Quinsam Coal Mine
2020 Dam Safety Inspections:

2 North Pit TDF and South Dam
2 South Pit and 3 South Pit PAG-CCR Disposal Facilities
Settling Pond 1 and Settling Pond 4

PRESENTED TO
Bowra Group Inc.

JUNE 16, 2021
ISSUED FOR USE
FILE: 704-ENG.DMPA03006-01

Tetra Tech Canada Inc.
#1 - 4376 Boban Drive
Nanaimo, BC V9T 6A7 CANADA
Tel 250.756.2256 Fax 250.756.2686

This page intentionally left blank.

EXECUTIVE SUMMARY

Quinsam Mine (Quinsam) is a coal mine located near the east coast of Vancouver Island in British Columbia (BC). The site is located 28 km southwest of the City of Campbell River. The Bowra Group (Bowra) was appointed Receiver of Quinsam on September 21, 2019. With the change, the site went from an Operation lifecycle phase to an Active Care and Maintenance phase. The underground mining ceased, and onsite staff were reduced in number from less than 100 to less than 10.

Tetra Tech Canada Inc. (Tetra Tech) has been retained by Bowra to complete the 2020 Dam Safety Inspection (DSI) for the two Tailing Disposal Facilities (TDFs) and four Water Management Facilities (WMFs) at Quinsam, which is documented in this report. Tetra Tech has worked on the site intermittently since April 2019, initially for Quinsam Coal Corporation (QCC), and then for Bowra late in 2019 early/2020 to complete the last DSI. It is understood that Bowra is in regular correspondence with the Ministry of Energy, Mines and Low Carbon Innovation (EMLCI) with respect to Quinsam site management during this time of transition, while a potential new mine owner is being secured. The authorization to proceed for the 2020 DSI was not received until late March 2021, as such the 2020 inspection and reporting is being completed outside of the 2020 calendar year. In this report the site visit and DSI are being referred to as the 2020 DSI.

Requirements for a DSI annual report are outlined in the EMLCI's Health Safety and Reclamation Code (HSRC) Guidance Document, Section 4.2 (2016). For ease of reference the information required in an executive summary is listed below in the order presented in the Guidance Document.

a. Summary of Facility Description

Facility descriptions for the TDFs are based on previous reports and a ground survey of the facilities completed in 2020. Facility descriptions of the WMF are based on our review of various background documentation as limited to incomplete as-built information exists for 2SP, 3SP and SP1; SP4 has partial construction records from a repair in 2004. Recent or representative surveys of the constructed WMFs was not available in time for this DSI. As such, it is possible that the dimensions may need to be revised as survey data is collected/available. Table E1 below summarizes the approximate WMF dimensions and details. The attached Figure 1 shows the general location of the TDFs and WMFS.

<u>2-North Pit TDF</u>

The 2-North Pit TDF is a rectangular shaped facility contained on four sides by dams. It was used for tailings disposal from 1995 to 2019, and is estimated to contains approximately 1.1M tonnes of tailings. It was constructed in the south portion of the 2-North Open Pit, and was originally contained by dams to the north and south, the pit wall to the east and by the open pit slope and waste spoil pile to the west. As the facility was raised above the crest of the open pit, dams were built on the east and west sides. The dams are referred to as the North Embankment, East Embankment, West Embankment and South Embankment.

The North Embankment is approximately 50 m high, 220 m long, with a crest width between 20 and 40 m. The downstream slope has 2 benches, below the lower bench it is sloped at approximately 2 horizontal to 1 vertical (2H:1V), between the two benches it is sloped at approximately 1.5H:1V, and above the upper it is sloped at approximately 1.4H:1V. The embankment was constructed of coarse material in the base of the open pit, on the crest of a bedrock cut slope that is approximately 16 m high, and sloped at approximately 1.1 to 1.2H:1V (based on 1 m contours from LiDAR collected in 2010). The embankment acts as a flow through structure with seepage from the facility discharging near the dam toe. Portals to the underground mine are located immediately north of the downstream toe of the bedrock cut slope.

The South Embankment is approximately 45 m high and 130 m long, with a crest width of approximately 15 m. The downstream side of the embankment is sloped at 1.7H:1V. It was constructed over exposed bedrock.

The East Embankment is approximately 15 to 20 m high, 400 m long, with a crest width varying between 15 and 22 m wide. The downstream side of the embankment is sloped at an angle between 1.5H:1V and 1.8H:1V. It was constructed along the crest of the east highwall.

The West Embankment is approximately 30 m high and 430 m long, with a crest width of 10 to 20 m wide. The downstream side of the embankment is sloped at 1.5H:1V. It was constructed over the waste spoil pile.

South Dam (Old TDF)

The South Dam is part of the Old TDF which was constructed in the north portion of the 2-North Open Pit. The Old TDF was used for tailings disposal between 1986 and 1994. Originally it was contained by the North, Central and South Dams, and the pit walls to the east and west. Between 2014 and 2017 tailings were removed from the cell between the Central and North Dam, and the area backfilled to surface with Non-PAG CCR, so that portion of the structure is no longer considered a dam (Quinsam, 2020). The South Dam retains tailings, and is approximately 15 m high and 130 m long with a crest width of 5 to 13 m.

Settling Pond 4 (SP4)

SP4 receives surface water from Brinco Brook and the north mine area. Water from the TDFs is pumped into Brinco Brook where it then flows into SP4. The facility is contained by topography to the north, east and south and by a dam to the west. The dam has a low level decant outlet pipe that discharges into an open channel. There is an emergency spillway near the north side of the dam, the downstream portion was observed to be very overgrown during the 2020 site visit.

A piping failure occurred through the dam in 2003, which was interpreted to be caused by failure of the decant pipe. The pipe was replaced and the dam reconstructed in 2004.

2 South Pit (2SP)

2SP is a subaqueous disposal facility for Potentially Acid Generating (PAG) waste rock. The facility is intended to have a water cover over the waste rock to limit oxidation. It was constructed in a former open pit, that had 3 portals to the underground mine in its base. The facility was constructed by plugging the portals and constructing a sand-bentonite liner over the base and sides of the pit, then infilling the pit with waste rock. The facility is contained by pit walls to the east and south, and by waste rock dumps to the west and southwest, and by a small embankment to the north that also acts as an overflow spillway. The waste rock dumps containing the facility to the north and northwest could be classified as dams based on the HSRC's definition; post-construction LiDAR should be collected and compared to pre-construction records, and a drilling investigation performed to assess the extent and composition of the material to evaluate if these waste dumps should be managed as a dam.

3 South Pit (3SP)

3SP is a subaqueous disposal facility for PAG waste rock constructed in a former open pit. The facility is currently contained by topography to the east and west, by a dam at the north end of the facility and a spillway to the southwest that appears to be constructed on waste rock.

The open pit was infilled with waste rock before a design for the water cover was prepared. After the pit was infilled, a dam was designed across the north end of the facility to retain water and cover the PAG waste rock to limit oxidation, and a conceptual design for the spillway was prepared so that the system could function with limited

manual input. At present there is not a discharge permit for the spillway so it is not used and water levels in the facility are kept low by pumping to SP1.

The toe of the north dam was difficult to differentiate during the 2019 and 2021 field reviews. The constructed embankment slope was benched and built on the crest of a steep slope. Half of the lower bench of the constructed embankment was supported by concrete lock blocks, and the other half appeared to have fill pushed against alder trees. Post-construction LiDAR should be collected and compared to pre-construction records, and a drilling investigation performed to assess the extent and composition of the material to evaluate the height of this dam.

The spillway to the southwest, constructed over what appears to be waste rock could be classified as a dam based on the HSRC's definition. Post-construction LiDAR should be collected and compared to pre-construction records, and a drilling investigation performed to assess the extent and composition of the material to evaluate if this structure should be managed as a dam.

Settling Pond 1 (SP1)

SP1 receives water from the south mine area, and water pumped from 2SP and 3SP. The facility is contained by topography to the east, south and west and by an earthfill dam to the north. Water discharges from the facility through a low level decant outlet and flows through a wide open channel to Middle Quinsam Lake. There is an emergency spillway near the east side of the dam, the downstream portion was observed to be very overgrown during 2021 site visit.

Table E1: Summary of Water Management Facility Descriptions

Facility	Year Constructed	Status of Design or As-built Records	Estimated Facility Capacity and Dimensions[1]					
			Water Storage Capacity m^3	Pond Area (approximate m by m)	Dam	Dam Length (m)	Dam Height (m)	Dam Minimum Crest Width (m)
SP4	1987 Decant pipe replaced in 2004.	A design or as-built report for the original facility was not provided. A design and as-built report for the decant pipe replacement was provided.	32,500	60 by 450	East Dam	105	6.5 to 8	4.7
2SP	2012 – 2013	Quinsam provided a Draft Construction Status memo dated November 2012. Memo describes that 80% of the sand-bentonite liner had been placed. The memo documented several issues including not receiving: survey data; Quality Control data; contractor reports; deficiency repair reports; and material quantity summaries. The memo did not include as-built drawings. Quinsam has located point survey files and testing records of the construction work but they have not been compiled or reviewed by Tetra Tech at this time.	49,350	100 by 180	North Embankment/ overflow spillway	Unknown	6	6
					Potential Dam: Waste Rock Dumps (north and northwest)	Unknown	Approximately 10 to 20	20 to 50
3SP	2016 to 2017	A conceptual design for the south spillway was prepared by Golder in 2011 as part of a 2SP and 3SP Water Management Plan. The conceptual design did not show assumed subgrade conditions, and specifically stated that it should be updated during detailed design. No other documentation for the design of this structure was provided. A design for the north dam was prepared by Golder in 2012. The two structures were built by Quinsam in 2016 or 2017. Quinsam has located testing records from construction but they have not been reviewed by Tetra Tech at this time.	38,912	40 by 200	North Dam	50	3.8 / Approximately 20 including natural pillar	6
					Potential Dam: Southwest Spillway, abutments in adjacent waste rock	Unknown	Unknown	Unknown

Table E1: Summary of Water Management Facility Descriptions

Facility	Year Constructed	Status of Design or As-built Records	Estimated Facility Capacity and Dimensions[1]					
			Water Storage Capacity m^3	Pond Area (approximate m by m)	Dam	Dam Length (m)	Dam Height (m)	Dam Minimum Crest Width (m)
SP1	EMPR permit for construction issued 1991	As-built records for the facility were not provided. A geotechnical design for the facility was prepared by Thurber in 1990, design report included uncertainty regarding the location of the dam.	Unknown	70 by 200	North Dam	170	4.5	4

1. A recent survey of the Water Management Facilities was not provided. Dimensions are based on OMS Manual (Quinsam, 2020), design reports and as-built reports. Dimensions may be revised in future reports when survey data is available.

b. Summary of Key Hazards

Internal erosion, embankment instability, liquefaction, and overtopping are the key hazards for the TDF facilities, identified by a potential failure modes assessment (Thurber, 2019b).

For the WMFs a hazard and failure mode review has not been carried out to date for the facilities. The facilities were designed and built between 1987 and 2017. As such, different methodologies were likely used during the design process to identify and address hazards. Key hazards identified, as part of this review include embankment overtopping, internal erosion, embankment instability and liquefaction. Additionally, 2SP was built over plugged underground portals, so failure of the portal plugs and loss of containment into the underground workings is also considered a hazard for this facility. These hazards should be assessed or reviewed with respect to as-built conditions and subsurface investigation data.

The Canadian Dam Association (2019) also identifies that failure modes for mining dams should consider environmental impacts. Quinsam provided exerts for summary in this DSI from their Quarterly Water Quality Monitoring Reports which span the period of January to September 2020. These quarterly reports and the Annual Water Quality reports are publicly available at the website http://www.quinsamcoalenvironmentalreports.com. These reports describes that water quality remained below effluent permit limits at the two discharge points for the TDFs and WMFs between January and September 2020 (October to December 2020 data was not available at the time of writing). Environmental assessments are outside of the area of expertise of the authors of this DSI report, Quinsam's Water Quality Reports should be read for context and discussion.

c. Consequence Classification

Dam Consequence Classifications have been assigned to the individual dams as follows:

- North Embankment – Very High
- East Embankment – Significant
- West Embankment – High
- South Embankment – High
- South Dam – Very High
- WMFs – Significant to Low

This has not changed since the 2019 DSI and no adjustment has been made for change in mine status due to the uncertain future of the mine. The 2-North Pit TDF and South Dam had a detailed assessment of the consequence classification performed by Golder in 2016, the current consequence classification is the same as that detailed assessment except for the East Embankment where the consequence classification was increased to Significant in 2019. The increase in consequence classification for the East Embankment was based on topography observations that a breach from the East Embankment could flow north and into the Portal Sump area where there is a temporary population at risk as workers can be in this area.

The WMF have not had a detailed assessment of consequence classification or dam break and runout assessments. Consequence Classification is discussed for each dam in detail in Section 12.2.

d. Summary of Significant Changes

2-North TDF – in 2020, starting in April, water levels were kept low in the pond by siphoning. This was in response to an Independent Tailings Review Board (ITRB) recommendation that water levels in the TDF should be kept as low as reasonably possible to reduce risk while the future of the mine site is uncertain.

2-North TDF and South Dam – staff gauges were installed/surveyed to reference elevation in 2020.

SP1 – significant ruts on the crest of the dam, near the middle, were infilled. Ruts near the abutments of the dam have not been infilled.

3SP – Quinsam personnel described that in April 2021 the leaning trees near the lock blocks on the downstream slope were cut, then after being cut the one root ball fell out of the soil, the hole created from the root ball was backfilled with fill. Quinsam described that the fill was from the same borrow source that was used for original construction of 3SP. Based on the 2020 site visit this area shows ongoing signs of instability including soil creep, the lock blocks were leaning and leaning trees.

e. Significant Changes in Instrumentation and/or Visual Monitoring Records

Other than what was stated above in Section d, there was no significant changes in the instrumentation records reviewed.

f. Significant Changes to Stability and or Surface Water Control

Other than what was stated above in Section d, there were no other changes to stability or surface water control in 2020.

g. Summary of Review of Operations, Maintenance and Surveillance (OMS) Manual

The OMS Manuals for the TDFs and WMFs were reviewed and specific suggestions and comments provided to Quinsam in the digital files (as comments in the PDF) to assist in improving the quality of the documents. The comments are summarized in Section 14.3.

h. Summary of Review of Emergency Preparedness and Response Plan (EPRP)

The Emergency Preparedness Plan Manuals for the TDFs and WMFs were reviewed and specific suggestions and comments provided to Quinsam in the digital files (as comments in the PDF) to assist in improving the quality of the documents. The comments are summarized in Section 14.3.

i. Date of Next Formal Dam Safety Review (DSR)

The TDFs had a DSR completed in 2018, therefore, the next DSR must take place by 2023 to meet the requirements of Section 10.5.4., of the HSRC (EMLCI, 2021). The HSRC requires a DSR at a minimum of every 5 years regardless of Dam Consequence Classification.

The WMFs have not had a DSR to date. The purpose of a DSR is an independent assessment of the safety status of a dam, based on data, analysis and professional engineering interpretation. A DSR includes an independent review of existing construction, design, performance and assessment records. Due to the lack of information in this regard as summarized in the 2019 DSI, it is suggested that priority be given to filling the identified gaps through updated survey and assessments and then a DSR for the WMFs be completed in short order (suggested as 2022).

j. Summary of Recommendations

Recommendations from this DSI are summarized in Table E-2 which is repeated from Section 13.0. Conditions have not changed significantly since the 2019 DSI except at the 3SP North Dam. Recommendations are generally related to vegetation removal, minor grading concerns. No signs related to instability, overtopping or other dam safety deficiencies were noted, except for the instability at 3SP.

The 2019 DSI included recommendations to locate design and construction records for 2SP and 3SP to delineate the extent of the waste rock piles that are confining the structures. It is understood that these additional records have not been found, so a recommendation to determine the extent of the waste rock fill and assess failure modes of these facilities is included as a recommendation.

Table E-2: 2020 DSI Recommendations

Structure	ID #	Deficiency or Non-Conformance	Regulation or Reference	Recommended Action	Priority[1]	Recommended Deadline
All	2020-01	The facilities do not have an EOR.	HSRC 2021 10.1.5	An EOR should be established. The work plan Tetra Tech has been requested to prepare will assist in prioritizing the recommended additional assessments, rehabilitation, design/construction work for the facilities that would be necessary for Tetra Tech to become EOR of the facilities.	2	December 2022
3SP	2020-02	Signs of instability/repairs were observed near the lock blocks / downstream slope of the dam.	HSRC 2021 10.1.4/10.5.1 and 1.7.3 (2)	The reservoir level in 3SP should be kept low (the pond level should be kept below the upstream toe of the North Dam). This is how 3SP is currently operated, as water cannot discharge through the spillway as there is not a discharge permit. This operational level should not change until additional investigations and assessments are performed for the North Dam.	1	Until assessments of the dam are performed.
3SP	2020-03	Signs of instability/repairs were observed near the lock blocks / downstream slope of the dam.	HSRC 2021 10.1.4	This area should continue to be monitored and if further instability is observed requiring work or repair a geotechnical engineer experienced with dam safety is consulted for advice. Subsurface information is required to determine if the instability is progressing and the best rehabilitation plan. This dam should be prioritized for assessment and rehabilitation.	2	Until assessments of the dam are performed.
2SP/3SP	2020-04	These facilities appear to be partially contained by waste dumps, that were not previously recognized as dams, yet could meet the HSRC's definition of a dam.	HSRC 2021 10.1.4 HSRC Guidance Doc. (2016) 3.4	The extent of fill in these locations should be assessed by subsurface investigations and comparing pre-construction and post-construction LiDAR. The type of material contained in the facilities should be determined by reviewing construction records or collecting subsurface information to determine if it is liquifiable. Credible failure modes should then be assessed to evaluate if these structures should be defined and managed as dams.	2	December 2022
2SP	2020-05	There was a section of weathered riprap near the downstream toe of the facility. The section is 15 m long and across the width of the spillway.	CDA 2013 3.5.5	The weather riprap should be removed and replaced.	2	October 2021
3SP	2020-06	The dam crest had ruts from vehicle traffic.	CDA 2013 3.5.3	Barriers should be placed to prevent vehicles driving on the dam crest.	3	October 2021
SP1	2020-08	There is continual water ponding near the toe of the dam (middle to north (right) abutment of the dam). The ponded water was about 15 m long, 5 m wide, and 0.4 m deep.	CDA 2013 3.5.3	This permanently saturates the toe of the dam which decreases stability. Work should be performed to permanently drain the toe pond by excavating a drainage channel.	3	June 2022
OMS and EPP	2020-09	OMS and EPP Manuals were reviewed and improvements are required to meet current standard of practice.	HSRC 2021 10.5.2	The comments provided to Quinsam and generalized in Section 14.3 should be reviewed and the OMS/EPP Manuals adjusted accordingly.	3	October 2021
2-North Pit TDF	2020-10	Vegetation was growing on the west side of the North Embankment toe (Photo 5) and the northwest corner of the TDF (Photo 25). Photos are provided in Appendix A.	CDA 2013 3.5.3.	From the dams, the trees and shrubs should be removed as the roots can create preferential seepage paths and weaker zones in the dam, and the heavy vegetation can impede the ability to complete inspection. In the spillways/channels, the vegetation reduces the flow capacity and increases the likelihood of blockages forming during an emergency. Spillways should be cleared to where water could discharge away from the dam structure. The trees should be cut off at the base and the stump/root ball left in place to not further disturb the dam structure. Chemical treatment could be considered to reduce regrowth in areas where it can be applied.	2	October 2021
South Dam	2020-11	There is one medium sized tree growing near the west abutment of the South Dam.	CDA 2013 3.5.3.		2	October 2021
SP4	2020-12	The upstream and downstream slopes had trees and shrubs growing on them that obstruct observation and the roots could cause preferential flow paths. The emergency spillway was very overgrown with shrubs and small trees between the dam crest and downstream toe.	CDA 2013 3.5.3/3.5.5		2	October 2021
2SP	2020-13	The crest and downstream slope of the waste rock dump that could be considered a dam were overgrown with shrubs obstructing observations.	CDA 2013 3.5.3		2	October 2021
2SP/ 3SP	2020-14	Small trees were observed growing in the channel between 2SP and 3SP.	CDA 2013 3.5.5		2	October 2021
3SP	2020-15	The spillway outlet channel had small trees growing in it.	CDA 2013 3.5.5		2	October 2021

Structure	ID #	Deficiency or Non-Conformance	Regulation or Reference	Recommended Action	Priority[1]	Recommended Deadline
SP1	2020-16	Large trees were observed growing on the downstream toe of the dam. Small trees/shrubs were observed growing on the dam crest and upstream crest. Thick vegetation was growing around the downstream toe where seepage is observed, this vegetation would obstruct observations.	CDA 2013 3.5.3	From the dams, the trees and shrubs should be removed as the roots can create preferential seepage paths and weaker zones in the dam, and the heavy vegetation can impede the ability to complete inspection. In the spillways/channels, the vegetation reduces the flow capacity and increases the likelihood of blockages forming during an emergency. Spillways should be cleared to where water could discharge away from the dam structure. The trees should be cut off at the base and the stump/root ball left in place to not further disturb the dam structure. Chemical treatment could be considered to reduce regrowth in areas where it can be applied.	2	October 2021
SP1	2020-17	The emergency spillway was very overgrown downstream of the dam crest.	CDA 2013 3.5.5		2	October 2021

1. Priority is assigned based on the HSRC Guidance Document (2016). Using the following ranking system
    1. A high probability or actual dam safety issues considered immediately dangerous to life, health or the environment, or a significant risk or 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.

TABLE OF CONTENTS

LIST OF TABLES IN TEXT

LIST OF FIGURES IN TEXT

APPENDIX SECTIONS

FIGURES

APPENDICES

Acronyms/Abbreviations	Definition
CDA	Canadian Dam Association
CB	Cast Blast
CCR	Coarse Coal Rejects
CR	Coarse Rejects (same as Coarse Coal Rejects)
DSI	Dam Safety Inspection
DSR	Dam Safety Review
EDGM	Earthquake Design Ground Motion
EMLCI	BC Ministry of Energy, Mines and Low Carbon Innovation, formerly BC Ministry of Energy, Mines and Petroleum Resources (EMPR)
EPP	Emergency Preparedness Plan
EPRP	Emergency Response and Preparedness Plan
ENV	BC Ministry of Environment and Climate Change Strategy
EOR	Engineer of Record
FLNRORD	BC Ministry of Forests, Lands and Natural Resource Operations and Rural Development
FOS	Factor of Safety
HDPE	High Density Polyethylene
HSRC	Health Safety and Reclamation Code
IDF	Inflow Design Flood
MCE	Maximum Credible Event
ML	Metal Leaching
MOU	Memorandum of Understanding
NOWL	Normal Operating Water Level
OMS	Operation, Maintenance and Surveillance
PAG	Potentially Acid Generating
QCC	Quinsam Coal Corporation
QPO	Quantifiable Performance Objectives
RASCI	Responsible, Accountable, Support, Consulted, Informed table
SPMDD	Standard Proctor Maximum Dry Density
TDF	Tailing Disposal Facility
VWP	Vibrating Wire Piezometer
WMF	Water Management Facility

LIMITATIONS OF REPORT

This report and its contents are intended for the sole use of Bowra Group Ltd. and their agents. Tetra Tech Canada Inc. (Tetra Tech) does not accept any responsibility for the accuracy of any of the data, the analysis, or the recommendations contained or referenced in the report when the report is used or relied upon by any Party other than Bowra Group Ltd., or for any Project other than the proposed development at the subject site. Any such unauthorized use of this report is at the sole risk of the user. Use of this document is subject to the Limitations on the Use of this Document attached in the Appendix or Contractual Terms and Conditions executed by both parties.

1.0 INTRODUCTION

Quinsam Mine (Quinsam) is an underground coal mine located near the east coast of Vancouver Island, west of the City of Campbell River. Quinsam was owned and operated by the Quinsam Coal Corporation (QCC) until they declared bankruptcy in July 2019. The Bowra Group (Bowra) was appointed Receiver of QCC on September 21, 2019. With the change, the site went from an Operation lifecycle phase to an Active Care and Maintenance phase. The underground mining ceased, and onsite staff were reduced in number from less than 100 to less than 10.

Tetra Tech Canada Inc. (Tetra Tech) has been retained by Bowra to complete the 2020 Dam Safety Inspection (DSI) for the two Tailing Disposal Facilities (TDFs) and four Water Management Facilities (WMFs) at Quinsam. Tetra Tech has worked on the site intermittently since April 2019, initially for QCC, and then for Bowra late in 2019/ early 2020 to complete the last DSI. It is understood that Bowra is in regular correspondence with the Ministry of Energy, Mines and Low Carbon Innovation (EMLCI) with respect to Quinsam site management during this time of transition, while a potential new mine owner is being secured. The authorization to proceed for the 2020 DSI was not received until late March 2021, as such the 2020 inspection and reporting is being completed outside of the 2020 calendar year, but will herein be referred to as the 2020 site visit, inspection or DSI.

This report documents the 2020 DSIs for the following facilities at Quinsam:

- North Area:
  - 2-North Pit TDF, which includes four dams: North Embankment; East Embankment; South Embankment; and West Embankment
  - South Dam (Old TDF)
  - Settling Pond 4 (SP4)
- South Area:
  - 2 South Pit PAG-CCR Disposal Facility (2SP)
  - 3 South Pit PAG-CCR Disposal Facility (3SP)
  - Settling Pond 1 (SP1)

The 2020 DSI site visits for Quinsam were performed by Jennifer Sinclair, P.Eng. and Angie Ramey, P.Eng. of Tetra Tech, who were shown around the site by Sarah Shi, P.Geo. of Quinsam. The TDF inspections were completed on April 28, 2021, when the weather was overcast, and included rain, light wind and temperatures of approximately 5 °C. The WMF inspections were completed on May 4, 2021, when the weather was sunny with temperatures ranging between 5 and 15 °C.

For consistency with previous TDF descriptions, the term “dam” is used to refer to the structures containing the Old TDF, and the word “embankment” is used to refer to structures containing the 2-North Pit TDF. For regulation and design purposes these structures are all considered tailings dams. Mine grid directions are used to describe the TDFs for consistency with existing drawings.

The WMFs are presented in this order to reflect how water flows and is pumped between them. In the south area of the site water flows from 2SP to 3SP and is then pumped to SP1 before it is discharged from site. In the north area of site, water from the TDFs is pumped into Brinco Brook, where it flows into SP4 before it is discharged from

site. Cardinal directions are used to describe these facilities, as Google Earth imagery was used to review these structures with respect to other facilities on the mine site.

The following sections provide a review of the 2020 climate data, descriptions of the facilities, maintenance, operation and inspections for each facility, a review of the dam classification and hazards and related Operations Maintenance and Surveillance (OMS) Manual and Emergency Preparedness and Response Plan (EPRP).

2.0 REGULATORY REQUIREMENTS

2.1 Provincial Regulation

The Ministry of Energy, Mines and Low Carbon Innovation (EMLCI) (previously BC Ministry of Energy, Mines and Petroleum Resources (EMPR)) regulates mine sites through the BC Mines Act and associated regulation document the "Health, Safety and Reclamation Code", dated April 2021 (HSRC). The HSRC specifies minimum reporting, design, operation, maintenance, and surveillance standards for TDFs. Which are enforced by directions from the "Chief Inspector of Mines" or their delegated representative.

EMLCI also issued a HSRC Guidance Document, dated July 2016 (Guidance Document) that provides specific details and expectations for the application of the HSRC. The Guidance Document includes information on dam design, Consequence Classifications, construction, operation, closure and annual reporting. The Guidance Document describes that the standard practice of the day, should be considered for dam management and directs the reader to the following dam safety organizations and guidance documents:

- Canadian Dam Association Dam Safety Guidelines, 2013 (CDA, 2013);
- Application of Dam Safety Guidelines to Mining Dams, 2019 (CDA, 2019);
- International Commission on Large Dams;
- BC Dam Safety Guidelines, published by BC Ministry of Forests, Lands, Natural Resource Operations and Rural Development; and
- The Mining Association of Canada.

TDFs and WMFs, on mine sites in BC, must also follow regulations and requirements from the following other BC Ministries:

- Ministry of Environment (ENV), regulates the quality and quantity of any discharge from a mine site impoundment; and
- Ministry of Forests, Lands, Natural Resource Operations, and Rural Development (FLNRORD), regulates and issues water licenses and approves diversions for water use and storage.

2.2 Design Criteria

The HSRC and related Guidance Document, issued by EMLCI, refer to the CDA consequence classification system for assessing and designing mining dams. CDA guidelines present a Consequence Classification System, which categorizes the consequences of dam failure in terms of incremental loss of life, environmental and cultural losses, and infrastructure and economic losses. The consequence classification of a dam is selected using the highest

rating based on these categories of loss. The consequences are considered incrementally to those that would have occurred in the same event without failure of the dam.

The CDA guidelines describe five consequence categories: Low, Significant, High, Very High and Extreme. The characteristics of each category are summarized in Table 2-1.

Table 2-1: CDA/ EMLCI Code Consequence Classification Criteria

Dam Classification	Population at Risk [1]	Loss of Life [2]	Economic and Social Losses	Environmental and Cultural Losses
Low	None	0	Low economic loss Area contains limited infrastructure or services	Minimal short term loss No long term loss
Significant	Temporary only	Unspecified	Losses to recreational facilities, seasonal workplaces and infrequently used transportation routes	No significant loss or deterioration of habitat Loss of marginal habitat only Restoration or compensation in kind highly possible
High	Permanent	1-10	High economic losses, affecting infrastructure, public transit and commercial facilities	Significant loss or deterioration of important habitat Restoration or compensation in kind highly possible
Very High	Permanent	10-100	Very high economic losses, affecting important infrastructure or services (e.g., highway, industrial facility)	Significant loss or deterioration of critical habitat Restoration or compensation in kind possible but impractical
Extreme	Permanent	>100	Extreme losses affecting critical infrastructure or service (e.g., hospital, major industrial complex)	Major loss of critical habitat Restoration or compensation in kind impossible

[1] Definitions of Population at Risk:

None-There is no identifiable population at risk, so there is no possibility of loss of life other than through unforeseeable misadventure.

Temporary-People are only temporarily in the dam-breach inundation zone (e.g., Season cottage use, passing through on transportation routes, participating in recreational activities).

Permanent- The population at risk is ordinarily located in the dam-breach inundation zone (e.g., As permanent residents); three consequence classes (high, very high, extreme) are proposed to allow for more detailed estimates of potential loss of life (to assist in decision making if the appropriate analysis is carried out).

[2] Implication of Loss of Life:

Unspecified – The appropriate level of safety required at a dam where people are temporarily at risk depends on the number of people, the exposure time, the nature of their activity and other conditions. A higher class could be appropriate, depending on the requirements. However, the design flood requirement, for example, might not be higher if the temporary population is not likely to be present during the flood season.

It should be noted that CDA recommends that incremental losses from hypothetical failure should be evaluated for two scenarios:

Sunny-day (fair weather/normal operations) – sudden failure that may be caused by internal erosion, piping, earthquake, mis-operation leading to overtopping, or another event.

Flood-induced – failure resulting from a natural flood of a magnitude that is greater than what the dam can safely pass.

The determined Dam Consequence Classification is then used to select appropriate design basis parameters such as the Inflow Design Flood (IDF), Earthquake Design Ground Motion (EDGM), and the standard of care expected of owners for the facility. EMLCI recommends minimum design criteria for TDFs as presented in Table 2-2 and for WMFs as presented in Table 2-2. CDA (2019) recommends for closed mine sites that higher minimum design criteria are used than those presented in Table 2-1 and 2-2 as there are less people and equipment on site available to observe and respond to events.

Table 2-2: Minimum Design Criteria for TDFs, from HSRC Guidance Document (EMLCI, 2016)

<table>
<tr><th rowspan="2">Dam Classification</th><th rowspan="2">Annual Exceedance Probability – Floods1</th><th rowspan="2">Annual Exceedance Probability – Earthquakes</th><th colspan="3">Minimum Static Factor of Safety</th></tr>
<tr><th>End of Construction</th><th>Long Term</th><th>Full or Partial Drawdown</th></tr>
<tr><td>Low</td><td rowspan="2">1/3 between 1/975-year event and the Probable Maximum Flood (PMF)</td><td rowspan="2">1/2,475-year return period</td><td rowspan="4">1.5</td><td rowspan="4">1.5</td><td rowspan="4">1.5</td></tr>
<tr><td>Significant</td></tr>
<tr><td>High</td><td>1/3 between 1/1,000-year event and the PMF</td></tr>
<tr><td>Very High</td><td>2/3 between 1/1,000-year event and PMF</td><td>½ between 1/2,475 and 1/10,000 or Maximum Credible Earthquake (MCE)</td></tr>
<tr><td>Extreme</td><td>PMF</td><td>1/10,000 or MCE</td></tr>
</table>

1. Based on a 72 hour event duration.

Table 2-3: Target Minimum Design Criteria for Water Dams on Mining Sites, from HSRC Guidance Document (EMLCI, 2016)

<table>
<tr><th rowspan="2">Dam Classification</th><th rowspan="2">Annual Exceedance Probability – Floods</th><th rowspan="2">Annual Exceedance Probability – Earthquakes</th><th colspan="3">Minimum Static Factor of Safety</th></tr>
<tr><th>End of Construction</th><th>Long Term</th><th>Full or Partial Drawdown</th></tr>
<tr><td>Low</td><td>1/100</td><td>1/100</td><td rowspan="5">1.3</td><td rowspan="5">1.5</td><td rowspan="5">1.2 – 1.3</td></tr>
<tr><td>Significant</td><td>Between 1/100 and 1/1,000</td><td>Between 1/100 and 1/1,000</td></tr>
<tr><td>High</td><td>1/3 between 1/1,000 and Probable Maximum Flood (PMF)</td><td>1/2,475</td></tr>
<tr><td>Very High</td><td>2/3 between 1/1,000 and PMF</td><td>½ between 1/2,475 and 1/10,000 or Maximum Credible Earthquake (MCE)</td></tr>
<tr><td>Extreme</td><td>PMF</td><td>1/10,000 or MCE</td></tr>
</table>

CDA also recommends minimum Factors of Safety (FOS) for seismic assessment of both the upstream and downstream dam slopes as outlined in Table 2-4.

Table 2-4: CDA Minimum Factors of Safety for Slope Stability – Seismic Assessment

Loading Conditions	Minimum Factor of Safety
Seismic	1.0
Post-Earthquake	1.2

3.0 CLIMATE REVIEW

Quinsam operates a weather station on the site that measures and records daily total rainfall, and daily maximum, average and minimum temperatures. Quinsam installed a Campbell Scientific SR50A sonic distance sensor to measure snowfall in 2020. It was installed in the summer of 2020, however no snowfall occurred in 2020 so it has not been included in the summary. Weather station data from January 2015 through December 2020 was provided for a climate review, this is a small dataset so frequent exceedances of historical maximums and minimums are expected.

Monthly temperatures for 2020 and the previous records are summarized in Figure 3-1. Temperatures were generally cooler in the first half of 2020 compared to historical temperatures. Historical low temperatures were measured in April, August, and October. The temperature range in October was particularly variable as both the historical minimum and maximum were exceeded.

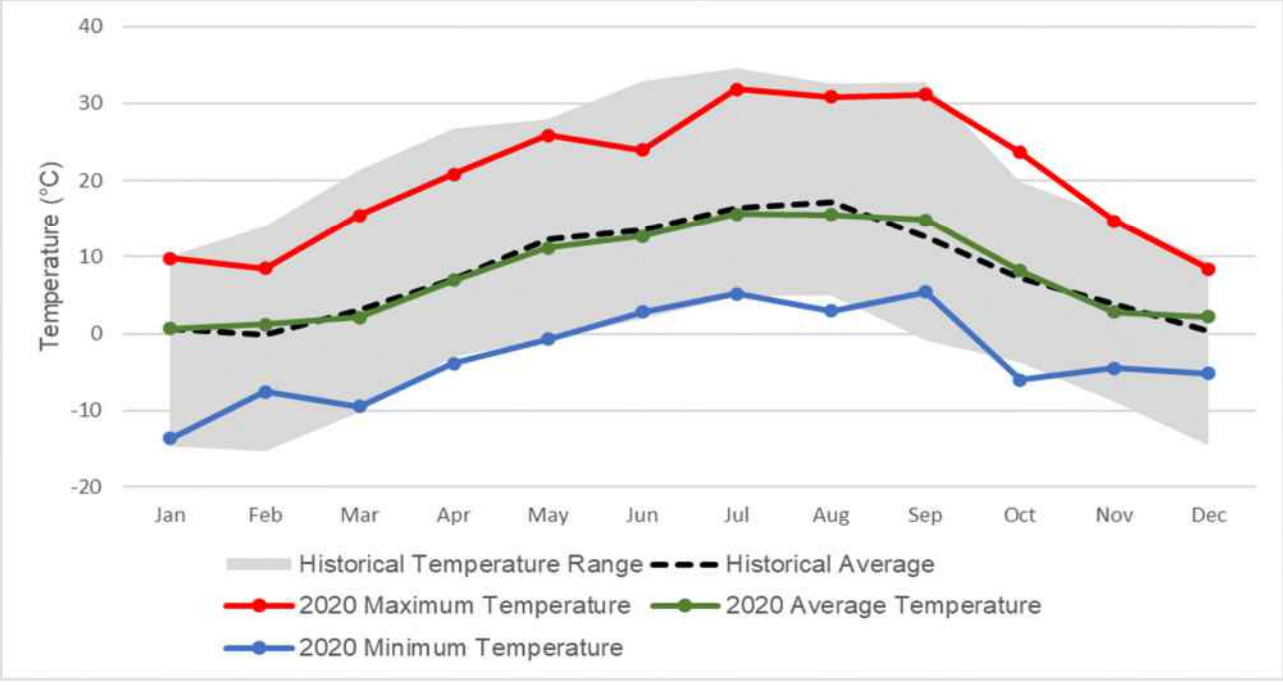


Figure 3-1: Historical Temperature Range and 2020 Measured Temperatures

Rainfall data for 2020 and the historical trends are shown on Figure 3-2. Snowfall is not included in the historical data. Based on this data, 2020 was relatively dry, with monthly rainfall below or close to average except for January which was wet. June was particularly dry with historically low total rainfall measured.

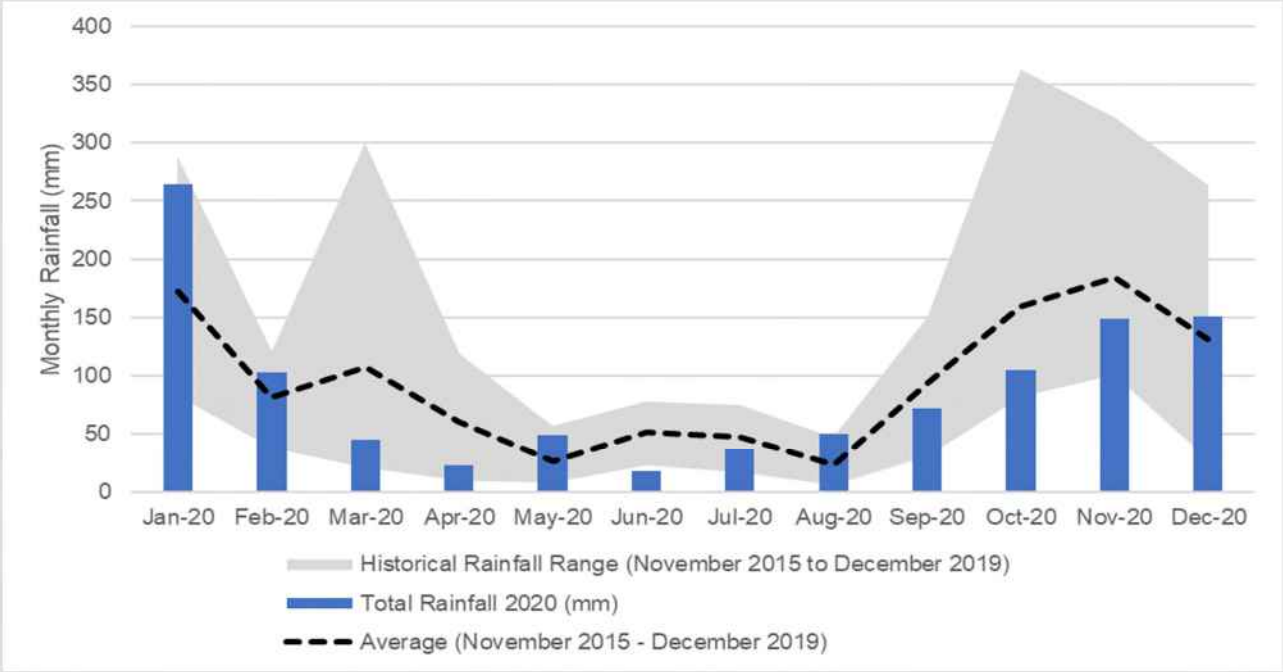


Figure 3-2: 2020 Rainfall Data

Total daily rainfall is shown on Figure 3-3. The largest storm events occurred in February and September. The largest 72-hour storm event in 2020 was 58 mm spanning September 24 to 27. This is a relatively small event compared to the largest storm recorded at Quinsam of 121 mm which occurred from October 14 to 16, 2016.

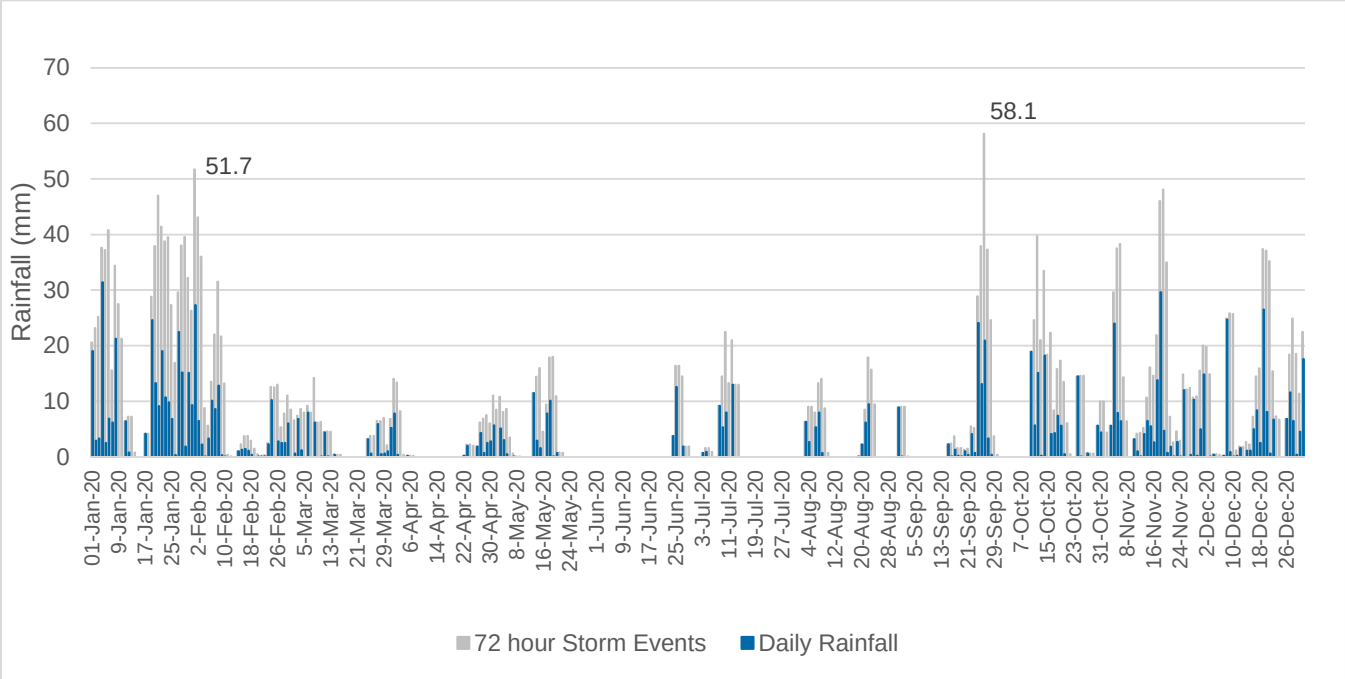


Figure 3-3: 2020 Total Daily Rainfall and 72 hour Storm Events

4.0 SITE DESCRIPTION AND HISTORY

Quinsam is located near the east coast of Vancouver Island, BC, approximately 28 km southwest of the City of Campbell River. Quinsam has two distinct mining areas with separate development histories. The south area includes the South Pit, portals to the south underground mines, 2SP, 3SP and SP1. The south area is located approximate 2.5 km south of site office, to the south of No Name Lake, Long Lake and the Quinsam River. The north area includes the site offices, Old TDF, 2-North Pit TDF, SP4 and portals to the north underground mines. The north area is located east of Middle Quinsam Lake and North of the Quinsam River. The site, the north area and the south area are shown on the attached Figures 1, 2, 3, and 4.

Mining began with excavation of the 2-North Open Pit in 1986. Excavation removed a major coal seam, described as 3 m to 4 m thick, that dipped east at approximately 5° to 10°. Coal was mined from west to east creating a sloped excavation with a 35 m highwall along the east side of the open pit. The open pit had a roughly rectangular footprint, approximately 200 m wide, east to west, and 1000 m long, north to south. Soils and waste rock removed from the open pit were stockpiled on the west edge of the pit. Towards the end of mining the open pit, a cast blast was carried out along the east highwall. The intention was to throw the overburden rock from the highwall across the pit onto the footwall, in an attempt to reduce the volume of overburden that needed to be stripped. However, the cast blast did not work as intended, the rock fragmented and heaved in place, resulting in a highly fractured rock mass. The fractured cast-blast material was partially removed and used for construction of the 2-North Pit TDF.

Mining operations then continued underground with construction of two portals near the middle of the open pit in the toe of the east high wall. The current portals are located between the downstream toes of the South Dam and 2-North Pit TDF. The two TDFs on site were built within the footprint of the 2-North Open Pit. The Old TDF was constructed in the north portion and was used to dispose of fine tailings between 1986 and 1994. The 2-North Pit TDF was constructed in the south portion of the open pit, and was used to dispose of tailings from 1995 to 2019. SP4 was constructed to the northwest of the former open pit in the early 1990s for water treatment.

Mining operations began in the south area in 1991 with development of the 1 South Open Pit, 2 South Open Pit and 3 South Open Pit. These South Pits were mined between 1991 and 1994. The south mine expanded underground starting in 1994 and continued until the recent present, with development of the 4 South, 5 South, 6 South and 7 South underground mines. SP1 was built in the south area in the early 1990s for water treatment. 2 South Open Pit and the 3 South Open Pit were then converted into the PAG-CCR waste rock management facilities 2SP and 3SP in the 2000s and 2010s.

Recently, ownership and the lifecycle phase of the mine has changed several times. Quinsam entered the Active Care and Maintenance phase of the mine's lifecycle in January 2016. Ownership then changed and the mine re-opened in the fall of 2017, returning to an Operation lifecycle phase. Operations continued until the summer of 2019 when the site was shut down due to bankruptcy of the owner. The site has returned to the Active Care and Maintenance phase of its lifecycle. Bowra is currently the Receiver for the site, responsible for coordinating necessary site maintenance and surveillance with approval from EMLCI.

5.0 WATER MANAGEMENT AND WATER QUALITY

5.1 Water Management

Water Management on site at Quinsam includes daily checks of the water levels, pumps and pipelines in the facilities by the site Shift Bosses, environmental team and technical services personnel (Quinsam, 2020). Water levels for major operating pumps are manually recorded daily by the Shift Bosses. The environmental and water management facility teams also carry out weekly checks of select sites. The system relies on regular manual input to maintain water levels in the ponds.

The site includes two distinct water catchment and management systems, the north system to the north of the Quinsam River and the south system to the south of the Quinsam River.

North Area

The north system includes dams of the 2-North Pit TDF, South Dam and SP4 WMF. Water from the 2 TDFs seeps or is siphoned into the underground workings, from which it is pumped into Brinco Brook which flows into SP4. SP4 also receives water from the 7-South underground mine, which is pumped to 5 South, to 2 North and then enters Brinco Brook from which it flows into SP4.

SP4 is the only permitted discharge location for the north water management system. If water quality meets permit requirements it is discharged into a channel and flows into the north end of Middle Quinsam Lake. If water quality does not meet discharge requirements it is pumped to the coal processing plant, from which it will be pumped to the TDFs or the coal processing plant ditch and re-enters the north water management system. Water is also occasionally pumped from SP4 to the 2-North PAG pond to retain the minimum required water cover. This is illustrated on Figure 1 of the OMS (Quinsam, 2020).

South Area

The south system includes the following facilities with dams: 2SP, 3SP and SP1. The water management requirements for this system are based on maintaining a water cover over 2SP and 3SP to prevent oxidation. Water from the upstream catchment can be directed into the 2SP, or two gate valves upstream of 2SP can be closed to direct this water directly into No Name Lake, from which it would flow to Long Lake

Water from the underground workings, including the 2 South Mine Pool and Long Lake Seep Passive System are pumped into 2SP for treatment. From 2SP water flows into 3SP, from which it can be pumped back to 2SP to maintain water cover or pumped to SP1 for discharge. From SP1 water can be discharged into Long Lake, or pumped back to 3SP. This is illustrated on Figure 14 of the OMS (Quinsam, 2021).

The south system was designed and constructed for passive operation, where overflow water from 3SP could discharge through a lined channel to No Name Lake. At this time Quinsam has not applied for a discharge permit for the system. Based on the current water management system, frequent operator checks, and input is required to maintain the pumps and prevent unregulated discharge from 3SP.

5.2 Water Balance

Freeboard is measured for the 6 facilities during the weekly inspections. Based on the records provided freeboard was maintained throughout the reporting period. Detailed water balances for volume pumped to/from the facilities is not kept.

No signs of inundation, flooding or overtopping were observed this year, so the facilities appear to be sufficiently sized and managed to handle the inflows from precipitation events that occurred in 2020. It is noted that 2020 was a relatively mild year for storm events.

5.3 WMF VWPs

Ten vibrating wire piezometers (VWPs) were installed near 3SP, SP1 WMF and SP4 WMF, during a subsurface investigation carried out by Golder in September 2018. The VWPs were connected to dataloggers, which automatically measure and record pressure and temperature twice per day. Due to changes in mine ownership a Factual Report documenting the instrumentation installation details was not published.

Without knowing the subsurface conditions where the VWPs are installed, it is challenging to interpret the variations in measured pressure, beyond noting changes which has limited value. Quinsam should make arrangements with Golder to finalize the Factual Report documenting subsurface conditions and installation methods, or perform drilling adjacent to the existing instruments to collect subsurface information.

Recorded data and graphs of pressure and temperature since installation, were provided by Quinsam for review as part of the owner weekly inspections. The trends from this data is discussed in the facility specific sections.

5.4 Water Quality Management Program

Quinsam collects water samples at the discharge of SP4 and SP1 as per Effluent Permit PE-7008 requirements. Samples are collected daily, weekly, monthly or bi-monthly depending on the measured flow rate at the facility outlet. Additionally, water samples from the 2SP and 3SP are collected and tested regularly (weekly or monthly) for SO4, alkalinity, acidity, pH and conductivity, and samples are collected bi-monthly for total and dissolved metals. A detailed description of water quality sampling is provided in the WMF OMS Manual (Quinsam, 2021).

Quinsam provided exerts for summary in this DSI from their Quarterly Water Quality Monitoring Reports which span the period of January to September 2020 (data from October to December 2020 was not available at the time of writing). These quarterly reports and Annual Water Quality reports are publicly available at the website http://www.quinsamcoalenvironmentalreports.com. These reports describe that water quality remained below effluent permit limits at the two discharge points for the TDFs and WMFs between January and September 2020. Environmental assessments are outside of the area of expertise of the authors of this DSI report, Quinsam's Water Quality Reports should be read for context and discussion.

6.0 2-NORTH PIT TDF

6.1 Facility Description and Construction History

The 2-North Pit TDF is in the south portion of the former open pit. It is a rectangular shaped facility contained on four sides by the North, East, South and West Embankments as shown on the attached Figure 4.

Construction started in 1994 with the South and North Embankments across the width of the open pit. The North Embankment was constructed near the center of the open pit, immediately south of the underground portals, and the South Embankment was located another 450 m further south, near the southern extent of the open pit.

The original facility design planned to contain the tailings with the two dams to the north and south, with the open pit highwall to the east and with a strippings spoil pile to the west. The East and West Embankments were added to the design in 2001, so the facility could be raised above the crest of the former open pit, which ranged from an elevation of 336 m to the north to 343 m to the south. The facility is currently permitted to an elevation of 355 m, and the embankments are currently at, or slightly above this elevation.

The facility is estimated to contain 1,100,000 tonnes of tailings. Tailings were initially deposited from a pipeline located on the South Embankment. During former operations, tailings were deposited from a pipeline located near the middle of the West Embankment. This formed a beach of coarse tailings that radiates out from the West Embankment as a relatively flat cone. In 2013 underground disposal of tailings began which reduced the yearly total volume of tailings deposited in the facility.

A combination of centerline and downstream raise methods were used to construct the dams. The following materials were used to construct the facility:

- Coarse Coal Rejects (CCR): described as a sandy gravel byproduct of coal processing. In older documents these are also called Coarse Rejects (CR).
- Cast Blast (CB): coarse rock or waste rock mined for coal recovery.
- Till: soil consisting of clay, silt, sand and gravel.
- Non-woven geotextile.

The East, South and West Embankments were designed to limit seepage, so included low-permeable fill layers consisting of compacted till. The North Embankment was designed to operate as a flow-through structure. Seepage water from the North Embankment collects near the toe of the downstream slope in the base of the former open pit.

6.1.1 North Embankment

The North Embankment is a combination of a downstream and centerline constructed dam, that is approximately 50 m high, 220 m long, and with a crest elevation between 354.7 and 355.9 m. The crest width varies between 20 m and 40 m wide. The downstream slope has 2 benches, below the lower bench it is sloped at approximately 2 horizontal to 1 vertical (2H:1V), between the two benches it is sloped at approximately 1.5H:1V, and above the upper it is sloped at approximately 1.4H:1V. The upstream side of the embankment is sloped at approximately 1.4H:1V. The North Embankment is built on the crest of a bedrock cut slope that is approximately 16 m high, and sloped at approximately 1.1H to 1.2H:1V (based on 1 m contours from the 2010 LiDAR). The area at the toe of the bedrock cut slope has a permanent pond from seepage from the TDF and from where the siphon line from the TDF discharges. Sections of the North Embankment are shown in Appendix B.

The North Embankment starter dam was constructed between 1995 and 1996. The east abutment of the starter dam was built over CB material in the bottom of the pit. The CB at this location was expected to be free draining and to contain less than 15% fines. The west abutment of the starter dam was built over the overburden stripping materials, which was described as a mix of glacial tills and highwall waste rock. The west abutment foundation was prepared by removing wet and soft material to create a key trench (Golder, 1996). The North Embankment was built to an elevation of 330 m using coarse CB for the downstream portion and finer CB for the upstream portion. CCR was also placed on the upstream slope, in an attempt to reduce seepage through the embankment.

Seepage and piping erosion was observed near the east abutment of the North Embankment in 1997. To address this, a secondary embankment of CCR was built immediately upstream of the starter dam, and the upstream slope of the starter dam was covered in geotextile. Additional CCR was then placed between the starter dam and secondary embankment to form a single embankment. Following this the embankment continued to be raised using CCR material.

Seepage with a high fines content was observed again in 2001. To reduce the migration of fines a toe filter, including layers of geotextile, was built along the downstream toe of the North Embankment in 2003. Additionally, the upstream slope of the North Embankment was covered in geotextile for future raises, approximately above elevation 337 m, to minimize the migration of tailings through the embankment.

6.1.2 South Embankment

The South Embankment is a downstream constructed dam that is approximately 45 m high and 130 m long. The crest is approximately 15 m wide and varies in elevation between 354.1 and 354.6 m. The downstream side of the embankment has one bench, the slope above and below the bench is at approximately 1.7H:1V. The upstream side of the embankment is also sloped at 1.7H:1V. Sections of the South Embankment are shown in Appendix B.

Construction of the South Embankment started in September 1994. To prepare the foundation, CB rock was removed from the footprint to expose competent, moderately strong, grey, siltstone and mudstone (Golder, 1996). The east highwall and west spoil pile were also stripped of loose material. The foundation was inspected and approved by a Golder representative. The starter dam footprint was described as 65.5 m wide near the east abutment and 41 m wide near the west abutment.

Raises to Elevation 340 m (near the crest of the east highwall) were constructed using CB material for the downstream portion of the dam shell, finer CB or CCR as a transition layer, and till for the upstream shell of the dam. The CB and CCR were nominally compacted by construction traffic. The till was compacted in 0.3 to 0.5 m thick lifts by passes of a sheep's foot roller, then tested using a portable nuclear densometer gauge. Till was compacted to between 90 and 100% of Standard Proctor Maximum Dry Density (SPMDD).

Above the elevation of 340 m, CCR was used to construct the middle and downstream portion of the dam, and till was used to construct the upstream shell of the dam.

To address seepage observed from the downstream toe, a toe filter berm with geotextile was constructed in 2002.

6.1.3 East Embankment

The East Embankment is a centerline dam, approximately 15 to 20 m high and 400 m long. The crest is between 15 and 22 m wide, and varies in elevation between 353.9 and 354.4 m. The upstream side of the embankment is sloped at 1.5H:1V. The downstream side of the embankment is sloped at an angle between 1.5H:1V and 1.8H:1V. A section of the East Embankment is shown in Appendix B.

The East Embankment was built along the crest of the open pit east highwall, which ranged in elevation from 336 m to the north, to 343 m to the south. Surface cracking of the bedrock was observed in the foundation footprint of the East Embankment. The cracking was inferred to be related to settlement caused by the underground workings. To prepare the foundation exposed cracks were infilled with CCR, covered with a layer of geotextile, and then covered in a 0.25 to 0.5 m thick layer of CCR.

The dam was built of CCR with a blanket of compacted fine-grained till placed on the upstream slope to reduce seepage.

6.1.4 West Embankment

The West Embankment is a centerline dam, approximately 430 m long. Its crest is about 10 m to 20 m wide and varies in elevation between 353.5 and 348.5 m. The upstream side is sloped at 1.5H:1V and the downstream side sloped at 1.7H:1V. Sections of the West Embankment are shown in Appendix B.

The embankment was built over the stripping spoil pile of overburden material from development of the 2-North Open Pit. The spoil pile is thought to consist of soil, cobbles and boulders placed to an approximate elevation of 345 m. The height of the constructed embankment and spoil pile is approximately 50 m.

The embankment was built of CCR with blanket of compacted fine-grained till placed along the upstream slope to reduce seepage.

A berm extending into the facility from the West Embankment was constructed in 2013. The purpose of the berm was to assist in removing and reprocessing the tailings, however after construction of the berm plans changed and tailings were not removed from the facility, but the berm was left in place.

6.2 2020 Operation, Surveillance and Performance

6.2.1 Owner Inspections

The 2-North Pit TDF was inspected 52 times in 2020 by Quinsam personnel, inspections occurred approximately once per week. The inspections are documented using checklist forms which are provided in Appendix C. Notable observations from the inspections are summarized in the table below.

Table 6-1: 2-North Pit TDF, Summary of Notable Observations from 2020 Owner Inspections

Notable Item	Location	Dates Occurred	Description
ITRB site inspection.	TDFs	February 26, 2020	ITRB site inspection.
Weir flooded by 2 North Portal Sump water	Seepage Weir at Downstream Toe of North Embankment	Jan 22 to Feb 5, 2020 Feb 27 to Apr 30, 2020 May 14 to Dec 30, 2020	Flow readings were visually estimated on these dates.
Water ponding observed on low points of crest	East Embankment Crest	Jan 22 to Jan 30, 2020 Apr 2, 2020 May 21 to May 28, 2020 June 25, 2020 Sept 23 to Sept 30, 2020 Oct 14 to Dec 30, 2020	Ponding described as relatively small.
	West Embankment Crest	May 21 to May 28, 2020 Oct 14 to Dec 30, 2020	
	North Embankment Crest	Sept 23, 2020 Oct 14 to Dec 30, 2020	
	South Embankment Crest	Oct 14 to Dec 30, 2020	
Vegetation Clearing	West Embankment	Apr 8 to Apr 30, 2020	Vegetation clearing used chemical and manual methods.
	South Embankment	Oct 7, 2020	

Notable Item	Location	Dates Occurred	Description
Shallow Erosion Gullies Formed	South Embankment Crest	June 4 to June 18, 2020	Erosion gullies that were up to 20 cm deep, 2 m wide, and 6 m long were observed and promptly filled in.
		Sept 30 to Oct 7, 2020	Two erosion gullies that were up to 30 cm deep that had developed were repaired
		Dec 16 to Dec 30, 2020	Previous erosion gully that had been infilled began to develop again to a depth of 5 cm.
	West Embankment	Sept 30, 2020	15 cm deep erosion gully was identified and repaired.
	Corner of South and West Embankments	Nov 4 to Dec 30, 2020	Erosion / washout noted on the downstream edge of the embankment crest that is 20 cm deep and 3 m long.
Maintenance Construction	North Embankment Crest	July 8, 2020	Crest was graded to fill in areas where ponded water had formed
		Aug 12, 2020	Crest was graded to prevent water ponding
	East Embankment	July 16, 2020	CCR was used to fill in low spots in the crest where ponded water forms
		Aug 19 to Aug 26, 2020	Embankment crest was graded to prevent water ponding
	West Embankment	Aug 26, 2020	Embankment crest was graded to prevent water ponding

As there are currently minimal staff and equipment on site, minor maintenance items require additional coordination to repair. It is understood that Quinsam personnel evaluates the features observed and coordinates maintenance based on their assessment of the risk, available resources and weather. Therefore, observations such as small ponding on the crest or shallow erosion gullies may be observed for several weeks or months before being repaired.

6.2.2 Tailings Deposition

No tailings were deposited in the facility in 2020.

6.2.3 Freeboard

The catchment area for the facility is limited to the perimeter embankments and is reported as 8.3 hectares (Quinsam, 2020). Freeboard is measured at a staff gauge located in the northeast corner of the facility, the staff gauge was surveyed to reference elevation in 2020.

Water discharges from the facility by seepage, evaporation, and siphoning. As the facility does not have an emergency spillway it must be operated with a maximum Normal Operating Water Level (NOWL) to contain the Inflow Design Flood (IDF). The NOWL for the facility is 352.6 m, which is equivalent to 1.4 m freeboard reading (Golder, 2019a).

Reported pond elevation and weekly total rainfall records provided by Quinsam, are shown on Figure 6-1, as can be seen water levels in 2020 were below the NOWL. Water levels in the pond were drawn down in early April in response to an ITRB recommendation that water levels in the TDF should be kept as low as reasonably possible to reduce immediate risk while the future of the dam is uncertain. The water level in the pond does not appear to be significantly influenced by rainfall. Based on the provided measurements the facility operated with more than sufficient freeboard throughout 2020 and there are no related dam safety concerns.

Figure 6-1: North TDF Pond Elevation Compared to Weekly Rainfall

6.2.4 Seepage Occurrence

Seepage is observed and recorded as part of the owner inspections. Seepage was observed from the bedrock below the northwest toe of the North Embankment where the weir is installed throughout 2020. Seepage at this location is expected, as the North Embankment was constructed of coarse material, and did not include layers of low permeability fill that would limit flow. There have been efforts to reduce risk associated with seepage in the past. A geotextile and CCR layer were added to the upstream slope of the embankment in 1997. A toe filter with geotextiles was added to the downstream toe in 2003.

A weir is installed near the seepage discharge location to measure and track flow rates. The largest calculated flow rate at the weir in 2020 was 2.5 L/s, the largest flow rate since installation in 2014, was 21.7 L/s on October 19, 2017. Figure 6-2 shows the 2020 calculated seepage flow rates provided by Quinsam, and total rainfall for the week before the weir measurement was collected. It is noted in the weekly inspections that the weir is frequently submerged by the ponded water at the toe of the North Embankment, when this occurs seepage flow rates are estimated by Quinsam personnel. It is understood that in early 2021 the operation of pumping the pond at the toe of the North Embankment changed so that the weir is no longer routinely flooded. Weekly rainfall does not appear to significantly influence the seepage rate based on the provided data. The highest seepage rates occurred in February and March which is when the pond level was highest, and following periods of high rainfall and therefore higher groundwater levels. There are no apparent related dam safety concerns based on the provided seepage measurements as seepage is expected in this location and seepage rates measured were lower than previous measurements so do not indicate signs of deterioration or change.

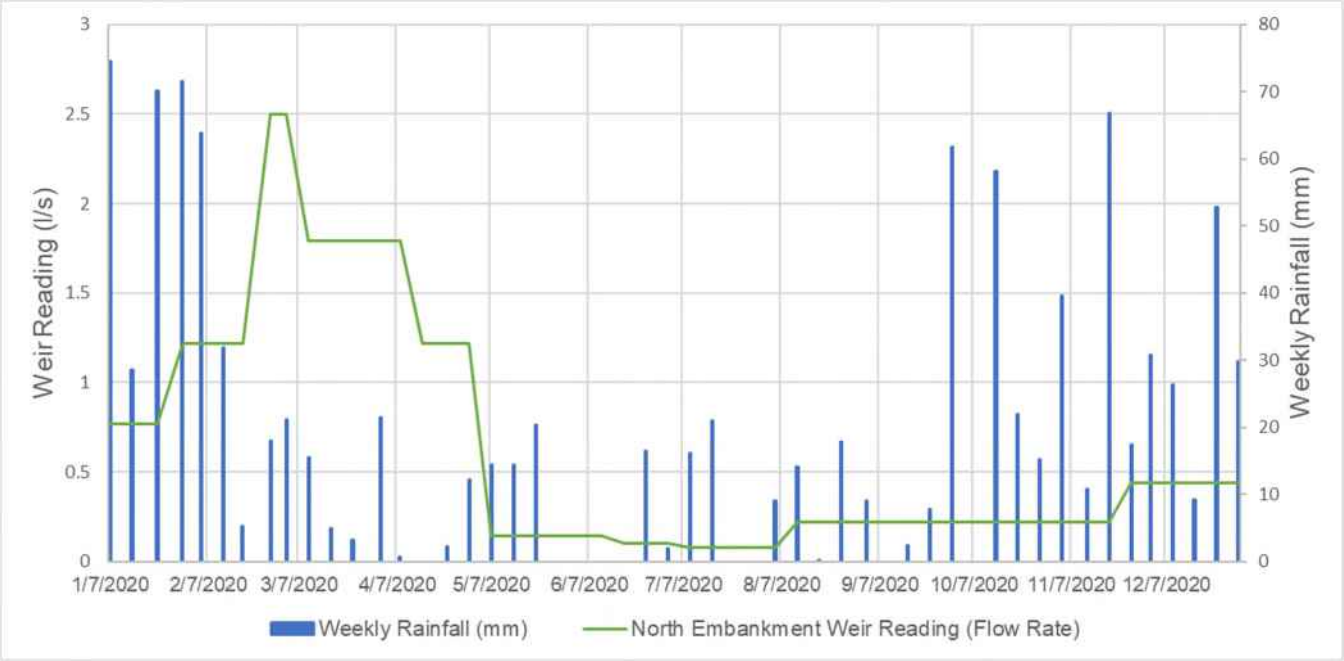


Figure 6-2: North TDF, Flow Rate at Toe Weir Compared to Weekly Rainfall

In previous years seepage was observed from the West Embankment during the wet seasons, this started in 2012. Seepage from this location was not observed in 2020 year during the weekly inspections. As seepage was not observed this year it is possible that seepage is related to tailings deposition and ponded water in the facility. In 2019 seepage was also observed from the South Embankment toe, however it was not observed in 2020, during the DSI site visit or during regular surveillance.

6.2.5 Piezometers

There are 4 functional VWPs located in the North Embankment for monitoring and tracking pore water pressures in the dam and the foundation. One is located below the centerline and three are located below the downstream slope. No piezometers stopped functioning in 2020, one piezometer stopped functioning in 2019 and has not been replaced.

The VWPs are manually read during the weekly inspections. The weekly piezometer readings are provided on the weekly inspection sheets in Appendix C. Based on the reported data, the VWPs did not exceed the trigger levels stated in the OMS Manual (Quinsam 2019). The data is summarized in Table 6-2 and shown on Figure 6-3 compared to weekly rainfall. As can be seen in Figure 6-3 the pressures measured by the piezometers are relatively constant throughout the year and there is limited correlation between VWP pressures and rainfall.

Based on conversations with Quinsam personnel, it was determined that the piezometer pressures are calculated using manufacture zero readings and not zero readings collected on site that would correct for differences in elevation. As the site is at approximately 350 m asl, and the instrument manufacture (RST Instruments) is at sea level, this difference would account for approximately 3 kPa of variation. This could explain why the piezometers regularly measure negative pressures, although would not change the trends observed.

The piezometers were significantly below the trigger levels, and did not indicate large rises or changes in pressure so there are not apparent concerns based on the pressure readings provided.

Table 6-2: Summary of 2-North Pit TDF 2019 VWPs Readings Provided by Quinsam

VWP ID	Tip Elevation (m)	Location	Trigger Level from OMS (kPa)	Maximum Recorded Pressure in 2020		Comments
				kPa[1]	Date	
VW0583	314.1	Below Crest	80	-2.7	February 18, 2020	Thermistor non-functional since July 2014.[2]
VW0584	316.0	Downstream	25	3.2	December 23, 2020	N/A
VW0586	316.2	Downstream	25	-3.0	November 19, 2020	N/A
VW16734	319.9	Downstream in CB	80	-0.2	May 28, 2020	N/A

1. Quinsam also does not apply an atmospheric correction factor to the piezometer pressure calculations, which results in an error of approximately 2 kPa.
2. Quinsam uses a temperature value of 0°C to calculate the reported pressures in this piezometer. Based on the temperature correction factor this results in an error of approximately 2 kPa.

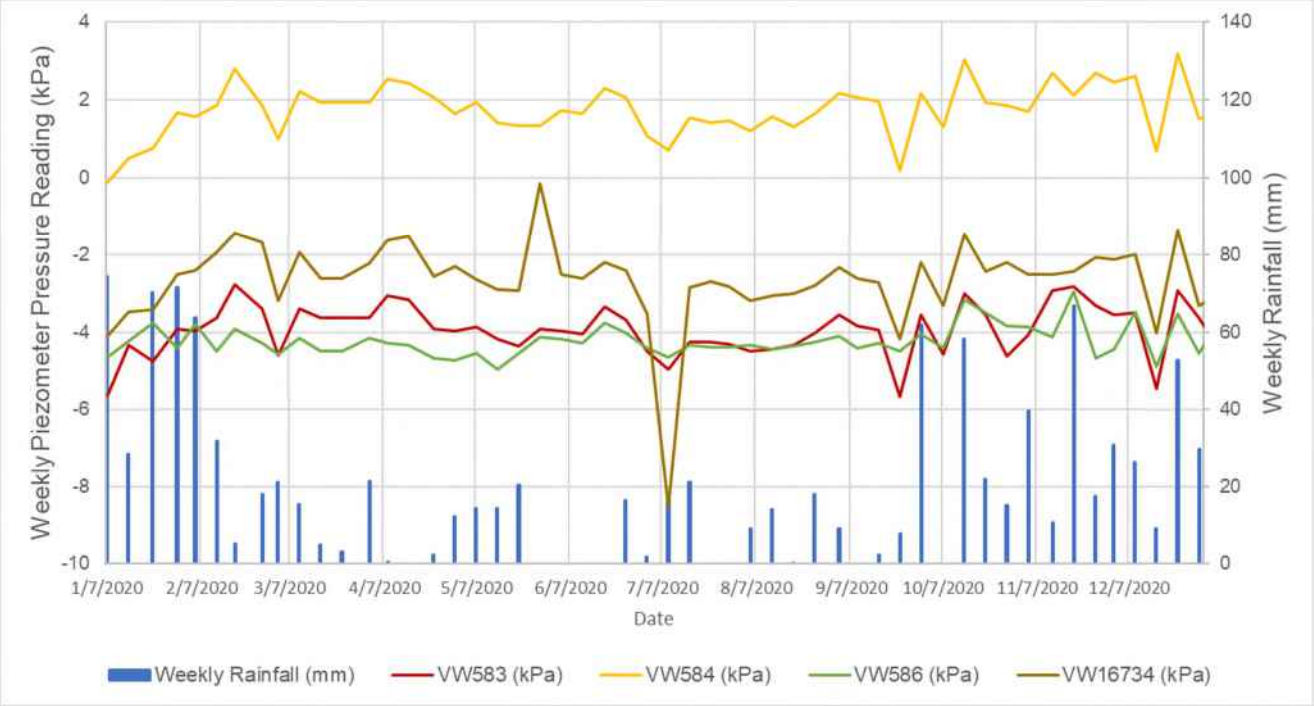


Figure 6-3: 2-North TDF, Weekly Piezometer Readings compared to Weekly Rainfall

6.2.6 Survey Monuments

Six survey monuments are installed on the 2-North Pit TDF embankment crests to monitor and track deformation and settlement of the embankments. There are three on the North Embankment, two on the South Embankment and one on the West Embankment. The survey monuments were surveyed in March and August 2020, the surveyed locations (in mine grid) are summarized in Table 6-3.

The survey data on March 11, 2020 was collected using a RTK GPS with Topcon HiperV Base and Rover. The reported accuracy for this survey instrument is 1 cm horizontal and 2 cm vertical. The survey data on August 31, 2020 was collected using a Trimble Total Station. The reported accuracy for this survey instrument is 4 mm horizontal and 1 mm vertical.

Table 6-3: 2020 Surveys of Monuments

	March 11, 2020			August 31, 2020		
Monument	Easting (m)	Northing (m)	Elevation (m)	Easting (m)	Northing (m)	Elevation (m)
SST-1 (Mon1)	99,382.501	103,064.088	355.228	99,382.497	103,064.095	355.231
SST-2 (Mon5)	99,417.431	103,042.275	355.701	99,417.430	103,042.275	355.709
SST-3 (Mon2)	99,453.832	103,020.490	355.657	99,453.709	103,020.586	355.653
SST-4 (Mon6)	99,282.786	102,622.377	353.965	99,282.785	102,622.379	353.971
SST-5 (Mon4)	99,221.547	102,642.873	354.892	99,221.539	102,642.871	354.895
SST-6 (Mon3)	99,190.567	102,768.655	354.896	99,190.558	102,768.656	354.899

Table 6-4 on the next page summarizes a review of the incremental and cumulative displacement of the monuments compared to the previously collected survey data. Horizontal movement of the monuments on the north, east and west embankments is generally minimal since installation, and can likely be attributed to survey error. The two monuments installed on the south embankments have moved approximately 35 mm to the east since the initial baseline was collected, most of this movement occurred between 2017 and 2018. This is relatively small and may be due instrument set up and sightlines to the monuments from the initial survey.

Vertical settlement has occurred in the west and south embankments. The majority of settlement occurred between 2017 and 2019, and there was minimal settlement between the two readings collected in 2020. The north embankment has shown the least amount of settlement since 2017. The embankments are predominantly built with CB and CCR material that was placed with minimal compaction so vertical settlement is expected.

There are no signs of deformation or settlement in 2020 based on the surveys of the monuments.

Table 6-4: Survey Monuments Movement Summary

		Cumulative Displacement		Incremental Displacement							
		Nov 2017 – Aug 2020		Nov 2017 – Oct 2018		Oct 2018 – Jan 2019		Jan 2019 – March 2020		March 2020 – Aug 2020	
Embankment	Monument	Vertical (mm)	Horizontal (mm)	Vertical (mm)	Horizontal (mm) / Azimuth	Vertical (mm)	Horizontal (mm) / Azimuth	Vertical (mm)	Horizontal (mm) / Azimuth	Vertical (mm)	Horizontal (mm) / Azimuth
North	SST-1 (Mon1)	-47	18	35	15/ 344°	-62	11/ 293°	-23	-13/ 261°	3	5/ 286°
	SST-2 (Mon5)	-22	13	-1	11/ 85°	-11	11/ 328°	-18	-10/ 241°	8	1/ 243°
	SST-3 (Mon2)[1]	n/a	n/a	n/a	n/a	n/a	n/a	-319	24/ 114°	n/a	n/a
South	SST-4 (Mon6)	-139	35	-30	36/ 136°	-97	-17/ 135°	-18	19/ 166°	6	-2/ 167°
	SST-5 (Mon4)	-144	36	-8	27/ 147°	-127	-9/ 251°	-12	15/ 180°	3	3/ 193°
West	SST-6 (Mon3)	-119	7	-5	17/ 80°	-113	121/ 355°	-4	-130/ 140°	3	-2/ 207°

1. Survey monument SST-3 was damaged and repaired several times since initial installation in 2017. Where incremental measurements are shown as n/a it indicates a new baseline was completed.
2. Azimuth is in mine grid.
3. Negative vertical movement indicates settlement.

6.2.7 Dam Survey

A ground survey of 2-North Pit TDF was completed in the summer of 2020 between August 31 and September 2 Table 6-5 summarizes our review of the 2020 survey data. The minimum dam crest from the survey was Elevation 353.9 m, which is 0.1 m lower than the previously reported minimum dam crest from the 2018 survey data. This variation is relatively small so is attributed to surveyors picking up different points on the ground or that the 2018 survey data was reviewed on the drawings and not as a full surface. As this variation in crest elevation is relatively small, re-evaluation of the facility capacity is not warranted at this time.

Table 6-5: Summary of 2020 2-North Pit TDF Survey

Area	Typical/Average Range m (Aug 31 - Sept 2, 2020)	Max Value m	Min Value m
North Embankment	355.3	354.9	354.7
East Embankment	354.2	354.4	353.9
South Embankment	354.4	354.6	354.1
West Embankment	354.9 north portion 354.2 south portion	355.4	353.9
Tailings Beach	3489.5 to 353.0 (increasing from east to west)	353.5	348.5

6.2.8 Construction and Repairs

As Quinsam is currently not in operation, limited construction work was performed in 2020. Minor repair work was carried out to clear vegetation, infill erosion gullies, infill low points on the dam crest and regrade the dam crest, as described previously in the summary of owner weekly inspections listed in Table 6-1.

The existing siphon line from the TDF was repaired on April 7, and water siphoned from the pond between April 8 and April 14 to lower the water level in the TDF pond.

6.3 2020 Dam Safety Inspection

Conditions observed appeared consistent with the Tetra Tech's previous Dam Safety Inspection in 2019. Observed features were identified as being generally in satisfactory condition. The following noteworthy conditions were observed:

- Minor ponded water was observed at various locations on the dam crest along the East, South, and North Embankments. On the crest near the middle of the East Embankment, there was an area of ponding with a pipe buried in the upstream dam crest to drain water into the TDF pond. The ponding should continue to be monitored and if it increases or continues to be concern, the crests should be graded to direct water into the TDF and avoid surface erosion.
- There was 4 m of observed freeboard, the crest is lowest along the West and East Embankments. There were also no signs of recent high water levels significantly higher than the observed level.
- There was seepage noted at the toe of the North Embankment. A weir for seepage measurement is located at the toe of the west abutment of the North Embankment. The weir was exposed and seepage was flowing through it. The seepage flow rate was relatively low which is what would be expected for April, the depth of flow through the weir was approximately 2 cm, which corresponds to a flow rate of 0.1 L/s. Based on the weekly

inspection records for 2020 the weir is frequently flooded; when this occurs Quinsam personnel described that they approximate flow by placing rocks in a similar weir shape upslope of the weir and estimating the depth of flow. It is understood that in 2021 pumping from the pond changes so the weir is no longer routinely flooded, if this changes and the weir is consistently flooded again it is recommended that the weir is relocated further upslope.

- Vegetation was growing on the west side of the North Embankment (Photo 5) and northwest corner of the TDF (Photo 25). The shrubs impeded the ability to make observations and the roots from the trees can create preferential seepage paths and weaker zones in the dam, so it is recommended that this is removed. The tree should be cut off and the stump/root ball left in place so as not to further disturb the dam structure. Chemical treatment could be considered to reduce regrowth. The rest of the dam was free of vegetation. Other locations where vegetation was observed in 2019 were free of vegetation showing an improvement in maintenance activities on the site and that chemical control of vegetation was successful.
- The north corner of the East Embankment is close to the angle of repose in the location where repairs occurred in 2019. Slope angles vary between 1.3H:1V to 2H:1V. No changes to stability were noted compared to the 2019 inspection. This area should continue to be monitored for evidence of slope instability.
- Animal tracks were noted near the middle of the East Embankment. Animal tracks were also noted on the North and East Embankments. The animal activity should continue to be monitored to ensure no burrows are made into the dam, or that significant traffic does not result in erosion.
- There was evidence of previous water ponding at the southeast toe of the South Embankment, although the area was dry during the inspection. No signs of internal erosion from the seepage was observed. This area should continue to be monitored.
- There is a single pipe through the West Embankment (approximately 3 m deep on the downstream side) which was used to deliver tailings to the pond. Quinsam personnel have identified that this pipe was installed between 1996 and 1997, and a portion beneath the haul road replaced in 2015. The pipes are surrounded with pea gravel. This should be considered in any changes to the TDF and water management plans.
- No cracking, slumping or evidence of instability was observed.
- No seepage was observed from the embankments, except at the North Embankment where it is expected.

Details of the inspection and photographs are provided in the Dam Safety Inspection Checklist in Appendix A.

7.0 SOUTH DAM

7.1 Facility Description and History

The Old TDF was used for tailing disposal between 1986 and 1994. It was constructed in the north portion of the 2-North Open Pit. Initially it was built and contained by three dams, the North Dam, Central Dam and South Dam, built across the width of the open pit, and contained to the east and west by the sides of the open pit. Between 2014 and 2017 tailings were removed from the cell between the Central and North Dam, and the area backfilled to surface with Non-PAG CCR, so the North Dam and Central Dam portion of the structure are no longer considered tailings dams (Quinsam, OMS, 2020). It is understood that the South Dam is retaining tailings and water. The location of the South Dam is shown on Figure 4 and plan and section layouts of the facility are provided in Appendix B.

7.1.1 South Dam

The South Dam is approximately 15 m high and 130 m long. The crest ranges in width between 5 m and 13 m, and varies in Elevation between 308.6 to 309.5 m. The upstream side of the embankment is sloped at 1.4H:1V and the downstream side is sloped at 3H:1V. The dam is located immediately north of the underground mine portals.

The South Dam operates as a flow through structure. Seepage flows through the dam and collects in sumps near the downstream toe near the 2-North Portal Sump or in the underground mine. It is then pumped to Brinco Brook, which flows into SP4, or to the north side of the Old TDF into the 2-North PAG Storage Facility.

There is limited design or construction information for the original South Dam. It is understood to have been constructed on a 7 m thick layer of waste rock that was end-dumped on the original open pit floor. Based on interviews with QCC personnel it is understood to have been constructed of CCR, waste rock and possibly till (Thurber, 2019a).

In 2010, the South Dam was raised to increase the flood storage capacity to contain the IDF, plus 1 m of additional freeboard. The dam was raised using a centerline construction method with the embankments built of CCR. The design elevation for the raise was 308.5 m. A significant volume of CCR was placed in the Old TDF between 2013 and 2017. This material is assumed to have reduced the flood storage capacity for the impoundment.

7.2 2020 Operation, Surveillance and Performance

7.2.1 Owner Inspections

The South Dam was inspected 52 times in 2020 by Quinsam personnel, inspections occur approximately once per week. The inspections are documented using checklist forms which are provided in Appendix C. Noteworthy observations from the inspections are summarized in the Table 7-1.

Table 7-1: South Dam, Summary of Notable Observations from Owner Inspections

Date	Key Observations and Summary of Weekly Activity
February 26, 2020	▪ ITRB site inspection.
March 11, 2020	▪ Four staff gauges installed and surveyed.
April 2, 2020	▪ Water ponding on crest from snow melt.
April 22, 2020	▪ Low spot on South Dam was filled with non-PAG CCR.
May 7 to June 18, 2020	▪ Vegetation clearing.
September 23 to October 14, 2020	▪ Water ponding in low spots of embankment crest.
November 4 to December 9, 2020	▪ Water ponding in low spots of embankment crest.

7.2.2 Freeboard

The catchment area for the South Dam, includes the 2-North Pit PAG storage facility, located to the north of the Old TDF, from which water seeps south and is retained by the South Dam. Seepage from the PAG Storage facility must pass through the North and Central Dams or through the foundations to reach the pond contained by the South Dam. The catchment area for the Old TDF is reported as 7.0 hectares (2020, OMS Manual). Freeboard is measured at a series of staff gauges located in the southwest corner of the facility, the staff gauges were installed and surveyed to reference elevation in 2020.

Water discharges from the facility by seepage, evaporation and siphoning. As the facility does not have an emergency spillway it must be operated with a maximum NOWL to contain the IDF. The NOWL for the facility is 303.5 m, which is equivalent to the freeboard reading 5.3 m (Golder, 2019b).

Water elevations were recorded during weekly inspections and are shown below on Figure 7-1 compared to weekly rainfall. The water elevation in the was consistently below the NOWL in 2020. The highest recorded water elevation occurred in February at 301.9 m. Rainfall does not appear to significantly influence pond levels in the facility.

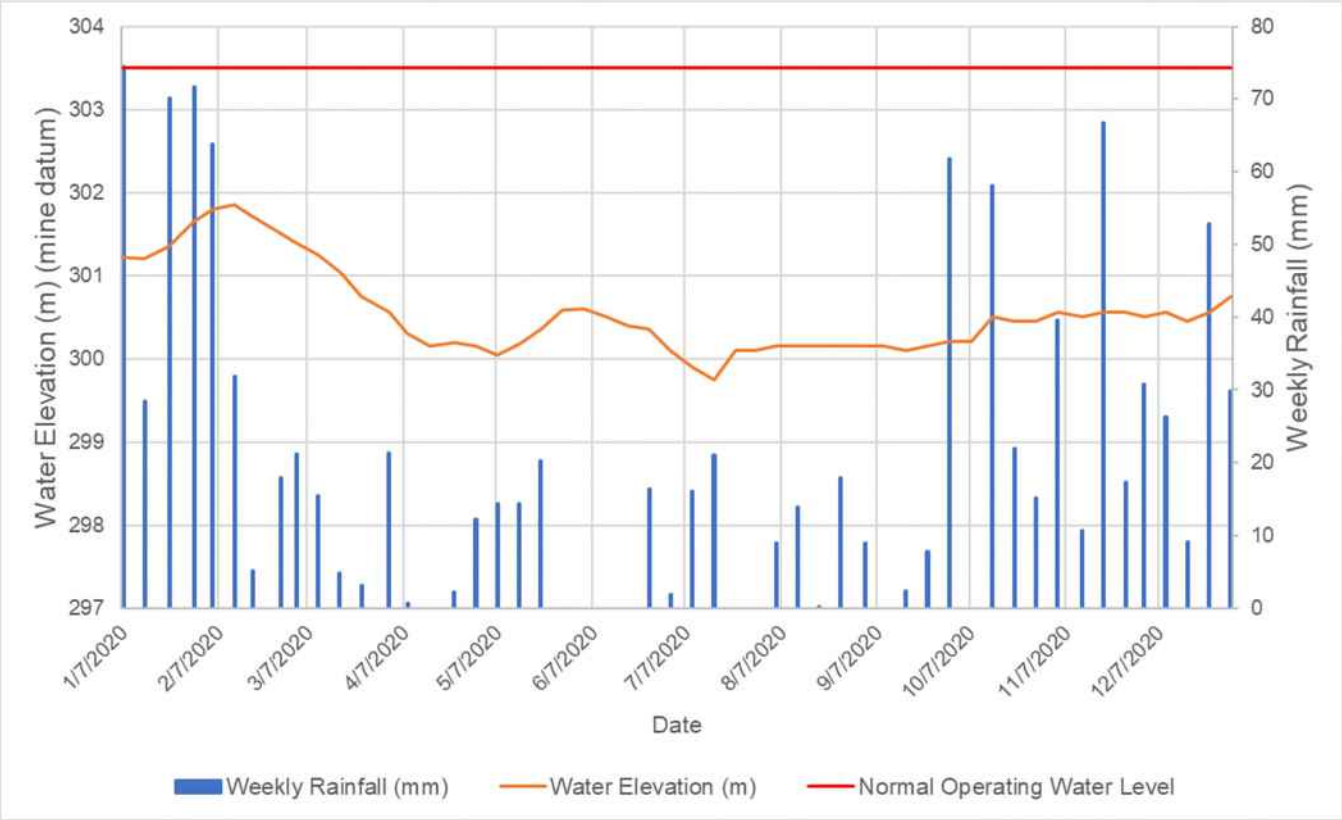


Figure 7-1: South Dam, Water Elevation Compared to Weekly Rainfall

7.2.3 Seepage Occurrence

Seepage was not observed from the South Dam in 2020 nor has it historically been observed in this area.

7.2.4 Dam Survey

A ground survey of the South Dam was completed in the summer of 2020. Based on our review of the 2020 survey data provided the minimum crest Elevation is 308.6 m and the maximum is 309.5 m. The minimum dam crest from the survey was 0.2 m lower than the previously reported minimum dam crest from the 2018 survey data. The minimum dam crest was located near the middle of the dam, between the two section drawings from the 2018 DSI

that the elevations are being compared to. This decrease in crest elevation is likely because a full survey surface is being compared to cross section drawings of previous survey data, although could also be due to settlement. If settlement of this magnitude continues to be observed it is suggested that survey monuments are installed to better track settlement. As this variation in crest elevation is relatively small the storage capacity for the dam has not been re-calculated at this time.

7.2.5 Construction and Repairs

As Quinsam is currently not in operation, limited construction work was performed in 2020. Minor repair work was carried out to clear vegetation, infill erosion gullies, infill low points on the dam crest and regrade the dam crest, as described previously in the summary of owner weekly inspections listed in Table 7-1.

7.3 2020 Dam Safety Inspection

Conditions observed appeared consistent with the Tetra Tech's previous Dam Safety inspection in 2019. Observed features were identified as being generally in satisfactory condition. The following noteworthy conditions were observed:

- There is one medium sized tree growing near the west abutment of the South Dam. The roots from this tree can create preferential seepage paths and weaker zones in the dam, so it is recommended that this is removed. The tree should be cut off and the stump/root ball left in place so as not to further disturb the dam structure. The rest of the dam was free of vegetation. Chemical treatment could be considered to reduce regrowth. It is understood that Quinsam removed this tree on June 9, 2021.
- There was some water ponding and vehicle ruts noted on the crest of the dam. The road runoff was concentrated causing small erosion rills to develop on the downstream slope. Due to the wide width of the dam this is not an immediate concern. This area should continue to be monitored if they increase in size the crest of the dam should be graded, and the ruts infilled to direct the surface water runoff into the Old TDF.
- There were three pipes running up the east abutment contact: one is on the surface and the other two are buried. Quinsam personnel have confirmed that there are no records for how the buried pipeline was installed. This should be considered in any changes to the TDF and water management plans.
- No cracking, slumping or evidence of instability was observed.
- No seepage was observed from the South Dam.

Details of the inspection and photographs are provided in the Dam Safety Inspection Checklist in Appendix A.

8.0 SETTLING POND 4

8.1 Facility Description

The SP4 is located in the north area of the mine site. The facility is located 650 m north of the site office and immediately west of the Quinsam Coal Access Road. The pond covers an area approximately 60 m by 140 m and has a capacity of approximately 32,500 m³ (Quinsam, 2021).

The facility is contained by natural topography to the north, east and south, and by a dam to the west. The dam is approximately 6.5 m to 8 m high, 105 m long and with a crest width of approximately 4.5 to 5.0 m. The dam crest is at an approximate elevation of 307.6 m. An emergency spillway is located near the north end of the dam and the spillway invert is approximately 0.3 m lower than the dam crest. There is a low level decant pipe that extends through the dam, with an inlet elevation of 305.1 m. The low level decant outlet pipe is 560 mm diameter and is made of HDPE. As-built drawings showing the low level decant pipe replacement are provided for reference in Appendix B.

The facility receives water from the 2 North and 7 South underground mines, 2 North Pit Sump, seepage pumped from the TDFs, and runoff from the coal preparation plant. The size of the catchment area is not specified in the documents that have been available for review. The low level decant outlet discharges to a stream which flows into Middle Quinsam Lake.

8.2 Design and Construction Background

Original construction records for the facility were not provided. The facility had a piping failure in 2003 which was repaired in 2004. The original facility construction and design are discussed in the 2003 design and 2004 repair reports (Golder).

The Golder 2003 repair report described the facility as being constructed in 1987 based on designs from Kohn Leonoff Ltd. (Klohn) and Ker, Preisman and Associates (KPA). The dam was described as approximately 8 m high and 100 m long. The original dam was described a homogenous till embankment, with a downstream toe drain, and a decant structure. The report also references as-built construction reports that were prepared by Klohn.

On December 22, 2003, QCC observed that SP4 had drained. Based on inspections and interviews with site personnel the failure was interpreted to be caused by piping erosion along the low level outlet decant pipe (Golder 2004). Golder designed a pipe replacement repair and provided Quality Control services during construction (Golder 2004). The repair consisted of removing the deteriorated decant pipe, replacing it with a HDPE pipe with concrete trench blocks, backfilling the trench with compacted CCR, installing welded geomembrane on the upstream dam slope, placing CCR over the geomembrane, then placing geotextile over the downstream toe to act as a filter.

8.3 2020 Operation, Surveillance and Performance

8.3.1 Owner Inspections

SP4 was inspected 35 times in 2020, regular documented inspections started at the end of April 2020 in response to a recommendation in the 2019 DSI that inspections of the WMFs should be documented. The inspections are documented using checklist forms which are provided in Appendix C. Notable observations from the inspections are summarized in the table below, only weeks with notable observations are included.

Table 8-1:Settling Pond 4, Summary of Notable Observations from Owner Inspections

Date	Key Observations and Summary of Weekly Activity
May 13 to May 20, 2020	Vegetation cleared from spillway
July 15, 2020	Water level is below staff gauge
December 22 to December 29, 2020	Water level is rising at 3-4 ft per day in the 2 North Underground due to pump breakdowns, so less water being pumped into SP4.

8.3.2 Freeboard

The water level in SP4 is measured at a staff gauge installed in the pond and is measured relative to the decant structure. Based on the repair as-built drawings the dam crest is at Elevation 307.6 m, and the decant is at Elevation 305.1 m (Golder, 2004), and from field observations the spillway invert is approximately 0.3 m below the dam crest.

Water elevations were recorded from the staff gauge during the weekly inspections, these levels compared to weekly rainfall are shown on Figure 8-1.

Based on the readings the water level in the pond was relatively constant throughout the year. Based on these readings, and design elevations, about 2 m of freeboard below the spillway was maintained throughout the year. Water in the pond was often above the level of the decant (i.e. the pond was discharging) except for 1 week in mid July, when it was noted in the weekly inspections that the plant pump was turned on and water from underground was being diverted into the 2 North PAG Pond. Rainfall does not appear to significantly influence pond levels in the facility. As most of the water entering the pond is being pumped from other locations on site, this would be expected as the water level would be controlled by pumping rate. Based on the provided measurements the facility operated with 2 m or more of freeboard to the spillway, so there are no related dam safety concerns.

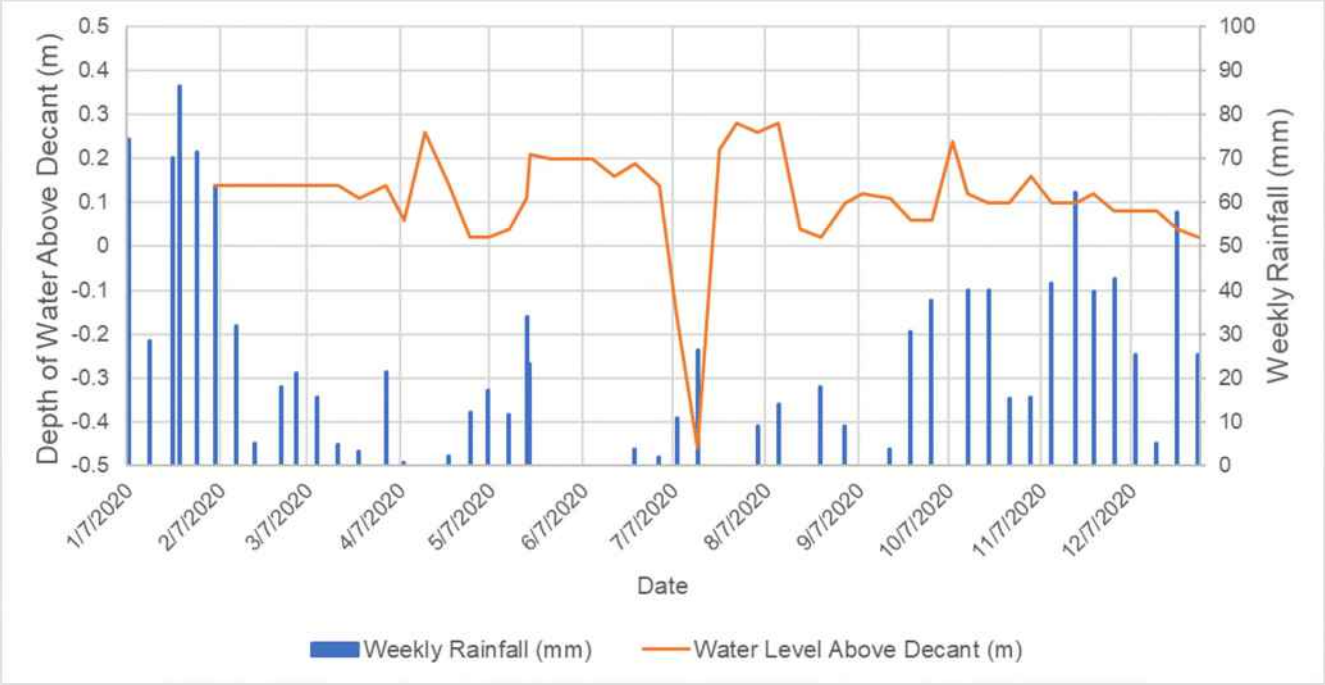


Figure 8-1: SP4, Depth of Water Above Decant Compared to Weekly Rainfall

8.3.3 Piezometers

There are shallow and deep VWPs installed in 1 borehole in SP4 dam near the low level outlet. These VWPs measured a similar trend of highest pressures recorded at the end of January, followed by a decrease in pressure until the end of summer, then were relatively constant for the remainder of the year. Graphs of the pressures and temperatures measured by the VWPs are provided on the owner weekly inspection reports in Appendix C. Based on information provided water levels are relatively constant in the embankment, varying by 0.2 m head.

8.3.4 Construction and Repairs

Minor repair work was carried out to clear vegetation on the dam crest and spillway, as described previously in the summary of owner weekly inspections listed in Table 8-1.

8.4 2020 Dam Safety Inspection

Conditions observed appeared consistent with the Tetra Tech's previous Dam Safety inspection in 2019. Observed features were identified as being generally in satisfactory condition. The following noteworthy conditions were observed:

- No signs of instability were observed on the embankment however significant shrubs and trees did impede inspection of the downstream and upstream slopes.
- The trees and small shrubs should be removed from the upstream and downstream slopes of the dam to better assess ground conditions. The shrubs impede the ability to collect observations and the roots from the trees can create preferential seepage paths and weaker zones in the dam, so it is recommended that they are removed. The tree should be cut off and the stump/root ball left in place so as not to further disturb the dam structure. Chemical treatment could be considered to reduce regrowth.
- The emergency spillway was partially infilled with gravel and was overgrown with vegetation. This reduces the capacity of the spillway and debris can be caught on the vegetation blocking flow during an emergency. Gravel and vegetation should be removed to improve the efficacy of the spillway and allow survey for future assessment. The trees should be cut off and the stump/root ball left in place. Chemical treatment could be considered to reduce regrowth.
- Downstream outlet of the decant structure was mostly submerged which prevented observations. The Quinsam Personnel described that the water at the outlet is never low enough to look in and inspect the inside of the pipe. The water ponding around the outlet was cloudy, as was the water retained by the dam so it was not possible to see if there were signs of seepage in the water.
- Seepage or signs of seepage were not observed from the downstream slope of the dam or toe in areas that were not submerged by ponding.
- No cracking, slumping or evidence of instability was observed.
- No ponding or rutting was noted on the dam crest.
- No erosion from waves was observed along the upstream dam slope.

Details of the inspection and photographs are provided in the Dam Safety Inspection Checklist in Appendix A.

9.0 2 SOUTH PIT

9.1 Facility Description

The 2SP is a subaqueous disposal facility for PAG waste rock, located in the former 2 South Open Pit. The facility was constructed by plugging 3 portals in the base of the open pit, lining the base and walls of the pit and waste dumps with compacted sand and bentonite, filling the interior with PAG waste rock, then once full the surface was flooded. The flooded surface area is approximately 100 m by 180 m. There is an internal dividing dyke built across the middle of the flooded area creating two pond; it is understood to have been built to increase the resident time

for the water, however design or construction records for this component were not provided. Design drawings for the facility are reproduced for reference and provided in Appendix B.

The facility is contained by pit highwalls to the east and southeast, by waste rock dumps to the west and southwest, and by a small embankment structure, that also acts as an overflow spillway, to the north. The north spillway structure is covered with a membrane, and was planned to be 6 m high with a 6 m wide crest. As the facility was partially constructed on, and is contained by waste rock dumps, the waste rock dumps to then north and northwest also retain the facility so could potentially be considered dams in consideration of the HSRC Guidance document definition (EMLCI, 2016). The waste rock dumps that could be considered as dams are approximately 10 to 20 m high, with crest widths varying between 20 and 50 m wide (Golder 2011c and 2011d). Determining the extents of the dam should be considered for future planning and investigation work.

The designed water storage capacity for the facility was 49,350 m³ assuming 1.8 m of water cover (Golder, 2011a). Water flows into the facility at the southeast corner, flows north across the facility, infiltrates through the interval dividing dyke and discharges at the northeast end. Water discharges over the overflow spillway, from which it flows into a 400 m long, riprap armoured, opened channel, to the 3SP facility. There is a small pond in the open channel spillway at the downstream toe of the waste rock dumps that could be considered dams.

9.2 Design and Construction Background

The 2-South Open Pit was mined between 1992 and 1993. Mining continued underground from 1994 to 1997, using three portals excavated near the east highwall of the open pit. The pit was approximately 50 m by 150 m in size, with a base Elevation near 331 m. The pit was contained by highwalls to the east and south, and by waste rock dumps to the north, west and southwest (Golder, 2011c). Prior to construction of the facility the open pit did not retain water (Golder, 2011d).

The facility was designed by Golder Associates Ltd. (Golder) between 2009 and 2011 (2011c). It was designed to store 155,000 m³ of PAG-CCR material under a water cover to limit oxidation. The design included plugging the three underground portals, recontouring the waste rock dumps, and constructing a sand-bentonite liner. The facility was designed to have PAG-CCR material placed to an elevation of 347.5 m, and had a spillway elevation of 349.3 m, resulting in a maximum water cover of 1.8 m (based on information provided by Quinsam, the as-built depth of water cover in the pond is 2.0 m). The design documents provided by Quinsam for review included a report called “Design Report for the Quinsam 2 South Pit PGA CCR Storage Facility” (Golder, 2011c), the design drawings attached to this report, and that are reproduced in Appendix B, specifically include the stamp “Not for Construction”. It is unknown if “Issued for Construction” drawings for the facility were produced.

Construction of the facility began in July 2012. Quality Control was performed by McElhanney Consultants Ltd. (McElhanney), and Quality Assurance by Golder, AEP permeability test by Thurber Engineering Ltd, and BAT permeability test by Quinsam staff. A completed as-built report for the project was not provided by Quinsam and is understood not to exist. The last construction document provided, was a draft Construction Status Report that was prepared by Golder in November 2012, and describes that approximately 80% of the sand-bentonite had been placed. The report also described that Golder had not received survey data, quality control data, contractor reports, deficiency repair reports and material quantity summaries (Golder, 2012b). It is unknown if these issues were resolved. Quinsam has located survey point files, and some lab testing results, these have not been reviewed by Tetra Tech at this time.

9.3 2020 Operation, Surveillance and Performance

9.3.1 Owner Inspections

2SP was inspected 35 times in 2020, regular documented inspections started at the end of April 2020 in response to a recommendation in the 2019 DSI that inspections of the WMFs should be documented. The inspections are documented using checklist forms which are provided in Appendix C. Notable observations from the inspections are summarized in the table below.

Table 9-1: 2-South PAG-CCR Pond (2SP), Summary of Notable Observations from Owner Inspections

Date	Key Observations and Summary of Weekly Activity
June 2 to June 10, 2020	▪ Vegetation was removed in the central dyke.
August 25, 2020	▪ Vegetation was removed from discharge channel and gate valves.

9.3.2 Freeboard

The catchment area for the 2SP is 44 ha, and described as relatively flat, hummocky, with a mixed land use of forest and open logged areas (Golder 2011a). Water from the catchment area collects in an open channel that can be directed, via two 250 mm diameter (10” diameter) gated valves, into 2SP or No Name Lake. Additionally water from the underground enters 2SP via pumping, from the underground it is pumped into the Long Lake Seep Passive Treatment System then flows via open channel to 2SP. Instantaneous inflow is measured daily by a data logger installed on a v-north weir in the inlet channel, this data was not provided by Quinsam. Figure 9-1 shows a comparison of depth of water level in the pond, water level in the inlet and weekly rainfall, in the figure Active Pumping into Pond identified when water is being pumped from the underground.

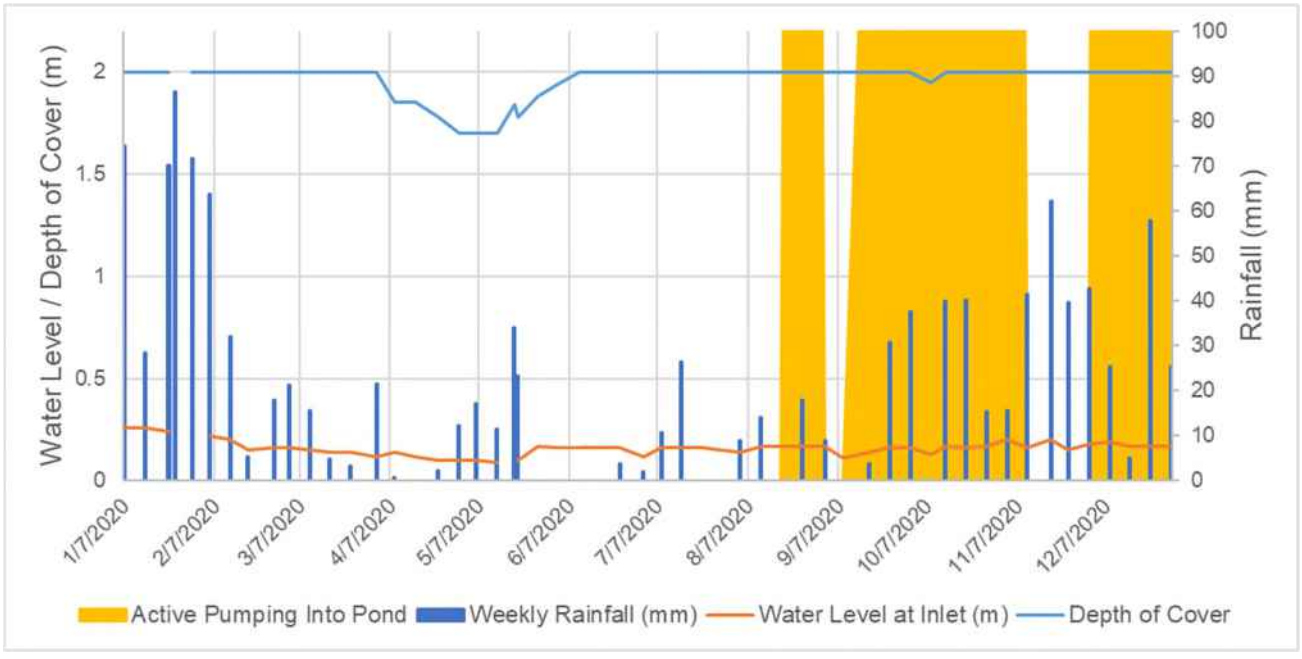


Figure 9-1: 2 South Pit, Water levels Compared to Weekly Rainfall

The water cover depth remained relatively constant throughout the year. The depth of cover and inlet flow does not appear to be significantly influenced by rainfall; it is understood that this is because of proactive water management by Quinsam personnel. There was periodic pumping from underground into 2SP starting in September. Based on the provided measurements the facility operated with the designed operational water cover throughout 2020 and there are no related dam safety concerns based on the readings provided.

9.3.3 Construction and Repairs

Minor repair work was carried out to clear vegetation on the dam crest and spillway, as described previously in the summary of owner weekly inspections listed in Table 9-1.

9.4 2020 Dam Safety Inspection

Conditions observed during the 2020 site visit appeared consistent with the Tetra Tech's previous Dam Safety inspection in 2019. Observed features were identified as being generally in satisfactory condition. The following noteworthy conditions were observed:

- Signs of instability around the facility were not observed, however the extent of the dam is not defined at this time. The crest and downstream slope of the waste dump that appears to retain the facility (north and northwest) was overgrown with vegetation obstructing observations. For the DSI inspection the break in the slope at the toe of what appears to be the waste rock pile was walked.
- The staff gauge in the 2SP pond was spun so it could not be read. This gauge was replaced with a staff gauge inside a vertical culvert in the internal dividing dyke of the facility, that vertical culvert is used for pumping water from the facility to SP1. If it is found that the staff gauge inside the vertical standpipe is not visible during routine inspections (for example due to water agitation from pumping), or that water levels in the vertical culvert appear different than the surrounding ponds the staff gauge in the pond should be replaced.
- There was significant number of shrubs (broom) growing on the crest and downstream slope of the waste rock pile that could be considered a dam. These shrubs should be removed as they impede the ability to collect observations in changes of stability or seepage. These should be removed by cutting off at the ground and leaving the roots in place to not further impact the dam structure. Chemical treatment could be considered to reduce regrowth.
- Small tears were observed in the membrane liner on the overflow spillway. These should be monitored, and the membrane patched if the tears increase in size.
- A 15 m long section of riprap across the width of the outlet channel near the downstream toe (of the waste rock pile that could be considered a dam), has degraded significantly due to isolated poor rock type. It is recommended this riprap is replaced to prevent erosion of the channel during large flow events that could lead to further instabilities/dam safety concerns.
- Ponded water was observed at the toe of the dam. This pond was connected by a channel to 3SP, and the channel had water flowing in it (estimate flow rate of 1 L/s), the flow could be from groundwater discharging or seepage from 2SP. The channel had small trees growing in it. It is recommended these trees are removed so that debris will not be caught on them blocking the channel. The tree should be cut off and the stump/root ball left in place.
- No cracking, slumping or evidence of instability was observed.
- No ponding or rutting was noted on the dam crest.

- No erosion from waves was observed along the upstream dam slope.

Details of the inspection and photographs are provided in the Dam Safety Inspection Checklist in Appendix A.

10.0 3 SOUTH PIT

10.1 Facility Description

The 3SP is a subaqueous disposal facility for PAG waste rock, located in the former 3 South Open Pit. The facility does not have a liner as the interior of the pit was filled with PAG waste rock before a design to flood the facility was created.

The flooded area is approximately 40 m by 200 m. It is contained by natural topography to the east and west, a dam at the north end, and a spillway, that could also be classified as a dam structure at the southwest end. Appendix B includes design drawing reproduced for reference of the north dam and a design for the 2SP and 3SP water management system that includes a conceptual design of the south spillway.

Based on the design report (Golder 2012a), the dam at the north end was planned to be built on bedrock, and be approximately 50 m long, 3.8 m high and with a crest 6.0 m wide. The design assumed the dam was going to be built on bedrock but that this would be confirmed by field reviews during construction. Construction records were not provided for this structure.

Field observations made in December 2019 and May 2021 by Tetra Tech, indicate the dam is likely significantly higher than designed. The downstream slope of the dam was benched, and the toe of one of the lower benches was supported by concrete lock blocks, at the crest of a steep slope (estimate as 30-35°) with mature trees. Lock blocks were not a component in the 2012 design. Below the lock blocks it appeared that fill had been pushed against the trees, as the root flares were covered and the trees were leaning. Based on field observations, in consideration of the HSRC Guidance Document's description that natural pillars should be considered part of the dam, the height of the dam could be up to 20 m. Determining the extents of the dam should be considered for future planning and investigation work.

The spillway at the south end of the facility was observed to have been built over what appeared to be fill. Reports for the detailed design or construction of this structure were not provided. If the spillway was built on fill, the fill could be considered a dam for regulatory purposes, which would mean the height of the dam could be up to 20 m. The abutments are unclear so the length of this potential dam is unknown Confirming if this is fill, and the extents, should be considered for planning future investigation work.

The designed water storage capacity for the facility was 38,912 m^3, assuming 2.5 m of water cover (Golder, 2011a).

10.2 Design and Construction Background

The 3 South Open Pit was developed and mined between August 1993 and March 1994. Dimensions and elevations of the original pit are unknown. The pit was then used as a disposal site for PAG CCR, the time frame of disposal are unclear based on the provided information. Quinsam reported that 196,793 tonnes of PAG-CCR from the 4 South Open Pit was disposed in the 3 South between 1998 and either 2003 or 2009 (Quinsam, 2017 or 2020). The PAG-CCR was placed to an elevation of 324.4 m (Quinsam, 2020).

A water management plan for the south area was prepared by Golder in conjunction with the plan for the 2SP facility (2011a). This plan included a conceptual design profile for the 2SP and 3SP facilities and the connecting channels. It also included a conceptual section and profile of the south spillway, but did not show or discuss subgrade conditions. The design was stamped “Not for Construction” and included the note “spillway dimensions to be updated in detailed design”. From this drawing the spillway was 1.05 m deep, 6 m wide, covered with non-woven geotextile and riprap and had an invert elevation of 327.15 m. This is approximately 1.8 m below the designed North Dam crest.

In 2012 a design for permanently flooding the facility was prepared by Golder (2012a). The design included a dam built across the north end of the facility, that would be approximately 3.8 m high, with a 6 m wide crest and built to an elevation of 329.0 m. The design was based on a single nearby borehole that was drilled to install a monitoring well in 2000. The borehole encountered 1.5 m of rockfill overlying shale and coal bedrock. The design for the facility included excavating a cut-off key trench and constructing a downstream toe drain. Armouring of the upstream dam slope was also included in the design. In later documents this dam was called the “East Dyke”, this is attributed to the difference of using cardinal north and the local mine grid coordinate system. The design memorandum did not discuss the southwest spillway.

Quinsam personnel constructed the north dam and south spillway between 2016 and 2017. Construction activities were inspected internally by Gary Gould, P.Eng. (Quinsam Mine Manager), with compaction testing being carried out by McElhanney (Quinsam, 2020). Construction is reported to have followed the 2012 Golder design, but did not include construction of the toe drain. Photographs showing construction of the cofferdam built prior to construction of the dam were provided by Quinsam for review in 2020. Photos of construction of the dam have not been located. Quinsam personnel described that they found compaction testing records that indicate 12 nuclear densometer tests were performed during construction, 10 of which failed to meet the specified compaction. These testing results have not been reviewed by Tetra Tech at this time.

10.3 2020 Operation, Surveillance and Performance

10.3.1 Owner Inspections

3SP was inspected 35 times in 2020, regular documented inspects started at the end of April 2020 in response to a recommendation in the 2019 DSI that inspections of the WMFs should be documented. The inspections are documented using checklist forms which are provided in Appendix C. Notable observations from the inspections are summarized in the table below.

Table 10-1: 3-South Pit Pond (3SP), Summary of Notable Observations from Owner Inspections

Date	Key Observations and Summary of Weekly Activity
May 6, 2020	▪ Inclined trees at the downstream slope of the embankment were identified.
May 20, 2020	▪ Small amount of ponding in low spots of embankment crest
June 24 to July 15, 2020	▪ Vegetation clearing on embankment crest
December 22, 2020	▪ Ponding/frozen water on embankment crest.
December 29, 2020	▪ Inclined trees previously identified in May appear to be leaning more. These leaning trees were cut down by Quinsam in April 2021, Section 10.4 has additional details about this.

10.3.2 Freeboard

The catchment area for the 3SP is 30 ha and described as relatively flat, hummocky, with a mixed land use of forest and open logged areas (Golder 2011a). Water entering 3SP is monitored at a weir immediately upstream of the facility. Water flow is monitored using a sonic water level sensor, coupled with an LCD readout that displays real-time information on the flow rate. Water enters the facility from the channel from 2SP, or via a siphon hose from the SP1.

The 3SP facility is used as a subaqueous PAG storage facility so adequate water levels in the facility must be maintained. The dam was designed to be built to Elevation 329 m, and the spillway was designed to be built to Elevation 327.15 m (Golder 2011a and 2012a). A staff gauge in the facility is used to monitor water levels. Water level in the facility is controlled by an electric floating pump that turns on if the water level rises above 1.8 m on the staff gauge. During the dry season water is pumped back into 2SP to maintain water cover in the facility. During the wet season water is pumped to SP1 for discharge.

3SP has a spillway near the south end that discharges to a constructed channel that enters a natural channel between No Name Lake and Long Lake. A discharge permit for 3SP has not been applied for, so the spillway cannot be used.

Water elevations were recorded from the staff gauge during the weekly inspections, these levels compared to weekly rainfall are shown on Figure 10-1. It is understood that the staff gauge is measuring depth of water cover above the CCR. The pond level remained relatively constant throughout the year, which is expected as the facility is required to have a minimum water cover, and has a floating pump that will turn off if the water level exceeds 1.8 m depth. The highest water level in the pond was 2.0 m water cover which was measured for 1 week in January, which is when several large rainfall events occurred. The constant higher water level between April and August is understood to be when additional water was directed into 2SP from the upstream catchment which would then flow into 3SP; during the winter season water from the upstream catchment bypasses the 2SP and 3SP system. Based on the provided measurements the facility operated with the designed water cover (between 1.0 and 1.8 m depth) throughout 2020. Based on the spillway invert elevation from the design drawings there was between 0.8 and 1.5 m of freeboard during the year. Maintaining this freeboard requires monitoring and adjustment by on site staff to ensure there is no discharge.

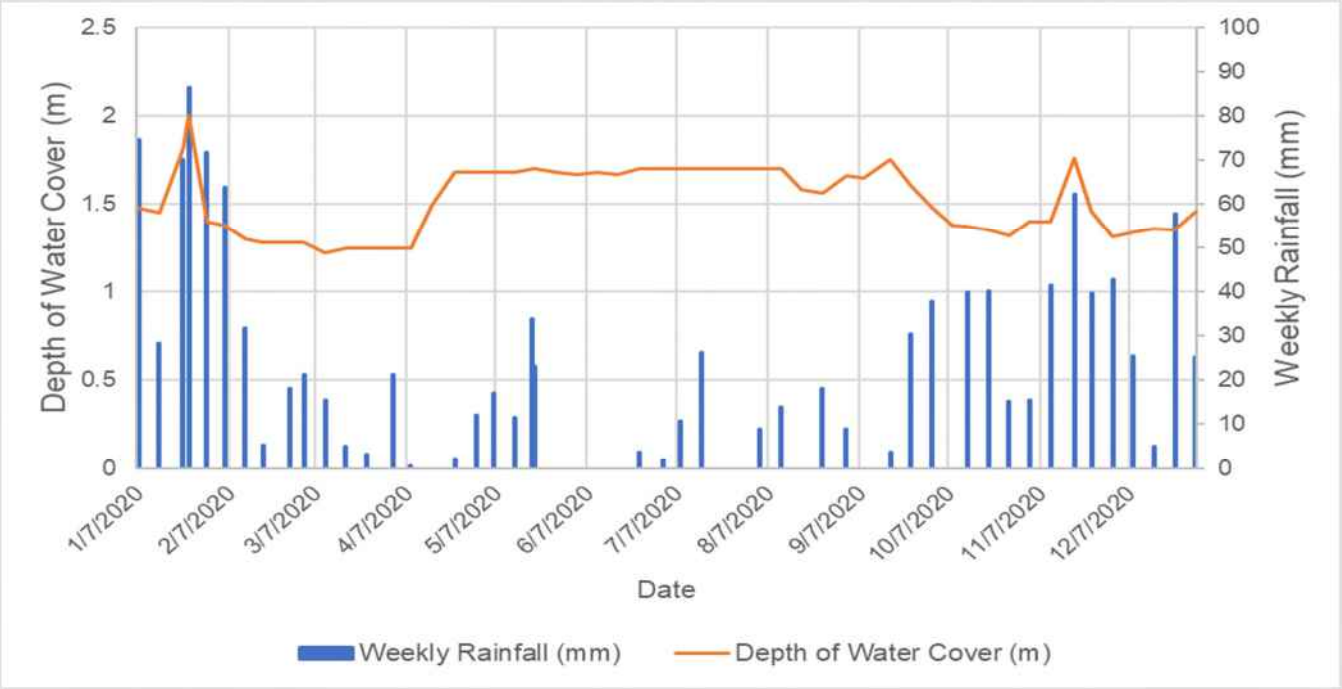


Figure 10-1: 3 South Pit, Depth of Water Cover Compared to Weekly Rainfall

10.3.3 Piezometers

There are four VWPs (2 shallow, 2 deep) installed in 2 boreholes in the 3SP dam. These VWPs measured a similar trend of highest pressures recorded at the end of January, followed by a decrease and relatively constant pressures throughout the remainder of the year. The increase in pressure in January corresponds with when pond levels were highest at 2 m depth and shows a 1 m rise in head compared to the lowest measurements. Whereas when the depth of water cover is maintained at 1.8 m, the VWPs measure a constant pressure approximately 0.5 m head above the lowest measurements. Graphs of the pressures and temperatures measured by the VWPs are provided on the owner weekly inspection reports in Appendix C.

10.3.4 Construction and Repairs

Minor repair work was carried out to clear vegetation on the dam crest and spillway, as described previously in the summary of owner weekly inspections listed in Table 10-1.

Quinsam personnel also described that in April 2021 the leaning trees near the lock blocks were cut, then after being cut one stump/root ball fell out of the soil, the hole created from the stump/root balls was immediately backfilled with nearby fill. Quinsam described the source of the fill material was the same borrow that was used for construction of the dam.

10.4 2020 Dam Safety Inspection

Conditions observed during the 2020 site visit appeared consistent with the Tetra Tech's previous Dam Safety inspection in 2019, except for the downstream slope of the North Dam where additional signs of instability were observed. The following noteworthy conditions were observed:

- North Dam:
  - The north end of the pond is retained by an earthfill dam. The downstream slope is benched, and the toe is supported by concrete lock blocks. Near the lock blocks it appears that fill has been pushed against alder trees that have been cut off. Recent fill was also observed around the lock blocks. Quinsam personnel described that in April 2021 the trees were cut down because they were leaning, then the stumps/root balls of the trees fell out of the soil, so fill was placed in the holes. Signs of continual creeping and instability based on the leaning trees were observed. This area also had several other leaning/snagged trees that were caught on other trees creating hazard conditions (i.e. window makers) preventing detailed review of the slope. In consideration of these observations and that there are not documented as-built records for this dam, and the records that have been found indicate the fill was placed below design density, it is recommended that the reservoir level in the pond is kept low (i.e., spillway cannot be used for discharge) until additional investigations and assessments are performed for the dam. This recommendation does not change the current operation of the pond as the spillway currently is not permitted for discharge and water level is pumped when depth of cover exceeds 1.8 m. It is also recommended that if Quinsam personnel observe changes to stability in this area that require assessment or repair that a geotechnical engineer experienced with dam safety is consulted for advice.
  - Small erosion rills were observed on the upstream slope of the dam. These should be monitored and if they increase in size repaired.
  - Ruts from vehicle traffic were observed on the embankment crest. These were relatively small, so should be monitored and if they increase in size repaired. It is recommended that barriers are placed to prevent vehicle traffic on the dam crest.
  - The toe of the upper bench on the downstream slope was moist, with a water content above the plastic limit of the soil. The area where the moisture was observed was above the pond level, so the water is inferred to be from rain and not related to seepage.
  - No seepage was observed from the dam.
  - No erosion from waves was observed along the upstream dam slope.
  - The constructed embankment was free of vegetation.
- Spillway:
  - The area to the northwest of the spillway was irregular and appeared to be comprised of fill. No construction records were available, so it is unknown if the spillway is cut into fill/old spoil or natural ground.
  - The outlet channel had small trees growing in it. It is recommended that these are removed as debris may be caught on them impeding flow during large rainfall events. These should be cut off and the stump/root ball left in place.
  - Facility does not have a permit to discharge water, so water was actively being pumped. This requires frequent operational input and adjustments.

Details of the inspection and photographs are provided in the Dam Safety Inspection Checklist in Appendix A.

11.0 SETTLING POND 1

11.1 Facility Description

SP1 receives water from the south mine area and is used to support water management in the 2SP and 3SP facilities. It is the only permitted discharge location for the South Water Management Area. The flooded area of the facility is approximately 70 m by 200 m, the capacity of the pond is unknown.

The facility is contained by natural topography to the east, south and west, and by an earthfill dam to the north. The dam is approximately 4.5 m high, 170 m long, with a crest width of 4 m at an Elevation of 358 m. Water discharges from the facility through a low level decant outlet, with an Elevation of 355.3 m, into a bedrock channel that discharges to Middle Quinsam Lake. The visible downstream pipe is solid steel, with 2 cm thick walls and is 50 cm in diameter.

There is an overgrown emergency spillway at the east side of the dam with an approximate Elevation of 357 m.

There is also a hose in the facility for pumping water between SP1 and 3SP. Design drawings for the dam are reproduced for reference and provided in Appendix B.

The size of the catchment area for the facility is not specified in the documents that have been available for review.

11.2 Design and Construction Background

A design for the dam was prepared by Thurber Engineering Ltd. (Thurber) and Ker, Priestman and Associates Ltd. (KPA) (Thurber, 1990). The design was based on a test pit excavation carried out by Thurber in October 1990. The subsurface investigation included test pits excavated below the proposed dam location, and test pits to assess adjacent borrow material. The material below the proposed dam was described as dense sand and gravel up to 2.8 m thick, underlain by very dense, till-like, silty sand, underlain by moderately strong sandstone bedrock. The maximum depth to bedrock was 3.5 m. The bedrock could be excavated with a ripping bucket to a depth of 0.7 m. Groundwater was not encountered during the investigation.

The Thurber 1990 design included a low permeability core (referred to as an “impervious core” in the design report, but based on the proposed material grain size gradations, Tetra Tech has inferred it would have a low permeability), drainage blanket, downstream toe, riprap bedding, riprap, and a decant structure. The design described that foundation preparation should include excavating a trench to expose competent bedrock along the dam core.

The design report also included the following paragraph, describing uncertainty about the proposed dam location.

“*Subsequent to completion of the field investigation program, KPA proposed relocating the centerline of the dam approximately 30 m upstream of the location that was investigated. The dam design presented in this report is suitable for the soil conditions encountered at the location investigation. If soil conditions vary at the upstream location, revisions to the dam design may be required.*”

A permit approval document from EMPR dated May 1991, indicates the facility was approved based on the Thurber 1990 design. Subsequent construction records for the facility were not provided, so it is unclear if the Thurber 1990 design was constructed, if the dam was relocated, or if foundation preparation occurred as specified in the design report.

11.3 2020 Operation, Surveillance and Performance

11.3.1 Owner Inspections

SP1 was inspected 36 times in 2020, regular documented inspections started at the end of April 2020 in response to a recommendation in the 2019 DSI that inspections of the WMFs should be documented. The inspections are documented using checklist forms which are provided in Appendix C. Notable observations from the inspections are summarized in the table below.

Table 11-1: Settling Pond 1, Summary of Notable Observations from Owner Inspections

Date	Key Observations and Summary of Weekly Activity
Feb 12, 2020	▪ During routine inspections noticed that ditches to drain ponding on the dam crest were excavated to drain onto the downstream slope of the dam. Notification to staff was distributed that ponding should not be drained to the downstream slope.
May 6, 2020	▪ Ruts have developed in the crest due to vehicle traffic.
May 6 to May 20, 2020	▪ Vegetation was cleared off the upstream slope of the embankment and spillway.
May 13 to July 22, 2020	▪ Wet spots were identified on the downstream slope of the embankment.
May 27 to July 22, 2020	▪ Water ponding was noted in the ruts along the embankment crest.
August 11, 2020	▪ Ruts in the crest were repaired.
August 18, 2020	▪ Area above the decant along the embankment crest was regraded, leveled, and covered with gravel. ▪ A log barrier was installed to limit traffic on embankment crest.
October 13 to December 29, 2020	▪ Water ponding was noted along the embankment crest
November 10 to November 18, 2020	▪ Three beavers were trapped and removed from the area and a fence was installed around the low level decant inlet to prevent beavers from blocking it.

11.3.2 Freeboard

Water is pumped into SP1 from the underground mines, 3SP and 2SP. Depending on measured water quality, water is discharged into Long Lake or siphoned to 3SP for lime treatment.

The catchment area, and how surface water flows into the 2SP1, is unknown based on the information provided.

Based on the design drawings the dam crest is at El. 358.0 m, the emergency spillway is at El. 357.0 m and the decant at El. 355.9 m (Thurber, 1990).

Water elevations were recorded from the staff gauge during the weekly inspections, these levels compared to weekly rainfall are shown on Figure 11-1. It is understood that the staff gauge measures water level above the decant. Water level in the pond was relatively constant throughout the year, with the highest recorded water level about 0.09 m above the decant in November. Based on these readings, and design elevations, over 1 m of freeboard below the spillway was maintained throughout the year.

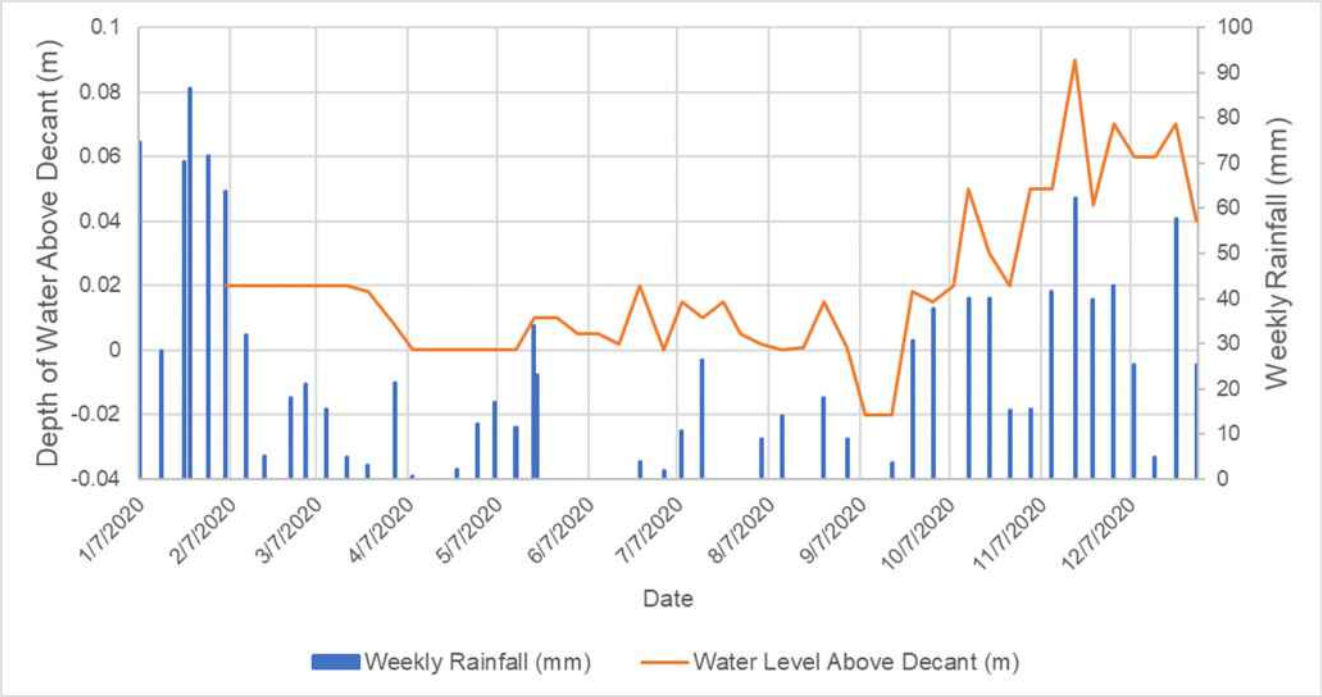


Figure 11-1: SP1, Depth of Water Above Decant Compared to Weekly Rainfall

11.3.3 Piezometers

There are four VWPs (2 shallow, 2 deep) installed in 2 boreholes in the SP1 dam. One borehole is located near the low level decant and the other is located near the northeast side of the dam where ponding and seepage is observed at the toe. One of the shallow piezometers (SP1-3, installed at 3.7 m depth) indicates pressures fluctuations of about 2 m head throughout the year, the trend in fluctuation was consist with the variation in pond level above the decant. This piezometer is located on the east (right looking downstream) side of the dam near the ponding and seepage is observed at the toe. The deep piezometer in this borehole, (SP1-3, installed at 6.0 m depth) showed pressure variations of 0.6 m head. The shallow and deep piezometers located at the southwest (left, facing downstream) side of the dam showed minimal variations of less than 0.2 m. This indicates the east side of the dam may have a more permeable layer or preferential seepage path. Graphs of the pressures and temperatures measured by the VWPs are provided on the owner weekly inspection reports in Appendix C.

11.3.4 Construction and Repairs

Minor repair work was carried out to clear vegetation, fill in low spots on the dam crest and place a log across the crest to prevent vehicle access, as described previously in the summary of owner weekly inspections listed in Table 11-1.

11.4 2020 Dam Safety Inspection

Conditions observed during the 2020 site visit appeared consistent with the Tetra Tech's previous Dam Safety inspection in 2019. Observed features were identified as being generally in satisfactory condition. The following noteworthy conditions were observed:

- Large trees were growing near the lower portion of the downstream slope. The roots from the trees can create preferential seepage paths and weaker zones in the dam, so it is recommended that they are removed. The tree should be cut off and the stump/root ball left in place so as not to further disturb the dam structure. Chemical treatment could be considered to reduce regrowth.
- Small trees and shrubs were growing on the upstream dam slope and crest, in particular near the abutments. It is recommended that these are removed. The shrubs impede the ability to collect observations and the roots from the trees can create preferential seepage paths and weaker zones in the dam, so it is recommended that these are removed. The trees should be cut off and the stump/root ball left in place so as not to further disturb the dam structure. Chemical treatment could be considered to reduce regrowth.
- Fill had been placed on the dam crest near the middle of the dam to fill in ruts.
- Deep ruts were observed at the southwest end (left facing downstream) of the dam crest. It is recommended that these are infilled and that measures are taken to prevent vehicle traffic on the dam crest.
- Water ponding and seepage was observed near the downstream toe of the dam near the middle to northeast (right facing downstream) abutment of the dam. The ponded water was about 15 m long, 5 m wide, and 0.4 m deep. The seepage appears to be coming through the dam. This ponding results in a permanently saturated area at the toe of the dam that decreases stability of the structure. It is recommended that work is performed to permanently drain this ponding by excavating a drain channel that connects to the outlet channel where the low level outlet discharges. Vegetation should be cleared from this area to facilitate inspections of the seepage.
- Slumping near the old utility pole at the southwest end (left facing downstream) of the dam was observed. Quinsam personnel described the slumping as an existing feature that had not changed.
- The emergency spillway downstream of the dam crest was very overgrown. Trees growing in the spillway can reduce the capacity of the spillway and catch debris blocking flow when the spillway is used. It is recommended that the spillway is cleared along the entire length.
- No cracking, new slumping or evidence of recent instability was observed.
- No erosion from waves was observed along the upstream dam slope.

Details of the inspection and photographs are provided in the Dam Safety Inspection Checklist in Appendix A.

12.0 DAM ASSESSMENT

12.1 Engineer of Record and TSF Qualified Person

The TSF Qualified Person for the facilities is Sarah Shi, P.Geo., of Quinsam.

The structures currently do not have an EOR. Tetra Tech prepared this DSI as per our proposal dated March 1, 2021 and the HSRC Section 10.1.5. It is noted that design and construction information is sparse and previously relied on assumptions for material properties that have not been confirmed. Tetra Tech is in the process of preparing

a workplan that outlines the recommended additional assessment, rehabilitation design/construction works for the facilities based on previous background reviews completed, that would be necessary for Tetra Tech to become EOR for the facilities.

12.2 Dam Consequence Classification

Mining dams in British Columbia are regulated under the HSRC, which recommends using CDA Guidelines for assigning a Dam Consequence Classification as described in Section 2.0. As previously described, the four consequence factors for consideration are:

- Population at Risk
- Loss of Life
- Environmental and Cultural Values
- Infrastructure and Economics

12.2.1 TDFs

The current Consequence Classification for the TDFs is summarized in Table 12-1 and has not changed since the 2019 DSI.

Table 12-1: Current Consequence Classification

TDF	Dam	Loss of Life	Incremental Losses		Consequence Classification
			Environmental and Cultural Values	Infrastructure and Economics	
2-North Pit TDF	North Embankment	Very High (10 to 100 staff in area/underground workings)	Significant (some potential for impact to Middle Quinsam Lake)	High (mine offices)	Very High
	East Embankment	Significant (temporary risk)[1]	Low (no significant loss of habitat)	Low (no infrastructure at risk)	Significant
	West Embankment	Significant (temporary risk)	High (Significant loss or deterioration of “good” fish habitat)	Low (infrequently used road at risk)	High
	South Embankment	Significant (temporary risk)	High (Significant loss or deterioration of “good” fish habitat)	Low (infrequently used road at risk)	High
Old TDF	South Dam	Very High (10 to 100 staff in area/underground workings)	Not considered/summarized in previous assessments	Not considered/summarized in previous assessments as not governing	Very High

[1]Based on topography, failure of the East Embankment could flow into the Portal Sump area where there is expected to be a temporary risk.

As the mine is currently in an Active Care and Maintenance phase, there are less personnel present within the inundation area. From discussions with Quinsam it is understood that there are less than 10 people working in the office/warehouse and there is only 1 person underground for approximately 1 hour per day. However, at this time lowering the consequence classification is not warranted, as CDA (2019) suggests that more stringent target design criteria is used for closed sites as there are less personnel available to respond to warning signs and emergencies. The concept of using higher design standards for closed mine sites is also supported by the Global Industry Standard for Tailings Management (2020).

12.2.2 WMFs

The current Consequence Classification for the Settling Ponds and CCR-PAG storage facilities is summarized in Table 12-2 and has not changed since the 2019 DSI.

Table 12-2: Preliminary Structure Consequence Classification

Structure	Population at Risk	Loss of Life	Economic and Social Losses	Environmental and Cultural Losses	Overall Classification
SP4	None There is no permanent population at risk downstream of the facilities.	0 Mine currently is in Care and Maintenance, so only has 10 staff on site. There is not a reason for these people to spend a significant amount of time downstream of the facilities.	Low Downstream areas contain limited infrastructure. There is an access road to the mine downstream of SP4, and a logging/resource access road downstream of SP1.	Low to Significant To be determined. Assumed no significant loss or deterioration of habitat. Restoration or compensation in kind highly possible.	Significant to Low
2SP					
3SP					
SP1					

Due to the remote locations of the facilities, and no permanent population at risk, or third-party infrastructure immediately downstream, the Consequence Classifications for these facilities are driven by environmental impacts. The environmental and cultural consequence are qualitatively assessed as “Significant to Low”, assuming the water released will either have no impact, or restoration or compensation in kind would be highly possible.

12.3 OMS Manual and EPP Review

Quinsam provided the following OMS and EPP documents for review:

- Quinsam Coal Operation, Maintenance and Surveillance Manual and Emergency Preparedness Plan 2-North Pit Tailings Disposal Facility and South Dam (September 2020) and Appendixes.
- Operation, Maintenance and Surveillance Manual and Emergency Preparedness Plan, Water Management Facility: SP1, 2S, 3S and SP4 (January 2021) and Appendix I only.

These documents were reviewed, and specific suggestions and comments provided in the PDFs to assist Quinsam in updating the manuals to reflect current conditions on site and to improve the clarity so a person who is not familiar with the site could step in and begin performing operation, maintenance and surveillance of the facilities with limited cross over. It is noted that there is limited documentation for the WMFs which makes it challenging to put together an OMS Manual and the new OMS Manual for the WMFs provides a good summary of what background information is available.

The comments generally included that:

- The Responsible, Accountable, Support, Consulted, Informed (RASCI) table should be revised. The roles of being responsible or accountable should generally only be assigned to one position so it is clear who is responsible or accountable. The list of types of tasks should be expanded to include specific tasks for operation, maintenance and surveillance on the site. It is suggested that the RASCI template from CDA's Mining Dams Bulleting (2019) is used as a starting template and that the Mining Association of Canada's guideline for developing an OMS Manual is reviewed.
- The consequence classification of the tailings dams should be adjusted to reflect the consequence classification described in this DSI and the 2019 DSI.
- The documents should be reviewed and adjusted so that it is clear there is not currently an EOR. Quinsam should work to establish an EOR to fulfill regulatory requirements, follow current best practice and have ongoing support for safe management of the facilities
- Descriptions of design/investigations are presented as "as-built" construction information. These sections should be clear as to what is actually "as constructed" or if the designs are assumed to be what was built.
- The adequacy of the responses to observations in the TARPs should be reviewed. External resources (EOR or geotechnical engineer/hydrotechnical engineer) should be notified within 24 to 48 hours.
- Quantifiable Performance Objectives (QPOs) should be added for when the pumps/valves in the water management system are adjusted. Recording this information assists with transfer of knowledge if staffing changes.
- The drawings that show the WMFs are unclear because they show designs and not existing conditions, and they do not show surrounding topography making it hard to use them to communicate where maintenance is required. Specifically, the drawings for SP2 does not show the internal dividing dyke or spillway; for SP3 they do not show the lock block wall or abutments; for SP1 they do not show the outlet channel or abutments; and for SP4 they do not show the emergency spillway. For consistency in field review/weekly reporting it is suggested that new drawings are produced that accurately depicting the existing conditions, that show the dam crest, dam abutments, toe, inlet, outlet, location of instrumentation and locations where seepage is routinely observed. This will assist in transfer of knowledge if staffing changes.
- The documents should be read through for completion/clarity as there were some unfinished sentences, or where key values (volume/elevations) were missing from the sentence.

These comments would be best to be addressed by Quinsam, as they are the owner of the dams who are responsible for the proper operation, maintenance and surveillance of the facilities. Tetra Tech could help in these efforts if required.

13.0 RECOMMENDATIONS

Recommendations from this DSI are summarized in Table 13-1. Conditions have not changed significantly since the 2019 DSI except at the 3SP North Dam. Recommendations are generally related to vegetation removal, minor grading concerns. No signs related to instability, overtopping or other dam safety deficiencies were noted, except for the instability at 3SP.

The 2019 DSI included recommendations to locate design and construction records for 2SP and 3SP to delineate the extent of the waste rock piles that are confining the structures. It is understood that these additional records have not been found, so a recommendation to determine the extent of the fill and assess failure modes of these facilities is included as a recommendation for 2020.

The 2020 status of previous recommendations is summarized in Appendix D, which includes the update Quinsam provided to EMLCI in April 2021 and Tetra Tech's comments based on information provided for this DSI. Quinsam made good progress in completing recommendations related to reducing risk by lowering water levels in the TDF; improving surveillance by completing surveys, documenting inspections and installing staff gauges; and performing maintenance by grading crests and clearing vegetation. The remaining recommendations are mostly related to data gaps, assessment and long term planning for the facilities; these have not progressed as they require the support and direction of an EOR. Tetra Tech is in the process of preparing a workplan that will describe detailed steps and a timeframe to address these remaining recommendations. Completing these assessments and if required rehabilitating the facilities would be necessary for Tetra Tech to become EOR.

Table13-1: 2020 DSI Recommendations

Structure	ID #	Deficiency or Non-Conformance	Regulation or Reference	Recommended Action	Priority[1]	Recommended Deadline
All	2020-01	The facilities do not have an EOR.	HSRC 2021 10.1.5	An EOR should be established. The work plan Tetra Tech has been requested to prepare will assist in prioritizing the recommended additional assessments, rehabilitation, design/construction work for the facilities that would be necessary for Tetra Tech to become EOR of the facilities.	2	December 2022
3SP	2020-02	Signs of instability/repairs were observed near the lock blocks / downstream slope of the dam.	HSRC 2021 10.1.4/10.5.1 and 1.7.3 (2)	The reservoir level in 3SP should be kept low (the pond level should be kept below the upstream toe of the North Dam). This is how 3SP is currently operated, as water cannot discharge through the spillway as there is not a discharge permit. This operational level should not change until additional investigations and assessments are performed for the North Dam.	1	Until assessments of the dam are performed.
3SP	2020-03	Signs of instability/repairs were observed near the lock blocks / downstream slope of the dam.	HSRC 2021 10.1.4	This area should continue to be monitored and if further instability is observed requiring work or repair a geotechnical engineer experienced with dam safety is consulted for advice. Subsurface information is required to determine if the instability is progressing and the best rehabilitation plan. This dam should be prioritized for assessment and rehabilitation.	2	Until assessments of the dam are performed.
2SP/3SP	2020-04	These facilities appear to be partially contained by waste dumps, that were not previously recognized as dams, yet could meet the HSRC's definition of a dam.	HSRC 2021 10.1.4 HSRC Guidance Doc. (2016) 3.4	The extent of fill in these locations should be assessed by subsurface investigations and comparing pre-construction and post-construction LiDAR. The type of material contained in the facilities should be determined by reviewing construction records or collecting subsurface information to determine if it is liquifiable. Credible failure modes should then be assessed to evaluate if these structures should be defined and managed as dams.	2	December 2022
2SP	2020-05	There was a section of weathered riprap near the downstream toe of the facility. The section is 15 m long and across the width of the spillway.	CDA 2013 3.5.5	The weather riprap should be removed and replaced.	2	October 2021
3SP	2020-06	The dam crest had ruts from vehicle traffic.	CDA 2013 3.5.3	Barriers should be placed to prevent vehicles driving on the dam crest.	3	October 2021
SP1	2020-08	There is continual water ponding near the toe of the dam (middle to north (right) abutment of the dam). The ponded water was about 15 m long, 5 m wide, and 0.4 m deep.	CDA 2013 3.5.3	This permanently saturates the toe of the dam which decreases stability. Work should be performed to permanently drain the toe pond by excavating a drainage channel.	3	June 2022
OMS and EPP	2020-09	OMS and EPP Manuals were reviewed and improvements are required to meet current standard of practice.	HSRC 2021 10.5.2	The comments provided to Quinsam and generalized in Section 14.3 should be reviewed and the OMS/EPP Manuals adjusted accordingly.	3	October 2021
2-North Pit TDF	2020-10	Vegetation was growing on the west side of the North Embankment toe (Photo 5) and the northwest corner of the TDF (Photo 25). Photos are provided in Appendix A.	CDA 2013 3.5.3.	From the dams, the trees and shrubs should be removed as the roots can create preferential seepage paths and weaker zones in the dam, and the heavy vegetation can impede the ability to complete inspection. In the spillways/channels, the vegetation reduces the flow capacity and increases the likelihood of blockages forming during an emergency. Spillways should be cleared to where water could discharge away from the dam structure. The trees should be cut off at the base and the stump/root ball left in place to not further disturb the dam structure. Chemical treatment could be considered to reduce regrowth in areas where it can be applied.	2	October 2021
South Dam	2020-11	There is one medium sized tree growing near the west abutment of the South Dam.	CDA 2013 3.5.3.		2	October 2021
SP4	2020-12	The upstream and downstream slopes had trees and shrubs growing on them that obstruct observation and the roots could cause preferential flow paths. The emergency spillway was very overgrown with shrubs and small trees between the dam crest and downstream toe.	CDA 2013 3.5.3/3.5.5		2	October 2021
2SP	2020-13	The crest and downstream slope of the waste rock dump that could be considered a dam were overgrown with shrubs obstructing observations.	CDA 2013 3.5.3		2	October 2021
2SP/ 3SP	2020-14	Small trees were observed growing in the channel between 2SP and 3SP.	CDA 2013 3.5.5		2	October 2021
3SP	2020-15	The spillway outlet channel had small trees growing in it.	CDA 2013 3.5.5		2	October 2021

Structure	ID #	Deficiency or Non-Conformance	Regulation or Reference	Recommended Action	Priority[1]	Recommended Deadline
SP1	2020-16	Large trees were observed growing on the downstream toe of the dam. Small trees/shrubs were observed growing on the dam crest and upstream crest. Thick vegetation was growing around the downstream toe where seepage is observed, this vegetation would obstruct observations.	CDA 2013 3.5.3	From the dams, the trees and shrubs should be removed as the roots can create preferential seepage paths and weaker zones in the dam, and the heavy vegetation can impede the ability to complete inspection. In the spillways/channels, the vegetation reduces the flow capacity and increases the likelihood of blockages forming during an emergency. Spillways should be cleared to where water could discharge away from the dam structure. The trees should be cut off at the base and the stump/root ball left in place to not further disturb the dam structure. Chemical treatment could be considered to reduce regrowth in areas where it can be applied.	2	October 2021
SP1	2020-17	The emergency spillway was very overgrown downstream of the dam crest.	CDA 2013 3.5.5		2	October 2021

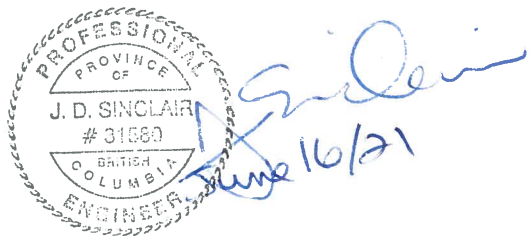
1. Priority is assigned based on the HSRC Guidance Document (2016). Using the following ranking system
    1. A high probability or actual dam safety issues considered immediately dangerous to life, health or the environment, or a significant risk or regulatory enforcement.
    2. If not corrected, could 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

14.0 CLOSURE

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

Respectfully submitted,
Tetra Tech Canada Inc.

Prepared by:
Angie Ramey, P.Eng.
Geotechnical Engineer
Direct Line: 778-674.2285
Angie.Ramey@tetratech.com



Reviewed by:
Bob Patrick, P.Eng.
Principal Geotechnical Engineer
Direct Line: 250.668.2765
Bob.Patrick@tetratech.com

Reviewed by:
Jennifer Sinclair, P.Eng.
Dam Practice Lead – Pacific Region
Direct Line: 250.802.8597
Jennifer.Sinclair@tetratech.com

/dr

REFERENCES

CDA “Dam Safety Guidelines 2007 (2013 Edition)”, 2013.

CDA “Technical Bulletin: Application of Dam Safety Guidelines to Mining Dams”, 2019.

EMPR/EMLCI, “Guidance Document, Health, Safety and Reclamation Code for Mines in British Columbia, Version 1.0”, July 2016.

EMPR/EMLCI, “Health Safety and Reclamation Code for Mines in British Columbia”, 2021

EMPR, ENV and FLNRO “Memorandum of Understanding Regulation of Impoundments and Diversion on a Mine Site”, November 2013.

EMPR “Report of Inspector of Mines Geotechnical Number 134759“, date of inspection July 31, 2019

EMPR “Report of Inspector of Mines Geotechnical Number 140465“, date of inspection October 3, 2019

Golder Associates Ltd. “As-built Report for the South and North Embankments in Pit Tailings Disposal Facility”, July 1996.

Golder Associates Ltd. “A Review of The Geotechnical aspects of the Proposed Expansion of the In-Pit Tailings Disposal Facility, Quinsam Coal, Campbell River, BC”, April 1997.

Golder Associates Ltd., “Site Inspection and Remedial Treatment Recommendations Sedimentation Pond #4, Quinsam Cola Plant.” December 24, 2003.

Golder Associates Ltd., “Quinsam Coal Mine Sediment Pond No. 4 Dam Repair Construction”, April 13, 2004.

Golder Associates Ltd. “Review of Dam Safety of Old Tailings area – Quinsam Coal Mine, BC” May 17, 2010.

Golder Associates Ltd., “Surface Water Management Plan – 2 South, 3 South Development, Quinsam Mine.” April 29, 2011a.

Golder Associates Ltd., “Water Quality Predictions – 2 south, 3 South Development, Quinsam Mine.” April 29, 2011b.

Golder Associates Ltd., “Design Report for the Quinsam 2 South Pit PAG CCR Storage Facility.” May 5, 2011c.

Golder Associates Ltd., “Geotechnical Assessment 2 South Pit, Quinsam Mine”, May 10, 2011d.

Golder Associates Ltd., “3 South Pit Dyke Design, Quinsam Coal Mine, Campbell River, B.C.”, March 16, 2012a.

Golder Associates Ltd., “Draft, 2 South Pit PAG CCR Storage Facility – Fall 2012 Construction Status”, November 7, 2012b.

Golder Associates Ltd. “2-North Pit TDF and South Dam Stability and Flood Storage Analyses Update, Quinsam Mine”, November 2016a.

Golder Associates Ltd. “DRAFT Design Precipitation Events for the 2-North Pit Tailings Disposal Facility and South Dam”, 2016b.

Golder Associates Ltd. “Engineer of Record 2 South Pit, 3 South Pit, Settling Pond 4, Quinsam Coal, Campbell River BC.” November 30, 2017.

Golder Associates Ltd. “DRAFT South Dam Flood Storage Analysis Update April 2018, Quinsam Mine, BC”, 1 June 2018.

Golder Associates Ltd. “2018 Annual Dam Safety Inspection, 2-North Pit TDF”, March 21, 2019a.

Golder Associates Ltd. “2018 Annual Dam Safety Inspection, South Dam Quinsam Mine”, March 21, 2019b.

Golder Associates Ltd. “2-North Pit TDF and South Dam Seismic Deformation Assessment, Quinsam Mine, BC”, March 21, 2019c.

ICMM, UN and PRI “Global Industry Standard for Tailings Management”, August 2020.

Mining Association of Canada, 2019. “Developing an Operation, Maintenance, and Surveillance Manual for Tailings and Water Management Facilities, Second Edition.” February 2019.

Quinsam Coal Corporation, “Annual Reclamation Report for 2016 Mines Act Permit Number C-172.” March 2017.

Quinsam Mine “Operation, Maintenance and Surveillance Manual and Emergency Preparedness Plan 2-North Pit Tailings Disposal Facility and South Dam. September 2020

Quinsam Mine “Operation, Maintenance and Surveillance Manual and Emergency Preparedness Plan, Water Management Facility: SP1, 2S, 3S and SP4 (no Appendixes)” January 2021.

Tetra Tech Canada Inc. “Quinsam Coal Mine Tailings Storage Facilities 2019 Dam Safety Inspection” March 2020a.

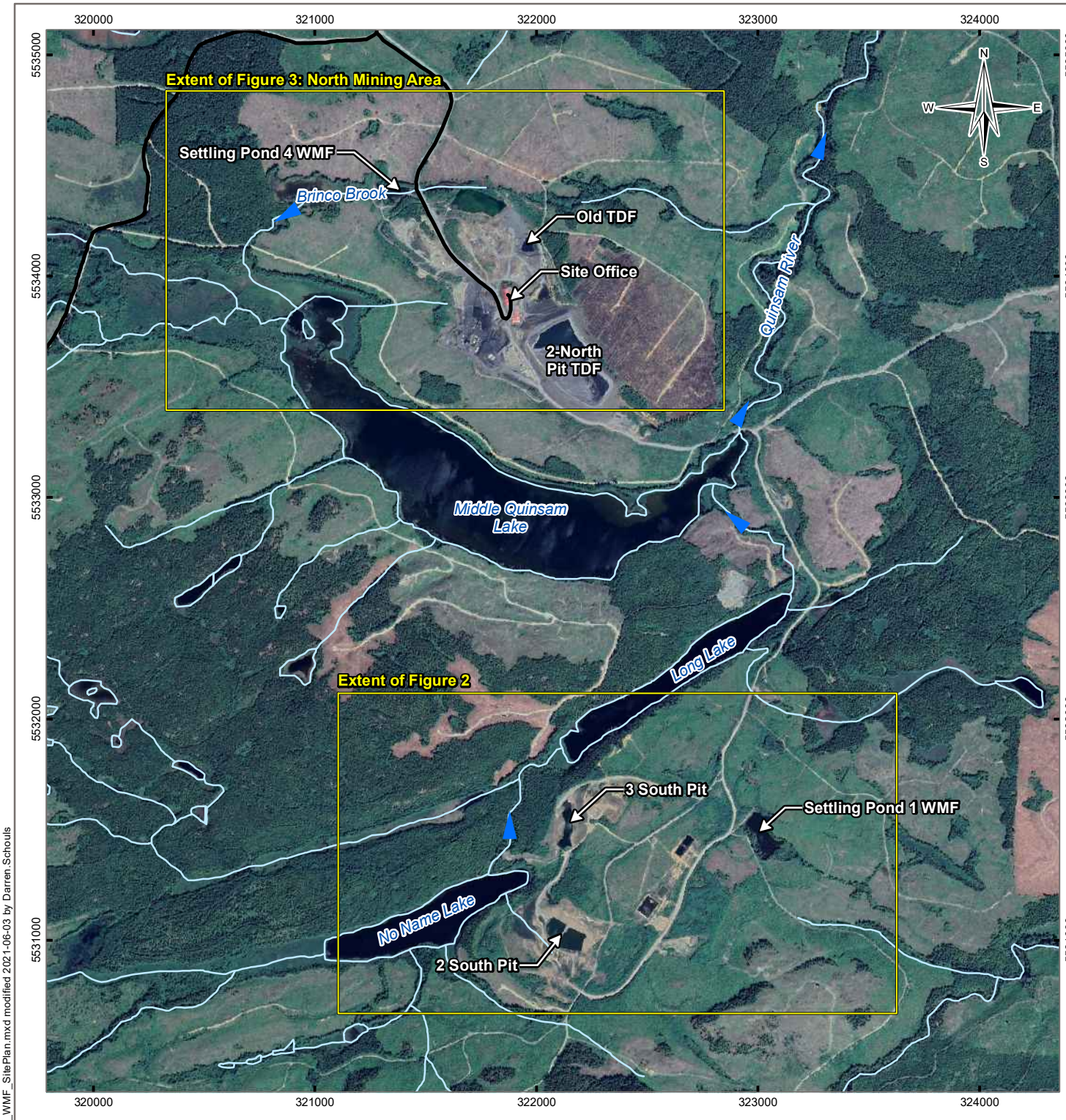
Tetra Tech Canada Inc. “Quinsam Coal Mine Water Management Facilities 2019 Dam Safety Inspection” March 2020b.

Thurber Engineering Ltd. “Quinsam Coal Project Settling Pond 1 Geotechnical Investigation”, November 28, 1990

Thurber Engineering Ltd. “Quinsam Coal Mine 2018 Dam Safety Review, Tailings Disposal Facilities at the 2-North Pit (Rev. 1)”, March 15, 2019a.

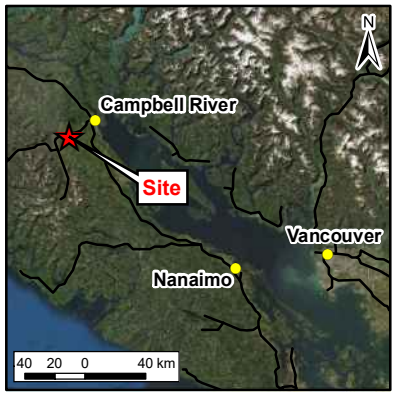
Thurber Engineering Ltd. “Quinsam Coal Mine Tailings Disposal facilities, Failure Mode and Effects Analysis”, March 27, 2019b.

FIGURES



LEGEND

- Extent of Figure 2 & Figure 3
- Waterflow Direction
- Access Road
- Watercourse
- Waterbody



NOTES
Base data source: CanVec 1:50,000 (2019).
Imagery from Google Earth; CNES/Airbus (2019).

STATUS
ISSUED FOR USE

QUINSAM COAL MINE
2020 DAM SAFETY INSPECTION

Overview Site Plan

PROJECTION UTM Zone 10			**DATUM** NAD83		**CLIENT** The Bowra Group
Scale: 1:25,000 500 250 0 500 Metres					TETRA TECH
FILE NO. DMPA03006-01_FIG01_WMF_SitePlan.mxd					
OFFICE Tt-CGY	**DWN** BB	**CKD** MV	**APVD** KW	**REV** 0	**Figure 1**
DATE June, 2021	**PROJECT NO.** ENG.DMPA03006-01				

M:\ENGINEERING\DMPA\DMPA03006-01\Maps\DMPA03006-01_FIG01_WMF_SitePlan.mxd modified 2021-06-03 by Darren.Schouls

M:\ENGINEERING\DMPA\DMPA03006-01\Maps\DMPA03006-01_FIG02_WMF_South.mxd modified 2021-05-28 by Brittney.Bietz

LEGEND

- Watercourse
- Waterbody

NOTES
Base data source: CanVec 1:50,000 (2019).
Imagery from Google Earth; CNES/Airbus (2019).

Scale: 1:10,000
200 100 0 200
Metres

PROJECTION	DATUM
UTM Zone 10	NAD83

FILE NO. DMPA03006-01_FIG02_WMF_South.mxd

CLIENT The Bowra Group

TETRA TECH

STATUS ISSUED FOR USE

QUINSAM COAL MINE
2020 DAM SAFETY INSPECTION

South Water Management Facilities

OFFICE	DWN	CKD	APVD	REV
Tt-CGY	BB	MV	KW	0

DATE	PROJECT NO.
May, 2021	ENG.DMPA03006-01

Figure 2

M:\ENGINEERING\DMPA\DMPA03006-01\Maps\DMPA03006-01_FIG03_WMF_North.mxd modified 2021-06-03 by Darren.Schouls

LEGEND

- Access Road
- Watercourse
- Waterbody

NOTES
Base data source: CanVec 1:50,000 (2019).
Imagery from Google Earth; CNES/Airbus (2019).

Scale: 1:10,000
200 100 0 200
Metres

PROJECTION	DATUM
UTM Zone 10	NAD83

FILE NO. DMPA03006-01_FIG03_WMF_North.mxd

CLIENT The Bowra Group

TETRA TECH

STATUS ISSUED FOR USE

QUINSAM COAL MINE
2020 DAM SAFETY INSPECTION

North Water Management Facilities

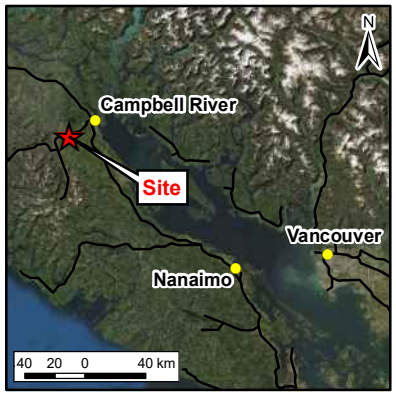
OFFICE	DWN	CKD	APVD	REV
Tt-CGY	BB	MV	KW	0

DATE	PROJECT NO.
June, 2021	ENG.DMPA03006-01

Figure 3

LEGEND

- Access Road
- Watercourse
- Waterbody



NOTES
Base data source: CanVec 1:50,000 (2019).
Imagery from Google Earth; CNES/Airbus (2019).

STATUS
ISSUED FOR USE

QUINSAM COAL MINE
2020 DAM SAFETY INSPECTION

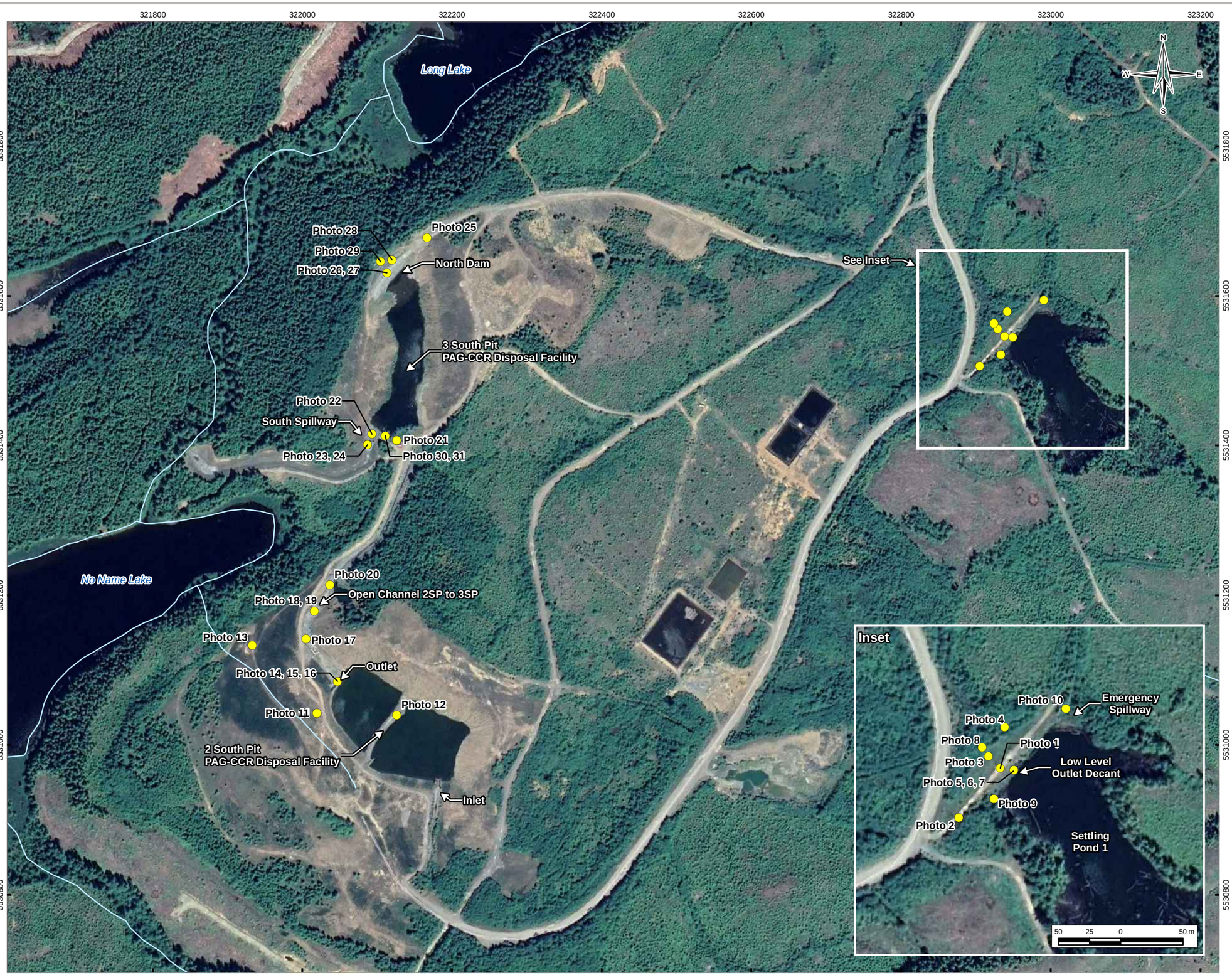
Tailings Disposal Facilities
Site Plan

PROJECTION UTM Zone 10			**DATUM** NAD83		**CLIENT** The Bowra Group
Scale: 1:7,000 100 50 0 100 Metres					TETRA TECH
FILE NO. DMPA03006-01_FIG04_WMF_SitePlan.mxd					
OFFICE Tt-CGY	**DWN** BB	**CKD** MV	**APVD** KW	**REV** 0	**Figure 4**
DATE June, 2021	**PROJECT NO.** ENG.DMPA03006-01				

M:\ENGINEERING\DMPA\DMPA03006-01\Maps\DMPA03006-01_FIG04_WMF_SitePlan.mxd modified 2021-06-03 by Darren.Schouls

APPENDIX A

DSI INSPECTIONS AND CHECKLISTS



M:\ENG\NEERING\DMPA\DMPA03006-01\Maps\DMPA03006-01_FIG05_PhotoLoc_South.mxd modified 2021-06-03 by Darren.Schouls

LEGEND

- Water Management Facility Photo Location
- Watercourse
- Waterbody

NOTES
Base data source:
CanVec 1:50,000 (2019).
Imagery from Google Earth; CNES/Airbus (2019).

STATUS
ISSUED FOR REVIEW

QUINSAM COAL MINE
2020 DAM SAFETY INSPECTION

Photo Locations - South Side of Site

PROJECTION UTM Zone 10		**DATUM** NAD83		**CLIENT** The Bowra Group
Scale: 1:5,000 — 100 50 0 100 Metres				TETRA TECH
FILE NO. DMPA03006-01_FIG05_PhotoLoc_South.mxd				
OFFICE Tt-VANC	**DWN** DS	**CKD** MRV	**APVD** KW	**REV** 0
DATE June 3, 2021	**PROJECT NO.** ENG.DMPA03006-01			**Figure 5**

LEGEND

- Water Management Facility Photo Location
- Tailings Disposal Facility North Pit Photo Location
- Old Tailings Disposal Facility Photo Location
- Access Road
- Watercourse
- Waterbody

NOTES
Base data source:
CanVec 1:50,000 (2019).
Imagery from Google Earth; CNES/Airbus (2019).

STATUS
ISSUED FOR REVIEW

QUINSAM COAL MINE
2020 DAM SAFETY INSPECTION

Photo Locations - North Side of Site

PROJECTION UTM Zone 10	**DATUM** NAD83			**CLIENT** The Bowra Group
Scale: 1:5,000 — 100 50 0 100 — Metres				TETRA TECH
FILE NO. DMPA03006-01_FIG06_PhotoLoc_North.mxd				
OFFICE Tt-VANC	**DWN** DS	**CKD** MRV	**APVD** KW	**REV** 0
DATE June 3, 2021	**PROJECT NO.** ENG.DMPA03006-01			**Figure 6**

M:\ENGINEERING\DMPA\DMPA03006-01\Maps\DMPA03006-01_FIG06_PhotoLoc_North.mxd modified 2021-06-03 by Darren.Schouls

TETRA TECH

DAM SAFETY INSPECTION CHECKLIST

Date:	April 28, 2021

Structure:	2 North Pit TDF North, South, East and West Embankments
Property:	Quinsam Coal Mine
Consequence Classification:	Significant to Very High
Purpose / MoU Pond Type:	Tailings Disposal Facility (TDF)
Inspection Performed By:	Jennifer Sinclair, P.Eng and Angie Ramey, P.Eng.

Conditions at Time of Inspection

Temperature:	3 – 5° C			
Weather	**Winds**	**Snow Cover**	**Pond**	**Wave Action**
☐Sunny	☐None	☒None	☐None	☒None
☐Scattered Cloud	☒Light	☐Slight	☒Open Water	☐Light
☐Overcast	☐Moderate	☐Heavy	☐Partially Frozen	☐Moderate
☒Raining	☐High	☐Drifts	☐Frozen	☐High
☐Snowing	From:	☐Melting	☐High Turbidity	☐Causing Erosion
Comments:	Mine has not been in operation since May 2019.			

Review of Surrounding Conditions (incl. Changes since previous DSI)

Upstream Conditions & Hazards	Downstream Conditions & Receptors
Not applicable. Dam perimeter embankment is the height of land.	Mine offices and warehouse immediately to the northeast. Underground portals to the north. Mine roads to the west and south. Logged forest lands to the east. Portals, warehouse and office to north and east. Portals are entered once per day to inspected underground for ~45 minutes. Middle Quinsam lake 300 to 600 m to the west and south

Are the following in Satisfactory Condition?

	Embankment	Yes	No	NA
C	Crest	X		
US	U/S Slope	X		
DS	D/S Slope	X		
T	D/S Toe	X		
LA	Left Abutment			X
RA	Right Abutment			X

	Channels	Yes	No	NA
I	Inlet			X
O	Outlet			X
S	Spillway			X
E	Emergency Spillway			X
D	Drains			X
IC	Inlet Controls			X
OC	Outlet Controls			X

	Other	Yes	No	NA
R	Reservoir	X		
RS	Reservoir U/S Slopes			X
ID	Internal Dikes			X
B	Baffles			X
IN	Instruments	X		

Tetra Tech Canada Inc.
#1- 4376 Boban Drive
Nanaimo, BC V9T 6A7 CANADA
Tel 250.756.2256 Fax 867.668.4349

OBSERVATIONS

1.0 GENERAL	YES	NO	NA	PHOTO #	COMMENTS
1.1 Evidence of Repairs		X			
1.2 Decant/Overflow Structure			X		
1.3 Emergency Spillway			X		
1.4 Interceptor/Diversion Ditch			X		
1.5 Crest Accessible by Truck	X				
1.6 Public Access to Dam/Site Security		X			Gate locked at night, security guard on site 24 hour/day.
1.7 Valves/Gates Operational			X		
1.8 Currently Pumping/Siphoning	X			3	Siphoning from reservoir, opened March 2021 and left open. Siphon pipe runs from northeast corner of reservoir, over crest to pond at the toe of the north Embankment.
1.9 Reservoir Level/Freeboard	X			10	4 m of freeboard. Crest is lowest and tailings deposition highest along West and East Embankments.
1.10 Signage/Safety Boom		X			
1.11 Tailings beach width			X	14	Minimum beach width not specified in design
2.0 UPSTREAM DAM SLOPE	**YES**	**NO**	**NA**	**PHOTO #**	**COMMENTS**
2.1 Erosion Protection/Vegetation		X			
2.2 Evidence of Erosion/Tension Cracks		X			
2.3 Slope Visually Uniform (no bulging / settlement)	X			8, 9, 14, 16, 22	
2.4 Animal Burrows/activity		X			
3.0 DAM CREST	**YES**	**NO**	**NA**	**PHOTO #**	**COMMENTS**
3.1 Evidence of Breach / Wash-out		X			
3.2 Lateral Movement		X			
3.3 Evidence of Settlement/Cracking		X			.
3.4 Shoulder Erosion/Reduced Width		X			
3.5 Crest Visually Horizontal	X			6, 17	
3.6 Surface Condition (soft / rutted / rilled/ ponding)	X			11, 15, 21	Minor ponding on crest of East, South and North embankments. Monitor and regrade if increase in size. Small buried pipe installed to drain ponding on East Embankment crest into TDF pond.
3.7 Vegetation		X			
3.8 Animal Burrows/activity		X			
3.9 Pipes/debris	X			17, 18	Several abandoned pipe pieces on South and East Embankments.

OBSERVATIONS

4.0 DOWNSTREAM DAM SLOPE	YES	NO	NA	PHOTO #	COMMENTS
4.1 Erosion Protection/Vegetation	X			5, 25	Vegetation on North Embankment west side and northeast corner of the dam. Should be cut and removed.
4.2 Evidence of Erosion		X			
4.3 Evidence of Slope Instability		X		12	East Embankment, north corner slope was close to the angle of repose in location where repair occurred in 2019. Slope angles vary between 1.3H:1V to 2H:1V
4.4 Evidence of Seepage or Piping		X			
4.5 Slope Visually Uniform (no bulging/settlement)		X		1, 3, 7, 12, 18, 19, 20, 23	No signs of settlement or bulging. Benches on North and South Embankment, East Embankment
4.6 Animal Burrows/activity		X		13	Animal tracks on north and east embankments. Significant animal tracks near middle of East Embankment.
4.7 Pipes through Embankment	X			24	Pipes through West Embankment (approximately 3 m deep on downstream side). Were previously used to deliver tailings to the facility. Installation records found by Quinsam and added to the OMS Manual.
5.0 DOWNSTREAM DAM TOE	**YES**	**NO**	**NA**	**PHOTO #**	**COMMENTS**
5.1 Toe Drain		X			
5.2 Toe Ditch	X			23	Ditch around west and south sides. Shows evidence of previous flowing water, inferred to be from runoff from road and not seepage from TDF.
5.3 Ponded Water or Seepage at Toe	X			2, 3, 4	Seepage and large pond at toe of North Embankment. Seepage in usual location. Signs of previous ponding near toe of South Embankment, area dry and no seepage observed during the inspection.
5.4 Flow in Toe Ditch		X			
5.5 Soft Toe/Evidence of Boils		X			
5.6 Toe Berm			X		
5.7 Animal Burrows/activity		X			
8.0 INSTRUMENTATION	**YES**	**NO**	**NA**	**PHOTO #**	**COMMENTS**
8.1 Standpipe Piezometers			X		
8.2 Vibrating Wire/Pneumatic Piezometers	X				
8.3 Slope Indicators			X		
8.4 Survey/Settlement Pins	X			26	
8.5 Staff Gauges	X			10	New lower staff gauge installed provides 3.5 m of measurable freeboard. Staff

OBSERVATIONS

						gauges were surveyed to reference elevation in 2020
8.6	Flow Weir	X			4	Toe of North Embankment. Frequently flooded by ponding at toe.
9.0	**Construction Activities**	**YES**	**NO**	**NA**	**PHOTO #**	**COMMENTS**
9.1	Current		X			
9.2	Proposed		X			
9.3	Previously Completed (date)		X			

OTHER NOTES

- Vegetation near northwest corner and west side of north embankment should be removed.
- Ponding on crest should be monitored and crest regraded if it increases in size.
- No cracking, slumping or evidence of instability was observed.
- No seepage was observed from the embankments, except at the North Embankment where it is expected.

Photo 1: 2-North Pit TDF, Downstream Slope of North Embankment Taken From the Site Office Parking Lot Looking Southeast.

Photo 2: 2-North Pit TDF, Ponded Seepage at the Toe of the North Embankment Downstream Toe and Pumping Barge identified by yellow arrow, Looking East.

Photo 3: 2-North Pit TDF, North Embankment Downstream Toe and Abutment, Siphon Pipe From Northeast Corner of TDF identified by yellow arrow, Looking East.

Photo 4: 2-North Pit TDF, Weir for Measuring Seepage Flow from North Embankment Toe.

Photo 5: 2-North Pit TDF, North Embankment Downstream Slope, Vegetation on the West Portion, identified by yellow arrow, Looking South.

Photo 6: 2-North Pit TDF, North Embankment Crest, Looking East.

Photo 7: 2-North Pit TDF, North Embankment Bench on Downstream Slope, Looking East.

Photo 8: 2-North Pit TDF, North Embankment Upstream Slope, Looking East.

Photo 9: 2-North Pit TDF, North Embankment, Upstream Slope Looking West.

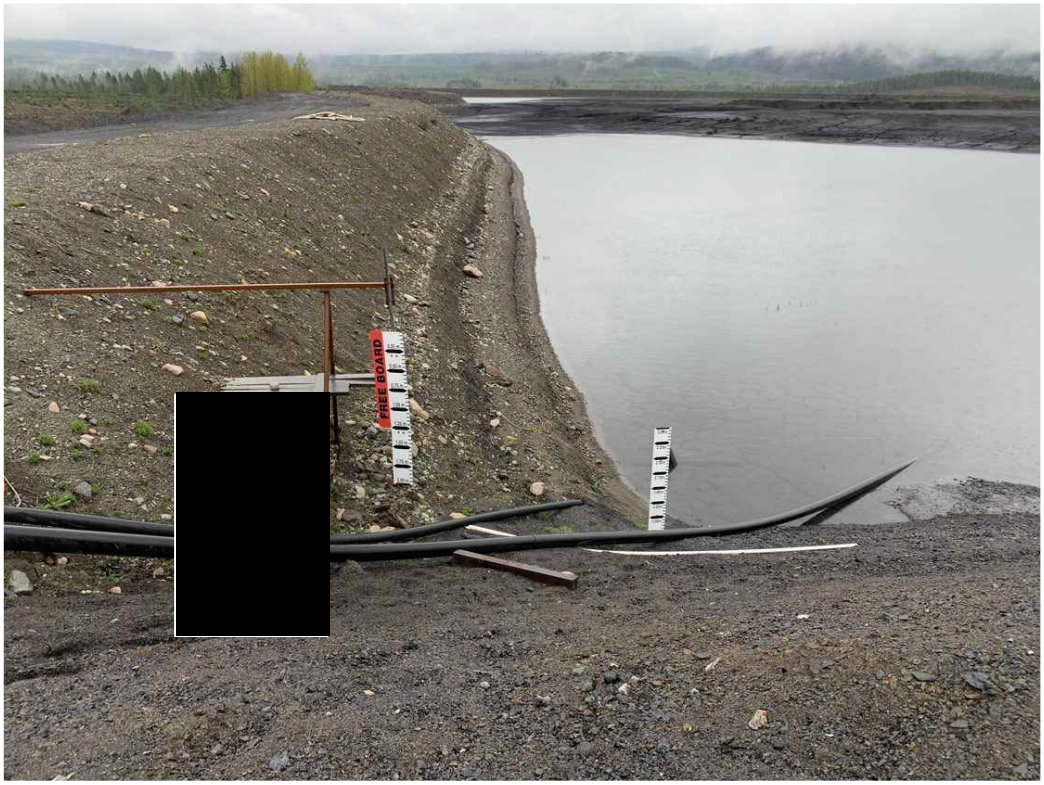


Photo 10: 2-North Pit TDF, East Embankment Upstream Slope and Freeboard Gauges, Looking South.

Photo 11: 2-North Pit TDF, East Embankment Crest with Ponded Water, Looking South.

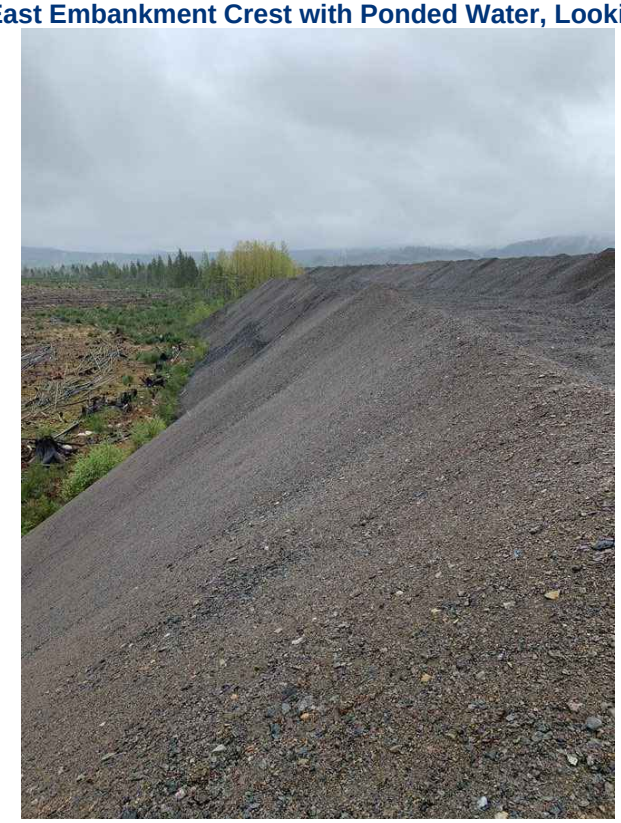


Photo 12: 2-North Pit TDF, East Embankment Downstream Slope, Looking South.

Photo 13: 2-North Pit TDF, East Embankment Downstream Slope With Animal Tracks, Looking Southeast.

Photo 14: 2-North Pit TDF, East Embankment Upstream Slope, Looking Southeast.

Photo 15: 2-North Pit TDF, Ponded Water on East Embankment Crest Drained by Pipe into TDF, Looking Southeast. Pipe identified by yellow arrow.

Photo 16: 2-North Pit TDF, South Embankment Upstream Slope, Looking South.

Photo 17: 2-North Pit TDF, South Embankment Crest With Abandoned Pipe Pieces, Looking West.

Photo 18: 2-North Pit TDF, South Embankment Downstream Slope, Looking Southwest.

Photo 19: 2-North Pit TDF, South Embankment Downstream Slope and Southeast Abutment, Looking Northeast.

Photo 20: 2-North Pit TDF, South Embankment Toe and Downstream Slope, Looking West.

Photo 21: 2-North Pit TDF, Ponding on West Embankment Crest, Looking North.

Photo 22: 2-North Pit TDF, West Embankment Upstream Slope and Tailings Deposition Pipe, Looking Northwest.

Photo 23: 2-North Pit TDF, West Embankment Downstream Slope, Looking South.

Photo 24: 2-North Pit TDF, West Embankment Downstream Slope, Looking North.

Photo 25: 2-North Pit TDF, Northwest Corner, with Trees to be Removed.

Photo 26: 2-North Pit TDF, Example of Survey Monument on dm crest.

TETRA TECH

DAM SAFETY INSPECTION CHECKLIST

Date:	April 28, 2021

Structure:	South Dam, Old TDF
Property:	Quinsam Coal Mine
Consequence Classification:	Very High
Purpose / MoU Pond Type:	Tailing Disposal Facility (TDF)
Inspection Performed By:	Jennifer Sinclair, P.Eng and Angie Ramey, P.Eng.

Conditions at Time of Inspection

Temperature:	3 – 5° C			
Weather	**Winds**	**Snow Cover**	**Pond**	**Wave Action**
☐Sunny	☐None	☒None	☐None	☒None
☐Scattered Cloud	☒Light	☐Slight	☒Open Water	☐Light
☐Overcast	☐Moderate	☐Heavy	☐Partially Frozen	☐Moderate
☒Raining	☐High	☐Drifts	☐Frozen	☐High
☐Snowing	From:	☐Melting	☐High Turbidity	☐Causing Erosion
Comments:	Mine has not been in operation since May 2019.			

Review of Surrounding Conditions (incl. Changes since previous DSI)

Upstream Conditions & Hazards	Downstream Conditions & Receptors
CCR to the north, east and west could fail into pond. Pipes to pump water from underground located along east side of reservoir.	Portals to the south. Portals are entered once per day to inspected underground for ~45 minutes

Are the following in Satisfactory Condition?

	Embankment	Yes	No	NA
C	Crest	X		
US	U/S Slope	X		
DS	D/S Slope	X		
T	D/S Toe	X		
LA	Left Abutment	X		
RA	Right Abutment	X		

	Channels	Yes	No	NA
I	Inlet			X
O	Outlet			X
S	Spillway			X
E	Emergency Spillway			X
D	Drains			X
IC	Inlet Controls			X
OC	Outlet Controls			X

	Other	Yes	No	NA
R	Reservoir	X		
RS	Reservoir U/S Slopes	X		
ID	Internal Dikes			X
B	Baffles			X
IN	Instruments			X

Tetra Tech Canada Inc.
#1- 4376 Boban Drive
Nanaimo, BC V9T 6A7 CANADA
Tel 250.756.2256 Fax 867.668.4349

OBSERVATIONS

1.0 GENERAL	YES	NO	NA	PHOTO #	COMMENTS
1.1 Evidence of Repairs		X			
1.2 Decant/Overflow Structure			X		
1.3 Emergency Spillway			X		
1.4 Interceptor/Diversion Ditch			X		
1.5 Crest Accessible by Truck	X			1	
1.6 Public Access to Dam/Site Security		X			Gate locked at night, security guard on site 24 hour/day.
1.7 Valves/Gates Operational			X		
1.8 Currently Pumping/Siphoning		X			
1.9 Reservoir Level/Freeboard	X			4	Approximaley 5 m of freeboard.
1.10 Signage/Safety Boom			X		
1.11 Tailings beach width			X		
1.12 Pipes	X			7	3 pipes on east abumtnet contact. 1 on surface and 2 buried. These are for pumping water from underground to Brinco Brook. Quinsam confirmed that there are no records for how the buried pipe
2.0 UPSTREAM DAM SLOPE	**YES**	**NO**	**NA**	**PHOTO #**	**COMMENTS**
2.1 Erosion Protection/Vegetation	X			4	1 medium sized trees near west abutment.
2.2 Evidence of Erosion/Tension Cracks		X			
2.3 Slope Visually Uniform (no bulging/settlement)		X		3	Upstream slope was irregular.
2.4 Animal Burrows		X			
3.0 DAM CREST	**YES**	**NO**	**NA**	**PHOTO #**	**COMMENTS**
3.1 Evidence of Breach / Wash-out		X			
3.2 Lateral Movement		X			
3.3 Evidence of Settlement/Cracking		X			.
3.4 Shoulder Erosion/Reduced Width		X			
3.5 Crest Visually Horizontal		X		2	
3.6 Surface soft, rutted, rilled	X			8	Some ponding and vehicle ruts. Runoff from crest creating small rills on downstream slope.
3.7 Vegetation		X			
3.8 Animal Burrows		X			
4.0 DOWNSTREAM DAM SLOPE	**YES**	**NO**	**NA**	**PHOTO #**	**COMMENTS**
4.1 Erosion Protection/Vegetation		X			

OBSERVATIONS					
4.2 Evidence of Erosion	X			5, 6	Road runoff concentrated causing small erosion rills.
4.3 Evidence of Slope Instability		X			
4.4 Evidence of Seepage or Piping		X			
4.5 Slope Visually Uniform (no bulging/settlement)		X			Slope surface is irregular, piles of material along west side
4.6 Animal Burrows		X			
5.0 DOWNSTREAM DAM TOE	**YES**	**NO**	**NA**	**PHOTO #**	**COMMENTS**
5.1 Toe Drain			x		.
5.2 Toe Ditch		X			
5.3 Ponded Water or Seepage at Toe	X			7	Ponded water at low point between toe of South Dam and 2North Pit TDF.
5.4 Flow in Toe Ditch		X			
5.5 Soft Toe/Evidence of Boils		X			
5.6 Toe Berm			x		
5.7 Animal Burrows		X			
8.0 INSTRUMENTATION	**YES**	**NO**	**NA**	**PHOTO #**	**COMMENTS**
8.1 Standpipe Piezometers			X		
8.2 Vibrating Wire/Pneumatic Piezometers			x		
8.3 Slope Indicators			X		
8.4 Survey/Settlement Pins			x		
8.7 Staff Gauges	X			4	3 staff gauges to measure wate level installed. Surveyed to reference elevation in 2020.
8.8 Flow Weir/meter			x		
8.9 Groundwater Wells – specify if monitoring or dewatering	X			10	Corregated steel pipe sump near east downstream toe. Not currently used. Water level in it was estimated as 8 m deep.
9.0 Construction Activities	**YES**	**NO**	**NA**	**PHOTO #**	**COMMENTS**
9.1 Current		X			
9.2 Proposed		X			
9.3 Previously Completed (date)		x			

OTHER NOTES

- Tree near west abutment should be removed as the roots can create preferential seepage paths and weaker zones in the dam. The tree should be cut off and the stump/root ball left in place so as not to further disturb the dam structure. The rest of the dam was free of vegetation.

OBSERVATIONS

- Reviewed infilled area of Old TDF between former Center Dam and North Dam. Relatively flat gravel surface. Downstream of former north dam is the 2 North PAG storage facility.
- No cracking, slumping or evidence of instability was observed.
- No seepage was observed from the South Dam.

Photo 1: Old TDF, South Dam circled in yellow, View of Facility Taken from the North Embankment of 2-North TDF, Looking North.

Photo 2: Old TDF, South Dam Crest, Looking West.

Photo 3: Old TDF, South Dam Upstream Slope, Slope Surface is Irregular, Looking West.

Photo 4: Old TDF, South Dam Upstream Slope, Showing the Three Staff Gauges and Tree on the West Abutment, Looking West.

Photo 5: Old TDF, South Dam Downstream Slope with Erosion Rills Across Surface, Looking West.

Photo 6: Old TDF, South Dam Erosion Rills on Downstream Slope.

Photo 7: Old TDF, South Dam Toe, Pipe on Dam Conveys Water from Underground Mine around Old TDF to Brinco Brook. Looking North.

Photo 8: Old TDF, West Abutment of South Dam, has Water Ponding and Vehicle Ruts Along Surface, Looking North.

Photo 9: Old TDF, East Abutment of South Dam. Pipe Conveys Water from Underground Mine around Old TDF to Brinco Brook. Looking North.

Photo 10: Old TDF South Dam, downstream toe. Corrugated Steel Pipe previous used for sampling identified by yellow arrow. Looking South.

TETRA TECH

DAM SAFETY INSPECTION CHECKLIST

Date:	May 4, 2021

Site:	Quinsam Coal Mine
Consequence Classification:	Low to Significant
Purpose / MoU Pond Type:	Sediment Ponds and Flooded Impoundments
Inspection Performed By:	Jennifer Sinclair, P.Eng and Angie Ramey, P.Eng.

Conditions at Time of Inspection

Temperature:	5 to 15° C			
Weather	**Winds**	**Snow Cover**	**Pond**	**Wave Action**
☒Sunny ☐Scattered Cloud ☐Overcast ☐Raining ☐Snowing	☒None ☐Light ☐Moderate ☐High From:	☒None ☐Slight ☐Heavy ☐Drifts ☐Melting	☐None ☒Open Water ☐Partially Frozen ☐Frozen ☐High Turbidity	☒None ☐Light ☐Moderate ☐High ☐Causing Erosion
Comments:	Mine has not been in operation since May 2019.			

The following tables provide a summary of conditions observed at each facility during the site visit.

Tetra Tech Canada Inc.
#1- 4376 Boban Drive
Nanaimo, BC V9T 6A7 CANADA
Tel 250.756.2256 Fax 867.668.4349

2 South Pit PAG Storage Facility

Are the following in Satisfactory Condition?

Embankment	Yes	No	NA
C Crest	X		
US U/S Slope	X		
DS D/S Slope	X		
T D/S Toe	X		
LA Left Abutment	X		
RA Right Abutment	X		

Channels	Yes	No	NA
I Inlet channel	X		
O Outlet channel		X	
S Spillway	X		
E Emergency Spillway			X
D Drains			X
IC Inlet Controls			X
OC Outlet Controls			X

Other	Yes	No	NA
R Reservoir	X		
RS Reservoir U/S Slopes	X		
ID Internal Dikes	X		
B Baffles			X
IN Instruments	X		

Comments

- **Reservoir:** No signs of instability around the facility not observed. No erosion from waves observed. 0.1 m of freeboard to crest of spillway. Approximately 2 to 3 m to crest of dam, challenging to estimate due to vegetation. (Photo 11)
- **Upstream Slopes**: No signs of instability, settlement, slumping, or cracking observed.
- **Crest (of waste rock potential dam):** Overgrown with broom, this impedes the ability to collect observations so should be removed. No signs of instability, settlement, slumping or cracking observed. No ponding or rutting observed.
- **Downstream Slopes (of waste rock potential dam)**: Overgrown with broom, this should be removed. No signs of instability, settlement, slumping, cracking or concerns observed in area that was walked, dam slope too overgrown to see small scale signs if they were there. (Photo 13)
- **Spillway:** Small tears in geomembrane liner, monitor and repair if increase in size. (Photo 15)
- **Outlet Channel:**
  - Riprap installed near toe of outlet channel is very weathered. Section of weathering approximately 15 m long and across width of spillway. This should be replaced to prevent erosion during large flow events. (Photos 18, 19)
  - Water ponded at toe of dam and flow in channel between pond and 3SP. The flow could be from seepage or groundwater discharging. Channel had small trees growing in it which could obstruct flows if debris is caught on them so should be removed. (Photo 20)
- **Instrumentation:** Staff gauge in inlet pond was spun so could not be read. This staff gauge was replaced with a staff gauge inside a vertical culvert in the internal dividing dyke that has a pump installed for pumping water from the facility. (Photo 12) If it is found that the staff gauge inside the vertical standpipe is not visible during routine inspections (for example due to pumping), or that water levels in the vertical culvert appear different than the surrounding ponds the staff gauge in the pond should be replaced.

3 South Pit PAG Storage Facility

Are the following in Satisfactory Condition?

Embankment	Yes	No	NA
C Crest	X		
US U/S Slope	X		
DS D/S Slope	X	X	
T D/S Toe		X	
LA Left Abutment	X		
RA Right Abutment	X		

Channels	Yes	No	NA
I Inlet channel	X		
O Outlet channel	X		
S Spillway	X		
E Emergency Spillway			X
D Drains			X
IC Inlet Controls			X
OC Outlet Controls			X

Other	Yes	No	NA
R Reservoir	X		
RS Reservoir U/S Slopes	X		
ID Internal Dikes			X
B Baffles			X
IN Instruments	X		

Comments

- **Reservoir:** No signs of instability or erosion from waves observed. Area to the northwest of spillway was irregular and appeared that it could be comprised of fill, construction records were not available. Approximately 3 m of freeboard to dam crest, 2 m of freeboard to spillway.
- **Upstream Slopes (North Dam)**: Small erosion rilling from crest. No signs of instability, settlement, slumping or cracking. (Photos 26, 27)
- **Crest (North Dam):** Ruts from vehicle traffic, monitor and repair if they increase in size. Recommended to prevent vehicle traffic on the dam crest. No signs of instability, settlement, slumping or cracking. (Photo 25)
- **Downstream Slopes (North Dam)**:
  - Upper bench did not have signs of instability, settlement, slumping or cracking. Toe of upper bench was moist with water limit above the plastic limit of the soil, where moisture was observed was above reservoir level so inferred to be from rain and not related to seepage. (Photo 28)
  - Lower bench retained by concrete lock blocks and fill pushed against trees at the crest of a natural slope. Natural slope at approximately 1.3H to 1.4H:1V and estimated as 20 m high. Leaning trees near toe of dam had been cut off in April 2021, QP described that stump/root balls then fell out of ground and area backfilled with adjacent fill. Signs of continual creeping and instability observed. (Photo 29)
  - No seepage was observed.
- **Spillway**: Does not have a permit to discharge water, so no flow through spillway and instead water is pumped to SP1 for discharge. Membrane and riprap appeared in good condition. (Photos 23, 24)
- **Outlet Channel**: Small trees growing in channel should be removed. Riprap appeared to be in good condition. (Photos 23, 24)
- **Instrumentation:** Staff gauge installed near inlet. Flow meter installed in inlet weir to measure seepage from 2SP. 4 VWPs installed in dam, installation records not available. (Photos 21, 31)

Settling Pond 1 Water Management Facility

Are the following in Satisfactory Condition?

	Embankment	Yes	No	NA
C	Crest		X	
US	U/S Slope	X		
DS	D/S Slope		X	
T	D/S Toe	X		
LA	Left Abutment	X		
RA	Right Abutment	X		

	Channels	Yes	No	NA
I	Decant inlet	X		
O	Decant outlet	X		
S	Spillway			X
E	Emergency Spillway		X	
D	Drains			X
IC	Inlet Controls			X
OC	Outlet Controls			X

	Other	Yes	No	NA
R	Reservoir	X		
RS	Reservoir U/S Slopes			X
ID	Internal Dikes			X
B	Baffles			X
IN	Instruments	X		

Comments

- **Reservoir:** No signs of instability observed. Approximately 1.6 m of freeboard at time of inspection, staff gauge 0 reading with water flowing into decant. Logs and woody floating debris observed in pond. Fencing around decant would prevent woody blocking decant. (Photo 7)
- **Upstream Slopes**:
  - Irregular slope, approximately 3H to 4H:1V covered with riprap.
  - Small trees and shrubs were growing on the upstream dam slope and crest, in particular near the abutments. It is recommended that these are removed. The shrubs impede the ability to collect observations and the roots from the trees can create preferential seepage paths and weaker zones in the dam, so it is recommended that these are removed. The trees should be cut off and the stump/root ball left in place so as not to further disturb the dam structure. (Photo 1)
  - No signs of instability, settlement, slumping or cracking.
- **Crest:**
  - Ruts near center of dam had been infilled. South end of the dam had deep ruts and ponding, these should be infilled and measures taken to prevent driving on the dam crest. (Photo 2)
  - Small trees and brush growing on crest, these should be removed.
  - HDPE and CSP pipes sitting on dam crest that are not currently used.
- **Downstream Slopes**:
  - Approximately sloped at 2H:1V.
  - Water ponding and seepage was observed near the downstream toe of the dam near the middle to north (right) abutment of the dam. The ponded water was about 15 m long, 5 m wide, and 0.4 m deep. The seepage appears to be coming through the dam. This ponding results in a permanently saturated area at the toe of the dam that decreases stability of the structure. It is recommended that work is performed to permanently drain this ponding by excavating a drain channel that connects to the outlet channel where the low level outlet discharges. (Photo 4)
  - Slumping near old utility pole near south end of dam. QP described that this was existing and area had not changed.
  - Trees had been cleared near crest of slope, large trees remain near lower portion of slope, these should be removed/cleared. (Photo 3)
- **Emergency Spillway**: Spillway has bedrock sill approximately 0.9 m below dam crest. Vegetation cleared between pond and sill, remainder of channel overgrown with trees, these should be removed. (Photo 10)
- **Outlet**: Decant inlet with vertical riser in pond, water level 1 cm above inlet. Discharges through metal pipe to channel downstream. Inlet had metal fencing installed around it to stop beavers from plugging outlet. Outlet is 50 cm in diameter, solid steel pipe with 2 cm thick walls. (Photos 5, 6, 8)
- **Instrumentation:** Staff gauge installed near inlet. Flow meter installed in inlet to decant. 4 VWPs installed in dam, installation records not available.
- **Other**: QP described that 3 beavers were trapped and removed from the area in November 2020.

Settling Pond 4 Water Management Facility

Are the following in Satisfactory Condition?

	Embankment	Yes	No	NA
C	Crest	X		
US	U/S Slope	X		
DS	D/S Slope		X	
T	D/S Toe	X		
LA	Left Abutment	X		
RA	Right Abutment	X		

	Channels	Yes	No	NA
I	Decant inlet			X
O	Decant outlet			X
S	Spillway			X
E	Emergency Spillway		X	
D	Drains			X
IC	Inlet Controls			X
OC	Outlet Controls			X

	Other	Yes	No	NA
R	Reservoir	X		
RS	Reservoir U/S Slopes	X		
ID	Internal Dikes			X
B	Baffles			X
IN	Instruments	X		

Comments

- **Reservoir:** No signs of instability or erosion from waves observed. Approximately 2 m of freeboard at time of inspection, staff gauge reading was 38 cm. Water in reservoir was brown and appeared to have a high sediment load.
- **Upstream Slopes**:
  - Approximately 1.7V:1H. Ends covered in riprap, repair in middle is exposed CCR.
  - Small shrubs at ends of dam, these should be removed. (Photo 32)
  - No signs of instability, settlement, slumping or cracking, although vegetation impeded ability to see whole slope.
- **Crest:** Crest appeared relatively horizontal, gravel surfacing. No signs of instability, settlement, slumping or cracking observed.
- **Downstream Slopes**:
  - Trees growing along lower portion of dam slopes. These should be removed. (Photos 34, 43)
  - Sloped at approximately 1.7 H:1V
  - No signs of instability, settlement, slumping or cracking, although vegetation impeded ability to see whole slope.
  - Seepage or signs of seepage were not observed from the downstream slope of the dam or toe in areas that were not submerged by ponding.
- **Emergency Spillway**: Spillway near dam crest infilled with gravel for road surface, invert of spillway approximately 1 m below dam crest. Shrubs growing in channel between reservoir and dam, channel downstream of spillway overgrown with trees. This vegetation should be removed. (Photo 42)
- **Outlet**: Decant inlet with vertical riser in pond, approximately 10 cm of water above inlet. Discharges through HDPE pipe to channel downstream, outlet mostly submerged. QP described that water at outlet is never low enough to look in and inspect pipe. (Photos 35, 37)
- **Instrumentation:** Staff gauge installed near decant inlet, QP noted that base of staff gauge at 16 cm, which is the elevation of the decant inlet. Flow meter installed in inlet to decant. 4 VWPs installed in dam, installation records not available. (Photo 38)

Photo 1: Settling Pond 1 Dam Crest, Small Vegetation Growing on Upstream Slope, Ruts in the Centre of the Dam Have Been Infilled.

Photo 2: Settling Pond 1 Dam Crest, South End of the Dam with Deep Ruts and Ponding.

Photo 3: Settling Pond 1 Dam Downstream Slope, Looking Southeast.

Photo 4: Settling Pond 1 Water Ponding at the Downstream Toe.

Photo 5: Settling Pond 1 Upstream Decant, Fencing is to Prevent Beavers Blocking Decant, Facing Northeast.

Photo 6: Settling Pond 1 Upstream Decant.

Photo 7: Settling Pond 1 Staff Gauge.

Photo 8: Settling Pond 1 Low Level Outlet Downstream Discharge.

Photo 9: Settling Pond 1 with Siphon Line to 2 South Pit in Foreground, Looking Southeast.

Photo 10: Settling Pond 1 Vegetation Growing in Emergency Spillway, Looking North in downstream direction from Bedrock Sill.

Photo 11: 2 South Pit Pond and Reservoir Slopes, Internal Dividing Dyke Across Pond in Photo Background, Looking Northeast.

Photo 12: 2 South Pit Pond, Staff Gauge Installed in Vertical Culvert in Internal Dividing Dyke

Photo 13: 2 South Pit Pond, Downstream Toe of Waste Rock (Potential Dam), Overgrown with Broom.

Photo 14: 2 South Pit Pond Outlet Spillway, Looking Southwest.

Photo 15: 2 South Pit Outlet Spillway, Small Tears in the Geomembrane.

Photo 16: 2 South Pit Outlet Spillway, Looking Downstream.

Photo 17: 2 South Pit Armored Outlet Channel, Looking Downstream.

Photo 18: 2 South Pit Armoured Outlet Channel to 3 South Pit, Riprap is Weathered, Looking North

Photo 19: Close Up of Weathered Riprap in Channel between 2 South Pit and 3 South Pit.

Photo 20: Water Ponded at the Toe of the 2 South Pit Dam in the Channel between 2 South Pit and 3 South Pit.

Photo 21: 3 South Pit Inlet Flow Measuring Weir, Immediately Downstream of Access Road.

Photo 22: 3 South Pit, Looking North Towards the North Dam.

Photo 23: 3 South Pit Pond South Overflow Spillway and Rip Rap Channel, Looking Southwest.

Photo 24: 3 South Pit Pond Overflow Spillway Channel Looking Downstream.

Photo 25: 3 South Pit North Dam Crest and Upstream Slope, Looking Northeast.

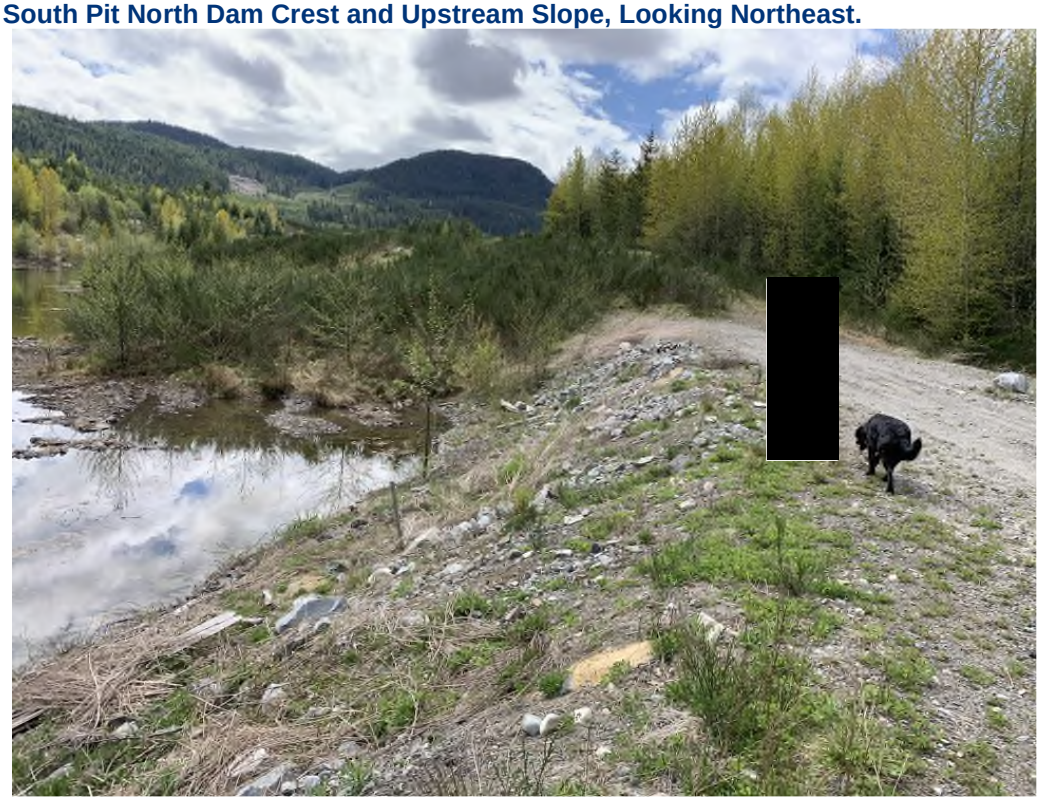


Photo 26: 3 South Pit North Dam Upstream Slope, Looking West.

Photo 27: 3 South Pit North Dam, Erosion Runoff Channel on Upstream side of Crest, Looking South.

Photo 28: 3 South Pit North Dam Downstream Slope, Looking Northeast.

Photo 29: 3 South Pit Pond North Dam Downstream Toe, Lock Blocks Supporting Slope, Trees fallen over and Root Ball Dislodged identified by yellow arrow, Looking West.

Photo 30: 3 South Pit Floating Pump Barge.

Photo 31: 3 South Pit Staff Gauge.

Photo 32: Settling Pond 4 Dam Crest and Upstream Slope, Looking North.

Photo 33: Settling Pond 4 Dam Upstream Slope Looking South.

Photo 34: Settling Pond 4 Dam Downstream Slope, Looking South.

Photo 35: Settling Pond 4 Submerged Downstream Outlet, identified by yellow arrow.

Photo 36: Settling Pond 4 Exposed Geotextile on crest, from 2004 Low Level Outlet Repairs.

Photo 37: Settling Pond 4 Inlet to Low Level Outlet Upstream and Staff Gauge, Looking Northeast.

Photo 38: Settling Pond 4 Close Up of Staff Gauge.

Photo 39: Settling Pond 4 Looking Downstream/West.

Photo 40: Settling Pond 4 Spillway, Looking East/Upstream.

Photo 41: Settling Pond 4 Spillway with Granular Fill, Looking West/Downstream.

Photo 42: Settling Pond 4 Vegetation Growing in Spillway, Looking Southwest/Downstream.

Photo 43: Settling Pond 4 Trees growing on South Side of Downstream Embankment. Dam Toe marked by yellow arrow, all trees upslope should be removed.

APPENDIX B

DRAWINGS

Reproduced From:

Quinsam Coal Project Settling Pond 1 Geotechnical Investigation (Thurber, 1990)

Quinsam Coal Mine Sediment Pond No. 4 Dam Repair Construction (Golder, 2004)

Design Report for the Quinsam 2 South Pit PAG CCR Storage Facility (Golder, 2011)

3 South Pit Dyke Design Quinsam Coal Mine, Campbell River, BC (Golder, 2012)

2018 Annual Dam Safety Inspection 2-North Pit Tailings Disposal Facility (Golder, 2019a)

2018 Annual Dam Safety Inspection South Dam Quinsam Mine (Golder, 2019b)

SIPHON PIPELINE
(SEE REFERENCE 4)

NORTHEAST CORNER RESLOPING
SURVEY (SEE REFERENCE 2)

PORTAL
SUMP

0.77 l/s
(2018 AVERAGE)

ULTIMATE EMBANKMENT TOE

10 MAY 2018 SURVEY LIMIT
(SEE REFERENCE 1)

POND EL. 350.8 m
(03 OCT 2018)

EAST EMBANKMENT CREST EL. 354.1 m TO 355.0 m (TILL)

3 OCT 2018 BATHYMETRY SURVEY
(SEE REFERENCE 3)

VWO587
VW16734
VWO586
VWO585
SST-2
VWO584
VWO583
SST-1
VWO582

NORTH EMBANKMENT CREST
EL. 354.0 m TO 356.8 m

MINIMUM FREEBOARD 2 m
(10 MAY 2018)

POND EL. 351.9 m
(10 MAY 2018)

SOUTH EMBANKMENT CREST
EL. 354.5 m TO 354.9 m (TILL)

SST-4

POND

SHOP

TAILINGS
EXCAVATION AREA

TAILINGS BEACH
EL. 352.0 m TO 353.5 m
(10 MAY 2018)

WEST EMBANKMENT CREST EL. 354.9 m TO 355.3 m (TILL)

SST-5

SST-6

STACKER

STORAGE YARD

SHOP

103 200 N
103 000 N
102 800 N
102 600 N
99 400 E
99 200 E

0 40 80 120m
1:2,000

LEGEND

- VWO587 / SSt-1 — PIEZOMETER / SURVEY MONUMENT
- 12 — LOCATION OF PHOTOGRAPHS SHOWING DIRECTION
- 0.77 l/s — OBSERVED SEEPAGE AND ESTIMATED FLOW RATE (2018 AVERAGE)
- APPROXIMATE LOCATION OF GEOTEXTILE FABRIC
- PROPOSED ULTIMATE EMBANKMENT TOE
- SIPHON PIPELINE (SEE REFERENCE 4)
- TAILINGS POND AREA (SEE REFERENCE 3)

NOTES

1. SEE FIGURE 7 FOR LAYOUT OF UNDERGROUND WORKINGS NEAR TAILINGS FACILITY.
2. MAJOR CONTOUR INTERVAL 5 m
   MINOR CONTOUR INTERVAL 1 m
3. PHOTO LOCATIONS BASED ON SITE INSPECTION FROM 12 APRIL 2018.
4. BEACH LIMITS APPROXIMATE.
5. COORDINATE SYSTEM IN MINE GRID.

REFERENCES

1. 2018 TSF AS-BUILT SURVEY PROVIDED BY QUINSAM COAL CORPORATION, FILE NAME: "2018_As_Built_Tailings_Dam_05_10_2018.dwg", RECEIVED: 10 MAY 2018.
2. NORTHEAST CORNER RE-SLOPING SURVEY PROVIDED BY QUINSAM COAL CORPORATION, RECEIVED: 10 MAY 2018.
3. BATHYMETRY SURVEY PROVIDED BY QUINSAM COAL CORPORATION, FILE NAME: "10_03_2018_TDF_Bathymetric_Survey.dwg", RECEIVED: 3 OCTOBER 2018.
4. SIPHON PIPELINE PROVIDED BY QUINSAM COAL CORPORATION, FILE NAME: "Siphon Pipe Line.dwg", RECEIVED: 3 OCTOBER 2018.
5. BASE TOPOGRAPHY PROVIDED BY QUINSAM COAL CORPORATION.

NOT FOR CONSTRUCTION

CLIENT
QUINSAM COAL CORPORATION

PROJECT
2-NORTH PIT TAILINGS DISPOSAL FACILITY
QUINSAM MINE 2018 DAM SAFETY INSPECTION
CAMPBELL RIVER, BC

TITLE
2-NORTH PIT TAILINGS DISPOSAL FACILITY
SITE PLAN

CONSULTANT
GOLDER

YYYY-MM-DD	2019-03-21
DESIGNED	BJ
PREPARED	BM
REVIEWED	MW
APPROVED	BEW

PROJECT NO.	PHASE/TASK	REV.	FIGURE
1784978	4000/4002	0	1

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

LEGEND

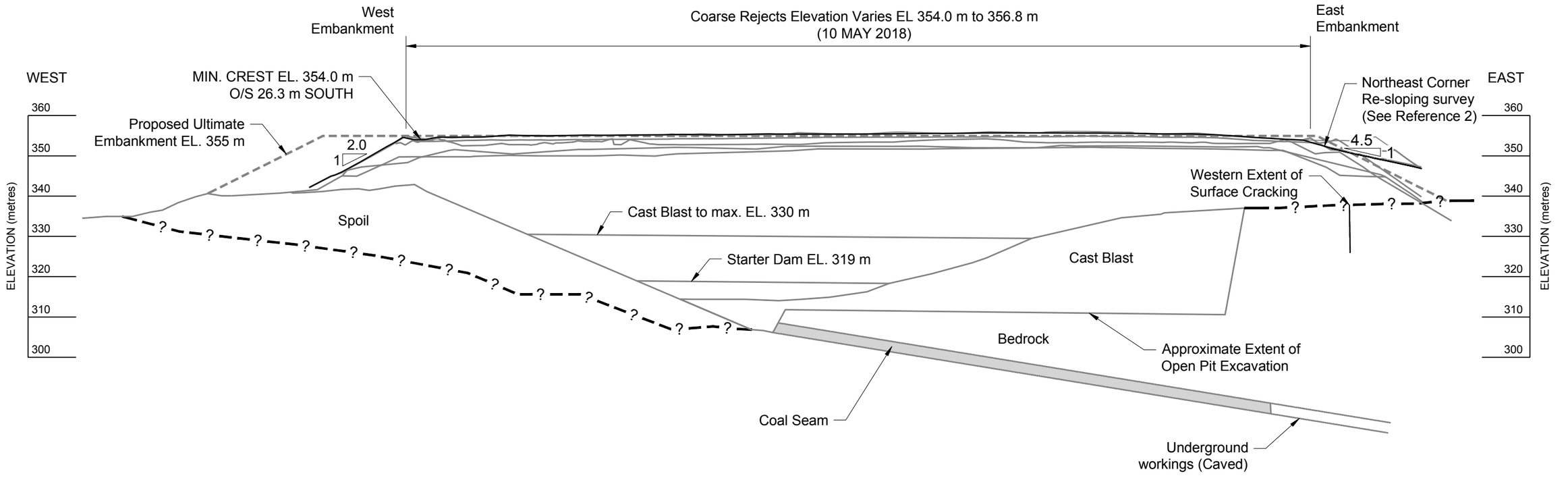
- SURVEY (10 MAY 2018)
- AS-BUILT EMBANKMENT CONSTRUCTION (2017 AND PREVIOUS YEARS)
- PROPOSED ULTIMATE EMBANKMENT
- INFERRED ORIGINAL GROUND SURFACE

NOTES

1. SEE FIGURE 7 FOR LAYOUT OF UNDERGROUND WORKINGS NEAR TAILINGS FACILITY.
2. LOCATIONS OF MATERIALS PLACED BELOW ELEVATION 348.5 m ARE APPROXIMATE.
3. COORDINATE SYSTEM IN MINE GRID.

REFERENCES

1. 2018 TSF AS-BUILT SURVEY PROVIDED BY QUINSAM COAL CORPORATION, FILE NAME: "2018_As_Built_Tailings_Dam_05_10_2018.dwg", RECEIVED: 10 MAY 2018.
2. NORTHEAST CORNER RE-SLOPING SURVEY PROVIDED BY QUINSAM COAL CORPORATION, RECEIVED: 10 MAY 2018.
3. PREVIOUS EMBANKMENT CONSTRUCTION SURVEY PROVIDED BY QUINSAM COAL CORPORATION.



A1 CROSS SECTION A-A'

SCALE: 1:1,000 m

NOT FOR CONSTRUCTION

0 20 40 60m

1:1,000

CLIENT
QUINSAM COAL CORPORATION

PROJECT
2-NORTH PIT TAILINGS DISPOSAL FACILITY
QUINSAM MINE 2018 DAM SAFETY INSPECTION
CAMPBELL RIVER, BC

TITLE
NORTH EMBANKMENT LONGITUDINAL SECTION

CONSULTANT
GOLDER

YYYY-MM-DD	2019-03-21
DESIGNED	BJ
PREPARED	BM
REVIEWED	MW
APPROVED	BEW

PROJECT NO.	PHASE/TASK	REV.	FIGURE
1784978	4000/4002	0	2

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

0 25 mm

LEGEND

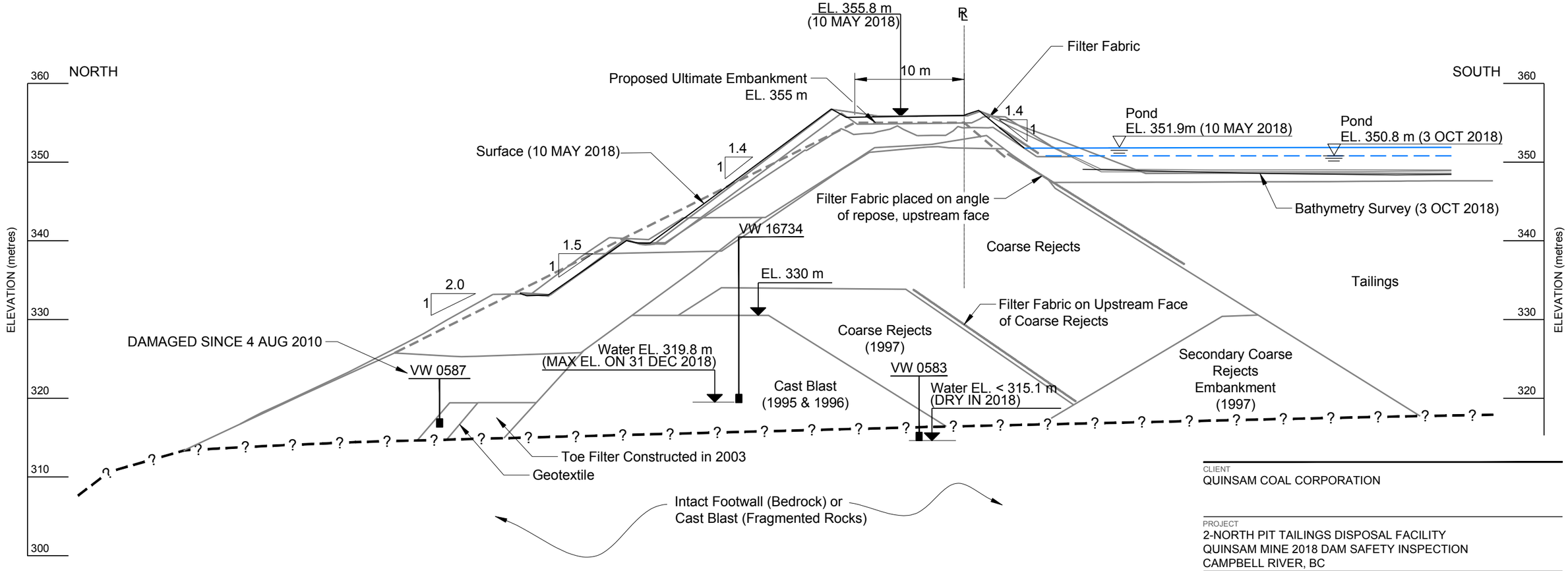
- SURVEY (10 MAY 2018)
- AS-BUILT EMBANKMENT CONSTRUCTION (2017 AND PREVIOUS YEARS)
- PROPOSED ULTIMATE EMBANKMENT
- INFERRED ORIGINAL GROUND SURFACE
- VW 0584 — PIEZOMETER
- POND ELEVATION (10 MAY 2018)
- POND ELEVATION (3 OCT 2018)

NOTES

1. LOCATIONS OF MATERIALS PLACED BELOW ELEVATION 348.5 m ARE APPROXIMATE.
2. COORDINATE SYSTEM IN MINE GRID.

REFERENCES

1. 2018 TSF AS-BUILT SURVEY PROVIDED BY QUINSAM COAL CORPORATION, FILE NAME: "2018_As_Built_Tailings_Dam_05_10_2018.dwg", RECEIVED: 10 MAY 2018.
2. BATHYMETRY SURVEY PROVIDED BY QUINSAM COAL CORPORATION, FILE NAME: "10_03_2018_TDF_Bathymetric_Survey.dwg", RECEIVED: 3 OCTOBER 2018.
3. PREVIOUS EMBANKMENT CONSTRUCTION SURVEY PROVIDED BY QUINSAM COAL CORPORATION.



B / 1 CROSS SECTION B-B'

SCALE: 1:500 m

NOT FOR CONSTRUCTION

0 10 20 30m

1:500

CLIENT
QUINSAM COAL CORPORATION

PROJECT
2-NORTH PIT TAILINGS DISPOSAL FACILITY
QUINSAM MINE 2018 DAM SAFETY INSPECTION
CAMPBELL RIVER, BC

TITLE
NORTH EMBANKMENT CROSS SECTION

CONSULTANT
GOLDER

YYYY-MM-DD	2019-03-21
DESIGNED	BJ
PREPARED	BM
REVIEWED	MW
APPROVED	BEW

PROJECT NO.	PHASE/TASK	REV.	FIGURE
1784978	4000/4002	0	3

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

0 25 mm

LEGEND

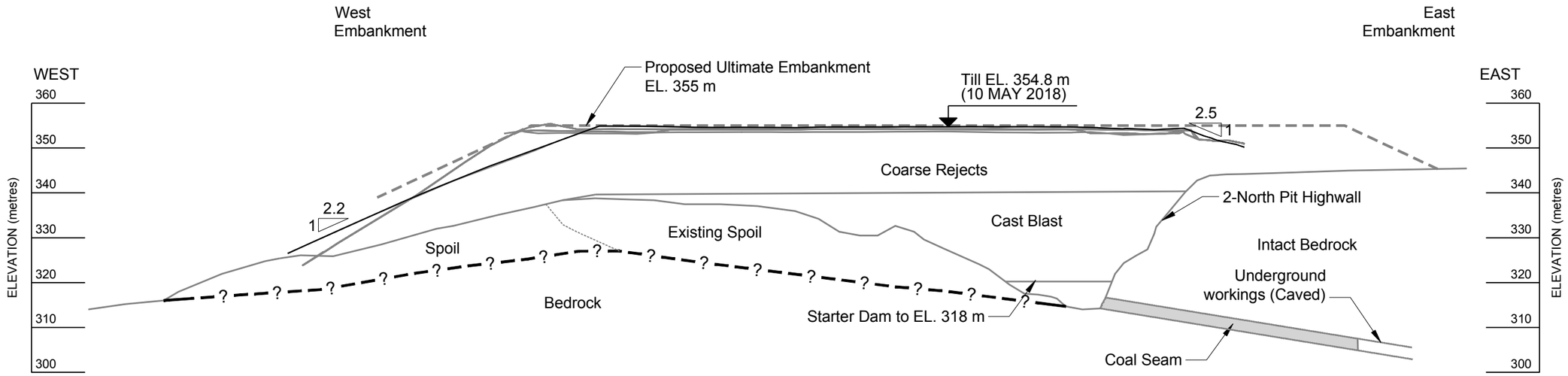
- SURVEY (10 MAY 2018)
- AS-BUILT EMBANKMENT CONSTRUCTION (2017 AND PREVIOUS YEARS)
- PROPOSED ULTIMATE EMBANKMENT
- INFERRED ORIGINAL GROUND SURFACE

NOTES

1. SEE FIGURE 7 FOR LAYOUT OF UNDERGROUND WORKINGS NEAR TAILINGS FACILITY.
2. LOCATIONS OF MATERIALS PLACED BELOW ELEVATION 348.5 m ARE APPROXIMATE.
3. COORDINATE SYSTEM IN MINE GRID.

REFERENCES

1. 2018 TSF AS-BUILT SURVEY PROVIDED BY QUINSAM COAL CORPORATION, FILE NAME: "2018_As_Built_Tailings_Dam_05_10_2018.dwg", RECEIVED: 10 MAY 2018.
2. PREVIOUS EMBANKMENT CONSTRUCTION SURVEY PROVIDED BY QUINSAM COAL CORPORATION.



C 1 CROSS SECTION C-C'

SCALE: 1:1,000 m

NOT FOR CONSTRUCTION

0 20 40 60m

1:1,000

CLIENT
QUINSAM COAL CORPORATION

PROJECT
2-NORTH PIT TAILINGS DISPOSAL FACILITY
QUINSAM MINE 2018 DAM SAFETY INSPECTION
CAMPBELL RIVER, BC

TITLE
SOUTH EMBANKMENT LONGITUDINAL SECTION

CONSULTANT
GOLDER

YYYY-MM-DD	2019-03-21
DESIGNED	BJ
PREPARED	BM
REVIEWED	MW
APPROVED	BEW

PROJECT NO.	PHASE/TASK	REV.	FIGURE
1784978	4000/4002	0	4

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

25 mm

0

LEGEND

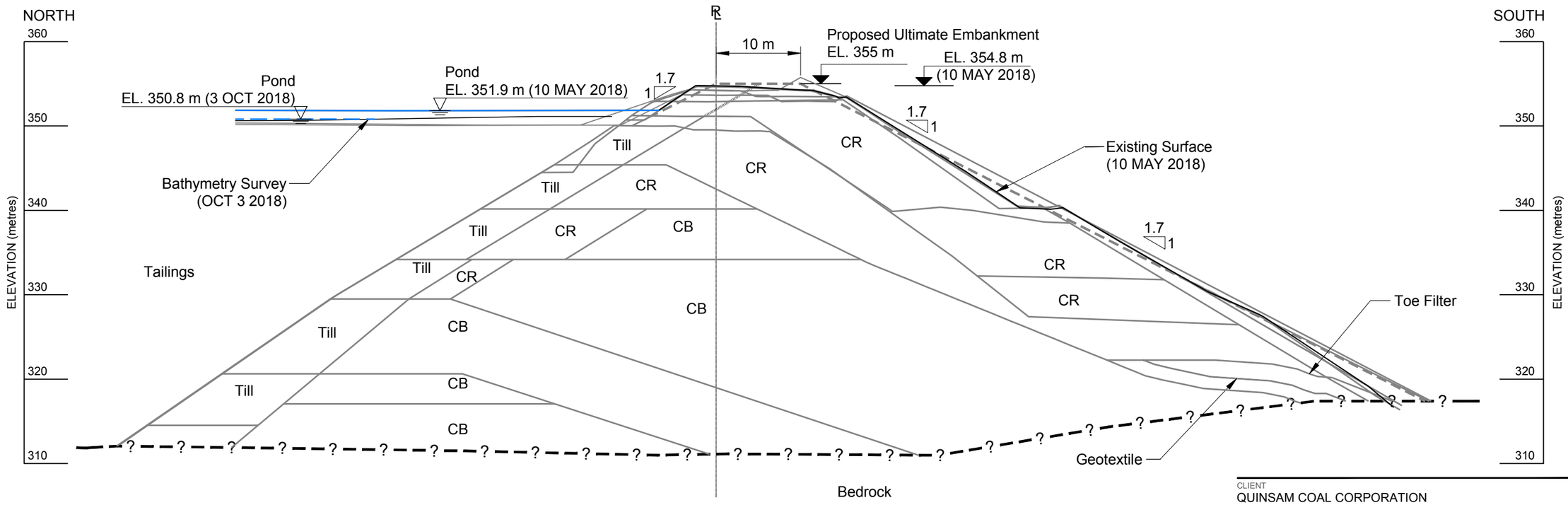
- SURVEY (10 MAY 2018)
- AS-BUILT EMBANKMENT CONSTRUCTION (2017 AND PREVIOUS YEARS)
- PROPOSED ULTIMATE EMBANKMENT
- INFERRED ORIGINAL GROUND SURFACE
- POND ELEVATION (10 MAY 2018)
- POND ELEVATION (3 OCT 2018)

NOTES

2. LOCATIONS OF MATERIALS PLACED BELOW ELEVATION 348.5 m ARE APPROXIMATE.
3. COORDINATE SYSTEM IN MINE GRID.

REFERENCES

1. 2018 TSF AS-BUILT SURVEY PROVIDED BY QUINSAM COAL CORPORATION, FILE NAME: "2018_As_Built_Tailings_Dam_05_10_2018.dwg", RECEIVED: 10 MAY 2018.
2. BATHYMETRY SURVEY PROVIDED BY QUINSAM COAL CORPORATION, FILE NAME: "10_03_2018_TDF_Bathymetric_Survey.dwg", RECEIVED: 3 OCTOBER 2018.
3. PREVIOUS EMBANKMENT CONSTRUCTION SURVEY PROVIDED BY QUINSAM COAL CORPORATION.



CR - Coarse Rejects
CB - Cast Blast

D-1 **CROSS SECTION D-D'**
SCALE: 1:500

NOT FOR CONSTRUCTION

0 10 20 30m
1:500

CLIENT
QUINSAM COAL CORPORATION

PROJECT
2-NORTH PIT TAILINGS DISPOSAL FACILITY
QUINSAM MINE 2018 DAM SAFETY INSPECTION
CAMPBELL RIVER, BC

TITLE
SOUTH EMBANKMENT CROSS SECTION

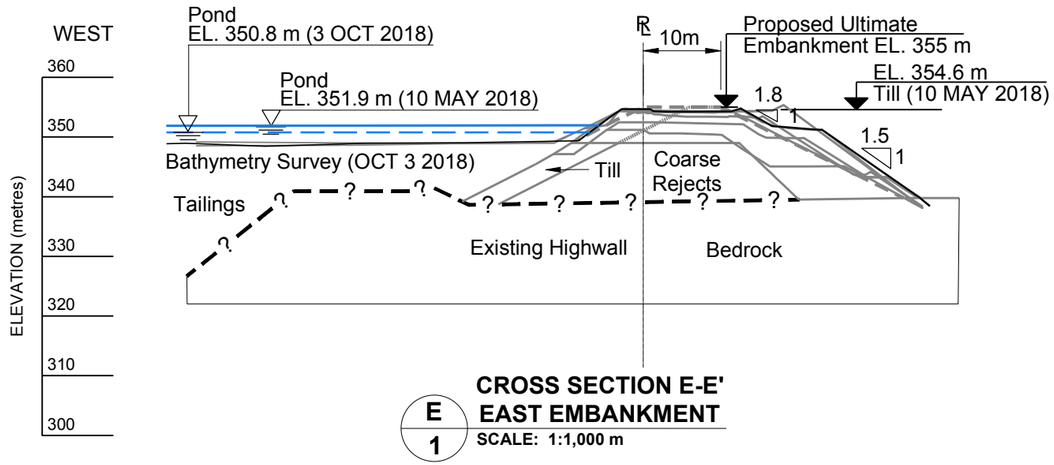
CONSULTANT
GOLDER

YYYY-MM-DD	2019-03-21
DESIGNED	BJ
PREPARED	BM
REVIEWED	MW
APPROVED	BEW

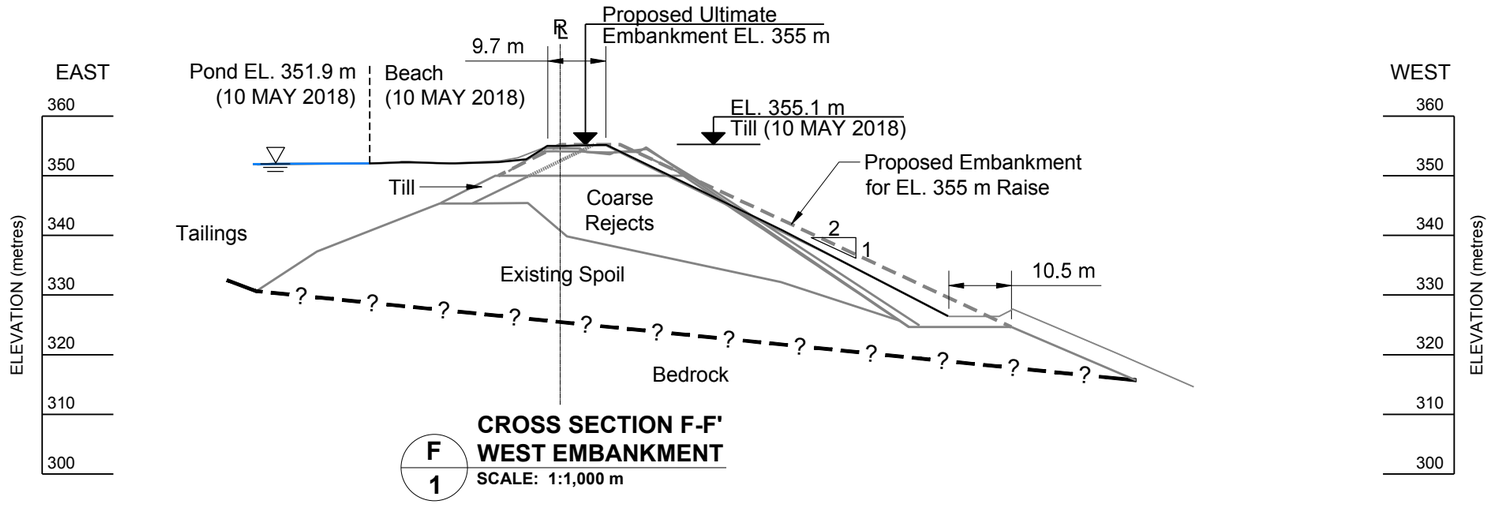
PROJECT NO.	PHASE/TASK	REV.	FIGURE
1784978	4000/4002	0	5

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

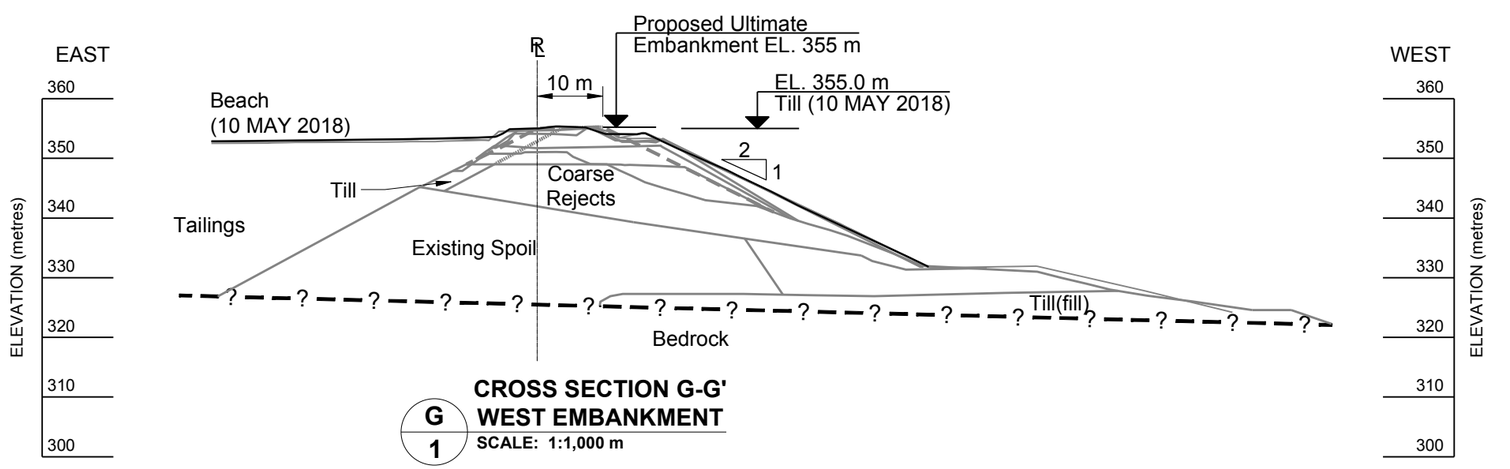
25 mm



CROSS SECTION E-E'
EAST EMBANKMENT
SCALE: 1:1,000 m



CROSS SECTION F-F'
WEST EMBANKMENT
SCALE: 1:1,000 m



CROSS SECTION G-G'
WEST EMBANKMENT
SCALE: 1:1,000 m

LEGEND

- SURVEY (10 MAY 2018)
- AS-BUILT EMBANKMENT CONSTRUCTION (2017 AND PREVIOUS YEARS)
- PROPOSED ULTIMATE EMBANKMENT
- INFERRED ORIGINAL GROUND SURFACE
- POND ELEVATION (10 MAY 2018)
- POND ELEVATION (3 OCT 2018)

NOTES

1. SEE FIGURE 7 FOR LAYOUT OF UNDERGROUND WORKINGS NEAR TAILINGS FACILITY.
2. LOCATIONS OF MATERIALS PLACED BELOW ELEVATION 348.5 m ARE APPROXIMATE.
3. COORDINATE SYSTEM IN MINE GRID.

REFERENCES

1. 2018 TSF AS-BUILT SURVEY PROVIDED BY QUINSAM COAL CORPORATION, FILE NAME: "2018_As_Built_Tailings_Dam_05_10_2018.dwg", RECEIVED: 10 MAY 2018.
2. PREVIOUS EMBANKMENT CONSTRUCTION SURVEY PROVIDED BY QUINSAM COAL CORPORATION.

NOT FOR CONSTRUCTION

0 20 40 60m
1:1,000

CLIENT
QUINSAM COAL CORPORATION

PROJECT
2-NORTH PIT TAILINGS DISPOSAL FACILITY
QUINSAM MINE 2018 DAM SAFETY INSPECTION
CAMPBELL RIVER, BC

TITLE
EAST AND WEST EMBANKMENTS CROSS SECTIONS

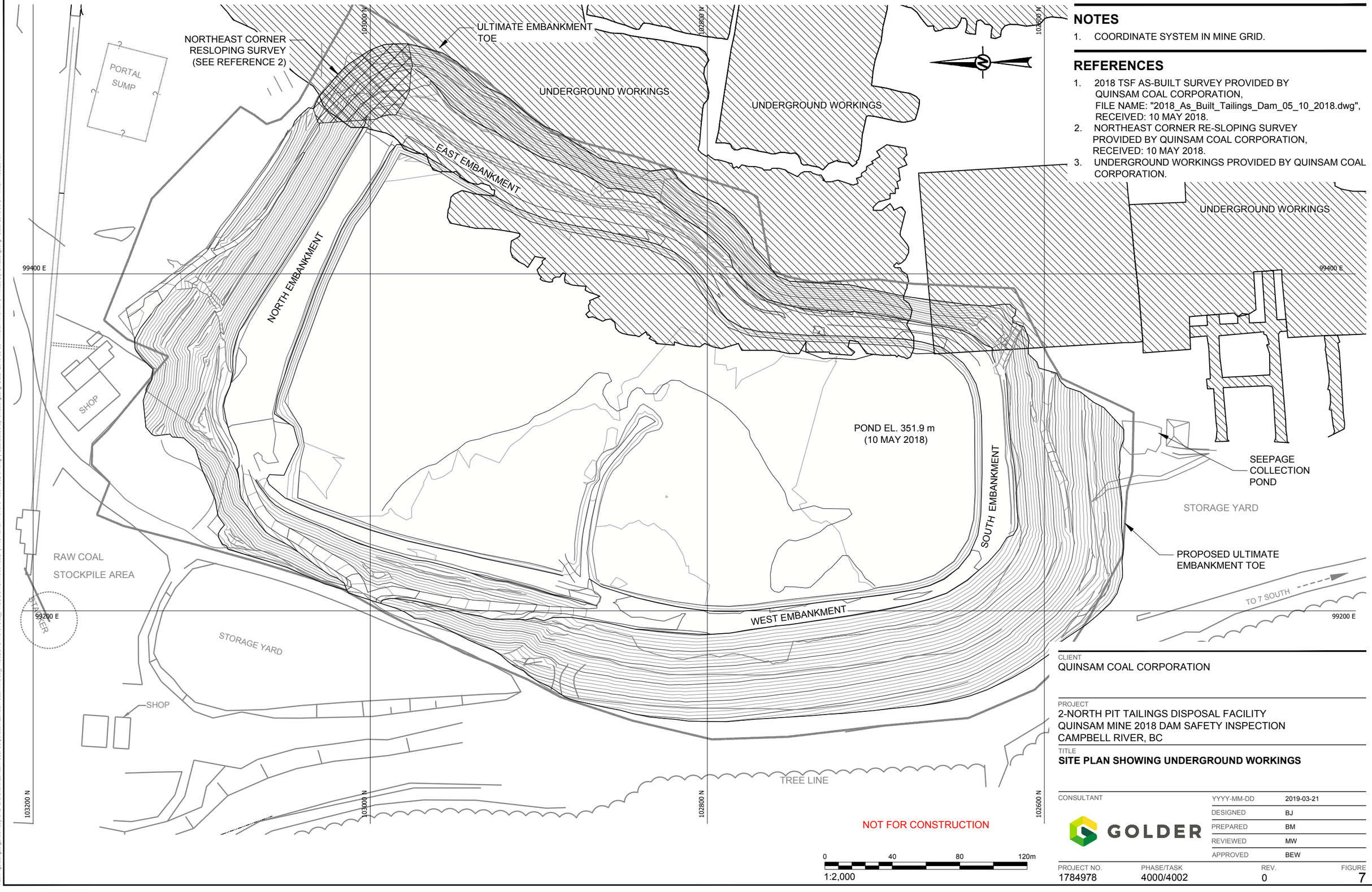
CONSULTANT
GOLDER

YYYY-MM-DD	2019-03-21
DESIGNED	BJ
PREPARED	BM
REVIEWED	MW
APPROVED	BEW

PROJECT NO.	PHASE/TASK	REV.	FIGURE
1784978	4000/4002	0	6

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

0 25 mm



NOTES

1. COORDINATE SYSTEM IN MINE GRID.

REFERENCES

1. 2018 TSF AS-BUILT SURVEY PROVIDED BY QUINSAM COAL CORPORATION, FILE NAME: "2018_As_Built_Tailings_Dam_05_10_2018.dwg", RECEIVED: 10 MAY 2018.
2. NORTHEAST CORNER RE-SLOPING SURVEY PROVIDED BY QUINSAM COAL CORPORATION, RECEIVED: 10 MAY 2018.
3. UNDERGROUND WORKINGS PROVIDED BY QUINSAM COAL CORPORATION.

CLIENT
QUINSAM COAL CORPORATION

PROJECT
2-NORTH PIT TAILINGS DISPOSAL FACILITY
QUINSAM MINE 2018 DAM SAFETY INSPECTION
CAMPBELL RIVER, BC

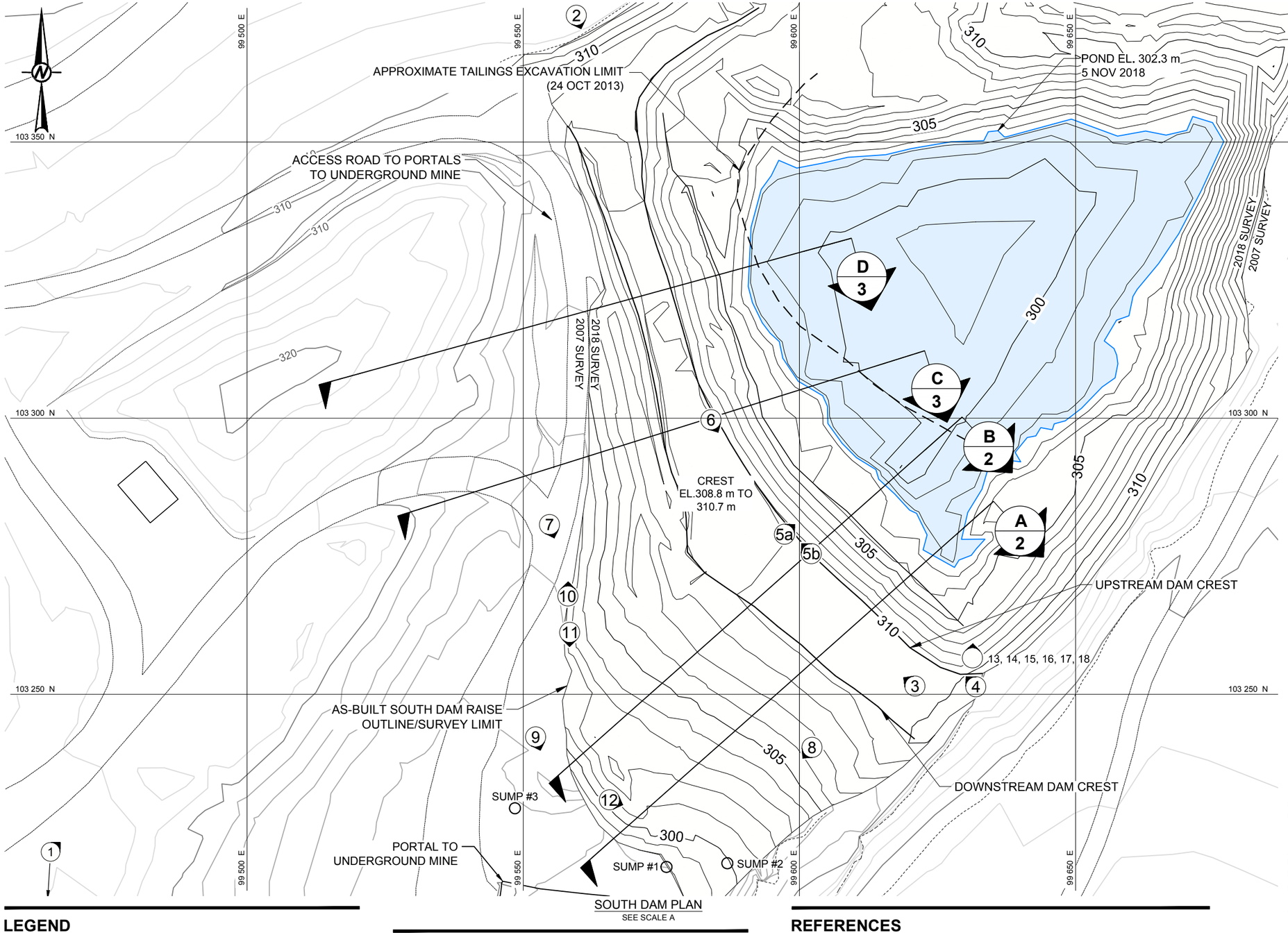
TITLE
SITE PLAN SHOWING UNDERGROUND WORKINGS

CONSULTANT
GOLDER

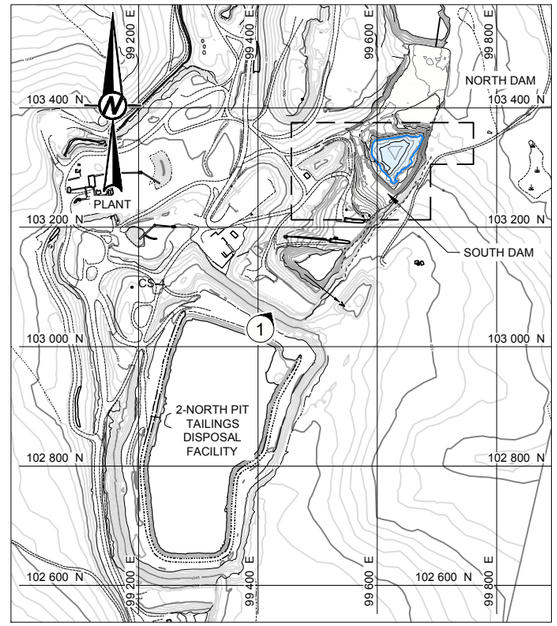
YYYY-MM-DD	2019-03-21
DESIGNED	BJ
PREPARED	BM
REVIEWED	MW
APPROVED	BEW

PROJECT NO.	PHASE/TASK	REV.	FIGURE
1784978	4000/4002	0	7

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



SOUTH DAM PLAN
SEE SCALE A



KEY PLAN
SEE SCALE B

NOT FOR CONSTRUCTION

LEGEND

- SOUTH DAM MAJOR CONTOUR (NOVEMBER 2018)
- SOUTH DAM MINOR CONTOUR (NOVEMBER 2018)
- SOUTH DAM POND EXTENT (NOVEMBER 2018)
- MAJOR CONTOUR (JULY 2007)
- MINOR CONTOUR (JULY 2007)
- ACCESS ROAD
- SUMP
- PHOTOGRAPH LOCATION (11 AND 12 APRIL 2018)

NOTES

1. ALL DIMENSIONS AND ELEVATIONS ARE IN METRES UNLESS OTHERWISE NOTED.
2. COORDINATE SYSTEM IN MINE GRID.
3. SOUTH DAM SURVEY MAJOR CONTOUR INTERVAL 5 m AND MINOR CONTOUR INTERVAL 1 m.
4. BASE PLAN AND OTHER AREA SURVEY MAJOR CONTOUR INTERVAL 10 m AND MINOR CONTOUR INTERVAL 2 m.

REFERENCES

1. BASE PLAN PROVIDED BY MCELHANNEY CONSULTING LTD, JULY 2007.
2. 2018 AS-BUILT SOUTH DAM CONTOURS PROVIDED BY QUINSAM COAL CORPORATION, FILE NAME: "South_Dam_11_05_2018.dwg", RECEIVED: NOVEMBER 5, 2018.
3. SOUTH DAM IMPOUNDMENT AREA CONTOURS FROM 8 MAY 2018 SURVEYED BY QUINSAM COAL CORPORATION, FILE NAME: "South_Dam.dwg", RECEIVED: MAY 9, 2018.

0 15 30 45m
SCALE A 1:750

0 200 400 600m
SCALE B 1:10,000

CLIENT
QUINSAM COAL CORPORATION

PROJECT
QUINSAM MINE SOUTH DAM 2018 DAM SAFETY INSPECTION
CAMPBELL RIVER, BC

TITLE
SOUTH DAM PLAN

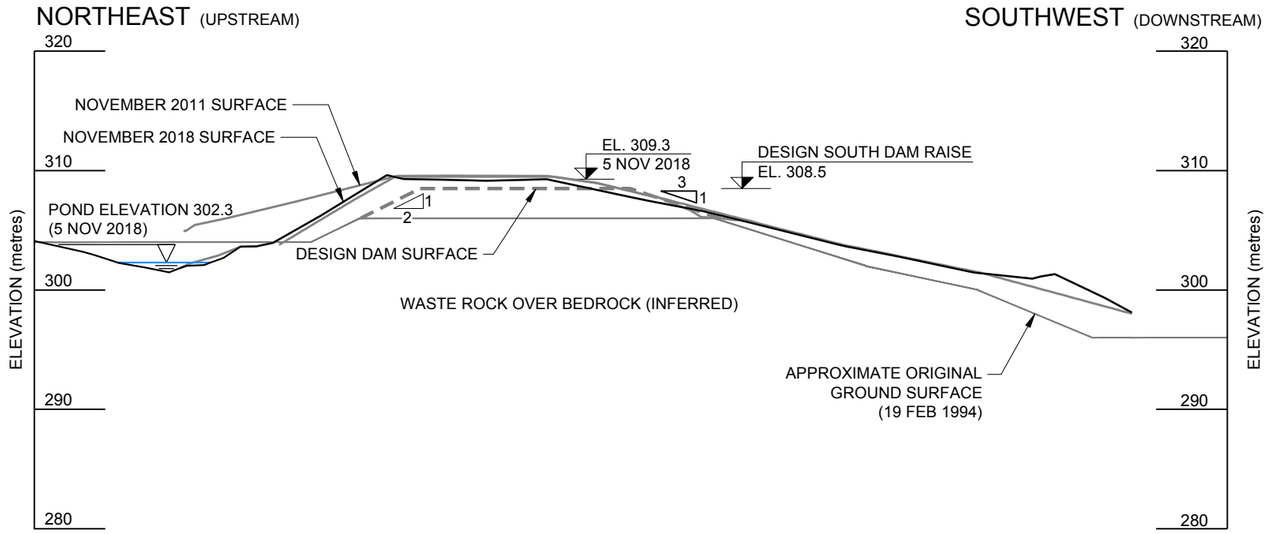
CONSULTANT
GOLDER

YYYY-MM-DD	2019-03-21
DESIGNED	BJ
PREPARED	BM
REVIEWED	MW
APPROVED	BEW

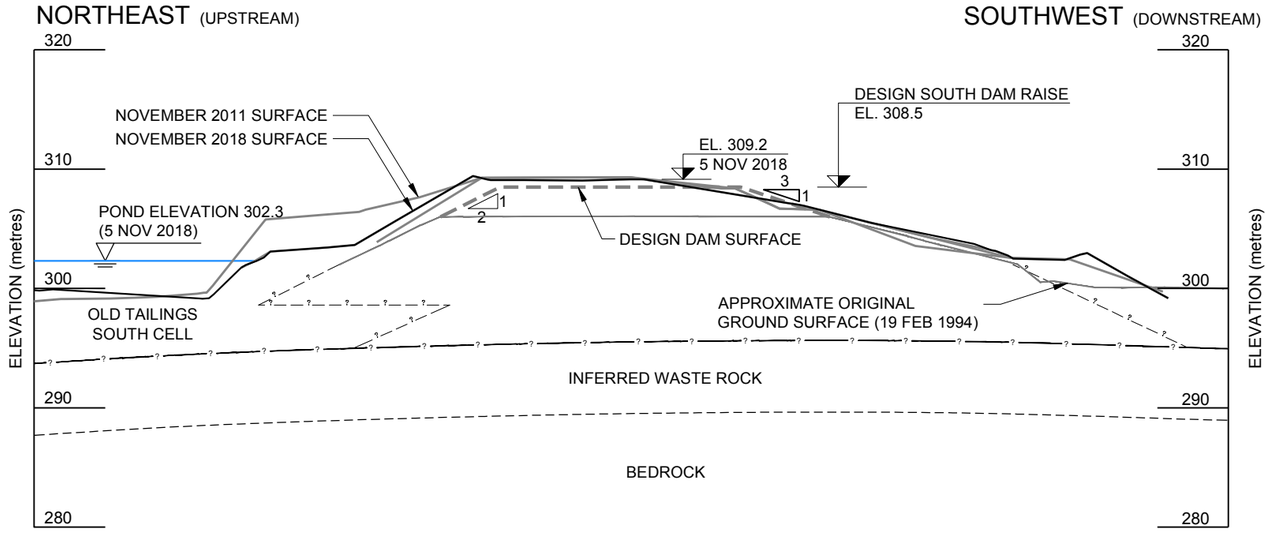
PROJECT NO.	PHASE/TASK	REV.	FIGURE
1784978	4000/4003	0	8

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

0 25 mm



A 1 SECTION
SCALE 1:500



B 1 SECTION
SCALE 1:500

LEGEND

- PIT FLOOR
- INFERRED WASTE ROCK
- INFERRED DAM SLOPE
- PREVIOUS CONSTRUCTION (2011 AND 1994 SURVEY)
- NOVEMBER 2018 SURFACE
- DESIGN DAM SURFACE
- POND ELEVATION

NOTES

1. ALL DIMENSIONS AND ELEVATIONS ARE IN METRES UNLESS OTHERWISE NOTED.

REFERENCES

1. BASE DRAWINGS PROVIDED BY QUINSAM COAL MINE CAD FILES: 94-QC-15.DWG, 94-QC-17.DWG, 94-QC-19.DWG, AND 94-QC-21.DWG DATED: 19 FEB 1994.
2. 2018 AS-BUILT SOUTH DAM CONTOURS PROVIDED BY QUINSAM COAL CORPORATION, FILE NAME: "South_Dam_11_05_2018.dwg", RECEIVED: NOVEMBER 5, 2018
3. 1994 and 2011 SURVEY PROVIDED BY QUINSAM COAL MINE.

NOT FOR CONSTRUCTION

0 10 20 30m
SCALE 1:500

CLIENT
QUINSAM COAL CORPORATION

PROJECT
QUINSAM MINE SOUTH DAM 2018 DAM SAFETY INSPECTION
CAMPBELL RIVER, BC

TITLE
SOUTH DAM SECTION A AND B

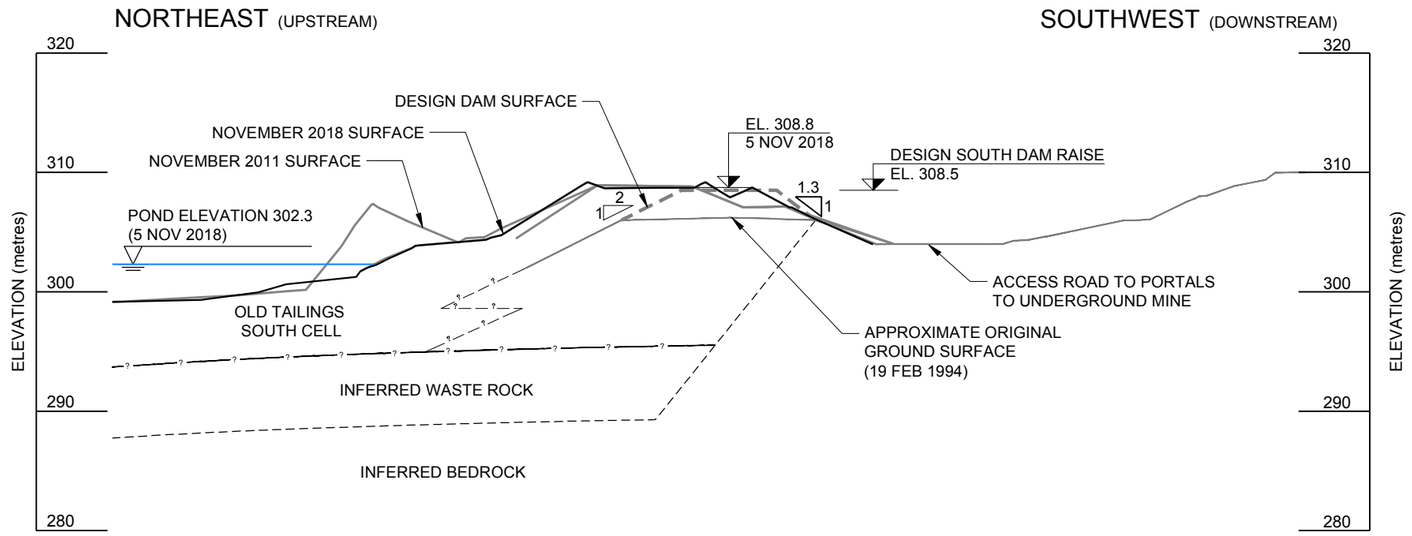
CONSULTANT
GOLDER

YYYY-MM-DD	2019-03-21
DESIGNED	BJ
PREPARED	BM
REVIEWED	MW
APPROVED	BEW

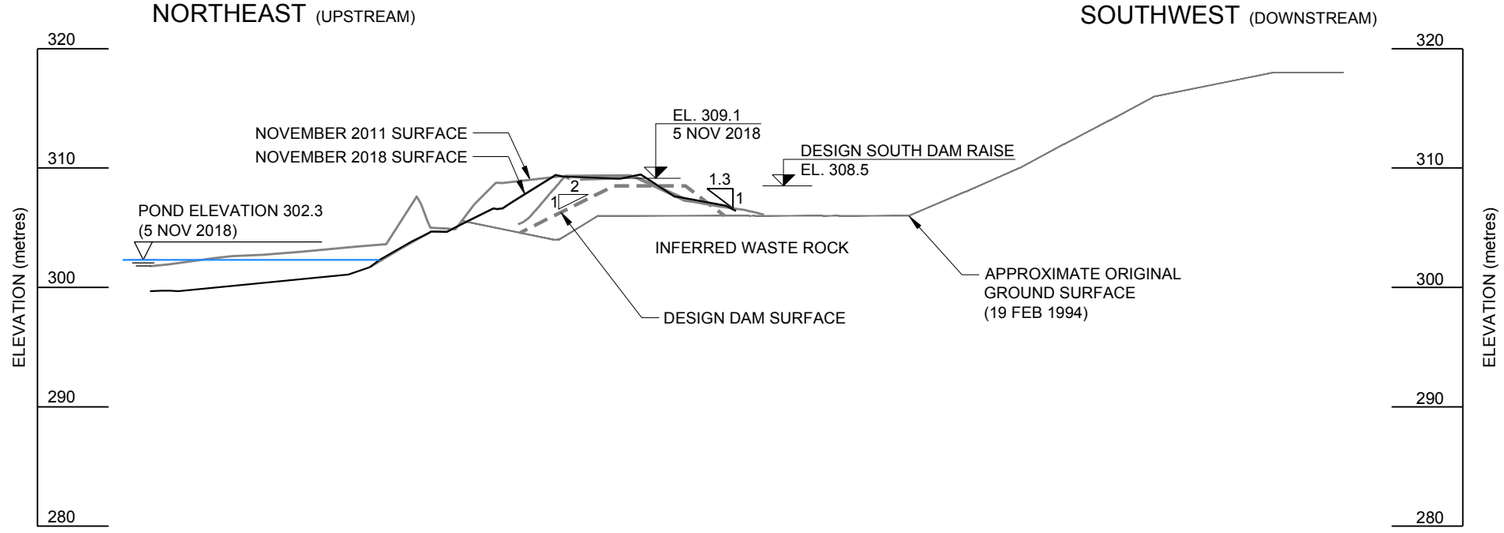
PROJECT NO.	PHASE/TASK	REV.	FIGURE
1784978	4000/4003	0	9

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

0 25 mm



C 1 SECTION
SCALE 1:500



D 1 SECTION
SCALE 1:500

LEGEND

- PIT FLOOR
- INFERRED WASTE ROCK
- INFERRED DAM SLOPE
- PREVIOUS CONSTRUCTION (2011 AND 1994 SURVEY)
- NOVEMBER 2018 SURFACE
- DESIGN DAM SURFACE
- POND ELEVATION

NOTES

1. ALL DIMENSIONS AND ELEVATIONS ARE IN METRES UNLESS OTHERWISE NOTED.

REFERENCES

1. BASE DRAWINGS PROVIDED BY QUINSAM COAL MINE CAD FILES: 94-QC-15.DWG, 94-QC-17.DWG, 94-QC-19.DWG, AND 94-QC-21.DWG DATED: 19 FEB 1994.
2. 2018 AS-BUILT SOUTH DAM CONTOURS PROVIDED BY QUINSAM COAL CORPORATION, FILE NAME: "South_Dam_11_05_2018.dwg", RECEIVED: NOVEMBER 5, 2018
3. 1994 and 2011 SURVEY PROVIDED BY QUINSAM COAL MINE.

NOT FOR CONSTRUCTION

0 10 20 30m
SCALE 1:500

CLIENT
QUINSAM COAL CORPORATION

PROJECT
QUINSAM MINE SOUTH DAM 2018 DAM SAFETY INSPECTION
CAMPBELL RIVER, BC

TITLE
SOUTH DAM SECTIONS C AND D

CONSULTANT
GOLDER

YYYY-MM-DD	2019-03-21
DESIGNED	BJ
PREPARED	BM
REVIEWED	MW
APPROVED	BEW

PROJECT NO.	PHASE/TASK	REV.	FIGURE
1784978	4000/4003	0	10

LEGEND

- BH10-03 — 2010 BOREHOLE LOCATIONS
- TP08-01 — TEST PIT LOCATIONS
- NW-1674-SPT — LOCATION OF NORTHWEST (2009) BOREHOLES
- MAJOR CONTOUR
- MINOR CONTOUR
- UNDERGROUND WORKINGS
- EXISTING ROAD

NOTES

1. ALL DIMENSIONS AND ELEVATIONS IN METRES UNLESS OTHERWISE NOTED.
2. GRID COORDINATES IN MINE GRID.

REFERENCES

1. BASE PLAN PROVIDED BY QUINSAM COAL CORPORATION CAD FILE: Quinsam Blocks 1-4 - 2D Mine.dwg DATED: 03 SEPT, 2010.

NOT FOR CONSTRUCTION

0 5 10 15 20 25
SCALE: 1:1000

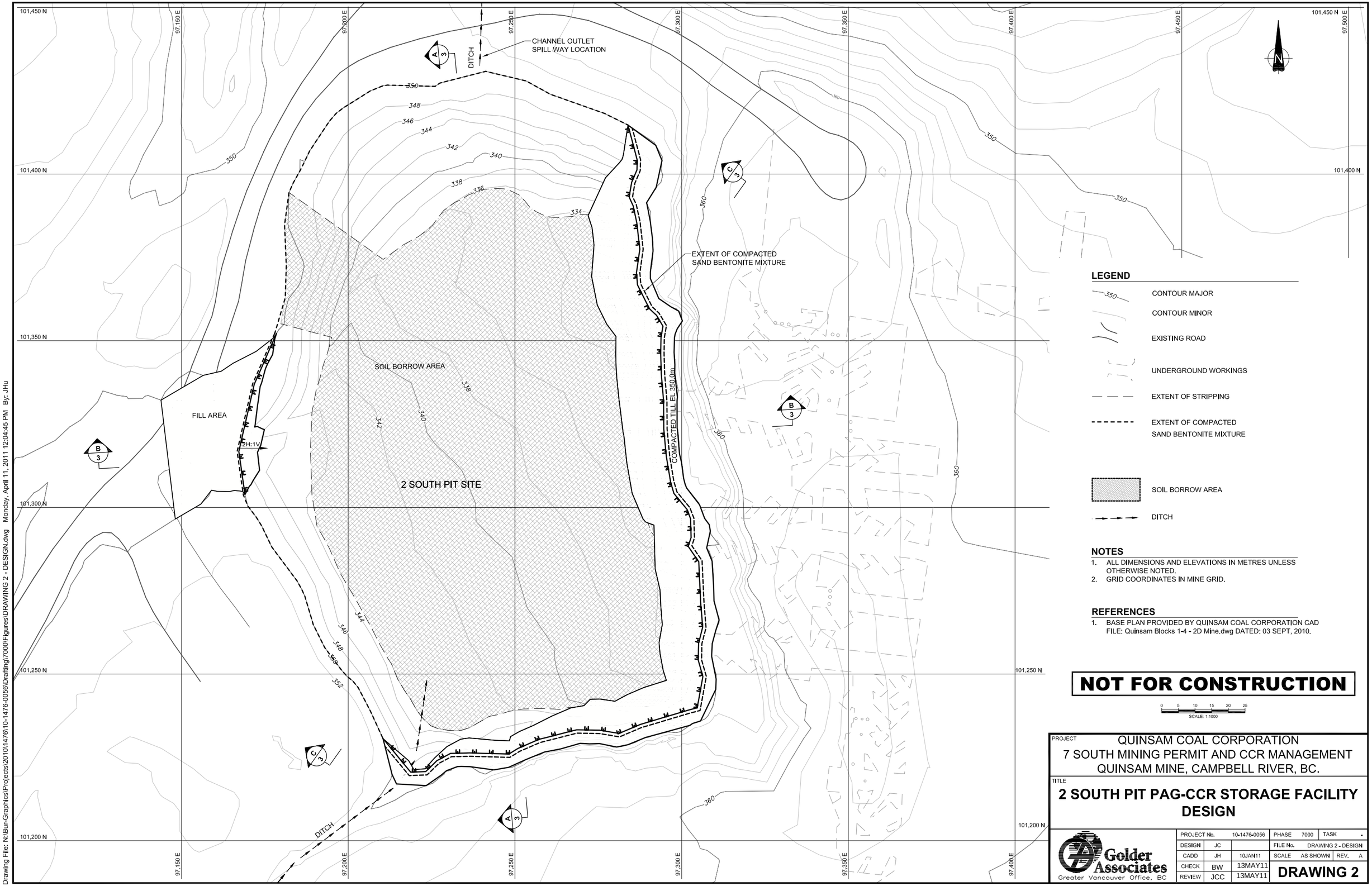
PROJECT
QUINSAM COAL CORPORATION
7 SOUTH MINING PERMIT AND CCR MANAGEMENT
QUINSAM MINE, CAMPBELL RIVER, BC.

TITLE
2 SOUTH PIT PAG-CCR STORAGE FACILITY SITE PLAN

Golder Associates
Greater Vancouver Office, BC

PROJECT No.	10-1476-0056		PHASE	7000	TASK -
DESIGN	JC		FILE No.	DRAWING 1 - SITE PLAN	
CADD	JH	10JAN11	SCALE	AS SHOWN	REV. A
CHECK	BW	13MAY11	DRAWING 1		
REVIEW	JCC	13MAY11			

Drawing File: N:\Bur-Graphics\Projects\2010\1476\10-1476-0056\Drafting\7000\Figures\DRAWING 1 - SITE PLAN.dwg Monday, April 11, 2011 12:04:19 PM By: JHu



NOTES

1. ALL DIMENSIONS AND ELEVATIONS IN METRES UNLESS OTHERWISE NOTED.
2. GRID COORDINATES IN MINE GRID.

REFERENCES

1. BASE PLAN PROVIDED BY QUINSAM COAL CORPORATION CAD FILE: Quinsam Blocks 1-4 - 2D Mine.dwg DATED: 03 SEPT, 2010.

NOT FOR CONSTRUCTION

SCALE: 1:1000

PROJECT
QUINSAM COAL CORPORATION
7 SOUTH MINING PERMIT AND CCR MANAGEMENT
QUINSAM MINE, CAMPBELL RIVER, BC.

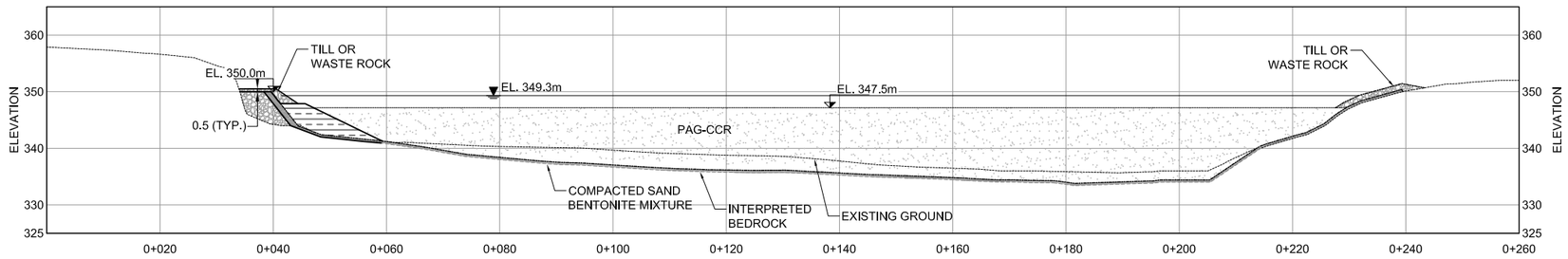
TITLE
2 SOUTH PIT PAG-CCR STORAGE FACILITY DESIGN

Golder Associates
Greater Vancouver Office, BC

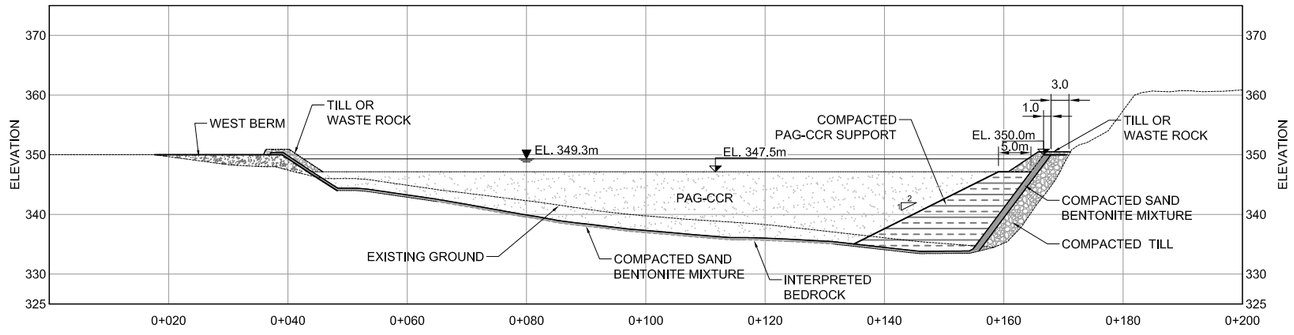
PROJECT No.		10-1476-0056	PHASE	7000	TASK -
DESIGN	JC		FILE No.	DRAWING 2 - DESIGN	
CADD	JH	10JAN11	SCALE	AS SHOWN	REV. A
CHECK	BW	13MAY11			
REVIEW	JCC	13MAY11			

DRAWING 2

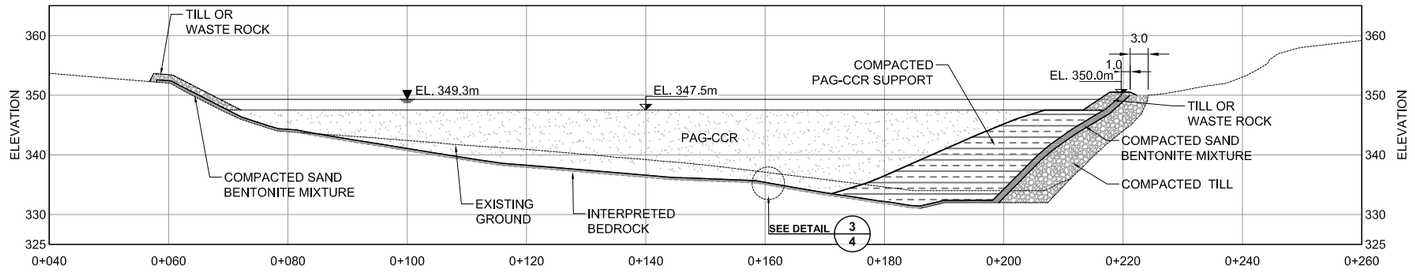
Drawing File: N:\Bur-Graphics\Projects\2010\1476\10-1476-0056\Drafting\7000\Figures\DRAWING 2 - DESIGN.dwg Monday, April 11, 2011 12:04:45 PM By: JHu



A-A 2 SECTION
SCALE: 1:1000



B-B 2 SECTION
SCALE: 1:1000



C-C 2 SECTION
SCALE: 1:1000

MATERIAL LEGEND

- PAG-CCR
- COMPACTED PAG-CCR
- COMPACTED TILL
- WEST BERM
- COMPACTED SAND BENTONITE MIXTURE

NOTES

1. ALL DIMENSIONS AND ELEVATIONS IN METERS UNLESS OTHERWISE NOTED.

REFERENCES

1. BASE PLAN PROVIDED BY QUINSAM COAL CORPORATION CAD FILE: Quinsam Blocks 1-4 - 2D Mine.dwg DATED: 03 SEPT, 2010.

NOT FOR CONSTRUCTION

0 5 10 15 20 25
SCALE: 1:1000

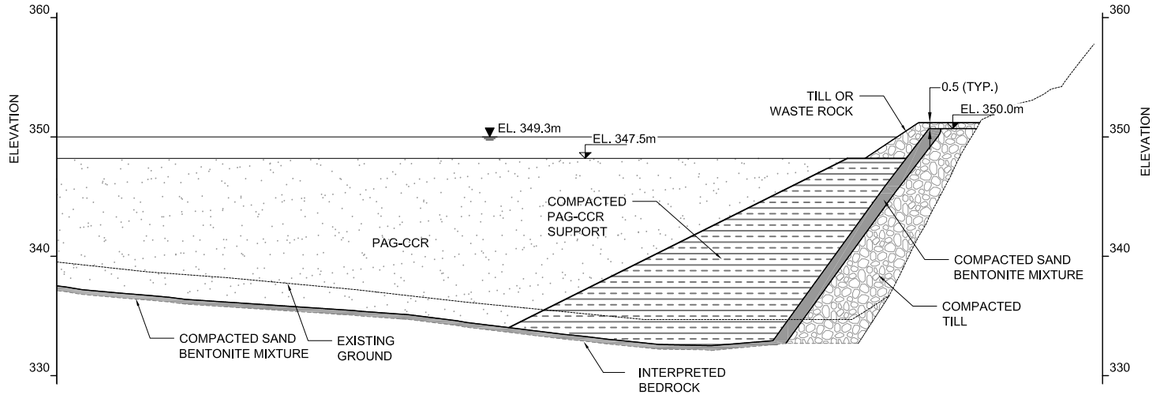
PROJECT
QUINSAM COAL CORPORATION
7 SOUTH MINING PERMIT AND CCR MANAGEMENT
QUINSAM MINE, CAMPBELL RIVER, BC.

TITLE
2 SOUTH PIT PAG-CCR STORAGE FACILITY SECTIONS

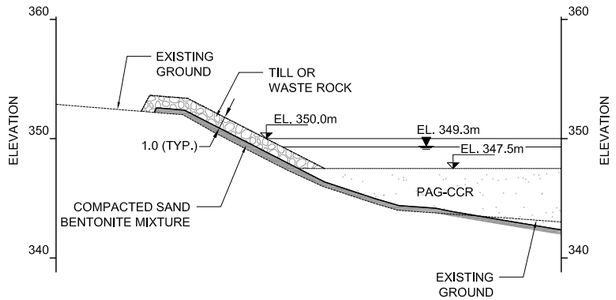
Golder Associates
Greater Vancouver Office, BC

PROJECT No.		10-1476-0056	PHASE	7000	TASK -
DESIGN	JC		FILE No.	DRAWING 3 - SECTIONS	
CADD	JH	10JAN11	SCALE	AS SHOWN	REV. A
CHECK	BW	13MAY11	DRAWING 3		
REVIEW	JCC	13MAY11			

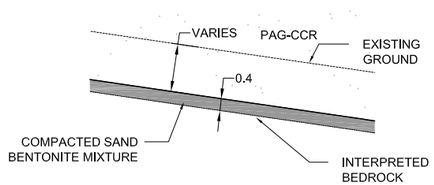
Drawing File: N:\Bur-Graphics\Projects\2010\1476\10-1476-0056\Drafting\7000\Figures\DRAWING 3 - SECTIONS.dwg Monday, April 11, 2011 1:06:12 PM By: JHu



1 **TYPICAL SECTION**
1:500



2 **TYPICAL SECTION**
1:500



3/3 **DETAIL**
1:200

MATERIAL LEGEND

- PAG-CCR
- COMPACTED PAG-CCR
- COMPACTED TILL
- COMPACTED SAND BENTONITE MIXTURE

NOTES

1. ALL DIMENSIONS AND ELEVATIONS IN METERS UNLESS OTHERWISE NOTED.

REFERENCES

1. BASE PLAN PROVIDED BY QUINSAM COAL CORPORATION CAD FILE: Quinsam Blocks 1-4 - 2D Mine.dwg DATED: 03 SEPT, 2010.

NOT FOR CONSTRUCTION

0 2.5 5 7.5 10 12.5
SCALE: 1:500

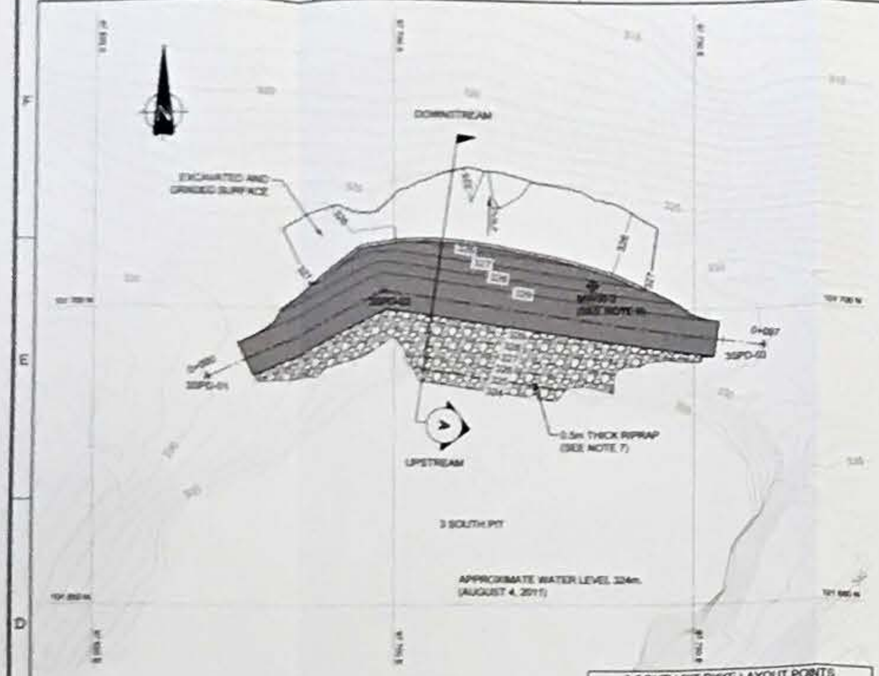
0 1 2 3 4 5
SCALE: 1:200

PROJECT
QUINSAM COAL CORPORATION
7 SOUTH MINING PERMIT AND CCR MANAGEMENT
QUINSAM MINE, CAMPBELL RIVER, BC.

TITLE
2 SOUTH PIT PAG-CCR STORAGE FACILITY TYPICAL SECTIONS

Golder Associates
Greater Vancouver Office, BC

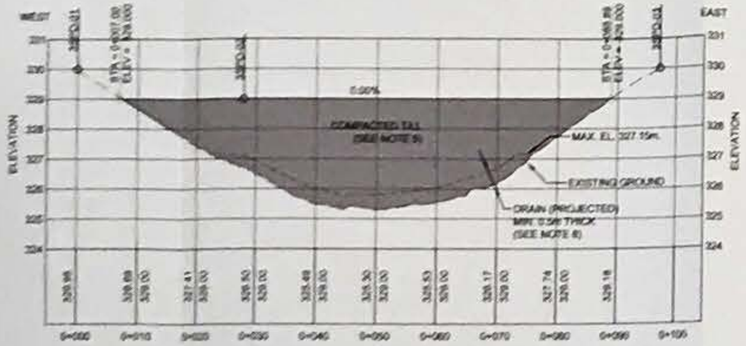
PROJECT No.	10-1476-0056		PHASE	7000	TASK -
DESIGN	JC		FILE No.	DRAWING 4 - DETAILS	
CADD	JH	10JAN11	SCALE	AS SHOWN	REV. A
CHECK	BW	13MAY11	DRAWING 4		
REVIEW	JCC	13MAY11			



3 SOUTH PIT DYKE - PLAN

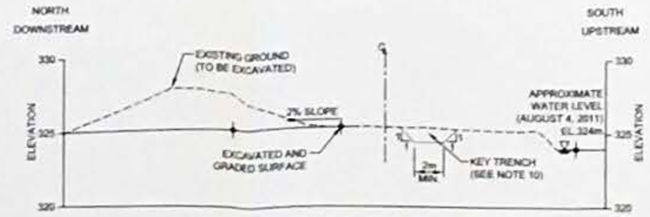
SCALE: 1:500

3 SOUTH PIT DYKE LAYOUT POINTS			
ID #	NORTHING	EASTING	ELEV. (m)
3SPD-01	101688.15	97668.90	330.0
3SPD-02	101702.82	97698.35	329.0
3SPD-03	101693.74	97761.80	330.0

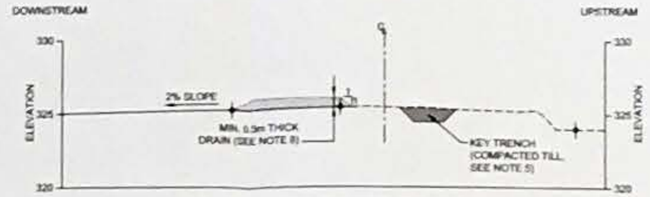


3 SOUTH PIT DYKE - PROFILE

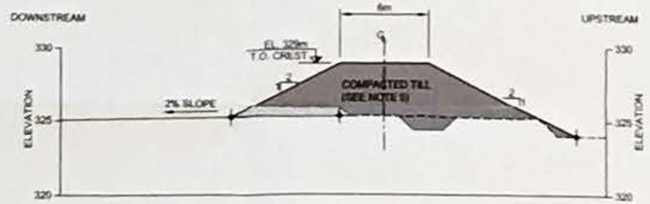
HORIZONTAL SCALE: 1:500
VERTICAL SCALE: 1:100



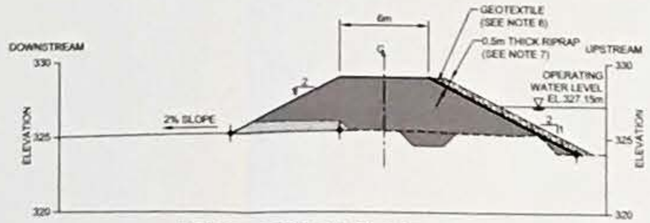
STAGE 1 SUBGRADE EXCAVATION CROSS SECTION



STAGE 2 SUBGRADE BACKFILL CROSS SECTION



STAGE 3 DYKE CONSTRUCTION CROSS SECTION



STAGE 4 RIPRAP PLACEMENT CROSS SECTION

A 3 SOUTH PIT DYKE - CROSS SECTION STAGES

SCALE: 1:200

LEGEND

- MAJOR CONTOUR INTERVAL 5m
- MINOR CONTOUR INTERVAL 1m
- EXISTING MONITORING WELL
- GEOTEXTILE
- TILL
- DRAIN
- RIPRAP

NOTES

1. ALL DIMENSIONS AND ELEVATIONS IN METERS UNLESS OTHERWISE NOTED.
2. COORDINATES IN MINE GRID.
3. IT IS THE RESPONSIBILITY OF THE USER OF THIS DRAWING TO ENSURE THE USE OF THE MOST RECENT REVISION.
4. THE INFORMATION PROVIDED ON THE DRAWING SHALL BE READ IN CONJUNCTION WITH THE MOST RECENT SPECIFICATIONS LISTED ON DRAWING 2000-00. PRIOR TO COMMENCING CONSTRUCTION ACTIVITIES THE CONTRACTOR SHALL BE FAMILIAR WITH THE SCOPE OF WORK.
5. TILL SHALL MEET SPECIFICATION S3 (EARTHWORKS).
6. GEOTEXTILE SHALL BE A MINIMUM OF 500 g/m2 AND SHALL MEET OR EXCEED THE MATERIAL PROPERTIES AS PER SPECIFICATION S4 (OTHER MATERIALS).
7. RIPRAP SHALL BE TYPE 1 RIP RAP AS DEFINED IN SPECIFICATION S3 (EARTHWORKS).
8. DRAIN SHALL BE CONSTRUCTED USING CULVERT BEDDING MATERIAL AS DEFINED IN SPECIFICATION S3 (EARTHWORKS).
9. MW00-2 SHALL BE PROTECTED AND RAISED DURING CONSTRUCTION.
10. KEY TRENCH EXCAVATION SHALL BE MINIMUM 1 METER DEEP OR TO APPROVED SUBGRADE.

REFERENCE

1. BASE PLAN PROVIDED BY QUINSAM COAL CORPORATION CAD FILE: QUINSAM BLOCKS 1-4 - 2D MINE.DWG DATED: 03 SEPT, 2010.
2. SURVEY INFORMATION PROVIDED BY QUINSAM COAL CORPORATION, AUGUST - SEPTEMBER 2011.

NO.	BY/APP'D	REVISION	DES	CHK	DRW	CHK	APP'D
0	BRW/KI	ISSUED FOR CONSTRUCTION	TG	JVK	LR	RWL	MJP
A	BRW/KI	ISSUED FOR DISCUSSION	TG	SES	LR	RWL	MJP

REVISIONS

NUMBER	SUBJECT	REVISION
04	OTHER MATERIALS	0
03	EARTHWORKS	0

SPECIFICATIONS

REFERENCE TITLE

REFERENCES

STAMP/SEAL

CLIENT: HILLSBOROUGH RESOURCES LIMITED

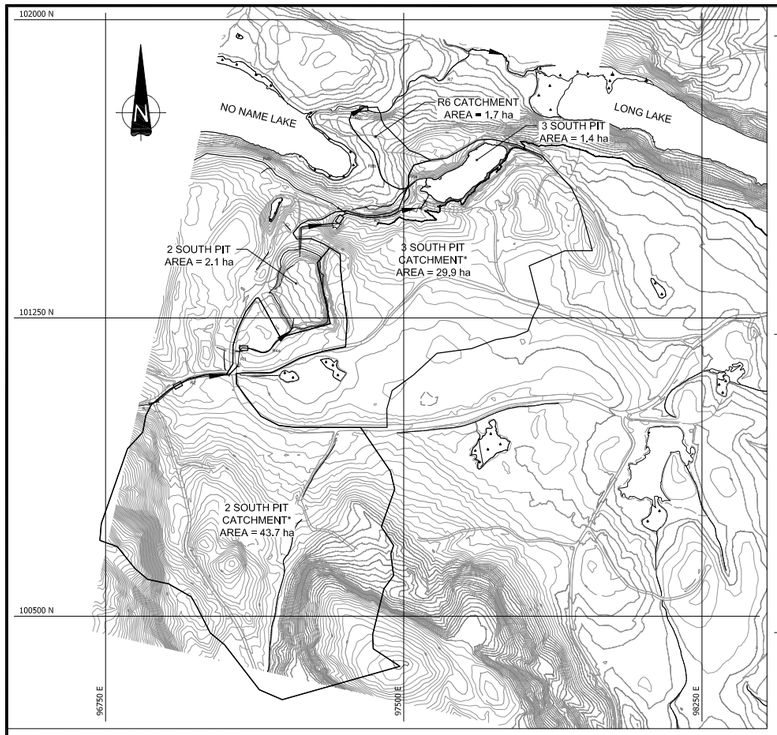
CONSULTANT: Golder Associates

PROJECT: 2 AND 3 SOUTH PIT SURFACE WATER MANAGEMENT QUINSAM COAL MINE, CAMPBELL RIVER, BC.

DRAWING TITLE: 3 SOUTH PIT DYKE PLAN PROFILE AND SECTIONS

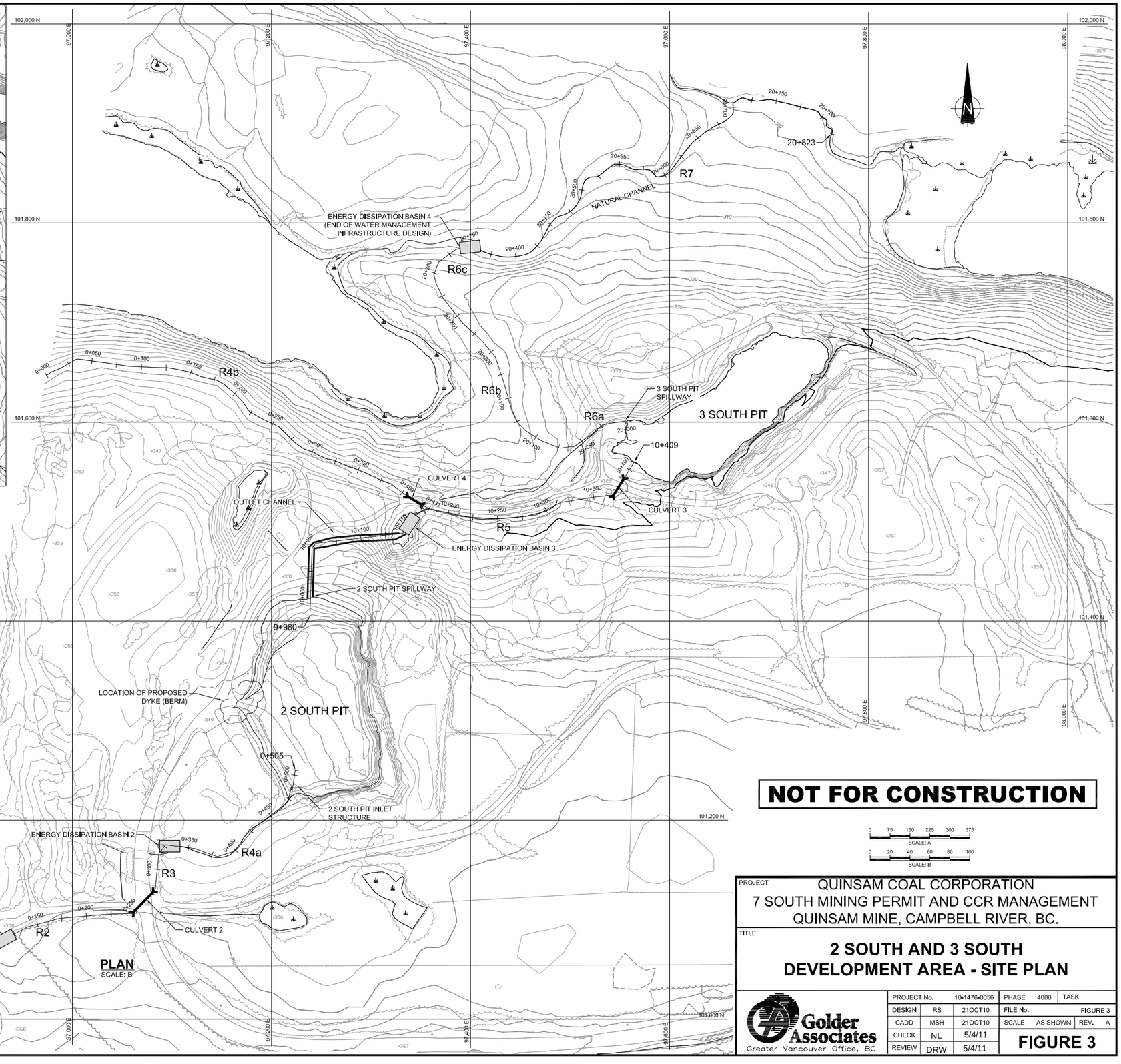
PROJECT No.	PHASE No.	TASK No.
11-1476-0046	2000	-

ORIGINAL SHEET SIZE	DRAWING No.	REVISION
ANSI D	2000 - 31	0



* CATCHMENT AREA DOES NOT INCLUDE SURFACE WATER AREAS IN THE PITS

WATERSHED PLAN
SCALE: A



PLAN
SCALE: B

NOT FOR CONSTRUCTION

0 75 150 225 300 375
SCALE: A

0 20 40 60 80 100
SCALE: B

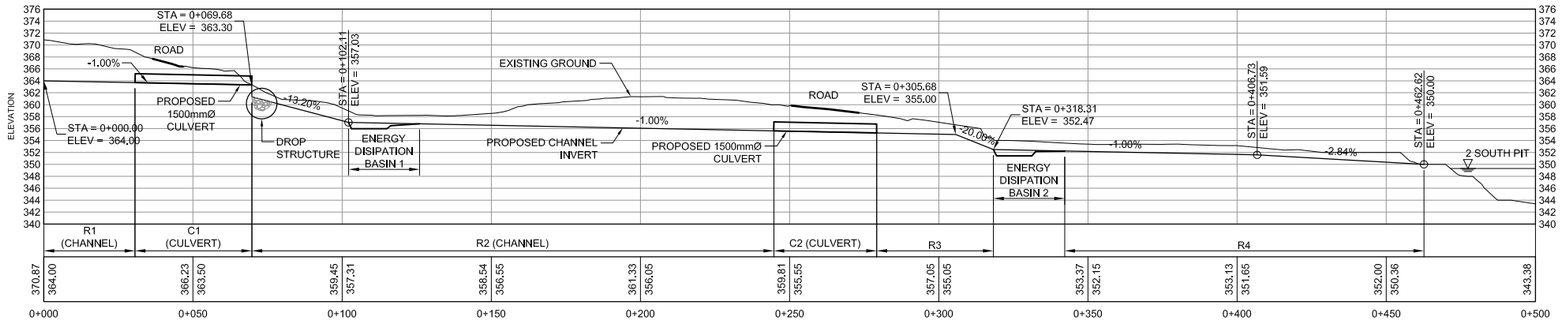
PROJECT
QUINSAM COAL CORPORATION
7 SOUTH MINING PERMIT AND CCR MANAGEMENT
QUINSAM MINE, CAMPBELL RIVER, BC.

TITLE
2 SOUTH AND 3 SOUTH DEVELOPMENT AREA - SITE PLAN

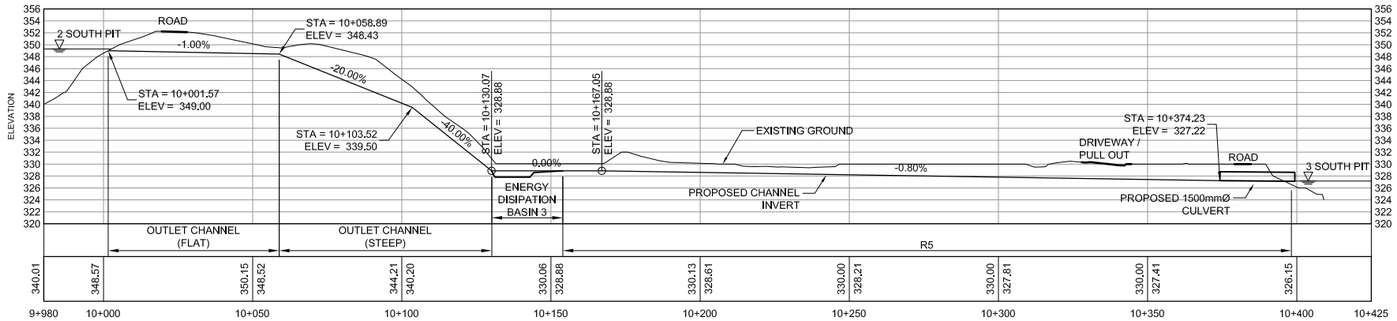
Golder Associates
Greater Vancouver Office, BC

PROJECT No.		10-1476-0056	PHASE 4000	TASK	
DESIGN	RS	21OCT10	FILE No.		FIGURE 3
CADD	MSH	21OCT10	SCALE AS SHOWN	REV.	A
CHECK	NL	5/4/11	**FIGURE 3**		
REVIEW	DRW	5/4/11			

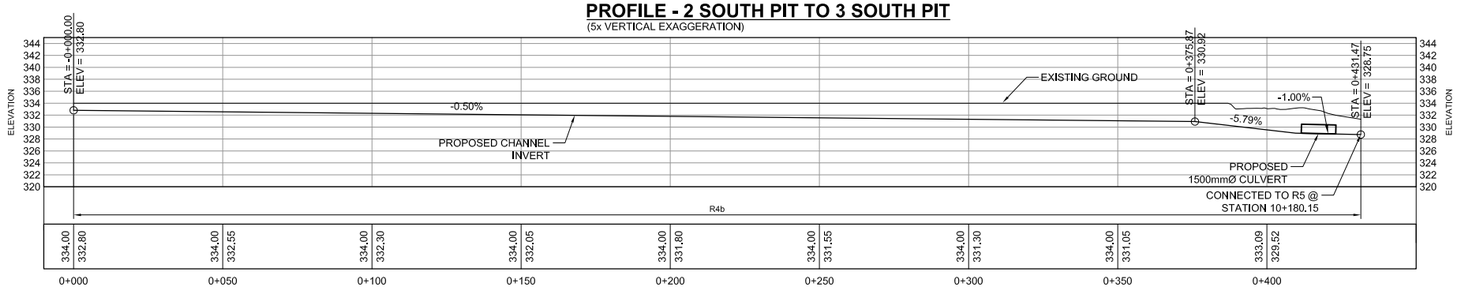
Drawing File: N:\Bur-Graphics\Projects\2010\14476\10-1476-0056\Drafting\4000\Figures\FIGURE 3.dwg Monday, May 02, 2011 10:40:19 AM By: JHu



PROFILE - R1 TO 2 SOUTH PIT
(5x VERTICAL EXAGGERATION)



PROFILE - 2 SOUTH PIT TO 3 SOUTH PIT
(5x VERTICAL EXAGGERATION)

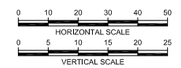


PROFILE - R4b
(5x VERTICAL EXAGGERATION)

NOTE

CHARACTERIZATION OF EXISTING CREEK AND STABILIZATION MEASURES FOR THIS STREAM, IF NEEDED, TOBE PROVIDED IN THE DETAIL DESIGN PHASE.

NOT FOR CONSTRUCTION

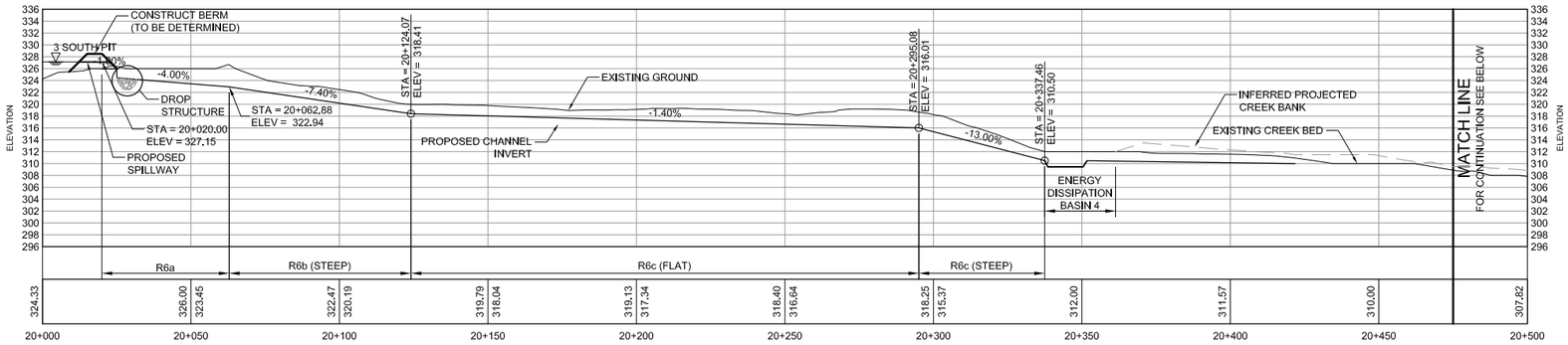


PROJECT
QUINSAM COAL CORPORATION
7 SOUTH MINING PERMIT AND CCR MANAGEMENT
QUINSAM MINE, CAMPBELL RIVER, BC.

TITLE
WATER MANAGEMENT INFRASTRUCTURE PROFILE

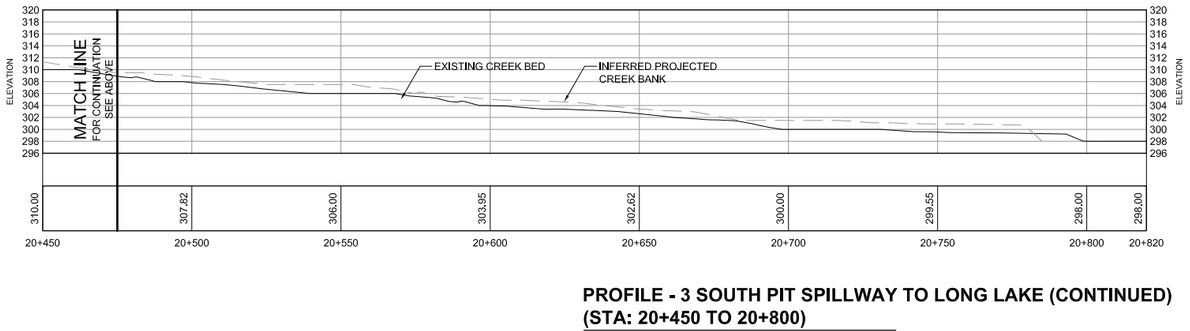
Golder Associates
Greater Vancouver Office, BC

PROJECT No.	10-1476-0056		PHASE 4000	TASK	
DESIGN	RS	21OCT10	FILE No.		FIGURE 4
CADD	MSH	21OCT10	SCALE AS SHOWN	REV.	A
CHECK	NL	5/4/11	**FIGURE 4A**		
REVIEW	DRW	5/4/11			



PROFILE - 3 SOUTH PIT SPILLWAY TO LONG LAKE (STA: 20+000 TO 20+450)

(5x VERTICAL EXAGGERATION)



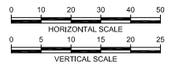
PROFILE - 3 SOUTH PIT SPILLWAY TO LONG LAKE (CONTINUED) (STA: 20+450 TO 20+800)

(5x VERTICAL EXAGGERATION)

NOTE

CHARACTERIZATION OF EXISTING CREEK AND STABILIZATION MEASURES FOR THIS STREAM, IF NEEDED, TOBE PROVIDED IN THE DETAIL DESIGN PHASE.

NOT FOR CONSTRUCTION



PROJECT

QUINSAM COAL CORPORATION
7 SOUTH MINING PERMIT AND CCR MANAGEMENT
QUINSAM MINE, CAMPBELL RIVER, BC.

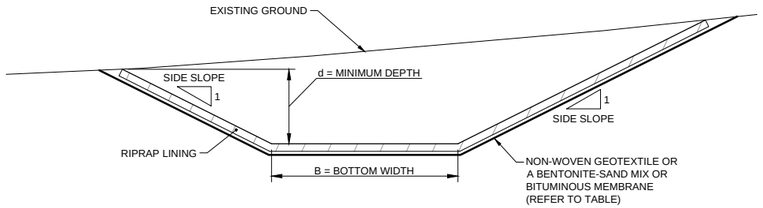
TITLE

WATER MANAGEMENT INFRASTRUCTURE PROFILE

Golder Associates
Greater Vancouver Office, BC

PROJECT No.		10-1476-0056	PHASE 4000	TASK	
DESIGN	RS	21OCT10	FILE No.		FIGURE 4
CADD	MSH	21OCT10	SCALE AS SHOWN		REV.
CHECK	NL	5/4/11	**FIGURE 4B**		
REVIEW	DRW	5/4/11			

Drawing File: N:\Bur-Graphics\Projects\2010\1476\10-1476-0056\Drafting\4000\Figures\FIGURE 4.dwg Friday, April 29, 2011 2:36:19 PM By: JHu



1 - TYPICAL DITCH CROSS-SECTION

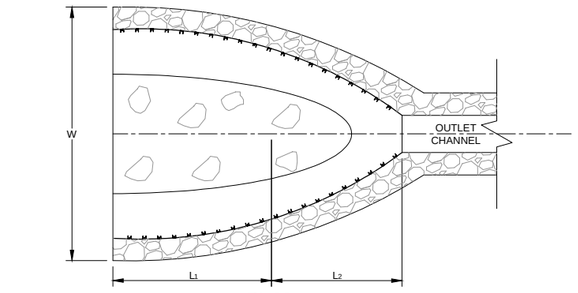
SCALE A (REFER TO TABLE FOR DIMENSIONS)

DITCH DIMENSIONS BY REACH						
REACH*	REACH LENGTH (m)	SIDE SLOPE	SLOPE (%) *	MINIMUM DEPTH d (m)	BOTTOM CHANNEL WIDTH B (m)	RIPRAP LINING (D_{50} IN mm)
R1	30	2H:1V	1.0	1.2	1.5	150
R2	200	2H:1V	1.0 TO 13.2	1.2	1.5	150 TO 455
R3	40	2H:1V	1.0 TO 20.0	1.2	1.5	150 TO 610
R4a	130	2H:1V	1.0 TO 2.8	1.2	1.5	150 TO 230
R4b	430	2H:1V	0.5 TO 5.8	1.2	1.5	150***
OUTLET CHANNEL (FLAT)	50	10H:1V	1.0	1.0	22.0	150
OUTLET CHANNEL (STEEP)	75	2H:1V	20.0 TO 40.0	1.0	4.0	455 TO 610
R5	200	2H:1V	0.8	1.2	1.0	150***
R6a	75	3H:1V	1.0 TO 4.0	1.0	2.0	150 TO 305
R6b (STEEP)	45	3H:1V	7.4	1.5	2.0	305
R6c (FLAT)	180	3H:1V	1.4	1.5	2.0	150
R6c (STEEP)	60	3H:1V	13.0	1.5	2.0	455

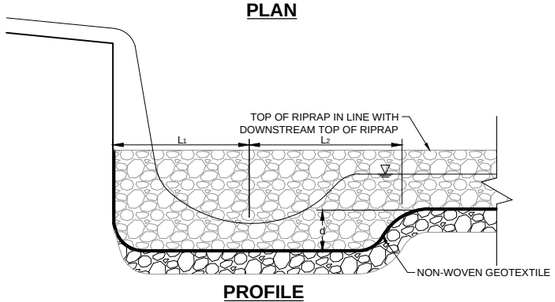
* REFER TO PROFILES ON FIGURE 4 FOR ADDITIONAL INFORMATION.

** DETAILS ON TRANSITION BETWEEN REACHES TO BE PROVIDED IN THE DETAIL DESIGN PHASE.

*** RIPRAP LINING IS TO BE PLACED ON A BENTONITE-SAND MIX OR BITUMINOUS MEMBRANE . RIPRAP LINING FOR ALL OTHER REACHES TO BE PLACED ON NON-WOVEN GEOTEXTILE. RIPRAP LINING MUST HAVE A DEPTH OF 2x D_{50}



PLAN



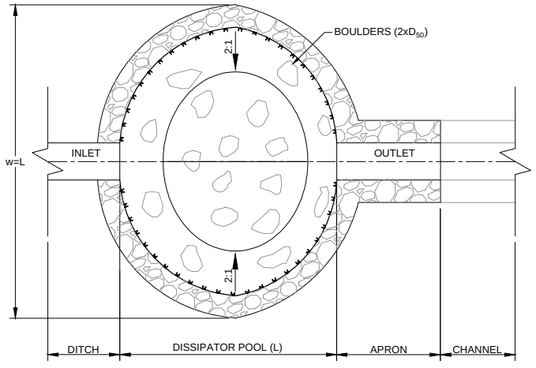
PROFILE

4 - CONCEPTUAL DROP STRUCTURE

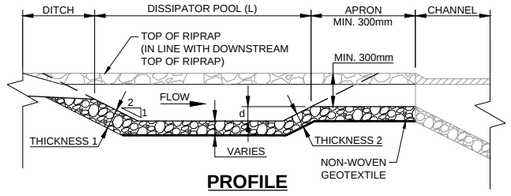
SCALE A (ACTUAL DIMENSIONS AND SHAPE TO BE DEFINED IN DETAIL DESIGN)

PLUNGE POOL DIMENSIONS					
PLUNGE POOL LOCATION	d (m)	L_1 (m)	L_2 (m)	W(m)	RIPRAP D_{50} (mm)*
DOWNSTREAM OF C1 CULVERT	1.2	4.1	3.2	7.0	910
DOWNSTREAM OF 3 PIT SOUTH SPILLWAY	0.0	1.3	0.5	20.5	460

* RIPRAP LAYER THICKNESS IS 2 x D_{50}



PLAN

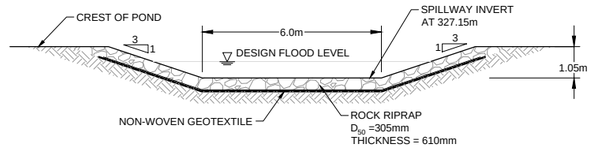


PROFILE

2 - CONCEPTUAL ENERGY DISSIPATION BASIN

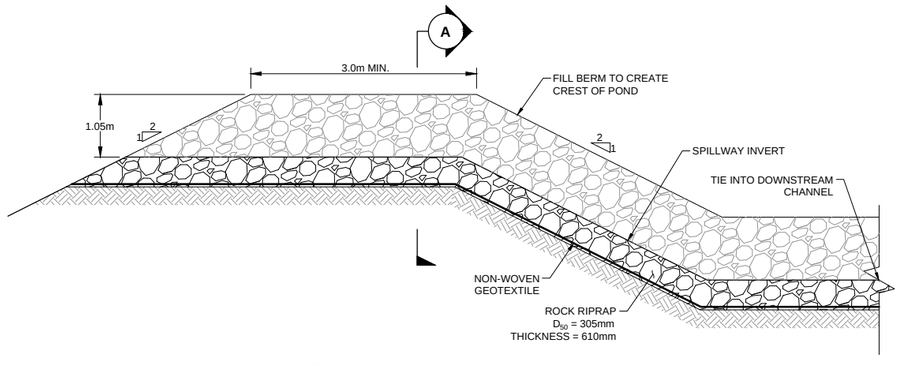
SCALE A (ACTUAL DIMENSIONS AND SHAPE TO BE DEFINED IN DETAIL DESIGN)

ENERGY DISSIPATION BASIN DIMENSIONS					
	d (m)	L (m)	THICKNESS 1 (mm)	THICKNESS 2 (mm)	RIPRAP D_{50} (mm)
ENERGY DISSIPATION BASIN 1	1.1	5.1	1365	910	910
ENERGY DISSIPATION BASIN 2	1.2	6.3	1830	1220	1220
ENERGY DISSIPATION BASIN 3	0.8	4.2	1365	1220	1220
ENERGY DISSIPATION BASIN 4	1.1	4.6	1365	910	910



A - 3 SOUTH PIT SPILLWAY SECTION

SCALE B



3 - 3 SOUTH PIT SPILLWAY PROFILE

N.T.S (SPILLWAY DIMENSIONS TO BE UPDATED IN DETAIL DESIGN)

NOT FOR CONSTRUCTION

0 0.2 0.4 0.6 0.8 1
SCALE A

0 1 2 3 4 5
SCALE B

PROJECT
QUINSAM COAL CORPORATION
7 SOUTH MINING PERMIT AND CCR MANAGEMENT
QUINSAM MINE, CAMPBELL RIVER, BC.

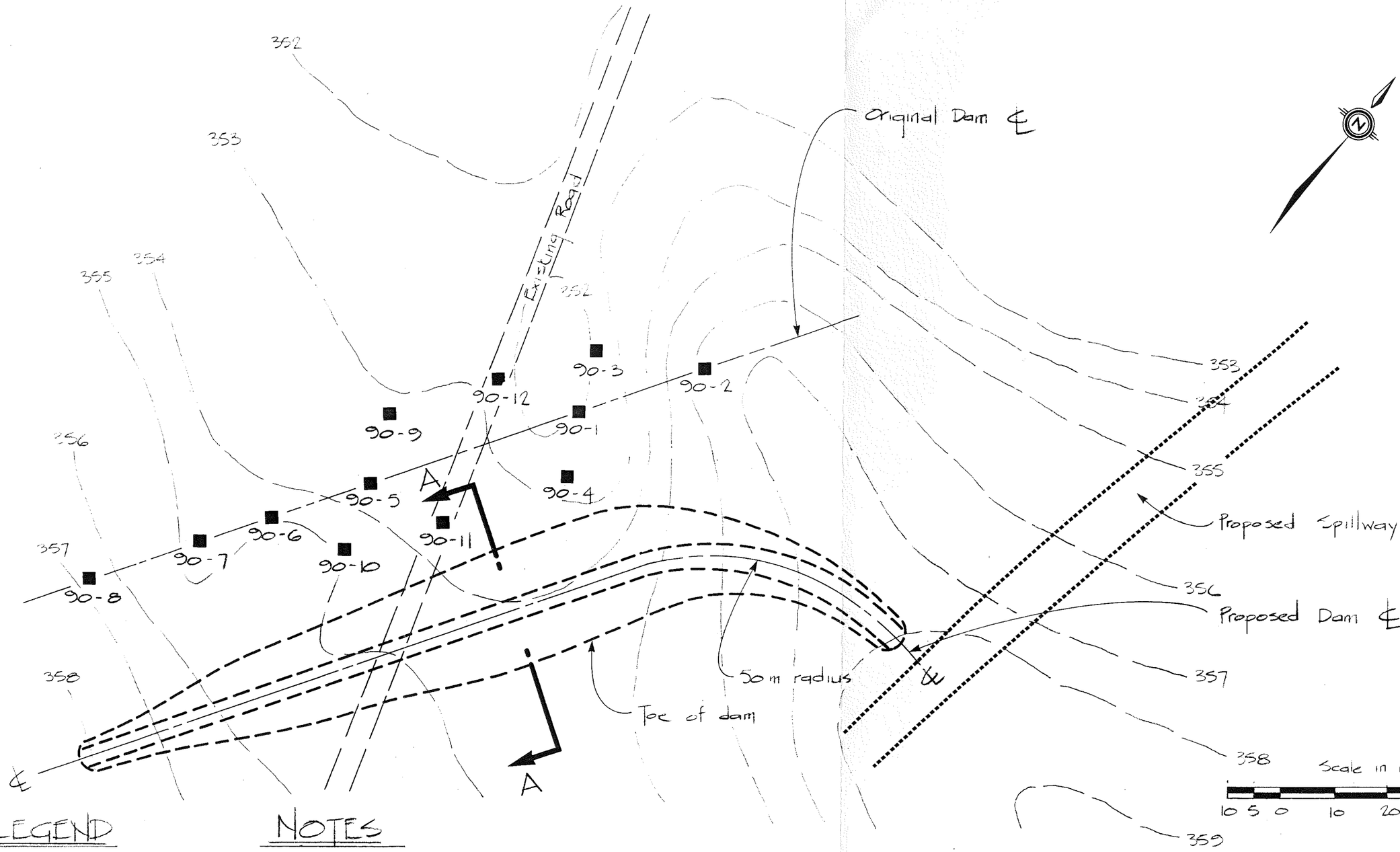
TITLE
WATER MANAGEMENT INFRASTRUCTURE TYPICAL DETAILS

Golder Associates
Greater Vancouver Office, BC

PROJECT No.	10-1476-0056		PHASE	4000	TASK
DESIGN	RS	21OCT10	FILE No.		FIGURE 5
CADD	MSH	21OCT10	SCALE	AS SHOWN	REV. A
CHECK	NL	5/4/11			
REVIEW	DRW	5/4/11			

FIGURE 5

DESIGNED PTB	KPA Engineering Ltd.	
DRAWN KM		
DATE Nov. 1990	SITE LOCATION	THURBER
APPROVED PTB		
SCALE 1:250,000	Quinsam Coal Project - Settling Pond 1	DRAWING NO F-11-C



LEGEND

■ Test pit

NOTES

1. Base plan (showing site topography and pit locations) provided by McElhanney Associates.

DESIGNED	PTB
DRAWN	KM
DATE	Nov. 8, 1990
APPROVED	PTB
SCALE	1:750

KPA Engineering Ltd.

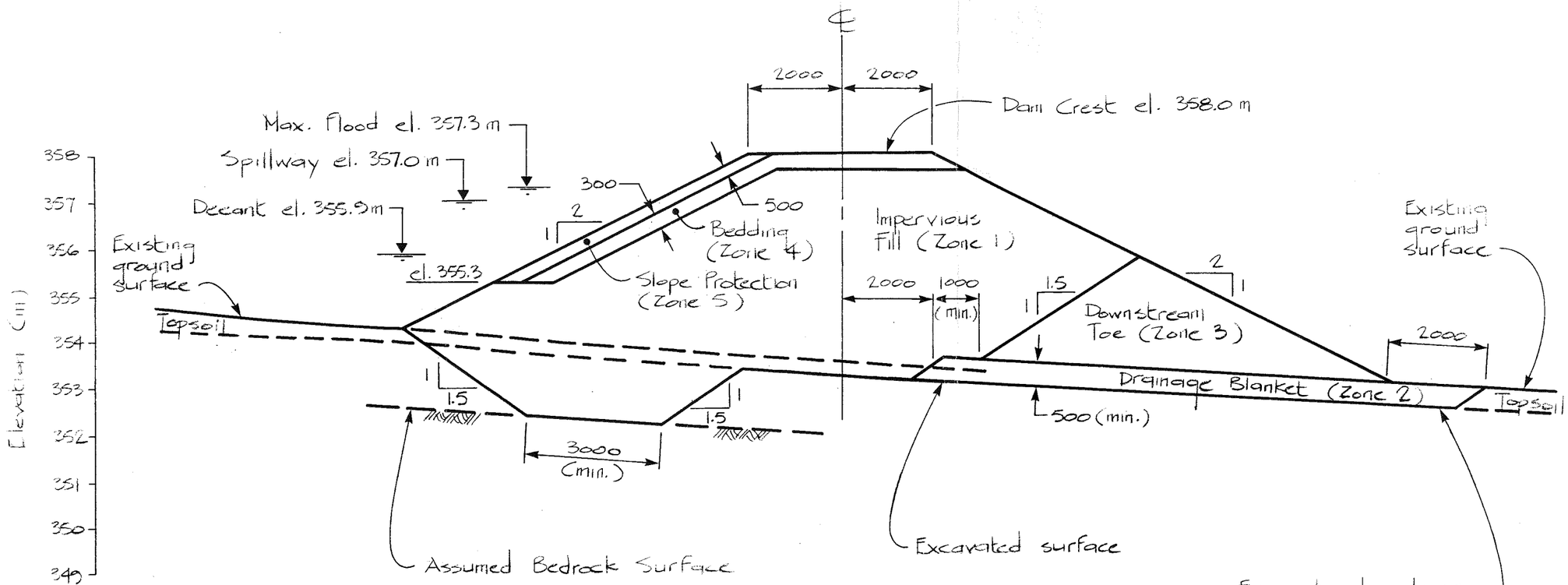
SITE PLAN

Quinsam Coal Project - Settling Pond 1

THURBER

DRAWING NO 17-25-106-2

TG-BLK-8H MAR/90

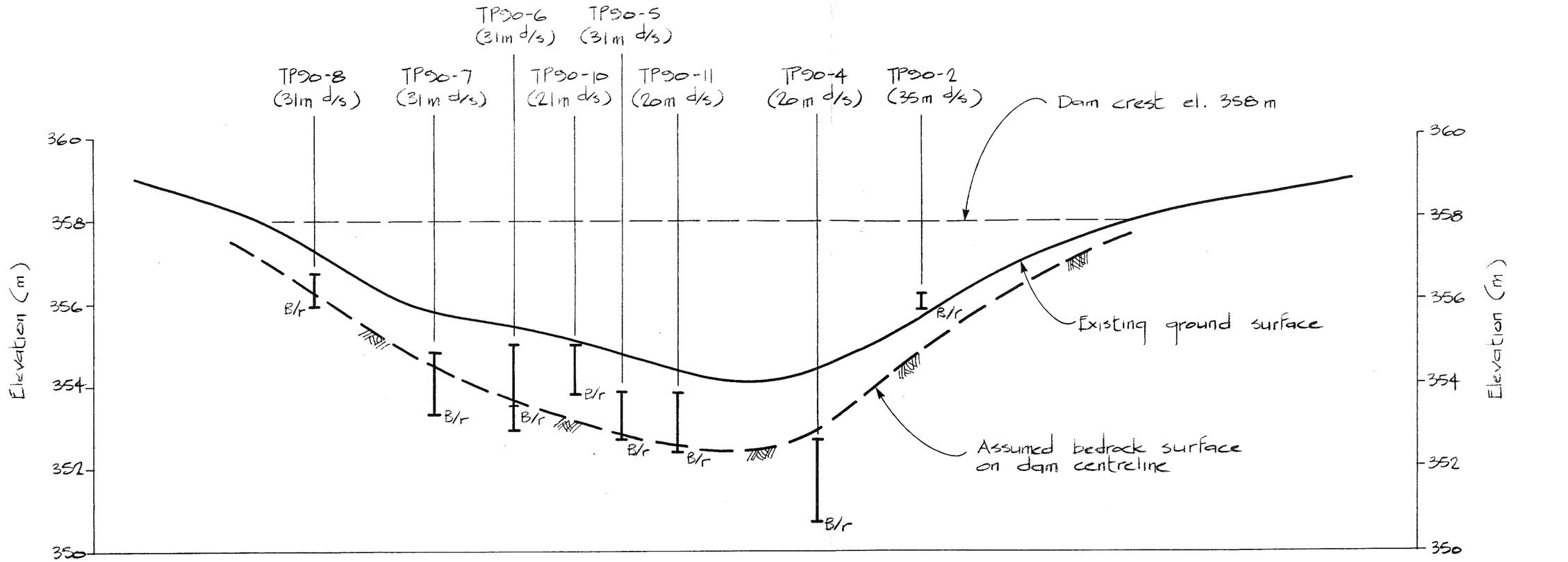


SECTION A-A

Note: See Dwg. 17-25-106-2 for section location.

DESIGNED PTB	KPA Engineering Ltd.	THURBER
DRAWN KM	DAM CROSS-SECTION AT MAXIMUM HEIGHT	DRAWING NO 17-25-106-3
DATE Nov. 9, 1990	Quintette Coal Project - Settling Pond 1	
APPROVED PTB		
SCALE 1:100		

TG-BLK-BH MAR/90



Horizontal scale in metres

10 5 0 10 20 30 40 50

NOTES

1. Test pits projected onto profile by perpendicular from dam centreline.
2. B/r indicates bedrock.

DESIGNED	DS
DRAWN	KM
DATE	Nov. 26, 1990
APPROVED	DS
SCALE	1 : 750 (H) 1 : 100 (V)

KPA Engineering Ltd

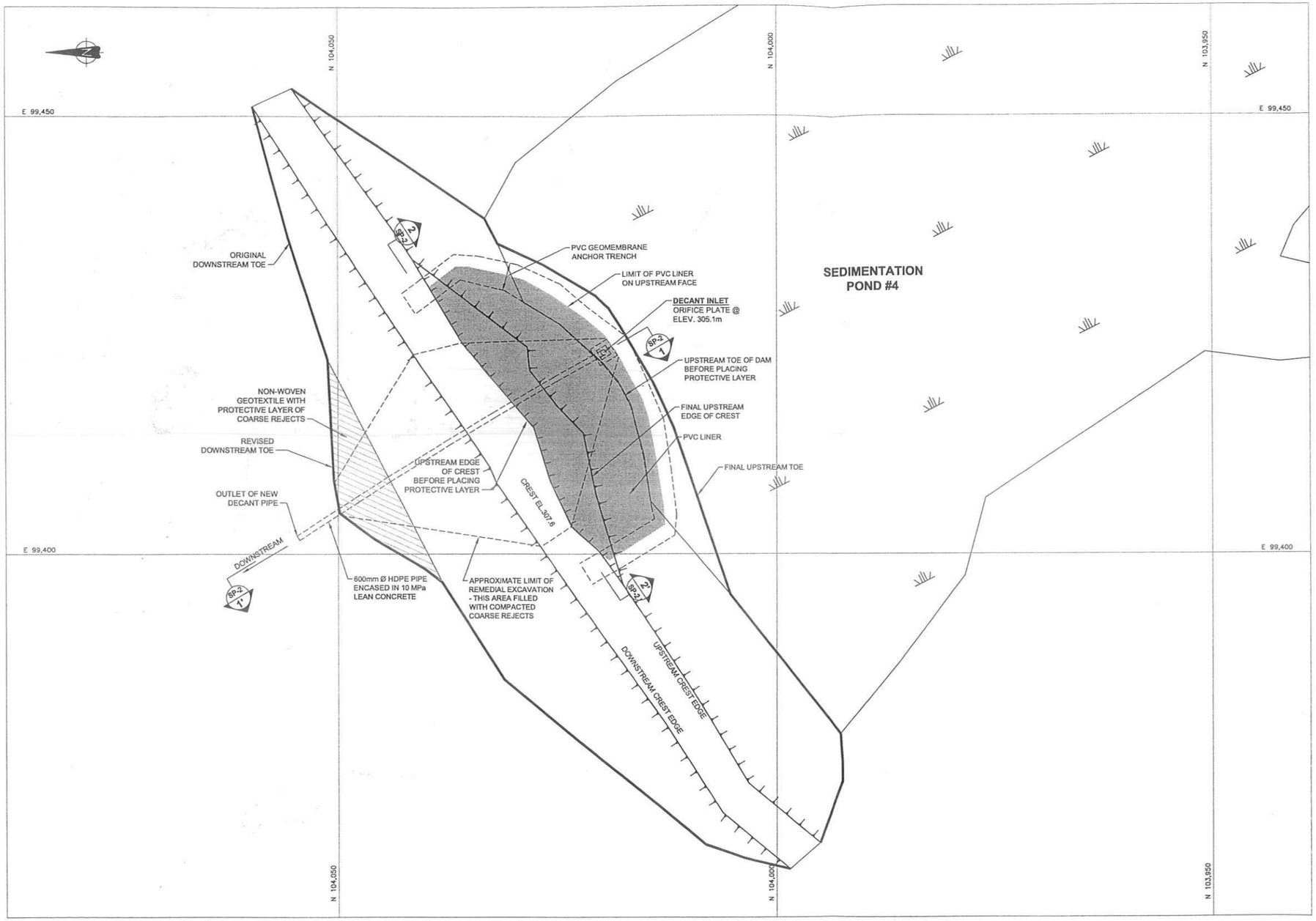
PROFILE ALONG DAM CENTRELINE

Quinsam Coal Project - Settling Pond 1

THURBER

DRAWING NO 17-25-106-4

TG-BLK-8H MAR/90



NOTES

1. AS-BUILT DRAWINGS PREPARED BASED UPON SURVEY DATA SUPPLIED BY QUINSAM COAL CORPORATION.
2. ELEVATIONS ARE IN METRES REFERENCED TO LOCAL DATUM.
3. NORTHINGS AND EASTINGS ARE IN METRES REFERENCED TO LOCAL MINE GRID.
4. ALL WORK DONE IN ACCORDANCE WITH THE DRAWINGS AND TO THE SATISFACTON OF THE GOLDER'S ENGINEER.
5. EXACT LOCATIONS OF OUTLET AND CONCRETE SUPPORT WERE DETERMINED IN THE FIELD.

0 2 4 6 8 10
Scale in Meters

REV	DATE	DES	REVISION DESCRIPTION	CADD	CHK	RVW
3	13APR04	DAH	AS-BUILT	NV	DAH	
2	14JAN04	PMB	ISSUED FOR CONSTRUCTION	JK	PMB	RB
1	12JAN04	PMB	ISSUED FOR CLIENT REVIEW	JK	AJH	AVC

PROJECT

QUINSAM COAL CORPORATION
SEDIMENTATION POND #4 EMBANKMENT
CAMPBELL RIVER, B.C.

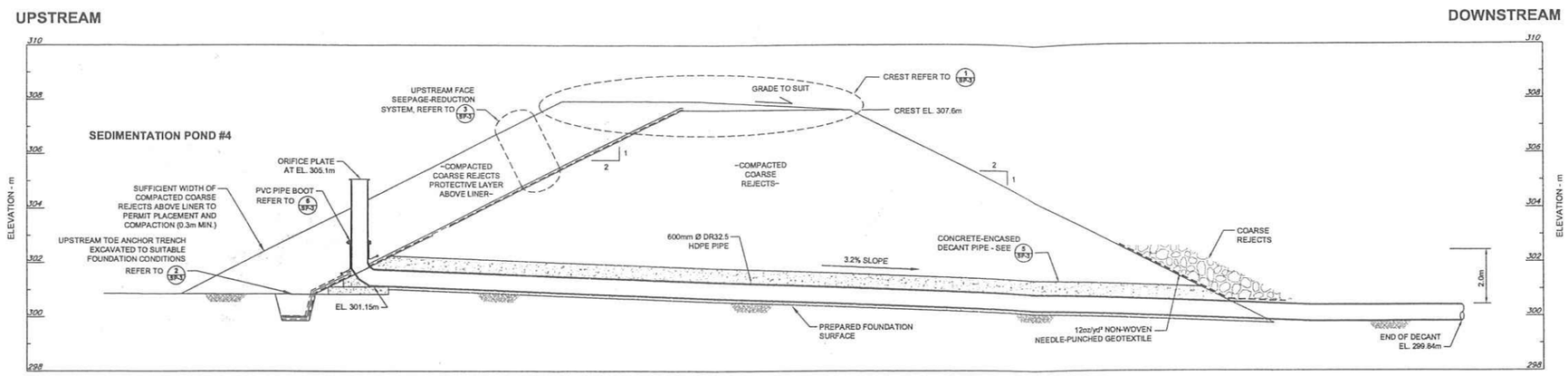
TITLE

AS-BUILT EMBANKMENT PLAN

Golder Associates

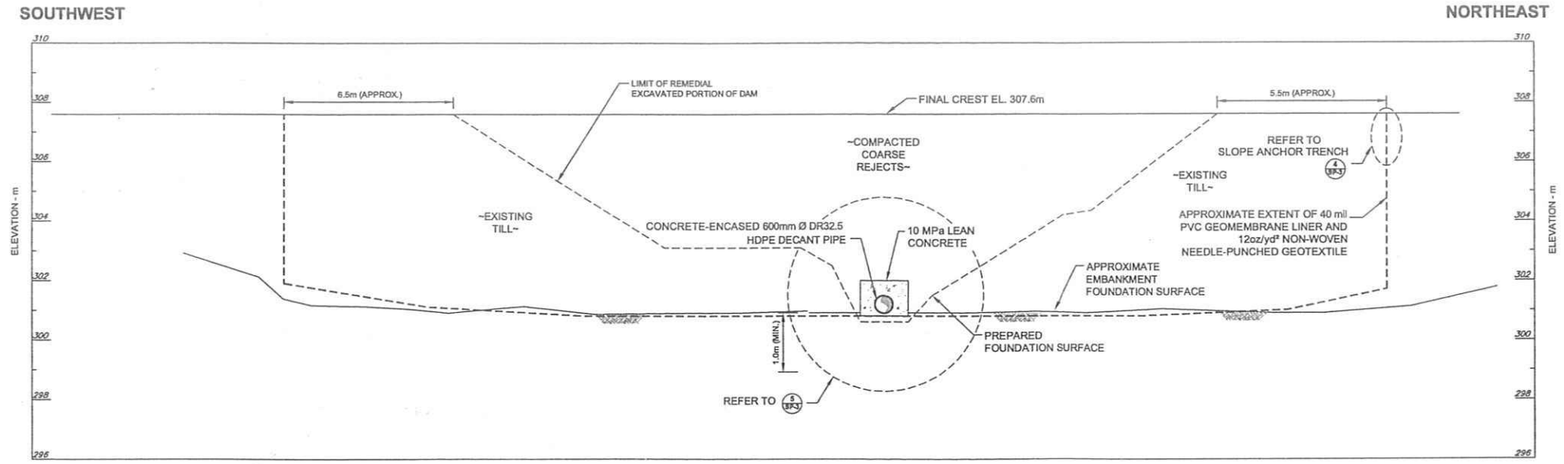
PROJECT No. 03-1413-090			FILE No. D1413-090-SP1-R1		
DESIGN	PMB	09JAN04	SCALE AS SHOWN	REV.	1
CADD	JK	09JAN04	SP-1		
CHECK	DAH	13APR04			
REVIEW	AVC	13APR04			

REVISION DATE: 04/02/13 11:58am By: rreeves CADD FILE: N:\Bur-Graphics\Projects\2003\(1413.03-1413-090\Drafting\cad\Sheet\P1413-090-SP1-R1.dwg



1 SP-1 CROSS-SECTION ALONG DECANT PIPE

Scale in Meters: 0 1 2 3 4 5



2 SP-1 PROFILE AT DAM CREST

Scale in Meters: 0 1 2 3 4 5

LEGEND

- GROUND SURFACE
- 40mil PVC GEOMEMBRANE
- 12oz/yd² NON-WOVEN NEEDLE-PUNCHED GEOTEXTILE
- CONCRETE

NOTES

1. GROUND SURFACE AND DAM OUTLINE BASED UPON SURVEY DATA SUPPLIED BY QUINSAM COAL CORPORATION.
2. NORTHINGS, EASTINGS, AND ELEVATIONS ARE IN METRES REFERENCED TO LOCAL DATUM AND MINE GRID.
3. EXCAVATED MATERIAL SHALL BE PLACED IN AN AREA APPROVED BY THE OWNER. THE SUITABILITY OF EXCAVATED MATERIAL FOR USE IN THE WORKS SHALL BE DETERMINED BY THE GOLDER'S ENGINEER IN THE FIELD.
4. NO GEOTEXTILE OR GEOMEMBRANE SHALL BE PLACED WITHOUT THE APPROVAL OF THE GOLDER'S ENGINEER.
5. GEOTEXTILE AND GEOMEMBRANE STORAGE, HANDLING AND INSTALLATION SHALL BE PERFORMED ACCORDING TO MANUFACTURER'S RECOMMENDATIONS AND TO THE SATISFACTION OF THE GOLDER'S ENGINEER. ALL MANUFACTURER'S RECOMMENDATIONS SHALL BE PROVIDED TO THE GOLDER'S ENGINEER PRIOR TO SITE DELIVERY OF THE GEOTEXTILE AND/OR THE GEOMEMBRANE.
6. MANUFACTURER'S QUALITY CONTROL CERTIFICATES FOR EACH PANEL OF GEOTEXTILE AND GEOMEMBRANE SHALL BE PROVIDED TO THE GOLDER'S ENGINEER PRIOR TO SITE DELIVERY OF THE GEOTEXTILE AND/OR GEOMEMBRANE.
7. GEOTEXTILE SHALL BE 12 oz/yd² NON-WOVEN NEEDLE-PUNCHED, LAYFIELD LP12.
8. GEOMEMBRANE SHALL BE 40 mil POLYVINYL CHLORIDE (PVC).
9. THE DECANT PIPE SHALL BE A 24" O.D. HIGH DENSITY POLYETHYLENE (HDPE) 32.5 DR PIPE. PIPE STORAGE, HANDLING AND INSTALLATION SHALL BE PERFORMED ACCORDING TO MANUFACTURER'S RECOMMENDATIONS AND TO THE SATISFACTION OF GOLDER'S ENGINEER. ALL MANUFACTURER'S RECOMMENDATIONS SHALL BE PROVIDED TO GOLDER'S ENGINEER PRIOR TO SITE DELIVERY OF THE PIPE.
10. MANUFACTURER'S QUALITY CONTROL CERTIFICATES FOR GEOTEXTILE AND GEOMEMBRANE SHALL BE PROVIDED TO GOLDER'S ENGINEER PRIOR TO SITE DELIVERY OF THE GEOTEXTILE AND/OR GEOMEMBRANE.
11. THE PIPE BOOT SHALL BE APPROVED BY GOLDER'S ENGINEER PRIOR TO INSTALLATION. INSTALLATION SHALL BE PERFORMED ACCORDING TO MANUFACTURER'S RECOMMENDATIONS AND TO THE SATISFACTION OF GOLDER'S ENGINEER.
12. CONCRETE SHALL HAVE A MINIMUM UCS OF 30 MPa AT 28 DAYS, WITH AN AIR CONTENT OF 6±1% AND BE PLACED AT A SLUMP OF 100±30 mm.
13. WHERE LEAN CONCRETE IS USED, IT SHOULD HAVE A MINIMUM UCS OF 10 MPa AFTER 28 DAYS.
14. COARSE REJECTS NOMINALLY COMPACTED USING PLACEMENT EQUIPMENT AND TO THE SATISFACTION OF GOLDER'S ENGINEER. MAXIMUM LOOSE LIFT THICKNESS OF 0.3 m.
15. COMPACTION IN CLOSE PROXIMITY TO THE CONCRETE SUPPORT AND DECANT PIPE SHALL BE PERFORMED USING HAND-OPERATED EQUIPMENT TO THE SATISFACTION OF GOLDER'S ENGINEER. CARE SHALL BE EXERCISED SO NOT TO DAMAGE THE CONCRETE SUPPORT OR THE DECANT PIPE.
16. THE BACKFILLING OF THE ANCHOR TRENCHES SHALL BE PERFORMED TO THE SATISFACTION OF GOLDER'S ENGINEER. TILL MATERIAL WILL BE USED AND PLACED IN A MAXIMUM LOOSE LIFT THICKNESS OF 0.5 m. COMPACTION WILL LIKELY BE PERFORMED USING A "KNUCKLED" EXCAVATOR BUCKET. CARE SHALL BE EXERCISED SO NOT TO DAMAGE THE GEOTEXTILE OR GEOMEMBRANE.
17. 12 oz/yd² NON-WOVEN NEEDLE-PUNCHED GEOTEXTILE AND COARSE REJECTS TO BE PLACED ON THE DOWNSTREAM FACE OF THE DAM AROUND THE OUTLET OF THE DECANT PIPE SHALL BE APPROVED BY GOLDER'S ENGINEER PRIOR TO PLACEMENT. CARE SHALL BE EXERCISED SO AS TO NOT DAMAGE THE DECANT PIPE.
18. FOUNDATION CONDITIONS ALONG PIPE AND ANCHOR TRENCHES SHALL BE TO THE SATISFACTION OF GOLDER'S ENGINEER.

REV	DATE	DES	REVISION DESCRIPTION	CADD	CHK	RVW
1	13APR04	DAH	AS-BUILT	NV		
0	14JAN04	PMB	ISSUED FOR CONSTRUCTION	JK	PMB	RB
A	12JAN04	PMB	ISSUED FOR CLIENT REVIEW	NV	AJH	AVC

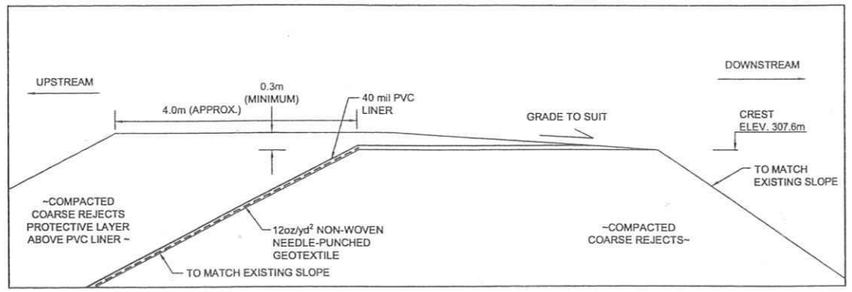
PROJECT
QUINSAM COAL CORPORATION
SEDIMENTATION POND #4 EMBANKMENT
CAMPBELL RIVER, B.C.

TITLE
EMBANKMENT CROSS-SECTION AND PROFILE

Golder Associates

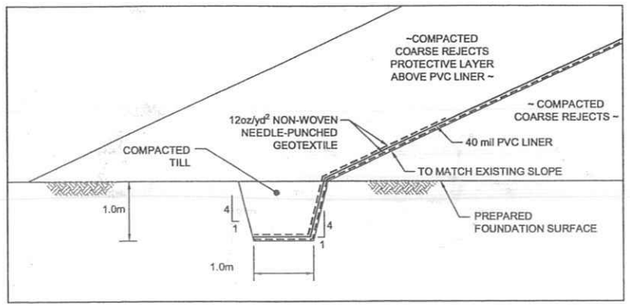
PROJECT No. 03-1413-090			FILE No. S1413-090-SP2-R1		
DESIGN	PMB	12JAN04	SCALE AS SHOWN	REV.	1
CADD	NV	12JAN04			
CHECK		13APR04	SP-2		
REVIEW		13APR04			

CADD FILE: N:\Burnaby\Projects\2003\1413\03-1413-090\Drafting\cad\Revd\S1413-090-SP2-R1.dwg
REVISION DATE: 04/05/17 10:14am By: mmikes



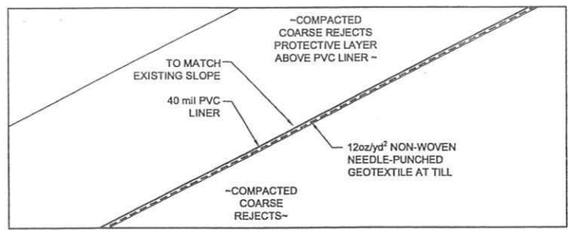
1 SP-2 **CREST DETAIL**

Scale in Meters



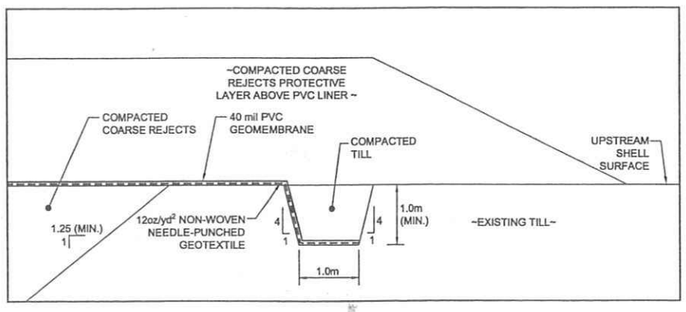
2 SP-3 **UPSTREAM TOE ANCHOR TRENCH DETAIL**

Scale in Meters



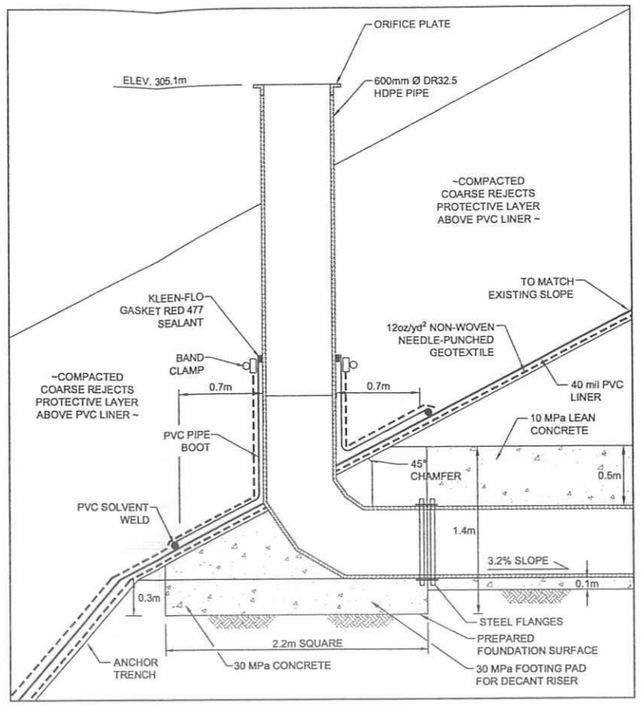
3 SP-2 **UPSTREAM FACE SEEPAGE - REDUCTION SYSTEM**

Scale in Meters



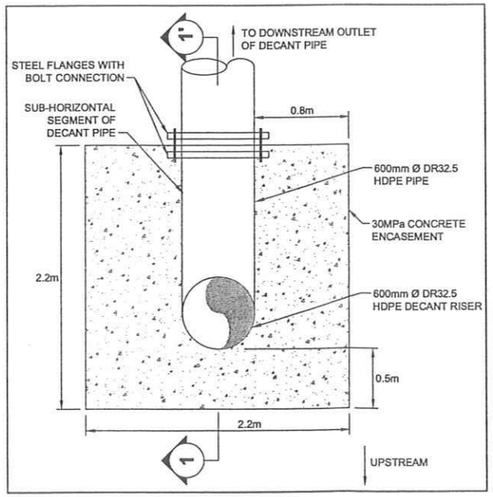
4 SP-2 **SLOPE ANCHOR TRENCH DETAIL**

Scale in Meters



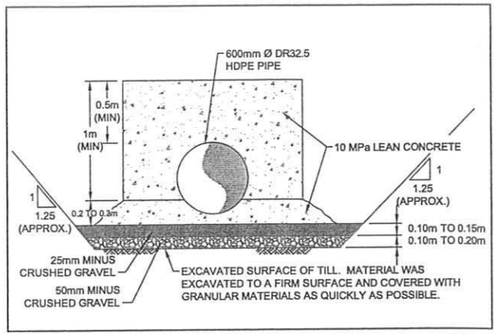
1 6 SP-2 **DETAIL - CONCRETE ENCASEMENT OF DECANT PIPE RISER**

Scale in Meters



PLAN VIEW - CONCRETE ENCASEMENT AT DECANT RISER

Scale in Meters



5 SP-2 **CROSS SECTION - DECANT PIPE**

Scale in Meters

LEGEND

- GROUND SURFACE
- 40mil PVC GEOMEMBRANE
- 12oz/yd² NON-WOVEN NEEDLE-PUNCHED GEOTEXTILE
- CONCRETE

NOTES

1. GROUND SURFACE AND DAM OUTLINE BASED UPON SURVEY DATA SUPPLIED BY QUINSAM COAL CORPORATION.
2. NORTHINGS, EASTINGS, AND ELEVATIONS ARE IN METRES REFERENCED TO LOCAL DATUM AND MINE GRID.
3. EXCAVATED MATERIAL SHALL BE PLACED IN AN AREA APPROVED BY THE OWNER. THE SUITABILITY OF EXCAVATED MATERIAL FOR USE IN THE WORKS SHALL BE DETERMINED BY THE GOLDER'S ENGINEER IN THE FIELD.
4. NO GEOTEXTILE OR GEOMEMBRANE SHALL BE PLACED WITHOUT THE APPROVAL OF THE GOLDER'S ENGINEER.
5. GEOTEXTILE AND GEOMEMBRANE STORAGE, HANDLING AND INSTALLATION SHALL BE PERFORMED ACCORDING TO MANUFACTURER'S RECOMMENDATIONS AND TO THE SATISFACTION OF THE GOLDER'S ENGINEER. ALL MANUFACTURER'S RECOMMENDATIONS SHALL BE PROVIDED TO THE GOLDER'S ENGINEER PRIOR TO SITE DELIVERY OF THE GEOTEXTILE AND/OR THE GEOMEMBRANE.
6. MANUFACTURER'S QUALITY CONTROL CERTIFICATES FOR EACH PANEL OF GEOTEXTILE AND GEOMEMBRANE SHALL BE PROVIDED TO THE GOLDER'S ENGINEER PRIOR TO SITE DELIVERY OF THE GEOTEXTILE AND/OR GEOMEMBRANE.
7. GEOTEXTILE SHALL BE 12 oz/yd² NON-WOVEN NEEDLE-PUNCHED, LAYFIELD LP12.
8. GEOMEMBRANE SHALL BE 40 mil POLYVINYL CHLORIDE (PVC).
9. THE DECANT PIPE SHALL BE A 24" O.D. HIGH DENSITY POLYETHYLENE (HDPE) 32.5 DR PIPE. PIPE STORAGE, HANDLING AND INSTALLATION SHALL BE PERFORMED ACCORDING TO MANUFACTURER'S RECOMMENDATIONS AND TO THE SATISFACTION OF GOLDER'S ENGINEER. ALL MANUFACTURER'S RECOMMENDATIONS SHALL BE PROVIDED TO GOLDER'S ENGINEER PRIOR TO SITE DELIVERY OF THE PIPE.
10. MANUFACTURER'S QUALITY CONTROL CERTIFICATES FOR GEOTEXTILE AND GEOMEMBRANE SHALL BE PROVIDED TO GOLDER'S ENGINEER PRIOR TO SITE DELIVERY OF THE GEOTEXTILE AND/OR GEOMEMBRANE.
11. THE PIPE BOOT SHALL BE APPROVED BY GOLDER'S ENGINEER PRIOR TO INSTALLATION. INSTALLATION SHALL BE PERFORMED ACCORDING TO MANUFACTURER'S RECOMMENDATIONS AND TO THE SATISFACTION OF GOLDER'S ENGINEER.
12. CONCRETE SHALL HAVE A MINIMUM UCS OF 30 MPa AT 28 DAYS, WITH AN AIR CONTENT OF 6±1% AND BE PLACED AT A SLUMP OF 100±30 mm.
13. WHERE LEAN CONCRETE IS USED, IT SHOULD HAVE A MINIMUM UCS OF 10 MPa AFTER 28 DAYS.
14. COARSE REJECTS NOMINALLY COMPACTED USING PLACEMENT EQUIPMENT AND TO THE SATISFACTION OF GOLDER'S ENGINEER. MAXIMUM LOOSE LIFT THICKNESS OF 0.3 m.
15. COMPACTION IN CLOSE PROXIMITY TO THE CONCRETE SUPPORT AND DECANT PIPE SHALL BE PERFORMED USING HAND-OPERATED EQUIPMENT TO THE SATISFACTION OF GOLDER'S ENGINEER. CARE SHALL BE EXERCISED SO NOT TO DAMAGE THE CONCRETE SUPPORT OR THE DECANT PIPE.
16. THE BACKFILLING OF THE ANCHOR TRENCHES SHALL BE PERFORMED TO THE SATISFACTION OF GOLDER'S ENGINEER. TILL MATERIAL WILL BE USED AND PLACED IN A MAXIMUM LOOSE LIFT THICKNESS OF 0.5 m. COMPACTION WILL LIKELY BE PERFORMED USING A "KNUCKLED" EXCAVATOR BUCKET. CARE SHALL BE EXERCISED SO NOT TO DAMAGE THE GEOTEXTILE OR GEOMEMBRANE.
17. 12 oz/yd² NON-WOVEN NEEDLE-PUNCHED GEOTEXTILE AND COARSE REJECTS TO BE PLACED ON THE DOWNSTREAM FACE OF THE DAM AROUND THE OUTLET OF THE DECANT PIPE SHALL BE APPROVED BY GOLDER'S ENGINEER PRIOR TO PLACEMENT. CARE SHALL BE EXERCISED SO AS TO NOT DAMAGE THE DECANT PIPE.
18. FOUNDATION CONDITIONS ALONG PIPE AND ANCHOR TRENCHES SHALL BE TO THE SATISFACTION OF GOLDER'S ENGINEER.

REV	DATE	DES	REVISION DESCRIPTION	CADD	CHK	RVW
1	13APR04	DAH	AS-BUILT	NV		
0	14JAN04	PMB	ISSUED FOR CONSTRUCTION	JK	PMB	RB
A	12JAN04	PMB	ISSUED FOR CLIENT REVIEW	JK	PMB	AVC

PROJECT

QUINSAM COAL CORPORATION
SEDIMENTATION POND #4 EMBANKMENT
CAMPBELL RIVER, B.C.

TITLE

DETAILS

Golder Associates

PROJECT No. 03-1413-090			FILE No. D1413-090-SP3-R1		
DESIGN	PMB	09JAN04	SCALE AS SHOWN	REV.	1
CADD	JK	09JAN04			
CHECK		13APR04	**SP-3**		
REVIEW		13APR04			

CADD FILE: N:\Burnaby\Projects\2003\1413\03-1413-090\Drafting\cad\Rev0\D1413-090-SP3-R0.dwg
REVISION DATE: 04/01/15 8:34am By: Jkamnicki

APPENDIX C

2020 OWNER WEEKLY INSPECTIONS

QUINSAM COAL

Tailings Disposal Facility and South Dam Inspection Report (TDF-Weekly, South Dam-Weekly)

Date:	January 14, 2020	**Inspected By:**	Sarah S
Weather:	Sunny/cloudy/cold		

2 North Tailings Disposal Facility

Comments: The facility's embankments are covered by snow, very cold weather, -12 degree.

TDF Freeboard: 354.10 Pond Elv.: **350.55** Freeboard: **3.55** Comment:

Minimum operating freeboard:1.4m; Maximum allowable pond elevation(calculated):352.9m

North Embankment Priezometers	Polynomial Gage Factors A	B	C	Readings (Lc)	Tk	Temperature (Ti)	Temperature (Tc)	Pressure kPa
VW0582	-6.5316E-07	-0.16458	1521.4	***malfunctioned***	0.0786	6.0		**#VALUE!**
VW0583	-6.0506E-07	-0.15820	1512.4	***9269.9***	-0.0840	20.9		**-4.336**
VW0584	-1.0595E-07	-0.12602	1110.0	***8726.6***	0.2815	20.8	***14.7***	**0.488**
VW0586	-3.2376E-17	-0.12615	1132.6	***9015.6***	-0.0568	21.0	***12.6***	**-4.241**
VW0587 (VW16734)	-1.8058E-07	-0.10650	994.16	***9225.8***	-0.0725	18.0	***14.0***	**-3.468**

$p(kPa) = [(A)(Lc)^2 + (B)(Lc) + C + (Tk)(Tc-Ti)] - [(0.10)(Bc-Bi)]$, assume Bc-Bi = 0

Trigger Level Pressure: Downstream Piezometer:25kPa; Centreline piezometer:80kPa

North Embankment 90° V-Notch Weir: Height of water(Hm): **0.05** Flow rate (Liters/Second): **0.77**

Liters/Second (L/S) = $1380\ H_m^{2.5}$

North Embankment

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	yes
Vegetation Growth	No	No	Yes	Yes
Animal Burrows	No	No	No	No

Comments: covered by snow

East Embankment

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	No
Vegetation Growth	No	No	No	Yes
Animal Burrows	No	No	No	No

Comments: covered by snow

South Embankment

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	yes
Vegetation Growth	No	No	Yes	Yes
Animal Burrows	No	No	No	No

Comments: covered by snow

West Embankment

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	No
Vegetation Growth	No	No	yes	Yes
Animal Burrows	No	No	No	No

Comments: covered by snow

South Dam

South Dam Freeboard: Crest Elevation: 308.8m Pond Elv.: Freeboard: **~6-8m** Comment:

Minimum opeating freeboard:5.3m; Maximum allowable pond elevation during normal operating conditions: 303.6m

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	Yes	No	No
Vegetation Growth	Yes	No	yes	Yes
Animal Burrows	No	No	No	No

Comments: frozen, the staff gauge reading is about 0.8m (the bottom staff gauge), was 1.7m when installed. The water level raise is caused by geyser at 2North (3wks ago). The bigger the reading is, the lower the water level is. covered by snow

QUINSAM COAL

Tailings Disposal Facility and South Dam Inspection Report (TDF-Weekly, South Dam-Weekly)

Date:	January 14, 2020	**Inspected By:**	Sarah S
Weather:	Sunny/cloudy/cold		

2 North Tailings Disposal Facility

Comments: All embankments are covered by snow, very cold weather, -12 degree.

TDF Freeboard: 354.10 Pond Elv.: **350.55** Freeboard: **3.55** Comment:

Minimum operating freeboard:1.4m; Maximum allowable pond elevation(calculated):352.9m

North Embankment Priezometers	Polynomial Gage Factors A	B	C	Readings (Lc)	Tk	Temperature (Ti)	Temperature (Tc)	Pressure kPa
VW0582	-6.5316E-07	-0.16458	1521.4	***malfunctioned***	0.0786	6.0		**#VALUE!**
VW0583	-6.0506E-07	-0.15820	1512.4	***9269.9***	-0.0840	20.9		**-4.336**
VW0584	-1.0595E-07	-0.12602	1110.0	***8726.6***	0.2815	20.8	***14.7***	**0.488**
VW0586	-3.2376E-17	-0.12615	1132.6	***9015.6***	-0.0568	21.0	***12.6***	**-4.241**
VW0587 (VW16734)	-1.8058E-07	-0.10650	994.16	***9225.8***	-0.0725	18.0	***14.0***	**-3.468**

$p(kPa) = [(A)(Lc)^2 + (B)(Lc) + C + (Tk)(Tc-Ti)] - [(0.10)(Bc-Bi)]$, assume Bc-Bi = 0

Trigger Level Pressure: Downstream Piezometer:25kPa; Centreline piezometer:80kPa

North Embankment 90° V-Notch Weir: Height of water(Hm): **0.05** Flow rate (Liters/Second): **0.77**

Liters/Second (L/S) = $1380\ H_m^{2.5}$

North Embankment

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	yes
Vegetation Growth	No	No	Yes	Yes
Animal Burrows	No	No	No	No

Comments: covered by snow

East Embankment

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	No
Vegetation Growth	No	No	No	Yes
Animal Burrows	No	No	No	No

Comments: covered by snow

South Embankment

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	yes
Vegetation Growth	No	No	Yes	Yes
Animal Burrows	No	No	No	No

Comments: covered by snow

West Embankment

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	No
Vegetation Growth	No	No	yes	Yes
Animal Burrows	No	No	No	No

Comments: covered by snow

South Dam

South Dam Freeboard: Crest Elevation: 308.8m Pond Elv.: Freeboard: **~6-8m** Comment:

Minimum opeating freeboard:5.3m; Maximum allowable pond elevation during normal operating conditions: 303.6m

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	Yes	No	No
Vegetation Growth	Yes	No	yes	Yes
Animal Burrows	No	No	No	No

Comments: frozen, the staff gauge reading is about 0.8m (the bottom staff gauge), was 1.7m when installed. The water level raise is caused by geyser at 2North (3wks ago). The bigger the reading is, the lower the water level is. covered by snow

QUINSAM COAL

Tailings Disposal Facility and South Dam Inspection Report (TDF-Weekly, South Dam-Weekly)

Date:	January 22, 2020	**Inspected By:**	Sarah S
Weather:	Sunny/cloudy		

2 North Tailings Disposal Facility

Comments: Heavy rain and snow melting during this week; no sign of re-opening of the repaired erosional channel at NE corner.
The weir is flooded.

TDF Freeboard: 354.10 Pond Elv.: **350.55** Freeboard: **3.55** Comment:
Minimum operating freeboard:1.4m; Maximum allowable pond elevation(calculated):352.9m

North Embankment Priezometers	Polynomial Gage Factors A	B	C	Readings (Lc)	Tk	Temperature (Ti)	Temperature (Tc)	Pressure kPa
VW0582	-6.5316E-07	-0.16458	1521.4	***malfunctioned***	0.0786	6.0		**#VALUE!**
VW0583	-6.0506E-07	-0.15820	1512.4	***9272.4***	-0.0840	20.9		**-4.760**
VW0584	-1.0595E-07	-0.12602	1110.0	***8724.4***	0.2815	20.8	***14.7***	**0.770**
VW0586	-3.2376E-07	-0.12615	1132.6	***9011.6***	-0.0568	21.0	***12.8***	**-30.040**
VW0587 (VW16734)	-1.8058E-07	-0.10650	994.16	***9225.0***	-0.0725	18.0	***14.4***	**-3.409**

$p(kPa) = [(A)(Lc)^2 + (B)(Lc) + C + (Tk)(Tc-Ti)] - [(0.10)(Bc-Bi)]$, assume Bc-Bi = 0

Trigger Level Pressure Downstream Piezometer:25kPa; Centreline piezometer:80kPa

North Embankment 90° V-Notch Weir Height of water(Hm): **0.05** Flow rate (Liters/Second): **0.77**
Liters/Second (L/S) = $1380\ H_m^{2.5}$

North Embankment

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	yes
Vegetation Growth	No	No	Yes	Yes
Animal Burrows	No	No	No	No

Comments: The weir is flooded.

East Embankment

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	No
Vegetation Growth	No	No	No	Yes
Animal Burrows	No	No	No	No

Comments: several puddles at the east embankment

South Embankment

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	yes
Vegetation Growth	No	No	Yes	Yes
Animal Burrows	No	No	No	No

Comments: normal

West Embankment

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	No
Vegetation Growth	No	No	yes	Yes
Animal Burrows	No	No	No	No

Comments: normal

South Dam

South Dam Freeboard: Crest Elevation: 308.8m Pond Elv.: Freeboard: **~6-8m** Comment:
Minimum opeating freeboard:5.3m; Maximum allowable pond elevation during normal operating conditions: 303.6m

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	Yes	No	No
Vegetation Growth	Yes	No	yes	Yes
Animal Burrows	No	No	No	No

Comments: frozen, the staff gauge reading is about 0.6m (the bottom staff gauge), was 1.7m when installed. The bigger the reading is, the lower the water level is. covered by snow

QUINSAM COAL

Tailings Disposal Facility and South Dam Inspection Report (TDF-Weekly, South Dam-Weekly)

Date:	January 30, 2020	**Inspected By:**	Sarah S
Weather:	Cloudy/Rainy		

2 North Tailings Disposal Facility

Comments: Heavy rain and snow melting during this week; 30cm water level raise in both 2-North TSF and south dam; no sign of re-opening of the repaired erosional channel at NE corner; The weir is flooded.

TDF Freeboard: 354.10 Pond Elv.: **350.85** Freeboard: **3.25** Comment:

Minimum operating freeboard:1.4m; Maximum allowable pond elevation(calculated):352.9m

North Embankment Priezometers	Polynomial Gage Factors A	B	C	Readings (Lc)	Tk	Temperature (Ti)	Temperature (Tc)	Pressure kPa
VW0582	-6.5316E-07	-0.16458	1521.4	***malfunctioned***	0.0786	6.0		**#VALUE!**
VW0583	-6.0506E-07	-0.15820	1512.4	***9267.4***	-0.0840	20.9		**-3.912**
VW0584	-1.0595E-07	-0.12602	1110.0	***8717.6***	0.2815	20.8	***14.8***	**1.667**
VW0586	-3.2376E-17	-0.12615	1132.6	***9016.8***	-0.0568	21.0	***12.8***	**-4.404**
VW0587 (VW16734)	-1.8058E-07	-0.10650	994.16	***9216.7***	-0.0725	18.0	***14.4***	**-2.497**

$p(kPa) = [(A)(Lc)^2 + (B)(Lc) + C + (Tk)(Tc-Ti)] - [(0.10)(Bc-Bi)]$, assume Bc-Bi = 0

Trigger Level Pressure Downstream Piezometer:25kPa; Centreline piezometer:80kPa

North Embankment 90° V-Notch Weir Height of water(Hm): **0.06** Flow rate (Liters/Second): **1.22**

Liters/Second (L/S) = $1380\ H_m^{2.5}$

North Embankment

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	yes
Vegetation Growth	No	No	Yes	Yes
Animal Burrows	No	No	No	No

Comments: The weir is flooded.

East Embankment

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	No
Vegetation Growth	No	No	No	Yes
Animal Burrows	No	No	No	No

Comments: 2 puddles at the east embankment; the pipeline laid on the east embankment crest leading the puddle water into the impoundment.

South Embankment

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	yes
Vegetation Growth	No	No	Yes	Yes
Animal Burrows	No	No	No	No

Comments: normal

West Embankment

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	No
Vegetation Growth	No	No	yes	Yes
Animal Burrows	No	No	No	No

Comments: normal

South Dam

South Dam Freeboard: Crest Elevation: 308.8m Pond Elv.: Freeboard: **~6-8m** Comment:

Minimum opeating freeboard:5.3m; Maximum allowable pond elevation during normal operating conditions: 303.6m

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	Yes	No	No
Vegetation Growth	Yes	No	yes	Yes
Animal Burrows	No	No	No	No

Comments: frozen, the staff gauge reading is about 0.3m (the bottom staff gauge), was 1.7m when installed. The bigger the reading is, the lower the water level is. The water color is orange.

QUINSAM COAL

Tailings Disposal Facility and South Dam Inspection Report (TDF-Weekly, South Dam-Weekly)

Date:	February 5, 2020	**Inspected By:**	Sarah S
Weather:	Snow		

2 North Tailings Disposal Facility

Comments:
The facility is covered by snow.
Water level at South Dam is about 0.2m, 10 cm rising above that from last week.
Angie from Tetra Tech suggested the polynomial gage factor for VW0586 should be -3.2376E-17.

TDF Freeboard: 354.10 Pond Elv.: **350.95** Freeboard: **3.15** Comment:
Minimum operating freeboard:1.4m; Maximum allowable pond elevation(calculated):352.9m

North Embankment Priezometers	Polynomial Gage Factors A	B	C	Readings (Lc)	Tk	Temperature (Ti)	Temperature (Tc)	Pressure kPa
VW0582	-6.5316E-07	-0.16458	1521.4	***malfunctioned***	0.0786	6.0		**#VALUE!**
VW0583	-6.0506E-07	-0.15820	1512.4	***9267.7***	-0.0840	20.9		**-3.963**
VW0584	-1.0595E-07	-0.12602	1110.0	***8718.4***	0.2815	20.8	***14.8***	**1.565**
VW0586	-3.2376E-17	-0.12615	1132.6	***9011.8***	-0.0568	21.0	***12.9***	**-3.778**
VW0587 (VW16734)	-1.8058E-07	-0.10650	994.16	***9215.8***	-0.0725	18.0	***14.4***	**-2.399**

$p(kPa) = [(A)(Lc)^2 + (B)(Lc) + C + (Tk)(Tc-Ti)] - [(0.10)(Bc-Bi)]$, assume Bc-Bi = 0

Trigger Level Pressure Downstream Piezometer:25kPa; Centreline piezometer:80kPa

North Embankment 90° V-Notch Weir Height of water(Hm): **0.06** Flow rate (Liters/Second): **1.22**
Liters/Second (L/S) = $1380\ H_m^{2.5}$

North Embankment

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	yes
Vegetation Growth	No	No	Yes	Yes
Animal Burrows	No	No	No	No

Comments: The weir is flooded.

East Embankment

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	No
Vegetation Growth	No	No	No	Yes
Animal Burrows	No	No	No	No

Comments: Covered by snow.

South Embankment

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	yes
Vegetation Growth	No	No	Yes	Yes
Animal Burrows	No	No	No	No

Comments: covered by snow.

West Embankment

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	No
Vegetation Growth	No	No	yes	Yes
Animal Burrows	No	No	No	No

Comments: covered by snow.

South Dam

South Dam Freeboard: Crest Elevation: 308.8 Pond Elv.: 301.80 Freeboard: **7** Comment:
Minimum opeating freeboard:5.3m; Maximum allowable pond elevation during normal operating conditions: 303.6m

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	Yes	No	No
Vegetation Growth	Yes	No	yes	Yes
Animal Burrows	No	No	No	No

Comments: frozen, the staff gauge reading is about 0.2m (the bottom staff gauge), was 1.7m when installed. The bigger the reading is, the lower the water level is. Covered by snow.

QUINSAM COAL

Tailings Disposal Facility and South Dam Inspection Report (TDF-Weekly, South Dam-Weekly)

Date:	February 12, 2020	**Inspected By:**	Sarah S
Weather:	Nice weather		

2 North Tailings Disposal Facility

Comments: Everything look good.
The pressure is lower than previous values for VW586 is due to the correction of the A factors.

TDF Freeboard: 354.10 Pond Elv.: **350.95** Freeboard: **3.15** Comment:
Minimum operating freeboard:1.4m; Maximum allowable pond elevation(calculated):352.9m

North Embankment Priezometers	Polynomial Gage Factors			Readings	Tk	Temperature	Temperature	Pressure
	A	B	C	(Lc)		(Ti)	(Tc)	kPa
VW0582	-6.5316E-07	-0.16458	1521.4	***malfunctioned***	0.0786	6.0		**#VALUE!**
VW0583	-6.0506E-07	-0.15820	1512.4	***9265.8***	-0.0840	20.9		**-3.641**
VW0584	-1.0595E-07	-0.12602	1110.0	***8716.2***	0.2815	20.8	***14.8***	**1.846**
VW0586	-3.2376E-17	-0.12615	1132.6	***9017.5***	-0.0568	21.0	***12.9***	**-4.498**
VW0587 (VW16734)	-1.8058E-07	-0.10650	994.16	***9211.5***	-0.0725	18.0	***14.4***	**-1.926**

$p(kPa) = [(A)(Lc)^2 + (B)(Lc) + C + (Tk)(Tc-Ti)] - [(0.10)(Bc-Bi)]$, assume Bc-Bi = 0

Trigger Level Pressure Downstream Piezometer:25kPa; Centreline piezometer:80kPa

North Embankment 90° V-Notch Weir Height of water(Hm): **0.06** Flow rate (Liters/Second): **1.22**
Liters/Second (L/S) = $1380\ H_m^{2.5}$

North Embankment

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	yes
Vegetation Growth	No	No	Yes	Yes
Animal Burrows	No	No	No	No

Comments: normal. The fixed erosion spot at the NE corner of the TSF look good.

East Embankment

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	No
Vegetation Growth	No	No	No	Yes
Animal Burrows	No	No	No	No

Comments: two puddles

South Embankment

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	yes
Vegetation Growth	No	No	Yes	Yes
Animal Burrows	No	No	No	No

Comments: normal

West Embankment

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	No
Vegetation Growth	No	No	yes	Yes
Animal Burrows	No	No	No	No

Comments: normal

South Dam

South Dam Freeboard: Crest Elevation: 308.8m Pond Elv.: Freeboard: **~6-8m** Comment:
Minimum opeating freeboard:5.3m; Maximum allowable pond elevation during normal operating conditions: 303.6m

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	Yes	No	No
Vegetation Growth	Yes	No	yes	Yes
Animal Burrows	No	No	No	No

Comments: the staff gauge reading is about 0.15m (the bottom staff gauge), was 1.7m when installed. The bigger the reading is, the lower the water level is. Covered by snow. Water color turns to green-brownish.

QUINSAM COAL

Tailings Disposal Facility and South Dam Inspection Report (TDF-Weekly, South Dam-Weekly)

Date:	February 18, 2020	**Inspected By:**	Sarah S
Weather:	Nice weather		

2 North Tailings Disposal Facility

Comments: Everything looks good.

TDF Freeboard: 354.10 Pond Elv.: **350.90** Freeboard: **3.2** Comment:

Minimum operating freeboard:1.4m; Maximum allowable pond elevation(calculated):352.9m

North Embankment Priezometers	Polynomial Gage Factors A	B	C	Readings (Lc)	Tk	Temperature (Ti)	Temperature (Tc)	Pressure kPa
VW0582	-6.5316E-07	-0.16458	1521.4	***malfunctioned***	0.0786	6.0		**#VALUE!**
VW0583	-6.0506E-07	-0.15820	1512.4	***9260.7***	-0.0840	20.9		**-2.777**
VW0584	-1.0595E-07	-0.12602	1110.0	***8708.8***	0.2815	20.8	***14.8***	**2.792**
VW0586	-3.2376E-17	-0.12615	1132.6	***9012.8***	-0.0568	21.0	***12.9***	**-3.905**
VW0587 (VW16734)	-1.8058E-07	-0.10650	994.16	***9207.3***	-0.0725	18.0	***14.0***	**-1.436**

$p(kPa) = [(A)(Lc)^2 + (B)(Lc) + C + (Tk)(Tc-Ti)] - [(0.10)(Bc-Bi)]$, assume Bc-Bi = 0

Trigger Level Pressure: Downstream Piezometer:25kPa; Centreline piezometer:80kPa

North Embankment 90° V-Notch Weir: Height of water(Hm): **0.06** Flow rate (Liters/Second): **1.22**

Liters/Second (L/S) = $1380\ H_m^{2.5}$

North Embankment

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	yes
Vegetation Growth	No	No	Yes	Yes
Animal Burrows	No	No	No	No

Comments: normal. The fixed erosion spot at the NE corner of the TSF look good.

East Embankment

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	No
Vegetation Growth	No	No	No	Yes
Animal Burrows	No	No	No	No

Comments: two puddles

South Embankment

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	yes
Vegetation Growth	No	No	Yes	Yes
Animal Burrows	No	No	No	No

Comments: normal

West Embankment

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	No
Vegetation Growth	No	No	yes	Yes
Animal Burrows	No	No	No	No

Comments: normal

South Dam

South Dam Freeboard: Crest Elevation: 308.8 Pond Elv.: 301.70 Freeboard: 7.1 Comment:

Minimum opeating freeboard:5.3m; Maximum allowable pond elevation during normal operating conditions: 303.6m

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	Yes	No	No
Vegetation Growth	Yes	No	yes	Yes
Animal Burrows	No	No	No	No

Comments: the staff gauge reading is about 0.3m (the bottom staff gauge), was 1.7m when installed. The bigger the reading is, the lower the water level is. Covered by snow. Water color turns to greenish.

QUINSAM COAL

Tailings Disposal Facility and South Dam Inspection Report (TDF-Weekly, South Dam-Weekly)

Date:	February 27, 2020	**Inspected By:**	Sarah S
Weather:	Nice weather		

2 North Tailings Disposal Facility

Comments: Normal. Had ITRB site inspection and meeting on February 26.

TDF Freeboard: Crest Elevation: 354.10 | Pond Elv.: **350.87** | Freeboard: **3.23** | Comment:

Minimum operating freeboard:1.4m; Maximum allowable pond elevation(calculated):352.9m

North Embankment Priezometers	Polynomial Gage Factors A	B	C	Readings (Lc)	Tk	Temperature (Ti)	Temperature (Tc)	Pressure kPa
VW0582	-6.5316E-07	-0.16458	1521.4	***malfunctioned***	0.0786	6.0		**#VALUE!**
VW0583	-6.0506E-07	-0.15820	1512.4	***9264.3***	-0.0840	20.9		**-3.387**
VW0584	-1.0595E-07	-0.12602	1110.0	***8715.2***	0.2815	20.8	***14.8***	**1.974**
VW0586	-3.2376E-17	-0.12615	1132.6	***9015.8***	-0.0568	21.0	***12.9***	**-4.283**
VW0587 (VW16734)	-1.8058E-07	-0.10650	994.16	***9209.5***	-0.0725	18.0	***14.0***	**-1.678**

$p(kPa) = [(A)(Lc)^2 + (B)(Lc) + C + (Tk)(Tc-Ti)] - [(0.10)(Bc-Bi)]$, assume Bc-Bi = 0

Trigger Level Pressure: Downstream Piezometer:25kPa; Centreline piezometer:80kPa

North Embankment 90° V-Notch Weir: Height of water(Hm): **0.08** | Flow rate (Liters/Second): **2.50**

Liters/Second (L/S) = $1380\ H_m^{2.5}$

North Embankment

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	yes
Vegetation Growth	No	No	Yes	Yes
Animal Burrows	No	No	No	No

Comments: The weir is flooded.The reading is by visualization.

East Embankment

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	No
Vegetation Growth	No	No	No	Yes
Animal Burrows	No	No	No	No

Comments: two small puddles

South Embankment

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	yes
Vegetation Growth	No	No	Yes	Yes
Animal Burrows	No	No	No	No

Comments: normal

West Embankment

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	No
Vegetation Growth	No	No	yes	Yes
Animal Burrows	No	No	No	No

Comments: normal

South Dam

South Dam Freeboard: Crest Elevation: 308.8 | Pond Elv.: 301.50 | Freeboard: 7.3 | Comment:

Minimum opeating freeboard:5.3m; Maximum allowable pond elevation during normal operating conditions: 303.6m

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	Yes	No	No
Vegetation Growth	Yes	No	yes	Yes
Animal Burrows	No	No	No	No

Comments: the staff gauge reading is about 0.5m (the bottom staff gauge), was 1.7m when installed. The bigger the reading is, the lower the water level is. Water color clear.

QUINSAM COAL

Tailings Disposal Facility and South Dam Inspection Report (TDF-Weekly, South Dam-Weekly)

Date:	March 3, 2020	**Inspected By:**	Sarah S
Weather:	Cloudy		

2 North Tailings Disposal Facility

Comments: Normal

TDF Freeboard: 353.97 | Pond Elv.: **350.92** | Freeboard: **3.05** | Comment: direct freeboard reading

Minimum operating freeboard:1.4m; Maximum allowable pond elevation(calculated):352.9m

North Embankment Priezometers	Polynomial Gage Factors A	B	C	Readings (Lc)	Tk	Temperature (Ti)	Temperature (Tc)	Pressure kPa
VW0582	-6.5316E-07	-0.16458	1521.4	***malfunctioned***	0.0786	6.0		**#VALUE!**
VW0583	-6.0506E-07	-0.15820	1512.4	***9271.4***	-0.0840	20.9		**-4.590**
VW0584	-1.0595E-07	-0.12602	1110.0	***8722.9***	0.2815	20.8	***14.8***	**0.990**
VW0586	-3.2376E-17	-0.12615	1132.6	***9018.0***	-0.0568	21.0	***12.9***	**-4.561**
VW0587 (VW16734)	-1.8058E-07	-0.10650	994.16	***9223.7***	-0.0725	18.0	***13.3***	**-3.186**

$p(kPa) = [(A)(Lc)^2 + (B)(Lc) + C + (Tk)(Tc-Ti)] - [(0.10)(Bc-Bi)]$, assume Bc-Bi = 0

Trigger Level Pressure: Downstream Piezometer:25kPa; Centreline piezometer:80kPa

North Embankment 90° V-Notch Weir: Height of water(Hm): **0.08** | Flow rate (Liters/Second): **2.50**

Liters/Second (L/S) = $1380\ H_m^{2.5}$

North Embankment

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	yes
Vegetation Growth	No	No	Yes	Yes
Animal Burrows	No	No	No	No

Comments: The wier is flooded, reading is by visualization.

East Embankment

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	No
Vegetation Growth	No	No	No	No
Animal Burrows	No	No	No	No

Comments: normal

South Embankment

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	yes
Vegetation Growth	No	No	Yes	No
Animal Burrows	No	No	No	No

Comments: normal

West Embankment

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	No
Vegetation Growth	No	No	yes	No
Animal Burrows	No	No	No	No

Comments: normal

South Dam

South Dam Freeboard: Crest Elevation (m): 308.8 | Pond Elv(m): **300.40** | Freeboard (m): **8.4** | Comment:

Minimum opeating freeboard:5.3m; Maximum allowable pond elevation during normal operating conditions: 303.6m

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	Yes	No	No
Vegetation Growth	Yes	No	yes	Yes
Animal Burrows	No	No	No	No

Comments: 4 staff guage (2m) installed at South dam. The freeboard/staff gauges are surveyed on March 11, 2020. so the water level is reading at the #4 staff gauge plus 6.8m

QUINSAM COAL

Tailings Disposal Facility and South Dam Inspection Report (TDF-Weekly, South Dam-Weekly)

Date:	March 11, 2020	**Inspected By:**	Sarah S
Weather:	Cloudy		

2 North Tailings Disposal Facility

Comments: Then monumnets are surveyed on March 11, 2020.
Staff gauage/Freeboard at both TSF and South Dam are surveyed.
Most of the non-operational stuff on the South Dam crest were removed on march 9, 2020

TDF Freeboard: 353.97 | Pond Elv.: **350.87** | Freeboard: **3.1** | Comment: direct freeboard reading

Minimum operating freeboard:1.4m; Maximum allowable pond elevation(calculated):352.9m

North Embankment Priezometers	Polynomial Gage Factors A	B	C	Readings (Lc)	Tk	Temperature (Ti)	Temperature (Tc)	Pressure kPa
VW0582	-6.5316E-07	-0.16458	1521.4	***malfunctioned***	0.0786	6.0		**#VALUE!**
VW0583	-6.0506E-07	-0.15820	1512.4	***9264.3***	-0.0840	20.9		**-3.387**
VW0584	-1.0595E-07	-0.12602	1110.0	***8713.3***	0.2815	20.8	***14.8***	**2.217**
VW0586	-3.2376E-17	-0.12615	1132.6	***9014.7***	-0.0568	21.0	***12.9***	**-4.144**
VW0587 (VW16734)	-1.8058E-07	-0.10650	994.16	***9212.7***	-0.0725	18.0	***12.8***	**-1.942**

$p(kPa) = [(A)(Lc)^2 + (B)(Lc) + C + (Tk)(Tc-Ti)] - [(0.10)(Bc-Bi)]$, assume Bc-Bi = 0

Trigger Level Pressure: Downstream Piezometer:25kPa; Centreline piezometer:80kPa

North Embankment 90° V-Notch Weir: Height of water(Hm): **0.07** | Flow rate (Liters/Second): **1.79**

Liters/Second (L/S) = $1380\ H_m^{2.5}$

North Embankment

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	yes
Vegetation Growth	No	No	Yes	Yes
Animal Burrows	No	No	No	No

Comments: The wier is flooded, reading is by visualization.

East Embankment

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	No
Vegetation Growth	No	No	No	No
Animal Burrows	No	No	No	No

Comments: normal

South Embankment

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	yes
Vegetation Growth	No	No	Yes	No
Animal Burrows	No	No	No	No

Comments: normal

West Embankment

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	No
Vegetation Growth	No	No	yes	No
Animal Burrows	No	No	No	No

Comments: normal

South Dam

South Dam Freeboard: Crest Elevation (m): 308.8 | Pond Elv(m): **301.25** | Freeboard (m): **7.55** | Comment:

Minimum opeating freeboard:5.3m; Maximum allowable pond elevation during normal operating conditions: 303.6m

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	Yes	No	No
Vegetation Growth	Yes	No	yes	Yes
Animal Burrows	No	No	No	No

Comments: 4 staff guage (2m) installed at South dam. The freeboard/staff gauges are surveyed on March 11, 2020. so the water level is reading at the #4 staff gauge plus 6.8m

QUINSAM COAL

Tailings Disposal Facility and South Dam Inspection Report (TDF-Weekly, South Dam-Weekly)

Date:	March 17, 2020	**Inspected By:**	Sarah S
Weather:	Sunny		

2 North Tailings Disposal Facility

Comments: Working on the year-end tailings dam reports.
Dry on crests of both 2-North TSF and South Dam.
Water level in both ponds is reduced.

TDF Freeboard: 353.97 | Pond Elv.: **350.69** | Freeboard: **3.28** | Comment: direct freeboard reading

Minimum operating freeboard:1.4m; Maximum allowable pond elevation(calculated):352.9m

North Embankment Priezometers	Polynomial Gage Factors A	B	C	Readings (Lc)	Tk	Temperature (Ti)	Temperature (Tc)	Pressure kPa
VW0582	-6.5316E-07	-0.16458	1521.4	***malfunctioned***	0.0786	6.0		**#VALUE!**
VW0583	-6.0506E-07	-0.15820	1512.4	***9265.7***	-0.0840	20.9		**-3.624**
VW0584	-1.0595E-07	-0.12602	1110.0	***8715.6***	0.2815	20.8	***14.8***	**1.923**
VW0586	-3.2376E-17	-0.12615	1132.6	***9017.5***	-0.0568	21.0	***12.9***	**-4.498**
VW0587 (VW16734)	-1.8058E-07	-0.10650	994.16	***9218.6***	-0.0725	18.0	***13.0***	**-2.605**

$p(kPa) = [(A)(Lc)^2 + (B)(Lc) + C + (Tk)(Tc-Ti)] - [(0.10)(Bc-Bi)]$, assume Bc-Bi = 0

Trigger Level Pressure: Downstream Piezometer:25kPa; Centreline piezometer:80kPa

North Embankment 90° V-Notch Weir: Height of water(Hm): **0.07** | Flow rate (Liters/Second): **1.79**

Liters/Second (L/S) = $1380\ H_m^{2.5}$

North Embankment

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	yes
Vegetation Growth	No	No	Yes	Yes
Animal Burrows	No	No	No	No

Comments: The wier is flooded, reading is by visualization.

East Embankment

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	No
Vegetation Growth	No	yes	No	No
Animal Burrows	No	No	No	No

Comments: Vegetation starts showing up.

South Embankment

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	yes
Vegetation Growth	No	yes	Yes	yes
Animal Burrows	No	No	No	No

Comments: Normal

West Embankment

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	No
Vegetation Growth	Yes	No	yes	No
Animal Burrows	No	No	No	No

Comments: Normal

South Dam

South Dam Freeboard: Crest Elevation (m): 308.8 | Pond Elv(m): **301.04** | Freeboard (m): **7.76** | Comment:

Minimum opeating freeboard:5.3m; Maximum allowable pond elevation during normal operating conditions: 303.6m

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	Yes	No	No
Vegetation Growth	Yes	No	yes	Yes
Animal Burrows	No	No	No	No

Comments: Normal

QUINSAM COAL

Tailings Disposal Facility and South Dam Inspection Report (TDF-Weekly, South Dam-Weekly)

Date:	March 24, 2020	**Inspected By:**	Sarah S
Weather:	Sunny		

2 North Tailings Disposal Facility

Comments: Working on the year-end tailings dam reports.
Dry on crests of both 2-North TSF and South Dam.

TDF Freeboard: 353.97 | Pond Elv.: **350.69** | Freeboard: **3.28** | Comment: direct freeboard reading

Minimum operating freeboard:1.4m; Maximum allowable pond elevation(calculated):352.9m

North Embankment Priezometers	Polynomial Gage Factors A	B	C	Readings (Lc)	Tk	Temperature (Ti)	Temperature (Tc)	Pressure kPa
VW0582	-6.5316E-07	-0.16458	1521.4	***malfunctioned***	0.0786	6.0		**#VALUE!**
VW0583	-6.0506E-07	-0.15820	1512.4	***9265.7***	-0.0840	20.9		**-3.624**
VW0584	-1.0595E-07	-0.12602	1110.0	***8715.6***	0.2815	20.8	***14.8***	**1.923**
VW0586	-3.2376E-17	-0.12615	1132.6	***9017.5***	-0.0568	21.0	***12.9***	**-4.498**
VW0587 (VW16734)	-1.8058E-07	-0.10650	994.16	***9218.6***	-0.0725	18.0	***13.0***	**-2.605**

$p(kPa) = [(A)(Lc)^2 + (B)(Lc) + C + (Tk)(Tc-Ti)] - [(0.10)(Bc-Bi)]$, assume Bc-Bi = 0

Trigger Level Pressure: Downstream Piezometer:25kPa; Centreline piezometer:80kPa

North Embankment 90° V-Notch Weir: Height of water(Hm): **0.07** | Flow rate (Liters/Second): **1.79**

Liters/Second (L/S) = $1380\ H_m^{2.5}$

North Embankment

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	yes
Vegetation Growth	No	No	Yes	Yes
Animal Burrows	No	No	No	No

Comments: The wier is flooded, reading is by visualization.

East Embankment

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	No
Vegetation Growth	yes	yes	No	No
Animal Burrows	No	No	No	No

Comments: Vegetation starts showing up.

South Embankment

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	yes
Vegetation Growth	yes	yes	Yes	yes
Animal Burrows	No	No	No	No

Comments: Normal

West Embankment

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	No
Vegetation Growth	Yes	No	yes	No
Animal Burrows	No	No	No	No

Comments: Normal

South Dam

South Dam Freeboard: Crest Elevation (m): 308.8 | Pond Elv(m): **300.75** | Freeboard (m): **8.05** | Comment:

Minimum opeating freeboard:5.3m; Maximum allowable pond elevation during normal operating conditions: 303.6m

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	Yes	No	No
Vegetation Growth	Yes	No	yes	Yes
Animal Burrows	No	No	No	No

Comments: Normal

QUINSAM COAL

Tailings Disposal Facility and South Dam Inspection Report (TDF-Weekly, South Dam-Weekly)

Date:	April 2, 2020	**Inspected By:**	Sarah S
Weather:	Sunny		

2 North Tailings Disposal Facility

Comments:
All regulatory year-end tailings dam reports were submitted online.
Pond on the South Dam Crest due to the melt of the snow on March 31, 2020.
Small pond on east embankment of the 2-North TSF crests
Water levels in both 2-North TSF and South Dam are lower than last week.

TDF Freeboard: 353.97 | Pond Elv.: **350.64** | Freeboard: **3.33** | Comment: direct freeboard reading

Minimum operating freeboard:1.4m; Maximum allowable pond elevation(calculated):352.9m

North Embankment Priezometers	Polynomial Gage Factors A	B	C	Readings (Lc)	Tk	Temperature (Ti)	Temperature (Tc)	Pressure kPa
VW0582	-6.5316E-07	-0.16458	1521.4	***malfunctioned***	0.0786	6.0		**#VALUE!**
VW0583	-6.0506E-07	-0.15820	1512.4	***9265.7***	-0.0840	20.9		**-3.624**
VW0584	-1.0595E-07	-0.12602	1110.0	***8715.4***	0.2815	20.8	***14.8***	**1.949**
VW0586	-3.2376E-17	-0.12615	1132.6	***9014.8***	-0.0568	21.0	***12.9***	**-4.157**
VW0587 (VW16734)	-1.8058E-07	-0.10650	994.16	***9215.8***	-0.0725	18.0	***11.9***	**-2.217**

$p(kPa) = [(A)(Lc)^2 + (B)(Lc) + C + (Tk)(Tc-Ti)] - [(0.10)(Bc-Bi)]$, assume Bc-Bi = 0

Trigger Level Pressure: Downstream Piezometer:25kPa; Centreline piezometer:80kPa

North Embankment 90° V-Notch Weir: Height of water(Hm): **0.07** | Flow rate (Liters/Second): **1.79**

Liters/Second (L/S) = $1380\ H_m^{2.5}$

North Embankment

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	yes
Vegetation Growth	No	No	Yes	Yes
Animal Burrows	No	No	No	No

Comments: The wier is flooded, reading is by visualization.

East Embankment

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	No
Vegetation Growth	yes	yes	No	No
Animal Burrows	No	No	No	No

Comments: Vegetation starts showing up.

South Embankment

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	yes
Vegetation Growth	yes	yes	Yes	yes
Animal Burrows	No	No	No	No

Comments: Normal

West Embankment

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	No
Vegetation Growth	Yes	No	yes	No
Animal Burrows	No	No	No	No

Comments: normal

South Dam

South Dam Freeboard: Crest Elevation (m): 308.8 | Pond Elv(m): **300.55** | Freeboard (m): **8.25** | Comment:

Minimum opeating freeboard:5.3m; Maximum allowable pond elevation during normal operating conditions: 303.6m

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	Yes	No	No
Vegetation Growth	Yes	No	yes	Yes
Animal Burrows	No	No	No	No

Comments: Pond on the crest

QUINSAM COAL

Tailings Disposal Facility and South Dam Inspection Report (TDF-Weekly, South Dam-Weekly)

Date:	April 8, 2020	**Inspected By:**	Sarah S
Weather:	Sunny		

2 North Tailings Disposal Facility

Comments:
Start planning the maintenance activities on the tailings dam following the recommendations from 2019 DSI and ITRB.
Siphon line from 2N TSF pond to 2N portal sump was fixed and started siphoning the water at 4:10pm Arpil 8, 2020.
South Dam crest is well-cleaned up.
Maitenance of vegetation on the 2N TSF started on April 8, 2020.
No water pond on the crests of both 2N TSF and South Dam.

TDF Freeboard: 353.97 | Pond Elv.: **350.60** | Freeboard: **3.37** | Comment: direct freeboard reading

Minimum operating freeboard:1.4m; Maximum allowable pond elevation(calculated):352.9m

North Embankment Piezometers	Polynomial Gage Factors A	B	C	Readings (Lc)	Tk	Temperature (Ti)	Temperature (Tc)	Pressure kPa
VW0582	-6.5316E-07	-0.16458	1521.4	***malfunctioned***	0.0786	6.0		**#VALUE!**
VW0583	-6.0506E-07	-0.15820	1512.4	***9262.3***	-0.0840	20.9		**-3.048**
VW0584	-1.0595E-07	-0.12602	1110.0	***8711.0***	0.2815	20.8	***14.9***	**2.539**
VW0586	-3.2376E-17	-0.12615	1132.6	***9015.7***	-0.0568	21.0	***12.9***	**-4.270**
VW0587 (VW16734)	-1.8058E-07	-0.10650	994.16	***9210.4***	-0.0725	18.0	***11.9***	**-1.624**

$p(kPa) = [(A)(Lc)^2 + (B)(Lc) + C + (Tk)(Tc-Ti)] - [(0.10)(Bc-Bi)]$, assume Bc-Bi = 0

Trigger Level Pressure: Downstream Piezometer:25kPa; Centreline piezometer:80kPa

North Embankment 90° V-Notch Weir: Height of water(Hm): **0.07** | Flow rate (Liters/Second): **1.79**

Liters/Second (L/S) = $1380\ H_m^{2.5}$

North Embankment

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	yes
Vegetation Growth	No	No	Yes	Yes
Animal Burrows	No	No	No	No

Comments: The wier is flooded, reading is by visualization. Draining the pond by siphon line at the NE corner of the 2N TSF started on April 8, 2020.

East Embankment

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	No
Vegetation Growth	Yes	yes	No	No
Animal Burrows	No	No	No	No

Comments: Vegetation starts showing up.

South Embankment

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	yes
Vegetation Growth	Yes	yes	Yes	yes
Animal Burrows	No	No	No	No

Comments: Vegetation starts showing up.

West Embankment

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	No
Vegetation Growth	Yes	yes	yes	No
Animal Burrows	No	No	No	No

Comments: Maintenance of vegetation on the west embankment was started on April 8, 2020.

South Dam

South Dam Freeboard: Crest Elevation (m): 308.8 | Pond Elv(m): **300.30** | Freeboard (m): **8.5** | Comment: Direct staff gauge reading

Minimum opeating freeboard:5.3m; Maximum allowable pond elevation during normal operating conditions: 303.6m

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	Yes	No	No
Vegetation Growth	Yes	No	yes	Yes
Animal Burrows	No	No	No	No

Comments: No pond on the crest.

QUINSAM COAL

Tailings Disposal Facility and South Dam Inspection Report (TDF-Weekly, South Dam-Weekly)

Date:	15/04/2020 and 16/04/2020	**Inspected By:**	Sarah S
Weather:	Sunny		

2 North Tailings Disposal Facility

Comments:
Crests are dry; Vegetation control on the west embankment will be continued using more concentrated Roundup.
Draining the 2North TSF pond using the siphon line at NE corner of the 2N-TSF between April 8-April 10, 2020. The water was siphoned to 2North Portal Sump (2NPS).
Water level at 2NPS is pumped back to normal level on April 16, 2020, (started on late April 8, 2020).
Editable spreadsheet of water levels are now avaiable.

TDF Freeboard: 353.97 | Pond Elv.: **349.62** | Freeboard: **4.35** | Comment: direct freeboard reading

Minimum operating freeboard:1.4m; Maximum allowable pond elevation(calculated):352.9m

North Embankment Piezometers	Polynomial Gage Factors A	B	C	Readings (Lc)	Tk	Temperature (Ti)	Temperature (Tc)	Pressure kPa
VW0582	-6.5316E-07	-0.16458	1521.4	***malfunctioned***	0.0786	6.0		**#VALUE!**
VW0583	-6.0506E-07	-0.15820	1512.4	***9263.0***	-0.0840	20.9		**-3.167**
VW0584	-1.0595E-07	-0.12602	1110.0	***8711.9***	0.2815	20.8	***14.9***	**2.424**
VW0586	-3.2376E-17	-0.12615	1132.6	***9016.3***	-0.0568	21.0	***12.9***	**-4.346**
VW0587 (VW16734)	-1.8058E-07	-0.10650	994.16	***9209.1***	-0.0725	18.0	***12.5***	**-1.525**

$p(kPa) = [(A)(Lc)^2 + (B)(Lc) + C + (Tk)(Tc-Ti)] - [(0.10)(Bc-Bi)]$, assume Bc-Bi = 0

Trigger Level Pressure: Downstream Piezometer:25kPa; Centreline piezometer:80kPa

North Embankment 90° V-Notch Weir: Height of water(Hm): **0.06** | Flow rate (Liters/Second): **1.22**

Liters/Second (L/S) = $1380\ H_m^{2.5}$

North Embankment

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	yes
Vegetation Growth	No	No	Yes	Yes
Animal Burrows	No	No	No	No

Comments: The wier is flooded, reading is by visualization. The seepage flow is slightly smaller.

East Embankment

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	No
Vegetation Growth	Yes	yes	No	No
Animal Burrows	No	No	No	No

Comments: Vegetation starts showing up.

South Embankment

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	yes
Vegetation Growth	Yes	yes	Yes	yes
Animal Burrows	No	No	No	No

Comments: Vegetation starts showing up.

West Embankment

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	No
Vegetation Growth	Yes	yes	yes	No
Animal Burrows	No	No	No	No

Comments: Vegetation control on the west embankment will be continued.

South Dam

South Dam Freeboard: Crest Elevation (m): 308.8 | Pond Elv(m): **300.15** | Freeboard (m): **8.65** | Comment: Direct staff gauge reading

Minimum opeating freeboard:5.3m; Maximum allowable pond elevation during normal operating conditions: 303.6m

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	Yes	No	No
Vegetation Growth	Yes	No	yes	Yes
Animal Burrows	No	No	No	No

Comments: Dry and clean.

QUINSAM COAL

Tailings Disposal Facility and South Dam Inspection Report (TDF-Weekly, South Dam-Weekly)

Date:	April 22, 2020	**Inspected By:**	Sarah S
Weather:	Cloudy with periods of shower		

2 North Tailings Disposal Facility

Comments:
The low spot on the South dam crest was filled/graded with non-PAG CCR material (same material used for the dam construction) using caterpillar 988 front-end loader.
Dry on the 2-North TSF.
More vegetation are showing up on the downstream slope of the west embankment.

TDF Freeboard: 353.97 | Pond Elv.: **349.59** | Freeboard: **4.38** | Comment: direct freeboard reading

Minimum operating freeboard:1.4m; Maximum allowable pond elevation(calculated):352.9m

North Embankment Piezometers	Polynomial Gage Factors A	B	C	Readings (Lc)	Tk	Temperature (Ti)	Temperature (Tc)	Pressure kPa
VW0582	-6.5316E-07	-0.16458	1521.4	***malfunctioned***	0.0786	6.0		**#VALUE!**
VW0583	-6.0506E-07	-0.15820	1512.4	***9267.4***	-0.0840	20.9		**-3.912**
VW0584	-1.0595E-07	-0.12602	1110.0	***8714.7***	0.2815	20.8	***14.9***	**2.066**
VW0586	-3.2376E-17	-0.12615	1132.6	***9018.9***	-0.0568	21.0	***12.9***	**-4.674**
VW0587 (VW16734)	-1.8058E-07	-0.10650	994.16	***9218.2***	-0.0725	18.0	***12.8***	**-2.546**

$p(kPa) = [(A)(Lc)^2 + (B)(Lc) + C + (Tk)(Tc-Ti)] - [(0.10)(Bc-Bi)]$, assume Bc-Bi = 0

Trigger Level Pressure: Downstream Piezometer:25kPa; Centreline piezometer:80kPa

North Embankment 90° V-Notch Weir: Height of water(Hm): **0.06** | Flow rate (Liters/Second): **1.22**

Liters/Second (L/S) = $1380\ H_m^{2.5}$

North Embankment

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	yes
Vegetation Growth	No	No	Yes	Yes
Animal Burrows	No	No	No	No

Comments: The wier is flooded, reading is by visualization.

East Embankment

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	No
Vegetation Growth	Yes	yes	No	No
Animal Burrows	No	No	No	No

Comments: Vegetation starts showing up.

South Embankment

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	yes
Vegetation Growth	Yes	yes	Yes	yes
Animal Burrows	No	No	No	No

Comments: Normal

West Embankment

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	No
Vegetation Growth	Yes	yes	yes	No
Animal Burrows	No	No	No	No

Comments: Concentrated Roundaup was sprayed on the upstream of the west embankment to control the vegetation duirng the weekend. More weeds are showing on the downstream slope.

South Dam

South Dam Freeboard: Crest Elevation (m): 308.8 | Pond Elv(m): **300.19** | Freeboard (m): **8.61** | Comment: Direct staff gauge reading

Minimum opeating freeboard:5.3m; Maximum allowable pond elevation during normal operating conditions: 303.6m

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	Yes	No	No
Vegetation Growth	Yes	No	yes	Yes
Animal Burrows	No	No	No	No

Comments: The low spot at the west end of the south dam is filled with non-PAG CCR (same material used for the dam construction) on April 22 using 988 loader.

QUINSAM COAL

Tailings Disposal Facility and South Dam Inspection Report (TDF-Weekly, South Dam-Weekly)

Date:	April 30, 2020	**Inspected By:**	Sarah S
Weather:	Cloudy with periods of shower		

2 North Tailings Disposal Facility

Comments: Blackfish visited the site for the vegetation control on the TSF.

TDF Freeboard: 353.97 | Pond Elv.: **349.62** | Freeboard: **4.35** | Comment: direct freeboard reading

Minimum operating freeboard:1.4m; Maximum allowable pond elevation(calculated):352.9m

North Embankment Piezometers	Polynomial Gage Factors A	B	C	Readings (Lc)	Tk	Temperature (Ti)	Temperature (Tc)	Pressure kPa
VW0582	-6.5316E-07	-0.16458	1521.4	***malfunctioned***	0.0786	6.0		**#VALUE!**
VW0583	-6.0506E-07	-0.15820	1512.4	***9267.8***	-0.0840	20.9		**-3.980**
VW0584	-1.0595E-07	-0.12602	1110.0	***8717.9***	0.2815	20.8	***14.9***	**1.657**
VW0586	-3.2376E-17	-0.12615	1132.6	***9019.4***	-0.0568	21.0	***12.9***	**-4.737**
VW0587 (VW16734)	-1.8058E-07	-0.10650	994.16	***9215.7***	-0.0725	18.0	***13.0***	**-2.286**

$p(kPa) = [(A)(Lc)^2 + (B)(Lc) + C + (Tk)(Tc-Ti)] - [(0.10)(Bc-Bi)]$, assume Bc-Bi = 0

Trigger Level Pressure: Downstream Piezometer:25kPa; Centreline piezometer:80kPa

North Embankment 90° V-Notch Weir: Height of water(Hm): **0.06** | Flow rate (Liters/Second): **1.22**

Liters/Second (L/S) = $1380\ H_m^{2.5}$

North Embankment

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	yes
Vegetation Growth	No	No	Yes	Yes
Animal Burrows	No	No	No	No

Comments: The wier is flooded, reading is by visualization.

East Embankment

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	No
Vegetation Growth	Yes	yes	No	No
Animal Burrows	No	No	No	No

Comments: Vegetation starts showing up.

South Embankment

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	yes
Vegetation Growth	Yes	yes	Yes	yes
Animal Burrows	No	No	No	No

Comments: Vegetation starts showing up.

West Embankment

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	No
Vegetation Growth	Yes	yes	yes	No
Animal Burrows	No	No	No	No

Comments: Vegetation starts showing up.

South Dam

South Dam Freeboard: Crest Elevation (m): 308.8 | Pond Elv(m): **300.15** | Freeboard (m): **8.65** | Comment: Direct staff gauge reading

Minimum opeating freeboard:5.3m; Maximum allowable pond elevation during normal operating conditions: 303.6m

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	Yes	No	No
Vegetation Growth	Yes	No	yes	Yes
Animal Burrows	No	No	No	No

Comments: Normal

Tailings Disposal Facility and South Dam Inspection Report (TDF-Weekly, South Dam-Weekly)

QUINSAM COAL

Date:	May 7, 2020	**Inspected By:**	Sarah S
Weather:	Sunny		

2 North Tailings Disposal Facility

Comments: Vegetation are mostly controlled on the South Dam by brushing and hand-pulling this week.
Seepage at the North Embankment is smaller.
The seepage at the North Embankment is obtained due to the low water Level in the 2North portal sump.

TDF Freeboard:	353.97	Pond Elv.:	**349.57**	Freeboard:	**4.4**

Minimum operating freeboard:1.4m; Maximum allowable pond elevation(calculated):352.9m

North Embankment Piezometers	**Polynomial Gage Factors**			**Readings**	**Tk**	**Temperature**	**Temperature**	**Pressure**
	A	**B**	**C**	**(Lc)**		**(Ti)**	**(Tc)**	**kPa**
VW0583	-6.0506E-07	-0.15820	1512.4	***9267.1***	-0.0840	20.9		**-3.862**
VW0584	-1.0595E-07	-0.12602	1110.0	***8715.8***	0.2815	20.8	***14.9***	**1.926**
VW0586	-3.2376E-17	-0.12615	1132.6	***9017.8***	-0.0568	21.0	***12.9***	**-4.535**
VW0587 (VW16734)	-1.8058E-07	-0.10650	994.16	***9218.8***	-0.0725	18.0	***13.0***	**-2.627**

$p(kPa) = [(A)(Lc)^2 + (B)(Lc) + C + (Tk)(Tc-Ti)] - [(0.10)(Bc-Bi)]$, assume Bc-Bi = 0

Trigger Level Pressure: Downstream Piezometer:25kPa; Centreline piezometer:80kPa

North Embankment 90° V-Notch Weir: Height of water(Hm): **0.025** Flow rate (Liters/Second): **0.14**

Liters/Second (L/S) = $1380\ H_m^{2.5}$

North Embankment

	Upstream Slope	**Crest**	**Downstream Slope**	**Downstream Toe**
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	yes
Vegetation Growth	No	Yes	Yes	Yes
Animal Burrows	No	No	No	No

Comments: Weeds around the wier are cleaned up and water level in the 2North portal sump is low. Seepage at the north embankment is able to obtain due to the low water level in the 2North portal sump.

East Embankment

	Upstream Slope	**Crest**	**Downstream Slope**	**Downstream Toe**
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	No
Vegetation Growth	Yes	yes	No	No
Animal Burrows	No	No	No	No

Comments: Vegetation starts showing up and flowering.

South Embankment

	Upstream Slope	**Crest**	**Downstream Slope**	**Downstream Toe**
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	yes
Vegetation Growth	Yes	yes	Yes	yes
Animal Burrows	No	No	No	No

Comments: Vegetation starts showing up and flowering.

West Embankment

	Upstream Slope	**Crest**	**Downstream Slope**	**Downstream Toe**
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	No
Vegetation Growth	Yes	yes	yes	No
Animal Burrows	No	No	No	No

Comments: Vegetation starts showing up and flowering.

South Dam

South Dam Freeboard:	Crest Elevation (m): 308.8	Pond Elv(m):	**300.05**	Freeboard (m): **8.75**	Comment: Direct staff gauge reading	

Minimum opeating freeboard:5.3m; Maximum allowable pond elevation during normal operating conditions: 303.6m

	Upstream Slope	**Crest**	**Downstream Slope**	**Downstream Toe**
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	Yes	No	No
Vegetation Growth	No	No	No	Yes
Animal Burrows	No	No	No	No

Comments: Vegetation is mostly contrlloed by using chainsaw and hand-pulling.

Tailings Disposal Facility and South Dam Inspection Report (TDF-Weekly, South Dam-Weekly)

Date:	May 14, 2020	**Inspected By:**	Sarah S
Weather:	Sunny		

2 North Tailings Disposal Facility

Comments:
Seepage at the North Embankment is smaller, but no seepage rate is obtained due to the weir is still flooded.
Vegetation on the 2North TSF crests starts flowering.
Vegetation on the South Dam is controlled by hand-pulling.

TDF Freeboard: 353.97 | Pond Elv.: **349.62** | Freeboard: **4.35** | Comment: direct freeboard reading

Minimum operating freeboard:1.4m; Maximum allowable pond elevation(calculated):352.9m

North Embankment Piezometers	Polynomial Gage Factors			Readings	Tk	Temperature	Temperature	Pressure
	A	B	C	(Lc)		(Ti)	(Tc)	kPa
VW0583	-6.0506E-07	-0.15820	1512.4	***9268.9***	-0.0840	20.9		**-4.167**
VW0584	-1.0595E-07	-0.12602	1110.0	***8719.8***	0.2815	20.8	***14.9***	**1.414**
VW0586	-3.2376E-17	-0.12615	1132.6	***9021.1***	-0.0568	21.0	***12.9***	**-4.952**
VW0587 (VW16734)	-1.8058E-07	-0.10650	994.16	***9221.1***	-0.0725	18.0	***13.1***	**-2.886**

$p(kPa) = [(A)(Lc)^2 + (B)(Lc) + C + (Tk)(Tc-Ti)] - [(0.10)(Bc-Bi)]$, assume Bc-Bi = 0

Trigger Level Pressure: Downstream Piezometer:25kPa; Centreline piezometer:80kPa

North Embankment 90° V-Notch Weir: Height of water(Hm): **0.025** | Flow rate (Liters/Second): **0.14**

Liters/Second (L/S) = $1380\ H_m^{2.5}$

North Embankment

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	yes
Vegetation Growth	No	Yes	Yes	Yes
Animal Burrows	No	No	No	No

Comments: Weir is flooded due to the precipitation during the past few days though 2N portal sump pump was lowered. No reading obtained.

East Embankment

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	No
Vegetation Growth	Yes	yes	No	No
Animal Burrows	No	No	No	No

Comments: Vegetation starts flowering.

South Embankment

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	yes
Vegetation Growth	Yes	yes	Yes	yes
Animal Burrows	No	No	No	No

Comments: Vegetation starts flowering.

West Embankment

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	No
Vegetation Growth	Yes	yes	yes	yes
Animal Burrows	No	No	No	No

Comments: Vegetation starts flowering.

South Dam

South Dam Freeboard: Crest Elevation (m): 308.8 | Pond Elv(m): **300.18** | Freeboard (m): **8.62** | Comment: Direct staff gauge reading

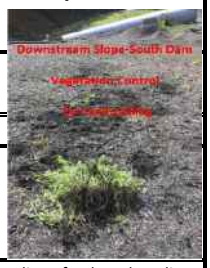
Minimum opeating freeboard:5.3m; Maximum allowable pond elevation during normal operating conditions: 303.6m

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	Yes	No	No
Vegetation Growth	No	No	No	Yes
Animal Burrows	No	No	No	No

Comments: Vegetation on the crest of the South Dam is contrlloed by hand-pulling.

QUINSAM COAL

Tailings Disposal Facility and South Dam Inspection Report
(TDF-Weekly, South Dam-Weekly)



Date:	May 21, 2020	**Inspected By:**	Sarah S
Weather:	Sunny		

2 North Tailings Disposal Facility

Comments:
No seepage rate is obtained, the weir is flooded.
Lots of rain during the past week.
Small ponds on both east and west embankments.
Noxious weed control on the 2-North TSF on May 19, 2020.
Ongoing vegetation control on South Dam by hand-pulling.

TDF Freeboard: 353.97 | Pond Elv.: **349.57** | Freeboard: **4.4** | Comment: direct freeboard reading

Minimum operating freeboard:1.4m; Maximum allowable pond elevation(calculated):352.9m

North Embankment Piezometers	Polynomial Gage Factors			Readings	Tk	Temperature	Temperature	Pressure
	A	B	C	(Lc)		(Ti)	(Tc)	kPa
VW0583	-6.0506E-07	-0.15820	1512.4	***9270.1***	-0.0840	20.9		**-4.370**
VW0584	-1.0595E-07	-0.12602	1110.0	***8720.5***	0.2815	20.8	***14.9***	**1.325**
VW0586	-3.2376E-17	-0.12615	1132.6	***9017.9***	-0.0568	21.0	***12.9***	**-4.548**
VW0587 (VW16734)	-1.8058E-07	-0.10650	994.16	***9221.4***	-0.0725	18.0	***13.1***	**-2.919**

$p(kPa) = [(A)(Lc)^2 + (B)(Lc) + C + (Tk)(Tc-Ti)] - [(0.10)(Bc-Bi)]$, assume Bc-Bi = 0

Trigger Level Pressure: Downstream Piezometer:25kPa; Centreline piezometer:80kPa

North Embankment 90° V-Notch Weir: Height of water(Hm): **0.025** | Flow rate (Liters/Second): **0.14**

Liters/Second (L/S) = $1380\ H_m^{2.5}$

North Embankment

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	yes
Vegetation Growth	No	Yes	Yes	Yes
Animal Burrows	No	No	No	No

Comments: Weir is flooded; The reading is visually same as the measured one when there is accurate reading obtained from the weir.

East Embankment

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	No
Vegetation Growth	Yes	yes	No	No
Animal Burrows	No	No	No	No

Comments: Vegetation sprayed at the beginning of April are wilted. Several small ponds on the east embankment due to the rain.

South Embankment

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	yes
Vegetation Growth	Yes	yes	Yes	yes
Animal Burrows	No	No	No	No

Comments: Vegetation sprayed.

West Embankment

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	No
Vegetation Growth	Yes	yes	yes	yes
Animal Burrows	No	No	No	No

Comments: Vegetation controlled. Several small ponds on the west embankment due to the rain.

South Dam

South Dam Freeboard: Crest Elevation (m): 308.8 | Pond Elv(m): **300.35** | Freeboard (m): **8.45** | Comment: Direct staff gauge reading

Minimum opeating freeboard:5.3m; Maximum allowable pond elevation during normal operating conditions: 303.6m

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	Yes	No	No
Vegetation Growth	No	No	No	Yes
Animal Burrows	No	No	No	No

Comments: Vegetation is contrlloed by hand-pulling.

Tailings Disposal Facility and South Dam Inspection Report
(TDF-Weekly, South Dam-Weekly)

Date:	May 28, 2020	**Inspected by**	Sarah S
Weather:	Sunny		

2 North Tailings Disposal Facility

Comments:
No seepage rate is obtained, the weir is flooded.
Two small ponds on both east and west embankments.
Noxious weeds sprayed on 2-North TSF are withering (see photo).
Vegetation control on South Dam is well maintained.

TDF Freeboard:	353.97	Pond Elv.:	**349.57**	Freeboard:	**4.4**	Comment: direct freeboard reading

Minimum operating freeboard:1.4m; Maximum allowable pond elevation(calculated):352.9m

North Embankment Piezometers	**Polynomial Gage Factors**			**Readings**	**Tk**	**Temperature**	**Temperature**	**Pressure**
	A	**B**	**C**	**(Lc)**		**(Ti)**	**(Tc)**	**kPa**
VW0583	-6.0506E-07	-0.15820	1512.4	***9267.4***	-0.0840	20.9		**-3.912**
VW0584	-1.0595E-07	-0.12602	1110.0	***8717.1***	0.2815	20.8	***13.4***	**1.337**
VW0586	-3.2376E-17	-0.12615	1132.6	***9014.5***	-0.0568	21.0	***12.9***	**-4.119**
VW0587 (VW16734)	-1.8058E-07	-0.10650	994.16	***9196.3***	-0.0725	18.0	***13.1***	**-0.163**

$p(kPa) = [(A)(Lc)^2 + (B)(Lc) + C + (Tk)(Tc-Ti)] - [(0.10)(Bc-Bi)]$, assume Bc-Bi = 0

Trigger Level Pressure	Downstream Piezometer:25kPa; Centreline piezometer:80kPa

North Embankment 90° V-Notch Weir	Height of water(Hm): **0.025**	Flow rate (Liters/Second): **0.14**
	Liters/Second (L/S) = $1380\ H_m^{2.5}$	

North Embankment

	Upstream Slope	**Crest**	**Downstream Slope**	**Downstream Toe**
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	yes
Vegetation Growth	No	Yes	Yes	Yes
Animal Burrows	No	No	No	No

Comments: Weir is flooded; The reading is visually same as the measured one when there is accurate reading obtained from the weir.

East Embankment

	Upstream Slope	**Crest**	**Downstream Slope**	**Downstream Toe**
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	No
Vegetation Growth	Yes	yes	No	No
Animal Burrows	No	No	No	No

Comments: Vegetation sprayed at the beginning of April are wilted. Two small ponds on the east embankment crest. Other noxiou weeds sprayed on May 19 is withering.

South Embankment

	Upstream Slope	**Crest**	**Downstream Slope**	**Downstream Toe**
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	yes
Vegetation Growth	Yes	yes	Yes	yes
Animal Burrows	No	No	No	No

Comments: Noxious weed sprayed on May 19 is withering.

West Embankment

	Upstream Slope	**Crest**	**Downstream Slope**	**Downstream Toe**
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	No
Vegetation Growth	Yes	yes	yes	yes
Animal Burrows	No	No	No	No

Comments: Vegetation controlled. Two small ponds on the west embankment crest due to the rain on May 25.

South Dam

South Dam Freeboard:	Crest Elevation (m): 308.8	Pond Elv(m):	**300.58**	Freeboard (m): **8.22**	Comment: Direct staff gauge reading

Minimum opeating freeboard:5.3m; Maximum allowable pond elevation during normal operating conditions: 303.6m

	Upstream Slope	**Crest**	**Downstream Slope**	**Downstream Toe**
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	Yes	No	No
Vegetation Growth	No	No	No	Yes
Animal Burrows	No	No	No	No

Comments: Vegetation control is well managed.

QUINSAM COAL

Tailings Disposal Facility and South Dam Inspection Report (TDF-Weekly, South Dam-Weekly)

Date:	June 4, 2020	**Inspected by**	Sarah S
Weather:	Cloudy-Rainy		

2 North Tailings Disposal Facility

Comments:
Noxious weed control by spraying is successful, the weeds are withered.
Vegetation control on South Dam is well maintained by brushing and hand-pulling.
No seepage reading, the weir is flooded.

TDF Freeboard:	353.97	Pond Elv.:	**349.47**	Freeboard:	**4.5**	Comment: direct freeboard reading
	Minimum operating freeboard:1.4m; Maximum allowable pond elevation(calculated):352.9m					

North Embankment Piezometers	**Polynomial Gage Factors**			**Readings**	**Tk**	**Temperature**	**Temperature**	**Pressure**
	A	**B**	**C**	**(Lc)**		**(Ti)**	**(Tc)**	**kPa**
VW0583	-6.0506E-07	-0.15820	1512.4	***9267.8***	-0.0840	20.9		**-3.980**
VW0584	-1.0595E-07	-0.12602	1110.0	***8717.4***	0.2815	20.8	***14.9***	**1.721**
VW0586	-3.2376E-17	-0.12615	1132.6	***9014.9***	-0.0568	21.0	***12.9***	**-4.170**
VW0587 (VW16734)	-1.8058E-07	-0.10650	994.16	***9217.6***	-0.0725	18.0	***13.2***	**-2.509**

$p(kPa) = [(A)(Lc)^2 + (B)(Lc) + C + (Tk)(Tc-Ti)] - [(0.10)(Bc-Bi)]$, assume Bc-Bi = 0

Trigger Level Pressure	Downstream Piezometer:25kPa; Centreline piezometer:80kPa

North Embankment 90° V-Notch Weir	Height of water(Hm): **0.025**	Flow rate (Liters/Second): **0.14**
	Liters/Second (L/S) = $1380\ H_m^{2.5}$	

North Embankment

	Upstream Slope	**Crest**	**Downstream Slope**	**Downstream Toe**
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	yes
Vegetation Growth	No	Yes	Yes	Yes
Animal Burrows	No	No	No	No

Comments: Weir is flooded; The reading is visually same as the measured one when there is accurate reading obtained from the weir.

East Embankment

	Upstream Slope	**Crest**	**Downstream Slope**	**Downstream Toe**
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	No
Vegetation Growth	Yes	yes	No	No
Animal Burrows	No	No	No	No

Comments: Dry embankment. Weeds are withered.

South Embankment

	Upstream Slope	**Crest**	**Downstream Slope**	**Downstream Toe**
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	yes
Vegetation Growth	Yes	yes	Yes	yes
Animal Burrows	No	No	No	No

Comments: Noxious weeds died.

West Embankment

	Upstream Slope	**Crest**	**Downstream Slope**	**Downstream Toe**
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	No
Vegetation Growth	Yes	yes	yes	yes
Animal Burrows	No	No	No	No

Comments: Vegetation controlled; dry embankment.

South Dam

South Dam Freeboard:	Crest Elevation (m): 308.8	Pond Elv(m):	**300.60**	Freeboard (m): **8.2**	Comment: Direct staff gauge reading
	Minimum opeating freeboard:5.3m; Maximum allowable pond elevation during normal operating conditions: 303.6m				

	Upstream Slope	**Crest**	**Downstream Slope**	**Downstream Toe**
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	Yes	No	No
Vegetation Growth	No	No	No	Yes
Animal Burrows	No	No	No	No

Comments: Normal.

Tailings Disposal Facility and South Dam Inspection Report
(TDF-Weekly, South Dam-Weekly)

Date:	June 11, 2020	**Inspected by**	Sarah S
Weather:	Cloudy-Sunny		

2 North Tailings Disposal Facility

Comments:	Small wash-out channels (about 5-20cm deep) at the crest edge of the South Embankment are filled, leveled and graded using shovel.

TDF Freeboard:	353.97	Pond Elv.:	**349.42**	Freeboard:	**4.55**
	Minimum operating freeboard:1.4m; Maximum allowable pond elevation(calculated):352.9m				

North Embankment Piezometers	**Polynomial Gage Factors**			**Readings**	**Tk**	**Temperature**	**Temperature**	**Pressure**
	A	**B**	**C**	**(Lc)**		**(Ti)**	**(Tc)**	**kPa**
VW0583	-6.0506E-07	-0.15820	1512.4	***9268.2***	-0.0840	20.9		**-4.048**
VW0584	-1.0595E-07	-0.12602	1110.0	***8717.9***	0.2815	20.8	***14.9***	**1.657**
VW0586	-3.2376E-17	-0.12615	1132.6	***9015.8***	-0.0568	21.0	***12.9***	**-4.283**
VW0587 (VW16734)	-1.8058E-07	-0.10650	994.16	***9218.5***	-0.0725	18.0	***13.2***	**-2.608**
p(kPa) = [(A)(Lc)^2 + (B)(Lc) + C + (Tk)(Tc-Ti)] - [(0.10)(Bc-Bi)], assume Bc-Bi = 0								
Trigger Level Pressure	Downstream Piezometer:25kPa; Centreline piezometer:80kPa							

North Embankment 90° V-Notch Weir	Height of water(Hm): **0.025**	Flow rate (Liters/Second): **0.14**
	Liters/Second (L/S) = 1380 $H_m^{2.5}$	

North Embankment

	Upstream Slope	**Crest**	**Downstream Slope**	**Downstream Toe**
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	yes
Vegetation Growth	No	No	Yes	Yes
Animal Burrows	No	No	No	No

Comments:	The Weir is flooded. The seepage seems similar to last week.

East Embankment

	Upstream Slope	**Crest**	**Downstream Slope**	**Downstream Toe**
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	No
Vegetation Growth	No	No	No	yes
Animal Burrows	No	No	No	No

Comments:	Normal

South Embankment

	Upstream Slope	**Crest**	**Downstream Slope**	**Downstream Toe**
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	yes
Vegetation Growth	No	No	NO	No
Animal Burrows	No	No	No	No

Comments:	The small wash-out channels with dimenstion varying from 0.3m (wide) x 0.5m(long) x 0.05m (deep) to 1m (wide) x 2m(long) x 0.2m (deep) at the crest edge of the south embankment are repaired using shovel.

West Embankment

	Upstream Slope	**Crest**	**Downstream Slope**	**Downstream Toe**
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	No
Vegetation Growth	No	No	No	yes
Animal Burrows	No	No	No	No

Comments:	Normal

South Dam

South Dam Freeboard:	Crest Elevation (m): 308.8	Pond Elv(m):	**300.50**	Freeboard (m): **8.3**	Comment:	Direct staff gauge reading
	Minimum opeating freeboard:5.3m; Maximum allowable pond elevation during normal operating conditions: 303.6m					

	Upstream Slope	**Crest**	**Downstream Slope**	**Downstream Toe**
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	No
Vegetation Growth	Yes	No	Yes	Yes
Animal Burrows	No	No	No	No

Comments:	Normal.

Tailings Disposal Facility and South Dam Inspection Report
(TDF-Weekly, South Dam-Weekly)

Date:	June 18, 2020	**Inspected by**	Sarah S
Weather:	Sunny-Cloudy		

2 North Tailings Disposal Facility

Comments: The wash-out channels (about 2m wide, 6m long and 10-15cm deep) on the downstream slope of the South Embankment were filled, leveled and graded using shovel. The weir is flooded.

TDF Freeboard:	353.97	Pond Elv.:	**349.42**	Freeboard:	**4.55**	Comment:	direct freeboard reading

Minimum operating freeboard:1.4m; Maximum allowable pond elevation(calculated):352.9m

North Embankment Piezometers	**Polynomial Gage Factors**			**Readings**	**Tk**	**Temperature**	**Temperature**	**Pressure**
	A	**B**	**C**	**(Lc)**		**(Ti)**	**(Tc)**	**kPa**
VW0583	-6.0506E-07	-0.15820	1512.4	***9264.1***	-0.0840	20.9		**-3.353**
VW0584	-1.0595E-07	-0.12602	1110.0	***8712.9***	0.2815	20.8	***14.9***	**2.296**
VW0586	-3.2376E-17	-0.12615	1132.6	***9011.7***	-0.0568	21.0	***13.0***	**-3.772**
VW0587 (VW16734)	-1.8058E-07	-0.10650	994.16	***9214.6***	-0.0725	18.0	***13.2***	**-2.180**

$p(kPa) = [(A)(Lc)^2 + (B)(Lc) + C + (Tk)(Tc-Ti)] - [(0.10)(Bc-Bi)]$, assume Bc-Bi = 0

Trigger Level Pressure	Downstream Piezometer:25kPa; Centreline piezometer:80kPa

North Embankment 90° V-Notch Weir	Height of water(Hm): **0.022**	Flow rate (Liters/Second): **0.10**
	Liters/Second (L/S) = $1380\ H_m^{2.5}$	

North Embankment

	Upstream Slope	**Crest**	**Downstream Slope**	**Downstream Toe**
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	yes
Vegetation Growth	No	No	Yes	Yes
Animal Burrows	No	No	No	No

Comments: The Weir is flooded. The seepage seems smaller than last week.

East Embankment

	Upstream Slope	**Crest**	**Downstream Slope**	**Downstream Toe**
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	No
Vegetation Growth	No	No	No	yes
Animal Burrows	No	No	No	No

Comments: Normal

South Embankment

	Upstream Slope	**Crest**	**Downstream Slope**	**Downstream Toe**
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	yes
Vegetation Growth	No	No	NO	yes
Animal Burrows	No	No	No	No

Comments: The wash-out channels on the downstream slope of the south embankment was repaird by hand shoveling, leveling, and grading.

West Embankment

	Upstream Slope	**Crest**	**Downstream Slope**	**Downstream Toe**
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	No
Vegetation Growth	No	No	No	No
Animal Burrows	No	No	No	No

Comments: Normal; Very small fraction of ongoing vegetation control on the downstream slope by hand pulling.

South Dam

South Dam Freeboard:	Crest Elevation (m): 308.8	Pond Elv(m):	**300.40**	Freeboard (m): **8.4**	Comment: Direct staff gauge reading

Minimum opeating freeboard:5.3m; Maximum allowable pond elevation during normal operating conditions: 303.6m

	Upstream Slope	**Crest**	**Downstream Slope**	**Downstream Toe**
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	No
Vegetation Growth	Yes	No	No	Yes
Animal Burrows	No	No	No	No

Comments: Normal, More vegetation control by hand pulling.

QUINSAM COAL

Tailings Disposal Facility and South Dam Inspection Report (TDF-Weekly, South Dam-Weekly)

Date:	June 25, 2020	**Inspected by**	Sarah S
Weather:	Sunny		

2 North Tailings Disposal Facility

Comments: The weir is flooded.

TDF Freeboard:	353.97	Pond Elv.:	**349.39**	Freeboard:	**4.58**	Comment:	direct freeboard reading

Minimum operating freeboard:1.4m; Maximum allowable pond elevation(calculated):352.9m

North Embankment Piezometers	**Polynomial Gage Factors**			**Readings**	**Tk**	**Temperature**	**Temperature**	**Pressure**
	A	**B**	**C**	**(Lc)**		**(Ti)**	**(Tc)**	**kPa**
VW0583	-6.0506E-07	-0.15820	1512.4	***9266.1***	-0.0840	20.9		**-3.692**
VW0584	-1.0595E-07	-0.12602	1110.0	***8714.7***	0.2815	20.8	***14.9***	**2.066**
VW0586	-3.2376E-17	-0.12615	1132.6	***9013.8***	-0.0568	21.0	***12.9***	**-4.031**
VW0587 (VW16734)	-1.8058E-07	-0.10650	994.16	***9216.5***	-0.0725	18.0	***13.2***	**-2.388**

$p(kPa) = [(A)(Lc)^2 + (B)(Lc) + C + (Tk)(Tc-Ti)] - [(0.10)(Bc-Bi)]$, assume Bc-Bi = 0

Trigger Level Pressure	Downstream Piezometer:25kPa; Centreline piezometer:80kPa

North Embankment 90° V-Notch Weir	Height of water(Hm): **0.022**	Flow rate (Liters/Second): **0.10**
	Liters/Second (L/S) = $1380\ H_m^{2.5}$	

North Embankment

	Upstream Slope	**Crest**	**Downstream Slope**	**Downstream Toe**
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	yes
Vegetation Growth	No	No	Yes	Yes
Animal Burrows	No	No	No	No

Comments: The Weir is flooded. The seepage was visually estimated.

East Embankment

	Upstream Slope	**Crest**	**Downstream Slope**	**Downstream Toe**
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	No
Vegetation Growth	No	No	No	yes
Animal Burrows	No	No	No	No

Comments: Small pondings.

South Embankment

	Upstream Slope	**Crest**	**Downstream Slope**	**Downstream Toe**
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	yes
Vegetation Growth	No	No	NO	yes
Animal Burrows	No	No	No	No

Comments: Normal.

West Embankment

	Upstream Slope	**Crest**	**Downstream Slope**	**Downstream Toe**
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	No
Vegetation Growth	No	No	No	No
Animal Burrows	No	No	No	No

Comments: Normal.

South Dam

South Dam Freeboard:	Crest Elevation (m): 308.8	Pond Elv(m):	**300.35**	Freeboard (m): **8.45**	Comment: Direct staff gauge reading

Minimum opeating freeboard:5.3m; Maximum allowable pond elevation during normal operating conditions: 303.6m

	Upstream Slope	**Crest**	**Downstream Slope**	**Downstream Toe**
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	No
Vegetation Growth	Yes	No	No	Yes
Animal Burrows	No	No	No	No

Comments: Normal.

QUINSAM COAL

Tailings Disposal Facility and South Dam Inspection Report (TDF-Weekly, South Dam-Weekly)

Date:	July 2, 2020	**Inspected by**	Sarah S
Weather:	Sunny and Cloudy		

2 North Tailings Disposal Facility

Comments: Normal. The weir is flooded.

TDF Freeboard:	353.97	Pond Elv.: **349.32**	Freeboard: **4.65**	Comment: direct freeboard reading
	Minimum operating freeboard:1.4m; Maximum allowable pond elevation(calculated):352.9m			

North Embankment Piezometers	**Polynomial Gage Factors**			**Readings**	**Tk**	**Temperature**	**Temperature**	**Pressure**
	A	**B**	**C**	**(Lc)**		**(Ti)**	**(Tc)**	**kPa**
VW0583	-6.0506E-07	-0.15820	1512.4	***9270.8***	-0.0840	20.9		**-4.488**
VW0584	-1.0595E-07	-0.12602	1110.0	***8722.4***	0.2815	20.8	***14.9***	**1.082**
VW0586	-3.2376E-17	-0.12615	1132.6	***9016.8***	-0.0568	21.0	***12.9***	**-4.409**
VW0587 (VW16734)	-1.8058E-07	-0.10650	994.16	***9226.9***	-0.0725	18.0	***13.2***	**-3.531**

$p(kPa) = [(A)(Lc)^2 + (B)(Lc) + C + (Tk)(Tc-Ti)] - [(0.10)(Bc-Bi)]$, assume Bc-Bi = 0

Trigger Level Pressure	Downstream Piezometer:25kPa; Centreline piezometer:80kPa

North Embankment 90° V-Notch Weir	Height of water(Hm): **0.022**	Flow rate (Liters/Second): **0.10**
	Liters/Second (L/S) = $1380\ H_m^{2.5}$	

North Embankment

	Upstream Slope	**Crest**	**Downstream Slope**	**Downstream Toe**
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	yes
Vegetation Growth	No	No	Yes	Yes
Animal Burrows	No	No	No	No

Comments: The Weir is flooded. The seepage was visually estimated.

East Embankment

	Upstream Slope	**Crest**	**Downstream Slope**	**Downstream Toe**
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	No
Vegetation Growth	No	No	No	yes
Animal Burrows	No	No	No	No

Comments: Normal.

South Embankment

	Upstream Slope	**Crest**	**Downstream Slope**	**Downstream Toe**
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	yes
Vegetation Growth	No	No	NO	yes
Animal Burrows	No	No	No	No

Comments: Normal.

West Embankment

	Upstream Slope	**Crest**	**Downstream Slope**	**Downstream Toe**
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	No
Vegetation Growth	No	No	No	No
Animal Burrows	No	No	No	No

Comments: Normal.

South Dam

South Dam Freeboard:	Crest Elevation (m): 308.8	Pond Elv(m): **300.10**	Freeboard (m): **8.7**	Comment: Direct staff gauge reading
	Minimum opeating freeboard:5.3m; Maximum allowable pond elevation during normal operating conditions: 303.6m			

	Upstream Slope	**Crest**	**Downstream Slope**	**Downstream Toe**
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	No
Vegetation Growth	Yes	No	No	Yes
Animal Burrows	No	No	No	No

Comments: Normal.

Tailings Disposal Facility and South Dam Inspection Report (TDF-Weekly, South Dam-Weekly)

QUINSAM COAL

Date:	July 9, 2020	**Inspected by**	Sarah S
Weather:	Cloudy and Rainy		

2 North Tailings Disposal Facility

Comments: Regrading (filling the dried puddles) the crest surface of north embankment of the 2-North Pit TSF using Bob Cat.

TDF Freeboard:	353.97	Pond Elv.: **349.22**	Freeboard: **4.75**	Comment: freeboard is above water
	Minimum operating freeboard:1.4m; Maximum allowable pond elevation(calculated):352.9m			

North Embankment Piezometers	**Polynomial Gage Factors**			**Readings**	**Tk**	**Temperature**	**Temperature**	**Pressure**
	A	**B**	**C**	**(Lc)**		**(Ti)**	**(Tc)**	**kPa**
VW0583	-6.0506E-07	-0.15820	1512.4	***9273.6***	-0.0840	20.9		**-4.963**
VW0584	-1.0595E-07	-0.12602	1110.0	***8725.3***	0.2815	20.8	***14.9***	**0.711**
VW0586	-3.2376E-17	-0.12615	1132.6	***9018.6***	-0.0568	21.0	***12.9***	**-4.636**
VW0587 (VW16734)	-1.8058E-07	-0.10650	994.16	***9272.5***	-0.0725	18.0	***13.2***	**-8.539**

$p(kPa) = [(A)(Lc)^2 + (B)(Lc) + C + (Tk)(Tc-Ti)] - [(0.10)(Bc-Bi)]$, assume Bc-Bi = 0

Trigger Level Pressure: Downstream Piezometer:25kPa; Centreline piezometer:80kPa

North Embankment 90° V-Notch Weir	Height of water(Hm): **0.02**	Flow rate (Liters/Second): **0.08**
	Liters/Second (L/S) = 1380 $H_m^{2.5}$	

North Embankment

	Upstream Slope	**Crest**	**Downstream Slope**	**Downstream Toe**
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	yes
Vegetation Growth	No	No	Yes	Yes
Animal Burrows	No	No	No	No

Comments: The Weir is flooded. The seepage was visually estimated, slower than before.
Grading the crest surface of the North Embankment.

East Embankment

	Upstream Slope	**Crest**	**Downstream Slope**	**Downstream Toe**
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	No
Vegetation Growth	No	No	No	yes
Animal Burrows	No	No	No	No

Comments: Normal.

South Embankment

	Upstream Slope	**Crest**	**Downstream Slope**	**Downstream Toe**
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	yes
Vegetation Growth	No	No	NO	yes
Animal Burrows	No	No	No	No

Comments: Normal.

West Embankment

	Upstream Slope	**Crest**	**Downstream Slope**	**Downstream Toe**
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	No
Vegetation Growth	No	No	No	No
Animal Burrows	No	No	No	No

Comments: Normal.

South Dam

South Dam Freeboard:	Crest Elevation (m): 308.8	Pond Elv(m): **299.90**	Freeboard (m): **8.9**	Comment: freeboard is above water
	Minimum opeating freeboard:5.3m; Maximum allowable pond elevation during normal operating conditions: 303.6m			

	Upstream Slope	**Crest**	**Downstream Slope**	**Downstream Toe**
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	No
Vegetation Growth	Yes	No	No	Yes
Animal Burrows	No	No	No	No

Comments: Normal.

QUINSAM COAL

Tailings Disposal Facility and South Dam Inspection Report (TDF-Weekly, South Dam-Weekly)

Date:	July 16, 2020	**Inspected by**	Sarah S
Weather:	Sunny, Cloudy		

2 North Tailings Disposal Facility

Comments: Ponds filling material hualing from coarse coal rejects.

TDF Freeboard:	353.97	Pond Elv.:	**349.17**	Freeboard:	**4.8**	Comment: freeboard is above water
	Minimum operating freeboard:1.4m; Maximum allowable pond elevation(calculated):352.9m					

North Embankment Piezometers	**Polynomial Gage Factors**			**Readings**	**Tk**	**Temperature**	**Temperature**	**Pressure**
	A	**B**	**C**	**(Lc)**		**(Ti)**	**(Tc)**	**kPa**
VW0583	-6.0506E-07	-0.15820	1512.4	***9269.3***	-0.0840	20.9		**-4.234**
VW0584	-1.0595E-07	-0.12602	1110.0	***8718.8***	0.2815	20.8	***14.9***	**1.542**
VW0586	-3.2376E-17	-0.12615	1132.6	***9016.2***	-0.0568	21.0	***12.9***	**-4.334**
VW0587 (VW16734)	-1.8058E-07	-0.10650	994.16	***9220.6***	-0.0725	18.0	***13.2***	**-2.839**

$p(kPa) = [(A)(Lc)^2 + (B)(Lc) + C + (Tk)(Tc-Ti)] - [(0.10)(Bc-Bi)]$, assume Bc-Bi = 0

Trigger Level Pressure: Downstream Piezometer:25kPa; Centreline piezometer:80kPa

North Embankment 90° V-Notch Weir: Height of water(Hm): **0.02** Flow rate (Liters/Second): **0.08**

Liters/Second (L/S) = $1380\ H_m^{2.5}$

North Embankment

	Upstream Slope	**Crest**	**Downstream Slope**	**Downstream Toe**
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	yes
Vegetation Growth	No	No	Yes	Yes
Animal Burrows	No	No	No	No

Comments: The Weir is flooded. The seepage was visually estimated, slower than before.
Hualing coarse coal rejects material to the dam for filling the ponds on the East Embankment crest.

East Embankment

	Upstream Slope	**Crest**	**Downstream Slope**	**Downstream Toe**
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	No
Vegetation Growth	No	No	No	yes
Animal Burrows	No	No	No	No

Comments: Normal.

South Embankment

	Upstream Slope	**Crest**	**Downstream Slope**	**Downstream Toe**
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	yes
Vegetation Growth	No	No	NO	yes
Animal Burrows	No	No	No	No

Comments: Normal.

West Embankment

	Upstream Slope	**Crest**	**Downstream Slope**	**Downstream Toe**
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	No
Vegetation Growth	No	No	No	No
Animal Burrows	No	No	No	No

Comments: Normal.

South Dam

South Dam Freeboard:	Crest Elevation (m): 308.8	Pond Elv(m):	**299.75**	Freeboard (m): **9.05**		Comment: freeboard is above water
	Minimum opeating freeboard:5.3m; Maximum allowable pond elevation during normal operating conditions: 303.6m					

	Upstream Slope	**Crest**	**Downstream Slope**	**Downstream Toe**
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	No
Vegetation Growth	Yes	No	No	Yes
Animal Burrows	No	No	No	No

Comments: Normal.

QUINSAM COAL

Tailings Disposal Facility and South Dam Inspection Report (TDF-Weekly, South Dam-Weekly)

Date:	July 23, 2020	**Inspected by**	Sarah S
Weather:	Sunny, Cloudy		

2 North Tailings Disposal Facility

Comments: Walked in the bush for pipelines related to South Dam.

TDF Freeboard:	353.97	Pond Elv.: **349.12**	Freeboard: **4.85**	Comment: freeboard is above water
	Minimum operating freeboard:1.4m; Maximum allowable pond elevation(calculated):352.9m			

North Embankment Piezometers	**Polynomial Gage Factors**			**Readings**	**Tk**	**Temperature**	**Temperature**	**Pressure**
	A	**B**	**C**	**(Lc)**		**(Ti)**	**(Tc)**	**kPa**
VW0583	-6.0506E-07	-0.15820	1512.4	***9269.5***	-0.0840	20.9		**-4.268**
VW0584	-1.0595E-07	-0.12602	1110.0	***8719.8***	0.2815	20.8	***14.9***	**1.414**
VW0586	-3.2376E-17	-0.12615	1132.6	***9016.6***	-0.0568	21.0	***13.0***	**-4.390**
VW0587 (VW16734)	-1.8058E-07	-0.10650	994.16	***9219.1***	-0.0725	18.0	***13.3***	**-2.681**

$p(kPa) = [(A)(Lc)^2 + (B)(Lc) + C + (Tk)(Tc-Ti)] - [(0.10)(Bc-Bi)]$, assume Bc-Bi = 0

Trigger Level Pressure: Downstream Piezometer:25kPa; Centreline piezometer:80kPa

North Embankment 90° V-Notch Weir	Height of water(Hm): **0.02**	Flow rate (Liters/Second): **0.08**
	Liters/Second (L/S) = 1380 $H_m^{2.5}$	

North Embankment

	Upstream Slope	**Crest**	**Downstream Slope**	**Downstream Toe**
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	yes
Vegetation Growth	No	No	Yes	Yes
Animal Burrows	No	No	No	No

Comments: The Weir is flooded.

East Embankment

	Upstream Slope	**Crest**	**Downstream Slope**	**Downstream Toe**
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	No
Vegetation Growth	No	No	No	yes
Animal Burrows	No	No	No	No

Comments: Normal.

South Embankment

	Upstream Slope	**Crest**	**Downstream Slope**	**Downstream Toe**
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	yes
Vegetation Growth	No	No	NO	yes
Animal Burrows	No	No	No	No

Comments: Normal.

West Embankment

	Upstream Slope	**Crest**	**Downstream Slope**	**Downstream Toe**
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	No
Vegetation Growth	No	No	No	No
Animal Burrows	No	No	No	No

Comments: Normal.

South Dam

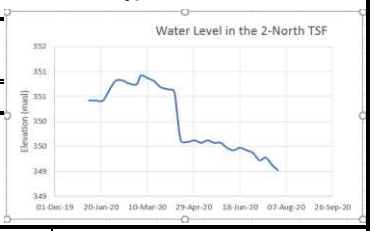
South Dam Freeboard:	Crest Elevation (m): 308.8	Pond Elv(m): **300.10**	Freeboard (m): **8.7**	Comment: freeboard is above water
	Minimum opeating freeboard:5.3m; Maximum allowable pond elevation during normal operating conditions: 303.6m			

	Upstream Slope	**Crest**	**Downstream Slope**	**Downstream Toe**
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	No
Vegetation Growth	Yes	No	No	Yes
Animal Burrows	No	No	No	No

Comments: Two 8" HDPE pipes and one metal pipe are at the entrance to the Brinco Brook.

Tailings Disposal Facility and South Dam Inspection Report
(TDF-Weekly, South Dam-Weekly)

Date:	July 29, 2020	**Inspected by**	Sarah S
Weather:	Sunny		



2 North Tailings Disposal Facility

Comments: Water level in the 2-North pit TSF is very low (see figure at the right)

TDF Freeboard:	353.97	Pond Elv.:	**349.02**	Freeboard:	**4.95**	Comment: freeboard is above water
	Minimum operating freeboard:1.4m; Maximum allowable pond elevation(calculated):352.9m					

North Embankment Piezometers	**Polynomial Gage Factors**			**Readings**	**Tk**	**Temperature**	**Temperature**	**Pressure**
	A	**B**	**C**	**(Lc)**		**(Ti)**	**(Tc)**	**kPa**
VW0583	-6.0506E-07	-0.15820	1512.4	***9269.8***	-0.0840	20.9		**-4.319**
VW0584	-1.0595E-07	-0.12602	1110.0	***8719.5***	0.2815	20.8	***14.9***	**1.452**
VW0586	-3.2376E-17	-0.12615	1132.6	***9016.5***	-0.0568	21.0	***13.0***	**-4.377**
VW0587 (VW16734)	-1.8058E-07	-0.10650	994.16	***9220.3***	-0.0725	18.0	***13.3***	**-2.813**

$p(kPa) = [(A)(Lc)^2 + (B)(Lc) + C + (Tk)(Tc-Ti)] - [(0.10)(Bc-Bi)]$, assume Bc-Bi = 0

Trigger Level Pressure: Downstream Piezometer:25kPa; Centreline piezometer:80kPa

North Embankment 90° V-Notch Weir: Height of water(Hm): **0.02** Flow rate (Liters/Second): **0.08**

Liters/Second (L/S) = $1380\ H_m^{2.5}$

North Embankment

	Upstream Slope	**Crest**	**Downstream Slope**	**Downstream Toe**
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	yes
Vegetation Growth	No	No	Yes	Yes
Animal Burrows	No	No	No	No

Comments: The Weir is flooded.

East Embankment

	Upstream Slope	**Crest**	**Downstream Slope**	**Downstream Toe**
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	No
Vegetation Growth	No	No	No	yes
Animal Burrows	No	No	No	No

Comments: Normal.

South Embankment

	Upstream Slope	**Crest**	**Downstream Slope**	**Downstream Toe**
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	yes
Vegetation Growth	No	No	NO	yes
Animal Burrows	No	No	No	No

Comments: Normal.

West Embankment

	Upstream Slope	**Crest**	**Downstream Slope**	**Downstream Toe**
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	No
Vegetation Growth	No	No	No	No
Animal Burrows	No	No	No	No

Comments: Normal.

South Dam

South Dam Freeboard: Crest Elevation (m): 308.8 Pond Elv(m): **300.10** Freeboard (m): **8.7** Comment: freeboard is above water

Minimum opeating freeboard:5.3m; Maximum allowable pond elevation during normal operating conditions: 303.6m

	Upstream Slope	**Crest**	**Downstream Slope**	**Downstream Toe**
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	No
Vegetation Growth	Yes	No	No	Yes
Animal Burrows	No	No	No	No

Comments: Normal.

QUINSAM COAL

Tailings Disposal Facility and South Dam Inspection Report
(TDF-Weekly, South Dam-Weekly)

Date:	August 5, 2020	**Inspected by**	Sarah S
Weather:	Sunny		

2 North Tailings Disposal Facility

Comments: Water level in the 2-North pit TSF is very low: 5m below the North Embankment crest.
Vegetation (Dandylines Flowers) control by hand-pulling on the South Embankment crest.

TDF Freeboard:	353.97	Pond Elv.:	**348.92**	Freeboard:	**5.05**	Comment: freeboard is above water
	Minimum operating freeboard:1.4m; Maximum allowable pond elevation(calculated):352.9m					

North Embankment Piezometers	**Polynomial Gage Factors**			**Readings**	**Tk**	**Temperature**	**Temperature**	**Pressure**
	A	**B**	**C**	**(Lc)**		**(Ti)**	**(Tc)**	**kPa**
VW0583	-6.0506E-07	-0.15820	1512.4	***9270.8***	-0.0840	20.9		**-4.488**
VW0584	-1.0595E-07	-0.12602	1110.0	***8721.4***	0.2815	20.8	***14.9***	**1.209**
VW0586	-3.2376E-17	-0.12615	1132.6	***9016.0***	-0.0568	21.0	***13.2***	**-4.325**
VW0587 (VW16734)	-1.8058E-07	-0.10650	994.16	***9223.8***	-0.0725	18.0	***13.3***	**-3.197**

$p(kPa) = [(A)(Lc)^2 + (B)(Lc) + C + (Tk)(Tc-Ti)] - [(0.10)(Bc-Bi)]$, assume Bc-Bi = 0

Trigger Level Pressure	Downstream Piezometer:25kPa; Centreline piezometer:80kPa		
North Embankment 90° V-Notch Weir	Height of water(Hm): **0.02**	Flow rate (Liters/Second): **0.08**	
	Liters/Second (L/S) = $1380\ H_m^{2.5}$		

North Embankment

	Upstream Slope	**Crest**	**Downstream Slope**	**Downstream Toe**
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	yes
Vegetation Growth	No	No	Yes	Yes
Animal Burrows	No	No	No	No

Comments: The Weir is flooded.

East Embankment

	Upstream Slope	**Crest**	**Downstream Slope**	**Downstream Toe**
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	No
Vegetation Growth	No	No	No	yes
Animal Burrows	No	No	No	No

Comments: Normal.

South Embankment

	Upstream Slope	**Crest**	**Downstream Slope**	**Downstream Toe**
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	yes
Vegetation Growth	No	No	NO	yes
Animal Burrows	No	No	No	No

Comments: Vegetation (Dandylines Flowers) control by hand-pulling.

West Embankment

	Upstream Slope	**Crest**	**Downstream Slope**	**Downstream Toe**
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	No
Vegetation Growth	No	No	No	No
Animal Burrows	No	No	No	No

Comments: Normal.

South Dam

South Dam Freeboard:	Crest Elevation (m): 308.8	Pond Elv(m):	**300.15**	Freeboard (m): **8.65**	Comment:	
	Minimum opeating freeboard:5.3m; Maximum allowable pond elevation during normal operating conditions: 303.6m					

	Upstream Slope	**Crest**	**Downstream Slope**	**Downstream Toe**
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	No
Vegetation Growth	Yes	No	No	Yes
Animal Burrows	No	No	No	No

Comments: Normal. The water level has been kept at the level of ~300.2masl for weeks during the summer, this is probably due to the seepage from the 2-Norh pit PAG pond.

QUINSAM COAL

Tailings Disposal Facility and South Dam Inspection Report (TDF-Weekly, South Dam-Weekly)

Date:	August 12, 2020	**Inspected by**	Sarah S
Weather:	Sunny		

2 North Tailings Disposal Facility

Comments: Maintenance: grading/leveling of the north embankment of the 2-North TSF.

TDF Freeboard:

353.97	Pond Elv.:	**348.87**	Freeboard:	**5.1**	Comment:	freeboard is above water	

Minimum operating freeboard:1.4m; Maximum allowable pond elevation(calculated):352.9m

North Embankment Piezometers	Polynomial Gage Factors			Readings	Tk	Temperature	Temperature	Pressure
	A	B	C	(Lc)		(Ti)	(Tc)	kPa
VW0583	-6.0506E-07	-0.15820	1512.4	***9270.5***	-0.0840	20.9		**-4.438**
VW0584	-1.0595E-07	-0.12602	1110.0	***8718.6***	0.2815	20.8	***14.9***	**1.567**
VW0586	-3.2376E-17	-0.12615	1132.6	***9016.8***	-0.0568	21.0	***13.2***	**-4.426**
VW0587 (VW16734)	-1.8058E-07	-0.10650	994.16	***9222.5***	-0.0725	18.0	***13.3***	**-3.055**

$p(kPa) = [(A)(Lc)^2 + (B)(Lc) + C + (Tk)(Tc-Ti)] - [(0.10)(Bc-Bi)]$, assume Bc-Bi = 0

Trigger Level Pressure: Downstream Piezometer:25kPa; Centreline piezometer:80kPa

North Embankment 90° V-Notch Weir

Height of water(Hm): **0.03** Flow rate (Liters/Second): **0.22**

Liters/Second (L/S) = $1380\ H_m^{2.5}$

North Embankment

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	yes
Vegetation Growth	No	No	Yes	Yes
Animal Burrows	No	No	No	No

Comments: The Weir is flooded. The reading is by visual estimation.

East Embankment

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	No
Vegetation Growth	No	No	No	yes
Animal Burrows	No	No	No	No

Comments: Normal.

South Embankment

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	yes
Vegetation Growth	No	No	NO	yes
Animal Burrows	No	No	No	No

Comments: Normal.

West Embankment

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	No
Vegetation Growth	No	No	No	No
Animal Burrows	No	No	No	No

Comments: Normal.

South Dam

South Dam Freeboard: Crest Elevation (m): 308.8 Pond Elv(m): **300.15** Freeboard (m): **8.65** Comment:

Minimum opeating freeboard:5.3m; Maximum allowable pond elevation during normal operating conditions: 303.6m

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	No
Vegetation Growth	Yes	No	No	Yes
Animal Burrows	No	No	No	No

Comments: Normal. The water level has been kept at the level of ~300.2masl for weeks during the summer, this is probably due to the seepage from the 2-Norh pit PAG pond.

QUINSAM COAL

Tailings Disposal Facility and South Dam Inspection Report (TDF-Weekly, South Dam-Weekly)

Date:	August 19, 2020	**Inspected by**	Sarah S
Weather:	Cloudy		

2 North Tailings Disposal Facility

Comments: Maintenance: grading/leveling of the puddles on the east embankment of the 2-North TSF.
Re-visited pipelines related to South Dam.

TDF Freeboard: 353.97 | Pond Elv.: **348.87** | Freeboard: **5.1** | Comment: freeboard is above water

Minimum operating freeboard:1.4m; Maximum allowable pond elevation(calculated):352.9m

North Embankment Piezometers	Polynomial Gage Factors A	B	C	Readings (Lc)	Tk	Temperature (Ti)	Temperature (Tc)	Pressure kPa
VW0583	-6.0506E-07	-0.15820	1512.4	***9269.9***	-0.0840	20.9		**-4.336**
VW0584	-1.0595E-07	-0.12602	1110.0	***8720.6***	0.2815	20.8	***14.9***	**1.312**
VW0586	-3.2376E-17	-0.12615	1132.6	***9016.4***	-0.0568	21.0	***12.9***	**-4.359**
VW0587 (VW16734)	-1.8058E-07	-0.10650	994.16	***9222.1***	-0.0725	18.0	***13.3***	**-3.011**

$p(kPa) = [(A)(Lc)^2 + (B)(Lc) + C + (Tk)(Tc-Ti)] - [(0.10)(Bc-Bi)]$, assume Bc-Bi = 0

Trigger Level Pressure: Downstream Piezometer:25kPa; Centreline piezometer:80kPa

North Embankment 90° V-Notch Weir: Height of water(Hm): **0.03** | Flow rate (Liters/Second): **0.22**

Liters/Second (L/S) = $1380\ H_m^{2.5}$

North Embankment

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	yes
Vegetation Growth	No	No	Yes	Yes
Animal Burrows	No	No	No	No

Comments: The Weir is flooded. The reading is by visual estimation.

East Embankment

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	No
Vegetation Growth	No	No	No	yes
Animal Burrows	No	No	No	No

Comments: The puddles are filled and re-graded.

South Embankment

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	yes
Vegetation Growth	No	No	NO	yes
Animal Burrows	No	No	No	No

Comments: Normal.

West Embankment

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	No
Vegetation Growth	No	No	No	No
Animal Burrows	No	No	No	No

Comments: Normal.

South Dam

South Dam Freeboard: Crest Elevation (m): 308.8 | Pond Elv(m): **300.15** | Freeboard (m): **8.65** | Comment:

Minimum opeating freeboard:5.3m; Maximum allowable pond elevation during normal operating conditions: 303.6m

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	No
Vegetation Growth	Yes	No	No	Yes
Animal Burrows	No	No	No	No

Comments: Normal. The water level has been kept at the level of ~300.2masl during last 4 weeks.
The 8"pipeline on the surface of the South Dam is not being used. There are 3 pipelines (two 12" and one 10") underneatht the South dam. One is for tailings injection to 2N undergound, two are from 9-10XC-2N.

QUINSAM COAL

Tailings Disposal Facility and South Dam Inspection Report (TDF-Weekly, South Dam-Weekly)

Date:	August 26, 2020	**Inspected by**	Sarah S
Weather:	Sunny		

2 North Tailings Disposal Facility

Comments: Maintenance: grading/leveling of the puddles on the east and west embankments of the 2-North TSF.

TDF Freeboard: 353.97 | Pond Elv.: **349.07** | Freeboard: **4.9** | Comment: freeboard is above water

Minimum operating freeboard:1.4m; Maximum allowable pond elevation(calculated):352.9m

North Embankment Piezometers	Polynomial Gage Factors A	B	C	Readings (Lc)	Tk	Temperature (Ti)	Temperature (Tc)	Pressure kPa
VW0583	-6.0506E-07	-0.15820	1512.4	***9268.1***	-0.0840	20.9		**-4.031**
VW0584	-1.0595E-07	-0.12602	1110.0	***8718.9***	0.2815	20.8	***14.9***	**1.529**
VW0586	-3.2376E-17	-0.12615	1132.6	***9015.6***	-0.0568	21.0	***12.9***	**-4.258**
VW0587 (VW16734)	-1.8058E-07	-0.10650	994.16	***9220.0***	-0.0725	18.0	***13.3***	**-2.780**

$p(kPa) = [(A)(Lc)^2 + (B)(Lc) + C + (Tk)(Tc-Ti)] - [(0.10)(Bc-Bi)]$, assume Bc-Bi = 0

Trigger Level Pressure: Downstream Piezometer:25kPa; Centreline piezometer:80kPa

North Embankment 90° V-Notch Weir: Height of water(Hm): **0.03** | Flow rate (Liters/Second): **0.22**

Liters/Second (L/S) = $1380\ H_m^{2.5}$

North Embankment

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	yes
Vegetation Growth	No	No	Yes	Yes
Animal Burrows	No	No	No	No

Comments: The Weir is flooded. The reading is by visual estimation.

East Embankment

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	No
Vegetation Growth	No	No	No	yes
Animal Burrows	No	No	No	No

Comments: The puddles are filled and re-graded.

South Embankment

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	yes
Vegetation Growth	No	No	NO	yes
Animal Burrows	No	No	No	No

Comments: Normal.

West Embankment

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	No
Vegetation Growth	No	No	No	No
Animal Burrows	No	No	No	No

Comments: Normal.

South Dam

South Dam Freeboard: Crest Elevation (m): 308.8 | Pond Elv(m): **300.15** | Freeboard (m): **8.65** | Comment:

Minimum opeating freeboard:5.3m; Maximum allowable pond elevation during normal operating conditions: 303.6m

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	No
Vegetation Growth	Yes	No	No	Yes
Animal Burrows	No	No	No	No

Comments: Normal. The water level has been kept at the level of ~300.2masl during last 4 weeks.

QUINSAM COAL

Tailings Disposal Facility and South Dam Inspection Report (TDF-Weekly, South Dam-Weekly)

Date:	September 3, 2020	**Inspected by**	Sarah S
Weather:	Sunny		

2 North Tailings Disposal Facility

Comments: Annual survey of the Tailings Dam Facility was done between August 31-September 2, 2020.

TDF Freeboard: 353.97 | Pond Elv.: **349.07** | Freeboard: **4.9** | Comment: freeboard is above water

Minimum operating freeboard:1.4m; Maximum allowable pond elevation(calculated):352.9m

North Embankment Piezometers	**Polynomial Gage Factors**			**Readings**	**Tk**	**Temperature**	**Temperature**	**Pressure**
	A	**B**	**C**	**(Lc)**		**(Ti)**	**(Tc)**	**kPa**
VW0583	-6.0506E-07	-0.15820	1512.4	***9265.3***	-0.0840	20.9		**-3.557**
VW0584	-1.0595E-07	-0.12602	1110.0	***8713.9***	0.2815	20.8	***14.9***	**2.168**
VW0586	-3.2376E-17	-0.12615	1132.6	***9014.3***	-0.0568	21.0	***12.9***	**-4.094**
VW0587 (VW16734)	-1.8058E-07	-0.10650	994.16	***9215.9***	-0.0725	18.0	***13.2***	**-2.323**

$p(kPa) = [(A)(Lc)^2 + (B)(Lc) + C + (Tk)(Tc-Ti)] - [(0.10)(Bc-Bi)]$, assume Bc-Bi = 0

Trigger Level Pressure: Downstream Piezometer:25kPa; Centreline piezometer:80kPa

North Embankment 90° V-Notch Weir: Height of water(Hm): **0.03** | Flow rate (Liters/Second): **0.22**

Liters/Second (L/S) = $1380\ H_m^{2.5}$

North Embankment

	Upstream Slope	**Crest**	**Downstream Slope**	**Downstream Toe**
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	yes
Vegetation Growth	No	No	Yes	Yes
Animal Burrows	No	No	No	No

Comments: The Weir is flooded. The reading is by visual estimation.

East Embankment

	Upstream Slope	**Crest**	**Downstream Slope**	**Downstream Toe**
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	No
Vegetation Growth	No	No	No	yes
Animal Burrows	No	No	No	No

Comments: Normal.

South Embankment

	Upstream Slope	**Crest**	**Downstream Slope**	**Downstream Toe**
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	yes
Vegetation Growth	No	No	NO	yes
Animal Burrows	No	No	No	No

Comments: Normal.

West Embankment

	Upstream Slope	**Crest**	**Downstream Slope**	**Downstream Toe**
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	No
Vegetation Growth	No	No	No	No
Animal Burrows	No	No	No	No

Comments: Normal.

South Dam

South Dam Freeboard: Crest Elevation (m): 308.8 | Pond Elv(m): **300.15** | Freeboard (m): **8.65** | Comment:

Minimum opeating freeboard:5.3m; Maximum allowable pond elevation during normal operating conditions: 303.6m

	Upstream Slope	**Crest**	**Downstream Slope**	**Downstream Toe**
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	No
Vegetation Growth	Yes	No	No	Yes
Animal Burrows	No	No	No	No

Comments: Normal. The water level has been kept at the level of ~300.2masl.

QUINSAM COAL

Tailings Disposal Facility and South Dam Inspection Report (TDF-Weekly, South Dam-Weekly)

Date:	September 9, 2020	**Inspected by**	Sarah S
Weather:	Sunny		

2 North Tailings Disposal Facility

Comments: Dry week. The tailings dams are in normal status.

TDF Freeboard: 353.97 | Pond Elv.: **349.02** | **4.95** | Comment:

Minimum operating freeboard:1.4m; Maximum allowable pond elevation(calculated):352.9m

North Embankment Piezometers	Polynomial Gage Factors A	B	C	Readings (Lc)	Tk	Temperature (Ti)	Temperature (Tc)	Pressure kPa
VW0583	-6.0506E-07	-0.15820	1512.4	***9267.9***	-0.0840	20.9		**-3.997**
VW0584	-1.0595E-07	-0.12602	1110.0	***8716.5***	0.2815	20.8	***14.9***	**1.836**
VW0586	-3.2376E-17	-0.12615	1132.6	***9015.8***	-0.0568	21.0	***12.9***	**-4.283**
VW0587 (VW16734)	-1.8058E-07	-0.10650	994.16	***9218.5***	-0.0725	18.0	***13.3***	**-2.615**

$p(kPa) = [(A)(Lc)^2 + (B)(Lc) + C + (Tk)(Tc-Ti)] - [(0.10)(Bc-Bi)]$, assume Bc-Bi = 0

Trigger Level Pressure: Downstream Piezometer:25kPa; Centreline piezometer:80kPa

North Embankment 90° V-Notch Weir: Height of water(Hm): **0.03** | Flow rate (Liters/Second): **0.22**

Liters/Second (L/S) = $1380\ H_m^{2.5}$

North Embankment

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	yes
Vegetation Growth	No	No	Yes	Yes
Animal Burrows	No	No	No	No

Comments: The weir is flooded, the reading is by visual estimation.

East Embankment

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	No
Vegetation Growth	No	No	No	yes
Animal Burrows	No	No	No	No

Comments: Normal

South Embankment

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	Yes
Vegetation Growth	No	No	NO	No
Animal Burrows	No	No	No	No

Comments: Normal, the moument in the middle south is marked with sticks.

West Embankment

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	No
Vegetation Growth	No	No	No	yes
Animal Burrows	No	No	No	No

Comments: Normal

South Dam

South Dam Freeboard: Crest Elevation (m): 308.8 | Pond Elv(m): **300.15** | Freeboard (m): **8.65** | Comment: Direct staff gauge reading

Minimum opeating freeboard:5.3m; Maximum allowable pond elevation during normal operating conditions: 303.6m

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	No
Vegetation Growth	Yes	No	Yes	Yes
Animal Burrows	No	No	No	No

Comments: the water level is kept same.

QUINSAM COAL

Tailings Disposal Facility and South Dam Inspection Report (TDF-Weekly, South Dam-Weekly)

Date:	September 16, 2020	**Inspected by**	Sarah S
Weather:	Smoky and Cloudy		

2 North Tailings Disposal Facility

Comments: no abnormal observation.

TDF Freeboard: 353.97 | Pond Elv.: **348.97** | Freeboard: **5** | Comment: freeboard is above water

Minimum operating freeboard:1.4m; Maximum allowable pond elevation(calculated):352.9m

North Embankment Piezometers	Polynomial Gage Factors A	B	C	Readings (Lc)	Tk	Temperature (Ti)	Temperature (Tc)	Pressure kPa
VW0583	-6.0506E-07	-0.15820	1512.4	***9267.5***	-0.0840	20.9		**-3.929**
VW0584	-1.0595E-07	-0.12602	1110.0	***8715.6***	0.2815	20.8	***14.9***	**1.951**
VW0586	-3.2376E-17	-0.12615	1132.6	***9015.8***	-0.0568	21.0	***12.9***	**-4.283**
VW0587 (VW16734)	-1.8058E-07	-0.10650	994.16	***9219.5***	-0.0725	18.0	***13.3***	**-2.725**

$p(kPa) = [(A)(Lc)^2 + (B)(Lc) + C + (Tk)(Tc-Ti)] - [(0.10)(Bc-Bi)]$, assume Bc-Bi = 0

Trigger Level Pressure: Downstream Piezometer:25kPa; Centreline piezometer:80kPa

North Embankment 90° V-Notch Weir: Height of water(Hm): **0.03** | Flow rate (Liters/Second): **0.22**

Liters/Second (L/S) = $1380\ H_m^{2.5}$

North Embankment

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	yes
Vegetation Growth	No	No	Yes	Yes
Animal Burrows	No	No	No	No

Comments: The Weir is flooded. The reading is by visual estimation.

East Embankment

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	No
Vegetation Growth	No	No	No	yes
Animal Burrows	No	No	No	No

Comments: Normal.

South Embankment

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	yes
Vegetation Growth	No	No	NO	yes
Animal Burrows	No	No	No	No

Comments: Normal.

West Embankment

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	No
Vegetation Growth	No	No	No	No
Animal Burrows	No	No	No	No

Comments: Normal.

South Dam

South Dam Freeboard: Crest Elevation (m): 308.8 | Pond Elv(m): **300.10** | Freeboard (m): **8.7** | Comment:

Minimum opeating freeboard:5.3m; Maximum allowable pond elevation during normal operating conditions: 303.6m

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	No
Vegetation Growth	Yes	No	No	Yes
Animal Burrows	No	No	No	No

Comments: Normal. The water level has been kept at the level of ~300.2masl.

QUINSAM COAL

Tailings Disposal Facility and South Dam Inspection Report (TDF-Weekly, South Dam-Weekly)

Date:	September 23, 2020	**Inspected by**	Sarah S
Weather:	Raining		

2 North Tailings Disposal Facility

Comments: Normal. Wet week.

TDF Freeboard:

353.97	Pond Elv.:	**349.02**	Freeboard:	**4.95**	Comment: freeboard is above water

Minimum operating freeboard:1.4m; Maximum allowable pond elevation(calculated):352.9m

North Embankment Piezometers	**Polynomial Gage Factors**			**Readings**	**Tk**	**Temperature**	**Temperature**	**Pressure**
	A	**B**	**C**	**(Lc)**		**(Ti)**	**(Tc)**	**kPa**
VW0583	-6.0506E-07	-0.15820	1512.4	***9277.7***	-0.0840	20.9		**-5.658**
VW0584	-1.0595E-07	-0.12602	1110.0	***8729.5***	0.2815	20.8	***14.9***	**0.174**
VW0586	-3.2376E-17	-0.12615	1132.6	***9017.5***	-0.0568	21.0	***12.9***	**-4.498**
VW0587 (VW16734)	-1.8058E-07	-0.10650	994.16	***9232.7***	-0.0725	18.0	***13.4***	**-4.182**

$p(kPa) = [(A)(Lc)^2 + (B)(Lc) + C + (Tk)(Tc-Ti)] - [(0.10)(Bc-Bi)]$, assume Bc-Bi = 0

Trigger Level Pressure: Downstream Piezometer:25kPa; Centreline piezometer:80kPa

North Embankment 90° V-Notch Weir: Height of water(Hm): **0.03** Flow rate (Liters/Second): **0.22**

Liters/Second (L/S) = $1380\ H_m^{2.5}$

North Embankment

	Upstream Slope	**Crest**	**Downstream Slope**	**Downstream Toe**
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	yes
Vegetation Growth	No	No	Yes	Yes
Animal Burrows	No	No	No	No

Comments: The Weir is flooded. The reading is by visual estimation.
Ponding at the NE corner of the crest.

East Embankment

	Upstream Slope	**Crest**	**Downstream Slope**	**Downstream Toe**
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	No
Vegetation Growth	No	No	No	yes
Animal Burrows	No	No	No	No

Comments: small ponding on the crest.

South Embankment

	Upstream Slope	**Crest**	**Downstream Slope**	**Downstream Toe**
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	yes
Vegetation Growth	No	No	NO	yes
Animal Burrows	No	No	No	No

Comments: Normal.

West Embankment

	Upstream Slope	**Crest**	**Downstream Slope**	**Downstream Toe**
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	No
Vegetation Growth	No	No	No	No
Animal Burrows	No	No	No	No

Comments: Normal.

South Dam

South Dam Freeboard: Crest Elevation (m): 308.8 Pond Elv(m): **300.15** Freeboard (m): **8.65** Comment:

Minimum opeating freeboard:5.3m; Maximum allowable pond elevation during normal operating conditions: 303.6m

	Upstream Slope	**Crest**	**Downstream Slope**	**Downstream Toe**
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	No
Vegetation Growth	Yes	No	No	Yes
Animal Burrows	No	No	No	No

Comments: Small pondings on the crest. The water level has been kept at the level of ~300.2masl.

QUINSAM COAL

Tailings Disposal Facility and South Dam Inspection Report (TDF-Weekly, South Dam-Weekly)

Date:	September 30, 2020	**Inspected by**	Sarah S
Weather:	Sunny		

2 North Tailings Disposal Facility

Comments: Two washouts on the south emabankment crest (30cm deep) and west emabnkment downslope (15cm deep) were observed and repaired.

TDF Freeboard: 353.97 | Pond Elv.: **349.02** | Freeboard: **4.95** | Comment: freeboard is above water

Minimum operating freeboard:1.4m; Maximum allowable pond elevation(calculated):352.9m

North Embankment Piezometers	Polynomial Gage Factors A	B	C	Readings (Lc)	Tk	Temperature (Ti)	Temperature (Tc)	Pressure kPa
VW0583	-6.0506E-07	-0.15820	1512.4	***9265.2***	-0.0840	20.9		**-3.540**
VW0584	-1.0595E-07	-0.12602	1110.0	***8713.8***	0.2815	20.8	***14.9***	**2.181**
VW0586	-3.2376E-17	-0.12615	1132.6	***9013.8***	-0.0568	21.0	***13.0***	**-4.036**
VW0587 (VW16734)	-1.8058E-07	-0.10650	994.16	***9214.6***	-0.0725	18.0	***13.4***	**-2.194**

$p(kPa) = [(A)(Lc)^2 + (B)(Lc) + C + (Tk)(Tc-Ti)] - [(0.10)(Bc-Bi)]$, assume Bc-Bi = 0

Trigger Level Pressure: Downstream Piezometer:25kPa; Centreline piezometer:80kPa

North Embankment 90° V-Notch Weir: Height of water(Hm): **0.03** | Flow rate (Liters/Second): **0.22**

Liters/Second (L/S) = $1380\ H_m^{2.5}$

North Embankment

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	yes
Vegetation Growth	No	No	Yes	Yes
Animal Burrows	No	No	No	No

Comments: The Weir is flooded. The reading is by visual estimation.
Ponding at the NE corner of the crest is dry.

East Embankment

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	No
Vegetation Growth	No	No	No	yes
Animal Burrows	No	No	No	No

Comments: small ponding on the crest.

South Embankment

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	yes
Vegetation Growth	No	No	NO	yes
Animal Burrows	No	No	No	No

Comments: Two washouts were obsered, one on the south embankment crest (30cm deep) was already repaired. The other one (10cm deep) on the downslope will be repaired.

West Embankment

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	No
Vegetation Growth	No	No	No	No
Animal Burrows	No	No	No	No

Comments: one wahsout (15cm deep) on the downslope of the west embankment was osberved and repaired

South Dam

South Dam Freeboard: Crest Elevation (m): 308.8 | Pond Elv(m): **300.20** | Freeboard (m): **8.6** | Comment:

Minimum opeating freeboard:5.3m; Maximum allowable pond elevation during normal operating conditions: 303.6m

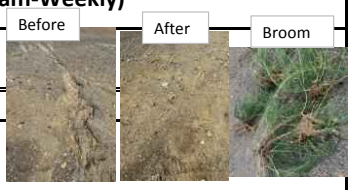
	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	No
Vegetation Growth	Yes	No	No	Yes
Animal Burrows	No	No	No	No

Comments: Small pondings on the crest. The water level has been kept at the level of ~300.2masl.

QUINSAM COAL

Tailings Disposal Facility and South Dam Inspection Report
(TDF-Weekly, South Dam-Weekly)

Date:	October 7, 2020	**Inspected by**	Sarah S
Weather:	Sunny		



2 North Tailings Disposal Facility

Comments: Washout on the downslope of the south embankment (15m long x10cm deep) was repaired.
Dry pondingss on the east and west embankment crests were filled with same CCR material.
More broom on the downslope of the south embankment is pulled out by hand.

TDF Freeboard:	353.97	Pond Elv.:	**349.02**	Freeboard:	**4.95**	Comment: freeboard is above water

Minimum operating freeboard:1.4m; Maximum allowable pond elevation(calculated):352.9m

North Embankment Piezometers	**Polynomial Gage Factors**			**Readings**	**Tk**	**Temperature**	**Temperature**	**Pressure**
	A	**B**	**C**	**(Lc)**		**(Ti)**	**(Tc)**	**kPa**
VW0583	-6.0506E-07	-0.15820	1512.4	***9271.3***	-0.0840	20.9		**-4.573**
VW0584	-1.0595E-07	-0.12602	1110.0	***8720.6***	0.2815	20.8	***14.9***	**1.312**
VW0586	-3.2376E-17	-0.12615	1132.6	***9016.8***	-0.0568	21.0	***12.9***	**-4.409**
VW0587 (VW16734)	-1.8058E-07	-0.10650	994.16	***9224.9***	-0.0725	18.0	***13.4***	**-3.325**

$p(kPa) = [(A)(Lc)^2 + (B)(Lc) + C + (Tk)(Tc-Ti)] - [(0.10)(Bc-Bi)]$, assume Bc-Bi = 0

Trigger Level Pressure	Downstream Piezometer:25kPa; Centreline piezometer:80kPa

North Embankment 90° V-Notch Weir	Height of water(Hm): **0.03**	Flow rate (Liters/Second): **0.22**

Liters/Second (L/S) = $1380\ H_m^{2.5}$

North Embankment

	Upstream Slope	**Crest**	**Downstream Slope**	**Downstream Toe**
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	yes
Vegetation Growth	No	No	Yes	Yes
Animal Burrows	No	No	No	No

Comments: The Weir is flooded. The reading is by visual estimation.

East Embankment

	Upstream Slope	**Crest**	**Downstream Slope**	**Downstream Toe**
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	No
Vegetation Growth	No	No	No	yes
Animal Burrows	No	No	No	No

Comments: one ponding on the crest is filled.

South Embankment

	Upstream Slope	**Crest**	**Downstream Slope**	**Downstream Toe**
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	yes
Vegetation Growth	No	No	NO	yes
Animal Burrows	No	No	No	No

Comments: The washout on the downslope of the south embankment is repaired.

West Embankment

	Upstream Slope	**Crest**	**Downstream Slope**	**Downstream Toe**
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	No
Vegetation Growth	No	No	No	No
Animal Burrows	No	No	No	No

Comments: one ponding on the crest is filled.

South Dam

South Dam Freeboard:	Crest Elevation (m): 308.8	Pond Elv(m):	**300.20**	Freeboard (m): **8.6**	Comment:

Minimum opeating freeboard:5.3m; Maximum allowable pond elevation during normal operating conditions: 303.6m

	Upstream Slope	**Crest**	**Downstream Slope**	**Downstream Toe**
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	No
Vegetation Growth	Yes	No	No	Yes
Animal Burrows	No	No	No	No

Comments: Small pondings on the crest. The water level has been kept at the level of ~300.2masl.

QUINSAM COAL

Tailings Disposal Facility and South Dam Inspection Report (TDF-Weekly, South Dam-Weekly)

Date:	October 14, 2020	**Inspected by**	Sarah S
Weather:	Sunny		

2 North Tailings Disposal Facility

Comments: No new wash-outs during the wet week.
Pondings as usual on the crests.

TDF Freeboard: 353.97 | Pond Elv.: **349.02** | Freeboard: **4.95** | Comment: freeboard is above water

Minimum operating freeboard:1.4m; Maximum allowable pond elevation(calculated):352.9m

North Embankment Piezometers	Polynomial Gage Factors A	B	C	Readings (Lc)	Tk	Temperature (Ti)	Temperature (Tc)	Pressure kPa
VW0583	-6.0506E-07	-0.15820	1512.4	***9262.1***	-0.0840	20.9		**-3.015**
VW0584	-1.0595E-07	-0.12602	1110.0	***8707.2***	0.2815	20.8	***14.9***	**3.025**
VW0586	-3.2376E-17	-0.12615	1132.6	***9006.9***	-0.0568	21.0	***12.9***	**-3.160**
VW0587 (VW16734)	-1.8058E-07	-0.10650	994.16	***9207.9***	-0.0725	18.0	***13.4***	**-1.458**

$p(kPa) = [(A)(Lc)^2 + (B)(Lc) + C + (Tk)(Tc-Ti)] - [(0.10)(Bc-Bi)]$, assume Bc-Bi = 0

Trigger Level Pressure: Downstream Piezometer:25kPa; Centreline piezometer:80kPa

North Embankment 90° V-Notch Weir: Height of water(Hm): **0.03** | Flow rate (Liters/Second): **0.22**

Liters/Second (L/S) = $1380\ H_m^{2.5}$

North Embankment

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	yes
Vegetation Growth	No	No	Yes	Yes
Animal Burrows	No	No	No	No

Comments: The Weir is flooded. The reading is by visual estimation.

East Embankment

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	No
Vegetation Growth	No	No	No	yes
Animal Burrows	No	No	No	No

Comments: Several pondings on the crest.

South Embankment

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	yes
Vegetation Growth	No	No	NO	yes
Animal Burrows	No	No	No	No

Comments: Normal. No new wash-out

West Embankment

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	No
Vegetation Growth	No	No	No	No
Animal Burrows	No	No	No	No

Comments: one ponding on the crest is filled.

South Dam

South Dam Freeboard: Crest Elevation (m): 308.8 | Pond Elv(m): **300.20** | Freeboard (m): **8.6** | Comment:

Minimum opeating freeboard:5.3m; Maximum allowable pond elevation during normal operating conditions: 303.6m

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	No
Vegetation Growth	Yes	No	No	Yes
Animal Burrows	No	No	No	No

Comments: Normal. The water level has been kept at the level of ~300.2masl.

QUINSAM COAL

Tailings Disposal Facility and South Dam Inspection Report (TDF-Weekly, South Dam-Weekly)

Date:	October 21, 2020	**Inspected by**	Sarah S
Weather:	Sunny		

2 North Tailings Disposal Facility

Comments: No new wash-outs during this week.
Pondings at NE conrer is dry, pondings on the east embankment crest are as usual.

TDF Freeboard: 353.97 | Pond Elv.: **349.02** | Freeboard: **4.95** | Comment: freeboard is above water

Minimum operating freeboard:1.4m; Maximum allowable pond elevation(calculated):352.9m

North Embankment Piezometers	Polynomial Gage Factors A	B	C	Readings (Lc)	Tk	Temperature (Ti)	Temperature (Tc)	Pressure kPa
VW0583	-6.0506E-07	-0.15820	1512.4	***9265.3***	-0.0840	20.9		**-3.557**
VW0584	-1.0595E-07	-0.12602	1110.0	***8715.8***	0.2815	20.8	***14.9***	**1.926**
VW0586	-3.2376E-17	-0.12615	1132.6	***9009.5***	-0.0568	21.0	***12.9***	**-3.488**
VW0587 (VW16734)	-1.8058E-07	-0.10650	994.16	***9216.8***	-0.0725	18.0	***13.4***	**-2.436**

$p(kPa) = [(A)(Lc)^2 + (B)(Lc) + C + (Tk)(Tc-Ti)] - [(0.10)(Bc-Bi)]$, assume Bc-Bi = 0

Trigger Level Pressure: Downstream Piezometer:25kPa; Centreline piezometer:80kPa

North Embankment 90° V-Notch Weir: Height of water(Hm): **0.03** | Flow rate (Liters/Second): **0.22**

Liters/Second (L/S) = $1380\ H_m^{2.5}$

North Embankment

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	yes
Vegetation Growth	No	No	Yes	Yes
Animal Burrows	No	No	No	No

Comments: The Weir is flooded. The reading is by visual estimation.

East Embankment

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	No
Vegetation Growth	No	No	No	yes
Animal Burrows	No	No	No	No

Comments: Pondings are still on the crest.

South Embankment

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	yes
Vegetation Growth	No	No	NO	yes
Animal Burrows	No	No	No	No

Comments: Normal. No new wash-out.

West Embankment

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	No
Vegetation Growth	No	No	No	No
Animal Burrows	No	No	No	No

Comments: Normal.

South Dam

South Dam Freeboard: Crest Elevation (m): 308.8 | Pond Elv(m): **300.45** | Freeboard (m): **8.35** | Comment:

Minimum opeating freeboard:5.3m; Maximum allowable pond elevation during normal operating conditions: 303.6m

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	No
Vegetation Growth	Yes	No	No	Yes
Animal Burrows	No	No	No	No

Comments: Normal. The new survey data is used. The water level has been kept at the level of ~300.4masl.

QUINSAM COAL

Tailings Disposal Facility and South Dam Inspection Report (TDF-Weekly, South Dam-Weekly)

Date:	October 28, 2020	**Inspected by**	Sarah S
Weather:	Cloudy		

2 North Tailings Disposal Facility

Comments: Normal.
Pondings on the crest of east embankment.

TDF Freeboard: 353.97 | Pond Elv.: **349.04** | Freeboard: **4.93** | Comment: freeboard is above water

Minimum operating freeboard:1.4m; Maximum allowable pond elevation(calculated):352.9m

North Embankment Piezometers	Polynomial Gage Factors A	B	C	Readings (Lc)	Tk	Temperature (Ti)	Temperature (Tc)	Pressure kPa
VW0583	-6.0506E-07	-0.15820	1512.4	***9271.6***	-0.0840	20.9		**-4.624**
VW0584	-1.0595E-07	-0.12602	1110.0	***8716.3***	0.2815	20.8	***14.9***	**1.862**
VW0586	-3.2376E-17	-0.12615	1132.6	***9012.3***	-0.0568	21.0	***12.9***	**-3.842**
VW0587 (VW16734)	-1.8058E-07	-0.10650	994.16	***9214.6***	-0.0725	18.0	***13.4***	**-2.194**

$p(kPa) = [(A)(Lc)^2 + (B)(Lc) + C + (Tk)(Tc-Ti)] - [(0.10)(Bc-Bi)]$, assume Bc-Bi = 0

Trigger Level Pressure: Downstream Piezometer:25kPa; Centreline piezometer:80kPa

North Embankment 90° V-Notch Weir: Height of water(Hm): **0.03** | Flow rate (Liters/Second): **0.22**

Liters/Second (L/S) = $1380\ H_m^{2.5}$

North Embankment

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	yes
Vegetation Growth	No	No	Yes	Yes
Animal Burrows	No	No	No	No

Comments: The Weir is flooded. The reading is by visual estimation.

East Embankment

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	No
Vegetation Growth	No	No	No	yes
Animal Burrows	No	No	No	No

Comments: Pondings on the crest.

South Embankment

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	yes
Vegetation Growth	No	No	NO	yes
Animal Burrows	No	No	No	No

Comments: Normal. No new wash-out.

West Embankment

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	No
Vegetation Growth	No	No	No	No
Animal Burrows	No	No	No	No

Comments: Normal.

South Dam

South Dam Freeboard: Crest Elevation (m): 308.8 | Pond Elv(m): **300.45** | Freeboard (m): **8.35** | Comment:

Minimum opeating freeboard:5.3m; Maximum allowable pond elevation during normal operating conditions: 303.6m

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	No
Vegetation Growth	Yes	No	No	Yes
Animal Burrows	No	No	No	No

Comments: Normal. The new survey data is used. The water level has been kept at the level of ~300.4masl.

QUINSAM COAL

Tailings Disposal Facility and South Dam Inspection Report (TDF-Weekly, South Dam-Weekly)

Date:	November 4, 2020	**Inspected by**	Sarah S
Weather:	Raining		

2 North Tailings Disposal Facility

Comments:
Lot of rain during the last 2 days
Pondings on the crests of both 2-North TSF and South Dam
Wash-out on the downslope crest edge of theSouthwest embankment of the 2-North TSF

TDF Freeboard: 353.97 | Pond Elv.: **349.07** | Freeboard: **4.9** | Comment: freeboard is above water

Minimum operating freeboard:1.4m; Maximum allowable pond elevation(calculated):352.9m

North Embankment Piezometers	Polynomial Gage Factors A	B	C	Readings (Lc)	Tk	Temperature (Ti)	Temperature (Tc)	Pressure kPa
VW0583	-6.0506E-07	-0.15820	1512.4	***9268.3***	-0.0840	20.9		**-4.065**
VW0584	-1.0595E-07	-0.12602	1110.0	***8717.5***	0.2815	20.8	***14.9***	**1.708**
VW0586	-3.2376E-17	-0.12615	1132.6	***9012.5***	-0.0568	21.0	***12.9***	**-3.867**
VW0587 (VW16734)	-1.8058E-07	-0.10650	994.16	***9217.4***	-0.0725	18.0	***13.4***	**-2.502**

$p(kPa) = [(A)(Lc)^2 + (B)(Lc) + C + (Tk)(Tc-Ti)] - [(0.10)(Bc-Bi)]$, assume Bc-Bi = 0

Trigger Level Pressure: Downstream Piezometer:25kPa; Centreline piezometer:80kPa

North Embankment 90° V-Notch Weir: Height of water(Hm): **0.03** | Flow rate (Liters/Second): **0.22**

Liters/Second (L/S) = $1380\ H_m^{2.5}$

North Embankment

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	Yes	No	yes
Vegetation Growth	No	No	Yes	Yes
Animal Burrows	No	No	No	No

Comments:
The Weir is flooded. The reading is by visual estimation.
Pondings on the crest of the North Embankment and NE corner

East Embankment

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	Yes	No	No
Vegetation Growth	No	No	No	yes
Animal Burrows	No	No	No	No

Comments: Pondings on the crest.

South Embankment

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	yes
Vegetation Growth	No	No	NO	yes
Animal Burrows	No	No	No	No

Comments: Pondings on the crest.

West Embankment

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	Yes (see comments)	No
Wet or Seepage Areas	No	Yes	No	yes
Vegetation Growth	No	No	No	No
Animal Burrows	No	No	No	No

Comments: Pondings on the crest and wash out at the downslope edge of the crest.

South Dam

South Dam Freeboard: Crest Elevation (m): 308.8 | Pond Elv(m): **300.55** | Freeboard (m): **8.25** | Comment:

Minimum opeating freeboard:5.3m; Maximum allowable pond elevation during normal operating conditions: 303.6m

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	Yes	No	Yes
Wet or Seepage Areas	No	No	No	No
Vegetation Growth	Yes	No	No	Yes
Animal Burrows	No	No	No	No

Comments: Puddles on the crest.The water level has been kept at the level of ~300.4masl.

QUINSAM COAL

Tailings Disposal Facility and South Dam Inspection Report (TDF-Weekly, South Dam-Weekly)

Date:	November 12, 2020	**Inspected by**	Sarah S
Weather:	Cloudy/Rainy		

2 North Tailings Disposal Facility

Comments: Pondings on the crests of both 2-North TSF and South Dam
Wash-out on the downslope crest edge of the Southwest embankment of the 2-North TSF

TDF Freeboard: 353.97 | Pond Elv.: **349.12** | Freeboard: **4.85** | Comment: freeboard is above water

Minimum operating freeboard:1.4m; Maximum allowable pond elevation(calculated):352.9m

North Embankment Piezometers	Polynomial Gage Factors A	B	C	Readings (Lc)	Tk	Temperature (Ti)	Temperature (Tc)	Pressure kPa
VW0583	-6.0506E-07	-0.15820	1512.4	***9261.5***	-0.0840	20.9		**-2.913**
VW0584	-1.0595E-07	-0.12602	1110.0	***8709.8***	0.2815	20.8	***14.9***	**2.693**
VW0586	-3.2376E-17	-0.12615	1132.6	***9014.5***	-0.0568	21.0	***12.9***	**-4.119**
VW0587 (VW16734)	-1.8058E-07	-0.10650	994.16	***9217.6***	-0.0725	18.0	***13.3***	**-2.516**

$p(kPa) = [(A)(Lc)^2 + (B)(Lc) + C + (Tk)(Tc-Ti)] - [(0.10)(Bc-Bi)]$, assume Bc-Bi = 0

Trigger Level Pressure: Downstream Piezometer:25kPa; Centreline piezometer:80kPa

North Embankment 90° V-Notch Weir: Height of water(Hm): **0.03** | Flow rate (Liters/Second): **0.22**

Liters/Second (L/S) = $1380\ H_m^{2.5}$

North Embankment

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	Yes	No	yes
Vegetation Growth	No	No	Yes	Yes
Animal Burrows	No	No	No	No

Comments: The Weir is flooded. The reading is by visual estimation.
Pondings on the crest of the North Embankment and NE corner

East Embankment

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	Yes	No	No
Vegetation Growth	No	No	No	yes
Animal Burrows	No	No	No	No

Comments: Pondings on the crest.

South Embankment

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	yes
Vegetation Growth	No	No	NO	yes
Animal Burrows	No	No	No	No

Comments: Pondings on the crest.

West Embankment

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	Yes (see comments)	No
Wet or Seepage Areas	No	Yes	No	yes
Vegetation Growth	No	No	No	No
Animal Burrows	No	No	No	No

Comments: Pondings on the crest and wash out at the downslope edge of the crest.

South Dam

South Dam Freeboard: Crest Elevation (m): 308.8 | Pond Elv(m): **300.50** | Freeboard (m): **8.3** | Comment:

Minimum opeating freeboard:5.3m; Maximum allowable pond elevation during normal operating conditions: 303.6m

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	Yes	No	Yes
Wet or Seepage Areas	No	No	No	No
Vegetation Growth	Yes	No	No	Yes
Animal Burrows	No	No	No	No

Comments: Puddle on the crest.

Tailings Disposal Facility and South Dam Inspection Report (TDF-Weekly, South Dam-Weekly)

QUINSAM COAL

Date:	November 19, 2020	**Inspected by**	Sarah S
Weather:	Cloudy		

2 North Tailings Disposal Facility

Comments: Same as last week. Pondings on the crests of the crests of the TSF and South dam

TDF Freeboard: 353.97 | Pond Elv.: **349.12** | Freeboard: **4.85** | Comment: freeboard is above water

Minimum operating freeboard:1.4m; Maximum allowable pond elevation(calculated):352.9m

North Embankment Piezometers	Polynomial Gage Factors A	B	C	Readings (Lc)	Tk	Temperature (Ti)	Temperature (Tc)	Pressure kPa
VW0583	-6.0506E-07	-0.15820	1512.4	***9267.0***	-0.0840	20.9		**-3.845**
VW0584	-1.0595E-07	-0.12602	1110.0	***8714.6***	0.2815	20.8	***15.0***	**2.107**
VW0586	-3.2376E-17	-0.12615	1132.6	***9005.2***	-0.0568	21.0	***13.0***	**-2.952**
VW0587 (VW16734)	-1.8058E-07	-0.10650	994.16	***9216.4***	-0.0725	18.0	***13.8***	**-2.421**

$p(kPa) = [(A)(Lc)^2 + (B)(Lc) + C + (Tk)(Tc-Ti)] - [(0.10)(Bc-Bi)]$, assume Bc-Bi = 0

Trigger Level Pressure: Downstream Piezometer:25kPa; Centreline piezometer:80kPa

North Embankment 90° V-Notch Weir: Height of water(Hm): **0.03** | Flow rate (Liters/Second): **0.22**

Liters/Second (L/S) = $1380\ H_m^{2.5}$

North Embankment

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	Yes	No	yes
Vegetation Growth	No	No	Yes	Yes
Animal Burrows	No	No	No	No

Comments: The Weir is flooded. The reading is by visual estimation.
Pondings on the crest of the North Embankment and NE corner

East Embankment

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	Yes	No	No
Vegetation Growth	No	No	No	yes
Animal Burrows	No	No	No	No

Comments: Pondings on the crest.

South Embankment

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	yes
Vegetation Growth	No	No	NO	yes
Animal Burrows	No	No	No	No

Comments: Pondings on the crest.

West Embankment

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	Yes (see comments)	No
Wet or Seepage Areas	No	Yes	No	yes
Vegetation Growth	No	No	No	No
Animal Burrows	No	No	No	No

Comments: Pondings on the crest and wash out (abouit 3m long, 20cm deep) at the downslope edge of the crest.

South Dam

South Dam Freeboard: Crest Elevation (m): 308.8 | Pond Elv(m): **300.50** | Freeboard (m): **8.3** | Comment:

Minimum opeating freeboard:5.3m; Maximum allowable pond elevation during normal operating conditions: 303.6m

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	Yes	No	Yes
Wet or Seepage Areas	No	No	No	No
Vegetation Growth	Yes	No	No	Yes
Animal Burrows	No	No	No	No

Comments: Puddle on the crest.

QUINSAM COAL

Tailings Disposal Facility and South Dam Inspection Report (TDF-Weekly, South Dam-Weekly)

Date:	November 26, 2020	**Inspected by**	Sarah S
Weather:	Cloudy		

2 North Tailings Disposal Facility

Comments: Pondings on the crests of the crests of the TSF and South dam.
Water Level in the 2-North TSF goes up about 10cm, but still far below 4m.

TDF Freeboard: 353.97 | Pond Elv.: **349.22** | Freeboard: **4.75** | Comment: freeboard is above water

Minimum operating freeboard:1.4m; Maximum allowable pond elevation(calculated):352.9m

North Embankment Piezometers	Polynomial Gage Factors A	B	C	Readings (Lc)	Tk	Temperature (Ti)	Temperature (Tc)	Pressure kPa
VW0583	-6.0506E-07	-0.15820	1512.4	***9263.9***	-0.0840	20.9		**-3.320**
VW0584	-1.0595E-07	-0.12602	1110.0	***8710.1***	0.2815	20.8	***15.0***	**2.683**
VW0586	-3.2376E-17	-0.12615	1132.6	***9018.9***	-0.0568	21.0	***13.0***	**-4.680**
VW0587 (VW16734)	-1.8058E-07	-0.10650	994.16	***9213.2***	-0.0725	18.0	***13.6***	**-2.055**

$p(kPa) = [(A)(Lc)^2 + (B)(Lc) + C + (Tk)(Tc-Ti)] - [(0.10)(Bc-Bi)]$, assume Bc-Bi = 0

Trigger Level Pressure: Downstream Piezometer:25kPa; Centreline piezometer:80kPa

North Embankment 90° V-Notch Weir: Height of water(Hm): **0.04** | Flow rate (Liters/Second): **0.44**

Liters/Second (L/S) = $1380\ H_m^{2.5}$

North Embankment

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	Yes	No	yes
Vegetation Growth	No	No	Yes	Yes
Animal Burrows	No	No	No	No

Comments: The Weir is flooded. The reading is by visual estimation.
Pondings on the crest of the North Embankment and NE corner

East Embankment

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	Yes	No	No
Vegetation Growth	No	No	No	yes
Animal Burrows	No	No	No	No

Comments: Pondings on the crest.

South Embankment

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	yes
Vegetation Growth	No	No	NO	yes
Animal Burrows	No	No	No	No

Comments: Pondings on the crest.

West Embankment

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	Yes (see comments)	No
Wet or Seepage Areas	No	Yes	No	yes
Vegetation Growth	No	No	No	No
Animal Burrows	No	No	No	No

Comments: Pondings on the crest and wash out (about 3m long, 20cm deep) at the downslope edge of the crest.The wash-out is same.

South Dam

South Dam Freeboard: Crest Elevation (m): 308.8 | Pond Elv(m): **300.55** | Freeboard (m): **8.25** | Comment:

Minimum opeating freeboard:5.3m; Maximum allowable pond elevation during normal operating conditions: 303.6m

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	Yes	No	Yes
Wet or Seepage Areas	No	No	No	No
Vegetation Growth	Yes	No	No	Yes
Animal Burrows	No	No	No	No

Comments: Puddle on the crest.

QUINSAM COAL

Tailings Disposal Facility and South Dam Inspection Report (TDF-Weekly, South Dam-Weekly)

Date:	December 2, 2020	**Inspected by**	Sarah S
Weather:	Sunny		

2 North Tailings Disposal Facility

Comments: The weather is frozen and cold. Pondings frozen on the crests of the TSF and South dam.

TDF Freeboard: 353.97 | Pond Elv.: **349.52** | Freeboard: **4.45** | Comment: freeboard is above water

Minimum operating freeboard:1.4m; Maximum allowable pond elevation(calculated):352.9m

North Embankment Piezometers	Polynomial Gage Factors A	B	C	Readings (Lc)	Tk	Temperature (Ti)	Temperature (Tc)	Pressure kPa
VW0583	-6.0506E-07	-0.15820	1512.4	***9265.3***	-0.0840	20.9		**-3.557**
VW0584	-1.0595E-07	-0.12602	1110.0	***8711.8***	0.2815	20.8	***15.0***	**2.465**
VW0586	-3.2376E-17	-0.12615	1132.6	***9017.0***	-0.0568	21.0	***13.0***	**-4.440**
VW0587 (VW16734)	-1.8058E-07	-0.10650	994.16	***9213.6***	-0.0725	18.0	***13.7***	**-2.106**

$p(kPa) = [(A)(Lc)^2 + (B)(Lc) + C + (Tk)(Tc-Ti)] - [(0.10)(Bc-Bi)]$, assume Bc-Bi = 0

Trigger Level Pressure: Downstream Piezometer:25kPa; Centreline piezometer:80kPa

North Embankment 90° V-Notch Weir: Height of water(Hm): **0.04** | Flow rate (Liters/Second): **0.44**

Liters/Second (L/S) = $1380\ H_m^{2.5}$

North Embankment

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	Yes	No	yes
Vegetation Growth	No	No	Yes	Yes
Animal Burrows	No	No	No	No

Comments: The Weir is flooded. The reading is by visual estimation.
Pondings on the crest of the North Embankment and NE corner

East Embankment

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	Yes	No	No
Vegetation Growth	No	No	No	yes
Animal Burrows	No	No	No	No

Comments: Frozen pondings on the crest.

South Embankment

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	yes
Vegetation Growth	No	No	NO	yes
Animal Burrows	No	No	No	No

Comments: Normal.

West Embankment

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	Yes (see comments)	No
Wet or Seepage Areas	No	Yes	No	yes
Vegetation Growth	No	No	No	No
Animal Burrows	No	No	No	No

Comments: Pondings on the crest and wash out (about 3m long, 20cm deep) at the downslope edge of the crest.The wash-out is same.

South Dam

South Dam Freeboard: Crest Elevation (m): 308.8 | Pond Elv(m): **300.50** | Freeboard (m): **8.3** | Comment:

Minimum opeating freeboard:5.3m; Maximum allowable pond elevation during normal operating conditions: 303.6m

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	Yes	No	Yes
Wet or Seepage Areas	No	No	No	No
Vegetation Growth	Yes	No	No	Yes
Animal Burrows	No	No	No	No

Comments: Frozen puddles on the crest.

QUINSAM COAL

Tailings Disposal Facility and South Dam Inspection Report (TDF-Weekly, South Dam-Weekly)

Date:	December 9, 2020	**Inspected by**	Sarah S
Weather:	Sunny		

2 North Tailings Disposal Facility

Comments: The weather is nice. Toes of the East and North embankment of the 2North TSF are inspected and nothing significant is noted.

TDF Freeboard: 353.97 | Pond Elv.: **349.52** | Freeboard: **4.45** | Comment: freeboard is above water

Minimum operating freeboard:1.4m; Maximum allowable pond elevation(calculated):352.9m

North Embankment Piezometers	Polynomial Gage Factors A	B	C	Readings (Lc)	Tk	Temperature (Ti)	Temperature (Tc)	Pressure kPa
VW0583	-6.0506E-07	-0.15820	1512.4	***9264.9***	-0.0840	20.9		**-3.489**
VW0584	-1.0595E-07	-0.12602	1110.0	***8710.7***	0.2815	20.8	***15.0***	**2.606**
VW0586	-3.2376E-17	-0.12615	1132.6	***9009.4***	-0.0568	21.0	***13.0***	**-3.481**
VW0587 (VW16734)	-1.8058E-07	-0.10650	994.16	***9212.5***	-0.0725	18.0	***13.7***	**-1.985**

$p(kPa) = [(A)(Lc)^2 + (B)(Lc) + C + (Tk)(Tc-Ti)] - [(0.10)(Bc-Bi)]$, assume Bc-Bi = 0

Trigger Level Pressure: Downstream Piezometer:25kPa; Centreline piezometer:80kPa

North Embankment 90° V-Notch Weir: Height of water(Hm): **0.04** | Flow rate (Liters/Second): **0.44**

Liters/Second (L/S) = $1380\ H_m^{2.5}$

North Embankment

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	Yes	No	yes
Vegetation Growth	No	No	Yes	Yes
Animal Burrows	No	No	No	No

Comments: The Weir is flooded. The reading is by visual estimation.
Pondings on the crest of the North Embankment and NE corner

East Embankment

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	Yes	No	No
Vegetation Growth	No	No	No	yes
Animal Burrows	No	No	No	No

Comments: Pondings on the crest.

South Embankment

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	yes
Vegetation Growth	No	No	NO	yes
Animal Burrows	No	No	No	No

Comments: Normal.

West Embankment

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	Yes (see comments)	No
Wet or Seepage Areas	No	Yes	No	yes
Vegetation Growth	No	No	No	No
Animal Burrows	No	No	No	No

Comments: Pondings on the crest and wash out (about 3m long, 20cm deep) at the downslope edge of the crest.The wash-out is same.

South Dam

South Dam Freeboard: Crest Elevation (m): 308.8 | Pond Elv(m): **300.55** | Freeboard (m): **8.25** | Comment:

Minimum opeating freeboard:5.3m; Maximum allowable pond elevation during normal operating conditions: 303.6m

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	Yes	No	Yes
Wet or Seepage Areas	No	No	No	No
Vegetation Growth	Yes	No	No	Yes
Animal Burrows	No	No	No	No

Comments: Puddles on the crest.

QUINSAM COAL

Tailings Disposal Facility and South Dam Inspection Report (TDF-Weekly, South Dam-Weekly)

Date:	December 16, 2020	**Inspected by**	Sarah S
Weather:	Overcast		

2 North Tailings Disposal Facility

Comments: Downslopes of all embankments are inspected, no issue is notified.

TDF Freeboard: 353.97 | Pond Elv.: **349.67** | Freeboard: **4.3** | Comment: freeboard is above water

Minimum operating freeboard:1.4m; Maximum allowable pond elevation(calculated):352.9m

North Embankment Piezometers	Polynomial Gage Factors A	B	C	Readings (Lc)	Tk	Temperature (Ti)	Temperature (Tc)	Pressure kPa
VW0583	-6.0506E-07	-0.15820	1512.4	***9276.5***	-0.0840	20.9		**-5.454**
VW0584	-1.0595E-07	-0.12602	1110.0	***8725.9***	0.2815	20.8	***15.1***	**0.690**
VW0586	-3.2376E-17	-0.12615	1132.6	***9020.5***	-0.0568	21.0	***13.0***	**-4.882**
VW0587 (VW16734)	-1.8058E-07	-0.10650	994.16	***9230.9***	-0.0725	18.0	***13.8***	**-4.013**

$p(kPa) = [(A)(Lc)^2 + (B)(Lc) + C + (Tk)(Tc-Ti)] - [(0.10)(Bc-Bi)]$, assume Bc-Bi = 0

Trigger Level Pressure: Downstream Piezometer:25kPa; Centreline piezometer:80kPa

North Embankment 90° V-Notch Weir: Height of water(Hm): **0.04** | Flow rate (Liters/Second): **0.44**

Liters/Second (L/S) = $1380\ H_m^{2.5}$

North Embankment

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	Yes	No	yes
Vegetation Growth	No	No	Yes	Yes
Animal Burrows	No	No	No	No

Comments: The Weir is flooded. The reading is by visual estimation.
Pondings on the crest of the North Embankment and NE corner

East Embankment

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	Yes	No	No
Vegetation Growth	No	No	No	yes
Animal Burrows	No	No	No	No

Comments: Pondings on the crest.

South Embankment

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	yes
Vegetation Growth	No	No	NO	yes
Animal Burrows	No	No	No	No

Comments: the previous wash-out on the downslope of the south embankment is re-opened slightly, with depth of about 5cm.

West Embankment

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	Yes (see comments)	No
Wet or Seepage Areas	No	Yes	No	yes
Vegetation Growth	No	No	No	No
Animal Burrows	No	No	No	No

Comments: Pondings on the crest and wash out (about 3m long, 20cm deep) at the downslope edge of the crest.The wash-out is same.

South Dam

South Dam Freeboard: Crest Elevation (m): 308.8 | Pond Elv(m): **300.45** | Freeboard (m): **8.35** | Comment:

Minimum opeating freeboard:5.3m; Maximum allowable pond elevation during normal operating conditions: 303.6m

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	Yes	No	Yes
Wet or Seepage Areas	No	No	No	No
Vegetation Growth	Yes	No	No	Yes
Animal Burrows	No	No	No	No

Comments: Normal.

QUINSAM COAL

Tailings Disposal Facility and South Dam Inspection Report (TDF-Weekly, South Dam-Weekly)

Date:	December 23, 2020	**Inspected by**	Sarah S
Weather:	cloudy		

2 North Tailings Disposal Facility

Comments: Water level in the 2North TSF goes up 40cm since last inspection., still lots of space below the minimum operating freeboard (1.4m).

TDF Freeboard: 353.97 | Pond Elv.: **350.07** | Freeboard: **3.9** | Comment: freeboard is above water

Minimum operating freeboard:1.4m; Maximum allowable pond elevation(calculated):352.9m

North Embankment Piezometers	Polynomial Gage Factors A	B	C	Readings (Lc)	Tk	Temperature (Ti)	Temperature (Tc)	Pressure kPa
VW0583	-6.0506E-07	-0.15820	1512.4	***9261.5***	-0.0840	20.9		**-2.913**
VW0584	-1.0595E-07	-0.12602	1110.0	***8706.3***	0.2815	20.8	***15.1***	**3.197**
VW0586	-3.2376E-17	-0.12615	1132.6	***9009.7***	-0.0568	21.0	***13.1***	**-3.525**
VW0587 (VW16734)	-1.8058E-07	-0.10650	994.16	***9206.7***	-0.0725	18.0	***13.8***	**-1.356**

$p(kPa) = [(A)(Lc)^2 + (B)(Lc) + C + (Tk)(Tc-Ti)] - [(0.10)(Bc-Bi)]$, assume Bc-Bi = 0

Trigger Level Pressure: Downstream Piezometer:25kPa; Centreline piezometer:80kPa

North Embankment 90° V-Notch Weir: Height of water(Hm): **0.04** | Flow rate (Liters/Second): **0.44**

Liters/Second (L/S) = $1380\ H_m^{2.5}$

North Embankment

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	Yes	No	yes
Vegetation Growth	No	No	Yes	Yes
Animal Burrows	No	No	No	No

Comments: The Weir is flooded. The reading is by visual estimation.
Pondings on the crest of the North Embankment and NE corner

East Embankment

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	Yes	No	No
Vegetation Growth	No	No	No	yes
Animal Burrows	No	No	No	No

Comments: Pondings on the crest.

South Embankment

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	yes
Vegetation Growth	No	No	NO	yes
Animal Burrows	No	No	No	No

Comments: the previous wash-out on the downslope of the south embankment is re-opened slightly, with depth of about 5cm.

West Embankment

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	Yes (see comments)	No
Wet or Seepage Areas	No	Yes	No	yes
Vegetation Growth	No	No	No	No
Animal Burrows	No	No	No	No

Comments: Pondings on the crest and wash out (about 3m long, 20cm deep) at the downslope edge of the crest.The wash-out is same.

South Dam

South Dam Freeboard: Crest Elevation (m): 308.8 | Pond Elv(m): **300.55** | Freeboard (m): **8.25** | Comment:

Minimum opeating freeboard:5.3m; Maximum allowable pond elevation during normal operating conditions: 303.6m

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	Yes	No	Yes
Wet or Seepage Areas	No	No	No	No
Vegetation Growth	Yes	No	No	Yes
Animal Burrows	No	No	No	No

Comments: Normal.

QUINSAM COAL

Tailings Disposal Facility and South Dam Inspection Report (TDF-Weekly, South Dam-Weekly)

Date:	December 30, 2020	**Inspected by**	Sarah S
Weather:	Rainy		

2 North Tailings Disposal Facility

Comments: Normal for winter season.

TDF Freeboard: 353.97 | Pond Elv.: **350.17** | Freeboard: **3.8** | Comment: freeboard is above water

Minimum operating freeboard:1.4m; Maximum allowable pond elevation(calculated):352.9m

North Embankment Piezometers	Polynomial Gage Factors A	B	C	Readings (Lc)	Tk	Temperature (Ti)	Temperature (Tc)	Pressure kPa
VW0583	-6.0506E-07	-0.15820	1512.4	***9265.8***	-0.0840	20.9		**-3.641**
VW0584	-1.0595E-07	-0.12602	1110.0	***8719.4***	0.2815	20.8	***15.1***	**1.522**
VW0586	-3.2376E-17	-0.12615	1132.6	***9017.8***	-0.0568	21.0	***13.1***	**-4.547**
VW0587 (VW16734)	-1.8058E-07	-0.10650	994.16	***9224.5***	-0.0725	18.0	***13.8***	**-3.311**

$p(kPa) = [(A)(Lc)^2 + (B)(Lc) + C + (Tk)(Tc-Ti)] - [(0.10)(Bc-Bi)]$, assume Bc-Bi = 0

Trigger Level Pressure: Downstream Piezometer:25kPa; Centreline piezometer:80kPa

North Embankment 90° V-Notch Weir: Height of water(Hm): **0.04** | Flow rate (Liters/Second): **0.44**

Liters/Second (L/S) = $1380\ H_m^{2.5}$

North Embankment

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	Yes	No	yes
Vegetation Growth	No	No	Yes	Yes
Animal Burrows	No	No	No	No

Comments: The Weir is flooded. The reading is by visual estimation.
Large Pondings on the crest of the North Embankment and NE corner

East Embankment

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	Yes	No	No
Vegetation Growth	No	No	No	yes
Animal Burrows	No	No	No	No

Comments: Pondings on the crest.

South Embankment

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	No	No
Wet or Seepage Areas	No	No	No	yes
Vegetation Growth	No	No	NO	yes
Animal Burrows	No	No	No	No

Comments: same as last week

West Embankment

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	No	Yes (see comments)	No
Wet or Seepage Areas	No	Yes	No	yes
Vegetation Growth	No	No	No	No
Animal Burrows	No	No	No	No

Comments: Pondings on the crest and wash out (about 3m long, 20cm deep) at the downslope edge of the crest.The wash-out is same.

South Dam

South Dam Freeboard: Crest Elevation (m): 308.8 | Pond Elv(m): **300.75** | Freeboard (m): **8.05** | Comment:

Minimum opeating freeboard:5.3m; Maximum allowable pond elevation during normal operating conditions: 303.6m

	Upstream Slope	Crest	Downstream Slope	Downstream Toe
Cracks	No	No	No	No
Settlement	No	No	No	No
Sloughing, Slide, Bulging	No	Yes	No	Yes
Wet or Seepage Areas	No	No	No	No
Vegetation Growth	Yes	No	No	Yes
Animal Burrows	No	No	No	No

Comments: 2North-3Mains pump is to WP PAG pond.

Date: Feb 12, 2020

Subject: Weekly inspection of the WFM

Today I did inspection for both TSF and water dams. There is one thing need to be notified:
I noticed 3 new ditches/channels (spaced at maximum of 2m) have been made by mine personnel towards downslope of the dam crest at SP1 in order to reduce the ponding water on the crest. This action will be harmful for dam integrity because further erosion channel will be easily developed along this.

We should make sure no ditches/channels should be excavated towards downslope.

For proper operation, these channels/ditches should be dug towards to pond, if needed to.

Here are photos for these dug ditches.

Weekly Inspection Report
Water Management Facility (WMF)-SP1, 2S, 3S and SP4

Date: April 30, 2020 **Weather:** Cloudy and Shower **Inspector:** Sarah S

Weekly Summary:

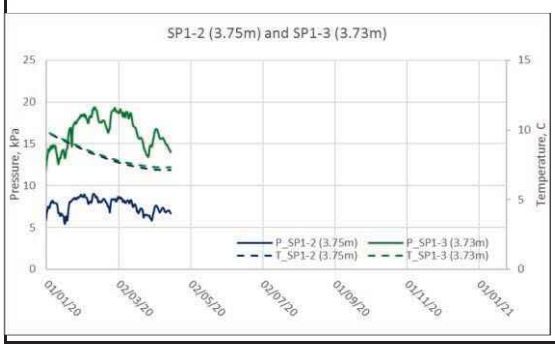
3S float pump was switched to 2S on April 6, 2020. Plant pump was turned on April 22, 2020.
Water management system during the low flow season is initiated for both north and south mine.
Vegetation control for WMF is ongoing, started in March, 2020.
Water Quality at SP4 is monitored by environmental staff.

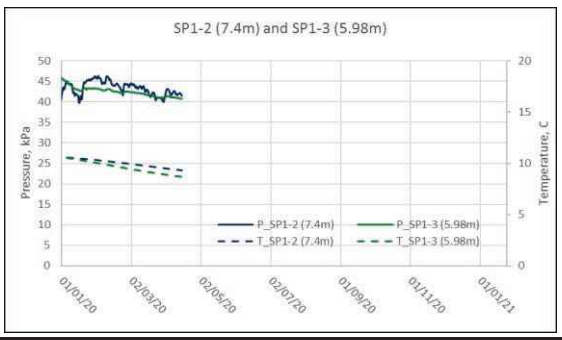
Settling Pond #1 (SP1)-South Water Management System

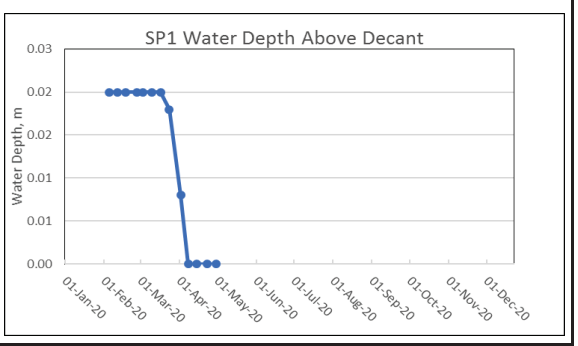
Notes: No discharge at SP1; Vegetation on spillway, downstream and debris in the pond needs to be controlled;depression on the crest above the decant needs to be investigated or filled when weather allows.

Depth of Water Above Decant (m):0
Vegetation and Debris: ongoing, QCC cut some trees flush in March and April. Blackfish was on site on April 28, 2020 for vegetation control
Pumps and Pipelines: no change

Instrumentation: VWPs Staff Gauge



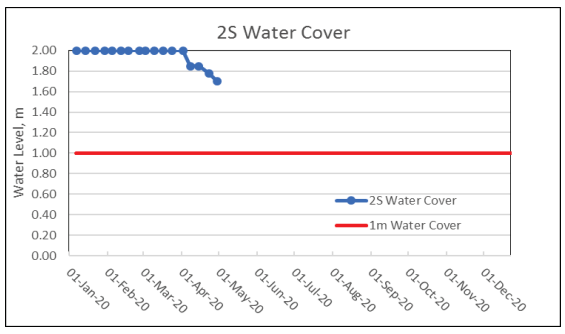




2-South PAG-CCR Pond (2S)-South Water Management System

Notes: Q11-11 (2S UG pump) is down
Gate valves at 2S are on to allow freshwater into 2S pit.
Depth of Water Cover (m): 1.7 **Water Level at 2SI (m): 0.1**
Vegetation and Debris: maintained
Pumps and Pipelines: Gate valves are open; 2S and 3S water are in closed loop system

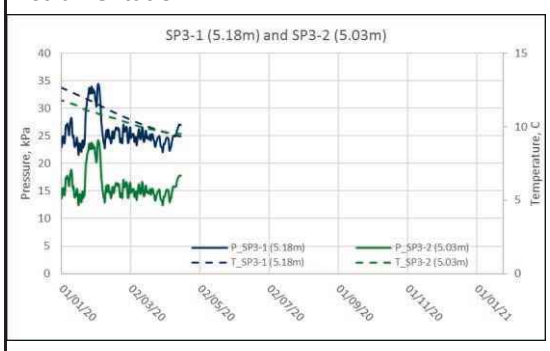
Instrumentation: no pizeometers at 2S pit. Staff Gauge

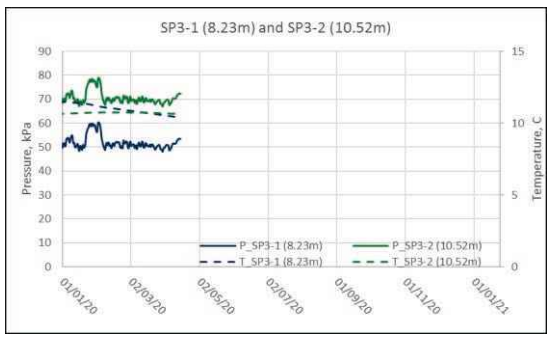


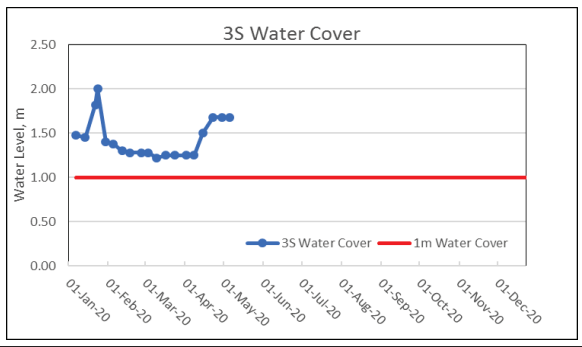
3-South PAG-CCR Pond (3S)-South Water Management System

Notes: 3S float pump is raised at about 1.7m.
The VWPs fluctuation at 3S at the beginning of February, when the disel pump was operated as a contigency plan for the site water management.
Depth of Water Cover (m): 1.68 **H-Flume Reading at 2SC:**0.099
Vegetation and Debris: maintained
Pumps and Pipelines: 3S float pump is pumping to 2S**;** 2S and 3S water are in closed loop system

Instrumentation: VWPs Staff Gauge



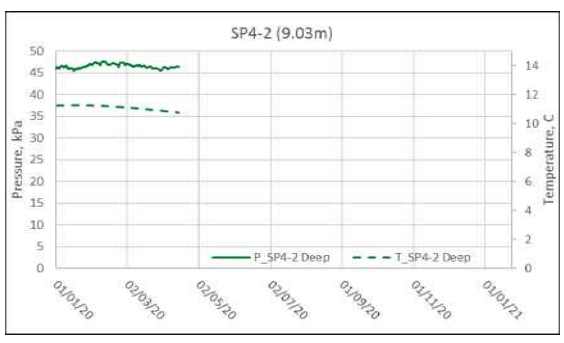


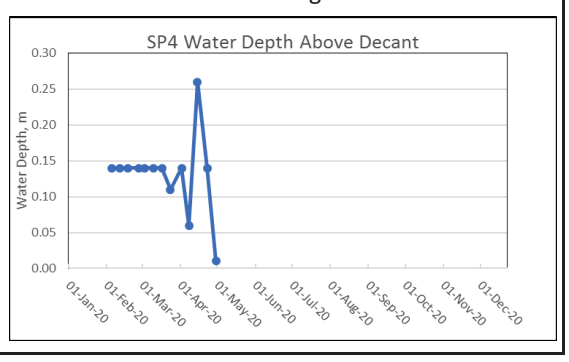


Settling Pond #4 (SP4)-North Water Management System

Notes: Water color is orangy green. The high water depth above decant in early April was due to the siphoning water from the TSF.
Pump at SP4 (plant pump) is on during the day shift to divert the water into 2North PAG pond to reduce the discharge at SP4.
Vegetation on spillway, downstream and debris in the pond needs to be controlled.
Depth of Water Above Decant (m): 0.01
Vegetation and Debris: ongoing, Blackfish was at site on April 28, 2020 for vegetation control
Pumps and Pipelines: the pump to plant is on

Instrumentation: VWPs Staff Gauge





Weekly Inspection Report
Water Management Facility (WMF)-SP1, 2S, 3S and SP4

QUINSAM COAL

Date: May 6, 2020 **Weather:** Nice, Sunny **Inspector:** Sarah S and John M

Weekly Summary:

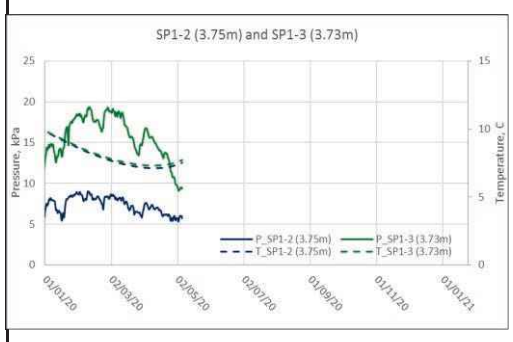
Water management system during the low flow season is initiated for both north and south mine.
Spillways at SP1, SP4 and 3S are not flowing.
2S undergound pump is fixed except a leaking valves on the surface.
Vegetation control for WMF is ongoing. Most of the trees and shrubs are cut off at surface of SP1.
Wet spots at SP4 and SP1 are continuously inspected to see wether it is seepage or not.

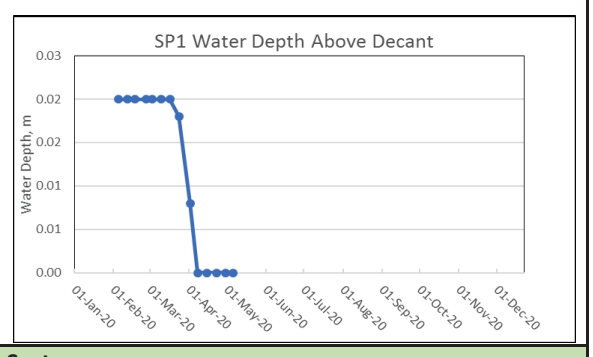
Settling Pond #1 (SP1)-South Water Management System

Notes: No discharge at SP1; trees and shrubs on the upstream and spillway are cut flush with the ground surface; The cut-down branches needs to be cleaned up.

Crest and Slopes Stability: Ruts in the crest caused by vehicle; no gullies, cracks, sinkholes, slides obseved on the downstream slope.
Vegetation: ongoing, most of the shrubs and trees have been cut off by QCC employees.
Seepage: No seepage is observed on downstream slope and toe.
Animal Activity: No burrowing is observed.
Pumps and Pipelines: No change.

Instrumentation: VWPs (2 shallow and 2 deep) Staff Gauge

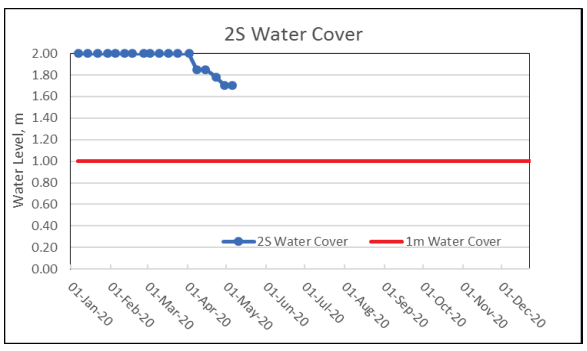




2-South PAG-CCR Pond (2S)-South Water Management System

Notes: No overflow to discharge channel to 3S; Q11-11 (2S UG pump) was fixed on April 5, 2020 except for a leaking valve.

Crest and Slope Stability: No ruts and settlement in the crest; no gullies, cracks, sinkholes, slides obseved on the crest and downstream slope.
Vegetation Control: trees and shrubs on the two slopes of the central connection way should be cut off.
Seepage: Seeping to 3S pit
Animal Activity: No burrowing is observed.
Pumps and Pipelines: Gate valves are open; 2S and 3S water are in closed loop system.
Instrumentation: no pizeometers at 2S pit.
Flow at 2S Inlet (m) ~0.1
Overflow to 3S: No

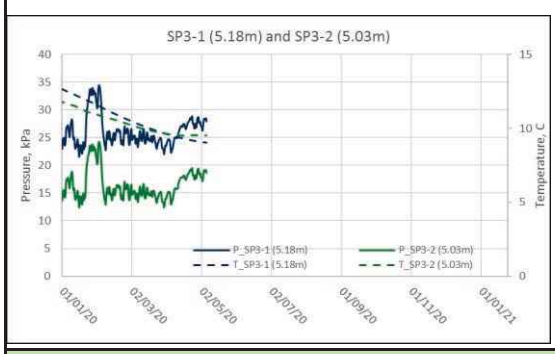


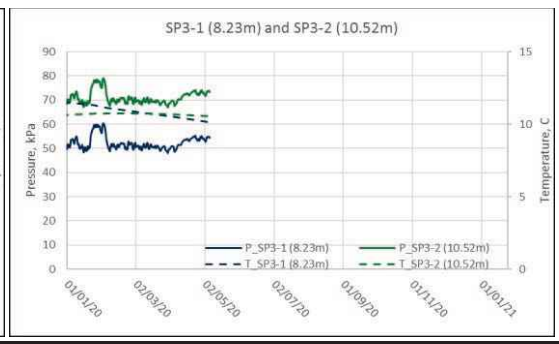
3-South PAG-CCR Pond (3S)-South Water Management System

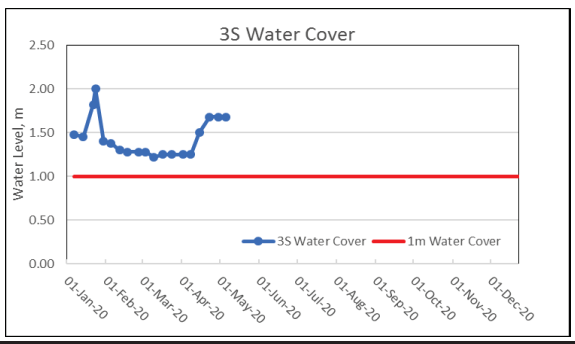
Notes: getotechnical concern of the inclined trees at the downstream slope of the dyke is being monitored and no significant change is observed.

Crest and Slope Stability: No ruts and settlement in the crest; no gullies, cracks, sinkholes, slides obseved on the crest and downstream slope.
Vegetation: Well-maintained
Seepage: No seepage is observed on downstream slope and toe
Animal Activity: No burrowing is observed
Pumps and Pipelines: 3S float pump is pumping to 2S; 2S and 3S water are in closed loop system

Instrumentation: VWPs (2 shallow and 2 deep) Staff Gauge





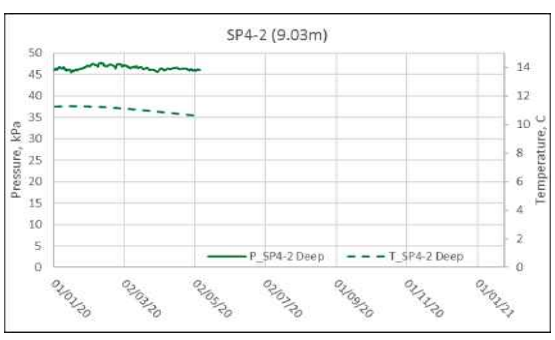


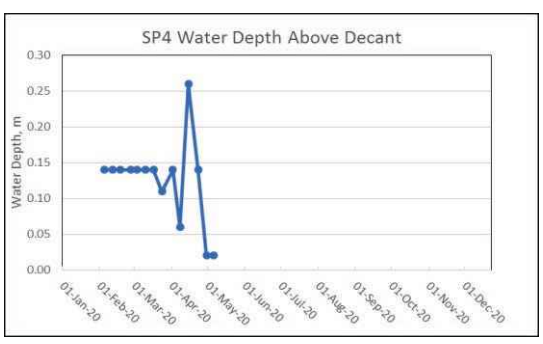
Settling Pond #4 (SP4)-North Water Management System

Notes: Water color is orangy green; Pump at SP4 (plant pump) is on during the day shift to divert the water into 2North PAG pond to reduce the discharge at SP4:Vegetation on spillway, downstream and debris in the pond needs to be controlled.

Crest and Slope Stability: No ruts and settlement in the crest; no gullies, cracks, sinkholes, slides obseved on the downstream slope.
Vegetation Control: Noxious weed control on May 11, 2020.
Seepage: No seepage is observed on downstream slope and toe
Animal Activity: No burrowing is observed
Pumps and Pipelines: The plant pump is on

Instrumentation: VWPs (1 shallow and 1 deep) Staff Gauge





Weekly Inspection Report
Water Management Facility (WMF)-SP1, 2S, 3S and SP4

Date: May 13, 2020 **Weather:** Cloudy and Rainy **Inspector:** Sarah S

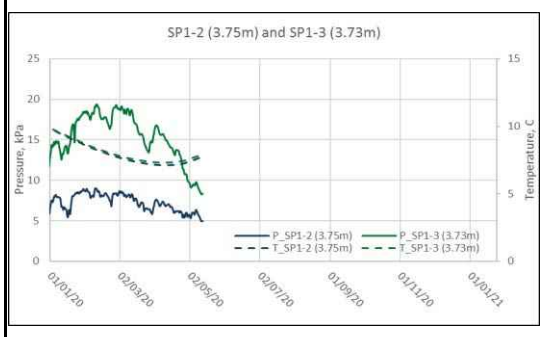
Weekly Summary:
2S undergound pump starts working on May 12, 2020.
Half of the trees/shrubs in the spillway at SP4 is cut off.
Most of the trees and shrubs in the spillway are cut off at SP1; bebris need be cleaned up.
Wet spots at SP4 and SP1 are continuously inspected to see wether it is seepage or not.
Water management system during the low flow season is initiated for both north and south mine.

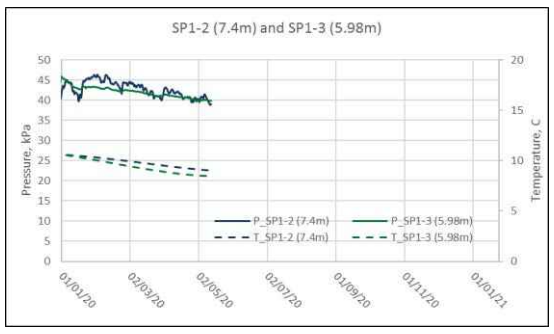
Settling Pond #1 (SP1)-South Water Management System

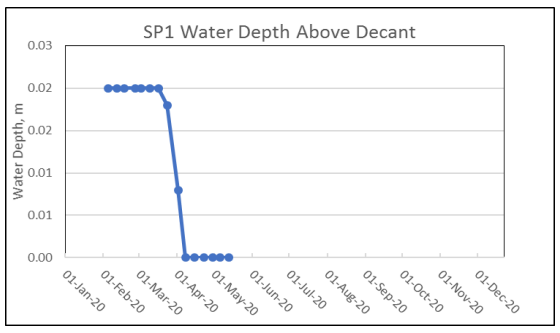
Notes: The cut-down branches needs to be cleaned up.

Crest and Slopes Stability: Ruts in the crest caused by vehicle; no gullies, cracks, sinkholes, slides obseved on the downstream slope.
Vegetation: ongoing, most of the shrubs and trees have been cut off by QCC employees.
Seepage: No apprent seepage is observed; wet spots on the downstream side are being monitored.
Animal Activity: No burrowing is observed.
Spillway: Vegetation at spillway is cut off; debris and cut-branches need clean up.
Water Management: No discharge at SP1; The valve controling the flow to SP1 is switched to 2S.

Instrumentation: VWPs (2 shallow and 2 deep) Staff Gauge

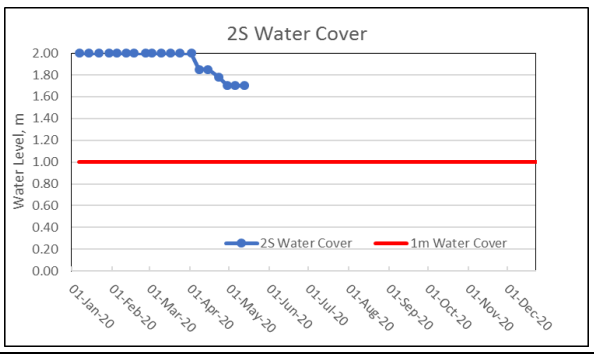






2-South PAG-CCR Pond (2S)-South Water Management System

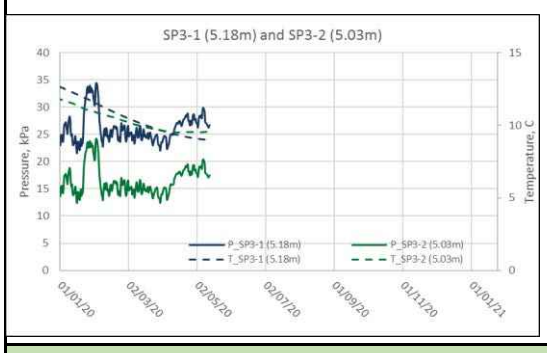
Notes: Q11-11 (2S UG pump) starts working on May 13, 2020; Vegetation needs to be controlled at 2S central passway.
Crest and Slope Stability: No ruts and settlement in the crest; no gullies, cracks, sinkholes, slides obseved on the crest and downstream slope.
Vegetation Control: Trees and shrubs on the two slopes of the central connection way need be cut off.
Seepage: Seeping to 3S pit
Animal Activity: No burrowing is observed.
Water Management: Gate valves are open; 2S and 3S water are in closed loop system.
Instrumentation: No pizeometers at 2S pit.
Flow at 2S Inlet (m) ~0.09
Spillway/Discharge Channel No overflow

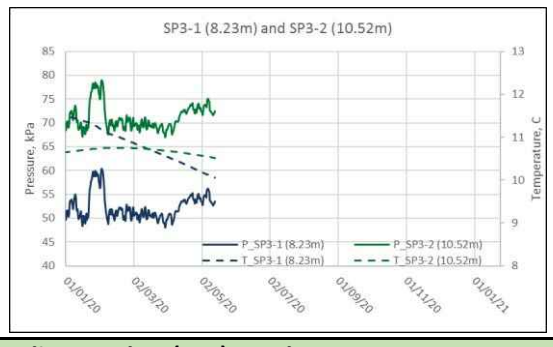


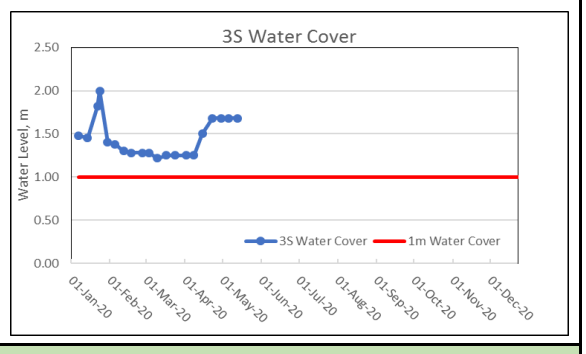
3-South PAG-CCR Pond (3S)-South Water Management System

Notes: getotechnical concern of the inclined trees at the downstream slope of the dyke is being monitored and no significant change is observed.
Crest and Slope Stability: No ruts and settlement in the crest; no gullies, cracks, sinkholes, slides obseved on the crest and downstream slope.
Vegetation: Well-maintained
Seepage: No seepage is observed on downstream slope and toe.
Animal Activity: No burrowing is observed
Spillway: Not being used and not permitted.
Water Management: 3S float pump is pumping to 2S; 2S and 3S water are in closed loop system.

Instrumentation: VWPs (2 shallow and 2 deep) Staff Gauge



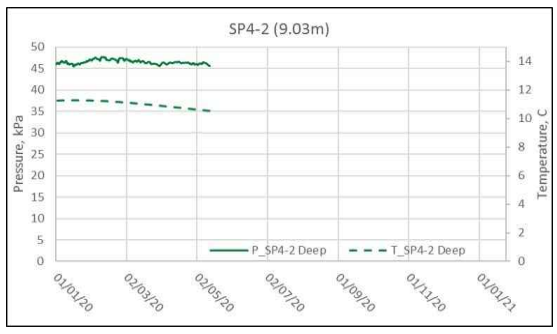


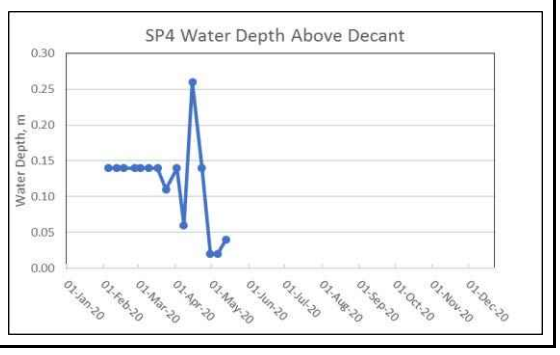


Settling Pond #4 (SP4)-North Water Management System

Notes: Water color is orangy green; The rest trees/shrubs need to be cut off at SP4.
Crest and Slope Stability: No ruts and settlement in the crest; no gullies, cracks, sinkholes, slides obseved on the downstream slope.
Vegetation Control: Half of the trees/shrubs on spillway is cut off on May 13, 2020.
Seepage: No seepage is observed on downstream slope and toe.
Animal Activity: No burrowing is observed.
Spillway: Vegetation at spillway is cut off; bebris and cut-branches need clean up.
Water Management: The plant pump is on during the day and off during the night.

Instrumentation: VWPs (1 shallow and 1 deep) Staff Gauge





Weekly Inspection Report
Water Management Facility (WMF)-SP1, 2S, 3S and SP4

Date: May 20, 2020 **Weather:** Cloudy **Inspector:** Sarah S

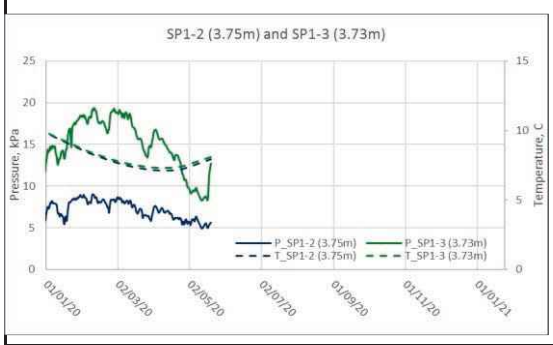
Weekly Summary:
Heavy rain on May 16, 2020; had rain (showers) almost every day during the past week.
Noxious weed control on SP1 and SP4 on May 19, 2020 following Pest Managment Regulations.
Most of the trees and shrubs in the spillways of SP1 and SP4 are cut off; bebris need be cleaned up.
Water management system during the low flow season is initiated for both north and south mine.
No flow at the SP1 and SP4 spillways.

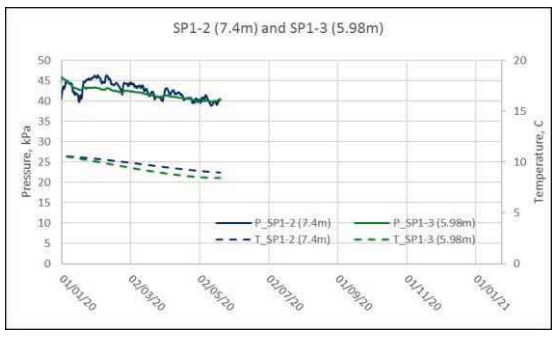
Settling Pond #1 (SP1)-South Water Management System

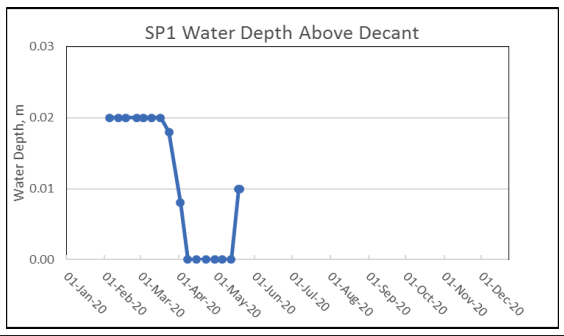
Notes: depressions/ruts need be filled

Crest and Slopes Stability: Ruts in the crest; no gullies, cracks, sinkholes, slides obseved on the downstream slope.
Vegetation: Ongoing, spary on noxious weed on May 19 following pest management guideline
Seepage: No apprent seepage is observed; wet spots on the downstream side are being monitored.
Animal Activity: No burrowing is observed.
Spillway: No overflow; debris and cut-branches need clean up.
Water Management: Discharging at SP1; 3S water is currently pumping to SP1

Instrumentation: VWPs (2 shallow and 2 deep) Staff Gauge

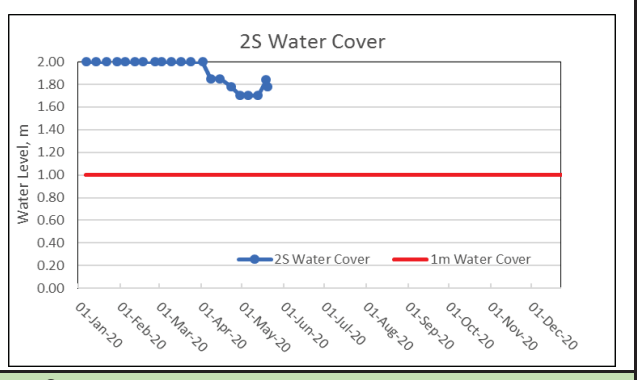






2-South PAG-CCR Pond (2S)-South Water Management System

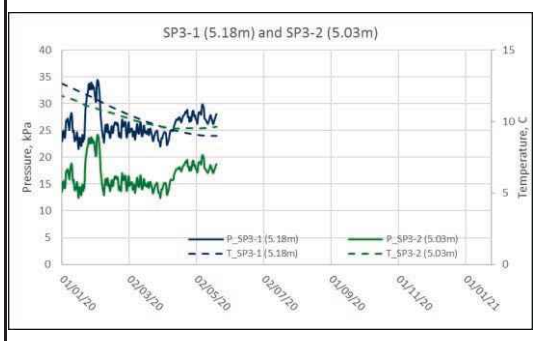
Notes: Q11-11 (2S UG pump) starts working on May 13, 2020; Vegetation needs to be controlled at 2S central passway.
Crest and Slope Stability: No settlement, gullies, cracks and slouging observed
Vegetation Control: Trees and shrubs on the two slopes of the central connection way need be cut off.
Seepage: Seeping to 3S pit
Animal Activity: No burrowing is observed.
Water Management: Gate valves are open
Instrumentation: No pizeometers at 2S pit.
Flow at 2S Inlet (m) ~0.1
Spillway/Discharge Channel No overflow

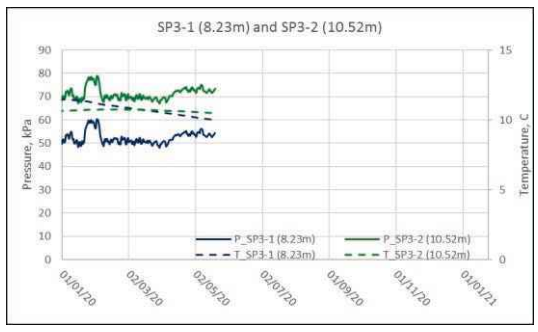


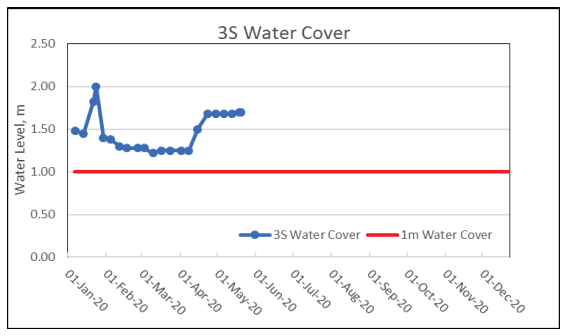
3-South PAG-CCR Pond (3S)-South Water Management System

Notes: getotechnical concern of the inclined trees at the downstream slope of the dyke is being monitored and no significant change is observed.
Crest and Slope Stability: Small ponding on the crest; No cracks, and sloughingobseved observed
Vegetation: Well-maintained
Seepage: No seepage is observed on downstream slope and toe.
Animal Activity: No burrowing is observed
Spillway: Not being used and not permitted.
Water Management: 3S float pump is pumping to permitted discharge site, SP1

Instrumentation: VWPs (2 shallow and 2 deep) Staff Gauge



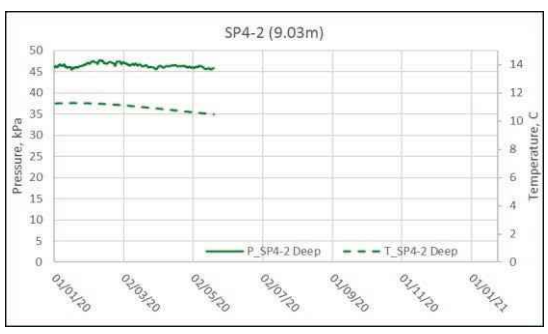


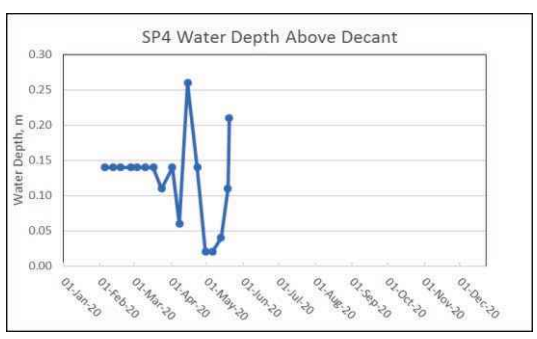


Settling Pond #4 (SP4)-North Water Management System

Notes: Water color is orangy green; No water quality concern after detailed investigation by Environmental staff; Vegetation control is still going on, mainly by hand-pulling/brushing.
Crest and Slope Stability: No cracks, gullies and sloughing observed
Vegetation Control: Ongoing; Spary on noxious weed on May 19 following pest management guideline.
Seepage: No seepage is observed on downstream slope and toe.
Animal Activity: No burrowing is observed.
Spillway: No overflow; debris and cut-branches need clean up.
Water Management: The plant pump is off.

Instrumentation: VWPs (1 shallow and 1 deep) Staff Gauge





Weekly Inspection Report
Water Management Facility (WMF)-SP1, 2S, 3S and SP4

QUINSAM COAL

Date: May 27, 2020 **Weather:** Sunny **Inspector:** Sarah S

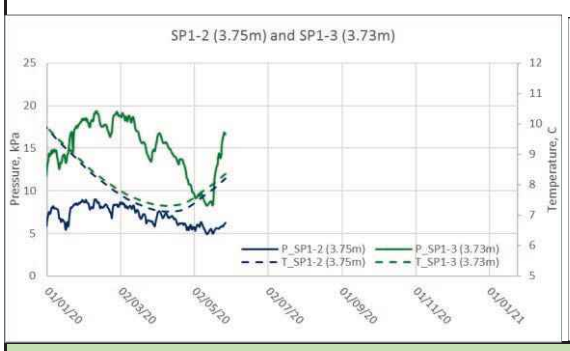
Weekly Summary:
Pondings on SP1 crest, which needs to be filled.
Trees/vegetations at 2S need to be cut off.
Noxious weed starts withering.
Water management system during the low flow season is initiated for both north and south mine.
No flow at the SP1 and SP4 spillways.

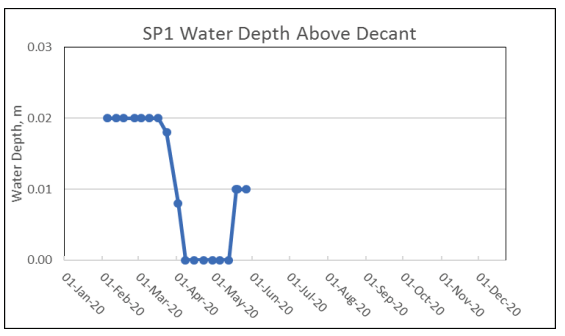
Settling Pond #1 (SP1)-South Water Management System

Notes: Ruts in the SP1 crest needs be filled, causing water ponding on the crest (see photo)

Crest and Slopes Stability: Ponds in the crest; no gullies, cracks, sinkholes, slides obseved on the downstream slope.
Vegetation: Ongoing, spary on noxious weed on May 19 following pest management guideline
Seepage: Wet spots on the downstream side are being monitored.
Animal Activity: No burrowing is observed.
Spillway: No overflow
Water Management: Discharging at SP1 (see the plot below of water depth above decant); 3S water is pumping to SP1

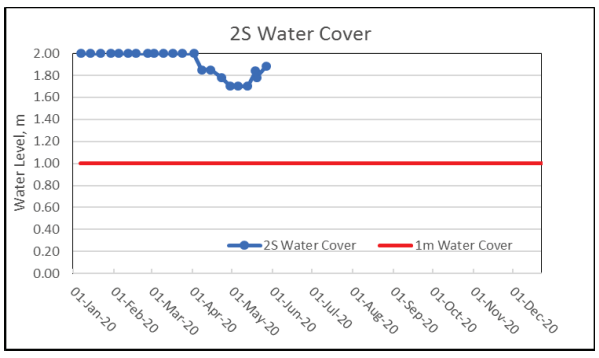
Instrumentation: VWPs (2 shallow and 2 deep) Staff Gauge





2-South PAG-CCR Pond (2S)-South Water Management System

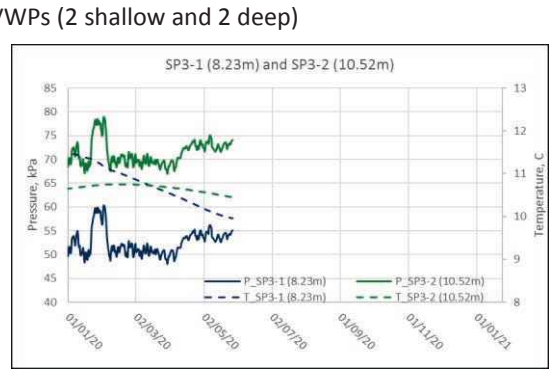
Notes: Vegetation needs to be controlled at 2S central passway.
Crest and Slope Stability: No settlement, gullies, cracks and slouging observed
Vegetation Control: Trees and shrubs on the two slopes of the central connection way need be cut off.
Seepage: Seeping to 3S pit through the Engineer designed channel
Animal Activity: No burrowing is observed.
Water Management: Gate valves are open
Instrumentation: No pizeometers at 2S pit.
Flow at 2S Inlet (m) ~0.17
Spillway/Discharge Channel No overflow

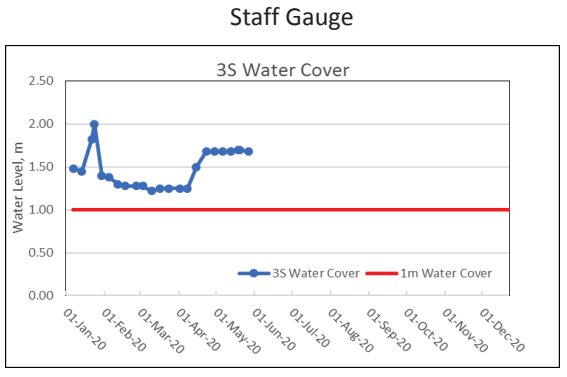


3-South PAG-CCR Pond (3S)-South Water Management System

Notes: getotechnical concern of the inclined trees at the downstream slope of the dyke is being monitored and no significant change is observed.
Crest and Slope Stability: Small pond on the crest; No cracks, and sloughingobseved observed
Vegetation: Maintained
Seepage: No seepage is observed on downstream slope and toe.
Animal Activity: No burrowing is observed
Spillway: Not being used and not permitted.
Water Management: 3S float pump is pumping to SP1

Instrumentation: VWPs (2 shallow and 2 deep) Staff Gauge



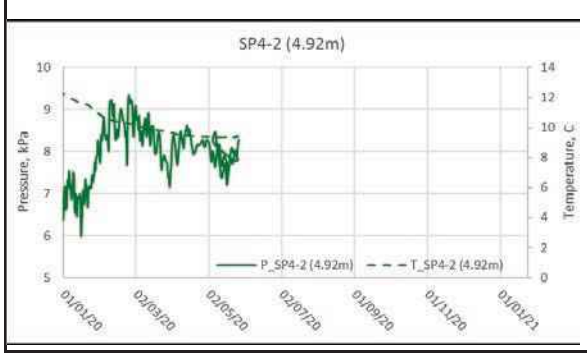


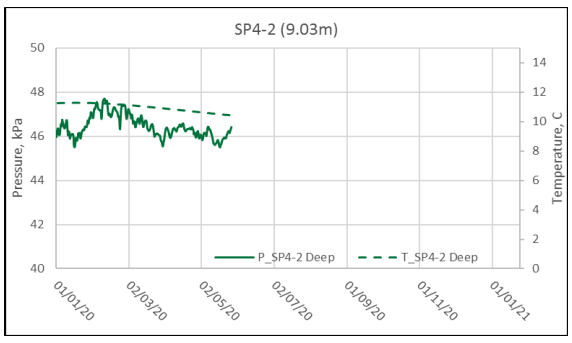
Settling Pond #4 (SP4)-North Water Management System

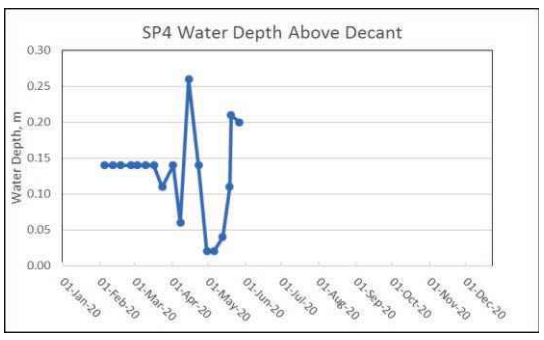
Notes: Water color is orangy green; No water quality concern brought up by Environmental staff; Sprayed noxioius weeds start withering.

Crest and Slope Stability: No cracks, gullies and sloughing observed
Vegetation Control: Ongoing; Spary on noxious weed on May 19 following pest management guideline.
Seepage: No seepage is observed on downstream slope and toe.
Animal Activity: No burrowing is observed.
Spillway: No overflow; debris and cut-branches need clean up.
Water Management: The plant pump is off.

Instrumentation: VWPs (1 shallow and 1 deep) Staff Gauge







Weekly Inspection Report
Water Management Facility (WMF)-SP1, 2S, 3S and SP4

QUINSAM COAL

Date: June 2, 2020 **Weather:** Sunny **Inspector:** Sarah S

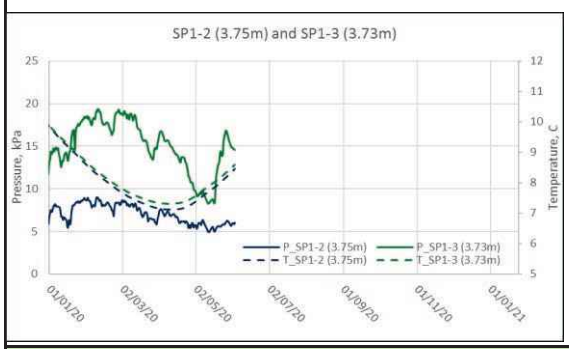
Weekly Summary:
Pondings on SP1 crest, which needs to be regraded.
1/3 of the trees on the 2S central embankment are cut off this week.
All sprayed noxious weeds are withered. All "pesticide" signs are removed after two weeks of spray.
No flow in the SP1 and SP4 spillways; permitted discharging at SP1 and SP4.
No overflow from 2S.

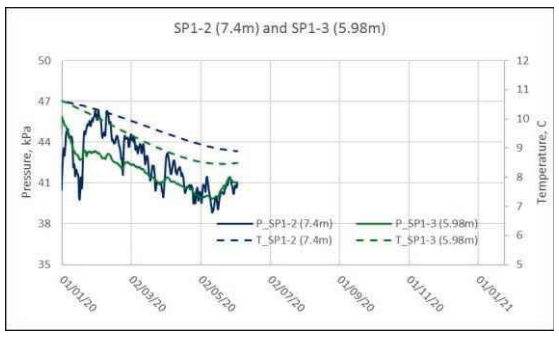
Settling Pond #1 (SP1)-South Water Management System

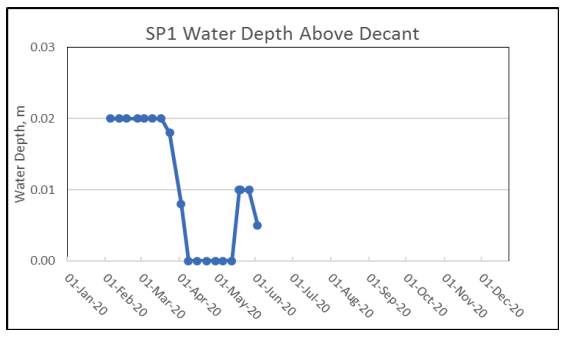
Notes: Ruts in the SP1 crest needs be filled, causing water ponding on the crest (see photo inlcuded in last week's report)

Crest and Slopes Stability: Ponds in the crest; no gullies, cracks, sinkholes, slides obseved on the downstream slope.
Vegetation: Vegetation in the sprayed areas are well controlled, those in the non-sprayed areas are ongoing.
Seepage: Wet spots on the downstream side are being monitored.
Animal Activity: No burrowing is observed.
Spillway: No overflow
Water Management: Discharging at SP1 (see the plot below of water depth above decant); 3S water is pumping to SP1

Instrumentation: VWPs (2 shallow and 2 deep) Staff Gauge

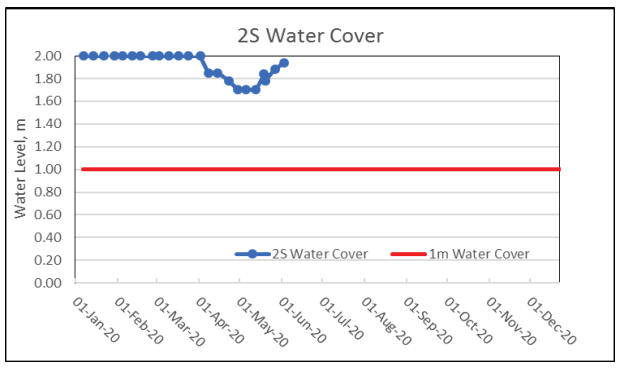






2-South PAG-CCR Pond (2S)-South Water Management System

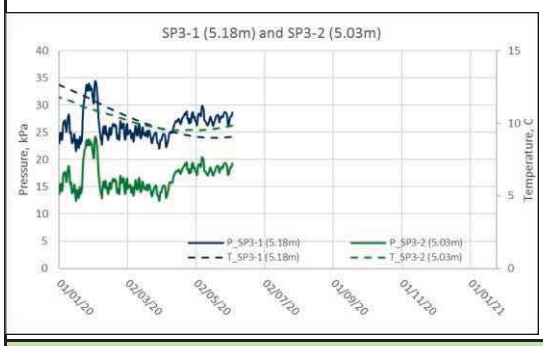
Notes: Vegetation is being controlled by brushing.
Crest and Slope Stability: No settlement, gullies, cracks and slouging observed
Vegetation Control: Trees and shrubs on the central connection way are being progressively cut off.
Seepage: Seeping to 3S pit through the Engineer designed channel
Animal Activity: No burrowing is observed.
Water Management: Gate valves are open, 2S UG pump is on
Instrumentation: No pizeometers at 2S pit.
Flow at 2S Inlet (m) ~0.16
Spillway/Discharge Channel No overflow

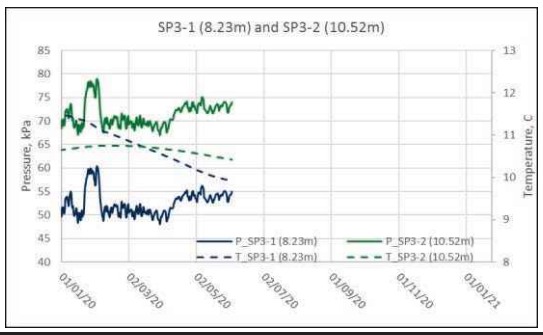


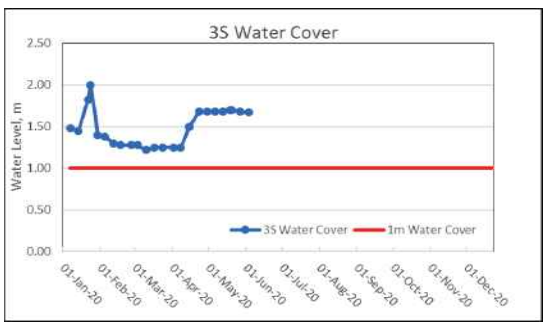
3-South PAG-CCR Pond (3S)-South Water Management System

Notes: getotechnical concern of the inclined trees at the downstream slope of the dyke is being monitored and no significant change is observed.
Crest and Slope Stability: No cracks, gullies and sloughing observed
Vegetation: Maintained and ongoing
Seepage: No seepage is observed on the downstream slope and toe.
Animal Activity: No burrowing is observed
Spillway: Not being used and not permitted.
Water Management: 3S float pump is pumping to SP1

Instrumentation: VWPs (2 shallow and 2 deep) Staff Gauge





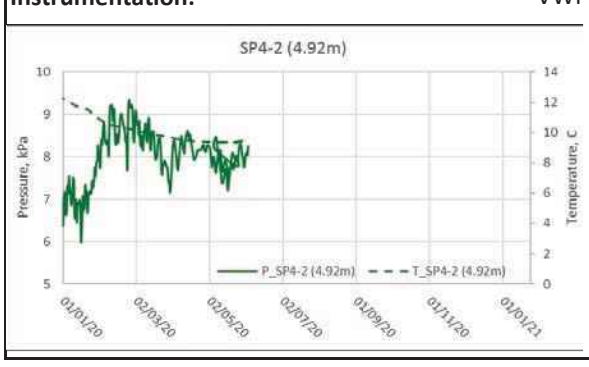


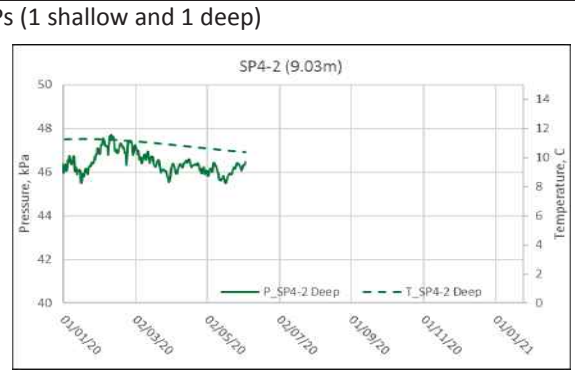
Settling Pond #4 (SP4)-North Water Management System

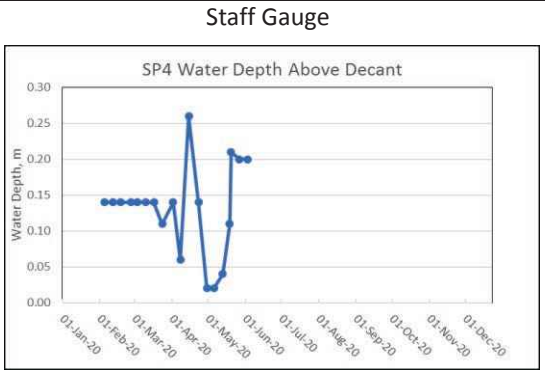
Notes: Water color is orangy green.

Crest and Slope Stability: No cracks, gullies and sloughing observed
Vegetation Control: Ongoing; Spary on noxious weed on May 19 following pest management guideline.
Seepage: No seepage is observed on downstream slope and toe.
Animal Activity: No burrowing is observed.
Spillway: No overflow; debris and cut-branches need clean up.
Water Management: (Permitted) discharging at SP4

Instrumentation: VWPs (1 shallow and 1 deep) Staff Gauge







Weekly Inspection Report
Water Management Facility (WMF)-SP1, 2S, 3S and SP4

QUINSAM COAL

Date: June 10, 2020 **Weather:** Cloudy-Sunny **Inspector:** Sarah S

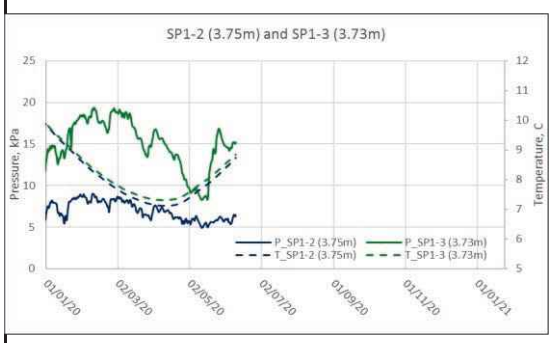
Weekly Summary:
Pondings in the SP1 crest, which needs to be regraded; had about 25mm rain since last week's inspection.
Big trees on 2S central bank and weeds around 2S gate valves are cut off, the roots are left in the ground.
More weeds (upstream slope) are cut off using lopper on SP4.
Overflow from 2S to 3S through the constructed channel.
No flow in the SP1 and SP4 spillways.

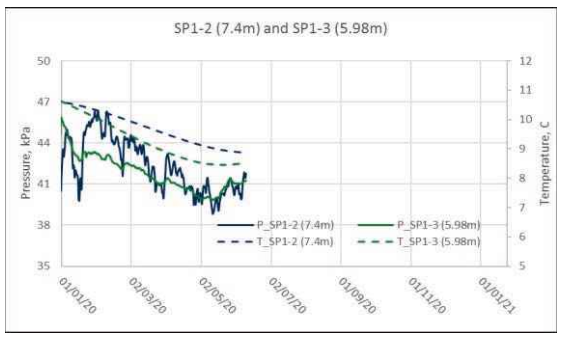
Settling Pond #1 (SP1)-South Water Management System

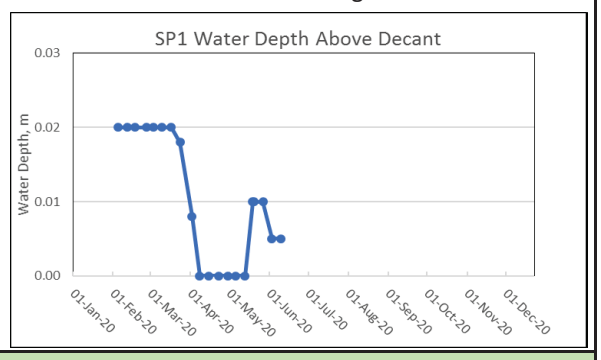
Notes: Ruts in the SP1 crest needs be filled, causing water ponding on the crest.

Crest and Slopes Stability: Pondings in the crest; no gullies, cracks, sinkholes, slides obseved on the downstream slope.
Vegetation: Non-sprayed areas on the SP1 crest are ongoing.
Seepage: Wet spots on the downstream toe are being monitored.
Animal Activity: No burrowing is observed.
Spillway: No overflow
Water Management: Discharging at SP1 (see the plot below of water depth above decant); 3S water is pumping to SP1

Instrumentation: VWPs (2 shallow and 2 deep) Staff Gauge

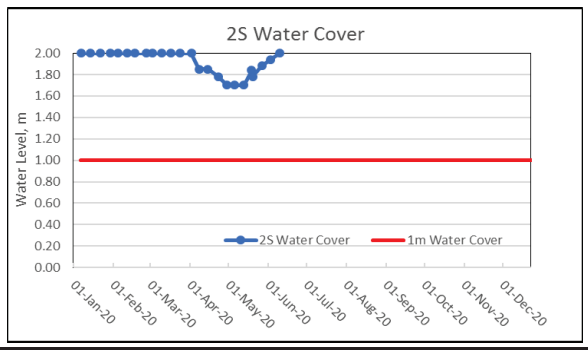






2-South PAG-CCR Pond (2S)-South Water Management System

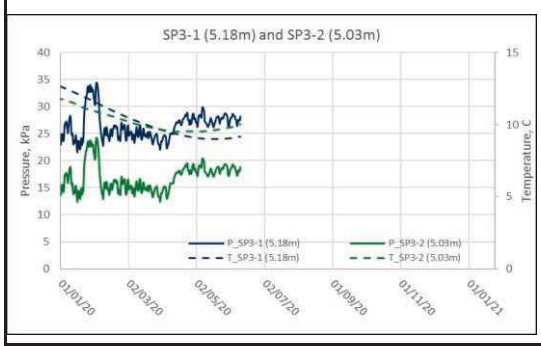
Notes: More trees are cut off at 2S central bank; Water level at 2S is above 2m; Overflow from 2S to 3S through the constructed channel.
Crest and Slope Stability: No settlement, gullies, cracks and slouging observed
Vegetation Control: Big trees are cut off at 2S central bank; Trees and weeds around the 2S gate valves are clipped.
Seepage: Seeping to 3S pit through the Engineer designed channel
Animal Activity: No burrowing is observed.
Water Management: Gate valves are open, 2S UG pump is on
Instrumentation: No pizeometers at 2S pit.
Flow at 2S Inlet (m) ~0.16
Spillway/Discharge Channel Overflow to 3S through the engineer designed channel.

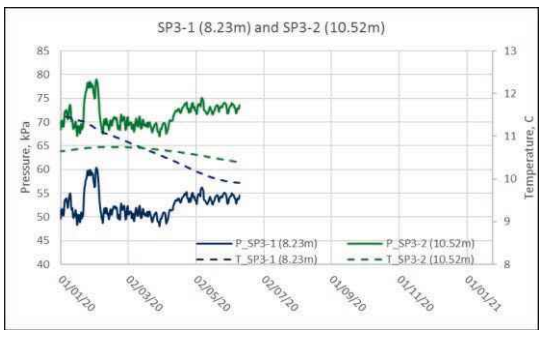


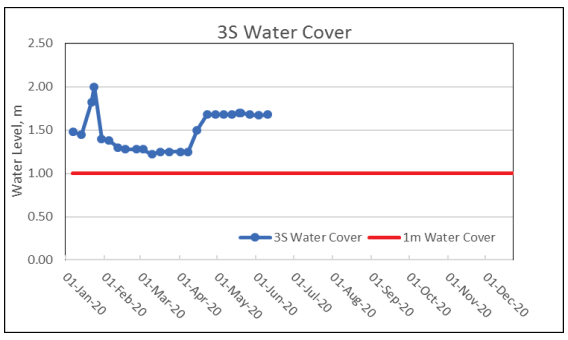
3-South PAG-CCR Pond (3S)-South Water Management System

Notes: getotechnical concern of the inclined trees at the downstream slope of the dyke is being monitored and no significant change is observed.
Crest and Slope Stability: No cracks, gullies and sloughing observed
Vegetation: More broom at the downstream slope.
Seepage: No seepage is observed on the downstream slope and toe.
Animal Activity: No burrowing is observed
Spillway: Not being used and not permitted.
Water Management: 3S float pump is pumping to SP1

Instrumentation: VWPs (2 shallow and 2 deep) Staff Gauge





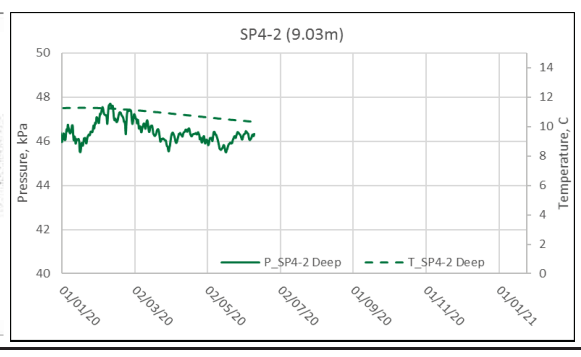


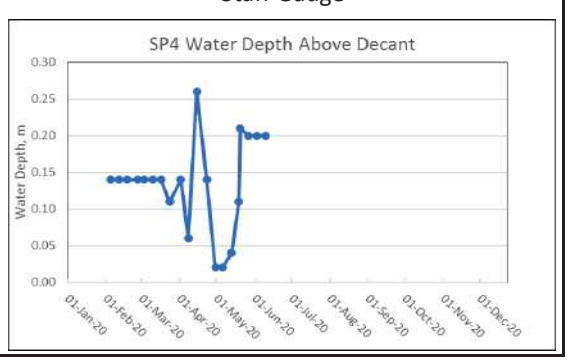
Settling Pond #4 (SP4)-North Water Management System

Notes: Water color is orangy green; More weeds are cut off.

Crest and Slope Stability: No cracks, gullies and sloughing observed
Vegetation Control: Ongoing.
Seepage: No seepage is observed on downstream slope and toe.
Animal Activity: No burrowing is observed.
Spillway: No overflow; debris and cut-branches need clean up.
Water Management: (Permitted) discharging at SP4

Instrumentation: VWPs (1 shallow and 1 deep) Staff Gauge





Weekly Inspection Report
Water Management Facility (WMF)-SP1, 2S, 3S and SP4

QUINSAM COAL

Date: June 24, 2020 **Weather:** Sunny after 10am **Inspector:** Sarah S

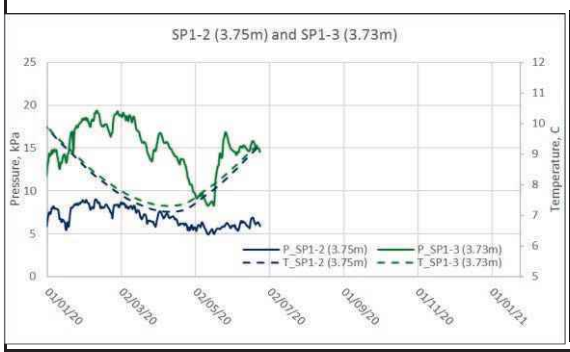
Weekly Summary:
Pondings in the SP1 crest.
Overflow from 2S to 3S through the constructed channel.
Ongoing vegetation control at 3S and 2S. More trees/brooms are cut at the edge of 3S crest.
No flow in the SP1 and SP4 spillways.

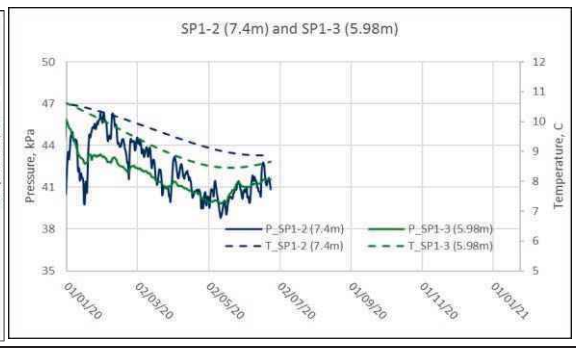
Settling Pond #1 (SP1)-South Water Management System

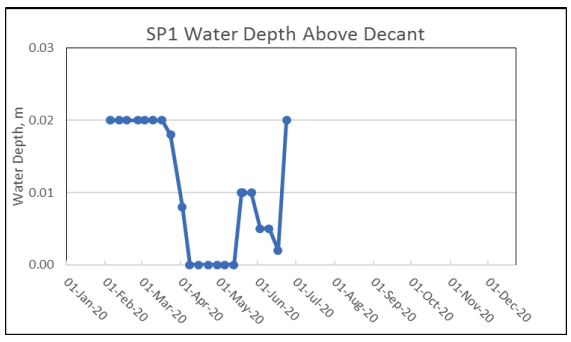
Notes: Ruts in the SP1 crest needs be filled, causing water ponding on the crest.

Crest and Slopes Stability: Pondings in the crest; no gullies, cracks, sinkholes, slides obseved on the downstream slope.
Vegetation: Weeds are growing fast in Rainy June.
Seepage: Wet spots on the downstream toe are being monitored.
Animal Activity: No burrowing is observed.
Spillway: No overflow
Water Management: Discharging at SP1 (see the plot below of water depth above decant); 3S water is pumping to SP1

Instrumentation: VWPs (2 shallow and 2 deep) Staff Gauge

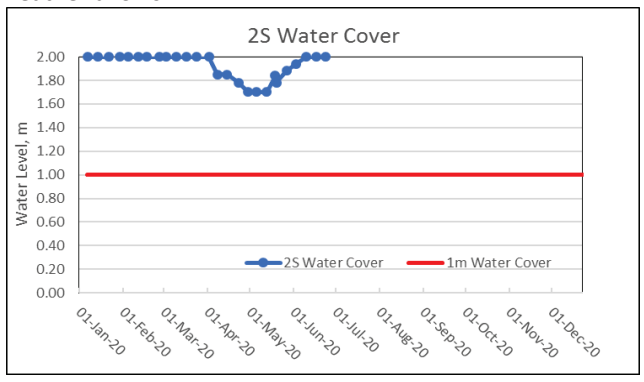






2-South PAG-CCR Pond (2S)-South Water Management System

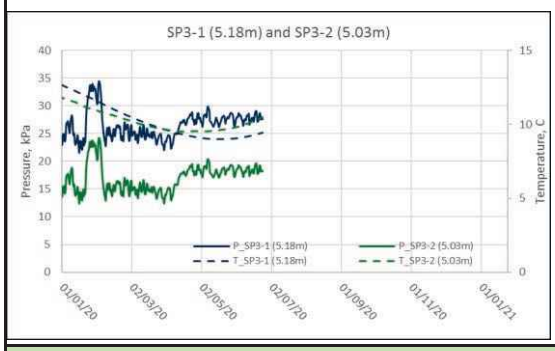
Notes: Water level at 2S is above 2m; 2S underground mine pool pump is on
Crest and Slope Stability: No settlement, gullies, cracks and slouging observed
Vegetation Control: Vegetation controll in the dischage channel will be started when the weather allows.
Seepage: Seeping to 3S pit through the Engineer designed channel
Animal Activity: No burrowing is observed.
Water Management: Low flow water management mode is on
Instrumentation: No pizeometers at 2S pit.
Flow at 2S Inlet (m) ~0.16
Spillway/Discharge Channel Overflow to 3S through the engineer designed channel.

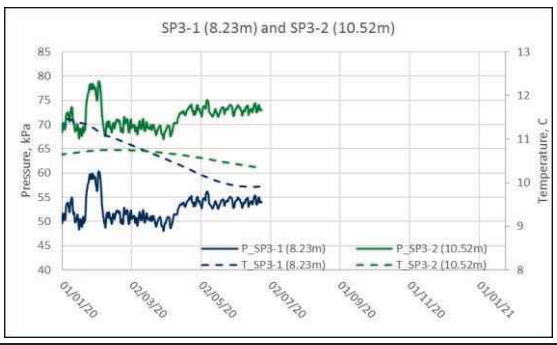


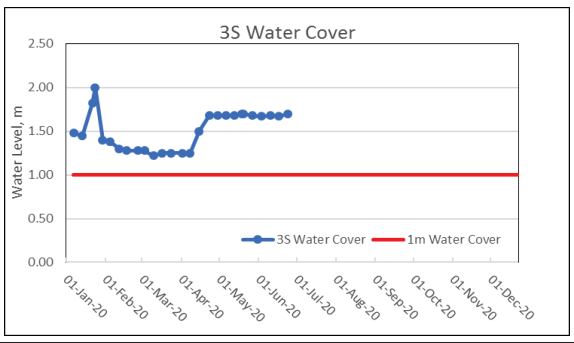
3-South PAG-CCR Pond (3S)-South Water Management System

Notes: getotechnical concern of the inclined trees at the downstream slope of the dyke is being monitored and no significant change is observed.
Crest and Slope Stability: No cracks, gullies and sloughing observed
Vegetation: Weeds are tall at 3S downstream. Trees/brooms were partially cut at the edge of the crest.
Seepage: No seepage is observed on the downstream slope and toe.
Animal Activity: No burrowing is observed
Spillway: Not being used and not permitted.
Water Management: 3S float pump is pumping to SP1

Instrumentation: VWPs (2 shallow and 2 deep) Staff Gauge





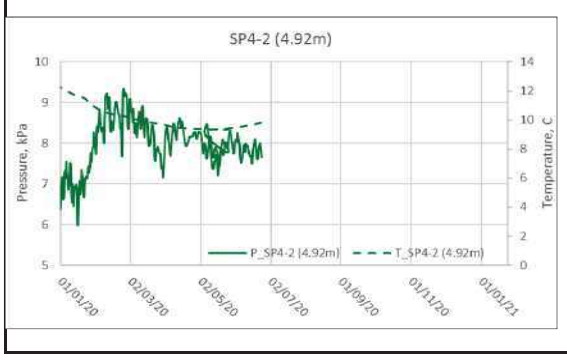


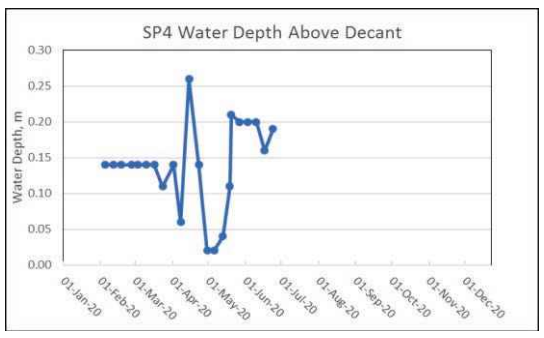
Settling Pond #4 (SP4)-North Water Management System

Notes: Orangy water color at SP4.

Crest and Slope Stability: No cracks, gullies and sloughing observed
Vegetation Control: Ongoing
Seepage: No seepage is observed on downstream slope and toe.
Animal Activity: No burrowing is observed.
Spillway: No overflow; debris and cut-branches need clean up.
Water Management: (Permitted) discharging at SP4

Instrumentation: VWPs (1 shallow and 1 deep) Staff Gauge



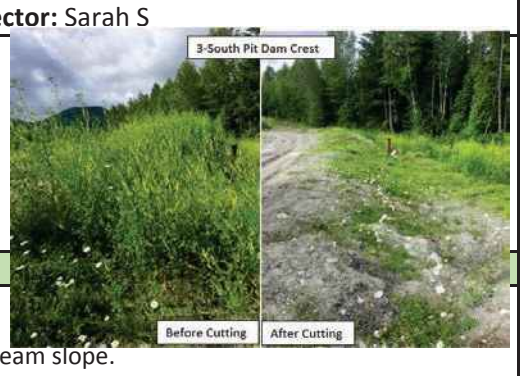


Weekly Inspection Report
Water Management Facility (WMF)-SP1, 2S, 3S and SP4

QUINSAM COAL

Date: July 2, 2020 **Weather:** Sunny and Cloudy **Inspector:** Sarah S

Weekly Summary:
Pondings on the SP1 crest.
No overflow at 2S; No flow in the SP1 and SP4 spillways.
The discharge at SP1 is very little and the discharge at SP4 is decreased, indicating low water levels at the site
More weeds are cut on the east edge of the 3S crest.

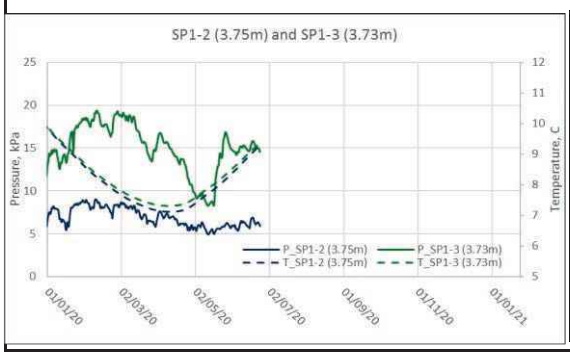


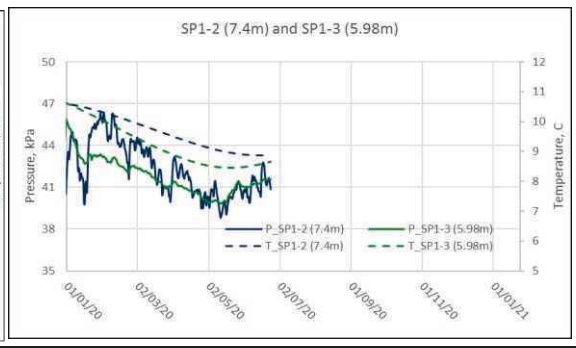
Settling Pond #1 (SP1)-South Water Management System

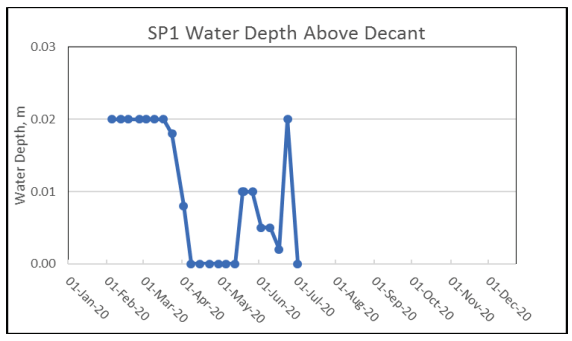
Notes: Ruts on the SP1 crest.

Crest and Slopes Stability: Pondings in the crest; no gullies, cracks, sinkholes, slides obseved on the downstream slope.
Vegetation: Weeds are growing fast in Rainy June.
Seepage: Wet spots on the downstream toe are being monitored.
Animal Activity: No burrowing is observed.
Spillway: No overflow
Water Management: Very little discharge at SP1 (see the plot below of water depth above decant); 3S water is pumping to SP1

Instrumentation: VWPs (2 shallow and 2 deep) Staff Gauge

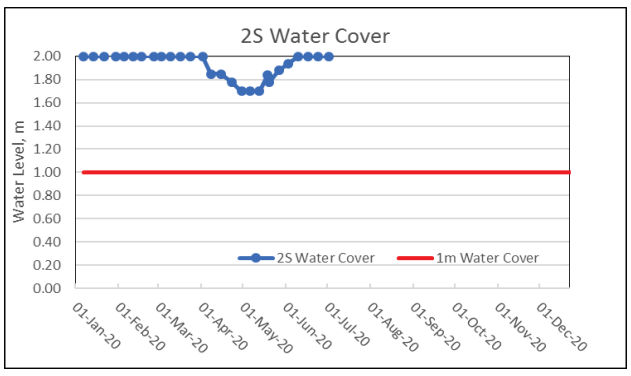






2-South PAG-CCR Pond (2S)-South Water Management System

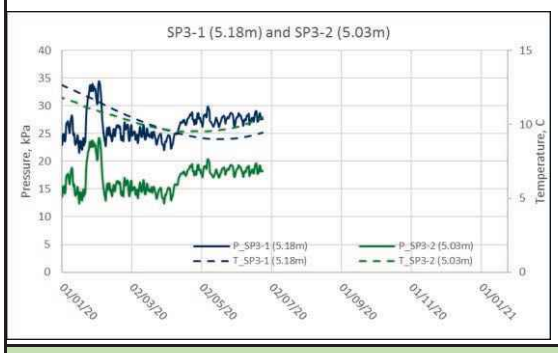
Notes: Water level at 2S is above 2m; 2S underground mine pool pump is on
Crest and Slope Stability: No settlement, gullies, cracks and slouging observed
Vegetation Control: Vegetation controll in the dischage channel will be started when the weather allows.
Seepage: Seeping to 3S pit through the Engineer designed channel
Animal Activity: No burrowing is observed.
Water Management: Low flow water management mode is on
Instrumentation: No pizeometers at 2S pit.
Flow at 2S Inlet (m) ~0.12
Spillway/Discharge Channel Overflow to 3S through the engineer designed channel.

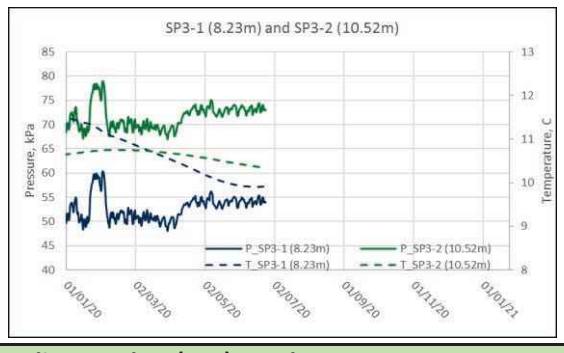


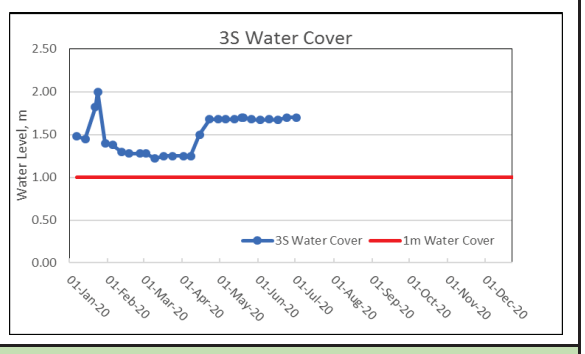
3-South PAG-CCR Pond (3S)-South Water Management System

Notes: getotechnical concern of the inclined trees at the downstream slope of the dyke is being monitored and no significant change is observed.
Crest and Slope Stability: No cracks, gullies and sloughing observed
Vegetation: Weeds are cut off using weed wacker at the edge of the 3S crest.
Seepage: No seepage is observed on the downstream slope and toe.
Animal Activity: No burrowing is observed
Spillway: Not being used and not permitted.
Water Management: 3S float pump is pumping to SP1

Instrumentation: VWPs (2 shallow and 2 deep) Staff Gauge





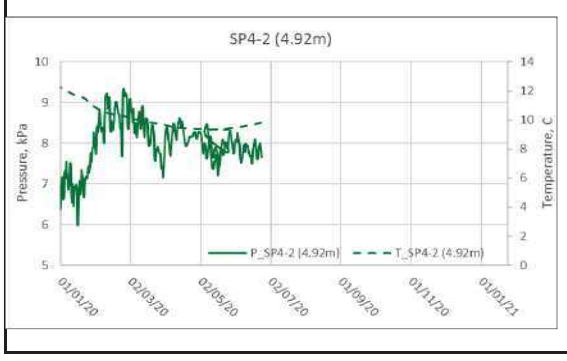


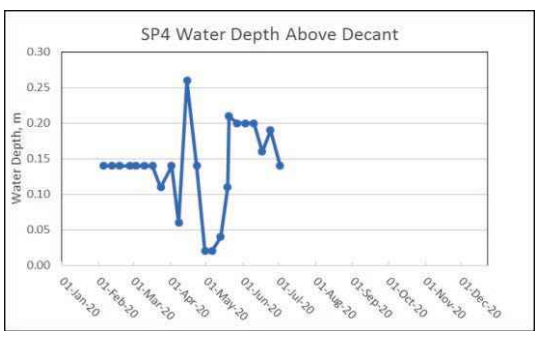
Settling Pond #4 (SP4)-North Water Management System

Notes: Orangy water color at SP4.

Crest and Slope Stability: No cracks, gullies and sloughing observed
Vegetation Control: Ongoing
Seepage: No seepage is observed on downstream slope and toe.
Animal Activity: No burrowing is observed.
Spillway: No overflow; debris and cut-branches need clean up.
Water Management: (Permitted) discharging at SP4

Instrumentation: VWPs (1 shallow and 1 deep) Staff Gauge





Weekly Inspection Report
Water Management Facility (WMF)-SP1, 2S, 3S and SP4

Date: July 8, 2020 **Weather:** Cloudy **Inspector:** Sarah S

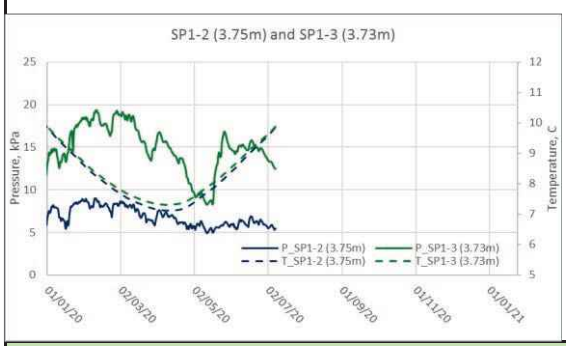
Weekly Summary:
Pondings on the SP1 crest
Overflow at 2S to 3S through the designed channel (rain storm during the night of July 7)
No discharge at SP4 (water from UG 2N is diverted to 2N PAG pond to ensure enough water cover on the PAG); Dischage at SP1
No flow in the SP1 and SP4 spillways

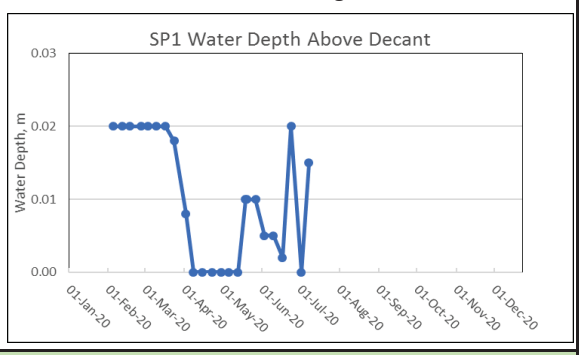
Settling Pond #1 (SP1)-South Water Management System

Notes: Ruts on the SP1 crest.

Crest and Slopes Stability: Pondings in the crest; no gullies, cracks, sinkholes, slides obseved on the downstream slope.
Vegetation: Ongoing weed control
Seepage: Wet spots on the downstream toe are being monitored.
Animal Activity: No burrowing is observed.
Spillway: No overflow
Water Management: Discharg at SP1; 3S water is pumping to SP1

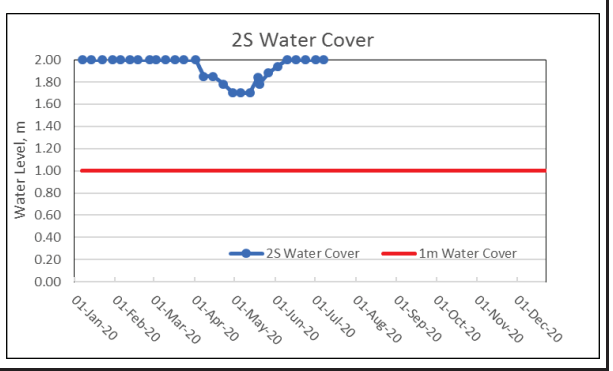
Instrumentation: VWPs (2 shallow and 2 deep) Staff Gauge





2-South PAG-CCR Pond (2S)-South Water Management System

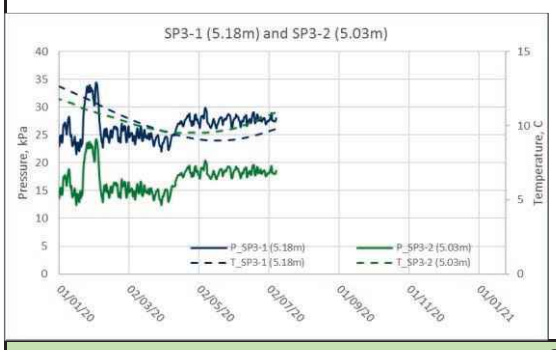
Notes: Water level at 2S is above 2m; 2S underground mine pool pump is on (5.2 l/s)
Crest and Slope Stability: No settlement, gullies, cracks and slouging observed
Vegetation Control: well-controlled
Seepage: Seeping to 3S pit through the Engineer designed channel
Animal Activity: No burrowing is observed.
Water Management: Low flow water management mode is on
Instrumentation: No pizeometers at 2S pit.
Flow at 2S Inlet (m) ~0.12
Spillway/Discharge Channel Overflow to 3S through the engineer designed channel.

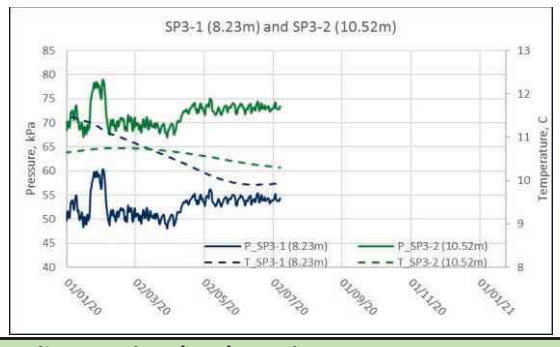


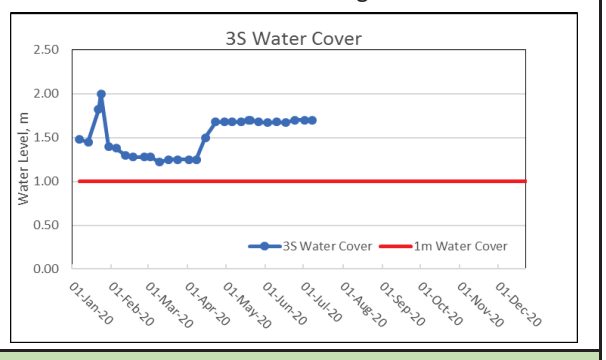
3-South PAG-CCR Pond (3S)-South Water Management System

Notes: getotechnical concern of the inclined trees at the downstream slope of the dyke is being monitored and no significant change is observed.
Crest and Slope Stability: No cracks, gullies and sloughing observed
Vegetation: Ongoing
Seepage: No seepage is observed
Animal Activity: No burrowing is observed
Spillway: Not being used and not permitted
Water Management: 3S float pump is pumping to SP1

Instrumentation: VWPs (2 shallow and 2 deep) Staff Gauge





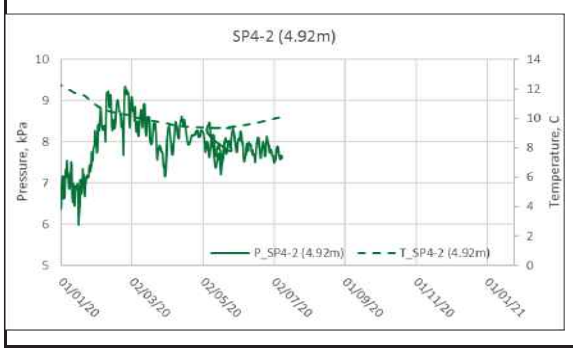


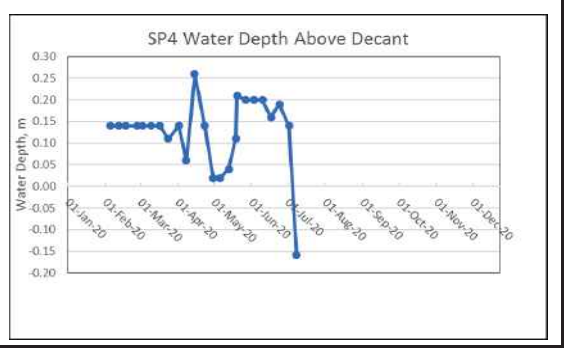
Settling Pond #4 (SP4)-North Water Management System

Notes: The low water level at SP4 is due to the plant pump is turned on and 2N UG water is diverted to 2N PAG pond.

Crest and Slope Stability: No cracks, gullies and sloughing observed
Vegetation Control: Well-controled
Seepage: No seepage is observed on downstream slope and toe.
Animal Activity: No burrowing is observed.
Spillway: No overflow; debris and cut-branches need clean up.
Water Management: No discharge at SP4; Plant pump is on.

Instrumentation: VWPs (1 shallow and 1 deep) Staff Gauge

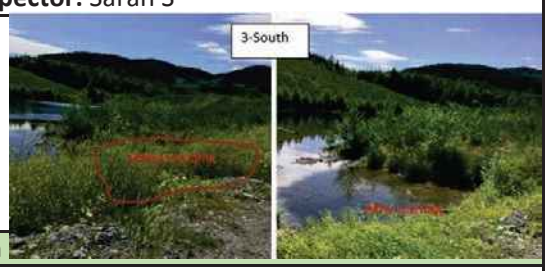




Weekly Inspection Report
Water Management Facility (WMF)-SP1, 2S, 3S and SP4

Date: July 15, 2020 **Weather:** Sunny (27C) **Inspector:** Sarah S

Weekly Summary:
Water color at SP4 is clear
Overflow at 2S to 3S through the designed channel
No discharge at SP4; Dischaging at SP1
More weeds and tree cutting at 3S upstream slope
No flow in the SP1 and SP4 spillways

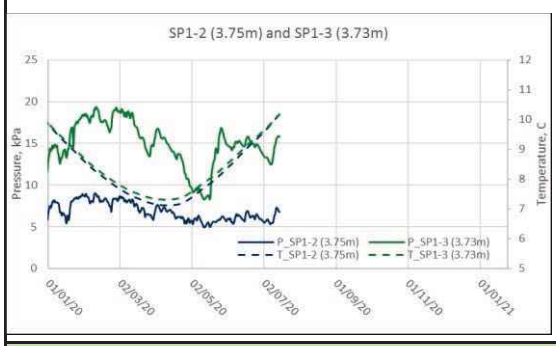


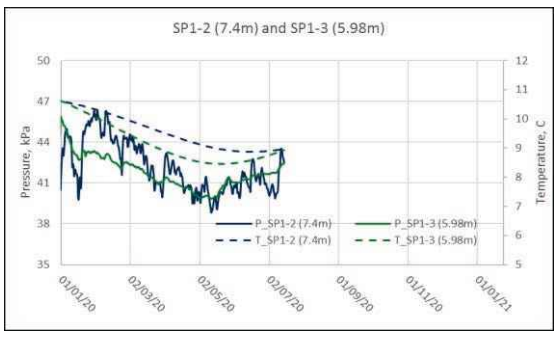
Settling Pond #1 (SP1)-South Water Management System

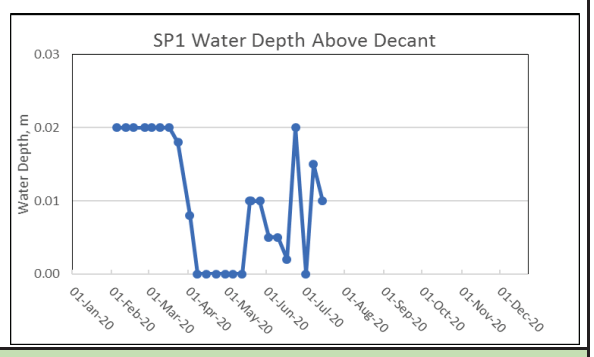
Notes: Ruts on the SP1 crest.

Crest and Slopes Stability: Pondings in the crest; no gullies, cracks, sinkholes, slides obseved on the downstream slope.
Vegetation: Ongoing
Seepage: Wet spots on the downstream toe are being monitored.
Animal Activity: No
Spillway: No overflow in the spillway
Water Management: Discharging at SP1; 3S water is pumping to SP1

Instrumentation: VWPs (2 shallow and 2 deep) Staff Gauge

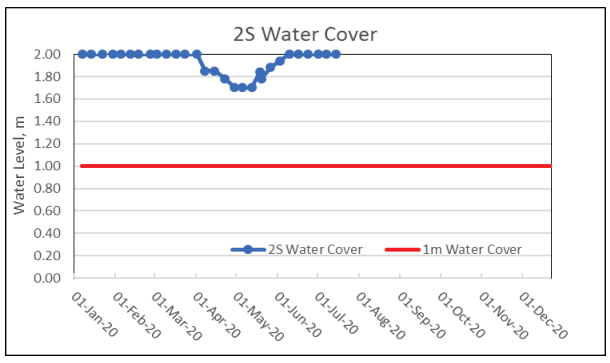






2-South PAG-CCR Pond (2S)-South Water Management System

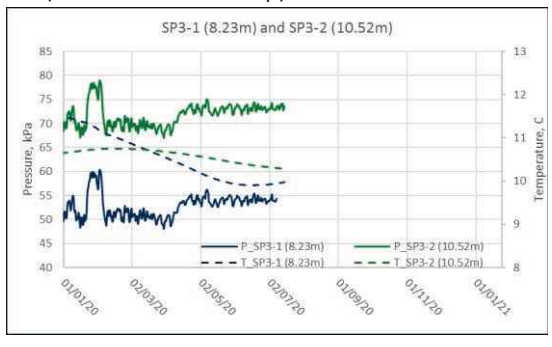
Notes: Water level at 2S is above 2m;
Crest and Slope Stability: No
Vegetation Control: well-controlled
Seepage: Seeping to 3S pit through the Engineer designed channel
Animal Activity: No
Water Management: Low flow water management mode is on
Instrumentation: No pizeometers at 2S pit.
Flow at 2S Inlet (m) ~0.14
Spillway/Discharge Channel Overflow to 3S through the engineer designed channel.

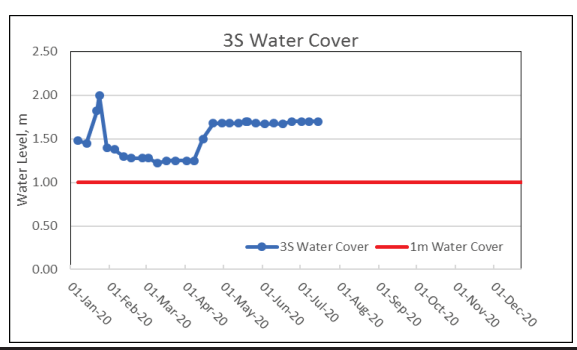


3-South PAG-CCR Pond (3S)-South Water Management System

Notes: getotechnical concern of the inclined trees at the downstream slope of the dyke is being monitored and no significant change is observed.
Crest and Slope Stability: No
Vegetation: Ongoing; more weeds and tree cut this week
Seepage: No
Animal Activity: No
Spillway: Not being used and not permitted
Water Management: 3S float pump is pumping to SP1

Instrumentation: VWPs (2 shallow and 2 deep) Staff Gauge



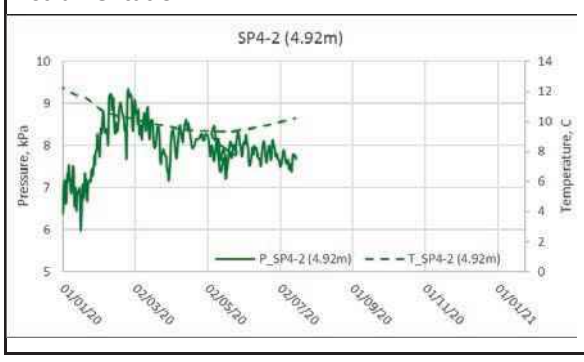


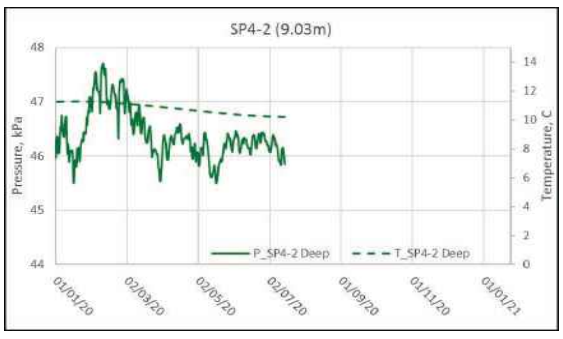
Settling Pond #4 (SP4)-North Water Management System

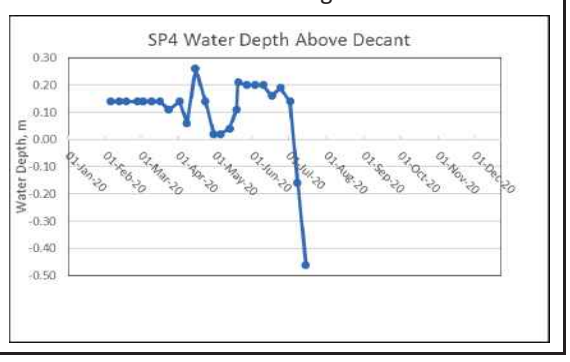
Notes: water color is clear (see photo). Water level is below the staff gauage (0).

Crest and Slope Stability: No cracks, gullies and sloughing observed
Vegetation Control: Well-controled
Seepage: No
Animal Activity: No
Spillway: No overflow in the spillway
Water Management: No discharge at SP4; Plant pump is off.

Instrumentation: VWPs (1 shallow and 1 deep) Staff Gauge







Weekly Inspection Report
Water Management Facility (WMF)-SP1, 2S, 3S and SP4

QUINSAM COAL

Date: July 22, 2020 **Weather:** Sunny (27C) **Inspector:** Sarah S

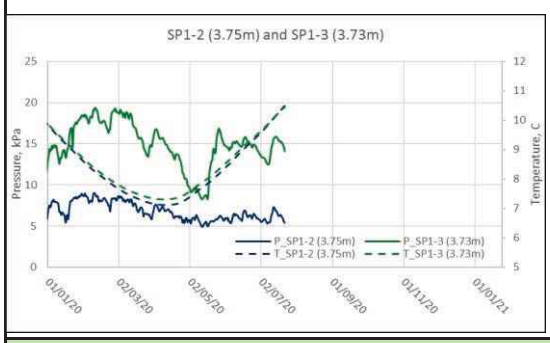
Weekly Summary:
Plant pump is off, so water level at SP4 is back to normal.
Overflow at 2S to 3S through the designed channel
Dischaging at SP1 and SP4
No flow in the SP1 and SP4 spillways

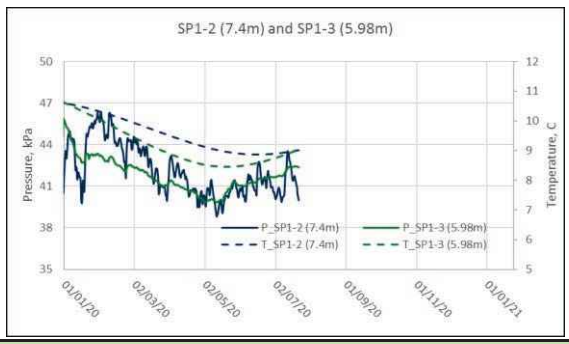
Settling Pond #1 (SP1)-South Water Management System

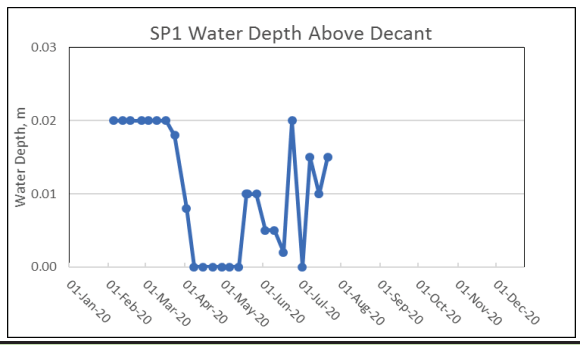
Notes: Ruts on the SP1 crest. The SP1 crest is almost dry.

Crest and Slopes Stability: almost dry in the crest; no gullies, cracks, sinkholes, slides obseved on the downstream slope.
Vegetation: Ongoing
Seepage: Wet spots on the downstream toe are being monitored.
Animal Activity: No
Spillway: No overflow in the spillway
Water Management: Discharging at SP1; 3S water is pumping to SP1

Instrumentation: VWPs (2 shallow and 2 deep) Staff Gauge

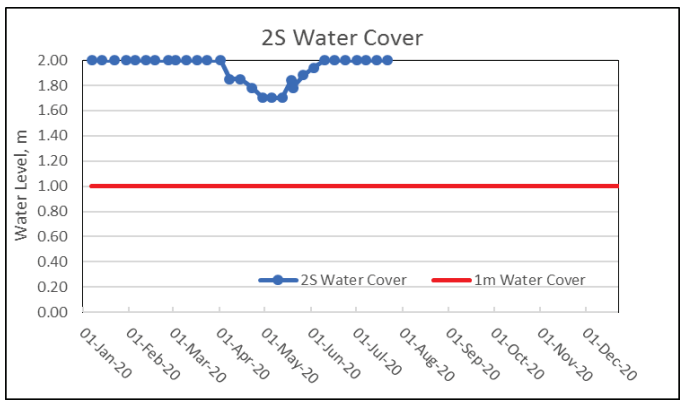






2-South PAG-CCR Pond (2S)-South Water Management System

Notes: Water level at 2S is above 2m;
Crest and Slope Stability: No
Vegetation Control: well-controlled
Seepage: Seeping to 3S pit through the Engineer designed channel
Animal Activity: No
Water Management: Low flow water management mode is on
Instrumentation: No pizeometers at 2S pit.
Flow at 2S Inlet (m) ~0.16
Spillway/Discharge Channel Overflow to 3S through the engineer designed channel.
2S UG pump (l/s) 6.2



3-South PAG-CCR Pond (3S)-South Water Management System

Notes: getotechnical concern of the inclined trees at the downstream slope of the dyke is being monitored and no significant change is observed.
Crest and Slope Stability: No
Vegetation: Ongoing; more weeds and tree cut this week
Seepage: No
Animal Activity: No
Spillway: Not being used and not permitted
Water Management: 3S float pump is pumping to SP1

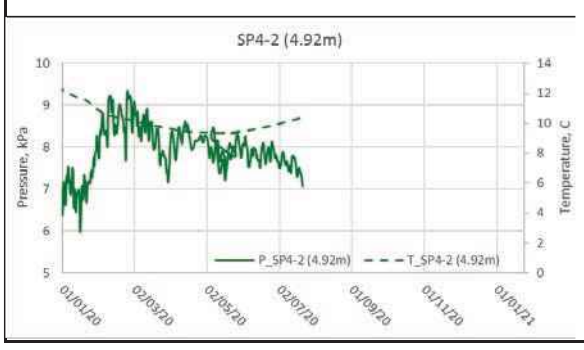
Instrumentation: VWPs (2 shallow and 2 deep) Staff Gauge

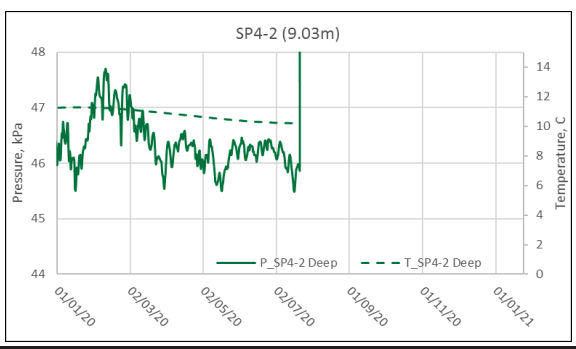
Settling Pond #4 (SP4)-North Water Management System

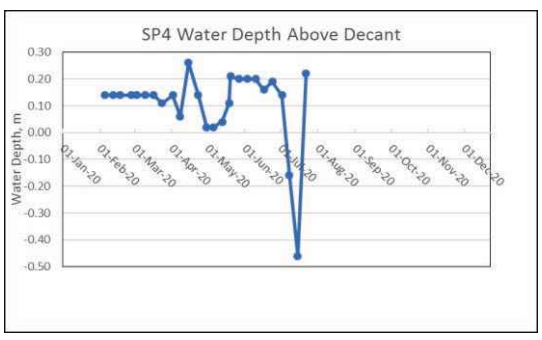
Notes: water color is orangy. Water level is back to normal, discharging at SP4

Crest and Slope Stability: No cracks, gullies and sloughing observed
Vegetation Control: Well-controled
Seepage: No
Animal Activity: No
Spillway: No overflow in the spillway
Water Management: No discharge at SP4; Plant pump is off.

Instrumentation: VWPs (1 shallow and 1 deep) Staff Gauge







Weekly Inspection Report
Water Management Facility (WMF)-SP1, 2S, 3S and SP4

Date: July 28, 2020 **Weather:** Sunny **Inspector:** Sarah S

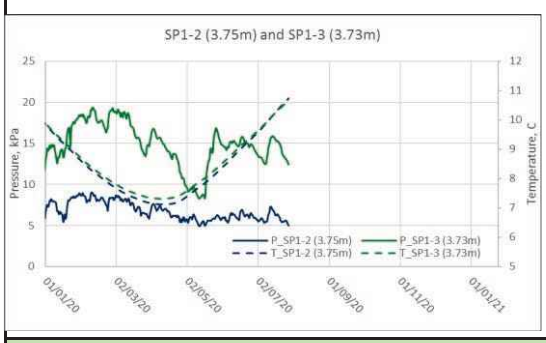
Weekly Summary:
Plant pump is off
Overflow at 2S to 3S through the designed channel
Dischaging at SP1 and SP4
No flow in the SP1 and SP4 spillways

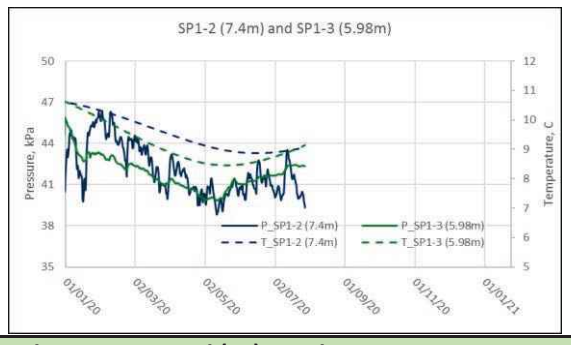
Settling Pond #1 (SP1)-South Water Management System

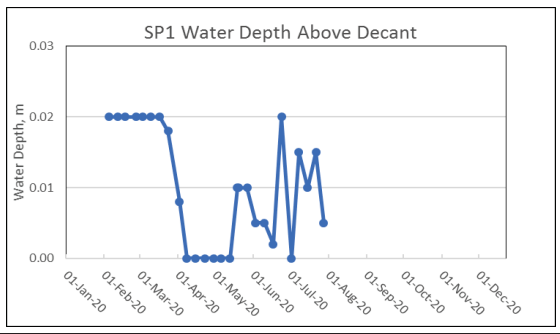
Notes: SP1 crest is dry, plan to grade/fill the ruts when equipment operator is at site.

Crest and Slopes Stability: Dry crest; no gullies, cracks, sinkholes, slides obseved on the downstream slope.
Vegetation: Ongoing
Seepage: Wet spots on the downstream toe are almost dry.
Animal Activity: No
Spillway: No overflow in the spillway
Water Management: Discharging at SP1

Instrumentation: VWPs (2 shallow and 2 deep) Staff Gauge

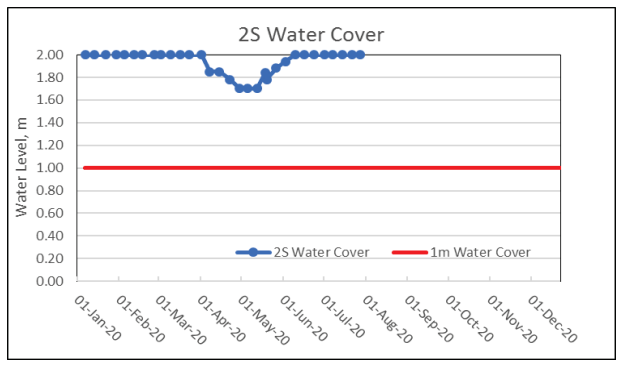






2-South PAG-CCR Pond (2S)-South Water Management System

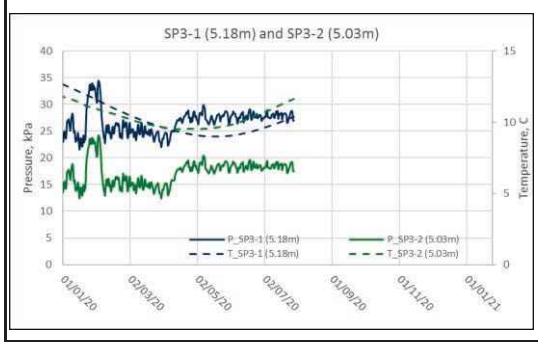
Notes: Water cover at 2S is above 2m;
Crest and Slope Stability: No
Vegetation Control: well-controlled
Seepage: Seeping to 3S pit through the Engineer designed channel
Animal Activity: No
Water Management: Low flow water management mode is on
Instrumentation: No pizeometers at 2S pit.
Flow at 2S Inlet (m) ~0.15
Spillway/Discharge Channel Overflow to 3S through the engineer designed channel.
2S UG pump (l/s) 5.1

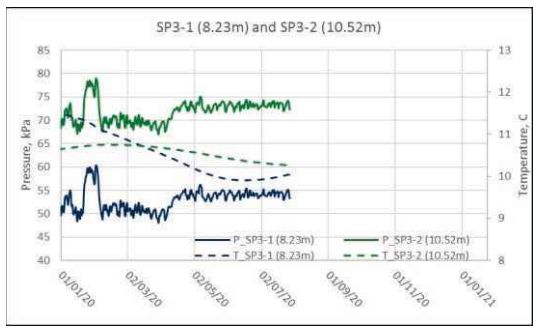


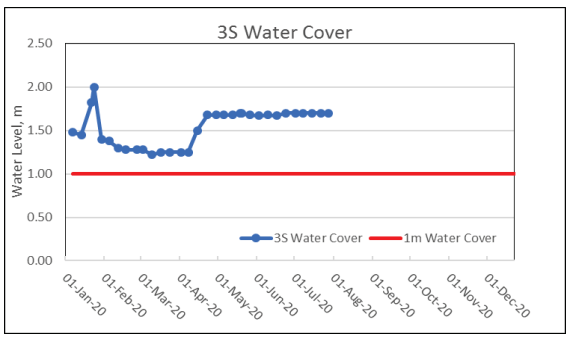
3-South PAG-CCR Pond (3S)-South Water Management System

Notes: getotechnical concern of the inclined trees at the downstream slope of the dyke is being monitored and no significant change is observed.
Crest and Slope Stability: No
Vegetation: Ongoing
Seepage: No
Animal Activity: No
Spillway: Not being used and not permitted
Water Management: 3S float pump is pumping to SP1

Instrumentation: VWPs (2 shallow and 2 deep) Staff Gauge





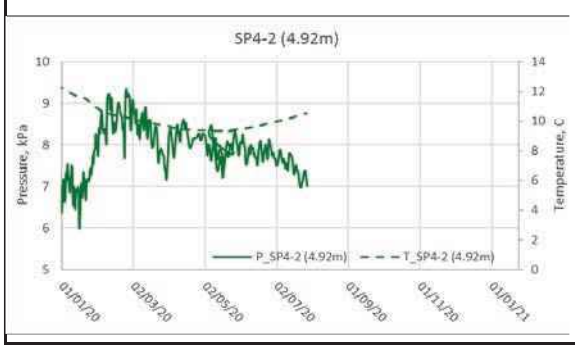


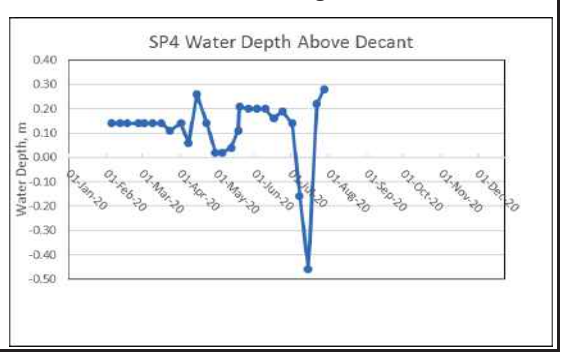
Settling Pond #4 (SP4)-North Water Management System

Notes: water color is orangy. Discharging at SP4

Crest and Slope Stability: No cracks, gullies and sloughing observed
Vegetation Control: Well-controled
Seepage: No
Animal Activity: No
Spillway: No overflow in the spillway
Water Management: No discharge at SP4; Plant pump is off.

Instrumentation: VWPs (1 shallow and 1 deep) Staff Gauge





Weekly Inspection Report
Water Management Facility (WMF)-SP1, 2S, 3S and SP4

QUINSAM COAL

Date: August 4, 2020 **Weather:** Sunny **Inspector:** Sarah S

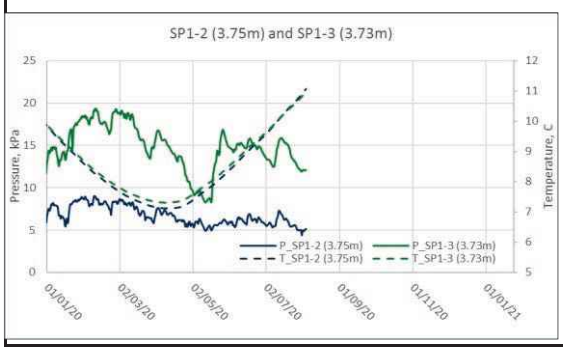
Weekly Summary:
Dischaging at SP4, little to none discharging at SP1
Overflow at 2S to 3S through the designed channel
No flow in the SP1 and SP4 spillways
One truck load of till is hauled to SP1 from 2-North stockpile for the ruts repair.

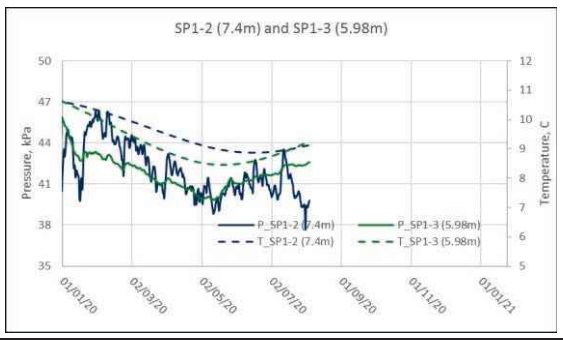
Settling Pond #1 (SP1)-South Water Management System

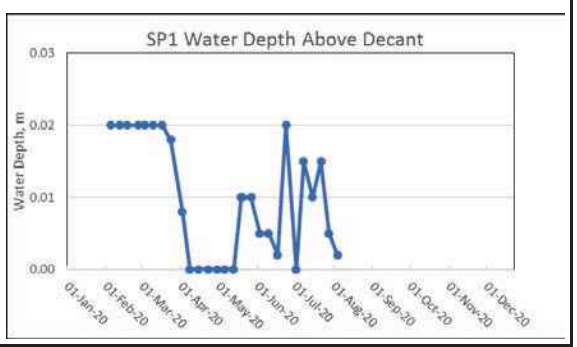
Notes: SP1 crest is dry, till from North stockpile is hauled to SP1.

Crest and Slopes Stability: Dry crest; no gullies, cracks, sinkholes, slides obseved on the downstream slope.
Vegetation: Ongoing
Seepage: Wet spots on the downstream toe are dry.
Animal Activity: No
Spillway: No overflow in the spillway
Water Management: Very little Discharging at SP1

Instrumentation: VWPs (2 shallow and 2 deep) Staff Gauge

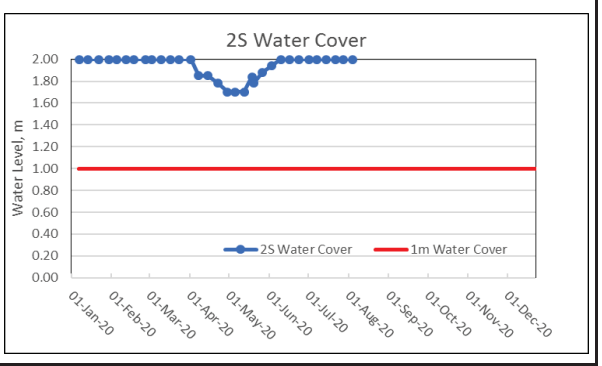






2-South PAG-CCR Pond (2S)-South Water Management System

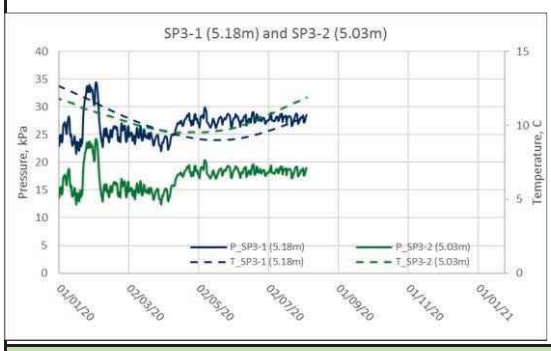
Notes: Water cover at 2S is above 2m;
Crest and Slope Stability: No
Vegetation Control: Trees in the discharge channel needs to be managed
Seepage: Seeping to 3S pit through the Engineer designed channel
Animal Activity: No
Water Management: Low flow water management mode is on
Instrumentation: No pizeometers at 2S pit.
Flow at 2S Inlet (m) ~0.14
Spillway/Discharge Channel Overflow to 3S through the engineer designed channel.
2S UG pump (l/s) 5.1

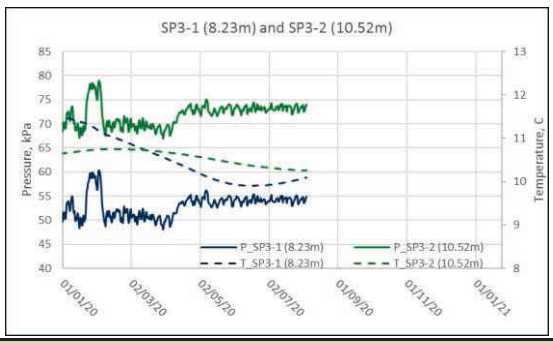


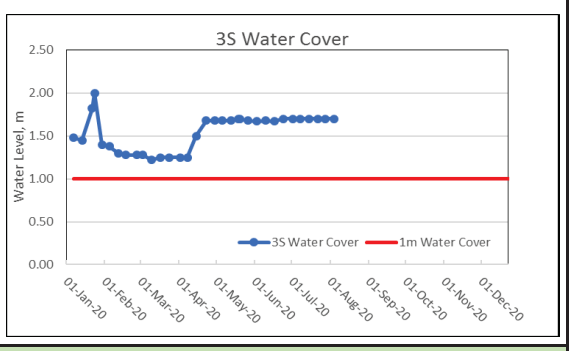
3-South PAG-CCR Pond (3S)-South Water Management System

Notes: getotechnical concern of the inclined trees at the downstream slope of the dyke is being monitored and no significant change is observed.
Crest and Slope Stability: No
Vegetation: Ongoing
Seepage: No
Animal Activity: No
Spillway: Not being used and not permitted
Water Management: 3S float pump is pumping to SP1

Instrumentation: VWPs (2 shallow and 2 deep) Staff Gauge





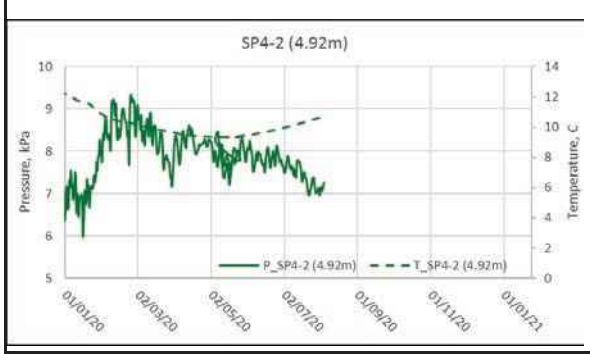


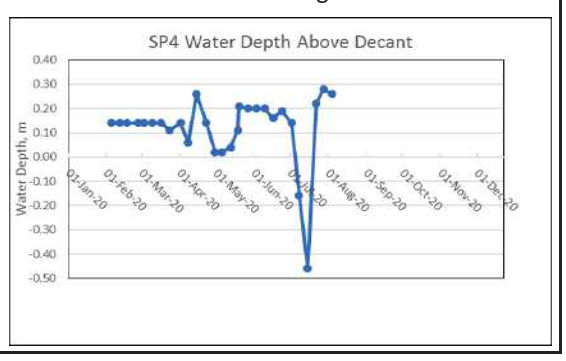
Settling Pond #4 (SP4)-North Water Management System

Notes: water color is orangy. Discharging at SP4

Crest and Slope Stability: No cracks, gullies and sloughing observed
Vegetation Control: Well-controled
Seepage: No
Animal Activity: No
Spillway: No overflow in the spillway
Water Management: Discharing at SP4; Plant pump is off.

Instrumentation: VWPs (1 shallow and 1 deep) Staff Gauge





Weekly Inspection Report
Water Management Facility (WMF)-SP1, 2S, 3S and SP4

QUINSAM COAL

Date: August 11, 2020 **Weather:** Sunny **Inspector:** Sarah S

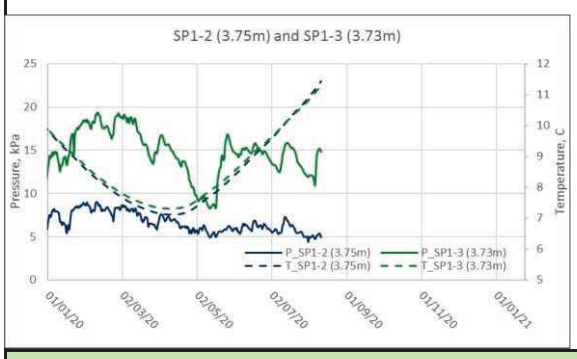
Weekly Summary:
Ruts in the SP1 crest is repaired; A construciton report will be prepared
More brushcutting on the SP1 crest
Dischaging at SP4, no discharging at SP1
Overflow at 2S to 3S through the designed channel
No flow in the SP1 and SP4 spillways

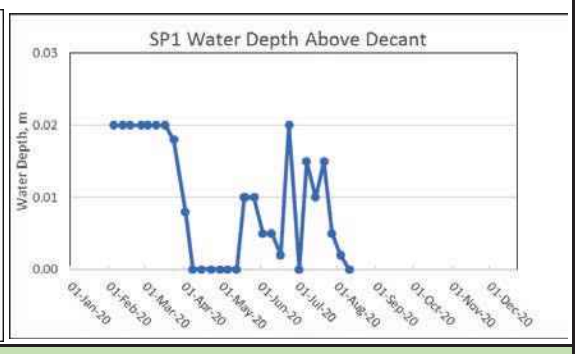
Settling Pond #1 (SP1)-South Water Management System

Notes: Ruts in the SP1 crest is repaired with same construction material

Crest and Slopes Stability: Dry crest; no gullies, cracks, sinkholes, slides obseved on the downstream slope.
Vegetation: the weeds around pizeomater and solar panel are cut off
Seepage: Wet spots on the downstream toe are dry.
Animal Activity: No
Spillway: No overflow in the spillway
Water Management: No Discharging at SP1

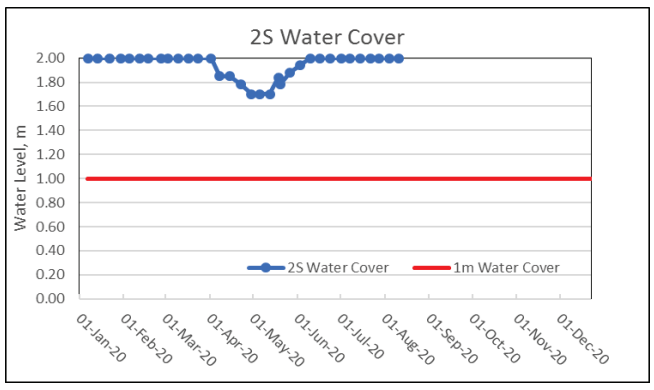
Instrumentation: VWPs (2 shallow and 2 deep) Staff Gauge





2-South PAG-CCR Pond (2S)-South Water Management System

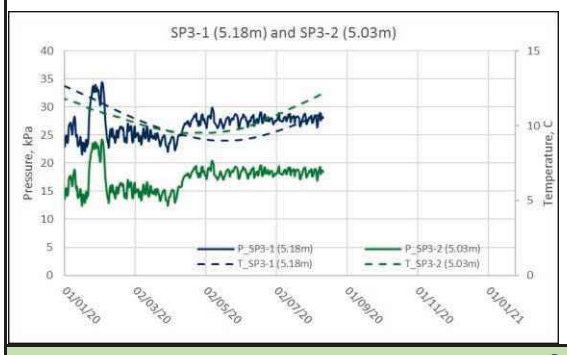
Notes: Water cover at 2S is above 2m;
Crest and Slope Stability: No
Vegetation Control: Trees in the discharge channel need to be managed
Seepage: Seeping to 3S pit through the Engineer designed channel
Animal Activity: No
Water Management: Low flow water management mode is on
Instrumentation: No pizeometers at 2S pit.
Flow at 2S Inlet (m) ~0.17
Spillway/Discharge Channel Overflow to 3S through the engineer designed channel.
2S UG pump (l/s) 6.5

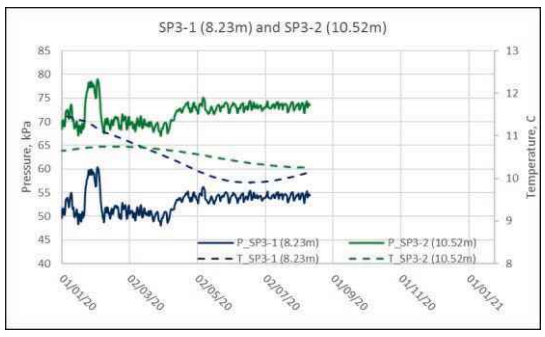


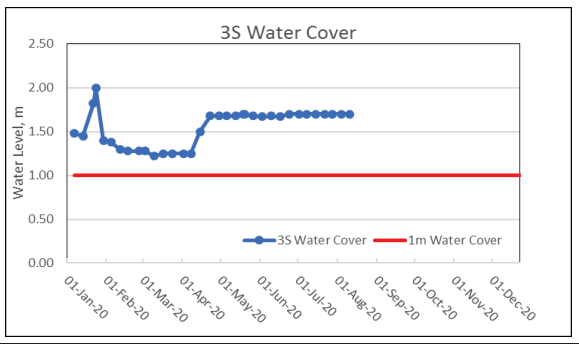
3-South PAG-CCR Pond (3S)-South Water Management System

Notes: getotechnical concern of the inclined trees at the downstream slope of the dyke is being monitored and no significant change is observed.
Crest and Slope Stability: No
Vegetation: Ongoing
Seepage: No
Animal Activity: No
Spillway: Not being used and not permitted
Water Management: 3S float pump is pumping to SP1

Instrumentation: VWPs (2 shallow and 2 deep) Staff Gauge





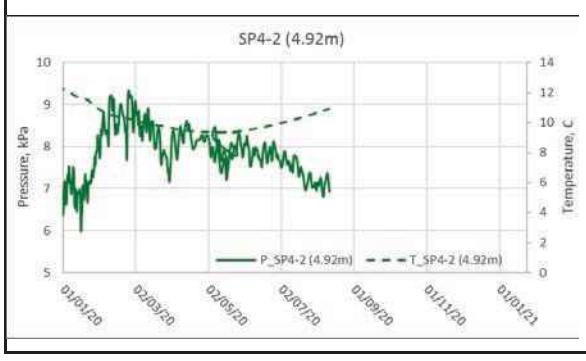


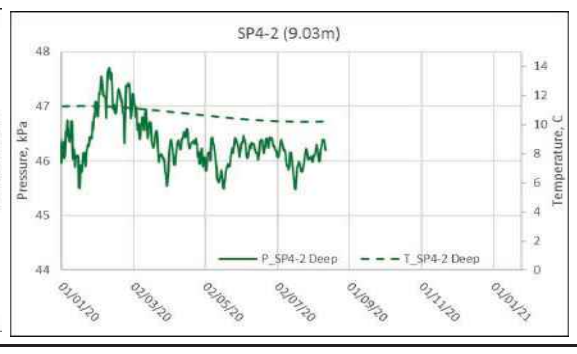
Settling Pond #4 (SP4)-North Water Management System

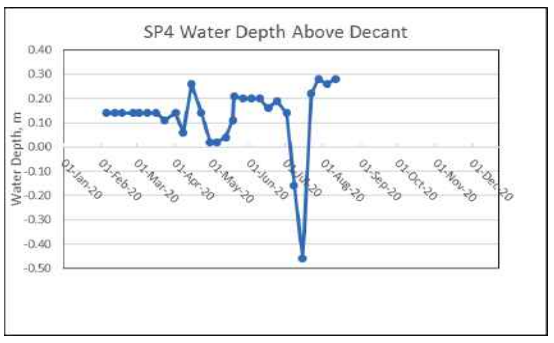
Notes: water color is orangy. Discharging at SP4

Crest and Slope Stability: No cracks, gullies and sloughing observed
Vegetation Control: Well-controled
Seepage: No
Animal Activity: No
Spillway: No overflow in the spillway
Water Management: Discharing at SP4; Plant pump is off.

Instrumentation: VWPs (1 shallow and 1 deep) Staff Gauge







Weekly Inspection Report
Water Management Facility (WMF)-SP1, 2S, 3S and SP4

QUINSAM COAL

Date: August 18, 2020 **Weather:** Sunny **Inspector:** Sarah S

Weekly Summary:

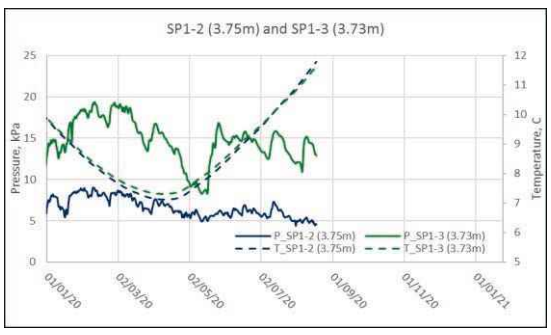
Ruts in the SP1 crest is repaired with a log put at the entrance of the SP1 crest; No driving except emergency/necessary maitenance is allowed on SP1 crest.
Very little discharging at SP1.
Dischaging at SP4. Lower water level at SP4, the 1Mains-2North pump is directed to PAG pond.
No overflow at 2S.
No flow in the SP1 and SP4 spillways

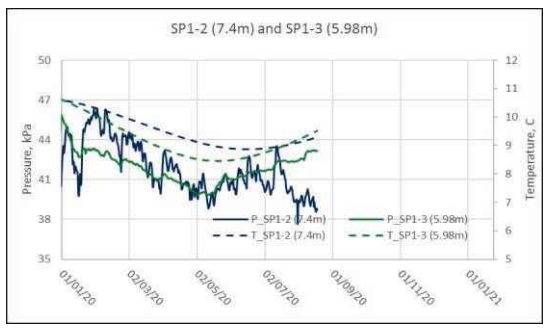
Settling Pond #1 (SP1)-South Water Management System

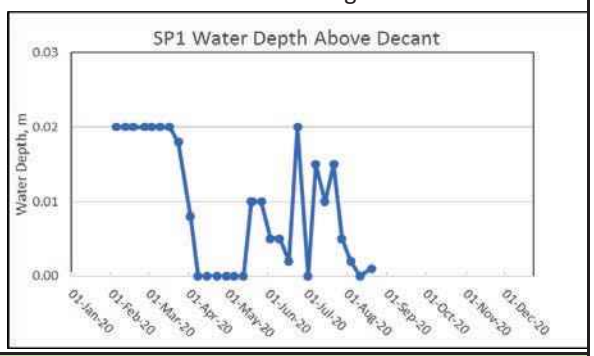
Notes: the area above the decant at SP1 crest is regraded, leveled and covered with gravels to reduce erosion.
A barrier of about 12ft long log is laid down at SP1 to limit traffic on the dam crest.

Crest and Slopes Stability: Dry crest; no cracks, sinkholes, slides obseved on the downstream slope.
Vegetation: the weeds around pizeomater and solar panel are cut off
Seepage: Wet spots on the downstream toe are dry.
Animal Activity: No
Spillway: No overflow in the spillway
Water Management: Very little discharging at SP1

Instrumentation: VWPs (2 shallow and 2 deep) Staff Gauge



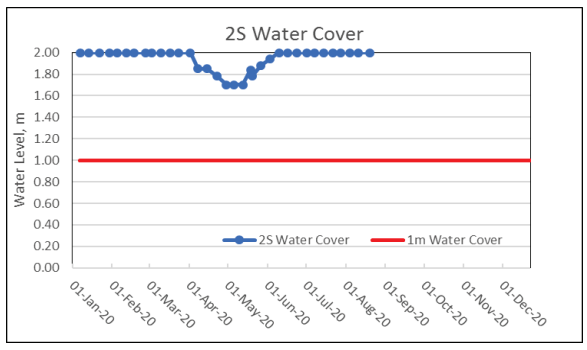




2-South PAG-CCR Pond (2S)-South Water Management System

Notes: Water cover at 2S is above 2m;

Crest and Slope Stability: No
Vegetation Control: Trees in the discharge channel need to be managed
Seepage: Seeping to 3S pit through the Engineer designed channel
Animal Activity: No
Water Management: Low flow water management mode is on
Instrumentation: No pizeometers at 2S pit.
Flow at 2S Inlet (m) ~0.17
Spillway/Discharge Channel No overflow
2S UG pump (l/s) 6.1

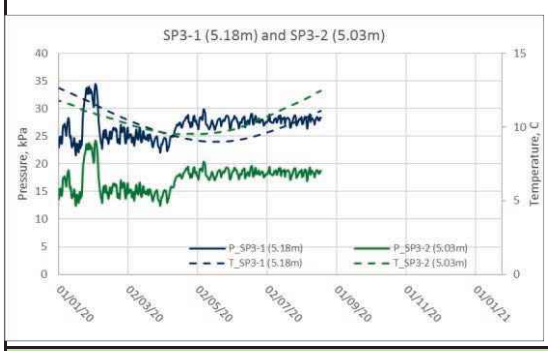


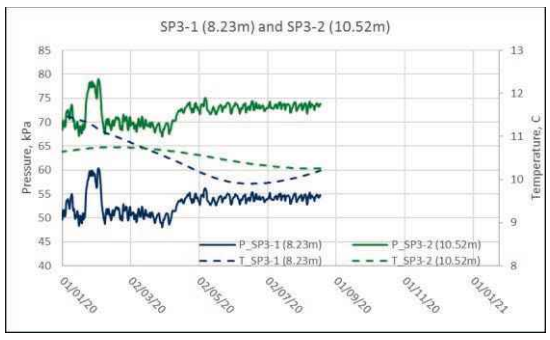
3-South PAG-CCR Pond (3S)-South Water Management System

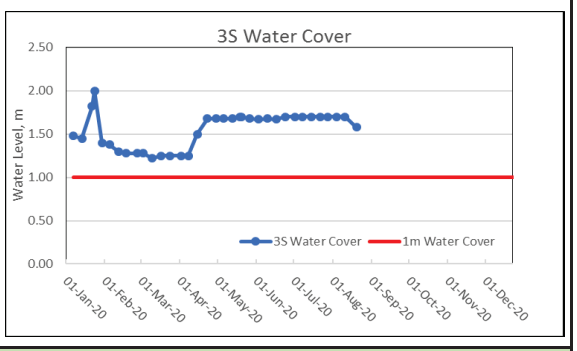
Notes: getotechnical concern of the inclined trees at the downstream slope of the dyke is being monitored and no significant change is observed.

Crest and Slope Stability: No
Vegetation: Ongoing
Seepage: No
Animal Activity: No
Spillway: Not being used and not permitted
Water Management: 3S float pump is pumping to 2S

Instrumentation: VWPs (2 shallow and 2 deep) Staff Gauge





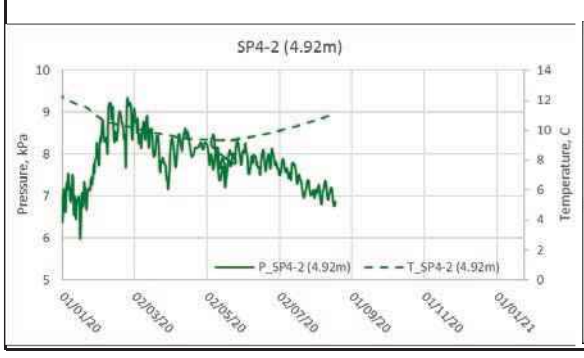


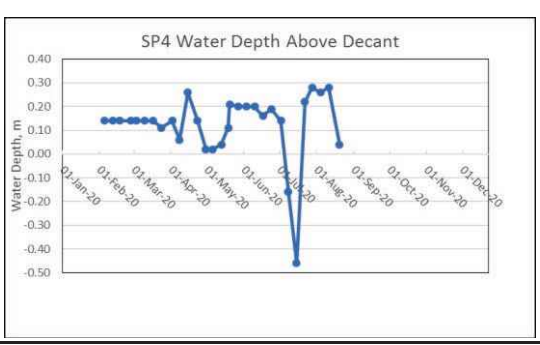
Settling Pond #4 (SP4)-North Water Management System

Notes: water level is low (compare to the reading during last two weeks), the 1Mains-2North pump is directed to 2-North PAG pond.
Plant pump is off.

Crest and Slope Stability: No cracks, gullies and sloughing observed
Vegetation Control: Well-controled
Seepage: No
Animal Activity: No
Spillway: No overflow in the spillway
Water Management: Discharing at SP4

Instrumentation: VWPs (1 shallow and 1 deep) Staff Gauge





Weekly Inspection Report
Water Management Facility (WMF)-SP1, 2S, 3S and SP4

QUINSAM

Date: August 25, 2020 **Weather:** Sunny **Inspector:** Sarah S

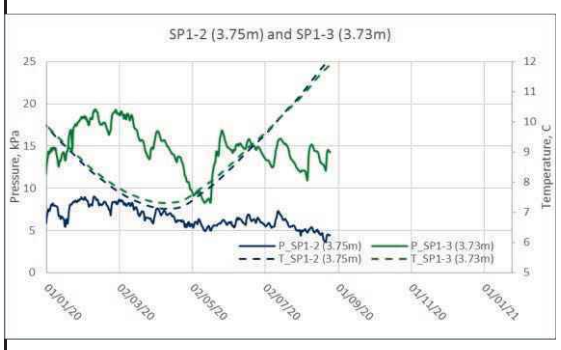
Weekly Summary:
Trees and weeds were cut/brushed off at 2S discharge channel and gate valves during this week and last week.
Dischaging at SP4. 1Mains-2North pump is directed to SP4 on August 25, 2020.
Overflow at 2S.
No flow in the SP1 and SP4 spillways.

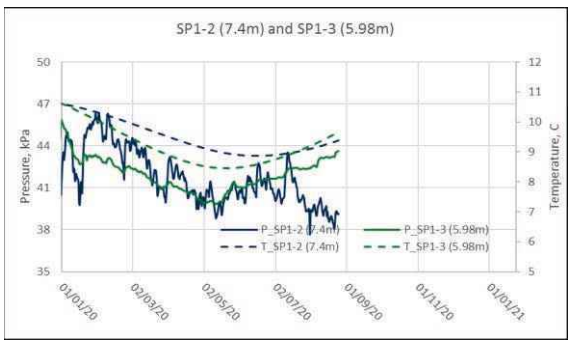
Settling Pond #1 (SP1)-South Water Management System

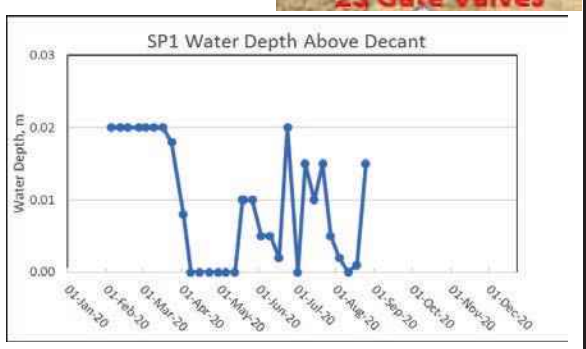
Notes: the area above the decant at SP1 crest is regraded, leveled and covered with gravels to reduce erosion.
A barrier of about 12ft long log is laid down at SP1 to limit traffic on the dam crest.

Crest and Slopes Stability: Dry crest; no cracks, sinkholes, slides obseved on the downstream slope.
Vegetation: the weeds around pizeomater and solar panel are cut off
Seepage: Wet spots on the downstream toe are dry.
Animal Activity: No
Spillway: No overflow in the spillway
Water Management: Discharging at SP1

Instrumentation: VWPs (2 shallow and 2 deep) Sta

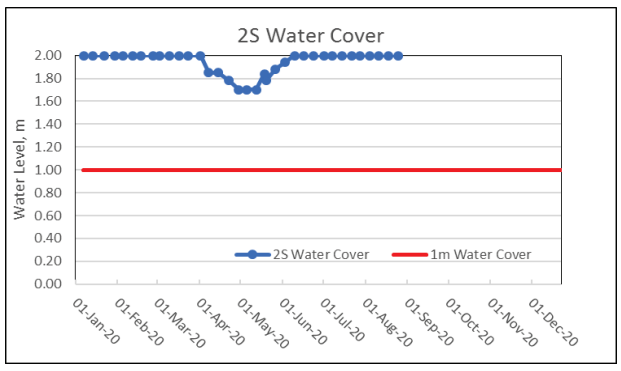






2-South PAG-CCR Pond (2S)-South Water Management System

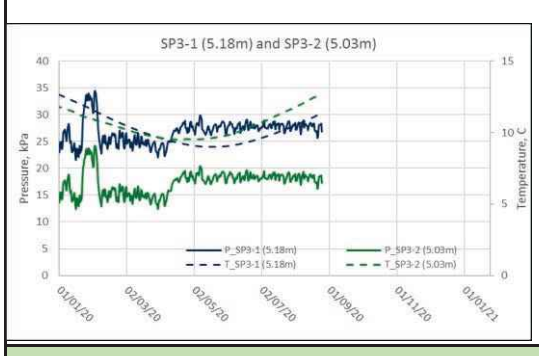
Notes: Water cover at 2S is above 2m;
Crest and Slope Stability: No
Vegetation Control: Trees are cut off in the 2S discharge channel and 2S gate valves.
Seepage: Seeping to 3S pit through the Engineer designed channel
Animal Activity: No
Water Management: Low flow water management mode is on (2S gate valves are open)
Instrumentation: No pizeometers at 2S pit.
Flow at 2S Inlet (m) ~0.17
Spillway/Discharge Channel No overflow
2S UG pump (l/s) 6.1

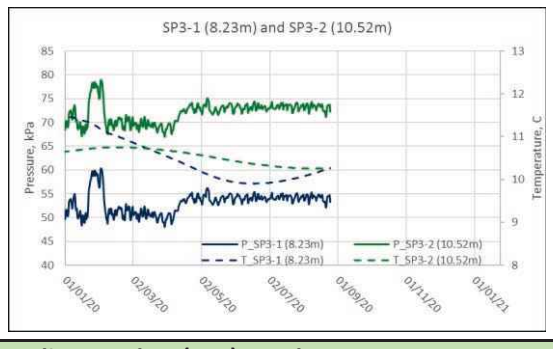


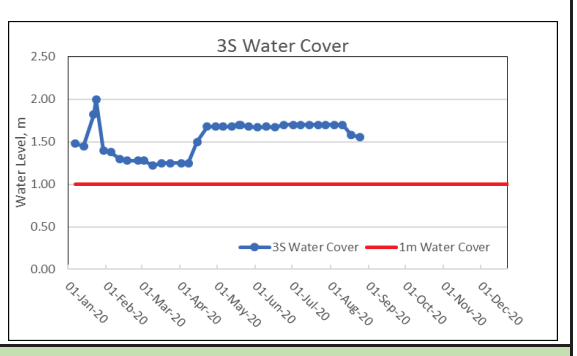
3-South PAG-CCR Pond (3S)-South Water Management System

Notes: getotechnical concern of the inclined trees at the downstream slope of the dyke is being monitored and no significant change is observed.
Crest and Slope Stability: No
Vegetation: Ongoing
Seepage: No
Animal Activity: No
Spillway: Not being used and not permitted
Water Management: 3S float pump is pumping to SP1

Instrumentation: VWPs (2 shallow and 2 deep) Staff Gauge





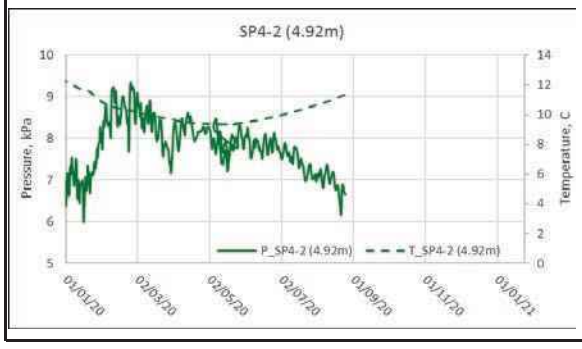


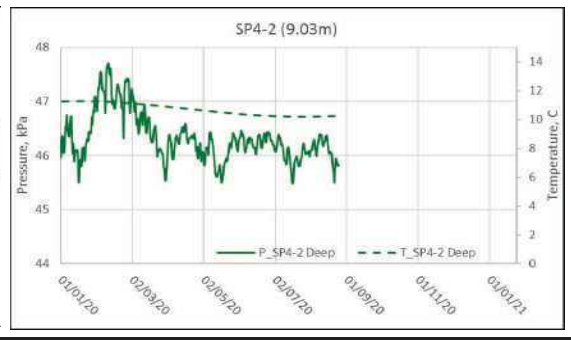
Settling Pond #4 (SP4)-North Water Management System

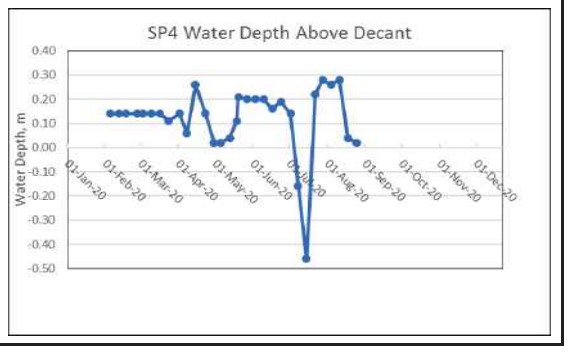
Notes: 1Mains-2North pump is directed to SP4. Plant pump is off.

Crest and Slope Stability: No cracks, gullies and sloughing observed
Vegetation Control: Well-controled
Seepage: No
Animal Activity: No
Spillway: No overflow in the spillway
Water Management: Discharing at SP4

Instrumentation: VWPs (1 shallow and 1 deep) Staff Gauge







Weekly Inspection Report
Water Management Facility (WMF)-SP1, 2S, 3S and SP4

QUINSAM COAL

Date: September 3, 2020 **Weather:** Sunny **Inspector:** Sarah S

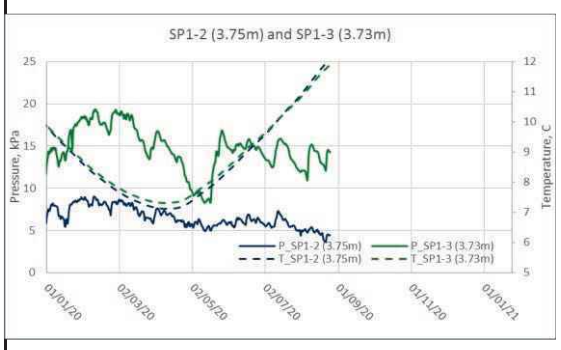
Weekly Summary:
No discharge on September 2 at SP1, tiny discharge on September 1 at SP1.
Dischaging at SP4.
Overflow at 2S.
No flow in the SP1 and SP4 spillways. 3S is discharging to SP4.

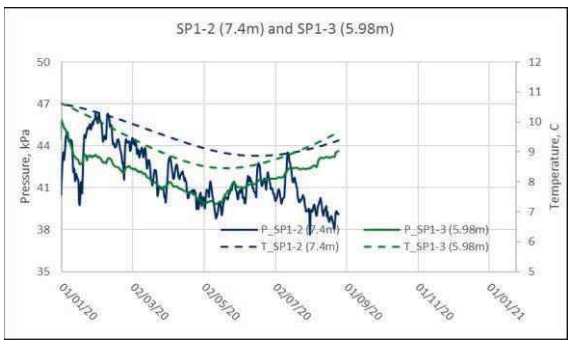
Settling Pond #1 (SP1)-South Water Management System

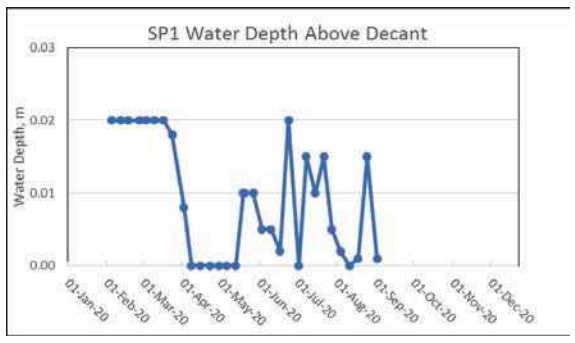
Notes: Normal

Crest and Slopes Stability: Dry crest; no cracks, sinkholes, slides obseved on the downstream slope.
Vegetation: well maintained
Seepage: No
Animal Activity: No
Spillway: No overflow in the spillway
Water Management: None to small discharging at SP1

Instrumentation: VWPs (2 shallow and 2 deep) Staff Gauge

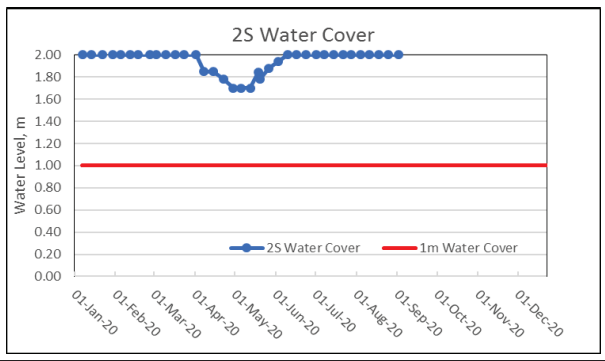






2-South PAG-CCR Pond (2S)-South Water Management System

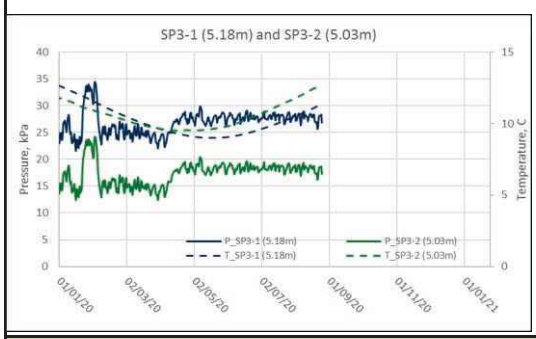
Notes: Water cover at 2S is above 2m;
Crest and Slope Stability: No
Vegetation Control: well maintained
Seepage: Seeping to 3S pit through the Engineer designed channel
Animal Activity: No
Water Management: Low flow water management mode is on (2S gate valves open)
Instrumentation: No pizeometers at 2S pit.
Flow at 2S Inlet (m) ~0.17
Spillway/Discharge Channel No overflow
2S UG pump (l/s)

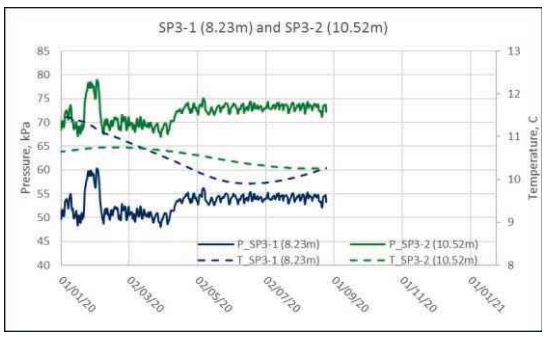


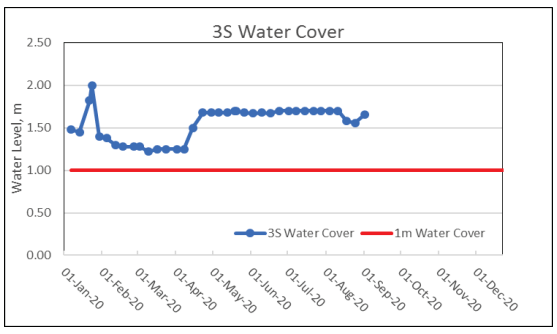
3-South PAG-CCR Pond (3S)-South Water Management System

Notes: getotechnical concern of the inclined trees at the downstream slope of the dyke is being monitored and no significant change is observed.
Crest and Slope Stability: No
Vegetation: well maintained
Seepage: No
Animal Activity: No
Spillway: Not being used and not permitted
Water Management: 3S float pump is pumping to SP1

Instrumentation: VWPs (2 shallow and 2 deep) Staff Gauge





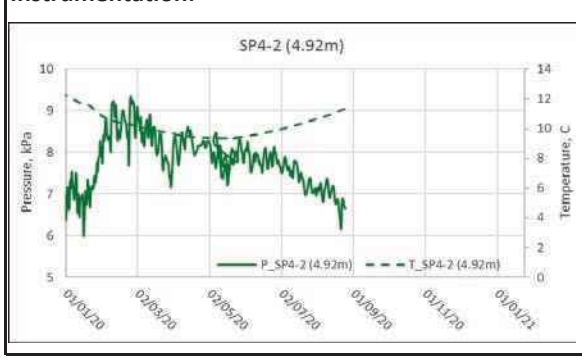


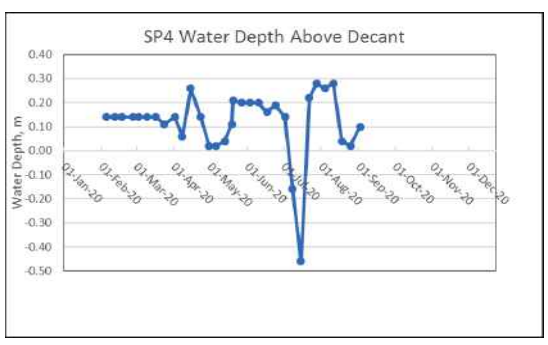
Settling Pond #4 (SP4)-North Water Management System

Notes: 1Mains-2North pump is directed to SP4. Plant pump is off.

Crest and Slope Stability: No cracks, gullies and sloughing observed
Vegetation Control: Well-controled
Seepage: No
Animal Activity: No
Spillway: No overflow in the spillway
Water Management: Discharing at SP4

Instrumentation: VWPs (1 shallow and 1 deep) Staff Gauge





Weekly Inspection Report
Water Management Facility (WMF)-SP1, 2S, 3S and SP4

QUINSAM COAL

Date: September 8, 2020 **Weather:** Sunny **Inspector:** Sarah S

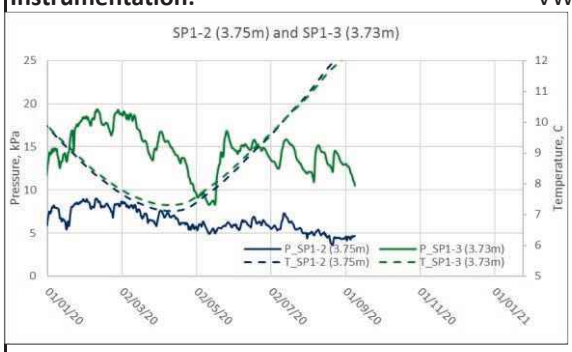
Weekly Summary:
Dry week, No discharge at SP1, no overflow at 2S.
Dischaging at SP4.
No flow in the SP1 and SP4 spillways.

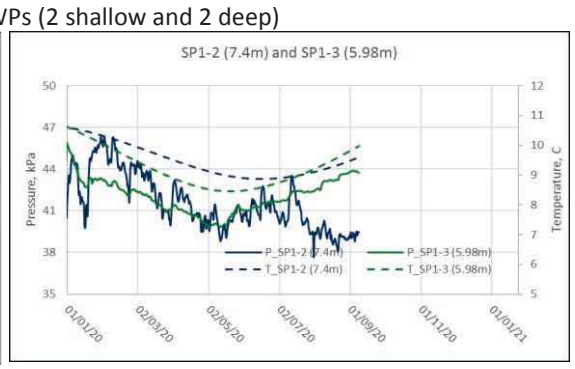
Settling Pond #1 (SP1)-South Water Management System

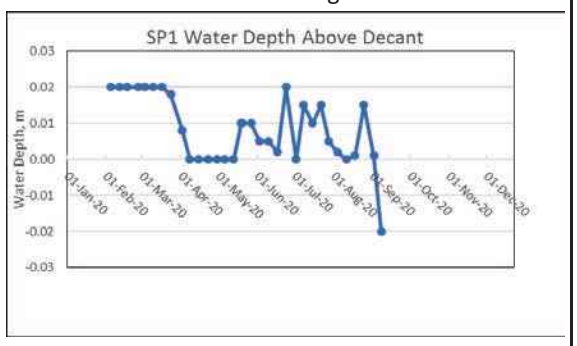
Notes: water level is below "0" of the staff gauge.

Crest and Slopes Stability: Dry crest; no cracks, sinkholes, slides obseved on the downstream slope.
Vegetation: well maintained
Seepage: No
Animal Activity: No
Spillway: No overflow in the spillway
Water Management: No discharge at SP1

Instrumentation: VWPs (2 shallow and 2 deep) Staff Gauge

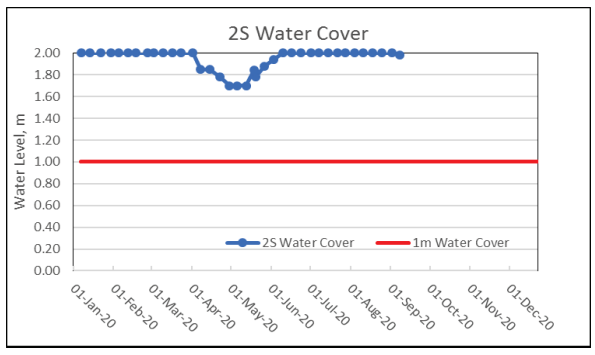






2-South PAG-CCR Pond (2S)-South Water Management System

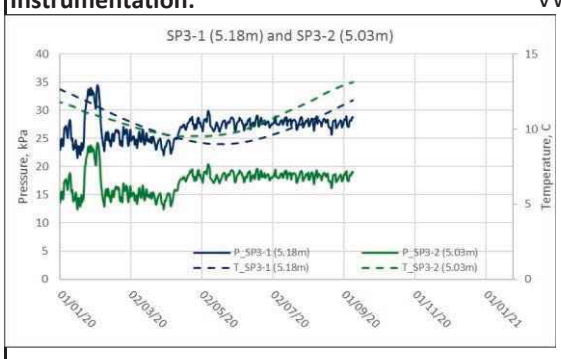
Notes: Water cover at 2S is 2m; no overflow to 3S; 2S mine pool pump at Q11-11 is working at the same pumping rate.
Crest and Slope Stability: No
Vegetation Control: well maintained
Seepage: Seeping to 3S pit through the Engineer designed channel
Animal Activity: No
Water Management: Low flow water management mode is on (2S gate valves open)
Instrumentation: No pizeometers at 2S pit.
Flow at 2S Inlet (m) ~0.11
Spillway/Discharge Channel No overflow
2S UG pump (l/s) 6.5

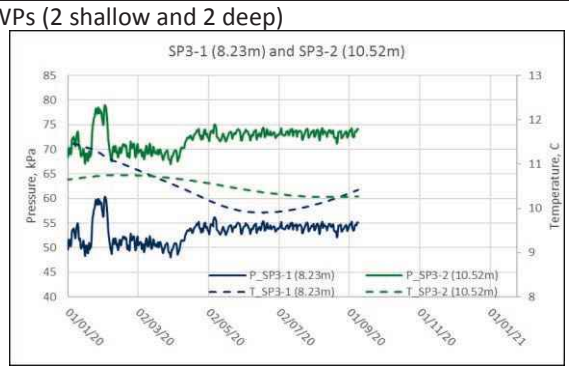


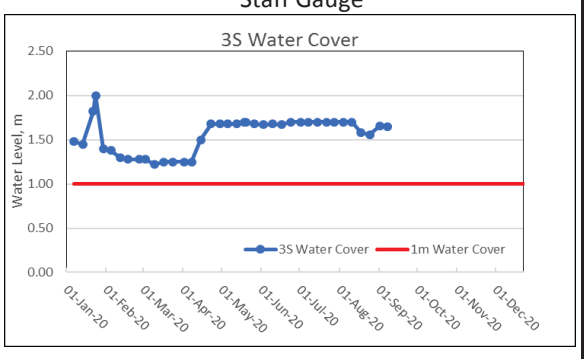
3-South PAG-CCR Pond (3S)-South Water Management System

Notes: getotechnical concern of the inclined trees at the downstream slope of the dyke is being monitored and no significant change is observed.
Crest and Slope Stability: No
Vegetation: well maintained
Seepage: No
Animal Activity: No
Spillway: Not being used and not permitted
Water Management: 3S float pump is pumping to SP1, no discharge at SP1

Instrumentation: VWPs (2 shallow and 2 deep) Staff Gauge





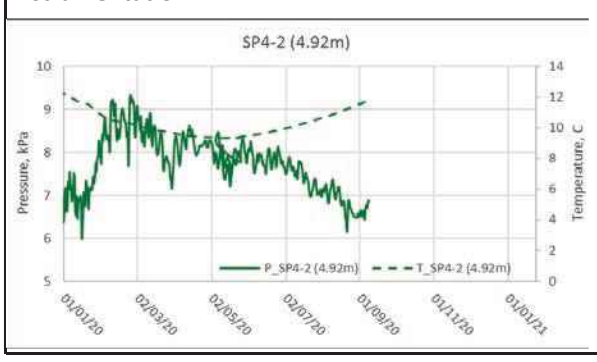


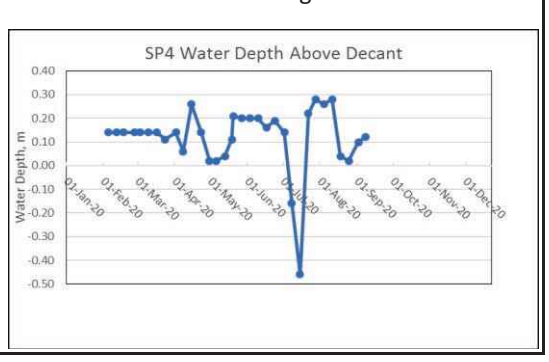
Settling Pond #4 (SP4)-North Water Management System

Notes: 1Mains-2North pump is directed to SP4. Plant pump is off.

Crest and Slope Stability: No cracks, gullies and sloughing observed
Vegetation Control: Well-controled
Seepage: No
Animal Activity: No
Spillway: No overflow in the spillway
Water Management: Discharing at SP4

Instrumentation: VWPs (1 shallow and 1 deep) Staff Gauge





Weekly Inspection Report
Water Management Facility (WMF)-SP1, 2S, 3S and SP4

QUINSAM COAL

Date: September 15, 2020 **Weather:** Foggy/Smoky/Rainy **Inspector:** Sarah S

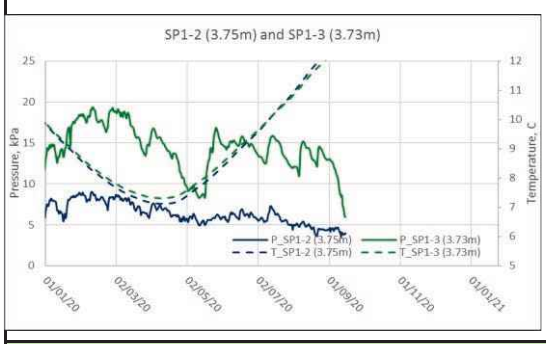
Weekly Summary:
No discharge at SP1, no overflow at 2S.
Dischaging at SP4.
No flow in the SP1 and SP4 spillways.

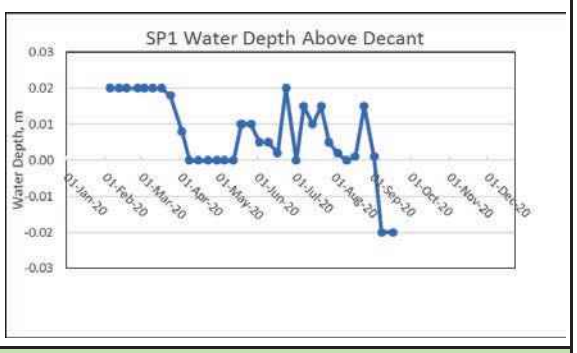
Settling Pond #1 (SP1)-South Water Management System

Notes: water level is below "0" of the staff gauge.

Crest and Slopes Stability: Dry crest; no cracks, sinkholes, slides obseved on the downstream slope.
Vegetation: Maintained
Seepage: No
Animal Activity: No
Spillway: No overflow in the spillway
Water Management: No discharge at SP1

Instrumentation: VWPs (2 shallow and 2 deep) Staff Gauge

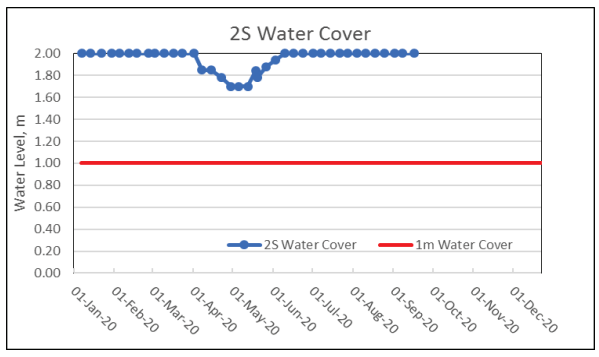




2-South PAG-CCR Pond (2S)-South Water Management System

Notes: Water cover at 2S is >2m; no overflow to 3S; 2S mine pool pump at Q11-11 is working at the same pumping rate.

Crest and Slope Stability: No
Vegetation Control: well maintained
Seepage: Seeping to 3S pit through the Engineer designed channel
Animal Activity: No
Water Management: Low flow water management mode is on (2S gate valves are open)
Instrumentation: No pizeometers at 2S pit.
Flow at 2S Inlet (m) ~0.14
Spillway/Discharge Channel No overflow
2S UG pump (l/s) 6.5

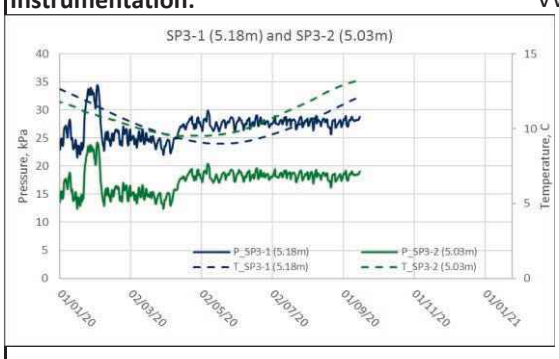


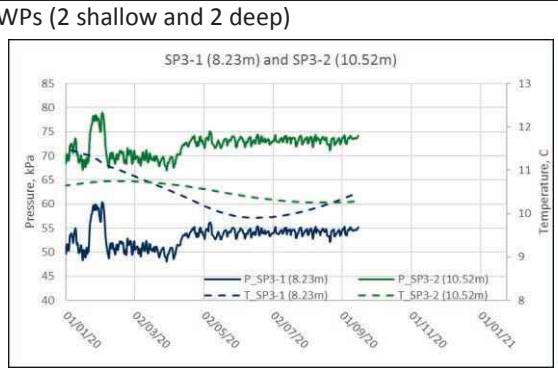
3-South PAG-CCR Pond (3S)-South Water Management System

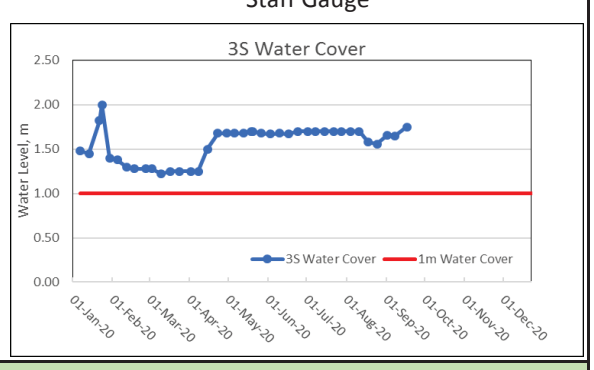
Notes: getotechnical concern of the inclined trees at the downstream slope of the dyke is being monitored and no significant change is observed.

Crest and Slope Stability: No
Vegetation: Maintained
Seepage: No
Animal Activity: No
Spillway: Not being used and not permitted
Water Management: no discharge at SP1

Instrumentation: VWPs (2 shallow and 2 deep) Staff Gauge





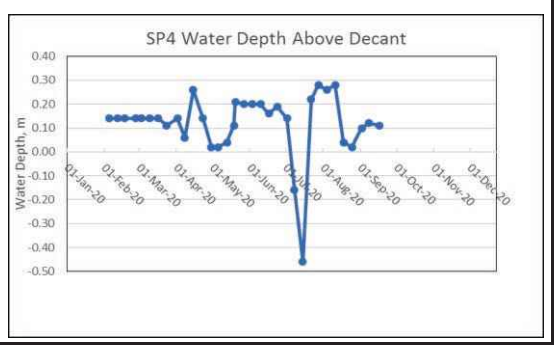


Settling Pond #4 (SP4)-North Water Management System

Notes: Plant pump is off. 2N UG pumps pumping to Brinco Brook, then to SP4

Crest and Slope Stability: No cracks, gullies and sloughing observed
Vegetation Control: Well-controled
Seepage: No
Animal Activity: No
Spillway: No overflow in the spillway
Water Management: Discharing at SP4

Instrumentation: VWPs (1 shallow and 1 deep) Staff Gauge



Weekly Inspection Report
Water Management Facility (WMF)-SP1, 2S, 3S and SP4

QUINSAM COAL

Date: September 22, 2020 **Weather:** Cloudy **Inspector:** Sarah S

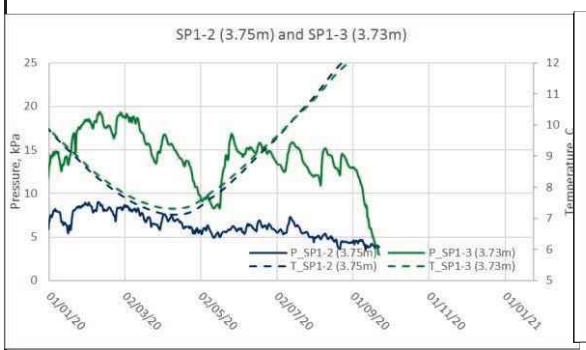
Weekly Summary:
Discharging at SP1 and SP4; overflowing at 2S.
No flow in the SP1 and SP4 spillways.
Cloudy and wet week.

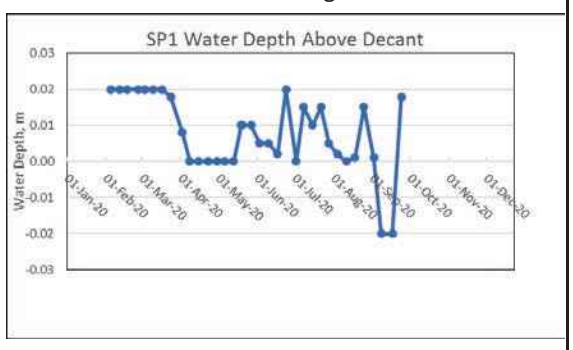
Settling Pond #1 (SP1)-South Water Management System

Notes: the repaired ruts above the decan are maitained in good situation

Crest and Slopes Stability: Dry crest; no cracks, sinkholes, slides obseved on the downstream slope.
Vegetation: Maintained
Seepage: No
Animal Activity: No
Spillway: No overflow in the spillway
Water Management: discharging at SP1

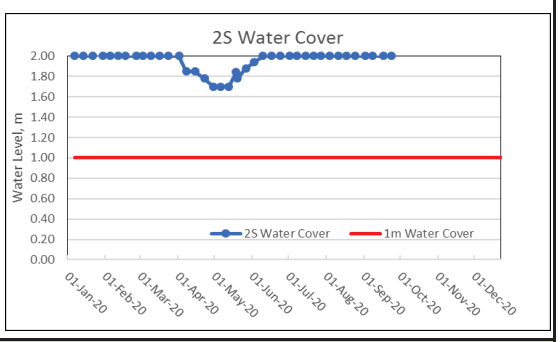
Instrumentation: VWPs (2 shallow and 2 deep) Staff Gauge





2-South PAG-CCR Pond (2S)-South Water Management System

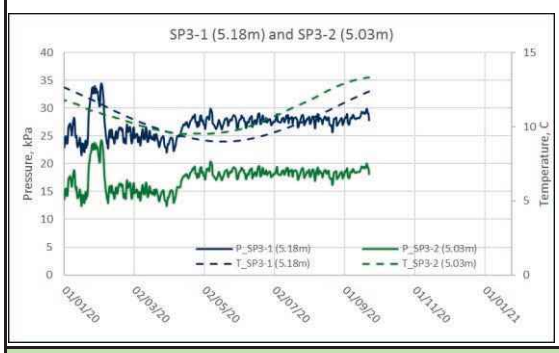
Notes: Water cover at 2S is >2m; 2S mine pool pump at Q11-11 is working at the same pumping rate.
Crest and Slope Stability: No
Vegetation Control: well maintained
Seepage: Seeping to 3S pit through the Engineer designed channel
Animal Activity: No
Water Management: High flow water management mode is on (2S gate valves closed)
Instrumentation: No pizeometers at 2S pit.
Flow at 2S Inlet (m) ~0.14
Spillway/Discharge Channel No overflow
2S UG pump (l/s) 6.5

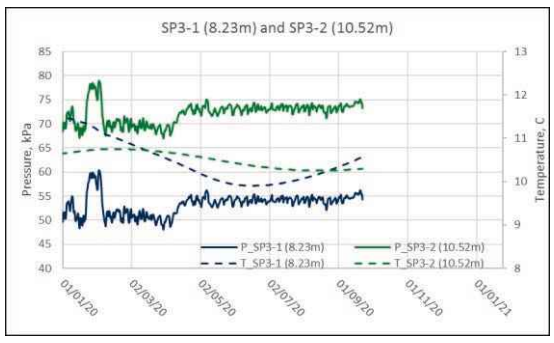


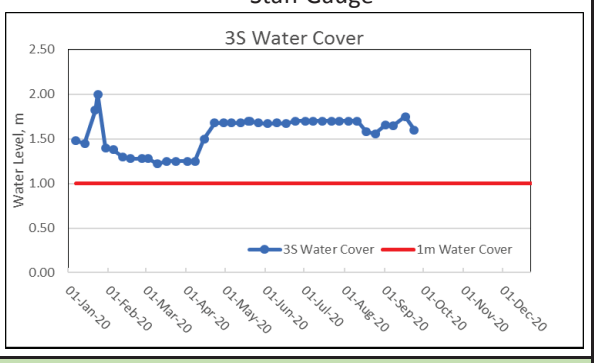
3-South PAG-CCR Pond (3S)-South Water Management System

Notes: getotechnical concern of the inclined trees at the downstream slope of the dyke is being monitored and no significant change is observed.
Crest and Slope Stability: No
Vegetation: Maintained
Seepage: No
Animal Activity: No
Spillway: Not being used and not permitted
Water Management: 3S is diverted to 2S

Instrumentation: VWPs (2 shallow and 2 deep) Staff Gauge





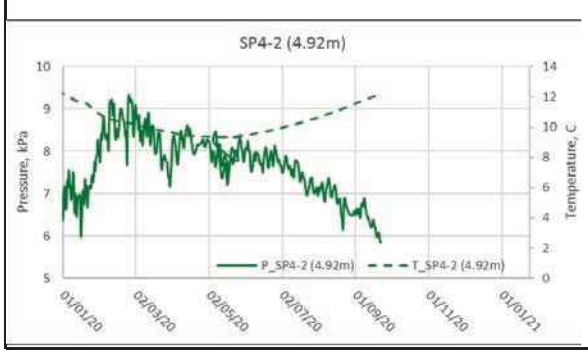


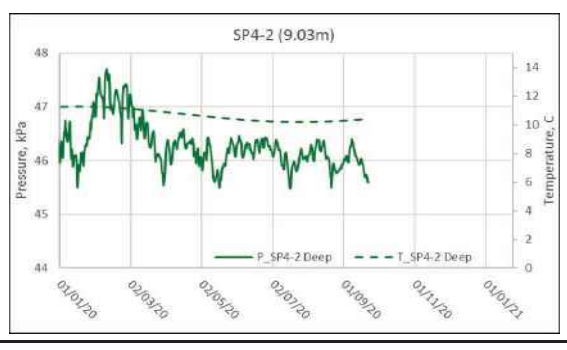
Settling Pond #4 (SP4)-North Water Management System

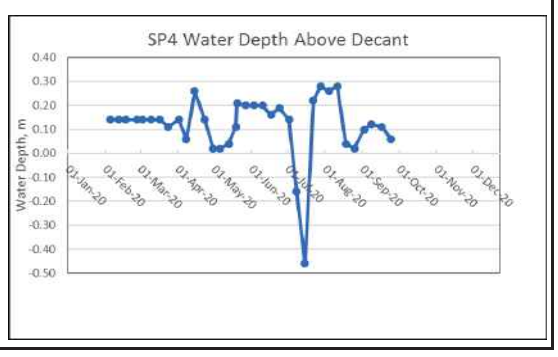
Notes: Plant pump is off. 2N UG pumps pumping to WP

Crest and Slope Stability: No cracks, gullies and sloughing observed
Vegetation Control: Well-controled
Seepage: No
Animal Activity: No
Spillway: No overflow in the spillway
Water Management: Discharing at SP4

Instrumentation: VWPs (1 shallow and 1 deep) Staff Gauge







Weekly Inspection Report
Water Management Facility (WMF)-SP1, 2S, 3S and SP4

QUINSAM COAL

Date: September 29, 2020 **Weather:** Sunny **Inspector:** Sarah S

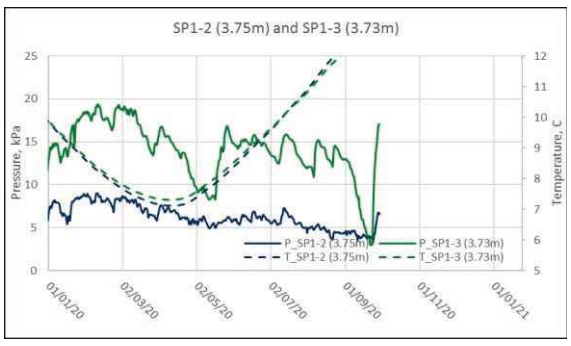
Weekly Summary:
Discharging at SP1 and SP4; overflowing at 2S.
No flow in the SP1 and SP4 spillways.
Mostly was loudy and wet during the week.

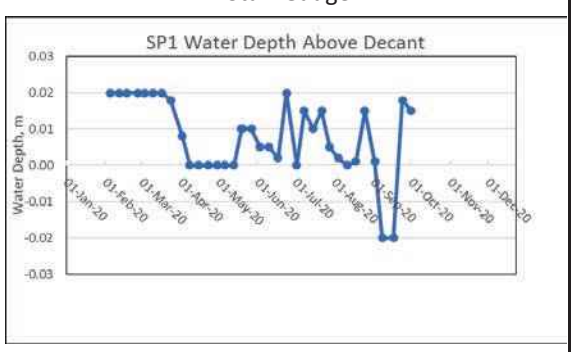
Settling Pond #1 (SP1)-South Water Management System

Notes: Wet week, high-flow water management mode is on.

Crest and Slopes Stability: Dry crest; no cracks, sinkholes, slides obseved on the downstream slope.
Vegetation: Maintained
Seepage: No
Animal Activity: No
Spillway: No overflow in the spillway
Water Management: discharging at SP1

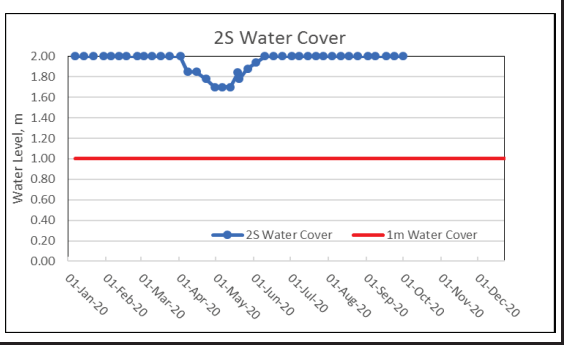
Instrumentation: VWPs (2 shallow and 2 deep) Staff Gauge





2-South PAG-CCR Pond (2S)-South Water Management System

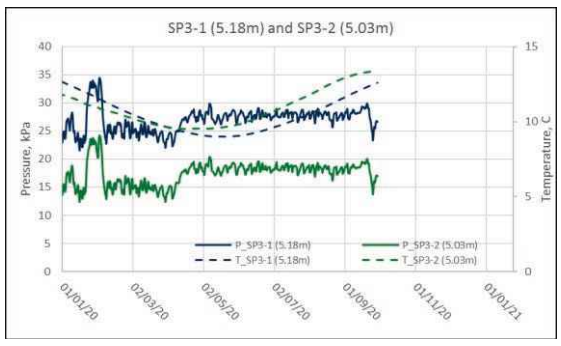
Notes: Water cover at 2S is >2m; 2S mine pool pump at Q11-11 is working at the same pumping rate.
Crest and Slope Stability: No
Vegetation Control: well maintained
Seepage: Seeping to 3S pit through the Engineer designed channel
Animal Activity: No
Water Management: High flow water management mode is on (2S gate valves closed)
Instrumentation: No pizeometers at 2S pit.
Flow at 2S Inlet (m) ~0.16
Spillway/Discharge Channel overflow
2S UG pump (l/s) 5

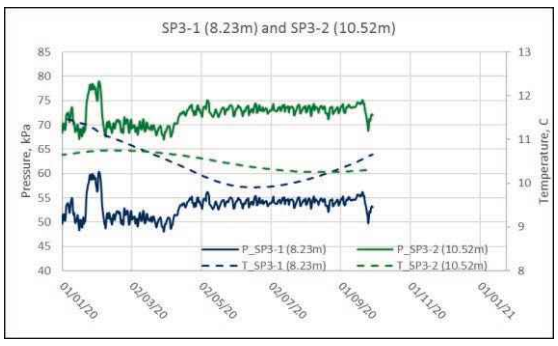


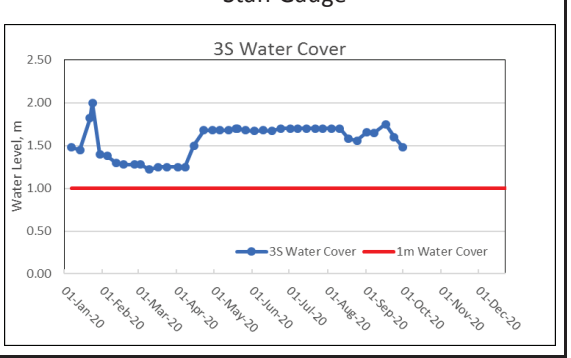
3-South PAG-CCR Pond (3S)-South Water Management System

Notes: getotechnical concern of the inclined trees at the downstream slope of the dyke is being monitored and no significant change is observed.
Crest and Slope Stability: No
Vegetation: Maintained
Seepage: No
Animal Activity: No
Spillway: Not being used and not permitted
Water Management: 3S is pumping to SP1

Instrumentation: VWPs (2 shallow and 2 deep) Staff Gauge





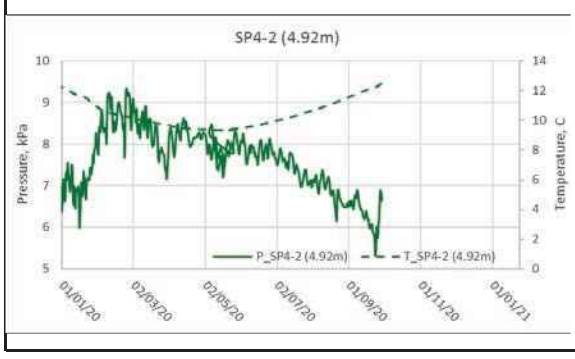


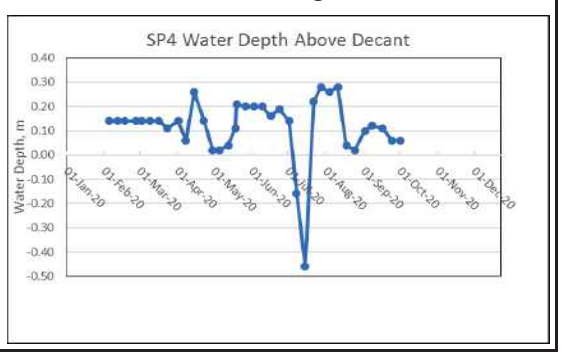
Settling Pond #4 (SP4)-North Water Management System

Notes: Plant pump is off

Crest and Slope Stability: No cracks, gullies and sloughing observed
Vegetation Control: Well-controled
Seepage: No
Animal Activity: No
Spillway: No overflow in the spillway
Water Management: Discharing at SP4

Instrumentation: VWPs (1 shallow and 1 deep) Staff Gauge





Weekly Inspection Report
Water Management Facility (WMF)-SP1, 2S, 3S and SP4

Date: October 6, 2020 **Weather:** Sunny, cloudy **Inspector:** Sarah S

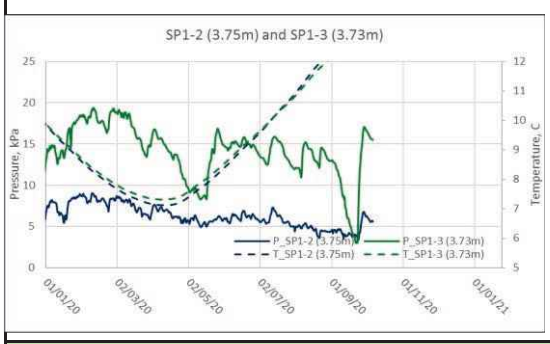
Weekly Summary:
Discharging at SP1 and SP4
No overflow at 2S
No flow in the SP1 and SP4 spillways.

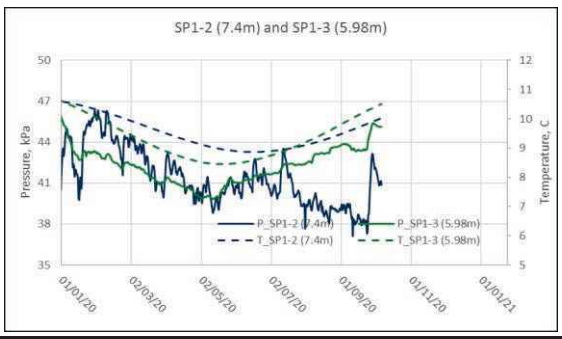
Settling Pond #1 (SP1)-South Water Management System

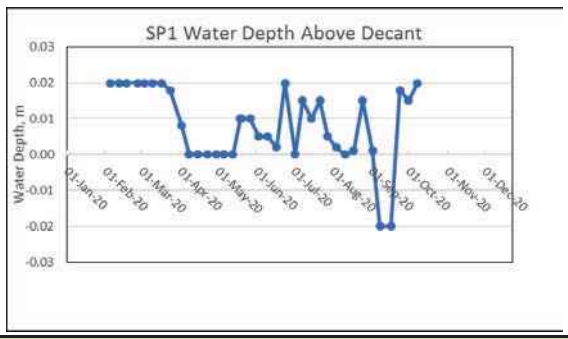
Notes: Discharging at SP1

Crest and Slopes Stability: Dry crest; no cracks, sinkholes, slides obseved on the downstream slope.
Vegetation: Maintained
Seepage: No
Animal Activity: No
Spillway: No overflow in the spillway
Water Management: discharging at SP1

Instrumentation: VWPs (2 shallow and 2 deep) Staff Gauge

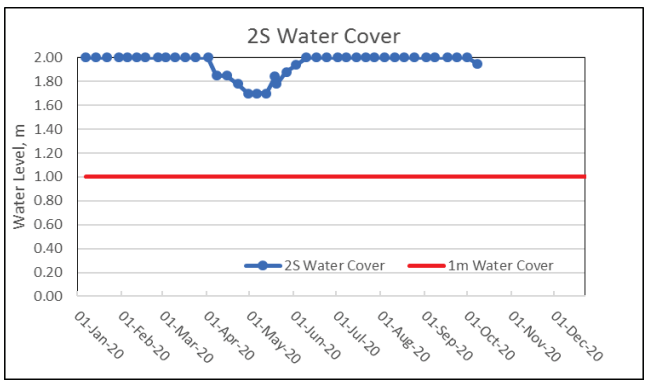






2-South PAG-CCR Pond (2S)-South Water Management System

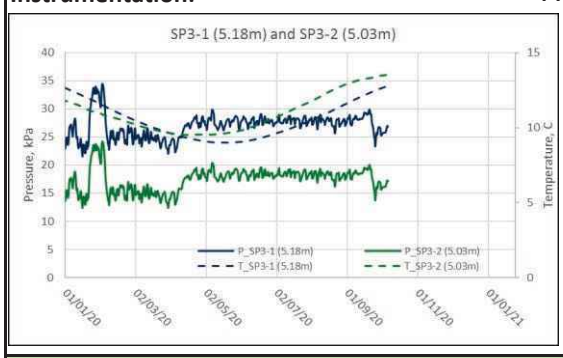
Notes: 2S mine pool pump at Q11-11 is working at the same pumping rate.
Crest and Slope Stability: No
Vegetation Control: well maintained
Seepage: Seeping to 3S pit through the Engineer designed channel
Animal Activity: No
Water Management: High flow water management mode is on (2S gate valves closed)
Instrumentation: Staff gauges, weir at 2SI, flowmeater at 2SC, no pizeometer
Flow at 2S Inlet (m) 0.13
Spillway/Discharge Channel overflow
2S UG pump (l/s) 5

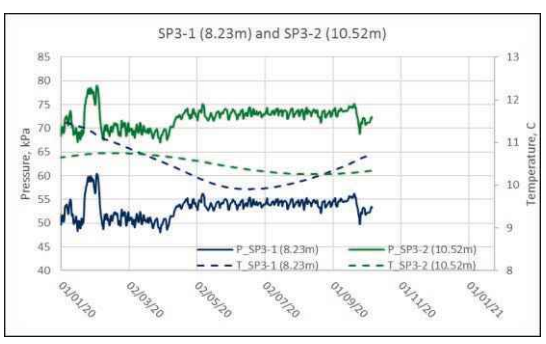


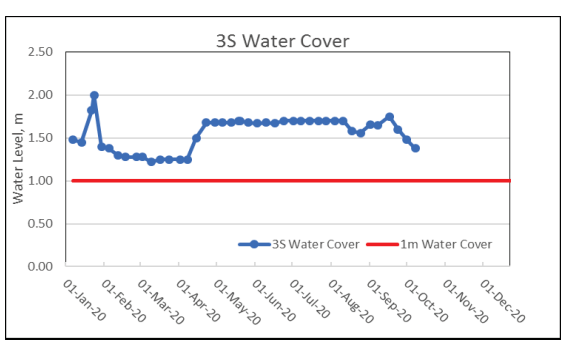
3-South PAG-CCR Pond (3S)-South Water Management System

Notes: getotechnical concern of the inclined trees at the downstream slope of the dyke is being monitored and no significant change is observed.
Crest and Slope Stability: No
Vegetation: Maintained
Seepage: No
Animal Activity: No
Spillway: Not being used and not permitted
Water Management: 3S is pumping to SP1

Instrumentation: VWPs (2 shallow and 2 deep) Staff Gauge





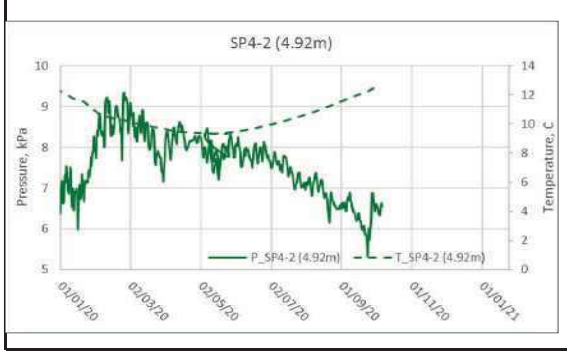


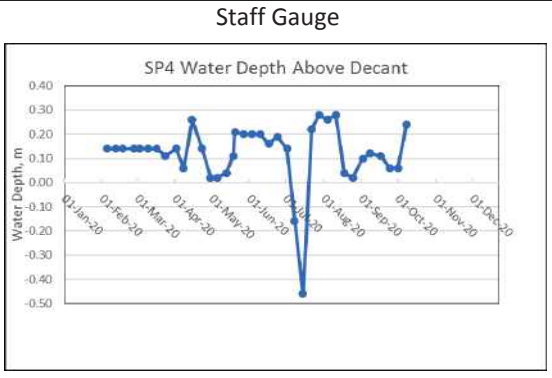
Settling Pond #4 (SP4)-North Water Management System

Notes: 2N underground pumps to SP4

Crest and Slope Stability: No cracks, gullies and sloughing observed
Vegetation Control: Well-controled
Seepage: No
Animal Activity: No
Spillway: No overflow in the spillway
Water Management: Discharing at SP4

Instrumentation: VWPs (1 shallow and 1 deep) Staff Gauge





Weekly Inspection Report
Water Management Facility (WMF)-SP1, 2S, 3S and SP4

QUINSAM COAL

Date: October 13, 2020 **Weather:** cloudy, windy **Inspector:** Sarah S

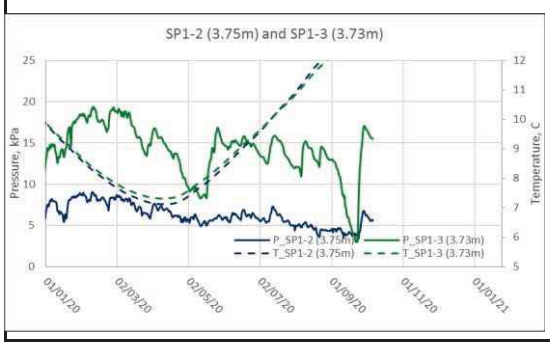
Weekly Summary:
Wet week; pondings on SP1 crest.
Discharging at SP1 and SP4; Overflow at 2S; Low water level at 3S.
No flow in the SP1 and SP4 spillways.

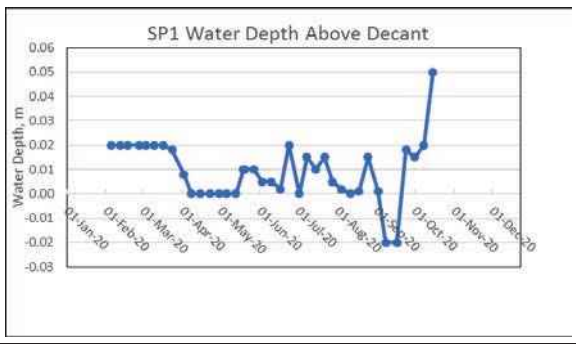
Settling Pond #1 (SP1)-South Water Management System

Notes: Discharging at SP1

Crest and Slopes Stability: pondings on the crest; no cracks, sinkholes, slides obseved on the downstream and upstream slope.
Vegetation: Maintained
Seepage: No
Animal Activity: Beaver is active in the downstream of SP1
Spillway: No overflow in the spillway
Water Management: discharging at SP1

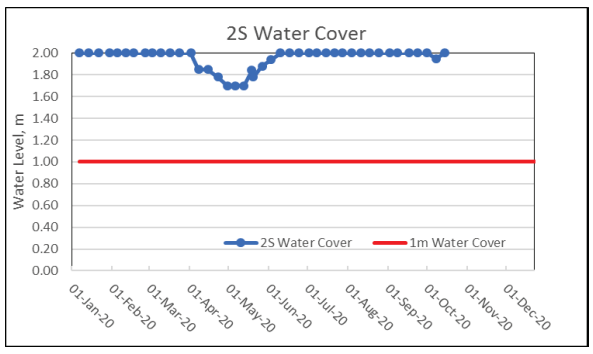
Instrumentation: VWPs (2 shallow and 2 deep) Staff Gauge





2-South PAG-CCR Pond (2S)-South Water Management System

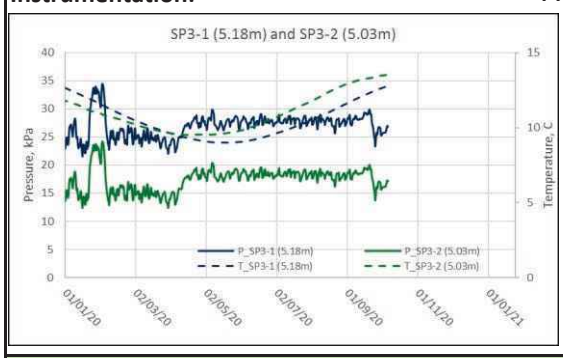
Notes: 2S mine pool pump at Q11-11 is working at the same pumping rate.
Crest and Slope Stability: No
Vegetation Control: well maintained
Seepage: Seeping to 3S pit through the Engineer designed channel
Animal Activity: No
Water Management: High flow water management mode is on (2S gate valves closed)
Instrumentation: Staff gauges, weir at 2SI, flowmeater at 2SC, no pizeometer
Flow at 2S Inlet (m) 0.17
Spillway/Discharge Channel overflow to 3S through the designed channel
2S UG pump (l/s) 5

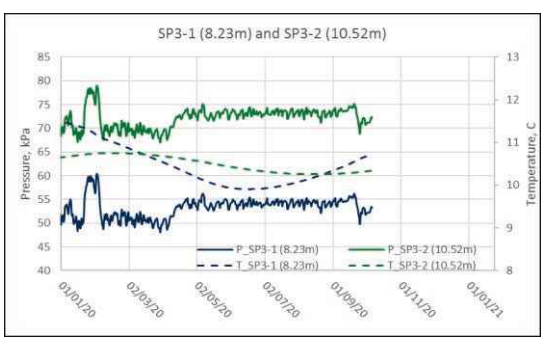


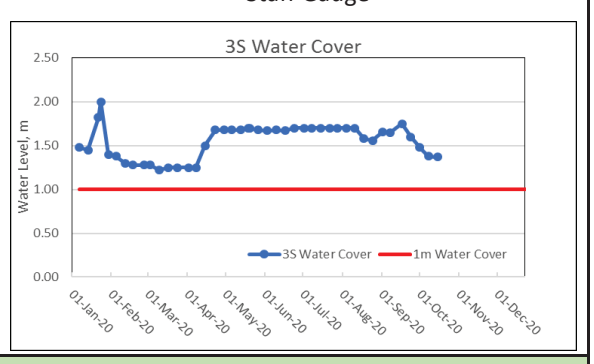
3-South PAG-CCR Pond (3S)-South Water Management System

Notes: getotechnical concern of the inclined trees at the downstream slope of the dyke is being monitored and no significant change is observed.
Crest and Slope Stability: No
Vegetation: Maintained
Seepage: No
Animal Activity: No
Spillway: Not being used and not permitted
Water Management: 3S is pumping to SP1

Instrumentation: VWPs (2 shallow and 2 deep) Staff Gauge





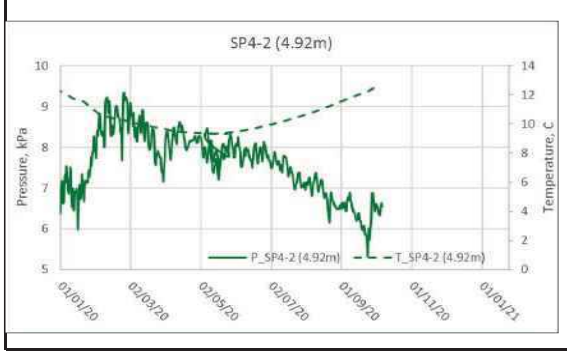


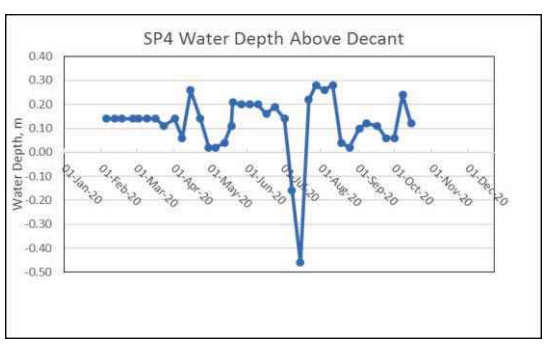
Settling Pond #4 (SP4)-North Water Management System

Notes: 2N underground pumps to SP4

Crest and Slope Stability: No cracks, gullies and sloughing observed
Vegetation Control: Well-controled
Seepage: No
Animal Activity: No
Spillway: No overflow in the spillway
Water Management: Discharing at SP4

Instrumentation: VWPs (1 shallow and 1 deep) Staff Gauge





Weekly Inspection Report
Water Management Facility (WMF)-SP1, 2S, 3S and SP4

QUINSAM COAL

Date: October 20, 2020 **Weather:** Sunny **Inspector:** Sarah S

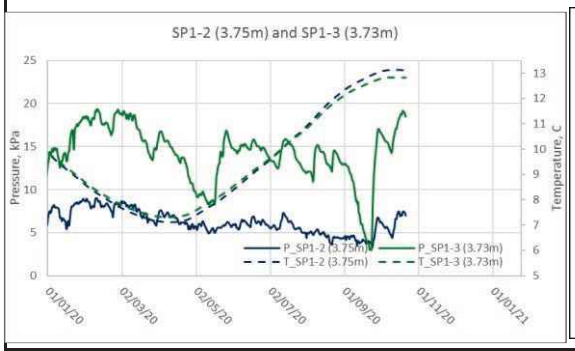
Weekly Summary:
Pondings on SP1 crest.
Discharging at SP1 and SP4; Overflow at 2S; Low water level at 3S.
No flow in the SP1 and SP4 spillways.
2N UG pumping to WP.

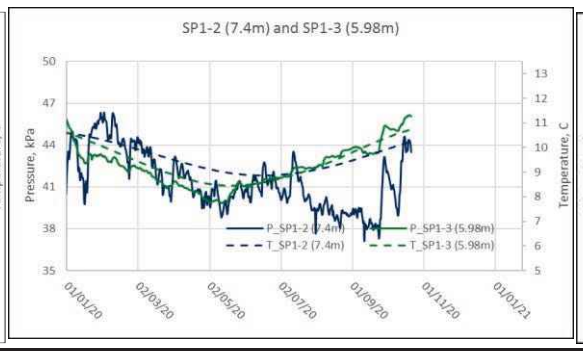
Settling Pond #1 (SP1)-South Water Management System

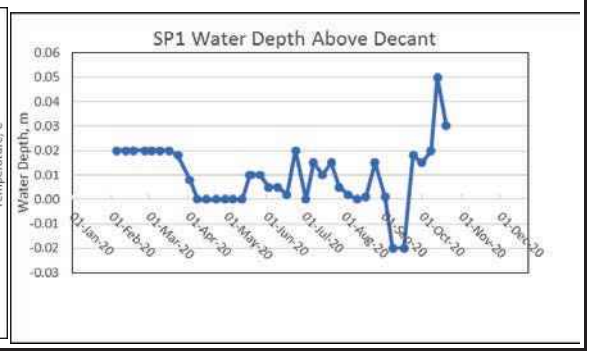
Notes: Discharging at SP1

Crest and Slopes Stability: pondings on the crest; no cracks, sinkholes, slides obseved on the downstream and upstream slope.
Vegetation: Maintained
Seepage: No
Animal Activity: Beaver is active in the downstream of SP1
Spillway: No overflow in the spillway
Water Management: discharging at SP1

Instrumentation: VWPs (2 shallow and 2 deep) Staff Gauge

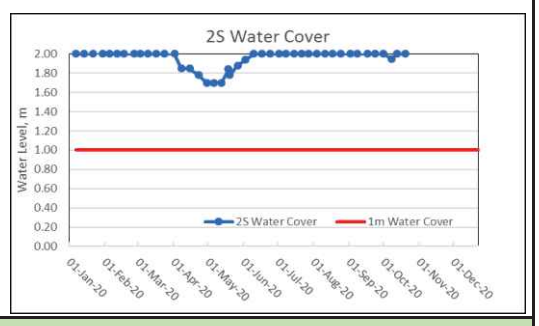






2-South PAG-CCR Pond (2S)-South Water Management System

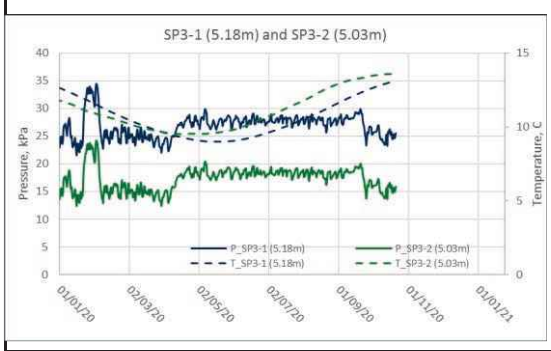
Notes: 2S mine pool pump at Q11-11 is working at the same pumping rate.
Crest and Slope Stability: No
Vegetation Control: well maintained
Seepage: Seeping to 3S pit through the Engineer designed channel
Animal Activity: No
Water Management: High flow water management mode is on (2S gate valves closed)
Instrumentation: Staff gauges, weir at 2SI, flowmeater at 2SC, no pizeometer
Flow at 2S Inlet (m) 0.17
Spillway/Discharge Channel overflow to 3S through the designed channel
2S UG pump (l/s) 4.5

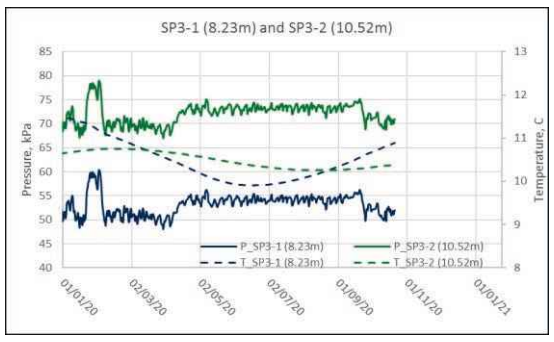


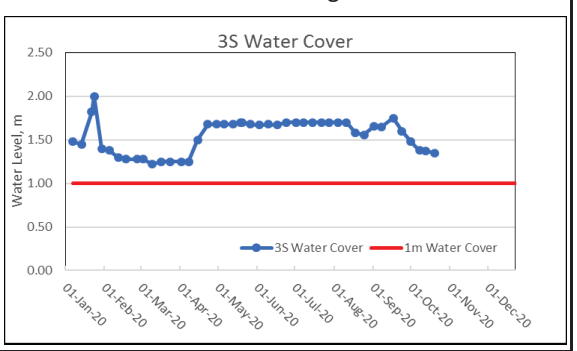
3-South PAG-CCR Pond (3S)-South Water Management System

Notes: getotechnical concern of the inclined trees at the downstream slope of the dyke is being monitored and no significant change is observed.
Crest and Slope Stability: No
Vegetation: Maintained
Seepage: No
Animal Activity: No
Spillway: Not being used and not permitted
Water Management: 3S is pumping to SP1

Instrumentation: VWPs (2 shallow and 2 deep) Staff Gauge





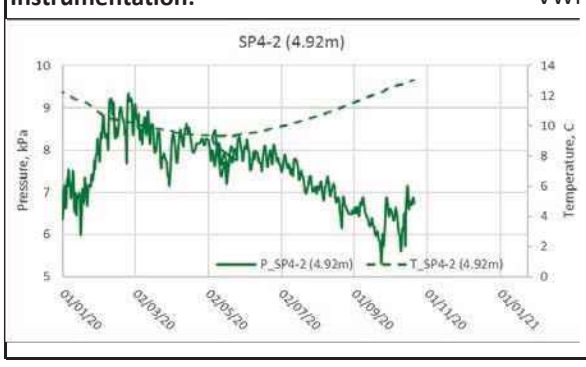


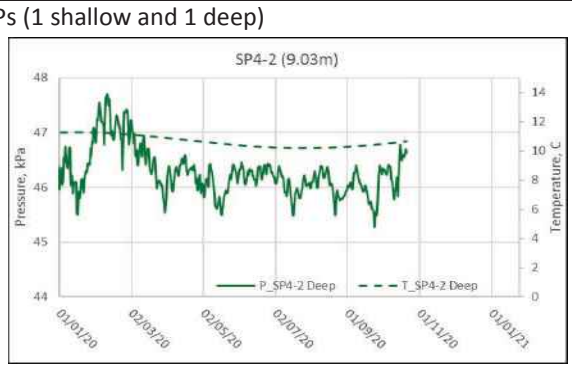
Settling Pond #4 (SP4)-North Water Management System

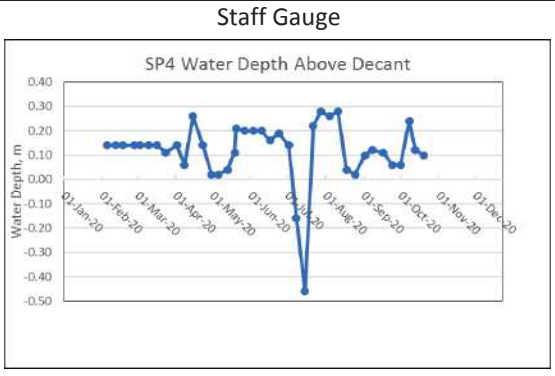
Notes: 2N underground pumps to WP

Crest and Slope Stability: No cracks, gullies and sloughing observed
Vegetation Control: Well-controled
Seepage: No
Animal Activity: No
Spillway: No overflow in the spillway
Water Management: Discharing at SP4

Instrumentation: VWPs (1 shallow and 1 deep) Staff Gauge







Weekly Inspection Report
Water Management Facility (WMF)-SP1, 2S, 3S and SP4

QUINSAM COAL

Date: October 27, 2020 **Weather:** Cloudy **Inspector:** Sarah S

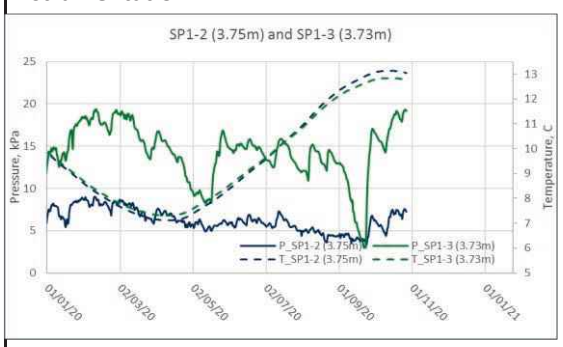
Weekly Summary:
Pondings on SP1 crest.
Discharging at SP1 and SP4; Overflow at 2S; Low water level at 3S (prepared for winter).
No flow in the SP1 and SP4 spillways.
Cold week.

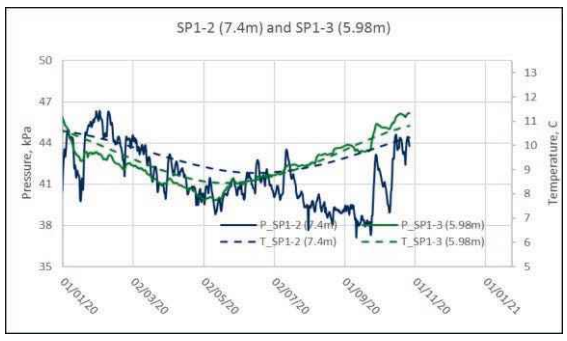
Settling Pond #1 (SP1)-South Water Management System

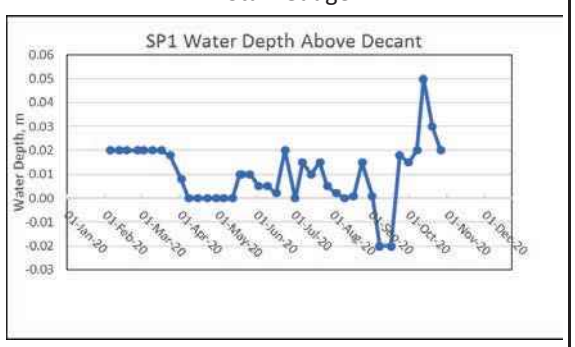
Notes: Discharging at SP1

Crest and Slopes Stability: pondings on the crest; no cracks, sinkholes, slides obseved on the downstream and upstream slope.
Vegetation: Maintained
Seepage: No
Animal Activity: Beaver is active in the downstream of SP1
Spillway: No overflow in the spillway
Water Management: discharging at SP1

Instrumentation: VWPs (2 shallow and 2 deep) Staff Gauge

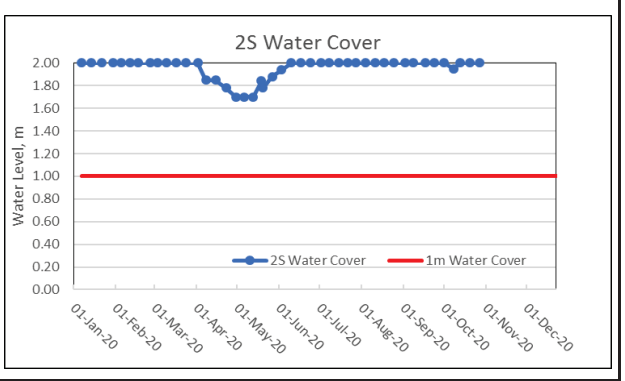






2-South PAG-CCR Pond (2S)-South Water Management System

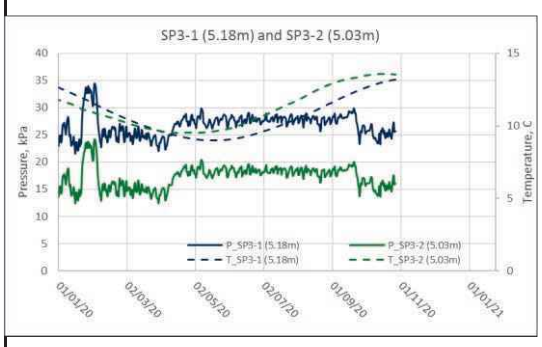
Notes: 2S mine pool pump at Q11-11 is working at the same pumping rate.
Crest and Slope Stability: No
Vegetation Control: well maintained
Seepage: Seeping to 3S pit through the Engineer designed channel
Animal Activity: No
Water Management: High flow water management mode is on (2S gate valves closed)
Instrumentation: Staff gauges, weir at 2SI, flowmeater at 2SC, no pizeometer
Flow at 2S Inlet (m) 0.17
Spillway/Discharge Channel overflow to 3S through the designed channel
2S UG pump (l/s) 4.5

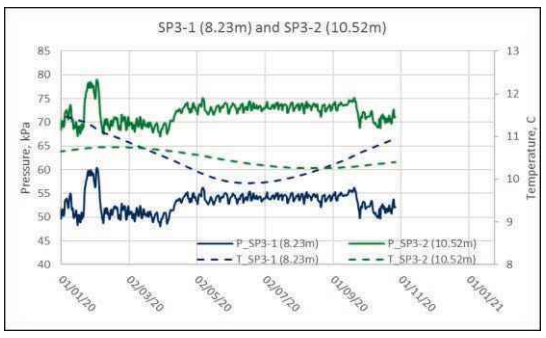


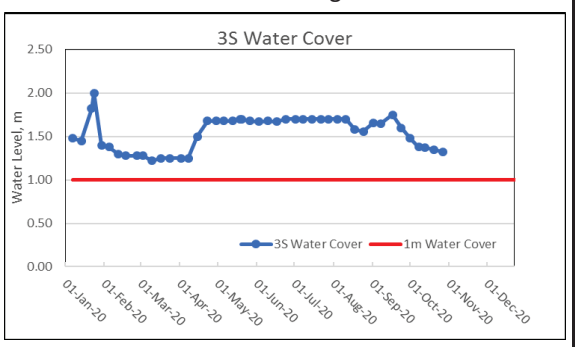
3-South PAG-CCR Pond (3S)-South Water Management System

Notes: getotechnical concern of the inclined trees at the downstream slope of the dyke is being monitored and no significant change is observed.
Crest and Slope Stability: No
Vegetation: Maintained
Seepage: No
Animal Activity: No
Spillway: Not being used and not permitted
Water Management: 3S is pumping to SP1

Instrumentation: VWPs (2 shallow and 2 deep) Staff Gauge





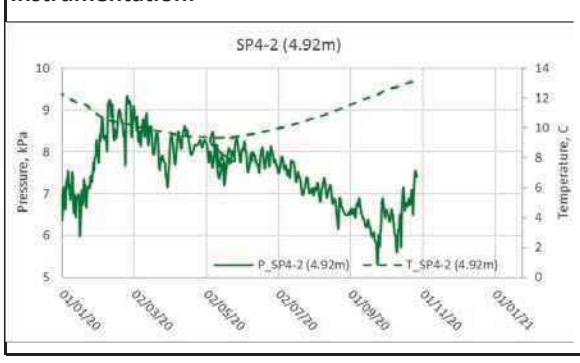


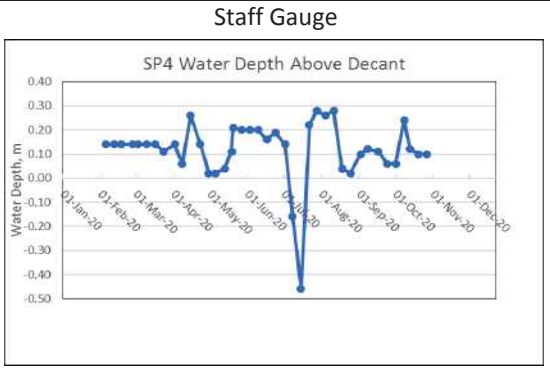
Settling Pond #4 (SP4)-North Water Management System

Notes: 2N underground pumps to WP

Crest and Slope Stability: No cracks, gullies and sloughing observed
Vegetation Control: Well-controled
Seepage: No
Animal Activity: No
Spillway: No overflow in the spillway
Water Management: Discharing at SP4

Instrumentation: VWPs (1 shallow and 1 deep) Staff Gauge





Weekly Inspection Report
Water Management Facility (WMF)-SP1, 2S, 3S and SP4

QUINSAM COAL

Date: November 3, 2020 **Weather:** Raining **Inspector:** Sarah S

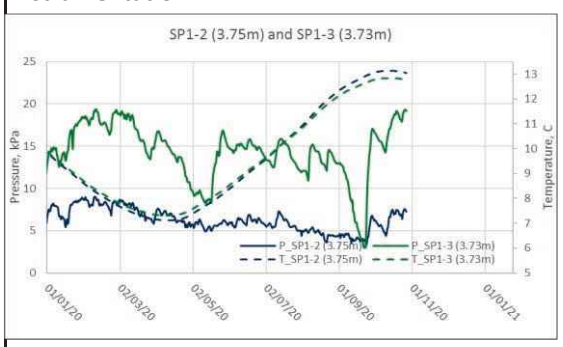
Weekly Summary:
Pondings on SP1 and 3S crests. About 100mm precipirtation on Nov 2-3;
Discharging at SP1 and SP4; Overflow at 2S;
No flow in the SP1 and SP4 spillways;

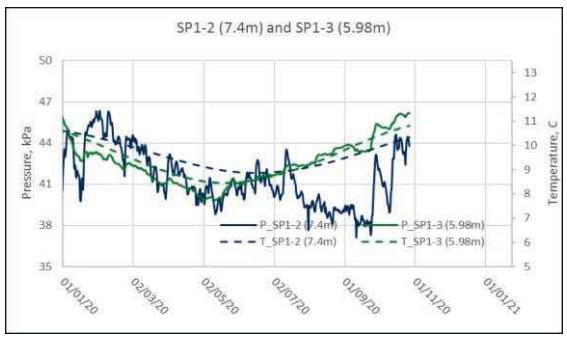
Settling Pond #1 (SP1)-South Water Management System

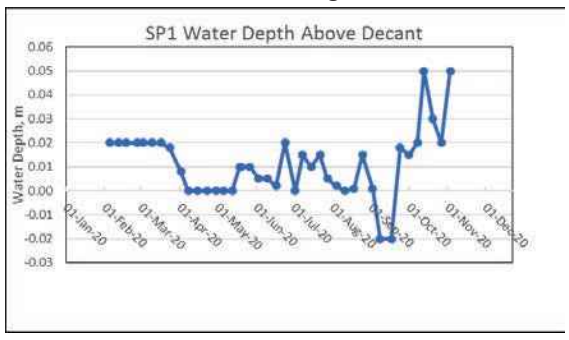
Notes: Discharging at SP1

Crest and Slopes Stability: pondings on the crest; no cracks, sinkholes, slides obseved on the downstream and upstream slope.
Vegetation: Maintained
Seepage: No
Animal Activity: Beaver is active in the downstream of SP1
Spillway: No overflow in the spillway
Water Management: discharging at SP1

Instrumentation: VWPs (2 shallow and 2 deep) Staff Gauge

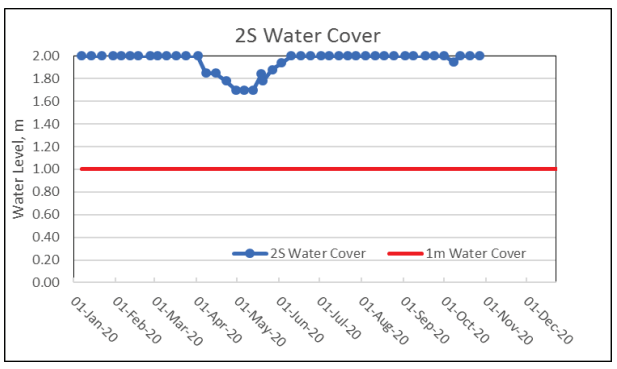






2-South PAG-CCR Pond (2S)-South Water Management System

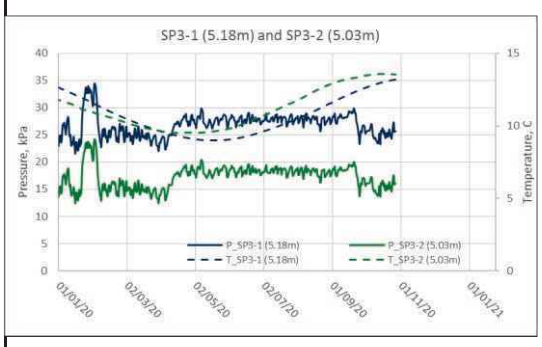
Notes: 2S mine pool pump at Q11-11 is working at the same pumping rate.
Crest and Slope Stability: No
Vegetation Control: well maintained
Seepage: Seeping to 3S pit through the Engineer designed channel
Animal Activity: No
Water Management: High flow water management mode is on (2S gate valves closed)
Instrumentation: Staff gauges, weir at 2SI, flowmeater at 2SC, no pizeometer
Flow at 2S Inlet (m) 0.2
Spillway/Discharge Channel overflow to 3S through the designed channel
2S UG pump (l/s) 4.5

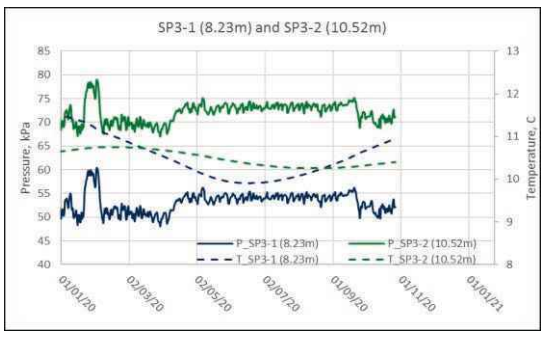


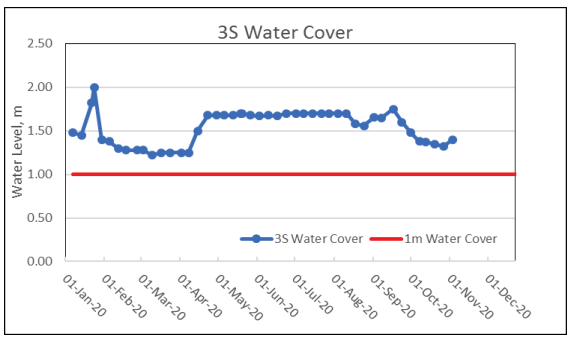
3-South PAG-CCR Pond (3S)-South Water Management System

Notes: getotechnical concern of the inclined trees at the downstream slope of the dyke is being monitored and no significant change is observed.
Crest and Slope Stability: No
Vegetation: Maintained
Seepage: No
Animal Activity: No
Spillway: Not being used and not permitted
Water Management: 3S is pumping to SP1

Instrumentation: VWPs (2 shallow and 2 deep) Staff Gauge





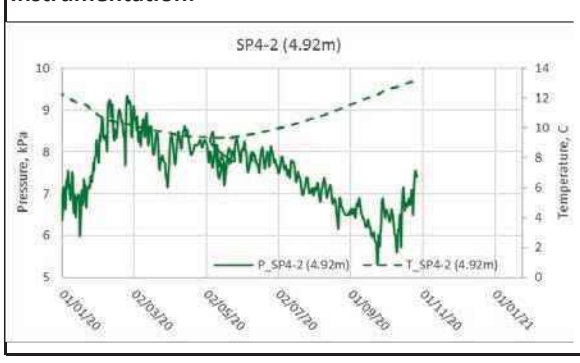


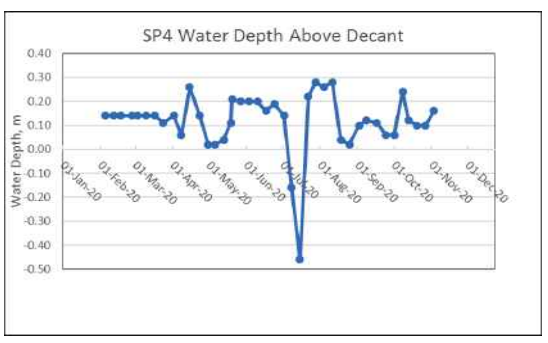
Settling Pond #4 (SP4)-North Water Management System

Notes: 2N underground pumps to WP

Crest and Slope Stability: No cracks, gullies and sloughing observed
Vegetation Control: Well-controled
Seepage: No
Animal Activity: No
Spillway: No overflow in the spillway
Water Management: Discharing at SP4

Instrumentation: VWPs (1 shallow and 1 deep) Staff Gauge





Weekly Inspection Report
Water Management Facility (WMF)-SP1, 2S, 3S and SP4

QUINSAM COAL

Date: November 10, 2020 **Weather:** Cloudy **Inspector:** Sarah S

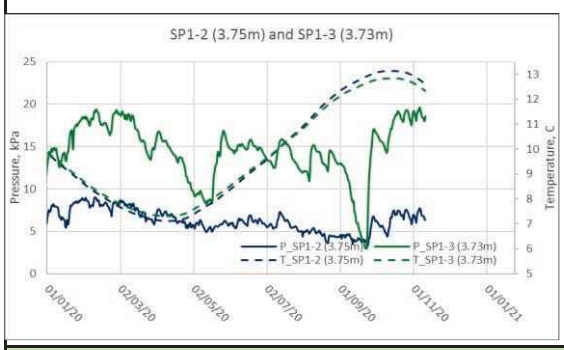
Weekly Summary:
Pondings on SP1 and 3S crests.
Nov 9 had lots of rain; during the weekend it was -3 clecius degree at site;
Discharging at SP1 and SP4; Overflow at 2S;
No flow in the SP1 and SP4 spillways

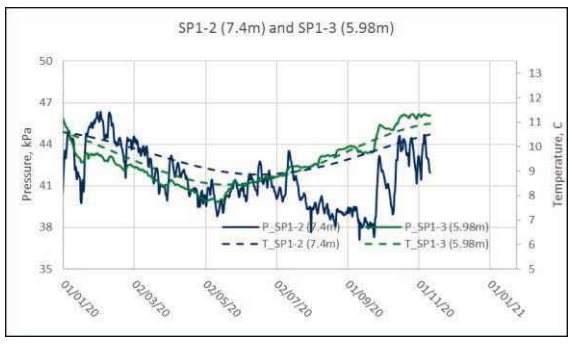
Settling Pond #1 (SP1)-South Water Management System

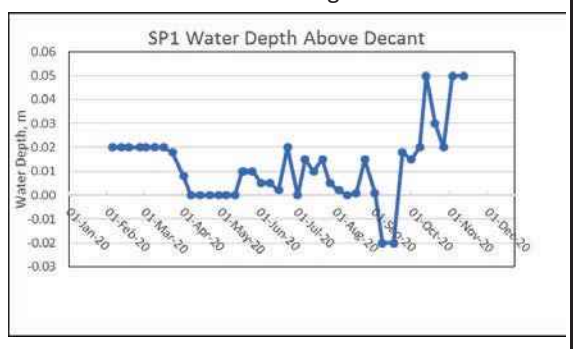
Notes: Discharging at SP1

Crest and Slopes Stability: pondings on the crest; no cracks, sinkholes, slides obseved on the downstream and upstream slope.
Vegetation: Maintained
Seepage: No
Animal Activity: Beaver is active in the downstream of SP1
Spillway: No overflow in the spillway
Water Management: discharging at SP1

Instrumentation: VWPs (2 shallow and 2 deep) Staff Gauge

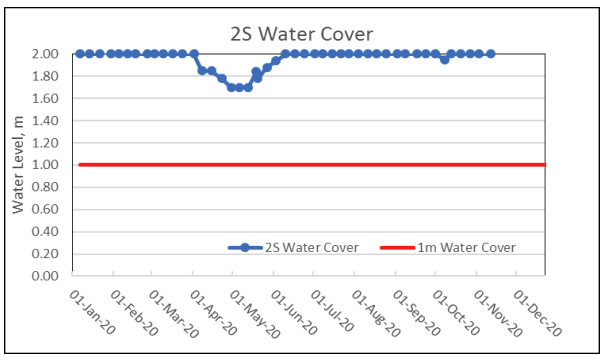






2-South PAG-CCR Pond (2S)-South Water Management System

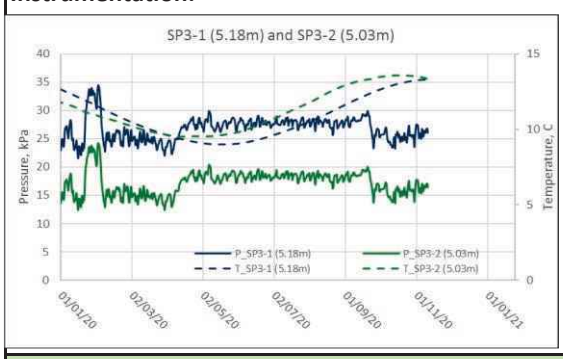
Notes: 2S mine pool pump at Q11-11 is working at the same pumping rate.
Crest and Slope Stability: No
Vegetation Control: well maintained
Seepage: Seeping to 3S pit through the Engineer designed channel
Animal Activity: No
Water Management: High flow water management mode is on (2S gate valves closed)
Instrumentation: Staff gauges, weir at 2SI, flowmeater at 2SC, no pizeometer
Flow at 2S Inlet (m) 0.2
Spillway/Discharge Channel overflow to 3S through the designed channel
2S UG pump (l/s)

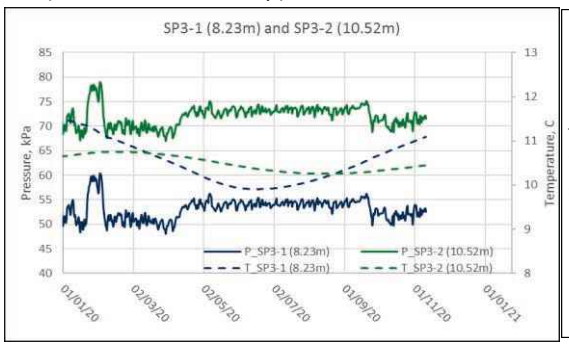


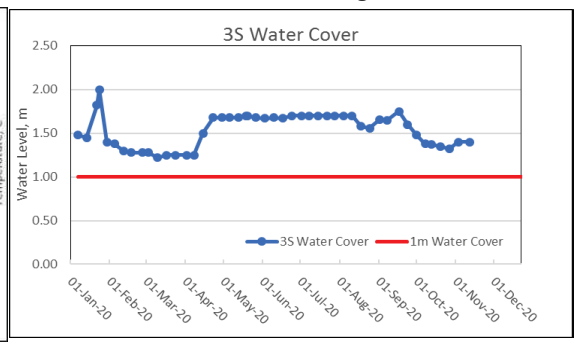
3-South PAG-CCR Pond (3S)-South Water Management System

Notes: getotechnical concern of the inclined trees at the downstream slope of the dyke is being monitored and no significant change is observed.
Crest and Slope Stability: No
Vegetation: Maintained
Seepage: No
Animal Activity: No
Spillway: Not being used and not permitted
Water Management: 3S is pumping to SP1

Instrumentation: VWPs (2 shallow and 2 deep) Staff Gauge





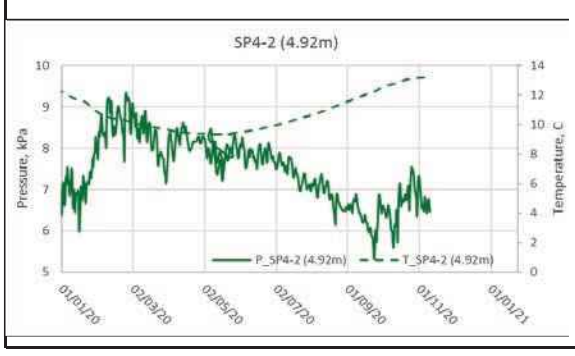


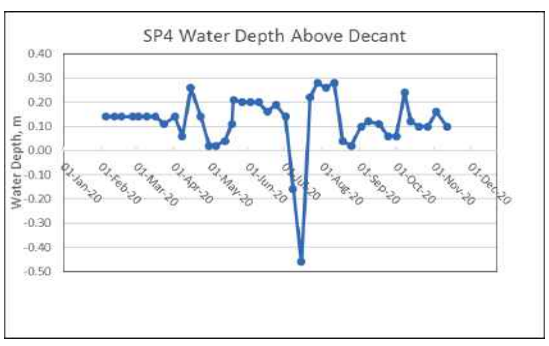
Settling Pond #4 (SP4)-North Water Management System

Notes: 2N underground pumps to WP

Crest and Slope Stability: No cracks, gullies and sloughing observed
Vegetation Control: Well-controled
Seepage: No
Animal Activity: No
Spillway: No overflow in the spillway
Water Management: Discharing at SP4

Instrumentation: VWPs (1 shallow and 1 deep) Staff Gauge





Weekly Inspection Report
Water Management Facility (WMF)-SP1, 2S, 3S and SP4

Date: November 18, 2020 **Weather:** Cloudy **Inspector:** Sarah S

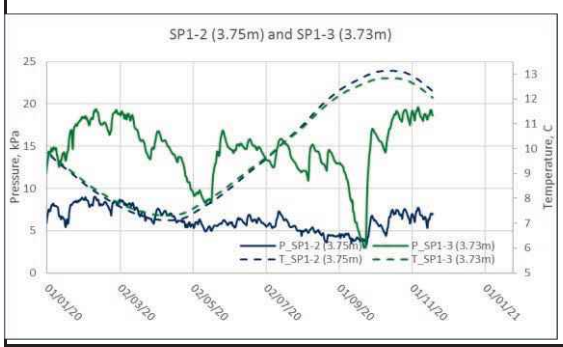
Weekly Summary:
Wet week; High flow water management system is on with more frequent monitoring and maintenance;
Discharging at SP1 and SP4; Overflow at 2S;
No flow in the SP1 and SP4 spillways;
Pondings on SP1 and 3S crests.

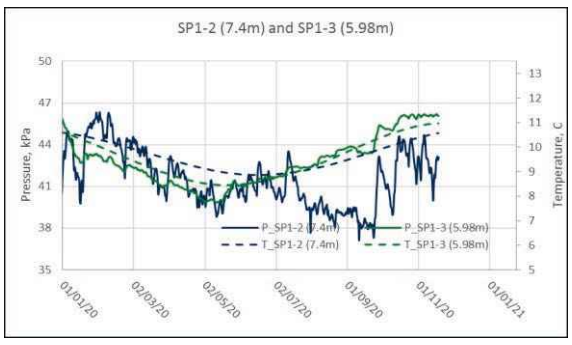
Settling Pond #1 (SP1)-South Water Management System

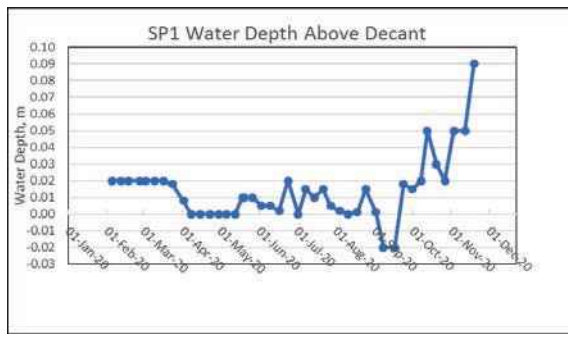
Notes: Discharging at SP1

Crest and Slopes Stability: pondings on the crest; no cracks, sinkholes, slides obseved on the downstream and upstream slope.
Vegetation: Maintained
Seepage: No
Animal Activity: Beaver is actively controlled in the downstream of SP1;
Spillway: No overflow in the spillway
Water Management: discharging at SP1

Instrumentation: VWPs (2 shallow and 2 deep) Staff Gauge







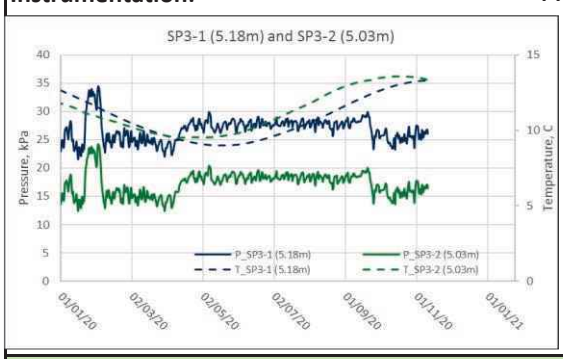
2-South PAG-CCR Pond (2S)-South Water Management System

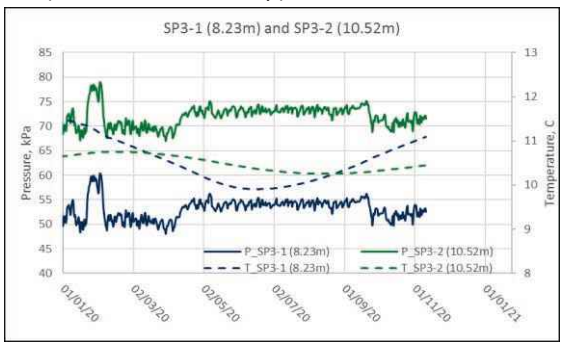
Notes: 2S mine pool pump at Q11-11 is working.
Crest and Slope Stability: No
Vegetation Control: well maintained
Seepage: Seeping to 3S pit through the Engineer designed channel
Animal Activity: No
Water Management: High flow water management mode is on (2S gate valves closed)
Instrumentation: Staff gauges, weir at 2SI, flowmeater at 2SC, no pizeometer
Flow at 2S Inlet (m) 0.2
Spillway/Discharge Channel overflow to 3S through the designed channel
2S UG pump (l/s)

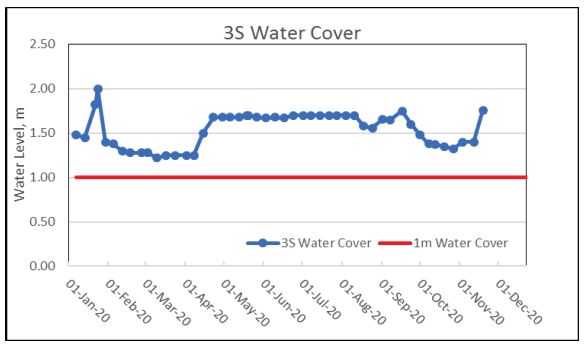
3-South PAG-CCR Pond (3S)-South Water Management System

Notes: getotechnical concern of the inclined trees at the downstream slope of the dyke is being monitored and no significant change is observed.
Crest and Slope Stability: No
Vegetation: Maintained
Seepage: No
Animal Activity: No
Spillway: Not being used and not permitted
Water Management: 3S is pumping to SP1

Instrumentation: VWPs (2 shallow and 2 deep) Staff Gauge





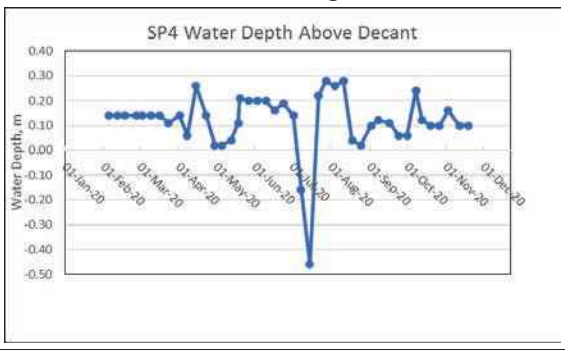


Settling Pond #4 (SP4)-North Water Management System

Notes: 2N underground pumps to SP4

Crest and Slope Stability: No cracks, gullies and sloughing observed
Vegetation Control: Maintained
Seepage: No
Animal Activity: No
Spillway: No overflow in the spillway
Water Management: Discharing at SP4

Instrumentation: VWPs (1 shallow and 1 deep) Staff Gauge



Note: Assumed to be weekly inspection from November 24, 2020 based on PDF file name

Weekly Inspection Report
Water Management Facility (WMF)-SP1, 2S, 3S and SP4

QUINSAM COAL

Date: November 18, 2020 **Weather:** Rainy **Inspector:** Sarah S

Weekly Summay

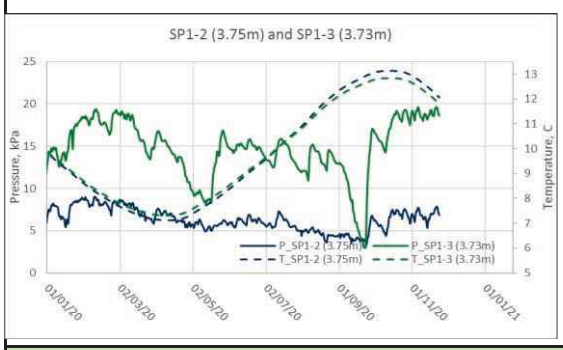
High flow water management system is on with more frequent monitoring and maintenance;
Discharging at SP1 and SP4; Overflow at 2S;
No flow in the SP1 and SP4 spillways;
Pondings on SP1 and 3S crests.

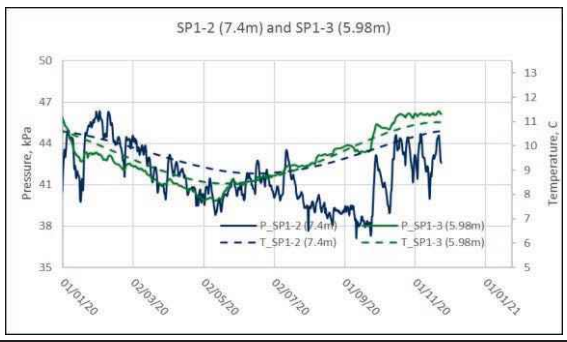
Settling Pond #1 (SP1)-South Water Management System

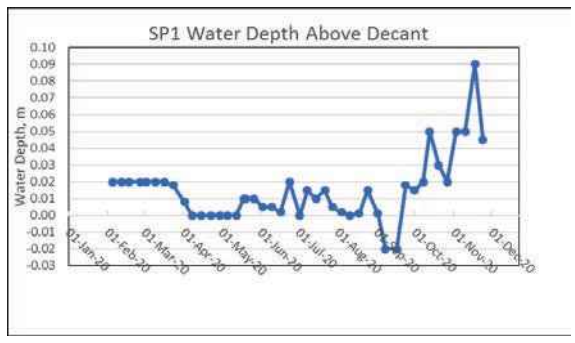
Notes: Discharging at SP1

Crest and Slopes Stability: pondings on the crest; no cracks, sinkholes, slides obseved on the downstream and upstream slope.
Vegetation: Maintained
Seepage: No
Animal Activity: Beaver is actively controlled in the downstream of SP1;
Spillway: No overflow in the spillway
Water Management: discharging at SP1

Instrumentation: VWPs (2 shallow and 2 deep) Staff Gauge

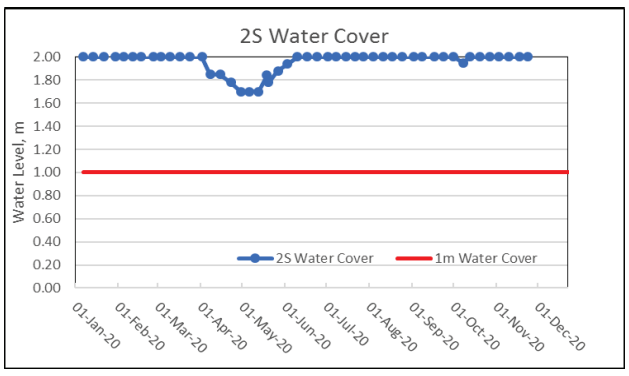






2-South PAG-CCR Pond (2S)-South Water Management System

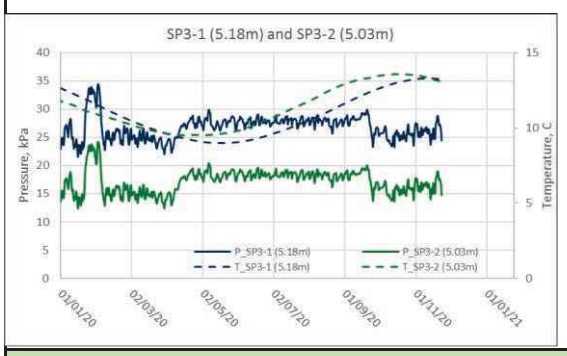
Notes: 2S mine pool pump at Q11-11 is working.
Crest and Slope Stability: No
Vegetation Control: well maintained
Seepage: Seeping to 3S pit through the Engineer designed channel
Animal Activity: No
Water Management: High flow water management mode is on (2S gate valves closed)
Instrumentation: Staff gauges, weir at 2SI, flowmeater at 2SC, no pizeometer
Flow at 2S Inlet (m) 0.15
Spillway/Discharge Channel overflow to 3S through the designed channel
2S UG pump (l/s)

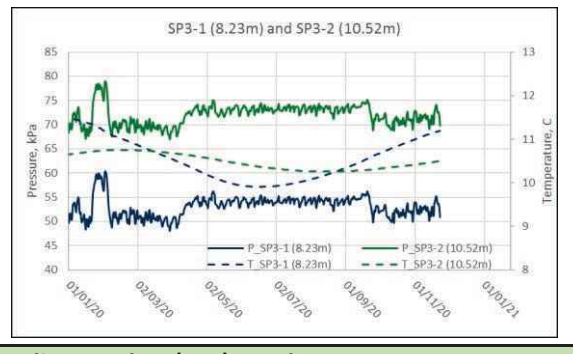


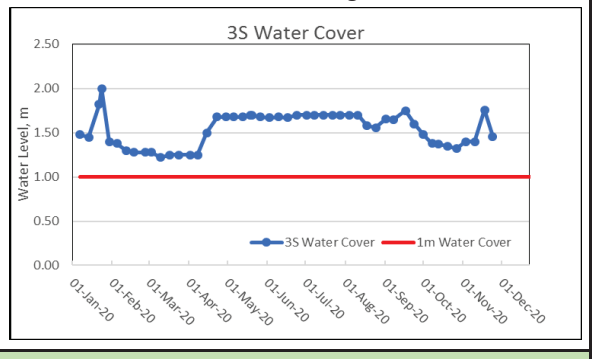
3-South PAG-CCR Pond (3S)-South Water Management System

Notes: getotechnical concern of the inclined trees at the downstream slope of the dyke is being monitored and no significant change is observed.
Crest and Slope Stability: No
Vegetation: Maintained
Seepage: No
Animal Activity: No
Spillway: Not being used and not permitted
Water Management: 3S is pumping to SP1

Instrumentation: VWPs (2 shallow and 2 deep) Staff Gauge





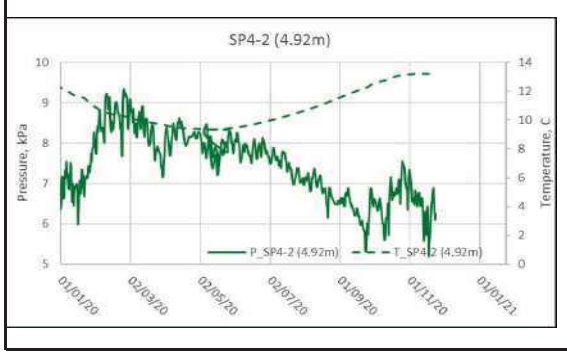


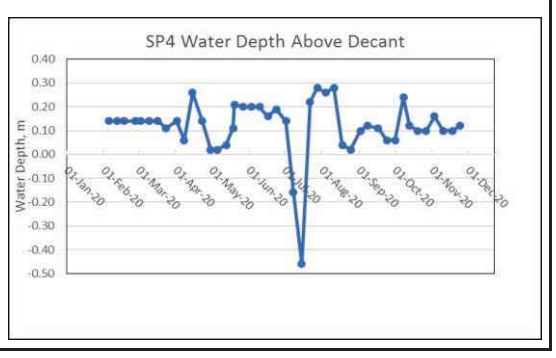
Settling Pond #4 (SP4)-North Water Management System

Notes: 2N underground pumps to SP4

Crest and Slope Stability: No cracks, gullies and sloughing observed
Vegetation Control: Maintained
Seepage: No
Animal Activity: No
Spillway: No overflow in the spillway
Water Management: Discharing at SP4

Instrumentation: VWPs (1 shallow and 1 deep) Staff Gauge





Weekly Inspection Report
Water Management Facility (WMF)-SP1, 2S, 3S and SP4

QUINSAM COAL

Date: December 1, 2020 **Weather:** Sunny **Inspector:** Sarah S

Weekly Summay

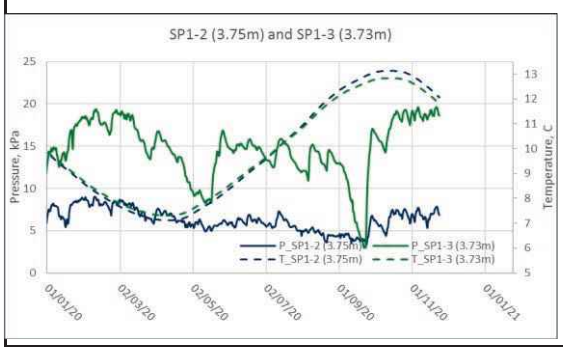
Cold sunny weather, 3S water level is low (1.31m); Pumps at 2North1Mains and 2North5Mians grounded;
High flow water management system is on with more frequent monitoring and maintenance;
Discharging at SP1 and SP4; Overflow at 2S;
No flow in the SP1 and SP4 spillways;
Pondings on SP1 and 3S crests.

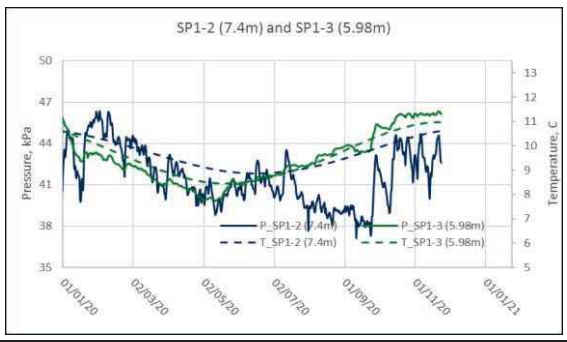
Settling Pond #1 (SP1)-South Water Management System

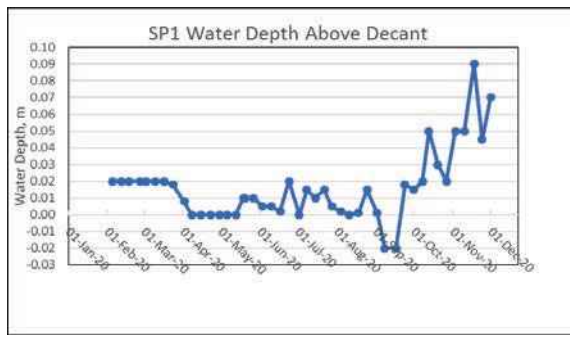
Notes: Discharging at SP1

Crest and Slopes Stability: pondings on the crest; no cracks, sinkholes, slides obseved on the downstream and upstream slope.
Vegetation: Maintained
Seepage: No
Animal Activity: Controlled
Spillway: No overflow in the spillway
Water Management: discharging at SP1

Instrumentation: VWPs (2 shallow and 2 deep) Staff Gauge

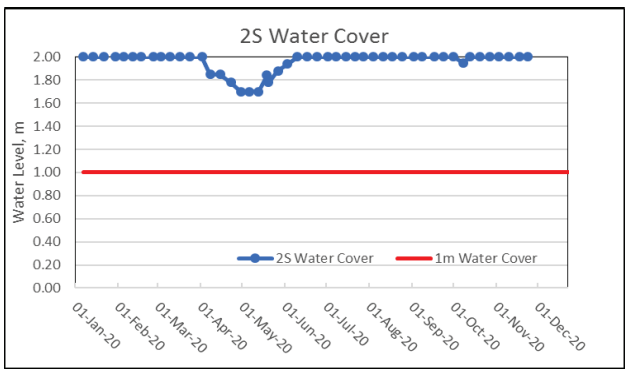






2-South PAG-CCR Pond (2S)-South Water Management System

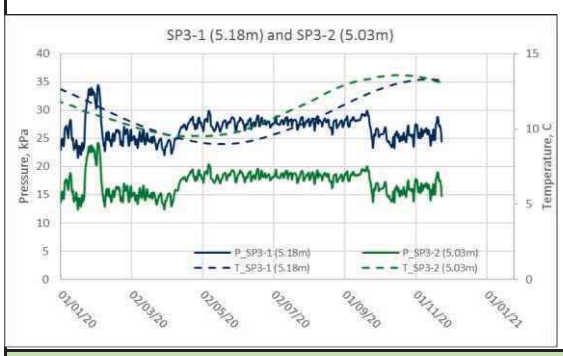
Notes: 2S mine pool pump at Q11-11 is working.
Crest and Slope Stability: No
Vegetation Control: well maintained
Seepage: Seeping to 3S pit through the Engineer designed channel
Animal Activity: No
Water Management: High flow water management mode is on (2S gate valves closed)
Instrumentation: Staff gauges, weir at 2SI, flowmeater at 2SC, no pizeometer
Flow at 2S Inlet (m) 0.18
Spillway/Discharge Channel overflow to 3S through the designed channel
2S UG pump (l/s)

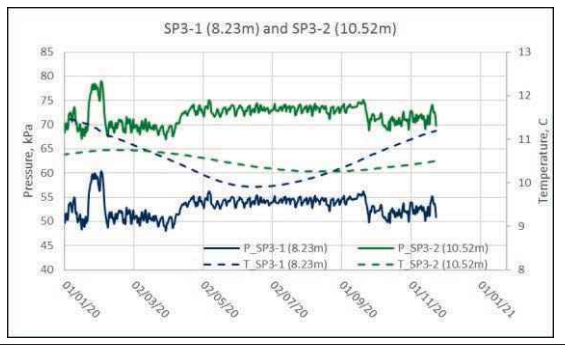


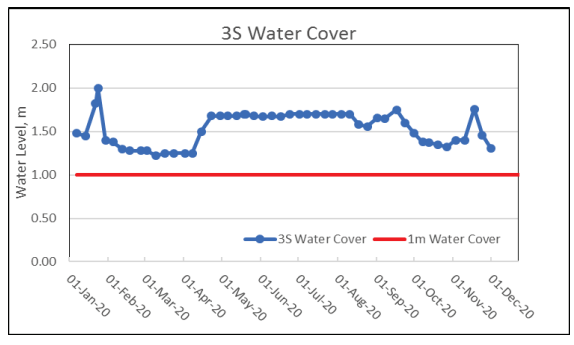
3-South PAG-CCR Pond (3S)-South Water Management System

Notes: getotechnical concern of the inclined trees at the downstream slope of the dyke is being monitored and no significant change is observed.
Crest and Slope Stability: No
Vegetation: Maintained
Seepage: No
Animal Activity: No
Spillway: Not being used and not permitted
Water Management: 3S is pumping to SP1

Instrumentation: VWPs (2 shallow and 2 deep) Staff Gauge





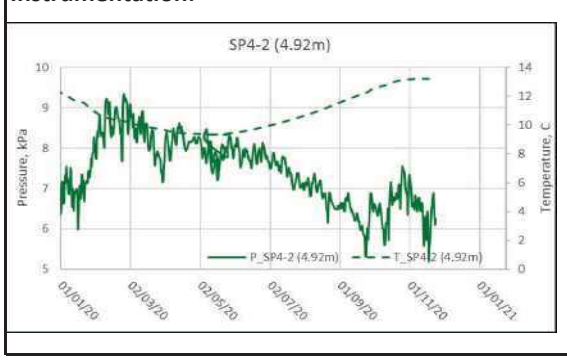


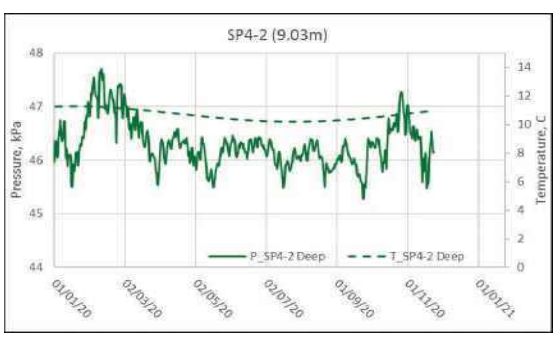
Settling Pond #4 (SP4)-North Water Management System

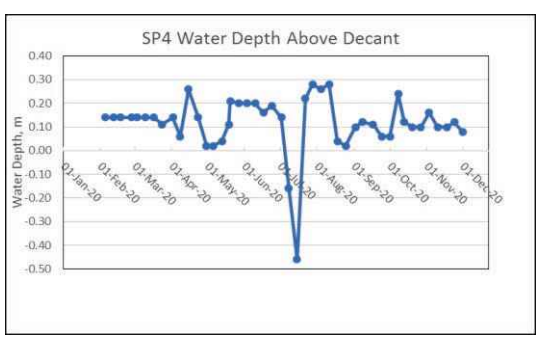
Notes: 2North 1Mains underground pumps grounded on Nov.30, 2020.

Crest and Slope Stability: No cracks, gullies and sloughing observed
Vegetation Control: Maintained
Seepage: No
Animal Activity: No
Spillway: No overflow in the spillway
Water Management: Discharing at SP4

Instrumentation: VWPs (1 shallow and 1 deep) Staff Gauge







Weekly Inspection Report
Water Management Facility (WMF)-SP1, 2S, 3S and SP4

QUINSAM COAL

Date: December 8, 2020 **Weather:** Cloudy **Inspector:** Sarah S

Weekly Summay

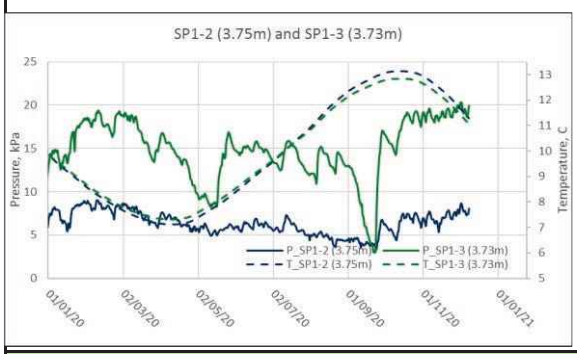
Pumps at 2North1Mains and 2North5Mians grounded; only 2North3Mains pumps are working; pumping companies are contacted;
High flow water management system is on with more frequent monitoring and maintenance;
Discharging at SP1 and SP4; Overflow at 2S;
No flow in the SP1 and SP4 spillways;
Pondings on SP1 and 3S crests.

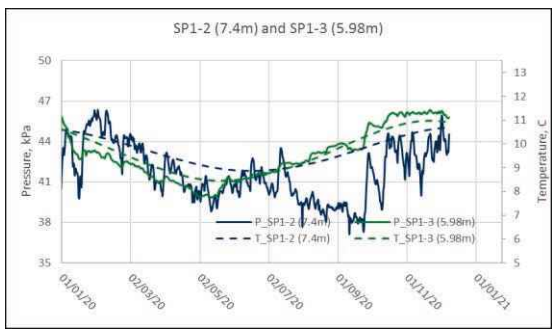
Settling Pond #1 (SP1)-South Water Management System

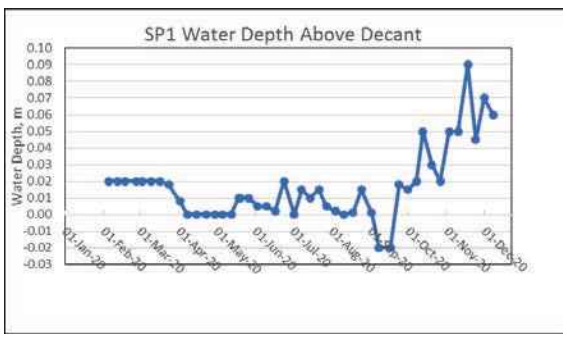
Notes: Discharging at SP1

Crest and Slopes Stability: pondings on the crest; no cracks, sinkholes, slides obseved on the downstream and upstream slope.
Vegetation: Maintained
Seepage: No
Animal Activity: Controlled
Spillway: No overflow in the spillway
Water Management: discharging at SP1

Instrumentation: VWPs (2 shallow and 2 deep) Staff Gauge

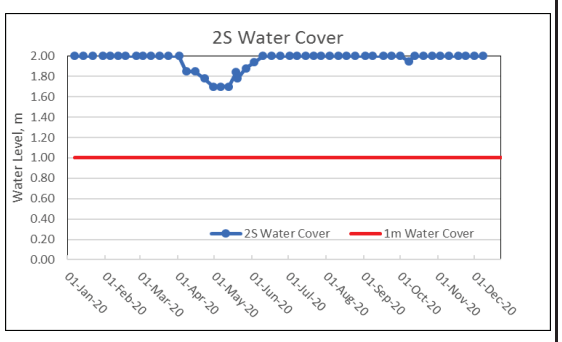






2-South PAG-CCR Pond (2S)-South Water Management System

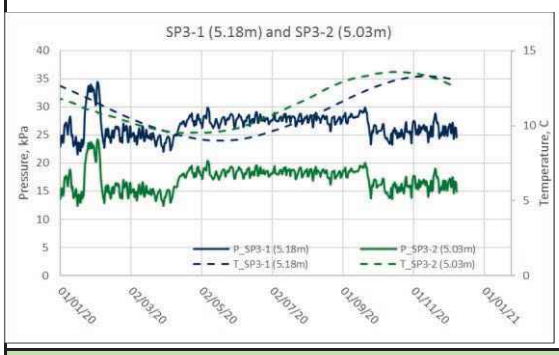
Notes: 2S mine pool pump at Q11-11 is working.
Crest and Slope Stability: No
Vegetation Control: well maintained
Seepage: Seeping to 3S pit through the Engineer designed channel
Animal Activity: No
Water Management: High flow water management mode is on (2S gate valves closed)
Instrumentation: Staff gauges, weir at 2SI, flowmeater at 2SC, no pizeometer
Flow at 2S Inlet (m) 0.19
Spillway/Discharge Channel overflow to 3S through the designed channel
2S UG pump (l/s) 4.5

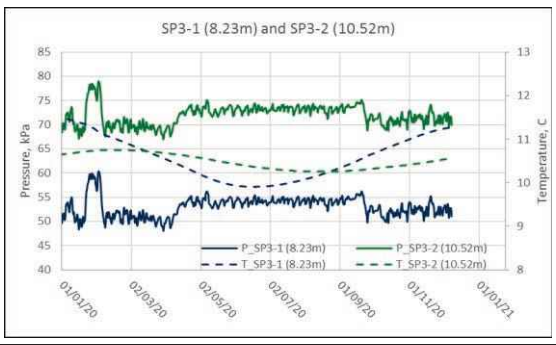


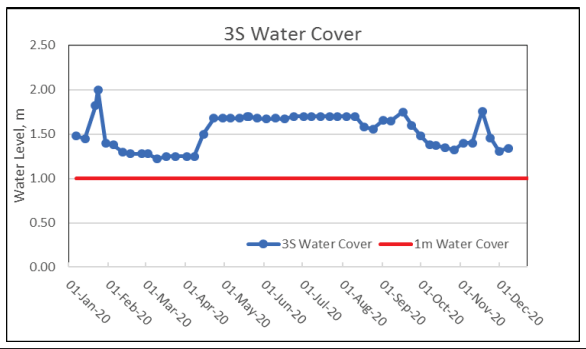
3-South PAG-CCR Pond (3S)-South Water Management System

Notes: getotechnical concern of the inclined trees at the downstream slope of the dyke is being monitored; 2 dead trees are observed
Crest and Slope Stability: No
Vegetation: Maintained
Seepage: No
Animal Activity: No
Spillway: Not being used and not permitted
Water Management: 3S is pumping to SP1

Instrumentation: VWPs (2 shallow and 2 deep) Staff Gauge



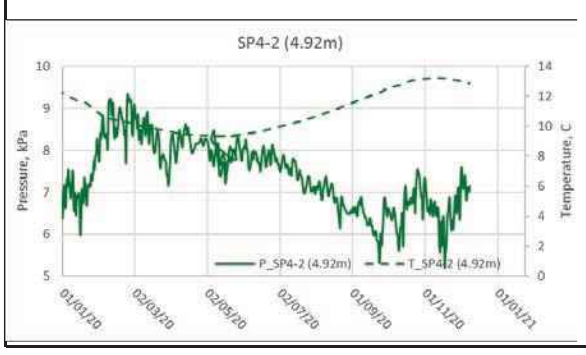


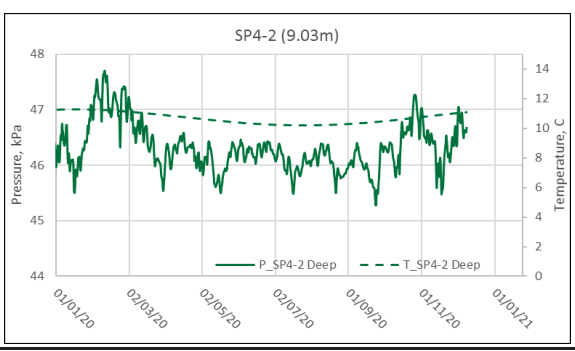


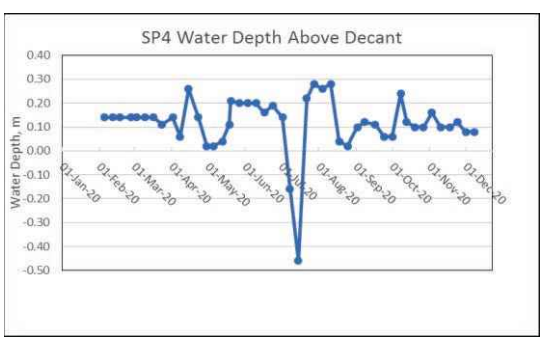
Settling Pond #4 (SP4)-North Water Management System

Notes: 2North1Mains underground pump (#2) grounded on Nov.30, 2020; the other pumps at 2North1Mains (#1) and 2North5Mains grounded in 2019 and early 2020; 2North3Mains pumps are working.
Crest and Slope Stability: No cracks, gullies and sloughing observed
Vegetation Control: Maintained
Seepage: No
Animal Activity: No
Spillway: No overflow in the spillway
Water Management: Discharing at SP4

Instrumentation: VWPs (1 shallow and 1 deep) Staff Gauge







Weekly Inspection Report
Water Management Facility (WMF)-SP1, 2S, 3S and SP4

QUINSAM COAL

Date: December 15, 2020 **Weather:** Rainy **Inspector:** Sarah S

Weekly Summay

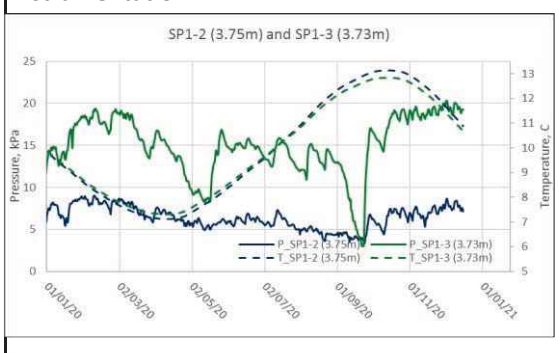
Pumps at 2North1Mains and 2North5Mians grounded; only 2North3Mains pumps are working; pumping companies are contacted;
High flow water management system is on with more frequent monitoring and maintenance;
Discharging at SP1 and SP4; Overflow at 2S;
No flow in the SP1 and SP4 spillways; Both spillways are inspected with no issues;
Pondings on SP1 and 3S crests.

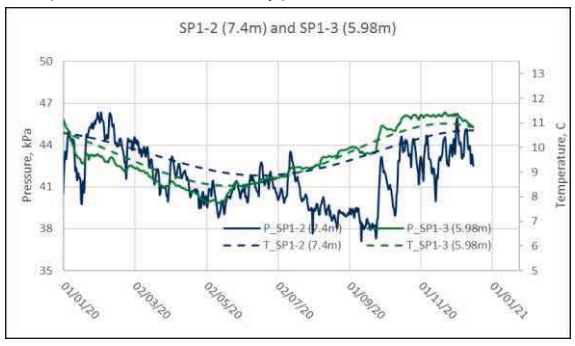
Settling Pond #1 (SP1)-South Water Management System

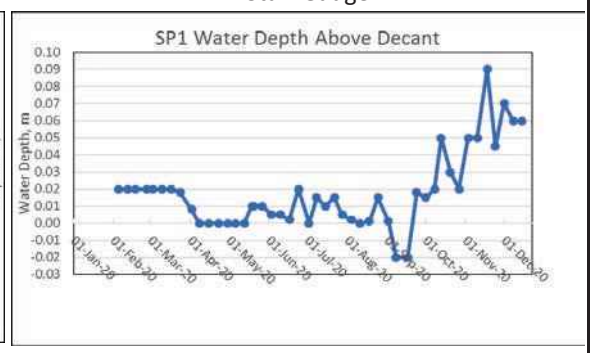
Notes: Discharging at SP1**,** spillway is inspected, no issue.

Crest and Slopes Stability: pondings on the crest; no cracks, sinkholes, slides obseved on the downstream and upstream slope.
Vegetation: Maintained
Seepage: No
Animal Activity: Controlled
Spillway: No overflow in the spillway
Water Management: discharging at SP1

Instrumentation: VWPs (2 shallow and 2 deep) Staff Gauge

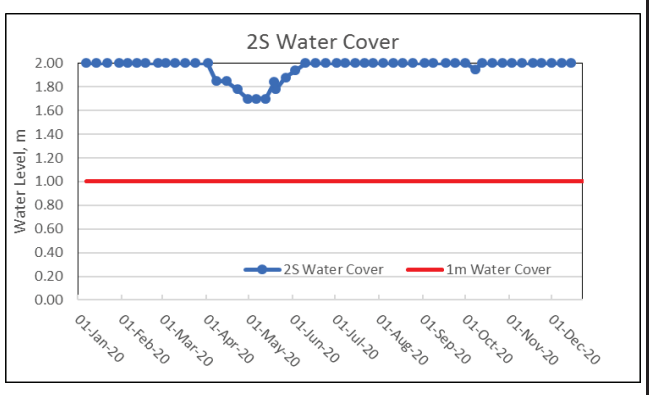






2-South PAG-CCR Pond (2S)-South Water Management System

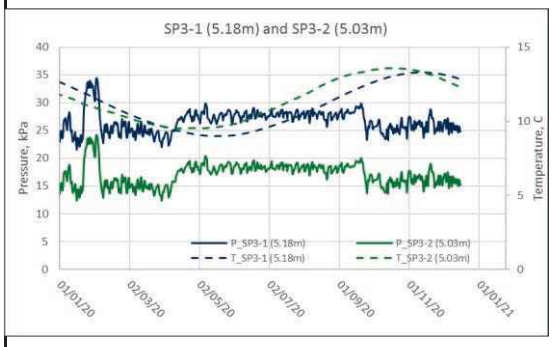
Notes: 2S mine pool pump at Q11-11 is working; spillway is inspected, no issue.
Crest and Slope Stability: No
Vegetation Control: Maintained
Seepage: Seeping to 3S pit through the Engineer designed channel
Animal Activity: No
Water Management: High flow water management mode is on (2S gate valves closed)
Instrumentation: Staff gauges, weir at 2SI, flowmeater at 2SC, no pizeometer
Flow at 2S Inlet (m) 0.17
Spillway/Discharge Channel overflow to 3S through the designed channel
2S UG pump (l/s) 3.5

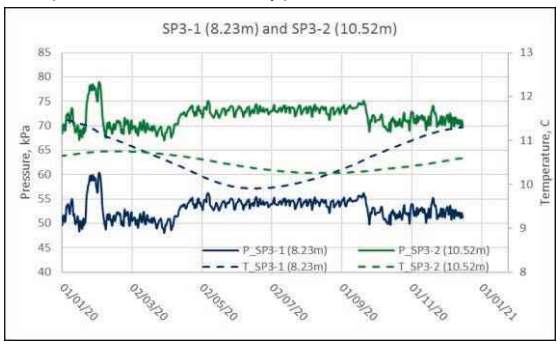


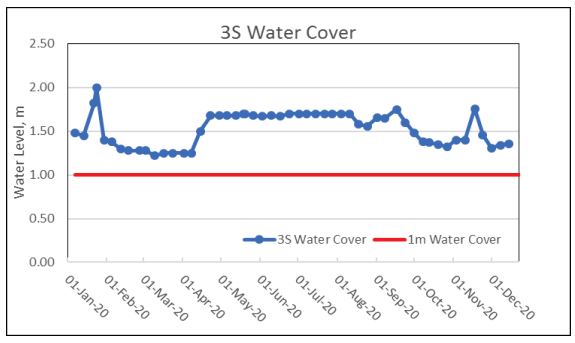
3-South PAG-CCR Pond (3S)-South Water Management System

Notes: getotechnical concern of the inclined trees at the downstream slope of the dyke is being closely monitored; 2 dead trees are observed.
Crest and Slope Stability: No
Vegetation: Maintained
Seepage: No
Animal Activity: No
Spillway: Not being used and not permitted
Water Management: 3S is pumping to SP1

Instrumentation: VWPs (2 shallow and 2 deep) Staff Gauge



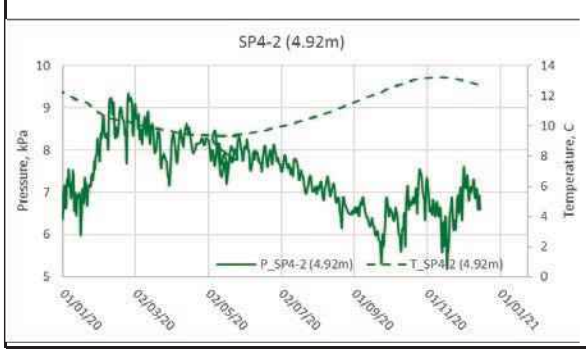


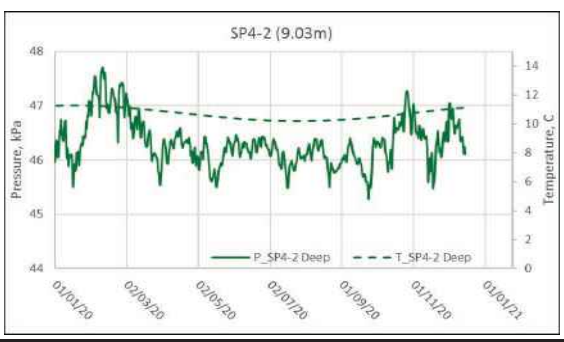


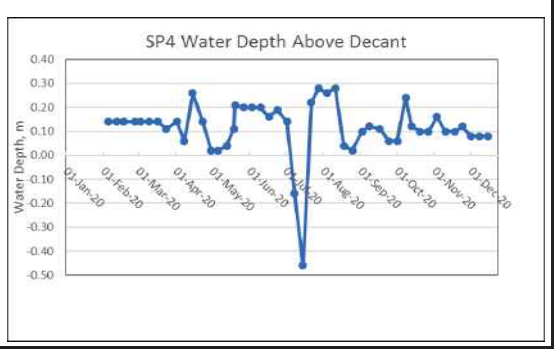
Settling Pond #4 (SP4)-North Water Management System

Notes: 2North1Mains underground pump (#2) grounded on Nov.30, 2020; the other pumps at 2North1Mains (#1) and 2North5Mains grounded in 2019 and early 2020; 2North3Mains pumps are working.
Crest and Slope Stability: No cracks, gullies and sloughing observed
Vegetation Control: Maintained
Seepage: No
Animal Activity: No
Spillway: spillway is inspected, no issue; No overflow in the spillway
Water Management: Discharing at SP4

Instrumentation: VWPs (1 shallow and 1 deep) Staff Gauge







Weekly Inspection Report
Water Management Facility (WMF)-SP1, 2S, 3S and SP4

QUINSAM COAL

Date: December 22, 2020 **Weather:** sunny/frozen **Inspector:** Sarah S

Weekly Summay

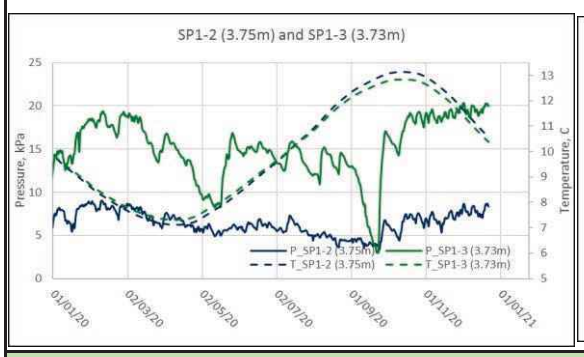
High flow water management system is on with more frequent monitoring and maintenance;
Discharging at SP1 and SP4; Overflow at 2S;
No flow in the SP1 and SP4 spillways; Both spillways are inspected with no issues;
Frozen pondings on SP1 and 3S crests.

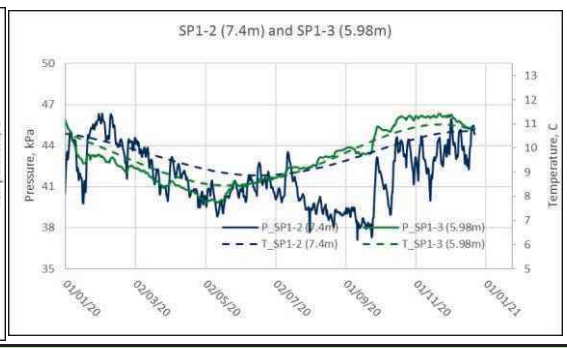
Settling Pond #1 (SP1)-South Water Management System

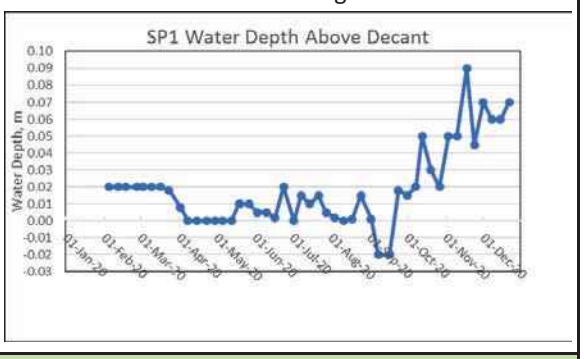
Notes: Discharging at SP1**,** spillway is inspected, no issue.

Crest and Slopes Stability: pondings on the crest; no cracks, sinkholes, slides obseved on the downstream and upstream slope.
Vegetation: Maintained
Seepage: No
Animal Activity: Controlled
Spillway: No overflow in the spillway
Water Management: discharging at SP1

Instrumentation: VWPs (2 shallow and 2 deep) Staff Gauge

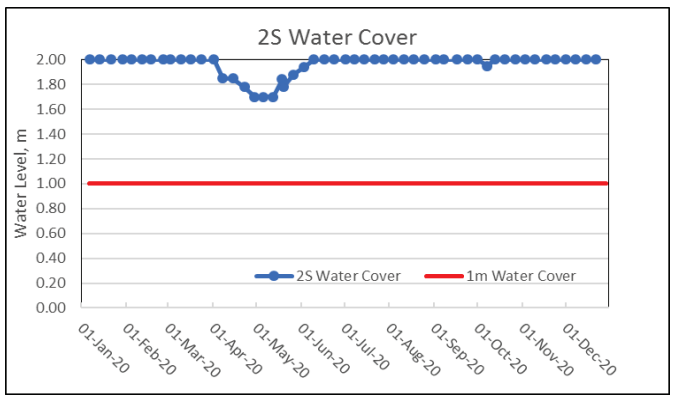






2-South PAG-CCR Pond (2S)-South Water Management System

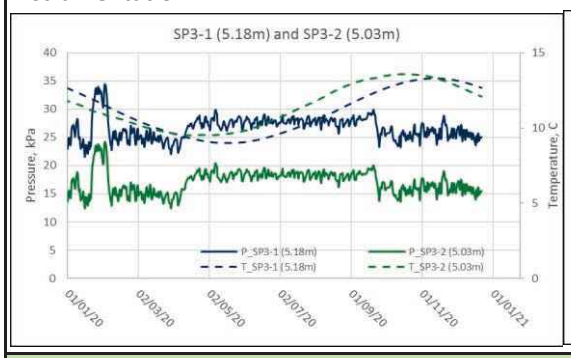
Notes: 2S mine pool pump at Q11-11 is working; spillway is inspected, no issue.
Crest and Slope Stability: No
Vegetation Control: Maintained
Seepage: Seeping to 3S pit through the Engineer designed channel
Animal Activity: No
Water Management: High flow water management mode is on (2S gate valves closed)
Instrumentation: Staff gauges, weir at 2SI, flowmeater at 2SC, no pizeometer
Flow at 2S Inlet (m) 0.17
Spillway/Discharge Channel overflow to 3S through the designed channel
2S UG pump (l/s) 3.5

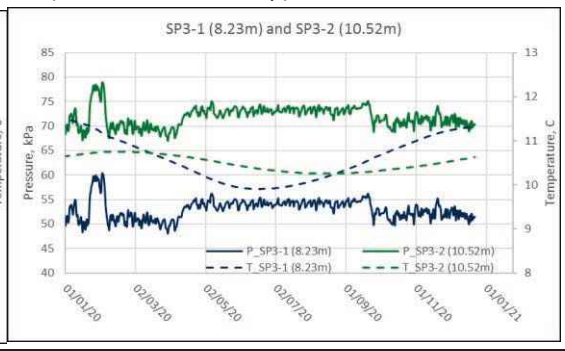


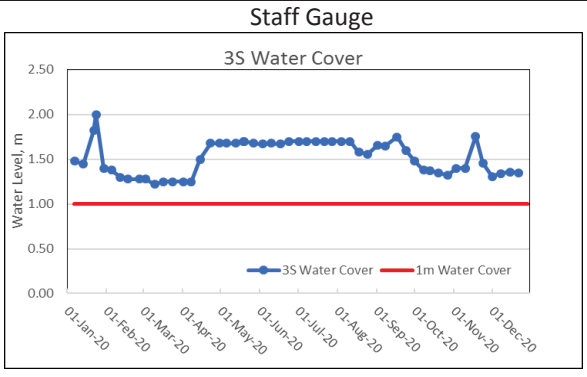
3-South PAG-CCR Pond (3S)-South Water Management System

Notes: getotechnical concern of the inclined trees at the downstream slope of the dyke is being closely monitored; 2 dead trees are observed.
Crest and Slope Stability: No
Vegetation: Maintained
Seepage: No
Animal Activity: No
Spillway: Not being used and not permitted
Water Management: 3S is pumping to SP1

Instrumentation: VWPs (2 shallow and 2 deep) Staff Gauge





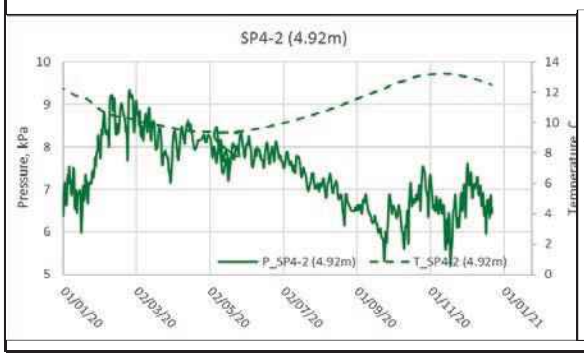


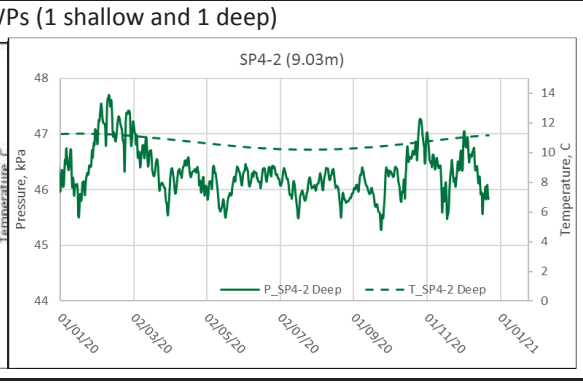
Settling Pond #4 (SP4)-North Water Management System

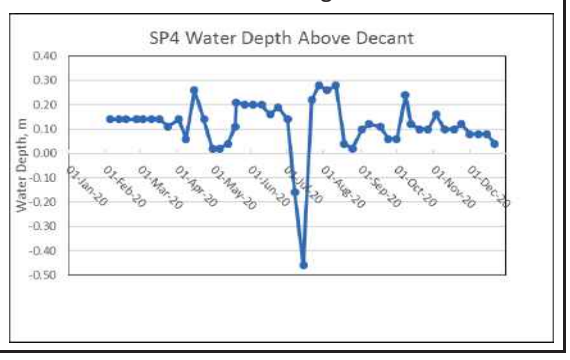
Notes: the water level is rising 3-4ft/day. Only 3mains-2North pumps are working.

Crest and Slope Stability: No cracks, gullies and sloughing observed
Vegetation Control: Maintained
Seepage: No
Animal Activity: No
Spillway: spillway is inspected, no issue; No overflow in the spillway
Water Management: Discharing at SP4

Instrumentation: VWPs (1 shallow and 1 deep) Staff Gauge







Weekly Inspection Report
Water Management Facility (WMF)-SP1, 2S, 3S and SP4

QUINSAM COAL

Date: December 29, 2020 **Weather:** Cloudy/Snow **Inspector:** Sarah S

Weekly Summay

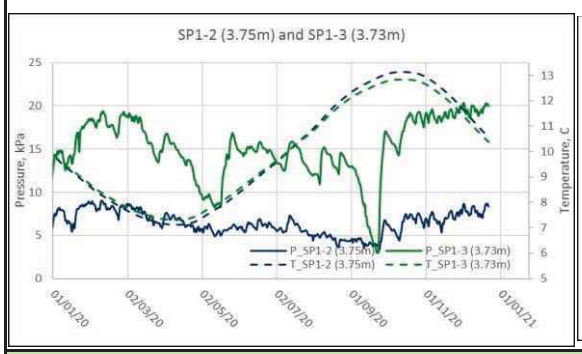
High flow water management system is on with more frequent monitoring and maintenance;
Discharging at SP1 and SP4; Overflow at 2S;
No flow in the SP1 and SP4 spillways;
Two dead trees are observed on the 3S downstream slope.

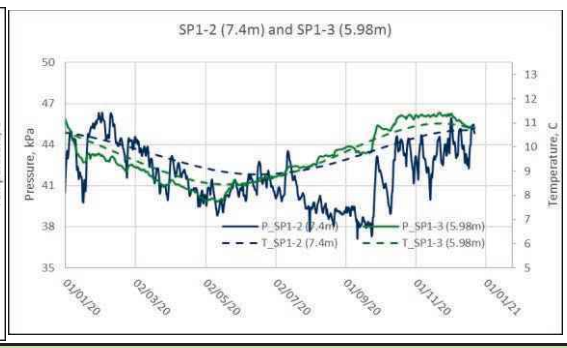
Settling Pond #1 (SP1)-South Water Management System

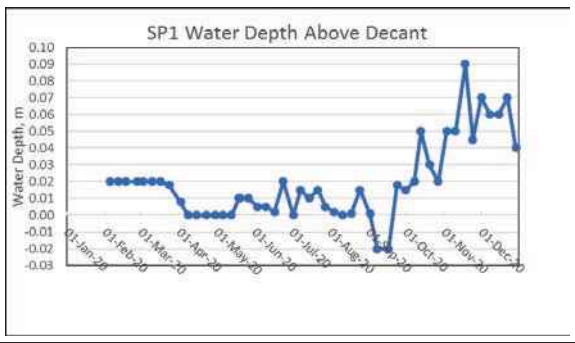
Notes: Discharging at SP1**,** spillway is inspected, no issue.

Crest and Slopes Stability: pondings on the crest; no cracks, sinkholes, slides obseved on the downstream and upstrea
Vegetation: Maintained
Seepage: No
Animal Activity: Controlled
Spillway: No overflow in the spillway
Water Management: discharging at SP1

Instrumentation: VWPs (2 shallow and 2 deep) Staff Gauge

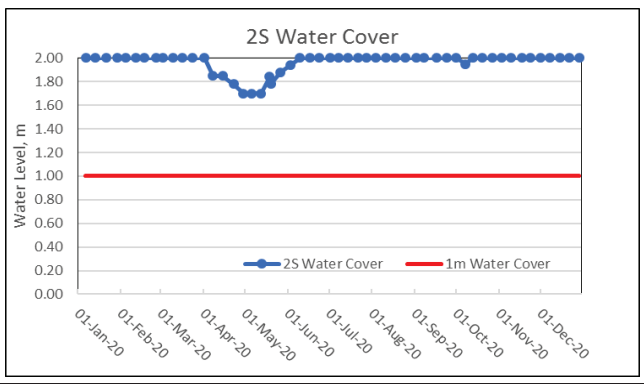






2-South PAG-CCR Pond (2S)-South Water Management System

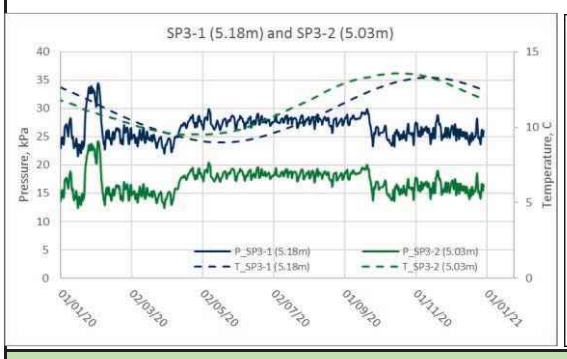
Notes: 2S mine pool pump at Q11-11 is working; spillway is inspected, no issue.
Crest and Slope Stability: No
Vegetation Control: Maintained
Seepage: Seeping to 3S pit through the Engineer designed channel
Animal Activity: No
Water Management: High flow water management mode is on (2S gate valves closed)
Instrumentation: Staff gauges, weir at 2SI, flowmeater at 2SC, no pizeometer
Flow at 2S Inlet (m) 0.17
Spillway/Discharge Channel overflow to 3S through the designed channel
2S UG pump (l/s)

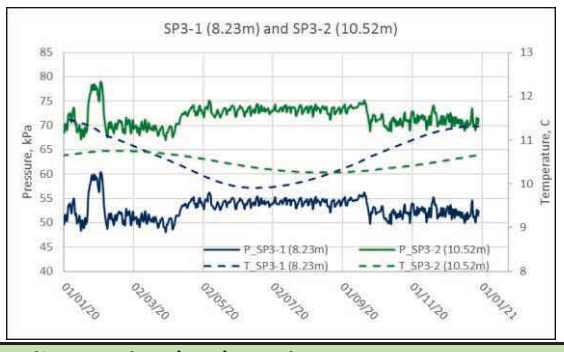


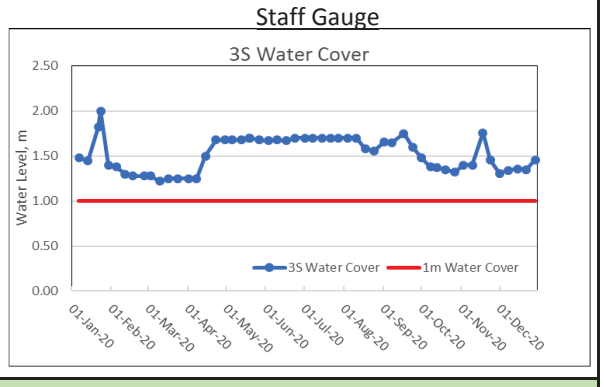
3-South PAG-CCR Pond (3S)-South Water Management System

Notes: getotechnical concern of the inclined trees at the downstream slope of the dyke is being closely monitored; 2 dead trees are observed and trees on the downstream of the 3S dam are leaning more by observation.
Crest and Slope Stability: No
Vegetation: Maintained
Seepage: No
Animal Activity: No
Spillway: Not being used and not permitted
Water Management: 3S is pumping to SP1

Instrumentation: VWPs (2 shallow and 2 deep) Staff Gauge





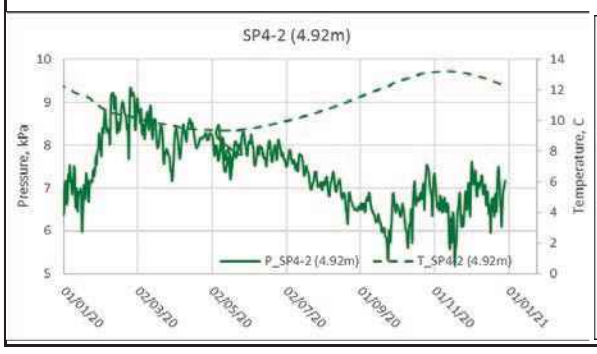


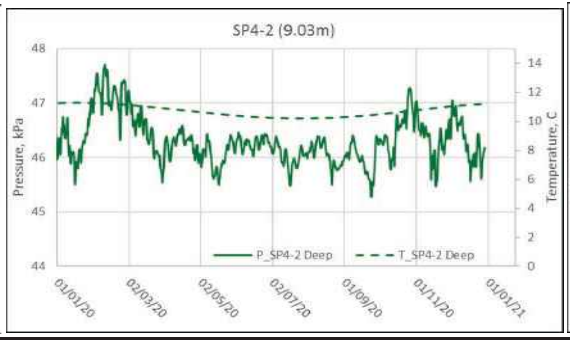
Settling Pond #4 (SP4)-North Water Management System

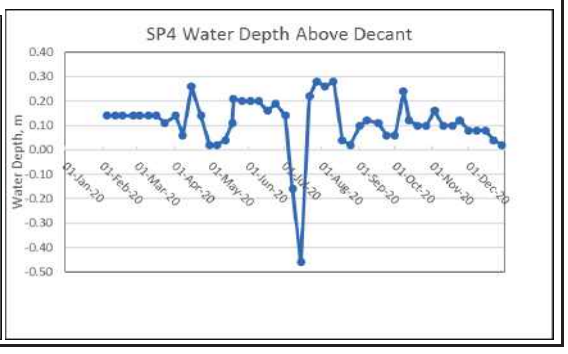
Notes: the water level is rising 3-4ft/day. Only 3mains-2North pumps are working.

Crest and Slope Stability: No cracks, gullies and sloughing observed
Vegetation Control: Maintained
Seepage: No
Animal Activity: No
Spillway: spillway is inspected, no issue; No overflow in the spillway
Water Management: Discharing at SP4

Instrumentation: VWPs (1 shallow and 1 deep) Staff Gauge







APPENDIX D

PREVIOUS RECOMMENDATIONS

APPENDIX D – PREVIOUS RECOMMENDATIONS

This appendix summarizes previous open recommendations from the 2019 DSIs, 2018 DSI and 2018 DSR. The 2019 recommendations combined duplicated recommendations from the 2018 DSIs, DSR and ITRB to assist in prioritizing work on site. The 2018 DSR and DSI recommendations are included at the end of this appendix for clarity.

Recommendation Priority Level is Based on the HSRC Guidance Document (EMLCI, 2016):

- Priority Level 1 – A high probability of or an actual dam safety issues considered immediately dangerous to life, health or the environment, or a significant risk of regulatory enforcement.
- Priority Level 2 – An issue that 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.
- Priority Level 3 – Single occurrences of deficiencies or non-conformances that alone would not be expected to result in dam safety issues.
- Priority Level 4 – Best Management Practice – further improvements are necessary to meet industry best practices or reduce potential risks.

1.0 2019 TDF DSI

Structure	ID #	Deficiency or Non-Conformance	Regulation or Reference	Recommended Action	Priority[1]	Recommended Deadline	Quinsam Response and Actions – 2020	2020 DSI Update
2-North Pit TDF	2019-01	A closure plan does not exist for the facility.	HSRC 10.1.3	A closure plan should be developed. Several of the following recommendations may be changed or influenced by closure planning decisions or configurations. A preliminary closure plan should be developed by June 2020 and a detailed closure plan by June 2021. The following are items identified by the 2018 ITRB during previous reviews that should be considered in developing the plan: Potentially Acid Generating (PAG) and Metal Leaching (ML) material may be present in the tailings. This should be investigated and assessed to develop a closure strategy for the site. Closure design process should consider critical controls. The following processes must continue during closure: quality control, quality assurance, adequate training, involvement of the EOR, change management, addressing nonconformance and record keeping.	4	June 2020/ June2021	QCC will work with the EoR or a professional geotechnical Engineer with expertise in closure plan for tailings dam, subject to the availability of the EoR and funding.	Incomplete. Will be considered as part of the Work Plan.
2-North Pit TDF	2019-02	Freeboard gauge ineffective due to location above pond. A tape measure is manually used to measure freeboard when pond level is below the base of the freeboard gauge.	CDA Section 6.4	Replace or adjust gauge such that pond level can be easily and repeatably measured. Gauge should be calibrated to elevation so it is easy to compare current conditions to NOWL. As the facility is large and the tailings surface is slightly conical consider installing staff gauges in all four corners.	3	August 2020	Completed. Additional freeboard was installed at 2-North TDF in March 2020.	Complete. Quinsam decided to install in Northeast corner only.
2-North Pit TDF	2019-03	Seepage weir at toe of the North Embankment cannot be used to measure flow rate when flooded.	CDA Section 6.6	Relocate the weir, permanently reduce water levels in the sump, or install automatic flow monitoring equipment that can be submerged. The benefit of installing automatic flow monitoring equipment would be less staff time spent collecting manual readings, and a more continuous data set that captures short duration increases and fluctuations.	3	August 2020	Installation of automatic flow monitoring equipment was considered, but not implemented. The 2-North portal pond where the weir is located is currently lowered to enable the reading for the weir.	Ongoing. Weir was flooded and flow estimate 48 of 52 weeks in 2020. It is understood that pumping operations changed in 2021 and that the weir is no longer flooded.

Structure	ID #	Deficiency or Non-Conformance	Regulation or Reference	Recommended Action	Priority[1]	Recommended Deadline	Quinsam Response and Actions – 2020	2020 DSI Update
2-North Pit TDF	2019-04	The facility was not surveyed in 2019.	CDA Section 6.6	If the facility will be imminently reformed for closure this recommendation is not required. Annual survey of the embankment crests and slopes and bathymetry of the impoundment should be collected to enable calculations of freeboard and consolidation of the tailings.	3	August 2020	Completed. Annal survey of the 2-North TDF and the South Dam was done between August 31- September 2, 2020.	Complete.
2-North Pit TDF	2019-05	Surface Monuments were not surveyed in 2019.	CDA Section 6.6	Surface monuments provide information on embankment deformation. Perform a survey as soon as possible. Survey data should be reviewed by the EOR.	3	August 2020	Completed. The monuments were surveyed in March 2020 and September 2020.	Complete.
2-North Pit TDF	2019-06	The 2-North Pit TDF's NOWL was established based on survey and topography data from 2011/2015. Tailings have been deposited in the facility since then. Freeboard requirements also did not consider wave height.	CDA Section 6.4	If the facility will be imminently reformed for closure this recommendation is not required. If mining operations resume downstream of the facility NOWL should be assessed based on the updated facility survey from recommendation 2019-04. The updated assessment should consider wave height.	3	December 2020	This is subject to future mine plan and retainment of the EoR.	Incomplete. Will be considered as part of the Work Plan. Syphon installed near North Embankment in 2020 to keep water levels as low as possible during care and maintenance.
2-North Pit TDF	2019-07	Ponding was observed on the embankment crests.	CDA Section 3.5	Embankment crests should be re-graded to direct surface water towards the impoundment to prevent pooling and surficial erosion.	4	August 2020	Ongoing. The crest face (North Embankment, East Embankment and West Embankment) where puddles are always created during the high flow season were filled and slightly regraded in August 2020.	Ongoing. Embankments have been regraded and there is minimal ponding on the dam crest.
2-North Pit TDF	2019-08	Vegetation observed on the upstream and downstream slopes and crests of the embankments.	CDA Section 3.5	Maintain upstream and downstream slopes and crests of the embankments free of vegetation. Trees and bushes located on the embankments should be cut flush with the ground surface. Roots may remain in place.	4	August 2020	Completed. Vegetation Control by professional contract and current QCC staff was done on both 2- North TDF and South Dam during May-August 2020.	Complete. Vegetation substantially under control, a few small areas with shrubs and small trees identified in 2020 inspection, which have been identified as 2020 DSI recommendations.
2-North Pit TDF	2019-09	A tailings deposition pipe was observed extending through the West Embankment. Pipes through dams can create preferential seepage paths.	CDA Technical Bulletin Section 3.5.4	If the facility will be imminently reformed for closure this recommendation is not required. If the facility continues in its current state, documentation of construction of the pipe through the embankment should be provided. If documentation cannot be provided, pipe should be removed and replaced using appropriate construction methods.	3	August 2020	Completed. The construction history of the pipelines on the 2-North TDF is created by communicating previous long-term contract and senior QCC employee.	Complete. Construction history described in the OMS. Pipes should be reviewed/assessed if operation resumes.

Structure	ID #	Deficiency or Non-Conformance	Regulation or Reference	Recommended Action	Priority[1]	Recommended Deadline	Quinsam Response and Actions – 2020	2020 DSI Update
2-North Pit TDF	2019-10	VWPs are manually read once per week. The data is not collected in a format that can be reviewed for long term trends. Best Available Technology and Practices for instrumentation are not being utilized on the site.	CDA Section 6.6 & MAC Section 2.2	If the facility will be imminently reformed for closure this recommendation may be modified. VWPs should be connected to an automatic datalogger that collects regular readings twice per day. Daily readings provide information to observe short duration fluctuations in groundwater from precipitation events. Data output from dataloggers should be in csv file format. This should reduce data collection and review time for Quinsam personnel and consultants. The instrumentation and monitoring system should be upgraded to reflect currently available standard technology and industry practices. Considering the Consequence Classification of the facility the following instrumentation is recommended to be considered for closure planning: ▪ Flow monitor with automated datalogger should be installed near the toe of the north embankment. ▪ The VWP datalogger should be connected to a real-time monitoring system that automatically send alerts if thresholds are exceeded.	3	August 2020	This is subject to future mine plan and retainment of the EoR.	Incomplete. Will be considered as part of the Work Plan.
2-North Pit TDF	2019-11	2018 DSR and ITRB identified deficiencies in the understanding of the embankment material properties and foundation conditions. A subsurface investigation was recommended. The investigation will also provide an opportunity to install additional instrumentation.	CDA Section 6.6	If the facility will be imminently reformed for closure this recommendation will be modified accordingly. The investigation should be planned to collect data to characterize the following: ▪ Fill data gaps to assist with closure planning. ▪ Spoil Pile beneath the West Embankment. ▪ Foundation conditions below the West Embankment Spoil Pile. ▪ Strength and durability parameters for the CCR (these were previously based on assumptions). The following instrumentation should be installed as part of the investigation: ▪ Replace North Embankment centerline VWP that stopped functioning in 2019. As there is currently only one VWP below the centerline there is not redundancy if it stops functioning. ▪ Slope inclinometers to monitor internal deformation of the embankments.	2	June 2021	This is subject to future mine plan and retainment of the EoR.	Incomplete. Will be considered as part of the Work Plan.

Structure	ID #	Deficiency or Non-Conformance	Regulation or Reference	Recommended Action	Priority[1]	Recommended Deadline	Quinsam Response and Actions – 2020	2020 DSI Update
2-North Pit TDF	2019-12	2018 DSR identified that the stability analysis for the facility should be updated to include a sensitivity analysis, multiple failure surfaces and lower material strength properties.	CDA Section 6.6	If the facility will be imminently reformed for closure this recommendation will be modified. If mining resumes or the facility is left in its current state for several years, the stability analysis should be updated to consider the following: ▪ The analysis should use updated parameters and data collected from the subsurface investigation recommended as 2019-11. ▪ Multiple failure surfaces through the upper and lower portions of the embankments should be considered. ▪ Sensitivity analysis of the materials in the West Spoil pile, as the material properties for this are likely variable, and there could be pockets of organic fill. ▪ A reduction in friction angle of the CCR should be considered. ▪ Impact on FOS by raising the assumed phreatic surface.	2	December 2021	This is subject to future mine plan and retainment of the EoR.	Incomplete. Will be considered as part of the Work Plan.
2-North Pit TDF	2019-13	It is unclear what the VWP trigger levels listed in the OMS Manual are based on.	EMPR Guidance Document Section 3.5	If the facility will be imminently reformed for closure this recommendation may be modified. The stability models developed for 2019-12 should be used to assess the impact on FOS from varying the phreatic surface. The modeled reduction in FOS should be used to establish trigger levels for the VWPs.	3	December 2021	This is subject to future mine plan and retainment of the EoR.	Incomplete. Will be considered as part of the Work Plan.
2-North Pit TDF	2019-14	Slopes of the embankments are steeper than the 2H:1V required by EMPR.	HSRC 10.1.9	If the facility will be imminently reformed for closure this recommendation may be modified. The results of the stability modeling from 2019-12. should be summarized in a technical memorandum and submitted to EMPR for documented formal approval of the steeper slopes.	3	September 2021	This is subject to future mine plan and retainment of the EoR.	Incomplete. Will be considered as part of the Work Plan.
2-North Pit TDF	2019-15	Limited information was provided on the bedrock cut slope at the toe of the North Embankment. The structural geology of the bedrock could impact the stability of the facility.	CDA Section 6.6	If the facility will be reformed for closure this recommendation may be modified. Review records to determine if existing information is available. If not carry out an investigation and assessment of the bedrock geology, focusing on joints and faults, including spacing, strike and dip, roughness, infilling and any stratigraphic layering that might impact the facility.	3	June 2021	This is subject to future mine plan and retainment of the EoR.	Incomplete. Will be considered as part of the Work Plan.
South Dam	2019-16	A closure plan does not exist for the facility.	HSRC 10.1.3	A closure plan should be developed. Several of the following recommendations may be changed or influenced by closure planning decisions or configurations. A preliminary closure plan should be developed by June 2020 and a detailed closure plan the includes results of the recommended investigations and stability modeling by June 2021.	3	June 2020/2021	QCC will work with the EoR or a professional geotechnical engineer with expertise in closure plan for tailings dam, subject to availability of EOR and funding.	Incomplete. Will be considered as part of the Work Plan.
South Dam	2019-17	Staff gauge installed in the Old TDF is not calibrated to elevation. Owner inspections do not report freeboard based on the staff gauge reading.	CDA Section 6.4	Staff gauge installed in the Old TDF should be calibrated to elevation. Freeboard reported on the weekly inspection forms should reflect actual freeboard measured on the staff gauge and not an approximate range.	3	May 2020	Completed. Two more freeboards were installed at the south dam and surveyed in March 2020.	Complete. Additional staff gauges installed and surveyed to reference elevation.

Structure	ID #	Deficiency or Non-Conformance	Regulation or Reference	Recommended Action	Priority[1]	Recommended Deadline	Quinsam Response and Actions – 2020	2020 DSI Update
South Dam	2019-18	Documentation for declassification of the North Dam is not available or was not provided.	EMPR Guidance Document Section 3.4	Quinsam should prepare a document describing how and when the North Dam was decommissioned and declassified as a dam structure. This should be submitted to EMPR. If this cannot be produced the North Dam should be included in scope of the 2020 DSI.	3	October 2020	Completed. This has been generated based on the best knowledge of the site and included in section 2.5 of the OMS Manual.	Complete. Description of history is provided in the OMS Manual.
South Dam	2019-19	Pipes on the dam reduce access and can cause erosion if they burst or leak.	Best Practice	All pipes that are not required for operations should be removed from the dam.	4	June 2020	Completed. The non-operational pipeline on the crest of the south dam was cleaned up in April 2020.	Complete.
South Dam	2019-20	Vegetation observed on the upstream and downstream slopes and crests of the dam.	CDA Section 3.5	Maintain upstream and downstream slopes and crests of the embankments free of vegetation. Trees and bushes located on the embankments should be cut flush with the ground surface. Roots may remain in place.	4	June 2020	Completed. vegetation control by professional contract and current QCC staff was done on both 2-North TDF and South Dam during May-August 2020.	Complete/superseded. Vegetation substantially under control, one small tree identified in 2020 and included as a specific recommendation for 2020.
South Dam	2019-21	There were two pipes running up the east abutment. One on surface and one was buried.	CDA Technical Bulletin Section 3.5.4	If the facility will be imminently reformed for closure this recommendation may be modified. Documentation of construction of the pipe through the dam should be provided. If documentation cannot be provided the pipes should be removed and replaced using appropriate construction methods such as trench blocks.	3	December 2020	The pipe is currently used as part of the water management system for the North part of the mine. No as-built construction report is available. However, communication with the previous senior employee assists understanding the function of the pipes. This is included in the OMS manual, Chapter 2.4.2	Complete. Pipes should be reviewed/assessed if operation resumes.
South Dam	2019-22	Limited information about the foundation conditions of the South Dam. It is understood, to have been built on the Open Pit floor but documentation or as-built reports do not exist or were not provided.	CDA Section 6.6	If the facility will be imminently reformed for closure this recommendation may be modified. During the subsurface investigation recommended for the 2-North Pit TDF, a couple boreholes should be advanced through the South Dam to characterize the material properties and install instrumentation. Location and depth of the boreholes will depend on the closure plan. Instrumentation will also depend on the closure plan, VWPs and slope inclinometers should be considered.	3	December 2020	This is subject to future mine plan and retainment of the EOR.	Incomplete. Will be considered as part of the Work Plan
Quality Management	2019-23	Facility has undergone multiple ownership and staffing changes.	EMPR Guidance Document Section 2.1	Confirm there are a sufficient number of staff, with adequate training, and resources to perform dam safety maintenance and surveillance. For example, if an individual has too many items they are responsible for monitoring and reporting it would be prudent to hire additional resources and support for them.	4	December 2020	Ongoing. Previous employee of QCC will be called in to help when requested.	Complete. Records for 2020 indicate dam safety surveillance and maintenance are being performed.
Quality Management	2019-24	Funds were not available to complete a survey of the TDF surface monuments in 2019.	CDA Section 6.6	Confirm there are sufficient resources and funding available to carry out dam safety monitoring.	4	December 2020	Ongoing.	Complete. Required surveillance performed in 2021.
Quality Management	2019-25	Risk register	EMPR Guidance Document Section 3.2	The FMEA risk assessment should be revisited and updated to reflect current site conditions and plans.	4	December 2020	Completed. QCC prepared a review summary report of the risk assessment for the tailings dam and submitted to the ministry on April 1, pursuant to HSRC 10.4.2.(d)	Quinsam has indicated complete but has not been reviewed by Tetra Tech.

Structure	ID #	Deficiency or Non-Conformance	Regulation or Reference	Recommended Action	Priority[1]	Recommended Deadline	Quinsam Response and Actions – 2020	2020 DSI Update
Quality Management	2019-26	Quality Management	ITRB	ITRB previously recommended assigning a role of a site Quality Manager to develop and implement a review process for the tailings management system.	4	December 2020	Completed. A review process is developed.	Complete. OMS describes a review process.
Quality Management	2019-27	Non-conformance documentation	EMPR Guidance Document Section 4.8	A system to document, report and address non-conformance should be established.	4	December 2020	Completed. This table is being used as a tracking table.	Complete.
Quality Management	2019-28	Documentation	EMPR Guidance Document Section 4.8	The 2018 ITRB recommended that a modern document management system should be used on the site. As the site moves towards closure it is particularly important to preserve historical documents as staffing may change.	4	December 2020	Completed and ongoing. Those historic documents have been digitized.	Quinsam has indicated complete but has not been reviewed by Tetra Tech.
Quality Management	2019-29	Site Terminology	Best Practice	Weekly inspection and construction reports should use language and terms that are descriptive and information for a person who is not on the site. Terms, such as “geyser” that have distinct geological definitions, that a future reader may interpret to indicate hazardous geological conditions, should not be used to describe water management practices.	4	December 2020	Completed.	Complete.
Quality Management	2019-30	Closure	HSRC 10.1.3	A closure plan should be developed for the site. The following are items identified by the 2018 ITRB review that should be considered in developing the plan: ▪ Potentially Acid Generating (PAG) and Metal Leaching (ML) material may be present in the tailings. This should be investigated and assessed to develop a closure strategy for the site. ▪ Closure design process should consider critical controls. The following processes must continue during closure: quality control, quality assurance, adequate training, involvement of the EOR, change management, addressing nonconformance and record keeping.	4	December 2020	EOR participation is needed.	Incomplete. Will be considered as part of the Work Plan
OMS Manual/EPRP	2019-31	Documents recently revised and should be reviewed by EOR.	HSRC Guidance Document Section 4.4	EOR should review revised documents in detail with respect to the previous recommendations and the change in mine status.	4	May 2020	EOR participation is needed.	Complete. OMS and EPRP were reviewed as part of this DSI.

2.0 2019 WMF DSI

Structure	ID #	Deficiency or Non-Conformance	Regulation or Reference	Recommended Action	Priority[1]	Recommended Deadline	Quinsam Response and Actions – 2020	2020 DSI Update
All four	2019-01	Instrumentation was installed around the facilities by Golder in 2018. Due to changes in mine ownership a factual geotechnical report describing the subsurface investigation, conditions encountered and how the instrumentation was installed was not issued. Interpreting the data collected from the instruments is challenging without this information.	CDA (2013) 6.6	Funds should be made available to acquire these records. These should be acquired as soon as possible so that the data is not lost or misremembered.	3	April 2020	Bowra and QCC are investigating the alternative options (such as obtaining new quote for a new drilling program or communicating with previous construction contractors) to acquire essential geotechnical information for the water dams.	Incomplete. Work Plan will consider drilling at these facilities to collect the missing information.
SP1 WMF	2019-02	Inspection of SP1 identified the following maintenance issues: The dam crest was rutted and had ponded water. Small trees and shrubs were observed growing on the downstream dam slope. Logs and debris were observed in the pond, these could block the outlet pipe. The emergency spillway was very overgrown with vegetation.	CDA (2013) 3.5	Maintenance items identified should be addressed by: The crest of the dam should be graded to improve drainage. Trees and shrubs growing on the downstream dam slope should be cut off at surface. The root ball should be left as is to not disturb the dam surface. Logs and debris should be removed. Vegetation in the emergency spillway should be removed.	3	May 2020	Completed. Vegetation control was done by both professional contract (Blackfish) and current staff (using weed trimmer) at the mine during May - August, 2020. Depressions in SP1 crest are filled with till and covered with 1 inch gravel.	Incomplete/superseded by 2020 DSI recommendations. Emergency spillway was overgrown downstream of the dam crest. Only the middle portion of the dam crest had been regraded. Small trees and shrubs were growing on the upstream and downstream slopes.
SP4 WMF	2019-03	Inspection of SP4 identified the following maintenance issues: Low level decant outlet pipe was partially blocked. Emergency spillway was infilled with gravel and overgrown with vegetation.	CDA (2013) 3.5	Maintenance items should be addressed by: The decant pipe should be unblocked. Measures, such as removing debris from the pond and installing a screen over the outlet, should be taken to prevent this from reoccurring. Vegetation and gravel in the emergency spillway should be removed.	3	May 2020	Completed. The decant pipe is not blocked. Vegetation in the emergency spillway was controlled using chainsaw, weed trimmer and edger by the current mine employee during May-August, 2020.	Incomplete/superseded by 2020 DSI recommendations. Emergency spillway was overgrown downstream of the dam crest.
2SP and 3SP	2019-04	Material was observed to have slumped into the channel between 2SP and 3SP.	CDA (2013) 3.5	Material should be removed.	3	May 2020	QCC will remove the slumped material after clarification with the EoR.	Closed. Detailed inspection in 2020 indicated that this was riprap that had weathered and not material that had slumped into the spillway.
2SP	2019-05	Design and construction records for 2SP were not provided prior to the December site inspection.	HSRC 10.5.3	2SP should be inspected in the early spring now that the design and construction records are understood.	3	May 2020	Completed. QCC provided EoR with the available records in December 2019.	Complete. 2SP was inspected in May 2020.

Structure	ID #	Deficiency or Non-Conformance	Regulation or Reference	Recommended Action	Priority[1]	Recommended Deadline	Quinsam Response and Actions – 2020	2020 DSI Update
All four	2019-06	Facilities are reported as inspected daily and weekly, however records of the inspects are not kept.	CDA (2013) 3.6	Pond levels for the facilities should be recorded during the regular inspections. Data should be recorded in a digital table so it can be readily transferred and reviewed. A documented inspection of the facilities should be carried out monthly as per BC Dam Safety minimum frequency for Significant Consequence Dams. Regularly documented inspections assist to identify maintenance trends.	3	Starting April 2020	Completed. The formal weekly inspection report was created in April 2020 and is currently being used weekly.	Complete. Weekly inspections are documented.
OMS Manual	2019-07	Documents recently revised and should be reviewed by EOR.	HSRC 10.5.2	Once the reports are prepared the EOR should review them in detail and provided recommendations if changes are required.	3	May 2020	Completed. OMS for water dam has been submitted to Ministry and provided to EoR in January 2020.	Complete. OMS Manual was reviewed as part of preparing this DSI.
All four	2019-08	There is not a recent LiDAR survey of the site. The previous survey was flown prior to construction of the 2SP, 3SP and associated ditches and channels.	HSRC 10.5.1	A LiDAR survey for the site should be completed. The LiDAR survey should provide full coverage of the facilities and the upstream catchment areas. This information will be used to assess the structures, assess the catchments for hydrology analysis and create drawings.	2	May 2020	Most recent and reliable LiDAR survey was done in 2011, which has been provided to the EoR in 2019. The 2011 version of LiDAR does not cover the whole area for SP1 and SP4; QCC will look into the options of obtaining new LiDAR, subject to the future of the mine.	Incomplete. 2SP and 3SP were constructed after the 2011 LiDAR survey. Work Plan will include recommendations for extents/timing for a new aerial survey.
2SP	2019-09	A potential low area on the crest of 2SP was observed on the south side of the facility, to the west of the internal dividing dyke.	HSRC 10.5.1	This should be reviewed once an updated LiDAR survey of the facility is collected.	3	July 2020	Same as the above.	Incomplete. Will be discussed in the work plan.
2SP	2019-10	As-built reporting for 2SP ends in the fall of 2012 when the facility was partially constructed. The draft construction status report identified several issues and deficiencies.	HSRC 10.5.1	Quinsam should search their databases and physical libraries for completed as-built records. If these cannot be located Quinsam should contact Golder to determine if a final as-built report was produced.	2	July 2020	Completed. QCC provided most available records to the EoR in December 2019.	Ongoing. Construction information (survey point files, lab/QC testing results) has been provided to Tetra Tech. Will require effort to sort and review. This will be discussed in the work plan.
2SP and 3SP	2019-11	Design and as-built records for plugging the portals in the based of 2SP were not available.	HSRC 10.5.1	Quinsam should search their databases, physical libraries for design and as-built records. If these cannot be located Quinsam should contact Golder/other consultants involved to request the referenced 2010 design report and determine if a final as-built report was produced.	3	July 2020	No as-built report for 3S.	Complete. Quinsam has found a design report for plugging the 2SP portals, and confirmed that there are not as-built records available.

Structure	ID #	Deficiency or Non-Conformance	Regulation or Reference	Recommended Action	Priority[1]	Recommended Deadline	Quinsam Response and Actions – 2020	2020 DSI Update
3SP	2019-12	As-built records are not available for 3SP. It was constructed between 2016 and 2017. Construction is reported to have been inspected internally by Quinsam's Mine Manager, Gary Gould, P.Eng.	HSRC 10.5.1	Quinsam should search their databases and physical libraries for photographs and notes documenting this construction work. As the work was supervised by a professional engineer, it is expected that documentation would be kept, and there should be a communication record between Mr. Gould and Golder as they originally designed the structure. If records cannot be located Golder should be contacted directly to ask if they have communication records documenting construction.	2	July 2020	Communication were held with the previous QCC employee and contractors. Construction photographs are now available and how the 3S dam was constructed is more clear.	Closed. Quinsam has confirmed that these as-built records are not available.
SP1 and SP4 WMFs	2019-13	As-built records are not available for SP1 WMF and SP4 WMF. An as-built report for SP4, issued by Kohn, was mentioned in the repair design (Golder, 2003).	HSRC 10.5.1	Quinsam should search their databases, physical libraries and contact consultants involved with the work to request the completed as-built records.	2	July 2020	One technical report by Thurber (1991) was found, which describes the design and construction materials for the SP1 dam.	Closed. Quinsam has confirmed that these as-built records are not available.
3SP	2019-14	Dams at the north and south ends of 3SP appear to have been constructed on fill.	HSRC Guidance 3.3.2	This should be confirmed through reviewing as-built information and LiDAR.	2	July 2020	No as-built report for 3S, however, communication with the previous QCC employee staff indicates that the southern portion of the 3S dam was constructed on the original ground, the northern portion of the 3S dam was constructed on fill.	Superseded. Additional work to understand the 3SP facility (LiDAR/drilling) is recommended in the 2020 DSI and will be considered as part of the Work Plan.
All four	2019-15	The site weather station only measures rainfall and not snow depth. Melting snow in the catchment areas for the facilities will contribute to inflow floods so should be understood.	CDA (2013) 3.4.2	Upgrade the weather station to include a device for measuring snowfall, such as a snow depth sensor or snow pillow.	3	September 2020	Completed. The weather station is updated in July 2020.	Complete. A snow sensor has been added to the weather station.
All four	2019-16	Information provided for catchments and flood calculations did not cover all four facilities.	CDA (2013) 3.4.2	Quinsam should search their records for a site wide hydrology analysis. The only hydrology report available to review for this DSI focused on 2SP and 3SP. If a report cannot be found a detailed hydrology analysis for the site should be completed. This report should include figures showing catchment areas, ditches, pumps and how water is managed for the facility.	3	December 2020	No site-wide hydrogeology is available.	Ongoing. This will be discussed and considered in the work plan.

Structure	ID #	Deficiency or Non-Conformance	Regulation or Reference	Recommended Action	Priority[1]	Recommended Deadline	Quinsam Response and Actions – 2020	2020 DSI Update
All four	2019-17	The Dam Consequence Classification, is based on qualitative information on environmental impact.	HSRC Guidance Document 3.4	CDA is currently in the process of creating an updated guidance document on a quantitative method for assessing the Environmental Consequences. After this is issued the Environmental Consequences of failure of the dams should be evaluated based on input from Quinsam's Environmental Department regarding water quality in the facilities and fish in the downstream environments.	3	6 months after CDA published updated guidelines	EoR participation is needed.	Incomplete. This will be considered/discussed in the work plan.
All four	2019-18	Hazard and failure modes analysis for the facilities have not been completed, are not documented, or were based on design assumptions and not as-built conditions.	HSRC Guidance 3.3	A hazard and failure mode analysis and geotechnical assessment for the facilities should be carried out, after the reports and LiDAR information described above is collected. At a minimum this should include: Review additional records found and identify any data gaps. Carry out geotechnical or hydrotechnical field work to address identified data gaps. Embankment overtopping: Full analysis for SP1 and SP4 WMFs. Compare as-built conditions and design assumptions for 2SP and 3SP. Internal Erosion: Full analysis for 3SP, SP1 and SP4 WMFs. Confirm as-built conditions and design assumptions for 2SP. Embankment Instability: Full analysis for SP1 and SP4 WMFs. Confirm as-built conditions to modeling assumptions used for 2SP and 3SP. Liquefaction: Full assessment for the four facilities. Loss of Containment into Underground Portals Review as-built records for 2SP.	2	June 2021	EoR or a professional geotechnical engineer participation is needed.	Incomplete. This will be considered/discussed in the work plan.
2SP and 3SP	2019-19	The design reports for 2SP and 3SP recommended future monitoring of seepage rates and water quality to confirm the PAG storage facilities are functioning as intended, and to refine the predictions to assist with closure.	HSRC Guidance 5.0	Quinsam should confirm the seepage rates and water quality data for these facilities is reviewed by a qualified professional who can comment on the geochemistry and if the structures are functioning as intended.	4	June 2021	Completed. The seepage rate has been evaluated and assessed in the report of Long Lake Groundwater Assessment by Lorax in 2012.	Incomplete. The 2012 report by Lorax discussed planned seepage rates, however the actual seepage rates and water quality data review is not included in this report.

3.0 2018 TDF DSR

Thurber carried out a DSR for Quinsam in 2018. The results of which, were published in a DSR dated March 15, 2019. Recommendations from the DSR are summarized in the table below. Note in the DSR the 2-North Pit TDF is referred to as the “Current TDF”.

No.	Recommendation	2020 DSI Update
1	All pertinent historic reports and record documents that are only available in hard copy should be scanned and compiled in PDF format, so they can more easily be transmitted, without the risk of being lost. A complete version of the current OMS Manual (including appendices) should also be available in PDF format.	Not reviewed as part of the DSI.
3	Given their High consequence rating and ongoing risk to nearby mine operations, VW piezometers should be installed at both the West and South Embankments at the Current TDF. These instruments are needed to confirm the shape of the assumed phreatic surfaces for these embankments. A minimum of 3 piezometers are recommended for the West Embankment and 1 piezometer at the South Embankment.	Incomplete. Will be considered as part of the Work Plan.
4	When drilling to install the new VW piezometers at the West Embankment, several drill holes should also be extended through the underlying spoil material to confirm the underlying foundation materials and depth to bedrock. Representative samples of any natural overburden soils should be collected to permit an evaluation of strength properties.	Incomplete. Will be considered as part of the Work Plan.
5	Additional documentation or justification is warranted for the assumed strength parameters for the embankment materials, particularly the CCR fill. This information should take into consideration the potential for reduced friction angles at higher confining stress.	Incomplete. Will be considered as part of the Work Plan.
6	The EOR should identify whether alternate failure surface configurations were considered in Golder’s 2016 stability analysis update, particularly for the North and South Embankments. The results presented in the technical memo suggest lower factors of safety could exist for alternate failure surface configurations that still originate on the upstream side of the crest.	Incomplete. Will be considered as part of the Work Plan.
7	In consideration of the (loose) placement methodology employed for the CCR fill, an assessment of earthquake-induced embankment deformations should be completed. The assessment should consider the seismic consolidation of unsaturated embankment fills. These settlements should be added to any predicted seismic slope movements to confirm that adequate freeboard will exist following the event.	Incomplete. Will be considered as part of the Work Plan.
8	The existing hoses and other materials should be removed from the crest of the South Dam.	Closed. Pipes required for water management during active care and maintenance. Pipes should be
10	The crest of the embankments at the Current TDF should be graded such ponded water does not collect during wet weather. The crests should be graded so that they shed water back into impoundment.	Ongoing. Embankments have been regraded and there is minimal ponding on the dam crest.
11	Following a significant earthquake, it is recommended that the period of elevated surveillance be increased from the current 2 days to at least a week, since changes in post-earthquake seepage. Patterns may require more than 48 hours to become evident.	Complete. Quinsam has confirmed they will updated the OMS to included these suggested response times.
12	Although the figures included in the OMS Manual have been updated to show current or near current embankment geometries; several of the figures are poor quality and are difficult to read. (e.g., Figure 1, Figure 2 and Figure 9). Clearer images should be included in future OMS revisions.	Complete. TDF OMS contains figures that are clear.
13	The OMS Manual states the six crest survey monuments installed at the Current TDF in 2017 are to be read monthly; however, we understand the EOR has recommended a yearly monitoring frequency. The OMS manual should be amended to reflect the EOR recommendations.	Complete. Monuments are surveyed yearly.
14	The response and notification flowchart for “Abnormal (increased or high turbidity) Seepage from any Slope” should be amended to provide clarification regarding the circumstances where the EOR should be notified.	Complete.

4.0 2018 TDF DSI

Structure	ID Number	Deficiency or Non-conformance	Applicable Regulation or OMS Manual Reference	Recommendation	Priority	2020 DSI Update
2 North Pit TDF	2015-2	Vegetation observed on the upstream and downstream slopes and crests of the embankments.	OMS Section 8.0	Maintain upstream and downstream slopes and crests of the embankments free of vegetation. Trees and bushes located on the embankments should be cut flush with the ground surface. Roots may remain in place.	3	Complete/superseded. Vegetation under control, a few small areas with shrubs and small trees identified in 2020 inspection, which have been identified as 2020 DSI recommendations.
2 North Pit TDF	2015-7	Notify Engineer of Record of changes to the facility.	MEM 2017 as presented in OMS Section 5.3	Engineer of Record should be notified prior to the implementation of closure or any other works which may impact the facility.	4	Incomplete. The facility does not have an EOR.
2 North Pit TDF	2016-1	No annual survey of embankment carried out.	MEM 2017 as presented in OMS Section 5.3	Annual survey of the embankment crests and slopes and bathymetry of the impoundment should be undertaken to enable calculations of freeboard and dam settlements. The goal of this measurement is to demonstrate increase or decrease in freeboard as the dam and tailings settle, as well as quantify flood storage capacity.	2	Complete.
2 North Pit TDF	2016-2	OMS manual requires update to reflect inspection intervals and requirements as per 2015-1.	OMS Section 9.0	Update OMS manual to meet requirements shown in 2015-1. Results of MERP drill should be incorporated into the OMS manual. Any changes to the OMS manual should be reviewed by the Engineer of Record.	3	Complete. 2020 OMS Manual describes an inspection interval/requirement that is sufficient for the current mine status.
2 North Pit TDF	2016-4	Facility water balance based on historic assumptions which may be out of date.	MEM 2017 as presented in OMS Section 5.3	Update facility water balance based on pond and tailings volumes.	3	Closed. No tailings placement. Capacity should be reassessed if future tailings deposition is planned.
2 North Pit TDF	2017-2	Ponding of surface water on embankment crests.	OMS Section 8.0	Embankment crests should be graded towards the impoundment to prevent pooling of surface water. The CR should be raised to the final design elevation of 355 m to limit ponding on the crest.	2	Ongoing. Embankments have been regraded and there is minimal ponding on the dam crest.
2 North Pit TDF	2018-1	Survey monument SSt-3 damaged.	OMS Section 9.0	Replace or repair.	3	Complete. Monument replaced in 2020.
2 North Pit TDF	2018-2	Incorrect survey frequency for monuments on dam crests in OMS Manual	OMS Section 9.0	Update OMS manual to annual frequency of survey.	4	Complete. 2020 OMS Manual describes an inspection interval/requirement that is sufficient for the current mine status.
2 North Pit TDF	2018-4	Seepage weir at the toe of the North Embankment inoperable when flooded by the 2-North Portal Sump.	OMS Section 9.0	Permanently reduce water levels in the 2-North Portal Sump or relocate the weir to allow weekly measurement of seepage rate.	3	Incomplete.
2 North Pit TDF	2018-5	Failure to notify EOR of installation of pipes on dams.	-	Update OMS manual with requirement for written approval by EOR for any proposed changes to facility, including earthworks, changes to water management procedures, installation or removal of pipes, removal of materials or grading.	2	Complete. OMS Manual describes EOR notification.
2 North Pit TDF	2018-6	Update OMS Minimum Operating Freeboard from 1.25 m to 1.4 m.	-	Update OMS manual and weekly inspection report checklist.	2	Complete.
2 North Pit TDF	2018-7	Pipes on dam area hazard.	-	All pipes that are not required for operation of the TDF to be removed from the TDF. Update OMS manual: No pipes shall be installed in or on the TDF embankments without written approval by the EOR. Add procedures for yearly inspection and reporting of pipes installed on the TDF that are required for operation.	2	Closed. Pipes should be reviewed/assessed if operation resumes.
Old TDF	2014-2	Vegetation observed on the upstream and downstream slopes and crests of the dam.	OMS Section 8.0	Maintain upstream and downstream slopes and crests of the embankments free of vegetation.	3	Complete.
Old TDF	2015-4	Notify Engineer of Record of changes to facility operation.	MEM 2017 as presented in OMS Section 5.3	Engineer of Record should be notified prior to implementation of closure, construction, removal of tailings, placement of materials in the impoundment area, or any other works which may impact the facility.	1	Incomplete. The facility does not have an EOR.

Structure	ID Number	Deficiency or Non-conformance	Applicable Regulation or OMS Manual Reference	Recommendation	Priority	2020 DSI Update
Old TDF	2018-1	Pipes on embankment slopes present risks for erosion in the event of a pipe breakage.	OMS	Remove the pipes. Update OMS manual: no pipes shall be placed on the South Dam without written approval by the EOR.	2	Closed. Pipes required for water management during active care and maintenance. Pipes should be reviewed/assessed if operation resumes.
Old TDF	2018-2	The staff gauge is above the pond.	OMS	Move or replace the gauge to allow measurement of pond level.	2	Complete.
Old TDF	2018-3	Update OMS Minimum Operating Freeboard updated to 5.3 m.	OMS	Update OMS Manual and weekly dam inspection checklist.	3	Complete.

APPENDIX E

LIMITATIONS OF USE

LIMITATIONS ON USE OF THIS DOCUMENT

GEOTECHNICAL

1.1 USE OF DOCUMENT AND OWNERSHIP

This document pertains to a specific site, a specific development, and a specific scope of work. The document may include plans, drawings, profiles and other supporting documents that collectively constitute the document (the "Professional Document").

The Professional Document is intended for the sole use of TETRA TECH's Client (the "Client") as specifically identified in the TETRA TECH Services Agreement or other Contractual Agreement entered into with the Client (either of which is termed the "Contract" herein). TETRA TECH does not accept any responsibility for the accuracy of any of the data, analyses, recommendations or other contents of the Professional Document when it is used or relied upon by any party other than the Client, unless authorized in writing by TETRA TECH.

Any unauthorized use of the Professional Document is at the sole risk of the user. TETRA TECH accepts no responsibility whatsoever for any loss or damage where such loss or damage is alleged to be or, is in fact, caused by the unauthorized use of the Professional Document.

Where TETRA TECH has expressly authorized the use of the Professional Document by a third party (an "Authorized Party"), consideration for such authorization is the Authorized Party's acceptance of these Limitations on Use of this Document as well as any limitations on liability contained in the Contract with the Client (all of which is collectively termed the "Limitations on Liability"). The Authorized Party should carefully review both these Limitations on Use of this Document and the Contract prior to making any use of the Professional Document. Any use made of the Professional Document by an Authorized Party constitutes the Authorized Party's express acceptance of, and agreement to, the Limitations on Liability.

The Professional Document and any other form or type of data or documents generated by TETRA TECH during the performance of the work are TETRA TECH's professional work product and shall remain the copyright property of TETRA TECH.

The Professional Document is subject to copyright and shall not be reproduced either wholly or in part without the prior, written permission of TETRA TECH. Additional copies of the Document, if required, may be obtained upon request.

1.2 ALTERNATIVE DOCUMENT FORMAT

Where TETRA TECH submits electronic file and/or hard copy versions of the Professional Document or any drawings or other project-related documents and deliverables (collectively termed TETRA TECH's "Instruments of Professional Service"), only the signed and/or sealed versions shall be considered final. The original signed and/or sealed electronic file and/or hard copy version archived by TETRA TECH shall be deemed to be the original. TETRA TECH will archive a protected digital copy of the original signed and/or sealed version for a period of 10 years.

Both electronic file and/or hard copy versions of TETRA TECH's Instruments of Professional Service shall not, under any circumstances, be altered by any party except TETRA TECH. TETRA TECH's Instruments of Professional Service will be used only and exactly as submitted by TETRA TECH.

Electronic files submitted by TETRA TECH have been prepared and submitted using specific software and hardware systems. TETRA TECH makes no representation about the compatibility of these files with the Client's current or future software and hardware systems.

1.3 STANDARD OF CARE

Services performed by TETRA TECH for the Professional Document have been conducted in accordance with the Contract, in a manner consistent with the level of skill ordinarily exercised by members of the profession currently practicing under similar conditions in the jurisdiction in which the services are provided. Professional judgment has been applied in developing the conclusions and/or recommendations provided in this Professional Document. No warranty or guarantee, express or implied, is made concerning the test results, comments, recommendations, or any other portion of the Professional Document.

If any error or omission is detected by the Client or an Authorized Party, the error or omission must be immediately brought to the attention of TETRA TECH.

1.4 DISCLOSURE OF INFORMATION BY CLIENT

The Client acknowledges that it has fully cooperated with TETRA TECH with respect to the provision of all available information on the past, present, and proposed conditions on the site, including historical information respecting the use of the site. The Client further acknowledges that in order for TETRA TECH to properly provide the services contracted for in the Contract, TETRA TECH has relied upon the Client with respect to both the full disclosure and accuracy of any such information.

1.5 INFORMATION PROVIDED TO TETRA TECH BY OTHERS

During the performance of the work and the preparation of this Professional Document, TETRA TECH may have relied on information provided by third parties other than the Client.

While TETRA TECH endeavours to verify the accuracy of such information, TETRA TECH accepts no responsibility for the accuracy or the reliability of such information even where inaccurate or unreliable information impacts any recommendations, design or other deliverables and causes the Client or an Authorized Party loss or damage.

1.6 GENERAL LIMITATIONS OF DOCUMENT

This Professional Document is based solely on the conditions presented and the data available to TETRA TECH at the time the data were collected in the field or gathered from available databases.

The Client, and any Authorized Party, acknowledges that the Professional Document is based on limited data and that the conclusions, opinions, and recommendations contained in the Professional Document are the result of the application of professional judgment to such limited data.

The Professional Document is not applicable to any other sites, nor should it be relied upon for types of development other than those to which it refers. Any variation from the site conditions present, or variation in assumed conditions which might form the basis of design or recommendations as outlined in this document, at or on the development proposed as of the date of the Professional Document requires a supplementary exploration, investigation, and assessment.

TETRA TECH is neither qualified to, nor is it making, any recommendations with respect to the purchase, sale, investment or development of the property, the decisions on which are the sole responsibility of the Client.

1.7 ENVIRONMENTAL AND REGULATORY ISSUES

Unless stipulated in the report, TETRA TECH has not been retained to explore, address or consider and has not explored, addressed or considered any environmental or regulatory issues associated with development on the subject site.

1.8 NATURE AND EXACTNESS OF SOIL AND ROCK DESCRIPTIONS

Classification and identification of soils and rocks are based upon commonly accepted systems, methods and standards employed in professional geotechnical practice. This report contains descriptions of the systems and methods used. Where deviations from the system or method prevail, they are specifically mentioned.

Classification and identification of geological units are judgmental in nature as to both type and condition. TETRA TECH does not warrant conditions represented herein as exact, but infers accuracy only to the extent that is common in practice.

Where subsurface conditions encountered during development are different from those described in this report, qualified geotechnical personnel should revisit the site and review recommendations in light of the actual conditions encountered.

1.9 LOGS OF TESTHOLES

The testhole logs are a compilation of conditions and classification of soils and rocks as obtained from field observations and laboratory testing of selected samples. Soil and rock zones have been interpreted. Change from one geological zone to the other, indicated on the logs as a distinct line, can be, in fact, transitional. The extent of transition is interpretive. Any circumstance which requires precise definition of soil or rock zone transition elevations may require further investigation and review.

1.10 STRATIGRAPHIC AND GEOLOGICAL INFORMATION

The stratigraphic and geological information indicated on drawings contained in this report are inferred from logs of test holes and/or soil/rock exposures. Stratigraphy is known only at the locations of the test hole or exposure. Actual geology and stratigraphy between test holes and/or exposures may vary from that shown on these drawings. Natural variations in geological conditions are inherent and are a function of the historical environment. TETRA TECH does not represent the conditions illustrated as exact but recognizes that variations will exist. Where knowledge of more precise locations of geological units is necessary, additional exploration and review may be necessary.

1.11 PROTECTION OF EXPOSED GROUND

Excavation and construction operations expose geological materials to climatic elements (freeze/thaw, wet/dry) and/or mechanical disturbance which can cause severe deterioration. Unless otherwise specifically indicated in this report, the walls and floors of excavations must be protected from the elements, particularly moisture, desiccation, frost action and construction traffic.

1.12 SUPPORT OF ADJACENT GROUND AND STRUCTURES

Unless otherwise specifically advised, support of ground and structures adjacent to the anticipated construction and preservation of adjacent ground and structures from the adverse impact of construction activity is required.

1.13 INFLUENCE OF CONSTRUCTION ACTIVITY

Construction activity can impact structural performance of adjacent buildings and other installations. The influence of all anticipated construction activities should be considered by the contractor, owner, architect and prime engineer in consultation with a geotechnical engineer when the final design and construction techniques, and construction sequence are known.

1.14 OBSERVATIONS DURING CONSTRUCTION

Because of the nature of geological deposits, the judgmental nature of geotechnical engineering, and the potential of adverse circumstances arising from construction activity, observations during site preparation, excavation and construction should be carried out by a geotechnical engineer. These observations may then serve as the basis for confirmation and/or alteration of geotechnical recommendations or design guidelines presented herein.

1.15 DRAINAGE SYSTEMS

Unless otherwise specified, it is a condition of this report that effective temporary and permanent drainage systems are required and that they must be considered in relation to project purpose and function. Where temporary or permanent drainage systems are installed within or around a structure, these systems must protect the structure from loss of ground due to mechanisms such as internal erosion and must be designed so as to assure continued satisfactory performance of the drains. Specific design details regarding the geotechnical aspects of such systems (e.g. bedding material, surrounding soil, soil cover, geotextile type) should be reviewed by the geotechnical engineer to confirm the performance of the system is consistent with the conditions used in the geotechnical design.

1.16 DESIGN PARAMETERS

Bearing capacities for Limit States or Allowable Stress Design, strength/stiffness properties and similar geotechnical design parameters quoted in this report relate to a specific soil or rock type and condition. Construction activity and environmental circumstances can materially change the condition of soil or rock. The elevation at which a soil or rock type occurs is variable. It is a requirement of this report that structural elements be founded in and/or upon geological materials of the type and in the condition used in this report. Sufficient observations should be made by qualified geotechnical personnel during construction to assure that the soil and/or rock conditions considered in this report in fact exist at the site.

1.17 SAMPLES

TETRA TECH will retain all soil and rock samples for 30 days after this report is issued. Further storage or transfer of samples can be made at the Client's expense upon written request, otherwise samples will be discarded.

1.18 APPLICABLE CODES, STANDARDS, GUIDELINES & BEST PRACTICE

This document has been prepared based on the applicable codes, standards, guidelines or best practice as identified in the report. Some mandated codes, standards and guidelines (such as ASTM, AASHTO Bridge Design/Construction Codes, Canadian Highway Bridge Design Code, National/Provincial Building Codes) are routinely updated and corrections made. TETRA TECH cannot predict nor be held liable for any such future changes, amendments, errors or omissions in these documents that may have a bearing on the assessment, design or analyses included in this report.