

# Tailings Storage Facilities - West Fork Tailings Facility and Lagoons A, B, C and D 2018 Dam Safety Inspection

**FINAL REPORT** 

Project # TE183022



Wood Environment & Infrastructure Solutions, a Division of Wood Canada Limited 495 Prospect Street, Suite 1 Fredericton, New Brunswick E3B 9M4 Canada T: 506-458-1000 www.woodplc.com

25-Mar-19

Mr. Zane Leonard Teck Coal Limited – Elkview Operations R.R. #1, Highway #3 Sparwood, BC V0B 2G1

#### **Dear Mr. Leonard:**

Re: Tailings Storage Facilities – West Fork Tailings Facility and Lagoons A, B, C and D 2018 Dam Safety Inspection

Wood Environment & Infrastructure Solutions, a Division of Wood Canada Limited is pleased to submit this final report to document the results of the 2018 Dam Safety Inspection of West Fork Tailings Facility and Lagoons A, B, C and D sites at the Teck Coal Limited – Elkview Operations in Sparwood, British Columbia. In general, the structures are in satisfactory condition.

Should you have any questions or comments upon your review of this document, please contact the undersigned at your convenience.

Sincerely,

Wood Environment and Infrastructure Solutions, a Division of Wood Canada Limited

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# Tailings Storage Facilities - West Fork Tailings Facility and Lagoons A, B, C and D - 2018 Dam Safety Inspection

#### **FINAL REPORT**

Tailings Storage Facilities – West Fork Tailings Facility and Lagoons A, B, C and D

Sparwood, British Columbia

#### **Project # TE183022**

#### **Prepared for:**

Teck Coal Limited – Elkview Operations Sparwood, British Columbia

#### Prepared by:

Wood Environment & Infrastructure Solutions, a Division of Wood Canada Limited 495 Prospect Street, Suite 1 Fredericton, New Brunswick E3B 9M4 Canada T: 506-458-1000

#### 25-Mar-19

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# **Executive Summary**

Wood Environment & Infrastructure Solutions, a Division of Wood Canada Limited (Wood), was contacted by the Teck Coal Limited – Elkview Operation (Elkview) to undertake a Dam Safety Inspection (DSI) on the West Fork Tailings Facility (WFTF) and Lagoons A, B, C and D. This report reflects operational and performance aspects of the structures from the beginning of October 2017 up to the end of September 2018.

This site inspection was completed by two senior geotechnical engineers who are also a registered Professional Engineer in the Province of British Columbia (BC) as required under Section 10.5.3 of the Health, Safety and Reclamation Code (HSRC) for Mines in BC (MEMPR, 2008 and revised 2017). The Engineer of Record (EOR) for the dams at the site is Mr. Andy Small, P.Eng. He was with Wood and is now with Klohn Crippen Berger. He worked with the Wood team during the preparation of this DSI report. He has been involved with the design, construction, and performance assessment of the dams since 2013.

In addition, the DSI was carried out following the Canadian Dam Association (CDA) 2007 Dam Safety Guidelines, the BC Water Act Dam Safety Regulations (Reg. 163/2011), and other best practices and procedures in the industry. This report has been prepared in accordance with the requirements of the BC Ministry of Energy and Mines (MEM) guidance, including MEM's updated guidelines for Annual DSI's, revised August 2013.

On the basis of the operational and monitoring information provided by Elkview and the site inspection performed, Wood considers that the performance of the WFTF and Lagoons A, B, C and D continues to be satisfactory.

In accordance with the HSRC (2017 updates), the Lagoons and WFTF are considered tailings storage facilities. Moreover, Lagoons A, B, C and D are considered as tailings dams since they contain tailings and water that could flow if the perimeter containment was breached. WFTF has been considered as a tailings dam since early 2017 when its beach elevation reached 1660 m. The beach tailings elevation was measured at 1665 m in August 2018.

The following presents the findings of the DSI for tailings dams in accordance with MEMPR's guidelines for annual DSI reports as per the format suggested in Section 4.2 of the HSRC Guidance document (MEMPR, 2016).

#### a) Summary of Facility Description

At Elkview, the clean coal is obtained by washing the mined material to isolate the saleable coal from other materials. The waste from the washing process can be further subdivided into coarse material and fine material. The fine refuse was traditionally placed into tailings storage areas designated as Lagoons A, B, C and D. The coarse refuse is placed in the Coarse Coal Refuse/Mixed Coal Refuse (CCR/MCR) Dump. Tailings are no longer discharged on Lagoons A and B and as such are considered inactive tailings facilities. Lagoon C has been inactive since 1987 and has been used as an emergency water decant facility for Lagoon D as well as periodic dredge spoils storage. Elkview commissioned the WFTF in 2006 for ongoing storage of fine refuse materials. Lagoon D is at its permitted elevation, and has become a secondary storage option, used when tailings cannot be sent to the WFTF. The following table provides pertinent configuration information regarding the five tailings facilities.

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Tailings Facility	Max Embankment Height (m)
WFTF	80
Lagoon A	4
Lagoon B	4
Lagoon C	19.5
Lagoon D	57

#### b) Summary of Key Hazards

The key hazards to the tailings dams are meteorological and seismicity.

Tailings Facility	Meteorological Hazard	Seismicity Hazard
WFTF	WFTF does not have a constructed spillway so meteorological could be considered as a hazard to WFTF. The facility has approximately 17.5 m of freeboard as of 2018. This is considered sufficient freeboard at this time for the facility since the facility will be able to contain a 72 hour probable maximum precipitation (PMP). However, it should be assessed to confirm this and determine if the facility can contain the 72 hour PMP at its ultimate configuration (i.e., ultimate dam height and tailings elevation). This will be assessed in 2019 based on the water balance model of WFTF.	The dam is not susceptible to seismic ground motions because it is constructed with rockfill on a competent bedrock foundation.
Lagoon A	Lagoon A has a spillway; therefore, this hazard is considered a low threat to the dam.	The dam is not susceptible to seismic ground motions because of the low design seismicity (less than 0.1g) and its small size
Lagoon B	Lagoon B does not have a constructed spillway, so there is a potential overtopping hazard for this facilityThe Overtopping Study completed in 2018 recommended Lagoon B be enhanced by adding an armoured spillway at the lagoon's southwest corner.	The dam is not susceptible to seismic ground motions because of the low design seismicity (less than 0.1g), the tailings are not saturated, and its small size.
Lagoon C	Lagoon C does not have a spillway. This hazard is considered a low threat to the dam as the facility can contain a 72 hour probable maximum precipitation.	The dam is well designed and built to withstand seismic ground motions.
Lagoon D	Lagoon D does not have a spillway. This hazard is considered a low threat to the dam as the facility can contain a 72 hour probable maximum precipitation.	The dam is well designed and built to withstand seismic ground motions.

# c) Classification of the Dam(s) in Terms of Consequence of Failure (ref. CDA, 2007 Dam Safety Guidelines

The WFTF currently meets the standard definition of a "dam" under the CDA Guidelines since the tailings beach elevation reached to 1660 m in early 2017. The current and final tailings configurations at WFTF are designated as a "Low" consequence classification under CDA Guidelines (Amec Foster Wheeler, 2016c) for both fair-weather and flood-induced failure conditions.

Under the CDA Guidelines the consequence classification for Lagoons A and B are considered as "Low".

Under the CDA Guidelines, Lagoon C has been designated with a "High" consequence classification for both fair-weather conditions and flood-induced events as outlined in the 2013 DSR. Lagoon D has been designated with a "High" consequence classification under fair-weather conditions and a "Very High" consequence classification under flood-induced events. There were no observations made during the 2018 DSI that suggested that the classifications should be changed.

#### d) Summary of Significant Changes (e.g. construction, development downstream, etc.)

There were no significant construction activities at WFTF or at Lagoons A, B, C and D from October 2017 to September 2018. Sediment excavated from sumps and ponds, located around the site, was placed within Lagoon C at the northeast corner of the facility below the level of the perimeter road. General maintenance activities were conducted around the sites, as required, and as recommended from the 2016 inspection.

#### e) Significant Changes in Instrumentation and/or Visual Monitoring Records

WFTF has two (2) groundwater monitoring wells that remain active within the historic West Fork Dump fill. The historical records of the water levels within these monitoring wells indicate this is a well-drained system. In 2016, nine (9) vibrating wire piezometers were installed within the tailings pond. They provide information on the pore water pressures in the tailings beach and are not related to the stability of the dam. In June 2017, one vibrating wire piezometer was installed within the eastern section of the tailings pond. The readings from those piezometers from July 2017 to September 2018 indicate the pore pressures stayed dry or fluctuated within a very small range.

There is no instrumentation installed at Lagoons A and B. No instrumentation installations are required at this time.

The instrumentation for Lagoon C consists of four (4) nested pairs of vibrating wire piezometers and a series of six (6) standpipes. In 2018, most of the standpipes and vibrating wire piezometers were reported dry or negative indicating the dam shell is well drained. There were no significant changes in instrumentation readings at Lagoon C.

The instrumentation for Lagoon D consists of a network of forty six (46) standpipe piezometers as well as eighteen (18) vibrating wire piezometers, eight (8) of which were installed at four locations as nested installations in 2012. The other ten (10) vibrating wire piezometers were installed at three locations (i.e., four piezometers at varying elevations). Water levels throughout 2018 indicate a well-drained system representing low pore pressures which is similar to previous year records.

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#### f) Significant Changes to Dam Stability and/or Surface Water Control

There are no significant changes observed in terms of stability and surface water control for WFTF or Lagoons A, B, C and D.

#### g) Summary of Review of the OMS Manual

As described in Part 10.5.2 of the Health, Safety and Reclamation Code for Mines in British Columbia, all operating dams shall have a current Operations, Maintenance and Surveillance (OMS) Manual. The annual report shall indicate the latest revision date of the OMS Manual.

The OMS Manuals have been frequently updated for the facilities. In March 2015, an update to the OMS Manual was issued for Lagoons A, B, and C; the OMS Manual for all three lagoons was combined into one document under the title "Inactive Tailings Facilities". A separate OMS Manual was updated for Lagoon D and the active WFTF in 2018 and will be finalized in 2019. Based on the review conducted as part of the 2018 DSI, these manuals are generally complete and cover most of the important elements, including management roles and responsibilities, for safe operations. Elkview continues to review these manuals annually and provide updates when required.

#### h) Summary of Review of the Emergency Preparedness and Response Plan

For tailings dams, an Emergency Preparedness Plan (EPP) is required (CDA guidelines, 2007). The annual report shall indicate the latest revision date of the EPP document.

Teck conducts annual reviews of the EPP/ERP manuals and provide updates when required as per the requirement of HSRC 10.4.2.1(e) and guidance in Section 4.3 of the HSRC Guidance Document. The Lagoon D combined Emergency Preparedness Plan (EPP) and Emergency Response Plan (ERP) manual was updated in October 2014. The Lagoon A, B, and C EPP/ERP manual was also updated in October 2014; for this update, similar to the OMS, all three lagoons were combined into one document under the title "Inactive Tailings Facilities". A tabletop test of the Lagoon D ERP was performed by Elkview on 28 January 2014. The manuals are generally complete and cover most of the important elements, including management roles and responsibilities, for safe operations. Another table top testing exercise will be conducted in 2019 for the facilities and if required, the EPP/ERP will be updated pending the results of the table top.

#### i) Dam Safety Review Schedule

As described in Part 10.5.4 of the Health, Safety and Reclamation Code for Mines in British Columbia, a dam safety review report for a tailings storage, water management facilities and associated dams shall be prepared at least every 5 years or as directed by the chief inspector.

A formal DSR was conducted for Lagoons C and D in 2013. A DSR is being conducted by SRK in 2018 with a draft report issued to be finalized in 2019.

#### j) Summary of Recommendations

Section 8 provides a complete listing of the recommendations. There are no Priority 1 recommendations that would indicate a near term threat to dam safety. Moreover, there are no key recommendations that need to be addressed in a short-term period.



#### **Table of Concordance**

To assist HSRC with reviewing this report, a table of concordance was prepared and is included below. The table outlines the HSRC requirements for a DSI report and indicates where each requirement is addressed, or specifies a reason why a particular section is not relevant to this site.

Compo	nents form HSRC	Sections in Report	Comments
1.	Executive Summary	Executive Summary	
	(a) Summary of Facility Description.	Executive Summary	
	(b) Summary of key hazards.	Executive Summary	
	(c) Consequence Classification.	Executive Summary	
	(d) Summary of significant changes (e.g. construction, development downstream, etc.).		
	(e) Significant changes in instrumentation and/or visual monitoring records.	Executive Summary	
	(f) Significant changes to stability and/or surface water control.	Executive Summary	
	(g) Summary of review of the OMS manual.	Executive Summary	
	(h) Summary of review of the Emergency Preparedness and Response Plan.	Executive Summary	
	(i) Scheduled date for the next formal Dam Safety Review in accordance the Code and the CDA Dam Safety Guidelines (2013).		
	(j) Summary of recommendations	Executive Summary	
2.	Facility Description	Section 2	
	(a) Description of facility components	Section 2	
	(b) History of key construction milestone	Not included	The dams containing the lagoons have not been modified or raised for many years. The 2013 DSR contains details on the history of construction.
	(c) Summary of past years' construction (if any) with a description of any problems and stabilization.		Same as above

Compo	nents form HSRC	Sections in Report	Comments
	(d) Summary of past years operation (tailings deposition, etc.)	Section 3	
3.	Identification of Engineer of Record and TSF qualified person.	Section 6	
4.	Updated plan and representative cross sections.	Appendix C – WFTF Appendix D – Lagoon C Appendix E – Lagoon D	
		Appendix F – WFTF Appendix G – Lagoon A Appendix H – Lagoon B Appendix I – Lagoon C	
5.	Site photographs.	Appendix J – Lagoon D	
6.	Review of climate data.	Section 4.1	
7.	Water balance review and reconciliation.	Section 4.2	
8.	Freeboard and storage availability (in excess of the design flood).	Section 4.3	
9.	Water discharge system, volumes, and quality.	Section 3 and Section 4.3	The only discharge is from Lagoon A and it meets water quality requirements.
10.	Seepage occurrence and water quality.	Section 7.5	
11.	Surface water control and surface erosion.	Section 6	
12.	Instrumentation review including:	Section 5	
	(a) Phreatic surfaces and		
	piezometric data.	Section 5	
	(b) Settlement.	Section 5	
	(c) Lateral movement.	Section 5	
13.	Recommendations	Section 8	
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#### 1.0 Introduction

Wood Environment & Infrastructure Solutions (formerly Amec Foster Wheeler), a division of Wood Canada Limited (Wood), was retained by Teck Coal Limited – Elkview Operation (Elkview), to conduct a Dam Safety Inspection on the West Fork Tailings Facility and Lagoons A, B, C and D at the Elkview Operations, near Sparwood, BC. This report presents the results of the 2018 dam safety inspection and a review of the operational and performance aspects of the tailings facilities from the beginning of October 2017 up to the end of September 2018.

DSI reporting on tailings facilities is a requirement under Section 10.5.3 of the HSRC (MEMPR 2016). As of early 2017, WFTF was considered as a dam since the tailings beach reached the 1660 m elevation.

The DSI was carried out following the Canadian Dam Association (CDA) 2007 Dam Safety Guidelines, the BC Water Act Dam Safety Regulations (Reg. 163/2011), and other best practices and procedures in the industry. This report has been prepared to comply with Section 10.5.3 of the Health, Safety and Reclamation Code (HSRC) for Mines in British Columbia, revised in 2017 and in accordance with the requirements of the BC Ministry of Energy and Mines (MEM) guidance, including MEM's updated guidelines for Annual DSI's, revised August 2013.

This report provides the following:

- Section 2.0 Facility description;
- Section 3.0 Summary of activities since the 2017 DSI related to dam safety;
- Section 4.0 Review of climate data and water balance;
- Section 5.0 Instrumentation readings;
- Section 6.0 Results of the DSI;
- Section 7.0 Assessment of dam safety; and
- Section 8.0 Recommendations arising from the DSI.

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# 2.0 Facility Description

The Elkview mine site is located in southeast British Columbia, approximately 3.5 km from the Town of Sparwood as illustrated in Figure 2.1. The mine has been an open pit operation since 1969 and has a remaining reserve life of approximately 31 years at a planned annual production rate of approximately 7 million tonnes of clean coal (Teck, 2016a).

Elkview obtains clean coal by washing the mined material to isolate the saleable coal from other materials. The waste from the washing process can be further subdivided into coarse material and fine material. The coarse refuse is placed in the CCR/MCR Dump. The majority of the fine refuse was traditionally placed into tailings storage areas designated as Lagoons A, B, C and D within the Lagoon Tailings area. This area is immediately down slope of the process plant, on a plain adjacent to the Elk River. In this area, there are two "ring dyke" tailings dams of significance; Lagoon C and Lagoon D (AMEC, 2013b). Lagoon A has been inactive tailings storage facility that was used during the mine start-up for storage of the fine tailings. Surface water from Cossarini Creek diversion is routed through Lagoon A and into the Otto Pond system downstream of Lagoon A. Lagoon B is an inactive tailings storage facility that currently retains no fluids. Lagoon B is sometimes used for plant discharge water when required. Lagoon C has been inactive since 1987 and has been used as an emergency water decant facility for Lagoon D as well as periodic dredge spoils storage. Lagoon D has been used since the early 1970s, however with the commissioning of the WFTF for storage of fine refuse materials in 2006, Lagoon D has become a secondary storage option for when tailings cannot be sent to the WFTF. There is roughly 390,000 tonnes of tailings storage remaining in Lagoon D. Figure 2.2 presents an aerial view of the WFTF and Figures 2.3 to 2.5 show aerial views of Lagoons A through D, respectively.

There is a spillway at Lagoons A and B, but no spillway for Lagoons C and D and the WFTF. Water from Lagoon A is directed to Otto Creek and meets the discharge water quality. No water is discharged from Lagoon B. Water that accumulates in Lagoon B is pumped out.

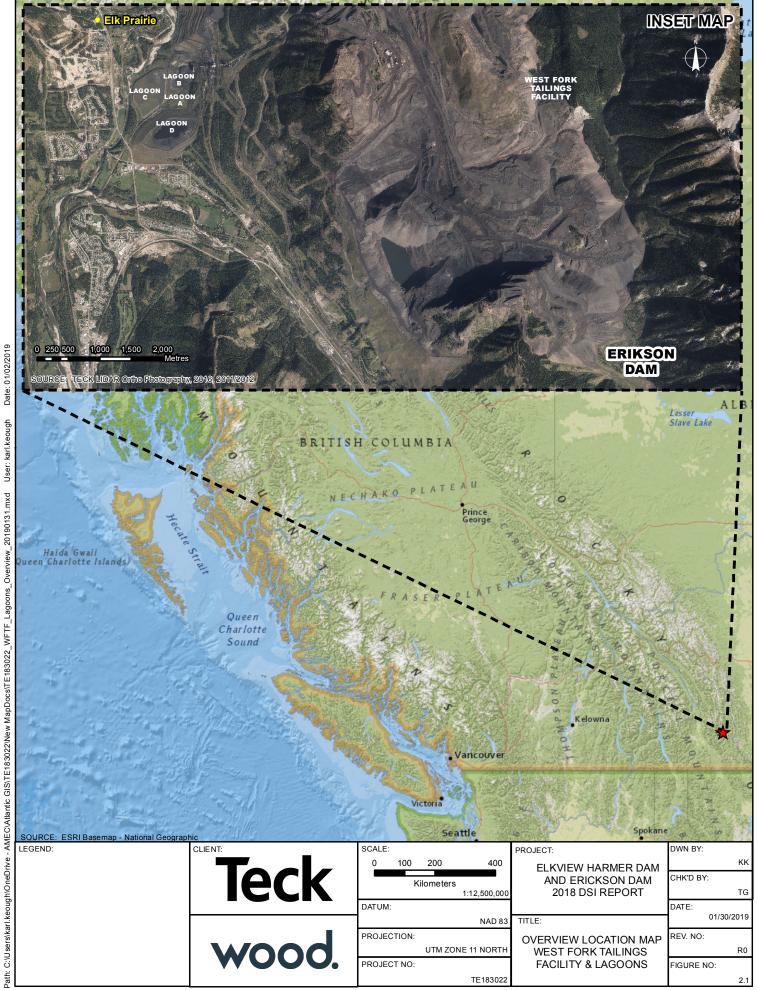
The WFTF is located approximately 1 km southeast of the Adit Pit in the upper reaches of the Erickson Valley. The facility consists of a confined area created by the abutting of the West Fork Dump with Cowboy Ridge and Adit Dump. Tailings are impounded within the facility by the West Fork Dump to the south, the Adit Dump to the west and natural ground to the north and east (i.e. Cowboy Ridge). In 2013, as the level of deposited tailings was approaching a low point at the east end of the West Fork Dump, EVO placed additional rockfill in this area to increase the dump containment to an elevation of 1679.5 m (AMEC, 2014a).

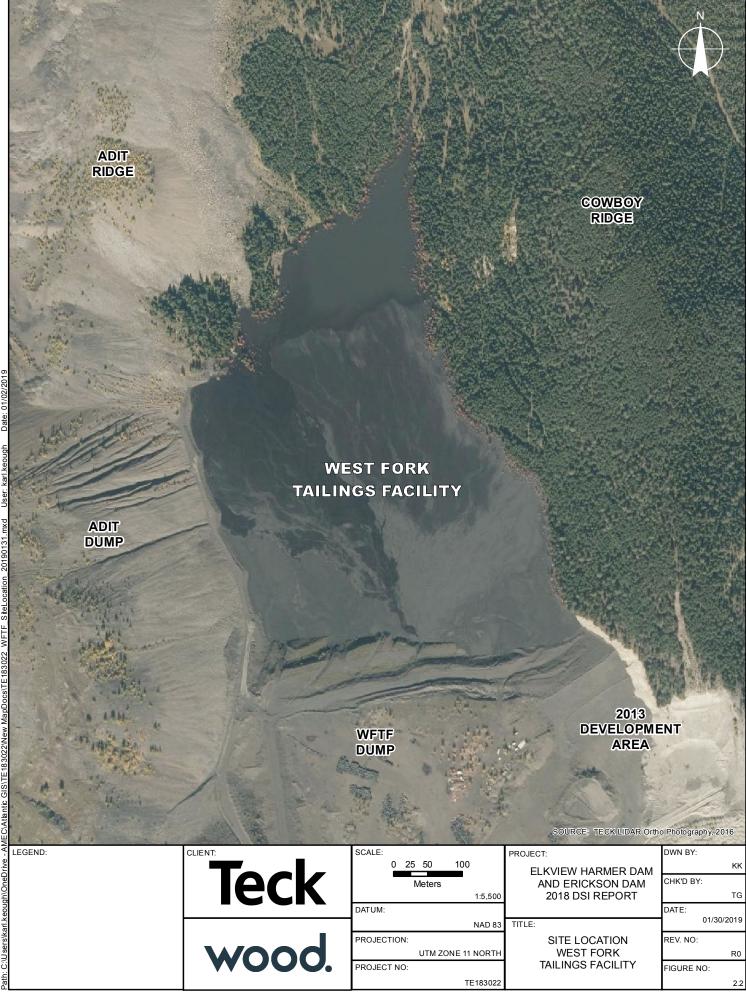
Table 2.1 provides pertinent configuration information regarding the five tailings facilities.

**Table 2.1** Tailings Facility Configuration Information

Tailings Facility	Max Embankment Height (m)	Approx. Footprint Area (ha)	Impounded Tailings Volume (m³)	Impounded Water Volume (m³)
WFTF	80	28.5	7,840,000	300,000
Lagoon A	4	5.8	185,000	550
Lagoon B	4	4.5	287,700	0
Lagoon C	19.5	32.6	4,658,600	0
Lagoon D	57	58.8	22,380,000	30,000













#### 3.0 **Activities Since the 2017 Annual Inspection**

The following activities with respect to dam safety are understood to have taken place at the tailings facilities over the period of October 2017 to September 2018.

#### 3.1 **West Fork Tailings Facility**

The tailings level within the WFTF impoundment has risen throughout 2017 and 2018 from about El. 1662 m (July 2017) up to El. 1665 m (August 2018).

A water balance model was developed for WFTF in 2017 to predict volumes and elevations of water and tailings within the WFTF from July 2017 to the end of 2020.

#### 3.2 Lagoon A

No new activities were undertaken between October 2017 and September 2018. It is noted that Lagoon A's spillway at the west dam was upgraded with rockfill in early 2016 to channel and convey surface water off the crest.

In 2017, the slumped areas at the west end of the north slope were repaired.

#### 3.3 Lagoon B

As part of plant maintenance activities, episodic discharges of plant washdown water were directed to the southeast corner of Lagoon B. There is no discharge structure and very little freeboard available for storing water on the surface of the Lagoon. In order to reduce the potential for overtopping the Lagoon, Elkview has put in place procedures such that discharge to the Lagoon is only permitted with written permission from both the Elkview Geotechnical Department and Environment Department.

An Inundation Memo and Spillway design was completed in 2018. A number of inflow design flood scenarios were reviewed. The Overtopping Study completed in 2018 recommended Lagoon B be enhanced by adding an armoured spillway at the lagoon's southwest corner.

#### 3.4 Lagoon C

Sediment excavated from various sumps and sedimentation ponds located around the site was placed on the surface of Lagoon C. Sediment (approximately 20 tonnes) was placed in the northeastern region adjacent to the access ramp and in the Southwest corner of the Lagoon. The sediments are dumped and spread out with a dozer.

Risk assessment for Lagoons C and D was conducted in 2017. The draft report was completed in 2018.

A Foundation Drilling Investigation was conducted in 2018. Data analysis and reporting underway at the time of writing.

#### 3.5 Lagoon D

Episodic discharges of tailings at an overall average rate of about 160 tonnes/day were performed at Lagoon D throughout 2018; discharge into Lagoon D occurred for multiple reasons including WFTF pipeline maintenance, WFTF pipe capacity, plant maintenance, etc. Tailings were discharged into cells around the perimeter of Lagoon to maintain beach requirements. Cell and road maintenance was also performed on an as needed basis.

A Risk Assessment for Lagoons C and D was conducted in 2017. The draft report was completed in 2018.

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A Foundation Drilling Investigation was conducted in 2018. Data analysis and reporting underway at the time of writing.

A formal DSR was conducted for Lagoons C and D in 2013. A DSR is being conducted by SRK in 2018 with a draft report issued and to be finalized in 2019.

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#### 4.0 Climate Data and Water Balance

#### 4.1 Climate

The total precipitation recorded at the mine site (data provided by Elkview) from October 2017 to the end of September 2018 was 528.6 millimetres (mm). Based on site precipitation records from 1987 to 2018, the total average precipitation for this time period is estimated at 586.4 mm (see Appendix A for precipitation and temperature chart). There were approximately 203 days without precipitation from October 2017 to September 2018 (i.e., 57% of 12 months period).

Precipitation from October to November 2017 was significantly higher than the historical average amount for those months and the temperature of those months were above zero. This indicates there was more runoff in the Fall 2017 than the historical average amount for the fall period. However, the precipitation from December 2017 to March 2018 was slightly lower than the historical average amount for those months, with the exception of February 2018. With the average temperature in March and April at approximately zero (see the chart in Appendix A), runoff amounts in Spring 2018 was less than the historical average amount, which was also lower than the runoff amount in the 2017 spring.

#### 4.2 Water Balance

A specific dam safety water balance for the WFTF was completed in 2017. The water balance was from July 2017 to end of December 2020. The current available freeboard (about 17.5 m) is far in excess of the annual precipitation or design storm events (AMEC, 2003). The water balance model does not include the ultimate configuration of the facility (i.e., ultimate dam height and tailings elevation).

A specific dam safety water balance for Lagoon A and B, under the current site conditions has not been completed. As Lagoons A and B are no longer in use, a water balance will be formally addressed upon closure of the facility.

A water balance model in spreadsheet format was developed in 2017 for Lagoons C and D that considered the inputs and outputs, including evaporation and seepage.

#### 4.3 Freeboard and Flood Routing

#### 4.3.1 WFTF

The current available freeboard for the WFTF is about 17.5 m as of September 2018 as measured from the current crest level of El. 1679.5 m. WFTF has not been assessed if it can contain the 72 hours PMP from now until the facility reaches the ultimate configuration. This will be addressed as a recommendation in this 2018 DSI report.

#### 4.3.2 Lagoons A and B

Lagoons A and B do not have an established freeboard and flood routing analyses completed. This will be established upon closure of the facilities. In 2016, the spillway at Lagoon A was upgraded with rockfill material. Further analysis is underway on Lagoon B to determine the available capacity and determine spillway design parameters.

#### 4.3.3 Lagoon C

Lagoon C can contain the 72 hours PMP. The Lagoon has had no tailings deposition since the late 1980's and is currently used for episodic disposal of dredged sediments.



#### 4.3.4 Lagoon D

Currently, the specified design minimum freeboard, above the maximum operating pond level, for Lagoon D is 1.25 m, which includes 0.25 m for the minimum flood storage (AMEC 2002) and 1 m for freeboard. The ponded area varies in size, but the freeboard is maintained. Freeboard is measured with a staff gauge on the east side of the internal splitter dyke. This freeboard can contain the 72 hours PMP.

The low area to the west side of the splitter dyke also has a freeboard of 1.25 m and can also contain the 72 hour PMP.

# 5.0 Instrumentation Readings

A review of the instrumentation readings was conducted for the WFTF, Lagoon C and Lagoon D. There is no instrumentation in Lagoons A and B. The instrumentation readings are presented prior to the site visit observations to aid interpretation of the site observations.

The instrument data was provided by Elkview for review in the form of spreadsheets with time-history plots. The plots of piezometer readings comprised of piezometric elevations versus time and tailings surface or free water pond elevations versus time. Inclinometer readings were also reviewed and have also been plotted versus time. None of the measurements exceed the quantifiable performance objectives as described in the OMS Manual.

#### 5.1 West Fork Tailings Facility

Two groundwater monitoring wells were installed in the original West Fork Dump fill, WF-2 (South) and WF-3 (North). In July 2015, the well WF-02 was considered no longer safe to access due to the Sun-toe dump. However, in June 2017, WF-02 has become accessible and the water levels were read in 2017. A third angled standpipe (WF-1) was installed in Cowboy Ridge on the East abutment; however, it was discontinued as part of the 2013 dump development activities. Water levels monitored in the remaining wells (North and South standpipes) by Elkview indicate a well-drained system at the south buttress area. Appendix C contains the map of the standpipes at the WFTF. Since tailings storage began in 2006 the water levels measured in WF-2 and WF-3 have slowly risen by about 12.42 and 8.56 m, respectively, in response to over 51 m of tailings deposition. This behaviour illustrates the importance of maintaining a wide, above water tailings beach adjacent to the dump face. A plot of the water levels in monitoring wells and standpipe, and tailings level for WFTF can be seen in Appendix C.

To monitor pore pressures at different locations within the tailings deposition area the following piezometers were installed:

- Five vibrating wire piezometers VW27171, 27172, 29155, 29158 and 29159 were installed in June 2016;
- Four vibrating wire piezometers 38582, 38583, 38584 and 38585 were installed in November 2016;
- One vibrating wire piezometer 38586 was installed in June 2017.

Locations and the plots of pore water pressure for each piezometer are included in Appendix C. The limited readings from the vibrating wire piezometers show that the pore water pressures at the piezometers fluctuated within a small range. The piezometers often experienced dry condition or the water levels were just slightly above the tip elevations. There are no concerns at this point with this piezometer reading.

#### 5.2 Lagoon C

According to the records, the free water pond in Lagoon C was at an approximate elevation of 1126 m prior to mid-2009 at the northeast corner. Thereafter, the free water pond elevation decreased to approximately 1125 m until mid-2011. In September 2011, the ponded water was noted at the southwest corner of Lagoon C while the one at the northeast location was dry. Since 2012, the entire Lagoon C has been recorded dry.

The instrumentation for Lagoon C consists of four nested pairs of vibrating wire piezometers and a series of six standpipes. Elkview has prepared five cross-sections (i.e., A, B, C, E and D from north to south, counter clockwise) for Lagoon C as shown in Appendix D. The cross-sections reported water levels from October





3rd, 2017. In 2017, three (99-01, C88-1 and OW-C2) of the six standpipes were reportedly dry while the readings of the C88-2 standpipe show stable and low water levels, similar to the 2016 levels. The other two (GT-9703A and GT-9703B) recorded water levels for 2017 show they are approximately 1.5 m below the surface elevation, no change from previous years. These two standpipes are located at the toe of Lagoon C and close to the Elk River. It is noted that the readings of the 3 non-dry standpipes (C88-2, GT-9703A and GT-9703B) show a peak of water level in May 2017 which were probably caused by higher river level during spring melt. These readings were consistent with expected performance and within the QPOs.

Three pairs of vibrating wire piezometers (i.e., VW23238/23242, VW23239/23243 and VW23244/23240) recorded negative readings throughout October 2016 to September 2017. Regarding to the remaining piezometer pair (VW23241 and VW23245), negative readings for VW23241 were recorded; whereas the recorded water levels of the VW23245 are well below (i.e., approximately 14.5 m lower) the ground surface and similar to previously recorded levels. Plots of piezometer and standpipe data for Lagoon C can be seen in Appendix D.

In the summer of 2015, Elkview Geotech group installed eight survey monuments (i.e., four pair-sets at four sections A-A, B-B, C-C and D-D) on Lagoon C to monitor lateral movement. Appendix D contains the GPS location map and the plot showing the results of the lateral movement survey. There have been insignificant movements observed for northing and easting directions. Movements have been within instrumentation accuracies and no significant trends have been observed.

#### 5.3 Lagoon D

Lagoon D contains a network of forty six active standpipe piezometers (excluding three broken ones D1, 99-02 and V01-01). Lagoon D also has eighteen vibrating wire piezometers, eight of which were installed at four locations as nested installations in 2012 (i.e., two piezometers at varying elevations). The other ten vibrating wire piezometers were installed per AMEC (2002) recommendations at three locations (i.e., four piezometers at varying elevations).

Elkview has prepared eight cross-sections for Lagoon D as shown in Appendix E. Plots of piezometer readings can also be found in Appendix E. The cross-section reported water levels in October 2017 indicate a well-drained system representing low pore pressures. The water level from sections C-C to F-F, is approximately 25 m lower than the crest surface. All piezometers have shown a steady decrease in water levels since 2012. The data also indicates the presence of downward gradients which suggest that the Lagoon is under drained by the soil below it; thus enhancing the overall stability of the Lagoon. It was noticed that water levels recorded at standpipe OW-7 located at the toe of Section E-E' was found to be slightly higher (i.e., at least 4 m higher) than water levels recorded at piezometers OW-6 and OW-9 located near the toe at the north and south of OW-7. The higher water level at the toe of section E-E' are not considered a stability issue. This could be due to the topography of the adjacent area, which requires further investigation.

Monitoring data from inclinometer Lagoon D North (LD\_N) and Lagoon D South (LD\_S) were reviewed as part of this DSI. Note that the base of the slope inclinometers are embedded in the foundation below Lagoon D. The cumulative displacement plots for the A-Axis and B-Axis are presented in Appendix E. Cumulative movements were recorded between February 2013 and August 2017 for both North and South locations. It is noted that the negative readings were assigned for the upslope movement.

The A-Axis for Inclinometer LD\_N showed overall movement measured to the top of the casing of about 25 mm to the upstream (southward), from February 2013 to August 2017. The B-Axis for Inclinometer LD\_N showed movements of approximately 27.5 mm to the east through this same period. It is noted that the baseline reading was revised and chosen as February 20, 2013. Despite the relatively significant level of

movement recorded there are no indications of discrete zones of movement and the lower displacement patterns are typical of minor settlement behaviour of the tailings along the casing.

Inclinometer LD\_S shows a similar movement pattern with 10 mm of overall A-Axis displacement recorded from baseline reading on March 19, 2013 to June 2017 to the upstream (northward). Movements recorded on the B-Axis showed movements of approximately 13 mm to the west through this same period.

The inclinometers are indicating that the tailings in the lagoon are consolidating and compressing and as they do so, the inclinometers tilt toward the middle of the pond.

In July 2015, eight sets of GPS survey points were installed at eight sections of Lagoon D, with 3 points (upper, middle and lower) for each set, except for section H-H' having only upper and lower points. The GPS readings have an accuracy of approximately +/-1.5 cm. Appendix E contains the plot showing the results of the lateral movement survey of those sets. There have been insignificant movements (within 0.025 m from the original location) observed for northing and easting directions for most of the survey points. The mid-D survey point shows movement (i.e., movement between 0.020 to 0.035 m from the original point). Regarding to the changes in elevation, the survey points elevations are found varying within a small range (i.e., maximum of 0.06 m (in March 2016) from the original elevation) and there are no confirmed trends of concern. These observations are well within the accuracy of the equipment.



# 6.0 Results of Dam Safety Inspection (DSI)

The site inspection/condition assessment was conducted for the WFTF, and Lagoons A, B, C and D on 17 June 2018. The inspections were carried out by Andy Small, P.Eng. and Michael Cyr, P.Eng., from Klohn Crippen Berger (formerly of Wood at the time of the site inspection), Adam Walker, Aaron Glover and Zane Leonard from Teck Coal. It is noted that since 2014, Andy Small, P.Eng. of Klohn Crippen Berger (formerly of Wood at the time of the site inspection), has been assigned as the Engineer of Record (EOR) for the facility. Adam Walker is the Tailings Storage Facility (TSF) qualified person at the site.

The visual inspection included, but was not limited to, observing the condition of the WFTF and the Lagoons for deficiencies, and potential or immediate concerns. Representative photographs of the WFTF and Lagoons A through D are presented in Appendices F to J, respectively.

When describing the structures and sites in this report, the standard orientation convention used in dam engineering was employed where the terminology "Left" and "Right" are used while looking in the downstream direction.

The following observations were noted during this inspection. Checklists that were completed as part of the DSI are included in Appendix K.

#### 6.1 General Observations

These general observations apply to the WFTF and Lagoons A to D:

- Vegetation including grass and shrubs were observed on the Lagoons but not on WFTF. Vegetation
  cover makes it difficult to observe cracks, localized slumps or movements, and animal burrows, if
  present. This was also noted in the 2013 DSR and past DSIs. There was no major slumping or
  movement observed on the slope of the Lagoons.
- Animal tracks and trails (likely Elk and Mule deer) were evident on the slopes of the Lagoons. These
  trails lead down the slopes to the river. With increased traffic these trails could create depressions,
  leading to erosion gullies. This was also noted in the 2013 DSR and past DSIs.

# **6.2** West Fork Tailings Facility

The following observations were made at the WFTF:

- Overall, the WFTF appeared to be in satisfactory condition.
- Active tailings discharge was occurring at the most eastern spigot line at the time of the site visit. There was good beach development taking place (Appendix F Photographs F3, F4, F5 and F8).
- Ponded water was located at the north section of the tailings facility against the Adit dump and natural hillsides with tailings beach spreading mostly at the southern side of the dump (Appendix F - Photographs F1 and F2). The beaching area is noted larger than in previous year. The tailings level was surveyed at about El. 1665 m in August 2018.
- Some braided flow channels were noted on the beach along the west side of the facility, near the toe of the Adit dump. The channels head from the spigot point towards the toe of the Adit dump and then run northward parallel to the toe (Appendix F Photograph F4). This could be an indication of tailings fines ingress into the dump rockfill (Appendix F- Photograph F9). This was also noted in the previous DSIs (since 2014 to now).



- A sign of tailings ingress into the adit dump was found at the southeast corner of the beach area, near the toe of the 2013 raised (left abutment area) (Appendix F Photographs F15 and F16).
- Erosion of the dump slope due to tailings discharge below the spigot lines was noted (Appendix F

   Photographs F11 and F12). It is recommended to continue using conveyor belts below the discharge lines to reduce erosion.
- Tension cracking along the Geho road, noticed in previous DSI reports was no longer present.
   However, a longitudinal crack was observed around spigot 5 during the 2018 site visit. (Appendix F Photograph F19).
- The crest and downstream slope of the 2013 development area at the east abutment showed no signs of settlement or movement and appeared to be similar to 2017 condition (Appendix F Photographs F14, F-17 and F-18). This was also noted in the 2017 DSIs.
- Standing water was noted at the extreme downstream toe of the Cowboy dump, roughly 450 m downstream of the crest centerline (Appendix F Photograph F20).

#### 6.3 Lagoon A

The following observations were made at Lagoon A:

- Overall, the Lagoon appeared to be in satisfactory condition.
- No new slumping and erosion has developed along the southwest section of the lagoon on either side of the previous armored overflow section since that section was filled with new riprap material at downstream slope in 2016. No active seepage exiting from the bottom of the new riprap placement section was noted.
- Several low spots and slumps along the slope on the north side of the lagoon noted in previous DSIs were not found in this DSI. Crest work along the northwest corner has removed many of these low spots.
- The spillway at the west face was upgraded with new rockfill material in 2016 (Appendix G Photographs G-4 to G-8).
- One discharge pipe was observed during the site visit. The pipe is located at the northwest section of the north slope of Lagoon A. The pipe had no dripping water at the time of the Site visit (Appendix G Photograph G-19).
- Two rockfill amoured outlets were observed at the west end of the north embankment of Lagoon A acting as overflow spillways (Appendix G Photographs G-14 to G-17).
- Water from Cossarini Creek discharges into the Lagoon through a pair of culverts at the east end of the facility (Appendix G Photograph G-2). Water was discharging through the lower culvert during the site visit (Appendix G Photograph G-10).

#### 6.4 Lagoon B

The following observations were made at Lagoon B:

• Overall, the Lagoon appeared to be in satisfactory condition - Photographs H-1 and H-2).

wood.

- The crest of the dam was not uniform and the elevation of the dam varies across its length (Appendix H Photographs H-9, H-10, H-11, H-14 and H-15). Erosion was noted on the north side of the lagoon (Appendix H Photograph H-3). This was also noted in the previous DSIs.
- Sand bags were placed at the southwest corner of the Lagoon to prevent overtopping of ponding water at this location. There is very little freeboard for storage of water on the surface of the Lagoon. The sand bags were in very poor condition and may not be effective (Appendix H Photographs H-9 and H-10). This was also noted in the previous DSIs.
- Cut trees located on the downstream and crest were left on the dam. This made it difficult to visually inspect the downstream slope of the dam (Appendix H Photographs H-12, H-14 and H-16). This was also noted in the previous DSIs.
- A discharge pipe was observed on the southeast section of the Lagoon. Recent discharge of water had occurred in the southeast corner of the Lagoon (Appendix H - Photographs H-17 and H-18). This was also noted in the previous DSIs.

#### 6.5 Lagoon C

The following observations were made at Lagoon C:

- Overall, the Lagoon appeared to be in satisfactory condition.
- Active placement of sediment excavated from site sedimentation ponds and sumps was in progress
  at northeast corner at the time of the inspection. The sediment was placed in the northeast corner
  of the lagoon adjacent to the access ramp and spread with a dozer (Appendix I Photographs I-1
  to I-4 and I-8). This was also noted in the previous DSIs.
- Grading of the access road regularly takes place on the crest of the Lagoon to remove ruts from vehicle traffic and provide a more trafficable surface. This was also noted in the previous DSIs. It is noted that the road below the trestle pipeline at the northeast corner is lower in elevation (Appendix I Photograph I-12).
- Erosion gullies were observed on downstream of north slopes, west, south and east slopes (Appendix I Photographs I-9 to I-11, I-13, I-22, I-24 and I-28). This was also noted in the previous DSIs.
- Ponded water was observed beyond the toe of the Lagoon at the east, south and west slopes, and southwest corner (Appendix I Photographs I-6, I-9, I-11, I-13, I-14, I-15 and I-27). However, no seepage was observed from the toe at those locations. Ponded water at the toe could be from underground seepage or from the local drainage area. This was also noted in the previous DSIs.
- The Elk River is located near the toe of the Lagoon and stretches from the north side of the lagoon around to the west side. (Appendix I Photographs I-1 to I-4). Riprap was noted along the toe, the condition of which does not appear to have changed since 2013 (Appendix I Photographs I-18, I-19, I-21 to I-23). The riprap covers a diversion culvert that drains the water from the pond at the south end of the lagoon and discharges into the Elk River (Appendix I Photograph I-20). The riprap also covers a natural gas pipeline routed along the edge of the Elk River (Appendix I Photograph I-21). Bedrock was noted on the bank of the Elk River at the water's edge. This was also noted in the previous DSIs.
- An overhead pipeline in the southeast corner of the Lagoon was previously used to transport tailings and as an emergency decant from Lagoon D to Lagoon C (Appendix I - Photographs I-2, I-



3, I-11 and I-12). Pipelines were also noted routed up the downstream slope on the north side of the Lagoon (Appendix I - Photograph I-26). This was also noted in the previous DSIs.

#### 6.6 Lagoon D

The following observations were made at Lagoon D:

- Overall, the Lagoon appeared to be in satisfactory condition (Appendix J Photographs J-1 to J-6).
- Lagoon D is an active tailings disposal facility and several cells were prepared to receive tailings on the dam crest (Appendix J - Photographs J-1 to J-3, J-6, J-7 and J-8). The crest of the dam was uniform (Appendix J - Photographs J-9, J-31 and J-32). These were also noted in the previous DSIs.
- It is noted that dry tailings were placed on the surface of the west side, outside of the tailings cells area (Appendix J - Photographs J-1, J-2, J-4, J-5 and J-24).
- Erosion gullies and local slumps on the downstream slopes were evident at some locations and are likely the result of runoff from the embankment crest and/or top of benches (Appendix J -Photographs J-10, J-13, J-15, J-16, J-18, J-25, J-26, J-28, J-29 and J-33). Erosion gullies are considered minor. Erosion gullies and local slumps were also noted in the previous DSIs.
- Several local sinkholes were found at the upstream crest, area within the southwest fencing area (Appendix J – Photograph J-27). This may be due to the thaw consolidation of tailings that were placed in winter months. These sinkholes were noticed in the 2016 and 2017 DSIs and later found that the sinkholes have likely existed for a few years after comparing photos from past years. Some sinkholes were infilled before the 2018 DSI visit. The wind control fencing has deformed in some areas near the sinkholes. These are not considered a concern with respect to the safety of the dam as they are internal and in the tailings beach. This was also noted in the previous DSIs.
- Two seep areas were identified on the north slope (Appendix J Photographs J-10 to J-12). These were also noted in the 2017 DSI.
- Trees located on the downstream slope were cut in 2013 and left on the dam along the north section of the Lagoon (Appendix J - Photographs J-11, J-14, J-16 and J-18). This was also noted in the previous DSI.
- Standing water was observed at the toe of the dam along the northern sections of the Lagoon (Appendix J - Photographs J-16 to J-18). This was also noted in the 2013 to 2017 DSI. This area corresponds to the Otto Creek drainage and includes the Otto Ponds however it is unclear whether there is a seepage component contributing to the water. Such a seepage component would likely be insignificant based on review of piezometric data which suggests a well-drained structure as noted above.
- Animal burrows and beaver activities were noticed at the toe next to the standing water pond of the north dam (Appendix J - Photographs J-18 to J-20). An animal burrow was also found at the toe of the south dam (Appendix J - Photograph J-33).

# 7.0 Dam Safety Assessment

#### 7.1 Dam Classification

There were no observations made during the 2018 DSI that suggested that the consequence classifications for the dams should be changed.

#### 7.1.1 West Fork Tailings Facility

In essence, the WFTF is a depression formed between the West Fork Dump to the south, the Adit Dump to the west and natural ground to the north and east (i.e., Cowboy Ridge). In 2013, EVO placed additional rockfill in the east end of the West Fork Dump to increase the dump containment to an elevation of 1679.5 m (AMEC, 2014), known as the West Fork expansion. Dam classification for WFTF was conducted in June 2016 (Amec Foster Wheeler, 2016c). According to the 2016 WFTF dam classification, once the tailings level reaches El. 1660 m, the WFTF will begin to act as a dam and the WFTF will be designated with appropriate "Low" consequence rating under CDA Guidelines for both fair-weather and flood-induced failure conditions (Amec Foster Wheeler, 2016c). As of early 2017, the WFTF currently meets the standard definition of a "dam" under the CDA Guidelines since the beach reached to 1662 m elevation. Moreover, the 2016 WFTF dam classification indicates that for the final tailings configuration (i.e., crest level of El. 1710 m), WFTF will also be designated with a "Low" consequence classification for both failure events.

It is noted that the consequences of failure would likely be limited to reputation/regulatory and internal to Elkview as the even more massive Mid Dump and Erickson Dump (built across the entire Erickson Valley about 2 km downstream) provides substantial secondary containment against a breach of the WFTF (AMEC, 2010).

#### 7.1.2 Lagoons A and B

Lagoons A and B were only used during mine start-up and are essentially coincidental with the natural ground. Water from plant operations is sometimes discharged to Lagoon B during emergency situations and plant maintenance activities. Lagoons A and B are defined as Tailings Storage Facilities dams under the HSRC guidelines. Under the CDA Guidelines the consequence classification for Lagoons A and B are considered as "Low".

#### 7.1.3 Lagoons C and D

Under the CDA Guidelines, Lagoon C has been designated with a "High" consequence classification for both sunny day conditions and flooding events as outlined in the 2013 DSR. Lagoon D has been designated with a "High" consequence classification under sunny day conditions and a "Very High" consequence classification under flooding events.

#### 7.2 Review of the Downstream and Upstream Conditions

As noted above, there has been no change in these conditions that would warrant a change in classification.

#### 7.3 Hazard and Failure Modes Review

These were reviewed in general terms for the Lagoons C and D as part of the 2013 DSR (AMEC 2013b) and it was determined that there was sufficient margin of safety to adequately manage the risk of the typical major failure modes or hazards such as slope instability or overtopping. The failure modes for Lagoons A and B have not been formally assessed and, as indicated above there is a concern with respect to overtopping of the berms. Early 2016, Elkview constructed a new spillway on Lagoon A to address this



concern. Lagoon B does not have a constructed spillway, so meteorological is considered as a hazard to Lagoon B and this is identified as a concern. The Overtopping Study completed in 2018 recommended Lagoon B be enhanced by expanding the existing sump located at the lagoon's southeast corner and adding an armoured spillway at the lagoon's southwest corner.

As of early 2017, the WFTF became classified as a tailings dam. According to the Dam Classification of WFTF (Amec Foster Wheeler, 2016c), regardless of the major failure modes or hazards such as seismic, internal erosion or overtopping during a flood event, the release of tailings and water from the breach of WFTF could flow downstream to the Erickson Valleys but then would be impounded by Erickson Dump.

Elkview reports information on overall site water quality in a separate document to the Ministry of Environment (MOE).

#### 7.4 Operational Performance

Table 7.2 summarizes the operational performance of the structures based on discussions with Elkview staff and a review of the OMS procedures, monthly inspection reports and instrumentation data provided.

**Table 7.2 Summary of Operational Performance** 

rable 7.2 Sammary of Operational Continuates						
Structure	Instrumentation	Operational Procedures	Maintenance			
WFTF	Satisfactory	Satisfactory	Satisfactory			
Lagoon A	N/A	Satisfactory	Satisfactory			
Lagoon B	11//1	Satisfactory	Satisfactory			
Lagoon C	Satisfactory	Satisfactory	Satisfactory			
Lagoon D	Satisfactory	Satisfactory	Satisfactory			

#### 7.5 Review of OMS, EPP and ERP Manuals

The Operation, Maintenance and Surveillance (OMS), Emergency Preparedness Plan (EPP) and Emergency Response Plan (ERP) Manuals have been frequently updated for the tailings facilities and Elkview continues to do so with the assistance of Wood.

The OMS Manuals have been frequently updated for the facilities. In March 2015, an update to the OMS Manual was issued for Lagoons A, B, and C; the OMS Manual for all three lagoons was combined into one document under the title "Inactive Tailings Facilities". A separate OMS Manual was updated for Lagoon D and the active WFTF in 2018 and will be finalized in 2019. Based on the review conducted as part of the 2018 DSI, these manuals are generally complete and cover most of the important elements, including management roles and responsibilities, for safe operations. Elkview continues to review these manuals annually and provide updates when required.

The Lagoon D combined Emergency Preparedness Plan (EPP) and Emergency Response Plan (ERP) manual was updated in October 2014. The Lagoon A, B, and C EPP/ERP manual was also updated in October 2014; for this update, similar to the OMS, all three lagoons were combined into one document under the title "Inactive Tailings Facilities". A tabletop test of the Lagoon D ERP was performed by Elkview on 28 January 2014. The manuals are generally complete and cover most of the important elements, including management roles and responsibilities, for safe operations. Another table top testing exercise will be conducted in 2019 for the facilities and if required, the EPP/ERP will be updated pending the results of the table top.



#### 8.0 2018 DSI Conclusion and Recommendations

The WFTF and Lagoons A, B, C and D are considered to be satisfactory condition. The dams conform to the BC HSRC and, where appropriate, and the CDA guidelines. The current surveillance program is adequate and should continue to be followed. In addition to the ongoing monitoring and surveillance as per the OMS manuals, recommendations for the continued safe operation of the tailings facilities are provided in Table 8.1. These recommendations pertain to studies or actions beyond the current OMS structure. Recommendations from the 2013 DSR and past DSIs with comments on the status for each recommendation are also provided in Table 8.1. Each recommendation is assigned a number with the prefix based on the year that item was recommended. Previous recommendations duplicating surveillance requirements of the OMS Manuals have been closed and removed from Table 8.1.

The priority for each recommendation has been re-evaluated as of September 2018 based on the priority levels descriptions in the HSRC guidance document:

**Priority 1:** A high probability or actual safety issue considered dangerous to life, health or the environment, or a significant risk of regulatory enforcement.

**Priority 2:** If not corrected could likely result in safety issues leading to injury, environmental impact or significant regulatory enforcement; or, a repetitive deficiency that demonstrates a systematic breakdown of procedures.

**Priority 3:** Single occurrences of deficiencies or non-conformances that alone would not be expected to result in safety issues.

**Priority 4:** Best Management Practice as a suggestion for continuous improvement towards industry best practices that could further reduce potential risks. This may include planned or ongoing construction items that require specific monitoring.

As noted in Table 8.1, there are nine recommendations made for the continued safe operation of the facilities and three recommendations (2017-01, 2015-01, and 2014-07) are closed in this year DSI period. The remaining six of the previous recommendations are still applicable and ongoing. There are no Priority 1 recommendations that would indicate an imminent threat to dam safety and the majority of the recommendations pertain to non-urgent non-compliances and opportunities for improvement. It is noted six recommendations (2013-01, 2014-05, 2013-06, 2013-07, 2013-10 and 2013-12) were closed in the 2017 DSI period and therefore, removed from Table 8.1.



Table 8.1 **Summary of Recommendations** 

		able 0.1 Suill	mary or Recommendations				
No.	Recommendation Description	Source of Recommendation	2018 Comments and Recommended Actions	Deficiency or Non-Con- formance	Applicable Regulation or OMS Reference	Priority Level	Recom- mended Timeline/ Status
	General Recommendations for All Structures						
2014-01	A detailed risk assessment (failure modes and effects analysis) should be undertaken for the facilities to better catalogue and assess the risks.	2014 DSI	The risk assessment for Lagoons C and D was conducted in 2017. Final report issued in 2018.  A risk assessment was conducted for WFTF in 2018. Final report to be issued in 2019.	Deficiency	N/A	4	Closed
	West Fork Tailings Facility	-		<del>-</del>		=	<del>-</del>
2017- 01	The 2D model should be revisited every other year and calibrated to piezometer readings to reestimate hydraulic gradients at closure.	2017 DSI	The 2-D seepage model was conducted in 2017, it was updated with instrumentation readings and finalized in 2018.	N/A	N/A	N/A	2020
			The seepage model should be revisited in 2020.				
2017- 02	The current water balance model should be upgraded to include the increases of the tailings surface and dam crest over time up to the ultimate configuration. An assessment should be conducted to determine if WFTF can contain water under the 72 hour PMP flood event.	2017 DSI	The current water balance model should be updated.	Non-con- formance	N/A	2	2020
	Lagoon B						
2015- 01	Assess the potential for overtopping the dam containing Lagoon B and determine if remedial measures are required.	2015 DSI	Lagoon B Inundation Memo and Spillway Design completed in 2018 and will be finalized in 2019.	N/A	N/A	N/A	2019
	Lagoon C						

Project # TE183022 | 3/25/2019 wood.

No.	Recommendation Description	Source of Recommendation	2018 Comments and Recommended Actions	Deficiency or Non-Con- formance	Applicable Regulation or OMS Reference	Priority Level	Recom- mended Timeline/ Status
2013- 02	Investigate possible removal of the overhead pipelines located in the southeast corner of the Lagoon as identified in the risk assessment. The wood structure could deteriorate over time creating voids in the Lagoon embankment.	2013 DSI	This recommendation is still applicable.	Deficiency	N/A	3	end-2019
2013-03	Along the shoreline of the Elk River, the grading, riprap material weathering, soil erosion and the existence of a filter zone under riprap needs to be assessed in the design evaluations.	2013 DSR	This recommendation is still applicable. The 2014 DSI report indicated that this should be done in 2016, but the deferral to 2019 is considered acceptable because of the low expected risk of significant erosion at this location.	N/A	N/A	4	2019
2013- 08	Per 2007 CDA guidelines, the next DSR for Lagoon C will be due in seven years (2020).	2013 DSR	EVO is completing the DSR in 2018 as HSRC (MEM 2017) requires DSR every five years.	N/A	HSRC	4	2023
	Lagoon D			-	-		_
2014- 07	The unused pipes/culverts including the unused buried pipes should continue to be monitored with problematic pipes removed or suitably plugged/grouted in place as directed by the EOR. The surveillance and maintenance sections of the OMS Manual should be updated accordingly.	2014 DSI	This recommendation can be closed in 2019.  OMS was updated in 2018 to include surveillance and maintenance of pipes and culverts. To be finalized in 2019.	N/A	N/A	N/A	Closed
2013-13	Per 2007 CDA guidelines, the next DSR for Lagoon D should be performed in five years	2013 DSR	EVO is completing the next DSR in 2018 as HSRC (MEM 2017) requires DSR every five year.	N/A	HSRC	4	2018



# 9.0 Limitations and Closing Remarks

This report was prepared by Tracey Germon, P.Geo., (registered in the Province of New Brunswick) and reviewed by Andy Small, P,Eng. (registered in the Province of British Columbia) (Klohn Crippen Berger) who is the Engineer of Record for the facility.

This report is for the exclusive use of Teck Coal Limited - Elkview Operations, for specific application to the area within this report. Any use which a third party makes of this report, or any reliance on or decisions made based on it, are the responsibility of such third parties. Wood accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report. It has been prepared in accordance with generally accepted geotechnical engineering practices. No other warranty, express or implied, is made.

Wood Environment & Infrastructure Solutions, a Division of Wood Canada Limited

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MAR. 19/19

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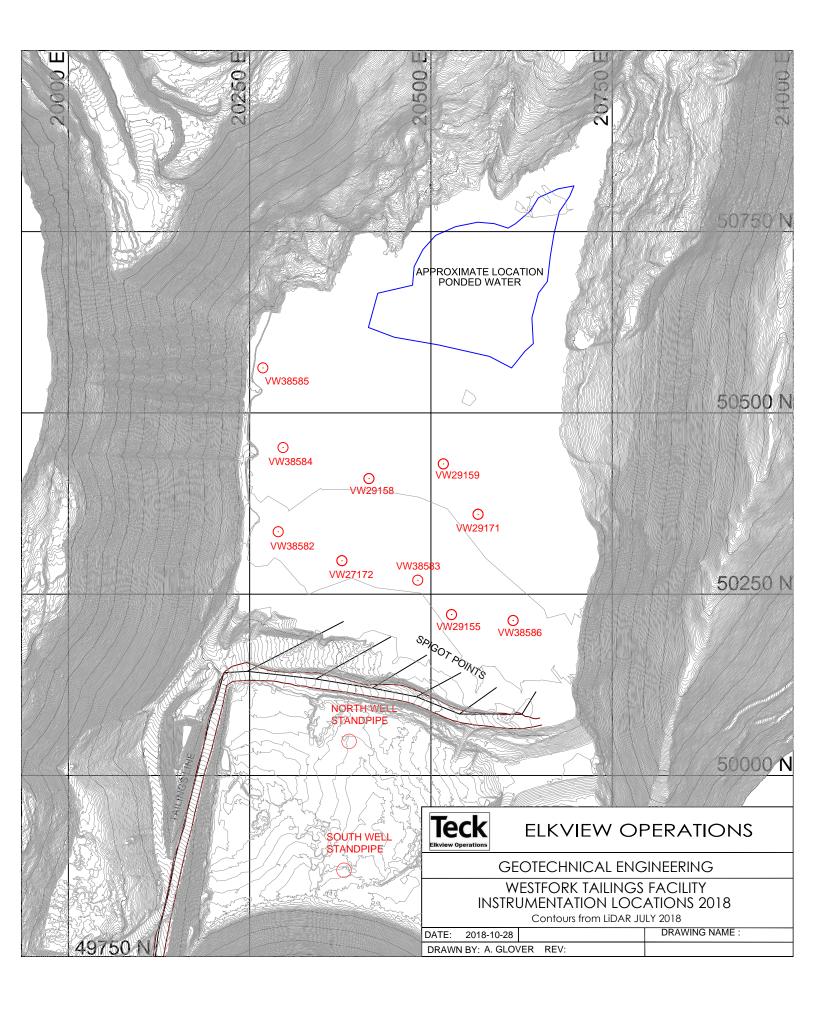
Project # TE183022 | 3/25/2019 Page 2

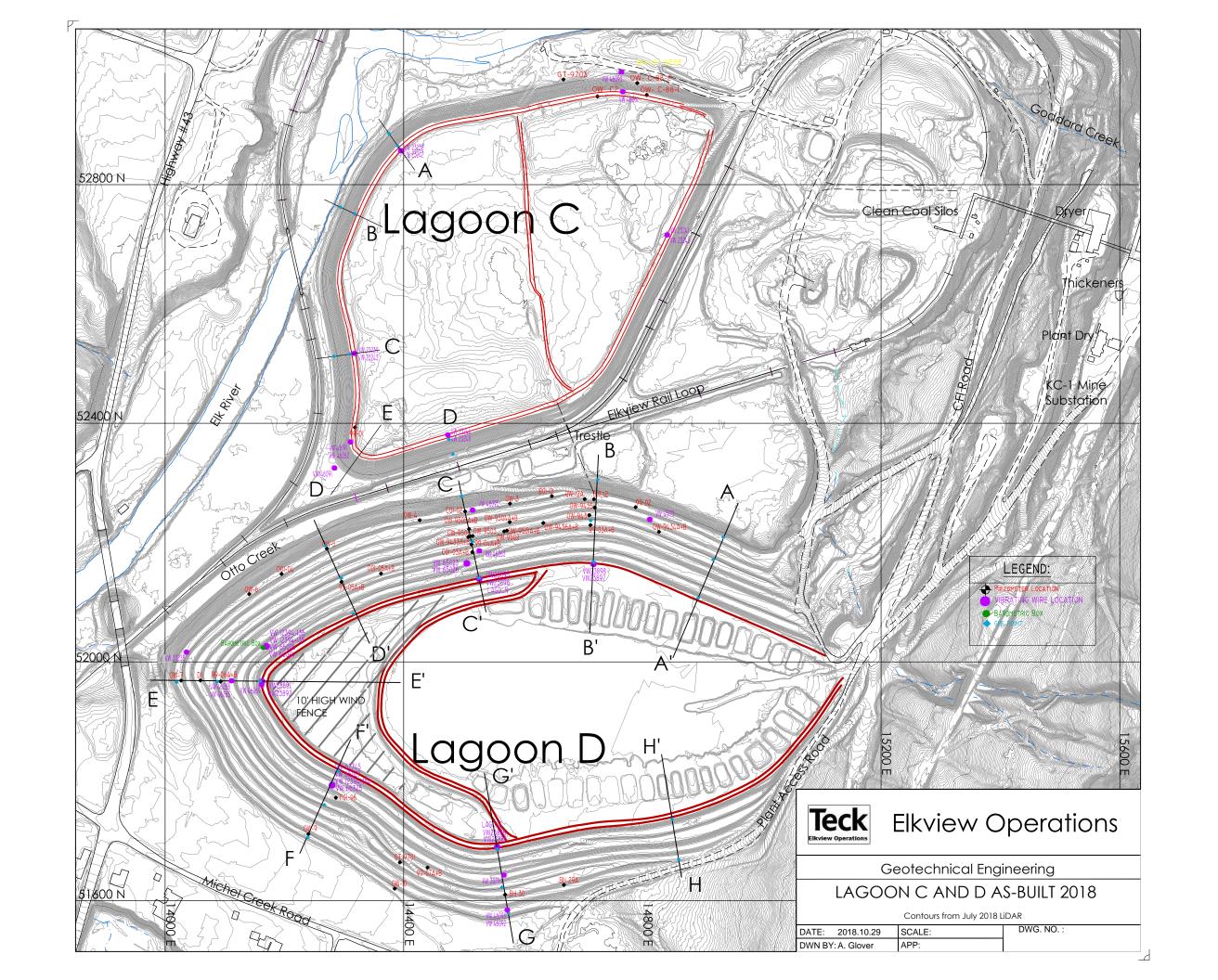


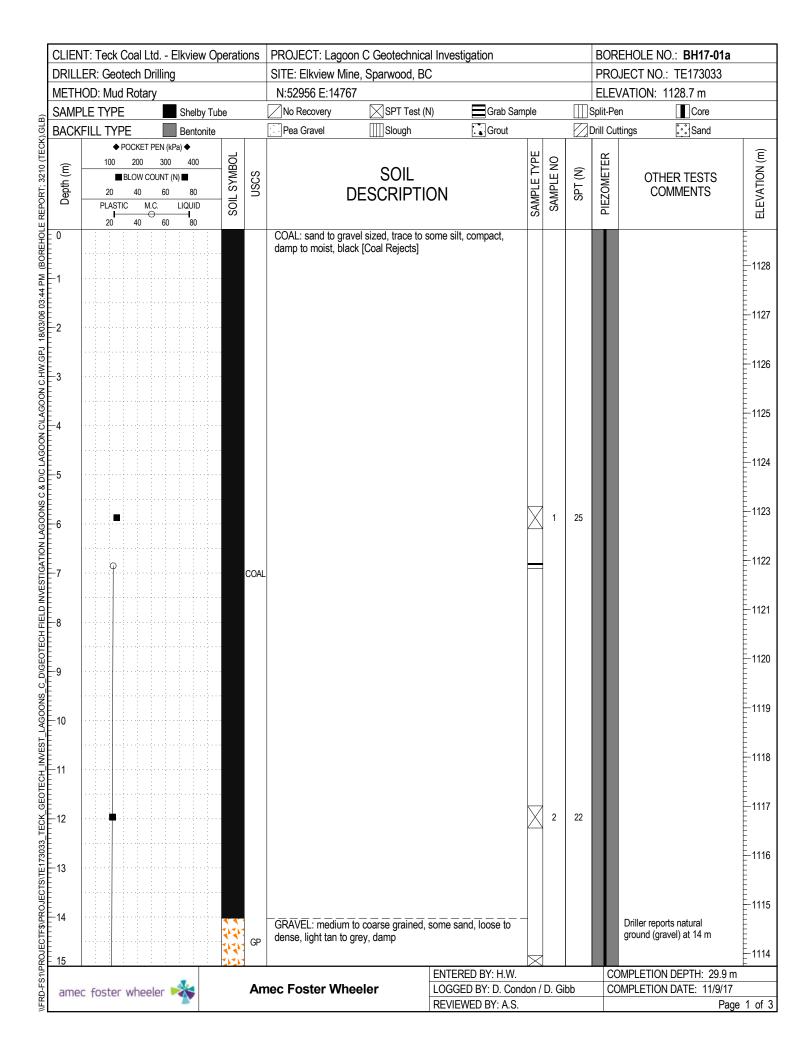
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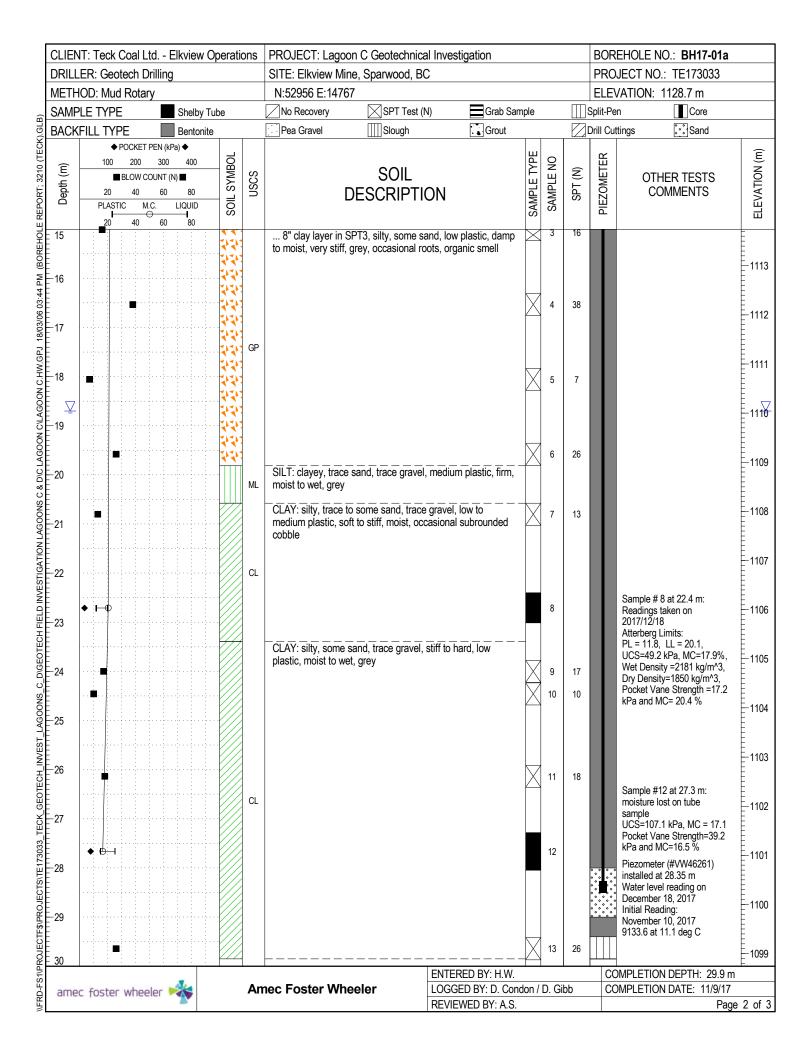
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## Appendix A Supporting Documents

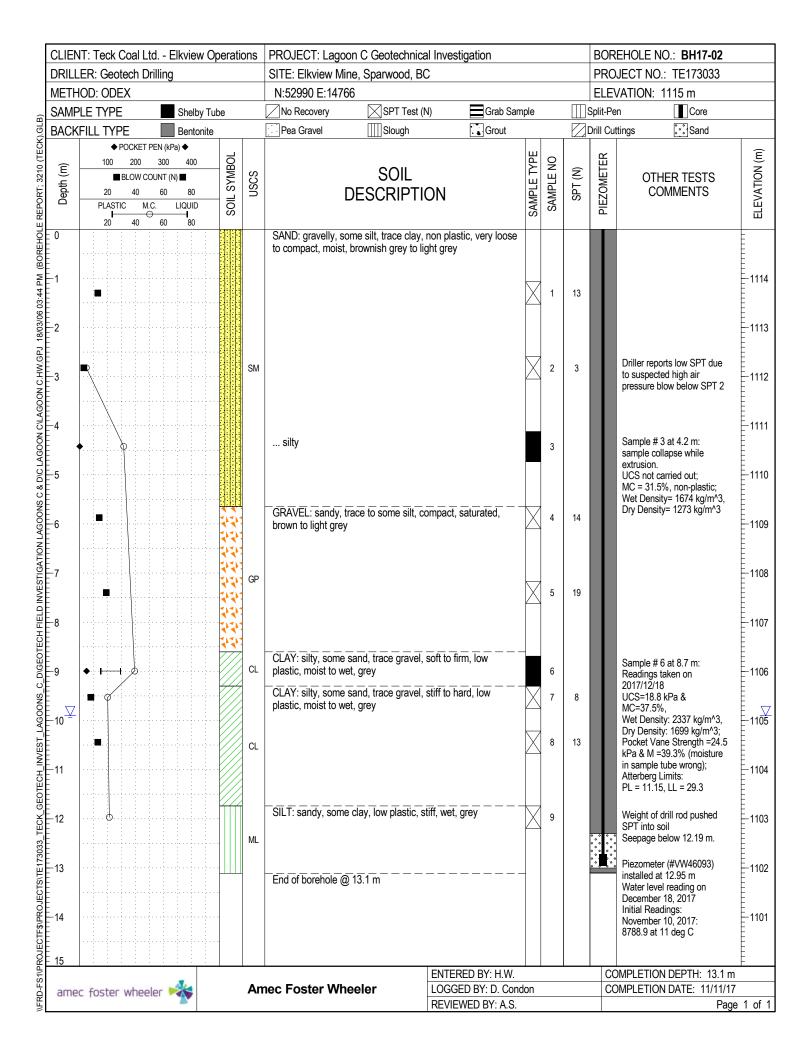




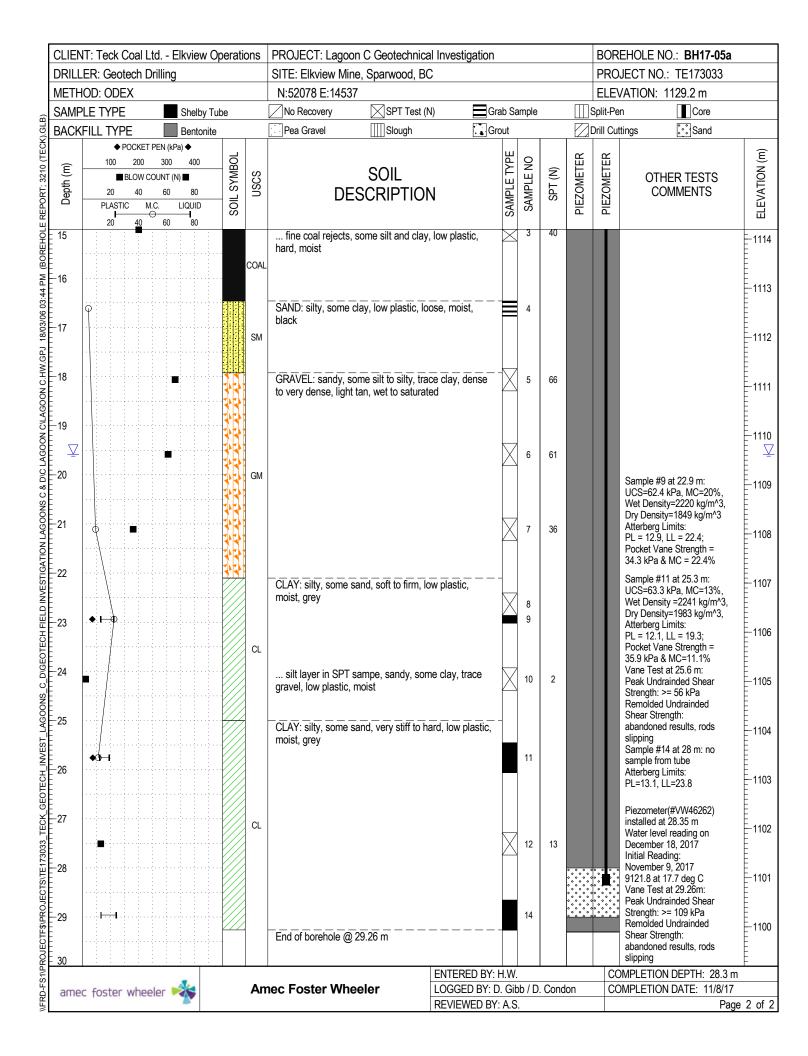


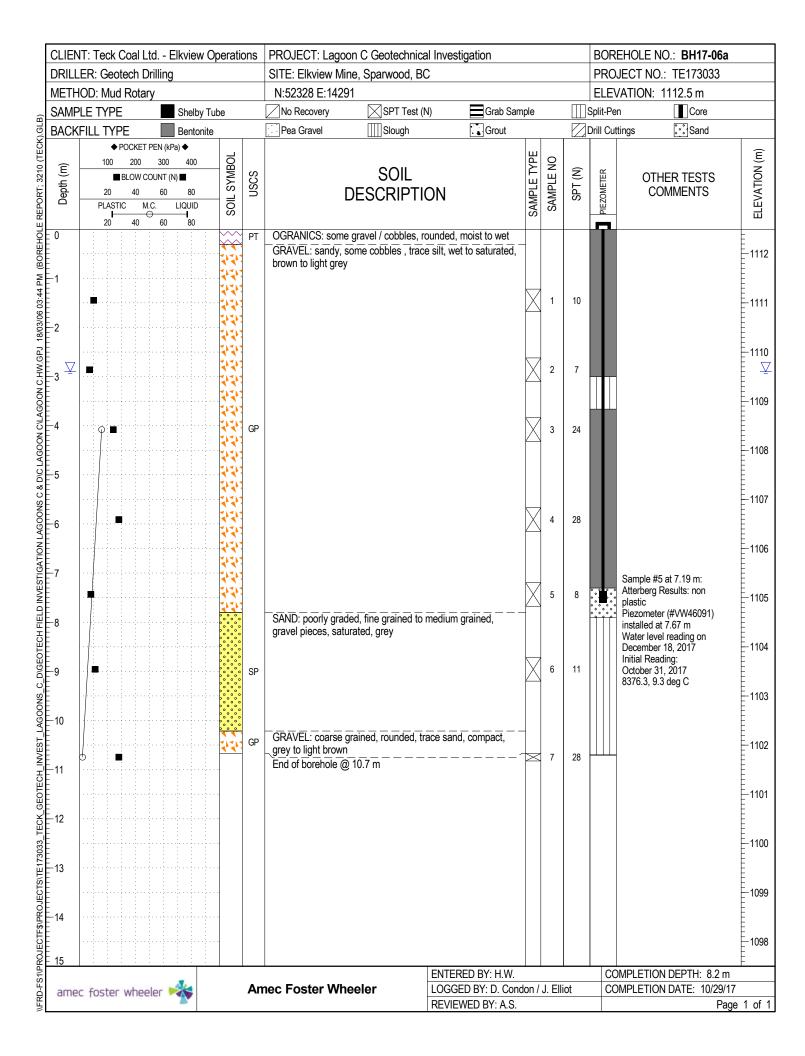


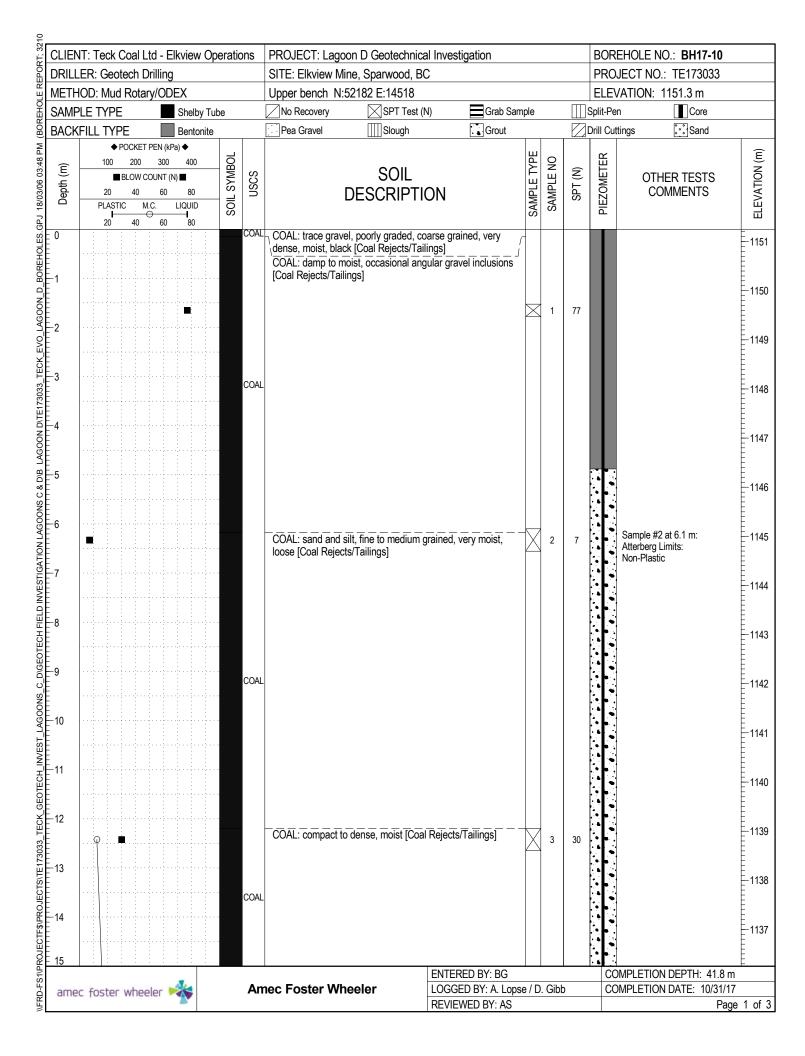
	T: Teck Coal Ltd Elkview Opera	tions	PROJECT: Lagoor							OLE NO.: <b>BH17-01a</b>	
	ER: Geotech Drilling		SITE: Elkview Mine		;					CT NO.: TE173033	
	OD: Mud Rotary		N:52956 E:14767							TON: 1128.7 m	
SAMPL	LE TYPE Shelby Tube		No Recovery	SPT Test (N		nple			Split-Pen	Core	
BACKE	FILL TYPE Bentonite		Pea Gravel	Slough	Grout				Orill Cutting:	s Sand	
BACKF (m) updag	◆ POCKET PEN (kPa) ◆ 100 200 300 400  ■ BLOW COUNT (N) ■ 20 40 60 80  PLASTIC M.C. LIQUID 1 0 0 0 80  □ 1 0 0 0 0 80	SOSN	D End of borehole @ 2	SOIL ESCRIPTIO	DN	SAMPLE TYPE	SAMPLE NO	SPT (N)	PIEZOMETER	OTHER TESTS COMMENTS	ELEVATION (m)
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31											1097
33 34 35 36 37 38 39 40 41 41 42 44 45											1096
34											-1095 
35											1094
36											1033
-37											1091
38											1090
39   ·											1089
40   ·											1088
-41 ·											1087
42											1086
-43											1000
44											1003
amec	foster wheeler	Am	nec Foster Whe		ENTERED BY: H.W. LOGGED BY: D. Cond REVIEWED BY: A.S.	don / I	D. Gib	b	_	LETION DEPTH: 29.9 m LETION DATE: 11/9/17	F



CLIENT: Teck Coal Ltd Elkview	Operations	PROJECT: Lagoon C Geotechnic	al Investigation		BOREHOLE NO.: BH17-	)5a
DRILLER: Geotech Drilling		SITE: Elkview Mine, Sparwood, B	С		PROJECT NO.: TE17303	3
METHOD: ODEX		N:52078 E:14537			ELEVATION: 1129.2 m	
SAMPLE TYPE Shelby 1		No Recovery SPT Test				
BACKFILL TYPE Bentonit  ◆ POCKET PEN (kPa) ◆	te	Pea Gravel Slough	Grout		Drill Cuttings Sand	
E 100 200 300 400  ■BLOW COUNT (N) ■ 20 40 60 80  PLASTIC M.C. LIQUID 20 40 60 80	SOIL SYMBOL	DEGOTAL TIO	S	SAMPLE NO SPT (N) PIEZOMETER	DTHER TESTS COMMENTS COMMENTS	ELEVAT
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amec foster wheeler	A	mec Foster Wheeler	ENTERED BY: H.W. LOGGED BY: D. Gibb REVIEWED BY: A.S.	o / D. Condon	COMPLETION DEPTH: 2: COMPLETION DATE: 11/	

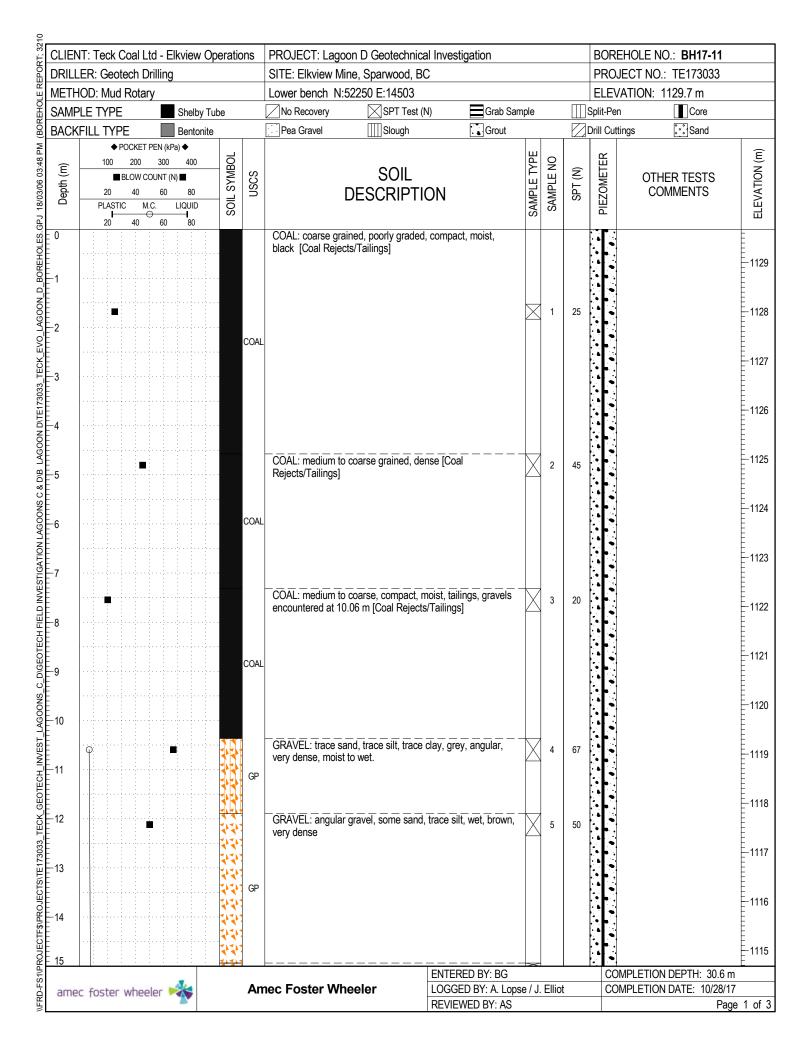






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DRILL						<b>.</b>	<u> </u>		SITE: Elkview Mine, Sparwood, B							DJECT NO.: TE173033	
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			<b>→</b> ■		:			SP	SAND: trace silt, poorly graded, fine (	grained, dense, v	wet,	X	6	46	•	•	Ē
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			. <u>.</u>						COAL	greyish brown silty clay, some sand, Rejects/Tailings]	trace gravel [Coal				<b>.</b> •	Non-Plastic Hydrometer: Sand: 73%,	F1
						:				rajoota raiiingaj						Silt: 26%, Clay: 1%	E
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40	:		:			:	-	11	GP	√with brown		H					F
42			· · : · · ·						GP	SAND: silty, fine grained, trace clay,	low plasticity, stiff,	[				Piezometer (#VW46263)	E <sub>1</sub>
			- <del>:</del>	: :		į				GRAVEL: coarse grained sandy do	mp vory donos light					installed at 42 m Water level reading on	Ė,
12										GRAVEL: coarse grained, sandy, da brown (limestone)	mp, very dense, light					December 18, 2017	E
43										GRAVEL: fine to coarse grained, sor	me coarse grained					Initial Reading: October 31, 2017	E_1
ł			j							sand, grey, saturated.						9048.7, 20.2 deg C	Ĕ.
11										End of borehole @ 41.76 m							E
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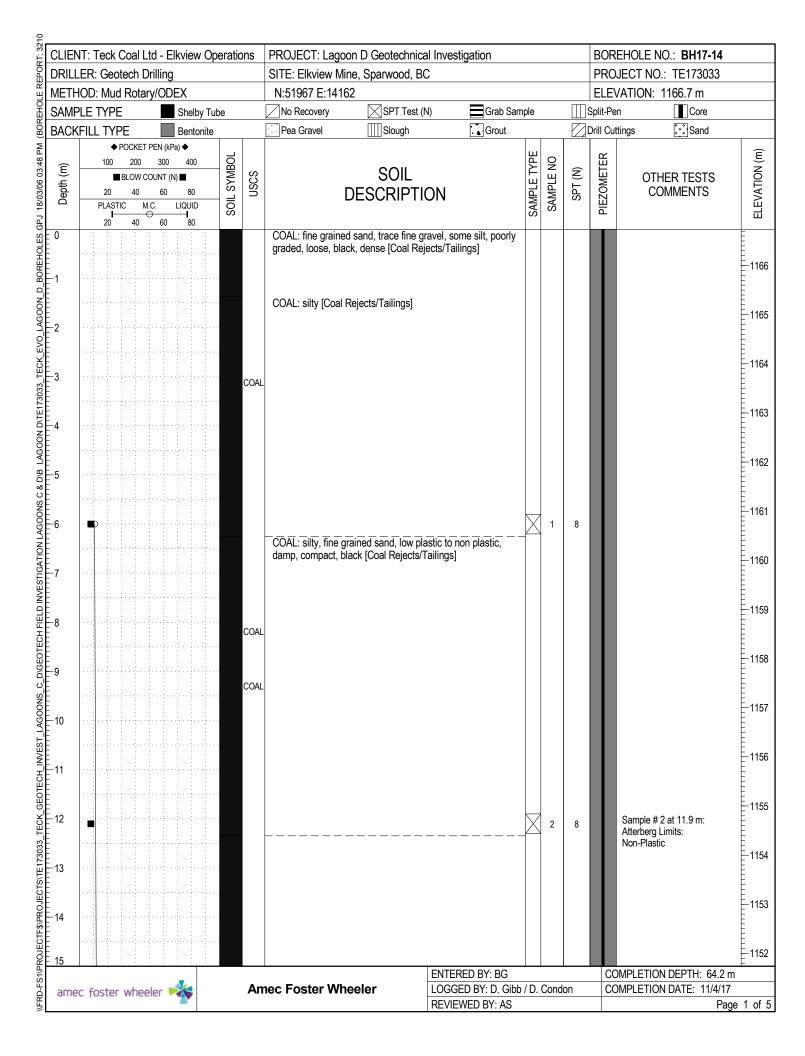


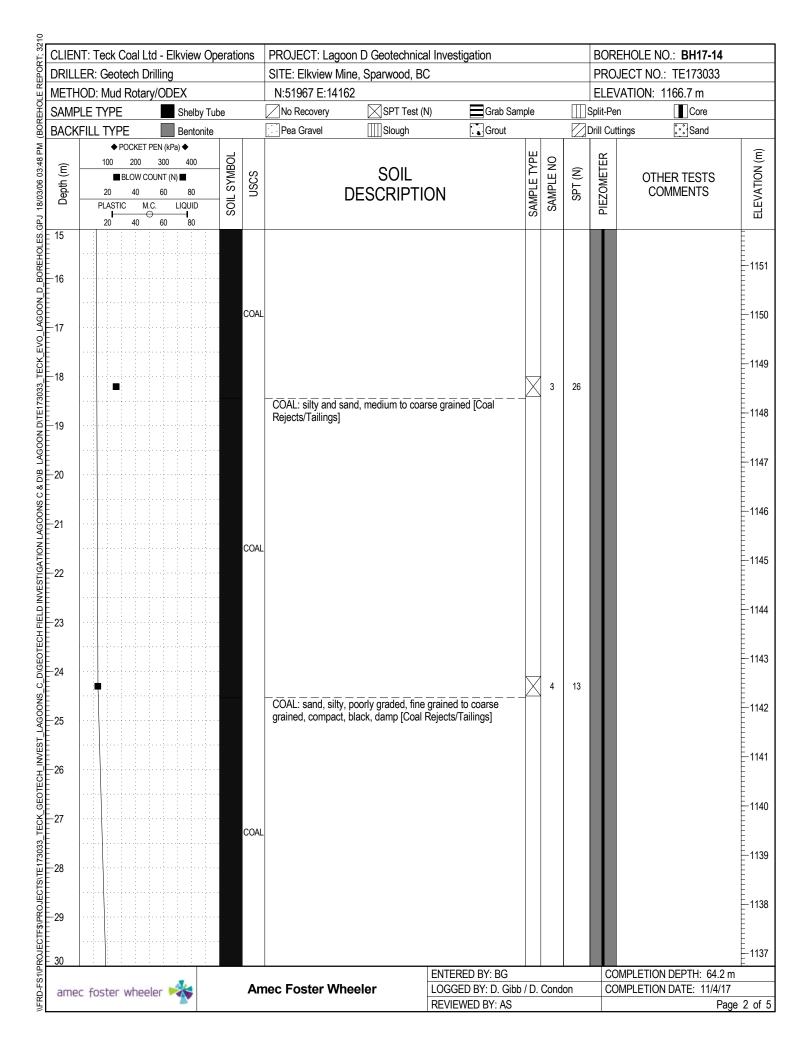
CLIEN	NT: Teck Coal Ltd - Elkview	/ Operation	ns	PROJECT: Lagoon D Geotechnica	Investigation			BOF	REHOLE NO.: BH17-11	
DRILL	ER: Geotech Drilling			SITE: Elkview Mine, Sparwood, BC				PRO	DJECT NO.: TE173033	
METH	IOD: Mud Rotary			Lower bench N:52250 E:14503				ELE	VATION: 1129.7 m	
SAMP	PLE TYPE Shelb	y Tube		✓ No Recovery ✓ SPT Test (N	Grab Sam	ple		Split-Po	en Core	
BACK	FILL TYPE Bento	nite		Pea Gravel Slough	Grout		7	Drill Cu	uttings :: Sand	
(m) Hopth (m)	◆ POCKET PEN (kPa) ◆ 100 200 300 400  ■ BLOW COUNT (N) ■ 20 40 60 80  PLASTIC M.C. LIQUID	SOIL SYMBOL	nscs	SOIL DESCRIPTIO	DN	SAMPLE TYPE	SAMPLE NO SPT (N)	PIEZOMETER	OTHER TESTS COMMENTS	EI EVATION (m)
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-16		77 77 77 77	GP	very dense, drilling became easier at 1 ground.	5.85 m at natural					-11
-17 -18 -19 -20   -21 -22 -23 -24 -25			SM	SAND: medium to fine grained, some s compact, wet to saturated, brown	ilt, trace gravel,	X	7 11			-11
-18 -18		**************************************		GRAVEL: some sand, trace silt, very d grey, angular	ense, wet, brownish		8 69		Sample # 8 at 17.98 m: Atterberg Limits: Non-Plastic	
-19 -		**** *** *** ***	GP							1
-20∑		*** *** **							Piezometer (#VW46095) installed at 20.42 m	1
-21 -22	<b>■</b> Φ			CLAY: trace gravel, low plasticity, loos brown, wet	e to compact, greyish		9 10		Water level reading on December 18, 2017 Initial Reading: October 29, 2017 8542.2; 8.6 deg C	-1
-23			CL			, ,			Vane Test at 22.56 m Peak undrainded shear strength: 123 kPa	1
-24				CLAY: trace gravel, low plasticity, loos	a to compact wet to		10		Remolded undrained shear strength: 73 kPa Shelby Tube at 23.01 m: no recovery	1
-25	• •		CL	saturated  CLAY: trace gravel, low plasticity, loos compact, grey			11   10 I2A		Sample # 11 at 24.08 m : Atterberg Limits: LL = 22.6, PL = 13.3, Pl = 9.3, "CL" Shelby Tube at 24.99 m:	1
-26			CL			X .	12B		clay; tube hit cobble at bottom; recovery of 15 in Sample # 12A at 24.99 m:	1
-27	ŀĊ■			CLAY: trace gravel approx. 2 cm diame	eter, high plasticity,		13 24		Atterberg Limits: LL = 26.3, PL = 14.8, Pl = 11.5, CL Pocket Vane Shear Strength: 39.2 kPA, MC:	1
-28			CL	wet to saturated, compact					15.9% Hydrometer: Gravel: 45%, Sand: 23%, Silt: 23%, Clay: 9% Sample 12B at 25.39 m:	1
-27 -28 -29 -30									Atterberg Limits: LL = 25.7, PL = 15.2, PI = 10.4, "CL" Hydrometer:	1
์ วก		177	GP	GRAVEL: cobbles, harder drilling					Sand: 2%, Silt: 74%, Clay: 24%	-11
00					ENTERED BY: BG			C	OMPLETION DEPTH: 30.6 m	<u> </u>
amo	c foster wheeler 💸		An	<u> </u>		e / J. E	Elliot			
	L JUSTEL MIRERE			nec Foster Wheeler  LOGGED BY: A. Lopse / J. Elliot  REVIEWED BY: AS				COMPLETION DATE: 10/28/17 Page 2		

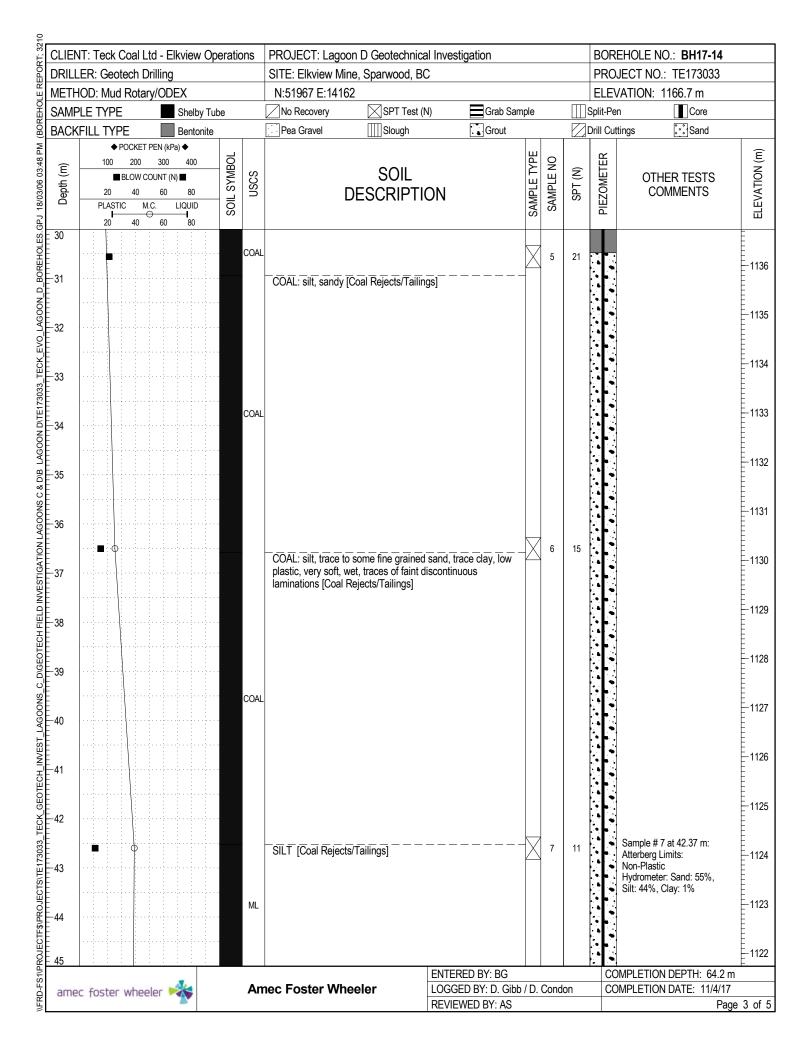
3210													
SRT;	CLIENT	T: Teck Coal Ltd		eratio	ns	PROJECT: Lagoon D Geotechnical						EHOLE NO.: BH17-11	
REP(	DRILLE	ER: Geotech Dril	ling			SITE: Elkview Mine, Sparwood, BC						JECT NO.: TE173033	
10LE	METHO	OD: Mud Rotary	<b>—</b>			Lower bench N:52250 E:14503		_		ПП,		VATION: 1129.7 m	
SREP FILE	SAMPL	LE TYPE	Shelby Tub	be		No Recovery		pie			Split-Pe		
M (B(	BACKE	FILL TYPE  POCKET PE	Bentonite			Pea Gravel Slough	Grout			الكا	Orill Cut	ttings Sand	
18/03/06 03:48 PI	CLIENT DRILLE METHO SAMPL BACKF  (E) 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	100 200 ■ BLOW COU 20 40 PLASTIC M.C.	300 400 INT (N) ■ 60 80	SOIL SYMBOL	nscs	SOIL DESCRIPTIO	N	SAMPLE TYPE	SAMPLE NO	SPT (N)	PIEZOMETER	OTHER TESTS COMMENTS	ELEVATION (m)
GB.		20 40	60 80	S				တ			ш		
D BOREHOLES.	30				CL	CLAY: trace gravel, low plasticity, grey, compact End of borehole @ 30.63 m	wet to saturated,	X	14	25		Sample # 14 at 30.18 m: Atterberg Limits: LL = 22.2, PL = 13.6, PI = 8.6, CL	1099
EVO_LAGOON_[	-32												1098
173033_TECK_	-33												-1097 
3 LAGOON D\TE	34												1095
AGOONS C & DV	-36												1094 
/ESTIGATION L	-37												1093
TECH FIELD IN	-38												1092
ONS_C_D\GEC	39												-1091     1090
H_INVEST_LAG(	-40 41												1089
TECK_GEOTEC	-42												1088
ECTS/TE173033_	-43												-1087
ROJECTF\$\PROJE	-40 -41 -42 -43 -44 -45												-1086             
S1/PI			_				ENTERED BY: BG					DMPLETION DEPTH: 30.6 m	
20-F	amec	foster wheele	er 🙀		An		LOGGED BY: A. Lopse	e / J.	Elliot		CC	OMPLETION DATE: 10/28/17	
正月							REVIEWED BY: AS				- 1	Pag	e 3 of 3

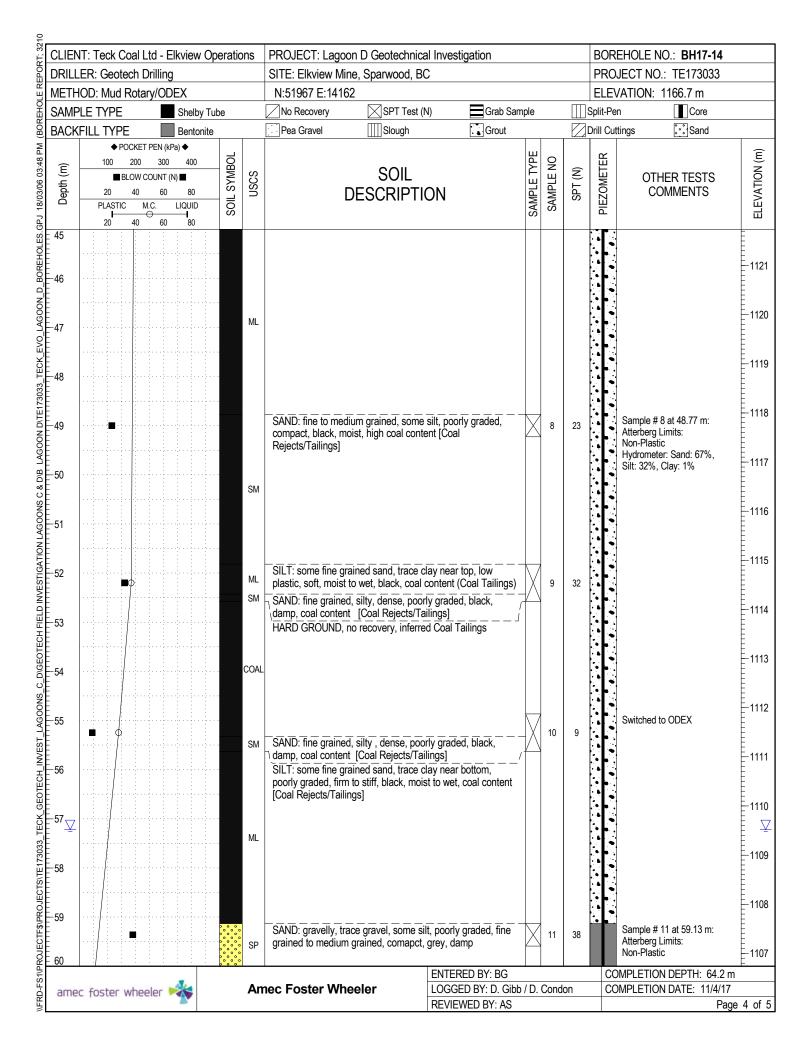
3210	01.1-1	T T 1 C 1111 5" :	0 "		DDO IDOT I DO COLO			505	FUOLENO BULL 15	
SRT.		IT: Teck Coal Ltd - Elkviev	w Operation	ons	PROJECT: Lagoon D Geotechnica	<u> </u>			EHOLE NO.: BH17-13	
REP(		ER: Geotech Drilling			SITE: Elkview Mine, Sparwood, BC	;			JECT NO.: TE173033	
OLE		OD: Mud Rotary			Lower bench N:52189 E:14273	. –	П		VATION: 1129.3 m	
REH			by Tube		No Recovery SPT Test (N	<del>_</del>		Split-Pe		
1 (BC	BACK	FILL TYPE Bento	onite		Pea Gravel Slough	Grout	_12	Drill Cu	ttings Sand	
GPJ 18/03/06 03:48 PM	Depth (m)	◆ POCKET PEN (kPa) ◆ 100 200 300 400  ■ BLOW COUNT (N) ■ 20 40 60 80  PLASTIC M.C. LIQUIC 1 0 40 60 80	SOIL SYMB	nscs	SOIL DESCRIPT	LION GAS	SAMPLE NO	SPT (N)	OTHER TESTS COMMENTS	ELEVATION (m)
BOREHOLES.G	- 0 - - - 1			COAL	COAL: coarse grained, occasional gra Rejects/Tailings]	vel, moist, black [Coal				1129
ECK_EVO	2			COAL	COAL: coarse grained, moist to wet, c Rejects/Tailings]	_	1 2	36 24		1128 1127
LAGOON D\TE173033	-4			COAL	COAL: coarse to medium grained, so to wet, compact [Coal Rejects/Tailing	me fine grained coal, moist sj	3	31		-1126             
ON LAGOONS C & D\B	6	Φ ■		COAL	COAL: coarse grained, moist, compac	t [Coal Rejects/Tailings]	4	26		—1124 —1123
FIELD INVESTIGAT		•		COAL	COAL: coarse grained, moist, dense [	Coal Rejects/Tailings]	5	34		1122
NS_C_D\GEOTECH	9	O <b>■</b>		COAL	COAL: coarse grained moist, compact	[Coal Rejects/Tailings]	6	18		—1121 —1120
NVEST_L	10 			COAL	COAL: fine grained to medium graine plasticity, wet, loose to compact [Coa	d, some silty coal layers, low Il Rejects/Tailings]	7	10	Sample # 7 at 10.06 m : Atterberg Limits: LL = 26.3, PL = 20.1, PI = 6.2, "CL-ML" Hydrometer: Sand: 53%, Silt: 42%, Clay:	-1119 1118
173033_TECK_GEO1	12 12		**************************************	GP	GRAVEL: sub-angular, 3 cm maximun drilling, possible cobbles	n size, washout from mud	8	14	5%	—1117 —
CTF\$\PROJECTS\TE	13 	•		SP	SAND: gravelly, some silt, 3 cm maxin brown, moist, dense,	num size, sub-rounded, dark	9	31		1116
OUE	15		1	GP	GRAVEL: washout gravels, angular		10	29		Ē
FRD-FS1\PROJ	- 13	<u>                                     </u>	· [2828]	<u> </u>		ENTERED BY: BG	1 10		DMPLETION DEPTH: 20.7 m	<u> </u>
D-FS	ame	c foster wheeler 💸		An	nec Foster Wheeler	LOGGED BY: A. Lopse / J. Ellio	t / D.			
Ŗ						REVIEWED BY: AS				1 of 2

RT; 321	CLIEN	IT: Teck Coal Ltd - Elkview Op	erations	PROJECT: Lago	on D Geotechnical In	estigation/		BOF	REHOLE NO.: BH17-13	
KEPO		ER: Geotech Drilling			ne, Sparwood, BC				DJECT NO.: TE173033	
OLE		IOD: Mud Rotary		Lower bench N:					VATION: 1129.3 m	
JREH		PLE TYPE Shelby Tub	oe	No Recovery	SPT Test (N)	Grab Sample		Split-Po		
M (B(		FILL TYPE Bentonite  ◆ POCKET PEN (kPa) ◆		Pea Gravel	Slough	Grout		Drill Cu	ittings Sand	
BOREHOLES.GPJ 18/03/06 03:48 PM	Depth (m)	100 200 300 400  ■BLOW COUNT (N) ■  20 40 60 80  PLASTIC M.C. LIQUID  1 0 10 10 10 10 10 10 10 10 10 10 10 10	SOIL SYMBOL USCS		SOIL DESCRIPTIO	DN	SAMPLE TYPE	SAMPLE NO SPT (N)	OTHER TESTS COMMENTS	ELEVATION (m)
_D_BOREHOLES.	15 - - - - - 16		GP GM	¬ GRAVEL: some si	It, trace sand, angular, ç	rev/brown_wet_verv		11 50	Sample # 11 at 16.15 m:	-1114 1113
<pre>&lt;_EVO_LAGOON_D</pre>			GP	GRAVEL: cobbles			,		Atterberg Limits: Non-Plastic Hydrometer: Gravel: 64%, Sand: 28%, Silt: 7%, Clay: 1%	
D\TE173033_TECF		<b>b</b>	GM	GRAVEL: some sa	and, trace silt, brown, de	nse, moist		12 38		
LAGOON			GP.	GRAVEL: sub-ang saturated	jular, trace sand and silt	compact, wet to		13 24		1110 1109
N LAGOONS C & D\B				End of borehole @	) 20.73 m		_			
H FIELD INVESTIGATION LAGO										1107
SEOTEC	-23 23 24									1106
OONS_C	24									1105
GEOTECH_INVEST_I										1104
333_TECK_GEO	27 									1102
OJECTS\	28									1101
JECTF	29 									1100
-FS1/I		a Castas utradas 🎎	۸۳	nec Foster Wh		TERED BY: BG	Flliot / F		OMPLETION DEPTH: 20.7 m  OMPLETION DATE: 10/23/17	
/FRD.	ame	c foster wheeler	AI	HEC I USIEI WIII		VIEWED BY: AS	LIIIUl / L	. Condudi		2 of 2

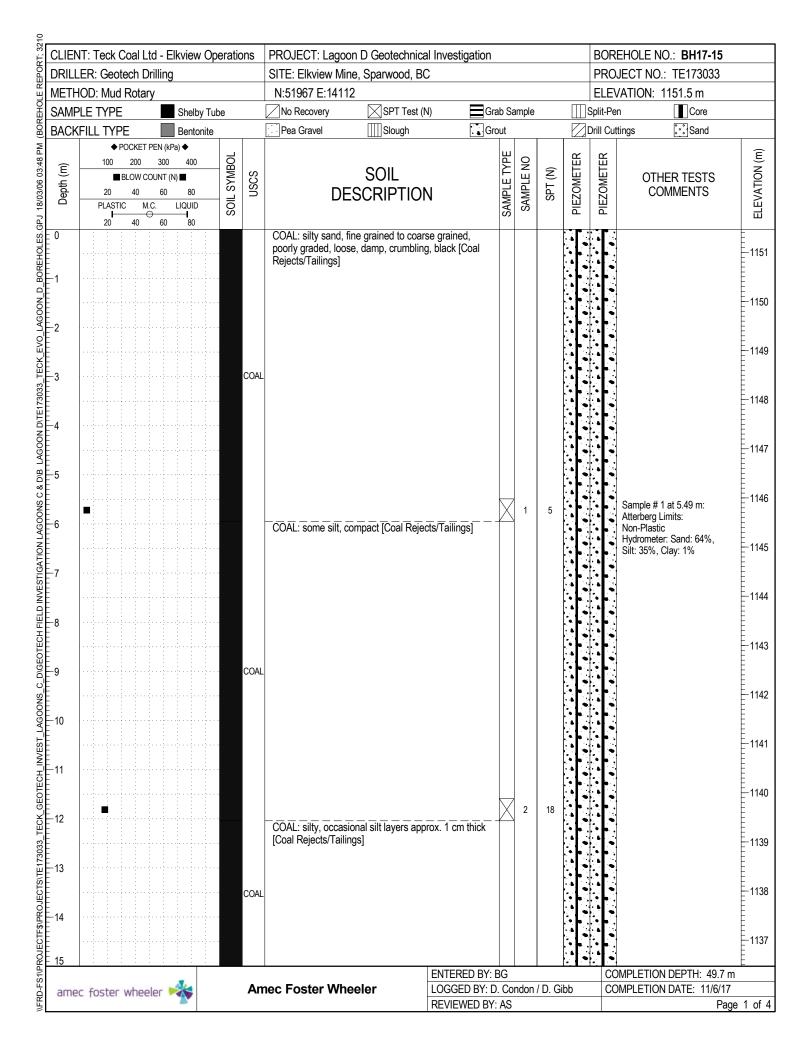


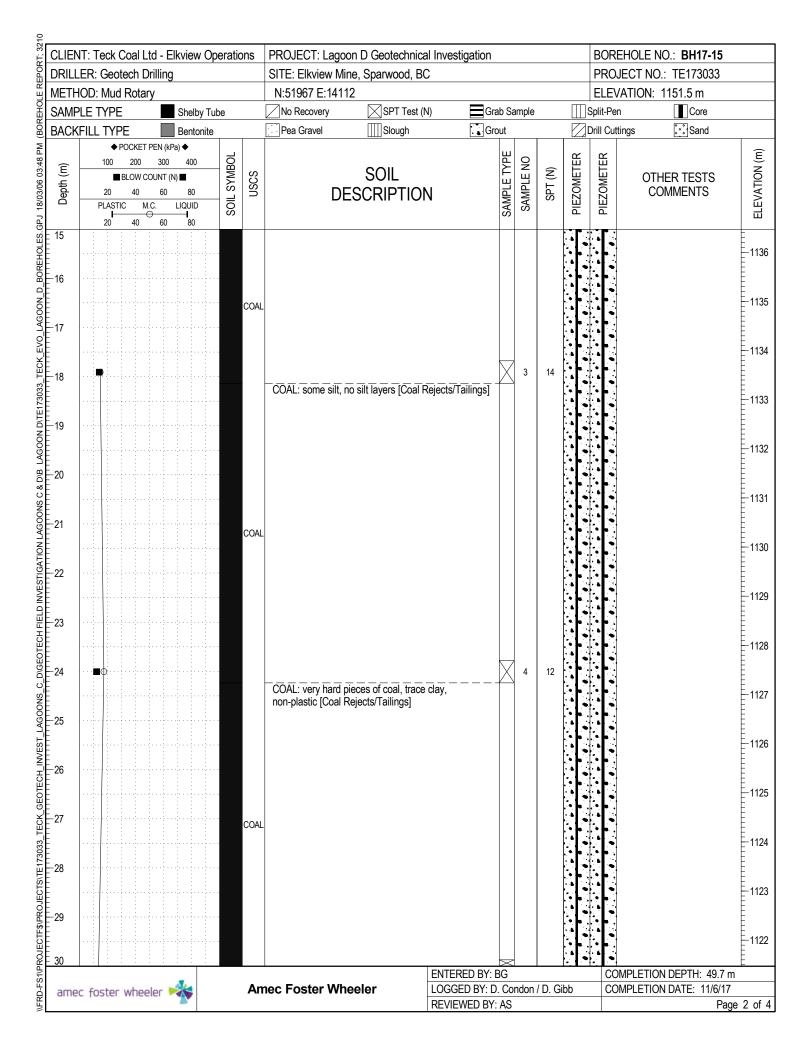


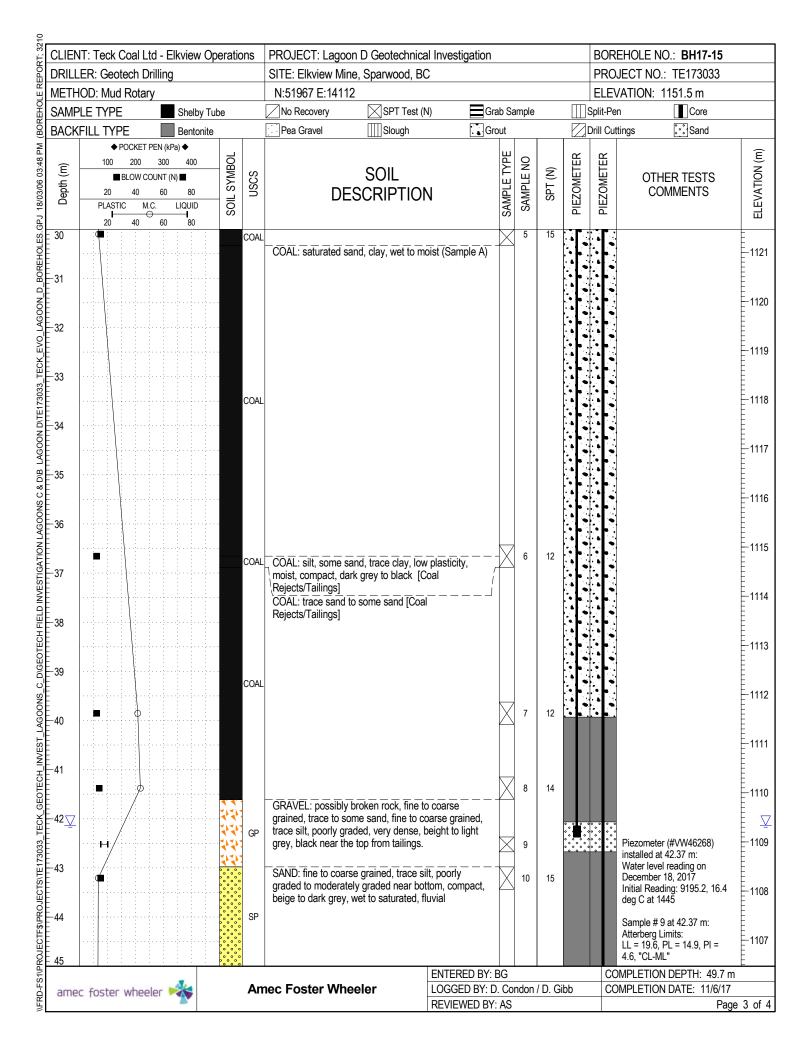


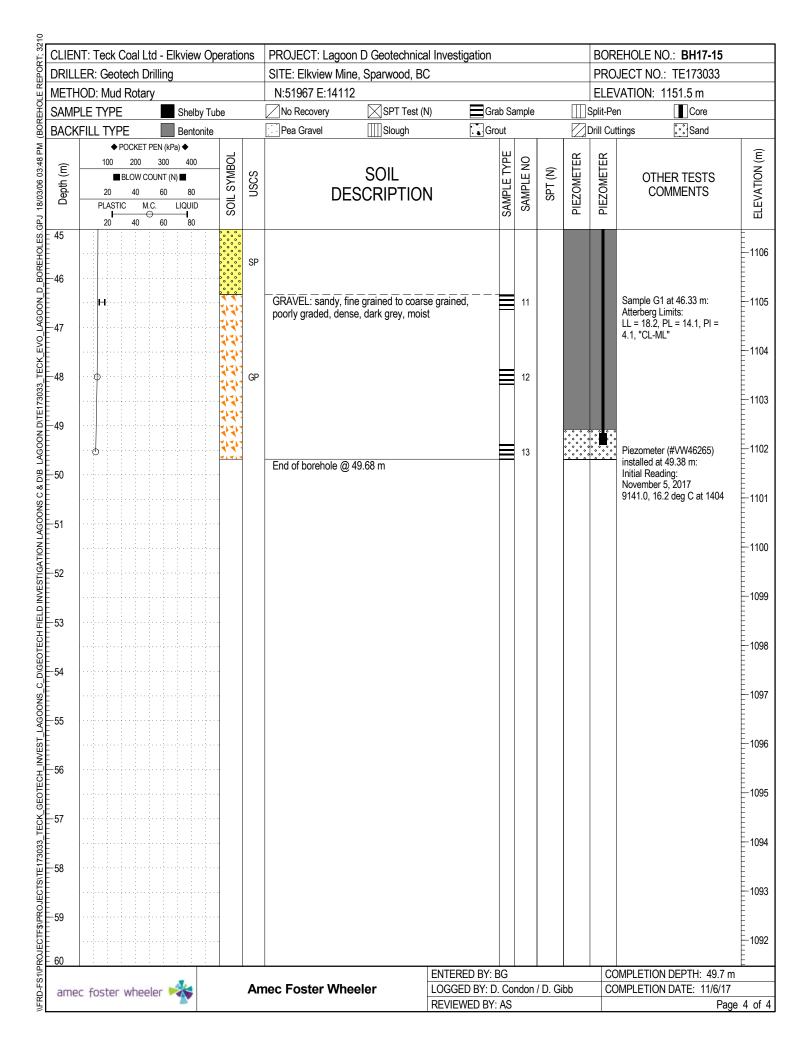


3210	0, 12.	NT T 10 1111 5" : 0	··	DDO IFOT / DO / / :	11 . e . e			ODELIOLE NO. BUILT	
ORT;	CLIEN	NT: Teck Coal Ltd - Elkview Ope	erations	PROJECT: Lagoon D Geotechnica				OREHOLE NO.: BH17-14	
REP	NET	LER: Geotech Drilling		SITE: Elkview Mine, Sparwood, BO N:51967 E:14162	,			ROJECT NO.: TE173033	
40LE	CAME	HOD: Mud Rotary/ODEX			N) Grab Sample		⊑ı ∭Spli	LEVATION: 1166.7 m t-Pen	
ORE	SAIVIF	PLE TYPE Shelby Tube	<u>e</u>	No Recovery SPT Test (N	Grout			Cuttings Sand	
(B)	BACK	KFILL TYPE Bentonite  ◆ POCKET PEN (kPa) ◆		Pea Gravei IIII Slough	Grout			Cuttings	
GPJ 18/03/06 03:48 PN	CLIEN DRILL METH SAMF BACK  (E) Hold 60 61 62 63 64 65 66	100 200 300 400  ■ BLOW COUNT (N) ■ 20 40 60 80  PLASTIC M.C. LIQUID 20 40 60 80	SOIL SYMBOL USCS	SOIL DESCRIPTION	NO SAMPLE TYPE	SAMPLE NO	SPT (N)	OTHER TESTS COMMENTS	ELEVATION (m)
DREHOLES.	60	6 •	SP	SAND: 75 mm trace gravel, fine to coa	arse grained, compact,	12	28		1106
300N_D_BC	61 - - - - - - -		SP	damp, grey, wet slough above. GRAV fine to coarse grained, compact to der	EL: sandy, 125 mm nse, light tan/grey		• • •	•	1105
3_TECK_EVO_LA	-62 	•	SM	SAND: silty, trace to some gravel, fine grained, compact, moist, dark grey, po	grained to coarse orly graded	13	15	Piezometer (#VW46269) installed at 62.18 m Water level reading on December 18, 2017 Initial Reading:	1104
ON D\TE17303	- - - 64		GP	GRAVEL: sandy, coarse grained, poo moist, brown to dark grey, 1 cm layer	rly graded, compact, of sand.	14	25	November 4, 2017 9019.3; 10.7 deg C Sample # 14 at 63.7 m: Atterberg Limits:	1103
& D\B LAGO	- - - - - - - - - - - - - - - - - - -			End of borehole @ 64.16 m				Non-Plastic Hydrometer: Gravel: 58%, Sand: 32%, Silt: 10%	1102
LAGOONS C	- - - - - - - - - - - - - - - - - - -								1101
/ESTIGATION	- - - - - - - - - - - - - - - - - - -								1100
ECH FIELD IN	- - - - - - - - - - - - - - - - - - -								1099
C D'GEOTE	- - - - - - - - -								1098
T_LAGOONS	- 70								1097
TECH INVE	- - -71								1096
3_TECK_GEC	- -72								1095
STS/TE17303	- -73								1094
JECTF\$\PROJEC	-70 -71 -72 -73 -74 -75								-1093 
PRO	75				ENTEDED DV DO			COMPLETION DEPTH 64.0	1032
FS1		os Costos utradas	Δn	nec Foster Wheeler	ENTERED BY: BG LOGGED BY: D. Gibb / D.	Condor	1	COMPLETION DEPTH: 64.2 m COMPLETION DATE: 11/4/17	
FRD	ame	ec foster wheeler	All	ISO I USIGI VVIIGGICI	REVIEWED BY: AS	JUNUUN			5 of 5







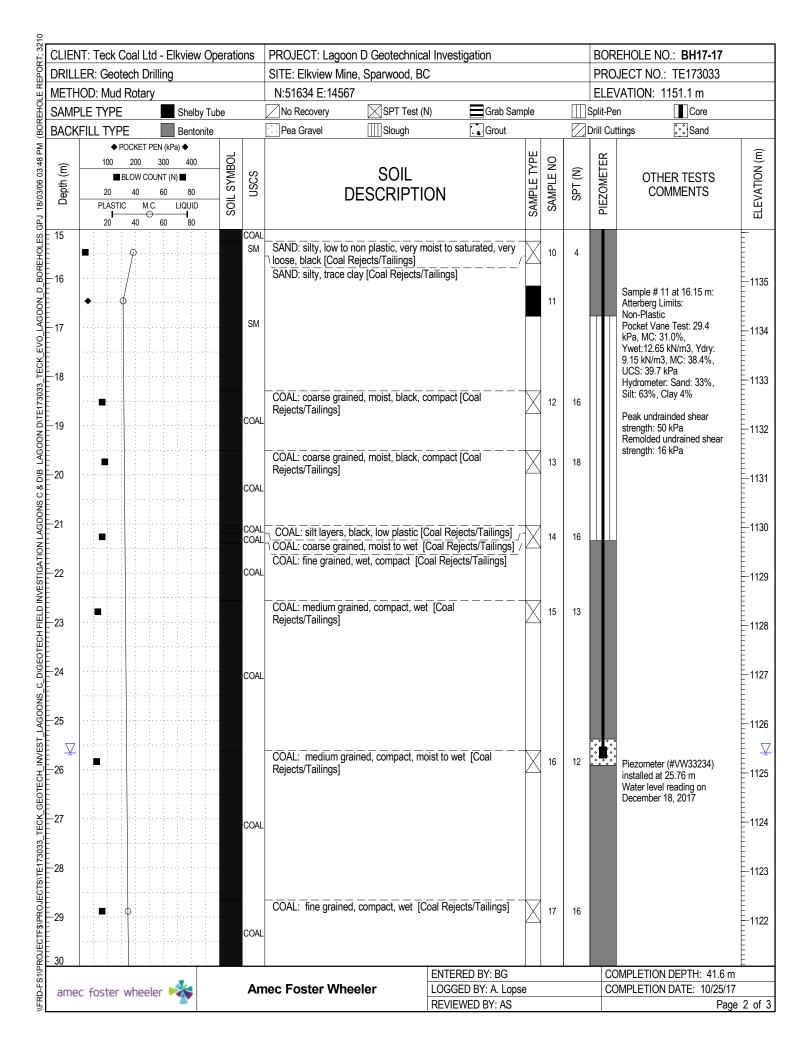


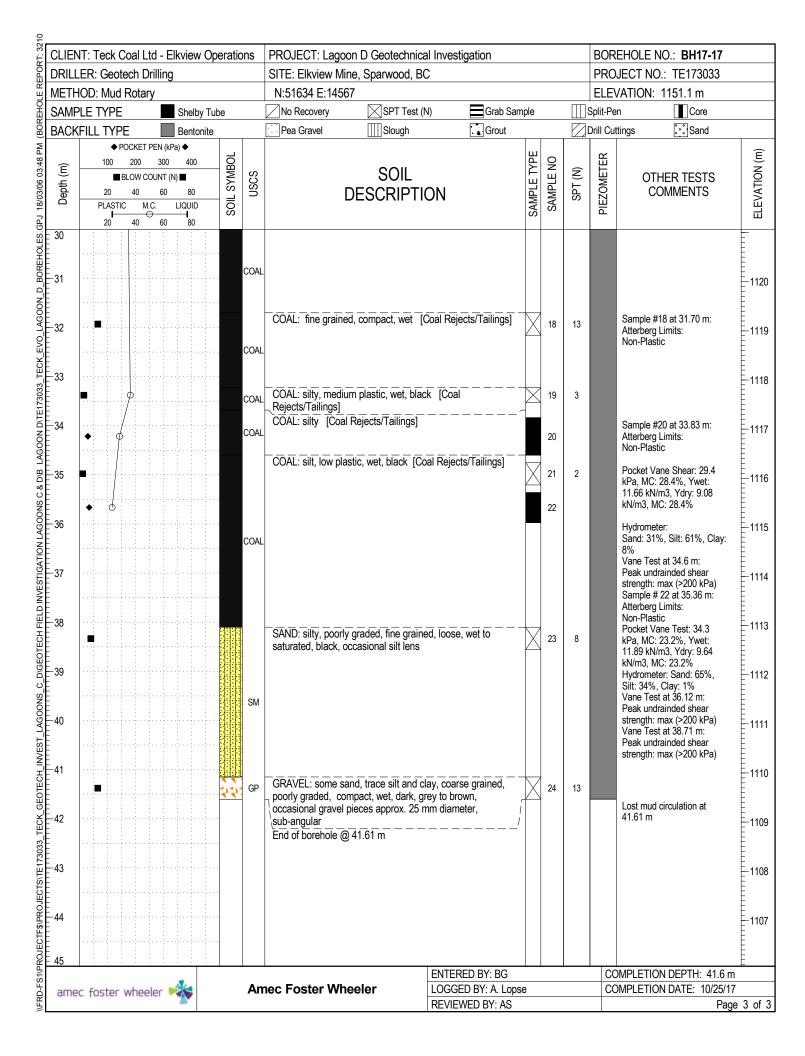
CLIEN	NT: Teck Coal Ltd - Elkviev	v Operation	ons	PROJECT: Lagoon D Geotechnic	al Investigation				BOR	REHOLE NO.: BH17-16	
DRILL	ER: Geotech Drilling			SITE: Elkview Mine, Sparwood, B	C				PRC	DJECT NO.: TE173033	
METH	IOD: Mud Rotary/ODEX			N:52008 E:14032					ELE'	VATION: 1129.3 m	
SAMP	PLE TYPE Shelb	y Tube		✓ No Recovery ✓ SPT Test	(N) Grab San	nple			Split-Pe	en Core	
BACK	FILL TYPE Bento	onite		Pea Gravel Slough	Grout				Orill Cu	ttings Sand	
Depth (m)	◆ POCKET PEN (kPa) ◆  100 200 300 400  ■ BLOW COUNT (N) ■  20 40 60 80  PLASTIC M.C. LIQUID  20 40 60 80	L SYMB	nscs	SOIL DESCRIPT	ON	SAMPLE TYPE	SAMPLE NO	SPT (N)	PIEZOMETER	OTHER TESTS COMMENTS	ACIF WALL
-1				COAL: poorly graded, coarse grained [Coal Rejects/Tailings]	d, moist to wet, black						-11
-2 -3 -4 -5 -6 -7	•		COAL			X	1	28			-11
-3 -4			COAL	COAL: occasional gravel pieces, app diameter, moist [Coal Rejects/Tailing	orox. 20 mm in Js]		2	41			1-
-5				COAL: medium to coarse grained, de Rejects/Tailings]	ense [Coal	X	3	37			-1
-6 -7	•		COAL			X	4	48			1
-8			COAL	COAL: coarse grained [Coal Rejects	Tailings]	X	5	12			-1
		**************************************	COAL COAL COAL		ings] [Coal Rejects/Tailings] / ned, compact, very	//×	6	57		Sample # 6 at 9.14 m: Atterberg Limits: Non-Plastic	1
-11	φ. ■	*** *** *** ***	GP		Signature of TV IIIII		7	17			-1
-12 -13	•	\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\	GP	GRAVEL: trace to some clay, dense diameter of 25 mm, sub angular	gravel pieces, approx.	X	8	32		Sample # 8 at 12.19 m: Atterberg Limits: Non-Plastic	1
-10 -11 -12 -13 -14		**************************************	GP GP	GRAVEL: trace to some sand  GRAVEL: sandy, trace to some silt, p dense, moist, greyish brown, mediun occasional shale pieces	poorly graded, very n to coarse grained,		9	78		Lost circulation within gravel at 13.11 m; advanced casing below 22.56 m	1
15											Ē
	•				ENTERED BY: BG				_	OMPLETION DEPTH: 30.2 m	
	c foster wheeler 🔀		Δn	nec Foster Wheeler	LOGGED BY: A. Lops	9			1.00	OMPLETION DATE: 10/27/17	7

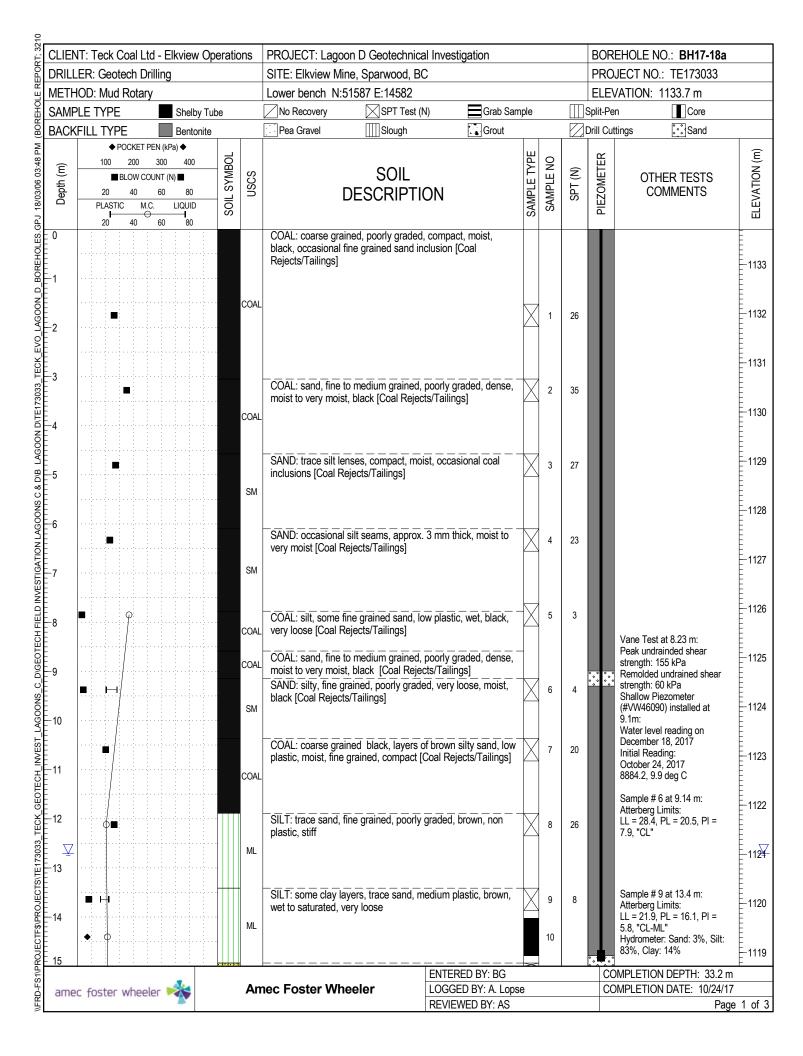
CLIEN	NT: Teck Coal Ltd - Elkview	Operation	ns	PROJECT: Lagoon D Geotechnic	al Investigation				BORE	HOLE NO.: <b>BH17-16</b>	
	LER: Geotech Drilling			SITE: Elkview Mine, Sparwood, B	<u> </u>			_		ECT NO.: TE173033	
	HOD: Mud Rotary/ODEX			N:52008 E:14032	<u> </u>			_		ATION: 1129.3 m	
	· _	. Tb		No Recovery SPT Test (	N) Grab Sam	مامد			plit-Pen		
		y Tube		<u> </u>		ipie			-		
	FILL TYPE Bento	nite		Pea Gravel Slough	Grout			טע	rill Cuttir	ngs 🚉 Sand	
Depth (m)	◆ POCKET PEN (kPa) ◆ 100 200 300 400  ■ BLOW COUNT (N) ■ 20 40 60 80  PLASTIC M.C. LIQUID	SOIL SYMBOL	SOSO	SOIL DESCRIPTI	ON	SAMPLE TYPE	SAMPLE NO	SPT (N)	PIEZOMETER	OTHER TESTS COMMENTS	ELEVATION (m)
15	20 40 60 80	77	GP GP	GRAVEL: occasional very moist silt le			10	75			111
16		4 4 4 4 4 4 4 4 3 4 4	GP	GRAVEL: limestone pieces	511003				ı		
- - - - - - - - - - - - - - - - - - -		<del>111</del> 111 111	GP	GRAVEL: trace to some shale, very r grey	noist, wet, brownish	X	11	75	ı		E-111
	•	77 77 1	ML	SILT: trace clay and fine grained san	d, low plastic, mosit,		12	85			-11
19 		77 <del>77</del> 77 22	GP GP	SANDY GRAVEL: some silt, trace day coarse grained, angular, damp to mo occasional shale inclusion	ist, brownish grey,		13				-11 <sup>-</sup>
20 			GP CL	GRAVEL: sub angular, approx. 10 mgrey GRAVEL: rounded gravel, approx. 15 CLAY: 5 in thick layer, low to medium	mm diameter		14	58			-11
-21 -22 -∑	•		CL CL	firm, moist  CLAY: fluvial, silt, low to medium plas	stic, moist, stiff to very		15	16	ı		-11
			CL SP	CLAY: damp to moist, trace fine grain roots and organics CLAY: wet and sandy, harder drilling	ned sand, occasional			0		Piezometer (#VW33235) installed at 22.56 m	11
23 			CL	¬ SAND: some gravel, trace silt, poorly coarse grained, compact, wet, grey CLAY: silty, trace to some sand and moist, brownish grey, frequent shale	grave, high plasticity,		16			Water level reading on December 18, 2017 Sample # 16 at 22.86 m: Atterberg Limits:	-11
	<b>6</b>		CL	Silt  CLAY: gravelly, some silt, trace sand angular to sub angular, wet to saturate coarse gravels up to 3 cm			17	67	!	Non-Plastic Hydrometer: Gravel: 14%, Sand: 71%, Silt: 14%, Clay: 1%	-11
25	H			CLAY: clay with gravels, trace sand, very dense, wet, grey, angular to sub			18		,	Sample # 20 at 28.65 m: Atterberg Limits: LL = 17.5, PL = 10.4,	11
			CL	SILTY SAND: fine grained, some clay	, grov von donos					LL = 17.5, PL = 10.4, PI = 7.1, "CL" Hydrometer: Gravel: 50%, Sand: 21%, Silt: 23%, Clay: 6%	-11
- - - - - - 28	Φ		SM	some gravels, sub-angular, grey, low			19				E-11
28 29 30	<b>—</b>		SM	SILTY SAND: fine grained, some gra clay, low plastic, very dense, moist to			20	64	1	Sample # 20 at 28.65 m: Atterberg Limits: LL = 17.5, PL = 10.4, PI = 7.1, "CL"	11
30										Hydrometer: Gravel: 50%, Sand: 21%,	E
					ENTERED BY: BG					MPLETION DEPTH: 30.2 r	n
amo	c foster wheeler 😽		An	nec Foster Wheeler	LOGGED BY: A. Lops	е				MPLETION DATE: 10/27/1	
CILIE	- 10000 11110000 -				REVIEWED BY: AS				_	Pag	

۲۲; 321	CLIEN	IT: Teck Coal Ltd - Elkview Op	erations	PROJECT: Lagoon D Geotechnica		BOREHOLE NO.: BH17-16	
EPOF		ER: Geotech Drilling		SITE: Elkview Mine, Sparwood, Bo	2		PROJECT NO.: TE173033
OLE F		IOD: Mud Rotary/ODEX		N:52008 E:14032			ELEVATION: 1129.3 m
REH		PLE TYPE Shelby Tu	be	No Recovery SPT Test (I			olit-Pen Core
7 (BC		FILL TYPE Bentonite  ◆ POCKET PEN (kPa) ◆		Pea Gravel Slough	Grout	Dı	rill Cuttings Sand
BOREHOLES.GPJ 18/03/06 03:48 PM	Depth (m)	100 200 300 400  ■BLOW COUNT (N) ■  20 40 60 80  PLASTIC M.C. LIQUID  1 0 10 60 80	SOIL SYMBOL USCS	SOIL DESCRIPTI	NO SAMPLE TYPE	SAMPLE NO SPT (N)	PIEZOMETER STANDO STAND
REHOLES.(	30			End of borehole @ 30.18 m	/		Silt: 23%, Clay: 6%
EVO_LAGOON_D_BO	-						1098
_TECK_EVO_L/	-32 						-1097
73033							1096
NB LAGOON D\TE1							1095
H FIELD INVESTIGATION LAGOONS C & D\B	- - - - - - -36						E-1094
IIGA I ION LA							1093
FIELD INVES	38						1092
EOTEC							E-1091
LAGOONS_C_I							=-1090 =-1090
ا∟							1089
CK_GEOTECH_INVES							1088
IS\TE173033_TECK	43						1087
JEC	43 						= 1086 = 1086
JECTF	44 						-1085
-S1/P					ENTERED BY: BG		COMPLETION DEPTH: 30.2 m
/FRD-F	ame	c foster wheeler	Aı	nec Foster Wheeler	LOGGED BY: A. Lopse REVIEWED BY: AS		COMPLETION DATE: 10/27/17  Page 3 of 3

CLIENT: Teck Coal Ltd - Elkview Operations				PROJECT: Lagoon D Geotechnical Investigation					BOR	BOREHOLE NO.: BH17-17		
DRILLER: Geotech Drilling				SITE: Elkview Mine, Sparwood, BC					PRC	PROJECT NO.: TE173033		
METHOD: Mud Rotary									ELE'	ELEVATION: 1151.1 m		
SAMPLE TYPE Shelby Tube									Split-Pe			
BACK	(FILL TYPE Bento	onite		Pea Gravel Slough	Grout				Drill Cu	ttings Sand		
Depth (m)	◆ POCKET PEN (kPa) ◆ 100 200 300 400  ■ BLOW COUNT (N) ■ 20 40 60 80  PLASTIC M.C. LIQUIC 100 100 100 100 100 100 100 100 100 100	L SYMB	nscs	SOIL DESCRIPTIO	ON	SAMPLE TYPE	SAMPLE NO	(N) LdS	PIEZOMETER	OTHER TESTS COMMENTS		
-1			COAL	COAL: coarse grained, occasional gra approx. 20 mm diameter, poory graded black [Coal Rejects/Tailings]	vel pieces at 1.8 m, d, very dense, moist,						-1	
-3						X	1	77			1	
-2 -3 -4 -5 -6 -7	<u> </u>	(	COAL	dense, black, occasional silt intrusions [Coal Rejects/Tailings]			2	32		Suspected cobble at 4.42 m	<u>-</u> 1	
-5			COAL	occasional gravel inclusion [Coal Reje COAL: medium to coarse grained, loos Rejects/Tailings]	cts/Tailings]/ se to compact [Coal		3	10			1	
-7		(	COAL	COAL: coarse grained to 2 m, turning grained, very dense [Coal Rejects/Tail	o medium-coarse ings]	X	4	52				
-8		(	COAL	COAL: sand, trace to some silt fine grace compact, moist to very moist, dark green Rejects/Tailings]	ined, poorly graded, y to black [Coal	X	5	12				
-10			COAL	COAL: coarse grained, poorly graded, moist, black, occasional very moist sa Rejects/Tailings]	dense, moist to very nd seam [Coal	X	6	37				
11				COAL: sand, trace to some silt, mediu poorly graded, compact, moist to very Rejects/Tailings]		X	7	14				
-10 -111 -112 -133 -144 -15		(	COAL				8	16				
14				some silt, very moist			9	13			1	
	_				ENTERED BY: BG				CC	OMPLETION DEPTH: 41.6 m	1	
ame	amec foster wheeler Ar			nec Foster Wheeler LOGGED BY: A. Lopse					COMPLETION DATE: 10/25/17  Page 1 c			







CLIEN	IT: Teck Coal Ltd - Elkview	Operatio	ns	PROJECT: Lagoon D Geotechnical Investigation				BOR	REHOLE NO.: BH17-18a			
DRILL	ER: Geotech Drilling			SITE: Elkview Mine, Sparwood, BC				PRC	PROJECT NO.: TE173033			
METH	IOD: Mud Rotary			Lower bench N:51587 E:14582	ELE'	ELEVATION: 1133.7 m						
SAMP	PLE TYPE Shelb	y Tube		✓ No Recovery SPT Test (N)	Sample			Split-Pe	en Tore			
BACK	FILL TYPE Bento	nite		Pea Gravel Slough Grou	t			Drill Cu	ittings Sand			
ට වි Depth (m)	◆ POCKET PEN (kPa) ◆ 100 200 300 400  ■ BLOW COUNT (N) ■ 20 40 60 80  PLASTIC M.C. LIQUID 20 40 60 80	SOIL SYMBOL	nscs	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NO	SPT (N)	PIEZOMETER	OTHER TESTS COMMENTS	FI EVATION (m)		
15 -16			SM	SAND: some silt, dense, brown, wet, non plastic, compare	t 🔀	11	24	• • • •	Sample # 10 at 14.02 m: Atterberg Limits: Non-Plastic Pocket Vane Shear Test: 34.3 kPa, MC: 21.2%,	-11		
-17	•			SAND: some silt, fine grained, compact, brown, wet, non plastic		12	25		Ywet: 14.83 kN/m3, Ydry: 12.23 kN/m3, MC: 21.2% Hydrometer: Sand: 36%, Silt: 63%, Clay: 1%	-11		
-18	•		SM		X	13	30		Vane Test m: Peak undrainded shear strength: >127 kPa Remolded undrained shear strength: test not fully completed	-11 -11		
-19 -20			011	SAND: some silt, fine grained, brown, wet to saturated	-	14	34		Deep Piezometer (#VW46092) installed at 14.9m: Water level reading on December 18, 2017 Initial Reading: October 24, 2017	11		
-17 -18 -19 -20 -21 -22	•		SM	SAND: some silt, fine grained, dense, brown, wet to saturated		15	30		8475.5, 9.7 deg C	1		
-22 -23			SM	SAND: some silt, fine grained, compact, brown, saturated	1-	16	25			11		
-24 -25				SAND: silty, fine grained, saturated, dense, greyish-brow	n X	17	35		Sample # 17 at 24.08 m: Atterberg Limits: Non-Plastic	11		
-25 -26 -27 -28 -29 30			SM							11		
-27 -28	0 •			SAND: silty, fine grained, very dense, saturated, greyish-brown		18	51			1		
-29			SM							1		
30										-11		
		10.10.10.10.1		ENTERED BY: B	<u> </u>	•		C	OMPLETION DEPTH: 33.2 m			
	_			nec Foster Wheeler LOGGED BY: A.					JIVIPLETION DEPTH. 33.2 II	1		

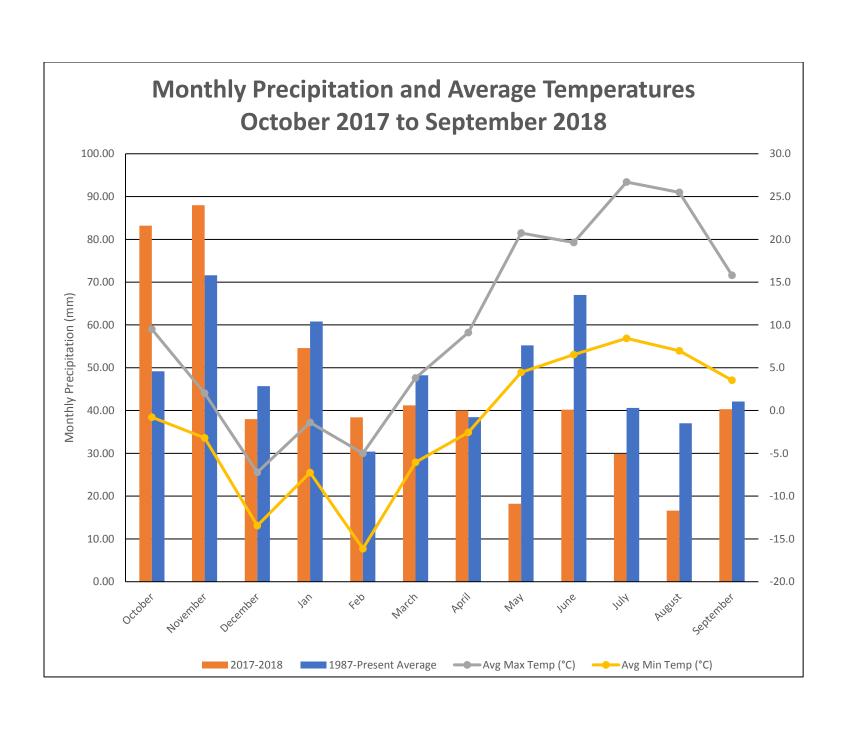
CLIENT: Teck Coal Ltd - Elkview Operations					_td	- E	lkvi	ew	Ор	era	tior	ns	PROJECT: Lagoon D Geotechnic	cal Investigation				BOR	REHOLE NO.: BH17-18a	<u> </u>
DRILLE	ER:	Geo	otec	h [	Drill	ing							SITE: Elkview Mine, Sparwood, E	PROJECT NO.: TE173033 ELEVATION: 1133.7 m						
METH	OD:	Mu	d R	ota	ry								Lower bench N:51587 E:14582							
SAMPL	LE 1	ΥP	Ε				Sh	elby	/ Tul	ре			No Recovery SPT Test (N) Grab Sample					Split-Pe	en Core	
BACKF	FILL	TY	PE				Ве	ntor	nite				Pea Gravel Slough	Grout				Drill Cu	ttings :: Sand	
CLIEN DRILLE METHO SAMPI BACKF  (I) Hoo To T	ŀ	100	■ BLC	200 DW 0 40	COUN	300 NT (N 60	N)■	400 80		SOII SYMBOI		SOSO	SOIL DESCRIPT	ION	SAMPLE TYPE	SAMPLE NO	SPT (N)	PIEZOMETER	OTHER TESTS COMMENTS	ELEVATION (m)
30													SAND: silty, very dense, greyish bro	wn, saturated		19	45		Sample # 19 at 30.18 m: Atterberg Limits: Non-Plastic	—110 —
-32												SM								-110 - - - - - 110
-34													End of borehole @ 33.22 m							-11
35																				= 10
36																				-10 
37																				-10
39																				10
10																				E-10
1 1																				—10
13																				10
14																				-10 10
amec	c fo	ste	r w	he	elei	r	*		•	1		An	nec Foster Wheeler	ENTERED BY: BG LOGGED BY: A. LO REVIEWED BY: AS	.opse		1		DMPLETION DEPTH: 33.2 DMPLETION DATE: 10/24/ Pa	

CLIEN	IT: Teck Coal Ltd	- Elkview Ope	rations	PROJECT: Lagoon D Geotechnic	al Investigation				BORE	HOLE NO.: BH17-9A			
DRILL	.ER: Geotech Dril	ling		SITE: Elkview Mine, Sparwood, B	PROJECT NO.: TE173033								
METH	IOD: Mud Rotary									ELEVATION: 1138.2 m			
SAMP	LE TYPE	Shelby Tube	)						Split-Pen Core				
BACK	FILL TYPE	Bentonite		Pea Gravel Slough	Grout				Orill Cutti	ngs Sand			
Depth (m)	◆ POCKET PE  100 200  ■ BLOW COU  20 40  PLASTIC M.C.  20 40	300 400	SOIL SYMBOL USCS	SOIL DESCRIPTI	ON	SAMPLE TYPE	SAMPLE NO	SPT (N)	PIEZOMETER	OTHER TESTS COMMENTS	ELEVATION (m)		
-1			COAL	COAL: coarse grained, dense, black	[Coal Rejects/Tailings]	X	1	45			-11;		
-3	•		COAL	COAL: coarse grained, dense to very Rejects/Tailings]	dense [Coal	X	2	50	l		11;		
-5				COAL: fine to medium grained, dense Rejects/Tailings]		X	3 4	31	l		-11		
8			COAL			X	5	35	l		—11 —11		
9	•		COAL	COAL: fine grained, sandy, loose to or Rejects/Tailings]	compact [Coal	X	6	11	ı		-11		
11	Φ		COAL	COAL: very loose to loose, very mois Rejects/Tailings]	t to wet [Coal	X	7	4	ı		<u>-</u> 1		
13			SP	SAND: fine to medium grained, trace loose, black, very moist to wet, abund [Coal Rejects/Tailings]	silt, poorly graded, dant coal inclusions		8	5			1-1-		
14 15			ML COAL	SILT: trace fine grained sand, low to to wet, black [Coal Rejects/Tailings] COAL: coarse grained, compact, black [Rejects/Tailings]	_		9	25			11		
					ENTERED BY: BG					MPLETION DEPTH: 28 m			
	c foster wheele		Am	nec Foster Wheeler LOGGED BY: A. Lopse					I CON	MPLETION DATE: 10/22/1	7		

CLIEN	NT: Teck Coal Ltd - Elkviev	v Operation	าร	PROJECT: Lagoon D Geotechnical Investigatio	n			BOF	REHOLE NO.: BH17-9A			
	LER: Geotech Drilling			SITE: Elkview Mine, Sparwood, BC				+	PROJECT NO.: TE173033			
	HOD: Mud Rotary			Lower bench N:52239 E:14813	ELE'	ELEVATION: 1138.2 m						
	· _	by Tube			Grab Samp	le	П	Split-Pe				
	KFILL TYPE Bento	•			Grout			Drill Cu				
	◆ POCKET PEN (kPa) ◆	Jiiito						1	, Journa			
Depth (m)	100 200 300 400  ■BLOW COUNT (N) ■ 20 40 60 80	L SYMB	nscs	SOIL DESCRIPTION		SAMPLE TYPE	SPT (N)	PIEZOMETER	OTHER TESTS COMMENTS	(m) NOITV/(a)		
	PLASTIC M.C. LIQUID 20 40 60 80					SA	Ď					
(m) Depth (m)	<b>1</b> 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1		COAL	SILT: trace fine grained sand and clay, low plastic, w black, loose, frequent coal inclusions [Coal		1	0 7		Sample # 10 at 15.24 m: Atterberg Limits: LL: 44.9, PL: 26.3, PI:	-11		
-17			ML	Rejects/Tailings]  SAND: fine grained, well graded, compact, moist, black.		1	1 14	ı	18.6, "CI"	-11		
-18			SP	abundant coal inclusions, occasional silt lenses [Co Rejects/Tailings]	oal 2					-11 		
-18 -19	•		SP COAL	SAND: trace to some silt [Coal Rejects/Tailings] COAL: 75 mm thick coarse coal layer [Coal Rejects/Tailings]	— — — J	1	2 11			-1		
-20	•		COAL	COAL: Coarse coal layer, wet [Coal Rejects/Tailings	<u>s</u> ] — —	1	3 12			-1		
-21	•		COAL	COAL: coarse grained, mixed with a layer of silt, me plastic, loose (21.34 - 21.49 m) [Coal Rejects/Tailing	edium gs]	1	4 10			1		
-21 -22 -23	•		COAL	COAL: medium grained, wet to saturated, loose [CoaRejects/Tailings]	al	1	5 8		Sample # 15 at 22.55 m: Atterberg Limits: Non-Plastic	-1·		
-24 <u>√</u> -25	•		COAL	COAL: medium grained with some silt layers, satural very loose, low plastic [Coal Rejects/Tailings]	ited,	1	6 4		Piezometer (#VW45123) installed at 24.08 m Water level reading on December 18, 2017	<u>-</u> 1		
-25 -26 -27 -28 -29			SM	SAND: silty, some gravel, low plastic, brown, saturat dense	ted, very	1	7 59			-1·		
-27		•	GM	GRAVEL: trace sand, trace silt, wash out from mud r weathered angular rock	rotary,	1	8 84			<u>-</u> 1		
-28		<b>** ** ** ** ** ** ** **</b>	ROCK	BEDROCK End of borehole @ 28.35 m						-1·		
-29 30										1′		
				ENTERED BY	Y: BG			C	OMPLETION DEPTH: 28 m			
	ec foster wheeler 🔀		Am	nec Foster Wheeler LOGGED BY	': A. Lopse			C	OMPLETION DATE: 10/22/1	7		

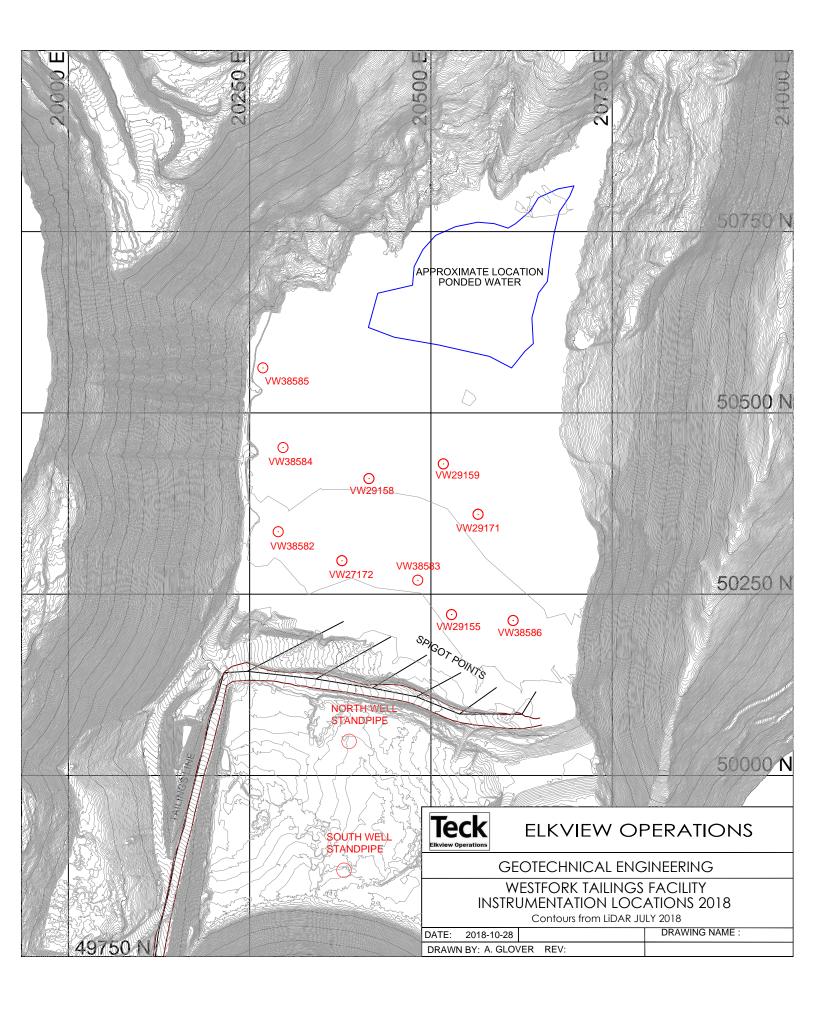
wood.

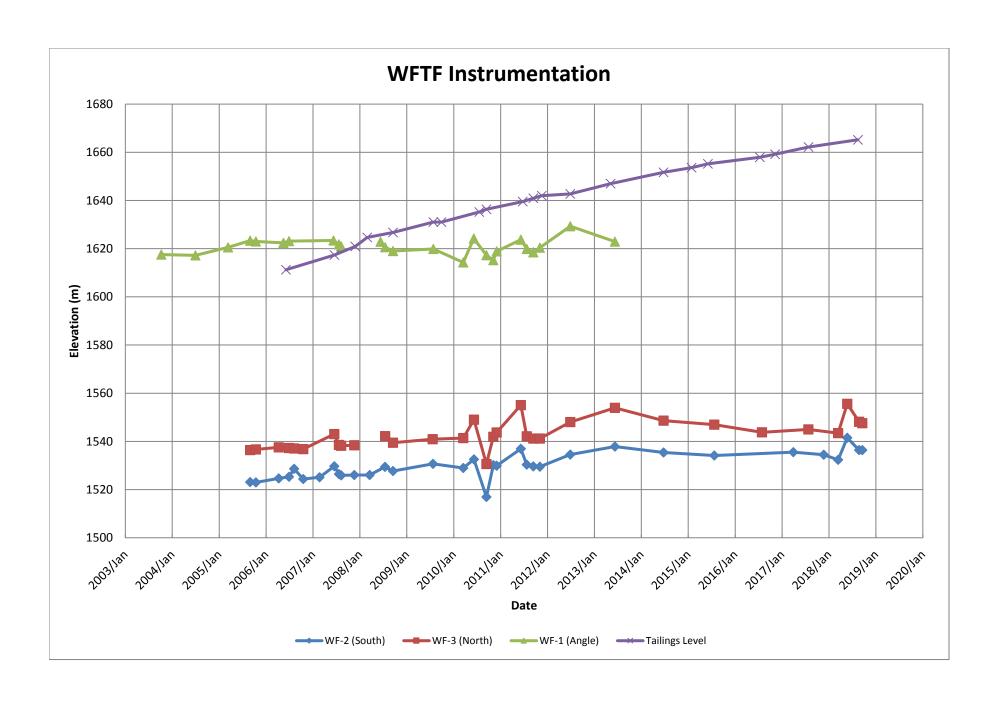
## Appendix B 2018 Precipitation Data

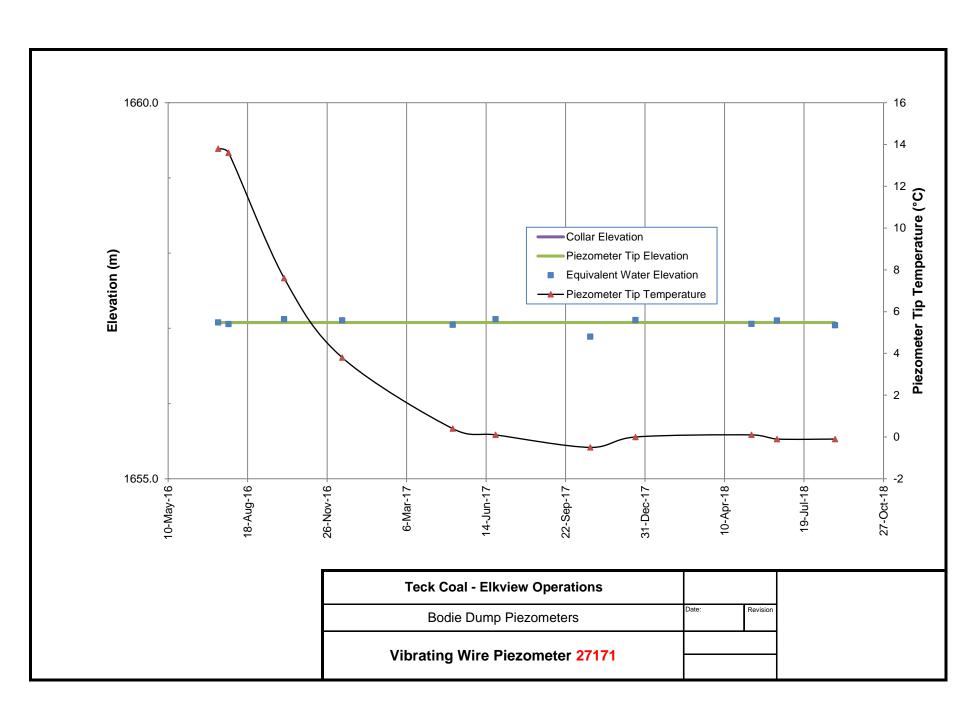


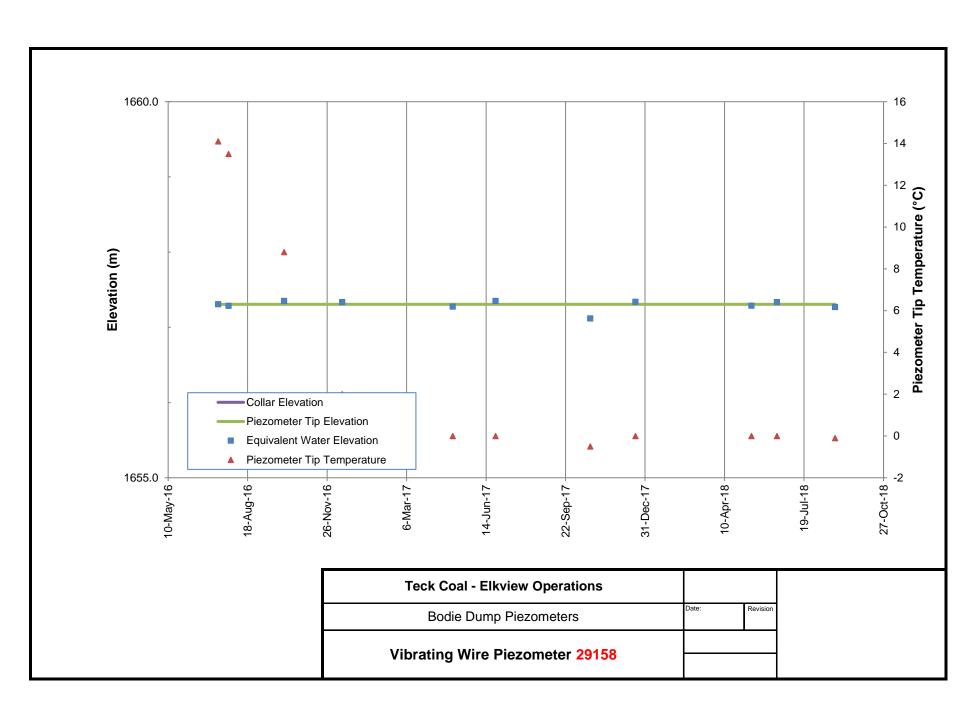
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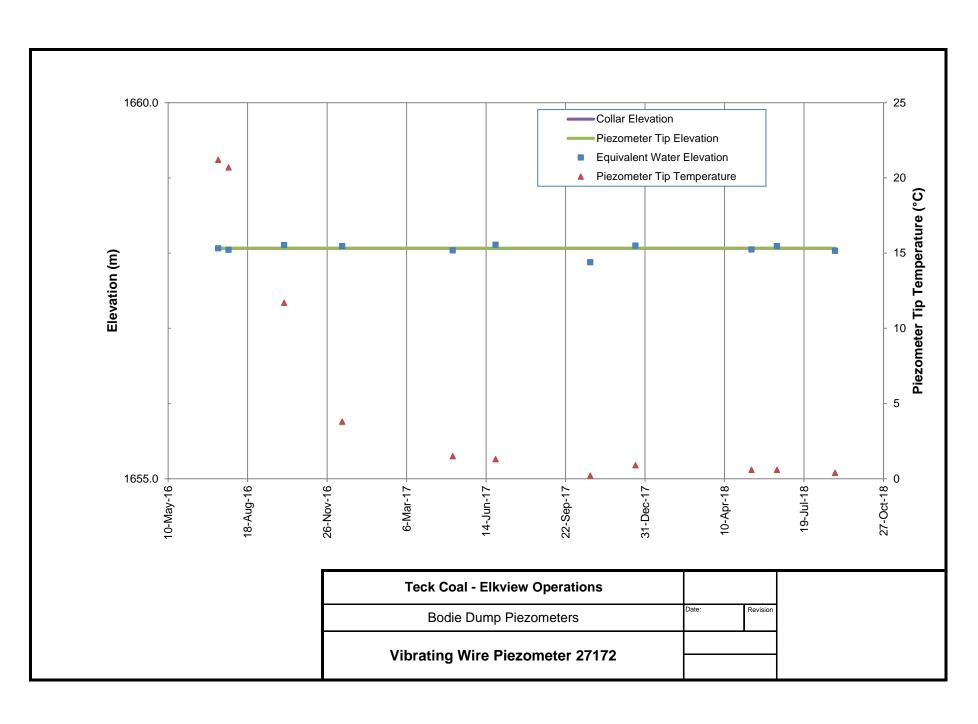
## Appendix C WFTF Plan, Sections and Instrumentation Data Plots

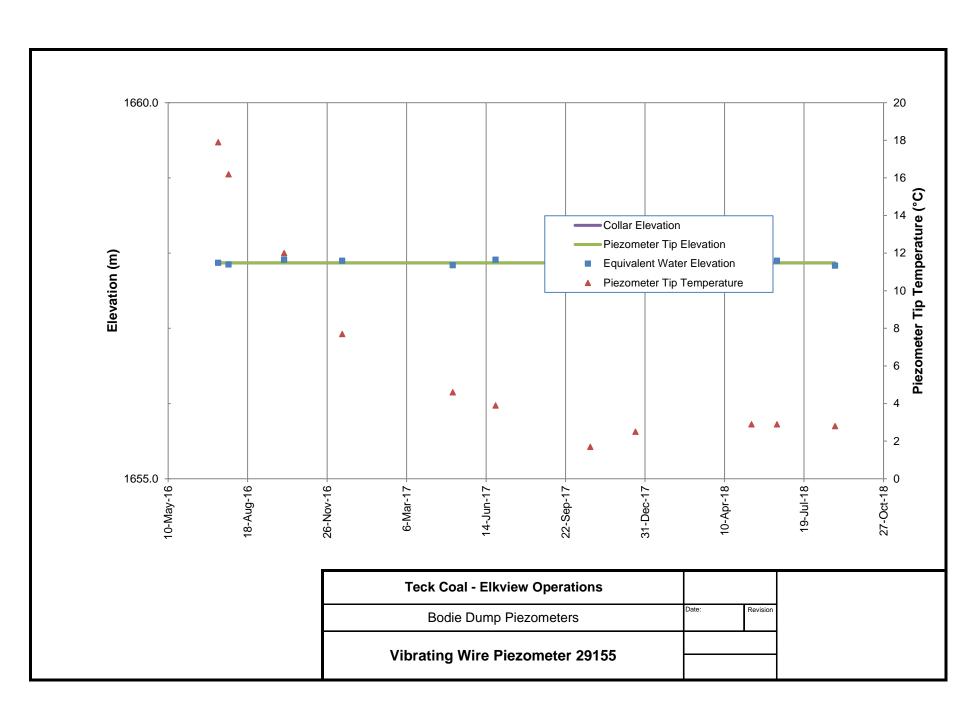


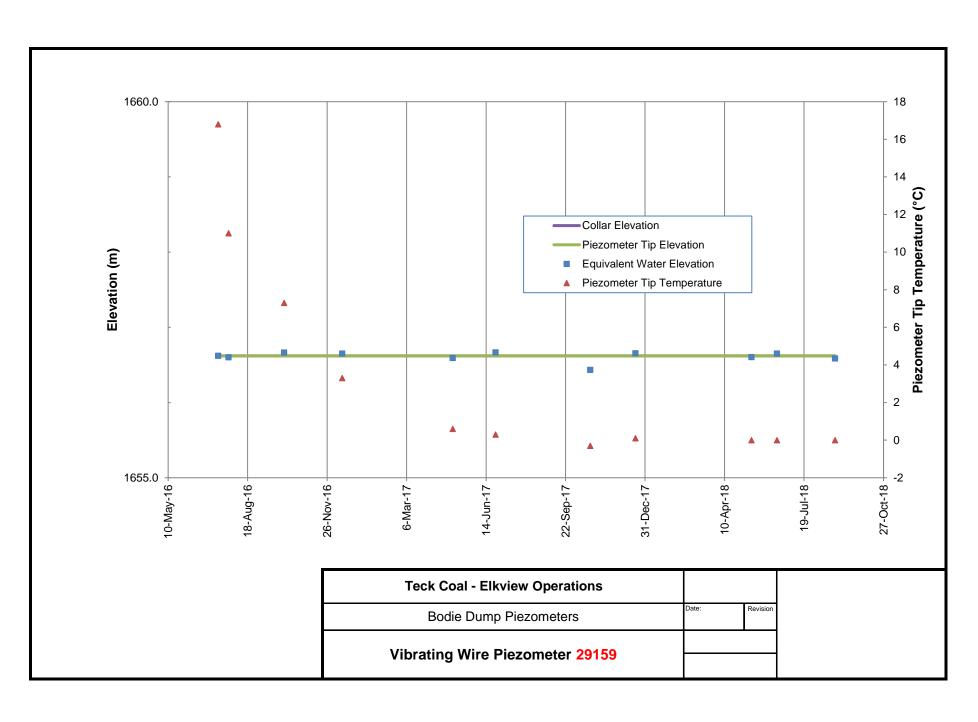


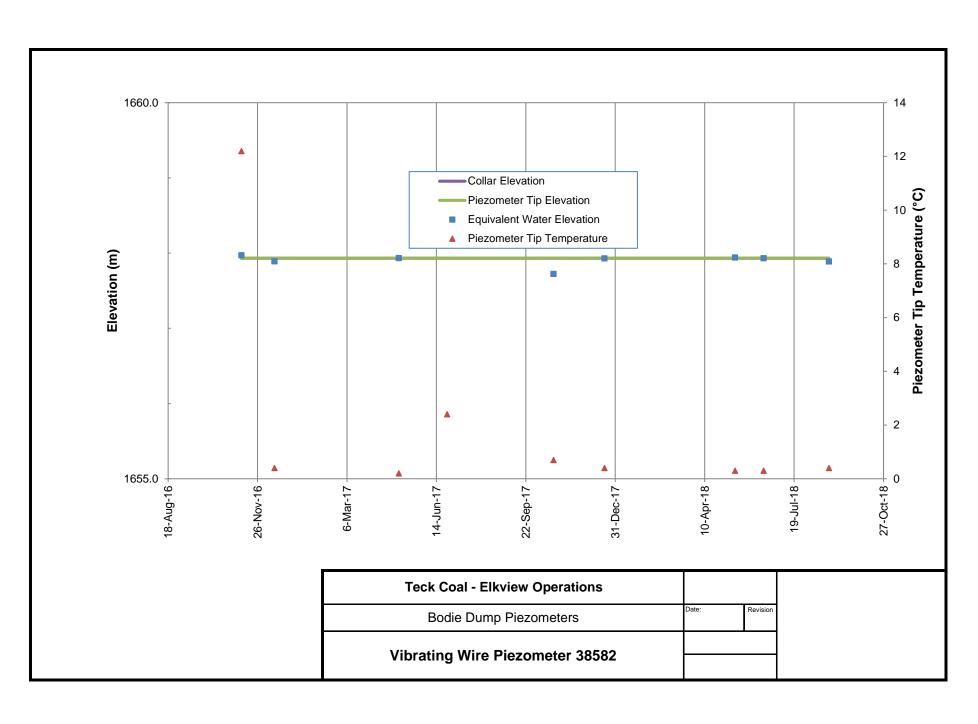


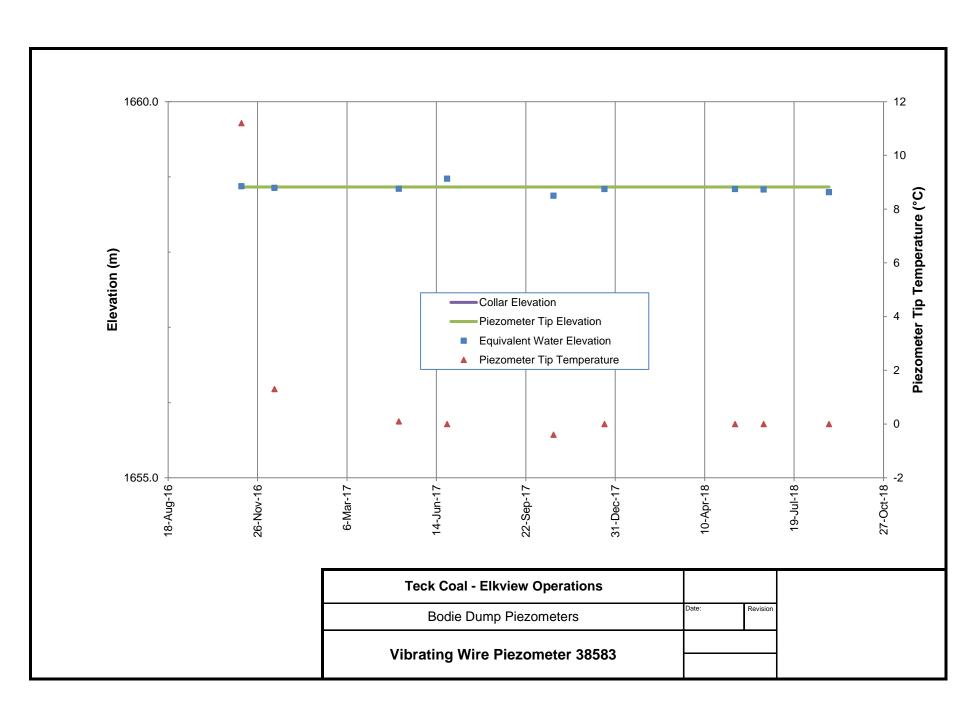


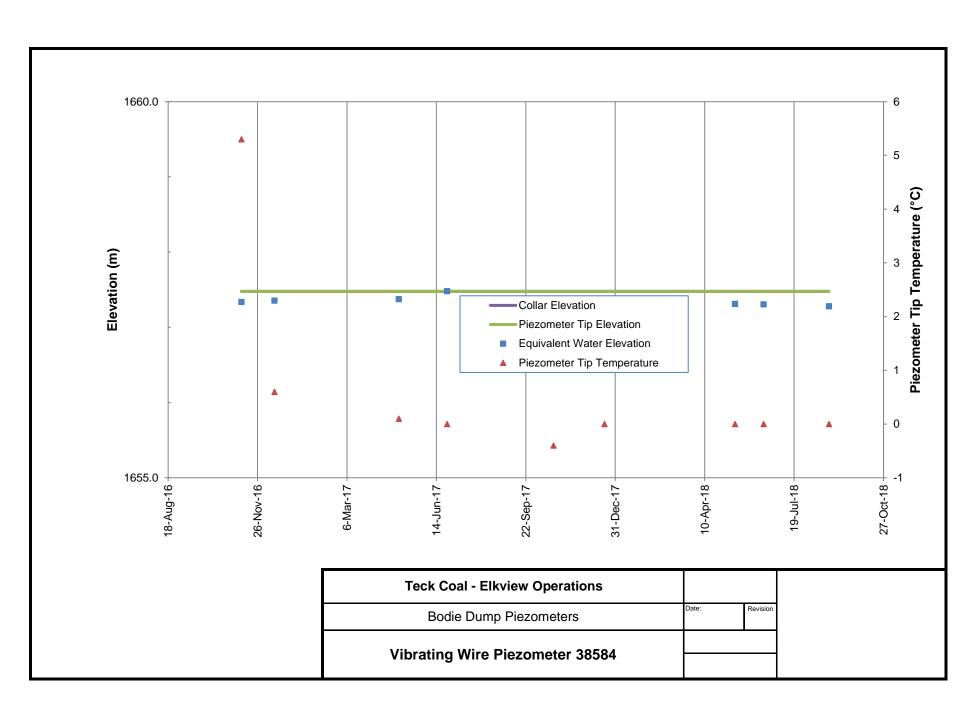


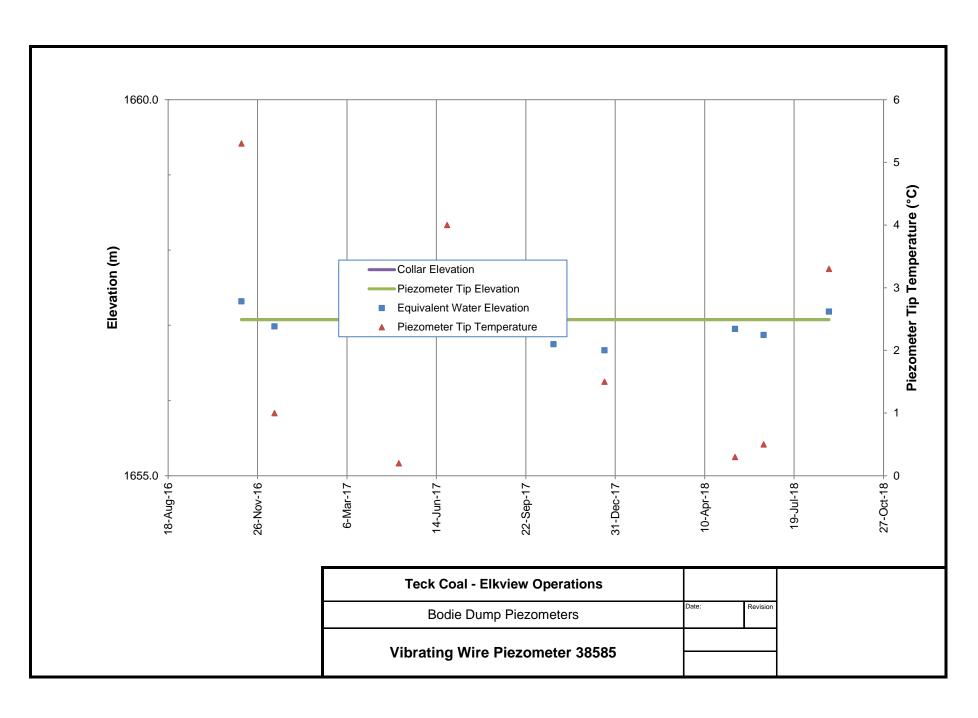


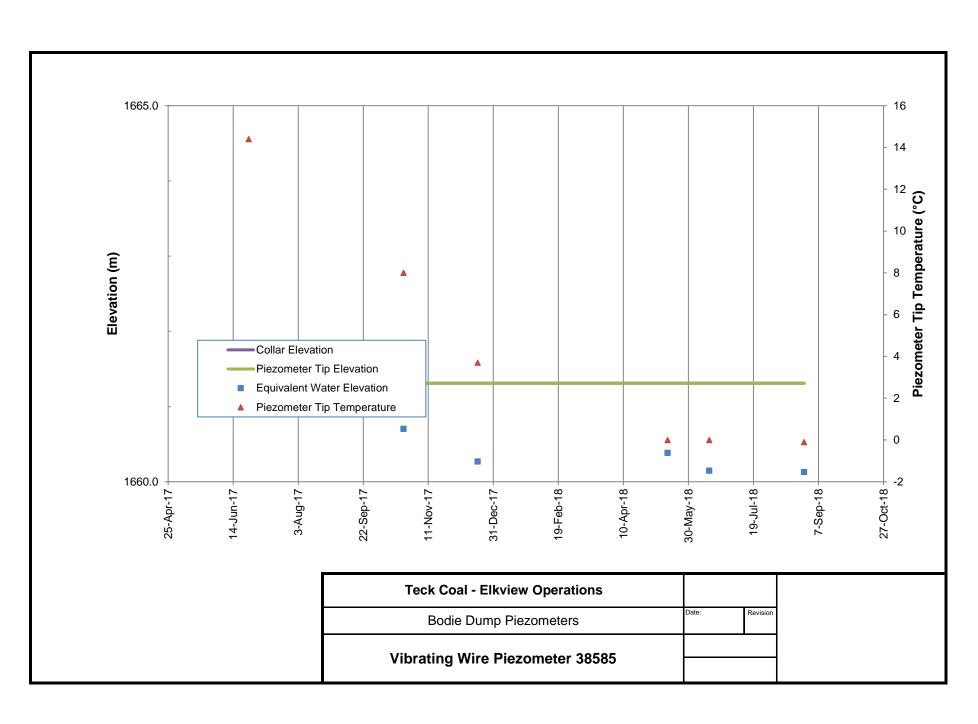






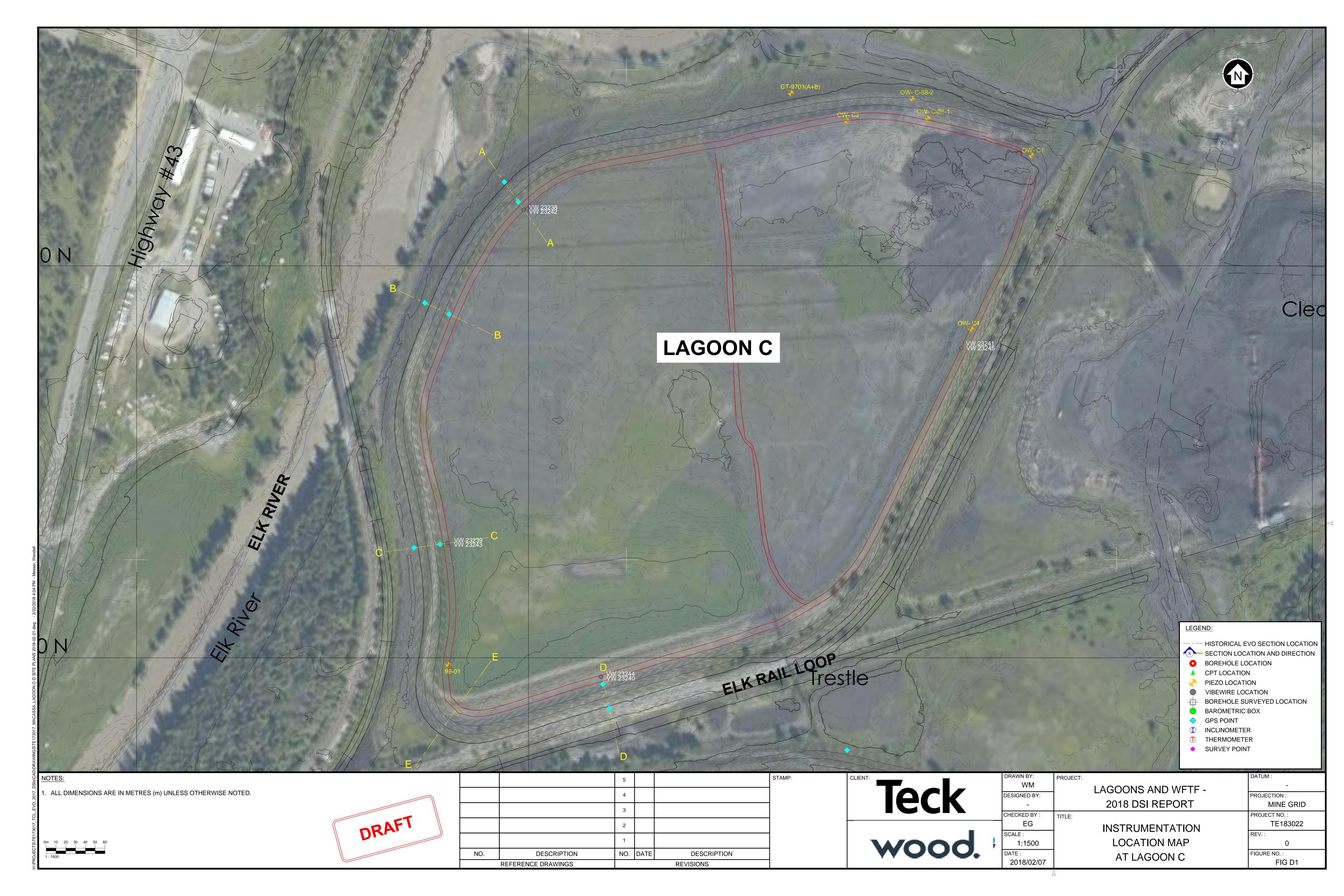






wood.

## Appendix D Lagoon C Cross Sections and Instrumentation Data Plots



**CROSS-SECTION** ORIGIN COORD: 14538.12E, 52909.99N AZIMUTH: 144°50'19" LAGOON C CROSS-SECTION A-A' 1200m -NOTES: - YEARS OF CONSTRUCTION, MATERIAL TYPE AND HISTORIC LOCATION OF LIFTS ARE ROUGHLY APPROXIMATED FROM GOLDER ASSOCIATES ANNUAL CONSTRUCTION REVIEW OF TAILINGS LAGOONS C AND D (1997) - PIEZOMETER DATA READ Oct 3, 2017 unless otherwise marked - TYPICAL PIEZOMETER DATA: PIEZOMETER NAME WATER ELEVATION WATER SELEVATION OF PIEZOMETER SENSOR TIP 1175m -- WATER LEVEL: - PIEZOMETER DEPTH (MEAS): - PIEZOMETER DEPTH (DES): - WET AT PIEZO TIP - GPS MONITORING POINT 1150m A = Sand and Gravel Fill B = Compacted Coarse Rejects C = Compacted Tails **LIDAR SURVEY AUGUST 2013 GPS SURVEY JULY 2015** 1125m -0 (1986<sup>1</sup>  $\bigcirc$ (1970-1982) ORIGINAL GROUND 1964 1100m · 25m 50m 100m 0m 75m 125m 150m **DISTANCE Elkview Operations** Geotechnical Engineering LAGOON C CROSS-SECTION A-A' 2017

DWG. NO.:

SCALE:

REV BY:

DATE:

NOV. 2017

DWN BY: A. GLOVER

**CROSS-SECTION** ORIGIN COORD: 14267.12E, 52774.79N AZIMUTH: 115°6'0" LAGOON C CROSS-SECTION B-B' 1200m -NOTES: - YEARS OF CONSTRUCTION, MATERIAL TYPE AND HISTORIC LOCATION OF LIFTS ARE ROUGHLY APPROXIMATED FROM GOLDER ASSOCIATES ANNUAL CONSTRUCTION REVIEW OF TAILINGS LAGOONS C AND D (1997) - PIEZOMETER DATA READ Oct 3, 2017 unless otherwise marked - TYPICAL PIEZOMETER DATA: PIEZOMETER NAME WATER ELEVATION DISTANCE EASTWEST NORTH/SOUTH FROM SECTION LINE DES. ELEVATION OF PIEZOMETER SENSOR TIP 1175m -- WATER LEVEL: - PIEZOMETER DEPTH (MEAS): - PIEZOMETER DEPTH (DES): - WET AT PIEZO TIP - GPS MONITORING POINT LEGEND: 1150m A = Sand and Gravel Fill B = Compacted Coarse Rejects C = Compacted Tails **LIDAR SURVEY AUGUST 2013 GPS SURVEY JULY 2015** 1125m - $\bigcirc$ **B** (1985)  $\bigcirc$ **ORIGINAL GROUND 1964** 1100m -25m 50m 75m 100m 0m 125m 150m **DISTANCE Elkview Operations** Geotechnical Engineering LAGOON C CROSS-SECTION B-B' 2017

DWG. NO.:

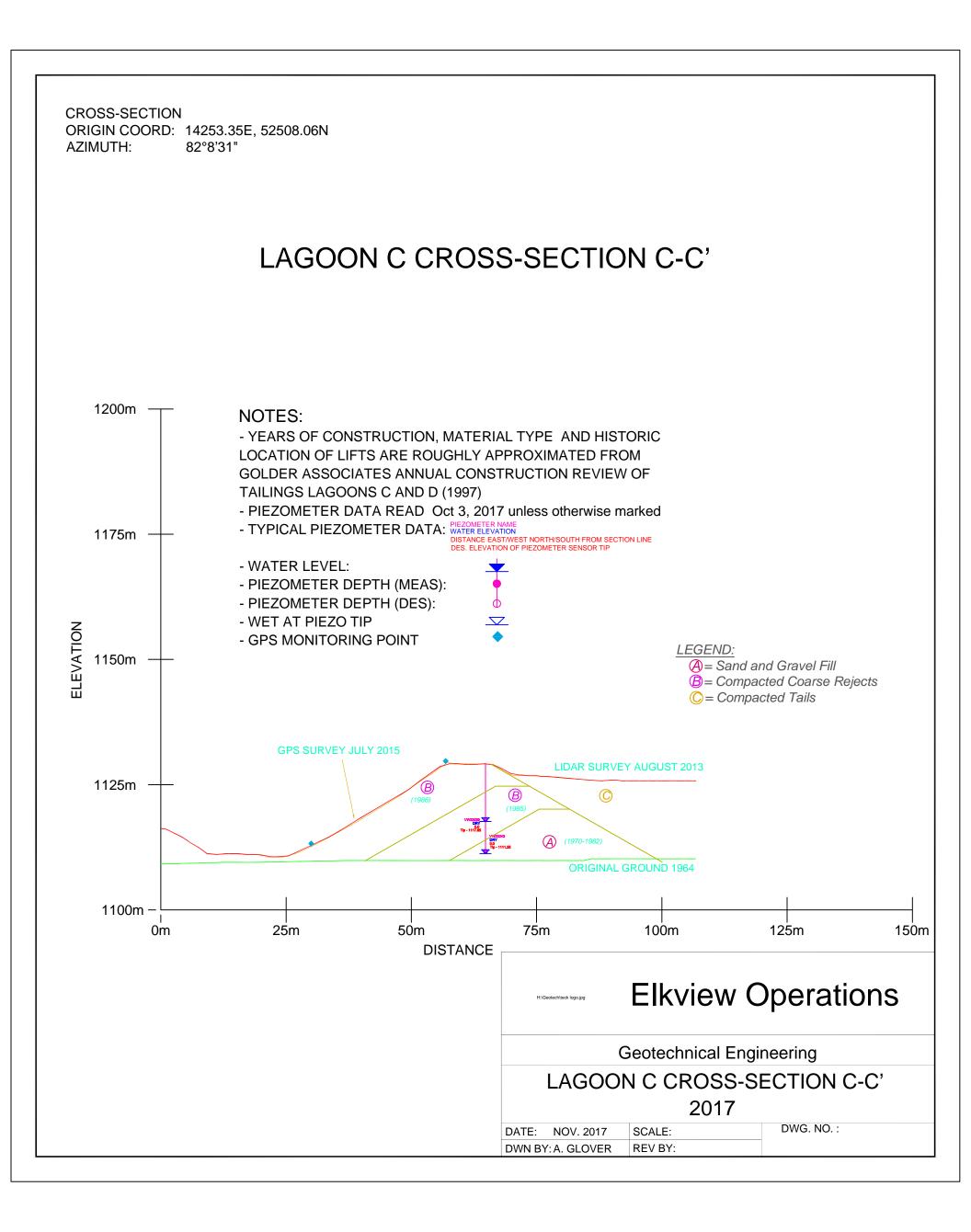
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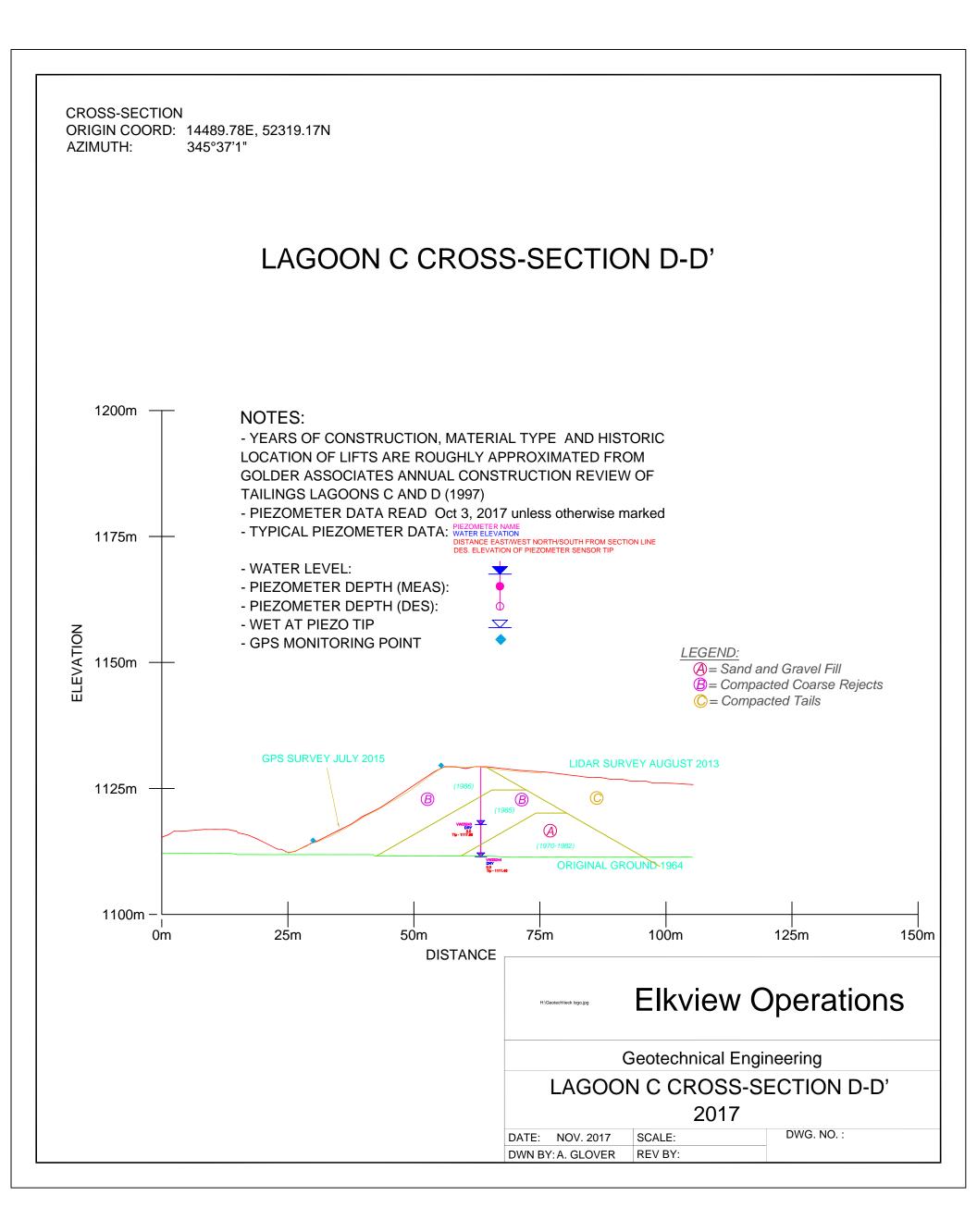
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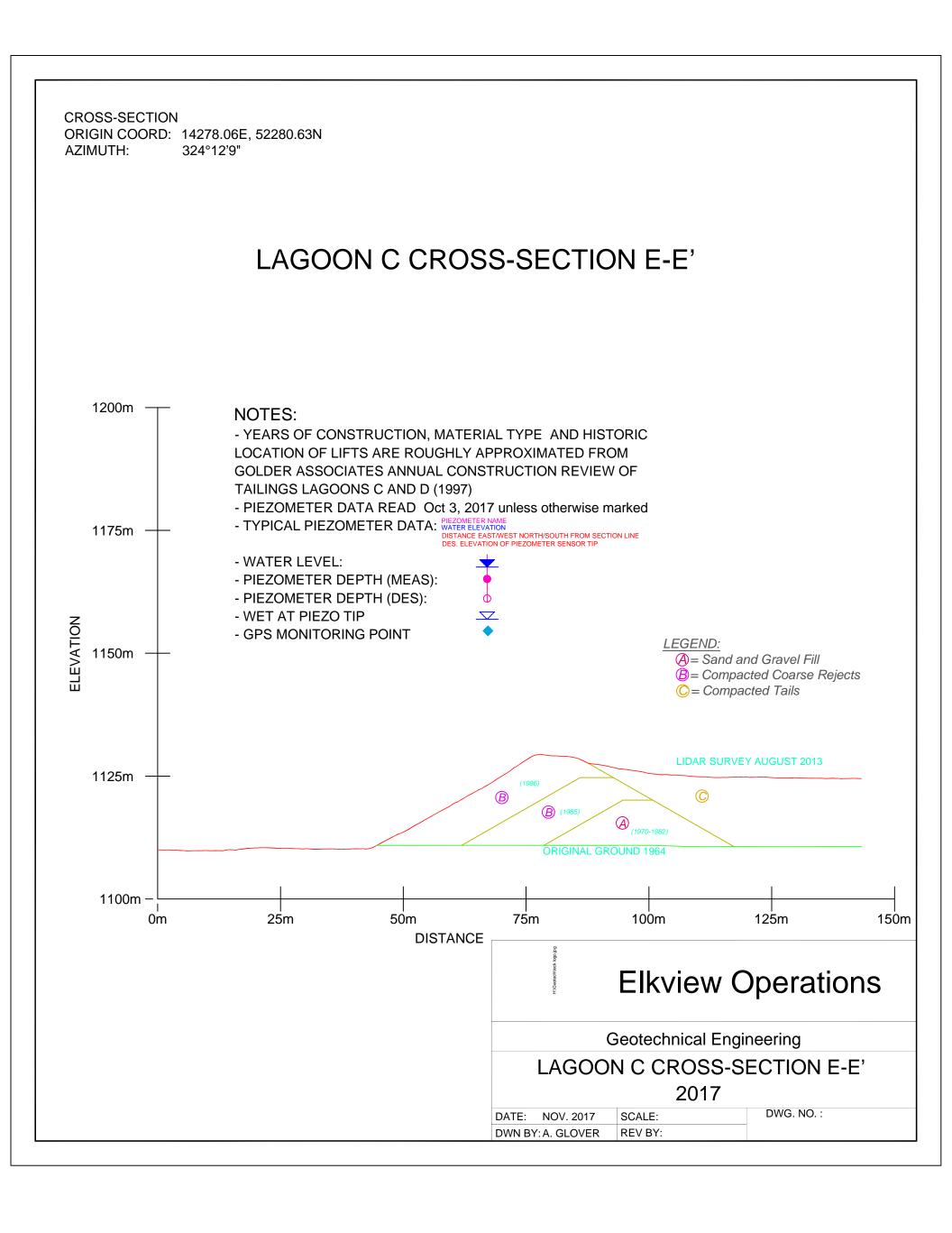
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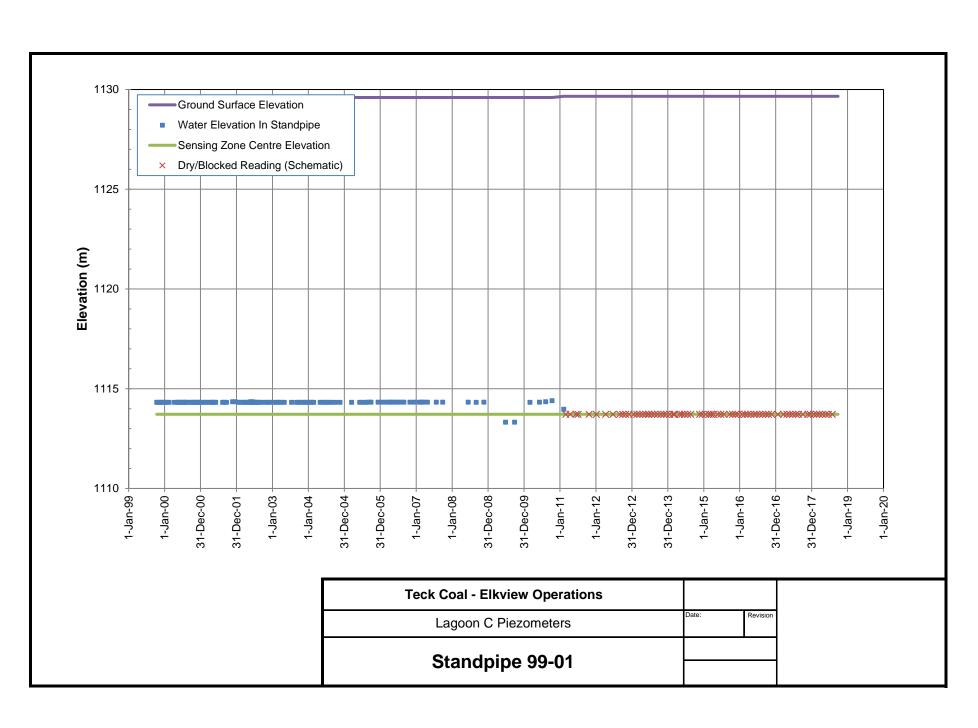
NOV. 2017

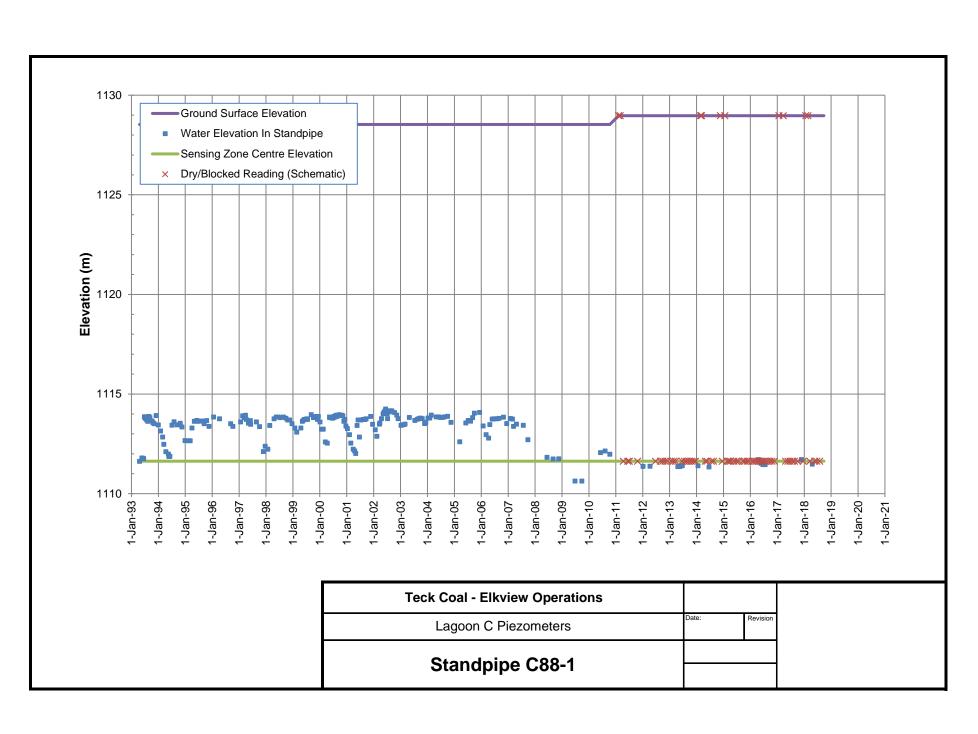
DWN BY: A. GLOVER

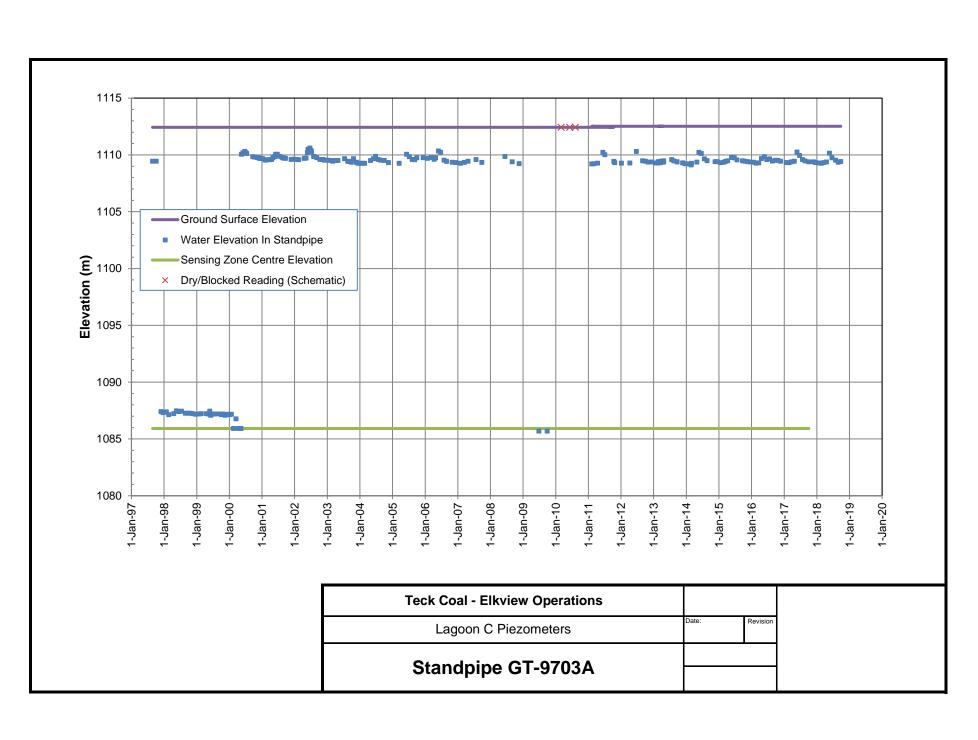


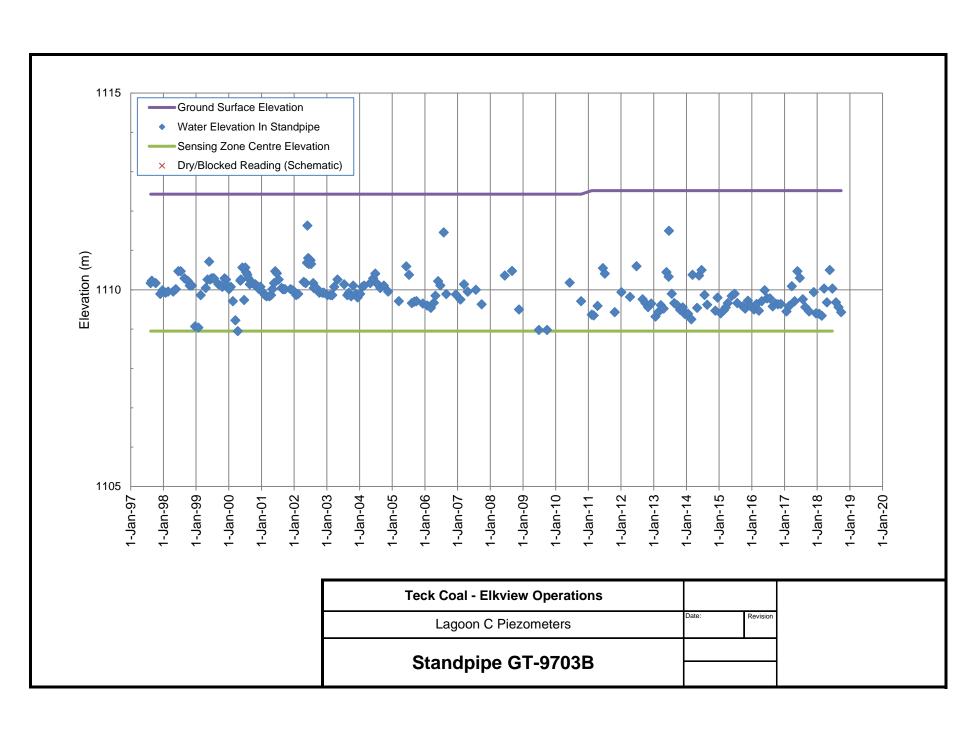


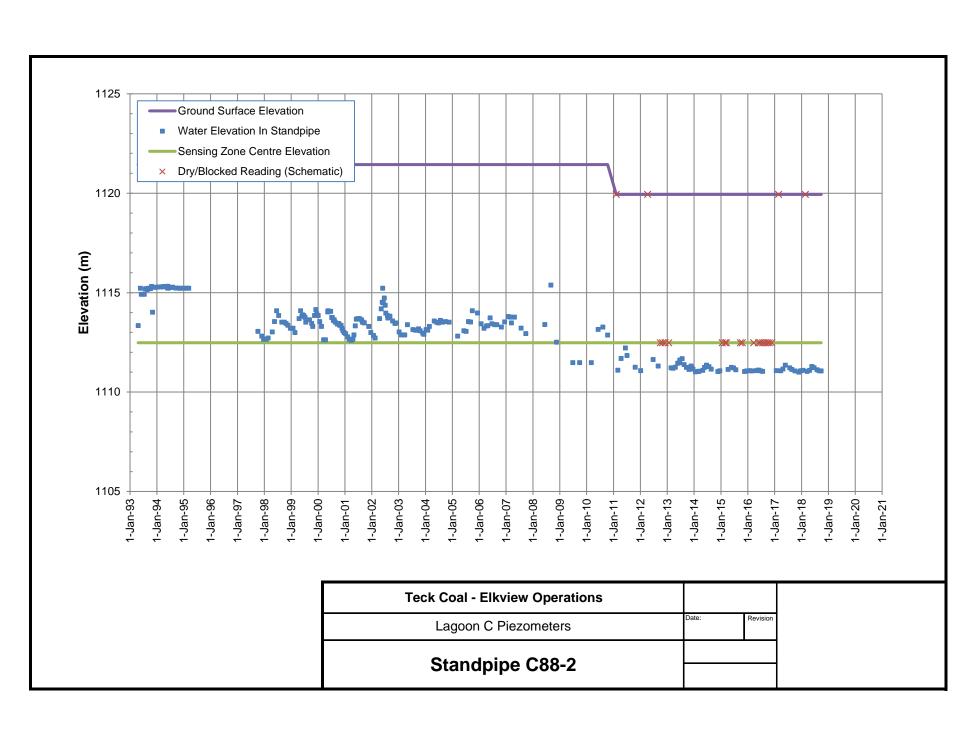


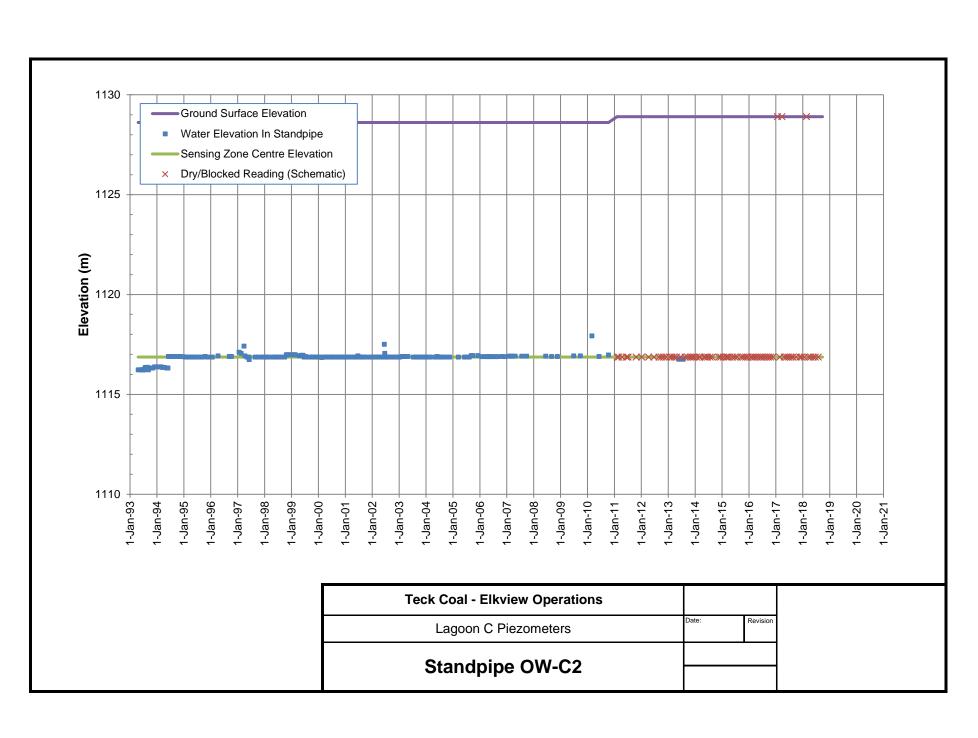


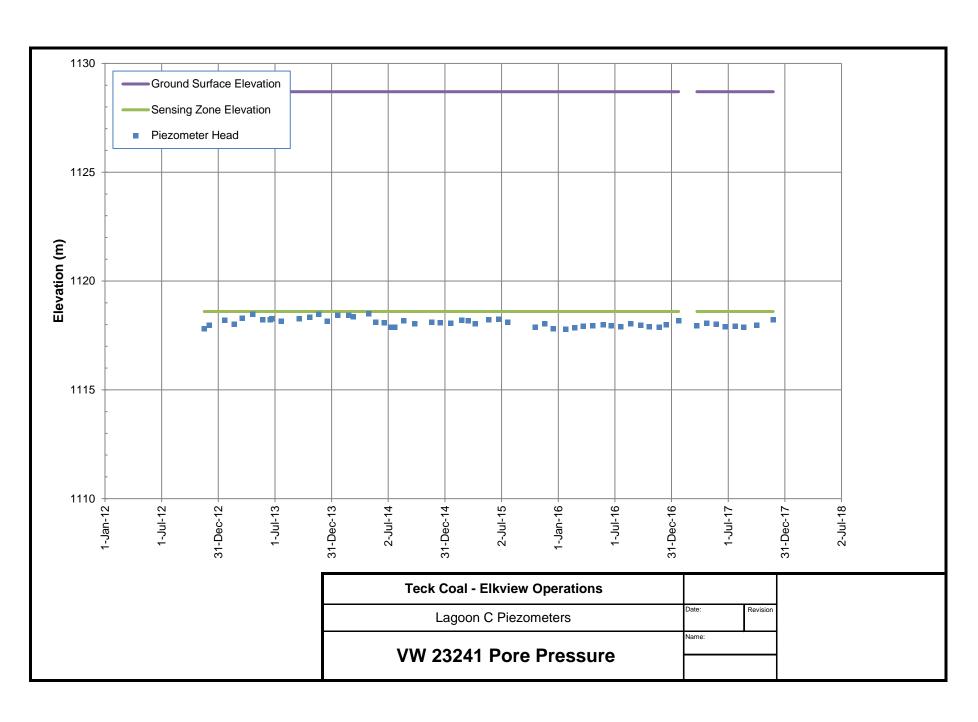


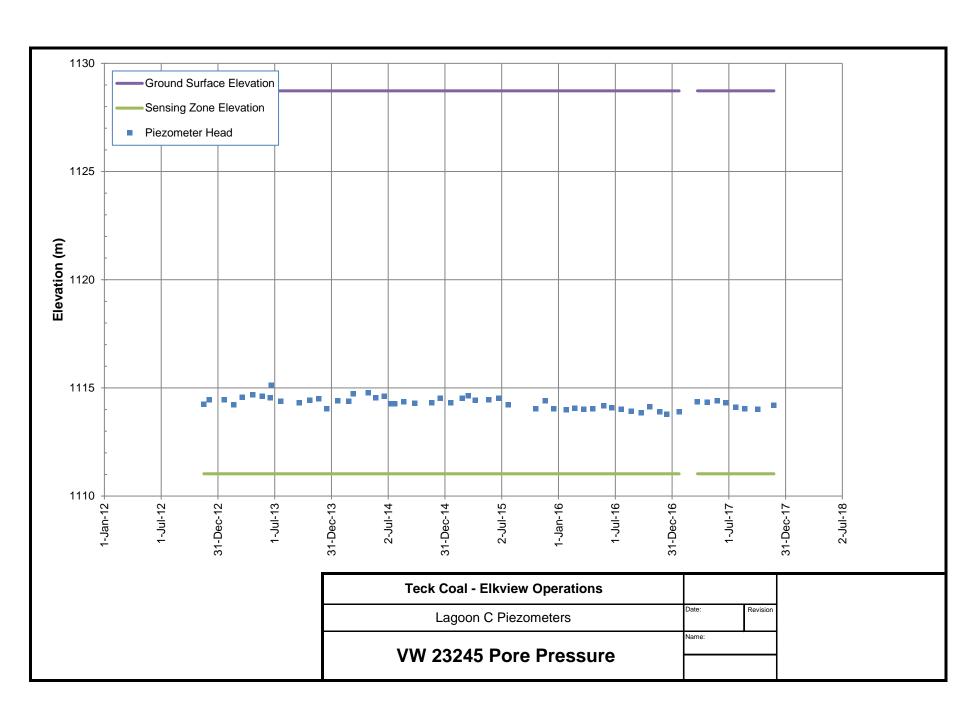


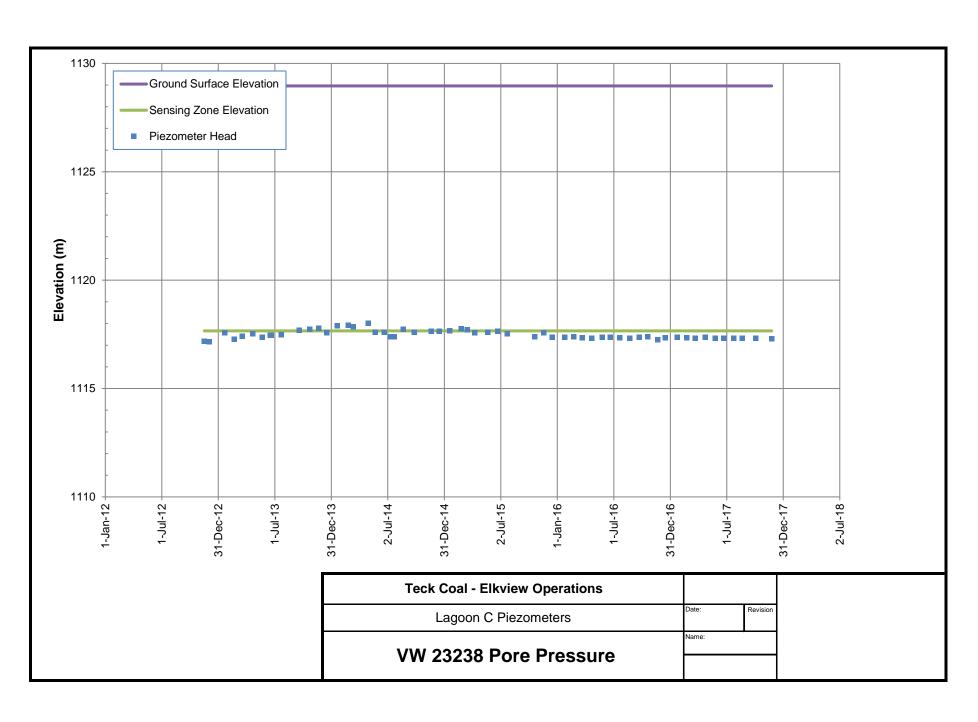


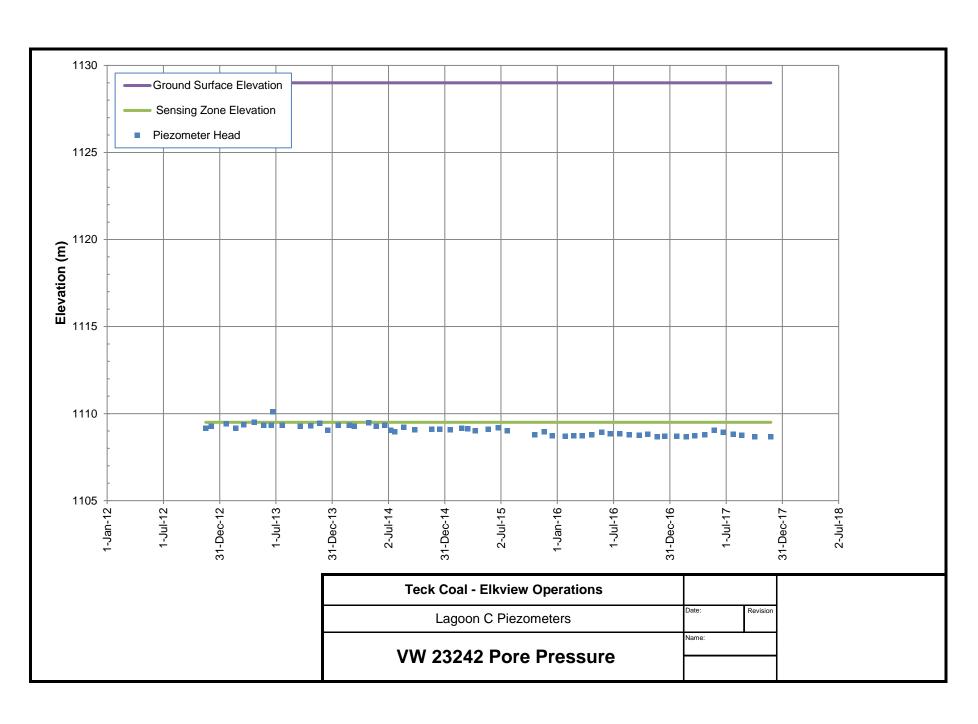


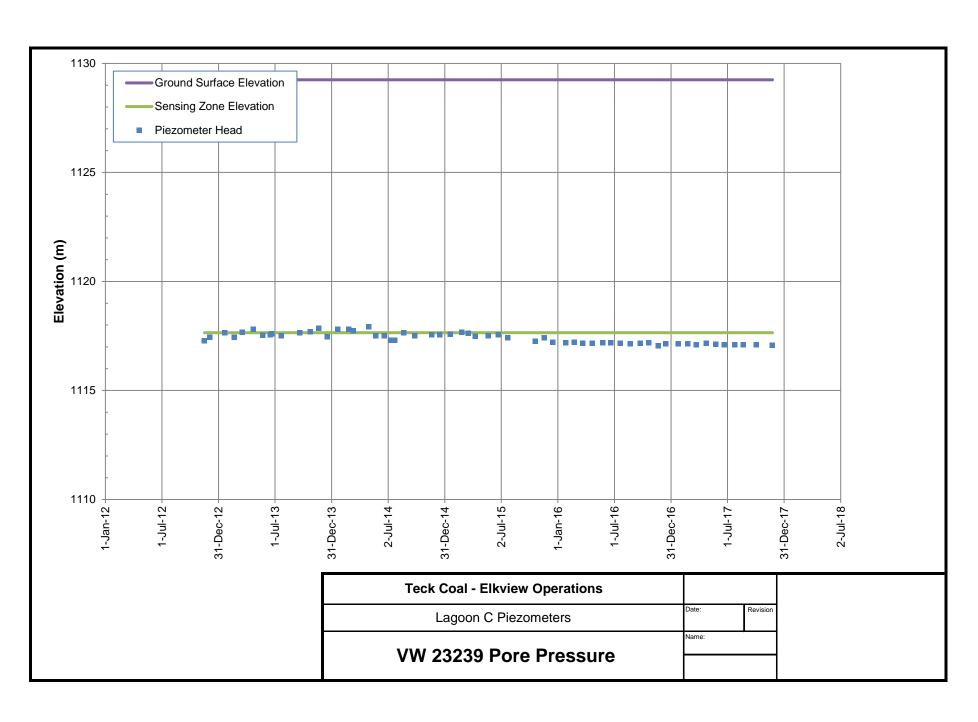


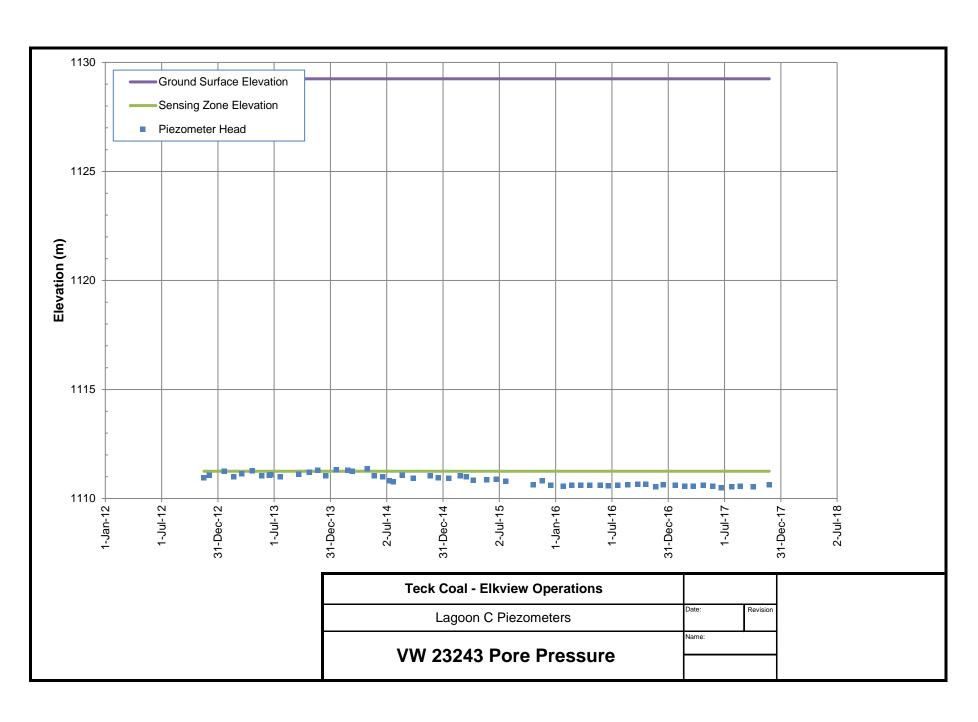


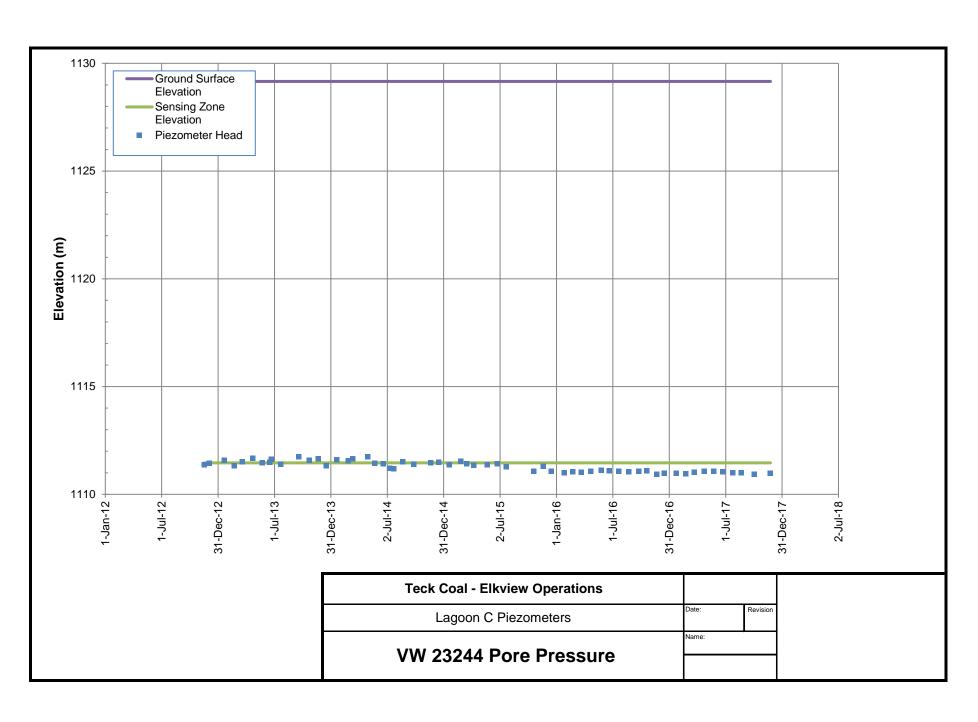


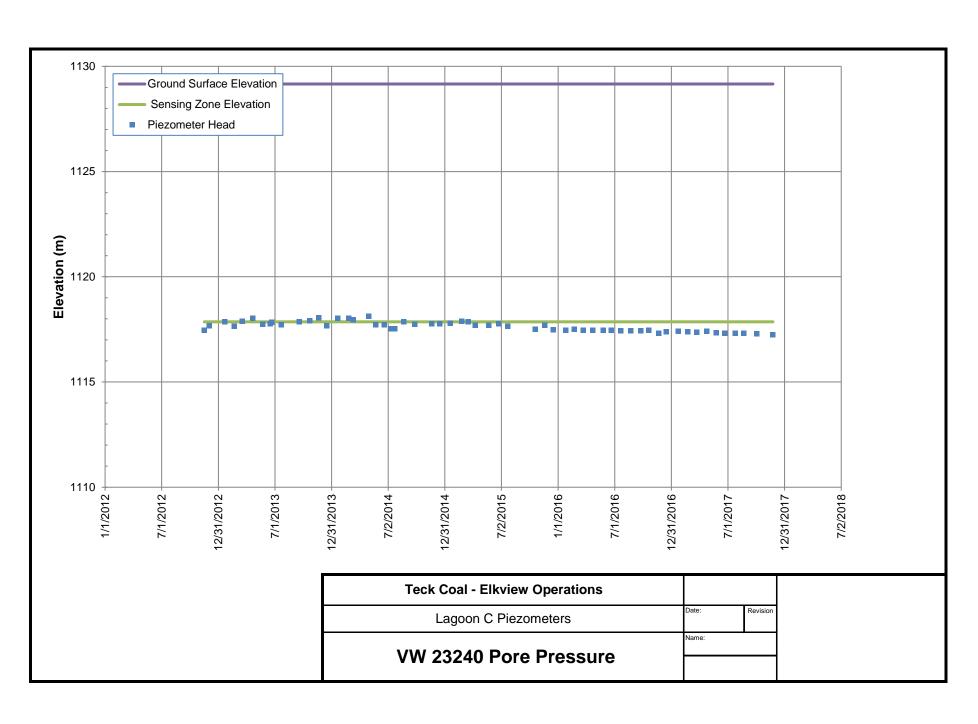


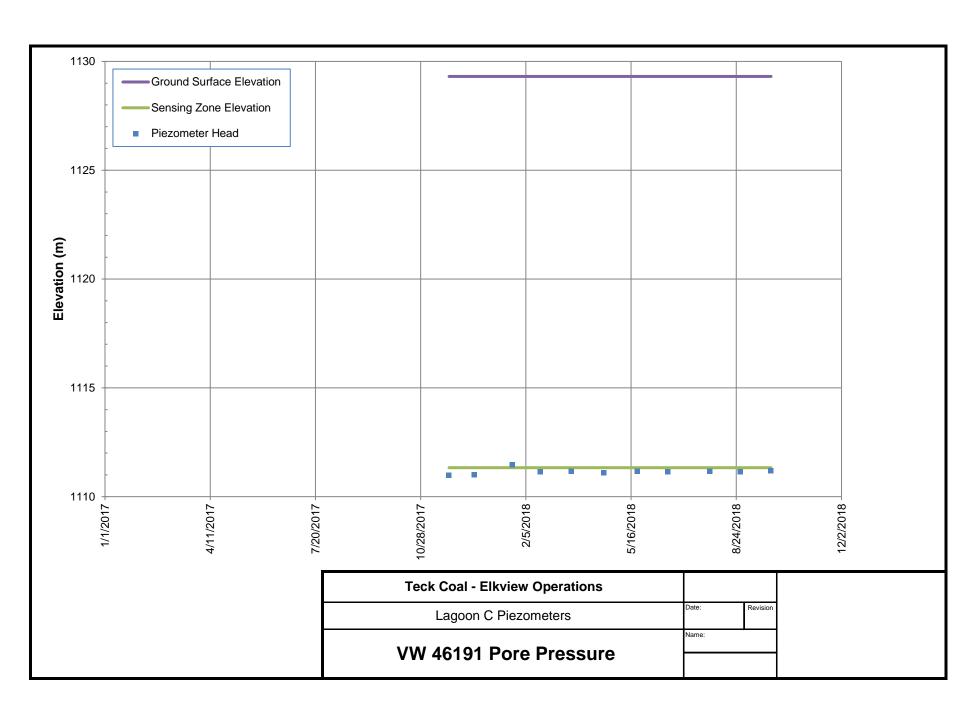


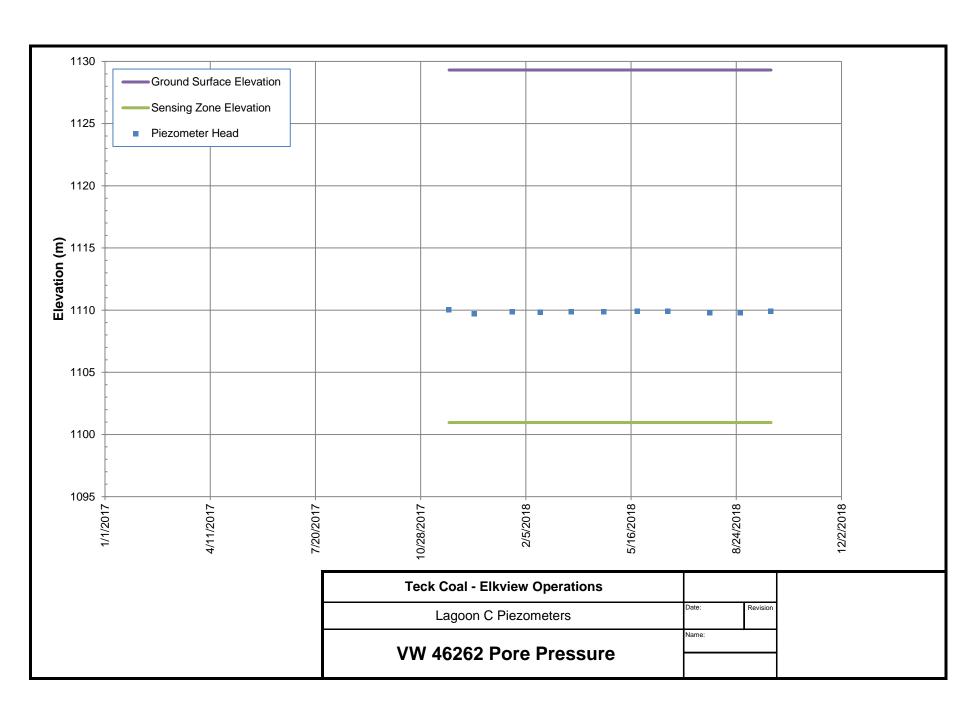


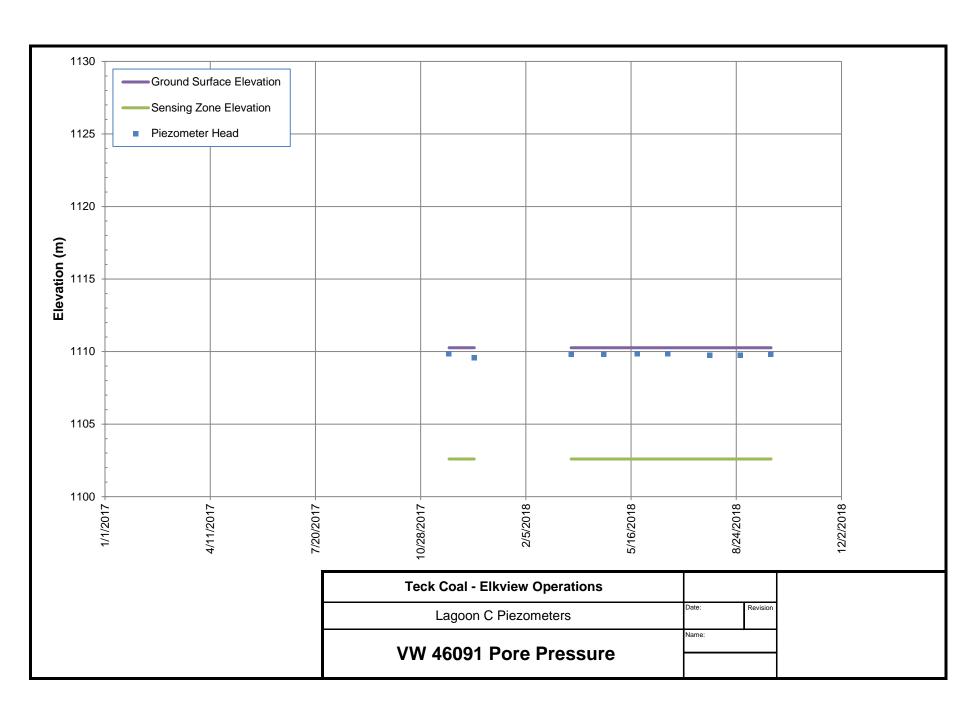


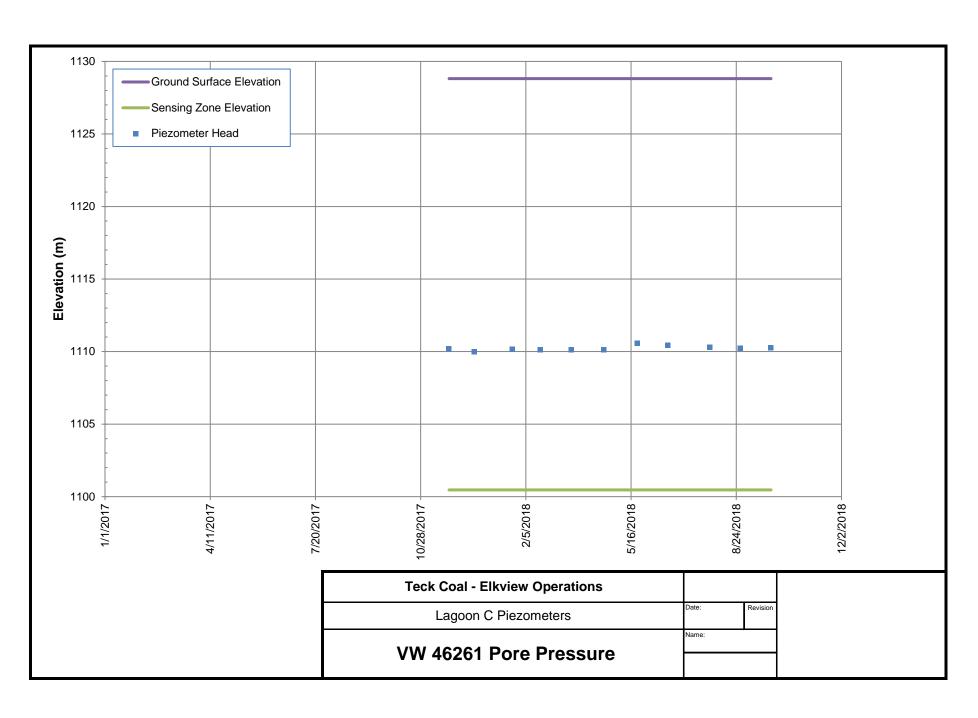


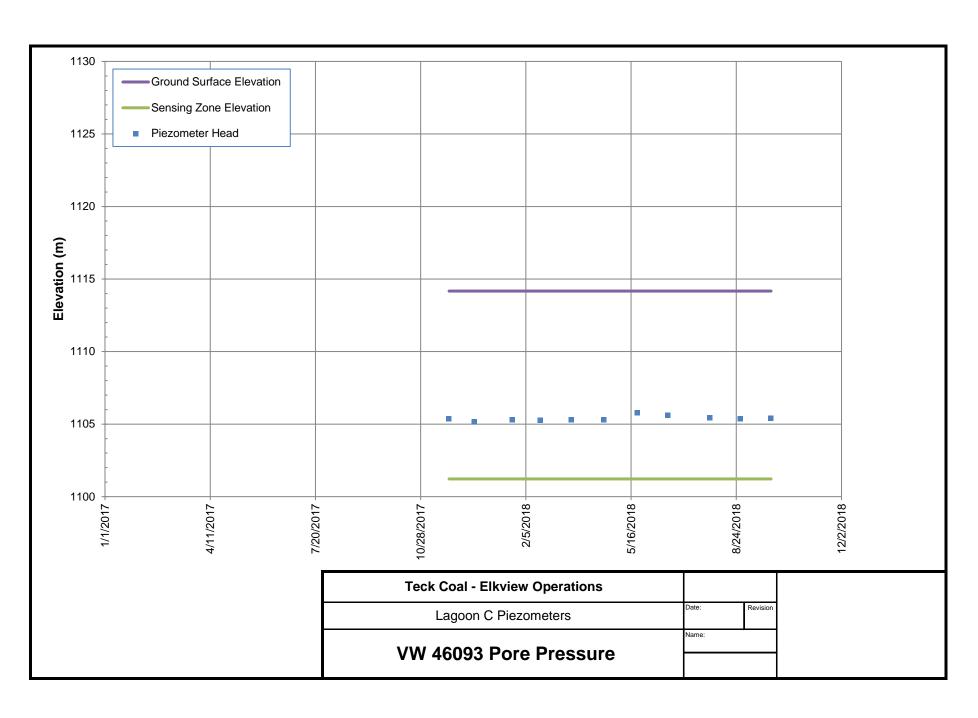




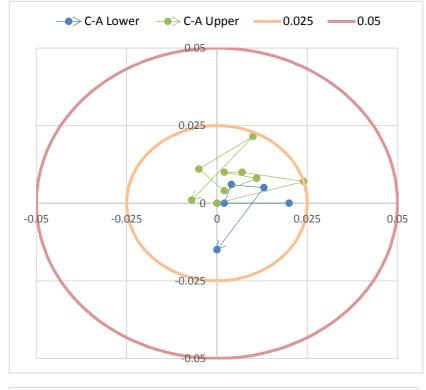


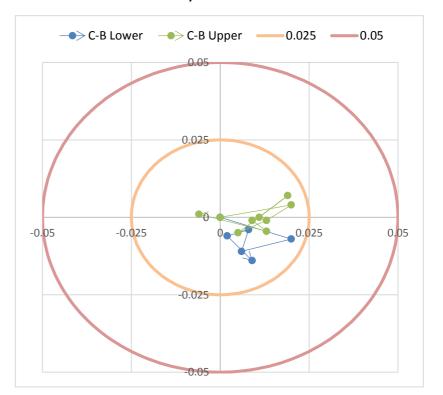


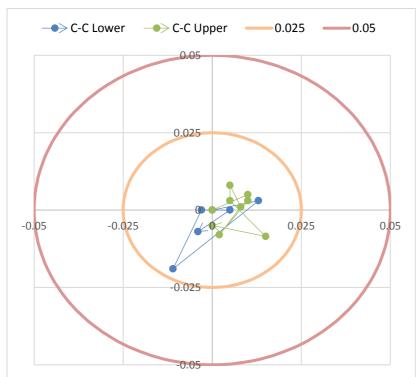


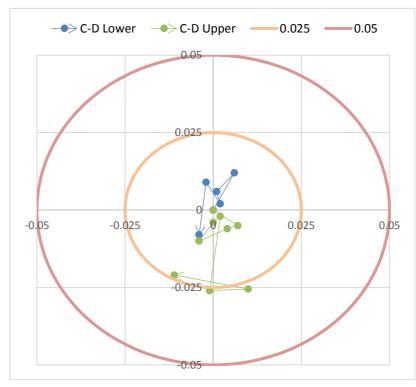


### EASTING AND NORTHING DELTA FOR GPS CONTROL POINTS AT LAGOON C (FROM JULY 2015 TO JUNE 2017)

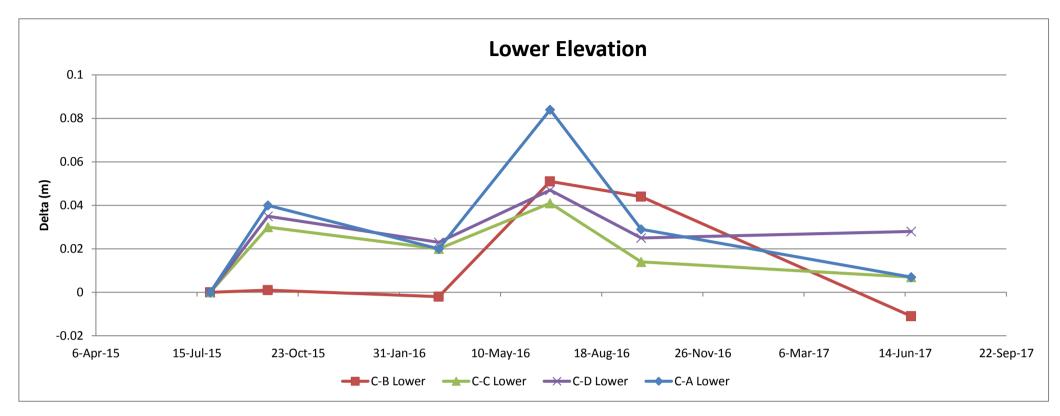


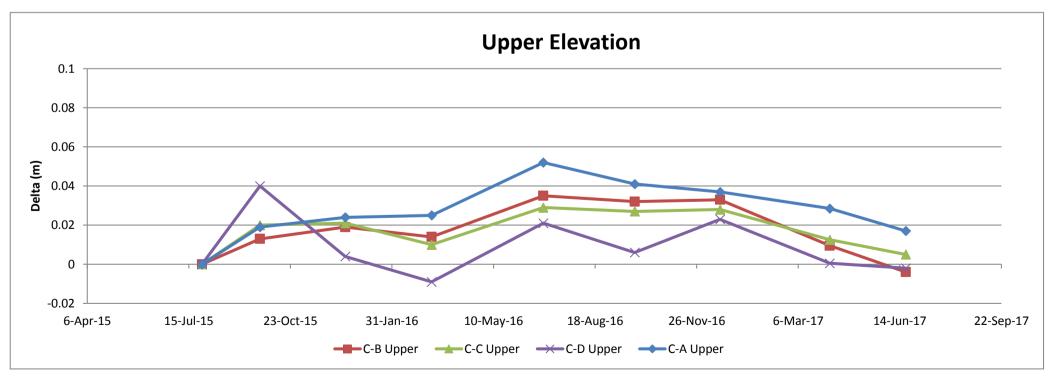






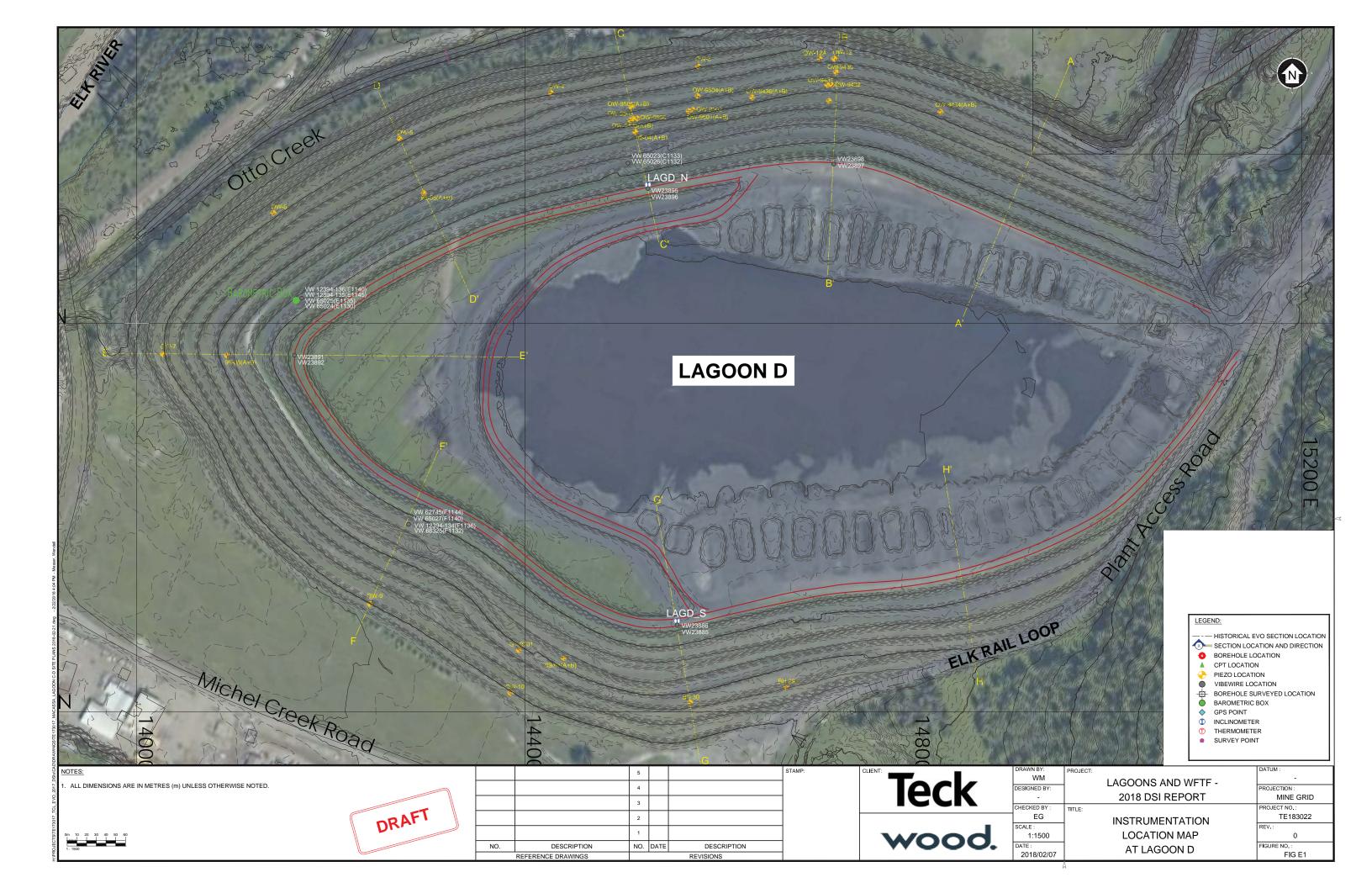
### EASTING AND NORTHING DELTA FOR GPS CONTROL POINTS AT LAGOON C (FROM JULY 2015 TO JUNE 2017)





wood.

# Appendix E Lagoon D Cross Sections and Instrumentation Data Plots

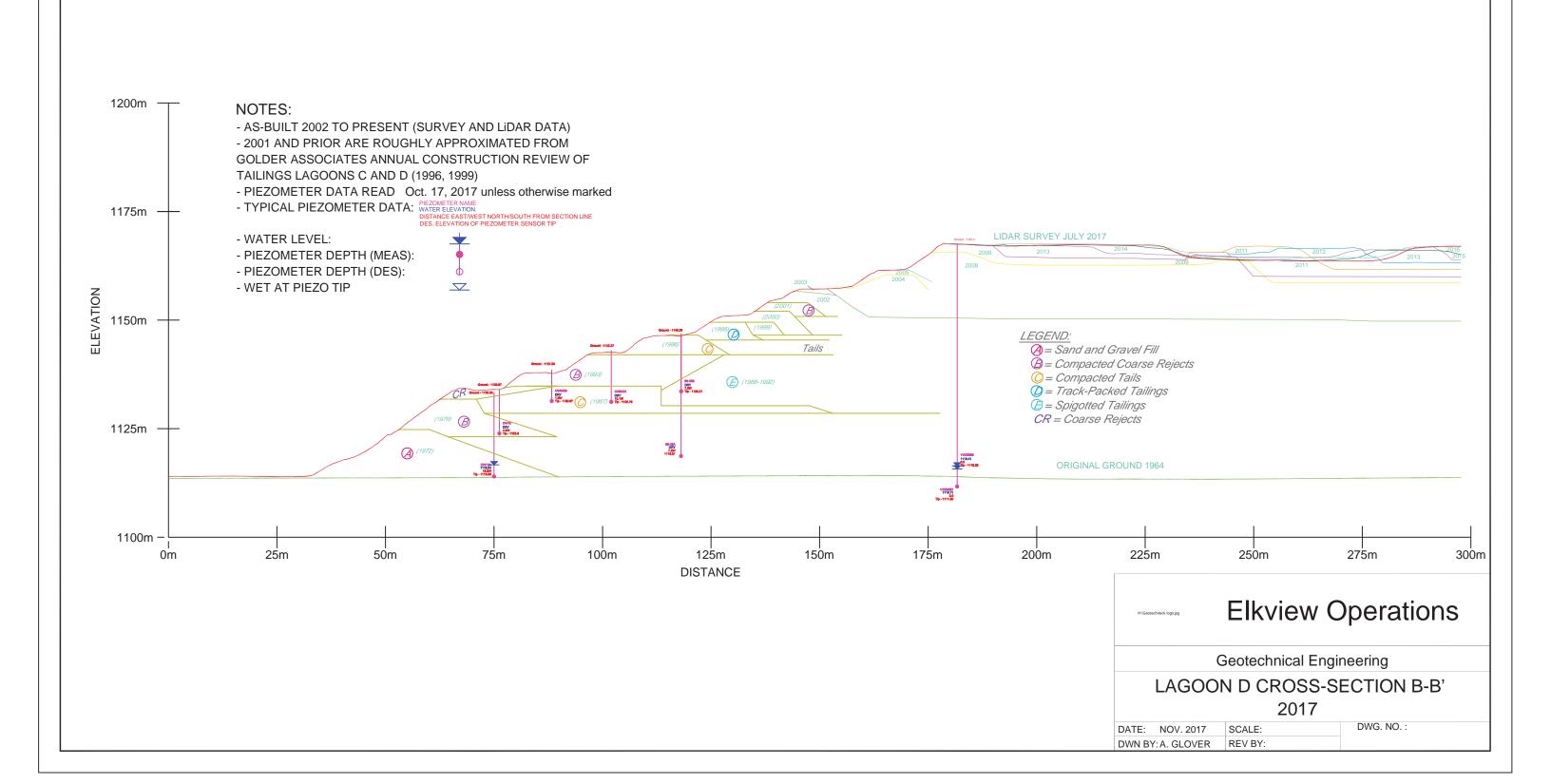


**CROSS-SECTION** ORIGIN COORD: 14960.53E, 52265.72N AZIMUTH: 202°53'07" LAGOON D CROSS-SECTION A-A' 1200m NOTES: - AS-BUILT 2002 TO PRESENT (SURVEY AND LIDAR DATA) - TYPICAL 2000 AND PRIOR (APPROXIMATED FROM GOLDER ASSOCIATES ANNUAL CONSTRUCTION REVIEW OF TAILINGS LAGOONS C AND D (1996, 1999)) 1175m LIDAR SURVEY JULY 2017 TION TION TION B A = Sand and Gravel Fill **B** (1993) B = Compacted Coarse Rejects C = Compacted TailsD = Track-Packed Tailings **(***i* = Spigotted Tailings CR = Coarse Rejects 1125m **(1972) ORIGINAL GROUND 1964** 1100m · 225m 250m 25m 50m 75m 150m 175m 200m 275m 0m 100m 125m 300m DISTANCE **Elkview Operations** Geotechnical Engineering LAGOON D CROSS-SECTION A-A' 2017 DWG. NO.: DATE: NOV. 2017 SCALE: DWN BY: A. GLOVER REV BY:

ORIGIN COORD: 14726.30E, 52346.74N

AZIMUTH: 182°47'27"

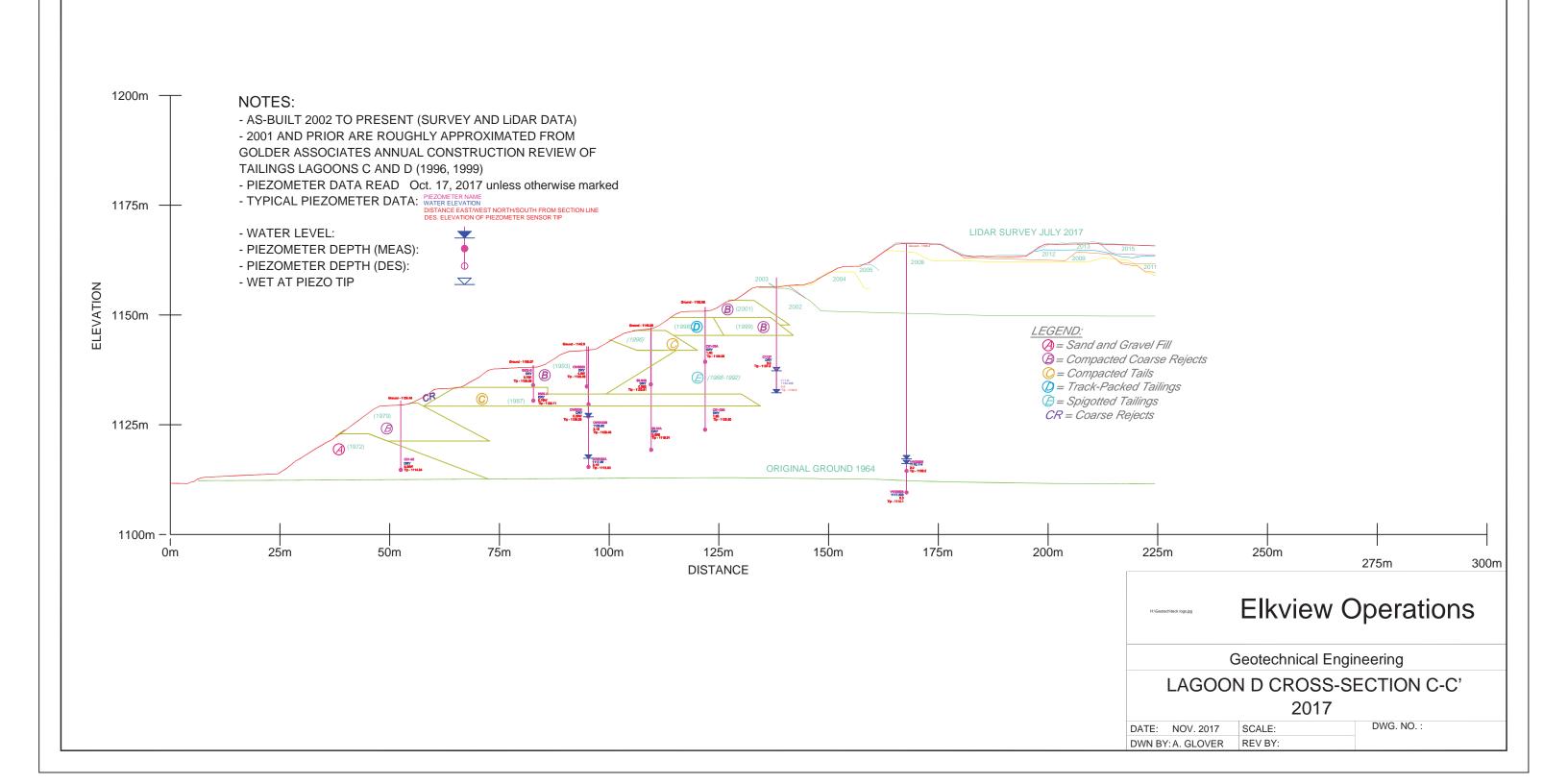
## LAGOON D CROSS-SECTION B-B'



ORIGIN COORD: 14491.89E, 52303.38N

AZIMUTH: 168°11'50"

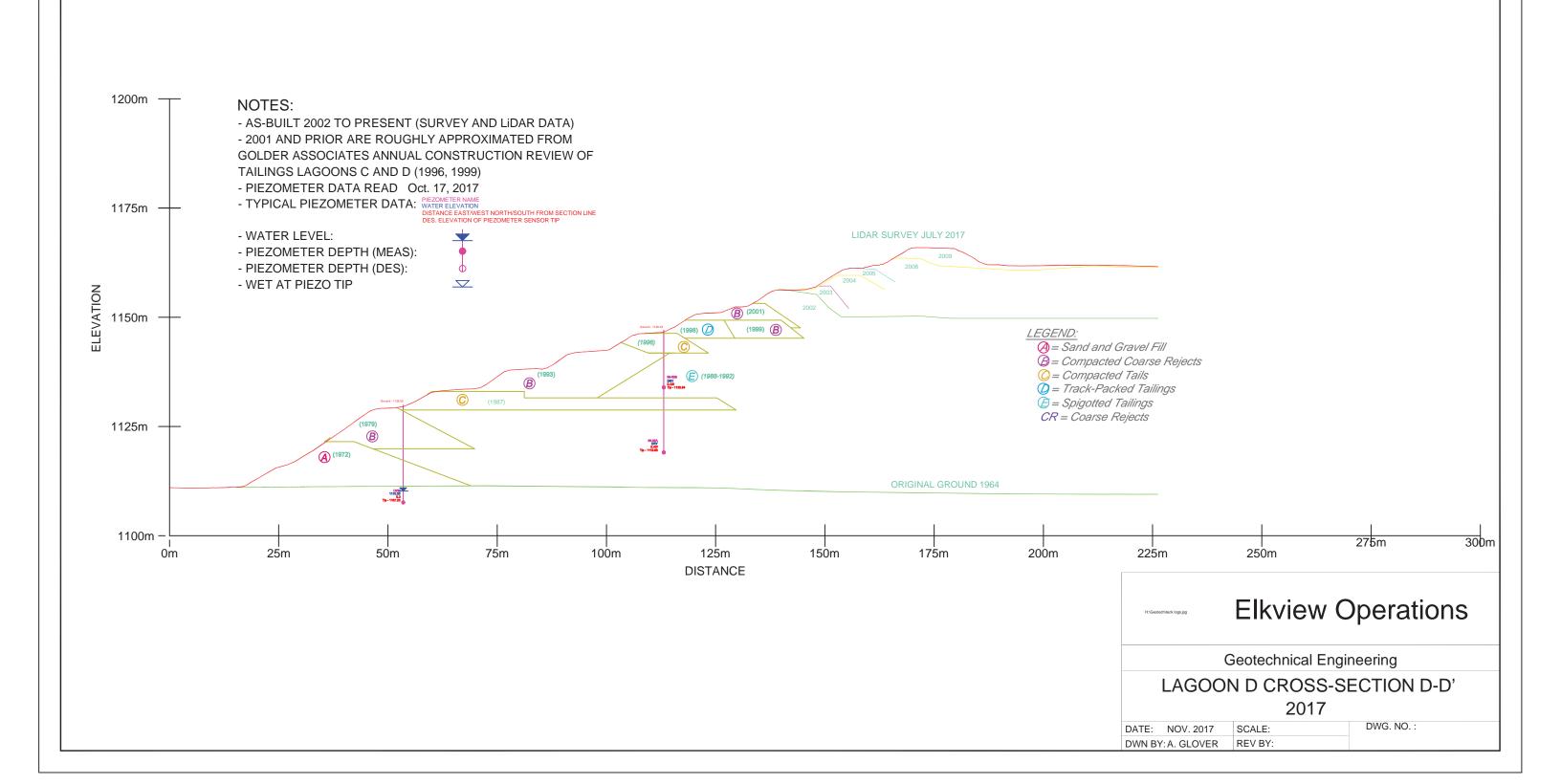
# LAGOON D CROSS-SECTION C-C'

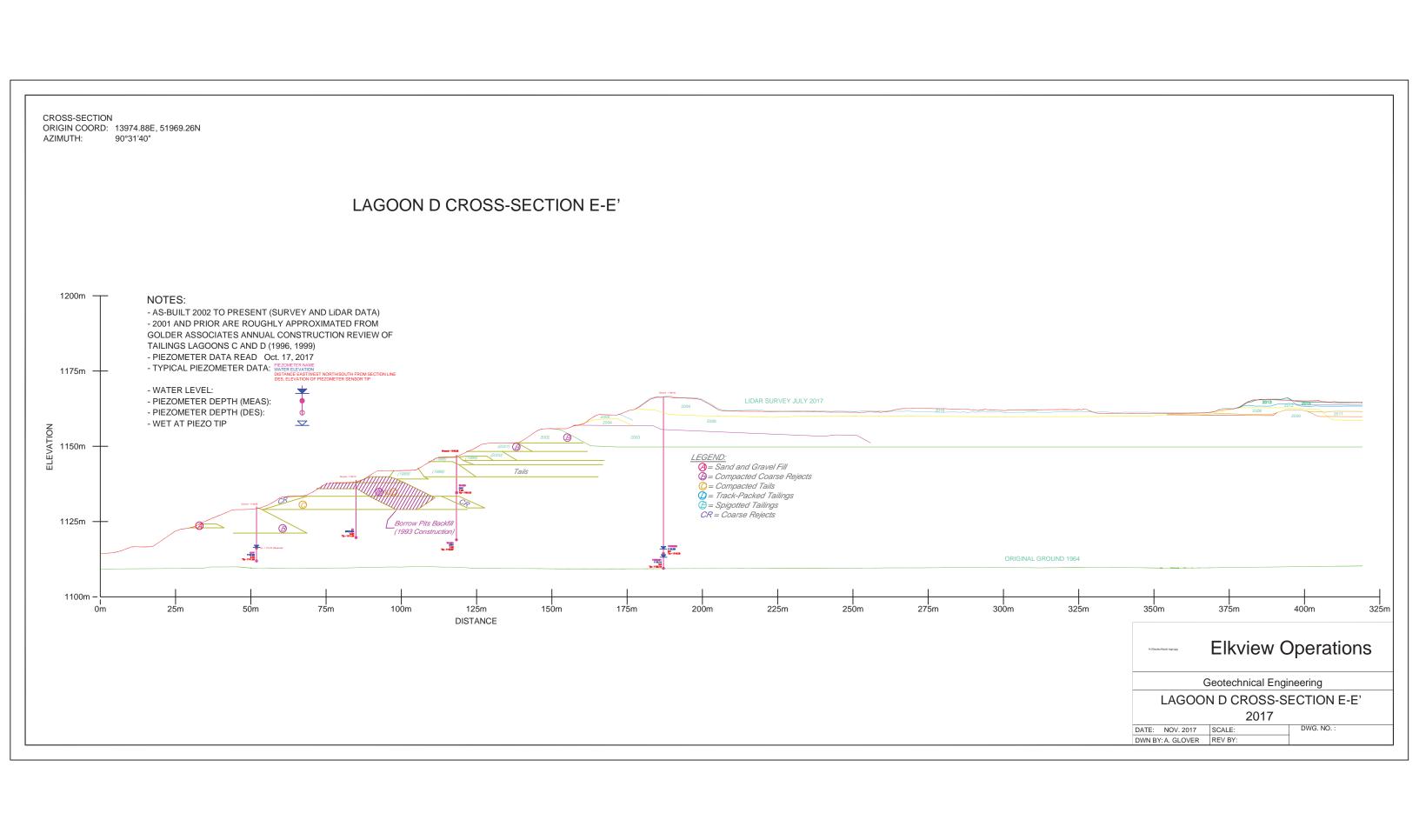


ORIGIN COORD: 14249.70E, 52237.31N

AZIMUTH: 155°43'21"

## LAGOON D CROSS-SECTION D-D'

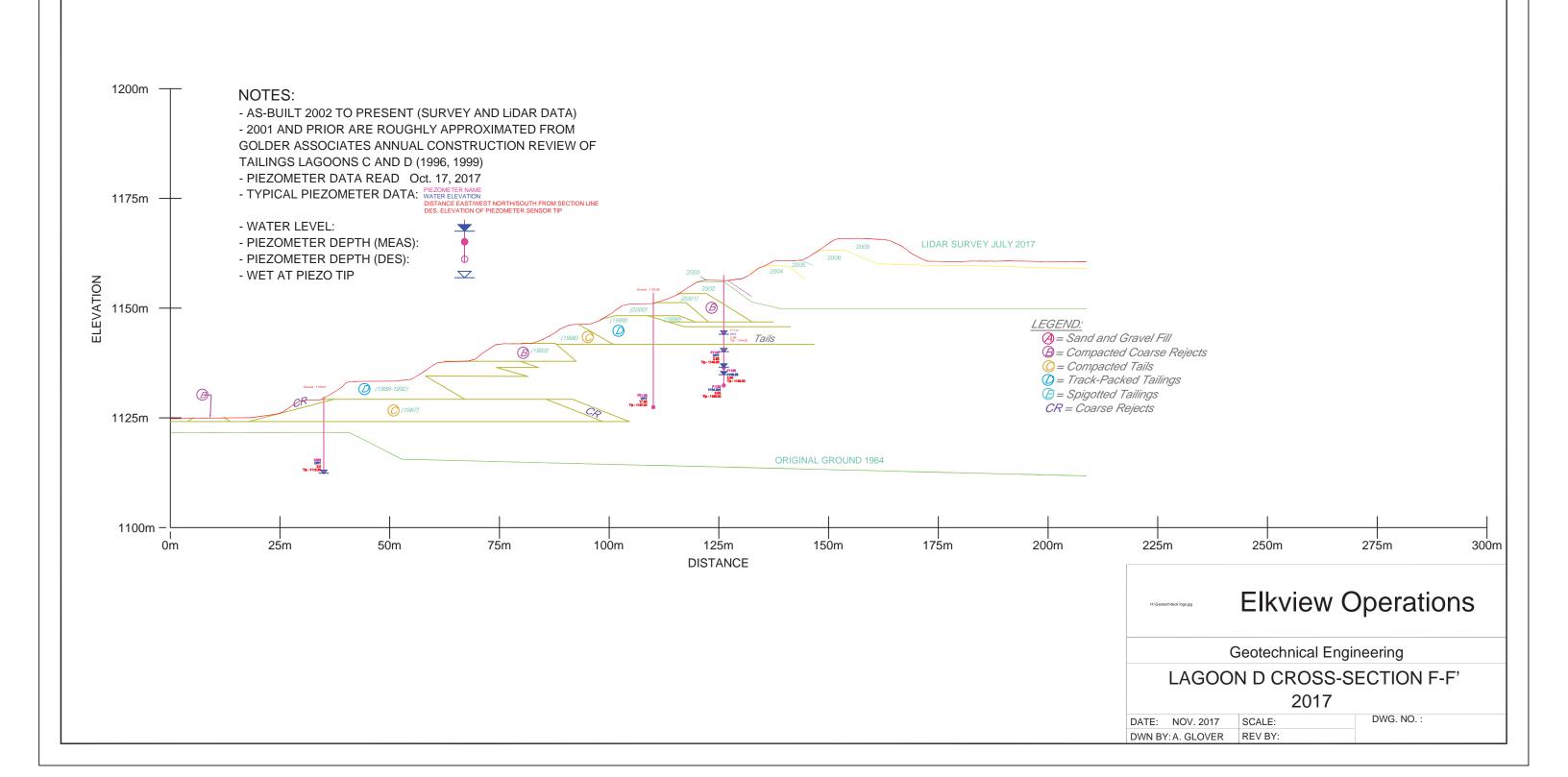




ORIGIN COORD: 14225.89E, 51679.04N

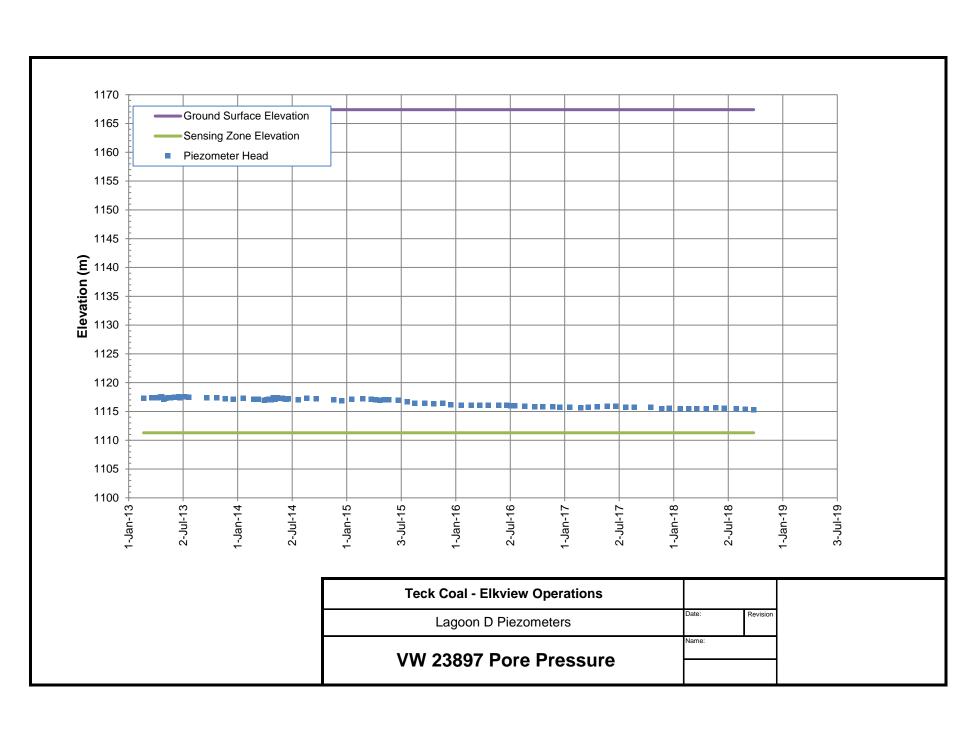
AZIMUTH: 24°05'20"

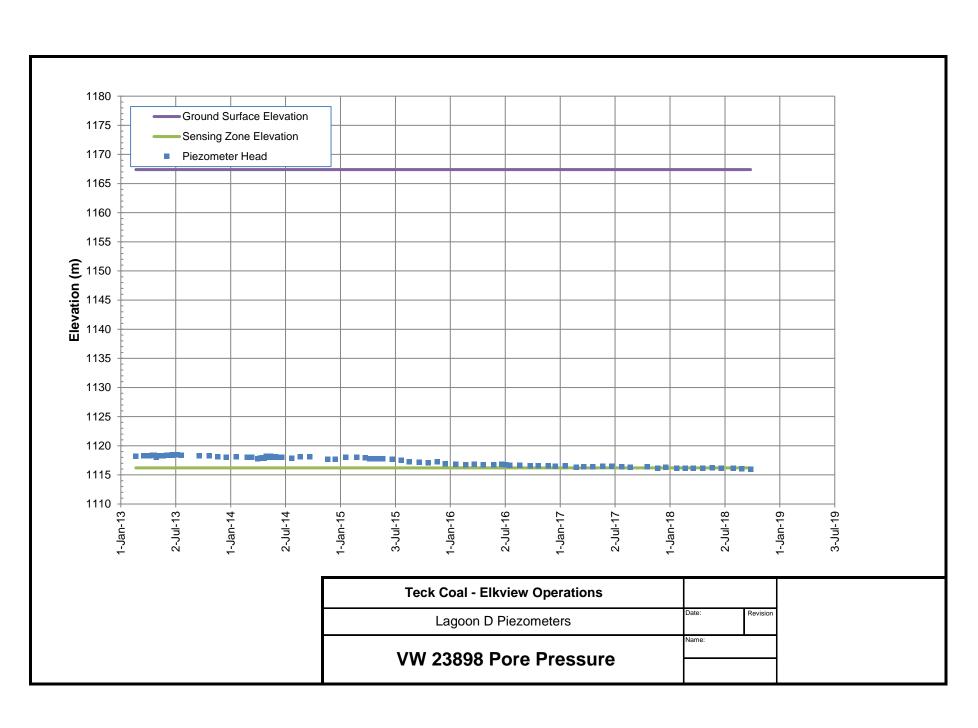
## LAGOON D CROSS-SECTION F-F'

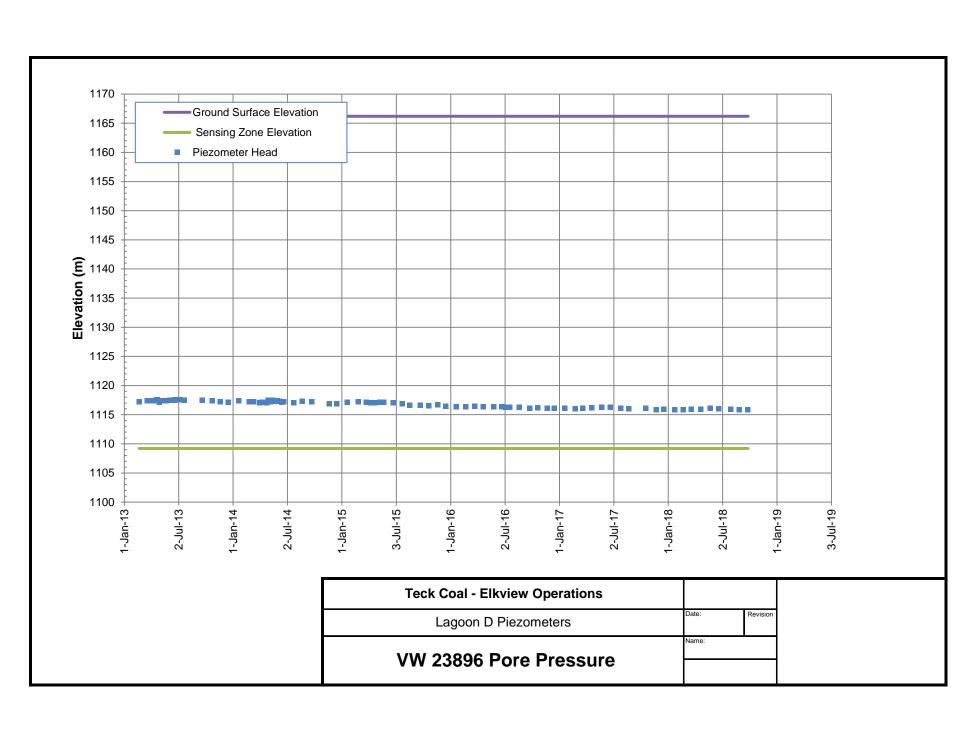


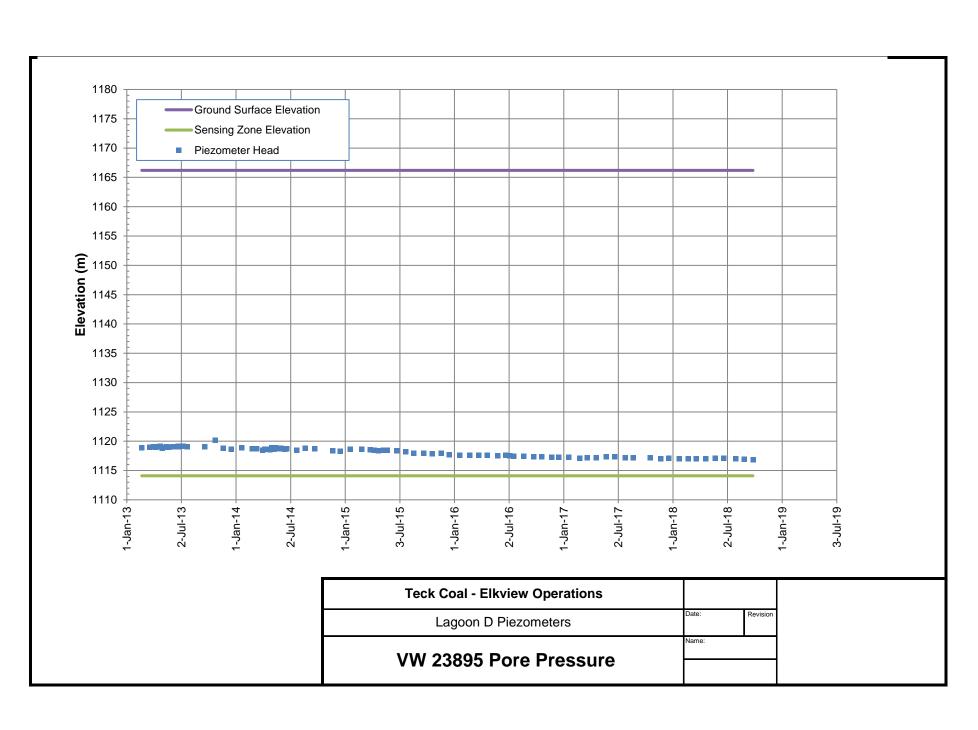
**CROSS-SECTION** ORIGIN COORD: 14583.76E, 51528.38N AZIMUTH: 350°18'50" LAGOON D CROSS-SECTION G-G' 1200m NOTES: - AS-BUILT 2002 TO PRESENT (SURVEY AND LIDAR DATA) - 2001 AND PRIOR ARE ROUGHLY APPROXIMATED FROM GOLDER ASSOCIATES ANNUAL CONSTRUCTION REVIEW OF TAILINGS LAGOONS C AND D (1996, 1999) - PIEZOMETER DATA READ Oct. 17, 2017 - TYPICAL PIEZOMETER DATA: PIEZOMETER NAME WATER ELEVATION DISTANCE EAST/WEST NORTH/SOUTH FROM SECTION LINE DES. ELEVATION OF PIEZOMETER SENSOR TIP 1175m - WATER LEVEL: LIDAR SURVEY JULY 2017 - PIEZOMETER DEPTH (MEAS): - PIEZOMETER DEPTH (DES): - WET AT PIEZO TIP  $\overline{\nabla}$ ELEVATION 1150m LEGEND: A = Sand and Gravel Fill Tails B = Compacted Coarse Rejects C = Compacted TailsD = Track-Packed Tailings (1987) **(***i* = Spigotted Tailings CR = Coarse Rejects 1125m **ORIGINAL GROUND 1964** 1100m · 200m 225m 250m 25m 50m 75m 100m 125m 150m 175m 275m 300m 0m DISTANCE **Elkview Operations** Geotechnical Engineering LAGOON D CROSS-SECTION G-G' 2017 DWG. NO.: SCALE: DATE: NOV. 2017 DWN BY: A. GLOVER REV BY:

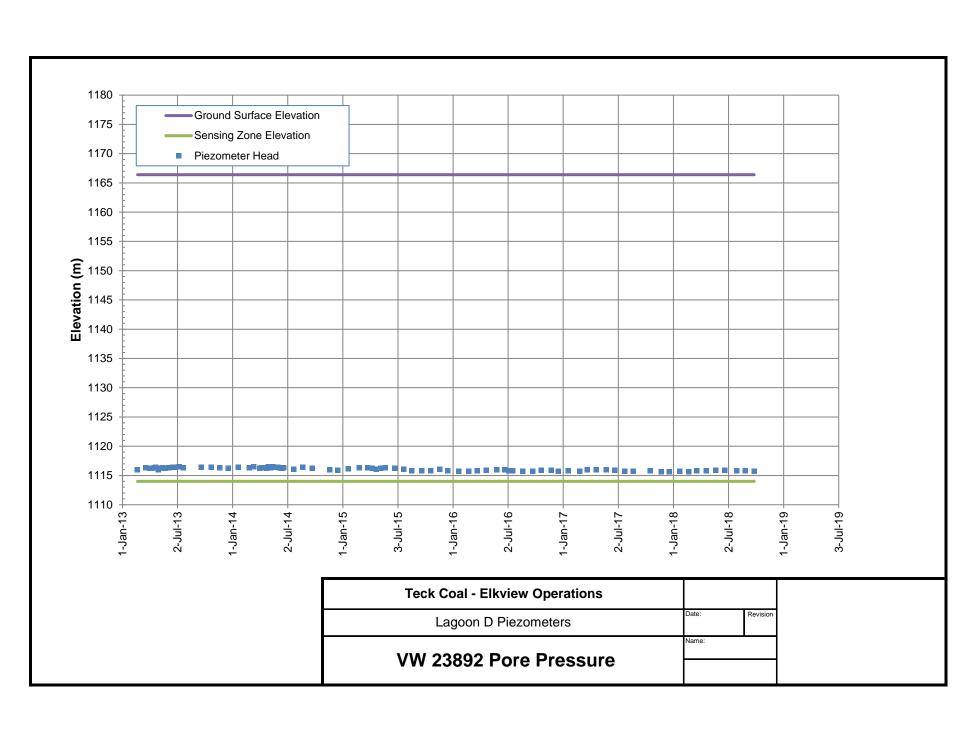
**CROSS-SECTION** ORIGIN COORD: 14865.68E, 51638.80N AZIMUTH: 350°43'36" LAGOON D CROSS-SECTION H-H' 1200m NOTES: - AS-BUILT 2002 TO PRESENT (SURVEY AND LIDAR DATA) - TYPICAL 2000 AND PRIOR (APPROXIMATED FROM GOLDER ASSOCIATES ANNUAL CONSTRUCTION REVIEW OF TAILINGS LAGOONS C AND D (1996, 1999)) 1175m LIDAR SURVEY JULY 2017 ELEVATION 1120m 1125m -**ORIGINAL GROUND 1964** 1100m -225m 25m 250m 50m 75m 100m 125m 150m 175m 200m 275m 300m 0m DISTANCE **Elkview Operations** Geotechnical Engineering LAGOON D CROSS-SECTION H-H' 2017 DWG. NO.: DATE: NOV. 2017 SCALE: DWN BY: A. GLOVER REV BY:

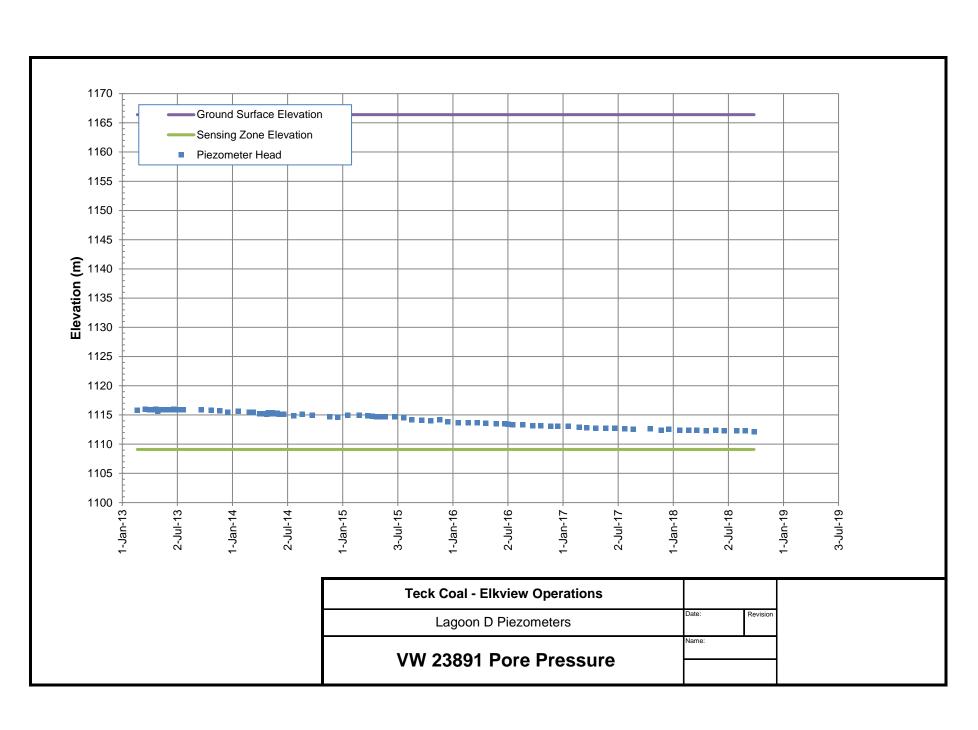


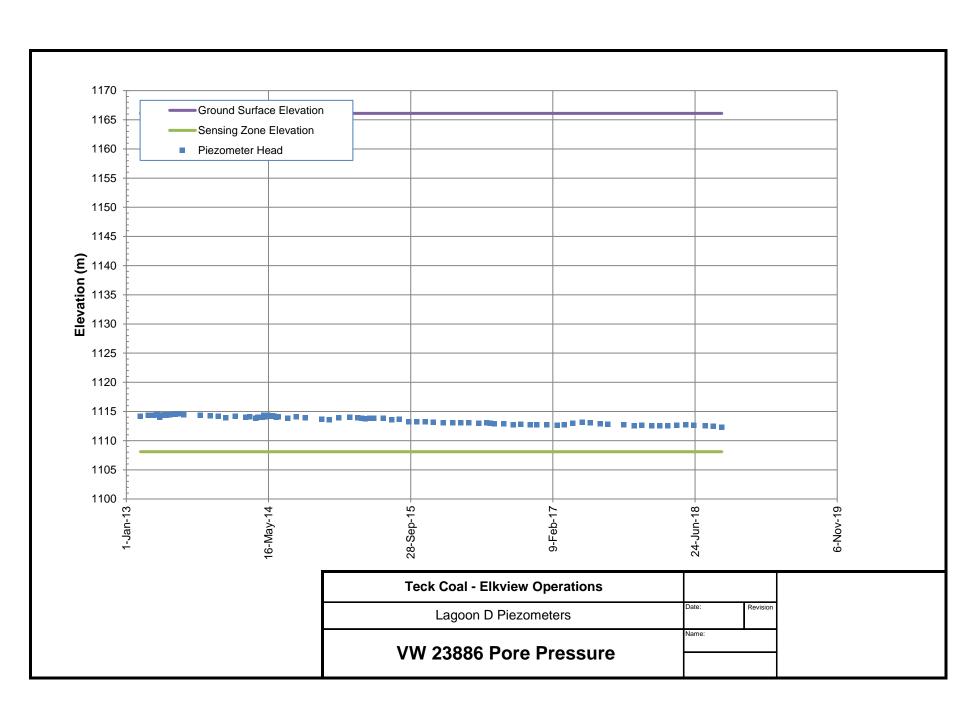


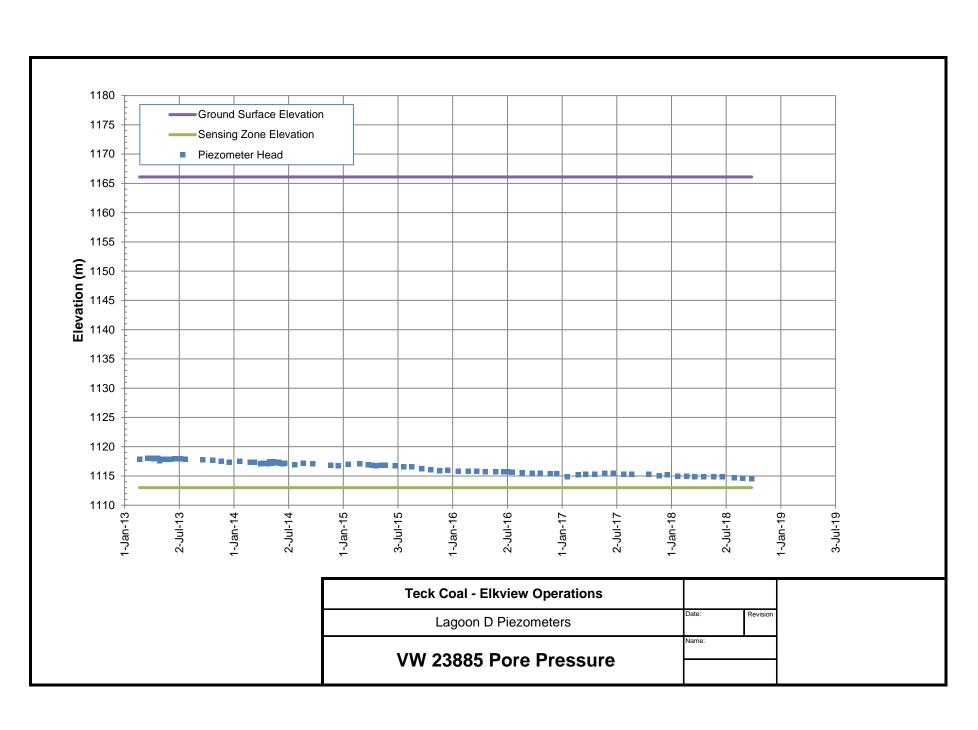


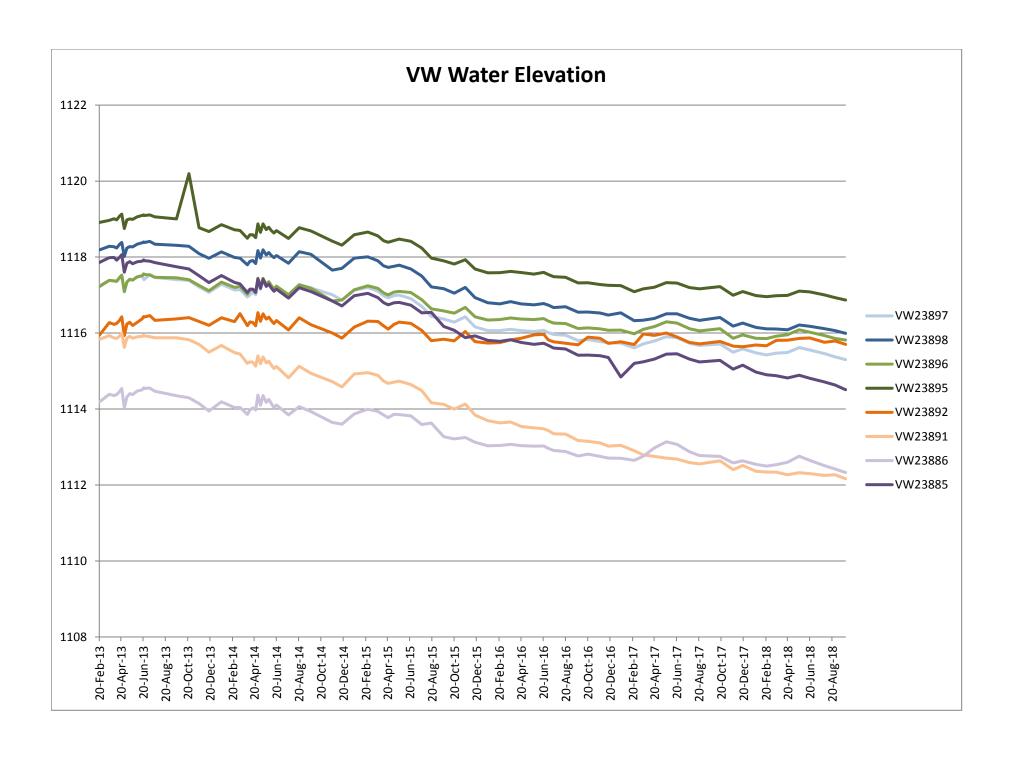


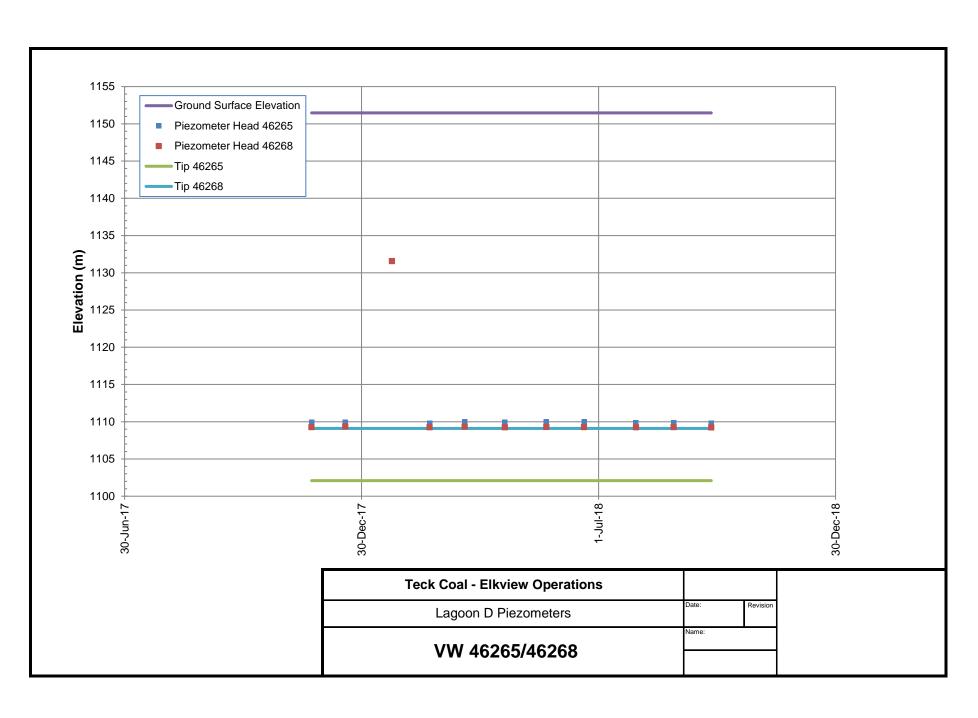


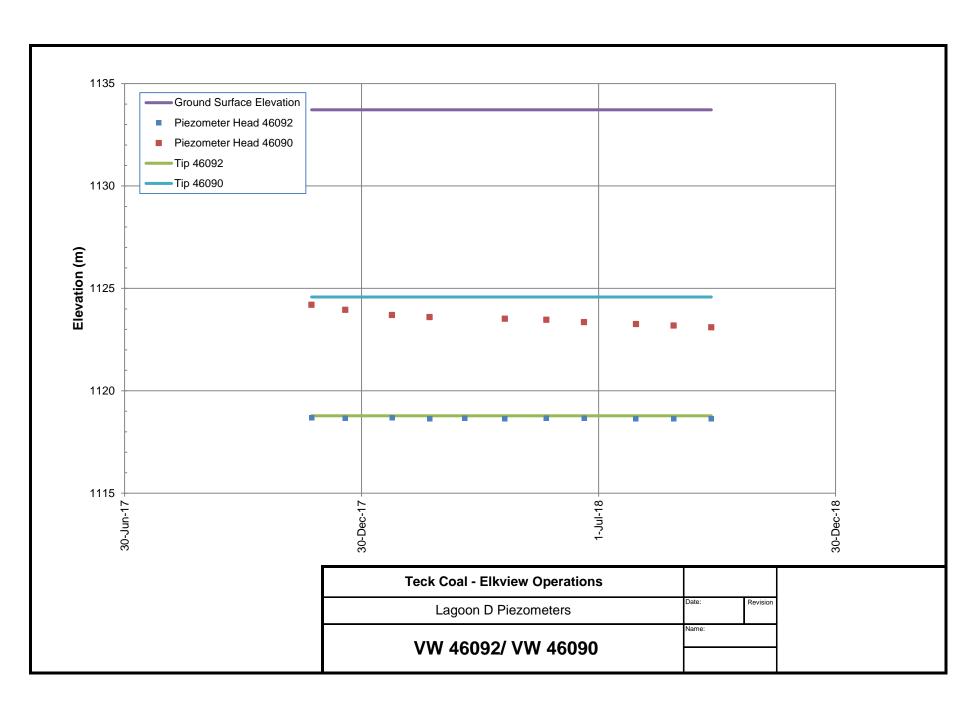


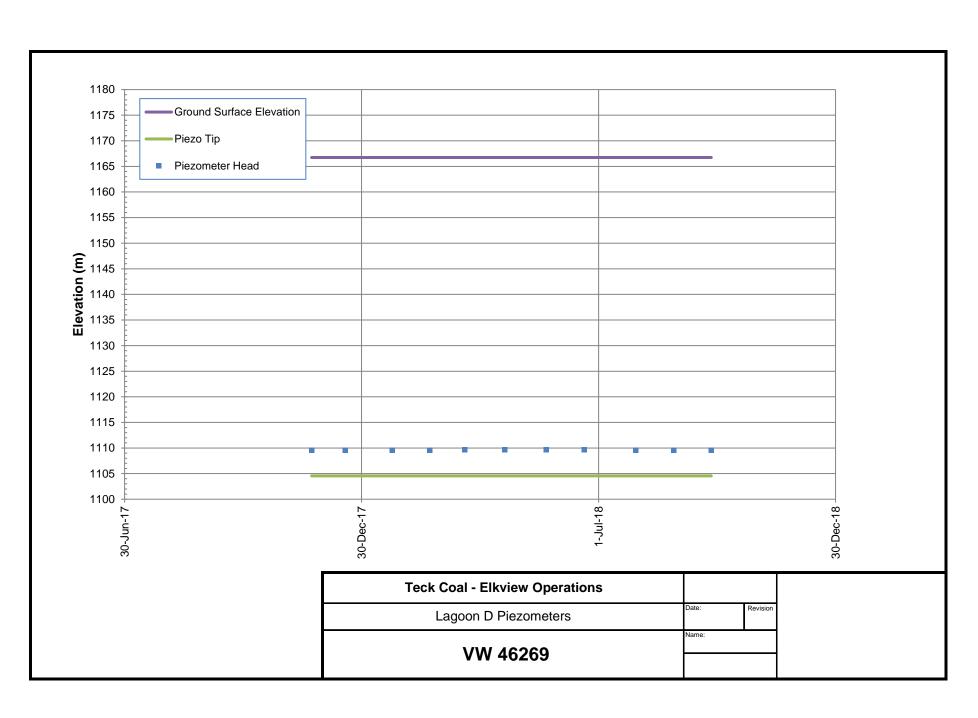


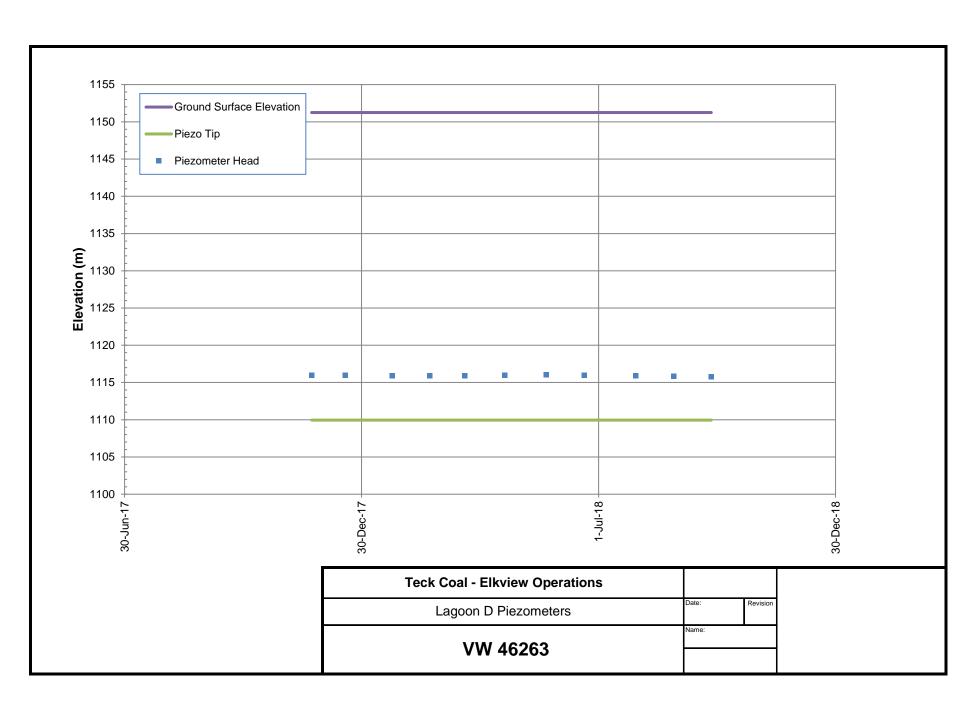


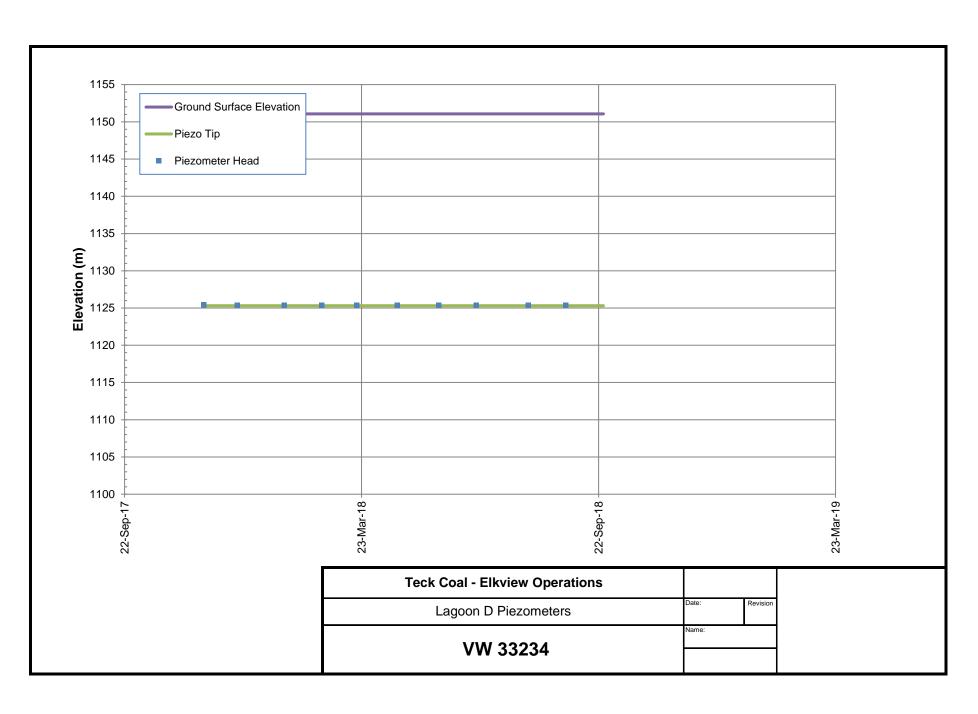


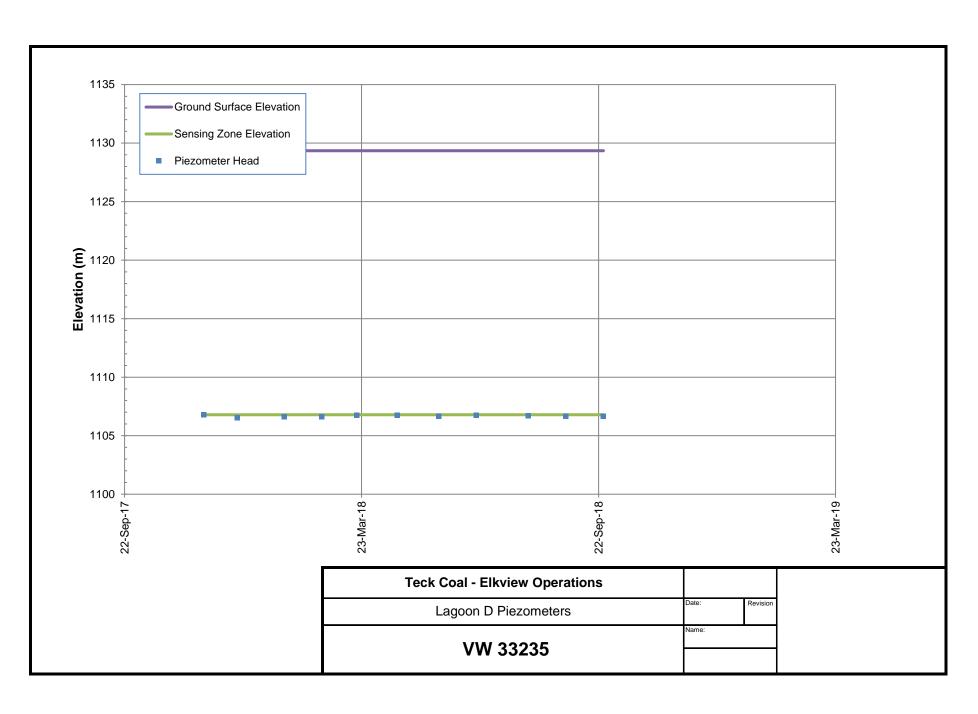


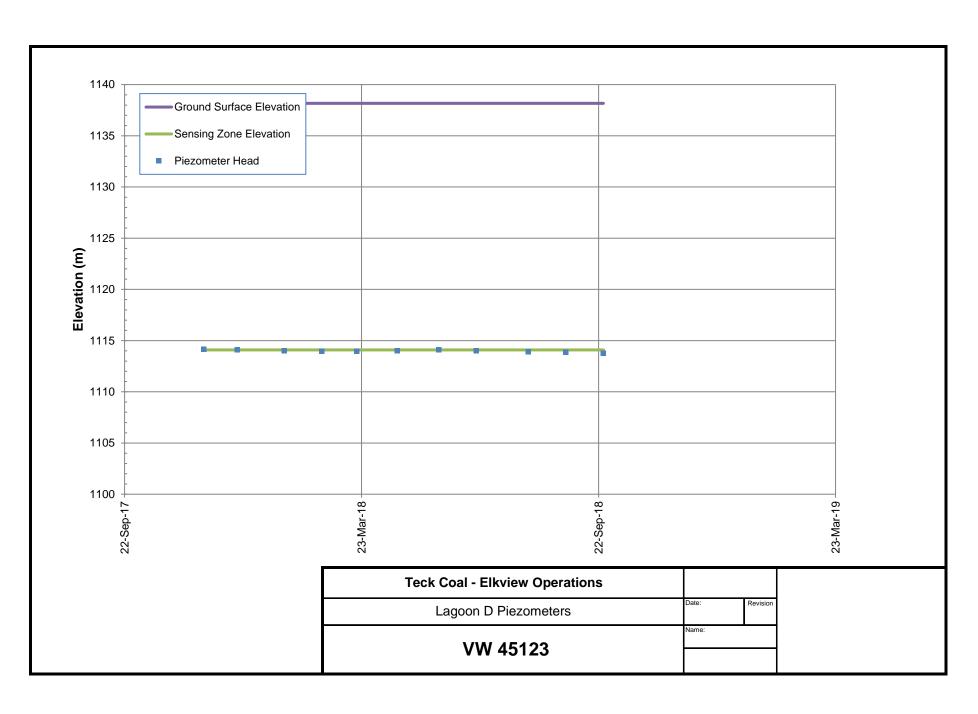


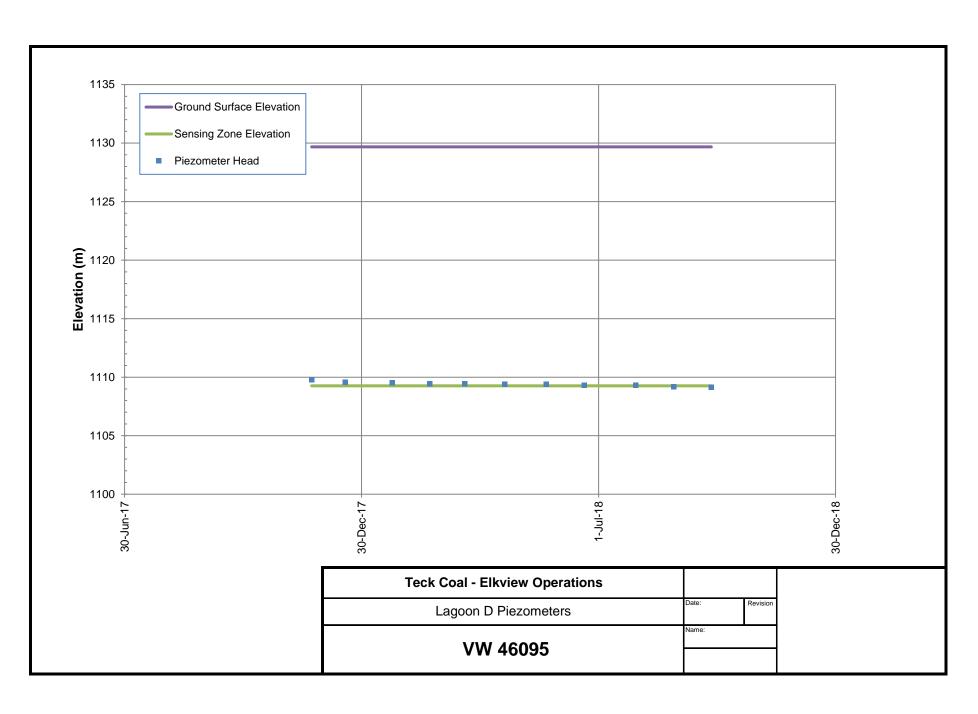


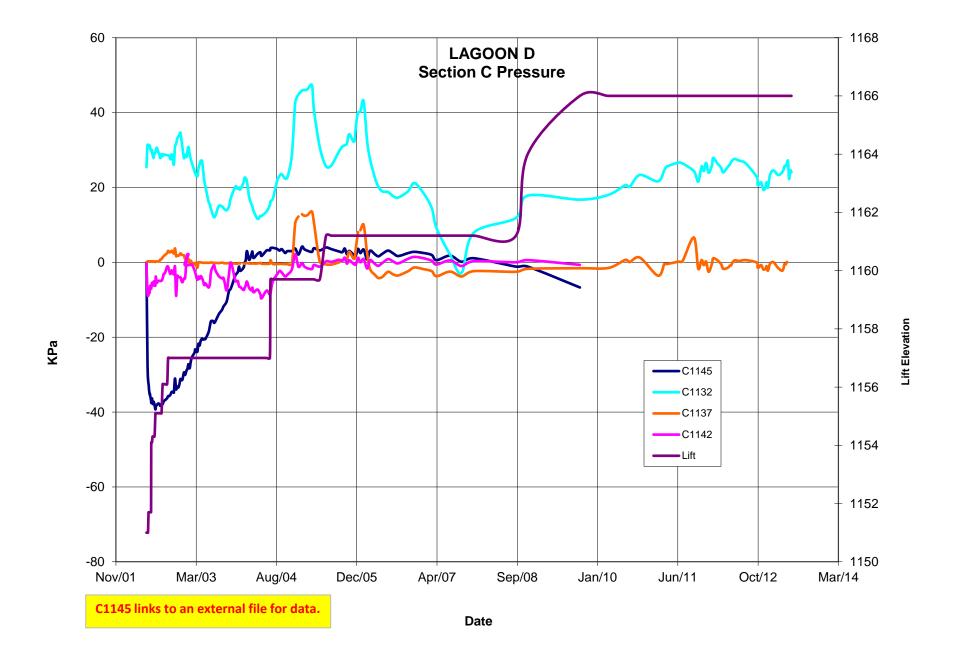




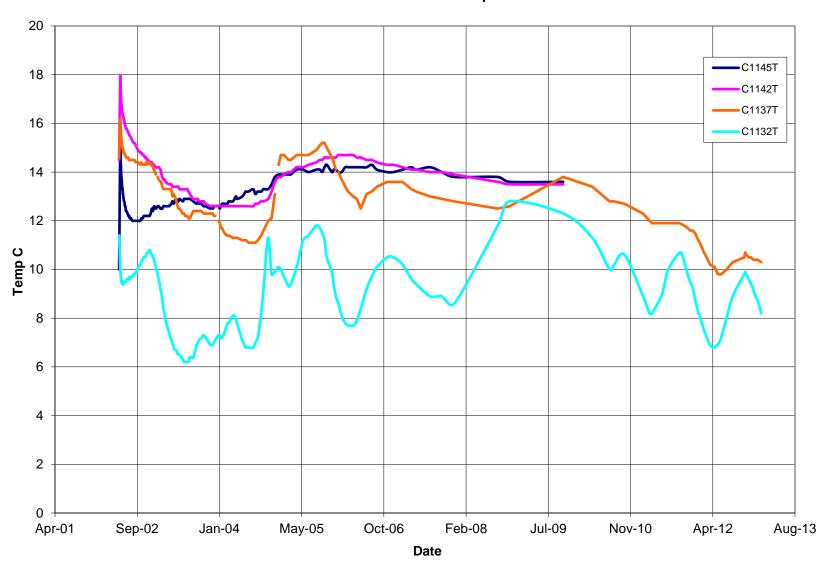


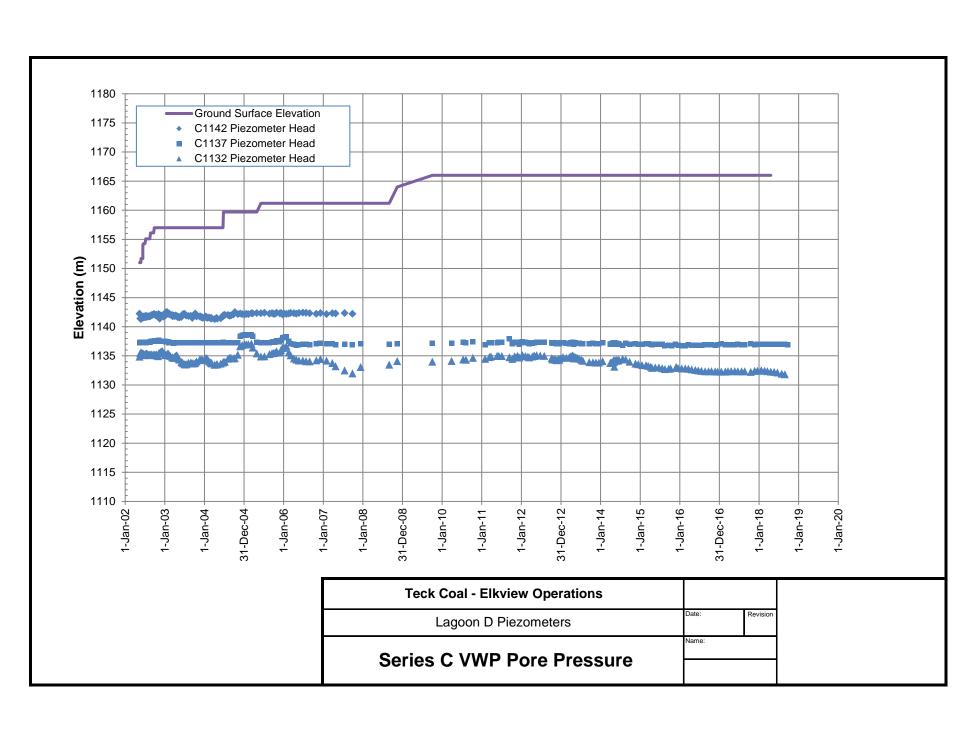


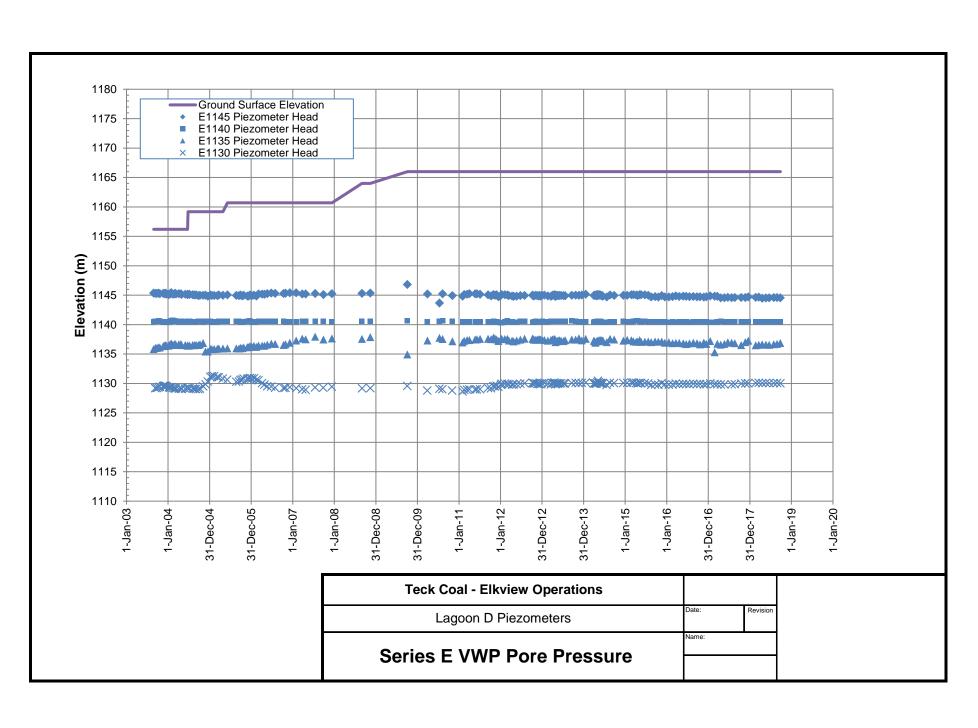


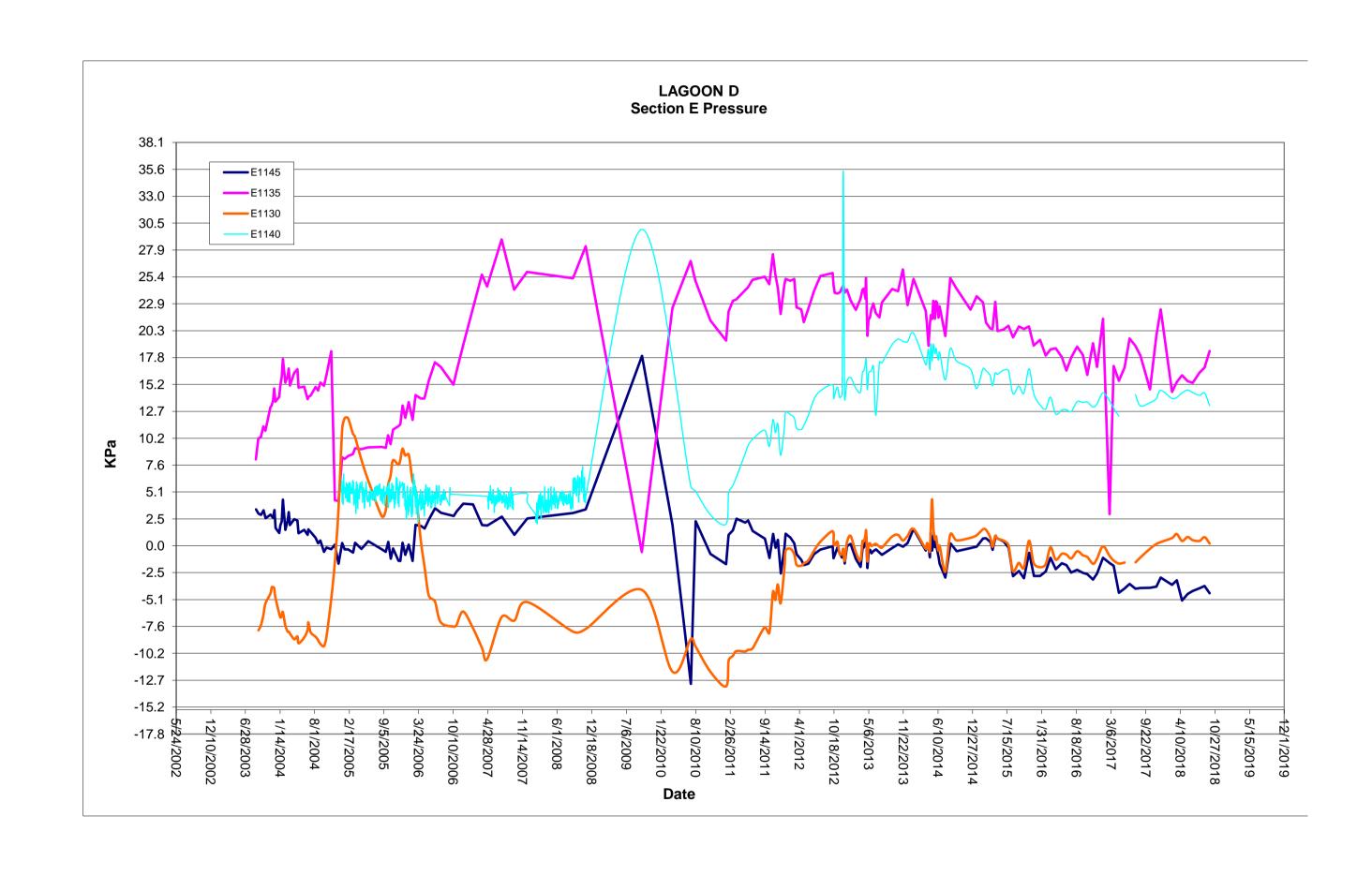


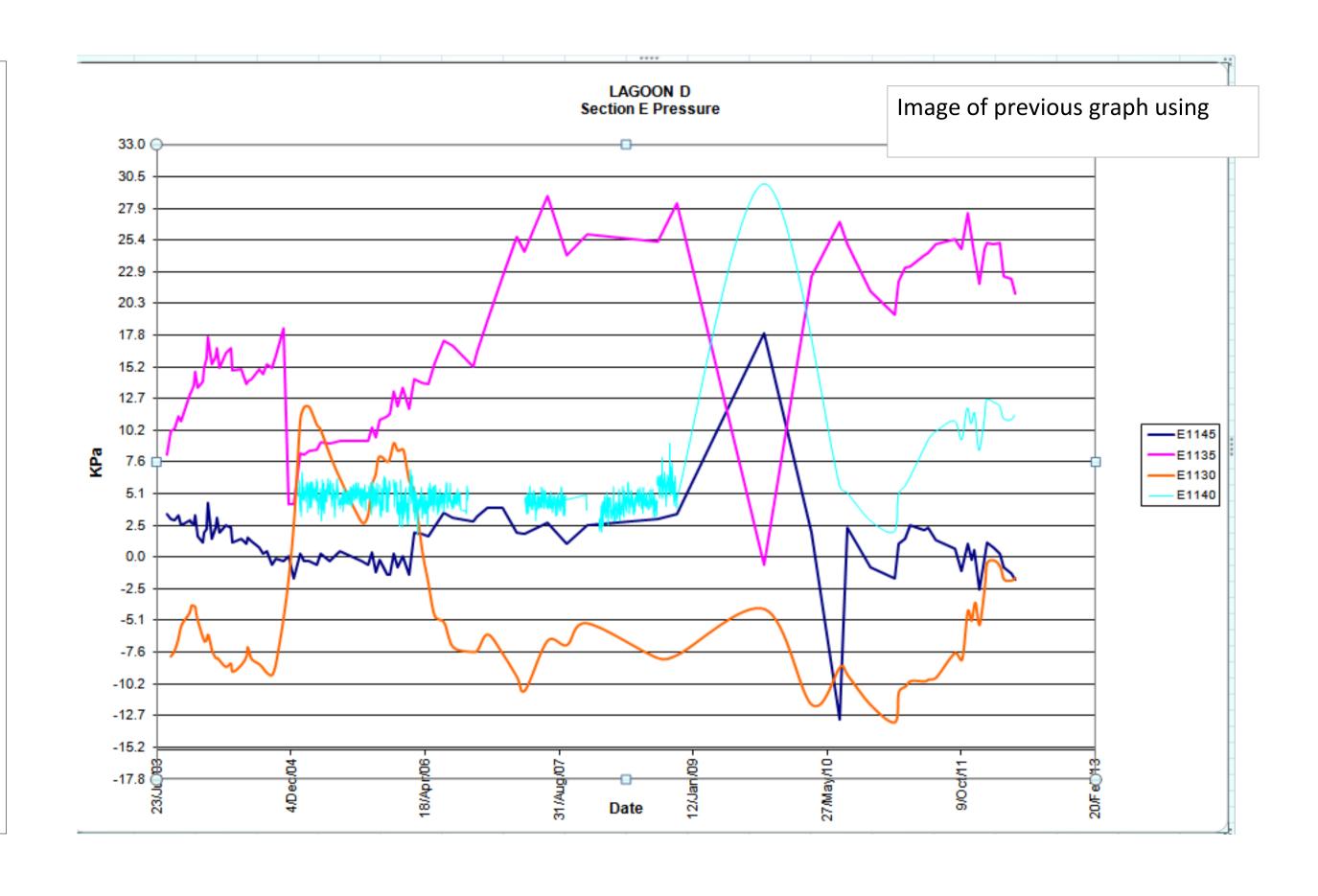
LAGOON D Section C Temperature



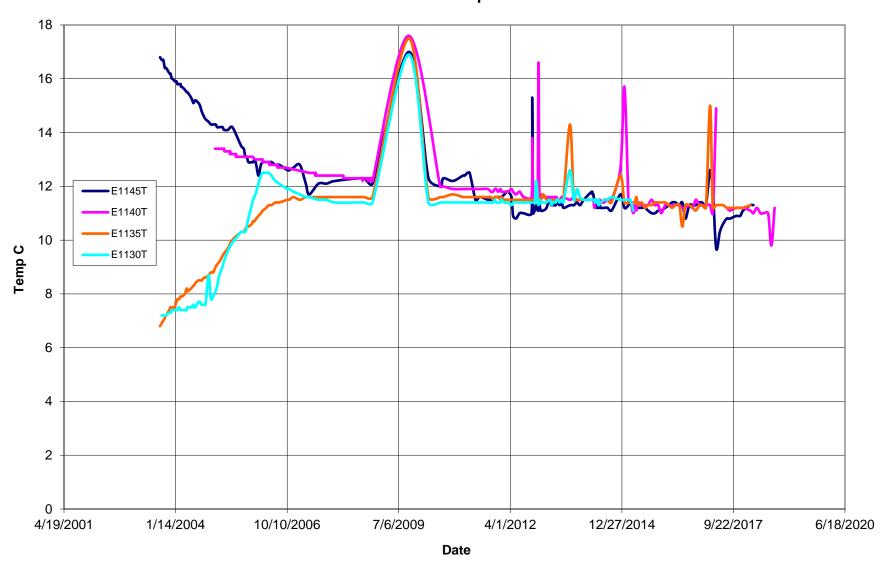


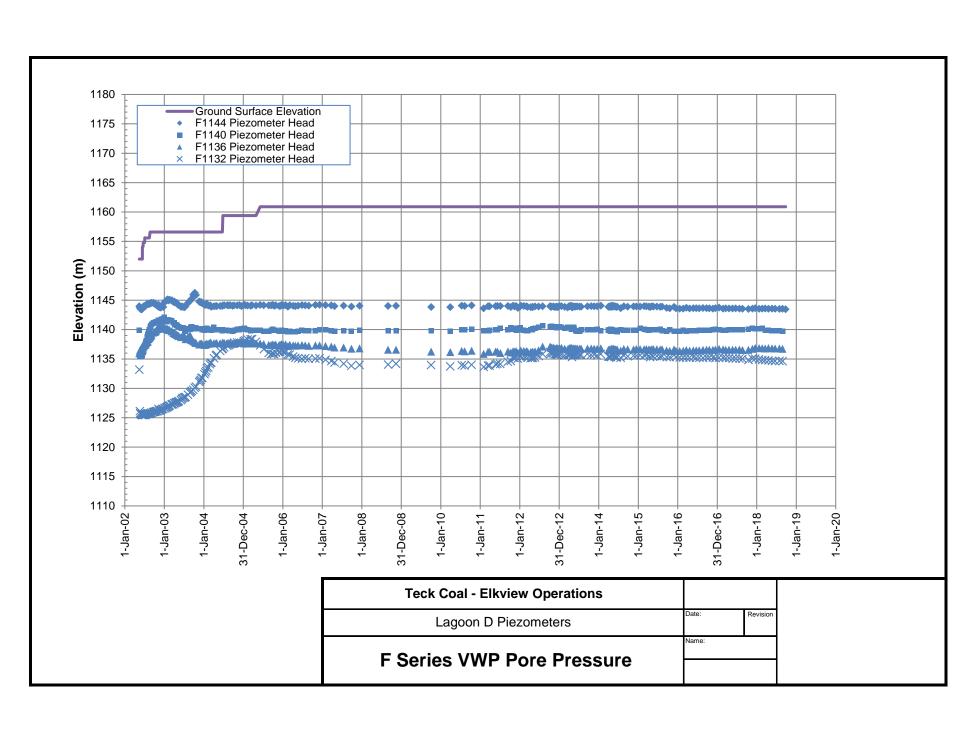


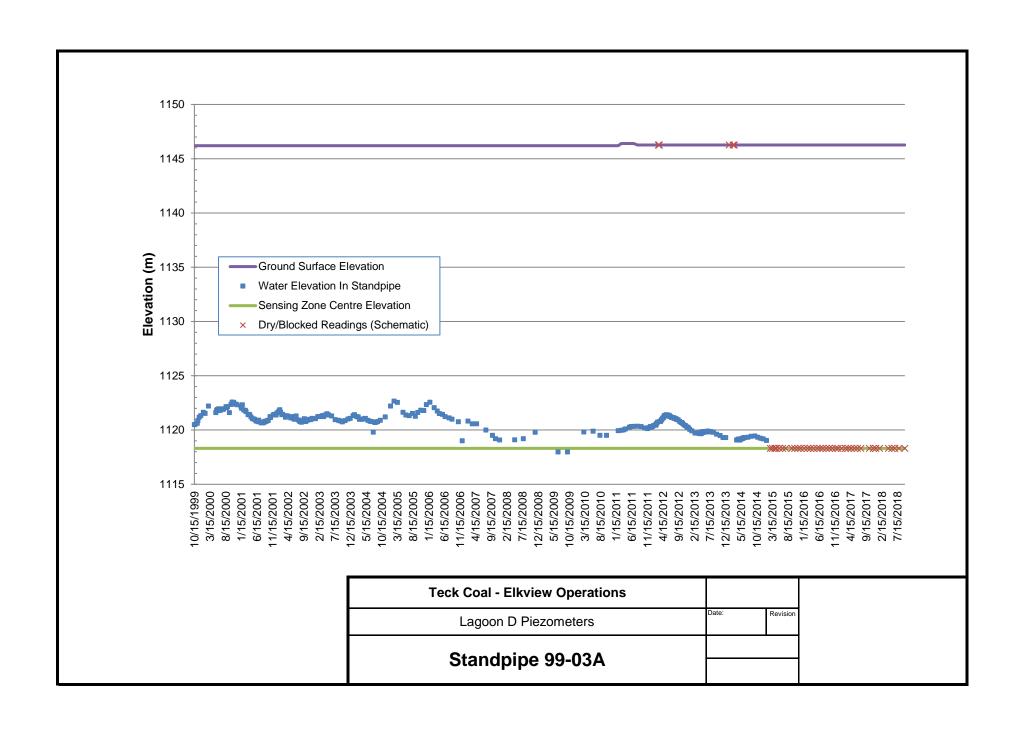


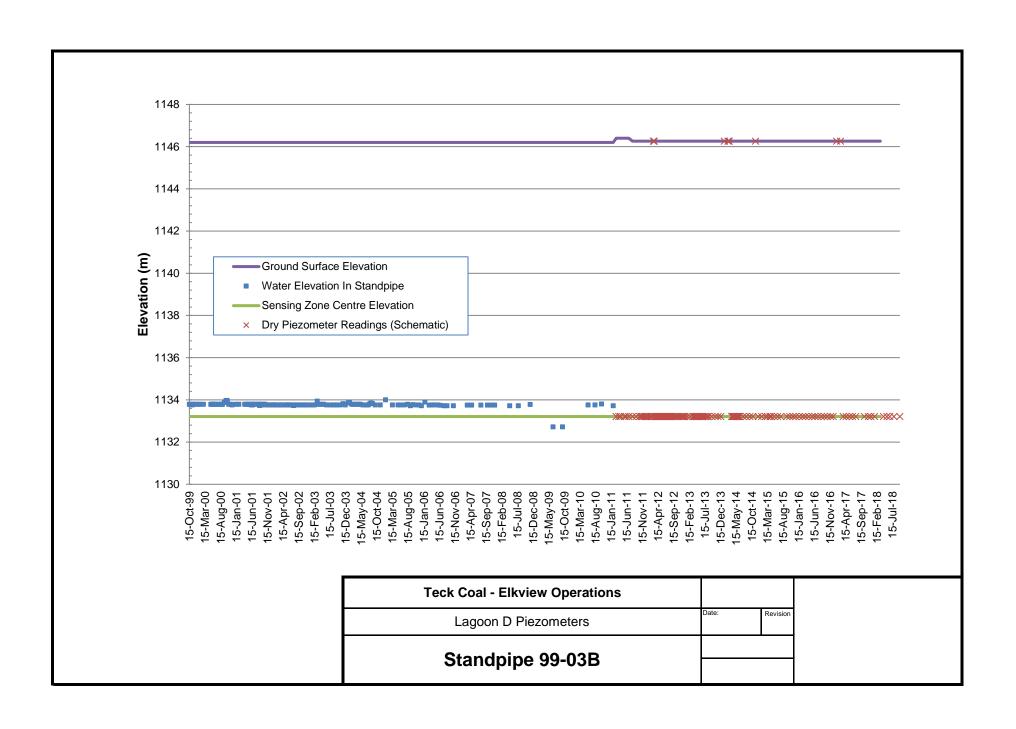


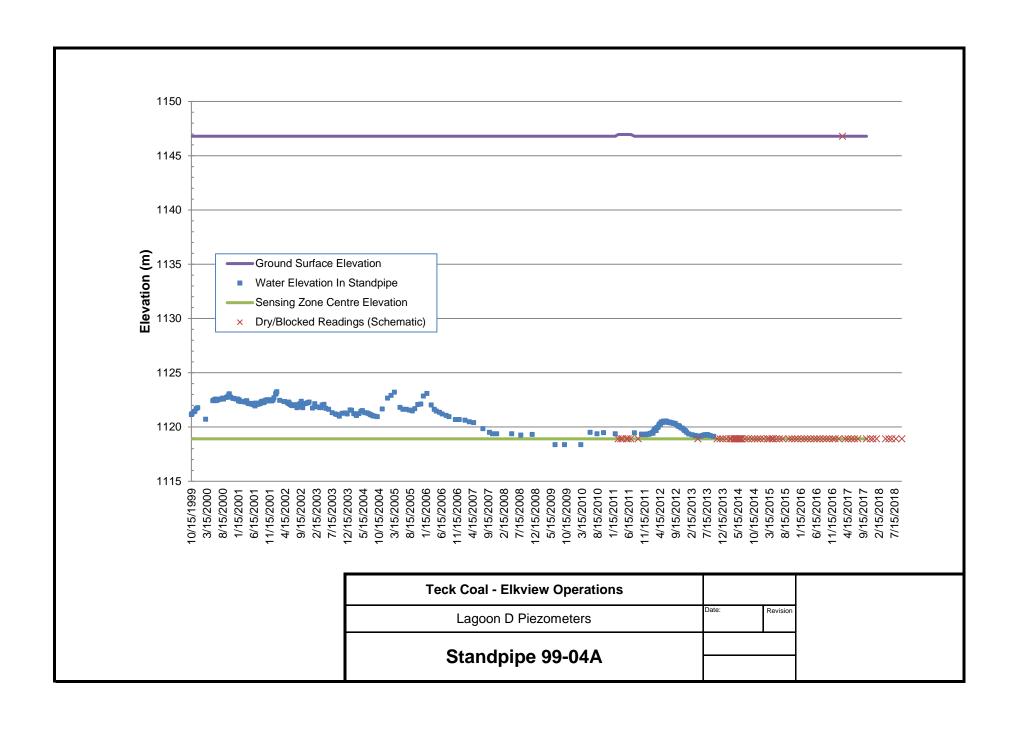
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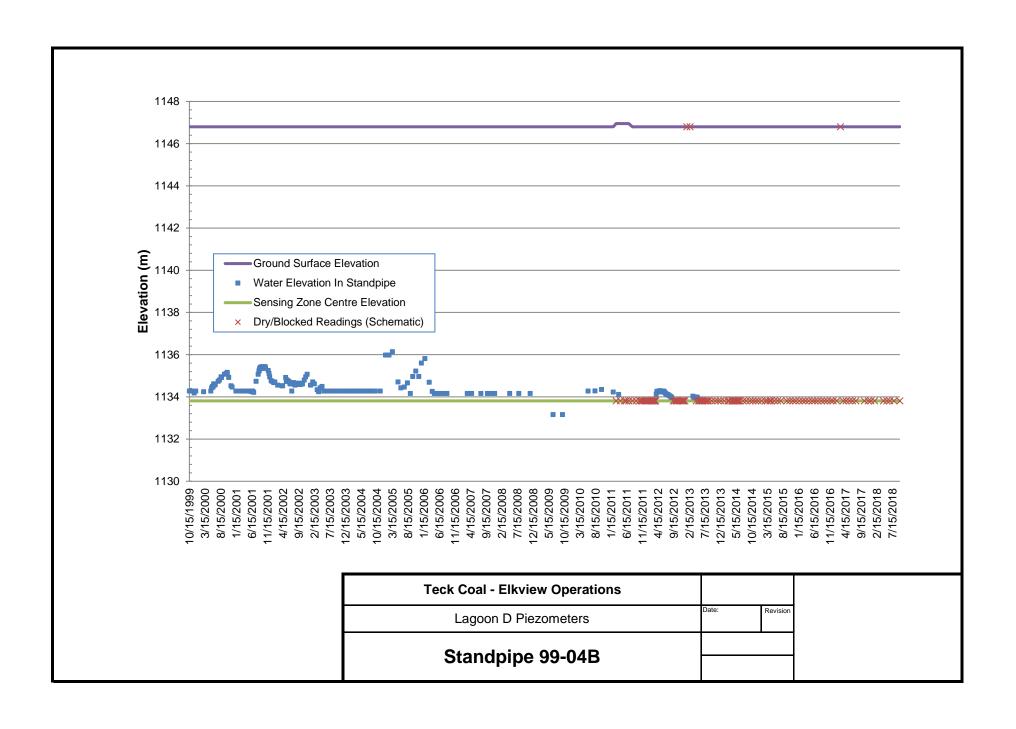


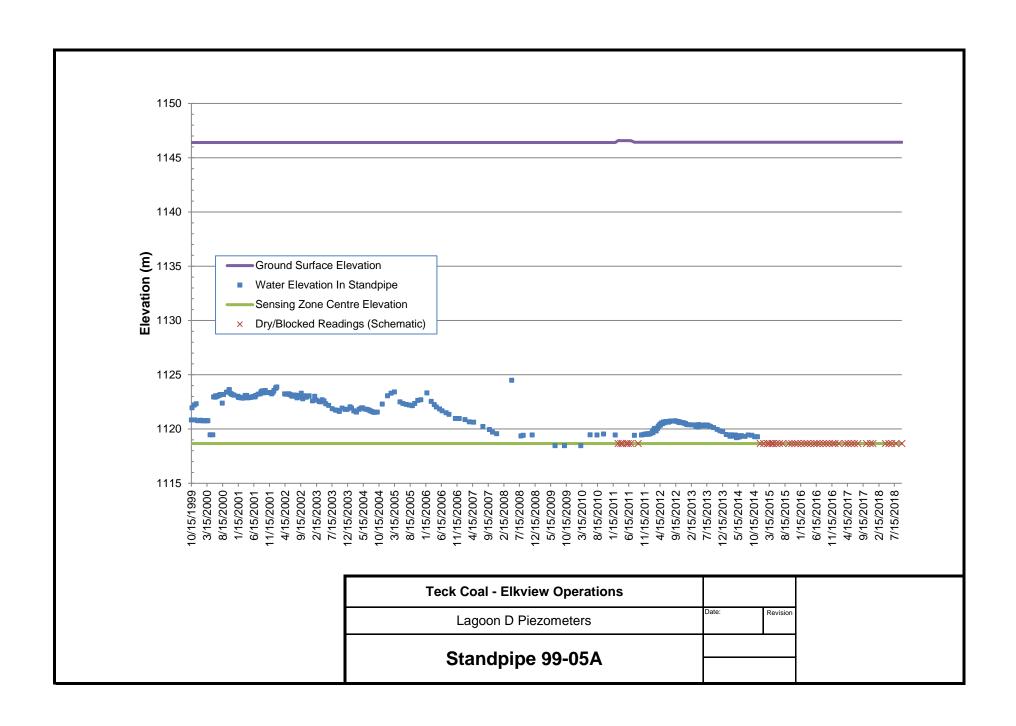


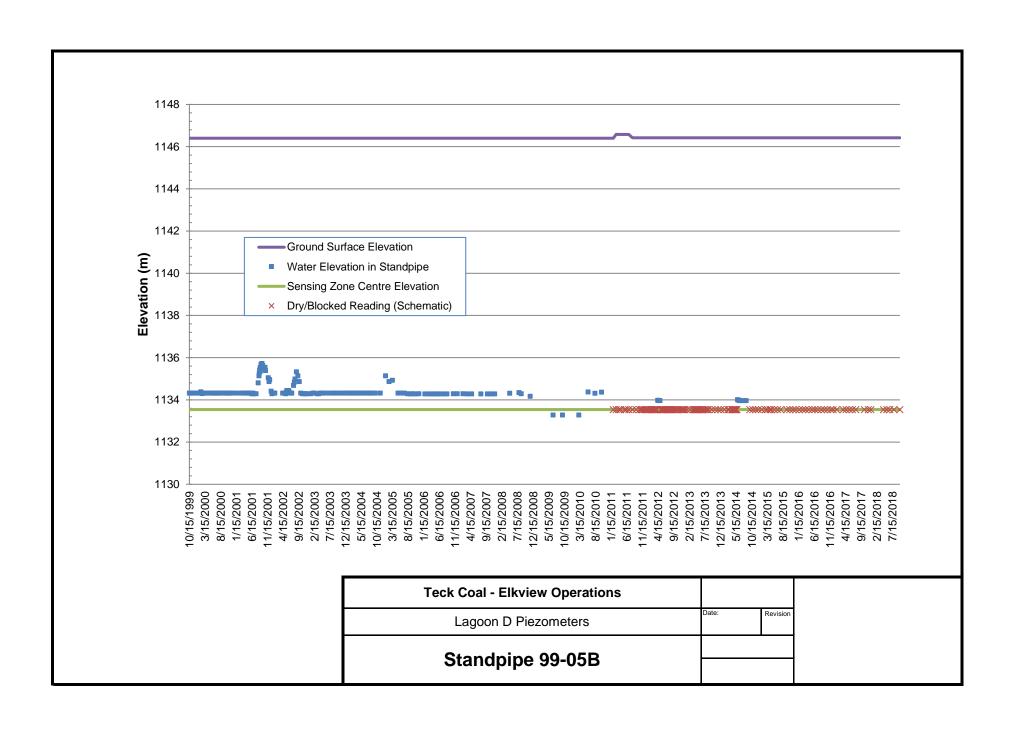


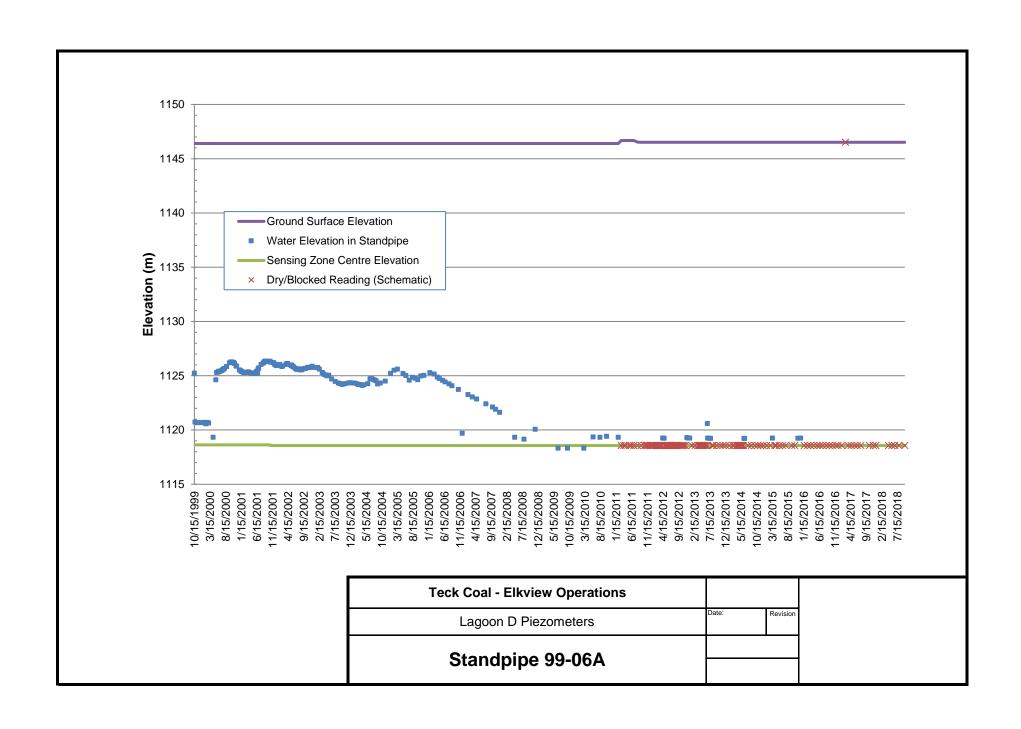


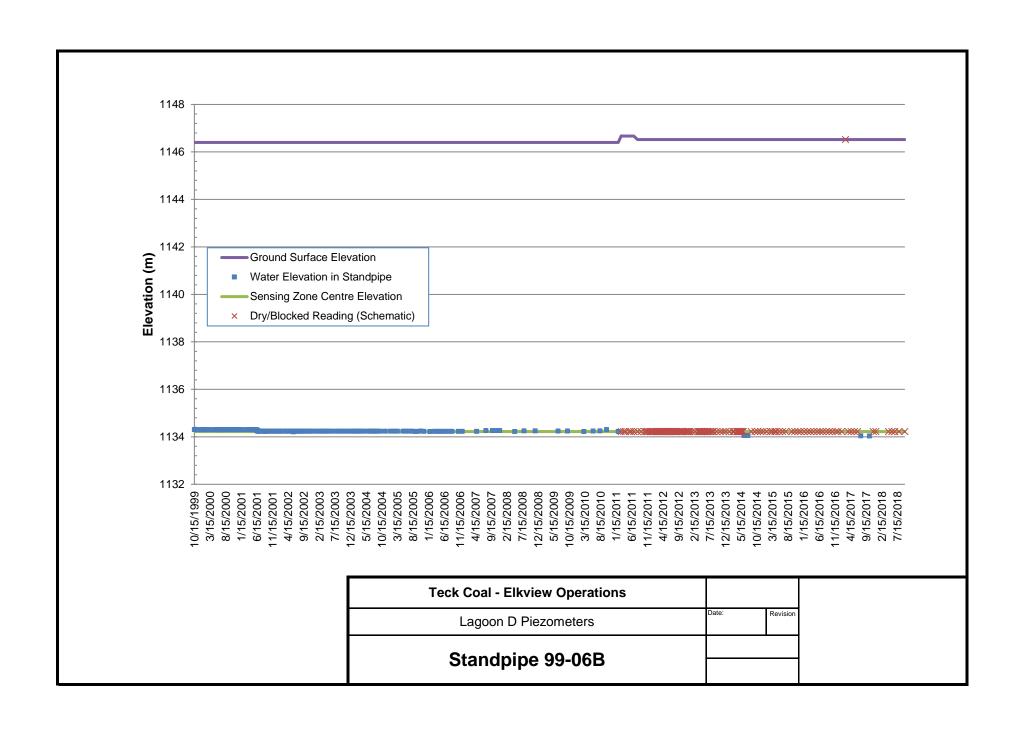


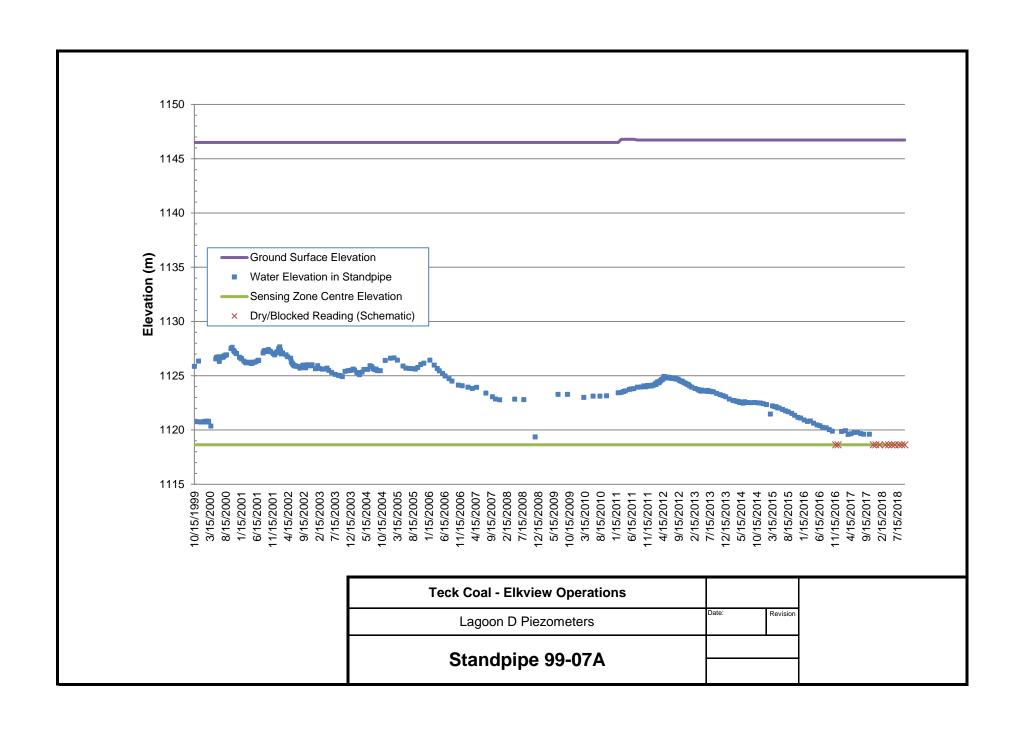


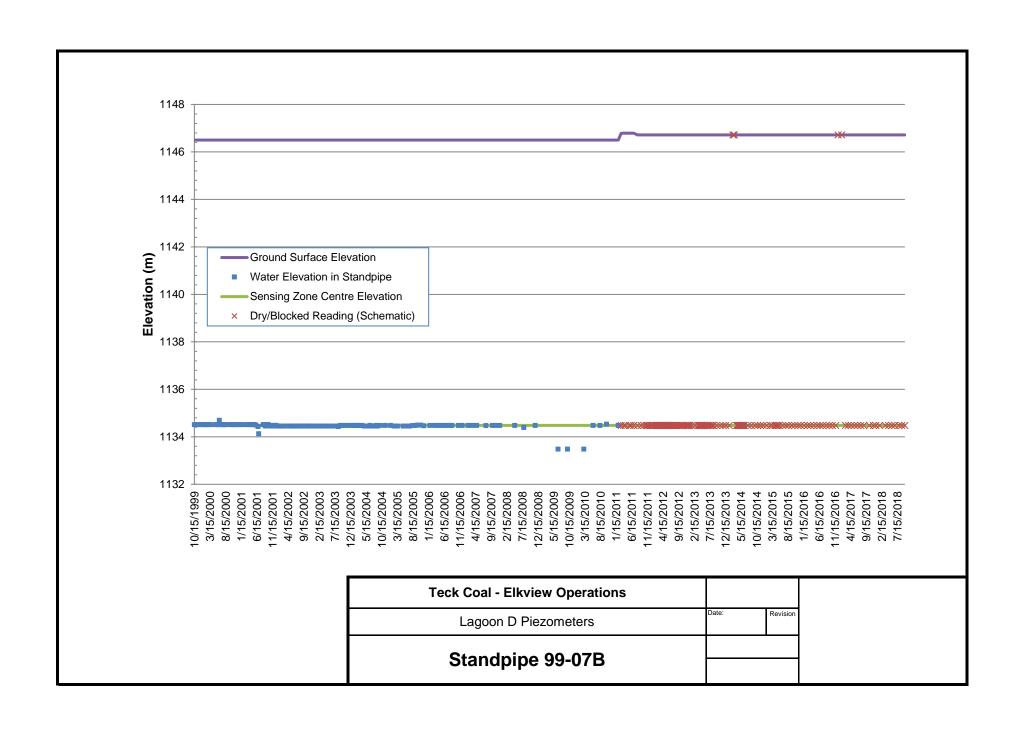


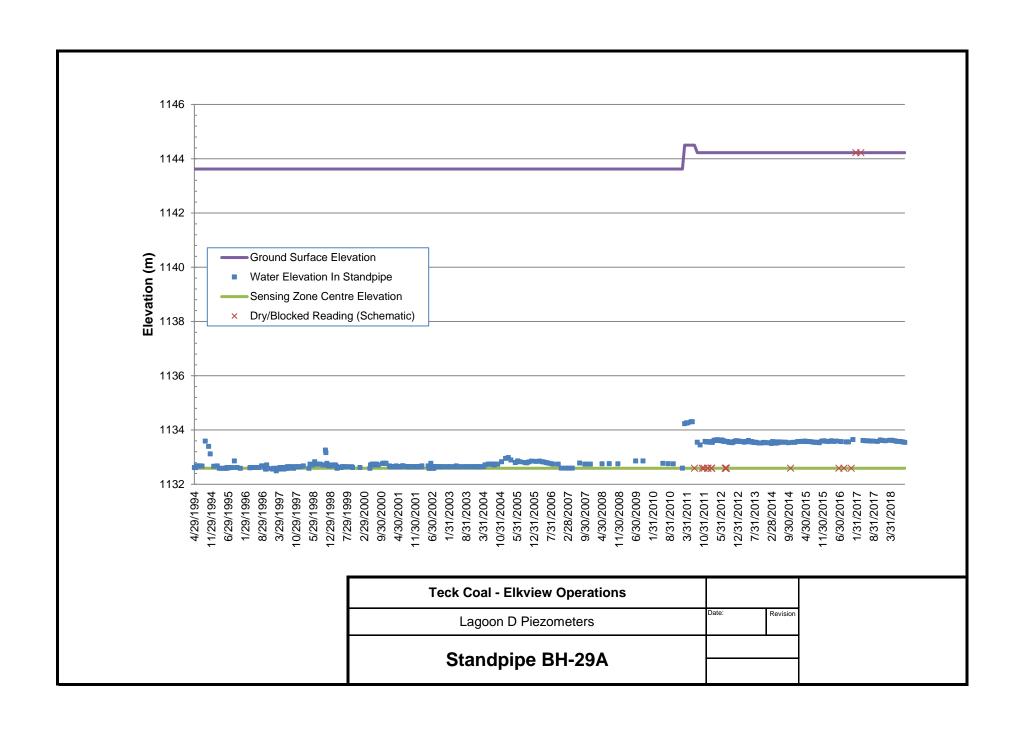


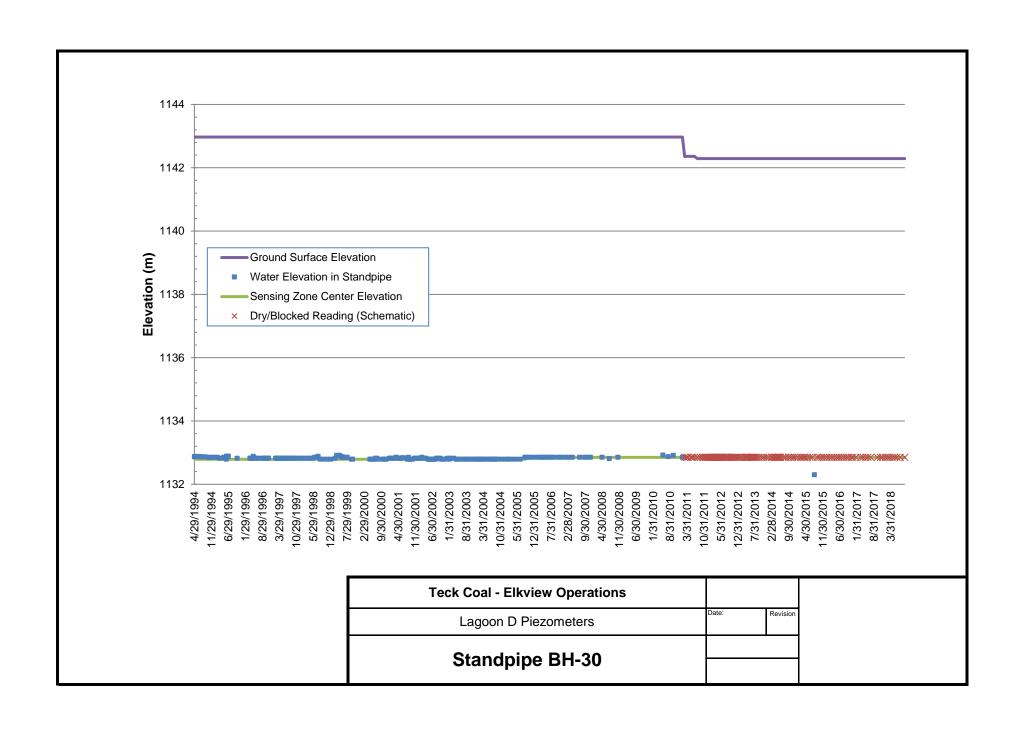


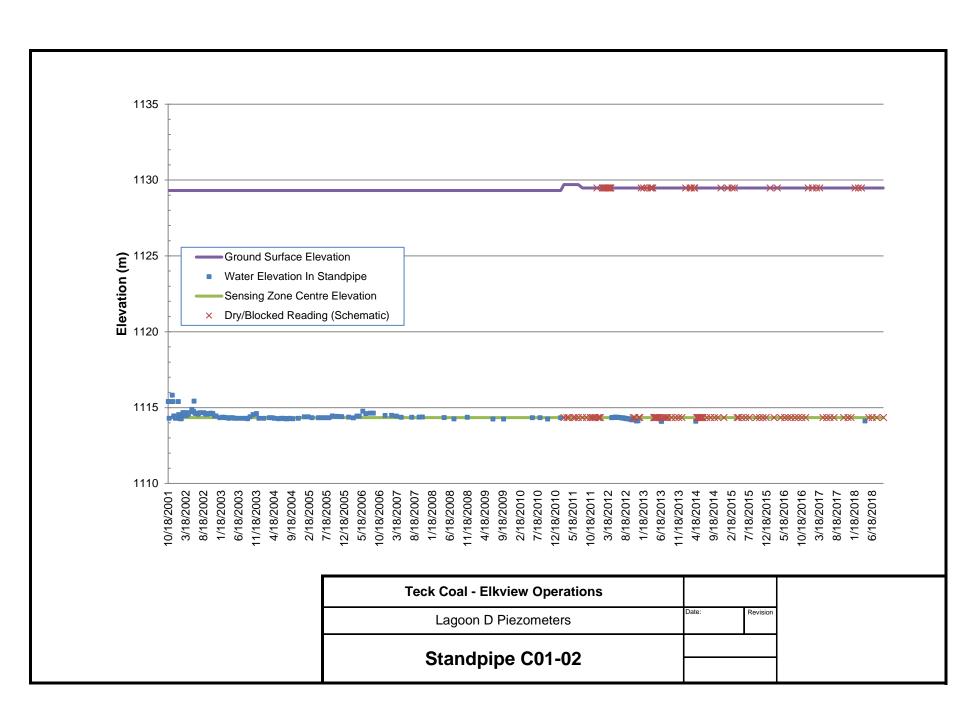


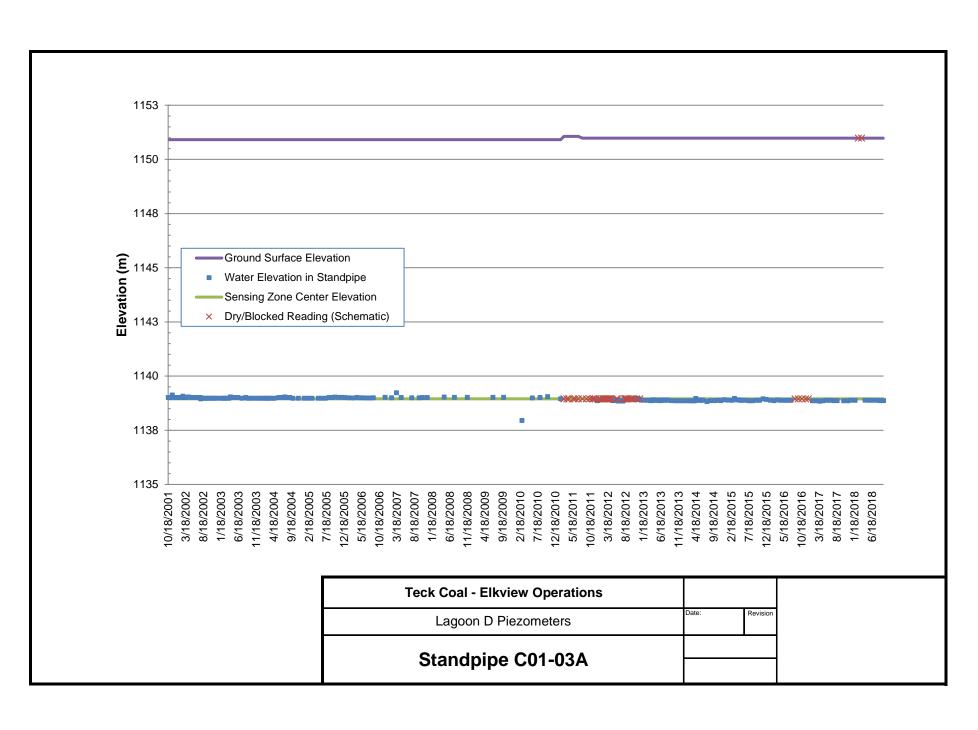


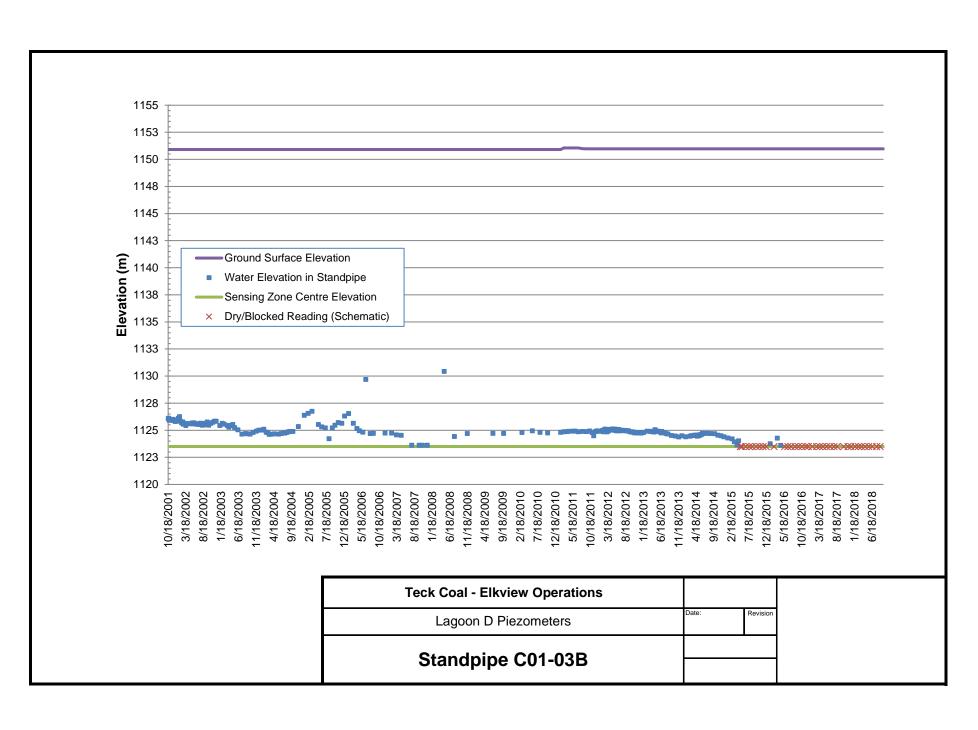


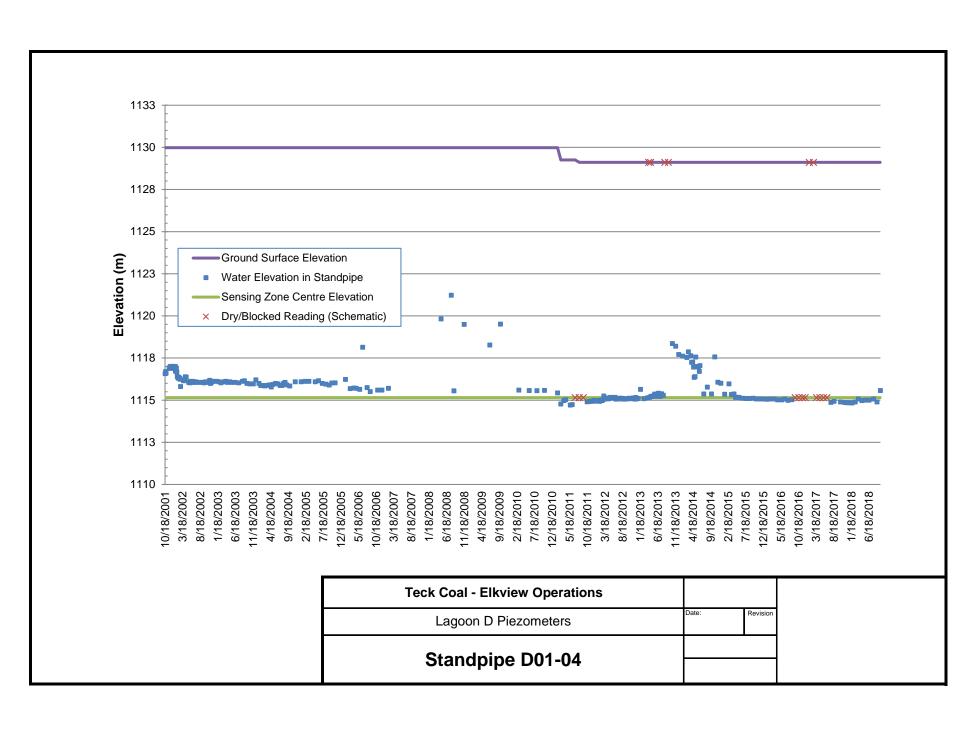


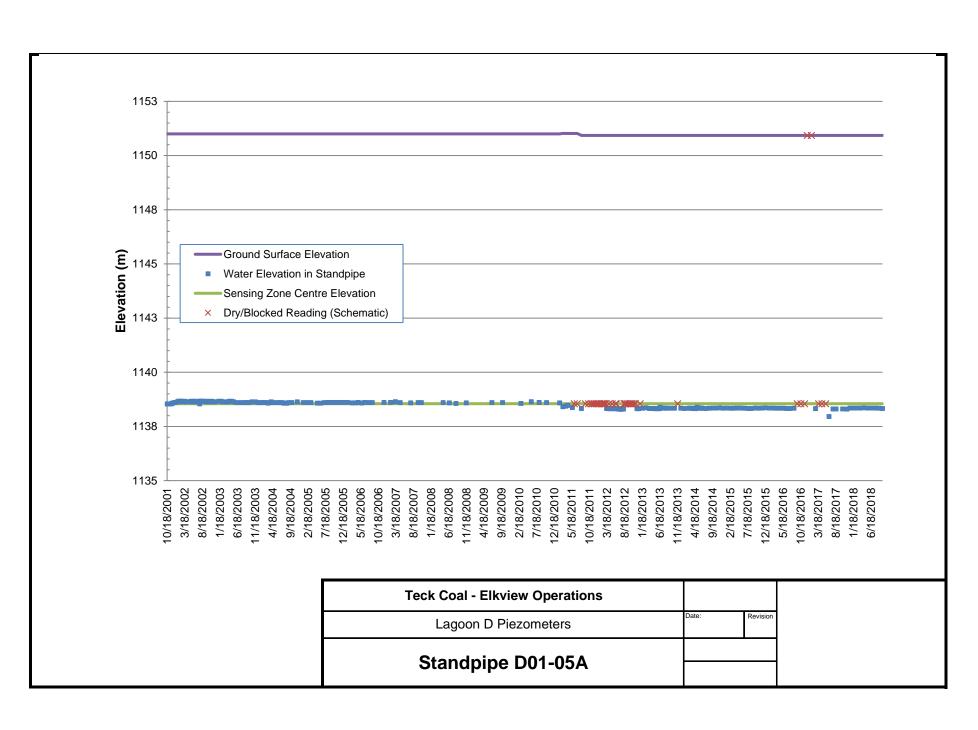


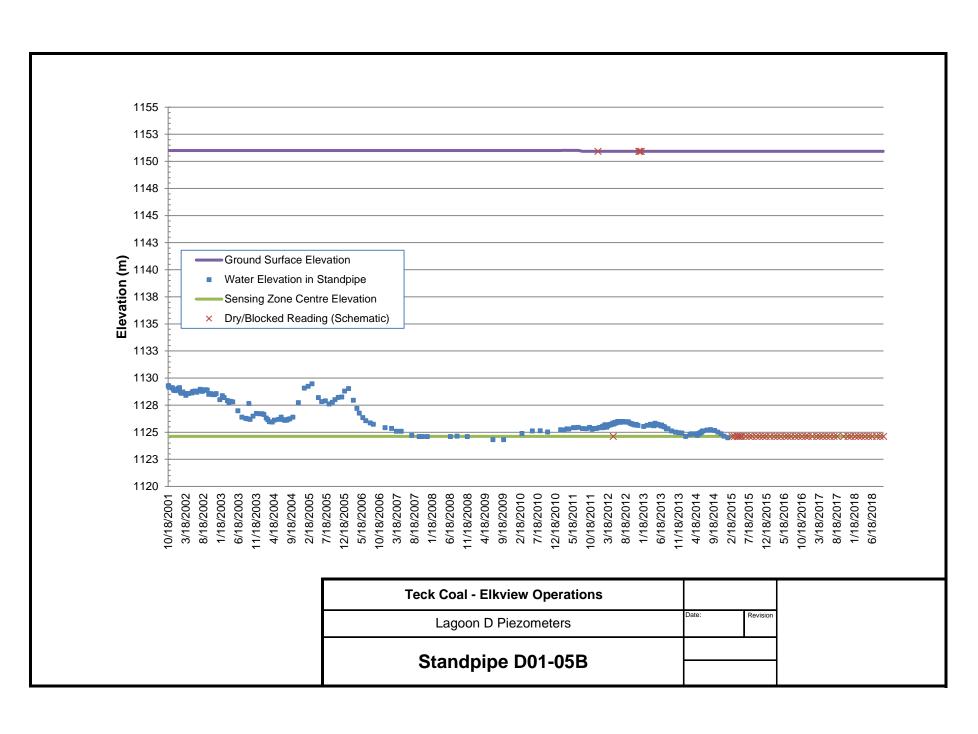


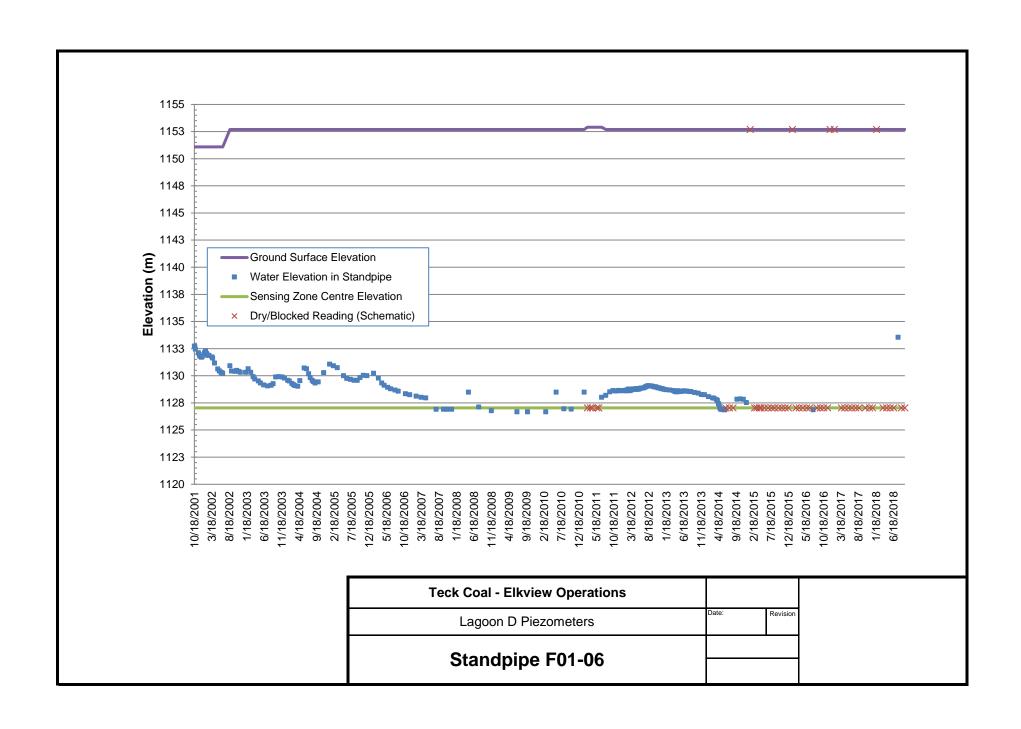


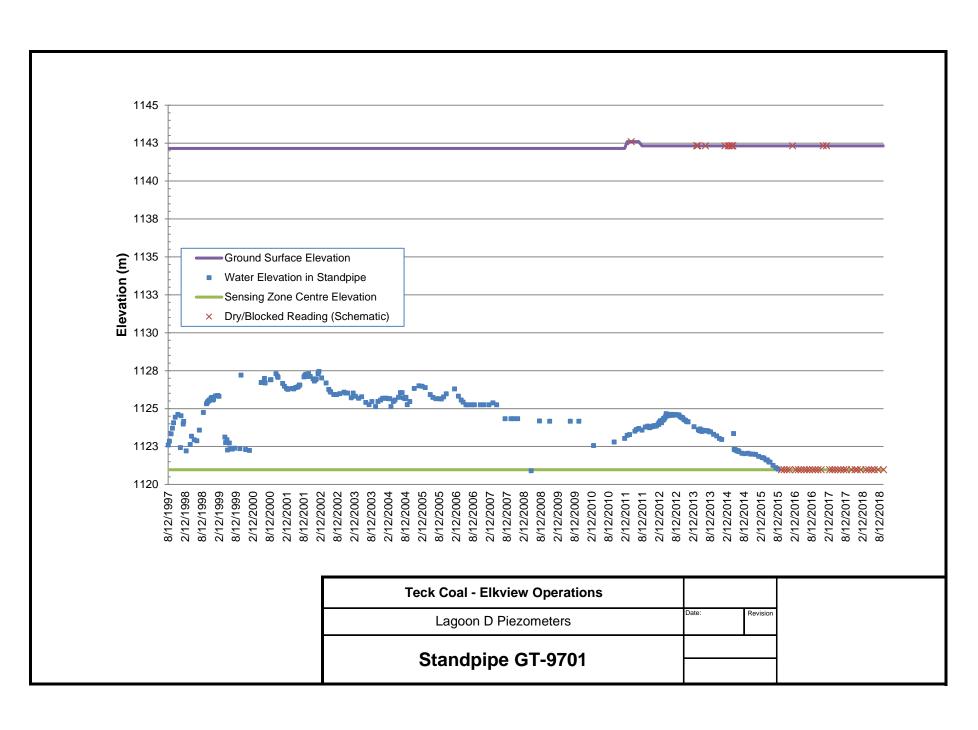


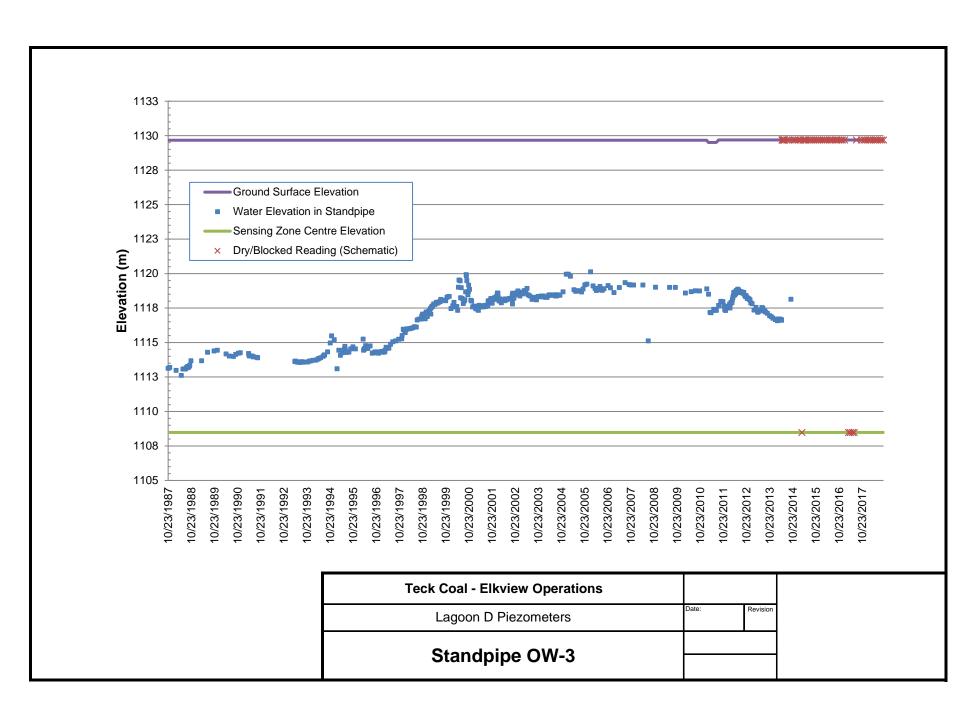


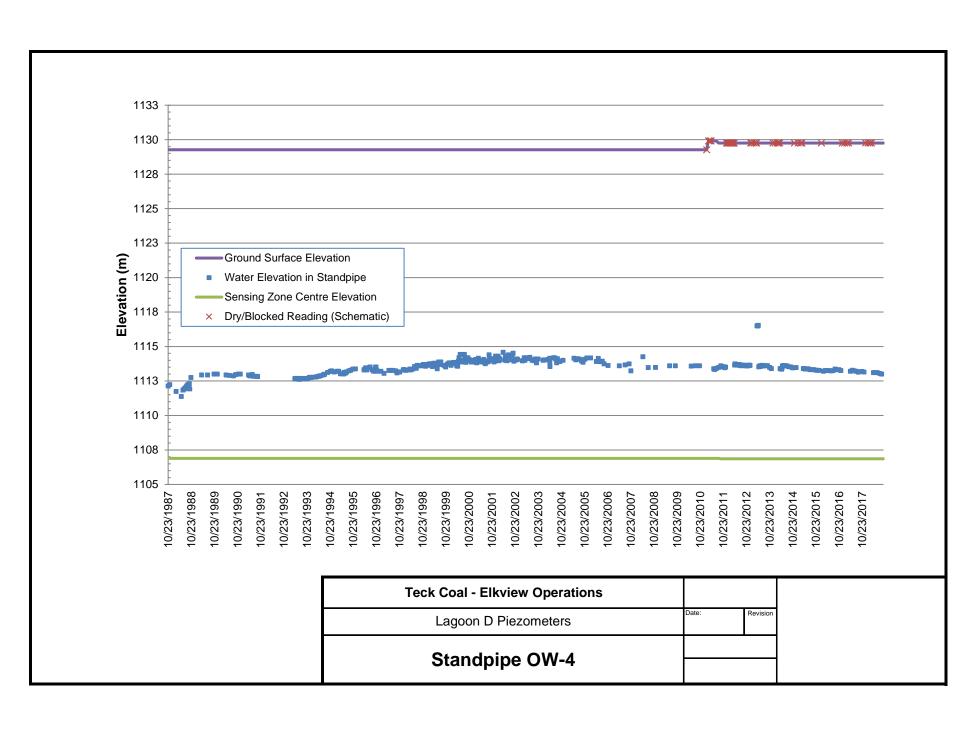


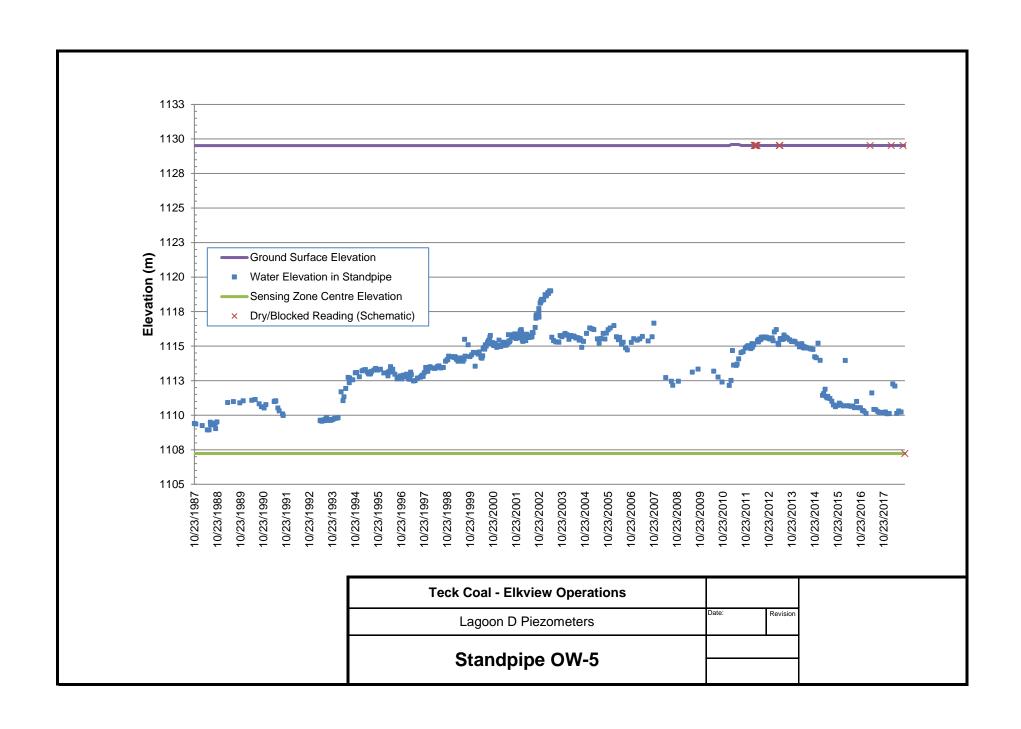


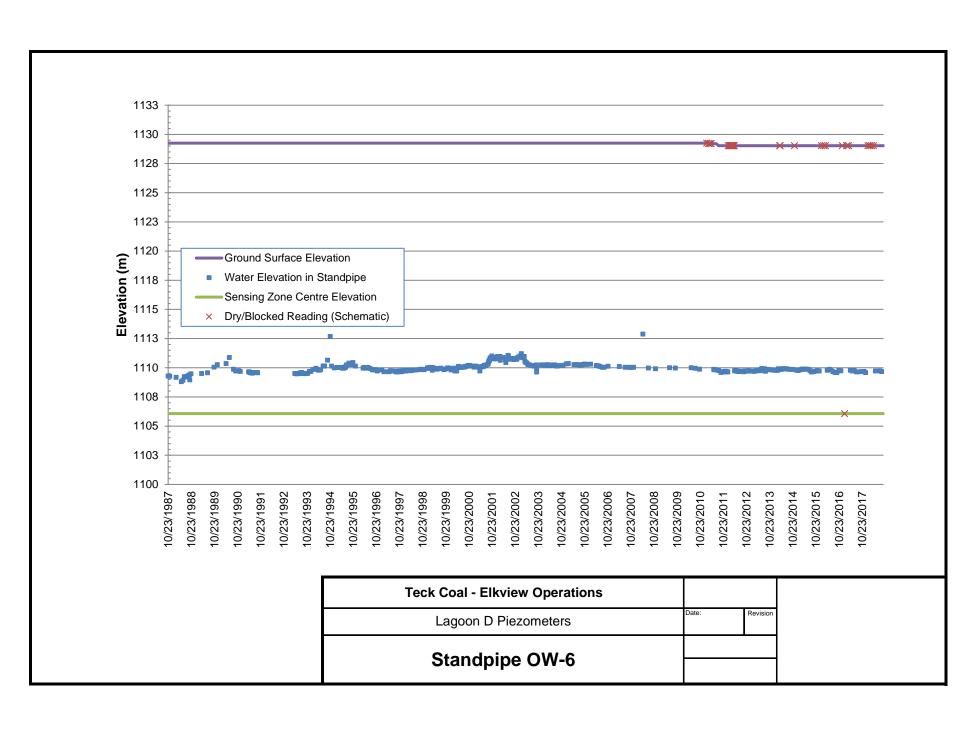


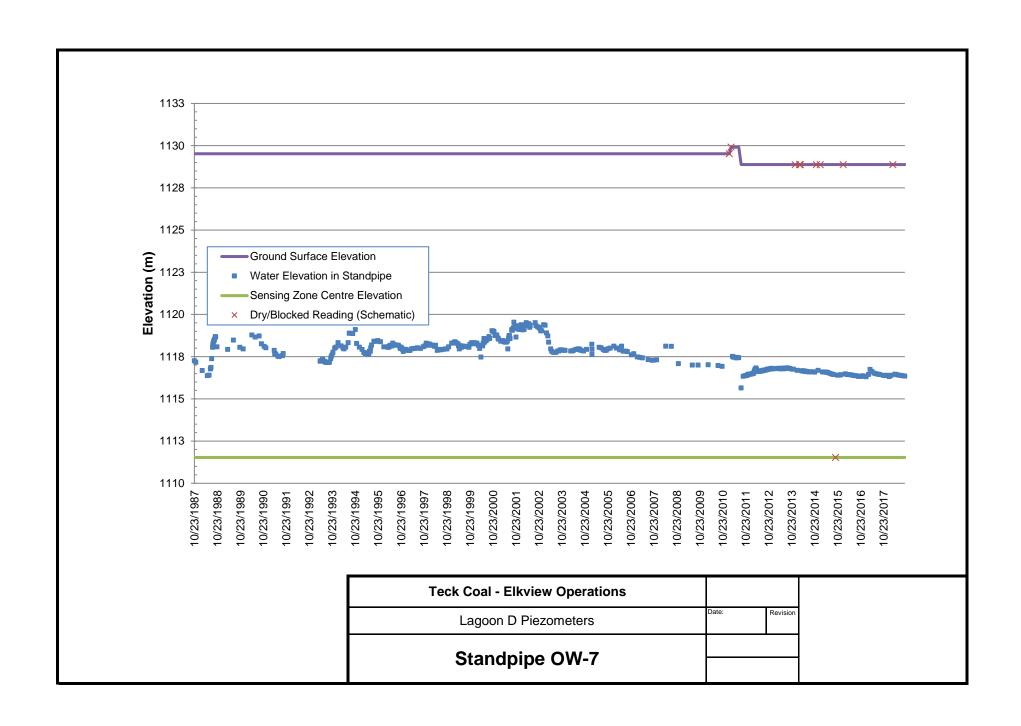


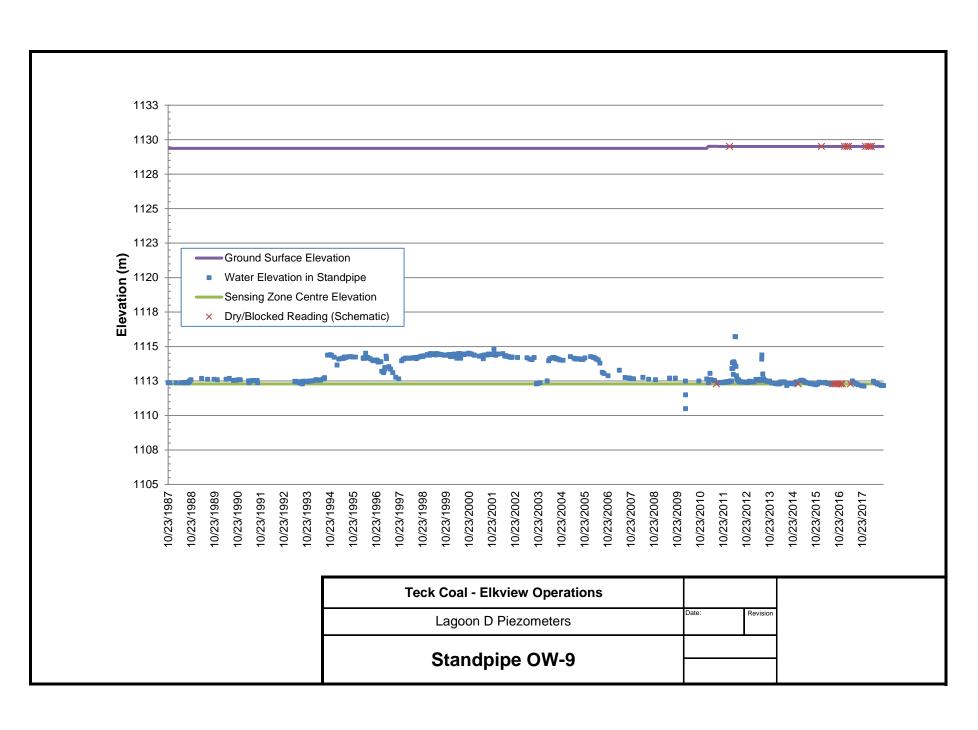


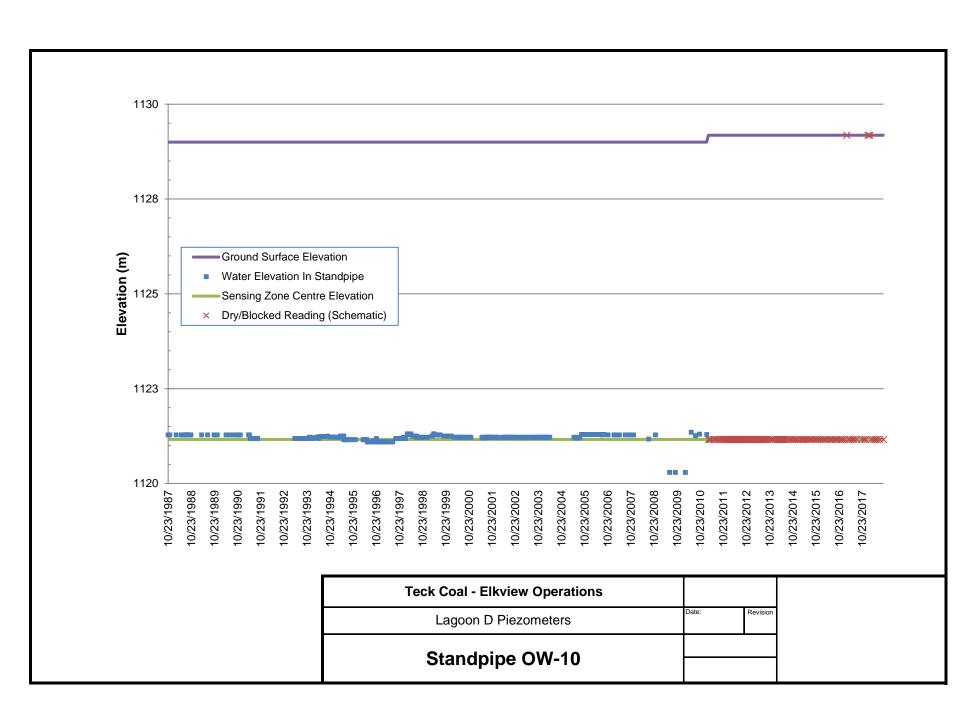


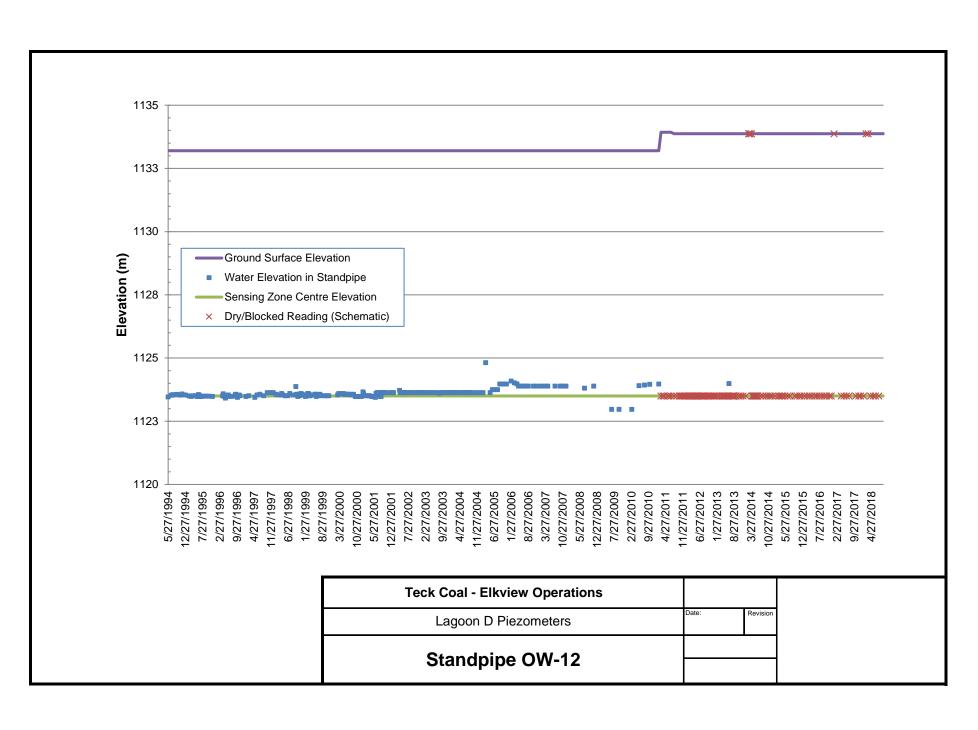


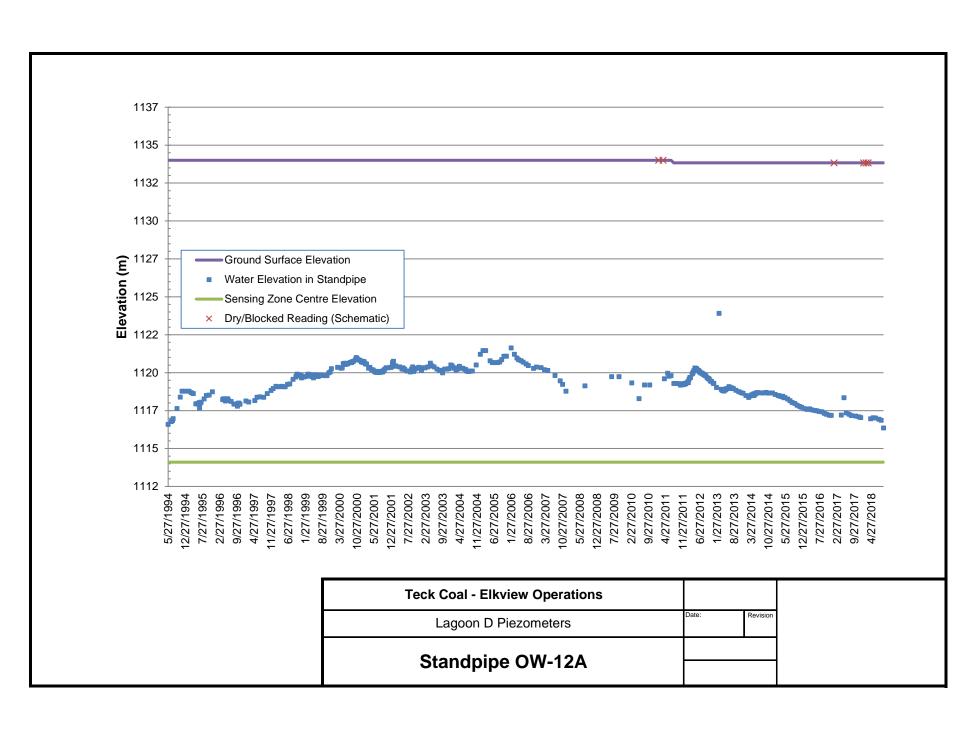


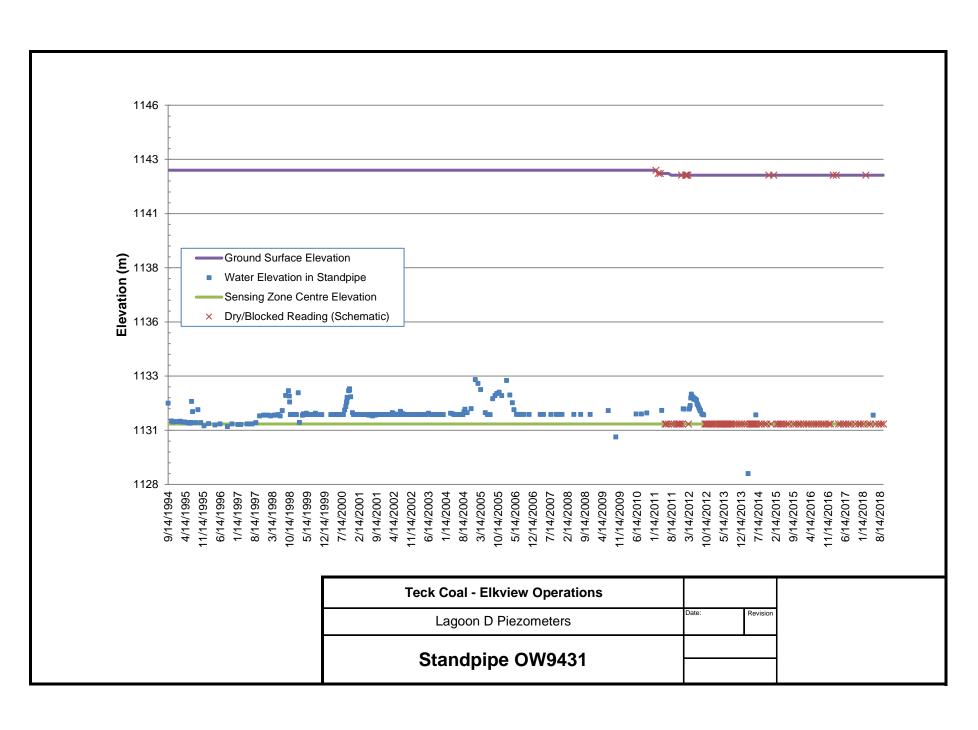


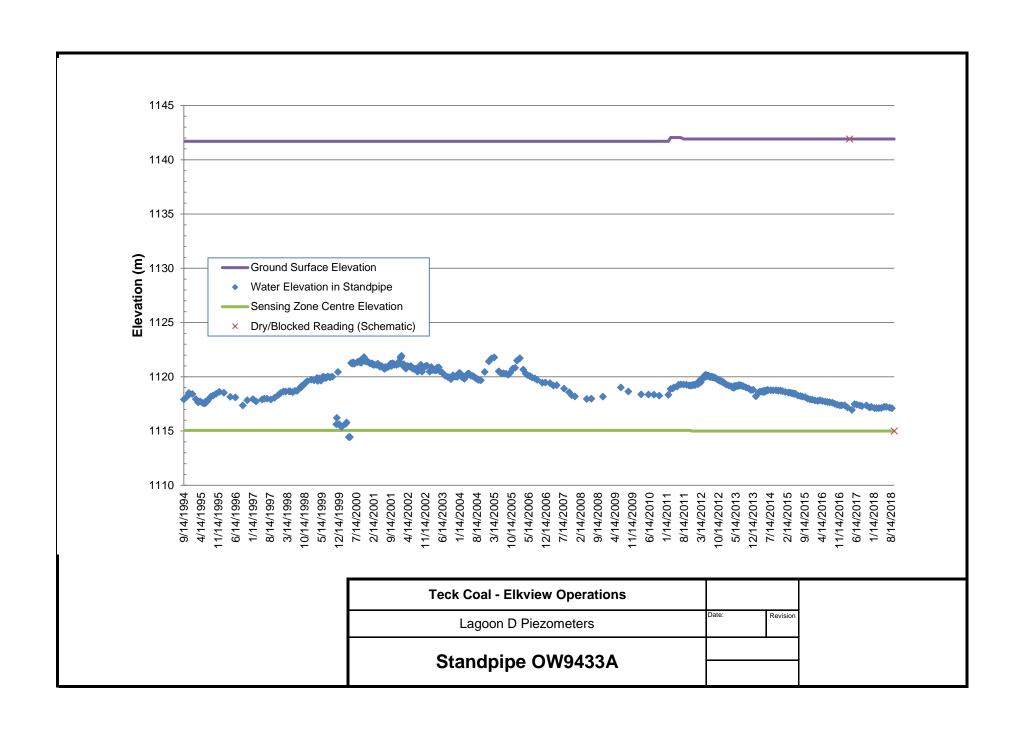


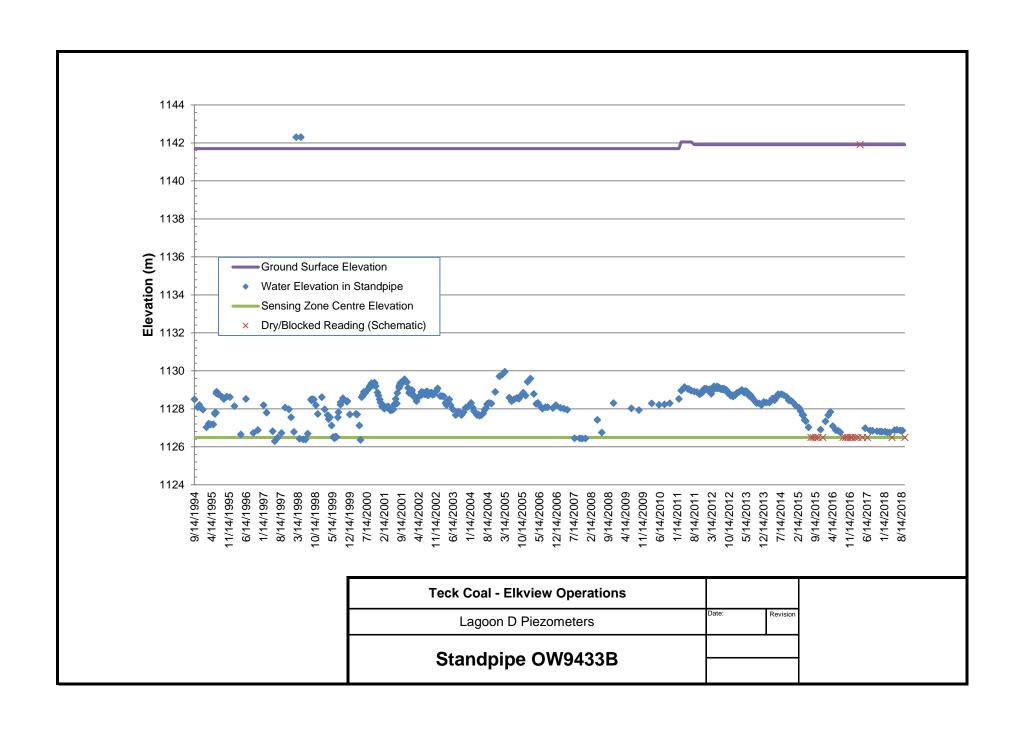


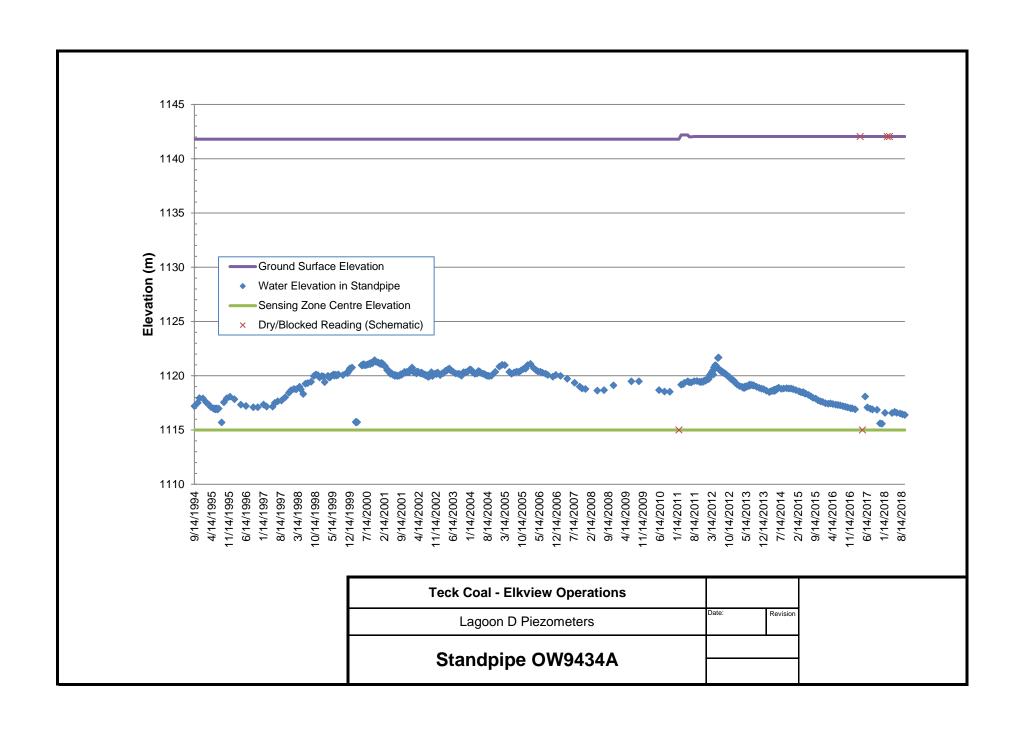


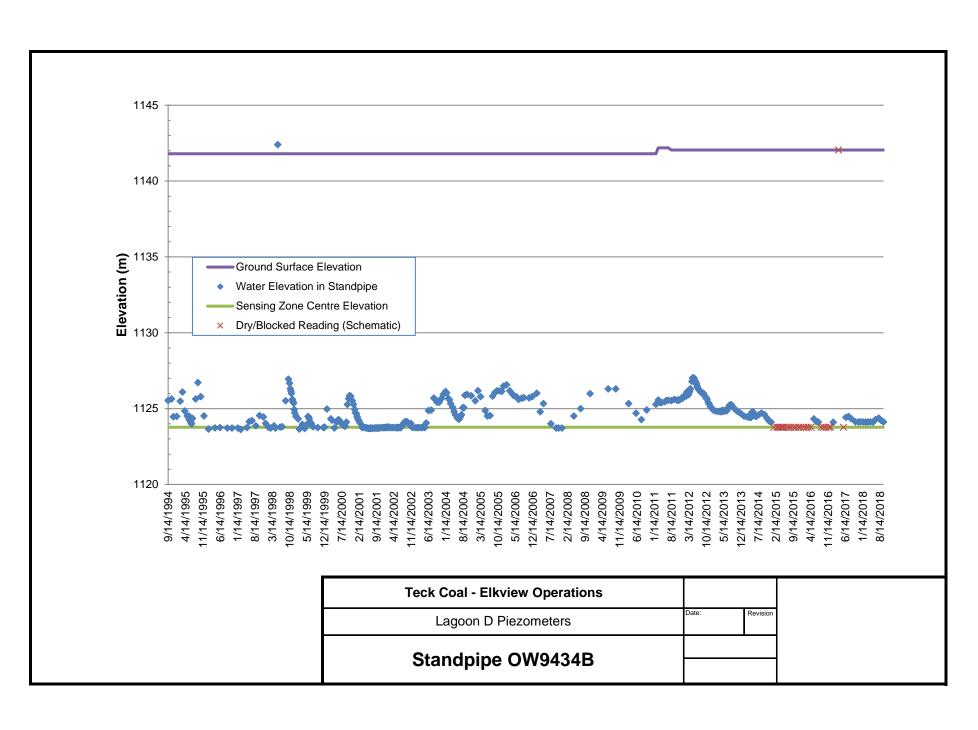


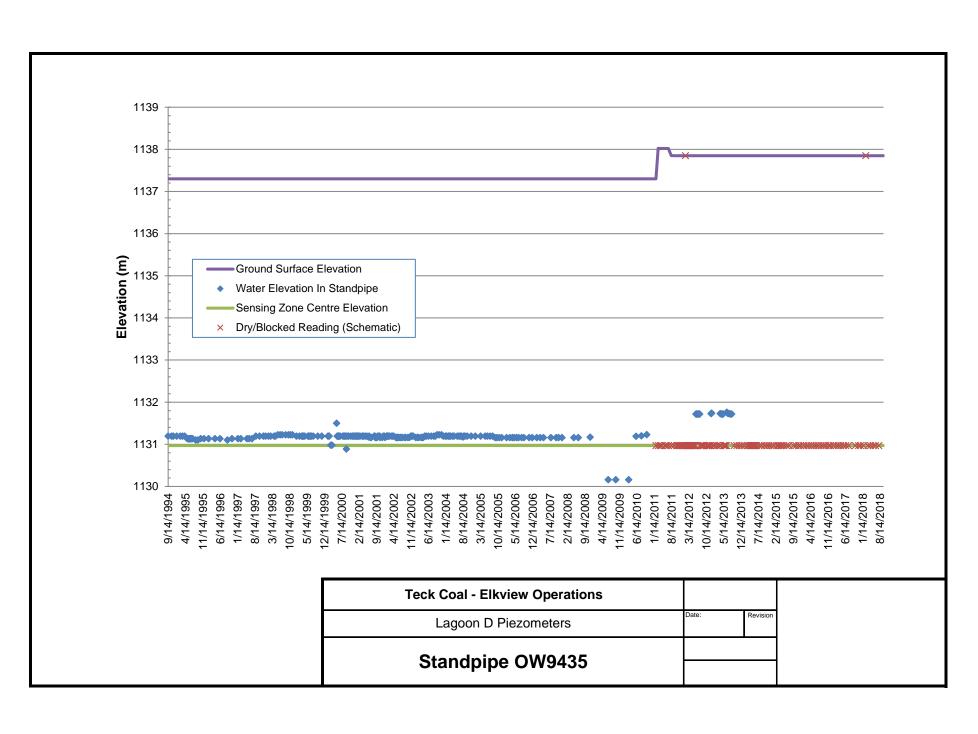


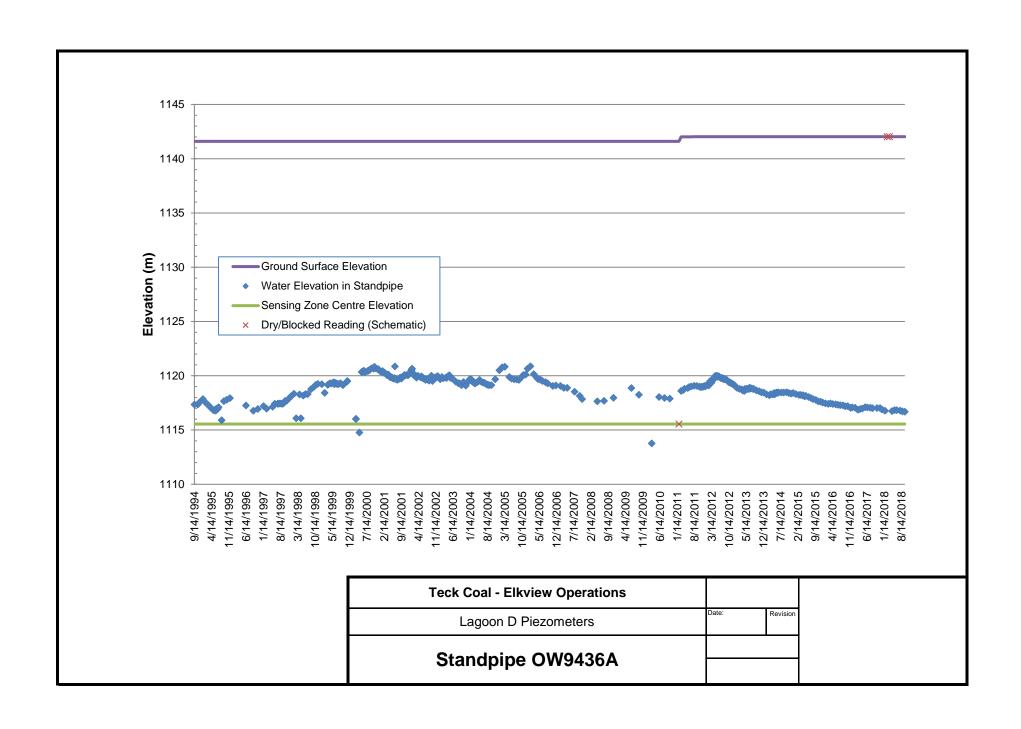


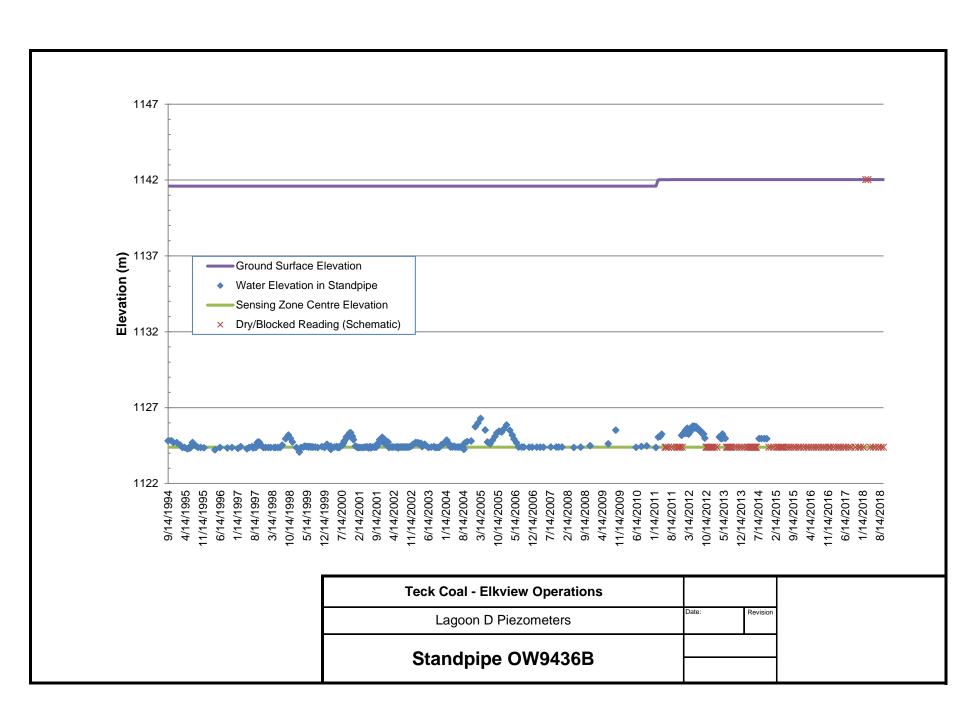


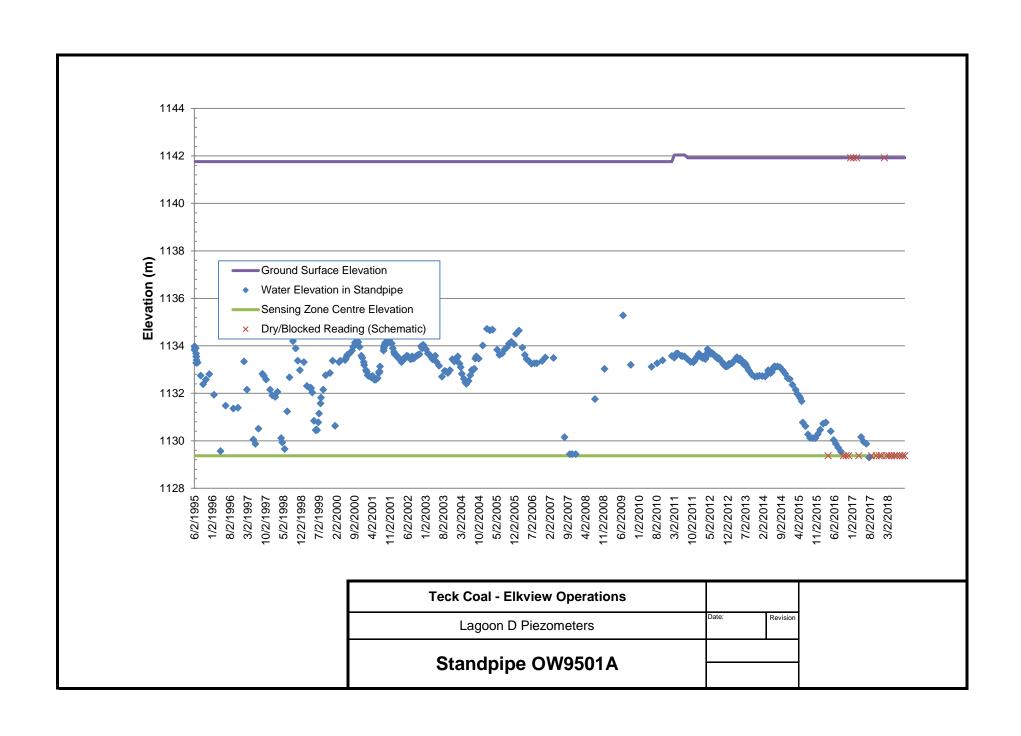


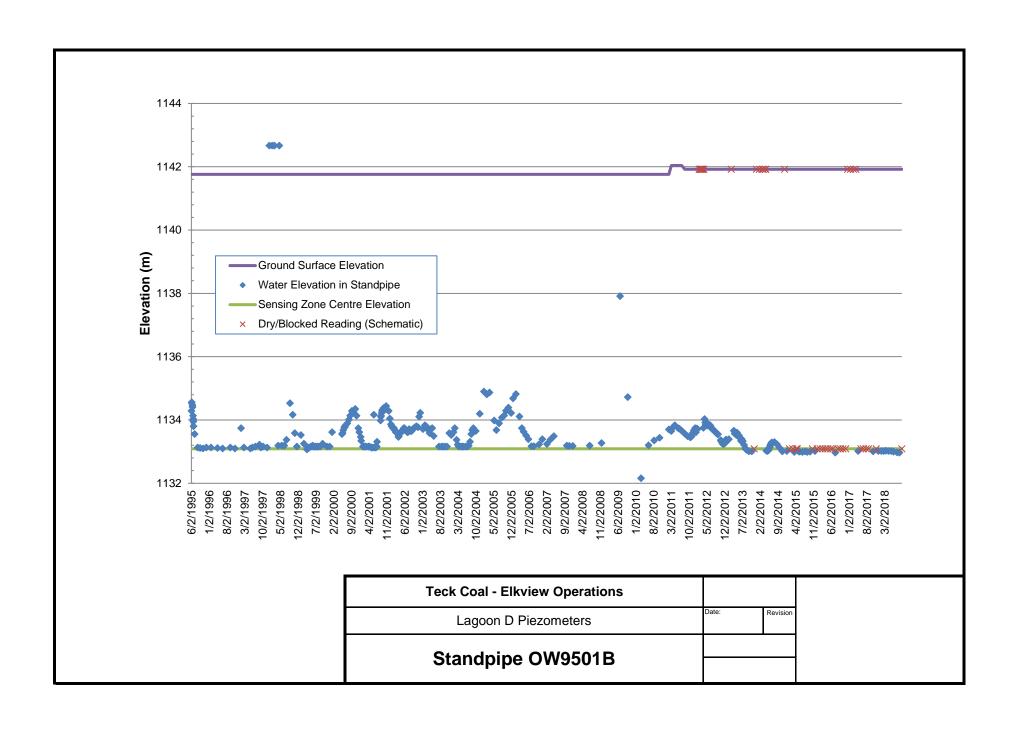


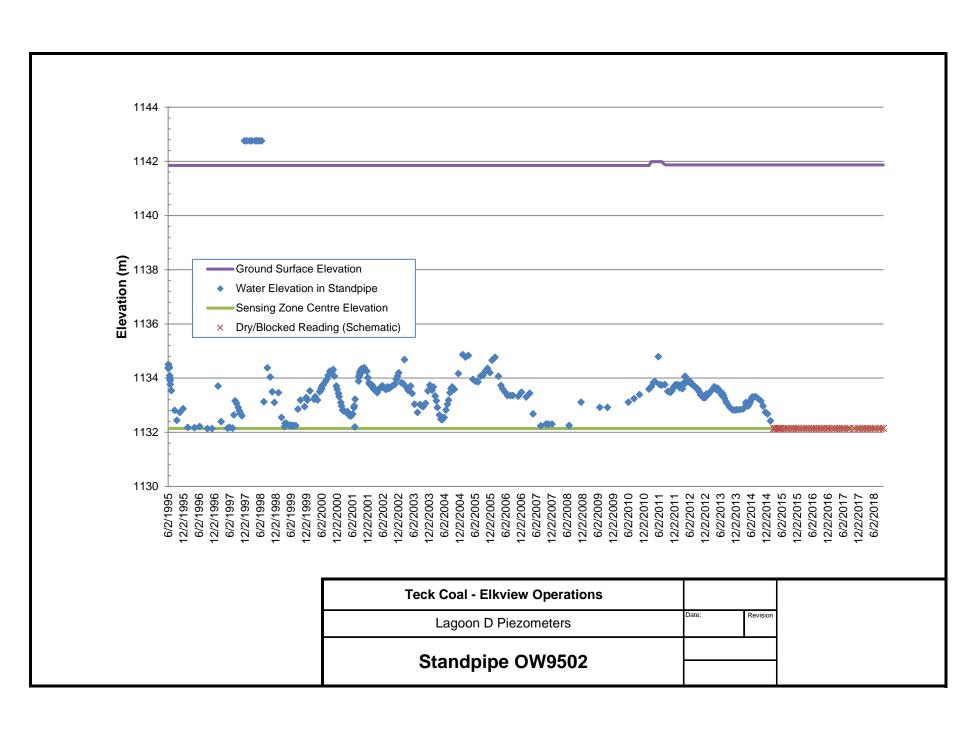


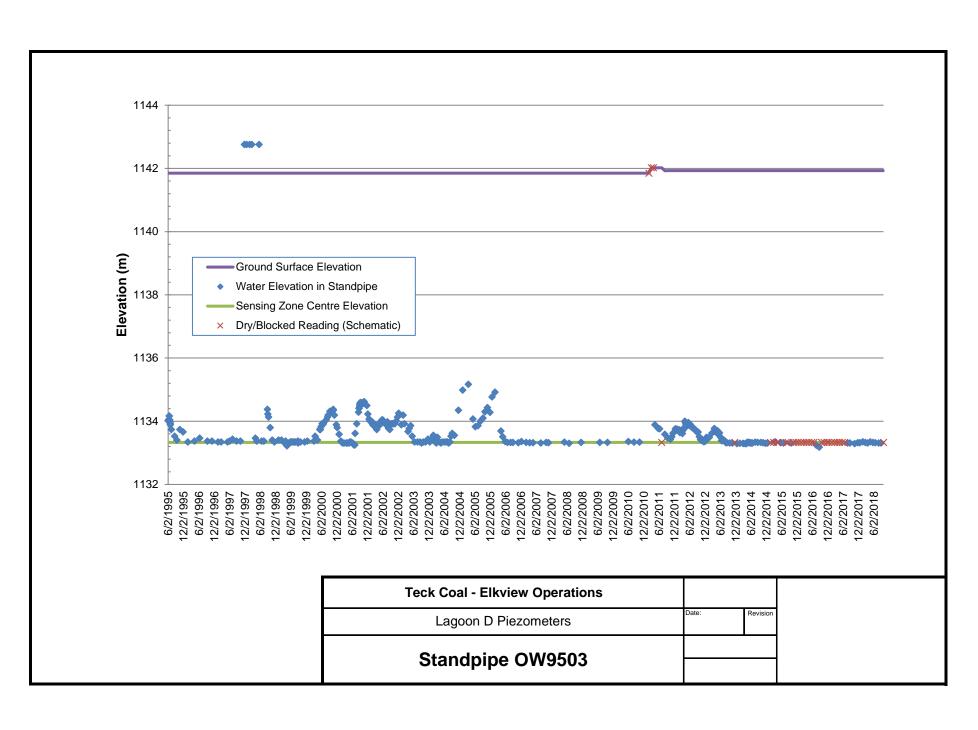


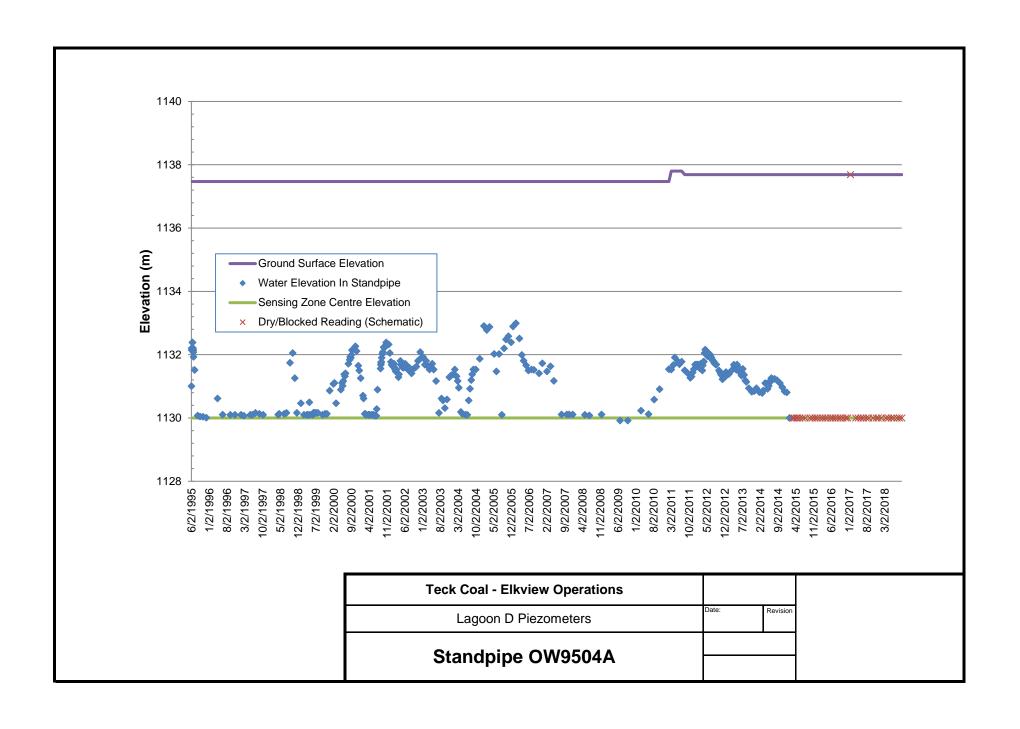


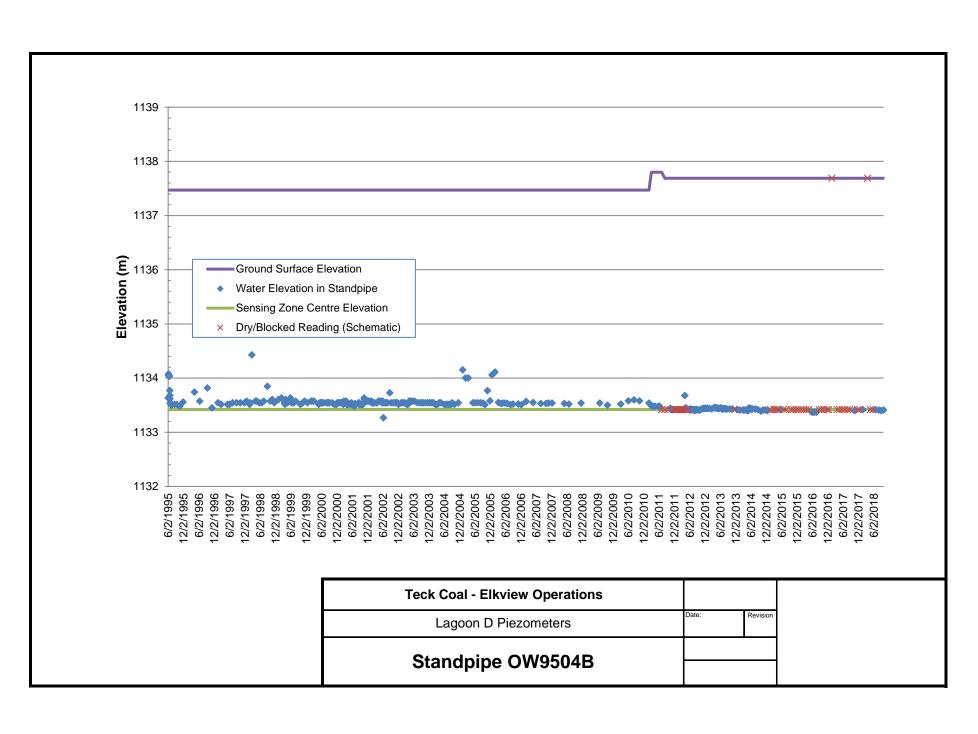


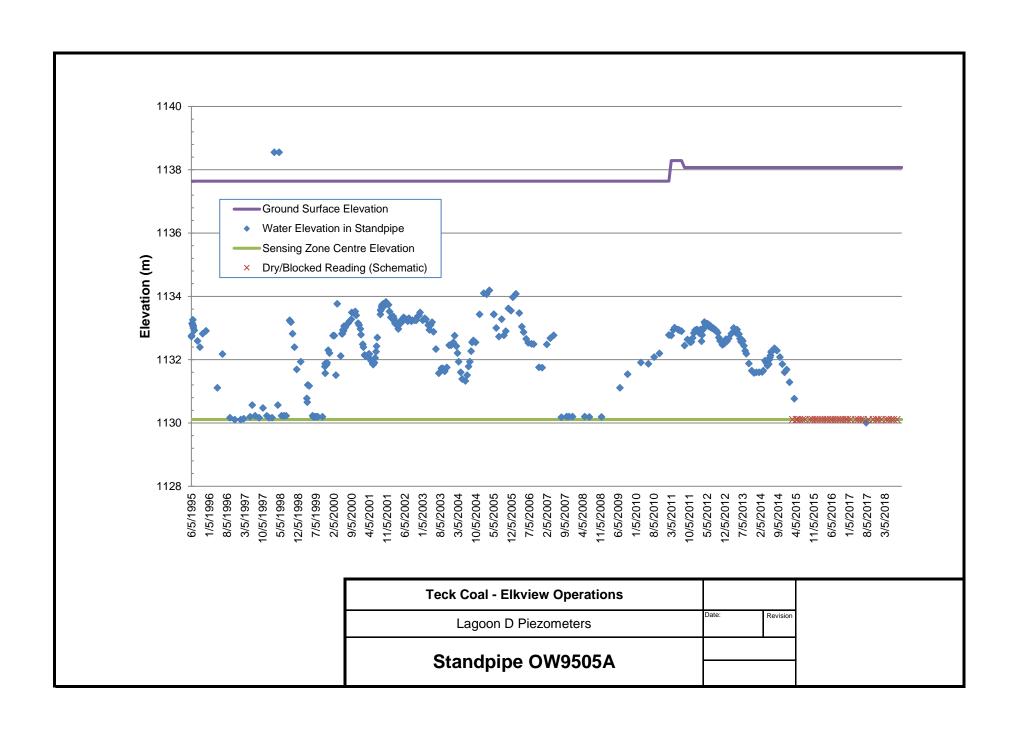


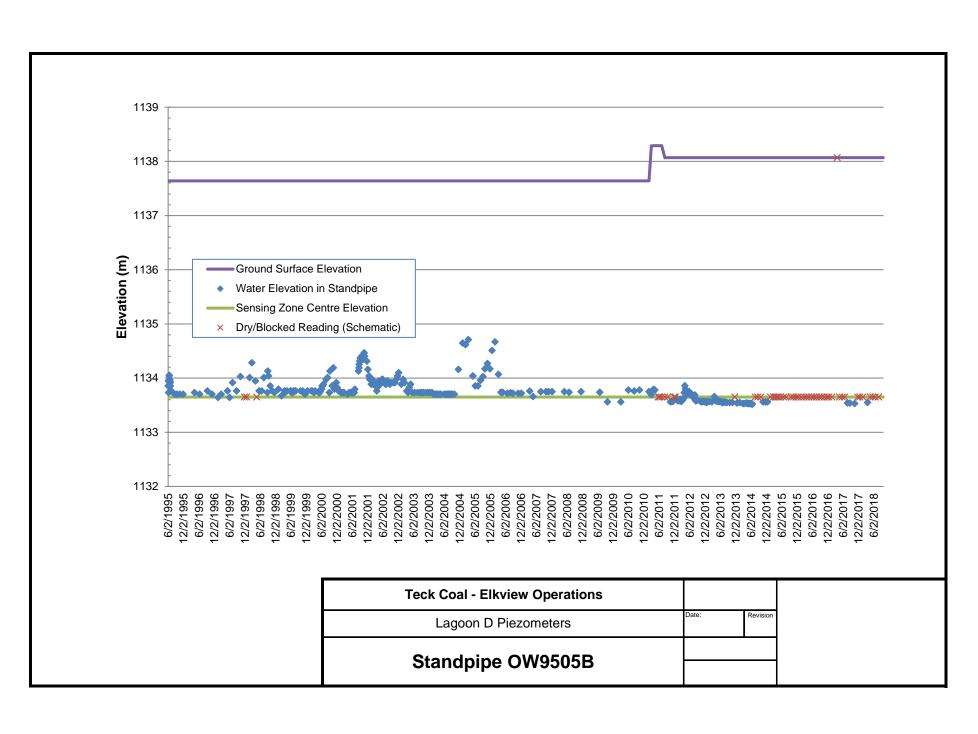


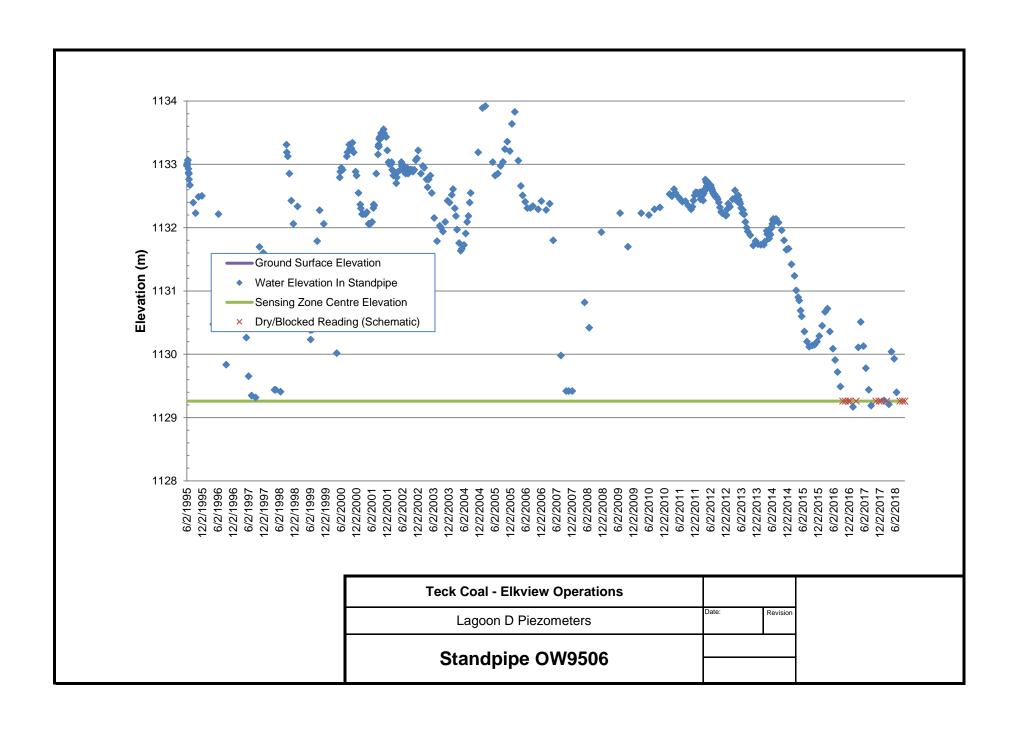


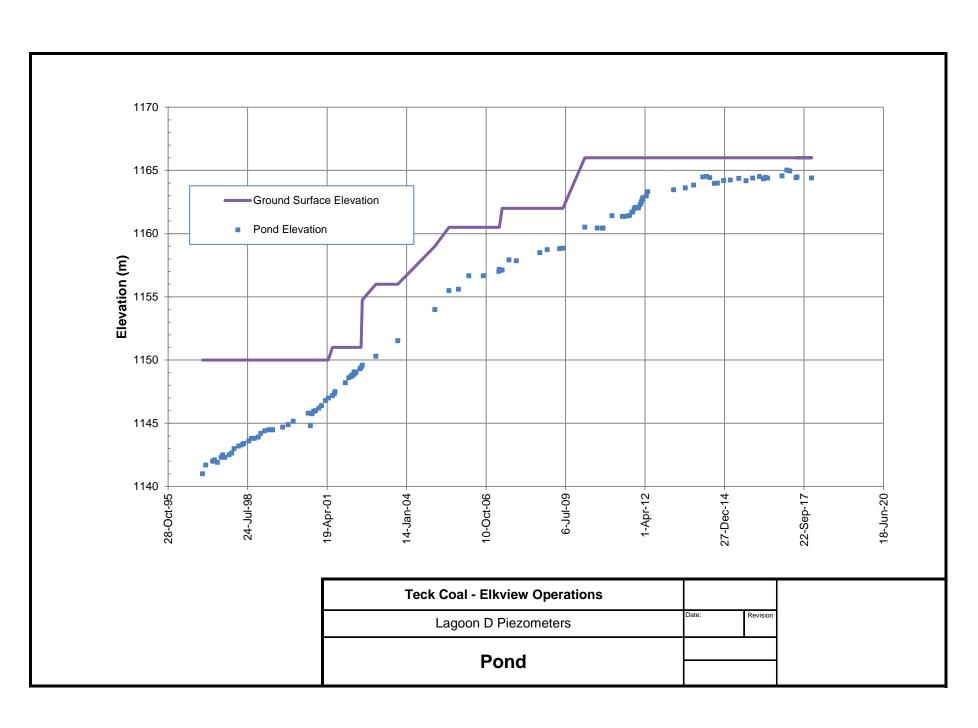








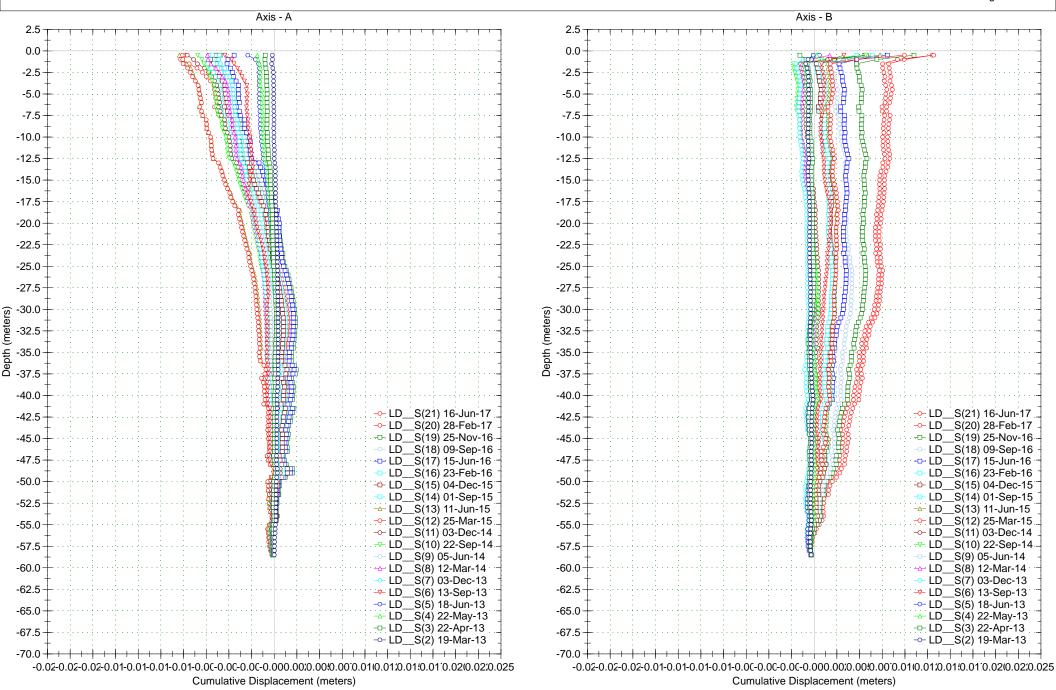




Spiral Correction: N/A Collar Elevation: 0.0 meters Borehole Total Depth: 58.5 meters North Groove Azimuth:

Base Reading: 2013 Feb 20 12:51 Axis A Azimuth: 0.0 degrees

Borehole: LD\_S Project: LagoonD Location: Northing: Easting: Collar:



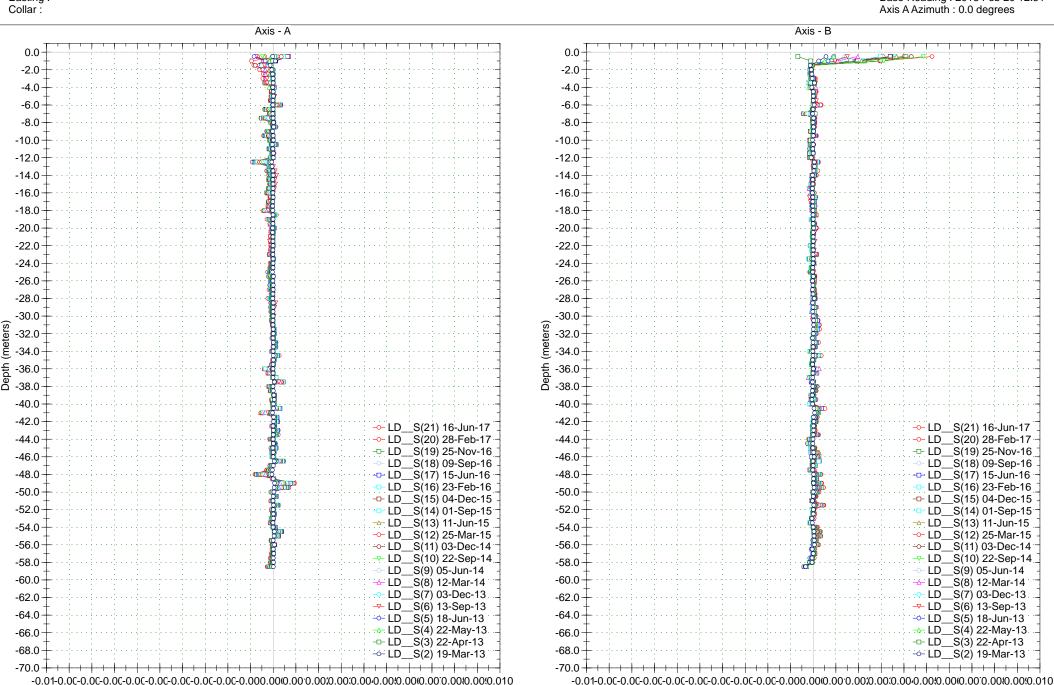
Incremental Displacement (meters)

Spiral Correction: N/A Collar Elevation: 0.0 meters Borehole Total Depth: 58.5 meters North Groove Azimuth:

Base Reading: 2013 Feb 20 12:51

Incremental Displacement (meters)

Borehole: LD\_S
Project: LagoonD
Location:
Northing:
Easting:

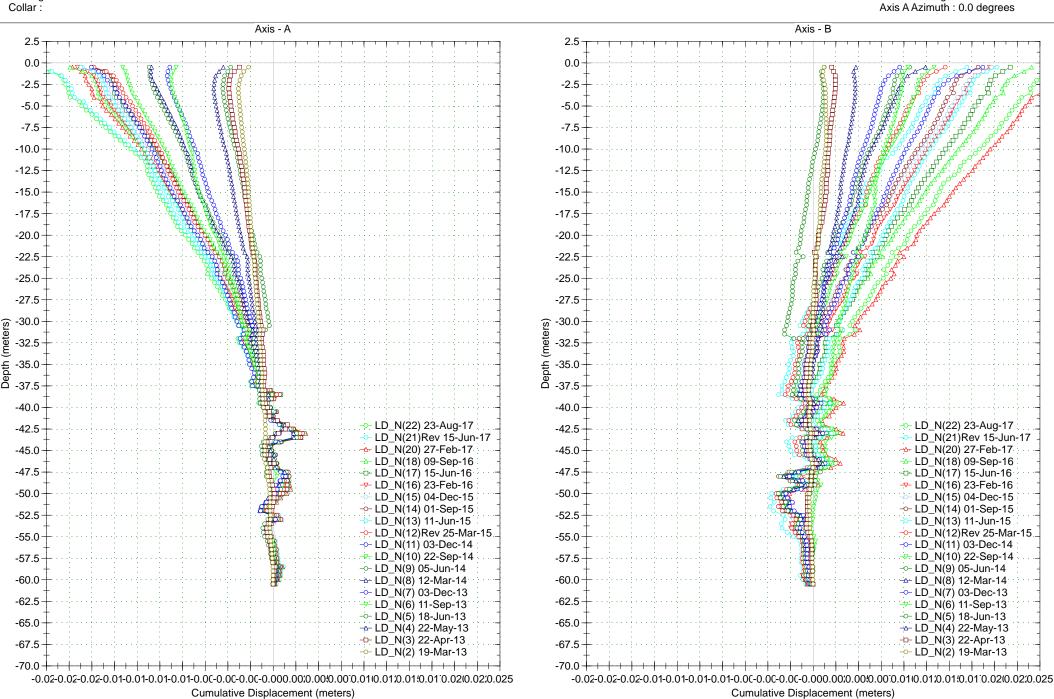




Spiral Correction: N/A Collar Elevation: 0.0 meters Borehole Total Depth: 60.5 meters North Groove Azimuth:

Base Reading: 2013 Feb 20 11:27 Axis A Azimuth: 0.0 degrees

Borehole: LD\_N Project: LagoonD Location: Northing: Easting:



Incremental Displacement (meters)

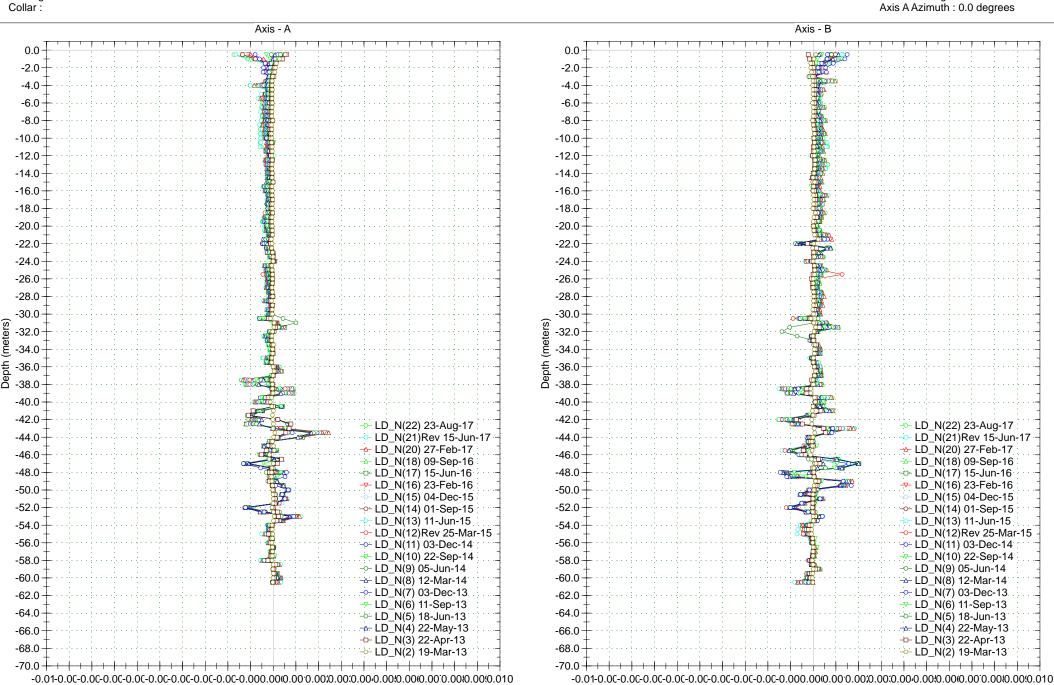
Borehole: LD N Project: LagoonD Location: Northing:

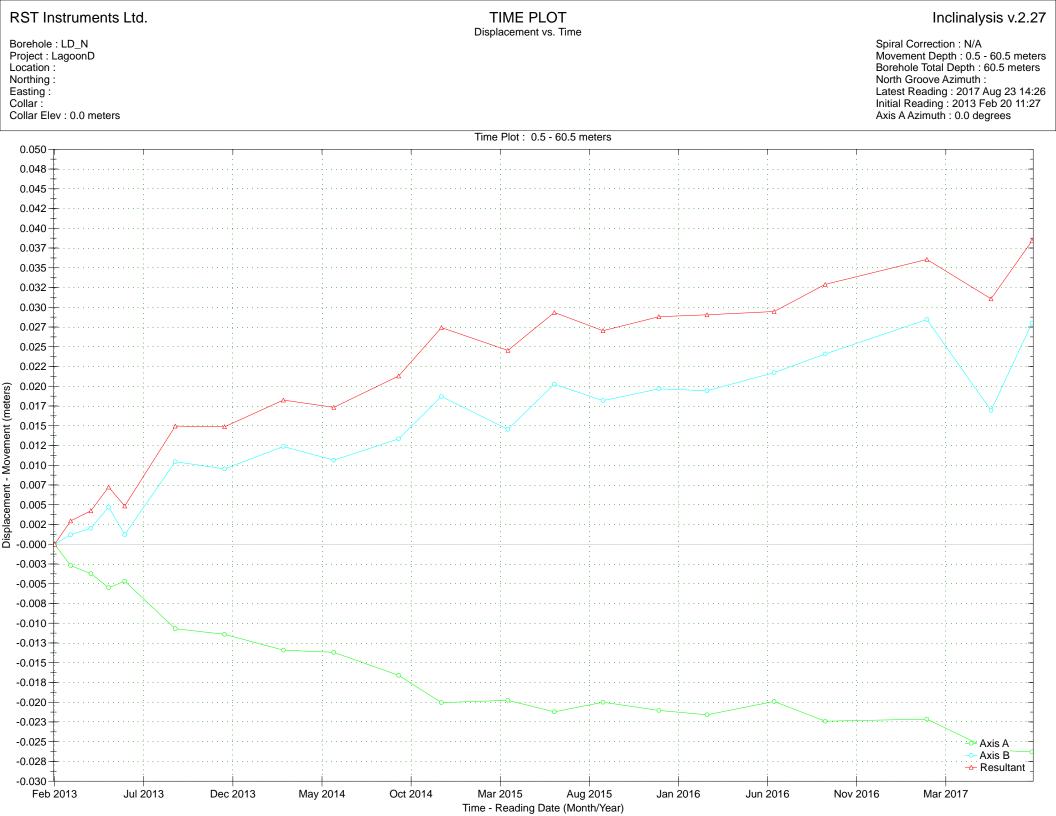
Easting:

Spiral Correction: N/A Collar Elevation: 0.0 meters Borehole Total Depth: 60.5 meters North Groove Azimuth:

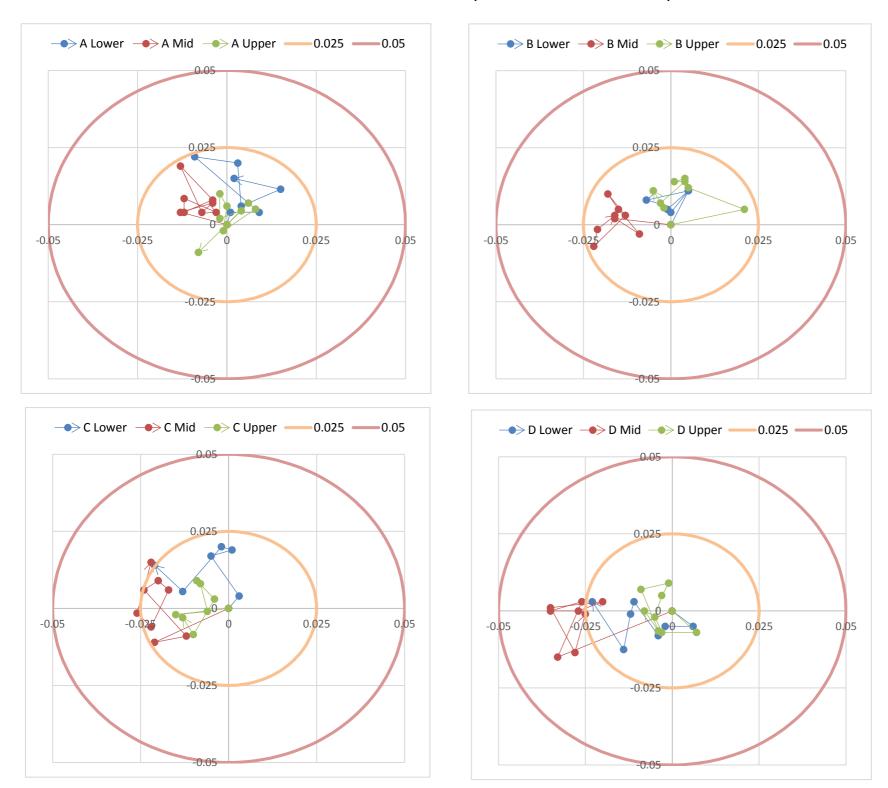
Base Reading: 2013 Feb 20 11:27 Axis A Azimuth : 0.0 degrees

Incremental Displacement (meters)

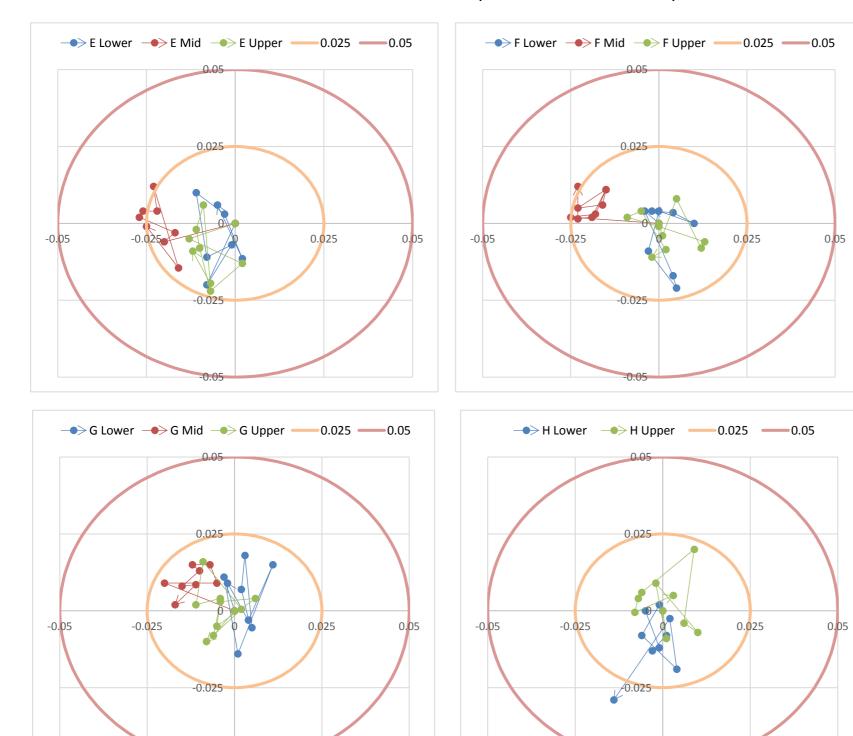




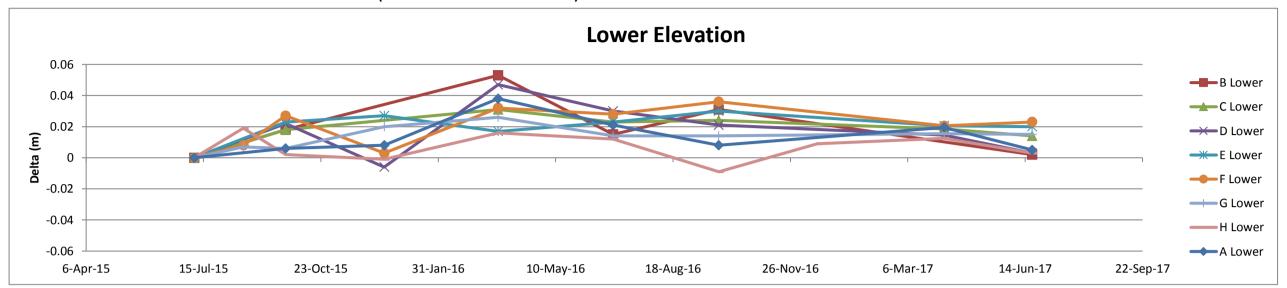
## EASTING AND NORTHING DELTA FOR GPS CONTROL POINTS AT LAGOON D (FROM JULY 2015 TO JUNE 2017)

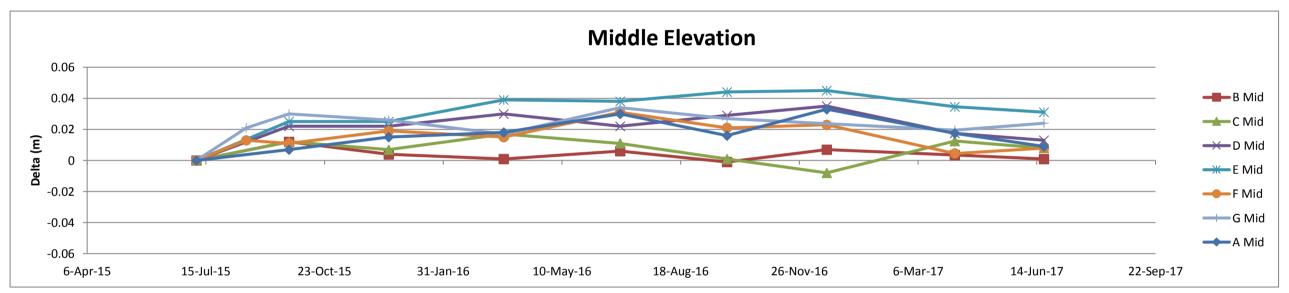


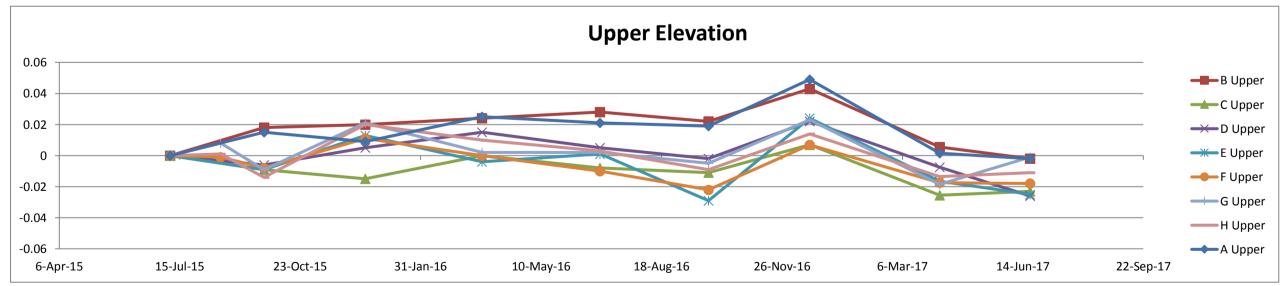
## EASTING AND NORTHING DELTA FOR GPS CONTROL POINTS AT LAGOON D (FROM JULY 2015 TO JUNE 2017)



## **ELEVATION DELTA FOR GPS CONTROL POINTS AT LAGOON D (FROM JULY 2015 TO JUNE 2017)**

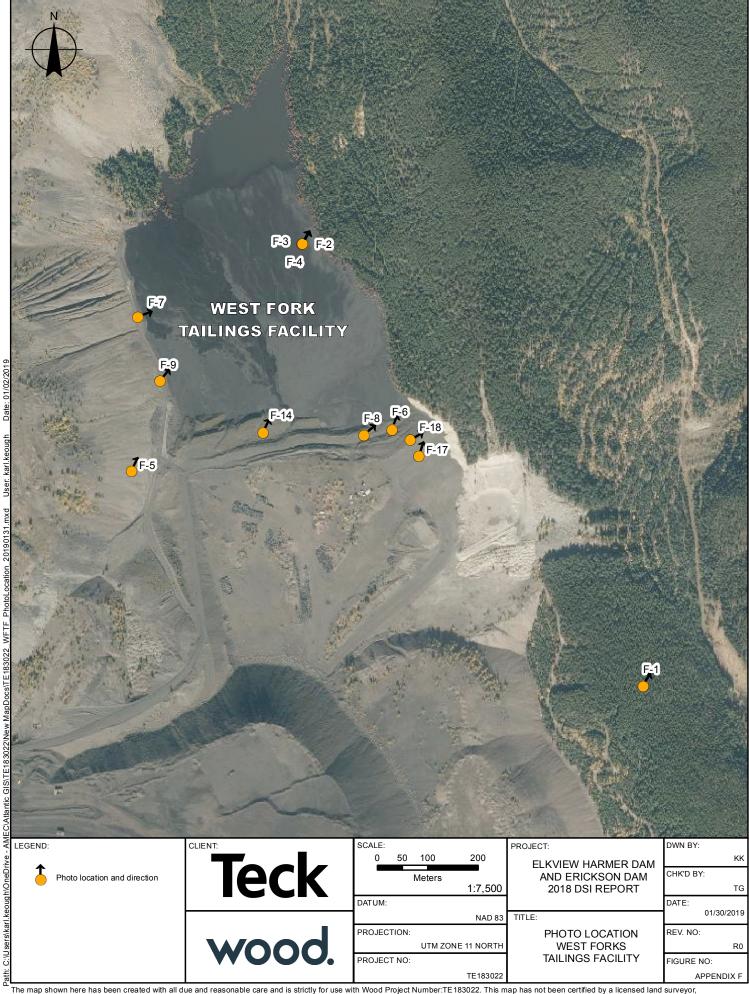






wood.

## Appendix F West Fork Tailings Facility Dam Safety Inspection Photographs







Photograph F - 1: Showing aerial overview of WFTF, looking northwest.



Photograph F - 2: Showing aerial overview of upstream of WFTF, looking south.



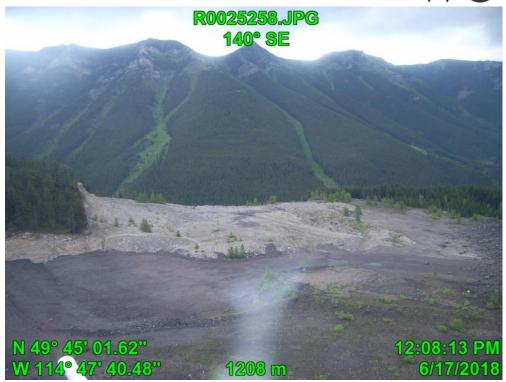


Photograph F - 3: Showing an aerial view of tailings pipelines and tailings beaching at the WTFT, looking west.



Photograph F - 4: Showing an aerial view of upstream of the WFTF, looking southwest.





Photograph F - 5: Showing an aerial view of upstream of the WTFT, looking east.



Photograph F - 6: Showing the south abutment, looking northeast from east abutment.





Photograph F - 7: Showing road constructed along toe of Adit dump looking northwest.



Photograph F - 8: Showing beach tailings on upstream, looking southeast from west abutment.



Photograph F - 9: Showing evidence of infiltration on the west side of the WFTF near the Adit dump, looking south.



Photograph F - 10: Showing a sinkhole on the west side of the WFTF near the Adit dump. (Photo R0018420, 06/06/2017)





Photograph F - 11: Showing an erosion gully on upstream slope due to tailings discharged from spigot 1 pipe located close to the Adit dump, looking south. (Photo R0018422, 06/06/2017)



Photograph F - 12: Showing an erosion gully on upstream slope due to tailings. (Photo R0018425, 06/06/2017)





Photograph F - 13: Showing Geho Road, looking west.



Photograph F - 14: Showing the 2013 raised area at the east abutment, looking east.



Photograph F - 15: Showing seepage at the east abutment against the 2013 raised, looking north. (Photo R0018375, 06/06/2017)

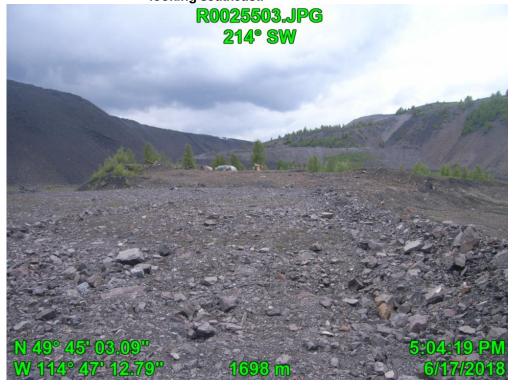


Photograph F - 16: Showing tailings beach at southeast corner of the basin, looking north. Noted seepage track on the tailings beach. (Photo R0018378, 06/06/2017)





Photograph F - 17: Showing east abutment at WFTF downstream slope, looking southeast.



Photograph F - 18: Showing downstream slope, east abutment and toe looking south.



Photograph F - 19: Showing a longitudinal cracking around spigot 5 (Photo P1100577, 06/06/2017).



Photograph F - 20: Showing toe of Cowboy dump looking south. Note toe is located approximately 450 m downstream of crest centerline. (Photo R0018407, 06/07/2017)

wood.

## Appendix G Lagoon A Dam Safety Inspection Photographs







Photograph G - 1: Showing aerial overview of Lagoon A, looking east.



Photograph G - 2: Showing an overview of the Lagoon A. Noted the Cossarini Creek inflow to east side of Lagoon A through 2 culverts, looking northwest. (Photo R0018030, 06/06/2017)





Photograph G - 3: Showing the south side of Lagoon A, looking southeast. (Photo R0018840, 06/07/2017)



Photograph G - 4: Showing west berm and the spillway, looking southeast. (Photo R0018844, 06/07/2017)





Photograph G - 5: Showing downstream of the west berm and the spillway, looking north.



Photograph G - 6: Showing downstream of the spillway of the west face of Lagoon A, looking north.





Photograph G - 7: Showing the spillway and riprap placement at downstream west slope, looking northwest.



Photograph G - 8: Showing upstream of the upgraded spillway, looking southeast. [R0039439432]



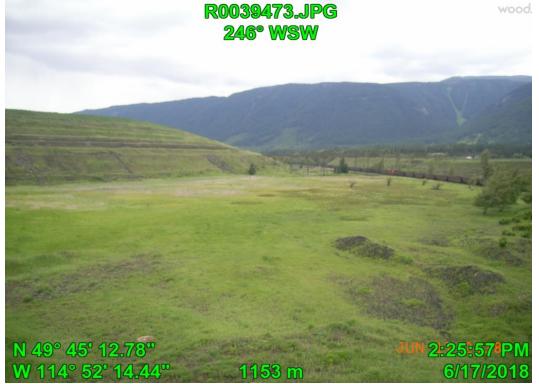


Photograph G - 9: Showing the crest of at the west face, looking south.



Photograph G - 10: Showing water discharge from Cossarini Creek onto east side of Lagoon A, looking west.





Photograph G - 11: Overview of southwest corner of Lagoon A, looking southwest.



Photograph G - 12: Showing downstream slope of Lagoon A on north embankment at northeast corner, looking northeast.





Photograph G - 13: Showing downstream slope of Lagoon A north embankment, looking southwest. (Photo R0018818, 06/07/2017)



Photograph G - 14: Showing the road along the north side of Lagoon A, looking southwest. Noted an amoured outlet in the mid length of the north berm. (Photo R0018823, 06/07/2017)





Photograph G - 15: Showing the closer view of the amoured outlet on the north slope, looking west.

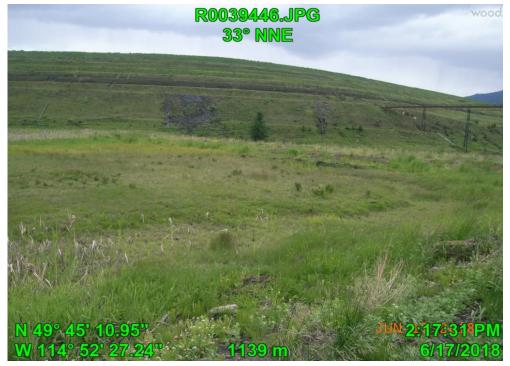


Photograph G - 16: Showing the downstream of north slope and another armoured outlet further west, looking west. (Photo R0018827, 06/07/2017)





Photograph G - 17: Showing a closer view of the amoured outlet at the west end of the north slope, looking northeast.



Photograph G - 18: Showing the surface of Lagoon A at southeast corner, looking southwest.





Photograph G - 19: Showing pipe flow on northwest end of Lagoon A, looking southwest.



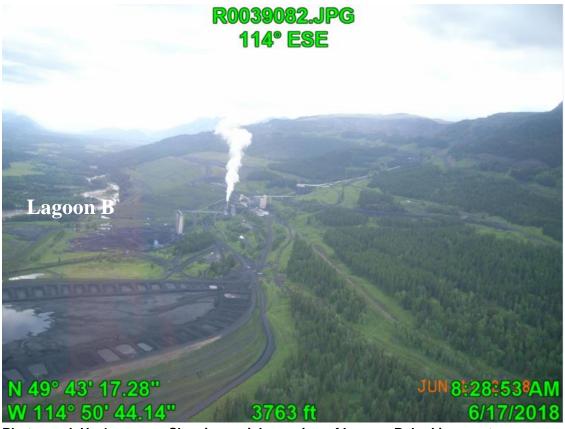
Photograph G - 20: Showing the north side of Lagoon A, looking northeast.

wood.

## Appendix H Lagoon B Dam Safety Inspection Photographs







Photograph H - 1: Showing aerial overview of Lagoon B, looking west.





Photograph H - 2: Showing aerial overview of Lagoon B, looking northwest.





Photograph H - 3: Showing east end of the north embankment of Lagoon B, looking east.



Photograph H - 4: Showing northeast area of Lagoon B, looking northeast.(Photo No. P1100788, 2017/06/07).





Photograph H - 5: Showing downstream slope of north end of the west embankment of Lagoon B, looking north. Noted ponded water at toe. (Photo No. P1100786, 2017/06/07)



Photograph H - 6: Showing west embankment of Lagoon B, looking southwest.





Photograph H - 7: Showing erosion on the slope of west embankment of Lagoon B, looking northeast.



Photograph H - 8: Showing a pipeline at the toe at south end of the west embankment and an erosion gully, looking north. (Photo No. P1100775, 2017/06/07)





Photograph H - 9: Showing plastic sand bag left at the southwest corner, looking southwest.



Photograph H - 10: Showing west surface of Lagoon B, view from southwest corner, looking north. [R0025696]





Photograph H - 11: Showing south surface of Lagoon B, view from southwest corner, looking northeast.



Photograph H - 12: Showing south end of Lagoon B, looking southeast. Noted the outlet steel pipe on the south slope.





Photograph H - 13: Showing dry outlet at southwest corner of Lagoon B, looking north. (Photo No. P1100766, 2017/06/07)



Photograph H - 14: Showing northwest area of Lagoon B, looking northeast.





Photograph H - 15: Showing crest and slope on south side of Lagoon B, Looking southwest (Photo No. P1100758, 2017/06/07).



Photograph H - 16: Showing north end of the south side of Lagoon B, looking northeast.





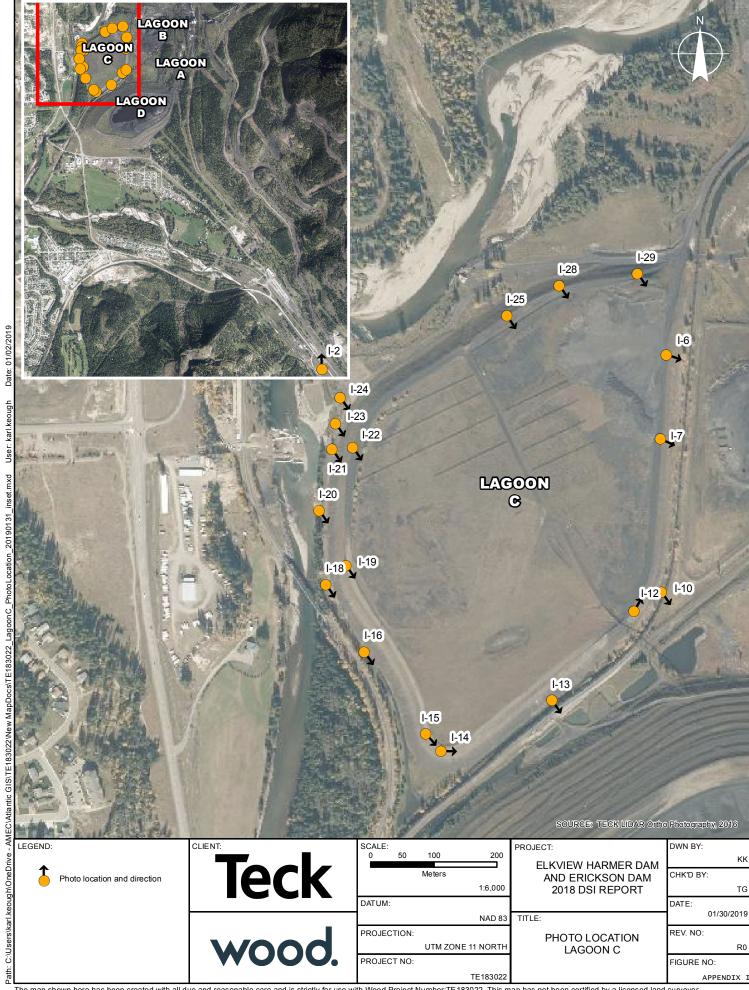
Photograph H - 17: Showing tailings discharge pipe and discharge area located at the southeast corner of Lagoon B, looking northeast. (Panorama Photo, 2017/06/07)



Photograph H - 18: Showing tailings discharge area located at the southeast corner of Lagoon B, looking southeast (Photo No. P1100748, 2017/06/07).

wood.

## Appendix I Lagoon C Dam Safety Inspection Photographs







Photograph I - 1: Showing aerial overview of Lagoon C, looking northeast.

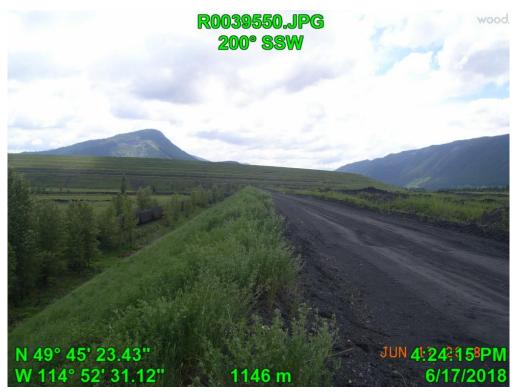


Photograph I - 2: Showing aerial overview of Lagoon C, looking east.





Photograph I - 5: Showing the crest and shoulder of the north end of east slope of Lagoon C, looking north.
(Photo R0018458, 06/07/2017



Photograph I - 6: Showing the crest and shoulder of the north end of east slope of Lagoon C, looking south.



## R0039556.JPG 206° SSW





Photograph I - 7: Showing the crest and upstream from the north end of Lagoon C, looking south.



Showing the crest and upstream at the north end of Lagoon C, looking north. (Photo No. P1100615, 2017/06/07) Photograph I - 8:





Photograph I - 9: Showing erosion at east slope toe of Lagoon C, looking north. (Photo R0018869, 06/07/2017)



Photograph I - 10: Showing erosion at the south end of the east slope toe of Lagoon C, looking north.



wood.



Photograph I - 11: Showing toe and downstream slope at the southeast corner of Lagoon C, looking southwest. (Photo R0018488, 06/07/2017)

R0039574.JPG 230° SW



Photograph I - 12: Showing the crest and shoulder of Lagoon C south embankment, looking southwest. Noted the crest is narrow and the access road is depressed underneath the trestle.





Photograph I - 13: Showing south slope and erosion on south slope of Lagoon C, looking northeast.



Photograph I - 14: Showing downstream toe at southwest corner of Lagoon C, looking southwest.





Photograph I - 15: Showing west crest and slope of Lagoon C at southwest corner, looking northwest. Noted beaver activities at the pond.



Photograph I - 16: Showing west slope and toe of Lagoon C, looking southeast.





Photograph I - 17: Showing an aerial view of the west slope and toe of Lagoon C, looking south. (Photo R0018038, 06/06/2017)



Photograph I- 18: Showing west slope and toe of Lagoon C, showing erosion protection, looking north.





Photograph I - 19: Showing west slope and toe of Lagoon C, looking northwest.

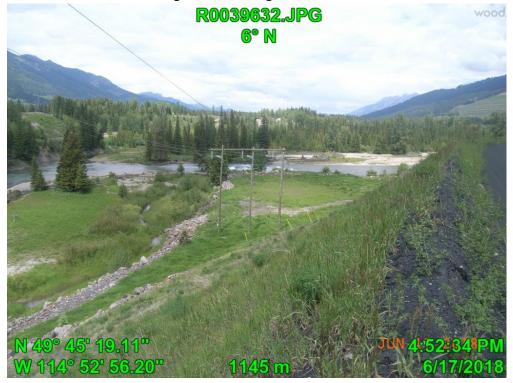


Photograph I- 20: Showing discharge outlet at the west slope toe of Lagoon C.





Photograph I - 21: Showing the sign of natural gas line at west slope toe of Lagoon C, looking northwest.



Photograph I - 22: Showing west slope and toe of Lagoon C at northwest corner, looking north.





Photograph I - 23: Showing erosion riprap along the shoreline of the Elk River, at the west toe of Lagoon C, looking southwest.



Photograph I - 24: Showing erosion on slope at northwest corner of Lagoon C, looking southeast.







Photograph I - 25: Showing crest and upstream at the northwest corner of Lagoon C, looking northeast.



Photograph I - 26: Showing pipeline routed on north slope of Lagoon C, looking Southwest. (Photo R0018037, 06/06/2017)





Photograph I - 27: Showing ponded water at toe of north slope of Lagoon C, looking west. (Photo R0018615, 06/07/2017)



Photograph I - 28: Showing erosion on north slope of Lagoon C, looking east.





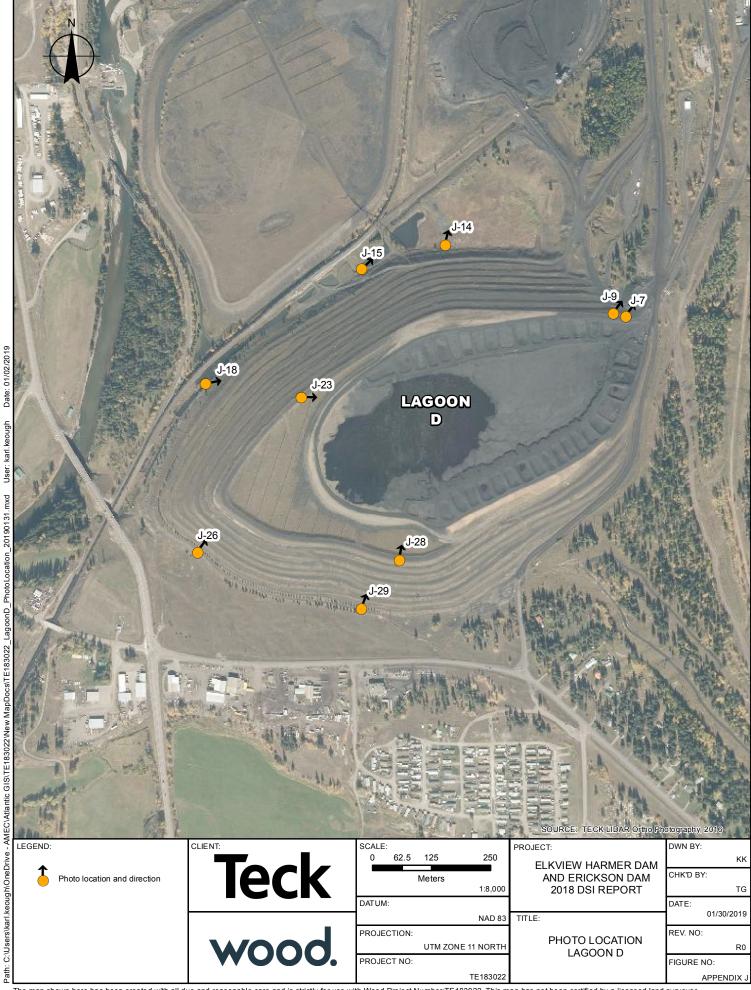
Photograph I - 29: Showing the toe of northeast corner of Lagoon C, looking east.



Photograph I - 30: Showing the surface of northwest area of Lagoon C, looking southwest. (Photo No.P1100678, 2017/06/07)

wood.

# Appendix J Lagoon D Dam Safety Inspection Photographs







Photograph J - 1: Showing an aerial overview of Lagoon D, looking south. (Photo R0018013, 06/06/2017)



Photograph J - 2: Showing an aerial overview of Lagoon D, looking northeast. (Photo R0018047, 06/06/2017)





Photograph J - 3: Showing surface of the west corner and east end of the north slope of Lagoon D, looking east. (Photo R0018016, 06/06/2017)



Photograph J - 4: Showing surface of the east corner and west end of the north slope of Lagoon D, looking southwest. (Photo R0018017, 06/06/2017)





Photograph J - 5: Showing surface of the west corner and west end of the south slope of Lagoon D, looking north. (Photo R0018050, 06/06/2017)



Photograph J - 6: Showing surface of the east corner and east end of the south slope of Lagoon D, looking northeast. (Photo R0018026, 06/06/2017)





Photograph J - 7: Showing an upstream tailings cells at the northeast corner of Lagoon D, looking west.



Photograph J - 8: Showing a close-view of a sinkhole within the tailings cell of Lagoon D, looking south.





Photograph J - 9: Showing the north crest at east end of Lagoon D, looking west.



Photograph J - 10: Showing the toe and the 2<sup>nd</sup> seep area at the east end of North toe of Lagoon D, looking west. (Photo R0018807, 06/07/2017)





Photograph J - 11: Showing a close-view of the first seep area on the north slope, looking southeast. (Photo R0018808, 06/07/2017)



Photograph J - 12: Showing a close-view of the second seep area on the north slope, looking southeast. (Photo R0018803, 06/07/2017)





Photograph J - 13: Showing erosion gully at lower north slope, looking south up from the toe. (Photo R0018766, 06/07/2017)



Photograph J - 14: Showing north slope, looking east. Noted the pipe on the lower north slope.



#### R0039391.JPG 74° ENE



Photograph J - 15: Showing the toe and lower section of north slope of Lagoon D, looking northeast. Note erosion at the toe.



Photograph J - 16: Showing the lower north slope of Lagoon D, looking southwest. Noted Otto Pond at the toe and erosions on the slope. (Photo R0018499, 06/07/2017)





Photograph J - 17: Showing an erosion at the bank of the pond located at the toe of north slope of Lagoon D, looking south. (Photo R0018520, 06/07/2017)



Photograph J - 18: Showing the toe at west end of the north slope of Lagoon D, looking northeast. Noted beaver activities within this area.





Photograph J - 19: Showing an animal borrow on the toe of north slope of Lagoon D, looking southwest. (Photo R0018721, 06/07/2017)



Photograph J - 20: Showing an animal activity at the toe of the north slope of Lagoon D, looking northwest. (Photo R0018710, 06/07/2017





Photograph J - 21: Showing upstream tailings beach at the north section of Lagoon D, looking east. (Photo P1100702, 2017/06/06)



Photograph J - 22: Showing upstream tailings beach at the north section of Lagoon D, looking west. (Photo P1100703, 2017/06/06)





Photograph J - 23: Showing surface of the west corner of Lagoon D, looking south. Noted active tailings deposition on the surface



Photograph J - 24: Showing tailings placement on the surface at the west corner of Lagoon D, looking north. (Photo P1100717, 2017/06/06)





Photograph J - 25: Showing the toe at the west corner of Lagoon D, looking southwest. (Photo R0018531, 06/07/2017)



Photograph J - 26: Showing the toe of the dam at west end of Lagoon D, looking northwest.





Photograph J - 27: Showing a sinkhole at south west crest of Lagoon D, looking east. (Photo P1100730, 2017/06/06).



Photograph J - 28: Showing the crest shoulder at the south corner of Lagoon D, looking southeast.





Photograph J - 29: Showing erosion on the south slope of Lagoon D, looking northwest.



Photograph J - 30: Showing the toe of the south embankment of Lagoon D, looking west. (Photo R0018639, 06/07/2017)





Photograph J - 31: Showing dam crest and upstream surface at the south area of Lagoon D, looking west. (Photo P1100735, 2017/06/07).



Photograph J - 32: Showing crest and upper south slope of Lagoon D, looking northeast. (Photo P1100736, 2017/06/06)





Photograph J - 33: Showing the toe and lower south slope at south corner of Lagoon D, looking northwest. Noted an animal borrow at the toe. (Photo R0018630, 06/07/2017



Photograph J - 34: Showing a tailings cell at southeast section of Lagoon D, looking northeast. (Photo P1100742, 2017/06/07)

wood.

## Appendix K Dam Safety Inspection Checklists

Dam Site:

Structure:

Teck Coal Limited - Elkview Operations West Fork Tailing Facility Michael Cyr, P.Eng. / Andy Small, P.Eng. Inspection Carried Out By:
Date of Inspection:
Walk Over Inspection Conducted:

17 June 2018

Yes

Weather Conditions: Sunny, clear, ~26°C



ID	Observed Features	Yes	No	N/A	Comments
1.0	Upstream Dam Slope			•	
	Concern with Current or Previous Water Level		Χ		
	Evidence of Wave or Other Erosion	Χ			Significant erosion around spigots 1-3 from tailings
	Deterioration of Erosion Protection	Χ			No erosion protection in place
	Unusual Accumulation of Debris/Logs		X		
	Evidence of Sloughing/Sliding		Χ		
	Evidence of Cracks	Χ	V		Longitudinal cracking around spigot 5 – does not appear recent
	Any Other Deformation		X		
1.8	Excessive Vegetation Other Unusual Conditions		X		
1.9	Other Unusual Conditions		Χ		
2.0	Dam Crest and Above Water Beach (if application	h/o)			
<b>2.0</b> 2.1	Evidence of Shoulder Erosion	l e	Х		
	Evidence of Cracking		X		
2.3	Other Deformation/Settlement/Sinkholes	Х			Sinkholes at left abutment and along adit dump toe road up to 0.6 m dia.
	Concerns with Low Areas on the Crest		Х		Officiolog at lost abatificiti and along date damp too road up to 0.0 m did.
	Concerning Vegetation Growth		X		
	Other Unusual Conditions	Х	,,		Animal tracks on tailings beach
<u> </u>			<u> </u>	<u> </u>	
3.0	Downstream Dam Slope				
	Evidence of Erosion		Χ		
3.2	Evidence of Sloughing/Sliding		Χ		
	Evidence of Cracking		Χ		
3.4	Any Other Deformation		Χ		
3.5	Signs of Phreatic Surface/Seepage		Χ		
3.6	Seepages Observed		Χ		
3.7	Is Seepage (if any) Turbid		Χ		
	Non-Uniform Slope		Χ		
	Excessive Vegetation		Χ		
	Vegetation Kills		Χ		
	Other Unusual Conditions		Χ		
	Dam Buttresses (if applicable)		1	1	
	Evidence of Erosion			Х	
	Evidence of Sloughing/Sliding			Χ	
	Evidence of Cracking			Х	
	Any Other Deformation			X	
	Signs of Phreatic Surface/Seepage			Х	
	Seepages Observed			X	
	Is Seepage (if any) Turbid			X	
	Non-Uniform Slope			X	
	Excessive Vegetation			X	
	Vegetation Kills			X	
	Other Unusual Conditions			^	
	Dam Abutments Seepages Observed		Х	I	
	Is Seepage (if any) Turbid		X		
	Evidence of Erosion		X		
	Evidence of Cracks		X		
	Other Deformation/Settlement		X		
	Evidence of Repairs		X		
	Concerns with Low areas at the		X		
	Other Unusual Conditions		X		
	Downstream Toe	<u> </u>		I	
	Seepages Observed		Х		Pond visible below dump, did not inspect closely
	Is Seepage (if any) Turbid		X		i ona visible below damp, ald not inspect closely
	Evidence of Soft Toe Condition		X		
	Evidence of Soils		X		
	Evidence of Contamination		X		
0.0		<u> </u>	^	<u> </u>	

Dam Site:

Structure:

Teck Coal Limited - Elkview Operations West Fork Tailing Facility Michael Cyr, P.Eng. / Andy Small, P.Eng. Inspection Carried Out By:

Date of Inspection: 17 June 2018

Walk Over Inspection Conducted: Yes

Weather Conditions: Sunny, clear, ~26°C



D Observed Features	Yes	No	N/A	Comments	
6 Excessive Vegetation		Χ			
7 Concern with Outlet of Drains		Χ			
.8 Other Unusual Conditions		Χ			
.0 Spillway/Flow Control Structures					
.1 Evidence of Erosion or Obstructions.			Х		
.2 Unusual Intensity of Flow in Spillway			Х		
Concern with Inlet Channel/Debris Boom Operation	1		Х		
.4 Unusual Accumulation of Debris/Logs			Х		
.5 Concerns with Spillway Weir/Flow Controls			X		
.6 Evidence of Damage to Channel Armouring			X		
7.7 Evidence of Sloughing/Sliding/Sedimentation			X		
.8 Other Deformation/Settlement			X		
.9 Excessive Vegetation			X		
10 Concern with Road Crossing			X		
11 Concern with Stilling Basin and Outlet Structure			X		
12 Evidence of Repairs			X		
13 Other Unusual Conditions	:I-I-\		Λ		
.0 Diversion Ditches/Drainage Swales (if appl	icabie)	1	1 [		
.1 Evidence of Erosion or Obstructions.			X		
.2 Unusual Intensity of Flow in Channel			X		
3.3 Evidence of Damage to Channel Armouring			X		
.4 Evidence of Sloughing/Sliding/Sedimentation			X		
.5 Other Deformation/Settlement			X		
.6 Excessive Vegetation			X		
7.7 Evidence of Repairs			X		
.8 Other Unusual Conditions			,,		
.0 Comments			, ,		
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Dam Site: Teck Coal Limited - Elkview Operations

Structure:

Lagoon A
Michael Cyr, P.Eng. / Andy Small, P.Eng. Inspection Carried Out By:

Date of Inspection: 17 June 2018

Walk Over Inspection Conducted: Yes

Weather Conditions: Sunny, clear, ~19°C



ID	Observed Features	Yes	No	N/A	Comments
1.0	Upstream Dam Slope			_	
1.1	Concern with Current or Previous Water Level		Χ		
1.2	Evidence of Wave or Other Erosion		Χ		
1.3	Deterioration of Erosion Protection		Χ		
1.4	Unusual Accumulation of Debris/Logs		Χ		
1.5	Evidence of Sloughing/Sliding		Χ		
	Evidence of Cracks		Χ		
1.7	Any Other Deformation		Χ		
1.8	Excessive Vegetation		Χ		
1.9	Other Unusual Conditions		Χ		
2.0	Dam Crest and Above Water Beach (if application	ble)			
2.1	Evidence of Shoulder Erosion		Χ		
2.2	Evidence of Cracking		Χ		
2.3	Other Deformation/Settlement/Sinkholes		Χ		
2.4	Concerns with Low Areas on the Crest		Χ		
	Concerning Vegetation Growth		Χ		
	Other Unusual Conditions		Χ		
	Downstream Dam Slope				
3.1	Evidence of Erosion		Χ		
	Evidence of Sloughing/Sliding		Χ		
3.3	Evidence of Cracking		Χ		
3.4	Any Other Deformation		Χ		
3.5	Signs of Phreatic Surface/Seepage		Χ		
3.6	Seepages Observed		Χ		
3.7	Is Seepage (if any) Turbid		Χ		
3.8	Non-Uniform Slope		Χ		
3.9	Excessive Vegetation		Χ		
	Vegetation Kills		Χ		
3.11	Other Unusual Conditions		Χ		
4.0	Dam Buttresses (if applicable)				
4.1	Evidence of Erosion			Х	
	Evidence of Sloughing/Sliding			Χ	
	Evidence of Cracking			Х	
	Any Other Deformation			Χ	
	Signs of Phreatic Surface/Seepage			Χ	
	Seepages Observed			Χ	
	Is Seepage (if any) Turbid			Χ	
	Non-Uniform Slope		-	Χ	
	Excessive Vegetation			Χ	
	Vegetation Kills			Х	
	Other Unusual Conditions			Χ	
	Dam Abutments				
	Seepages Observed		Х		
	Is Seepage (if any) Turbid		X		
	Evidence of Erosion		Χ		
	Evidence of Cracks		X		
	Other Deformation/Settlement		Χ		
	Evidence of Repairs		X		
	Concerns with Low areas at the		X		
	Other Unusual Conditions		Χ		
	Downstream Toe				
	Seepages Observed		Χ		
	Is Seepage (if any) Turbid		Χ		
	Evidence of Soft Toe Condition		Χ		
	Evidence of Boils		Χ		
6.5	Evidence of Contamination		Χ		

Teck Coal Limited - Elkview Operations Dam Site:

Structure:

Lagoon A
Michael Cyr, P.Eng. / Andy Small, P.Eng. Inspection Carried Out By:
Date of Inspection:

17 June 2018



	Yes	No	N/A	Comments
Excessive Vegetation		Χ		
Concern with Outlet of Drains		Χ		
Other Unusual Conditions		Χ		
Spillway/Flow Control Structures	•			
Spillway/Flow Control Structures Evidence of Erosion or Obstructions.		Χ		
2 Unusual Intensity of Flow in Spillway		Χ		
.3 Concern with Inlet Channel/Debris Boom Oper	ation	Χ		
.4 Unusual Accumulation of Debris/Logs		Χ		
.5 Concerns with Spillway Weir/Flow Controls		Χ		
.6 Evidence of Damage to Channel Armouring		Χ		
.7 Evidence of Sloughing/Sliding/Sedimentation		Χ		
.8 Other Deformation/Settlement		Χ		
.9 Excessive Vegetation		Χ		
10 Concern with Road Crossing			Х	
11 Concern with Stilling Basin and Outlet Structur	е	Χ		
12 Evidence of Repairs		Χ		
13 Other Unusual Conditions		Χ		
.0 Diversion Ditches/Drainage Swales (if a	applicable)			
.1 Evidence of Erosion or Obstructions.			Х	
.2 Unusual Intensity of Flow in Channel			X	
.3 Evidence of Damage to Channel Armouring			X	
.4 Evidence of Sloughing/Sliding/Sedimentation			X	
.5 Other Deformation/Settlement			X	
.6 Excessive Vegetation			X	
.7 Evidence of Repairs			X	
.8 Other Unusual Conditions			X	
.0 Comments				
.1 Other site observations				
One pipe previously observed on the downstre	am north slope	was f	lowina	

Dam Site: Teck Coal Limited - Elkview Operations

Structure: Lagoon B

Inspection Carried Out By: Michael Cyr, P.Eng. / Andy Small, P.Eng.

Date of Inspection: 1 7 June 2018

Walk Over Inspection Conducted: Yes

Weather Conditions: Sunny, clear, ~19°C



ID	Observed Features	Yes	No	N/A	Comments
	Upstream Dam Slope			<u> </u>	
1.1	Concern with Current or Previous Water Level		Х		No water in lagoon
	Evidence of Wave or Other Erosion		X		ito water in lageon
	Deterioration of Erosion Protection		X		
	Unusual Accumulation of Debris/Logs		X		
	Evidence of Sloughing/Sliding		X		
	Evidence of Cracks		X		
	Any Other Deformation		X		
	Excessive Vegetation		X		
	Other Unusual Conditions		X		
	Dam Crest and Above Water Beach (if applical	hle)			
2.1	Evidence of Shoulder Erosion	<i>,</i>	Х		
	Evidence of Cracking		X		
	Other Deformation/Settlement/Sinkholes		X		
	Concerns with Low Areas on the Crest	Χ			Low area at left abutment where flush line debris accumulating
	Concerning Vegetation Growth	- , ,	Х		
	Other Unusual Conditions		X		
	Downstream Dam Slope		^	l .	
	Evidence of Erosion		Х		
	Evidence of Sloughing/Sliding		X		
	Evidence of Cracking		X		
	Any Other Deformation		X		
	Signs of Phreatic Surface/Seepage		X		
	Seepages Observed		X		
	Is Seepage (if any) Turbid		X		
	Non-Uniform Slope		X		
	Excessive Vegetation	Х			Large shrub/small tree to right of "spillway"
	Vegetation Kills		Х		Large Strub/Strial free to right of Spillway
	Other Unusual Conditions	Х			12" steel pipe sticking out of slope, no flow but lush vegetation
	Dam Buttresses (if applicable)	, ,			TE GOOT PIPE GROWING GOLD CODES, THE HOW BULLIOUT TO GOLD ROOT
4.1	Evidence of Erosion			Χ	
4.2	Evidence of Sloughing/Sliding			Χ	
	Evidence of Cracking			Х	
	Any Other Deformation			Х	
	Signs of Phreatic Surface/Seepage			Х	
	Seepages Observed			Х	
	Is Seepage (if any) Turbid			Х	
	Non-Uniform Slope			Х	
4.9	Excessive Vegetation			Х	
	Vegetation Kills			Х	
	Other Unusual Conditions			Х	
	Dam Abutments				
	Seepages Observed		Χ		
5.2	Is Seepage (if any) Turbid		Χ		
	Evidence of Erosion		Χ		
	Evidence of Cracks		Χ		
5.5	Other Deformation/Settlement		Χ		
5.6	Evidence of Repairs		Χ		
	Concerns with Low areas at the		Χ		
5.8	Other Unusual Conditions		Χ		
6.0	Downstream Toe			-	
	Seepages Observed		Х		
	Is Seepage (if any) Turbid		X		
	Evidence of Soft Toe Condition		X		
	Evidence of Boils		X		
	Evidence of Contamination		X		
0.0	=				

Dam Site:

Structure:

Teck Coal Limited - Elkview Operations Lagoon B Michael Cyr, P.Eng. / Andy Small, P.Eng. Inspection Carried Out By:
Date of Inspection:

17 June 2018



	Observed Features	Yes	No	N/A	Comments
	Excessive Vegetation		Χ		
	Concern with Outlet of Drains		Χ		
8.	Other Unusual Conditions	Х			Bent steel pipe sticking up at toe near "spillway"
.0	Spillway/Flow Control Structures			•	
1	Evidence of Erosion or Obstructions.	Х			Gullying into slope
.2	Unusual Intensity of Flow in Spillway			Х	No flow or water at time of inspection
	Concern with Inlet Channel/Debris Boom Operation			Х	
.4	Unusual Accumulation of Debris/Logs			Χ	
.5	Concerns with Spillway Weir/Flow Controls			Χ	
.6	Evidence of Damage to Channel Armouring	Х			Sand bags all broken apart
.7	Evidence of Sloughing/Sliding/Sedimentation			Χ	
'.8	Other Deformation/Settlement			Χ	
	Excessive Vegetation			Х	
10	Concern with Road Crossing			Х	
11	Concern with Stilling Basin and Outlet Structure			Χ	
12	Evidence of Repairs			Х	
.13	Other Unusual Conditions			Χ	
.0	Diversion Ditches/Drainage Swales (if application	ible)			
	Evidence of Erosion or Obstructions.	T		Х	
	Unusual Intensity of Flow in Channel			X	
	Evidence of Damage to Channel Armouring			Х	
	Evidence of Sloughing/Sliding/Sedimentation			X	
	Other Deformation/Settlement			X	
	Excessive Vegetation			X	
	Evidence of Repairs			X	
3.8	Other Unusual Conditions			Х	
	Comments	ı			
	Other site observations				
<i>/</i> . I	Significant amounts of animal tracks on Lagoon.				
	eignmourit amounte of arimial tracke on Eagoon.				

Teck Coal Limited - Elkview Operations Dam Site:

Structure:

Lagoon C Michael Cyr, P.Eng. / Andy Small, P.Eng. Inspection Carried Out By:

Date of Inspection:
Walk Over Inspection Conducted: 17 June 2018

Yes

Weather Conditions: Sunny, clear, ~19°C



ID	Observed Features	Yes	No	N/A	Comments
1.0	Upstream Dam Slope				
	Concern with Current or Previous Water Level		Χ		No water in pond
	Evidence of Wave or Other Erosion		Χ		
	Deterioration of Erosion Protection		Χ		
1.4	Unusual Accumulation of Debris/Logs		Χ		
	Evidence of Sloughing/Sliding		Χ		
	Evidence of Cracks		Χ		
1.7	Any Other Deformation		Χ		
	Excessive Vegetation		Χ		
	Other Unusual Conditions		Χ		
2.0	Dam Crest and Above Water Beach (if applied	cable)			
2.1	Evidence of Shoulder Erosion		Χ		
	Evidence of Cracking		Χ		
	Other Deformation/Settlement/Sinkholes		Χ		
2.4	Concerns with Low Areas on the Crest	Χ			Under decant tower crest is narrow and road is low
	Concerning Vegetation Growth		Χ		
2.6	Other Unusual Conditions	Χ			Ongoing placement of spoils at northeast corner
	Downstream Dam Slope				
	Evidence of Erosion		Χ		
	Evidence of Sloughing/Sliding		Χ		
3.3	Evidence of Cracking		Χ		
3.4	Any Other Deformation		Χ		
3.5	Signs of Phreatic Surface/Seepage		Χ		
3.6	Seepages Observed		Χ		
	Is Seepage (if any) Turbid		Χ		
	Non-Uniform Slope		Χ		
3.9	Excessive Vegetation		Χ		
3.10	Vegetation Kills		Χ		
3.11	Other Unusual Conditions		Χ		
4.0	Dam Buttresses (if applicable)	•			
	Evidence of Erosion			Х	
4.2	Evidence of Sloughing/Sliding			Х	
4.3	Evidence of Cracking			Х	
	Any Other Deformation			Х	
4.5	Signs of Phreatic Surface/Seepage			Х	
4.6	Seepages Observed			Х	
4.7	Is Seepage (if any) Turbid			Х	
4.8	Non-Uniform Slope			Х	
4.9	Excessive Vegetation			Х	
	Vegetation Kills			Х	
4.11	Other Unusual Conditions			Х	
5.0	Dam Abutments			•	
5.1	Seepages Observed			Х	
	Is Seepage (if any) Turbid			Χ	
	Evidence of Erosion			Х	
	Evidence of Cracks			Χ	
	Other Deformation/Settlement			X	
	Evidence of Repairs			X	
	Concerns with Low areas at the			X	
	Other Unusual Conditions			X	
	Downstream Toe				<u></u>
	Seepages Observed		Х		
	Is Seepage (if any) Turbid		X		
	Evidence of Soft Toe Condition		X		
	Evidence of Soit Toe Condition		X		
	Evidence of Contamination		X		
0.0	12 Tradition of Contamination		^	<u> </u>	

Dam Site:

Structure:

Teck Coal Limited - Elkview Operations Lagoon C Michael Cyr, P.Eng. / Andy Small, P.Eng. Inspection Carried Out By:
Date of Inspection:

17 June 2018



	Excessive Vegetation Concern with Outlet of Drains Other Unusual Conditions Spillway/Flow Control Structures Evidence of Erosion or Obstructions. Unusual Intensity of Flow in Spillway	Х	Χ		
) () () ()	Concern with Outlet of Drains Other Unusual Conditions Spillway/Flow Control Structures Evidence of Erosion or Obstructions. Unusual Intensity of Flow in Spillway	X			
, 	Spillway/Flow Control Structures Evidence of Erosion or Obstructions. Unusual Intensity of Flow in Spillway	Χ	Χ		
I () () () ()	Evidence of Erosion or Obstructions.  Jnusual Intensity of Flow in Spillway	/\			River erosion protection discontinuous in size and coverage
	Jnusual Intensity of Flow in Spillway				
() () () ()				Х	
 				Х	
	Concern with Inlet Channel/Debris Boom Operation			Х	
	Jnusual Accumulation of Debris/Logs			Χ	
	Concerns with Spillway Weir/Flow Controls			Х	
0 10 0	Evidence of Damage to Channel Armouring			Χ	
(	Evidence of Sloughing/Sliding/Sedimentation			Х	
0	Other Deformation/Settlement			Χ	
•	Excessive Vegetation			Х	
	Concern with Road Crossing			Х	
	Concern with Stilling Basin and Outlet Structure			Х	
I	Evidence of Repairs			Х	
	Other Unusual Conditions			Х	
	Diversion Ditches/Drainage Swales (if applica	ble)		•	
	Evidence of Erosion or Obstructions.			Х	
	Jnusual Intensity of Flow in Channel			X	
	Evidence of Damage to Channel Armouring			X	
	Evidence of Sloughing/Sliding/Sedimentation			X	
	Other Deformation/Settlement			X	
	Excessive Vegetation			X	
╁	Evidence of Repairs			X	
╁	Other Unusual Conditions			X	
-				^	
_	Comments				
	Other site observations				
F	Significant amount of animal tracks the Lagoon.				
F					
F					
F					
F					
F					

Teck Coal Limited - Elkview Operations Dam Site:

Structure:

Lagoon D
Michael Cyr, P.Eng. / Andy Small, P.Eng. Inspection Carried Out By:

Date of Inspection: 17 June 2018

Walk Over Inspection Conducted: Yes

Weather Conditions: Sunny, clear, ~19°C



ID Observed Features	Yes	No	N/A	Comments
1.0 Upstream Dam Slope				
1.1 Concern with Current or Previous Water Level		Χ		Pond level near inside of cells
1.2 Evidence of Wave or Other Erosion		Χ		
1.3 Deterioration of Erosion Protection		Χ		
1.4 Unusual Accumulation of Debris/Logs		Χ		
1.5 Evidence of Sloughing/Sliding		Χ		
1.6 Evidence of Cracks		Χ		
1.7 Any Other Deformation		Χ		
1.8 Excessive Vegetation		Χ		
1.9 Other Unusual Conditions		Χ		
2.0 Dam Crest and Above Water Beach (if applica	ble)			
2.1 Evidence of Shoulder Erosion		Χ		
2.2 Evidence of Cracking	Χ			Cell 6 previously breached from culvert failure into lagoon
2.3 Other Deformation/Settlement/Sinkholes	Χ			Sinkholes visible ~20 m u/s of crest in west lagoon, some filled in
2.4 Concerns with Low Areas on the Crest		Χ		
2.5 Concerning Vegetation Growth		Χ		
2.6 Other Unusual Conditions		Χ		Ongoing placement of excavated tailings in lifts in west lagoon
3.0 Downstream Dam Slope				
3.1 Evidence of Erosion		Χ		
3.2 Evidence of Sloughing/Sliding		Χ		
3.3 Evidence of Cracking		Χ		
3.4 Any Other Deformation		Χ		
3.5 Signs of Phreatic Surface/Seepage		Χ		
3.6 Seepages Observed		Χ		
3.7 Is Seepage (if any) Turbid		Χ		
3.8 Non-Uniform Slope		Χ		
3.9 Excessive Vegetation		Χ		
3.10 Vegetation Kills		Χ		
3.11 Other Unusual Conditions		Χ		
4.0 Dam Buttresses (if applicable)				
4.1 Evidence of Erosion			Х	
4.2 Evidence of Sloughing/Sliding			Х	
4.3 Evidence of Cracking			Χ	
4.4 Any Other Deformation			Х	
4.5 Signs of Phreatic Surface/Seepage			Х	
4.6 Seepages Observed			Χ	
4.7 Is Seepage (if any) Turbid			Х	
4.8 Non-Uniform Slope			Χ	
4.9 Excessive Vegetation			Χ	
4.10 Vegetation Kills			Χ	
4.11 Other Unusual Conditions			Χ	
5.0 Dam Abutments				
5.1 Seepages Observed			Χ	
5.2 Is Seepage (if any) Turbid			Χ	
5.3 Evidence of Erosion			Χ	
5.4 Evidence of Cracks			Χ	
5.5 Other Deformation/Settlement			Χ	
5.6 Evidence of Repairs			Χ	
5.7 Concerns with Low areas at the			Χ	
5.8 Other Unusual Conditions			Χ	
6.0 Downstream Toe				
6.1 Seepages Observed		Χ		
6.2 Is Seepage (if any) Turbid		X		
6.3 Evidence of Soft Toe Condition		X		
6.4 Evidence of Boils		X		
6.5 Evidence of Contamination		X		
5.5 2 Toolis S. Schallington	<u> </u>	Λ.	<u> </u>	

Teck Coal Limited - Elkview Operations Dam Site:

Structure:

Lagoon D Michael Cyr, P.Eng. / Andy Small, P.Eng. Inspection Carried Out By:
Date of Inspection:

17 June 2018



Observed Features	Yes	No	N/A	Comments
Excessive Vegetation		Х		
Concern with Outlet of Drains		Χ		
8 Other Unusual Conditions	Х			Animal burrows in toe from Otto Pond.
0   Spillway/Flow Control Structures	ı			
1 Evidence of Erosion or Obstructions.			Х	
2 Unusual Intensity of Flow in Spillway			Х	
3 Concern with Inlet Channel/Debris Boom Operation			Х	
4 Unusual Accumulation of Debris/Logs			Х	
5 Concerns with Spillway Weir/Flow Controls			Х	
6 Evidence of Damage to Channel Armouring			Х	
7 Evidence of Sloughing/Sliding/Sedimentation			Х	
8 Other Deformation/Settlement			Χ	
9 Excessive Vegetation			Х	
0 Concern with Road Crossing			Х	
1 Concern with Stilling Basin and Outlet Structure			Х	
2 Evidence of Repairs			X	
3 Other Unusual Conditions			Х	
0 Diversion Ditches/Drainage Swales (if applications)	ahle)			
1 Evidence of Erosion or Obstructions.			Х	
Unusual Intensity of Flow in Channel			X	
3 Evidence of Damage to Channel Armouring			X	
4 Evidence of Sloughing/Sliding/Sedimentation			X	
5 Other Deformation/Settlement			X	
6 Excessive Vegetation			X	
7 Evidence of Repairs				
8 Other Unusual Conditions			X	
			^	
0 Comments				
1 Other site observations				
Significant amount of animal tracks on the lagoon.				