-dispersive infrared gas analyzer (NDIR) where carbon dioxide is detected. For total inorganic carbon and dissolved inorganic carbon, the sample is injected into an IC reactor vessel where only the IC component is decomposed to become carbon dioxide.

The peak area generated by the NDIR indicates the TC/TDC or TIC/DIC as applicable. The total organic carbon content of the sample is calculated by subtracting the TIC from the TC.

TOC = TC-TIC, DOC = TDC-DIC, Particulate = Total - Dissolved.

CL-IC-N-CL Water Chloride in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

EC-L-PCT-CL Water Electrical Conductivity (EC) APHA 2510B

Conductivity, also known as Electrical Conductivity (EC) or Specific Conductance, is measured by immersion of a conductivity cell with platinum electrodes into a water sample. Conductivity measurements are temperature-compensated to 25C.

F-IC-N-CL Water Fluoride in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

HARDNESS-CALC-VA Water Hardness APHA 2340B

Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

HG-D-CVAA-VA Water Diss. Mercury in Water by CVAAS or CVAFS APHA 3030B/EPA 1631E (mod)

Water samples are filtered (0.45 um), preserved with hydrochloric acid, then undergo a cold-oxidation using bromine monochloride prior to reduction

L2341172 CONTD....

PAGE 6 of 7 Version: FINAL

### **Reference Information**

**Test Method References:** 

ALS Test Code Matrix Test Description Method Reference\*\*

with stannous chloride, and analyzed by CVAAS or CVAFS.

IONBALANCE-BC-CL Water Ion Balance Calculation APHA 1030E

Cation Sum, Anion Sum, and Ion Balance (as % difference) are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Because all aqueous solutions are electrically neutral, the calculated ion balance (% difference of cations minus anions) should be near-zero.

Cation and Anion Sums are the total meq/L concentration of major cations and anions. Dissolved species are used where available. Minor ions are included where data is present. Ion Balance is calculated as:

Ion Balance (%) = [Cation Sum-Anion Sum] / [Cation Sum+Anion Sum]

MET-D-CCMS-VA Water Dissolved Metals in Water by CRC ICPMS APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

MET-T-CCMS-VA Water Total Metals in Water by CRC ICPMS EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

NH3-L-F-CL Water Ammonia, Total (as N) J. ENVIRON. MONIT., 2005, 7, 37-42, RSC

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.

NO2-L-IC-N-CL Water Nitrite in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

NO3-L-IC-N-CL Water Nitrate in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

ORP-CL Water Oxidation redution potential by elect. ASTM D1498

This analysis is carried out in accordance with the procedure described in the "ASTM" method D1498 "Oxidation-Reduction Potential of Water" published by the American Society for Testing and Materials (ASTM). Results are reported as observed oxidation-reduction potential of the platinum metal-reference electrode employed, in mV.

It is recommended that this analysis be conducted in the field.

P-T-L-COL-CL Water Phosphorus (P)-Total APHA 4500-P PHOSPHORUS

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after persulphate digestion of the sample.

PH-CL Water pH APHA 4500 H-Electrode

pH is determined in the laboratory using a pH electrode. All samples analyzed by this method for pH will have exceeded the 15 minute recommended hold time from time of sampling (field analysis is recommended for pH where highly accurate results are needed)

PO4-DO-L-COL-CL Water Orthophosphate-Dissolved (as P) APHA 4500-P PHOSPHORUS

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.

SO4-IC-N-CL Water Sulfate in Water by IC EPA 300.1 (mod

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

SOLIDS-TDS-CL Water Total Dissolved Solids APHA 2540 C

A well-mixed sample is filtered through a glass fibre filter paper. The filtrate is then evaporated to dryness in a pre-weighed vial and dried at 180 - 2 °C. The increase in vial weight represents the total dissolved solids (TDS).

TECKCOAL-IONBAL-CL Water Ion Balance Calculation APHA 1030E

Cation Sum, Anion Sum, and Ion Balance (as % difference) are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Because all aqueous solutions are electrically neutral, the calculated ion balance (% difference of cations minus anions) should be near-zero.

Cation and Anion Sums are the total meg/L concentration of major cations and anions. Dissolved species are used where available. Minor ions are

LINE CREEK OPERATION L2341172 CONTD....

**Reference Information** 

PAGE 7 of 7 Version: FINAL

**Test Method References:** 

ALS Test Code Matrix Test Description Method Reference\*\*

included where data is present. Ion Balance is calculated as:

Ion Balance (%) = [Cation Sum-Anion Sum] / [Cation Sum+Anion Sum]

TKN-L-F-CL Water Total Kieldahl Nitrogen APHA 4500-NORG (TKN)

This analysis is carried out using procedures adapted from APHA Method 4500-Norg D. "Block Digestion and Flow Injection Analysis". Total Kjeldahl

Nitrogen is determined using block digestion followed by Flow-injection analysis with fluorescence detection.

TSS-L-CL Water Total Suspended Solids APHA 2540 D-Gravimetric

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total suspended solids (TSS) are determined by filtering a sample through a glass fibre filter, and by drying the filter at 104 deg. C.

TURBIDITY-CL Water Turbidity APHA 2130 B-Nephelometer

This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.

\*\* ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

<b>Laboratory Definition Code</b>	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA
CL	ALS ENVIRONMENTAL - CALGARY, ALBERTA, CANADA

#### **Chain of Custody Numbers:**

20190903 PIZDC0901

### GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.

mg/kg - milligrams per kilogram based on dry weight of sample

mg/kg wwt - milligrams per kilogram based on wet weight of sample

mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight

mg/L - unit of concentration based on volume, parts per million.

< - Less than.

D.L. - The reporting limit.

N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory. UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.



Workorder: L2341172

Report Date: 11-SEP-19

Page 1 of 11

Client:

TECK COAL LIMITED (LINE CREEK)

PO BOX 2003

SPARWOOD BC V0B 2G0

Contact: Carla Froyman Parker

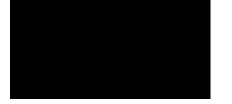
Test	Matrix	Reference	Result Qualifier	Units	RPD	Limit	Analyzed
ACIDITY-PCT-CL	Water						
Batch R4785468 WG3154179-11 LCS Acidity (as CaCO3)			109.7	%		85-115	05-SEP-19
WG3154179-10 MB Acidity (as CaCO3)			1.5	mg/L		2	05-SEP-19
ALK-MAN-CL	Water						
Batch R4784875 WG3154107-14 LCS Alkalinity, Total (as CaC	O3)		101.6	%		85-115	05-SEP-19
WG3154107-13 MB Alkalinity, Total (as CaC	O3)		<1.0	mg/L		1	05-SEP-19
BE-D-L-CCMS-VA	Water						
Batch R4784963 WG3153796-2 LCS							
Beryllium (Be)-Dissolved	1	ND	95.1	%		80-120	07-SEP-19
WG3153796-1 MB Beryllium (Be)-Dissolved		NP	<0.000020	mg/L		0.00002	07-SEP-19
BE-T-L-CCMS-VA	Water						
Batch R4786437 WG3153810-2 LCS Beryllium (Be)-Total			97.5	%		80-120	07-SEP-19
WG3153810-1 MB Beryllium (Be)-Total			<0.000020	mg/L		0.00002	07-SEP-19
BR-L-IC-N-CL	Water						
Batch R4785017 WG3154490-10 LCS							
Bromide (Br)			102.0	%		85-115	04-SEP-19
<b>WG3154490-9 MB</b> Bromide (Br)			<0.050	mg/L		0.05	04-SEP-19
C-DIS-ORG-LOW-CL	Water						
Batch R4790198 WG3155689-2 LCS Dissolved Organic Carbo	on		95.4	%		80-120	09-SEP-19
WG3155689-1 MB Dissolved Organic Carbo			<0.50	mg/L		0.5	09-SEP-19
WG3155689-4 MS Dissolved Organic Carbo	on	L2341172-1	106.8	%		70-130	09-SEP-19
C-TOT-ORG-LOW-CL	Water						



Workorder: L2341172

Report Date: 11-SEP-19 Page 2 of 11

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
C-TOT-ORG-LOW-CL	Water							
Batch R4790198								
WG3155689-2 LCS Total Organic Carbon			97.2		%		80-120	09-SEP-19
WG3155689-1 MB Total Organic Carbon			<0.50		mg/L		0.5	09-SEP-19
WG3155689-4 MS Total Organic Carbon		L2341172-1	104.6		%		70-130	09-SEP-19
CL-IC-N-CL	Water							
Batch R4785017								
WG3154490-10 LCS Chloride (Cl)			102.0		%		90-110	04-SEP-19
<b>WG3154490-9 MB</b> Chloride (CI)			<0.50		mg/L		0.5	04-SEP-19
EC-L-PCT-CL	Water							
Batch R4784875								
WG3154107-14 LCS Conductivity (@ 25C)			99.9		%		90-110	05-SEP-19
WG3154107-13 MB Conductivity (@ 25C)			<2.0		uS/cm		2	05-SEP-19
F-IC-N-CL	Water							
Batch R4785017								
<b>WG3154490-10 LCS</b> Fluoride (F)			109.1		%		90-110	04-SEP-19
<b>WG3154490-9 MB</b> Fluoride (F)			<0.020		mg/L		0.02	04-SEP-19
HG-D-CVAA-VA	Water							
Batch R4790938								
WG3155401-2 LCS Mercury (Hg)-Dissolved			96.9		%		80-120	09-SEP-19
WG3155401-1 MB Mercury (Hg)-Dissolved			<0.000005	5C	mg/L		0.000005	09-SEP-19
MET-D-CCMS-VA	Water							
Batch R4784963								
WG3153796-2 LCS								
Aluminum (Al)-Dissolved			100.0		%		80-120	07-SEP-19
Antimony (Sb)-Dissolved			90.7		%		80-120	07-SEP-19
Arsenic (As)-Dissolved			100.1		%		80-120	07-SEP-19
Barium (Ba)-Dissolved			100.9		%		80-120	07-SEP-19



Workorder: L2341172

Report Date: 11-SEP-19 Page 3 of 11

Test Matri	x Reference	Result Qualifie	r Units	RPD	Limit	Analyzed
MET-D-CCMS-VA Wate	er					
Batch R4784963						
WG3153796-2 LCS						
Bismuth (Bi)-Dissolved		91.3	%		80-120	07-SEP-19
Boron (B)-Dissolved		94.4	%		80-120	07-SEP-19
Cadmium (Cd)-Dissolved		97.8	%		80-120	07-SEP-19
Calcium (Ca)-Dissolved		97.1	%		80-120	07-SEP-19
Chromium (Cr)-Dissolved		98.6	%		80-120	07-SEP-19
Cobalt (Co)-Dissolved		97.7	%		80-120	07-SEP-19
Copper (Cu)-Dissolved		97.6	%		80-120	07-SEP-19
Iron (Fe)-Dissolved		94.6	%		80-120	07-SEP-19
Lead (Pb)-Dissolved		93.8	%		80-120	07-SEP-19
Lithium (Li)-Dissolved		88.5	%		80-120	07-SEP-19
Magnesium (Mg)-Dissolved		102.3	%		80-120	07-SEP-19
Manganese (Mn)-Dissolved		101.9	%		80-120	07-SEP-19
Molybdenum (Mo)-Dissolved		95.9	%		80-120	07-SEP-19
Nickel (Ni)-Dissolved		97.6	%		80-120	07-SEP-19
Potassium (K)-Dissolved		100.3	%		80-120	07-SEP-19
Selenium (Se)-Dissolved		94.4	%		80-120	07-SEP-19
Silicon (Si)-Dissolved		103.5	%		60-140	07-SEP-19
Silver (Ag)-Dissolved		92.9	%		80-120	07-SEP-19
Sodium (Na)-Dissolved		103.7	%		80-120	07-SEP-19
Strontium (Sr)-Dissolved		100.1	%		80-120	07-SEP-19
Thallium (TI)-Dissolved		93.6	%		80-120	07-SEP-19
Tin (Sn)-Dissolved		91.3	%		80-120	07-SEP-19
Titanium (Ti)-Dissolved		92.5	%		80-120	07-SEP-19
Uranium (U)-Dissolved		102.6	%		80-120	07-SEP-19
Vanadium (V)-Dissolved		100.0	%		80-120	07-SEP-19
Zinc (Zn)-Dissolved		100.1	%		80-120	07-SEP-19
WG3153796-1 MB	NP					
Aluminum (AI)-Dissolved		<0.0010	mg/L		0.001	07-SEP-19
Antimony (Sb)-Dissolved		<0.00010	mg/L		0.0001	07-SEP-19
Arsenic (As)-Dissolved		<0.00010	mg/L		0.0001	07-SEP-19
Barium (Ba)-Dissolved		<0.00010	mg/L		0.0001	07-SEP-19
Bismuth (Bi)-Dissolved		<0.000050	mg/L		0.00005	07-SEP-19
Boron (B)-Dissolved		<0.010	mg/L		0.01	07-SEP-19
Cadmium (Cd)-Dissolved		<0.000050	mg/L		0.000005	07-SEP-19



Workorder: L2341172

Report Date: 11-SEP-19 Page 4 of 11

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA	Water							
Batch R4784963	3							
WG3153796-1 MB		NP						
Calcium (Ca)-Dissolve			<0.050		mg/L		0.05	07-SEP-19
Chromium (Cr)-Dissolv	ved		<0.00010		mg/L		0.0001	07-SEP-19
Cobalt (Co)-Dissolved			<0.00010		mg/L		0.0001	07-SEP-19
Copper (Cu)-Dissolved	d		<0.00020		mg/L		0.0002	07-SEP-19
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	07-SEP-19
Lead (Pb)-Dissolved			<0.000050	)	mg/L		0.00005	07-SEP-19
Lithium (Li)-Dissolved			<0.0010		mg/L		0.001	07-SEP-19
Magnesium (Mg)-Disse			<0.0050		mg/L		0.005	07-SEP-19
Manganese (Mn)-Diss			<0.00010		mg/L		0.0001	07-SEP-19
Molybdenum (Mo)-Dis	solved		<0.000050	)	mg/L		0.00005	07-SEP-19
Nickel (Ni)-Dissolved			<0.00050		mg/L		0.0005	07-SEP-19
Potassium (K)-Dissolv	ed		< 0.050		mg/L		0.05	07-SEP-19
Selenium (Se)-Dissolv	ed		<0.000050	)	mg/L		0.00005	07-SEP-19
Silicon (Si)-Dissolved			< 0.050		mg/L		0.05	07-SEP-19
Silver (Ag)-Dissolved			<0.000010	)	mg/L		0.00001	07-SEP-19
Sodium (Na)-Dissolved	d		<0.050		mg/L		0.05	07-SEP-19
Strontium (Sr)-Dissolve	ed		<0.00020		mg/L		0.0002	07-SEP-19
Thallium (TI)-Dissolved	b		<0.000010	)	mg/L		0.00001	07-SEP-19
Tin (Sn)-Dissolved			<0.00010		mg/L		0.0001	07-SEP-19
Titanium (Ti)-Dissolved	d		<0.00030		mg/L		0.0003	07-SEP-19
Uranium (U)-Dissolved	i		<0.000010	)	mg/L		0.00001	07-SEP-19
Vanadium (V)-Dissolve	ed		<0.00050		mg/L		0.0005	07-SEP-19
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	07-SEP-19
MET-T-CCMS-VA	Water							
Batch R478643	7							
WG3153810-2 LCS								
Aluminum (Al)-Total			107.0		%		80-120	07-SEP-19
Antimony (Sb)-Total			99.5		%		80-120	07-SEP-19
Arsenic (As)-Total			105.4		%		80-120	07-SEP-19
Barium (Ba)-Total			102.3		%		80-120	07-SEP-19
Bismuth (Bi)-Total			98.6		%		80-120	07-SEP-19
Boron (B)-Total			95.4		%		80-120	07-SEP-19
Cadmium (Cd)-Total			105.3		%		80-120	07-SEP-19
Calcium (Ca)-Total			102.2		%		80-120	07-SEP-19



Workorder: L2341172

Report Date: 11-SEP-19 Page 5 of 11

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-VA	Water							
Batch R4786437								
WG3153810-2 LCS			100.0		0.4			
Chromium (Cr)-Total			106.2		%		80-120	07-SEP-19
Cobalt (Co)-Total			105.8		%		80-120	07-SEP-19
Copper (Cu)-Total			103.8		%		80-120	07-SEP-19
Iron (Fe)-Total			103.2		%		80-120	07-SEP-19
Lead (Pb)-Total			101.4		%		80-120	07-SEP-19
Lithium (Li)-Total			93.2		%		80-120	07-SEP-19
Magnesium (Mg)-Total			106.4		%		80-120	07-SEP-19
Manganese (Mn)-Total			101.0		%		80-120	07-SEP-19
Molybdenum (Mo)-Total			102.3		%		80-120	07-SEP-19
Nickel (Ni)-Total			104.2		%		80-120	07-SEP-19
Potassium (K)-Total			108.0		%		80-120	07-SEP-19
Selenium (Se)-Total			108.8		%		80-120	07-SEP-19
Silicon (Si)-Total			102.2		%		80-120	07-SEP-19
Silver (Ag)-Total			104.9		%		80-120	07-SEP-19
Sodium (Na)-Total			107.4		%		80-120	07-SEP-19
Strontium (Sr)-Total			100.2		%		80-120	07-SEP-19
Thallium (TI)-Total			98.1		%		80-120	07-SEP-19
Tin (Sn)-Total			101.1		%		80-120	07-SEP-19
Titanium (Ti)-Total			102.3		%		80-120	07-SEP-19
Uranium (U)-Total			93.0		%		80-120	07-SEP-19
Vanadium (V)-Total			107.9		%		80-120	07-SEP-19
Zinc (Zn)-Total			107.4		%		80-120	07-SEP-19
WG3153810-1 MB								
Aluminum (Al)-Total			<0.0030		mg/L		0.003	07-SEP-19
Antimony (Sb)-Total			<0.00010		mg/L		0.0001	07-SEP-19
Arsenic (As)-Total			<0.00010		mg/L		0.0001	07-SEP-19
Barium (Ba)-Total			<0.00010		mg/L		0.0001	07-SEP-19
Bismuth (Bi)-Total			<0.000050		mg/L		0.00005	07-SEP-19
Boron (B)-Total			<0.010		mg/L		0.01	07-SEP-19
Cadmium (Cd)-Total			<0.000005	C	mg/L		0.000005	07-SEP-19
Calcium (Ca)-Total			<0.050		mg/L		0.05	07-SEP-19
Chromium (Cr)-Total			<0.00010		mg/L		0.0001	07-SEP-19
Cobalt (Co)-Total			<0.00010		mg/L		0.0001	07-SEP-19
Copper (Cu)-Total			<0.00050		mg/L		0.0005	07-SEP-19



Workorder: L2341172

Report Date: 11-SEP-19 Page 6 of 11

Test	Matrix	Reference	Result Qualifie	r Units	RPD	Limit	Analyzed
MET-T-CCMS-VA	Water						
Batch R4786437							
WG3153810-1 MB			0.040	<i>I</i> I			
Iron (Fe)-Total			<0.010	mg/L		0.01	07-SEP-19
Lead (Pb)-Total			<0.000050	mg/L		0.00005	07-SEP-19
Lithium (Li)-Total			<0.0010	mg/L		0.001	07-SEP-19
Magnesium (Mg)-Total			<0.0050	mg/L		0.005	07-SEP-19
Manganese (Mn)-Total			<0.00010	mg/L		0.0001	07-SEP-19
Molybdenum (Mo)-Total			<0.000050	mg/L		0.00005	07-SEP-19
Nickel (Ni)-Total			<0.00050	mg/L		0.0005	07-SEP-19
Potassium (K)-Total			<0.050	mg/L		0.05	07-SEP-19
Selenium (Se)-Total			<0.000050	mg/L		0.00005	07-SEP-19
Silicon (Si)-Total			<0.10	mg/L		0.1	07-SEP-19
Silver (Ag)-Total			<0.000010	mg/L		0.00001	07-SEP-19
Sodium (Na)-Total			<0.050	mg/L		0.05	07-SEP-19
Strontium (Sr)-Total			<0.00020	mg/L		0.0002	07-SEP-19
Thallium (TI)-Total			<0.000010	mg/L		0.00001	07-SEP-19
Tin (Sn)-Total			<0.00010	mg/L		0.0001	07-SEP-19
Titanium (Ti)-Total			<0.00030	mg/L		0.0003	07-SEP-19
Uranium (U)-Total			<0.00010	mg/L		0.00001	07-SEP-19
Vanadium (V)-Total			<0.00050	mg/L		0.0005	07-SEP-19
Zinc (Zn)-Total			<0.0030	mg/L		0.003	07-SEP-19
NH3-L-F-CL	Water						
Batch R4786970							
WG3154352-18 LCS							
Ammonia as N			109.2	%		85-115	06-SEP-19
WG3154352-17 MB							
Ammonia as N			<0.0050	mg/L		0.005	06-SEP-19
NO2-L-IC-N-CL	Water						
Batch R4785017							
WG3154490-10 LCS			4047	0/			
Nitrite (as N)			104.7	%		90-110	04-SEP-19
<b>WG3154490-9 MB</b> Nitrite (as N)			<0.0010	mg/L		0.001	04-SEP-19
,	Wate:			··· <b>·</b> g· =		0.001	0-4-0E1 -10
NO3-L-IC-N-CL	Water						



Workorder: L2341172

Report Date: 11-SEP-19 Page 7 of 11

Test	Matrix	Reference	Result Qua	lifier Units	RPD	Limit	Analyzed
NO3-L-IC-N-CL	Water						
Batch R4785017 WG3154490-10 LCS Nitrate (as N)			103.0	%		90-110	04-SEP-19
<b>WG3154490-9 MB</b> Nitrate (as N)			<0.0050	mg/L		0.005	04-SEP-19
ORP-CL	Water						
<b>Batch R4783621</b> <b>WG3152195-11 CRM</b> ORP		CL-ORP	225	mV		210-230	04-SEP-19
P-T-L-COL-CL	Water						
Batch R4787208 WG3155059-6 LCS Phosphorus (P)-Total			99.8	%		80-120	07-SEP-19
WG3155059-5 MB Phosphorus (P)-Total			<0.0020	mg/L		0.002	07-SEP-19
PH-CL	Water						
Batch R4784875 WG3154107-14 LCS pH			7.03	рН		6.9-7.1	05-SEP-19
PO4-DO-L-COL-CL	Water						
Batch R4783210							
WG3152121-12 LCS Orthophosphate-Dissolv	red (as P)		98.0	%		80-120	04-SEP-19
WG3152121-6 MB Orthophosphate-Dissolv	ed (as P)		<0.0010	mg/L		0.001	04-SEP-19
SO4-IC-N-CL	Water						
Batch R4785017 WG3154490-10 LCS Sulfate (SO4)			101.0	%		90-110	04-SEP-19
WG3154490-9 MB Sulfate (SO4)			<0.30	mg/L		0.3	04-SEP-19
SOLIDS-TDS-CL	Water						
Batch R4783683 WG3151269-11 LCS Total Dissolved Solids			100.9	%		85-115	04-SEP-19
WG3151269-10 MB							



Workorder: L2341172

Report Date: 11-SEP-19 Page 8 of 11

Test	Matrix	Reference	Result Qualifier	Units	RPD	Limit	Analyzed
SOLIDS-TDS-CL  Batch R4783683  WG3151269-10 MB  Total Dissolved Solids	Water		<10	mg/L		10	04-SEP-19
TKN-L-F-CL	Water						
Batch R4784825 WG3154145-10 LCS Total Kjeldahl Nitrogen			99.1	%		75-125	06-SEP-19
WG3154145-12 LCS Total Kjeldahl Nitrogen			94.4	%		75-125	06-SEP-19
WG3154145-2 LCS Total Kjeldahl Nitrogen			97.3	%		75-125	06-SEP-19
WG3154145-4 LCS Total Kjeldahl Nitrogen			98.5	%		75-125	06-SEP-19
WG3154145-6 LCS Total Kjeldahl Nitrogen			96.0	%		75-125	06-SEP-19
WG3154145-8 LCS Total Kjeldahl Nitrogen			93.0	%		75-125	06-SEP-19
WG3154145-1 MB Total Kjeldahl Nitrogen			<0.050	mg/L		0.05	06-SEP-19
WG3154145-11 MB Total Kjeldahl Nitrogen			<0.050	mg/L		0.05	06-SEP-19
WG3154145-3 MB Total Kjeldahl Nitrogen			<0.050	mg/L		0.05	06-SEP-19
<b>WG3154145-5 MB</b> Total Kjeldahl Nitrogen			<0.050	mg/L		0.05	06-SEP-19
<b>WG3154145-7 MB</b> Total Kjeldahl Nitrogen			<0.050	mg/L		0.05	06-SEP-19
WG3154145-9 MB Total Kjeldahl Nitrogen			<0.050	mg/L		0.05	06-SEP-19
TSS-L-CL	Water						
Batch R4793008 WG3154618-14 LCS Total Suspended Solids			96.4	%		85-115	09-SEP-19
WG3154618-13 MB Total Suspended Solids			<1.0	mg/L		1	09-SEP-19
TURBIDITY-CL	Water						



Workorder: L2341172

Report Date: 11-SEP-19 Page 9 of 11

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
TURBIDITY-CL	Water							
Batch R4783219 WG3152189-15 LCS Turbidity			96.5		%		85-115	04-SEP-19
WG3152189-13 MB Turbidity			<0.10		NTU		0.1	04-SEP-19

Report Date: 11-SEP-19 Workorder: L2341172 Page 10 of 11

#### Legend:

Limit ALS Control Limit (Data Quality Objectives)

DUP Duplicate

Relative Percent Difference RPD

N/A Not Available

LCS Laboratory Control Sample Standard Reference Material SRM

MS Matrix Spike

MSD

Matrix Spike Duplicate
Average Desorption Efficiency ADE

Method Blank MB

Internal Reference Material IRM Certified Reference Material CRM Continuing Calibration Verification CCV CVS Calibration Verification Standard LCSD Laboratory Control Sample Duplicate

Workorder: L2341172 Report Date: 11-SEP-19 Page 11 of 11

#### **Hold Time Exceedances:**

	Sample						
ALS Product Description	ID	Sampling Date	Date Processed	Rec. HT	Actual HT	Units	Qualifier
Physical Tests							
Oxidation redution potential	l by elect.						
	1	03-SEP-19 11:35	04-SEP-19 17:00	0.25	30	hours	EHTR-FM
рН							
	1	03-SEP-19 11:35	05-SEP-19 12:00	0.25	48	hours	EHTR-FM

#### Legend & Qualifier Definitions:

EHTR-FM: Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended.

EHTR: Exceeded ALS recommended hold time prior to sample receipt.

EHTL: Exceeded ALS recommended hold time prior to analysis. Sample was received less than 24 hours prior to expiry.

EHT: Exceeded ALS recommended hold time prior to analysis.

Rec. HT: ALS recommended hold time (see units).

#### Notes\*:

Where actual sampling date is not provided to ALS, the date (& time) of receipt is used for calculation purposes. Where actual sampling time is not provided to ALS, the earlier of 12 noon on the sampling date or the time (& date) of receipt is used for calculation purposes. Samples for L2341172 were received on 04-SEP-19 08:40.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against predetermined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

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TECK COAL LIMITED (LINE CREEK)

ATTN: Carla Froyman Parker Box 2003 15km North Hwy 43

Sparwood BC VOB 2G0

Date Received: 06-SEP-19

Report Date: 16-SEP-19 08:48 (MT)

Version: FINAL

Client Phone: 250-425-3196

# Certificate of Analysis

Lab Work Order #: L2342753
Project P.O. #: VP000608129

Job Reference: LINE CREEK OPERATION

C of C Numbers: 20190905 ERX

Legal Site Desc:



Lyudmyla Shvets, B.Sc. Account Manager

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L2342753 CONTD.... PAGE 2 of 10 Version: FINAL

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2342753-1 LC_ERX_WG_2019_10F2_NP			T				
Sampled By: KC/DT on 05-SEP-19 @ 12:01							
, ,							
Matrix: WG Miscellaneous Parameters							
	0.07		0.50	a:/I		44 CED 40	D 4004070
Dissolved Organic Carbon	2.97		0.50	mg/L		11-SEP-19	R4801270
Total Kjeldahl Nitrogen	0.267		0.050	mg/L		10-SEP-19	R4795109
Mercury (Hg)-Total	0.00093		0.00050	ug/L		11-SEP-19	R4799468
Total Organic Carbon	3.01		0.50	mg/L		11-SEP-19	R4801270
Dissolved Metals in Water							
Diss. Be (low) in Water by CRC ICPMS	.0.000		0.000	/1	00 CED 10	11 CED 10	D4004445
Beryllium (Be)-Dissolved Dissolved Metals Filtration Location	<0.020		0.020	ug/L	09-SEP-19	11-SEP-19 09-SEP-19	R4801415
	FIELD					09-SEP-19	R4790692
Diss. Mercury in Water by CVAAS or CVAFS Mercury (Hg)-Dissolved	<0.000050		0.0000050	mg/L	10-SEP-19	11-SEP-19	R4795914
Dissolved Mercury Filtration Location	FIELD		0.0000000	mg/L	10-021-13	10-SEP-19	R4793989
Dissolved Metals in Water by CRC ICPMS	I ILLD					10 021 -19	1171 0000
Dissolved Metals III Water by CRC ICFM3  Dissolved Metals Filtration Location	FIELD					09-SEP-19	R4790692
Aluminum (Al)-Dissolved	0.0033		0.0030	mg/L	09-SEP-19	11-SEP-19	R4801415
Antimony (Sb)-Dissolved	0.00019		0.00010	mg/L	09-SEP-19	11-SEP-19	R4801415
Arsenic (As)-Dissolved	0.00055		0.00010	mg/L	09-SEP-19	11-SEP-19	R4801415
Barium (Ba)-Dissolved	0.180		0.00010	mg/L	09-SEP-19	11-SEP-19	R4801415
Bismuth (Bi)-Dissolved	< 0.000050		0.000050	mg/L	09-SEP-19	11-SEP-19	R4801415
Boron (B)-Dissolved	0.041		0.010	mg/L	09-SEP-19	11-SEP-19	R4801415
Cadmium (Cd)-Dissolved	0.0135		0.0050	ug/L	09-SEP-19	11-SEP-19	R4801415
Calcium (Ca)-Dissolved	87.8		0.050	mg/L	09-SEP-19	11-SEP-19	R4801415
Chromium (Cr)-Dissolved	0.00012		0.00010	mg/L	09-SEP-19	11-SEP-19	R4801415
Cobalt (Co)-Dissolved	<0.10		0.10	ug/L	09-SEP-19	11-SEP-19	R4801415
Copper (Cu)-Dissolved	0.00080		0.00050	mg/L	09-SEP-19	11-SEP-19	R4801415
Iron (Fe)-Dissolved	<0.010		0.010	mg/L	09-SEP-19	11-SEP-19	R4801415
Lead (Pb)-Dissolved	<0.000050		0.000050	mg/L	09-SEP-19	11-SEP-19	R4801415
Lithium (Li)-Dissolved	0.0214		0.0010	mg/L	09-SEP-19	11-SEP-19	R4801415
Magnesium (Mg)-Dissolved	29.9		0.10	mg/L	09-SEP-19	11-SEP-19	R4801415
Manganese (Mn)-Dissolved	0.00209		0.00010	mg/L	09-SEP-19	11-SEP-19	R4801415
Molybdenum (Mo)-Dissolved	0.00249		0.000050	mg/L	09-SEP-19	11-SEP-19	R4801415
Nickel (Ni)-Dissolved	0.00059		0.00050	mg/L	09-SEP-19	11-SEP-19	R4801415
Potassium (K)-Dissolved	2.43		0.050	mg/L	09-SEP-19	11-SEP-19	R4801415
Selenium (Se)-Dissolved	0.821		0.050	ug/L	09-SEP-19	11-SEP-19	R4801415
Silicon (Si)-Dissolved Silver (Ag)-Dissolved	6.86		0.050	mg/L	09-SEP-19 09-SEP-19	11-SEP-19 11-SEP-19	R4801415
Sodium (Na)-Dissolved	<0.000010 9.00		0.000010 0.050	mg/L mg/L	09-SEP-19 09-SEP-19	11-SEP-19 11-SEP-19	R4801415 R4801415
Strontium (Sr)-Dissolved	9.00 0.499		0.000	mg/L	09-SEP-19 09-SEP-19	11-SEP-19 11-SEP-19	R4801415
Thallium (TI)-Dissolved	0.499		0.00020	mg/L	09-SEP-19	11-SEP-19	R4801415
Tin (Sn)-Dissolved	<0.00010		0.000010	mg/L	09-SEP-19	11-SEP-19	R4801415
Titanium (Ti)-Dissolved	<0.010		0.00010	mg/L	09-SEP-19	11-SEP-19	R4801415
Uranium (U)-Dissolved	0.00149		0.000010	mg/L	09-SEP-19	11-SEP-19	R4801415
Vanadium (V)-Dissolved	0.00122		0.00050	mg/L	09-SEP-19	11-SEP-19	R4801415
Zinc (Zn)-Dissolved	< 0.0010		0.0010	mg/L	09-SEP-19	11-SEP-19	R4801415
Total Metals in Water				J			
Hardness							
Hardness (as CaCO3)	342		0.50	mg/L		12-SEP-19	
Total Be (Low) in Water by CRC ICPMS				•			
Beryllium (Be)-Total	<0.020		0.020	ug/L		11-SEP-19	R4797110
Total Mercury in Water by CVAAS or CVAFS							
Mercury (Hg)-Total	<0.0000050		0.0000050	mg/L		11-SEP-19	R4795914
Total Metals in Water by CRC ICPMS							

<sup>\*</sup> Refer to Referenced Information for Qualifiers (if any) and Methodology.

L2342753 CONTD.... PAGE 3 of 10 Version: FINAL

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2342753-1 LC_ERX_WG_2019_10F2_NP							
Sampled By: KC/DT on 05-SEP-19 @ 12:01							
Total Metals in Water by CRC ICPMS Aluminum (Al)-Total	0.194		0.0030	mg/L		11-SEP-19	R4797110
Antimony (Sb)-Total	0.00021		0.00010	mg/L		11-SEP-19	R4797110
Arsenic (As)-Total	0.00062		0.00010	mg/L		11-SEP-19	R4797110
Barium (Ba)-Total	0.162		0.00010	mg/L		11-SEP-19	R4797110
Bismuth (Bi)-Total	<0.000050		.000050	mg/L		11-SEP-19	R4797110
Boron (B)-Total	0.041		0.010	mg/L		11-SEP-19	R4797110
Cadmium (Cd)-Total	0.0777		0.0050	ug/L		11-SEP-19	R4797110
Calcium (Ca)-Total	78.5		0.050	mg/L		11-SEP-19	R4797110
Chromium (Cr)-Total	0.00040	0	0.00010	mg/L		11-SEP-19	R4797110
Cobalt (Co)-Total	0.12		0.10	ug/L		11-SEP-19	R4797110
Copper (Cu)-Total	0.00126	0	0.00050	mg/L		11-SEP-19	R4797110
Iron (Fe)-Total	0.114		0.010	mg/L		11-SEP-19	R4797110
Lead (Pb)-Total	0.000131	0.	.000050	mg/L		11-SEP-19	R4797110
Lithium (Li)-Total	0.0206		0.0010	mg/L		11-SEP-19	R4797110
Magnesium (Mg)-Total	29.5		0.10	mg/L		11-SEP-19	R4797110
Manganese (Mn)-Total	0.00454	0	0.00010	mg/L		11-SEP-19	R4797110
Molybdenum (Mo)-Total	0.00221		.000050	mg/L		11-SEP-19	R4797110
Nickel (Ni)-Total	0.00095		0.00050	mg/L		11-SEP-19	R4797110
Potassium (K)-Total	2.21		0.050	mg/L		11-SEP-19	R4797110
Selenium (Se)-Total	0.840		0.050	ug/L		11-SEP-19	R4797110
Silicon (Si)-Total	7.47		0.10	mg/L		11-SEP-19	R4797110
Silver (Ag)-Total	<0.000010		.000010	mg/L		11-SEP-19	R4797110
Sodium (Na)-Total	8.33		0.050	mg/L		11-SEP-19	R4797110
Strontium (Sr)-Total Thallium (TI)-Total	0.452		0.00020	mg/L		11-SEP-19	R4797110
Tin (Sn)-Total	0.000032 <0.00010		.000010 0.00010	mg/L		11-SEP-19 11-SEP-19	R4797110 R4797110
Titanium (Ti)-Total	<0.00010		0.010	mg/L mg/L		11-SEP-19 11-SEP-19	R4797110 R4797110
Uranium (U)-Total	0.00150		.000010	mg/L		11-SEP-19	R4797110
Vanadium (V)-Total	0.00130		0.00050	mg/L		11-SEP-19	R4797110
Zinc (Zn)-Total	<0.0030		0.0030	mg/L		11-SEP-19	R4797110
Routine for Teck Coal	<b>VO.0000</b>	'	0.0050	1119/12		11 021 10	114757110
Acidity by Automatic Titration							
Acidity (as CaCO3)	<1.0		1.0	mg/L		08-SEP-19	R4789448
Alkalinity (Species) by Manual Titration				Č			
Alkalinity, Bicarbonate (as CaCO3)	233		1.0	mg/L		08-SEP-19	R4789379
Alkalinity, Carbonate (as CaCO3)	6.8		1.0	mg/L		08-SEP-19	R4789379
Alkalinity, Hydroxide (as CaCO3)	<1.0		1.0	mg/L		08-SEP-19	R4789379
Alkalinity, Total (as CaCO3)	240		1.0	mg/L		08-SEP-19	R4789379
Ammonia, Total (as N)							
Ammonia as N	<0.0050		0.0050	mg/L		10-SEP-19	R4797611
Bromide in Water by IC (Low Level)	0.450		0.050			06 055 40	D 4700 40 4
Bromide (Br)	0.456		0.050	mg/L		06-SEP-19	R4789491
Chloride in Water by IC Chloride (CI)	47.6		0.50	mg/L		06-SEP-19	R4789491
Electrical Conductivity (EC)	77.0		0.00	9, _		55 52. 10	
Conductivity (@ 25C)	579		2.0	uS/cm		08-SEP-19	R4789379
Fluoride in Water by IC							
Fluoride (F)	0.244		0.020	mg/L		06-SEP-19	R4789491
Ion Balance Calculation							
Ion Balance	110		-100	%		12-SEP-19	
Ion Balance Calculation	4.7			0/		12 SED 10	
Cation - Anion Balance	4.7			%		12-SEP-19	

<sup>\*</sup> Refer to Referenced Information for Qualifiers (if any) and Methodology.

L2342753 CONTD.... PAGE 4 of 10 Version: FINAL

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2342753-1 LC_ERX_WG_2019_1OF2_NP							
Sampled By: KC/DT on 05-SEP-19 @ 12:01							
Matrix: WG							
Ion Balance Calculation							
Anion Sum	6.64			meq/L		12-SEP-19	
Cation Sum	7.29			meq/L		12-SEP-19	
Nitrate in Water by IC (Low Level) Nitrate (as N)	0.0050		0.0050	a/I		06 650 40	D 4700 404
Nitrite in Water by IC (Low Level)	<0.0050		0.0050	mg/L		06-SEP-19	R4789491
Nitrite (as N)	<0.0010		0.0010	mg/L		06-SEP-19	R4789491
Orthophosphate-Dissolved (as P)							
Orthophosphate-Dissolved (as P)	0.0015		0.0010	mg/L		06-SEP-19	R4785668
Oxidation redution potential by elect. ORP	269		-1000	mV		06-SEP-19	R4785653
Phosphorus (P)-Total	200		1000	111.4		00 021 10	114703033
Phosphorus (P)-Total	0.0150		0.0020	mg/L		10-SEP-19	R4794549
Sulfate in Water by IC						00.055 ::	D. 4700 15 1
Sulfate (SO4)	23.5		0.30	mg/L		06-SEP-19	R4789491
Total Dissolved Solids Total Dissolved Solids	393	DLHC	20	mg/L		09-SEP-19	R4793289
Total Suspended Solids				J			
Total Suspended Solids	6.1		1.0	mg/L		11-SEP-19	R4801248
Turbidity Turbidity	4.28		0.10	NTU		06-SEP-19	D4705640
pH	4.20		0.10	NIO		00-3EF-19	R4785610
pH	8.39		0.10	рН		08-SEP-19	R4789379
L2342753-2 LC_PIZP1105_WG_2019-Q3_N							
Sampled By: KC/DT on 05-SEP-19 @ 14:14							
Matrix: WG							
Miscellaneous Parameters							
Dissolved Organic Carbon	0.86 2.86	DLM	0.50 0.10	mg/L		13-SEP-19 10-SEP-19	R4807350 R4795109
Total Kjeldahl Nitrogen Total Organic Carbon	16.9	DLM	5.0	mg/L mg/L		13-SEP-19	R4807350
EPH Testing for teck Coal	10.9	DEW!	3.0	mg/L		10 021 10	114607330
EPH (C10-C19) & EPH (C19-C32)							
EPH10-19	<0.25		0.25	mg/L	06-SEP-19	08-SEP-19	R4787774
EPH19-32	<0.25		0.25	mg/L	06-SEP-19 06-SEP-19	08-SEP-19 08-SEP-19	R4787774
Surrogate: 2-Bromobenzotrifluoride  Sum of EPH (10-32)	89.9		60-140	%	00-357-19	00-SEP-19	R4787774
EPH (C10-C32)	<0.50		0.50	mg/L		08-SEP-19	
TEH (C10-C30)							
TEH (C10-C30)	<0.25		0.25	mg/L	06-SEP-19	08-SEP-19	R4787774
Surrogate: 2-Bromobenzotrifluoride  Dissolved Metals in Water	89.9		60-140	%	06-SEP-19	08-SEP-19	R4787774
Diss. Be (low) in Water by CRC ICPMS							
Beryllium (Be)-Dissolved	<0.020		0.020	ug/L	09-SEP-19	11-SEP-19	R4801415
Dissolved Metals Filtration Location	FIELD					09-SEP-19	R4790692
Diss. Mercury in Water by CVAAS or CVAFS Mercury (Hg)-Dissolved	<0.000050		0.0000050	mg/L	10-SEP-19	11-SEP-19	R4795914
Dissolved Mercury Filtration Location	FIELD		0.0000000	mg/L	10-021-19	10-SEP-19	R4793914 R4793989
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	FIELD					09-SEP-19	R4790692
Aluminum (Al)-Dissolved	<0.0030		0.0030	mg/L	09-SEP-19	11-SEP-19	R4801415
Antimony (Sb)-Dissolved Arsenic (As)-Dissolved	<0.00010 <0.00010		0.00010 0.00010	mg/L mg/L	09-SEP-19 09-SEP-19	11-SEP-19 11-SEP-19	R4801415 R4801415
	30.00010		0.00010	9/ -	00 021 10	11.021 10	11-001-110

<sup>\*</sup> Refer to Referenced Information for Qualifiers (if any) and Methodology.

L2342753 CONTD.... PAGE 5 of 10 Version: FINAL

Sample Details/Parameters	Result	Qualifier* D.L.	Units	Extracted	Analyzed	Batch
L2342753-2 LC PIZP1105 WG 2019-Q3 N						
L2342753-2 LC_PIZP1105_WG_2019-Q3_N Sampled By: KC/DT on 05-SEP-19 @ 14:14						
Matrix: WG						
Dissolved Metals in Water by CRC ICPMS Barium (Ba)-Dissolved	0.108	0.00010	mg/L	09-SEP-19	11-SEP-19	R4801415
Bismuth (Bi)-Dissolved	<0.000050	0.000050	mg/L	09-SEP-19	11-SEP-19	R4801415
Boron (B)-Dissolved	0.021	0.010	mg/L	09-SEP-19	11-SEP-19	R4801415
Cadmium (Cd)-Dissolved	0.0355	0.0050	ug/L	09-SEP-19	11-SEP-19	R4801415
Calcium (Ca)-Dissolved	181	0.050	mg/L	09-SEP-19	11-SEP-19	R4801415
Chromium (Cr)-Dissolved	<0.00010	0.00010	mg/L	09-SEP-19	11-SEP-19	R4801415
Cobalt (Co)-Dissolved	<0.10	0.10	ug/L	09-SEP-19	11-SEP-19	R4801415
Copper (Cu)-Dissolved	<0.00050	0.00050	mg/L	09-SEP-19	11-SEP-19	R4801415
Iron (Fe)-Dissolved	<0.010	0.010	mg/L	09-SEP-19	11-SEP-19	R4801415
Lead (Pb)-Dissolved	<0.000050	0.000050	mg/L	09-SEP-19	11-SEP-19	R4801415
Lithium (Li)-Dissolved	0.0178	0.0010	mg/L	09-SEP-19	11-SEP-19	R4801415
Magnesium (Mg)-Dissolved	58.1	0.10	mg/L	09-SEP-19	11-SEP-19	R4801415
Manganese (Mn)-Dissolved	0.00280	0.00010	mg/L	09-SEP-19	11-SEP-19	R4801415
Molybdenum (Mo)-Dissolved	0.000235	0.000050	mg/L	09-SEP-19	11-SEP-19	R4801415
Nickel (Ni)-Dissolved	0.00067	0.00050	mg/L	09-SEP-19	11-SEP-19	R4801415
Potassium (K)-Dissolved	2.04	0.050	mg/L	09-SEP-19	11-SEP-19	R4801415
Selenium (Se)-Dissolved	0.078	0.050	ug/L	09-SEP-19	11-SEP-19	R4801415
Silicon (Si)-Dissolved	5.13	0.050	mg/L	09-SEP-19	11-SEP-19	R4801415
Silver (Ag)-Dissolved	<0.000010	0.000010	mg/L	09-SEP-19	11-SEP-19	R4801415
Sodium (Na)-Dissolved	16.3	0.050	mg/L	09-SEP-19	11-SEP-19	R4801415
Strontium (Sr)-Dissolved Thallium (TI)-Dissolved	0.430	0.00020	mg/L	09-SEP-19 09-SEP-19	11-SEP-19 11-SEP-19	R4801415
Tin (Sn)-Dissolved	0.000022	0.000010	mg/L	09-SEP-19 09-SEP-19	11-SEP-19 11-SEP-19	R4801415
Titanium (Ti)-Dissolved	0.00044 <0.010	0.00010	mg/L mg/L	09-SEP-19	11-SEP-19	R4801415 R4801415
Uranium (U)-Dissolved	0.000558	0.000010	mg/L	09-SEP-19	11-SEP-19	R4801415
Vanadium (V)-Dissolved	<0.00050	0.00050	mg/L	09-SEP-19	11-SEP-19	R4801415
Zinc (Zn)-Dissolved	0.0024	0.00030	mg/L	09-SEP-19	11-SEP-19	R4801415
Total Metals in Water	0.0024	0.0010	ilig/L	00 021 10	11 021 10	114001413
Hardness						
Hardness (as CaCO3)	691	0.50	mg/L		12-SEP-19	
Total Be (Low) in Water by CRC ICPMS						
Beryllium (Be)-Total	0.523	0.020	ug/L		11-SEP-19	R4797110
Total Mercury in Water by CVAAS or CVAFS						
Mercury (Hg)-Total	0.000259	0.000050	mg/L		11-SEP-19	R4795914
Total Metals in Water by CRC ICPMS	0.5-		"		44.055.45	D 470-115
Aluminum (Al)-Total	6.05	0.0030	mg/L		11-SEP-19	R4797110
Antimony (Sb)-Total	0.00064	0.00010	mg/L		11-SEP-19	R4797110
Arsenic (As)-Total Barium (Ba)-Total	0.00479	0.00010	mg/L		11-SEP-19 11-SEP-19	R4797110
Bismuth (Bi)-Total	0.338 0.000072	0.00010	mg/L mg/L		11-SEP-19 11-SEP-19	R4797110 R4797110
Boron (B)-Total	0.00072	0.00050	mg/L		11-SEP-19 11-SEP-19	R4797110 R4797110
Cadmium (Cd)-Total	2.62	0.010	ug/L		11-SEP-19	R4797110 R4797110
Calcium (Ca)-Total	419	0.0050	mg/L		11-SEP-19	R4797110 R4797110
Chromium (Cr)-Total	0.0115	0.00010	mg/L		11-SEP-19	R4797110
Cobalt (Co)-Total	7.79	0.10	ug/L		11-SEP-19	R4797110
Copper (Cu)-Total	0.0110	0.00050	mg/L		11-SEP-19	R4797110
Iron (Fe)-Total	10.8	0.010	mg/L		11-SEP-19	R4797110
Lead (Pb)-Total	0.00445	0.000050	mg/L		11-SEP-19	R4797110
Lithium (Li)-Total	0.0254	0.0010	mg/L		11-SEP-19	R4797110
Magnesium (Mg)-Total	90.3	0.10	mg/L		11-SEP-19	R4797110
Manganese (Mn)-Total	1.51	0.00010	mg/L		11-SEP-19	R4797110
Molybdenum (Mo)-Total	0.00123	0.000050	mg/L		11-SEP-19	R4797110

<sup>\*</sup> Refer to Referenced Information for Qualifiers (if any) and Methodology.

L2342753 CONTD.... PAGE 6 of 10 Version: FINAL

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2342753-2 LC PIZP1105 WG 2019-Q3 N							
Sampled By: KC/DT on 05-SEP-19 @ 14:14							
Matrix: WG							
Total Metals in Water by CRC ICPMS							
Nickel (Ni)-Total	0.0151		0.00050	mg/L		11-SEP-19	R4797110
Potassium (K)-Total	3.51		0.050	mg/L		11-SEP-19	R4797110
Selenium (Se)-Total	0.487		0.050	ug/L		11-SEP-19	R4797110
Silicon (Si)-Total Silver (Ag)-Total	14.7 0.000123		0.10 0.000010	mg/L mg/L		11-SEP-19 11-SEP-19	R4797110 R4797110
Sodium (Na)-Total	14.8		0.050	mg/L		11-SEP-19	R4797110
Strontium (Sr)-Total	0.661		0.00020	mg/L		11-SEP-19	R4797110
Thallium (TI)-Total	0.000246		0.000010	mg/L		11-SEP-19	R4797110
Tin (Sn)-Total	0.00031		0.00010	mg/L		11-SEP-19	R4797110
Titanium (Ti)-Total	0.055		0.010	mg/L		11-SEP-19	R4797110
Uranium (U)-Total	0.000709		0.000010	mg/L		11-SEP-19	R4797110
Vanadium (V)-Total	0.0164		0.00050	mg/L		11-SEP-19	R4797110
Zinc (Zn)-Total	0.0927		0.0030	mg/L		11-SEP-19	R4797110
Routine for Teck Coal							
Acidity by Automatic Titration Acidity (as CaCO3)	123		1.0	mg/L		08-SEP-19	R4789448
Alkalinity (Species) by Manual Titration	1.23			∌, =		11 02. 10	
Alkalinity, Bicarbonate (as CaCO3)	492		1.0	mg/L		08-SEP-19	R4789379
Alkalinity, Carbonate (as CaCO3)	<1.0		1.0	mg/L		08-SEP-19	R4789379
Alkalinity, Hydroxide (as CaCO3)	<1.0		1.0	mg/L		08-SEP-19	R4789379
Alkalinity, Total (as CaCO3)	492		1.0	mg/L		08-SEP-19	R4789379
Ammonia, Total (as N)							
Ammonia as N	0.0050		0.0050	mg/L		10-SEP-19	R4797611
Bromide in Water by IC (Low Level) Bromide (Br)	4.50	DLHC	0.05	a/I		06 SED 40	D 4700 404
• •	1.52	DLITC	0.25	mg/L		06-SEP-19	R4789491
Chloride in Water by IC Chloride (CI)	125	DLHC	2.5	mg/L		06-SEP-19	R4789491
Electrical Conductivity (EC)	120		2.0	9/ =		0002.	111100101
Conductivity (@ 25C)	1140		2.0	uS/cm		08-SEP-19	R4789379
Fluoride in Water by IC							
Fluoride (F)	0.31	DLHC	0.10	mg/L		06-SEP-19	R4789491
Ion Balance Calculation							
Cation - Anion Balance	-2.6			%		12-SEP-19	
Anion Sum Cation Sum	15.4			meq/L		12-SEP-19 12-SEP-19	
Ion Balance Calculation	14.6			meq/L		12-367-19	
Ion Balance Calculation	94.9		-100	%		12-SEP-19	
Nitrate in Water by IC (Low Level)	35			. •			
Nitrate (as N)	0.039	DLHC	0.025	mg/L		06-SEP-19	R4789491
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	<0.0050	DLHC	0.0050	mg/L		06-SEP-19	R4789491
Orthophosphate-Dissolved (as P)			0.001	/*		00.055 ::	D 477777
Orthophosphate-Dissolved (as P)	0.0102		0.0010	mg/L		06-SEP-19	R4785668
Oxidation redution potential by elect. ORP	296		-1000	mV		06-SEP-19	R4785653
Phosphorus (P)-Total	250		-1000	111 V		00-021-19	14700000
Phosphorus (P)-Total	4.71	DLHC	0.50	mg/L		10-SEP-19	R4794549
Sulfate in Water by IC				J			
Sulfate (SO4)	95.2	DLHC	1.5	mg/L		06-SEP-19	R4789491
Total Dissolved Solids							
Total Dissolved Solids	869	DLHC	20	mg/L		09-SEP-19	R4793289
Total Suspended Solids							

<sup>\*</sup> Refer to Referenced Information for Qualifiers (if any) and Methodology.

L2342753 CONTD.... PAGE 7 of 10 Version: FINAL

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2342753-2 LC_PIZP1105_WG_2019-Q3_N							
Sampled By: KC/DT on 05-SEP-19 @ 14:14							
Matrix: WG  Total Suspended Solids							
Total Suspended Solids Total Suspended Solids	3270	DLHC	8.0	mg/L		11-SEP-19	R4801248
<b>Turbidity</b> Turbidity	3320		0.10	NTU		06-SEP-19	R4785610
<b>pH</b> pH	7.92		0.10	pН		08-SEP-19	R4789379
P	7.02		0.10	Pii		00 021 10	14700070

<sup>\*</sup> Refer to Referenced Information for Qualifiers (if any) and Methodology.

#### L2342753 CONTD....

PAGE 8 of 10 Version: FINAL

### **Reference Information**

Sample Parameter Qualifier Key:

Qualifier	Description
DLHC	Detection Limit Raised: Dilution required due to high concentration of test analyte(s).
DLM	Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.

#### **Test Method References:**

Test Method Reference	<del>.</del>		
ALS Test Code	Matrix	Test Description	Method Reference**
ACIDITY-PCT-CL	Water	Acidity by Automatic Titration	APHA 2310 Acidity

This analysis is carried out using procedures adapted from APHA Method 2310 "Acidity". Acidity is determined by potentiometric titration to a specified endpoint.

ALK-MAN-CL Water Alkalinity (Species) by Manual Titration APHA 2320 ALKALINITY

This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.

BE-D-L-CCMS-VA Water Diss. Be (low) in Water by CRC ICPMS APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

BE-T-L-CCMS-VA Water Total Be (Low) in Water by CRC ICPMS EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

BR-L-IC-N-CL Water Bromide in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

C-DIS-ORG-LOW-CL Water Dissolved Organic Carbon APHA 5310 B-Instrumental

This method is applicable to the analysis of ground water, wastewater, and surface water samples. The form detected depends upon sample pretreatment: Unfiltered sample = TC, 0.45um filtered = TDC. Samples are injected into a combustion tube containing an oxidation catalyst. The carrier gas containing the combustion product from the combustion tube flows through an inorganic carbon reactor vessel and is then sent through a halogen scrubber into a sample cell set in a non-dispersive infrared gas analyzer (NDIR) where carbon dioxide is detected. For total inorganic carbon and dissolved inorganic carbon, the sample is injected into an IC reactor vessel where only the IC component is decomposed to become carbon dioxide.

The peak area generated by the NDIR indicates the TC/TDC or TIC/DIC as applicable. The total organic carbon content of the sample is calculated by subtracting the TIC from the TC.

TOC = TC-TIC, DOC = TDC-DIC, Particulate = Total - Dissolved.

C-TOT-ORG-LOW-CL Water Total Organic Carbon APHA 5310 TOTAL ORGANIC CARBON (TOC)

This method is applicable to the analysis of ground water, wastewater, and surface water samples. The form detected depends upon sample pretreatment: Unfiltered sample = TC, 0.45um filtered = TDC. Samples are injected into a combustion tube containing an oxidation catalyst. The carrier gas containing the combustion product from the combustion tube flows through an inorganic carbon reactor vessel and is then sent through a halogen scrubber into a sample cell set in a non-dispersive infrared gas analyzer (NDIR) where carbon dioxide is detected. For total inorganic carbon and dissolved inorganic carbon, the sample is injected into an IC reactor vessel where only the IC component is decomposed to become carbon dioxide.

The peak area generated by the NDIR indicates the TC/TDC or TIC/DIC as applicable. The total organic carbon content of the sample is calculated by subtracting the TIC from the TC.

TOC = TC-TIC, DOC = TDC-DIC, Particulate = Total - Dissolved.

CL-IC-N-CL Water Chloride in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

EC-L-PCT-CL Water Electrical Conductivity (EC) APHA 2510E

Conductivity, also known as Electrical Conductivity (EC) or Specific Conductance, is measured by immersion of a conductivity cell with platinum electrodes into a water sample. Conductivity measurements are temperature-compensated to 25C.

EPH(10-32)-CALC-CL Water Sum of EPH (10-32) Sum of EPH - Auto Calculated

The sum of EPH(C10-C19) and EPH(C19-C32)

F-IC-N-CL Water Fluoride in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

HARDNESS-CALC-VA Water Hardness APHA 2340B

Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

L2342753 CONTD....

PAGE 9 of 10 Version: FINAL

### **Reference Information**

Test Method References:

ALS Test Code Matrix Test Description Method Reference\*\*

HG-D-CVAA-VA Water Diss. Mercury in Water by CVAAS or CVAFS APHA 3030B/EPA 1631E (mod)

Water samples are filtered (0.45 um), preserved with hydrochloric acid, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

HG-T-CVAA-VA Water Total Mercury in Water by CVAAS or CVAFS EPA 1631E (mod)

Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

HG-T-U-CVAF-VA Water Total Mercury in Water by CVAFS (Ultra) EPA 1631 REV. E

This analysis is carried out using procedures adapted from Method 1631 Rev. E. by the United States Environmental Protection Agency (EPA). The procedure involves a cold-oxidation of the acidified sample using bromine monochloride prior to a purge and trap concentration step and final reduction of the sample with stannous chloride. Instrumental analysis is by cold vapour atomic fluorescence spectrophotometry.

IONBALANCE-BC-CL Water Ion Balance Calculation APHA 1030E

Cation Sum, Anion Sum, and Ion Balance (as % difference) are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Because all aqueous solutions are electrically neutral, the calculated ion balance (% difference of cations minus anions) should be near-zero.

Cation and Anion Sums are the total meq/L concentration of major cations and anions. Dissolved species are used where available. Minor ions are included where data is present. Ion Balance is calculated as:

Ion Balance (%) = [Cation Sum-Anion Sum] / [Cation Sum+Anion Sum]

MET-D-CCMS-VA Water Dissolved Metals in Water by CRC ICPMS APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

MET-T-CCMS-VA Water Total Metals in Water by CRC ICPMS EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

NH3-L-F-CL Water Ammonia, Total (as N) J. ENVIRON. MONIT., 2005, 7, 37-42, RSC

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.

NO2-L-IC-N-CL Water Nitrite in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

NO3-L-IC-N-CL Water Nitrate in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

ORP-CL Water Oxidation redution potential by elect. ASTM D1498

This analysis is carried out in accordance with the procedure described in the "ASTM" method D1498 "Oxidation-Reduction Potential of Water" published by the American Society for Testing and Materials (ASTM). Results are reported as observed oxidation-reduction potential of the platinum metal-reference electrode employed, in mV.

It is recommended that this analysis be conducted in the field.

P-T-L-COL-CL Water Phosphorus (P)-Total APHA 4500-P PHOSPHORUS

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after persulphate digestion of the sample.

PH-CL Water pH APHA 4500 H-Electrode

pH is determined in the laboratory using a pH electrode. All samples analyzed by this method for pH will have exceeded the 15 minute recommended hold time from time of sampling (field analysis is recommended for pH where highly accurate results are needed)

PO4-DO-L-COL-CL Water Orthophosphate-Dissolved (as P) APHA 4500-P PHOSPHORUS

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.

SO4-IC-N-CL Water Sulfate in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

L2342753 CONTD....

PAGE 10 of 10 Version: FINAL

### **Reference Information**

Test Method References:

ALS Test Code Matrix Test Description Method Reference\*\*

SOLIDS-TDS-CL Water Total Dissolved Solids APHA 2540 C

A well-mixed sample is filtered through a glass fibre filter paper. The filtrate is then evaporated to dryness in a pre-weighed vial and dried at 180 – 2 °C.

The increase in vial weight represents the total dissolved solids (TDS).

TECKCOAL-IONBAL-CL Water Ion Balance Calculation APHA 1030B

Cation Sum, Anion Sum, and Ion Balance (as % difference) are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Because all aqueous solutions are electrically neutral, the calculated ion balance (% difference of cations minus anions) should be near-zero.

Cation and Anion Sums are the total meq/L concentration of major cations and anions. Dissolved species are used where available. Minor ions are included where data is present. Ion Balance is calculated as:

Ion Balance (%) = [Cation Sum-Anion Sum] / [Cation Sum+Anion Sum]

TEH-BC-VA-CL Water EPH (C10-C19) & EPH (C19-C32) BCMOE EPH GCFID

Analysis is in accordance with BC MOE Lab Manual method "Extractable Petroleum Hydrocarbons in Water by GC/FID", v2.1, July 1999. Whole water samples are extracted with DCM prior to gas chromatography with flame ionization detection (GC-FID). EPH results include Polycyclic Aromatic Hydrocarbons (PAH) and are therefore not equivalent to Light and Heavy Extractable Petroleum Hydrocarbons (LEPH/HEPH).

TEH-WATER-VA-CL Water TEH (C10-C30) BC Lab Manual

Water samples are spiked with 2-BBTF surrogate, and extracted by reciprocal action shaker for 1 hour using a single micro-extraction with hexane. After extraction, the hexane layer is drawn off and analyzed on a gas chromatograph equipped with a flame ionization detector.

TKN-L-F-CL Water Total Kjeldahl Nitrogen APHA 4500-NORG (TKN)

This analysis is carried out using procedures adapted from APHA Method 4500-Norg D. "Block Digestion and Flow Injection Analysis". Total Kjeldahl Nitrogen is determined using block digestion followed by Flow-injection analysis with fluorescence detection.

TSS-L-CL Water Total Suspended Solids APHA 2540 D-Gravimetric

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total suspended solids (TSS) are determined by filtering a sample through a glass fibre filter, and by drying the filter at 104 deg. C.

TURBIDITY-CL Water Turbidity APHA 2130 B-Nephelometer

This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.

\*\* ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

<b>Laboratory Definition Code</b>	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA
CL	ALS ENVIRONMENTAL - CALGARY, ALBERTA, CANADA

#### **Chain of Custody Numbers:**

20190905 ERX

#### **GLOSSARY OF REPORT TERMS**

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.

mg/kg - milligrams per kilogram based on dry weight of sample

mg/kg wwt - milligrams per kilogram based on wet weight of sample

mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight

mg/L - unit of concentration based on volume, parts per million.

< - Less than.

D.L. - The reporting limit.

N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory. UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.



Workorder: L2342753

Report Date: 16-SEP-19

Page 1 of 12

Client: TECK COAL LIMITED (LINE CREEK)

Box 2003 15km North Hwy 43 Sparwood BC V0B 2G0

Contact: Carla Froyman Parker

Test	Matrix	Reference	Result Qualifier	Units	RPD	Limit	Analyzed
ACIDITY-PCT-CL	Water						
Batch R4789448							
WG3155958-11 LCS Acidity (as CaCO3)			102.6	%		85-115	08-SEP-19
WG3155958-10 MB			. 02.10	,-		00 110	00 021 10
Acidity (as CaCO3)			1.2	mg/L		2	08-SEP-19
ALK-MAN-CL	Water						
Batch R4789379							
WG3155938-8 LCS Alkalinity, Total (as CaC	O3)		100.7	%		85-115	08-SEP-19
WG3155938-7 MB	,					00 110	00 021 10
Alkalinity, Total (as CaC	O3)		<1.0	mg/L		1	08-SEP-19
BE-D-L-CCMS-VA	Water						
Batch R4801415							
WG3156352-2 LCS Beryllium (Be)-Dissolved	i		96.1	%		80-120	11-SEP-19
WG3156352-1 MB		NP					
Beryllium (Be)-Dissolved	i		<0.000020	mg/L		0.00002	11-SEP-19
BE-T-L-CCMS-VA	Water						
Batch R4797110							
WG3156061-2 LCS Beryllium (Be)-Total			89.7	%		80-120	11-SEP-19
WG3156061-1 MB							
Beryllium (Be)-Total			<0.000020	mg/L		0.00002	11-SEP-19
BR-L-IC-N-CL	Water						
Batch R4789491							
<b>WG3156041-6 LCS</b> Bromide (Br)			100.5	%		85-115	06-SEP-19
WG3156041-5 MB							
Bromide (Br)			<0.050	mg/L		0.05	06-SEP-19
C-DIS-ORG-LOW-CL	Water						
Batch R4801270							
WG3159660-2 LCS Dissolved Organic Carbo	on		103.6	%		80-120	11-SEP-19
WG3159660-1 MB							
Dissolved Organic Carbo	on		<0.50	mg/L		0.5	11-SEP-19



Workorder: L2342753

Report Date: 16-SEP-19 Page 2 of 12

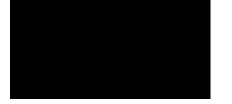
est	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
C-DIS-ORG-LOW-CL	Water							
Batch R4807350 WG3161810-2 LCS Dissolved Organic Carbo	on		106.2		%		80-120	13-SEP-19
WG3161810-1 MB Dissolved Organic Carbo	on		<0.50		mg/L		0.5	13-SEP-19
C-TOT-ORG-LOW-CL	Water							
Batch R4801270 WG3159660-2 LCS Total Organic Carbon			105.7		%		80-120	11-SEP-19
WG3159660-1 MB Total Organic Carbon			<0.50		mg/L		0.5	11-SEP-19
Batch R4807350 WG3161810-2 LCS Total Organic Carbon			113.2		%		80-120	13-SEP-19
WG3161810-1 MB Total Organic Carbon			<0.50		mg/L		0.5	13-SEP-19
CL-IC-N-CL	Water							
Batch R4789491 WG3156041-6 LCS Chloride (CI)			101.0		%		90-110	06-SEP-19
WG3156041-5 MB Chloride (Cl)			<0.50		mg/L		0.5	06-SEP-19
C-L-PCT-CL	Water							
<b>Batch R4789379 WG3155938-8 LCS</b> Conductivity (@ 25C)			98.7		%		90-110	08-SEP-19
WG3155938-7 MB Conductivity (@ 25C)			<2.0		uS/cm		2	08-SEP-19
F-IC-N-CL	Water							
Batch R4789491 WG3156041-6 LCS Fluoride (F)			103.0		%		90-110	06-SEP-19
WG3156041-5 MB Fluoride (F)			<0.020		mg/L		0.02	06-SEP-19
IG-D-CVAA-VA	Water							



Workorder: L2342753

Report Date: 16-SEP-19 Page 3 of 12

Test	Matrix	Reference	Result Qua	lifier Units	RPD	Limit	Analyzed
HG-D-CVAA-VA	Water						
Batch R4795914 WG3157152-2 LCS Mercury (Hg)-Dissolved			99.2	%		80-120	11-SEP-19
WG3157152-1 MB Mercury (Hg)-Dissolved			<0.0000050	mg/L		0.000005	11-SEP-19
HG-T-CVAA-VA	Water						
Batch R4795914 WG3157912-2 LCS Mercury (Hg)-Total			99.0	%		80-120	11-SEP-19
WG3157912-1 MB Mercury (Hg)-Total			<0.0000050	mg/L		0.000005	11-SEP-19
HG-T-U-CVAF-VA	Water						
Batch R4799468 WG3158996-2 LCS Mercury (Hg)-Total			84.4	%		80-120	11-SEP-19
WG3158996-1 MB Mercury (Hg)-Total			<0.00050	ug/L		0.0005	11-SEP-19
MET-D-CCMS-VA	Water						
Batch R4801415							
WG3156352-2 LCS Aluminum (Al)-Dissolved	d		99.1	%		80-120	11-SEP-19
Antimony (Sb)-Dissolved	t		92.7	%		80-120	11-SEP-19
Arsenic (As)-Dissolved			97.1	%		80-120	11-SEP-19
Barium (Ba)-Dissolved			102.9	%		80-120	11-SEP-19
Bismuth (Bi)-Dissolved			95.1	%		80-120	11-SEP-19
Boron (B)-Dissolved			95.8	%		80-120	11-SEP-19
Cadmium (Cd)-Dissolved	d		95.8	%		80-120	11-SEP-19
Calcium (Ca)-Dissolved			99.0	%		80-120	11-SEP-19
Chromium (Cr)-Dissolve	d		99.2	%		80-120	11-SEP-19
Cobalt (Co)-Dissolved			98.5	%		80-120	11-SEP-19
Copper (Cu)-Dissolved			98.9	%		80-120	11-SEP-19
Iron (Fe)-Dissolved			100.4	%		80-120	11-SEP-19
Lead (Pb)-Dissolved			96.1	%		80-120	11-SEP-19
Lithium (Li)-Dissolved			90.5	%		80-120	11-SEP-19
Magnesium (Mg)-Dissolv	ved		93.9	%		80-120	11-SEP-19
Manganese (Mn)-Dissolv	ved		96.5	%		80-120	11-SEP-19
Molybdenum (Mo)-Disso	olved		96.1	%		80-120	11-SEP-19



Workorder: L2342753 Report Date: 16-SEP-19 Page 4 of 12

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA	Water							
Batch R4801415								
WG3156352-2 LCS			05.0		04			
Nickel (Ni)-Dissolved	a.		95.6		%		80-120	11-SEP-19
Potassium (K)-Dissolved			98.3		%		80-120	11-SEP-19
Selenium (Se)-Dissolved	a		99.4		%		80-120	11-SEP-19
Silicon (Si)-Dissolved			97.1		%		60-140	11-SEP-19
Silver (Ag)-Dissolved			93.8		%		80-120	11-SEP-19
Sodium (Na)-Dissolved			100.6		%		80-120	11-SEP-19
Strontium (Sr)-Dissolved	d		95.4		%		80-120	11-SEP-19
Thallium (TI)-Dissolved			95.6		%		80-120	11-SEP-19
Tin (Sn)-Dissolved			96.2		%		80-120	11-SEP-19
Titanium (Ti)-Dissolved			96.7		%		80-120	11-SEP-19
Uranium (U)-Dissolved			97.0		%		80-120	11-SEP-19
Vanadium (V)-Dissolved	i		100.0		%		80-120	11-SEP-19
Zinc (Zn)-Dissolved			96.5		%		80-120	11-SEP-19
WG3156352-1 MB	<u>ا</u>	NP	<0.0010				0.004	44.055.40
Aluminum (Al)-Dissolved					mg/L		0.001	11-SEP-19
Antimony (Sb)-Dissolved	0		<0.00010		mg/L		0.0001	11-SEP-19
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	11-SEP-19
Barium (Ba)-Dissolved			<0.00010		mg/L		0.0001	11-SEP-19
Bismuth (Bi)-Dissolved			<0.00005	0	mg/L		0.00005	11-SEP-19
Boron (B)-Dissolved			<0.010	<b>-</b> 0	mg/L		0.01	11-SEP-19
Cadmium (Cd)-Dissolve			<0.00000	50	mg/L		0.000005	11-SEP-19
Calcium (Ca)-Dissolved			<0.050		mg/L		0.05	11-SEP-19
Chromium (Cr)-Dissolve	ed		<0.00010		mg/L		0.0001	11-SEP-19
Cobalt (Co)-Dissolved			<0.00010		mg/L		0.0001	11-SEP-19
Copper (Cu)-Dissolved			<0.00020		mg/L		0.0002	11-SEP-19
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	11-SEP-19
Lead (Pb)-Dissolved			<0.00005	0	mg/L		0.00005	11-SEP-19
Lithium (Li)-Dissolved			<0.0010		mg/L		0.001	11-SEP-19
Magnesium (Mg)-Dissol			<0.0050		mg/L		0.005	11-SEP-19
Manganese (Mn)-Dissol			<0.00010		mg/L		0.0001	11-SEP-19
Molybdenum (Mo)-Disso	olved		<0.00005	0	mg/L		0.00005	11-SEP-19
Nickel (Ni)-Dissolved			<0.00050		mg/L		0.0005	11-SEP-19
Potassium (K)-Dissolved			<0.050		mg/L		0.05	11-SEP-19
Selenium (Se)-Dissolved	d		<0.00005	0	mg/L		0.00005	11-SEP-19



Workorder: L2342753

Report Date: 16-SEP-19

Page 5 of 12

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA	Water							
Batch R4801415								
WG3156352-1 MB		NP						
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	11-SEP-19
Silver (Ag)-Dissolved			<0.000010		mg/L		0.00001	11-SEP-19
Sodium (Na)-Dissolved			<0.050		mg/L		0.05	11-SEP-19
Strontium (Sr)-Dissolved	d		<0.00020		mg/L		0.0002	11-SEP-19
Thallium (TI)-Dissolved			<0.000010		mg/L		0.00001	11-SEP-19
Tin (Sn)-Dissolved			<0.00010		mg/L		0.0001	11-SEP-19
Titanium (Ti)-Dissolved			<0.00030		mg/L		0.0003	11-SEP-19
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	11-SEP-19
Vanadium (V)-Dissolved	d		<0.00050		mg/L		0.0005	11-SEP-19
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	11-SEP-19
MET-T-CCMS-VA	Water							
Batch R4796861								
WG3156061-2 LCS								
Sodium (Na)-Total			112.9		%		80-120	11-SEP-19
Batch R4797110 WG3156061-2 LCS								
Aluminum (Al)-Total			101.7		%		80-120	11-SEP-19
Antimony (Sb)-Total			98.8		%		80-120	11-SEP-19
Arsenic (As)-Total			100.6		%		80-120	11-SEP-19
Barium (Ba)-Total			104.3		%		80-120	11-SEP-19
Bismuth (Bi)-Total			94.2		%		80-120	11-SEP-19
Boron (B)-Total			111.4		%		80-120	11-SEP-19
Cadmium (Cd)-Total			93.5		%		80-120	11-SEP-19
Calcium (Ca)-Total			105.3		%		80-120	11-SEP-19
Chromium (Cr)-Total			100.6		%		80-120	11-SEP-19
Cobalt (Co)-Total			94.1		%		80-120	11-SEP-19
Copper (Cu)-Total			90.7		%		80-120	11-SEP-19
Iron (Fe)-Total			97.6		%		80-120	11-SEP-19
Lead (Pb)-Total			94.1		%		80-120	11-SEP-19
Lithium (Li)-Total			86.7		%		80-120	11-SEP-19
Magnesium (Mg)-Total			114.7		%		80-120	11-SEP-19
Manganese (Mn)-Total			103.1		%		80-120	11-SEP-19
Molybdenum (Mo)-Total			97.5		%		80-120	11-SEP-19
Nickel (Ni)-Total			94.4		%		80-120	11-SEP-19
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Workorder: L2342753

Report Date: 16-SEP-19

Page 6 of 12

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-VA	Water							
Batch R4797110								
WG3156061-2 LCS								
Potassium (K)-Total			111.7		%		80-120	11-SEP-19
Selenium (Se)-Total			102.9		%		80-120	11-SEP-19
Silicon (Si)-Total			101.6		%		80-120	11-SEP-19
Silver (Ag)-Total			96.2		%		80-120	11-SEP-19
Strontium (Sr)-Total			112.3		%		80-120	11-SEP-19
Thallium (TI)-Total			96.3		%		80-120	11-SEP-19
Tin (Sn)-Total			96.8		%		80-120	11-SEP-19
Titanium (Ti)-Total			102.0		%		80-120	11-SEP-19
Uranium (U)-Total			96.2		%		80-120	11-SEP-19
Vanadium (V)-Total			98.6		%		80-120	11-SEP-19
Zinc (Zn)-Total			100.7		%		80-120	11-SEP-19
WG3156061-1 MB								
Aluminum (Al)-Total			<0.0030		mg/L		0.003	11-SEP-19
Antimony (Sb)-Total			<0.00010		mg/L		0.0001	11-SEP-19
Arsenic (As)-Total			<0.00010		mg/L		0.0001	11-SEP-19
Barium (Ba)-Total			<0.00010		mg/L		0.0001	11-SEP-19
Bismuth (Bi)-Total			<0.000050	)	mg/L		0.00005	11-SEP-19
Boron (B)-Total			<0.010		mg/L		0.01	11-SEP-19
Cadmium (Cd)-Total			<0.000005	5C	mg/L		0.000005	11-SEP-19
Calcium (Ca)-Total			<0.050		mg/L		0.05	11-SEP-19
Chromium (Cr)-Total			<0.00010		mg/L		0.0001	11-SEP-19
Cobalt (Co)-Total			<0.00010		mg/L		0.0001	11-SEP-19
Copper (Cu)-Total			<0.00050		mg/L		0.0005	11-SEP-19
Iron (Fe)-Total			<0.010		mg/L		0.01	11-SEP-19
Lead (Pb)-Total			<0.000050	)	mg/L		0.00005	11-SEP-19
Lithium (Li)-Total			<0.0010		mg/L		0.001	11-SEP-19
Magnesium (Mg)-Total			<0.0050		mg/L		0.005	11-SEP-19
Manganese (Mn)-Total			<0.00010		mg/L		0.0001	11-SEP-19
Molybdenum (Mo)-Tota	l		<0.000050	)	mg/L		0.00005	11-SEP-19
Nickel (Ni)-Total			<0.00050		mg/L		0.0005	11-SEP-19
Potassium (K)-Total			<0.050		mg/L		0.05	11-SEP-19
Selenium (Se)-Total			<0.000050	)	mg/L		0.00005	11-SEP-19
Silicon (Si)-Total			<0.10		mg/L		0.1	11-SEP-19
Silver (Ag)-Total			<0.000010	)	mg/L		0.00001	11-SEP-19



Workorder: L2342753

Report Date: 16-SEP-19

Page 7 of 12

Test	Matrix	Reference	Result Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-VA	Water						
<b>Batch R4797110 WG3156061-1 MB</b> Sodium (Na)-Total			<0.050	mg/L		0.05	11-SEP-19
Strontium (Sr)-Total			<0.0000	mg/L		0.0002	11-SEP-19
Thallium (TI)-Total			<0.00020	mg/L		0.0002	11-SEP-19 11-SEP-19
Tin (Sn)-Total			<0.00010	mg/L		0.00001	11-SEP-19
Titanium (Ti)-Total			<0.00010	mg/L		0.0001	11-SEP-19
Uranium (U)-Total			<0.000010	mg/L		0.00001	11-SEP-19
Vanadium (V)-Total			<0.00050	mg/L		0.0005	11-SEP-19
Zinc (Zn)-Total			<0.0030	mg/L		0.003	11-SEP-19
NH3-L-F-CL	Water			-			
Batch R4797611 WG3157258-10 LCS Ammonia as N			109.2	%		85-115	10-SEP-19
WG3157258-9 MB Ammonia as N			<0.0050	mg/L		0.005	10-SEP-19
NO2-L-IC-N-CL	Water						
Batch R4789491 WG3156041-6 LCS Nitrite (as N)			102.4	%		90-110	06-SEP-19
WG3156041-5 MB Nitrite (as N)			<0.0010	mg/L		0.001	06-SEP-19
NO3-L-IC-N-CL	Water						
Batch R4789491 WG3156041-6 LCS Nitrate (as N)			101.4	%		90-110	06-SEP-19
<b>WG3156041-5 MB</b> Nitrate (as N)			<0.0050	mg/L		0.005	06-SEP-19
ORP-CL	Water						
Batch R4785653 WG3154603-5 CRM ORP		CL-ORP	226	mV		210-230	06-SEP-19
P-T-L-COL-CL	Water						
Batch R4794549 WG3157489-67 LCS Phosphorus (P)-Total WG3157489-65 MB			95.6	%		80-120	10-SEP-19



Workorder: L2342753

Report Date: 16-SEP-19 Page 8 of 12

Test	Matrix	Reference	Result Qualifie	· Units	RPD	Limit	Analyzed
P-T-L-COL-CL	Water						
Batch R4794549 WG3157489-65 MB Phosphorus (P)-Total			<0.0020	mg/L		0.002	10-SEP-19
PH-CL	Water						
Batch R4789379 WG3155938-8 LCS pH			7.03	рН		6.9-7.1	08-SEP-19
PO4-DO-L-COL-CL	Water						
Batch R4785668							
WG3154558-6 LCS Orthophosphate-Dissolve	ed (as P)		99.2	%		80-120	06-SEP-19
WG3154558-5 MB Orthophosphate-Dissolve	ed (as P)		<0.0010	mg/L		0.001	06-SEP-19
SO4-IC-N-CL	Water						
Batch R4789491 WG3156041-6 LCS			404.0	0/			
Sulfate (SO4)  WG3156041-5 MB			101.2	%		90-110	06-SEP-19
Sulfate (SO4)			<0.30	mg/L		0.3	06-SEP-19
SOLIDS-TDS-CL	Water						
Batch R4793289							
WG3155681-5 LCS Total Dissolved Solids			96.6	%		85-115	09-SEP-19
WG3155681-4 MB							
Total Dissolved Solids			<10	mg/L		10	09-SEP-19
TEH-BC-VA-CL	Water						
Batch R4787774							
<b>WG3154202-2 LCS</b> EPH10-19			87.2	%		70-130	06-SEP-19
EPH19-32			91.0	%		70-130	06-SEP-19
<b>WG3154202-1 MB</b> EPH10-19			<0.25	mg/L		0.25	06-SEP-19
EPH19-32			<0.25	mg/L		0.25	06-SEP-19
Surrogate: 2-Bromobenz	otrifluoride		77.2	%		60-140	06-SEP-19
TEH-WATER-VA-CL	Water						



Workorder: L2342753

Report Date: 16-SEP-19 Page 9 of 12

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
TEH-WATER-VA-CL	Water							
Batch R4787774 WG3154202-2 LCS TEH (C10-C30)			88.0		%		70-130	06-SEP-19
<b>WG3154202-1 MB</b> TEH (C10-C30)			<0.25		mg/L		0.25	06-SEP-19
Surrogate: 2-Bromoben:	zotrifluoride		77.2		%		60-140	06-SEP-19
TKN-L-F-CL	Water							
Batch R4795109 WG3157524-10 LCS Total Kjeldahl Nitrogen			106.3		%		75-125	10-SEP-19
WG3157524-14 LCS Total Kjeldahl Nitrogen			106.5		%		75-125	10-SEP-19
WG3157524-18 LCS Total Kjeldahl Nitrogen			103.0		%		75-125	11-SEP-19
WG3157524-2 LCS Total Kjeldahl Nitrogen			105.8		%		75-125	10-SEP-19
WG3157524-6 LCS Total Kjeldahl Nitrogen			104.9		%		75-125	10-SEP-19
WG3157524-1 MB Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	10-SEP-19
WG3157524-13 MB Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	10-SEP-19
WG3157524-17 MB Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	11-SEP-19
<b>WG3157524-5 MB</b> Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	10-SEP-19
WG3157524-9 MB Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	10-SEP-19
TSS-L-CL	Water							
Batch R4801248								
WG3158841-4 LCS Total Suspended Solids			97.7		%		85-115	11-SEP-19
WG3158841-3 MB Total Suspended Solids			<1.0		mg/L		1	11-SEP-19
TURBIDITY-CL	Water							
Batch R4785610 WG3154591-8 LCS Turbidity			94.0		%		85-115	06-SEP-19
WG3154591-7 MB								



Workorder: L2342753

Report Date: 16-SEP-19 Page 10 of 12

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
TURBIDITY-CL	Water							
Batch R478561 WG3154591-7 MB	0							
Turbidity			<0.10		NTU		0.1	06-SEP-19

Report Date: 16-SEP-19 Workorder: L2342753 Page 11 of 12

#### Legend:

ALS Control Limit (Data Quality Objectives) Limit

DUP Duplicate

Relative Percent Difference RPD

N/A Not Available

LCS Laboratory Control Sample Standard Reference Material SRM

MS Matrix Spike

MSD

Matrix Spike Duplicate
Average Desorption Efficiency ADE

Method Blank MB

Internal Reference Material IRM Certified Reference Material CRM Continuing Calibration Verification CCV CVS Calibration Verification Standard LCSD Laboratory Control Sample Duplicate

Workorder: L2342753 Report Date: 16-SEP-19 Page 12 of 12

#### **Hold Time Exceedances:**

	Sample						
ALS Product Description	ID <sup>-</sup>	Sampling Date	Date Processed	Rec. HT	Actual HT	Units	Qualifie
Physical Tests							
Oxidation redution potentia	al by elect.						
	1	05-SEP-19 12:01	06-SEP-19 15:30	0.25	28	hours	EHTR-FN
	2	05-SEP-19 14:14	06-SEP-19 15:30	0.25	25	hours	EHTR-FM
pН							
	1	05-SEP-19 12:01	08-SEP-19 09:00	0.25	69	hours	EHTR-FM
	2	05-SEP-19 14:14	08-SEP-19 09:00	0.25	67	hours	EHTR-FN

#### **Legend & Qualifier Definitions:**

EHTR-FM: Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended.

EHTR: Exceeded ALS recommended hold time prior to sample receipt.

EHTL: Exceeded ALS recommended hold time prior to analysis. Sample was received less than 24 hours prior to expiry.

EHT: Exceeded ALS recommended hold time prior to analysis.

Rec. HT: ALS recommended hold time (see units).

#### Notes\*:

Where actual sampling date is not provided to ALS, the date (& time) of receipt is used for calculation purposes. Where actual sampling time is not provided to ALS, the earlier of 12 noon on the sampling date or the time (& date) of receipt is used for calculation purposes. Samples for L2342753 were received on 06-SEP-19 09:50.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against predetermined data quality objectives to provide confidence in the accuracy of associated test results.

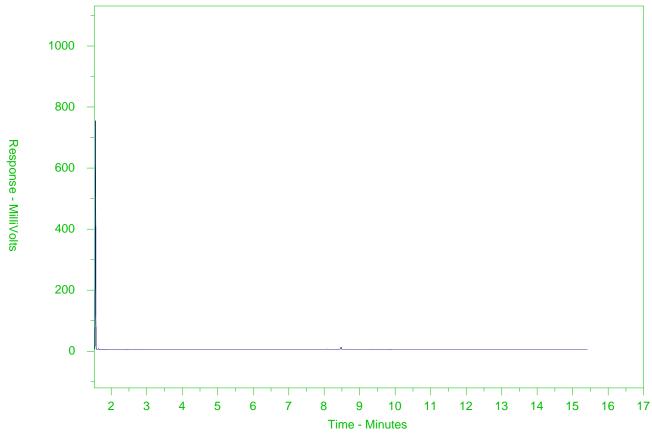
Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

### CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT



ALS Sample ID: L2342753-2

Client Sample ID: LC\_PIZP1105\_WG\_2019-Q3\_N



<b>←</b> F2	F3 —		F4	
nC10	nC16	nC34	nC50	
174°C	287°C	481°C	575°C	
346'F	549'F	898'F	1067'F	
← Gasoli	ne →	←	Motor Oils/ Lube Oils/ Grease	
<del></del>	Diesel/ Jet Fuels			

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at <a href="https://www.alsglobal.com">www.alsglobal.com</a>.

Teck TURNAROUND TIME: COC ID: 20190905 ERX and PIZP1105 RUSH: PROJECT/CLIENT INFO OTHER INFO LABORATORY Facility Name / Job# Line Creek Operation Lab Name ALS Calgary Excel PDF EDD Report Format / Distribution Lab Contact Lyudinyla Shvets Project Manager Carla Froyman Parker Email 1: carla.froymanparker@teck.comx x Email Carla FroymanParker@teck.com Email Lyudinyla, Shvets@ALSGlobal.com Email 2: teckcoal@equisonline.con Address Box 2003 Address 2559 29 Street NE Email 3: drake.tvmstra@teck.com 15km North Hwy 43 Email 4: kirsten.campbell@teck.com\*\* Sparwood Province BC City Calgary Province ΑB Email 5: City kennedy,allen@teck.com V0B 2G0 Postal Code T1Y 7B5 VPO00008129 Postal Code Country Canada Country Canada PO number Phone Number 250-425-3196 Phone Number 403 407 1794 SAMPLE DETAILS Fiftered | F. Fleid, L.; Lab, Fl.; Field & Lab, N.; Non NONE\* HCI NABSO4 112504 Hazardous Material (Yes/No) L2342753-COFC TECKCOAL-ROUTINE-ALS\_Package-TKN/TOC FECKCOAL-MET-D. VA FECKCOAL-MET-T HG-T-U-CVAF-VA ALS\_Package-EPH HG-D-CVAF-VA HG-T-CVAF-VA Sample Location Field G=Grab #Of Time ٧ Sample ID (sys loc code) Matrix Date (24hr) C=Comp Cont. LC\_ERX LC\_ERX\_WG\_2019\_1of2\_NP WG 9/5/2019 12:01 G 1 1 1 8 LC\_PIZP1105\_WG\_2019-Q3\_N LC PIZP1105 WG 9/5/2019 14:14  $\mathbf{G}$ 9 1 ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS RELINQUISHED BY/AFFILIATION ACCEPTED BY/AFFILIATION DATE/TIME DATE/TIME the art relief and the paper relief to the design brown D.Tymstra/K.Campbell 5-Sep (depolkments) SERVICE REQUEST (rush - subject to availability) Regular (default) X

K. Campbell/D. Tymstra

Mobile #

Date/Time

Sampler's Name

Sampler's Signature

Priority (2-3 business days) - 50% surcharge Emergency (1 Business Day) - 100% surcharge

For Emergency <1 Day, ASAP or Weekend - Contact ALS



September 5, 2019



TECK COAL LIMITED (LINE CREEK)

ATTN: CHRIS BLURTON

PO BOX 2003

SPARWOOD BC VOB 2G0

Date Received: 13-SEP-19

Report Date: 20-SEP-19 16:54 (MT)

Version: FINAL

Client Phone: 250-425-6111

# Certificate of Analysis

Lab Work Order #: L2346868
Project P.O. #: VP000608129

Job Reference: LINE CREEK OPERATION
C of C Numbers: 20190912 - LC GW

Legal Site Desc:



Lyudmyla Shvets, B.Sc. Account Manager

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L2346868 CONTD.... PAGE 2 of 7 Version: FINAL

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2346868-1 LC_PIZP1104_WG_Q3-2019_NP			T			]	
Sampled By: KC/DT on 12-SEP-19 @ 14:19							
'					1		
Matrix: WG Miscellaneous Parameters							
	0.50		0.50	a./I		40 CED 40	D 4000 470
Dissolved Organic Carbon	<0.50		0.50	mg/L		18-SEP-19	R4822478
Total Kjeldahl Nitrogen	0.149		0.050	mg/L		17-SEP-19	R4819105
Total Organic Carbon	1.24		0.50	mg/L		18-SEP-19	R4822478
Dissolved Metals in Water							
Diss. Be (low) in Water by CRC ICPMS	0.000		0.000	//	40.050.40	47.050.40	D 4040404
Beryllium (Be)-Dissolved	<0.020		0.020	ug/L	16-SEP-19	17-SEP-19	R4816494
Dissolved Metals Filtration Location	LAB				ļ	16-SEP-19	R4809388
Diss. Mercury in Water by CVAAS or CVAFS	0.0000050		, ,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	a/I	18-SEP-19	19-SEP-19	D 4004070
Mercury (Hg)-Dissolved	<0.000050	0	0.0000050	mg/L	18-SEP-19		R4821972
Dissolved Mercury Filtration Location	LAB					18-SEP-19	R4821370
Dissolved Metals in Water by CRC ICPMS Dissolved Metals Filtration Location	LAB					16-SEP-19	R4809388
Aluminum (AI)-Dissolved	< 0.0030		0.0030	mg/L	16-SEP-19	17-SEP-19	R4816494
Antimony (Sb)-Dissolved	0.00014		0.00010	mg/L	16-SEP-19	17-SEP-19	R4816494
Arsenic (As)-Dissolved	0.00032		0.00010	mg/L	16-SEP-19	17-SEP-19	R4816494
Barium (Ba)-Dissolved	0.282		0.00010	mg/L	16-SEP-19	17-SEP-19	R4816494
Bismuth (Bi)-Dissolved	< 0.000050		0.000050	mg/L	16-SEP-19	17-SEP-19	R4816494
Boron (B)-Dissolved	0.024		0.010	mg/L	16-SEP-19	17-SEP-19	R4816494
Cadmium (Cd)-Dissolved	0.0453		0.0050	ug/L	16-SEP-19	17-SEP-19	R4816494
Calcium (Ca)-Dissolved	141		0.050	mg/L	16-SEP-19	17-SEP-19	R4816494
Chromium (Cr)-Dissolved	<0.00010		0.00010	mg/L	16-SEP-19	17-SEP-19	R4816494
Cobalt (Co)-Dissolved	1.07		0.10	ug/L	16-SEP-19	17-SEP-19	R4816494
Copper (Cu)-Dissolved	0.00053		0.00050	mg/L	16-SEP-19	17-SEP-19	R4816494
Iron (Fe)-Dissolved	< 0.010		0.010	mg/L	16-SEP-19	17-SEP-19	R4816494
Lead (Pb)-Dissolved	< 0.000050		0.000050	mg/L	16-SEP-19	17-SEP-19	R4816494
Lithium (Li)-Dissolved	0.0225		0.0010	mg/L	16-SEP-19	17-SEP-19	R4816494
Magnesium (Mg)-Dissolved	48.6		0.10	mg/L	16-SEP-19	17-SEP-19	R4816494
Manganese (Mn)-Dissolved	0.584		0.00010	mg/L	16-SEP-19	17-SEP-19	R4816494
Molybdenum (Mo)-Dissolved	0.00177		0.000050	mg/L	16-SEP-19	17-SEP-19	R4816494
Nickel (Ni)-Dissolved	0.00280		0.00050	mg/L	16-SEP-19	17-SEP-19	R4816494
Potassium (K)-Dissolved	2.82		0.050	mg/L	16-SEP-19	17-SEP-19	R4816494
Selenium (Se)-Dissolved	0.155		0.050	ug/L	16-SEP-19	17-SEP-19	R4816494
Silicon (Si)-Dissolved	4.72		0.050	mg/L	16-SEP-19	17-SEP-19	R4816494
Silver (Ag)-Dissolved	<0.000010		0.000010	mg/L	16-SEP-19	17-SEP-19	R4816494
Sodium (Na)-Dissolved	15.6		0.050	mg/L	16-SEP-19	17-SEP-19	R4816494
Strontium (Sr)-Dissolved	0.473		0.00020	mg/L	16-SEP-19	17-SEP-19	R4816494
Thallium (TI)-Dissolved	0.000016	1	0.000010	mg/L	16-SEP-19	17-SEP-19	R4816494
Tin (Sn)-Dissolved	<0.00010		0.00010	mg/L	16-SEP-19	17-SEP-19	R4816494
Titanium (Ti)-Dissolved	< 0.010		0.010	mg/L	16-SEP-19	17-SEP-19	R4816494
Uranium (U)-Dissolved	0.00366		0.000010	mg/L	16-SEP-19	17-SEP-19	R4816494
Vanadium (V)-Dissolved	< 0.00050		0.00050	mg/L	16-SEP-19	17-SEP-19	R4816494
Zinc (Zn)-Dissolved	0.0106		0.0010	mg/L	16-SEP-19	17-SEP-19	R4816494
Total Metals in Water				3			
Hardness						1	
Hardness (as CaCO3)	552		0.50	mg/L		17-SEP-19	
Total Be (Low) in Water by CRC ICPMS				=			
Beryllium (Be)-Total	< 0.020		0.020	ug/L		16-SEP-19	R4812049
Total Metals in Water by CRC ICPMS						I	
Aluminum (Al)-Total	0.210		0.0030	mg/L		16-SEP-19	R4812049
Antimony (Sb)-Total	0.00019		0.00010	mg/L		16-SEP-19	R4812049
Antimony (Ob)-Total							

<sup>\*</sup> Refer to Referenced Information for Qualifiers (if any) and Methodology.

L2346868 CONTD.... PAGE 3 of 7 Version: FINAL

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2346868-1 LC_PIZP1104_WG_Q3-2019_NP							
Sampled By: KC/DT on 12-SEP-19 @ 14:19							
Matrix: WG							
Total Metals in Water by CRC ICPMS Barium (Ba)-Total	0.293		0.00010	mg/L		16-SEP-19	R4812049
Bismuth (Bi)-Total	<0.00050		0.00010	mg/L		16-SEP-19	R4812049
Boron (B)-Total	0.026		0.010	mg/L		16-SEP-19	R4812049
Cadmium (Cd)-Total	0.0734		0.0050	ug/L		16-SEP-19	R4812049
Calcium (Ca)-Total	151		0.050	mg/L		16-SEP-19	R4812049
Chromium (Cr)-Total	0.00081		0.00010	mg/L		16-SEP-19	R4812049
Cobalt (Co)-Total	1.15		0.10	ug/L		16-SEP-19	R4812049
Copper (Cu)-Total	0.00221		0.00050	mg/L		16-SEP-19	R4812049
Iron (Fe)-Total	0.945		0.010	mg/L		16-SEP-19	R4812049
Lead (Pb)-Total	0.000407		0.000050	mg/L		16-SEP-19	R4812049
Lithium (Li)-Total	0.0240		0.0010	mg/L		16-SEP-19	R4812049
Magnesium (Mg)-Total	45.5		0.10	mg/L		16-SEP-19	R4812049
Manganese (Mn)-Total	0.564		0.00010	mg/L		16-SEP-19	R4812049
Molybdenum (Mo)-Total	0.00158		0.000050	mg/L		16-SEP-19	R4812049
Nickel (Ni)-Total	0.00298		0.00050	mg/L		16-SEP-19	R4812049
Potassium (K)-Total	2.84		0.050	mg/L		16-SEP-19	R4812049
Selenium (Se)-Total	0.322		0.050	ug/L		16-SEP-19	R4812049
Silicon (Si)-Total	4.95		0.10	mg/L		16-SEP-19	R4812049
Silver (Ag)-Total	<0.000010		0.000010	mg/L		16-SEP-19	R4812049
Sodium (Na)-Total	14.7		0.050	mg/L		16-SEP-19	R4812049
Strontium (Sr)-Total	0.477		0.00020	mg/L		16-SEP-19	R4812049
Thallium (TI)-Total	0.000023		0.000010	mg/L		16-SEP-19	R4812049
Tin (Sn)-Total	<0.00010		0.00010	mg/L		16-SEP-19	R4812049
Titanium (Ti)-Total	<0.010		0.010	mg/L		16-SEP-19	R4812049
Uranium (U)-Total	0.00365		0.000010	mg/L		16-SEP-19	R4812049
Vanadium (V)-Total Zinc (Zn)-Total	0.00085		0.00050	mg/L		16-SEP-19	R4812049
Routine for Teck Coal	0.0131		0.0030	mg/L		16-SEP-19	R4812049
Acidity by Automatic Titration							
Acidity by Automatic Titration Acidity (as CaCO3)	12.2		1.0	mg/L		16-SEP-19	R4813488
Alkalinity (Species) by Manual Titration	12.2		1.0	1119/ =		10 021 10	114010400
Alkalinity, Bicarbonate (as CaCO3)	250		1.0	mg/L		16-SEP-19	R4813455
Alkalinity, Carbonate (as CaCO3)	<1.0		1.0	mg/L		16-SEP-19	R4813455
Alkalinity, Hydroxide (as CaCO3)	<1.0		1.0	mg/L		16-SEP-19	R4813455
Alkalinity, Total (as CaCO3)	250		1.0	mg/L		16-SEP-19	R4813455
Ammonia, Total (as N)				-			
Ammonia as N	<0.0050		0.0050	mg/L		20-SEP-19	R4828712
Bromide in Water by IC (Low Level)							
Bromide (Br)	2.30	DLHC	0.25	mg/L		13-SEP-19	R4812009
Chloride in Water by IC		D		,-		40.0== :-	
Chloride (Cl)	198	DLHC	2.5	mg/L		13-SEP-19	R4812009
Electrical Conductivity (EC)	4440					16 000 10	D4049455
Conductivity (@ 25C)	1140		2.0	uS/cm		16-SEP-19	R4813455
Fluoride in Water by IC Fluoride (F)	0.28	DLHC	0.10	mg/L		13-SEP-19	R4812009
Ion Balance Calculation	0.20		0.10	illy/L		13-367-19	12009
Ion Balance Calculation	99.3		-100	%		17-SEP-19	
Ion Balance Calculation	55.0			,0		55	
Cation - Anion Balance	-0.3			%		17-SEP-19	
Anion Sum	11.9			meq/L		17-SEP-19	
Cation Sum	11.8			meq/L		17-SEP-19	
Nitrate in Water by IC (Low Level)				•			
	L					l	

<sup>\*</sup> Refer to Referenced Information for Qualifiers (if any) and Methodology.

L2346868 CONTD.... PAGE 4 of 7 Version: FINAL

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2346868-1 LC_PIZP1104_WG_Q3-2019_NP Sampled By: KC/DT on 12-SEP-19 @ 14:19							
Matrix: WG  Nitrate in Water by IC (Low Level)  Nitrate (as N)	0.279	DLHC	0.025	mg/L		13-SEP-19	R4812009
Nitrite in Water by IC (Low Level) Nitrite (as N)	<0.0050	DLHC	0.0050	mg/L		13-SEP-19	R4812009
Orthophosphate-Dissolved (as P) Orthophosphate-Dissolved (as P)	<0.0010		0.0010	mg/L		13-SEP-19	R4806504
Oxidation redution potential by elect. ORP	338		-1000	mV		13-SEP-19	R4806851
Phosphorus (P)-Total Phosphorus (P)-Total	0.0378		0.0020	mg/L		19-SEP-19	R4824051
Sulfate in Water by IC Sulfate (SO4)	60.5	DLHC	1.5	mg/L		13-SEP-19	R4812009
Total Dissolved Solids Total Dissolved Solids	975	DLHC	20	mg/L		18-SEP-19	R4823505
Total Suspended Solids Total Suspended Solids Total Suspended Solids	16.2	22.10	1.0	mg/L		18-SEP-19	R4823272
Turbidity Turbidity	21.1		0.10	NTU		13-SEP-19	R4806565
pH pH	8.03		0.10	pH		16-SEP-19	R4813455
Fr.:	0.00		0.10	<b>P</b>		10 02. 10	1010100

<sup>\*</sup> Refer to Referenced Information for Qualifiers (if any) and Methodology.

LINE CREEK OPERATION

L2346868 CONTD....

PAGE 5 of 7 Version: FINAL

### **Reference Information**

**Qualifiers for Individual Samples Listed:** 

Lab Sample ID	Client Sample ID	Qualifier	Description
L2346868-1	LC_PIZP1104_WG_Q3-2019_	SFPL	DOC/DIS METALS LAB FILTER/PRESERVE - Sample was Filtered and Preserved at the laboratory

Sample Parameter Qualifier Key:

Qualifier	Description
DLHC	Detection Limit Raised: Dilution required due to high concentration of test analyte(s).
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.

**Test Method References:** 

ALS Test Code	Matrix	Test Description	Method Reference**
ACIDITY-PCT-CL	Water	Acidity by Automatic Titration	APHA 2310 Acidity

This analysis is carried out using procedures adapted from APHA Method 2310 "Acidity". Acidity is determined by potentiometric titration to a specified endpoint.

ALK-MAN-CL Water Alkalinity (Species) by Manual Titration APHA 2320 ALKALINITY

This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.

BE-D-L-CCMS-VA Water Diss. Be (low) in Water by CRC ICPMS APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

BE-T-L-CCMS-VA Water Total Be (Low) in Water by CRC ICPMS EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

BR-L-IC-N-CL Water Bromide in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

C-DIS-ORG-LOW-CL Water Dissolved Organic Carbon APHA 5310 B-Instrumental

This method is applicable to the analysis of ground water, wastewater, and surface water samples. The form detected depends upon sample pretreatment: Unfiltered sample = TC, 0.45um filtered = TDC. Samples are injected into a combustion tube containing an oxidation catalyst. The carrier gas containing the combustion product from the combustion tube flows through an inorganic carbon reactor vessel and is then sent through a halogen scrubber into a sample cell set in a non-dispersive infrared gas analyzer (NDIR) where carbon dioxide is detected. For total inorganic carbon and dissolved inorganic carbon, the sample is injected into an IC reactor vessel where only the IC component is decomposed to become carbon dioxide.

The peak area generated by the NDIR indicates the TC/TDC or TIC/DIC as applicable. The total organic carbon content of the sample is calculated by subtracting the TIC from the TC.

TOC = TC-TIC, DOC = TDC-DIC, Particulate = Total - Dissolved.

C-TOT-ORG-LOW-CL Water Total Organic Carbon APHA 5310 TOTAL ORGANIC CARBON (TOC)

This method is applicable to the analysis of ground water, wastewater, and surface water samples. The form detected depends upon sample pretreatment: Unfiltered sample = TC, 0.45um filtered = TDC. Samples are injected into a combustion tube containing an oxidation catalyst. The carrier gas containing the combustion product from the combustion tube flows through an inorganic carbon reactor vessel and is then sent through a halogen scrubber into a sample cell set in a non-dispersive infrared gas analyzer (NDIR) where carbon dioxide is detected. For total inorganic carbon and dissolved inorganic carbon, the sample is injected into an IC reactor vessel where only the IC component is decomposed to become carbon dioxide.

The peak area generated by the NDIR indicates the TC/TDC or TIC/DIC as applicable. The total organic carbon content of the sample is calculated by subtracting the TIC from the TC.

TOC = TC-TIC, DOC = TDC-DIC, Particulate = Total - Dissolved.

CL-IC-N-CL Water Chloride in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

EC-L-PCT-CL Water Electrical Conductivity (EC) APHA 2510B

Conductivity, also known as Electrical Conductivity (EC) or Specific Conductance, is measured by immersion of a conductivity cell with platinum electrodes into a water sample. Conductivity measurements are temperature-compensated to 25C.

F-IC-N-CL Water Fluoride in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

HARDNESS-CALC-VA Water Hardness APHA 2340B

HG-D-CVAA-VA

L2346868 CONTD....

PAGE 6 of 7 Version: FINAL

### **Reference Information**

**Test Method References:** 

**ALS Test Code** Matrix Method Reference\*\* **Test Description** 

Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO3 equivalents,

Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

Water samples are filtered (0.45 um), preserved with hydrochloric acid, then undergo a cold-oxidation using bromine monochloride prior to reduction

Diss. Mercury in Water by CVAAS or CVAFS APHA 3030B/EPA 1631E (mod)

with stannous chloride, and analyzed by CVAAS or CVAFS.

Water

IONBALANCE-BC-CL Ion Balance Calculation **APHA 1030E** Water

Cation Sum, Anion Sum, and Ion Balance (as % difference) are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Because all aqueous solutions are electrically neutral, the calculated ion balance (% difference of cations minus anions) should be near-zero.

Cation and Anion Sums are the total meg/L concentration of major cations and anions. Dissolved species are used where available. Minor ions are included where data is present. Ion Balance is calculated as:

Ion Balance (%) = [Cation Sum-Anion Sum] / [Cation Sum+Anion Sum]

MET-D-CCMS-VA Dissolved Metals in Water by CRC ICPMS APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

MET-T-CCMS-VA Water Total Metals in Water by CRC ICPMS EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

NH3-L-F-CL Water Ammonia, Total (as N) J. ENVIRON. MONIT., 2005, 7, 37-42, RSC

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et

NO2-L-IC-N-CL Water Nitrite in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

NO3-L-IC-N-CL Nitrate in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

ORP-CL Water **ASTM D1498** Oxidation redution potential by elect.

This analysis is carried out in accordance with the procedure described in the "ASTM" method D1498 "Oxidation-Reduction Potential of Water" published by the American Society for Testing and Materials (ASTM). Results are reported as observed oxidation-reduction potential of the platinum metal-reference electrode employed, in mV.

It is recommended that this analysis be conducted in the field.

P-T-L-COL-CL Phosphorus (P)-Total APHA 4500-P PHOSPHORUS Water

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after persulphate digestion of the sample.

APHA 4500 H-Electrode PH-CI Water Ha

pH is determined in the laboratory using a pH electrode. All samples analyzed by this method for pH will have exceeded the 15 minute recommended hold time from time of sampling (field analysis is recommended for pH where highly accurate results are needed)

PO4-DO-L-COL-CL Water Orthophosphate-Dissolved (as P) APHA 4500-P PHOSPHORUS

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.

SO4-IC-N-CL Sulfate in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

SOLIDS-TDS-CL Water **Total Dissolved Solids** APHA 2540 C

A well-mixed sample is filtered through a glass fibre filter paper. The filtrate is then evaporated to dryness in a pre-weighed vial and dried at 180 – 2 °C. The increase in vial weight represents the total dissolved solids (TDS).

TECKCOAL-IONBAL-CL Ion Balance Calculation **APHA 1030E**  LINE CREEK OPERATION L2346868 CONTD....

### **Reference Information**

PAGE 7 of 7 Version: FINAL

#### **Test Method References:**

ALS Test Code Matrix Test Description Method Reference\*\*

Cation Sum, Anion Sum, and Ion Balance (as % difference) are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Because all aqueous solutions are electrically neutral, the calculated ion balance (% difference of cations minus anions) should be near-zero.

Cation and Anion Sums are the total meq/L concentration of major cations and anions. Dissolved species are used where available. Minor ions are included where data is present. Ion Balance is calculated as:

Ion Balance (%) = [Cation Sum-Anion Sum] / [Cation Sum+Anion Sum]

TKN-L-F-CL Water Total Kjeldahl Nitrogen APHA 4500-NORG (TKN)

This analysis is carried out using procedures adapted from APHA Method 4500-Norg D. "Block Digestion and Flow Injection Analysis". Total Kjeldahl Nitrogen is determined using block digestion followed by Flow-injection analysis with fluorescence detection.

TSS-L-CL Water Total Suspended Solids APHA 2540 D-Gravimetric

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total suspended solids (TSS) are determined by filtering a sample through a glass fibre filter, and by drying the filter at 104 deg. C.

TURBIDITY-CL Water Turbidity APHA 2130 B-Nephelometer

This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.

\*\* ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

<b>Laboratory Definition Code</b>	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA
CL	ALS ENVIRONMENTAL - CALGARY, ALBERTA, CANADA

#### **Chain of Custody Numbers:**

20190912- LC GW

### GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.

mg/kg - milligrams per kilogram based on dry weight of sample

mg/kg wwt - milligrams per kilogram based on wet weight of sample

mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight

mg/L - unit of concentration based on volume, parts per million.

< - Less than.

D.L. - The reporting limit.

N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory. UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.



Workorder: L2346868

Report Date: 20-SEP-19

Page 1 of 11

Client:

TECK COAL LIMITED (LINE CREEK)

PO BOX 2003

SPARWOOD BC V0B 2G0

Contact: CHRIS BLURTON

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
ACIDITY-PCT-CL	Water							
Batch R4813488								
WG3163597-2 LCS Acidity (as CaCO3)			102.0		%		85-115	16-SEP-19
<b>WG3163597-1 MB</b> Acidity (as CaCO3)			1.6		mg/L		2	16-SEP-19
ALK-MAN-CL	Water							
Batch R4813455								
WG3163607-2 LCS Alkalinity, Total (as CaCo	D3)		103.0		%		85-115	16-SEP-19
WG3163607-1 MB Alkalinity, Total (as CaCo	D3)		<1.0		mg/L		1	16-SEP-19
BE-D-L-CCMS-VA	Water							
Batch R4816494								
WG3162600-2 LCS Beryllium (Be)-Dissolved			100.8		%		80-120	17-SEP-19
WG3162600-1 MB Beryllium (Be)-Dissolved		LF	<0.000020	)	mg/L		0.00002	17-SEP-19
BE-T-L-CCMS-VA	Water							
Batch R4812049								
WG3162194-2 LCS Beryllium (Be)-Total			110.9		%		80-120	16-SEP-19
WG3162194-1 MB Beryllium (Be)-Total			<0.000020	1	mg/L		0.00002	40 CED 40
	<b>M</b>		<0.000020	J	mg/L		0.00002	16-SEP-19
BR-L-IC-N-CL Batch R4812009	Water							
WG3163268-10 LCS								
Bromide (Br)			96.6		%		85-115	13-SEP-19
WG3163268-9 MB Bromide (Br)			<0.050		mg/L		0.05	13-SEP-19
C-DIS-ORG-LOW-CL	Water							
Batch R4822478								
WG3166371-2 LCS Dissolved Organic Carbo	on		96.4		%		80-120	18-SEP-19
WG3166371-1 MB Dissolved Organic Carbo	on		<0.50		mg/L		0.5	18-SEP-19
C-TOT-ORG-LOW-CL	Water							



Workorder: L2346868

Report Date: 20-SEP-19 Page 2 of 11

Test	Matrix	Reference	Result Qualifier	Units RPD	Limit Analyzed
C-TOT-ORG-LOW-CL	Water				•
Batch R4822478					
WG3166371-2 LCS					
Total Organic Carbon			107.0	%	80-120 18-SEP-19
WG3166371-1 MB			0.50		
Total Organic Carbon			<0.50	mg/L	0.5 18-SEP-19
CL-IC-N-CL	Water				
Batch R4812009					
<b>WG3163268-10 LCS</b> Chloride (CI)			97.5	%	90-110 13-SEP-19
WG3163268-9 MB			01.0	,,	30 110 13-3E1 -13
Chloride (CI)			<0.50	mg/L	0.5 13-SEP-19
EC-L-PCT-CL	Water				
Batch R4813455					
WG3163607-2 LCS					
Conductivity (@ 25C)			97.8	%	90-110 16-SEP-19
WG3163607-1 MB			20	C/om	0 40.05D 40
Conductivity (@ 25C)			<2.0	uS/cm	2 16-SEP-19
F-IC-N-CL	Water				
Batch R4812009					
<b>WG3163268-10 LCS</b> Fluoride (F)			107.0	%	90-110 13-SEP-19
WG3163268-9 MB					00 110 10 021 10
Fluoride (F)			<0.020	mg/L	0.02 13-SEP-19
HG-D-CVAA-VA	Water				
Batch R4821972					
WG3165929-2 LCS					
Mercury (Hg)-Dissolved			99.4	%	80-120 19-SEP-19
WG3165929-1 MB Mercury (Hg)-Dissolved		LF	<0.000050	mg/L	0.000005 19-SEP-19
			<b>10.000000</b>	mg/L	0.000005 19-3EF-19
MET-D-CCMS-VA	Water				
Batch R4816494 WG3162600-2 LCS					
Aluminum (Al)-Dissolved			103.8	%	80-120 17-SEP-19
Antimony (Sb)-Dissolved			97.3	%	80-120 17-SEP-19
Arsenic (As)-Dissolved			98.2	%	80-120 17-SEP-19
Barium (Ba)-Dissolved			99.4	%	80-120 17-SEP-19
Bismuth (Bi)-Dissolved			94.6	%	80-120 17-SEP-19
Boron (B)-Dissolved			100.8	%	80-120 17-SEP-19



Workorder: L2346868

Report Date: 20-SEP-19

Page 3 of 11

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA	Water							
Batch R48164	94							
WG3162600-2 LC								
Cadmium (Cd)-Disso			95.2		%		80-120	17-SEP-19
Calcium (Ca)-Dissolv			96.7		%		80-120	17-SEP-19
Chromium (Cr)-Disso			101.1		%		80-120	17-SEP-19
Cobalt (Co)-Dissolve			98.5		%		80-120	17-SEP-19
Copper (Cu)-Dissolv	ed		99.5		%		80-120	17-SEP-19
Iron (Fe)-Dissolved			100.4		%		80-120	17-SEP-19
Lead (Pb)-Dissolved			97.2		%		80-120	17-SEP-19
Lithium (Li)-Dissolve			98.3		%		80-120	17-SEP-19
Magnesium (Mg)-Dis			104.2		%		80-120	17-SEP-19
Manganese (Mn)-Dis	ssolved		101.6		%		80-120	17-SEP-19
Molybdenum (Mo)-D	issolved		94.6		%		80-120	17-SEP-19
Nickel (Ni)-Dissolved	i		100.4		%		80-120	17-SEP-19
Potassium (K)-Disso	lved		102.0		%		80-120	17-SEP-19
Selenium (Se)-Disso	lved		97.5		%		80-120	17-SEP-19
Silicon (Si)-Dissolved	b		103.2		%		60-140	17-SEP-19
Silver (Ag)-Dissolved	t		100.5		%		80-120	17-SEP-19
Sodium (Na)-Dissolv	red		104.6		%		80-120	17-SEP-19
Strontium (Sr)-Disso	lved		98.2		%		80-120	17-SEP-19
Thallium (TI)-Dissolv	red		99.6		%		80-120	17-SEP-19
Tin (Sn)-Dissolved			97.1		%		80-120	17-SEP-19
Titanium (Ti)-Dissolv	red		99.8		%		80-120	17-SEP-19
Uranium (U)-Dissolve	ed		101.5		%		80-120	17-SEP-19
Vanadium (V)-Dissol	lved		101.6		%		80-120	17-SEP-19
Zinc (Zn)-Dissolved			104.6		%		80-120	17-SEP-19
WG3162600-1 MB	3	LF						
Aluminum (Al)-Disso	lved		<0.0010		mg/L		0.001	17-SEP-19
Antimony (Sb)-Disso	lved		<0.00010	1	mg/L		0.0001	17-SEP-19
Arsenic (As)-Dissolve	ed		<0.00010	1	mg/L		0.0001	17-SEP-19
Barium (Ba)-Dissolve	ed		<0.00010	)	mg/L		0.0001	17-SEP-19
Bismuth (Bi)-Dissolve	ed		< 0.00005	0	mg/L		0.00005	17-SEP-19
Boron (B)-Dissolved			<0.010		mg/L		0.01	17-SEP-19
Cadmium (Cd)-Disso	olved		<0.00000	50	mg/L		0.000005	17-SEP-19
Calcium (Ca)-Dissolv	ved		< 0.050		mg/L		0.05	17-SEP-19
Chromium (Cr)-Disso	olved		<0.00010	1	mg/L		0.0001	17-SEP-19



Workorder: L2346868

Report Date: 20-SEP-19 Page 4 of 11

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA	Water							
Batch R481649	94							
WG3162600-1 MB		LF	0.00040					
Cobalt (Co)-Dissolved			<0.00010		mg/L		0.0001	17-SEP-19
Copper (Cu)-Dissolve	ed		<0.00020		mg/L		0.0002	17-SEP-19
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	17-SEP-19
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	17-SEP-19
Lithium (Li)-Dissolved			<0.0010		mg/L		0.001	17-SEP-19
Magnesium (Mg)-Diss			<0.0050		mg/L		0.005	17-SEP-19
Manganese (Mn)-Diss	solved		<0.00010		mg/L		0.0001	17-SEP-19
Molybdenum (Mo)-Dis	ssolved		<0.000050		mg/L		0.00005	17-SEP-19
Nickel (Ni)-Dissolved			<0.00050		mg/L		0.0005	17-SEP-19
Potassium (K)-Dissolv	ved		<0.050		mg/L		0.05	17-SEP-19
Selenium (Se)-Dissol	ved		<0.000050		mg/L		0.00005	17-SEP-19
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	17-SEP-19
Silver (Ag)-Dissolved			<0.000010		mg/L		0.00001	17-SEP-19
Sodium (Na)-Dissolve	ed		<0.050		mg/L		0.05	17-SEP-19
Strontium (Sr)-Dissolv	ved		<0.00020		mg/L		0.0002	17-SEP-19
Thallium (TI)-Dissolve	ed		<0.000010		mg/L		0.00001	17-SEP-19
Tin (Sn)-Dissolved			<0.00010		mg/L		0.0001	17-SEP-19
Titanium (Ti)-Dissolve	ed		<0.00030		mg/L		0.0003	17-SEP-19
Uranium (U)-Dissolve	ed		<0.000010		mg/L		0.00001	17-SEP-19
Vanadium (V)-Dissolv	/ed		<0.00050		mg/L		0.0005	17-SEP-19
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	17-SEP-19
MET-T-CCMS-VA	Water							
Batch R481204	19							
WG3162194-2 LCS	3		404.4		0/		00.400	
Aluminum (Al)-Total			104.1		%		80-120	16-SEP-19
Antimony (Sb)-Total			105.0		%		80-120	16-SEP-19
Arsenic (As)-Total			101.7		%		80-120	16-SEP-19
Barium (Ba)-Total			105.4		%		80-120	16-SEP-19
Bismuth (Bi)-Total			100.4		%		80-120	16-SEP-19
Boron (B)-Total			113.0		%		80-120	16-SEP-19
Cadmium (Cd)-Total			104.1		%		80-120	16-SEP-19
Calcium (Ca)-Total			113.8		%		80-120	16-SEP-19
Chromium (Cr)-Total			100.6		%		80-120	16-SEP-19
Cobalt (Co)-Total			103.4		%		80-120	16-SEP-19



Workorder: L2346868

Report Date: 20-SEP-19 Page 5 of 11

Test	Matrix	Reference	Result Qu	alifier Units	RPD	Limit	Analyzed
MET-T-CCMS-VA	Water						
Batch R4812049							
WG3162194-2 LCS			404.0	0/			
Copper (Cu)-Total			101.3	%		80-120	16-SEP-19
Iron (Fe)-Total			98.2	%		80-120	16-SEP-19
Lead (Pb)-Total			105.8	%		80-120	16-SEP-19
Lithium (Li)-Total			113.1	%		80-120	16-SEP-19
Magnesium (Mg)-Total			103.1	%		80-120	16-SEP-19
Manganese (Mn)-Total			102.0	%		80-120	16-SEP-19
Molybdenum (Mo)-Tota	ıl		101.6	%		80-120	16-SEP-19
Nickel (Ni)-Total			101.2	%		80-120	16-SEP-19
Potassium (K)-Total			106.0	%		80-120	16-SEP-19
Selenium (Se)-Total			99.8	%		80-120	16-SEP-19
Silicon (Si)-Total			102.2	%		80-120	16-SEP-19
Silver (Ag)-Total			104.8	%		80-120	16-SEP-19
Sodium (Na)-Total			105.8	%		80-120	16-SEP-19
Strontium (Sr)-Total			103.1	%		80-120	16-SEP-19
Thallium (TI)-Total			104.0	%		80-120	16-SEP-19
Tin (Sn)-Total			102.6	%		80-120	16-SEP-19
Titanium (Ti)-Total			98.7	%		80-120	16-SEP-19
Uranium (U)-Total			114.4	%		80-120	16-SEP-19
Vanadium (V)-Total			104.1	%		80-120	16-SEP-19
Zinc (Zn)-Total			103.6	%		80-120	16-SEP-19
WG3162194-1 MB							
Aluminum (Al)-Total			<0.0030	mg/L		0.003	16-SEP-19
Antimony (Sb)-Total			<0.00010	mg/L		0.0001	16-SEP-19
Arsenic (As)-Total			<0.00010	mg/L		0.0001	16-SEP-19
Barium (Ba)-Total			<0.00010	mg/L		0.0001	16-SEP-19
Bismuth (Bi)-Total			<0.000050	mg/L		0.00005	16-SEP-19
Boron (B)-Total			<0.010	mg/L		0.01	16-SEP-19
Cadmium (Cd)-Total			<0.000050	mg/L		0.000005	16-SEP-19
Calcium (Ca)-Total			<0.050	mg/L		0.05	16-SEP-19
Chromium (Cr)-Total			<0.00010	mg/L		0.0001	16-SEP-19
Cobalt (Co)-Total			<0.00010	mg/L		0.0001	16-SEP-19
Copper (Cu)-Total			<0.00050	mg/L		0.0005	16-SEP-19
Iron (Fe)-Total			<0.010	mg/L		0.01	16-SEP-19
Lead (Pb)-Total			<0.00050	mg/L		0.00005	16-SEP-19



Workorder: L2346868

Report Date: 20-SEP-19 Page 6 of 11

Test	Matrix	Reference	Result Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-VA	Water						
Batch R4812049 WG3162194-1 MB Lithium (Li)-Total			<0.0010	mg/L		0.004	40.050.40
Magnesium (Mg)-Total			<0.0010	mg/L		0.001 0.005	16-SEP-19 16-SEP-19
Manganese (Mn)-Total			<0.00010	mg/L		0.005	16-SEP-19 16-SEP-19
Molybdenum (Mo)-Total			<0.00010	mg/L		0.0001	16-SEP-19 16-SEP-19
Nickel (Ni)-Total			<0.00050	mg/L			
Potassium (K)-Total			<0.050	•		0.0005	16-SEP-19
Selenium (Se)-Total			<0.00050	mg/L mg/L		0.05	16-SEP-19
			<0.10	•		0.00005	16-SEP-19
Silver (Ag) Total				mg/L		0.1	16-SEP-19
Silver (Ag)-Total			<0.00010	mg/L		0.00001	16-SEP-19
Sodium (Na)-Total			<0.050	mg/L		0.05	16-SEP-19
Strontium (Sr)-Total			<0.00020	mg/L		0.0002	16-SEP-19
Thallium (TI)-Total			<0.000010	mg/L		0.00001	16-SEP-19
Tin (Sn)-Total			<0.00010	mg/L		0.0001	16-SEP-19
Titanium (Ti)-Total			<0.00030	mg/L		0.0003	16-SEP-19
Uranium (U)-Total			<0.000010	mg/L		0.00001	16-SEP-19
Vanadium (V)-Total			<0.00050	mg/L		0.0005	16-SEP-19
Zinc (Zn)-Total			<0.0030	mg/L		0.003	16-SEP-19
NH3-L-F-CL	Water						
Batch R4828712							
WG3168424-2 LCS Ammonia as N			110.2	%		85-115	20-SEP-19
WG3168424-1 MB Ammonia as N			<0.0050	mg/L		0.005	20-SEP-19
NO2-L-IC-N-CL	Water						
Batch R4812009							
WG3163268-10 LCS Nitrite (as N)			98.4	%		90-110	13-SEP-19
WG3163268-9 MB Nitrite (as N)			<0.0010	mg/L		0.001	13-SEP-19
NO3-L-IC-N-CL	Water						
Batch R4812009							
WG3163268-10 LCS Nitrate (as N)			97.9	%		90-110	13-SEP-19
WG3163268-9 MB Nitrate (as N)			<0.0050	mg/L			



Workorder: L2346868

Report Date: 20-SEP-19 Page 7 of 11

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
ORP-CL	Water							
<b>Batch R4806851 WG3161485-12 CRM</b> ORP		CL-ORP	227		mV		210-230	13-SEP-19
P-T-L-COL-CL	Water							
Batch R4824051 WG3166984-10 LCS Phosphorus (P)-Total			101.0		%		80-120	19-SEP-19
WG3166984-9 MB Phosphorus (P)-Total			<0.0020		mg/L		0.002	19-SEP-19
PH-CL	Water							
Batch R4813455 WG3163607-2 LCS pH			7.02		рН		6.9-7.1	16-SEP-19
PO4-DO-L-COL-CL	Water							
Batch R4806504 WG3161199-8 LCS Orthophosphate-Dissolve	ed (as P)		99.0		%		80-120	13-SEP-19
WG3161199-2 MB Orthophosphate-Dissolve	ed (as P)		<0.0010		mg/L		0.001	13-SEP-19
SO4-IC-N-CL	Water							
<b>Batch</b> R4812009 <b>WG3163268-10</b> LCS Sulfate (SO4)			96.6		%		90-110	13-SEP-19
WG3163268-9 MB Sulfate (SO4)			<0.30		mg/L		0.3	13-SEP-19
SOLIDS-TDS-CL	Water							
Batch R4823505 WG3164467-8 LCS Total Dissolved Solids			103.5		%		85-115	18-SEP-19
WG3164467-7 MB Total Dissolved Solids			<10		mg/L		10	18-SEP-19
TKN-L-F-CL	Water							
Batch R4819105 WG3164332-10 LCS Total Kjeldahl Nitrogen WG3164332-14 LCS			101.3		%		75-125	17-SEP-19

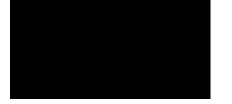


Workorder: L2346868

Report Date: 20-SEP-19

Page 8 of 11

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
TKN-L-F-CL	Water							
Batch R4819105								
WG3164332-14 LCS Total Kjeldahl Nitrogen			100.4		%		75-125	17-SEP-19
WG3164332-18 LCS Total Kjeldahl Nitrogen			98.6		%		75-125	17-SEP-19
WG3164332-2 LCS Total Kjeldahl Nitrogen			97.2		%		75-125	17-SEP-19
WG3164332-22 LCS Total Kjeldahl Nitrogen			97.7		%		75-125	17-SEP-19
WG3164332-26 LCS Total Kjeldahl Nitrogen			96.4		%		75-125	17-SEP-19
WG3164332-30 LCS Total Kjeldahl Nitrogen			97.5		%		75-125	17-SEP-19
WG3164332-34 LCS Total Kjeldahl Nitrogen			97.2		%		75-125	17-SEP-19
WG3164332-6 LCS Total Kjeldahl Nitrogen			97.0		%		75-125	17-SEP-19
<b>WG3164332-1 MB</b> Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	17-SEP-19
WG3164332-13 MB Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	17-SEP-19
WG3164332-17 MB Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	17-SEP-19
WG3164332-21 MB Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	17-SEP-19
WG3164332-25 MB Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	17-SEP-19
WG3164332-29 MB Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	17-SEP-19
WG3164332-33 MB Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	17-SEP-19
<b>WG3164332-5 MB</b> Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	17-SEP-19
WG3164332-9 MB Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	17-SEP-19
TSS-L-CL	Water							
Batch R4823272								
WG3164429-6 LCS Total Suspended Solids WG3164429-5 MB			93.5		%		85-115	18-SEP-19
WG3164429-5 MB								



Workorder: L2346868

Report Date: 20-SEP-19 Page 9 of 11

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
TSS-L-CL	Water							
Batch R4823272 WG3164429-5 MB Total Suspended Solids			<1.0		mg/L		1	18-SEP-19
TURBIDITY-CL	Water							
Batch R4806565								
WG3161381-26 LCS Turbidity			96.5		%		85-115	13-SEP-19
WG3161381-25 MB Turbidity			<0.10		NTU		0.1	13-SEP-19

Report Date: 20-SEP-19 Workorder: L2346868 Page 10 of 11

#### Legend:

ALS Control Limit (Data Quality Objectives) Limit

DUP Duplicate

Relative Percent Difference RPD

N/A Not Available

LCS Laboratory Control Sample Standard Reference Material SRM

MS Matrix Spike

MSD

Matrix Spike Duplicate
Average Desorption Efficiency ADE

Method Blank MB

Internal Reference Material IRM Certified Reference Material CRM Continuing Calibration Verification CCV CVS Calibration Verification Standard LCSD Laboratory Control Sample Duplicate

Workorder: L2346868 Report Date: 20-SEP-19 Page 11 of 11

#### **Hold Time Exceedances:**

	Sample						
ALS Product Description	ID	Sampling Date	Date Processed	Rec. HT	Actual HT	Units	Qualifier
Physical Tests							
Oxidation redution potential	by elect.						
	1	12-SEP-19 14:19	13-SEP-19 18:45	0.25	28	hours	EHTR-FM
рН							
	1	12-SEP-19 14:19	16-SEP-19 13:00	0.25	95	hours	EHTR-FM

#### **Legend & Qualifier Definitions:**

EHTR-FM: Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended.

EHTR: Exceeded ALS recommended hold time prior to sample receipt.

EHTL: Exceeded ALS recommended hold time prior to analysis. Sample was received less than 24 hours prior to expiry.

EHT: Exceeded ALS recommended hold time prior to analysis.

Rec. HT: ALS recommended hold time (see units).

#### Notes\*:

Where actual sampling date is not provided to ALS, the date (& time) of receipt is used for calculation purposes. Where actual sampling time is not provided to ALS, the earlier of 12 noon on the sampling date or the time (& date) of receipt is used for calculation purposes. Samples for L2346868 were received on 13-SEP-19 08:50.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against predetermined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

**Teck** COC ID: 20190912- LC GW TURNAROUND TIME: RUSH: OTHERINFO PROJECT/CLIENT INFO LABORATORY Facility Name / Job# Line Creek Operation Lab Name ALS Calgary EDD Report Format / Distribution Excel Lab Contact Lyudmyla Shvets carla froymanparker mteck.com Project Manager Chris Blurton Email 1: Email Lyudinyla. Shvets@ALSGlobal.com teckcoal@equisonline.con Email Chris.Blurton@teck.com Email 2: Address Box 2003 Address 2559 29 Street NE drake.tymstra@teck.com To the Common transfer of the Common transfer Email 3: 15km North Hwy 43 Email 4: BC City Calgary Province Email 4: kennedy.allen@teck.com City Sparwood Province AB Postal Code V0B 2G0 Country Canada - Postal Code T1Y 7B5 Country Canada PO number VPOHOUS129 Phone Number 403 407 1794 Phone Number 250-425-3196 Filtered - F; Field, L. Lab, FL, bield & Lab, N: Non-(au, of the sage of the same) SAMPLE DETAILS ANALYSIS REQUESTED Ν HNO3 NONE NONE NONE NONE H25O4 Hazardous Material (Yes/No) L2346868-COFC FECKCOAL-MET-D-VA FECKCOAL-MET-T-VA TECKCOAL-ROUTINE-VA ALS\_Package-TKN/TOC NLS\_Package-DOC HG-D-CVAF-VA Field #Of Sample Location Time G=Grab Sample ID (sys\_loc\_code) Matrix Date (24hr) C=Comp Cont LC\_PIZP1104\_WG\_Q3-2019\_NP LC\_PIZP1104 WG 2019/09/12 14:19  $\mathbf{G}$ 6 ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS RELINQUISHED BY/AFFILIATION DATE/TIME ACCEPTED BY A FILIATION SEED DATE/TIME HE WE WILL AND ALL A WAS SAMPLED TO WARD PLACE FOR D.Tymstra/K.Campbell 0-Jan OR OLUMBUS SERVICE REQUEST (rush subject to availability) Regular (default) X Sampler's Name K. Campbell/D. Tymstra Mobile # Priority (2-3 business-days) - 50% surcharge

Date/Time

Sampler's Signature

Emergency (1 Business Day) - 100% surcharge

For Emergency <1 Day, ASAP or Weekend - Contact ALS



TECK COAL LIMITED (LINE CREEK)

ATTN: Carla Froyman Parker

PO BOX 2003

SPARWOOD BC VOB 2G0

Date Received: 11-OCT-19

Report Date: 22-OCT-19 17:10 (MT)

Version: FINAL

Client Phone: 250-425-3196

# Certificate of Analysis

Lab Work Order #: L2364506
Project P.O. #: VP000608129

Job Reference: LINE CREEK OPERATION

C of C Numbers:

20191010 LC GW

Legal Site Desc:



Lyudmyla Shvets, B.Sc. Account Manager

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L2364506 CONTD.... PAGE 2 of 9 Version: FINAL

Sample Details/Parameters	Result	Qualifier	* D.L.	Units	Extracted	Analyzed	Batch
   L2364506-1							
Sampled By: KC/DT on 10-OCT-19 @ 13:25							
Matrix: WG Miscellaneous Parameters							
Dissolved Organic Carbon	2.62		0.50	ma/l		19-OCT-19	D4074000
_	2.62		0.50	mg/L			R4874992
Total Kjeldahl Nitrogen	0.298		0.050	mg/L		17-OCT-19	R4872902
Total Organic Carbon	2.86		0.50	mg/L		19-OCT-19	R4874992
Dissolved Metals in Water							
Diss. Be (Iow) in Water by CRC ICPMS Beryllium (Be)-Dissolved	<0.020		0.020	ug/L	15-OCT-19	17-OCT-19	R4872734
Dissolved Metals Filtration Location	<0.020 FIELD		0.020	ug/L	15-001-19	17-OCT-19 15-OCT-19	R4870254
Diss. Mercury in Water by CVAAS or CVAFS	FILLD					13-001-19	K4670254
Mercury (Hg)-Dissolved	<0.000050		0.0000050	mg/L	17-OCT-19	17-OCT-19	R4872448
Dissolved Mercury Filtration Location	FIELD		0.000000	9, =	17 001 10	17-OCT-19	R4872405
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	FIELD					15-OCT-19	R4870254
Aluminum (AI)-Dissolved	0.0036		0.0030	mg/L	15-OCT-19	17-OCT-19	R4872734
Antimony (Sb)-Dissolved	<0.00010		0.00010	mg/L	15-OCT-19	17-OCT-19	R4872734
Arsenic (As)-Dissolved	0.00071		0.00010	mg/L	15-OCT-19	17-OCT-19	R4872734
Barium (Ba)-Dissolved	0.0684		0.00010	mg/L	15-OCT-19	17-OCT-19	R4872734
Bismuth (Bi)-Dissolved	<0.000050		0.000050	mg/L	15-OCT-19	17-OCT-19	R4872734
Boron (B)-Dissolved	0.480		0.010	mg/L	15-OCT-19	17-OCT-19	R4872734
Cadmium (Cd)-Dissolved	<0.0050		0.0050	ug/L	15-OCT-19	17-OCT-19	R4872734
Calcium (Ca)-Dissolved	28.9		0.050	mg/L	15-OCT-19	17-OCT-19	R4872734
Chromium (Cr)-Dissolved	0.00015		0.00010	mg/L	15-OCT-19	17-OCT-19	R4872734
Cobalt (Co)-Dissolved	0.91		0.10	ug/L	15-OCT-19	17-OCT-19	R4872734
Copper (Cu)-Dissolved	0.00040		0.00020	mg/L	15-OCT-19	17-OCT-19	R4872734
Iron (Fe)-Dissolved	0.077		0.010	mg/L	15-OCT-19	17-OCT-19	R4872734
Lead (Pb)-Dissolved	<0.000050		0.000050	mg/L	15-OCT-19	17-OCT-19	R4872734
Lithium (Li)-Dissolved	0.117		0.0010	mg/L	15-OCT-19	17-OCT-19	R4872734
Magnesium (Mg)-Dissolved	16.1		0.10	mg/L	15-OCT-19	17-OCT-19	R4872734
Manganese (Mn)-Dissolved	0.558		0.00010	mg/L	15-OCT-19	17-OCT-19	R4872734
Molybdenum (Mo)-Dissolved	0.00993		0.000050	mg/L	15-OCT-19	17-OCT-19	R4872734
Nickel (Ni)-Dissolved	0.00245		0.00050	mg/L	15-OCT-19	17-OCT-19	R4872734
Potassium (K)-Dissolved	1.66		0.050	mg/L	15-OCT-19	17-OCT-19	R4872734
Selenium (Se)-Dissolved	0.211	DTSE	0.050	ug/L	15-OCT-19	17-OCT-19	R4872734
Silicon (Si)-Dissolved	4.45		0.050	mg/L	15-OCT-19	17-OCT-19	R4872734
Silver (Ag)-Dissolved	<0.000010		0.000010	mg/L	15-OCT-19	17-OCT-19	R4872734
Sodium (Na)-Dissolved	137		0.050	mg/L	15-OCT-19	17-OCT-19	R4872734
Strontium (Sr)-Dissolved	0.787		0.00020	mg/L	15-OCT-19	17-OCT-19	R4872734
Thallium (TI)-Dissolved	<0.000010	DTM	0.000010	mg/L	15-OCT-19	17-OCT-19	R4872734
Tin (Sn)-Dissolved	0.00217	DTMF	0.00010	mg/L	15-OCT-19	17-OCT-19	R4872734
Titanium (Ti)-Dissolved	<0.010		0.010	mg/L	15-OCT-19	17-OCT-19	R4872734
Uranium (U)-Dissolved	0.00196		0.000010	mg/L	15-OCT-19	17-OCT-19	R4872734
Vanadium (V)-Dissolved	<0.00050		0.00050	mg/L	15-OCT-19	17-OCT-19	R4872734
Zinc (Zn)-Dissolved	0.0013		0.0010	mg/L	15-OCT-19	17-OCT-19	R4872734
Hardness Hardness (as CaCO3)	120		0.50	ma/l		18-OCT-19	
Total Metals in Water	139		0.50	mg/L		10-001-19	
Total Be (Low) in Water by CRC ICPMS							
Beryllium (Be)-Total	<0.020		0.020	ug/L		17-OCT-19	R4874512
Total Metals in Water by CRC ICPMS	\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\		0.020	ug/ L		17 001 10	114074312
Aluminum (Al)-Total	0.189		0.0030	mg/L		17-OCT-19	R4874512
Antimony (Sb)-Total	0.00025		0.00010	mg/L		17-OCT-19	R4874512
Arsenic (As)-Total	0.00020		0.00010	mg/L		17-OCT-19	R4874512
				J-			

<sup>\*</sup> Refer to Referenced Information for Qualifiers (if any) and Methodology.

L2364506 CONTD.... PAGE 3 of 9 Version: FINAL

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2364506-1 LC PIZP1103 WG Q4-2019 NP							
L2364506-1 LC_PIZP1103_WG_Q4-2019_NP Sampled By: KC/DT on 10-OCT-19 @ 13:25							
Matrix: WG							
Total Metals in Water by CRC ICPMS Barium (Ba)-Total	0.0698		0.00010	mg/L		17-OCT-19	R4874512
Bismuth (Bi)-Total	<0.00050	1	0.000050	mg/L		17-OCT-19	R4874512
Boron (B)-Total	0.547		0.010	mg/L		17-OCT-19	R4874512
Cadmium (Cd)-Total	0.0317		0.0050	ug/L		17-OCT-19	R4874512
Calcium (Ca)-Total	30.1		0.050	mg/L		17-OCT-19	R4874512
Chromium (Cr)-Total	0.00048		0.00010	mg/L		17-OCT-19	R4874512
Cobalt (Co)-Total	1.13		0.10	ug/L		17-OCT-19	R4874512
Copper (Cu)-Total	0.00270		0.00050	mg/L		17-OCT-19	R4874512
Iron (Fe)-Total	0.313		0.010	mg/L		17-OCT-19	R4874512
Lead (Pb)-Total	0.000635	0	.000050	mg/L		17-OCT-19	R4874512
Lithium (Li)-Total	0.122		0.0010	mg/L		17-OCT-19	R4874512
Magnesium (Mg)-Total	17.1		0.10	mg/L		17-OCT-19	R4874512
Manganese (Mn)-Total	0.563		0.00010	mg/L		17-OCT-19	R4874512
Molybdenum (Mo)-Total	0.00892	0	.000050	mg/L		17-OCT-19	R4874512
Nickel (Ni)-Total	0.00314		0.00050	mg/L		17-OCT-19	R4874512
Potassium (K)-Total	1.76		0.050	mg/L		17-OCT-19	R4874512
Selenium (Se)-Total	<0.050		0.050	ug/L		17-OCT-19	R4874512
Silicon (Si)-Total	4.61		0.10	mg/L		17-OCT-19	R4874512
Silver (Ag)-Total	<0.000010	0	.000010	mg/L		17-OCT-19	R4874512
Sodium (Na)-Total	142		0.050	mg/L		17-OCT-19	R4874512
Strontium (Sr)-Total	0.822		0.00020	mg/L		17-OCT-19	R4874512
Thallium (TI)-Total	0.000011	1 1	.000010	mg/L		17-OCT-19	R4874512
Tin (Sn)-Total	0.00125		0.00010	mg/L		17-OCT-19	R4874512
Titanium (Ti)-Total	<0.010		0.010	mg/L		17-OCT-19	R4874512
Uranium (U)-Total	0.00147		0.000010	mg/L		17-OCT-19	R4874512
Vanadium (V)-Total Zinc (Zn)-Total	0.00056	1 1	0.00050	mg/L		17-OCT-19 17-OCT-19	R4874512
Routine for Teck Coal	0.0136		0.0030	mg/L		17-001-19	R4874512
Acidity by Automatic Titration							
Acidity by Automatic Intration Acidity (as CaCO3)	1.1		1.0	mg/L		16-OCT-19	R4873457
Alkalinity (Species) by Manual Titration	1		1.0	1119/12		10 001 10	114073437
Alkalinity, Bicarbonate (as CaCO3)	406		1.0	mg/L		16-OCT-19	R4873462
Alkalinity, Carbonate (as CaCO3)	<1.0		1.0	mg/L		16-OCT-19	R4873462
Alkalinity, Hydroxide (as CaCO3)	<1.0		1.0	mg/L		16-OCT-19	R4873462
Alkalinity, Total (as CaCO3)	406		1.0	mg/L		16-OCT-19	R4873462
Ammonia, Total (as N)				-			
Ammonia as N	0.0667		0.0050	mg/L		20-OCT-19	R4875988
Bromide in Water by IC (Low Level)							
Bromide (Br)	0.146		0.050	mg/L		13-OCT-19	R4870507
Chloride in Water by IC							
Chloride (CI)	3.25		0.50	mg/L		13-OCT-19	R4870507
Electrical Conductivity (EC)	700		0.0	07-		40.007.10	D 4070 455
Conductivity (@ 25C)	720		2.0	uS/cm		16-OCT-19	R4873462
Fluoride in Water by IC Fluoride (F)	0.400		0.000	ma/l		13-OCT-19	D4070507
,	0.429		0.020	mg/L		13-001-19	R4870507
Ion Balance Calculation Cation - Anion Balance	-0.2			%		18-OCT-19	
Anion Sum	8.82			meg/L		18-OCT-19	
Cation Sum	8.78			meg/L		18-OCT-19	
Ion Balance Calculation	0.70			moq/L		10 001-19	
Ion Balance	99.6		-100	%		18-OCT-19	
Nitrate in Water by IC (Low Level)							
	I .						

<sup>\*</sup> Refer to Referenced Information for Qualifiers (if any) and Methodology.

L2364506 CONTD.... PAGE 4 of 9 Version: FINAL

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2364506-1 LC_PIZP1103_WG_Q4-2019_NP							
Sampled By: KC/DT on 10-OCT-19 @ 13:25							
Matrix: WG							
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	<0.0050		0.0050	mg/L		13-OCT-19	R4870507
Nitrite in Water by IC (Low Level)				,,		10 00T 10	
Nitrite (as N)	0.0011		0.0010	mg/L		13-OCT-19	R4870507
Orthophosphate-Dissolved (as P) Orthophosphate-Dissolved (as P)	0.0132		0.0010	mg/L		11-OCT-19	R4867889
Oxidation redution potential by elect.				Ü			
ORP	203		-1000	mV		13-OCT-19	R4868484
Phosphorus (P)-Total Phosphorus (P)-Total	0.0520		0.0020	mg/L		13-OCT-19	R4868369
Sulfate in Water by IC	0.0320		0.0020	mg/L		13 001-13	114000309
Sulfate (SO4)	29.1		0.30	mg/L		13-OCT-19	R4870507
Total Dissolved Solids							
Total Dissolved Solids	478	DLHC	20	mg/L		16-OCT-19	R4872764
Total Suspended Solids Total Suspended Solids	19.9		1.0	mg/L		16-OCT-19	R4872935
Turbidity	10.0			∌, ⊏		.5 551 10	
Turbidity	13.6		0.10	NTU		11-OCT-19	R4867979
рН						10 00T 10	D
pH	8.07		0.10	рН		16-OCT-19	R4873462
L2364506-2 WG_Q4-2019_004							
Sampled By: KC/DT on 10-OCT-19 @ 13:25  Matrix: WG							
Matrix: WG Miscellaneous Parameters							
Dissolved Organic Carbon	<0.50		0.50	mg/L		19-OCT-19	R4874992
Total Kjeldahl Nitrogen	<0.050		0.050	mg/L		17-OCT-19	R4872902
Total Organic Carbon	<0.50		0.50	mg/L		19-OCT-19	R4874992
Dissolved Metals in Water							
Diss. Be (low) in Water by CRC ICPMS							
Beryllium (Be)-Dissolved Dissolved Metals Filtration Location	<0.020		0.020	ug/L	15-OCT-19	17-OCT-19	R4872734
Diss. Mercury in Water by CVAAS or CVAFS	FIELD					15-OCT-19	R4870254
Mercury (Hg)-Dissolved	<0.000050		0.0000050	mg/L	17-OCT-19	17-OCT-19	R4872448
Dissolved Mercury Filtration Location	FIELD					17-OCT-19	R4872405
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	FIELD		0.0000	البحصو	10 OOT 10	18-OCT-19	R4873642
Aluminum (Al)-Dissolved Antimony (Sb)-Dissolved	<0.0030 <0.00010		0.0030 0.00010	mg/L mg/L	18-OCT-19 15-OCT-19	18-OCT-19 17-OCT-19	R4874176 R4872734
Arsenic (As)-Dissolved	<0.00010		0.00010	mg/L	15-OCT-19 15-OCT-19	17-OCT-19 17-OCT-19	R4872734
Barium (Ba)-Dissolved	0.00029	RRV	0.00010	mg/L	18-OCT-19	18-OCT-19	R4874176
Bismuth (Bi)-Dissolved	<0.000050		0.000050	mg/L	15-OCT-19	17-OCT-19	R4872734
Boron (B)-Dissolved	<0.010		0.010	mg/L	15-OCT-19	17-OCT-19	R4872734
Cadmium (Cd)-Dissolved	<0.0050	DE:/	0.0050	ug/L	15-OCT-19	17-OCT-19	R4872734
Calcium (Ca)-Dissolved Chromium (Cr)-Dissolved	0.063	RRV	0.050	mg/L mg/l	18-OCT-19 15-OCT-19	18-OCT-19 17-OCT-19	R4874176
Cobalt (Co)-Dissolved	<0.00010 <0.10		0.00010 0.10	mg/L ug/L	15-OCT-19 15-OCT-19	17-OCT-19 17-OCT-19	R4872734 R4872734
Copper (Cu)-Dissolved	<0.0020		0.00020	mg/L	15-OCT-19	17-OCT-19	R4872734
Iron (Fe)-Dissolved	<0.010		0.010	mg/L	15-OCT-19	17-OCT-19	R4872734
Lead (Pb)-Dissolved	<0.000050		0.000050	mg/L	15-OCT-19	17-OCT-19	R4872734
Lithium (Li)-Dissolved	<0.0010		0.0010	mg/L	15-OCT-19	17-OCT-19	R4872734
Magnesium (Mg)-Dissolved	<0.10		0.10	mg/L	15-OCT-19	17-OCT-19	R4872734
Manganese (Mn)-Dissolved	<0.00010		0.00010	mg/L	15-OCT-19	17-OCT-19	R4872734

<sup>\*</sup> Refer to Referenced Information for Qualifiers (if any) and Methodology.

L2364506 CONTD.... PAGE 5 of 9 Version: FINAL

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
   L2364506-2   WG_Q4-2019_004							
Sampled By: KC/DT on 10-OCT-19 @ 13:25							
Matrix: WG							
Dissolved Metals in Water by CRC ICPMS							
Molybdenum (Mo)-Dissolved	<0.000050		0.000050	mg/L	15-OCT-19	17-OCT-19	R4872734
Nickel (Ni)-Dissolved	<0.00050		0.00050	mg/L	15-OCT-19	17-OCT-19	R4872734
Potassium (K)-Dissolved	<0.050		0.050	mg/L	15-OCT-19	17-OCT-19	R4872734
Selenium (Se)-Dissolved	<0.050		0.050	ug/L	15-OCT-19	17-OCT-19	R4872734
Silicon (Si)-Dissolved	0.227	RRV	0.050	mg/L	18-OCT-19	18-OCT-19	R4874176
Silver (Ag)-Dissolved	<0.000010		0.000010	mg/L	15-OCT-19	17-OCT-19	R4872734
Sodium (Na)-Dissolved	0.233	RRV	0.050	mg/L	18-OCT-19	18-OCT-19	R4874176
Strontium (Sr)-Dissolved	<0.00020		0.00020	mg/L	15-OCT-19	17-OCT-19	R4872734
Thallium (TI)-Dissolved	<0.000010		0.000010	mg/L	15-OCT-19	17-OCT-19	R4872734
Tin (Sn)-Dissolved	0.00075	RRV	0.00010	mg/L	18-OCT-19	18-OCT-19	R4874176
Titanium (Ti)-Dissolved	<0.010		0.010	mg/L	15-OCT-19	17-OCT-19	R4872734
Uranium (U)-Dissolved	<0.000010		0.000010	mg/L	15-OCT-19	17-OCT-19	R4872734
Vanadium (V)-Dissolved	<0.00050		0.00050	mg/L	15-OCT-19	17-OCT-19	R4872734
Zinc (Zn)-Dissolved	<0.0010		0.0010	mg/L	15-OCT-19	17-OCT-19	R4872734
Hardness							
Hardness (as CaCO3)	<0.50		0.50	mg/L		21-OCT-19	
Total Metals in Water							
Total Be (Low) in Water by CRC ICPMS	0.000		0.000	/1		47 OOT 40	D 4074540
Beryllium (Be)-Total	<0.020		0.020	ug/L		17-OCT-19	R4874512
Total Mercury in Water by CVAAS or CVAFS Mercury (Hg)-Total	<0.0000050		0.0000050	mg/L		17-OCT-19	R4872448
Total Metals in Water by CRC ICPMS							
Aluminum (AI)-Total	<0.0030		0.0030	mg/L		17-OCT-19	R4874512
Antimony (Sb)-Total	<0.00010		0.00010	mg/L		17-OCT-19	R4874512
Arsenic (As)-Total	<0.00010		0.00010	mg/L		17-OCT-19	R4874512
Barium (Ba)-Total	<0.00010		0.00010	mg/L		17-OCT-19	R4874512
Bismuth (Bi)-Total	<0.000050		0.000050	mg/L		17-OCT-19	R4874512
Boron (B)-Total	<0.010		0.010	mg/L		17-OCT-19	R4874512
Cadmium (Cd)-Total	<0.0050		0.0050	ug/L		17-OCT-19	R4874512
Calcium (Ca)-Total	<0.050		0.050	mg/L		17-OCT-19	R4874512
Chromium (Cr)-Total	<0.00010		0.00010	mg/L		17-OCT-19	R4874512
Copper (Cu) Total	<0.10		0.10	ug/L		17-OCT-19	R4874512
Copper (Cu)-Total Iron (Fe)-Total	<0.00050		0.00050	mg/L mg/l		17-OCT-19 17-OCT-19	R4874512
Lead (Pb)-Total	<0.010		0.010 0.000050	mg/L mg/L		17-OCT-19	R4874512 R4874512
Lithium (Li)-Total	<0.000050 <0.0010		0.000050	mg/L		17-OCT-19	R4874512 R4874512
Magnesium (Mg)-Total	<0.0010	1	0.0010	mg/L		17-OCT-19	R4874512
Manganese (Mn)-Total	0.00010	RRV	0.00010	mg/L		19-OCT-19	R4876507
Molybdenum (Mo)-Total	<0.00010		0.00010	mg/L		17-OCT-19	R4874512
Nickel (Ni)-Total	<0.00050	1	0.00050	mg/L		17-OCT-19	R4874512
Potassium (K)-Total	<0.050	1	0.050	mg/L		17-OCT-19	R4874512
Selenium (Se)-Total	<0.050		0.050	ug/L		17-OCT-19	R4874512
Silicon (Si)-Total	<0.10	1	0.10	mg/L		17-OCT-19	R4874512
Silver (Ag)-Total	<0.000010		0.000010	mg/L		17-OCT-19	R4874512
Sodium (Na)-Total	<0.050		0.050	mg/L		17-OCT-19	R4874512
Strontium (Sr)-Total	<0.00020		0.00020	mg/L		17-OCT-19	R4874512
Thallium (TI)-Total	<0.000010		0.000010	mg/L		17-OCT-19	R4874512
Tin (Sn)-Total	0.00012	RRV	0.00010	mg/L		19-OCT-19	R4876507
Titanium (Ti)-Total	<0.010		0.010	mg/L		17-OCT-19	R4874512
Uranium (U)-Total	<0.000010		0.000010	mg/L		17-OCT-19	R4874512
Vanadium (V)-Total	<0.00050		0.00050	mg/L		17-OCT-19	R4874512
Zinc (Zn)-Total	<0.0030		0.0030	mg/L		17-OCT-19	R4874512

<sup>\*</sup> Refer to Referenced Information for Qualifiers (if any) and Methodology.

L2364506 CONTD.... PAGE 6 of 9 Version: FINAL

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2364506-2 WG Q4-2019 004							
L2364506-2 WG_Q4-2019_004 Sampled By: KC/DT on 10-OCT-19 @ 13:25							
Matrix: WG							
Routine for Teck Coal							
Acidity by Automatic Titration							
Acidity (as CaCO3)	1.5		1.0	mg/L		16-OCT-19	R4873457
Alkalinity (Species) by Manual Titration Alkalinity, Bicarbonate (as CaCO3)	<1.0		1.0	mg/L		16-OCT-19	R4873462
Alkalinity, Carbonate (as CaCO3)	<1.0		1.0	mg/L		16-OCT-19	R4873462
Alkalinity, Hydroxide (as CaCO3)	<1.0		1.0	mg/L		16-OCT-19	R4873462
Alkalinity, Total (as CaCO3)	<1.0		1.0	mg/L		16-OCT-19	R4873462
Ammonia, Total (as N)				,,		00 00T 40	
Ammonia as N	<0.0050		0.0050	mg/L		20-OCT-19	R4875988
Bromide in Water by IC (Low Level) Bromide (Br)	<0.050		0.050	mg/L		13-OCT-19	R4870507
Chloride in Water by IC							
Chloride (CI)	<0.50		0.50	mg/L		13-OCT-19	R4870507
Electrical Conductivity (EC) Conductivity (@ 25C)	<2.0		2.0	uS/cm		16-OCT-19	R4873462
Fluoride in Water by IC	<2.0		2.0	uo/ciii		10-001-19	114073402
Fluoride (F)	<0.020		0.020	mg/L		13-OCT-19	R4870507
Ion Balance Calculation							
Cation - Anion Balance	0.0			%		22-OCT-19 22-OCT-19	
Anion Sum Cation Sum	<0.10 <0.10			meq/L meq/L		22-OCT-19 22-OCT-19	
Ion Balance Calculation	<b>VO.10</b>			moq/L		22 001 10	
Ion Balance	0.0		-100	%		22-OCT-19	
Nitrate in Water by IC (Low Level)				,,		40 00T 40	
Nitrate (as N)	<0.0050		0.0050	mg/L		13-OCT-19	R4870507
Nitrite in Water by IC (Low Level) Nitrite (as N)	<0.0010		0.0010	mg/L		13-OCT-19	R4870507
Orthophosphate-Dissolved (as P)				Ŭ			
Orthophosphate-Dissolved (as P)	<0.0010		0.0010	mg/L		11-OCT-19	R4867889
Oxidation redution potential by elect. ORP	344		1000	mV		13-OCT-19	D4060404
Phosphorus (P)-Total	344		-1000	IIIV		13-001-19	R4868484
Phosphorus (P)-Total	<0.0020		0.0020	mg/L		13-OCT-19	R4868369
Sulfate in Water by IC							
Sulfate (SO4) Total Dissolved Solids	<0.30		0.30	mg/L		13-OCT-19	R4870507
Total Dissolved Solids Total Dissolved Solids	<10		10	mg/L		16-OCT-19	R4872764
Total Suspended Solids				3-			
Total Suspended Solids	<1.0		1.0	mg/L		16-OCT-19	R4872935
Turbidity Turbidity	<0.10		0.10	NTU		11-OCT-19	R4867979
pH	<0.10		0.10	INTO		11-001-19	174001919
pH	5.62		0.10	рН		16-OCT-19	R4873462

<sup>\*</sup> Refer to Referenced Information for Qualifiers (if any) and Methodology.

LINE CREEK OPERATION L2364506 CONTD....

**Reference Information** 

PAGE 7 of 9 Version: FINAL

Sample Parameter Qualifier Kev:

Qualifier	Description
В	Method Blank exceeds ALS DQO. Associated sample results which are < Limit of Reporting or > 5 times blank level are considered reliable.
DLHC	Detection Limit Raised: Dilution required due to high concentration of test analyte(s).
DTMF	Dissolved concentration exceeds total for field-filtered metals sample. Metallic contaminants may have been introduced to dissolved sample during field filtration.
DTSE	Dissolved Se concentration exceeds total. Positive bias on D-Se suspected due to signal enhancement from volatile selenium species Contact ALS if an alternative test to address this interference is needed.
DUP-H	Duplicate results outside ALS DQO, due to sample heterogeneity.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RRV	Reported Result Verified By Repeat Analysis

#### **Test Method References:**

ALS Test Code	Matrix	Test Description	Method Reference**
ACIDITY-PCT-CL	Water	Acidity by Automatic Titration	APHA 2310 Acidity

This analysis is carried out using procedures adapted from APHA Method 2310 "Acidity". Acidity is determined by potentiometric titration to a specified endpoint.

ALK-MAN-CL Water Alkalinity (Species) by Manual Titration APHA 2320 ALKALINITY

This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.

BE-D-L-CCMS-VA Water Diss. Be (low) in Water by CRC ICPMS APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

BE-T-L-CCMS-VA Water Total Be (Low) in Water by CRC ICPMS EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

BR-L-IC-N-CL Water Bromide in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

C-DIS-ORG-LOW-CL Water Dissolved Organic Carbon APHA 5310 B-Instrumental

This method is applicable to the analysis of ground water, wastewater, and surface water samples. The form detected depends upon sample pretreatment: Unfiltered sample = TC, 0.45um filtered = TDC. Samples are injected into a combustion tube containing an oxidation catalyst. The carrier gas containing the combustion product from the combustion tube flows through an inorganic carbon reactor vessel and is then sent through a halogen scrubber into a sample cell set in a non-dispersive infrared gas analyzer (NDIR) where carbon dioxide is detected. For total inorganic carbon and dissolved inorganic carbon, the sample is injected into an IC reactor vessel where only the IC component is decomposed to become carbon dioxide.

The peak area generated by the NDIR indicates the TC/TDC or TIC/DIC as applicable. The total organic carbon content of the sample is calculated by subtracting the TIC from the TC.

TOC = TC-TIC, DOC = TDC-DIC, Particulate = Total - Dissolved.

C-TOT-ORG-LOW-CL Water Total Organic Carbon APHA 5310 TOTAL ORGANIC CARBON (TOC)

This method is applicable to the analysis of ground water, wastewater, and surface water samples. The form detected depends upon sample pretreatment: Unfiltered sample = TC, 0.45um filtered = TDC. Samples are injected into a combustion tube containing an oxidation catalyst. The carrier gas containing the combustion product from the combustion tube flows through an inorganic carbon reactor vessel and is then sent through a halogen scrubber into a sample cell set in a non-dispersive infrared gas analyzer (NDIR) where carbon dioxide is detected. For total inorganic carbon and dissolved inorganic carbon, the sample is injected into an IC reactor vessel where only the IC component is decomposed to become carbon dioxide.

The peak area generated by the NDIR indicates the TC/TDC or TIC/DIC as applicable. The total organic carbon content of the sample is calculated by subtracting the TIC from the TC.

TOC = TC-TIC, DOC = TDC-DIC, Particulate = Total - Dissolved.

CL-IC-N-CL Water Chloride in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

EC-L-PCT-CL Water Electrical Conductivity (EC) APHA 2510B

Conductivity, also known as Electrical Conductivity (EC) or Specific Conductance, is measured by immersion of a conductivity cell with platinum electrodes into a water sample. Conductivity measurements are temperature-compensated to 25C.

F-IC-N-CL Water Fluoride in Water by IC EPA 300.1 (mod)

#### L2364506 CONTD....

PAGE 8 of 9 Version: FINAL

### **Reference Information**

**Test Method References:** 

ALS Test Code Matrix Test Description Method Reference\*\*

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

HARDNESS-CALC-VA Water Hardness APHA 2340B

Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO3 equivalents.

Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

HG-D-CVAA-VA Water Diss. Mercury in Water by CVAAS or CVAFS APHA 3030B/EPA 1631E (mod)

Water samples are filtered (0.45 um), preserved with hydrochloric acid, then undergo a cold-oxidation using bromine monochloride prior to reduction with stangely chloride, and analyzed by CVAAS or CVAES.

with stannous chloride, and analyzed by CVAAS or CVAFS.

HG-T-CVAA-VA Water Total Mercury in Water by CVAAS or CVAFS EPA 1631E (mod)

Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

IONBALANCE-BC-CL Water Ion Balance Calculation APHA 1030E

Cation Sum, Anion Sum, and Ion Balance (as % difference) are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Because all aqueous solutions are electrically neutral, the calculated ion balance (% difference of cations minus anions) should be near-zero.

Cation and Anion Sums are the total meq/L concentration of major cations and anions. Dissolved species are used where available. Minor ions are included where data is present. Ion Balance is calculated as:

Ion Balance (%) = [Cation Sum-Anion Sum] / [Cation Sum+Anion Sum]

MET-D-CCMS-VA Water Dissolved Metals in Water by CRC ICPMS APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

MET-T-CCMS-VA Water Total Metals in Water by CRC ICPMS EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

NH3-L-F-CL Water Ammonia, Total (as N) J. ENVIRON. MONIT., 2005, 7, 37-42, RSC

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.

NO2-L-IC-N-CL Water Nitrite in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

NO3-L-IC-N-CL Water Nitrate in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

ORP-CL Water Oxidation redution potential by elect. ASTM D1498

This analysis is carried out in accordance with the procedure described in the "ASTM" method D1498 "Oxidation-Reduction Potential of Water" published by the American Society for Testing and Materials (ASTM). Results are reported as observed oxidation-reduction potential of the platinum metal-reference electrode employed, in mV.

It is recommended that this analysis be conducted in the field.

P-T-L-COL-CL Water Phosphorus (P)-Total APHA 4500-P PHOSPHORUS

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after persulphate digestion of the sample.

PH-CL Water pH APHA 4500 H-Electrode

pH is determined in the laboratory using a pH electrode. All samples analyzed by this method for pH will have exceeded the 15 minute recommended hold time from time of sampling (field analysis is recommended for pH where highly accurate results are needed)

PO4-DO-L-COL-CL Water Orthophosphate-Dissolved (as P) APHA 4500-P PHOSPHORUS

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.

SO4-IC-N-CL Water Sulfate in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

#### LINE CREEK OPERATION L2364506 CONTD....

PAGE 9 of 9 Version: FINAL

### Reference Information

**Test Method References:** 

TECKCOAL-IONBAL-CL

ALS Test Code Matrix Test Description Method Reference\*\*

SOLIDS-TDS-CL Water Total Dissolved Solids APHA 2540 C

A well-mixed sample is filtered through a glass fibre filter paper. The filtrate is then evaporated to dryness in a pre-weighed vial and dried at 180 – 2 °C. The increase in vial weight represents the total dissolved solids (TDS).

The increase in viai weight represents the total dissolved solids (103

Water

Cation Sum, Anion Sum, and Ion Balance (as % difference) are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Because all aqueous solutions are electrically neutral, the calculated ion balance (% difference of cations minus anions) should be near-zero.

Cation and Anion Sums are the total meq/L concentration of major cations and anions. Dissolved species are used where available. Minor ions are included where data is present. Ion Balance is calculated as:

Ion Balance (%) = [Cation Sum-Anion Sum] / [Cation Sum+Anion Sum]

TKN-L-F-CL Water Total Kjeldahl Nitrogen APHA 4500-NORG (TKN)

Ion Balance Calculation

This analysis is carried out using procedures adapted from APHA Method 4500-Norg D. "Block Digestion and Flow Injection Analysis". Total Kjeldahl Nitrogen is determined using block digestion followed by Flow-injection analysis with fluorescence detection.

TSS-L-CL Water Total Suspended Solids APHA 2540 D-Gravimetric

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total suspended solids (TSS) are determined by filtering a sample through a glass fibre filter, and by drying the filter at 104 deg. C.

TURBIDITY-CL Water Turbidity APHA 2130 B-Nephelometer

This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.

\*\* ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA
CL	ALS ENVIRONMENTAL - CALGARY, ALBERTA, CANADA

#### **Chain of Custody Numbers:**

20191010 LC GW

#### **GLOSSARY OF REPORT TERMS**

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.

mg/kg - milligrams per kilogram based on dry weight of sample

mg/kg wwt - milligrams per kilogram based on wet weight of sample

mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight

mg/L - unit of concentration based on volume, parts per million.

< - Less than.

D.L. - The reporting limit.

N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory. UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.



Workorder: L2364506

Report Date: 22-OCT-19

Page 1 of 16

Client:

TECK COAL LIMITED (LINE CREEK)

PO BOX 2003

SPARWOOD BC V0B 2G0

Contact: Carla Froyman Parker

Test	Matrix	Reference	Result Q	ualifier	Units	RPD	Limit	Analyzed
ACIDITY-PCT-CL	Water							
Batch R4873457 WG3193534-2 LCS								
Acidity (as CaCO3)			102.8		%		85-115	16-OCT-19
WG3193534-1 MB Acidity (as CaCO3)			1.4		mg/L		2	16-OCT-19
ALK-MAN-CL	Water							
Batch R4873462								
WG3193596-2 LCS Alkalinity, Total (as CaC	CO3)		101.5		%		85-115	16-OCT-19
WG3193596-1 MB Alkalinity, Total (as CaC	CO3)		<1.0		mg/L		1	16-OCT-19
BE-D-L-CCMS-VA	Water							
Batch R4872734								
WG3191229-2 LCS Beryllium (Be)-Dissolve	d		96.9		%		80-120	17-OCT-19
WG3191229-1 MB Beryllium (Be)-Dissolve	d	NP	<0.000020		mg/L		0.00002	17-OCT-19
BE-T-L-CCMS-VA	Water							
Batch R4874512								
WG3191741-3 DUP Beryllium (Be)-Total		<b>L2364506-2</b> <0.000020	<0.000020	RPD-NA	mg/L	N/A	20	17-OCT-19
WG3191741-2 LCS Beryllium (Be)-Total			94.9		%		80-120	17-OCT-19
WG3191741-1 MB Beryllium (Be)-Total			<0.000020		mg/L		0.00002	17-OCT-19
WG3191741-4 MS Beryllium (Be)-Total		L2364506-1	103.2		%		70-130	17-OCT-19
BR-L-IC-N-CL	Water							
Batch R4870507								
<b>WG3191321-10 LCS</b> Bromide (Br)			100.7		%		85-115	12-OCT-19
<b>WG3191321-14 LCS</b> Bromide (Br)			100.6		%		85-115	13-OCT-19
<b>WG3191321-13 MB</b> Bromide (Br)			<0.050		mg/L		0.05	13-OCT-19
WG3191321-9 MB Bromide (Br)			<0.050		mg/L		0.05	12-OCT-19
C-DIS-ORG-LOW-CL	Water							



Workorder: L2364506

Report Date: 22-OCT-19 Page 2 of 16

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
C-DIS-ORG-LOW-CL Batch R4874992	Water							
WG3196054-6 LCS Dissolved Organic Carbo	on		105.6		%		80-120	19-OCT-19
WG3196054-5 MB Dissolved Organic Carbo	on		<0.50		mg/L		0.5	19-OCT-19
C-TOT-ORG-LOW-CL	Water							
Batch R4874992 WG3196054-6 LCS Total Organic Carbon			106.4		%		80-120	19-OCT-19
WG3196054-5 MB Total Organic Carbon			<0.50		mg/L		0.5	19-OCT-19
CL-IC-N-CL	Water							
Batch R4870507 WG3191321-10 LCS								
Chloride (CI)			102.9		%		90-110	12-OCT-19
<b>WG3191321-14 LCS</b> Chloride (CI)			102.1		%		90-110	13-OCT-19
WG3191321-13 MB Chloride (CI)			<0.50		mg/L		0.5	13-OCT-19
WG3191321-9 MB Chloride (Cl)			<0.50		mg/L		0.5	12-OCT-19
EC-L-PCT-CL	Water							
Batch R4873462								
WG3193596-2 LCS Conductivity (@ 25C)			94.4		%		90-110	16-OCT-19
WG3193596-1 MB Conductivity (@ 25C)			<2.0		uS/cm		2	16-OCT-19
F-IC-N-CL	Water							
Batch R4870507								
<b>WG3191321-10 LCS</b> Fluoride (F)			107.7		%		90-110	12-OCT-19
<b>WG3191321-14 LCS</b> Fluoride (F)			108.8		%		90-110	13-OCT-19
<b>WG3191321-13 MB</b> Fluoride (F)			<0.020		mg/L		0.02	13-OCT-19
<b>WG3191321-9 MB</b> Fluoride (F)			<0.020		mg/L		0.02	12-OCT-19
HG-D-CVAA-VA	Water							



Workorder: L2364506

Report Date: 22-OCT-19 Page 3 of 16

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
HG-D-CVAA-VA	Water							
Batch R4872448 WG3193123-2 LCS Mercury (Hg)-Dissolved			98.3		%		80-120	17-OCT-19
WG3193123-1 MB Mercury (Hg)-Dissolved			<0.00000	95C	mg/L		0.000005	17-OCT-19
HG-T-CVAA-VA	Water							
Batch R4872448 WG3193221-2 LCS Mercury (Hg)-Total			97.5		%		80-120	17-OCT-19
WG3193221-1 MB Mercury (Hg)-Total			<0.00000	<b>95</b> C	mg/L		0.000005	17-OCT-19
MET-D-CCMS-VA	Water							
Batch R4872734								
WG3191229-2 LCS Aluminum (Al)-Dissolved	d		98.7		%		80-120	17-OCT-19
Antimony (Sb)-Dissolved	d		97.5		%		80-120	17-OCT-19
Arsenic (As)-Dissolved			97.6		%		80-120	17-OCT-19
Barium (Ba)-Dissolved			97.9		%		80-120	17-OCT-19
Bismuth (Bi)-Dissolved			100.9		%		80-120	17-OCT-19
Boron (B)-Dissolved			92.6		%		80-120	17-OCT-19
Cadmium (Cd)-Dissolve	d		99.5		%		80-120	17-OCT-19
Calcium (Ca)-Dissolved			99.4		%		80-120	17-OCT-19
Chromium (Cr)-Dissolve	ed		97.0		%		80-120	17-OCT-19
Cobalt (Co)-Dissolved			99.3		%		80-120	17-OCT-19
Copper (Cu)-Dissolved			98.1		%		80-120	17-OCT-19
Iron (Fe)-Dissolved			97.9		%		80-120	17-OCT-19
Lead (Pb)-Dissolved			102.6		%		80-120	17-OCT-19
Lithium (Li)-Dissolved			95.9		%		80-120	17-OCT-19
Magnesium (Mg)-Dissol	ved		99.1		%		80-120	17-OCT-19
Manganese (Mn)-Dissol	ved		99.9		%		80-120	17-OCT-19
Molybdenum (Mo)-Disso	olved		99.7		%		80-120	17-OCT-19
Nickel (Ni)-Dissolved			98.1		%		80-120	17-OCT-19
Potassium (K)-Dissolved	b		97.6		%		80-120	17-OCT-19
Selenium (Se)-Dissolved	d		103.4		%		80-120	17-OCT-19
Silicon (Si)-Dissolved			97.1		%		60-140	17-OCT-19
Silver (Ag)-Dissolved			96.2		%		80-120	17-OCT-19
Sodium (Na)-Dissolved			102.2		%		80-120	17-OCT-19



Workorder: L2364506

Report Date: 22-OCT-19 Page 4 of 16

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA	Water							
Batch R4872734	4							
WG3191229-2 LCS								
Strontium (Sr)-Dissolve			99.95		%		80-120	17-OCT-19
Thallium (TI)-Dissolved	d		101.4		%		80-120	17-OCT-19
Tin (Sn)-Dissolved			98.9		%		80-120	17-OCT-19
Titanium (Ti)-Dissolved			97.3		%		80-120	17-OCT-19
Uranium (U)-Dissolved			101.2		%		80-120	17-OCT-19
Vanadium (V)-Dissolve	ed		98.9		%		80-120	17-OCT-19
Zinc (Zn)-Dissolved			97.8		%		80-120	17-OCT-19
WG3191229-1 MB Aluminum (Al)-Dissolve	ed	NP	<0.0010		mg/L		0.001	17-OCT-19
Antimony (Sb)-Dissolve			<0.0010	<b>\</b>	mg/L		0.001	17-OCT-19
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	17-OCT-19
Barium (Ba)-Dissolved			<0.00010		mg/L		0.0001	17-OCT-19
Bismuth (Bi)-Dissolved			<0.00005		mg/L		0.0001	17-OCT-19
Boron (B)-Dissolved			<0.010		mg/L		0.01	17-OCT-19
Cadmium (Cd)-Dissolv	/ed		<0.00000	<b>15</b> C	mg/L		0.000005	17-OCT-19
Calcium (Ca)-Dissolve	ed		<0.050		mg/L		0.05	17-OCT-19
Chromium (Cr)-Dissolv	ved		<0.00010	)	mg/L		0.0001	17-OCT-19
Cobalt (Co)-Dissolved			<0.00010	)	mg/L		0.0001	17-OCT-19
Copper (Cu)-Dissolved	d		<0.00020	)	mg/L		0.0002	17-OCT-19
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	17-OCT-19
Lead (Pb)-Dissolved			<0.00005	0	mg/L		0.00005	17-OCT-19
Lithium (Li)-Dissolved			<0.0010		mg/L		0.001	17-OCT-19
Magnesium (Mg)-Disso	olved		<0.0050		mg/L		0.005	17-OCT-19
Manganese (Mn)-Disse	olved		<0.00010	)	mg/L		0.0001	17-OCT-19
Molybdenum (Mo)-Diss	solved		<0.00005	60	mg/L		0.00005	17-OCT-19
Nickel (Ni)-Dissolved			<0.00050	)	mg/L		0.0005	17-OCT-19
Potassium (K)-Dissolve	ed		< 0.050		mg/L		0.05	17-OCT-19
Selenium (Se)-Dissolve	ed		<0.00005	0	mg/L		0.00005	17-OCT-19
Silicon (Si)-Dissolved			< 0.050		mg/L		0.05	17-OCT-19
Silver (Ag)-Dissolved			<0.00001	0	mg/L		0.00001	17-OCT-19
Sodium (Na)-Dissolved	d		< 0.050		mg/L		0.05	17-OCT-19
Strontium (Sr)-Dissolve	ed		<0.00020	)	mg/L		0.0002	17-OCT-19
Thallium (TI)-Dissolved	d		<0.00001	0	mg/L		0.00001	17-OCT-19
Tin (Sn)-Dissolved			<0.00010	)	mg/L		0.0001	17-OCT-19



Workorder: L2364506

Report Date: 22-OCT-19

Page 5 of 16

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA	Water							
Batch R4872734								
WG3191229-1 MB		NP			,,			
Titanium (Ti)-Dissolved			<0.00030		mg/L		0.0003	17-OCT-19
Uranium (U)-Dissolved			<0.00001		mg/L		0.00001	17-OCT-19
Vanadium (V)-Dissolved	d		<0.00050	)	mg/L		0.0005	17-OCT-19
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	17-OCT-19
Batch R4874176								
WG3194439-2 LCS Aluminum (Al)-Dissolve	d		106.4		%		00.400	40 OOT 40
Antimony (Sb)-Dissolve			106.4		%		80-120	18-OCT-19
, ,	u				%		80-120	18-OCT-19
Arsenic (As)-Dissolved			106.8 107.7				80-120	18-OCT-19
Barium (Ba)-Dissolved					%		80-120	18-OCT-19
Bismuth (Bi)-Dissolved			103.6 102.5		%		80-120	18-OCT-19
Boron (B)-Dissolved	a d		102.5		%		80-120	18-OCT-19
Cadmium (Cd)-Dissolve					%		80-120	18-OCT-19
Calcium (Ca)-Dissolved			101.0 108.1				80-120	18-OCT-19
Chromium (Cr)-Dissolved	eu				%		80-120	18-OCT-19
Cobalt (Co)-Dissolved			106.2				80-120	18-OCT-19
Copper (Cu)-Dissolved			104.8 103.1		%		80-120	18-OCT-19
Iron (Fe)-Dissolved							80-120	18-OCT-19
Lead (Pb)-Dissolved			103.4		%		80-120	18-OCT-19
Lithium (Li)-Dissolved	L I		99.8		%		80-120	18-OCT-19
Magnesium (Mg)-Disso			108.4		%		80-120	18-OCT-19
Manganese (Mn)-Disso			106.6		%		80-120	18-OCT-19
Molybdenum (Mo)-Diss	oivea		108.8		%		80-120	18-OCT-19
Nickel (Ni)-Dissolved			108.9		%		80-120	18-OCT-19
Potassium (K)-Dissolve			104.8		%		80-120	18-OCT-19
Selenium (Se)-Dissolve	d		105.2		%		80-120	18-OCT-19
Silicon (Si)-Dissolved			106.3		%		60-140	18-OCT-19
Silver (Ag)-Dissolved			103.6		%		80-120	18-OCT-19
Sodium (Na)-Dissolved			106.8		%		80-120	18-OCT-19
Strontium (Sr)-Dissolve			103.8		%		80-120	18-OCT-19
Thallium (TI)-Dissolved			102.4		%		80-120	18-OCT-19
Tin (Sn)-Dissolved			105.9		%		80-120	18-OCT-19
Titanium (Ti)-Dissolved			102.6		%		80-120	18-OCT-19
Uranium (U)-Dissolved			104.0		%		80-120	18-OCT-19

Workorder: L2364506

Report Date: 22-OCT-19

Page 6 of 16

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA	Water							
Batch R4874176								
WG3194439-2 LCS			400.0		0/			
Vanadium (V)-Dissolved			108.8 106.5		%		80-120	18-OCT-19
Zinc (Zn)-Dissolved			106.5		%		80-120	18-OCT-19
WG3194439-1 MB Aluminum (Al)-Dissolved		NP	<0.0010		mg/L		0.001	18-OCT-19
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	18-OCT-19
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	18-OCT-19
Barium (Ba)-Dissolved			<0.00010		mg/L		0.0001	18-OCT-19
Bismuth (Bi)-Dissolved			<0.00005	)	mg/L		0.00005	18-OCT-19
Boron (B)-Dissolved			<0.010		mg/L		0.01	18-OCT-19
Cadmium (Cd)-Dissolved			<0.00000	5C	mg/L		0.000005	18-OCT-19
Calcium (Ca)-Dissolved			<0.050		mg/L		0.05	18-OCT-19
Chromium (Cr)-Dissolved	i		<0.00010		mg/L		0.0001	18-OCT-19
Cobalt (Co)-Dissolved			<0.00010		mg/L		0.0001	18-OCT-19
Copper (Cu)-Dissolved			<0.00020		mg/L		0.0002	18-OCT-19
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	18-OCT-19
Lead (Pb)-Dissolved			<0.00005	)	mg/L		0.00005	18-OCT-19
Lithium (Li)-Dissolved			<0.0010		mg/L		0.001	18-OCT-19
Magnesium (Mg)-Dissolve	ed		<0.0050		mg/L		0.005	18-OCT-19
Manganese (Mn)-Dissolv	ed		<0.00010		mg/L		0.0001	18-OCT-19
Molybdenum (Mo)-Dissol	ved		<0.000050	)	mg/L		0.00005	18-OCT-19
Nickel (Ni)-Dissolved			<0.00050		mg/L		0.0005	18-OCT-19
Potassium (K)-Dissolved			<0.050		mg/L		0.05	18-OCT-19
Selenium (Se)-Dissolved			<0.000050	)	mg/L		0.00005	18-OCT-19
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	18-OCT-19
Silver (Ag)-Dissolved			<0.00001	)	mg/L		0.00001	18-OCT-19
Sodium (Na)-Dissolved			<0.050		mg/L		0.05	18-OCT-19
Strontium (Sr)-Dissolved			<0.00020		mg/L		0.0002	18-OCT-19
Thallium (TI)-Dissolved			<0.00001	)	mg/L		0.00001	18-OCT-19
Tin (Sn)-Dissolved			<0.00010		mg/L		0.0001	18-OCT-19
Titanium (Ti)-Dissolved			<0.00030		mg/L		0.0003	18-OCT-19
Uranium (U)-Dissolved			<0.00001	)	mg/L		0.00001	18-OCT-19
Vanadium (V)-Dissolved			<0.00050		mg/L		0.0005	18-OCT-19
Zinc (Zn)-Dissolved			< 0.0010		mg/L		0.001	18-OCT-19

MET-T-CCMS-VA

Water



Workorder: L2364506 Report Date: 22-OCT-19 Page 7 of 16

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-VA	Water							
Batch R4874512								
WG3191741-3 DUP		L2364506-2	0.0000					
Aluminum (Al)-Total		<0.0030	<0.0030	RPD-NA	mg/L	N/A	20	17-OCT-19
Antimony (Sb)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	17-OCT-19
Arsenic (As)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	17-OCT-19
Barium (Ba)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	17-OCT-19
Bismuth (Bi)-Total		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	17-OCT-19
Boron (B)-Total		<0.010	<0.010	RPD-NA	mg/L	N/A	20	17-OCT-19
Cadmium (Cd)-Total		<0.000050	<0.0000050	RPD-NA	mg/L	N/A	20	17-OCT-19
Calcium (Ca)-Total		<0.050	< 0.050	RPD-NA	mg/L	N/A	20	17-OCT-19
Chromium (Cr)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	17-OCT-19
Cobalt (Co)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	17-OCT-19
Copper (Cu)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	17-OCT-19
Iron (Fe)-Total		<0.010	<0.010	RPD-NA	mg/L	N/A	20	17-OCT-19
Lead (Pb)-Total		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	17-OCT-19
Lithium (Li)-Total		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	17-OCT-19
Magnesium (Mg)-Total		<0.10	<0.10	RPD-NA	mg/L	N/A	20	17-OCT-19
Molybdenum (Mo)-Total		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	17-OCT-19
Nickel (Ni)-Total		< 0.00050	<0.00050	RPD-NA	mg/L	N/A	20	17-OCT-19
Potassium (K)-Total		< 0.050	<0.050	RPD-NA	mg/L	N/A	20	17-OCT-19
Selenium (Se)-Total		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	17-OCT-19
Silicon (Si)-Total		<0.10	<0.10	RPD-NA	mg/L	N/A	20	17-OCT-19
Silver (Ag)-Total		<0.00010	<0.000010	RPD-NA	mg/L	N/A	20	17-OCT-19
Sodium (Na)-Total		<0.050	<0.050	RPD-NA	mg/L	N/A	20	17-OCT-19
Strontium (Sr)-Total		<0.00020	<0.00020	RPD-NA	mg/L	N/A	20	17-OCT-19
Thallium (TI)-Total		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	17-OCT-19
Titanium (Ti)-Total		<0.010	<0.010	RPD-NA	mg/L	N/A	20	17-OCT-19
Uranium (U)-Total		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	17-OCT-19
Vanadium (V)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	17-OCT-19
Zinc (Zn)-Total		< 0.0030	<0.0030	RPD-NA	mg/L	N/A	20	17-OCT-19
WG3191741-2 LCS Aluminum (Al)-Total			108.5		%			
Antimony (Sb)-Total			99.6		%		80-120	17-OCT-19
					%		80-120	17-OCT-19
Arsenic (As)-Total			99.5				80-120	17-OCT-19
Barium (Ba)-Total			98.6		%		80-120	17-OCT-19
Bismuth (Bi)-Total			96.0		%		80-120	17-OCT-19



Workorder: L2364506

Report Date: 22-OCT-19 Page 8 of 16

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-VA	Water							
Batch R4874512								
WG3191741-2 LCS			22.2		04			
Boron (B)-Total			96.3		%		80-120	17-OCT-19
Cadmium (Cd)-Total			99.0		%		80-120	17-OCT-19
Calcium (Ca)-Total			96.8		%		80-120	17-OCT-19
Chromium (Cr)-Total			101.4		%		80-120	17-OCT-19
Cobalt (Co)-Total			100.9		%		80-120	17-OCT-19
Copper (Cu)-Total			98.9		%		80-120	17-OCT-19
Iron (Fe)-Total			98.9		%		80-120	17-OCT-19
Lead (Pb)-Total			96.9		%		80-120	17-OCT-19
Lithium (Li)-Total			95.9		%		80-120	17-OCT-19
Magnesium (Mg)-Total			101.5		%		80-120	17-OCT-19
Manganese (Mn)-Total			103.9		%		80-120	17-OCT-19
Molybdenum (Mo)-Total			98.0		%		80-120	17-OCT-19
Nickel (Ni)-Total			101.0		%		80-120	17-OCT-19
Potassium (K)-Total			103.2		%		80-120	17-OCT-19
Selenium (Se)-Total			97.5		%		80-120	17-OCT-19
Silicon (Si)-Total			94.9		%		80-120	17-OCT-19
Silver (Ag)-Total			96.8		%		80-120	17-OCT-19
Sodium (Na)-Total			102.4		%		80-120	17-OCT-19
Strontium (Sr)-Total			99.3		%		80-120	17-OCT-19
Thallium (TI)-Total			96.2		%		80-120	17-OCT-19
Tin (Sn)-Total			98.9		%		80-120	17-OCT-19
Titanium (Ti)-Total			97.6		%		80-120	17-OCT-19
Uranium (U)-Total			99.98		%		80-120	17-OCT-19
Vanadium (V)-Total			102.2		%		80-120	17-OCT-19
Zinc (Zn)-Total			98.5		%		80-120	17-OCT-19
WG3191741-1 MB								
Aluminum (Al)-Total			< 0.0030		mg/L		0.003	17-OCT-19
Antimony (Sb)-Total			<0.00010		mg/L		0.0001	17-OCT-19
Arsenic (As)-Total			<0.00010		mg/L		0.0001	17-OCT-19
Barium (Ba)-Total			<0.00010		mg/L		0.0001	17-OCT-19
Bismuth (Bi)-Total			<0.000050	1	mg/L		0.00005	17-OCT-19
Boron (B)-Total			<0.010		mg/L		0.01	17-OCT-19
Cadmium (Cd)-Total			<0.000005	iC	mg/L		0.000005	17-OCT-19
Calcium (Ca)-Total			<0.050		mg/L			



Workorder: L2364506

Report Date: 22-OCT-19

Page 9 of 16

METR-T-CCMS-VA	Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
NG319174.1-1 MB   Chromium (Cr)-Total   <0.0001   mg/L   0.0001   17-OCT-19   Cobalt (Co)-Total   <0.00010   mg/L   0.0001   17-OCT-19   Copper (Cu)-Total   <0.00050   mg/L   0.0005   17-OCT-19   Iron (Fe)-Total   <0.0010   mg/L   0.0005   17-OCT-19   Iron (Fe)-Total   <0.0010   mg/L   0.0005   17-OCT-19   Lead (Pb)-Total   <0.00050   mg/L   0.0005   17-OCT-19   Iron (Fe)-Total   <0.00050   mg/L   0.001   17-OCT-19   Magnasium (Mg)-Total   <0.0010   mg/L   0.001   17-OCT-19   Magnasium (Mg)-Total   0.00018   B mg/L   0.0005   17-OCT-19   Magnases (Mn)-Total   0.00018   B mg/L   0.0005   17-OCT-19   Molybachum (Mo)-Total   0.00050   mg/L   0.0005   17-OCT-19   Molybachum (Mo)-Total   0.00050   mg/L   0.0005   17-OCT-19   Potassium (K)-Total   0.00050   mg/L   0.0005   17-OCT-19   Selenium (Se)-Total   0.00050   mg/L   0.005   17-OCT-19   Selenium (Se)-Total   0.00050   mg/L   0.0005   17-OCT-19   Silver (Ag)-Total   0.00050   mg/L   0.00050   17-OCT-19   Silver (Ag)-Total   0.00050   mg/L   0.00001   17-OCT-19   Silver (Ag)-Total   0.00001   0.00001   0.00001   17-OCT-19   Silver (Ag)-Total   0.00001   0.00001   0.00001   17-OCT-19   Silver (Ag)-Total   0.00001   0.00001   0.00001   0.00001   17-OCT-19   Silver (Ag)-Total   0.00001   0.00001   0.00001   0.00001   17-OCT-19   Silver (Ag)-Total   0.00001	MET-T-CCMS-VA	Water							
Chomium (Cr)-Total	Batch R4874512								
Cobait (Co)-Total				0.00040					
Copper (Cu)-Total <a href="color: red;">c.0.0050</a> mg/L         0.0005         17-OCT-19           Iron (Fe)-Total <a href="color: red;">c.0.010</a> mg/L         0.01         17-OCT-19           Lead (Pb)-Total <a href="color: red;">c.0.00050</a> mg/L         0.0005         17-OCT-19           Magnesium (Mg)-Total <a href="color: red;">c.0.0050</a> mg/L         0.0001         17-OCT-19           Manganese (Mn)-Total <a href="color: red;">c.0.0001</a> mg/L         0.0001         17-OCT-19           Molybdenum (Mo)-Total <a href="color: red;">c.0.000050</a> mg/L         0.0005         17-OCT-19           Nickel (Ni)-Total <a href="color: red;">c.0.00050</a> mg/L         0.0005         17-OCT-19           Selenium (Se)-Total <a href="color: red;">c.0.00050</a> mg/L         0.005         17-OCT-19           Selenium (Se)-Total <a href="color: red;">c.0.10</a> mg/L         0.00005         17-OCT-19           Silver (Ag)-Total <a href="color: red;">c.0.00001</a> mg/L         0.00001         17-OCT-19           Sitronium (Se)-Total <a href="color: red;">c.0.00002</a> mg/L         0.0001         17-OCT-19           Stronium (	, ,					-			
Iron (Fe)-Total	` ,					-			
Lead (Pb)-Total						•			
Lithium (Li)-Total         <0.0010         mg/L         0.001         17-OCT-19           Magnesium (Mg)-Total         <0.0050	` ,					-			
Magnesium (Mg)-Total <a href="#"><a href="#"><a href="#"><a href="#"><a href="#"><a href="#"><a href="#"><a href="#"><a href="#"><a href="#"><a href="#"><a href="#"><a href="#"><a href="#"><a href="#"><a href="#"><a href="#"><a href="#"><a href="#"><a href="#"><a href="#"><a href="#"><a href="#"><a href="#"><a href="#"><a href="#"><a href="#"><a href="#"><a href="#"><a href="#"><a href="#"><a href="#"><a href="#"><a href="#"><a href="#"><a href="#"><a href="#"><a href="#"><a href="#"><a href="#"><a href="#"><a href="#"><a href="#"><a href="#"><a href="#"><a href="#"><a href="#"><a href="#"><a href="#"><a href="#"><a href="#"><a href="#"><a href="#"><a href="#"><a href="#"><a href="#"><a href="#"><a href="#"><a href="#"><a href="#"><a href="#"><a href="#"><a href="#"><a href="#"><a href="#"><a href="#"><a href="#"><a href="#"><a href="#"><a href="#"><a href="#"><a href="#"><a href="#"><a href="#"><a href="#"><a href="#"><a href="#"><a href="#"><a href="#"><a href="#"><a href="#"><a href="#"><a href="#"><a href="#"><a href="#"><a href="#"><a href="#"><a href="#"><a href="#"><a href="#"><a href="#"><a href="#"><a href="#"><a href="#"><a href="#"><a href="#"><a href="#"><a href="#"><a href="#"><a href="#"><a href="#"><a href="#"><a href="#"><a href="#"><a href="#"><a href="#"><a href="#"><a href="#"><a href="#"><a href="#"><a href="#"><a href="#"><a href="#"><a href="#"><a href="#"><a href="#"><a href="#"><a href="#"><a href="#"><a href="#"><a href="#"><a href="#"><a href="#"><a href="#"><a href="#"><a href="#"><a href="#"><a href="#"><a href="#"><a href="#"><a href="#"><a href="#"><a href="#"><a href="#"><a href="#"><a href="#"><a href="#"><a href="#"><a href="#"><a href="#"><a href="#"><a href="#"><a href="#"><a href="#"><a href="#"><a href="#"><a href="#"><a href="#"><a href="#"><a href="#"><a href="#"><a href="#"><a href="#"><a href="#"><a href="#"><a href="#"><a href="#"><a href="#"><a href="#"><a href="#"><a href="#"><a href="#"><a href="#"><a href="#"><a href="#"><a hr<="" td=""><td>, ,</td><td></td><td></td><td></td><td>)</td><td>-</td><td></td><td></td><td></td></a></a></a></a></a></a></a></a></a></a></a></a></a></a></a></a></a></a></a></a></a></a></a></a></a></a></a></a></a></a></a></a></a></a></a></a></a></a></a></a></a></a></a></a></a></a></a></a></a></a></a></a></a></a></a></a></a></a></a></a></a></a></a></a></a></a></a></a></a></a></a></a></a></a></a></a></a></a></a></a></a></a></a></a></a></a></a></a></a></a></a></a></a></a></a></a></a></a></a></a></a></a></a></a></a></a></a></a></a></a></a></a></a></a></a></a></a></a></a></a></a></a></a></a></a></a></a></a></a></a></a></a></a></a></a></a></a></a></a></a></a></a></a></a></a></a></a></a></a></a></a></a></a></a></a></a></a></a></a></a></a></a></a></a></a></a>	, ,				)	-			
Manganese (Mn)-Total         0.00018         B         mg/L         0.0001         17-OCT-19           Molybdenum (Mo)-Total         <0.000050	, ,					-			
Molybdenum (Mo)-Total         <0.000050	,				_	•			
Nickel (Ni)-Total	• , ,					•			
Potassium (K)-Total	, ,				)	-		0.00005	
Selenium (Se)-Total         <0.000050	, ,					•			17-OCT-19
Silicon (Si)-Total       <0.10						-		0.05	17-OCT-19
Silver (Ag)-Total         <0.000010         mg/L         0.00001         17-OCT-19           Sodium (Na)-Total         <0.050	` ,				)	-		0.00005	17-OCT-19
Sodium (Na)-Total         <0.050         mg/L         0.05         17-OCT-19           Strontium (Sr)-Total         <0.00020				<0.10		mg/L		0.1	17-OCT-19
Strontium (Sr)-Total         <0.00020         mg/L         0.0002         17-OCT-19           Thallium (Ti)-Total         <0.000010	Silver (Ag)-Total			<0.000010	)	mg/L		0.00001	17-OCT-19
Thallium (TI)-Total         <0.000010	` '			<0.050		mg/L		0.05	17-OCT-19
Tin (Sn)-Total	Strontium (Sr)-Total			<0.00020		mg/L		0.0002	17-OCT-19
Titanium (Ti)-Total         <0.00030	Thallium (TI)-Total			<0.000010	)	mg/L		0.00001	17-OCT-19
Uranium (U)-Total         <0.000010	Tin (Sn)-Total			<0.00010		mg/L		0.0001	17-OCT-19
Vanadium (V)-Total         <0.00050         mg/L         0.0005         17-OCT-19           Zinc (Zn)-Total         <0.0030	Titanium (Ti)-Total			<0.00030		mg/L		0.0003	17-OCT-19
Zinc (Zn)-Total       <0.0030       mg/L       0.003       17-OCT-19         WG3191741-4 MS       L2364506-1       N/A       WG3191741-4 MS       N/A       MS-B       %       70-130       17-OCT-19         Antimony (Sb)-Total       97.0       %       70-130       17-OCT-19         Arsenic (As)-Total       102.9       %       70-130       17-OCT-19         Barium (Ba)-Total       N/A       MS-B       %       -       17-OCT-19         Bismuth (Bi)-Total       90.1       %       70-130       17-OCT-19         Boron (B)-Total       N/A       MS-B       %       -       17-OCT-19         Cadmium (Cd)-Total       96.7       %       70-130       17-OCT-19         Calcium (Ca)-Total       N/A       MS-B       %       -       17-OCT-19         Chromium (Cr)-Total       102.3       %       70-130       17-OCT-19         Cobalt (Co)-Total       101.1       %       70-130       17-OCT-19	Uranium (U)-Total			<0.000010	)	mg/L		0.00001	17-OCT-19
WG3191741-4       MS       L2364506-1         Aluminum (Al)-Total       108.8       %       70-130       17-OCT-19         Antimony (Sb)-Total       97.0       %       70-130       17-OCT-19         Arsenic (As)-Total       102.9       %       70-130       17-OCT-19         Barium (Ba)-Total       N/A       MS-B       %       -       17-OCT-19         Bismuth (Bi)-Total       90.1       %       70-130       17-OCT-19         Boron (B)-Total       N/A       MS-B       %       -       17-OCT-19         Cadmium (Cd)-Total       96.7       %       70-130       17-OCT-19         Calcium (Ca)-Total       N/A       MS-B       %       -       17-OCT-19         Chromium (Cr)-Total       102.3       %       70-130       17-OCT-19         Cobalt (Co)-Total       101.1       %       70-130       17-OCT-19	Vanadium (V)-Total			<0.00050		mg/L		0.0005	17-OCT-19
Aluminum (Al)-Total       108.8       %       70-130       17-OCT-19         Antimony (Sb)-Total       97.0       %       70-130       17-OCT-19         Arsenic (As)-Total       102.9       %       70-130       17-OCT-19         Barium (Ba)-Total       N/A       MS-B       %       -       17-OCT-19         Bismuth (Bi)-Total       90.1       %       70-130       17-OCT-19         Boron (B)-Total       N/A       MS-B       %       -       17-OCT-19         Cadmium (Cd)-Total       96.7       %       70-130       17-OCT-19         Calcium (Ca)-Total       N/A       MS-B       %       -       17-OCT-19         Chromium (Cr)-Total       102.3       %       70-130       17-OCT-19         Cobalt (Co)-Total       101.1       %       70-130       17-OCT-19	Zinc (Zn)-Total			<0.0030		mg/L		0.003	17-OCT-19
Antimony (Sb)-Total 97.0 % 70-130 17-OCT-19 Arsenic (As)-Total 102.9 % 70-130 17-OCT-19 Barium (Ba)-Total N/A MS-B % - 17-OCT-19 Bismuth (Bi)-Total 90.1 % 70-130 17-OCT-19 Boron (B)-Total N/A MS-B % - 17-OCT-19 Cadmium (Cd)-Total 96.7 % 70-130 17-OCT-19 Calcium (Ca)-Total N/A MS-B % - 17-OCT-19 Chromium (Cr)-Total 102.3 % 70-130 17-OCT-19 Cobalt (Co)-Total 101.1 % 70-130 17-OCT-19			L2364506-1	400.0		0/			
Arsenic (As)-Total 102.9 % 70-130 17-OCT-19 Barium (Ba)-Total N/A MS-B % - 17-OCT-19 Bismuth (Bi)-Total 90.1 % 70-130 17-OCT-19 Boron (B)-Total N/A MS-B % - 17-OCT-19 Cadmium (Cd)-Total 96.7 % 70-130 17-OCT-19 Calcium (Ca)-Total N/A MS-B % - 17-OCT-19 Chromium (Cr)-Total 102.3 % 70-130 17-OCT-19 Cobalt (Co)-Total 101.1 % 70-130 17-OCT-19	, ,								
Barium (Ba)-Total       N/A       MS-B       %       -       17-OCT-19         Bismuth (Bi)-Total       90.1       %       70-130       17-OCT-19         Boron (B)-Total       N/A       MS-B       %       -       17-OCT-19         Cadmium (Cd)-Total       96.7       %       70-130       17-OCT-19         Calcium (Ca)-Total       N/A       MS-B       %       -       17-OCT-19         Chromium (Cr)-Total       102.3       %       70-130       17-OCT-19         Cobalt (Co)-Total       101.1       %       70-130       17-OCT-19									
Bismuth (Bi)-Total       90.1       %       70-130       17-OCT-19         Boron (B)-Total       N/A       MS-B       %       -       17-OCT-19         Cadmium (Cd)-Total       96.7       %       70-130       17-OCT-19         Calcium (Ca)-Total       N/A       MS-B       %       -       17-OCT-19         Chromium (Cr)-Total       102.3       %       70-130       17-OCT-19         Cobalt (Co)-Total       101.1       %       70-130       17-OCT-19	` ,							70-130	
Boron (B)-Total         N/A         MS-B         %         -         17-OCT-19           Cadmium (Cd)-Total         96.7         %         70-130         17-OCT-19           Calcium (Ca)-Total         N/A         MS-B         %         -         17-OCT-19           Chromium (Cr)-Total         102.3         %         70-130         17-OCT-19           Cobalt (Co)-Total         101.1         %         70-130         17-OCT-19					MS-B			-	
Cadmium (Cd)-Total       96.7       %       70-130       17-OCT-19         Calcium (Ca)-Total       N/A       MS-B       %       -       17-OCT-19         Chromium (Cr)-Total       102.3       %       70-130       17-OCT-19         Cobalt (Co)-Total       101.1       %       70-130       17-OCT-19								70-130	
Calcium (Ca)-Total       N/A       MS-B       %       -       17-OCT-19         Chromium (Cr)-Total       102.3       %       70-130       17-OCT-19         Cobalt (Co)-Total       101.1       %       70-130       17-OCT-19	. ,				MS-B			-	17-OCT-19
Chromium (Cr)-Total       102.3       %       70-130       17-OCT-19         Cobalt (Co)-Total       101.1       %       70-130       17-OCT-19	` '							70-130	17-OCT-19
Cobalt (Co)-Total 101.1 % 70-130 17-OCT-19	, ,				MS-B			-	17-OCT-19
	` ,							70-130	17-OCT-19
Copper (Cu)-Total 96.6 % 70-130 17-OCT-19								70-130	17-OCT-19
	Copper (Cu)-Total			96.6		%		70-130	17-OCT-19



Workorder: L2364506

Report Date: 22-OCT-19 Page 10 of 16

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-VA	Water							
Batch R4874512								
WG3191741-4 MS		L2364506-1	00.7		0.4			
Iron (Fe)-Total			98.7		%		70-130	17-OCT-19
Lead (Pb)-Total			90.6		%		70-130	17-OCT-19
Lithium (Li)-Total			N/A	MS-B	%		-	17-OCT-19
Magnesium (Mg)-Total			N/A	MS-B	%		-	17-OCT-19
Manganese (Mn)-Total			N/A	MS-B	%		-	17-OCT-19
Molybdenum (Mo)-Tota	I		101.6		%		70-130	17-OCT-19
Nickel (Ni)-Total			99.2		%		70-130	17-OCT-19
Potassium (K)-Total			104.7		%		70-130	17-OCT-19
Selenium (Se)-Total			99.0		%		70-130	17-OCT-19
Silicon (Si)-Total			96.1		%		70-130	17-OCT-19
Silver (Ag)-Total			95.8		%		70-130	17-OCT-19
Sodium (Na)-Total			N/A	MS-B	%		-	17-OCT-19
Strontium (Sr)-Total			N/A	MS-B	%		-	17-OCT-19
Thallium (TI)-Total			91.3		%		70-130	17-OCT-19
Tin (Sn)-Total			97.9		%		70-130	17-OCT-19
Titanium (Ti)-Total			104.6		%		70-130	17-OCT-19
Uranium (U)-Total			96.0		%		70-130	17-OCT-19
Vanadium (V)-Total			107.0		%		70-130	17-OCT-19
Zinc (Zn)-Total			97.5		%		70-130	17-OCT-19
Batch R4876507								
WG3195649-2 LCS								
Aluminum (Al)-Total			98.9		%		80-120	19-OCT-19
Antimony (Sb)-Total			103.1		%		80-120	19-OCT-19
Arsenic (As)-Total			96.3		%		80-120	19-OCT-19
Barium (Ba)-Total			97.1		%		80-120	19-OCT-19
Bismuth (Bi)-Total			97.1		%		80-120	19-OCT-19
Boron (B)-Total			92.8		%		80-120	19-OCT-19
Cadmium (Cd)-Total			96.9		%		80-120	19-OCT-19
Calcium (Ca)-Total			100.0		%		80-120	19-OCT-19
Chromium (Cr)-Total			96.5		%		80-120	19-OCT-19
Cobalt (Co)-Total			98.1		%		80-120	19-OCT-19
Copper (Cu)-Total			96.3		%		80-120	19-OCT-19
Iron (Fe)-Total			96.4		%		80-120	19-OCT-19
Lead (Pb)-Total			97.7		%		80-120	19-OCT-19



Workorder: L2364506 Report Date: 22-OCT-19 Page 11 of 16

est	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-VA	Water							
Batch R4876507								
WG3195649-2 LCS			04.7		0/			
Lithium (Li)-Total			91.7		%		80-120	19-OCT-19
Magnesium (Mg)-Total			97.0		%		80-120	19-OCT-19
Manganese (Mn)-Total			98.6		%		80-120	19-OCT-19
Molybdenum (Mo)-Total			100.1		%		80-120	19-OCT-19
Nickel (Ni)-Total			99.2		%		80-120	19-OCT-19
Potassium (K)-Total			97.9		%		80-120	19-OCT-19
Selenium (Se)-Total			99.9		%		80-120	19-OCT-19
Silicon (Si)-Total			99.4		%		80-120	19-OCT-19
Silver (Ag)-Total			96.1		%		80-120	19-OCT-19
Sodium (Na)-Total			104.9		%		80-120	19-OCT-19
Strontium (Sr)-Total			106.5		%		80-120	19-OCT-19
Thallium (Tl)-Total			97.4		%		80-120	19-OCT-19
Tin (Sn)-Total			98.9		%		80-120	19-OCT-19
Titanium (Ti)-Total			93.0		%		80-120	19-OCT-19
Uranium (U)-Total			97.1		%		80-120	19-OCT-19
Vanadium (V)-Total			99.3		%		80-120	19-OCT-19
Zinc (Zn)-Total			94.3		%		80-120	19-OCT-19
WG3195649-1 MB								
Aluminum (Al)-Total			<0.0030		mg/L		0.003	19-OCT-19
Antimony (Sb)-Total			<0.00010		mg/L		0.0001	19-OCT-19
Arsenic (As)-Total			<0.00010		mg/L		0.0001	19-OCT-19
Barium (Ba)-Total			<0.00010		mg/L		0.0001	19-OCT-19
Bismuth (Bi)-Total			<0.000050		mg/L		0.00005	19-OCT-19
Boron (B)-Total			<0.010		mg/L		0.01	19-OCT-19
Cadmium (Cd)-Total			<0.000005	С	mg/L		0.000005	19-OCT-19
Calcium (Ca)-Total			< 0.050		mg/L		0.05	19-OCT-19
Chromium (Cr)-Total			<0.00010		mg/L		0.0001	19-OCT-19
Cobalt (Co)-Total			<0.00010		mg/L		0.0001	19-OCT-19
Copper (Cu)-Total			<0.00050		mg/L		0.0005	19-OCT-19
Iron (Fe)-Total			<0.010		mg/L		0.01	19-OCT-19
Lead (Pb)-Total			<0.000050		mg/L		0.00005	19-OCT-19
Lithium (Li)-Total			<0.0010		mg/L		0.001	19-OCT-19
Magnesium (Mg)-Total			<0.0050		mg/L		0.005	19-OCT-19
Manganese (Mn)-Total			<0.00010		mg/L		0.0001	19-OCT-19



Workorder: L2364506

Report Date: 22-OCT-19

Page 12 of 16

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-VA	Water							
Batch R4876507								
WG3195649-1 MB Molybdenum (Mo)-Total			<0.000050	1	mg/L		0.00005	19-OCT-19
Nickel (Ni)-Total			<0.00050		mg/L		0.0005	19-OCT-19
Potassium (K)-Total			< 0.050		mg/L		0.05	19-OCT-19
Selenium (Se)-Total			<0.000050	1	mg/L		0.00005	19-OCT-19
Silicon (Si)-Total			<0.10		mg/L		0.1	19-OCT-19
Silver (Ag)-Total			<0.000010	)	mg/L		0.00001	19-OCT-19
Sodium (Na)-Total			< 0.050		mg/L		0.05	19-OCT-19
Strontium (Sr)-Total			<0.00020		mg/L		0.0002	19-OCT-19
Thallium (TI)-Total			<0.000010	1	mg/L		0.00001	19-OCT-19
Tin (Sn)-Total			<0.00010		mg/L		0.0001	19-OCT-19
Titanium (Ti)-Total			<0.00030		mg/L		0.0003	19-OCT-19
Uranium (U)-Total			<0.000010	)	mg/L		0.00001	19-OCT-19
Vanadium (V)-Total			<0.00050		mg/L		0.0005	19-OCT-19
Zinc (Zn)-Total			<0.0030		mg/L		0.003	19-OCT-19
NH3-L-F-CL	Water							
Batch R4875988								
WG3196193-22 LCS Ammonia as N			99.8		%		85-115	20-OCT-19
WG3196193-21 MB Ammonia as N			<0.0050		mg/L		0.005	20-OCT-19
NO2-L-IC-N-CL	Water							
Batch R4870507								
WG3191321-10 LCS Nitrite (as N)			104.3		%		90-110	12-OCT-19
<b>WG3191321-14 LCS</b> Nitrite (as N)			103.3		%		90-110	13-OCT-19
WG3191321-13 MB Nitrite (as N)			<0.0010		mg/L		0.001	13-OCT-19
<b>WG3191321-9 MB</b> Nitrite (as N)			<0.0010		mg/L		0.001	12-OCT-19
NO3-L-IC-N-CL	Water							
Batch R4870507								
WG3191321-10 LCS Nitrate (as N)			102.6		%		90-110	12-OCT-19
WG3191321-14 LCS								



Workorder: L2364506

Report Date: 22-OCT-19

Page 13 of 16

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
NO3-L-IC-N-CL	Water							
Batch R4870507 WG3191321-14 LCS Nitrate (as N)			102.0		%		90-110	13-OCT-19
<b>WG3191321-13 MB</b> Nitrate (as N)			<0.0050		mg/L		0.005	13-OCT-19
<b>WG3191321-9 MB</b> Nitrate (as N)			<0.0050		mg/L		0.005	12-OCT-19
ORP-CL	Water							
Batch R4868484								
<b>WG3190461-1 CRM</b> ORP		CL-ORP	219		mV		210-230	13-OCT-19
P-T-L-COL-CL	Water							
Batch R4868369 WG3190258-10 LCS Phosphorus (P)-Total			100.5		%		80-120	13-OCT-19
WG3190258-9 MB Phosphorus (P)-Total			<0.0020		mg/L		0.002	13-OCT-19
PH-CL	Water							
Batch R4873462 WG3193596-2 LCS pH			7.02		рН		6.9-7.1	16-OCT-19
PO4-DO-L-COL-CL	Water							
Batch R4867889								
WG3189621-18 LCS Orthophosphate-Dissolv	red (as P)		102.8		%		80-120	11-OCT-19
WG3189621-17 MB Orthophosphate-Dissolv	red (as P)		<0.0010		mg/L		0.001	11-OCT-19
SO4-IC-N-CL	Water							
Batch R4870507								
<b>WG3191321-10 LCS</b> Sulfate (SO4)			103.0		%		90-110	12-OCT-19
<b>WG3191321-14 LCS</b> Sulfate (SO4)			102.2		%		90-110	13-OCT-19
<b>WG3191321-13 MB</b> Sulfate (SO4)			<0.30		mg/L		0.3	13-OCT-19
WG3191321-9 MB								



Workorder: L2364506

Report Date: 22-OCT-19 Page 14 of 16

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
SO4-IC-N-CL Batch R4870507	Water							
<b>WG3191321-9 MB</b> Sulfate (SO4)			<0.30		mg/L		0.3	12-OCT-19
SOLIDS-TDS-CL	Water							
Batch R4872764 WG3192050-8 LCS Total Dissolved Solids			101.8		%		85-115	16-OCT-19
WG3192050-7 MB								10-001-13
Total Dissolved Solids			<10		mg/L		10	16-OCT-19
TKN-L-F-CL	Water							
Batch R4872902 WG3193743-10 LCS Total Kjeldahl Nitrogen			95.9		%		75-125	17-OCT-19
WG3193743-9 MB Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	17-OCT-19
TSS-L-CL	Water							
Batch R4872935 WG3192023-6 LCS			05.0		0/			
Total Suspended Solids WG3192023-5 MB			95.9		%		85-115	16-OCT-19
Total Suspended Solids			<1.0		mg/L		1	16-OCT-19
TURBIDITY-CL	Water							
Batch R4867979								
WG3189524-14 LCS Turbidity			96.5		%		85-115	11-OCT-19
WG3189524-17 LCS Turbidity			96.0		%		85-115	11-OCT-19
WG3189524-13 MB Turbidity			<0.10		NTU		0.1	11-OCT-19
WG3189524-16 MB Turbidity			<0.10		NTU		0.1	11-OCT-19

Workorder: L2364506 Report Date: 22-OCT-19 Page 15 of 16

### Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

### **Sample Parameter Qualifier Definitions:**

Qualifier	Description
В	Method Blank exceeds ALS DQO. Associated sample results which are < Limit of Reporting or > 5 times blank level are considered reliable.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

Workorder: L2364506 Report Date: 22-OCT-19 Page 16 of 16

#### **Hold Time Exceedances:**

	Sample						-
ALS Product Description	ID	Sampling Date	Date Processed	Rec. HT	Actual HT	Units	Qualifier
Physical Tests							
Oxidation redution potential	by elect.						
	1	10-OCT-19 13:25	13-OCT-19 09:15	0.25	68	hours	EHTR-FM
	2	10-OCT-19 13:25	13-OCT-19 09:15	0.25	68	hours	EHTR-FM
pН							
	1	10-OCT-19 13:25	16-OCT-19 13:00	0.25	144	hours	EHTR-FM
	2	10-OCT-19 13:25	16-OCT-19 13:00	0.25	144	hours	EHTR-FM

#### Legend & Qualifier Definitions:

EHTR-FM: Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended.

EHTR: Exceeded ALS recommended hold time prior to sample receipt.

EHTL: Exceeded ALS recommended hold time prior to analysis. Sample was received less than 24 hours prior to expiry.

EHT: Exceeded ALS recommended hold time prior to analysis.

Rec. HT: ALS recommended hold time (see units).

#### Notes\*:

Where actual sampling date is not provided to ALS, the date (& time) of receipt is used for calculation purposes. Where actual sampling time is not provided to ALS, the earlier of 12 noon on the sampling date or the time (& date) of receipt is used for calculation purposes. Samples for L2364506 were received on 11-OCT-19 08:40.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against predetermined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

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13 March 2020 19135981-2020-064-R-Rev0

Q4 - COAs



TECK COAL LIMITED (LINE CREEK)

ATTN: Carla Froyman Parker

PO BOX 2003

SPARWOOD BC VOB 2G0

Date Received: 11-OCT-19

Report Date: 22-OCT-19 17:10 (MT)

Version: FINAL

Client Phone: 250-425-3196

# Certificate of Analysis

Lab Work Order #: L2364506
Project P.O. #: VP000608129

Job Reference: LINE CREEK OPERATION

C of C Numbers:

20191010 LC GW

Legal Site Desc:



Lyudmyla Shvets, B.Sc. Account Manager

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L2364506 CONTD.... PAGE 2 of 9 Version: FINAL

Sample Details/Parameters	Result	Qualifier	* D.L.	Units	Extracted	Analyzed	Batch
   L2364506-1							
Sampled By: KC/DT on 10-OCT-19 @ 13:25							
Matrix: WG Miscellaneous Parameters							
Dissolved Organic Carbon	2.62		0.50	ma/l		19-OCT-19	D4074000
	2.62		0.50	mg/L			R4874992
Total Kjeldahl Nitrogen	0.298		0.050	mg/L		17-OCT-19	R4872902
Total Organic Carbon	2.86		0.50	mg/L		19-OCT-19	R4874992
Dissolved Metals in Water							
Diss. Be (Iow) in Water by CRC ICPMS Beryllium (Be)-Dissolved	<0.020		0.020	ug/L	15-OCT-19	17-OCT-19	R4872734
Dissolved Metals Filtration Location	<0.020 FIELD		0.020	ug/L	15-001-19	17-0CT-19 15-0CT-19	R4870254
Diss. Mercury in Water by CVAAS or CVAFS	FILLD					13-001-19	K4670254
Mercury (Hg)-Dissolved	<0.000050		0.0000050	mg/L	17-OCT-19	17-OCT-19	R4872448
Dissolved Mercury Filtration Location	FIELD		0.000000	9, =	17 001 10	17-OCT-19	R4872405
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	FIELD					15-OCT-19	R4870254
Aluminum (AI)-Dissolved	0.0036		0.0030	mg/L	15-OCT-19	17-OCT-19	R4872734
Antimony (Sb)-Dissolved	<0.00010		0.00010	mg/L	15-OCT-19	17-OCT-19	R4872734
Arsenic (As)-Dissolved	0.00071		0.00010	mg/L	15-OCT-19	17-OCT-19	R4872734
Barium (Ba)-Dissolved	0.0684		0.00010	mg/L	15-OCT-19	17-OCT-19	R4872734
Bismuth (Bi)-Dissolved	<0.000050		0.000050	mg/L	15-OCT-19	17-OCT-19	R4872734
Boron (B)-Dissolved	0.480		0.010	mg/L	15-OCT-19	17-OCT-19	R4872734
Cadmium (Cd)-Dissolved	<0.0050		0.0050	ug/L	15-OCT-19	17-OCT-19	R4872734
Calcium (Ca)-Dissolved	28.9		0.050	mg/L	15-OCT-19	17-OCT-19	R4872734
Chromium (Cr)-Dissolved	0.00015		0.00010	mg/L	15-OCT-19	17-OCT-19	R4872734
Cobalt (Co)-Dissolved	0.91		0.10	ug/L	15-OCT-19	17-OCT-19	R4872734
Copper (Cu)-Dissolved	0.00040		0.00020	mg/L	15-OCT-19	17-OCT-19	R4872734
Iron (Fe)-Dissolved	0.077		0.010	mg/L	15-OCT-19	17-OCT-19	R4872734
Lead (Pb)-Dissolved	<0.000050		0.000050	mg/L	15-OCT-19	17-OCT-19	R4872734
Lithium (Li)-Dissolved	0.117		0.0010	mg/L	15-OCT-19	17-OCT-19	R4872734
Magnesium (Mg)-Dissolved	16.1		0.10	mg/L	15-OCT-19	17-OCT-19	R4872734
Manganese (Mn)-Dissolved	0.558		0.00010	mg/L	15-OCT-19	17-OCT-19	R4872734
Molybdenum (Mo)-Dissolved	0.00993		0.000050	mg/L	15-OCT-19	17-OCT-19	R4872734
Nickel (Ni)-Dissolved	0.00245		0.00050	mg/L	15-OCT-19	17-OCT-19	R4872734
Potassium (K)-Dissolved	1.66		0.050	mg/L	15-OCT-19	17-OCT-19	R4872734
Selenium (Se)-Dissolved	0.211	DTSE	0.050	ug/L	15-OCT-19	17-OCT-19	R4872734
Silicon (Si)-Dissolved	4.45		0.050	mg/L	15-OCT-19	17-OCT-19	R4872734
Silver (Ag)-Dissolved	<0.000010		0.000010	mg/L	15-OCT-19	17-OCT-19	R4872734
Sodium (Na)-Dissolved	137		0.050	mg/L	15-OCT-19	17-OCT-19	R4872734
Strontium (Sr)-Dissolved	0.787		0.00020	mg/L	15-OCT-19	17-OCT-19	R4872734
Thallium (TI)-Dissolved	<0.000010	DTME	0.000010	mg/L	15-OCT-19	17-OCT-19	R4872734
Tin (Sn)-Dissolved	0.00217	DTMF	0.00010	mg/L	15-OCT-19	17-OCT-19	R4872734
Titanium (Ti)-Dissolved	<0.010		0.010	mg/L	15-OCT-19	17-OCT-19	R4872734
Uranium (U)-Dissolved	0.00196		0.000010	mg/L	15-OCT-19	17-OCT-19	R4872734
Vanadium (V)-Dissolved	<0.00050		0.00050	mg/L	15-OCT-19	17-OCT-19	R4872734
Zinc (Zn)-Dissolved	0.0013		0.0010	mg/L	15-OCT-19	17-OCT-19	R4872734
Hardness Hardness (as CaCO3)	120		0.50	ma/l		18-OCT-19	
Total Metals in Water	139		0.50	mg/L		10-001-19	
Total Be (Low) in Water by CRC ICPMS							
Beryllium (Be)-Total	<0.020		0.020	ug/L		17-OCT-19	R4874512
Total Metals in Water by CRC ICPMS	\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\		0.020	ug/ L		17 001 10	114074312
Aluminum (Al)-Total	0.189		0.0030	mg/L		17-OCT-19	R4874512
Antimony (Sb)-Total	0.00025		0.00010	mg/L		17-OCT-19	R4874512
Arsenic (As)-Total	0.00020		0.00010	mg/L		17-OCT-19	R4874512
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<sup>\*</sup> Refer to Referenced Information for Qualifiers (if any) and Methodology.

L2364506 CONTD.... PAGE 3 of 9 Version: FINAL

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2364506-1 LC PIZP1103 WG Q4-2019 NP							
L2364506-1 LC_PIZP1103_WG_Q4-2019_NP Sampled By: KC/DT on 10-OCT-19 @ 13:25							
Matrix: WG							
Total Metals in Water by CRC ICPMS Barium (Ba)-Total	0.0698		0.00010	mg/L		17-OCT-19	R4874512
Bismuth (Bi)-Total	<0.00050	1	0.000050	mg/L		17-OCT-19	R4874512
Boron (B)-Total	0.547		0.010	mg/L		17-OCT-19	R4874512
Cadmium (Cd)-Total	0.0317		0.0050	ug/L		17-OCT-19	R4874512
Calcium (Ca)-Total	30.1		0.050	mg/L		17-OCT-19	R4874512
Chromium (Cr)-Total	0.00048		0.00010	mg/L		17-OCT-19	R4874512
Cobalt (Co)-Total	1.13		0.10	ug/L		17-OCT-19	R4874512
Copper (Cu)-Total	0.00270		0.00050	mg/L		17-OCT-19	R4874512
Iron (Fe)-Total	0.313		0.010	mg/L		17-OCT-19	R4874512
Lead (Pb)-Total	0.000635	0	.000050	mg/L		17-OCT-19	R4874512
Lithium (Li)-Total	0.122		0.0010	mg/L		17-OCT-19	R4874512
Magnesium (Mg)-Total	17.1		0.10	mg/L		17-OCT-19	R4874512
Manganese (Mn)-Total	0.563		0.00010	mg/L		17-OCT-19	R4874512
Molybdenum (Mo)-Total	0.00892	0	.000050	mg/L		17-OCT-19	R4874512
Nickel (Ni)-Total	0.00314		0.00050	mg/L		17-OCT-19	R4874512
Potassium (K)-Total	1.76		0.050	mg/L		17-OCT-19	R4874512
Selenium (Se)-Total	<0.050		0.050	ug/L		17-OCT-19	R4874512
Silicon (Si)-Total	4.61		0.10	mg/L		17-OCT-19	R4874512
Silver (Ag)-Total	<0.000010	0	.000010	mg/L		17-OCT-19	R4874512
Sodium (Na)-Total	142		0.050	mg/L		17-OCT-19	R4874512
Strontium (Sr)-Total	0.822		0.00020	mg/L		17-OCT-19	R4874512
Thallium (TI)-Total	0.000011	1 1	.000010	mg/L		17-OCT-19	R4874512
Tin (Sn)-Total	0.00125		0.00010	mg/L		17-OCT-19	R4874512
Titanium (Ti)-Total	<0.010		0.010	mg/L		17-OCT-19	R4874512
Uranium (U)-Total	0.00147		0.000010	mg/L		17-OCT-19	R4874512
Vanadium (V)-Total Zinc (Zn)-Total	0.00056	1 1	0.00050	mg/L		17-OCT-19 17-OCT-19	R4874512
Routine for Teck Coal	0.0136		0.0030	mg/L		17-001-19	R4874512
Acidity by Automatic Titration							
Acidity by Automatic Intration Acidity (as CaCO3)	1.1		1.0	mg/L		16-OCT-19	R4873457
Alkalinity (Species) by Manual Titration	1		1.0	1119/12		10 001 10	114073437
Alkalinity, Bicarbonate (as CaCO3)	406		1.0	mg/L		16-OCT-19	R4873462
Alkalinity, Carbonate (as CaCO3)	<1.0		1.0	mg/L		16-OCT-19	R4873462
Alkalinity, Hydroxide (as CaCO3)	<1.0		1.0	mg/L		16-OCT-19	R4873462
Alkalinity, Total (as CaCO3)	406		1.0	mg/L		16-OCT-19	R4873462
Ammonia, Total (as N)				-			
Ammonia as N	0.0667		0.0050	mg/L		20-OCT-19	R4875988
Bromide in Water by IC (Low Level)							
Bromide (Br)	0.146		0.050	mg/L		13-OCT-19	R4870507
Chloride in Water by IC							
Chloride (CI)	3.25		0.50	mg/L		13-OCT-19	R4870507
Electrical Conductivity (EC)	700		0.0	07-		40.007.10	D 4070 455
Conductivity (@ 25C)	720		2.0	uS/cm		16-OCT-19	R4873462
Fluoride in Water by IC Fluoride (F)	0.400		0.000	ma/l		13-OCT-19	D4070507
,	0.429		0.020	mg/L		13-001-19	R4870507
Ion Balance Calculation Cation - Anion Balance	-0.2			%		18-OCT-19	
Anion Sum	8.82			meg/L		18-OCT-19	
Cation Sum	8.78			meg/L		18-OCT-19	
Ion Balance Calculation	0.70			moq/L		10 001-19	
Ion Balance	99.6		-100	%		18-OCT-19	
Nitrate in Water by IC (Low Level)							
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<sup>\*</sup> Refer to Referenced Information for Qualifiers (if any) and Methodology.

L2364506 CONTD.... PAGE 4 of 9 Version: FINAL

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2364506-1 LC_PIZP1103_WG_Q4-2019_NP							
Sampled By: KC/DT on 10-OCT-19 @ 13:25							
Matrix: WG							
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	<0.0050		0.0050	mg/L		13-OCT-19	R4870507
Nitrite in Water by IC (Low Level)				,,		10 00T 10	
Nitrite (as N)	0.0011		0.0010	mg/L		13-OCT-19	R4870507
Orthophosphate-Dissolved (as P) Orthophosphate-Dissolved (as P)	0.0132		0.0010	mg/L		11-OCT-19	R4867889
Oxidation redution potential by elect.				Ü			
ORP	203		-1000	mV		13-OCT-19	R4868484
Phosphorus (P)-Total Phosphorus (P)-Total	0.0520		0.0020	mg/L		13-OCT-19	R4868369
Sulfate in Water by IC	0.0320		0.0020	mg/L		13 001-13	114000309
Sulfate (SO4)	29.1		0.30	mg/L		13-OCT-19	R4870507
Total Dissolved Solids							
Total Dissolved Solids	478	DLHC	20	mg/L		16-OCT-19	R4872764
Total Suspended Solids Total Suspended Solids	19.9		1.0	mg/L		16-OCT-19	R4872935
Turbidity	10.0			∌, ⊏		.5 551 10	
Turbidity	13.6		0.10	NTU		11-OCT-19	R4867979
рН						10 00T 10	D
pH	8.07		0.10	рН		16-OCT-19	R4873462
L2364506-2 WG_Q4-2019_004							
Sampled By: KC/DT on 10-OCT-19 @ 13:25  Matrix: WG							
Matrix: WG Miscellaneous Parameters							
Dissolved Organic Carbon	<0.50		0.50	mg/L		19-OCT-19	R4874992
Total Kjeldahl Nitrogen	<0.050		0.050	mg/L		17-OCT-19	R4872902
Total Organic Carbon	<0.50		0.50	mg/L		19-OCT-19	R4874992
Dissolved Metals in Water							
Diss. Be (low) in Water by CRC ICPMS							
Beryllium (Be)-Dissolved Dissolved Metals Filtration Location	<0.020		0.020	ug/L	15-OCT-19	17-OCT-19	R4872734
Diss. Mercury in Water by CVAAS or CVAFS	FIELD					15-OCT-19	R4870254
Mercury (Hg)-Dissolved	<0.000050		0.0000050	mg/L	17-OCT-19	17-OCT-19	R4872448
Dissolved Mercury Filtration Location	FIELD					17-OCT-19	R4872405
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	FIELD		0.0000	البحصو	10 OOT 10	18-OCT-19	R4873642
Aluminum (AI)-Dissolved Antimony (Sb)-Dissolved	<0.0030 <0.00010		0.0030 0.00010	mg/L mg/L	18-OCT-19 15-OCT-19	18-OCT-19 17-OCT-19	R4874176 R4872734
Arsenic (As)-Dissolved	<0.00010		0.00010	mg/L	15-OCT-19 15-OCT-19	17-OCT-19 17-OCT-19	R4872734
Barium (Ba)-Dissolved	0.00029	RRV	0.00010	mg/L	18-OCT-19	18-OCT-19	R4874176
Bismuth (Bi)-Dissolved	<0.000050		0.000050	mg/L	15-OCT-19	17-OCT-19	R4872734
Boron (B)-Dissolved	<0.010		0.010	mg/L	15-OCT-19	17-OCT-19	R4872734
Cadmium (Cd)-Dissolved	<0.0050	DE:/	0.0050	ug/L	15-OCT-19	17-OCT-19	R4872734
Calcium (Ca)-Dissolved Chromium (Cr)-Dissolved	0.063	RRV	0.050	mg/L mg/l	18-OCT-19 15-OCT-19	18-OCT-19 17-OCT-19	R4874176
Cobalt (Co)-Dissolved	<0.00010 <0.10		0.00010 0.10	mg/L ug/L	15-OCT-19 15-OCT-19	17-OCT-19 17-OCT-19	R4872734 R4872734
Copper (Cu)-Dissolved	<0.0020		0.00020	mg/L	15-OCT-19	17-OCT-19	R4872734
Iron (Fe)-Dissolved	<0.010		0.010	mg/L	15-OCT-19	17-OCT-19	R4872734
Lead (Pb)-Dissolved	<0.000050		0.000050	mg/L	15-OCT-19	17-OCT-19	R4872734
Lithium (Li)-Dissolved	<0.0010		0.0010	mg/L	15-OCT-19	17-OCT-19	R4872734
Magnesium (Mg)-Dissolved	<0.10		0.10	mg/L	15-OCT-19	17-OCT-19	R4872734
Manganese (Mn)-Dissolved	<0.00010		0.00010	mg/L	15-OCT-19	17-OCT-19	R4872734

<sup>\*</sup> Refer to Referenced Information for Qualifiers (if any) and Methodology.

L2364506 CONTD.... PAGE 5 of 9 Version: FINAL

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
   L2364506-2   WG_Q4-2019_004							
Sampled By: KC/DT on 10-OCT-19 @ 13:25							
Matrix: WG							
Dissolved Metals in Water by CRC ICPMS							
Molybdenum (Mo)-Dissolved	<0.000050		0.000050	mg/L	15-OCT-19	17-OCT-19	R4872734
Nickel (Ni)-Dissolved	<0.00050		0.00050	mg/L	15-OCT-19	17-OCT-19	R4872734
Potassium (K)-Dissolved	<0.050		0.050	mg/L	15-OCT-19	17-OCT-19	R4872734
Selenium (Se)-Dissolved	<0.050		0.050	ug/L	15-OCT-19	17-OCT-19	R4872734
Silicon (Si)-Dissolved	0.227	RRV	0.050	mg/L	18-OCT-19	18-OCT-19	R4874176
Silver (Ag)-Dissolved	<0.000010		0.000010	mg/L	15-OCT-19	17-OCT-19	R4872734
Sodium (Na)-Dissolved	0.233	RRV	0.050	mg/L	18-OCT-19	18-OCT-19	R4874176
Strontium (Sr)-Dissolved	<0.00020		0.00020	mg/L	15-OCT-19	17-OCT-19	R4872734
Thallium (TI)-Dissolved	<0.000010		0.000010	mg/L	15-OCT-19	17-OCT-19	R4872734
Tin (Sn)-Dissolved	0.00075	RRV	0.00010	mg/L	18-OCT-19	18-OCT-19	R4874176
Titanium (Ti)-Dissolved	<0.010		0.010	mg/L	15-OCT-19	17-OCT-19	R4872734
Uranium (U)-Dissolved	<0.000010		0.000010	mg/L	15-OCT-19	17-OCT-19	R4872734
Vanadium (V)-Dissolved	<0.00050		0.00050	mg/L	15-OCT-19	17-OCT-19	R4872734
Zinc (Zn)-Dissolved	<0.0010		0.0010	mg/L	15-OCT-19	17-OCT-19	R4872734
Hardness							
Hardness (as CaCO3)	<0.50		0.50	mg/L		21-OCT-19	
Total Metals in Water							
Total Be (Low) in Water by CRC ICPMS	0.000		0.000	/1		47 OOT 40	D 4074540
Beryllium (Be)-Total	<0.020		0.020	ug/L		17-OCT-19	R4874512
Total Mercury in Water by CVAAS or CVAFS Mercury (Hg)-Total	<0.0000050		0.0000050	mg/L		17-OCT-19	R4872448
Total Metals in Water by CRC ICPMS							
Aluminum (AI)-Total	<0.0030		0.0030	mg/L		17-OCT-19	R4874512
Antimony (Sb)-Total	<0.00010		0.00010	mg/L		17-OCT-19	R4874512
Arsenic (As)-Total	<0.00010		0.00010	mg/L		17-OCT-19	R4874512
Barium (Ba)-Total	<0.00010		0.00010	mg/L		17-OCT-19	R4874512
Bismuth (Bi)-Total	<0.000050		0.000050	mg/L		17-OCT-19	R4874512
Boron (B)-Total	<0.010		0.010	mg/L		17-OCT-19	R4874512
Cadmium (Cd)-Total	<0.0050		0.0050	ug/L		17-OCT-19	R4874512
Calcium (Ca)-Total	<0.050		0.050	mg/L		17-OCT-19	R4874512
Chromium (Cr)-Total	<0.00010		0.00010	mg/L		17-OCT-19	R4874512
Copper (Cu) Total	<0.10		0.10	ug/L		17-OCT-19	R4874512
Copper (Cu)-Total Iron (Fe)-Total	<0.00050		0.00050	mg/L mg/l		17-OCT-19 17-OCT-19	R4874512
Lead (Pb)-Total	<0.010		0.010 0.000050	mg/L mg/L		17-OCT-19	R4874512 R4874512
Lithium (Li)-Total	<0.000050 <0.0010		0.000050	mg/L		17-OCT-19 17-OCT-19	R4874512 R4874512
Magnesium (Mg)-Total	<0.0010	1	0.0010	mg/L		17-OCT-19	R4874512
Manganese (Mn)-Total	0.00010	RRV	0.00010	mg/L		19-OCT-19	R4876507
Molybdenum (Mo)-Total	<0.00010		0.00010	mg/L		17-OCT-19	R4874512
Nickel (Ni)-Total	<0.00050	1	0.00050	mg/L		17-OCT-19	R4874512
Potassium (K)-Total	<0.050	1	0.050	mg/L		17-OCT-19	R4874512
Selenium (Se)-Total	<0.050		0.050	ug/L		17-OCT-19	R4874512
Silicon (Si)-Total	<0.10	1	0.10	mg/L		17-OCT-19	R4874512
Silver (Ag)-Total	<0.000010		0.000010	mg/L		17-OCT-19	R4874512
Sodium (Na)-Total	<0.050		0.050	mg/L		17-OCT-19	R4874512
Strontium (Sr)-Total	<0.00020		0.00020	mg/L		17-OCT-19	R4874512
Thallium (TI)-Total	<0.000010		0.000010	mg/L		17-OCT-19	R4874512
Tin (Sn)-Total	0.00012	RRV	0.00010	mg/L		19-OCT-19	R4876507
Titanium (Ti)-Total	<0.010		0.010	mg/L		17-OCT-19	R4874512
Uranium (U)-Total	<0.000010		0.000010	mg/L		17-OCT-19	R4874512
Vanadium (V)-Total	<0.00050		0.00050	mg/L		17-OCT-19	R4874512
Zinc (Zn)-Total	<0.0030		0.0030	mg/L		17-OCT-19	R4874512

<sup>\*</sup> Refer to Referenced Information for Qualifiers (if any) and Methodology.

L2364506 CONTD.... PAGE 6 of 9 Version: FINAL

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2364506-2 WG Q4-2019 004							
L2364506-2 WG_Q4-2019_004 Sampled By: KC/DT on 10-OCT-19 @ 13:25							
Matrix: WG							
Routine for Teck Coal							
Acidity by Automatic Titration							
Acidity (as CaCO3)	1.5		1.0	mg/L		16-OCT-19	R4873457
Alkalinity (Species) by Manual Titration Alkalinity, Bicarbonate (as CaCO3)	<1.0		1.0	mg/L		16-OCT-19	R4873462
Alkalinity, Carbonate (as CaCO3)	<1.0		1.0	mg/L		16-OCT-19	R4873462
Alkalinity, Hydroxide (as CaCO3)	<1.0		1.0	mg/L		16-OCT-19	R4873462
Alkalinity, Total (as CaCO3)	<1.0		1.0	mg/L		16-OCT-19	R4873462
Ammonia, Total (as N)				,,		00 00T 40	
Ammonia as N	<0.0050		0.0050	mg/L		20-OCT-19	R4875988
Bromide in Water by IC (Low Level) Bromide (Br)	<0.050		0.050	mg/L		13-OCT-19	R4870507
Chloride in Water by IC							
Chloride (CI)	<0.50		0.50	mg/L		13-OCT-19	R4870507
Electrical Conductivity (EC) Conductivity (@ 25C)	<2.0		2.0	uS/cm		16-OCT-19	R4873462
Fluoride in Water by IC	<2.0		2.0	uo/ciii		10-001-19	114073402
Fluoride (F)	<0.020		0.020	mg/L		13-OCT-19	R4870507
Ion Balance Calculation							
Cation - Anion Balance	0.0			%		22-OCT-19 22-OCT-19	
Anion Sum Cation Sum	<0.10 <0.10			meq/L meq/L		22-OCT-19 22-OCT-19	
Ion Balance Calculation	<b>VO.10</b>			moq/L		22 001 10	
Ion Balance	0.0		-100	%		22-OCT-19	
Nitrate in Water by IC (Low Level)				,,		40 00T 40	
Nitrate (as N)	<0.0050		0.0050	mg/L		13-OCT-19	R4870507
Nitrite in Water by IC (Low Level) Nitrite (as N)	<0.0010		0.0010	mg/L		13-OCT-19	R4870507
Orthophosphate-Dissolved (as P)				Ŭ			
Orthophosphate-Dissolved (as P)	<0.0010		0.0010	mg/L		11-OCT-19	R4867889
Oxidation redution potential by elect. ORP	344		1000	mV		13-OCT-19	D4060404
Phosphorus (P)-Total	344		-1000	IIIV		13-001-19	R4868484
Phosphorus (P)-Total	<0.0020		0.0020	mg/L		13-OCT-19	R4868369
Sulfate in Water by IC							
Sulfate (SO4) Total Dissolved Solids	<0.30		0.30	mg/L		13-OCT-19	R4870507
Total Dissolved Solids Total Dissolved Solids	<10		10	mg/L		16-OCT-19	R4872764
Total Suspended Solids				3-			
Total Suspended Solids	<1.0		1.0	mg/L		16-OCT-19	R4872935
Turbidity Turbidity	<0.10		0.10	NTU		11-OCT-19	R4867979
pH	<0.10		0.10	INTO		11-001-19	174001919
pH	5.62		0.10	рН		16-OCT-19	R4873462

<sup>\*</sup> Refer to Referenced Information for Qualifiers (if any) and Methodology.

LINE CREEK OPERATION L2364506 CONTD....

**Reference Information** 

PAGE 7 of 9 Version: FINAL

Sample Parameter Qualifier Kev:

Qualifier	Description
В	Method Blank exceeds ALS DQO. Associated sample results which are < Limit of Reporting or > 5 times blank level are considered reliable.
DLHC	Detection Limit Raised: Dilution required due to high concentration of test analyte(s).
DTMF	Dissolved concentration exceeds total for field-filtered metals sample. Metallic contaminants may have been introduced to dissolved sample during field filtration.
DTSE	Dissolved Se concentration exceeds total. Positive bias on D-Se suspected due to signal enhancement from volatile selenium species Contact ALS if an alternative test to address this interference is needed.
DUP-H	Duplicate results outside ALS DQO, due to sample heterogeneity.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RRV	Reported Result Verified By Repeat Analysis

#### **Test Method References:**

ALS Test Code	Matrix	Test Description	Method Reference**			
ACIDITY-PCT-CL	Water	Acidity by Automatic Titration	APHA 2310 Acidity			

This analysis is carried out using procedures adapted from APHA Method 2310 "Acidity". Acidity is determined by potentiometric titration to a specified endpoint.

ALK-MAN-CL Water Alkalinity (Species) by Manual Titration APHA 2320 ALKALINITY

This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.

BE-D-L-CCMS-VA Water Diss. Be (low) in Water by CRC ICPMS APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

BE-T-L-CCMS-VA Water Total Be (Low) in Water by CRC ICPMS EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

BR-L-IC-N-CL Water Bromide in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

C-DIS-ORG-LOW-CL Water Dissolved Organic Carbon APHA 5310 B-Instrumental

This method is applicable to the analysis of ground water, wastewater, and surface water samples. The form detected depends upon sample pretreatment: Unfiltered sample = TC, 0.45um filtered = TDC. Samples are injected into a combustion tube containing an oxidation catalyst. The carrier gas containing the combustion product from the combustion tube flows through an inorganic carbon reactor vessel and is then sent through a halogen scrubber into a sample cell set in a non-dispersive infrared gas analyzer (NDIR) where carbon dioxide is detected. For total inorganic carbon and dissolved inorganic carbon, the sample is injected into an IC reactor vessel where only the IC component is decomposed to become carbon dioxide.

The peak area generated by the NDIR indicates the TC/TDC or TIC/DIC as applicable. The total organic carbon content of the sample is calculated by subtracting the TIC from the TC.

TOC = TC-TIC, DOC = TDC-DIC, Particulate = Total - Dissolved.

C-TOT-ORG-LOW-CL Water Total Organic Carbon APHA 5310 TOTAL ORGANIC CARBON (TOC)

This method is applicable to the analysis of ground water, wastewater, and surface water samples. The form detected depends upon sample pretreatment: Unfiltered sample = TC, 0.45um filtered = TDC. Samples are injected into a combustion tube containing an oxidation catalyst. The carrier gas containing the combustion product from the combustion tube flows through an inorganic carbon reactor vessel and is then sent through a halogen scrubber into a sample cell set in a non-dispersive infrared gas analyzer (NDIR) where carbon dioxide is detected. For total inorganic carbon and dissolved inorganic carbon, the sample is injected into an IC reactor vessel where only the IC component is decomposed to become carbon dioxide.

The peak area generated by the NDIR indicates the TC/TDC or TIC/DIC as applicable. The total organic carbon content of the sample is calculated by subtracting the TIC from the TC.

TOC = TC-TIC, DOC = TDC-DIC, Particulate = Total - Dissolved.

CL-IC-N-CL Water Chloride in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

EC-L-PCT-CL Water Electrical Conductivity (EC) APHA 2510B

Conductivity, also known as Electrical Conductivity (EC) or Specific Conductance, is measured by immersion of a conductivity cell with platinum electrodes into a water sample. Conductivity measurements are temperature-compensated to 25C.

F-IC-N-CL Water Fluoride in Water by IC EPA 300.1 (mod)

#### L2364506 CONTD....

PAGE 8 of 9 Version: FINAL

### **Reference Information**

**Test Method References:** 

ALS Test Code Matrix Test Description Method Reference\*\*

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

HARDNESS-CALC-VA Water Hardness APHA 2340B

Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO3 equivalents.

Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

HG-D-CVAA-VA Water Diss. Mercury in Water by CVAAS or CVAFS APHA 3030B/EPA 1631E (mod)

Water samples are filtered (0.45 um), preserved with hydrochloric acid, then undergo a cold-oxidation using bromine monochloride prior to reduction with stangely chloride, and analyzed by CVAAS or CVAES.

with stannous chloride, and analyzed by CVAAS or CVAFS.

HG-T-CVAA-VA Water Total Mercury in Water by CVAAS or CVAFS EPA 1631E (mod)

Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

IONBALANCE-BC-CL Water Ion Balance Calculation APHA 1030E

Cation Sum, Anion Sum, and Ion Balance (as % difference) are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Because all aqueous solutions are electrically neutral, the calculated ion balance (% difference of cations minus anions) should be near-zero.

Cation and Anion Sums are the total meq/L concentration of major cations and anions. Dissolved species are used where available. Minor ions are included where data is present. Ion Balance is calculated as:

Ion Balance (%) = [Cation Sum-Anion Sum] / [Cation Sum+Anion Sum]

MET-D-CCMS-VA Water Dissolved Metals in Water by CRC ICPMS APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

MET-T-CCMS-VA Water Total Metals in Water by CRC ICPMS EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

NH3-L-F-CL Water Ammonia, Total (as N) J. ENVIRON. MONIT., 2005, 7, 37-42, RSC

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.

NO2-L-IC-N-CL Water Nitrite in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

NO3-L-IC-N-CL Water Nitrate in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

ORP-CL Water Oxidation redution potential by elect. ASTM D1498

This analysis is carried out in accordance with the procedure described in the "ASTM" method D1498 "Oxidation-Reduction Potential of Water" published by the American Society for Testing and Materials (ASTM). Results are reported as observed oxidation-reduction potential of the platinum metal-reference electrode employed, in mV.

It is recommended that this analysis be conducted in the field.

P-T-L-COL-CL Water Phosphorus (P)-Total APHA 4500-P PHOSPHORUS

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after persulphate digestion of the sample.

PH-CL Water pH APHA 4500 H-Electrode

pH is determined in the laboratory using a pH electrode. All samples analyzed by this method for pH will have exceeded the 15 minute recommended hold time from time of sampling (field analysis is recommended for pH where highly accurate results are needed)

PO4-DO-L-COL-CL Water Orthophosphate-Dissolved (as P) APHA 4500-P PHOSPHORUS

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.

SO4-IC-N-CL Water Sulfate in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

### LINE CREEK OPERATION L2364506 CONTD....

PAGE 9 of 9 Version: FINAL

### Reference Information

**Test Method References:** 

TECKCOAL-IONBAL-CL

ALS Test Code Matrix Test Description Method Reference\*\*

SOLIDS-TDS-CL Water Total Dissolved Solids APHA 2540 C

A well-mixed sample is filtered through a glass fibre filter paper. The filtrate is then evaporated to dryness in a pre-weighed vial and dried at 180 – 2 °C. The increase in vial weight represents the total dissolved solids (TDS).

The increase in viai weight represents the total dissolved solids (103

Water

Cation Sum, Anion Sum, and Ion Balance (as % difference) are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Because all aqueous solutions are electrically neutral, the calculated ion balance (% difference of cations minus anions) should be near-zero.

Cation and Anion Sums are the total meq/L concentration of major cations and anions. Dissolved species are used where available. Minor ions are included where data is present. Ion Balance is calculated as:

Ion Balance (%) = [Cation Sum-Anion Sum] / [Cation Sum+Anion Sum]

TKN-L-F-CL Water Total Kjeldahl Nitrogen APHA 4500-NORG (TKN)

Ion Balance Calculation

This analysis is carried out using procedures adapted from APHA Method 4500-Norg D. "Block Digestion and Flow Injection Analysis". Total Kjeldahl Nitrogen is determined using block digestion followed by Flow-injection analysis with fluorescence detection.

TSS-L-CL Water Total Suspended Solids APHA 2540 D-Gravimetric

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total suspended solids (TSS) are determined by filtering a sample through a glass fibre filter, and by drying the filter at 104 deg. C.

TURBIDITY-CL Water Turbidity APHA 2130 B-Nephelometer

This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.

\*\* ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA
CL	ALS ENVIRONMENTAL - CALGARY, ALBERTA, CANADA

#### **Chain of Custody Numbers:**

20191010 LC GW

#### **GLOSSARY OF REPORT TERMS**

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.

mg/kg - milligrams per kilogram based on dry weight of sample

mg/kg wwt - milligrams per kilogram based on wet weight of sample

mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight

mg/L - unit of concentration based on volume, parts per million.

< - Less than.

D.L. - The reporting limit.

N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory. UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.



Workorder: L2364506

Report Date: 22-OCT-19

Page 1 of 16

Client:

TECK COAL LIMITED (LINE CREEK)

PO BOX 2003

SPARWOOD BC V0B 2G0

Contact: Carla Froyman Parker

Test	Matrix	Reference	Result Q	ualifier	Units	RPD	Limit	Analyzed
ACIDITY-PCT-CL	Water							
Batch R4873457 WG3193534-2 LCS								
Acidity (as CaCO3)			102.8		%		85-115	16-OCT-19
WG3193534-1 MB Acidity (as CaCO3)			1.4		mg/L		2	16-OCT-19
ALK-MAN-CL	Water							
Batch R4873462								
WG3193596-2 LCS Alkalinity, Total (as CaC	CO3)		101.5		%		85-115	16-OCT-19
WG3193596-1 MB Alkalinity, Total (as CaC	CO3)		<1.0		mg/L		1	16-OCT-19
BE-D-L-CCMS-VA	Water							
Batch R4872734								
WG3191229-2 LCS								
Beryllium (Be)-Dissolve	d		96.9		%		80-120	17-OCT-19
WG3191229-1 MB Beryllium (Be)-Dissolve	d	NP	<0.000020		mg/L		0.00002	17-OCT-19
BE-T-L-CCMS-VA	Water							
Batch R4874512								
WG3191741-3 DUP Beryllium (Be)-Total		<b>L2364506-2</b> <0.000020	<0.000020	RPD-NA	mg/L	N/A	20	17-OCT-19
WG3191741-2 LCS Beryllium (Be)-Total			94.9		%		80-120	17-OCT-19
WG3191741-1 MB Beryllium (Be)-Total			<0.000020		mg/L		0.00002	17-OCT-19
WG3191741-4 MS Beryllium (Be)-Total		L2364506-1	103.2		%		70-130	17-OCT-19
BR-L-IC-N-CL	Water							
Batch R4870507								
<b>WG3191321-10 LCS</b> Bromide (Br)			100.7		%		85-115	12-OCT-19
<b>WG3191321-14 LCS</b> Bromide (Br)			100.6		%		85-115	13-OCT-19
WG3191321-13 MB Bromide (Br)			<0.050		mg/L		0.05	13-OCT-19
WG3191321-9 MB Bromide (Br)			<0.050		mg/L		0.05	12-OCT-19
C-DIS-ORG-LOW-CL	Water		<del>-</del>		J		0.00	.2 331 10



Workorder: L2364506

Report Date: 22-OCT-19 Page 2 of 16

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
C-DIS-ORG-LOW-CL Batch R4874992	Water							
WG3196054-6 LCS Dissolved Organic Carbo	on		105.6		%		80-120	19-OCT-19
WG3196054-5 MB Dissolved Organic Carbo	on		<0.50		mg/L		0.5	19-OCT-19
C-TOT-ORG-LOW-CL	Water							
Batch R4874992 WG3196054-6 LCS Total Organic Carbon			106.4		%		80-120	19-OCT-19
WG3196054-5 MB Total Organic Carbon			<0.50		mg/L		0.5	19-OCT-19
CL-IC-N-CL	Water							
Batch R4870507 WG3191321-10 LCS								
Chloride (CI)			102.9		%		90-110	12-OCT-19
<b>WG3191321-14 LCS</b> Chloride (CI)			102.1		%		90-110	13-OCT-19
WG3191321-13 MB Chloride (CI)			<0.50		mg/L		0.5	13-OCT-19
<b>WG3191321-9 MB</b> Chloride (Cl)			<0.50		mg/L		0.5	12-OCT-19
EC-L-PCT-CL	Water							
Batch R4873462								
WG3193596-2 LCS Conductivity (@ 25C)			94.4		%		90-110	16-OCT-19
WG3193596-1 MB Conductivity (@ 25C)			<2.0		uS/cm		2	16-OCT-19
F-IC-N-CL	Water							
Batch R4870507								
<b>WG3191321-10 LCS</b> Fluoride (F)			107.7		%		90-110	12-OCT-19
<b>WG3191321-14 LCS</b> Fluoride (F)			108.8		%		90-110	13-OCT-19
<b>WG3191321-13 MB</b> Fluoride (F)			<0.020		mg/L		0.02	13-OCT-19
WG3191321-9 MB Fluoride (F)					-			
			<0.020		mg/L		0.02	12-OCT-19



Workorder: L2364506

Report Date: 22-OCT-19 Page 3 of 16

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
HG-D-CVAA-VA	Water							
Batch R4872448 WG3193123-2 LCS Mercury (Hg)-Dissolved			98.3		%		80-120	17-OCT-19
WG3193123-1 MB Mercury (Hg)-Dissolved			<0.00000	5C	mg/L		0.000005	17-OCT-19
HG-T-CVAA-VA	Water							
Batch R4872448 WG3193221-2 LCS Mercury (Hg)-Total			97.5		%		80-120	17-OCT-19
WG3193221-1 MB Mercury (Hg)-Total			<0.00000	50	mg/L		0.000005	17-OCT-19
MET-D-CCMS-VA	Water							
Batch R4872734								
WG3191229-2 LCS Aluminum (Al)-Dissolved	d		98.7		%		80-120	17-OCT-19
Antimony (Sb)-Dissolved	d		97.5		%		80-120	17-OCT-19
Arsenic (As)-Dissolved			97.6		%		80-120	17-OCT-19
Barium (Ba)-Dissolved			97.9		%		80-120	17-OCT-19
Bismuth (Bi)-Dissolved			100.9		%		80-120	17-OCT-19
Boron (B)-Dissolved			92.6		%		80-120	17-OCT-19
Cadmium (Cd)-Dissolve	ed		99.5		%		80-120	17-OCT-19
Calcium (Ca)-Dissolved			99.4		%		80-120	17-OCT-19
Chromium (Cr)-Dissolve	ed		97.0		%		80-120	17-OCT-19
Cobalt (Co)-Dissolved			99.3		%		80-120	17-OCT-19
Copper (Cu)-Dissolved			98.1		%		80-120	17-OCT-19
Iron (Fe)-Dissolved			97.9		%		80-120	17-OCT-19
Lead (Pb)-Dissolved			102.6		%		80-120	17-OCT-19
Lithium (Li)-Dissolved			95.9		%		80-120	17-OCT-19
Magnesium (Mg)-Dissol	ved		99.1		%		80-120	17-OCT-19
Manganese (Mn)-Dissol	ved		99.9		%		80-120	17-OCT-19
Molybdenum (Mo)-Disso	olved		99.7		%		80-120	17-OCT-19
Nickel (Ni)-Dissolved			98.1		%		80-120	17-OCT-19
Potassium (K)-Dissolved	d		97.6		%		80-120	17-OCT-19
Selenium (Se)-Dissolved	d		103.4		%		80-120	17-OCT-19
Silicon (Si)-Dissolved			97.1		%		60-140	17-OCT-19
Silver (Ag)-Dissolved			96.2		%		80-120	17-OCT-19
Sodium (Na)-Dissolved			102.2		%		80-120	17-OCT-19



Workorder: L2364506

Report Date: 22-OCT-19 Page 4 of 16

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA	Water							
Batch R4872734	4							
WG3191229-2 LCS								
Strontium (Sr)-Dissolve			99.95		%		80-120	17-OCT-19
Thallium (TI)-Dissolved	d		101.4		%		80-120	17-OCT-19
Tin (Sn)-Dissolved			98.9		%		80-120	17-OCT-19
Titanium (Ti)-Dissolved			97.3		%		80-120	17-OCT-19
Uranium (U)-Dissolved			101.2		%		80-120	17-OCT-19
Vanadium (V)-Dissolve	ed		98.9		%		80-120	17-OCT-19
Zinc (Zn)-Dissolved			97.8		%		80-120	17-OCT-19
WG3191229-1 MB Aluminum (Al)-Dissolve	ed	NP	<0.0010		mg/L		0.001	17-OCT-19
Antimony (Sb)-Dissolve			<0.0010	<b>\</b>	mg/L		0.001	17-OCT-19
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	17-OCT-19
Barium (Ba)-Dissolved			<0.00010		mg/L		0.0001	17-OCT-19
Bismuth (Bi)-Dissolved			<0.00005		mg/L		0.0001	17-OCT-19
Boron (B)-Dissolved			<0.010		mg/L		0.01	17-OCT-19
Cadmium (Cd)-Dissolv	/ed		<0.00000	<b>15</b> C	mg/L		0.000005	17-OCT-19
Calcium (Ca)-Dissolve	ed		<0.050		mg/L		0.05	17-OCT-19
Chromium (Cr)-Dissolv	ved		<0.00010	)	mg/L		0.0001	17-OCT-19
Cobalt (Co)-Dissolved			<0.00010	)	mg/L		0.0001	17-OCT-19
Copper (Cu)-Dissolved	d		<0.00020	)	mg/L		0.0002	17-OCT-19
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	17-OCT-19
Lead (Pb)-Dissolved			<0.00005	0	mg/L		0.00005	17-OCT-19
Lithium (Li)-Dissolved			<0.0010		mg/L		0.001	17-OCT-19
Magnesium (Mg)-Disso	olved		<0.0050		mg/L		0.005	17-OCT-19
Manganese (Mn)-Disse	olved		<0.00010	)	mg/L		0.0001	17-OCT-19
Molybdenum (Mo)-Diss	solved		<0.00005	60	mg/L		0.00005	17-OCT-19
Nickel (Ni)-Dissolved			<0.00050	)	mg/L		0.0005	17-OCT-19
Potassium (K)-Dissolve	ed		< 0.050		mg/L		0.05	17-OCT-19
Selenium (Se)-Dissolve	ed		<0.00005	0	mg/L		0.00005	17-OCT-19
Silicon (Si)-Dissolved			< 0.050		mg/L		0.05	17-OCT-19
Silver (Ag)-Dissolved			<0.00001	0	mg/L		0.00001	17-OCT-19
Sodium (Na)-Dissolved	d		< 0.050		mg/L		0.05	17-OCT-19
Strontium (Sr)-Dissolve	ed		<0.00020	)	mg/L		0.0002	17-OCT-19
Thallium (TI)-Dissolved	d		<0.00001	0	mg/L		0.00001	17-OCT-19
Tin (Sn)-Dissolved			<0.00010	)	mg/L		0.0001	17-OCT-19



Workorder: L2364506

Report Date: 22-OCT-19

Page 5 of 16

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA	Water							
Batch R4872734								
WG3191229-1 MB		NP			,,			
Titanium (Ti)-Dissolved			<0.00030		mg/L		0.0003	17-OCT-19
Uranium (U)-Dissolved			<0.00001		mg/L		0.00001	17-OCT-19
Vanadium (V)-Dissolved	d		<0.00050	)	mg/L		0.0005	17-OCT-19
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	17-OCT-19
Batch R4874176								
WG3194439-2 LCS Aluminum (Al)-Dissolve	d		106.4		%		00.400	40 OOT 40
Antimony (Sb)-Dissolve			106.4		%		80-120	18-OCT-19
, ,	u				%		80-120	18-OCT-19
Arsenic (As)-Dissolved			106.8 107.7				80-120	18-OCT-19
Barium (Ba)-Dissolved					%		80-120	18-OCT-19
Bismuth (Bi)-Dissolved			103.6 102.5		%		80-120	18-OCT-19
Boron (B)-Dissolved	a d		102.5		%		80-120	18-OCT-19
Cadmium (Cd)-Dissolve					%		80-120	18-OCT-19
Calcium (Ca)-Dissolved			101.0 108.1				80-120	18-OCT-19
Chromium (Cr)-Dissolved	eu				%		80-120	18-OCT-19
Cobalt (Co)-Dissolved			106.2				80-120	18-OCT-19
Copper (Cu)-Dissolved			104.8 103.1		%		80-120	18-OCT-19
Iron (Fe)-Dissolved							80-120	18-OCT-19
Lead (Pb)-Dissolved			103.4		%		80-120	18-OCT-19
Lithium (Li)-Dissolved	L I		99.8		%		80-120	18-OCT-19
Magnesium (Mg)-Disso			108.4		%		80-120	18-OCT-19
Manganese (Mn)-Disso			106.6		%		80-120	18-OCT-19
Molybdenum (Mo)-Diss	oivea		108.8		%		80-120	18-OCT-19
Nickel (Ni)-Dissolved			108.9		%		80-120	18-OCT-19
Potassium (K)-Dissolve			104.8		%		80-120	18-OCT-19
Selenium (Se)-Dissolve	d		105.2		%		80-120	18-OCT-19
Silicon (Si)-Dissolved			106.3		%		60-140	18-OCT-19
Silver (Ag)-Dissolved			103.6		%		80-120	18-OCT-19
Sodium (Na)-Dissolved			106.8		%		80-120	18-OCT-19
Strontium (Sr)-Dissolve			103.8		%		80-120	18-OCT-19
Thallium (TI)-Dissolved			102.4		%		80-120	18-OCT-19
Tin (Sn)-Dissolved			105.9		%		80-120	18-OCT-19
Titanium (Ti)-Dissolved			102.6		%		80-120	18-OCT-19
Uranium (U)-Dissolved			104.0		%		80-120	18-OCT-19

Workorder: L2364506

Report Date: 22-OCT-19

Page 6 of 16

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA	Water							
Batch R4874	176							
WG3194439-2 LC Vanadium (V)-Disso	-		108.8		%		00.400	40 OOT 40
			106.6		%		80-120	18-OCT-19
Zinc (Zn)-Dissolved		ND	100.5		70		80-120	18-OCT-19
WG3194439-1 MI Aluminum (Al)-Disse		NP	<0.0010		mg/L		0.001	18-OCT-19
Antimony (Sb)-Disse			<0.00010		mg/L		0.0001	18-OCT-19
Arsenic (As)-Dissolv			<0.00010		mg/L		0.0001	18-OCT-19
Barium (Ba)-Dissolv	/ed		<0.00010		mg/L		0.0001	18-OCT-19
Bismuth (Bi)-Dissolv	ved		<0.00005	0	mg/L		0.00005	18-OCT-19
Boron (B)-Dissolved	i		<0.010		mg/L		0.01	18-OCT-19
Cadmium (Cd)-Diss	solved		<0.00000	<b>5</b> C	mg/L		0.000005	18-OCT-19
Calcium (Ca)-Disso	lved		< 0.050		mg/L		0.05	18-OCT-19
Chromium (Cr)-Diss	solved		<0.00010		mg/L		0.0001	18-OCT-19
Cobalt (Co)-Dissolv	ed		<0.00010		mg/L		0.0001	18-OCT-19
Copper (Cu)-Dissol	ved		<0.00020		mg/L		0.0002	18-OCT-19
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	18-OCT-19
Lead (Pb)-Dissolved	d		<0.00005	0	mg/L		0.00005	18-OCT-19
Lithium (Li)-Dissolve	ed		<0.0010		mg/L		0.001	18-OCT-19
Magnesium (Mg)-Di	issolved		<0.0050		mg/L		0.005	18-OCT-19
Manganese (Mn)-Di	issolved		<0.00010		mg/L		0.0001	18-OCT-19
Molybdenum (Mo)-	Dissolved		<0.00005	0	mg/L		0.00005	18-OCT-19
Nickel (Ni)-Dissolve	d		<0.00050		mg/L		0.0005	18-OCT-19
Potassium (K)-Disse	olved		< 0.050		mg/L		0.05	18-OCT-19
Selenium (Se)-Disse	olved		< 0.00005	0	mg/L		0.00005	18-OCT-19
Silicon (Si)-Dissolve	ed		< 0.050		mg/L		0.05	18-OCT-19
Silver (Ag)-Dissolve	d		<0.00001	0	mg/L		0.00001	18-OCT-19
Sodium (Na)-Dissol	ved		< 0.050		mg/L		0.05	18-OCT-19
Strontium (Sr)-Disso	olved		<0.00020		mg/L		0.0002	18-OCT-19
Thallium (TI)-Dissol	ved		<0.00001	0	mg/L		0.00001	18-OCT-19
Tin (Sn)-Dissolved			<0.00010		mg/L		0.0001	18-OCT-19
Titanium (Ti)-Dissol	ved		<0.00030		mg/L		0.0003	18-OCT-19
Uranium (U)-Dissolv	ved		<0.00001	0	mg/L		0.00001	18-OCT-19
Vanadium (V)-Disso	olved		<0.00050		mg/L		0.0005	18-OCT-19
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	18-OCT-19

MET-T-CCMS-VA

Water



Workorder: L2364506 Report Date: 22-OCT-19 Page 7 of 16

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-VA	Water							
Batch R4874512								
WG3191741-3 DUP		L2364506-2	0.0000					
Aluminum (Al)-Total		<0.0030	<0.0030	RPD-NA	mg/L	N/A	20	17-OCT-19
Antimony (Sb)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	17-OCT-19
Arsenic (As)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	17-OCT-19
Barium (Ba)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	17-OCT-19
Bismuth (Bi)-Total		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	17-OCT-19
Boron (B)-Total		<0.010	<0.010	RPD-NA	mg/L	N/A	20	17-OCT-19
Cadmium (Cd)-Total		<0.000050	<0.0000050	RPD-NA	mg/L	N/A	20	17-OCT-19
Calcium (Ca)-Total		<0.050	< 0.050	RPD-NA	mg/L	N/A	20	17-OCT-19
Chromium (Cr)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	17-OCT-19
Cobalt (Co)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	17-OCT-19
Copper (Cu)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	17-OCT-19
Iron (Fe)-Total		<0.010	<0.010	RPD-NA	mg/L	N/A	20	17-OCT-19
Lead (Pb)-Total		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	17-OCT-19
Lithium (Li)-Total		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	17-OCT-19
Magnesium (Mg)-Total		<0.10	<0.10	RPD-NA	mg/L	N/A	20	17-OCT-19
Molybdenum (Mo)-Total		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	17-OCT-19
Nickel (Ni)-Total		< 0.00050	<0.00050	RPD-NA	mg/L	N/A	20	17-OCT-19
Potassium (K)-Total		< 0.050	<0.050	RPD-NA	mg/L	N/A	20	17-OCT-19
Selenium (Se)-Total		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	17-OCT-19
Silicon (Si)-Total		<0.10	<0.10	RPD-NA	mg/L	N/A	20	17-OCT-19
Silver (Ag)-Total		<0.00010	<0.000010	RPD-NA	mg/L	N/A	20	17-OCT-19
Sodium (Na)-Total		<0.050	<0.050	RPD-NA	mg/L	N/A	20	17-OCT-19
Strontium (Sr)-Total		<0.00020	<0.00020	RPD-NA	mg/L	N/A	20	17-OCT-19
Thallium (TI)-Total		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	17-OCT-19
Titanium (Ti)-Total		<0.010	<0.010	RPD-NA	mg/L	N/A	20	17-OCT-19
Uranium (U)-Total		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	17-OCT-19
Vanadium (V)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	17-OCT-19
Zinc (Zn)-Total		< 0.0030	<0.0030	RPD-NA	mg/L	N/A	20	17-OCT-19
WG3191741-2 LCS Aluminum (Al)-Total			108.5		%			
Antimony (Sb)-Total			99.6		%		80-120	17-OCT-19
					%		80-120	17-OCT-19
Arsenic (As)-Total			99.5				80-120	17-OCT-19
Barium (Ba)-Total			98.6		%		80-120	17-OCT-19
Bismuth (Bi)-Total			96.0		%		80-120	17-OCT-19



Workorder: L2364506

Report Date: 22-OCT-19 Page 8 of 16

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-VA	Water							
Batch R4874512								
WG3191741-2 LCS			22.2		04			
Boron (B)-Total			96.3		%		80-120	17-OCT-19
Cadmium (Cd)-Total			99.0		%		80-120	17-OCT-19
Calcium (Ca)-Total			96.8		%		80-120	17-OCT-19
Chromium (Cr)-Total			101.4		%		80-120	17-OCT-19
Cobalt (Co)-Total			100.9		%		80-120	17-OCT-19
Copper (Cu)-Total			98.9		%		80-120	17-OCT-19
Iron (Fe)-Total			98.9		%		80-120	17-OCT-19
Lead (Pb)-Total			96.9		%		80-120	17-OCT-19
Lithium (Li)-Total			95.9		%		80-120	17-OCT-19
Magnesium (Mg)-Total			101.5		%		80-120	17-OCT-19
Manganese (Mn)-Total			103.9		%		80-120	17-OCT-19
Molybdenum (Mo)-Total			98.0		%		80-120	17-OCT-19
Nickel (Ni)-Total			101.0		%		80-120	17-OCT-19
Potassium (K)-Total			103.2		%		80-120	17-OCT-19
Selenium (Se)-Total			97.5		%		80-120	17-OCT-19
Silicon (Si)-Total			94.9		%		80-120	17-OCT-19
Silver (Ag)-Total			96.8		%		80-120	17-OCT-19
Sodium (Na)-Total			102.4		%		80-120	17-OCT-19
Strontium (Sr)-Total			99.3		%		80-120	17-OCT-19
Thallium (TI)-Total			96.2		%		80-120	17-OCT-19
Tin (Sn)-Total			98.9		%		80-120	17-OCT-19
Titanium (Ti)-Total			97.6		%		80-120	17-OCT-19
Uranium (U)-Total			99.98		%		80-120	17-OCT-19
Vanadium (V)-Total			102.2		%		80-120	17-OCT-19
Zinc (Zn)-Total			98.5		%		80-120	17-OCT-19
WG3191741-1 MB								
Aluminum (Al)-Total			<0.0030		mg/L		0.003	17-OCT-19
Antimony (Sb)-Total			<0.00010		mg/L		0.0001	17-OCT-19
Arsenic (As)-Total			<0.00010		mg/L		0.0001	17-OCT-19
Barium (Ba)-Total			<0.00010		mg/L		0.0001	17-OCT-19
Bismuth (Bi)-Total			<0.000050	1	mg/L		0.00005	17-OCT-19
Boron (B)-Total			<0.010		mg/L		0.01	17-OCT-19
Cadmium (Cd)-Total			<0.000005	iC	mg/L		0.000005	17-OCT-19
Calcium (Ca)-Total			<0.050		mg/L			



Workorder: L2364506

Report Date: 22-OCT-19 Page 9 of 16

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-VA	Water							
Batch R4874512								
WG3191741-1 MB Chromium (Cr)-Total			0.00040		e./I		0.0004	
,			<0.00010		mg/L		0.0001	17-OCT-19
Cobalt (Co)-Total			<0.00010		mg/L		0.0001	17-OCT-19
Copper (Cu)-Total Iron (Fe)-Total			<0.00050		mg/L		0.0005	17-OCT-19
,			<0.010		mg/L		0.01	17-OCT-19
Lead (Pb)-Total			<0.000050	1	mg/L		0.00005	17-OCT-19
Lithium (Li)-Total			<0.0010		mg/L		0.001	17-OCT-19
Magnesium (Mg)-Total			<0.0050	_	mg/L		0.005	17-OCT-19
Manganese (Mn)-Total			0.00018	В	mg/L		0.0001	17-OCT-19
Molybdenum (Mo)-Total			<0.000050		mg/L		0.00005	17-OCT-19
Nickel (Ni)-Total			<0.00050		mg/L		0.0005	17-OCT-19
Potassium (K)-Total			<0.050		mg/L		0.05	17-OCT-19
Selenium (Se)-Total			<0.000050		mg/L		0.00005	17-OCT-19
Silicon (Si)-Total			<0.10		mg/L		0.1	17-OCT-19
Silver (Ag)-Total			<0.000010		mg/L		0.00001	17-OCT-19
Sodium (Na)-Total			<0.050		mg/L		0.05	17-OCT-19
Strontium (Sr)-Total			<0.00020		mg/L		0.0002	17-OCT-19
Thallium (TI)-Total			<0.000010		mg/L		0.00001	17-OCT-19
Tin (Sn)-Total			<0.00010		mg/L		0.0001	17-OCT-19
Titanium (Ti)-Total			<0.00030		mg/L		0.0003	17-OCT-19
Uranium (U)-Total			<0.000010	1	mg/L		0.00001	17-OCT-19
Vanadium (V)-Total			<0.00050		mg/L		0.0005	17-OCT-19
Zinc (Zn)-Total			<0.0030		mg/L		0.003	17-OCT-19
WG3191741-4 MS		L2364506-1	108.8		%		70.400	47 OOT 40
Aluminum (Al)-Total			97.0		% %		70-130	17-OCT-19
Antimony (Sb)-Total					%		70-130	17-OCT-19
Arsenic (As)-Total			102.9	MS-B			70-130	17-OCT-19
Barium (Ba)-Total			N/A	IVIO-D	%		-	17-OCT-19
Bismuth (Bi)-Total			90.1	140.5	%		70-130	17-OCT-19
Boron (B)-Total			N/A	MS-B	%		-	17-OCT-19
Cadmium (Cd)-Total			96.7		%		70-130	17-OCT-19
Calcium (Ca)-Total			N/A	MS-B	%		-	17-OCT-19
Chromium (Cr)-Total			102.3		%		70-130	17-OCT-19
Cobalt (Co)-Total			101.1		%		70-130	17-OCT-19
Copper (Cu)-Total			96.6		%		70-130	17-OCT-19



Workorder: L2364506

Report Date: 22-OCT-19 Page 10 of 16

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-VA	Water							
Batch R4874512								
WG3191741-4 MS		L2364506-1	00.7		0.4			
Iron (Fe)-Total			98.7		%		70-130	17-OCT-19
Lead (Pb)-Total			90.6		%		70-130	17-OCT-19
Lithium (Li)-Total			N/A	MS-B	%		-	17-OCT-19
Magnesium (Mg)-Total			N/A	MS-B	%		-	17-OCT-19
Manganese (Mn)-Total			N/A	MS-B	%		-	17-OCT-19
Molybdenum (Mo)-Tota	I		101.6		%		70-130	17-OCT-19
Nickel (Ni)-Total			99.2		%		70-130	17-OCT-19
Potassium (K)-Total			104.7		%		70-130	17-OCT-19
Selenium (Se)-Total			99.0		%		70-130	17-OCT-19
Silicon (Si)-Total			96.1		%		70-130	17-OCT-19
Silver (Ag)-Total			95.8		%		70-130	17-OCT-19
Sodium (Na)-Total			N/A	MS-B	%		-	17-OCT-19
Strontium (Sr)-Total			N/A	MS-B	%		-	17-OCT-19
Thallium (TI)-Total			91.3		%		70-130	17-OCT-19
Tin (Sn)-Total			97.9		%		70-130	17-OCT-19
Titanium (Ti)-Total			104.6		%		70-130	17-OCT-19
Uranium (U)-Total			96.0		%		70-130	17-OCT-19
Vanadium (V)-Total			107.0		%		70-130	17-OCT-19
Zinc (Zn)-Total			97.5		%		70-130	17-OCT-19
Batch R4876507								
WG3195649-2 LCS								
Aluminum (Al)-Total			98.9		%		80-120	19-OCT-19
Antimony (Sb)-Total			103.1		%		80-120	19-OCT-19
Arsenic (As)-Total			96.3		%		80-120	19-OCT-19
Barium (Ba)-Total			97.1		%		80-120	19-OCT-19
Bismuth (Bi)-Total			97.1		%		80-120	19-OCT-19
Boron (B)-Total			92.8		%		80-120	19-OCT-19
Cadmium (Cd)-Total			96.9		%		80-120	19-OCT-19
Calcium (Ca)-Total			100.0		%		80-120	19-OCT-19
Chromium (Cr)-Total			96.5		%		80-120	19-OCT-19
Cobalt (Co)-Total			98.1		%		80-120	19-OCT-19
Copper (Cu)-Total			96.3		%		80-120	19-OCT-19
Iron (Fe)-Total			96.4		%		80-120	19-OCT-19
Lead (Pb)-Total			97.7		%		80-120	19-OCT-19



Workorder: L2364506 Report Date: 22-OCT-19 Page 11 of 16

est	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-VA	Water							
Batch R4876507								
WG3195649-2 LCS			04.7		0/			
Lithium (Li)-Total			91.7		%		80-120	19-OCT-19
Magnesium (Mg)-Total			97.0		%		80-120	19-OCT-19
Manganese (Mn)-Total			98.6		%		80-120	19-OCT-19
Molybdenum (Mo)-Total			100.1		%		80-120	19-OCT-19
Nickel (Ni)-Total			99.2		%		80-120	19-OCT-19
Potassium (K)-Total			97.9		%		80-120	19-OCT-19
Selenium (Se)-Total			99.9		%		80-120	19-OCT-19
Silicon (Si)-Total			99.4		%		80-120	19-OCT-19
Silver (Ag)-Total			96.1		%		80-120	19-OCT-19
Sodium (Na)-Total			104.9		%		80-120	19-OCT-19
Strontium (Sr)-Total			106.5		%		80-120	19-OCT-19
Thallium (Tl)-Total			97.4		%		80-120	19-OCT-19
Tin (Sn)-Total			98.9		%		80-120	19-OCT-19
Titanium (Ti)-Total			93.0		%		80-120	19-OCT-19
Uranium (U)-Total			97.1		%		80-120	19-OCT-19
Vanadium (V)-Total			99.3		%		80-120	19-OCT-19
Zinc (Zn)-Total			94.3		%		80-120	19-OCT-19
WG3195649-1 MB								
Aluminum (Al)-Total			<0.0030		mg/L		0.003	19-OCT-19
Antimony (Sb)-Total			<0.00010		mg/L		0.0001	19-OCT-19
Arsenic (As)-Total			<0.00010		mg/L		0.0001	19-OCT-19
Barium (Ba)-Total			<0.00010		mg/L		0.0001	19-OCT-19
Bismuth (Bi)-Total			<0.000050		mg/L		0.00005	19-OCT-19
Boron (B)-Total			<0.010		mg/L		0.01	19-OCT-19
Cadmium (Cd)-Total			<0.000005	С	mg/L		0.000005	19-OCT-19
Calcium (Ca)-Total			< 0.050		mg/L		0.05	19-OCT-19
Chromium (Cr)-Total			<0.00010		mg/L		0.0001	19-OCT-19
Cobalt (Co)-Total			<0.00010		mg/L		0.0001	19-OCT-19
Copper (Cu)-Total			<0.00050		mg/L		0.0005	19-OCT-19
Iron (Fe)-Total			<0.010		mg/L		0.01	19-OCT-19
Lead (Pb)-Total			<0.000050		mg/L		0.00005	19-OCT-19
Lithium (Li)-Total			<0.0010		mg/L		0.001	19-OCT-19
Magnesium (Mg)-Total			<0.0050		mg/L		0.005	19-OCT-19
Manganese (Mn)-Total			<0.00010		mg/L		0.0001	19-OCT-19



Workorder: L2364506

Report Date: 22-OCT-19

Page 12 of 16

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-VA	Water							
Batch R4876507								
WG3195649-1 MB Molybdenum (Mo)-Total			<0.000050	1	mg/L		0.00005	19-OCT-19
Nickel (Ni)-Total			<0.00050		mg/L		0.0005	19-OCT-19
Potassium (K)-Total			< 0.050		mg/L		0.05	19-OCT-19
Selenium (Se)-Total			<0.000050	1	mg/L		0.00005	19-OCT-19
Silicon (Si)-Total			<0.10		mg/L		0.1	19-OCT-19
Silver (Ag)-Total			<0.000010	)	mg/L		0.00001	19-OCT-19
Sodium (Na)-Total			< 0.050		mg/L		0.05	19-OCT-19
Strontium (Sr)-Total			<0.00020		mg/L		0.0002	19-OCT-19
Thallium (TI)-Total			<0.000010	1	mg/L		0.00001	19-OCT-19
Tin (Sn)-Total			<0.00010		mg/L		0.0001	19-OCT-19
Titanium (Ti)-Total			<0.00030		mg/L		0.0003	19-OCT-19
Uranium (U)-Total			<0.000010	)	mg/L		0.00001	19-OCT-19
Vanadium (V)-Total			<0.00050		mg/L		0.0005	19-OCT-19
Zinc (Zn)-Total			<0.0030		mg/L		0.003	19-OCT-19
NH3-L-F-CL	Water							
Batch R4875988								
WG3196193-22 LCS Ammonia as N			99.8		%		85-115	20-OCT-19
WG3196193-21 MB Ammonia as N			<0.0050		mg/L		0.005	20-OCT-19
NO2-L-IC-N-CL	Water							
Batch R4870507								
WG3191321-10 LCS Nitrite (as N)			104.3		%		90-110	12-OCT-19
<b>WG3191321-14 LCS</b> Nitrite (as N)			103.3		%		90-110	13-OCT-19
WG3191321-13 MB Nitrite (as N)			<0.0010		mg/L		0.001	13-OCT-19
<b>WG3191321-9 MB</b> Nitrite (as N)			<0.0010		mg/L		0.001	12-OCT-19
NO3-L-IC-N-CL	Water							
Batch R4870507								
WG3191321-10 LCS Nitrate (as N)			102.6		%		90-110	12-OCT-19
WG3191321-14 LCS								



Workorder: L2364506

Report Date: 22-OCT-19

Page 13 of 16

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
NO3-L-IC-N-CL	Water							
Batch R4870507 WG3191321-14 LCS Nitrate (as N)			102.0		%		90-110	13-OCT-19
<b>WG3191321-13 MB</b> Nitrate (as N)			<0.0050		mg/L		0.005	13-OCT-19
<b>WG3191321-9 MB</b> Nitrate (as N)			<0.0050		mg/L		0.005	12-OCT-19
ORP-CL	Water							
Batch R4868484								
<b>WG3190461-1 CRM</b> ORP		CL-ORP	219		mV		210-230	13-OCT-19
P-T-L-COL-CL	Water							
Batch R4868369 WG3190258-10 LCS Phosphorus (P)-Total			100.5		%		80-120	13-OCT-19
WG3190258-9 MB Phosphorus (P)-Total			<0.0020		mg/L		0.002	13-OCT-19
PH-CL	Water							
Batch R4873462 WG3193596-2 LCS pH			7.02		рН		6.9-7.1	16-OCT-19
PO4-DO-L-COL-CL	Water							
Batch R4867889								
WG3189621-18 LCS Orthophosphate-Dissolv	red (as P)		102.8		%		80-120	11-OCT-19
WG3189621-17 MB Orthophosphate-Dissolv	red (as P)		<0.0010		mg/L		0.001	11-OCT-19
SO4-IC-N-CL	Water							
Batch R4870507								
<b>WG3191321-10 LCS</b> Sulfate (SO4)			103.0		%		90-110	12-OCT-19
<b>WG3191321-14 LCS</b> Sulfate (SO4)			102.2		%		90-110	13-OCT-19
<b>WG3191321-13 MB</b> Sulfate (SO4)			<0.30		mg/L		0.3	13-OCT-19
WG3191321-9 MB								



Workorder: L2364506

Report Date: 22-OCT-19 Page 14 of 16

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
SO4-IC-N-CL Batch R4870507	Water							
<b>WG3191321-9 MB</b> Sulfate (SO4)			<0.30		mg/L		0.3	12-OCT-19
SOLIDS-TDS-CL	Water							
Batch R4872764 WG3192050-8 LCS Total Dissolved Solids			101.8		%		85-115	16-OCT-19
WG3192050-7 MB								10-001-13
Total Dissolved Solids			<10		mg/L		10	16-OCT-19
TKN-L-F-CL	Water							
Batch R4872902 WG3193743-10 LCS Total Kjeldahl Nitrogen			95.9		%		75-125	17-OCT-19
WG3193743-9 MB Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	17-OCT-19
TSS-L-CL	Water							
Batch R4872935 WG3192023-6 LCS			05.0		0/			
Total Suspended Solids WG3192023-5 MB			95.9		%		85-115	16-OCT-19
Total Suspended Solids			<1.0		mg/L		1	16-OCT-19
TURBIDITY-CL	Water							
Batch R4867979								
WG3189524-14 LCS Turbidity			96.5		%		85-115	11-OCT-19
WG3189524-17 LCS Turbidity			96.0		%		85-115	11-OCT-19
WG3189524-13 MB Turbidity			<0.10		NTU		0.1	11-OCT-19
WG3189524-16 MB Turbidity			<0.10		NTU		0.1	11-OCT-19

Workorder: L2364506 Report Date: 22-OCT-19 Page 15 of 16

### Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

### **Sample Parameter Qualifier Definitions:**

Qualifier	Description
В	Method Blank exceeds ALS DQO. Associated sample results which are < Limit of Reporting or > 5 times blank level are considered reliable.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

Workorder: L2364506 Report Date: 22-OCT-19 Page 16 of 16

### **Hold Time Exceedances:**

	Sample						-
ALS Product Description	ID	Sampling Date	Date Processed	Rec. HT	Actual HT	Units	Qualifier
Physical Tests							
Oxidation redution potential	by elect.						
	1	10-OCT-19 13:25	13-OCT-19 09:15	0.25	68	hours	EHTR-FM
	2	10-OCT-19 13:25	13-OCT-19 09:15	0.25	68	hours	EHTR-FM
pН							
	1	10-OCT-19 13:25	16-OCT-19 13:00	0.25	144	hours	EHTR-FM
	2	10-OCT-19 13:25	16-OCT-19 13:00	0.25	144	hours	EHTR-FM

### Legend & Qualifier Definitions:

EHTR-FM: Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended.

EHTR: Exceeded ALS recommended hold time prior to sample receipt.

EHTL: Exceeded ALS recommended hold time prior to analysis. Sample was received less than 24 hours prior to expiry.

EHT: Exceeded ALS recommended hold time prior to analysis.

Rec. HT: ALS recommended hold time (see units).

### Notes\*:

Where actual sampling date is not provided to ALS, the date (& time) of receipt is used for calculation purposes. Where actual sampling time is not provided to ALS, the earlier of 12 noon on the sampling date or the time (& date) of receipt is used for calculation purposes. Samples for L2364506 were received on 11-OCT-19 08:40.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against predetermined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

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TECK COAL LIMITED (LINE CREEK)

ATTN: Carla Froyman Parker

PO BOX 2003

SPARWOOD BC VOB 2G0

Date Received: 24-OCT-19

Report Date: 31-OCT-19 16:16 (MT)

Version: FINAL

Client Phone: 250-425-3196

# Certificate of Analysis

Lab Work Order #: L2371413
Project P.O. #: VP000608129

Job Reference: LINE CREEK OPERATION
C of C Numbers: 20191023 DC GW

Legal Site Desc:



Lyudmyla Shvets, B.Sc. Account Manager

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L2371413 CONTD.... PAGE 2 of 9 Version: FINAL

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2371413-1 LC_PIZDC1404D_WG_Q4-2019_NP							
Sampled By: KC/DT on 23-OCT-19 @ 12:42							
Matrix: WG Miscellaneous Parameters							
	4.54		0.50	/1		00 OCT 40	D 4000000
Dissolved Organic Carbon	1.54	DIM	0.50	mg/L		29-OCT-19	R4889000
Total Kjeldahl Nitrogen	2.93	DLM	0.10	mg/L		25-OCT-19	R4884311
Total Organic Carbon	1.65		0.50	mg/L		28-OCT-19	R4889000
Dissolved Metals in Water							
Diss. Be (low) in Water by CRC ICPMS	0.000		0.000	/1	25 OCT 10	26-OCT-19	D 4000000
Beryllium (Be)-Dissolved Dissolved Metals Filtration Location	<0.020 FIELD		0.020	ug/L	25-OCT-19	25-OCT-19 25-OCT-19	R4888233 R4884851
	FIELD					25-001-19	K4004001
Diss. Mercury in Water by CVAAS or CVAFS Mercury (Hg)-Dissolved	<0.000050		0.0000050	mg/L	28-OCT-19	29-OCT-19	R4889334
Dissolved Mercury Filtration Location	FIELD		0.0000000	mg/L	20 001 13	28-OCT-19	R4888405
Dissolved Metals in Water by CRC ICPMS	TILLD					20 001 10	114000403
Dissolved Metals III Water by CRC ICF MS  Dissolved Metals Filtration Location	FIELD					25-OCT-19	R4884851
Aluminum (AI)-Dissolved	<0.0030		0.0030	mg/L	25-OCT-19	26-OCT-19	R4888233
Antimony (Sb)-Dissolved	<0.00010		0.00010	mg/L	25-OCT-19	26-OCT-19	R4888233
Arsenic (As)-Dissolved	0.00238		0.00010	mg/L	25-OCT-19	26-OCT-19	R4888233
Barium (Ba)-Dissolved	4.00		0.00010	mg/L	25-OCT-19	26-OCT-19	R4888233
Bismuth (Bi)-Dissolved	<0.000050		0.000050	mg/L	25-OCT-19	26-OCT-19	R4888233
Boron (B)-Dissolved	0.023		0.010	mg/L	25-OCT-19	26-OCT-19	R4888233
Cadmium (Cd)-Dissolved	<0.020	DLM	0.020	ug/L	25-OCT-19	26-OCT-19	R4888233
Calcium (Ca)-Dissolved	56.2		0.050	mg/L	25-OCT-19	26-OCT-19	R4888233
Chromium (Cr)-Dissolved	<0.00010		0.00010	mg/L	25-OCT-19	26-OCT-19	R4888233
Cobalt (Co)-Dissolved	0.13		0.10	ug/L	25-OCT-19	26-OCT-19	R4888233
Copper (Cu)-Dissolved	0.00080		0.00020	mg/L	25-OCT-19	26-OCT-19	R4888233
Iron (Fe)-Dissolved	1.87		0.010	mg/L	25-OCT-19	26-OCT-19	R4888233
Lead (Pb)-Dissolved	<0.000050		0.000050	mg/L	25-OCT-19	26-OCT-19	R4888233
Lithium (Li)-Dissolved	0.684		0.0010	mg/L	25-OCT-19	26-OCT-19	R4888233
Magnesium (Mg)-Dissolved	39.9		0.10	mg/L	25-OCT-19	26-OCT-19	R4888233
Manganese (Mn)-Dissolved	0.0186		0.00010	mg/L	25-OCT-19	26-OCT-19	R4888233
Molybdenum (Mo)-Dissolved	0.0232		0.000050	mg/L	25-OCT-19	26-OCT-19	R4888233
Nickel (Ni)-Dissolved	0.00060		0.00050	mg/L	25-OCT-19	26-OCT-19	R4888233
Potassium (K)-Dissolved	25.7		0.050	mg/L	25-OCT-19	26-OCT-19	R4888233
Selenium (Se)-Dissolved	<0.050		0.050	ug/L	25-OCT-19	26-OCT-19	R4888233
Silicon (Si)-Dissolved	2.85		0.050	mg/L	25-OCT-19	26-OCT-19	R4888233
Silver (Ag)-Dissolved	<0.000010		0.000010	mg/L	25-OCT-19	26-OCT-19	R4888233
Sodium (Na)-Dissolved	40.5		0.050	mg/L	25-OCT-19	26-OCT-19	R4888233
Strontium (Sr)-Dissolved	0.241		0.00020	mg/L	25-OCT-19	26-OCT-19	R4888233
Thallium (TI)-Dissolved	<0.000010		0.000010	mg/L	25-OCT-19	26-OCT-19	R4888233
Tin (Sn)-Dissolved	0.00030		0.00010	mg/L	25-OCT-19	26-OCT-19	R4888233
Titanium (Ti)-Dissolved	<0.010		0.010	mg/L	25-OCT-19	26-OCT-19	R4888233
Uranium (U)-Dissolved	0.000069		0.000010	mg/L	25-OCT-19	26-OCT-19	R4888233
Vanadium (V)-Dissolved	<0.00050		0.00050	mg/L	25-OCT-19	26-OCT-19	R4888233
Zinc (Zn)-Dissolved	0.0039		0.0010	mg/L	25-OCT-19	26-OCT-19	R4888233
Hardness							
Hardness (as CaCO3)	304		0.50	mg/L		28-OCT-19	
Total Metals in Water							
Total Be (Low) in Water by CRC ICPMS Beryllium (Be)-Total	0.067		0.020	ug/L		26-OCT-19	R4888233
Total Metals in Water by CRC ICPMS	0.007		3.020	~g/ <b>-</b>			11.300200
Aluminum (Al)-Total	0.330		0.0030	mg/L		26-OCT-19	R4888233
Antimony (Sb)-Total	0.00017		0.00010	mg/L		26-OCT-19	R4888233
Arsenic (As)-Total	0.00303		0.00010	mg/L		26-OCT-19	R4888233
			5.55515	··· · · · · · ·			

<sup>\*</sup> Refer to Referenced Information for Qualifiers (if any) and Methodology.

L2371413 CONTD.... PAGE 3 of 9 Version: FINAL

Sample Details/Parameters	Result	Qualifier*	* D.L.	Units	Extracted	Analyzed	Batch
L2371413-1 LC_PIZDC1404D_WG_Q4-2019_NP							
Sampled By: KC/DT on 23-OCT-19 @ 12:42							
Matrix: WG							
Total Metals in Water by CRC ICPMS Barium (Ba)-Total	4.24		0.00010	mg/L		26-OCT-19	R4888233
Bismuth (Bi)-Total	<0.000050		0.000050	mg/L		26-OCT-19	R4888233
Boron (B)-Total	0.024		0.010	mg/L		26-OCT-19	R4888233
Cadmium (Cd)-Total	0.178		0.0050	ug/L		26-OCT-19	R4888233
Calcium (Ca)-Total	61.4		0.050	mg/L		26-OCT-19	R4888233
Chromium (Cr)-Total	0.00126		0.00010	mg/L		26-OCT-19	R4888233
Cobalt (Co)-Total	0.61		0.10	ug/L		26-OCT-19	R4888233
Copper (Cu)-Total	0.00401		0.00050	mg/L		26-OCT-19	R4888233
Iron (Fe)-Total	3.97		0.010	mg/L		26-OCT-19	R4888233
Lead (Pb)-Total	0.00206		0.000050	mg/L		26-OCT-19	R4888233
Lithium (Li)-Total	0.735		0.0010	mg/L		26-OCT-19	R4888233
Magnesium (Mg)-Total	43.9		0.10	mg/L		26-OCT-19	R4888233
Manganese (Mn)-Total	0.0375		0.00010	mg/L		26-OCT-19	R4888233
Molybdenum (Mo)-Total	0.0233		0.000050	mg/L		26-OCT-19	R4888233
Nickel (Ni)-Total	0.00312		0.00050	mg/L		26-OCT-19	R4888233
Potassium (K)-Total	26.3		0.050	mg/L		26-OCT-19	R4888233
Selenium (Se)-Total	0.092		0.050	ug/L		26-OCT-19	R4888233
Silicon (Si)-Total	3.45		0.10	mg/L		26-OCT-19	R4888233
Silver (Ag)-Total	0.000028		0.000010	mg/L		26-OCT-19	R4888233
Sodium (Na)-Total	42.5		0.050	mg/L		26-OCT-19	R4888233
Strontium (Sr)-Total	0.254		0.00020	mg/L		26-OCT-19	R4888233
Thallium (TI)-Total	0.000028		0.000010	mg/L		26-OCT-19	R4888233
Tin (Sn)-Total Titanium (Ti)-Total	0.00051		0.00010	mg/L		26-OCT-19	R4888233
Uranium (U)-Total	<0.010		0.010	mg/L		26-OCT-19 26-OCT-19	R4888233
Vanadium (V)-Total	0.000247 0.00322		0.000010 0.00050	mg/L mg/L		26-OCT-19 26-OCT-19	R4888233 R4888233
Zinc (Zn)-Total	0.00322		0.00030	mg/L		26-OCT-19	R4888233
Routine for Teck Coal	0.0240		0.0030	IIIg/L		20-001-19	K4000233
Acidity by Automatic Titration							
Acidity (as CaCO3)	<1.0		1.0	mg/L		25-OCT-19	R4888065
Alkalinity (Species) by Manual Titration	1.10						
Alkalinity, Bicarbonate (as CaCO3)	435		1.0	mg/L		25-OCT-19	R4888006
Alkalinity, Carbonate (as CaCO3)	14.0		1.0	mg/L		25-OCT-19	R4888006
Alkalinity, Hydroxide (as CaCO3)	<1.0		1.0	mg/L		25-OCT-19	R4888006
Alkalinity, Total (as CaCO3)	449		1.0	mg/L		25-OCT-19	R4888006
Ammonia, Total (as N)							
Ammonia as N	2.86	DLHC	0.050	mg/L		30-OCT-19	R4892248
Bromide in Water by IC (Low Level)							
Bromide (Br)	<0.050		0.050	mg/L		24-OCT-19	R4884134
Chloride in Water by IC				,,		04.00= :=	
Chloride (CI)	<0.50		0.50	mg/L		24-OCT-19	R4884134
Electrical Conductivity (EC)	704		2.0	uS/cm		25 OCT 40	D499999
Conductivity (@ 25C)	724		2.0	u3/cm		25-OCT-19	R4888006
Fluoride in Water by IC Fluoride (F)	0.210		0.020	mg/L		24-OCT-19	R4884134
Ion Balance Calculation	0.210		0.020	my/L		27 001-19	114004134
Cation - Anion Balance	-2.1			%		28-OCT-19	
Anion Sum	8.98			meg/L		28-OCT-19	
Cation Sum	8.60			meg/L		28-OCT-19	
Ion Balance Calculation							
Ion Balance	95.8		-100	%		28-OCT-19	
Nitrate in Water by IC (Low Level)							
	L	1				1	

<sup>\*</sup> Refer to Referenced Information for Qualifiers (if any) and Methodology.

L2371413 CONTD.... PAGE 4 of 9 Version: FINAL

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2371413-1 LC_PIZDC1404D_WG_Q4-2019_NP							
Sampled By: KC/DT on 23-OCT-19 @ 12:42							
Matrix: WG							
Nitrate in Water by IC (Low Level)							
Nitrate in Water by IC (Low Level) Nitrate (as N)	0.0078		0.0050	mg/L		24-OCT-19	R4884134
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	<0.0010		0.0010	mg/L		24-OCT-19	R4884134
Orthophosphate-Dissolved (as P)	0.0044		0.0040			04.007.40	D 4000000
Orthophosphate-Dissolved (as P)	0.0011		0.0010	mg/L		24-OCT-19	R4883326
Oxidation redution potential by elect. ORP	465		-1000	mV		24-OCT-19	R4883661
Phosphorus (P)-Total							
Phosphorus (P)-Total	0.0567		0.0020	mg/L		25-OCT-19	R4884566
Sulfate in Water by IC							
Sulfate (SO4)	<0.30		0.30	mg/L		24-OCT-19	R4884134
Total Dissolved Solids Total Dissolved Solids	408	DLHC	20	ma/l		29-OCT-19	R4889928
Total Suspended Solids	408	DLITO	20	mg/L		29-001-19	K4009928
Total Suspended Solids Total Suspended Solids	47.8		1.0	mg/L		28-OCT-19	R4889096
Turbidity				<i>3</i> –			
Turbidity	44.3		0.10	NTU		24-OCT-19	R4883631
pH							
pH	8.39		0.10	рН		25-OCT-19	R4888006
L2371413-2 LC_PIZDC1404S_WG_Q4-2019_NP							
Sampled By: KC/DT on 23-OCT-19 @ 13:15							
Matrix: WG							
Miscellaneous Parameters			_	,.		00 00= ::	D. 40
Dissolved Organic Carbon	1.88		0.50	mg/L		28-OCT-19	R4889000
Total Carania Carlon	0.137		0.050	mg/L		25-OCT-19	R4884311
Total Organic Carbon	2.02		0.50	mg/L		28-OCT-19	R4889000
Dissolved Metals in Water Diss. Be (low) in Water by CRC ICPMS							
Beryllium (Be)-Dissolved	<0.020		0.020	ug/L	25-OCT-19	26-OCT-19	R4888233
Dissolved Metals Filtration Location	FIELD			J.		25-OCT-19	R4884851
Diss. Mercury in Water by CVAAS or CVAFS							
Mercury (Hg)-Dissolved	<0.000050		0.0000050	mg/L	28-OCT-19	29-OCT-19	R4889334
Dissolved Mercury Filtration Location	FIELD					28-OCT-19	R4888405
Dissolved Metals in Water by CRC ICPMS Dissolved Metals Filtration Location	FIEL D					25 OCT 40	D4004054
Aluminum (Al)-Dissolved	FIELD <0.0030		0.0030	mg/L	25-OCT-19	25-OCT-19 26-OCT-19	R4884851 R4888233
Antimony (Sb)-Dissolved	<0.0030		0.0030	mg/L	25-OCT-19	26-OCT-19	R4888233
Arsenic (As)-Dissolved	0.00187		0.00010	mg/L	25-OCT-19	26-OCT-19	R4888233
Barium (Ba)-Dissolved	0.224		0.00010	mg/L	25-OCT-19	26-OCT-19	R4888233
Bismuth (Bi)-Dissolved	<0.000050		0.000050	mg/L	25-OCT-19	26-OCT-19	R4888233
Boron (B)-Dissolved	<0.010		0.010	mg/L	25-OCT-19	26-OCT-19	R4888233
Cadmium (Cd)-Dissolved	<0.0050		0.0050	ug/L	25-OCT-19	26-OCT-19	R4888233
Calcium (Ca)-Dissolved	46.5		0.050	mg/L	25-OCT-19	26-OCT-19	R4888233
Chromium (Cr)-Dissolved Cobalt (Co)-Dissolved	<0.00010		0.00010	mg/L	25-OCT-19	26-OCT-19	R4888233
Copper (Cu)-Dissolved	0.32 <0.00020		0.10 0.00020	ug/L mg/L	25-OCT-19 25-OCT-19	26-OCT-19 26-OCT-19	R4888233 R4888233
Iron (Fe)-Dissolved	0.878		0.00020	mg/L	25-OCT-19 25-OCT-19	26-OCT-19 26-OCT-19	R4888233
Lead (Pb)-Dissolved	<0.000050		0.00050	mg/L	25-OCT-19	26-OCT-19	R4888233
Lithium (Li)-Dissolved	0.0060		0.0010	mg/L	25-OCT-19	26-OCT-19	R4888233
Magnesium (Mg)-Dissolved	17.2		0.10	mg/L	25-OCT-19	26-OCT-19	R4888233
Manganese (Mn)-Dissolved	0.0284		0.00010	mg/L	25-OCT-19	26-OCT-19	R4888233

<sup>\*</sup> Refer to Referenced Information for Qualifiers (if any) and Methodology.

L2371413 CONTD.... PAGE 5 of 9 Version: FINAL

L2371413-2 LC_PIZDC1404S_WG_Q4-2019_NP						
Sampled By: KC/DT on 23-OCT-19 @ 13:15						
Matrix: WG						
-						
Dissolved Metals in Water by CRC ICPMS Molybdenum (Mo)-Dissolved	0.00326	0.000050	mg/L	25-OCT-19	26-OCT-19	R4888233
Nickel (Ni)-Dissolved	0.00320	0.00050	mg/L	25-OCT-19	26-OCT-19	R4888233
Potassium (K)-Dissolved	1.53	0.050	mg/L	25-OCT-19	26-OCT-19	R4888233
Selenium (Se)-Dissolved	<0.050	0.050	ug/L	25-OCT-19	26-OCT-19	R4888233
Silicon (Si)-Dissolved	3.69	0.050	mg/L	25-OCT-19	26-OCT-19	R4888233
Silver (Ag)-Dissolved	<0.000010	0.000010	mg/L	25-OCT-19	26-OCT-19	R4888233
Sodium (Na)-Dissolved	1.25	0.050	mg/L	25-OCT-19	26-OCT-19	R4888233
Strontium (Sr)-Dissolved	0.0446	0.00020	mg/L	25-OCT-19	26-OCT-19	R4888233
Thallium (TI)-Dissolved	<0.000010	0.000010	mg/L	25-OCT-19	26-OCT-19	R4888233
Tin (Sn)-Dissolved	0.00020	0.00010	mg/L	25-OCT-19	26-OCT-19	R4888233
Titanium (Ti)-Dissolved	<0.010	0.010	mg/L	25-OCT-19	26-OCT-19	R4888233
Uranium (U)-Dissolved	0.000570	0.000010	mg/L	25-OCT-19	26-OCT-19	R4888233
Vanadium (V)-Dissolved	<0.00050	0.00050	mg/L	25-OCT-19	26-OCT-19	R4888233
Zinc (Zn)-Dissolved	0.0010	0.0010	mg/L	25-OCT-19	26-OCT-19	R4888233
Hardness						
Hardness (as CaCO3)	187	0.50	mg/L		28-OCT-19	
Total Metals in Water						
Total Be (Low) in Water by CRC ICPMS		2 222	0		00 00T 10	D 4000000
Beryllium (Be)-Total	<0.020	0.020	ug/L		26-OCT-19	R4888233
Total Metals in Water by CRC ICPMS Aluminum (AI)-Total	0.0126	0.0030	mg/L		26-OCT-19	R4888233
Antimony (Sb)-Total	<0.00126	0.0030	mg/L		26-OCT-19	R4888233
Arsenic (As)-Total	0.00187	0.00010	mg/L		26-OCT-19	R4888233
Barium (Ba)-Total	0.239	0.00010	mg/L		26-OCT-19	R4888233
Bismuth (Bi)-Total	<0.000050	0.000050	mg/L		26-OCT-19	R4888233
Boron (B)-Total	<0.010	0.010	mg/L		26-OCT-19	R4888233
Cadmium (Cd)-Total	<0.0050	0.0050	ug/L		26-OCT-19	R4888233
Calcium (Ca)-Total	48.8	0.050	mg/L		26-OCT-19	R4888233
Chromium (Cr)-Total	<0.00010	0.00010	mg/L		26-OCT-19	R4888233
Cobalt (Co)-Total	0.35	0.10	ug/L		26-OCT-19	R4888233
Copper (Cu)-Total	<0.00050	0.00050	mg/L		26-OCT-19	R4888233
Iron (Fe)-Total	0.991	0.010	mg/L		26-OCT-19	R4888233
Lead (Pb)-Total	<0.000050	0.000050	mg/L		26-OCT-19	R4888233
Lithium (Li)-Total	0.0064	0.0010	mg/L		26-OCT-19	R4888233
Magnesium (Mg)-Total	18.5	0.10	mg/L		26-OCT-19	R4888233
Manganese (Mn)-Total	0.0293	0.00010	mg/L		26-OCT-19	R4888233
Molybdenum (Mo)-Total	0.00338	0.000050	mg/L		26-OCT-19	R4888233
Nickel (Ni)-Total	0.00135	0.00050	mg/L		26-OCT-19	R4888233
Potassium (K)-Total	1.54	0.050	mg/L		26-OCT-19	R4888233
Selenium (Se)-Total	<0.050	0.050	ug/L		26-OCT-19	R4888233
Silicon (Si)-Total	3.77	0.10	mg/L		26-OCT-19	R4888233
Silver (Ag)-Total	<0.000010	0.000010	mg/L		26-OCT-19	R4888233
Sodium (Na)-Total Strontium (Sr)-Total	1.32	0.050	mg/L		26-OCT-19 26-OCT-19	R4888233 R4888233
Strontium (Sr)-Total Thallium (Tl)-Total	0.0463 <0.000010	0.00020 0.000010	mg/L		26-OCT-19 26-OCT-19	R4888233 R4888233
Tin (Sn)-Total	0.000010	0.000010	mg/L		26-OCT-19 26-OCT-19	R4888233
Titanium (Ti)-Total	<0.00021	0.00010	mg/L mg/L		26-OCT-19 26-OCT-19	R4888233 R4888233
Uranium (U)-Total	0.000638	0.010	mg/L		26-OCT-19 26-OCT-19	R4888233
Vanadium (V)-Total	<0.00050	0.00050	mg/L		26-OCT-19 26-OCT-19	R4888233
Zinc (Zn)-Total	<0.0030	0.00030	mg/L		26-OCT-19	R4888233
Routine for Teck Coal	10.0000	0.000	··· · · · ·		== 555	
Acidity by Automatic Titration						

<sup>\*</sup> Refer to Referenced Information for Qualifiers (if any) and Methodology.

L2371413 CONTD.... PAGE 6 of 9 Version: FINAL

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2371413-2 LC_PIZDC1404S_WG_Q4-2019_NP							
Sampled By: KC/DT on 23-OCT-19 @ 13:15							
Matrix: WG							
Acidity by Automatic Titration							
Acidity (as CaCO3)	<1.0		1.0	mg/L		25-OCT-19	R4888065
Alkalinity (Species) by Manual Titration				,,		05 00T 40	
Alkalinity, Bicarbonate (as CaCO3) Alkalinity, Carbonate (as CaCO3)	190 3.2		1.0 1.0	mg/L mg/L		25-OCT-19 25-OCT-19	R4888006 R4888006
Alkalinity, Galbonate (as CaCO3)  Alkalinity, Hydroxide (as CaCO3)	<1.0		1.0	mg/L		25-OCT-19 25-OCT-19	R4888006
Alkalinity, Total (as CaCO3)	193		1.0	mg/L		25-OCT-19	R4888006
Ammonia, Total (as N)							
Ammonia as N	0.0110		0.0050	mg/L		30-OCT-19	R4892248
Bromide in Water by IC (Low Level) Bromide (Br)	<0.050		0.050	mg/L		24-OCT-19	R4884134
Chloride in Water by IC	<0.030		0.030	ilig/L		24-001-13	114004134
Chloride (Cl)	<0.50		0.50	mg/L		24-OCT-19	R4884134
Electrical Conductivity (EC)				<u> </u>		05 005 :-	
Conductivity (@ 25C)	330		2.0	uS/cm		25-OCT-19	R4888006
Fluoride in Water by IC Fluoride (F)	0.142		0.020	mg/L		24-OCT-19	R4884134
Ion Balance Calculation	J <u>-</u>		0.020				
Cation - Anion Balance	-1.4			%		28-OCT-19	
Anion Sum	3.98			meq/L		28-OCT-19	
Cation Sum Ion Balance Calculation	3.88			meq/L		28-OCT-19	
Ion Balance Calculation	97.3		-100	%		28-OCT-19	
Nitrate in Water by IC (Low Level)	00			,,,			
Nitrate (as N)	<0.0050		0.0050	mg/L		24-OCT-19	R4884134
Nitrite in Water by IC (Low Level)	-0.0010		0.0010	ma/l		24-OCT-19	D4004424
Nitrite (as N) Orthophosphate-Dissolved (as P)	<0.0010		0.0010	mg/L		24-001-19	R4884134
Orthophosphate-Dissolved (as P)	0.0013		0.0010	mg/L		24-OCT-19	R4883326
Oxidation redution potential by elect.							
ORP	354		-1000	mV		24-OCT-19	R4883661
Phosphorus (P)-Total Phosphorus (P)-Total	0.0206		0.0020	mg/L		25-OCT-19	R4884566
Sulfate in Water by IC	0.0200		0.0020	ilig/ L		20 001 10	114004300
Sulfate (SO4)	5.57		0.30	mg/L		24-OCT-19	R4884134
Total Dissolved Solids		DILLO				00 007 :-	D 4063355
Total Dissolved Solids  Total Suspended Solids	201	DLHC	20	mg/L		29-OCT-19	R4889928
Total Suspended Solids Total Suspended Solids	11.0		1.0	mg/L		28-OCT-19	R4889096
Turbidity				_			
Turbidity	12.9		0.10	NTU		24-OCT-19	R4883631
<b>рН</b> рН	8.31		0.10	pН		25-OCT-19	R4888006
	0.01		3.10	L			

<sup>\*</sup> Refer to Referenced Information for Qualifiers (if any) and Methodology.

L2371413 CONTD....

PAGE 7 of 9 Version: FINAL

### **Reference Information**

Sample Parameter Qualifier Key:

 Qualifier
 Description

 DLHC
 Detection Limit Raised: Dilution required due to high concentration of test analyte(s).

 DLM
 Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).

 MS-B
 Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.

#### **Test Method References:**

ALS Test Code	Matrix	Test Description	Method Reference**
ACIDITY-PCT-CL	Water	Acidity by Automatic Titration	APHA 2310 Acidity

This analysis is carried out using procedures adapted from APHA Method 2310 "Acidity". Acidity is determined by potentiometric titration to a specified endpoint.

ALK-MAN-CL Water Alkalinity (Species) by Manual Titration APHA 2320 ALKALINITY

This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.

BE-D-L-CCMS-VA Water Diss. Be (low) in Water by CRC ICPMS APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

BE-T-L-CCMS-VA Water Total Be (Low) in Water by CRC ICPMS EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

BR-L-IC-N-CL Water Bromide in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

C-DIS-ORG-LOW-CL Water Dissolved Organic Carbon APHA 5310 B-Instrumental

This method is applicable to the analysis of ground water, wastewater, and surface water samples. The form detected depends upon sample pretreatment: Unfiltered sample = TC, 0.45um filtered = TDC. Samples are injected into a combustion tube containing an oxidation catalyst. The carrier gas containing the combustion product from the combustion tube flows through an inorganic carbon reactor vessel and is then sent through a halogen scrubber into a sample cell set in a non-dispersive infrared gas analyzer (NDIR) where carbon dioxide is detected. For total inorganic carbon and dissolved inorganic carbon, the sample is injected into an IC reactor vessel where only the IC component is decomposed to become carbon dioxide.

The peak area generated by the NDIR indicates the TC/TDC or TIC/DIC as applicable. The total organic carbon content of the sample is calculated by subtracting the TIC from the TC.

TOC = TC-TIC, DOC = TDC-DIC, Particulate = Total - Dissolved.

C-TOT-ORG-LOW-CL Water Total Organic Carbon APHA 5310 TOTAL ORGANIC CARBON (TOC)

This method is applicable to the analysis of ground water, wastewater, and surface water samples. The form detected depends upon sample pretreatment: Unfiltered sample = TC, 0.45um filtered = TDC. Samples are injected into a combustion tube containing an oxidation catalyst. The carrier gas containing the combustion product from the combustion tube flows through an inorganic carbon reactor vessel and is then sent through a halogen scrubber into a sample cell set in a non-dispersive infrared gas analyzer (NDIR) where carbon dioxide is detected. For total inorganic carbon and dissolved inorganic carbon, the sample is injected into an IC reactor vessel where only the IC component is decomposed to become carbon dioxide.

The peak area generated by the NDIR indicates the TC/TDC or TIC/DIC as applicable. The total organic carbon content of the sample is calculated by subtracting the TIC from the TC.

TOC = TC-TIC, DOC = TDC-DIC, Particulate = Total - Dissolved.

CL-IC-N-CL Water Chloride in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

EC-L-PCT-CL Water Electrical Conductivity (EC) APHA 2510E

Conductivity, also known as Electrical Conductivity (EC) or Specific Conductance, is measured by immersion of a conductivity cell with platinum electrodes into a water sample. Conductivity measurements are temperature-compensated to 25C.

F-IC-N-CL Water Fluoride in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

HARDNESS-CALC-VA Water Hardness APHA 2340B

Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

HG-D-CVAA-VA Water Diss. Mercury in Water by CVAAS or CVAFS APHA 3030B/EPA 1631E (mod)

Water samples are filtered (0.45 um), preserved with hydrochloric acid, then undergo a cold-oxidation using bromine monochloride prior to reduction

### L2371413 CONTD....

PAGE 8 of 9

### **Reference Information**

PAGE 8 of 9 Version: FINAL

**Test Method References:** 

ALS Test Code Matrix Test Description Method Reference\*\*

with stannous chloride, and analyzed by CVAAS or CVAFS.

IONBALANCE-BC-CL Water Ion Balance Calculation APHA 1030E

Cation Sum, Anion Sum, and Ion Balance (as % difference) are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Because all aqueous solutions are electrically neutral, the calculated ion balance (% difference of cations minus anions) should be near-zero.

Cation and Anion Sums are the total meq/L concentration of major cations and anions. Dissolved species are used where available. Minor ions are included where data is present. Ion Balance is calculated as:

Ion Balance (%) = [Cation Sum-Anion Sum] / [Cation Sum+Anion Sum]

MET-D-CCMS-VA Water Dissolved Metals in Water by CRC ICPMS APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

MET-T-CCMS-VA Water Total Metals in Water by CRC ICPMS EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

NH3-L-F-CL Water Ammonia, Total (as N) J. ENVIRON. MONIT., 2005, 7, 37-42, RSC

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.

NO2-L-IC-N-CL Water Nitrite in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

NO3-L-IC-N-CL Water Nitrate in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

ORP-CL Water Oxidation redution potential by elect. ASTM D1498

This analysis is carried out in accordance with the procedure described in the "ASTM" method D1498 "Oxidation-Reduction Potential of Water" published by the American Society for Testing and Materials (ASTM). Results are reported as observed oxidation-reduction potential of the platinum metal-reference electrode employed, in mV.

It is recommended that this analysis be conducted in the field.

P-T-L-COL-CL Water Phosphorus (P)-Total APHA 4500-P PHOSPHORUS

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after persulphate digestion of the sample.

PH-CL Water pH APHA 4500 H-Electrode

pH is determined in the laboratory using a pH electrode. All samples analyzed by this method for pH will have exceeded the 15 minute recommended hold time from time of sampling (field analysis is recommended for pH where highly accurate results are needed)

PO4-DO-L-COL-CL Water Orthophosphate-Dissolved (as P) APHA 4500-P PHOSPHORUS

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.

SO4-IC-N-CL Water Sulfate in Water by IC EPA 300.1 (mod

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

SOLIDS-TDS-CL Water Total Dissolved Solids APHA 2540 C

A well-mixed sample is filtered through a glass fibre filter paper. The filtrate is then evaporated to dryness in a pre-weighed vial and dried at 180 - 2 °C. The increase in vial weight represents the total dissolved solids (TDS).

TECKCOAL-IONBAL-CL Water Ion Balance Calculation APHA 1030E

Cation Sum, Anion Sum, and Ion Balance (as % difference) are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Because all aqueous solutions are electrically neutral, the calculated ion balance (% difference of cations minus anions) should be near-zero.

Cation and Anion Sums are the total meg/L concentration of major cations and anions. Dissolved species are used where available. Minor ions are

LINE CREEK OPERATION L2371413 CONTD....

**Reference Information** 

PAGE 9 of 9 Version: FINAL

**Test Method References:** 

ALS Test Code Matrix Test Description Method Reference\*\*

included where data is present. Ion Balance is calculated as:

Ion Balance (%) = [Cation Sum-Anion Sum] / [Cation Sum+Anion Sum]

TKN-L-F-CL Water Total Kjeldahl Nitrogen APHA 4500-NORG (TKN)

This analysis is carried out using procedures adapted from APHA Method 4500-Norg D. "Block Digestion and Flow Injection Analysis". Total Kjeldahl

Nitrogen is determined using block digestion followed by Flow-injection analysis with fluorescence detection.

TSS-L-CL Water Total Suspended Solids APHA 2540 D-Gravimetric

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total suspended solids (TSS) are determined by filtering a sample through a glass fibre filter, and by drying the filter at 104 deg. C.

APHA 2130 B-Nephelometer

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**Turbidity** 

This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.

\*\* ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

<b>Laboratory Definition Code</b>	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA
CL	ALS ENVIRONMENTAL - CALGARY, ALBERTA, CANADA

### **Chain of Custody Numbers:**

20191023 DC GW

**TURBIDITY-CL** 

### **GLOSSARY OF REPORT TERMS**

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.

mg/kg - milligrams per kilogram based on dry weight of sample

mg/kg wwt - milligrams per kilogram based on wet weight of sample

mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight

mg/L - unit of concentration based on volume, parts per million.

< - Less than.

D.L. - The reporting limit.

N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory. UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.



Workorder: L2371413

Report Date: 31-OCT-19

Page 1 of 11

Client:

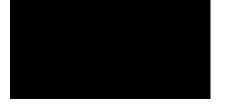
TECK COAL LIMITED (LINE CREEK)

PO BOX 2003

SPARWOOD BC V0B 2G0

Contact: Carla Froyman Parker

Test	Matrix	Reference	Result Qualific	er Units	RPD	Limit	Analyzed
ACIDITY-PCT-CL	Water						
Batch R4888065							
WG3203249-2 LCS Acidity (as CaCO3)			97.5	%		85-115	25-OCT-19
WG3203249-1 MB							
Acidity (as CaCO3)			1.2	mg/L		2	25-OCT-19
ALK-MAN-CL	Water						
Batch R4888006 WG3203253-6 DUP		1.0074.440.4					
WG3203253-6 DUP Alkalinity, Total (as CaC	CO3)	<b>L2371413-1</b> 449	465	mg/L	3.6	20	25-OCT-19
WG3203253-11 LCS							
Alkalinity, Total (as CaC	CO3)		99.5	%		85-115	25-OCT-19
WG3203253-5 LCS Alkalinity, Total (as CaC	CO3)		99.9	%		85-115	25-OCT-19
WG3203253-10 MB	200)			_			
Alkalinity, Total (as CaC	203)		<1.0	mg/L		1	25-OCT-19
WG3203253-4 MB Alkalinity, Total (as CaC	CO3)		<1.0	mg/L		1	25-OCT-19
BE-D-L-CCMS-VA	Water						
Batch R4888233							
WG3201889-2 LCS Beryllium (Be)-Dissolve	d		99.6	%		80-120	26-OCT-19
WG3201889-1 MB		NP				00 .20	20 001 10
Beryllium (Be)-Dissolve	d		<0.000020	mg/L		0.00002	26-OCT-19
BE-T-L-CCMS-VA	Water						
Batch R4888233							
WG3201973-2 LCS Beryllium (Be)-Total			105.0	%		80-120	26-OCT-19
WG3201973-1 MB							
Beryllium (Be)-Total			<0.000020	mg/L		0.00002	26-OCT-19
BR-L-IC-N-CL	Water						
Batch R4884134 WG3201511-10 LCS							
Bromide (Br)			104.6	%		85-115	24-OCT-19
WG3201511-9 MB			-0.050	ma/l		0.05	04.007.40
Bromide (Br)			<0.050	mg/L		0.05	24-OCT-19
C-DIS-ORG-LOW-CL	Water						



Workorder: L2371413

Report Date: 31-OCT-19 Page 2 of 11

Test N	latrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
C-DIS-ORG-LOW-CL V	Vater							
Batch R4889000 WG3204701-2 LCS Dissolved Organic Carbon			99.4		%		80-120	28-OCT-19
WG3204701-6 LCS Dissolved Organic Carbon			89.1		%		80-120	29-OCT-19
WG3204701-1 MB Dissolved Organic Carbon			<0.50		mg/L		0.5	28-OCT-19
WG3204701-5 MB Dissolved Organic Carbon			<0.50		mg/L		0.5	29-OCT-19
C-TOT-ORG-LOW-CL V	Vater							
Batch R4889000								
WG3204701-2 LCS Total Organic Carbon			100.8		%		80-120	28-OCT-19
WG3204701-6 LCS Total Organic Carbon			90.9		%		80-120	29-OCT-19
WG3204701-1 MB Total Organic Carbon			<0.50		mg/L		0.5	28-OCT-19
WG3204701-5 MB Total Organic Carbon			<0.50		mg/L		0.5	29-OCT-19
CL-IC-N-CL V	Vater							
<b>Batch</b> R4884134 <b>WG3201511-10 LCS</b> Chloride (CI)			102.3		%		90-110	24-OCT-19
WG3201511-9 MB Chloride (Cl)			<0.50		mg/L		0.5	24-OCT-19
EC-L-PCT-CL V	Vater							
Batch R4888006 WG3203253-6 DUP Conductivity (@ 25C)		<b>L2371413-1</b> 724	731		uS/cm	1.0	10	25-OCT-19
WG3203253-11 LCS Conductivity (@ 25C)			100.9		%		90-110	25-OCT-19
WG3203253-5 LCS Conductivity (@ 25C)			98.8		%		90-110	25-OCT-19
WG3203253-10 MB Conductivity (@ 25C)			<2.0		uS/cm		2	25-OCT-19
WG3203253-4 MB Conductivity (@ 25C)			<2.0		uS/cm		2	25-OCT-19
F-IC-N-CL V	Vater							



Workorder: L2371413

Report Date: 31-OCT-19 Page 3 of 11

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
F-IC-N-CL	Water							
Batch R4884134 WG3201511-10 LCS								
Fluoride (F)			103.0		%		90-110	24-OCT-19
<b>WG3201511-9 MB</b> Fluoride (F)			<0.020		mg/L		0.02	24-OCT-19
HG-D-CVAA-VA	Water							
Batch R4889334 WG3203886-10 LCS Mercury (Hg)-Dissolved			100.8		%		80-120	29-OCT-19
WG3203886-9 MB Mercury (Hg)-Dissolved			<0.00000	50	mg/L		0.000005	29-OCT-19
MET-D-CCMS-VA	Water							
Batch R4888233								
WG3201889-2 LCS	al.		104.7		0/		00.400	00 007 40
Aluminum (Al)-Dissolved Antimony (Sb)-Dissolved			96.9		%		80-120	26-OCT-19
Arsenic (As)-Dissolved	u		105.5		%		80-120	26-OCT-19
Barium (Ba)-Dissolved			103.3		%		80-120	26-OCT-19 26-OCT-19
Bismuth (Bi)-Dissolved			92.4		%		80-120 80-120	26-OCT-19 26-OCT-19
Boron (B)-Dissolved			109.9		%		80-120	26-OCT-19 26-OCT-19
Cadmium (Cd)-Dissolve	h		103.6		%		80-120	26-OCT-19 26-OCT-19
Calcium (Ca)-Dissolved			103.0		%		80-120	26-OCT-19
Chromium (Cr)-Dissolve			102.0		%		80-120	26-OCT-19
Cobalt (Co)-Dissolved			99.6		%		80-120	26-OCT-19
Copper (Cu)-Dissolved			98.4		%		80-120	26-OCT-19
Iron (Fe)-Dissolved			99.7		%		80-120	26-OCT-19
Lead (Pb)-Dissolved			95.6		%		80-120	26-OCT-19
Lithium (Li)-Dissolved			103.4		%		80-120	26-OCT-19
Magnesium (Mg)-Dissol	lved		102.5		%		80-120	26-OCT-19
Manganese (Mn)-Dissol	lved		104.7		%		80-120	26-OCT-19
Molybdenum (Mo)-Disso	olved		103.7		%		80-120	26-OCT-19
Nickel (Ni)-Dissolved			100.1		%		80-120	26-OCT-19
Potassium (K)-Dissolve	d		103.9		%		80-120	26-OCT-19
Selenium (Se)-Dissolve	d		104.0		%		80-120	26-OCT-19
Silicon (Si)-Dissolved			110.7		%		60-140	26-OCT-19
Silver (Ag)-Dissolved			98.2		%		80-120	26-OCT-19
Sodium (Na)-Dissolved			105.5		%		80-120	26-OCT-19



Workorder: L2371413

Report Date: 31-OCT-19 Page 4 of 11

Metro-DCMS-VA   Water	Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
WG3201889-2 LCS   Strontium (Sr)-Dissolved   99.2   %   80-120   26-OCT-19   Thallium (Ti)-Dissolved   99.8   %   80-120   26-OCT-19   Tin (Sn)-Dissolved   99.8   %   80-120   26-OCT-19   Tin (Sn)-Dissolved   99.8   %   80-120   26-OCT-19   Tinalium (Ti)-Dissolved   106.3   %   80-120   26-OCT-19   Uranium (U)-Dissolved   101.0   %   80-120   26-OCT-19   Zinc (Zn)-Dissolved   101.0   %   80-120   26-OCT-19   Zinc (Zn)-Dissolved   103.4   %   80-120   26-OCT-19   Zinc (Zn)-Dissolved   103.4   %   80-120   26-OCT-19   Zinc (Zn)-Dissolved   40.0010   mg/L   0.001   26-OCT-19   Zinc (Zn)-Dissolved   40.0010   mg/L   0.0011   26-OCT-19   Zinc (Zn)-Dissolved   40.0010   mg/L   0.0011   26-OCT-19   Zinc (Zn)-Dissolved   40.00010   mg/L   0.0001   26-OCT-19   Zinc (Zn)-Dissolved   40.00010   mg/L   0.0001   26-OCT-19   Zinc (Zn)-Dissolved   40.00010   mg/L   0.0001   26-OCT-19   Zinc (Zn)-Dissolved   40.00010   mg/L   0.0001   26-OCT-19   Zinc (Zn)-Dissolved   40.00010   mg/L   0.0001   26-OCT-19   Zinc (Zn)-Dissolved   40.00050   mg/L   0.0001   26-OCT-19   Zinc (Zn)-Dissolved   40.00050   mg/L   0.0001   26-OCT-19   Zinc (Zn)-Dissolved   40.000050   mg/L   0.00005   26-OCT-19   Zinc (Zn)-Dissolved   40.00010   mg/L   0.0001   26-OCT-19   Zinc (Zn)-Dissolved   40.00010   mg/L   0.0001   26-OCT-19   Zinc (Zn)-Dissolved   40.00010   mg/L   0.0001   26-OCT-19   Zinc (Zn)-Dissolved   40.00010   mg/L   0.0001   26-OCT-19   Zinc (Zn)-Dissolved   40.00050   mg/L   0.0005   26-OCT-19   Zinc (Zn)-Dissolved   40.00050   mg/L   0.0005   26-OCT-19   Zinc (Zn)-Dissolved   40.00050   mg/L   0.0005   26-OCT-19   Zinc (Zn)-Dissolved   40.00050   mg/L   0.0005   26-OCT-19   Zinc (Zn)-Dissolved   40.00050   mg/L   0.0005   26-OCT-19   Zinc (Zn)-Dissolved   40.00050   mg/L   0.0005   26-OCT-19   Zinc (Zn)-Dissolved   40.00050   mg/L   0.0005   26-OCT-19   Zinc (Zn)-Dissolved   40.00050   mg/L   0.0005   26-OCT-19   Zinc (Zn)-Dissolved   40.00050   mg/L   0.0005   26-OCT-19   Zinc (Zn)-Dissolved   40.00050   mg/L   0.0005   26-OCT-19	MET-D-CCMS-VA	Water							
Strontium (Sr)-Dissolved   99.2   % 80-120   26-OCT-19	Batch R48882	33							
Thallium (TI)-Dissolved 96.4 % 80-120 26-OCT-19 Tin (Sn)-Dissolved 99.8 % 80-120 26-OCT-19 Titanium (TI)-Dissolved 106.3 % 80-120 26-OCT-19 Uranium (TI)-Dissolved 98.3 % 80-120 26-OCT-19 Vanadium (V)-Dissolved 101.0 % 80-120 26-OCT-19 Vanadium (V)-Dissolved 101.0 % 80-120 26-OCT-19 Vanadium (V)-Dissolved 101.0 % 80-120 26-OCT-19 Vanadium (V)-Dissolved 101.0 % 80-120 26-OCT-19 Vanadium (V)-Dissolved 101.0 % 80-120 26-OCT-19 Vanadium (V)-Dissolved 101.0 % 80-120 26-OCT-19 Vanadium (V)-Dissolved 100.0		-		00.0		0/			
Tin (Sn)-Dissolved         99.8         %         80-120         26-OCT-19           Titanium (Ti)-Dissolved         106.3         %         80-120         26-OCT-19           Uranium (U)-Dissolved         98.3         %         80-120         26-OCT-19           Zinc (Zn)-Dissolved         103.4         %         80-120         26-OCT-19           WG3201889-1         MB         NP         NP         NB         NP           Aluminum (Al)-Dissolved         <0.0010									
Titanium (Ti)-Dissolved         106.3         %         80-120         26-OCT-19           Uranium (U)-Dissolved         98.3         %         80-120         26-OCT-19           Vanadium (V)-Dissolved         101.0         %         80-120         26-OCT-19           Zinc (Zah-)-Dissolved         103.4         %         80-120         26-OCT-19           WG3201889-1         MB         NP         NP         NP         NP         NP         0.0001         mg/L         0.0001         26-OCT-19           Antimory (Sh)-Dissolved         <0.00010		ea							
Uranium (U)-Dissolved 98.3 % 80.120 26-OCT-19 Vanadium (V)-Dissolved 101.0 % 80.120 26-OCT-19 Zinc (Zn)-Dissolved 103.4 % 80.120 26-OCT-19 WG3201889-1 MB NP Alluminum (Al)-Dissolved < 0.00010 mg/L 0.0001 26-OCT-19 Antimony (Sb)-Dissolved < 0.00010 mg/L 0.0001 26-OCT-19 Barium (Ba)-Dissolved < 0.00010 mg/L 0.0001 26-OCT-19 Barium (Ba)-Dissolved < 0.00010 mg/L 0.0001 26-OCT-19 Barium (Ba)-Dissolved < 0.00010 mg/L 0.0001 26-OCT-19 Barium (Ba)-Dissolved < 0.00010 mg/L 0.00005 26-OCT-19 Boron (B)-Dissolved < 0.000050 mg/L 0.00005 26-OCT-19 Boron (B)-Dissolved < 0.0000050 mg/L 0.00005 26-OCT-19 Cadmium (Cd)-Dissolved < 0.0000050 mg/L 0.00005 26-OCT-19 Calcium (Ca)-Dissolved < 0.00000050 mg/L 0.00005 26-OCT-19 Cobatt (Co)-Dissolved < 0.00010 mg/L 0.000 26-OCT-19 Cobatt (Co)-Dissolved < 0.00010 mg/L 0.0001 26-OCT-19 Copper (Cu)-Dissolved < 0.00010 mg/L 0.0001 26-OCT-19 Copper (Cu)-Dissolved < 0.00010 mg/L 0.0001 26-OCT-19 Lead (Pb)-Dissolved < 0.00010 mg/L 0.0001 26-OCT-19 Lead (Pb)-Dissolved < 0.00010 mg/L 0.0001 26-OCT-19 Lead (Pb)-Dissolved < 0.00010 mg/L 0.0002 26-OCT-19 Magnesium (Mg)-Dissolved < 0.00050 mg/L 0.0005 26-OCT-19 Magnesium (Mg)-Dissolved < 0.00010 mg/L 0.0001 26-OCT-19 Magnesium (Mg)-Dissolved < 0.00050 mg/L 0.0005 26-OCT-19 Magnesium (Mg)-Dissolved < 0.00050 mg/L 0.0005 26-OCT-19 Magnesium (Mg)-Dissolved < 0.00050 mg/L 0.0005 26-OCT-19 Molybdenum (Mo)-Dissolved < 0.00050 mg/L 0.0005 26-OCT-19 Molybdenum (Mo)-Dissolved < 0.00050 mg/L 0.0005 26-OCT-19 Selenium (Se)-Dissolved < 0.00050 mg/L 0.0005 26-OCT-19 Selenium (Se)-Dissolved < 0.00050 mg/L 0.005 26-OCT-19 Selenium (Se)-Dissolved < 0.00050 mg/L 0.05 26-OCT-19 Silicon (Si)-Dissolved < 0.00050 mg/L 0.05 26-OCT-19 Silicon (Si)-Dissolved < 0.00050 mg/L 0.05 26-OCT-19 Silicon (Si)-Dissolved < 0.00050 mg/L 0.05 26-OCT-19 Silicon (Si)-Dissolved < 0.00050 mg/L 0.0005 26-OCT-19 Silicon (Si)-Dissolved < 0.00050 mg/L 0.0005 26-OCT-19 Silicon (Si)-Dissolved < 0.000010 mg/L 0.0000 26-OCT-19 Silicon (Si)-Dissolved < 0.000010 mg/L 0.0000 26-OCT-19									
Vanadium (V)-Dissolved         101.0         %         80-120         26-OCT-19           Zinc (Zn)-Dissolved         103.4         %         80-120         26-OCT-19           WG3201889-1         MB         NP         NP           Aluminum (Al)-Dissolved         <0.00010         mg/L         0.001         26-OCT-19           Antimony (Sb)-Dissolved         <0.00010         mg/L         0.0001         26-OCT-19           Arsenic (As)-Dissolved         <0.00010         mg/L         0.0001         26-OCT-19           Barium (Ba)-Dissolved         <0.00010         mg/L         0.00005         26-OCT-19           Bismuth (Bi)-Dissolved         <0.000050         mg/L         0.00005         26-OCT-19           Boron (B)-Dissolved         <0.010         mg/L         0.00005         26-OCT-19           Cadmium (Ca)-Dissolved         <0.00000         mg/L         0.00000         26-OCT-19           Calcium (Ca)-Dissolved         <0.0050         mg/L         0.0001         26-OCT-19           Chromium (Cr)-Dissolved         <0.00010         mg/L         0.0001         26-OCT-19           Chair (Ca)-Dissolved         <0.00010         mg/L         0.0001         26-OCT-19           Choper (Cu)-Dissolved         <	,								
Zinc (Zn)-Dissolved         103.4         %         80-120         26-OCT-19           WG3201889-1 MB         NP         Aluminum (Al)-Dissolved         <0.0010         mg/L         0.001         26-OCT-19           Antimony (Sb)-Dissolved         <0.00010         mg/L         0.0001         26-OCT-19           Arsenic (As)-Dissolved         <0.00010         mg/L         0.0001         26-OCT-19           Barium (Ba)-Dissolved         <0.00010         mg/L         0.0001         26-OCT-19           Bismuth (Bj)-Dissolved         <0.000050         mg/L         0.00005         26-OCT-19           Boron (B)-Dissolved         <0.010         mg/L         0.00005         26-OCT-19           Cadmium (Cd)-Dissolved         <0.00005         mg/L         0.00005         26-OCT-19           Calcium (Ca)-Dissolved         <0.050         mg/L         0.000         26-OCT-19           Chromium (C1)-Dissolved         <0.050         mg/L         0.0001         26-OCT-19           Chromium (C7)-Dissolved         <0.00010         mg/L         0.0001         26-OCT-19           Chromium (C7)-Dissolved         <0.00010         mg/L         0.0001         26-OCT-19           Copper (Cu)-Dissolved         <0.00002         mg/L         0	` ,								
WG3201889-1         MB         NP           Aluminum (Al)-Dissolved         <0.0010	` '	ved							
Aluminum (Al)-Dissolved         <0.0010         mg/L         0.001         26-OCT-19           Antimony (Sb)-Dissolved         <0.00010	, ,			103.4		%		80-120	26-OCT-19
Antimony (Sb)-Dissolved         <0.00010         mg/L         0.0001         26-OCT-19           Arsenic (As)-Dissolved         <0.00010			NP	<0.0010		mg/L		0.001	26-OCT-19
Arsenic (As)-Dissolved         <0.00010	Antimony (Sb)-Disso	lved		<0.00010		mg/L			
Barium (Ba)-Dissolved         <0.00010				<0.00010		-			
Bismuth (Bi)-Dissolved         <0.000050         mg/L         0.00005         26-OCT-19           Boron (B)-Dissolved         <0.010	Barium (Ba)-Dissolve	ed		<0.00010		mg/L		0.0001	
Cadmium (Cd)-Dissolved         <0.000005C	Bismuth (Bi)-Dissolve	ed		<0.00005	0	mg/L		0.00005	
Cadmium (Cd)-Dissolved         <0.000005C	Boron (B)-Dissolved			<0.010		mg/L		0.01	26-OCT-19
Chromium (Cr)-Dissolved         <0.00010         mg/L         0.0001         26-OCT-19           Cobalt (Co)-Dissolved         <0.00010	Cadmium (Cd)-Disso	olved		<0.00000	5C	mg/L		0.000005	
Cobalt (Co)-Dissolved         <0.00010	Calcium (Ca)-Dissolv	ved		<0.050		mg/L		0.05	26-OCT-19
Copper (Cu)-Dissolved         <0.00020         mg/L         0.0002         26-OCT-19           Iron (Fe)-Dissolved         <0.010	Chromium (Cr)-Disso	olved		<0.00010		mg/L		0.0001	26-OCT-19
Iron (Fe)-Dissolved         <0.010	Cobalt (Co)-Dissolve	ed		<0.00010		mg/L		0.0001	26-OCT-19
Lead (Pb)-Dissolved         <0.000050	Copper (Cu)-Dissolve	ed		<0.00020		mg/L		0.0002	26-OCT-19
Lithium (Li)-Dissolved       <0.0010	Iron (Fe)-Dissolved			<0.010		mg/L		0.01	26-OCT-19
Magnesium (Mg)-Dissolved         <0.0050         mg/L         0.005         26-OCT-19           Manganese (Mn)-Dissolved         <0.00010	Lead (Pb)-Dissolved			<0.000050	0	mg/L		0.00005	26-OCT-19
Manganese (Mn)-Dissolved         <0.00010	Lithium (Li)-Dissolve	d		<0.0010		mg/L		0.001	26-OCT-19
Molybdenum (Mo)-Dissolved         <0.000050         mg/L         0.00005         26-OCT-19           Nickel (Ni)-Dissolved         <0.00050	Magnesium (Mg)-Dis	ssolved		<0.0050		mg/L		0.005	26-OCT-19
Nickel (Ni)-Dissolved       <0.00050	Manganese (Mn)-Dis	ssolved		<0.00010		mg/L		0.0001	26-OCT-19
Potassium (K)-Dissolved         <0.050         mg/L         0.05         26-OCT-19           Selenium (Se)-Dissolved         <0.000050	Molybdenum (Mo)-Di	issolved		<0.000050	0	mg/L		0.00005	26-OCT-19
Selenium (Se)-Dissolved       <0.000050	Nickel (Ni)-Dissolved	I		<0.00050		mg/L		0.0005	26-OCT-19
Silicon (Si)-Dissolved       <0.050       mg/L       0.05       26-OCT-19         Silver (Ag)-Dissolved       <0.000010	Potassium (K)-Disso	lved		<0.050		mg/L		0.05	26-OCT-19
Silver (Ag)-Dissolved       <0.000010	Selenium (Se)-Disso	lved		<0.000050	0	mg/L		0.00005	26-OCT-19
Sodium (Na)-Dissolved         <0.050         mg/L         0.05         26-OCT-19           Strontium (Sr)-Dissolved         <0.00020	Silicon (Si)-Dissolved	d		<0.050		mg/L		0.05	26-OCT-19
Strontium (Sr)-Dissolved         <0.00020         mg/L         0.0002         26-OCT-19           Thallium (TI)-Dissolved         <0.000010	Silver (Ag)-Dissolved	i		<0.000010	0	mg/L		0.00001	26-OCT-19
Thallium (TI)-Dissolved <0.000010 mg/L 0.00001 26-OCT-19	Sodium (Na)-Dissolv	red		<0.050		mg/L		0.05	26-OCT-19
2 20 20 10	Strontium (Sr)-Disso	lved		<0.00020		mg/L		0.0002	26-OCT-19
Tin (Sn)-Dissolved <0.00010 mg/L 0.0001 26-OCT-19	Thallium (TI)-Dissolv	ed		<0.000010	0	mg/L		0.00001	26-OCT-19
•	Tin (Sn)-Dissolved			<0.00010		mg/L		0.0001	26-OCT-19



Workorder: L2371413

Report Date: 31-OCT-19

Page 5 of 11

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA	Water							
Batch R4888233								
WG3201889-1 MB		NP						
Titanium (Ti)-Dissolved			<0.00030		mg/L		0.0003	26-OCT-19
Uranium (U)-Dissolved			<0.0000′		mg/L		0.00001	26-OCT-19
Vanadium (V)-Dissolved	d		<0.00050	)	mg/L		0.0005	26-OCT-19
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	26-OCT-19
MET-T-CCMS-VA	Water							
Batch R4888233								
WG3201973-2 LCS Aluminum (Al)-Total			111.3		%		00.400	00 OOT 40
Antimony (Sb)-Total			111.3		%		80-120	26-OCT-19
Arsenic (As)-Total			109.6		%		80-120	26-OCT-19
Barium (Ba)-Total			109.6		%		80-120	26-OCT-19
Bismuth (Bi)-Total			107.3		%		80-120 80-120	26-OCT-19
Boron (B)-Total			112.7		%		80-120	26-OCT-19
Cadmium (Cd)-Total			107.0		%		80-120	26-OCT-19
Calcium (Ca)-Total			107.5		%		80-120	26-OCT-19 26-OCT-19
Chromium (Cr)-Total			109.3		%		80-120	26-OCT-19 26-OCT-19
Cobalt (Co)-Total			105.7		%		80-120	26-OCT-19 26-OCT-19
Copper (Cu)-Total			105.0		%		80-120	26-OCT-19 26-OCT-19
Iron (Fe)-Total			102.9		%		80-120	26-OCT-19
Lead (Pb)-Total			108.4		%		80-120	26-OCT-19
Lithium (Li)-Total			106.6		%		80-120	26-OCT-19
Magnesium (Mg)-Total			110.2		%		80-120	26-OCT-19
Manganese (Mn)-Total			105.7		%		80-120	26-OCT-19
Molybdenum (Mo)-Tota	ıl		108.6		%		80-120	26-OCT-19
Nickel (Ni)-Total			107.0		%		80-120	26-OCT-19
Potassium (K)-Total			108.3		%		80-120	26-OCT-19
Selenium (Se)-Total			104.3		%		80-120	26-OCT-19
Silicon (Si)-Total			115.9		%		80-120	26-OCT-19
Silver (Ag)-Total			103.2		%		80-120	26-OCT-19
Sodium (Na)-Total			110.0		%		80-120	26-OCT-19
Strontium (Sr)-Total			104.2		%		80-120	26-OCT-19
Thallium (TI)-Total			105.1		%		80-120	26-OCT-19
Tin (Sn)-Total			106.7		%		80-120	26-OCT-19
Titanium (Ti)-Total			111.8		%		80-120	26-OCT-19



Workorder: L2371413

Report Date: 31-OCT-19

Page 6 of 11

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-VA	Water							
Batch R4888233								
WG3201973-2 LCS Uranium (U)-Total			107.9		%		00.400	00 OOT 10
Vanadium (V)-Total			107.9		% %		80-120	26-OCT-19
			104.7		%		80-120	26-OCT-19
Zinc (Zn)-Total			104.7		70		80-120	26-OCT-19
WG3201973-1 MB Aluminum (Al)-Total			<0.0030		mg/L		0.003	26-OCT-19
Antimony (Sb)-Total			<0.00010		mg/L		0.0001	26-OCT-19
Arsenic (As)-Total			<0.00010		mg/L		0.0001	26-OCT-19
Barium (Ba)-Total			<0.00010		mg/L		0.0001	26-OCT-19
Bismuth (Bi)-Total			<0.00005	0	mg/L		0.00005	26-OCT-19
Boron (B)-Total			<0.010		mg/L		0.01	26-OCT-19
Cadmium (Cd)-Total			<0.00000	50	mg/L		0.000005	26-OCT-19
Calcium (Ca)-Total			<0.050		mg/L		0.05	26-OCT-19
Chromium (Cr)-Total			<0.00010		mg/L		0.0001	26-OCT-19
Cobalt (Co)-Total			<0.00010		mg/L		0.0001	26-OCT-19
Copper (Cu)-Total			<0.00050		mg/L		0.0005	26-OCT-19
Iron (Fe)-Total			<0.010		mg/L		0.01	26-OCT-19
Lead (Pb)-Total			< 0.00005	0	mg/L		0.00005	26-OCT-19
Lithium (Li)-Total			<0.0010		mg/L		0.001	26-OCT-19
Magnesium (Mg)-Total			<0.0050		mg/L		0.005	26-OCT-19
Manganese (Mn)-Total			<0.00010		mg/L		0.0001	26-OCT-19
Molybdenum (Mo)-Total			< 0.00005	0	mg/L		0.00005	26-OCT-19
Nickel (Ni)-Total			<0.00050		mg/L		0.0005	26-OCT-19
Potassium (K)-Total			< 0.050		mg/L		0.05	26-OCT-19
Selenium (Se)-Total			< 0.00005	0	mg/L		0.00005	26-OCT-19
Silicon (Si)-Total			<0.10		mg/L		0.1	26-OCT-19
Silver (Ag)-Total			<0.00001	0	mg/L		0.00001	26-OCT-19
Sodium (Na)-Total			< 0.050		mg/L		0.05	26-OCT-19
Strontium (Sr)-Total			<0.00020		mg/L		0.0002	26-OCT-19
Thallium (TI)-Total			<0.00001	0	mg/L		0.00001	26-OCT-19
Tin (Sn)-Total			<0.00010		mg/L		0.0001	26-OCT-19
Titanium (Ti)-Total			<0.00030		mg/L		0.0003	26-OCT-19
Uranium (U)-Total			<0.00001	0	mg/L		0.00001	26-OCT-19
Vanadium (V)-Total			<0.00050		mg/L		0.0005	26-OCT-19
Zinc (Zn)-Total			< 0.0030		mg/L		0.003	26-OCT-19



Workorder: L2371413

Report Date: 31-OCT-19 Page 7 of 11

Test	Matrix	Reference	Result Qualifier	Units	RPD	Limit	Analyzed
NH3-L-F-CL	Water						
Batch R489: WG3206395-3 D Ammonia as N	2248 DUP	<b>L2371413-2</b> 0.0110	0.0129	mg/L	16	20	30-OCT-19
<b>WG3206395-14</b> L Ammonia as N	cs		97.6	%		85-115	30-OCT-19
WG3206395-2 L Ammonia as N	cs		102.4	%		85-115	30-OCT-19
WG3206395-1 N Ammonia as N	1B		<0.0050	mg/L		0.005	30-OCT-19
WG3206395-13 N Ammonia as N	1B		<0.0050	mg/L		0.005	30-OCT-19
WG3206395-4 N Ammonia as N	IS	L2371413-2	117.3	%		75-125	30-OCT-19
NO2-L-IC-N-CL	Water						
Batch R488- WG3201511-10 L Nitrite (as N)			103.8	%		90-110	24-OCT-19
	1B		<0.0010	mg/L		0.001	24-OCT-19
NO3-L-IC-N-CL	Water						
Batch R4884 WG3201511-10 L Nitrate (as N)			103.0	%		90-110	24-OCT-19
<b>WG3201511-9 N</b> Nitrate (as N)	1B		<0.0050	mg/L		0.005	24-OCT-19
ORP-CL	Water						
Batch R4883 WG3200864-5 C ORP	3661 :RM	CL-ORP	222	mV		210-230	24-OCT-19
P-T-L-COL-CL	Water						
Batch R4884 WG3201630-18 L Phosphorus (P)-To	4566 .CS		107.7	%		80-120	25-OCT-19
<b>WG3201630-17 N</b> Phosphorus (P)-To			<0.0020	mg/L		0.002	25-OCT-19
PH-CL	Water						

Workorder: L2371413

Report Date: 31-OCT-19 Page 8 of 11

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PH-CL	Water							
Batch R4888006 WG3203253-6 DUP pH	<b>3</b>	<b>L2371413-1</b> 8.39	8.20	J	рН	0.19	0.2	25-OCT-19
WG3203253-11 LCS pH			7.02	·	рН		6.9-7.1	25-OCT-19
<b>WG3203253-5 LCS</b> pH			7.01		рН		6.9-7.1	25-OCT-19
PO4-DO-L-COL-CL	Water							
Batch R4883326 WG3200572-10 LCS Orthophosphate-Dissol			102.4		%		80-120	24-OCT-19
WG3200572-9 MB Orthophosphate-Dissol			<0.0010		mg/L		0.001	24-OCT-19
SO4-IC-N-CL	Water							
Batch R4884134 WG3201511-10 LCS	ı							
Sulfate (SO4)  WG3201511-9 MB  Sulfate (SO4)			102.5 <0.30		% mg/L		90-110	24-OCT-19
SOLIDS-TDS-CL	Water							
Batch R4889928 WG3204372-5 LCS Total Dissolved Solids	3		100.7		%		85-115	29-OCT-19
WG3204372-4 MB Total Dissolved Solids			<10		mg/L		10	29-OCT-19
TKN-L-F-CL	Water							
Batch R4884311 WG3201558-14 LCS			100.2		%		75.405	05 OOT 40
Total Kjeldahl Nitrogen  WG3201558-18 LCS  Total Kjeldahl Nitrogen			100.3 98.1		%		75-125 75-125	25-OCT-19 25-OCT-19
WG3201558-13 MB Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	25-OCT-19
WG3201558-17 MB Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	25-OCT-19
TSS-L-CL	Water							



Workorder: L2371413

Report Date: 31-OCT-19

Page 9 of 11

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
TSS-L-CL	Water							
Batch R4889090 WG3203434-10 LCS Total Suspended Solid			95.5		%		85-115	28-OCT-19
WG3203434-9 MB Total Suspended Solid	s		<1.0		mg/L		1	28-OCT-19
TURBIDITY-CL	Water							
Batch R488363' WG3200828-8 LCS Turbidity	I		95.0		%		85-115	24-OCT-19
WG3200828-7 MB Turbidity			<0.10		NTU		0.1	24-OCT-19

Workorder: L2371413 Report Date: 31-OCT-19 Page 10 of 11

Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

### **Sample Parameter Qualifier Definitions:**

Qualifier	Description
J	Duplicate results and limits are expressed in terms of absolute difference.

Workorder: L2371413 Report Date: 31-OCT-19 Page 11 of 11

### **Hold Time Exceedances:**

	Sample						
ALS Product Description	ID	Sampling Date	Date Processed	Rec. HT	Actual HT	Units	Qualifier
Physical Tests							
Oxidation redution potential	by elect.						
	1	23-OCT-19 12:42	24-OCT-19 17:45	0.25	29	hours	EHTR-FM
	2	23-OCT-19 13:15	24-OCT-19 17:45	0.25	29	hours	EHTR-FM
рН							
	1	23-OCT-19 12:42	25-OCT-19 09:00	0.25	44	hours	EHTR-FM
	2	23-OCT-19 13:15	25-OCT-19 09:00	0.25	44	hours	EHTR-FM

### Legend & Qualifier Definitions:

EHTR-FM: Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended.

EHTR: Exceeded ALS recommended hold time prior to sample receipt.

EHTL: Exceeded ALS recommended hold time prior to analysis. Sample was received less than 24 hours prior to expiry.

EHT: Exceeded ALS recommended hold time prior to analysis.

Rec. HT: ALS recommended hold time (see units).

#### Notes\*:

Where actual sampling date is not provided to ALS, the date (& time) of receipt is used for calculation purposes. Where actual sampling time is not provided to ALS, the earlier of 12 noon on the sampling date or the time (& date) of receipt is used for calculation purposes. Samples for L2371413 were received on 24-OCT-19 09:00.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against predetermined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

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TECK COAL LIMITED (LINE CREEK)

ATTN: Chris Blurton

PO BOX 2003

SPARWOOD BC VOB 2G0

Date Received: 31-OCT-19

Report Date: 06-NOV-19 18:06 (MT)

Version: FINAL

Client Phone: 250-425-6111

# Certificate of Analysis

Lab Work Order #: L2375126
Project P.O. #: VP000608129

Job Reference: LINE CREEK OPERATION

C of C Numbers: 20191010

Legal Site Desc:



Lyudmyla Shvets, B.Sc. Account Manager

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L2375126 CONTD.... PAGE 2 of 12 Version: FINAL

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2375126-1 LC_PIZDC1307_WG_Q4-2019_NP							
Sampled By: KC/DT on 30-OCT-19 @ 13:10							
Matrix: WG							
Miscellaneous Parameters							
Dissolved Organic Carbon	4.02		0.50	ma/l		03-NOV-19	D4006764
	1.93		0.50	mg/L			R4896761
Total Kjeldahl Nitrogen	0.218		0.050	mg/L		01-NOV-19	R4895549
Total Organic Carbon	2.97		0.50	mg/L		03-NOV-19	R4896761
Dissolved Metals in Water							
Diss. Be (Iow) in Water by CRC ICPMS Beryllium (Be)-Dissolved	-0.000		0.000	ua/l	01-NOV-19	03-NOV-19	D4006765
Dissolved Metals Filtration Location	<0.020 FIELD		0.020	ug/L	01-1100-19	03-NOV-19 01-NOV-19	R4896765 R4896063
Diss. Mercury in Water by CVAAS or CVAFS	FILLD					01-11001-19	K4690003
Mercury (Hg)-Dissolved	<0.000050		0.0000050	mg/L	04-NOV-19	05-NOV-19	R4898478
Dissolved Mercury Filtration Location	FIELD		0.0000000	mg/L	04110113	04-NOV-19	R4896948
Dissolved Metals in Water by CRC ICPMS	I ILLD					0-110V-13	117030340
Dissolved Metals III Water by CRC ICPMS  Dissolved Metals Filtration Location	FIELD					01-NOV-19	R4896063
Aluminum (Al)-Dissolved	<0.0030		0.0030	mg/L	01-NOV-19	03-NOV-19	R4896765
Antimony (Sb)-Dissolved	<0.00010		0.00010	mg/L	01-NOV-19	03-NOV-19	R4896765
Arsenic (As)-Dissolved	0.00129		0.00010	mg/L	01-NOV-19	03-NOV-19	R4896765
Barium (Ba)-Dissolved	1.41		0.00010	mg/L	01-NOV-19	03-NOV-19	R4896765
Bismuth (Bi)-Dissolved	<0.000050		0.000050	mg/L	01-NOV-19	03-NOV-19	R4896765
Boron (B)-Dissolved	0.022		0.010	mg/L	01-NOV-19	03-NOV-19	R4896765
Cadmium (Cd)-Dissolved	<0.010	DLM	0.010	ug/L	01-NOV-19	03-NOV-19	R4896765
Calcium (Ca)-Dissolved	36.3		0.050	mg/L	01-NOV-19	03-NOV-19	R4896765
Chromium (Cr)-Dissolved	<0.00010		0.00010	mg/L	01-NOV-19	03-NOV-19	R4896765
Cobalt (Co)-Dissolved	<0.10		0.10	ug/L	01-NOV-19	03-NOV-19	R4896765
Copper (Cu)-Dissolved	0.00027		0.00020	mg/L	01-NOV-19	03-NOV-19	R4896765
Iron (Fe)-Dissolved	0.199		0.010	mg/L	01-NOV-19	03-NOV-19	R4896765
Lead (Pb)-Dissolved	<0.000050		0.000050	mg/L	01-NOV-19	03-NOV-19	R4896765
Lithium (Li)-Dissolved	0.0737		0.0010	mg/L	01-NOV-19	03-NOV-19	R4896765
Magnesium (Mg)-Dissolved	22.2		0.10	mg/L	01-NOV-19	03-NOV-19	R4896765
Manganese (Mn)-Dissolved	0.00860		0.00010	mg/L	01-NOV-19	03-NOV-19	R4896765
Molybdenum (Mo)-Dissolved	0.0316		0.000050	mg/L	01-NOV-19	03-NOV-19	R4896765
Nickel (Ni)-Dissolved	0.00072		0.00050	mg/L	01-NOV-19	03-NOV-19	R4896765
Potassium (K)-Dissolved	5.33		0.050	mg/L	01-NOV-19	03-NOV-19	R4896765
Selenium (Se)-Dissolved	<0.050		0.050	ug/L	01-NOV-19	03-NOV-19	R4896765
Silicon (Si)-Dissolved	2.82		0.050	mg/L	01-NOV-19	03-NOV-19	R4896765
Silver (Ag)-Dissolved	<0.000010		0.000010	mg/L	01-NOV-19	03-NOV-19	R4896765
Sodium (Na)-Dissolved	14.7		0.050	mg/L	01-NOV-19	03-NOV-19	R4896765
Strontium (Sr)-Dissolved	0.135		0.00020	mg/L	01-NOV-19	03-NOV-19	R4896765
Thallium (TI)-Dissolved	<0.000010		0.000010	mg/L	01-NOV-19	03-NOV-19	R4896765
Tin (Sn)-Dissolved	<0.00010		0.00010	mg/L	01-NOV-19	03-NOV-19	R4896765
Titanium (Ti)-Dissolved	<0.010		0.010	mg/L	01-NOV-19	03-NOV-19	R4896765
Uranium (U)-Dissolved	0.000027		0.000010	mg/L	01-NOV-19	03-NOV-19	R4896765
Vanadium (V)-Dissolved	<0.00050		0.00050	mg/L	01-NOV-19	03-NOV-19	R4896765
Zinc (Zn)-Dissolved	0.0030		0.0010	mg/L	01-NOV-19	03-NOV-19	R4896765
Hardness							
Hardness (as CaCO3)	182		0.50	mg/L		05-NOV-19	
Total Metals in Water							
Total Be (Low) in Water by CRC ICPMS Beryllium (Be)-Total	0.029		0.020	ug/L		02-NOV-19	R4897295
Total Metals in Water by CRC ICPMS	0.020		0.020	~g/ <b>=</b>		32 0	
Aluminum (Al)-Total	0.467		0.0030	mg/L		04-NOV-19	R4898993
Antimony (Sb)-Total	<0.00010		0.00010	mg/L		02-NOV-19	R4897295
Arsenic (As)-Total	0.00161		0.00010	mg/L		02-NOV-19	R4897295
	3.55.51		0.00010	···· <i>y</i> =		,	

<sup>\*</sup> Refer to Referenced Information for Qualifiers (if any) and Methodology.

L2375126 CONTD.... PAGE 3 of 12 Version: FINAL

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2375126-1 LC_PIZDC1307_WG_Q4-2019_NP							
Sampled By: KC/DT on 30-OCT-19 @ 13:10							
Matrix: WG							
Total Metals in Water by CRC ICPMS Barium (Ba)-Total	1.42		0.00010	mg/L		02-NOV-19	R4897295
Bismuth (Bi)-Total	< 0.000050		0.000050	mg/L		02-NOV-19	R4897295
Boron (B)-Total	0.024		0.010	mg/L		02-NOV-19	R4897295
Cadmium (Cd)-Total	0.0824		0.0050	ug/L		02-NOV-19	R4897295
Calcium (Ca)-Total	38.7		0.050	mg/L		02-NOV-19	R4897295
Chromium (Cr)-Total	0.00065		0.00010	mg/L		02-NOV-19	R4897295
Cobalt (Co)-Total	0.14		0.10	ug/L		02-NOV-19	R4897295
Copper (Cu)-Total	0.00277		0.00050	mg/L		02-NOV-19	R4897295
Iron (Fe)-Total	1.29		0.010	mg/L		02-NOV-19	R4897295
Lead (Pb)-Total	0.000596		0.000050	mg/L		02-NOV-19	R4897295
Lithium (Li)-Total	0.0815		0.0010	mg/L		02-NOV-19	R4897295
Magnesium (Mg)-Total	19.5		0.10	mg/L		02-NOV-19	R4897295
Manganese (Mn)-Total	0.0130		0.00010	mg/L		02-NOV-19	R4897295
Molybdenum (Mo)-Total	0.0307		0.000050	mg/L		02-NOV-19	R4897295
Nickel (Ni)-Total	0.00140		0.00050	mg/L		02-NOV-19	R4897295
Potassium (K)-Total	4.98		0.050	mg/L		02-NOV-19	R4897295
Selenium (Se)-Total	<0.050		0.050	ug/L		02-NOV-19	R4897295
Silicon (Si)-Total	3.24		0.10	mg/L		02-NOV-19	R4897295
Silver (Ag)-Total	0.000041		0.000010	mg/L		04-NOV-19	R4898993
Sodium (Na)-Total	13.5		0.050	mg/L		02-NOV-19	R4897295
Strontium (Sr)-Total	0.126		0.00020	mg/L		02-NOV-19	R4897295
Thallium (TI)-Total	0.000013		0.000010	mg/L		02-NOV-19	R4897295
Tin (Sn)-Total Titanium (Ti)-Total	0.00016		0.00010	mg/L		02-NOV-19	R4897295
Uranium (U)-Total	<0.010 0.000077		0.010	mg/L		02-NOV-19 02-NOV-19	R4897295
Vanadium (V)-Total	0.000077		0.000010 0.00050	mg/L mg/L		02-NOV-19 02-NOV-19	R4897295 R4897295
Zinc (Zn)-Total	0.00122		0.0030	mg/L		02-NOV-19 02-NOV-19	R4897295
Routine for Teck Coal	0.0104		0.0030	mg/L		02-110 1-13	114097293
Acidity by Automatic Titration							
Acidity (as CaCO3)	<1.0		1.0	mg/L		01-NOV-19	R4895745
Alkalinity (Species) by Manual Titration			-	J			
Alkalinity, Bicarbonate (as CaCO3)	219		1.0	mg/L		01-NOV-19	R4897006
Alkalinity, Carbonate (as CaCO3)	4.4		1.0	mg/L		01-NOV-19	R4897006
Alkalinity, Hydroxide (as CaCO3)	<1.0		1.0	mg/L		01-NOV-19	R4897006
Alkalinity, Total (as CaCO3)	223		1.0	mg/L		01-NOV-19	R4897006
Ammonia, Total (as N)							
Ammonia as N	0.131		0.0050	mg/L		05-NOV-19	R4900036
Bromide in Water by IC (Low Level)						04 00= :-	
Bromide (Br)	<0.050		0.050	mg/L		31-OCT-19	R4895623
Chloride in Water by IC	0.00		0.50	m= =://		24 007 40	D4005000
Chloride (Cl)	0.68		0.50	mg/L		31-OCT-19	R4895623
Electrical Conductivity (EC) Conductivity (@ 25C)	355		2.0	uS/cm		01-NOV-19	R4897006
Fluoride in Water by IC	333		2.0	uo/UIII		01-1100-19	114097000
Fluoride in Water by IC	0.584		0.020	mg/L		31-OCT-19	R4895623
Ion Balance Calculation	0.504		0.020	∌, ⊑		3. 23. 13	
Ion Balance	97.8		-100	%		05-NOV-19	
Ion Balance Calculation							
Cation - Anion Balance	-1.1			%		05-NOV-19	
Anion Sum	4.52			meq/L		05-NOV-19	
Cation Sum	4.42			meq/L		05-NOV-19	
Nitrate in Water by IC (Low Level)							

<sup>\*</sup> Refer to Referenced Information for Qualifiers (if any) and Methodology.

L2375126 CONTD.... PAGE 4 of 12 Version: FINAL

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2375126-1 LC_PIZDC1307_WG_Q4-2019_NP							
Sampled By: KC/DT on 30-OCT-19 @ 13:10							
Matrix: WG							
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	0.0121		0.0050	mg/L		31-OCT-19	R4895623
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	<0.0010		0.0010	mg/L		31-OCT-19	R4895623
Orthophosphate-Dissolved (as P)				"		04 007 40	D
Orthophosphate-Dissolved (as P)	0.0010		0.0010	mg/L		31-OCT-19	R4893366
Oxidation redution potential by elect. ORP	478		-1000	mV		31-OCT-19	R4893526
Phosphorus (P)-Total	470		1000	****		01 001 10	114000020
Phosphorus (P)-Total	0.0387		0.0020	mg/L		04-NOV-19	R4897866
Sulfate in Water by IC							
Sulfate (SO4)	0.38		0.30	mg/L		31-OCT-19	R4895623
Total Dissolved Solids Total Dissolved Solids	046	DLHC	20	ma/l		04 NOV 40	D4000040
Total Suspended Solids Total Suspended Solids	216	DLITO	20	mg/L		04-NOV-19	R4899012
Total Suspended Solids Total Suspended Solids	24.0		1.0	mg/L		03-NOV-19	R4898646
Turbidity				Ū			
Turbidity	36.2		0.10	NTU		31-OCT-19	R4893412
pH							
pH	8.31		0.10	рН		01-NOV-19	R4897006
L2375126-2 LC_PIZDC1308_WG_Q4-2019_NP							
Sampled By: KC/DT on 30-OCT-19 @ 12:28							
Matrix: WG							
Miscellaneous Parameters	2.42		0.50			02 NOV 10	D4000704
Dissolved Organic Carbon	2.12		0.50	mg/L		03-NOV-19	R4896761
Total Kjeldahl Nitrogen Total Organic Carbon	0.092 2.06		0.050 0.50	mg/L		01-NOV-19 03-NOV-19	R4895549 R4896761
Dissolved Metals in Water	2.00		0.50	mg/L		03-1107-19	K4090701
Diss. Be (low) in Water by CRC ICPMS							
Beryllium (Be)-Dissolved	<0.020		0.020	ug/L	01-NOV-19	03-NOV-19	R4896765
Dissolved Metals Filtration Location	FIELD					01-NOV-19	R4896063
Diss. Mercury in Water by CVAAS or CVAFS							
Mercury (Hg)-Dissolved	<0.000050		0.0000050	mg/L	04-NOV-19	05-NOV-19	R4898478
Dissolved Mercury Filtration Location	FIELD					04-NOV-19	R4896948
Dissolved Metals in Water by CRC ICPMS Dissolved Metals Filtration Location	FIELD					01-NOV-19	R4896063
Aluminum (Al)-Dissolved	<0.0030		0.0030	mg/L	01-NOV-19	03-NOV-19	R4896765
Antimony (Sb)-Dissolved	<0.00010		0.00010	mg/L	01-NOV-19	03-NOV-19	R4896765
Arsenic (As)-Dissolved	0.00012		0.00010	mg/L	01-NOV-19	03-NOV-19	R4896765
Barium (Ba)-Dissolved	0.385		0.00010	mg/L	01-NOV-19	03-NOV-19	R4896765
Bismuth (Bi)-Dissolved	<0.000050		0.000050	mg/L	01-NOV-19	03-NOV-19	R4896765
Boron (B)-Dissolved	0.013		0.010	mg/L	01-NOV-19	03-NOV-19	R4896765
Cadmium (Cd)-Dissolved Calcium (Ca)-Dissolved	0.0469 69.5		0.0050 0.050	ug/L mg/L	01-NOV-19 01-NOV-19	03-NOV-19 03-NOV-19	R4896765 R4896765
Chromium (Cr)-Dissolved	<0.00010		0.00010	mg/L	01-NOV-19	03-NOV-19 03-NOV-19	R4896765
Cobalt (Co)-Dissolved	0.90		0.00010	ug/L	01-NOV-19	03-NOV-19	R4896765
Copper (Cu)-Dissolved	0.00025		0.00020	mg/L	01-NOV-19	03-NOV-19	R4896765
Iron (Fe)-Dissolved	0.206		0.010	mg/L	01-NOV-19	03-NOV-19	R4896765
Lead (Pb)-Dissolved	<0.000050		0.000050	mg/L	01-NOV-19	03-NOV-19	R4896765
Lithium (Li)-Dissolved	0.0182		0.0010	mg/L	01-NOV-19	03-NOV-19	R4896765
Magnesium (Mg)-Dissolved	27.3		0.10	mg/L	01-NOV-19	03-NOV-19	R4896765
Manganese (Mn)-Dissolved	0.0804		0.00010	mg/L	01-NOV-19	03-NOV-19	R4896765

<sup>\*</sup> Refer to Referenced Information for Qualifiers (if any) and Methodology.

L2375126 CONTD.... PAGE 5 of 12 Version: FINAL

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
1 2275426 2							
L2375126-2 LC_PIZDC1308_WG_Q4-2019_NP							
Sampled By: KC/DT on 30-OCT-19 @ 12:28							
Matrix: WG							
Dissolved Metals in Water by CRC ICPMS Molybdenum (Mo)-Dissolved	0.00620		0.000050	ma/l	01-NOV-19	03-NOV-19	D4906765
Nickel (Ni)-Dissolved	0.00630 0.00167		0.000050 0.00050	mg/L mg/L	01-NOV-19	03-NOV-19 03-NOV-19	R4896765 R4896765
Potassium (K)-Dissolved	2.69		0.00030	mg/L	01-NOV-19	03-NOV-19	R4896765
Selenium (Se)-Dissolved	0.075		0.050	ug/L	01-NOV-19	03-NOV-19	R4896765
Silicon (Si)-Dissolved	4.45		0.050	mg/L	01-NOV-19	03-NOV-19	R4896765
Silver (Ag)-Dissolved	<0.00010		0.00010	mg/L	01-NOV-19	03-NOV-19	R4896765
Sodium (Na)-Dissolved	4.97		0.050	mg/L	01-NOV-19	03-NOV-19	R4896765
Strontium (Sr)-Dissolved	0.106		0.00020	mg/L	01-NOV-19	03-NOV-19	R4896765
Thallium (TI)-Dissolved	0.000029		0.000010	mg/L	01-NOV-19	03-NOV-19	R4896765
Tin (Sn)-Dissolved	< 0.00010		0.00010	mg/L	01-NOV-19	03-NOV-19	R4896765
Titanium (Ti)-Dissolved	<0.010		0.010	mg/L	01-NOV-19	03-NOV-19	R4896765
Uranium (U)-Dissolved	0.000887		0.000010	mg/L	01-NOV-19	03-NOV-19	R4896765
Vanadium (V)-Dissolved	< 0.00050		0.00050	mg/L	01-NOV-19	03-NOV-19	R4896765
Zinc (Zn)-Dissolved	0.0018		0.0010	mg/L	01-NOV-19	03-NOV-19	R4896765
Hardness							
Hardness (as CaCO3)	286		0.50	mg/L		04-NOV-19	
Total Metals in Water							
Total Be (Low) in Water by CRC ICPMS				_			
Beryllium (Be)-Total	<0.020		0.020	ug/L		02-NOV-19	R4897295
Total Metals in Water by CRC ICPMS	0.0075		0.0000			00 NOV 40	D 4007005
Aluminum (Al)-Total	0.0275		0.0030	mg/L		02-NOV-19	R4897295
Antimony (Sb)-Total	<0.00010		0.00010	mg/L		02-NOV-19	R4897295
Arsenic (As)-Total Barium (Ba)-Total	0.00023 0.386		0.00010	mg/L		02-NOV-19 02-NOV-19	R4897295
Bismuth (Bi)-Total	<0.00050		0.00010 0.000050	mg/L mg/L		02-NOV-19 02-NOV-19	R4897295 R4897295
Boron (B)-Total	0.014		0.00030	mg/L		02-NOV-19 02-NOV-19	R4897295
Cadmium (Cd)-Total	0.114		0.010	ug/L		02-NOV-19	R4897295
Calcium (Ca)-Total	81.6		0.050	mg/L		02-NOV-19	R4897295
Chromium (Cr)-Total	0.00012		0.00010	mg/L		02-NOV-19	R4897295
Cobalt (Co)-Total	0.87		0.10	ug/L		02-NOV-19	R4897295
Copper (Cu)-Total	0.00054		0.00050	mg/L		02-NOV-19	R4897295
Iron (Fe)-Total	0.343		0.010	mg/L		02-NOV-19	R4897295
Lead (Pb)-Total	0.000149		0.000050	mg/L		02-NOV-19	R4897295
Lithium (Li)-Total	0.0198		0.0010	mg/L		02-NOV-19	R4897295
Magnesium (Mg)-Total	25.1		0.10	mg/L		02-NOV-19	R4897295
Manganese (Mn)-Total	0.0709		0.00010	mg/L		02-NOV-19	R4897295
Molybdenum (Mo)-Total	0.00489		0.000050	mg/L		02-NOV-19	R4897295
Nickel (Ni)-Total	0.00172		0.00050	mg/L		02-NOV-19	R4897295
Potassium (K)-Total	2.53		0.050	mg/L		02-NOV-19	R4897295
Selenium (Se)-Total	0.073		0.050	ug/L		02-NOV-19	R4897295
Silicon (Si)-Total	4.68		0.10	mg/L		02-NOV-19	R4897295
Silver (Ag)-Total	0.000014		0.000010	mg/L		02-NOV-19	R4897295
Sodium (Na)-Total	5.07		0.050	mg/L		02-NOV-19	R4897295
Strontium (Sr)-Total	0.104		0.00020	mg/L		02-NOV-19	R4897295
Thallium (TI)-Total	0.000032		0.000010	mg/L		02-NOV-19	R4897295
Tin (Sn)-Total	<0.00010		0.00010	mg/L		02-NOV-19	R4897295
Titanium (Ti)-Total	< 0.010		0.010	mg/L		02-NOV-19	R4897295
Uranium (U)-Total Vanadium (V)-Total	0.00103		0.000010	mg/L		02-NOV-19 02-NOV-19	R4897295
Zinc (Zn)-Total	<0.00050 <0.0030		0.00050 0.0030	mg/L mg/L		02-NOV-19 02-NOV-19	R4897295 R4897295
Routine for Teck Coal	<u> </u>		0.0030	my/L		02-140 V-13	114031230
Acidity by Automatic Titration							
Acidity by Automatic Intation					-		

<sup>\*</sup> Refer to Referenced Information for Qualifiers (if any) and Methodology.

L2375126 CONTD.... PAGE 6 of 12 Version: FINAL

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2375126-2 LC PIZDC1308 WG Q4-2019 NP							
Sampled By: KC/DT on 30-OCT-19 @ 12:28							
Matrix: WG							
Acidity by Automatic Titration							
Acidity by Automatic Titration Acidity (as CaCO3)	<1.0		1.0	mg/L		01-NOV-19	R4895745
Alkalinity (Species) by Manual Titration	_						
Alkalinity, Bicarbonate (as CaCO3)	329		1.0	mg/L		01-NOV-19	R4897006
Alkalinity, Carbonate (as CaCO3)	<1.0		1.0	mg/L		01-NOV-19	R4897006
Alkalinity, Hydroxide (as CaCO3)	<1.0		1.0	mg/L		01-NOV-19	R4897006
Alkalinity, Total (as CaCO3)	329		1.0	mg/L		01-NOV-19	R4897006
Ammonia, Total (as N) Ammonia as N	0.0378		0.0050	mg/L		05-NOV-19	R4900036
Bromide in Water by IC (Low Level)			1.1000	J -			
Bromide (Br)	<0.050		0.050	mg/L		31-OCT-19	R4895623
Chloride in Water by IC							
Chloride (Cl)	1.03		0.50	mg/L		31-OCT-19	R4895623
Electrical Conductivity (EC) Conductivity (@ 25C)	526		2.0	uS/cm		01-NOV-19	R4897006
Fluoride in Water by IC	320		2.0	u3/cm		01-1101-19	K4697000
Fluoride (F)	0.235		0.020	mg/L		31-OCT-19	R4895623
Ion Balance Calculation				-			
Cation - Anion Balance	-5.4			%		04-NOV-19	
Anion Sum	6.70			meq/L		04-NOV-19	
Cation Sum	6.01			meq/L		04-NOV-19	
Ion Balance Calculation Ion Balance	89.7		-100	%		04-NOV-19	
Nitrate in Water by IC (Low Level)	00.7		100	"		5.7107 10	
Nitrate (as N)	0.0142		0.0050	mg/L		31-OCT-19	R4895623
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	<0.0010		0.0010	mg/L		31-OCT-19	R4895623
Orthophosphate-Dissolved (as P) Orthophosphate-Dissolved (as P)	<0.0010		0.0010	mg/L		31-OCT-19	R4893366
Oxidation redution potential by elect.	<b>10.0010</b>		0.0010	g, L		3. 331-13	114000000
ORP OSCIOLARION POTENTIAL BY CICCU.	439		-1000	mV		31-OCT-19	R4893526
Phosphorus (P)-Total							
Phosphorus (P)-Total	0.0037		0.0020	mg/L		04-NOV-19	R4897866
Sulfate in Water by IC Sulfate (SO4)	4 20		0.30	ma/l		31-OCT-19	D4805633
Total Dissolved Solids	4.20		0.30	mg/L		31-001-19	R4895623
Total Dissolved Solids Total Dissolved Solids	322	DLHC	20	mg/L		04-NOV-19	R4899012
Total Suspended Solids							
Total Suspended Solids	5.6		1.0	mg/L		03-NOV-19	R4898646
Turbidity Turbidity	7.40		0.40	NITI I		31-OCT-19	D4000440
pH	7.49		0.10	NTU		31-001-19	R4893412
pH pH	8.09		0.10	pН		01-NOV-19	R4897006
L2375126-3 WG Q4-2019 CC1			-				
Sampled By: KC/DT on 30-OCT-19 @ 12:28							
Matrix: WG							
Miscellaneous Parameters							
Dissolved Organic Carbon	1.90		0.50	mg/L		03-NOV-19	R4896761
Total Kjeldahl Nitrogen	0.080		0.050	mg/L		01-NOV-19	R4895549
Total Organic Carbon	2.08		0.50	mg/L		03-NOV-19	R4896761
Dissolved Metals in Water							
Diss. Be (low) in Water by CRC ICPMS Beryllium (Be)-Dissolved	~0.020		0.020	ua/l	01-NOV-19	03-NOV-19	D/806765
Por Amorn (De)-Dissolven	<0.020		0.020	ug/L	U1-NOV-19	U3-NOV-19	R4896765

<sup>\*</sup> Refer to Referenced Information for Qualifiers (if any) and Methodology.

L2375126 CONTD.... PAGE 7 of 12 Version: FINAL

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2375126-3 WG Q4-2019 CC1							
Sampled By: KC/DT on 30-OCT-19 @ 12:28							
Matrix: WG							
Diss. Be (low) in Water by CRC ICPMS Dissolved Metals Filtration Location	FIELD					01-NOV-19	R4896063
Diss. Mercury in Water by CVAAS or CVAFS						<b>_</b>	
Mercury (Hg)-Dissolved	<0.000050		0.0000050	mg/L	04-NOV-19	05-NOV-19	R4898478
Dissolved Mercury Filtration Location	FIELD					04-NOV-19	R4896948
Dissolved Metals in Water by CRC ICPMS Dissolved Metals Filtration Location	FIELD					01-NOV-19	R4896063
Aluminum (AI)-Dissolved	<0.0030		0.0030	mg/L	01-NOV-19	03-NOV-19	R4896765
Antimony (Sb)-Dissolved	<0.00010		0.00010	mg/L	01-NOV-19	03-NOV-19	R4896765
Arsenic (As)-Dissolved	0.00014		0.00010	mg/L	01-NOV-19	03-NOV-19	R4896765
Barium (Ba)-Dissolved	0.389		0.00010	mg/L	01-NOV-19	03-NOV-19	R4896765
Bismuth (Bi)-Dissolved	<0.000050		0.000050	mg/L	01-NOV-19	03-NOV-19	R4896765
Boron (B)-Dissolved	0.013		0.010	mg/L	01-NOV-19	03-NOV-19	R4896765
Cadmium (Cd)-Dissolved	0.0390		0.0050	ug/L	01-NOV-19	03-NOV-19	R4896765
Calcium (Ca)-Dissolved	71.9		0.050	mg/L	01-NOV-19	03-NOV-19	R4896765
Chromium (Cr)-Dissolved	<0.00010		0.00010	mg/L	01-NOV-19 01-NOV-19	03-NOV-19	R4896765
Cobalt (Co)-Dissolved Copper (Cu)-Dissolved	0.90 0.00022		0.10 0.00020	ug/L mg/L	01-NOV-19 01-NOV-19	03-NOV-19 03-NOV-19	R4896765 R4896765
Iron (Fe)-Dissolved	0.00022		0.00020	mg/L	01-NOV-19	03-NOV-19	R4896765
Lead (Pb)-Dissolved	<0.00050		0.00050	mg/L	01-NOV-19	03-NOV-19	R4896765
Lithium (Li)-Dissolved	0.0183		0.000030	mg/L	01-NOV-19	03-NOV-19	R4896765
Magnesium (Mg)-Dissolved	26.9		0.0010	mg/L	01-NOV-19	03-NOV-19	R4896765
Manganese (Mn)-Dissolved	0.0812		0.00010	mg/L	01-NOV-19	03-NOV-19	R4896765
Molybdenum (Mo)-Dissolved	0.00631	DTMF	0.000050	mg/L	01-NOV-19	03-NOV-19	R4896765
Nickel (Ni)-Dissolved	0.00168		0.00050	mg/L	01-NOV-19	03-NOV-19	R4896765
Potassium (K)-Dissolved	2.67		0.050	mg/L	01-NOV-19	03-NOV-19	R4896765
Selenium (Se)-Dissolved	0.053		0.050	ug/L	01-NOV-19	03-NOV-19	R4896765
Silicon (Si)-Dissolved	4.43		0.050	mg/L	01-NOV-19	03-NOV-19	R4896765
Silver (Ag)-Dissolved	<0.00010		0.000010	mg/L	01-NOV-19	03-NOV-19	R4896765
Sodium (Na)-Dissolved	4.97		0.050	mg/L	01-NOV-19	03-NOV-19	R4896765
Strontium (Sr)-Dissolved	0.105		0.00020	mg/L	01-NOV-19	03-NOV-19	R4896765
Thallium (TI)-Dissolved	0.000027		0.000010	mg/L	01-NOV-19	03-NOV-19	R4896765
Tin (Sn)-Dissolved	<0.00010		0.00010	mg/L	01-NOV-19	03-NOV-19	R4896765
Titanium (Ti)-Dissolved	<0.010		0.010	mg/L	01-NOV-19	03-NOV-19	R4896765
Uranium (U)-Dissolved	0.000884		0.000010	mg/L	01-NOV-19	03-NOV-19	R4896765
Vanadium (V)-Dissolved	<0.00050		0.00050	mg/L	01-NOV-19	03-NOV-19	R4896765
Zinc (Zn)-Dissolved	0.0018		0.0010	mg/L	01-NOV-19	03-NOV-19	R4896765
Hardness				,		05.1.0	
Hardness (as CaCO3)	290		0.50	mg/L		05-NOV-19	
Total Metals in Water							
Total Be (Low) in Water by CRC ICPMS  Beryllium (Be)-Total	<b>-0.000</b>		0.000	ug/l		02 NOV 10	D4907005
, , ,	<0.020		0.020	ug/L		02-NOV-19	R4897295
Total Mercury in Water by CVAAS or CVAFS Mercury (Hg)-Total	<0.0000050		0.0000050	mg/L		04-NOV-19	R4898268
Total Metals in Water by CRC ICPMS							
Aluminum (Al)-Total	0.0622		0.0030	mg/L		02-NOV-19	R4897295
Antimony (Sb)-Total	<0.00010		0.00010	mg/L		04-NOV-19	R4898993
Arsenic (As)-Total	0.00023		0.00010	mg/L		02-NOV-19	R4897295
Barium (Ba)-Total	0.392		0.00010	mg/L		02-NOV-19	R4897295
Bismuth (Bi)-Total	<0.000050		0.000050	mg/L		02-NOV-19	R4897295
Boron (B)-Total	0.012		0.010	mg/L		02-NOV-19	R4897295
Cadmium (Cd)-Total	0.123		0.0050	ug/L		02-NOV-19	R4897295
Calcium (Ca)-Total	73.1		0.050	mg/L		02-NOV-19	R4897295

<sup>\*</sup> Refer to Referenced Information for Qualifiers (if any) and Methodology.

L2375126 CONTD.... PAGE 8 of 12 Version: FINAL

Sample Details/Parameters	Result	Qualifier* D.L.	Units	Extracted	Analyzed	Batch
L2375126-3 WG_Q4-2019_CC1						
Sampled By: KC/DT on 30-OCT-19 @ 12:28						
Matrix: WG						
Total Metals in Water by CRC ICPMS Chromium (Cr)-Total	0.00017	0.00010	mg/L		02-NOV-19	R4897295
Cobalt (Co)-Total	0.88	0.10	ug/L		02-NOV-19	R4897295
Copper (Cu)-Total	0.00067	0.00050	mg/L		02-NOV-19	R4897295
Iron (Fe)-Total	0.355	0.010	mg/L		02-NOV-19	R4897295
Lead (Pb)-Total	0.000154	0.000050	mg/L		02-NOV-19	R4897295
Lithium (Li)-Total	0.0172	0.0010	mg/L		02-NOV-19	R4897295
Magnesium (Mg)-Total	24.9	0.10	mg/L		02-NOV-19	R4897295
Manganese (Mn)-Total	0.0704	0.00010	mg/L		02-NOV-19	R4897295
Molybdenum (Mo)-Total	0.00444	0.000050	mg/L		02-NOV-19	R4897295
Nickel (Ni)-Total	0.00171	0.00050	mg/L		02-NOV-19	R4897295
Potassium (K)-Total	2.51	0.050	mg/L		02-NOV-19	R4897295
Selenium (Se)-Total	0.051	0.050	ug/L		02-NOV-19	R4897295
Silicon (Si)-Total	4.64	0.10	mg/L		02-NOV-19	R4897295
Silver (Ag)-Total	<0.000010	0.000010	mg/L		02-NOV-19	R4897295
Sodium (Na)-Total	5.04	0.050	mg/L		02-NOV-19	R4897295
Strontium (Sr)-Total	0.0956	0.00020	mg/L		02-NOV-19	R4897295
Thallium (TI)-Total	0.000031	0.000010	mg/L		02-NOV-19	R4897295
Tin (Sn)-Total	0.00021	0.00010	mg/L		02-NOV-19	R4897295
Titanium (Ti)-Total Uranium (U)-Total	<0.010	0.010	mg/L		02-NOV-19	R4897295
Vanadium (V)-Total	0.000950	0.000010	mg/L		02-NOV-19 02-NOV-19	R4897295
Zinc (Zn)-Total	0.00055 0.0030	0.00050 0.0030	mg/L mg/L		02-NOV-19 02-NOV-19	R4897295 R4897295
Routine for Teck Coal	0.0030	0.0030	IIIg/L		02-1107-19	K4097295
Acidity by Automatic Titration						
Acidity (as CaCO3)	2.3	1.0	mg/L		01-NOV-19	R4895745
Alkalinity (Species) by Manual Titration						
Alkalinity, Bicarbonate (as CaCO3)	324	1.0	mg/L		01-NOV-19	R4897006
Alkalinity, Carbonate (as CaCO3)	<1.0	1.0	mg/L		01-NOV-19	R4897006
Alkalinity, Hydroxide (as CaCO3)	<1.0	1.0	mg/L		01-NOV-19	R4897006
Alkalinity, Total (as CaCO3)	324	1.0	mg/L		01-NOV-19	R4897006
Ammonia, Total (as N)						
Ammonia as N	0.0413	0.0050	mg/L		05-NOV-19	R4900036
Bromide in Water by IC (Low Level)			,,		04 007 40	D 100-000
Bromide (Br)	<0.050	0.050	mg/L		31-OCT-19	R4895623
Chloride in Water by IC Chloride (CI)	1.09	0.50	mg/L		31-OCT-19	R4895623
Electrical Conductivity (EC)	1.09	0.50	IIIg/L		31-001-19	N4090023
Conductivity (@ 25C)	526	2.0	uS/cm		01-NOV-19	R4897006
Fluoride in Water by IC		2.0				
Fluoride (F)	0.202	0.020	mg/L		31-OCT-19	R4895623
Ion Balance Calculation						
Ion Balance	92.2	-100	%		05-NOV-19	
Ion Balance Calculation						
Cation - Anion Balance	-4.1		%		05-NOV-19	
Anion Sum	6.62		meq/L		05-NOV-19	
Cation Sum	6.10		meq/L		05-NOV-19	
Nitrate in Water by IC (Low Level) Nitrate (as N)	0.0156	0.0050	mg/L		31-OCT-19	R4895623
Nitrite in Water by IC (Low Level) Nitrite (as N)	<0.0010	0.0010	mg/L		31-OCT-19	R4895623
Orthophosphate-Dissolved (as P) Orthophosphate-Dissolved (as P)	<0.0010	0.0010	mg/L		31-OCT-19	R4893366
	10.0010	0.0010	9/ -		3. 551 10	11400000

<sup>\*</sup> Refer to Referenced Information for Qualifiers (if any) and Methodology.

L2375126 CONTD.... PAGE 9 of 12 Version: FINAL

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
   L2375126-3   WG_Q4-2019_CC1							
Sampled By: KC/DT on 30-OCT-19 @ 12:28							
Matrix: WG							
Oxidation redution potential by elect. ORP	276		-1000	mV		31-OCT-19	R4893526
Phosphorus (P)-Total	0.0004		0.0000			04 NOV 40	D 4007000
Phosphorus (P)-Total Sulfate in Water by IC	0.0034		0.0020	mg/L		04-NOV-19	R4897866
Sulfate (SO4)	4.52		0.30	mg/L		31-OCT-19	R4895623
Total Dissolved Solids Total Dissolved Solids	324	DLHC	20	mg/L		04-NOV-19	R4899012
Total Suspended Solids							
Total Suspended Solids  Turbidity	6.5		1.0	mg/L		03-NOV-19	R4898646
Turbidity	7.04		0.10	NTU		31-OCT-19	R4893412
<b>pH</b> pH	8.11		0.10	pН		01-NOV-19	R4897006

<sup>\*</sup> Refer to Referenced Information for Qualifiers (if any) and Methodology.

L2375126 CONTD....

PAGE 10 of 12 Version: FINAL

### **Reference Information**

Sample Parameter Qualifier Key:

Qualifier	Description			
DLHC	Detection Limit Raised: Dilution required due to high concentration of test analyte(s).			
DLM	Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).			
DTMF	Dissolved concentration exceeds total for field-filtered metals sample. Metallic contaminants may have been introduced to dissolved sample during field filtration.			
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.			

### **Test Method References:**

ALS Test Code	Matrix	Test Description	Method Reference**			
ACIDITY-PCT-CL	Water	Acidity by Automatic Titration	APHA 2310 Acidity			
<b>-</b> 1. 1		1 1 1 1 A DULA M (1 10040				

This analysis is carried out using procedures adapted from APHA Method 2310 "Acidity". Acidity is determined by potentiometric titration to a specified endpoint.

ALK-MAN-CL Water Alkalinity (Species) by Manual Titration APHA 2320 ALKALINITY

This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.

BE-D-L-CCMS-VA Water Diss. Be (low) in Water by CRC ICPMS APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

BE-T-L-CCMS-VA Water Total Be (Low) in Water by CRC ICPMS EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

BR-L-IC-N-CL Water Bromide in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

C-DIS-ORG-LOW-CL Water Dissolved Organic Carbon APHA 5310 B-Instrumental

This method is applicable to the analysis of ground water, wastewater, and surface water samples. The form detected depends upon sample pretreatment: Unfiltered sample = TC, 0.45um filtered = TDC. Samples are injected into a combustion tube containing an oxidation catalyst. The carrier gas containing the combustion product from the combustion tube flows through an inorganic carbon reactor vessel and is then sent through a halogen scrubber into a sample cell set in a non-dispersive infrared gas analyzer (NDIR) where carbon dioxide is detected. For total inorganic carbon and dissolved inorganic carbon, the sample is injected into an IC reactor vessel where only the IC component is decomposed to become carbon dioxide.

The peak area generated by the NDIR indicates the TC/TDC or TIC/DIC as applicable. The total organic carbon content of the sample is calculated by subtracting the TIC from the TC.

TOC = TC-TIC, DOC = TDC-DIC, Particulate = Total - Dissolved.

C-TOT-ORG-LOW-CL Water Total Organic Carbon APHA 5310 TOTAL ORGANIC CARBON (TOC)

This method is applicable to the analysis of ground water, wastewater, and surface water samples. The form detected depends upon sample pretreatment: Unfiltered sample = TC, 0.45um filtered = TDC. Samples are injected into a combustion tube containing an oxidation catalyst. The carrier gas containing the combustion product from the combustion tube flows through an inorganic carbon reactor vessel and is then sent through a halogen scrubber into a sample cell set in a non-dispersive infrared gas analyzer (NDIR) where carbon dioxide is detected. For total inorganic carbon and dissolved inorganic carbon, the sample is injected into an IC reactor vessel where only the IC component is decomposed to become carbon dioxide.

The peak area generated by the NDIR indicates the TC/TDC or TIC/DIC as applicable. The total organic carbon content of the sample is calculated by subtracting the TIC from the TC.

TOC = TC-TIC, DOC = TDC-DIC, Particulate = Total - Dissolved.

CL-IC-N-CL Water Chloride in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

EC-L-PCT-CL Water Electrical Conductivity (EC) APHA 2510B

Conductivity, also known as Electrical Conductivity (EC) or Specific Conductance, is measured by immersion of a conductivity cell with platinum electrodes into a water sample. Conductivity measurements are temperature-compensated to 25C.

F-IC-N-CL Water Fluoride in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

HARDNESS-CALC-VA Water Hardness APHA 2340B

Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

#### L2375126 CONTD....

PAGE 11 of 12 Version: FINAL

### **Reference Information**

**Test Method References:** 

ALS Test Code Matrix Test Description Method Reference\*\*

HG-D-CVAA-VA Water Diss. Mercury in Water by CVAAS or CVAFS APHA 3030B/EPA 1631E (mod)

Water samples are filtered (0.45 um), preserved with hydrochloric acid, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

HG-T-CVAA-VA Water Total Mercury in Water by CVAAS or CVAFS EPA 1631E (mod)

Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

IONBALANCE-BC-CL Water Ion Balance Calculation APHA 1030E

Cation Sum, Anion Sum, and Ion Balance (as % difference) are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Because all aqueous solutions are electrically neutral, the calculated ion balance (% difference of cations minus anions) should be near-zero.

Cation and Anion Sums are the total meq/L concentration of major cations and anions. Dissolved species are used where available. Minor ions are included where data is present. Ion Balance is calculated as:

Ion Balance (%) = [Cation Sum-Anion Sum] / [Cation Sum+Anion Sum]

MET-D-CCMS-VA Water Dissolved Metals in Water by CRC ICPMS APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

MET-T-CCMS-VA Water Total Metals in Water by CRC ICPMS EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

NH3-L-F-CL Water Ammonia, Total (as N) J. ENVIRON. MONIT., 2005, 7, 37-42, RSC

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.

NO2-L-IC-N-CL Water Nitrite in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

NO3-L-IC-N-CL Water Nitrate in Water by IC (Low Level) EPA 300.1 (mod

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

ORP-CL Water Oxidation redution potential by elect. ASTM D1498

This analysis is carried out in accordance with the procedure described in the "ASTM" method D1498 "Oxidation-Reduction Potential of Water" published by the American Society for Testing and Materials (ASTM). Results are reported as observed oxidation-reduction potential of the platinum metal-reference electrode employed, in mV.

It is recommended that this analysis be conducted in the field.

P-T-L-COL-CL Water Phosphorus (P)-Total APHA 4500-P PHOSPHORUS

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after persulphate digestion of the sample.

PH-CL Water pH APHA 4500 H-Electrode

pH is determined in the laboratory using a pH electrode. All samples analyzed by this method for pH will have exceeded the 15 minute recommended hold time from time of sampling (field analysis is recommended for pH where highly accurate results are needed)

PO4-DO-L-COL-CL Water Orthophosphate-Dissolved (as P) APHA 4500-P PHOSPHORUS

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.

SO4-IC-N-CL Water Sulfate in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

SOLIDS-TDS-CL Water Total Dissolved Solids APHA 2540 C

A well-mixed sample is filtered through a glass fibre filter paper. The filtrate is then evaporated to dryness in a pre-weighed vial and dried at 180 - 2 °C. The increase in vial weight represents the total dissolved solids (TDS).

TECKCOAL-IONBAL-CL Water Ion Balance Calculation APHA 1030E

#### LINE CREEK OPERATION

L2375126 CONTD....

PAGE 12 of 12 Version: FINAL

#### **Reference Information**

**Test Method References:** 

ALS Test Code Matrix Test Description Method Reference\*\*

Cation Sum, Anion Sum, and Ion Balance (as % difference) are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Because all aqueous solutions are electrically neutral, the calculated ion balance (% difference of cations minus anions) should be near-zero.

Cation and Anion Sums are the total meq/L concentration of major cations and anions. Dissolved species are used where available. Minor ions are included where data is present. Ion Balance is calculated as:

Ion Balance (%) = [Cation Sum-Anion Sum] / [Cation Sum+Anion Sum]

TKN-L-F-CL Water Total Kjeldahl Nitrogen APHA 4500-NORG (TKN)

This analysis is carried out using procedures adapted from APHA Method 4500-Norg D. "Block Digestion and Flow Injection Analysis". Total Kjeldahl Nitrogen is determined using block digestion followed by Flow-injection analysis with fluorescence detection.

TSS-L-CL Water Total Suspended Solids APHA 2540 D-Gravimetric

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total suspended solids (TSS) are determined by filtering a sample through a glass fibre filter, and by drying the filter at 104 deg. C.

TURBIDITY-CL Water Turbidity APHA 2130 B-Nephelometer

This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.

\*\* ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

<b>Laboratory Definition Code</b>	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA
CL	ALS ENVIRONMENTAL - CALGARY, ALBERTA, CANADA

#### **Chain of Custody Numbers:**

20191010

#### **GLOSSARY OF REPORT TERMS**

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.

mg/kg - milligrams per kilogram based on dry weight of sample

mg/kg wwt - milligrams per kilogram based on wet weight of sample

mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight

mg/L - unit of concentration based on volume, parts per million.

< - Less than.

D.L. - The reporting limit.

N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory. UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.



Workorder: L2375126 Report Date: 06-NOV-19 Page 1 of 16

Client: TECK COAL LIMITED (LINE CREEK)

PO BOX 2003

SPARWOOD BC V0B 2G0

Contact: Chris Blurton

Test Matrix	Reference	Result Qu	alifier Unit	s RPD	Limit	Analyzed
ACIDITY-PCT-CL Water						
Batch R4895745						
WG3208457-2 LCS Acidity (as CaCO3)		100.9	%		85-115	01-NOV-19
WG3208457-5 LCS Acidity (as CaCO3)		99.4	%		85-115	01-NOV-19
WG3208457-1 MB Acidity (as CaCO3)		1.7	mg/l	L	2	01-NOV-19
WG3208457-4 MB Acidity (as CaCO3)		1.5	mg/l	L	2	01-NOV-19
ALK-MAN-CL Water						
Batch R4897006						
WG3209642-9 DUP Alkalinity, Total (as CaCO3)	<b>L2375126-2</b> 329	329	mg/l	0.2	20	01-NOV-19
WG3209642-8 LCS Alkalinity, Total (as CaCO3)		100.3	%		85-115	01-NOV-19
WG3209642-7 MB Alkalinity, Total (as CaCO3)		<1.0	mg/l	L	1	01-NOV-19
BE-D-L-CCMS-VA Water						
Batch R4896765						
WG3208763-2 LCS Beryllium (Be)-Dissolved		88.7	%		80-120	03-NOV-19
WG3208763-1 MB Beryllium (Be)-Dissolved	NP	<0.000020	mg/l	L	0.00002	03-NOV-19
BE-T-L-CCMS-VA Water						
Batch R4897295						
WG3208734-3 DUP Beryllium (Be)-Total	<b>L2375126-1</b> 0.000029	0.000024	mg/l	_ 18	20	02-NOV-19
WG3208734-2 LCS Beryllium (Be)-Total		98.2	%		80-120	02-NOV-19
WG3208734-1 MB Beryllium (Be)-Total		<0.000020	mg/l	L	0.00002	02-NOV-19
WG3208734-4 MS Beryllium (Be)-Total	L2375126-2	99.1	%		70-130	02-NOV-19
BR-L-IC-N-CL Water						
Batch R4895623						
<b>WG3208339-7 DUP</b> Bromide (Br)	<b>L2375126-3</b> < 0.050	<0.050	RPD-NA mg/l	L N/A	20	31-OCT-19
WG3208339-6 LCS						



Workorder: L2375126

Report Date: 06-NOV-19 Page 2 of 16

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
BR-L-IC-N-CL	Water							
Batch R4895623 WG3208339-6 LCS Bromide (Br)			104.7		%		85-115	31-OCT-19
<b>WG3208339-5 MB</b> Bromide (Br)			<0.050		mg/L		0.05	31-OCT-19
WG3208339-8 MS Bromide (Br)		L2375126-3	113.0		%		75-125	31-OCT-19
C-DIS-ORG-LOW-CL	Water							
Batch R4896761								
WG3209597-11 DUP Dissolved Organic Carbo	on	<b>L2375126-3</b> 1.90	1.89		mg/L	0.4	20	03-NOV-19
WG3209597-2 LCS Dissolved Organic Carbo	on		117.7		%		80-120	03-NOV-19
WG3209597-6 LCS Dissolved Organic Carbo	on		94.0		%		80-120	03-NOV-19
WG3209597-1 MB Dissolved Organic Carbo	on		<0.50		mg/L		0.5	03-NOV-19
WG3209597-5 MB Dissolved Organic Carbo	on		<0.50		mg/L		0.5	03-NOV-19
WG3209597-12 MS Dissolved Organic Carbo	on	L2375126-3	85.7		%		70-130	03-NOV-19
C-TOT-ORG-LOW-CL	Water							
Batch R4896761								
WG3209597-11 DUP Total Organic Carbon		<b>L2375126-3</b> 2.08	1.95		mg/L	6.6	20	03-NOV-19
WG3209597-2 LCS Total Organic Carbon			101.2		%		80-120	03-NOV-19
WG3209597-6 LCS Total Organic Carbon			85.0		%		80-120	03-NOV-19
WG3209597-1 MB Total Organic Carbon			<0.50		mg/L		0.5	03-NOV-19
WG3209597-5 MB Total Organic Carbon			<0.50		mg/L		0.5	03-NOV-19
WG3209597-12 MS Total Organic Carbon		L2375126-3	87.4		%		70-130	03-NOV-19
CL-IC-N-CL	Water							



Workorder: L2375126

Report Date: 06-NOV-19 Page 3 of 16

Test		Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
CL-IC-N-CL		Water							
	95623 DUP		<b>L2375126-3</b> 1.09	1.14		mg/L	4.2	20	31-OCT-19
<b>WG3208339-6 L</b> Chloride (CI)	LCS			108.3		%		90-110	31-OCT-19
<b>WG3208339-5</b> Chloride (CI)	МВ			<0.50		mg/L		0.5	31-OCT-19
<b>WG3208339-8</b> Chloride (CI)	MS		L2375126-3	117.3		%		75-125	31-OCT-19
EC-L-PCT-CL		Water							
Batch R489	97006								
WG3209642-9 [ Conductivity (@ 29	<b>DUP</b> 25C)		<b>L2375126-2</b> 526	526		uS/cm	0.0	10	01-NOV-19
WG3209642-8 L Conductivity (@ 29	LCS 25C)			94.8		%		90-110	01-NOV-19
WG3209642-7 Conductivity (@ 29	<b>MB</b> 25C)			<2.0		uS/cm		2	01-NOV-19
F-IC-N-CL		Water							
Batch R489	95623								
<b>WG3208339-7</b> If Fluoride (F)	DUP		<b>L2375126-3</b> 0.202	0.197		mg/L	2.6	20	31-OCT-19
<b>WG3208339-6 L</b> Fluoride (F)	LCS			109.5		%		90-110	31-OCT-19
<b>WG3208339-5</b> Fluoride (F)	MB			<0.020		mg/L		0.02	31-OCT-19
<b>WG3208339-8</b> Fluoride (F)	MS		L2375126-3	115.9		%		75-125	31-OCT-19
HG-D-CVAA-VA		Water							
	98478 DUP		L2375126-2	<0.000005	C PDD NA	mg/L	N/Δ	20	05 NOV 10
WG3209761-6 L Mercury (Hg)-Diss	LCS		<0.0000050	95.7	C RPD-NA	™g/L %	N/A	20 80-120	05-NOV-19 05-NOV-19
	МВ			<0.000005	С	mg/L		0.000005	05-NOV-19
	MS		L2375126-1	105.1	-	%		70-130	05-NOV-19
HG-T-CVAA-VA		Water							



Workorder: L2375126

Report Date: 06-NOV-19 Page 4 of 16

Test Matri	ix Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
HG-T-CVAA-VA Wate	er						
Batch R4898268							
WG3210266-2 LCS		04.4		0/			
Mercury (Hg)-Total		91.4		%		80-120	04-NOV-19
WG3210266-1 MB Mercury (Hg)-Total		<0.0000050		mg/L		0.000005	04-NOV-19
		40.000000		g/ <u></u>		0.000003	04-110 7-19
MET-D-CCMS-VA Wate	er						
Batch R4896765 WG3208763-2 LCS							
Aluminum (Al)-Dissolved		104.9		%		80-120	03-NOV-19
Antimony (Sb)-Dissolved		96.6		%		80-120	03-NOV-19
Arsenic (As)-Dissolved		97.0		%		80-120	03-NOV-19
Barium (Ba)-Dissolved		101.4		%		80-120	03-NOV-19
Bismuth (Bi)-Dissolved		95.3		%		80-120	03-NOV-19
Boron (B)-Dissolved		89.0		%		80-120	03-NOV-19
Cadmium (Cd)-Dissolved		98.6		%		80-120	03-NOV-19
Calcium (Ca)-Dissolved		90.7		%		80-120	03-NOV-19
Chromium (Cr)-Dissolved		99.8		%		80-120	03-NOV-19
Cobalt (Co)-Dissolved		97.9		%		80-120	03-NOV-19
Copper (Cu)-Dissolved		98.7		%		80-120	03-NOV-19
Iron (Fe)-Dissolved		99.3		%		80-120	03-NOV-19
Lead (Pb)-Dissolved		94.0		%		80-120	03-NOV-19
Lithium (Li)-Dissolved		86.7		%		80-120	03-NOV-19
Magnesium (Mg)-Dissolved		102.1		%		80-120	03-NOV-19
Manganese (Mn)-Dissolved		101.8		%		80-120	03-NOV-19
Molybdenum (Mo)-Dissolved		97.7		%		80-120	03-NOV-19
Nickel (Ni)-Dissolved		97.3		%		80-120	03-NOV-19
Potassium (K)-Dissolved		100.1		%		80-120	03-NOV-19
Selenium (Se)-Dissolved		100.8		%		80-120	03-NOV-19
Silicon (Si)-Dissolved		104.5		%		60-140	03-NOV-19
Silver (Ag)-Dissolved		96.6		%		80-120	03-NOV-19
Sodium (Na)-Dissolved		104.4		%		80-120	03-NOV-19
Strontium (Sr)-Dissolved		99.1		%		80-120	03-NOV-19
Thallium (TI)-Dissolved		96.3		%		80-120	03-NOV-19
Tin (Sn)-Dissolved		95.9		%		80-120	03-NOV-19
Titanium (Ti)-Dissolved		98.7		%		80-120	03-NOV-19
Uranium (U)-Dissolved		93.3		%		80-120	03-NOV-19

Workorder: L2375126 R

Report Date: 06-NOV-19

Page 5 of 16

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA	Water							
Batch R489676								
WG3208763-2 LCS Vanadium (V)-Dissolv			100.0		%		00.400	00 NOV 40
	reu		98.3		%		80-120	03-NOV-19
Zinc (Zn)-Dissolved		ND	90.3		70		80-120	03-NOV-19
WG3208763-1 MB Aluminum (Al)-Dissolv	ved	NP	<0.0010		mg/L		0.001	03-NOV-19
Antimony (Sb)-Dissolv			<0.00010		mg/L		0.0001	03-NOV-19
Arsenic (As)-Dissolve			<0.00010		mg/L		0.0001	03-NOV-19
Barium (Ba)-Dissolved	d		<0.00010		mg/L		0.0001	03-NOV-19
Bismuth (Bi)-Dissolve	d		<0.00005	0	mg/L		0.00005	03-NOV-19
Boron (B)-Dissolved			<0.010		mg/L		0.01	03-NOV-19
Cadmium (Cd)-Dissol	ved		<0.00000	5C	mg/L		0.000005	03-NOV-19
Calcium (Ca)-Dissolve	ed		<0.050		mg/L		0.05	03-NOV-19
Chromium (Cr)-Dissol	lved		<0.00010		mg/L		0.0001	03-NOV-19
Cobalt (Co)-Dissolved	d		<0.00010		mg/L		0.0001	03-NOV-19
Copper (Cu)-Dissolve	d		<0.00020		mg/L		0.0002	03-NOV-19
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	03-NOV-19
Lead (Pb)-Dissolved			<0.00005	0	mg/L		0.00005	03-NOV-19
Lithium (Li)-Dissolved			<0.0010		mg/L		0.001	03-NOV-19
Magnesium (Mg)-Diss	solved		< 0.0050		mg/L		0.005	03-NOV-19
Manganese (Mn)-Diss	solved		<0.00010		mg/L		0.0001	03-NOV-19
Molybdenum (Mo)-Dis	ssolved		<0.00005	0	mg/L		0.00005	03-NOV-19
Nickel (Ni)-Dissolved			<0.00050		mg/L		0.0005	03-NOV-19
Potassium (K)-Dissolv	ved		< 0.050		mg/L		0.05	03-NOV-19
Selenium (Se)-Dissolv	ved		<0.00005	0	mg/L		0.00005	03-NOV-19
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	03-NOV-19
Silver (Ag)-Dissolved			<0.00001	0	mg/L		0.00001	03-NOV-19
Sodium (Na)-Dissolve	ed		<0.050		mg/L		0.05	03-NOV-19
Strontium (Sr)-Dissolv	/ed		<0.00020		mg/L		0.0002	03-NOV-19
Thallium (TI)-Dissolve	ed		<0.00001	0	mg/L		0.00001	03-NOV-19
Tin (Sn)-Dissolved			<0.00010		mg/L		0.0001	03-NOV-19
Titanium (Ti)-Dissolve	ed		<0.00030		mg/L		0.0003	03-NOV-19
Uranium (U)-Dissolve	d		<0.00001	0	mg/L		0.00001	03-NOV-19
Vanadium (V)-Dissolv	red .		<0.00050		mg/L		0.0005	03-NOV-19
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	03-NOV-19

MET-T-CCMS-VA

Water



Workorder: L2375126 Report Date: 06-NOV-19 Page 6 of 16

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-VA	Water							
Batch R4897295								
WG3208734-3 DUP Antimony (Sb)-Total		<b>L2375126-1</b> < 0.00010	<0.00010	RPD-NA	mg/L	N/A	20	02-NOV-19
Arsenic (As)-Total		0.00161	0.00169		mg/L	5.1	20	02-NOV-19
Barium (Ba)-Total		1.42	1.45		mg/L	1.9	20	02-NOV-19
Bismuth (Bi)-Total		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	02-NOV-19
Boron (B)-Total		0.024	0.024		mg/L	0.3	20	02-NOV-19
Cadmium (Cd)-Total		0.0000824	0.0000749		mg/L	9.5	20	02-NOV-19
Calcium (Ca)-Total		38.7	38.9		mg/L	0.5	20	02-NOV-19
Chromium (Cr)-Total		0.00065	0.00055		mg/L	17	20	02-NOV-19
Cobalt (Co)-Total		0.00014	0.00013		mg/L	4.2	20	02-NOV-19
Copper (Cu)-Total		0.00277	0.00283		mg/L	2.4	20	02-NOV-19
Iron (Fe)-Total		1.29	1.29		mg/L	0.4	20	02-NOV-19
Lead (Pb)-Total		0.000596	0.000592		mg/L	0.7	20	02-NOV-19
Lithium (Li)-Total		0.0815	0.0782		mg/L	4.1	20	02-NOV-19
Magnesium (Mg)-Total		19.5	20.0		mg/L	2.8	20	02-NOV-19
Manganese (Mn)-Total		0.0130	0.0127		mg/L	2.3	20	02-NOV-19
Molybdenum (Mo)-Total	I	0.0307	0.0299		mg/L	2.8	20	02-NOV-19
Nickel (Ni)-Total		0.00140	0.00134		mg/L	4.2	20	02-NOV-19
Potassium (K)-Total		4.98	5.06		mg/L	1.7	20	02-NOV-19
Selenium (Se)-Total		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	02-NOV-19
Silicon (Si)-Total		3.24	3.12		mg/L	3.9	20	02-NOV-19
Sodium (Na)-Total		13.5	13.5		mg/L	0.1	20	02-NOV-19
Strontium (Sr)-Total		0.126	0.124		mg/L	2.0	20	02-NOV-19
Thallium (TI)-Total		0.000013	<0.000010	RPD-NA	mg/L	N/A	20	02-NOV-19
Tin (Sn)-Total		0.00016	0.00015		mg/L	8.0	20	02-NOV-19
Titanium (Ti)-Total		<0.010	<0.010	RPD-NA	mg/L	N/A	20	02-NOV-19
Uranium (U)-Total		0.000077	0.000077		mg/L	0.4	20	02-NOV-19
Vanadium (V)-Total		0.00122	0.00105		mg/L	15	20	02-NOV-19
Zinc (Zn)-Total		0.0104	0.0104		mg/L	0.7	20	02-NOV-19
WG3208734-2 LCS Aluminum (Al)-Total			98.1		%		80-120	02-NOV-19
Antimony (Sb)-Total			108.8		%		80-120	02-NOV-19
Arsenic (As)-Total			102.2		%		80-120	02-NOV-19
Barium (Ba)-Total			101.9		%		80-120	02-NOV-19
Bismuth (Bi)-Total			101.3		%		80-120	02-NOV-19



Workorder: L2375126 F

Report Date: 06-NOV-19

Page 7 of 16

est	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-VA	Water							
Batch R4897295								
WG3208734-2 LCS			99.9		0/		00.400	00 1101/ 40
Boron (B)-Total			100.4		%		80-120	02-NOV-19
Cadmium (Cd)-Total							80-120	02-NOV-19
Calcium (Ca)-Total			100.6		%		80-120	02-NOV-19
Chromium (Cr)-Total			97.7		%		80-120	02-NOV-19
Cobalt (Co)-Total			98.2		%		80-120	02-NOV-19
Copper (Cu)-Total			97.7		%		80-120	02-NOV-19
Iron (Fe)-Total			92.8		%		80-120	02-NOV-19
Lead (Pb)-Total			101.5		%		80-120	02-NOV-19
Lithium (Li)-Total			99.6		%		80-120	02-NOV-19
Magnesium (Mg)-Total			97.7		%		80-120	02-NOV-19
Manganese (Mn)-Total			96.1		%		80-120	02-NOV-19
Molybdenum (Mo)-Total			104.1		%		80-120	02-NOV-19
Nickel (Ni)-Total			98.7		%		80-120	02-NOV-19
Potassium (K)-Total			99.0		%		80-120	02-NOV-19
Selenium (Se)-Total			98.3		%		80-120	02-NOV-19
Silicon (Si)-Total			107.4		%		80-120	02-NOV-19
Silver (Ag)-Total			99.9		%		80-120	02-NOV-19
Sodium (Na)-Total			104.1		%		80-120	02-NOV-19
Strontium (Sr)-Total			101.5		%		80-120	02-NOV-19
Thallium (TI)-Total			100.9		%		80-120	02-NOV-19
Tin (Sn)-Total			100.5		%		80-120	02-NOV-19
Titanium (Ti)-Total			95.1		%		80-120	02-NOV-19
Uranium (U)-Total			104.4		%		80-120	02-NOV-19
Vanadium (V)-Total			102.9		%		80-120	02-NOV-19
Zinc (Zn)-Total			97.8		%		80-120	02-NOV-19
WG3208734-1 MB								
Aluminum (AI)-Total			<0.0030		mg/L		0.003	02-NOV-19
Antimony (Sb)-Total			<0.00010		mg/L		0.0001	02-NOV-19
Arsenic (As)-Total			<0.00010		mg/L		0.0001	02-NOV-19
Barium (Ba)-Total			<0.00010		mg/L		0.0001	02-NOV-19
Bismuth (Bi)-Total			<0.00005	0	mg/L		0.00005	02-NOV-19
Boron (B)-Total			<0.010		mg/L		0.01	02-NOV-19
Cadmium (Cd)-Total			<0.00000	<b>5</b> C	mg/L		0.000005	02-NOV-19
Calcium (Ca)-Total			< 0.050		mg/L		0.05	02-NOV-19



Workorder: L2375126

Report Date: 06-NOV-19

Page 8 of 16

est	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-VA	Water							
Batch R4897295								
WG3208734-1 MB Chromium (Cr)-Total			<0.00010		mg/L		0.0001	02-NOV-19
Cobalt (Co)-Total			<0.00010		mg/L		0.0001	02-NOV-19
Copper (Cu)-Total			<0.00050		mg/L		0.0005	02-NOV-19
Iron (Fe)-Total			<0.010		mg/L		0.01	02-NOV-19
Lead (Pb)-Total			<0.00005	0	mg/L		0.00005	02-NOV-19
Lithium (Li)-Total			<0.0010		mg/L		0.001	02-NOV-19
Magnesium (Mg)-Total			<0.0050		mg/L		0.005	02-NOV-19
Manganese (Mn)-Total			<0.00010		mg/L		0.0001	02-NOV-19
Molybdenum (Mo)-Total			<0.00005	0	mg/L		0.00005	02-NOV-19
Nickel (Ni)-Total			<0.00050		mg/L		0.0005	02-NOV-19
Potassium (K)-Total			< 0.050		mg/L		0.05	02-NOV-19
Selenium (Se)-Total			<0.00005	0	mg/L		0.00005	02-NOV-19
Silicon (Si)-Total			<0.10		mg/L		0.1	02-NOV-19
Silver (Ag)-Total			<0.00001	0	mg/L		0.00001	02-NOV-19
Sodium (Na)-Total			<0.050		mg/L		0.05	02-NOV-19
Strontium (Sr)-Total			<0.00020		mg/L		0.0002	02-NOV-19
Thallium (TI)-Total			<0.00001	0	mg/L		0.00001	02-NOV-19
Tin (Sn)-Total			<0.00010		mg/L		0.0001	02-NOV-19
Titanium (Ti)-Total			<0.00030		mg/L		0.0003	02-NOV-19
Uranium (U)-Total			<0.00001	0	mg/L		0.00001	02-NOV-19
Vanadium (V)-Total			<0.00050		mg/L		0.0005	02-NOV-19
Zinc (Zn)-Total			<0.0030		mg/L		0.003	02-NOV-19
WG3208734-4 MS		L2375126-2	102.2		0/		70.400	00 NOV 40
Aluminum (Al)-Total			103.2 93.1		%		70-130	02-NOV-19
Antimony (Sb)-Total  Arsenic (As)-Total					%		70-130	02-NOV-19
` ,			101.3 N/A	MS-B	%		70-130	02-NOV-19
Barium (Ba)-Total				IVIO-D			-	02-NOV-19
Bismuth (Bi)-Total			92.4		%		70-130	02-NOV-19
Boron (B)-Total Cadmium (Cd)-Total			100.0		% %		70-130	02-NOV-19
			97.1 N/A	MOD			70-130	02-NOV-19
Calcium (Ca)-Total			N/A	MS-B	%		-	02-NOV-19
Chromium (Cr)-Total			98.3		%		70-130	02-NOV-19
Cobalt (Co)-Total Copper (Cu)-Total			95.0 90.3		%		70-130	02-NOV-19



Workorder: L2375126

Report Date: 06-NOV-19

Page 9 of 16

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-VA	Water							
Batch R4897295								
WG3208734-4 MS		L2375126-2						
Iron (Fe)-Total			97.6		%		70-130	02-NOV-19
Lead (Pb)-Total			89.8		%		70-130	02-NOV-19
Lithium (Li)-Total			99.6		%		70-130	02-NOV-19
Magnesium (Mg)-Total			N/A	MS-B	%		-	02-NOV-19
Manganese (Mn)-Total			N/A	MS-B	%		-	02-NOV-19
Molybdenum (Mo)-Total			98.5		%		70-130	02-NOV-19
Nickel (Ni)-Total			90.7		%		70-130	02-NOV-19
Potassium (K)-Total			97.0		%		70-130	02-NOV-19
Selenium (Se)-Total			99.9		%		70-130	02-NOV-19
Silicon (Si)-Total			95.9		%		70-130	02-NOV-19
Silver (Ag)-Total			94.6		%		70-130	02-NOV-19
Sodium (Na)-Total			N/A	MS-B	%		-	02-NOV-19
Strontium (Sr)-Total			N/A	MS-B	%		-	02-NOV-19
Thallium (TI)-Total			89.0		%		70-130	02-NOV-19
Tin (Sn)-Total			95.7		%		70-130	02-NOV-19
Titanium (Ti)-Total			97.4		%		70-130	02-NOV-19
Uranium (U)-Total			94.6		%		70-130	02-NOV-19
Vanadium (V)-Total			102.1		%		70-130	02-NOV-19
Zinc (Zn)-Total			91.6		%		70-130	02-NOV-19
Batch R4898993								
WG3210268-5 DUP Aluminum (Al)-Total		<b>L2375126-1</b> 0.467	0.509		mg/L	8.7	20	04-NOV-19
Antimony (Sb)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	04-NOV-19
Arsenic (As)-Total		0.00161	0.00172		mg/L	1.7	20	04-NOV-19
Barium (Ba)-Total		1.42	1.47		mg/L	3.2	20	04-NOV-19
Bismuth (Bi)-Total		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	04-NOV-19
Boron (B)-Total		0.024	0.026		mg/L	0.2	20	04-NOV-19
Calcium (Ca)-Total		38.7	40.5		mg/L	1.8	20	04-NOV-19
Chromium (Cr)-Total		0.00065	0.00122		mg/L	2.3	20	04-NOV-19
Cobalt (Co)-Total		0.00014	0.00018		mg/L	5.4	20	04-NOV-19
Copper (Cu)-Total		0.00277	0.00311		mg/L	1.3	20	04-NOV-19
Iron (Fe)-Total		1.29	1.45		mg/L	0.7	20	04-NOV-19
Lead (Pb)-Total		0.000596	0.000678		mg/L	0.1	20	04-NOV-19
Lithium (Li)-Total		0.0815	0.0803		mg/L	1.3	20	04-NOV-19



Workorder: L2375126

Report Date: 06-NOV-19 Page 10 of 16

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-VA	Water							
Batch R4898993	1							
WG3210268-5 DUP		L2375126-1	04.0					
Magnesium (Mg)-Total		19.5	21.2		mg/L	1.2	20	04-NOV-19
Manganese (Mn)-Total		0.0130	0.0145		mg/L	0.8	20	04-NOV-19
Molybdenum (Mo)-Tota	N	0.0307	0.0326		mg/L	2.0	20	04-NOV-19
Nickel (Ni)-Total		0.00140	0.00171		mg/L	1.6	20	04-NOV-19
Potassium (K)-Total		4.98	5.16		mg/L	2.2	20	04-NOV-19
Selenium (Se)-Total		<0.000050	0.000053		mg/L	5.9	20	04-NOV-19
Silicon (Si)-Total		3.24	4.05		mg/L	1.0	20	04-NOV-19
Silver (Ag)-Total		0.000041	0.000044		mg/L	6.0	20	04-NOV-19
Sodium (Na)-Total		13.5	14.4		mg/L	0.3	20	04-NOV-19
Strontium (Sr)-Total		0.126	0.142		mg/L	2.3	20	04-NOV-19
Thallium (TI)-Total		0.000013	0.000016		mg/L	15	20	04-NOV-19
Tin (Sn)-Total		0.00016	0.00018		mg/L	5.5	20	04-NOV-19
Uranium (U)-Total		0.000077	0.000094		mg/L	1.6	20	04-NOV-19
Vanadium (V)-Total		0.00122	0.00293		mg/L	7.1	20	04-NOV-19
Zinc (Zn)-Total		0.0104	0.0118		mg/L	2.3	20	04-NOV-19
WG3210268-2 LCS								
Aluminum (Al)-Total			104.0		%		80-120	04-NOV-19
Antimony (Sb)-Total			107.5		%		80-120	04-NOV-19
Arsenic (As)-Total			100.9		%		80-120	04-NOV-19
Barium (Ba)-Total			100.7		%		80-120	04-NOV-19
Bismuth (Bi)-Total			106.8		%		80-120	04-NOV-19
Boron (B)-Total			98.0		%		80-120	04-NOV-19
Cadmium (Cd)-Total			106.3		%		80-120	04-NOV-19
Calcium (Ca)-Total			104.7		%		80-120	04-NOV-19
Chromium (Cr)-Total			103.4		%		80-120	04-NOV-19
Cobalt (Co)-Total			103.8		%		80-120	04-NOV-19
Copper (Cu)-Total			102.2		%		80-120	04-NOV-19
Iron (Fe)-Total			101.5		%		80-120	04-NOV-19
Lead (Pb)-Total			105.4		%		80-120	04-NOV-19
Lithium (Li)-Total			101.9		%		80-120	04-NOV-19
Magnesium (Mg)-Total			103.1		%		80-120	04-NOV-19
Manganese (Mn)-Total			104.9		%		80-120	04-NOV-19
Molybdenum (Mo)-Tota	ıl		106.1		%		80-120	04-NOV-19
Nickel (Ni)-Total			105.6		%		80-120	04-NOV-19



Workorder: L2375126

Report Date: 06-NOV-19 Page 11 of 16

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-VA	Water							
Batch R4898993								
WG3210268-2 LCS			00.4		0/			
Potassium (K)-Total			98.1		%		80-120	04-NOV-19
Selenium (Se)-Total			109.3		%		80-120	04-NOV-19
Silicon (Si)-Total			106.1		%		80-120	04-NOV-19
Silver (Ag)-Total			104.1		%		80-120	04-NOV-19
Sodium (Na)-Total			110.3		%		80-120	04-NOV-19
Strontium (Sr)-Total			102.8		%		80-120	04-NOV-19
Thallium (Tl)-Total			104.9		%		80-120	04-NOV-19
Tin (Sn)-Total			105.0		%		80-120	04-NOV-19
Titanium (Ti)-Total			104.7		%		80-120	04-NOV-19
Uranium (U)-Total			100.4		%		80-120	04-NOV-19
Vanadium (V)-Total			104.2		%		80-120	04-NOV-19
Zinc (Zn)-Total			105.7		%		80-120	04-NOV-19
WG3210268-1 MB								
Aluminum (AI)-Total			< 0.0030		mg/L		0.003	04-NOV-19
Antimony (Sb)-Total			<0.00010		mg/L		0.0001	04-NOV-19
Arsenic (As)-Total			<0.00010		mg/L		0.0001	04-NOV-19
Barium (Ba)-Total			<0.00010		mg/L		0.0001	04-NOV-19
Bismuth (Bi)-Total			<0.000050	)	mg/L		0.00005	04-NOV-19
Boron (B)-Total			<0.010		mg/L		0.01	04-NOV-19
Cadmium (Cd)-Total			< 0.000005	5C	mg/L		0.000005	04-NOV-19
Calcium (Ca)-Total			< 0.050		mg/L		0.05	04-NOV-19
Chromium (Cr)-Total			<0.00010		mg/L		0.0001	04-NOV-19
Cobalt (Co)-Total			<0.00010		mg/L		0.0001	04-NOV-19
Copper (Cu)-Total			<0.00050		mg/L		0.0005	04-NOV-19
Iron (Fe)-Total			<0.010		mg/L		0.01	04-NOV-19
Lead (Pb)-Total			<0.000050	)	mg/L		0.00005	04-NOV-19
Lithium (Li)-Total			<0.0010		mg/L		0.001	04-NOV-19
Magnesium (Mg)-Total			<0.0050		mg/L		0.005	04-NOV-19
Manganese (Mn)-Total			<0.00010		mg/L		0.0001	04-NOV-19
Molybdenum (Mo)-Total			<0.000050	)	mg/L		0.00005	04-NOV-19
Nickel (Ni)-Total			<0.00050		mg/L		0.0005	04-NOV-19
Potassium (K)-Total			<0.050		mg/L		0.05	04-NOV-19
Selenium (Se)-Total			<0.000050	)	mg/L		0.00005	04-NOV-19
Silicon (Si)-Total			<0.10		mg/L		0.1	04-NOV-19



Workorder: L2375126

Report Date: 06-NOV-19 Page 12 of 16

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-VA	Water							
<b>Batch</b> R4898993 <b>WG3210268-1 MB</b> Silver (Ag)-Total			<0.000010		mg/L		0.00001	04-NOV-19
Sodium (Na)-Total			<0.050		mg/L		0.05	04-NOV-19
Strontium (Sr)-Total			<0.00020		mg/L		0.0002	04-NOV-19
Thallium (TI)-Total			<0.000010		mg/L		0.00001	04-NOV-19
Tin (Sn)-Total			<0.00010		mg/L		0.0001	04-NOV-19
Titanium (Ti)-Total			<0.00030		mg/L		0.0003	04-NOV-19
Uranium (U)-Total			<0.000010		mg/L		0.00001	04-NOV-19
Vanadium (V)-Total			<0.00050		mg/L		0.0005	04-NOV-19
Zinc (Zn)-Total			<0.0030		mg/L		0.003	04-NOV-19
NH3-L-F-CL	Water				3			00.
Batch R4900036	Water							
WG3211471-14 LCS Ammonia as N			113.7		%		85-115	05-NOV-19
WG3211471-13 MB Ammonia as N			<0.0050		mg/L		0.005	05-NOV-19
NO2-L-IC-N-CL	Water							
Batch R4895623								
WG3208339-7 DUP Nitrite (as N)		<b>L2375126-3</b> < 0.0010	<0.0010	RPD-NA	mg/L	N/A	20	31-OCT-19
WG3208339-6 LCS Nitrite (as N)			106.9		%		90-110	31-OCT-19
WG3208339-5 MB Nitrite (as N)			<0.0010		mg/L		0.001	31-OCT-19
WG3208339-8 MS Nitrite (as N)		L2375126-3	117.8		%		75-125	31-OCT-19
NO3-L-IC-N-CL	Water							
Batch R4895623 WG3208339-7 DUP		L2375126-3						
Nitrate (as N)  WG3208339-6 LCS  Nitrate (as N)		0.0156	0.0164		mg/L %	5.0	20	31-OCT-19
WG3208339-5 MB Nitrate (as N)			<0.0050		% mg/L		90-110	31-OCT-19
WG3208339-8 MS Nitrate (as N)		L2375126-3	116.9		mg/L %		0.005 75-125	31-OCT-19 31-OCT-19
			110.0		/0		10-120	31-001-19



Workorder: L2375126

Report Date: 06-NOV-19 Page 13 of 16

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
ORP-CL	Water							
Batch R4893526 WG3207572-3 CRM ORP		CL-ORP	217		mV		210-230	31-OCT-19
<b>WG3207572-4 DUP</b> ORP		<b>L2375126-2</b> 439	437	J	mV	1.5	15	31-OCT-19
P-T-L-COL-CL	Water							
Batch R4897866 WG3209926-2 LCS Phosphorus (P)-Total			101.3		%		80-120	04-NOV-19
WG3209926-1 MB Phosphorus (P)-Total			<0.0020		mg/L		0.002	04-NOV-19
PH-CL	Water							
Batch R4897006 WG3209642-9 DUP		<b>L2375126-2</b> 8.09	0.40		all.			
рН <b>WG3209642-8 LCS</b> рН		8.09	8.10 7.01	J	pН pН	0.01	0.2 6.9-7.1	01-NOV-19 01-NOV-19
PO4-DO-L-COL-CL	Water							
Batch R4893366								
WG3207287-6 LCS Orthophosphate-Dissol	ved (as P)		100.6		%		80-120	31-OCT-19
WG3207287-5 MB Orthophosphate-Dissol	ved (as P)		<0.0010		mg/L		0.001	31-OCT-19
SO4-IC-N-CL	Water							
Batch R4895623								
<b>WG3208339-7 DUP</b> Sulfate (SO4)		<b>L2375126-3</b> 4.52	4.56		mg/L	0.9	20	31-OCT-19
<b>WG3208339-6 LCS</b> Sulfate (SO4)			107.9		%		90-110	31-OCT-19
<b>WG3208339-5 MB</b> Sulfate (SO4)			<0.30		mg/L		0.3	31-OCT-19
<b>WG3208339-8 MS</b> Sulfate (SO4)		L2375126-3	116.0		%		75-125	31-OCT-19
SOLIDS-TDS-CL	Water							
Batch R4899012 WG3209631-8 LCS								
Total Dissolved Solids WG3209631-7 MB			101.8		%		85-115	04-NOV-19



Workorder: L2375126

Report Date: 06-NOV-19 Page 14 of 16

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
SOLIDS-TDS-CL Batch R4899012	Water							
WG3209631-7 MB Total Dissolved Solids			<10		mg/L		10	04-NOV-19
TKN-L-F-CL	Water							
Batch R4895549								
WG3208229-19 DUP Total Kjeldahl Nitrogen		<b>L2375126-2</b> 0.092	0.082		mg/L	12	20	01-NOV-19
WG3208229-14 LCS Total Kjeldahl Nitrogen			96.6		%		75-125	01-NOV-19
WG3208229-18 LCS Total Kjeldahl Nitrogen			96.9		%		75-125	01-NOV-19
WG3208229-13 MB Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	01-NOV-19
WG3208229-17 MB Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	01-NOV-19
WG3208229-20 MS Total Kjeldahl Nitrogen		L2375126-2	124.0		%		70-130	01-NOV-19
TSS-L-CL	Water							
Batch R4898646								
WG3209204-10 LCS Total Suspended Solids			94.0		%		85-115	03-NOV-19
WG3209204-9 MB Total Suspended Solids			<1.0		mg/L		1	03-NOV-19
TURBIDITY-CL	Water							
Batch R4893412 WG3207471-5 LCS								
Turbidity			95.5		%		85-115	31-OCT-19
WG3207471-4 MB Turbidity			<0.10		NTU		0.1	31-OCT-19

Workorder: L2375126 Report Date: 06-NOV-19 Page 15 of 16

### Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

### **Sample Parameter Qualifier Definitions:**

Qualifier	Description
J	Duplicate results and limits are expressed in terms of absolute difference.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

Workorder: L2375126 Report Date: 06-NOV-19 Page 16 of 16

#### **Hold Time Exceedances:**

ID	Sampling Date	Date Processed	Rec. HT	Actual HT	Units	Qualifier
y elect.						
1	30-OCT-19 13:10	31-OCT-19 16:45	0.25	28	hours	EHTR-FM
2	30-OCT-19 12:28	31-OCT-19 16:45	0.25	28	hours	EHTR-FM
3	30-OCT-19 12:28	31-OCT-19 16:45	0.25	28	hours	EHTR-FM
1	30-OCT-19 13:10	01-NOV-19 11:00	0.25	46	hours	EHTR-FM
2	30-OCT-19 12:28	01-NOV-19 11:00	0.25	47	hours	EHTR-FM
3	30-OCT-19 12:28	01-NOV-19 11:00	0.25	47	hours	EHTR-FM
	1 2 3 1 2	1 30-OCT-19 13:10 2 30-OCT-19 12:28 3 30-OCT-19 12:28 1 30-OCT-19 13:10 2 30-OCT-19 12:28	1 30-OCT-19 13:10 31-OCT-19 16:45 2 30-OCT-19 12:28 31-OCT-19 16:45 3 30-OCT-19 12:28 31-OCT-19 16:45 1 30-OCT-19 13:10 01-NOV-19 11:00 2 30-OCT-19 12:28 01-NOV-19 11:00	1 30-OCT-19 13:10 31-OCT-19 16:45 0.25 2 30-OCT-19 12:28 31-OCT-19 16:45 0.25 3 30-OCT-19 12:28 31-OCT-19 16:45 0.25 1 30-OCT-19 13:10 01-NOV-19 11:00 0.25 2 30-OCT-19 12:28 01-NOV-19 11:00 0.25	1 30-OCT-19 13:10 31-OCT-19 16:45 0.25 28 2 30-OCT-19 12:28 31-OCT-19 16:45 0.25 28 3 30-OCT-19 12:28 31-OCT-19 16:45 0.25 28 1 30-OCT-19 13:10 01-NOV-19 11:00 0.25 46 2 30-OCT-19 12:28 01-NOV-19 11:00 0.25 47	1 30-OCT-19 13:10 31-OCT-19 16:45 0.25 28 hours 2 30-OCT-19 12:28 31-OCT-19 16:45 0.25 28 hours 3 30-OCT-19 12:28 31-OCT-19 16:45 0.25 28 hours 1 30-OCT-19 13:10 01-NOV-19 11:00 0.25 46 hours 2 30-OCT-19 12:28 01-NOV-19 11:00 0.25 47 hours

#### Legend & Qualifier Definitions:

EHTR-FM: Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended.

EHTR: Exceeded ALS recommended hold time prior to sample receipt.

EHTL: Exceeded ALS recommended hold time prior to analysis. Sample was received less than 24 hours prior to expiry.

EHT: Exceeded ALS recommended hold time prior to analysis.

Rec. HT: ALS recommended hold time (see units).

#### Notes\*:

Where actual sampling date is not provided to ALS, the date (& time) of receipt is used for calculation purposes. Where actual sampling time is not provided to ALS, the earlier of 12 noon on the sampling date or the time (& date) of receipt is used for calculation purposes. Samples for L2375126 were received on 31-OCT-19 08:50.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against predetermined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

Teck 20191010 COC ID: TURNAROUND TIME: RUSH: OTHER INFO PROJECT/CLIENT INFO ASSESSED ABORATORY Lab Name ALS Calgary Facility Name / Job# Line Creek Operation PDF Excel Report Format / Distribution Lab Contact Lyudmyla Shvets cariá froymatiparker@teck.com Project Manager Chris Blurton Email 1: Email Chris.Blurton@teck.com Email Lyudmyla, Shvets@ALSGlobal.com Email 2: teckcoal@equisonline.con Address Box 2003 Address 2559 29 Street NE Email 3: drake.tymstra@teck:com 15km North Hwy 43 Email 4: Province lвс City Calgary AΒ City Sparwood Province Email 4: kennedy allen@teck.com Postal Code T1Y 7B5 V0B 2G0 Country Canada PO number Postal Code Country Canada Phone Number 403 407 1794 Phone Number 250-425-3196 SAMPLE DETAILS TO A PROPERTY OF THE PROPERTY O ANALYSIS REQUESTED Filtered Tr. Field, L. Lab, FL? Field & Lab, N. Nondinon None dieson Hazardous Material (Yes/No) L2375126-COFC FECKCOAL-MET-D-VA TECKCOAL-MET-T-VA TECKCOAL-ROUTINE. VA ALS\_Package-TKN/TOC ALS\_Package-DOC L2375/26 HG-D-CVAF-VA HG-T-CVAF-VA Sample Location Field Time G≃Grab #Of Conf. Sample ID (sys loc code) Matrix (24hr) C=Comp Date LC PIZDC1307 WG Q4-2019 NP LC\_PIZDC1307 WG 2019/10/30 13:10 6 1 1 1 1 WG LC\_PIZDC1308\_WG\_Q4-2019\_NP LC PIZDC1308 2019/10/30  $\mathbf{G}$ 12:28 6 1 1 1 WG\_Q4-2019\_CC1 LC\_PIZDC1308 WG 2019/10/30 G 7 1 1 1 1 12:28 THE STATE OF ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS RELINQUISHED BY/AFFILIATION ACCEPTED BY/AFFILIATION DATE/TIME D.Tymstra/K.Campbell 30-Oct (mid-) (mil-) (885) (8 SERVICE REQUEST (rush-subject to availability) Regular (default) X K. Campbell/D. Tymstra Mobile # Sampler's Name Priority (2-3 business days) - 50% surcharge Emergency (1 Business Day) - 100% surcharge 134 Sampler's Signature Date/Time October 30, 2019 For Emergency <1 Day, ASAP or Weekend - Contact ALS



TECK COAL LIMITED (LINE CREEK)

ATTN: Carla Froyman Parker

PO BOX 2003

SPARWOOD BC VOB 2G0

Date Received: 07-NOV-19

Report Date: 17-NOV-19 16:31 (MT)

Version: FINAL

Client Phone: 250-425-6111

# Certificate of Analysis

Lab Work Order #: L2379297
Project P.O. #: VP000608129

Job Reference: LINE CREEK OPERATION
C of C Numbers: 20191106 - DC GW

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Lyudmyla Shvets, B.Sc. Account Manager

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L2379297 CONTD.... PAGE 2 of 9 Version: FINAL

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2379297-1 LC_PIZDC0901_WG_Q4-2019_NP							
Sampled By: DT/KC on 06-NOV-19 @ 12:16							
Matrix: WG Miscellaneous Parameters							
	0.00		0.50			00 NOV 40	D 400 4007
Dissolved Organic Carbon	3.38		0.50	mg/L		09-NOV-19	R4904067
Total Kjeldahl Nitrogen	0.149		0.050	mg/L		09-NOV-19	R4903830
Total Organic Carbon	4.73		0.50	mg/L		09-NOV-19	R4904067
Dissolved Metals in Water							
Diss. Be (low) in Water by CRC ICPMS				_			
Beryllium (Be)-Dissolved	<0.020		0.020	ug/L	10-NOV-19	13-NOV-19	R4905405
Dissolved Metals Filtration Location	FIELD					10-NOV-19	R4904078
Diss. Mercury in Water by CVAAS or CVAFS					44 1101/440	45 1101/40	D
Mercury (Hg)-Dissolved	<0.000050		0.0000050	mg/L	14-NOV-19	15-NOV-19	R4908847
Dissolved Mercury Filtration Location	FIELD					14-NOV-19	R4908407
Dissolved Metals in Water by CRC ICPMS Dissolved Metals Filtration Location	FIELD					13-NOV-19	R4905671
Aluminum (Al)-Dissolved	<0.0030		0.0030	mg/L	10-NOV-19	13-NOV-19	R4905405
Antimony (Sb)-Dissolved	0.00039		0.00010	mg/L	10-NOV-19	13-NOV-19	R4905405
Arsenic (As)-Dissolved	0.00034		0.00010	mg/L	10-NOV-19	13-NOV-19	R4905405
Barium (Ba)-Dissolved	0.316		0.00010	mg/L	10-NOV-19	13-NOV-19	R4905405
Bismuth (Bi)-Dissolved	<0.000050		0.000050	mg/L	10-NOV-19	13-NOV-19	R4905405
Boron (B)-Dissolved	<0.010		0.010	mg/L	10-NOV-19	13-NOV-19	R4905405
Cadmium (Cd)-Dissolved	0.0564		0.0050	ug/L	10-NOV-19	13-NOV-19	R4905405
Calcium (Ca)-Dissolved	104		0.050	mg/L	10-NOV-19	13-NOV-19	R4905405
Chromium (Cr)-Dissolved	0.00012		0.00010	mg/L	10-NOV-19	13-NOV-19	R4905405
Cobalt (Co)-Dissolved	<0.10		0.10	ug/L	10-NOV-19	13-NOV-19	R4905405
Copper (Cu)-Dissolved	0.00060		0.00020	mg/L	10-NOV-19	13-NOV-19	R4905405
Iron (Fe)-Dissolved	<0.010		0.010	mg/L	10-NOV-19	13-NOV-19	R4905405
Lead (Pb)-Dissolved	<0.000050		0.000050	mg/L	10-NOV-19	13-NOV-19	R4905405
Lithium (Li)-Dissolved	0.0033		0.0010	mg/L	10-NOV-19	13-NOV-19	R4905405
Magnesium (Mg)-Dissolved	28.0		0.10	mg/L	10-NOV-19	13-NOV-19	R4905405
Manganese (Mn)-Dissolved	0.00026		0.00010	mg/L	10-NOV-19	13-NOV-19	R4905405
Molybdenum (Mo)-Dissolved	0.000763		0.000050	mg/L	10-NOV-19	13-NOV-19	R4905405
Nickel (Ni)-Dissolved	0.00114		0.00050	mg/L	10-NOV-19	13-NOV-19	R4905405
Potassium (K)-Dissolved	1.61		0.050	mg/L	10-NOV-19	13-NOV-19	R4905405
Selenium (Se)-Dissolved	1.57		0.050	ug/L	10-NOV-19	13-NOV-19	R4905405
Silicon (Si)-Dissolved	6.39		0.050	mg/L	10-NOV-19	13-NOV-19	R4905405
Silver (Ag)-Dissolved	<0.00010		0.000010	mg/L	10-NOV-19	13-NOV-19	R4905405
Sodium (Na)-Dissolved	3.50		0.050	mg/L	10-NOV-19	13-NOV-19	R4905405
Strontium (Sr)-Dissolved	0.189		0.00020	mg/L	10-NOV-19	13-NOV-19	R4905405
Thallium (TI)-Dissolved	0.000010		0.000010	mg/L	10-NOV-19	13-NOV-19	R4905405
Tin (Sn)-Dissolved	0.00012		0.00010	mg/L	13-NOV-19	13-NOV-19	R4905910
Titanium (Ti)-Dissolved	<0.010		0.010	mg/L	10-NOV-19	13-NOV-19	R4905405
Uranium (U)-Dissolved	0.00255		0.000010	mg/L	10-NOV-19	13-NOV-19	R4905405
Vanadium (V)-Dissolved	<0.00050		0.00050	mg/L	10-NOV-19	13-NOV-19	R4905405
Zinc (Zn)-Dissolved	0.0014		0.0010	mg/L	10-NOV-19	13-NOV-19	R4905405
Total Metals in Water							
Hardness Hardness (as CaCO3)	375		0.50	mg/L		14-NOV-19	
Total Be (Low) in Water by CRC ICPMS	070		0.50	9/ ⊏		7.1.15	
Beryllium (Be)-Total	1.92		0.020	ug/L		13-NOV-19	R4905405
Total Metals in Water by CRC ICPMS				J.			
Aluminum (Al)-Total	0.276		0.0030	mg/L		13-NOV-19	R4905405
Antimony (Sb)-Total	0.00042		0.00010	mg/L		13-NOV-19	R4905405
Arsenic (As)-Total	0.00054		0.00010	mg/L		13-NOV-19	R4905405

<sup>\*</sup> Refer to Referenced Information for Qualifiers (if any) and Methodology.

L2379297 CONTD.... PAGE 3 of 9 Version: FINAL

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2379297-1 LC_PIZDC0901_WG_Q4-2019_NP							
Sampled By: DT/KC on 06-NOV-19 @ 12:16							
Matrix: WG							
Total Metals in Water by CRC ICPMS Barium (Ba)-Total	0.293		0.00010	mg/L		13-NOV-19	R4905405
Bismuth (Bi)-Total	<0.000050		0.000050	mg/L		13-NOV-19	R4905405
Boron (B)-Total	0.010		0.010	mg/L		13-NOV-19	R4905405
Cadmium (Cd)-Total	0.105		0.0050	ug/L		13-NOV-19	R4905405
Calcium (Ca)-Total	95.0		0.050	mg/L		13-NOV-19	R4905405
Chromium (Cr)-Total	0.00068		0.00010	mg/L		13-NOV-19	R4905405
Cobalt (Co)-Total	0.39		0.10	ug/L		13-NOV-19	R4905405
Copper (Cu)-Total	0.0998		0.00050	mg/L		13-NOV-19	R4905405
Iron (Fe)-Total	0.423		0.010	mg/L		13-NOV-19	R4905405
Lead (Pb)-Total	0.000346		0.000050	mg/L		13-NOV-19	R4905405
Lithium (Li)-Total	0.0032		0.0010	mg/L		13-NOV-19	R4905405
Magnesium (Mg)-Total	26.7		0.10	mg/L		13-NOV-19	R4905405
Manganese (Mn)-Total	0.0106		0.00010	mg/L		13-NOV-19	R4905405
Molybdenum (Mo)-Total	0.000798		0.000050	mg/L		13-NOV-19	R4905405
Nickel (Ni)-Total	0.00868		0.00050	mg/L		13-NOV-19	R4905405
Potassium (K)-Total	1.60		0.050	mg/L		13-NOV-19	R4905405
Selenium (Se)-Total	1.23		0.050	ug/L		13-NOV-19	R4905405
Silicon (Si)-Total	6.86		0.10	mg/L		13-NOV-19	R4905405
Silver (Ag)-Total	0.000021		0.000010	mg/L		13-NOV-19	R4905405
Sodium (Na)-Total	3.50		0.050	mg/L		13-NOV-19	R4905405
Strontium (Sr)-Total	0.186		0.00020	mg/L		13-NOV-19	R4905405
Thallium (TI)-Total	0.000027		0.000010	mg/L		13-NOV-19	R4905405
Tin (Sn)-Total Titanium (Ti)-Total	<0.00010		0.00010	mg/L		13-NOV-19	R4905405
Uranium (U)-Total	<0.010		0.010	mg/L		13-NOV-19 13-NOV-19	R4905405
Vanadium (V)-Total	0.00272 0.00227		0.000010 0.00050	mg/L mg/L		13-NOV-19	R4905405 R4905405
Zinc (Zn)-Total	0.00227		0.00030	mg/L		13-NOV-19	R4905405
Routine for Teck Coal	0.0002		0.0030	IIIg/L		13-110 1-19	K4903403
Acidity by Automatic Titration							
Acidity (as CaCO3)	1.7		1.0	mg/L		08-NOV-19	R4903797
Alkalinity (Species) by Manual Titration				3			
Alkalinity, Bicarbonate (as CaCO3)	352		1.0	mg/L		08-NOV-19	R4903794
Alkalinity, Carbonate (as CaCO3)	<1.0		1.0	mg/L		08-NOV-19	R4903794
Alkalinity, Hydroxide (as CaCO3)	<1.0		1.0	mg/L		08-NOV-19	R4903794
Alkalinity, Total (as CaCO3)	352		1.0	mg/L		08-NOV-19	R4903794
Ammonia, Total (as N)							
Ammonia as N	<0.0050		0.0050	mg/L		13-NOV-19	R4906413
Bromide in Water by IC (Low Level)							
Bromide (Br)	<0.050		0.050	mg/L		08-NOV-19	R4903855
Chloride in Water by IC			0.75			00 11017	D 400000
Chloride (CI)	1.07		0.50	mg/L		08-NOV-19	R4903855
Electrical Conductivity (EC)	F07		2.0	uS/cm		08 NOV 40	D4003704
Conductivity (@ 25C)	587		2.0	uS/CM		08-NOV-19	R4903794
Fluoride in Water by IC Fluoride (F)	0.126		0.020	mg/L		08-NOV-19	R4903855
Ion Balance Calculation	0.120		0.020	illy/L		00-140 V-19	114903033
Ion Balance Calculation	105		-100	%		14-NOV-19	
Ion Balance Calculation			. 50	,0			
Cation - Anion Balance	2.5			%		14-NOV-19	
Anion Sum	7.31			meq/L		14-NOV-19	
Cation Sum	7.69			meq/L		14-NOV-19	
Nitrate in Water by IC (Low Level)				•			
	l				l		

<sup>\*</sup> Refer to Referenced Information for Qualifiers (if any) and Methodology.

L2379297 CONTD.... PAGE 4 of 9 Version: FINAL

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2379297-1 LC_PIZDC0901_WG_Q4-2019_NP							
Sampled By: DT/KC on 06-NOV-19 @ 12:16							
Matrix: WG							
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	0.113		0.0050	mg/L		08-NOV-19	R4903855
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	<0.0010		0.0010	mg/L		08-NOV-19	R4903855
Orthophosphate-Dissolved (as P) Orthophosphate-Dissolved (as P)	0.0165		0.0010	mg/L		08-NOV-19	R4903541
Oxidation redution potential by elect.	0.0100		0.0010	9, =		00110110	111000011
ORP	513		-1000	mV		08-NOV-19	R4903603
Phosphorus (P)-Total							
Phosphorus (P)-Total	0.0283		0.0020	mg/L		09-NOV-19	R4903905
Sulfate in Water by IC Sulfate (SO4)	11.7		0.30	mg/L		08-NOV-19	R4903855
Total Dissolved Solids			0.50	··· <i>a</i> , =			
Total Dissolved Solids	424	DLHC	20	mg/L		12-NOV-19	R4905928
Total Suspended Solids						40 NOV 45	D 4005555
Total Suspended Solids	8.0		1.0	mg/L		12-NOV-19	R4905839
<b>Turbidity</b> Turbidity	21.3		0.10	NTU		08-NOV-19	R4903594
pH							
pH	8.21		0.10	рН		08-NOV-19	R4903794
L2379297-2 WG_Q4-2019_006							
Sampled By: DT/KC on 06-NOV-19 @ 15:43							
Matrix: WG							
Miscellaneous Parameters							
Total Kjeldahl Nitrogen	<0.050		0.050	mg/L		09-NOV-19	R4903830
Total Organic Carbon  Total Metals in Water	<0.50		0.50	mg/L		09-NOV-19	R4904067
Hardness							
Hardness (as CaCO3)	<0.50		0.50	mg/L		13-NOV-19	
Total Be (Low) in Water by CRC ICPMS							
Beryllium (Be)-Total	<0.020		0.020	ug/L		10-NOV-19	R4904882
Total Mercury in Water by CVAAS or CVAFS	-0.0000050		0.000050	ma/l		14-NOV-19	R4906863
Mercury (Hg)-Total  Total Metals in Water by CRC ICPMS	<0.000050		0.0000050	mg/L		14-1100-19	K4900003
Aluminum (Al)-Total	<0.0030		0.0030	mg/L		10-NOV-19	R4904882
Antimony (Sb)-Total	<0.00010		0.00010	mg/L		10-NOV-19	R4904882
Arsenic (As)-Total	<0.00010		0.00010	mg/L		10-NOV-19	R4904882
Barium (Ba)-Total	<0.00010		0.00010	mg/L		10-NOV-19	R4904882
Bismuth (Bi)-Total Boron (B)-Total	<0.00050		0.000050	mg/L		10-NOV-19 10-NOV-19	R4904882
Cadmium (Cd)-Total	<0.010 <0.0050		0.010 0.0050	mg/L ug/L		10-NOV-19	R4904882 R4904882
Calcium (Ca) Total	<0.050		0.050	mg/L		10-NOV-19	R4904882
Chromium (Cr)-Total	<0.00010		0.00010	mg/L		10-NOV-19	R4904882
Cobalt (Co)-Total	<0.10		0.10	ug/L		10-NOV-19	R4904882
Copper (Cu)-Total	<0.00050		0.00050	mg/L		10-NOV-19	R4904882
Iron (Fe)-Total	<0.010		0.010	mg/L		10-NOV-19	R4904882
Lead (Pb)-Total Lithium (Li)-Total	<0.000050 <0.0010		0.000050 0.0010	mg/L mg/L		10-NOV-19 10-NOV-19	R4904882 R4904882
Magnesium (Mg)-Total	<0.0010		0.0010	mg/L		10-NOV-19	R4904882
Manganese (Mn)-Total	<0.00010		0.00010	mg/L		10-NOV-19	R4904882
Molybdenum (Mo)-Total	<0.000050		0.000050	mg/L		10-NOV-19	R4904882
Nickel (Ni)-Total	<0.00050		0.00050	mg/L		10-NOV-19	R4904882

<sup>\*</sup> Refer to Referenced Information for Qualifiers (if any) and Methodology.

L2379297 CONTD.... PAGE 5 of 9 Version: FINAL

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2379297-2 WG_Q4-2019_006							
Sampled By: DT/KC on 06-NOV-19 @ 15:43							
Matrix: WG							
Total Metals in Water by CRC ICPMS							
Potassium (K)-Total	< 0.050		0.050	mg/L		10-NOV-19	R4904882
Selenium (Se)-Total	< 0.050		0.050	ug/L		10-NOV-19	R4904882
Silicon (Si)-Total	<0.10		0.10	mg/L		10-NOV-19	R4904882
Silver (Ag)-Total	<0.000010		0.000010	mg/L		10-NOV-19	R4904882
Sodium (Na)-Total	< 0.050		0.050	mg/L		10-NOV-19	R4904882
Strontium (Sr)-Total	<0.00020		0.00020	mg/L		10-NOV-19	R4904882
Thallium (TI)-Total	<0.000010		0.000010	mg/L		10-NOV-19	R4904882
Tin (Sn)-Total	<0.00010		0.00010	mg/L		10-NOV-19	R4904882
Titanium (Ti)-Total	<0.010		0.010	mg/L		10-NOV-19	R4904882
Uranium (U)-Total	<0.000010		0.000010	mg/L		10-NOV-19	R4904882
Vanadium (V)-Total	<0.00050		0.00050	mg/L		10-NOV-19	R4904882
Zinc (Zn)-Total	<0.0030		0.0030	mg/L		10-NOV-19	R4904882
Routine for Teck Coal							
Acidity by Automatic Titration Acidity (as CaCO3)	1.5		1.0	mg/L		08-NOV-19	R4903797
Alkalinity (Species) by Manual Titration	1.0		1.0	illy/L		00-140-19	1816064
Alkalinity, Bicarbonate (as CaCO3)	<1.0		1.0	mg/L		08-NOV-19	R4903794
Alkalinity, Carbonate (as CaCO3)	<1.0		1.0	mg/L		08-NOV-19	R4903794
Alkalinity, Hydroxide (as CaCO3)	<1.0		1.0	mg/L		08-NOV-19	R4903794
Alkalinity, Total (as CaCO3)	<1.0		1.0	mg/L		08-NOV-19	R4903794
Ammonia, Total (as N)				3			
Ammonia as N	0.0069	RRV	0.0050	mg/L		13-NOV-19	R4906413
Bromide in Water by IC (Low Level)							
Bromide (Br)	<0.050		0.050	mg/L		08-NOV-19	R4903855
Chloride in Water by IC							
Chloride (CI)	<0.50		0.50	mg/L		08-NOV-19	R4903855
Dissolved Metals in Water by CRC ICPMS							
Dissolved Metals Filtration Location	LAB					12-NOV-19	R4905142
Calcium (Ca)-Dissolved	<0.050		0.050	mg/L		13-NOV-19	R4905147
Magnesium (Mg)-Dissolved	<0.0050		0.0050	mg/L		13-NOV-19	R4905147
Potassium (K)-Dissolved	<0.050		0.050	mg/L		13-NOV-19	R4905147
Sodium (Na)-Dissolved	<0.050		0.050	mg/L		13-NOV-19	R4905147
Electrical Conductivity (EC)			0.0	C/om		00 NOV 10	D 4000704
Conductivity (@ 25C)	<2.0		2.0	uS/cm		08-NOV-19	R4903794
Fluoride in Water by IC Fluoride (F)	<0.020		0.020	mg/L		08-NOV-19	R4903855
Ion Balance Calculation	\0.020		0.020	g/∟		001407-19	117303033
Cation - Anion Balance	0.0			%		13-NOV-19	
Anion Sum	<0.10			meg/L		13-NOV-19	
Cation Sum	<0.10			meq/L		13-NOV-19	
Ion Balance Calculation							
Ion Balance	0.0		-100	%		13-NOV-19	
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	<0.0050		0.0050	mg/L		08-NOV-19	R4903855
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	<0.0010		0.0010	mg/L		08-NOV-19	R4903855
Orthophosphate-Dissolved (as P)							
Orthophosphate-Dissolved (as P)	<0.0010		0.0010	mg/L		08-NOV-19	R4903541
Oxidation redution potential by elect.	440		4000	\		00 NOV 40	D4000000
ORP	448		-1000	mV		08-NOV-19	R4903603
Phosphorus (P)-Total Phosphorus (P)-Total	~0.0020		0.0020	ma/l		00-NOV 10	D4002005
rnosphorus (r)-rotal	<0.0020		0.0020	mg/L		09-NOV-19	R4903905

<sup>\*</sup> Refer to Referenced Information for Qualifiers (if any) and Methodology.

L2379297 CONTD.... PAGE 6 of 9 Version: FINAL

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2379297-2 WG_Q4-2019_006							
Sampled By: DT/KC on 06-NOV-19 @ 15:43							
Matrix: WG							
Sulfate in Water by IC Sulfate (SO4)	<0.30		0.30	mg/L		08-NOV-19	R4903855
Total Dissolved Solids Total Dissolved Solids	<10		10	mg/L		12-NOV-19	R4905928
Total Suspended Solids Total Suspended Solids	<1.0		1.0	mg/L		12-NOV-19	R4905839
Turbidity Turbidity	<0.10		0.10	NTU		08-NOV-19	R4903594
pH pH	5.49		0.10	pН		08-NOV-19	R4903794

<sup>\*</sup> Refer to Referenced Information for Qualifiers (if any) and Methodology.

Reference Information

PAGE 7 of 9 Version: FINAL

Sample Parameter Qualifier Kev:

Qualifier	Description
В	Method Blank exceeds ALS DQO. Associated sample results which are < Limit of Reporting or > 5 times blank level are considered reliable.
DLHC	Detection Limit Raised: Dilution required due to high concentration of test analyte(s).
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RRV	Reported Result Verified By Repeat Analysis

#### **Test Method References:**

ALS Test Code	Matrix	Test Description	Method Reference**
ACIDITY-PCT-CL	Water	Acidity by Automatic Titration	APHA 2310 Acidity

This analysis is carried out using procedures adapted from APHA Method 2310 "Acidity". Acidity is determined by potentiometric titration to a specified endpoint.

ALK-MAN-CL Water Alkalinity (Species) by Manual Titration APHA 2320 ALKALINITY

This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.

BE-D-L-CCMS-VA Water Diss. Be (low) in Water by CRC ICPMS APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

BE-T-L-CCMS-VA Water Total Be (Low) in Water by CRC ICPMS EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

BR-L-IC-N-CL Water Bromide in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

C-DIS-ORG-LOW-CL Water Dissolved Organic Carbon APHA 5310 B-Instrumental

This method is applicable to the analysis of ground water, wastewater, and surface water samples. The form detected depends upon sample pretreatment: Unfiltered sample = TC, 0.45um filtered = TDC. Samples are injected into a combustion tube containing an oxidation catalyst. The carrier gas containing the combustion product from the combustion tube flows through an inorganic carbon reactor vessel and is then sent through a halogen scrubber into a sample cell set in a non-dispersive infrared gas analyzer (NDIR) where carbon dioxide is detected. For total inorganic carbon and dissolved inorganic carbon, the sample is injected into an IC reactor vessel where only the IC component is decomposed to become carbon dioxide.

The peak area generated by the NDIR indicates the TC/TDC or TIC/DIC as applicable. The total organic carbon content of the sample is calculated by subtracting the TIC from the TC.

TOC = TC-TIC, DOC = TDC-DIC, Particulate = Total - Dissolved.

C-TOT-ORG-LOW-CL Water Total Organic Carbon APHA 5310 TOTAL ORGANIC CARBON (TOC)

This method is applicable to the analysis of ground water, wastewater, and surface water samples. The form detected depends upon sample pretreatment: Unfiltered sample = TC, 0.45um filtered = TDC. Samples are injected into a combustion tube containing an oxidation catalyst. The carrier gas containing the combustion product from the combustion tube flows through an inorganic carbon reactor vessel and is then sent through a halogen scrubber into a sample cell set in a non-dispersive infrared gas analyzer (NDIR) where carbon dioxide is detected. For total inorganic carbon and dissolved inorganic carbon, the sample is injected into an IC reactor vessel where only the IC component is decomposed to become carbon dioxide.

The peak area generated by the NDIR indicates the TC/TDC or TIC/DIC as applicable. The total organic carbon content of the sample is calculated by subtracting the TIC from the TC.

TOC = TC-TIC, DOC = TDC-DIC, Particulate = Total - Dissolved.

CL-IC-N-CL Water Chloride in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

EC-L-PCT-CL Water Electrical Conductivity (EC) APHA 2510B

Conductivity, also known as Electrical Conductivity (EC) or Specific Conductance, is measured by immersion of a conductivity cell with platinum electrodes into a water sample. Conductivity measurements are temperature-compensated to 25C.

F-IC-N-CL Water Fluoride in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

HARDNESS-CALC-VA Water Hardness APHA 2340B

Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

LINE CREEK OPERATION

**Reference Information** 

L2379297 CONTD.... PAGE 8 of 9 Version: FINAL

Test Method References:

ALS Test Code Matrix Test Description Method Reference\*\*

HG-D-CVAA-VA Water Diss. Mercury in Water by CVAAS or CVAFS APHA 3030B/EPA 1631E (mod)

Water samples are filtered (0.45 um), preserved with hydrochloric acid, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

HG-T-CVAA-VA Water Total Mercury in Water by CVAAS or CVAFS EPA 1631E (mod)

Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

IONBALANCE-BC-CL Water Ion Balance Calculation APHA 1030E

Cation Sum, Anion Sum, and Ion Balance (as % difference) are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Because all aqueous solutions are electrically neutral, the calculated ion balance (% difference of cations minus anions) should be near-zero.

Cation and Anion Sums are the total meq/L concentration of major cations and anions. Dissolved species are used where available. Minor ions are included where data is present. Ion Balance is calculated as:

Ion Balance (%) = [Cation Sum-Anion Sum] / [Cation Sum+Anion Sum]

MET-D-CCMS-CL Water Dissolved Metals in Water by CRC ICPMS APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

MET-D-CCMS-VA Water Dissolved Metals in Water by CRC ICPMS APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

MET-T-CCMS-VA Water Total Metals in Water by CRC ICPMS EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

NH3-L-F-CL Water Ammonia, Total (as N) J. ENVIRON. MONIT., 2005, 7, 37-42, RSC

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.

NO2-L-IC-N-CL Water Nitrite in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

NO3-L-IC-N-CL Water Nitrate in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

ORP-CL Water Oxidation redution potential by elect. ASTM D1498

This analysis is carried out in accordance with the procedure described in the "ASTM" method D1498 "Oxidation-Reduction Potential of Water" published by the American Society for Testing and Materials (ASTM). Results are reported as observed oxidation-reduction potential of the platinum metal-reference electrode employed, in mV.

It is recommended that this analysis be conducted in the field.

P-T-L-COL-CL Water Phosphorus (P)-Total APHA 4500-P PHOSPHORUS

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after persulphate digestion of the sample.

PH-CL Water pH APHA 4500 H-Electrode

pH is determined in the laboratory using a pH electrode. All samples analyzed by this method for pH will have exceeded the 15 minute recommended hold time from time of sampling (field analysis is recommended for pH where highly accurate results are needed)

PO4-DO-L-COL-CL Water Orthophosphate-Dissolved (as P) APHA 4500-P PHOSPHORUS

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.

SO4-IC-N-CL Water Sulfate in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

#### LINE CREEK OPERATION L2379297 CONTD....

PAGE 9 of 9 Version: FINAL

#### Reference Information

**Test Method References:** 

TECKCOAL-IONBAL-CL

ALS Test Code Matrix Test Description Method Reference\*\*

SOLIDS-TDS-CL Water Total Dissolved Solids APHA 2540 C

A well-mixed sample is filtered through a glass fibre filter paper. The filtrate is then evaporated to dryness in a pre-weighed vial and dried at 180 – 2 °C. The increase in vial weight represents the total dissolved solids (TDS).

The increase in viai weight represents the total dissolved solids (105

Water

Cation Sum, Anion Sum, and Ion Balance (as % difference) are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Because all aqueous solutions are electrically neutral, the calculated ion balance (% difference of cations minus anions) should be near-zero.

Cation and Anion Sums are the total meq/L concentration of major cations and anions. Dissolved species are used where available. Minor ions are included where data is present. Ion Balance is calculated as:

Ion Balance (%) = [Cation Sum-Anion Sum] / [Cation Sum+Anion Sum]

TKN-L-F-CL Water Total Kjeldahl Nitrogen APHA 4500-NORG (TKN)

Ion Balance Calculation

This analysis is carried out using procedures adapted from APHA Method 4500-Norg D. "Block Digestion and Flow Injection Analysis". Total Kjeldahl Nitrogen is determined using block digestion followed by Flow-injection analysis with fluorescence detection.

TSS-L-CL Water Total Suspended Solids APHA 2540 D-Gravimetric

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total suspended solids (TSS) are determined by filtering a sample through a glass fibre filter, and by drying the filter at 104 deg. C.

TURBIDITY-CL Water Turbidity APHA 2130 B-Nephelometer

This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.

\*\* ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA
CL	ALS ENVIRONMENTAL - CALGARY, ALBERTA, CANADA

#### **Chain of Custody Numbers:**

20191106 - DC GW

#### **GLOSSARY OF REPORT TERMS**

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.

mg/kg - milligrams per kilogram based on dry weight of sample

mg/kg wwt - milligrams per kilogram based on wet weight of sample

mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight

mg/L - unit of concentration based on volume, parts per million.

< - Less than.

D.L. - The reporting limit.

N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory. UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.



Workorder: L2379297

Report Date: 17-NOV-19

Page 1 of 15

Client:

TECK COAL LIMITED (LINE CREEK)

PO BOX 2003

SPARWOOD BC V0B 2G0

Contact: Carla Froyman Parker

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
ACIDITY-PCT-CL	Water							
Batch R4903797								
WG3215184-8 LCS Acidity (as CaCO3)			100.3		%		85-115	08-NOV-19
WG3215184-7 MB Acidity (as CaCO3)			1.5		mg/L		2	08-NOV-19
ALK-MAN-CL	Water							
Batch R4903794								
WG3215187-11 LCS Alkalinity, Total (as CaC	CO3)		97.9		%		85-115	08-NOV-19
WG3215187-10 MB Alkalinity, Total (as CaC	CO3)		<1.0		mg/L		1	08-NOV-19
BE-D-L-CCMS-VA	Water							
Batch R4905405								
WG3215663-3 DUP Beryllium (Be)-Dissolve	d	<b>L2379297-1</b> <0.000020	<0.000020	RPD-NA	mg/L	N/A	20	13-NOV-19
WG3215663-2 LCS Beryllium (Be)-Dissolve	d		93.1		%		80-120	13-NOV-19
WG3215663-1 MB Beryllium (Be)-Dissolve	d	NP	<0.000020		mg/L		0.00002	13-NOV-19
BE-T-L-CCMS-VA	Water							
Batch R4904882								
WG3215533-2 LCS Beryllium (Be)-Total			93.2		%		80-120	10-NOV-19
WG3215533-1 MB Beryllium (Be)-Total			<0.000020		mg/L		0.00002	10-NOV-19
Batch R4905405					J			
WG3215530-2 LCS								
Beryllium (Be)-Total			92.8		%		80-120	13-NOV-19
WG3215530-1 MB Beryllium (Be)-Total			<0.000020		mg/L		0.00002	13-NOV-19
BR-L-IC-N-CL	Water							
Batch R4903855								
WG3215339-2 LCS Bromide (Br)			96.8		%		85-115	08-NOV-19
<b>WG3215339-1 MB</b> Bromide (Br)			<0.050		mg/L		0.05	08-NOV-19
C-DIS-ORG-LOW-CL	Water							



Workorder: L2379297

Report Date: 17-NOV-19 Page 2 of 15

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
C-DIS-ORG-LOW-CL  Batch R4904067	Water							
WG3215640-2 LCS Dissolved Organic Carb	on		101.3		%		80-120	09-NOV-19
WG3215640-1 MB Dissolved Organic Carb	on		<0.50		mg/L		0.5	09-NOV-19
C-TOT-ORG-LOW-CL	Water							
Batch R4904067								
WG3215640-3 DUP Total Organic Carbon		<b>L2379297-2</b> <0.50	<0.50	RPD-NA	mg/L	N/A	20	09-NOV-19
WG3215640-2 LCS Total Organic Carbon			106.8		%		80-120	09-NOV-19
WG3215640-1 MB Total Organic Carbon			<0.50		mg/L		0.5	09-NOV-19
WG3215640-4 MS Total Organic Carbon		L2379297-2	94.2		%		70-130	09-NOV-19
CL-IC-N-CL	Water							
Batch R4903855								
<b>WG3215339-2 LCS</b> Chloride (Cl)			100.3		%		90-110	08-NOV-19
<b>WG3215339-1 MB</b> Chloride (Cl)			<0.50		mg/L		0.5	08-NOV-19
EC-L-PCT-CL	Water							
Batch R4903794								
WG3215187-11 LCS Conductivity (@ 25C)			96.2		%		90-110	08-NOV-19
WG3215187-10 MB Conductivity (@ 25C)			<2.0		uS/cm		2	08-NOV-19
F-IC-N-CL	Water							
Batch R4903855								
<b>WG3215339-2 LCS</b> Fluoride (F)			96.7		%		90-110	08-NOV-19
<b>WG3215339-1 MB</b> Fluoride (F)			<0.020		mg/L		0.02	08-NOV-19
HG-D-CVAA-VA	Water							
Batch R4908847								
WG3219184-2 LCS Mercury (Hg)-Dissolved			101.9		%		80-120	15-NOV-19
WG3219184-1 MB		NP						



Workorder: L2379297 Report Date: 17-NOV-19 Page 3 of 15

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
HG-D-CVAA-VA	Water							
Batch R4908847 WG3219184-1 MB Mercury (Hg)-Dissolved		NP	<0.00000	5C	mg/L		0.000005	15-NOV-19
HG-T-CVAA-VA	Water							
Batch R4906863 WG3218776-2 LCS Mercury (Hg)-Total			95.3		%		80-120	14-NOV-19
WG3218776-1 MB Mercury (Hg)-Total			<0.000005	5C	mg/L		0.000005	14-NOV-19
MET-D-CCMS-CL	Water							
Batch R4905147 WG3216833-6 LCS			100.5		0/		00.455	40 NOV 15
Calcium (Ca)-Dissolved			109.5 118.1		% %		80-120	12-NOV-19
Magnesium (Mg)-Dissol Potassium (K)-Dissolved			118.1		%		80-120	12-NOV-19 12-NOV-19
Sodium (Na)-Dissolved	<b>-</b>		110.1		%		80-120 80-120	12-NOV-19 12-NOV-19
WG3216833-5 MB			110.1		70		00-120	12-1100-19
Calcium (Ca)-Dissolved			<0.050		mg/L		0.05	12-NOV-19
Magnesium (Mg)-Dissol	ved		<0.0050		mg/L		0.005	12-NOV-19
Potassium (K)-Dissolved	d		<0.050		mg/L		0.05	12-NOV-19
Sodium (Na)-Dissolved			<0.050		mg/L		0.05	12-NOV-19
MET-D-CCMS-VA	Water							
Batch R4905405								
WG3215663-3 DUP	٨	L2379297-1	-0.0000	DDD 111	ma/l	<b>N</b> 1/A	00	40 1101/115
Aluminum (Al)-Dissolved		<0.0030	<0.0030	RPD-NA	mg/L	N/A	20	13-NOV-19
Antimony (Sb)-Dissolved	u	0.00039 0.00034	0.00039		mg/L	0.5	20	13-NOV-19
Arsenic (As)-Dissolved Barium (Ba)-Dissolved		0.00034	0.00033		mg/L mg/l	2.8	20	13-NOV-19
Bismuth (Bi)-Dissolved					mg/L mg/L	0.7 N/A	20	13-NOV-19
Boron (B)-Dissolved		<0.00050 <0.010	<0.000050 <0.010	RPD-NA RPD-NA	mg/L	N/A N/A	20	13-NOV-19
Cadmium (Cd)-Dissolve	d	0.0000564	0.0000585		mg/L	N/A 3.7	20	13-NOV-19
Calcium (Ca)-Dissolved		104	102	,	mg/L	3. <i>1</i> 2.1	20 20	13-NOV-19 13-NOV-19
Chromium (Cr)-Dissolved		0.00012	<0.00010	RPD-NA	mg/L	2.1 N/A	20	
Cobalt (Co)-Dissolved	<b>,</b>	<0.00012	<0.00010	RPD-NA	mg/L	N/A	20	13-NOV-19 13-NOV-19
Copper (Cu)-Dissolved		0.00060	0.00059	ICD-INA	mg/L	0.7	20	13-NOV-19 13-NOV-19
Iron (Fe)-Dissolved		<0.010	<0.010	RPD-NA	mg/L	N/A	20	13-NOV-19 13-NOV-19
iioii (i c)-Dissolved		<b>\0.010</b>	<b>\0.010</b>	KFD-NA	mg/L	IN/A	20	13-140-19



Workorder: L2379297 Report Date: 17-NOV-19 Page 4 of 15

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA	Water							
Batch R4905405								
WG3215663-3 DUP		L2379297-1						
Lead (Pb)-Dissolved		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	13-NOV-19
Lithium (Li)-Dissolved		0.0033	0.0032		mg/L	2.4	20	13-NOV-19
Magnesium (Mg)-Dissol		28.0	28.2		mg/L	0.7	20	13-NOV-19
Manganese (Mn)-Dissol		0.00026	0.00029		mg/L	8.2	20	13-NOV-19
Molybdenum (Mo)-Disso	olved	0.000763	0.000784		mg/L	2.6	20	13-NOV-19
Nickel (Ni)-Dissolved		0.00114	0.00117		mg/L	2.4	20	13-NOV-19
Potassium (K)-Dissolve	d	1.61	1.61		mg/L	0.5	20	13-NOV-19
Selenium (Se)-Dissolve	d	0.00157	0.00166		mg/L	5.0	20	13-NOV-19
Silicon (Si)-Dissolved		6.39	6.48		mg/L	1.3	20	13-NOV-19
Silver (Ag)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	13-NOV-19
Sodium (Na)-Dissolved		3.50	3.60		mg/L	2.6	20	13-NOV-19
Strontium (Sr)-Dissolved	b	0.189	0.193		mg/L	1.7	20	13-NOV-19
Thallium (TI)-Dissolved		0.000010	<0.000010	RPD-NA	mg/L	N/A	20	13-NOV-19
Titanium (Ti)-Dissolved		<0.010	<0.010	RPD-NA	mg/L	N/A	20	13-NOV-19
Uranium (U)-Dissolved		0.00255	0.00258		mg/L	1.1	20	13-NOV-19
Vanadium (V)-Dissolved	d	<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	13-NOV-19
Zinc (Zn)-Dissolved		0.0014	0.0014		mg/L	0.2	20	13-NOV-19
WG3215663-2 LCS								
Aluminum (Al)-Dissolve			94.5		%		80-120	13-NOV-19
Antimony (Sb)-Dissolve	d		92.2		%		80-120	13-NOV-19
Arsenic (As)-Dissolved			93.3		%		80-120	13-NOV-19
Barium (Ba)-Dissolved			96.9		%		80-120	13-NOV-19
Bismuth (Bi)-Dissolved			97.3		%		80-120	13-NOV-19
Boron (B)-Dissolved			94.9		%		80-120	13-NOV-19
Cadmium (Cd)-Dissolve	ed		92.1		%		80-120	13-NOV-19
Calcium (Ca)-Dissolved			99.9		%		80-120	13-NOV-19
Chromium (Cr)-Dissolve	ed		93.7		%		80-120	13-NOV-19
Cobalt (Co)-Dissolved			91.3		%		80-120	13-NOV-19
Copper (Cu)-Dissolved			91.6		%		80-120	13-NOV-19
Iron (Fe)-Dissolved			88.5		%		80-120	13-NOV-19
Lead (Pb)-Dissolved			99.0		%		80-120	13-NOV-19
Lithium (Li)-Dissolved			92.2		%		80-120	13-NOV-19
Magnesium (Mg)-Dissol	ved		92.0		%		80-120	13-NOV-19
Manganese (Mn)-Dissol	ved		96.6		%		80-120	13-NOV-19



Workorder: L2379297 Report Date: 17-NOV-19 Page 5 of 15

Test Mat	rix Reference	Result Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA Wa	ter					
Batch R4905405						
WG3215663-2 LCS		05.0	0/			
Molybdenum (Mo)-Dissolved		95.2	%		80-120	13-NOV-19
Nickel (Ni)-Dissolved		90.9	%		80-120	13-NOV-19
Potassium (K)-Dissolved		93.7	%		80-120	13-NOV-19
Selenium (Se)-Dissolved		98.2	%		80-120	13-NOV-19
Silicon (Si)-Dissolved		101.1	%		60-140	13-NOV-19
Silver (Ag)-Dissolved		94.6	%		80-120	13-NOV-19
Sodium (Na)-Dissolved		96.3	%		80-120	13-NOV-19
Strontium (Sr)-Dissolved		93.4	%		80-120	13-NOV-19
Thallium (TI)-Dissolved		96.1	%		80-120	13-NOV-19
Titanium (Ti)-Dissolved		89.3	%		80-120	13-NOV-19
Uranium (U)-Dissolved		97.0	%		80-120	13-NOV-19
Vanadium (V)-Dissolved		95.1	%		80-120	13-NOV-19
Zinc (Zn)-Dissolved		88.3	%		80-120	13-NOV-19
WG3215663-1 MB	NP		_			
Aluminum (Al)-Dissolved		<0.0010	mg/L		0.001	13-NOV-19
Antimony (Sb)-Dissolved		<0.00010	mg/L		0.0001	13-NOV-19
Arsenic (As)-Dissolved		<0.00010	mg/L		0.0001	13-NOV-19
Barium (Ba)-Dissolved		<0.00010	mg/L		0.0001	13-NOV-19
Bismuth (Bi)-Dissolved		<0.000050	mg/L		0.00005	13-NOV-19
Boron (B)-Dissolved		<0.010	mg/L		0.01	13-NOV-19
Cadmium (Cd)-Dissolved		<0.0000050	mg/L		0.000005	13-NOV-19
Calcium (Ca)-Dissolved		<0.050	mg/L		0.05	13-NOV-19
Chromium (Cr)-Dissolved		<0.00010	mg/L		0.0001	13-NOV-19
Cobalt (Co)-Dissolved		<0.00010	mg/L		0.0001	13-NOV-19
Copper (Cu)-Dissolved		<0.00020	mg/L		0.0002	13-NOV-19
Iron (Fe)-Dissolved		<0.010	mg/L		0.01	13-NOV-19
Lead (Pb)-Dissolved		<0.000050	mg/L		0.00005	13-NOV-19
Lithium (Li)-Dissolved		<0.0010	mg/L		0.001	13-NOV-19
Magnesium (Mg)-Dissolved		<0.0050	mg/L		0.005	13-NOV-19
Manganese (Mn)-Dissolved		<0.00010	mg/L		0.0001	13-NOV-19
Molybdenum (Mo)-Dissolved		<0.000050	mg/L		0.00005	13-NOV-19
Nickel (Ni)-Dissolved		<0.00050	mg/L		0.0005	13-NOV-19
Potassium (K)-Dissolved		<0.050	mg/L		0.05	13-NOV-19
Selenium (Se)-Dissolved		<0.000050	mg/L		0.00005	13-NOV-19



Workorder: L2379297

Report Date: 17-NOV-19

Page 6 of 15

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA	Water							
Batch R4905405	5							
WG3215663-1 MB		NP						
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	13-NOV-19
Silver (Ag)-Dissolved			<0.000010	)	mg/L		0.00001	13-NOV-19
Sodium (Na)-Dissolved			<0.050		mg/L		0.05	13-NOV-19
Strontium (Sr)-Dissolve			<0.00020		mg/L		0.0002	13-NOV-19
Thallium (TI)-Dissolved	d		<0.000010	)	mg/L		0.00001	13-NOV-19
Titanium (Ti)-Dissolved	d		<0.00030		mg/L		0.0003	13-NOV-19
Uranium (U)-Dissolved	i		<0.000010	)	mg/L		0.00001	13-NOV-19
Vanadium (V)-Dissolve	ed		<0.00050		mg/L		0.0005	13-NOV-19
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	13-NOV-19
Batch R4905910	0							
WG3217491-2 LCS								
Aluminum (Al)-Dissolv			100.9		%		80-120	13-NOV-19
Antimony (Sb)-Dissolv			100.9		%		80-120	13-NOV-19
Arsenic (As)-Dissolved			100.1		%		80-120	13-NOV-19
Barium (Ba)-Dissolved			96.8		%		80-120	13-NOV-19
Bismuth (Bi)-Dissolved	i		101.5		%		80-120	13-NOV-19
Boron (B)-Dissolved			96.6		%		80-120	13-NOV-19
Cadmium (Cd)-Dissolv			99.9		%		80-120	13-NOV-19
Calcium (Ca)-Dissolve	d		96.9		%		80-120	13-NOV-19
Chromium (Cr)-Dissolv	ved		99.8		%		80-120	13-NOV-19
Cobalt (Co)-Dissolved			100.8		%		80-120	13-NOV-19
Copper (Cu)-Dissolved	t		98.1		%		80-120	13-NOV-19
Iron (Fe)-Dissolved			95.9		%		80-120	13-NOV-19
Lead (Pb)-Dissolved			98.1		%		80-120	13-NOV-19
Lithium (Li)-Dissolved			96.5		%		80-120	13-NOV-19
Magnesium (Mg)-Disse	olved		97.0		%		80-120	13-NOV-19
Manganese (Mn)-Diss	olved		97.6		%		80-120	13-NOV-19
Molybdenum (Mo)-Dis	solved		104.2		%		80-120	13-NOV-19
Nickel (Ni)-Dissolved			100.3		%		80-120	13-NOV-19
Potassium (K)-Dissolv	ed		103.9		%		80-120	13-NOV-19
Selenium (Se)-Dissolv	ed		98.0		%		80-120	13-NOV-19
Silicon (Si)-Dissolved			100.5		%		60-140	13-NOV-19
Silver (Ag)-Dissolved			101.0		%		80-120	13-NOV-19
Sodium (Na)-Dissolved	d		104.6		%		80-120	13-NOV-19



Workorder: L2379297 Report Date: 17-NOV-19

Page 7 of 15

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA	Water							
Batch R4905910	0							
WG3217491-2 LCS								
Strontium (Sr)-Dissolve			106.6		%		80-120	13-NOV-19
Thallium (TI)-Dissolved	d		97.7		%		80-120	13-NOV-19
Tin (Sn)-Dissolved			99.9		%		80-120	13-NOV-19
Titanium (Ti)-Dissolved			102.7		%		80-120	13-NOV-19
Uranium (U)-Dissolved			100.8		%		80-120	13-NOV-19
Vanadium (V)-Dissolve	ed		99.6		%		80-120	13-NOV-19
Zinc (Zn)-Dissolved			99.2		%		80-120	13-NOV-19
WG3217491-1 MB		NP						
Aluminum (Al)-Dissolve			<0.0010	_	mg/L		0.001	13-NOV-19
Antimony (Sb)-Dissolve			<0.00010		mg/L		0.0001	13-NOV-19
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	13-NOV-19
Barium (Ba)-Dissolved			<0.00010		mg/L		0.0001	13-NOV-19
Bismuth (Bi)-Dissolved	i		<0.0000	50	mg/L		0.00005	13-NOV-19
Boron (B)-Dissolved			<0.010		mg/L		0.01	13-NOV-19
Cadmium (Cd)-Dissolv			<0.0000	050	mg/L		0.000005	13-NOV-19
Calcium (Ca)-Dissolve			< 0.050		mg/L		0.05	13-NOV-19
Chromium (Cr)-Dissolv	ved		<0.00010	)	mg/L		0.0001	13-NOV-19
Cobalt (Co)-Dissolved			<0.00010	0	mg/L		0.0001	13-NOV-19
Copper (Cu)-Dissolved	d		<0.00020	0	mg/L		0.0002	13-NOV-19
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	13-NOV-19
Lead (Pb)-Dissolved			<0.0000	50	mg/L		0.00005	13-NOV-19
Lithium (Li)-Dissolved			<0.0010		mg/L		0.001	13-NOV-19
Magnesium (Mg)-Disso	olved		<0.0050		mg/L		0.005	13-NOV-19
Manganese (Mn)-Disso	olved		<0.00010	)	mg/L		0.0001	13-NOV-19
Molybdenum (Mo)-Diss	solved		<0.0000	50	mg/L		0.00005	13-NOV-19
Nickel (Ni)-Dissolved			<0.00050	ס	mg/L		0.0005	13-NOV-19
Potassium (K)-Dissolve	ed		< 0.050		mg/L		0.05	13-NOV-19
Selenium (Se)-Dissolve	ed		<0.0000	50	mg/L		0.00005	13-NOV-19
Silicon (Si)-Dissolved			< 0.050		mg/L		0.05	13-NOV-19
Silver (Ag)-Dissolved			<0.0000	10	mg/L		0.00001	13-NOV-19
Sodium (Na)-Dissolved	d		< 0.050		mg/L		0.05	13-NOV-19
Strontium (Sr)-Dissolve	ed		<0.00020	)	mg/L		0.0002	13-NOV-19
Thallium (TI)-Dissolved	d		<0.0000	10	mg/L		0.00001	13-NOV-19
Tin (Sn)-Dissolved			<0.00010	)	mg/L		0.0001	13-NOV-19



Workorder: L2379297

Report Date: 17-NOV-19

Page 8 of 15

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA	Water							
Batch R4905910								
WG3217491-1 MB Titanium (Ti)-Dissolved		NP	<0.00030		mg/L		0.0003	13-NOV-19
Uranium (U)-Dissolved			<0.00001	0	mg/L		0.00001	13-NOV-19
Vanadium (V)-Dissolved	I		<0.00050		mg/L		0.0005	13-NOV-19
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	13-NOV-19
MET-T-CCMS-VA	Water							
Batch R4904882								
WG3215533-2 LCS								
Aluminum (Al)-Total			102.2		%		80-120	10-NOV-19
Antimony (Sb)-Total			105.2		%		80-120	10-NOV-19
Arsenic (As)-Total			98.8		%		80-120	10-NOV-19
Barium (Ba)-Total			96.7		%		80-120	10-NOV-19
Bismuth (Bi)-Total			101.0		%		80-120	10-NOV-19
Boron (B)-Total			90.4		%		80-120	10-NOV-19
Cadmium (Cd)-Total			98.2		%		80-120	10-NOV-19
Calcium (Ca)-Total			96.7		%		80-120	10-NOV-19
Chromium (Cr)-Total			99.7		%		80-120	10-NOV-19
Cobalt (Co)-Total			100.9		%		80-120	10-NOV-19
Copper (Cu)-Total			97.0		%		80-120	10-NOV-19
Iron (Fe)-Total			93.0		%		80-120	10-NOV-19
Lead (Pb)-Total			94.8		%		80-120	10-NOV-19
Lithium (Li)-Total			96.4		%		80-120	10-NOV-19
Magnesium (Mg)-Total			99.2		%		80-120	10-NOV-19
Manganese (Mn)-Total			97.8		%		80-120	10-NOV-19
Molybdenum (Mo)-Total			101.8		%		80-120	10-NOV-19
Nickel (Ni)-Total			100.0		%		80-120	10-NOV-19
Potassium (K)-Total			102.1		%		80-120	10-NOV-19
Selenium (Se)-Total			93.2		%		80-120	10-NOV-19
Silicon (Si)-Total			98.1		%		80-120	10-NOV-19
Silver (Ag)-Total			98.0		%		80-120	10-NOV-19
Sodium (Na)-Total			98.6		%		80-120	10-NOV-19
Strontium (Sr)-Total			100.4		%		80-120	10-NOV-19
Thallium (Tl)-Total			96.2		%		80-120	10-NOV-19
Tin (Sn)-Total			98.2		%		80-120	10-NOV-19
Titanium (Ti)-Total			101.6		%		80-120	10-NOV-19



Workorder: L2379297

Report Date: 17-NOV-19 Page 9 of 15

Test	Matrix	Reference	Result	Qualifie	er Units	RPD	Limit	Analyzed
MET-T-CCMS-VA	Water							
Batch R4904882								
WG3215533-2 LCS			95.9		0/		00.400	40 NOV 40
Uranium (U)-Total			95.9 99.8		%		80-120	10-NOV-19
Vanadium (V)-Total					%		80-120	10-NOV-19
Zinc (Zn)-Total			100.2		70		80-120	10-NOV-19
WG3215533-1 MB Aluminum (Al)-Total			<0.0030		mg/L		0.003	10-NOV-19
Antimony (Sb)-Total			<0.00010		mg/L		0.0001	10-NOV-19
Arsenic (As)-Total			<0.00010		mg/L		0.0001	10-NOV-19
Barium (Ba)-Total			<0.00010		mg/L		0.0001	10-NOV-19
Bismuth (Bi)-Total			<0.00005	0	mg/L		0.00005	10-NOV-19
Boron (B)-Total			<0.010		mg/L		0.01	10-NOV-19
Cadmium (Cd)-Total			<0.00000	5C	mg/L		0.000005	10-NOV-19
Calcium (Ca)-Total			<0.050		mg/L		0.05	10-NOV-19
Chromium (Cr)-Total			<0.00010		mg/L		0.0001	10-NOV-19
Cobalt (Co)-Total			<0.00010		mg/L		0.0001	10-NOV-19
Copper (Cu)-Total			<0.00050		mg/L		0.0005	10-NOV-19
Iron (Fe)-Total			<0.010		mg/L		0.01	10-NOV-19
Lead (Pb)-Total			<0.00005	0	mg/L		0.00005	10-NOV-19
Lithium (Li)-Total			<0.0010		mg/L		0.001	10-NOV-19
Magnesium (Mg)-Total			<0.0050		mg/L		0.005	10-NOV-19
Manganese (Mn)-Total			<0.00010		mg/L		0.0001	10-NOV-19
Molybdenum (Mo)-Total			<0.00005	0	mg/L		0.00005	10-NOV-19
Nickel (Ni)-Total			<0.00050		mg/L		0.0005	10-NOV-19
Potassium (K)-Total			<0.050		mg/L		0.05	10-NOV-19
Selenium (Se)-Total			<0.00005	0	mg/L		0.00005	10-NOV-19
Silicon (Si)-Total			<0.10		mg/L		0.1	10-NOV-19
Silver (Ag)-Total			<0.00001	0	mg/L		0.00001	10-NOV-19
Sodium (Na)-Total			<0.050		mg/L		0.05	10-NOV-19
Strontium (Sr)-Total			<0.00020		mg/L		0.0002	10-NOV-19
Thallium (TI)-Total			<0.00001	0	mg/L		0.00001	10-NOV-19
Tin (Sn)-Total			0.00220	В	mg/L		0.0001	10-NOV-19
Titanium (Ti)-Total			<0.00030		mg/L		0.0003	10-NOV-19
Uranium (U)-Total			<0.00001	0	mg/L		0.00001	10-NOV-19
Vanadium (V)-Total			<0.00050		mg/L		0.0005	10-NOV-19
Zinc (Zn)-Total			<0.0030		mg/L		0.003	10-NOV-19



Workorder: L2379297 Report Date: 17-NOV-19 Page 10 of 15

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-VA	Water							
Batch R4905405								
WG3215530-2 LCS Aluminum (Al)-Total			93.6		%		00.400	40 NOV 40
Antimony (Sb)-Total			98.6		%		80-120	13-NOV-19
Arsenic (As)-Total			93.5		%		80-120 80-120	13-NOV-19
Barium (Ba)-Total			93.3		%			13-NOV-19
Bismuth (Bi)-Total			96.5		%		80-120	13-NOV-19
` ,			96.5		%		80-120	13-NOV-19
Boron (B)-Total							80-120	13-NOV-19
Cadmium (Cd)-Total			90.2		%		80-120	13-NOV-19
Calcium (Ca)-Total			94.5		%		80-120	13-NOV-19
Chromium (Cr)-Total			94.8		%		80-120	13-NOV-19
Cobalt (Co)-Total			92.3		%		80-120	13-NOV-19
Copper (Cu)-Total			92.5		%		80-120	13-NOV-19
Iron (Fe)-Total			90.1		%		80-120	13-NOV-19
Lead (Pb)-Total			99.4		%		80-120	13-NOV-19
Lithium (Li)-Total			93.0		%		80-120	13-NOV-19
Magnesium (Mg)-Total			93.0		%		80-120	13-NOV-19
Manganese (Mn)-Total			96.4		%		80-120	13-NOV-19
Molybdenum (Mo)-Total			98.7		%		80-120	13-NOV-19
Nickel (Ni)-Total			91.6		%		80-120	13-NOV-19
Potassium (K)-Total			97.0		%		80-120	13-NOV-19
Selenium (Se)-Total			96.1		%		80-120	13-NOV-19
Silicon (Si)-Total			104.7		%		80-120	13-NOV-19
Silver (Ag)-Total			97.3		%		80-120	13-NOV-19
Sodium (Na)-Total			97.0		%		80-120	13-NOV-19
Strontium (Sr)-Total			96.4		%		80-120	13-NOV-19
Thallium (TI)-Total			98.1		%		80-120	13-NOV-19
Tin (Sn)-Total			91.9		%		80-120	13-NOV-19
Titanium (Ti)-Total			88.3		%		80-120	13-NOV-19
Uranium (U)-Total			95.2		%		80-120	13-NOV-19
Vanadium (V)-Total			96.2		%		80-120	13-NOV-19
Zinc (Zn)-Total			88.4		%		80-120	13-NOV-19
WG3215530-1 MB								
Aluminum (Al)-Total			<0.0030		mg/L		0.003	13-NOV-19
Antimony (Sb)-Total			<0.00010	)	mg/L		0.0001	13-NOV-19
Arsenic (As)-Total			<0.00010	1	mg/L		0.0001	13-NOV-19



Workorder: L2379297

Report Date: 17-NOV-19

Page 11 of 15

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-VA	Water							
Batch R4905405								
WG3215530-1 MB Barium (Ba)-Total			<0.00010		ma/l		0.0004	40 NOV 40
Bismuth (Bi)-Total			<0.00010		mg/L		0.0001	13-NOV-19
Boron (B)-Total			<0.010	O .	mg/L mg/L		0.00005	13-NOV-19
Cadmium (Cd)-Total			<0.0000	EC.	mg/L		0.01 0.000005	13-NOV-19
• •			<0.050	SC.	-			13-NOV-19
Calcium (Ca)-Total Chromium (Cr)-Total			<0.000		mg/L		0.05	13-NOV-19
` '					mg/L		0.0001	13-NOV-19
Cobalt (Co)-Total			<0.00010		mg/L		0.0001	13-NOV-19
Copper (Cu)-Total			<0.00050		mg/L		0.0005	13-NOV-19
Iron (Fe)-Total			<0.010	•	mg/L		0.01	13-NOV-19
Lead (Pb)-Total			<0.00005	0	mg/L		0.00005	13-NOV-19
Lithium (Li)-Total			<0.0010	_	mg/L		0.001	13-NOV-19
Magnesium (Mg)-Total			0.0061	В	mg/L		0.005	13-NOV-19
Manganese (Mn)-Total			<0.00010		mg/L		0.0001	13-NOV-19
Molybdenum (Mo)-Total			<0.00005		mg/L		0.00005	13-NOV-19
Nickel (Ni)-Total			<0.00050		mg/L		0.0005	13-NOV-19
Potassium (K)-Total			<0.050		mg/L		0.05	13-NOV-19
Selenium (Se)-Total			<0.00005	0	mg/L		0.00005	13-NOV-19
Silicon (Si)-Total			<0.10		mg/L		0.1	13-NOV-19
Silver (Ag)-Total			<0.00001	0	mg/L		0.00001	13-NOV-19
Sodium (Na)-Total			< 0.050		mg/L		0.05	13-NOV-19
Strontium (Sr)-Total			<0.00020		mg/L		0.0002	13-NOV-19
Thallium (TI)-Total			<0.00001	0	mg/L		0.00001	13-NOV-19
Tin (Sn)-Total			0.00016	В	mg/L		0.0001	13-NOV-19
Titanium (Ti)-Total			<0.00030		mg/L		0.0003	13-NOV-19
Uranium (U)-Total			<0.00001	0	mg/L		0.00001	13-NOV-19
Vanadium (V)-Total			<0.00050		mg/L		0.0005	13-NOV-19
Zinc (Zn)-Total			<0.0030		mg/L		0.003	13-NOV-19
NH3-L-F-CL	Water							
Batch R4906413								
WG3217773-26 LCS Ammonia as N			102.3		%		85-115	13-NOV-19
WG3217773-25 MB			0.222-		,,			
Ammonia as N			<0.0050		mg/L		0.005	13-NOV-19
NO2-L-IC-N-CL	Water							



Workorder: L2379297

Report Date: 17-NOV-19 Page 12 of 15

Test	Matrix	Reference	Result Quali	fier Units	RPD	Limit	Analyzed
NO2-L-IC-N-CL	Water						
Batch R4903855 WG3215339-2 LCS Nitrite (as N)			98.1	%		90-110	08-NOV-19
WG3215339-1 MB Nitrite (as N)			<0.0010	mg/L		0.001	08-NOV-19
NO3-L-IC-N-CL	Water						
Batch R4903855 WG3215339-2 LCS Nitrate (as N)			102.3	%		90-110	08-NOV-19
<b>WG3215339-1 MB</b> Nitrate (as N)			<0.0050	mg/L		0.005	08-NOV-19
ORP-CL	Water						
<b>Batch R4903603</b> <b>WG3214902-9 CRM</b> ORP		CL-ORP	211	mV		210-230	08-NOV-19
P-T-L-COL-CL	Water						
Batch R4903905 WG3215416-18 LCS Phosphorus (P)-Total			103.0	%		80-120	09-NOV-19
WG3215416-17 MB Phosphorus (P)-Total			<0.0020	mg/L		0.002	09-NOV-19
PH-CL	Water						
Batch R4903794 WG3215187-11 LCS pH			7.00	рН		6.9-7.1	08-NOV-19
PO4-DO-L-COL-CL	Water						
Batch R4903541 WG3214522-2 LCS Orthophosphate-Dissolv	ved (as P)		97.6	%		80-120	08-NOV-19
WG3214522-1 MB Orthophosphate-Dissolv			<0.0010	mg/L		0.001	08-NOV-19
SO4-IC-N-CL	Water						
Batch R4903855 WG3215339-2 LCS Sulfate (SO4)			100.6	%		90-110	08-NOV-19
WG3215339-1 MB							



Workorder: L2379297

Report Date: 17-NOV-19 Page 13 of 15

								go 10 01 10
Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
SO4-IC-N-CL	Water							
Batch R4903855								
WG3215339-1 MB								
Sulfate (SO4)			<0.30		mg/L		0.3	08-NOV-19
SOLIDS-TDS-CL	Water							
Batch R4905928								
WG3216312-2 LCS								
Total Dissolved Solids			102.9		%		85-115	12-NOV-19
			102.5		70		65-115	12-1100-19
WG3216312-1 MB Total Dissolved Solids			40				4.0	
Total Dissolved Solids			<10		mg/L		10	12-NOV-19
TKN-L-F-CL	Water							
Batch R4903830								
WG3215247-30 LCS								
Total Kjeldahl Nitrogen			92.4		%		75-125	09-NOV-19
WG3215247-29 MB								
Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	09-NOV-19
TSS-L-CL	Water							
Batch R4905839								
WG3216494-12 LCS								
Total Suspended Solids			96.5		%		85-115	12-NOV-19
WG3216494-11 MB								
Total Suspended Solids			<1.0		mg/L		1	12-NOV-19
TURBIDITY-CL	Water							
Batch R4903594								
WG3214636-2 LCS								
Turbidity			97.0		%		85-115	08-NOV-19
WG3214636-1 MB							555	33 1.3 1 13
Turbidity			<0.10		NTU		0.1	08-NOV-19
· albidity			<b>NO.10</b>				0.1	00-140-19

Workorder: L2379297 Report Date: 17-NOV-19 Page 14 of 15

Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

#### **Sample Parameter Qualifier Definitions:**

Qualifier	Description
В	Method Blank exceeds ALS DQO. Associated sample results which are < Limit of Reporting or > 5 times blank level are considered reliable.
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

Workorder: L2379297 Report Date: 17-NOV-19 Page 15 of 15

#### **Hold Time Exceedances:**

	Sample						
ALS Product Description	ID	Sampling Date	Date Processed	Rec. HT	Actual HT	Units	Qualifie
Physical Tests							
Oxidation redution potentia	al by elect.						
	1	06-NOV-19 12:16	08-NOV-19 14:00	0.25	50	hours	EHTR-FN
	2	06-NOV-19 15:43	08-NOV-19 14:00	0.25	46	hours	EHTR-FM
pН							
	1	06-NOV-19 12:16	08-NOV-19 14:00	0.25	50	hours	EHTR-FM
	2	06-NOV-19 15:43	08-NOV-19 14:00	0.25	46	hours	EHTR-FM

#### Legend & Qualifier Definitions:

EHTR-FM: Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended.

EHTR: Exceeded ALS recommended hold time prior to sample receipt.

EHTL: Exceeded ALS recommended hold time prior to analysis. Sample was received less than 24 hours prior to expiry.

EHT: Exceeded ALS recommended hold time prior to analysis.

Rec. HT: ALS recommended hold time (see units).

#### Notes\*:

Where actual sampling date is not provided to ALS, the date (& time) of receipt is used for calculation purposes. Where actual sampling time is not provided to ALS, the earlier of 12 noon on the sampling date or the time (& date) of receipt is used for calculation purposes. Samples for L2379297 were received on 07-NOV-19 09:10.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against predetermined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

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20191106- DC GW COC ID: -PURNAROUND TIME:-RUSH: 411 PROJECT/CLIENT INFO LABORATORY OTHER INFO Facility Name / Joh# Line Creek Operation Lab Name ALS Calgary Report Format / Distribution Excel PDF EDD Project Manager Carla Froyman Parker Lab Contact Lyudmyla Shvets Email 1: Email Carla FroymanParker@teck.com Email Lyudanyla.Shvets@ALSGlobal.com Email 2: Address Box 2003 Address 2559 29 Street NE Email 3: 15km North Hwy 43 Email 4: BC City Calgary City Sparwood Province lab. Email 4: Province V0B 2G0 Postal Code Country Canada Postal Code TIY 7B5 Country Canada PO number Phone Number 250-425-3196 Phone Number 403 407 1794 SAMPLE DETAILS H2SO4 HCI. HNO3 HNO3 Hazardous Material (Yes/No) L2379297-COFC ALS\_Package-TKN/TOC FECKCOAL-ROUTINE TECKCOAL-MET-D-FECKCOAL-MET-T. IG-D-CVAF-VA HG-T-CVAE-VA Sample Location Field Time G=Grab #Of Sample ID (sys loc code) C=Comp Cont. Matrix Date (24hr)LC\_PIZDC0901\_WG\_Q4-2019\_NP LC PIZDC0901 WG 2019/11/06 12:16 G 6 LC\_TBLANK WG\_Q4-2019\_006 WG 2019/11/06 15:43  $\mathbf{G}$ 4 ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS RELINQUISHED BY/AFFILIATION ACCEPTED BY/AFFILIATION मित्र क्षेत्री व्यवस्था विश्वास माना हो है के क्षेत्रीमा है विश्व हो है कि पूर्व क्षेत्र है कि D.Tymstra/K.Campbell 6-Nov (90.49) (0.018) SERVICE REQUEST (rush - subject to availability) Regular (default) X Sampler's Name K. Campbell/D. Tymstra Mobile # Priority (2-3 business days) - 50% surcharge Emergency (1 Business Day) - 100% surcharge November 6, 2019 Sampler's Signature Date/Time For Emergency <1 Day, ASAP or Weekend - Contact ALS



TECK COAL LIMITED (LINE CREEK)

ATTN: Carla Froyman Parker

PO BOX 2003

SPARWOOD BC VOB 2G0

Date Received: 08-NOV-19

Report Date: 19-NOV-19 13:53 (MT)

Version: FINAL

Client Phone: 250-425-6111

# Certificate of Analysis

Lab Work Order #: L2379566
Project P.O. #: VP000608129

Job Reference: LINE CREEK OPERATION
C of C Numbers: 20191107 - DC GW

Legal Site Desc:



Lyudmyla Shvets, B.Sc. Account Manager

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L2379566 CONTD.... PAGE 2 of 7 Version: FINAL

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2379566-1 LC_PIZDC1306_WG_Q4-2019_NP							
Sampled By: KC/DT on 07-NOV-19 @ 12:13							
Matrix: WG							
Miscellaneous Parameters				"		00 1101/ 40	
Dissolved Organic Carbon	1.58		0.50	mg/L		09-NOV-19	R4904084
Total Kjeldahl Nitrogen	0.110		0.050	mg/L		09-NOV-19	R4903830
Total Organic Carbon	2.25		0.50	mg/L		09-NOV-19	R4904084
Dissolved Metals in Water							
Diss. Be (low) in Water by CRC ICPMS							
Beryllium (Be)-Dissolved	<0.020		0.020	ug/L	12-NOV-19	15-NOV-19	R4908769
Dissolved Metals Filtration Location	FIELD					12-NOV-19	R4904883
Diss. Mercury in Water by CVAAS or CVAFS				"	44 NOV 40	45 NOV 40	D 100001-
Mercury (Hg)-Dissolved	<0.000050		0.0000050	mg/L	14-NOV-19	15-NOV-19	R4908847
Dissolved Mercury Filtration Location	FIELD					14-NOV-19	R4908407
Dissolved Metals in Water by CRC ICPMS Dissolved Metals Filtration Location	FIELD					18-NOV-19	R4915381
Aluminum (AI)-Dissolved	<0.0030		0.0030	mg/L	12-NOV-19	15-NOV-19	R4908769
Antimony (Sb)-Dissolved	0.00021		0.00010	mg/L	12-NOV-19	15-NOV-19	R4908769
Arsenic (As)-Dissolved	<0.00010		0.00010	mg/L	12-NOV-19	15-NOV-19	R4908769
Barium (Ba)-Dissolved	0.158		0.00010	mg/L	12-NOV-19	15-NOV-19	R4908769
Bismuth (Bi)-Dissolved	<0.000050		0.000050	mg/L	12-NOV-19	15-NOV-19	R4908769
Boron (B)-Dissolved	0.011		0.010	mg/L	12-NOV-19	15-NOV-19	R4908769
Cadmium (Cd)-Dissolved	0.140		0.0050	ug/L	12-NOV-19	15-NOV-19	R4908769
Calcium (Ca)-Dissolved	61.7		0.050	mg/L	12-NOV-19	15-NOV-19	R4908769
Chromium (Cr)-Dissolved	<0.00010		0.00010	mg/L	12-NOV-19	15-NOV-19	R4908769
Cobalt (Co)-Dissolved	<0.10		0.10	ug/L	12-NOV-19	15-NOV-19	R4908769
Copper (Cu)-Dissolved	0.00228		0.00020	mg/L	12-NOV-19	15-NOV-19	R4908769
Iron (Fe)-Dissolved	<0.010		0.010	mg/L	12-NOV-19	15-NOV-19	R4908769
Lead (Pb)-Dissolved	<0.000050		0.000050	mg/L	12-NOV-19	15-NOV-19	R4908769
Lithium (Li)-Dissolved	0.0104		0.0010	mg/L	12-NOV-19	15-NOV-19	R4908769
Magnesium (Mg)-Dissolved	22.3		0.10	mg/L	12-NOV-19	15-NOV-19	R4908769
Manganese (Mn)-Dissolved	0.00032		0.00010	mg/L	12-NOV-19	15-NOV-19	R4908769
Molybdenum (Mo)-Dissolved	0.00193		0.000050	mg/L	12-NOV-19	15-NOV-19	R4908769
Nickel (Ni)-Dissolved	0.00124		0.00050	mg/L	12-NOV-19	15-NOV-19	R4908769
Potassium (K)-Dissolved	2.02		0.050	mg/L	12-NOV-19	15-NOV-19	R4908769
Selenium (Se)-Dissolved	3.36		0.050	ug/L	12-NOV-19	15-NOV-19	R4908769
Silicon (Si)-Dissolved	2.81		0.050	mg/L	12-NOV-19	15-NOV-19	R4908769
Silver (Ag)-Dissolved	<0.00010		0.000010	mg/L	12-NOV-19	15-NOV-19	R4908769
Sodium (Na)-Dissolved	0.710		0.050	mg/L	12-NOV-19	15-NOV-19	R4908769
Strontium (Sr)-Dissolved	0.0678		0.00020	mg/L	12-NOV-19	15-NOV-19	R4908769
Thallium (TI)-Dissolved	<0.000010		0.000010	mg/L	12-NOV-19	15-NOV-19	R4908769
Tin (Sn)-Dissolved	0.00013		0.00010	mg/L	12-NOV-19	15-NOV-19	R4908769
Titanium (Ti)-Dissolved	<0.010		0.010	mg/L	12-NOV-19	15-NOV-19	R4908769
Uranium (U)-Dissolved	0.000828		0.000010	mg/L	12-NOV-19	15-NOV-19	R4908769
Vanadium (V)-Dissolved	0.00050		0.00050	mg/L	12-NOV-19	15-NOV-19	R4908769
Zinc (Zn)-Dissolved	0.0195	DTC	0.0010	mg/L	18-NOV-19	18-NOV-19	R4915189
Total Metals in Water							
Hardness Hardness (as CaCO3)	246		0.50	mg/L		19-NOV-19	
Total Be (Low) in Water by CRC ICPMS	2-10		3.00	9, ⊏		.5.10	
Beryllium (Be)-Total	<0.020		0.020	ug/L		13-NOV-19	R4905405
Total Metals in Water by CRC ICPMS			0.222-			40 NOV : 5	D 4027 17-
Aluminum (Al)-Total	0.254		0.0030	mg/L		13-NOV-19	R4905405
Antimony (Sb)-Total	0.00022		0.00010	mg/L		13-NOV-19	R4905405
Arsenic (As)-Total	0.00016		0.00010	mg/L		13-NOV-19	R4905405

<sup>\*</sup> Refer to Referenced Information for Qualifiers (if any) and Methodology.

L2379566 CONTD.... PAGE 3 of 7 Version: FINAL

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2379566-1 LC_PIZDC1306_WG_Q4-2019_NP							
Sampled By: KC/DT on 07-NOV-19 @ 12:13							
Matrix: WG							
Total Metals in Water by CRC ICPMS Barium (Ba)-Total	0.164		0.00010	mg/L		13-NOV-19	R4905405
Bismuth (Bi)-Total	<0.000050		0.000050	mg/L		13-NOV-19	R4905405
Boron (B)-Total	0.010	'	0.010	mg/L		13-NOV-19	R4905405
Cadmium (Cd)-Total	0.149		0.0050	ug/L		13-NOV-19	R4905405
Calcium (Ca)-Total	61.2		0.050	mg/L		13-NOV-19	R4905405
Chromium (Cr)-Total	0.00170		0.00010	mg/L		13-NOV-19	R4905405
Cobalt (Co)-Total	0.27		0.10	ug/L		13-NOV-19	R4905405
Copper (Cu)-Total	0.00542		0.00050	mg/L		13-NOV-19	R4905405
Iron (Fe)-Total	0.159		0.010	mg/L		13-NOV-19	R4905405
Lead (Pb)-Total	0.000373		0.000050	mg/L		13-NOV-19	R4905405
Lithium (Li)-Total	0.0106		0.0010	mg/L		13-NOV-19	R4905405
Magnesium (Mg)-Total	21.7		0.10	mg/L		13-NOV-19	R4905405
Manganese (Mn)-Total	0.00792		0.00010	mg/L		13-NOV-19	R4905405
Molybdenum (Mo)-Total	0.00201		0.000050	mg/L		13-NOV-19	R4905405
Nickel (Ni)-Total	0.00208		0.00050	mg/L		13-NOV-19	R4905405
Potassium (K)-Total	2.13		0.050	mg/L		13-NOV-19	R4905405
Selenium (Se)-Total	2.97		0.050	ug/L		13-NOV-19	R4905405
Silicon (Si)-Total	3.61		0.10	mg/L		13-NOV-19	R4905405
Silver (Ag)-Total	0.000010		0.000010	mg/L		13-NOV-19	R4905405
Sodium (Na)-Total	0.749		0.050	mg/L		13-NOV-19	R4905405
Strontium (Sr)-Total	0.0664		0.00020	mg/L		13-NOV-19	R4905405
Thallium (TI)-Total	0.000015		0.000010	mg/L		13-NOV-19	R4905405
Tin (Sn)-Total	<0.00010		0.00010	mg/L		13-NOV-19	R4907546
Titanium (Ti)-Total Uranium (U)-Total	<0.010		0.010	mg/L		13-NOV-19	R4905405
Vanadium (V)-Total	0.000878 0.00218		0.000010 0.00050	mg/L		13-NOV-19 13-NOV-19	R4905405
Zinc (Zn)-Total	0.00218		0.00030	mg/L mg/L		13-NOV-19 13-NOV-19	R4905405 R4905405
Routine for Teck Coal	0.0124		0.0030	IIIg/L		13-1100-19	K4905405
Acidity by Automatic Titration							
Acidity (as CaCO3)	2.2		1.0	mg/L		08-NOV-19	R4903797
Alkalinity (Species) by Manual Titration	_:_		1.0	9/ =		33	111000101
Alkalinity, Bicarbonate (as CaCO3)	260		1.0	mg/L		09-NOV-19	R4904007
Alkalinity, Carbonate (as CaCO3)	<1.0		1.0	mg/L		09-NOV-19	R4904007
Alkalinity, Hydroxide (as CaCO3)	<1.0		1.0	mg/L		09-NOV-19	R4904007
Alkalinity, Total (as CaCO3)	260		1.0	mg/L		09-NOV-19	R4904007
Ammonia, Total (as N)				•			
Ammonia as N	<0.0050		0.0050	mg/L		14-NOV-19	R4909057
Bromide in Water by IC (Low Level)							
Bromide (Br)	<0.050		0.050	mg/L		08-NOV-19	R4903855
Chloride in Water by IC	_						_
Chloride (CI)	<0.50		0.50	mg/L		08-NOV-19	R4903855
Electrical Conductivity (EC)	207		0.0			00 NOV 40	D4004007
Conductivity (@ 25C)	387		2.0	uS/cm		09-NOV-19	R4904007
Fluoride in Water by IC Fluoride (F)	0.128		0.020	mg/L		08-NOV-19	R4903855
lon Balance Calculation	0.126		0.020	mg/L		00-110-19	N4903033
Cation - Anion Balance	-3.4			%		19-NOV-19	
Anion Sum	5.34			meg/L		19-NOV-19	
Cation Sum	4.99			meg/L		19-NOV-19	
Ion Balance Calculation						.55.	
Ion Balance	93.5		-100	%		19-NOV-19	
Nitrate in Water by IC (Low Level)						-	
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<sup>\*</sup> Refer to Referenced Information for Qualifiers (if any) and Methodology.

L2379566 CONTD.... PAGE 4 of 7 Version: FINAL

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2379566-1 LC_PIZDC1306_WG_Q4-2019_NP Sampled By: KC/DT on 07-NOV-19 @ 12:13							
Matrix: WG  Nitrate in Water by IC (Low Level)  Nitrate (as N)	0.114		0.0050	mg/L		08-NOV-19	R4903855
Nitrite in Water by IC (Low Level) Nitrite (as N)	<0.0010		0.0010	mg/L		08-NOV-19	R4903855
Orthophosphate-Dissolved (as P) Orthophosphate-Dissolved (as P)	0.0023		0.0010	mg/L		08-NOV-19	R4903541
Oxidation redution potential by elect. ORP	430		-1000	mV		08-NOV-19	R4903603
Phosphorus (P)-Total Phosphorus (P)-Total	0.0132		0.0020	mg/L		09-NOV-19	R4903905
Sulfate in Water by IC Sulfate (SO4)	6.06		0.30	mg/L		08-NOV-19	R4903855
Total Dissolved Solids Total Dissolved Solids	254	DLHC	20	mg/L		13-NOV-19	R4909193
Total Suspended Solids Total Suspended Solids	12.1	22110	1.0	mg/L		13-NOV-19	R4907025
Turbidity Turbidity							
pH	7.51		0.10	NTU		08-NOV-19	R4903594
pH	8.00		0.10	pН		09-NOV-19	R4904007

<sup>\*</sup> Refer to Referenced Information for Qualifiers (if any) and Methodology.

L2379566 CONTD....

PAGE 5 of 7 Version: FINAL

#### Reference Information

Sample Parameter Qualifier Key:

Qualifier	Description
DLHC	Detection Limit Raised: Dilution required due to high concentration of test analyte(s).
DTC	Dissolved concentration exceeds total. Results were confirmed by re-analysis.
DUP-H	Duplicate results outside ALS DQO, due to sample heterogeneity.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.

#### **Test Method References:**

ALS Test Code	Matrix	Test Description	Method Reference**	
ACIDITY-PCT-CL	Water	Acidity by Automatic Titration	APHA 2310 Acidity	

This analysis is carried out using procedures adapted from APHA Method 2310 "Acidity". Acidity is determined by potentiometric titration to a specified endpoint.

ALK-MAN-CL Water APHA 2320 ALKALINITY Alkalinity (Species) by Manual Titration

This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.

BE-D-L-CCMS-VA Water Diss. Be (low) in Water by CRC ICPMS APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

BE-T-L-CCMS-VA Total Be (Low) in Water by CRC ICPMS EPA 200.2/6020A (mod) Water

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

BR-L-IC-N-CL Water Bromide in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

C-DIS-ORG-LOW-CL Dissolved Organic Carbon APHA 5310 B-Instrumental

This method is applicable to the analysis of ground water, wastewater, and surface water samples. The form detected depends upon sample pretreatment: Unfiltered sample = TC, 0.45um filtered = TDC. Samples are injected into a combustion tube containing an oxidation catalyst. The carrier gas containing the combustion product from the combustion tube flows through an inorganic carbon reactor vessel and is then sent through a halogen scrubber into a sample cell set in a non-dispersive infrared gas analyzer (NDIR) where carbon dioxide is detected. For total inorganic carbon and dissolved inorganic carbon, the sample is injected into an IC reactor vessel where only the IC component is decomposed to become carbon dioxide.

The peak area generated by the NDIR indicates the TC/TDC or TIC/DIC as applicable. The total organic carbon content of the sample is calculated by subtracting the TIC from the TC.

TOC = TC-TIC, DOC = TDC-DIC, Particulate = Total - Dissolved.

C-TOT-ORG-LOW-CL **Total Organic Carbon** APHA 5310 TOTAL ORGANIC CARBON (TOC)

This method is applicable to the analysis of ground water, wastewater, and surface water samples. The form detected depends upon sample pretreatment: Unfiltered sample = TC, 0.45um filtered = TDC. Samples are injected into a combustion tube containing an oxidation catalyst. The carrier gas containing the combustion product from the combustion tube flows through an inorganic carbon reactor vessel and is then sent through a halogen scrubber into a sample cell set in a non-dispersive infrared gas analyzer (NDIR) where carbon dioxide is detected. For total inorganic carbon and dissolved inorganic carbon, the sample is injected into an IC reactor vessel where only the IC component is decomposed to become carbon dioxide.

The peak area generated by the NDIR indicates the TC/TDC or TIC/DIC as applicable. The total organic carbon content of the sample is calculated by subtracting the TIC from the TC.

TOC = TC-TIC, DOC = TDC-DIC, Particulate = Total - Dissolved.

Chloride in Water by IC CL-IC-N-CL Water EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

EC-L-PCT-CL Water Electrical Conductivity (EC) **APHA 2510B** 

Conductivity, also known as Electrical Conductivity (EC) or Specific Conductance, is measured by immersion of a conductivity cell with platinum electrodes into a water sample. Conductivity measurements are temperature-compensated to 25C.

Fluoride in Water by IC EPA 300.1 (mod) F-IC-N-CL Water

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

HARDNESS-CALC-VA Hardness **APHA 2340B** 

Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

HG-D-CVAA-VA Diss. Mercury in Water by CVAAS or CVAFS APHA 3030B/EPA 1631E (mod) Water

LINE CREEK OPERATION

L2379566 CONTD....

PAGE 6 of 7 Version: FINAL

#### **Reference Information**

**Test Method References:** 

**ALS Test Code** Matrix Method Reference\*\* **Test Description** 

Water samples are filtered (0.45 um), preserved with hydrochloric acid, then undergo a cold-oxidation using bromine monochloride prior to reduction

with stannous chloride, and analyzed by CVAAS or CVAFS.

**IONBALANCE-BC-CL** Water Ion Balance Calculation **APHA 1030E** 

Cation Sum, Anion Sum, and Ion Balance (as % difference) are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Because all aqueous solutions are electrically neutral, the calculated ion balance (% difference of cations minus anions) should be near-zero.

Cation and Anion Sums are the total meg/L concentration of major cations and anions. Dissolved species are used where available. Minor ions are included where data is present. Ion Balance is calculated as:

Ion Balance (%) = [Cation Sum-Anion Sum] / [Cation Sum+Anion Sum]

MET-D-CCMS-VA Water Dissolved Metals in Water by CRC ICPMS APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

MET-T-CCMS-VA Water Total Metals in Water by CRC ICPMS EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

NH3-L-F-CL J. ENVIRON. MONIT., 2005, 7, 37-42, RSC Water Ammonia, Total (as N)

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et

NO2-L-IC-N-CL Water Nitrite in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

NO3-L-IC-N-CL Water Nitrate in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

ORP-CL **ASTM D1498** Water Oxidation redution potential by elect.

This analysis is carried out in accordance with the procedure described in the "ASTM" method D1498 "Oxidation-Reduction Potential of Water" published by the American Society for Testing and Materials (ASTM). Results are reported as observed oxidation-reduction potential of the platinum metal-reference electrode employed, in mV.

It is recommended that this analysis be conducted in the field.

P-T-L-COL-CL Water Phosphorus (P)-Total APHA 4500-P PHOSPHORUS

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after persulphate digestion of the sample.

APHA 4500 H-Electrode PH-CI Water

pH is determined in the laboratory using a pH electrode. All samples analyzed by this method for pH will have exceeded the 15 minute recommended hold time from time of sampling (field analysis is recommended for pH where highly accurate results are needed)

PO4-DO-L-COL-CL APHA 4500-P PHOSPHORUS Water Orthophosphate-Dissolved (as P)

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.

SO4-IC-N-CL Water Sulfate in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

SOLIDS-TDS-CL **Total Dissolved Solids** APHA 2540 C Water

A well-mixed sample is filtered through a glass fibre filter paper. The filtrate is then evaporated to dryness in a pre-weighed vial and dried at 180 – 2 °C. The increase in vial weight represents the total dissolved solids (TDS).

TECKCOAL-IONBAL-CL Water Ion Balance Calculation **APHA 1030E** 

Cation Sum, Anion Sum, and Ion Balance (as % difference) are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Because all aqueous solutions are electrically neutral, the calculated ion balance (% difference of cations minus anions) should be near-zero.

#### LINE CREEK OPERATION L2379566 CONTD....

**Reference Information** 

PAGE 7 of 7 Version: FINAL

#### **Test Method References:**

**ALS Test Code** Matrix Method Reference\*\* **Test Description** 

Cation and Anion Sums are the total meg/L concentration of major cations and anions. Dissolved species are used where available. Minor ions are included where data is present. Ion Balance is calculated as:

Ion Balance (%) = [Cation Sum-Anion Sum] / [Cation Sum+Anion Sum]

TKN-L-F-CL Total Kjeldahl Nitrogen APHA 4500-NORG (TKN) Water

This analysis is carried out using procedures adapted from APHA Method 4500-Norg D. "Block Digestion and Flow Injection Analysis". Total Kjeldahl

Nitrogen is determined using block digestion followed by Flow-injection analysis with fluorescence detection. **Total Suspended Solids** 

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total suspended solids (TSS) are determined by filtering a sample through a glass fibre filter, and by drying the filter at 104 deg. C.

APHA 2540 D-Gravimetric

**TURBIDITY-CL** APHA 2130 B-Nephelometer Water **Turbidity** 

This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.

\*\* ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA
CL	ALS ENVIRONMENTAL - CALGARY, ALBERTA, CANADA

#### **Chain of Custody Numbers:**

20191107- DC GW

#### **GLOSSARY OF REPORT TERMS**

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.

mg/kg - milligrams per kilogram based on dry weight of sample

mg/kg wwt - milligrams per kilogram based on wet weight of sample

mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight

mg/L - unit of concentration based on volume, parts per million.

< - Less than.

D.L. - The reporting limit.

N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory. UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.



Workorder: L2379566

Report Date: 19-NOV-19

Page 1 of 14

Client:

TECK COAL LIMITED (LINE CREEK)

PO BOX 2003

SPARWOOD BC V0B 2G0

Contact: Carla Froyman Parker

Test N	latrix R	eference	Result	Qualifier	Units	RPD	Limit	Analyzed
ACIDITY-PCT-CL V	Vater							
Batch R4903797								
WG3215184-15 DUP Acidity (as CaCO3)		<b>.2379566-1</b> 2.2	1.9		mg/L	16	20	08-NOV-19
WG3215184-14 LCS Acidity (as CaCO3)			101.6		%		85-115	08-NOV-19
WG3215184-13 MB Acidity (as CaCO3)			1.7		mg/L		2	08-NOV-19
ALK-MAN-CL V	Vater							
Batch R4904007								
WG3215492-9 DUP Alkalinity, Total (as CaCO3		<b>.2379566-1</b> 260	264		mg/L	1.5	20	09-NOV-19
WG3215492-8 LCS Alkalinity, Total (as CaCO3	3)		100.3		%		85-115	09-NOV-19
WG3215492-7 MB Alkalinity, Total (as CaCO3	3)		<1.0		mg/L		1	09-NOV-19
BE-D-L-CCMS-VA V	Vater							
Batch R4908769 WG3216569-2 LCS								
Beryllium (Be)-Dissolved			93.9		%		80-120	15-NOV-19
WG3216569-1 MB Beryllium (Be)-Dissolved	N	NP	<0.000020	•	mg/L		0.00002	15-NOV-19
BE-T-L-CCMS-VA	Vater							
Batch R4905405 WG3215568-2 LCS								
Beryllium (Be)-Total WG3215568-1 MB			94.6		%		80-120	13-NOV-19
Beryllium (Be)-Total			<0.000020	1	mg/L		0.00002	13-NOV-19
	Vater							
Batch R4903855								
<b>WG3215339-10 LCS</b> Bromide (Br)			97.6		%		85-115	08-NOV-19
<b>WG3215339-9 MB</b> Bromide (Br)			<0.050		mg/L		0.05	08-NOV-19
C-DIS-ORG-LOW-CL V	Vater							
Batch R4904084								
WG3215681-6 LCS Dissolved Organic Carbon			91.4		%		80-120	09-NOV-19
WG3215681-5 MB								



Workorder: L2379566

Report Date: 19-NOV-19 Page 2 of 14

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
C-DIS-ORG-LOW-CL  Batch R4904084  WG3215681-5 MB  Dissolved Organic Carb			<0.50		mg/L		0.5	09-NOV-19
C-TOT-ORG-LOW-CL  Batch R4904084  WG3215681-6 LCS	Water							
Total Organic Carbon WG3215681-5 MB Total Organic Carbon			97.1		% mg/L		80-120 0.5	09-NOV-19
CL-IC-N-CL	Water							
Batch R4903855 WG3215339-10 LCS Chloride (CI)			100.6		%		90-110	08-NOV-19
<b>WG3215339-9 MB</b> Chloride (CI)			<0.50		mg/L		0.5	08-NOV-19
EC-L-PCT-CL	Water							
Batch R4904007 WG3215492-9 DUP Conductivity (@ 25C)		<b>L2379566-1</b> 387	380		uS/cm	1.8	10	09-NOV-19
WG3215492-8 LCS Conductivity (@ 25C)			94.6		%		90-110	09-NOV-19
WG3215492-7 MB Conductivity (@ 25C)			<2.0		uS/cm		2	09-NOV-19
F-IC-N-CL	Water							
Batch R4903855 WG3215339-10 LCS Fluoride (F)			101.8		%		90-110	08-NOV-19
<b>WG3215339-9 MB</b> Fluoride (F)			<0.020		mg/L		0.02	08-NOV-19
HG-D-CVAA-VA	Water							
Batch R4908847 WG3219184-6 LCS Mercury (Hg)-Dissolved			100.8		%		80-120	15-NOV-19
WG3219184-5 MB Mercury (Hg)-Dissolved		NP	<0.000005	5C	mg/L		0.000005	15-NOV-19
WG3219184-8 MS Mercury (Hg)-Dissolved		L2379566-1	99.1		%		70-130	15-NOV-19



Workorder: L2379566 Report Date: 19-NOV-19

Page 3 of 14

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA	Water							
Batch R49087	769							
WG3216569-2 LC			400.0		0/			
Aluminum (Al)-Disso			100.3		%		80-120	15-NOV-19
Antimony (Sb)-Disso			95.4		%		80-120	15-NOV-19
Arsenic (As)-Dissolv			96.9		%		80-120	15-NOV-19
Barium (Ba)-Dissolve			96.3		%		80-120	15-NOV-19
Bismuth (Bi)-Dissolv			99.2		%		80-120	15-NOV-19
Boron (B)-Dissolved			95.5		%		80-120	15-NOV-19
Cadmium (Cd)-Disso			96.3		%		80-120	15-NOV-19
Calcium (Ca)-Dissolv			97.4		%		80-120	15-NOV-19
Chromium (Cr)-Disse			93.4		%		80-120	15-NOV-19
Cobalt (Co)-Dissolve			93.4		%		80-120	15-NOV-19
Copper (Cu)-Dissolv	red		93.6		%		80-120	15-NOV-19
Iron (Fe)-Dissolved			95.0		%		80-120	15-NOV-19
Lead (Pb)-Dissolved			101.5		%		80-120	15-NOV-19
Lithium (Li)-Dissolve	ed		89.3		%		80-120	15-NOV-19
Magnesium (Mg)-Dis			93.0		%		80-120	15-NOV-19
Manganese (Mn)-Dis	ssolved		97.3		%		80-120	15-NOV-19
Molybdenum (Mo)-D	issolved		104.1		%		80-120	15-NOV-19
Nickel (Ni)-Dissolved	d		93.4		%		80-120	15-NOV-19
Potassium (K)-Disso	olved		94.4		%		80-120	15-NOV-19
Selenium (Se)-Disso	olved		104.0		%		80-120	15-NOV-19
Silicon (Si)-Dissolved	d		97.1		%		60-140	15-NOV-19
Silver (Ag)-Dissolved	t		98.7		%		80-120	15-NOV-19
Sodium (Na)-Dissolv	/ed		97.0		%		80-120	15-NOV-19
Strontium (Sr)-Disso	lved		101.1		%		80-120	15-NOV-19
Thallium (TI)-Dissolv	ved .		100.8		%		80-120	15-NOV-19
Tin (Sn)-Dissolved			95.2		%		80-120	15-NOV-19
Titanium (Ti)-Dissolv	/ed		90.4		%		80-120	15-NOV-19
Uranium (U)-Dissolv	red		99.6		%		80-120	15-NOV-19
Vanadium (V)-Dissol	lved		94.3		%		80-120	15-NOV-19
WG3216569-1 MB		NP	0.0045		n			
Aluminum (Al)-Disso			<0.0010		mg/L		0.001	15-NOV-19
Antimony (Sb)-Disso			<0.00010		mg/L		0.0001	15-NOV-19
Arsenic (As)-Dissolv			<0.00010		mg/L		0.0001	15-NOV-19
Barium (Ba)-Dissolve	ed		<0.00010		mg/L		0.0001	15-NOV-19



Workorder: L2379566

Report Date: 19-NOV-19

Page 4 of 14

MET-D-CCMS-VA   Water   Batch   R4998769   WG2316569-1 MB   NP	Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
WG3216569-1 MB   NP   Bismuth (B)-Dissolved	MET-D-CCMS-VA	Water							
Bismuth (Bi)-Dissolved	Batch R4908	769							
Boron (B)-Dissolved			NP		_	,,			
Cadmium (Cd)-Dissolved <a href="Color: Not V-19">Calcium (Ca)-Dissolved</a> <a href="Color: Not V-19">Color: Not V-19</a> Calcium (Ca)-Dissolved <a href="Color: Not V-19">C. 0.050</a> mg/L <a href="Color: Not V-19">C. 0.051</a> 15-NOV-19           Cobalt (Co)-Dissolved <a href="Color: Not V-19">C. 0.0001</a> 15-NOV-19           Copper (Cu)-Dissolved <a href="Color: Not V-19">C. 0.0002</a> 15-NOV-19           Iron (Fe)-Dissolved <a href="Color: Not V-19">C. 0.000</a> 15-NOV-19           Icad (Pb)-Dissolved <a href="Color: Not V-19">C. 0.000</a> 15-NOV-19           Icad (Pb)-Dissolved <a href="Color: Not V-19">C. 0.0005</a> mg/L <a href="Color: Not V-19">C. 0.001</a> 15-NOV-19           Margnesium (Mg)-Dissolved <a href="Color: Not V-19">C. 0.0005</a> 15-NOV-19           Manganese (Mn)-Dissolved <a href="Color: Not V-19">C. 0.0005</a> mg/L <a href="Color: Not V-19">C. 0.0005</a> 15-NOV-19           Mickel (Ni)-Dissolved <a href="Color: Not V-19">C. 0.0005</a> mg/L <a href="Color: Not V-19">C. 0.0005</a> 15-NOV-19           Selenium (Se)-Dissolved <a href="Color: Not V-19">C. 0.0005</a> mg/L <a href="Color: Not V-19">C. 0.0005</a> 15-NOV-19 <t< td=""><td>` '</td><td></td><td></td><td></td><td>00</td><td>•</td><td></td><td></td><td></td></t<>	` '				00	•			
Calcium (Ca)-Dissolved         <0.050         mg/L         0.05         15-NOV-19           Chromium (Cr)-Dissolved         <0.00010	,					•			
Chromium (Cr)-Dissolved					)5C	<u>-</u>			
Cobalt (Co)-Dissolved         <0.00010						•			
Copper (Cu)-Dissolved									



Cobalt (Co)-Dissolved

#### **Quality Control Report**

Workorder: L2379566 Report Date: 19-NOV-19

Page 5 of 14 Test Matrix Reference Result Qualifier Units **RPD** Limit Analyzed MET-D-CCMS-VA Water R4915189 WG3221761-2 LCS Calcium (Ca)-Dissolved 98.3 % 80-120 18-NOV-19 Chromium (Cr)-Dissolved 96.8 % 80-120 18-NOV-19 Cobalt (Co)-Dissolved 95.8 % 80-120 18-NOV-19 Copper (Cu)-Dissolved 94.6 % 80-120 18-NOV-19 Iron (Fe)-Dissolved 86.2 % 80-120 18-NOV-19 Lead (Pb)-Dissolved 98.2 % 80-120 18-NOV-19 Lithium (Li)-Dissolved 100.8 % 80-120 18-NOV-19 Magnesium (Mg)-Dissolved 95.8 % 80-120 18-NOV-19 Manganese (Mn)-Dissolved 97.9 % 80-120 18-NOV-19 Molybdenum (Mo)-Dissolved % 98.7 80-120 18-NOV-19 Nickel (Ni)-Dissolved 96.4 % 80-120 18-NOV-19 Potassium (K)-Dissolved 99.3 % 80-120 18-NOV-19 Selenium (Se)-Dissolved 93.5 % 80-120 18-NOV-19 Silicon (Si)-Dissolved 101.6 % 60-140 18-NOV-19 96.1 Silver (Ag)-Dissolved % 80-120 18-NOV-19 Sodium (Na)-Dissolved 99.1 % 80-120 18-NOV-19 Strontium (Sr)-Dissolved 101.9 % 80-120 18-NOV-19 Thallium (TI)-Dissolved 98.8 % 18-NOV-19 80-120 Tin (Sn)-Dissolved 94.5 % 80-120 18-NOV-19 Titanium (Ti)-Dissolved 97.2 % 80-120 18-NOV-19 Uranium (U)-Dissolved 100.6 % 80-120 18-NOV-19 Vanadium (V)-Dissolved 99.2 % 80-120 18-NOV-19 Zinc (Zn)-Dissolved 92.3 % 80-120 18-NOV-19 WG3221761-1 MB NP < 0.0010 Aluminum (Al)-Dissolved mg/L 0.001 18-NOV-19 Antimony (Sb)-Dissolved < 0.00010 mg/L 0.0001 18-NOV-19 Arsenic (As)-Dissolved < 0.00010 mg/L 0.0001 18-NOV-19 Barium (Ba)-Dissolved < 0.00010 mg/L 0.0001 18-NOV-19 Bismuth (Bi)-Dissolved < 0.000050 mg/L 0.00005 18-NOV-19 Boron (B)-Dissolved < 0.010 mg/L 0.01 18-NOV-19 Cadmium (Cd)-Dissolved < 0.0000050 mg/L 0.000005 18-NOV-19 Calcium (Ca)-Dissolved < 0.050 mg/L 0.05 18-NOV-19 Chromium (Cr)-Dissolved < 0.00010 mg/L 0.0001 18-NOV-19

< 0.00010

mg/L

0.0001

18-NOV-19



Workorder: L2379566

Report Date: 19-NOV-19

Page 6 of 14

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA	Water							
Batch R49151	189							
WG3221761-1 ME Copper (Cu)-Dissolv		NP	<0.00020		mg/L		0.0002	18-NOV-19
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	18-NOV-19
Lead (Pb)-Dissolved			<0.000050	)	mg/L		0.00005	18-NOV-19
Lithium (Li)-Dissolve	ed		<0.0010		mg/L		0.001	18-NOV-19
Magnesium (Mg)-Dis	ssolved		<0.0050		mg/L		0.005	18-NOV-19
Manganese (Mn)-Dis	ssolved		<0.00010		mg/L		0.0001	18-NOV-19
Molybdenum (Mo)-D	issolved		<0.000050	)	mg/L		0.00005	18-NOV-19
Nickel (Ni)-Dissolved	d		<0.00050		mg/L		0.0005	18-NOV-19
Potassium (K)-Disso	olved		< 0.050		mg/L		0.05	18-NOV-19
Selenium (Se)-Disso	olved		<0.00005	)	mg/L		0.00005	18-NOV-19
Silicon (Si)-Dissolved	d		< 0.050		mg/L		0.05	18-NOV-19
Silver (Ag)-Dissolved	d		<0.00001	)	mg/L		0.00001	18-NOV-19
Sodium (Na)-Dissolv	/ed		<0.050		mg/L		0.05	18-NOV-19
Strontium (Sr)-Disso	lved		<0.00020		mg/L		0.0002	18-NOV-19
Thallium (TI)-Dissolv	ved .		<0.00001	)	mg/L		0.00001	18-NOV-19
Tin (Sn)-Dissolved			<0.00010		mg/L		0.0001	18-NOV-19
Titanium (Ti)-Dissolv	/ed		<0.00030		mg/L		0.0003	18-NOV-19
Uranium (U)-Dissolv	red		<0.000010	)	mg/L		0.00001	18-NOV-19
Vanadium (V)-Disso	lved		<0.00050		mg/L		0.0005	18-NOV-19
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	18-NOV-19
MET-T-CCMS-VA	Water							
Batch R49054	105							
WG3215568-2 LC			00.0		0/			
Aluminum (Al)-Total			99.2		%		80-120	13-NOV-19
Antimony (Sb)-Total			96.7		%		80-120	13-NOV-19
Arsenic (As)-Total			94.7		%		80-120	13-NOV-19
Barium (Ba)-Total			99.0		%		80-120	13-NOV-19
Bismuth (Bi)-Total			99.6		%		80-120	13-NOV-19
Boron (B)-Total	ı		101.1		%		80-120	13-NOV-19
Cadmium (Cd)-Total	I		93.5		%		80-120	13-NOV-19
Calcium (Ca)-Total	1		97.9		%		80-120	13-NOV-19
Chromium (Cr)-Tota	I		97.3		%		80-120	13-NOV-19
Cobalt (Co)-Total			96.3		%		80-120	13-NOV-19
Copper (Cu)-Total			94.7		%		80-120	13-NOV-19



Workorder: L2379566

Report Date: 19-NOV-19

Page 7 of 14

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-VA	Water							
Batch R4905405								
WG3215568-2 LCS			00.0		0/			
Iron (Fe)-Total			92.8		%		80-120	13-NOV-19
Lead (Pb)-Total			98.7		%		80-120	13-NOV-19
Lithium (Li)-Total			96.2		%		80-120	13-NOV-19
Magnesium (Mg)-Total			93.3		%		80-120	13-NOV-19
Manganese (Mn)-Total			99.7		%		80-120	13-NOV-19
Molybdenum (Mo)-Total			99.98		%		80-120	13-NOV-19
Nickel (Ni)-Total			94.5		%		80-120	13-NOV-19
Potassium (K)-Total			100.5		%		80-120	13-NOV-19
Selenium (Se)-Total			91.7		%		80-120	13-NOV-19
Silicon (Si)-Total			103.4		%		80-120	13-NOV-19
Silver (Ag)-Total			99.8		%		80-120	13-NOV-19
Sodium (Na)-Total			101.8		%		80-120	13-NOV-19
Strontium (Sr)-Total			101.0		%		80-120	13-NOV-19
Thallium (TI)-Total			97.1		%		80-120	13-NOV-19
Titanium (Ti)-Total			94.1		%		80-120	13-NOV-19
Uranium (U)-Total			95.3		%		80-120	13-NOV-19
Vanadium (V)-Total			100.1		%		80-120	13-NOV-19
Zinc (Zn)-Total			89.4		%		80-120	13-NOV-19
WG3215568-1 MB								
Aluminum (Al)-Total			<0.0030		mg/L		0.003	13-NOV-19
Antimony (Sb)-Total			<0.00010		mg/L		0.0001	13-NOV-19
Arsenic (As)-Total			<0.00010		mg/L		0.0001	13-NOV-19
Barium (Ba)-Total			<0.00010		mg/L		0.0001	13-NOV-19
Bismuth (Bi)-Total			<0.000050	)	mg/L		0.00005	13-NOV-19
Boron (B)-Total			<0.010		mg/L		0.01	13-NOV-19
Cadmium (Cd)-Total			<0.000005	5C	mg/L		0.000005	13-NOV-19
Calcium (Ca)-Total			< 0.050		mg/L		0.05	13-NOV-19
Chromium (Cr)-Total			<0.00010		mg/L		0.0001	13-NOV-19
Cobalt (Co)-Total			<0.00010		mg/L		0.0001	13-NOV-19
Copper (Cu)-Total			<0.00050		mg/L		0.0005	13-NOV-19
Iron (Fe)-Total			<0.010		mg/L		0.01	13-NOV-19
Lead (Pb)-Total			<0.000050	)	mg/L		0.00005	13-NOV-19
Lithium (Li)-Total			<0.0010		mg/L		0.001	13-NOV-19
Magnesium (Mg)-Total			<0.0050		mg/L		0.005	13-NOV-19



Workorder: L2379566

Report Date: 19-NOV-19

Page 8 of 14

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-VA	Water							
Batch R4905405								
WG3215568-1 MB			0.00046		4			
Manganese (Mn)-Total			<0.00010		mg/L		0.0001	13-NOV-19
Molybdenum (Mo)-Tota	I		<0.00005		mg/L		0.00005	13-NOV-19
Nickel (Ni)-Total			<0.00050	)	mg/L		0.0005	13-NOV-19
Potassium (K)-Total			<0.050	_	mg/L		0.05	13-NOV-19
Selenium (Se)-Total			<0.00005	50	mg/L		0.00005	13-NOV-19
Silicon (Si)-Total			<0.10		mg/L		0.1	13-NOV-19
Silver (Ag)-Total			<0.00001	0	mg/L		0.00001	13-NOV-19
Sodium (Na)-Total			<0.050		mg/L		0.05	13-NOV-19
Strontium (Sr)-Total			<0.00020	)	mg/L		0.0002	13-NOV-19
Thallium (Tl)-Total			<0.00001	0	mg/L		0.00001	13-NOV-19
Titanium (Ti)-Total			<0.00030	)	mg/L		0.0003	13-NOV-19
Uranium (U)-Total			<0.00001	0	mg/L		0.00001	13-NOV-19
Vanadium (V)-Total			<0.00050	)	mg/L		0.0005	13-NOV-19
Zinc (Zn)-Total			< 0.0030		mg/L		0.003	13-NOV-19
Batch R4907546	i							
WG3217443-2 LCS								
Aluminum (Al)-Total			98.7		%		80-120	13-NOV-19
Antimony (Sb)-Total			99.2		%		80-120	13-NOV-19
Arsenic (As)-Total			102.3		%		80-120	13-NOV-19
Barium (Ba)-Total			99.6		%		80-120	13-NOV-19
Bismuth (Bi)-Total			96.2		%		80-120	13-NOV-19
Boron (B)-Total			105.6		%		80-120	13-NOV-19
Cadmium (Cd)-Total			103.3		%		80-120	13-NOV-19
Calcium (Ca)-Total			98.9		%		80-120	13-NOV-19
Chromium (Cr)-Total			104.9		%		80-120	13-NOV-19
Cobalt (Co)-Total			103.1		%		80-120	13-NOV-19
Copper (Cu)-Total			97.2		%		80-120	13-NOV-19
Iron (Fe)-Total			100.9		%		80-120	13-NOV-19
Lead (Pb)-Total			95.9		%		80-120	13-NOV-19
Lithium (Li)-Total			98.9		%		80-120	13-NOV-19
Magnesium (Mg)-Total			97.6		%		80-120	13-NOV-19
Manganese (Mn)-Total			100.8		%		80-120	13-NOV-19
Molybdenum (Mo)-Tota	ıl		97.3		%		80-120	13-NOV-19
Nickel (Ni)-Total			96.7		%		80-120	13-NOV-19



Workorder: L2379566

Report Date: 19-NOV-19

Page 9 of 14

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-VA	Water							
Batch R4907546	i							
WG3217443-2 LCS Potassium (K)-Total			99.8		%		80-120	13-NOV-19
Selenium (Se)-Total			106.5		%			
Silicon (Si)-Total			99.98		%		80-120	13-NOV-19
Silver (Ag)-Total			95.7		%		80-120	13-NOV-19
			95.7 97.5				80-120	13-NOV-19
Sodium (Na)-Total			97.5		%		80-120	13-NOV-19
Strontium (Sr)-Total					%		80-120	13-NOV-19
Thallium (TI)-Total			94.9		%		80-120	13-NOV-19
Tin (Sn)-Total			96.8		%		80-120	13-NOV-19
Titanium (Ti)-Total			99.5		%		80-120	13-NOV-19
Uranium (U)-Total			95.5		%		80-120	13-NOV-19
Vanadium (V)-Total			105.6		%		80-120	13-NOV-19
Zinc (Zn)-Total			102.0		%		80-120	13-NOV-19
WG3217443-1 MB Aluminum (Al)-Total			<0.0030		mg/L		0.003	13-NOV-19
Antimony (Sb)-Total			<0.00010		mg/L		0.0001	13-NOV-19
Arsenic (As)-Total			<0.00010		mg/L		0.0001	13-NOV-19
Barium (Ba)-Total			<0.00010		mg/L		0.0001	13-NOV-19
Bismuth (Bi)-Total			<0.00005	0	mg/L		0.00005	13-NOV-19
Boron (B)-Total			<0.010		mg/L		0.01	13-NOV-19
Cadmium (Cd)-Total			<0.00000	50	mg/L		0.000005	13-NOV-19
Calcium (Ca)-Total			< 0.050		mg/L		0.05	13-NOV-19
Chromium (Cr)-Total			<0.00010		mg/L		0.0001	13-NOV-19
Cobalt (Co)-Total			<0.00010		mg/L		0.0001	13-NOV-19
Copper (Cu)-Total			<0.00050		mg/L		0.0005	13-NOV-19
Iron (Fe)-Total			<0.010		mg/L		0.01	13-NOV-19
Lead (Pb)-Total			<0.00005	0	mg/L		0.00005	13-NOV-19
Lithium (Li)-Total			<0.0010		mg/L		0.001	13-NOV-19
Magnesium (Mg)-Total			<0.0050		mg/L		0.005	13-NOV-19
Manganese (Mn)-Total			<0.00010		mg/L		0.0001	13-NOV-19
Molybdenum (Mo)-Tota			<0.00005	0	mg/L		0.00005	13-NOV-19
Nickel (Ni)-Total			<0.00050		mg/L		0.0005	13-NOV-19
Potassium (K)-Total			<0.050		mg/L		0.05	13-NOV-19
Selenium (Se)-Total			<0.00005	0	mg/L		0.00005	13-NOV-19
Silicon (Si)-Total			<0.10		mg/L		0.1	13-NOV-19

Workorder: L2379566

Report Date: 19-NOV-19

Page 10 of 14

Test	Matrix	Reference	Result Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-VA	Water						
<b>Batch</b> R4907546 <b>WG3217443-1 MB</b> Silver (Ag)-Total			<0.000010	mg/L		0.00001	13-NOV-19
Sodium (Na)-Total			<0.050	mg/L		0.00001	13-NOV-19
Strontium (Sr)-Total			<0.00020	mg/L		0.0002	13-NOV-19
Thallium (TI)-Total			<0.00010	mg/L		0.0002	13-NOV-19
Tin (Sn)-Total			<0.00010	mg/L		0.0001	13-NOV-19
Titanium (Ti)-Total			<0.00030	mg/L		0.0003	13-NOV-19
Uranium (U)-Total			<0.000010	mg/L		0.00001	13-NOV-19
Vanadium (V)-Total			<0.00050	mg/L		0.0005	13-NOV-19
Zinc (Zn)-Total			<0.0030	mg/L		0.003	13-NOV-19
NH3-L-F-CL	Water						
Batch R4909057 WG3219029-10 LCS Ammonia as N			99.1	%		85-115	14-NOV-19
WG3219029-9 MB Ammonia as N			<0.0050	mg/L		0.005	14-NOV-19
NO2-L-IC-N-CL	Water						
Batch R4903855 WG3215339-10 LCS Nitrite (as N)			97.5	%		90-110	08-NOV-19
<b>WG3215339-9 MB</b> Nitrite (as N)			<0.0010	mg/L		0.001	08-NOV-19
NO3-L-IC-N-CL	Water						
Batch R4903855 WG3215339-10 LCS			404.0	0/			
Nitrate (as N)			101.8	%		90-110	08-NOV-19
WG3215339-9 MB Nitrate (as N)			<0.0050	mg/L		0.005	08-NOV-19
ORP-CL	Water						
Batch R4903603 WG3214902-13 CRM ORP		CL-ORP	229	mV		210-230	08-NOV-19

P-T-L-COL-CL Water



Workorder: L2379566

Report Date: 19-NOV-19 Page 11 of 14

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
P-T-L-COL-CL	Water							
Batch R4903905								
WG3215416-10 LCS			05.0		0/			
Phosphorus (P)-Total			95.2		%		80-120	09-NOV-19
WG3215416-9 MB Phosphorus (P)-Total			<0.0020		mg/L		0.002	09-NOV-19
PH-CL	Water							
Batch R4904007								
WG3215492-9 DUP		L2379566-1						
рН		8.00	7.96	J	рН	0.04	0.2	09-NOV-19
<b>WG3215492-8 LCS</b> pH			7.01		рН		6.9-7.1	09-NOV-19
PO4-DO-L-COL-CL	Water							
Batch R4903541								
WG3214522-6 LCS								
Orthophosphate-Dissolve	ed (as P)		101.5		%		80-120	08-NOV-19
WG3214522-5 MB Orthophosphate-Dissolve	ed (as P)		<0.0010		mg/L		0.001	08-NOV-19
SO4-IC-N-CL	Water							
Batch R4903855								
WG3215339-10 LCS								
Sulfate (SO4)			98.9		%		90-110	08-NOV-19
WG3215339-9 MB					_			
Sulfate (SO4)			<0.30		mg/L		0.3	08-NOV-19
SOLIDS-TDS-CL	Water							
Batch R4909193								
WG3216923-5 LCS								
Total Dissolved Solids			99.5		%		85-115	13-NOV-19
WG3216923-4 MB Total Dissolved Solids			-10		~~ ~ /I		40	40 1101/40
Total Dissolved Solids			<10		mg/L		10	13-NOV-19
TKN-L-F-CL	Water							
Batch R4903830								
WG3215247-42 LCS			02.7		9/		75 405	00 NOV 10
Total Kjeldahl Nitrogen			92.7		%		75-125	09-NOV-19
WG3215247-41 MB Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	00 NOV 10
			<b>~0.030</b>		IIIg/∟		0.03	09-NOV-19
TSS-L-CL	Water							



Workorder: L2379566

Report Date: 19-NOV-19

Page 12 of 14

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
TSS-L-CL	Water							
Batch R4907025 WG3216835-2 LCS Total Suspended Solids			95.1		%		85-115	13-NOV-19
WG3216835-1 MB Total Suspended Solids			<1.0		mg/L		1	13-NOV-19
TURBIDITY-CL Batch R4903594	Water							
WG3214636-8 LCS Turbidity			96.5		%		85-115	08-NOV-19
WG3214636-7 MB Turbidity			<0.10		NTU		0.1	08-NOV-19

Workorder: L2379566 Report Date: 19-NOV-19 Page 13 of 14

Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

#### **Sample Parameter Qualifier Definitions:**

Qualifier	Description
J	Duplicate results and limits are expressed in terms of absolute difference.

Workorder: L2379566 Report Date: 19-NOV-19 Page 14 of 14

#### **Hold Time Exceedances:**

	Sample						
ALS Product Description	ID <sup>.</sup>	Sampling Date	Date Processed	Rec. HT	Actual HT	Units	Qualifier
Physical Tests							
Oxidation redution potential	by elect.						
	1	07-NOV-19 12:13	08-NOV-19 16:00	0.25	28	hours	EHTR-FM
рН							
	1	07-NOV-19 12:13	09-NOV-19 09:00	0.25	45	hours	EHTR-FM

#### **Legend & Qualifier Definitions:**

EHTR-FM: Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended.

EHTR: Exceeded ALS recommended hold time prior to sample receipt.

EHTL: Exceeded ALS recommended hold time prior to analysis. Sample was received less than 24 hours prior to expiry.

EHT: Exceeded ALS recommended hold time prior to analysis.

Rec. HT: ALS recommended hold time (see units).

#### Notes\*:

Where actual sampling date is not provided to ALS, the date (& time) of receipt is used for calculation purposes. Where actual sampling time is not provided to ALS, the earlier of 12 noon on the sampling date or the time (& date) of receipt is used for calculation purposes. Samples for L2379566 were received on 08-NOV-19 08:30.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against predetermined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

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L2379566-C		Yes/No)		, M				H H H	104 mg				H2SO4					
Sample ID	Sample Location -(sys_loc_code)	Field First Material (Yes/No)	D	Table 1	Time (24hr)	, G=Grab C=Comp	# Of Cont.	SISATIVAL A STA		HG-D-CVAF-VA TECKCOAL-MET-D	TECKCOAL-MET-T-	TECKCOAL-ROUTINE VA	ALS_Package-TKN/TO					₩ ₩ ₩ 2 2 2 3 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4
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Priorite	Regula y (2-3 business days) - 50%	r (default) X	Sample	r's Nam	e		K. Ca	mpbell/	D. Tyms	stra	Mo	bile#						1
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TECK COAL LIMITED (LINE CREEK)

ATTN: Carla Froyman Parker Box 2003 15km North Hwy 43

Sparwood BC VOB 2G0

Date Received: 15-NOV-19

Report Date: 22-NOV-19 15:35 (MT)

Version: FINAL

Client Phone: 250-425-3196

# Certificate of Analysis

Lab Work Order #: L2382999
Project P.O. #: VP000608129

Job Reference: LINE CREEK OPERATION
C of C Numbers: 20191114-LC GW

Legal Site Desc:



Lyudmyla Shvets, B.Sc. Account Manager

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L2382999 CONTD.... PAGE 2 of 7 Version: FINAL

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2382999-1 LC_PIZDC1105_WG_Q4-2019_NP							
Sampled By: KC/DT on 14-NOV-19 @ 14:33							
Matrix: WG							
Miscellaneous Parameters							
Dissolved Organic Carbon	<0.50		0.50	mg/L		15-NOV-19	R4912067
Total Kjeldahl Nitrogen	0.266		0.050	mg/L		16-NOV-19	R4912590
Total Organic Carbon	3.08		0.50	mg/L		15-NOV-19	R4912067
EPH Testing for teck Coal	3.00		0.30	IIIg/L		13-11001-19	K4912007
EPH (C10-C19) & EPH (C19-C32)							
EPH10-19	<0.25		0.25	mg/L	16-NOV-19	16-NOV-19	R4914746
EPH19-32	<0.25		0.25	mg/L	16-NOV-19	16-NOV-19	R4914746
Surrogate: 2-Bromobenzotrifluoride	95.7		60-140	%	16-NOV-19	16-NOV-19	R4914746
Sum of EPH (10-32)							
EPH (C10-C32)	< 0.50		0.50	mg/L		18-NOV-19	
TEH (C10-C30)							
TEH (C10-C30)	<0.25		0.25	mg/L	16-NOV-19	16-NOV-19	R4914746
Surrogate: 2-Bromobenzotrifluoride	95.7		60-140	%	16-NOV-19	16-NOV-19	R4914746
Dissolved Metals in Water							
Diss. Be (low) in Water by CRC ICPMS							
Beryllium (Be)-Dissolved	<0.020		0.020	ug/L	21-NOV-19	21-NOV-19	R4919320
Dissolved Metals Filtration Location	FIELD					21-NOV-19	R4919178
Diss. Mercury in Water by CVAAS or CVAFS						<del>-</del>	
Mercury (Hg)-Dissolved	<0.000050		0.0000050	mg/L	20-NOV-19	21-NOV-19	R4919230
Dissolved Mercury Filtration Location	FIELD					20-NOV-19	R4918294
Dissolved Metals in Water by CRC ICPMS	EIEL D					24 NOV 40	D4040470
Dissolved Metals Filtration Location	FIELD		0.0000	m a/I	24 NOV 40	21-NOV-19 21-NOV-19	R4919178
Aluminum (AI)-Dissolved Antimony (Sb)-Dissolved	<0.0030		0.0030 0.00010	mg/L	21-NOV-19 21-NOV-19	21-NOV-19 21-NOV-19	R4919320 R4919320
Aritimony (Sb)-Dissolved  Arsenic (As)-Dissolved	<0.00010 0.00010		0.00010	mg/L mg/L	21-NOV-19 21-NOV-19	21-NOV-19 21-NOV-19	R4919320 R4919320
Barium (Ba)-Dissolved	0.00010		0.00010	mg/L	21-NOV-19	21-NOV-19 21-NOV-19	R4919320 R4919320
Bismuth (Bi)-Dissolved	<0.00050		0.00010	mg/L	21-NOV-19	21-NOV-19	R4919320
Boron (B)-Dissolved	0.020		0.010	mg/L	21-NOV-19	21-NOV-19	R4919320
Cadmium (Cd)-Dissolved	0.0670		0.0050	ug/L	21-NOV-19	21-NOV-19	R4919320
Calcium (Ca)-Dissolved	172		0.050	mg/L	21-NOV-19	21-NOV-19	R4919320
Chromium (Cr)-Dissolved	<0.00010		0.00010	mg/L	21-NOV-19	21-NOV-19	R4919320
Cobalt (Co)-Dissolved	0.28		0.10	ug/L	21-NOV-19	21-NOV-19	R4919320
Copper (Cu)-Dissolved	0.00042		0.00020	mg/L	21-NOV-19	21-NOV-19	R4919320
Iron (Fe)-Dissolved	<0.010		0.010	mg/L	21-NOV-19	21-NOV-19	R4919320
Lead (Pb)-Dissolved	<0.000050		0.000050	mg/L	21-NOV-19	21-NOV-19	R4919320
Lithium (Li)-Dissolved	0.0171		0.0010	mg/L	21-NOV-19	21-NOV-19	R4919320
Magnesium (Mg)-Dissolved	52.4		0.10	mg/L	21-NOV-19	21-NOV-19	R4919320
Manganese (Mn)-Dissolved	0.0747		0.00010	mg/L	21-NOV-19	21-NOV-19	R4919320
Molybdenum (Mo)-Dissolved	0.000331		0.000050	mg/L	21-NOV-19	21-NOV-19	R4919320
Nickel (Ni)-Dissolved	0.00162		0.00050	mg/L	21-NOV-19	21-NOV-19	R4919320
Potassium (K)-Dissolved	1.79		0.050	mg/L	21-NOV-19	21-NOV-19	R4919320
Selenium (Se)-Dissolved	0.238		0.050	ug/L	21-NOV-19	22-NOV-19	R4921469
Silicon (Si)-Dissolved	5.15		0.050	mg/L	21-NOV-19	21-NOV-19	R4919320
Silver (Ag)-Dissolved	<0.000010		0.000010	mg/L	21-NOV-19	21-NOV-19	R4919320
Sodium (Na)-Dissolved	14.3		0.050	mg/L	21-NOV-19	21-NOV-19	R4919320
Strontium (Sr)-Dissolved	0.391		0.00020	mg/L	21-NOV-19	21-NOV-19	R4919320
Thallium (TI)-Dissolved	0.000030		0.000010	mg/L	21-NOV-19	21-NOV-19	R4919320
Tin (Sn)-Dissolved	0.00017		0.00010	mg/L	21-NOV-19	21-NOV-19	R4919320
Titanium (Ti)-Dissolved	< 0.010		0.010	mg/L	21-NOV-19	21-NOV-19	R4919320
Uranium (U)-Dissolved	0.000429		0.000010	mg/L	21-NOV-19	21-NOV-19	R4919320
	< 0.00050	1	0.00050	mg/L	21-NOV-19	21-NOV-19	R4919320

<sup>\*</sup> Refer to Referenced Information for Qualifiers (if any) and Methodology.

L2382999 CONTD.... PAGE 3 of 7 Version: FINAL

Sample Details/Parameters	Result	Qualifier	* D.L.	Units	Extracted	Analyzed	Batch
L2382999-1 LC_PIZDC1105_WG_Q4-2019_NP							
Sampled By: KC/DT on 14-NOV-19 @ 14:33							
Matrix: WG							
Dissolved Metals in Water by CRC ICPMS							
Zinc (Zn)-Dissolved	0.0052		0.0010	mg/L	21-NOV-19	21-NOV-19	R4919320
Hardness				Ü			
Hardness (as CaCO3)	645		0.50	mg/L		22-NOV-19	
Total Metals in Water							
Total Be (Low) in Water by CRC ICPMS Beryllium (Be)-Total	0.179		0.020	ug/L		20-NOV-19	R4918528
Total Mercury in Water by CVAAS or CVAFS Mercury (Hg)-Total	0.0000153		0.0000050	mg/L		20-NOV-19	R4917046
Total Metals in Water by CRC ICPMS							
Aluminum (AI)-Total	2.67		0.0030	mg/L		20-NOV-19	R4918528
Antimony (Sb)-Total	0.00031		0.00010	mg/L		20-NOV-19	R4918528
Arsenic (As)-Total	0.00192		0.00010	mg/L		20-NOV-19	R4918528
Barium (Ba)-Total	0.159		0.00010	mg/L		20-NOV-19	R4918528
Bismuth (Bi)-Total	<0.000050		0.000050	mg/L		20-NOV-19	R4918528
Boron (B)-Total	0.027		0.010	mg/L		20-NOV-19	R4918528
Cadmium (Cd)-Total Calcium (Ca)-Total	0.377		0.0050	ug/L		20-NOV-19	R4918528
Chromium (Cr)-Total	183		0.050	mg/L		20-NOV-19	R4918528
Cobalt (Co)-Total	0.00474 1.93		0.00010	mg/L		20-NOV-19 20-NOV-19	R4918528 R4918528
Copper (Cu)-Total	0.00503		0.00050	ug/L mg/L		20-NOV-19 20-NOV-19	R4918528
Iron (Fe)-Total	4.78		0.00030	mg/L		20-NOV-19 20-NOV-19	R4918528
Lead (Pb)-Total	0.00211		0.000050	mg/L		20-NOV-19	R4918528
Lithium (Li)-Total	0.0221		0.00000	mg/L		20-NOV-19	R4918528
Magnesium (Mg)-Total	55.2		0.10	mg/L		20-NOV-19	R4918528
Manganese (Mn)-Total	0.227		0.00010	mg/L		20-NOV-19	R4918528
Molybdenum (Mo)-Total	0.000765		0.000050	mg/L		20-NOV-19	R4918528
Nickel (Ni)-Total	0.00630		0.00050	mg/L		20-NOV-19	R4918528
Potassium (K)-Total	2.69		0.050	mg/L		20-NOV-19	R4918528
Selenium (Se)-Total	0.444		0.050	ug/L		20-NOV-19	R4918528
Silicon (Si)-Total	9.39		0.10	mg/L		20-NOV-19	R4918528
Silver (Ag)-Total	0.000065		0.000010	mg/L		20-NOV-19	R4918528
Sodium (Na)-Total	15.0		0.050	mg/L		20-NOV-19	R4918528
Strontium (Sr)-Total	0.385		0.00020	mg/L		20-NOV-19	R4918528
Thallium (TI)-Total	0.000149		0.000010	mg/L		20-NOV-19	R4918528
Tin (Sn)-Total	0.00028		0.00010	mg/L		20-NOV-19	R4918528
Titanium (Ti)-Total	0.016		0.010	mg/L		20-NOV-19	R4918528
Uranium (U)-Total	0.000647		0.000010	mg/L		20-NOV-19	R4918528
Vanadium (V)-Total	0.00804		0.00050	mg/L		20-NOV-19	R4918528
Zinc (Zn)-Total	0.0381		0.0030	mg/L		20-NOV-19	R4918528
Routine for Teck Coal							
Acidity by Automatic Titration Acidity (as CaCO3)	164		1.0	mg/L		15-NOV-19	R4914627
Alkalinity (Species) by Manual Titration Alkalinity, Bicarbonate (as CaCO3)	418		1.0	mg/L		15-NOV-19	R4914599
Alkalinity, Carbonate (as CaCO3)	<1.0	1	1.0	mg/L		15-NOV-19	R4914599
Alkalinity, Hydroxide (as CaCO3)	<1.0	1	1.0	mg/L		15-NOV-19	R4914599
Alkalinity, Total (as CaCO3)	418	1	1.0	mg/L		15-NOV-19	R4914599
Ammonia, Total (as N) Ammonia as N	<0.0050		0.0050	mg/L		16-NOV-19	R4912029
Bromide in Water by IC (Low Level) Bromide (Br)	1.64	DLHC	0.25	mg/L		15-NOV-19	R4911969
Chloride in Water by IC	1.04		0.25	mg/L		13-1404-19	134911909

<sup>\*</sup> Refer to Referenced Information for Qualifiers (if any) and Methodology.

L2382999 CONTD.... PAGE 4 of 7 Version: FINAL

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2382999-1 LC_PIZDC1105_WG_Q4-2019_NP							
Sampled By: KC/DT on 14-NOV-19 @ 14:33							
Matrix: WG							
Chloride in Water by IC Chloride (CI)	135	DLHC	2.5	mg/L		15-NOV-19	R4911969
Electrical Conductivity (EC) Conductivity (@ 25C)	1040		2.0	uS/cm		15-NOV-19	R4914599
Fluoride in Water by IC Fluoride (F)	0.32	DLHC	0.10	mg/L		15-NOV-19	R4911969
Ion Balance Calculation Ion Balance	94.9		-100	%		22-NOV-19	
Ion Balance Calculation Cation - Anion Balance	-2.6			%		22-NOV-19	
Anion Sum	14.3			meg/L		22-NOV-19	
Cation Sum	13.6			meq/L		22-NOV-19	
Nitrate in Water by IC (Low Level) Nitrate (as N)	0.051	DLHC	0.025	mg/L		15-NOV-19	R4911969
Nitrite in Water by IC (Low Level) Nitrite (as N)	<0.0050	DLHC	0.0050	mg/L		15-NOV-19	R4911969
Orthophosphate-Dissolved (as P) Orthophosphate-Dissolved (as P)	0.0078		0.0010	mg/L		15-NOV-19	R4910869
Oxidation redution potential by elect. ORP	414		-1000	mV		15-NOV-19	R4911508
Phosphorus (P)-Total Phosphorus (P)-Total	0.320	DLHC	0.050	mg/L		16-NOV-19	R4915232
Sulfate in Water by IC Sulfate (SO4)	102	DLHC	1.5	mg/L		15-NOV-19	R4911969
Total Dissolved Solids Total Dissolved Solids Total Dissolved Solids	825	DLHC	20	mg/L		17-NOV-19	R4915195
Total Suspended Solids Total Suspended Solids Turbidity	283		1.0	mg/L		18-NOV-19	R4916100
Turbidity	338		0.10	NTU		15-NOV-19	R4911451
<b>pH</b> pH	7.65		0.10	рН		15-NOV-19	R4914599

<sup>\*</sup> Refer to Referenced Information for Qualifiers (if any) and Methodology.

LINE CREEK OPERATION L2382999 CONTD....

**Reference Information** 

PAGE 5 of 7 Version: FINAL

Sample Parameter Qualifier Kev:

Campic i aran	notor qualifier reg.
Qualifier	Description
DLHC	Detection Limit Raised: Dilution required due to high concentration of test analyte(s).
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.

#### **Test Method References:**

ALS Test Code	Matrix	Test Description	Method Reference**	
ACIDITY-PCT-CL	Water	Acidity by Automatic Titration	APHA 2310 Acidity	

This analysis is carried out using procedures adapted from APHA Method 2310 "Acidity". Acidity is determined by potentiometric titration to a specified endpoint.

ALK-MAN-CL Water Alkalinity (Species) by Manual Titration APHA 2320 ALKALINITY

This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.

BE-D-L-CCMS-VA Water Diss. Be (low) in Water by CRC ICPMS APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

BE-T-L-CCMS-VA Water Total Be (Low) in Water by CRC ICPMS EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

BR-L-IC-N-CL Water Bromide in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

C-DIS-ORG-LOW-CL Water Dissolved Organic Carbon APHA 5310 B-Instrumental

This method is applicable to the analysis of ground water, wastewater, and surface water samples. The form detected depends upon sample pretreatment: Unfiltered sample = TC, 0.45um filtered = TDC. Samples are injected into a combustion tube containing an oxidation catalyst. The carrier gas containing the combustion product from the combustion tube flows through an inorganic carbon reactor vessel and is then sent through a halogen scrubber into a sample cell set in a non-dispersive infrared gas analyzer (NDIR) where carbon dioxide is detected. For total inorganic carbon and dissolved inorganic carbon, the sample is injected into an IC reactor vessel where only the IC component is decomposed to become carbon dioxide.

The peak area generated by the NDIR indicates the TC/TDC or TIC/DIC as applicable. The total organic carbon content of the sample is calculated by subtracting the TIC from the TC.

TOC = TC-TIC, DOC = TDC-DIC, Particulate = Total - Dissolved.

C-TOT-ORG-LOW-CL Water Total Organic Carbon APHA 5310 TOTAL ORGANIC CARBON (TOC)

This method is applicable to the analysis of ground water, wastewater, and surface water samples. The form detected depends upon sample pretreatment: Unfiltered sample = TC, 0.45um filtered = TDC. Samples are injected into a combustion tube containing an oxidation catalyst. The carrier gas containing the combustion product from the combustion tube flows through an inorganic carbon reactor vessel and is then sent through a halogen scrubber into a sample cell set in a non-dispersive infrared gas analyzer (NDIR) where carbon dioxide is detected. For total inorganic carbon and dissolved inorganic carbon, the sample is injected into an IC reactor vessel where only the IC component is decomposed to become carbon dioxide.

The peak area generated by the NDIR indicates the TC/TDC or TIC/DIC as applicable. The total organic carbon content of the sample is calculated by subtracting the TIC from the TC.

TOC = TC-TIC, DOC = TDC-DIC, Particulate = Total - Dissolved.

CL-IC-N-CL Water Chloride in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

EC-L-PCT-CL Water Electrical Conductivity (EC) APHA 2510B

Conductivity, also known as Electrical Conductivity (EC) or Specific Conductance, is measured by immersion of a conductivity cell with platinum electrodes into a water sample. Conductivity measurements are temperature-compensated to 25C.

EPH(10-32)-CALC-CL Water Sum of EPH (10-32) Sum of EPH - Auto Calculated

The sum of EPH(C10-C19) and EPH(C19-C32)

F-IC-N-CL Water Fluoride in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

HARDNESS-CALC-VA Water Hardness APHA 2340B

Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

HG-D-CVAA-VA Water Diss. Mercury in Water by CVAAS or CVAFS APHA 3030B/EPA 1631E (mod)

LINE CREEK OPERATION

**Reference Information** 

L2382999 CONTD.... PAGE 6 of 7 Version: FINAL

**Test Method References:** 

ALS Test Code Matrix Test Description Method Reference\*\*

Water samples are filtered (0.45 um), preserved with hydrochloric acid, then undergo a cold-oxidation using bromine monochloride prior to reduction

with stannous chloride, and analyzed by CVAAS or CVAFS.

HG-T-CVAA-VA Water Total Mercury in Water by CVAAS or CVAFS EPA 1631E (mod)

Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

IONBALANCE-BC-CL Water Ion Balance Calculation APHA 1030E

Cation Sum, Anion Sum, and Ion Balance (as % difference) are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Because all aqueous solutions are electrically neutral, the calculated ion balance (% difference of cations minus anions) should be near-zero.

Cation and Anion Sums are the total meq/L concentration of major cations and anions. Dissolved species are used where available. Minor ions are included where data is present. Ion Balance is calculated as:

Ion Balance (%) = [Cation Sum-Anion Sum] / [Cation Sum+Anion Sum]

MET-D-CCMS-VA Water Dissolved Metals in Water by CRC ICPMS APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

MET-T-CCMS-VA Water Total Metals in Water by CRC ICPMS EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

NH3-L-F-CL Water Ammonia, Total (as N) J. ENVIRON. MONIT., 2005, 7, 37-42, RSC

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.

NO2-L-IC-N-CL Water Nitrite in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

NO3-L-IC-N-CL Water Nitrate in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

ORP-CL Water Oxidation redution potential by elect. ASTM D1498

This analysis is carried out in accordance with the procedure described in the "ASTM" method D1498 "Oxidation-Reduction Potential of Water" published by the American Society for Testing and Materials (ASTM). Results are reported as observed oxidation-reduction potential of the platinum metal-reference electrode employed, in mV.

It is recommended that this analysis be conducted in the field.

P-T-L-COL-CL Water Phosphorus (P)-Total APHA 4500-P PHOSPHORUS

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after persulphate digestion of the sample.

PH-CL Water pH APHA 4500 H-Electrode

pH is determined in the laboratory using a pH electrode. All samples analyzed by this method for pH will have exceeded the 15 minute recommended hold time from time of sampling (field analysis is recommended for pH where highly accurate results are needed)

PO4-DO-L-COL-CL Water Orthophosphate-Dissolved (as P) APHA 4500-P PHOSPHORUS

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.

SO4-IC-N-CL Water Sulfate in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

SOLIDS-TDS-CL Water Total Dissolved Solids APHA 2540 C

A well-mixed sample is filtered through a glass fibre filter paper. The filtrate is then evaporated to dryness in a pre-weighed vial and dried at 180 - 2 °C. The increase in vial weight represents the total dissolved solids (TDS).

TECKCOAL-IONBAL-CL Water Ion Balance Calculation APHA 1030E

Cation Sum, Anion Sum, and Ion Balance (as % difference) are calculated based on guidance from APHA Standard Methods (1030E Checking

LINE CREEK OPERATION L2382999 CONTD....

**Reference Information** 

PAGE 7 of 7 Version: FINAL

#### Test Method References:

ALS Test Code Matrix Test Description Method Reference\*\*

Correctness of Analysis). Because all aqueous solutions are electrically neutral, the calculated ion balance (% difference of cations minus anions) should be near-zero.

Cation and Anion Sums are the total meq/L concentration of major cations and anions. Dissolved species are used where available. Minor ions are included where data is present. Ion Balance is calculated as:

Ion Balance (%) = [Cation Sum-Anion Sum] / [Cation Sum+Anion Sum]

TEH-BC-VA-CL Water EPH (C10-C19) & EPH (C19-C32)

BCMOE EPH GCFID

Analysis is in accordance with BC MOE Lab Manual method "Extractable Petroleum Hydrocarbons in Water by GC/FID", v2.1, July 1999. Whole water samples are extracted with DCM prior to gas chromatography with flame ionization detection (GC-FID). EPH results include Polycyclic Aromatic Hydrocarbons (PAH) and are therefore not equivalent to Light and Heavy Extractable Petroleum Hydrocarbons (LEPH/HEPH).

TEH-WATER-VA-CL

Water

TEH (C10-C30)

BC Lab Manual

Water samples are spiked with 2-BBTF surrogate, and extracted by reciprocal action shaker for 1 hour using a single micro-extraction with hexane. After extraction, the hexane layer is drawn off and analyzed on a gas chromatograph equipped with a flame ionization detector.

TKN-L-F-CL

Water

Total Kjeldahl Nitrogen

APHA 4500-NORG (TKN)

This analysis is carried out using procedures adapted from APHA Method 4500-Norg D. "Block Digestion and Flow Injection Analysis". Total Kjeldahl Nitrogen is determined using block digestion followed by Flow-injection analysis with fluorescence detection.

TSS-L-CL

Water

**Total Suspended Solids** 

APHA 2540 D-Gravimetric

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total suspended solids (TSS) are determined by filtering a sample through a glass fibre filter, and by drying the filter at 104 deg. C.

TURBIDITY-CL

Water

Turbidity

APHA 2130 B-Nephelometer

This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.

\*\* ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA
CL	ALS ENVIRONMENTAL - CALGARY, ALBERTA, CANADA

#### **Chain of Custody Numbers:**

20191114-LC GW

### **GLOSSARY OF REPORT TERMS**

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.

mg/kg - milligrams per kilogram based on dry weight of sample

mg/kg wwt - milligrams per kilogram based on wet weight of sample

mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight

mg/L - unit of concentration based on volume, parts per million.

< - Less than.

D.L. - The reporting limit.

N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory. UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.



Workorder: L2382999

Report Date: 22-NOV-19

Page 1 of 12

Client: TECK COAL LIMITED (LINE CREEK)

Box 2003 15km North Hwy 43 Sparwood BC V0B 2G0

Contact: Carla Froyman Parker

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
ACIDITY-PCT-CL	Water							
Batch R4914627								
WG3221146-5 LCS Acidity (as CaCO3)			102.4		%		85-115	15-NOV-19
WG3221146-4 MB Acidity (as CaCO3)			1.3		mg/L		2	15-NOV-19
ALK-MAN-CL	Water							
Batch R4914599 WG3221151-11 LCS Alkalinity, Total (as CaC	O3)		96.7		%		85-115	15-NOV-19
WG3221151-10 MB Alkalinity, Total (as CaC	O3)		<1.0		mg/L		1	15-NOV-19
BE-D-L-CCMS-VA	Water							
Batch R4919320								
WG3224244-2 LCS Beryllium (Be)-Dissolved	t		102.2		%		80-120	21-NOV-19
WG3224244-1 MB Beryllium (Be)-Dissolved	t	NP	<0.000020	)	mg/L		0.00002	21-NOV-19
WG3224244-4 MS Beryllium (Be)-Dissolved	d	L2382999-1	99.1		%		70-130	21-NOV-19
BE-T-L-CCMS-VA	Water							
Batch R4918528								
WG3222056-2 LCS Beryllium (Be)-Total			93.9		%		80-120	20-NOV-19
WG3222056-1 MB Beryllium (Be)-Total			<0.000020	)	mg/L		0.00002	20-NOV-19
BR-L-IC-N-CL	Water							
Batch R4911969								
WG3220375-6 LCS Bromide (Br)			101.2		%		85-115	15-NOV-19
WG3220375-5 MB Bromide (Br)			<0.050		mg/L		0.05	15-NOV-19
C-DIS-ORG-LOW-CL	Water							
Batch R4912067								
WG3220408-6 LCS Dissolved Organic Carb	on		89.2		%		80-120	15-NOV-19
WG3220408-5 MB Dissolved Organic Carb	on		<0.50		mg/L		0.5	15-NOV-19
C-TOT-ORG-LOW-CL	Water							



Workorder: L2382999

Report Date: 22-NOV-19

Page 2 of 12

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
C-TOT-ORG-LOW-CL	Water							
Batch R4912067 WG3220408-6 LCS Total Organic Carbon			93.8		%		80-120	15-NOV-19
WG3220408-5 MB Total Organic Carbon			<0.50		mg/L		0.5	15-NOV-19
CL-IC-N-CL	Water							
Batch R4911969 WG3220375-6 LCS Chloride (CI)			100.9		%		90-110	15-NOV-19
<b>WG3220375-5 MB</b> Chloride (CI)			<0.50		mg/L		0.5	15-NOV-19
EC-L-PCT-CL	Water							
Batch R4914599 WG3221151-11 LCS Conductivity (@ 25C)			92.9		%		90-110	15-NOV-19
WG3221151-10 MB Conductivity (@ 25C)			<2.0		uS/cm		2	15-NOV-19
F-IC-N-CL	Water							
Batch R4911969 WG3220375-6 LCS Fluoride (F)			105.6		%		90-110	15-NOV-19
<b>WG3220375-5 MB</b> Fluoride (F)			<0.020		mg/L		0.02	15-NOV-19
HG-D-CVAA-VA	Water							
Batch R4919230 WG3223800-2 LCS Mercury (Hg)-Dissolved			97.6		%		80-120	21-NOV-19
WG3223800-1 MB Mercury (Hg)-Dissolved		NP	<0.000005	5C	mg/L		0.000005	21-NOV-19
HG-T-CVAA-VA	Water							
Batch R4917046 WG3223173-2 LCS Mercury (Hg)-Total			97.4		%		80-120	20-NOV-19
WG3223173-1 MB Mercury (Hg)-Total			<0.000005	5C	mg/L		0.000005	20-NOV-19
MET-D-CCMS-VA	Water							



Workorder: L2382999 Report Date: 22-NOV-19 Page 3 of 12

Test Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA Water							
Batch R4919320							
WG3224244-2 LCS							
Aluminum (Al)-Dissolved		101.5		%		80-120	21-NOV-19
Antimony (Sb)-Dissolved		96.6		%		80-120	21-NOV-19
Arsenic (As)-Dissolved		96.7		%		80-120	21-NOV-19
Barium (Ba)-Dissolved		94.8		%		80-120	21-NOV-19
Bismuth (Bi)-Dissolved		97.0		%		80-120	21-NOV-19
Boron (B)-Dissolved		98.4		%		80-120	21-NOV-19
Cadmium (Cd)-Dissolved		96.8		%		80-120	21-NOV-19
Calcium (Ca)-Dissolved		99.1		%		80-120	21-NOV-19
Chromium (Cr)-Dissolved		99.4		%		80-120	21-NOV-19
Cobalt (Co)-Dissolved		96.6		%		80-120	21-NOV-19
Copper (Cu)-Dissolved		92.9		%		80-120	21-NOV-19
Iron (Fe)-Dissolved		98.8		%		80-120	21-NOV-19
Lead (Pb)-Dissolved		97.6		%		80-120	21-NOV-19
Lithium (Li)-Dissolved		98.0		%		80-120	21-NOV-19
Magnesium (Mg)-Dissolved		96.6		%		80-120	21-NOV-19
Manganese (Mn)-Dissolved		97.9		%		80-120	21-NOV-19
Molybdenum (Mo)-Dissolved		102.8		%		80-120	21-NOV-19
Nickel (Ni)-Dissolved		97.4		%		80-120	21-NOV-19
Potassium (K)-Dissolved		102.2		%		80-120	21-NOV-19
Selenium (Se)-Dissolved		95.4		%		80-120	21-NOV-19
Silicon (Si)-Dissolved		103.7		%		60-140	21-NOV-19
Silver (Ag)-Dissolved		99.1		%		80-120	21-NOV-19
Sodium (Na)-Dissolved		99.5		%		80-120	21-NOV-19
Strontium (Sr)-Dissolved		98.4		%		80-120	21-NOV-19
Thallium (TI)-Dissolved		99.2		%		80-120	21-NOV-19
Tin (Sn)-Dissolved		99.8		%		80-120	21-NOV-19
Titanium (Ti)-Dissolved		91.0		%		80-120	21-NOV-19
Uranium (U)-Dissolved		98.0		%		80-120	21-NOV-19
Vanadium (V)-Dissolved		100.3		%		80-120	21-NOV-19
Zinc (Zn)-Dissolved		92.6		%		80-120	21-NOV-19
WG3224244-1 MB	NP						
Aluminum (Al)-Dissolved	•	<0.0010		mg/L		0.001	21-NOV-19
Antimony (Sb)-Dissolved		<0.00010		mg/L		0.0001	21-NOV-19
Arsenic (As)-Dissolved		<0.00010		mg/L		0.0001	21-NOV-19



Workorder: L2382999 Report Date: 22-NOV-19 Page 4 of 12

Test Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA Water							
Batch R4919320							
WG3224244-1 MB	NP						
Barium (Ba)-Dissolved		<0.00010		mg/L		0.0001	21-NOV-19
Bismuth (Bi)-Dissolved		<0.000050		mg/L		0.00005	21-NOV-19
Boron (B)-Dissolved		<0.010		mg/L		0.01	21-NOV-19
Cadmium (Cd)-Dissolved		<0.0000050		mg/L		0.000005	21-NOV-19
Calcium (Ca)-Dissolved		<0.050		mg/L		0.05	21-NOV-19
Chromium (Cr)-Dissolved		<0.00010		mg/L		0.0001	21-NOV-19
Cobalt (Co)-Dissolved		<0.00010		mg/L		0.0001	21-NOV-19
Copper (Cu)-Dissolved		<0.00020		mg/L		0.0002	21-NOV-19
Iron (Fe)-Dissolved		<0.010		mg/L		0.01	21-NOV-19
Lead (Pb)-Dissolved		<0.000050		mg/L		0.00005	21-NOV-19
Lithium (Li)-Dissolved		<0.0010		mg/L		0.001	21-NOV-19
Magnesium (Mg)-Dissolved		<0.0050		mg/L		0.005	21-NOV-19
Manganese (Mn)-Dissolved		<0.00010		mg/L		0.0001	21-NOV-19
Molybdenum (Mo)-Dissolved		<0.000050		mg/L		0.00005	21-NOV-19
Nickel (Ni)-Dissolved		<0.00050		mg/L		0.0005	21-NOV-19
Potassium (K)-Dissolved		< 0.050		mg/L		0.05	21-NOV-19
Selenium (Se)-Dissolved		<0.000050		mg/L		0.00005	21-NOV-19
Silicon (Si)-Dissolved		<0.050		mg/L		0.05	21-NOV-19
Silver (Ag)-Dissolved		<0.000010		mg/L		0.00001	21-NOV-19
Sodium (Na)-Dissolved		< 0.050		mg/L		0.05	21-NOV-19
Strontium (Sr)-Dissolved		<0.00020		mg/L		0.0002	21-NOV-19
Thallium (TI)-Dissolved		<0.000010		mg/L		0.00001	21-NOV-19
Tin (Sn)-Dissolved		<0.00010		mg/L		0.0001	21-NOV-19
Titanium (Ti)-Dissolved		<0.00030		mg/L		0.0003	21-NOV-19
Uranium (U)-Dissolved		<0.000010		mg/L		0.00001	21-NOV-19
Vanadium (V)-Dissolved		<0.00050		mg/L		0.0005	21-NOV-19
Zinc (Zn)-Dissolved		<0.0010		mg/L		0.001	21-NOV-19
WG3224244-4 MS	L2382999-1						
Aluminum (Al)-Dissolved		98.9		%		70-130	21-NOV-19
Antimony (Sb)-Dissolved		98.5		%		70-130	21-NOV-19
Arsenic (As)-Dissolved		101.0		%		70-130	21-NOV-19
Barium (Ba)-Dissolved		N/A	MS-B	%		-	21-NOV-19
Bismuth (Bi)-Dissolved		90.7		%		70-130	21-NOV-19
Boron (B)-Dissolved		99.9		%		70-130	21-NOV-19



Workorder: L2382999 Report Date: 22-NOV-19 Page 5 of 12

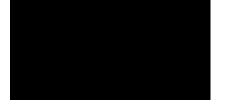
Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA	Water							
Batch R491	19320							
	MS	L2382999-1						
Cadmium (Cd)-Di			99.7		%		70-130	21-NOV-19
Calcium (Ca)-Diss			N/A	MS-B	%		-	21-NOV-19
Chromium (Cr)-D			99.8		%		70-130	21-NOV-19
Cobalt (Co)-Disso			93.8		%		70-130	21-NOV-19
Copper (Cu)-Diss			88.6		%		70-130	21-NOV-19
Iron (Fe)-Dissolve			98.8		%		70-130	21-NOV-19
Lead (Pb)-Dissolv			94.8		%		70-130	21-NOV-19
Lithium (Li)-Disso			98.1		%		70-130	21-NOV-19
Magnesium (Mg)-			N/A	MS-B	%		-	21-NOV-19
Manganese (Mn)-			N/A	MS-B	%		-	21-NOV-19
Molybdenum (Mo			102.9		%		70-130	21-NOV-19
Nickel (Ni)-Dissol	ved		93.4		%		70-130	21-NOV-19
Potassium (K)-Dis	ssolved		104.4		%		70-130	21-NOV-19
Selenium (Se)-Dis	ssolved		105.7		%		70-130	21-NOV-19
Silicon (Si)-Dissol	lved		93.4		%		70-130	21-NOV-19
Silver (Ag)-Dissol	ved		101.0		%		70-130	21-NOV-19
Sodium (Na)-Diss	solved		N/A	MS-B	%		-	21-NOV-19
Strontium (Sr)-Dis	ssolved		N/A	MS-B	%		=	21-NOV-19
Thallium (TI)-Diss	solved		93.8		%		70-130	21-NOV-19
Tin (Sn)-Dissolve	d		101.5		%		70-130	21-NOV-19
Titanium (Ti)-Diss	solved		94.5		%		70-130	21-NOV-19
Uranium (U)-Diss	olved		96.9		%		70-130	21-NOV-19
Vanadium (V)-Dis	ssolved		101.5		%		70-130	21-NOV-19
Zinc (Zn)-Dissolve	ed		89.4		%		70-130	21-NOV-19
MET-T-CCMS-VA	Water							
Batch R491	18528							
WG3222056-2			07.5		0/			
Aluminum (Al)-To			97.5		%		80-120	20-NOV-19
Antimony (Sb)-To			91.9		%		80-120	20-NOV-19
Arsenic (As)-Tota			98.4		%		80-120	20-NOV-19
Barium (Ba)-Total			98.6		%		80-120	20-NOV-19
Bismuth (Bi)-Tota	II		99.4		%		80-120	20-NOV-19
Boron (B)-Total			96.9		%		80-120	20-NOV-19
Cadmium (Cd)-To	otal		93.8		%		80-120	20-NOV-19



Page 6 of 12

Workorder: L2382999 Report Date: 22-NOV-19

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-VA	Water							
Batch R4918528								
WG3222056-2 LCS			05.0		0/			
Calcium (Ca)-Total			95.6		%		80-120	20-NOV-19
Chromium (Cr)-Total			97.8		%		80-120	20-NOV-19
Cobalt (Co)-Total			96.7		%		80-120	20-NOV-19
Copper (Cu)-Total			96.2		%		80-120	20-NOV-19
Iron (Fe)-Total			90.2		%		80-120	20-NOV-19
Lead (Pb)-Total			99.1		%		80-120	20-NOV-19
Lithium (Li)-Total			95.0		%		80-120	20-NOV-19
Magnesium (Mg)-Total			98.4		%		80-120	20-NOV-19
Manganese (Mn)-Total			98.3		%		80-120	20-NOV-19
Molybdenum (Mo)-Total			92.5		%		80-120	20-NOV-19
Nickel (Ni)-Total			96.7		%		80-120	20-NOV-19
Potassium (K)-Total			97.8		%		80-120	20-NOV-19
Selenium (Se)-Total			97.1		%		80-120	20-NOV-19
Silicon (Si)-Total			99.0		%		80-120	20-NOV-19
Silver (Ag)-Total			91.5		%		80-120	20-NOV-19
Sodium (Na)-Total			102.1		%		80-120	20-NOV-19
Strontium (Sr)-Total			90.3		%		80-120	20-NOV-19
Thallium (TI)-Total			95.9		%		80-120	20-NOV-19
Tin (Sn)-Total			90.9		%		80-120	20-NOV-19
Titanium (Ti)-Total			92.5		%		80-120	20-NOV-19
Uranium (U)-Total			97.7		%		80-120	20-NOV-19
Vanadium (V)-Total			99.1		%		80-120	20-NOV-19
Zinc (Zn)-Total			98.0		%		80-120	20-NOV-19
WG3222056-1 MB								
Aluminum (Al)-Total			<0.0030		mg/L		0.003	20-NOV-19
Antimony (Sb)-Total			<0.00010		mg/L		0.0001	20-NOV-19
Arsenic (As)-Total			<0.00010		mg/L		0.0001	20-NOV-19
Barium (Ba)-Total			<0.00010		mg/L		0.0001	20-NOV-19
Bismuth (Bi)-Total			<0.00005	50	mg/L		0.00005	20-NOV-19
Boron (B)-Total			<0.010		mg/L		0.01	20-NOV-19
Cadmium (Cd)-Total			<0.00000	<b>)5</b> C	mg/L		0.000005	20-NOV-19
Calcium (Ca)-Total			< 0.050		mg/L		0.05	20-NOV-19
Chromium (Cr)-Total			<0.00010	)	mg/L		0.0001	20-NOV-19
Cobalt (Co)-Total			<0.00010	)	mg/L		0.0001	20-NOV-19



Workorder: L2382999

Report Date: 22-NOV-19

Page 7 of 12

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-VA	Water							
Batch R4918528								
WG3222056-1 MB								
Copper (Cu)-Total			<0.00050		mg/L		0.0005	20-NOV-19
Iron (Fe)-Total			<0.010		mg/L		0.01	20-NOV-19
Lead (Pb)-Total			<0.000050	)	mg/L		0.00005	20-NOV-19
Lithium (Li)-Total			<0.0010		mg/L		0.001	20-NOV-19
Magnesium (Mg)-Total			<0.0050		mg/L		0.005	20-NOV-19
Manganese (Mn)-Total			<0.00010		mg/L		0.0001	20-NOV-19
Molybdenum (Mo)-Total			<0.000050	)	mg/L		0.00005	20-NOV-19
Nickel (Ni)-Total			<0.00050		mg/L		0.0005	20-NOV-19
Potassium (K)-Total			< 0.050		mg/L		0.05	20-NOV-19
Selenium (Se)-Total			<0.000050	)	mg/L		0.00005	20-NOV-19
Silicon (Si)-Total			<0.10		mg/L		0.1	20-NOV-19
Silver (Ag)-Total			<0.000010	)	mg/L		0.00001	20-NOV-19
Sodium (Na)-Total			< 0.050		mg/L		0.05	20-NOV-19
Strontium (Sr)-Total			<0.00020		mg/L		0.0002	20-NOV-19
Thallium (TI)-Total			<0.000010	)	mg/L		0.00001	20-NOV-19
Tin (Sn)-Total			<0.00010		mg/L		0.0001	20-NOV-19
Titanium (Ti)-Total			<0.00030		mg/L		0.0003	20-NOV-19
Uranium (U)-Total			<0.000010	)	mg/L		0.00001	20-NOV-19
Vanadium (V)-Total			<0.00050		mg/L		0.0005	20-NOV-19
Zinc (Zn)-Total			<0.0030		mg/L		0.003	20-NOV-19
NH3-L-F-CL	Water							
Batch R4912029								
WG3219851-26 LCS								
Ammonia as N			107.9		%		85-115	16-NOV-19
WG3219851-25 MB Ammonia as N			<0.0050		mg/L		0.005	16-NOV-19
NO2-L-IC-N-CL	Water							
Batch R4911969								
WG3220375-6 LCS Nitrite (as N)			102.4		%		90-110	15-NOV-19
<b>WG3220375-5 MB</b> Nitrite (as N)			<0.0010		mg/L		0.001	15-NOV-19
NO3-L-IC-N-CL	Water							



Workorder: L2382999

Report Date: 22-NOV-19

Page 8 of 12

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
NO3-L-IC-N-CL	Water							
Batch R4911969 WG3220375-6 LCS Nitrate (as N)			101.3		%		90-110	15-NOV-19
<b>WG3220375-5 MB</b> Nitrate (as N)			<0.0050		mg/L		0.005	15-NOV-19
ORP-CL	Water							
<b>Batch R4911508 WG3220205-3 CRM</b> ORP		CL-ORP	214		mV		210-230	15-NOV-19
P-T-L-COL-CL	Water							
Batch R4915232 WG3221415-14 LCS								
Phosphorus (P)-Total			90.9		%		80-120	16-NOV-19
WG3221415-13 MB Phosphorus (P)-Total			<0.0020		mg/L		0.002	16-NOV-19
PH-CL	Water							
<b>Batch R4914599 WG3221151-11 LCS</b> pH			7.00		рН		6.9-7.1	15-NOV-19
PO4-DO-L-COL-CL	Water							
Batch R4910869								
WG3219963-6 LCS Orthophosphate-Dissolve	ed (as P)		99.0		%		80-120	15-NOV-19
WG3219963-5 MB Orthophosphate-Dissolve	ed (as P)		<0.0010		mg/L		0.001	15-NOV-19
SO4-IC-N-CL	Water							
Batch R4911969 WG3220375-6 LCS								
Sulfate (SO4)			100.9		%		90-110	15-NOV-19
<b>WG3220375-5 MB</b> Sulfate (SO4)			<0.30		mg/L		0.3	15-NOV-19
SOLIDS-TDS-CL	Water							
Batch R4915195								
WG3220685-9 DUP Total Dissolved Solids		<b>L2382999-1</b> 825	829		mg/L	0.5	20	17-NOV-19
WG3220685-8 LCS								



Workorder: L2382999

Report Date: 22-NOV-19 Page 9 of 12

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
SOLIDS-TDS-CL	Water							
Batch R4915195 WG3220685-8 LCS Total Dissolved Solids			98.4		%		85-115	17-NOV-19
WG3220685-7 MB Total Dissolved Solids			<10		mg/L		10	17-NOV-19
TEH-BC-VA-CL	Water							
Batch R4914746 WG3220479-2 LCS EPH10-19			100.9		%		70-130	16-NOV-19
EPH19-32			91.8		%		70-130	16-NOV-19 16-NOV-19
WG3220479-1 MB								
EPH10-19			<0.25		mg/L		0.25	16-NOV-19
EPH19-32			<0.25		mg/L		0.25	16-NOV-19
Surrogate: 2-Bromobenz	zotrifluoride		80.1		%		60-140	16-NOV-19
TEH-WATER-VA-CL	Water							
Batch R4914746 WG3220479-2 LCS TEH (C10-C30)			98.0		%		70-130	16-NOV-19
<b>WG3220479-1 MB</b> TEH (C10-C30)			<0.25		mg/L		0.25	16-NOV-19
Surrogate: 2-Bromobenz	zotrifluoride		80.1		%		60-140	16-NOV-19
TKN-L-F-CL	Water							
Batch R4912590 WG3220521-6 LCS								
Total Kjeldahl Nitrogen			91.3		%		75-125	16-NOV-19
WG3220521-5 MB Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	16-NOV-19
TSS-L-CL	Water							
Batch R4916100 WG3221140-12 LCS Total Suspended Solids			105.3		%		0F 44F	40 NOV 40
WG3221140-11 MB Total Suspended Solids			<1.0		mg/L		85-115 1	18-NOV-19 18-NOV-19
TURBIDITY-CL	Water		3		<b>5</b>		•	101101-10
Batch R4911451								
WG3220150-5 LCS Turbidity			94.5		%		85-115	15-NOV-19
WG3220150-4 MB								



Workorder: L2382999

Report Date: 22-NOV-19 Page 10 of 12

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
TURBIDITY-CL	Water							
Batch R491145 WG3220150-4 MB	1							
Turbidity			<0.10		NTU		0.1	15-NOV-19

Workorder: L2382999 Report Date: 22-NOV-19 Page 11 of 12

Legend:

ALS Control Limit (Data Quality Objectives)
Duplicate
Relative Percent Difference
Not Available
Laboratory Control Sample
Standard Reference Material
Matrix Spike
Matrix Spike Duplicate
Average Desorption Efficiency
Method Blank
Internal Reference Material
Certified Reference Material
Continuing Calibration Verification
Calibration Verification Standard
Laboratory Control Sample Duplicate

### **Sample Parameter Qualifier Definitions:**

Qualifier	Description
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.

Workorder: L2382999 Report Date: 22-NOV-19 Page 12 of 12

#### **Hold Time Exceedances:**

	Sample						
ALS Product Description	ID	Sampling Date	Date Processed	Rec. HT	Actual HT	Units	Qualifier
Physical Tests							
Oxidation redution potentia	l by elect.						
	1	14-NOV-19 14:33	15-NOV-19 14:30	0.25	24	hours	EHTR-FM
рН							
	1	14-NOV-19 14:33	15-NOV-19 14:00	0.25	24	hours	EHTR-FM

### Legend & Qualifier Definitions:

EHTR-FM: Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended.

EHTR: Exceeded ALS recommended hold time prior to sample receipt.

EHTL: Exceeded ALS recommended hold time prior to analysis. Sample was received less than 24 hours prior to expiry.

EHT: Exceeded ALS recommended hold time prior to analysis.

Rec. HT: ALS recommended hold time (see units).

#### Notes\*:

Where actual sampling date is not provided to ALS, the date (& time) of receipt is used for calculation purposes. Where actual sampling time is not provided to ALS, the earlier of 12 noon on the sampling date or the time (& date) of receipt is used for calculation purposes. Samples for L2382999 were received on 15-NOV-19 09:05.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against predetermined data quality objectives to provide confidence in the accuracy of associated test results.

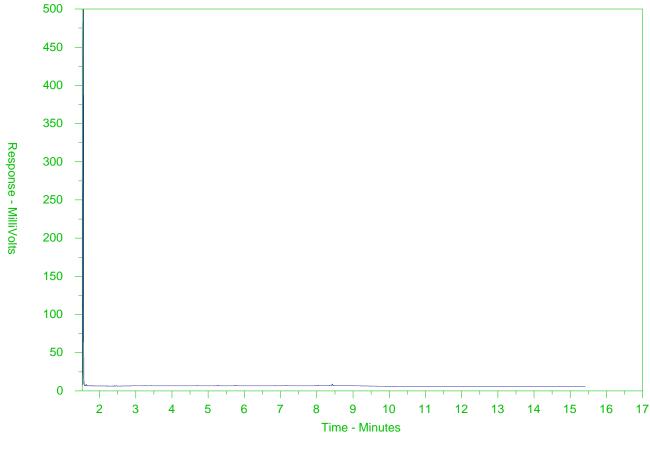
Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

### CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT



ALS Sample ID: L2382999-1

Client Sample ID: LC\_PIZDC1105\_WG\_Q4-2019\_NP



<b>←</b> F2	F3 —		4	
nC10	nC16	nC34	nC50	
174°C	287°C	481°C	575°C	
346'F	549'F	898'F	1067'F	
← Gasoli	ne →	<b>*</b>	Motor Oils/ Lube Oils/ Grease	
<del></del>	Diesel/ Jet Fuels			

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at <a href="https://www.alsglobal.com">www.alsglobal.com</a>.

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TECK COAL LIMITED (LINE CREEK)

ATTN: Carla Froyman Parker Box 2003 15km North Hwy 43

Sparwood BC VOB 2G0

Date Received: 22-NOV-19

Report Date: 27-NOV-19 17:30 (MT)

Version: FINAL

Client Phone: 250-425-3196

# Certificate of Analysis

Lab Work Order #: L2386569
Project P.O. #: VP000608129

Job Reference: LINE CREEK OPERATION
C of C Numbers: 20191121ERXPIZP1104

Legal Site Desc:



Lyudmyla Shvets, B.Sc. Account Manager

 $[This\ report\ shall\ not\ be\ reproduced\ except\ in\ full\ without\ the\ written\ authority\ of\ the\ Laboratory.]$ 

L2386569 CONTD.... PAGE 2 of 9 Version: FINAL

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2386569-1 LC_ERX_WG_2019_20F2_NP							
Sampled By: DT/KC on 20-NOV-19 @ 14:10							
Matrix: WG Miscellaneous Parameters							
Dissolved Organic Carbon	2.56		0.50	ma/l		23-NOV-19	D4022020
	2.56		0.50	mg/L			R4922038
Total Kjeldahl Nitrogen	0.344		0.050	mg/L		25-NOV-19	R4922734
Total Organic Carbon	2.81		0.50	mg/L		23-NOV-19	R4922038
Dissolved Metals in Water							
Diss. Be (low) in Water by CRC ICPMS	0.000		0.000	/1	05 NOV 40	00 NOV 40	D 400 4000
Beryllium (Be)-Dissolved Dissolved Metals Filtration Location	<0.020 FIELD		0.020	ug/L	25-NOV-19	26-NOV-19	R4924069
	FIELD					25-NOV-19	R4922976
Diss. Mercury in Water by CVAAS or CVAFS Mercury (Hg)-Dissolved	<0.000050		0.0000050	mg/L	26-NOV-19	26-NOV-19	R4923087
Dissolved Mercury Filtration Location	<0.000050 FIELD		0.0000050	IIIg/L	26-11007-19	26-NOV-19 26-NOV-19	R4923067 R4923367
_	LIELD					20-INO V-18	N4323307
Dissolved Metals in Water by CRC ICPMS Dissolved Metals Filtration Location	FIELD					25-NOV-19	R4922976
Aluminum (Al)-Dissolved	<0.0030		0.0030	mg/L	25-NOV-19	26-NOV-19	R4922976 R4924069
Antimony (Sb)-Dissolved	0.00028		0.0030	mg/L	25-NOV-19 25-NOV-19	26-NOV-19	R4924069 R4924069
Arsenic (As)-Dissolved	0.00023		0.00010	mg/L	25-NOV-19	26-NOV-19	R4924069
Barium (Ba)-Dissolved	0.00033		0.00010	mg/L	25-NOV-19 25-NOV-19	26-NOV-19	R4924069 R4924069
Bismuth (Bi)-Dissolved	<0.00050		0.00010	mg/L	25-NOV-19	26-NOV-19	R4924069
Boron (B)-Dissolved	0.026		0.000030	mg/L	25-NOV-19	26-NOV-19	R4924069
Cadmium (Cd)-Dissolved	0.0590		0.0050	ug/L	25-NOV-19	26-NOV-19	R4924069
Calcium (Ca)-Dissolved	143		0.050	mg/L	25-NOV-19	26-NOV-19	R4924069
Chromium (Cr)-Dissolved	<0.00010		0.00010	mg/L	25-NOV-19	26-NOV-19	R4924069
Cobalt (Co)-Dissolved	<0.10		0.10	ug/L	25-NOV-19	26-NOV-19	R4924069
Copper (Cu)-Dissolved	0.00047		0.00020	mg/L	25-NOV-19	26-NOV-19	R4924069
Iron (Fe)-Dissolved	<0.010		0.010	mg/L	25-NOV-19	26-NOV-19	R4924069
Lead (Pb)-Dissolved	<0.00050		0.000050	mg/L	25-NOV-19	26-NOV-19	R4924069
Lithium (Li)-Dissolved	0.0219		0.0010	mg/L	25-NOV-19	26-NOV-19	R4924069
Magnesium (Mg)-Dissolved	42.4		0.10	mg/L	25-NOV-19	26-NOV-19	R4924069
Manganese (Mn)-Dissolved	0.0118		0.00010	mg/L	25-NOV-19	26-NOV-19	R4924069
Molybdenum (Mo)-Dissolved	0.00434		0.000050	mg/L	25-NOV-19	26-NOV-19	R4924069
Nickel (Ni)-Dissolved	0.00105		0.00050	mg/L	25-NOV-19	26-NOV-19	R4924069
Potassium (K)-Dissolved	2.56		0.050	mg/L	25-NOV-19	26-NOV-19	R4924069
Selenium (Se)-Dissolved	2.67		0.050	ug/L	25-NOV-19	26-NOV-19	R4924069
Silicon (Si)-Dissolved	6.57		0.050	mg/L	25-NOV-19	26-NOV-19	R4924069
Silver (Ag)-Dissolved	<0.000010		0.000010	mg/L	25-NOV-19	26-NOV-19	R4924069
Sodium (Na)-Dissolved	12.0		0.050	mg/L	25-NOV-19	26-NOV-19	R4924069
Strontium (Sr)-Dissolved	0.688		0.00020	mg/L	25-NOV-19	26-NOV-19	R4924069
Thallium (TI)-Dissolved	0.000021		0.000010	mg/L	25-NOV-19	26-NOV-19	R4924069
Tin (Sn)-Dissolved	<0.00010		0.00010	mg/L	25-NOV-19	26-NOV-19	R4924069
Titanium (Ti)-Dissolved	<0.010		0.010	mg/L	25-NOV-19	26-NOV-19	R4924069
Uranium (U)-Dissolved	0.00283		0.000010	mg/L	25-NOV-19	26-NOV-19	R4924069
Vanadium (V)-Dissolved	<0.00050		0.00050	mg/L	25-NOV-19	26-NOV-19	R4924069
Zinc (Zn)-Dissolved	<0.0010		0.0010	mg/L	25-NOV-19	26-NOV-19	R4924069
Total Metals in Water			-	Č			
Hardness							
Hardness (as CaCO3)	533		0.50	mg/L		26-NOV-19	
Total Be (Low) in Water by CRC ICPMS Beryllium (Be)-Total	0.021		0.020	ug/L		25-NOV-19	R4922859
	0.021		0.020	ug/L		23-1107-19	K4922039
Total Mercury in Water by CVAAS or CVAFS Mercury (Hg)-Total	<0.000050		0.0000050	mg/L		26-NOV-19	R4923087
Total Metals in Water by CRC ICPMS							
Aluminum (Al)-Total	0.534		0.0030	mg/L		25-NOV-19	R4922859
Antimony (Sb)-Total	0.00028		0.00010	mg/L		25-NOV-19	R4922859

<sup>\*</sup> Refer to Referenced Information for Qualifiers (if any) and Methodology.

L2386569 CONTD.... PAGE 3 of 9 Version: FINAL

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2386569-1 LC_ERX_WG_2019_20F2_NP							
Sampled By: DT/KC on 20-NOV-19 @ 14:10							
Matrix: WG							
Total Metals in Water by CRC ICPMS Arsenic (As)-Total	0.00051		0.00010	mg/L		25-NOV-19	R4922859
Barium (Ba)-Total	0.306		0.00010	mg/L		25-NOV-19 25-NOV-19	R4922859
Bismuth (Bi)-Total	<0.00050		0.00010	mg/L		25-NOV-19	R4922859
Boron (B)-Total	0.027		0.000	mg/L		25-NOV-19	R4922859
Cadmium (Cd)-Total	0.127		0.0050	ug/L		25-NOV-19	R4922859
Calcium (Ca)-Total	144		0.050	mg/L		25-NOV-19	R4922859
Chromium (Cr)-Total	0.00076		0.00010	mg/L		25-NOV-19	R4922859
Cobalt (Co)-Total	0.30		0.10	ug/L		25-NOV-19	R4922859
Copper (Cu)-Total	0.00126		0.00050	mg/L		25-NOV-19	R4922859
Iron (Fe)-Total	0.408		0.010	mg/L		25-NOV-19	R4922859
Lead (Pb)-Total	0.000249		0.000050	mg/L		25-NOV-19	R4922859
Lithium (Li)-Total	0.0239		0.0010	mg/L		25-NOV-19	R4922859
Magnesium (Mg)-Total	44.0		0.10	mg/L		25-NOV-19	R4922859
Manganese (Mn)-Total	0.0183		0.00010	mg/L		25-NOV-19	R4922859
Molybdenum (Mo)-Total	0.00380		0.000050	mg/L		25-NOV-19	R4922859
Nickel (Ni)-Total	0.00179		0.00050	mg/L		25-NOV-19	R4922859
Potassium (K)-Total	2.54		0.050	mg/L		25-NOV-19	R4922859
Selenium (Se)-Total	2.79		0.050	ug/L		25-NOV-19	R4922859
Silicon (Si)-Total	7.36		0.10	mg/L		25-NOV-19	R4922859
Silver (Ag)-Total	0.000011		0.000010	mg/L		25-NOV-19	R4922859
Sodium (Na)-Total	11.7		0.050	mg/L		25-NOV-19	R4922859
Strontium (Sr)-Total	0.640		0.00020	mg/L		25-NOV-19	R4922859
Thallium (TI)-Total	0.000033		0.000010	mg/L		25-NOV-19	R4922859
Tin (Sn)-Total	<0.00010		0.00010	mg/L		25-NOV-19	R4922859
Titanium (Ti)-Total	0.012		0.010	mg/L		25-NOV-19	R4922859
Uranium (U)-Total	0.00277		0.000010	mg/L		25-NOV-19	R4922859
Vanadium (V)-Total Zinc (Zn)-Total	0.00151		0.00050	mg/L		25-NOV-19 25-NOV-19	R4922859
Routine for Teck Coal	0.0045		0.0030	mg/L		25-1107-19	R4922859
Acidity by Automatic Titration							
Acidity by Automatic Titration Acidity (as CaCO3)	1.9		1.0	mg/L		22-NOV-19	R4920946
Alkalinity (Species) by Manual Titration	1.5		1.0	1119/12		22 110 1 15	114520540
Alkalinity, Bicarbonate (as CaCO3)	276		1.0	mg/L		22-NOV-19	R4920806
Alkalinity, Carbonate (as CaCO3)	<1.0		1.0	mg/L		22-NOV-19	R4920806
Alkalinity, Hydroxide (as CaCO3)	<1.0		1.0	mg/L		22-NOV-19	R4920806
Alkalinity, Total (as CaCO3)	276		1.0	mg/L		22-NOV-19	R4920806
Ammonia, Total (as N)				_			
Ammonia as N	0.0217		0.0050	mg/L		26-NOV-19	R4922870
Bromide in Water by IC (Low Level)							
Bromide (Br)	1.30	DLHC	0.25	mg/L		22-NOV-19	R4921956
Chloride in Water by IC							
Chloride (CI)	152	DLHC	2.5	mg/L		22-NOV-19	R4921956
Electrical Conductivity (EC)						00 11011 15	D 4000005
Conductivity (@ 25C)	1050		2.0	uS/cm		22-NOV-19	R4920806
Fluoride in Water by IC Fluoride (F)	0.13	DLHC	0.10	mg/L		22-NOV-19	R4921956
Ion Balance Calculation	0.13	DE 10	0.10	illy/L		ZZ-INOV-19	174371330
Cation - Anion Balance	-2.0			%		26-NOV-19	
Anion Sum	11.7			meg/L		26-NOV-19	
Cation Sum	11.2			meg/L		26-NOV-19	
Ion Balance Calculation				Yr =			
Ion Balance	96.0		-100	%		26-NOV-19	
		1					

<sup>\*</sup> Refer to Referenced Information for Qualifiers (if any) and Methodology.

L2386569 CONTD.... PAGE 4 of 9 Version: FINAL

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2386569-1 LC_ERX_WG_2019_20F2_NP							
Sampled By: DT/KC on 20-NOV-19 @ 14:10							
Matrix: WG							
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	0.728	DLHC	0.025	mg/L		22-NOV-19	R4921956
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	<0.0050	DLHC	0.0050	mg/L		22-NOV-19	R4921956
Orthophosphate-Dissolved (as P) Orthophosphate-Dissolved (as P)	0.0014		0.0010	mg/L		22-NOV-19	R4921606
Oxidation redution potential by elect.	0.0014		0.0010	g/ =		22 110 1 10	114321000
ORP	345		-1000	mV		22-NOV-19	R4921776
Phosphorus (P)-Total							
Phosphorus (P)-Total	0.0384		0.0020	mg/L		24-NOV-19	R4922111
Sulfate in Water by IC Sulfate (SO4)	89.1	DLHC	1.5	mg/L		22-NOV-19	R4921956
Total Dissolved Solids	05.1	32.10	1.0	g, L		140 V=13	117021000
Total Dissolved Solids	691		20	mg/L		22-NOV-19	R4922588
Total Suspended Solids							
Total Suspended Solids	30.7		1.0	mg/L		22-NOV-19	R4921505
<b>Turbidity</b> Turbidity	11.8		0.10	NTU		22-NOV-19	R4921777
pH	11.0		0.10	1110		22 110 1 10	104321777
рН	8.22		0.10	рН		22-NOV-19	R4920806
L2386569-2 LC_PIZP1104_WG_Q4-2019_NP							
Sampled By: DT/KC on 21-NOV-19 @ 11:48							
Matrix: WG							
Miscellaneous Parameters							
Dissolved Organic Carbon	1.84		0.50	mg/L		23-NOV-19	R4922038
Total Kjeldahl Nitrogen	0.206		0.050	mg/L		26-NOV-19	R4922734
Total Organic Carbon	1.81		0.50	mg/L		23-NOV-19	R4922038
Dissolved Metals in Water							
Diss. Be (low) in Water by CRC ICPMS Beryllium (Be)-Dissolved	<0.020		0.020	ug/L	25-NOV-19	26-NOV-19	R4924069
Dissolved Metals Filtration Location	FIELD		0.020	ug/L	201101 10	25-NOV-19	R4922976
Diss. Mercury in Water by CVAAS or CVAFS							
Mercury (Hg)-Dissolved	<0.0000050		0.0000050	mg/L	26-NOV-19	26-NOV-19	R4923087
Dissolved Mercury Filtration Location	FIELD					26-NOV-19	R4923367
Dissolved Metals in Water by CRC ICPMS Dissolved Metals Filtration Location	FIEL D					25 NOV 40	D400070
Aluminum (Al)-Dissolved	FIELD <0.0030		0.0030	mg/L	25-NOV-19	25-NOV-19 26-NOV-19	R4922976 R4924069
Antimony (Sb)-Dissolved	0.00016		0.0030	mg/L	25-NOV-19 25-NOV-19	26-NOV-19 26-NOV-19	R4924069 R4924069
Arsenic (As)-Dissolved	0.00016		0.00010	mg/L	25-NOV-19	26-NOV-19	R4924069
Barium (Ba)-Dissolved	0.317		0.00010	mg/L	25-NOV-19	26-NOV-19	R4924069
Bismuth (Bi)-Dissolved	<0.000050		0.000050	mg/L	25-NOV-19	26-NOV-19	R4924069
Boron (B)-Dissolved	0.025		0.010	mg/L	25-NOV-19	26-NOV-19	R4924069
Cadmium (Cd)-Dissolved	0.0257		0.0050	ug/L	25-NOV-19	26-NOV-19	R4924069
Calcium (Ca)-Dissolved	131		0.050	mg/L	25-NOV-19	26-NOV-19	R4924069
Chromium (Cr)-Dissolved Cobalt (Co)-Dissolved	<0.00010 1.88		0.00010 0.10	mg/L	25-NOV-19 25-NOV-19	26-NOV-19 26-NOV-19	R4924069 R4924069
Copper (Cu)-Dissolved	0.00168		0.00020	ug/L mg/L	25-NOV-19 25-NOV-19	26-NOV-19 26-NOV-19	R4924069 R4924069
Iron (Fe)-Dissolved	0.825		0.00020	mg/L	25-NOV-19	26-NOV-19	R4924069
Lead (Pb)-Dissolved	<0.000050		0.000050	mg/L	25-NOV-19	26-NOV-19	R4924069
Lithium (Li)-Dissolved	0.0167		0.0010	mg/L	25-NOV-19	26-NOV-19	R4924069
Magnesium (Mg)-Dissolved	43.7		0.10	mg/L	25-NOV-19	26-NOV-19	R4924069
Manganese (Mn)-Dissolved	1.10		0.00010	mg/L	25-NOV-19	26-NOV-19	R4924069

<sup>\*</sup> Refer to Referenced Information for Qualifiers (if any) and Methodology.

L2386569 CONTD.... PAGE 5 of 9 Version: FINAL

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2386569-2 LC_PIZP1104_WG_Q4-2019_NP							
Sampled By: DT/KC on 21-NOV-19 @ 11:48							
Matrix: WG							
Dissolved Metals in Water by CRC ICPMS							
Molybdenum (Mo)-Dissolved	0.00302		0.000050	mg/L	25-NOV-19	26-NOV-19	R4924069
Nickel (Ni)-Dissolved	0.00321		0.00050	mg/L	25-NOV-19	26-NOV-19	R4924069
Potassium (K)-Dissolved	2.36		0.050	mg/L	25-NOV-19	26-NOV-19	R4924069
Selenium (Se)-Dissolved	< 0.050		0.050	ug/L	25-NOV-19	26-NOV-19	R4924069
Silicon (Si)-Dissolved	4.87		0.050	mg/L	25-NOV-19	26-NOV-19	R4924069
Silver (Ag)-Dissolved	<0.000010		0.000010	mg/L	25-NOV-19	26-NOV-19	R4924069
Sodium (Na)-Dissolved	12.2		0.050	mg/L	25-NOV-19	26-NOV-19	R4924069
Strontium (Sr)-Dissolved	0.450		0.00020	mg/L	25-NOV-19	26-NOV-19	R4924069
Thallium (TI)-Dissolved	0.000028		0.000010	mg/L	25-NOV-19	26-NOV-19	R4924069
Tin (Sn)-Dissolved	0.00014		0.00010	mg/L	25-NOV-19	26-NOV-19	R4924069
Titanium (Ti)-Dissolved	<0.010		0.010	mg/L	25-NOV-19	26-NOV-19	R4924069
Uranium (U)-Dissolved	0.00413		0.000010	mg/L	25-NOV-19	26-NOV-19	R4924069
Vanadium (V)-Dissolved	<0.00050		0.00050	mg/L	25-NOV-19	26-NOV-19	R4924069
Zinc (Zn)-Dissolved	0.0123		0.0010	mg/L	25-NOV-19	26-NOV-19	R4924069
Total Metals in Water							
Hardness Hardness (as CaCO3)	508		0.50	mg/L		27-NOV-19	
Total Be (Low) in Water by CRC ICPMS	000		0.00	g/ =		27 110 7 10	
Beryllium (Be)-Total	0.050		0.020	ug/L		26-NOV-19	R4925150
Total Metals in Water by CRC ICPMS	0.000		0.020	ug/ L		20110110	114020100
Aluminum (Al)-Total	0.601		0.0030	mg/L		26-NOV-19	R4925150
Antimony (Sb)-Total	0.00032		0.00010	mg/L		26-NOV-19	R4925150
Arsenic (As)-Total	0.00190		0.00010	mg/L		26-NOV-19	R4925150
Barium (Ba)-Total	0.346		0.00010	mg/L		26-NOV-19	R4925150
Bismuth (Bi)-Total	< 0.000050		0.000050	mg/L		26-NOV-19	R4925150
Boron (B)-Total	0.023		0.010	mg/L		26-NOV-19	R4925150
Cadmium (Cd)-Total	0.182		0.0050	ug/L		26-NOV-19	R4925150
Calcium (Ca)-Total	139		0.050	mg/L		26-NOV-19	R4925150
Chromium (Cr)-Total	0.00186		0.00010	mg/L		26-NOV-19	R4925150
Cobalt (Co)-Total	2.32		0.10	ug/L		26-NOV-19	R4925150
Copper (Cu)-Total	0.0247		0.00050	mg/L		26-NOV-19	R4925150
Iron (Fe)-Total	3.31		0.010	mg/L		26-NOV-19	R4925150
Lead (Pb)-Total	0.00151		0.000050	mg/L		26-NOV-19	R4925150
Lithium (Li)-Total	0.0175		0.0010	mg/L		26-NOV-19	R4925150
Magnesium (Mg)-Total	45.7		0.10	mg/L		26-NOV-19	R4925150
Manganese (Mn)-Total	1.07		0.00010	mg/L		26-NOV-19	R4925150
Molybdenum (Mo)-Total	0.00258		0.000050	mg/L		26-NOV-19	R4925150
Nickel (Ni)-Total	0.00467		0.00050	mg/L		26-NOV-19	R4925150
Potassium (K)-Total	2.50		0.050	mg/L		26-NOV-19	R4925150
Selenium (Se)-Total	0.145		0.050	ug/L		26-NOV-19	R4925150
Silicon (Si)-Total	5.86		0.10	mg/L		26-NOV-19	R4925150
Silver (Ag)-Total	0.000039		0.000010	mg/L		26-NOV-19	R4925150
Sodium (Na)-Total	11.6		0.050	mg/L		26-NOV-19	R4925150
Strontium (Sr)-Total	0.461		0.00020	mg/L		26-NOV-19	R4925150
Thallium (TI)-Total	0.000062		0.000010	mg/L		26-NOV-19	R4925150
Tin (Sn)-Total	0.00024		0.00010	mg/L		26-NOV-19	R4925150
Titanium (Ti)-Total	<0.010		0.010	mg/L		26-NOV-19	R4925150
Uranium (U)-Total	0.00399		0.000010	mg/L		26-NOV-19	R4925150
Vanadium (V)-Total	0.00250		0.00050	mg/L		26-NOV-19	R4925150
Zinc (Zn)-Total	0.0286		0.0030	mg/L		26-NOV-19	R4925150
Routine for Teck Coal					1	1	1

<sup>\*</sup> Refer to Referenced Information for Qualifiers (if any) and Methodology.

L2386569 CONTD.... PAGE 6 of 9 Version: FINAL

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2386569-2 LC_PIZP1104_WG_Q4-2019_NP							
Sampled By: DT/KC on 21-NOV-19 @ 11:48							
Matrix: WG							
Acidity by Automatic Titration							
Acidity by Automatic Titration Acidity (as CaCO3)	19.5		1.0	mg/L		22-NOV-19	R4920946
Alkalinity (Species) by Manual Titration							
Alkalinity, Bicarbonate (as CaCO3)	265		1.0	mg/L		22-NOV-19	R4920806
Alkalinity, Carbonate (as CaCO3)	<1.0		1.0	mg/L		22-NOV-19	R4920806
Alkalinity, Hydroxide (as CaCO3)	<1.0		1.0	mg/L		22-NOV-19	R4920806
Alkalinity, Total (as CaCO3)	265		1.0	mg/L		22-NOV-19	R4920806
Ammonia, Total (as N) Ammonia as N	0.0133		0.0050	ma/l		26-NOV-19	D4022870
Bromide in Water by IC (Low Level)	0.0133		0.0050	mg/L		20-110-19	R4922870
Bromide (Br)	2.23	DLHC	0.25	mg/L		22-NOV-19	R4921956
Chloride in Water by IC							
Chloride (CI)	187	DLHC	2.5	mg/L		22-NOV-19	R4921956
Electrical Conductivity (EC)							
Conductivity (@ 25C)	1060		2.0	uS/cm		22-NOV-19	R4920806
Fluoride in Water by IC	0.33	DLHC	0.40	ma/l		22 NOV 40	D4004056
Fluoride (F) Ion Balance Calculation	0.23	DLITC	0.10	mg/L		22-NOV-19	R4921956
Ion Balance Calculation	95.3		-100	%		27-NOV-19	
Ion Balance Calculation							
Cation - Anion Balance	-2.4			%		27-NOV-19	
Anion Sum	11.4			meq/L		27-NOV-19	
Cation Sum	10.8			meq/L		27-NOV-19	
Nitrate in Water by IC (Low Level)		DILLO		,,		00 1101/ 40	
Nitrate (as N)	0.249	DLHC	0.025	mg/L		22-NOV-19	R4921956
Nitrite in Water by IC (Low Level) Nitrite (as N)	<0.0050	DLHC	0.0050	mg/L		22-NOV-19	R4921956
Orthophosphate-Dissolved (as P)	<0.0000		0.0000	1119/ =		22 110 1 10	114521550
Orthophosphate-Dissolved (as P)	<0.0010		0.0010	mg/L		22-NOV-19	R4921606
Oxidation redution potential by elect.							
ORP	303		-1000	mV		22-NOV-19	R4921776
Phosphorus (P)-Total	0.455	DILLO	0.040			04 NOV 40	D 1000111
Phosphorus (P)-Total	0.155	DLHC	0.010	mg/L		24-NOV-19	R4922111
Sulfate in Water by IC Sulfate (SO4)	36.2	DLHC	1.5	mg/L		22-NOV-19	R4921956
Total Dissolved Solids	00.2		1.0	9/ ⊑			
Total Dissolved Solids	705		20	mg/L		22-NOV-19	R4922588
Total Suspended Solids							
Total Suspended Solids	82.6		1.0	mg/L		22-NOV-19	R4921505
<b>Turbidity</b> Turbidity	48.8		0.10	NTU		22-NOV-19	R4921777
pH	40.0		0.10	INTO		22-INOV-19	114341111
pH	7.56		0.10	рН		22-NOV-19	R4920806
				* *			

<sup>\*</sup> Refer to Referenced Information for Qualifiers (if any) and Methodology.

LINE CREEK OPERATION L2386569 CONTD....

**Reference Information** 

PAGE 7 of 9 Version: FINAL

Sample Parameter Qualifier Key:

 Qualifier
 Description

 DLHC
 Detection Limit Raised: Dilution required due to high concentration of test analyte(s).

 MS-B
 Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.

**Test Method References:** 

ALS Test Code	Test Code Matrix Test Description		Method Reference**	
ACIDITY-PCT-CL	Water	Acidity by Automatic Titration	APHA 2310 Acidity	

This analysis is carried out using procedures adapted from APHA Method 2310 "Acidity". Acidity is determined by potentiometric titration to a specified endpoint.

enapoint.

ALK-MAN-CL Water Alkalinity (Species) by Manual Titration APHA 2320 ALKALINITY

This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.

BE-D-L-CCMS-VA Water Diss. Be (low) in Water by CRC ICPMS APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

BE-T-L-CCMS-VA Water Total Be (Low) in Water by CRC ICPMS EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

BR-L-IC-N-CL Water Bromide in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

C-DIS-ORG-LOW-CL Water Dissolved Organic Carbon APHA 5310 B-Instrumental

This method is applicable to the analysis of ground water, wastewater, and surface water samples. The form detected depends upon sample pretreatment: Unfiltered sample = TC, 0.45um filtered = TDC. Samples are injected into a combustion tube containing an oxidation catalyst. The carrier gas containing the combustion product from the combustion tube flows through an inorganic carbon reactor vessel and is then sent through a halogen scrubber into a sample cell set in a non-dispersive infrared gas analyzer (NDIR) where carbon dioxide is detected. For total inorganic carbon and dissolved inorganic carbon, the sample is injected into an IC reactor vessel where only the IC component is decomposed to become carbon dioxide.

The peak area generated by the NDIR indicates the TC/TDC or TIC/DIC as applicable. The total organic carbon content of the sample is calculated by subtracting the TIC from the TC.

TOC = TC-TIC, DOC = TDC-DIC, Particulate = Total - Dissolved.

C-TOT-ORG-LOW-CL Water Total Organic Carbon APHA 5310 TOTAL ORGANIC CARBON (TOC)

This method is applicable to the analysis of ground water, wastewater, and surface water samples. The form detected depends upon sample pretreatment: Unfiltered sample = TC, 0.45um filtered = TDC. Samples are injected into a combustion tube containing an oxidation catalyst. The carrier gas containing the combustion product from the combustion tube flows through an inorganic carbon reactor vessel and is then sent through a halogen scrubber into a sample cell set in a non-dispersive infrared gas analyzer (NDIR) where carbon dioxide is detected. For total inorganic carbon and dissolved inorganic carbon, the sample is injected into an IC reactor vessel where only the IC component is decomposed to become carbon dioxide.

The peak area generated by the NDIR indicates the TC/TDC or TIC/DIC as applicable. The total organic carbon content of the sample is calculated by subtracting the TIC from the TC.

TOC = TC-TIC, DOC = TDC-DIC, Particulate = Total - Dissolved.

CL-IC-N-CL Water Chloride in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

EC-L-PCT-CL Water Electrical Conductivity (EC) APHA 2510B

Conductivity, also known as Electrical Conductivity (EC) or Specific Conductance, is measured by immersion of a conductivity cell with platinum electrodes into a water sample. Conductivity measurements are temperature-compensated to 25C.

F-IC-N-CL Water Fluoride in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

HARDNESS-CALC-VA Water Hardness APHA 2340B

Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

HG-D-CVAA-VA Water Diss. Mercury in Water by CVAAS or CVAFS APHA 3030B/EPA 1631E (mod)

Water samples are filtered (0.45 um), preserved with hydrochloric acid, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

LINE CREEK OPERATION L2386569 CONTD....

**Reference Information** 

PAGE 8 of 9 Version: FINAL

**Test Method References:** 

**ALS Test Code** Matrix Method Reference\*\* **Test Description** 

HG-T-CVAA-VA Water Total Mercury in Water by CVAAS or CVAFS EPA 1631E (mod)

Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

**IONBALANCE-BC-CL** Water Ion Balance Calculation **APHA 1030E** 

Cation Sum, Anion Sum, and Ion Balance (as % difference) are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Because all agueous solutions are electrically neutral, the calculated ion balance (% difference of cations minus anions) should be near-zero.

Cation and Anion Sums are the total meg/L concentration of major cations and anions. Dissolved species are used where available. Minor ions are included where data is present. Ion Balance is calculated as:

Ion Balance (%) = [Cation Sum-Anion Sum] / [Cation Sum+Anion Sum]

MET-D-CCMS-VA Water Dissolved Metals in Water by CRC ICPMS APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

MET-T-CCMS-VA Water Total Metals in Water by CRC ICPMS EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

NH3-L-F-CL Water Ammonia, Total (as N) J. ENVIRON. MONIT., 2005, 7, 37-42, RSC

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et

NO2-L-IC-N-CL Water Nitrite in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

NO3-L-IC-N-CL Water Nitrate in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

ORP-CL Water Oxidation redution potential by elect. **ASTM D1498** 

This analysis is carried out in accordance with the procedure described in the "ASTM" method D1498 "Oxidation-Reduction Potential of Water" published by the American Society for Testing and Materials (ASTM). Results are reported as observed oxidation-reduction potential of the platinum metal-reference electrode employed, in mV.

It is recommended that this analysis be conducted in the field.

P-T-L-COL-CL Phosphorus (P)-Total APHA 4500-P PHOSPHORUS Water

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after persulphate digestion of the sample.

APHA 4500 H-Electrode

pH is determined in the laboratory using a pH electrode. All samples analyzed by this method for pH will have exceeded the 15 minute recommended hold time from time of sampling (field analysis is recommended for pH where highly accurate results are needed)

PO4-DO-L-COL-CL Water Orthophosphate-Dissolved (as P) APHA 4500-P PHOSPHORUS

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.

SO4-IC-N-CI Sulfate in Water by IC EPA 300.1 (mod) Water

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

APHA 2540 C SOLIDS-TDS-CL **Total Dissolved Solids** 

A well-mixed sample is filtered through a glass fibre filter paper. The filtrate is then evaporated to dryness in a pre-weighed vial and dried at 180 – 2 °C. The increase in vial weight represents the total dissolved solids (TDS).

**APHA 1030E** Ion Balance Calculation

Cation Sum, Anion Sum, and Ion Balance (as % difference) are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Because all aqueous solutions are electrically neutral, the calculated ion balance (% difference of cations minus anions) should be near-zero.

#### LINE CREEK OPERATION L2386569 CONTD....

**Reference Information** 

PAGE 9 of 9 Version: FINAL

**Test Method References:** 

**ALS Test Code** Matrix Method Reference\*\* **Test Description** 

Cation and Anion Sums are the total meg/L concentration of major cations and anions. Dissolved species are used where available. Minor ions are included where data is present. Ion Balance is calculated as:

Ion Balance (%) = [Cation Sum-Anion Sum] / [Cation Sum+Anion Sum]

TKN-L-F-CL Total Kjeldahl Nitrogen APHA 4500-NORG (TKN) Water

This analysis is carried out using procedures adapted from APHA Method 4500-Norg D. "Block Digestion and Flow Injection Analysis". Total Kjeldahl

Nitrogen is determined using block digestion followed by Flow-injection analysis with fluorescence detection. **Total Suspended Solids** 

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total suspended solids (TSS) are determined by filtering a sample through a glass fibre filter, and by drying the filter at 104 deg. C.

APHA 2540 D-Gravimetric

**TURBIDITY-CL** APHA 2130 B-Nephelometer Water **Turbidity** 

This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.

\*\* ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

<b>Laboratory Definition Code</b>	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA
CL	ALS ENVIRONMENTAL - CALGARY, ALBERTA, CANADA

#### **Chain of Custody Numbers:**

20191121ERXPIZP1104

### **GLOSSARY OF REPORT TERMS**

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.

mg/kg - milligrams per kilogram based on dry weight of sample

mg/kg wwt - milligrams per kilogram based on wet weight of sample

mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight

mg/L - unit of concentration based on volume, parts per million.

< - Less than.

D.L. - The reporting limit.

N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory. UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.



Workorder: L2386569

Report Date: 27-NOV-19

Page 1 of 12

Client: TECK Co

TECK COAL LIMITED (LINE CREEK) Box 2003 15km North Hwy 43

Sparwood BC V0B 2G0

Contact: Carla Froyman Parker

Test	Matrix	Reference	Result Qualifier	Units	RPD	Limit	Analyzed
ACIDITY-PCT-CL	Water						
Batch R4920946							
WG3225969-6 DUP Acidity (as CaCO3)		<b>L2386569-2</b> 19.5	17.8	mg/L	9.0	20	22-NOV-19
WG3225969-5 LCS Acidity (as CaCO3)			107.0	%		85-115	22-NOV-19
<b>WG3225969-4 MB</b> Acidity (as CaCO3)			1.3	mg/L		2	22-NOV-19
ALK-MAN-CL	Water						
Batch R4920806							
WG3225900-8 LCS Alkalinity, Total (as CaC	CO3)		97.2	%		85-115	22-NOV-19
<b>WG3225900-7 MB</b> Alkalinity, Total (as CaC	O3)		<1.0	mg/L		1	22-NOV-19
BE-D-L-CCMS-VA	Water						
Batch R4924069							
WG3227958-2 LCS Beryllium (Be)-Dissolve	d		87.0	%		80-120	26-NOV-19
WG3227958-1 MB Beryllium (Be)-Dissolve	d	NP	<0.000020	mg/L		0.00002	26-NOV-19
BE-T-L-CCMS-VA	Water						
Batch R4922859							
WG3227401-3 DUP Beryllium (Be)-Total		<b>L2386569-1</b> 0.000021	0.000023	mg/L	9.6	20	25-NOV-19
WG3227401-2 LCS Beryllium (Be)-Total			89.9	%		80-120	25-NOV-19
WG3227401-1 MB Beryllium (Be)-Total			<0.000020	mg/L		0.00002	25-NOV-19
Batch R4925150							
WG3227401-4 MS Beryllium (Be)-Total		L2386569-2	90.3	%		70-130	26-NOV-19
BR-L-IC-N-CL	Water						
Batch R4921956							
WG3226696-2 LCS Bromide (Br)			106.5	%		85-115	22-NOV-19
WG3226696-1 MB Bromide (Br)			<0.050	mg/L		0.05	22-NOV-19



Workorder: L2386569

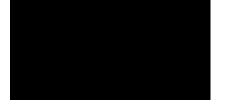
Report Date: 27-NOV-19 Page 2 of 12

% mg/L %		90-110 0.5	22-NOV-19 22-NOV-19
mg/L			
·		0.5	22-NOV-19
%			
%			
		90-110	22-NOV-19
uS/cm		2	22-NOV-19
%		00 110	22-NOV-19
mg/L		0.02	22-NOV-19 22-NOV-19
ι mg/L	N/A	20	26-NOV-19
%		80-120	26-NOV-19
mg/L		0.000005	26-NOV-19
%		70-130	26-NOV-19
%		80-120	26-NOV-19
mg/L		0.000005	26-NOV-19
%		80-120	26-NOV-19
%			26-NOV-19
	% mg/L % mg/L % mg/L %	% mg/L  Mmg/L  Mmg/L  Mmg/L  Mmg/L  Mmg/L  Mmg/L  Mmg/L	% 90-110 mg/L 0.02  M mg/L N/A 20 % 80-120 mg/L 0.000005 % 70-130  % 80-120 mg/L 0.000005



Workorder: L2386569 Report Date: 27-NOV-19 Page 3 of 12

Test Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA Water							
Batch R4924069							
WG3227958-2 LCS							
Arsenic (As)-Dissolved		102.2		%		80-120	26-NOV-19
Barium (Ba)-Dissolved		99.6		%		80-120	26-NOV-19
Bismuth (Bi)-Dissolved		97.8		%		80-120	26-NOV-19
Boron (B)-Dissolved		94.8		%		80-120	26-NOV-19
Cadmium (Cd)-Dissolved		97.8		%		80-120	26-NOV-19
Calcium (Ca)-Dissolved		97.0		%		80-120	26-NOV-19
Chromium (Cr)-Dissolved		99.6		%		80-120	26-NOV-19
Cobalt (Co)-Dissolved		97.6		%		80-120	26-NOV-19
Copper (Cu)-Dissolved		96.3		%		80-120	26-NOV-19
Iron (Fe)-Dissolved		98.5		%		80-120	26-NOV-19
Lead (Pb)-Dissolved		99.2		%		80-120	26-NOV-19
Lithium (Li)-Dissolved		88.3		%		80-120	26-NOV-19
Magnesium (Mg)-Dissolved		93.0		%		80-120	26-NOV-19
Manganese (Mn)-Dissolved		103.2		%		80-120	26-NOV-19
Molybdenum (Mo)-Dissolved		102.2		%		80-120	26-NOV-19
Nickel (Ni)-Dissolved		96.0		%		80-120	26-NOV-19
Potassium (K)-Dissolved		102.4		%		80-120	26-NOV-19
Selenium (Se)-Dissolved		100.2		%		80-120	26-NOV-19
Silicon (Si)-Dissolved		102.1		%		60-140	26-NOV-19
Silver (Ag)-Dissolved		95.7		%		80-120	26-NOV-19
Sodium (Na)-Dissolved		101.4		%		80-120	26-NOV-19
Strontium (Sr)-Dissolved		97.3		%		80-120	26-NOV-19
Thallium (TI)-Dissolved		97.5		%		80-120	26-NOV-19
Tin (Sn)-Dissolved		98.5		%		80-120	26-NOV-19
Titanium (Ti)-Dissolved		97.0		%		80-120	26-NOV-19
Uranium (U)-Dissolved		99.4		%		80-120	26-NOV-19
Vanadium (V)-Dissolved		100.8		%		80-120	26-NOV-19
Zinc (Zn)-Dissolved		99.9		%		80-120	26-NOV-19
WG3227958-1 MB Aluminum (Al)-Dissolved	NP	<0.0010		mg/L		0.001	26-NOV-19
Antimony (Sb)-Dissolved		<0.00010		mg/L		0.0001	26-NOV-19
Arsenic (As)-Dissolved		<0.00010		mg/L		0.0001	26-NOV-19
Barium (Ba)-Dissolved		<0.00010		mg/L		0.0001	26-NOV-19
Bismuth (Bi)-Dissolved		<0.00010		mg/L		0.0001	20 110 1-13



Workorder: L2386569 Report Date: 27-NOV-19 Page 4 of 12

Test Matri	x Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA Water	er						
Batch R4924069							
WG3227958-1 MB	NP			,,			
Boron (B)-Dissolved		<0.010		mg/L		0.01	26-NOV-19
Cadmium (Cd)-Dissolved		<0.0000050		mg/L		0.000005	26-NOV-19
Calcium (Ca)-Dissolved		<0.050		mg/L		0.05	26-NOV-19
Chromium (Cr)-Dissolved		<0.00010		mg/L		0.0001	26-NOV-19
Cobalt (Co)-Dissolved		<0.00010		mg/L		0.0001	26-NOV-19
Copper (Cu)-Dissolved		<0.00020		mg/L		0.0002	26-NOV-19
Iron (Fe)-Dissolved		<0.010		mg/L		0.01	26-NOV-19
Lead (Pb)-Dissolved		<0.000050		mg/L		0.00005	26-NOV-19
Lithium (Li)-Dissolved		<0.0010		mg/L		0.001	26-NOV-19
Magnesium (Mg)-Dissolved		<0.0050		mg/L		0.005	26-NOV-19
Manganese (Mn)-Dissolved		<0.00010		mg/L		0.0001	26-NOV-19
Molybdenum (Mo)-Dissolved		<0.000050		mg/L		0.00005	26-NOV-19
Nickel (Ni)-Dissolved		<0.00050		mg/L		0.0005	26-NOV-19
Potassium (K)-Dissolved		< 0.050		mg/L		0.05	26-NOV-19
Selenium (Se)-Dissolved		<0.000050		mg/L		0.00005	26-NOV-19
Silicon (Si)-Dissolved		< 0.050		mg/L		0.05	26-NOV-19
Silver (Ag)-Dissolved		<0.000010		mg/L		0.00001	26-NOV-19
Sodium (Na)-Dissolved		<0.050		mg/L		0.05	26-NOV-19
Strontium (Sr)-Dissolved		<0.00020		mg/L		0.0002	26-NOV-19
Thallium (TI)-Dissolved		<0.000010		mg/L		0.00001	26-NOV-19
Tin (Sn)-Dissolved		<0.00010		mg/L		0.0001	26-NOV-19
Titanium (Ti)-Dissolved		<0.00030		mg/L		0.0003	26-NOV-19
Uranium (U)-Dissolved		<0.000010		mg/L		0.00001	26-NOV-19
Vanadium (V)-Dissolved		<0.00050		mg/L		0.0005	26-NOV-19
Zinc (Zn)-Dissolved		<0.0010		mg/L		0.001	26-NOV-19
MET-T-CCMS-VA Water	er						
Batch R4922859							
WG3227401-3 DUP	L2386569-1			_			
Aluminum (Al)-Total	0.534	0.479		mg/L	11	20	25-NOV-19
Antimony (Sb)-Total	0.00028	0.00026		mg/L	6.6	20	25-NOV-19
Arsenic (As)-Total	0.00051	0.00046		mg/L	9.5	20	25-NOV-19
Barium (Ba)-Total	0.306	0.269		mg/L	13	20	25-NOV-19
Bismuth (Bi)-Total	<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	25-NOV-19
Boron (B)-Total	0.027	0.025		mg/L	4.9	20	25-NOV-19



Workorder: L2386569 Report Date: 27-NOV-19 Page 5 of 12

Test Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-VA	Water							
Batch R4922859								
WG3227401-3 DUP		L2386569-1						
Calcium (Ca)-Total		144	140		mg/L	2.8	20	25-NOV-19
Chromium (Cr)-Total		0.00076	0.00065		mg/L	16	20	25-NOV-19
Cobalt (Co)-Total		0.00030	0.00027		mg/L	8.9	20	25-NOV-19
Copper (Cu)-Total		0.00126	0.00109		mg/L	15	20	25-NOV-19
Iron (Fe)-Total		0.408	0.402		mg/L	1.4	20	25-NOV-19
Lead (Pb)-Total		0.000249	0.000234		mg/L	6.3	20	25-NOV-19
Lithium (Li)-Total		0.0239	0.0226		mg/L	5.4	20	25-NOV-19
Magnesium (Mg)-Total		44.0	39.0		mg/L	12	20	25-NOV-19
Manganese (Mn)-Total		0.0183	0.0158		mg/L	15	20	25-NOV-19
Molybdenum (Mo)-Total		0.00380	0.00368		mg/L	3.3	20	25-NOV-19
Nickel (Ni)-Total		0.00179	0.00166		mg/L	8.0	20	25-NOV-19
Potassium (K)-Total		2.54	2.27		mg/L	11	20	25-NOV-19
Selenium (Se)-Total		0.00279	0.00261		mg/L	6.5	20	25-NOV-19
Silicon (Si)-Total		7.36	7.56		mg/L	2.6	20	25-NOV-19
Silver (Ag)-Total		0.000011	<0.000010	RPD-NA	mg/L	N/A	20	25-NOV-19
Sodium (Na)-Total		11.7	10.4		mg/L	12	20	25-NOV-19
Strontium (Sr)-Total		0.640	0.616		mg/L	3.9	20	25-NOV-19
Thallium (TI)-Total		0.000033	0.000033		mg/L	1.1	20	25-NOV-19
Tin (Sn)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	25-NOV-19
Titanium (Ti)-Total		0.012	<0.010	RPD-NA	mg/L	N/A	20	25-NOV-19
Uranium (U)-Total		0.00277	0.00264		mg/L	5.2	20	25-NOV-19
Vanadium (V)-Total		0.00151	0.00128		mg/L	17	20	25-NOV-19
Zinc (Zn)-Total		0.0045	0.0040		mg/L	13	20	25-NOV-19
WG3227401-2 LCS			00.0		0/			
Aluminum (Al)-Total			99.0		%		80-120	25-NOV-19
Antimony (Sb)-Total			95.9		%		80-120	25-NOV-19
Arsenic (As)-Total			100.1		%		80-120	25-NOV-19
Barium (Ba)-Total			97.6		%		80-120	25-NOV-19
Bismuth (Bi)-Total			97.9		%		80-120	25-NOV-19
Boron (B)-Total			94.2		%		80-120	25-NOV-19
Cadmium (Cd)-Total			98.2		%		80-120	25-NOV-19
Calcium (Ca)-Total			102.0		%		80-120	25-NOV-19
Chromium (Cr)-Total			101.2		%		80-120	25-NOV-19
Cobalt (Co)-Total			99.98		%		80-120	25-NOV-19



Workorder: L2386569

Report Date: 27-NOV-19

Page 6 of 12

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-VA	Water							
Batch R4922859								
WG3227401-2 LCS								
Copper (Cu)-Total			95.9		%		80-120	25-NOV-19
Iron (Fe)-Total			94.1		%		80-120	25-NOV-19
Lead (Pb)-Total			94.5		%		80-120	25-NOV-19
Lithium (Li)-Total			99.1		%		80-120	25-NOV-19
Magnesium (Mg)-Total			96.7		%		80-120	25-NOV-19
Manganese (Mn)-Total			103.4		%		80-120	25-NOV-19
Molybdenum (Mo)-Total			94.2		%		80-120	25-NOV-19
Nickel (Ni)-Total			98.5		%		80-120	25-NOV-19
Potassium (K)-Total			98.8		%		80-120	25-NOV-19
Selenium (Se)-Total			100.3		%		80-120	25-NOV-19
Silicon (Si)-Total			101.4		%		80-120	25-NOV-19
Silver (Ag)-Total			91.0		%		80-120	25-NOV-19
Sodium (Na)-Total			103.5		%		80-120	25-NOV-19
Strontium (Sr)-Total			94.8		%		80-120	25-NOV-19
Thallium (TI)-Total			94.5		%		80-120	25-NOV-19
Tin (Sn)-Total			92.3		%		80-120	25-NOV-19
Titanium (Ti)-Total			97.3		%		80-120	25-NOV-19
Uranium (U)-Total			96.1		%		80-120	25-NOV-19
Vanadium (V)-Total			101.4		%		80-120	25-NOV-19
Zinc (Zn)-Total			96.2		%		80-120	25-NOV-19
WG3227401-1 MB								
Aluminum (AI)-Total			<0.0030		mg/L		0.003	25-NOV-19
Antimony (Sb)-Total			<0.00010		mg/L		0.0001	25-NOV-19
Arsenic (As)-Total			<0.00010		mg/L		0.0001	25-NOV-19
Barium (Ba)-Total			<0.00010		mg/L		0.0001	25-NOV-19
Bismuth (Bi)-Total			<0.000050	)	mg/L		0.00005	25-NOV-19
Boron (B)-Total			<0.010		mg/L		0.01	25-NOV-19
Cadmium (Cd)-Total			<0.000005	5C	mg/L		0.000005	25-NOV-19
Calcium (Ca)-Total			< 0.050		mg/L		0.05	25-NOV-19
Chromium (Cr)-Total			<0.00010		mg/L		0.0001	25-NOV-19
Cobalt (Co)-Total			<0.00010		mg/L		0.0001	25-NOV-19
Copper (Cu)-Total			<0.00050		mg/L		0.0005	25-NOV-19
Iron (Fe)-Total			<0.010		mg/L		0.01	25-NOV-19
Lead (Pb)-Total			<0.000050	)	mg/L		0.00005	25-NOV-19



Workorder: L2386569

Report Date: 27-NOV-19 Page 7 of 12

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-VA	Water							
Batch R4922859 WG3227401-1 MB								
Lithium (Li)-Total			<0.0010		mg/L		0.001	25-NOV-19
Magnesium (Mg)-Total			<0.0050		mg/L		0.005	25-NOV-19
Manganese (Mn)-Total			<0.00010		mg/L		0.0001	25-NOV-19
Molybdenum (Mo)-Tota	l		<0.000050	)	mg/L		0.00005	25-NOV-19
Nickel (Ni)-Total			<0.00050		mg/L		0.0005	25-NOV-19
Potassium (K)-Total			<0.050		mg/L		0.05	25-NOV-19
Selenium (Se)-Total			<0.000050	)	mg/L		0.00005	25-NOV-19
Silicon (Si)-Total			<0.10		mg/L		0.1	25-NOV-19
Silver (Ag)-Total			<0.000010	)	mg/L		0.00001	25-NOV-19
Sodium (Na)-Total			< 0.050		mg/L		0.05	25-NOV-19
Strontium (Sr)-Total			<0.00020		mg/L		0.0002	25-NOV-19
Thallium (TI)-Total			<0.000010	)	mg/L		0.00001	25-NOV-19
Tin (Sn)-Total			<0.00010		mg/L		0.0001	25-NOV-19
Titanium (Ti)-Total			<0.00030		mg/L		0.0003	25-NOV-19
Uranium (U)-Total			<0.000010	)	mg/L		0.00001	25-NOV-19
Vanadium (V)-Total			<0.00050		mg/L		0.0005	25-NOV-19
Zinc (Zn)-Total			<0.0030		mg/L		0.003	25-NOV-19
Batch R4925150								
WG3227401-4 MS		L2386569-2	N1/A	MC D	0/			
Aluminum (Al)-Total			N/A	MS-B	%		=	26-NOV-19
Antimony (Sb)-Total			95.1		%		70-130	26-NOV-19
Arsenic (As)-Total			93.9		%		70-130	26-NOV-19
Barium (Ba)-Total			N/A	MS-B	%		-	26-NOV-19
Bismuth (Bi)-Total			86.2		%		70-130	26-NOV-19
Boron (B)-Total			90.1		%		70-130	26-NOV-19
Cadmium (Cd)-Total			93.9		%		70-130	26-NOV-19
Calcium (Ca)-Total			N/A	MS-B	%		-	26-NOV-19
Chromium (Cr)-Total			95.5		%		70-130	26-NOV-19
Cobalt (Co)-Total			89.9		%		70-130	26-NOV-19
Copper (Cu)-Total			N/A	MS-B	%		-	26-NOV-19
Iron (Fe)-Total			N/A	MS-B	%		-	26-NOV-19
Lead (Pb)-Total			87.2		%		70-130	26-NOV-19
Lithium (Li)-Total			87.5		%		70-130	26-NOV-19
Magnesium (Mg)-Total			N/A	MS-B	%		-	26-NOV-19



Workorder: L2386569

Report Date: 27-NOV-19

Page 8 of 12

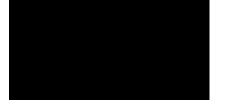
Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-VA	Water							
Batch R4925150								
WG3227401-4 MS		L2386569-2						
Manganese (Mn)-Total			N/A	MS-B	%		-	26-NOV-19
Molybdenum (Mo)-Total			95.0		%		70-130	26-NOV-19
Nickel (Ni)-Total			90.0		%		70-130	26-NOV-19
Potassium (K)-Total			94.1		%		70-130	26-NOV-19
Selenium (Se)-Total			99.6		%		70-130	26-NOV-19
Silicon (Si)-Total			92.8		%		70-130	26-NOV-19
Silver (Ag)-Total			96.5		%		70-130	26-NOV-19
Sodium (Na)-Total			N/A	MS-B	%		-	26-NOV-19
Strontium (Sr)-Total			N/A	MS-B	%		-	26-NOV-19
Thallium (TI)-Total			86.8		%		70-130	26-NOV-19
Tin (Sn)-Total			93.1		%		70-130	26-NOV-19
Titanium (Ti)-Total			96.8		%		70-130	26-NOV-19
Uranium (U)-Total			89.5		%		70-130	26-NOV-19
Vanadium (V)-Total			96.1		%		70-130	26-NOV-19
Zinc (Zn)-Total			87.0		%		70-130	26-NOV-19
NH3-L-F-CL	Water							
Batch R4922870								
WG3226751-6 LCS Ammonia as N			100.7		%		85-115	23-NOV-19
WG3226751-5 MB Ammonia as N			<0.0050		mg/L		0.005	23-NOV-19
NO2-L-IC-N-CL	Water							
Batch R4921956								
WG3226696-2 LCS								
Nitrite (as N)			102.6		%		90-110	22-NOV-19
WG3226696-1 MB								
Nitrite (as N)			<0.0010		mg/L		0.001	22-NOV-19
NO3-L-IC-N-CL	Water							
Batch R4921956								
WG3226696-2 LCS Nitrate (as N)			101.1		%		90-110	22-NOV-19
WG3226696-1 MB Nitrate (as N)			<0.0050		mg/L		0.005	22-NOV-19
ORP-CL	Water							



Workorder: L2386569

Report Date: 27-NOV-19 Page 9 of 12

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
ORP-CL	Water							
<b>Batch R4921776 WG3226063-7 CRM</b> ORP		CL-ORP	225		mV		210-230	22-NOV-19
P-T-L-COL-CL	Water							
Batch R4922111 WG3226900-6 LCS Phosphorus (P)-Total			96.5		%		80-120	24-NOV-19
WG3226900-5 MB Phosphorus (P)-Total			<0.0020		mg/L		0.002	24-NOV-19
PH-CL	Water							
<b>Batch R4920806</b> <b>WG3225900-8 LCS</b> pH			7.01		рН		6.9-7.1	22-NOV-19
PO4-DO-L-COL-CL	Water							
Batch R4921606 WG3226122-2 LCS Orthophosphate-Dissolve	ed (as P)		110.0		%		80-120	22-NOV-19
WG3226122-1 MB Orthophosphate-Dissolve			<0.0010		mg/L		0.001	22-NOV-19
SO4-IC-N-CL	Water							
Batch R4921956 WG3226696-2 LCS			100.0		07			
Sulfate (SO4)  WG3226696-1 MB  Sulfate (SO4)			106.6		% mg/L		90-110	22-NOV-19
SOLIDS-TDS-CL	Water		<0.30		mg/L		0.3	22-NOV-19
Batch R4922588 WG3225678-5 LCS	Water							
Total Dissolved Solids			96.6		%		85-115	22-NOV-19
WG3225678-4 MB Total Dissolved Solids			<10		mg/L		10	22-NOV-19
TKN-L-F-CL	Water							
Batch R4922734 WG3227635-3 DUP Total Kjeldahl Nitrogen WG3227635-2 LCS		<b>L2386569-2</b> 0.206	0.184		mg/L	11	20	26-NOV-19



Workorder: L2386569

Report Date: 27-NOV-19 Page 10 of 12

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
TKN-L-F-CL	Water							
Batch R4922734 WG3227635-2 LCS								
Total Kjeldahl Nitrogen			107.2		%		75-125	25-NOV-19
<b>WG3227635-1 MB</b> Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	25-NOV-19
WG3227635-4 MS Total Kjeldahl Nitrogen		L2386569-2	114.7		%		70-130	26-NOV-19
TSS-L-CL	Water							
Batch R4921505								
WG3225798-5 LCS Total Suspended Solids			96.6		%		85-115	22-NOV-19
WG3225798-4 MB Total Suspended Solids			<1.0		mg/L		1	22-NOV-19
TURBIDITY-CL	Water							
Batch R4921777								
WG3226388-2 LCS Turbidity			95.0		%		85-115	22-NOV-19
WG3226388-1 MB Turbidity			<0.10		NTU		0.1	22-NOV-19

Workorder: L2386569 Report Date: 27-NOV-19 Page 11 of 12

Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Description Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard

### **Sample Parameter Qualifier Definitions:**

LCSD Laboratory Control Sample Duplicate

Qualifier	Description
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

Workorder: L2386569 Report Date: 27-NOV-19 Page 12 of 12

#### **Hold Time Exceedances:**

ALS Product Description	Sample ID	Sampling Date	Date Processed	Rec. HT	Actual HT	Units	Qualifier
Oxidation redution potentia	al by elect.						
	1	20-NOV-19 14:10	22-NOV-19 17:50	0.25	52	hours	EHTR-FM
	2	21-NOV-19 11:48	22-NOV-19 17:50	0.25	30	hours	EHTR-FM
рН							
	1	20-NOV-19 14:10	22-NOV-19 14:00	0.25	48	hours	EHTR-FM
	2	21-NOV-19 11:48	22-NOV-19 14:00	0.25	26	hours	EHTR-FM

### Legend & Qualifier Definitions:

EHTR-FM: Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended.

EHTR: Exceeded ALS recommended hold time prior to sample receipt.

EHTL: Exceeded ALS recommended hold time prior to analysis. Sample was received less than 24 hours prior to expiry.

EHT: Exceeded ALS recommended hold time prior to analysis.

Rec. HT: ALS recommended hold time (see units).

#### Notes\*:

Where actual sampling date is not provided to ALS, the date (& time) of receipt is used for calculation purposes. Where actual sampling time is not provided to ALS, the earlier of 12 noon on the sampling date or the time (& date) of receipt is used for calculation purposes. Samples for L2386569 were received on 22-NOV-19 09:00.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against predetermined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

Teck 20191121 ERX PIZP1104 RUSH: COC ID: TURNAROUND TIME: PROJECT/CLIENT INFO OTHER INFO LABORATORY Lab Name ALS Calgary PDF EDD Facility Name / Joh# Line Creek Operation Excel Report Format / Distribution Project Manager Carla Froyman Parker Lab Contact Lyudmyla Shvets Email 1: carla,froymanparker@teck.com Email Lyudmyla.Shvets@ALSGlobal.com Email Carta FroymanParker@teck.com Email 2: leckcoal@equisonline.con Address 2559 29 Street NE Address Box 2003 Email 3: drake.tymstra@teck.com 154399 **x**33330 15km North Hwy 43 Email 4: kirsten.campbell@teck.com BCCity Calgary Sparwood Province AB Email 5: ennedv.allen@teck.com Province City EPO00688129 V0B 2G0 Canada Postal Code TIY 7B5 Postal Code Country Country Canada PO number Phone Number 403 407 1794 Phone Number 250-425-3196 SAMPLEADETAILS ANALYSIS REQUESTED Faltered - F: Field, L.: Lab. FL: Field & Lab, N: None Hazardous Material (Yes/No) ALS\_Package-TKN/TOC FECKCOAL-ROUTINE TECKCOAL-MET-T-VA TECKCOAL-MET-D-VA HG-T-U-CVAF-VA HG-D-CVAF-VA HG-T-CVAF-VA Sample Location Field Time G=Grab #Of Matrix Date (24hr) C=Comp Cont. (sys loc code) Sample ID A.4 LC\_ERX WG 11/20/2019 1 1 1 14:10 8 LC ERX WG 2019 2012\_NP G Mary Com LC PIZP1304 WG 11/21/2019 11:48 G 6 1 1 LC PIZP1104 WG Q4-2019 NP endale. \*\* RELINQUISHED BY/AFFILIATION DATE/TIME ACCEPTED BY/AFFILIATION D.Tymstra/K.Campbell 21-Nov क्षात्रक विकास SERVICE REQUEST (rush - subject to availability

K. Campbell/D. Tymstra

Mobile #

Date/Time

November 21, 2019

Regular (default) X

Priority (2-3 business days) - 50% surcharge Emergency (1 Business Day) - 100% surcharge

For Emergency <1 Day, ASAP or Weekend - Contact ALS

Sampler's Name

Sampler's Signature



TECK COAL LIMITED (LINE CREEK)

ATTN: Carla Froyman Parker Box 2003 15km North Hwy 43

Sparwood BC VOB 2G0

Date Received: 17-DEC-19

Report Date: 24-DEC-19 14:43 (MT)

Version: FINAL

Client Phone: 250-425-3196

# Certificate of Analysis

Lab Work Order #: L2397341
Project P.O. #: VP000608129

Job Reference: LINE CREEK OPERATIONS

C of C Numbers: 20191216 LC GW

Legal Site Desc:



Lyudmyla Shvets, B.Sc. Account Manager

 $[This\ report\ shall\ not\ be\ reproduced\ except\ in\ full\ without\ the\ written\ authority\ of\ the\ Laboratory.]$ 

L2397341 CONTD.... PAGE 2 of 7 Version: FINAL

### ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result Qu	ıalifier* D.L.	Units	Extracted	Analyzed	Batch
L2397341-1 LC_PIZP1101_WG_Q4-2019_N						
Sampled By: KC/DT on 16-DEC-19 @ 12:57						
Matrix: WG						
Miscellaneous Parameters						
Dissolved Organic Carbon	<0.50	0.50	mg/L		21-DEC-19	R4951855
			•			
Total Organia Carbon	0.220	0.050	mg/L		24-DEC-19	R4952977
Total Organic Carbon	2.27	0.50	mg/L		21-DEC-19	R4951855
EPH Testing for teck Coal						
EPH (C10-C19) & EPH (C19-C32) EPH10-19	<0.25	0.25	mg/L	20-DEC-19	20-DEC-19	R4950388
EPH19-32	<0.25	0.25	mg/L	20-DEC-19	20-DEC-19	R4950388
Surrogate: 2-Bromobenzotrifluoride	95.0	60-140	//////////////////////////////////////	20-DEC-19	20-DEC-19	R4950388
Sum of EPH (10-32)	30.0	00 140	70	20 020 10	20 020 10	11400000
EPH (C10-C32)	<0.50	0.50	mg/L		20-DEC-19	
TEH (C10-C30)			Ü			
TEH (C10-C30)	<0.25	0.25	mg/L	20-DEC-19	20-DEC-19	R4950388
Surrogate: 2-Bromobenzotrifluoride	95.0	60-140	%	20-DEC-19	20-DEC-19	R4950388
Dissolved Metals in Water						
Diss. Be (low) in Water by CRC ICPMS						
Beryllium (Be)-Dissolved	<0.020	0.020	ug/L	19-DEC-19	20-DEC-19	R4950133
Dissolved Metals Filtration Location	FIELD				19-DEC-19	R4946314
Diss. Mercury in Water by CVAAS or CVAFS						
Mercury (Hg)-Dissolved	<0.000050	0.0000050	mg/L	19-DEC-19	20-DEC-19	R4949181
Dissolved Mercury Filtration Location	FIELD				19-DEC-19	R4946321
Dissolved Metals in Water by CRC ICPMS	EIEL D				40 050 40	D 40 400 4 4
Dissolved Metals Filtration Location	FIELD	0.000		40.050.40	19-DEC-19	R4946314
Aluminum (Al)-Dissolved	0.0072	0.0030	mg/L	19-DEC-19	20-DEC-19	R4950133
Antimony (Sb)-Dissolved	<0.00010	0.00010	mg/L	19-DEC-19	20-DEC-19	R4950133
Arsenic (As)-Dissolved	0.00111	0.00010	mg/L	19-DEC-19	20-DEC-19	R4950133
Barium (Ba)-Dissolved	0.434	0.00010	mg/L	19-DEC-19	20-DEC-19	R4950133
Bismuth (Bi)-Dissolved Boron (B)-Dissolved	<0.000050 0.023	0.000050	mg/L	19-DEC-19 19-DEC-19	20-DEC-19 20-DEC-19	R4950133
Cadmium (Cd)-Dissolved	0.023	0.010 0.0050	mg/L ug/L	19-DEC-19	20-DEC-19 20-DEC-19	R4950133 R4950133
Calcium (Ca)-Dissolved	28.6	0.0050	mg/L	19-DEC-19	20-DEC-19 20-DEC-19	R4950133
Chromium (Cr)-Dissolved	<0.00010	0.00010	mg/L	19-DEC-19	20-DEC-19 20-DEC-19	R4950133
Cobalt (Co)-Dissolved	0.24	0.00010	ug/L	19-DEC-19	20-DEC-19 20-DEC-19	R4950133
Copper (Cu)-Dissolved	0.00161	0.00020	mg/L	19-DEC-19	20-DEC-19	R4950133
Iron (Fe)-Dissolved	0.148	0.0020	mg/L	19-DEC-19	20-DEC-19 20-DEC-19	R4950133
Lead (Pb)-Dissolved	<0.000050	0.000050	mg/L	19-DEC-19	20-DEC-19	R4950133
Lithium (Li)-Dissolved	0.0105	0.0010	mg/L	19-DEC-19	20-DEC-19	R4950133
Magnesium (Mg)-Dissolved	14.5	0.10	mg/L	19-DEC-19	20-DEC-19	R4950133
Manganese (Mn)-Dissolved	0.246	0.00010	mg/L	19-DEC-19	20-DEC-19	R4950133
Molybdenum (Mo)-Dissolved	0.00984	0.000050	mg/L	19-DEC-19	20-DEC-19	R4950133
Nickel (Ni)-Dissolved	<0.00050	0.00050	mg/L	19-DEC-19	20-DEC-19	R4950133
Potassium (K)-Dissolved	0.849	0.050	mg/L	19-DEC-19	20-DEC-19	R4950133
Selenium (Se)-Dissolved	<0.050	0.050	ug/L	19-DEC-19	20-DEC-19	R4950133
Silicon (Si)-Dissolved	4.02	0.050	mg/L	19-DEC-19	20-DEC-19	R4950133
Silver (Ag)-Dissolved	<0.000010	0.000010	mg/L	19-DEC-19	20-DEC-19	R4950133
Sodium (Na)-Dissolved	19.5	0.050	mg/L	19-DEC-19	20-DEC-19	R4950133
Strontium (Sr)-Dissolved	0.206	0.00020	mg/L	19-DEC-19	20-DEC-19	R4950133
Thallium (TI)-Dissolved	<0.00010	0.000010	mg/L	19-DEC-19	20-DEC-19	R4950133
Tin (Sn)-Dissolved	0.00018	0.00010	mg/L	19-DEC-19	20-DEC-19	R4950133
Titanium (Ti)-Dissolved	<0.010	0.010	mg/L	19-DEC-19	20-DEC-19	R4950133
Uranium (U)-Dissolved	0.00174	0.000010	mg/L	19-DEC-19	20-DEC-19	R4950133

<sup>\*</sup> Refer to Referenced Information for Qualifiers (if any) and Methodology.

L2397341 CONTD.... PAGE 3 of 7 Version: FINAL

### ALS ENVIRONMENTAL ANALYTICAL REPORT

L2397341-1 LC_PIZP1101_WG_Q4-2019_N Sampled By: KC/DT on 16-DEC-19 @ 12:57				1	i .	
Matrix: WG						
Dissolved Metals in Water by CRC ICPMS						
Zinc (Zn)-Dissolved	0.0045	0.0010	mg/L	19-DEC-19	20-DEC-19	R4950133
Hardness			Ü			
Hardness (as CaCO3)	131	0.50	mg/L		20-DEC-19	
Total Metals in Water						
Total Be (Low) in Water by CRC ICPMS Beryllium (Be)-Total	0.058	0.020	ug/L		20-DEC-19	R4950133
Total Mercury in Water by CVAAS or CVAFS Mercury (Hg)-Total	<0.0000050	0.0000050	mg/L		19-DEC-19	R4945995
Total Metals in Water by CRC ICPMS			_			
Aluminum (AI)-Total	1.37	0.0030	mg/L		20-DEC-19	R4950133
Antimony (Sb)-Total	0.00019	0.00010	mg/L		20-DEC-19	R4950133
Arsenic (As)-Total	0.00151	0.00010	mg/L		20-DEC-19	R4950133
Barium (Ba)-Total	0.445	0.00010	mg/L		20-DEC-19	R4950133
Bismuth (Bi)-Total	<0.000050	0.000050	mg/L		20-DEC-19	R4950133
Boron (B)-Total	0.023	0.010	mg/L		20-DEC-19	R4950133
Cadmium (Cd)-Total	0.120	0.0050	ug/L		20-DEC-19	R4950133
Calcium (Ca)-Total	30.3	0.050	mg/L		20-DEC-19	R4950133
Chromium (Cr)-Total	0.00197	0.00010	mg/L		20-DEC-19	R4950133
Cobalt (Co)-Total	0.64	0.10	ug/L		20-DEC-19	R4950133
Copper (Cu)-Total Iron (Fe)-Total	0.00387	0.00050	mg/L		20-DEC-19	R4950133
Lead (Pb)-Total	1.25 0.000723	0.010	mg/L		20-DEC-19 20-DEC-19	R4950133 R4950133
Lithium (Li)-Total	0.000723	0.000050 0.0010	mg/L mg/L		20-DEC-19 20-DEC-19	R4950133
Magnesium (Mg)-Total	15.0	0.0010	mg/L		20-DEC-19 20-DEC-19	R4950133
Manganese (Mn)-Total	0.266	0.00010	mg/L		20-DEC-19	R4950133
Molybdenum (Mo)-Total	0.00946	0.000050	mg/L		20-DEC-19	R4950133
Nickel (Ni)-Total	0.00207	0.00050	mg/L		20-DEC-19	R4950133
Potassium (K)-Total	1.25	0.050	mg/L		20-DEC-19	R4950133
Selenium (Se)-Total	0.304	0.050	ug/L		20-DEC-19	R4950133
Silicon (Si)-Total	6.97	0.10	mg/L		20-DEC-19	R4950133
Silver (Ag)-Total	0.000048	0.000010	mg/L		20-DEC-19	R4950133
Sodium (Na)-Total	18.1	0.050	mg/L		20-DEC-19	R4950133
Strontium (Sr)-Total	0.202	0.00020	mg/L		20-DEC-19	R4950133
Thallium (TI)-Total	0.000061	0.000010	mg/L		20-DEC-19	R4950133
Tin (Sn)-Total	0.00029	0.00010	mg/L		20-DEC-19	R4950133
Titanium (Ti)-Total	0.027	0.010	mg/L		20-DEC-19	R4950133
Uranium (U)-Total	0.00180	0.000010	mg/L		20-DEC-19	R4950133
Vanadium (V)-Total	0.00358	0.00050	mg/L		20-DEC-19	R4950133
Zinc (Zn)-Total	0.0098	0.0030	mg/L		20-DEC-19	R4950133
Routine for Teck Coal						
Acidity by Automatic Titration Acidity (as CaCO3)	2.9	1.0	mg/L		17-DEC-19	R4945439
Alkalinity (Species) by Manual Titration Alkalinity, Bicarbonate (as CaCO3)	172	1.0	mg/L		17-DEC-19	R4946155
Alkalinity, Carbonate (as CaCO3)	<1.0	1.0	mg/L		17-DEC-19	R4946155
Alkalinity, Hydroxide (as CaCO3)	<1.0	1.0	mg/L		17-DEC-19	R4946155
Alkalinity, Total (as CaCO3)	172	1.0	mg/L		17-DEC-19	R4946155
Ammonia, Total (as N) Ammonia as N	0.0182	0.0050	mg/L		22-DEC-19	R4952706
Bromide in Water by IC (Low Level)			-			
Bromide (Br) Chloride in Water by IC	<0.050	0.050	mg/L		17-DEC-19	R4946491

<sup>\*</sup> Refer to Referenced Information for Qualifiers (if any) and Methodology.

L2397341 CONTD.... PAGE 4 of 7 Version: FINAL

### ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2397341-1 LC_PIZP1101_WG_Q4-2019_N							
Sampled By: KC/DT on 16-DEC-19 @ 12:57							
Matrix: WG							
Chloride in Water by IC Chloride (CI)	0.55		0.50	mg/L		17-DEC-19	R4946491
Electrical Conductivity (EC) Conductivity (@ 25C)	291		2.0	uS/cm		17-DEC-19	R4946155
Fluoride in Water by IC Fluoride (F)	1.83		0.020	mg/L		17-DEC-19	R4946491
Ion Balance Calculation Ion Balance	96.6		-100	%		20-DEC-19	
Ion Balance Calculation Cation - Anion Balance	4.7			%		20 DEC 10	
Anion Sum	-1.7			% meg/L		20-DEC-19 20-DEC-19	
Cation Sum	3.63 3.51			meq/L		20-DEC-19 20-DEC-19	
Nitrate in Water by IC (Low Level)	3.51			meq/L		20-DEC-19	
Nitrate (as N)	<0.0050		0.0050	mg/L		17-DEC-19	R4946491
Nitrite in Water by IC (Low Level) Nitrite (as N)	<0.0010		0.0010	mg/L		17-DEC-19	R4946491
Orthophosphate-Dissolved (as P) Orthophosphate-Dissolved (as P)	0.0099		0.0010	mg/L		17-DEC-19	R4944992
Oxidation redution potential by elect. ORP	282		-1000	mV		19-DEC-19	R4948435
Phosphorus (P)-Total Phosphorus (P)-Total	0.0610		0.0020	mg/L		18-DEC-19	R4945457
Sulfate in Water by IC Sulfate (SO4)	3.88		0.30	mg/L		17-DEC-19	R4946491
<b>Total Dissolved Solids</b> Total Dissolved Solids	183	DLHC	20	mg/L		20-DEC-19	R4953146
<b>Total Suspended Solids</b> Total Suspended Solids	30.1		1.0	mg/L		20-DEC-19	R4953177
<b>Turbidity</b> Turbidity	55.4		0.10	NTU		17-DEC-19	R4945760
<b>pH</b> pH	8.06		0.10	рН		17-DEC-19	R4946155

<sup>\*</sup> Refer to Referenced Information for Qualifiers (if any) and Methodology.

Reference Information

PAGE 5 of 7 Version: FINAL

Sample Parameter Qualifier Key:

Qualifier	Description
DLHC	Detection Limit Raised: Dilution required due to high concentration of test analyte(s).
MB-LOR	Method Blank exceeds ALS DQO. Limits of Reporting have been adjusted for samples with positive hits below 5x blank level.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.

#### **Test Method References:**

Test metriod References.								
ALS Test Code	Matrix	Test Description	Method Reference**					
ACIDITY-PCT-CL	Water	Acidity by Automatic Titration	APHA 2310 Acidity					

This analysis is carried out using procedures adapted from APHA Method 2310 "Acidity". Acidity is determined by potentiometric titration to a specified endpoint.

ALK-MAN-CL Water Alkalinity (Species) by Manual Titration APHA 2320 ALKALINITY

This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.

BE-D-L-CCMS-VA Water Diss. Be (low) in Water by CRC ICPMS APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

BE-T-L-CCMS-VA Water Total Be (Low) in Water by CRC ICPMS EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

BR-L-IC-N-CL Water Bromide in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

C-DIS-ORG-LOW-CL Water Dissolved Organic Carbon APHA 5310 B-Instrumental

This method is applicable to the analysis of ground water, wastewater, and surface water samples. The form detected depends upon sample pretreatment: Unfiltered sample = TC, 0.45um filtered = TDC. Samples are injected into a combustion tube containing an oxidation catalyst. The carrier gas containing the combustion product from the combustion tube flows through an inorganic carbon reactor vessel and is then sent through a halogen scrubber into a sample cell set in a non-dispersive infrared gas analyzer (NDIR) where carbon dioxide is detected. For total inorganic carbon and dissolved inorganic carbon, the sample is injected into an IC reactor vessel where only the IC component is decomposed to become carbon dioxide.

The peak area generated by the NDIR indicates the TC/TDC or TIC/DIC as applicable. The total organic carbon content of the sample is calculated by subtracting the TIC from the TC.

TOC = TC-TIC, DOC = TDC-DIC, Particulate = Total - Dissolved.

C-TOT-ORG-LOW-CL Water Total Organic Carbon APHA 5310 TOTAL ORGANIC CARBON (TOC)

This method is applicable to the analysis of ground water, wastewater, and surface water samples. The form detected depends upon sample pretreatment: Unfiltered sample = TC, 0.45um filtered = TDC. Samples are injected into a combustion tube containing an oxidation catalyst. The carrier gas containing the combustion product from the combustion tube flows through an inorganic carbon reactor vessel and is then sent through a halogen scrubber into a sample cell set in a non-dispersive infrared gas analyzer (NDIR) where carbon dioxide is detected. For total inorganic carbon and dissolved inorganic carbon, the sample is injected into an IC reactor vessel where only the IC component is decomposed to become carbon dioxide.

The peak area generated by the NDIR indicates the TC/TDC or TIC/DIC as applicable. The total organic carbon content of the sample is calculated by subtracting the TIC from the TC.

TOC = TC-TIC, DOC = TDC-DIC, Particulate = Total - Dissolved.

CL-IC-N-CL Water Chloride in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

EC-L-PCT-CL Water Electrical Conductivity (EC) APHA 2510E

Conductivity, also known as Electrical Conductivity (EC) or Specific Conductance, is measured by immersion of a conductivity cell with platinum electrodes into a water sample. Conductivity measurements are temperature-compensated to 25C.

EPH(10-32)-CALC-CL Water Sum of EPH (10-32) Sum of EPH - Auto Calculated

The sum of EPH(C10-C19) and EPH(C19-C32)

F-IC-N-CL Water Fluoride in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

HARDNESS-CALC-VA Water Hardness APHA 2340B

Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

LINE CREEK OPERATIONS

#### L2397341 CONTD....

PAGE 6 of 7 Version: FINAL

#### **Reference Information**

**Test Method References:** 

ALS Test Code Matrix Test Description Method Reference\*\*

HG-D-CVAA-VA Water Diss. Mercury in Water by CVAAS or CVAFS APHA 3030B/EPA 1631E (mod)

Water samples are filtered (0.45 um), preserved with hydrochloric acid, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

HG-T-CVAA-VA Water Total Mercury in Water by CVAAS or CVAFS EPA 1631E (mod)

Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

IONBALANCE-BC-CL Water Ion Balance Calculation APHA 1030E

Cation Sum, Anion Sum, and Ion Balance (as % difference) are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Because all aqueous solutions are electrically neutral, the calculated ion balance (% difference of cations minus anions) should be near-zero.

Cation and Anion Sums are the total meq/L concentration of major cations and anions. Dissolved species are used where available. Minor ions are included where data is present. Ion Balance is calculated as:

Ion Balance (%) = [Cation Sum-Anion Sum] / [Cation Sum+Anion Sum]

MET-D-CCMS-VA Water Dissolved Metals in Water by CRC ICPMS APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

MET-T-CCMS-VA Water Total Metals in Water by CRC ICPMS EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

NH3-L-F-CL Water Ammonia, Total (as N) J. ENVIRON. MONIT., 2005, 7, 37-42, RSC

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.

NO2-L-IC-N-CL Water Nitrite in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

NO3-L-IC-N-CL Water Nitrate in Water by IC (Low Level) EPA 300.1 (mod

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

ORP-CL Water Oxidation redution potential by elect. ASTM D1498

This analysis is carried out in accordance with the procedure described in the "ASTM" method D1498 "Oxidation-Reduction Potential of Water" published by the American Society for Testing and Materials (ASTM). Results are reported as observed oxidation-reduction potential of the platinum metal-reference electrode employed, in mV.

It is recommended that this analysis be conducted in the field.

P-T-L-COL-CL Water Phosphorus (P)-Total APHA 4500-P PHOSPHORUS

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after persulphate digestion of the sample.

PH-CL Water pH APHA 4500 H-Electrode

pH is determined in the laboratory using a pH electrode. All samples analyzed by this method for pH will have exceeded the 15 minute recommended hold time from time of sampling (field analysis is recommended for pH where highly accurate results are needed)

PO4-DO-L-COL-CL Water Orthophosphate-Dissolved (as P) APHA 4500-P PHOSPHORUS

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.

SO4-IC-N-CL Water Sulfate in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

SOLIDS-TDS-CL Water Total Dissolved Solids APHA 2540 C

A well-mixed sample is filtered through a glass fibre filter paper. The filtrate is then evaporated to dryness in a pre-weighed vial and dried at 180 – 2 °C. The increase in vial weight represents the total dissolved solids (TDS).

TECKCOAL-IONBAL-CL Water Ion Balance Calculation APHA 1030E

LINE CREEK OPERATIONS L2397341 CONTD....

**Reference Information** 

PAGE 7 of 7 Version: FINAL

**Test Method References:** 

ALS Test Code Matrix Test Description Method Reference\*\*

Cation Sum, Anion Sum, and Ion Balance (as % difference) are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Because all aqueous solutions are electrically neutral, the calculated ion balance (% difference of cations minus anions) should be near-zero.

Cation and Anion Sums are the total meq/L concentration of major cations and anions. Dissolved species are used where available. Minor ions are included where data is present. Ion Balance is calculated as:

Ion Balance (%) = [Cation Sum-Anion Sum] / [Cation Sum+Anion Sum]

TEH-BC-VA-CL Water EPH (C10-C19) & EPH (C19-C32) BCMOE EPH GCFID

Analysis is in accordance with BC MOE Lab Manual method "Extractable Petroleum Hydrocarbons in Water by GC/FID", v2.1, July 1999. Whole water samples are extracted with DCM prior to gas chromatography with flame ionization detection (GC-FID). EPH results include Polycyclic Aromatic Hydrocarbons (PAH) and are therefore not equivalent to Light and Heavy Extractable Petroleum Hydrocarbons (LEPH/HEPH).

TEH-WATER-VA-CL Water TEH (C10-C30) BC Lab Manual

Water samples are spiked with 2-BBTF surrogate, and extracted by reciprocal action shaker for 1 hour using a single micro-extraction with hexane. After extraction, the hexane layer is drawn off and analyzed on a gas chromatograph equipped with a flame ionization detector.

TKN-L-F-CL Water Total Kjeldahl Nitrogen APHA 4500-NORG (TKN)

This analysis is carried out using procedures adapted from APHA Method 4500-Norg D. "Block Digestion and Flow Injection Analysis". Total Kjeldahl Nitrogen is determined using block digestion followed by Flow-injection analysis with fluorescence detection.

TSS-L-CL Water Total Suspended Solids APHA 2540 D-Gravimetric

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total suspended solids (TSS) are determined by filtering a sample through a glass fibre filter, and by drying the filter at 104 deg. C.

TURBIDITY-CL Water Turbidity APHA 2130 B-Nephelometer

This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.

\*\* ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

<b>Laboratory Definition Code</b>	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA
CL	ALS ENVIRONMENTAL - CALGARY, ALBERTA, CANADA

#### **Chain of Custody Numbers:**

20191216 LC GW

#### **GLOSSARY OF REPORT TERMS**

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.

mg/kg - milligrams per kilogram based on dry weight of sample

mg/kg wwt - milligrams per kilogram based on wet weight of sample

mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight

mg/L - unit of concentration based on volume, parts per million.

< - Less than.

D.L. - The reporting limit.

N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory. UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.



Workorder: L2397341 Report Date: 24-DEC-19

Page 1 of 11

Client: TECK COAL LIMITED (LINE CREEK)

Box 2003 15km North Hwy 43 Sparwood BC V0B 2G0

Contact: Carla Froyman Parker

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
ACIDITY-PCT-CL	Water							
Batch R4945439								
WG3245353-5 LCS Acidity (as CaCO3)			98.5		%		85-115	17-DEC-19
WG3245353-4 MB Acidity (as CaCO3)			1.6		mg/L		2	17-DEC-19
ALK-MAN-CL	Water							
Batch R4946155 WG3246260-24 LCS Alkalinity, Total (as CaC			105.2		%		85-115	17-DEC-19
WG3246260-23 MB Alkalinity, Total (as CaC	CO3)		1.2	MB-LOR	mg/L		1	17-DEC-19
BE-D-L-CCMS-VA	Water							
Batch R4950133								
WG3246370-2 LCS Beryllium (Be)-Dissolve	d		103.2		%		80-120	20-DEC-19
WG3246370-1 MB Beryllium (Be)-Dissolve	d	NP	<0.000020	)	mg/L		0.00002	20-DEC-19
BE-T-L-CCMS-VA	Water							
Batch R4950133								
WG3246621-2 LCS Beryllium (Be)-Total			104.5		%		80-120	20-DEC-19
WG3246621-1 MB Beryllium (Be)-Total			<0.000020	)	mg/L		0.00002	20-DEC-19
BR-L-IC-N-CL	Water							
Batch R4946491								
WG3246516-7 DUP Bromide (Br)		<b>L2397341-1</b> <0.050	<0.050	RPD-NA	mg/L	N/A	20	17-DEC-19
WG3246516-6 LCS Bromide (Br)			109.4		%		85-115	17-DEC-19
WG3246516-5 MB Bromide (Br)			<0.050		mg/L		0.05	17-DEC-19
<b>WG3246516-8 MS</b> Bromide (Br)		L2397341-1	103.0		%		75-125	17-DEC-19
C-DIS-ORG-LOW-CL	Water							
Batch R4951855								
WG3248161-6 LCS Dissolved Organic Carb	oon		91.2		%		80-120	21-DEC-19
WG3248161-5 MB								



Workorder: L2397341

Report Date: 24-DEC-19 Page 2 of 11

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
C-DIS-ORG-LOW-CL  Batch R4951855  WG3248161-5 MB  Dissolved Organic Carb			<0.50		mg/L		0.5	21-DEC-19
C-TOT-ORG-LOW-CL  Batch R4951855	Water							
WG3248161-6 LCS Total Organic Carbon			99.4		%		80-120	21-DEC-19
WG3248161-5 MB Total Organic Carbon			<0.50		mg/L		0.5	21-DEC-19
CL-IC-N-CL	Water							
Batch R4946491 WG3246516-7 DUP Chloride (CI)		<b>L2397341-1</b> 0.55	0.58		mg/L	5.0	20	17-DEC-19
<b>WG3246516-6 LCS</b> Chloride (CI)			100.8		%		90-110	17-DEC-19
WG3246516-5 MB Chloride (Cl)			<0.50		mg/L		0.5	17-DEC-19
WG3246516-8 MS Chloride (Cl)		L2397341-1	105.7		%		75-125	17-DEC-19
EC-L-PCT-CL	Water							
Batch R4946155								
WG3246260-24 LCS Conductivity (@ 25C)			101.5		%		90-110	17-DEC-19
WG3246260-23 MB Conductivity (@ 25C)			<2.0		uS/cm		2	17-DEC-19
F-IC-N-CL	Water							
Batch R4946491 WG3246516-7 DUP Fluoride (F)		<b>L2397341-1</b> 1.83	1.84		mg/L	0.1	20	17-DEC-19
WG3246516-6 LCS Fluoride (F)			103.1		%	0.1	90-110	17-DEC-19
<b>WG3246516-5 MB</b> Fluoride (F)			<0.020		mg/L		0.02	17-DEC-19
<b>WG3246516-8 MS</b> Fluoride (F)		L2397341-1	N/A	MS-B	%		-	17-DEC-19
HG-D-CVAA-VA	Water							



Workorder: L2397341

Report Date: 24-DEC-19 Page 3 of 11

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
HG-D-CVAA-VA	Water							
Batch R4949181 WG3246418-2 LCS Mercury (Hg)-Dissolved			108.3		%		80-120	20-DEC-19
WG3246418-1 MB Mercury (Hg)-Dissolved			<0.00000	<b>5</b> C	mg/L		0.000005	20-DEC-19
HG-T-CVAA-VA	Water							
Batch R4945995 WG3245988-2 LCS Mercury (Hg)-Total			106.4		%		80-120	19-DEC-19
WG3245988-1 MB Mercury (Hg)-Total			<0.00000	50	mg/L		0.000005	19-DEC-19
MET-D-CCMS-VA	Water							
Batch R4950133								
WG3246370-2 LCS Aluminum (Al)-Dissolved	d		106.1		%		80-120	20-DEC-19
Antimony (Sb)-Dissolved	b		102.6		%		80-120	20-DEC-19
Arsenic (As)-Dissolved			100.9		%		80-120	20-DEC-19
Barium (Ba)-Dissolved			104.7		%		80-120	20-DEC-19
Bismuth (Bi)-Dissolved			98.4		%		80-120	20-DEC-19
Boron (B)-Dissolved			84.6		%		80-120	20-DEC-19
Cadmium (Cd)-Dissolve	d		95.1		%		80-120	20-DEC-19
Calcium (Ca)-Dissolved			98.6		%		80-120	20-DEC-19
Chromium (Cr)-Dissolve	ed		98.1		%		80-120	20-DEC-19
Cobalt (Co)-Dissolved			99.4		%		80-120	20-DEC-19
Copper (Cu)-Dissolved			97.3		%		80-120	20-DEC-19
Iron (Fe)-Dissolved			98.4		%		80-120	20-DEC-19
Lead (Pb)-Dissolved			96.8		%		80-120	20-DEC-19
Lithium (Li)-Dissolved			103.5		%		80-120	20-DEC-19
Magnesium (Mg)-Dissol	ved		99.0		%		80-120	20-DEC-19
Manganese (Mn)-Dissol	ved		98.5		%		80-120	20-DEC-19
Molybdenum (Mo)-Disso	olved		96.7		%		80-120	20-DEC-19
Nickel (Ni)-Dissolved			96.2		%		80-120	20-DEC-19
Potassium (K)-Dissolved	t		102.0		%		80-120	20-DEC-19
Selenium (Se)-Dissolved	b		105.6		%		80-120	20-DEC-19
Silicon (Si)-Dissolved			103.8		%		60-140	20-DEC-19
Silver (Ag)-Dissolved			106.1		%		80-120	20-DEC-19
Sodium (Na)-Dissolved			103.7		%		80-120	20-DEC-19



Workorder: L2397341 Report Date: 24-DEC-19 Page 4 of 11

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA	Water							
Batch R4950133	}							
WG3246370-2 LCS								
Strontium (Sr)-Dissolve			100.7		%		80-120	20-DEC-19
Thallium (TI)-Dissolved			96.2		%		80-120	20-DEC-19
Tin (Sn)-Dissolved			95.4		%		80-120	20-DEC-19
Titanium (Ti)-Dissolved			93.7		%		80-120	20-DEC-19
Uranium (U)-Dissolved			98.6		%		80-120	20-DEC-19
Vanadium (V)-Dissolve	d		101.0		%		80-120	20-DEC-19
Zinc (Zn)-Dissolved			99.1		%		80-120	20-DEC-19
WG3246370-1 MB Aluminum (Al)-Dissolve	ed	NP	<0.0010		mg/L		0.001	20-DEC-19
Antimony (Sb)-Dissolve			<0.00010	)	mg/L		0.001	20-DEC-19 20-DEC-19
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	20-DEC-19 20-DEC-19
Barium (Ba)-Dissolved			<0.00010		mg/L		0.0001	20-DEC-19 20-DEC-19
Bismuth (Bi)-Dissolved			<0.00015		mg/L		0.0001	20-DEC-19 20-DEC-19
Boron (B)-Dissolved			<0.010		mg/L		0.0000	20-DEC-19 20-DEC-19
Cadmium (Cd)-Dissolve	ed		<0.00000	)5C	mg/L		0.000005	20-DEC-19
Calcium (Ca)-Dissolved			<0.050		mg/L		0.05	20-DEC-19
Chromium (Cr)-Dissolv			<0.00010	)	mg/L		0.0001	20-DEC-19
Cobalt (Co)-Dissolved			<0.00010		mg/L		0.0001	20-DEC-19
Copper (Cu)-Dissolved			<0.00020		mg/L		0.0002	20-DEC-19
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	20-DEC-19
Lead (Pb)-Dissolved			<0.00005	60	mg/L		0.00005	20-DEC-19
Lithium (Li)-Dissolved			<0.0010		mg/L		0.001	20-DEC-19
Magnesium (Mg)-Disso	olved		<0.0050		mg/L		0.005	20-DEC-19
Manganese (Mn)-Disso			<0.00010	)	mg/L		0.0001	20-DEC-19
Molybdenum (Mo)-Diss			<0.00005	0	mg/L		0.00005	20-DEC-19
Nickel (Ni)-Dissolved			<0.00050	)	mg/L		0.0005	20-DEC-19
Potassium (K)-Dissolve	ed		< 0.050		mg/L		0.05	20-DEC-19
Selenium (Se)-Dissolve			<0.00005	0	mg/L		0.00005	20-DEC-19
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	20-DEC-19
Silver (Ag)-Dissolved			<0.00001	0	mg/L		0.00001	20-DEC-19
Sodium (Na)-Dissolved			<0.050		mg/L		0.05	20-DEC-19
Strontium (Sr)-Dissolve	ed		<0.00020	)	mg/L		0.0002	20-DEC-19
Thallium (TI)-Dissolved			<0.00001		mg/L		0.00001	20-DEC-19
Tin (Sn)-Dissolved			<0.00010		mg/L		0.0001	20-DEC-19
,					5			20 220 10



Workorder: L2397341

Report Date: 24-DEC-19 Page 5 of 11

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA	Water							
Batch R4950133								
WG3246370-1 MB		NP						
Titanium (Ti)-Dissolved			<0.00030		mg/L		0.0003	20-DEC-19
Uranium (U)-Dissolved			<0.00001		mg/L		0.00001	20-DEC-19
Vanadium (V)-Dissolved	d		<0.00050		mg/L		0.0005	20-DEC-19
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	20-DEC-19
MET-T-CCMS-VA	Water							
Batch R4950133								
WG3246621-2 LCS			400.4		0/			
Aluminum (Al)-Total			108.4		%		80-120	20-DEC-19
Antimony (Sb)-Total			104.2		%		80-120	20-DEC-19
Arsenic (As)-Total			98.2		%		80-120	20-DEC-19
Barium (Ba)-Total			104.9		%		80-120	20-DEC-19
Bismuth (Bi)-Total			98.6		%		80-120	20-DEC-19
Boron (B)-Total			98.0		%		80-120	20-DEC-19
Cadmium (Cd)-Total			96.8		%		80-120	20-DEC-19
Calcium (Ca)-Total			101.5		%		80-120	20-DEC-19
Chromium (Cr)-Total			99.9		%		80-120	20-DEC-19
Cobalt (Co)-Total			98.2		%		80-120	20-DEC-19
Copper (Cu)-Total			96.6		%		80-120	20-DEC-19
Iron (Fe)-Total			98.3		%		80-120	20-DEC-19
Lead (Pb)-Total			99.8		%		80-120	20-DEC-19
Lithium (Li)-Total			105.5		%		80-120	20-DEC-19
Magnesium (Mg)-Total			102.4		%		80-120	20-DEC-19
Manganese (Mn)-Total			99.0		%		80-120	20-DEC-19
Molybdenum (Mo)-Total			101.0		%		80-120	20-DEC-19
Nickel (Ni)-Total			98.4		%		80-120	20-DEC-19
Potassium (K)-Total			101.2		%		80-120	20-DEC-19
Selenium (Se)-Total			99.4		%		80-120	20-DEC-19
Silicon (Si)-Total			107.2		%		80-120	20-DEC-19
Silver (Ag)-Total			101.0		%		80-120	20-DEC-19
Sodium (Na)-Total			103.2		%		80-120	20-DEC-19
Strontium (Sr)-Total			104.6		%		80-120	20-DEC-19
Thallium (TI)-Total			100.1		%		80-120	20-DEC-19
Tin (Sn)-Total			95.6		%		80-120	20-DEC-19
Titanium (Ti)-Total			97.8		%		80-120	20-DEC-19



Workorder: L2397341

Report Date: 24-DEC-19 Page 6 of 11

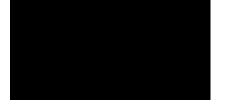
Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-VA	Water							
Batch R4950133								
WG3246621-2 LCS			101.0		0.4			
Uranium (U)-Total			101.8		%		80-120	20-DEC-19
Vanadium (V)-Total			101.8		%		80-120	20-DEC-19
Zinc (Zn)-Total			95.3		%		80-120	20-DEC-19
WG3246621-1 MB Aluminum (Al)-Total			<0.0030		mg/L		0.003	20 DEC 10
Antimony (Sb)-Total			<0.00010		mg/L		0.003	20-DEC-19
Arsenic (As)-Total			<0.00010		mg/L		0.0001	20-DEC-19
Barium (Ba)-Total			<0.00010		mg/L			20-DEC-19
Bismuth (Bi)-Total			<0.00010	1	mg/L		0.0001	20-DEC-19
Boron (B)-Total			<0.000	,	mg/L		0.00005	20-DEC-19
Cadmium (Cd)-Total			<0.00000	5C	mg/L		0.01	20-DEC-19
Calcium (Ca)-Total			<0.050	)C	mg/L		0.000005	20-DEC-19
Chromium (Cr)-Total			<0.00010		mg/L		0.05	20-DEC-19
Cobalt (Co)-Total			<0.00010		mg/L		0.0001 0.0001	20-DEC-19
Copper (Cu)-Total			<0.00010		mg/L		0.0001	20-DEC-19
Iron (Fe)-Total			<0.010		mg/L		0.0003	20-DEC-19
Lead (Pb)-Total			<0.00050	<b>1</b>	mg/L		0.0005	20-DEC-19
Lithium (Li)-Total			<0.000030	,	mg/L		0.00005	20-DEC-19
Magnesium (Mg)-Total			<0.0010		mg/L		0.001	20-DEC-19
Manganese (Mn)-Total			<0.00010		mg/L		0.005	20-DEC-19
Molybdenum (Mo)-Total			<0.00010	1	mg/L		0.0001	20-DEC-19
Nickel (Ni)-Total			<0.00050	,	mg/L		0.00005	20-DEC-19 20-DEC-19
Potassium (K)-Total			<0.050		mg/L		0.0005	
Selenium (Se)-Total			<0.000050	1	mg/L		0.0005	20-DEC-19 20-DEC-19
Silicon (Si)-Total			<0.10	,	mg/L			
Silver (Ag)-Total			<0.000010	1	mg/L		0.1 0.00001	20-DEC-19
Sodium (Na)-Total			<0.050	,				20-DEC-19
Strontium (Sr)-Total			<0.00020		mg/L mg/L		0.05 0.0002	20-DEC-19
Thallium (TI)-Total			<0.00020	<b>1</b>	mg/L		0.0002	20-DEC-19
Tin (Sn)-Total			<0.00010	,	mg/L		0.00001	20-DEC-19
Titanium (Ti)-Total			<0.00010		mg/L		0.0001	20-DEC-19
Uranium (U)-Total			<0.00030	1	mg/L			20-DEC-19
Vanadium (V)-Total			<0.00050	,	mg/L		0.00001 0.0005	20-DEC-19
Zinc (Zn)-Total			<0.0030		mg/L		0.0005	20-DEC-19
Z1110 (Z11)-1 Olai			<u> </u>		mg/L		0.003	20-DEC-19



Workorder: L2397341

Report Date: 24-DEC-19 Page 7 of 11

Test		Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
NH3-L-F-CL		Water							
Batch R49 WG3248179-14 Ammonia as N	952706 LCS			101.7		%		85-115	22-DEC-19
<b>WG3248179-13</b> Ammonia as N	MB			<0.0050		mg/L		0.005	22-DEC-19
NO2-L-IC-N-CL		Water							
Batch R49	946491								
<b>WG3246516-7</b> Nitrite (as N)	DUP		<b>L2397341-1</b> <0.0010	<0.0010	RPD-NA	mg/L	N/A	20	17-DEC-19
<b>WG3246516-6</b> Nitrite (as N)	LCS			103.5		%		90-110	17-DEC-19
<b>WG3246516-5</b> Nitrite (as N)	MB			<0.0010		mg/L		0.001	17-DEC-19
<b>WG3246516-8</b> Nitrite (as N)	MS		L2397341-1	108.5		%		75-125	17-DEC-19
NO3-L-IC-N-CL		Water							
Batch R49	946491								
WG3246516-7 Nitrate (as N)	DUP		<b>L2397341-1</b> <0.0050	<0.0050	RPD-NA	mg/L	N/A	20	17-DEC-19
WG3246516-6 Nitrate (as N)	LCS			104.5		%		90-110	17-DEC-19
<b>WG3246516-5</b> Nitrate (as N)	MB			<0.0050		mg/L		0.005	17-DEC-19
WG3246516-8 Nitrate (as N)	MS		L2397341-1	105.3		%		75-125	17-DEC-19
ORP-CL		Water							
<b>Batch R4</b> 9 <b>WG3246740-7</b> ORP	948435 CRM		CL-ORP	226		mV		210-230	19-DEC-19
P-T-L-COL-CL		Water							
Batch R49	945457								
WG3245389-14 Phosphorus (P)-				111.7		%		80-120	18-DEC-19
WG3245389-13 Phosphorus (P)-				<0.0020		mg/L		0.002	18-DEC-19
PH-CL		Water							



Workorder: L2397341

Report Date: 24-DEC-19 Page 8 of 11

Test Mat	rix Reference	Result Q	ualifier Units	RPD	Limit	Analyzed
PH-CL Wa	ter					
Batch R4946155 WG3246260-24 LCS pH		7.01	рН		6.9-7.1	17-DEC-19
PO4-DO-L-COL-CL Wa	ter					
Batch R4944992 WG3244586-6 LCS Orthophosphate-Dissolved (a:	s P)	102.4	%		80-120	17-DEC-19
WG3244586-5 MB Orthophosphate-Dissolved (a:	s P)	<0.0010	mg/L		0.001	17-DEC-19
SO4-IC-N-CL Wa	ter					
<b>Batch R4946491 WG3246516-7 DUP</b> Sulfate (SO4)	<b>L2397341-1</b> 3.88	3.83	mg/L	1.3	20	17-DEC-19
WG3246516-6 LCS Sulfate (SO4)		104.7	%	1.0	90-110	17-DEC-19
<b>WG3246516-5 MB</b> Sulfate (SO4)		<0.30	mg/L		0.3	17-DEC-19
<b>WG3246516-8 MS</b> Sulfate (SO4)	L2397341-1	102.3	%		75-125	17-DEC-19
SOLIDS-TDS-CL Wa	ter					
Batch R4953146 WG3247197-2 LCS Total Dissolved Solids		99.0	%		85-115	20-DEC-19
WG3247197-1 MB Total Dissolved Solids		<10	mg/L		10	20-DEC-19
TEH-BC-VA-CL Wa	ter					
Batch R4950388						
<b>WG3246426-2 LCS</b> EPH10-19		91.7	%		70-130	20-DEC-19
EPH19-32		82.1	%		70-130	20-DEC-19
<b>WG3246426-1 MB</b> EPH10-19		<0.25	mg/L		0.25	20-DEC-19
EPH19-32		<0.25	mg/L		0.25	20-DEC-19
Surrogate: 2-Bromobenzotriflu	uoride	75.8	%		60-140	20-DEC-19
TEH-WATER-VA-CL Wa	ter					



Workorder: L2397341

Report Date: 24-DEC-19 Page 9 of 11

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
TEH-WATER-VA-CL	Water							
Batch R4950388								
<b>WG3246426-2 LCS</b> TEH (C10-C30)			89.1		%		70-130	20-DEC-19
<b>WG3246426-1 MB</b> TEH (C10-C30)			<0.25		mg/L		0.25	20-DEC-19
Surrogate: 2-Bromobenz	otrifluoride		75.8		%		60-140	20-DEC-19
TKN-L-F-CL	Water							
Batch R4952977 WG3247745-7 DUP Total Kjeldahl Nitrogen		<b>L2397341-1</b> 0.220	0.220		mg/L	0.0	20	24-DEC-19
WG3247745-2 LCS Total Kjeldahl Nitrogen		0.220	93.7		₩	0.0	75-125	24-DEC-19 20-DEC-19
WG3247745-6 LCS Total Kjeldahl Nitrogen			96.3		%		75-125	20-DEC-19
<b>WG3247745-1 MB</b> Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	20-DEC-19
<b>WG3247745-5 MB</b> Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	20-DEC-19
WG3247745-8 MS Total Kjeldahl Nitrogen		L2397341-1	101.9		%		70-130	24-DEC-19
TSS-L-CL	Water							
Batch R4953177								
WG3247196-6 LCS Total Suspended Solids			99.8		%		85-115	20-DEC-19
WG3247196-5 MB Total Suspended Solids			<1.0		mg/L		1	20-DEC-19
TURBIDITY-CL	Water							
Batch R4945760								
WG3245360-5 LCS Turbidity			100.5		%		85-115	17-DEC-19
WG3245360-4 MB Turbidity			<0.10		NTU		0.1	17-DEC-19

Workorder: L2397341 Report Date: 24-DEC-19 Page 10 of 11

Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard

#### **Sample Parameter Qualifier Definitions:**

LCSD Laboratory Control Sample Duplicate

Qualifier	Description
MB-LOR	Method Blank exceeds ALS DQO. Limits of Reporting have been adjusted for samples with positive hits below 5x blank level.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

Workorder: L2397341 Report Date: 24-DEC-19 Page 11 of 11

#### **Hold Time Exceedances:**

	Sample						
ALS Product Description	ID	Sampling Date	Date Processed	Rec. HT	Actual HT	Units	Qualifier
Physical Tests							
Oxidation redution potentia	l by elect.						
	1	16-DEC-19 12:57	19-DEC-19 14:30	0.25	73	hours	EHTR-FM
рН							
	1	16-DEC-19 12:57	17-DEC-19 11:00	0.25	22	hours	EHTR-FM

#### Legend & Qualifier Definitions:

EHTR-FM: Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended.

EHTR: Exceeded ALS recommended hold time prior to sample receipt.

EHTL: Exceeded ALS recommended hold time prior to analysis. Sample was received less than 24 hours prior to expiry.

EHT: Exceeded ALS recommended hold time prior to analysis.

Rec. HT: ALS recommended hold time (see units).

#### Notes\*:

Where actual sampling date is not provided to ALS, the date (& time) of receipt is used for calculation purposes. Where actual sampling time is not provided to ALS, the earlier of 12 noon on the sampling date or the time (& date) of receipt is used for calculation purposes. Samples for L2397341 were received on 17-DEC-19 08:40.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against predetermined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

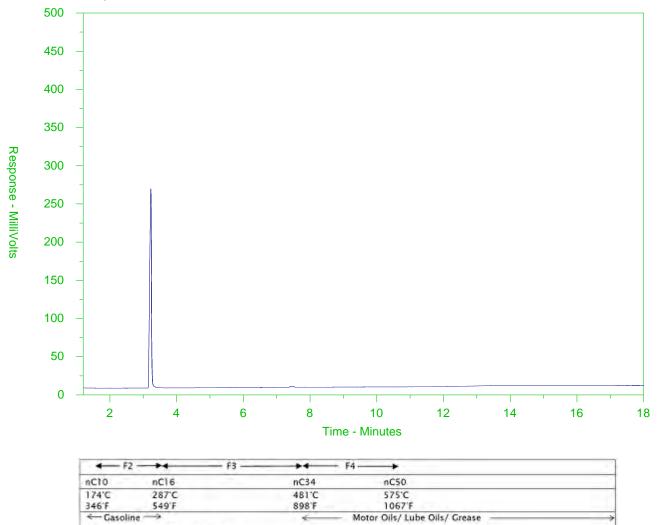
### CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT



ALS Sample ID: L2397341-1

Client Sample ID: LC\_PIZP1101\_WG\_Q4-2019\_N

Diesel/ Jet Fuels



The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at <a href="https://www.alsglobal.com">www.alsglobal.com</a>.

**Teck** RUSH: COC ID: 20191216 LC GW TURNAROUND TIME: OTHER INFO LABORATORY PROJECT/CLIENT INFO Lab Name ALS Calgary Excel PDF EDD Facility Name / Job# Line Creek Operation Report Format / Distribution Lab Contact Lyudmyla Shvets Project Manager Carla Froyman Parker Email 1: carla froymanparker@teck.com Email Lyudmyla.Shvets@ALSGlobal.com Email 2: Email Sestember 1884 teckcoal@equisonline.com Address 2559 29 Street NE Email 3: Address Box 2003 drake.tvmstra@teck.com |x Email 4: kirsten.campbell@teck.com 15km North Hwy 43 ВC City Calgary Email 4: kennedy, allen@teck.com City Sparwood Province Province AB Canada Postal Code TIY 7B5 Canada PO number V0B 2G0 Country Country Postal Code Phone Number 403 407 1794 \*\* Phone Number 250-425-3196 Fiftered V. Vield, L. Lub, FL. Field & Lub, N. Non SAMPLIZ DETAILS NAUSO4 \$ H2SO4 Hazardous Material (Yes/No) ALS\_Package-TKN/TOC TECKCOAL-ROUTINE. VA L2397341-COFC TECKCOAL-MET-D-FECKCOAL-MET-T-VA ALS\_Package-EPH HG-D-CVAF-VA HG-T-CVAF-VA G=Grab #Of Sample Location Field Time Sample ID (sys loc code) Matrix Date (24hr) C=Comp Cont. LC\_PIZP1101 WG 2019/12/16 Х х Х Х LC\_PIZP1101\_WG\_Q4-2019\_N 12:57 G RELINQUISHED BY/AFFILIATION \*\*ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS BATE/TIME ACCEPTED BY/AFFILIATION DATE/TIME THE THE FORM TRUME OF THE SAMPLES TO THE BURNING FOR D.Tymstra/K.Campbell 16-Dec **CONTRACTO** ISERVICE REQUEST (rush subject to availability) Regular (default) X

K, Campbell/D. Tymstra

Mobile #

Date/Time

December 16, 2019

Sampler's Name

Sampler's Signature

Priority (2-3 business days) - 50% surcharge Emergency (1 Business Day) - 100% surcharge

For Emergency <1 Day, ASAP or Weekend - Contact ALS

13 March 2020 19135981-2020-064-R-Rev0

**APPENDIX H** 

**QP Forms** 



### **Conflict of Interest Disclosure Statement**

A qualified professional <sup>1</sup> providing services to either the Ministry of Environment and Climate Change Strategy ("ministry"), or to a regulated person for the purpose of obtaining an authorization from the ministry, or pursuant to a requirement imposed under the *Environmental Management Act*, the *Integrated Pest Management Act* or the *Park Act* has a real or perceived conflict of interest when the qualified professional, or their relatives, close associates or personal friends have a financial or other interest in the outcome of the work being performed.

A real or perceived conflict of interest occurs when a qualified professional has

- a) an ownership interest in the regulated person's business;
- b) an opportunity to influence a decision that leads to financial benefits from the regulated person or their business other than a standard fee for service (e.g. bonuses, stock options, other profit sharing arrangements);
- c) a personal or professional interest in a specific outcome;
- d) the promise of a long term or ongoing business relationship with the regulated person;
- e) a spouse or other family member who will benefit from a specific outcome; or
- f) any other interest that could be perceived as a threat to the independence or objectivity of the qualified professional in performing a duty or function.

Qualified professionals who fulfill regulatory requirements on behalf of regulated persons seeking authorization under ministry legislation must take care in the conduct of their work that potential conflicts of interest within their control are avoided or mitigated. Precise rules in conflict of interest are not possible and professionals must rely on guidance of their professional associations, their common sense, conscience and sense of personal integrity.

This conflict of interest disclosure statement is collected under section 26(c) of the *Freedom of Information and Protection of Privacy Act* for the purposes of increasing government transparency and ensuring professional ethics and accountability. By signing and submitting this statement you consent to its publication and its disclosure outside of Canada. This consent is valid from the date submitted and cannot be revoked. If you have any questions about the collection, use or disclosure of your personal information please contact the Ministry of Environment and Climate Change Headquarters Office at 1-800-663-7867.

- a) is registered in British Columbia with a professional association, is acting under that organization's code of ethics, and is subject to disciplinary action by that association, and
- b) through suitable education, experience, accreditation and knowledge, may reasonably by relied on to provide advice within his or her area of expertise, which area of expertise is applicable to the duty or function.

 $<sup>^1</sup>$ Qualified Professional, in relation to a duty or function under ministry legislation, means an individual who



# **Declaration**

l, _	Margaret dillian Mitton Name as a member of Engineers and Geoscientists British Columbia
de	lare
Sel	ect one of the following:
	X Absence from conflict of interest
	Other than the standard fee I will receive for my professional services, I have no financial or other interest in the outcome of this work application/project/work/etc.  I further declare that should a conflict of interest arise in the future during the course of this work, I will fully disclose the circumstances in writing and without delay to Ministry of Environment and Climate Change Strategy, erring on the side of caution.
	☐ Real or perceived conflict of interest
	Description and nature of conflict(s):
	·
	I will maintain my objectivity, conducting my work in accordance with my Code of Ethics and standards of practice.  In addition, I will take the following steps to mitigate the real or perceived conflict(s) I have disclosed, to ensure the public interest remains paramount:
6:	Further, I acknowledge that this disclosure may be interpreted as a threat to my independence and will be considered by the statutory decision maker accordingly.
Sig	nature: Witnessed by:
<b>X</b> _	M. J. Ilian Mittro
Pri	nt name: <u>Jillian Mitton</u> Print name: <u>Lexya Oulton</u>
Da	e: March 25, 2020



### **Declaration of Competency**

The Ministry of Environment and Climate Change Strategy relies on the work, advice, recommendations and in some cases decision making of qualified professionals<sup>1</sup>, under government's professional reliance regime. With this comes an assumption that professionals who undertake work in relation to ministry legislation, regulations and codes of practice have the knowledge, experience and objectivity necessary to fulfill this role.

This declaration of competency is collected for the purposes of increasing government transparency and ensuring professional ethics and accountability. It will be disclosed to the public.

1.	Name of Qualified Professional	Margaret Jillian Mitton
	Title	Professional Engineer - Practising
2.	Are you a registered member of a	professional association in B.C.?   ☑ Yes □ No
		Name of Association: Engineers & Geoscientists British Columbia
3.	Brief description of professional se	rvices:
	Technical review of groundwater da	ta for Line Creek Operations Site Specific Groundwater Monitoring
	Program.	
		Declaration
pro	· · ·	onal with the required knowledge, skills and experience to d/or recommendations in relation to the specific work
Sig	nature:	Witnessed by:
<b>x</b> _	M. J. Mian mittro	х
Pri	nt Name: <u>Jillian Mitton</u>	Print Name: <u>Lexya Oulton</u>
Da	te signed: March 25, 2020	

- a) is registered in British Columbia with a professional association, is acting under that organization's code of ethics, and is subject to disciplinary action by that association, and
- b) through suitable education, experience, accreditation and knowledge, may reasonably by relied on to provide advice within his or her area of expertise, which area of expertise is applicable to the duty or function.

<sup>&</sup>lt;sup>1</sup>Qualified Professional, in relation to a duty or function under ministry legislation, means an individual who



golder.com

# Appendix III

Analyte List

#### **APPENDIX III: Analyte List**

	Units
Field Parameters	Office
Temperature	°C
pH	pH unit
Dissolved Oxygen	mg/L
Specific Conductance	μS/cm
Oxidation-Reduction Potential (ORP)	mV
Physical Parameters (laboratory)	
pH	pH unit
Hardness (as CaCO3)	mg/L
Specific Conductance	μS/cm
Total Suspended Solids	mg/L
Total Dissolved Solids	mg/L
<u>Turbidity</u>	NTU
Alkalinity, total (as CaCO <sub>3</sub> )	mg/L
Bicarbonate	mg/L
Carbonate	mg/L
Hydroxide	mg/L
Ammonia (as N)	mg/L
Bromide	mg/L
<u>Chloride</u>	mg/L
Fluoride	mg/L
Nitrate (as N)*	mg/L
Nitrite (as N)	mg/L
Total Kjeldhal Nitrogen	mg/L
Ortho-Phosphate Total Phosphorus	mg/L
·	mg/L
Sulphate (SO 4)*	mg/L
Dissolved Metals	//
Antimony	µg/L
Antimony Arsenic	μg/L
Barium	μg/L μg/L
Beryllium	μg/L
Bismuth	μg/L
Boron	μg/L
Cadmium*	µg/L
Calcium	µg/L
<u>Chromium</u>	μg/L
<u>Cobalt</u>	μg/L
Copper	μg/L
<u>Iron</u>	μg/L
<u>Lead</u>	μg/L
<u>Lithium</u>	μg/L
Magnesium	μg/L
<u>Manganese</u>	μg/L
<u>Mercury</u>	μg/L
<u>Molybdenum</u>	μg/L
Nickel Barton	μg/L
Potassium Salanium*	μg/L
Silver	μg/L
<u>Silver</u> Sodium	μg/L
Strontium	µg/L
Thallium	μg/L μg/L
<u>Triallium</u> Tin	μg/L μg/L
Titanium	μg/L μg/L
<u>Titanium</u> Uranium	μg/L μg/L
<u>Vanadium</u>	μg/L μg/L
<u>vanadium</u> Zinc	μg/L
<u>Zinc</u> Organics	<u>μ</u>
Total Organic Carbon	-
Dissolved Organic Carbon	_
2.55554 Organio Carbon	

#### BOLD = Included in the Elk Valley Drinking Water Sampling Plan

<u>Underlined = Standards are available in the CSR for AW, IW, or LW: BC WQG AW; or, Guidelines for Canadian Drinking Water Quality DW</u> *Italics = Constituents included in the TG6 "Core List of General Water Quality Analytes and Field Measurements" and above detection limits*\* = Constituents of interest (CI)

TG6 = Technical Guidance 6 Water and Air Baseline Monitoring Document for Mine Proponents and Operators (BC MoE, 2012).

# Appendix IV

Borehole Logs

DATA ENTRY: VI

PROJECT No.: 11.1348.0020,2000

### RECORD OF BOREHOLE: GA-HMW5

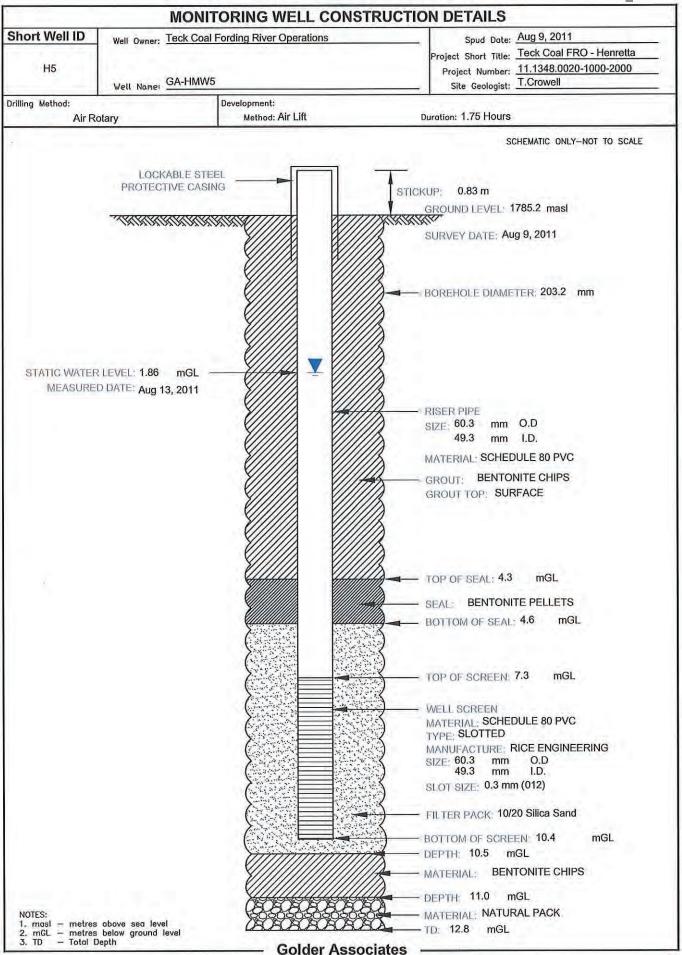
SHEET 1 OF 1

LOCATION: See Location Plan

BORING DATE: August 09, 2011

DATUM: Geodetic

$\int$	100 H	L	SOIL PROFILE	1.	1	S/	MPL	<del>,</del>	DYNAMIC RESISTA	PENETRA NCE, BLOV	ATION VS/0.3m	1	k, c			. (1)	PIEZOMETEI OR
2	MET			PLOT	ELEV.	뗬	ш	'0.3m	20	40	60	80	10*	10'5 10"	10'3 1	ONAL	STANDPIPE INSTALLATIO
MEI NES	BORING METHOD		DESCRIPTION	STRATA PLOT	DEPTH	NUMBER	TYPE	BLOWS/0.3m	SHEAR S Cu, kPa	TRENGTH	nat V. rem V.	+ Q-● ⊕ U-O	WATER Wp I	CONTENT PE	RCENT WI	ADDITIONAL LAB. TESTING	
_	8			STS	(m)	Ĺ		9	20	40	60	80	10	20 30	40	₹₹	
٥	_	$\downarrow$	Ground Surface	D'A-	1785,20	_		$\vdash$									
			Very loose, non-plastic, dry, grey to brown, loose grained to cobble size GRAVEL, non-cohesive with some medium grained, angular to subangular, (with little matrix)		1												
			medium grained, angular to		2												
1			(ALLUVIUM)		3												
					3	1	GRAI	B									A2 Aug 2011
				Ä	2												13 Aug 2011 ☑
2				<b>X</b>	2												
					2												
		-			3						-						
3					4		1								,		
					4												
4			Soft, low plasticity, damp, non-cohesive, with more grey CLAY		4												
			3														
				6													
5				贫	3	2	GRA	1									
	- 1	is E		K	5												
	<u>ا</u>	Service		贫	3												
6	Rog :	8		気	3												
	H24 /	llonm		这	2												
	Barber Rig H24 Air Rotary	E E	Hard layer, angular fragments, low returns GRAVEL		1778,50		1	1									
7	ag l		returns GRAVEL  Very loose, low plasticity, damp, grey	- 俗	6.90								1				
		ä	Very loose, low plasticity, damp, grey to brown, loose grained to cobble size GRAVEL, non-cohesive with some medium grained, angular to		9												
- 1	-	"	supangular (with little matrix)	6		3	GRA	9									
8			(ALLUVIUM)	E E	1								177				
				贫	\$												
9						L											
ı			<ul> <li>Clay becomes dark brown, damp, cohesive and very dense</li> </ul>		3												
				X	2	١.	L										
10				Z	2	4	GRA	B									
		١			2												
		-	Very loose fragments (drill cut-up),		1774.50	+	1										
"			wet, massive, light to dark grey, angular BEDROCK		1												
				K	1								.				
[ ]						5	GRA	els.									
12																	
				K	1772.40								-				
13		+	End of BOREHOLE.	1	12.80		T	T			$\top$						1
								1				1					
											1						
14																	
15															1 1		
Ц	_																
									B	<b>A</b>						LOGGED:	



DATA ENTRY: VI

PROJECT No.: 11.1348.0020.2000

#### RECORD OF BOREHOLE: GA-HMW4

SHEET 1 OF 1

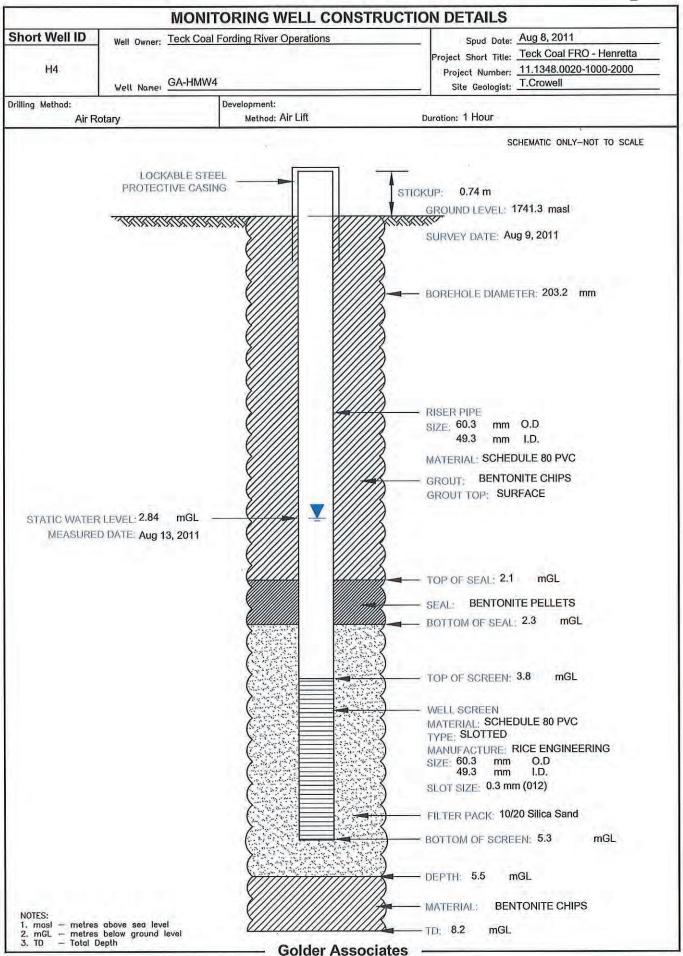
LOCATION: See Location Plan

BORING DATE: August 08, 2011

DATUM: Geodetic

N: 653255 E: 5566821

I.E		오	SOIL PROFILE			SA	MPL	_	DYNAMIC PENE RESISTANCE, E	TRATIO	N 1.3m	\	HYDRAULIC C		ΓΙVΙΤΥ,	T	. m	PIEZOMETER OR
DEPTH SCALE METRES		BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	20 40 SHEAR STRENG Cu, kPa	STH na	at V. + m V. ⊕	Q- <b>0</b> U- O	WATER C	ONTENT OW	PERCE	Wi	ADDITIONAL LAB, TESTING	STANDPIPE INSTALLATION
ļ	H	_	Ground Surface	ຶ່ນ	1741.30	$\vdash$		114	20 40	1 60	98 (	)	10 2	20 3	30 4	10		
1 1 2			Very loose, non-plastic, non-cohesive, dry, fine to medium grained WASTE ROCK mixed with coal fragments	00000000	0.00													111111111111111111111111111111111111111
3 4	Barber Rig H24 Alr Rotary	BECK Drilling & Environmental Services Ltd.		00000000000000000000000000000000000000	1735,80		GRAL											I3 Aug 2011
7			Massive, grey, angular BEDROCK, with smaller, white to light brown fragments (limestone)  End of BOREHOLE.		5,50 1733,10 8.20	2	GRAE											
9 10			LIN O BONCHOLL.		V.EV													
11																		
12															15.000			1
10 11 12 12 15 DE			·											A Parama a raman a Parama a Parama a Parama a Parama a Parama a Parama a Parama a Parama a Parama a Parama a Pa	A-meaning of the control of the cont			111111111111111111111111111111111111111
DE			SCALE					(	G	olde ocia	r tes						LOGGED: 1 CHECKED: J	



PROJECT No.: 11.1348.0020.2000

LOCATION: See Location Plan

### RECORD OF BOREHOLE: GA-HMW3

BORING DATE: August 12, 2011

SHEET 1 OF 2

DATUM: Geodetic

N: 652810 E: 5566540

METRES	WETHOD		SOIL PROFILE	5			MPL	_	RESISTANCE, BLOWS/0.3III	HYDRAULIC CONDUCTIVITY, k, cm/s	PIEZOMETE OR STANDPIPE INSTALLATIO
נַ	BORING METHOD		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	SHEAR STRENGTH nat V. + Q - ● Cu, kPa rem V. ⊕ U - O	10 <sup>4</sup> 10 <sup>5</sup> 10 <sup>4</sup> 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup> 1 10 <sup>3</sup>	MOTALBAIR
0			Ground Surface		1728.20				20 40 60 60	10 20 30 40	
1 2 3			Compacted road materials  Brown and grey, cobble size WASTE ROCK with sandy clay matrix, rock is sub-rounded to subangular, matrix is soft, damp, non-plastic, cohesive, silty, with some very fine grains	000000000000	0.30		GRAI	3			
4 5			Hard layer, ROP fow, no retums	00000000	1722,40 5.80						
7 8	Barber Rig H24 Air Rotary	BECK Drilling & Environmental Services Ltd.	Brown and grey, cobble size WASTE ROCK with sandy clay matrix, rock is sub-rounded to subangular, matrix is soft, dry, non-plastic, cohesive, silty, with some very fine grains	000000000000	6.40		GRAI	The second section is a second section in the second section in the second section is a second section in the second section in the second section is a second section in the second section in the second section is a second section in the second section in the second section is a second section in the second section in the second section is a second section in the second section in the second section is a second section in the second section in the second section is a second section in the second section in the second section is a second section in the second section in the second section is a second section in the second section in the second section is a second section in the second section in the second section is a second section in the second section in the second section is a second section in the second section in the second section is a second section in the second section in the second section is a second section in the second section in the second section is a second section in the second section in the second section is a section in the second section in the section is a section in the section in the section is a section in the section in the section is a section in the section in the section is a section in the section in the section in the section is a section in the section in the section in the section is a section in the section in the section in the section in the section is a section in the			13 Aug 2011 ∑.
110	i utavo.		Wet, white to grey and brown, cobble size to very coarse grained, round to	0000000000	1716.00 12.20						
13 14			sub-angular GRAVEL, brown clay matrix, silly			3	GRA	B			
			CONTINUED NEXT PAGE								<u></u>

PROJECT No.: 11.1348.0020.2000

N: 652810 E: 5566540

### RECORD OF BOREHOLE: GA-HMW3

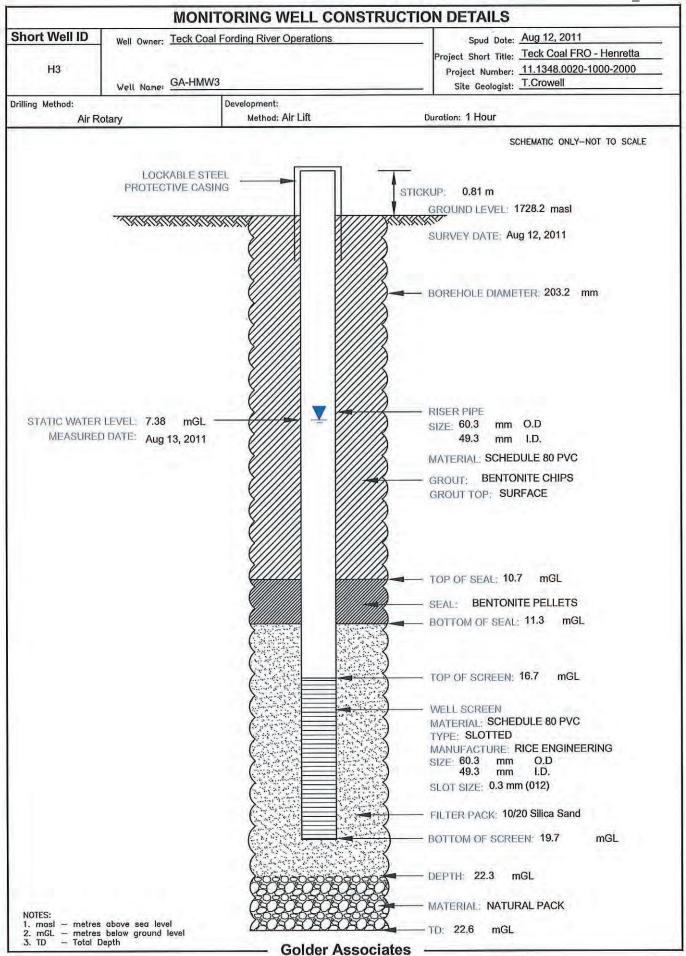
SHEET 2 OF 2

LOCATION: See Location Plan

BORING DATE: August 12, 2011

DATUM: Geodetic

	٥	SOIL PROFILE		s	AMP	LES	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m		HYDRAULIC CONDUCTIVITY, T			PIEZOMETER OR STANDPIPE INSTALLATION
METRES	BORING METHOD	DESCRIPTION	A DE	ELEV.		ag B	RESISTANCE, BLOWS/0.3m  20		k, cm/s  10 <sup>4</sup> 10 <sup>5</sup> 10 <sup>4</sup> 10 <sup>3</sup> WATER CONTENT PERCENT  Wp I OW I WI		ADDITIONAL LAB. TESTING	
15				,,,,,		<u>a</u>	20 40	60 80	10 20 30	40	<b>₹</b> 3	
16		Wet, white to grey and brown, cobble size to very coarse grained, round to sub-angular GRAVEL, brown clay matrix, silty (continued)		3	GR/	A B						
18	Barber Rig H24 Alr Rotary BECK Drilling & Environmental Services Ltd.			4	GRA							
21				5	GRV	1						
22 23 24 25 26 27 28 29 30 DE 1		Massive, grey BEDROCK, small drill-broken fragments End of BOREHOLE.	Ø 17	22.60								
23												
24												
25												
26								***				
27												
28												
29												
30												
	PTH : 75	SCALE				(	ASSO	lder			LOGGED; T	



DATA ENTRY; VI

PROJECT No.: 11.1348.0020.2000

#### RECORD OF BOREHOLE: GA-HMW2

SHEET 1 OF 4

LOCATION: See Location Plan

BORING DATE: August 09, 2011

ē	SOIL PROFILE			SAI	/PLI	ES	DYNAMIC PENE RESISTANCE, B	TRATION LOWS/0.3m	· \	HYDRAULIC CONDUC k, cm/s	TIVITY, T		PIEZOMETER OR
BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	20 40 SHEAR STRENG Cu, kPa 20 40	60 TH nat V rem \	80	10° 10° WATER CONTEN	IO <sup>-1</sup> 10 <sup>-3</sup>	ADDITIONAL LAB. TESTING	STANDPIPE INSTALLATIO
0 -	Ground Surface		1767,30	П	1	$\Box$		$\perp$					
0 6 Barber Rg H24 Air Ratary BECK Offling & Ferviormental Services Ltd.	Compacted road materials  Dry, grey to black, angular, coarse grained to cobble sized SPOILS, covered in clay and sand matrix, cohesive to plastic, dark brown to black, silty	000000000000000000000000000000000000000	0.30		RAE								
11 12 13 13 14 14 15	CONTINUED NEXT PAGE	000000000000000000		3 6	RAS								

PROJECT No.: 11.1348.0020.2000

#### RECORD OF BOREHOLE: GA-HMW2

SHEET 2 OF 4

LOCATION: See Location Plan

BORING DATE: August 09, 2011

29 E	SOIL PROFILE	- L. 1		SAM	_		YNAMIC ESISTA				1	HYDRAU I					.0	PIEZOMETER OR
METRES BORING METHOD	DESCRIPTION		ELEV. DEPTH	NUMBER	1 7 FE	SLOWS/U.sm	20 HEAR S u, kPa		(0 ∤GTH	nat V. rem V.	80 + Q- ⊕ U-O	10⁴ WA¹ Wp I	TER C	ţ	T PERC	10°3	ADDITIONAL LAB, TESTING	STANDPIPE INSTALLATION
8		STR	(m)	Z	_	ă	20	4	10 T	60	80	10			30 T	40	48	
15 16 17 17 18 18 19 20 21 22 23 24 18 EXPLORMY BECK DIMING & ENVIronmental Services Ltd.	Dry, grey to black, angular, coarse grained to cobble sized SPOILS, covered in clay and sand matrix, cohesive to plastic, dark brown to black, silty (continued)	020202020202020202020202020202020202020		4 GF														
27	Black, broken COAL LENS	000000	1739.90 27.40	6 6	KAB.		LACAMAGINATION			and the second s	· ·	Account of the state of the sta			A AMPARTMENT OF THE PARTMENT O			
29	Dry, grey to black, angular, coarse grained to cobble sized SPOILS, covered in clay and sand matrix, cohesive to plastic dark brown to black, silty	20004	1738.40 28.90	7 61	SAB.													
	CONTINUED NEXT PAGE																	

PROJECT No.: 11.1348.0020.2000

LOCATION: See Location Plan

#### RECORD OF BOREHOLE: GA-HMW2

BORING DATE: August 09, 2011

SHEET 3 OF 4

DATUM: Geodetic

N: 652666 E: 5566634

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE DESCRIPTION	STRATA PLOT	v. Ha	AMPi	BLOWS/0.3m	DVNAMIC PENETRATION   RESISTANCE, BLOWS/0.3m     20	HYDRAULIC CONDUCTIVITY, k, cm/s  10° 10° 10° 10° 10°  WATER CONTENT PERCENT	PIEZOMETER OR STANDPIPE INSTALLATION OR STANDPIPE INSTALLATION
OEP	BORI	5255 W. 1151	STRAT.	TH 5	F	BLOW	Cu, kPa rem V. ⊕ U - O	Wp I O W I WI 10 20 30 40	APDI LAB. 7
- 31		Dry, grey to black, angular, coarse grained to cobble sized SPOILS, covered in clay and sand matrix, cohesive to plastic dark brown to black, silty, smaller fragments	1736	).48	GRAI	9.			
33 34 35		Dry, grey to black, angular, coarse grained to cobble sized SPOILS, covered in clay and sand matrix, cohesive to plastic dark brown to black, silty	000000000000000000000000000000000000000	2.90					
36 37 38	Barber Rig H24 Air Rotary BECX Drilling & Enginemental Services   td		000000000000	9	GRAI	TANKET TA			
39 40 41	Jue		000000000000000000000000000000000000000	10	¢GRA:	8			
41 42 43 44 45 DE		COAL LENS	172:	3.50	GRA				13 Aug 2011 ▽
		CONTINUED NEXT PAGE							
DE 4	PTH 75	SCALE				(	Golder Associates		LOGGED; TC HECKED: JW

DATA ENTRY: VI

PROJECT No.: 11.1348.0020,2000

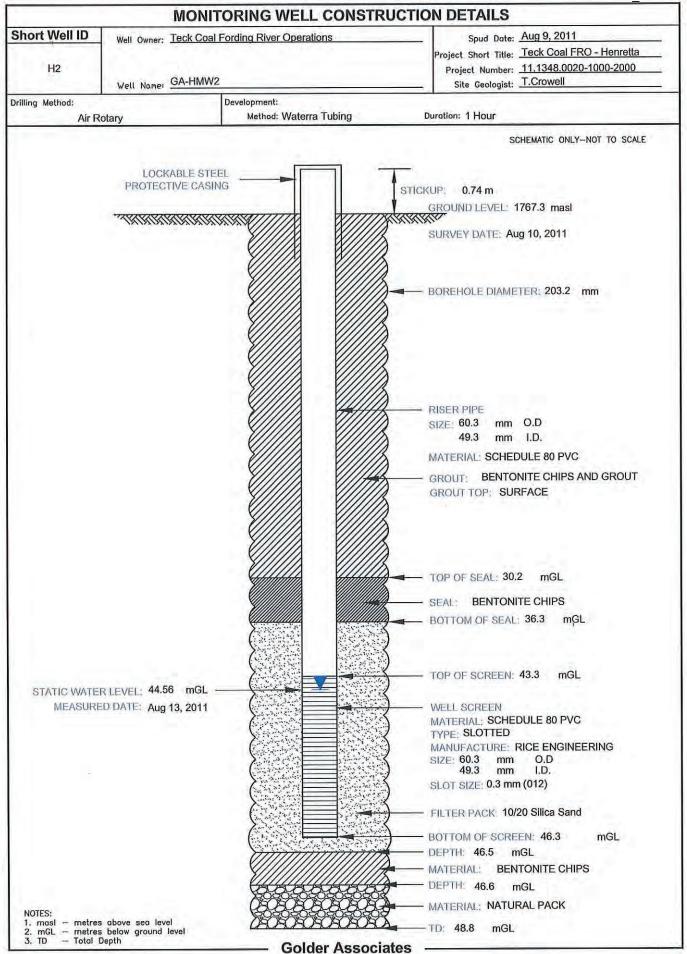
#### RECORD OF BOREHOLE: GA-HMW2

SHEET 4 OF 4

LOCATION: See Location Plan

BORING DATE: August 09, 2011

4		8	SOIL PROFILE			SA	MPL	ES	DYNAN RESIS	IIC PEN	ETRATIONS	ON 0.3m	1	HYDR	AULIC C	ONDUC	TIVITY,	Т		PIEZOMETER OR
DEPTH SCALE METRES		BORING METHOD		PLOT	FIEW	H.	711	0.3m	2	0 4	io €	0 1	30		i	L	L	10.3 T	ADDITIONAL LAB. TESTING	STANDPIPE INSTALLATION
		NN NO	DESCRIPTION	STRATA PLOT	ELEV. DEPTH	NUMBER	TYPE	BLOWS/0.3m	SHEAF Cu, kPa	R STREN	IGTH r	ıat V. + em V. ⊕	Q- • U- O			омтем1 —⊖W			DDITIC B. TER	
	L	8		STR	(m)	_		BĽ	2	0 4	0 <del>(</del>	0 :	30					40	A A	
45	H	1	COAL LENS (continued)	44																
46		ices Ltc																		
	Sotary	al Serv			•	116	BRAE	2												
	24 Air 1	nument		,	}															
47	P. Rid F.	Drilling & Environmental Services Ltd			4															
	Barber	Drilling			1719.60															
48	1	HICK	BEDROCK, clay fragments trending into grey massive sample	S	47.70															
							RAE	,												
	-	+	End of BOREHOLE.	122	1718,60 48.70			H					<del> </del>		ļ			<del> </del>		
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DATA ENTRY: VI

PROJECT No.: 11.1348.0020.2000

N: 652437 E: 5566516

#### RECORD OF BOREHOLE: GA-HMW1D

SHEET 1 OF 4

LOCATION: See Location Plan

BORING DATE: August 10, 2011

" l	HOD	SOIL PROFILE	Τ⊨	r	SA	MPL		DYNAMIC PENETR RESISTANCE, BLO		\	k, cın			ى ر	PIEZOMETER OR
METKES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	20 40 SHEAR STRENGTH Cu, kPa		Q - • U - O		10° 10° CONTENT PE	10°3 T RCENT	ADDITIONAL LAB. TESTING	STANDPIPE INSTALLATIO
	an .	Ground Surface	S	1732.20	_	_	αñ	20 40	60 8	0	10	20 30	40	~ )	
1 2		Very loose, non-plastic, non-cohesive, dry to slightly damp, grey to black, variable grain size, mainly coarse grain to cobbles WASTE ROCK, covered in clay and sand matrix, black to dark brown, slightly cohesive with silt.	2000	0.00											
3 4 5			0000000000000		1	GRAS									
8 9	BECK Drilling & Environmental Services Ltd.		000000000000000000000000000000000000000		2	GRAG	**								
10		Very hard layer, no returns	000	1721.50 10.70		THE TAXABLE PARTY OF THE TAXABLE PARTY.			AND THE REST OF THE PARTY OF TH						
12		COALLENS		1719.70 12.50 1719.40		GRAI			1						
13		Very hard layer, no returns Increase in matrix material, fine to coarse grained and cobble sized clay returns	0000	13.10		GRAE	3								-
15		CONTINUED NEXT PAGE	Š	1717.60 14.60		-									13 Aug 2011 
		GONTINGED NEXT PAGE			<u>L</u>				Ш	<u> </u>	<u> </u>				

DATA ENTRY: VI

PROJECT No.: 11.1348.0020.2000

#### RECORD OF BOREHOLE: GA-HMW1D

SHEET 2 OF 4

LOCATION: See Location Plan

BORING DATE: August 10, 2011

DATUM: Geodetic

N: 652437 E: 5566516 HYDRAULIC CONDUCTIVITY, k, cm/s DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m PIEZOMETER SAMPLES SOIL PROFILE BORING METHOD DEPTH SCALE METRES OR STANDPIPE ADDITIONAL LAB. TESTING STRATA PLOT 10'⁵ INSTALLATION NUMBER ELEV. BLOWS/0. SHEAR STRENGTH Cu, kPa nat V. + Q - ● rem V. ⊕ U - O WATER CONTENT PERCENT DESCRIPTION DEPTH -0W (m) 10 20 Very loose, non-plastic, non-cohesive, dry to slightly damp, grey to black, variable grain size, mainly coarse grained to cobbles WASTE ROCK, Ocovered in clay and sand matrix, black to dark brown, slightly cohesive with sit (continued) O - Moisture content increases from 19.0 to 20.1 m Ď, Hard layer, no returns 21 Very loose, non-plastic, non-cohesive, dry to slightly damp, grey to black, variable grain size, mainly coarse grained to cobbles WASTE ROCK, covered in clay and sand matrix, black to dark brown, slightly cohesive with silf 22 O 1700.30 22.90 23 Massive, grey, very coarse grained to cobble sized, angular to sub-rounded GRAVEL 12/15/11 24 .GDT Soft, plastic, cohesive, brown CLAY, little returns CALGARY. 25 25 2000 BH LOGS. 26 11.1348.0020 27 TESTING 28 LAB\_ 29 EXPANDED ADD. 1702.30 CONTINUED NEXT PAGE LOGGED: TC DEPTH SCALE 1:75 CHECKED: JW

PROJECT No.: 11.1348.0020.2000

#### RECORD OF BOREHOLE: GA-HMW1D

BORING DATE: August 10, 2011

SHEET 3 OF 4

LOCATION: See Location Plan N: 652437 E: 5566516

	ç		SOIL PROFILE			SA	MPL	ES	DYNAMIC PENE RESISTANCE, E	TRATI	ON /0.3m	1	HYDR	AULIC C	ONDUC	ΓΙVΙΤΥ,	T		PIEZOMETER OR
METRES	BORING METHOD		DESCRIPTION	STRATA PLOT	ELEV.	NUMBER	TYPE	BLOWS/0.3m	20 40 SHEAR STRENG	GTH .	60 8 nat V. +	0 Q-	1	<u> </u>	0° <sup>5</sup> 1 ONTENT		O <sup>3</sup> L	ADDITIONAL LAB. TESTING	STANDPIPE INSTALLATION
ĭ i	BORIN		DESCRIPTION	STRATA	DEPTH (m)	NUM	₹	BLOW	SHEAR STRENG Cu, kPa 20 40			ΰ-Ō :0	VVI	·	-ow			ADDIT	
30	_	Massher	aray yang basa arahad ta		29.90				20 40		Ī			Ĭ	Ĭ		13		
		cobble s	grey, very loose grained to fized GRAVEL, angular to ded (continued)	8	28.50														
31				8															
32				**															
02																			
33																			
33					1698.70	8 (	SRAB												
		Hard lay	er, no returns		33.50														
34																			
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	Ž <sub>a</sub>	Massive cobble s cobble s cobble s cobble s cobble s	, grey, very loose grained to ized GRAVEL, angular to	X	1695,60 36,60	Н													
37	Barber Rlg H24 Air Rotary	sub-rour	nded																
	Rig H2	Environ																	
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DATA ENTRY: VI PROJECT No.: 11.1348.0020.2000 LOCATION: See Location Plan

#### RECORD OF BOREHOLE: GA-HMW1D

BORING DATE: August 10, 2011

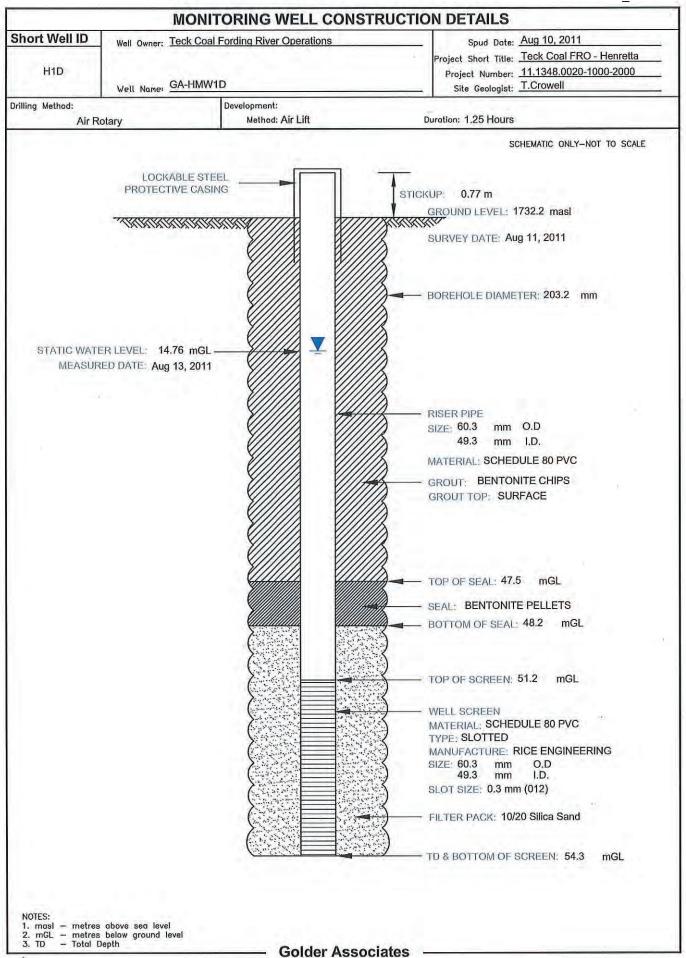
SHEET 4 OF 4

DATUM: Geodetic

N: 652437 E: 5566516

DEPTH SCALE METRES BORING METHOD	-	SOIL PROFILE	  -	I	SA	MPLES			NETRAT , BLOWS		1		k, cm/s			[	٥٦	PIEZOMETER OR STANDPIPE
DEPTH SCALE METRES SORING METHOD		DESCRIPTION	STRATA PLOT	ELEV.	NUMBER	TYPE TYPE	SHEA			60 € nat V. + rem V. ⊕	Q - •	10° WA		ONTENT		O <sup>-3</sup> — NT	ADDITIONAL LAB. TESTING	INSTALLATIO
BORIN ME		SESSINI TION	TRAT	DEPTH (m)	NUN	7 9	Cu, kF					ΨVĐ		-ow			ADDI LAB. T	:
4	+		- 07					20	40	60 E	80	10	2	u a	0 4	10	-	
45		Massive, grey, very loose grained to cobble sized GRAVEL, angular to sub-rounded (continued)	深															
		sub-rounded (continued)	8					4			}							
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55 & & & Barber Rig H24 Air Rotary	Š		於															
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52	l	Black, broken COAL		1680.10 52.10														
					111	BRAB												
- 53	-	Massive, grey, very loose grained to		1679.20 53.00							}							
- 1 1		Massive, grey, very loose grained to cobble sized GRAVEL, angular to sub-rounded				∋RAB												
- 11			<b>X</b>	1679,30														
. 54		Massive, grey BEDROCK	W	53,90 1677.90	13+	SRAB												
		End of BOREHOLE.		54.30														
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DEPTH	18	CALE						E		er ates							LOGGED: 1	rc
1:75	i						V	As	soci	ates						(	CHECKED: J	W





PROJECT No.: 11.1348.0020.2000

#### RECORD OF BOREHOLE: GA-HMW1S

BORING DATE: August 11, 2011

SHEET 1 OF 3

DATUM: Geodetic

N: 652441 E: 5566518

		T	SOIL PROFILE			SA	MPL	ES	DYNAMIC PER RESISTANCE	ETRATI	ON (0.3m	<u>\</u>	HYDRAU k	LIC CO	ONDUC:	Γ <del>Ι</del> ΥΙΤΥ,	Т		PIEZOMETER
METRES	BORING METHOD			řo <sub>T</sub>		$\vdash$			20	10 (	30 E	10	10€				10 <sub>-3</sub> T	ADDITIONAL LAB, TESTING	OR STANDPIPE INSTALLATION
MET	SING		DESCRIPTION	STRATA PLOT	ELEV. DEPTH	NUMBER	TYPE	BLOWS/0.3m	SHEAR STREI Cu, kPa	IGTH I	nat V. + rem V. ⊕	Q - <b>6</b> U - O	WAT			PERCE		DITIO , TES	INSTALLATION
	80			STR	(m)	Ž		BLC				10	Wp F		⊕W 0 :		40	PAB LAB	
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DE	PT	-I SCAL	E					1	PAG	باداد	<b>1</b> 14							LOGGED: T	c
1:	75	<u>.                                    </u>						1	<b>D</b> As	SOCI	ates						C	HECKED: J	w

PROJECT No.: 11.1348.0020.2000 LOCATION: See Location Plan

#### RECORD OF BOREHOLE: GA-HMW1S

SHEET 2 OF 3

BORING DATE: August 11, 2011

$\top$	유	SOIL PROFILE	1. 1	$\Box$	SAME	LES	DYNAMIC PENETRA RESISTANCE, BLOV	ATION VS/0.3m	HYDRAULIC CONDUCTIVITY, k, cm/s	PIEZOMETER OR
WEI NES	BORING METHOD	DESCRIPTION	¥ □	LEV. EPTH (m)	NUMBER	BLOWS/0.3m	20 40 SHEAR STRENGTH Cu, kPa 20 40	60 80 nat V. + Q • rem V. ⊕ U • O	10 <sup>9</sup> 10 <sup>3</sup> 10 <sup>4</sup> 10 <sup>3</sup> 1.  WATER CONTENT PERCENT  Wp I	OR STANDONAL PROPERTY OF THE STANDONAL PROPE
15		Samples are not logged (continued)								<u>₹</u> 13 Aug 2011
16										
17										:
18					4 GR	AB				
19									Of the second se	
20									7 0 0	
21	td.		17	711.00						·
22	Barber Rig H24 Air Rotary BECK Drilling & Environmental Services Ltd.	Very loose, non-plastic, non-cohesive, dry to slightly damp, grey to black, coarse grained to cobbles sized, WASTE ROCK, covered in clay and sand matrix, matrix is black, slightly	0	21.30						
	Barber Rig H24 Air Rotary Illing & Environmental Ser	cohesive, silty	000							
23	Barber CK Drilling &		000							
24	8		0		5 GR					
25			000		9 01.	10				
			00							
26			000							
27			000	704.90						
28		Massive, grey, very coarse grained to cobble sized GRAVEL, angular to sub-rounded		27.40						
					6 GR	A DB				
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	2711.0	SCALE					Gold		1	LOGGED: TC

PROJECT No.: 11.1348.0020.2000

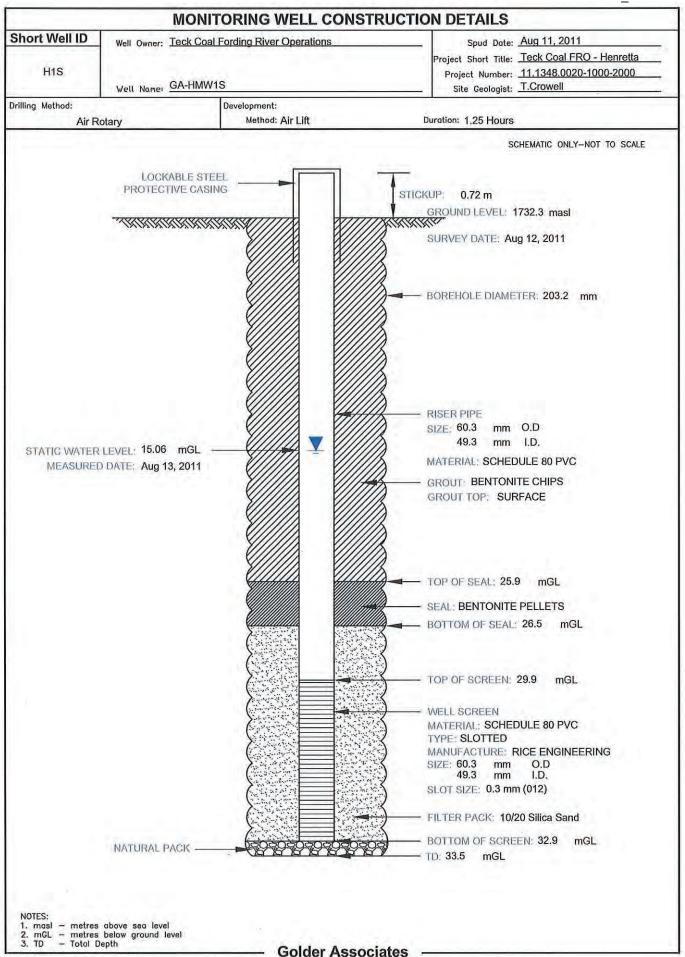
#### RECORD OF BOREHOLE: GA-HMW1S

SHEET 3 OF 3

LOCATION: See Location Plan

BORING DATE: August 11, 2011

DATA			N; 652441 E: 5566518																
-	 ÿ	무	SOIL PROFILE			SA	MPL	ES	DYNAM RESIST	IC PEN ANCE,	ETRATIONS/	DN 0.3m	\	HYDRAULIC k, cm.	CONDUC /s	TIVITY,	T		PIEZOMETER OR
	H SCA TRES	3 METH		PLOT	ELEV.	JER	, 된	₩,0,3m	20 SUEAR				0	10 <sup>-6</sup> WATER			0.3 T	ONAL	STANDPIPE INSTALLATION
	DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	DEPTH (m)	NUMBER	TYPE	всомѕ/о.3т	SHEAR Cu, kPa					Wp I		<u>'</u> (	WI	ADDITIONAL LAB. TËSTING	
	- 30								20	4	<u>0 E</u>	0 8	0	10	20	30 4	10		
		Barber Rig H24 Air Rotary BECK Drilling & Environmental Services Ltd.	Massive, grey, very coarse grained to cobble sized GRAVEL, angular to sub-rounded (continued) Gravel is very large in size (inches across)			6	GRAE												
		Barber R BECK Drilling & E	BEDROCK		1698.80 33.50														
	- 34		End of BOREHOLE.																1
	- 35																		-
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0020 20C	- 42																		
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TESTING	- 43																		
BY CAB	- 44	:												Ather					
ANDED A	- 45																		
BOREHOLE - EXPANDED ADD. LAST ESS ING 11:348:0020_2000 BH LOGS:GPJ CALGARY;GLJ 72:11	DE 1 :	PTH 5	CALE				<u></u>			G Ass	olde socia	er ates			<b>у</b> нуудуулан жана		(	LOGGED: 1	

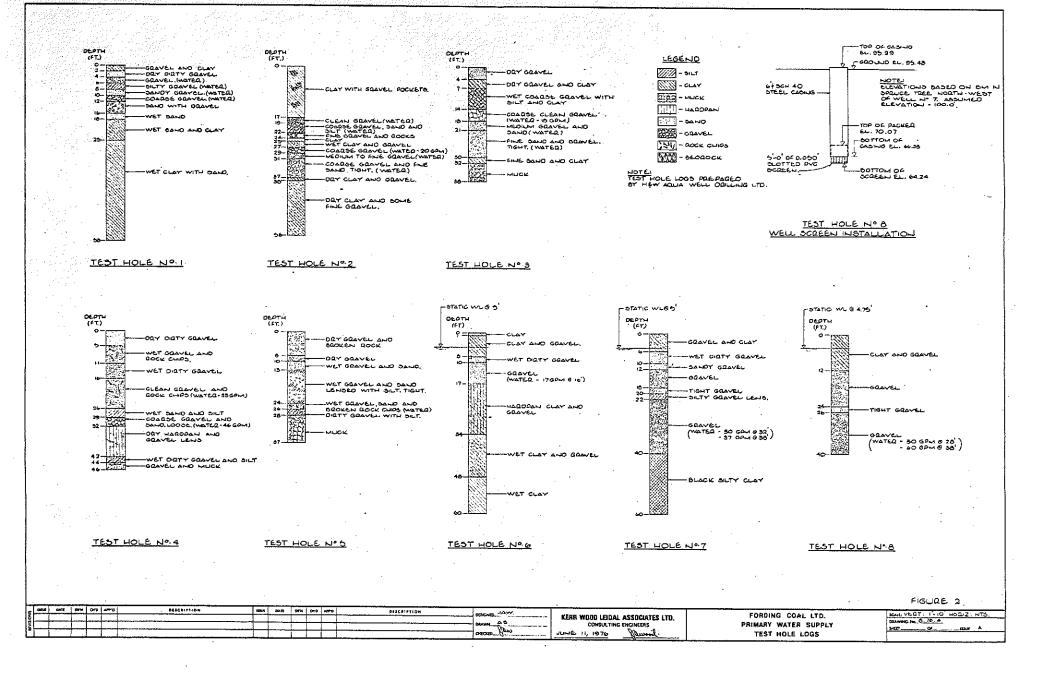


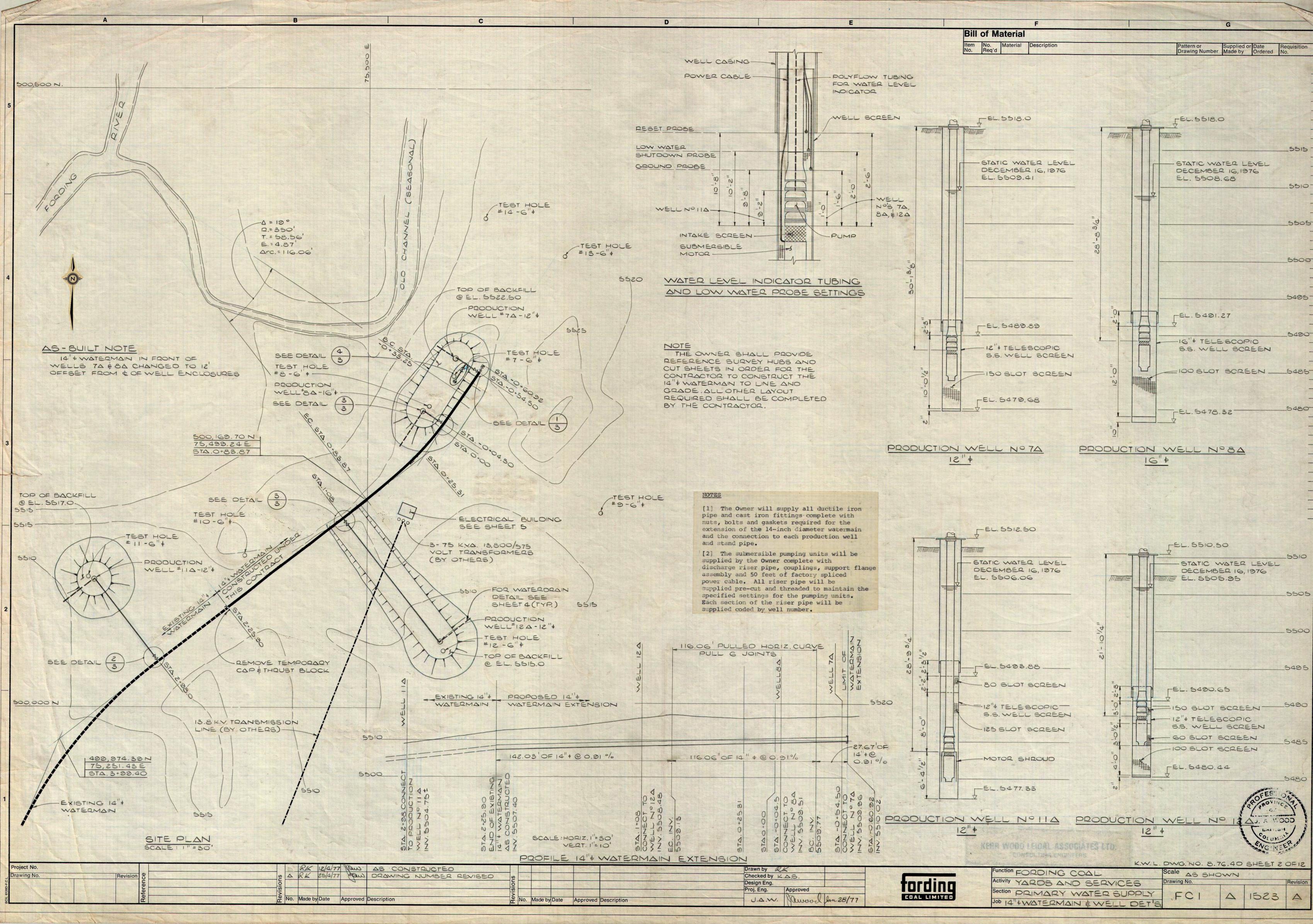
	CRIC T ATTA	T T T T T	1	eck C	Client oal Lin	nited				Borehole	e No. : F	R_TBSSMW-1
<b>*))</b>	SNC+LAVA	LIN	Tu		cation , Elkfo						PAGE 1	OF 3
Drilling Boreh	Contractor Foraco International SA Method Dual Rotary Die Dia. (m) 0.15 Notted Pipe Dia. (m) 0.05/0.05		Date Monitored Ground Surface El Top of Casing Elev Northing: 5565868	/. (m) ´	1697 1697	7 08 08 7.039 7.969 ting: 6516	603.74	17		Project Number: Borehole Logged Date Drilled: Log Typed By:	By: S	48811 60 017 08 02 /L
Depth in Metres	Drilling Legend  Sample Interval  ▼▼▼▼  Air Rotary	Water/NA  ▼ Water Lev  ✓ Water Lev  ◆ NAPL  △ NAPL		Stratigraphy Plot	Sample Interval Core Run	Sample Number	Blow Count	overy	•	Reading within indicated scale Reading outside indicated scale  Soil Vapour (ppm)	Slo	lid PVC otted PVC me 1: TBSSMW-1
Deptl	Soil Desc			Stratig	Sample Core F	Sample	Blow	% Recovery	.0 <sup>1</sup>	10 <sup>2</sup> 10 <sup>3</sup> 10 <sup>4</sup>	_	
1-	COBBLES and BOULDERS (SPontage and gravel matrix, grey-black.	•	, with silt, sand									SAND
4-	GRAVEL (NATIVE), with sand, co	ontains cobbl	es.			1-1					•	
6-	SILT, with sand, with gravel.  GRAVEL, silty, brown.					1-3						BENTONITE
7-									• • • • • • • • • • • • • • • • • • • •			
9 10	GRAVEL, sandy, with silt, brown.  GRAVEL, silty, brown.					1- <b>4</b> 1-5						
				<b>NO</b> 1 150 Bold	mm s	teel cas mple de	sing 1 enote	to 5.0	O m	n. ble analyzed.		

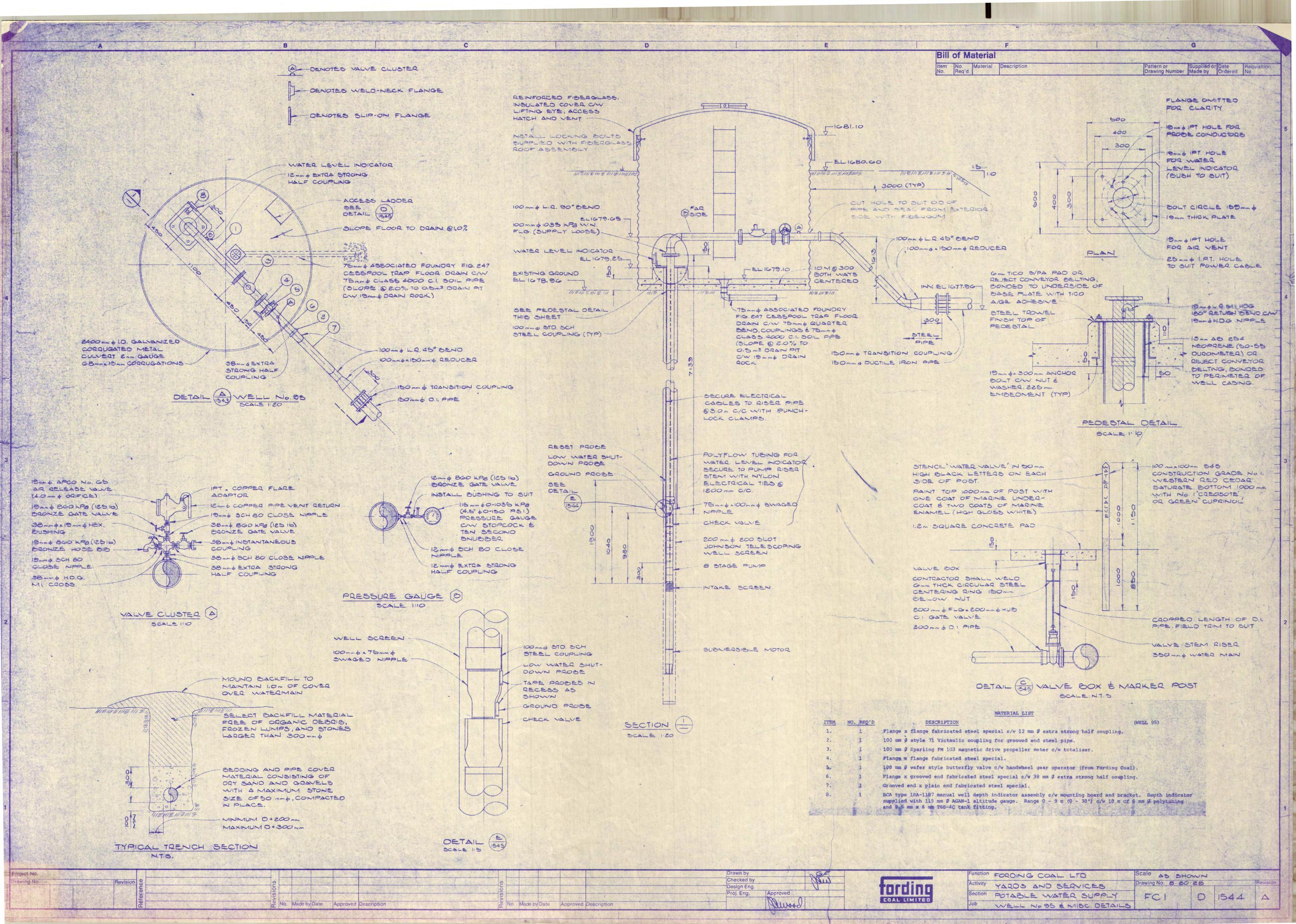
			т		Client oal Lin	nited			Borehole	No. : FR_TBSSMW-1
	SNC+LAVA	LIN		Lo	cation					PAGE 2 OF 3
lling reho	Contractor Foraco International SA Method Dual Rotary Die Dia. (m) 0.15 Otted Pipe Dia. (m) 0.05/0.05		Date Monitored Ground Surface El Top of Casing Elev Northing: 5565868	ev. (m)	2017 1697 1697	7 08 08 7.039 7.969 ing: 6516	603.747	7	Project Number: Borehole Logged Date Drilled: Log Typed By:	648811
	Drilling Legend Sample Interval  ▼▼▼▼ Air Rotary	Water/NA  ▼ Water Le  ▽ Water Le  ◆ NAPL  ◇ NAPL		Stratigraphy Plot	Sample Interval Core Run	Sample Number	Blow Count	% Recovery	Reading within indicated scale Reading outside indicated scale  Soil Vapour (ppm)	Solid PVC Slotted PVC Well Name 1: TBSSMW-1
	Soil Des	scription		St	ပင္လွဳ	Sa	B	% 10 <sup>1</sup>	10² 10³ 10⁴	
)	GRAVEL, silty, brown. (continue					1-6				BENTONITE
3-11-11-11-1	BOULDER, grey-black.  GRAVEL (TILL), silty, with sand boulders, dense, brown.	I, contains cobl	oles and			1-7				SLOUGH
5 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1										BENTONITE
7 <del>-</del>	BOULDER.									SLOUGH
9 1 1 1 1 1 1 1 1 1 1 1 1	GRAVEL (TILL), silty, with sand boulders, dense, brown.	I, contains cobi	oles and			1-9				BENTONITE

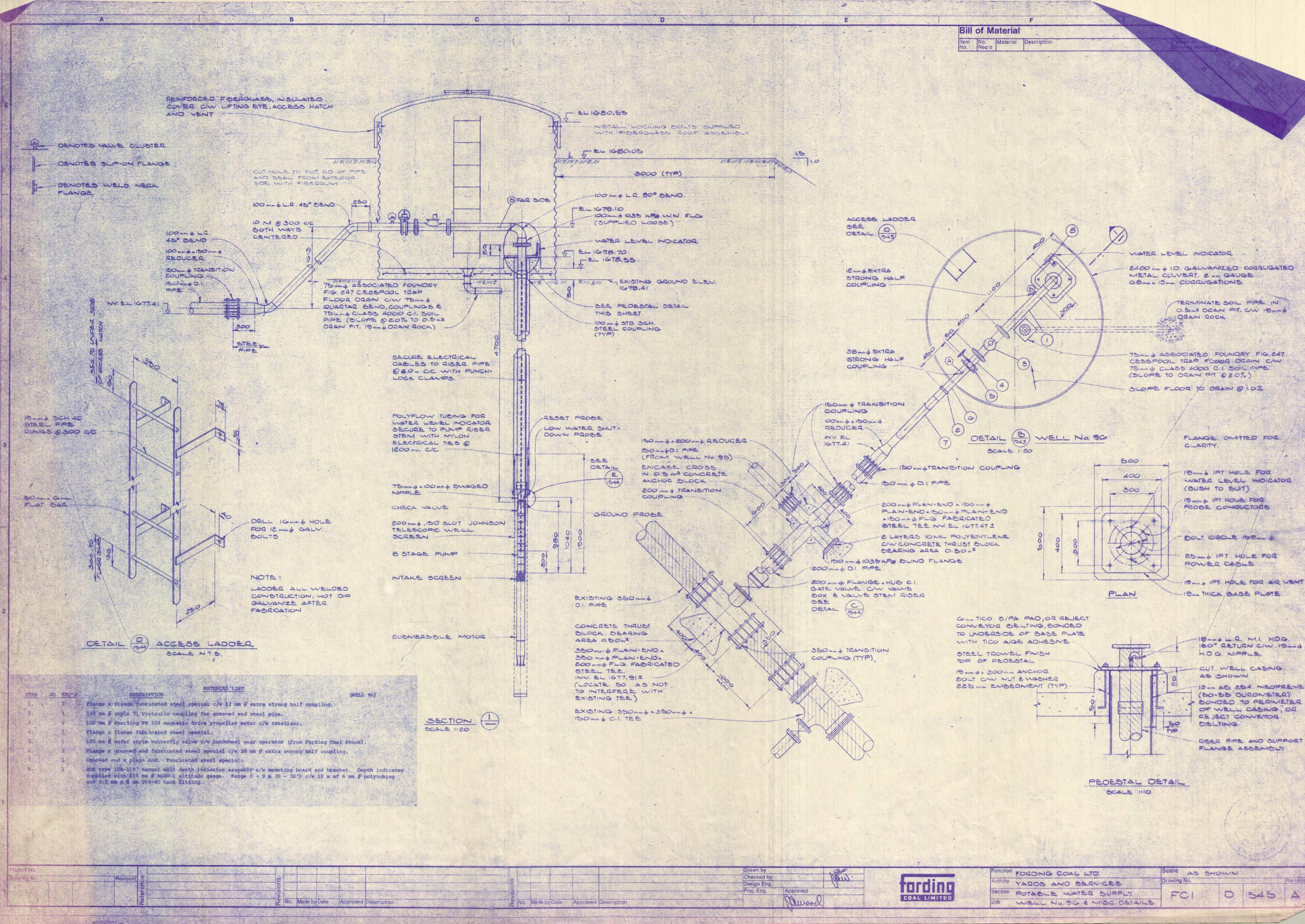
	CNIC T ATTA		Te		Client oal Lin	nited				Borehole	No. : FR_TBSSMW-1
<b> *))</b>	SNC+LAVA	LIN	Tur		cation , <b>Elkfo</b>	rd, BC					PAGE 3 OF 3
Drilling Boreho	Contractor Foraco International SA Method Dual Rotary Ole Dia. (m) 0.15 Iotted Pipe Dia. (m) 0.05/0.05		Date Monitored Ground Surface Ele Top of Casing Elev. Northing: 5565868.	(m)	1697 1697	7 08 08 7.039 7.969 ting: 6516	603.74	17		Project Number: Borehole Logged Date Drilled: Log Typed By:	648811 By: SC 2017 08 02 VL
Depth in Metres	Drilling Legend Sample Interval  TYYY Air Rotary	Water/NA  ▼ Water Lev  ✓ Water Lev  ◆ NAPL  ◇ NAPL		Stratigraphy Plot	Sample Interval Core Run	Sample Number	Blow Count	% Recovery	•	Reading within indicated scale Reading outside indicated scale  Soil Vapour (ppm)	Solid PVC Slotted PVC Well Name 1: TBSSMW-1
Dept	Soil Desc	cription		Stratig	Samp Core I	Samp	Blow	% Red	10 <sup>1</sup>	10 <sup>2</sup> 10 <sup>3</sup> 10 <sup>4</sup>	
21-	GRAVEL (TILL), silty, with sand, boulders, dense, brown. (continu	contains cobl ed)	oles and			1-10					BENTONITE  TBSSMW-1
22	GRAVEL, sandy.					1-11					
23-	BEDROCK, fresh, SILT/SANDST	FONE, grey to	) black.			1-12					SAND
25-	Bottom of hole at 25.5 m.										BENTONITE
27-											
29-				<b>NOT</b> 150	<b>ES</b> mm s	teel cas	sing 1	to 5.	0 n	n.	
				Bold	led sa	mple de	enote	10 5. es sa	o n am	n. ple analyzed.	

	CNIC T ATTA		T	eck C	Client oal Lin	nited				Borehole	e No. : FR_TBSSMW-2
<b>(\$)</b>	SNC+LAVA	LIN	Tui		cation , <b>Elkfo</b>	rd, BC					PAGE 1 OF 1
Drilling Boreho	Contractor Foraco International SA Method Dual Rotary Die Dia. (m) 0.15 Noted Pipe Dia. (m) 0.05/0.05		Date Monitored Ground Surface Ele Top of Casing Elev Northing: 5565866.	. (m) ´	1697 1697	7 08 08 7.026 7.949 ting: 6516	604.80	)3		Project Number: Borehole Logged Date Drilled: Log Typed By:	648811 I By: RSW 2017 08 03 VL
Depth in Metres	Drilling Legend Sample Interval  ▼*▼*▼ Air Rotary	Water/NA  ▼ Water Lev  ▽ Water Lev  • NAPL  ○ NAPL	vel 1	Stratigraphy Plot	Sample Interval Core Run	Sample Number	Blow Count	% Recovery	•	Reading within indicated scale Reading outside indicated scale  Soil Vapour (ppm)	Solid PVC Slotted PVC Well Name 1: TBSSMW-2
Det	Soil Desc	cription		Strat	Sam	Sam	Blo	% Re	10 <sup>1</sup>	10 <sup>2</sup> 10 <sup>3</sup> 10 <sup>4</sup>	
2-	COBBLES and BOULDERS (SPound gravel matrix, grey-black.	OIL), angular,	with silt, sand								SAND
5-1	GRAVEL (NATIVE), with sand, vacobbles.	ari-coloured, (	contains								BENTONITE
7-	GRAVEL (NATIVE), with sand, w	ith silt, contai	ns cobbles.								TBSSMW-2
9-	Bottom of hole at 9.0 m.			ν,	7_V_V_				•	······································	
10-											
				<b>NO</b> 1 150 Bold	TES mm s led sa	teel cas mple de	sing t	to 4.	6 m amp	n. ole analyzed.	









	CRIC T ATTA	T T T T T	Te	eck C	Client oal Lin	nited			ı	Borehole	No. :	FR_GC	MW-1A/B
<b>?</b> ))	SNC+LAVA	LIN	Tur		cation , Elkfo	rd, BC					PAGE	1 OF :	3
Drilling Boreho	Contractor Foraco International SA Method Dual Rotary Die Dia. (m) 0.15 lotted Pipe Dia. (m) 0.05/0.05		Date Monitored Ground Surface Ele Top of Casing Elev. Northing: 5564000.	. (m) ´	1670 167 <i>1</i>	7 08 08 0.643 1.355 167 ting: 6509			Bore Date	ect Number: ehole Logged e Drilled: Typed By:	I Ву:	648811 SC 2017 08 VL	01
Depth in Metres	Drilling Legend Sample Interval  ▼▼▼ Air Rotary	Water/NA  ▼ Water Lev  ⊽ Water Lev  ♠ NAPL  ♦ NAPL		Stratigraphy Plot	Sample Interval Core Run	Sample Number	Blow Count	% Recovery	<ul><li>Readi indica</li><li>Soil '</li></ul>	ng within ted scale ng outside ted scale Vapour pm)	Well	Solid PVC Slotted PVC Name 1: GC Name 2: GC	CMW-1A
De	Soil Desc	cription		Strat	Sam	Sam	Blo	N %	0 <sup>1</sup> 10 <sup>2</sup>	10 <sup>3</sup> 10	] ] [	<b>-</b>	
2-	GRAVEL (SPOIL), silty, with sand boulders, grey-black.	d, contains co	obbles and			1-1							SAND
5-1	GRAVEL (FILL), silty, with sand, boulders, brown.	contains cobl	oles and										BENTONITE
7	GRAVEL (NATIVE), subrounded, cobbles, brown.	, with silt, with	n sand, contains			1-2				B A	▼ /		
10	SAND (NATIVE), silty, brown.			<b>NO1</b> 150 Bold	mm s	teel cas	sing t	to 10	5 m. mple aı	nalyzed.			

	CRIC T ATTA	TINI	Te		Client oal Lin	nited			Borehole	No. : F	R_GCMW-1A/B
*))	SNC+LAVA	LII	Tur		cation , Elkfo	rd, BC				PAGE 2	OF 3
Drilling Boreh	Contractor Foraco International SA Method Dual Rotary ole Dia. (m) 0.15 lotted Pipe Dia. (m) 0.05/0.05		Date Monitored Ground Surface Ele Top of Casing Elev. Northing: 5564000.5	(m)	1670 167	7 08 08 0.643 1.355 167 ing: 6509			Project Number: Borehole Logged Date Drilled: Log Typed By:	By: S	48811 CC 017 08 01 /L
Depth in Metres	Drilling Legend Sample Interval  ▼ ▼ ▼ Air Rotary	▼ Water Lev  ▼ Water Lev  • NAPL		Stratigraphy Plot	Sample Interval Core Run	Sample Number	ount	very •	indicated scale Reading outside indicated scale  Soil Vapour	Slo Well Nar	iid PVC vitted PVC me 1: GCMW-1A me 2: GCMW-1B
Depth	Soil Desc			Stratigra	Sample Core Ru	Sample	Blow Count	% Recovery	(ppm)	VVCII IVai	TIC 2. GOWWY-TD
10-	GRAVEL, with sand, with silt.	Sription		L"	   • • • •			° 10¹	10 <sup>2</sup> 10 <sup>3</sup> 10 <sup>4</sup>		
12	COBBLES and BOULDERS (TIL	L), with silty g	gravel matrix.			1-4					BENTONITE
15-						1-6					GCMW-1B
17-						1-7					BENTONITE
19-				NOT 150 Bold	mm s	teel cas	sing t	to 10.5	m. pple analyzed.		GCMW-1A
200									-		

				liont					
71)	SNC·LAVAL		Teck C	Client oal Lin	nited			Borehole	No. : FR_GCMW-1A/B
<b>\</b>	SINCYLAVAL	Tu Tu		cation , <b>Elkfo</b>	rd, BC			1	PAGE 3 OF 3
Drilling Boreho	Contractor Foraco International SA Method Dual Rotary ble Dia. (m) 0.15 lotted Pipe Dia. (m) 0.05/0.05	Date Monitored Ground Surface El Top of Casing Elev Northing: 5564000	v. (m) ´	1670 167	7 08 08 0.643 1.355 167 ting: 6509		4	Project Number: Borehole Logged Date Drilled: Log Typed By:	648811 By: SC 2017 08 01 VL
Depth in Metres	Air Rotary	ater/NAPL Levels Water Level 1 Water Level 2 NAPL NAPL	Stratigraphy Plot	Sample Interval Core Run	Sample Number	Blow Count	Recovery	Reading within indicated scale Reading outside indicated scale Soil Vapour (ppm)	Solid PVC Slotted PVC  Well Name 1: GCMW-1A Well Name 2: GCMW-1B
	Soil Descrip	tion	Str	Sar	Sar	ă	% 101	10² 10³ 10⁴	
20-	COBBLES and BOULDERS (TILL), w (continued)								GCMW-1A
22	BEDROCK, fresh, SILT/SANDSTONE	t, grey to black.			1-8				
23							•		—— SLOUGH
24-									
	Bottom of hole at 24.1 m.						•		<u></u>
25									
26-									
27-									
28-									
20									
29-									
- 30			<b>NO</b> 1 150 Bold	r <b>ES</b> mm s ded sa	teel cas mple de	ing t	o 10.5	m. iple analyzed.	

	ONIO T ATTA		Te	eck C	Client oal Lin	nited				Boreho	le No.	: FR_	GCMW-2
<b>*))</b>	SNC+LAVA	LIN	Tur		cation , <b>Elkfo</b>						PAGE	1 OF	2
Drilling Boreh	g Contractor Foraco International SA g Method Dual Rotary ole Dia. (m) 0.15 slotted Pipe Dia. (m) 0.05/0.05		Date Monitored Ground Surface Ele Top of Casing Elev. Northing: 5563998.	. (m) ´	1670 1671	7 08 08 0.444 1.342 ting: 6509	966.06	88		Project Number: Borehole Logged Date Drilled: Log Typed By:	Ву:	648811 RSW 2017 08 VL	3 02
Depth in Metres	Drilling Legend Sample Interval  ▼*▼*▼ Air Rotary	Water/NA  ▼ Water Lev  ⊽ Water Lev  • NAPL  ◇ NAPL		Stratigraphy Plot	Sample Interval Core Run	Sample Number	Blow Count	% Recovery	•	Reading within indicated scale Reading outside indicated scale Soil Vapour (ppm)		Solid PVC Slotted P\ Name 1: G	/C
De	Soil Desc	cription		Strai	Sam	Sam	Blo	& %	0 <sup>1</sup>	10 <sup>2</sup> 10 <sup>3</sup> 10 <sup>4</sup>		П	
2	GRAVEL (SPOIL), silty, with sand boulders, grey-black.  GRAVEL (NATIVE), sandy, with shown, black (vari-coloured).												SAND BENTONITE
8-	SAND (NATIVE), gravelly, with si	lt, brown.			ES mm seled sa	2-1 2-2 2-3 2-4 2-5 teel cas	sing 1	to 4.9es sa	) m	ile analyzed.	¥		GCMW-2  SAND  BENTONITE

					1/	<u> </u>					
	ONIC TATA		т	eck C	Client oal Lin	nited				Boreho	le No. : FR_GCMW-2
<b>*</b> ))	SNC+LAVA	LIN	Tur		cation , Elkfo	rd, BC					PAGE 2 OF 2
Drilling Boreho	g Contractor Foraco International SA g Method Dual Rotary ole Dia. (m) 0.15 Slotted Pipe Dia. (m) 0.05/0.05		Date Monitored Ground Surface Ele Top of Casing Elev. Northing: 5563998.	(m) ´	1670 167	7 08 08 0.444 1.342 ting: 6509	966.06	88		Project Number: Borehole Logged Date Drilled: Log Typed By:	648811 By: RSW 2017 08 02 VL
Depth in Metres	Drilling Legend Sample Interval  ▼ ▼ ▼ Air Rotary	Water/NA  ▼ Water Le  ⊽ Water Le  • NAPL  ◇ NAPL		Stratigraphy Plot	Sample Interval Core Run	Sample Number	Blow Count	% Recovery	•	Reading within indicated scale Reading outside indicated scale  Soil Vapour (ppm)	Solid PVC Slotted PVC Well Name 1: GCMW-2
De	Soil Desc	cription		Stra	Sarr	San	Blo	% R	1 <sub>0</sub> 1	10 <sup>2</sup> 10 <sup>3</sup> 10 <sup>4</sup>	
10-	SAND (NATIVE), gravelly, with si	lt, brown. (cc	ntinued)			2-6					BENTONITE
	Bottom of hole at 11.0 m.										
12-											
12											
13-											
14-											
15-											
16-											
17-											
18-											
19-											
-											
20-			_								
				NOT 150 Bold	TES mm s led sa	teel cas mple de	sing t	to 4.	9 m am <sub>l</sub>	n. ple analyzed.	

PROJECT No.: 09-1349-1007.3102 LOCATION: See Location Plan

DATA ENTRY: KJM

#### RECORD OF BOREHOLE: GA-MW-1B

BORING DATE: September 8, 2010

SHEET 1 OF 1

DATUM: UTM Zone 11 (Nad 83)

DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m HYDRAULIC CONDUCTIVITY, k, cm/s PIEZOMETER SAMPLES SOIL PROFILE BORING METHOD DEPTH SCALE METRES ADDITIONAL LAB. TESTING OR STANDPIPE STRATA PLOT 80 BLOWS/0.3m INSTALLATION NUMBER ELEV. TYPE SHEAR STRENGTH nat V. + Q - ● rem V. ⊕ U - ○ WATER CONTENT PERCENT DESCRIPTION DEPTH OW Wp F (m) Ground Surface 1652.0 Soil Materials 11/ 1651. Soil Materials with light grey gravel 0.9 11, 1650.2 Loose, dry, dark brown, coarse-grained GRAVEL AND COBBLES, unconsolidated (TILL) Becker Hammer 1646.5 Loose to dense, wet, dark brown, non-plastic CLAY, large gravel grain-size (TILL) 1645.6 Soft, dry, light to medium, brown, weakly plastic, MUDSTONE 1644.7 Hard, dry, black, very fine-grained SHALE, no fractures or planes 09-1349-1007.3102\_LOGS.GPJ\_CALGARY.GDT\_1/1/1/16 1643.8 End of BOREHOLE. 9 10 DEPTH SCALE LOGGED: TC 1:50 CHECKED: JW

		т.	Client	1 4 4		Borehole	No. : FR_BH_NTPNE
SNC+L	AVALIN	Fording River	Location	1	ord BC		PAGE 1 OF 3
orilling Contractor Owen's Drilling India Dual Rotary Iorehole Dia. (m) 0.15 Pipe/Slotted Pipe Dia. (m) 0.05/	•	Date Monitored Ground Surface Elev. Top of Casing Elev. (n Northing: 651102.616	20° (m) 164 n) 164	18 09 24 14.168 15.168 sting: 5562		Project Number: Borehole Logged Date Drilled: Log Typed By:	656139
Drilling Legend Sample Interval Auger Flight	Water/ Le  ▼ Water Le  ▼ Water Le  ▼ Water Le  • • • • • • • • • • • • • • • • • •		Stratigraphy Plot Sample Interval	Sample Number		Reading within indicated scale     Reading outside indicated scale     Soil Vapour (ppm)  1 102 103 106	Solid PVC Slotted PVC Well Name 1: FR_MW_NTPNE
GRAVEL and COBBLE boulder size), angular, dark grey, loose, dry, m  At 1.3 m - sulphur-like of the coarse angular gravel (graded, dark brown, me of the coarse angular gravel (up to dense, dry.	ES (FILL/RIPRAP), coar sandstone and siltstone innor coal rejects present odour	and, fine to some silt, well					■ BENTONITE

						<u> </u>				
<i>.</i> 11	SNC+LAVAI	TNI			lient Coal Li	d.			Borehole	No. : FR_BH_NTPNE
IJ)	SINC LAVAI	<b>TI</b>	Fording Ri		cation eration	s, Elkfo	ord, BC			PAGE 2 OF 3
rilling oreho	Contractor Owen's Drilling Method Dual Rotary sle Dia. (m) 0.15 otted Pipe Dia. (m) 0.05/0.05		Date Monitored Ground Surface E Top of Casing Ele Northing: 651102.	v. (m) ´	1644 1645	.168	2261.871		Project Number: Borehole Logged Date Drilled: Log Typed By:	656139 By: BH 2018 09 24 VL
Depth in Metres	Auger Flight	Water/ Le Water Lev Water Lev	vel 1	 Stratigraphy Plot	Sample Interval Core Run	Sample Number	Blow Count	% Kecovery	Reading within indicated scale Reading outside indicated scale Soil Vapour (ppm)	Solid PVC Slotted PVC Well Name 1: FR_MW_NTPNE
ă	Soil Descri	ption		Stra	San	San		10 <sup>1</sup>	10 <sup>2</sup> 10 <sup>3</sup> 10 <sup>4</sup>	
10-	SAND and GRAVEL, medium to co subangular gravel (up to 6 mm), we dense, dry. <i>(continued)</i> SAND, fine to coarse grained, some brown to black, loose, dry.	ll graded, b	orown, medium							
2-	At 12.0 m - moist			\$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$						
3	SILT, some sand to sandy (fine to m brown to black, soft, non-plastic, mc SAND and GRAVEL, fine to coarse some silt, well graded, dark brown,	oist. grained sa	and, fine gravel,							BENTONITE
5	Between 15.3 m and 15.6 m - moist	:								
7	At 16.8 m - wet									FR_MW_NTPNE
8-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1	SAND, fine to medium grained, som 10 mm), some silt to silty, poorly gradense, moist.	aded, dark	ular gravel (up to brown, medium							SLOUGH BENTONITE
0-1	BEDROCK, siltstone, dark grey, free	sh, weak.		× ×   × ×						
				NOT	ES					

					1/				1	
	CRIC T ATTA	TINT		Teck	Client <b>Coal L</b>	td.			Borehole	No. : FR_BH_NTPNE
*))	SNC+LAVA	LIN	Fording Riv		cation eration	ns, Elkfo	ord, B	С		PAGE 3 OF 3
Drilling Boreho	g Contractor Owen's Drilling g Method Dual Rotary ole Dia. (m) 0.15 slotted Pipe Dia. (m) 0.05/0.05		Date Monitored Ground Surface Ele Top of Casing Elev Northing: 651102.6	. (m) ´	1644 1644	3 09 24 4.168 5.168 ting: 5562	2261.8	71	Project Number: Borehole Logged Date Drilled: Log Typed By:	656139 By: BH 2018 09 24 VL
Depth in Metres	Drilling Legend Sample Interval Auger Flight	Water/ Le  ▼ Water Le  ✓ Water Le  ◆	vel 1	Stratigraphy Plot	Sample Interval Core Run	Sample Number	Blow Count	% Recovery	indicated scale	Solid PVC Slotted PVC Well Name 1: FR_MW_NTPNE
Del	Soil Des	cription		Strat	Sam	Sam	Blo	% 101	10 <sup>2</sup> 10 <sup>3</sup> 10 <sup>4</sup>	
20-	BEDROCK, siltstone, dark grey,	fresh, weak.	(continued)	× × × × ×						
	Bottom of hole at 20.4 m.			I× ×				I:_	: : :	
21-										
22										
23										
24-										
25										
26-										
27-										
= =										
28-										
29										
30										
				NOT	ES					
1										

11)	CRIC. T ATTA	TENT			lient Coal L	td.			Borehole	No.: FR_BH_NTPSE	
IJ	SNC · LAVA		Fording Rive		cation eration	ıs, Elkfo	rd, BC	;		PAGE 1 OF 2	
ling Mo ehole	ontractor Owen's Drilling ethod Dual Rotary Dia. (m) 0.15 ed Pipe Dia. (m) none/none		Date Monitored Ground Surface Ele Top of Casing Elev. Northing: 650855.43	(m)	1635 1636	3 09 24 5.398 5.398 ing: 5561	252.28	0	Project Number: 656139 Borehole Logged By: BH Date Drilled: 2018 09 26 Log Typed By: VL		
	Drilling Legend Sample Interval Auger Flight	Water/ Le ▼ Water Lev	vel 1	Stratigraphy Plot	Sample Interval Core Run	Sample Number	Blow Count	% Recovery	Reading within indicated scale Reading outside indicated scale Soil Vapour (ppm)	Solid PVC Slotted PVC Well Name 1: FR_MW_NTPSE	
	Soil Des	cription		Str	တ္တ လိ	Sa	B	% 10 <sup>1</sup>	10 <sup>2</sup> 10 <sup>3</sup> 10 <sup>4</sup>	П	
1 2 3 4 5 6 7 8 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9	SAND and GRAVEL (FILL), fine to coarse subangular to angular grolack, loose to medium dense, of the state of	avel (up to 60 coarse coal rej	e subrounded se grained, ebris.							FR_MW_NTPS  SAND	

	CNIC . T ANIA	TINI		Teck	Client Coal L	td.			Borehole	No. : FR_BH_NTPSE
7))	SNC+LAVA	LLIN	Fording Riv		cation eration	ns, Elkfo	rd, B	С		PAGE 2 OF 2
Drilling Boreh	Contractor Owen's Drilling Method Dual Rotary Dle Dia. (m) 0.15 lotted Pipe Dia. (m) none/none		Date Monitored Ground Surface Ele Top of Casing Elev Northing: 650855.4	. (m)	1635 1636	3 09 24 5.398 5.398 ing: 5561	252.2	:80	Project Number: Borehole Logged Date Drilled: Log Typed By:	656139 By: BH 2018 09 26 VL
Depth in Metres	Drilling Legend Sample Interval Auger Flight	Water/ Lev  ▼ Water Lev  □ Water Lev  •	vel 1	Stratigraphy Plot	Sample Interval Core Run	Sample Number	Blow Count	% Recovery	indicated scale	Solid PVC Slotted PVC  Well Name 1: FR_MW_NTPSE
	Soil Des	cription		Strai	Sam	Sam	Blo	₩ 10	10 <sup>2</sup> 10 <sup>3</sup> 10 <sup>4</sup>	
10-	SAND, fine to coarse grained, so 5 mm), silty, medium dense, dar	k grey, moist.		♦ ♦ ♦ ♦				:		SAND
11-	SAND and GRAVEL, fine to coa subangular to angular gravel (up BEDROCK, siltstone, dark grey,	to 10 mm), si		××				:		BENTONITE
12-	Between 11.4 m and 11.5 m - we			× × × × × × × × × × × × × × × × × × ×						
13-	Bottom of hole at 12.5 m.			1\$ \$	<u> </u>				. : : :	V_ / _ / _ / _ / _ / _ / _ / _ / _ / _ /
14-										
15										
16										
17-										
18-										
19-										
20-			r							
				NOT	ES					

*) SNC+LAVALIN			Client Teck Coal Ltd.  Location Fording River Operations, Elkford, BC						Borehole No. : FR_BH_STPNW  PAGE 1 OF 2			
חפליוו ווו ואופוו פא	Drilling Legend Sample Interval Auger Flight	Water/ Le  ▼ Water Lev  ▼ Water Lev  •	rel 1	Stratigraphy Plot	Sample Interval Core Run	Sample Number	Blow Count	% Recovery	Reading within indicated scale Reading outside indicated scale Soil Vapour (ppm)	Solid PVC Slotted PVC Well Name 1: FR_MW_STPNW		
5	Soil Des	cription		Stra	Sar	Sar	Bi	% 101	10 <sup>2</sup> 10 <sup>3</sup> 10 <sup>4</sup>			
0 1 2 2 1	SAND and GRAVEL, fine to coa coarse subangular gravel (up to dark brown-black, loose-medium	300 mm), silty n dense, moist	, well graded,									
3	At 4.1 m - silty, moist									BENTONITE		
7 <del>-</del>	SAND, fine to coarse grained, so subangular to subrounded grave medium dense, moist.									FR_MW_STPNM		
9-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1	SAND and GRAVEL, fine to coa subangular gravel (up to 10 mm) medium dense, moist to wet.	rse grained sa ), some silt to s	nd, fine silty, dark grey,							SAND		
-0				P ∑ ∑	TES			1:				

	CRIC. T AND	TINI	Client Teck Coal Ltd.						Borehol	Borehole No. : FR_BH_STPNW				
📆	SNC · LAVA	Location Fording River Operations, Elkford, BC							PAGE 2 OF 2					
Drilling Boreh	g Contractor Owen's Drilling g Method Dual Rotary ole Dia. (m) 0.15 slotted Pipe Dia. (m) 0.05/0.05		Date Monitored Ground Surface Ele Top of Casing Elev Northing: 651067.8	. (m)	162° 162°	3 09 24 1.603 2.603 ting: 5560	0687.2	270	Project Number: Borehole Logger Date Drilled: Log Typed By:	656139 I By: BH 2018 09 26 VL				
Depth in Metres	Drilling Legend Sample Interval Auger Flight	Water/ Lev  ▼ Water Lev  ▼ Water Lev	/el 1	Stratigraphy Plot	Sample Interval Core Run	Sample Number	count	very	<ul> <li>Reading within indicated scale</li> <li>Reading outside indicated scale</li> <li>Soil Vapour</li> </ul>	Solid PVC Slotted PVC Well Name 1: FR_MW_STPNW				
Depth	Soil Des	© scription		Stratigra	Sample Core Rt	Sample	Blow Count	% Recovery	(ppm) 0 <sup>1</sup> 10 <sup>2</sup> 10 <sup>3</sup> 10					
10-	SAND and GRAVEL, medium to coarse gravel (up to 15 mm cutt some silt, medium dense, grey,	coarse graine	to subrounded, ,	6 C S					0 <sup>1</sup> 10 <sup>2</sup> 10 <sup>3</sup> 10					
11-	BEDROCK, sandstone, fine grain									BENTONITE				
12-														
13-	Bottom of hole at 12.7 m.				[1]				<u> </u>	] (////				
14-														
15														
16-														
17-														
18-														
0A/QC: BH 2018 12 04 PMRt Date::018-12-1-19														
20-			ſ	NOT	res									
JAVUC: BH ZL														

*) SNC+LAVALIN			Client Teck Coal Limited  Location Fording River Operations						Borehole No. : FR_BH-STPSW  PAGE 1 OF 1			
Depth in Metres	Drilling Legend  Sample Interval  ŢŢŢŢŢ Air Rotary	Water/NA  ▼ Water Lev  ▼ Water Lev  • NAPL  • NAPL		Stratigraphy Plot	Sample Interval Core Run	Sample Number	Blow Count	Recovery	Reading within indicated scale     Reading outside indicated scale     Soil Vapour (ppm)		Solid PVC Slotted PVC  Name 1: FR_MW_STPSW-A Name 2: FR_MW_STPSW-B	
	Soil Description			Stra	Sal	Sar	ă	· 0	0 <sup>1</sup> 10 <sup>2</sup> 10 <sup>3</sup> 1	<u>역</u> [		
1-	GRAVEL, some sand, some silt,  At 1.5 m - dry to moist	, containing co	obbles.								SANDICUITINGS	
2-	SAND, silty, trace gravel, moist.				<b>****</b>						BENTONITE	
3-	GRAVEL, silty, some sand, brow	vn. moist. com	pact.	W							FR_MW_STPSW-E	
4-										• • • • • • • • • • • • • • • • • • • •	FR_MW_STPSW-E	
6-	SAND, silty, brown, moist, comp	pact.		00							BENTONITE	
7-	SAND, silty, some gravel, brown	n, moist, silty g	ravel lenses.								FR_MW_STPSW-A	
8-	DEDDOCK weathered resist or			N//							SAND	
	BEDROCK, weathered, moist, co	uttings.									BENTONITE	
9 1 10	Bottom of hole at 9.1 m.											
_ 10 <u>-</u>				NO.	TES							

LOCATION: South Taillings Pond - West (non-channel)

PROJECT No.: 09-1324-1039

#### **RECORD OF MONITORING WELL:**

09-04A

BORING DATE: October 16, 2009

SHEET 1 OF 1 DATUM: Local

DATA ENTRY: KJM DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m HYDRAULIC CONDUCTIVITY, k, cm/s SOIL PROFILE SAMPLES PIEZOMETER BORING METHOD DEPTH SCALE METRES ADDITIONAL LAB. TESTING OR STANDPIPE INSTALLATION STRATA PLOT 10<sup>-5</sup> BLOWS/0.3m NUMBER ELEV. TYPE SHEAR STRENGTH nat V. + Q - ● rem V. ⊕ U - ○ WATER CONTENT PERCENT DESCRIPTION DEPTH OW Wp F (m) Stickup Ground Surface 1605.0 =0.91 m Silty SAND, some gravel, medium grain Bentonite sand, loose, slightly moist, dark brown Slough Barber Rig - DR-24 - 9" Hole Diameter Bentonite 1603.5 Sandy GRAVEL, trace silt, medium َ) ہ gravel, loose, moist, medium brown --- Coarse to medium gravel from 2.5 to Slotted Section --- Very moist from 3.5 to 4.0 m 0 Slough 1600.0 5.0 End of MONITORING WELL. 10 12 09-1324-1039\_LOGS.GPJ\_CALGARY.GDT\_1/11/16 16 20

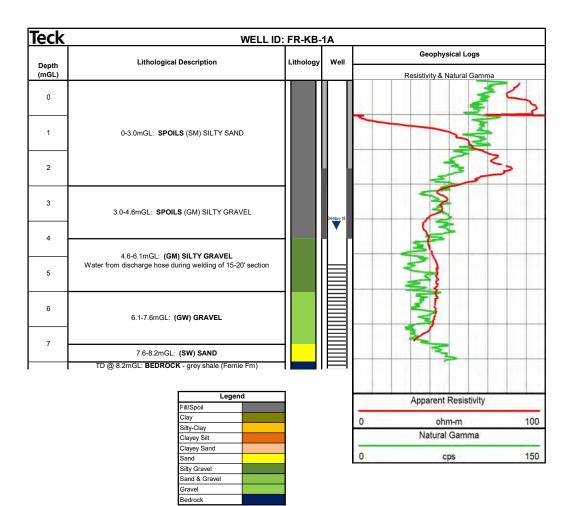
DEPTH SCALE 1:100

LOGGED: EA CHECKED: MB

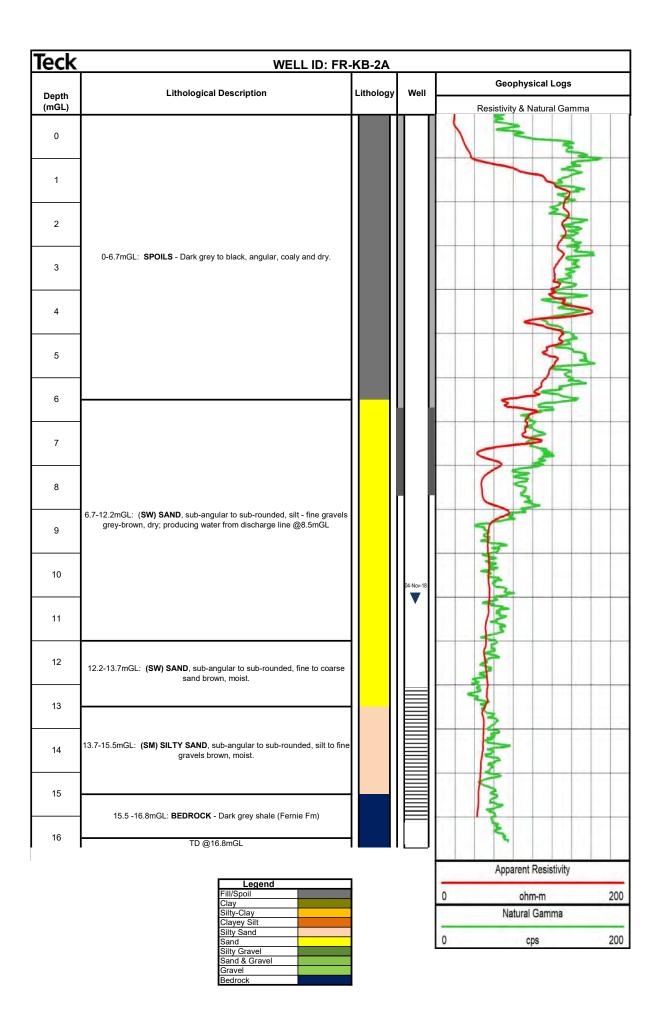
#### **RECORD OF MONITORING WELL:** 09-04B

	QO	SOIL PROFILE			SAN	//PLE	S	DYNAMIC RESISTAN	PENETRA CE, BLOV	TION /S/0.3m	1	HYDR	AULIC C	ONDUC	TIVITY,	T	٥٫	PIEZOMET
METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	æ.	20 SHEAR ST Cu, kPa	40 RENGTH	nat V. H		W	0 <sup>-6</sup> 1 ATER C	0 <sup>-5</sup> 1 ONTENT	Γ PERCE	WI	ADDITIONAL LAB. TESTING	OR STANDPIF INSTALLATI
0		Ground Surface		1605.0			_	10	20	30	40	1	0 2	:0 :	30 4	40		Stickup =0.64 m
	Ltd.	Silty SAND, some gravel, medium gra sand, loose, slightly moist, dark brown  Sandy GRAVEL, trace silt, medium gravel, loose, moist, medium brown	n a o	1603.5 1.5														Bentonite
	Barber Rig - DR-24 - 9" Hole Diameter Beck Drilling and Environmental Services Ltd.	Coarse to medium gravel from 2.5 to 3.0 m																Slough
4	Barber Rig - D	Sax coming and																Bentonite Granular Filter
6	ă	GRAVEL, medium to coarse gravel, loose, saturated, light grey to brown Sandy GRAVEL, loose, saturated, medium brown		1599.5 5.5 1599.0 6.0 1598.5														Slotted Section
		BEDROCK, loose, dark grey		6.5														Slough
10																		
12																		
16																		
18																		

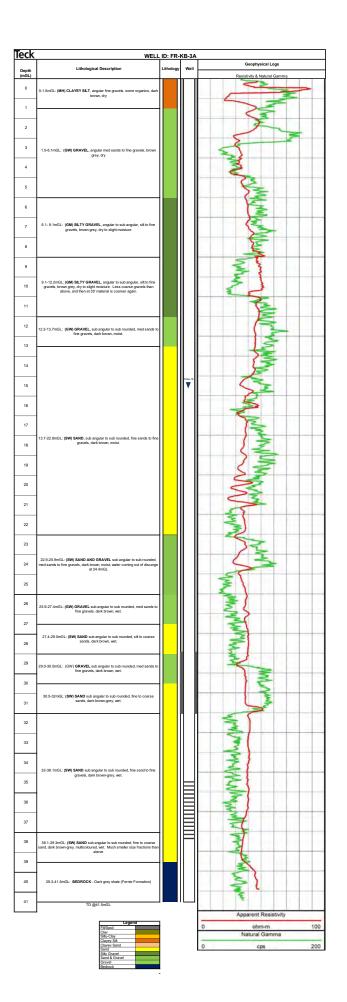




## MONITORING WELL CONSTRUCTION DETAILS **Short Well ID** Well Owner: Teck Coal - FORDING RIVER AWTF SOUTH Spud Date: 15-OCT-2018 Project Short Title: AWTF-S FR-KB-1A Project Number: <u>1786270</u> Well Name: FR-KB-1A (N5559830, E652737) Site Geologist: G. Harding Drilling Method: Development: Airlifting Dual Air Rotary Method: SCHEMATIC ONLY-NOT TO SCALE LOCKABLE STEEL PROTECTIVE CASING STICKUP: 1.0 m GROUND LEVEL: 1622.4 masl SURVEY DATE: 05-NOV-18 BOREHOLE DIAMETER: 187 mm RISER PIPE SIZE: 50.8 mm 2 in MATERIAL: SCH80 PVC **GROUT TO SURFACE** TOP OF SEAL: 2.6 mGL STATIC WATER LEVEL: 3.30 mGL **SEAL: BENTONITE PELLETS** MEASURED DATE: 4-NOV-2018 BOTTOM OF SEAL: 4.6 mGL TOP OF SCREEN: 5.2 mGL WELL SCREEN MATERIAL: SCHD80 PVC SIZE: 50.8 mm 2 in SLOT SIZE: 10-SLOT FILTER PACK: 10/20 SAND TD & BOTTOM OF SCREEN: 8.2 mGL NOTES: 1. masl - metres above sea level 2. mGL — metres belo 3. TD — Total Depth metres below ground level Golder Associates -



## MONITORING WELL CONSTRUCTION DETAILS **Short Well ID** Spud Date: 14-OCT-2018 Well Owner: TECK COAL - FORDING RIVER AWTF SOUTH Project Short Title: AWTF-S FR-KB-2A Project Number: <u>1786270</u> Well Name: FR-KB-2A Site Geologist: G. Harding Drilling Method: Development: Airlifting **Dual Air Rotary** Method: SCHEMATIC ONLY-NOT TO SCALE LOCKABLE STEEL PROTECTIVE CASING STICKUP: 1.2 m GROUND LEVEL: 1625.5 masl SURVEY DATE: 05-NOV-2018 BOREHOLE DIAMETER: 187 mm RISER PIPE SIZE: 50.8 mm 2 in MATERIAL: SCH80 PVC B **GROUT TO SURFACE** TOP OF SEAL: 6.7 mGL SEAL: BENTONITE PELLETS BOTTOM OF SEAL: 8.8 mGL STATIC WATER LEVEL: 11.19 mGL MEASURED DATE: 4-NOV-2018 TOP OF SCREEN: 13.1 mGL WELL SCREEN MATERIAL: SCH80 PVC SIZE: 50.8 mm 2 in SLOT SIZE: 10-SLOT FILTER PACK: 10/20 SAND BOTTOM OF SCREEN: 16.2 mGL TD: 16.8 mGL NOTES: 1. masl - metres above sea level 2. mGL — metres belo 3. TD — Total Depth metres below ground level Golder Associates -



## MONITORING WELL CONSTRUCTION DETAILS **Short Well ID** Well Owner: TECK COAL - FORDING RIVER AWTF SOUTH Spud Date: 09-OCT-2018 Project Short Title: AWTF-S FR-KB-3A Project Number: <u>1786270</u> Well Name: FR-KB-3A Site Geologist: G. Harding Drilling Method: Development: Airlifting **Dual Air Rotary** Method: SCHEMATIC ONLY-NOT TO SCALE LOCKABLE STEEL PROTECTIVE CASING STICKUP: 0.96 m GROUND LEVEL: 1616.1 masl SURVEY DATE: 01-NOV-2018 BOREHOLE DIAMETER: 187 mm RISER PIPE STATIC WATER LEVEL: 15.68 mGL SIZE: 50.8 mm MEASURED DATE: 3-NOV-2018 2 in MATERIAL: SCH80 PVC GROUT TO SURFACE TOP OF SEAL: 29 mGL SEAL: BENTONITE PELLETS BOTTOM OF SEAL: 32 mGL TOP OF SCREEN: 35.4 mGL WELL SCREEN MATERIAL: SCH80 PVC SIZE: 50.8 mm 2 in SLOT SIZE: 10-SLOT FILTER PACK: 10/20 SAND BOTTOM OF SCREEN: 38.4 mGL TD: 41.5 mGL NOTES: 1. masl - metres above sea level 2. mGL — metres belo 3. TD — Total Depth metres below ground level Golder Associates -

Teck	WELL ID: FR-KB-3B		
Depth (mGL)	Lithological Description	Lithology	Well
0	0 - 1.5mGL: (MH) CLAYEY SILT		
1			
2			
3	1.5 - 6.1mGL: <b>(SW) SAND</b>		
4			
5			
6			
7	64 40 7mCl / CNN SH TV CRAVEL Water from displaces have 9		
8	6.1 - 10.7mGL: (GM) SILTY GRAVEL; Water from discharge hose @ 10.1mGL		
9			
10			
11	10.7 - 12.2mGL - <b>(SW) SAND</b>		
12			
13	12.2 - 15.2mGL: <b>(GW) GRAVEL</b>		Н
14			05-Nov-18
15			
16			
17			
18	15.2 - 21.3mGL: <b>(SW) SAND</b>		
19			
20			
21	TD @ 21.3mGL		

Legend										

# MONITORING WELL CONSTRUCTION DETAILS **Short Well ID** Spud Date: 11-OCT-2018 Well Owner: TECK COAL - FORDING RIVER AWTF SOUTH Project Short Title: AWTF-S FR-KB-3B Project Number: <u>1786270</u> Well Name: FR-KB-3B Site Geologist: G. Harding Drilling Method: Development: Airlifting Dual Air Rotary Method: SCHEMATIC ONLY-NOT TO SCALE LOCKABLE STEEL PROTECTIVE CASING STICKUP: 0.95 m GROUND LEVEL: 1616.1 masl SURVEY DATE: 05-NOV-18 BOREHOLE DIAMETER: 187 mm RISER PIPE SIZE: 50.8 mm 2 in MATERIAL: SCH80 PVC GROUT TO SURFACE TOP OF SEAL: 12.6 mGL SEAL: BENTONITE PELLETS BOTTOM OF SEAL: 15.7 mGL STATIC WATER LEVEL: 15.40 mGL MEASURED DATE: 5-NOV-2018 TOP OF SCREEN: 18.3 mGL WELL SCREEN MATERIAL: SCHD80 PVC SIZE: 50.8 mm 2 in SLOT SIZE: 10-SLOT FILTER PACK: 10/20 SAND TD & BOTTOM OF SCREEN: 21.3 mGL NOTES: 1. masl - metres above sea level 2. mGL — metres belo 3. TD — Total Depth metres below ground level Golder Associates -

THE ATTA T NIGO AND	. Te		Client <b>oal Lim</b>	ited			Borehole No. : FR_BH-SK1A			
)) SNC+LAVALIN	Regional (		cation idwate	r Monito	oring			PAGE 1 OF 2		
rilling Contractor JR Drilling rilling Method Dual Rotary orehole Dia. (m) 0.15 ipe/Slotted Pipe Dia. (m) 0.05/0.05	Date Monitored Ground Surface Elet Top of Casing Elev. Northing: 5558635.1	(m)	1586 1587		80.68	5	Project Number: Borehole Logged Date Drilled: Log Typed By:	631283 By: MCA 2018 12 21 VL		
Drilling Legend Sample Interval Sample Interval Water/N Water I Water I NAPL NAPL		Stratigraphy Plot	Sample Interval Core Run	Sample Number	Blow Count	% Recovery	Property of the control of the contr	Solid PVC Slotted PVC  Well Name 1: FR_MW-SK1A		
Soil Description		Stra	San	San	B	% 10	1 10 <sup>2</sup> 10 <sup>3</sup> 10 <sup>1</sup>			
SAND, fine to medium grained, silty, some fit gravel, contains cobbles, subrounded, brown damp.  SILT, sandy, fine grained sand, trace fine grasubrounded, dark brown to black, medium fit	n, medium dense,									
coarse gravel, silty, contains cobbles, suban	SAND and GRAVEL, fine to medium grained sand, fine to coarse gravel, silty, contains cobbles, subangular to subrounded, brown, loose to medium dense, damp.  At 3.7 m - increased gravel with depth									
SILT, sandy, fine to medium grained, trace fi gravel, trace cobbles, dark brown, soft, dam		o 🗸 (						BENTONITE/SLOUGH		
SAND and GRAVEL, fine to coarse grained coarse gravel, silty, some cobbles, subangul brown, dense, damp to moist.										
At 7.8 m - increased moisture with depth  Between 8.5 m and 9.1 m - saturated At 8.7 m - increased gravel with depth		NOT	ES							

<b></b>	CRIC T ATTA		Т		Client oal Lin	nited			Borehole No. : FR_BH-SK1A			
<b>?</b> ))	SNC · LAVA	LIN	Regional		cation ndwate	r Monito	oring			PAGE 2 OF 2		
Drilling Boreho	g Contractor JR Drilling g Method Dual Rotary ole Dia. (m) 0.15 lotted Pipe Dia. (m) 0.05/0.05		Date Monitored Ground Surface Ele Top of Casing Elev Northing: 5558635.	. (m) ´	1586 1587	0 03 28 6.479 7.429 ing: 6526	680.68	35	Project Number: Borehole Logged Date Drilled: Log Typed By:	631283 By: MCA 2018 12 21 VL		
Depth in Metres	Drilling Legend Sample Interval  ▼ ▼ ▼ Air Rotary	Water/NA  ▼ Water Lev  ⊽ Water Lev  ♠ NAPL  ◇ NAPL		Stratigraphy Plot	Sample Interval Core Run	Sample Number	Blow Count	% Recovery	indicated scale	Solid PVC Slotted PVC  Well Name 1: FR_MW-SK1A		
De	Soil Desc	ription		Strai	Sam	Sam	Blo	₩ % 10	10² 10³ 10°			
11-	SAND and GRAVEL, fine to coars coarse gravel, silty, some cobbles brown, dense, damp to moist. (co							BENTONITE/SLOUGH				
13-	SAND and GRAVEL, fine to coars coarse gravel, some silt, subangu medium dense to loose, saturated At 12.3 m - decreased silt with de											
15-	At 14.9 m - trace silt, loose, satura							BENTONITE  FR_MW-SK1A  SAND				
	Bottom of hole at 16.8 m.				<b>***</b> **							
18-												
				NOT	TES							

		Т		Client coal Lim	ited			Borehole No. : FR_BH-SK1B			
<b>*))</b>	SNC · LAVA	LIN	Regional		ocation ndwate	r Monito	ring			PAGE 1 OF 7	
Drilling Boreho	Contractor JR Drilling Method Dual Rotary Ile Dia. (m) 0.15 otted Pipe Dia. (m) 0.05/0.05		Date Monitored Ground Surface Ele Top of Casing Elev Northing: 5558637.	. (m) ´	1586 1587		80.728	3	Project Number: Borehole Logged Date Drilled: Log Typed By:	631283 By: MCA 2018 12 18 VL	
Depth in Metres	Drilling Legend Sample Interval  ▼▼▼▼ Air Rotary	Water/NA  ▼ Water Le  ▽ Water Le  ◆ NAPL  ◇ NAPL		Stratigraphy Plot	Sample Interval Core Run	Sample Number	Blow Count	% Recovery	Reading within indicated scale Reading outside indicated scale Soil Vapour (ppm)	Solid PVC Slotted PVC Well Name 1: FR_MW-SK1B	
	Soil Desc	st	ပို့အ	Sa	酉	% <sub>10</sub> 1	10 <sup>2</sup> 10 <sup>3</sup> 10 <sup>4</sup>				
1-	SAND, fine to medium grained, si gravel, contains cobbles, subroun damp.  SILT, sandy, fine grained sand, trasubrounded, dark brown to black,							SAND			
3-	SAND and GRAVEL, fine to medi coarse gravel, silty, contains cobb subrounded, brown, loose to med At 3.7 m - increased gravel with d										
5	SILT, sandy, fine to medium grained, trace fine to coarse gravel, trace cobbles, dark brown, soft, damp.									BENTONITE	
7- 8- 9-	SAND and GRAVEL, fine to coars coarse gravel, silty, some cobbles brown, dense, damp to moist.  At 7.8 m - increased moisture with At 8.7 m - increased gravel with descriptions.							BENTONITE/SLOUGH			
				NO	TES						

		1		Client oal Lim	nited			Borehole No. : FR_BH-SK1B			
•))	SNC+LAVA	LIN	Regional		cation ndwate	r Monito	oring		PAGE 2 OF 7		
Drilling Boreho	Contractor JR Drilling Method Dual Rotary ble Dia. (m) 0.15 lotted Pipe Dia. (m) 0.05/0.05		Date Monitored Ground Surface El Top of Casing Elev Northing: 5558637	v. (m) ´	1586 1587		80.728	3	Project Number: Borehole Logged Date Drilled: Log Typed By:	631283 By: MCA 2018 12 18 VL	
Depth in Metres	Drilling Legend Sample Interval  ▼▼▼▼ Air Rotary	Water/NA  ▼ Water Le  ∨ Water Le  ◆ NAPL  ◇ NAPL		 Stratigraphy Plot	Sample Interval Core Run	Sample Number	Blow Count	% Recovery	Reading within indicated scale Reading outside indicated scale Soil Vapour (ppm)	Solid PVC Slotted PVC Well Name 1: FR_MW-SK1B	
۵	Soil Desc	Str	Sar	Sar	ă	% 10 <sup>1</sup>	10² 10³ 10⁴				
11	SAND and GRAVEL, fine to coarse gravel, silty, some cobbles brown, dense, damp to moist. (co. At 10.7 m - saturated  SAND and GRAVEL, fine to coarse gravel, some silt, subangumedium dense to loose, saturated.  At 12.3 m - decreased silt with decrease gravel, silty, subrounded, pmedium dense, loose, saturated.  SAND and GRAVEL, fine to coarse coarse gravel, silty, subrounded, pmedium dense, loose, saturated.  SAND and GRAVEL, fine to coarse gravel, contains cobbles, t subrounded, trace rounded, poorts saturated.	s, subangular ntinued)  see grained salar to subroular.  pth  see grained salar to subroular.  see grained salar to subroular.	and, fine to and, fine to and, fine to and, fine to and, frown,							— BENTONITE/SLOUGH	
				NOT	ΓES						

A) ONG I	Т	eck C	Client oal Lin	nited			Boreho	le No. : F	R_BH-SK1B		
SNC+L	AVALIN	Regional		cation ndwate	r Monite	oring		PAGE 3 OF 7			
Drilling Contractor JR Drilling Drilling Method Dual Rotary Borehole Dia. (m) 0.15 Pipe/Slotted Pipe Dia. (m) 0.05/	; ;/0.05	Date Monitored Ground Surface Ele Top of Casing Elev Northing: 5558637.	r. (m)	1586 1587	9 03 28 5.478 7.540 ting: 6526	80.728	3	Project Number: 631283 Borehole Logged By: MCA Date Drilled: 2018 12 18 Log Typed By: VL			
Drilling Legend Sample Interval Air Rotary  Lu Lu Lu Lu Lu Lu Lu Lu Lu Lu Lu Lu Lu	Water/NA  ▼ Water Lev  ▽ Water Lev  • NAPL  ◇ NAPL		Stratigraphy Plot	Sample Interval Core Run	Sample Number	Blow Count	Recovery	indicated scale	Slott	d PVC ted PVC e 1: FR_MW-SK1B	
Se Se	oil Description		Stra	Sar	Sar	ā	% 10¹	10 <sup>2</sup> 10 <sup>3</sup> 10	4		
SAND and GRAVEL, fi coarse gravel, contains subrounded, trace rour saturated. (continued)  21  22  23  24  25	silt, increased coarse g fine to coarse grained sa s cobbles, trace silt, sub nded, poorly graded, bro	and, fine to hangular to bown, dense,		ES						— BENTONITE/SLC	ЭUGH

SNC+LAVALIN  Location Regional Groundwater Monitoring  PAGE 4 OF 7	
Drilling Contractor JR Drilling Date Monitored 2019 03 28 Project Number: 631283 Drilling Method Dual Rotary Ground Surface Elev. (m) 1586.478 Borehole Dia. (m) 0.15 Top of Casing Elev. (m) 1587.540 Date Drilled: 2018 12 18 Pipe/Slotted Pipe Dia. (m) 0.05/0.05 Northing: 5558637.329 Easting: 652680.728 Log Typed By: VL	
Drilling Legend Sample Interval Sample Interval Sample Interval Water/NAPL Levels Water Level 1  Water Level 2 NAPL NAPL Solid PVC Solid PVC Solid PVC Solid PVC Solid PVC Solid PVC Solid PVC Water Level 2 NAPL NAPL Solid PVC Solid PVC Well Name 1: FR_M	W-SK1B
Soil Description	
SAND and GRAVEL, fine to coarse grained sand, fine to coarse gravel, contains cobbles, trace salt subangular to subrounded, trace runded, poorly graded, trown, dense, saturated, (continued)  31-  At 30.1 m - subrounded, medium dense  33-  34-  35-  36-  37-  SAND and GRAVEL, fine to coarse grained sand, fine to coarse gravel, silty, contains cobbles, subrounded, moderately to poorly graded, brown, medium dense, saturated.  NOTES	- BENTONITE/SLOUGH

	- CDIC T ATTA		T-		Client Coal Lin	nited			Boreho	le No. : l	FR_BH-	-SK1B
<b>(</b> *))	SNC+LAVA	LIN	Regional		ocation ndwate	r Monit	oring			PAGE 5	OF 7	
Drilling Boreh	g Contractor JR Drilling g Method Dual Rotary ole Dia. (m) 0.15 lotted Pipe Dia. (m) 0.05/0.05		Date Monitored Ground Surface Ele Top of Casing Elev Northing: 5558637.	. (m̀) ´	1586 1587	9 03 28 5.478 7.540 ing: 652	680.72	8	Project Number: 631283 Borehole Logged By: MCA Date Drilled: 2018 12 18 Log Typed By: VL			
/letres	Drilling Legend Sample Interval  ▼▼▼▼ Air Rotary	Water/NA ▼ Water Le ∑ Water Le		/ Plot	ırval	nber	ıt	•	indicated scale	l H	id PVC tted PVC	
Depth in Metres		NAPL		Stratigraphy Plot	Sample Interval Core Run	Sample Number	Blow Count	Recovery	Soil Vapour (ppm)	Well Nan	ne 1: FR_M	W-SK1B
De	Soil Des		Stratii			6B % 101		10 <sup>2</sup> 10 <sup>3</sup> 10				
44-44-44-44-44-44-44-44-44-44-44-44-44-	SAND and GRAVEL, fine to coar coarse gravel, silty, contains cob to poorly graded, brown, medium  At 48.9 m - increased silt with de	bles, subroun	ided, moderately	20 00 00 00 00 00 00 00 00 00 00 00 00 0								- BENTONITE/SLOUGH

W 6716 T 47	т		Client oal Lin	nited			Boreho	le No. : FR_BH-SK1B	
SNC · LAY	ALIN	Regional		cation ndwate	r Monite	oring			PAGE 6 OF 7
Drilling Contractor JR Drilling Drilling Method Dual Rotary Borehole Dia. (m) 0.15 Pipe/Slotted Pipe Dia. (m) 0.05/0.05		Date Monitored Ground Surface Ele Top of Casing Elev Northing: 5558637.	′. (m̀) ´	1586 1587	0 03 28 6.478 7.540 ing: 6520	680.72	3	Project Number: Borehole Logged Date Drilled: Log Typed By:	631283 By: MCA 2018 12 18 VL
Drilling Legend Sample Interval TT T Air Rotary	Water/NA  ▼ Water Le  ⊽ Water Le  • NAPL  ◇ NAPL		Stratigraphy Plot	Sample Interval Core Run	Sample Number	Blow Count	% Recovery	Reading within indicated scale Reading outside indicated scale Soil Vapour (ppm)	Solid PVC Slotted PVC  Well Name 1: FR_MW-SK1B
Soil I	Soil Description						₩ % 101	10 <sup>2</sup> 10 <sup>3</sup> 10 <sup>4</sup>	
SAND and GRAVEL, fine to coarse gravel, silty, contain to poorly graded, brown, moderately graded.  SATISTICAL STATES OF THE STA	s cobbles, subrour edium dense, satu	ided, moderately rated. (continued)	<b>N</b>	E					— BENTONITE/SLOUGH

	CRIC. T ANIA	TTNT	т		Client oal Lin	nited			Borehol	le No. : FR_BH-SK1B
<b>7</b> ))	SNC · LAVA	LIN	Regional		cation ndwate	r Monite	oring			PAGE 7 OF 7
Drilling Boreh	g Contractor JR Drilling g Method Dual Rotary ole Dia. (m) 0.15 slotted Pipe Dia. (m) 0.05/0.05		Date Monitored Ground Surface Ele Top of Casing Elev Northing: 5558637.	v. (m) 1587.540			8	Project Number: Borehole Logged Date Drilled: Log Typed By:	631283 By: MCA 2018 12 18 VL	
Depth in Metres	Drilling Legend  Sample Interval  ▼▼▼▼ Air Rotary	Water/NA  ▼ Water Lev  ✓ Water Lev  ◆ NAPL  △ NAPL		Stratigraphy Plot	Sample Interval Core Run	Sample Number	Blow Count	% Recovery	Reading within indicated scale Reading outside indicated scale Soil Vapour (ppm)	Solid PVC Slotted PVC  Well Name 1: FR_MW-SK1B
ď	Soil Desc	ription		Stra	San San San Blc Blc Blc Blc Blc Blc Blc Blc Blc Blc				10 <sup>2</sup> 10 <sup>3</sup> 10 <sup>4</sup>	
63 - 64 - 65 - 66 - 67 - 68 - 69 - 69 - 69 - 69 - 69 - 69 - 69	SAND and GRAVEL, fine to coarse gravel, silty, contains cobb to poorly graded, brown, medium GRAVEL, silty, possible boulders, brown, dense, moist to wet.  SAND and GRAVEL, fine to coarse coarse gravel, silty, subrounded, medium dense, saturated.  BEDROCK, fine grained siltstone, appears weathered (soft).	es, subroundense, satur subangular se grained sa moderately g	ded, moderately ated. (continued) to angular, and, fine to raded, brown							— BENTONITE  FR_MW-SK1B  SAND
-	Bottom of hole at 69.3 m.			IV/>	<b>V V</b> V				; ; ;	<u>  0 0 0 0 0 0 d</u>
- 70 <del>-</del>				NOT	ES					

PROJECT No.: 09-1324-1039 LOCATION: East of Old Stream

DATA ENTRY: KJM

### RECORD OF MONITORING WELL:

09-01A

SHEET 1 OF 1

LOCATION: East of Old Stream Bed Kilmarnock Alluvium BORING DATE: October 14, 2009

DEPTH SCALE  O METRES	BORING METHOD	DESCRIPTION	STRATA PLOT		~		F I									n-3 —		
	B		RAT	DEPTH	NUMBER	TYPE	SHE Cu,	20 EAR STRE kPa		1	Q - • U - O	w	ATER C	ONTENT	PERCE		ADDITIONAL LAB. TESTING	STANDPIPE INSTALLATION
- 0	$\blacksquare$		STI	(m)	_		<b>#</b>	10	20	30 4	10					10 	ļ-	Stickup
		Ground Surface Silty SAND, trace gravel, loose, dry, light brown Sandy GRAVEL, trace silt, loose, moist, medium brown		1584.1 0.0 1583.6 0.5														=0.85 m
Barber Rig - DR-24 - 9" Hole Diameter	Beck Drilling and Environmental Services Ltd.	Clayey SILT, some sand and gravel, soft, low to medium plasticity, moist, medium brown Sandy GRAVEL, loose, moist, medium brown		2.0 1581.6 2.5														Granular Filter
9 Barber Rig	Beck Drilling ar																	Slotted Section Oct. 16, 2009
- 8		End of MONITORING WELL.		1575.7 8.4														Slough
- 10																		
- 12																		
- 14																		
- 16																		
- 18																		
- 20 DEPT								A G									1000	GED: EA

DATA ENTRY: KJM PROJECT No.: 09-1324-1039

RECORD OF MONITORING WELL:

09-01B

SHEET 1 OF 2

LOCATION: East of Old Stream Bed Kilmarnock Alluvium

BORING DATE: October 14, 2009

METRES	BORING METHOD	SOIL PROFILE	ТО.			MPL		DYNAMIC F RESISTANO 20	CE, BLOV		80	HYDRAUL k, 10 <sup>-6</sup>	cm/s 10 <sup>-5</sup>	10-4	, I	STING	PIEZOMETER OR STANDPIPE
METF	RING N	DESCRIPTION	STRATA PLOT	ELEV. DEPTH	NUMBER	TYPE	BLOWS/0.3m	SHEAR STI Cu, kPa		nat V. + rem V. €	Q - • U - O		R CONTE			ADDITIONAL LAB. TESTING	INSTALLATION
$\dashv$	BC	010 (	STF	(m)	_		BL	10	20	30	40	10	20	30	40		Stickup
0		Ground Surface Silty SAND, trace gravel, loose, dry,		1584.1 0.0 1583.6													=0.76 m
		light brown Sandy GRAVEL, trace silt, loose, moist, medium brown	0.0	0.5													
		median brown	0.														
2		Clause Cli T. come and and arreal	<u>ن</u>	1582.1													
		Clayey SILT, some sand and gravel, soft, low to medium plasticity, moist, medium brown		2.0 1581.6 2.5													
		Sandy GRAVEL, loose, moist, medium brown	000														Bentonite
			000														
4			0.[.														
			<u>ن</u>														
			000	1													
6			000														Fit
			00														
			0.0														Oct 16, 2009
			000														
8	Ed		000														
	iameter		ن. ن. ن														
	'Hole D		000														
10	Barber Rig - DR-24 - 9" Hole Diameter Beck Drilling and Environmental Services Ltd.	Coarse GRAVEL, trace sand, loose,		1574.1 10.0	-												
	Rig - Di	saturated, grey to medium brown															Slough
	Barber X Drillir																
12	Be																
		Some silty sand from 12.5 to 13.0 m															
14																	17/17/
16																	Bentonite
1																	Slotted Section
18		Medium to coarse gravel, light grey to brown from 18.0 to 23.0 m															
																	Slough
20	_L	CONTINUED NEXT PAGE	130		<u> </u>	$\vdash$	_		-	-		-	-+-	-	-	-	£
DE	PTH S	SCALE	•	•	•		_		Cal		•	• '		1	,	LOG	GED: EA
	100						(		SSOC	der <u>iates</u>							KED: MB

#### RECORD OF MONITORING WELL: 09-01B

щ	2	ξŢ	SOIL PROFILE			SA	MPLE	ES	DYNAM	IIC PEN	ETRATION S.	ON	<u> </u>	HYDR	AULIC C	ONDUCT	IVITY,	Т		PIEZOMETER
DEPTH SCALE METRES	DODING METHOD	DONING ME	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	20	STREN	IO 6 I IGTH r	60 8 L lat V. + em V. ⊕	Q - • U - O	W W	ATER C	0 <sup>-5</sup> 10 L ONTENT OW	0 <sup>-4</sup> 10 PERCE	NT MI	ADDITIONAL LAB. TESTING	OR STANDPIPE INSTALLATION
- 20 - 22 - 24 - 26	Barber Rig - DR-24 - 9" Hole Diameter	Beck Drilling and Environmental Services Ltd.	Coarse GRAVEL, trace sand, loose, saturated, grey to medium brown (continued)  Silty sand, saturated, medium brown from 28.5 to 29.0 m End of MONITORING WELL.		1555.1 29.0															Slough
- 30			EIU UI MONITORING WELL.																	
- 32 - 34																				
- 36 - 38 - 40 DE 1 :																				
- 38																				

1:100



PROJECT No.: 09-1324-1039

DATA ENTRY: KJM

### RECORD OF MONITORING WELL:

09-02A

SHEET 1 OF 1

LOCATION: West of Old Stream Bed Kilmarnock Alluvium

BORING DATE: October 15, 2009

		00	SOIL PROFILE			SAM	MPLE	S	DYNAMIC RESISTAL	PENE	TRATIC	0N 0.3m	1	HYDR	AULIC C	ONDUC	TIVITY,	Т		PIEZOMETER OR
DEPTH SCALE METRES		BORING METHOD		PLOT	515)/	띪			20	40	) 6	0 8			0 <sup>-6</sup> 1	0 <sup>-5</sup> 1	1	10 <sup>-3</sup>	ADDITIONAL LAB. TESTING	STANDPIPE INSTALLATION
EPTH		RING	DESCRIPTION	STRATA PLOT	ELEV. DEPTH	NUMBER	TYPE	BLOWS/0.3m	SHEAR S Cu, kPa	TRENC	GTH n	at V. + em V. ⊕	Q - • U - O			ONTEN		ENT I WI	ADDIT AB. TI	internal trion
		8 8		STR	(m)	_		) H	10	20	) 3	0 4	0					40		Stickup
	,  -	+	Ground Surface Sandy GRAVEL, coarse gravel,	بن ه	1584.7 0.0		4	4												=0.82 m
E			medium grain sand, loose, slightly moist, medium grown	$\circ$																
Ė			Increasing sand content from 1.0 to	00																
E			1.5 m	00																
<u> </u>	2			00																Bentonite
-				00																
Ē			Decreasing sand content from 3.0 to	00																
Ė			3.5 m	00																
F .	4	_tq		00																Bentonite
Ė	ofomoi	amete	Moist, some silt from 4.5 to 5.0 m	0.0																
-	200	nole D		000																Slough
F	.0	vironme		0.(.)																
F '	ŝ   è	Beck Drilling and Environmental Services Ltd.		000																Slough Slough
F	i d	rilling a	Trace silt from 6.5 yo 7.0 m	0.0																
E	o c	Beck D		0.0																Bentonite
Ė,	В			00																Oct. 16, 2009 🔽 📗 🕒
ļ `			Coarse to medium gravel, increasing moisture content at 8.0 m	0000																
E				0																
Ė				90.																
- 10	0			000																Slotted Section
-																				
Ė																				Slotted Section
Ė			End of MONITORING WELL.	0 .	1573.2 11.5		+													Slough : 🖰 -
— 1: -	2																			=
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91/11	6																			=
BOKEHOLE 09-1324-1039_LOGS.GPJ CALGARY.GD 1/1/1/16																				]
ار ا د																				]
3}- 31- 11	В																			
25 - 20 -																				]
7 -																				
3-																				
20	0																			-
٥										$\perp$				<u> </u>			1			
			CALE						Ð	Go	olde	r								GED: EA
2 1	:	100						_	J)	<b>Ass</b>	<u>ocia</u>	<u>tes</u>							CHECK	(ED: MB

j	OC	SOIL PROFILE			SAI	MPLE	s	DYNAMIC PE RESISTANCE	NETRATI	ON 2/0.3m	1	HYDRAUL	IC CONDUC	TIVITY, T	- (	PIEZOMETER
METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	20 SHEAR STRE Cu, kPa	40 NGTH	60 8 nat V. + rem V. ⊕		10 <sup>-6</sup> WATE Wp <b>⊢</b>	10 <sup>-5</sup> 1 ER CONTENT	wi	ADDITIONAL LAB. TESTING	OR STANDPIPE INSTALLATIOI
	ш —	Ground Surface	S	1584.7			ш	10	20	30 4	0	10	20 ;	30 40		Stickup =0.67 m
0		Sandy GRAVEL, coarse gravel, medium grain sand, loose, slightly	0.00	0.0												
		moist, medium brown  Increasing sand content from 1.0 to 1.5 m														
2		Decreasing sand content from 3.0 to 3.5 m														
4		Moist, some silt from 4.5 to 5.0 m	000													Bentonite
6		Trace silt from 6.5 to 7.0 m														
10	oer Rig - DR-24 - 9" Hole Diameter rilling and Environmental Services Ltd.	Coarse to medium gravel, increasing moisture content at 8.0 m														Oct 16, 2009
12	Barber F Beck Drilling	GRAVEL, trace sand, coarse to medium gravel, loose, saturated, light grey to brown  Sandy GRAVEL, trace silt, medium to coarse gravel, medium grain sand, loose, saturated, medium brown		1573.2 11.5 1572.2 12.5 1571.7 13.0												Bentonite
14		GRAVEL, trace sand, coarse gravel, loose, saturated, light grey to brown	14916161614F													
16																

DATA ENTRY: KJM PROJECT No.: 09-1324-1039

#### RECORD OF MONITORING WELL:

09-02B

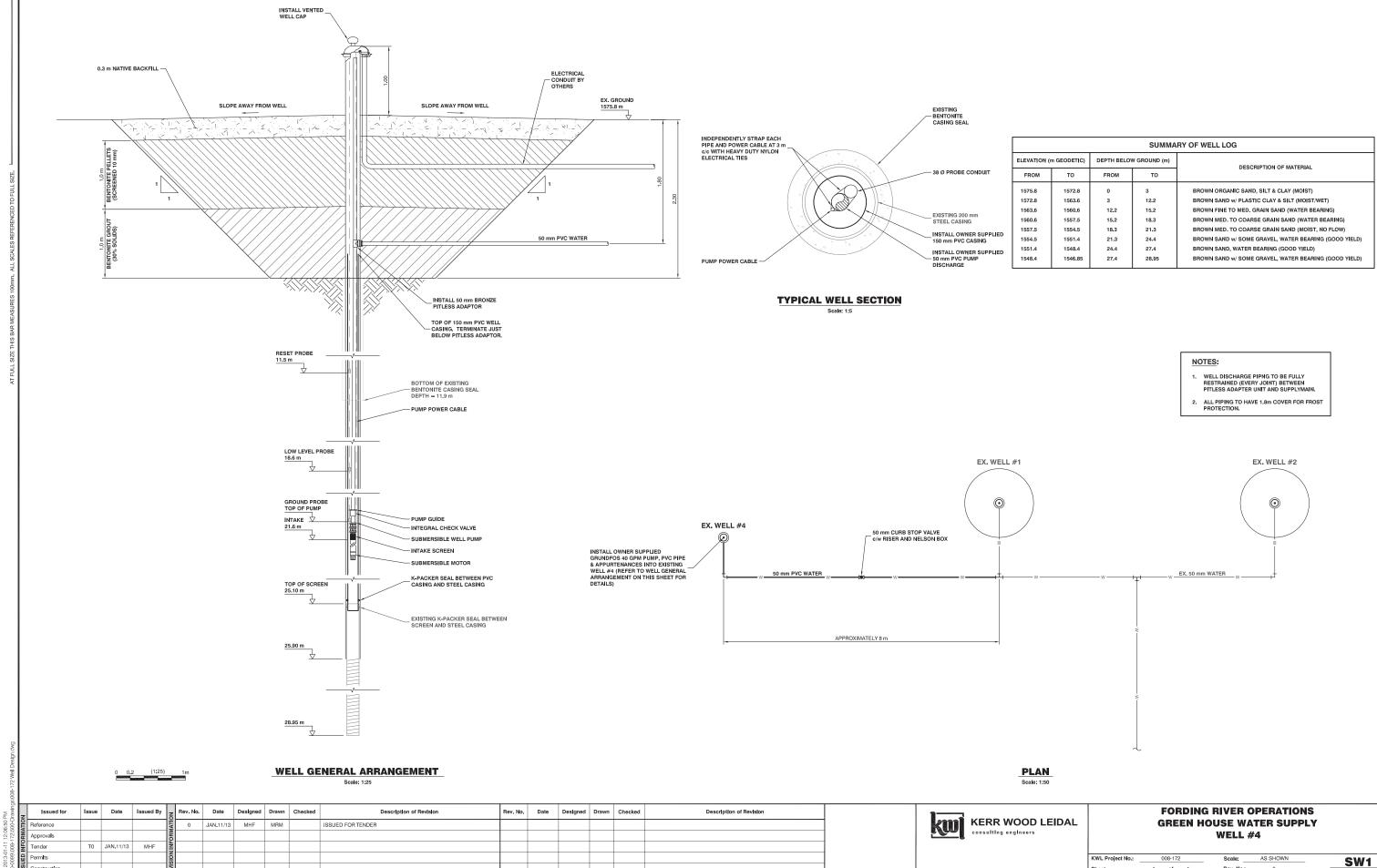
SHEET 2 OF 2

LOCATION: West of Old Stream Bed Kilmarnock Alluvium

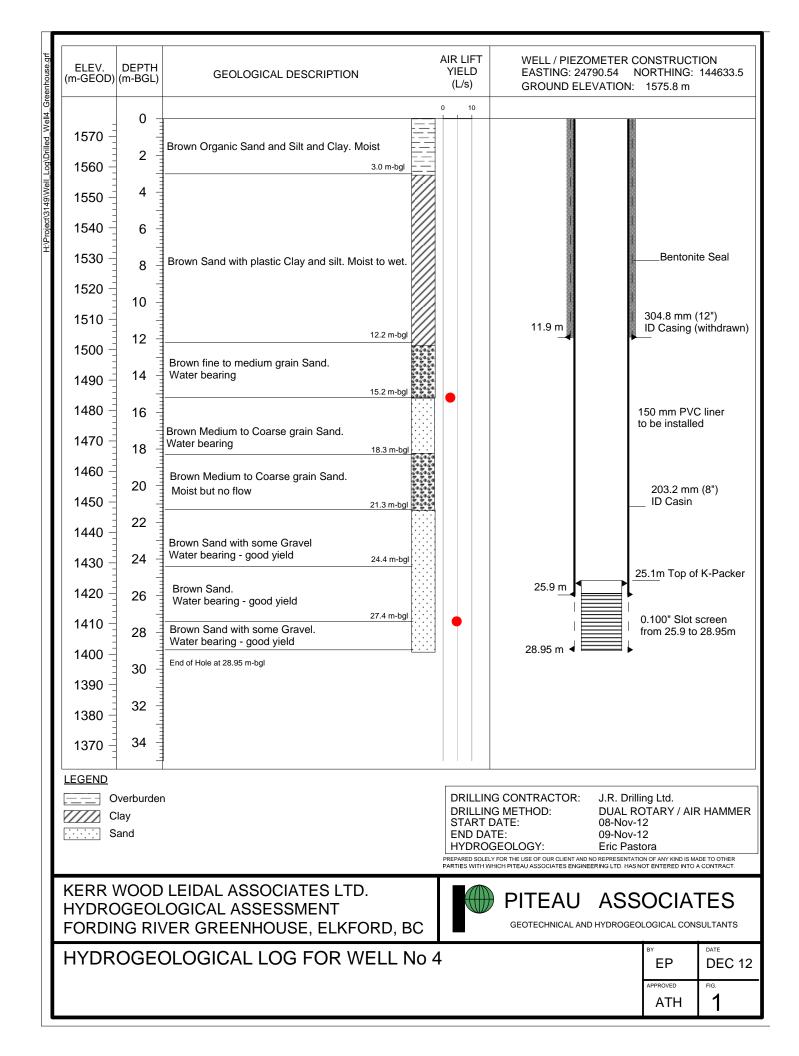
BORING DATE: October 15, 2009

۵							D.A	ETP		LIN/DDAL!!!!!	7/ 1	
	Ш	유	SOIL PROFILE	. 1	SAMPI	1	DYNAMIC PEN RESISTANCE,	ETRATION BLOWS/0	.3m	HYDRAULIC CONDUCTIVIT k, cm/s	r,    -	PIEZOMETER OR
	DEPTH SCALE METRES	BORING METHOD	DESCRIPTION 4 1 4 1 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5	ELEV.	# III	BLOWS/0.3m		0 60		10 <sup>-6</sup> 10 <sup>-5</sup> 10 <sup>-4</sup>	10 <sup>3</sup> 1	OR OR STANDPIPE INSTALLATION
	Ä	RING	DESCRIPTION	DEPTH	NUMBER	/SMO	SHEAR STREM Cu, kPa	IGTH na rei	t V. + Q - ● n V. ⊕ U - O	WATER CONTENT PE	RCENT I	AB. T
		BO	E E	(m)		B	10 2	20 30	40	10 20 30	40	
L	- 20	L		_								E4 E4
Ē			Sandy CBAVEL some silt soarse	1564.2								
F			gravel, loose, saturated, medium brown	1563.7								
F			GRAVEL, trace sand, medium to coarse gravel, loose, saturated, light grey to brown	\$1.0								
E	- 22		grey to brown									Slotted Section
F				5								
E												Sand
-			E E									
E	- 24	amete		2								
-	2-7	ole Di	8 8 8									
Ē		H6 -	oumer	\$								
-		DR-24		\$								
Ė	- 26	- Rig -	ng aw	\$								
E	- 20	Barber Rig - DR-24 - 9" Hole Diameter	Beck Drilling and Environmental Services Ltd.									Slough
Ė			*	7								
F												
Ė	- 28											
E	- 20											
Ė				\$								
F				\$								
F	- 30			1554.7								
F	- 30		End of MONITORING WELL.	30.0								
Ė												]
F												
Ė	- 32											]
F	- 32											
F												1
E												
E	- 24											
F	- 34											]
F												
F												]
11/16	- 30											
BOREHOLE 09-1324-1039 LOGS.GPJ CALGARY.GDT 1/11/16	- 36											]
7.60												
GAR												]
CAL	- 20											
GPJ	- 38											
0.068												
339_L												]
24-10												
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REH	DE		I SCALE			(	<b>A</b> SS	oldei	•			OGGED: EA
BO	1 :	100	0				<b>V</b> Ass	<u>ocia</u>	tes		CHE	ECKED: MB

Rev. No.:



onstruction



<b>*</b> ))	SNC+LAVA	TIN	-	Teck C	Client oal Lim	ited				Borehole	e No. : FR_BH_FRRD1
\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \	OINC LAWA		Regiona		ocation ndwate	r Monit	oring				PAGE 1 OF 2
Drilling Boreh	g Contractor Owen's Drilling g Method Dual Rotary ole Dia. (m) 0.17 lotted Pipe Dia. (m) 0.05/0.05		Date Monitored Ground Surface E Top of Casing Ele Northing: 5556128	v. (m) ´	1581		883.84	5		Project Number: Borehole Logged Date Drilled: Log Typed By:	657269   By: IPC 2019 01 31   VL
Depth in Metres	Drilling Legend Sample Interval  ▼▼▼▼ Air Rotary	Water/NA  ▼ Water Le  ▽ Water Le  ◆ NAPL  ◇ NAPL		Stratigraphy Plot	Sample Interval Core Run	Sample Number	Blow Count	% Recovery	•	Reading within indicated scale Reading outside indicated scale Soil Vapour (ppm)	Solid PVC Slotted PVC Well Name 1: FR_MW_FRRD1
	Soil Des	cription		₽\$	လ လိ	Sa	B	% 1	0 <sup>1</sup>	10 <sup>2</sup> 10 <sup>3</sup> 10 <sup>3</sup>	
1-	SAND and GRAVEL, fine- to cocoarse gravel, some silt, subang At 0.9 m - cobbles, trace silt	arse-grained s gular, well grad	sand, fine to ded, brown, dry.								SAND
3-	SAND, fine- to coarse-grained, s some silt, subangular, well grade  Between 4.3 m and 4.9 m - boul	ed, brown, dry	oarse gravel,								BENTONITE
5-	At 6.1 m - trace to some silt, cob	obles, dark bro	own, damp								
7	At 6.9 m - damp to moist  At 7.3 m - some silt, moist										
9-	At 8.5 m - trace gravel, damp  At 9.1 m - some gravel			\$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$							FR_MW_FRRD1
9-				NOT	ΓES						

	SNC·LAVA	TINI	т	eck C	Client oal Lir	nited				Borehol	e No. : FR_BH_FRRD1	
	SINCYLAVA		Regional		ocation ndwate		oring				PAGE 2 OF 2	
Drilling Boreh	g Contractor Owen's Drilling g Method Dual Rotary ole Dia. (m) 0.17 Slotted Pipe Dia. (m) 0.05/0.05		Date Monitored Ground Surface El- Top of Casing Elev Northing: 5556128	r. (m) ´	158	1.026 1.955 ting: 6538	383.84	<b>1</b> 5		Project Number: Borehole Logged Date Drilled: Log Typed By:	657269 d By: IPC 2019 01 31 VL	
Depth in Metres	Drilling Legend Sample Interval  ▼・▼・▼ Air Rotary	Water/NA  ▼ Water Le  ▽ Water Le  ◆ NAPL  ◇ NAPL		Stratigraphy Plot	Sample Interval Core Run	Sample Number	Blow Count	% Recovery	•	Reading within indicated scale Reading outside indicated scale  Soil Vapour (ppm)	Solid PVC Slotted PVC  Well Name 1: FR_MW_FRRD1	
Dek	Soil Des	cription		Strati	Sam	Sam	Blov	% Re	10 <sup>1</sup>	10 <sup>2</sup> 10 <sup>3</sup> 10	1	
10-	SAND, fine- to coarse-grained, some silt, subangular, well grad At 10.1 m - no cobbles, trace gra	ed, brown, dry	parse gravel, . (continued)						:		FR_MW_FRRD1	
11-	Between 11.0 m and 11.3 m - α								: : : : :			
12-	SAND and GRAVEL, fine- to co coarse gravel, some silt, well grant BEDROCK, siltstone, grey.		and, fine to		\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\							
	BEBROOK, sinstone, grey.				***** *****				:			
13-					***** *****				:		BENTONITE	
"					*****							
					***** *****							
14-												
	Bottom of hole at 14.6 m.			<b>X</b>	<u> </u>				:			
15-												
16-												
17-												
10												
18-												
09-26												
19- - - - -												
11 Print Date:2019-09-26												
20-	I		I	NOT	reo.							
OA/QC: BH 2019 04 01 Print Date;2019-09-26				NO1	IES							
DA/QC:												

Contractor Owen's Drilling Method Dual Rotary le Dia. (m) 0.17 lotted Pipe Dia. (m) 0.05/0.05	Region  Date Monitored		ocation <b>ndwate</b> i	Monito	rina			PAGE 1 OF 3
Method Dual Rotary ole Dia. (m) 0.17								
	Ground Surface Top of Casing E Northing: 55545	ev. (m)	1557	.027 .764 1557 ng: 6550		)	Project Number: Borehole Logged Date Drilled: Log Typed By:	
Drilling Legend Sample Interval  ▼▼▼ Air Rotary	Water/NAPL Levels  ▼ Water Level 1  ∇ Water Level 2  • NAPL  ○ NAPL	Stratigraphy Plot	Sample Interval Core Run	Sample Number	w Count	ecovery	Reading within indicated scale Reading outside indicated scale Soil Vapour (ppm)	Solid PVC Slotted PVC  Well Name 1: FR_MW_CASW6-Well Name 2: FR_MW_CASW6-
Soil Des	cription	Stra	Sarr	San	Blo	₩ 10 <sup>1</sup>	10² 10³ 10	
coarse gravel, cobbles, some silmoist.  SAND and SILT, fine- to coarse coarse gravel, subrounded, well plasticity, wet.	It, well graded, dark brown,  grained sand, some fine to graded, dark brown, low							DOX DOX CONCRETE  SAND  BENTONITE  FR_MW_CASW
moist, organics (woody debris).								BENTONITE
graded, dark brown, wet.  SILT, some fine- to coarse-grain	ned sand, some fine to coarse							FR_MW_CASW
	SAND and GRAVEL, fine- to co coarse gravel, cobbles, some si moist.  SAND and SILT, fine- to coarse coarse gravel, subrounded, well plasticity, wet.  At 1.2 m - trace subangular gravel and the coarse gravel, subrounded and the coarse gravel, subrounded, well plasticity, wet.  At 1.2 m - trace subangular gravel and the coarse gravel, subrounded, well plasticity, wet.  At 6.7 m - trace fine to coarse gravel, trace organics  GRAVEL, fine to coarse, silty, traced, dark brown, wet.	SAND and GRAVEL, fine- to coarse-grained sand, fine to coarse gravel, cobbles, some silt, well graded, dark brown, moist.  SAND and SILT, fine- to coarse-grained sand, some fine to coarse gravel, subrounded, well graded, dark brown, low plasticity, wet.  At 1.2 m - trace subangular gravel, soft  SILT, some fine-grained sand, dark brown, low plasticity, moist, organics (woody debris).  At 6.7 m - trace fine to coarse gravel, subangular, very soft, wet, trace organics	SAND and GRAVEL, fine- to coarse-grained sand, fine to coarse gravel, cobbles, some silt, well graded, dark brown, moist.  SAND and SILT, fine- to coarse-grained sand, some fine to coarse gravel, subrounded, well graded, dark brown, low plasticity, wet.  At 1.2 m - trace subangular gravel, soft  SILT, some fine-grained sand, dark brown, low plasticity, moist, organics (woody debris).  At 6.7 m - trace fine to coarse gravel, subangular, very soft, wet, trace organics  GRAVEL, fine to coarse, silty, trace sand, subangular, well graded, dark brown, wet.  SILT, some fine- to coarse-grained sand, some fine to coarse gravel, subangular, dark brown, soft, non-plastic, wet.	SAND and GRAVEL, fine- to coarse-grained sand, fine to coarse gravel, cobbles, some silt, well graded, dark brown, moist.  SAND and SILT, fine- to coarse-grained sand, some fine to coarse gravel, subrounded, well graded, dark brown, low plasticity, wet.  At 1.2 m - trace subangular gravel, soft  SILT, some fine-grained sand, dark brown, low plasticity, moist, organics (woody debris).  At 6.7 m - trace fine to coarse gravel, subangular, very soft, wet, trace organics  GRAVEL, fine to coarse, silty, trace sand, subangular, well graded, dark brown, wet.	SAND and GRAVEL, fine- to coarse-grained sand, fine to coarse gravel, cobbles, some silt, well graded, dark brown, moist.  SAND and SILT, fine- to coarse-grained sand, some fine to coarse gravel, subrounded, well graded, dark brown, low plasticity, wet.  At 1.2 m - trace subangular gravel, soft  SILT, some fine-grained sand, dark brown, low plasticity, moist, organics (woody debris).  At 6.7 m - trace fine to coarse gravel, subangular, very soft, wet, trace organics  GRAVEL, fine to coarse, silty, trace sand, subangular, well graded, dark brown, wet.  SILT, some fine- to coarse-grained sand, some fine to coarse gravel, subangular, dark brown, soft, non-plastic, wet.	SAND and GRAVEL, fine- to coarse-grained sand, fine to coarse gravel, cobbles, some silt, well graded, dark brown, moist.  SAND and SILT, fine- to coarse-grained sand, some fine to coarse gravel, subrounded, well graded, dark brown, low plasticity, wet.  At 1.2 m - trace subangular gravel, soft  SILT, some fine-grained sand, dark brown, low plasticity, moist, organics (woody debris).  At 6.7 m - trace fine to coarse gravel, subangular, very soft, wet, trace organics  GRAVEL, fine to coarse, silty, trace sand, subangular, well graded, dark brown, wet.  SILT, some fine- to coarse-grained sand, some fine to coarse gravel, subangular, dark brown, soft, non-plastic, wet.	SAND and GRAVEL, fine- to coarse-grained sand, fine to coarse gravel, cobbles, some silt, well graded, dark brown, moist.  SAND and SILT, fine- to coarse-grained sand, some fine to coarse gravel, subrounded, well graded, dark brown, low plasticity, wet.  At 1.2 m - trace subangular gravel, soft  SILT, some fine-grained sand, dark brown, low plasticity, moist, organics (woody debris).  At 6.7 m - trace fine to coarse gravel, subangular, very soft, wet, trace organics  GRAVEL, fine to coarse, silty, trace sand, subangular, well graded, dark brown, wet.  SILT, some fine- to coarse-grained sand, some fine to coarse gravel, subangular, dark brown, soft, non-plastic, wet.	SAND and GRAVEL, fine- to coarse-grained sand, fine to coarse gravel, cobbles, some silt, well graded, dark brown, moist.  SAND and SILT, fine- to coarse-grained sand, some fine to coarse gravel. subrounded, well graded, dark brown, low plasticity, wet.  At 1.2 m - trace subangular gravel, soft  SILT, some fine-grained sand, dark brown, low plasticity, moist, organics (woody debris).  At 6.7 m - trace fine to coarse gravel, subangular, very soft, wet, trace organics  GRAVEL, fine to coarse, silty, trace sand, subangular, well graded, dark brown, wet.  SILT, some fine-to coarse-grained sand, some fine to coarse gravel, subangular, dark brown, wet.

	CRIC. T AND	TINI	т	eck C	Client Coal Lir	nited			Borehole	e No. : FR_BH_CASW6
	SNC · LAVA		Regional		ocation ndwate		oring			PAGE 2 OF 3
Drilling Boreh	g Contractor Owen's Drilling g Method Dual Rotary ole Dia. (m) 0.17 Slotted Pipe Dia. (m) 0.05/0.05		Date Monitored Ground Surface Ele Top of Casing Elev Northing: 5554575.	. (m) ´	155	7.027 7.764 155 ting: 655			Project Number: Borehole Logged Date Drilled: Log Typed By:	657269 d By: IPC 2019 02 02 VL
Depth in Metres	Drilling Legend Sample Interval  ▼▼▼▼ Air Rotary	Water/NA  ▼ Water Lev  ▽ Water Lev  • NAPL  ○ NAPL		Stratigraphy Plot	Sample Interval Core Run	Sample Number	Blow Count	% Recovery	Reading within indicated scale     Reading outside indicated scale     Soil Vapour (ppm)	Solid PVC Slotted PVC  Well Name 1: FR_MW_CASW6-A Well Name 2: FR_MW_CASW6-B
Dept	Soil Des	cription		Stratic	Samp Core F	Samp	Blow	% Red	,0 <sup>1</sup> 10 <sup>2</sup> 10 <sup>3</sup> 10	1
10-0000 BH 5008 04 01 Puint Date: 5018-08-508	SILT, some fine- to coarse-grain gravel, subangular, dark brown, (continued)  SILT, gravelly, fine to coarse, so sand, subangular, dark brown, v  At 13.1 m - coal, dry	ome fine- to covet.	tic, wet.							FR_MW_CASW6-A  SAND  BENTONITE
2A/QC: BH 2019 (				NO.	TES					

	CNIC . T ANTA	TINT	To		Client oal Limit	ed			Borehole	No. : FR_BH_CASW6
7))	SNC+LAVA		Regional		cation idwater l	Monito	ring			PAGE 3 OF 3
Drilling Boreho	Contractor Owen's Drilling Method Dual Rotary ole Dia. (m) 0.17 lotted Pipe Dia. (m) 0.05/0.05		Date Monitored Ground Surface Ele Top of Casing Elev Northing: 5554575.	. (m)	1557.7	27 64 1557 g: 6550			Project Number: Borehole Logged Date Drilled: Log Typed By:	657269 By: IPC 2019 02 02 VL
Depth in Metres	Drilling Legend Sample Interval  ▼▼▼▼ Air Rotary	Water/NA  ▼ Water Le  □ Water Le  • NAPL  □ NAPL		Stratigraphy Plot	Sample Interval Core Run	Sample Number	Blow Count	% Recovery	Reading within indicated scale Reading outside indicated scale Soil Vapour (ppm)	Solid PVC Slotted PVC  Well Name 1: FR_MW_CASW6-A Well Name 2: FR_MW_CASW6-B
ď	Soil Des	cription		Stra	San	San	B	% 101	10 <sup>2</sup> 10 <sup>3</sup> 10 <sup>4</sup>	
20	Bottom of hole at 20.1 m.			N//	[▼ <b>'</b> ▼'▼			1:	···:	BENTONITE
21-										
22-										
23-										
24-										
25-										
26-										
27-										
28-										
97-60-65 29-										
02/QC: BH 2019 04 01 PINT DARE:2019-09-00-0										
20-J			г							
BH 2019				NOT	ES					
CAVCC:										

	SNC+LAVA	TINI	т	eck C	Client oal Lim	ited				Boreho	ole No	). : FF	R_BH_CH1
<b>\\\</b>	SINCYLAVA		Regional		ocation ndwate	r Monite	oring				PAGE	1 0	F 5
Drilling Boreh	Contractor Owen's Drilling Method Dual Rotary Dle Dia. (m) 0.17 lotted Pipe Dia. (m) 0.05/0.05		Date Monitored Ground Surface El- Top of Casing Elev Northing: 5552549	r. (m) ´	1562	.013 .940 156 ng: 6559		5		Project Number: Borehole Logged Date Drilled: Log Typed By:	Ву:	6572 IPC 2019 VL	69 01 30
Depth in Metres	Drilling Legend Sample Interval  ▼▼▼ Air Rotary	Water/NA  ▼ Water Lev  □ Water Lev  ◆ NAPL  ○ NAPL		Stratigraphy Plot	Sample Interval Core Run	Sample Number	Blow Count	% Recovery	•	Reading within indicated scale Reading outside indicated scale  Soil Vapour (ppm)	Well Well	Solid F Slotted Name 2	
De	Soil Des	cription		Stra	Sam	San	Blo	₩ % 1	0 <sup>1</sup>	10 <sup>2</sup> 10 <sup>3</sup> 10	] ]	ПГ	]
1-	SAND, fine- to coarse-grained, g silt, well graded, grey, dry.	gravelly, fine to	o coarse, some									Po-9:::::::	CONCRETE
3-	At 1.5 m - cobbles												BENTONITE
5-													stough
6-	SAND, fine- to coarse-grained, s trace silt, well graded, brown, dry		parse gravel,										BENTONITE
8-	At 7.3 m - cobbles At 7.6 m - some silt, damp to mo	oist										/ / 	FR_MW_CH1-B
OA/QC: BH 2019 04 01 Print Date:2019-09-26	At 9.1 m - moist to wet  SAND, fine- to medium-grained, graded, dark brown, moist to we		ne gravel, poorly	*									SAND
QA/QC: BH 2019 04				NOT	TES								

Drillir Drillir Borel	g Contractor g Method Dual Rotary Ouel Dia. (m)  Owen's Drilling Dual Rotary Out Out Only Out Out Out Out Out Out Out Out Out Out			I٥				Borehole No. : FR_BH_CH1			
Drillir Borel	ig Method Dual Rotary nole Dia. (m) 0.17		Regional		cation idwater	Monito	oring			PAGE 2 OF 5	
	Slotted Pipe Dia. (m) 0.05/0.05		Date Monitored Ground Surface Ele Top of Casing Elev Northing: 5552549.	. (m)		013 940 156 g: 6559		5	Project Number: Borehole Logged Date Drilled: Log Typed By:	657269 d By: IPC 2019 01 30 VL	
Depth in Metres	Drilling Legend Sample Interval  ▼▼▼▼ Air Rotary	Water/NA  ▼ Water Le  ⊽ Water Le  • NAPL  ○ NAPL		Stratigraphy Plot	Sample Interval Core Run	Sample Number	Blow Count	Recovery	Property of the control of the contr	Solid PVC Slotted PVC  Well Name 1: FR_MW_CH1-A Well Name 2: FR_MW_CH1-B	
ă	Soil Des	scription		Stra	Sar	Sar	Bi	% 10	<sup>1</sup> 10 <sup>2</sup> 10 <sup>3</sup> 10	1	
11- 12- 13- 14- 16- 17-	SAND, fine- to medium-grained graded, dark brown, moist to we At 10.4 m - trace gravel  At 10.7 m - some silt to silty, trace at 12.3 m - silty  At 17.5 m - some gravel  SAND, fine- to coarse-grained, some silt, well graded, dark browns at 15.5 m - some gravel	some fine to c	wet							SAND  BENTONITE	
				NOT	ES						

<b>~</b> 1))	CNICAT ANA	Client Teck Coal Limited							Borehole No. : FR_BH_CH1				
*)) SNC+LAVALIN			Location Regional Groundwater Monitoring						PAGE 3 OF 5				
Drilling Contractor Owen's Drilling Drilling Method Dual Rotary Borehole Dia. (m) 0.17 Pipe/Slotted Pipe Dia. (m) 0.05/0.05		Date Monitored         n/a           Ground Surface Elev. (m)         1562.013           Top of Casing Elev. (m)         1562.940 1562.983           Northing: 5552549.191         Easting: 655940.085						Project Number: 657269 Borehole Logged By: IPC Date Drilled: 2019 01 30 Log Typed By: VL			30		
Depth in Metres	Drilling Legend Sample Interval  ▼▼▼ Air Rotary	Water/NA  ▼ Water Le  □ Water Le  ◆ NAPL  ○ NAPL		Stratigraphy Plot	Sample Interval Core Run	Sample Number	Blow Count	% Recovery	•	Reading within indicated scale Reading outside indicated scale  Soil Vapour (ppm)	Well	Solid PVC Slotted PV Name 1: FF Name 2: FF	C R_MW_CH1-A R_MW_CH1-B
De	Soil Des	cription		Stra	San	San	BIG	% 1	0 <sup>1</sup>	10 <sup>2</sup> 10 <sup>3</sup> 10 <sup>1</sup>			
21-	SAND, fine- to coarse-grained, s some silt, well graded, dark brow At 20.7 m - trace gravel to gravel	vn, wet. <i>(conti</i>	parse gravel, nued)										BENTONITE  BENTONITE  BENTONITE
23-	GRAVEL, fine to coarse, some fi some silt, well graded, brown, we	ine- to coarse et.	-grained sand,										BENTONITE  BENTONITE
26-	At 26.2 m - trace sand												
28-	At 28.0 m - some sand												FR_MW_CH1-A
30	At 29.0 m - cobbles								:				
				NO	TES								

A) CRIC. I AVIA I TRI			Client Teck Coal Limited						Boreho	Borehole No. : FR_BH_CH1			
SNC · LAVALIN			Location Regional Groundwater Monitoring							PAGE 4 OF 5			
orilling Contractor Owen's Drilling Orilling Method Dual Rotary Iorehole Dia. (m) 0.17 Ipe/Slotted Pipe Dia. (m) 0.05/0.05		Date Monitored Ground Surface Elev. (m) Top of Casing Elev. (m) Northing: 5552549.191		n/a 1562.013 1562.940 1562.983 Easting: 655940.085				Project Number: Borehole Logged Date Drilled: Log Typed By:	: 657269 kd By: IPC 2019 01 30 VL				
Depth in Metres	Drilling Legend Sample Interval  ▼▼▼▼ Air Rotary	Water/NA  ▼ Water Le  ▽ Water Le  ◆ NAPL  ◇ NAPL		Stratigraphy Plot	Sample Interval Core Run	Sample Number	Blow Count	% Recovery	Reading within indicated scale     Reading outside indicated scale     Soil Vapour (ppm)	Solid PVC Slotted PVC  Well Name 1: FR_MW_CH1-A Well Name 2: FR_MW_CH1-B			
	Soil Des	scription		Str	Sa	Sal	B	%	1,0 <sup>1</sup> 10 <sup>2</sup> 10 <sup>3</sup> 10 <sup>4</sup>				
31-332-333-333-333-333-333-333-333-333-3	SILT and CLAY (TILL), gravelly (continued)	, sandy, dark b	orown, wet.							SAND			
35-										BENTONITE			
37-	BEDROCK, siltstone, light grey.												
39-													

<b>~11</b>	SNC+LAVA	TINT	т	eck C	Client oal Lin	nited			Borehole No. : FR_BH_CH1
<b>7</b> //	SNC+LAVA		Regional		cation ndwate	r Monite	oring		PAGE 5 OF 5
Drilling Boreho	Contractor Owen's Drilling Method Dual Rotary ble Dia. (m) 0.17 lotted Pipe Dia. (m) 0.05/0.05		Date Monitored Ground Surface Ele Top of Casing Elev Northing: 5552549	r. (m)	1562	2.013 2.940 156 ing: 6559			Project Number: 657269 Borehole Logged By: IPC Date Drilled: 2019 01 30 Log Typed By: VL
Depth in Metres	Drilling Legend  Sample Interval  ▼▼▼  Air Rotary	Water/NA  ▼ Water Le  ⊽ Water Le  • NAPL  ○ NAPL		Stratigraphy Plot	Sample Interval Core Run	Sample Number	Blow Count	% Recovery	Reading within indicated scale     Reading outside indicated scale     Soil Vapour (ppm)     Solid PVC     Slotted PVC     Well Name 1: FR_MW_CH1-A Well Name 2: FR_MW_CH1-B
ă	Soil Des	cription		Stra	Sar	Sar	В́	4 %	10 <sup>1</sup> 10 <sup>2</sup> 10 <sup>3</sup> 10 <sup>4</sup>
40-	BEDROCK, siltstone, light grey.	(continued)							BENTONITE
=	Bottom of hole at 41.2 m.								
42-									
43-									
44- -									
45 <u>-</u>									
46 <del>-</del>									
47-									
48-									
49-									
50-									
				NOT	res				

CI HEMMERA

Project Name/No: 577-016.07

Client: Teck Coal Greenhills Operation

Date Drilled: September 2nd, 2016

Drilling Company: JR Drilling

**Drilling Method: Dual Rotary** 

Logged by: TK

Sheet: 1 of 8 Site Location: Elkford, BC

		SUBSURFACE PROFILE			- 4							
Depth	Symbol	Description		Sample ID	Analysed Y,N	Sample Type	Vapour ppm 0 250500	KEL %	I	Back	fill det	alis
# m	を含まれるである。 では、他のでは、これでは、他のでは、他のでは、これできない。 では、これでは、他のでは、他のでは、他のでは、これできない。 では、これでは、他のでは、他のでは、他のでは、これできない。 では、これでは、これでは、他のでは、他のでは、これできない。 では、これでは、これでは、これでは、これでは、これでは、これでは、これでは、これ	TOPSOIL. TOPSOIL, brown, fine to medium silty sand with fine sub-angular gravel and rootlets  COBBLES and GRAVEL. COBBLES and GRAVEL, with allt and sand, pulverized from drilling.	-1.00 1.00						Bentonite Chips			Contract to the contract to th
3		Groundwater encountered at approximately 4.5 mbgs.							Schedule 40 PVC		3.852 m on Sept*6th, 2016	Pack refill

Well location: Porter Creek

Well casing diameter: 50.8mm

Well screen slot size: 0.25mm

Depth of well (TOC): 7.601

Depth to water level (TOC): 3,852

Well casing material: Schedule 40 PVC

Well Elevation (TOC): -

Date of water level: September 6th, 2016

Ground Elevation: -

Borehole diameter: 15.24

CI HEMMERA

Project Name/No: 577-016.07

Client: Teck Coal Greenhills Operation

Date Drilled: September 2nd, 2016

Site Location: Elkford, BC

Drilling Company: JR Drilling

Drilling Method: Dual Rotary

Logged by: TK

Sheet: 2 of 8

	SUBSURFACE PROFILE			S	AMPL	.E		
Depth Symbol	Description	Depth/Elev (m)	Sample ID	Analysed Y,N	Sample Type	Vapour ppm 0 250500	% 0 50 100	Backfill details
17 - 18 - 19 - 20 - 6 21 - 22 - 23 - 7 24 - 25 - 26 - 8 27 - 28 - 29 - 9 30 - 31 - 32 - 33 - 10 33 - 34 - 35 - 36 - 11	BEDROCK (likely limestone), pulverized sill to fine/medium sub-angular/sub-rounded gravel size particles, crystalline, very hard, dry	-5.50 5.50						

Well location: Porter Creek

Depth to water level (TOC): 3.852

Date of water level: September 6th, 2016

Borehole diameter: 15.24

Well casing diameter: 50.8mm

Well casing material: Schedule 40 PVC

Well screen slot size: 0.25mm

Well screen interval (bgs): 3,5-6.5

Depth of well (TOC): 7.601

Well Elevation (TOC): -

[] HEMMERA

Project Name/No: 577-016.07

Client: Teck Coal Greenhills Operation

Date Drilled: September 2nd, 2016

Site Location: Elkford, BC

Drilling Company: JR Drilling

**Drilling Method: Dual Rotary** 

Logged by: TK

Sheet: 3 of 8

su	BSURFACE PROFILE			SA	MPL	E.		
Depth	Description	Depth/Elev (m)	Sample ID	Analysed Y,N	Sample Type	Vapour ppm 0 250 500	LEL % 0 50 100	Backfill details
7 - 12 - 12 - 13 - 14 - 14 - 14 - 14 - 14 - 14 - 14								

Well location: Porter Creek

Depth to water level (TOC): 3.852

Date of water level: September 6th, 2016

Borehole diameter: 15.24

Well casing diameter: 50.8mm

Well casing material: Schedule 40 PVC

Well screen slot size: 0.25mm

Well screen interval (bgs): 3.5-6.5

Depth of well (TOC): 7.601

Well Elevation (TOC): -

HEMMERA

Project Name/No: 577-016.07

Client: Teck Coal Greenhills Operation

Date Drilled: September 2nd, 2016

Site Location: Elkford, BC

Drilling Company: JR Drilling

Drilling Method: Dual Rotary

Logged by: TK

Sheet: 4 of 8

SUB	SURFACE PROFILE			SA	AMPL	E		
Depth	Description	Depth/Elev (m)	Sample ID	Analysed Y,N	Sample Type	Vapour ppm 0 250 500	LEL % 0 50 100	Backfill details
33 - 18 - 19 - 18 - 19 - 18 - 19 - 18 - 19 - 18 - 19 - 18 - 19 - 19								

Well location: Porter Creek

Depth to water level (TOC): 3.852

Date of water level: September 6th, 2016

Borehole diameter: 15.24

Well casing diameter: 50.8mm

Well casing material: Schedule 40 PVC

Well screen slot size: 0.25mm

Well screen interval (bgs): 3.5-6.5

Depth of well (TOC): 7,601

Well Elevation (TOC): -

TI HEMMERA

Project Name/No: 577-016.07

Drilling Company: JR Drilling

Client: Teck Coal Greenhills Operation

Drilling Method: Dual Rotary

Date Drilled: September 2nd, 2016

Logged by: TK

Site Location: Elkford, BC

Sheet: 5 of 8

		SUBSURFACE PROFILE			S	AMPL	E.		
Depth	Symbol	Description	Depth/Elev (m)	Sample ID	Analysed Y,N	Sample Type	Vapour ppm 0 250500	% 0 50 100	Backfill details
9-10-11-12-13-14-1		Small fracture encountered at 24 mbgs but was not found to have enough water to conduct a flow test							
5 - 3 - 5 - 5 - 5 - 5 - 5 - 5 - 5 - 5 -		From 27.5 mbgs drilling was noted to be smoother/easier; no observable change was identified in rock chips							

Well location: Porter Creek

Depth to water level (TOC): 3,852

Well casing diameter: 50.8mm

Well casing material: Schedule 40 PVC

Date of water level: September 6th, 2016

Well screen slot size: 0,25mm

Depth of well (TOC): 7,601

Well Elevation (TOC): -

Ground Elevation: -

Borehole diameter: 15.24



Project Name/No: 577-016.07

Client: Teck Coal Greenhills Operation

Date Drilled: September 2nd, 2016

Drilling Company: JR Drilling

**Drilling Method: Dual Rolary** 

Logged by: TK

Sheet: 6 of 8 Site Location: Elkford, BC

SI	SUBSURFACE PROFILE  Description			SA	MPL	E		
Depth		Depth/Elev (m)	Sample ID	Analysed Y,N	Sample Type	Vapour ppm 0 250500	LEL % 0 50 100	Backfill details
99 - 30 - 30 - 31 - 34 - 35 - 35 - 35 - 35 - 35 - 35 - 35								

Well location: Porter Creek

Depth to water level (TOC): 3.852

Well casing diameter; 50.8mm

Date of water level: September 6th, 2016

Borehole diameter: 15,24

Well casing material: Schedule 40 PVC

Well screen slot size: 0.25mm

Well screen Interval (bgs): 3.5-6.5

Dopth of well (TOC): 7.601

Well Elevation (TOC): -



Project Name/No: 577-016.07

Client: Teck Coal Greenhills Operation

Date Drilled: September 2nd, 2016

Drilling Company: JR Drilling

**Drilling Method: Dual Rotary** 

Logged by: TK

Sheet: 7 of 8 Site Location; Elkford, BC

SUB	SURFACE PROFILE		SAMPLE								
Depth Symbol	Description E S		Sample ID	Analysed Y,N	Sample Type	Vapour ppm 0 250500	KEL %	Backfill details			
		Depth/Elev (m)									

Well location: Porter Creek

Well casing diameter: 50.8mm

Depth of well (TOC): 7.601

Depth to water level (TOC): 3.852

Well casing material: Schedule 40 PVC

Well Elevation (TOC): -

Date of water level: September 6th, 2016

Well screen slot size: 0.25mm

Ground Elevation: -

Borehole diameter: 15.24

II HEMMERA

Project Name/No: 577-016.07

Client: Teck Coal Greenhills Operation

Date Drilled: September 2nd, 2016

Site Location: Elkford, BC

Drilling Company: JR Drilling

**Drilling Method: Dual Rotary** 

Logged by: TK

Sheet: 8 of 8

	SUBSURFACE PROFILE			S	AMPL	E.		
Depth Symbol	Description	Depth/Elev (m)	Sample ID	Analysed Y,N	Sample Type	Vapour ppm	LEL % 0 50 100	Backfill details
	End of Log	45.00 45.00						

Well location: Porter Creek

: Porter Creek

Depth to water level (TOC): 3.852

Date of water level: September 6th, 2016

Borehole diameter: 15,24

Well casing diameter: 50.8mm

Well casing material: Schedule 40 PVC

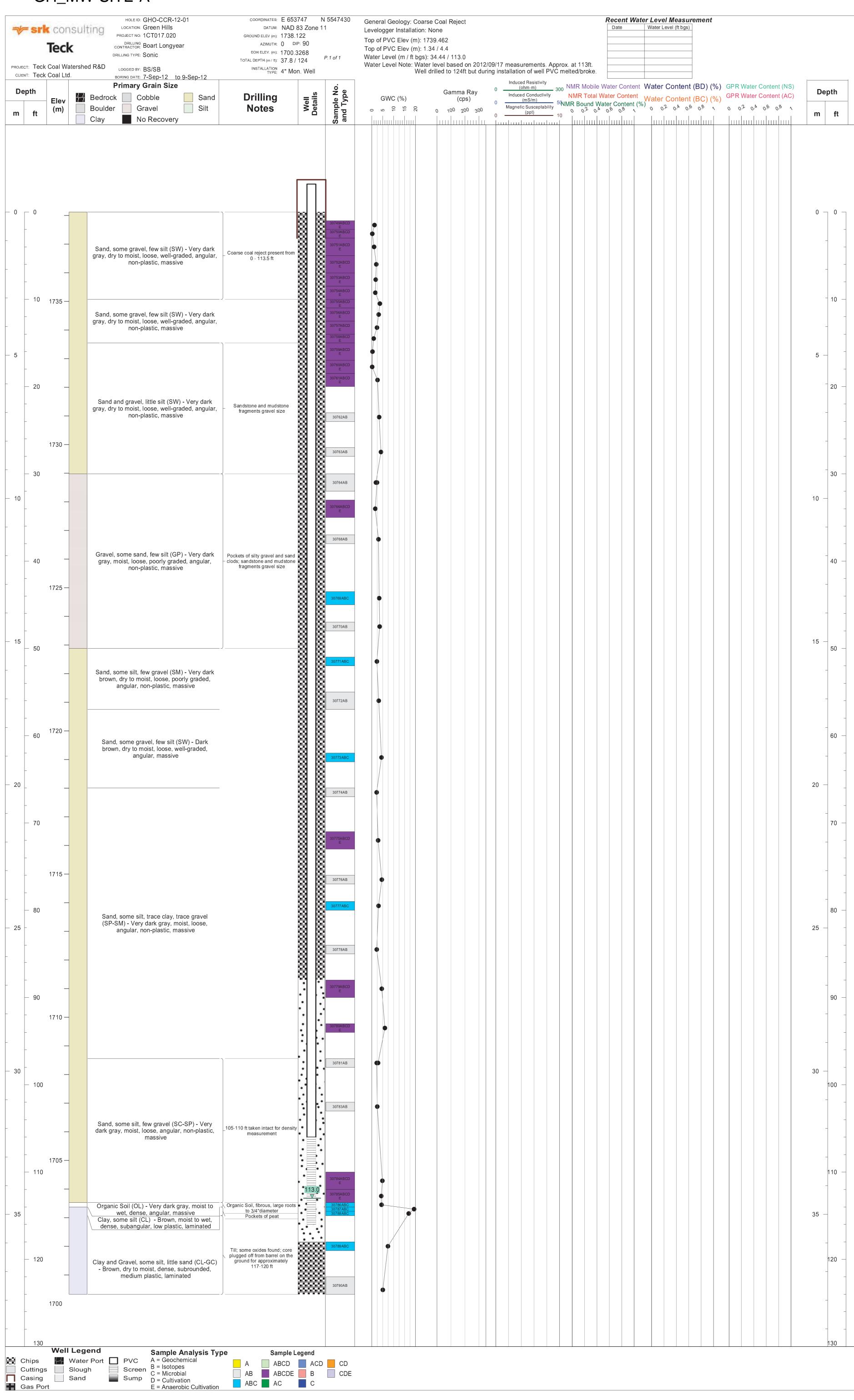
Well screen slot size: 0.25mm

Well screen interval (bgs): 3.5-6.5

Depth of well (TOC): 7.601

Well Elevation (TOC): -

# GH\_MW-SITE-A



Drilling Company: JR Drilling

Project Name/No: Greenhills Ops Elkford BC/577-016.04

Drilling Method: Dual air rotary

Date Drilled: November 20, 2014

Client: Teck Coal Ltd.

Logged by: RM

Site Location: Greenhills Operations, BC

Sheet: 1 of 2

[] HEMMERA

		SUBSURFACE PROFILE			S	AMPL	E		
Depth	Symbol	Description	Depth/Elev (m)	Sample ID	Analysed Y,N	Sample Type	Vapour ppm 0 250500	LEL %	Backfill details
ft m									
7	PSINE P	Ground Surface TOPSOIL	1810.00				1 7 /	1	8 8
3-		Black, dry, loose, organic soil TILL					11 1 18		
1		Sandy (fine, medium and coarse grain) TiLL, some gravel (fine and medium grain, sub-angular), brown, dry, loose, well graded Silty TiLL, dark brown, wel, dense	1608.78 1.22						Bentonite
-2			1607.87 2.13		11				
4		Water table at 2.13 m	2.10		41				
3					$^{11}$				
3			1606.34 3.66		Ш			11.11	
4		Gravelly (fine to medium grain, sub-angular) TILL, dark brown, wet, loose to medium dense, well graded. Silty lenses present throughout. Between 4.57 m and 7.62 m, moderate water yield.	3.99						:\# (Water level, 25 Nevember, 2014
5									\$ ± 8
=	11								(Water (eve), 25 Nevember, 2014
- 6			Male						Newer S
3									8 8
7					11				a a
1								67 U	2 E
- B			144		11		1		9 = 8
+		Sitty TILL, some gravels (fine to medium grain, sub-	1601.47 8.53		11				
- 9		angular), dark brown, wet, dense to very dense.	5.4				1111		
7		()			11		117		
10									
1									
1									
7			+ 4						

Well location: 5,547,207 N, 654,052 E

Well casing diameter: 2"

Depth of well (TOC): 21.36 m

Depth to water level (TOC): 8.639 m

Well casing material: Sch. 80 PVC

Well Elevation (TOC); 1610.8 m

Date of water level: 25 November, 2014

Well screen slot size: 010

Ground Elevation: 1610 m

Borehole diameter: 0.15 m

Well screen interval (bgs): 18.31 m - 21.36 m

**Drilling Company: JR Drilling** 

Project Name/No: Greenhills Ops Elkford BC/577-016.04 Client: Teck Coal Ltd.

Drilling Method: Dual air rotary

Date Drilled: November 20, 2014

Logged by: RM

Site Location: Greenhills Operations, BC

Sheet: 2 of 2

CI HEMMERA

		SUBSURFACE PROFILE	1		S	AMPL	E		
Depth	Symbol	Description	Depth/Elev (m)	Sample ID	Analysed Y,N	Sample Type	Vapour ppm 0 250500	LEL % 0 50 100	Backfill details
3 - 15 3 - 15 3 - 16		BEDROCK Quartzitic Sandstone. Light grey, moderately strong, moderately fractured, weathered  Sandstone, competent, very strong, small and uniform bedrock cuttings  Between 18.9 m - 20.4 m, major fracture zone, high water yield, exidation present, nonuniform bedrock cuttings  Between 21.0 m - 21.7 m, major fracture zone, moderate water yield, nonuniform bedrock cuttings	1595.37 14.63 1593.85 16.15						Filler Send topa
7-		End of Log	23.16				1 1 1		

Well location: 5,547,207 N, 654,052 E

Well casing diameter: 2"

Depth of well (TOC): 21.36 m

Depth to water level (TOC): 8.639 m

Well casing material: Sch. 80 PVC

Well Elevation (TOC): 1610.8 m

Date of water level: 25 November, 2014

Well screen slot size: 010

Ground Elevation: 1610 m

Borehole diameter: 0.15 m

Well screen interval (bgs): 18.31 m - 21.36 m

Drilling Company: JR Drilling

Project Name/No: Greenhills Ops Elkford BC/577-016.04

Drilling Method: Dual air rotary

Client: Teck Coal Ltd.

Date Drilled: November 18, 2014

Logged by: RM

Site Location: Greenhills Operations, BC

Sheet: 1 of 2

CI HEMMERA

		SUBSURFACE PROFILE	1		S	AMPL	.E		
Depth	Symbol	Description	Depth/Elev (m)	Sample ID	Analysed Y,N	Sample Type	Vapour ppni 0 250500	% 50 100	Backfill details
m 2 2 3 4		TOPSOIL Black, dry, loose, organic soil TILL Sandy (fine, medium and coarse grain) TILL, some gravel (fine and medium grain, sub-angular), brown, dry, loose, well graded  Silty TILL, dark brown, wel, dense  Water table at 2,13 m  Gravelly (fine to medium grain, sub-angular) TILL, dark brown, wel, loose to medium dense, well graded. Silty lenses present throughout. Between 4.57 m and 7.62 m, moderate water yield.	1610.00 0.00 1608.78 1.22 1607.87 2.13						W Water level, 25 November, 2014
5		graded. Sity lenses present throughout. Between 4,57 m and 7.62 m, moderate water yield.							Filter Sand 10/20

Well location: 5,547,205 N, 654,050 E

Well casing diameter: 2"

Well screen slot size: 010

Depth of well (TOC): 7.63 m

Depth to water level (TOC): 2.976 m

Well casing material: Sch. 80 PVC

Well Elevation (TOC); 1610.8 m

Date of water level: 25 November, 2014

Ground Elevation: 1610 m

Borehole diameter: 0.17 m

Well screen interval (bgs): 4.58 m - 7.63 m

Project Name/No: Greenhills Ops Elkford BC/577-016.04

Drilling Company: JR Drilling

Client: Teck Coal Ltd.

Drilling Method: Dual air rolary

Date Drilled: November 18, 2014

Logged by: RM

Site Location: Greenhilts Operations, BC

Sheet: 2 of 2

[] HEMMERA

	SUBSURFACE PROFILE	Day		S	AMPL	.E		
Depth	Description			Analysed Y,N	Sample Type	Vapour ppm 0 250500	KEL % 0 50 100	Backfill details
	Silty TILL, some gravels (fine to medium grain, sub- angular), dark brown, wet, dense to very dense.	1601.47 8.53						(chools)
12	Bedrock encountered at 14.6 m	1595.57 14.33 1595.37 14.63						

Well location: 5,547,205 N, 654,050 E

Well casing diameter: 2"

Depth of well (TOC): 7.63 m

Depth to water level (TOC): 2.976 m

Well casing material: Sch. 80 PVC

Well Elevation (TOC): 1610.8 m

Date of water level: 25 November, 2014

Well screen slot size: 010

Ground Elevation: 1610 m

Borehole diameter: 0.17 m

Well screen interval (bgs): 4.58 m - 7.63 m

THEMMERA

Project Name/No: Greenhills Ops Elkford BC/577-016.04

Client: Teck Coal Ltd.

Date Drilled: November 21, 2014

Site Location: Greenhills Operations, BC

Drilling Company: JR Drilling

Drilling Method: Dual air rotary

Logged by: RM

Sheet: 1 of 3

	SUBSURFACE PROFILE			S	AMPL	E		
Depth	Description	Depth/Elev (m)	Sample ID	Analysed Y,N	Sample Type	Vapour ppm 0 250500	% 0 50 100	Backfill details
3 n m 2	TOPSOIL Black, dry, loose, organic soil TILL Sand, gravelly (medium to coarse grain, sub- rounded), some tenses of sand and silt, moist, dense, brown Lots of broken rock fragments  Below 2.13 m becomes dry.  Below 3.66 m becomes medium dense  Below 4.6 m moist and dense Below 4.9 m dry, very dense  Below 5.5 m, becomes more silty, more dense  Below 7.3 m, siltstone clasts, very dry, very dense	1507.87 2.13 1596.34 3.66 1595.43 4.57 1694.61 5.49						Bentonite

Well location: 5,546,536 N, 652,694 E

Well casing diameter: 2"

Depth of well (TOC): 34.44 m

Depth to water level (TOC): Flowing artesian wellWell casing material: Sch. 80 PVC

Well Elevation (TOC): 1600.75 m asl

Date of water level: N/A

Well screen slot size: 010

Ground Elevation: 1600 m asl

Borehole diameter: 0.17 m

Well screen interval (bgs): 31,39 - 34.44 m

[] HEMMERA

Project Name/No; Greenhills Ops Elkford BC/577-016.04

Client: Teck Coal Ltd.

Drilling Method: Dual air rolary

Drilling Company: JR Drilling

Date Drilled: November 21, 2014

Logged by: RM

Site Location: Greenhills Operations, BC

Sheet: 2 of 3

	SUBSURFACE PROFILE			S	AMPL	E		
Depth	Description	Depth/Elev (m)	Sample ID	Analysed Y,N	Sample Type	Vapour ppm	LEL %	Backfill details
13 - 13	Below 14.6 m medium dense, increasing sand content  Below 16.2 m very dense, dry, sillstone clasts (angular to sub-angular), trace sandstone clasts.  Below 18.3 m Silt and Sand (fine), some siltstone clasts, dark brown  Below 19.2 m medium dense  Below 20.1 m very dense	1585.37 14.03 1583.85 10.15 1581.71 18.29 1589.80 19.20						Bertonite

Well location: 5,546,536 N, 652,694 E

Well casing diameter: 2"

Well screen slot size: 010

Depth of well (TOC): 34.44 m

Depth to water level (TOC): Flowing artesian wellWell casing material: Sch. 80 PVC

Well Elevation (TOC): 1600.75 m asl

Date of water level: N/A Borehole diameter: 0.17 m

Well screen Interval (bgs): 31.39 - 34.44 m

Ground Elevation: 1600 m asi

[] HEMMERA

Project Name/No: Greenhills Ops Elkford BC/577-016.04

Client: Teck Coal Ltd.

Drilling Company: JR Drilling Drilling Method: Dual air rotary

Date Drilled: November 21, 2014

Logged by: RM

Site Location: Greenhills Operations, BC

Sheet: 3 of 3

SUBSURFACE PROFILE			S	AMPL	E	- 1	
Description	Depth/Elev (m)	Sample ID	Analysed Y,N	Sample Type	Vapour ppm 0 250500	KEL. %	Backfill details
Below 27.4 m increasing sand conctent, decreasing sift content, trace mudstone clasts, light brown, dense, dry	1572.57. 27.43						
Below 30.2 m send and silt till with siltstone clast, wet. First water bearing unit.	1569.82 30.18						
Moderate water yield between 32.3 m and 34.1 m	1567.69 32.31						
BEDROCK Sitistone, fresh, competent, very dense, dry,	1664-96 35.05						•
End of Log	1561.90 38,10						
	Below 27.4 m increasing sand conctent, decreasing sit content, trace mudstone clasts, light brown, dense, dry  Below 30.2 m sand and sill till with sitistone clast, wet. First water bearing unit.  Moderate water yield between 32.3 m and 34.1 m  BEDROCK Sittstone, fresh, competent, very dense, dry.	Below 27.4 m increasing sand conctent, decreasing slit content, trace mudstone clasts, light brown, dense, dry  Below 30.2 m sand and slit till with slitstone clast, wet. First water bearing unit.  Moderate water yield between 32.3 m and 34.1 m  BEDROCK Siltstone, fresh, competent, very dense, dry.	Below 27.4 m increasing sand conctent, decreasing silt content, trace mudstone clasts, light brown, dense, dry  Below 30.2 m sand and silt till with siltstone clast, wet. First water bearing unit.  1569.62 30.18  Moderate water yield between 32.3 m and 34.1 m  1567.69 32.31  BEDROCK Siltstone, fresh, competent, very dense, dry.	Below 27.4 m increasing sand conctent, decreasing slit content, trace mudstone clasts, light brown, dense, dry  Below 30.2 m sand and sill till with slitstone clast, vet. First water bearing unit.  1569.82 30.18  Moderate water yield between 32.3 m and 34.1 m  BEDROCK Siltstone, fresh, competent, very dense, dry.	Description    Comparison	Description    Comparison   Com	Description    Comparison   Com

Well location: 5,546,536 N, 652,694 E

Well casing diameter: 2"

Depth of well (TOC): 34.44 m

Depth to water level (TOC): Flowing artesian wellWell casing material; Sch. 80 PVC

Well Elevation (TOC): 1600.75 m asl

Borehole diameter: 0.17 m

Date of water level: N/A

Well screen slot size: 010

Ground Elevation: 1600 m asi

Well screen interval (bgs): 31.39 - 34.44 m



Project Name/No: 577-016.07

Drilling Company: JR Drilling

Client: Teck Coal Greenhills Operation

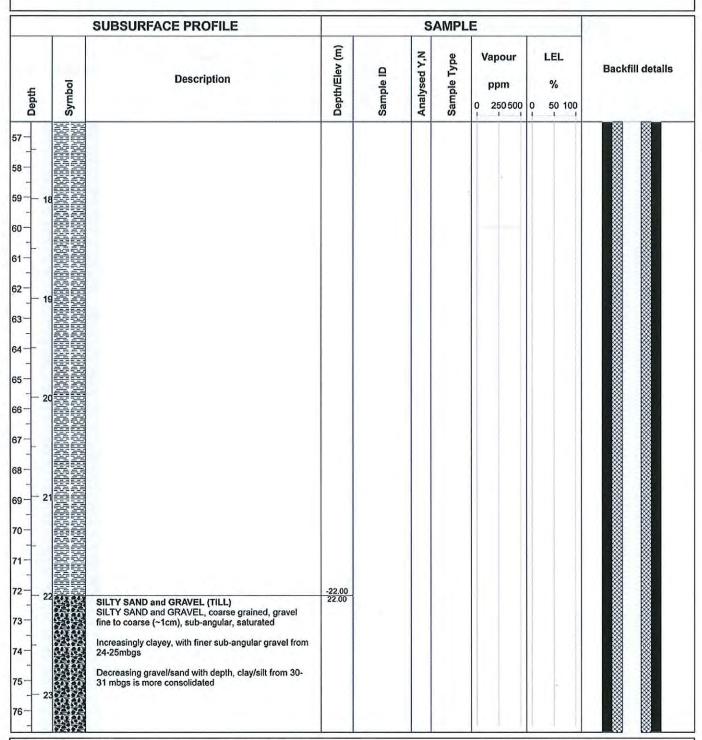
**Drilling Method: Dual Rotary** 

Date Drilled: September 3rd-4th, 2016

Logged by: TK

Site Location: Elkford, BC

Sheet: 4 of 14



Well location: Rail Loop

Well casing diameter: 50.8mm

Depth of well (TOC): -

Depth to water level (TOC): -

Well casing material: Schedule 40 PVC

Well Elevation (TOC): -

Date of water level: -

Well screen slot size: 0.25mm

Ground Elevation: -

Borehole diameter: 15.24cm

[] HEMMERA

Project Name/No: 577-016.07

**Drilling Company: JR Drilling** 

Client: Teck Coal Greenhills Operation

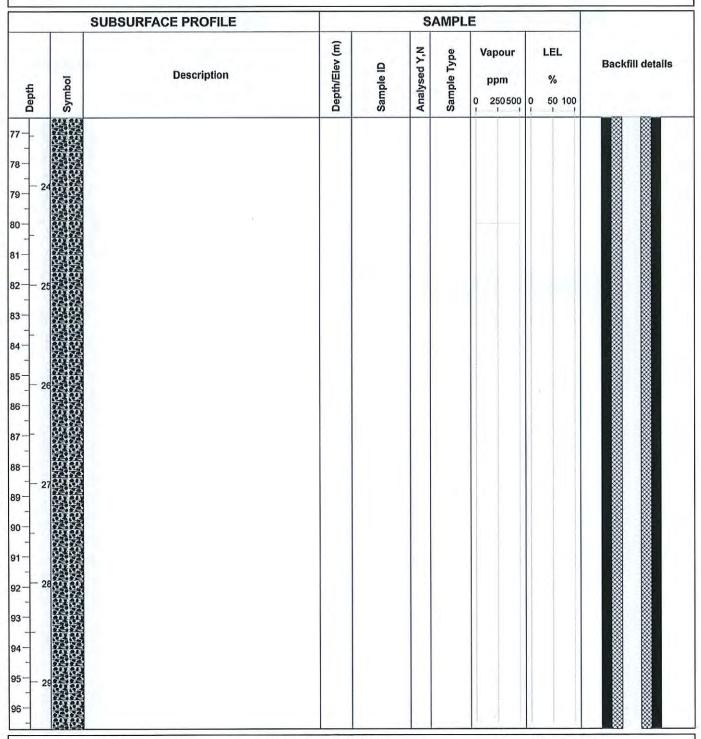
**Drilling Method: Dual Rotary** 

Date Drilled: September 3rd-4th, 2016

Logged by: TK

Site Location: Elkford, BC

Sheet: 5 of 14



Well location: Rail Loop

Well casing diameter: 50.8mm

Depth of well (TOC): -

Depth to water level (TOC): -

Well casing material: Schedule 40 PVC

Well Elevation (TOC): -

Date of water level: -

Well screen slot size: 0.25mm

Borehole diameter: 15.24cm

Well screen interval (bgs): 82.5-79.5



Project Name/No: 577-016.07

Drilling Company: JR Drilling

Client: Teck Coal Greenhills Operation

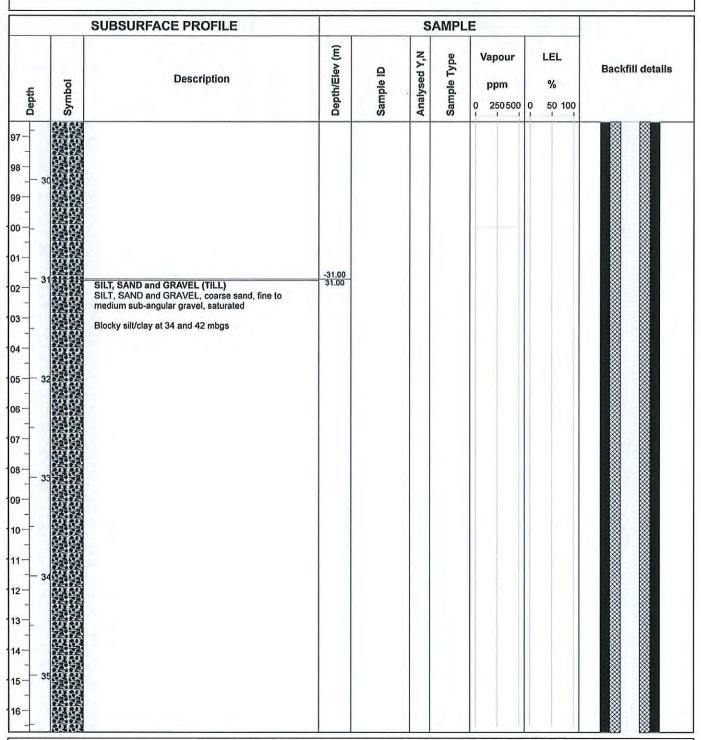
**Drilling Method: Dual Rotary** 

Date Drilled: September 3rd-4th, 2016

Logged by: TK

Site Location: Elkford, BC

Sheet: 6 of 14



Well location: Rail Loop

Well casing diameter: 50.8mm

Depth of well (TOC): -

Depth to water level (TOC): -

Well casing material: Schedule 40 PVC

Well Elevation (TOC): -

Date of water level: -

Well screen slot size: 0.25mm

Ground Elevation: -

Borehole diameter: 15.24cm

CI HEMMERA

Project Name/No: 577-016.07

Client: Teck Coal Greenhills Operation

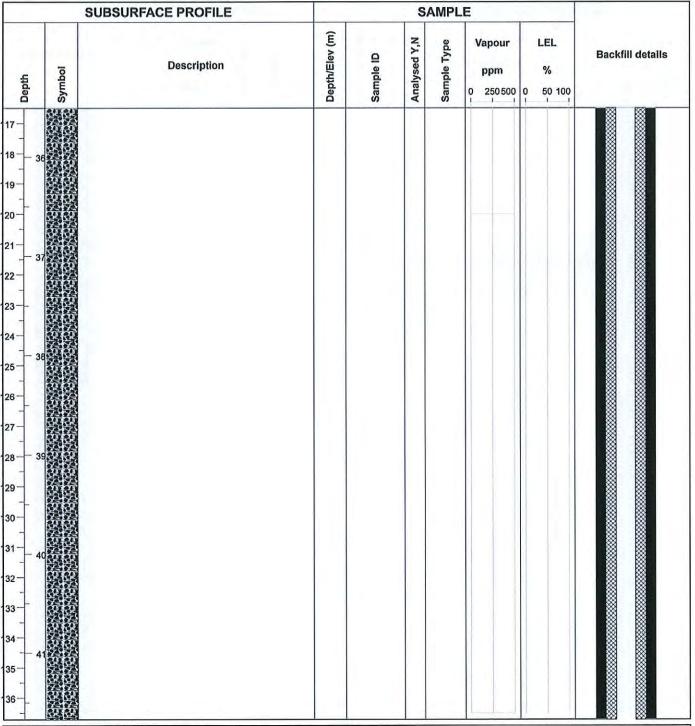
Date Drilled: September 3rd-4th, 2016

**Drilling Company: JR Drilling** 

**Drilling Method: Dual Rotary** 

Logged by: TK

Site Location: Elkford, BC Sheet: 7 of 14



Well location: Rail Loop

Depth to water level (TOC): -

Date of water level: -

Borehole diameter: 15.24cm

Well casing diameter: 50.8mm

Well casing material: Schedule 40 PVC

Well screen slot size: 0.25mm

Well screen interval (bgs): 82.5-79.5

Depth of well (TOC): -

Well Elevation (TOC): -



Project Name/No: 577-016.07

Client: Teck Coal Greenhills Operation

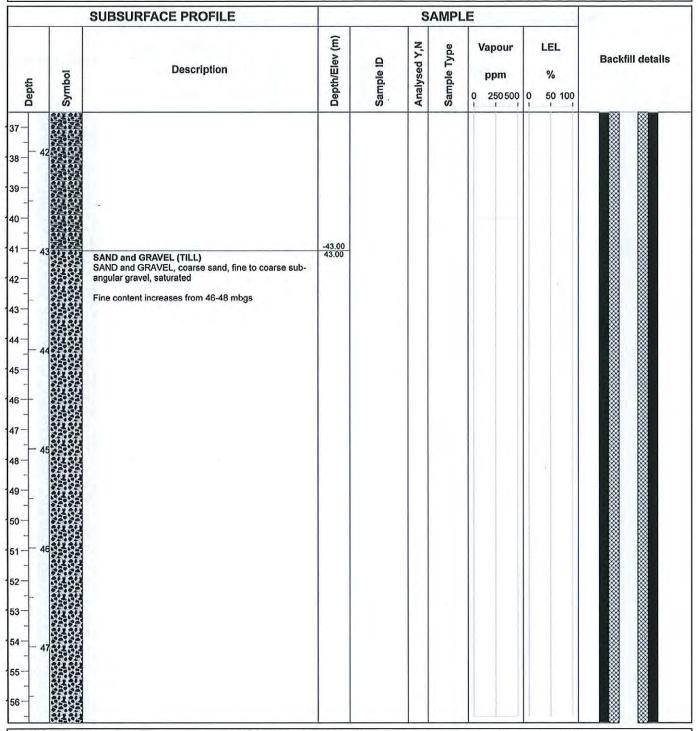
Date Drilled: September 3rd-4th, 2016

**Drilling Company: JR Drilling** 

**Drilling Method: Dual Rotary** 

Logged by: TK

Site Location: Elkford, BC Sheet: 8 of 14



Well location: Rail Loop

Well casing diameter: 50.8mm

Depth of well (TOC): -

Depth to water level (TOC): -

Well casing material: Schedule 40 PVC

Well Elevation (TOC): -

Date of water level: -

Well screen slot size: 0.25mm

Ground Elevation: -

Borehole diameter: 15.24cm



Project Name/No: 577-016.07

Drilling Company: JR Drilling

Client: Teck Coal Greenhills Operation

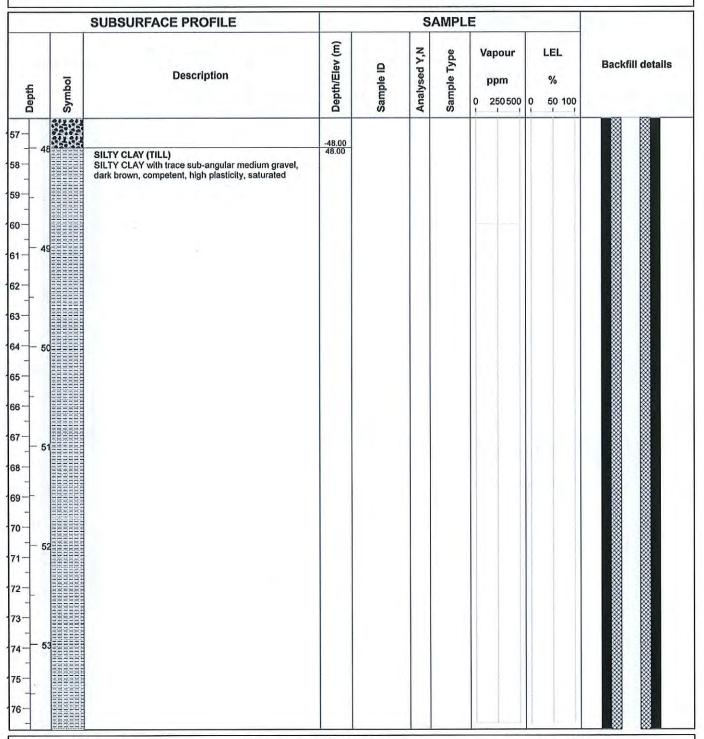
**Drilling Method: Dual Rotary** 

Date Drilled: September 3rd-4th, 2016

Logged by: TK

Site Location: Elkford, BC

Sheet: 9 of 14



Well location: Rail Loop

Well casing diameter: 50.8mm

Depth of well (TOC): -

Depth to water level (TOC): -

Well casing material: Schedule 40 PVC

Well Elevation (TOC): -

Date of water level: -

Well screen slot size: 0.25mm

Ground Elevation: -

Borehole diameter: 15.24cm



Project Name/No: 577-016.07

Site Location: Elkford, BC

Drilling Company: JR Drilling

Client: Teck Coal Greenhills Operation

**Drilling Method:** Dual Rotary

Logged by: TK

Date Drilled: September 3rd-4th, 2016

Sheet: 10 of 14

	SUBSURFACE PROFILE			S	AMPL	E	- //	
Depth Symbol	Description	Depth/Elev (m)	Sample ID	Analysed Y,N	Sample Type	Vapour ppm 0 250 500	% 0 50 100	Backfill details
7 — 54 8 — — 9 — — 55 1 — — 55 1 — — 56 3 — — 57 8 — — 9 — — 9 — — 9 — — 9 — — 9 — — 11 — — 12 — 14 — 15 — 16 — 16 — 16 — 16 — 16 — 16 — 16	GRAVEL (TILL) GRAVEL, fine to coarse, sub-angular, with fine to coarse sand Increased fine content with depth	-57.00 57.00						

Well location: Rail Loop

Well casing diameter: 50.8mm

Depth of well (TOC): -

Depth to water level (TOC): -

Well casing material: Schedule 40 PVC

Well Elevation (TOC): -

Date of water level: -

Well screen slot size: 0.25mm

Ground Elevation: -

Borehole diameter: 15.24cm



Project Name/No: 577-016.07

**Drilling Company: JR Drilling** 

Client: Teck Coal Greenhills Operation

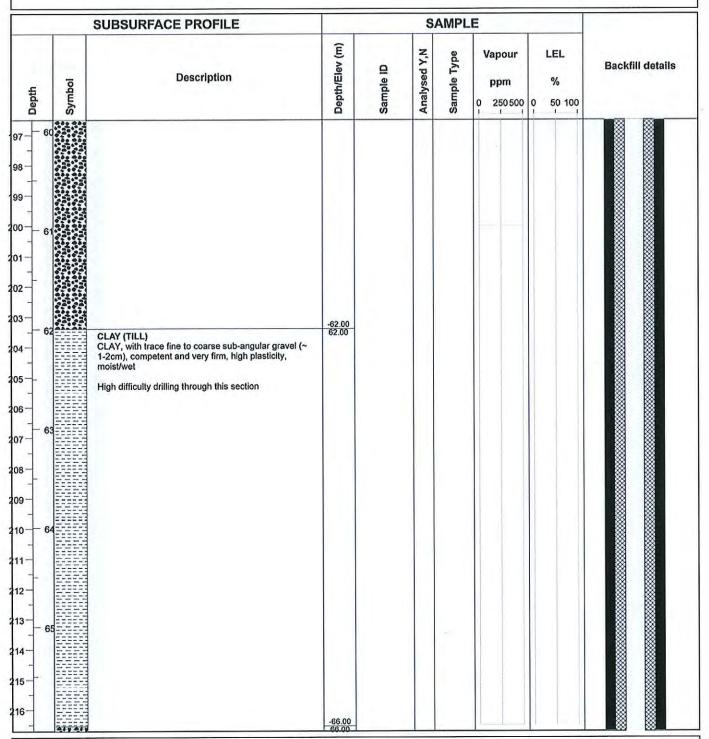
**Drilling Method: Dual Rotary** 

Date Drilled: September 3rd-4th, 2016

Logged by: TK

Site Location: Elkford, BC

Sheet: 11 of 14



Well location: Rail Loop

Well casing diameter: 50.8mm

Depth of well (TOC): -

Depth to water level (TOC): -

Well casing material: Schedule 40 PVC

Well Elevation (TOC): -

Date of water level: -

Well screen slot size: 0.25mm

Ground Elevation: -

Borehole diameter: 15.24cm

[] HEMMERA

Project Name/No: 577-016.07

Drilling Company: JR Drilling

Client: Teck Coal Greenhills Operation

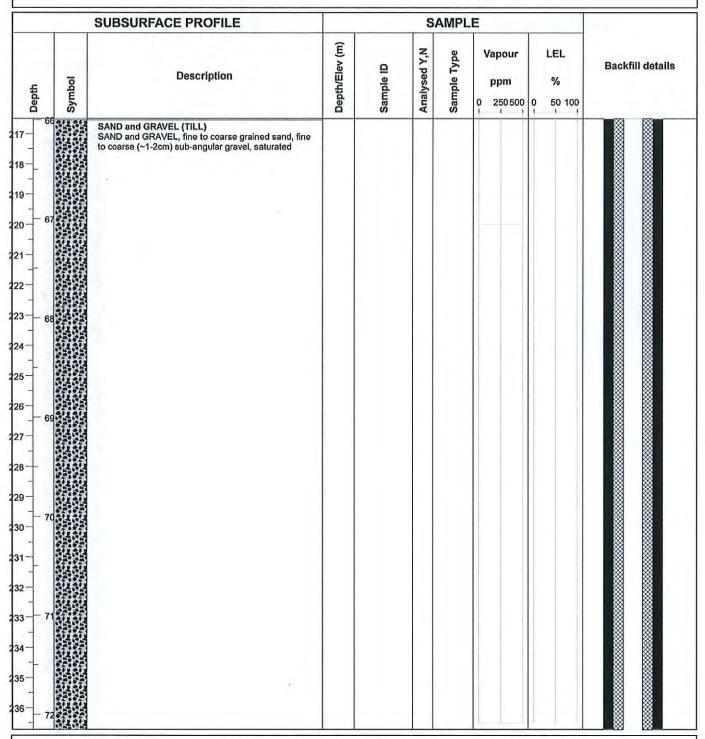
**Drilling Method: Dual Rotary** 

Date Drilled: September 3rd-4th, 2016

Logged by: TK

Site Location: Elkford, BC

Sheet: 12 of 14



Well location: Rail Loop

Well casing diameter: 50.8mm

Depth of well (TOC): -

Depth to water level (TOC): -

Well casing material: Schedule 40 PVC

Well Elevation (TOC): -

Date of water level: -

Well screen slot size: 0.25mm

Ground Elevation: -

Borehole diameter: 15.24cm



Project Name/No: 577-016.07

Drilling Company: JR Drilling

Client: Teck Coal Greenhills Operation

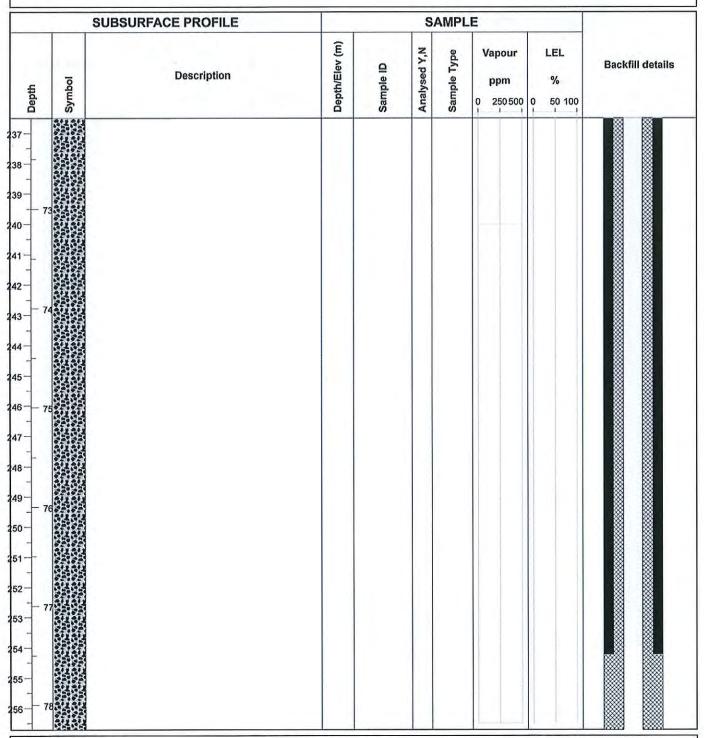
**Drilling Method:** Dual Rotary

Date Drilled: September 3rd-4th, 2016

Logged by: TK

Site Location: Elkford, BC

Sheet: 13 of 14



Well location: Rail Loop

Well casing diameter: 50.8mm

Depth of well (TOC): -

Depth to water level (TOC): -

Well casing material: Schedule 40 PVC

Well Elevation (TOC): -

Date of water level: -

Well screen slot size: 0.25mm

Ground Elevation: -

Borehole diameter: 15.24cm



Project Name/No: 577-016.07

**Drilling Company: JR Drilling** 

Client: Teck Coal Greenhills Operation

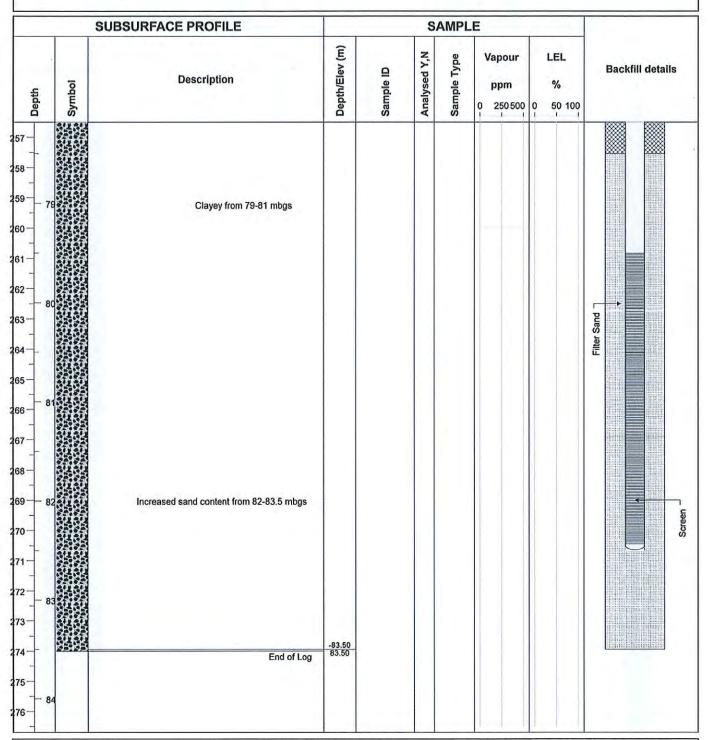
**Drilling Method: Dual Rotary** 

Date Drilled: September 3rd-4th, 2016

Logged by: TK

Site Location: Elkford, BC

Sheet: 14 of 14



Well location: Rail Loop

Well casing diameter: 50.8mm

Depth of well (TOC): -

Depth to water level (TOC): -

Well casing material: Schedule 40 PVC

Well Elevation (TOC): -

Date of water level: -

Well screen slot size: 0.25mm

Ground Elevation: -

Borehole diameter: 15.24cm



## Greenhills Well 9 Report 1 - Detailed Well Record

**GH POTW09** 

```
Construction Date: 1992-06-29 00:00:00
Well Tag Number: 85223
                                                 Driller:
Owner: ELK VALLEY COAL - GREENHILLS OPERATION
                                                 Well Identification Plate Number: 15802
                                                 Plate Attached By: KIMBERLY RASMUSSEN
                                                 Where Plate Attached: WELL CASING
Area: GREENHILLS
                                                 PRODUCTION DATA AT TIME OF DRILLING:
                                                Well Yield:
                                                                  (Driller's Estimate)
WELL LOCATION:
                                                 Development Method:
Land District
                                                Pump Test Info Flag: N
                                                                     UNKNOWN YIELD
District Lot: 4588 Plan: 11279 Lot: 1
                                                Artesian Flow:
Township: Section: Range:
                                                 Artesian Pressure (ft):
Indian Reserve: Meridian: Block:
                                                Static Level:
Quarter:
Island:
                                                WATER QUALITY:
BCGS Number (NAD 83): Well: 5
                                                 Character:
                                                Colour:
Class of Well:
                                                Odour:
Subclass of Well:
                                                Well Disinfected: N
Orientation of Well:
                                                EMS ID:
Status of Well:
                                                Water Chemistry Info Flag: N
Well Use:
                                                Field Chemistry Info Flag:
Observation Well Number:
                                                Site Info (SEAM): N
Observation Well Status:
Construction Method:
                                                Water Utility: N
Diameter: 10.75 inches
                                                Water Supply System Name: GREENHILLS WATER SUPPLY SYSTEM
Casing drive shoe:
                                                 Water Supply System Well Name: WELL 9
Well Depth: 117 feet
Elevation:
                 feet (ASL)
                                                SURFACE SEAL:
Final Casing Stick Up: inches
                                                Flag: Y
Well Cap Type:
                                                Material:
Bedrock Depth: 117 feet
                                                Method:
                                                Depth (ft): 88 feet
Lithology Info Flag: Y
File Info Flag: N
                                                Thickness (in):
Sieve Info Flag: N
                                                WELL CLOSURE INFORMATION:
Screen Info Flag: Y
                                                Reason For Closure:
Site Info Details:
                                                 Method of Closure:
Other Info Flag:
                                                Closure Sealant Material:
Other Info Details:
                                                 Closure Backfill Material:
                                                 Details of Closure:
Screen from
                                                                 Slot Size
                                           Туре
88
                                                                 .25
                     119
ทน11
                     nu11
                                                                 .12
Casing from
                      to feet
                                           Diameter
                                                                 Material
                                                                                       Drive Shoe
                                           10.75
                                                                 Other
                                                                                       null
GENERAL REMARKS:
LITHOLOGY INFORMATION:
From 0 to 19.7 Ft.
                          GRAVELY CLAY
                                           0 nothing entered
From 19.7 to 21.4 Ft. GRAVELY CLAY 0 nothing entered
From 21.4 to 43 Ft.
From 43 to 65 Ft.
                                                    0 nothing entered
0 nothing entered
                          GRAVELY CLAY COLLUVIUM
                          SILTY CLAY - LACUSTRINE
     65 to 70 Ft.
70 to 98.43 Ft.
From
                          GRAVEL- DIRTY - WATER
                                                    0 nothing entered
                          CLEANER GRAVEL 0 nothing entered GRAVEL SILTY 0 nothing entered
From
From 98.43 to 118 Ft.
                                           0 nothing entered
From 118.4 to 121.4 Ft.
                          SANDSTONE AND SHALE
                                                   0 nothing entered
```

- Return to Main
- Return to Search Options
- · Return to Search Criteria

#### Information Disclaimer

The Province disclaims all responsibility for the accuracy of information provided. Information provided should not be used as a basis for making financial or any other commitments.



#### Greenhills Well 10

#### Report 1 - Detailed Well Record

**GH POTW10** 

```
Construction Date: 2001-06-22 00:00:00
Well Tag Number: 85218
                                               Driller:
Owner: ELK VALLEY COAL - GREENHILLS OPERATION
                                               Well Identification Plate Number: 15805
                                               Plate Attached By:
                                               Where Plate Attached:
Address:
Area: GREENHILLS
                                               PRODUCTION DATA AT TIME OF DRILLING:
                                               Well Yield: 50 (Driller's Estimate)
WELL LOCATION:
                                               Development Method:
Land District
                                               Pump Test Info Flag: N
District Lot: 4588 Plan: 11279 Lot: 1
                                               Artesian Flow:
Township: Section: Range:
                                               Artesian Pressure (ft):
Indian Reserve: Meridian: Block:
                                               Static Level:
Quarter:
Island:
                                               WATER QUALITY:
BCGS Number (NAD 83): Well: 5
                                               Character:
                                               Colour:
Class of Well:
                                               Odour:
Subclass of Well:
                                               Well Disinfected: N
Orientation of Well:
                                               EMS ID:
Status of Well:
                                               Water Chemistry Info Flag: N
Well Use:
                                               Field Chemistry Info Flag:
Observation Well Number:
                                               Site Info (SEAM): N
Observation Well Status:
Construction Method:
                                               Water Utility: N
                                               Water Supply System Name: GREENHILLS WATER SUPPLY SYSTEM
Diameter: 8" inches
Casing drive shoe:
                                               Water Supply System Well Name: WELL 10
Well Depth: 176 feet
Elevation:
                feet (ASL)
                                               SURFACE SEAL:
Final Casing Stick Up: inches
                                               Flag: N
Well Cap Type:
                                               Material:
Bedrock Depth: feet
                                               Method:
Lithology Info Flag: Y
                                               Depth (ft):
File Info Flag: N
                                               Thickness (in):
Sieve Info Flag: N
Screen Info Flag: N
                                               WELL CLOSURE INFORMATION:
                                               Reason For Closure:
                                               Method of Closure:
Site Info Details:
Other Info Flag:
                                               Closure Sealant Material:
Other Info Details:
                                               Closure Backfill Material:
                                               Details of Closure:
Screen from
                     to feet
                                                               Slot Size
                                          Type
Casing from
                     to feet
                                          Diameter
                                                               Material
                                                                                    Drive Shoe
                     176
                                          n1111
                                                               Other
                                                                                    null
GENERAL REMARKS:
WATER QUALITY GUARANTEED BY CONTRACTOR
LITHOLOGY INFORMATION:
        0 to
                 58 Ft.
From
                         CTAY
                                  0 nothing entered
From
        58 to
                 78 Ft.
                          GRAVEL AND BOULDERS 0 nothing entered
       78 to
               110 Ft.
                         CLAY AND GRAVEL 0 nothing entered
From
                          COURSE GRAVEL
From
      110 to
                176 Ft.
                                           0 nothing entered
```

- Return to Main
- Return to Search Options
- Return to Search Criteria

#### **Information Disclaimer**

The Province disclaims all responsibility for the accuracy of information provided. Information provided should not be used as a basis for making financial or any other commitments.



## Greenhills Well 15 Report 1 - Detailed Well Record

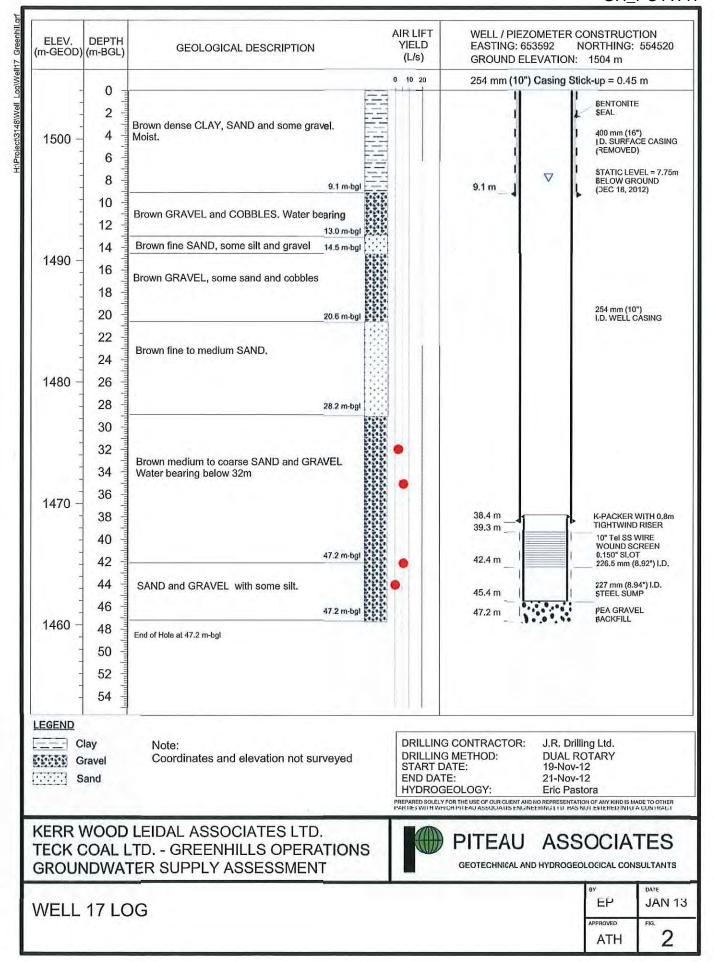
**GH POTW15** 

```
Construction Date: 2001-11-01 00:00:00
Well Tag Number: 85221
                                               Driller:
Owner: ELK VALLEY COAL - GREENHILLS OPERATION
                                               Well Identification Plate Number: 15803
                                               Plate Attached By: KIMBERLY RASMUSSEN
                                               Where Plate Attached: WELL CASING
Address:
Area:
                                               PRODUCTION DATA AT TIME OF DRILLING:
                                               Well Yield: 100 (Driller's Estimate)
WELL LOCATION:
                                               Development Method:
Land District
                                               Pump Test Info Flag: N
District Lot: 4588 Plan: 11279 Lot: 1
                                               Artesian Flow:
                                               Artesian Pressure (ft):
Township: Section: Range:
Indian Reserve: Meridian: Block:
                                               Static Level: 11 feet
Quarter:
Island:
                                               WATER QUALITY:
BCGS Number (NAD 83): Well: 7
                                               Character:
                                               Colour:
Class of Well:
                                               Odour:
Subclass of Well:
                                               Well Disinfected: N
Orientation of Well:
                                               EMS ID:
Status of Well:
                                               Water Chemistry Info Flag: N
Well Use:
                                               Field Chemistry Info Flag:
Observation Well Number:
                                               Site Info (SEAM): N
Observation Well Status:
Construction Method:
                                               Water Utility: N
                                               Water Supply System Name: GREENHILLS WATER SUPPLY SYSTEM
Diameter: inches
Casing drive shoe:
                                               Water Supply System Well Name: WELL 15
Well Depth: 144 feet
Elevation:
                feet (ASL)
                                               SURFACE SEAL:
Final Casing Stick Up: inches
                                               Flag: N
Well Cap Type:
                                               Material:
Bedrock Depth: feet
                                               Method:
Lithology Info Flag: Y
                                               Depth (ft):
File Info Flag: N
                                               Thickness (in):
Sieve Info Flag: N
Screen Info Flag: N
                                               WELL CLOSURE INFORMATION:
                                               Reason For Closure:
                                               Method of Closure:
Site Info Details:
Other Info Flag:
                                               Closure Sealant Material:
Other Info Details:
                                               Closure Backfill Material:
                                               Details of Closure:
Screen from
                     to feet
                                                               Slot Size
                                          Type
Casing from
                     to feet
                                          Diameter
                                                               Material
                                                                                    Drive Shoe
                     144
                                          n1111
                                                               Other
                                                                                    null
GENERAL REMARKS:
WATER QUALITY GUARANTEED BY CONTRACTOR
LITHOLOGY INFORMATION:
        0 to
                7 Ft.
                                 0 nothing entered
From
                         FILL
From
         7 to
                 15 Ft.
                          CLAY AND GRAVEL
                                           0 nothing entered
       15 to
              125 Ft. SILTY CLAY
                                      0 nothing entered
From
                          COARSE GRAVEL AND COBBLE
From
      125 to
                144 Ft.
                                                       0 nothing entered
```

- Return to Main
- Return to Search Options
- Return to Search Criteria

#### **Information Disclaimer**

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PROJECT No.: 11.1422.0052 LOCATION: See Location Plan

1 : 50

#### RECORD OF MONITORING WELL: GA-MW-01

BORING DATE: September 21, 2012

SHEET 1 OF 3

CHECKED: JW

DATUM: UTM Zone 11 (Nad 83)

DATA ENTRY: IPG N: 5554750 E: 648019 HYDRAULIC CONDUCTIVITY, k, cm/s DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m PIEZOMETER SOIL PROFILE SAMPLES BORING METHOD DEPTH SCALE METRES ADDITIONAL LAB. TESTING STANDPIPE INSTALLATION 105 105 10" 40 BLOWS/0.3m NUMBER ELEV. SHEAR STRENGTH Cu, kPa nat V. + Q- ● rem V. ⊕ U- Q WATER CONTENT PERCENT DESCRIPTION DEPTH -oW I WI Wp 1 (m) Stick-up = 1,05 m Ground Surface (SP) SAND, coarse-grained, 1357,00 sub-angular, poorly-graded, dark grey 1353.00 (GP) CLAYEY GRAVEL, coarse-grained, poorly-graded, sub-rounded clay, brown, firm Bentonite Pellets CALGARY,GDT 7/30/15 BH LOGS.GPJ BOREHOLE - EXPANDED ADD. LAB TESTING 11,1422,0052 1348,00 (SP) SAND, coarse-grained, poorly-graded, trace gravel, sub-angular, trace clay, dark grey GRAS CONTINUED NEXT PAGE LOGGED: TG DEPTH SCALE Golder

PROJECT No.: 11.1422.0052 LOCATION: See Location Plan

#### RECORD OF MONITORING WELL: GA-MW-01

BORING DATE: September 21, 2012

SHEET 2 OF 3

DATUM: UTM Zone 11 (Nad 83)

N:5554750 E:648019

DATA ENTRY: HYDRAULIC CONDUCTIVITY, DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m PIEZOMETER SOIL PROFILE SAMPLES BORING METHOD DEPTH SCALE METRES ADDITIONAL LAB, TESTING STANOPIPE INSTALLATION 10° 10° 104 100 40 80 NUMBER TYPE SHEAR STRENGTH nat V. + Q+ • rem V. ⊕ U + O WATER CONTENT PERCENT DESCRIPTION DEPTH oW WPI (m) (SP) SAND, coarse-grained, poorly-graded, trace gravel, sub-angular, trace clay, dark grey (continued) Bentonite Pellets 10/20 Sand (SC) CLAYEY SAND, medium-grained, poorly-graded, dark grey CALGARY, GDT 7/30/15 Slotted Section 10/20 Sand BH LOGS,GPJ BOREHOLE - EXPANDED ADD. LAB TESTING 11,1422,0052 1338,00 (SP) SAND, coarse-grained, sub-angular, poorly-graded, dark grey Bentonite Pellets CONTINUED NEXT PAGE LOGGED: TO DEPTH SCALE Golder CHECKED: JW

1 : 50



DATA ENTRY: IPG PROJECT No.: 11.1422.0052 LOCATION: See Location Plan

#### RECORD OF MONITORING WELL: GA-MW-01

BORING DATE: September 21, 2012

SHEET 3 OF 3

DATUM: UTM Zone 11 (Nad 83)

N: 5554750 E: 648019

	НОВ	SÓIL PROFILE	SAMPL			_		MIC PENETF TANCE, BLC	RATION DWS/0.3m	1	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	m/s			PIEZOMETER OR	
METRES	BORING METHOD	DESCRIPTION		ELEV.	NUMBER	TYPE BLOWS/0.3m	SHEA	R STRENGT	H nat V.	# Q+ ● ⊕ U- O	WATE	R CONTEN	IT PERC	10° ENT	ADDITIONAL LAB, TESTING	STANDPIPE INSTALLATION
	BORII		STRAT	DEPTH (m)	NUN	BI ON	Cu, kP	a 20 40	rem V.	80	Wp 1-	20	30	40 40	ADD LAB.	
20		(SP) SAND, coarse-grained, sub-angular, poorly-graded, dark grey	100			+						-11-				
	Н	sub-angular, poorly-graded, dark grey (continued)				1				11	4-4-	7			-	
												Ш				
21	otary						8				311					
	Barber Rig – Air Rotary Tervita				6.6	RAB									li n	Bentonite Pellets
	mer Rig													1 7		, 5,10,5
	Ba															
22																
		- Bedrock at 22.6 m		1334,40	7	RAB							Ш	1.		
		End of MONITORING WELL.		22.60												
23		NOTES: Hit BEDROCK at 22.6 m.														
		Standpipe installed to 18.6 m. Groundwater level measured at at 17.5 mGL on September 23, 2012.							Ш							
		17.5 mgc un deplember 25, 2012.	11					1 1								
24			ш		П											
					Н											
25					Ш						1	1				
			11											11 1		
					Ш											
26		'	11		Ш					1			1	10		
N					Ш			M							1	
A																
-		h ()														
27																
28																
29		III I								8-						
	1															
G2	9.4							14								
30							0.1							1	1	A second
	_	SCALE					-	Go Asso							LOGGED	

	CNIC. T ANIA	TINI	Т		lient oal Lin	nited			Boreho	ole No. : (	GH_BH-MC-1		
7)	SNC · LAVA	LII		cation ions N	lickelso	n Por	nd	PAGE 1 OF 5					
Drilling Boreh	Contractor Owen's Drilling Method Dual Rotary Dle Dia. (m) 0.15 lotted Pipe Dia. (m) 0.05/0.05	2018 12 06 lev. (m) 1313.098 v. (m) 1314.011 1313.988 5.222 Easting: 647979.304					Project Number: 658004 Borehole Logged By: MCA Date Drilled: 2018 11 15 Log Typed By: VL						
Depth in Metres	Drilling Legend Sample Interval Auger Flight	Water/NA  ▼ Water Lev  ✓ Water Lev  ◆ NAPL  ◇ NAPL	vel 1	Stratigraphy Plot	Sample Interval Core Run	Sample Number	Blow Count	% Recovery	<ul> <li>Reading within indicated scale</li> <li>Reading outside indicated scale</li> <li>Soil Vapour (ppm)</li> </ul>	Slot Well Nam	d PVC ted PVC ne 1: GH_MW-MC-1S ne 2: GH_MW-MC-1D		
Dep	Soil Desc	cription		Stratiç	Samp Core	Samp	Blow	Re 1	0 <sup>1</sup> 10 <sup>2</sup> 10 <sup>3</sup> 10	1 _			
1-	SAND, fine grained, silty, trace fir moist, some to trace organics (root SAND and GRAVEL, fine to medicoarse gravel, cobbles present, tr graded, brown, loose to medium of	ots/rootlets).  ium grained stace silt, subn	eand, fine to										
3-	At 3.1 m - fine to coarse grained s	sand, no silt								▼ / /	BENTONITE/SLOUG	ЭН	
5	From 4.3 m to 4.9 m - wet  SAND and GRAVEL, fine to coar coarse gravel, cobbles present, tr well graded, medium dense, wet.	ace to some											
7-	At 7.0 m - increase in gravel, den	se, wet to mo	ist								BENTONITE		
OA: MCA 2019 01 14 Print Date:2019-12-04	SAND and GRAVEL, fine to coarse gravel, trace silt, subround brown, loose, wet.												
GA: MCA 2019 01				NOT Wat Wat	ES er leve er leve	el 1 and el 2 and	l first I sec	top	of casing elevation of casing elev	on is for GI vation is fo	H_MW-MC-1S. r GH_MW-MC-1D.		

	CNIC . T ANIA	TINI	Т		Client oal Lim	ited			Boreho	ole No. : GH_BH-MC-1
7))	SNC·LAVA		Greenhills (		cation ions M	ickelso	n Por	nd		PAGE 2 OF 5
Drilling Boreh	g Contractor Owen's Drilling g Method Dual Rotary ole Dia. (m) 0.15 slotted Pipe Dia. (m) 0.05/0.05		Date Monitored Ground Surface El- Top of Casing Elev Northing: 5553565	ر. (m̀) ´	1313 1314	12 06 .098 .011 131 ng: 6479		4	Project Number: Borehole Logged Date Drilled: Log Typed By:	658004 I By: MCA 2018 11 15 VL
Depth in Metres	Drilling Legend Sample Interval Auger Flight	Water/NA  ▼ Water Lev  ✓ Water Lev  ◆ NAPL  ◇ NAPL		Stratigraphy Plot	Sample Interval Core Run	Sample Number	Blow Count	% Recovery	Reading within indicated scale Reading outside indicated scale  Soil Vapour (ppm)	Solid PVC Slotted PVC  Well Name 1: GH_MW-MC-1S Well Name 2: GH_MW-MC-1D
Det	Soil Des	scription		Strat	Sam	Sam	Blo	% 10 <sup>1</sup>	10 <sup>2</sup> 10 <sup>3</sup> 10	
11-	SAND and GRAVEL, fine to coaccoarse gravel, trace silt, subrou brown, loose, wet. (continued)  SILT, some fine grained sand, t subrounded, brown to dark bro	race fine to coa	arse gravel,							SAND
15-	coarse gravel, some silt, subroudense, damp to dry. SAND, fine grained, silty, some subrounded, poorly graded, bro  SILT, sandy, fine grained, trace to dry.	to trace gravel wn, dense, dar	, fine to coarse, np to dry.							BENTONITE
OA: MCA 2019 01 14 Print Date: 2019-12-04	SAND, fine to medium grained, coarse, subrounded, well grade  SAND and GRAVEL, fine to me coarse gravel, some silt, subroudense, damp.	d, brown, damp	p. Sand, fine to							
DA: MCA 2019 01 14				NOT Wat Wat	er leve	l 1 and	l first	top of ond to	casing elevation of casing elev	on is for GH_MW-MC-1S. ration is for GH_MW-MC-1D.

	CRIC. T AND	TINT	Te		lient oal Lin	nited			Boreho	le No. : GH_BH-MC-1
7/)	SNC·LAVA		Greenhills C		cation ions N	lickelso	n Poi	nd		PAGE 3 OF 5
Drilling Boreh	g Contractor Owen's Drilling g Method Dual Rotary ole Dia. (m) 0.15 lotted Pipe Dia. (m) 0.05/0.05		Date Monitored Ground Surface Ele Top of Casing Elev. Northing: 5553565.2	(m) ´	1313 1314	3 12 06 3.098 3.011 131 ing: 6479			Project Number: Borehole Logged Date Drilled: Log Typed By:	658004 I By: MCA 2018 11 15 VL
Depth in Metres	Drilling Legend Sample Interval Auger Flight	Water/NA  ▼ Water Lev  ⊽ Water Lev  • NAPL  ◇ NAPL		Stratigraphy Plot	Sample Interval Core Run	Sample Number	Blow Count	% Recovery	Reading within indicated scale     Reading outside indicated scale     Soil Vapour (ppm)	Solid PVC Slotted PVC  Well Name 1: GH_MW-MC-1S Well Name 2: GH_MW-MC-1D
De	Soil Des	scription		Stra	San	San	Blo	% %	0 <sup>1</sup> 10 <sup>2</sup> 10 <sup>3</sup> 10	
21-	SAND and GRAVEL, fine to me coarse gravel, some silt, subroudense, damp. (continued)	edium grained s unded, well gra	sand, fine to ded, brown,							
24-	SAND and GRAVEL, fine to coacoarse gravel, trace silt, well gramoist. At 22.6 m - some silt to silty, loc	aded, brown, m	edium dense,							BENTONITE
OA: MCA 2019 01 14 Print Date: 2019-12-04	SAND and GRAVEL, fine to coarse gravel, some to trace sil well graded, loose, wet.  At 27.7 m - some silt  At 29.0 m - trace silt		o subangular,							SAND
QA: MCA 2019 01				NOT Wate Wate	er leve	el 1 and el 2 and	first sec	top ond	of casing elevation top of casing elev	n is for GH_MW-MC-1S. ation is for GH_MW-MC-1D.

	CRIC. T AND	TTNT	Т		lient oal Lim	nited			Boreho	ole No. : GH_BH-MC-1
7)	SNC·LAVA		Greenhills (		cation ions M	ickelso	n Po	nd		PAGE 4 OF 5
Drilling Boreh	g Contractor Owen's Drilling g Method Dual Rotary ole Dia. (m) 0.15 lotted Pipe Dia. (m) 0.05/0.05		Date Monitored Ground Surface Ele Top of Casing Elev Northing: 5553565.	. (m) ´	1313 1314	12 06 .098 .011 131 ing: 6479			Project Number: Borehole Logged Date Drilled: Log Typed By:	
Depth in Metres	Drilling Legend Sample Interval Auger Flight	Water/NA  ▼ Water Lev  ▽ Water Lev  ◆ NAPL  ◇ NAPL		Stratigraphy Plot	Sample Interval Core Run	Sample Number	Blow Count	% Recovery	Reading within indicated scale     Reading outside indicated scale     Soil Vapour (ppm)	Solid PVC Slotted PVC  Well Name 1: GH_MW-MC-1S Well Name 2: GH_MW-MC-1D
De De	Soil Des	scription		Stra	Sarr	Sam	Blo	% R	0 <sup>1</sup> 10 <sup>2</sup> 10 <sup>3</sup> 10	9
30- 30- 30- 30- 30- 30- 30- 30- 30- 30-	SAND and GRAVEL, fine to coacoarse gravel, some to trace silt well graded, loose, wet. (continuation)  At 35.4 m - some silt  At 36.3 m - silty  SAND and GRAVEL, fine grainsilty, subrounded to subangular silty, subrounded to subangular wet to moist (possibly weathered)	ed sand, fine to poorly graded	o coarse gravel, , wet.							GH_MW-MC-1D  —— SAND
DA: MCA 2019 01 1				NOT Wate Wate	ES er leve er leve	el 1 and el 2 and	d first	t top ond	of casing elevatic top of casing elev	on is for GH_MW-MC-1S. ration is for GH_MW-MC-1D.

	CNIC . T ANIA	TINI	T		Client oal Lin	nited			Borehole No. : GH_BH-MC-1
7))	SNC+LAVA	LIIN	Greenhills C		cation ions N	lickelso	n Poi	nd	PAGE 5 OF 5
Drilling Boreho	Ocntractor Owen's Drilling Method Dual Rotary Dle Dia. (m) 0.15 lotted Pipe Dia. (m) 0.05/0.05		Date Monitored Ground Surface Ele Top of Casing Elev Northing: 5553565	. (m) ´	1313 1314	3 12 06 3.098 4.011 131; ting: 6479		14	Project Number: 658004 Borehole Logged By: MCA Date Drilled: 2018 11 15 Log Typed By: VL
Depth in Metres	Drilling Legend Sample Interval Auger Flight	Water/NA  ▼ Water Lev  ▽ Water Lev  ◆ NAPL  ○ NAPL		Stratigraphy Plot	Sample Interval Core Run	Sample Number	Blow Count	% Recovery	Reading within indicated scale     Reading outside indicated scale     Soil Vapour (ppm)     Soil Vapour (ppm)     Soil Vapour (ppm)     Soil Vapour (ppm)     Soil Vapour (ppm)
Ď	Soil Des	cription		Stra	San	San	Bi	% 1	10 <sup>1</sup> 10 <sup>2</sup> 10 <sup>3</sup> 10 <sup>4</sup>
42-43-44-44-44-	GRAVEL, fine to coarse, some fi silty, subangular to angular, poor wet to moist (possibly weathered At 40.2 m - moist At 40.8 m - wet	ly graded, dar I bedrock). <i>(cc</i>	k grey to brown, intinued)						— BENTONITE/SLOUGH
46-	Bottom of hole at 47.2 m.								
OA: MCA 2019 01 14 Print Date: 2019-12-04									
QA: MCA 2019 01				<b>NOT</b> Wat Wat	ES er leve er leve	el 1 and el 2 and	I first I sec	top ond	of casing elevation is for GH_MW-MC-1S. top of casing elevation is for GH_MW-MC-1D.

<b>~</b> 1)	SNC · LAVA	TINI	т	eck C	lient oal Lin	nited			Boreho	ole No. : GH_B	H-MC-2
<b>~//</b>	SINC LAVE		Greenhills (		cation ions M	ickelso	n Po	nd		PAGE 1 OF 2	
Drilling Boreho	Contractor Owen's Drilling Method Dual Rotary Dle Dia. (m) 0.15 Otted Pipe Dia. (m) 0.05/0.05		Date Monitored Ground Surface El- Top of Casing Elev Northing: 5553498	r. (m) ´	1314 1315	12 06 150 115 131 115 131 115 6482			Project Number: Borehole Logged Date Drilled: Log Typed By:		4
Depth in Metres	Drilling Legend Sample Interval Auger Flight	Water/NA  ▼ Water Le  ▽ Water Le  ◆ NAPL  ◇ NAPL		Stratigraphy Plot	Sample Interval Core Run	Sample Number	Blow Count	% Recovery	Reading within indicated scale     Reading outside indicated scale     Soil Vapour (ppm)	Solid PVC Slotted PVC Well Name 1: GH Well Name 2: GH	
٥	Soil Des	scription		Str	လ လ	Sa	B	%	0 <sup>1</sup> 10 <sup>2</sup> 10 <sup>3</sup> 10		
1-	SAND, fine to medium grained, to subangular, poorly graded, d	ark brown, Īoos	se, dry.								
2-	SAND and GRAVEL, fine to me coarse gravel, subangular to su well graded, brown, loose, dam  At 3.1 m - fine grained sand, po	brounded, cob p/dry.									— BENTONITE
5-	SILT, some fine to medium grai coarse gravel, subangular to su wet. SAND and GRAVEL, fine to me coarse gravel, some silt, suban- graded, brown to dark brown, m	brounded, soft edium grained s gular to subrou nedium dense,	to medium firm, sand, fine to inded, well damp to dry.	2000 000000000000000000000000000000000							— BENTONITE  SH_MW-MC-2S  — SAND
7- 8- 9-	At 6.1 m - increased fine graine dense	d sand, trace t	o some silt,								
				NOT Wat Wat GH_	ES er leve er leve MW-N	el 1 and el 2 and MC-2S	l first I sec mon	top ond itore	of casing elevation of casing elevation of casing eleval 2018 11 18.	on is for GH_MW vation is for GH_I	-MC-2S. MW-MC-2D.

	CNIC . T ANIA	TINI	T.		Client oal Lin	nited			Boreho	le No. : GH_BH-MC-2
7))	SNC·LAVA	LLIN	Greenhills C		cation ions N	lickelso	n Po	nd		PAGE 2 OF 2
Drilling Boreho	g Contractor Owen's Drilling g Method Dual Rotary ole Dia. (m) 0.15 lotted Pipe Dia. (m) 0.05/0.05		Date Monitored Ground Surface Ele Top of Casing Elev Northing: 5553498.	. (m) ´	1314 1315	3 12 06 4.150 5.115 131 ing: 6482		7	Project Number: Borehole Logged Date Drilled: Log Typed By:	658004 I By: MCA 2018 11 14 VL
Depth in Metres	Drilling Legend Sample Interval Auger Flight	Water/NA  ▼ Water Lev  ▽ Water Lev  ◆ NAPL  ◇ NAPL		Stratigraphy Plot	Sample Interval Core Run	Sample Number	Blow Count	% Recovery	<ul> <li>Reading within indicated scale</li> <li>Reading outside indicated scale</li> <li>Soil Vapour (ppm)</li> </ul>	Solid PVC Slotted PVC  Well Name 1: GH_MW-MC-2S Well Name 2: GH_MW-MC-2D
Dep	Soil Des	scription		Strati	Samp Core	Samp	Blow	Re 1	0 <sup>1</sup> 10 <sup>2</sup> 10 <sup>3</sup> 10	
11-	SAND and GRAVEL, fine to me coarse gravel, some silt, subang graded, brown to dark brown, m (continued)  At 11.6 m - moist  At 12.2 m - damp to dry  BEDROCK, fine grained, grey to weathered.	gular tō subrou ledium dense,	nded, well damp to dry.							BENTONITE  BENTONITE  GH_MW-MC-2D  SAND
17-	Bottom of hole at 16.8 m.								; ; ;	
OA: MCA 2019 01 14 Print Date:2019-12-04										
QA: MCA 2019 01				NOT Wate Wate GH_	er leve	el 1 and el 2 and MC-2S	d first d sec mon	top ond tored	of casing elevation of casing elevation of casing eleval 2018 11 18.	n is for GH_MW-MC-2S. ation is for GH_MW-MC-2D.

PROJECT No.: 11.1422,0052

DEPTH SCALE

### RECORD OF MONITORING WELL: GA-MW-02

SHEET 1 OF 3

LOGGED: TG CHECKED: JW

DATA ENTRY: IPG BORING DATE: September 19, 2012 DATUM: UTM Zone 11 (Nad 83) LOCATION: See Location Plan N: 5552115 E: 648291 DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m HYDRAULIC CONDUCTIVITY, k, cm/s PIEZOMETER SOIL PROFILE SAMPLES BORING METHOD OR STANDPIPE INSTALLATION DEPTH SCALE METRES ADDITIONAL LAB, TESTING STRATA PLOT BLOWS/0.3rr NUMBER ELEV. TYPE SHEAR STRENGTH nat V. + Q - O rem V. & U - O WATER CONTENT PERCENT DESCRIPTION ΘW DEPTH Wp 1 (m) Stick-up = 1.02 m Ground Surface (SP) SAND, coarse-grained, trace fine gravel, angular, poorly-graded, grey 1310.00 Bentonite Pellets 1305.00 (GP) GRAVEL, coarse-grained, sub-rounded, brown CALGARY.GDT 7/30/15 1303.00 (CI) SILTY CLAY, some fine gravel, brown, cohesive, water content is close to plastic limit, very soft BH LOGS.GPJ 11.1422.0052 3 GRAE BOREHOLE - EXPANDED ADD, LAB TESTING 1300.00 CONTINUED NEXT PAGE

PROJECT No.: 11.1422.0052 LOCATION: See Location Plan

1:50

#### RECORD OF MONITORING WELL: GA-MW-02

BORING DATE: September 19, 2012

SHEET 2 OF 3

DATUM: UTM Zone 11

DATA ENTRY: IPG (Nad 83) N: 5552115 E: 648291 DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m HYDRAULIC CONDUCTIVITY, k, cm/s PIEZOMETER. SOIL PROFILE SAMPLES BORING METHOD OR STANDPIPE INSTALLATION DEPTH SCALE METRES ADDITIONAL LAB. TESTING STRATA PLOT 80 105 104 BLOWS/0.3m NUMBER SHEAR STRENGTH nal V. + Q - Cu, kPa rem V. ⊕ U - Q ELEV. TYPE WATER CONTENT PERCENT DESCRIPTION DEPTH OW Wp. (m) (GW) GRAVEL, coarse-grained, sub-angular, well graded, grey 4 BRAE 1298.50 (CI) SILTY CLAY, with some fine gravel, brown, cohesive, very soft, w-PL 12 13 Bentonite 15 Pellets 7/30/15 EXPANDED ADD. LAB TESTING 11.1422.0052. BH LOGS.GPJ. CALGARY.GDT (SP) SAND, coarse-grained, some fine gravel, angular, poorly-graded, dark grey 1290,50 (GW) GRAVEL, coarse-grained, sub-angular, well graded, grey CONTINUED NEXT PAGE LOGGED: TG DEPTH SCALE Golder Associates CHECKED: JW

PROJECT No.: 11.1422,0052

LOCATION: See Location Plan
N: 5552115 F: 6.

DATA ENTRY: IPG

#### RECORD OF MONITORING WELL: GA-MW-02

BORING DATE: September 19, 2012

SHEET 3 OF 3

DATUM: UTM Zone 11 (Nad 83)

N: 5552115 E: 648291

DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m HYDRAULIC CONDUCTIVITY, k, cn/s PIEZOMETER SOIL PROFILE SAMPLES BORING METHOD DEPTH SCALE METRES OR STANDPIPE ADDITIONAL LAB. TESTING STRATA PLOT 80 101 BLOWS/0.3m INSTALLATION NUMBER TYPE ELEV. SHEAR STRENGTH nat V. + Q- 
Cu, kPa rem V. 
U- O WATER CONTENT PERCENT DESCRIPTION OW DEPTH Wp I (m) (GW) GRAVEL, coarse-grained, sub-angular, well graded, grey Bentonite Pellets (continued) 10/20 Sand 22 (ML) SILT, some fine gravel, trace coarse gravel, dark grey, non-cohesive, 1286.00 (SP) SAND, coarse-grained, some fine gravel, angular, poorly-graded, dark grey 25 Slotted 7/30/15 Section 10/20 Sand GDT CALGARY 27 BH LOGS.GPJ EXPANDED ADD. LAB TESTING 11.1422.0052 28 - Bedrock at 28.5 m NOTES: Encountered BEDROCK at 28.5 m. 29 Standpipe installed to 29.0 m. Groundwater level measured at Bentonite 11.0 mGL on September 19, 2012. 1280.50 (SP) SAND, coarse-grained, coarse gravel, bits of bedrock, sub-angular, 29.60 poorly-graded, light grey End of MONITORING WELL. 30 Golder LOGGED: TG DEPTH SCALE CHECKED: JW 1:50 Associates

DATA ENTRY: IPG PROJECT No.: 11,1422,0052 LOCATION: See Location Plan

## RECORD OF MONITORING WELL: GA-MW-04

BORING DATE: September 20, 2012

SHEET 1 OF 2

DATUM: UTM Zone 11 (Nad 83)

N: 5552963 E: 648217

	100	SOIL PROFILE			SAM	PLES	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m	HYDRAULIC CONDUCTIVITY, k, cm/s		PIEZOMETER
-	BORING METHOD	DESCRIPTION	D	LEV. EPTH	NUMBER	BLOWS/0.3m	20 40 60 80  SHEAR STRENGTH natV + Q - ♠ Cu, kPa	10° 10° 10° 10° 10° 10° WATER CONTENT PERCENT  WA   OW   WI 10 20 30 40	ADDITIONAL LAB. TESTING	STANDPIPE INSTALLATION
1 2 3 4 4 5	Sarber Rig — Air Rolary Tervita	Ground Surface (SP) GRAVELLY SAND, coarse-grained, fine gravel, sub-angular, poorly-graded, dark grey		0.00	1 GA		20 40 60 80	10 20 30 40		Bentonite Pellets
7 8 9		(SM) SILTY SAND, medium to fine-grained, sub-rounded, poorly-graded, brown and dark grey		9,00 9,00	2 \$6	RAS				
		GOTTINGED NEXT PAGE					Golder		-	



PROJECT No.: 11,1422,0052 LOCATION: See Location Plan

#### RECORD OF MONITORING WELL: GA-MW-04

BORING DATE: September 20, 2012

SHEET 2 OF 2

DATUM: UTM Zone 11 (Nad 83)

N: 5552963 E: 648217

DATA ENTRY: IPG DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m HYDRAULIC CONDUCTIVITY, k, cm/s PIEZOMETER SOIL PROFILE SAMPLES BORING METHOD OR STANDPIPE ADDITIONAL LAB. TESTING DEPTH SCAL METRES STRATA PLOT BLOWS/0.3m INSTALLATION NUMBER ELEV. TYPE SHEAR STRENGTH nat V. + Q - 0 rem V. & U - O WATER CONTENT PERCENT DESCRIPTION OW DEPTH Wp 1 (m) (SP) GRAVELLY SAND, coarse-grained, fine gravel, sub-angular, poorly-graded, dark grey Bentonite Pellets 10/20 Sand (SM) SILTY SAND, medium to fine-grained, sub-rounded, poorly-graded, brown and dark grey (GW) GRAVEL, fine with coarse, sub-angular to sub-rounded, well graded, grey Slotted Section 10/20 Sand 7/30/15 CALGARY.GDT Bentonite 1287,00 Pellets (SP) GRAVELLY SAND, 8 GRAE coarse-grained, fine gravel, poorly-graded, sub-engular, dark grey End of MONITORING WELL. BH LOGS.GPJ Standpipe installed to 16.7 m. Groundwater present at 6.0 m on September 24, 2012. 11,1422,0052 TESTING 19 LAB BOREHOLE - EXPANDED ADD. LOGGED: TG DEPTH SCALE CHECKED: JW

DATA ENTRY: IPG PROJECT No.: 11,1422,0052 LOCATION: See Location Plan

## RECORD OF MONITORING WELL: GA-MW-3S

BORING DATE: September 23, 2012

SHEET 1 OF 2

DATUM: UTM Zone 11 (Nad 83)

HOD	SOIL PROFILE	La ex	SA	MPLES	DYNAMIC PENETRATION HYDRAULIC RESISTANCE, BLOWS/0.3mi	CONDUCTIVITY,	PIEZOMETER
BORING METHOD	DESCRIPTION	STRATA PLOT		TYPE TYPE	20 40 60 80 10 <sup>®</sup> SHEAR STRENGTH nat V. + Q. ■ Cu, kPa rem V. ⊕ U. O  20 40 60 80 10	10 <sup>8</sup> 10 <sup>4</sup> 10 <sup>5</sup> 1 10 10 10 10 10 10 10 10 10 10 10 10 1	STANDPIPE INSTALLATIO
1 2	Ground Surface (SP) SAND, coarse-grained, sub-angular, poorly-graded, dark grey, homogenous, moist	1294,0	0	SRAE			Bentonite Pellets
o barber Rig – Air Rotary Tervita	(SP) GRAVELY SAND, coarse-grained, fine gravel, poorly-graded, sub-angular, grey	1289.5 4.5 0					
7 8			2 (	SRAB			10/20 Sand
g	CONTINUED NEXT PAGE						Slotted Section 10/20 Sand

PROJECT No.: 11.1422,0052 LOCATION: See Location Plan

#### RECORD OF MONITORING WELL: GA-MW-3S

BORING DATE: September 23, 2012

SHEET 2 OF 2

DATUM: UTM Zone 11 (Nad 83)

N: 5550296 E: 648578

DATA ENTRY: HYDRAULIC CONDUCTIVITY, k, cm/s DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m PIEZOMETER SAMPLES SOIL PROFILE BORING METHOD ADDITIONAL LAB. TESTING DEPTH SCALE METRES STANDPIPE 100 STRATA PLOT 80 100 10 BLOWS/0.3m INSTALLATION NUMBER ELEV. TYPE SHEAR STRENGTH nat V. + Q- 0
Cu, kPa rem V. 
U- O WATER CONTENT PERCENT DESCRIPTION OW DEPTH WPL (m) (SP) GRAVELY SAND, coarse-grained, fine gravel, poorly-graded, sub-angular, grey (continued) GRA Slotted Section 10/20 Sand 12 Bentonite Pellets End of MONITORING WELL. Encountered BEDROCK at 14.4 m CALGARY.GDT 7/30/15 17 BH LOGS.GPJ LAB TESTING 11.1422.0052 BOREHOLE - EXPANDED ADD. 20 Golder Associates LOGGED: TG DEPTH SCALE CHECKED: JW

Drilling Company: JR Drilling

Client: Teck Coal Greenhills Operation

**Drilling Method: Dual Rotary** 

Date Drilled: August 29th-September 1st 2016

Logged by: TK

Site Location: Elkford, BC

Project Name/No: 577-016.07

Sheet: 1 of 9

[] HEMMERA

7	SUBSURFACE PROFILE			S	AMPL	E.		
Depth	Description	Depth/Elev (m)	Sample ID	Analysed Y,N	Sample Type	Vapour ppm 0 250500	% 50 100	Backfill details
m 2552762767676767676767676767676767676767	TOPSOIL Silt and Clay TOPSOIL, dark brown, loose, dry, well sorted  SILT and SAND SILT and SAND, fine grained, some amail blocky clay, dry, poorly sorted  CLAY CLAY, with silt and sand, some medium sub-rounded/sub-angular gravel, moderate plasticity, dry  SILTY SAND SILTY SAND, fine grained, with some small blocky clay and fine to medium sub-rounded/sub-angular gravel, dry, poorly sorted  CLAY CLAY with some silty sand, some fine to medium sub-rounded/sub-angular gravel, high plasticity, moist to wet  Groundwater encountered at approximately 4.5m	-1.00 1.00 2.00 2.00						Schedule 40 PVC Bentonite Chips Bentonite Chip

Well location: Thompson Creek

Borehole diameter: 15.24cm

Well casing diameter: 50.8mm

Devices We make

Depth of well (TOC): 44.846m

Depth to water level (TOC): 32.422m

Well casing material: Schedule 40 PVC

Well screen interval (bgs): 40-43 mbgs

Well Elevation (TOC): -Ground Elevation: -

Date of water level: September 6th, 2016

Well screen slot size: 0.25mm

# GH\_MW\_UTC-A

Log of Monitoring Well: GH\_MW-UTC-1D

[] HEMMERA

Project Name/No: 577-016.07

Drilling Company: JR Drilling

Client: Teck Coal Greenhills Operation

**Drilling Method: Dual Rotary** 

Date Drilled: August 29th-September 1st 2016

Logged by: TK

Site Location: Elkford, BC

Sheet: 2 of 9

	SUBSURFACE PROFILE			S	AMPL	E.		
Depth	Description	Depth/Elev (m)	Sample ID	Analysed Y,N	Sample Type	Vapour ppm 0 250500	% 0 50 100	Backfill details
7 - 6 - 9 - 6 - 6 - 7 - 8 - 9 - 9 - 9 - 1 - 2 - 3 - 10 - 1 - 2 - 3 - 10 - 1 - 2 - 3 - 10 - 1 - 2 - 3 - 10 - 1 - 2 - 3 - 10 - 1 - 2 - 3 - 10 - 1 - 2 - 3 - 10 - 1 - 2 - 3 - 10 - 1 - 3 - 3 - 10 - 3 - 3 - 3 - 3 - 3 - 3 - 3 - 3 - 3 -	BEDROCK, gray, dry from 6-7m, sample pulverized from drilling. 5.5-6m is mixed with clay  BEDROCK (Shale) BEDROCK (shale), gray/brown, pulverized dust and rock chips from drilling, dry  From 30m on, recovered samples are moist-wet from water in cyclone and open hole	-5.50 5.50						

Well location: Thompson Creek

Well casing diameter: 50.8mm

Depth of well (TOC): 44.846m

Depth to water level (TOC): 32.422m

Well casing material: Schedule 40 PVC

Well Elevation (TOC): -

Date of water level: September 6th, 2016

Well screen slot size: 0.25mm

Ground Elevation: -

Borehole diameter: 15.24cm

Well screen interval (bgs); 40-43 mbgs

# GH\_MW\_UTC-A

Log of Monitoring Well: GH\_MW-UTC-1D

[] HEMMERA

Project Name/No: 577-016.07

Client: Teck Coal Greenhills Operation

onene room order orderming operation

Date Drilled: August 29th-September 1st 2016

Site Location: Elkford, BC

**Drilling Company: JR Drilling** 

**Drilling Method: Dual Rotary** 

Logged by: TK

Sheet: 3 of 9

SUI	SSURFACE PROFILE			SA	MPL	E		
Depth	Description	Depth/Elev (m)	Sample ID	Analysed Y,N	Sample Type	Vapour ppm 0 250500	LEL %	Backfill details
7 - 12 - 13 - 14 - 15 - 16 - 17 - 16 - 17 - 18 - 17 - 18 - 17 - 18 - 17 - 18 - 17 - 18 - 17 - 18 - 17 - 18 - 17 - 18 - 17 - 18 - 17 - 18 - 18								

Well location: Thompson Creek

Depth to water level (TOC): 32.422m

Date of water level: September 6th, 2016

Borehole diameter: 15.24cm

Well casing diameter; 50,8mm

Well casing material: Schedule 40 PVC

Well screen slot size: 0.25mm

Well screen interval (bgs): 40-43 mbgs

Depth of well (TOC): 44.846m

Well Elevation (TOC): -

[] HEMMERA

Project Name/No: 577-016.07

Drilling Company: JR Drilling

Client: Teck Coal Greenhills Operation

**Drilling Method: Dual Rotary** 

Date Drilled: August 29th-September 1st 2016

Logged by: TK

Site Location: Elkford, BC

Sheet: 4 of 9

SUBS	SURFACE PROFILE			S	AMPL	E		
Depth	Description	Depth/Elev (m)	Sample ID	Analysed Y,N	Sample Type	Vapour ppm 0 250500	LEL % 0 50 100	Backfill details
7 - 18 - 18 - 18 - 19 - 18 - 19 - 18 - 19 - 19								

Well location: Thompson Creek

Well casing diameter: 50.8mm

Depth of well (TOC): 44.846m

Depth to water level (TOC): 32,422m

Well casing material: Schedule 40 PVC

Well screen interval (bgs): 40-43 mbgs

Well Elevation (TOC): -

Date of water level: September 6th, 2016 Borehole diameter: 15.24cm Well screen slot size: 0.25mm

# GH\_MW\_UTC-A

### Log of Monitoring Well: GH\_MW-UTC-1D

[] HEMMERA

Project Name/No: 577-016.07

Drilling Company: JR Drilling

Client: Teck Coal Greenhills Operation

**Drilling Method: Dual Rotary** 

Date Drilled: August 29th-Seplember 1st 2016

Logged by: TK

Site Location: Elkford, BC

Sheet: 5 of 9

SUBS	URFACE PROFILE			S	AMPL	E.		
Depth Symbol	Description	Depth/Elev (m)	Sample ID	Analysed Y,N	Sample Type	Vapour ppm 0 250500	KEL % 0 50 100	Backfill details
25								

Well location: Thompson Creek

Borehole diameter: 15,24cm

Well casing diameter: 50.8mm

Well screen slot size: 0.25mm

Depth to water level (TOC): 32.422m

Well casing material: Schedule 40 PVC

Date of water level: September 6th, 2016

Well screen interval (bgs): 40-43 mbgs

Depth of well (TOC): 44.846m

Well Elevation (TOC): -

[] HEMMERA

Project Name/No: 577-016.07

Drilling Company: JR Drilling

Client: Teck Coal Greenhills Operation

**Drilling Method: Dual Rotary** 

Date Drilled: August 29th-September 1st 2016

Logged by: TK

Site Location: Elkford, BC

Sheet: 6 of 9

SUBS	SURFACE PROFILE			S	AMPL	E		
Depth	Description	Depth/Elev (m)	Sample ID	Analysed Y,N	Sample Type	Vapour ppm	LEL % 0 50 100	Backfill details
7 - 3 - 3 - 3 - 3 - 3 - 3 - 3 - 3 - 3 -	Fracture Encountered at 30m							414 32.42m on Sept. 6h., 2016

Well location: Thompson Creek

Well casing diameter: 50.8mm

Depth of well (TOC): 44.846m

Depth to water level (TOC): 32,422m Date of water level: September 6th, 2016 Well casing material: Schedule 40 PVC

Well screen interval (bgs): 40-43 mbgs

Well Elevation (TOC): -

Borehole dlameter: 15.24cm

Well screen slot size: 0.25mm

Drilling Company: JR Drilling

Client: Teck Coal Greenhills Operation

**Drilling Method: Dual Rotary** 

Date Drilled: August 29th-September 1st 2016

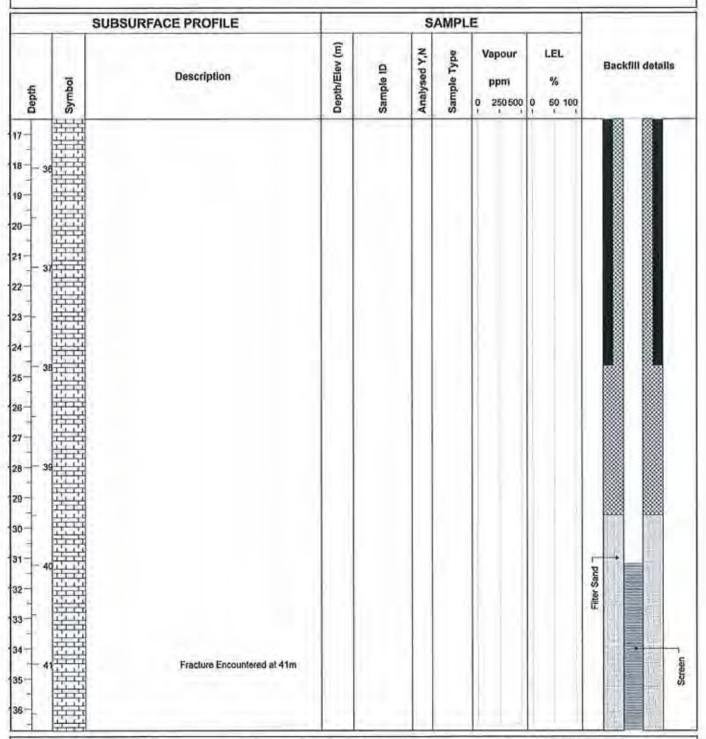
Logged by: TK

Site Location: Elkford, BC

Project Name/No: 577-016.07

Sheet: 7 of 9

[] HEMMERA



Well location: Thompson Creek

Well casing diameter: 50.8mm

Depth of well (TOC): 44.846m

Depth to water level (TOC): 32.422m

Well casing material: Schedule 40 PVC

Well Elevation (TOC): -

Date of water level: September 6th, 2016

Well screen slot size: 0.25mm

Ground Elevation: -

Borehole diameter: 15.24cm

Well screen interval (bgs): 40-43 mbgs

CI HEMMERA

Project Name/No: 577-016.07

Drilling Company: JR Drilling

Client: Teck Coal Greenhills Operation

**Drilling Method: Dual Rotary** 

Date Drilled: August 29th-September 1st 2016

Logged by: TK

Site Location: Elkford, BC

Sheet: 8 of 9

SUB	SURFACE PROFILE			S	AMPL	E		
Depth	Description	Depth/Elev (m)	Sample ID	Analysed Y,N	Sample Type	Vapour ppm 0 250500	LEL % 0 50 100	Backfill detalls
	Fracture Encountered at 46m							

Well location: Thompson Creek

Well casing diameter: 50.8mm

Depth of well (TOC): 44.846m

Depth to water level (TOC): 32.422m

Date of water level: September 6th, 2016

Woll casing material: Schedule 40 PVC

Well Elevation (TOC): -

Borehole diameter: 15:24cm

Well screen slot size: 0.25mm

Well screen interval (bgs): 40-43 mbgs

Drilling Company: JR Drilling

Client: Teck Coal Greenhills Operation

**Drilling Method: Dual Rotary** 

Date Drilled; August 29th-September 1st 2016

Logged by: TK

Site Location: Elkford, BC

Project Name/No: 577-016.07

Sheet: 9 of 9

C HEMMERA

SUE	SURFACE PROFILE			S	AMPL	.E		
Depth	Description	Depth/Elev (m)	Sample ID	Analysed Y,N	Sample Type	Vapour ppm 0 250500	KEL %	Backfill details
	End of L	49.99 43.99						

Well location: Thompson Creek

Borehole diameter: 15.24cm

Well casing diameter: 50.8mm

7

Depth of well (TOC): 44.846m

Depth to water level (TOC): 32.422m

Well casing material: Schedule 40 PVC

Well screen interval (bgs): 40-43 mbgs

Well Elevation (TOC): -

Date of water level: September 6th, 2016

Well screen slot size: 0.25mm

Drilling Company: JR Drilling

Client: Teck Coal Greenhills Operation

Drilling Method: Dual Rotary

Date Drilled: September 1st 2016

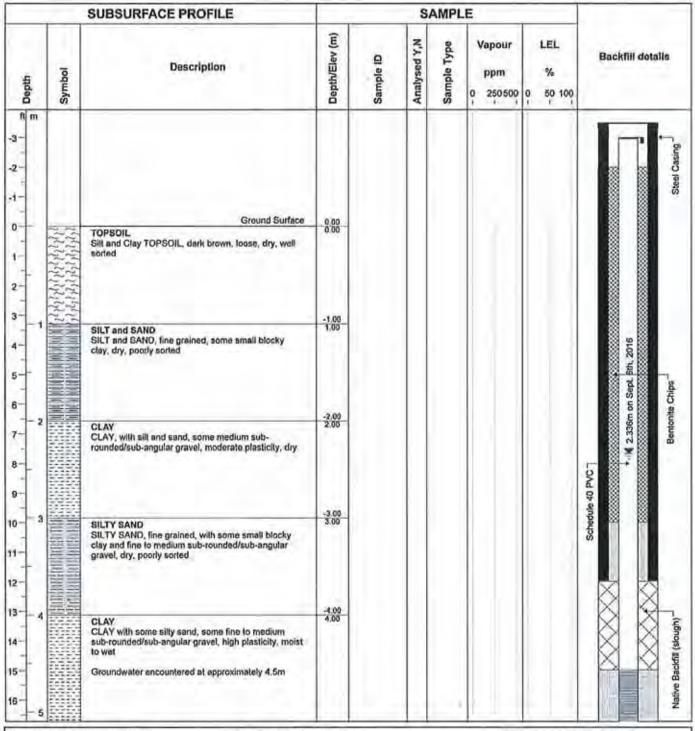
Project Name/No: 577-016.07

Logged by: TK

Site Location: Elkford, BC

Sheet: 1 of 2

[] HEMMERA



Well location: Thompson Creek

Depth to water level (TOC): 2.336 m

Date of water level: September 6th, 2016

Well casing diameter: 50,8mm

Well casing material: Schedule 40 PVC

Well screen interval (bgs): 4.5-7.5 m

Well screen slot size: 0.25mm

Borehole diameter: 15.24cm

Depth of well (TOC): 8.690 m

Well Elevation (TOC): -

[] HEMMERA

Project Name/No: 577-016.07

Client: Teck Coal Greenhills Operation

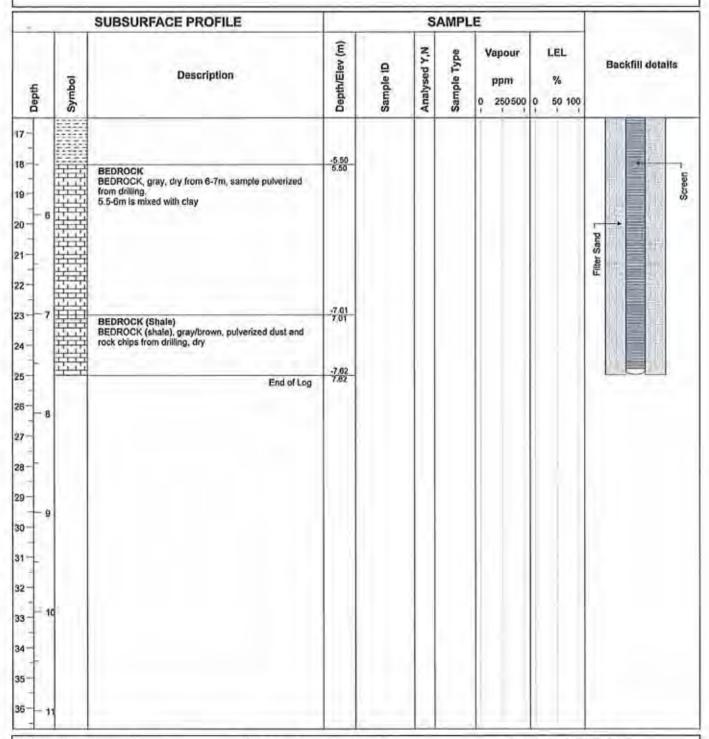
Drilling Company: JR Drilling
Drilling Method: Dual Rotary

Date Drilled: September 1st 2016

Logged by: TK

Site Location: Elkford, BC

Sheet: 2 of 2



Well location: Thompson Creek

Well casing diameter: 50.8mm

Depth to water level (TOC): 2.336 m Date of water level: September 6th, 2016 Well casing material: Schedule 40 PVC

Well screen interval (bgs): 4.5-7.5 m

Borehole diameter: 15,24cm

Well screen slot size: 0.25mm

Depth of well (TOC): 8,690 m

Well Elevation (TOC): -

[] HEMMERA

Project Name/No: Greenhills Ops Elkford BC/577-016.04

Client: Teck Coal Ltd.

Drilling Company: JR Drilling Drilling Method: Dual air rolary

Date Drilled: November 24, 2014

Logged by: RM

Site Location: Greenhills Operations, BC

Sheet: 1 of 1

	SUBSURFACE PROFILE			S	AMPL	E		
B Depth	Description	Depth/Elev (m)	Sample ID	Analysed Y,N	Sample Type	Vapour ppm 0 250 500	% 0 50 100	Backfill details
	TOPSOIL Black, dry, loose, organic soil TILL Gravelly Till (rounded to subrounded, medium to coarse grain), brown, dry, dense, well graded, lots of rock cuttings.  Sandy Till (medium grain) and Gravel (rounded to subrounded, medium to coarse grain), brown, moist, dense, well graded, lots of rock cuttings.  Below 5.2 m, a water bearing seam <0.31 m width.  Sandy Till (medium grain) and Gravel (rounded to subrounded, medium to coarse grain), brown, moist, dense, well graded, lots of rock cuttings.  BEDROCK Siltstone, grey, dry, competent, very hard  Between 6.7 m and 7.0 m, fracture zone, moist  Below 7.2 m material is dry, very hard, uniform size cuttings, dusty drilling conditions	1293.00 0.00 0.00 1208.73 4.27 1287.82 5.16 1287.51 5.49 1289.90 6.71 1285.99 7.01						Bentonite Filter Sand 10/20

Well location: 5,548,704 N, 649,081 E Depth to water level (TOC): 5,349 m Well casing diameter: 2"

Well casing material: Sch. 80 PVC

Well screen slot size: 010

Ground Elevation: 1293 m

Depth of well (TOC): 7,924 m

Well Elevation (TOC); 1293.75 m

Date of water level: 26 November, 2014

Borehole diameter: 0,17 m

Well screen interval (bgs): 4.12 m - 7.17 m

PROJECT No.: 12.1349.0013 LOCATION: See Location Plan

### RECORD OF BOREHOLE: EV\_GV3gw

BORING DATE: October 23, 2013

SHEET 1 OF 3

DATUM: UTM Zone 11 (Nad 83)

N: 5522255 E: 656580 DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m HYDRAULIC CONDUCTIVITY, k, crivs PIEZOMETER SOIL PROFILE SAMPLES BORING METHOD DEPTH SCALE METRES OR STANDPIPE ADDITIONAL LAB, TESTING STRATA PLOT BLOWS/0.3m INSTALLATION NUMBER ELEV. SHEAR STRENGTH Cu, kPa nat V. + Q - ● rem V. ⊕ U - O WATER CONTENT PERCENT DESCRIPTION ΘМ DEPTH Wρ I− (m) Stick-up ≃0,91 m Ground Surface
SANDY GRAVEL, fine-grained,
sub-angular to angular, moderately
graded, dry, very toose SAND, some gravel, fine to coarse-grained, sub-rounded to sub-angular, moderately graded, dry, 397.61 2.90 SANDY GRAVEL, fine-grained, sub-angular to angular, moderately graded, dry, very loose 395,94 4.57 SAND, some gravel, localized thin zones of gravel, fine to coarse-grained, sub-rounded to sub-angular, moderately graded, moist, very loose Bentonite Chips BOREHOLE - EXPANDED ADD. LAB TESTING 12,1349,0013 BH LOGS,GPJ CALGARY,GDT 4/8/14 15 Nov 2013 ∑

DEPTH SCALE

CONTINUED NEXT PAGE

1:50



LOGGED: RT

CHECKED: CD

PROJECT No.: 12.1349.0013 LOCATION: See Location Plan

# RECORD OF BOREHOLE: EV\_GV3gw

BORING DATE: October 23, 2013

SHEET 2 OF 3

DATUM: UTM Zone 11 (Nad 83)

N: 5522255 E: 656580

y [8]	SOIL PROFILE			SA	MPLE	5	DYNAM RESIST	IC PEN	ETRATI BLOWS	DN: /0.3m	1	HYDR	AULIC C	ONDUC	τΜτ <b>γ</b> ,	Ţ		PIEZOMETI - OR
DEPTH SCALE METRES BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	SHEAR Cu, kPa 20	STREN	IGTH	nal V. 1 rem V. Œ	30 U-O	W <sub>i</sub>	/ATER C	ONTEN	PERCE		ADDITIONAL LAB. TESTING	STANDPIP INSTALLATI
- 11	SAND, same gravel, localized thin zones of gravel, fine to coarse-grained, sub-rounded to sub-angular, moderately graded, moist, very loose (continued)																	
- 13	SILTY GRAVEL, fine-grained, sub-rounded to sub-angular, poorly graded, wat, very loose		387,55 12,95										A CONTRACTOR OF THE CONTRACTOR					
5 Sonic 127 mm (ID) Casing 152.4 mm (OD) JR Drilling	GRAVEL, fine-grained, sub-rounded to sub-angular, well graded, moist, very loose		385.88 14.63						-		Transfer Y.		TO THE PARTY OF TH					Bontonite Chips
- 17	SAND, some gravel, fine to coarse-grained, sub-rounded to sub-angular, moderately graded, moist, very loose		384,35 16,15															
- 18	GRAVEL, some sitt, fine-grained, sub-rounded to sub-angular, poorly graded, moist, wary loose	GEORGE CONTRACTOR	382.98 17.63											Annual Indiana Control of the Contro				
- 19	SILTY GRAVEL, fine-grained, sub-rounded to sub-angular, poorly graded, wet, very loose		381,46 19,05															
DEPTH S		1	<u> </u>	<u> </u>		(		G	olde	er ates	<u> </u>	.I.		<u> </u>	<u> </u>		LOGGED: CHECKED:	



PROJECT No.: 12,1349,0013 LOCATION: See Location Plan

# RECORD OF BOREHOLE: EV\_GV3gw

BORING DATE: October 23, 2013

SHEET 3 OF 3

DATUM: UTM Zone 11 (Nad 83)

N: 5522255 E: 656580

ă			N: 5522255 E: 656580																	١
ı	щ	8	SOIL PROFILE			SA	MPL	ES	DYNAMIC RESISTAN	PENETRA CE, BLO	ATION NS/0,3m	1	HYDRA	ULIC CO	NDUCT	IVITY,	T		PIEZOMETER OR	
ļ	DEPTH SCALE METRES	BORING METHOD		LOT		œ		Зп	20	40	60	80	10		<sup>5</sup> 1(	10	<sup>га</sup> Т	ADDITIONAL LAB. TESTING	STANDPIPE INSTALLATION	
	ᇎ	SING	DESCRIPTION	STRATA PLOT	ELEV. DEPTH	NUMBER	TYPE	вцомѕ/р.ап	SHEAR ST Cu, kPa	RENGTH	nat V. rem V	+ q- • ⊕ U-0	ı		<del>OW</del> -	PERCEN		отто 1. TES		
	2	ä		STR	(m)	Z		BLC	20	40_	60	80	Wp 10					88		-
	- 20	Ĺ,		ьΨ				_				$\bot$							1889 18	. I
ŀ			SILTY GRAVEL, fine-grained, sub-rounded to sub-angular, poorly																	
-			graded, wet, very loose (continued)																	#
ŀ				1																
Ī	- 21		SILTY GRAVEL, fine and	团	379.63 20.88															鄙
ŀ			coarse-grained, sub-angular to angular, poorly graded, wet, very loose	64															Bentonite Chips	糾
ŀ				βþ																83
ŀ		 		<u>}</u>													1			#
Ì	- 22	(S)		βþ																3
ŀ		152.4		βŸ																
ŀ		Casing		β 															Cities Cond	3
ŀ				ŀЙ															Silica Sand	爿
ŀ	- 23	27 mm		B)															目	:
-		Sonic 127 mm (ID) Casing 152.4 mm (OD)		BA																詌
		"		6												[				
ŀ				ŀΝ												}			Slotted Section	
Ē	- 24			6																
ŀ				ŀΝ																
ŀ				6																$\blacksquare$
ŀ				[·N															Silica Sand	泪
ŀ	- 25		E. L. DOPPLIOLE	8	375,51 25.00															對
ŀ			End of BOREHOLE.		20.00															=
ŀ			NOTES: Standpipe installed to 24.4 m upon well completion.																	4
ŀ			Groundwater level measured at 9,9 mbgs on November 15, 2013,								-				:					-
4	- 26		9,8 mogs on November 15, 2015,																	4
RY.GDT 4/8/14		1									-									-
턍																				=
Ä																				7
캏	- 27																			-
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BOREHOLE - EXPANDED ADD, LAB TESTING 12,1349,0013 BH LOGS,GPJ CALGA	DE	HT4:	SCALE					4	<b>D</b>	الم	dor							LOGGED: F	रा	
SORE	1	: 50						- (	TE A	SSO	uer Liate	S						CHECKED: (	D .	
					-															

PROJECT No.: 12.1349.0013
LOCATION: See Location Plan

# RECORD OF BOREHOLE: EV\_BALgw

BORING DATE: October 27, 2014

SHEET 1 OF 2

DATUM: UTM Zone 11 (Nad 83)

DATA ENTRY: AM PROJECT No.: 12.1349.0013 LOCATION: See Location Plan

# RECORD OF BOREHOLE: EV\_BALgw

BORING DATE: October 27, 2014

SHEET 2 OF 2

DATUM: UTM Zone 11 (Nad 83)

S	THOD	SOIL PROFILE	<u> </u>			MPLE		DYNAMIC PENET RESISTANCE, BL			'	k, cm/s	UCTIVITY,		- 무리의	PIEZOMETER OR STANDPIPE
METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	20 40 SHEAR STRENG Cu, kPa	rem	V. ⊕ U - O	Wp	TER CONT	ENT PERCI	WI	FIELD EC AND ADDITIONAL LAB. TESTING	INSTALLATIO
			S			$\dashv$		20 40	60	80	10	20	30	40	E .7	
11 11 12	Sonic 127 mm (ID) Casing 152.4 mm (OD)  JR Drilling	CLAY, some sand and fine gravel, sub-angular to sub-rounded, poorly graded, dark grey, moist SILTSTONE, fine-grained, grey / brown Fractured with water from 10.7 to 11.3 m	\$	10.10												Bentonite Chips  28 Oct 2014  V Slotted Section
13		End of BOREHOLE.		12.74												
14		NOTES: Standpipe installed to 12.7 m upon well completion. Groundwater level measured at 11.1 mbgs on October 28, 2014.														
16																
17																
18																
19																
20																
DEF	PTH S	CALE	1					ASSO	lder	l	1		ı		LOGGED: I	<del>'</del> रा

PROJECT No.: 12.1349.0013 LOCATION: See Location Plan

# RECORD OF BOREHOLE: EV\_LSgw

BORING DATE: October 24, 2013

SHEET 1 OF 2

DATUM: UTM Zone 11 (Nad 83)

	DATIC	N: 5514731 E: 653274					ВО	MINGL	MIE.	JOIUDEI 2	.4, 2013					DATON	(Nad 83)	"
щ	<u>0</u>	SOIL PROFILE		<u> </u>	SAMPI	LES	DYNAA RESIST	IIC PENI	ETRATI BLOWS	ON M.3m	1	HYDRAULI k, c	C CONDUC	CTIVITY,	Ţ		PIEZOME OR	rer
DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	/. H	NUMBER	BLOWS/0.3m	2	0 4 R STREN	IGTH			10*	10 <sup>5</sup> R CONTEN	10 <sup>4</sup> 10 TPERCEN	IT VI	ADDITIONAL LAB. TESTING	STANDPI INSTALLAT	PE TION
1 2	inm (OD)	Ground Surface  FILL - Sand sized particles, medium to coarse-grained, sub-rounded to sub-angular, well graded, dark black carbonaceous, moist, very looso  SANDY GRAVEL, some silt, fine-grained, sub-rounded to sub-angular, poorly graded, moist, very loose  GRAVELY SAND, coarse-grained with fine-grained gravel, sub-rounded to sub-angular, poorly graded, moist, very loose	345.	51 52				0 4						JU TA			Stick-up =0.93 m Bentonile Chips	
5	Sonic 127 mm (ID) Casing 152.4 mm (OD) JR Dyflling	SANDY SILT, fine to medium-grained, wet, mud		1886													Silica Sand Silica Sand	

DEPTH SCALE

CONTINUED NEXT PAGE

1:60



Logged; Rt

CHECKED: CD

PROJECT No.: 12.1349.0013

#### RECORD OF BOREHOLE: EV\_LSgw

SHEET 2 OF 2

LOCATION: See Location Plan

BORING DATE: October 24, 2013

DATUM: UTM Zone 11 (Nad 63)

ا آ	НОБ	SOIL PROFILE	12		SA	MPLES			ETRATI BLOWS		\		ULIC CO k, cm/s			Ţ	.0	PIEZOMETEI OR STANDPIPE
DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE BLOWS/0.3m	SHEAF Gu, kP	STREM	KGTH	nat V. + rem V. +	0 - ● U - O	10 W/ Wp	ATER CO	NTENT	PERCE		ADDITIONAL LAB. TESTING	STANDPIPE INSTALLATIO
- 10	JR Drilling	SANDY SILT, fine to medium-grained, wet, mud (conlinued)																Silica Sand
		End of BOREHOLE.		334.36 10.67			<b> </b>											
• 11		NOTES: Standpipe installed to 6,7 m upon well completion. Groundwater level measured at 3,4 mbgs on November 14, 2013.																
- 12								-										
13							:											,
- 14																		
15																		
16																		
- 17																	·	
- 17 - 18 - 19 DEF																		
19																		
- 20																		
DEF	TH S	CALE						G Ass		l					<u> </u>	<u></u>	LOGGED; I	DT.

DATA ENTRY: IPG LOCATION: Sea Location Plan

PROJECT No.; 12,1349,0013

# RECORD OF BOREHOLE: EV\_GCgw

BORING DATE: October 25, 2013

SHEET 1 OF 2

DATUM: UTM Zone 11 (Nad 03)

N: 5513879 E: 653059

<del></del>																		
<u>ш</u>   §		SO(L PROFILE			SA	(PLE	s	DYNAMIC PI RESISTANC	NETRAT	ON 30.3m	1	HYDR	AULIC C	ONDUC	πνιτγ,	T		PIEZOMETER
DEPTH SCALE METRES BORING METHOD		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/D.3m	20 SHEAR STR Cu, kPa	10	60	9:8	W			TPERCE	IO <sup>3</sup> I INT WI	ADDITIONAL LAB. TESTING	OR STANDPIPE Installation
m	}	O	S		$\dashv$	ď	<u>~</u>	20	40	60	80	1	0 ;			40	45	Słick-up ≍0,72 m
0		Ground Surface SAND, fine to medium-grained, sub-rounded to sub-angular, well graded, dark black carbonaceous, dry, very loose		344,42 0.00								,						
- 2		SANDY GRAVEL, trace silt, fine-grained, sub-trounded to sub-trounded to sub-angular, poorly graded, moist, very loose	\$\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\	342,90 1,52												•	•	14 Nov 2013
4 6 2 6 7 7 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	1 1	CLAY, some gravel, fine-greined, sub-rounded to sub-angular, pocity graded, moist, firm		3.01														Bentonite Chips
- 8		SILTY CLAY, well graded, wol, very soft		336.19 8.23						AND THE PROPERTY OF THE PROPER								
→ 10	T	CONTINUED NEXT PAGE				7	7			Τ	$\Gamma^{-1}$				<u> </u>	I		1503 150

1:50

LOGGED: RT CHECKED: CD

DATA ENTRY: IPG RECORD OF BOREHOLE: EV\_GCgw PROJECT No.: 12.1349.0013 SHEET 2 OF 2 LOCATION: See Location Plan DATUM: UTM Zone 11 (Nad 83) BORING DATE: October 25, 2013 N: 5513879 E: 653059 DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m HYDRAULIC CONDUCTIVITY, k, cm/a PIEZOMETER OR STANDPIPE INSTALLATION SOIL PROFILE SAMPLES BORING METHOD DEPTH SCALE METRES ADDITIONAL LAB. TESTING TYPE STRATA PLOT SHEAR STRENGTH Cu. kPa natV, + Q. ● remV, ⊕ U-O WATER CONTENT PERCENT DESCRIPTION DEPTH <del>-----О</del>W ------1 WI Wp I− (m) SILTY CLAY, well graded, wel, very soft (continued) Bentonite Chips Silica Sand Slotted Section 15 LAB TESTING 12.1349.0013 BH LOGS, GPJ CALGARY, GDT 4/8/14 End of BOREHOLE. NOTES: Standplpe installed to 15.6 m upon well completion. Groundwater level measured at 2.0 mbgs on November 14, 2013. BOREHOLE - EXPANDED ADD. DEPTH SCALE Golder Associates LOGGED: RT 1:50 CHECKEO; CO

PROJECT No.: 12.1349.0013

# RECORD OF BOREHOLE: EV\_OCgw

BORING DATE: November 7, 2013

SHEET 1 OF 2

DATUM: UTM Zone 11 (Nad 63)

LOCATION: See Location Plan

N: 5512671 E: 652460

	٥	SOIL PROFILE			SA	MPL	ES	DYNAMIC PENETRA RESISTANCE, BLOV	TION	<u> </u>	HYDRAULIC CONDUCTIVITY. k, cm/s		PIEZOMETER
DEPTH SCALE METRES	BORING METHOD	]						RESISTANCE, BLOV	/S/0.3m 60 80		10 <sup>5</sup> 10 <sup>5</sup> 10 <sup>4</sup> 10 <sup>3</sup>	A S S	OR STANDPIPE INSTALLATION
FIE S	SING N	DESCRIPTION		ELEV. DEPTH	NUMBER	TYPE	BLOWS/0.3m	SHEAR STRENGTH Cu, kPa			WATER CONTENT PERCENT Wp 1 OW 1 WI	ADDITIONAL LAB. TESTING	INSTALLATION
ä	BOF		STR	(m)	Ź		温	20 40		30	10 20 30 40	₹3	Stick-up =0.89 m
		Ground Surface  SANDY GRAVEL, fine-grained with occasional coarse grains, rounded to sub-rounded, moderately graded, dry, very loose	20,000,000	342,60 0.00									=0.89 m
2		SAND and GRAVEL, coarse sand and fine gravel, rounded to sub-rounded, angular, poorly graded, moist, very loose  — Hole is being drilled on the edge of a waste rock pile  — Moisture at 2.1 m		341.07 1.52									15 Nov 2013 又
4	Sonic 127 mm (ID) Casing 152.4 mm (OD) JR Drilling	GRAVEL, trace sand, fine to coarse-grained, sub-rounded to rounded, poorly graded, moist, loose	KORBOBBB	338.94 3.66			•					:	Bentonite Chips
6	Soric 127 mm (	SAND, fine to medium-grained with occasional coarse grains, some gravel, fine to coarse-grained, sub-angular to sub-rounded, dry to moist, loose,		335.69 6.71									
10	LL	CONTINUED NEXT PAGE			$\vdash \exists$	-	-	<del> </del>	-+	<b></b>	1		
		1			Ш		<u> </u>		J	<u> </u>			

DEPTH SCALE

1:50

BOREHOLE - EXPANDED ADD. LAB TESTING 12,1349,0013 BH LOGS,GPJ CALGARY,GDT 4/8/14



LOGGED: RT

CHECKED; CD

DATA ENTRY: IPG LOCATION: See Location Plan

PROJECT No.: 12.1349.0013

# RECORD OF BOREHOLE: EV\_OCgw

BORING DATE: November 7, 2013

SHEET 2 OF 2

DATUM: UTM Zone 11 (Nad 83)

N: 5512671 E: 652480

불 <sub>의</sub> [ 본 ]	SOIL PROFILE	T <sub>F</sub>	1	SA	MPL	r	DYNAMIC PER RESISTANCE				1	IC CONDU		<b>,</b> ]	ەر	PIEZOMETE
BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV, DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	SHEAR STRE Cu, kPa	NGTH	natV. + remV. (9	0 • ● U • O	10 <sup>4</sup> WATE Wp I- 10	10 <sup>6</sup> R CONTEN O <sup>V</sup>	T PERCE	IO <sup>3</sup> T ENT WI 40	ADDITIONAL LAB, TESTING	STANDPIPI INSTALLATIO
. 11	SAND, fine to medium-grained with occasional coarse grains, some gravel, fine to coarse-grained, sub-angular to sub-rounded, dry to moist, toose, (continued)						,									Bentonite Chips
55 Sonio 127 mm (ID) Casing 152.4 mm (OD) JR Dolling	SAND, fine to medium-grained with occasional coarse grains, some fine-grained gravel, sub-angular to sub-rounded, moist, loose to compact		329,79 12,80											designation of the state of the		Stotted Section
15	BEDROCK		328, 12 14.48 327.06													Silica Sand Tall Pipe
16	End of BOREHOLE.  NOTES: Standpipe Instelled to 14.6 m upon well completion. Groundwater level measured at 2.1 mbgs on November 15, 2013.		15.54		-											
17																
18																
20																

WF Tal	lings	Migration	n Well	(South	WF-2)	AS-BUILT
Northing	498	69				
Easting	503	90				
Elev.	1679	2.25	222			
locar neb	th	Drilling 163.0m	or 535ft			
Plezo Dep	ths	N/A				
Contract	or	J.R. Drilling Lt	d (Cranbr	ook)		
E.V.C.C. Te	ch	D. Gfrerer				
Start/Fin	lsh <u>.</u>	April 11-16, 20	05- 6° co	ing Installed		
			68m stick	up _		
153.0		lev. 1679.25m	CC	DRILLERS FILL 0-15 Molst-151 Wood/Rou TD- 163m	LOG  Silm  M  and Rock  Sing	Surface s-157m

EV\_WF\_SW

DATA ENTRY: IPG

PROJECT No.: 12.1349.0013

## RECORD OF BOREHOLE: EV\_ECgw

BORING DATE: October 27, 2013

SHEET 1 DF 2

DATUM: UTM Zone 11 (Nad 83)

LOCATION: See Location Plan N: 5506384 E: 660795

BORING DATE: October 27, 2013

٥	1	SOIL PROFILE		Τ,	SAMPLI	s	DYNAMIC I RESISTAN	ENETRA	TION	$\overline{}$	HYDRAUL	IC CONDU	CTIVITY,	т		PIEZOMETE
METRES BORING METHOD			ō	<del> -</del>		- t	RESISTAN 20	40	8/0.3m 60	80	10°	un√s 10 <sup>5</sup>	104 1	16. T	AS S	OR STANDPIP
2   S		DESCRIPTION		EPTH	TYPE	BLOWS/0.3m	SHEAR ST		L		WATE	R CONTE	VT PERCE	NT	ADDITIONAL LAB. TESTING	INSTALLATK
- B R			STRA	(w) 2	2   -	P.G	20	40	60	80	Wp 1− 10	—————————————————————————————————————	Δ1 30	₩≀ 40	Ā8.	Stick-up
<del> </del>	Ground S	urface	-11-	406.30			Ĭ	Ï	Ĭ	Ĩ		Ĩ	Ī			=0.74 m
1	GRAVEI coarse-( fine grav sub-rout very loos	LLY SAND, medium and grained sand with occasional wil grains, rounded to nded, moderately graded, dry, sa														16 Nov 2014 \( \subseteq \) Bentonile Chips
2	SAND, t rounded graded,	race gravel, medium-grained, to sub-rounded, moderately dry, very toose		1.52												Silica Sand
3	CLAYa	nd SAND medium-orained with		402.49 3.81												Slotted Section
sing 152.4 mm (OD)	[im	nd SAND, medium-grained with nal coarse grains, rounded to nded, moderately graded, molst,	و المراجعة المراجعة المراجعة المراجعة المراجعة المراجعة المراجعة المراجعة المراجعة المراجعة المراجعة المراجعة													Silica Sand
Soulc 127 mm (ID) Casing 152.4 mm (OD) JR Drilling	occasion	CLAY, medium-grained with nal coarse grains, rounded to ndod, moderately graded, moist,		401.12 5.18	-				The state of the s							
7	rounded	some sand, medium-grained, i to sub-rounded, moderately moist, semi-firm		399,44 6.86												Bentonite Pellets
9			Management of the control of the con													
10		CONTINUED NEXT PAGE		-	-+-	-			+	-	<del>  -</del>	-+-		<del> </del>		
- 1	1		$\perp$	L		1.					<u> 1l</u>			1		

1:50



CHECKED: CD

PROJECT No.: 12,1349,0013 LOCATION: See Location Plan

N: 5506384 E: 660795

## RECORD OF BOREHOLE: EV\_ECgw

BORING DATE: October 27, 2013

SHEET 2 OF 2

DATUM: UTM Zone 11 (Nad 83)

DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m HYDRAULIC CONDUCTMTY, k, cm/s PIEZOMETER SOIL PROFILE SAMPLES BORING METHOD DEPTH SCALE METRES OR STANDPIPE ADDITIONAL LAB. TESTING STRATA PLOT 104 BLOWS/0.3m NUMBER INSTALLATION TYE SHEAR STRENGTH nat V. + Q - • rom V. ⊕ U - O WATER CONTENT PERCENT DESCRIPTION DEPTH -o<sup>W</sup> -twi Wp **├** (m) CLAY, some sand, medium-grained, rounded to sub-rounded, moderately graded, molst, semi-firm (continued) Bentonite Pellets End of BOREHOLE. NOTES: Standpipe installed to 4.1 m upon well completion. Groundwater level measured at 1.8 mbgs on November 12, 2013. 13 15 EXPANDED ADD, LAB TESTING 12.1349.0013 BH LOGS.GPJ CALGARY.GDT 4/8/14 16 18 20 Golder Associates LOGGED: RT DEPTH SCALE CHECKED: CD 1:50

DATA ENTRY: IPG

PROJECT No.: 12.1349,0013

## RECORD OF BOREHOLE: EV\_BCgw

BORING DATE: October 22, 2013

SHEET 1 OF 3

DATUM: UTM Zone 11 (Nad 83)

LOCATION: See Location Plan

N: 6509659 E: 655381

Cill III	<b>6</b> 1	SOIL PROFILE	T <sub>5</sub>			IPLES	DYNAMIC P RESISTANO 20	E, BLOW		80	10 <sup>6</sup>	.IC CONDU cin√s 10 <sup>8</sup>	10 <sup>4</sup> 10 <sup>3</sup>	∐ <sup>48</sup>	PIEZOMETE OR STANDPIPE
DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE BLOWS/0.3m	20 SHEAR STR Cu, kPa	RENGTH	nal V. + rem V. €	0- <b>0</b> U- 0	WATI Wp I	R CONTEN	IT PERCENT  Y WI	ADDITIONAL LAB. TESTING	INSTALLATIO
	ω	Ground Surface	T			- 0	20	40	60	80	10	20	30 40	٠ ا	Stick-up ≃0,86 m
- 1		SANDY GRAVEL, fine-grained with occasional coarse grains, rounded to sub-rounded, moderately graded, dry, very loose		353.26 0.00											
- 2		GRAVEL, trace send, fine-grained with occasional coarse grains, rounded to sub-rounded, poorly graded, very loose  Moist at 2.1 m	BBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBB	351.74 1,52											12 Nov 2013 又
. 3															
. 4	lo) casing 152,4 mm (OD) JR Drilling														Bentonite Chips
Soule 127 mm (D)	(UI) mm (St. 2008)	Silly SANDY GRAVEL, fine-grained	<b>300000</b>	347.17 6.10											Gilips
7		Sity SANDY GRAVEL, fine-grained with occasional coarse grains, sub-rounded to sub-angular, poorly graded, wet, very loose													
8														***************************************	
. 9				343,51 9,75											
10 -		CONTINUED NEXT PAGE	<u> </u>		_†	7	T-†-		T			*** *** *** **			



DATA ENTRY: IPG LOCATION: See Location Plan

RECORD OF BOREHOLE: EV\_BCgw PROJECT No.: 12.1349.0013

SHEET 2 OF 3

DATUM: UTM Zone 11 (Nad 83)

BORING DATE: October 22, 2013

N: 5509659 E: 655381

Ä.	нор	SOIL PROFILE		r	s۸	MPLI		DYNAMIC PENETRA RESISTANCE, BLOW	FION 19/0.3m	HYDRAULIC CONDI	UCTIMITY,	(0)	PIEZÓMET. OR STANDPIF
DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	20 40 SHEAR STRENGTH Cu, kPa 20 40	60 80 remV. ⊕ U. ○	10° 10°  WATER CONTE  Wp   ———————————————————————————————————	10' 10' L ENT PERCENT 9W 1 WI 30 40	ADDITIONAL LAB. TESTING	STANDPIF INSTALLATI
- 10 - 12 - 13 - 15 - 16 - 17 - 18 - 20 - 20	Sonie 127 rum (ID) Casing 1824 rum (OD)  - IR Dallling	GRAVEL, some sand, trace sill, fine-grained, sub-angular to angular, poorly graded, wet, very loose (continued)					The second control of the second control of						Bentonite Chips
		CONTINUED NEXT PAGE	1	I			- 1		1				



DATA ENTRY: IPG

PROJECT No.: 12.1349.0013 LOCATION: Soo Location Plan

## RECORD OF BOREHOLE: EV\_BCgw

BORING DATE: October 22, 2013

SHEET 3 OF 3

DATUM: UTM Zone 11 (Nad 83)

N: 5509659 E: 655381

1	후	SOJL PROFILE			SA	MPL	ES	DYNAMIC PI RESISTANC	NETRAT E, BLOW	ION 5/0.3m	\	HYDRAULIC CO	NDUCTIVIT	<del>ν,</del> Τ		PIEZOMETER OR
METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	20 SHEAR STR Gu, kPa 20	ENGTH	natV. + remV. ⊕	0-0 U-0	10 <sup>6</sup> 10 WATER CO Wp I 10 20	NTENT PER	10 <sup>3</sup> L CENT -I WI 40	ADDITIONAL LAB. TESTING	STANDPIPE INSTALLATION
20	0	GRAVEL, some sand, trace silt, fine-grained, sub-angular to angular, poorty graded, wet, very loose (continued)						20	40	au c	U	)	, 30	-		Statted Section
21	Sonic 127 mm (ID) Casing 152.4 mm (OD) JR Drilling		2000 D	331,17												Silica Sand
23	Sonic	Sandy Sil.TY GRAVEL, fine-grained, sub-angular to angular, poorly graded, wet, very loose		22.10 330.10 333.10												
		End of BOREHOLE.  NOTES: Standpipe installed to 20.7 m upon well completion.		325.78												
24		NOTES: Standpipe installed to 20.7 m upon well completion. Groundwater lovel measured at 2.4 mbgs on October 23, 2013. Groundwater level measured at 2.2 mbgs on November 12, 2013.							:			:				
25																
																1
26												,				
27																
28																
29																

Golder Associates

CHECKED; CD

<b>*)</b> )	SNC+LAVA	LIN	1	Teck C	Client oal Lim	ited				В	oreho	le No. :	EV_B	H_AQ1
	Contractor Owen's Drilling		Regional  Date Monitored		ndwate	03 07	oring			Project N		PAGE 1	OF 3	
Drilling Boreh	Method Dual Rotary ple Dia. (m) 0.15 lotted Pipe Dia. (m) 0.05/0.05		Ground Surface E Top of Casing Ele Northing: 5511292	v. (m) ´	1173 1174	.956	572.61	8		Borehole Date Dril Log Type	Logged lled: ed By:	By: F	RAS 2019 01 1 <sup>-</sup> /L	l
Depth in Metres	Drilling Legend Sample Interval  ▼ ▼ ▼ Air Rotary	Water/NA  ▼ Water Lev  ▼ Water Lev  • NAPL  ◇ NAPL		Stratigraphy Plot	Sample Interval Core Run	Sample Number	Blow Count	% Recovery	•	Reading wiindicated so indicated so Soil Vapo (ppm)	cale utside cale	Slo	olid PVC otted PVC me 1: EV_	MW_AQ1
Dep	Soil Des	cription		Stratic	Samp	Samp	Blow	% Re	1 <sub>0</sub> 1			Γ	$\neg$	
3 - 10 - 10 - 10 - 10 - 10 - 10 - 10 - 1	SAND and GRAVEL, fine to coarcoarse gravel, trace silt, subangudense, damp.  GRAVEL, fine to coarse, some fitrace silt, subangular to angular, dense, damp.  From 7.9 m to 12.5 m - brown	rse grained saular, well grad	ed, dark brown,			8		6	101	102 1	o <sup>3</sup> 10 <sup>4</sup>			— BENTONITE
10-				60					<u>:</u>		: : : : : : : : : : : : : : : : : : :	<u> </u>	//	
				NO	ΓES									

PAGE 2 OF 3   PAGE 2 OF 3	<b>*))</b>	SNC · LAVA	LIN		Teck C	Client coal Lim	ited				Boreh	ole No. : EV_BH_AQ1
Dilling Method Dual Rolary Dual Scales (Secretal Dual Fig. 1) 173 862 Dual Dual Fig. 1) 174 862 Dual Fig. 1) 174 Pig. 1) 174 Pig. 1) 174 Pig. 1) 174 Pig. 1) 174 Pig. 1) 174 Pig. 1) 174 Pig. 1) 174 Pig. 1) 174 Pig. 1) 174 Pig. 1) 174 Pig. 1) 174 Pig. 1) 174 Pig. 1) 174 Pig. 1) 1				Regiona			r Monit	oring				PAGE 2 OF 3
WeterNAPL Levels  Water Level 2  Water Level 3  Water Level 2  Wat	Drilling Boreho	Method Dual Rotary ole Dia. (m) 0.15		Ground Surface E Top of Casing Ele	ev. (m) ´	1173 1174	.956 .862	572.61	8		Borehole Logge Date Drilled:	d By: RAS 2019 01 11
Soil Description  GRAVEL fine to case, some fine to case grained sand, trace sit, subangular to angular, well graded, dark brown, dense, damp, (continued)  11-  12-  At 12.5 m - moist  13-  At 16.5 m - light brown  At 16.8 m - wet  19-  At 18.9 m - loose, potentially sitt or clay  BEDROCK, dry.	pth in Metres	Sample Interval	▼ Water Le	vel 1	tigraphy Plot	iple Interval e Run	ple Number	w Count	ecovery		indicated scale Reading outside indicated scale Soil Vapour	Slotted PVC
The second is subangular to coarse grained sand, dense, damp. (continued)  11-  12-  At 12.5 m - moist  13-  14-  At 16.5 m - light brown  At 16.8 m - wet  19-  At 18.9 m - loose, potentially silt or clay  BEDROCK, dry.	De	Soil Des	scription		Stra	Sam	San	Blo	% R	10¹	10² 10³ 10	21
At 16.5 m - light brown At 16.8 m - wet  SAND  At 18.9 m - loose, potentially silt or clay  BEDROCK, dry.	13-	trace silt, subangular to angular, dense, damp. (continued)	fine to coarse , well graded, (	grained sand, dark brown,	$h \sim$							BENTONITE
NOTES	17—	At 16.8 m - wet  At 18.9 m - loose, potentially silt	t or clay									EV_MW_AQ1
					NOT	TES						

<b>~</b> ]])	SNC+LAVA	TINI	т	eck C	Client oal Lin	nited			Boreho	le No. : EV_BH_AQ1
7//	SINC LAVA		Regional		cation ndwate	r Monit	oring			PAGE 3 OF 3
Orilling Boreho	Contractor Owen's Drilling Method Dual Rotary le Dia. (m) 0.15 otted Pipe Dia. (m) 0.05/0.05		Date Monitored Ground Surface Ele Top of Casing Elev Northing: 5511292.	r. (m) ´	1173 1174	03 07 3.956 3.862 ing: 654	572.61	8	Project Number: Borehole Logged Date Drilled: Log Typed By:	660613 By: RAS 2019 01 11 VL
Depth in Metres	Drilling Legend  Sample Interval  ▼▼▼  Air Rotary	Water/NA  ▼ Water Le  ▽ Water Le  ◆ NAPL  ◇ NAPL		Stratigraphy Plot	Sample Interval Core Run	Sample Number	Blow Count	% Recovery	Reading within indicated scale     Reading outside indicated scale     Soil Vapour (ppm)	Solid PVC Slotted PVC  Well Name 1: EV_MW_AQ1
ă	Soil Des	cription		Stra	Sar	Sar	Вĕ	% H	0 <sup>1</sup> 10 <sup>2</sup> 10 <sup>3</sup> 10 <sup>4</sup>	
21-	BEDROCK, dry. (continued)									BENTONITE
1	Bottom of hole at 22.3 m.				<u> </u>				· · · · · · · · · · · · · · · · · · ·	
23-										
25— -										
26-										
27 <del>-</del>										
28 <del>-</del>										
30-										
JU-				NOT	TES					

	SNC·LAVA	TIN	т	eck C	Client oal Lin	nited				Boreho	ole No. : E	V_BH_AQ	2
	OINC LAVA		Regional		ocation ndwate	r Monite	oring				PAGE 1	OF 2	
Drilling Boreh	g Contractor Owen's Drilling g Method Dual Rotary ole Dia. (m) 0.15 Slotted Pipe Dia. (m) 0.05/0.05		Date Monitored Ground Surface El- Top of Casing Elev Northing: 5511871	. (m) ´	1150 1151	9 03 08 0.689 1.673 ting: 6538	354.17	71		Project Number: Borehole Logged Date Drilled: Log Typed By:	By: RG	0613 /AMH 19 01 23	
Depth in Metres	Drilling Legend  Sample Interval  ▼▼▼ Air Rotary	Water/NA  ▼ Water Le  ▽ Water Le  • NAPL  ◇ NAPL		Stratigraphy Plot	Sample Interval Core Run	Sample Number	Blow Count	% Recovery	•	Reading within indicated scale Reading outside indicated scale  Soil Vapour (ppm)	Slotte	PVC ed PVC et 1: EV_MW_AQ2	?
De	Soil Des	scription		Stra	San	San	B B	% R	10¹	10 <sup>2</sup> 10 <sup>3</sup> 10	] ]		
2-	SAND and GRAVEL, coarse grasubangular, poorly graded, loosed GRAVEL, coarse, subangular, p	e, dry.										— BENTONI	ΙΤΕ
240CS: BH 2019 04 10 Punit Date: 2019 04 Punit Date: 2019 04 10 Punit Date: 2019 04 10 Punit Date: 2019 04 Punit	SAND, fine to medium grained, poorly graded, brown, damp.  At 7.5 m - trace fine to coarse g											BENTONI	ΠΈ
JA/QC: BH 2019 0				NO	ΓES								

((ه	SNC·LAVA	TIN	1	Teck C	Client oal Lin	nited				Boreho	ole No. : EV_BH_AQ2
<b>'</b> //	OINC LIE		Regional		ocation ndwate	r Monit	oring				PAGE 2 OF 2
Drilling Boreho	g Contractor Owen's Drilling g Method Dual Rotary ole Dia. (m) 0.15 lotted Pipe Dia. (m) 0.05/0.05		Date Monitored Ground Surface E Top of Casing Ele Northing: 5511871	v. (m) ´	1150 1151		354.17	<b>'</b> 1		Project Number: Borehole Logged Date Drilled: Log Typed By:	660613   By: RG/AMH 2019 01 23   VL
Depth in Metres	Drilling Legend Sample Interval  ▼▼▼ Air Rotary	▼ Water Lev  ▼ Water Lev  • NAPL  • NAPL		Stratigraphy Plot	Sample Interval Core Run	Sample Number	Blow Count	6 Recovery	•	Reading within indicated scale Reading outside indicated scale Soil Vapour (ppm)	Solid PVC Slotted PVC  Well Name 1: EV_MW_AQ2
	Soil Des	scription		ν	ਔÖ	ΐ	Ш	%	10 <sup>1</sup>	10 <sup>2</sup> 10 <sup>3</sup> 10 <sup>7</sup>	4
11	SAND, fine to medium grained, poorly graded, brown, damp. (consumption of the coarse gravel, subangular to sul grey-black, damp, interbedded.  SAND, fine to medium grained, poorly graded, dark grey-black, GRAVEL, fine to coarse, subang grey-black.	edium grained statements brounded, poor	sand, fine to rly graded, dark subrounded,								EV_MW_AQ2
117	BEDROCK, shale, grey, very ha	ard, damp.		NOT	ES						BENTONITE

	CNICAT ANIA	TINI	Т		Client coal Lim	ited			Borehole No. : EV_BH_BC1
<b> 7</b> //	SNC · LAVA		Regional		ocation ndwate	r Monite	oring		PAGE 1 OF 3
Drilling Boreho	g Contractor Owen's Drilling g Method Dual Rotary ole Dia. (m) 0.15 lotted Pipe Dia. (m) 0.05/0.05		Date Monitored Ground Surface Ele Top of Casing Elev Northing: 5509503.	. (m) ´	1156 1157	03 07 .271 .085 115 ng: 6556		7	Project Number: 660613 Borehole Logged By: AMH Date Drilled: 2019 01 15 Log Typed By: VL
Depth in Metres	Drilling Legend Sample Interval  ▼▼▼▼ Air Rotary	Water/NA  ▼ Water Le  ▽ Water Le  • NAPL  ○ NAPL		Stratigraphy Plot	Sample Interval Core Run	Sample Number	Blow Count		O Reading within indicated scale  Reading outside indicated scale  Soil Vapour (ppm)  Solid PVC  Slotted PVC  Slotted PVC  Well Name 1: EV_MW_BC1-A Well Name 2: EV_MW_BC1-B
Ď	Soil Des	cription		Stra	San	San	BIG	% 10	01 102 103 101
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	SAND and GRAVEL, fine to cocoarse gravel, some silt, subang dry, wood debris present.  At 3.5 m - damp  At 4.1 m - wet SAND and GRAVEL, coarse gragravel, some silt, subrounded, w SAND, fine to medium grained, graded, wet.  At 6.1 m - damp	gular, well grad gained sand, fir vell graded, w	ne to coarse et.						S S S S S S S S S S S S S S S S S S S
10-			ĺ	NO	- ' ' ▼ ' ▼ <sup>*</sup>    ΓES		ı l	Ii.	i. V I V / / I
					- <del></del>				

	CNIC . T ANIA	TINI	т		Client oal Lim	ited			Boreho	ole No. : EV_B	H_BC1
7)	SNC·LAVA		Regional		cation ndwate	r Monito	oring			PAGE 2 OF 3	
Drilling Boreh	g Contractor Owen's Drilling g Method Dual Rotary ole Dia. (m) 0.15 slotted Pipe Dia. (m) 0.05/0.05		Date Monitored Ground Surface Ele Top of Casing Elev Northing: 5509503.	. (m)	1156 1157	03 07 .271 .085 115 ng: 6556		7	Project Number: Borehole Logged Date Drilled: Log Typed By:	660613 By: AMH 2019 01 15 VL	5
Depth in Metres	Drilling Legend  Sample Interval  ▼▼▼▼ Air Rotary	Water/NA  ▼ Water Le  ⊽ Water Le  • NAPL  ○ NAPL		Stratigraphy Plot	Sample Interval Core Run	Sample Number	Blow Count	Recovery	Page Reading within indicated scale Reading outside indicated scale  Soil Vapour (ppm)	Solid PVC Slotted PVC Well Name 1: EV Well Name 2: EV	MW_BC1-A MW_BC1-B
ď	Soil Des	cription		Stra	San	San	BIG	% 10	1 10 <sup>2</sup> 10 <sup>3</sup> 10 <sup>4</sup>		
11 - 12 - 13 - 14 - 15 - 16 - 17 - 18 - 17 - 18 - 17 - 18 - 18 - 19 - 19 - 19 - 19 - 19 - 19	SAND, fine to medium grained, s graded, wet. (continued)  GRAVEL, fine to coarse, subang loose, wet.  SAND, fine to medium grained, s graded, damp.	gular, some si	It, well graded,								—— BENTONITE
1 8102 H				NOT	ES						

<b>~</b> ///	SNC+LAVA	TINI	1	Client oal Lir				Boreho	le No. : EV_BH_BC1	
<b>7</b> //	SINCYLAVA		Regional		ocation ndwate		oring			PAGE 3 OF 3
Drilling Boreho	g Contractor Owen's Drilling g Method Dual Rotary ole Dia. (m) 0.15 lotted Pipe Dia. (m) 0.05/0.05		Date Monitored Ground Surface E Top of Casing Ele Northing: 5509503	v. (m) ´	115 115	9 03 07 6.271 7.085 115 ting: 655			Project Number: Borehole Logged Date Drilled: Log Typed By:	660613 By: AMH 2019 01 15 VL
Depth in Metres	Drilling Legend Sample Interval  ▼▼▼ Air Rotary	Water/NA  ▼ Water Le  ∑ Water Le  ♠ NAPL  △ NAPL		Stratigraphy Plot	Sample Interval Core Run	Sample Number	Blow Count		Reading within indicated scale     Reading outside indicated scale     Soil Vapour (ppm)	Solid PVC Slotted PVC  Well Name 1: EV_MW_BC1-A Well Name 2: EV_MW_BC1-B
De	Soil Des	cription		Stra	San	San	Blo	₩ %	0 <sup>1</sup> 10 <sup>2</sup> 10 <sup>3</sup> 10 <sup>4</sup>	
21-	SAND and GRAVEL, fine to med coarse gravel, some silt, subroul orange-brown, wet. (continued)  At 21.8 m - dark brown	dium grained anded to round	sand, fine to ed, well graded,							EV_MW_BC1-A
24	BEDROCK.									BENTONITE
20	Bottom of hole at 27.9 m.				\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\					
28 <del>-</del>	BOLLOTT OF HOLE AL 21.3 III.									
29-										
30-⊐				NO	ΓES					

			1		Client oal Lim	ited			Boreho	ole No.	: EV_BH_GT1
<b>(</b> *)	SNC+LAVA	LIN	Regional		ocation ndwater	Monito	oring			PAGE	1 OF 7
Drilling Boreh	Contractor Owen's Drilling Method Dual Rotary ole Dia. (m) 0.15 lotted Pipe Dia. (m) 0.05/0.05		Date Monitored Ground Surface E Top of Casing Ele Northing: 5509290	v. (m) ´	1156. 1157.	03 07 515 442 115 ng: 6556			Project Number: Borehole Logged Date Drilled: Log Typed By:	I By:	660613 AMH 2019 01 17 VL
Depth in Metres	Drilling Legend Sample Interval  ▼▼▼ Air Rotary	▼ Water Le  ▽ Water Le  ◆ NAPL  ◇ NAPL		Stratigraphy Plot	Sample Interval Core Run	Sample Number	Blow Count	•	Reading within indicated scale Reading outside indicated scale Soil Vapour (ppm)	Well N	Solid PVC Slotted PVC  Jame 1: EV_MW_GT1-A Jame 2: EV_MW_GT1-B
	Soil Des	cription		₹	ဖွဲ့ပြ	တိ	B 8	1 <sub>0</sub> 1	10 <sup>2</sup> 10 <sup>3</sup> 10	1	1 П
1-	FILL, coal and shale boulders, and GRAVEL, coarse, some fine to n subrounded to rounded, poorly g hydrocarbon-like odour.	nedium graine	ed sand,						9		BENTONITE
3-	SAND and GRAVEL, fine to coar coarse gravel, trace silt, subroun damp to moist.	rse grained sa ded, well grad	and, fine to ded, dark brown,						C		EV_MW_GT1-B
04/0C: BH 20/19 04 10 Print Date: 20/19-09-26	SAND, fine to coarse grained, tra subrounded, well graded, dark but At 7.6 m - fine grained sand, no g	rown, moist to		90							BENTONITE
10-	At 9.8 m - fine to coarse grained	sand, trace g	ravel					<u>:</u>			
2A/QC; BH 2019				<b>NO</b> T Tar	res was be	eing sto	ored in a	area	at time of drilling	ng.	

	CRIC. T AND	TINI	T	eck C	Client Coal Lin	nited			Borehole	e No. : EV_BH_GT1
*/)	SNC+LAVA	LLIN	Regional		ocation ndwate	r Monit	oring		P	AGE 2 OF 7
Drilling Boreho	Contractor Owen's Drilling Method Dual Rotary ble Dia. (m) 0.15 lotted Pipe Dia. (m) 0.05/0.05		Date Monitored Ground Surface Ele Top of Casing Elev Northing: 5509290.	. (m) ´	) 1156 1157	03 07 6.515 7.442 115 ing: 6556			Project Number: Borehole Logged B Date Drilled: Log Typed By:	660613 ty: AMH 2019 01 17 VL
Depth in Metres	Drilling Legend Sample Interval  ▼▼▼▼ Air Rotary	Water/NA  ▼ Water Lev  ✓ Water Lev  ◆ NAPL  ◇ NAPL		Stratigraphy Plot	Sample Interval Core Run	Sample Number	Blow Count	% Recovery	Reading within indicated scale     Reading outside indicated scale     Soil Vapour (ppm)	Solid PVC Slotted PVC  Well Name 1: EV_MW_GT1-A Well Name 2: EV_MW_GT1-B
Dep	Soil Des	cription		Strati	Samp	Samp	Blow	% Re	0 <sup>1</sup> 10 <sup>2</sup> 10 <sup>3</sup> 10 <sup>4</sup>	
10-10-11-11-11-11-11-11-11-11-11-11-11-1	SAND, fine to coarse grained, transubrounded, well graded, dark be (continued)  At 19.5 m - fine grained sand and	rown, moist to	arse gravel, silty, wet.							BENTONITE
QA/QC: BH 2018			NOTES Tar was being stored in area at time of drilling.							

	CRIC. I ANIA	TINI	т	eck C	Client Coal Lin	nited			Boreho	ole No. : EV_BH_GT1
7))	SNC · LAVA	LLIN	Regional		ocation ndwate	r Monite	oring			PAGE 3 OF 7
Drilling Boreh	Contractor Owen's Drilling Method Dual Rotary Dle Dia. (m) 0.15 lotted Pipe Dia. (m) 0.05/0.05		Date Monitored Ground Surface Ele Top of Casing Elev Northing: 5509290.	. (m) <sup>^</sup>	) 1156 115	9 03 07 6.515 7.442 115 ting: 6556			Project Number: Borehole Logged Date Drilled: Log Typed By:	660613 I By: AMH 2019 01 17 VL
Depth in Metres	Drilling Legend Sample Interval  ▼▼▼ Air Rotary	Water/NA  ▼ Water Lev  ✓ Water Lev  ◆ NAPL  ◇ NAPL		Stratigraphy Plot	Sample Interval Core Run	Sample Number	Blow Count	% Recovery	Reading within indicated scale     Reading outside indicated scale     Soil Vapour (ppm)	Solid PVC Slotted PVC  Well Name 1: EV_MW_GT1-A Well Name 2: EV_MW_GT1-B
Del	Soil Des	cription		Strat	Sam	Sam	Blo	% Re	0 <sup>1</sup> 10 <sup>2</sup> 10 <sup>3</sup> 10	1
20-00-00 10 Deliut Date: 201-0-20-20-20-20-20-20-20-20-20-20-20-20-2	SAND, fine to coarse grained, tr subrounded, well graded, dark b (continued)  SAND and GRAVEL, fine to coa gravel, trace silt, subrounded, we	arse grained sa	and, coarse							BENTONITE
2A/QC; BH 2019			<b>NO</b> Tar	<b>TES</b> was b	eing sto	ored	in ar	ea at time of drillir	ng.	

	CNIC I ANIA	TTAT	Te		Client oal Lin	nited			Boreho	ole No. : EV_E	 3H_GT1
7))	SNC · LAVA		Regional (		cation ndwate	r Monite	oring			PAGE 4 OF	7
Drilling Boreho	Contractor Owen's Drilling Method Dual Rotary Dle Dia. (m) 0.15 lotted Pipe Dia. (m) 0.05/0.05		Date Monitored Ground Surface Ele Top of Casing Elev. Northing: 5509290.3	(m)	1156 1157	03 07 i.515 '.442 115 ing: 6556		00	Project Number: Borehole Logged Date Drilled: Log Typed By:	660613 By: AMH 2019 01 VL	17
Depth in Metres	Drilling Legend Sample Interval  ▼▼▼▼ Air Rotary	Water/NA  ▼ Water Le  □ Water Le  • NAPL  □ NAPL		Stratigraphy Plot	Sample Interval Core Run	Sample Number	Blow Count		Reading within indicated scale     Reading outside indicated scale     Soil Vapour (ppm)	Solid PVC Slotted PVC Slotted PVC Well Name 1: EV Well Name 2: EV	/ MW GT1-A
Ď	Soil Des	scription		Stra	San	San	Big	8 %	D <sup>1</sup> 10 <sup>2</sup> 10 <sup>3</sup> 10	1	
33 - 34 - 33 - 34 - 35 - 35 - 36 - 37 - 37 - 37 - 37 - 37 - 37 - 37	SAND and GRAVEL, fine to coagravel, trace silt, subrounded, w (continued) At 30.5 m - medium to coarse g subrounded to rounded  At 37.2 m - fine grained sand, so	arse grained sa rell graded, bro rained sand, n	wn, wet.			eina st	pred				—— BENTONITE
DA/QC: BH 2(				Tar	was b	eing sto	ored	in are	ea at time of drillin	ng.	

	CNIC AT ATTA	TINI	To		Client oal Lin	nited				Boreho	ole No	o. : <b>EV_B</b> H_	GT1
7))	SNC · LAVA	LLIN	Regional		cation ndwate	r Monit	oring				PAGE	5 OF 7	
Drilling Boreho	Contractor Owen's Drilling Method Dual Rotary Dle Dia. (m) 0.15 lotted Pipe Dia. (m) 0.05/0.05		Date Monitored Ground Surface Ele Top of Casing Elev Northing: 5509290.	. (m) ´	1156 1157	03 07 6.515 7.442 115 ing: 6556			Boreh Date I Log T	ct Number: nole Logged Drilled: Typed By:	i By:	660613 AMH 2019 01 17 VL	
Depth in Metres	Drilling Legend Sample Interval  ▼▼▼▼ Air Rotary	Water/NA  ▼ Water Le  ∇ Water Le  • NAPL  ○ NAPL		Stratigraphy Plot	Sample Interval Core Run	Sample Number	Blow Count	% Recovery	<ul> <li>Reading indicate</li> <li>Reading indicate</li> <li>Soil Va (pp</li> </ul>	d scale g outside d scale apour		Solid PVC Slotted PVC  I Name 1: EV_MW Name 2: EV_MW	
De	Soil Des	scription		Stra	San	San	Blo	₩ % 1	0 <sup>1</sup> 10 <sup>2</sup>	10 <sup>3</sup> 10	1		
40	SAND and GRAVEL, fine to coagravel, trace silt, subrounded, wo (continued)  At 42.1 m - coarse grained sand  At 44.5 m - some angular black  At 47.7 m - medium to coarse gravel, subrounded	ell graded, bro	wn, wet.										ENTONITE
2A/QC: BH 2019 C				<b>NOT</b> Tar	r <b>ES</b> was b	eing sto	ored	in ar	ea at time	e of drillir	ng.		

	CNIC. T AND	TTAT	Te		Client oal Lin	nited			Boreh	ole No. : E	V_BH_GT1
<b> </b> *//	SNC · LAVA		Regional (		cation ndwate	r Monito	oring			PAGE 6 C	)F 7
Drilling Boreho	Contractor Owen's Drilling Method Dual Rotary Ie Dia. (m) 0.15 otted Pipe Dia. (m) 0.05/0.05		Date Monitored Ground Surface Ele Top of Casing Elev. Northing: 5509290.3	(m) ´	1156 1157	03 07 i.515 '.442 115' ing: 6556			Project Number: Borehole Logge Date Drilled: Log Typed By:	d By: AMH	
Depth in Metres	Drilling Legend Sample Interval  ▼▼▼▼ Air Rotary	Water/NA  ▼ Water Lev  ▽ Water Lev  ♠ NAPL  △ NAPL		Stratigraphy Plot	Sample Interval Core Run	Sample Number	Blow Count		<ul> <li>Reading within indicated scale</li> <li>Reading outside indicated scale</li> <li>Soil Vapour (ppm)</li> </ul>	Solid F Slotted Well Name Well Name	
De	Soil Des	scription		Stra	San	San	Blo	% 10	0 <sup>1</sup> 10 <sup>2</sup> 10 <sup>3</sup> 10	)*	
50 - 50 - 50 - 50 - 50 - 50 - 50 - 50 -	SAND and GRAVEL, fine to coagravel, trace silt, subrounded, wo (continued)  GRAVEL, coarse, some coarse grey.	vell graded, bro	wn, wet.		Es b	eing sto	pred i	in are	a at time of drilli	ng.	BENTONITE
DAVQC: BH 2019 04 10 Pri.				NOT Tar	FES was b	eing sto	pred i	in are	a at time of drilli	ng.	<u>/}</u>

	CRIC. T ANIA	TINI	T	eck C	Client oal Lin	nited				Boreho	le No. : EV_BH_GT1
<b> </b> *//	SNC · LAVA		Regional		cation idwate		oring			ı	PAGE 7 OF 7
Drilling Boreho	Contractor Owen's Drilling Method Dual Rotary ble Dia. (m) 0.15 lotted Pipe Dia. (m) 0.05/0.05		Date Monitored Ground Surface Ele Top of Casing Elev Northing: 5509290.	. (m)	1156 115	9 03 07 6.515 7.442 115 ting: 6556			Boreho Date D	t Number: ole Logged Orilled: /ped By:	660613 By: AMH 2019 01 17 VL
Depth in Metres	Drilling Legend Sample Interval  ▼▼▼ Air Rotary	Water/NA  ▼ Water Lev  □ Water Lev  • NAPL  □ NAPL		Stratigraphy Plot	Sample Interval Core Run	Sample Number	Blow Count	% Recovery	<ul> <li>Reading indicated</li> <li>Reading indicated</li> <li>Soil Va (ppn</li> </ul>	d scale outside d scale	Solid PVC Slotted PVC  Well Name 1: EV_MW_GT1-A Well Name 2: EV_MW_GT1-B
De	Soil Des	cription		Straf	Sam	Sam	Blo	N %	10 <sup>1</sup> 10 <sup>2</sup>	10 <sup>3</sup> 10 <sup>4</sup>	
62-63-63-64-	GRAVEL, coarse, some coarse grey. (continued)  SAND, silty.	grained sand,	poorly graded,								BENTONITE  EV_MW_GT1-A  SAND
65-	BEDROCK, shale, black, angula	ar.									BENTONITE
OA/QC: BH 2019 04 10 Print Date:2019-09-26  0.0  1.0  1.0  1.0  1.0  1.0  1.0  1.	DOMONI OF HOTE AL OF A HILL			NOT	TES.						
QA/QC: BH 201				<b>NOT</b>	<b>ES</b> was b	eing sto	ored	in ar	ea at time	of drillin	g.

	CNICAT ANIA	TINT	т		Client oal Lim	nited			Borehole No. : EV_BH_MC1
7))	SNC · LAVA		Regional		ocation ndwate	r Monite	oring		PAGE 1 OF 4
Drilling Boreh	o Contractor Owen's Drilling Method Dual Rotary Die Dia. (m) 0.15 lotted Pipe Dia. (m) 0.05/0.05		Date Monitored Ground Surface Ele Top of Casing Elev Northing: 5510593.	. (m) ´	1147 1148	03 07 .631 .587 114 ing: 6549		4	Project Number: 660613 Borehole Logged By: AMH Date Drilled: 2019 01 20 Log Typed By: VL
Depth in Metres	Drilling Legend Sample Interval  ▼▼▼▼ Air Rotary	Water/NA  ▼ Water Le  ▽ Water Le  ◆ NAPL  ◇ NAPL		Stratigraphy Plot	Sample Interval Core Run	Sample Number	Blow Count		<ul> <li>Reading within indicated scale</li> <li>Reading outside indicated scale</li> <li>Soil Vapour (ppm)</li> <li>Solid PVC</li> <li>Slotted PVC</li> <li>Soil Vapour Well Name 1: EV_MW_MC1-A Well Name 2: EV_MW_MC1-B</li> </ul>
	Soil Des	cription		Stra	Sar	Sar	面	% 10	0 <sup>1</sup> 10 <sup>2</sup> 10 <sup>3</sup> 10 <sup>1</sup>
3-	SAND and GRAVEL, fine to mee gravel, rounded, poorly graded, local.  At 3.7 m - some silt, brown, dam  SAND, fine grained, silty, poorly	dium grained black to dark	brown, dry, some						S V / P P P P P P P P P P P P P P P P P P
OANGC: BH 2019 04 10 Print Date:2019-09-26	At 7.6 m - some silt to silty			NO	ES				BENTONITE/SLOUGH

الم	CNICAT ANIA	TINT	Т	eck C	Client oal Lim	ited				Boreho	ole No	. : EV_B	H_MC1
<b>7</b> //	SNC+LAVA		Regional		ocation ndwate	r Monite	oring				PAGE	2 OF 4	
Drilling Boreho	Contractor Owen's Drilling Method Dual Rotary ble Dia. (m) 0.15 lotted Pipe Dia. (m) 0.05/0.05		Date Monitored Ground Surface Ele Top of Casing Elev Northing: 5510593.	(m)	1147 1148	03 07 .631 .587 114 ng: 6549				Project Number: Borehole Logged Date Drilled: Log Typed By:	Ву:	660613 AMH 2019 01 20 VL	)
Depth in Metres	Drilling Legend Sample Interval  ▼▼▼ Air Rotary	▼ Water Le		Stratigraphy Plot	Sample Interval Core Run	Sample Number	Blow Count	Recovery	•	Reading within indicated scale Reading outside indicated scale Soil Vapour (ppm)	Well I	Solid PVC Slotted PVC  Name 1: EV_ Name 2: EV_	MW_MC1-A MW_MC1-B
_	Soil Des	cription		Ī	တ္တီလ	Š	В	<b>~</b>	10¹	10 <sup>2</sup> 10 <sup>3</sup> 10	1		
10— 11— 12— 13— 14— 16— 17— 18—	SAND, fine grained, silty, poorly (continued)  At 15.8 m - some medium to coacoarse gravel, subrounded to rot wet.	arse grained s	and										— BENTONITE/SLOUGH
_•				NO	TES								

~!)	SNC+LAVA	TINT	Т		Client oal Lim	ited			Boreho	ole No. : EV_BH_MC1
7/)	SINC*LAVA		Regional		cation ndwate	r Monite	oring			PAGE 3 OF 4
Drilling Boreho	Contractor Owen's Drilling Method Dual Rotary Dle Dia. (m) 0.15 lotted Pipe Dia. (m) 0.05/0.05		Date Monitored Ground Surface El- Top of Casing Elev Northing: 5510593	. (m)	1147 1148	03 07 .631 .587 114 ng: 6549		1	Project Number: Borehole Logged Date Drilled: Log Typed By:	By: 660613 By: AMH 2019 01 20 VL
Depth in Metres	Drilling Legend Sample Interval  ▼▼▼ Air Rotary	Water/NA  ▼ Water Le  □ Water Le  • NAPL  □ NAPL		Stratigraphy Plot	Sample Interval Core Run	Sample Number	Blow Count	Recovery	indicated scale	Solid PVC Slotted PVC  Well Name 1: EV_MW_MC1-A Well Name 2: EV_MW_MC1-B
De	Soil Des	cription		Stra	San	San	Blo	₩ 10	<sup>1</sup> 10 <sup>2</sup> 10 <sup>3</sup> 10 <sup>4</sup>	
21— 22— 23— 24— 26— 27—	SAND and GRAVEL, fine to coar coarse gravel, subrounded to rowet. (continued)  From 21.4 m to 22.6 m - gravelly  At 22.6 m - subangular to subrounded.  SAND, fine grained, poorly grade  BOULDERS, shale, angular, son subrounded.	unded, well gr	raded, brown,							BENTONITE  BENTONITE  BENTONITE  BENTONITE
E <sub>30</sub> ∃			ı	h ~	∤ <b>∵</b> ▼↓▼↓  			li.	iii	<u>   //// </u>
				NOT	ES					

<b>~</b> 1)	SNC+LAVA	TINI	Client Teck Coal Limited  Location Regional Groundwater Monitoring				Borehole No. : EV_BH_MC1		
<b>7</b> //	SINCYLAVA		Regional			r Monite	oring	I	PAGE 4 OF 4
Drilling Boreho	Contractor Owen's Drilling Method Dual Rotary sle Dia. (m) 0.15 otted Pipe Dia. (m) 0.05/0.05		Date Monitored Ground Surface Ele Top of Casing Elev Northing: 5510593.	. (m)	1147 1148	0 03 07 7.631 3.587 114 ing: 6549			Project Number: 660613 Borehole Logged By: AMH Date Drilled: 2019 01 20 Log Typed By: VL
Depth in Metres	Drilling Legend Sample Interval ▼▼▼ Air Rotary	Water/NA  ▼ Water Le  □ Water Le  • NAPL  □ NAPL		Stratigraphy Plot	Sample Interval Core Run	Sample Number	Blow Count	% Recovery	Reading within indicated scale     Reading outside indicated scale     Soil Vapour (ppm)     Well Name 1: EV_MW_MC1-A Well Name 2: EV_MW_MC1-B
Ğ	Soil Des	cription		Stra	San	San	8	%	10 <sup>1</sup> 10 <sup>2</sup> 10 <sup>3</sup> 10 <sup>4</sup>
31-	BEDROCK, shale, angular, black	ς.							BENTONITE
32 <del>-</del>	Bottom of hole at 32.0 m.				Y_V_V_		ļ		
33-									
34-									
35-									
36-									
37 <del>-</del>									
38-									
39-									
40-									
-				NO	ΓES				

<i>a</i> )) c	NC+LAVA	TIN	-	Teck C	Client oal Lin	nited			Boreho	ole No	.:EV_BH_MC2
<i>7))</i> 3			Regiona		cation ndwate	r Monit	oring			PAGE	1 OF 6
Orilling Contra Orilling Method Borehole Dia. Pipe/Slotted P	(m) 0.15		Date Monitored Ground Surface E Top of Casing Ele Northing: 5510529	v. (m) ´	1146 1147	9 03 07 6.989 7.950 114 ing: 654			Project Number: Borehole Logged Date Drilled: Log Typed By:	i By:	660613 RAS 2019 01 14 VL
	ing Legend Sample Interval Ty Air Rotary	Water/NA  ▼ Water Le  ▽ Water Le  • NAPL  ○ NAPL		Stratigraphy Plot	Sample Interval Core Run	Sample Number	Blow Count	% Recovery	Reading within indicated scale     Reading outside indicated scale     Soil Vapour (ppm)	Well	Solid PVC Slotted PVC  Name 1: EV_MW_MC2 Name 2: EV_MW_MC2
ă ا	Soil Des	scription		Stra	San	San	Blc	Ы %	0 <sup>1</sup> 10 <sup>2</sup> 10 <sup>3</sup> 10	] 1	
1 - At 1.	sand and gravel, fine to come gravel, some silt, angula coal present, wood debris put many and the subangular to angula to many and many a	ar, well graded, present.	sand, fine to black, dense,						E 9	<b>I</b>	BENTONIT
	VEL, fine to coarse, trace to ngular, well graded, black,		grained sand,								EV_MW_M(
6- 	brown, medium dense, w	ret.									
GRA'subai	VEL, fine to coarse, trace in negular to angular, well grad	fine to coarse ç ded, brown, de	grained sand, nse, wet.	NOT							BENTONIT

) SNC·LAVA	IIN	Client Teck Coal Limi	ted	Borehol	e No. : EV_BH_MC2
)) SINC LAVA		Location I Groundwater	Monitoring	F	PAGE 2 OF 6
Orilling Contractor Owen's Drilling Orilling Method Dual Rotary Borehole Dia. (m) 0.15 Pipe/Slotted Pipe Dia. (m) 0.05/0.05	Date Monitored Ground Surface E Top of Casing Ele Northing: 5510529	v. (m) ´ 1147.9		Project Number: Borehole Logged E Date Drilled: Log Typed By:	660613 By: RAS 2019 01 14 VL
Drilling Legend Sample Interval Fra Air Rotary  Li Had	Water/NAPL Levels  ▼ Water Level 1  □ Water Level 2  ◆ NAPL  ○ NAPL	Stratigraphy Plot Sample Interval Core Run		Reading within indicated scale     Reading outside indicated scale     Soil Vapour (ppm)	Solid PVC Slotted PVC  Well Name 1: EV_MW_MC2-A Well Name 2: EV_MW_MC2-B
Soil Des	cription	Sar	Sar Bic	0 <sup>1</sup> 10 <sup>2</sup> 10 <sup>3</sup> 10 <sup>4</sup>	
GRAVEL, fine to coarse, trace fisubangular to angular, well grad (continued)  11-  12-  13-  From 12.8 m to 14.9 m - some s	ed, brown, dense, wet.				BENTONITE
16- 17- At 17.1 m - trace silt, some sand	1	NOTES			

Soil Description  Soil Description  GRAVEL, fine to coarse, trace fine to coarse grained sand, subangular to angular, well graded, brown, dense, wet. (continued)  At 21.6 m - very dense  At 22.3 m - dense  SAND, fine to coarse grained, some fine to coarse gravel, trace silt, subrounded to angular, well graded, orange/brown, dense, wet.  GRAVEL, fine to coarse, some fine to coarse gravel, trace silt, subrounded to angular, well graded, light brown, dense, wet.	M CNICAT AVA	TINI	Teck Co		ted				Boreho	ole No. : EV_BH_MC2
Deliming Method Double Role (m) 0.15 Top of Casing Elev. (m) Northing 56/0029-408 114/980 1147/980 114					Monito	oring				PAGE 3 OF 6
Water/NAPL Levels  Water Level 1  Water Level 2  NAPL  Soil Description  Soil Description  Soil Description  Soil Description  The least of the level of the leve	Orilling Method Dual Rotary  Borehole Dia. (m) 0.15	Ground Surface E Top of Casing Ele	ev. (m)	1146. 1147.	989 950 114		6		Borehole Logged Date Drilled: Log Typed By:	I By: RAS 2019 01 14
Soil Description  Soil Descrip	Sample Interval  Sample Interval  Air Rotary	▼ Water Level 1  □ Water Level 2  • NAPL  □ NAPL	ratigraphy Plot	ample Interval ore Run	ample Number	Slow Count	Recovery		indicated scale Reading outside indicated scale Soil Vapour	
At 21.6 m - very dense  At 22.3 m - dense  SAND, fine to coarse grained, some fine to coarse gravel, trace silt, subrounded to angular, well graded, light brown, dense, wet.  GRAVEL, fine to coarse, some fine to coarse grained sand, trace silt, subrounded to angular, well graded, light brown, dense, wet.	Soil Des	scription	ठ	ű ő	SS	Ш	%	10 <sup>1</sup>	10 <sup>2</sup> 10 <sup>3</sup> 10	
SAND and GRAVEL, fine to coarse grained sand, fine to coarse gravel, trace silt, subrounded to angular, well graded, brown, loose.	At 21.6 m - very dense  At 22.3 m - dense  SAND, fine to coarse grained, s trace silt, subrounded to angular dense, wet.  GRAVEL, fine to coarse, some trace silt, subrounded to angular dense, wet.	ome fine to coarse gravel, r, well graded, orange/brown, fine to coarse grained sand, r, well graded, light brown,								BENTONITE

V_BH_MC2	e No. : EV_	Borehole				nited	Client oal Lim	eck C	TIN	SNC+LAVALIN	<b>~</b> 1)
OF 6	PAGE 4 OF	PA			oring	r Monite	cation ndwate		Regional	SINCYLAVALIN	<b>(</b> ))
		Project Number: Borehole Logged By Date Drilled: Log Typed By:				03 07 6.989 6.950 114 ing: 654	1146 1147	/. (m)	Date Monitored Ground Surface El Top of Casing Elev Northing: 5510529	ntractor Owen's Drilling thod Dual Rotary Dia. (m) 0.15 d Pipe Dia. (m) 0.05/0.05	rilling Soreh
	Solid PV Slotted F Well Name 1: Well Name 2:	Reading within ndicated scale Reading outside ndicated scale Soil Vapour (ppm)	•	% Recovery	Blow Count	Sample Number	Sample Interval Core Run	Stratigraphy Plot	Water/NAPL Levels  ▼ Water Level 1  ∇ Water Level 2  • NAPL  ○ NAPL	Air Rotary  ✓ Water Le  ✓ Water Le  ✓ NAPL	Depth in Metres
		10 <sup>2</sup> 10 <sup>3</sup> 10 <sup>4</sup>	1 <sub>0</sub> 1	1 %	ă	Sar	Sar	Stra	cription	Soil Description	
									rse grained sand, fine to ded to angular, well graded,	AND and GRAVEL, fine to coarse grained si parse gravel, trace silt, subrounded to angula own, loose. <i>(continued)</i>	331
											34
									gravel	rom 39.8 m to 41.1 m - angular gravel	39-
							ES	NOT	gravel	om 39.8 m to 41.1 m - angular gravel	38-

Drilling Contractor Owen's Drilling Drilling Method Dual Rotary Borehole Dia, (m) O.050.05 Northing: 5510529.408 Drilling Legend Water/NAPL Levels Water Level 1 Water Level 2 NAPL NAPL NAPL NAPL NAPL NAPL NAPL NAPL	SNC·LAVA	IIN	Client Teck Coal Limited		Borehole	No. : EV_BH_MC2
Filling Method Dual Rotary cross-file bit (m) 0.15 (m) 0.050.05 (m) 0.050.05 (m) 0.050.05 (m) Northing: 5510529-408 (m) No	)) SINC LAVA		Location al Groundwater Monito	ring	PA	GE 5 OF 6
Water Level 1  Water Level 2  NAPL	rilling Method Dual Rotary orehole Dia. (m) 0.15	Ground Surface E Top of Casing Ele	Elev. (m) 1146.989 ev. (m) 1147.950 1147	.969 I	Borehole Logged By: Date Drilled:	RAS 2019 01 14
SOII Description  SAND and GRAVEL, fine to coarse grained sand, fine to coarse gravel, trace silt, subrounded to angular, well graded, brown, loose. (continued)  41- 42- 44- 44- 46-	Sample Interval	▼ Water Level 1  ▼ Water Level 2  • NAPL	atigraphy Plot nple Interval e Run nple Number	ind • Re ind	dicated scale eading outside dicated scale soil Vapour	
AND and CRAVEL, line to coarse grained sand, fine to coarse gravel, trace silt, subrounded to angular, well graded, brown, loose. (continued)  2-  3-  4-  6-  6-  6-  6-  6-  6-  6-  6-  6	Soil Des	scription			10 <sup>2</sup> 10 <sup>3</sup> 10 <sup>4</sup>	
<sup>™</sup> ‡	SAND and GRAVEL, fine to cor- coarse gravel, trace silt, subrou brown, loose. (continued)  41  42  44  45  46	arse grained sand, fine to nded to angular, well graded,				BENTONITE
48- 49- 50-	48					

<b>~</b> 1))	SNC+LAVA	TINI		Teck C		nited			Boreho	le No. : EV_BH_MC2
<b>7</b> //	SINCYLAVA		Regiona		ocation ndwate	er Monit	oring			PAGE 6 OF 6
Drilling Boreho	g Contractor Owen's Drilling I Method Dual Rotary ole Dia. (m) 0.15 lotted Pipe Dia. (m) 0.05/0.05		Date Monitored Ground Surface E Top of Casing Ele Northing: 5510529	v. (m)	114 114	9 03 07 6.989 7.950 114 ting: 654			Project Number: Borehole Logged Date Drilled: Log Typed By:	660613 By: RAS 2019 01 14 VL
Depth in Metres	Drilling Legend Sample Interval  ▼▼▼ Air Rotary	Water/NA  ▼ Water Le  □ Water Le  • NAPL  □ NAPL		Stratigraphy Plot	Sample Interval Core Run	Sample Number	Blow Count		Reading within indicated scale     Reading outside indicated scale     Soil Vapour (ppm)	Solid PVC Slotted PVC  Well Name 1: EV_MW_MC2-A Well Name 2: EV_MW_MC2-B
De	Soil Des	cription		Stra	San	San	Blo	& % 10	0 <sup>1</sup> 10 <sup>2</sup> 10 <sup>3</sup> 10 <sup>4</sup>	
50-	SAND and GRAVEL, fine to coa coarse gravel, trace silt, subrour brown, loose. (continued)	rse grained sa	and, fine to ar, well graded,							BENTONITE
52-	At 52.1 m - increased sand									EV_MW_MC2-A
54 <del>-</del>	BEDROCK.									BENTONITE
56-	Bottom of hole at 55.8 m.			<u> </u>	<u>}****</u>			l;		
57-										
58-										
59-										
60				NO	ΓES					

Date Monitored Ground Surface Ele Top of Casing Elev Northing: 5510983.  ater/NAPL Levels Water Level 1 Water Level 2 NAPL NAPL	ev. (m) /. (m) .197	2019 1137. 1138.	03 08 925			Bo	ject Numbe	r:	E 1 OF 3 660613 RAS
Ground Surface Elitop of Casing Elev Northing: 5510983. ater/NAPL Levels Water Level 1 Water Level 2 NAPL	v. (m) ( .197	1137. 1138.	925 815	866 80		Bo	ehole Logg		RAS
Water Level 1 Water Level 2 NAPL	Plot			00.00	1	Log	e Drilled: Typed By:		2019 01 23 VL
	Stratigraphy Plot	Sample Interval Core Run	Sample Number	Blow Count	Recovery	<ul><li>Read indicate</li><li>Soil</li></ul>	ling within lated scale ling outside lated scale ling outside lated scale ling outside lated scale ling outside lated scale ling outside later l	Wel	Solid PVC Slotted PVC
tion	\ <u>\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ </u>	ώ Q	, ,	ш	% 10	D <sup>1</sup> 10 <sup>2</sup>	10 <sup>3</sup> 1	oʻ	
grained sand, cobbles								<b>▼</b>	BENTONI
									BENTONI
rained sand, fine to silt, subrounded to e, damp.									—— SLOUGH
	grained sand, cobbles graded, brown, very	grained sand, cobbles graded, brown, very	grained sand, cobbles graded, brown, very	grained sand, cobbles graded, brown, very	grained sand, cobbles graded, brown, very	grained sand, cobbles graded, brown, very	grained sand, cobbles graded, brown, very	grained sand, cobbles graded, brown, very	grained sand, cobbles raded, brown, very

<u>~1)</u>	CNICAT AND	TTAT	т		Client oal Lim	ited				Boreho	ole No. : EV_BH_MC3
<b>7</b> //	SNC · LAVA	LLIN	Regional		cation ndwater	r Monit	oring				PAGE 2 OF 3
Drilling Boreh	g Contractor Owen's Drilling J Method Dual Rotary ole Dia. (m) 0.15 lotted Pipe Dia. (m) 0.05/0.05		Date Monitored Ground Surface Ele Top of Casing Elev Northing: 5510983.	. (m)	1137. 1138.		666.89	)1		Project Number: Borehole Logger Date Drilled: Log Typed By:	660613 d By: RAS 2019 01 23 VL
Depth in Metres	Drilling Legend Sample Interval TTVT Air Rotary  Soil Des	▼ Water Le		Stratigraphy Plot	Sample Interval Core Run	Sample Number	Blow Count	% Recovery	•	indicated scale Reading outside indicated scale  Soil Vapour (ppm)	Solid PVC Slotted PVC Well Name 1: EV_MW_MC3
11- 	SAND and GRAVEL, fine to coarse gravel, cobbles present, subangular, well graded, brown, At 10.1 m - some silt, moist  GRAVEL, fine to coarse, some sand, angular to subrounded, with moist.  At 16.5 m - wet  BEDROCK, hard.	arse grained sa trace silt, subr , dense, damp	ounded to (continued)					6	101	102 103 10	BENTONITE  BENTONITE
20-				NOT	rivivi res		<u> </u>		i	ii	

) SNC+LAV	A T TNT	т	eck C	Client <b>oal Lin</b>	nited			Boreho	le No. : EV_BH_MC3
)) SINC LAV	ALII	Regional		cation ndwate	r Monit	oring			PAGE 3 OF 3
Orilling Contractor Owen's Drilling Orilling Method Dual Rotary Borehole Dia. (m) 0.15 Pipe/Slotted Pipe Dia. (m) 0.05/0.05		Date Monitored Ground Surface El Top of Casing Elev Northing: 5510983	′. (m̀) ´	1137 1138	9 03 08 7.925 3.815 ing: 6536	666.89	1	Project Number: Borehole Logged Date Drilled: Log Typed By:	660613 By: RAS 2019 01 23 VL
Drilling Legend Sample Interval Air Rotary  Li Li Li Li Li Li Li Li Li Li Li Li Li	Water/NA  ▼ Water Le  ▽ Water Le  ◆ NAPL  ◇ NAPL		Stratigraphy Plot	Sample Interval Core Run	Sample Number	Blow Count	% Recovery	indicated scale	Solid PVC Slotted PVC  Well Name 1: EV_MW_MC3
Šoil D	escription		Stra	San	San	BIG	% 10	¹ 10² 10³ 10⁴	
BEDROCK, hard. (continued	)								BENTONITE
Bottom of hole at 21.0 m.									
22-									
23-									
24									
25-									
26-									
27-									
8-									
29									
30									
			NO	res					

M CNIC	LAVALIN		Client Coal Lim	ited			Boreho	le No. : EV_BH_MC4
A) STAC.	LAVALLIN	Regional Gro	Location undwater	· Monito	ring			PAGE 1 OF 3
Orilling Contractor Owen's Drilling Method Dual Rorehole Dia. (m) Pipe/Slotted Pipe Dia. (m)		Date Monitored Ground Surface Elev. (I Top of Casing Elev. (m) Northing: 5512279.753	m) 1144. ) 1145.		09.224		Project Number: Borehole Logged Date Drilled: Log Typed By:	660613 By: RAS 2019 01 09 VL
Drilling Legend Sample V'V' Air Rot	ilitervai	1 2	Sample Interval	Sample Number	Blow Count	% Recovery	Reading within indicated scale Reading outside indicated scale Soil Vapour (ppm)	Solid PVC Slotted PVC  Well Name 1: EV_MW_MC4
ă	Soil Description	7	San	San	BIG	10 <sup>1</sup>	10 <sup>2</sup> 10 <sup>3</sup> 10 <sup>4</sup>	
GRAVEL, fine to trace silt, suban dense, damp.  1  At 3.0 m - dark l	o coarse, some fine to coarse gular to subrounded, well gra	grained sand, ded, brown,						BENTONITI
SAND, fine grain	ned, trace fine gravel, some s ark brown, medium dense, m	silt, subrounded, noist.						
8 - At 7.9 m - no gra	avel							

Date Monitored Ground Surface E Top of Casing Ele Northing: 5512278  atter/NAPL Levels Water Level 1 Water Level 2 NAPL NAPL ION Some silt, subrounded, inse, moist. (continued)	Elev. (m) ev. (m) 9.753	2019 03 07 1144.345 1145.308 Easting: 65		Borel Date Log 1  Readin indicate Readin indicate	ect Number: hole Logged Drilled: Typed By: g within ed scale gg outside ed scale /apour om)  10³ 10⁴	PAGE 2 OF 3  By: 660613 RAS 2019 01 09 VL  Solid PVC Slotted PVC  Well Name 1: EV_MW_MC4
Ground Surface E Top of Casing Ele Northing: 5512279  ater/NAPL Levels  Vater Level 1  Vater Level 2  NAPL  NAPL  ion	ev. (m) <sup>'</sup> 9.753	1144.345 1145.308 Easting: 65		Borel Date Log 1  Readin indicate Readin indicate Soil V (pp	hole Logged Drilled: Typed By: Ig within ed scale g outside ed scale	By: RAS 2019 01 09 VL Solid PVC Slotted PVC
Water Level 1 Water Level 2 NAPL NAPL  ion  some silt, subrounded,	Stratigraphy Plot	Sample Interval Core Run Sample Number	Blow Count % Recovery	indicate Readin indicate Soil V	ed scale ng outside ed scale /apour om)	Slotted PVC
some silt, subrounded,				10' 10-	10° 10]	
		V V V V V V V V V V V V V V V				
poorly graded, medium						BENTONITE
						BENTONITE
		NOT	NOTES	NOTES	NOTES	NOTES

<i>-)))</i>	SNC+LAVA	TINI	т	eck C	Client Coal Lim	nited			Borehole No. : EV_BH_MC4				
<b>7</b> ))	SINCYLAVA		Regional		ocation Indwate	r Monit	oring			PAGE 3 OF 3			
Orilling N Borehole	Contractor Owen's Drilling Method Dual Rotary e Dia. (m) 0.15 tted Pipe Dia. (m) 0.05/0.05		Date Monitored Ground Surface Ele Top of Casing Elev Northing: 5512279.	(m)	) 1144 1145		309.22	4	Project Number: Borehole Logged Date Drilled: Log Typed By:	660613 By: RAS 2019 01 09 VL			
Depth in Metres	Drilling Legend Sample Interval ▼▼▼▼ Air Rotary	Water/NA  ▼ Water Le  ⊽ Water Le  • NAPL  ∴ NAPL		Stratigraphy Plot	Sample Interval Core Run	Sample Number	Blow Count		Reading within indicated scale     Reading outside indicated scale     Soil Vapour (ppm)	Solid PVC Slotted PVC  Well Name 1: EV_MW_MC4			
ă	Soil Des	cription		Stra	Sar	Sar	BIG	% 10	0 <sup>1</sup> 10 <sup>2</sup> 10 <sup>3</sup> 10 <sup>4</sup>				
22-	SAND, fine grained, silty, dark b dense, moist. <i>(continued)</i>	rown, poorly g	raded, medium							BENTONITE  EV_MW_MC4  SAND			
26-	BEDROCK.  Bottom of hole at 26.2 m.									BENTONITE			
27-													
28-													
30-													
				NO	TES								

Drillir Drillir Borel Pipe/	g Contractor Owen's Drilling g Method Dual Rotary nole Dia. (m) 0.15 Slotted Pipe Dia. (m) 0.05/0.05	Reg							
Drillir Borel Pipe/	g Method Dual Rotary nole Dia. (m) 0.15	Date Monito	Regional Groundwater Monitoring  Date Monitored 2019 03 08						PAGE 1 OF 6
		Ground Sur	face Elev. (m) ng Elev. (m)	1137. 1138.				Project Number: Borehole Logger Date Drilled: Log Typed By:	
Depth in Metres	Drilling Legend Sample Interval  ▼ ▼ ▼ Air Rotary	Water/NAPL Levels  ▼ Water Level 1  ▽ Water Level 2  ◆ NAPL  ○ NAPL	Stratigraphy Plot	Sample Interval Core Run	Sample Number	Blow Count	% Recovery	Property of the control of the contr	Solid PVC Slotted PVC  Well Name 1: EV_MW_SPR1-A Well Name 2: EV_MW_SPR1-B
ă	Soil Des	scription	Stra	San	San	Blc	الا % إر	<sup>1</sup> 10 <sup>2</sup> 10 <sup>3</sup> 10	
2-0-0-1	SAND, fine grained, some fine t subrounded, poorly graded, brownship and GRAVEL, fine to coagravel, subrounded, well graded At 4.0 m - moist	m, grey.  o coarse gravel, rounded wn, loose, dry.  arse grained sand, coarse l, brown, damp.						D2	BENTONITE
04/QC: BH 2019 04 10 FINI Date: 2019-09-20			NO	TES					

<b>3</b>	CNIC AT ATTA	TINI	Т	eck C	Client Coal Lim	ited				Boreho	le No	.: EV_BH_SPR1
<b>  V</b> )	SNC · LAVA		Regional		ocation I <b>ndwate</b>	r Monite	oring				PAGE	E 2 OF 6
Drilling Boreho	Contractor Owen's Drilling Method Dual Rotary ble Dia. (m) 0.15 lotted Pipe Dia. (m) 0.05/0.05		Date Monitored Ground Surface Ele Top of Casing Elev Northing: 5511277.	. (m)	) 1137 1138	03 08 .376 .248 113 ng: 6539				Project Number: Borehole Logged Date Drilled: Log Typed By:	I Ву:	660613 AMH 2019 01 21 VL
Depth in Metres	Drilling Legend Sample Interval  ▼▼▼ Air Rotary	Water/NA  ▼ Water Le  ⊽ Water Le  ◆ NAPL  ◇ NAPL		Stratigraphy Plot	Sample Interval Core Run	Sample Number	Blow Count	% Recovery	•	Reading within indicated scale Reading outside indicated scale Soil Vapour (ppm)	Well	Solid PVC Slotted PVC  I Name 1: EV_MW_SPR1-A I Name 2: EV_MW_SPR1-B
	Soil Des	scription		l ţ	တ္တလိ	SS .	В	%	10 <sup>1</sup>	10 <sup>2</sup> 10 <sup>3</sup> 10	4	
11	CLAY, silty, brown, intermediate plastic limit.				TES							BENTONITE
				NU	IES							

	CNICAT ANIA	TINT	Т		Client Coal Lim	nited				Boreho	le No.	: EV_B	H_SPR1	
7/)	SNC · LAVA	LLIN	Regional		ocation <b>ndwate</b>	r Monit	oring				PAGE	3 OF 6	3	
Drilling Boreh	g Contractor Owen's Drilling g Method Dual Rotary ole Dia. (m) 0.15 lotted Pipe Dia. (m) 0.05/0.05		Date Monitored Ground Surface Ele Top of Casing Elev Northing: 5511277.	. (m)	) 1137 1138	03 08 .376 .248 113 ing: 653		8	Boreh Date	ct Number: nole Logged Drilled: yped By:	d By:	660613 AMH 2019 01 2 VL	21	
Depth in Metres	Drilling Legend Sample Interval TTV Air Rotary	▼ Water Le		Stratigraphy Plot	Sample Interval Core Run	Sample Number	Blow Count	% Recovery	<ul> <li>Reading</li> </ul>	ed scale g outside ed scale	Well Well	Solid PVC Slotted PVC Name 1: EV	C /_MW_SPR1-A /_MW_SPR1-B	
21 22 23 24 25 26 27 28	CLAY, silty, brown, intermediate plastic limit. (continued)  At 20.7 m - moisture level below  GRAVEL, fine, subrounded, poor  SAND and SILT, fine grained sa	e plasticity, mo	imp to wet.	<b>N</b>	**************************************								EV_MW_SPR1-	В

	SNC+LAVA	TINT	Т	eck (	Client Coal Lim	ited			Borehole No. : EV_BH_SPR1	
	SINC LAVA		Regional		ocation indwate	r Monite	oring		PAGE 4 OF 6	
Drilling Boreh	g Contractor Owen's Drilling g Method Dual Rotary ole Dia. (m) 0.15 lotted Pipe Dia. (m) 0.05/0.05		Date Monitored Ground Surface Ele Top of Casing Elev Northing: 5511277.	(m)	) 1137 1138	03 08 .376 .248 113 ng: 6539		8	Project Number: 660613 Borehole Logged By: AMH Date Drilled: 2019 01 21 Log Typed By: VL	
Depth in Metres	Drilling Legend Sample Interval  ▼▼▼▼ Air Rotary	Water/NA  ▼ Water Le  ✓ Water Le  ◆ NAPL  ◇ NAPL		Stratigraphy Plot	Sample Interval Core Run	Sample Number	Blow Count	% Recovery	○ Reading within indicated scale  ● Reading outside indicated scale  Soil Vapour (ppm)  Soil Vapour Well Name 1: EV_MW_SPR1-FW Well Name 2: EV_MW_SPR1-FW Well Name 2: EV_MW_SPR1-FW Well Name 2: EV_MW_SPR1-FW Well Name 3: EV_MW_SPR1-FW W	 \ 3
ă	Soil Des	scription		Stra	Sar	Sar	BIG	%	10 <sup>1</sup> 10 <sup>2</sup> 10 <sup>3</sup> 10 <sup>4</sup>	
31 32 34 34 35 35 35	SAND and SILT, fine grained sa (continued)  At 34.7 m - dense	and, poorly gra	ded, moist.						BENTONITE	
38-	SAND, fine grained, silty, poorly  At 39.0 m - some silt to silty	graded, loose	, wet.	NO	TES					

<b>~</b>	CNICAT ANIA	TINT	т	eck (	Client Coal Lin	nited				Boreho	ole No.	: EV_B	H_SPR1
<b>  V</b> )	SNC · LAVA		Regional		ocation Indwate	r Monit	oring				PAGE	5 OF 6	3
Drilling Boreho	Contractor Owen's Drilling Method Dual Rotary ble Dia. (m) 0.15 lotted Pipe Dia. (m) 0.05/0.05		Date Monitored Ground Surface Ele Top of Casing Elev Northing: 5511277.	. (m)	i) 1137 1138	03 08 7.376 3.248 113 ing: 6539			Bore Date	ect Number: hole Logge Drilled: Typed By:	: d By:	660613 AMH 2019 01 2 VL	21
Depth in Metres	Drilling Legend Sample Interval  ▼▼▼ Air Rotary	▼ Water Le		Stratigraphy Plot	Sample Interval Core Run	Sample Number	Blow Count	Recovery	<ul> <li>Readir indicat</li> <li>Soil \</li> </ul>	ng within ed scale ng outside ed scale /apour om)	Well	Solid PVC Slotted PVC Name 1: EV Name 2: EV	_MW_SPR1-A _MW_SPR1-B
	Soil Des	cription		l ţ	ဖွဲ့ပြ	SS .	В	· 0	0 <sup>1</sup> 10 <sup>2</sup>	10 <sup>3</sup> 10	21		
43-44-44-44-44-44-44-44-44-44-44-44-44-4	SAND, fine grained, silty, poorly (continued)  At 42.1 m - trace gravel  At 43.6 m - silty	graded, loose	, wet.										EV_MW_SPR1-A  —— SAND  —— BENTONITE
50-⊒			[	NO	TES		1 1			i	:I I/ /	/ / / /	
				140	120								

<b>~</b> 1)	SNC+LAVA	TINI	Т	eck C	Client oal Lin	nited			Borehole No. : EV_BH_SPR1
<b>7</b> //	SNCTLAVA		Regional		cation ndwate	r Monite	oring		PAGE 6 OF 6
Drilling Boreh	g Contractor Owen's Drilling g Method Dual Rotary ole Dia. (m) 0.15 lotted Pipe Dia. (m) 0.05/0.05		Date Monitored Ground Surface Ele Top of Casing Elev Northing: 5511277.	. (m)	113 113	9 03 08 7.376 3.248 113 ting: 6539			Project Number: 660613 Borehole Logged By: AMH Date Drilled: 2019 01 21 Log Typed By: VL
Depth in Metres	Drilling Legend Sample Interval  ▼▼▼ Air Rotary	Water/NA  ▼ Water Le  □ Water Le  • NAPL  □ NAPL		Stratigraphy Plot	Sample Interval Core Run	Sample Number	Blow Count	% Recovery	Reading within indicated scale     Reading outside indicated scale     Soil Vapour (ppm)     Solid PVC     Solid PVC     Slotted PVC     Well Name 1: EV_MW_SPR1-A Well Name 2: EV_MW_SPR1-B
ă	Soil Des	cription		Stra	Sar	Sar	BIG	%1	10 <sup>1</sup> 10 <sup>2</sup> 10 <sup>3</sup> 10 <sup>4</sup>
51-	SAND, fine grained, silty, poorly (continued) BEDROCK, shale, angular, black		e, wet.						BENTONITE
53-	Bottom of hole at 53.3 m.								
54-									
56-									
58-									
59-									
00-				NOT	TES				

	CNICAT ANA	TINI	Т		Client <b>oal Lir</b>	nited			Borehole	e No. : EV_BH_SPR-C
7))	SNC+LAVA		Regional		cation ndwate		oring			PAGE 1 OF 1
Drilling Boreh	g Contractor Owen's Drilling g Method Dual Rotary ole Dia. (m) 0.15 Slotted Pipe Dia. (m) 0.05/0.05		Date Monitored Ground Surface Ele Top of Casing Elev Northing: 5511278.	. (m) ´	113 113	9 03 06 7.270 8.188 ting: 653	945.61	9	Project Number: Borehole Logged Date Drilled: Log Typed By:	660613 By: AMH 2019 01 21 VL
Depth in Metres	Drilling Legend  Sample Interval  ▼▼▼ Air Rotary	Water/NA  ▼ Water Le  ▽ Water Le  • NAPL  ◇ NAPL		Stratigraphy Plot	Sample Interval Core Run	Sample Number	Blow Count		Reading within indicated scale Reading outside indicated scale  Soil Vapour (ppm)	Solid PVC Slotted PVC  Well Name 1: EV_MW_SPR1-C
De	Soil Des	cription		Straf	Sam	Sam	Blo	ਔ % 10	0 <sup>1</sup> 10 <sup>2</sup> 10 <sup>3</sup> 10 <sup>4</sup>	
0-	COBBLES, rounded, up to 20 cr		al rounded to	00000						
2-	SAND, fine grained, some fine to subrounded, poorly graded, brow	o coarse gravi vn, loose, dry.	el, rounaea to							BENTONITE
3-										¥// //
	SAND and GRAVEL, fine to coa coarse gravel, subrounded, well	rse grained sa graded, brow	and, fine to n, damp.	(° ()						EV_MW_SPR1-C
4-	At 4.0 m - moist									SAND
5-	At 4.9 m - wet			00	* * * * * * * * * * * * * * * * * * *					
- 6-	Bottom of hole at 5.2 m.									
7-										
8-										
9-										
10-	1			NO	ΓES					

1:50

PROJECT No.: 12.1349.0013

#### RECORD OF BOREHOLE: EV\_MCgwD

BORING DATE: November 3, 2013

SHEET 1 OF 5

CHECKED: CD

DATUM: UTM Zone 11 (Nad 83)

LOCATION: See Location Plan N: 5511616 E: 653475

SS THOD	SOIL PROFILE	[ <sub>5</sub> ]	SAMP		DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m 20 40 60 80	HYDRAULIC CONDUCTIMITY, k, cm/s 10 <sup>6</sup> 10 <sup>5</sup> 10 <sup>4</sup> 10 <sup>3</sup>	PIEZOMETE OR Z STANDPIP
METRES BORING METHOD	DESCRIPTION	STRATA PLOT	NUMBER	BLOWS/0.3m	20 40 60 80  SHEAR STRENGTH nat V. + Q- rem V. ⊕ U- 20 40 60 80	WATER CONTENT PERCENT  Wp :	OSE INSTALLATI NESTALLATI
0	Ground Surface	344.73	1		20 40 60 80	10 20 30 40	Stick-up =0.84 m
1	SAND, coarse and medium-grained, and fine-grained GRAVEL, rounded to sub-rounded, moderately graded, wet, very loose						
52.4 mm (OD)	SAND, fine and medium-grained, sub-rounded to sub-angular, well graded, dry, very loose	341.07 3.66					15 Nov 2013 ☑
o o Sonic 127 mm (ID) Casing 152.4  Sonic 127 mm (ID) Casing 152.4	Sh.T, some fine-grained sand, well graded, very loose Wet at 5.8 m	339.05					Bentonite Pellets
8	CLAY, some fine-grained sand, well-sorted, moist, compact	336.65 8.00					
10	CONTINUED NEXT PAGE				Golder		

DATA ENTRY: IPG LOCATION: See Location Plan

PROJECT No.: 12,1349,0013

# RECORD OF BOREHOLE: EV\_MCgwD

BORING DATE: November 3, 2013

SHEET 2 OF 5

DATUM: UTM Zone 11 (Nad 83)

	N: 5511616 E: 653475																(Nad 83)
빌	SOIL PROFILE	1.	, <u> </u>	SA	MPLES			NETRATA , BLOWS			HYDRAU k				T	.0	PIEZOMETE OR
METRES METRES BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE TYPE	SHEA Cu, ki	R STRE a	NGTH	natV. + rem.V.⊕	Q- <b>●</b> U- Q	10 <sup>4</sup> WA <b>W</b> p 1	TER CO	NTENT P	ERCEN	T /I	ADDITIONAL LAB, TESTING	STANDPIPI INSTALLATIO
- 10	CLAY, some fine-grained sand, well-sorted, moist, compact (continued)															***************************************	
- 11	SILT, some fine-grained sand, well graded, well, very toose		333.30 11.43														
- 13																	
19 (ID) Casing 152.4 mm (OD) JR Drilling	CLAY, some fine-grained sand, well-sorted, wet, soft		330.40 14.33														Bentonite Pellets
99 Sonic 127 Fr	CLAY, some fine-grained sand, well-sorted, moist, compact		328.88 15.85			da d'Alt des fest fest des sais à l'Alt resident des des la company de la company de la company de la company d								,			
17	CLAY, some fine-grained sand, well-sorted, moist, loose		327.36 17.37														
- 18	•						W- Walder Address of the Control of										
. 20	CONTINUED NEXT PAGE																
DEPTH So	CALE					Œ	AS	olde soci	er ates							LOGGED: (	



PROJECT No.: 12.1349.0013 LOCATION: See Location Plan RECORD OF BOREHOLE: EV\_MCgwD

BORING DATE: November 3, 2013

SHEET 3 OF 5

DATUM: UTM Zone 11 (Nad 63)

N: 5511616 E: 653475

3 2 3 3 3 3	한	SOIL PROFILE	۱ <sub>۲</sub>	T	┼~	MPLE		DYNAN RESIST				<b>)</b>	HYDR/		ОМОИС 0 <sup>6</sup> 1		193 I	កិចិ	PIEZOMET OR STANDPII INSTALLAT
DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	SHEAR Cu, kPa	STREA	IGTH	nat V1 rem V. 6	80 - Q- <b>●</b> 0 U- O	W <sub>s</sub>	ATER C	ОМТЕМІ	PERCE	WI	ADDITTONAL LAB. TESTING	INSTALLAT
- 20		•						2	0 4	10	60	80	1	0 :	20 :	30	40		<u> </u>
- 21		CLAY, some fine-grained sand, well-sorted, moist, loose (continued)														p production			Bentonita Pellets
- 22																			
- 24	: mm (OD)							•											Silica Sand
26	Sonio 127 mm (ID) Casing 152.4 JR Drilling																	,	Slotted Section
28								The state of the s			Salari Sa								Silica Sand
- 30									. <del></del>										Bentonite Pellels Slough
		CONTINUED NEXT PAGE																	
DEF	P7H S0	CALE					(	PA P	G	olde	er ates							LOGGED; (	

PROJECT No.: 12.1349.0013 LOCATION: See Location Plan RECORD OF BOREHOLE: EV\_MCgwD

BORING DATE: November 3, 2013

SHEET 4 OF 5

DATUM: UTM Zone 11 (Nad 83)

N: 5511616 E: 653475

DEPTH SCALE METRES BORING METHOD	SOIL PROFILE	SAMPLES DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m	HYDRAULIC CONDUCTIVITY, k, cm/s  10 <sup>4</sup> 10 <sup>3</sup> 10 <sup>1</sup> 10 <sup>3</sup> 10 <sup>4</sup> 10 <sup>5</sup> 10 <sup>1</sup> 10 <sup>5</sup> 2 2 5 STANOPIPE INSTALLATION
DEPTH MED BORING	DESCRIPTION	EV. PTH m)	Q-  WATER CONTENT PERCENT
- 30 - 31 - 32 - 33 - 34 - 34 - 6	CLAY, some fine-grained sand, well-sorted, molst, loose (continued)  CLAY, some fine-grained sand, well-sorted, wol, soft	14.28 30.45	
2. 2. 2. 2. 2. 2. 2. 2. 2. 2. 2. 2. 2. 2			Slough
- 38	angular, well graded, wel, vary loose	05.87 38.86	
DEPTH S	CONTINUED NEXT PAGE	Golder	LOGGED: RT



PROJECT No.: 12.1349,0013 LOCATION: See Location Plan

N: 6511616 E: 653475

# RECORD OF BOREHOLE: EV\_MCgwD

BORING DATE: November 3, 2013

SHEET 5 OF 5

DATUM: UTM Zone 11 (Nad 83)

S VE	S S S	SOIL PROFILE	; T <sub>F</sub>	1	SA	MPLE		AMIC PEI			1	F	AULIC C			 .10	PIEZOMETE
DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	SHE Cu,	AR STRE	NGTH	nat V. + rem V.	30 U O	W	ATER C	ONTENT	PERCE	ADDITIONAL LAB. TESTING	STANDPIPE INSTALLATIO
41		SILT and SAND, coarse-grained, sub-angular, moderately-sorted, wet, vory loose (confinued) SANDY SILT, fine-grained, moderately-sorted, wet, very loose		304,34 40,39													THE THE THE THE THE
52.4 mm (OD)	fling	CLAYEY SAND, fine-grained, some coarse-grained gravel, angular, moderately-sorted, brown, wet, very loose		302,03 42.67													SECTION STANDARD AND AND AND AND AND AND AND AND AND AN
Sonic 127 mm (ID) Cas	an Drilling	GRAVEL, fine-grained, sub-rounded, moderately-sorted, grey to brown, very toose, wet	DO DO DO DO DO DO DO DO DO DO DO DO DO D	300.69 44.04													Slough
46		SAND, medium-grained with some fine grains, sub-rounded, poorly graded, mainly black to grey and brown, wet									1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1						CANTANTANTANTANTANTANTA
47		End of BOREHOLE.		297,18 47,55													XV-LXV-LXXV-L
46		NOTES: Sloughing present to 29.9 m. Stendpipo installed to 27.6 m upon well completion. Groundwater fewel measured at 2.5 mbgs on November 7, 2013. Groundwater level measured at at 2.5 mbgs on November 1, 2013.		41.00													
49	-	3.4 mbgs on November 15, 2013.				,											
50																	
DEPT		CALE ,					(	) G	olde	er ates						LOGGED: F CHECKED: (	

PROJECT No.: 12.1349.0013 LOCATION: Soe Location Plan

#### RECORD OF BOREHOLE: EV\_MCgwS

BORING DATE: November 6, 2013

SHEET 1 OF 2

DATUM: UTM Zone 11 (Nad 83)

N: 5511624 E: 653476 DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3ml HYDRAULIC CONDUCTIVITY, k, cm/s PIEZOMETER SOIL PROFILE SAMPLES BORING METHOD DEPTH SCALE METRES OR STANDPIPE BLOWS/0.3m INSTALLATION NUMBER 가 ELEV. SHEAR STRENGTH Cu, kPa nal V. + Q - ● rem V. ⊕ U - Q WATER CONTENT PERCENT DESCRIPTION -ОМ. DEPTH Wρ ⊢ (m) Stick-up =0.96 m Ground Surface
SAND, coarse and medium-grained,
and fine-grained GRAVEL, rounded to
sub-rounded, moderately graded, dark
brown, damp, very loose 15 Nov 2013 \( \frac{1}{2} SAND, fine and medium-grained, sub-rounded to sub-angular, poorly graded, brown, dry, very loose Bentonite Pellets 340.16 4.57 CLAYEY SILT, some fine-grained sand, dark brown to grey, moist, soft to very 339.24 5,49 CLAYEY SILT, some fine-grained sand, dark brown to grey, wet, very soft, very Sillca Sand loose (runny) BOREHOLE - EXPANDED ADD. LAB TESTING 12,1349,0013 BH LOGS, GPJ CALGARY, GDT 4/8/14 Slotted Section Slough 335.58 9.14 CLAY, some fine-grained sand, well-sorted, moist, compact CONTINUED NEXT PAGE

DEPTH SCALE

1:50



LOGGED: RT

1:50

PROJECT No.: 12.1349.0013

LOCATION: See Location Plan

# RECORD OF BOREHOLE: EV\_MCgwS

BORING DATE: November 6, 2013

SHEET 2 OF 2

CHECKED: CD

DATUM: UTM Zone 11 (Nad 83)

N: 5511624 F: 653476

		N: 5511624 E: G53476																		
ų.	Ş	SOIL PROFILE			S/	MPL	ES	DYNAM RESIS	IIC PEN	ETRATI BLOWS	ON 10.3m	1	HYDR	AULIC C	ONDUC	TIVITY,	T			METER IR
METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/D.am	SHEAF Cu, kPa	O 4 R STREN	0	50	0- 0 U- 0	1 V	0 <sup>6</sup> 1	ONTEN	PERCE	NT WI	ADDITTONAL LAB. TESTING	STANI INSTAL	39i9d
10	H	CLAY, some fine-grained sand, well-sorted, moist, compact (confinued)				-	8	2	0 4	0	50	30		10 :	20	30	10	~		11.5
	JR Ddilling	End of BOREHOLE.		334,06 10,67															Slough	
11		NOTES: Standpipe installed to 7.32 m upon well completion. Groundwater level measured at 3.8 mbgs on November 7, 2013. Groundwater level measured at 1.1 mbgs on November 15, 2013.																		
12		1,1 mbgs on November 15, 2013.							-											
13																				
4		·																		
15																				
		·																		
16																				
7												:								
.8				4																
9		•						:												
18 18																				

DATA ENTRY: IPG PROJECT No.: 12.1349.0013 LOCATION: See Location Plan

#### RECORD OF BOREHOLE: EV\_ER1gwD

BORING DATE: 29 and 31 October, 2013

SHEET 1 OF 4

DATUM: UTM Zone 11 (Nad 83)

N: 5510952 E: 651379

PIEZOMETER OR STANDPIPE INSTALLATION DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m HYDRAULIC CONDUCTIVITY, k, cm/s SOIL PROFILE SAMPLES BORING METHOD DEPTH SCALE METRES 105 BLOWS/0.3m NUMBER TYPE ELEV. SHEAR STRENGTH Cu, kPa nat V. + Q.- ● rem V. ⊕ U - Q WATER CONTENT PERCENT DESCRIPTION DEPTH (m) -М-Wp I Stick-up =0.71 m Ground Surface
SILTY SAND, fine-grained with
occasional medium grains, rounded to
sub-rounded, moderately graded, minor
organics (roots), dry, very loose SAND, medium and coarse-grained, and fine-grained with some coarse-grained GRAVEL, poorly sorted, sub-rounded, sub-angular and angular clasts, dry, very loose 16 Nov 2013 ∑ Bentonite Chips BOREHOLE - EXPANDED ADD, LAB TESTING 12.1349.0013 BH LOGS.GPJ CALGARY.GDT 4/8/14 329,95 \_\_\_9,91 CONTINUED NEXT PAGE DEPTH SCALE

1:50



LOGGED: RT

PROJECT No.: 12.1349.0013 LOCATION: See Location Plan RECORD OF BOREHOLE: EV\_ER1gwD

BORING DATE: 29 and 31 October, 2013

SHEET 2 OF 4

DATUM: UTM Zone 11 (Nad 83)

N: 5510952 E: 651379

DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m HYDRAULIC CONDUCTIVITY, k, cm/s PIEZOMETER OR STANDPIPE INSTALLATION SOIL PROFILE SAMPLES 80

щ 8	SOIL PROFILE			SA	MPL	ES	DYNA! RESIS	IC PEN	ETRAT BLOW	ION 5/0.3m	1	HYDR	AULIC C	ONDUC	TIVITY,	Т		PJEZOMETE
DEPTH SCAL METRES BORING METH	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	SHEAF Gu, kPa	O 4 RSTREM	IO I IGTH	60 nat V. + rem V. €		M W	0 <sup>6</sup> · ∕ATER C	ONTEN	TPERCE	WI	ADDITIONAL LAB. TESTING	STANDPIPE INSTALLATIO
10 0 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	SAND, medium to coarse-grained with some coarse grains, sub-rounded to sub-angular, poorly sorted, wet, very loose (continued)	STEATA PLOT	(m)		TYPE	LEGNSW018	SHEAF Gu, kPa	O 4 RSTREM A	IO I IGTH	60 nat V. + rem V. €		M W	0 <sup>6</sup> · ∕ATER C	ONTEN	TPERCE	NT	ADDITIONAL LAB. TESTING	OR STANDPIPE INSTALLATIO
- 19	CONTINUED NEXT PAGE							·	<b></b>									
DEPTH S	CONTINUED NEXT PAGE					_				er ates				<u> </u>		<del></del>	LOGGED: I	



DATA ENTRY: IPG LOCATION: See Location Plan

PROJECT No.: 12,1349,0013

#### RECORD OF BOREHOLE: EV\_ER1gwD

BORING DATE: 29 and 31 October, 2013

SHEET 3 OF 4

N: 5510952 E: 651379

DATUM: UTM Zone 11 (Nad 83)

ij.	ορ	SOIL PROFILE			SA	MPL	ES	DYNA/ RESIS	VIC PEN TANCE,	ETRATI BLOWS	Ο.3m	1	HYDR	AULIC C	ONDUC	IMITY,	T		PIEZOMET
METRES	BORING METHOD		P	<b></b>	œ		33m					30		t	1	<u> </u>	03 T	ADDITIONAL LAB, TESTING	OR STANDPIE INSTALLATI
	RING	DESCRIPTION	STRATA PLOT	ELEV. DEPTH	NUMBER	TYPE	BLOWS/0.3m	SHEAR Cu, kP	R STREN	IGTH	natV. 1 em V. ⊕	Q- <b>●</b> U- Q		ATER C	онт <b>е</b> мт —— <del>О</del> W	PERCE			,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,
5	BOF		STR	(m)	ž	ľ	B.C					30					WI 10	<u>8</u> 8	
20																			
21		SAND, medium to coarse-grained, some fine-grained gravel, angular to sub-angular, moderately sorted, wet, very loose (continued)																	
22				-															Bentonite Chips
23			30.350.350.350.35																
24	(00)																		
25	127 rnm (ID) Casing 152,4 mm (OD) JR Drilling												-						Silica Sand
26	Sonic 127 r											E							
27				311.96 27.89															Slotted Section
28		SILTY SAND, fine to medium-grained, occasional angular gravel, rounded to sub-rounded, moderately graded, dry, very loose (BEDROCK)		27.69															Sition Count
29																			Silica Sand Bentonite Pellets Slough
~ [		CONTINUED NEXT PAGE									l			i					
DEI	РТН S 50	CALE					(	F	<del>,</del>	olde oci	er ates							LOGGED: CHECKED:	



PROJECT No.: 12.1349.0013 LOCATION: See Location Plan

#### RECORD OF BOREHOLE: EV\_ER1gwD

BORING DATE: 29 and 31 October, 2013

SHEET 4 OF 4

DATUM: UTM Zone 11 (Nad 83)

		N: 5510952 E: 651379																(Nau ba)	
ш	8	SOIL PROFILE			S	AMP	.ES	DYNA	MIC PEI	NETRAT	ION S/O 3 m	1	HYDRAU	LIC CONE	UCTIVITY	, т	1	PIEZOMI	ETER
DEPTH SCALE METRES	BORING METHOD		ō		<u>_</u>		Ë					30	106	10 <sup>6</sup>	10*	10° T	ADDITIONAL LAB, TESTING	OR STANDI	PE
H. H.	ON.	DESCRIPTION	TA PI	ELEV. DEPTH	NUMBER	TYPE	BLOWS/0.3m				natV. + remV. ⊕	Q- •	WAT	ER CONT			FEE FEE	INSTALL	ATION
A	BOR		STRATA PLOT	(m)	₹	-	E,O	1				30	Wp F 10	20	30 30	] W( 40	各		
			T	<b>-</b>	╁	╁	<del> </del>	<del> </del>	1	1	T	1		Ť	30	10			
→ 30 -	Π.	SILTY SAND, fine to medium-grained, occasional angular gravel, rounded to sub-rounded, moderately graded, dry, very loose (BEDROCK) (continued)	W		T										$\top$				
-	JR Drilling	sub-rounded, moderately graded, dry,										1						Slough	
-	, E	Tery toose (DEDITOCITY (Commission)	N.	1								1							
_	╟┸╴	End of BOREHOLE.	-\\	309.07 30.78	-	┼-	<del> </del>	<del> </del>		<del> </del>	<del> </del>	├─			+				
— 31 -					l														-
-																			-
_		NOTES: Standpipe installed to 28.9 m upon																	=
-		Standpipe installed to 28.9 m upon well completion. Groundwater level measured at 4.6 mbgs on November 16, 2013.															<u> </u>		-
_ 32		'4.6 mbgs on November 16, 2013,	ļ						}	-									-
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									-										

DEPTH SCALE

1:50

BOREHOLE - EXPANDED ADD, LAB TESTING 12.1349,0013 BH LOGS,GPJ CALGARY,GDT 4/8/14



LOGGED: RT

PROJECT No.: 12.1349.0013

# RECORD OF BOREHOLE: EV\_ER1gwS

BORING DATE: October 30, 2013

SHEET 1 OF 2

DATUM: UTM Zone 11 (Nad 83)

LOCATION: See Location Plan

N: 5510955 E: 651374

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with scene file galants, rounded to sub-control, moderately granted, day, why occords.  15 Nov 2015 1
COMTINUED NEXT PAGE



DATA ENTRY: IPG PROJECT No.: 12.1349,0013 LOCATION: See Location Plan

#### RECORD OF BOREHOLE: EV\_ER1gwS

BORING DATE: October 30, 2013

SHEET 2 OF 2

DATUM: UTM Zone 11 (Nad 83)

N: 5510955 E: 651374

SS E	SOIL PROFILE	Τĸ	1	-	MPI		!	MIC PEN TANCE,			, l		AULICC k,cm√s 0 <sup>6</sup> 1	_		103 I	78	PIEZOMETE OR STANDPIPE
DEPTH SCALE METRES BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	SHEAI Cu, kP	R STRE	NGTH	nat V. + rem V. €	80 - Q - O 80	w w	ATER C	ONTENT OW	PERCE	NT	ADDTHONAL LAB. TESTING	INSTALLATIO
- 11	SAND, medium to coarse-grained, some fine-grained gravel, sub-rounded, sub-angular and engular, moderately sorted, wet, very loose (continued)																	Bentonite Chips
13 13 13 14 152.4 mm (OD)																		(771,771,
9 9 7 1 1 1 1 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	-																	Silice Send
. 16		90000000000000000000000000000000000000														,		Stotted Section :
			322,24															
- 18	End of BOREHOLE,  NOTES: Slandpipe installed to 17.6 m upon well completion. Groundwater level measured at 8.2 mbgs on October 30, 2013. Groundwater level measured at 4.7 mbgs on November 16, 2013.		17.61								-							
- 19 - 20	THE HOUSE OF FLORENHOOL TO, 2010.																	
DEPTH S	CALE	<u> </u>		<u> </u>		<u>l</u>	4	G	old	er ates	1		L	<u> </u>	L	<u></u>	LOGGED:	

Depth (mGL)	Lithological Description Lith	ology
o		1.2.00 S
1	0-3.0mGL: FILL (GW) GRAVEL, fine sand - fine gravels, angular - sub- rounded, dark grey - black, moist	2012
2		
3	3.0-11.9mGL: (GW) GRAVEL, fine sand - fine gravels , sub-angular - sub-rounded, dark brown, moist	
4	GRAVEL, as above but dry and brown-grey	
5	GRAVEL, as above but angular - sub-rounded	
6	GRAVEL, as above but sub-angular - sub-rounded, and moist, very rare clay	
7		
8	GRAVEL, as above but sandier, with white precipitate or silty texture (cemented horizon?), dry	
9		1
10	GRAVEL, as above but more moist again	
11	Water indications from driller around 11,3-11.6mGL	
12	11.9-16,8mGL: BEDROCK- brown and grey shale (Kootenay Fm)	Ī
13		Ì
14	Driller felt what might have been a fracture zone around 14.3 mGL	
15		
16		

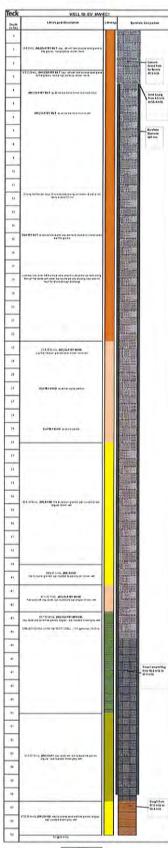
Leg	end
Fill/Spoil	
Clay	
Silty-Clay	
Clayey Silt	The second
Clayey Sand	
Sand	
Clayey Gravel	100
Sand & Gravel	1000
Gravel	
Bedrock	

# MONITORING WELL CONSTRUCTION DETAILS Short Well ID Spud Date: 27-JAN-2019 Well Owner: TECK COAL - EVO-AWTF Project Short Title: EVO-AWTF Project Number: 18102898 EV\_MW\_BC2 (N5509496, E655878) Well Name: EV\_MW\_BC2 Site Geologist: G. Harding Drilling Method: Development: Airlifting **Dual Air Rotary** Method: SCHEMATIC ONLY-NOT TO SCALE LOCKABLE STEEL PROTECTIVE CASING STICKUP: 0.95 m GROUND LEVEL: 1175.59 masl XXXXXXXXXXXXXXXX BOREHOLE DIAMETER: 187 mm STATIC WATER LEVEL. 5.28 mGL MEASURED DATE: 31-JAN-2019 RISER PIPE SIZE: 50.8 mm 2 in MATERIAL: SCH80 PVC **GROUT TO SURFACE** TOP OF SEAL: 10.5 mGL SEAL: BENTONITE PELLETS BOTTOM OF SEAL: 12.5 mGL TOP OF SCREEN: 13.7 mGL WELL SCREEN MATERIAL: SCHD80 PVC SIZE: 50.8 mm 2 in SLOT SIZE: 10-SLOT FILTER PACK: 10/20 SAND TD & BOTTOM OF SCREEN: 16.8 mGL NOTES: 1. mosl - metres obove see level 2. mGL - metres below ground level 3. TD - Total Depth **Golder Associates**

<u>ľeck</u>	WELL ID: EV_MW_BC3		
Depth (mGL)	Lithological Description	Lithology	Well
0			
1	0-3.0mGL: FILL (GW) GRAVEL, fine sand - fine gravels, angular - sub- rounded, dark grey - black, moist		
2			
3	3.0-11.9mGL: (GW) GRAVEL, fine sand - fine gravels , sub-angular - sub-rounded, dark brown, moist		
4	GRAVEL, as above but dry and brown-grey		48
5			
6	GRAVEL, as above but angular - sub-rounded		
7			
8	GRAVEL, as above but sub-angular - sub-rounded, and moist, very rare clay		
9			
10	GRAVEL, as above but sandier, with white precipitate or silty texture (cemented horizon?), dry		31-01-19
11	GRAVEL, as above but more moist again		
	11.9-12.2mGL: Bedrock - brown and grey shale (Kootenay Fm)		
12	TD @ 12.2 mGL		

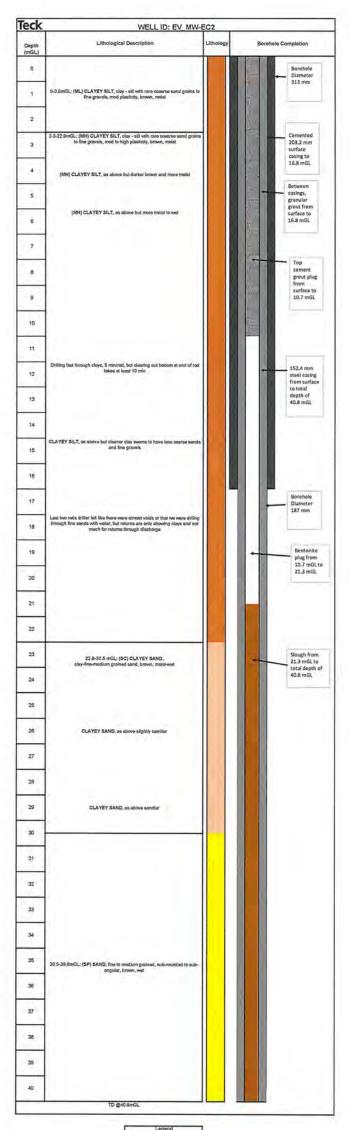
Lege	end
Fill/Spoil	A CONTRACTOR OF THE PARTY OF TH
Clay	
Silty-Clay	800000000000000000000000000000000000000
Clayey Silt	
Clayey Sand	
Sand	
Clayey Gravel Sand & Gravel	
Sand & Gravel	
Gravel	
Bedrock	

# MONITORING WELL CONSTRUCTION DETAILS Short Well ID Well Owner: TECK COAL - EVO-AWTF Spud Date: 29-JAN-2019 Project Short Title: EVO-AWTF EV MW BC3 Project Number: 18102898 (N5509498, E655878) Well Name: EV\_MW\_BC3 Site Geologist: G. Harding Drilling Method: Development: Airlifting Method: **Dual Air Rotary** SCHEMATIC ONLY-NOT TO SCALE LOCKABLE STEEL PROTECTIVE CASING STICKUP: 0.99 m GROUND LEVEL: 1175.62 masl SURVEY DATE: 05-NOV-2018 BOREHOLE DIAMETER: 187 mm RISER PIPE SIZE: 50.8 mm 2 in MATERIAL: SCH80 PVC GROUT TO SURFACE TOP OF SEAL: 4.2 mGL SEAL. BENTONITE PELLETS BOTTOM OF SEAL 6.4 mGL TOP OF SCREEN 8.5 mGL WELL SCREEN MATERIAL: SCH80 PVC SIZE: 50.8 mm 2 in SLOT SIZE: 10-SLOT STATIC WATER LEVEL: 10.62 mGL MEASURED DATE: 31-JAN-2019 FILTER PACK: 10/20 SAND BOTTOM OF SCREEN: 11.6 mGL TD: 12.2 mGL NOTES: masl — metres above sea level mGL — metres below ground level TD — Total Depth - Total Depth Golder Associates

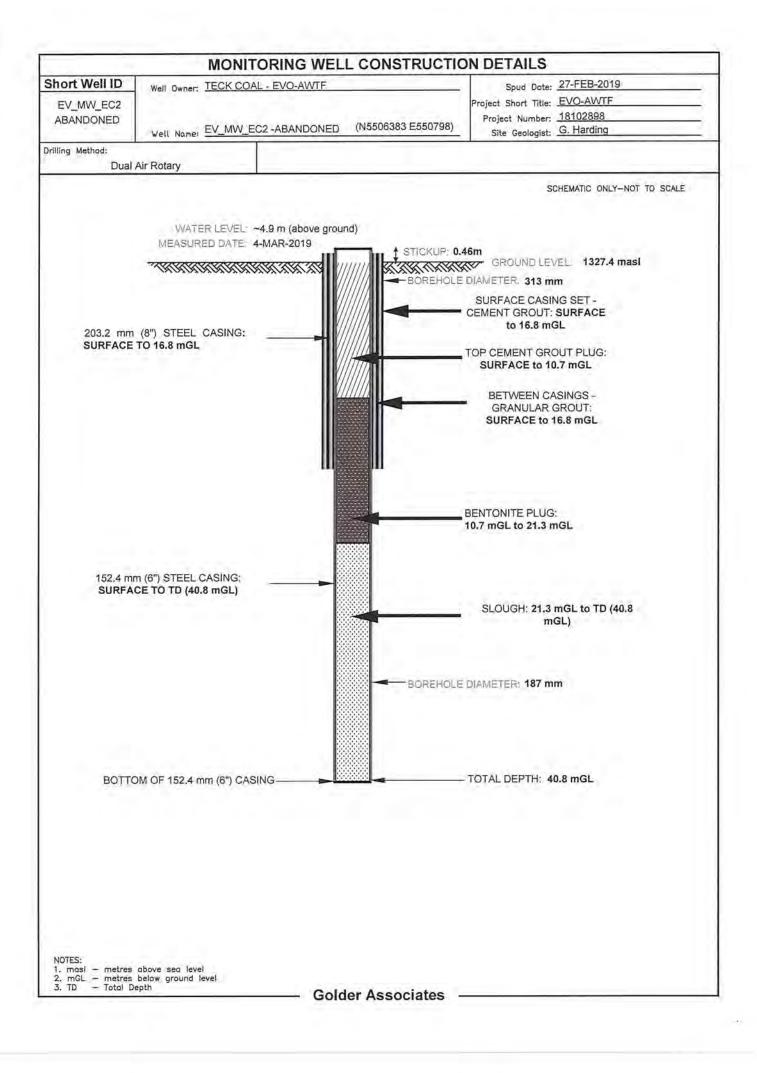




# MONITORING WELL CONSTRUCTION DETAILS Short Well ID Spud Date: 30-JAN-2019 Well Owner: TECK COAL - EVO-AWTF Project Short Title: EVO-AWTF EV\_MW\_EC1 Project Number: 18102898 ABANDONED Well Namer EV\_MW\_EC1 (ABANDONED) (N5506381 E660795) Site Geologist: G. Harding **Drilling Method: Dual Air Rotary** SCHEMATIC ONLY-NOT TO SCALE WATER LEVEL: ~20.4 m (above ground) MEASURED DATE: 18-FEB-2019 GROUND LEVEL: 1327.58 masl SURFACE - BENTONITE NEW MENTAL SERVICE SERVICES SE CHIPS TOP OF CASING: 4.3 mGL BOREHOLE DIAMETER: 187 mm CEMENT-GROUT (THERMAL 40 CEMENT): SURFACE TO 45.1 mGL 152.4 mm (6") STEEL CASING: 4.3 mGL TO 56.4 mGL TRICAN CEMENT PLUG (THIXOTROPIC CLASS G THERMAL): 45.1 mGL TO 57 mGL BOTTOM OF CASING: 56.4 mGL SLOUGH: 57 mGL to TD (59.4 mGL) TOTAL DEPTH: 59.4 mGL NOTES: 1. masl – metres above sea level 2. mGL – metres below ground level 3. TD – Total Depth **Golder Associates**

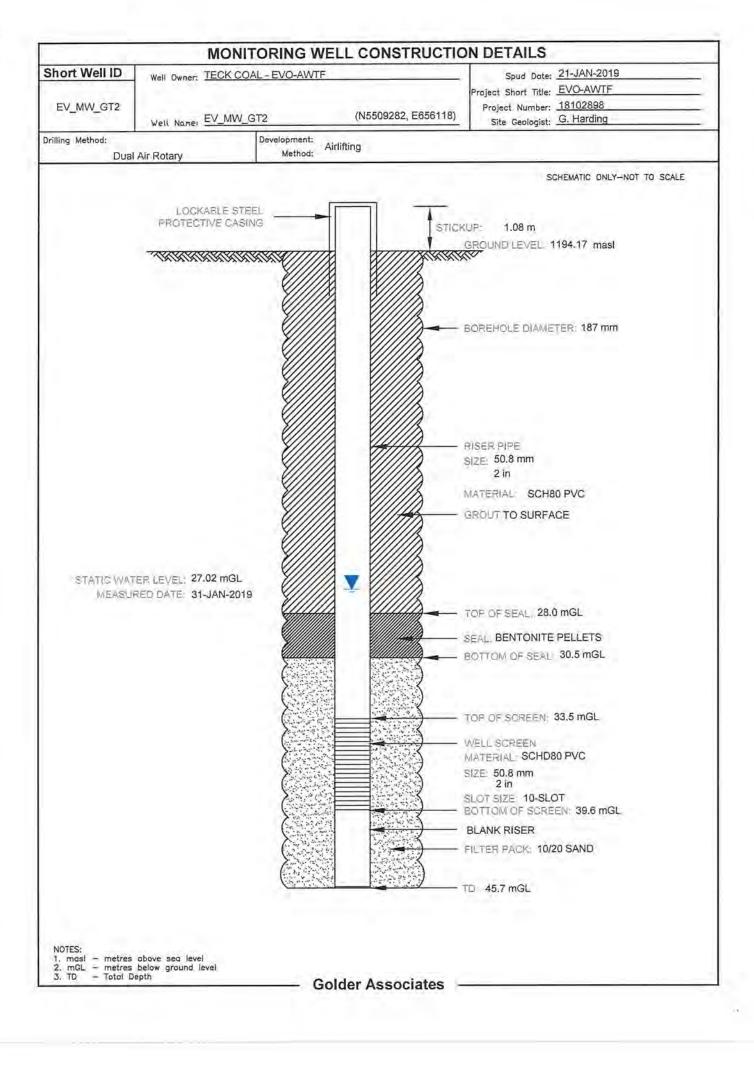






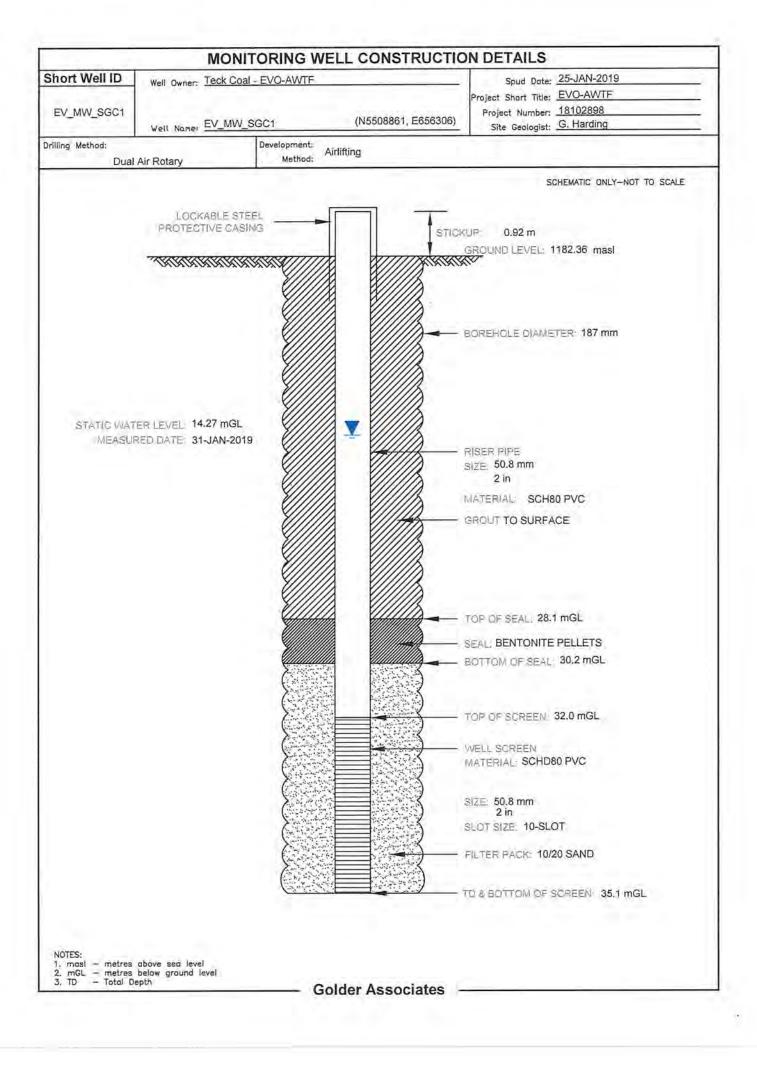
Teck	WELL ID: EV_MW_GT2	in T	45.4
Depth (mGL)	Lithological Description	Lithology	Well
0			
3	The form intelligence to the same and the sa		
2	D-L.SmCL: (SW) SAND, tine sand - fine gravels , sub-angular - sub-counded, dark brown, dry		
3			
4			
5	4.6-5.1mGL: (OW) GRAVEL, fine sand - fine gravets , sub-angular - sus- rounded, dark brown, dry		
6			
7	6,1-9,1mGL, (SW) SAND, fine sand - fine growth, sub-angular - sub- rounded, dark brown, moist		
ő			
9	9.1-15.2mGL: (GW) GRAVEL line send - fine gravels , sub-angular - sub- rounded, brown, any		
10			
-11	GRAVEL, as above, but more moist and darker brown		
12			
13			
14	GRAVEL, as above, but drier and lighter brown		
15	15.2-16,8mGL; (SP) SAND, few grained, most, brown, with rare fine gravel clasts		П
16	clasts		П
17			
16			
19			
20			
21	16.6-26.5mGL: (GW) GRAVEL, fire sand - tine prevers , sup-engular - sup- tounded, brown, dry		Н
22			Ш
23			
24			
25			
26	26.5-27.4mGL: boulder, angular - sub-angular, light brown, dry		
27	ani-rational powers, argues t assembly says strong, says		A
28			
29			П
30	27,4-35,6mGL (GW) GRAVEL medium sand - fine gravets , sub-langular - sub-rounded, clark brown, most		
31			П
32			П
33	enue la de de de de de de de de de de de de de		
34	GRAVEL is more claying darker grey proven, and elicro moist		
35	GRAVEL is slightly more moist		
36	Some water between connections		
37			
38	THE SALT THE SALT CHANGE CHANGE CHANGE CHANGE CHANGE		目
39	38.6-42.7mGL: (GC) CLAYEY GRAVEL, clay - Tine gravula , sub-angular - sub-counded, dark brown grey, most.	-	目
40			
41			
42			
	42,7-44,2mGL (OW) ORAVEL, coarse cand - fine gravelo , angular - sub- rounded, dark brown grey, wat (possibly bedrock angular fragments)		
43			1
43	44.2-45.7 mGL (SC) CLAYEY SAND, clay - line gravels , sub-angular - sub-		

Legend		
FilVSpoil		
Silty-Clay		
Clayey Silt		
Clayey Sand	4	
Sand		
Clayey Gravel		
Sand & Gravel		
Clay Silty-Clay Clayey Silt Clayey Sand Sand Clayey Gravel Sand & Gravel Gravel Bedrock		
Bedrock		



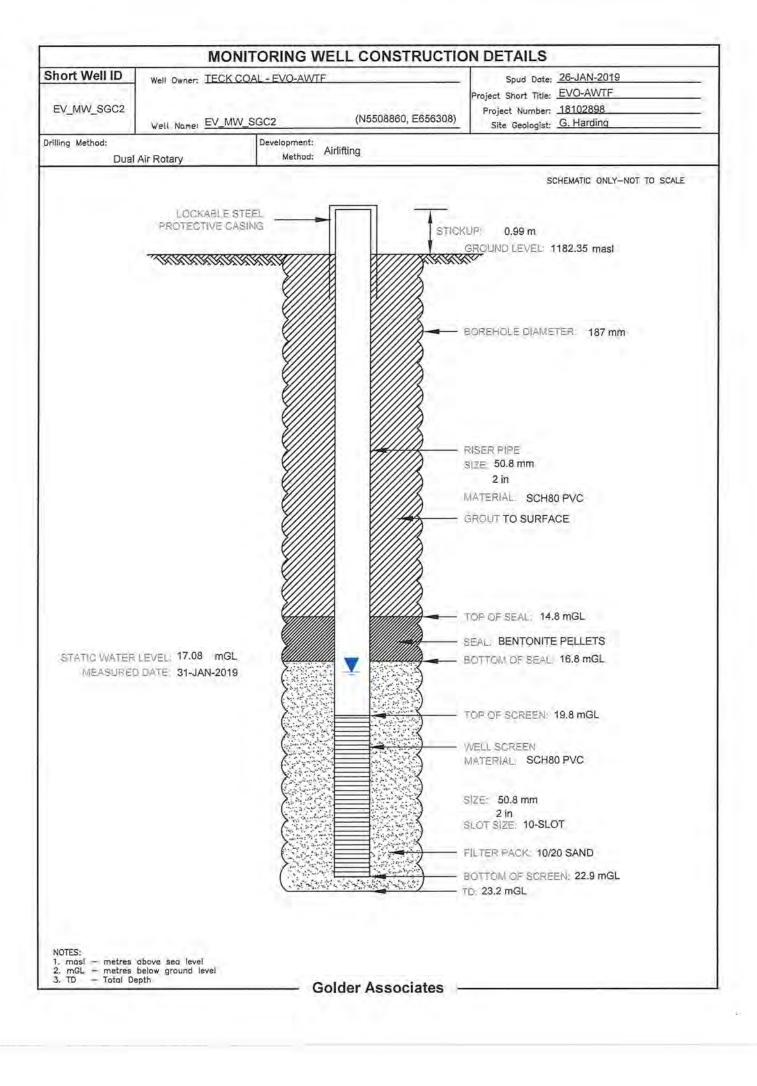
eck	CK WELL ID: EV_MW_SGC1		
Depth (mGL)	Lithological Description	Lithology	Well
0		****	
1	0-3,0mGL: (OL) ORGANIC SOIL, silty, dark brown, dry-moist		
2		į.	
3	3.0-9.1mGL: (GW) GRAVEL, fine sand - fine gravels , sub-angular - sub- rounded, grey brown, dry		
4			
5	GRAVEL, as above but moist and brown	8	ı
			L
6			
7			
V No.			
8			
9	9.1-12.2mGL:(GC) CLAYEY GRAVEL, clay- fine gravels , sub-angular - sub- rounded, brown, moist		
10			
10	CLAYEY GRAVEL, as above, but sandier, less clay		
-11			
12	422427-CL MODELLO 6-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1		
	12.2-13.7mGL: (SP) SAND, fine to medium sand with rare fine gravels and clay clast, sub-angular - sub-rounded, brown, moist		
13			31-01-11
14	13.7-22.9mGL: (SW) SAND, fine sand to fine gravels, sub-angular - sub-		١,
	rounded, brown, moist, and slightly clayey		
15			
16	SAND, as above slightly more clayey		
17	Sixto. Section Capity may carry		
11			
18	DURING INSTALL DRILLER INDICATED THAT THERE WAS WATER ACCUMULATING 3m deep at about 18,3mGL		
19			
			ı
20			ı
21			
22			
-22			
23	22.9-24.4mGL: (GC) CLAYEY GRAVEL, clay to fine gravels, sub-angular - sub-rounded, brown, and moist		ı
24			
	24.4-25.9mGL; (SC) CLAYEY SAND, clay to fine gravels, sub-engular - sub- rounded, brown with grey white matrix -possible coment residue(hard		
25	drilling and HCL rxn), and dry		
26	25.9-27.4mGL: (GC) CLAYEY GRAVEL, clay to fine gravels, sub-angular-		
27	sub-rounded, brown, and dry		
27	27.4-29.0mGL: (GM) SILTY GRAVEL, silt to fine gravets, sub-angular - sub-		
28	founded, brown, and dry		
29	29.0-30.2mGL: (GC) CLAYEY GRAVEL, clay to fine gravels, sub-angular -		
	sub-rounded, brown, and moist  DRILLER INDIGATED WATER AFTER CONNECTION WAS MADE @		
30	29.0mGL		
31			
32	30.2-35,1mGL: BEDROCK - light grey-brown shale (Kootenay Fm)		
33			
64			
34			

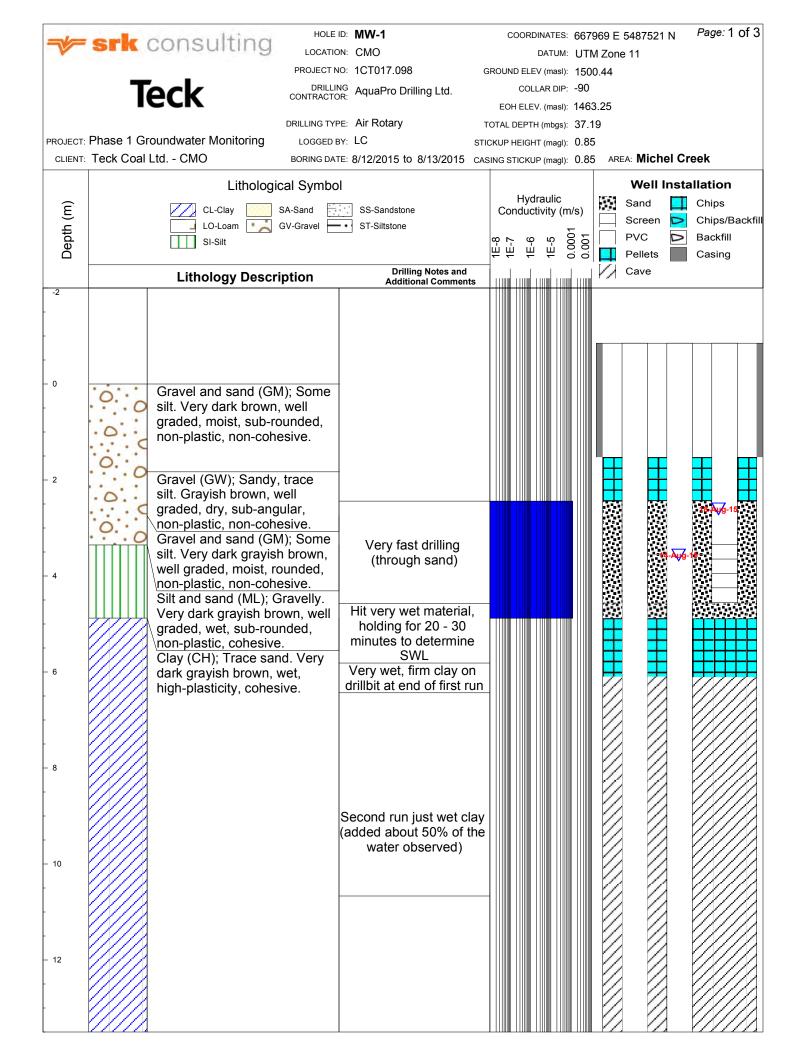
Legend		
Fill/Spoil	1000000	
Clay		
Silty-Clay		
Clayey Silt		
Clayey Sand Sand		
Sand		
Clayey Gravel		
Sand & Gravel		
Clayey Gravel Sand & Gravel Gravel		
Bedrock		

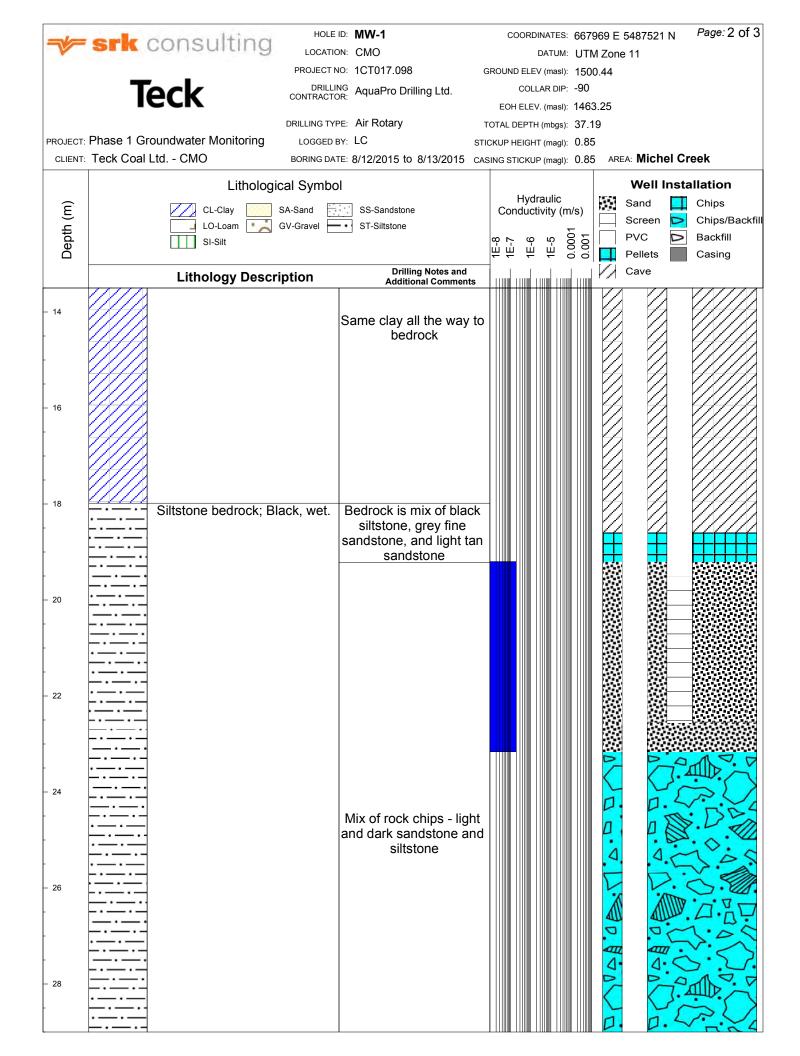


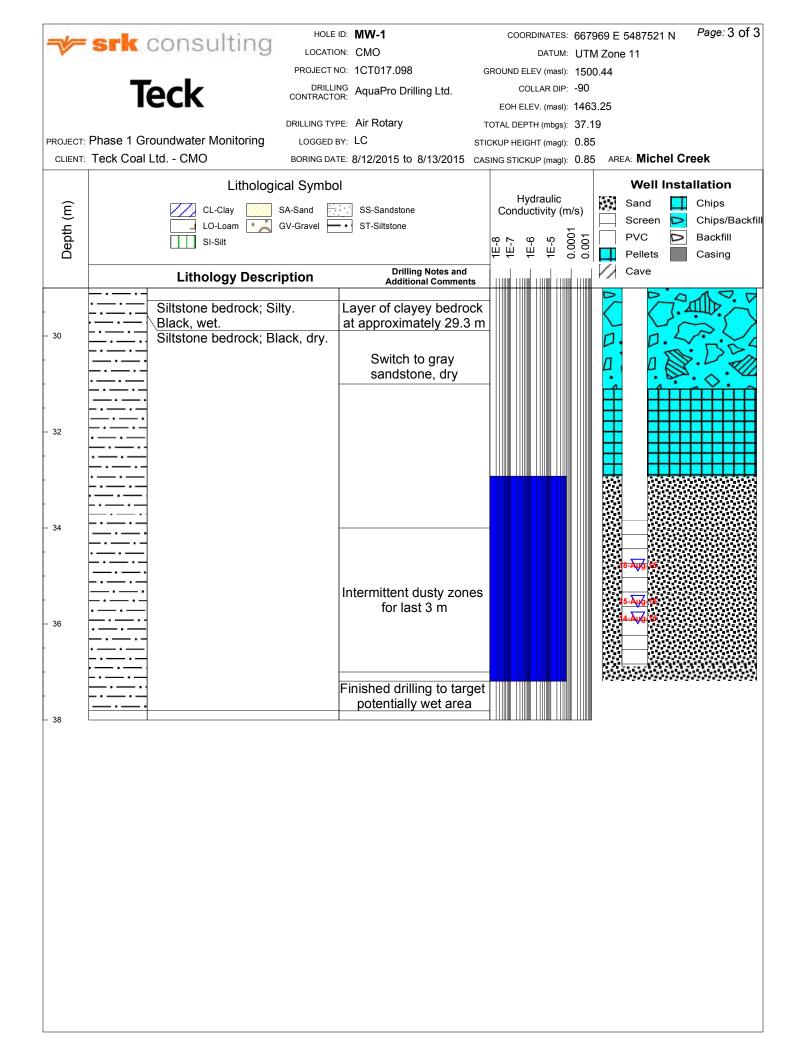
Depth (mGL)	Lithological Description	Lithology	Wel
0			
1	0-3.0mGL: (OL) ORGANIC SOIL, silty, dark brown, dry-moist:	0	
2			
3			
4	3.0-9.1mGL: (GW) GRAVEL, fine sand - fine gravels , sub-angular - sub-rounded, grey brown, dry		
5	GRAVEL, as above but moist and brown		
6			
7			
В			
9	9.1-12.2mGL: (GC) CLAYEY GRAVEL, clay- fine gravels , sub-angular-		
10	sub-rounded, brown, moist		
11	CLAYEY GRAVEL, as above, but sandier, less clay		
12	12,2-13,7mGL: (SP) SAND, fine to medium sand with rare fine gravels and clay clast, sub-angular - sub-rounded, brown, moist		
13			
14			
15			
16	13.7-23,2mGL: (SW) SAND, fine sand to fine gravels, sub-angular - sub-rounded, brown, moist, and slightly clayey		31-01-1
17			1
18			
19			
20	SAND, as above slightly more clayey		
21			
22			
23	TD @ 23.2mGL		

Legend		
Organic Material		
Clay		
Silty-Clay		
Clayey Silt		
Clayey Sand		
Sand		
Clayey Gravel		
Sand & Gravel		
Gravel		
Bedrock		

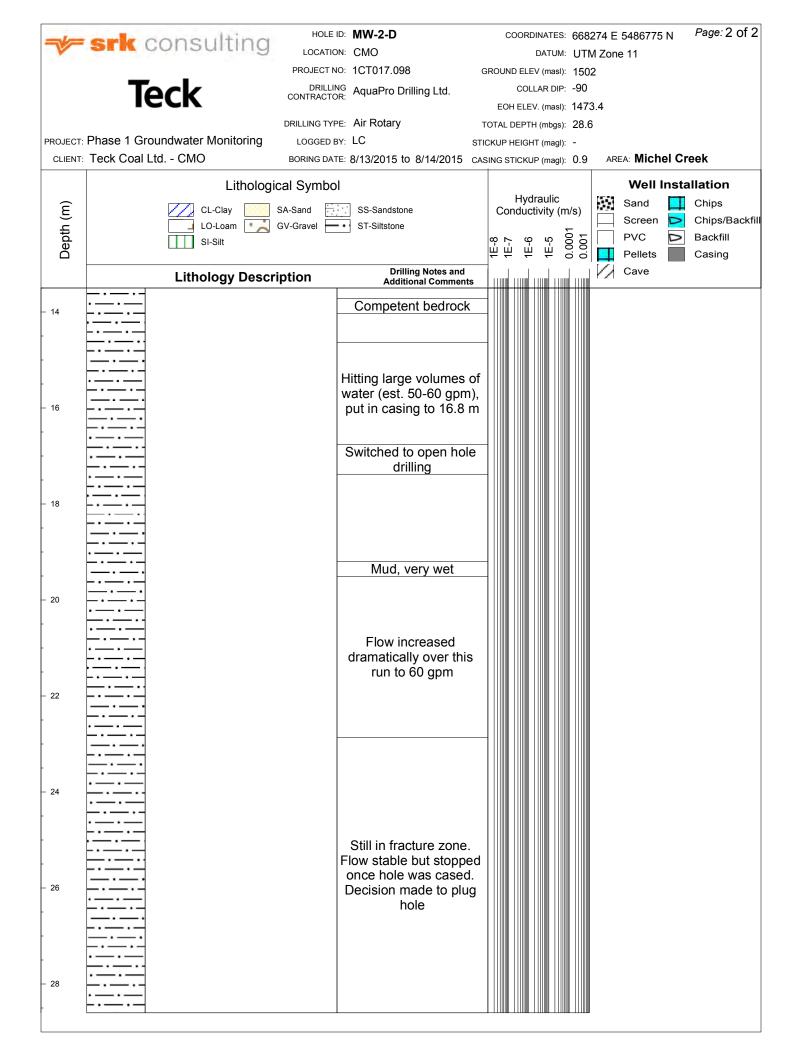


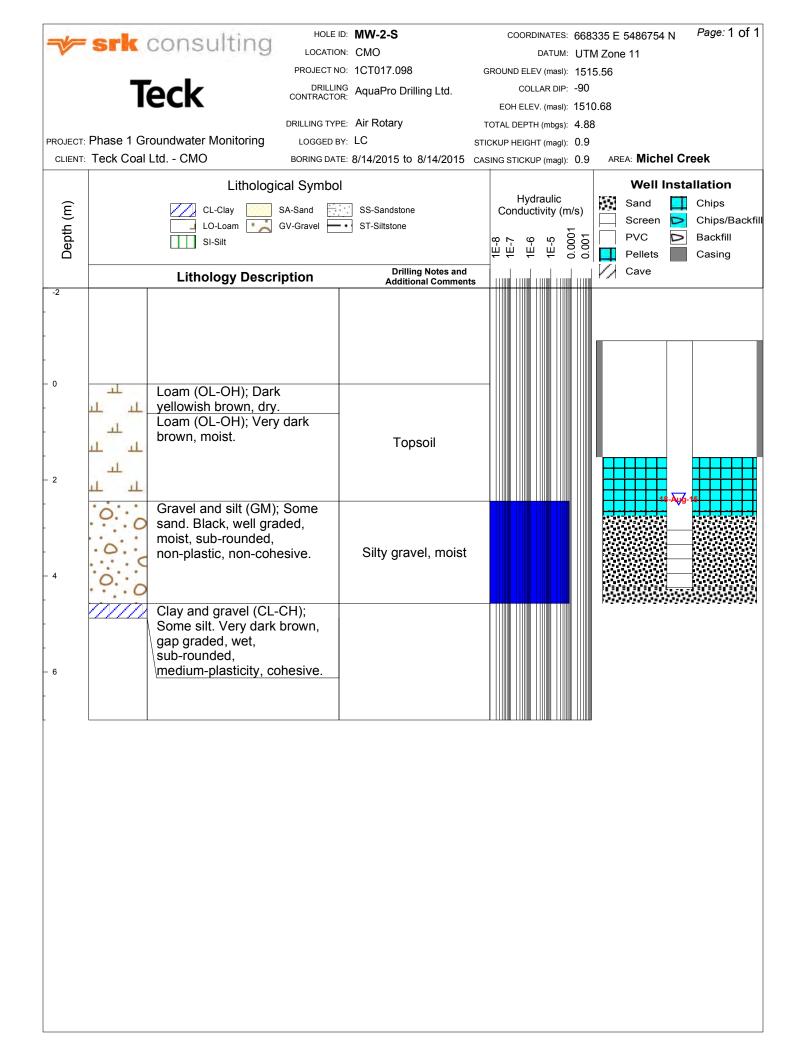


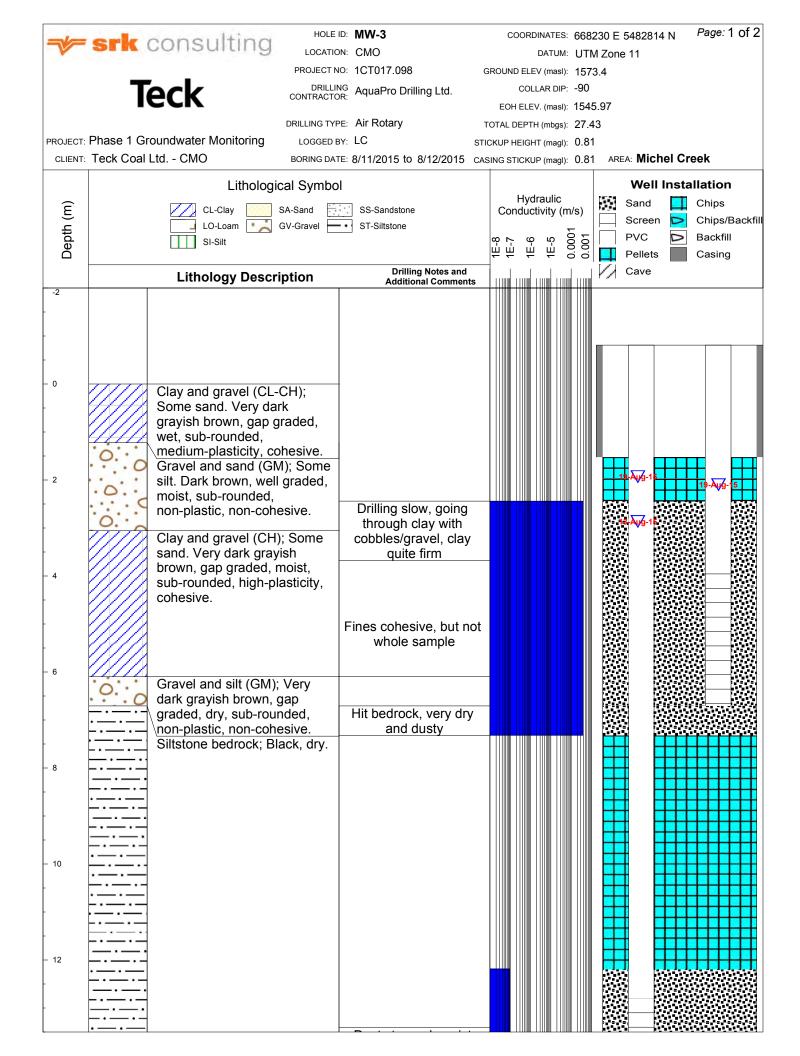


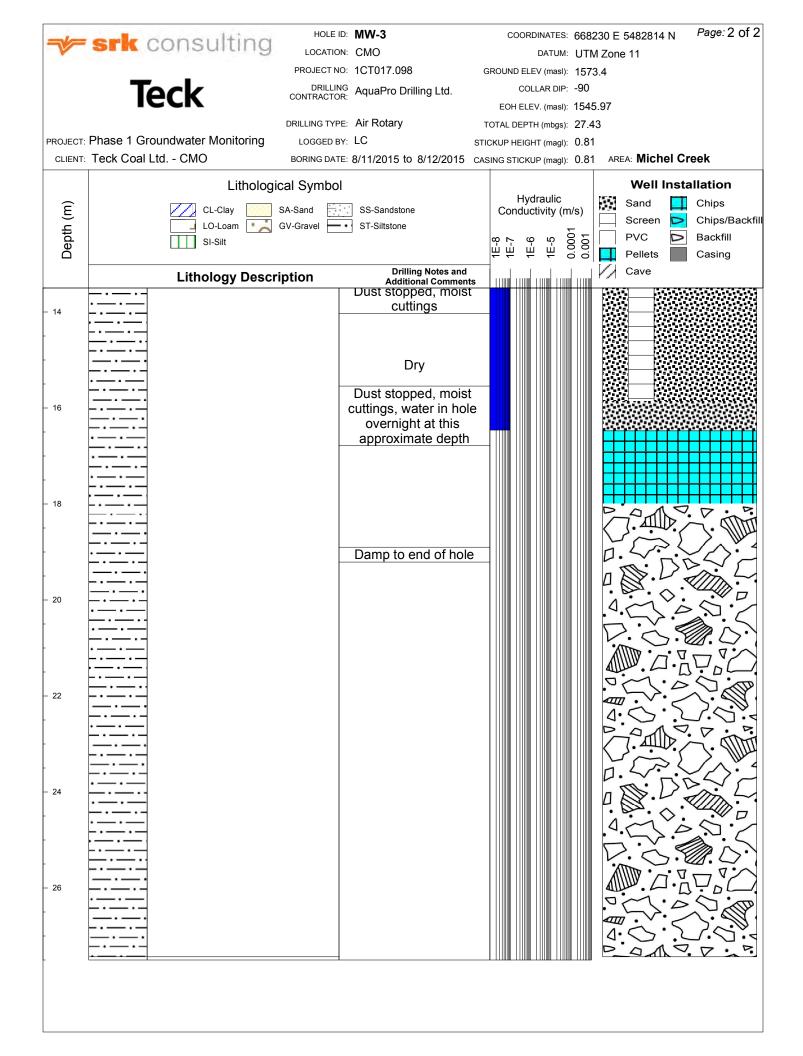


		444	HOLE	ID: <b>MW-2-D</b>			COOR	DINAT	FS.	668	274 F	5486775	5 NI	Page: 1 of 2
~	srk	consulting		DN: CMO		•							) I <b>V</b>	
											M Zon	e i i		
	_			io: 1CT017.098	GF	ROUN	ND EL	.EV (m	asl):	150	2			
	7	eck	DRILLIN	NG AquaPro Drilling Ltd.			CO	LLAR	DIP:	-90				
		CCIX	001111010			EO	H ELE	EV. (m	asl):	147	3.4			
			DRILLING TYP	E: Air Rotary	TC	TAL	DEP	TH (mb	gs):	28.6	3			
PROJECT:	Phase 1 Gr	roundwater Monitoring	LOGGED E	BY: LC	STIC	KUP	HFIG	HT (m	adl).	_				
		Ltd CMO		TE: 8/13/2015 to 8/14/2015					• /		۸۵	EA: <b>Mich</b>	al Cr	ook
OLILIVI.	T CON OOUI	Ltd. OWO	DOMINO DA	0/13/2013 to 0/14/2013	CASII	ING 3	TICK	OF (III	ayı).	0.5	AIN	LA. WIICII		COR
		Lithologi	cal Symbo	I								Well	Insta	llation
								draul				Sand		Chips
Depth (m)			SA-Sand	SS-Sandstone		Co	ndu	ctivity	/ (m/	s)		Screen		Chips/Backfil
₽			GV-Gravel -	ST-Siltstone					7			PVC		Backfill
de		SI-Silt			ľ	ф И	, <u> </u>	<u>т</u> 5. Т	ì	0.001				
						<del>, ,</del>			. 0	0		Pellets		Casing
		Lithology Descr	iption	Drilling Notes and Additional Comment		1111111	11111111			1111111	//	Cave		
-2			•	Additional Common						ш				
-											_			
-														
- 0	VI.													
	<u> </u>	Loam (OL-OH); Som												
	11 11	Very dark brown, poo												
	ıL	graded, moist, sub-ro		Topsoil										
	d d	non-plastic, non-coh	esive.	·										
-											-			
- 2		Gravel and silt (GM);	Some											
	0.0	sand. Black, well gra												
-		moist, sub-rounded,	ided,											
	.0	non-plastic, non-coh	aciva											
-		Gravel and silt (GM);												
_	0	sand. Very dark brov		Very fast drilling starti	na									
	0	graded, moist, sub-a		around 3.4 m - soft, w	ng									
- 4		non-plastic, non-coh		clay around 4.6 m	,ei									
			CSIVC.	Clay around 4.0 m										
		Clay and gravel (CL-	CH):											
-		Some silt. Very dark												
		gap graded, wet,	,											
-		sub-rounded,												
- 6		medium-plasticity, co	hesive.											
		, ,,												
-														
- 8		Siltstone bedrock; BI	ack, wet.	Fine sandstone to										
_				siltstone - fractured zo	one									
- 10				Switched to open hol	le									
	::			drilling										
ĺ	<b></b>			urining	-									
-					-									
- 12	·			Lots of clay mixed ir	า									
				with rock chips										
-				(weathered bedrock	()									
	_:-:-:													
L	. — . —													

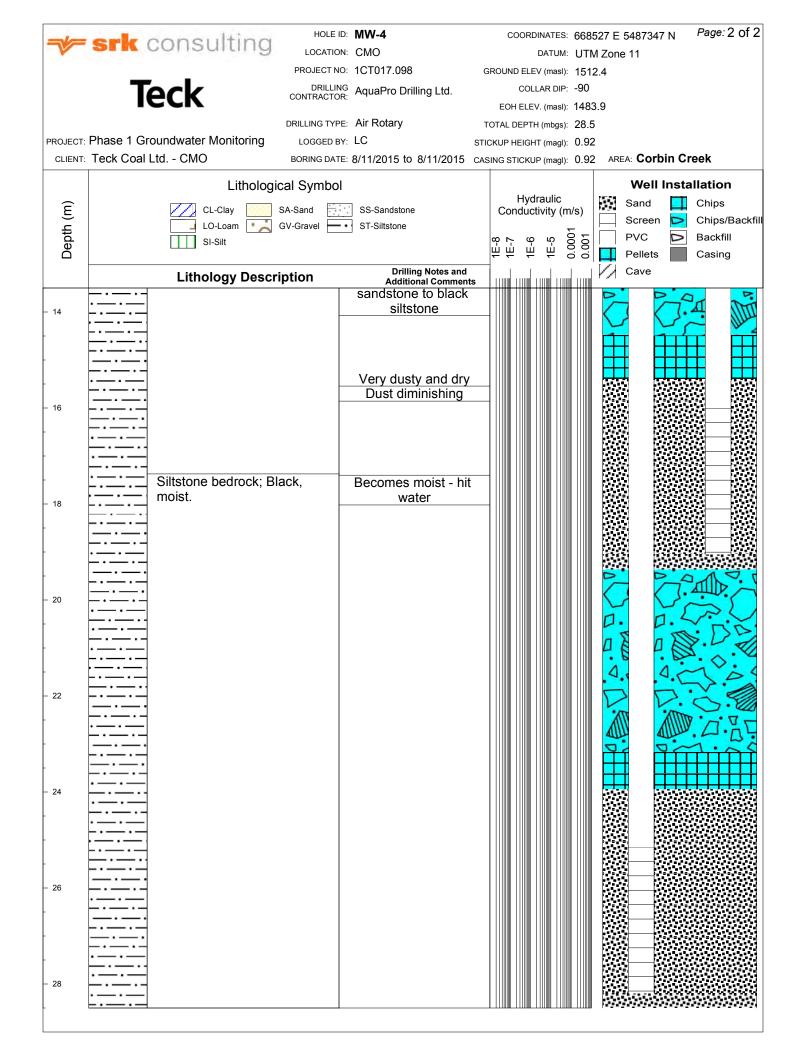


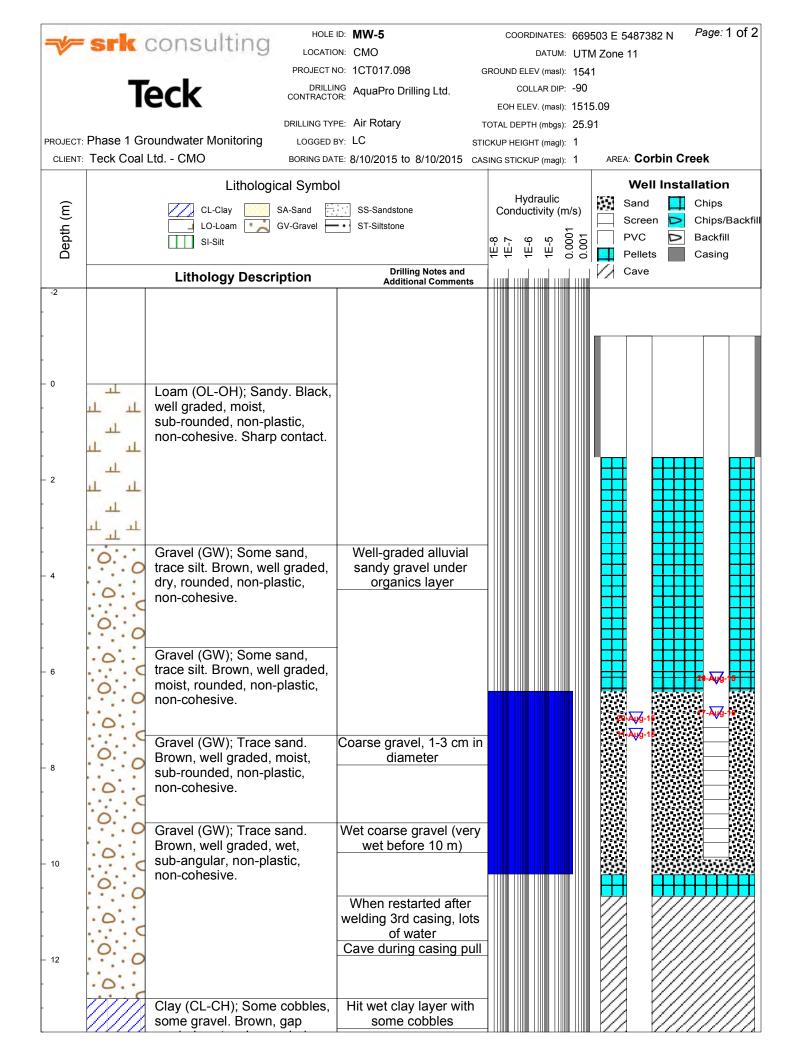


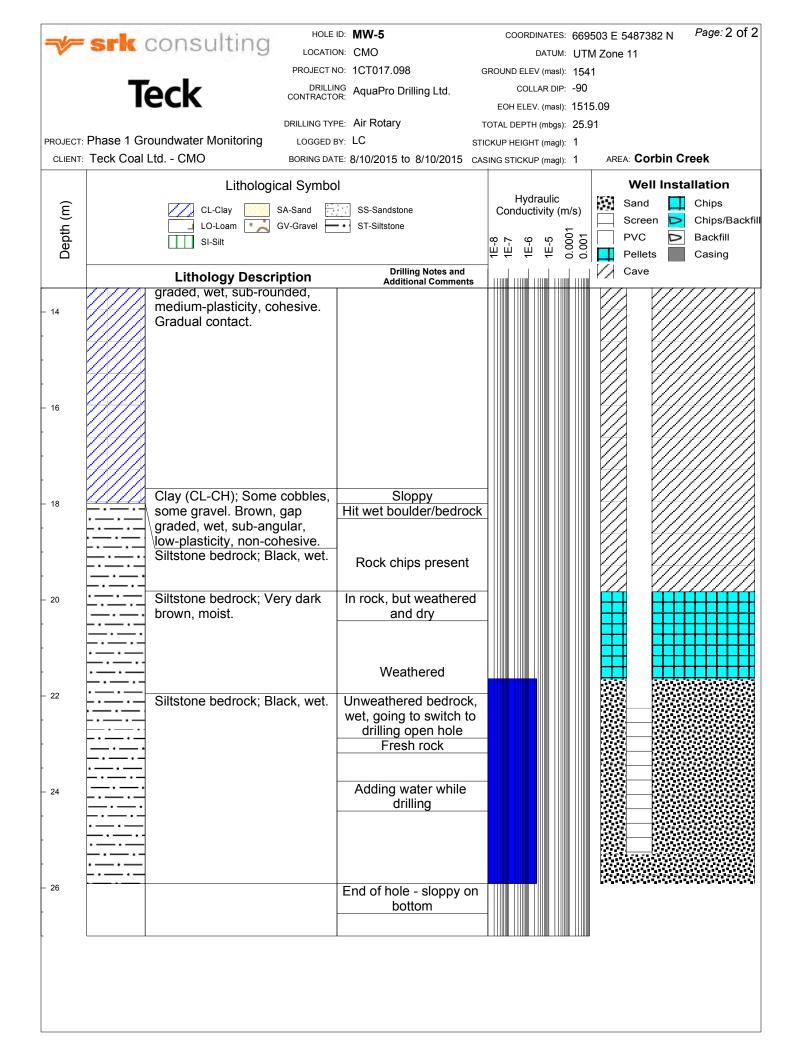


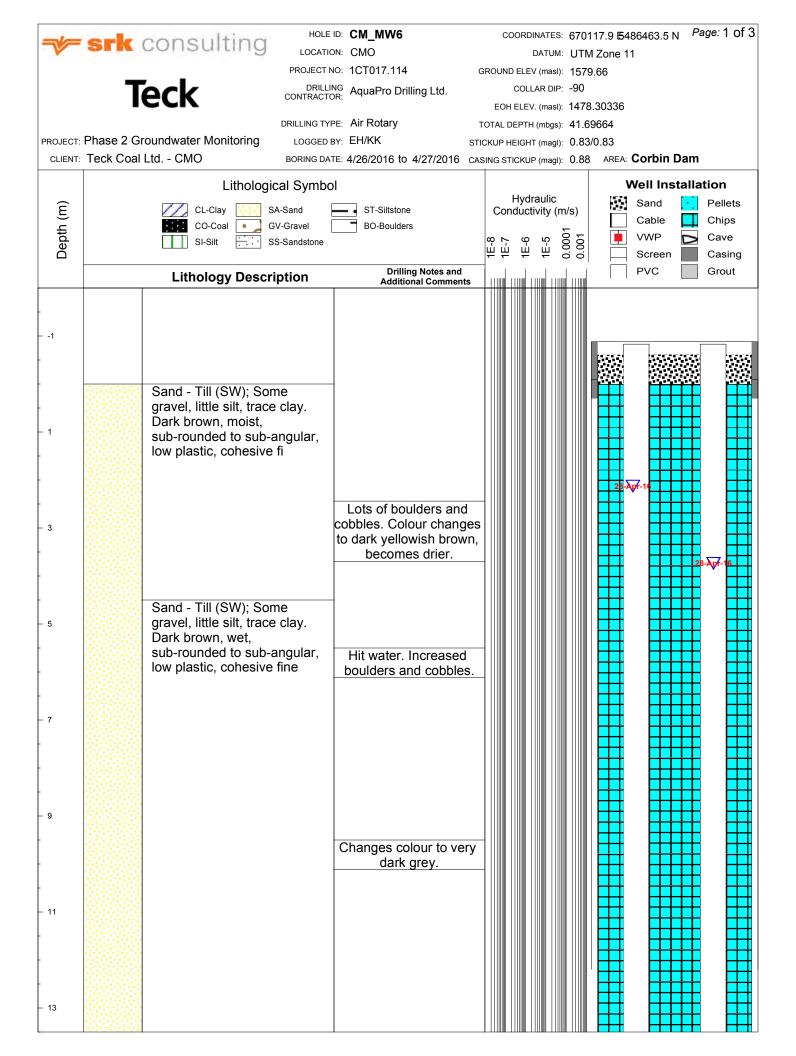


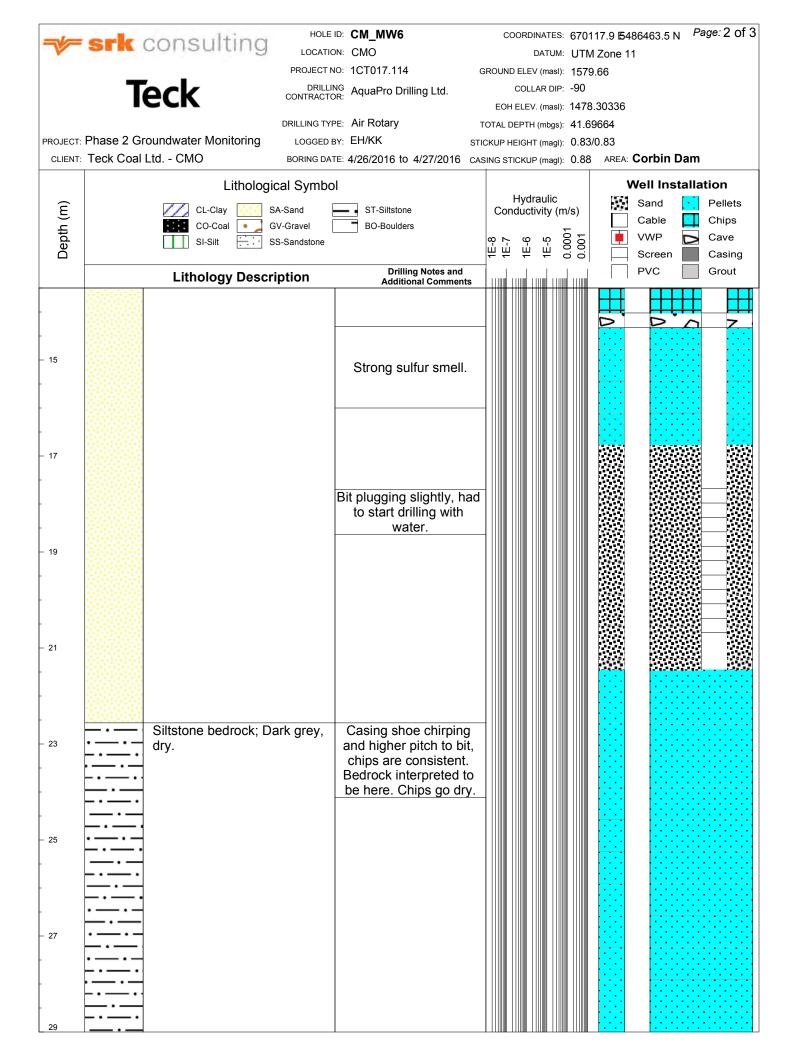
	cele	consulting	HOLE IE	D: MW-4	(	COORDIN	NATES:	6685	527 E	5487347 N	Pag	e: 1 of 2
	SIN	consuming	LOCATION	i: CMO		D	ATUM:	UTN	/I Zone	: 11		
	_		PROJECT NO	: 1CT017.098	GROU	ND ELEV	(masl):	1512	2.4			
	T	eck	DRILLING CONTRACTOR	G AquaPro Drilling Ltd.			AR DIP:					
	•	CCIX		Ain Datama		OH ELEV.						
DDO IFOT	Phase 1 Gr	roundwater Monitoring	LOGGED BY	E: Air Rotary		DEPTH						
		Ltd CMO		:: 8/11/2015 to 8/11/2015	STICKUP		,			:A: Corbin (	Creek	
OLILIVI.	TOOK OOU			0/11/2013 to 0/11/2013	CASING	STICKUP	(IIIagi).	0.52	. AIL			
		Lithologi	cal Symbol			Hydra	ulic		10020	Well Ins	_	
(E)		CL-Clay	SA-Sand	SS-Sandstone	Co	onductiv		s)		Sand Screen	Chip	os os/Backfi
Depth (m)		LO-Loam	GV-Gravel	• ST-Siltstone			. 5	. —	$\Box$	PVC D	Bac	
Dep		SI-Silt			行 8 1	1E-7 1E-6	1E-5	0.001		Pellets	Cas	
		Lithology Descr	ription	Drilling Notes and Additional Comments			1 1	ĺ		Cave	_	
-2		<b></b>		Additional Comments	•				1	9- <mark>Aug</mark> -15	10 X	ψ <mark>g</mark> -15
-									-1.8	4 mags 4.24 masl		mags
									131	4.24 111051		.13 masl
- 0		Gravel (GW); Sandy	. trace									
-	0	silt. Very dark brown	, well	Road fill								
	.0:	graded, moist, angul		rtodd iii								
		non-plastic, non-coh Gravel and sand (G\										
	00	dark brown, well gra									0	~ ·
- 2		moist, sub-angular,							Κ,		• 41	
-	.0.	\non-plastic, non-coh Gravel (GW-GP); So							П.	7.	2	. ~
_		Dark grayish brown,		Possibly weathered					0.5	5 0 5	6	5
		graded, moist, round	led,						4	¥ 4.6	<b>X</b> .	
		\non-plastic, non-coh							1.	4		
- 4		Sand (SM); Silty, sor gravel. Dark grayish										5
-	-:	well graded, moist,	Diowii,	Some siltstone preser	nt 📖				-41	775	The .	
		sub-rounded, non-pl	astic,								W. 7	
		non-cohesive. Sandstone bedrock;	Dark						D,	70	~	(ID)
		gray, dry.	Dark						411)		$\sim$	1
- 6		Sandstone bedrock;	Dark	Drilling like bedrock. Switching to open hole	_				4.	4.	$\sim$	] . <
-		gray, moist.		to confirm after first					7	7	A	M
_				casing					7		5	Miles
									1.	V	· ·	5
										DE	3.	<i>-</i>
- 8									1	1		D
-											-	<
-									1		. <	>.
											1	
				Some siltstone preser	nt				D	D	~	
- 10									4111		~	
-									4.	4.		] ~ <
-		Siltetone hadraale: Di	lack dry	Continuing through rea					7	7	PI	Mi
	·—·—	Siltstone bedrock; B		Continuing through roc open hole. Moist but no						٧	~	
				wet. Waiting for 1 hr to					0.	0.	4	کے ا
- 12				check WLs.					ПΣ	n E	\$.	2
-			ļr	No water after 1 hr ope hole. About 0.5 m	en				- 1	. 6	<i>∞</i> .	D
-	·			collapse.					٠4.	4		1
				Switch from grey fine					D			3.

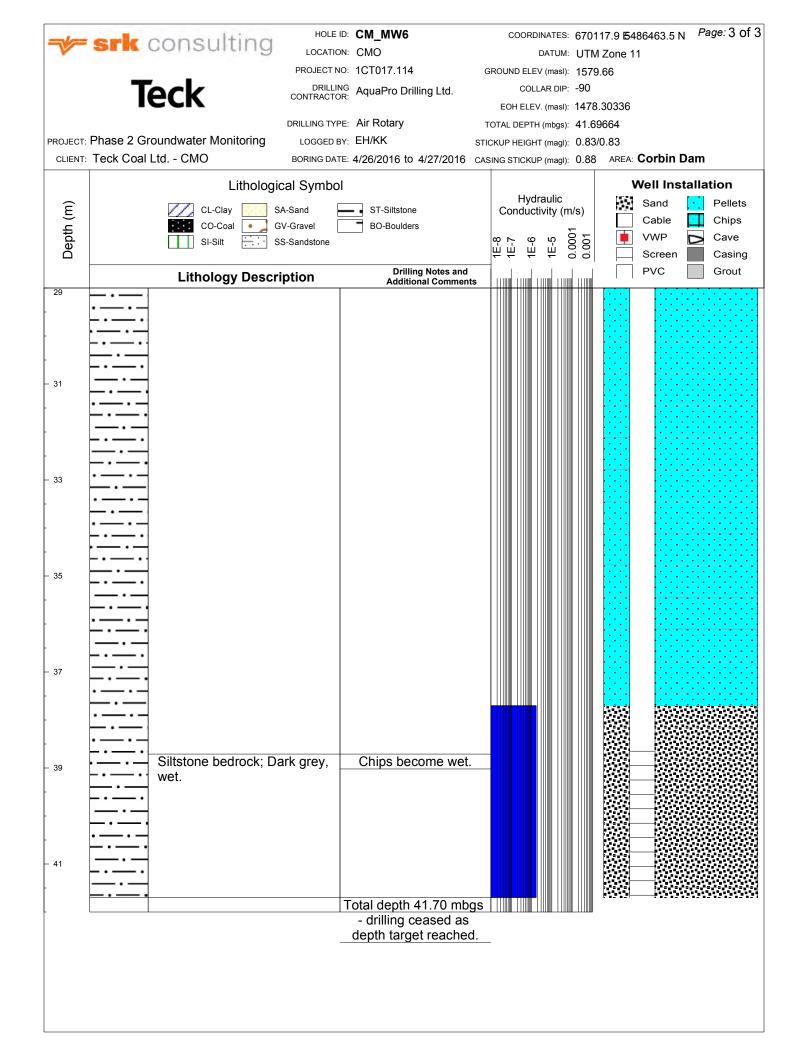














CMO LOCATION:

PROJECT NO: 1CT017.114

DRILLING CONTRACTOR: AquaPro Drilling Ltd.

COORDINATES:

668833 E 5485919.6 N Page: 1 of 9

DATUM: UTM Zone 11

GROUND ELEV (masl): 1755.77

> -90 COLLAR DIP:

1668.72736 EOH ELEV. (masl):

	DRILLING TYPE: T: Phase 2 Groundwater Monitoring LOGGED BY: T: Teck Coal Ltd CMO BORING DATE:	DM/E	Rotary EH 2016 to 4/22	/2016		TOTAL DEPTH STICKUP HEIGH CASING STICKU	T (magl):	78.27264 0.81/0.81 0.86 AREA: <b>34</b>	Pit		
Depth (m)	Lithological Symbol  CL-Clay SA-Sand ST-Siltstone  CO-Coal GV-Gravel BO-Boulders  SI-Silt SS-Sandstone		Gamma (API-GR)	00 00 00 00 00 00 00 00 00 00 00 00 00	Resistivity (ohm-m)	Dhysics Density Comp (g/cc)	(g/cc) Comp	BHC-DELT (usec/m)		ell Installa Sand Cable VWP Screen	Pellets Chips Cave Casing
_	Lithology Description Drilling Notes and Additional Comme	ents					111111111111111111111111111111111111111			PVC	Grout
1 - 1 - 3 - 5			AMANAMANAMANAMANAMANAMANAMANAMANAMANAMA								
- - 7	Sand and Gravel (SW/GM); Sand with gravel and silt, possible cobbles; Dark grey to brown, damp, moist,		While Many May Ally						\[ \frac{1}{\frac{1}{2}} \]	4.0	



CMO LOCATION:

PROJECT NO: 1CT017.114

DRILLING CONTRACTOR: AquaPro Drilling Ltd. GROUND ELEV (masl):

COORDINATES:

UTM Zone 11

668833 E 5485919.6 N Page: 2 of 9

DATUM: 1755.77

-90 COLLAR DIP:

1668.72736 EOH ELEV. (masl):

			DRILLING TYPE: Air	Rotary			TOTAL DEPTH (	, ,	78.27264		
D	DO IECT:	Phase 2 Groundwater Monitoring		1/EH					0.81/0.81		
- 1		Teck Coal Ltd CMO			/2010		STICKUP HEIGHT	. 0,	0.86 AREA: <b>34</b>	Dis	
$\vdash$	CLIENT.	Teck Coal Etd CIVIO	BORING DATE: 4/2	0/2016 to 4/22	72016		CASING STICKUP	(magl):	U.00 AREA: 34	<i>-</i>	
		Lithological Symbo	I			Geo	ohysics			Well Ins	stallation
	<u>ج</u> ا	CL-Clay SA-Sand	ST-Siltstone	Gamma	Caliper	Resistivity	Density	Comp	BHC-DELT	Sand	Pellets
	ב	CO-Coal GV-Gravel	BO-Boulders	(API-GR)	(mm)	(ohm-m)		Density	(usec/m)	Cable	Chips
	Depth (m)	SI-Silt SS-Sandstone	BO-boulders				(g/cc)	(g/cc)	_ 0	VWP	Cave
	De	Si-Silt SS-Salidstolle		0 50 100 150	90 140 190 240 290	0 250 500 750 1000	0 0.25 0.5 0.75	0 4	0 500 1000	Screen	Casing
		Lithology Description	Drilling Notes and	-			l			PVC	Grout
$\vdash$		Sub-arigular, non-prastic	Additional Comments		111111111111111111111111111111111111111			111111111111111111111111111111111111111		D D	<del></del>
			mostly sand and fine					}			74 (-11
		Sand and Gravel (SW/GM);	gravel; typically dry to					}		$K \mid K$	١٠ ١٦
ŀ		Sand with gravel and some silt, possible cobbles; Dark	moist; not many chips -	<del></del>				}			' /   //
-	9	grey to brown, damp, dry,	fines content variable	M.				}			, 9 🔀
		sub-angular, non-plas		My S				{			
Ť				<b>2</b>				}		u  u	
-								>			• ]
				<b>N</b>				5		[4 [4,	·( > 1
Ī								}			
-	11			<b>M</b>				}			·
		Silty gravel with sand (GM);						}		%   %	$\overline{\mathcal{I}}$
		With silt, trace clay; Dark grey						}			
ŀ		to brown, dry, sub-rounded,						}		0	
-		\non-plastic, nonconhesive		~				{		•   •	$\forall \  \   \   $
		City and with mount (CM)						}			
ı	13	Silty sand with gravel (SM); Significant silt; trace clay.						}		4 4.	$\mathcal{A} \vdash \mathcal{A}$
-		Dark grey to brown, dry,						}		D D	_4 % 1
		sub-rounded, non-plastic,						}			(.
		∖rapid dilatancy,		W				}			
+				<b>S</b>				<b>\</b>			. 4 💹
	15							{			
		Sand and gravel (SP-SM);						}			
+		sandstone chips = possible						{		•   • '	<b>&gt;</b>
-		cobbles or boulders; brown to		Man				(		4	
		tan, dry, sub-rounded,		-				}			, \
t		non-plastic, noncohesi		AMANA MANAMANANANANANANANANANANANANANANA				}			ا 📗 ا
L	17	(2020)		3						., .,	



CMO LOCATION:

PROJECT NO: 1CT017.114

DRILLING CONTRACTOR:

AquaPro Drilling Ltd.

COLLAR DIP:

GROUND ELEV (masl):

COORDINATES:

DATUM:

EOH ELEV. (masl): 1668.72736

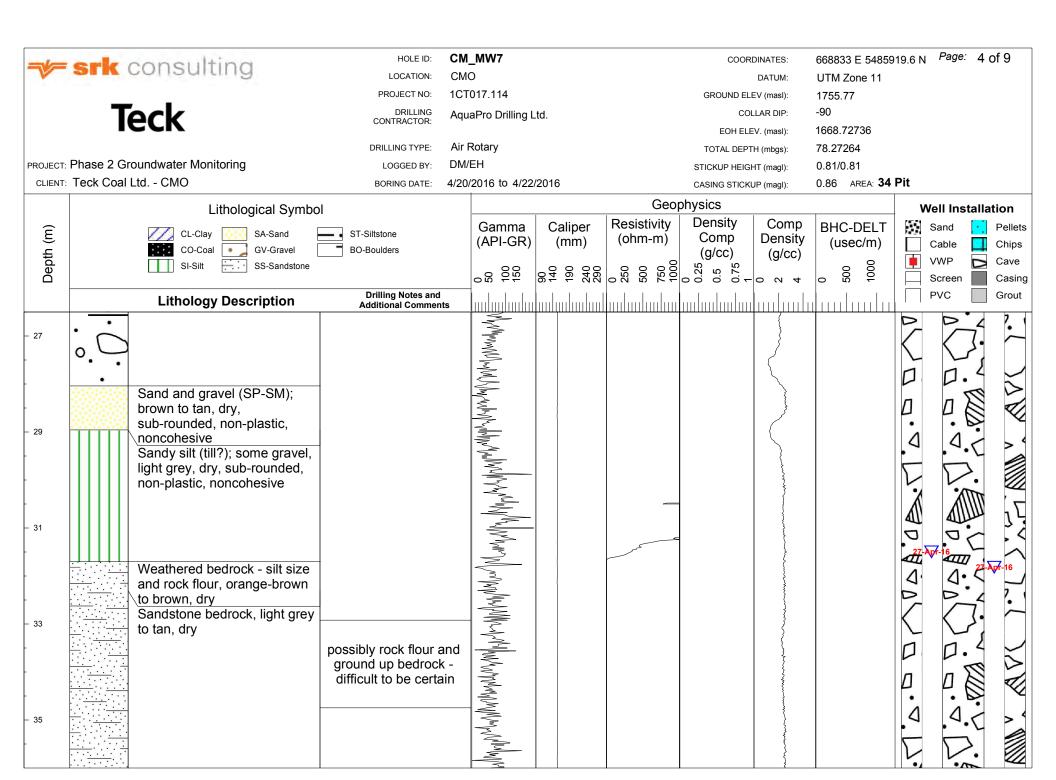
UTM Zone 11

1755.77

-90

668833 E 5485919.6 N Page: 3 of 9

						EOH ELEV. (masi).	1000.72730	
		DRILLING TYPE:	Air Rotary			TOTAL DEPTH (mbgs):	78.27264	
	T: Phase 2 Groundwater Monitoring	LOGGED BY:	DM/EH			STICKUP HEIGHT (magl):	0.81/0.81	
CLIEN	T: Teck Coal Ltd CMO	BORING DATE:	4/20/2016 to 4/22	2/2016		CASING STICKUP (magl):	0.86 AREA: <b>34</b>	Pit
	Lithological Symb	ool			Geor	ohysics		Well Installation
			Gamma	Caliper	Resistivity	Density Comp	BHC-DELT	Sand Pellets
Ε.	CL-Clay SA-Sand	ST-Siltstone	(API-GR)		(ohm-m)	Comp Density	(usec/m)	Cable Chips
Depth (m)	CO-Coal GV-Gravel SI-Silt SS-Sandstone	BO-Boulders			0	(g/cc) (g/cc)		VWP Cave
De	31-311t 33-3aliustolle		0 50 100 150	90 140 240 290	0 250 500 750 1000	0.25 0.25 0.75 4	0 500 1000	Screen Casing
	Lithology Description	Drilling Notes and Additional Comment		1		landandandanda da lara b		PVC Grout
17 - 19 - 21 - 23 - 25	Boulders or cobbles	similar to above; variable moisture; suspect cobbles gett pushed to sides	mulling Mynymbles Mynymble					





CMO LOCATION:

DRILLING TYPE:

PROJECT NO: 1CT017.114

DRILLING CONTRACTOR: AquaPro Drilling Ltd.

Air Rotary

COORDINATES:

UTM Zone 11

668833 E 5485919.6 N

Page: 5 of 9

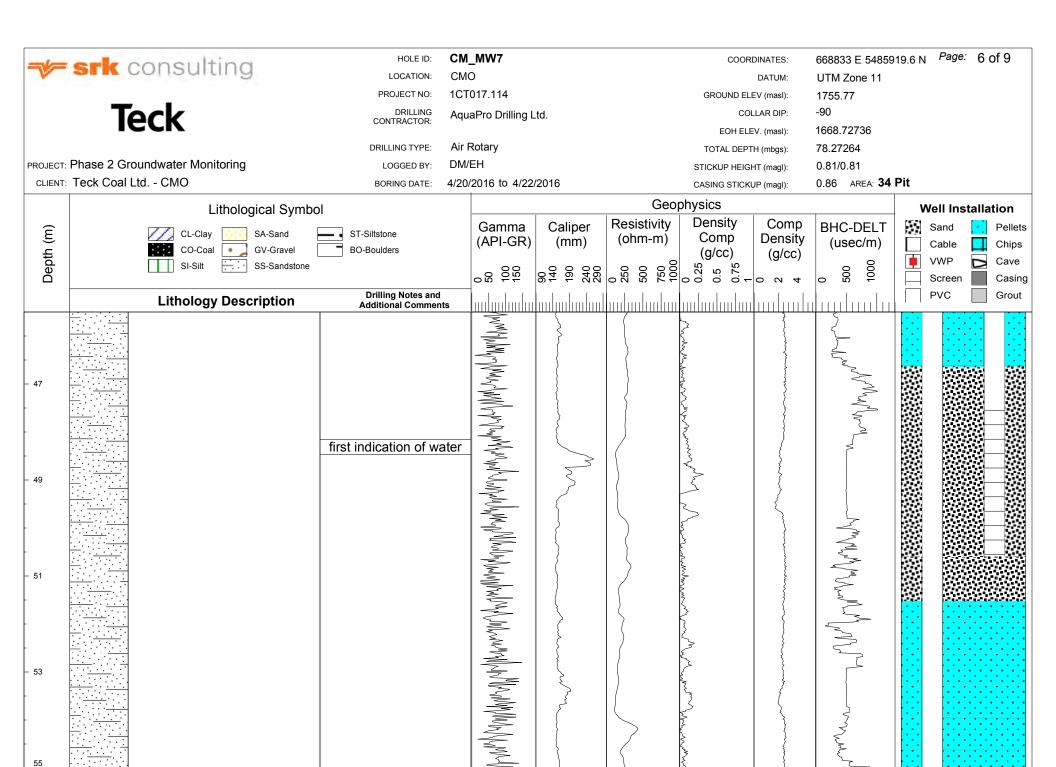
DATUM: GROUND ELEV (masl): 1755.77

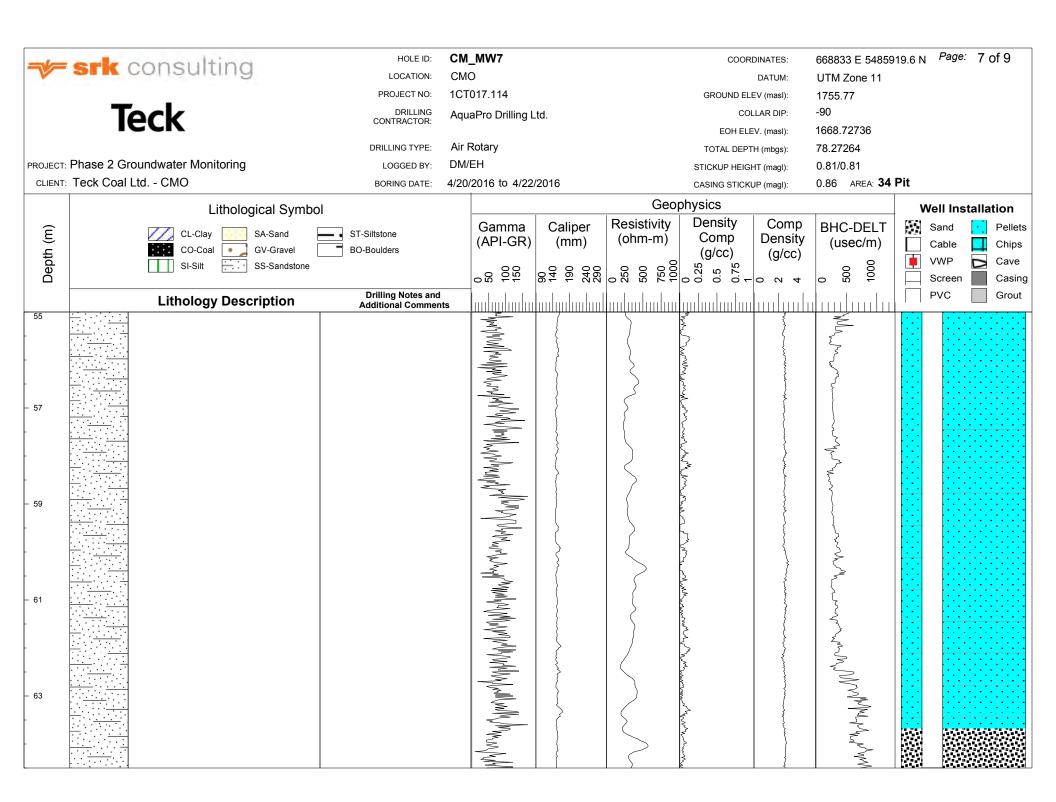
> -90 COLLAR DIP:

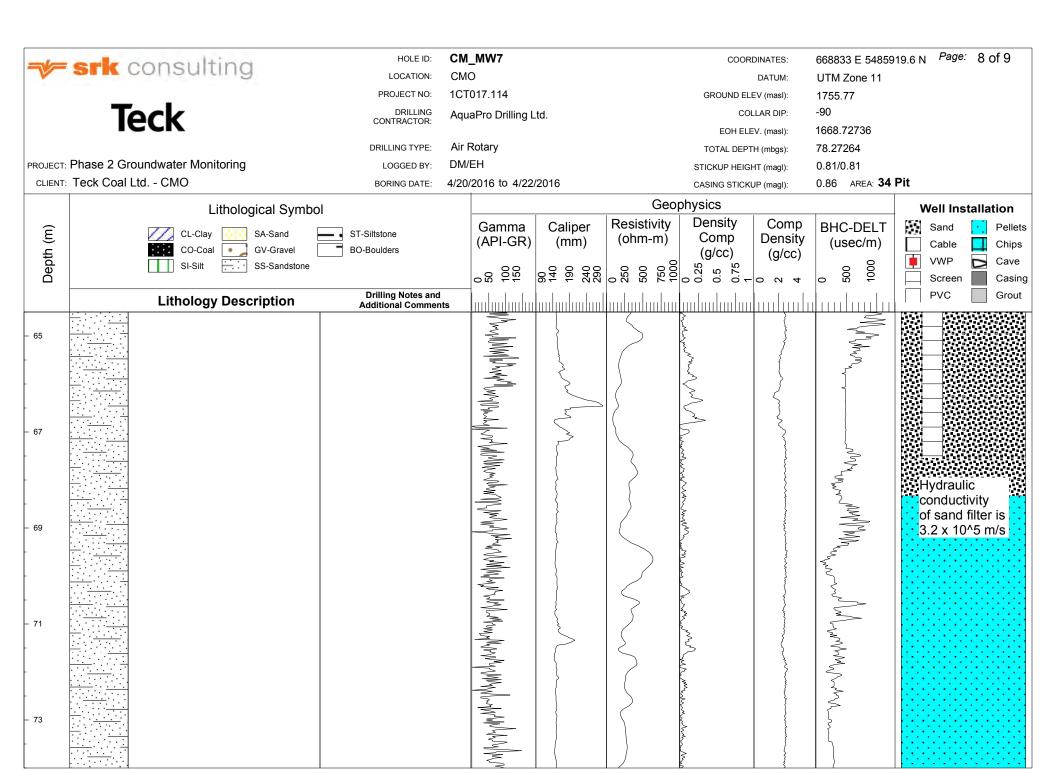
1668.72736 EOH ELEV. (masl):

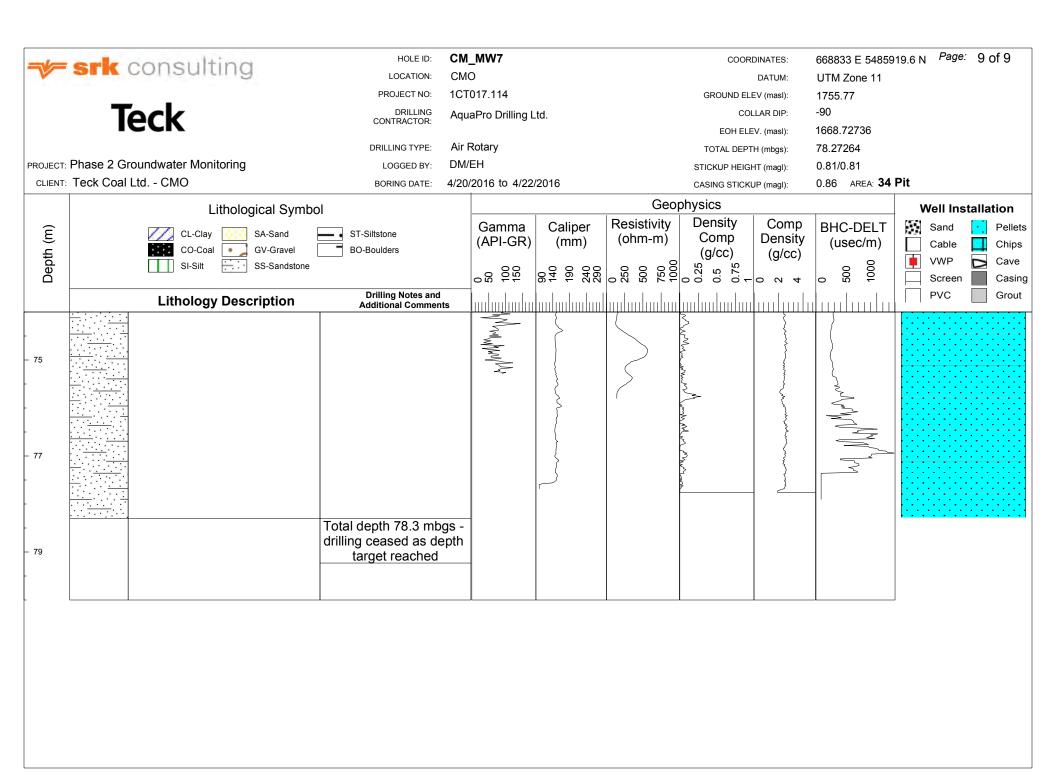
78.27264 TOTAL DEPTH (mbgs):

Lithology Description    Co-Coal   GV-Gravel   BO-Boulders   GV-Gravel   BO-Boulders   Co-Coal   GV-Gravel   BO-Boulders   Co-Coal   GV-Gravel   BO-Boulders   Co-Coal   GV-Gravel   BO-Boulders   Co-Coal   GV-Gravel   BO-Boulders   Comp   Co	
Lithological Symbol  Geophysics  Gamma Caliper (API-GR) (mm)  Co-Coal GV-Gravel SS-Sandstone  Co-Coal SI-Silt Silt SS-Sandstone  Co-Coal GV-Gravel SS-Sandstone  Co-Coal GV-Gravel SS-Sandstone  Comp Density (g/cc) (g/cc)  Co-Coal GV-Gravel SS-Sandstone  Comp Density (g/cc)  Comp (mm)  Comp (g/cc)  Comp (	t
Example of the control of the contro	Well Installation
	Sand Pellet: Cable Chips VWP Cave Screen Casin
37	PVC Grout
- 39 tan, wet	

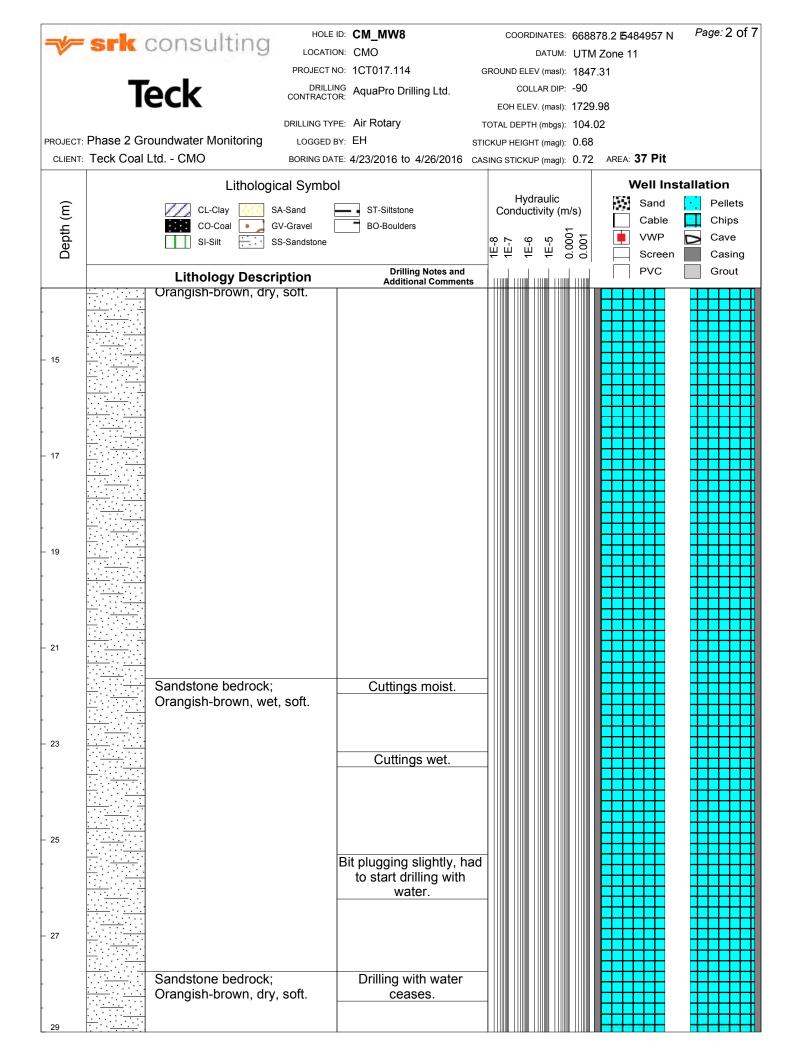


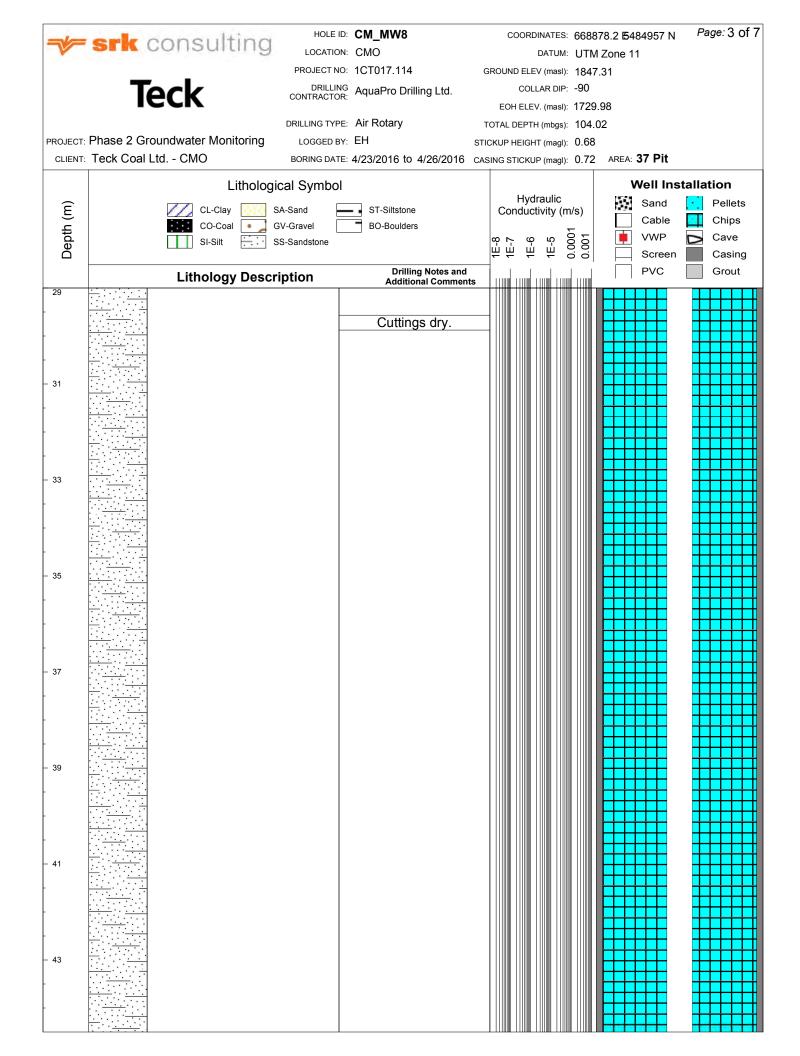


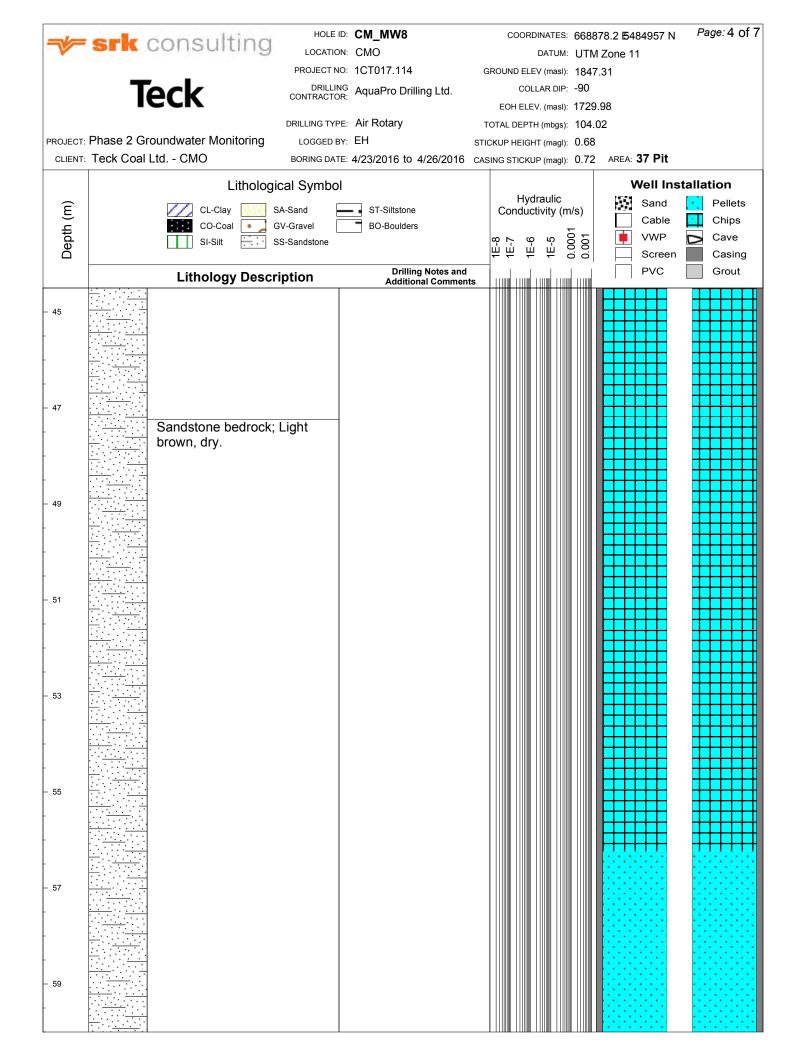


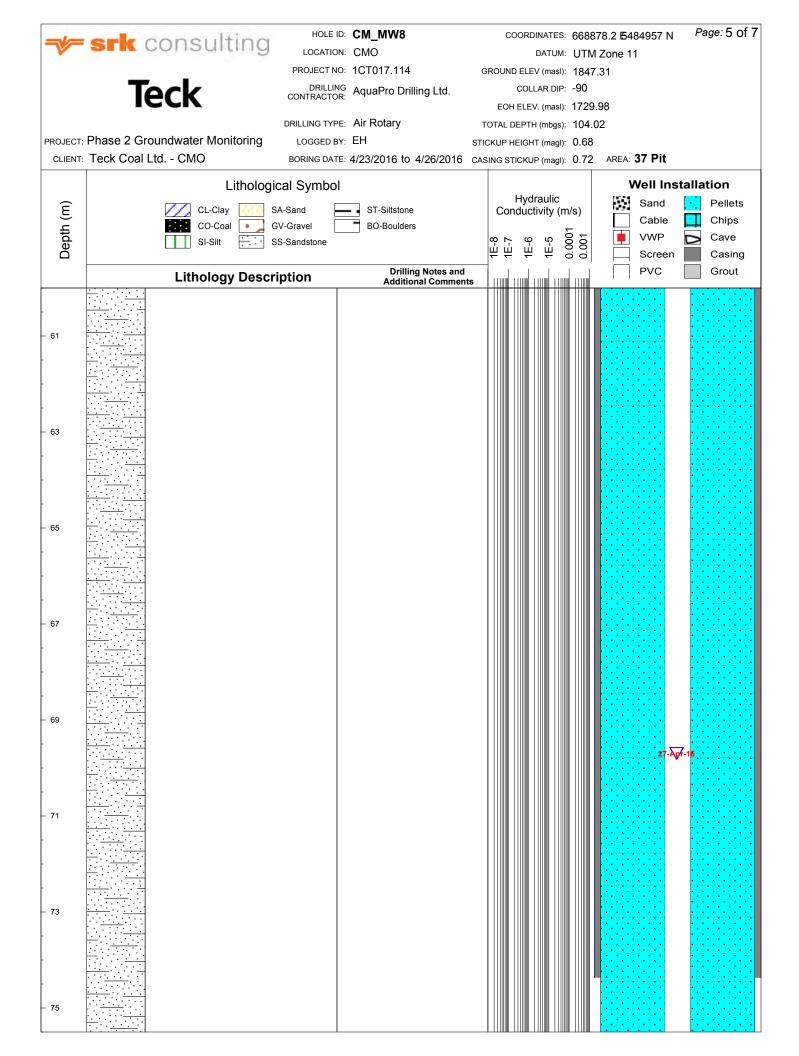


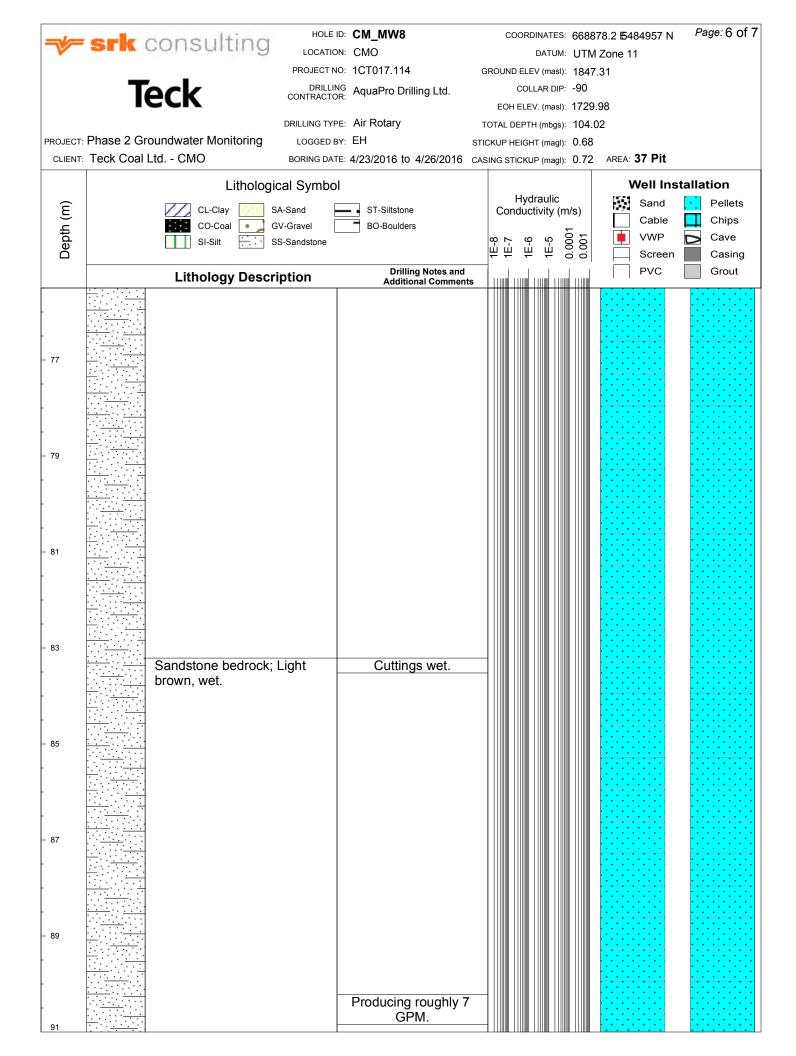
_4_	cele	consulting	HOLE ID:	CM_MW8	COORDINATES:	6688	78.2 <b>5</b> 484957 N	Page: 1 of 7
	SIN	consulting	LOCATION:	CMO	DATUM:	UTM	Zone 11	
	_			1CT017.114	GROUND ELEV (masl):		.31	
	T	eck	DRILLING CONTRACTOR:	AquaPro Drilling Ltd.	COLLAR DIP:			
	-	<b>-</b>	DRILLING TYPE:	Air Rotary	EOH ELEV. (masl): TOTAL DEPTH (mbgs):			
PROJECT:	Phase 2 Gr	oundwater Monitoring	LOGGED BY:		STICKUP HEIGHT (magl):		<i>3</i> 2	
1	Teck Coal	<del>-</del>	BORING DATE:	4/23/2016 to 4/26/2016			AREA: 37 Pit	
		L ithologic	cal Symbol				Well Ins	tallation
<u> </u>			A-Sand	ST-Siltstone	Hydraulic	./->	Sand	Pellets
L L			V-Gravel	BO-Boulders	Conductivity (n		Cable	Chips
Depth (m)			S-Sandstone		1E-8 1E-7 1E-6 1E-5	0.0001	<b>▶</b> VWP	Cave
				Drilling Notes and		o o	Screen	Casing Grout
		Lithology Descri	ption	Drilling Notes and Additional Comments			FVC	Glout
1							_	
-								
-		Gravel (GW); Some s	sand					
-	0.	Very dark grey, wet,	Jana.					
- 1		sub-angular to angula	ar.					
	.0.							
-	0 .	Coal bedrock; Black,	dny					
-		Coal Decirock, Diack,	ury.					
- 3								
- 5								
-								
7								
-								
-								
-								
- 9								
-								
-								
- 11								
- 13		Candatana hadaad						
1	· · · · · · · · · · · · · · · · · · ·	Sandstone bedrock;						

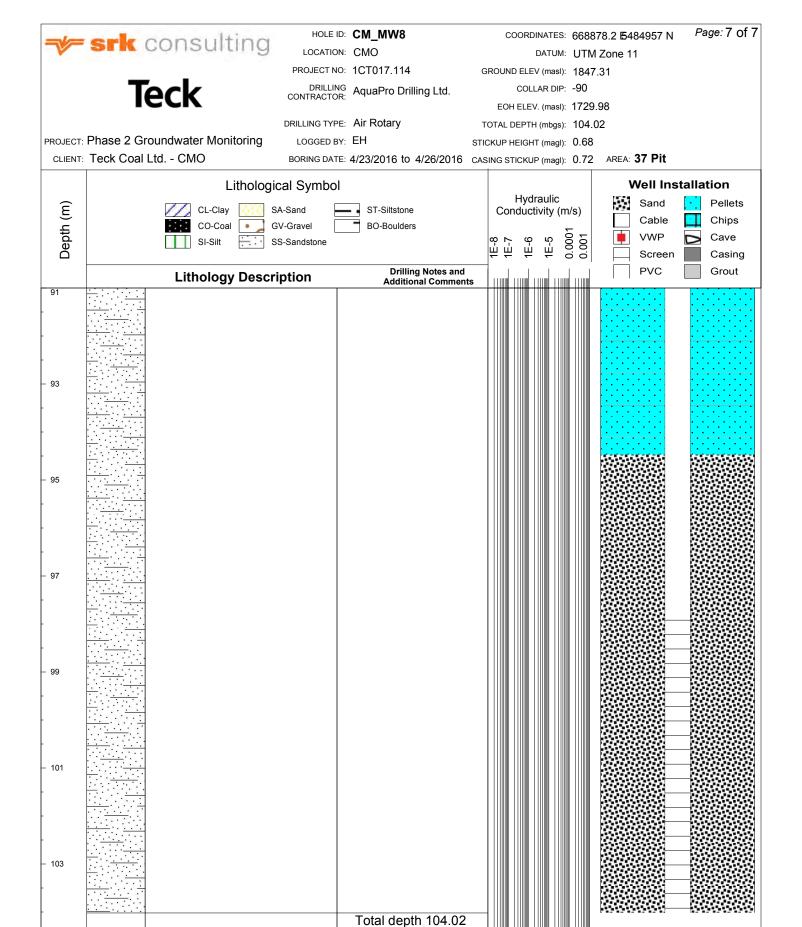






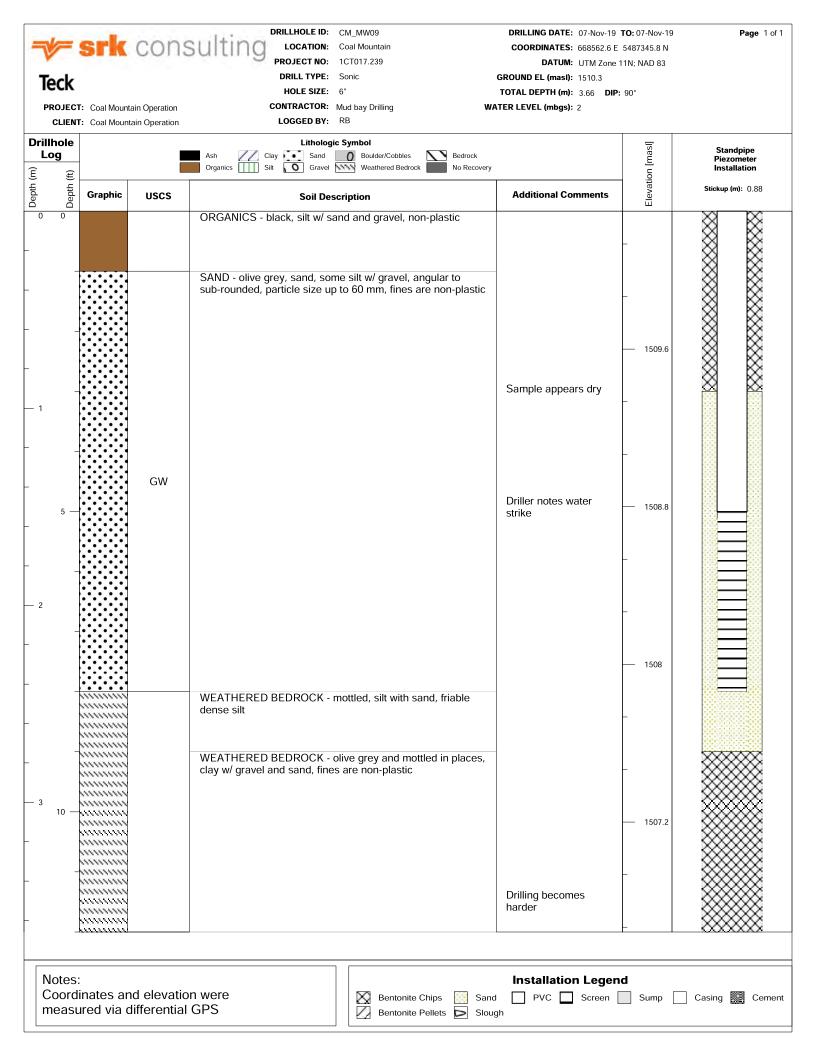


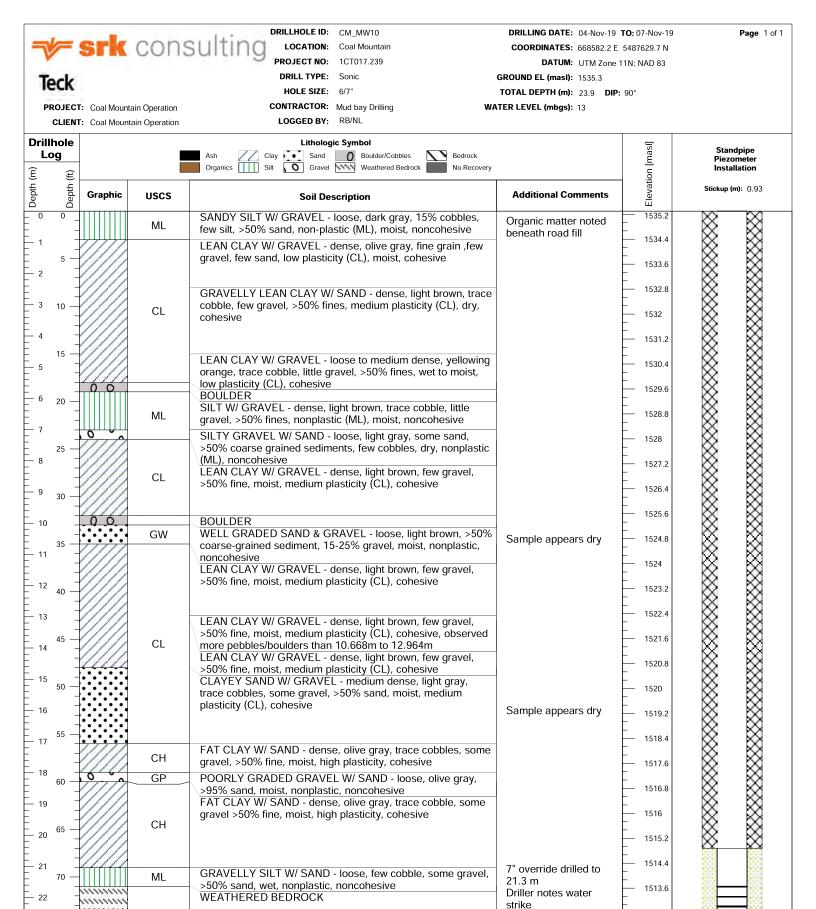




mbgs - drilling ceases as depth target reached.

105





Notes: Coordinates and elevation were measured via differential GPS

minn

minn

minn

23

			Ins	talla	tion	Lege	nd			
	Bentonite Chips Bentonite Pellets			PVC		Screen		Sump	Casing	Cement

Outer casing

becomes stuck;

casing sheared.

1512.8

1512

1



RG\_01-03 (Elkford Supply Well)

```
Construction Date: 1979-07-01 00:00:00
Well Tag Number: 42698
                                    Driller:
Owner: VILLAGE OF ELKFORD
                                    Well Identification Plate Number:
                                    Plate Attached By:
Address: BOIVIN CK & ELK RIVER
                                    Where Plate Attached:
Area:
                                    PRODUCTION DATA AT TIME OF DRILLING:
                                    Well Yield: 0 (Driller's Estimate)
WELL LOCATION:
                                    Development Method:
Land District
                                    Pump Test Info Flag: Y
District Lot: 12378 Plan: Lot:
                                    Artesian Flow:
Township: Section: Range:
                                    Artesian Pressure (ft):
Indian Reserve: Meridian: Block:
                                    Static Level:
Ouarter:
Island:
                                    WATER QUALITY:
BCGS Number (NAD 83): Well: 5
                                    Character:
                                    Colour:
Class of Well:
                                    Odour:
                                    Well Disinfected: N
Subclass of Well:
                                    EMS ID:
Orientation of Well:
Status of Well: New
                                    Water Chemistry Info Flag: Y
Well Use:
                                    Field Chemistry Info Flag:
Observation Well Number:
                                    Site Info (SEAM):
Observation Well Status:
Construction Method:
                                    Water Utility:
Diameter: 0.0 inches
                                    Water Supply System Name:
Casing drive shoe:
                                    Water Supply System Well Name:
Well Depth: 0 feet
Elevation: 0 feet (ASL)
                                    SURFACE SEAL:
Final Casing Stick Up: inches
                                    Flag:
Well Cap Type:
                                    Material:
Bedrock Depth: feet
                                    Method:
Lithology Info Flag:
                                    Depth (ft):
File Info Flag:
                                    Thickness (in):
Sieve Info Flag:
                                    WELL CLOSURE INFORMATION:
Screen Info Flag:
                                    Reason For Closure:
Site Info Details:
                                    Method of Closure:
Other Info Flag:
                                    Closure Sealant Material:
Other Info Details:
                                    Closure Backfill Material:
                                    Details of Closure:
                                            Slot Size
Screen from to feet
                              Type
                              Diameter
Casing from
              to feet
                                              Material
                                                             Drive Shoe
GENERAL REMARKS:
YIELD:NO DATA EXPLORATORY & WATER WELL
LITHOLOGY INFORMATION:
From 0 to 0 Ft. MEASURED IN METERS
       0 to 12.2 Ft. DRY MED. FINE SAND SOME SILT TRACE OF
From
From
        0 to 0 Ft.
                        GRAVEL.
```



RG\_DW-01-07

Date: 1985-07-22 00:00:00.0  n's Drilling Ltd. ication Plate Number: ed By: Attached:  ATA AT TIME OF DRILLING: 2.5 (Driller's Estimate) Gallons per Minute (U.S./Imperial) Method: for Flag: w: ssure (ft): 22 feet  f: cted: N  try Info Flag: try Info Flag: CAM):  // System Name: System Well Name:
ication Plate Number: ed By: Attached: ATA AT TIME OF DRILLING: 2.5 (Driller's Estimate) Gallons per Minute (U.S./Imperial for Flag: w: ssure (ft): 22 feet  T: Cted: N  try Info Flag: try Info Flag: EAM):  Y: System Name: System Well Name:
ication Plate Number: ed By: Attached: ATA AT TIME OF DRILLING: 2.5 (Driller's Estimate) Gallons per Minute (U.S./Imperial Method: for Flag: w: ssure (ft): 22 feet  T: cted: N  try Info Flag: try Info Flag: EAM):  Y: System Name: System Well Name:
ATA AT TIME OF DRILLING:  2.5 (Driller's Estimate) Gallons per Minute (U.S./Imperial Method: fo Flag: w: ssure (ft): : 22 feet  #:  cted: N  try Info Flag: try Info Flag: EAM): //: System Name: System Well Name:
2.5 (Driller's Estimate) Gallons per Minute (U.S./Imperial Method: fo Flag: w: ssure (ft): : 22 feet  f: cted: N  try Info Flag: try Info Flag: CAM): // System Name: System Well Name:
cted: N  try Info Flag: try Info Flag: EAM):  System Name: System Well Name:
cted: N  try Info Flag: try Info Flag: EAM):  /: System Name: System Well Name:
cted: N  try Info Flag: try Info Flag: EAM):  /: System Name: System Well Name:
try Info Flag: try In
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rry Info Flag: EAM):  /: System Name: System Well Name:
rry Info Flag: EAM):  /: System Name: System Well Name:
CAM):  /: System Name: System Well Name:
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System Name: System Well Name:
System Well Name:
) feet
) feet
To: feet
TO. TEST
INFORMATION:
osure:
osure:
int Material;
ill Material:
osure;
Slot Size
0
0
0
0
Material Drive Shoe
null null

- Return to Main
- Return to Search Options
- Return to Search Criteria

### Information Disclaimer

The Province disclaims all responsibility for the accuracy of information provided. Information provided should not be used as a basis for making financial or any other commitments.



RG\_DW-02-20

```
Construction Date: 2002-04-02 00:00:00
 Well Tag Number: 101942
                                                      Driller: J. R. Drilling
Well Identification Plate Number:
Owner: ELK VALLEY FLYING CLUB
                                                      Plate Attached By:
                                                      Where Plate Attached:
Address:
                                                      PRODUCTION DATA AT TIME OF DRILLING:
Area:
                                                                      60 (Driller's Estimate) U.S. Gallons per Minute
                                                      Development Method: Air lifting
WELL LOCATION:
                                                      Pump Test Info Flag: N
KOOTENAY Land District
                                                      Artesian Flow:
Artesian Pressure (ft):
District Lot: 4144 Plan: Lot:
Township: Section: Range:
                                                      Static Level: 7 feet
Indian Reserve: Meridian: Block:
                                                      WATER QUALITY:
Island:
                                                      Character:
BCGS Number (NAD 27): 082G086231 Well: 4
                                                      Colour:
                                                      Odour:
Class of Well: Water supply
                                                      Well Disinfected: N
Subclass of Well: Domestic
                                                      EMS ID:
Orientation of Well; Vertical
Status of Well: New
                                                      Water Chemistry Info Flag: N
                                                      Field Chemistry Info Flag:
Well Use: Private Domestic
                                                      Site Info (SEAM) :
Observation Weil Number:
Observation Well Status:
                                                      Water Utility:
Water Supply System Name:
Water Supply System Well Name:
Construction Method:
Diameter: inches
Casing drive shoe:
Well Depth: 60 feet
                                                      SURFACE SEAL:
Elevation:
                 feet (ASL)
                                                      Flag: N
Material:
Final Casing Stick Up: inches
Well Cap Type:
Bedrock Depth: feet
                                                      Method:
                                                      Depth (ft):
Lithology Info Flag: N
File Info Flag: N
                                                      Thickness (in):
                                                      Liner from
                                                                        To:
                                                                                    feet
Sieve Info Flag: N
Screen Info Flag: N
                                                      WELL CLOSURE INFORMATION:
                                                      Reason For Closure:
Site Info Details:
                                                      Method of Closure:
Other Info Flag:
                                                      Closure Sealant Material:
Other Info Details:
                                                      Closure Backfill Material:
                                                      Details of Closure:
Screen from
                           to feet
                                                      Type
                                                                                  Slot Size
Casing from
                                                      Diameter
                                                                                 Material
                           to feet
                                                                                                             Drive Shoe
                                                                                  Steel
GENERAL REMARKS:
 MEASUREMENTS: TOP OF CASING. PITLESS UNIT: WELDED. SHOE: BARBER. WATER QUALITY AND QUANTITY NOT GUARANTEED BY CONTRACTOR.
LITHOLOGY INFORMATION:
         0 to
                  47 Ft,
From
                                   gravel
                                   clay
From
         47 to
                  52 Ft.
From
        52 to
                  60 Ft.
                                   gravel
```

- Return to Main
- Return to Search Options
- · Return to Search Criteria

### Information Disclaimer

The Province disclaims all responsibility for the accuracy of information provided. Information provided should not be used as a basis for making financial or any other commitments.



Construction Date: 2008-02-28 00:00:00

RG DW-03-01

Well Tag Number: 94779 Driller: Owen's Drilling Ltd. Owner: SPARDELL MOBILE HOME PARK LTD Well Identification Plate Number: 26287 Plate Attached By: MIKE CALDWELL Address: 100 INDUSTRIAL ROAD #1 Where Plate Attached: TOP OF CASING Area: SPARWOOD PRODUCTION DATA AT TIME OF DRILLING: Well Yield: 30 (Driller's Estimate) U.S. Gallons per Minute WELL LOCATION: Development Method: Air lifting KOOTENAY Land District Pump Test Info Flag: N District Lot: 4588 Plan: 1358 & NEP 64776 Lot: 13 & 1 Artesian Flow: Township: Section: Range: Artesian Pressure (ft): Indian Reserve: Meridian: Block: Static Level: Quarter: Island: WATER QUALITY: BCGS Number (NAD 83): 082G076233 Well: 9 Character: Colour: Class of Well: Water supply Odour: Subclass of Well: Domestic Well Disinfected: N Orientation of Well: Vertical Status of Well: New Water Chemistry Info Flag: N Field Chemistry Info Flag: Licence General Status: UNLICENSED Site Info (SEAM): Well Use: Water Supply System Observation Well Number: Observation Well Status: Water Utility: Construction Method: Water Supply System Name: Diameter: inches Water Supply System Well Name: Casing drive shoe: Y Well Depth: 50 feet SURFACE SEAL! Elevation: 3697 feet (ASL) Flag: Y Final Casing Stick Up: 12 inches Material: Bentonite clay Well Cap Type: BOLT ON Method: Poured Bedrock Depth: feet Depth (ft): 15 feet Lithology Info Flag: Y Thickness (in): 2 inches File Info Flag: N Liner from To: feet Sieve Info Flag: N Screen Info Flag: Y WELL CLOSURE INFORMATION: Reason For Closure: Site Info Details: Method of Closure: Other Info Flag: Closure Sealant Material: Other Info Details: Closure Backfill Material: Details of Closure: Screen from to feet Type Slot Size Casing from to feet Diameter Material Drive Shoe Steel

```
GENERAL REMARKS:

LITHOLOGY INFORMATION:

From 0 to 15 Ft. Medium CLAY & TOP SOIL brown

From 15 to 30 Ft. Medium brown

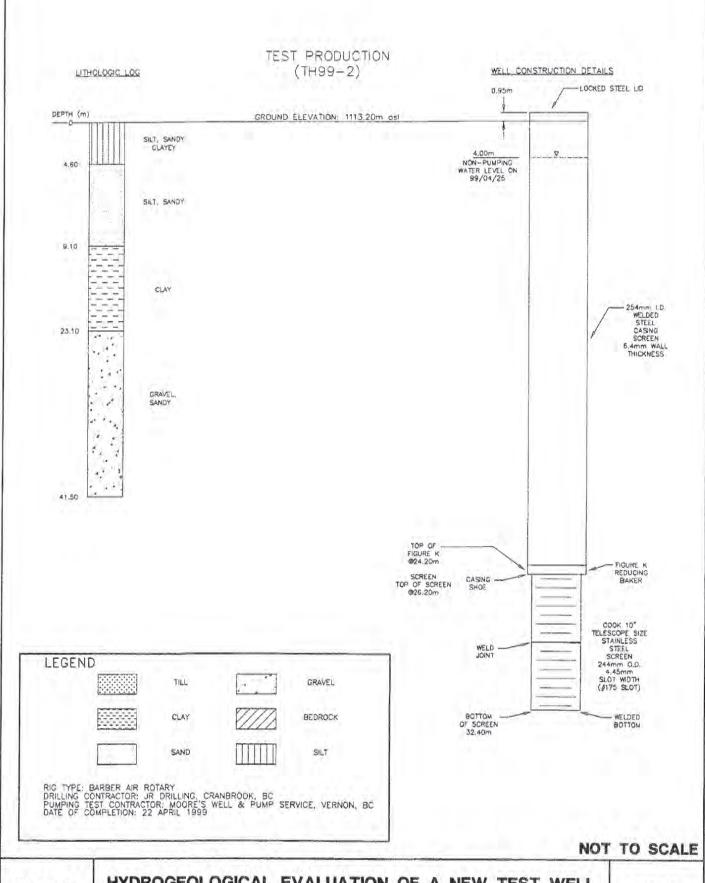
From 30 to 45 Ft. Medium CLAY & GRAVEL brown

From 45 to 50 Ft. Medium 30 U.S. Gallons per Minute brown
```

- Return to Main
- Return to Search Options
- Return to Search Criteria

#### **Information Disclaimer**

The Province disclaims all responsibility for the accuracy of information provided. Information provided should not be used as a basis for making financial or any other commitments.



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HYDROGEOLOGICAL EVALUATION OF A NEW TEST WELL DISTRICT OF SPARWOOD, BC

FIG. 3

# Appendix V

Field Methodology



## Field Methodology

Water sample collection and handling was completed by Teck or others in accordance with the 2013 edition of the British Columbia Field Sampling Manual (BCFSM; Clark, 2013) as required in Permit 107517 and Teck's Standard Practices and Procedures (SP&Ps) for well monitoring, purging, and sampling (TC\_GW-01 and TC\_GW-02), using appropriate well-specific methods to account for well construction, type, and recharge. A consistent method was followed for each location. During monitoring and sampling events, field observations were recorded, such as weather conditions and any unusual occurrences (i.e. changes in site use or site physical conditions, the condition of the monitoring well and whether repairs are needed, and ponded water in the vicinity of the monitoring well).

## Sampling Frequency

Permit 107517 prescribes a minimum quarterly sampling frequency. Therefore, the monitoring schedule and rationale was as follows:

- Winter (First Quarter): Winter sampling to capture when groundwater levels are nearing their lowest and recharge to groundwater is minimized due to frozen ground.
- > Spring (Second Quarter): Sampling during the freshet months to capture when groundwater levels and the extent of groundwater recharge and discharge are maximized.
- Summer (Third Quarter): Sampling during the post freshet months to capture when the groundwater levels are decreasing.
- Fall (Fourth Quarter): Sampling to capture groundwater conditions between the summer and winter sampling events.

Quarterly sampling was recommended for a minimum of one year after well installation to assess seasonal variability of groundwater conditions as per the BC Ministry of Environment & Climate Change Strategy (ENV) Water and Air Baseline Monitoring Guidance Document for Mine Proponents and Operators (ENV, 2016). Monitoring frequency is reviewed on an annual basis to assess adequacy to address the seasonal variability and to address whether the frequency should be reduced if little to no variability is observed.

## **Analyte List**

Groundwater was analyzed for select constituents from the core list of general water quality analytes provided in Table 2 of the BC ENV's Water and Air Baseline Monitoring Guidance Document for Mine Proponents and Operators (ENV, 2016) and Permit 107517 Table 25. Minimum detection limits for each parameter are suitable for comparison to the screening criteria. The list of recommended constituents, detection limits, and rationale is presented in the Site-specific Groundwater Monitoring Program (SSGMP) Update report.

Analyses for dissolved metals is specified to prevent misrepresentation of the mobile concentrations of constituents due to increased turbidity, which may occur as the result of sampling techniques, well construction, and/or geological formation (i.e., clay or silt bearing formations). For metals, the dissolved (i.e., filtered samples) component provides the best representation of groundwater transport. Approval for removal of total metals from all of Teck's groundwater sampling programs was received via email to Teck from ENV on November 3, 2016.



The 2018 SSGMP Update recommends analyzing for bicarbonate, carbonate, and hydroxide in place of bicarbonate-, carbonate-, and hydroxide-alkalinity to assist with water-type data interpretation. These parameters are used to characterize water type and direct analysis of these parameters would eliminate the need to convert alkalinity results.

## Sample Handling and Shipment

Samples were handled and shipped in a manner that is consistent with the practices and procedures prescribed in the British Columbia Field Sampling Manual. Samples were submitted to a Canadian Association for Laboratory Accreditation Inc. (CALA) accredited laboratory for analysis in accordance with the British Columbia Environmental Laboratory Manual (Austin, 2016).

Samples were shipped to an accredited laboratory to reduce hold time exceedances. Teck used a more local laboratory to avoid the potential for hold time exceedances.

The following was completed as per Teck's SP&P:

- Preservatives and certified clean sample bottles were provided by an accredited laboratory;
- Samples collected for dissolved metals were field-filtered using an in-line filter;
- Samples that required preservation were preserved in the field, with the exception of dissolved ultra-trace mercury that was lab filtered as required by the laboratory; and
- > Samples were shipped in ice-chilled coolers under chain-of-custody documentation and procedures.

## Fording River Operations

As per Teck's SP&P and the BCFSM, groundwater monitoring, purging, and sampling at Fording River Operations (FRO) was completed as follows:

- The equipment was prepared and calibrated. If a field measurement was identified out of the expected historical ranges from previous sampling events at the monitoring well, calibration of field probes was re-confirmed.
- Prior to sample collection, manual water level measurements (i.e. with a water level tape) were measured from each location.
- In addition to manual monitoring, wells FR\_HMW1S/D, FR\_HMW2, FR\_HMW3, FR\_HMW5, FR\_TBSSMW-1, FR\_TBSSMW-2, FR\_GCMW-1B, FR\_GCMW-2, FR\_KB-1, FR\_KB-2, FR\_KB-3A/B, FR\_MW-SK1A/B were continuously monitored with data loggers.
- Data from the loggers were downloaded each quarter when possible. Prior to sampling or deployment of pressure transducers (also referred to as dataloggers) depth-to-water measurements were collected. Manual and data logger measurements were collected at approximately the same time of day to avoid possible discrepancies in data due to daily fluctuation of water table. Data loggers were removed and uploaded following the depth to water measurement. After samples were collected the data logger was re-deployed at the same depth. Any changes in length of cable used were noted.
- Pressure transducer data was corrected for atmospheric influences using a barometric logger which measures atmospheric pressure. Pressure transducers were deployed below water level and both pressure transducers and barometric loggers were deployed below the anticipated frost penetration depth to prevent the instrument from freezing.

Internal Ref: 671557 March 31, 2020 3



- Dedicated tubing was installed in each well and a pump was used to draw water to the surface for sample collection. The specific pump type selected for each monitoring well location was determined based on well construction, type, and recharge characteristics (Table 2b). Wells with depth to water less than 7 mbgs were purged and sampled following low-flow (0.5 L/min) sampling techniques to minimize sediment entrainment. In cases where depth to water was approximately 7 mbgs or greater, wells were sampled using tubing fitted with a Waterra foot valve or a bladder pump. Wells were purged three well volumes or until field parameters [electrical conductivity (EC), dissolved oxygen (DO), pH, oxidation-reduction potential (ORP), and temperature] stabilized after three consecutive readings using a YSI flow through cell. Field parameters were recorded once stable, prior to sampling.
- > Following purging, a sample was collected at a flow rate of approximately 0.1 L/min using the lowest possible setting for the particular pump. The low-flow rate is intended to minimize the disturbance of entrained sediments mixing within the well and is intended to draw water directly from the formation around the well.

Select wells at FRO require different methods for sampling. Supply wells, FR\_GH\_WELL4 and FR\_POTWELLS, have limited access to the wellhead; therefore, samples were collected from a distribution point (i.e. faucet) within the water system or at the sample port at the well head. Samples from FR\_POTWELLS are representative of one or more of a number of wells in the water supply system, while FR\_GH\_WELL4 is representative of a single well. Both supply wells FR\_POTWELLS (continuously running) and FR\_GH\_WELL4 (not continuously running), were purged and parameters were monitored to ensure stabilization prior to sampling.

## **Greenhills Operations**

As per Teck's SP&P and the BCFSM, groundwater monitoring, purging, and sampling at Greenhills Operations (GHO) was completed as follows:

- The equipment was prepared and calibrated. If a field measurement was identified out of the expected historical ranges from previous sampling events at the monitoring well, calibration of field probes was re-confirmed.
- Prior to sample collection, manual water level measurements (i.e. with a water level tape) were measured from each location.
- In addition to manual monitoring, all wells except for GH\_MW-TD were continuously monitored with data loggers. Continuous water level data from the supply wells GH\_POTW09, GH\_POTW10, GH\_POTW15, and GH\_POTW17 could not be reduced as the data loggers require calibration.
- Data from the loggers were downloaded each quarter when possible. Prior to sampling or deployment of pressure transducers (also referred to as dataloggers) depth-to-water measurements were collected. Manual and data logger measurements were collected at approximately the same time of day to avoid possible discrepancies in data due to daily fluctuation of water table. Data loggers were removed and uploaded following the depth to water measurement. After samples were collected the data logger was re-deployed at the same depth. Any changes in length of cable used were noted.
- Pressure transducer data was corrected for atmospheric influences using a barometric logger which measures atmospheric pressure. Pressure transducers were deployed below water level and both pressure transducers and barometric loggers were deployed below the anticipated frost penetration depth to prevent the instrument from freezing.



- Dedicated tubing was installed in each well and a pump was used to draw water to the surface for sample collection. The specific pump type selected for each monitoring well location was determined based on well construction, type, and recharge characteristics (Table 3b). The specific pump type selected for each monitoring well location was determined based on well construction, type, and recharge characteristics. Wells with depth to water less than 7 mbgs were purged and sampled following low-flow (0.5 L/min) sampling techniques to minimize sediment entrainment. In cases where depth to water was approximately 7 mbgs or greater, wells were sampled using tubing fitted with a Waterra foot valve. Wells were purged three well volumes or until field parameters (EC, DO, pH, ORP, and temperature) stabilized after three consecutive readings using a YSI flow through cell. Field parameters were recorded once stable, prior to sampling.
- > Following purging, a sample was collected at a flow rate of approximately 0.1 L/min using the lowest possible setting for the particular pump. The low-flow rate is intended to minimize the disturbance of entrained sediments mixing within the well and is intended to draw water directly from the formation around the well.

Select wells at GHO require different methods for sampling (GH\_MW-TD and supply wells). Flowing artesian conditions were encountered at GH\_MW-TD during installation. Groundwater at this well is collected directly from the discharge spigot using filters and a syringe. Supply wells were GH\_POTW09, GH\_POTW10, GH\_POTW15, and GH\_POTW17 were sampled from the sample port at the wellhead. Prior to collection of samples, the supply wells were purged and parameters were monitored to ensure stabilization prior to sampling.

## **Elkview Operations**

As per Teck's SP&P and the BCFSM, groundwater monitoring, purging, and sampling at Elkview Operations (EVO) was completed as follows:

- Prior to sample collection, manual water level measurements (i.e. with a water level tape) were measured from each location. Water levels were measured relative to the top of the well casing using an electronic water level probe.
- In addition to manual monitoring, the following wells were continuously monitored with data loggers: EV\_BCgw, EV\_BRgw, EV\_EVgw, EV\_ER1gwS, EV\_GCgw, EV\_GV3gw, EV\_LSgw, EV\_MCgwS/D, EV\_MW\_AQ1, EV\_MW\_BC1-A/B, EV\_MW\_GT1B, EV\_MW\_MC2B, EV\_MW\_MC3, EV\_MW\_SPRB/C and EV\_OCgw.
- Data loggers were removed and uploaded following the depth to water measurement. After samples were collected the data logger was re-deployed at the same depth. Any changes in length of cable used were noted.
- Pressure transducer data was corrected for atmospheric influences using a barometric logger which measures atmospheric pressure. Pressure transducers were deployed below water level and both pressure transducers and barometric loggers were deployed below the anticipated frost penetration depth to prevent the instrument from freezing.
- Dedicated tubing was installed in each well and a pump was used to draw water to the surface for sample collection. The specific pump type selected for each monitoring well location was determined based on well construction, type, and recharge characteristics (Table 4b). The specific pump type



selected for each monitoring well location was determined based on well construction, type, and recharge characteristics.

- Prior to sampling, wells were purged with the exception of EV\_WF\_SW and supply wells EV\_RCgw and EV\_HW1. EV\_WF\_SW was sampled using a Hydrasleeve™ (no purge method) due to the deep water level at this well (>130 mbgs). Supply wells were sampled from a distribution point. Prior to collection of samples, the tap or valve at the supply wells was opened for a minimum of five minutes to purge water through the distribution system. The objective of purging was to obtain samples representative of the water source and not a sample influenced by the distribution system.
- Purging was completed using a bladder pump or a submersible pump following low-flow sampling techniques (<0.5 L/min) until field parameters (pH, temperature, EC, ORP, DO) stabilized for three consecutive readings. Field parameters were measured using a calibrated multi-parameter YSI Pro-DSS or YSI 6820 V2-2 Sonde probe which include in-built turbidity measurements. Groundwater parameter values were recorded periodically during purging and prior to sampling.

## **Coal Mountain Operations**

As per Teck's SP&P and the BCFSM, groundwater monitoring, purging, and sampling at Coal Mountain Operations (CMO) was completed as follows:

- Prior to sampling, manual water level measurements were measured. Water levels were measured relative to the top of the well casing using an electronic water level probe. Water levels were measured relative to the top of the steel casing up to Q2 2019. In Q3 2019 water levels were measured relative to top of PVC to be consistent with methodology at other sites.
- Pressure transducer data loggers were deployed to collect continuous groundwater levels at two wells: CM\_MW5-SH and CM\_MW5-DP. Dataloggers were set to record pressure and temperature measurements every hour; pressure measurements were corrected using barometric pressure data collected with a barometric logger.

Monitoring wells were sampled using three methods: low-flow purging/sampling, artesian flow grab sampling, and no-purge sampling. The specific pump type selected for each monitoring well location was determined based on well construction, type, and recharge characteristics (Table 5b).

- Low-flow sampling was conducted using dedicated bladder pumps for nine wells: CM\_MW1-OB, CM\_MW1-SH, CM\_MW2-SH, CM\_MW3-SH, CM\_MW3-DP, CM\_MW5-SH, CM\_MW5-DP, CM\_MW6-SH and CM\_MW6-DP. Flow rates were sustained below 0.5 L/min while purging, and samples were collected following stabilization of field parameters. Field parameter stabilization was confirmed by three consecutive readings of all parameters (pH, temperature, conductivity, ORP, DO) within stabilization criteria.
- Grab samples were collected from artesian flow at monitoring wells CM\_MW4-SH and CM\_MW4-DP. Water discharging from the top of the standpipe was directed into sample bottles.
- No-purge sampling was conducted at four monitoring wells (CM\_MW1-DP, CM\_MW7-SH, CM\_MW7-DP, and CM\_MW8) using the hydrasleeve system. The hydrasleeve was lowered to the bottom of the standpipe a few days prior to sample collection. Recovering the sleeve captured a core of water from the standpipe along the well screen interval.

Internal Ref: 671557 March 31, 2020 6



- Field parameter measurements were recorded immediately before filling sample bottles. Field parameters were measured using multi-parameter probes (pH, temperature, EC, ORP, DO) and a separate turbidity sensor. Sensors were calibrated on a routine basis and the calibration process was documented.
- One new monitoring well was developed in 2019: CM\_MW10. Development was conducted using inertial pumping with a surge block. A total of 680 L of water was pumped out of the well over three and a half hours. Field parameters (pH, EC, temperature) were measured frequently as development progressed and demonstrated stabilization. Development was assessed to be complete and quarterly sampling initiated for Q4 2019.

## Regional Drinking Water Program

As per Teck's SP&P and the BCFSM, groundwater monitoring, purging, and sampling was completed as follows:

- The equipment was prepared and calibrated. If a field measurement was identified out of the expected historical ranges from previous sampling events at the monitoring well, calibration of field probes was re-confirmed.
- There is limited access to the wellhead at supply and domestic wells sampled as part of the RGMP (RG\_DW-01-03, RG\_DW-01-07, RG\_DW-02-20, RG\_DW-03-01, RG\_DW-03-04); therefore, samples were collected from a distribution point (i.e. faucet) within the water system or at the sample port at the well head as shown on Table 6b. Domestic wells were sampled, where possible, via the sample port used in the initial drinking water evaluation or previous sampling event.
- Prior to collection of samples, the tap or valve at the sample location was opened for a minimum of five minutes to purge water through the distribution system. The objective of purging was to obtain samples representative of the water source and not a sample influenced by the distribution system.
- Water quality parameters (pH/EC/temperature) were monitored until stable readings were obtained. Once the stabilized water quality parameters were recorded, the flow was reduced to minimize splashing and samples were collected in laboratory supplied bottles.

## References

- Austin, J. (editor). 2016. British Columbia Environmental Laboratory Manual. Environmental Monitoring, Reporting and Economics Section, Knowledge Management Branch, B.C., Ministry of Environment, Victoria, BC.
- British Columbia Ministry of Environment, 2016. Technical Guidance 6: Water and Air Baseline Monitoring Guidance Document for Mine Proponents and Operators. Technical Guidance for Environmental Management Act Applications, Version 2.0, June 2016.
- Clark, M.J.R., 2013. British Columbia Field Sampling Manual: 2013 For Continuous Monitoring plus the Collection of Air, Air-Emission, Water, Wastewater, Soil, Sediment, and Biological Samples. Water, Air and Climate Change Branch, Ministry of Water, Land and Air Protection, Victoria, BC, Canada. 344 pp.

Internal Ref: 671557 March 31, 2020 7

New Version #: 01

#### MEASUREMENT OF WATER TABLE ELEVATION IN WELLS

## **Teck**

Teck Coal Ltd. utilizes a system in which Standard Practices and Procedures are developed, implemented and maintained. This helps ensure that safety and environmental risks associated with various work tasks are identified, mitigated and managed.

#### 1.0 PURPOSE AND SCOPE

This document outlines the procedure which will be used by personnel for measuring water depth in wells, observation wells, and piezometers.

#### 2.0 RESPONSIBILITIES

Depending on the operation, field monitoring activities and documentation may be carried out by an Environmental Officer, Environmental Technician (not all operations have this position), or a designate, such as an Environmental Co-op Student.

The Environmental Officer, Technician, or designate is responsible for:

Measuring the depth to groundwater in a structure (well, observation well, piezometer)

#### 3.0 BACKGROUND

Depth to groundwater surface is measured using an electric water level meter (such as Solinst Model No. 101 or equivalent). A light on the water level meter illuminates and/or an audible alarm sounds when the weighted probe tip contacts the water surface in the well and completes an electronic circuit. The measured depth to water is determined to within 0.01 meter by noting the point on the probe cable that corresponds to the measuring point (MP) at the top of the well/piezometer casing at the initial point of contact.

#### 4.0 PROCEDURES

The following steps are necessary to collect water level measurements:

1. Check the operation of the meter by turning on the indicator switch and pressing the test button.

New Version #: 01

#### MEASUREMENT OF WATER TABLE ELEVATION IN WELLS

## **Teck**

- 2. Holding the water level indicator above the well casing, lower the cable gradually into the well or piezometer until the indicator contacts the water surface. The contact with water surface is indicated by the buzzer sounding and/or illumination of the indicator light. At this point, stop lowering the cable.
- 3. Note the point on the graduated cable that corresponds to the MP at the top of the casing when the electronic circuit is first completed. The MP should be the inner casing and not the outer casing that is protecting the well. If the inner casing cannot be reached and the outer casing is used as the MP, then this must be recorded in the datasheet. If necessary, grasp tape with thumb and index finger exactly at the measuring point marked at the top of the well casing. Pull tape out of well slowly and read measurement.
- 4. Record the depth to the water surface to the nearest 0.01 m.
- 5. Draw the cable about 0.25 above the surface of the water, then lower it and repeat Steps 2 through 4. If these two readings differ by more than 0.02 m, repeat until the measured readings stabilize. Measurements should always be taken as the indicator is lowered into the well, not as it is raised.

#### 5.0 DEVIATION FROM PROCEDURE

Adherence to this procedure will help to ensure that depth to water is measured properly, can be consistently repeated, and provides accurate data for measurement of water table elevation. Deviation from this procedure may result in improper measurement of water depth and inaccurate data being recorded.

#### 6.0 KEY DOCUMENTS/TOOLS/REFERENCES

- Teck. 2012. Environment, Health, Safety and Community Management Standards. July.
  - Standard 4 Water, Ecosystems and Biodiversity
  - o Standard 13 Monitoring Measurement, Inspection and Audit
  - Standard 20 Documents and Records

New Version #: 01

#### MONITORING WELL PURGING AND GROUNDWATER SAMPLING

## **Teck**

Teck Coal Ltd. utilizes a system in which Standard Practices and Procedures are developed, implemented and maintained. This helps ensure that safety and environmental risks associated with various work tasks are identified, mitigated and managed.

#### 1.0 PURPOSE AND SCOPE

This document outlines the procedure which will be used by Teck Coal for purging, monitoring and sampling groundwater from monitoring wells. This is applicable to more routine monitoring programs such as compliance monitoring, and not necessarily to research and development programs, which may require far more detailed water chemistry.

### 2.0 <u>RESPONSIBILITIES</u>

Depending on the operation, field monitoring activities and documentation may be carried out by an Environmental Officer, Environmental Technician (not all operations have this position), or a designate, such as an Environmental Co-op Student.

The Environmental Officer, Technician, or designate is responsible for:

- Purging the well as possible prior to performing any monitoring or sampling activities.
- Collecting the water sample(s)

#### 3.0 BACKGROUND

It is recommended that a low-flow pump is used to sample groundwater where possible. This is not always a feasible or practical methodology. Having to use a pump, power source, and associated equipment can be a major hindrance, especially for sampling locations which may be remote and/or off of roadways or good pathways.

Manual methods to purge and collect groundwater include use of bailers or plastic tubing with foot valves to allow water to be pumped one-way by hand. Dedicated plastic tubing with foot valves is inexpensive, effective, easy to use and can be set up so that each monitoring well has its own dedicated tubing. This would eliminate potential for cross-contamination between wells. Bailers can also be used for purging and sampling, and are inexpensive and very portable. If bailers are used, care must be taken to prevent contamination from one well to the next. Either

New Version #: 01

#### MONITORING WELL PURGING AND GROUNDWATER SAMPLING

## Teck

bailers need to be disposable (single use), or carefully cleaned and decontaminated between sampling locations.

#### 4.0 PROCEDURES

#### Actively producing well

If a dewatering well has been installed and is actively being used to lower or control the water table, then samples can likely be collected at the surface. Either sample at the discharge point of the pump (hard or soft line) or from a tap installed at the well head.

#### **Monitoring Well or Piezometer**

A monitoring well or piezometer is a passive structure (no permanent pump installed) and so water must be brought to the surface manually or by use of a low flow pump.

Water can be brought to the surface for measurement and sample collection using a low flow pump, plastic tubing and one-way foot valve, or bailer.

#### **Preparation**

Preparation includes inspecting the condition of the well, monitoring health and safety conditions, and calibrating and decontaminating equipment. General procedures are presented below:

- Make sure area around well head is clean and free of debris. If necessary, place a
  plastic drop cloth around the well head to prevent sampling equipment from coming
  into contact with the ground surface.
- 2. Inspect condition of well (e.g., well locked, loose-fitting cap, measuring point well marked, surface casing disturbed, well casing straight, condition of concrete pad). Indicate condition of well on the datasheet.
- 3. All equipment should be decontaminated before and after introduction to each well. Protective latex or nitrile gloves should be worn during possible water-contact or

New Version #: 01

#### MONITORING WELL PURGING AND GROUNDWATER SAMPLING

## **Teck**

equipment-contact activities. At a minimum, gloves should be changed between each well or when introduction of potential contaminants to the well is possible.

- 4. Measure water level using an electronic water level meter as described in SP&P TC-GW-01. Sounding the bottom of the well using a weighted tape (i.e., for well casing volume calculations) before sampling is not recommended to avoid resuspension of settled solids. If possible, determine the elevation of the well bottom from drilling records.
- 5. Calculate the well casing volume as follows:

well casing volume (L) = 
$$\pi$$
 (r<sup>2</sup>)(h)(1000 L/m<sup>3</sup>)

where h = height of water in the well casing (i.e., depth to bottom of the well minus depth to water (in m), and r = radius of well casing (in m).

6. Calibrate water quality meters for measuring field parameters as appropriate. At a minimum, temperature, pH, specific conductance, and turbidity measurements should be collected during purging and before sampling. Record equipment calibration and maintenance in the equipment log sheets. Decontaminate meters between wells by rinsing with distilled water.

#### **Well Purging**

Where reasonably practicable, it is recommended that 3-4 purge volumes of water is removed from the well. Monitoring wells are purged before groundwater samples are collected for analyses. The purpose of well purging is to remove stagnant groundwater from the well (which has interacted with air in the well casing).

The well must then be allowed to recharge prior to sampling. In some cases, such as encountering a very low production and/or essentially dry well, it is not feasible to purge 3-4 volumes of water. If this situation is encountered, be sure to keep good records of the field conditions experienced, the volume of water purged, and notes detailing why 3-4 purge volumes are not possible. Also record any visual observations of the water purged, such as color, turbidity, odor, presence of invertebrates (eg. mayfly larva) etc., which may provide useful information about the state of the well.

Field parameters (i.e., at a minimum pH, temperature and specific conductance) are measured during the purging process (See SOP TC-GW-03).

Purging is assumed to be complete when the readings of these parameters have stabilized.

New Version #: 01

#### MONITORING WELL PURGING AND GROUNDWATER SAMPLING

## Teck

It is recommended that purging takes place the day before sampling. The well needs to nave the stagnant water removed and then recharge. However, recharge water should not sit for too long prior to sampling, as it can react again with air in the casing and become unrepresentative of the groundwater in the area.

- Lower the pump intake or intake tubing (as applicable) into the water column. The
  pump intake should be placed at the middle or slightly above the middle of the
  screened interval in confined aquifers. Placement of the pump intake near the top of
  the water column is recommended for unconfined aquifers screened across the
  water table.
- 2. Conduct purging at a rate that is lower than used to develop the well and that will minimize drawdown in the well. Recommended purge rates for low-flow sampling are generally less than 0.5 L/min, or a rate that results in minimal (i.e., less than 0.3 m) drawdown in the well. Actual purge rates will vary on the basis of aquifer material, well construction, and purging equipment.
- 3. Continue purging the well until field parameters have stabilized. Field parameters are stable when three successive readings are within  $\pm$  0.1 for pH,  $\pm$ 3 percent for conductivity,  $\pm$  0.2 °C for temperature,  $\pm$  10 mV for redox potential and  $\pm$  10 percent for turbidity and dissolved oxygen.
- 4. After the field parameters have stabilized, reduce the pump rate to approximately 0.1 L/min or the lowest possible flow setting for the particular pump. Pump should be operated at a rate less than 0.1 L/min when collecting samples for VOC analysis.
- 5. In the event that even very low purge rates result in emptying of the well, groundwater samples for laboratory analyses should be collected as soon as sufficient groundwater accumulates in the well, regardless of field parameters or total volume purged.

#### **Groundwater Sampling**

- Groundwater sampling is conducted after proper purging of the well.
- Where possible, groundwater samples for analyses should be collected directly from the pump discharge at the lowest rate possible to minimize cross contamination, suspension of solids, and aeration of the sample.
- Both bladder pumps and submersible pumps are suitable for purging and sampling of all groundwater parameters. A bailer may be used to collect groundwater samples for laboratory

New Version #: 01

#### MONITORING WELL PURGING AND GROUNDWATER SAMPLING

## Teck

analyses of volatile organic compounds; however, the peristaltic pump is suitable for collection of semivolatile organic compounds (SVOCs), metals, and general chemistry parameters.

- Bailers are not recommended for purging or sampling of groundwater monitoring wells because they may agitate solids in and next to the well.
  - 1. Groundwater samples should be introduced directly from the pump discharge into the proper sample container and filled to capacity.
  - 2. In general, groundwater samples collected for multiple compounds should be collected in the following order:
    - Volatile organic compounds (VOCs)
    - Dissolved gasses and total organic carbon (TOC)
    - SVOCs (such as polycyclic aromatic hydrocarbons)
    - Metals and cyanide
    - Major water quality cations and anions
    - Radionuclides.
  - 3. In some cases, field filtration may be required (e.g., metals). Filtered water should be introduced directly into the appropriate sample container. If samples cannot be filtered in the field, do not preserve them. The receiving lab can filter then preserve.
  - 4. If applicable, remove the pump or tubing from the well. Close and lock the well. Decontaminate the sampling equipment.

#### 5.0 DEVIATION FROM PROCEDURE

Adherence to this procedure will ensure that wells are purged and sampled correctly. Deviation from this procedure may result in improper collection of samples which yield poor or incorrect data, or to unnecessary health and safety risk to the person(s) collecting the sample(s).

#### 6.0 KEY DOCUMENTS/TOOLS/REFERENCES

New Version #: 01

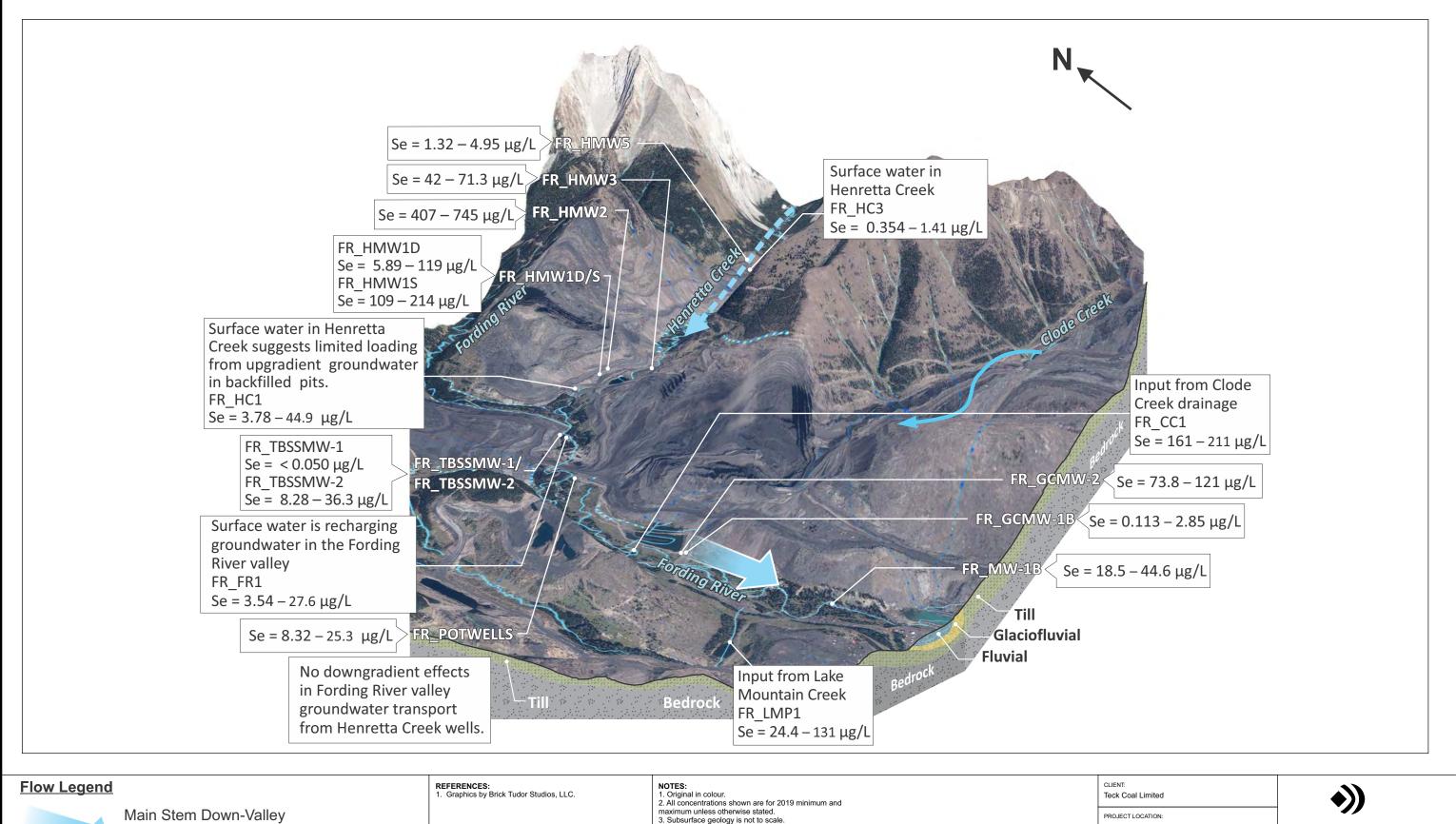
#### MONITORING WELL PURGING AND GROUNDWATER SAMPLING

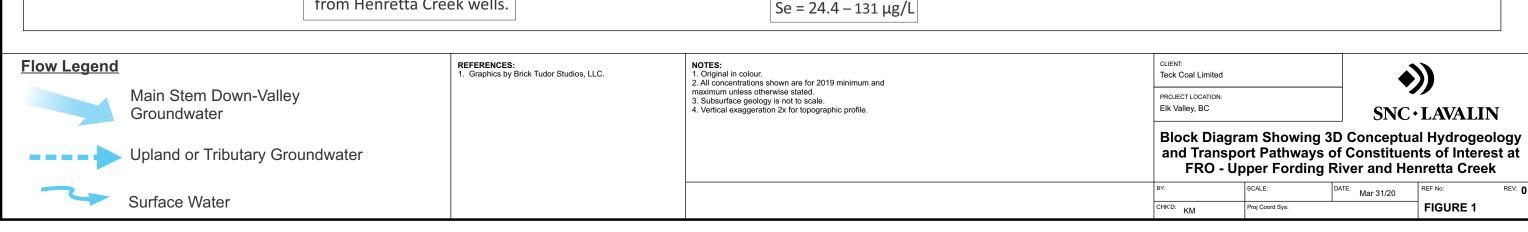
## **Teck**

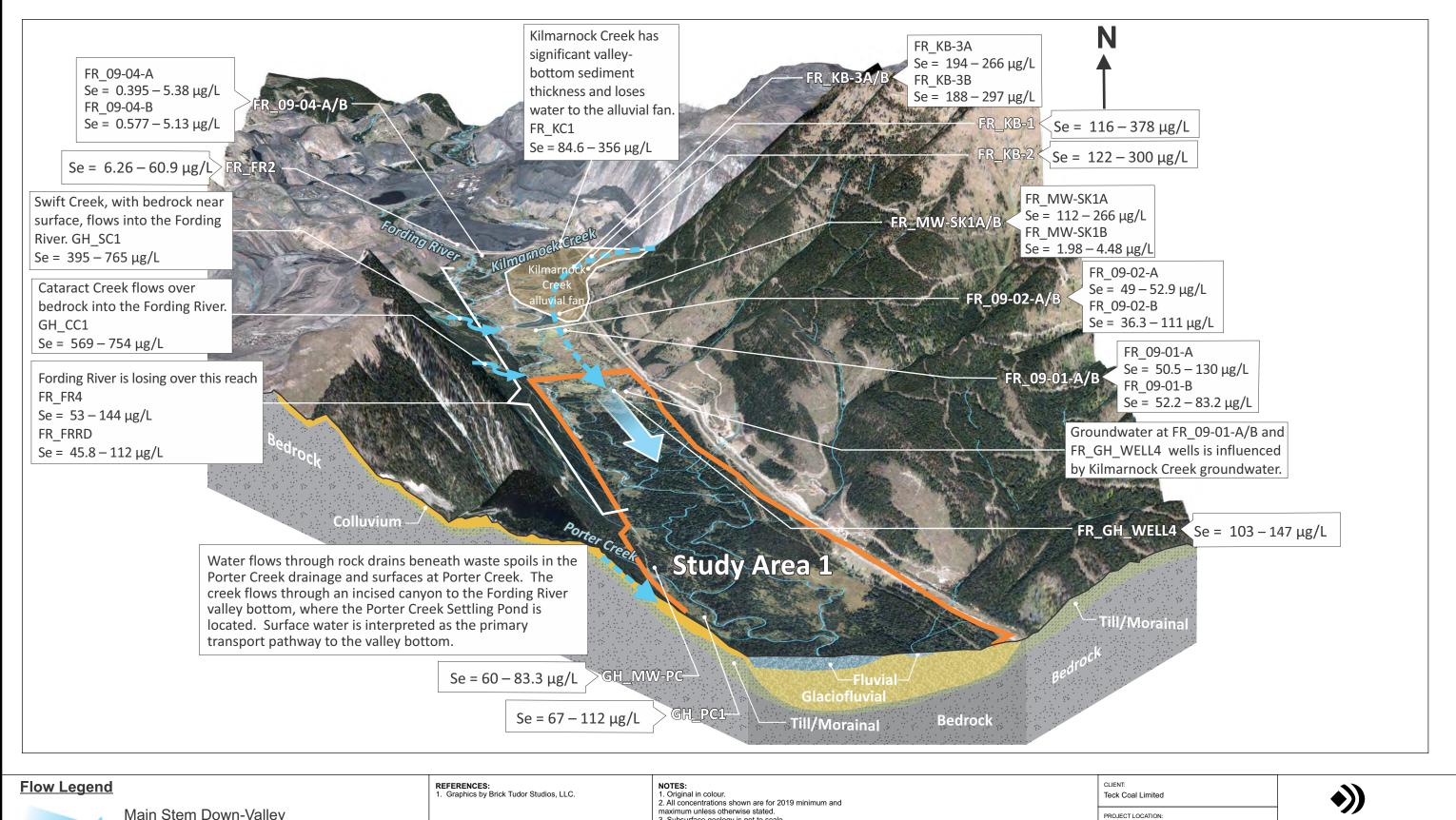
- British Columbia. 2003. British Columbia field sampling manual for continuous monitoring and the collection of air, air-emission, water, wastewater, soil, sediment and biological samples. Province of British Columbia, Ministry of Water, Land and Air Protection. January.
- Teck. 2012. Environment, Health, Safety and Community Management Standards. July.
  - o Standard 4 Water, Ecosystems and Biodiversity
  - o Standard 13 Monitoring Measurement, Inspection and Audit
  - Standard 20 Documents and Records
- U.S. EPA. 1993. Ground water sampling—a workshop summary. EPA/600/R-94/205.
   U.S. Environmental Protection Agency, Robert S. Kerr Environmental Research Laboratory, Ada, OK.

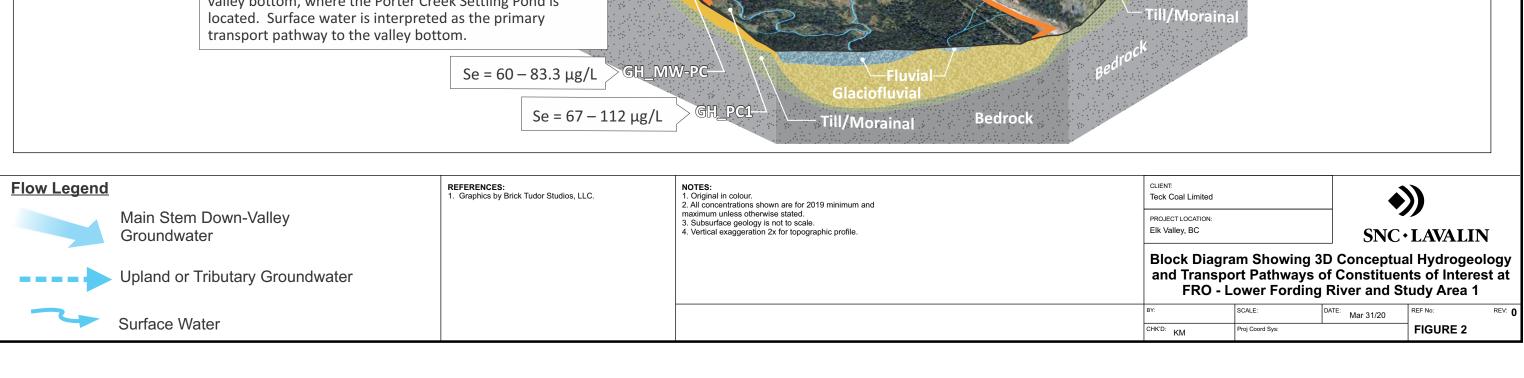
# Appendix VI

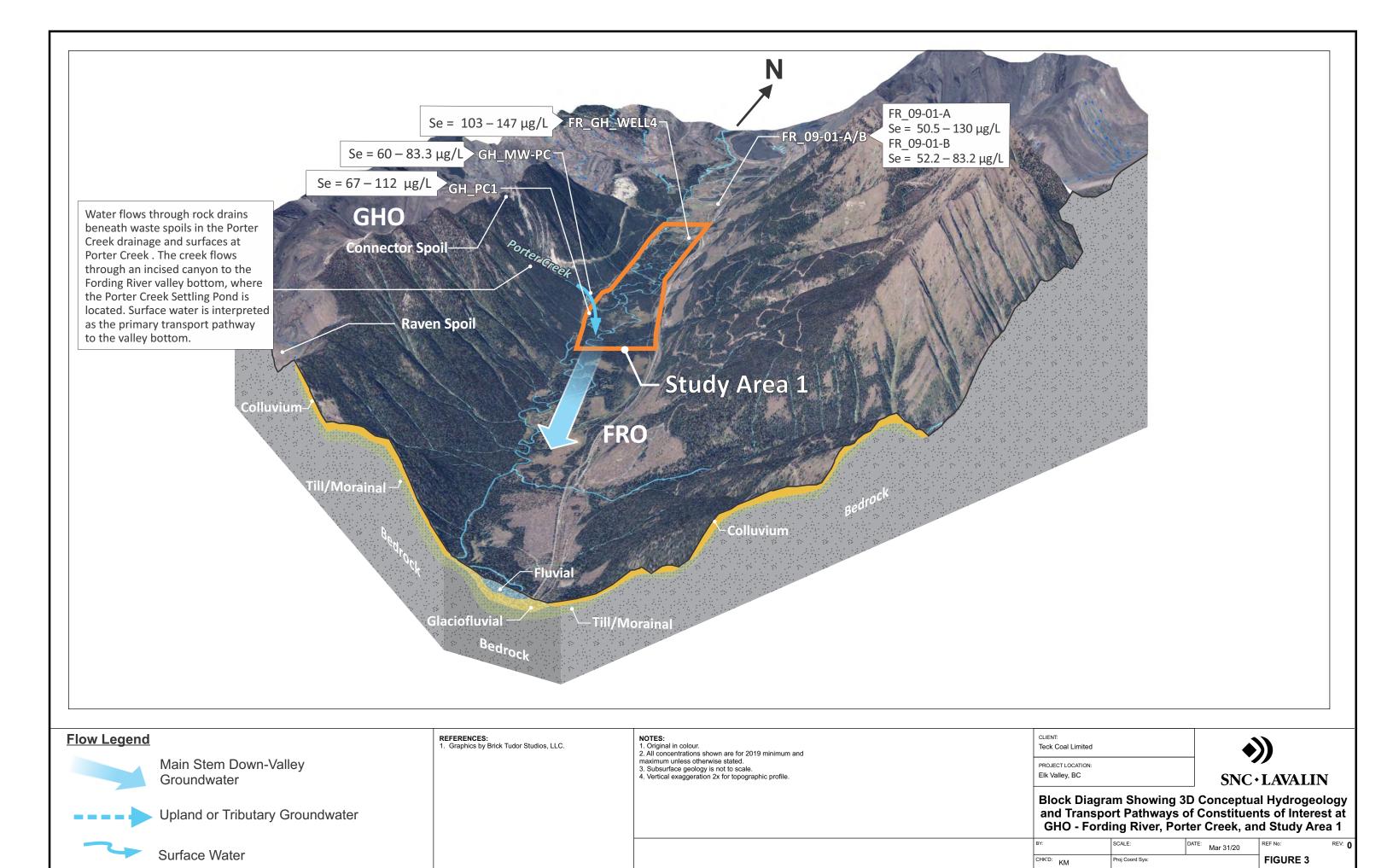
Block Diagrams

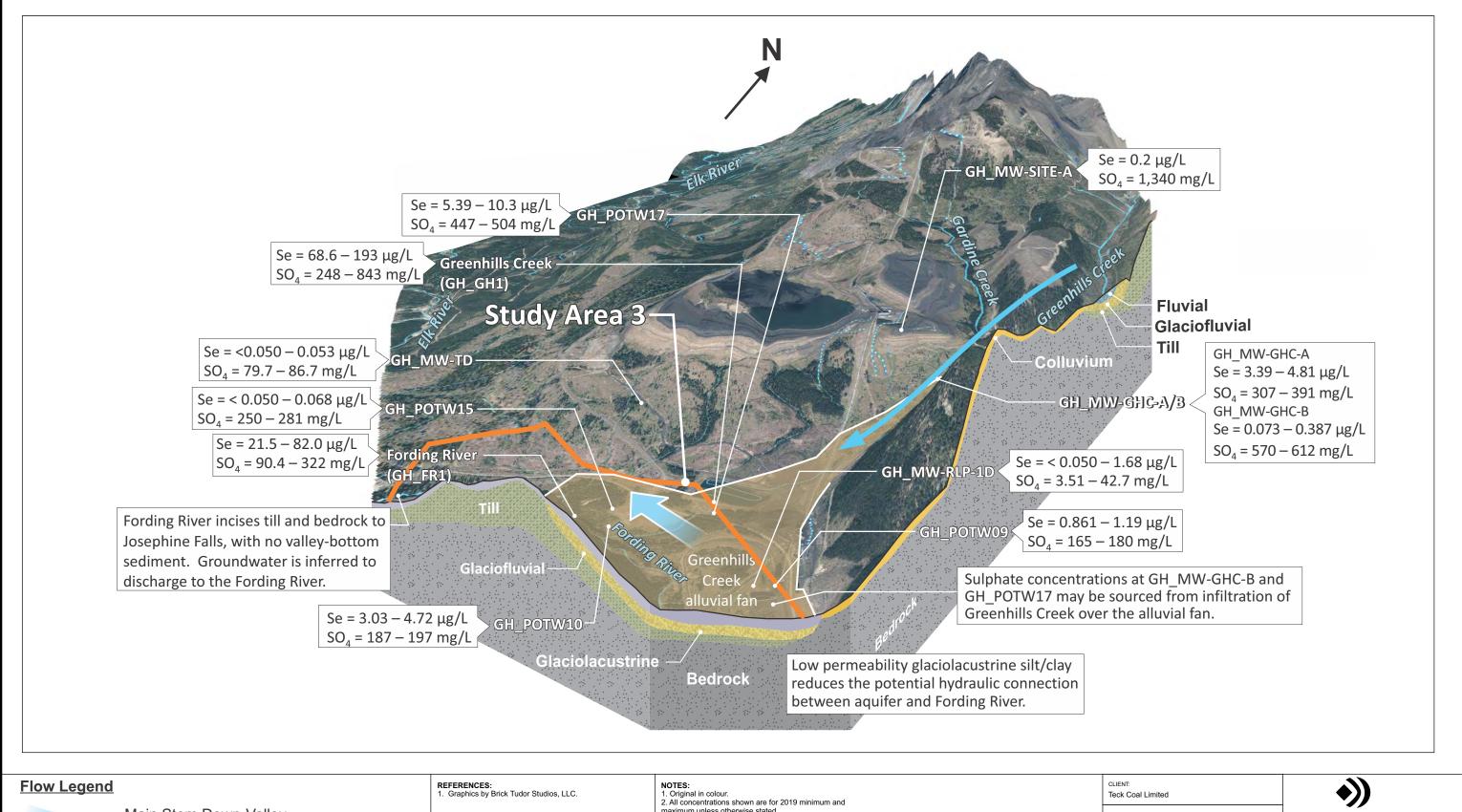


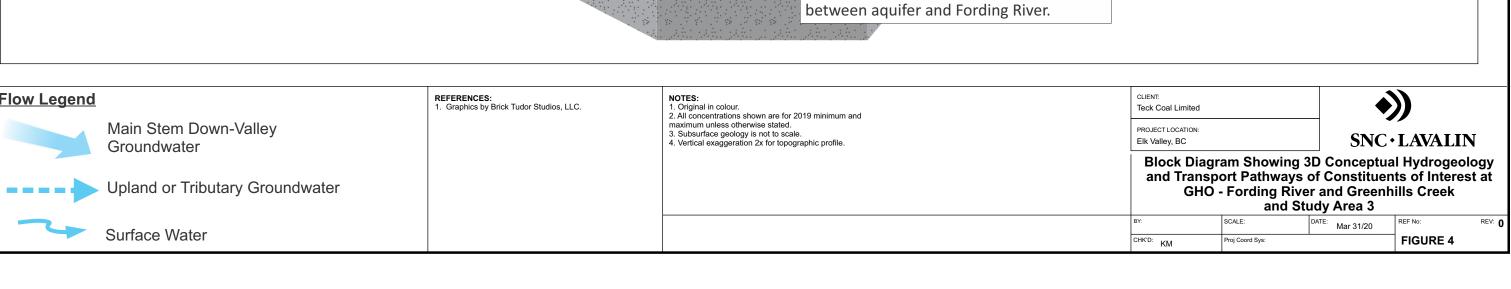


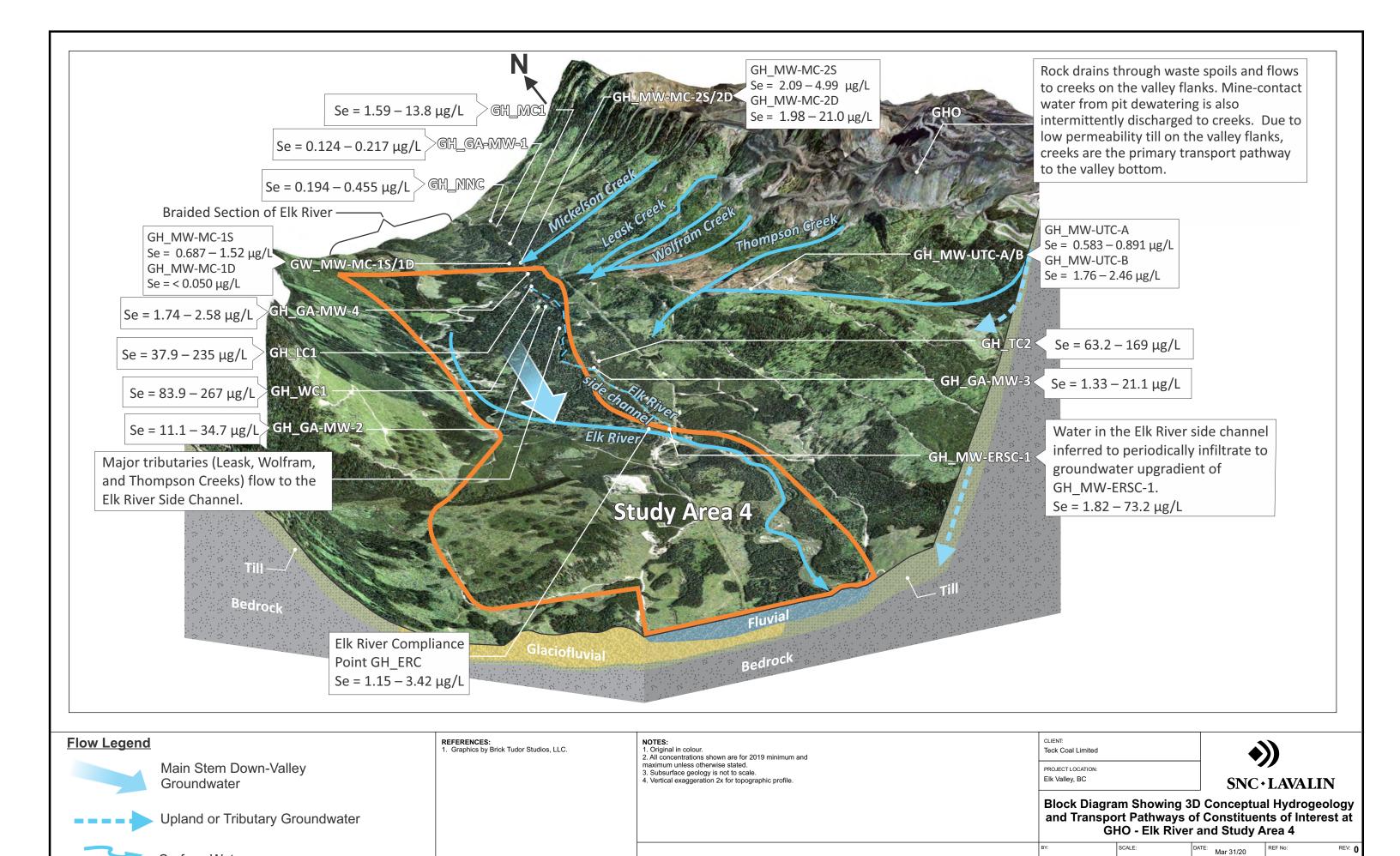










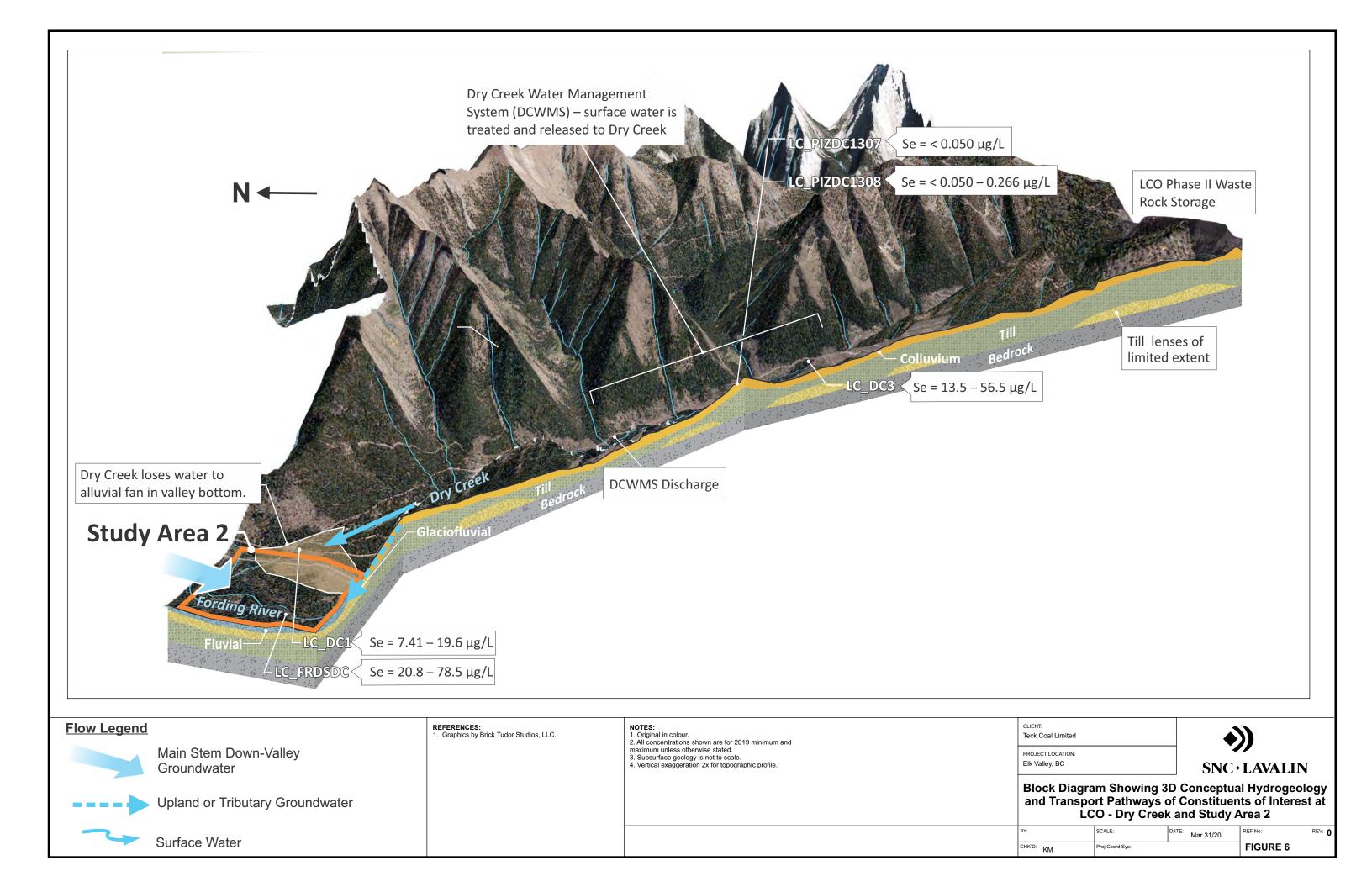


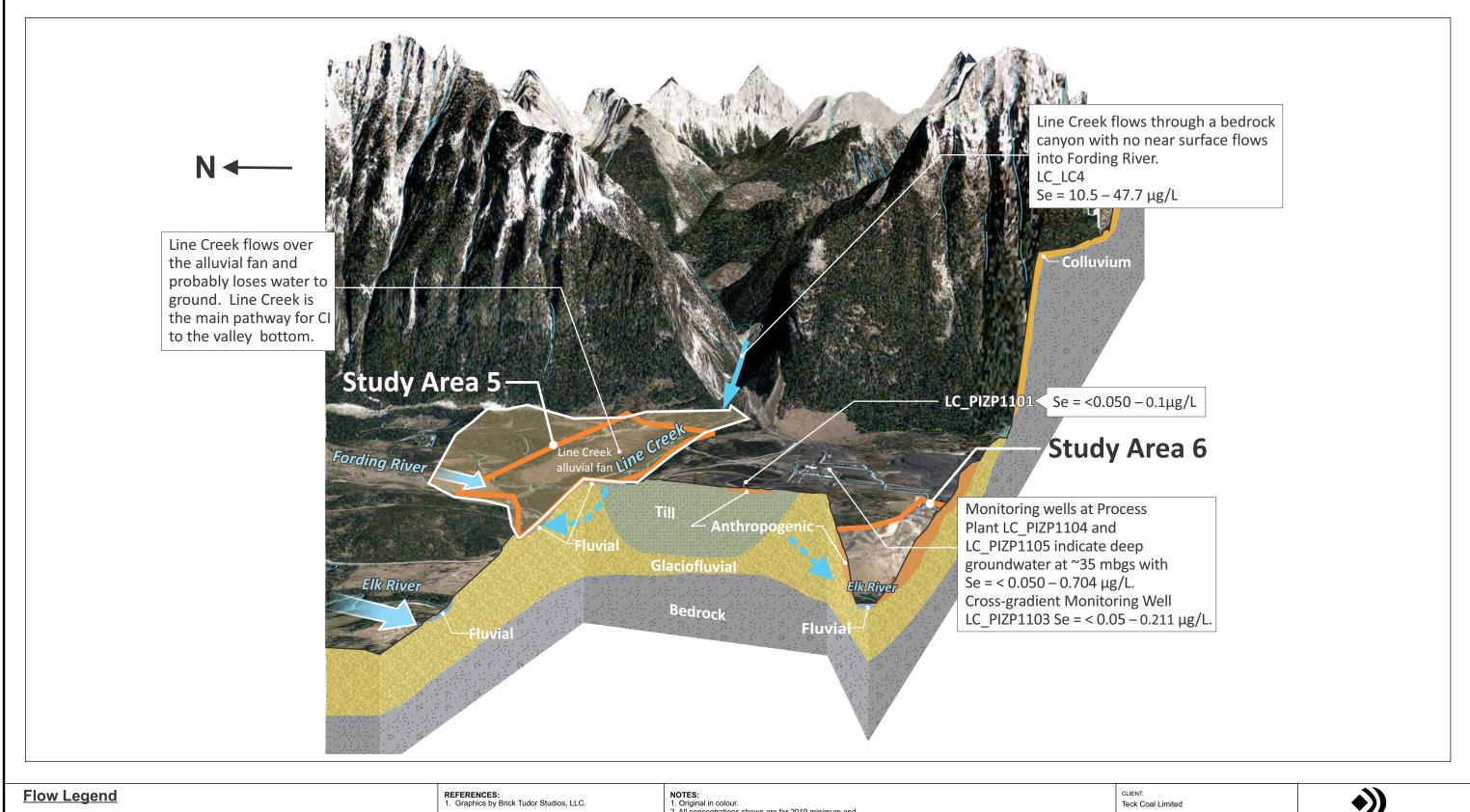
CHK'D: KM

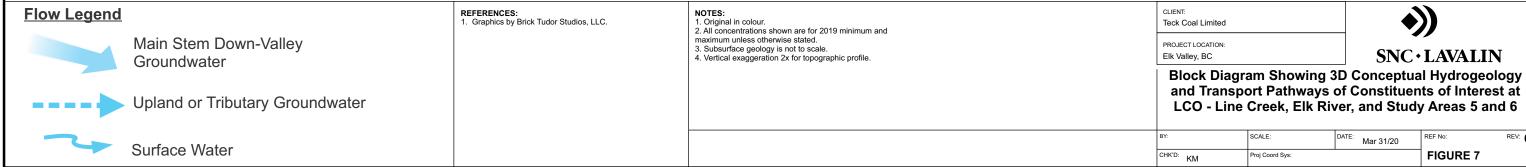
Proj Coord Sys:

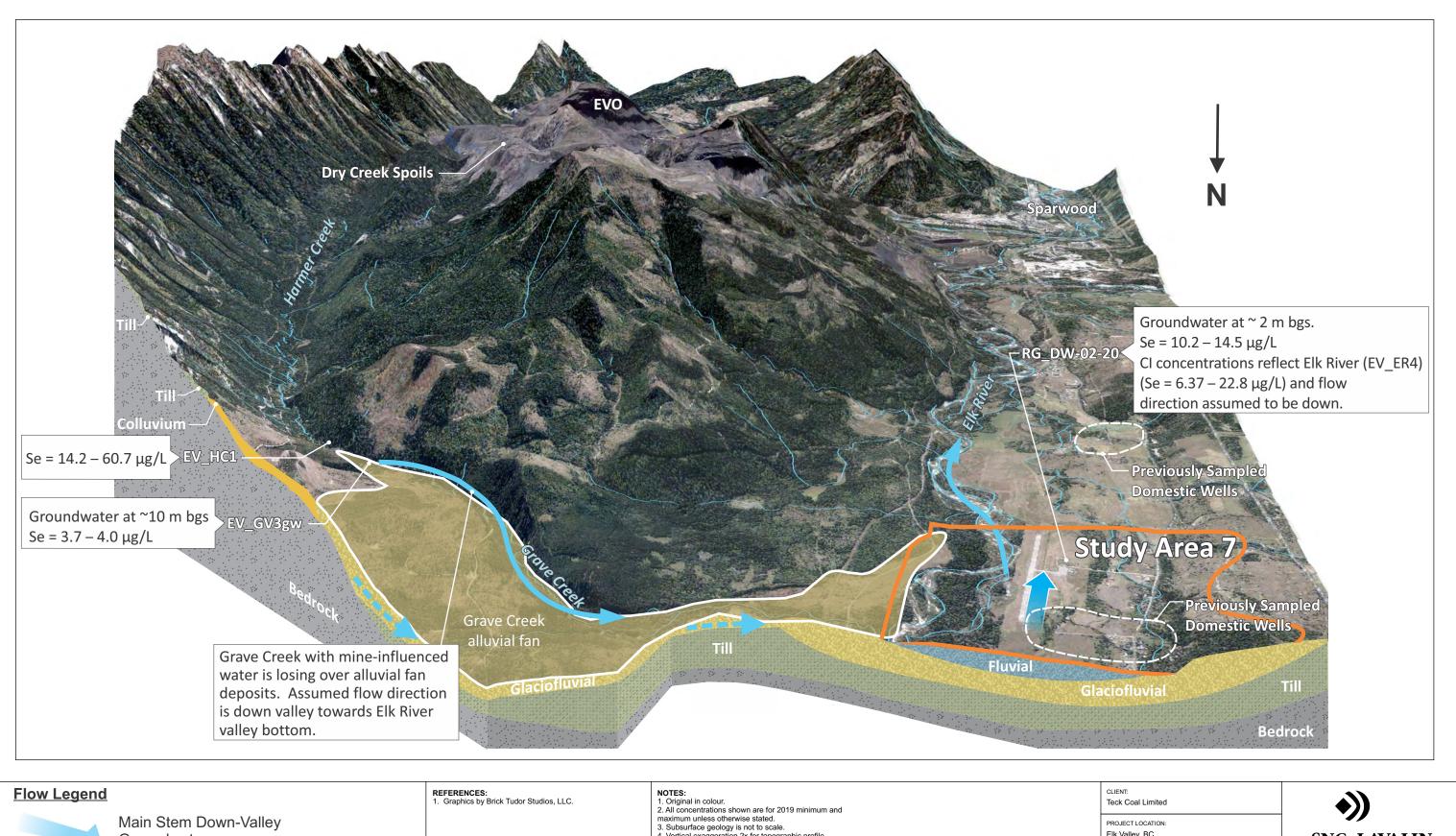
FIGURE 5

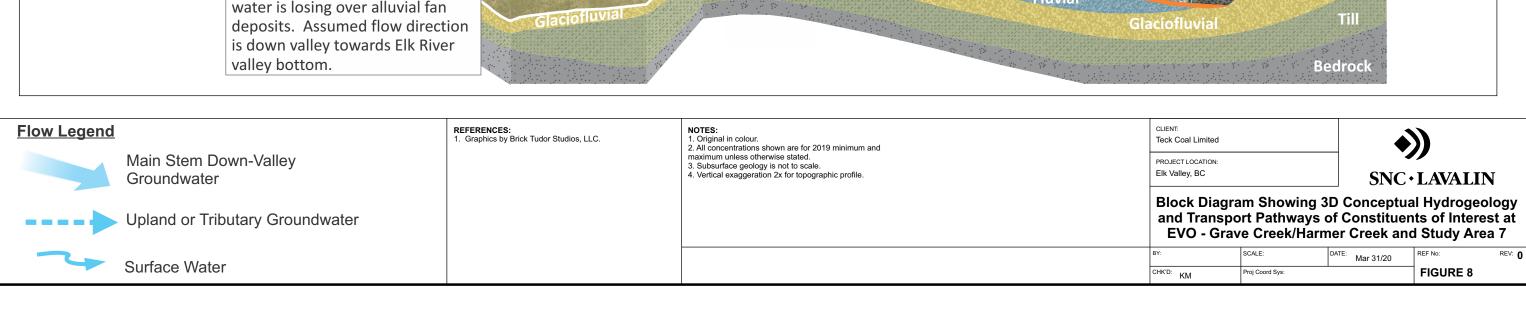
Surface Water

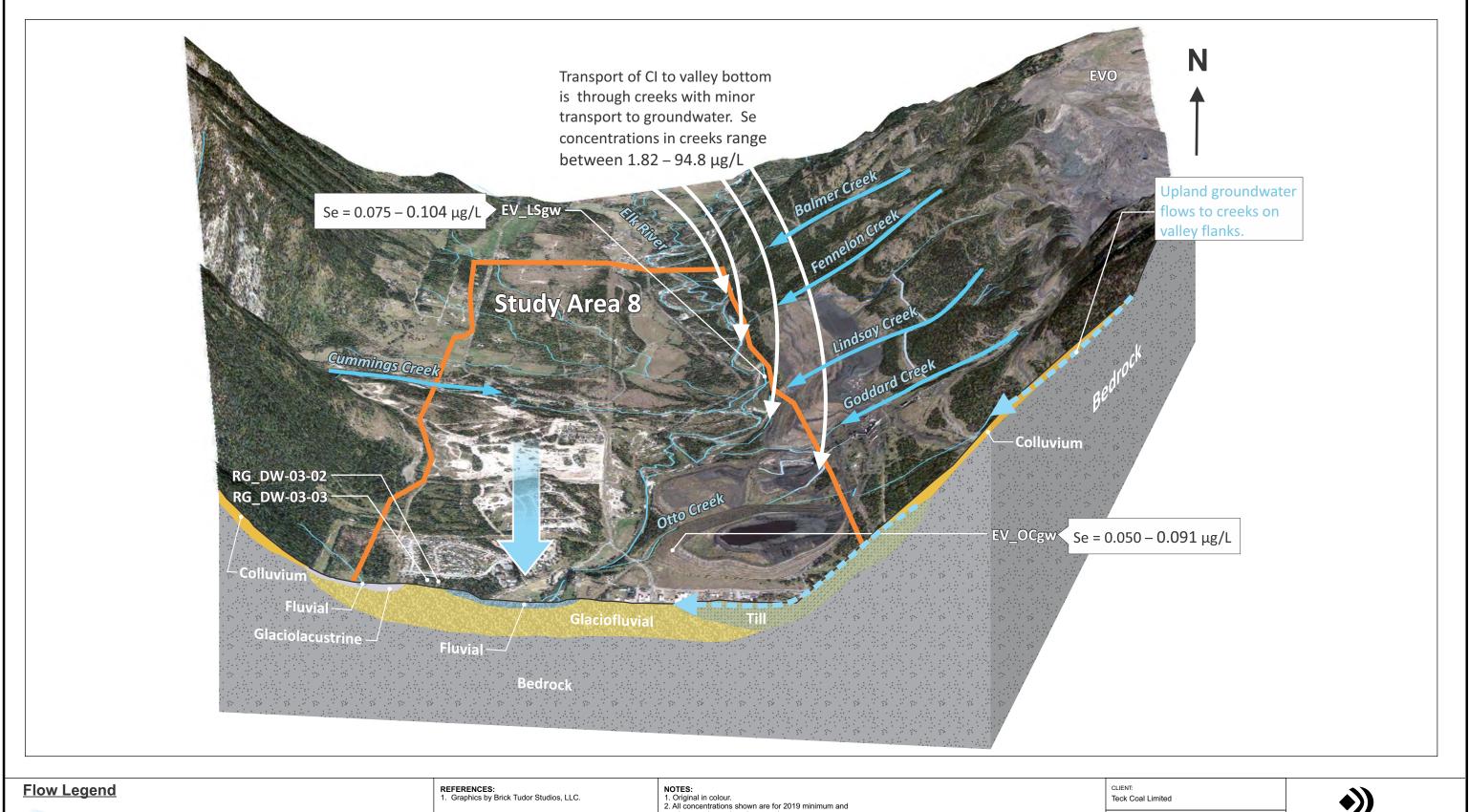


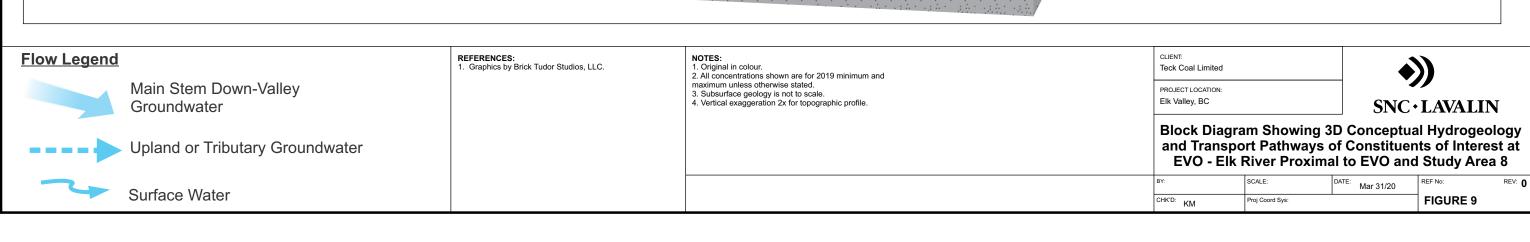


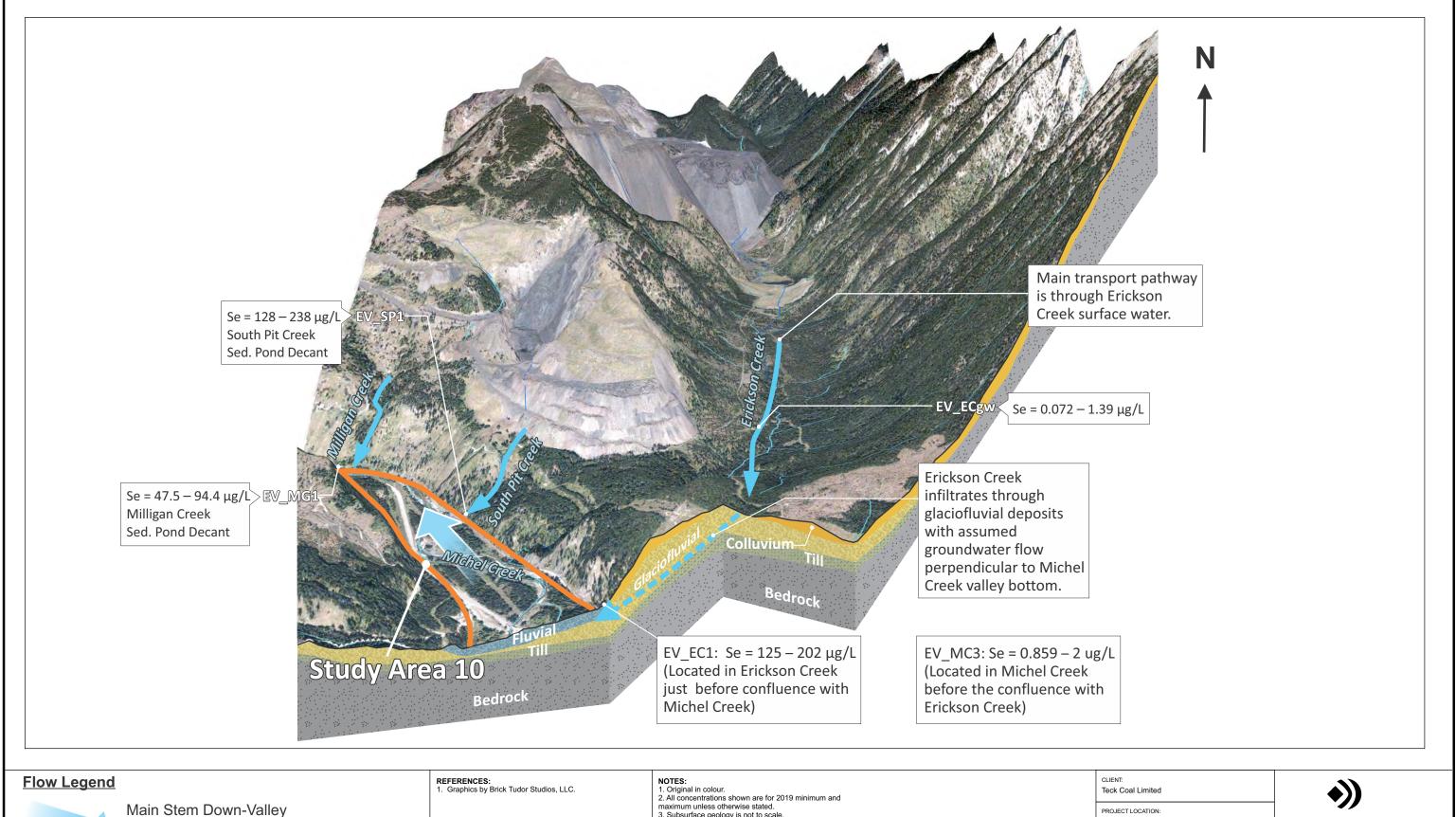


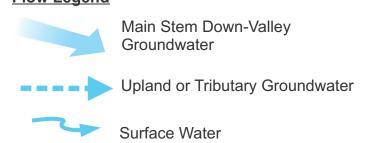












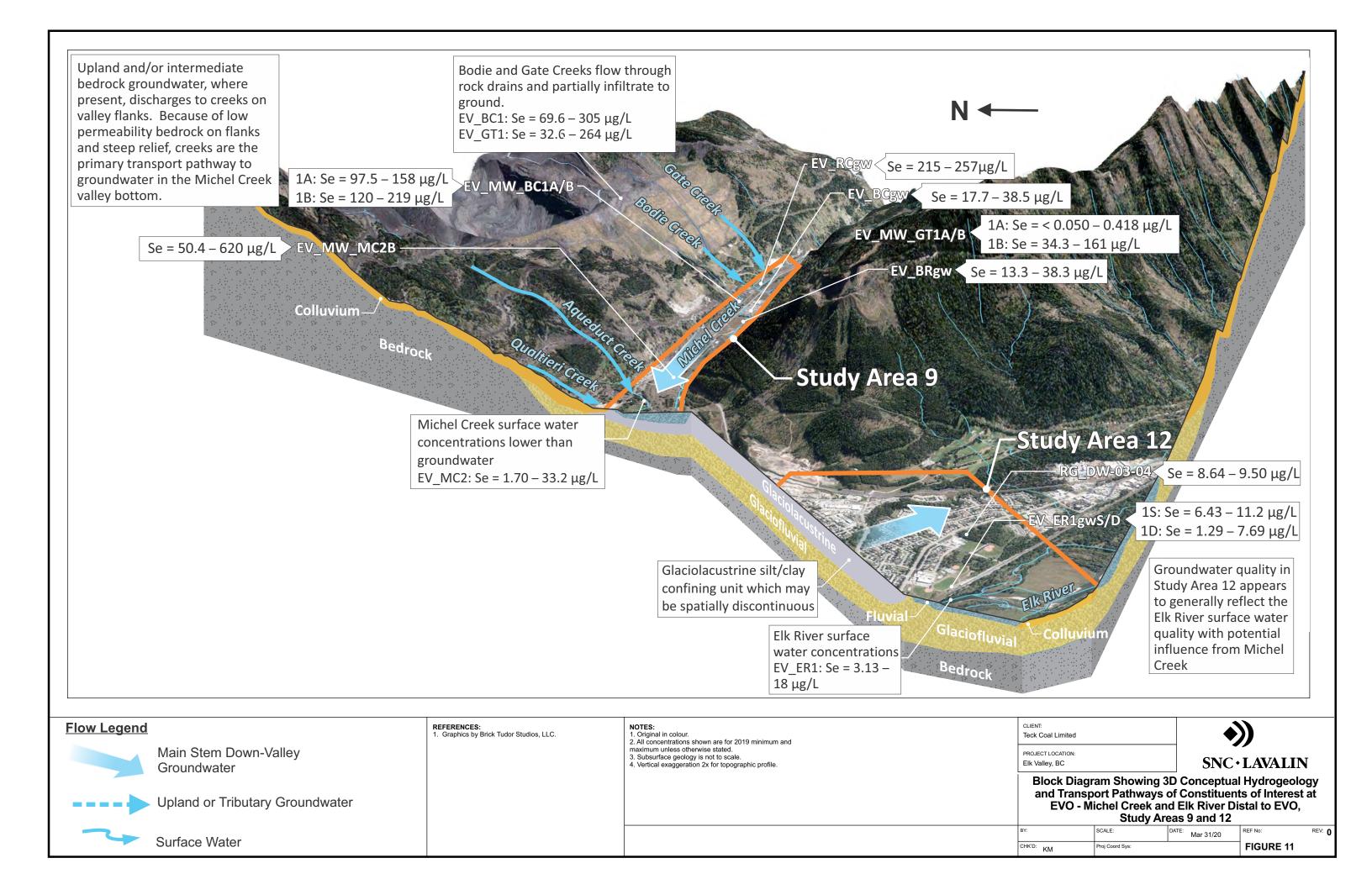
NOTES:
1. Original in colour.
2. All concentrations shown are for 2019 minimum and maximum unless otherwise stated.
3. Subsurface geology is not to scale.
4. Vertical exaggeration 2x for topographic profile.

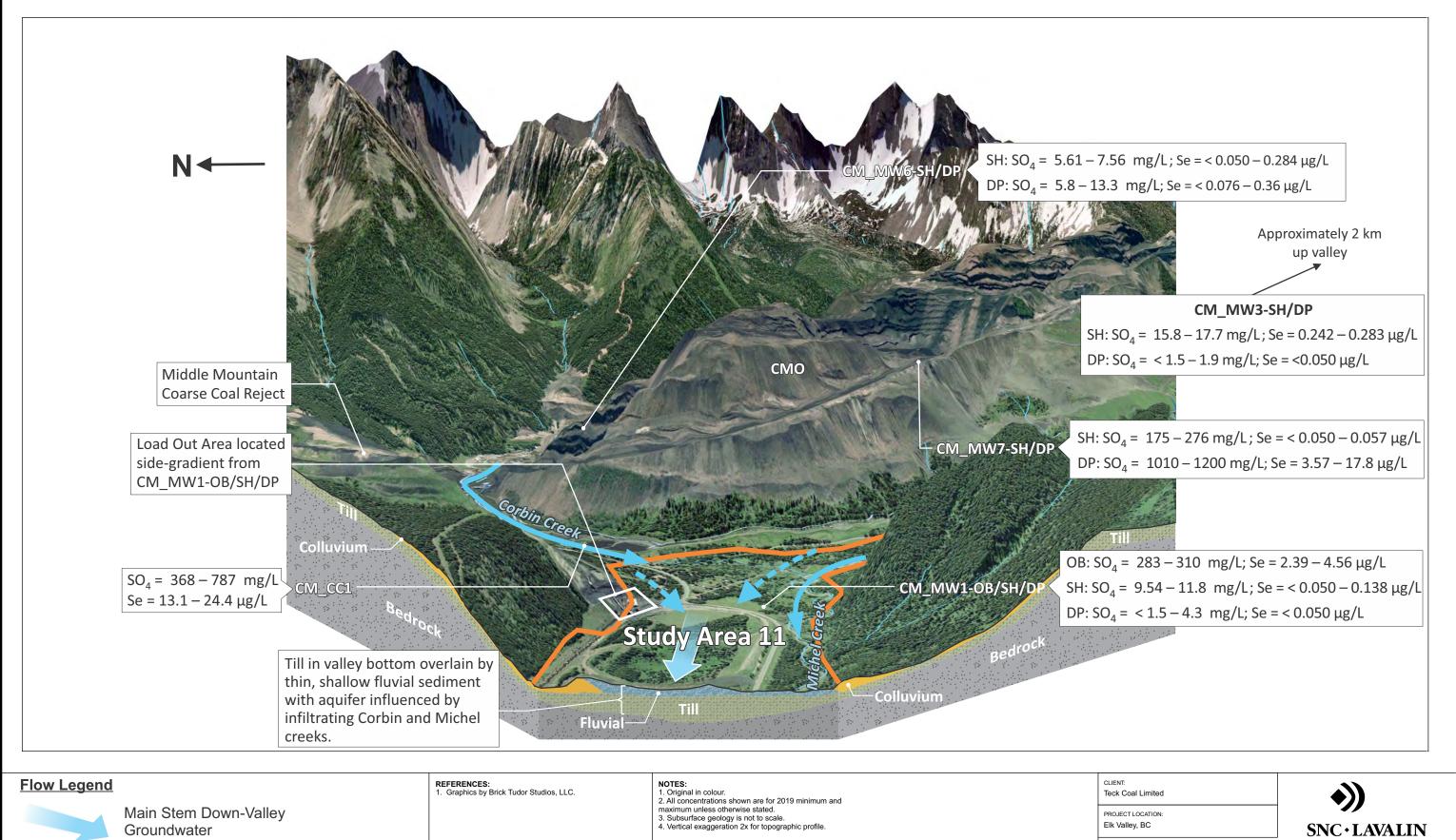
Elk Valley, BC

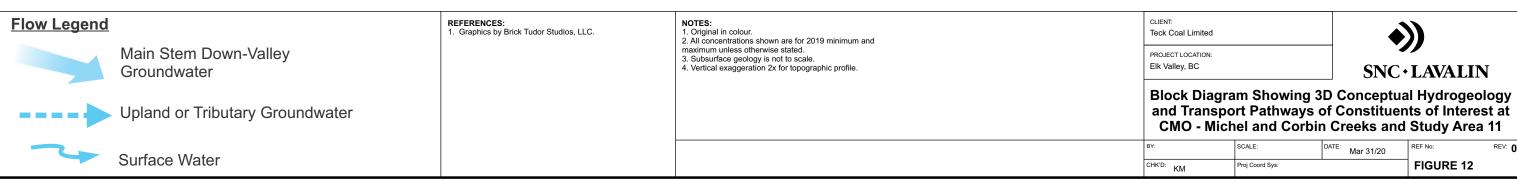


Block Diagram Showing 3D Conceptual Hydrogeology and Transport Pathways of Constituents of Interest at EVO - Erickson Creek and Study Area 10

Υ:	SCALE:	DATE: Mar 31/20	REF No:	REV: 0
HK'D: KM	Proj Coord Sys:	•	FIGURE 10	







## Appendix VII

Mann-Kendall Trend Analysis

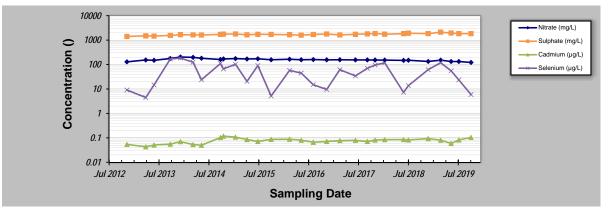
## **GSI MANN-KENDALL TOOLKIT**

for Constituent Trend Analysis

Evaluation Date: 05-Feb-20 Job ID: 671557
Facility Name: Teck Coal Regional Groundwater - FRO Location FR\_HMW1D
Conducted By: NDS

Parameter (units) Nitrate (mg/L) Sulphate (mg/L) Cadmium (µg/L) Selenium (µg/L)

Pali	ameter (umits)	Mitrate (IIIg/L)	Sulphate (IIIg/L)	Caumum (µg/L)	Selemum (µg/L	· <u>) </u>	
Sampling Event	Sampling Date				MW1D CONCENT	RATION	
1	9-Nov-12	129	1410	0.054	9.1		
2	28-Mar-13	154	1500	0.043	4.46		
3	28-May-13	149	1460	0.051	14.6		
4	25-Sep-13	177	1560	0.055	168		
5	9-Dec-13	203	1660	0.07	184		
6	12-Mar-14	197	1640	0.053	125		
7	13-May-14	181	1620	0.05	23.8		
8	30-Sep-14	161	1710	0.103	110		
9	22-Oct-14	170	1760	0.118	66.5		
10	19-Jan-15	175	1780	0.107	103		
11	14-Apr-15	169	1650	0.085	20.5		
12	3-Jul-15	172	1730	0.071	90.7		
13	9-Oct-15	157	1710	0.087	5.17		
14	22-Feb-16	165	1660	0.088	57.5		
15	18-May-16	157	1600	0.08	44.8		
16	15-Aug-16	160	1700	0.066	15		
17	22-Nov-16	156	1780	0.071	9.55		
18	27-Feb-17	157	1630	0.0769	61.5		
19	22-Jun-17	155	1730	0.079	34.3		
20	18-Sep-17	155	1800	0.071	70.1		
21	14-Nov-17	153	1860	0.081	95.6		
22	24-Jan-18	152	1740	0.084	118		
23	12-Jun-18	148	1830	0.085	7.31		
24	18-Jul-18	150	1910	0.082	13.7		
25	11-Dec-18	134	1850	0.0934	61.7		
26	13-Mar-19	151	2110	0.08	119		
27	29-May-19	133	1950	0.059	55.4		
28	25-Jul-19	133	1840	0.082	23.5		
29	23-Oct-19	122	1840	0.104	5.91		
30							
Coefficien	t of Variation:	0.12	0.09	0.24	0.86		
Mann-Kendal	I Statistic (S):	-233	269	122	-32		
Confi	dence Factor:	>99.9%	>99.9%	98.9%	71.8%		
Concen	tration Trend:	Decreasing	Increasing	Increasing	Stable		



#### Notes

- 1. At least four independent sampling events per well are required for calculating the trend. Methodology is valid for 4 to 40 samples.
- 2. Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
- Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, Ground Water, 41(3):355-367, 2003.

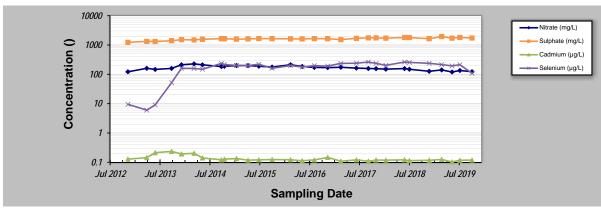
### **GSI MANN-KENDALL TOOLKIT**

for Constituent Trend Analysis

Evaluation Date: 05-Feb-20 Job ID: 671557
Facility Name: Teck Coal Regional Groundwater - FRO Location FR\_HMW1S
Conducted By: NDS

Parameter (units)	Nitrate (mg/L)	Sulphate	(mg/L) Cadmium	(µg/L) Selenium (բ	ıg/L)

T GIV	arriotor (drinto)	retruto (mg/L)	Carpitate (mg/L)	Oddiniani (pg/L)	Colomani (pg/L)	7	
Sampling Event	Sampling Date			FR_HI	MW1S CONCENTR	RATION	
1	9-Nov-12	122	1230	0.128	9.51		
2	28-Mar-13	160	1330	0.144	6		
3	29-May-13	147	1320	0.213	9.07		
4	27-Sep-13	159	1400	0.235	51.9		
5	9-Dec-13	212	1520	0.192	160		
6	12-Mar-14	227	1490	0.203	158		
7	13-May-14	211	1570	0.141	149		
8	30-Sep-14	184	1640	0.121	236		
9	22-Oct-14	188	1640	0.128	215		
10	19-Jan-15	199	1580	0.134	202		
11	14-Apr-15	199	1610	0.118	199		
12	3-Jul-15	189	1660	0.121	220		
13	9-Oct-15	177	1640	0.124	161		
14	22-Feb-16	212	1620	0.122	199		
15	18-May-16	185	1610	0.113	178		
16	15-Aug-16	172	1650	0.12	197		
17	22-Nov-16	169	1640	0.147	191		
18	27-Feb-17	174	1530	0.109	236		
19	22-Jun-17	163	1690	0.121	239		
20	18-Sep-17	158	1750	0.109	262		
21	14-Nov-17	156	1760	0.119	236		
22	25-Jan-18	150	1710	0.118	203		
23	12-Jun-18	157	1810	0.121	262		
24	18-Jul-18	149	1790	0.114	255		
25	11-Dec-18	127	1640	0.117	238		
26	13-Mar-19	141	1940	0.125	214		
27	29-May-19	120	1710	0.103	194		
28	25-Jul-19	135	1810	0.117	213		
29	23-Oct-19	123	1730	0.119	109		
30							
	t of Variation:	0.18	0.10	0.25	0.41		
Mann-Kendal	l Statistic (S):	-198	287	-213	169		
Confi	dence Factor:	>99.9%	>99.9%	>99.9%	99.9%		
Concen	tration Trend:	Decreasing	Increasing	Decreasing	Increasing		



#### Notes

- 1. At least four independent sampling events per well are required for calculating the trend. Methodology is valid for 4 to 40 samples.
- 2. Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
- Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, Ground Water, 41(3):355-367, 2003.

### **GSI MANN-KENDALL TOOLKIT**

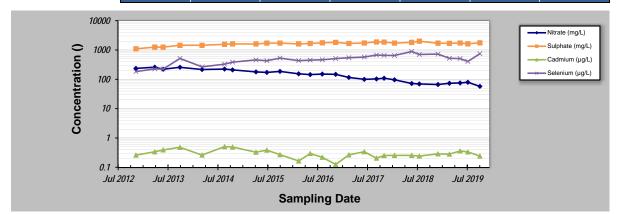
for Constituent Trend Analysis

Evaluation Date: 05-Feb-20
Facility Name: Teck Coal Regional Groundwater - FRO
Conducted By: NDS

Job ID: 671557 Location FR\_HMW2

Parameter (units)	Nitrate (mg/L)	Sulphate (	(mg/L) Cadmium	(μg/L) Selenium (μ	ıg/L)

Taranete (units) Marate (mg/L) Outprinte (mg/L)Outermain (pg/L)Outermain (pg/L)								
Sampling	Sampling	FR HMW2 CONCENTRATION						
Event	Date				WWWZ CONCENTR	AHON		
1	9-Nov-12	236	1100	0.26	184			
2	28-Mar-13	259	1250	0.338	226			
3	29-May-13	221	1250	0.392	224			
4	30-Sep-13	257	1450	0.48	516			
5	12-Mar-14	216	1450	0.261	267			
6	25-Aug-14	224	1560	0.506	329			
7	23-Oct-14	210	1610	0.492	385			
8	14-Apr-15	179	1600	0.327	461			
9	3-Jul-15	172	1710	0.384	430			
10	8-Oct-15	186	1720	0.27	530			
11	23-Feb-16	154	1610	0.164	434			
12	18-May-16	145	1670	0.295	451			
13	15-Aug-16	151	1760	0.22	465			
14	22-Nov-16	148	1820	0.125	509			
15	27-Feb-17	116	1670	0.265	547			
16	21-Jun-17	100	1730	0.339	574			
17	19-Sep-17	103	1880	0.205	674			
18	14-Nov-17	109	1860	0.252	657			
19	30-Jan-18	96.5	1720	0.254	650			
20	6-Jun-18	72	1830	0.254	891			
21	1-Aug-18	69.5	1990	0.241	705			
22	17-Dec-18	66.5	1700	0.287	725			
23	11-Mar-19	73.3	1690	0.28	522			
24	29-May-19	75.2	1730	0.36	510			
25	25-Jul-19	79.3	1620	0.334	407			
26	22-Oct-19	57.5	1760	0.241	745			
27								
28								
29								
30								
Coefficien	t of Variation:	0.45	0.12	0.31	0.35			
Mann-Kendal		-277	186	-69	203			
	dence Factor:	>99.9%	>99.9%	93.3%	>99.9%			



#### Notes

Concentration Trend:

- 1. At least four independent sampling events per well are required for calculating the trend. Methodology is valid for 4 to 40 samples.
- 2. Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
- Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, Ground Water, 41(3):355-367, 2003.

#### **GSI MANN-KENDALL TOOLKIT** for Constituent Trend Analysis Evaluation Date: 05-Feb-20 Job ID: 671557 Facility Name: Teck Coal Regional Groundwater - FRO Location FR HMW3 Conducted By: NDS Parameter (units) Nitrate (mg/L) Sulphate (mg/L) Cadmium (µg/L) Selenium (µg/L) 1.8 0.097 1.24 8-Nov-12 259 28-May-13 3 28.4 405 0.117 33.7 4 29-Aug-13 18.9 0.057 60 5 27-Sep-13 18.6 286 0.048 56.2 6 9-Dec-13 15.1 270 0.04 49.7 12-Mar-14 11.2 0.057 45.7 13-May-14 23.1 368 0.061 57.8 9 25-Aug-14 12.8 229 0.026 51.8 220 243 10 22-Oct-14 9.98 0.041 38.5 54.4 11 21-Jan-15 15.1 0.046 12 14-Apr-15 15.6 304 0.0615 48.3 13 3-Jul-15 11.5 204 0.032 50.9 14 8-Oct-15 231 0.0496 48.9 13 22-Feb-16 288 0.0592 33.4 16 19-May-16 14.8 17 10.1 214 44.4 15-Aug-16 0.0336 17-Nov-16 18 19.6 19 0.091 44.4 20 22-Jun-17 9.17 193 0.025 44.6 21 208 236 253 19-Sep-17 7.6 0.035 56.3 22 14-Nov-17 0.0377 66.1 8.7 23 25-Jan-18 8.43 0.0295 61.2 24 7-Jun-18 14.7 263 0.026 73.5 18-Jul-18 8.92 203 0.025 62.9 26 11-Dec-18 9.9 0.026 27 11-Mar-19 9.13 270 0.052 71.3 28 16-May-19 9.38 220 0.0217 55.5 151 7.02 0.0178 24-Jul-19 30 31 32 33 34 0.48 Coefficient of Variation Mann-Kendall Statistic (S) -214 131 -190 Confidence Factor: Concentration Trend: 1000 Nitrate (mg/L) Sulphate (mg/L) 100 Concentration Cadmium (µg/L) 10 0.1 0.01 Jul 2016 Jul 2012 Jul 2013 Jul 2014 Jul 2015 Jul 2017 Jul 2018 Jul 2019 **Sampling Date**

#### Notes:

- 1. At least four independent sampling events per well are required for calculating the trend. Methodology is valid for 4 to 40 samples.
- 2. Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥90% = Probably Increasing or Probably Decreasing; <90% and S>0 = No Trend; <90%, S≤0, and COV ≥1 = No Trend; <90% and COV <1 = Stable.
- Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, Ground Water. 41(3):355-367. 2003.

#### **GSI MANN-KENDALL TOOLKIT** for Constituent Trend Analysis Evaluation Date: 05-Feb-20 Job ID: 671557 Location FR\_HMW5 Facility Name: Teck Coal Regional Groundwater - FRO Conducted By: NDS Parameter (units) Sulphate (mg/L) Selenium (µg/L) 1 8-Nov-12 18.8 0.1 2 27-Mar-13 16.7 0.1 3 28-May-13 0.1 15.2 14-May-14 0.1 22.9 0.1 23-Oct-14 6 25-May-15 34.8 0.05 3-Jul-15 8 8-Oct-15 41.2 0.05 9 21-Jan-16 29.8 0.05 10 18-May-16 41 0.054 11 10-Aug-16 40 3.04 12 3-Nov-16 13 21-Jun-17 43.2 14 0.595 44.5 18-Sep-17 15 14-Nov-17 45.4 1.03 16 6-Jun-18 50.3 0.345 17 18-Jul-18 51.4 18 48.7 0.318 18-Dec-18 19 16-May-19 45.2 1.32 20 24-Jul-19 4.95 21 22-Oct-19 57.4 1.36 22 23 24 Coefficient of Variation: 0.33 1.60 Mann-Kendall Statistic (S) 168 Confidence Factor Concentration Trend: 100 Sulphate (mg/L) Concentration () 10 1 0.1 0.01 Jul 2019 Jul 2013 Jul 2014 Jul 2015 Jul 2016 Jul 2017 Jul 2018 Jul 2012 **Sampling Date**

#### Notes

- 1. At least four independent sampling events per well are required for calculating the trend. Methodology is valid for 4 to 40 samples.
- Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing;
   ≥90% = Probably Increasing or Probably Decreasing;
   <90% and S>0 = No Trend;
   <90%, S≤0, and COV ≥ 1 = No Trend;</li>
   <90% and COV < 1 = Stable.</li>
- 3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, Ground Water, 41(3):355-367, 2003.

#### **GSI MANN-KENDALL TOOLKIT** for Constituent Trend Analysis Evaluation Date: 05-Feb-20 Facility Name: Teck Coal Regional Groundwater - FRO Job ID: 671557 Location FR\_POTWELLS Conducted By: NDS Parameter (units) Nitrate (mg/L) Sulphate (mg/L) Selenium (µg/L) 4.48 11.9 21-Mar-11 12.6 106 28-Mar-11 5-Apr-11 14 1 11-Apr-11 5.18 116 15.1 18-Apr-11 119 15.9 5.32 26-Apr-11 2-May-11 5.37 114 17.7 9 24-May-11 3.66 68.4 10.1 10 20-Jun-11 44.6 1.96 5.69 27-Jun-11 40.2 5.97 12 18-Jul-11 1.76 41.3 31-Oct-13 119 24.5 14 35.3 24.8 13-Mar-14 8.48 183 14-May-14 30-Sep-14 16 3.14 81.6 13 17 23-Oct-14 3.62 94.6 14.7 18 22-Jan-15 22.6 19 14-Apr-15 5.74 129 23.3 20 3-Jul-15 21 9-Oct-15 11 90.4 27-Jan-16 5.29 137 19.7 14-Jun-16 8.78 24 16-Aug-16 17-Nov-16 3.07 96.1 13 2-Mar-17 27-Jun-17 1.65 9.4 19-Sep-17 3.82 20.5 121 29 21-Nov-17 30 20-Feb-18 5.75 186 31.6 12-Jun-18 1.64 2-Aug-18 11.8 33 27-Dec-18 3.99 147 24.6 34 14-Mar-19 4.44 169 25.4 13-Jun-19 8.73 56.5 36 31-Jul-19 1.13 50.2 37 17.4 7-Nov-19 2.77 118 40 Mann-Kendall Statistic (S) Confidence Factor 81.5% 99.0% 74.6% Concentration Trend 1000 Nitrate (mg/L) -Sulphate (mg/L) Concentration 100 Selenium (µg/L) 10 Jan 2011 Jan 2012 Jan 2013 Jan 2014 Jan 2015 Jan 2016 Jan 2017 Jan 2018 Jan 2019 Sampling Date

## Notes:

- At least four independent sampling events per well are required for calculating the trend. Methodology is valid for 4 to 40 samples.
- Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; 
  ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.</li>
- Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, Ground Water, 41(3):355-367, 2003.

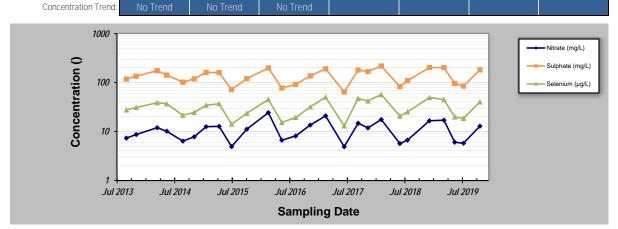
for Constituent Trend Analysis

Evaluation Date: 05-Feb-20
Facility Name: Conducted By: NDS

Job ID: 671557
Location FR\_MW-1B

Parameter (units) Nitrate (mg/L) Sulphate (mg/L) Selenium (µg/L)

	Tarantee (units) Natrate (mgrz) Outphate (mgrz) Setemum (pgrz)									
Sampling	Sampling			ED M	IW-1B CONCENTRA	VTION				
Event	Date			FR_IV	IW-IB CONCENTRA	THON -				
1	29-Aug-13	7.3	118	27.5						
2	31-Oct-13	8.64	135	31						
3	14-Mar-14	11.9	175	38.6						
4	14-May-14	10.1	142	36.8						
5	25-Aug-14	6.33	102	21.4						
6	6-Nov-14	7.76	119	24.5						
7	21-Jan-15	12.5	162	34.3						
8	14-Apr-15	12.7	159	36.8						
9	3-Jul-15	4.89	71.8	14.1						
10	8-Oct-15	11.1	120	23.5						
11	23-Feb-16	24.2	199	45						
12	19-May-16	6.61	77.4	15.3						
13	16-Aug-16	8.08	91.4	19.3						
14	17-Nov-16	13.5	137	31.7						
15	23-Feb-17	20.8	191	50.2						
16	22-Jun-17	4.87	64.2	13						
17	19-Sep-17	14.7	180	47.1						
18	21-Nov-17	11.8	168	42						
19	14-Feb-18	17.5	218	57						
20	13-Jun-18	5.64	82.5	20.6						
21	1-Aug-18	6.65	109	25.1						
22	19-Dec-18	16.5	203	49.3						
23	22-Mar-19	17	202	44.6						
24	30-May-19	6.01	95.9	19.8						
25	25-Jul-19	5.73	84.5	18.5						
26	7-Nov-19	12.8	182	40.1						
27										
28										
29										
30										
Coefficien	it of Variation:	0.47	0.34	0.40						
Mann-Kenda	II Statistic (S):	27	31	20						
Confi	dence Factor:	71.5%	74.4%	66.1%						



## Notes

- 1. At least four independent sampling events per well are required for calculating the trend. Methodology is valid for 4 to 40 samples.
- 2. Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
- 3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, Ground Water, 41(3):355-367, 2003.

#### **GSI MANN-KENDALL TOOLKIT** for Constituent Trend Analysis Evaluation Date: 05-Feb-20 Job ID: 671557 Facility Name: Teck Coal Regional Groundwater - FRO Location FR\_09-04-A Conducted By: NDS Parameter (units) Nitrate (mg/L) Sulphate (mg/L) Cadmium (µg/L) Selenium (µg/L) 444 0.48 15-Nov-12 21.9 0.795 29-May-13 3 3.7 331 0.695 0.54 4 19-Jun-13 0.53 5 29-Aug-13 5.99 345 0.719 0.57 6 17-Sep-13 0.51 31-Oct-13 8.34 375 0.686 0.47 17-Dec-13 0.47 9 12-Feb-14 0.6 10 13-Mar-14 4.9 391 0.715 0.47 11 14-May-14 2.99 0.794 0.47 12 25-Aug-14 0.424 361 0.923 0.43 13 26-Sep-14 0.41 14 0.147 0.917 360 27-Oct-14 0.39 14-Jan-15 0.063 387 0.884 0.27 16 0.913 17 414 0.975 0.172 2-Jul-15 0.025 18 413 19 0.146 20 15-Jun-16 0.025 402 1.07 0.117 21 16-Aug-16 0.212 391 1.04 0.361 22 21-Nov-16 378 1.05 0.154 0.025 23 23-Feb-17 0.108 347 1.05 0.197 24 12-Jun-17 0.07 370 1.13 0.107 344 12-Sep-17 0.049 1.01 0.107 26 21-Nov-17 0.025 337 0.985 0.112 27 31-Jan-18 0.0921 348 0.986 0.118 28 13-Jun-18 0.089 396 1.3 0.177 406 1.23 1-Aug-18 30 1.04 0.147 12-Dec-18 31 0.955 13-Feb-19 1.12 366 2.38 33 29-Jul-19 3.29 397 1.11 3.57 34 24-Oct-19 1.31 377 1.12 2.03 0.08 Coefficient of Variation 0.17 1.71 Mann-Kendall Statistic (S): Confidence Factor: Concentration Trend: 1000 Nitrate (mg/L) -Sulphate (mg/L) 100 Concentration -Cadmium (µg/L) 10 0.1 0.01 Jul 2012 Jul 2013 Jul 2014 Jul 2015 Jul 2016 Jul 2017 Jul 2018 Jul 2019

## Notes:

- 1. At least four independent sampling events per well are required for calculating the trend. Methodology is valid for 4 to 40 samples.
- 2. Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥90% = Probably Increasing or Probably Decreasing; <90% and S>0 = No Trend; <90%, S≤0, and COV ≥1 = No Trend; <90% and COV <1 = Stable.
- Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, Ground Water. 41(3):355-367. 2003.

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**Sampling Date** 

#### **GSI MANN-KENDALL TOOLKIT** for Constituent Trend Analysis Evaluation Date: 05-Feb-20 Job ID: 671557 Facility Name: Teck Coal Regional Groundwater - FRO Location FR\_09-04-B Conducted By: NDS Parameter (units) Nitrate (mg/L) Sulphate (mg/L) Cadmium (µg/L) Selenium (µg/L) 0.769 15-Nov-12 442 0.63 29-May-13 3 3.96 335 0.641 0.87 4 19-Jun-13 0.81 5 29-Aug-13 5.95 343 0.736 0.74 6 17-Sep-13 0.73 31-Oct-13 8.34 369 0.67 0.61 17-Dec-13 0.6 9 12-Feb-14 0.46 10 13-Mar-14 392 0.704 0.69 11 14-May-14 3.12 0.772 0.67 12 25-Aug-14 0.573 370 0.888 0.69 13 26-Sep-14 0.59 14 0.23 359 0.884 27-Oct-14 0.75 14-Jan-15 0.105 387 0.849 0.31 16 0.036 17 416 0.946 0.191 2-Jul-15 0.025 18 419 19 0.154 20 15-Jun-16 0.025 411 0.992 0.135 21 395 376 17-Aug-16 0.228 1.09 0.494 22 0.172 21-Nov-16 1.02 0.025 23 23-Feb-17 0.109 1.02 0.201 24 12-Jun-17 0.04 378 1.13 0.147 0.141 12-Sep-17 0.033 343 1.01 26 21-Nov-17 0.005 0.977 0.134 27 31-Jan-18 0.0776 350 0.99 0.232 28 13-Jun-18 0.664 392 1.15 0.13 418 1.14 1-Aug-18 0.915 0.261 30 0.218 353 0.957 12-Dec-18 31 0.931 13-Feb-19 1.05 369 2.32 5.13 33 29-Jul-19 3.29 426 1.16 3.62 34 24-Oct-19 1.04 1.95 0.09 0.16 1.42 Coefficient of Variation Mann-Kendall Statistic (S): -177Confidence Factor: Concentration Trend: Nitrate (mg/L) 100 -Sulphate (mg/L) Concentration -Cadmium (µg/L) 10 0.1 0.01 0.001 Jul 2016 Jul 2012 Jul 2013 Jul 2014 Jul 2015 Jul 2017 Jul 2018 Jul 2019 **Sampling Date**

## Notes:

- 1. At least four independent sampling events per well are required for calculating the trend. Methodology is valid for 4 to 40 samples.
- 2. Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥90% = Probably Increasing or Probably Decreasing; <90% and S>0 = No Trend; <90%, S≤0, and COV ≥1 = No Trend; <90% and COV <1 = Stable.
- Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, Ground Water. 41(3):355-367. 2003.

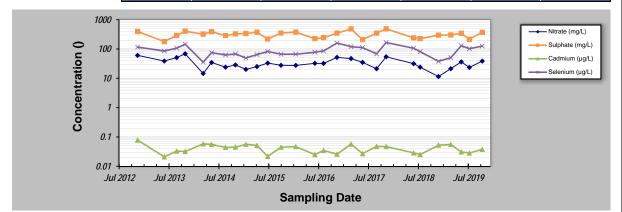
for Constituent Trend Analysis

Evaluation Date: 05-Feb-20 Facility Name: Teck Coal Regional Groundwater - FRO Conducted By: NDS

Job ID: **671557** Location FR\_09-01-A

Parameter (units)	Nitrate (mg/L)	Sulphate	(mg/L) Cadmium	(µg/L) Selenium (µg/L)	

Par	ameter (units)	Nitrate (mg/L)	Sulphate (mg/L	Cadmium (µg/L	Selenium (µg/L)		
Sampling	Sampling			ED 00	9-01-A CONCENTR	ATION	
Event	Date			FR_0	7-UI-A CUNCENTR	ATION	
1	14-Nov-12	60.6	395	0.078	116		
2	30-May-13	38.9	178	0.021	85.5		
3	29-Aug-13	50.8	290	0.033	107		
4	31-Oct-13	68.6	403	0.032	146		
5	13-Mar-14	14.6	320	0.058	35.6		
6	14-May-14	34.7	389	0.056	75		
7	25-Aug-14	24	287	0.044	62.7		
8	6-Nov-14	28.6	327	0.045	68		
9	22-Jan-15	20.2	337	0.056	49.3		
10	14-Apr-15	25.1	374	0.0517	64.5		
11	2-Jul-15	33.1	219	0.0217	82.2		
12	8-Oct-15	27.8	351	0.0447	66.6		
13	25-Jan-16	27.6	374	0.0468	66.3		
14	14-Jun-16	32.4	226	0.025	77.5		
15	17-Aug-16	32.2	242	0.0348	85.7		
16	24-Nov-16	51.7	347	0.0257	159		
17	8-Mar-17	47.2	481	0.0571	120		
18	1-Jun-17	35.1	208	0.0269	112		
19	12-Sep-17	21.2	347	0.0478	68.1		
20	22-Nov-17	54.3	486	0.0471	166		
21	13-Jun-18	31.6	239	0.0286	106		
22	31-Jul-18	24	226	0.0251	81.2		
23	13-Dec-18	11.5	297	0.0525	38.1		
24	14-Mar-19	21.3	302	0.0553	50.5		
25	30-May-19	36.5	343	0.031	130		
26	29-Jul-19	23.5	215	0.0284	102		
27	1-Nov-19	38.7	371	0.0377	126		
28							
29							
30			•				
	nt of Variation:	0.41	0.25	0.35	0.39		
Mann-Kenda	II Statistic (S):	-50	-24	-34	47		
Confi	dence Factor:	84.5%	68.3%	75.3%	83.0%		
Concer	tration Trend:	Stable	Stable	Stable	No Trend		



- 1. At least four independent sampling events per well are required for calculating the trend. Methodology is valid for 4 to 40 samples.
- 2. Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
- 3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, Ground Water, 41(3):355-367, 2003.

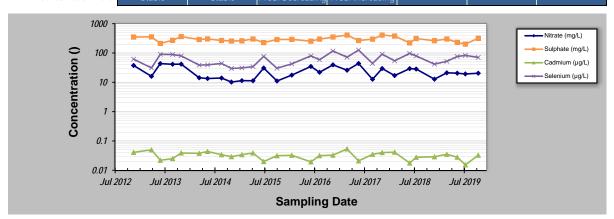
for Constituent Trend Analysis

Evaluation Date: 05-Feb-20
Facility Name: Teck Coal Regional Groundwater - FRO
Conducted By: NDS

Job ID: 671557 Location FR\_09-01-B

Parameter (units)	Nitrate (mg/L)	Sulphate (mg/	L) Cadmium (	μg/L) Selenium	(µg/L)

Pala	ameter (units)	Nitrate (mg/L)	Sulphate (mg/L	.) Cadmium (µg/L)	Selenium (µg/L)		
Sampling	Sampling			LD 00	-01-B CONCENTR	ATION	
Event	Date			FK_U9	-UI-D CUNCENTRA	ATION	
1	14-Nov-12	37.6	350	0.041	61.5		
2	26-Mar-13	16	354	0.05	31.1		
3	30-May-13	43.5	212	0.022	90.2		
4	29-Aug-13	41.3	271	0.025	89		
5	31-Oct-13	41.8	364	0.039	79.9		
6	13-Mar-14	14.3	288	0.038	38.7		
7	14-May-14	13.5	302	0.044	39.5		
8	25-Aug-14	14	267	0.034	44		
9	6-Nov-14	10.2	256	0.029	29.7		
10	22-Jan-15	11.4	261	0.034	31.1		
11	14-Apr-15	11.3	300	0.039	34.2		
12	2-Jul-15	30.8	227	0.0199	76.8		
13	8-Oct-15	11.1	288	0.0314	30.2		
14	25-Jan-16	17.6	291	0.0325	42.6		
15	14-Jun-16	34.8	252	0.0194	79.9		
16	17-Aug-16	22	297	0.0316	58.9		
17	24-Nov-16	39.4	351	0.0328	117		
18	8-Mar-17	25.9	409	0.0536	71.8		
19	1-Jun-17	43.9	267	0.0209	126		
20	12-Sep-17	12.7	296	0.035	44.2		
21	22-Nov-17	29.6	407	0.0402	91.5		
22	22-Feb-18	17	378	0.0414	54.1		
23	13-Jun-18	29.3	222	0.0177	97.1		
24	31-Jul-18	28.4	311	0.0278	79.4		
25	13-Dec-18	12.8	262	0.0289	41.8		
26	14-Mar-19	21.1	300	0.0351	52.2		
27	30-May-19	20.5	230	0.028	76		
28	29-Jul-19	19.3	201	0.0153	83.2		
29	1-Nov-19	20.4	317	0.0327	70.7		
30							
Coefficien	t of Variation:	0.47	0.19	0.29	0.42		
Mann-Kendal	I Statistic (S):	-24	-13	-80	74		
Confid	dence Factor:	66.6%	58.8%	93.0%	91.4%		
Concent	tration Trend:	Stable	Stable	Prob. Decreasing	Prob. Increasing		



## Notes

- 1. At least four independent sampling events per well are required for calculating the trend. Methodology is valid for 4 to 40 samples.
- 2. Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
- Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, Ground Water, 41(3):355-367, 2003.

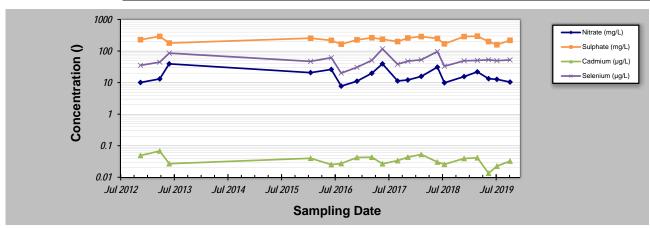
for Constituent Trend Analysis

Evaluation Date: 05-Feb-20
Facility Name: Teck Coal Regional Groundwater - FRO
Conducted By: NDS

Job ID: **671557** Location **FR\_09-02-A** 

Danamatan (unita)	Nitrata (man/l)	Sulphate (mg/L) Ca		Calamirum (result )
- Parameier (units)	Nitrate (md/L)	Sulphate (mg/L)/Ca	admium (ud/L)i	Seienium (ud/Li

				7- 13 /	113		
Sampling Event	Sampling Date			FR_09-	02-A CONCENTR	RATION	
1	14-Nov-12	10.1	229	0.049	35.2		
2	26-Mar-13	13.1	291	0.068	44.5		
3	30-May-13	39.3	179	0.027	85.9		
4	25-Jan-16	20.7	255	0.04	47.1		
5	15-Jun-16	26.1	218	0.0253	61.5		
6	22-Aug-16	7.74	165	0.0272	20		
7	8-Dec-16	11.1	226	0.0424	30.5		
8	20-Mar-17	19.8	264	0.0431	50.8		
9	1-Jun-17	39.4	236	0.0268	117		
10	13-Sep-17	11.3	200	0.0337	38.2		
11	22-Nov-17	12.1	259	0.0434	47.9		
12	22-Feb-18	15.7	287	0.0528	52.8		
13	13-Jun-18	31	250	0.0304	96.3		
14	31-Jul-18	9.87	169	0.0257	33		
15	13-Dec-18	15.5	288	0.0394	49.2		
16	14-Mar-19	21.9	296	0.0414	50.4		
17	30-May-19	13.3	200	0.0134	52.9		
18	26-Jul-19	12.7	158	0.0225	49.5		
19	24-Oct-19	10.4	219	0.0326	52.4		
20							
Coefficier	t of Variation:	0.54	0.19	0.35	0.44		
Mann-Kenda	II Statistic (S):	-11	-2	-39	33		
Confi	dence Factor:	63.5%	51.4%	90.7%	86.7%		
Concen	tration Trend:	Stable	Stable	Prob. Decreasing	No Trend		



## Notes

- 1. At least four independent sampling events per well are required for calculating the trend. Methodology is valid for 4 to 40 samples.
- Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing;
   ≥ 90% = Probably Increasing or Probably Decreasing;
   < 90% and S>0 = No Trend;
   < 90%, S≤0, and COV ≥ 1 = No Trend;</li>
   < 90% and COV < 1 = Stable.</li>
- 3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, Ground Water, 41(3):355-367, 2003.

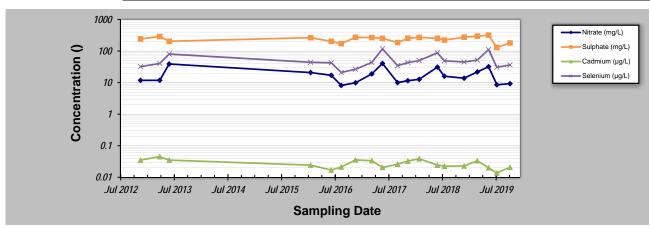
for Constituent Trend Analysis

Evaluation Date: 05-Feb-20
Facility Name: Teck Coal Regional Groundwater - FRO
Conducted By: NDS

Job ID: **671557** Location **FR\_09-02-B** 

Darameter (unite)	Nitrata (ma/l )	Culphata (ma/l.)	Cadmium (µg/L)	Colonium (ug/L)
raiailletei (uilits)	Miliale (IIIq/L)	Sulphate (IIIq/L)	∥Caulillulli (µy/∟)	Selemum (µg/L)

		<u> </u>					 •
Sampling Event	Sampling Date			FR_09	-02-B CONCENTR	ATION	
1	14-Nov-12	11.8	242	0.035	32.1		
2	26-Mar-13	11.8	288	0.045	40.4		
3	30-May-13	38.9	204	0.035	80.2		
4	25-Jan-16	20.8	265	0.0242	44.1		
5	15-Jun-16	17	202	0.017	42.4		
6	22-Aug-16	8.15	171	0.0211	21		
7	28-Nov-16	9.87	271	0.0355	26.4		
8	20-Mar-17	18.9	267	0.0335	43.8		
9	1-Jun-17	40.5	253	0.0205	117		
10	13-Sep-17	10	186	0.0259	34.4		
11	22-Nov-17	11.5	254	0.0326	43.1		
12	8-Feb-18	12.7	270	0.0387	49.9		
13	13-Jun-18	31	252	0.0243	87.8		
14	31-Jul-18	15.9	223	0.0225	49		
15	13-Dec-18	13.8	274	0.0228	45		
16	14-Mar-19	21.8	296	0.0334	51.8		
17	30-May-19	31.9	319	0.02	111		
18	26-Jul-19	8.56	130	0.0137	30.6		
19	24-Oct-19	9.24	180	0.0207	36.3		
20							
Coefficier	nt of Variation:	0.57	0.20	0.31	0.52		
Mann-Kenda	II Statistic (S):	-2	5	-60	33		
Confi	idence Factor:	51.4%	55.5%	98.1%	86.7%		
Concer	ntration Trend:	Stable	No Trend	Decreasing	No Trend		



## Notes:

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   ≥ 90% = Probably Increasing or Probably Decreasing;
   < 90% and S>0 = No Trend;
   < 90%, S≤0, and COV ≥ 1 = No Trend;</li>
   < 90% and COV < 1 = Stable.</li>
- 3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, Ground Water, 41(3):355-367, 2003.

#### **GSI MANN-KENDALL TOOLKIT** for Constituent Trend Analysis Evaluation Date: 05-Feb-20 Job ID: 671557 Facility Name: Teck Coal Regional Groundwater - FRO Location FR\_GH\_WELL4 Conducted By: NDS Parameter (units) Nitrate (mg/L) | Sulphate (mg/L) | Cadmium (μg/L) | Selenium (μg/L) 5-Nov-12 0.13 54.4 0.118 3-Dec-12 278 103 8-Jan-13 64.5 0.055 5-Mar-13 419 0.047 1-Apr-13 0.041 94.9 55.2 262 7-May-13 51.7 0.04 29.8 17.8 3-Jun-13 181 0.034 67.9 9 0.034 2-Jul-13 116 10 0.03 7-Oct-13 174 35.9 0.048 42.8 0.045 12 31-Oct-13 84.5 50.4 0.065 14 56.2 61.2 6-Jan-14 0.054 3-Feb-14 121 0.052 16 4-Mar-14 0.065 17 13-Mar-14 63.6 0.053 127 18 7-Apr-14 0.054 19 14-May-14 61.4 349 0.059 140 25-Aug-14 20 34.4 0.04 23-Oct-14 40.3 0.045 87 21-Jan-15 46.7 276 0.047 14-Apr-15 0.0441 0.0486 24 2-Jul-15 37.8 97.5 5-Nov-15 0.0421 280 25-Jan-16 18-May-16 68.4 438 0.0353 160 17-Aug-16 0.0305 91 36.3 29 30 1-Jun-17 33.4 248 0.0408 93.5 0.0403 15-Nov-17 34.9 0.0297 33 31-Jan-18 40.4 0.0468 109 34 14-Jun-18 22.4 207 0.0382 31-Jul-18 30.9 0.0342 76.9 36 13-Dec-18 31.6 271 0.038 37 21-Mar-19 37.7 342 0.05 147 43.1 0.0529 40 1-Nov-19 0.32 0.26 0.40 0.26 Mann-Kendall Statistic (S) Confidence Factor 99.7% 79.2% 95.3% 76.4% Concentration Trend 1000 Nitrate (mg/L) Concentration () 100 Cadmium (µg/L) - Selenium (µg/L) 10 0.1 0.01 Jul 2014 Jul 2015 Jul 2016 Jul 2017 Jul 2012 Jul 2013 Jul 2018 Jul 2019 Sampling Date

## Notes:

- At least four independent sampling events per well are required for calculating the trend. Methodology is valid for 4 to 40 samples.
- Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing;
   ≥ 90% = Probably Increasing or Probably Decreasing;
   < 90% and S>0 = No Trend;
   < 90%, S≤0, and COV ≥ 1 = No Trend;</li>
   < 90% and COV < 1 = Stable.</li>
- Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, Ground Water, 41(3):355-367, 2003.

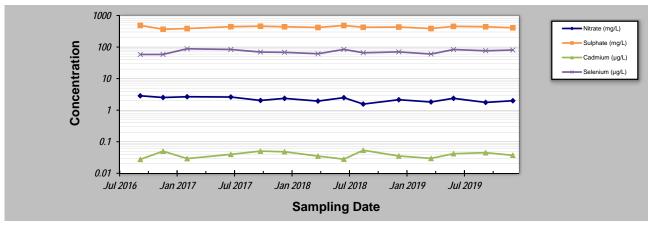
for Constituent Trend Analysis

Evaluation Date: 05-Feb-20
Facility Name: Teck Coal Regional Groundwater - GHO
Conducted By: NDS

Job ID: 671557 Location GH\_MW-PC

Parameter (units)	Nitrate (mg/L)	Sulphate (mg/L)	Cadmium (µg/L)	Selenium (µg/L)

Sampling Event	Sampling Date		GH_MW-PC CONCENTRATION							
1	5-Sep-16	2.85	485	0.0276	58.2					
2	17-Nov-16	2.52	366	0.05	58.4					
3	2-Feb-17	2.66	385	0.0292	88.1					
4	22-Jun-17	2.61	442	0.0397	83.7					
5	25-Sep-17	2.03	456	0.0503	69.3					
6	11-Dec-17	2.36	440	0.0481	68.1					
7	28-Mar-18	1.94	417	0.035	61.3					
8	19-Jun-18	2.49	481	0.028	84					
9	20-Aug-18	1.56	423	0.0536	65.9					
10	12-Dec-18	2.14	430	0.0353	70.3					
11	25-Mar-19	1.82	386	0.0296	60					
12	5-Jun-19	2.37	452	0.0417	83.3					
13	16-Sep-19	1.76	440	0.045	76.4					
14	12-Dec-19	1.99	407	0.0372	80.5					
15										
16										
17										
18										
19										
20										
Coefficien	t of Variation:	0.17	0.08	0.23	0.15					
Mann-Kendal	II Statistic (S):	-49	-6	9	15					
Confi	dence Factor:	99.7%	60.6%	66.6%	77.5%					



## Notes

Concentration Trend:

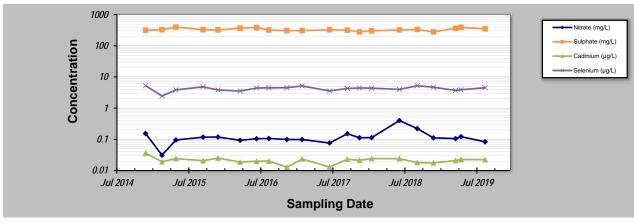
- 1. At least four independent sampling events per well are required for calculating the trend. Methodology is valid for 4 to 40 samples.
- Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing;
   ≥ 90% = Probably Increasing or Probably Decreasing;
   < 90% and S>0 = No Trend;
   < 90%, S≤0, and COV ≥ 1 = No Trend;</li>
   < 90% and COV < 1 = Stable.</li>
- 3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, Ground Water, 41(3):355-367, 2003.

for Constituent Trend Analysis

Evaluation Date: 05-Feb-20 Job ID: 671557
Facility Name: Teck Coal Regional Groundwater - GHO Location GH\_MW-GHC-A
Conducted By: NDS

Parameter (units) Nitrate (mg/L) | Sulphate (mg/L) | Cadmium (μg/L) | Selenium (μg/L)

				•			•	
Sampling Event	Sampling Date			GH_MW	/-GHC-A CONCEN	TRATION		
1	25-Nov-14	0.154	316	0.036	5.26			
2	17-Feb-15	0.031	328	0.019	2.45			
3	29-Apr-15	0.095	398	0.0241	3.85			
4	15-Sep-15	0.117	329	0.0205	4.81			
5	30-Nov-15	0.118	322	0.025	3.83			
6	22-Mar-16	0.093	369	0.0186	3.51			
7	14-Jun-16	0.104	383	0.0198	4.43			
8	16-Aug-16	0.106	320	0.02	4.46			
9	16-Nov-16	0.099	306	0.0127	4.53			
10	2-Feb-17	0.098	307	0.0232	5.15			
11	22-Jun-17	0.076	326	0.0129	3.55			
12	21-Sep-17	0.151	317	0.0229	4.27			
13	22-Nov-17	0.112	280	0.0213	4.43			
14	23-Jan-18	0.113	302	0.024	4.37			
15	14-Jun-18	0.4	322	0.0239	3.98			
16	13-Sep-18	0.221	334	0.0179	5.24			
17	5-Dec-18	0.111	279	0.0175	4.68			
18	28-Mar-19	0.105	365	0.0207	3.7			
19	25-Apr-19	0.121	391	0.0224	3.89			
20	26-Aug-19	0.0829	349	0.0222	4.51			
21								
22								
23								
24			_					
25								
	t of Variation:	0.59	0.10	0.23	0.16			
	I Statistic (S):	24	-9	-18	11			
Confi	dence Factor:	77.0%	60.1%	70.7%	62.6%			
Concen	tration Trend:	No Trend	Stable	Stable	No Trend			



## Notes

- 1. At least four independent sampling events per well are required for calculating the trend. Methodology is valid for 4 to 40 samples.
- Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing;
   ≥90% = Probably Increasing or Probably Decreasing;
   <90% and S>0 = No Trend;
   <90%, S≤0, and COV ≥ 1 = No Trend;</li>
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- 3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, Ground Water, 41(3):355-367, 2003.

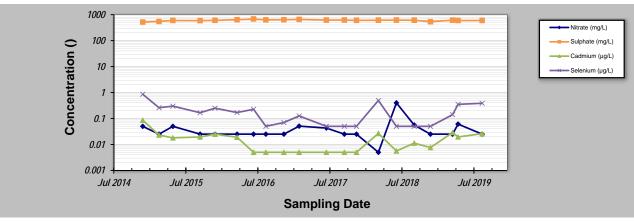
## **GSI MANN-KENDALL TOOLKIT** for Constituent Trend Analysis

Evaluation Date: 05-Feb-20 Facility Name: Teck Coal Regional Groundwater - GHO Conducted By: NDS

Job ID: 671557 Location GH\_MW-GHC-B

raid	imeter (umits)	Miliale (IIIg/L)	Sulphate (mg/L)/Caumum (µg/L)/Selemum (µg/L)
ng	Sampling		GH MW-GHC-B CONCENTR

	, ,						
Sampling	Sampling			GH MW	/-GHC-B CONCENT	RATION	
Event	Date						
1	26-Nov-14	0.05	518	0.086	0.86		
2	17-Feb-15	0.025	548	0.023	0.26		
3	29-Apr-15	0.05	595	0.018	0.3		
4	15-Sep-15	0.025	587	0.0195	0.167		
5	30-Nov-15	0.025	602	0.025	0.25		
6	22-Mar-16	0.025	638	0.019	0.17		
7	14-Jun-16	0.025	682	0.005	0.227		
8	16-Aug-16	0.025	629	0.005	0.05		
9	16-Nov-16	0.025	636	0.005	0.07		
10	2-Feb-17	0.051	655	0.005	0.126		
11	21-Jun-17	0.043	615	0.005	0.05		
12	21-Sep-17	0.025	619	0.005	0.05		
13	22-Nov-17	0.025	601	0.005	0.05		
14	14-Mar-18	0.005	610	0.0267	0.494		
15	14-Jun-18	0.4	615	0.0056	0.05		
16	13-Sep-18	0.056	608	0.0113	0.05		
17	5-Dec-18	0.025	537	0.0076	0.05		
18	28-Mar-19	0.025	612	0.0289	0.141		
19	25-Apr-19	0.061	593	0.0195	0.351		
20	26-Aug-19	0.025	595	0.0261	0.387		
21							
22							
23							
24							
25							
Coefficien	of Variation:	1.64	0.06	1.05	0.98		
Mann-Kendal	Statistic (S):	7	-4	0	-45		
Confid	dence Factor:	57.7%	53.8%	48.7%	92.3%		
Concent	ration Trend:	No Trend	Stable	No Trend	Prob. Decreasing		



- 1. At least four independent sampling events per well are required for calculating the trend. Methodology is valid for 4 to 40 samples.
- Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
- 3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, Ground Water, 41(3):355-367, 2003.

#### **GSI MANN-KENDALL TOOLKIT** for Constituent Trend Analysis Evaluation Date: 05-Feb-20 Job ID: 671557 Location GH\_MW-TD Facility Name: Teck Coal Regional Groundwater - GHO Conducted By: NDS Parameter (units) Sulphate (mg/L) Cadmium (µg/L) 1 24-Nov-14 89.6 0.162 2 26-Nov-14 0.173 3 17-Feb-15 86.1 0.028 29-Apr-15 0.0691 5 0.0434 15-Sep-15 88.5 6 30-Nov-15 88.3 0.053 22-Mar-16 8 14-Jun-16 90.2 0.0638 9 16-Aug-16 85.9 0.0836 10 17-Nov-16 86.1 0.173 11 16-Feb-17 86.3 0.176 12 19-Jun-17 13 27-Sep-17 0.144 87.3 14 21-Nov-17 0.23 83.4 15 23-Jan-18 87.6 0.0526 16 18-Jun-18 86.6 0.232 17 30-Aug-18 87.9 0.339 18 83.6 5-Dec-18 0.288 19 12-Mar-19 79.7 0.203 20 27-May-19 21 28-Aug-19 85.5 0.227 22 12-Dec-19 81.8 23 24 Coefficient of Variation: 0.03 0.74 Mann-Kendall Statistic (S) -72 132 Confidence Factor: 97.8% Concentration Trend: 100 Sulphate (mg/L) Concentration () 10 0.1 0.01 Jul 2017 Jul 2015 Jul 2016 Jul 2018 Jul 2019 Jul 2014 **Sampling Date**

## Notes

- 1. At least four independent sampling events per well are required for calculating the trend. Methodology is valid for 4 to 40 samples.
- Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing;
   ≥ 90% = Probably Increasing or Probably Decreasing;
   < 90% and S>0 = No Trend;
   < 90%, S≤0, and COV ≥ 1 = No Trend;</li>
   < 90% and COV < 1 = Stable.</li>
- 3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, Ground Water, 41(3):355-367, 2003.

#### **GSI MANN-KENDALL TOOLKIT** for Constituent Trend Analysis Evaluation Date: 05-Feb-20 Job ID: 671557 Location GH\_MW-RLP-1D Facility Name: Teck Coal Regional Groundwater - GHO Conducted By: NDS Parameter (units) Sulphate (mg/L) Selenium (µg/L) 20-Sep-16 43.8 0.338 17-Nov-16 42.9 0.227 2.45 3 2-Feb-17 39 4 22-Jun-17 29.9 0.08 5 26-Sep-17 18.9 6.53 6 13-Dec-17 8.09 2 09 7 6-Mar-18 0.68 4.26 8 31-May-18 1.61 17-Sep-18 9 0.05 0.3 10 29-Nov-18 0.3 0.05 11 25-Mar-19 39.8 0.05 12 30-Apr-19 0.05 13 24-Sep-19 0.05 14 12-Dec-19 3 51 15 16 17 18 19 Coefficient of Variation: Mann-Kendall Statistic (S) Confidence Factor: Concentration Trend: Prob. Decreasing Prob. Decreasing 100 Sulphate (mg/L) Selenium (ua/L) Concentration () 10 0.1 0.01 Jul 2014 Jul 2015 Jul 2016 Jul 2017 Jul 2018 Jul 2019 Sampling Date

## Notes

- 1. At least four independent sampling events per well are required for calculating the trend. Methodology is valid for 4 to 40 samples.
- Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing;
   ≥ 90% = Probably Increasing or Probably Decreasing;
   < 90% and S>0 = No Trend;
   < 90%, S≤0, and COV ≥ 1 = No Trend;</li>
   < 90% and COV < 1 = Stable.</li>
- 3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

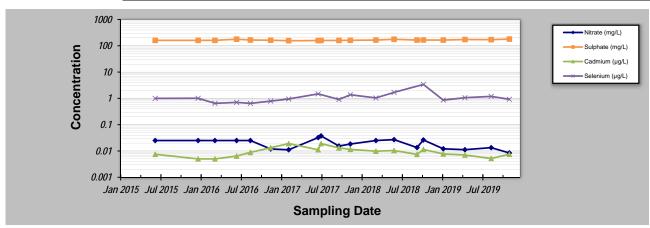
for Constituent Trend Analysis

Evaluation Date: 05-Feb-20
Facility Name: Teck Coal Regional Groundwater - GHO
Conducted By: NDS

Job ID: 671557 Location GH\_POTW09

Daramatar (unita)	Nitrata (mar/l)	Culmbata (mau/L)	Condensions (con/L)	Calamirum (reall )
Parameter (units)	Nitrate (mg/L)	Sulphate (mg/L)	Cadmium (µg/L)	(Seienium (µg/L)

	arriotor (arrito)			oudinam (pg)	,	4	
Sampling Event	Sampling Date			GH_P	OTW09 CONCENT	RATION	
1	8-Jun-15	0.025	161	0.0075	1		
2	21-Dec-15	0.025	161	0.005	1.01		
3	7-Mar-16	0.025	161	0.005	0.647		
4	14-Jun-16	0.025	178	0.0064	0.705		
5	16-Aug-16	0.025	166	0.0088	0.645		
6	17-Nov-16	0.0119	163	0.0133	0.788		
7	7-Feb-17	0.0111	156	0.0191	0.951		
8	22-Jun-17	0.0323	158	0.0111	1.48		
9	5-Jul-17	0.0375	159	0.0191			
10	25-Sep-17	0.0154	160	0.0131	0.91		
11	16-Nov-17	0.0184	162	0.0115	1.37		
12	13-Mar-18	0.025	165	0.0098	1.04		
13	4-Jun-18	0.027	177	0.0104	1.69		
14	17-Sep-18	0.0135	165	0.0074			
15	16-Oct-18	0.0263	166	0.0114	3.39		
16	15-Jan-19	0.0121	165	0.0077	0.861		
17	24-Apr-19	0.0112	173	0.007	1.06		
18	22-Aug-19	0.0134	171	0.0052	1.19		
19	13-Nov-19	0.0084	180	0.0075	0.926		
20							
Coefficier	nt of Variation:	0.40	0.04	0.42	0.56		
Mann-Kenda	II Statistic (S):	-48	70	-8	44		
	idence Factor:	95.0%	99.3%	59.6%	96.2%		
Concer	ntration Trend:	Prob Decreasing	Increasing	Stable	Increasing		



## Notes

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- Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing;
   ≥ 90% = Probably Increasing or Probably Decreasing;
   < 90% and S>0 = No Trend;
   < 90%, S≤0, and COV ≥ 1 = No Trend;</li>
   < 90% and COV < 1 = Stable.</li>
- 3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, Ground Water, 41(3):355-367, 2003.

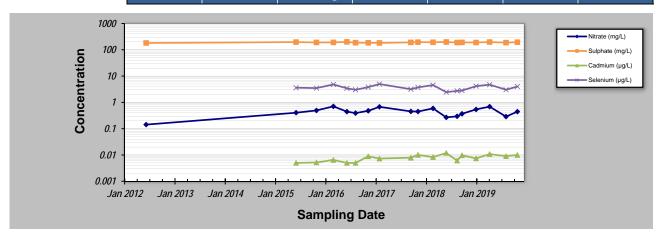
for Constituent Trend Analysis

Evaluation Date: 05-Feb-20
Facility Name: Teck Coal Regional Groundwater - GHO
Conducted By: NDS

Job ID: 671557 Location GH\_POTW10

Parameter (units)	Nitrate (mg/L)	Sulphate (mg/L)	Cadmium (µg/L)	Selenium (µg/L)

							·	
Sampling Event	Sampling Date			GH_PC	TW10 CONCENT	RATION		
1	6-Jun-12	0.143	181					
2	8-Jun-15	0.405	196	0.005	3.62			
3	4-Nov-15	0.493	190	0.0052	3.49			
4	7-Mar-16	0.705	191	0.0065	4.8			
5	14-Jun-16	0.445	200	0.005	3.42			
6	16-Aug-16	0.391	186	0.005	3.02			
7	17-Nov-16	0.478	185	0.0089	3.8			
8	7-Feb-17	0.677	182	0.0073	4.99			
9	19-Jun-17							
10	25-Sep-17	0.453	191	0.0079	3.17			
11	16-Nov-17	0.448	195	0.0101	3.71			
12	6-Mar-18	0.591	193	0.0083	4.55			
13	11-Jun-18	0.269	198	0.0119	2.45			
14	29-Aug-18	0.295	188	0.0061	2.73			
15	4-Oct-18	0.369	191	0.0097	2.82			
16	15-Jan-19	0.539	189	0.0074	4.14			
17	24-Apr-19	0.688	197	0.0108	4.72			
18	22-Aug-19	0.288	187	0.009	3.03			
19	13-Nov-19	0.445	194	0.01	4			
20								
Coefficier	nt of Variation:	0.34	0.03	0.28	0.21			
Mann-Kenda	II Statistic (S):	-2	18	71	-6			
	idence Factor:	51.5%	73.8%	99.9%	58.0%			
Concer	ntration Trend:	Stable	No Trend	Increasing	Stable			



## Notes

- 1. At least four independent sampling events per well are required for calculating the trend. Methodology is valid for 4 to 40 samples.
- Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing;
   ≥ 90% = Probably Increasing or Probably Decreasing;
   < 90% and S>0 = No Trend;
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- 3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, Ground Water, 41(3):355-367, 2003.

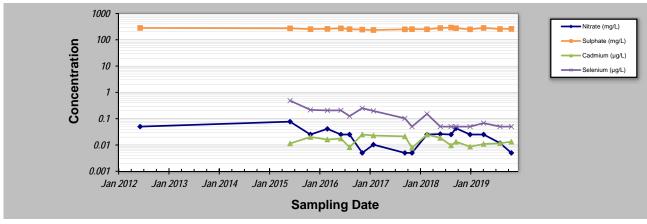
for Constituent Trend Analysis

Evaluation Date: 05-Feb-20
Facility Name: Teck Coal Regional Groundwater - GHO
Conducted By: NDS

Job ID: 671557 Location GH\_POTW15

Parameter (units)	Nitrate (mg/L)	Sulphate (mg/L)	Cadmium (µg/L)	Selenium (ug/L)

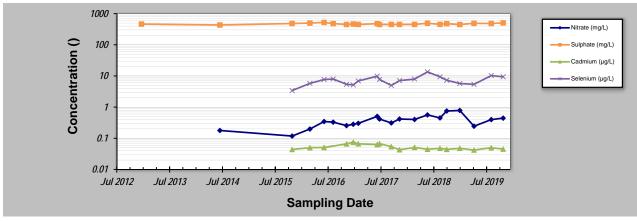
		(g/ _/ )		(-3-	// C C C C C C C C C C C C C C C C C C			
Sampling Event	Sampling Date			GH_P(	OTW15 CONCENT	RATION		
			~~	ı		ı	1	
1	6-Jun-12	0.05	282					
2	8-Jun-15	0.077	272	0.0114	0.486			
3	4-Nov-15	0.025	254	0.0201	0.216			
4	7-Mar-16	0.041	261	0.0161	0.206			
5	14-Jun-16	0.025	273	0.0175	0.207			
6	16-Aug-16	0.025	254	0.0082	0.125			
7	17-Nov-16	0.005	244	0.025	0.25			
8	7-Feb-17	0.0103	234	0.0229	0.197			
9	19-Jun-17							
10	25-Sep-17	0.005	250	0.0212	0.103			
11	16-Nov-17	0.005	254	0.0078	0.05			
12	6-Mar-18	0.025	251	0.0249	0.152			
13	11-Jun-18	0.026	279	0.0186	0.05			
14	29-Aug-18	0.025	291	0.0096	0.05			
15	4-Oct-18	0.043	275	0.0133	0.05			
16	15-Jan-19	0.025	250	0.0086	0.05			
17	24-Apr-19	0.025	281	0.0109	0.068			
18	22-Aug-19	0.0118	256	0.0116	0.05			
19	13-Nov-19	0.005	261	0.0134	0.05			
20								
Coefficien	t of Variation:	0.74	0.06	0.38	0.83			
Mann-Kendal	I Statistic (S):	-42	4	-20	-87			
Confi	dence Factor:	93.9%	54.5%	78.0%	>99.9%			
Concen	tration Trend:	Prob. Decreasing	No Trend	Stable	Decreasing			



## Notes:

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   < 90%, S≤0, and COV ≥ 1 = No Trend;</li>
   < 90% and COV < 1 = Stable.</li>
- 3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, Ground Water, 41(3):355-367, 2003.

#### **GSI MANN-KENDALL TOOLKIT** for Constituent Trend Analysis Evaluation Date: 05-Feb-20 Job ID: **671557** Location GH\_POTW17 Facility Name: Teck Coal Regional Groundwater - GHO Conducted By: NDS Parameter (units) Nitrate (mg/L) | Sulphate (mg/L) | Cadmium (µg/L) | Selenium (µg/L) | 1 20-Dec-12 462 2 19-Jun-14 0.178 432 3 482 0.0437 4-Nov-15 0.118 7-Mar-16 0.198 498 0.05 5.76 7.71 522 0.0506 0.345 14-Jun-16 6 16-Aug-16 0.33 480 7.98 17-Nov-16 448 8 464 0.075 3-Jan-17 0.281 5.15 9 7-Feb-17 450 0.302 0.066 6.93 10 19-Jun-17 0.505 475 0.063 11 5-Jul-17 0.414 448 0.0671 7.71 12 450 13 21-Nov-17 0.415 450 0.0429 7.09 14 451 6-Mar-18 0.402 0.0509 7.96 15 4-Jun-18 0.563 492 0.0444 13.5 16 30-Aug-18 0.45 453 0.0477 9.42 17 16-Oct-18 475 0.044 0.752 7.3 18 447 0.0477 5.73 15-Jan-19 0.782 19 24-Apr-19 0.244 489 0.042 5.39 20 22-Aug-19 482 21 13-Nov-19 0.443 504 0.045 9.42 22 23 24 0.45 0.05 0.19 0.32 Coefficient of Variation: Mann-Kendall Statistic (S) Confidence Factor 95 6% 93.8% Concentration Trend: Prob. Increasing 1000 100 Sulphate (mg/L) Cadmium (µg/L) 10 Selenium (µg/L)



## Notes

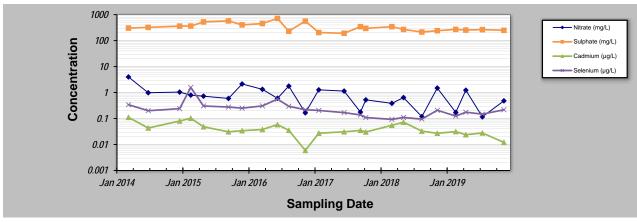
- 1. At least four independent sampling events per well are required for calculating the trend. Methodology is valid for 4 to 40 samples.
- Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing;
   ≥ 90% = Probably Increasing or Probably Decreasing;
   < 90% and S>0 = No Trend;
   < 90%, S≤0, and COV ≥ 1 = No Trend;</li>
   < 90% and COV < 1 = Stable.</li>
- 3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, Ground Water, 41(3):355-367, 2003.

for Constituent Trend Analysis

Evaluation Date: 05-Feb-20 Job ID: 671557
Facility Name: Teck Coal Regional Groundwater - GHO Location GH\_GA-MW-1
Conducted By: NDS

Parameter (units) Nitrate (mg/L) | Sulphate (mg/L) | Cadmium (μg/L) | Selenium (μg/L)

	•	rate dies (engra)	carpinate (trigital)	- ( - S) - )			
Sampling	Sampling			GH GA	-MW-1 CONCENT	RATION	
Event	Date			611_67	CINIO I GONGEINI	10 111011	
1	7-Mar-14	3.98	303	0.111	0.34		
2	25-Jun-14	0.984	323	0.043	0.2		
3	17-Dec-14	1.04	361	0.08	0.24		
4	17-Feb-15	0.796	363	0.103	1.57		
5	29-Apr-15	0.726	525	0.048	0.303		
6	15-Sep-15	0.592	573	0.0308	0.276		
7	30-Nov-15	2.14	403	0.034	0.25		
8	22-Mar-16	1.33	453	0.0377	0.306		
9	14-Jun-16	0.6	715	0.058	0.56		
10	16-Aug-16	1.77	229	0.0352	0.296		
11	16-Nov-16	0.165	564	0.0059	0.218		
12	30-Jan-17	1.27	204	0.0272	0.205		
13	20-Jun-17	1.14	192	0.0307	0.169		
14	19-Sep-17	0.177	344	0.035	0.137		
15	19-Oct-17	0.523	295	0.0303	0.109		
16	13-Mar-18	0.384	344	0.0546	0.093		
17	17-May-18	0.64	269	0.0722	0.11		
18	27-Aug-18	0.118	214	0.0326	0.095		
19	21-Nov-18	1.49	240	0.027	0.208		
20	4-Mar-19	0.172	271	0.0313	0.124		
21	29-Apr-19	1.23	254	0.0238	0.175		
22	30-Jul-19	0.116	265	0.0277	0.147		
23	27-Nov-19	0.479	249	0.0121	0.217		
24							
25							
Coefficien	t of Variation:	0.91	0.39	0.61	1.09		
Mann-Kendal	II Statistic (S):	-91	-82	-121	-117		
Confi	dence Factor:	99.2%	98.4%	100.0%	99.9%		
Concen	tration Trend:	Decreasing	Decreasing	Decreasing	Decreasing		



## Notes

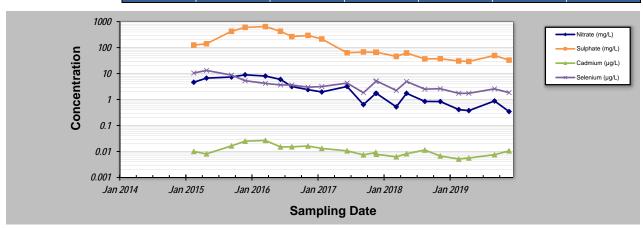
- 1. At least four independent sampling events per well are required for calculating the trend. Methodology is valid for 4 to 40 samples.
- Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing;
   ≥90% = Probably Increasing or Probably Decreasing;
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   <90%, S≤0, and COV ≥ 1 = No Trend;</li>
   <90% and COV < 1 = Stable.</li>
- 3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, Ground Water, 41(3):355-367, 2003.

for Constituent Trend Analysis

Evaluation Date: 05-Feb-20 Job ID: 671557
Facility Name: Teck Coal Regional Groundwater - GHO Location GH\_GA-MW-4
Conducted By: NDS

Parameter (units) Nitrate (mg/L) Sulphate (mg/L) Cadmium (µg/L) Selenium (µg/L)

	. ,						*	-
Sampling	Sampling			GH GA	-MW-4 CONCENT	RATION		
Event	Date			611_6/	CIMIN TOOMOEIN	0 111011		
1	7-Mar-14							
2	25-Jun-14							
3	17-Dec-14							
4	17-Feb-15	4.63	125	0.01	10.5			
5	29-Apr-15	6.68	141	0.0081	13.2			
6	15-Sep-15	7.35	425	0.0164	8.74			
7	30-Nov-15	8.98	599	0.025	5.31			
8	22-Mar-16	8.02	646	0.0266	4.19			
9	14-Jun-16	5.97	425	0.015	3.66			
10	16-Aug-16	3.16	266	0.0152	3.62			
11	14-Nov-16	2.41	294	0.0162	3			
12	30-Jan-17	1.96	215	0.0131	3.16			
13	20-Jun-17	3.18	63	0.0106	4.31			
14	19-Sep-17	0.638	68	0.0074	1.83			
15	27-Nov-17	1.73	66.4	0.0092	4.93			
16	30-Nov-17	1.74	66.7	0.0078	5.23			
17	21-Mar-18	0.523	45.7	0.0062	2.23			
18	17-May-18	1.74	61.6	0.0082	4.95			
19	27-Aug-18	0.848	36.7	0.0114	2.51			
20	21-Nov-18	0.838	37.1	0.0067	2.61			
21	4-Mar-19	0.411	30.5	0.0051	1.74			
22	29-Apr-19	0.375	29.4	0.0056	1.74			
23	19-Sep-19	0.883	49.7	0.0075	2.58			
24	9-Dec-19	0.345	33	0.0106	1.85			
25								
	t of Variation:	0.94	1.09	0.51	0.69			
Mann-Kenda	II Statistic (S):	-151	-145	-99	-119			
	dence Factor:	>99.9%	>99.9%	99.9%	>99.9%			
Concen	tration Trend:	Decreasing	Decreasing	Decreasing	Decreasing			



## Notes

- 1. At least four independent sampling events per well are required for calculating the trend. Methodology is valid for 4 to 40 samples.
- Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing;
   ≥90% = Probably Increasing or Probably Decreasing;
   <90% and S>0 = No Trend;
   <90%, S≤0, and COV ≥ 1 = No Trend;</li>
   <90% and COV < 1 = Stable.</li>
- 3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, Ground Water, 41(3):355-367, 2003.

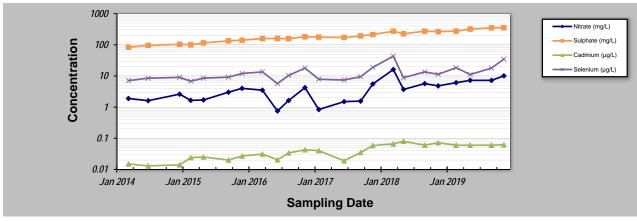
for Constituent Trend Analysis

Evaluation Date: 05-Feb-20 Job ID: 671557
Facility Name: Teck Coal Regional Groundwater - GHO Location ONDS GH\_GA-MW-2

Conducted By: NDS

Parameter (units) Nitrate (mg/L) | Sulphate (mg/L) | Cadmium (μg/L) | Selenium (μg/L)

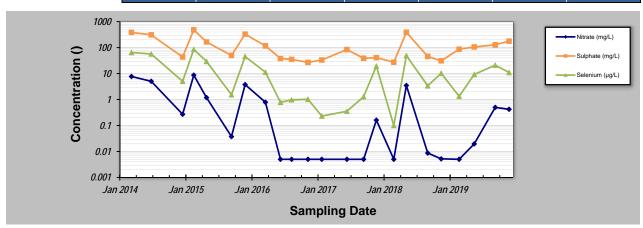
		rate dies (engra)	- tariffication (angle	Guarrian (pg/ =	(1-2)		•	
Sampling	Sampling			GH GA	-MW-2 CONCENT	RATION		
Event	Date							
1	7-Mar-14	1.89	84	0.015	7.09			
2	25-Jun-14	1.61	95.4	0.013	8.5			
3	17-Dec-14	2.61	104	0.014	8.99			
4	17-Feb-15	1.65	99.9	0.024	6.78			
5	29-Apr-15	1.7	115	0.0251	8.56			
6	15-Sep-15	3.01	134	0.02	9.13			
7	30-Nov-15	4	141	0.027	12			
8	22-Mar-16	3.49	158	0.0312	13.5			
9	14-Jun-16	0.751	160	0.0204	5.7			
10	15-Aug-16	1.63	157	0.0338	10.4			
11	14-Nov-16	4.22	181	0.0428	17.9			
12	30-Jan-17	0.837	176	0.0401	7.87			
13	20-Jun-17	1.5	171	0.0189	7.41			
14	20-Sep-17	1.56	192	0.035	9.49			
15	27-Nov-17	5.52	214	0.0584	18.9			
16	21-Mar-18	16.1	272	0.066	43.1			
17	17-May-18	3.7	226	0.08	8.78			
18	12-Sep-18	5.68	273	0.06	13.5			
19	26-Nov-18	4.8	265	0.072	11.3			
20	6-Mar-19	6.09	274	0.06	18.4			
21	23-May-19	7.23	320	0.06	11.1			
22	19-Sep-19	7.21	351	0.06	17.9			
23	27-Nov-19	10.1	354	0.0618	34.7			
24			-					
25								
Coefficien	t of Variation:	0.84	0.42	0.52	0.67			
Mann-Kendal		125	235	177	117			
	dence Factor:	>99.9%	>99.9%	>99.9%	99.9%			
Concen	tration Trend:	Increasing	Increasing	Increasing	Increasing			



## Notes

- 1. At least four independent sampling events per well are required for calculating the trend. Methodology is valid for 4 to 40 samples.
- Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing;
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- 3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, Ground Water, 41(3):355-367, 2003.

#### **GSI MANN-KENDALL TOOLKIT** for Constituent Trend Analysis Evaluation Date: 05-Feb-20 Job ID: 671557 Location GH\_GA-MW-3 Facility Name: Teck Coal Regional Groundwater - GHO Conducted By: NDS Parameter (units) Nitrate (mg/L) Sulphate (mg/L) Selenium (µg/L) 1 7-Mar-14 7.73 382 64.6 2 25-Jun-14 5.04 310 3 0.271 43.5 5.03 17-Dec-14 17-Feb-15 481 85.3 8.71 5 29.4 29-Apr-15 1.19 165 6 15-Sep-15 0.0374 50 1.53 45.4 8 22-Mar-16 0.789 117 11.3 9 14-Jun-16 0.005 37.7 0.783 10 15-Aug-16 0.005 0.972 11 14-Nov-16 0.005 26.9 1.03 12 30-Jan-17 13 19-Jun-17 0.005 84 0.354 14 20-Sep-17 38.7 0.005 1.29 15 30-Nov-17 0.161 41.1 19.4 16 7-Mar-18 0.005 27.4 0.1 17 16-May-18 49.2 3.48 387 18 12-Sep-18 45.8 3.38 0.0087 19 26-Nov-18 0.0052 30.9 10.3 20 6-Mar-19 0.005 21 29-May-19 0.0196 106 9.26 22 23-Sep-19 0.498 128 21.1 23 177 9-Dec-19 0.422 11 24 Coefficient of Variation: 1.83 1.01 1.32 Mann-Kendall Statistic (S) -33



87.6%

## Notes

Confidence Factor:

Concentration Trend:

95.4%

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- 3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, Ground Water, 41(3):355-367, 2003.

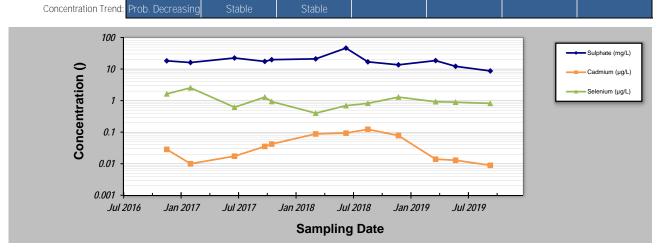
for Constituent Trend Analysis

Evaluation Date: 05-Feb-20
Facility Name: Teck Coal Regional Groundwater - GHO
Conducted By: NDS

Job ID: 671557 Location GH\_MW-UTC-A

Parameter (units	Sulphate	(mg/L) Cadmiu	m (µg/L) Se	elenium (µg/L	.)
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		, , , , , , , , , , , , , , , , , , ,	, - · · · · · · · · · · · · · · · · · ·	VI J	-	•			
Sampling Event	Sampling Date		GH_MW-UTC-A CONCENTRATION						
1	20-Sep-16								
2	16-Nov-16	18.2	0.0285	1.63					
3	31-Jan-17	16.1	0.01	2.54					
4	21-Jun-17	22.4	0.0173	0.615					
5	26-Sep-17	17.4	0.0353	1.29					
6	18-Oct-17	19.8	0.042	0.933					
7	8-Mar-18	21	0.088	0.4					
8	13-Jun-18	46.1	0.093	0.69					
9	22-Aug-18	16.9	0.123	0.82					
10	28-Nov-18	13.6	0.0778	1.29					
11	27-Mar-19	18.5	0.0139	0.921					
12	30-May-19	12.2	0.0129	0.891					
13	18-Sep-19	8.7	0.0089	0.814					
14									
15									
16									
17									
18									
19									
20									
	t of Variation:	0.48	0.86	0.53					
Mann-Kendal	I Statistic (S):	-22	0	-17					
Confi	dence Factor:	92.4%	47.3%	86.0%					



## Notes

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   < 90% and S>0 = No Trend;
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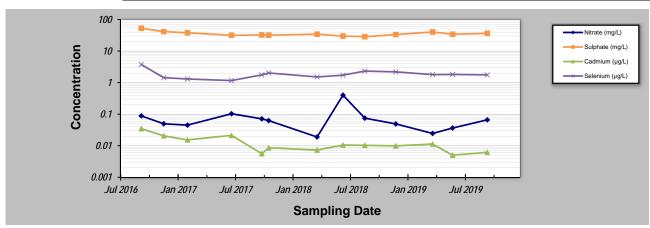
for Constituent Trend Analysis

Evaluation Date: 05-Feb-20
Facility Name: Teck Coal Regional Groundwater - GHO
Conducted By: NDS

Job ID: 671557 Location GH\_MW-UTC-B

Parameter (units)	Nitrate (mg/L)	Sulphate (mg/L)	Cadmium (µg/L)	Selenium (µq/L)

Sampling Event	Sampling Date			GH_MW	-UTC-B CONCENT	RATION	
1	5-Sep-16	0.0883	52.7	0.0347	3.75		
2	16-Nov-16	0.0496	41.3	0.0206	1.43		
3	31-Jan-17	0.045	37.8	0.0153	1.3		
4	21-Jun-17	0.103	31.5	0.0212	1.16		
5	26-Sep-17	0.071	32.4	0.0056	1.76		
6	18-Oct-17	0.0626	31.8	0.0086	2.02		
7	22-Mar-18	0.0189	34.2	0.0073	1.51		
8	13-Jun-18	0.4	29.8	0.0105	1.72		
9	22-Aug-18	0.0746	28.5	0.0103	2.32		
10	29-Nov-18	0.0491	33.3	0.0099	2.19		
11	27-Mar-19	0.0245	40.1	0.0113	1.79		
12	30-May-19	0.0364	34.1	0.005	1.81		
13	18-Sep-19	0.066	36.4	0.0062	1.76		
14							
15							
16							
17							
18							
19							
20							 
Coefficien	t of Variation:	1.17	0.18	0.65	0.34		
Mann-Kendal	II Statistic (S):	-16	-14	-36	15		
Confi	dence Factor:	81.6%	78.2%	98.5%	79.9%		
Concen	tration Trend:	No Trend	Stable	Decreasing	No Trend		



## Notes

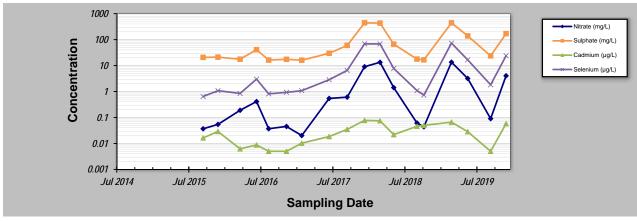
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   < 90% and S>0 = No Trend;
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- 3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, Ground Water, 41(3):355-367, 2003.

for Constituent Trend Analysis

Evaluation Date: 05-Feb-20 Job ID: 671557
Facility Name: Teck Coal Regional Groundwater - GHO Location GH\_MW-ERSC-1
Conducted By: NDS

Parameter (units) Nitrate (mg/L) | Sulphate (mg/L) | Cadmium (μg/L) | Selenium (μg/L)

	•			Oddinian (p.g/ _			·	
Sampling	Sampling			GH MW	-ERSC-1 CONCEN	TRATION		
Event	Date				2.100 1 00110211			
1	26-Nov-14							
2	17-Feb-15							
3	29-Apr-15							
4	15-Sep-15	0.0368	20.7	0.0164	0.646			
5	30-Nov-15	0.0543	21.1	0.029	1.08			
6	22-Mar-16	0.19	17.6	0.0062	0.847			
7	14-Jun-16	0.412	40.9	0.0088	3.01			
8	15-Aug-16	0.037	16.3	0.005	0.815			
9	14-Nov-16	0.0453	17.4	0.005	0.932			
10	31-Jan-17	0.0202	16.1	0.0103	1.08			
11	20-Jun-17	0.543	29.7	0.0185	2.85			
12	20-Sep-17	0.608	59.6	0.0349	6.53			
13	18-Dec-17	9.04	442	0.0777	68.7			
14	7-Mar-18	13.4	432	0.0747	68.1			
15	16-May-18	1.42	66.8	0.0219	7.75			
16	12-Sep-18	0.0609	17.7	0.0459	1.09			
17	17-Oct-18	0.0437	16.6	0.0497	0.73			
18	7-Mar-19	13.5	440	0.0662	73.2			
19	29-May-19	3.19	139	0.0285	16.6			
20	23-Sep-19	0.0903	23.7	0.005	1.82			
21	11-Dec-19	4.03	170	0.058	23.9			
22								
23								
24								
25								
Coefficien	t of Variation:	1.75	1.42	0.80	1.66			
Mann-Kendal		61	45	50	66			
Confi	dence Factor:	98.9%	95.2%	96.9%	99.4%			
Concen	tration Trend:	Increasing	Increasing	Increasing	Increasing			



## Notes

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- 2. Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
- 3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, Ground Water, 41(3):355-367, 2003.

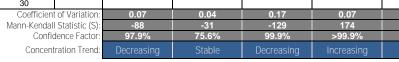
for Constituent Trend Analysis

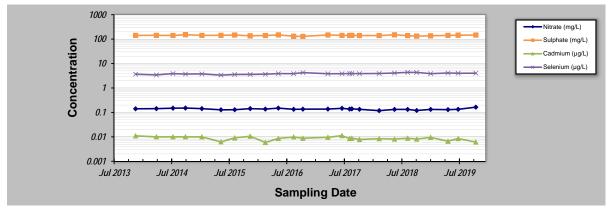
Evaluation Date: 05-Feb-20 Facility Name: Teck Coal Regional Groundwater - EVO Conducted By: NDS

Job ID: 671557 Location EV\_GV3gw

Para	ameter (units)	Nitrate (mg/L)	Sulphate	(mg/L) Cadmium	(µg/L)	Selenium (	ıg/L)
Sampling Event	Sampling Date					V3GW CONCE	ENTRATIO

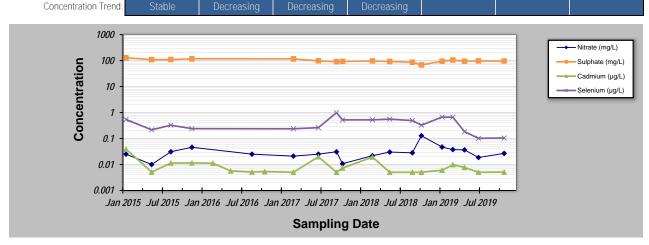
Sampling Event	Sampling Date	EV_GV3GW CONCENTRATION						
1	15-Nov-13	0.141	142	0.011	3.65			
2	28-Mar-14	0.143	143	0.01	3.43			
3	12-Jul-14	0.149	141	0.01	3.87			
4	30-Sep-14	0.151	151	0.01	3.71			
5	13-Jan-15	0.143	142	0.01	3.76			
6	15-May-15	0.128	143	0.0062	3.35			
7	11-Aug-15	0.129	147	0.0091	3.56			
8	18-Nov-15	0.143	137	0.0106	3.59			
9	23-Feb-16	0.137	140	0.0059	3.66			
10	16-May-16	0.15	149	0.0086	3.88			
11	22-Aug-16	0.134	131	0.0099	3.85			
12	20-Oct-16	0.136	129	0.0088	4.24			
13	29-Mar-17	0.137	148	0.0096	3.83			
14	27-Jun-17	0.147	142	0.0112	3.84			
15	15-Aug-17	0.137	141	0.0085	3.9			
16	29-Aug-17	0.14	142	0.0088	3.89			
17	17-Oct-17	0.134	140	0.0078	3.87			
18	20-Feb-18	0.118	140	0.0084	3.92			
19	29-May-18	0.133	150	0.0081	4.09			
20	21-Aug-18	0.133	139	0.0088	4.36			
21	18-Oct-18	0.12	132	0.0081	4.34			
22	15-Jan-19	0.133	137	0.0095	3.85			
23	6-May-19	0.13	142	0.0066	4.1			
24	10-Jul-19	0.134	144	0.0085	4.01			
25	31-Oct-19	0.164	147	0.0061	4.02			
26								
27								
28								
29								
30		_						
Coefficier	nt of Variation:	0.07	0.04	0.17	0.07			
Mann-Kenda	II Statistic (S):	-88	-31	-129	174			
Confi	idence Factor:	97.9%	75.6%	99.9%	>99.9%			





- 1. At least four independent sampling events per well are required for calculating the trend. Methodology is valid for 4 to 40 samples.
- 2. Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
- 3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, Ground Water, 41(3):355-367, 2003.

#### **GSI MANN-KENDALL TOOLKIT** for Constituent Trend Analysis Evaluation Date: 05-Feb-20 Job ID: **671557** Facility Name: Teck Coal Regional Groundwater - EVO Location EV\_BALgw Conducted By: NDS Parameter (units) Nitrate (mg/L) Sulphate (mg/L) Cadmium (µg/L) Selenium (µg/L) 1 16-Jan-15 0.025 129 0.039 0.54 2 15-May-15 0.01 109 0.0051 0.216 3 110 12-Aug-15 0.031 0.0114 0.325 0.0115 18-Nov-15 0.046 118 0.24 23-Feb-16 150 0.073 0.457 0.0112 6 16-May-16 0.035 118 0.0056 0.194 22-Aug-16 115 8 20-Oct-16 0.0065 109 0.0053 0.241 9 3-Mar-17 0.021 117 0.005 0.237 10 27-Jun-17 0.025 98.1 0.0198 0.262 11 19-Sep-17 0.0308 91.6 0.005 0.992 12 17-Oct-17 13 5-Mar-18 0.0218 96.9 0.0193 0.521 14 24-May-18 0.0301 926 0.005 0.555 15 6-Sep-18 0.0281 86.6 0.005 0.491 0.128 16 18-Oct-18 68.4 0.005 0.326 17 0.006 22-Jan-19 0.0469 94.8 0.672 18 13-Mar-19 0.0375 106 0.0098 0.663 19 6-May-19 0.0366 94.8 0.0077 0.184 20 10-Jul-19 0.0186 0.102 21 6-Nov-19 0.0267 96.4 0.0051 0.105 22



0.86

95 1%

0.58

96.8%

## Notes:

23 24

Coefficient of Variation: Mann-Kendall Statistic (S) Confidence Factor: 0.77

55 9%

1. At least four independent sampling events per well are required for calculating the trend. Methodology is valid for 4 to 40 samples.

0.14

- Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing;
   ≥ 90% = Probably Increasing or Probably Decreasing;
   < 90% and S>0 = No Trend;
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- 3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, Ground Water, 41(3):355-367, 2003.

#### **GSI MANN-KENDALL TOOLKIT** for Constituent Trend Analysis Evaluation Date: 05-Feb-20 Job ID: **671557** Facility Name: Teck Coal Regional Groundwater - EVO Location EV\_LSgw Conducted By: NDS Parameter (units) Nitrate (mg/L) Sulphate (mg/L) Selenium (ug/L) 1 14-Jan-15 0.025 117 0.14 2 14-May-15 0.025 99.6 0.104 3 98.3 0.136 12-Aug-15 19-Nov-15 0.005 109 0.101 23-Feb-16 0.025 110 0.413 6 17-May-16 0.048 101 0.12 24-Aug-16 8 19-Oct-16 97.9 0.083 0.025 9 7-Mar-17 0.025 80.1 0.077 10 27-Jun-17 0.025 81.1 0.065 11 22-Aug-17 0.027 79.5 0.087 12 17-Oct-17 13 77.1 15-Feb-18 0.006 0.116 14 10-May-18 0.005 78.1 0.075 15 6-Sep-18 0.025 70 0.073 16 9-Oct-18 0.078 71 0.077 17 22-Jan-19 0.025 72.8 0.102 18 9-May-19 0.005 75.9 0.104 19 10-Jul-19 0.025 69.5 0.075 20 21 22 23 24 1.24 0.18 0.68 Coefficient of Variation: Mann-Kendall Statistic (S) -152 Confidence Factor: 52.6% 96.6% Concentration Trend: 1000 Nitrate (mg/L) 100 Concentration () Sulphate (mg/L) 10 Selenium (ug/L) 0.1 0.01 0.001 Jan 2015 Jul 2015 Jan 2016 Jul 2016 Jan 2017 Jul 2017 Jan 2018 Jul 2018 Jan 2019 Jul 2019 Sampling Date

## Notes

- 1. At least four independent sampling events per well are required for calculating the trend. Methodology is valid for 4 to 40 samples.
- Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing;
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- 3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, Ground Water, 41(3):355-367, 2003.

#### **GSI MANN-KENDALL TOOLKIT** for Constituent Trend Analysis Evaluation Date: 05-Feb-20 Job ID: 671557 Facility Name: Teck Coal Regional Groundwater - EVO Location EV\_GCgw Conducted By: NDS Parameter (units) Sulphate (mg/L) 1 15-Jan-15 46.3 2 13-May-15 51.7 3 45.4 13-Aug-15 18-Nov-15 55.1 52.0 24-Feb-16 6 18-May-16 56.3 24-Aug-16 8 18-Oct-16 58.1 9 7-Mar-17 55.3 10 20-Jun-17 60 11 16-Aug-17 55.9 12 13 21-Feb-18 71 14 15-May-18 59 15 20-Aug-18 54.2 16 23-Oct-18 62.8 17 22-Jan-19 58.6 18 9-May-19 65.3 19 12-Jul-19 69.1 20 21 22 23 24 0.13 Coefficient of Variation Mann-Kendall Statistic (S): Confidence Factor: Concentration Trend: 100 Sulphate (mg/L) Sulphate (mg/L) Concentration () 10 Jan 2015 Jul 2015 Jan 2016 Jul 2016 Jan 2017 Jul 2017 Jan 2018 Jul 2018 Jan 2019 Jul 2019 Sampling Date

## Notes

- 1. At least four independent sampling events per well are required for calculating the trend. Methodology is valid for 4 to 40 samples.
- Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing;
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#### **GSI MANN-KENDALL TOOLKIT** for Constituent Trend Analysis Evaluation Date: 05-Feb-20 Job ID: **671557** Facility Name: Teck Coal Regional Groundwater - EVO Location EV\_Ocgw Conducted By: NDS Parameter (units) Nitrate (mg/L) Sulphate (mg/L) Selenium (ug/L) 1 14-Jan-15 0.0135 47.5 0.1 2 14-May-15 0.005 59.3 0.05 3 60.1 10-Aug-15 0.005 0.207 19-Nov-15 0.005 0.069 59.3 22-Feb-16 0.005 0.05 6 18-May-16 0.005 51.7 0.685 24-Aug-16 8 19-Oct-16 60.6 0.104 0.005 9 29-Mar-17 0.336 0.005 58.2 10 19-Jun-17 0.005 57.4 0 149 11 29-Jun-17 0.005 56.7 0.76 12 15-Aug-17 13 29-Aug-17 0.005 52.5 0.129 14 21-Sep-17 0.0084 52.3 0.05 15 18-Oct-17 0.005 53.7 0.05 16 21-Feb-18 0.0284 62.3 0.087 17 15-May-18 0.0336 62.9 0.05 18 71.5 0.005 0.05 20-Aug-18 19 17-Oct-18 0.0114 65.1 0.05 20 23-Jan-19 0.005 68.4 0.05 21 21-May-19 0.0079 59 0.05 22 15-Jul-19 61.3 0.091 0.005 23 5-Nov-19 0.005 76.5 0.05 24 0.93 0.11 1.28 Coefficient of Variation: Mann-Kendall Statistic (S): Confidence Factor: 76.8% 94.6% Concentration Trend: Prob. Decreasing Nitrate (mg/L) Sulphate (mg/L) Concentration () 10 Selenium (ug/L) 0.1 0.01 0.001 Jan 2015 Jul 2015 Jan 2016 Jul 2016 Jan 2017 Jul 2017 Jan 2018 Jul 2018 Jan 2019 Jul 2019 Sampling Date

## Notes

- 1. At least four independent sampling events per well are required for calculating the trend. Methodology is valid for 4 to 40 samples.
- Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing;
   ≥90% = Probably Increasing or Probably Decreasing;
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   <90%, S≤0, and COV ≥ 1 = No Trend;</li>
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- 3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, Ground Water, 41(3):355-367, 2003.

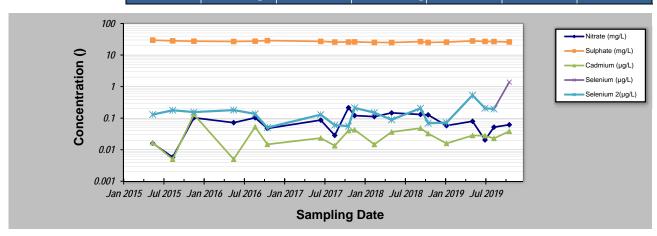
for Constituent Trend Analysis

Evaluation Date: 05-Feb-20
Facility Name: Teck Coal Regional Groundwater - EVO
Conducted By: NDS

Job ID: 671557 Location EV\_ECgw

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Parameter (units)	Nitrate (mg/L)	Sulphate (mg/L)	Cadmium (µg/L)	(Selenium (µg/L)	Selenium 2(µg/L)

Sampling Event	Sampling Date	EV_ECGW CONCENTRATION						
1	14-May-15	0.016	29.6	0.0167	0.13	0.13		
2	13-Aug-15	0.0058	28.2	0.005	0.178	0.178		
3	18-Nov-15	0.103	27.5	0.131	0.156	0.156		
4	18-May-16	0.072	26.9	0.005	0.18	0.18		
5	24-Aug-16	0.103	27.5	0.0529	0.137	0.137		
6	19-Oct-16	0.0473	28.7	0.0148	0.05	0.05		
7	20-Jun-17	0.0868	27.1	0.0234	0.129	0.129		
8	23-Aug-17	0.0285	25.8	0.0134	0.06	0.06		
9	25-Oct-17	0.215	25.8	0.0404	0.056	0.056		
10	22-Nov-17	0.121	26.1	0.0429	0.212	0.212		
11	20-Feb-18	0.112	25.1	0.0147	0.15	0.15		
12	10-May-18	0.147	24.9	0.0365	0.089	0.089		
13	19-Sep-18	0.131	26.7	0.0481	0.206	0.206		
14	24-Oct-18	0.127	25	0.0326	0.069	0.069		
15	16-Jan-19	0.0579	25.7	0.0158	0.072	0.072		
16	15-May-19	0.0796	28	0.0283	0.534	0.534		
17	11-Jul-19	0.0204	27	0.0278	0.206	0.206		
18	21-Aug-19	0.0519	26.7	0.0229	0.195	0.195		
19	30-Oct-19	0.0618	26	0.0383	1.39	·		
20						•		
Coefficier	nt of Variation:	0.63	0.05	0.86	1.37	0.70		
Mann-Kenda	all Statistic (S):	16	-66	18	38	20		
Conf	idence Factor:	69.8%	98.9%	72.2%	90.1%	76.2%		
Concer	ntration Trend:	No Trend	Decreasing	No Trend	Prob. Increasing	No Trend		



## Notes

- 1. At least four independent sampling events per well are required for calculating the trend. Methodology is valid for 4 to 40 samples.
- Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing;
   ≥ 90% = Probably Increasing or Probably Decreasing;
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- 3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, Ground Water, 41(3):355-367, 2003.

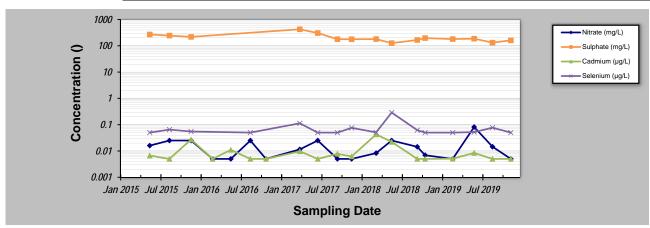
for Constituent Trend Analysis

Evaluation Date: 05-Feb-20
Facility Name: Teck Coal Regional Groundwater - EVO
Conducted By: NDS

Job ID: 671557 Location EV\_WF\_SW

Daramatar (unita)	Nitrata (mar/l)	Culmbata (mau/L)	Condensions (con/L)	Calamirum (reall )
Parameter (units)	Nitrate (mg/L)	Sulphate (mg/L)	Cadmium (µg/L)	(Seienium (µg/L)

Sampling Event	Sampling Date	EV_WF_SW CONCENTRATION						
1	14-May-15	0.016	269	0.0067	0.05			
2	12-Aug-15	0.025	244	0.005	0.065			
3	19-Nov-15	0.025	218	0.0272	0.055			
4	25-Feb-16	0.005	157	0.005	0.425			
5	18-May-16	0.005	128	0.011	0.066			
6	16-Aug-16	0.025	298	0.005	0.05			
7	26-Oct-16	0.005	170	0.005	0.072			
8	30-Mar-17	0.0115	424	0.0097	0.113			
9	20-Jun-17	0.025	305	0.005	0.05			
10	18-Sep-17	0.005	178	0.0078	0.05			
11	22-Nov-17	0.005	177	0.0062	0.076			
12	14-Mar-18	0.0083	180	0.0428	0.051			
13	24-May-18	0.025	126	0.0221	0.289			
14	18-Sep-18	0.0144	166	0.005	0.062			
15	24-Oct-18	0.0069	196	0.005	0.05			
16	27-Feb-19	0.005	180	0.0051	0.05			
17	5-Jun-19	0.0817	186	0.0084	0.052			
18	28-Aug-19	0.0145	132	0.005	0.077			
19	20-Nov-19	0.005	161	0.005	0.05			
20								
Coefficier	nt of Variation:	1.08	0.36	0.99	0.80			
Mann-Kenda	III Statistic (S):	-12	-84	-15	-28			
Conf	idence Factor:	64.8%	>99.9%	68.6%	88.6%			
Concer	ntration Trend:	No Trend	Decreasing	Stable	Stable			



## Notes

- 1. At least four independent sampling events per well are required for calculating the trend. Methodology is valid for 4 to 40 samples.
- Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing;
   ≥ 90% = Probably Increasing or Probably Decreasing;
   < 90% and S>0 = No Trend;
   < 90%, S≤0, and COV ≥ 1 = No Trend;</li>
   < 90% and COV < 1 = Stable.</li>
- 3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, Ground Water, 41(3):355-367, 2003.

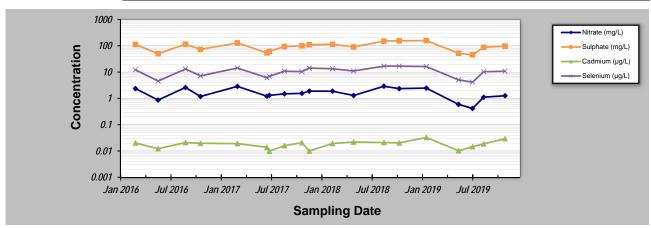
for Constituent Trend Analysis

Evaluation Date: 05-Feb-20
Facility Name: Teck Coal Regional Groundwater - EVO
Conducted By: NDS

Job ID: 671557 Location EV\_WH50gw

Parameter (units) Nitrate (mg/L)   Sulphate (mg/L)   Cadmium (µg/L)   Selenium (µg/L)
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	· amotor (amo)	reaction (mg/ = )	outprides (mg/ =)	Journal (p.g. =	/ Co.c (p.g/ = /	4	
Sampling Event	Sampling Date			EV_W	H50GW CONCENT	RATION	
1	24-Feb-16	2.36	113	0.0201	12.2		
2	17-May-16	0.861	49.9	0.0122	4.56		
3	25-Aug-16	2.6	115	0.0208	13.1		
4	19-Oct-16	1.18	72.8	0.0196	7.17		
5	3-Mar-17	2.86	129	0.0191	14.3		
6	19-Jun-17	1.21	53.6	0.0138	6.12		
7	28-Jun-17	1.3	61	0.0099	6.89		
8	22-Aug-17	1.49	94.1	0.016	10.8		
9	25-Oct-17	1.55	99.4	0.0206	10.4		
10	21-Nov-17	1.89	110	0.01	14.2		
11	14-Feb-18	1.87	114	0.0193	13.4		
12	2-May-18	1.29	90.6	0.0218	11		
13	21-Aug-18	2.89	150	0.021	16.8		
14	16-Oct-18	2.35	154	0.0202	16.8		
15	23-Jan-19	2.46	158	0.0327	16.2		
16	21-May-19	0.59	52.1	0.0102	5.04		
17	11-Jul-19	0.414	45.3	0.0146	4.13		
18	21-Aug-19	1.11	87.5	0.0186	10.3		
19	7-Nov-19	1.26	96.8	0.0294	10.8		
20	İ						
Coefficier	Coefficient of Variation:		0.37	0.33	0.38		
Mann-Kenda	all Statistic (S):	-17	13	25	13		
Conf	idence Factor:	71.0%	66.1%	79.7%	66.1%		
Concer	ntration Trend:	Stable	No Trend	No Trend	No Trend		



## Notes

- 1. At least four independent sampling events per well are required for calculating the trend. Methodology is valid for 4 to 40 samples.
- Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing;
   ≥ 90% = Probably Increasing or Probably Decreasing;
   < 90% and S>0 = No Trend;
   < 90%, S≤0, and COV ≥ 1 = No Trend;</li>
   < 90% and COV < 1 = Stable.</li>
- 3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, Ground Water, 41(3):355-367, 2003.

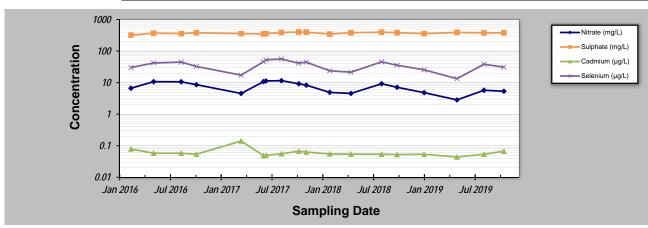
# GSI MANN-KENDALL TOOLKIT for Constituent Trend Analysis

Evaluation Date: 05-Feb-20
Facility Name: Teck Coal Regional Groundwater - EVO
Conducted By: NDS

Job ID: 671557 Location EV\_BRgw

Parameter (units)	Nitrate (mg/L)	Sulphate (mg/L)	Cadmium (µg/L)	Selenium (µg/L)
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Sampling Event	Sampling Date	EV_BRGW CONCENTRATION						
1	25-Feb-16	6.64	320	0.0788	30			
2	17-May-16	10.7	367	0.0579	41.9			
3	25-Aug-16	10.6	358	0.0581	44.7			
4	19-Oct-16	8.6	379	0.0539	32.5			
5	30-Mar-17	4.53	357	0.141	17.2			
6	19-Jun-17	10.7	348	0.0483	45.9			
7	28-Jun-17	11.3	358	0.0497	52.4			
8	23-Aug-17	11.5	387	0.0555	56.2			
9	25-Oct-17	9.18	399	0.0671	41.1			
10	21-Nov-17	8.31	395	0.0628	44.5			
11	14-Feb-18	4.9	346	0.055	23.7			
12	2-May-18	4.54	379	0.054	21.4			
13	21-Aug-18	9.2	396	0.0539	45.5			
14	16-Oct-18	7.1	382	0.0525	35.6			
15	22-Jan-19	4.8	357	0.0537	25.4			
16	21-May-19	2.83	389	0.0438	13.3			
17	27-Aug-19	5.72	376	0.0537	38.3			
18	7-Nov-19	5.31	378	0.0669	30.7			
19								
20								
Coefficien	it of Variation:	0.37	0.06	0.35	0.34			
Mann-Kenda	II Statistic (S):	-52	36	-47	-27			
Confi	dence Factor:	97.4%	90.6%	95.9%	83.5%			



## Notes

Concentration Trend:

- 1. At least four independent sampling events per well are required for calculating the trend. Methodology is valid for 4 to 40 samples.
- Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing;
   ≥ 90% = Probably Increasing or Probably Decreasing;
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   < 90%, S≤0, and COV ≥ 1 = No Trend;</li>
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- 3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, Ground Water, 41(3):355-367, 2003.

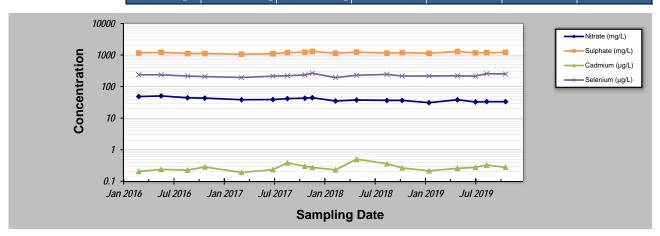
# GSI MANN-KENDALL TOOLKIT for Constituent Trend Analysis

Evaluation Date: 05-Feb-20
Facility Name: Teck Coal Regional Groundwater - EVO
Conducted By: NDS

Job ID: 671557 Location EV\_RCgw

Parameter (units)	Nitrate (mg/L)	Sulphate (mg/L)	Cadmium (µg/L)	Selenium (µg/L)
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Sampling Event	Sampling Date	EV_RCGW CONCENTRATION						
1	25-Feb-16	48.4	1160	0.205	238			
2	17-May-16	50.6	1220	0.238	237			
3	22-Aug-16	44.2	1120	0.226	216			
4	24-Oct-16	43.1	1120	0.284	208			
5	7-Mar-17	38.4	1060	0.191	195			
6	30-Jun-17	38.9	1100	0.233	214			
7	22-Aug-17	41.6	1190	0.384	221			
8	25-Oct-17	42.9	1230	0.299	235			
9	21-Nov-17	44.4	1300	0.274	266			
10	14-Feb-18	35	1140	0.23	193			
11	2-May-18	37.6	1240	0.501	229			
12	21-Aug-18	36.5	1150	0.36	244			
13	16-Oct-18	36.5	1190	0.265	216			
14	22-Jan-19	31	1140	0.214	217			
15	6-May-19	38.2	1290	0.257	220			
16	11-Jul-19	32.6	1170	0.277	215			
17	21-Aug-19	33.3	1180	0.325	257			
18	29-Oct-19	33.3	1220	0.278	251			
19								
20								
Coefficien	t of Variation:	0.14	0.05	0.27	0.09			
Mann-Kendal	I Statistic (S):	-99	37	39	20			
Confi	dence Factor:	>99.9%	91.2%	92.4%	76.2%			
Concen	tration Trend:	Decreasing	Prob. Increasing	Prob. Increasing	No Trend			



## Notes

- 1. At least four independent sampling events per well are required for calculating the trend. Methodology is valid for 4 to 40 samples.
- Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing;
   ≥ 90% = Probably Increasing or Probably Decreasing;
   < 90% and S>0 = No Trend;
   < 90%, S≤0, and COV ≥ 1 = No Trend;</li>
   < 90% and COV < 1 = Stable.</li>
- 3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, Ground Water, 41(3):355-367, 2003.

#### **GSI MANN-KENDALL TOOLKIT** for Constituent Trend Analysis Evaluation Date: 05-Feb-20 Job ID: **671557** Facility Name: Teck Coal Regional Groundwater - EVO Location EV\_BCgw Conducted By: NDS Parameter (units) Nitrate (mg/L) Sulphate (mg/L) Cadmium (µg/L) Selenium (µg/L) 1 13-Jan-15 11.5 338 0.049 67.3 2 11-May-15 19.4 531 0.0463 3 449 10-Aug-15 16.5 0.0599 73.8 16-Nov-15 0.0548 411 59.7 14 0.0544 53.2 22-Feb-16 13.3 6 16-May-16 11.2 350 0.0529 45.3 22-Aug-16 8 18-Oct-16 27.4 5.96 235 0.0361 9 14-Mar-17 0.0335 20.3 10 9 04 30-Mar-17 314 0.0551 37.7 11 16-May-17 14 462 0.0609 59 12 27-Jun-17 3.09 23-Aug-17 13 10.6 391 0.0603 56.8 14 18-Oct-17 34.5 6 27 261 0.0426 15 15-Feb-18 311 0.0521 46.9 16 9-May-18 7.46 289 0.0504 39 17 21-Aug-18 0.048 6.17 287 18 253 0.0448 29.8 4.98 24-Oct-18 19 23-Jan-19 4.02 234 0.0431 24.9 20 9-May-19 0.0453 21 9-Jul-19 4.07 0.0382 30.2 266 22 31-Oct-19 0.0385 17.7 23 24 0.54 0.30 0.16 0.46 Coefficient of Variation: Mann-Kendall Statistic (S): -144 -101 -113 Confidence Factor: >99.9% 96.9% Concentration Trend: 1000 Sulphate (mg/L) Concentration 100 Selenium (µg/L) 10 0.1 Jan 2015 Jul 2015 Jan 2016 Jul 2016 Jan 2017 Jul 2017 Jan 2018 Jul 2018 Jan 2019 Jul 2019

## Notes:

- 1. At least four independent sampling events per well are required for calculating the trend. Methodology is valid for 4 to 40 samples.
- Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing;
   ≥ 90% = Probably Increasing or Probably Decreasing;
   < 90% and S>0 = No Trend;
   < 90%, S≤0, and COV ≥ 1 = No Trend;</li>
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- 3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, Ground Water, 41(3):355-367, 2003.

DISCLAIMER: The GSI Mann-Kendall Toolkit is available "as is". Considerable care has been exercised in preparing this software product; however, no party, including without limitation GSI Environmental Inc., makes any representation or warranty regarding the accuracy, correctness, or completeness of the information contained herein, and no such party shall be liable for any direct, indirect, consequential, incidental or other damages resulting from the use of this product or the information contained herein. Information in this publication is subject to change without notice. GSI Environmental Inc., disclaims any responsibility or obligation to update the information contained herein.

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Sampling Date

#### **GSI MANN-KENDALL TOOLKIT** for Constituent Trend Analysis Evaluation Date: 05-Feb-20 Job ID: 671557 Facility Name: Teck Coal Regional Groundwater - EVO Location EV\_MCgwS Conducted By: NDS Parameter (units) Nitrate (mg/L) Sulphate (mg/L) Selenium (ug/L) 1 12-Jan-15 0.028 111 0.1 2 12-May-15 0.01 107 0.05 3 0.05 11-Aug-15 93.6 17-Nov-15 0.025 0.05 128 107 0.155 24-Feb-16 0.025 6 18-May-16 0.025 123 0.05 23-Aug-16 8 24-Oct-16 94.1 0.05 0.025 9 8-Mar-17 0.025 0.05 105 10 30-Mar-17 0.0069 124 0.05 11 16-May-17 0.025 104 0.073 12 28-Jun-17 94.2 16-Aug-17 13 0.005 88.1 0.05 14 94.4 21-Sep-17 0.005 0.05 15 18-Oct-17 0.005 82.3 0.05 16 8-Mar-18 0.005 109 0.05 17 10-May-18 0.005 134 0.05 18 135 1.31 0.0613 20-Aug-18 19 17-Oct-18 0.104 161 0.05 20 30-Jan-19 0.025 168 0.214 21 8-May-19 0.0058 154 0.052 22 9-Jul-19 132 0.056 0.005 23 4-Nov-19 0.0115 0.05 24 Coefficient of Variation: 1.01 0.20 2.19 Mann-Kendall Statistic (S): Confidence Factor: Concentration Trend: 1000 Nitrate (mg/L) 100 Concentration () Sulphate (mg/L) 10 Selenium (ug/L) 0.1 0.01

### Notes

0.001

- 1. At least four independent sampling events per well are required for calculating the trend. Methodology is valid for 4 to 40 samples.
- Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing;
   ≥ 90% = Probably Increasing or Probably Decreasing;
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   < 90%, S≤0, and COV ≥ 1 = No Trend;</li>
   < 90% and COV < 1 = Stable.</li>

Jan 2015 Jul 2015 Jan 2016 Jul 2016 Jan 2017 Jul 2017 Jan 2018 Jul 2018 Jan 2019 Jul 2019

Sampling Date

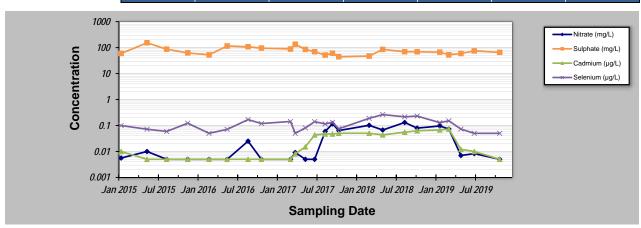
3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

for Constituent Trend Analysis

Evaluation Date: 05-Feb-20 Job ID: 671557
Facility Name: Teck Coal Regional Groundwater - EVO Location Conducted By: NDS

Parameter (units) Nitrate (mg/L) | Sulphate (mg/L) | Cadmium (μg/L) | Selenium (μg/L)

	annotor (anno)	·····are (····g/ =)	ourpridite (mg/ =)	- (mg/ = )	- (mg/ = /		
Sampling Event	Sampling Date			EV_M(	CGWD CONCENTR	RATION	
1	12-Jan-15	0.0056	59.5	0.01	0.1	I	
2	12-May-15	0.0030	153	0.005	0.072		
3	11-Aug-15	0.005	87.2	0.005	0.072		
4	17-Nov-15	0.005	62.2	0.005	0.039		
5	24-Feb-16	0.005	52.5	0.005	0.123		
6		0.005	116	0.005	0.03		
7	18-May-16	0.005		0.005			
8	23-Aug-16 24-Oct-16	0.025	108 95.8	0.005	0.169 0.119		
9							
	8-Mar-17	0.005	88.3	0.005	0.143		
10	30-Mar-17	0.0091	135	0.0081	0.05		
11	16-May-17	0.005	85.1	0.0151	0.081		
12	28-Jun-17	0.005	69.4	0.0434	0.141		
13	16-Aug-17	0.059	51.7	0.047	0.115		
14	19-Sep-17	0.117	60.1	0.047	0.133		
15	18-Oct-17	0.0639	44.5	0.0503	0.075		
16	8-Mar-18	0.102	47.1	0.0503	0.189		
17	10-May-18	0.0671	85.1	0.0434	0.263		
18	20-Aug-18	0.131	69.6	0.0552	0.216		
19	17-Oct-18	0.0794	69.3	0.0627	0.231		
20	30-Jan-19	0.0959	66.8	0.0677	0.129		
21	13-Mar-19	0.073	52.9	0.0724	0.152		
22	8-May-19	0.007	59.2	0.0121	0.073		
23	9-Jul-19	0.0083	74.6	0.01	0.05		
24	4-Nov-19	0.005	65.6	0.005	0.05		
25							
Coefficien	it of Variation:	1.14	0.36	0.92	0.51		
Mann-Kendal	II Statistic (S):	84	-79	134	38		
Confi	dence Factor:	98.1%	97.4%	>99.9%	81.9%		
Concen	tration Trend:	Increasing	Decreasing	Increasing	No Trend		



### Notes:

- 1. At least four independent sampling events per well are required for calculating the trend. Methodology is valid for 4 to 40 samples.
- Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing;
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   <90% and S>0 = No Trend;
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- 3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, Ground Water, 41(3):355-367, 2003.

#### **GSI MANN-KENDALL TOOLKIT** for Constituent Trend Analysis Evaluation Date: 05-Feb-20 Job ID: 671557 Facility Name: Teck Coal Regional Groundwater - EVO Location EV\_ER1gwS Conducted By: NDS Parameter (units) Nitrate (mg/L) Sulphate (mg/L) Selenium (ug/L) 1 13-Jan-15 2.03 71.3 10.4 2 12-May-15 1.79 59.2 9.16 3 63.3 11-Aug-15 2.06 9.22 17-Nov-15 2.36 10.4 76.8 2.51 85.2 10.1 24-Feb-16 6 18-May-16 1.46 48.8 6.49 23-Aug-16 8.44 8 18-Oct-16 1.99 70.6 9.04 9 10.3 15-Feb-17 2.69 10 28-Jun-17 1 19 42 1 4 95 11 22-Aug-17 1.74 60.6 8.59 12 24-Oct-17 7.74 13 21-Feb-18 2.08 82.2 10.8 14 16-May-18 1.89 77.7 8.02 15 18-Sep-18 1.97 74.5 11.8 16 9-Oct-18 1.85 71.2 10.5 17 31-Jan-19 2.02 88.7 11.1 18 1.81 8-May-19 11.2 89.2 19 15-Jul-19 1.23 51.9 6.43 20 10.3 21 22 23 24 0.20 0.19 0.20 Coefficient of Variation: Mann-Kendall Statistic (S) Confidence Factor: 90.2% 72.9% Concentration Trend: 100 Nitrate (mg/L) Concentration () Sulphate (mg/L) Selenium (ug/L) 10 Jan 2015 Jul 2015 Jan 2016 Jul 2016 Jan 2017 Jul 2017 Jan 2018 Jul 2018 Jan 2019 Jul 2019 Sampling Date

### Notes

- 1. At least four independent sampling events per well are required for calculating the trend. Methodology is valid for 4 to 40 samples.
- Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing;
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- 3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

#### **GSI MANN-KENDALL TOOLKIT** for Constituent Trend Analysis Evaluation Date: 05-Feb-20 Job ID: 671557 Location EV\_ER1gwD Facility Name: Teck Coal Regional Groundwater - EVO Conducted By: NDS Parameter (units) Nitrate (mg/L) Sulphate (mg/L) Selenium (ug/L) 1 13-Jan-15 1.71 63.7 8.98 2 12-May-15 1.59 55.5 8.12 3 1.8 57.6 11-Aug-15 8.66 17-Nov-15 2.01 8.84 67.7 2.41 9.88 24-Feb-16 82.2 6 18-May-16 1.25 44.7 5.71 23-Aug-16 8 18-Oct-16 1.51 57.5 6.77 9 15-Feb-17 2.1 73.8 8.16 10 28-Jun-17 1.26 40 5.67 11 22-Aug-17 1.48 53.8 6.95 12 24-Oct-17 13 21-Feb-18 1.93 75.3 10.1 14 16-May-18 1 44 54.4 7.52 15 18-Sep-18 0.704 34.8 4.56 16 9-Oct-18 0.937 40.7 5.99 17 31-Jan-19 1.4 62.9 7.69 18 1.22 54.4 7.28 8-May-19 19 15-Jul-19 0.394 22.6 23.9 1.29 20 21 22 23 24 0.37 0.30 0.35 Coefficient of Variation: Mann-Kendall Statistic (S): Confidence Factor: 99 9% 98.0% Concentration Trend: 100 Nitrate (mg/L) Concentration () Sulphate (mg/L) 10 Selenium (ug/L) Jan 2015 Jul 2015 Jan 2016 Jul 2016 Jan 2017 Jul 2017 Jan 2018 Jul 2018 Jan 2019 Jul 2019 Sampling Date

### Notes

- 1. At least four independent sampling events per well are required for calculating the trend. Methodology is valid for 4 to 40 samples.
- Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing;
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   < 90%, S≤0, and COV ≥ 1 = No Trend;</li>
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- 3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

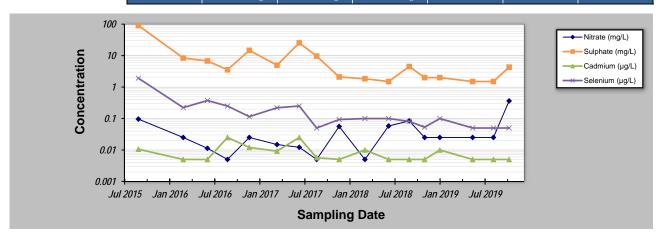
for Constituent Trend Analysis

Evaluation Date: 05-Feb-20
Facility Name: Teck Coal Regional Groundwater - CMO
Conducted By: NDS

Job ID: 671557 Location CM\_MW1-DP

Daramatar (unita)	Nitrata (mar/l)	Culmbata (mau/L)	Condensions (con/L)	Calamirum (reall )
Parameter (units)	Nitrate (mg/L)	Sulphate (mg/L)	Cadmium (µg/L)	(Seienium (µg/L)

							•
Sampling Event	Sampling Date			CM_M\	W1-DP CONCENT	RATION	
1	9-Sep-15	0.096	90.6	0.0106	1.92		
2	10-Mar-16	0.025	8.4	0.005	0.223		
3	17-Jun-16	0.0113	6.77	0.005	0.374		
4	7-Sep-16	0.005	3.54	0.025	0.25		
5	5-Dec-16	0.025	14.7	0.012	0.115		
6	28-Mar-17	0.0149	4.97	0.0092	0.22		
7	27-Jun-17	0.0122	25.4	0.025	0.25		
8	6-Sep-17	0.005	9.64	0.0057	0.05		
9	7-Dec-17	0.056	2.1	0.005	0.093		
10	22-Mar-18	0.005	1.84	0.01	0.1		
11	27-Jun-18	0.058	1.5	0.005	0.1		
12	19-Sep-18	0.084	4.5	0.005	0.081		
13	21-Nov-18	0.025	2	0.005	0.053		
14	22-Jan-19	0.025	2	0.01	0.1		
15	5-Jun-19	0.025	1.5	0.005	0.05		
16	29-Aug-19	0.025	1.5	0.005	0.05		
17	1-Nov-19	0.363	4.3	0.005	0.05		
18							
19							
20							
Coefficien	t of Variation:	1.68	1.97	0.73	1.85		
Mann-Kenda	II Statistic (S):	26	-74	-42	-92		
Confi	dence Factor:	84.6%	99.9%	95.4%	>99.9%		
Concen	tration Trend:	No Trend	Decreasing	Decreasing	Decreasing		



### Notes

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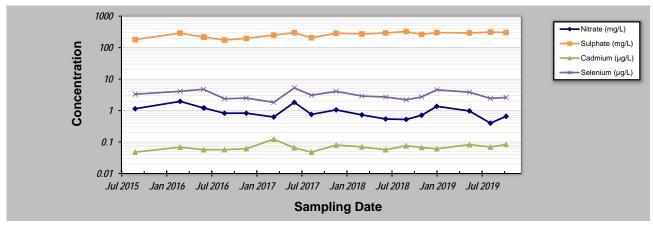
for Constituent Trend Analysis

Evaluation Date: 05-Feb-20
Facility Name: Teck Coal Regional Groundwater - CMO
Conducted By: NDS

Job ID: 671557 Location CM\_MW1-OB

Parameter (units)	Nitrate (mg/L)	Sulphate (mg/L)	Cadmium (µg/L)	Selenium (µg/L)

Sampling Event	Sampling Date			CM_M	W1-OB CONCENT	RATION	
1	8-Sep-15	1.14	180	0.0474	3.3		
2	10-Mar-16	1.95	291	0.0685	4.1		
3	13-Jun-16	1.21	216	0.057	4.73		
4	16-Jun-16	1.2	216				
5	7-Sep-16	0.82	174	0.057	2.36		
6	5-Dec-16	0.824	197	0.0613	2.49		
7	27-Mar-17	0.622	250	0.122	1.82		
8	19-Jun-17	1.82	297	0.0653	5.24		
9	28-Aug-17	0.751	206	0.0474	3.07		
10	7-Dec-17	1.05	287	0.0799	4.07		
11	22-Mar-18	0.726	272	0.0695	2.89		
12	27-Jun-18	0.538	293	0.0569	2.69		
13	19-Sep-18	0.52	324	0.0761	2.2		
14	21-Nov-18	0.707	264	0.0668	2.71		
15	22-Jan-19	1.36	300	0.0611	4.56		
16	4-Jun-19	0.97	292	0.0824	3.82		
17	29-Aug-19	0.396	310	0.0691	2.43		
18	1-Nov-19	0.657	303	0.0833	2.6		
19							
20							
Coefficien	t of Variation:	0.45	0.19	0.25	0.31		
Mann-Kenda	II Statistic (S):	-67	82	46	-20		
Confi	dence Factor:	99.5%	99.9%	96.8%	78.0%		



### Notes:

Concentration Trend:

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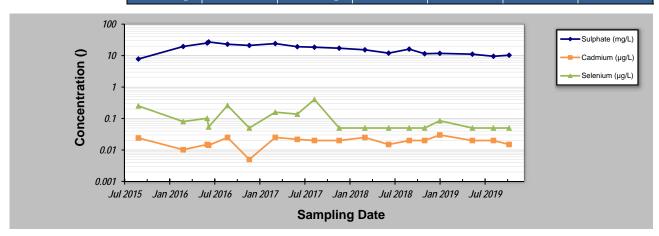
for Constituent Trend Analysis

Evaluation Date: 05-Feb-20
Facility Name: Teck Coal Regional Groundwater - CMO
Conducted By: NDS

Job ID: 671557 Location CM\_MW1-SH

Parameter (units)	Sulphate (	(mg/L)C	admium (µg/L	Selenium (	µg/L)

	21110tor (G111to)	- u.p.:.a.to (g, =)	Guarrian (pg/ =	// CC:C::::::: (p.g/ = /			
Sampling Event	Sampling Date			CM_M	W1-SH CONCENT	RATION	
1	9-Sep-15	7.8	0.0241	0.252			
2	10-Mar-16	19.5	0.0102	0.08			
3	16-Jun-16	25.2	0.015	0.102			
4	22-Jun-16	27.2	0.0141	0.054			
5	7-Sep-16	23	0.025	0.26			
6	5-Dec-16	21.1	0.005	0.05			
7	21-Mar-17	24.1	0.0251	0.159			
8	19-Jun-17	19.2	0.0218	0.138			
9	28-Aug-17	18.5	0.02	0.404			
10	7-Dec-17	17.2	0.02	0.05			
11	22-Mar-18	15.3	0.025	0.05			
12	27-Jun-18	12	0.015	0.05			
13	19-Sep-18	16.1	0.02	0.05			
14	21-Nov-18	11.5	0.02	0.05			
15	22-Jan-19	11.8	0.03	0.085			
16	4-Jun-19	11.1	0.02	0.05			
17	29-Aug-19	9.54	0.02	0.05			
18	1-Nov-19	10.3	0.015	0.05			
19							
20							
Coefficien	t of Variation:	0.35	0.31	0.91			
Mann-Kendal		-95	10	-59			
Confi	dence Factor:	>99.9%	63.2%	98.7%			
Concen	tration Trend:	Decreasing	No Trend	Decreasing			



### Notes

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   ≥ 90% = Probably Increasing or Probably Decreasing;
   < 90% and S>0 = No Trend;
   < 90%, S≤0, and COV ≥ 1 = No Trend;</li>
   < 90% and COV < 1 = Stable.</li>
- 3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, Ground Water, 41(3):355-367, 2003.

#### **GSI MANN-KENDALL TOOLKIT** for Constituent Trend Analysis Evaluation Date: 05-Feb-20 Job ID: 671557 Facility Name: Teck Coal Regional Groundwater - CMO Location CM\_MW2-SH Conducted By: NDS Parameter (units) Sulphate (mg/L) 8-Sep-15 363 23-Nov-15 244 307 3 10-Mar-16 4 6-Sep-16 372 5 6-Dec-16 386 6 15-Mar-17 343 7 15-Jun-17 417 8 14-Aug-17 406 16-Nov-17 9 348 10 27-Mar-18 339 11 25-Jun-18 491 12 442 18-Sep-18 13 15-Nov-18 298 14 24-Jan-19 344 15 4-Jun-19 16 20-Aug-19 409 17 31-Oct-19 347 18 19 Coefficient of Variation: Mann-Kendall Statistic (S): Confidence Factor: Concentration Trend: 1000 Sulphate (mg/L) Sulphate (mg/L Concentration () 100 10 Jul 2015 Jan 2016 Jul 2016 Jan 2017 Jul 2017 Jan 2018 Jul 2018 Jan 2019 Jul 2019 **Sampling Date**

### Notes

- 1. At least four independent sampling events per well are required for calculating the trend. Methodology is valid for 4 to 40 samples.
- Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing;
   ≥ 90% = Probably Increasing or Probably Decreasing;
   < 90% and S>0 = No Trend;
   < 90%, S≤0, and COV ≥ 1 = No Trend;</li>
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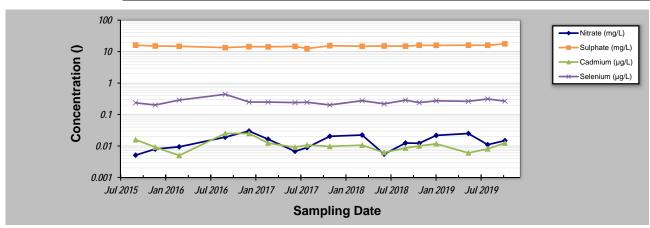
for Constituent Trend Analysis

Evaluation Date: 05-Feb-20
Facility Name: Teck Coal Regional Groundwater - CMO
Conducted By: NDS

Job ID: 671557 Location CM\_MW3-SH

Daramatar (unita)	Nitrata (mar/l)	Culmbata (mau/L)	Condensions (con/L)	Calamirum (reall )
Parameter (units)	Nitrate (mg/L)	Sulphate (mg/L)	Cadmium (µg/L)	(Seienium (µg/L)

			3 /	(13	(13	4	
Sampling Event	Sampling Date			CM_M	W3-SH CONCENT	RATION	
1	14-Sep-15	0.0051	16	0.0159	0.236		
2	3-Dec-15	0.008	15.1	0.0092	0.201		
3	10-Mar-16	0.0094	14.8	0.005	0.288		
4	14-Sep-16	0.0191	13.4	0.025	0.44		
5	20-Dec-16	0.0298	14.4	0.025	0.25		
6	8-Mar-17	0.0164	14.2	0.0124	0.249		
7	26-Jun-17	0.0068	14.7	0.0091	0.24		
8	14-Aug-17	0.0089	12.5	0.0107	0.246		
9	15-Nov-17	0.0203	15.4	0.0097	0.202		
10	27-Mar-18	0.0223	14.8	0.0106	0.275		
11	25-Jun-18	0.0055	15.1	0.0062	0.219		
12	20-Sep-18	0.0124	14.9	0.0086	0.286		
13	15-Nov-18	0.0122	15.9	0.01	0.239		
14	24-Jan-19	0.0217	15.8	0.0117	0.273		
15	4-Jun-19	0.0249	16	0.006	0.263		
16	22-Aug-19	0.011	15.9	0.0081	0.313		
17	31-Oct-19	0.0148	17.7	0.0124	0.266		
18							
19							
20							
Coefficien	t of Variation:	0.50	0.08	0.50	0.21		
Mann-Kendal	II Statistic (S):	32	56	-28	22		
Confi	dence Factor:	89.8%	98.9%	86.5%	80.4%		
Concen	tration Trend:	No Trend	Increasing	Stable	No Trend		



### Notes

- 1. At least four independent sampling events per well are required for calculating the trend. Methodology is valid for 4 to 40 samples.
- Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing;
   ≥ 90% = Probably Increasing or Probably Decreasing;
   < 90% and S>0 = No Trend;
   < 90%, S≤0, and COV ≥ 1 = No Trend;</li>
   < 90% and COV < 1 = Stable.</li>
- 3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, Ground Water, 41(3):355-367, 2003.

#### **GSI MANN-KENDALL TOOLKIT** for Constituent Trend Analysis Evaluation Date: 05-Feb-20 Job ID: 671557 Facility Name: Teck Coal Regional Groundwater - CMO Location CM\_MW4-DP Conducted By: NDS Parameter (units) Nitrate (mg/L) 3-Sep-15 0.1 23-Nov-15 0.1 11-Mar-16 0.1 3 4 6-Sep-16 0.086 5 1-Dec-16 0.076 6 15-Mar-17 0.025 7 15-Jun-17 0.025 8 23-Aug-17 9 19-Jun-18 0.036 10 5-Sep-18 0.025 11 21-Nov-18 0.025 12 28-Jan-19 0.025 13 0.076 5-Jun-19 14 21-Aug-19 0.308 15 5-Nov-19 16 17 18 19 Coefficient of Variation: Mann-Kendall Statistic (S): Confidence Factor: Concentration Trend: Nitrate (mg/L) Concentration () Nitrate (mg/L) 0.1 Jul 2015 Jan 2016 Jul 2016 Jan 2017 Jul 2017 Jan 2018 Jul 2018 Jan 2019 Jul 2019 **Sampling Date**

### Notes

- 1. At least four independent sampling events per well are required for calculating the trend. Methodology is valid for 4 to 40 samples.
- Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing;
   ≥ 90% = Probably Increasing or Probably Decreasing;
   < 90% and S>0 = No Trend;
   < 90%, S≤0, and COV ≥ 1 = No Trend;</li>
   < 90% and COV < 1 = Stable.</li>
- 3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

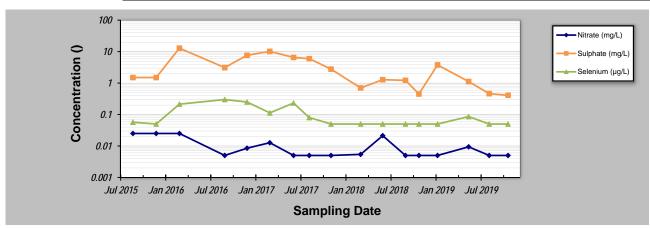
for Constituent Trend Analysis

Evaluation Date: 05-Feb-20
Facility Name: Teck Coal Regional Groundwater - CMO
Conducted By: NDS

Job ID: 671557 Location CM\_MW5-DP

Parameter (units)	Nitrate (mg/L)	Sulphate (mg/L)	Selenium (µg/L)

Sampling Event	Sampling Date			CM_M	W5-DP CONCENT	RATION	
1	3-Sep-15	0.025	1.5	0.057			
2	7-Dec-15	0.025	1.5	0.05			
3	11-Mar-16	0.025	12.9	0.214			
4	12-Sep-16	0.005	3.1	0.3			
5	12-Dec-16	0.0085	7.66	0.25			
6	15-Mar-17	0.0127	10.2	0.113			
7	20-Jun-17	0.005	6.53	0.232			
8	23-Aug-17	0.005	5.97	0.08			
9	20-Nov-17	0.005	2.78	0.05			
10	21-Mar-18	0.0054	0.7	0.05			
11	19-Jun-18	0.0213	1.28	0.05			
12	20-Sep-18	0.005	1.22	0.05			
13	14-Nov-18	0.005	0.45	0.05			
14	29-Jan-19	0.005	3.78	0.05			
15	5-Jun-19	0.0094	1.12	0.086			
16	28-Aug-19	0.005	0.46	0.05			
17	13-Nov-19	0.005	0.41	0.05			
18							
19							
20							
Coefficien	nt of Variation:	0.78	1.04	0.82			
Mann-Kenda	II Statistic (S):	-51	-71	-50			
Confi	dence Factor:	98.1%	99.9%	97.9%			



### Notes:

Concentration Trend:

- 1. At least four independent sampling events per well are required for calculating the trend. Methodology is valid for 4 to 40 samples.
- Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing;
   ≥ 90% = Probably Increasing or Probably Decreasing;
   < 90% and S>0 = No Trend;
   < 90%, S≤0, and COV ≥ 1 = No Trend;</li>
   < 90% and COV < 1 = Stable.</li>
- 3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, Ground Water, 41(3):355-367, 2003.

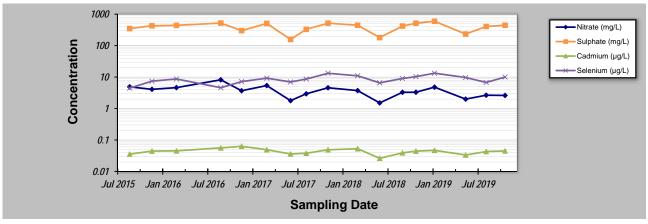
for Constituent Trend Analysis

Evaluation Date: 05-Feb-20
Facility Name: Teck Coal Regional Groundwater - CMO
Conducted By: NDS

Job ID: 671557 Location CM\_MW5-SH

Parameter (units) Nitrate (mg/L)   Sulphate (mg/L)   Cadmium (µg/L)   Selenium (µg/L)
---

Sampling Event	Sampling Date			CM_M	W5-SH CONCENT	RATION	
1	2-Sep-15	4.89	349	0.0356	4.45		
2	2-Dec-15	4.08	428	0.0443	7.43		
3	11-Mar-16	4.62	441	0.0451	8.71		
4	8-Sep-16	8.18	521	0.056	4.59		
5	2-Dec-16	3.68	299	0.063	7.19		
6	15-Mar-17	5.37	508	0.049	9.22		
7	20-Jun-17	1.78	157	0.0359	6.99		
8	23-Aug-17	2.94	330	0.0379	8.65		
9	20-Nov-17	4.57	517	0.0487	13.2		
10	21-Mar-18	3.72	445	0.0527	11		
11	19-Jun-18	1.51	180	0.0261	6.55		
12	20-Sep-18	3.28	419	0.039	9.02		
13	14-Nov-18	3.3	516	0.0442	10.3		
14	29-Jan-19	4.78	595	0.0468	13.3		
15	5-Jun-19	1.99	233	0.0333	9.69		
16	28-Aug-19	2.65	406	0.0429	6.75		
17	13-Nov-19	2.61	445	0.0449	10		
18							
19							
20							
Coefficien	t of Variation:	0.43	0.31	0.20	0.29		
Mann-Kendal	I Statistic (S):	-54	9	-14	48		
Confi	dence Factor:	98.6%	62.7%	70.1%	97.4%		



### Notes:

Concentration Trend:

- 1. At least four independent sampling events per well are required for calculating the trend. Methodology is valid for 4 to 40 samples.
- Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing;
   ≥ 90% = Probably Increasing or Probably Decreasing;
   < 90% and S>0 = No Trend;
   < 90%, S≤0, and COV ≥ 1 = No Trend;</li>
   < 90% and COV < 1 = Stable.</li>
- 3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, Ground Water, 41(3):355-367, 2003.

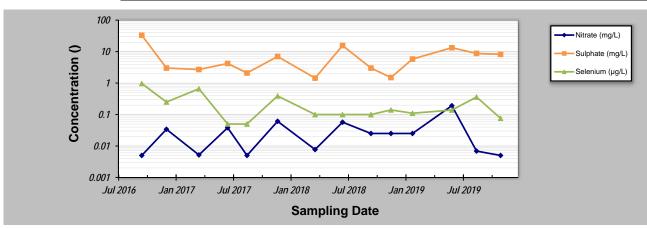
# GSI MANN-KENDALL TOOLKIT for Constituent Trend Analysis

Evaluation Date: 05-Feb-20
Facility Name: Teck Coal Regional Groundwater - CMO
Conducted By: NDS

Job ID: 671557 Location CM\_MW6-DP

Parameter (units)	Nitrate (mg/L)	Sulphate (mg/L)	Selenium (µg/L)

						•	•	
Sampling Event	Sampling Date			CM_M	W6-DP CONCEN <sup>-</sup>	TRATION		
1	13-Sep-16	0.005	33.3	0.97				
2	1-Dec-16	0.034	3	0.25				
3	15-Mar-17	0.0052	2.7	0.659				
4	15-Jun-17	0.038	4.2	0.05				
5	16-Aug-17	0.005	2.09	0.05				
6	22-Nov-17	0.061	7	0.39				
7	22-Mar-18	0.0077	1.44	0.1				
8	18-Jun-18	0.057	15.6	0.1				
9	17-Sep-18	0.025	3	0.1				
10	20-Nov-18	0.025	1.5	0.14				
11	28-Jan-19	0.025	5.8	0.11				
12	3-Jun-19	0.191	13.3	0.139				
13	21-Aug-19	0.0069	8.77	0.36				
14	6-Nov-19	0.005	8.22	0.076				
15								
16								
17								
18								
19								
20								
	nt of Variation:	1.39	1.09	1.08				
	III Statistic (S):	5	10	-13				
Confi	idence Factor:	58.5%	68.6%	74.1%				
Concer	ntration Trend:	No Trend	No Trend	No Trend				



### Notes

- 1. At least four independent sampling events per well are required for calculating the trend. Methodology is valid for 4 to 40 samples.
- Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing;
   ≥ 90% = Probably Increasing or Probably Decreasing;
   < 90% and S>0 = No Trend;
   < 90%, S≤0, and COV ≥ 1 = No Trend;</li>
   < 90% and COV < 1 = Stable.</li>
- 3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, Ground Water, 41(3):355-367, 2003.

#### **GSI MANN-KENDALL TOOLKIT** for Constituent Trend Analysis Evaluation Date: 05-Feb-20 Job ID: 671557 Facility Name: Teck Coal Regional Groundwater - CMO Location CM\_MW6-SH Conducted By: NDS Parameter (units) Sulphate (mg/L) Selenium (µg/L) 13-Sep-16 7.89 0.41 1-Dec-16 8.61 0.25 15-Mar-17 0.388 3 21.1 4 15-Jun-17 20.4 0.05 5 16-Aug-17 17.6 0.05 22-Nov-17 6 13.8 0.05 7 22-Mar-18 12.5 0.05 8 18-Jun-18 10.2 17-Sep-18 9 8.96 0.05 10 20-Nov-18 8 12 0.05 11 28-Jan-19 7.56 0.05 12 5.61 3-Jun-19 0.204 13 21-Aug-19 5.69 0.284 14 6-Nov-19 5 65 15 16 17 18 19 Coefficient of Variation: Mann-Kendall Statistic (S): Confidence Factor: Concentration Trend: 100 Sulphate (mg/L) Concentration () 0.1 0.01 Jul 2016 Jan 2017 Jul 2017 Jan 2018 Jul 2018 Jan 2019 Jul 2019 **Sampling Date**

### Notes

- 1. At least four independent sampling events per well are required for calculating the trend. Methodology is valid for 4 to 40 samples.
- Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing;
   ≥ 90% = Probably Increasing or Probably Decreasing;
   < 90% and S>0 = No Trend;
   < 90%, S≤0, and COV ≥ 1 = No Trend;</li>
   < 90% and COV < 1 = Stable.</li>
- 3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

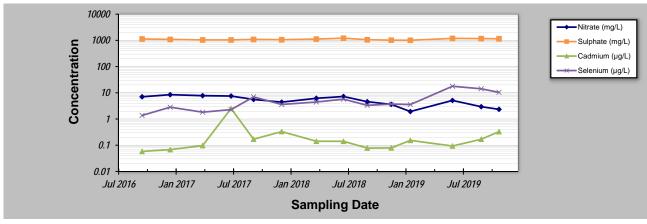
for Constituent Trend Analysis

Evaluation Date: 05-Feb-20
Facility Name: Teck Coal Regional Groundwater - CMO
Conducted By: NDS

Job ID: 671557 Location CM\_MW7-DP

Parameter (units)	Nitrate (mg/L)	Sulphate (mg/L)	Cadmium (µg/L)	Selenium (µq/L)

Sampling Event	Sampling Date			CM_M	W7-DP CONCENT	RATION	
1	14-Sep-16	7.05	1130	0.058	1.37		
2	13-Dec-16	8.48	1090	0.068	2.83		
3	27-Mar-17	7.77	1040	0.097	1.82		
4	26-Jun-17	7.53	1040	2.53	2.28		
5	6-Sep-17	5.59	1090	0.169	6.98		
6	5-Dec-17	4.4	1060	0.332	3.59		
7	26-Mar-18	6.18	1120	0.142	4.45		
8	21-Jun-18	7.22	1210	0.141	5.73		
9	5-Sep-18	4.58	1060	0.078	3.33		
10	21-Nov-18	3.62	1020	0.079	3.71		
11	21-Jan-19	1.93	1010	0.153	3.57		
12	5-Jun-19	5.11	1190	0.0933	17.8		
13	5-Sep-19	2.95	1170	0.169	14.2		
14	1-Nov-19	2.34	1150	0.33	10.4		
15							
16							
17							
18							
19		•	•				
20							
Coefficier	nt of Variation:	0.40	0.06	2.03	0.84		
Mann-Kenda	all Statistic (S):	-59	8	20	51		
Conf	idence Factor:	100.0%	64.6%	84.8%	99.8%		



### Notes

Concentration Trend:

- 1. At least four independent sampling events per well are required for calculating the trend. Methodology is valid for 4 to 40 samples.
- Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing;
   ≥ 90% = Probably Increasing or Probably Decreasing;
   < 90% and S>0 = No Trend;
   < 90%, S≤0, and COV ≥ 1 = No Trend;</li>
   < 90% and COV < 1 = Stable.</li>
- 3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, Ground Water, 41(3):355-367, 2003.

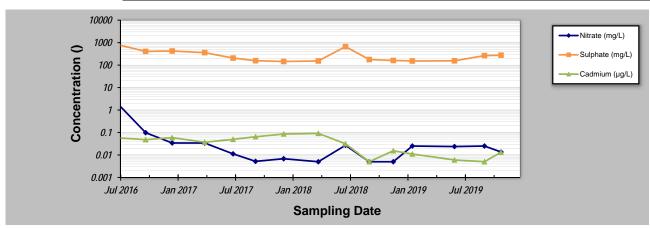
# GSI MANN-KENDALL TOOLKIT for Constituent Trend Analysis

Evaluation Date: 05-Feb-20
Facility Name: Teck Coal Regional Groundwater - CMO
Conducted By: NDS

Job ID: 671557 Location CM\_MW7-SH

Parameter (units)	Nitrate (mg/L)	Sulphate (mg/L)	Cadmium (ug/L

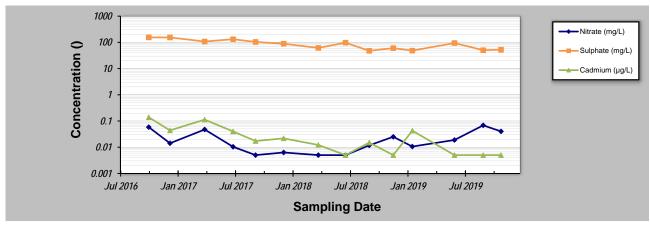
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Sampling Event	Sampling Date			CM_M	W7-SH CONCENTR	RATION	
1	21-Apr-16	14.8	1310	0.065			
2	19-Sep-16	0.0984	408	0.048			
3	13-Dec-16	0.0341	424	0.059			
4	27-Mar-17	0.034	359	0.0368			
5	26-Jun-17	0.0112	206	0.0496			
6	6-Sep-17	0.0052	157	0.0645			
7	5-Dec-17	0.0068	145	0.086			
8	26-Mar-18	0.005	153	0.0917			
9	21-Jun-18	0.027	667	0.0314			
10	5-Sep-18	0.005	177	0.005			
11	21-Nov-18	0.005	161	0.0154			
12	21-Jan-19	0.025	153	0.011			
13	5-Jun-19	0.0237	155	0.006			
14	9-Sep-19	0.025	264	0.005			
15	1-Nov-19	0.0136	276	0.0133			
16							
17							
18							
19							
20							
Coefficien	t of Variation:	3.79	0.92	0.76			
Mann-Kendal	I Statistic (S):	-41	-32	-50			
Confi	dence Factor:	97.7%	93.7%	99.3%			
Concen	tration Trend:	Decreasing	Prob. Decreasing	Decreasing			



### Notes

- 1. At least four independent sampling events per well are required for calculating the trend. Methodology is valid for 4 to 40 samples.
- Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing;
   ≥ 90% = Probably Increasing or Probably Decreasing;
   < 90% and S>0 = No Trend;
   < 90%, S≤0, and COV ≥ 1 = No Trend;</li>
   < 90% and COV < 1 = Stable.</li>
- 3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, Ground Water, 41(3):355-367, 2003.

#### **GSI MANN-KENDALL TOOLKIT** for Constituent Trend Analysis Evaluation Date: 05-Feb-20 Job ID: 671557 Facility Name: Teck Coal Regional Groundwater - CMO Location CM\_MW8 Conducted By: NDS Parameter (units) Nitrate (mg/L) Sulphate (mg/L) Cadmium (µg/L) 29-Sep-16 0.0584 155 0.139 6-Dec-16 0.0142 154 0.0439 27-Mar-17 0.0475 108 0.113 3 4 26-Jun-17 0.0104 132 0.04 0.0172 5 6-Sep-17 0.005 104 6 0.0063 89 0.0218 5-Dec-17 7 26-Mar-18 0.005 61.2 0.0122 8 21-Jun-18 0.005 9 0.0118 47.6 0.015 5-Sep-18 10 21-Nov-18 0.025 60.4 0.005 11 21-Jan-19 0.0106 48.4 0.0428 12 94.3 5-Jun-19 0.0189 0.005 13 5-Sep-19 0.0684 50.2 0.005 14 1-Nov-19 0.0402 52.5 0.005 15 16 17 18 19 Coefficient of Variation: Mann-Kendall Statistic (S):



100.0%

### Notes:

Confidence Factor:

Concentration Trend:

- 1. At least four independent sampling events per well are required for calculating the trend. Methodology is valid for 4 to 40 samples.
- Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing;
   ≥ 90% = Probably Increasing or Probably Decreasing;
   < 90% and S>0 = No Trend;
   < 90%, S≤0, and COV ≥ 1 = No Trend;</li>
   < 90% and COV < 1 = Stable.</li>
- 3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

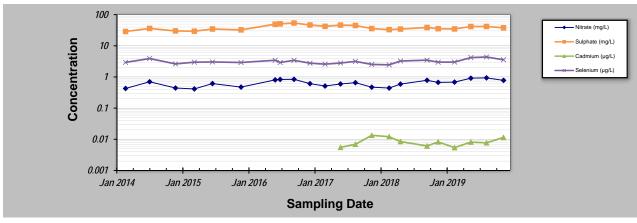
# GSI MANN-KENDALL TOOLKIT for Constituent Trend Analysis

Evaluation Date: 05-Feb-20
Facility Name: Teck Coal Regional Groundwater - RG
Conducted By: NDS

Job ID: **671557** Location **RG\_DW-01-03** 

Parameter (units)	Nitrate (mg/L)	Sulphate (mg/L)	Cadmium (µg/L)	Selenium (µg/L)
-------------------	----------------	-----------------	----------------	-----------------

Sampling	Sampling						
Event	Date			RG_DV	V-01-03 CONCENT	RATION	
1	19-Feb-14	0.427	28.8		2.94		
2	3-Jul-14	0.701	36.1		3.9		
3	24-Nov-14	0.442	30		2.62		
4	9-Mar-15	0.413	29.4		2.98		
5	18-Jun-15	0.614	34.6		3.03		
6	24-Nov-15	0.473	32.4		2.91		
7	1-Jun-16	0.806	49.2		3.43		
8	29-Jun-16	0.833	50.7		2.92		
9	14-Sep-16	0.84	53.7		3.42		
10	12-Dec-16	0.61	46.5		2.77		
11	6-Mar-17	0.512	42.1		2.58		
12	31-May-17	0.596	46	0.0055	2.8		
13	22-Aug-17	0.655	44.8	0.0069	3.16		
14	21-Nov-17	0.47	35.7	0.0134	2.53		
15	26-Feb-18	0.441	33	0.0121	2.45		
16	30-Apr-18	0.591	34.4	0.0084	3.25		
17	25-Sep-18	0.782	38.5	0.0061	3.46		
18	26-Nov-18	0.67	35.4	0.0082	2.98		
19	25-Feb-19	0.683	34.8	0.0054	3.01		
20	27-May-19	0.913	41.6	0.0081	4.18		
21	22-Aug-19	0.935	41.7	0.0077	4.37		
22	25-Nov-19	0.777	37.8	0.0115	3.56		
23							
24							
25							
	t of Variation:	0.25	0.18	0.32	0.16		
Mann-Kendal		77	27	-1	44		
Confi	dence Factor:	98.5%	76.6%	50.0%	88.6%		
Concen	tration Trend:	Increasing	No Trend	Stable	No Trend		



### Notes:

- 1. At least four independent sampling events per well are required for calculating the trend. Methodology is valid for 4 to 40 samples.
- Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing;
   ≥90% = Probably Increasing or Probably Decreasing;
   <90% and S>0 = No Trend;
   <90%, S≤0, and COV ≥ 1 = No Trend;</li>
   <90% and COV < 1 = Stable.</li>
- 3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, Ground Water, 41(3):355-367, 2003.

#### **GSI MANN-KENDALL TOOLKIT** for Constituent Trend Analysis Evaluation Date: 05-Feb-20 Job ID: 671557 Facility Name: Teck Coal Regional Groundwater - RG Location RG\_DW-01-07 Conducted By: NDS Parameter (units) Nitrate (mg/L) Sulphate (mg/L) Cadmium (µg/L) Selenium (µg/L) 1 6-Mar-14 0.358 69.9 2.07 2 3-Jul-14 0.559 3 2.1 25-Nov-14 0.512 69.2 11-Mar-15 0.714 1.85 66.9 18-Jun-15 0.228 26.9 1.8 6 24-Nov-15 0.526 69.2 2.09 1-Jun-16 8 29-Jun-16 61.3 1.54 0.612 9 14-Sep-16 0.623 64.2 1.72 10 12-Dec-16 0.661 68.5 1.79 11 1-Mar-17 0.634 64.5 1.84 12 29-May-17 64 13 21-Aug-17 0.997 65.1 0.0437 1.78 14 15-Nov-17 1 92 0.863 66.6 0.0408 15 26-Feb-18 0.838 0.0463 1.97 16 30-Apr-18 0.987 57.3 0.0524 1.66

0.0434

0.0421

0.0374

0.0374

0.0444

0.0473

1.82

2.09

1.89

1.84

1.61

24						Ī
25						ĺ
Coefficient	of Variation:	0.29	0.14	0.12	0.09	I
Mann-Kendall	Statistic (S):	119	-63	-12	-26	I
Confid	dence Factor:	>99.9%	96.0%	79.9%	75.7%	ĺ
Concent	ration Trend:	Increasing	Decreasing	Stable	Stable	
						Ī

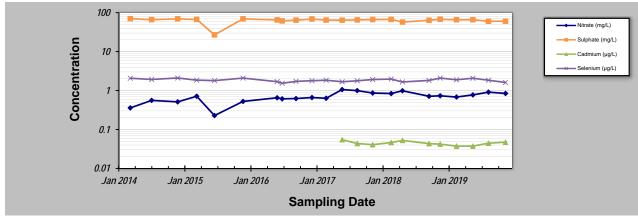
63.7

67.4

65.7

60

60.2



### Notes

17

18

19

20

21

22

25-Sep-18

26-Nov-18

25-Feb-19

27-May-19

22-Aug-19

25-Nov-19

0.712

0.733

0.681

0.91

0.843

- 1. At least four independent sampling events per well are required for calculating the trend. Methodology is valid for 4 to 40 samples.
- Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing;
   ≥90% = Probably Increasing or Probably Decreasing;
   <90% and S>0 = No Trend;
   <90%, S≤0, and COV ≥ 1 = No Trend;</li>
   <90% and COV < 1 = Stable.</li>
- 3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, Ground Water, 41(3):355-367, 2003.

for Constituent Trend Analysis

Evaluation Date: 05-Feb-20 Job ID: 671557

Facility Name: Teck Coal Regional Groundwater - RG

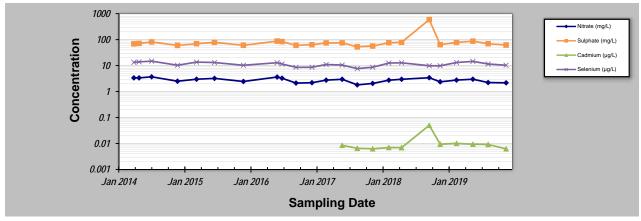
Conducted By: NDS

Job ID: 671557

Location RG\_DW-02-20

Parameter (units) Nitrate (mg/L) | Sulphate (mg/L) | Cadmium (μg/L) | Selenium (μg/L)

	arriotor (arrito)		Carpitate (iiig/ =)	Cuarrian (p.gr	-/			
Sampling Event	Sampling Date			RG_D	W-02-20 CONCENTF	RATION		
1	26-Mar-14	3.36	68.6		13.3			
2	24-Apr-14	3.36	71.3		13.9			
3	3-Jul-14	3.69	81.2		14.8			
4	24-Nov-14	2.5	59.6		10.3			
5	10-Mar-15	2.98	69.4		13.6			
6	18-Jun-15	3.21	78.2		13.1			
7	26-Nov-15	2.44	60.2		10.3			
8	1-Jun-16	3.62	87.6		12.9			
9	28-Jun-16	3.26	83.6		11.5			
10	14-Sep-16	2.12	59.9		8.58			
11	12-Dec-16	2.12	63.5		8.63			
12	1-Mar-17	2.75	74.6		11			
13	29-May-17	2.73	74.9	0.0085	10.5			
14	21-Aug-17	1.81	52.8	0.0065	7.65			
15	15-Nov-17	2.05	56.5	0.0062	8.64			
16	13-Nov-17	2.74	75.6	0.0062	12.5			
17	25-Apr-18	2.74	78.9	0.007	12.8			
18	26-Sep-18	3.41	586	0.0069	9.87			
19		2.37	63.9	0.05	9.83			
20	26-Nov-18 25-Feb-19	2.76	77.6	0.0094	13.1			
21	27-May-19	2.99	87	0.0094	14.5			
22	20-Aug-19	2.99	69.5	0.0094	11.5			
23	28-Nov-19	2.17	61.6	0.0092				
24	20-INUV-19	2.17	01.0	0.0062	10.3		+	
25							+	
	t of Variation:	0.20	1.16	1.09	0.18			
Mann-Kendal		-75	1.16	7	-52			
	dence Factor:	97.5%	68.1%	67.6%	91.0%			
Concen	tration Trend:	Decreasing	No Trend	No Trend	Prob. Decreasing			



### Notes:

- 1. At least four independent sampling events per well are required for calculating the trend. Methodology is valid for 4 to 40 samples.
- 2. Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
- 3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, Ground Water, 41(3):355-367, 2003.

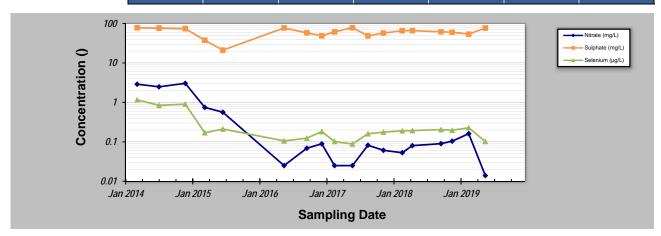
for Constituent Trend Analysis

Evaluation Date: 05-Feb-20 Job ID: Facility Name: Teck Coal Regional Groundwater - RG Location Conducted By: NDS

Job ID: **671557** Location **RG\_DW-03-01** 

Parameter (units) Nitrate (mg/L) Sulphate (mg/L) Selenium (µ
--

1 01	arriotor (arrito)			( Jug / L	1			
Sampling Event	Sampling Date	RG_DW-03-01 CONCENTRATION						
1	5-Mar-14	2.89	78	1.16				
2	3-Jul-14	2.48	76.2	0.84				
3	24-Nov-14	3.04	74	0.9				
4	11-Mar-15	0.745	37.6	0.17				
5	18-Jun-15	0.563	21.1	0.211				
6	19-May-16	0.025	76.9	0.106				
7	21-Sep-16	0.069	57.8	0.124				
8	12-Dec-16	0.089	48.5	0.182				
9	20-Feb-17	0.025	61.2	0.102				
10	29-May-17	0.025	78.2	0.088				
11	22-Aug-17	0.082	48.4	0.16				
12	15-Nov-17	0.061	57.2	0.176				
13	26-Feb-18	0.053	65.4	0.19				
14	23-Apr-18	0.08	65.7	0.193				
15	27-Sep-18	0.09	61.4	0.204				
16	27-Nov-18	0.104	59.9	0.196				
17	26-Feb-19	0.161	53.7	0.227				
18	28-May-19	0.014	76.6	0.102				
19	20-Aug-19	0.0550	64.4	0.155				
20								
Coefficier	nt of Variation:	1.77	0.25	1.07				
Mann-Kenda	II Statistic (S):	-30	11	0				
Conf	idence Factor:	86.2%	64.6%	48.5%				
Concer	ntration Trend:	No Trend	No Trend	No Trend				



### Notes

- 1. At least four independent sampling events per well are required for calculating the trend. Methodology is valid for 4 to 40 samples.
- Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing;
   ≥ 90% = Probably Increasing or Probably Decreasing;
   < 90% and S>0 = No Trend;
   < 90%, S≤0, and COV ≥ 1 = No Trend;</li>
   < 90% and COV < 1 = Stable.</li>
- 3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, Ground Water, 41(3):355-367, 2003.

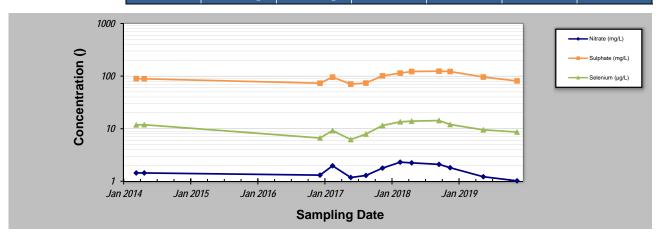
for Constituent Trend Analysis

Evaluation Date: 05-Feb-20
Facility Name: Teck Coal Regional Groundwater - RG
Conducted By: NDS

Job ID: **671557** Location **RG\_DW-03-04** 

Parameter (units)	Nitrate (mg/L)	Sulphate (mg/L)	Selenium (	(ua/L)

Sampling Event	Sampling Date			RG_DV	V-03-04 CONCEN	TRATION	
1	11-Mar-14	1.44	89.2	11.8			
2	24-Apr-14	1.44	88.7	11.9			
3	13-Dec-16	1.31	73.2	6.65			
4	20-Feb-17	1.97	95.5	9.21			
5	31-May-17	1.18	70.3	6.21			
6	22-Aug-17	1.29	73.7	7.9			
7	21-Nov-17	1.78	101	11.5			
8	26-Feb-18	2.31	114	13.5			
9	30-Apr-18	2.24	122	13.9			
10	27-Sep-18	2.1	124	14.3			
11	27-Nov-18	1.81	122	12			
12	26-Feb-19	1.95	129	15.8			
13	28-May-19	1.22	95.9	9.5			
14	20-Aug-19	0.662	57.5	5.88			
15	29-Nov-19	1.02	80.8	8.64			
16							
17							
18							
19							
20							
Coefficier	Coefficient of Variation:		0.20	0.26			
	II Statistic (S):	16	48	35			
Confi	idence Factor:	81.6%	99.9%	98.2%			
Concer	ntration Trend:	No Trend	Increasing	Increasing			



### Notes

- 1. At least four independent sampling events per well are required for calculating the trend. Methodology is valid for 4 to 40 samples.
- Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing;
   ≥ 90% = Probably Increasing or Probably Decreasing;
   < 90% and S>0 = No Trend;
   < 90%, S≤0, and COV ≥ 1 = No Trend;</li>
   < 90% and COV < 1 = Stable.</li>
- 3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, Ground Water, 41(3):355-367, 2003.

# Appendix VIII

Quality Assurance/Quality Control (QA/QC)



## Data Quality Assurance / Quality Control

Teck provided field and laboratory data relevant to the Site-Specific Groundwater Monitoring Programs (SSGMPs) and Regional Groundwater Monitoring Program (RGMP) to SNC-Lavalin Inc. (SNC-Lavalin) and Golder Associates (Golder). Analysis of the Quality Assurance/Quality Control (QA/QC) data was completed by SNC-Lavalin and Golder. SNC-Lavalin has relied on data and information provided by Teck and has therefore assumed that the information provided is both complete and accurate. Interpretations and conclusions within this report are made with the assumption that data collection was completed in accordance with Permit 107517, the British Columbia Field Sampling Manual (Clark, 2013), and Teck's Standard Practice and Procedures (SP&P).

A QA/QC program specific to the RGMP is not yet in place; however, each Operation conducted a QA/QC program, which is described below, with the exception of LCO, which is described in the site-specific report (Appendix II). The QA/QC assessment completed for the RGMP included shipping and handling issues, summarized results of relative percent differences (RPDs) from duplicate samples, and any detection of analytes in field blanks for QA/QC samples not already identified in the SSGMPs. A summary of QA/QC methods and results of the QA/QC programs are summarized in the following sections.

## Summary of QA/QC Methods

## Shipping and Handling

Shipping and handling QA/QC includes assessment of sample integrity upon arrival at the laboratory and analysis hold time exceedances. Sample integrity observations are documented by the laboratory upon receipt of the sample and may include elevated sample temperature, bottle damage, or labelling errors. The British Columbia Laboratory Analysis Manual (BCLAM) specifies a maximum sample temperature of 10oC during transport (Austin, 2016). Bottle damage and labelling errors may result in analysis with preservation that deviates from the specifications of the BCLAM, or analyses not conducted.

Maximum hold times between sample collection and analysis are specified in Austin (2016). Hold time exceedances may be from samples arriving past their specified hold time, or from analysis after the maximum hold time. Hold time exceedances are identified on the Certificates of Analyses (COAs).

## **Duplicate Samples**

Duplicate samples were collected at a frequency of at least one per ten samples during sampling events to assess the precision of the field sampling methodology and consistency of laboratory analysis. Duplicate samples were evaluated by calculation of the RPD of the concentration between the sample and duplicate, as follows:

$$RPD = \frac{|sample 1 - sample 2|}{\frac{1}{2}(sample 1 + sample 2)} \times 100\%$$



RPDs are calculated for parameters where at least one of the samples was greater than five times the laboratory detection limit; an RPD of less than 20% for metals and inorganics is considered as an acceptable level of precision per the BC Field Sampling Manual (Clark, 2013). Teck have a QA/QC program based on this manual; where the result is less than five times the detection limit, the acceptable RPD will be modified as follows:

- RPD < 20%: Acceptable;</p>
- RPD > 20% with value > 5 times the DL: Possible problem; and
- RPD > 50% with results > 5 times the DL: Definite problem, most likely sample contamination or lack of sample representativeness.

### **Blanks**

Field and trip blanks were processed and submitted for analysis as part of each sampling event under each SSGMP and the RGMP. Teck's standard practice for collecting field blank samples is to open a designated field blank sample bottle pre-filled with ultra-pure de-ionized (DI) water and preservative (where applicable) at the sampling site during regular sample collection. Field blanks provide information on contamination resulting from the handling technique and exposure to ambient air.

Filter blanks were collected as part of the Greenhills Operations (GHO) Cougar Pit Extension Phase 2 Program (CPX2). Select wells from GHO CPX2 have been included in the SSGMP; therefore, these results are summarized. The filter blank is collected by passing laboratory-supplied DI water though a filter and collecting the sample. The sample is subsequently preserved in the same manner as the original samples, replicating the sampling protocol. Filter blanks provide information on contamination resulting from potential residue remaining on the filter, which may result in sample bias.

Standard practice for trip blanks includes delivery of a sample set from the laboratory pre-filled with ultra-pure DI water and preservative (where applicable), which are kept in a cooler (with the other samples) and are unopened throughout the sampling trip. Trip blanks are meant to detect widespread contamination from the container and preservative during transport and storage. Field and trip blanks were shipped to the laboratory with routine samples and screened for analyte detections.

## Laboratory QA/QC

ALS Laboratory (ALS) conducted routine internal QA/QC in accordance with Austin (2016) and reported these results as analyte qualifiers alongside the sample analysis results. SNC-Lavalin reviewed the qualifiers and considered them in the context of the other QA/QC analyses in evaluating their potential effects on the groundwater quality data.



## **Fording River Operations**

## Shipping and Handling

A summary of shipping and handling issues from the 2019 sampling program is provided in Table VIII-A.

Table VIII-A: Summary of Shipping and Handling Issues

Qualifier	Quarter	Well ID	Possibly Affected Analytes	Comment
Hold Time Exceedance	1-4	All wells blanks and duplicates	pH, Oxidation Reduction Potential (ORP)	Exceeded ALS recommended hold time of 15 minutes prior to sample receipt. Field measurement recommended.
Hold Time Exceedance	1	FR_TBSSMW-1 FR_TBSSMW-2	Total Suspended Solids (TSS)	Exceeded ALS recommended hold time of 7 days prior to analysis. Samples were received on time but analysed one day after hold time.

Except for pH and ORP for each sample and two TSS samples, initial hold times were not exceeded for parameters analysed in 2019. Parameters pH and ORP have a hold time of 15 minutes and measurements are taken in the field. These hold time exceedances are not considered to be an issue as field measurement for pH and ORP are used for data analysis. Both samples that were past hold times for TSS arrived at the laboratory within the 7 day hold time; however, the laboratory did not complete the analyses until after the hold time had expired. Results from Q1 for TSS were similar to subsequent quarters and not identified as an issue.

## **Duplicate Samples**

A summary of duplicate samples from the 2019 sampling program is provided in Table VIII-B.

Table VIII-B: Summary of Relative Percent Difference Values for Duplicate Samples

Quarter	Number of Duplicate Samples Collected	Summary of RPDs above Acceptable Percentage
1	5	Cadmium with an RPD of 57% FR_HMW3
2	3	None
3	5	None
4	6	Alkalinity (Carbonate as CaCO <sub>3</sub> ) with an RPD value of 58% FR_TBSSMW-1
		Turbidity with an RPD value of 149% FR_09-02-A

Review of duplicate sample results indicated that dissolved cadmium at FR\_HMW3 had an RPD above acceptable levels. The results were an order of magnitude less than the lower limit of the Contaminated Sites Regulation Aquatic Life (CSR AW) standard and is not a concern. Alkalinity (carbonate as CaCO<sub>3</sub>) in FR TBSSMW-1 and turbidity in FR 09-02 had RPDs above the acceptable level. There are no standards



for alkalinity (carbonate as CaCO<sub>3</sub>) or turbidity. Of the numerous organic, inorganic, and physical parameters analysed, RPDs were otherwise less than 50%. These results indicate a good sampling program with low variability in constituent concentrations from sampling and handling.

## Field and Trip Blanks

A summary of field and trip blanks from the 2019 sampling program is provided in Table VIII-C.

Table VIII-C: Summary of Blank Samples with Parameters above Detection Limit

Quarter	Location or Date	Parameter Above Detection Limit	Value
Field Blanks			
		Ammonia-N	0.747 μg/L
1	FR_HMW1D	Total Kjeldahl Nitrogen-N (TKN)	0.203 μg/L
'	FK_HIMWID	Orthophosphate	0.0014 µg/L
		Dissolved boron	46 μg/L
	FR_KB-3A	Ammonia-N	0.0187 μg/L
2	FR_09-04-A	Ammonia-N	0.0124 μg/L
	FR_TBSSMW-1	Ammonia-N	0.0070 μg/L
4	FR_1D33WW-1	Dissolved zinc	2.8 µg/L
	FR_HMW1D	Ammonia-N	0.0069 µg/L
Trip Blanks			
		Ammonia-N	0.140 μg/L
4	February 13	TKN	0.071 μg/L
1		Orthophosphate	0.0016 μg/L
	February 25	Ammonia-N	0.0448 μg/L
	April 10	Ammonia-N	0.0305 μg/L
2	April 11	Ammonia-N	0.0374 μg/L
2	June 10	Dissolved chromium	0.12 μg/L
	July 24	Ammonia-N	0.0385 μg/L
4	October 21	Ammonia-N	0.0162 μg/L
4	October 22	Ammonia-N	0.0276 μg/L

Notes: Detection Limits – Ammonia-N <0.0050  $\mu$ g/L; Total Kjeldahl Nitrogen-N <0.050  $\mu$ g/L; Orthophosphate <0.0010  $\mu$ g/L; dissolved boron <10  $\mu$ g/L; dissolved chromium <0.20  $\mu$ g/L; dissolved zinc <1.0  $\mu$ g/L

Total Kjeldahl Nitrogen-N concentrations were slightly above to four times greater than the detection limit in field and trip blank samples; however, there is no standard for TKN. Dissolved boron concentrations were greater than four times the detection limit, but one order of magnitude below the most stringent standard. Dissolved chromium was marginally above the detection limit for one sample, but more than an order of magnitude less than the most stringent standard. Dissolved zinc was nearly three times the detection limit, but less than an order of magnitude less than the most stringent standard. Because of their low concentrations, these constituents are not considered a concern.



Orthophosphate concentrations above the detection limit in trip and field blanks were marginally above the detection limit (0.0010 mg/L) and are not a concern. Ammonia-N concentrations were approximately three orders of magnitude above the detection limit, but several orders of magnitude below primary screening criteria. The parameters above the detection limits are not considered to affect the reliability of the data.

In 2019 SNC-Lavalin contacted the laboratory to determine the source(s) of parameters above the DLs for the 2018 SSGMP (SNC-Lavalin, 2019a). The laboratory provided results of ultra-pure DI water for select months in 2018; however, there results did not provide any clear resolution to detections in blanks. There is a possibility that the elevated concentrations of select parameters in field blanks is from contamination in the field or that the bottles and lids or preservative may be contributing to the detectable parameters. The parameters above the DLs did not affect the reliability of the data due to their low concentrations. In addition, similar detectable parameters in field and trip blanks from groundwater monitoring at other mines (Elkview Operations [EVO and GHO]) were also reported in 2017 and 2018 and are also being investigated by the laboratory.

## Laboratory QA/QC

The detailed results of laboratory QA/QC are included in COAs in Appendix X. The Quality Control Reports noted the following for some samples:

- Matrix Spike recovery could not be accurately calculated for some constituents due to high analyte background in sample;
- detection limits were raised or adjusted due to dilution required due to high concentration of test analyte(s), high dissolved solids/electrical conductivity, sample matrix effects (e.g., chemical interference, colour, turbidity), or because analyte was detected at comparable level in method blank;
- > TKN results may be biased low due to nitrate interference. Nitrate-N is > 10x TKN;
- reported result was verified by repeat analysis;
- duplicate results outside ALS data quality objectives (DQO), due to sample heterogeneity;
- dissolved concentration exceeds total. Results were confirmed by re-analysis;
- water sample(s) for dissolved mercury analysis was not submitted in glass or polytetrafluoroethylene (PTFE) container with hydrochloric (HCL) preservative. Results may be biased low;
- water sample(s) for total mercury analysis was not submitted in glass or PTFE container with HCL preservative. Results may be biased low;
- data quality objective was marginally exceeded (by <10% absolute) for <10% of analytes in a Multi-Element Scan/Multi-Parameter Scan (considered acceptable);
- hold time exceeded for re-analysis or dilution, but initial testing was conducted within hold time; and
- method blank exceeded ALS DQO. Limits of reporting were adjusted for samples with positive hits below 5x blank level.

These notes are not unusual for these analyses considering the chemistry of the samples that reflects a mine-influenced groundwater (i.e., select samples have high total dissolved solids or nitrate concentrations). The results of the laboratory QA/QC were acceptable for the purpose of this assessment. A review of the quality assurance portion of the laboratory analytical reports did not identify any additional QA/QC issues.



## **QA/QC Summary**

The field QA/QC program and laboratory QA/QC results for groundwater samples indicated the data collected are acceptable for use in this report. Except for three RPD values greater than 50% for three parameters, the remaining RPD values for the remaining parameters sampled were less than 50%. The possibility of higher dissolved cadmium, alkalinity (carbonate as CaCO<sub>3</sub>) and turbidity concentrations reflected in the RPD result will be considered in the interpretation of the result. Hold time exceedances were considered in analysis of the results. The results reflect low variability for handling and sampling for the program.

The laboratory quality control reports were reviewed, and the data are considered reliable. Detectable concentrations of select parameters in trip and field blanks were marginally above the detection limit for orthophosphate, ammonia-N, TKN, and dissolved zinc, boron, and chromium were well below applicable primary screening criteria where applicable and did not affect the reliability of the data.

## **Greenhills Operations**

## Shipping and Handling

A summary of shipping and handling issues from the 2019 sampling program is provided in Table VIII-D.

Table VIII-D: GHO - Summary of Shipping and Handling

Qualifier	Quarter	Well ID	Possibly Affected Analytes	Comment	
Hold Time Exceedance	1-4	All wells, duplicates and blanks	pH, ORP	Exceeded ALS recommended hold time of 15 minutes prior to sample receipt. Field measurement recommended.	
		GH_MW-MC-1S GH_MW-MC-1D	Nitrate-N and Nitrite-N	Laboratory received sample on time. However, hold times were exceeded by the addition of analyzing for select parameters after the laboratory received the samples.	
Hold Time Exceedance	1	GH_MW-MC-2S GH_MW-MC-2D MW 19-A (Duplicate)	Nitrate-N, Nitrite- N, and Total Dissolved Solids (TDS)	Laboratory received samples on time. However, hold times were exceeded by the addition of analyzing select parameters after laboratory received the samples.	
			GH_GA-MW-2 GH_GA-MW-3 GH_MW-ERSC-1	Nitrate-N and Nitrite-N	Laboratory received sample on time. Hold time exceeded for re-analysis or dilution, but initial testing was conducted within hold time.
Hold Time		GH_GWB3 (Field Blank)	Nitrate-N	Laboratory received sample on time. Hold time exceeded for re-analysis or dilution, but initial testing was conducted within hold time.	
Exceedance	2	GH_MW-MC-1C (Trip Blank)	Nitrate-N and Nitrite-N	Laboratory received samples less than 24 hours prior to expiry. Although the same was originally analysed within 24 hours, the hold time exceeded for re-analysis or dilution.	



Table VIII-D (Cont'd): GHO - Summary of Shipping and Handling

Qualifier	Quarter	Well ID	Possibly Affected Analytes	Comment
Hold Time Exceedance	3	GH_GWB3 (Field Blank)	Orthophosphate	Laboratory received sample on time. Hold time exceeded for re-analysis or dilution, but initial testing was conducted within hold time.
Hold Time		GH_MW-RLP-1D	Orthophosphate	Laboratory received sample on time. Hold
Hold Time Exceedance	4	GH_GWB2 (Field Blank)	TDS	time exceeded for re-analysis or dilution, but initial testing was conducted within hold time.

Except for pH and ORP and the above listed, hold-times were not exceeded for parameters analysed in 2019. Parameters pH and ORP have a hold time of 15 minutes and measurements are taken in the field. These hold time exceedances are not considered to be an issue as field measurement for pH and ORP are used for data analysis. The other hold time exceedances listed above are not considered to be an issue as concentrations of these parameters remained consistent with other sampling events.

Results from 2018 for these parameters were similar to historical results; therefore, exceedances of hold times were not identified as an issue. Furthermore, with the exception of nitrate, concentrations of these parameters have historically been low in groundwater samples.

## **Duplicate Samples**

A summary of duplicate samples from the 2019 sampling program is provided in Table VIII-E.

Table VIII-E: GHO – Summary of Relative Percent Difference Values for Duplicate Samples

Quarter	Number of Duplicate Samples Collected	Summary of RPDs above Acceptable Percentage
1	3	None
2	4	None
3	5	Alkalinity (carbonate as CaCO <sub>3</sub> ) with an RPD value of 63% GH_GA-MW-1
4	4	None

Review of duplicate sample results indicated that an RPD value of 63% was calculated for alkalinity (carbonate as CaCO<sub>3</sub>) in GH\_GA-MW-1 in Q3, while RPDs for total alkalinity, alkalinity (bicarbonate as CaCO<sub>3</sub>) and alkalinity (hydroxide as CaCO<sub>3</sub>) were below 3%. There is no standard for alkalinity (carbonate as CaCO<sub>3</sub>) and the RPD value greater than 50% is not a concern for the integrity of the sampling program. Of the numerous organic, inorganic, and physical parameters analysed, RPDs were otherwise less than 50%. These results indicate a good sampling program with low variability in constituent concentrations from sampling and handling.



## Field, Filter, and Trip Blanks

A summary of field and trip blanks from the 2019 sampling program is provided in Table VIII-F.

Table VIII-F: Summary of Blank Samples with Parameters above Detection Limit

Quarter	Location or Date	Parameter	Value	Detection Limit
Field Blanks	s		•	
		Ammonia-N	0.0233 mg/L	0.0050 mg/L
	GH_MW-POTW06	TKN	0.089 mg/L	0.050 mg/L
	GH_WW-FOTWOO	Dissolved boron	23 μg/L	10 μg/L
		Dissolved mercury	0.0053 μg/L	0.0050 μg/L
		TDS	23 mg/L	10 mg/L
		Turbidity	0.21 NTU	0.10 NTU
	GH_MW-UTC-A	Ammonia-N	0.0131 μg/L	0.005 μg/L
1		Dissolved barium	0.17 μg/L	0.10 μg/L
'		Dissolved boron	25 μg/L	10 μg/L
		Dissolved barium	5.55 μg/L	0.10 μg/L
		Dissolved boron	22 μg/L	10 μg/L
	GH_MW-GHC-A	Dissolved calcium	0.129 mg/L	0.050 mg/L
		Dissolved manganese	0.16 mg/L	0.10 mg/L
		Dissolved sodium	0.502 mg/L	0.050 mg/L
		Dissolved strontium	0.23 μg/L	0.20 μg/L
		Dissolved tin	0.31 µg/L	0.10 μg/L
	GH_MW-MC-1D	Turbidity	0.30 NTU	0.10 NTU
	GH MW-GHC-A	Ammonia-N	0.0067 mg/L	0.0050 mg/L
	GI I_WW-GI IC-A	Dissolved barium	0.22 µg/L	0.10 μg/L
		Ammonia-N	0.0072 mg/L	0.0050 mg/L
		Dissolved aluminum	3.0 μg/L	3.0 µg/L
2		Dissolved barium	2.73 µg/L	0.10 μg/L
	GH_MW-ERSC-1	Dissolved calcium	0.164 mg/L	0.050 mg/L
	O11_WW-L1\OO-1	Dissolved chromium	0.17 µg/L	0.10 μg/L
		Dissolved sodium	0.515 mg/L	0.05 mg/L
		Dissolved strontium	0.27 μg/L	0.20 μg/L
		Dissolved tin	0.36 µg/L	0.10 μg/L



Table VIII-F (Cont'd): Summary of Blank Samples with Parameters above Detection Limit

Quarter	Location or Date	Parameter	Value	Detection Limit
Field Blanks	5			•
		Turbidity	0.26 NTU	0.10 NTU
3	GH_MW-RLP-1D	Ammonia-N	0.0160 mg/L	0.0050 mg/L
3		Orthophosphate	0.0016 mg/L	0.0010 mg/L
	GH_GA-MW-1	Dissolved magnesium	0.005 mg/L	0.10 mg/L
4	GH_MW-UTC-B	Dissolved copper	0.38 μg/L	0.20 μg/L
4	GH_GA-MW-4	Orthophosphate	0.0010 mg/L	0.0010 mg/L
Filter Blank	S			
3	GH_MW-MC-2S	Dissolved Organic Carbon (DOC)	2.04 mg/L	0.50 mg/L
4	GH MW-MC-2S	Dissolved copper	0.25 μg/L	0.20 μg/L
4	GH_IVIVV-IVIC-23	Dissolved manganese	0.005 mg/L	0.10 mg/L
Trip Blanks				
1	March 25	Ammonia-N	0.0372 mg/L	0.0050 mg/L
I		TKN	0.207 mg/L	0.050 mg/L
		Ammonia-N	0.0280 mg/L	0.0050 mg/L
2	April 25	TOC	0.659mg/L	0.50 mg/L
2	April 25	DOC	0.54 mg/L	0.50 mg/L
		Dissolved calcium	0.057 mg/L	0.050 mg/L
3	November 20	Ammonia-N	0.0223 mg/L	0.0050 mg/L
3	November 20	Dissolved copper	0.53 μg/L	0.20 μg/L
4	December 9	Dissolved copper	1.26 μg/L	0.20 μg/L

Overall detectable concentrations in the field, filter and trip blanks were within 5 times the DL, with the exception of the following:

- Dissolved barium and sodium at field blanks associated with GH\_MW-GHC-A in Q1 and GH\_MW-ERSC-1 in Q2;
- Ammonia-N in trip blanks collected on March 25 and April 25, 2019; and
- Dissolved copper in the trip blank collected on December 9, 2019.

The laboratory indicated that physical damage was observed for the filter used to collect the field blank associated with GH\_MW-GHC-A in Q1 2019. Although the filter was damaged, the majority of the detected parameters in this sample were within five times the detection limits, with the exception of dissolved barium and sodium. Concentrations of these parameters in groundwater from GH\_MW-GHC-A in Q1 were consistent with historical results. Groundwater samples associated with GH\_MW-GHC-A, GH\_MW-ERSC-1, and the March 25 and April 25, 2019 trip blanks, contained concentrations of dissolved barium, sodium, copper, and ammonia-N at least one to two orders of magnitudes below the most stringent CSR standards.



In 2019 SNC-Lavalin contacted the laboratory to determine the source(s) of parameters above the DLs for the 2018 SSGMP. The laboratory provided results of ultra-pure DI water for select months in 2018; however, there results did not provide any clear resolution to detections in blanks. There is a possibility that the elevated concentrations of select parameters in field blanks is from contamination in the field or that the bottles and lids or preservative may be contributing to the detectable parameters. The parameters above the DLs did not affect the reliability of the data due to their low concentrations. In addition, similar detectable parameters in field and trip blanks from groundwater monitoring at other mines [Fording River Operations (FRO) and Elkview Operations (EVO)] were also reported in 2017 and 2018 and are also being investigated by the laboratory.

## Laboratory QA/QC

The detailed results of laboratory QA/QC are included in COAs in Appendix X. The Quality Control Reports noted the following for some samples:

- Matrix Spike recovery could not be accurately calculated for some constituents due to high analyte background in sample;
- detection limits were raised or adjusted due to dilution required due to high concentration of test analyte(s), high dissolved solids/electrical conductivity, sample matrix effects (e.g., chemical interference, colour, turbidity), or because analyte was detected at comparable level in method blank;
- > TKN results may be biased low due to nitrate interference. Nitrate-N is > 10x TKN;
- reported result was verified by repeat analysis;
- report results was verified by alternate process;
- duplicate results outside ALS DQO, due to sample heterogeneity;
- dissolved metals concentrations exceeds total for field-filtered metals sample. Metallic contaminants may be introduced to dissolved sample during field filtration;
- dissolved concentration exceeds total. Results were confirmed by re-analysis;
- ilter shows some physical damage. Use result with caution;
- refer to report remarks for issues regarding analysis;
- sample was preserved at the laboratory;
- sample was filtered and preserved at the laboratory;
- hold time exceeded for re-analysis or dilution, but initial testing was conducted within hold time;
- dissolved selenium concentration exceeds total. Positive bias on D-Se suspected due to signal enhancement from volatile selenium species. Contact ALS if an alternative test to address this interference is needed:
- Brown Ring: IRB dominant;
- Brown Cloudy: IRB dominant;
- detection limit adjusted for required dilution;
- balance reviewed: Interference or non-measured component;
- data quality objective was marginally exceeded (by <10% absolute) for <10% of analytes in a Multi-Element Scan/Multi-Parameter Scan (considered acceptable); and
- refer to report remarks for information regarding this QC result.

Internal Ref: 671557 March 31, 2020 | 10



These notes are not unusual for these analyses considering the chemistry of the samples that reflects a mine-influenced groundwater (i.e., select samples have high total dissolved solids or nitrate concentrations). The results of the laboratory QA/QC were considered to be acceptable for the purpose of this assessment. A review of the quality assurance portion of the laboratory analytical reports did not identify any additional QA/QC issues.

Dissolved metals sample was missing for field blanks from GH\_POTW06 in Q1 and GH\_MW-RLP-1D in Q3 and samples were filtered and preserved in the laboratory from the routine water bottles. The field blank from GH\_POTW06 contained detectable concentrations of select dissolved metals; however, these concentrations remained less than five times the DL. No detectable concentrations of dissolved parameters were measured at GH\_MW-RLP-1D. The dissolved metals results for these field blanks are considered to be acceptable.

Between Q2 and Q4 several groundwater samples were flagged indicating that the dissolved selenium concentration exceeded the total and a positive bias may exist. Groundwater samples containing this qualifier included GH\_MW-RLP-1D (Q4), GH\_MW-UTC-A (Q2 and Q3), GH\_GA-MW-2 (Q4), GH\_GAMW3 (Q3 and Q4), and GH\_MW-ERSC-1 (Q3). A review of dissolved selenium concentrations vs total selenium concentrations was completed and RPDs were calculated and are presented in Table VIII-G.

Table VIII-G: GHO - Dissolved vs. Total Selenium for Select Samples

Well ID	Quarter	Dissolved Selenium (µg/L)	Total Selenium (µg/L)	RPD (%)
GH_MW-RLP-1D	Q4	1.86	< 0.50	108
GH_MW-UTC-A	Q2	0.891	0.584	42
	Q3	0.814	0.435	61
GH_GA-MW-2	Q4	34.7	22.1	44
GH_GA-MW-3	Q3	21.1	12	55
	Q4	11	7.26	41
GH_MW-ERSC-1	Q3	1.82	0928	65

Relative Percent Differences ranged from 41% (GH\_GA-MW-3 in Q4) to 108% (GH\_MW-RLP-1D). Although a high RPD was calculated at GH\_MW-RLP-1D, the concentration measured in Q4 remained well below the most stringent CSR standard and considered acceptable for this assessment. The remainder of the groundwater results have also been included in the groundwater assessment. These results are not expected to affect overall evaluation of trends; however, are considered suspect. A more in depth investigation into the significance and representativeness of higher dissolved selenium relative to total selenium concentrations is recommended.

## QA/QC Summary

The field QA/QC program and laboratory QA/QC results for groundwater samples indicated the data collected are acceptable for use in this report, except for dissolved selenium results from GH\_MW-RLP-1D (Q4), GH\_MW-UTC-A (Q2 and Q3), GH\_GA-MW-2 (Q4), GH\_GA-MW-3 (Q3 and Q4), and GH\_MW-ERSC-1 where concentrations are inferred to be biased high. These dissolved selenium results are considered suspect; however, do not appear to affect the overall evaluation. With the exception of one RPD value greater than 50% for one parameter, the remaining RPD values for the remaining parameters



sampled were less than 50%. Hold time exceedances were only for re-analysed samples. Detectable concentrations of select parameters in trip and field blanks were well below applicable primary screening criteria for dissolved boron, sodium, copper, and ammonia-N and did not affect the reliability of the data. The laboratory quality control reports were reviewed and the data are considered reliable.

## **Elkview Operations**

## Shipping and Handling Issues

A summary of shipping and handling issues from the 2019 sampling program is provided in Table VIII-H below.

Table VIII-H: Summary of Shipping and Handling Issues

Qualifier	Quarter	Well ID	Possibly Affected Analytes	Comment	
	1	EV_MW_AQ1, EV_MW_AQ2, EV_MW_BC1A, EV_MW_BC1B, EV_MW_GT1A, EV_MW_GT1B, EV_MW_MC1A, EV_MW_MC3, EV_MW_MC4, EV_MW_SPR1_A	Nitrate-N, Nitrite-N	Laboratory received sample on time. Hold time exceeded for re-analysis or dilution, but initial testing was conducted	
Hold Time Exceedance		EV_MW_MC2B and duplicate	TSS	within hold time.	
	2	Field Blank (BC10-C from EV_MW_BC1A)	Orthophosphate		
	3	EV_MW_MC2A	Nitrate-N, Nitrite-N		
	4	EV_MW_MC1A	Orthophosphate		
	1-4	All wells, duplicates and blanks	pH, ORP	Exceeded ALS recommended hold time of 15 minutes prior to sample receipt. Field measurement recommended.	

With the exception of pH and ORP for each sample and two total phosphorus samples, initial hold times were not exceeded for parameters analysed in 2019. Parameters pH and ORP have a hold time of 15 minutes and measurements are taken in the field. These hold time exceedances are not considered to be an issue as field measurements for pH and ORP are used for data analysis. The three day hold time for nitrate, nitrite, colour and orthophosphate were met for initial analyses; however, re-analyses or dilution were completed past the holding time.



Results from 2018 for these parameters were similar to historical results; therefore, exceedances of hold times were not identified as an issue. Furthermore, with the exception of nitrate, concentrations of these parameters have historically been low in groundwater samples.

### **Duplicate Samples**

Table VIII-I below summarizes RPDs above acceptable levels (RPD > 50% with results > 5 times the detection limit).

Table VIII-I: Summary of Relative Percent Difference Values for Duplicate Samples

Quarter	Number of Duplicate Samples Collected	Summary of RPDs above Acceptable Percentage		
1	4	Turbidity with an RPD value of 85% at EV_MW_MC2B		
2	4	› None		
3	4	Alkalinity (Carbonate as CaCO3) with an RPD value of 121% at EV_MW_MC3.		
4	3	› None		

At EV\_MW\_MC3, an RPD value of 121% was calculated for alkalinity (carbonate as CaCO3), while RPDs for total alkalinity, alkalinity (bicarbonate as CaCO3) and alkalinity (hydroxide as CaCO3) were below 5%. The RPD values > 50 % for turbidity and alkalinity (carbonate as CaCO3) are not a concern for the integrity of the sampling program. Of the numerous organic, inorganic, and physical parameters analysed, RPDs were otherwise less than 50%. These results indicate a good sampling program with low variability in constituent concentrations from sampling and handling.

## Field and Trip Blanks

Table VIII-J below summarizes field and trip blank samples with parameters above the detection limit. Trip blanks were only collected in Q1 and Q3. For future sampling programs, it is recommended trip blanks be collected every quarter.

Table VIII-J: Summary of Blank Samples with Parameters above Detection Limit

Quarter	Location or Date	Parameter	Value	Detection Limit		
Field Blank						
		Hardness	13.8 mg/L	0.50 mg/L		
		Dissolved barium	2.71 μg/L	0.10 μg/L		
	EV_GCgw	Dissolved calcium	4.02 mg/L	0.050 mg/L		
1		Dissolved iron	14 μg/L	10 μg/L		
		Dissolved magnesium	0.91 mg/L	0.10 μg/L		
		Dissolved manganese	6.59 µg/L	0.10 μg/L		
		Dissolved molybdenum	0.053 μg/L	0.050 μg/L		
		Dissolved potassium	0.081 mg/L	0.050 μg/L		



Table VIII-J (Cont'd): Summary of Blank Samples with Parameters above Detection Limit

Quarter	Location or Date	Parameter	Value	Detection Limit			
Field Blank (Cont'd)							
		Dissolved sodium	0.322 mg/L	0.050 mg/L			
		Dissolved strontium	15.6 μg/L	0.20 μg/L			
	EV_GCgw (Cont'd)	Dissolved uranium	0.033 μg/L	0.010 μg/L			
1 (Cont'd)		Dissolved zinc	33.8 µg/L	1.0 μg/L			
1 (Cont'd)		Ammonia-N	0.0058 mg/L	0.0050 mg/L			
		Dissolved calcium	0.105 mg/L	0.050 mg/L			
	EV_OCgw	Dissolved zinc	3.7 μg/L	1.0 μg/L			
		Ammonia-N	0.0331 mg/L	0.0050 mg/L			
3	EV_MW_BC1B	Dissolved barium	0.47 μg/L	0.10 μg/L			
3	EV_IVIVV_BCIB	DOC	2.59 mg/L	0.50 mg/L			
4	EV_ER1gwS	Dissolved barium	0.29 μg/L	0.10 μg/L			
4	EV_MW_SPR1-C	Dissolved barium	0.16 μg/L	0.10 μg/L			
Trip Blank							
1	January 22	Ammonia-N	0.0257 mg/L	0.0050 mg/L			
		Ammonia-N	0.0936 mg/L	0.0050 mg/L			
	January 23	Nitrogen	117 μg/L	50 μg/L			
		Phosphorus-T	2.2 µg/L	2 μg/L			

Detections were reported for 13 parameters in the field blank taken at EV GCgw in Q1 of 2019. The blank analysis results indicate that the blank may have been contaminated with water from EV GCgw. None of the non-detect parameters in EV\_GCgw were observed above detection limits in the field blank, suggesting the Q1 results from EV\_GCgw are considered acceptable. All parameters for the associated trip blank were below detection limits.

Field blank detections in samples other than EV\_GCgw in Q1 and trip blank detections were identified for various parameters; these detections were compared to the most stringent CSR standards and there were no parameter detections close to standards.

In 2019 SNC-Lavalin contacted the laboratory to determine the source(s) of parameters above the DLs for the 2018 SSGMP. The laboratory provided results of ultra-pure DI water for select months in 2018; however, there results did not provide any clear resolution to detections in blanks. There is a possibility that the elevated concentrations of select parameters in field blanks is from contamination in the field or that the bottles and lids or preservative may be contributing to the detectable parameters. The parameters above the DLs did not affect the reliability of the data due to their low concentrations. In addition, similar detectable parameters in field and trip blanks from groundwater monitoring at other mines (FRO and GHO) were also reported in 2017 and 2018 and are also being investigated by the laboratory.



## Laboratory QA/QC

The detailed results of laboratory QA/QC are included in COAs in Appendix X. The Quality Control Reports noted the following for some samples:

Detection limits were occasionally increased in response to a series of commonly encountered analytical circumstances, including the following:

- the analyte was detected at a comparable level in the batch method blank;
- dilution was required due to high dissolves solids in the sample;
- dilution was required due to high test analyte concentration; and
- sample matrix effects (e.g., chemical interference, colour, turbidity).

The higher detection limits were consistently below the screening standards and as such these detection limit qualifiers did not affect data quality.

Results for laboratory QA/QC samples occasionally yielded a series of qualifiers used to flag limitations in the reportability of the QA/QC result. These qualifiers are not expected to reflect on data quality, and include the following:

- duplicate results and limits were expressed in terms of absolute difference;
- matrix spike recovery could not be accurately calculated due to high analyte background in sample; and
- relative percent difference between duplicates not available due to result being less than detection limit.

These notes are not unusual for these analyses considering the chemistry of the samples that reflects a mine-influenced groundwater (i.e., select samples have high total dissolved solids or nitrate concentrations). The results of the laboratory QA/QC were considered to be acceptable for the purpose of this assessment. A review of the quality assurance portion of the laboratory analytical reports did not identify any additional QA/QC issues.

## **QA/QC Summary**

The field QA/QC program and laboratory QA/QC results for groundwater samples indicated the data collected are acceptable for use in this report. RPD values greater than 50% were identified for turbidity and alkalinity (carbonate as CaCO3) in one sample in Q1 and Q3, respectively; however, the remaining RPD values for all other parameters were less than 50%. Hold time exceedances were only for re-analysed samples. Detectable concentrations of select parameters in trip and field blanks were well below applicable primary screening criteria for ammonia-N and did not affect the reliability of the data. For future sampling programs, it is recommended trip blanks be collected every quarter. The laboratory quality control reports were reviewed and the data are considered reliable.

## **Coal Mountain Operations**

## Shipping and Handling

The COAs indicate that shipping and handling of samples was conducted in a manner that led to consistently meeting the specifications of Austin (2016). One batch of samples collected during the second quarter arrived at the laboratory with a measured temperature of 12°C (Table VIII-K), exceeding the specification of 10°C. Austin (2016) specifies that refrigeration is required for storage prior to analysis for all physical properties, nitrogen, and phosphorous parameters analyzed. Refrigeration is not required for metals.



Table VIII-K: Summary of Shipping and Handling Issues

Qualifier	Quarter	Well ID	Possibly Affected Analytes	Comments
Hold Time Exceedances	1	CM_MW5-SH	Nitrate-N, Nitrite-N	Hold time exceeded for re-analysis or dilution but initial testing was conducted within hold time
Transport Temperature	2	CM_MW1-OB CM_MW1-SH CM_MW2-SH CM_MC3-DP CM_MW3-SH duplicate 1 duplicate 2 trip blank	Physical properties, Nitrogen analytes, Phosphorous analytes	Laboratory recorded temperature of 12°C on receipt
Sample Integrity Observations	None	None	None	
Incorrect Preservation	2	CM_MW6-DP	Dissolved metals	Analysis conducted on sample filtered and preserved at lab

With the exception of pH and ORP, initial hold times were not exceeded for parameters analysed in 2019. Parameters pH and ORP have a hold time of 15 minutes and measurements are taken in the field. These hold time exceedances are not considered to be an issue as field measurements for pH and ORP are used for data analysis. The three day hold time for nitrate, nitrite, colour and orthophosphate were met for initial analyses; however, re-analyses or dilution of nitrate and nitrite at CM\_MW-SH were completed past the hold time.

One sample (CM\_MW6-DP in Q2) for dissolved metals was incorrectly preserved with sulfuric acid rather than nitric acid, as a result the lab filtered and preserved from a raw unfiltered sample. Dissolved metals results for the Q2 sample were reviewed and found to be consistent with the ranges identified in the other 2019 samples. One exception was dissolved iron which was low at 11 ug/L in Q2 vs 69 to 157 ug/L during the remainder of 2019.

## **Duplicate Samples**

The duplicate samples indicate adequate precision associated with the field and laboratory methods. 199 RPDs were calculated for the eight duplicate samples collected over the four quarterly sampling events. Among these RPDs, one was greater than 50% (Table VIII-L). The elevated RPD for turbidity in Q2 occurred for values near the detection limit: measurements of 1.08 NTU and 0.51 NTU, detection limit of 0.1 NTU. Both are considered very low turbidity readings and there are no screening criteria turbidity.



Table VIII-L: Summary of Relative Percent Difference Values for Duplicate Samples

Quarter	Number of Duplicate Samples Collected	Summary of RPDs above Acceptable Percentage	
1	2	>	None
2	2	>	Turbidity, CM_MW1-OB, RPD of 72%
3	2	>	None
4	2	>	None

### Field and Trip Blanks

Detections were reported in three of the eight blanks (four field and four trip) submitted for laboratory analysis in 2019 (Table VIII-M). Among the six detections, one is for a metal, one is for a phosphorus analyte, and four are for nitrogen analytes.

Table VIII-M: Summary of Blank Samples with Parameters above Detection Limit

Quarter	Location or Date	Parameter Above Detection Limit	Value
Field Blanks			
		Ammonia-N	8.8 µg/L
1	CM_MW1-SH	Orthophosphate	1.3 μg/L
		Dissolved manganese	0.12 μg/L <sup>A</sup>
2	CM_MW1-DP	Ammonia-N	26.1 μg/L <sup>a</sup>
Trip Blanks	•		
2	June 4	Ammonia-N	142 μg/L <sup>a</sup>
2	Julie 4	TKN	0.202 mg/L

<sup>&</sup>lt;sup>a</sup> Result verified by repeat analysis

Detection limits: ammonia-N 5  $\mu$ g/L, orthophosphate 1  $\mu$ g/L, manganese 0.1  $\mu$ g/L, TKN 0.05 mg/L

Results for ammonia-N in groundwater samples collected at CMO ranged from the DL (5  $\mu$ g/L) to 659  $\mu$ g/L. The ammonia results should be regarded as provisional because the concentrations in blanks range over the same orders of magnitude as the sample results. However, both the results and blank detections are an order of magnitude lower than the primary screening criteria.

Given that these ammonia analyte detections occurred in both field and trip blanks, the potential sources of the detections have been identified as the laboratory and bottles. A similar elevated frequency of nitrogen analyte detections in blank samples was identified for the 2018 monitoring year for GHO (SNC-Lavalin 2019b).

The laboratory conducted an investigation into elevated nitrogen analyte concentrations in blanks following completion of the 2018 SSGMP and RGMP monitoring programs. The investigation included examination of the laboratory QC method blank data and reverse-osmosis water monitoring data (source of deionized water used for lab, field and trip blanks). The laboratory investigation did not identify a potential sources of sample cross-contamination. Additional possible sources of ammonia cross-contamination include the bottles (pre-use decontamination and leaching from the materials) and sulfuric acid preservative. The blank analysis results indicate no sample contamination in the lab or field that materially affects data quality, notwithstanding ammonia.



## Laboratory QA/QC

Complete laboratory QA/QC results are included in the COAs issued by the laboratory (Appendix X).

Detection limits were occasionally increased in response to a series of commonly encountered analytical circumstances, including the following:

- the analyte was detected at a comparable level in the batch method blank;
- dilution was required due to high dissolves solids in the sample;
- dilution was required due to high test analyte concentration; and
- sample matrix effects (e.g., chemical interference, colour, turbidity).

The higher detection limits were consistently below the primary and secondary screening criteria and therefore these detection limit qualifiers have not affected data quality.

Results for laboratory QA/QC samples occasionally yielded a series of qualifiers used to flag limitations in the reportability of the QA/QC result. These qualifiers are not expected to reflect on data quality, and include the following:

- duplicate results and limits were expressed in terms of absolute difference;
- matrix spike recovery could not be accurately calculated due to high analyte background in sample;
- relative percent difference between duplicates not available due to result being less than detection limit.

Additional non-routine data qualifiers were reported for isolated analytes in isolated samples or batches. These data qualifiers include the following:

- method blanks exceeded laboratory DQO (one sample batch during each of Q1 and Q4);
- DOC concentration was greater than TOC concentration in three samples (Q1 CM MW6-DP, Q2 CM MW6-DP and Q3 CM MW1-SH);
- TKN results may be biased low due to nitrate interference where nitrate-N concentration is more than ten times TKN concentration (Q2 CM\_MW7-DP and Q4 CM\_MW7-DP); and
- Data Quality Objective was exceeded by less than 10% in a multi-element scan (affects bismuth analysis for Q3 trip blank).

The laboratory QA/QC results indicate data quality acceptable for the groundwater quality analyses conducted for CMO.

## QA/QC Summary

The field QA/QC program and laboratory QA/QC results for groundwater samples indicate the data collected are acceptable for the analyses conducted in this report. With one except, all RPD values were less than 50%. Sample temperatures in transport exceeded the Austin (2016) target by 2°C in one batch of samples. Ammonia-N results should be regarded as provisional because concentrations in blanks ranged the same orders of magnitude as the sample results; however, both the results and blank detections are an order of magnitude lower than the primary screening criteria. The laboratory quality control reports were reviewed and the data are considered reliable.

Internal Ref: 671557 March 31, 2020 | 18



## Regional Drinking Water Sampling Program

## Shipping and Handling

There were no shipping and handling issues identified for RG-DW-series wells included in the RGMP with the exception of laboratory measured pH and ORP. All laboratory measured pH and ORP exceeded a hold time of 15 minutes. These measurements are collected in the field provide a reliable measurement.

## **Duplicate Samples**

Table VIII-N summarizes the number of sample duplicates for wells included only in the RGMP (i.e., not in the SSGMP above) and any RPDs above acceptable levels (RPD > 50% with results > 5 times the DL).

Table VIII-N: Summary of Relative Percent Difference Values for Duplicate Samples

Quarter	Number of Duplicate Samples Collected	Summary of RPDs above Acceptable Percentage		
1	1	none		
2	0	› n/a		
3	1	Turbidity with an RPD value of 53% at RG_DW-02-20		
4	1	none		

The RPD values > 50 % for turbidity at RG\_DW-02-20 are not a concern for the integrity of the sampling program. Of the numerous organic, inorganic, and physical parameters analysed, RPDs were otherwise less than 50%. These results indicate a good sampling program with low variability in constituent concentrations from sampling and handling.

### **Blanks**

In 2019, there were no trip or field blanks collected at any of the RG\_DW-series locations included in the RGMP.

## Laboratory QA/QC

The detailed results of laboratory QA/QC are included in COAs in Appendix X. The Quality Control Reports noted the following for some samples.

- Matrix Spike recovery could not be accurately calculated for some constituents due to high analyte background in sample.
- DLs were raised due to dilution required due to high concentration of test analyte(s), analyte was detected at a comparable level in the method blank, high dissolved solids/electrical conductivity, or sample matrix effects (e.g., chemical interference, colour, turbidity).
- > TKN results were likely biased low due to nitrate interference. Nitrate-N is > 10x TKN.
- Method blank exceeded ALS DQO. Limits of reporting were adjusted for samples with positive hits below 5x blank level.
- Lab control sample recovery was above ALS DQO. Non-detected sample results are considered reliable. Other results, it reported, have been qualified.



Dissolved concentrations exceeded total on one occasion. Results were confirmed by re-analysis.

These notes are not unusual for these analyses and the results of the laboratory QA/QC were considered to be acceptable for the purpose of this assessment. A review of the QA portion of the laboratory analytical reports did not identify any additional QA/QC issues.

### **QA/QC Summary**

QA/QC data relating to the RGMP were considered acceptable. A summary of the QA/QC results is as follows. There were no hold time exceedances. The RPD for turbidity above acceptable levels is not considered to influence interpretation of results. SNC-Lavalin recommends collecting field and trip blanks at the RG\_DW-series locations included in the RGMP.

## References

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- Clark, M.J.R., 2013. British Columbia Field Sampling Manual: 2013 For Continuous Monitoring plus the Collection of Air, Air-Emission, Water, Wastewater, Soil, Sediment, and Biological Samples. Water, Air and Climate Change Branch, Ministry of Water, Land and Air Protection, Victoria, BC, Canada. 344 pp.
- SNC-Lavalin, 2019. 2018 Site-Specific Groundwater Monitoring Report Fording River Operations. Prepared for Teck Coal Limited. Dated March 28, 2019.

# Appendix IX

K Testing



## **EVO Hydraulic Conductivity Testing**

Single well response testing was conducted at EV\_MCgwD and EV\_MCgwS on November 5, 2019 using falling- and rising-head single well response tests (i.e., "slug"). The single well response testing involved inserting a section of solid PVC into the water column resulting in the displacement of a known volume of water which causes a short-term increase in the groundwater level; the slug was held below the initial static level and recovery was monitored until it was within approximately 95% of the static measurement (i.e., falling-head test). When the water level returned to the static level the slug was 'instantaneously' removed resulting in a drop in the groundwater level; groundwater entered the well from the surrounding formation to stabilize, eventually returning to static conditions (i.e., rising-head test).

Well response (i.e., water level change and recovery) was recorded using a Solinst® Levelogger suspended in the water column on a stainless steel cable. Water level measurements were downloaded from the Levelogger and hydraulic conductivity was estimated using AQTESOLV software; the well response was matched using the appropriate solution based on the aquifer type and response.

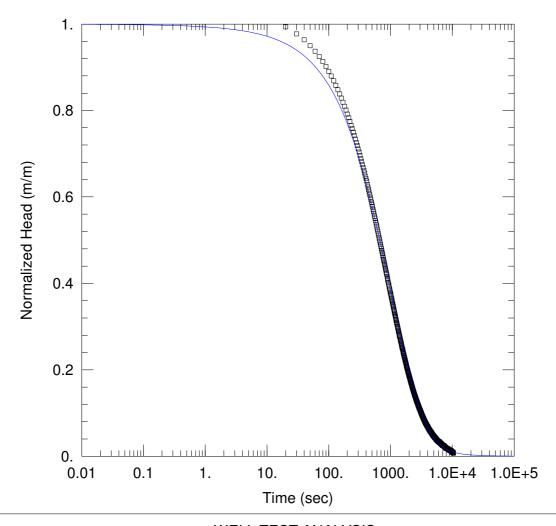
The results of the single well response tests completed are presented in Table IX-A below.

Table IX-A: Hydraulic Conductivity Results

Well ID	Lithology of Screen Interval	Hydraulic Conductivity Estimate (m/s)	Solution	Range of typical Hydraulic Conductivity for Screened Lithology (m/s) <sup>1</sup>
EV_MCgwS	SIIt	1.9 x 10 <sup>-6</sup>	KGS Model w/skin	1x10 <sup>-9</sup> to 2x10 <sup>-5</sup>
EV_MCgwD	Clay	2.8 x 10 <sup>-7</sup>	KGS Model	1x10 <sup>-11</sup> to 4.7x10 <sup>-9</sup>

<sup>&</sup>lt;sup>1</sup> Range of typical hydraulic conductivity from Domenico and Schwartz (1990).

The hydraulic conductivity estimate for EV\_MCgwS is consistent with expectations for the silt unit observed in the screened interval during drilling. Skin effects were identified and corrected when the data was initially analyzed using the KGS-model type curve. The hydraulic conductivity estimate for EV\_MCgwD is higher than would be expected for a well screened within a homogeneous clay unit. It is possible that this unit contains a larger amount of silt and fine sand than was observed at the time of drilling, which would result in a higher hydraulic conductivity estimate.



### WELL TEST ANALYSIS

Data Set: \...\EV\_MCgwd.aqt

Date: 02/11/20 Time: 11:47:02

### PROJECT INFORMATION

Company: SNC-Lavalin Inc.

Client: Teck Coal Project: 635544

Location: Elkview Operations

Test Well: EV\_MCgwd

Test Date: November 5, 2019

### **AQUIFER DATA**

Saturated Thickness: 22.28 m

### WELL DATA (EV\_MCgwd)

Initial Displacement: 0.67 m Static Water Column Height: 24.21 m

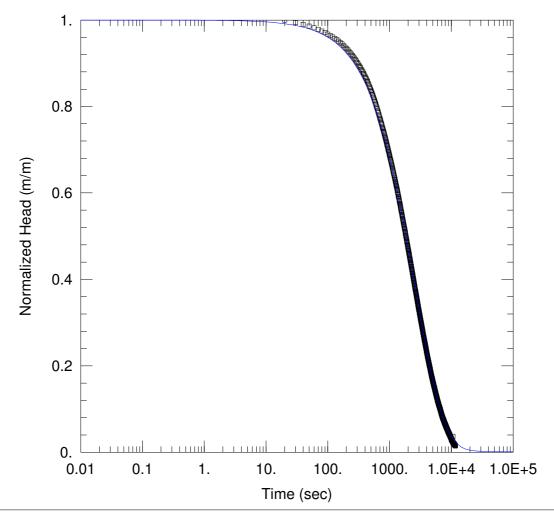
Total Well Penetration Depth: 21.9 m Screen Length: 3. m Casing Radius: 0.025 m Well Radius: 0.075 m

### SOLUTION

Aquifer Model: Confined Solution Method: KGS Model

Kr = 2.838E-7 m/sec Ss = 0.0001515 m<sup>-1</sup>

Kz/Kr = 1.



### **WELL TEST ANALYSIS**

Data Set: \...\EV\_MCgws.aqt

Date: 02/11/20 Time: 11:06:56

### PROJECT INFORMATION

Company: SNC-Lavalin Inc.

Client: Teck Coal Project: 635544

Location: Elkview Operations

Test Well: EV\_MCgws

Test Date: November 5, 2019

### **AQUIFER DATA**

Saturated Thickness: 1.2 m

### WELL DATA (EV\_MCgws)

Initial Displacement: 0.649 m

Total Well Penetration Depth: 2.7 m

Casing Radius: 0.025 m Well Skin Radius: 1. m

Static Water Column Height: 5.137 m

Screen Length: 1.5 m Well Radius: 0.075 m Gravel Pack Porosity: 0.

### **SOLUTION**

Aquifer Model: Confined

Kr = 1.874E-6 m/sec

 $Kz/Kr = \overline{1}$ .

Ss' =  $\frac{1.0E-10 \text{ m}^{-1}}{1.0E-10 \text{ m}^{-1}}$ 

Solution Method: KGS Model w/skin

Ss =  $\frac{3.112E-11}{Kr'}$  m<sup>-1</sup> Kr' =  $\frac{4.132E-7}{Mr}$  m/sec

 $Kz/Kr' = \overline{0.001}$