REPORT

2020 Annual Dam Safety Inspection for 2 Pit and 3 Pit Tailings Storage Area

Teck Coal Limited, Fording River Operations

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Executive Summary

This report presents the 2020 annual dam safety inspection (DSI) for the 2 Pit and 3 Pit Tailings Storage Area (2P-3P TSA) at the Teck Coal Limited, Fording River Operations (FRO) mine site, located near Elkford, British Columbia. This report was prepared based on a site visit carried out by Golder Associates Ltd. (Golder) from 19 to 20 August 2020 and discussion with FRO staff. The reporting period for the data review is from 1 September 2019 to 31 August 2020, unless otherwise noted. The inspection report and photographs from the site visit are presented with this report. The DSI report was prepared in accordance with Part 10 of the Health, Safety and Reclamation Code (HSRC) for Mines in British Columbia (EMLI 2021), which sets out the frequency for inspection of tailings storage facilities and associated dams.

Summary of Facility Description

The 2P-3P TSA includes the tailings storage portion and an in-pit pond (Shandley Pit) within the previously mined-out area on the west side of the FRO site. The mined-out area includes 2 Pit, 3 Pit, and Shandley Pit.

Prior to about 1995, mining of the north–south striking coal seams in the 2 Pit and 3 Pit areas was carried out, which resulted in a bedrock highwall on the west side and waste rock spoils around the mined-out pits on the east side. A waste rock spoil access road (3 Pit causeway) was advanced through 3 Pit, separating the area into 3 Pit South (3PS) and 3 Pit North (3PN). Mining of pits higher in elevation than the 2 Pit, 3 Pit, and Shandley Pit areas resulted in some waste rock spoils being placed over the west highwall of these pits.

Tailings from the North Tailings Pond and South Tailings Pond were dredged seasonally then deposited into the 2P-3P TSA over a number of years between 1995 and 2015. Tailings discharged into this area have filled the remaining open space of 2 Pit and 3 Pit, as well as voids in the waste rock both within the pits and to the east of the 2 Pit and 3 Pit areas. The lower portions of the tailings are contained within the pits, while the upper portions of the tailings are contained to the west by the highwall and to the east, south, and north by waste rock. While the majority of the tailings are impounded by the waste rock, a portion of the tailings has migrated conically within the voids of the waste rock and is contained within the waste rock.

Tailings migration through the waste rock voids is known to occur during deposition of dredged tailings, but does not occur once dredging has ceased. Notably, the tailings deposit in 3PN is due to tailings migration from dredging discharge to 3PS. The waste rock spoils and the 3PS Embankment along the east side therefore act as a dam to prevent the uncontrolled flow of tailings slurry from reaching downstream receivers, namely the Fording River and the North Tailings Pond.

No dredged tailings have been deposited in the 2P-3P TSA since 2015, and the water level within the 3PN tailings deposit has drained down to the elevation of the regional groundwater table. FRO does not plan to resume tailings deposition into the 2P-3P TSA. Shandley Pit is the low point of the facility and contains an in-pit pond. The Shandley Pit pond is being dewatered with pumping and when needed is used as a source of makeup water for the plant. Water level in Shandley Pit pond has recently been managed by pumping and discharge through the Liverpool Water Management Facility. The Shandley Pit pond can also be used as a source for dust suppression and mine drilling water.

The 2P-3P TSA has two constructed portions: the 3PS Embankment and the 3PN Embankment.
The 3PS Embankment is a dam constructed using waste rock across a low point in the 3 Pit waste rock spoil.
The 3PN Embankment is an internal filtering berm between the 2P-3P TSA and Shandley Pit.

Summary of Key Hazards

The credible failure mode for the 2P-3P TSA is instability (both static and seismic), and it is considered a low risk as the likelihood of occurrence and the consequence of failure are both considered low.

In the event that FRO re-starts discharge of dredged tailings to the 2P-3P TSA, a potential credible failure mechanism is the migration of tailings through waste rock from 2 Pit or 3 Pit out of the facility. At this time, FRO has no plans to restart discharge of dredged tailings into the 2P-3P TSA.

The hazards and credible failure modes for the TSA are to be reviewed and revised, if necessary, as the tailings from the TSA are mined out as part of Swift Pit mining.

Dam Classification

Based on the HSRC definitions, the 2P-3P TSA is a tailings storage facility.

The 2P-3P TSA consequence class remains at Low, following the consequence classification in Section 3.4 of the HSRC Guidance Document (Ministry of Energy and Mines 2016).

Summary of Significant Changes, Changes to Instrumentation, Stability, and Surface Water Control

There were no significant changes in visual monitoring records, dam stability, or surface water control for 2P and 3PS since the 2019 DSI. The surface of the tailings in 3PN continues to be disturbed as a result of nearby Swift Pit mining (fly rock from blasts impacting tailings surface, plus material dozed from the work area upslope of the TSA); however, the integrity of the TSA and containment of the tailings has not been affected.

FRO is preparing plans to mine out the tailings in 2P, 3PN, 3PS, and Shandley Pit to facilitate the continued advancement of Swift Pit mining, with excavation of waste rock in the 3 Pit causeway planned for early 2021 and excavation of tailings and waste rock from 3PN later in 2021.

To support planning and design for the excavation of tailings from this facility, a site investigation program (Golder 2020c) was conducted in 2019 on the tailings in the 2P-3P TSA. This included the installation of five vibrating wire piezometers which were connected to dataloggers between December 2019 and January 2020.

Bearing capacity of tailings in 2P, 3PS, and 3PN (Golder 2020a) was assessed based on data from cone penetration testing and vane shear testing data collected during the 2019 site investigation program (Golder 2020c). The bearing capacity of tailings in 3PN is being updated with data from 16 cone penetration tests conducted by FRO in October 2020 to support 3PN mining.

Dewatering of the Shandley Pit pond to support excavation of tailings and for Swift Pit mining was carried out in 2020. FRO has established a target pumping rate to dewater the Shandley Pit pond in time for the planned excavation of tailings and mining in this area in 2021.

Materials (tailings and waste rock) handling and compaction trials were conducted by Golder from 20 to 26 August 2020 in the 2P-3P TSA to support the design of the South and North Spoils Co-management facilities.

Review of Operation, Maintenance, and Surveillance Manual

FRO completed an update of the operation, maintenance, and surveillance (OMS) manual for the 2P-3P TSA on 27 May 2020 (FRO 2020a). The OMS manual was reviewed and approved by the Engineer of Record.

Review of Emergency Response and Preparedness Plans

An emergency response plan (ERP) for the tailings facilities at FRO was updated in May 2020 (EP.009.R1; FRO 2020b). The ERP was developed considering guidelines provided by the HSRC (Ministry of Energy and Mines 2016, 2017), the Canadian Dam Association (CDA 2013), the Mining Association of Canada (MAC 2011, 2017), and Teck Resources Limited (Teck 2019). The Engineer of Record reviewed and provided input to the updated ERP, and considered the ERP adequate.

The current emergency preparedness plan for tailings facilities is EP.008.R2 dated 25 May 2020 (FRO 2020c).

The emergency planning documents should continue to be reviewed at least annually, with updates incorporated when required. The ERP should be tested every year. FRO carries out annual testing of the ERP, with the most recent internal tabletop exercise (with a field component) carried out on 26 November 2020.

Dam Safety Review

A dam safety review, as defined in Section 4.6 in the HSRC Guidance Document (Ministry of Energy and Mines 2016), was completed in 2019 by a third-party consultant (SNC-Lavalin 2020). The dam safety review did not identify any issues associated with the 2P-3P TSA.

The next DSR should be carried out in 2024 based on the current regulatory requirements.

Annual Dam Inspection

The 2P and 3PS were observed to be in good condition at the time of the 2020 inspection.

Status of Previous and New Dam Safety Inspection Recommended Actions

Table E-1 summarizes the status of recommended actions from the 2019 annual DSI (Golder 2020b) and new recommended actions from the 2020 annual inspection. For recommended actions carried over from previous years or new recommendations, only those of priority level 1 or 2 are listed in Table E-1. Recommendations of other priorities are presented in the report body.

No discharge of dredged tailings to the 2P-3P TSA has occurred since 6 October 2015, and FRO does not report any plans for future dredging to the 2P-3P TSA. However, if plans change and it is proposed to dredge tailings to the 2P-3P TSA in the future, the conditional recommended actions listed in Table 4.1 in the OMS manual (FRO 2020a) must be completed prior to the start of dredging.

Table E-1: Status of 2019 Recommended Actions and New Actions from 2020 Annual Dam Inspection for 2 Pit and 3 Pit Tailings Storage Area

ID Number	Deficiency or Non-conformance	Applicable Regulation or Guideline	Recommended Action	Priority Level	Recommended Timing for the Action	Status as of March 2021
2020-01	Impact of tailings and waste rock excavation on stability of 3 Pit causeway needs to be assessed	n/a	Conduct geotechnical drilling to determine foundation of the 3 Pit causeway and carry out slope stability analysis of during the various stages of planned excavation of 3PN tailings as part of the Swift Pit mining	2	Q1 2021	In progress

3PN = 3 Pit North

Priority Level	Description
1	A high probability or actual dam safety issue considered immediately dangerous to life, health, or the environment, or a significant risk of regulatory enforcement.
2	If not corrected, could likely result in dam safety issues leading to injury, environmental impact, or significant regulatory enforcement; or, a repetitive deficiency that demonstrates a systematic breakdown of procedures.
3	Single occurrences of deficiencies or non-conformances that alone would not be expected to result in dam safety issues.
4	Best Management Practice – Further improvements are necessary to meet industry best practices or reduce potential risks.

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1.0 INTRODUCTION

1.1 Purpose, Scope of Work, Method

Golder Associates Ltd. (Golder) has completed this annual dam safety inspection (DSI) report for the 2 Pit and 3 Pit Tailings Storage Area (2P-3P TSA) at the Teck Coal Limited, Fording River Operations (FRO) site, located near Elkford, BC. The reporting period for the data review is from 1 September 2019 through 31 August 2020, unless otherwise noted. This revision (Rev) 1 version of this report supersedes the previously issued Rev0 version.

DSI reporting for the 2P-3P TSA was started in 2014 by FRO (2015a) and continued since 2015 by Golder. The 2020 DSI report was prepared based on a site visit carried out by Golder from 19 to 20 August 2020, discussions with FRO staff, and review of data from FRO. This report presents the following and was prepared with consideration of the Teck Resources Limited *Guideline for Tailings and Water Retaining Structures* (Teck 2019):

- a summary of the site conditions and background information for the facility
- a summary of the construction, operating, and/or maintenance activities for the reporting period
- dam consequence classification and review of required documentation
- site photographs and records of dam inspection
- review of potential hazards and failure modes, design basis, and dam performance
- recommended actions

Photographs of 2P-3P TSA from the site inspection are presented in Appendix A, and a summary of the observations for the 3 Pit South embankment is included in the inspection report in Appendix B.

FRO switched coordinate systems on 25 October 2016 from FRO Mine Grid to Universal Transverse Mercator (UTM) with elevations referenced to the Elk Valley Elevation Datum. All coordinates presented in this report are in UTM with elevations referenced to the Elk Valley Elevation Datum unless otherwise noted.

The previous annual DSI for this facility was carried out in September 2019 and is reported in the 2019 DSI report (Golder 2020b).

This revision of the report only includes data provided to Golder up to and including 31 August 2020 unless otherwise stated.

This report is to be read in conjunction with the Study Limitations provided at the end of the report.

1.2 Regulatory Requirements

1.2.1 BC Health, Safety and Reclamation Code

This DSI report was prepared in accordance with Part 10 of the Health, Safety and Reclamation Code (HSRC) for Mines in British Columbia (EMLI 2021), which sets out the frequency for inspection of tailings storage facilities and associated dams. It is understood that this report will be submitted by FRO to the Chief Inspector of Mines.

The guidelines for annual DSI reports provided in the HSRC Guidance Document (Ministry of Energy and Mines 2016, Section 4.2) were followed during the preparation of this report.

1.2.2 Permits and Licences

Specific sections and amendments to the permits concerning 2P-3P TSA are as follows:

- Permit C-3 Amendment to permit approving work system – South Tailings Pond tailings dredging project. Issued by the Ministry of Energy, Mines and Petroleum Resources. 27 April 1995.

2.0 BACKGROUND

2.1 Fording River Operations Tailings Storage

The FRO site is an open pit coal mine located near Elkford, BC, which currently has two tailings pond facilities on site along the Fording River: the North Tailings Pond (NTP) and South Tailings Pond (STP). FRO currently has two permitted destinations for in-pit tailings disposal: the 2P-3P TSA and Turnbull Tailings Storage Facility. These pits, combined with their associated ponds, pumps and pipeline infrastructure, constitute the in-pit tailings disposal systems that are in place at FRO. The Turnbull Tailings Storage Facility is the only active in-pit tailings facility at this time; dredging operations to 2P-3P TSA ceased in October 2015. FRO continues to deposit tailings into the STP, and since 2016 has transferred tailings from the STP to the Turnbull Tailings Storage Facility via dredging operations.

There are currently no plans to return to discharging dredged tailings to the inactive 2P-3P TSA. The three pits and surrounding spoils that form the 2P-3P TSA are part of previous mining developments located on the west side of the Fording River, in an area now known as Swift. FRO's current mine plan for the Swift Pit includes advancing to remove waste rock surrounding the 3 Pit North (3PN) area starting in early 2021, with removal of the tailings and waste rock from the 3PN area later in 2021. The site plan is shown in Figure 1 and the general arrangement of the pits is shown in Figures 2 and 3.

Shandley Pit is located at the north end of the 2P-3P TSA and is hydraulically connected to the 2P-3P TSA. Shandley Pit was used as a makeup water source for the processing plant through pumping to the STP during discharge of tailings into 2P-3P TSA. No dredged tailings had been discharged directly to Shandley Pit.

Water level in Shandley Pit pond has recently been managed through pumping and discharge through the Liverpool Water Management Facility. The Shandley Pit pond can be used as a source for dust suppression and mine drilling water. Additional water management including pumping water to the STP has been implemented to reduce water levels within the facility to facilitate Swift Pit mining.

The 2P-3P TSA is composed of tailings which have been deposited into mined-out pits which are surrounded by waste rock spoils on the east and highwalls and in-pit spoils on the west. Dredged tailings were deposited into either 2 Pit or 3 Pit South (3PS) seasonally over a number of years between 1995 and 2015. During active dredging discharge, the excess dredge tailings slurry water flows south to north from the discharge location and reports to Shandley Pit. In 2005, dredging to 2 Pit was discontinued due to tailings migration from 2 Pit to the Smith Ponds. Dredging discharge continued to 3PS until 2015. The tailings deposit in 3PN is due to tailings migration from dredging discharge to 3PS, as planned.

2.2 Overview of Design, Construction, and Previous Operation

2.2.1 Description of Tailings Facility

The 2P-3P TSA includes the tailings storage portion and an in-pit pond (Shandley Pit) within the previously mined-out area on the west side of the FRO site. The mined-out area includes 2 Pit, 3 Pit, and Shandley Pit.

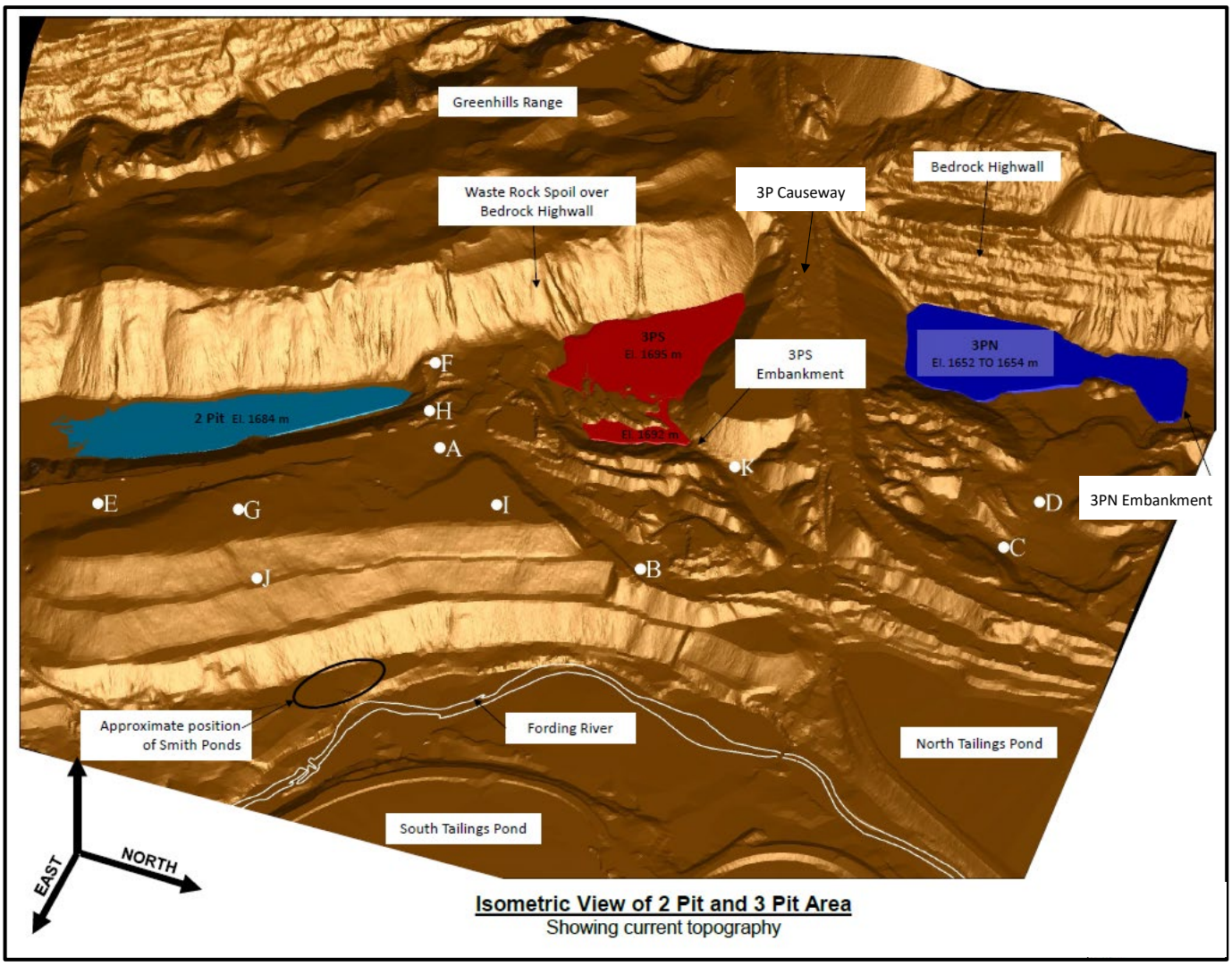
Prior to about 1995, mining of the north–south striking coal seams in the 2 Pit and 3 Pit areas resulted in a bedrock highwall on the west side and waste rock spoils around the mined-out pits on the east side. An access road constructed of waste rock spoil, the 3 Pit causeway, was advanced through 3 Pit and separated the area into 3PS and 3PN. Tailings and water flowed through the voids of the waste rock in the 3 Pit causeway from 3PS to 3PN. Mining of pits higher in elevation above the 2 Pit, 3 Pit, and Shandley Pit areas resulted in some waste rock spoils being placed over the west highwall of these pits.

Tailings discharged into this area have filled the remaining open space of 2 Pit and 3 Pit, as well as voids in the waste rock spoils both within the pits and to the east of the 2 Pit and 3 Pit areas. The lower portions of the tailings are contained within the pits, while the upper portions of the tailings are contained on the west by the highwall and on the east, south, and north by waste rock within the waste rock spoils. While the majority of the tailings are impounded by the waste rock spoils, a portion of the tailings has migrated conically within the voids of the waste rock. Within the waste rock spoils, the portions of the waste rock with void spaces filled by tailings are less hydraulically conductive than the waste rock with open void space.

The 2 Pit and 3 Pit portion of the facility can be described in two parts, based on elevation and confinement of tailings:

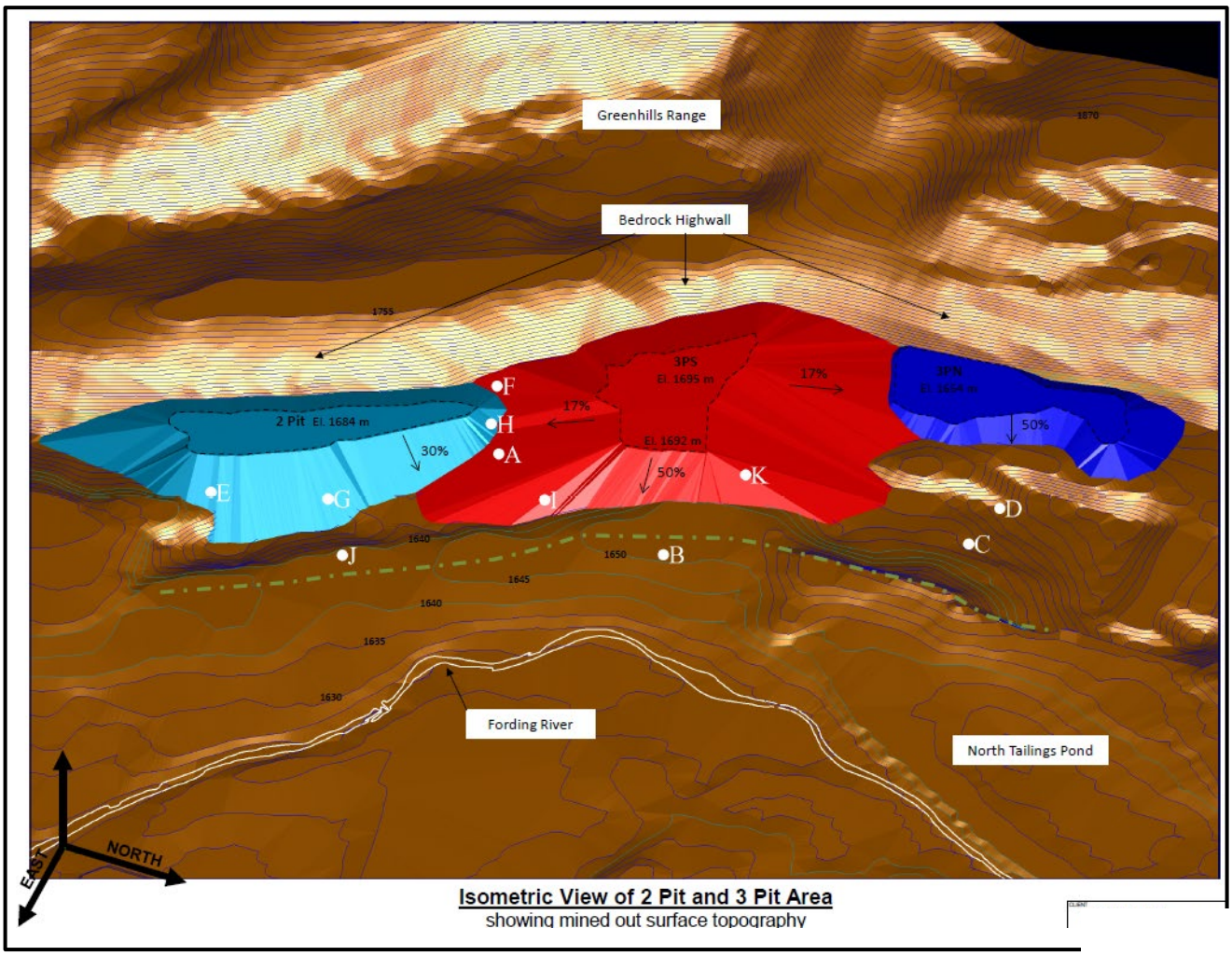
- The lower portion is an in-pit tailings facility. The walls of the mined-out pits act as in situ pillars which contain tailings, waste rock, tailings within the void spaces of the waste rock spoils, water within the tailings void spaces, and ponded water in Shandley Pit. Tailings within the lower portion are assumed to be saturated. The lower portion is located below the low point elevation in the bedrock ridge to the east of the facility (approximate elev. 1,645 m, low point near 2 Pit).
- The upper portion of the facility is composed of stacked tailings (referred to as “dry stack” in the HSRC). Tailings within the upper portion are expected to be unsaturated; however, recent sampling of these materials has indicated zones of tailings with high moisture content. The spread of the stacked tailings to the west is prevented by the highwall of the mined-out pits and limited to the east, north, and south by waste rock spoils, where the spoils along the east side act as dams. During active dredging, tailings can migrate through the waste rock voids, but the spread of the tailings is slowed by the conductivity of the waste rock, resulting in a truncated cone deposit of tailings within the waste rock voids. When active dredging deposition is not occurring, the tailings migration through the voids stops.

Illustrations 1 and 2 show the tailings deposition with and without the waste rock to demonstrate the truncated cone deposition and interaction with the mined-out surface. Note that the tailings elevations shown reflect the understood conditions in 2014, prior to additional dredging to 3PS in 2015.



Note: Dated 2014; elevations are in FRO Mine Grid.

Illustration 1: Isometric View of 2 Pit and 3 Pit Area Showing Tailings (in light blue, red, and blue), Topography (in brown), and Monitoring Wells A to K (not monitored since 2015)



Note: Dated 2014; elevations are in FRO Mine Grid. Approximate bedrock ridge crest is shown in green dashed line. The waste rock dumps shown in Illustration 1 have been removed from this illustration to show the mined-out surface.

Illustration 2*:* **Isometric View of 2 Pit and 3 Pit Showing Tailings (in light blue, red, and blue) and Monitoring Wells A to K (not monitored since 2015) over Mined-out Surface**

2.2.2 Description of Water Flow

During active dredging, subsurface water flow through the 2P-3P TSA is understood to be from south to north but is expected to be controlled and altered by the subterrestrial tailings surfaces within the waste rock.

When active dredging is not occurring, water drains through the tailings deposit down to an elevation controlled by the local groundwater table. Surface water is observed to rapidly infiltrate both the waste rock and tailings surface. Surface water is not observed to collect in either 2 Pit or 3 Pit under non-dredging conditions.

Shandley Pit has the lowest mined-out elevation in the TSA and currently contains an in-pit pond. As part of dewatering for mining of the Swift project, FRO pumps water from the Shandley Pit pond to the Liverpool Water Management Facility and to the STP as makeup water for the plant when needed. Lowering the Shandley Pit pond elevation will have a drawdown effect on the groundwater table in the area.

2.2.2.1 Water Levels from 2012 Site Investigation

A geotechnical site investigation of 2 Pit, 3PS, and 3PN was undertaken in 2012, four years after the previous discharge of dredged tailings in 2008. The phreatic conditions found in the 2012 investigation are summarized in Table 1. In 2 Pit and 3PS, cone penetration tests (CPTs) and drilling did not encounter a phreatic surface in the tailings deposit or underlying waste rock (Golder 2012). At one location in 3PN, a phreatic surface was encountered at about elev. 1,644 m, which was similar to the elevation of the pit pond in Shandley Pit in 2012.

Table 1: Summary of Water Levels Observed in 2012 Cone Penetration Testing Investigation

Location	CPT Number	Top of Tailings Elevation (approximate) (m)	Final Depth (m)	Approximate Tailings Thickness (m)	Assumed Depth to Phreatic Surface (m)	Assumed Phreatic Surface Elevation (m)
2 Pit	CPT12-2P-01	1,683.5	19.3	19.1	dry	<1,664.2
	CPT12-2P-02	1,683.5	21.5	21.5	dry	<1,662.0
	CPT12-2P-03	1,683.5	20.7	20.6	dry	<1,662.8
	CPT12-2P-04	1,683.5	25.75	25.75	dry	<1,657.8
	SCPT12-2P-05	1,683.5	34.25	34.2	dry	<1,649.3
3 Pit South	CPT12-3PS-01	1,694.5	16.6	16.3	dry	<1,677.9
	CPT12-3PS-02	1,694.5	27.1	26.4	dry	<1,667.4
	CPT12-3PS-03	1,694.5	40.35	40.3	dry	<1,654.2
3 Pit North	SCPT12-3PN-01	1,652.5	39.5	39.45	9.2	1,643.3

Note: Elevations are in FRO Elk Valley Elevation Datum, converted from Mine Grid elevations reported in Golder (2012).
CPT = cone penetration test; SCPT = seismic cone penetration test.

2.2.2.2 Water Levels from 2019 Site Investigation

Phreatic surfaces were measured during a site investigation program in 2019 (Golder 2020c). Groundwater levels were recorded following sonic drilling and were inferred from results of CPTs. Five vibrating wire piezometers were installed in the sonic drillholes to monitor the pore pressure within the tailings. The locations of the test holes are shown in Figure 3.

No groundwater was observed in 2 Pit or 3PS based on results from CPTs. Groundwater levels on 31 August 2020 were measured using the vibrating wire piezometers installed in the sonic drillholes during the 2019 site investigation program. Groundwater is present in 3PS and 3PN based on vibrating wire piezometer readings.

The vibrating wire piezometer installed in 2 Pit did not record any data in the reporting period because the datalogger cord was destroyed by wildlife. A summary of the groundwater data from September 2019 through August 2020 is provided in Table 2.

Table 2: Summary of Water Levels Observed from September 2019 Site Investigation and Vibrating Wire Piezometers on 31 August 2020

Location	CPT & Borehole ID	VW Piezometer ID	Groundwater Elevation (m)	
			From Drilling and CPT (September 2019)	Measured in VW Piezometer (31 August 2020)
2 Pit	SCPT19-06 & BH19-06	VW19-06	Not found	No data available as VW piezometer cable was destroyed by wildlife
3 Pit South	SCPT19-05 & BH19-05	VW19-05	Not found	1,678.9
3 Pit North	SCPT19-02 & BH19-02	n/a	1,650.3	n/a
	CPT19-03 & BH19-03	VW19-03	Not found	1,642.3
	CPT19-04 & BH19-04	VW19-04S	1,645.5	1,646.4
		VW19-04D		1,646.2

Notes: Elevations in Elk Valley Elevation Datum.

CPT = cone penetration test; VW = vibrating wire; n/a = not applicable.

2.2.3 Historical Operations

The history of dredging from the STP and NTP to the 2P-3P TSA is summarized in Table 3.

Table 3: History of Dredging to 2 Pit and 3 Pit

Year	Dry Metric Tonnes	From	To	Reference
1995	226,484	STP	2 Pit	FCL 1995
1996	567,241	STP	2 Pit	FCL 1997
1997	725,135	STP	2 Pit	FCL 1998
1998	964,994	STP	2 Pit	FCL 1999
1999	0	n/a	n/a	n/a
2000	691,552	STP	3PS	FCL 2001
2001	893,119	NTP	3PS	FCL 2002
2002	827,068	NTP	2 Pit	FCL 2003
2003	994,748	STP	2 Pit	Muller 2011, pers. comm.
2004	81,630	STP	2 Pit	FCL 2006a
2005	0	n/a	n/a	FCL 2006b
2006	0	n/a	n/a	n/a
2007	930,082	STP	3PS	FCL 2008
2008	934,405	STP	3PS	Muller 2011, pers. comm.
2009	0	n/a	n/a	n/a
2010	0	n/a	n/a	n/a
2011	0	n/a	n/a	n/a

Table 3: History of Dredging to 2 Pit and 3 Pit

Year	Dry Metric Tonnes	From	To	Reference
2012	0	n/a	n/a	n/a
2013	0	n/a	n/a	n/a
2014	542,500	STP	3PS	FRO 2015a
2015	451,302	STP	3PS	FRO 2015b
TOTAL Dry Metric Tonnes	**8,830,260**			

STP = South Tailings Pond; NTP = North Tailings Pond; n/a = not applicable; 3PS = 3 Pit South.

2.2.4 Design and Construction of 2 Pit and 3 Pit Tailings Storage Area Components

2.2.4.1 Pits and Waste Rock Spoils

The development of 2 Pit, 3 Pit, and Shandley Pit is a result of mining the north–south striking coal seams within this area in the 1980s. At the time, the pits were referred to as the Greenhills K seam pit or the Greenhills K-Pit (Golder 1981).

The pits were excavated down into bedrock, which resulted in a bedrock highwall on the west side and a bedrock ridge on the east side separating the mined-out pits from the Fording River. The approximate crest of the bedrock ridge from the mined-out surface is shown in Figure 3. Waste rock spoils are located within and along the east side of the pits and cover some areas of the highwall. The spoils along the east side provide partial containment of the tailings above the bedrock ridge, although tailings migration into the void space of the waste rock occurred. The waste rock spoils were not designed and constructed for the containment of tailings. The footwalls of the pits are located beneath the waste rock spoils and provide containment for a large portion of the subterrestrial tailings within the pit.

The mined-out surface was surveyed and is assumed to represent the approximate bedrock surface. In 2008, FRO provided the mined-out surface in the file “Mout contours GH.dxf,” which is shown in section in Figure 4.

The 3 Pit causeway is constructed of waste rock spoil; water and tailings were known to flow through the structure from 3PS to 3PN. This was acceptable, and consistent with expectations for the facility.

2.2.4.2 3 Pit North Embankment

FRO constructed the 3PN Embankment in 2008 to a height of 2 m at centreline, elev. 1,653.4 m (reported as elev. 1,653.9 m FRO Mine Grid in FRO 2014a), and in 2014 raised by about 4 m at centreline to crest elev. 1,657.2 m (reported as elev. 1,657.7 m FRO Mine Grid in FRO 2014b) based on designs provided by Golder (2008, 2014).

The 3PN Embankment is an internal filtering berm, not an exterior dam. It separates 3PN on its upstream side from Shandley Pit on its downstream side. There is no low permeability requirement for the embankments as water is expected to flow freely through the material. The embankment was constructed using local rockfill with a base that has been wrapped in non-woven geotextile on the upstream face to limit flow-through of solids (tailings) into the Shandley Pit pond. Combined coarse and fine rejects was used to cover the geotextile. The interior divider dike was not intended to prevent all tailings from moving toward the Shandley Pit pond, and some tailings have migrated through and built up on the downstream side of the dike. Dike geometry details are summarized in Table 4 and shown in Figure 5.

Table 4: 3 Pit North Embankment (divider dike) Geometry

Item	Design Value
Upstream slope	1.5H:1V
Crest width	12.0 m
Maximum height	6 m
Crest elevation (minimum) (confirmed with 2020 LiDAR survey data from FRO)	1,657.2 m
Downstream slope	1.5H:1V
Length	~150 m

Note: Elevations reported in Elk Valley Elevation Datum.

2.2.4.3 3 Pit South Embankment

The 3PS Embankment was constructed in 2008 to a height of approximately 4 m (elev. 1,695.7 m) and a length of about 30 m across a low point between two areas of waste rock spoils located on the northeast corner of 3PS. The 2008 construction was completed by FRO personnel (FRO 2014a).

The foundation under the 3PS Embankment consists of waste rock mixed with subterrestrial tailings overlying bedrock (Golder 2017b). Based on the 3PS mined-out surface in Figure 4, the top of bedrock is at elev. 1,610 to 1,625 m in the area of the embankment.

Seepage through the existing waste rock spoils around and below the 3PS Embankment as a result of the discharge of dredged tailings to 3PS was expected to continue to occur due to the expected high hydraulic conductivity of the adjacent waste spoils. Material for the construction of the 3PS Embankment was therefore not required to meet any low permeability requirements (Golder 2008). Potential seepage from the 3PS Embankment is directed to the NTP.

The 3PS Embankment was last raised in 2015 (Golder 2015a,b) to approximately crest elev. 1,697.5 m so that the recommended minimum 0.5 m freeboard would be maintained between the top of the 3PS Embankment and the tailings elevation at the upstream toe of the 3PS Embankment (Golder 2014).

Table 5 summarizes the design geometry for the 3PS Embankment. A section of the 3PS Embankment is shown in Figure 5.

Table 5: 3 Pit South Embankment Geometry

Item	Design Value
Upstream slope	1.5H:1V
Crest width	6.0 m
Maximum height	5.8 m
Crest elevation (minimum) (confirmed with 2020 LiDAR survey data from FRO)	1,697.5 m
Downstream slope	1.5H:1V
Length	~30 m

Note: Elevations reported in Elk Valley Elevation Datum.
FRO = Fording River Operations.

2.2.4.4 Historical Instrumentation

The historical instrumentation in the TSA was focused on tracking groundwater elevations and tailings migration through the waste rock during active discharge of dredged tailings into the 2P-3P TSA. The last monitoring well readings were taken in October 2015. No new monitoring well data have been recorded since as there was no active dredging to the 2P-3P TSA since October 2015.

Ten standpipe monitoring wells, marked A through J, were installed within the waste rock spoils to the east of the 2P-3P TSA between November 2001 and May 2004, and one additional monitoring well (K) was installed in 2014. Most of the monitoring wells extend into the underlying bedrock. Monitoring well locations are shown in Figure 3.

It was observed during the 2019 site inspection that monitoring well K was buried by materials stockpiled by FRO downstream of the 3PS Embankment. This instrument does not require replacement as no dredging is occurring or planned to occur. The remaining 10 monitoring wells should be protected so they will be available if dredging resumes. However, FRO does not report any proposed future dredging to the 2P-3P TSA.

2.2.5 Site Seismicity

The site is located in an area of relatively low seismicity in BC. Golder developed a site-specific seismic hazard model for the FRO site based on historical seismicity and a review of geological and paleoseismological features (Golder 2016). Golder's model includes four area sources from the 5th Generation Seismic Hazard Model and nine faults and fault segments mapped in northwest Montana. The 5th Generation Seismic Hazard Model was developed by Natural Resources Canada for use in the 2015 National Building Code of Canada.

Probabilistic analysis results from site-specific hazard model are listed in Table 6. All site-specific peak ground acceleration values were evaluated for a soil Site Class C as described in the 2010 National Building Code of Canada (NRCC 2010) as this represents Golder's understanding of the general foundation conditions at the dam locations.

Table 6: Fording River Operations Site Seismic Hazard Values

Exceedance Probability	Return Period (years)	Peak Ground Acceleration (g)
40% in 50 years	100	0.020
10% in 50 years	475	0.063
5% in 50 years	1,000	0.097
2% in 50 years	**2,475**	**0.158**
1% in 50 years	5,000	0.222
½% in 50 years	10,000	0.300

Notes:

For firm ground site class "C," very dense soil and soft rock foundation, as defined by 2010 National Building Code of Canada (NRCC 2010).

Return periods are not exact representations of annual exceedance probabilities; rounding per Canadian Dam Association (CDA 2013, 2019) is shown.

FRO site coordinates: 50.202°N, -114.876°W.

HSRC Section 10.1.8 (EMLI 2021) recommends a seismic event with a return period of 1 in 2,475 years as the minimum seismic design criteria.

2.3 Key Personnel

The Engineer of Record (EoR) for the 2P-3P TSA is John Cunning, P.Eng., an employee of Golder. A succession plan for the EoR has been developed between Golder and FRO, where the EoR designate is Julia Steele, another employee of Golder. In an event where neither Ms. Steele nor Mr. Cunning could be reached (e.g., they are travelling to site), Golder has provided FRO with contact details of backup EoRs.

As of 31 August 2020, the tailings engineer at FRO was Robyn Gaebel, P.Eng. The Qualified Professional for the 2P-3P TSA was Adam Langer, P.Eng., Superintendent Engineering, who is an employee of Teck Coal Limited. Ms. Gaebel became the Qualified Professional for the 2P-3P TSA on 1 December 2020. Patrick Lea, P.Eng., is the tailings engineer at FRO.

2.4 Quantifiable Performance Objectives

Quantifiable performance objectives (QPOs) have been established with consideration of the relative risk of the credible failure modes for the facility. For the 2P-3P TSA, QPOs are required when the facility has a High consequence classification (during active dredging) because the QPOs were established to monitor tailings migration and deposition. The QPOs are included in the current operation, maintenance, and surveillance (OMS) manual (FRO 2020a) and would be required to be followed during active dredging.

Monitoring for instability is not considered necessary in the facility's current Low consequence condition. Monthly visual inspections are considered adequate to monitor facility conditions, including the monitoring for any ponded water elevation with respect to the theoretical potential for overtopping. This is based on the drained condition of the tailings surface and on the flood routing and flood capacity assessment presented in Golder (2017a).

3.0 OPERATIONS AND CONSTRUCTION DURING THE 2019/2020 REPORTING PERIOD

Blasting in Swift Pit, west of the TSA, continues to advance closer to the 3PN area. Tailings in 3PN were displaced by waste material sloughing into the pit after blasting in Swift Pit, and this was first noticed by FRO personnel in May 2019 and reported to the EoR. Displacement of tailings due to waste material sloughing continued to be recorded throughout the reporting period. The monthly inspection report by FRO for May 2020 noted that dry tailings in 3PN appeared to be approaching the crest elevation of the 3PN embankment, but the displaced tailings remained contained by the 3PN Embankment. FRO worked with the Swift mining team on efforts to reduce waste migrating into the TSA, and FRO continues to monitor this during monthly inspections by qualified FRO personnel.

A dam safety review (SNC-Lavalin 2020) was conducted for the 2P-3P TSA by a third-party consultant in 2019. The dam safety review did not identify any issues associated with the 2P-3P TSA.

The 2P-3P TSA was inspected once per month during the reporting period by FRO geotechnical personnel. The inspections were completed at the required frequency despite challenges and restrictions as a result of the COVID-19 pandemic. The inspection reports have been reviewed by the EoR.

No dredged tailings were deposited in 2P-3P TSA during the reporting period. There was no required maintenance at 2P-3P TSA over the reporting period.

3.1 2019 Site Investigation

To support planning and design for the excavation of tailings from this facility as part of the Swift project, a site investigation program (Golder 2020c) was conducted in 2019 on the tailings in the 2P-3P TSA, some four years after the previous discharge of dredged tailings into 3PS in 2015. The site investigation program included sonic borehole drilling, seismic CPT, CPT, electronic vane shear testing, vibrating wire piezometer installations, and laboratory testing.

The locations of the test holes are shown in Figure 3.

Based on observations from the site investigation and laboratory testing results on selected samples:

- The stratigraphy encountered was tailings over waste rock mixed with tailings.
- Water content decreased with depth in the boreholes where groundwater was not found. Samples collected in tailings have greater water content than those samples collected within the waste rock mixed with tailings.
- Gradation ranged from sand and clayey silt to silty sand in 2P, clayey silt and sand to sand in 3PS, and clayey silt to silty sand in 3PN.
- Six samples from 3PN and one sample from 3PS indicated Atterberg limits with liquid limit between 34% and 44%, and corresponding plasticity index between 4% and 11%. Two samples from 3PN, one sample from 3PS, and one from 2 Pit indicated non-plastic results in Atterberg limits testing.
- Specific gravity was between 1.4 and 1.6.
- In situ density inferred from Shelby tube samples was as follows:
  - dry density between 477 and 916 kg/m^3 and average of 783 kg/m^3

- bulk density between 600 and 1,263 kg/m³ and average of 1,079 kg/m³
- average void ratio of 1.0
- average degree of saturation of 54%

Five vibrating wire piezometers were installed within tailings as part of the site investigation program. The five piezometers were installed at four locations: VW19-03 (3PN), VW19-04S and VW19-04D (3PN), VW19-05 (3PS), and VW19-06 (2 Pit). The piezometers were connected to dataloggers in December 2019 and January 2020. No data have been received for piezometer VW19-06 in 2 Pit because the connection with the datalogger was destroyed by wildlife. Piezometric data from December 2019 to 31 August 2020 are provided and discussed in Section 5.5.1.

3.2 Bearing Capacity of Tailings

A bearing capacity assessment (Golder 2020a) was conducted for the 2P-3P TSA using results from CPT data and vane shear testing from the 2019 site investigation program (Golder 2020c).

In October 2020, FRO carried out 16 CPTs in 3PN to better understand the tailings thickness and depth to waste rock. Work is underway to update the bearing capacity of tailings in 3PN with the additional CPT data to support 3PN mining.

3.3 2020 Materials Trials

Materials (tailings and waste rock) handling and compaction trials were conducted by Golder from 20 to 26 August 2020 in the 2P-3P TSA to support the design of the South and North Spoils Co-management Facility. The results from the trials will be used to support planning and design for the relocation of tailings from the 2P-3P TSA, as well as spoiling following relocation as part of the Swift project. FRO's mine plan has excavation of tailings and tailing with waste rock starting later in 2021.

4.0 REVIEW OF CLIMATE DATA AND WATER BALANCE

4.1 Climatic Review

Three local climate monitoring stations exist at FRO: waste water treatment plant, A Spoil, and Brownie Spoil. Records were available from the waste water treatment plant and Brownie Spoil weather stations during the reporting period of 1 September 2019 to 31 August 2020. No precipitation data were available for the A Spoil station; data from the A Spoil station was not used for the climate review.

The Fording River Cominco station is the closest regional Environment and Climate Change Canada station to the FRO site; however, the station did not publish precipitation data over the reporting period. Data from the waste water treatment plant station has been used as the main precipitation station for the Fording River Cominco infilling gap process since December 2013. The waste water treatment plant station precipitation data were used over the majority of the reporting period with the exception of 7 July to 9 July 2020 (inclusive), where missing data were infilled with data from the Sparwood CS regional station.

The total precipitation recorded at the waste water treatment plant and Brownie Spoil stations over the reporting period is shown in Table 7, with their monthly total precipitation presented in Chart 1. For comparison purposes, the long-term (1970 to 2019) average monthly precipitation at FRO (from the Fording River Cominco infilled dataset) is also presented in Chart 1. The long-term (1970 to 2019) average annual precipitation at the mine site is estimated to be 634 mm.

Note that data presented in Table 7 and Chart 1 for the waste water treatment plant and Brownie Spoil stations are raw data; no adjustments for station elevation or undercatch were made.

Table 7: Total Precipitation from 1 September 2019 to 31 August 2020

Weather Station	Total Precipitation (mm)
Waste water treatment plant	488
Brownie Spoil	510[(a)]

(a) The majority of data for January to March 2020 were omitted by FRO due to instrument malfunction or variable data.

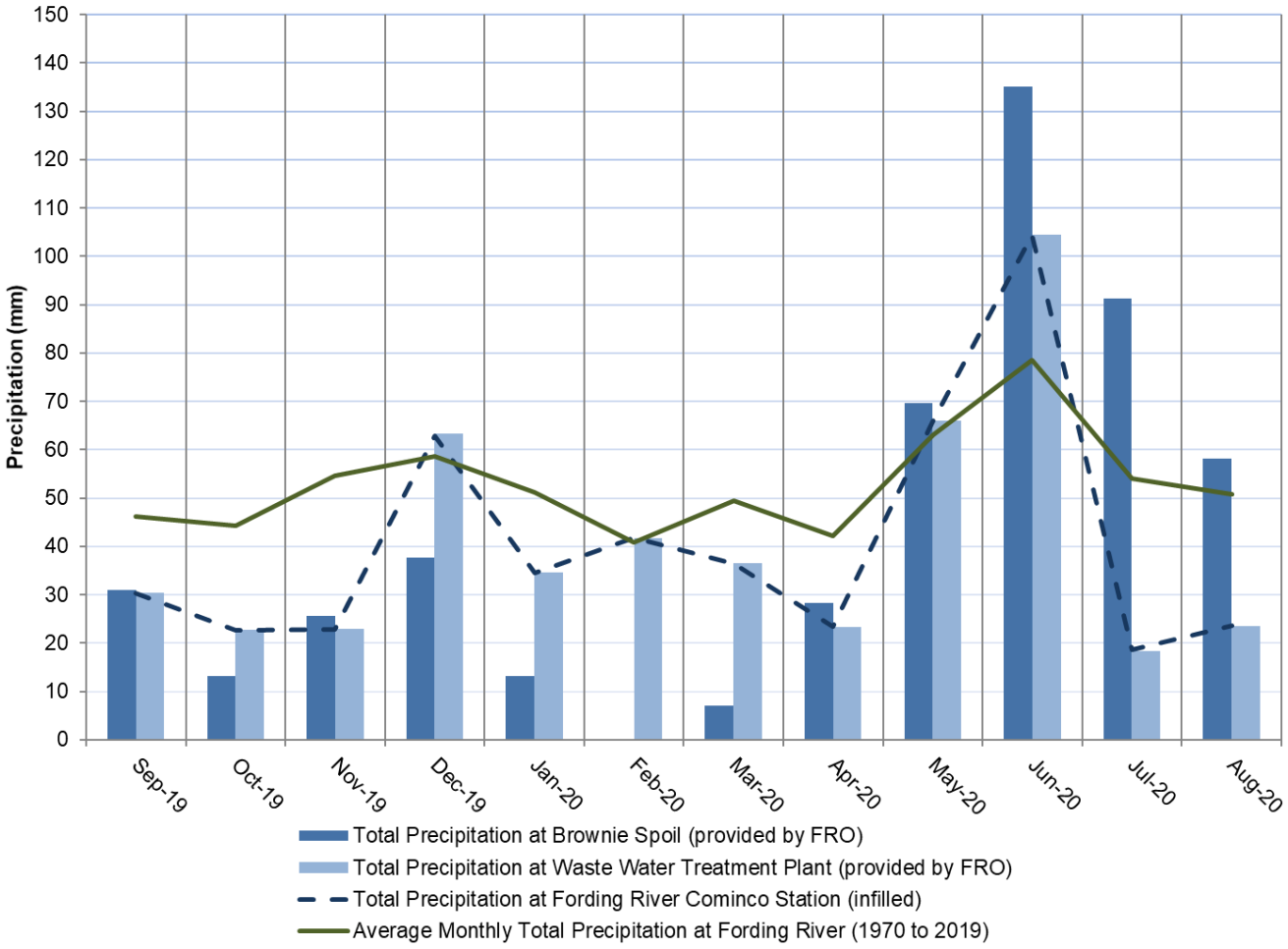


Chart 1: Monthly Precipitation Data from 1 September 2019 to 31 August 2020

The climate data in Table 7 indicate the annual precipitation received at the local FRO weather stations from 1 September 2019 to 31 August 2020 was lower than the long-term annual average of 634 mm. A similar observation can be made from Chart 1, where the total monthly precipitation data recorded at each of the local weather stations were generally at or lower than the long-term average except in:

- December 2019 at the waste water treatment plant station
- May and June 2020 at the waste water treatment plant station
- May through August 2020 at the Brownie Spoil station

Freshet typically starts in April to May at FRO, with higher runoff flow events expected during those months as a result of combined rainfall and snowmelt. During the 2020 freshet, FRO observed a higher peak flow in the Fording River than in 2019. FRO started active flood season monitoring on 15 April 2020 and entered the following stages of flood monitoring:

- Level 1 (Flood Season Monitoring I) for active monitoring and no risk to site, from 15 April to 28 May, and from 11 June to 6 July 2020
- Level 2 (Flood Season Monitoring II) for heightened awareness with elevated water levels and no risk to site, from 29 to 31 May, and from 4 to 10 June 2020
- Level 3 (Active Flood Watch) for non-invasive response activities from 1 to 3 June 2020

4.2 Water Balance

The water balance for the 2P-3P TSA from 1 September 2019 to 31 August 2020 is summarized in Table 8 using climate inputs from the waste water treatment plant station.

Table 8: 2 Pit and 3 Pit Tailings Storage Area Water Balance – 1 September 2019 to 31 August 2020

IN	Annual Volume (m^3)	OUT	Annual Volume (m^3)	Total Inventory Change (m^3)
Surface water runoff and precipitation	620,000	Evaporation and seepage loss	620,000	-
Sum	**620,000**	**Sum**	**620,000**	**0.0**

There was no dredging to the 2P-3P TSA during the reporting period. The water balance model indicated there was no inventory change, and this is consistent with the observed dry surface conditions during all monthly inspections in the reporting period. The reported water balance for the 2P-3P TSA does not raise any concerns and appears to reflect observed conditions.

Golder completed an update to the site-wide water balance at FRO in 2020. The water balance was to support FRO to meet requirements from the Ministry of Energy, Mines and Low Carbon Innovation for a mine water management plan, information requirements from the *Joint Application Information Requirements for Mines Act and Environmental Management Act Permits*, and Teck's own internal water governance and health and safety requirements. The FRO site-wide water balance update was completed with site data collected from 2014 to 2019.

5.0 2 PIT AND 3 PIT TAILINGS STORAGE AREA SAFETY ASSESSMENT

This section presents the facility safety assessment for the 2P-3P TSA based on the observations and data review for each of the failure modes that are most relevant to this facility.

5.1 Site Visit

A site inspection was carried out from 19 to 20 August 2020 by Mr. John Cunning, P.Eng. of Golder. Mr. Cunning was accompanied by Ms. Robyn Gaebel, P.Eng., Mr. Patrick Lea, P.Eng., and Mr. Ross Roseingrave, all from FRO. The temperature during the visit was approximately 25°C and the weather was sunny with some light cloud cover.

Appendix A presents a summary of photographs of the 2P-3P TSA from the site inspection. The location, direction, and number for each photograph are noted in Figure 2.

Items of note from the site visit are:

- FRO has advanced a mine plan for Swift Pit which will start excavation of 3 Pit causeway road and 3PN tailings area, while leaving tailings in the 3PS and 2P south of the 3 Pit causeway road. Once mining of the 3 Pit causeway road has advanced enough to establish a working bench above the 3PN tailings, geotechnical drilling should be carried out to confirm foundation conditions for the causeway fill material and complete a stability assessment of the planned excavation of the causeway fill, which will retain the 3PS tailings (recommended action 2020-01).
- Waste rock material from mining the adjacent Swift Pit continues to be deposited onto the 3PN tailings, resulting in local displacement; however, the integrity of the TSA and containment of the tailings has not been affected.
- A small sinkhole area was observed in the surface of the tailings in 3PN, likely due to local consolidation of the 3PN tailings as a result of blasting in the nearby Swift Pit.

A summary of the observations from the site visit is included in the inspection report in Appendix B.

There was no dredging to the 2P-3P TSA over the reporting period and the facility is currently inactive. No data were collected from the monitoring wells, which are only monitored during dredging, as discussed in Section 2.4.

5.2 Review of Background Information

FRO provided the following information for this DSI:

- records of routine visual inspections by FRO qualified personnel
- pond water levels at Shandley Pit
- FRO site 2020 LiDAR topographic data and orthophoto
- site climate data from 1 September 2019 to 31 August 2020
- vibrating wire piezometer data

5.3 Dam Consequence Classification Review

Guidelines for the classification of dams are presented in the HSRC Guidance Document, Section 3.4 (Ministry of Energy and Mines 2016), which references the Canadian Dam Association (CDA) *Dam Safety Guidelines* (CDA 2013).

The dam classification criteria are presented in Table 9. Consequence categories are based on the incremental losses that a failure of the dam may inflict on downstream or upstream areas, or at the dam location itself. Incremental losses are those over and above losses that might have occurred in the same natural event or condition had the dam not failed. The consequences of a dam failure are ranked as Low, Significant, High, Very High, or Extreme for each of four loss categories. The classification assigned to a dam is the highest rank determined among the four loss categories.

Table 9: Dam Classification

Dam Class	Population at Risk	Incremental Losses		
		Loss of Life	Environmental and Cultural Values	Infrastructure and Economics
Low	None.	0	Minimal short-term loss. No long-term loss.	Low economic losses; area contains limited infrastructure or service.
Significant	Temporary only (e.g., seasonal cottage use, passing through on transportation routes, participating in recreation activities).	The appropriate level of safety required depends on the number of people, the exposure time, the nature of their activities, and other considerations.	No significant loss or deterioration of fish or wildlife habitat, *or* Loss of marginal habitat only. Restoration or compensation in kind highly possible.	Losses to recreational facilities, seasonal workplaces, and infrequently used transportation routes.
High	Permanent– ordinarily located in the dam-breach inundation zone (e.g., as permanent residents).	10 or fewer	Significant loss or deterioration of important fish or wildlife habitat. Restoration or compensation in kind highly possible.	High economic losses affecting infrastructure, public transport, and commercial facilities.
Very High	Permanent– ordinarily located in the dam-breach inundation zone (e.g., as permanent residents).	100 or fewer	Significant loss or deterioration of critical fish or wildlife habitat. Restoration or compensation in kind possible but impractical.	Very high economic losses affecting important infrastructure or services (e.g., highway, industrial facility, storage facilities for dangerous substances).
Extreme	Permanent– ordinarily located in the dam-breach inundation zone (e.g., as permanent residents).	More than 100	Major loss of critical fish or wildlife habitat. Restoration or compensation in kind impossible.	Extreme losses affecting critical infrastructure or services (e.g., hospital, major industrial complex, major storage facilities for dangerous substances).

Source: HSRC Guidance Document (Ministry of Energy and Mines 2016) Table 3-3 based on CDA (2013) Table 2-1.

The HSRC Guidance Document and CDA guidelines were used to assign a consequence classification to the 2P-3P TSA. It is judged that the consequence classification for the 2P-3P TSA will vary with the operational status of the facility, and so two classifications are provided: Low (for inactive status) and High (for active dredging operations).

The applied classification regime is based on the following credible failure scenarios of the 2P-3P TSA:

- Dam breach at the 3PS Embankment was determined to be a credible failure scenario as it contains the point of lowest freeboard and the point of most narrow confinement in the 2P-3P TSA containment (Golder 2008).
- Migration of tailings out of the facility is considered a credible failure scenario while active dredging is occurring, as tailings are known to migrate though the surrounding waste rock spoils during the deposition of the dredged tailings. When no dredging discharge is occurring, no tailings migration has been observed. Currently, tailings migration is not considered a credible failure scenario as there are no plans to restart discharge of dredged tailings to the 2P-3P TSA.

Failure of the 3PN Embankment is not considered a dam breach, as tailings would be contained within Shandley Pit and therefore remain within the site water and tailings management system.

A summary of the dam failure consequence classifications is provided in Table 10, and the rationale for each is described in Sections 5.3.1 and 5.3.2.

Table 10: Dam Failure Consequence Classification for the 2 Pit and 3 Pit Tailings Storage Area

Facility Status	Consequence Classification	Population at Risk	Consequences of Failure		
			Loss of Life	Environment and Cultural Values	Infrastructure and Economics
Before and after active dredging, once tailings are unsaturated to below 3PS Embankment (elev. 1,690.5 m)	Low	None	Low	Low	Low
During active dredging, and while tailings are saturated above base of 3PS Embankment (elev. 1,690.5 m)	High	Temporary only	Significant	High	Low

Notes:

The class assigned to a dam is the highest rank determined among the four attributes (i.e., population at risk, loss of life, environmental and cultural values, and infrastructure and economics).

FRO does not have plan to resume dredging to the 2P-3P TSA.

Elevations reported in Elk Valley Elevation Datum.

3PS = 3 Pit South.

5.3.1 Low Consequence Condition

The facility has a Low consequence classification when active dredging is not occurring and when the tailings adjacent to the 3PS Embankment are confirmed to be unsaturated below the base elevation of the 3PS Embankment (elev. 1,690.5 m).

A geotechnical site investigation was undertaken in 2012, which included 2 Pit, 3PS, and 3PN. The 2012 investigation found the water level in the 2P-3P TSA to be at approximately elev. 1,644 m four years after the last discharge of dredge tailings in 2008. On this basis, it was concluded that the tailings drain when no dredging is being conducted (Golder 2012). Piezometric data for the vibrating wire piezometers installed in 2019 in the 2P-3P TSA follow a similar trend to the water elevation in Shandley Pit (Chart 2 in Section 5.5.1), confirming that tailings drain freely. However, the rate at which the upper tailings reach an unsaturated state is not known. As such, this state would need to be manually confirmed after the completion of any future dredging operations. With tailings confirmed as being in an unsaturated state adjacent to the 3PS Embankment, a failure of the 3PS Embankment would not be expected to release a mobile volume of tailings as the unsaturated tailings would slump and remain largely in place.

- **Population at Risk (None)**—The expected failure extent is very small. No population is at risk.
- **Loss of Life (Low)**—The tailings are unsaturated, they are expected to have low mobility during a potential failure, and no loss of life is expected.
- **Environmental and Cultural (Low)**—The tailings are unsaturated, and the environmental consequences of a breach are expected to be low due to the relatively low mobility of the unsaturated tailings.
- **Infrastructure and Economics (Low)**—Economic losses are anticipated to be low in the event of a failure as there are no major structures in the expected inundation path.

The dam classification is to be reviewed as mining progresses in Swift Pit and to be consistent with the FRO mine plan.

5.3.2 High Consequence Condition

A classification of High will be applied during and immediately after active dredging operations, when the tailings are saturated and a significant volume of water is being discharged to the facility as part of the dredging process. However, FRO does not have plans to resume dredging discharge into the 2P-3P TSA, and the facility classification remains as Low as described in Section 5.3.1. Plans to remove tailings from the 2P-3P TSA are being developed.

Refer to Section 3.6.5 in the OMS manual (FRO 2020a) for conditions of the TSA with High classification. Golder has recommended specific conditions that must be met prior to resumption of discharge of dredged tailings operations to 2P-3P TSA and these are detailed in Table 4.1 in the OMS manual (FRO 2020a).

5.3.3 Current Consequence Classification

No dredging to 2P-3P TSA has occurred since 6 October 2015, and the tailings adjacent to the 3PS Embankment remain unsaturated (confirmed during this year's inspection, Photo A-3 in Appendix A). Thus, the Low consequence conditions for the 2P-3P TSA have been met, and the facility's consequence class remains at a Low classification.

5.4 Review of Facility Documents

5.4.1 Operation, Maintenance, and Surveillance Manual

FRO completed an update of the OMS manual for the 2P-3P TSA on 27 May 2020 (FRO 2020a). The OMS manual was reviewed and approved by the EoR.

5.4.2 Emergency Preparedness and Response Plans

An emergency response plan (ERP) for the tailings facilities at FRO was updated in 2020 (EP.009.R1; FRO 2020b). The ERP was developed considering guidelines provided by the HSRC (Ministry of Energy and Mines 2016, 2017), the CDA (2013), the Mining Association of Canada (MAC 2011, 2017), and Teck Resources Limited (Teck 2019). The EoR reviewed and provided input to the updated ERP, and considered the ERP adequate.

The current emergency preparedness plan for tailings facilities is EP.008.R2 dated 25 May 2020 (FRO 2020c).

The emergency planning documents should continue to be reviewed at least annually, with updates incorporated when required. The ERP should be tested every year. FRO carries out annual testing of the ERP, with the most recent internal tabletop exercise (with a field component) carried out on 26 November 2020.

5.4.3 Dam Safety Review

A dam safety review, as defined in Section 10.5.4 in the HSRC (EMLI 2021), was completed in 2019 by a third-party consultant (SNC-Lavalin 2020). The completed dam safety review was submitted to the Ministry of Energy, Mines and Petroleum Resources on 26 June 2020. The dam safety review did not identify any issues associated with the 2P-3P TSA.

The next DSR should be carried out in 2024 based on the current regulatory requirements.

5.5 Review of Potential Hazards and Failure Modes, Design Basis, and Dam Performance

A summary of the assessment and potential failure modes is presented in Table 11. The credible failure modes are considered low risk as the likelihood of occurrence and/or the consequence of failure are considered to be low.

Table 11: Assessment of Dam Safety Relative to Potential Failure Modes

Potential Failure Mode	Observations/Data	Comments
Internal erosion (suffusion and piping)	The impounding layer that defines the lower (in-pit) portion of the TSA is bedrock	Non-credible failure mode
Tailings migration to Fording River	Migration through waste rock voids occurs during active dredging	Well monitoring for 2015 dredging reported in 2015 DSI, with no concerns. No discharge of dredged tailings to the TSA in 2016 through 2020; therefore, this failure mode is non-credible when there is no dredging.
Overtopping	Within acceptable range	Inflow design flood can be contained within TSA (Golder 2017a). This failure mode is non-credible.
Instability	No evident embankment instability	Stability assessment completed, no stability concerns (Golder 2017b). This failure mode is credible with low likelihood of occurrence and low consequence of failure.

DSI = dam safety inspection; TSA = tailings storage area.

5.5.1 Internal Erosion (suffusion and piping) / Tailings Migration

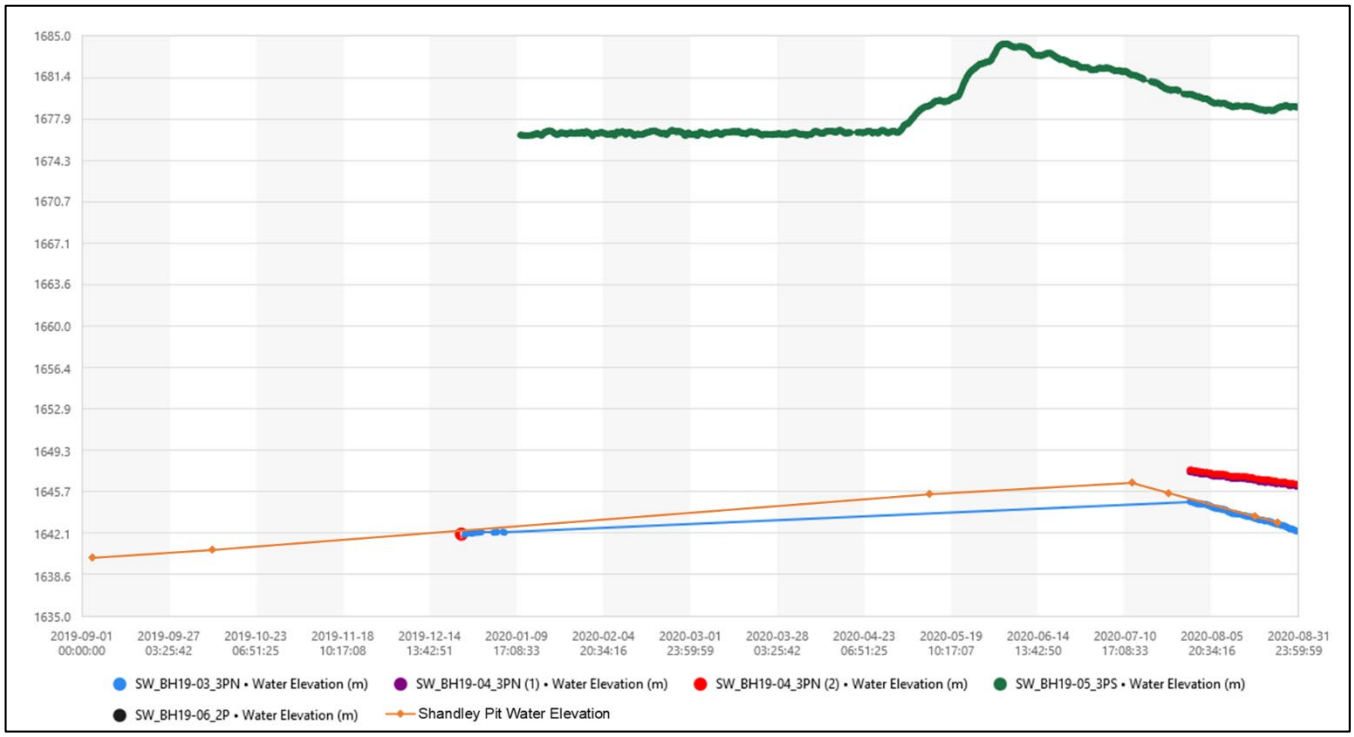
Internal instability of a dam can be caused by materials migrating out of the dam, leaving voids. This generally happens with materials that do not have filter compatibility; that is, the fines fraction of one material can migrate into or through the voids of the adjacent material under a sufficient hydraulic gradient. Piping is induced by regressive erosion of particles toward an outside environment until a continuous pipe is formed. Suffusion is the migration of soil particles through the soil matrix.

Design Basis

The impounding layer that defines the lower (in-pit) portion of the 2P-3P TSA is bedrock, and failure by internal erosion or tailings migration is not a credible failure mode.

The upper (stacked tailings) portion of the 2P-3P TSA was not intended to contain surface water or achieve filter compatibility. Data collected during the 2019 investigation (Golder 2020c) indicated drained conditions (no local groundwater table) in 2P and 3PS. Piezometric data from the vibrating wire piezometer installed during the 2019 investigation in 3PS have indicated a local groundwater table based on readings starting in May 2020. This may be a result of surface runoff and groundwater from the area. FRO should continue to monitor data collected from VW19-05 (shown as SW_BH19-05_3PS) in 3PS.

In 3PN, pore water pressure in the tailings was observed to fluctuate in response to water level in Shandley Pit. Piezometric data for the reporting period are shown in Chart 2, along with the Shandley Pit water elevation for comparison.



Notes: Elevations reported in Elk Valley Elevation Datum.

Chart 2: 3PN and 3PS Vibrating Wire Piezometer Groundwater Elevations and Shandley Pit Water Elevation from 1 September 2019 to 31 August 2020

Migration of tailings into the waste rock is known to occur during active dredging. This is not a stability concern as the tailings fill the voids in the waste rock and increase grain-to-grain contact in the material. During dredging, migration of tailings to unintended receptors is a failure mode due to the environmental impact.

Tailings migration during dredging was monitored in wells A through K. The wells were used to monitor groundwater elevations and, in some wells, the rise of tailings solids in waste spoils during dredging discharge. Critical tailings elevations are included in the current 2P-3P OMS manual (FRO 2020a) per the recommendations by Golder (2008, 2014).

Observed Performance

In 2004 while tailings were being deposited to 2 Pit, tailings began reporting to the Smith Ponds, which are located above the Fording River (FCL 2006a). In response, dredging to 2 Pit was suspended indefinitely.

Migration of tailings to unintended receptors while not actively discharging dredged tailings to the TSA is not a concern; therefore, well monitoring was not required in 2020. Comparison of well monitoring against quantifiable performance objectives was not required for 2020. Well monitoring last occurred in October 2015 during dredging to the 2P-3P TSA.

Surface water reporting to the 2P-3P TSA is observed to rapidly infiltrate both the waste rock and tailings surface, and the migration of tailings as a result of runoff or significant flood event is considered a low risk.

No zones of subsidence or sinkholes were observed that would indicate voids due to either suffusion or piping.

5.5.2 Overtopping

Design Basis

A technical memorandum evaluating disposal of tailings into 3PS (Golder 2014) recommended that 0.5 m of freeboard for the tailings elevation be maintained at the 3PS Embankment to allow for potential settlement of the embankment. This was used during active dredging operations.

An assessment of flood routing and flood storage capacity for the 2P-3P TSA has been completed (Golder 2017a). This assessment meets the HSRC design criteria for Low to High consequence tailings facilities of 72-hour duration inflow design flood equal to 1/3 between the 1-in-1,000-year event and the probable maximum flood event. The assessment concluded:

- For 2 Pit, the net inflow volume is fully contained within the pit, with an expectation of seepage into the surrounding waste rock and toward Shandley Pit.
- For 3PS, the net inflow volume is fully contained within the pit, with an expectation of seepage into the surrounding waste rock including transmission of seepage through the 3 Pit causeway into 3PN.
- For 3PN, the net inflow volume exceeds the capacity of 3PN. However, the overflow from 3PN will flow into Shandley Pit, which has the capacity to contain the overflow.
- For Shandley Pit, the net inflow volume (including the 3PN overflow) is fully contained within the pit.

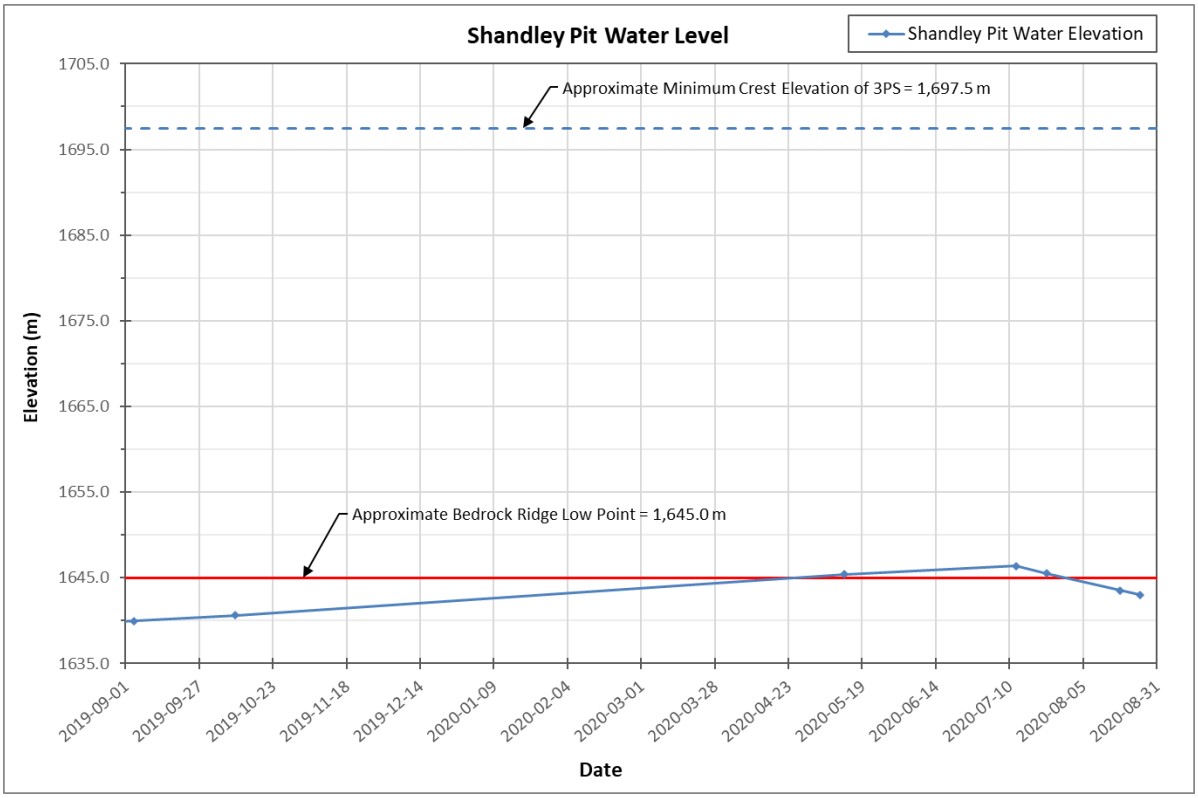
Per the assessment, the High consequence inflow design flood can be contained within the 2P-3P TSA. Therefore, overtopping is not a credible failure mode.

Observed Performance

The 2P-3P TSA is not intended to store water because it is expected that water will migrate through the subsurface north to Shandley Pit or east toward the Fording River. The 3PN water level was at approximately elev. 1,643 m within the tailings on 26 August 2020 as measured in a vibrating wire piezometer installed during the 2019 geotechnical investigation (Chart 2), generally consistent with the Shandley Pit water level.

Monthly visual inspections of the 2P-3P TSA confirmed a dry tailings surface at 2 Pit, 3PS, and 3PN and the minimum 0.5 m of freeboard at the 3PS Embankment was maintained. These visual inspections are considered adequate to monitor for overtopping, based on the typical drained condition of the tailings surface and on the flood routing and flood capacity assessment (Golder 2017a). More frequent monitoring and quantitative measurements of water would be necessary if ponding is noted on the tailings surface.

As discussed in Section 2.1, 2 Pit, 3 Pit, and Shandley Pit are hydraulically connected. Water is observed to generally migrate north to Shandley Pit. The water level in Shandley Pit was low in August 2019, where it was at elev. 1,639.8 m on 24 August 2019. The water level then rose to elev. 1,646.4 m in July 2020, after which it lowered to elev. 1,643.0 m by 26 August 2020. As no dredging has been occurring in the last few years, the water levels in Shandley Pit are dictated by the local groundwater table, and are managed by pumping. Dewatering of Shandley Pit to facilitate mining and dewatering of 3PS tailings in advance of excavation began in July 2020. Shandley Pit water levels from 1 September 2019 to 31 August 2020 are shown in Chart 3.



Note: Pond elevations reported in Elk Valley Elevation Datum.

Chart 3: Shandley Pit Water Elevation from 1 September 2019 to 31 August 2020

5.5.3 Instability

Design Basis

Instability of the 3PS Embankment and through the 2P-3P TSA and surrounding waste rock spoils is a credible failure mode. The HSRC Guidance Document (Ministry of Energy and Mines 2016) recommends a minimum factor of safety of 1.5 under normal (static) operating conditions, and the CDA (2013) recommends a minimum factor of safety of 1.0 under seismic conditions. The HSRC Guidance Document recommends a 2,475-year return period seismic event be used for Low to High consequence structures.

A stability assessment of the 2P-3P TSA to confirm the facility met the design criteria was completed by Golder (2017b) in accordance with the CDA (2013) guidelines, related technical bulletins (CDA 2007, 2019), and the HSRC Guidance Document (Ministry of Energy and Mines 2016). For Low to High consequence structures, the 2,475-year earthquake event was selected (2% probability of exceedance in 50 years) for long-term stability analyses under pseudo-static loading conditions as recommended by the HSRC Guidance Document. A peak ground acceleration of 0.158 g was used in the pseudo-static analyses based on the site-specific seismic hazard assessment completed by Golder (2016).

The stability assessment found that the facilities are stable under static and pseudo-static conditions, and no analyses were required for post-earthquake conditions (Golder 2017b). The results of the stability assessment indicated this failure mode has low likelihood of occurrence and low consequence of failure.

Instability of the 3 Pit causeway during and after excavation of the tailings in 3PN need to be assessed prior to excavation of 3PN tailings later in 2021 (recommended action 2020-01).

Observed Performance

No evidence of embankment instability, such as excessive erosion, cracking, or deformation, was observed during the inspection.

During the 20 August 2020 inspection, dry tailings were noted (Photo A-3 in Appendix A) in the 3PS observation pit, which was dug in 2016. The 3PS water elevation was noted as having no water or dry on the FRO monthly inspection sheets throughout the reporting period. The 2P-3P TSA monthly inspection sheet should be updated to include a record of observation of water conditions in this observation pit to be consistent with Section 4.2 of the OMS manual (FRO 2020a).

5.6 Review of Previous Deficiencies and Non-conformances

The deficiencies and non-conformances that were noted in the 2019 DSI (Golder 2020b) are outlined in Table 12.

Table 12: Status of 2019 Recommended Actions for 2 Pit and 3 Pit Tailings Storage Area

ID Number	Deficiency or Non-conformance	Recommended Action	Status as of January 2021
2016-01	No dam safety review	Complete dam safety review for 2P-3P TSA.	**Complete** – dam safety review report (SNC-Lavalin 2020) submitted to EMPR on 26 June 2020
2019-01	Portions of the OMS manual require update	Complete OMS manual update	**Complete**
2019-02	No inundation or dam breach completed	Complete inundation study prior to additional dredging	**Not currently required** – no dredging is planned

OMS = operation, maintenance, and surveillance; 2P-3P TSA = 2 Pit and 3 Pit Tailings Storage Area; EMPR = Ministry of Energy, Mines and Petroleum Resources.

6.0 SUMMARY AND RECOMMENDATIONS

6.1 Summary of Activities

No maintenance or construction was required at the facility. The 2P-3P TSA was inspected once per month by qualified FRO personnel.

A few notable activities were observed during the reporting period:

- A site investigation program (Golder 2020c) was conducted in 2019 on the tailings in the 2P-3P TSA. This included the installation of five vibrating wire piezometers which were connected to dataloggers between December 2019 and January 2020. All piezometers except for VW19-06 are active and reporting data in real time as of 31 August 2020. No data have been received for piezometer VW19-06 in 2 Pit because the datalogger wire was destroyed by wildlife.
- Bearing capacity (Golder 2020a) of tailings in the TSA were determined using data from the 2019 site investigation (Golder 2020c).
- Materials handling and compaction trials were completed by Golder from 20 to 26 August 2020 to support design of the South and North Spoils Co-management facilities.
- FRO carried out 16 CPTs in 3PN to better understand the tailings thickness and depth to waste rock in October 2020.
- Dewatering of the Shandley Pit to support excavation of tailings and for Swift Pit mining was carried out in 2020. FRO has established a target pumping rate to dewater Shandley Pit pond in time for the planned excavation of tailings and mining in this area in 2021.

6.2 Summary of Climate and Water Balance

The climate data during the reporting period indicate the annual precipitation received at the local FRO weather stations was lower than the long-term annual average.

6.3 Summary of Performance and Changes

No significant changes in condition were noted in 2P and 3PS based on visual monitoring records, dam stability, and surface water control. FRO is preparing plans to mine out the tailings and waste rock in the TSA as part of the Swift project in Q1 2021.

6.4 Consequence Classification

The 2P-3P TSA consequence class remains at Low, following the consequence classification in Section 3.4 of the HSRC Guidance Document (Ministry of Energy and Mines 2016).

6.5 Current Deficiencies and Non-conformances

The 2020 DSI recommended actions for the 2P-3P TSA, including the action carried forward from 2019, are summarized in Table 13.

Table 13: 2020 Dam Safety Inspection Recommended Actions for 2 Pit and 3 Pit Tailings Storage Area

ID Number	Deficiency or Non-conformance	Applicable Regulation or Guideline	Recommended Action	Priority Level	Recommended Timing for the Action
2019-02	No inundation or dam breach completed	HSRC §10.1.7 and 10.1.11 HSRC Guidance Document §3.3	Complete inundation study prior to additional dredging	3	Prior to start of additional dredging
2020-01	Impact of tailings and waste rock excavation on stability of 3 Pit causeway needs to be assessed	n/a	Conduct geotechnical drilling to determine foundation of the 3 Pit causeway and carry out slope stability analysis of during the various stages of planned excavation of 3PN tailings as part of the Swift Pit mining	2	Q1 2021

HSRC = Health, Safety and Reclamation Code; 3PN = 3 Pit North; n/a = not applicable

Priority Level	Description
1	A high probability or actual dam safety issue considered immediately dangerous to life, health, or the environment, or a significant risk of regulatory enforcement.
2	If not corrected, could likely result in dam safety issues leading to injury, environmental impact, or significant regulatory enforcement; or, a repetitive deficiency that demonstrates a systematic breakdown of procedures.
3	Single occurrences of deficiencies or non-conformances that alone would not be expected to result in dam safety issues.
4	Best Management Practice – Further improvements are necessary to meet industry best practices or reduce potential risks.

Source: HSRC Guidance Document, Section 4.2 (Ministry of Energy and Mines 2016).

No discharge of dredged tailings to the 2P-3P TSA has occurred since 6 October 2015, and FRO does not report any plans for future dredging to the 2P-3P TSA. However, if plans change and it is proposed to dredge tailings to the 2P-3P TSA in the future, the conditional recommended actions listed in Table 4.1 in the OMS manual (FRO 2020a) must be completed prior to the start of dredging.

7.0 CLOSURE

The reader is referred to the Study Limitations section, which follows the text and forms an integral part of this report.

We trust that this report meets your present requirements. If you have any questions or additional requirements, please contact the undersigned.

Golder Associates Ltd.

PROFESSIONAL ENGINEER
PROVINCE OF BRITISH COLUMBIA
J. C. CUNNING
18 March 2021

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Geotechnical Engineer

John Cunning, M.Sc., P.Eng.
Principal, Senior Geotechnical Engineer

CYL/JCC/NC/HP/hg

https://golderassociates.sharepoint.com/sites/121039/project files/6 deliverables/issued/2020-220-r-rev1-2000-2p-3p tsa dsi report/20136981-2020-220-r-rev1-2000-2p-3p tsa annual inspection fro 18mar_21.docx

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STUDY LIMITATIONS

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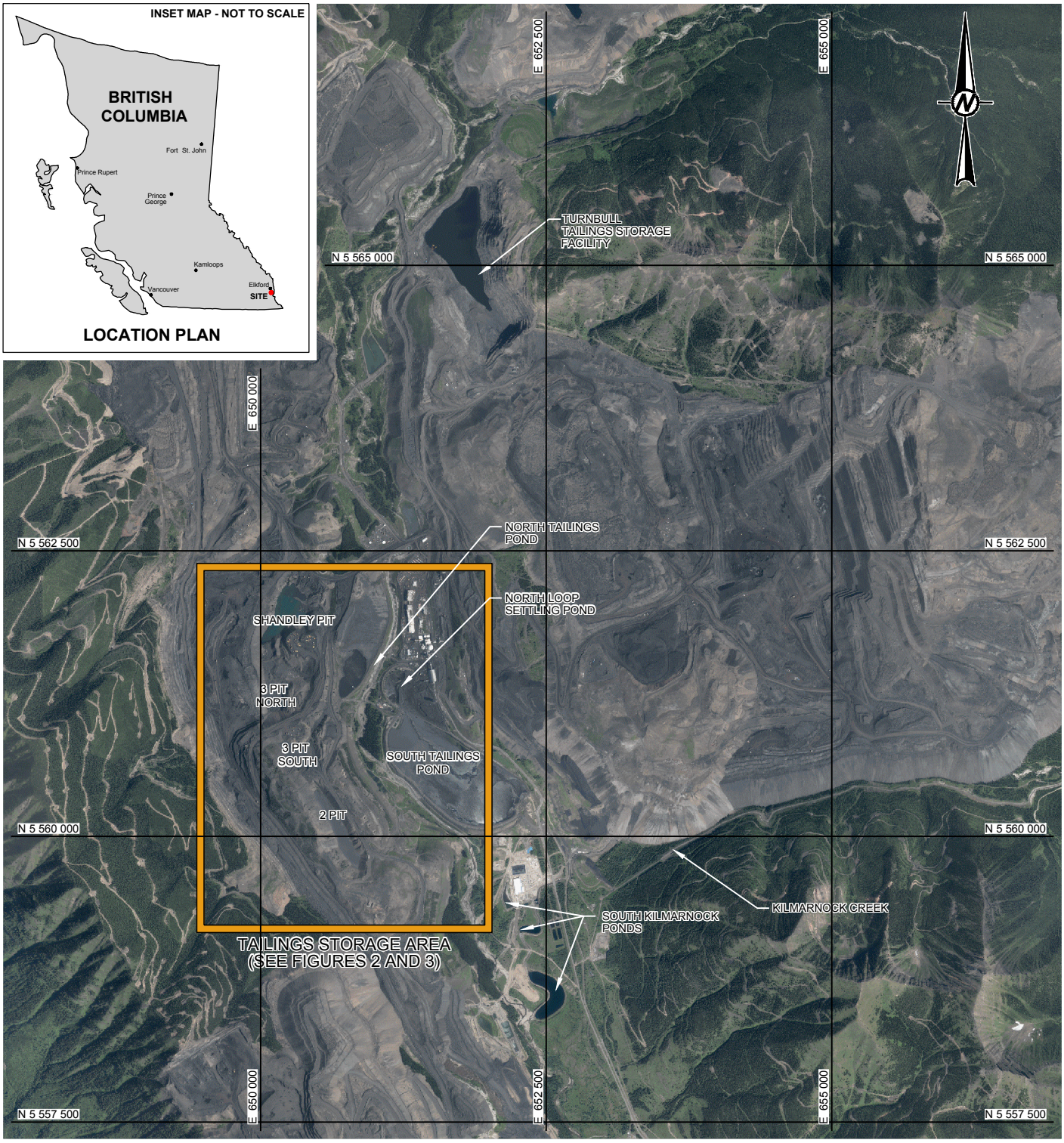
FIGURES



REFERENCE

1. 2020 AERIAL PHOTO AND LIDAR TOPOGRAPHY PROVIDED BY TECK COAL LIMITED, RECEIVED: 01 DECEMBER 2020, DATES FLOWN: 15-26 JULY 2020.

NOTES

1. ALL UNITS ARE SHOWN IN METRES UNLESS NOTED OTHERWISE.
2. COORDINATES ARE IN UTM ZONE 11, ELEVATIONS ARE REFERENCED TO THE ELK VALLEY ELEVATION DATUM.

0 1,000 2,000
1:50,000 METRES

CLIENT
TECK COAL LIMITED
FORDING RIVER OPERATIONS
ELKFORD, B.C.

PROJECT
2 PIT AND 3 PIT TAILINGS STORAGE AREA
2020 ANNUAL DAM SAFETY INSPECTION

CONSULTANT
GOLDER

YYYY-MM-DD	2021-03-03
DESIGNED	A. VAN ENGELEN
PREPARED	A. KIM
REVIEWED	C. LEE
APPROVED	J. CUNNING

TITLE
FORDING RIVER OPERATIONS SITE PLAN

PROJECT NO.	PHASE/TASK/DOC.	REV.	FIGURE
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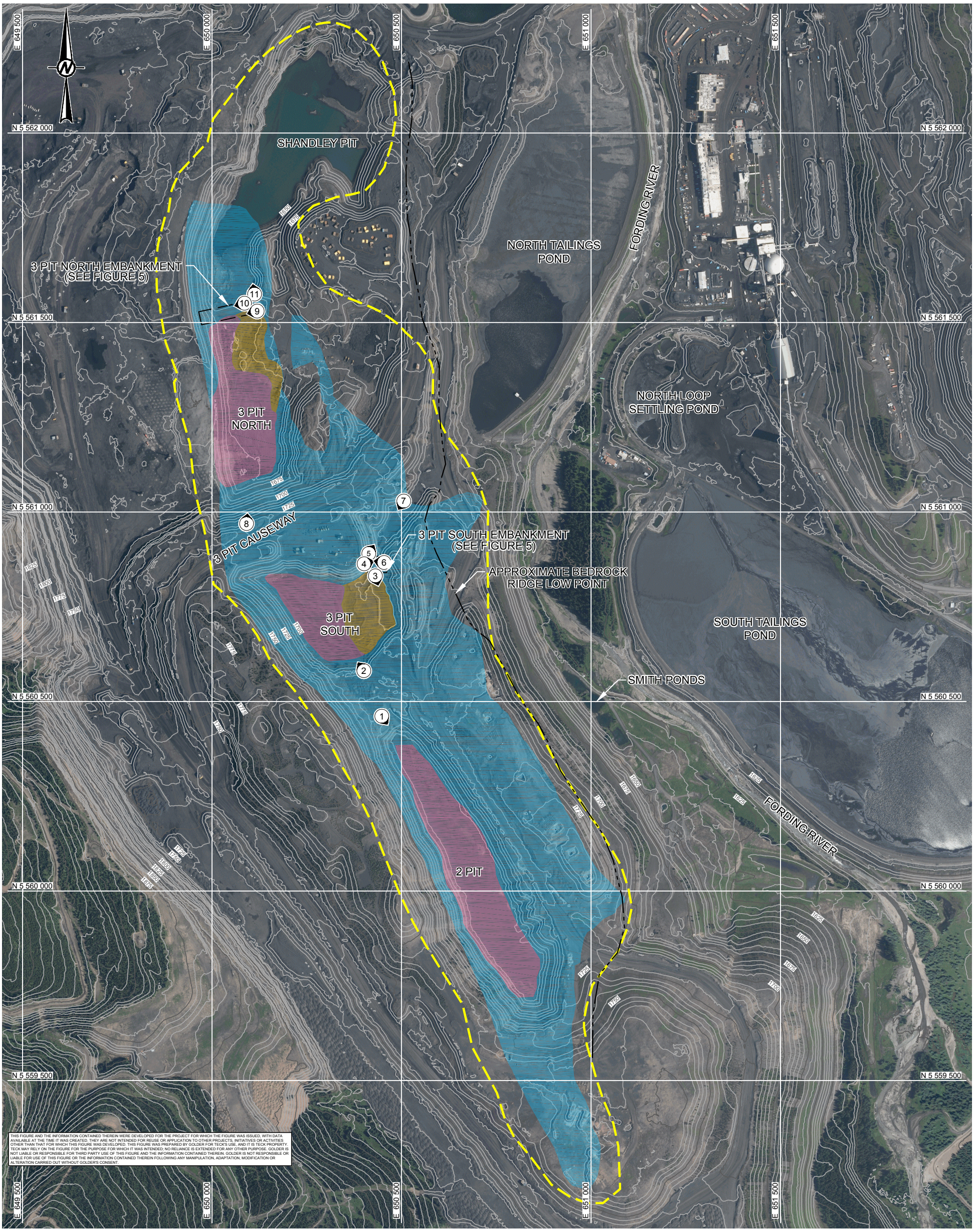

LEGEND

- TOPOGRAPHIC CONTOURS
- APPROXIMATE CREST OF BEDROCK RIDGE FROM MINED OUT SURFACE
- APPROXIMATE TAILINGS STORAGE AREA
- APPROXIMATE BOUNDARY OF IN-PIT COAL TAILINGS AS OF 2011
- APPROXIMATE BOUNDARY OF ADDITIONAL IN-PIT COAL TAILINGS AS OF 2016
- APPROXIMATE BOUNDARY OF THE ESTIMATED EXTEND OF COAL TALINGS MIXED WITH WASTE ROCK AS 2011
- (#) 2020 SITE INSPECTION PHOTOGRAPH LOCATION

NOTES

1. ALL UNITS ARE SHOWN IN METRES UNLESS NOTED OTHERWISE.
2. COORDINATES ARE IN UTM ZONE 11, ELEVATIONS ARE REFERENCED TO THE ELK VALLEY ELEVATION DATUM.
3. TOPOGRAPHIC CONTOURS SHOWN AT 5 m MINOR AND 25 m MAJOR INTERVAL.

REFERENCES

1. 2020 AERIAL PHOTO AND LIDAR TOPOGRAPHY PROVIDED BY TECK COAL LIMITED, RECEIVED: 01 DECEMBER 2020, DATES FLOWN: 15-26 JULY 2020.
2. COAL TAILIINGS (Subaerial Tailings.dxf) AND WASTE ROCK MIXED WITH COAL TAILINGS (Subterrestrial Tailings.dxf) PROVIDED BY TECK COAL LIMITED FORDING RIVER OPERATIONS, DATED: FEBRUARY 2011.

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1:10,000 METRES

CLIENT
TECK COAL LIMITED
FORDING RIVER OPERATIONS
ELKFORD, B.C.

CONSULTANT
GOLDER

YYYY-MM-DD	2021-03-03
DESIGNED	A. VAN ENGELEN
PREPARED	A. KIM
REVIEWED	C. LEE
APPROVED	J. CUNNING

PROJECT
2 PIT AND 3 PIT TAILINGS STORAGE AREA
2020 ANNUAL DAM SAFETY INSPECTION

TITLE
2020 SITE INSPECTION PHOTOGRAPH LOCATION

PROJECT NO.	PHASE/TASK/DOC.	REV.	FIGURE
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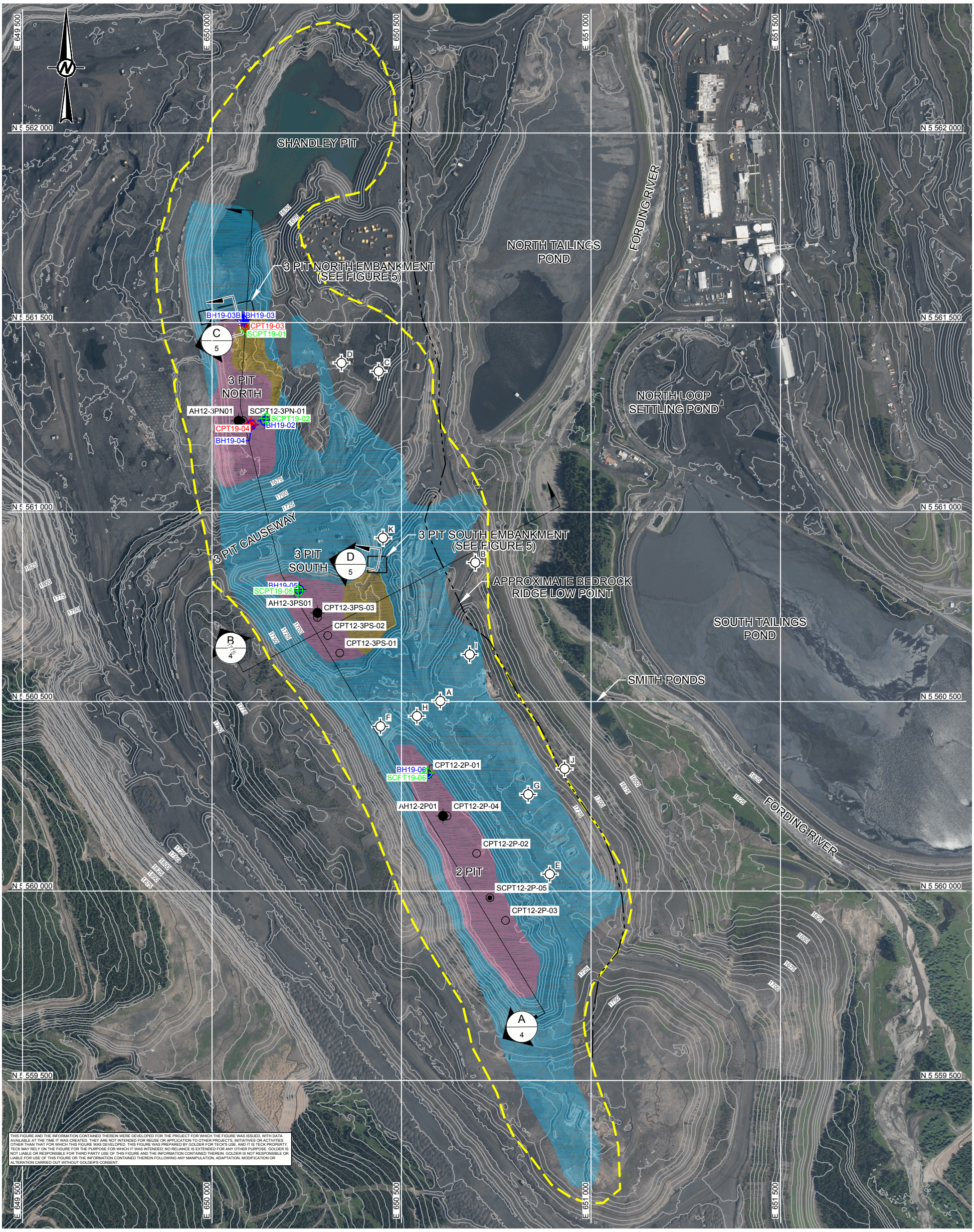

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- APPROXIMATE BOUNDARY OF ADDITIONAL IN-PIT COAL TAILINGS AS OF 2016
- APPROXIMATE BOUNDARY OF THE ESTIMATED EXTEND OF COAL TALINGS MIXED WITH WASTE ROCK AS 2011
- SONIC BOREHOLE (2019)
- CONE PENETRATION TEST (2019)
- SEISMIC CONE PENETRATION TEST (2019)
- MONITORING WELL
- AUGER HOLE (2012)
- CONE PENETRATION TEST HOLE (2012)
- SEISMIC CONE PENETRATION TEST HOLE (2012)

NOTES

1. ALL UNITS ARE SHOWN IN METRES UNLESS NOTED OTHERWISE.
2. COORDINATES ARE IN UTM ZONE 11, ELEVATIONS ARE REFERENCED TO THE ELK VALLEY ELEVATION DATUM.
3. TOPOGRAPHIC CONTOURS SHOWN AT 5 m MINOR AND 25 m MAJOR INTERVAL.
4. MONITORING WELL LOCATIONS WERE PROVIDED BY TECK COAL LIMITED FORDING RIVER OPERATIONS IN FRO MINE GRID AND WERE ADJUSTED TO UTM BY GOLDER.

REFERENCES

1. 2020 AERIAL PHOTO AND LIDAR TOPOGRAPHY PROVIDED BY TECK COAL LIMITED, RECEIVED: 01 DECEMBER 2020, DATES FLOWN: 15-26 JULY 2020.
2. 2019 SONIC, CPT AND SCPT HOLES PROVIDED BY TECK COAL LIMITED, FORDING RIVER OPERATIONS. SURVEYED ON 1 SEPTEMBER 2019. RECEIVED ON 9 SEPTEMBER 2019.
3. COAL TAILIINGS (Subaerial Tailings.dxf) AND WASTE ROCK MIXED WITH COAL TAILINGS (Subterrestrial Tailings.dxf) PROVIDED BY TECK COAL LIMITED FORDING RIVER OPERATIONS, DATED: FEBRUARY 2011.
4. 2012 AUGER HOLE AND CPT LOCATIONS FROM GOLDER PROJECT NO. 11-1426-0002/8000. GOLDER DOC. NO. 2012-176 REV.0 DATED 7 SEPTEMBER 2012.

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1:10,000 METRES

CLIENT
TECK COAL LIMITED
FORDING RIVER OPERATIONS
ELKFORD, B.C.

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GOLDER

YYYY-MM-DD	2021-03-03
DESIGNED	A. VAN ENGELEN
PREPARED	A. KIM
REVIEWED	C. LEE
APPROVED	J. CUNNING

PROJECT
2 PIT AND 3 PIT TAILINGS STORAGE AREA
2020 ANNUAL DAM SAFETY INSPECTION

TITLE
DETAIL PLAN AND CROSS-SECTION LOCATIONS

PROJECT NO.	PHASE/TASK/DOC.	REV.	FIGURE
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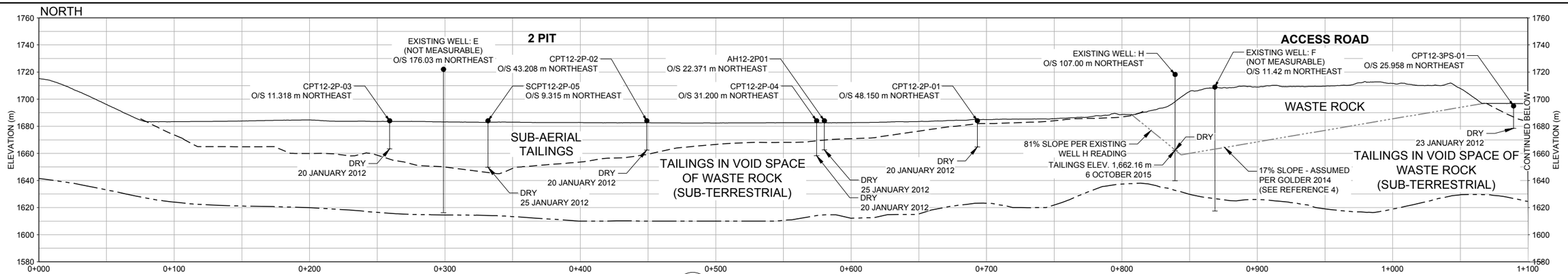
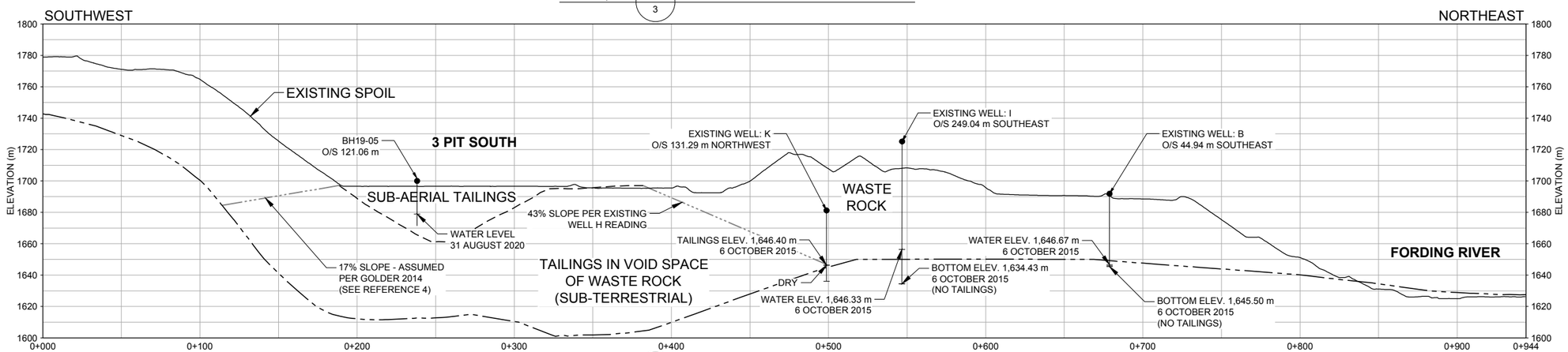


SCALE 1:3,000 m — A/3 — 2 PIT TO SHANDLEY PIT - SECTION

SCALE 1:3,000 m — A/3 — 2 PIT TO SHANDLEY PIT - SECTION



SCALE 1:3,000 m — B/3 — 3 PIT SOUTH THROUGH FORDING RIVER - SECTION

LEGEND

- 2020 GROUND SURFACE (SEE REFERENCE 1)
- 3PS MINED OUT SURFACE (SEE REFERENCE 2)
- SURFACE OF SPOIL BENEATH TAILINGS (SEE REFERENCE 3)
- CPT/AH/WELL LOCATION (SEE REFERENCES 5, 7 AND 8)

NOTES

1. ALL UNITS ARE SHOWN IN METRES UNLESS NOTED OTHERWISE.
2. MONITORING WELL DATA WAS LAST COLLECTED IN 2015 IN FRO MINE GRID ELEVATION AND 2012 TEST HOLE DATA COLLECTED IN FRO MINE GRID ELEVATION WERE ADJUSTED TO THE ELK VALLEY ELEVATION DATUM BY SUBTRACTING 0.454 m AS PER AIRBORNE IMAGING (2017).
3. SURFACE OF SPOIL BENEATH TAILINGS MAY BE LOWER THAN SHOWN IN PROVIDED SURFACE (REFERENCE 3) BASED ON CPT INVESTIGATION LOCATION RESULTS.

REFERENCES

1. 2020 GROUND SURFACE FROM LIDAR TOPOGRAPHY PROVIDED BY TECK COAL LIMITED, RECEIVED: 01 DECEMBER 2020, DATES FLOWN: 15-26 JULY 2020.
2. 3PS MINED OUT SURFACE CREATED USING CONTOURS PROVIDED BY TECK COAL LIMITED FORDING RIVER OPERATIONS. FOR ORIGINAL REPORT INFORMATION, REFER TO JOB NUMBER: "08-1427-0098/2000", DATED: 11 SEPTEMBER 2008.
3. SPOIL SURFACE CREATED USING CONTOURS PROVIDED BY TECK COAL LIMITED FORDING RIVER OPERATIONS IN 2008.
4. GOLDER. 2014. *TAILINGS DISPOSAL INTO 3 PIT SOUTH.*
5. CPT AND AUGERHOLE ELEVATIONS TAKEN FROM TECHNICAL MEMORANDUM, REFERENCE NO. 1414270098-2014-529-TM-Rev1-5000 DATED: 5 JUNE 2014
6. AUGER HOLE AND CPT LOCATIONS TAKEN FROM REPORT PREPARED FOR TECK COAL LTD. DOCUMENT NUMBER 2012-176 DATED: 7 SEPTEMBER 2012.
7. COORDINATES FOR MONITORING WELLS A-J PROVIDED BY TECK COAL LIMITED FORDING RIVER OPERATIONS ON 21 JANUARY 2014.
8. COORDINATES FOR MONITORING WELL H PROVIDED BY TECK COAL LIMITED FORDING RIVER OPERATIONS ON 12 MARCH 2014.

0 50 100
1:3,000 METRES

CLIENT
TECK COAL LIMITED
FORDING RIVER OPERATIONS
ELKFORD, B.C.

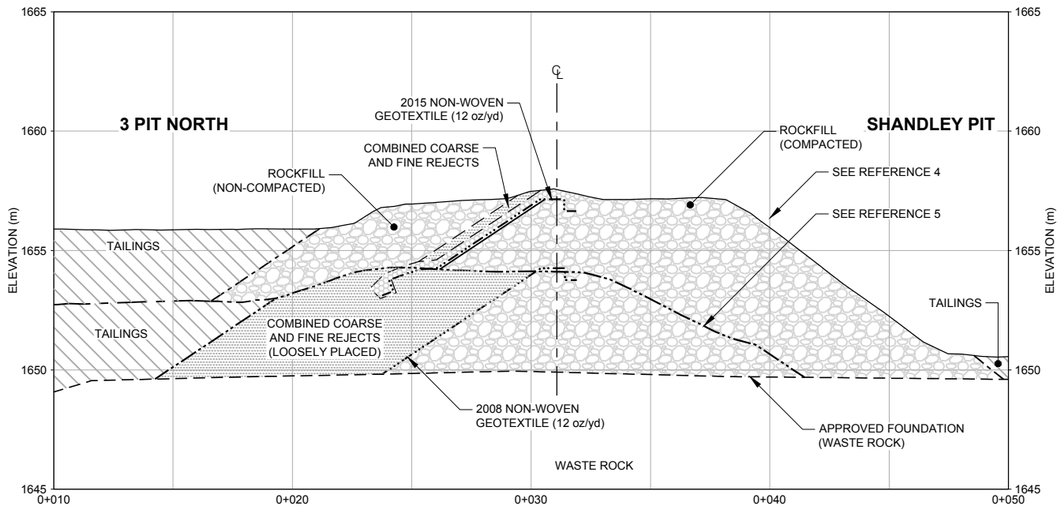
CONSULTANT
GOLDER

YYYY-MM-DD	2021-03-03
DESIGNED	A. VAN ENGELEN
PREPARED	A. KIM
REVIEWED	C. LEE
APPROVED	J. CUNNING

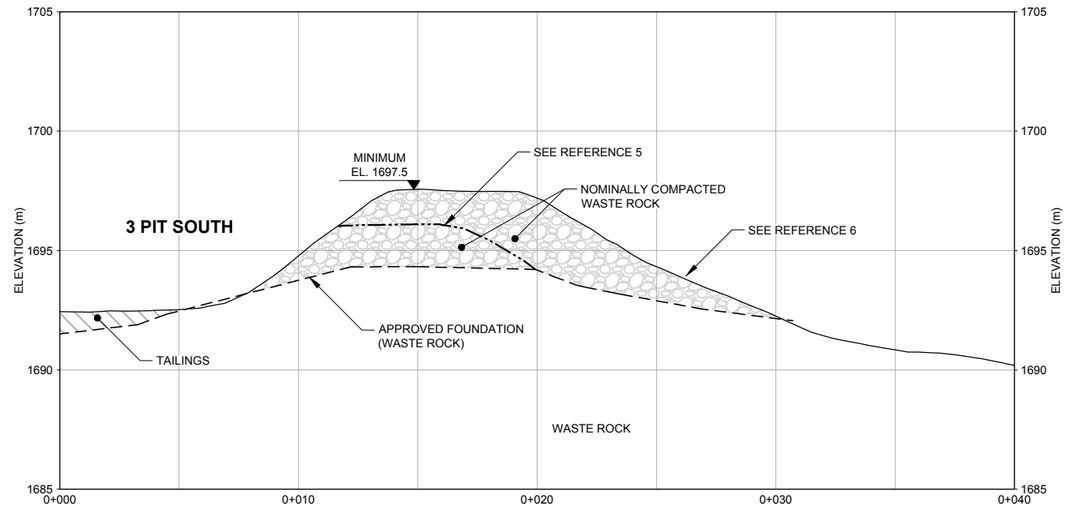
PROJECT
2 PIT AND 3 PIT TAILINGS STORAGE AREA
2020 ANNUAL DAM SAFETY INSPECTION

TITLE
CROSS-SECTIONS

PROJECT NO.	PHASE/TASK/DOC.	REV.	FIGURE
20136981	2000/2006/2020-220	0	4



SCALE 1:250 m C 3 3 PIT NORTH EMBANKMENT



SCALE 1:250 m D 3 3 PIT SOUTH EMBANKMENT

LEGEND

- 2020 GROUND SURFACE (SEE REFERENCE 1)
- SPOIL SURFACE (SEE REFERENCE 2)
- 2008 EMBANKMENT CONSTRUCTION
- 2014 EMBANKMENT CONSTRUCTION
- NON-WOVEN GEOTEXTILE

NOTE

1. ALL UNITS ARE SHOWN IN METRES UNLESS NOTED OTHERWISE.
2. COORDINATES ARE IN UTM ZONE 11, ELEVATIONS ARE REFERENCED TO THE ELK VALLEY ELEVATION DATUM.

REFERENCES

1. 2020 GROUND SURFACE FROM LIDAR TOPOGRAPHY PROVIDED BY TECK COAL LIMITED, RECEIVED: 01 DECEMBER 2020, DATES FLOWN: 15-26 JULY 2020.
2. SPOIL SURFACE CREATED USING CONTOURS PROVIDED BY TECK COAL LIMITED FORDING RIVER OPERATIONS IN 2008.
3. GROUND SURFACE PROVIDED BY TECK COAL LIMITED FORDING RIVER OPERATIONS, FILE NAME: "3PitDyke.dxf", RECEIVED: 8 NOVEMBER 2015.
4. FRO 2014a. *FRO 3 PIT NORTH/SHANDLEY CONSTRUCTION REPORT.*
5. FRO 2014b. *SUMMARY OF 2008 CONSTRUCTION IN 3 PIT SOUTH AND 3 PIT NORTH.*
6. GOLDER. 2015b. *3 PIT SOUTH BERM RAISE CONSTRUCTION SUMMARY.*

0 5 10
1:250 METRES

CLIENT
TECK COAL LIMITED
FORDING RIVER OPERATIONS
ELKFORD, B.C.

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YYYY-MM-DD	2021-03-03
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PROJECT
2 PIT AND 3 PIT TAILINGS STORAGE AREA
2020 ANNUAL DAM SAFETY INSPECTION

TITLE
3 PIT NORTH AND SOUTH EMBANKMENT SECTIONS

PROJECT NO.	PHASE/TASK/DOC.	REV.	FIGURE
20136981	2000/2006/2020-220	0	5

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

0 20 mm

APPENDIX A

Site Photographs

PHOTOGRAPH A-1 **20 August 2020**

2 Pit overview, looking southeast.

2020 Annual Dam Safety Inspection for 2 Pit and 3 Pit Tailings Storage Area

PHOTOGRAPH A-2

20 August 2020

3 Pit South overview, looking northwest.

PHOTOGRAPH A-3

20 August 2020

3 Pit South desiccated tailings surface and dry conditions observed in pit upstream of 3 Pit South Embankment, looking south.

PHOTOGRAPH A-4

20 August 2020

3 Pit South Embankment crest and upstream slope, looking east.

PHOTOGRAPH A-5

20 August 2020

3 Pit South Embankment crest and downstream area, looking northeast.

PHOTOGRAPH A-6

20 August 2020

3 Pit South Embankment crest at south abutment, looking west.

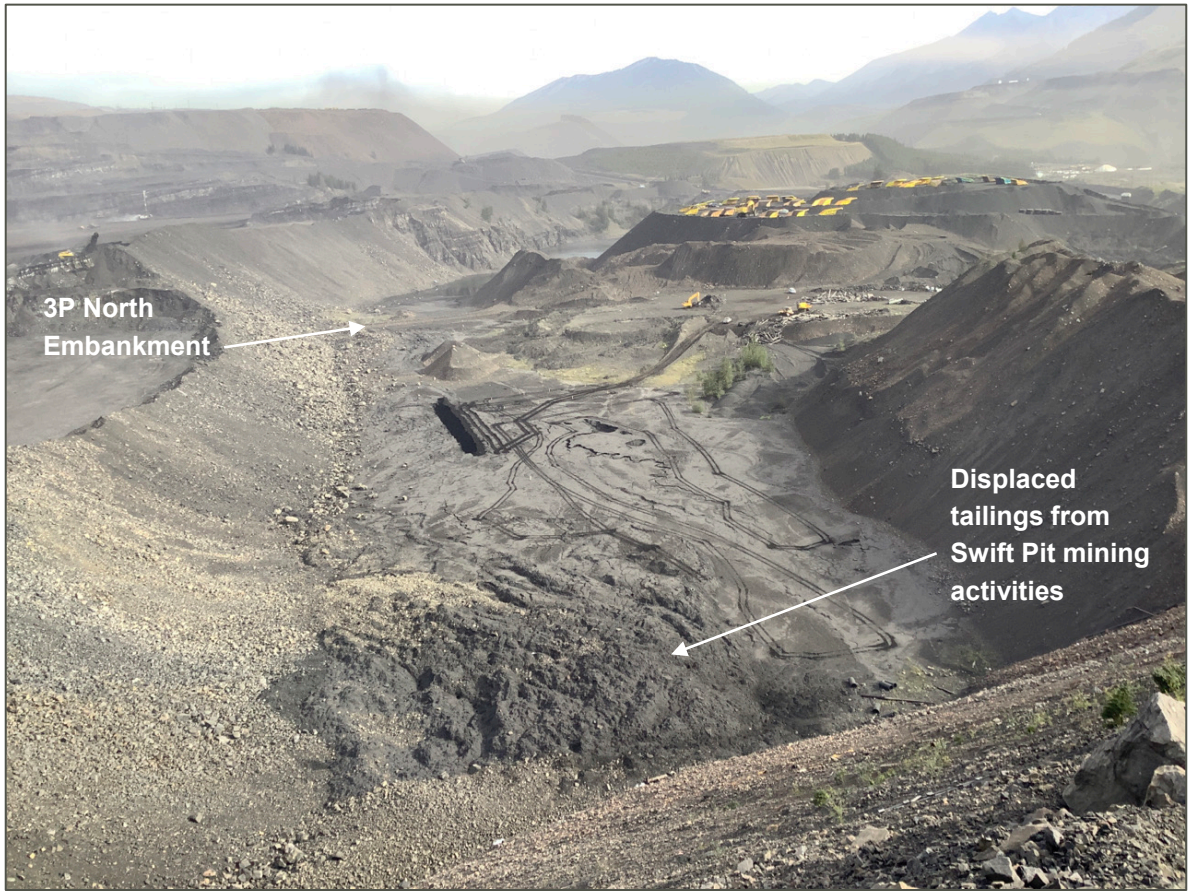
PHOTOGRAPH A-7

20 August 2020

3 Pit South Embankment view from coal stockpile area downstream, looking southwest. Tailings area notifications signs at downstream limit of embankment.

PHOTOGRAPH A-8

20 August 2020



3 Pit North overview, looking north.

PHOTOGRAPH A-9 **19 August 2020**

3 Pit North Embankment crest and upstream slope, looking west.

PHOTOGRAPH A-10 **19 August 2020**

3 Pit North Embankment crest and downstream slope, looking west.

PHOTOGRAPH A-11

19 August 2020

View to north downstream of 3 Pit North Embankment crest showing Shandley Pit pond.

APPENDIX B

2P-3P Tailings Storage Area Inspection Report

Client:	**Teck Coal Limited, Fording River Operations**	**By:**	**John Cunning, P.Eng.**
Project:	**20136981 FRO Tailings Facilities 2020 Annual Dam Safety Inspection**	**Date:**	**19 and 20 August 2020**
Location:	**3 Pit South Embankment, low point of 2 Pit and 3 Pit Tailings Storage Area**	**Reviewed by:**	**Clara Lee, P.Eng.**

General Information			
Dam Type:	Waste Rock Fill		
Weather Conditions:	Sunny, light cloud	**Temp:**	25°C–30°C

Inspection Item	Observations/Data	Photo	Comments & Other Data
1.0 DAM CREST			
1.1 Crest Elevation	Elev. 1,697.5 m (3PS Embankment)	4,6	Confirmed by 2020 LiDAR survey data
1.2 Reservoir Level/ Freeboard	Dry Tailing Surface **Tailings:** Elev. 1,693 m (against 3PS Embankment)	3	Confirmed by 2020 LiDAR survey data
1.3 Surface Cracking	None		
1.4 Unexpected Settlement	None		
1.5 Lateral Movement	None		
1.6 Other Unusual Conditions	None		
2.0 UPSTREAM SLOPE			
2.1 Slope angle	1.5H:1V	4	
2.2 Signs of Erosion	None		
2.3 Signs of Movement (Deformation)	None		
2.4 Cracks	None		
2.5 Face Liner Condition (if applicable)	N/A		
2.6 Other Unusual Conditions	None		

Inspection Item	Observations/Data	Photo	Comments & Other Data
3.0 DOWNSTREAM SLOPE			
3.1 Slope Angle	1.0 to 1.5H:1V	7	
3.2 Signs of Erosion	None		
3.3 Signs of Movement (Deformation)	None		
3.4 Cracks	None		
3.5 Seepage or Wet Areas	None		
3.6 Vegetation Growth	None		
4.0 DOWNSTREAM TOE AREA		7	
4.1 Seepage from Dam	None		
4.2 Signs of Erosion	None		
4.3 Signs of Turbidity in Seepage Water	None		
4.4 Discoloration/Staining	None		
4.5 Outlet Operating Problem (if applicable)	N/A		
4.6 Other Unusual Conditions	None		
5.0 ABUTMENTS		4, 6	
5.1 Seepage at Contact Zone (Abutment/Embankment)	None		
5.2 Signs of Erosion	None		
5.3 Excessive Vegetation	None		
5.4 Presence of Rodent Burrows	None		
5.5 Other Unusual Conditions	None		
6.0 RESERVOIR		1, 2, 8	
6.1 Stability of Slopes	Good		
6.2 Distance to Nearest Slide (if applicable)	Waste rock spoils to east, highwall to west		
6.3 Estimate of Slide Volume (if applicable)	Undetermined		
6.4 Floating Debris	None		
6.5 Other Unusual Conditions	Yes		Desiccated and dry tailings surface observed. Cracks and depressions in tailings in 3 Pit North area likely as a result of blasting in adjacent Swift pit.

Inspection Item	Observations/Data	Photo	Comments & Other Data
7.0 EMERGENCY SPILLWAY/ OUTLET STRUCTURE	None		
8.0 INSTRUMENTATION	Vibrating wire piezometers in 3PS and 3PN as part of tailings removal investigations and trials		In 3PS: VW19-05 In 3PN: VW19-03, VW19-04S, and VW19-04D
9.0 DOCUMENTATION			
9.1 Operation, Maintenance and Surveillance (OMS) Manual 9.1.1 OMS Manual Exists	Yes		2 Pit – 3 Pit Tailings Storage Area Operation, Maintenance and Surveillance Manual. (FRO 2020a)
9.1.2 OMS Manual Reflects Current Dam Conditions	Yes		
9.1.3 Date of Last Revision	27 May 2020		Version R4
9.2 Emergency Response Plan (ERP) 9.2.1 ERP Exists	Yes		2P-3P TSA included in site tailings facilities ERP. (EP.009.R1) (FRO 2020b)
9.2.2 ERP Reflects Current Conditions	Yes		
9.2.3 Date of Last Revision	25 May 2020		
10. NOTES ■ Tailings excavation trials were underway in 3 Pit North area in August 2020. ■ FRO continues to dewater the Shandley Pit pond in preparation for mining out the 3 Pit North tailings as part of Swift Pit mining in 2021.			
Inspectors:	John Cunning, P.Eng.	**Date:**	19 and 20 August 2020

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