Klohn Crippen Berger

Teck Highland Valley Copper Partnership

2023 Annual Facility Performance Report

Trojan Tailings Storage Facility

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March 2024

Klohn Crippen Berger

March 27, 2024

Teck Highland Valley Copper Partnership
PO Box 1500
Logan Lake, British Columbia
V0K 1W0

Mr. Carl Diederichs, P.Eng.
Superintendent, Geotechnical

Dear Mr. Diederichs:

2023 Annual Facility Performance Report
Trojan Tailings Storage Facility

We are pleased to submit the final Trojan Tailings Storage Facility 2023 Annual Facility Performance Report. The review period for this document is from October 2022 through September 2023.

Yours truly,

KLOHN CRIPPEN BERGER LTD.

Rick Friedel, P.Eng.
Engineer of Record, Representative
Senior Geotechnical Engineer

RF/CT:cd

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Teck Highland Valley Copper Partnership

2023 Annual Facility Performance Report

Trojan Tailings Storage Facility

EXECUTIVE SUMMARY

Klohn Crippen Berger Ltd. (KCB) was engaged by Teck Highland Valley Copper Partnership (HVC) to complete the 2023 Annual Facility Performance Report (AFPR) for the Trojan Tailings Storage Facility (TSF). The review period of this AFPR is from October 2022 through September 2023.

The Trojan TSF is at the Highland Valley Copper Mine Site (HVC Mine Site) 4 km north of the operating Highland Mill. The Trojan TSF was operated (i.e., tailings were deposited into the facility) from 1982 to 1989 and contains an estimated 26 Mm^3 of tailings. After operations, the facility was reclaimed, is maintained by HVC, and is considered to be in the Closure – Active Care Phase based on the Canadian Dam Association definition[1].

The Trojan TSF Structures

This review covers the following structures that comprise the Trojan TSF:

- Trojan Dam – retains tailings in the TSF and is comprised of a rockfill starter dam that was raised in an upstream manner with cycloned sand.
- R4 Seepage Pond – collects seepage from the toe of the Trojan Dam and surface runoff from the local catchment.
- Lower Trojan Pond – collects local runoff and outflows from the R3 Seepage Pond (Bethlehem No. 1 TSF) and from the R4 Seepage Pond.

The Trojan TSF has been inactive for more than 30 years. The surface of the dam has been reclaimed, and the pond level has been lowered by more than 3 m, relative to the end of operations. No significant dam safety incidents have been reported at the facility during operations or since reclamation. In the current configuration, the piezometric levels and gradients through the tailings and starter dam fill are lower than during operations, which increases the factor of safety against slope failure and against internal erosion.

During the review period, Mr. Rick Friedel, P.Eng., was the Engineer of Record (EoR), as a representative of KCB. In April 2023, the TSF Qualified Person (QP) role transitioned from Mr. Bryan Bale, P.Eng. to Mr. Carl Diederichs, P.Eng. (Superintendent, Geotechnical). These roles are consistent with the definitions in the Health Safety and Reclamation Code for Mines in B.C. (HSRC[2]).

Activity During the Review Period

During the review period, the Trojan TSF was maintained within the design basis and conditions assumed in the design.

[1]CDA. 2019. "Technical Bulletin – Application of Dam Safety Guidelines to Mining Dams." 2014 ed. Updated 2019.
[2] EMLI. 2022. "Health, Safety and Reclamation Code for Mines in British Columbia, Revised." November.

Other than routine maintenance activities, as defined in the Operations, Maintenance and Surveillance (OMS) Manual[3], there were no major repairs or construction activities completed during the review period. HVC completed a cone penetration test (CPT) program near the right[4] abutment of the Trojan Dam to confirm the conditions within the dam and in the foundation were consistent with design assumptions. This program addressed recommendation TD-2022-01 (Table 1). One additional CPT was completed near an existing piezometer (P86-1) to confirm the piezometric reading at that location.

Governance and Surveillance

The OMS Manual, including the Emergency Preparedness and Response Plan (EPRP), is suitable for the facility. A routine update to the OMS Manual was prepared and issued in March 2024. The 2022 version of the OMS Manual was current during the review period and is used as the reference document for this AFPR.

The Trojan TSF surveillance program, described in the OMS Manual, is appropriate for an inactive, reclaimed tailings facility. During the review period, routine surveillance activities were completed as per the OMS Manual.

HVC commissioned a Dam Safety Review (DSR) of the Trojan TSF during 2023, which meets the 5-year DSR frequency required under the HSRC. The DSR report was being finalized during the preparation of this report and is due for submission to the Ministry of Energy, Mines and Low Carbon Innovation (EMLI) prior to the end of March 2024. An action plan to address any recommendations will be prepared by HVC and the EoR, and reported in the next AFPR. The next DSR is scheduled to be initiated in 2028 (5-year frequency).

Trojan TSF Performance

The facility performance during the review period was consistent with historic performance; no issues of dam safety concern or unacceptable performance were identified. As the facility is inactive, changes in the conditions at the facility throughout the year, or on an annual basis, are primarily driven by variations in climate. KCB made the following observations regarding the performance of the Trojan TSF during the review period:

- Existing design and management controls are in place and are performing as intended based on measured performance.
- All piezometers are measuring levels below those assumed in design analyses and are consistent with acceptable performance. An additional piezometer was installed in the cycloned sand below the downstream slope near the right abutment during the 2023 CPT program. This instrument will be incorporated into the routine surveillance program during the next review period.

[3] HVC. 2022. “Bethlehem and Trojan Tailings Storage Facility Operation, Maintenance and Surveillance (OMS) Manual.” June.
[4] Left and right naming convention used to describe dam abutments is relative to looking in a downstream direction.

- Monitoring of the survey monuments and the inclinometer do not show horizontal deformations, which is consistent with expected performance based on design and previous monitoring.
- Visual inspections by the HVC inspection team, the EoR, and others working in the area did not identify unacceptable behaviour at the dam.
- Pond levels and seasonal fluctuation were similar to historic trends, primarily driven by snowmelt.
- The peak measured pond level was 6.5 m below the dam crest, 2 m below the spillway invert, and separated from the dam crest by a tailings beach more than 200 m wide. This is consistent with expected conditions and exceeds the minimum required in design.

Design Basis and Failure Mode Reviews

The Canadian Dam Association (CDA) Dam Safety Guidelines[5] provide a dam classification scheme based on the potential consequences of a hypothetical failure that can be used to provide guidance on the standard of care expected of dam owners and designers. The consequence classification is not related to the likelihood of a failure, but rather to the potential impact resulting from a failure if it did occur.

A “Very High” consequence category, based on the CDA (2013) classification scheme, has been assigned to the Trojan TSF. Both the R4 Seepage Pond and Lower Trojan Dam have been assigned consequence categories of “Low.” There have been no material changes to the facilities, or to the upstream or downstream conditions during the review period that support a modification to the consequence category.

The spillway design flood and the earthquake design ground motion (EDGM) for each of the facilities meet or exceed the equivalent requirements under the HSRC (EMLI 2022).

Potential failure modes and the risk assessment for the Trojan TSF were also reviewed by HVC and KCB during the review period, based on available information and existing controls. The review concluded that potential failure modes are being managed appropriately.

Flood Routing

Flood routing assessments for both the Trojan TSF and the R4 Seepage Pond were updated during the review period, based on the most recent site-wide hydrology. The analysis confirmed that the R4 Seepage Pond can route the 100-year return period flood, which meets the inflow design flood (IDF) requirements under the HSRC; the Trojan TSF can route the Probable Maximum Flood (PMF), which exceeds the IDF requirements under the HSRC.

The Lower Trojan Pond requires additional flood management upgrades to route the IDF requirements under the HSRC (100-year return period). Since the most recent upgrade was completed (~32 years ago), the Lower Trojan Pond has managed flood and freshet events without a

[5] CDA. 2013. “Dam Safety Guidelines 2007 (Revised 2013)”.

reported overtopping concern. This includes a 66 mm rainfall event during May 2011, which is equivalent in magnitude to a 100-year return period (rain only) event. HVC maintains remote monitoring of the Lower Trojan Pond level that sends out an automated notification if pond level thresholds, defined in the OMS Manual, are exceeded. HVC can then implement additional controls (e.g., increasing monitoring, deploying pumps).

HVC has been advancing a design and seeking regulatory approval to decommission the Lower Trojan Pond as a dam, therefore removing the need to upgrade the flood routing capacity. HVC's current schedule is to achieve this during 2024.

Recommendations

No new recommendations were identified during the 2023 AFPR.

Dam safety recommendations identified during past AFPRs, and their status as of the report date, are summarized in Table 1. During the review period, four of the six AFPR recommendations open at the start of the review period were closed (Table 1, shown in *italics*).

The AFPR recommendation related to upgrading flood routing at the Lower Trojan Pond (LTD-2017-01) has been outstanding since 2017 and closing this out is an important milestone. During the review period HVC progressed a design to decommission the dam and started engagement with regulators to obtain approval. Decommissioning would eliminate any risks related to the dam as well as the need to upgrade flood routing capacity. HVC has a plan to complete the decommissioning in 2024.

Table 1 Previous AFPR Recommendations Related to Facility Performance – Status Update

ID No.	Performance Area	Recommended Action	Priority[1]	Deadline (Status)
Trojan Dam				
TD-2022-01	*Site Investigation*	*Complete investigations and install piezometers below the downstream slope, near the right abutment, as a direct measure to confirm key design assumption.*	*3*	*Q1 2024 CLOSED*
TD-2022-02	*Governance*	*Complete a review of available historic records to confirm whether any information is present that would help reduce remaining uncertainty related to decommissioning the culvert below the starter dam.*	*4*	*Q1 2024 CLOSED*
TD-2022-03	Design Review	Complete a review of the technical basis for minimum beach width performance criteria under peak PMF flood level based on existing condition. *NOTE:* EoR endorses HVC's plan to increase the minimum width under peak PMF flood level as an alternative resolution to this recommendation.	3	Q4 2023 (Timeline to complete for revised plan to resolve: Q3 2024)
TD-2022-04	*Maintenance*	*Investigate whether P86-1 and P95-4 (piezometers installed in cycloned sand beach) are plugged.*	*4*	*Q4 2023 CLOSED*
R4 Seepage Pond				
R4-2022-01	*Governance*	*Add the outlet pipe inspection frequency to the OMS Manual with the first one to be completed by end of 2024.*	*4*	*Q4 2023 CLOSED*
Lower Trojan Dam				
LTD-2017-01	Flood Management	Complete appropriate upgrade works to allow the Lower Trojan Pond to safely pass IDF with adequate freeboard, including decommissioning of the spillway pipe.	2	2022 (Open; scheduled for completion in 2024)

Notes:

1. Recommendation priority guidelines, specified by HVC and assigned by KCB:
   - *Priority 1*: A high probability or actual dam safety issue considered immediately dangerous to life, health ,or the environment, or a significant risk of regulatory enforcement.
   - *Priority 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.
   - *Priority 3*: Single occurrences of deficiencies or non-conformances that alone would not be expected to result in dam safety issues.
   - *Priority 4*: Best Management Practice – Further improvements are necessary to meet industry best practices or reduce potential risks.

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CLARIFICATIONS REGARDING THIS REPORT

This report is an instrument of service of Klohn Crippen Berger (KCB). The report has been prepared for the use of Teck highland Valley Copper Partnership (Client) for the specific application to the 2023 Dam Safety Support Project, and may be published or disclosed by the Client to the BC Ministry of Energy, Mines, and Low Carbon Innovation.

KCB has prepared this report in a manner consistent with the level of care, skill and diligence ordinarily provided by members of the same profession for projects of a similar nature at the time and place the services were rendered; however, the use of this report will be at the user's sole risk absolutely and in all respects, and KCB makes no warranty, express or implied. This report may not be relied upon by any person other than the Client or BC Ministry of Energy, Mines, and Low Carbon Innovation without KCB's written consent.

Use of or reliance upon this instrument of service by the Client is subject to the following conditions:

1. The report is to be read in full, with sections or parts of the report relied upon in the context of the whole report.
2. The Executive Summary is a selection of key elements of the report. It does not include details needed for the proper application of the findings and recommendations in the report.
3. The observations, findings and conclusions in this report are based on observed factual data and conditions that existed at the time of the work and should not be relied upon to precisely represent conditions at any other time.
4. The report is based on information provided to KCB by the Client or by other parties on behalf of the Client (Client-supplied information). KCB has not verified the correctness or accuracy of such information and makes no representations regarding its correctness or accuracy. KCB shall not be responsible to the Client for the consequences of any error or omission contained in Client-supplied information.
5. KCB should be consulted regarding the interpretation or application of the findings and recommendations in the report.

1 INTRODUCTION

Klohn Crippen Berger Ltd. (KCB) was engaged by Teck Highland Valley Copper Partnership (HVC) to complete the 2023 Annual Facility Performance Report (AFPR) for the Trojan Tailings Storage Facility (TSF). The AFPR review period is from October 2022 through September 2023.

The Trojan TSF is located on the Highland Valley Copper Mine Site (HVC Mine Site); refer to Figure 1. Tailings from the now inactive Bethlehem Mine were discharged into the Trojan TSF from 1982 to 1989 and the facility has subsequently been reclaimed. Table 1.1 summarizes the Trojan TSF structures and their functions. Refer to Figure 2 for the Trojan TSF layout.

Table 1.1 Trojan TSF Retaining Structures

Structure	Function
Trojan Dam	Cross-valley dam that retains tailings in the Trojan TSF
R4 Seepage Pond	Collects local runoff and seepage from the Trojan Dam
Lower Trojan	Collects local surface runoff and flows from the R4 Seepage Pond and R3 Seepage Pond which is downstream of the Bethlehem TSF, directly east of the Trojan TSF

HVC continues ongoing surveillance of the Trojan TSF, including instrumentation monitoring, environmental sampling, visual inspections, and maintenance activities. Under this level of site presence, the Trojan TSF is considered to be in the Closure – Active Care Phase based on the Canadian Dam Association definitions (CDA 2019).

During the review period, Mr. Rick Friedel, P.Eng., was the Engineer of Record (EoR), as a representative of KCB. In April 2023, the TSF Qualified Person (QP) role transitioned from Mr. Bryan Bale, P.Eng. to Mr. Carl Diederichs, P.Eng. (Superintendent, Geotechnical). These roles are consistent with the definitions in the Health, Safety and Reclamation Code for Mines in British Columbia (HSRC) (EMLI 2022).

The AFPR scope of work consisted of:

- a site visit to observe the physical conditions of the various containment facilities;
- review of surveillance data for the review period, provided by HVC;
- review of climate and water balance data for the site;
- review of the Operations, Maintenance and Surveillance (OMS) Manual and Emergency Preparedness and Response Plan (EPRP) to confirm they are appropriate for the facility; and
- review of construction activities completed at the site during the review period, if any.

The AFPR site visit to the Trojan TSF was completed by KCB and HVC representatives, including the EoR.

The Bethlehem Mine, including the Trojan TSF, was operated under Permit M11 issued by the Ministry of Energy, Mines and Petroleum Resources (EMPR) in January 1970. In July 1998, the mining permits for the Highmont Mine, the Lornex Mine, and the Bethlehem Mine were amalgamated under the M11 Permit (EMPR 2019). The most recent version of the permit was issued in 2021 (EMLI 2021).

The water discharge quantity and quality from the Trojan TSF are regulated under Permit PE-376 (MECCS 2023). Other pertinent permits include water licences C131299 (BC 2014), and C114183 (BC 2002).

2 FACILITY DESCRIPTION

The HVC Mine Site is approximately 14 km west of Logan Lake in the British Columbia Interior. The Trojan TSF is 4 km north of the operating Highland Mill, immediately west of the Bethlehem No. 1 TSF; refer to Figure 1 and Figure 2. The Trojan TSF was operated (i.e., tailings were deposited into the facility) from 1982 to 1989 and contains an estimated 26 Mm^3 of tailings (HVC 2022). Under existing conditions, a pond is present on the upstream (north) side of the impoundment, separated from the dam crest by the vegetated tailings beach.

The R4 Seepage Pond is immediately downstream of the Trojan Dam (Figure 4) and collects seepage from the underdrain and local surface runoff from the two collection ditches that run along the dam toe. The Lower Trojan Pond is approximately 1.1 km downstream of the R4 Seepage Pond (Figure 5) and collects local surface runoff and flows from the R4 Seepage Pond and R3 Seepage Pond (at the toe of Bethlehem Dam No. 1).

Layouts of the structures are shown on Figure 3 to Figure 5. Typical geometry and key dimensions of the dams are summarized in Table 2.1, and summaries of the structures are as follows:

Trojan Dam

- The Trojan Dam (Figure 2.1) comprises a pervious rockfill starter dam, which was completed in 1981 to El. 1414 m, that is underlain by a drainage layer to maintain low piezometric and saturation levels in the upstream cycloned sand beach. A sand-and-gravel filter zone covers the upstream slope of the starter dam to prevent the finer tailings particles from being washed through the dam with seepage (KL 1982). The rockfill and filter zones are separated by a finer rockfill transition zone for filter compatibility.
- Above the starter dam, the crest was raised in an upstream manner with cycloned sand spigotted from the beach. The design specified minimum beach widths under normal operating (150 m) and temporary flood (100 m) conditions, measured from the downstream edge of the crest (KL 1987). Under existing conditions, at a normal range of pond levels, the minimum beach width is more than 200 m along the crest.
- The right[6] abutment of the dam, above the starter dam crest (El. 1414 m), is constructed entirely of cycloned sand. The beach was extended along the west side of the impoundment to keep the pond farther away from this segment of the dam, as specified in design (KL 1987), to avoid saturated tailings layers from extending below the downstream slope.
- The left abutment of the dam is constructed against the adjacent Dam No. 1 of the Bethlehem No. 1 TSF that was operated between 1964 and 1985. A wide tailings beach (>500 m) separates the existing pond within the Trojan TSF from the downstream slope of Dam No. 1.
- The minimum beach widths and pervious rockfill starter dam were, and continue to be, effective controls in maintaining low piezometric levels in the cycloned sand beach near the dam.

[6] Left and right naming convention used to describe dam abutments is relative to looking in a downstream direction.

- A 24 in. culvert pipe, 250 m to 300 m long, was buried below the starter dam to divert flows from Trojan Creek during starter dam construction. The upstream 15 m of the culvert pipe were plugged with concrete prior to tailings deposition in the impoundment, but the rest of the pipe was left open (KL 1984). The upstream end of the pipe is more than 150 m (horizontal) away from the pond and approximately 50 m below the pond level under normal operations.
- After operations, the tailings beach and downstream slope of the dam were graded and a vegetation cover established. In addition, an open-channel spillway (invert El. 1435.5 m) was constructed to route flood flows around the right abutment, discharging downstream of the dam toe.

R4 Seepage Pond

- The R4 Seepage Pond was constructed in 1984, the year after the culvert pipe below the Trojan starter dam was plugged. The retaining dam is composed of compacted glacial till fill on a glacial till foundation, with a cut-off trench and a 300 mm-thick layer of waste rock on the upstream slope for erosion protection (KCB 2005), refer to Figure 2.2.
- The pond level is managed by discharging water through a 300 mm diameter Low-Level Outlet (LLO) with a control valve downstream of the dam and a 100 mm diameter overflow pipe embedded in the dam near the left abutment. Flows from both pipes report to Lower Trojan Pond.
- An open-channel riprap lined spillway is located near the right abutment.

Lower Trojan Pond

- The Lower Trojan Dam was constructed in 1989; no as-built records are available. Figure 2.3 is a typical cross-section (KC 2005).
- Discharge is through a diversion pipeline (a 460 mm diameter culvert pipe is buried through the dam near the left abutment) with a control valve downstream of the dam. Flow is discharged to the same channel that conveys flow from the Trojan Diversion.
- An open-channel spillway is located near the right abutment.
- A spillway pipe (810 mm diameter) is buried through the dam near the right abutment.

Trojan Diversion Ditch

- The Trojan Diversion Ditch is an open channel constructed around the northwestern perimeter of the Trojan TSF (Figure 3) that intercepts runoff from the upslope catchment and diverts the flow around the impoundment except during high flow periods (e.g., freshet) when water is diverted into the Trojan TSF to reduce downstream flooding impacts and to manage elevated water quality concentrations from an upslope catchment not related to HVC mining activity. Water is diverted into the Trojan TSF by a series of valves installed along the channel that are manually operated by HVC's Environment department.

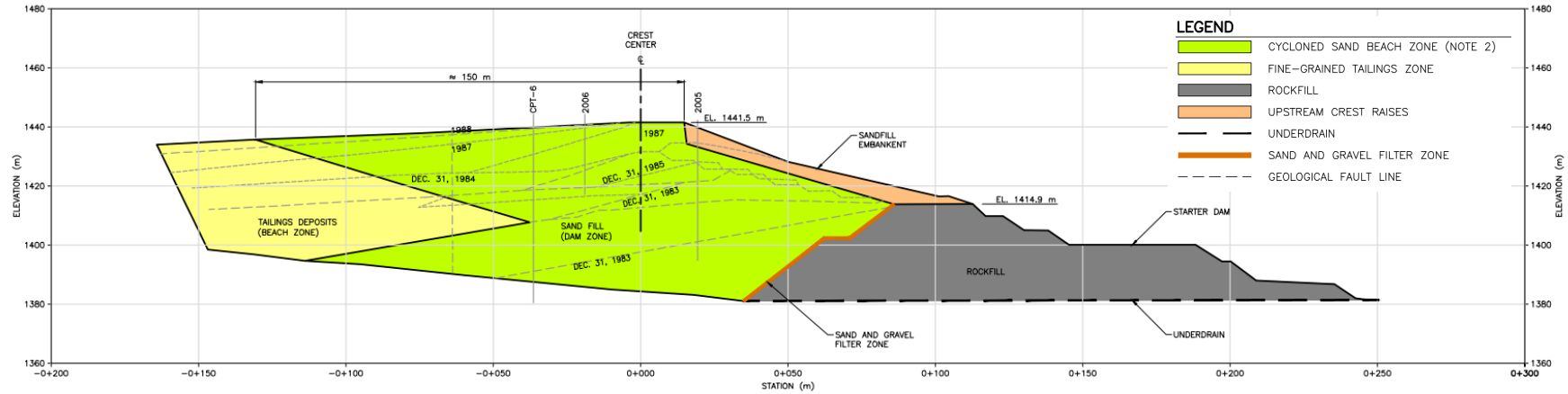
- Northwest of the impoundment, the open-channel portion of the Trojan Diversion Ditch transitions to a pipeline that ultimately discharges into Witches Brook.

Table 2.1 Summary of Approximate Dam Geometry

Dam	Trojan Dam	R4 Seepage Pond Dam	Lower Trojan Dam
Length (m)	1500.0	100.0	100.0
Minimum Crest Elevation (m)	1440.0	1365.0	1296.5
Minimum Crest Width (m)	39.0	5.0	5.0
Maximum Height[(2)] (m)	70.0	3.0	4.0
Upstream Slope	1.5H:1V (rockfill starter dam design)	2.5H:1V	1.75H:1V
Downstream Slope	3.7H:1V (overall)	2H:1V	2H:1V
Construction Method	Rockfill starter dam with upstream cycloned sand crest raises	Single raise dam with cutoff trench	Single raise dam

Notes:
1. Dimensions are estimated from 2014 LiDAR data unless otherwise noted.
2. Height is measured as the vertical distance between the downstream toe and the crest.

Figure 2.1 Typical Cross Section of the Trojan Dam



Note:

1. Upstream extent of the cycloned sand zone is based on the beach placed prior to early 1985 (i.e., when tailings slimes started being discharged upstream of the beach) after that time, a minimum 150 m wide beach was maintained.

Figure 2.2 Typical Cross Section of the R4 Seepage Pond Dam (KC 2005)

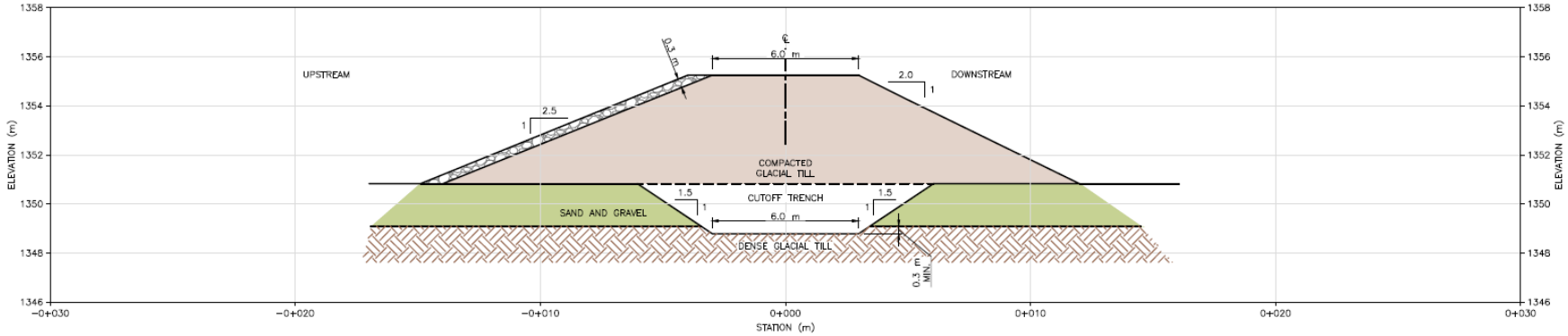
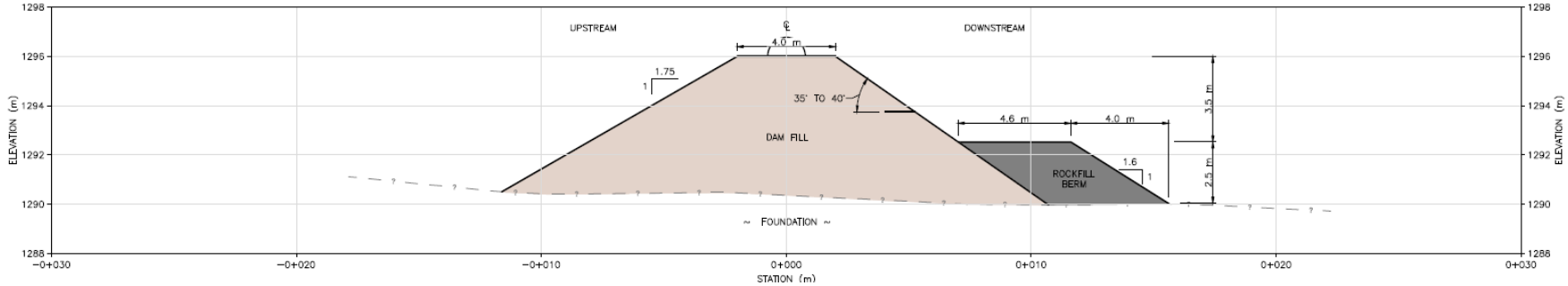


Figure 2.3 Typical Cross Section of the Lower Trojan Dam (KC 2005)



3 ACTIVITIES DURING THE REVIEW PERIOD

During the review period, the Trojan TSF was maintained within the design basis and conditions assumed in the design. There were no significant remedial or construction activities required or completed during the review period.

Routine maintenance activities were carried out as defined in the OMS Manual (HVC 2022), including clearing vegetation from the spillway channels and the Lower Trojan Dam upstream face and clearing debris from outlets at the Lower Trojan Pond and the R4 Seepage Pond; this is discussed further in Section 6. HVC also replaced the debris booms at the Lower Trojan Pond and the R4 Seepage Pond to reduce debris build-up on the outlets and the frequency of clearing.

In November 2023, HVC completed a cone penetration test (CPT) program that included four test locations in the downstream slope of the Trojan Dam near the right abutment. Although this program was completed outside of the AFPR review period, it is referenced here since the work resolves an outstanding recommendation (TD-2022-02, Table 8.1). The purposes of the program was to confirm the conditions assumed in design (KL 1987) (i.e., cycloned sand is not saturated). The review of the program results are in progress but the initial review of the CPT measurements are consistent with conditions assumed in design analysis and risk assessment. Refer to Section 5.3 for further discussion.

4 WATER MANAGEMENT

4.1 Overview

The flow schematic for the Trojan TSF and the nearby Bethlehem No. 1 TSF is shown in Figure 6.

Under normal conditions, evaporation from the pond surface and seepage through the pervious Trojan Dam are sufficient to offset inflows, with no surface discharges, on an annual basis. There has been no pond discharge through the spillway since it was constructed in 1996. The Trojan TSF water balance is passive (i.e., no active management by HVC), except for the Trojan Diversion Ditch as discussed in Section 2. The amount of water diverted into the impoundment is managed by the HVC Environment department during high flow periods. Water from the diversion is diverted into the Trojan TSF to reduce downstream flooding and to intercept water with elevated water quality concentrations (not related to HVC activity), while maintaining the Trojan TSF pond level within the typical range and below the spillway invert.

4.2 Climate

HVC provided climate data to KCB from the Shula Weather Station[7] for the review period (October 2022 to September 2023). The station is in the base of the Witches Brook drainage, approximately 3 km south of the Trojan TSF at El. 1208 m.

Climate reviews for the Trojan TSF in recent AFPRs have been made based on data from the L-L Weather Station located near the Highland TSF. However, the Shula Weather Station was upgraded in March 2022 with new equipment (e.g., sensors, modem, power supplies) and is now used as the reference station for the Trojan TSF climate review. The Historical Average Lornex Synthetic Record data (Golder 2021) was used for comparison to average climate trends at the HVC Mine Site. The climate data for the review period from the Kamloops Pratt Road Weather Station (Environment and Climate Change Canada station 116C8P0), approximately 60 km NE of the Shula Station at El. 729 m, was used for a comparison to regional trends.

Table 4.1 summarizes the monthly precipitation during the review period for the referenced climate stations and data sets. The Historical Average Lornex Synthetic Record data, and the Shula Weather Station data, have been adjusted based on the appropriate Bethlehem-Trojan Area temperature and precipitation adjustment factors provided in the site-wide Surface Water Quantity Existing Conditions report (Golder 2021). The monthly precipitation record for the reporting period is shown in Figure 4.1. Overall observations regarding precipitation trends at the Trojan TSF during the review period are as follows:

- Precipitation followed a monthly precipitation pattern similar to the Lornex historical averages and Kamloops Pratt Road weather station, but annual precipitation was 9% below the historical average.

[7] The data provided was raw data, and HVC have advised that the routine quality assurance/quality control review has not been completed at the time of this assessment.

- Precipitation at the site was 50% or less of the historical average value during October, January, March and April. November, February and June recorded precipitation more than 15% above the historical average. This precipitation trend is consistent with values measured at the Kamloops Pratt Road weather station as well.

Observations related to high-precipitation storm events based on the Shula Weather Station data for the review period are as follows:

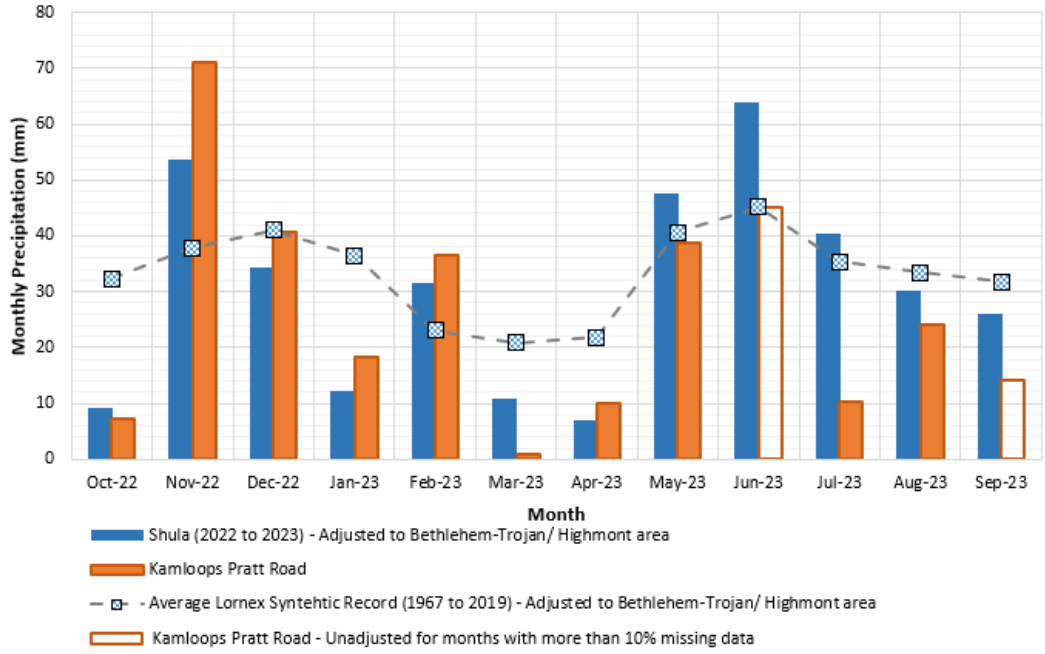
- No rainfall events were recorded during the review period greater than the 10-year return period annual rainfall event: 40 mm in 24 hours (Golder 2021).
- The three largest recorded precipitation events occurred on June 19, 2023 (20.0 mm), July 12, 2023 (23.4 mm), and August 31, 2023 (21.6 mm):
  - A simultaneous flow increase was observed in the flow data from Guichon Creek above Tunkwa Lake Diversion flow station (ID: 08LG056) following the largest precipitation event on July 12th. The flow station is approximately 15 km north-west of the Shula Weather Station.

Table 4.1 Monthly Precipitation for the Review Period (October 2022 to September 2023)

Month	Availability of Data (%)		Precipitation (mm)		
	Shula Weather Station	Kamloops Pratt Road Weather Station	Shula Weather Station Data (Corrected)(1)	Historical Average Lornex Synthetic Record (Corrected)(1)	Kamloops Pratt Road Weather Station
Oct 2022	100	100	9	32	7
Nov 2022	100	100	53	38	71
Dec 2022	100	100	34	41	41
Jan 2023	100	100	12	37	18
Feb 2023	100	93	32	23	37
Mar 2023	100	100	11	21	1
Apr 2023	100	100	7	22	10
May 2023	100	94	47	41	39
Jun 2023	100	80	64	45	45
Jul 2023	100	100	40	35	10
Aug 2023	100	100	30	33	24
Sep 2023	100	63	26	32	14
Review Period Total	–	–	365	400	318

Notes:
1. Monthly precipitation recorded at the Shula Weather Station and Historical Average Lornex Synthetic Record were corrected based on adjustment factors to the Trojan TSF provided in Golder (2021).

Figure 4.1 Monthly Precipitation Summary: October 2022 to September 2023



Seasonal snowpack depth is not measured at the Shula Weather Station. Instead, HVC monitors snowpack with monthly measurements at the Highland Valley Snow Survey Station (Station No: 1C09A). Table 4.2 summarizes historical snowpack averages and the snowpack measurements during the review period in snow-water equivalent (SWE). Snowpack measurements, in SWE, are also plotted on Figure 4.2 along with temperature data from the Shula Weather Station. Based on this information, KCB notes the following:

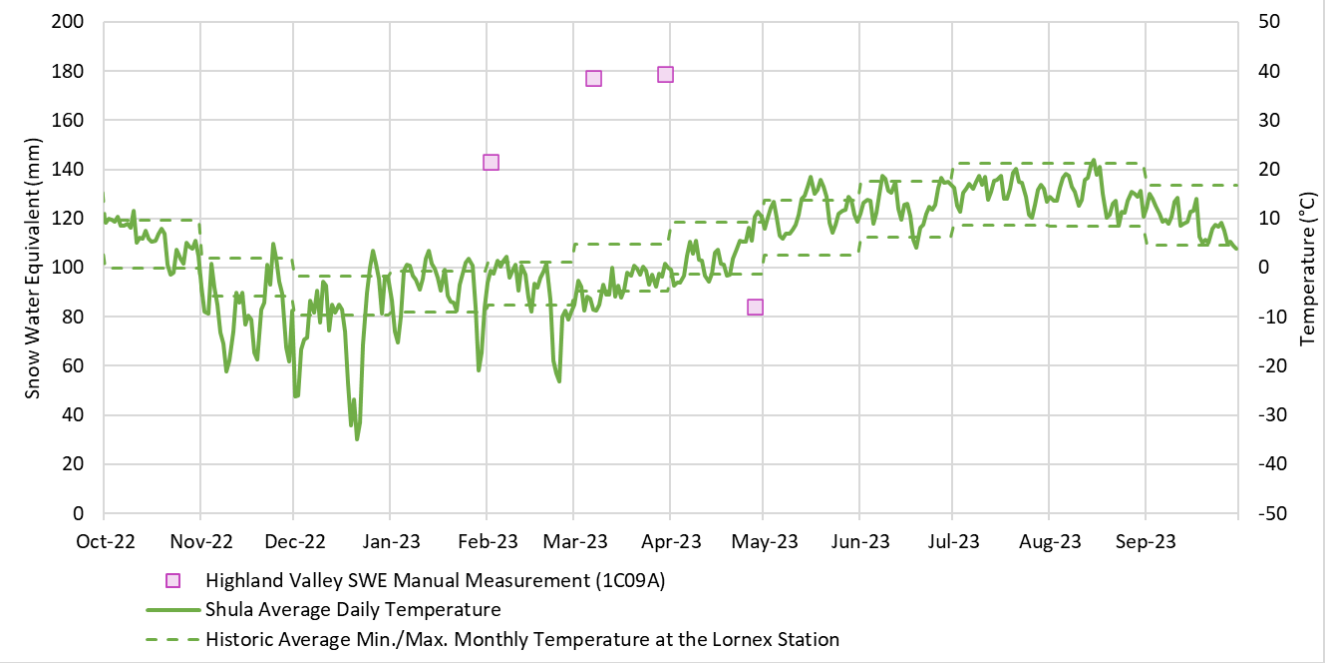
- The daily temperatures recorded at the Shula Weather Station between October 2022 and September 2023 are generally within the historic climate normals from Highland Valley Lornex Weather Station (1981 to 2010); however, there are some colder than average periods (of short-duration) recorded from November to March.
- All snowpack measurements were above historic climate normals, with the maximum measured snowpack over the review period (179 mm) approximately equivalent to a 10-year return period snowpack (169 mm) as reported by Golder (2020).
- Snowmelt began in April and continued into June. This is consistent with the snowmelt trends presented in the Spring Extreme Events and Wind Analysis report (Golder 2020) and coincides with measured temperatures that did not rise consistently above freezing until early April.
- Consistent with previous site observations, temperature, not precipitation, is the primary factor that drove snowmelt during the review period. Snowmelt began in April when precipitation was only 32% of the historic average.

Table 4.2 Historical Snowpack Averages and 2023 Snowpack Depths (mm SWE)

Survey Period	Years of Record[1]	Historic Average Snowpack Depth (mm SWE)	2023 Snowpack Depth[2] (mm SWE)	Percent Change Relative to Historic Average
January 1st	11	50	Not Surveyed	N/A
February 1st	33	83	143	+72%
March 1st	62	94	177	+87%
April 1st	60	102	179	+75%
May 1st	60	29	84	+187%
May 15th	25	2	Not Surveyed	N/A
June 1st	8	0	Not Surveyed	N/A

Notes:
1. Data prior to 1966 were not included as the station was moved to its current location in 1965.
2. Measured at the Highland Valley Snow Survey Station (1C09A) near the Bethlehem No. 1 TSF.

Figure 4.2 Measured Temperature and Snowpack: October 2022 to September 2023

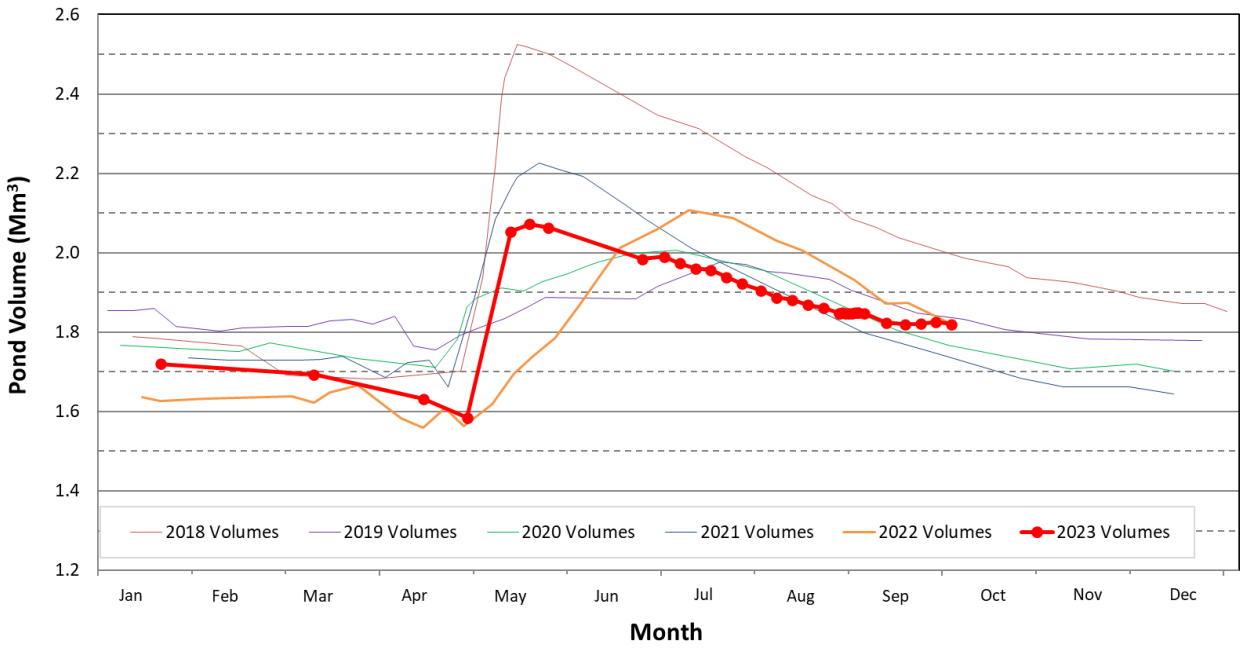


Notes:
1. Measured at the Highland Valley Weather Station (1C09A) near the Bethlehem No. 1 TSF.
2. Daily average temperature data at the Shula Weather Station provided by HVC.
3. The historic Lornex Climate Station minimum and monthly temperature averages from 1981 to 2010 are from ECCC Climate Normals (2023) and are presented as representative of the Shula Weather Station area.

4.3 Water Balance

Figure 4.3 plots the pond volume within the Trojan TSF from 2018 through 2023 estimated based on pond level and bathymetric survey data. Under existing conditions, the pond volume follows a typical seasonal pattern primarily driven by freshet when increased flows from the Trojan Diversion Ditch and local runoff report to the impoundment. On an annual basis, the pond volume fluctuates within a similar range and stays below the spillway invert with no surface discharges. The pond volume during the review period was consistent with established trends and expected response based on climate; i.e., the pond level rose in May when precipitation was above historical monthly average and snowmelt was ongoing. Other than May, there was a decreasing trend in pond level during the review period. Refer to the further discussion of pond levels in Section 5.2.

Figure 4.3 Trojan Pond Volumes – 2018 to 2023



4.4 Flood Management

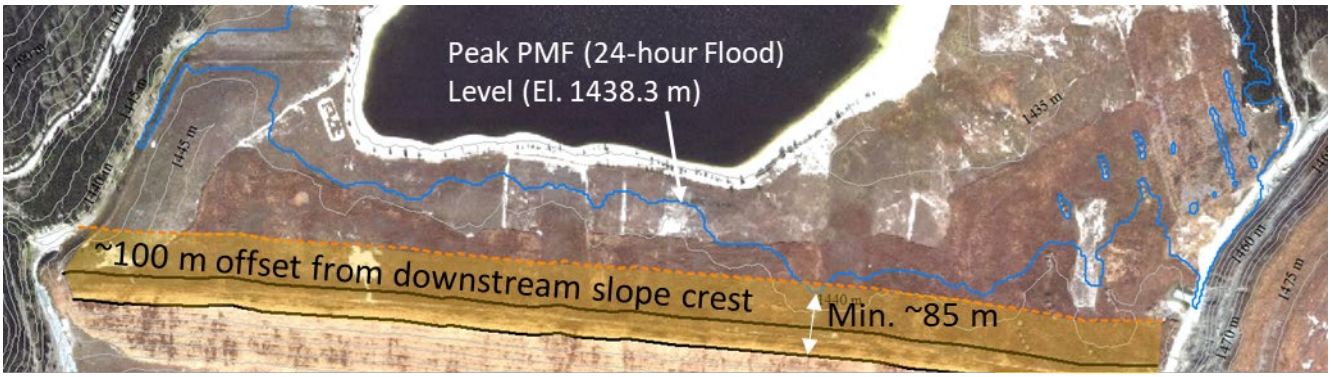
This section summarizes flood management and most recent flood routing completed at the Trojan TSF, R4 Seepage Pond and Lower Trojan Pond. Flood routing information during the spillway design flood and the corresponding Inflow Design Flood (IDF) for each facility are summarized in Table 4.3.

Trojan TSF and R4 Seepage Pond

Flood routing analyses for both the Trojan TSF and the R4 Seepage Pond (KCB 2022) concluded the following:

- The Trojan TSF spillway can route, with adequate freeboard, the PMF (24-hour) flood event, which is greater than the IDF (Table 4.3) required under the HSRC (EMLI 2022).
- The minimum beach width at the Torjan TSF, at the peak flood level during the spillway design event (PMF 24-hour) exceeds the 100 m minimum requirement specified in the design (KL 1987), except for a ~40 m segment where the beach width is between 85 m to 100 m, as shown on Figure 4.4. Refer to Section 7.2.2 for further discussion and HVC's plan to address the outstanding AFPR recommendation (Table 8.1).
- The R4 Seepage Pond can safely route, with adequate freeboard, the IDF (Table 4.3) required under the HSRC (EMLI 2022).

Figure 4.4 Beach Width at Peak PMF 24-Hour Flood Level



Lower Trojan Pond

Based on a flood routing analysis (KCB 2019), the Lower Trojan Pond requires additional flood management upgrades to route the IDF required (100-year return period) under the HSRC (EMLI 2022). HVC have stated they prefer to decommission the facility by breaching the dam. This removes any flood-related hazards, as well as provides other benefits. HVC have developed a plan to complete this in 2024 which is an important milestone to meet since this recommendation has been outstanding since 2017. HVC have stated the following specific actions were completed during the review period:

- Finalized feasibility designs for decommissioning;
- Collected baseline environmental monitoring to support regulatory approval;
- Met with Ministry of Environment in January 2023 to start regulatory approval process;
- Started engagement with Indigenous Governments and Organizations; and
- Completed archeological approval requirements.

Regarding the flood routing capacity and management for the existing conditions of the Lower Trojan Pond, KCB notes the following:

- The facility has managed flood and freshet events without a reported overtopping concern since the most recent upgrade (~32 years). This includes a 66 mm rainfall event during May 2011, which is equivalent in magnitude to a 100-year return period (rain only) event. In addition, the above-average freshet events during 2017 and 2018 were managed without engaging the spillway and maintaining freeboard greater than the minimum required (0.5 m).
- Starting in 2017, when the need to upgrade the flood routing capacity was identified, HVC implemented remote monitoring of the Lower Trojan Pond level with threshold levels defined in the OMS Manual (HVC 2022) that, if exceeded, send out an automated notification to HVC personnel and trigger actions to manage flood scenarios such as increased monitoring and deploying pumps to increase discharge capacity.

Table 4.3 Inflow Design Flood Requirements for the Trojan TSF and Supplementary Structures

Facility	Outfall Type	Inflow Design Flood[1]	Spillway Design Event[2]	Peak Design Flood Level
Trojan TSF	Open channel	2/3 between 1,000-year and PMF	PMF 24-hour	1438.3 m
R4 Seepage Pond	Open channel	100-year	100-year 24-hour	1364.7 m
Lower Trojan Pond	Open channel and pipe	100-year	100-year 24-hour	Note 3

Notes:
1. The IDF events meet the requirements under the HSRC (EMLI 2022) as discussed in KCB (2022).
2. Spillway design events were reviewed based on the most recent flood routing analysis (KCB 2022).
3. The Lower Trojan Pond cannot route the IDF, and HVC have stated there is a plan to decommission the facility in 2024.

5 REVIEW OF MONITORING RECORDS AND DOCUMENTS

5.1 Monitoring Plan

The OMS Manual (HVC 2022) was reviewed by the TSF QP and the EoR during the review period and an updated version was issued in 2024. The 2022 version of the OMS Manual was current during the review period and is used as the reference document for this AFPR. The changes with the 2024 update were typical for a routine OMS Manual update (e.g., updating emergency contact information and minor modifications to the surveillance program agreed upon with the EoR) and include adding the outlet pipe inspection frequency that will close the outstanding AFPR recommendation within the scheduled timeframe (Table 8.1).

The Trojan TSF surveillance program, described in the OMS Manual (HVC 2022), is appropriate for an inactive, reclaimed TSF and includes the following activities: visual inspections; measured behaviour from piezometers, pond level readings, survey monuments, and an inclinometer installed at the facility; and a Trigger-Action-Response Plan (TARP). Surveillance information is reviewed as it is collected during routine weekly meetings by the HVC site team, including the TSF QP.

Surveillance activities and frequencies, specified in the OMS Manual (HVC 2022), are summarized in Table 5.1. Surveillance records provided to KCB by HVC, and reviewed by the EoR, demonstrate that the surveillance requirements in the OMS Manual (HVC 2022) were met during the review period. Two piezometers in the cycloned sand beach were not measured during the 2nd quarter (Q2) of 2023. The absence of these readings does not represent a significant deviation from the surveillance plan or impact the assessment of dam performance.

HVC commissioned a dam safety review (DSR) in 2023 in accordance with the frequency (every five years) specified in the OMS Manual (HVC 2022) and required under the HSRC (EMLI 2022). The DSR is scheduled to be submitted to the Ministry of Energy, Mines and Low Carbon Innovation (EMLI) prior to March 31, 2024.

In addition, the AFPR recommendation relative to confirming the status of two standpipe piezometers installed at the Trojan TSF (Table 8.1) was resolved during the review period. Refer to Section 5.3 for further discussion.

Table 5.1 Surveillance Requirements from the OMS Manual (HVC 2022) and Activities Completed During the Review Period

Surveillance Activity	Facility	Minimum Frequency	Responsibility	Documentation	Frequency Met	Notes for the Review Period
Inspections						
Routine Visual Inspection[1]	Trojan Dam	Monthly	HVC	HVC inspection reports (reviewed by KCB)	Yes	Completed monthly.
	LTP and R4S	Quarterly	HVC		Yes	Completed quarterly.
Event-Driven Inspection	All	Event-Driven[2]	HVC		N/A	No event-driven inspection during the review period.
AFPR	All	Annually	KCB		Yes	This report.
Dam Safety Review (DSR)	All	Every 5 years	HVC	Report	Yes	2023 DSR is underway, site visit completed. Regulatory submission deadline March 31, 2024.
Instrumentation Monitoring						
Piezometers	Trojan Dam	Monthly (when accessible)	HVC	HVC instrument plots and GeoExplorer	No (see Note 3)	Measured monthly, except when not accessible due to snow cover. Two piezometers in the cycloned sand were not measured in Q2 2023.
Inclinometers	Trojan Dam	Twice per year (min. 5 months between readings)	HVC		Yes	Readings were taken in Q4 2022 and Q2 2023.
Seepage Flow	Trojan Dam	Monthly	HVC	Electronic record of weir measurements	Yes	Completed monthly except when not accessible Dec 2022 and April 2023.
	LTP	Monthly	HVC		Yes	
Pond Level	Trojan Dam	Monthly	HVC	GeoExplorer and HVC visual inspection sheets	Yes	Trojan TSF pond levels were converted to automated readings starting in November 2022.
	LTP and R4S	Monthly	HVC		Yes	The pond level measurement is automated.
Surveys						
Survey Monuments	Trojan Dam	Annually	HVC	AFPR report by KCB	Yes	Completed on July 12, 2023.
Pipe Condition Assessment	All Seepage Ponds (with outlet piping)	Every 5 years	HVC	HVC internal report (reviewed by KCB as part of AFPR)	N/A	Planned to be completed by the end of 2024.

Notes:
1. Visual inspections include pond level measurements and observations for evidence of unusual conditions (e.g., settlement, sinkholes, slope sloughing, erosion, seepage, piping, etc.).
2. HVC staff are to complete an event-driven inspection in response to one of the following events: earthquake greater than magnitude 5 within 100 km of the site or any earthquake felt at the HVC Mine Site, or rainfall event greater than the 10-year, 24-hour duration storm: 39.9 mm (Golder 2021).
3. When accessible, typically outside of winter.
4. Lower Trojan Pond = LTP; and R4 Seepage Pond = R4S.

5.2 Pond Levels and Freeboard

Pond levels are measured more frequently than the monthly requirement in the OMS Manual (HVC 2022). The pond level in the Trojan TSF has been measured by a transducer connected to an automated data logger since November 2022. The R4 Seepage Pond and the Lower Trojan Pond levels were also measured in a similar manner during the review period. As a routine check of pond level transducer calibration, HVC completed a manual pond level survey at each facility, and the surveyed levels were similar to the levels recorded by the automated transducers.

Observations related to the Trojan TSF pond level during the review period:

- the peak pond level was 0.1 m lower than the previous year and the pond level was the same at the start and end of the review period; refer to Table 5.2; and
- the pond level rose starting in late April and then levelled off in mid-May. Consistent with typical behaviour this coincides with freshet runoff from snowmelt (Section 4.2).
- the peak pond level in the Trojan TSF was 2 m below the invert of the spillway (i.e., no discharge through the spillway), refer to Figure 5.1.

The minimum freeboard measured during the review period at the Trojan TSF, R4 Seepage Pond and Lower Trojan Pond are summarized in Table 5.3 and meet minimum requirements for normal and flood conditions[8].

Table 5.2 Trojan TSF Change in Pond Level

Annual Change	Change in Pond Level 2022 to 2023	Range of Annual Pond Level Change 2018 to 2023
Peak Pond	–0.1 m	–1.3 m to 0.5 m
Pond at End of Review Period (1)	No Change	–0.5 m to 0.2 m

Notes:
1. Pond levels at the end of September.

[8] CDA (2007) defines two freeboard requirements for dam safety: the vertical distance between the lowest point of the crest of the dam and the maximum operating pond level, referred to as Normal freeboard; and the vertical distance between crest of the lowest point of the dam and the peak reservoir level during the IDF, referred to as Flood freeboard.

Figure 5.1 Trojan Pond Water Elevations – 2018 to 2023

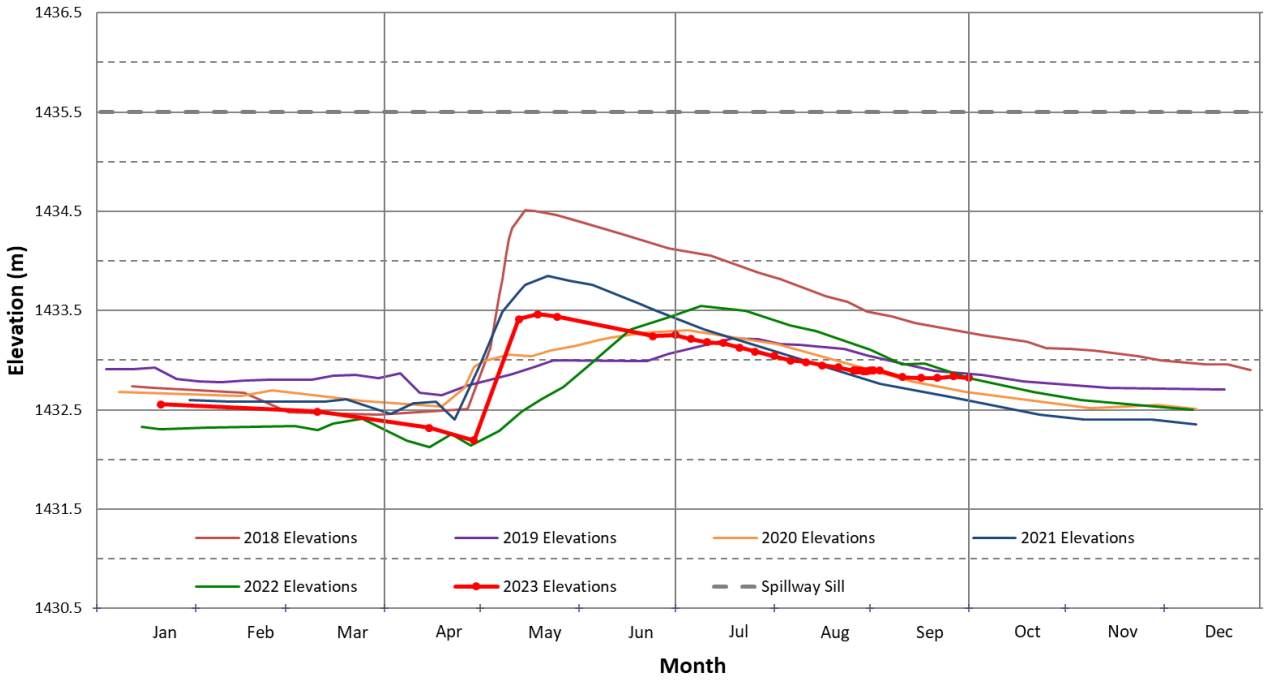


Table 5.3 Minimum Freeboard at the Trojan TSF, R4 Seepage Pond, and Lower Trojan Pond

Facility	Minimum Freeboard (m)[1]		
	Flood Freeboard Required[2]	Normal Freeboard Required[2]	Observed During the Review Period[3]
Trojan TSF	0.20	0.20	6.55
R4 Seepage Pond	0.50 [4]	0.25	0.79
Lower Trojan Pond	0.50 [4]	-	0.73

Notes:
1. Refers to the minimum vertical distance between the dam crest and the pond level; based on KCB (2022).
2. CDA (2007) defines two freeboard requirements for dam safety: the vertical distance between the lowest point of the crest of the dam and the maximum operating pond level, referred to as Normal freeboard; and the vertical distance between crest of the lowest point of the dam and the peak reservoir level during the IDF, referred to as Flood freeboard.
3. Based on the maximum recorded pond elevation during the review period.
4. Freeboard target of 0.5 m has been adopted by HVC, which is greater than the minimum required freeboard to accommodate wave run-up (0.43 m for the R4 Seepage Pond, and 0.4 m for the Lower Trojan Dam).

5.3 Piezometers

At the end of the review period, 11 piezometers listed in the OMS Manual (HVC 2022) were active in the Trojan TSF (Figure 3): five standpipes and six vibrating wire piezometers (VWPs). This does not include the additional piezometer installed during the November 2023 CPT program (Section 3). This instrument will be incorporated into the routine surveillance program during 2024. Three piezometers were removed from routine surveillance during the review period:

- P86-1 and P95-4 (standpipe piezometers in the cycloned sand beach) – both piezometers were confirmed to have obstructions near the base of the standpipes, above the screened interval, and neither could be relied upon as reflective of piezometric levels at the installed depths and locations. This review was recommended in the 2022 AFPR (KCB 2023) as both instruments were measuring piezometric levels and/or showing a response that differed from nearby piezometers and/or conditions measured by CPTs completed in the same area.
- P94-1 (standpipe piezometer in the impoundment area) – the tip elevation of the piezometer was not known and a vibrating wire piezometer (VWP) installed nearby (TRJ-VWP19-06) that has replaced the need for this instrument.

With the addition of the piezometers installed in November 2023, the current suite of instruments is considered sufficient to monitor piezometric levels in the cycloned sand beach, which is a key design control.

Piezometers have measured relatively consistent trends and values, some for more than 10 years, and are well below levels assumed in the design analysis. Therefore, Notification Level thresholds have been defined that, if exceeded, identify to HVC and the EoR of a change in pattern or typical level, but an exceedance does not represent a dam performance concern.

Measured piezometric elevations are plotted on Figures 7 to 9. September 2023 piezometric elevations are plotted on typical sections on Figure 12. A summary of key observations for piezometric readings during the review period are as follows:

- Piezometer VW16-2A exceeded the Notification Level threshold value during the review period. This piezometer has been measuring a continued rise since installation in 2017. The rate of rise has been attenuating. The current piezometric level and threshold value are set below the level assumed in stability analysis. Piezometric rise is not a dam performance concern and the threshold is set so the reading is reviewed periodically as the instrument reading levels off. A revised threshold was defined for the 2024 update to the OMS Manual based on the rate of rise observed over the past 2 years:
  - The prolonged rate of rise measured by this piezometer could be related to an extended equilibration period after installation. The long duration of this response could be an indication that air was trapped at the piezometer tip during installation. This will influence the reading and time required to equilibrate.
- Cycloned Sand (Impoundment and Crest) (Figure 7 and Figure 8): Piezometric readings and trends during the review period were consistent with historic monitoring:
  - As shown on Figure 12, piezometric levels below the crest are well below the starter dam crest. Current levels are more than 10 m below readings during operations. The observations support the assumption that the pervious starter dam is an effective drain for the cycloned sand beach.

- Six CPTs have been completed near the right abutment, in the beach and below the downstream slope. None have measured pore pressure in the cycloned sand, which supports the design assumption that the cycloned sand below the downstream slope, where no starter dam is present, is not saturated:
  - Piezometers TRJ-VWP19-04 and TRJ-VWP19-05 were installed to monitor changes over time; during the review period, conditions remained relatively constant (i.e., no change in piezometric level during the review period).

- Starter dam fill (Figure 8): Piezometers installed in sand-and-gravel fill zones of the starter dam (TB-PS-04/P13-3 and TB-PS-03/P13-4) measure low piezometric levels (Figure 8). This also supports the assumption that the pervious starter dam is an effective drain for the cycloned sand beach.
- Starter Dam Foundation (Figure 9): Piezometers installed in the glacial till foundation below the crest and the downstream slope (Figure 12) measured piezometric heads lower than assumed in stability analysis (KCB 2020) and with little variance throughout the year.

5.4 Survey Monuments

Survey of the monuments at the Trojan TSF are plotted on Figure 10. During the review period, there were no horizontal threshold value exceedances, and the survey locations from the review period were within the cluster of previous readings and showing no horizontal deformation trend. The settlement (vertical) thresholds were exceeded at 4 of 6 monuments but these are interpreted to be related to reliability of the survey method, discussed below, rather than representative of actual movements. The overall magnitude of settlement to date, if accurate, is not impacting freeboard (Section 5.2) or other aspects of performance.

In November 2019, HVC changed to a GPS Real-Time Kinematic (RTK) method to survey the monuments. The horizontal surveys plotted on Figure 10 are for the RTK method only, based on the initial RTK survey location. However, a continuous record of settlement has been maintained on Figure 10.

The RTK surveys have shown an improvement (i.e., less variance between readings) over the previous method with respect to northing/easting, but show higher variance in elevation. This pattern is evident when reviewing readings since 2020 (Figure 10).

The 2022 surveys suggested all monuments, except for TD-2A, measured uplift relative to 2021. The 2023 surveys showed a reverse of this trend with above average settlement readings, including large settlements at TD-1 (~85 mm) and TD-4 (~75 mm). This is interpreted to be related to the measurement method as this behaviour is not consistent with historic performance nor was there any activity in the area that would explain this response. KCB and HVC will consider alternate displacement monitoring methods, specifically related to settlement, as part of a surveillance program review planned for 2024. This review will include a review of INSAR data (20 m centers) that HVC has been completed for the site and to assess whether it would be a preferred alternative to monitor settlement.

5.5 Inclinometers

A single inclinometer (IB16-2) is installed at the Trojan Dam. IB16-2 was read twice during 2023, as per the OMS Manual (HVC 2022). No significant deformations in the downstream direction have been observed since the inclinometer was installed in 2016 (Figure 11).

5.6 Seepage Weir Flows

Seepage flows measured at weirs installed downstream of the Trojan TSF are plotted on Figure 13 and Figure 14. The number and relative locations of the active weirs are listed below:

- two weirs (TB-R4-FS-01 and TB-R4-FS-02, Figure 4), located immediately upstream of the R4 Seepage Pond, measure flow from the collection ditch along the Trojan Dam toe; and
- one weir (TB-LT-FS-01, Figure 5), located downstream of the Lower Trojan Pond, measures a combination of outflow from the Lower Trojan Pond and the Trojan Diversion.

Flows at each weir, converted from weir flow depths recorded by a data logger, are consistent with trends measured over the past five years and are within the recent flow rates. The highest seepage flow at the Lower Trojan weir (TB-LT-FS-01) is within the typical range for freshet and corresponds with the period that the pond level in the Trojan TSF pond level rose (i.e., both linked to increased freshet runoff). Rising flows were measured at TB-R4-FS-01 between February and early April 2023. This is prior to freshet and during the same period when the snowpack was accumulating (Figure 4.2). There was precipitation during this period and the average temperatures were near freezing (Figure 4.2) so this could have been related to localized runoff at the Trojan TSF. Similar elevated flow rates have been measured previously during this period.

5.7 Water Quality

HVC's Water Quality Monitoring and Reporting Plan, approved under the PE-376 effluent permit (MECCS 2023), specifies minimum water-quality sampling requirements at the HVC Mine Site, including downstream of the Trojan TSF. A revision to the PE-376 effluent permit was issued to HVC on July 27, 2023. HVC report there were no changes to the permit that impact operation or compliance at the Trojan TSF.

Water-sampling activities and results during the review period are reported in HVC's annual water-quality monitoring report, prepared by an appropriately qualified professional. The annual water-quality monitoring report was being prepared at the time of writing this AFPR and will be submitted to the Ministry of Environment and Climate Change Strategy and Ministry of Mines prior to March 31, 2024. This report, when available, should be referred to for monitoring data and a discussion of the results. HVC has confirmed that the water-quality monitoring requirements, related to the Trojan TSF, were met during the review period.

There were no surface discharges from the Trojan TSF spillway, and the primary controls related to seepage (i.e., tailings beach, downstream collection ditch and ponds, Trojan Diversion) were in place and performing consistent with design expectations during the review period.

6 VISUAL OBSERVATIONS AND PHOTOGRAPHS

The AFPR site visit checklists, observations, and photographs are included in Appendix I, with key observations summarized as follows:

Trojan TSF (Appendix I-A)

- The facility was observed to be in good physical condition with no significant visual change or issues of concern.
- Seasonal vegetation growth in the Trojan TSF spillway channel upstream of the bedrock chute is primarily grass and small bushes, with no large debris or trees observed. HVC provided photographs to show the vegetation was cleared as part of routine maintenance following the site visit.
- The debris boom was observed to be secured in place at the spillway inlet, with no obstructions present besides minor vegetation.
- The spillway was observed to be in good condition with no signs of deterioration.
- No observations of potential concern (e.g., sinkholes or turbid seepage) were observed in the area of the inlet or outlet of the plugged culvert buried below the starter dam (Section 2).

R4 Seepage Pond (Appendix I-B)

- The facility was observed to be in good physical condition with no significant visual change or issues of concern.
- The LLO valve could not be hand turned. The need to close the valve is not a dam safety control, but KCB suggests that HVC confirm whether there is an operational requirement for the valve and document the condition in the OMS Manual.
- The log boom upstream of the LLO inlet was partially submerged during the site visit. After the site visit, HVC replaced the log boom with the same debris boom that is used at other ponds.
- The spillway was observed to be in good condition with no signs of deterioration. Minor vegetation was present in the spillway inlet, which is not a concern at this time.

Lower Trojan Pond (Appendix I-C)

- The dam was observed to be in good physical condition with no significant visual change or issues of concern. Issues related to flood routing capacity are discussed in Section 4.4.
- No observed signs of recent flow, channel erosion, or deterioration were observed. At the time of the site visit, there was dense seasonal grass and bushes growing over the base of the spillway channel and at the inlet. HVC provided photographs to show the vegetation was cleared after site visit as part of routine maintenance.
- The facility comprises two basins, referred to as the upper and lower basins. The upper basin comprises several smaller connected areas where water ponds.

- The new debris boom was observed to be in good condition. During the site visit, HVC cleared vegetation accumulated on the LLO intake as a routine maintenance task. Subsequent to the site visit, HVC repositioned the debris boom to protect the intake of the LLO, which is also a routine task under the OMS Manual (HVC 2022).

Trojan Diversion Ditch (Appendix I-A)

- The Trojan Diversion Ditch has significant vegetation growth in some areas. The diversion is not relied upon for dam safety (i.e., is assumed to be breached for flood routing). However, the diversion is relied upon to operate the Trojan TSF and to manage water flows and water quality downstream. KCB suggested HVC prepare a consolidated operation and maintenance plan for the Trojan Diversion Ditch that clarifies responsibilities and triggers for maintenance and operational requirements.

7 ASSESSMENT OF DAM SAFETY

7.1 Review of Potential Downstream Consequences

Conditions and land use downstream of all tailings and water-retaining structures were reviewed by HVC and KCB during the review period as part of the failure mode review (Section 7.2), and no significant changes were identified.

The Canadian Dam Association (CDA) Dam Safety Guidelines (CDA 2013) provide a dam classification scheme based on the potential consequences of a hypothetical failure that can be used to provide guidance on the standard of care expected of dam owners and designers. The consequence classification is not related to the likelihood of a failure, but rather to the potential impact resulting from a failure if it did occur.

Teck provided the following statement regarding the consequence classification of the facility:

> *Teck is committed to the safe and environmentally responsible management of tailings facilities throughout the mining life cycle to minimize harm to the environment and protect the health and safety of our people and surrounding Communities of Interest. This commitment includes the implementation of the Global Industry Standard on Tailings Management (GISTM) and industry-leading guidelines established by the International Council on Mining and Metals (ICMM), the Mining Association of Canada (MAC) and CDA.*
>
> *For the purpose of assigning a dam classification, the consequences of potential failure modes are assessed as per the CDA guidelines and the requirements of the jurisdictions in which we operate. The GISTM bases consequence classification on credible failure modes only, which may result in a lower stated classification.*
>
> *As part of Teck's commitment to the safety of tailings facilities, Teck has adopted using extreme loading criteria for any new facilities with a credible catastrophic flow failure mode, regardless of consequence classification. Risk assessments are performed for all tailings facilities, with the objective of reducing risks to As Low As Reasonably Practicable (ALARP). In some cases, this results in further risk reduction beyond applicable regulatory requirements and is consistent with the GISTM and industry-leading best practice.*

A "Very High" consequence category, based on the CDA (2013) classification scheme, has been assigned to the Trojan TSF. Both the R4 Seepage Pond and Lower Trojan Dam have been assigned consequence categories of "Low." There have been no material changes to the facilities, or to the upstream or downstream conditions during the review period that support a modification to the consequence category.

The spillway design flood and the earthquake design ground motion (EDGM) for each of the facilities meet or exceed the equivalent requirements under the HSRC (EMLI 2022).

7.2 Failure Mode Review

7.2.1 General

Potential failure modes and risk assessment for the Trojan TSF were reviewed by HVC and KCB during the review period based on currently available information and existing controls. The review concluded that potential failure modes are being managed appropriately.

Design and operational controls in place to manage potential failure modes are summarized below, along with their status at the end of the review period.

7.2.2 Trojan Dam

Overtopping:

The spillway is designed to manage a flood (PMF) greater than the IDF (Table 4.3) recommended under the HSRC (EMLI 2022) and is an effective control to prevent overtopping. In addition, under existing conditions, the following controls and factors significantly reduce the potential for overtopping:

- Freeboard: The freeboard at the Trojan Dam is greater than 6.5 m under normal and freshet conditions during the review period. Even at the peak flood level during the PMF (24-hour), the minimum freeboard between the pond and the low point of the perimeter crest would be 1.5 m. This exceeds the minimum freeboard of 0.2 m required to accommodate wave run-up and wind (Table 5.3).
- Beach width: Under normal conditions, the minimum beach width is more than 200 m along the crest. At the peak flood level during the PMF (24-hour), the beach width meets or exceeds the minimum design requirement (100 m) along the crest, except for an approximately 40 m segment where the minimum beach width is 85 m. A beach width less than 100 m would be present for less than 12 hours as the flood passes though the spillway, and the freeboard relative to the crest in that area is approximately 2.7 m:
  - KCB believes that the beach condition predicted by flood routing (KCB 2022) does not have a significant impact on the overall risk of the Trojan TSF and does not offset the impact to the reclamation cover if the beach surface were modified. However, in the 2022 AFPR (KCB 2023), KCB recommended the technical basis around the minimum beach width requirements, at the peak PMF flood level, be reviewed with HVC and any modification to the minimum beach requirement be documented. HVC proposed an alternative approach to build up the beach in this area and establish a minimum 100 m width under the peak PMF flood level. The EoR endorses this plan. The work is planned to be completed in 2024.

Slope Stability:

The current condition of the dam meets design factor of safety (FoS) criteria for global slip surfaces that would result in an uncontrolled release of tailings under static (FoS $\geq$ 1.5) and post-earthquake (FoS $\geq$ 1.2) loading (KCB 2020).

The tailings are retained by a drained sandy cycloned sand beach and embankment, which is supported by a compacted pervious rockfill starter dam with underdrains founded on competent glacial till. The design (KL 1987) also included minimum beach widths to prevent cycloned sand near the right abutment, where the starter dam is not present, from becoming saturated and potentially susceptible to liquefaction. CPTs through the beach area and ongoing piezometric monitoring demonstrate that these were successful, and the as-built condition of the facility is consistent with design intent. The inclinometer installed through the downstream slope does not show any horizontal movement through the dam shell or foundation.

Internal Erosion Through the Dam Fill:

The primary controls for managing internal erosion through the dam are a wide tailings beach that reduces the piezometric levels and seepage gradients near the dam, and the filter zones on the upstream slope of the starter dam.

Measured performance (i.e., piezometers) and visual observations during the review period are consistent with historic performance and demonstrate that these controls have been successful at preventing the progress of internal erosion.

Internal Erosion Related to the Buried Culvert Pipe:

The upstream 15 m of the culvert pipe buried below the starter dam (Section 2) were plugged with concrete prior to tailings deposition in the impoundment. No turbid seepage or other indicators of material being washed through the culvert have been observed under existing conditions or during operations, when seepage gradients and piezometric levels were higher than existing.

KCB reviewed historic records to look for additional information regarding the culvert and any other decommissioning work. Additional information was found to confirm details of the 15 m plug installed at the upstream end. Photographs and aerial imagery confirm that the outlet of the culvert was buried when the lower portion of the starter dam downstream slope was regraded for reclamation in 1990. No information was found regarding any decommissioning work that was completed at the outlet (e.g., plugged or covered with filter materials) prior to burial. This review addressed the recommendation from the 2022 AFPR (KCB 2023), refer to Table 8.1.

7.2.3 R4 Seepage Pond

Overtopping:

The design flood for the emergency spillway (100-year return period) meets the IDF requirements under the HSRC (EMLI 2022). The spillway has the capacity to route events larger than the IDF.

Slope Stability:

The current condition of the dam meets the design FoS criteria for global slip surfaces that would result in an uncontrolled release of water under static (FoS $\geq$ 1.5) and post-earthquake (FoS $\geq$ 1.2) loading (KCB 2021).

7.2.4 Lower Trojan Pond

Overtopping:

An outlet pipe and spillway are in place to route flood events. Flood management upgrades are required to route the IDF (100-year return period) (KCB 2019). Refer to Section 4.4 for information on the flood capacity of the existing condition, controls implemented by HVC to manage flood conditions, and the plan to resolve recommendations related to flood management.

7.3 Status of Dam Safety Review Recommendations

A DSR of the Trojan TSF and supplementary structures was completed by SRK Consulting (SRK) in 2018 (SRK 2019). The report concluded the facility is well-managed with a high level of technical stewardship and appropriate operating procedures. The credible failure modes are understood and effectively controlled.

The DSR included 16 recommendations related to dam safety for the Trojan TSF and seepage ponds. The only outstanding recommendation from the 2018 DSR is related to flood routing capacity at the Lower Trojan Pond, which is also covered by the AFPR recommendation LTD-2017-01 (Table 8.1) and is discussed in Section 4.4.

HVC commissioned a DSR in 2023. The DSR report was being finalized during the preparation of this report. An action plan to address any recommendations will be prepared by HVC and the EoR, and reported in the next AFPR.

7.4 Emergency Preparedness and Response Plan (EPRP)

The Trojan TSF EPRP forms a part of the OMS Manual (HVC 2022), which was reviewed during the review period. Similar to the OMS Manual, the EPRP the document went through a routine update and an update was issued in 2024. The Trojan TSF EPRP is appropriate for the existing structure and includes a list of preventative actions that can be taken in response to potential unusual or emergency conditions.

On December 5, 2023, participants from HVC's operation team (including site management), and including the TSF QP, participated in a simulated exercise to test the TSF EPRP. The Trojan TSF EoR participated remotely in this exercise.

8 SUMMARY

Based on the review of measured performance and observations summarized herein, KCB concludes that the Trojan TSF performed as expected, was maintained within design requirements, and operated in accordance with the OMS Manual (HVC 2022) from October 2022 through September 2023.

The status of dam safety recommendations identified during past AFPRs, as of the report date, are summarized in Table 8.1. During the review period, four of the six AFPR recommendations open at the start of the review period were closed. No new recommendations were identified during this review. The status of the two remaining recommendations is as follows:

- TD-2022-03 – The recommendation to complete a technical review of beach widths was not completed as planned. However, HVC has proposed to build up the local area of beach to increase the width to meet the minimum design width under the peak PMF flood level. KCB endorses this alternate approach and HVC's plan to complete this recommendation during 2024.
- LTD-2017-01 – The item was also recommended in the 2018 DSR (SRK 2019) and is related to upgrading flood routing at the Lower Trojan Pond. HVC has been advancing a decommissioning option, as discussed in Section 4.4. HVC have stated that during the review period a design for the decommissioning was prepared and they began regulator and IGO engagement during the review period, in addition they have a plan to obtain regulatory approval and execute the work in 2024. KCB support this as an important milestone to achieve.

Table 8.1 Previous Recommendations Related to Facility Performance – Status Update

ID No.	Performance Area	Recommended Action	Priority[1]	Deadline (Status)
Trojan Dam				
TD-2022-01	*Site Investigation*	*Complete investigations and install piezometers below the downstream slope, near the right abutment, as a direct measure to confirm key design assumption.*	*3*	*Q1 2024 CLOSED*
TD-2022-02	*Governance*	*Complete a review of available historic records to confirm whether any information is present that would help reduce remaining uncertainty related to decommissioning the culvert below the starter dam.*	*4*	*Q1 2024 CLOSED*
TD-2022-03	Design Review	Complete a review of the technical basis for minimum beach width performance criteria under peak PMF flood level based on existing condition. *NOTE:* EoR endorses HVC's plan to increase the minimum width under peak PMF flood level as an alternative resolution to this recommendation.	3	Q4 2023 (Timeline to complete for revised plan to resolve: Q3 2024)
TD-2022-04	*Maintenance*	*Investigate whether P86-1 and P95-4 (piezometers installed in cycloned sand beach) are plugged.*	*4*	*Q4 2023 CLOSED*
R4 Seepage Pond				
R4-2022-01	*Governance*	*Add the outlet pipe inspection frequency to the OMS Manual with the first one to be completed by end of 2024.*	*4*	*Q4 2023 CLOSED*
Lower Trojan Dam				
LTD-2017-01	Flood Management	Complete appropriate upgrade works to allow the Lower Trojan Pond to safely pass IDF with adequate freeboard, including decommissioning of the spillway pipe.	2	2022 (Open; scheduled for completion in 2024)

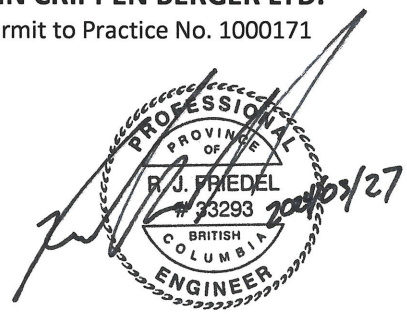
Notes:

1. Recommendation priority guidelines, specified by HVC and assigned by KCB:
   Priority 1: A high probability or actual dam safety issue considered immediately dangerous to life, health, or the environment, or a significant risk of regulatory enforcement.
   Priority 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.
   Priority 3: Single occurrences of deficiencies or non-conformances that alone would not be expected to result in dam safety issues.
   Priority 4: Best Management Practice – Further improvements are necessary to meet industry best practices or reduce potential risks.

9 CLOSING

We thank you for the opportunity to work on this project. Should you have any questions, please contact the undersigned.

KLOHN CRIPPEN BERGER LTD.
B.C Permit to Practice No. 1000171



Rick Friedel, P.Eng.
Engineer of Record, Designated Representative
Senior Geotechnical Engineer

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FIGURES

LEGEND

- WEATHER STATION
- CREEK/RIVER
- HIGHWAY
- INKIKUH DIVERSION

NOTES:

1. PROJECTION: HVC MINE GRID.
2. TSF = TAILINGS STORAGE FACILITY.
3. HIGHWAY AND CREEK DATA FROM THE GOVERNMENT OF CANADA (CANVEC 2012).
4. IMAGERY FROM HVC OBTAINED OCTOBER, 2023, SUPPLEMENTED WITH IMAGERY FROM ESRI, WORLD IMAGERY.

NOT FOR CONSTRUCTION

SCALE 0 5km

CLIENT: Highland Valley Copper / Teck

Klohn Crippen Berger

PROJECT: TROJAN TAILINGS STORAGE FACILITY
2023 ANNUAL FACILITY PERFORMANCE REPORT

TITLE: MINE SITE PLAN

SCALE	PROJECT No.	FIG No.
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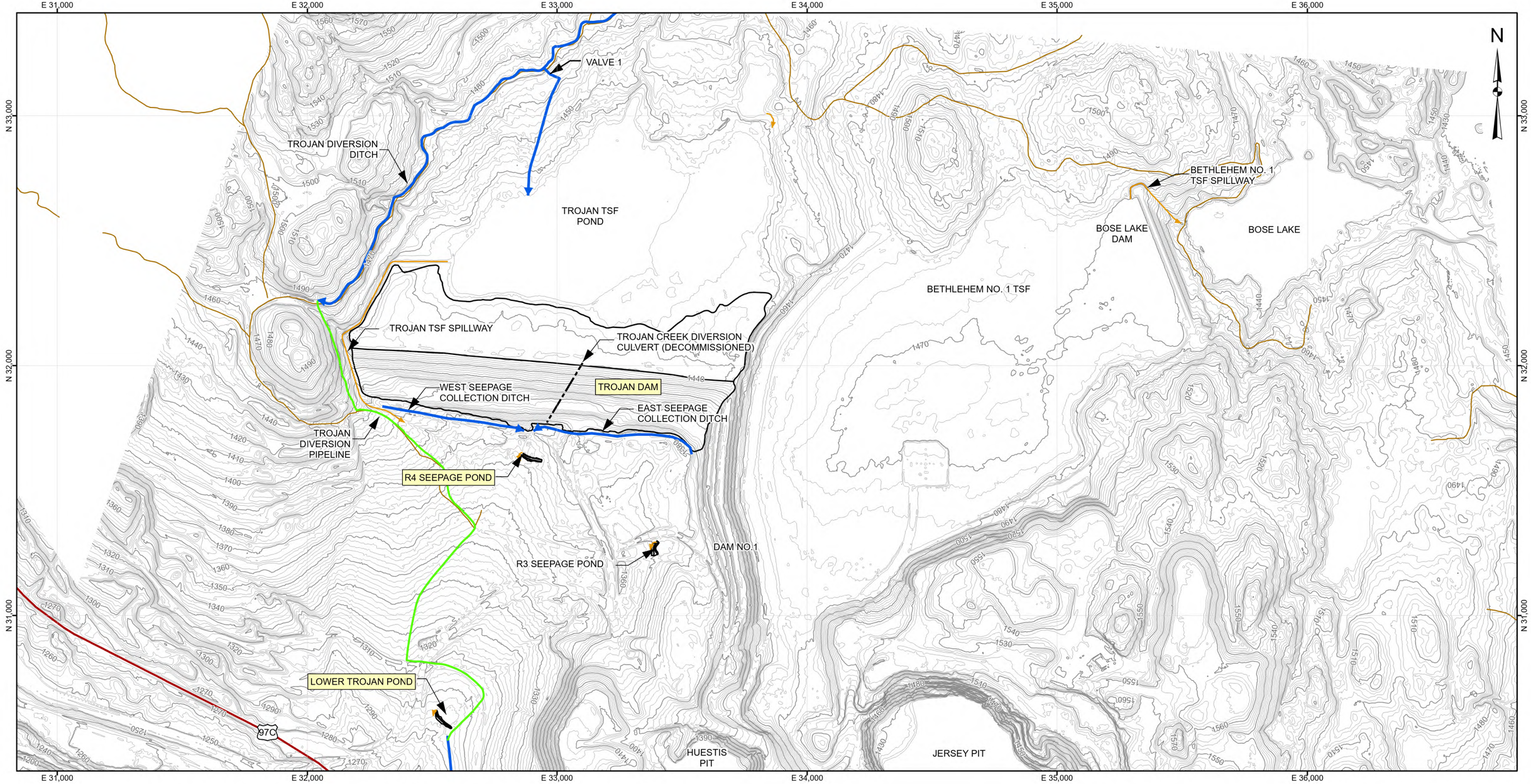

LEGEND

- SPILLWAY
- DITCH
- ABOVE GROUND PIPELINE
- BURIED CULVERT
- DAM
- ROAD
- HIGHWAY

NOTES:

1. PROJECTION: HVC MINE GRID.
2. TSF = TAILINGS STORAGE FACILITY.
3. TOPOGRAPHY FROM HVC OBTAINED OCTOBER 2023.
4. ROADS FROM THE BC GEOGRAPHIC WAREHOUSE, FOREST TENURES BRANCH, ACCESSED NOVEMBER 2023.

NOT FOR CONSTRUCTION

SCALE 0 500 m

CLIENT: Highland Valley Copper / Teck

PROJECT: TROJAN TAILINGS STORAGE FACILITY
2023 ANNUAL FACILITY PERFORMANCE REPORT

TITLE: TROJAN TAILINGS STORAGE FACILITY OVERVIEW

Klohn Crippen Berger

SCALE	PROJECT No.	FIG No.
AS SHOWN	M02341C62	2

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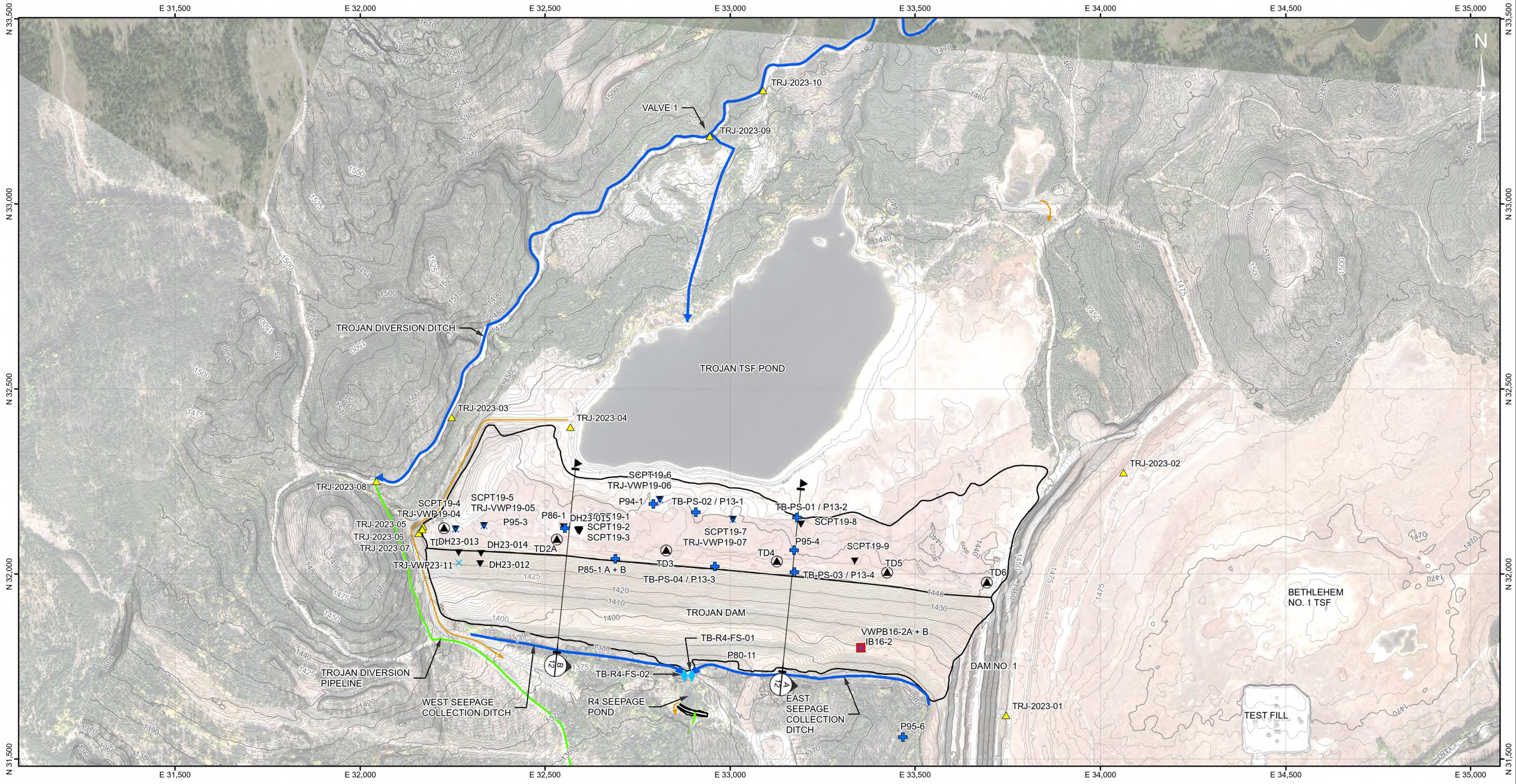

LEGEND

- WAYPOINT (TRJ-2023-xx)

ACTIVE INSTRUMENT

- VIBRATING WIRE PIEZOMETER
- STANDPIPE PIEZOMETER
- MANUAL INCLINOMETER
- CONE PENETRATION TEST (2019)
- WEIR
- SURVEY MONUMENT
- DITCH
- ABOVE GROUND PIPELINE
- SPILLWAY
- DAM

NOTES:

1. PROJECTION: HVC MINE GRID.
2. IMAGERY FROM HVC OBTAINED OCTOBER, 2023, SUPPLEMENTED WITH IMAGERY FROM ESRI, WORLD IMAGERY.
3. TOPOGRAPHY FROM HVC, OBTAINED OCTOBER 2023.

NOT FOR CONSTRUCTION

SCALE 0 500m

CLIENT: Highland Valley Copper / Teck

Klohn Crippen Berger

PROJECT: TROJAN TAILINGS STORAGE FACILITY
2023 ANNUAL FACILITY PERFORMANCE REPORT

TITLE: TROJAN TAILINGS STORAGE FACILITY PLAN

SCALE	PROJECT No.	FIG No.
AS SHOWN	M02341C62	3

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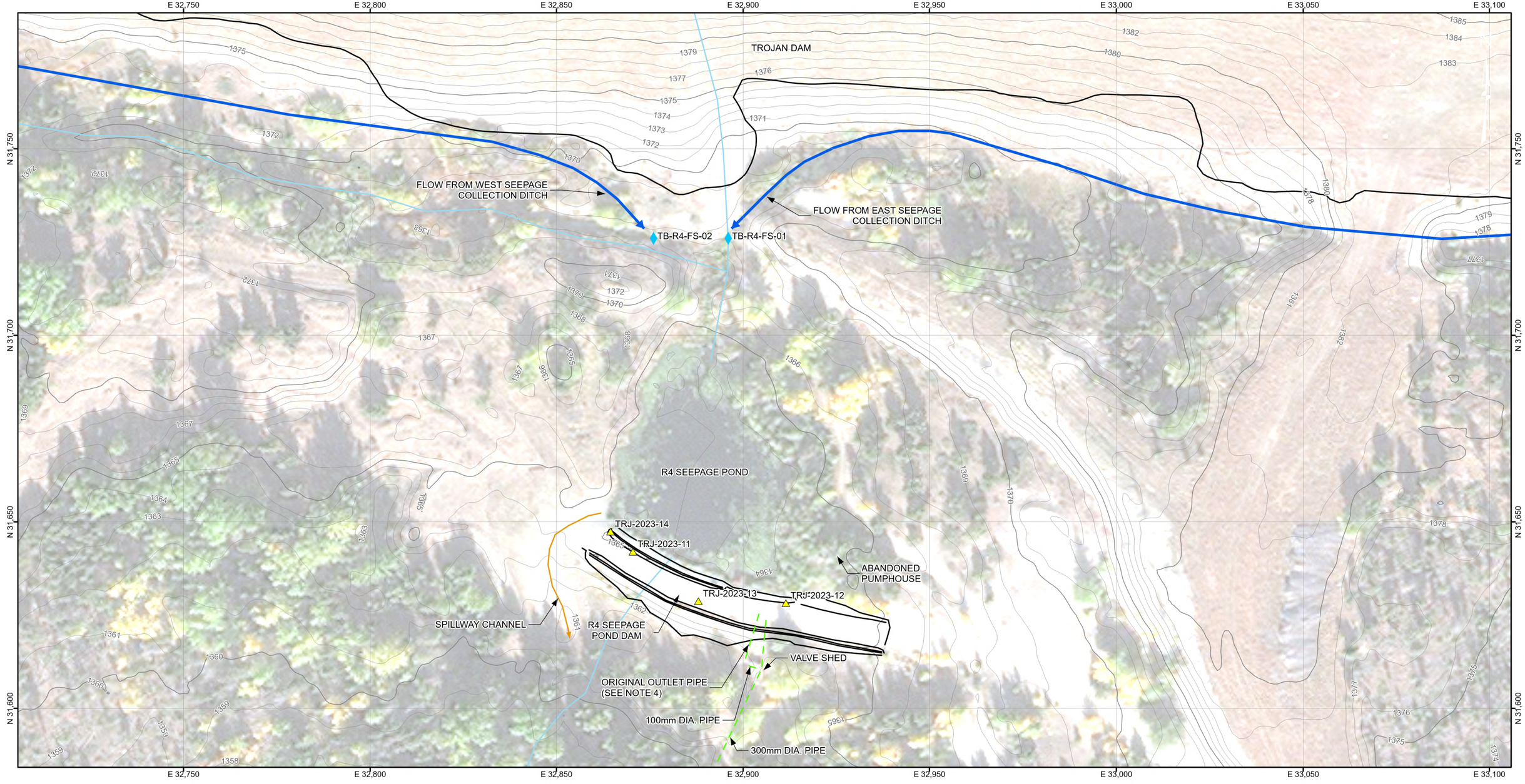

LEGEND

- WAYPOINT (TRJ-2023-xx)
- WEIR
- DITCH
- BURIED PIPE
- SPILLWAY
- DAM

NOTES:

1. PROJECTION: HVC MINE GRID.
2. IMAGERY FROM HVC OBTAINED OCTOBER, 2023.
3. TOPOGRAPHY FROM HVC OBTAINED OCTOBER 2023.
4. THE STATUS OF THE ORIGINAL OUTLET PIPE IS UNKNOWN.
5. LOCATIONS OF BURIED PIPES ARE APPROXIMATE.

NOT FOR CONSTRUCTION

SCALE 0 50m

CLIENT: Highland Valley Copper / Teck

PROJECT: TROJAN TAILINGS STORAGE FACILITY
2023 ANNUAL FACILITY PERFORMANCE REPORT

TITLE: R4 SEEPAGE POND DAM
PLAN

Klohn Crippen Berger

SCALE	PROJECT No.	FIG No.
AS SHOWN	M02341C62	4

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LEGEND

- WAYPOINT (TRJ-2023-xx)
- WEIR
- DITCH
- ABOVE GROUND PIPELINE
- BURIED PIPE
- SPILLWAY
- DAM

NOTES:

1. PROJECTION: HVC MINE GRID.
2. IMAGERY FROM HVC OBTAINED OCTOBER, 2023.
3. TOPOGRAPHY FROM HVC, OBTAINED OCTOBER 2023.
4. LOCATIONS OF BURIED PIPES ARE APPROXIMATE.

NOT FOR CONSTRUCTION

SCALE 0 50m

CLIENT: Highland Valley Copper / Teck

PROJECT: TROJAN TAILINGS STORAGE FACILITY
2023 ANNUAL FACILITY PERFORMANCE REPORT

TITLE: LOWER TROJAN DAM
PLAN

Klohn Crippen Berger

SCALE	PROJECT No.	FIG No.
AS SHOWN	M02341C62	5

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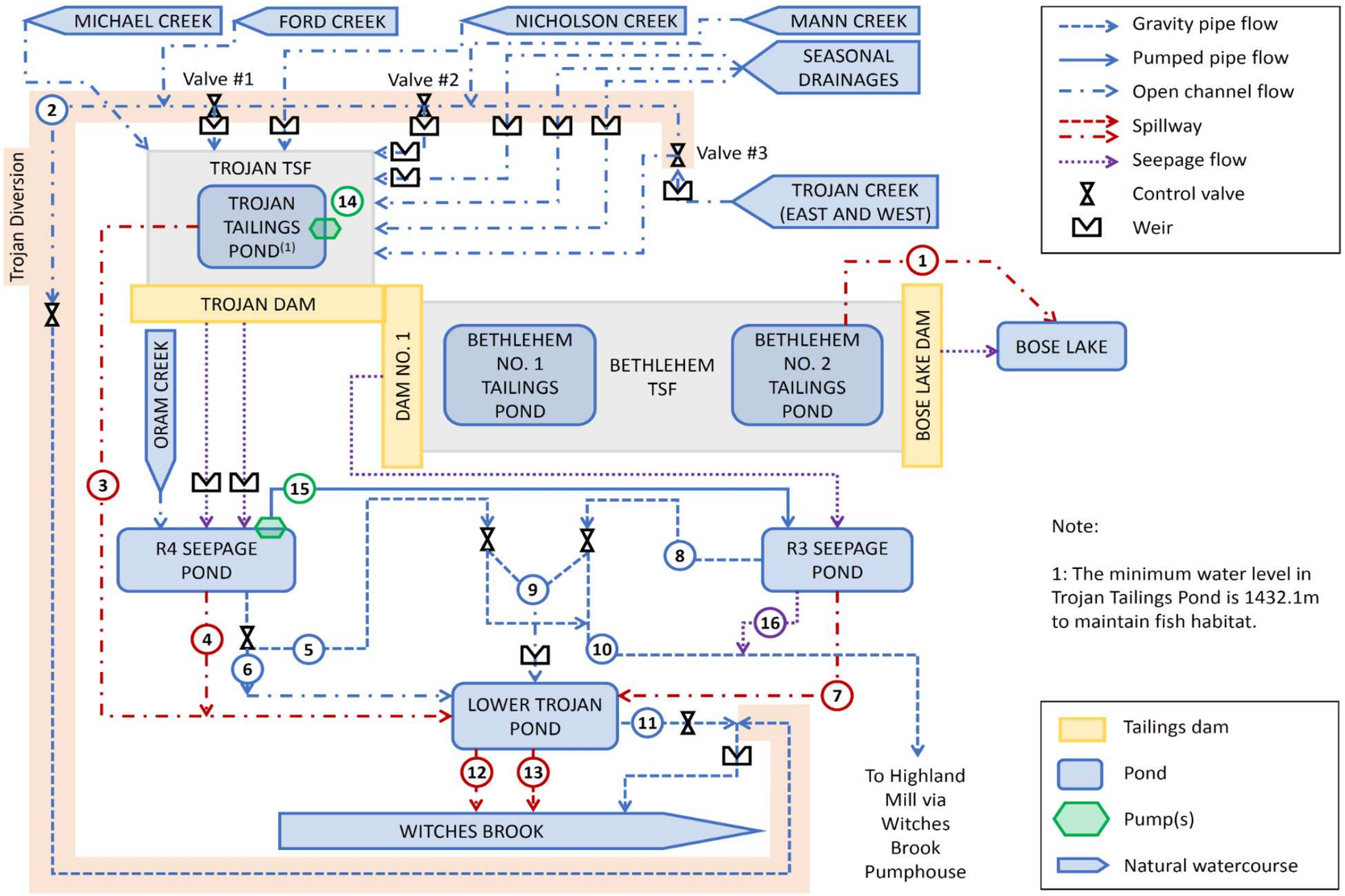

Note:

1: The minimum water level in Trojan Tailings Pond is 1432.1m to maintain fish habitat.

No.	Name
1	Bose Lake Spillway
2	Trojan Diversion
3	Trojan Spillway
4	R4 Spillway
5	R4 Low-Level Outlet
6	R4 Overflow
7	R3 Spillway
8	R3 Low-Level Outlet
9	R3/R4 Seepage to Lower Trojan Pond
10	R3/R4 Seepage to Northern Collection Line
11	LTP Low-Level Outlet
12	LTP Spillway
13	LTP Overflow
14	Trojan Pump
15	R4 Pump to R3 Pond
16	R3 Overland Collector

CLIENT
Highland Valley Copper / Teck

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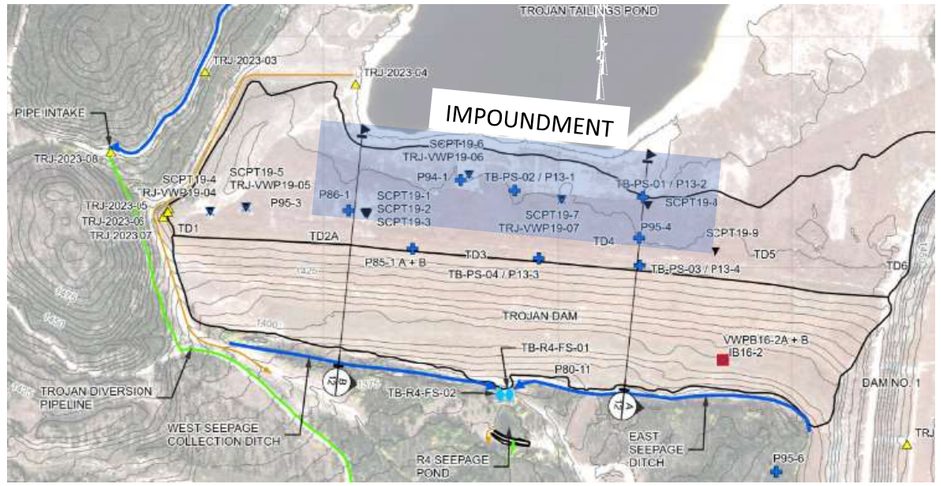
PROJECT
TROJAN TAILINGS STORAGE FACILITY
2023 ANNUAL FACILITY PERFORMANCE REPORT

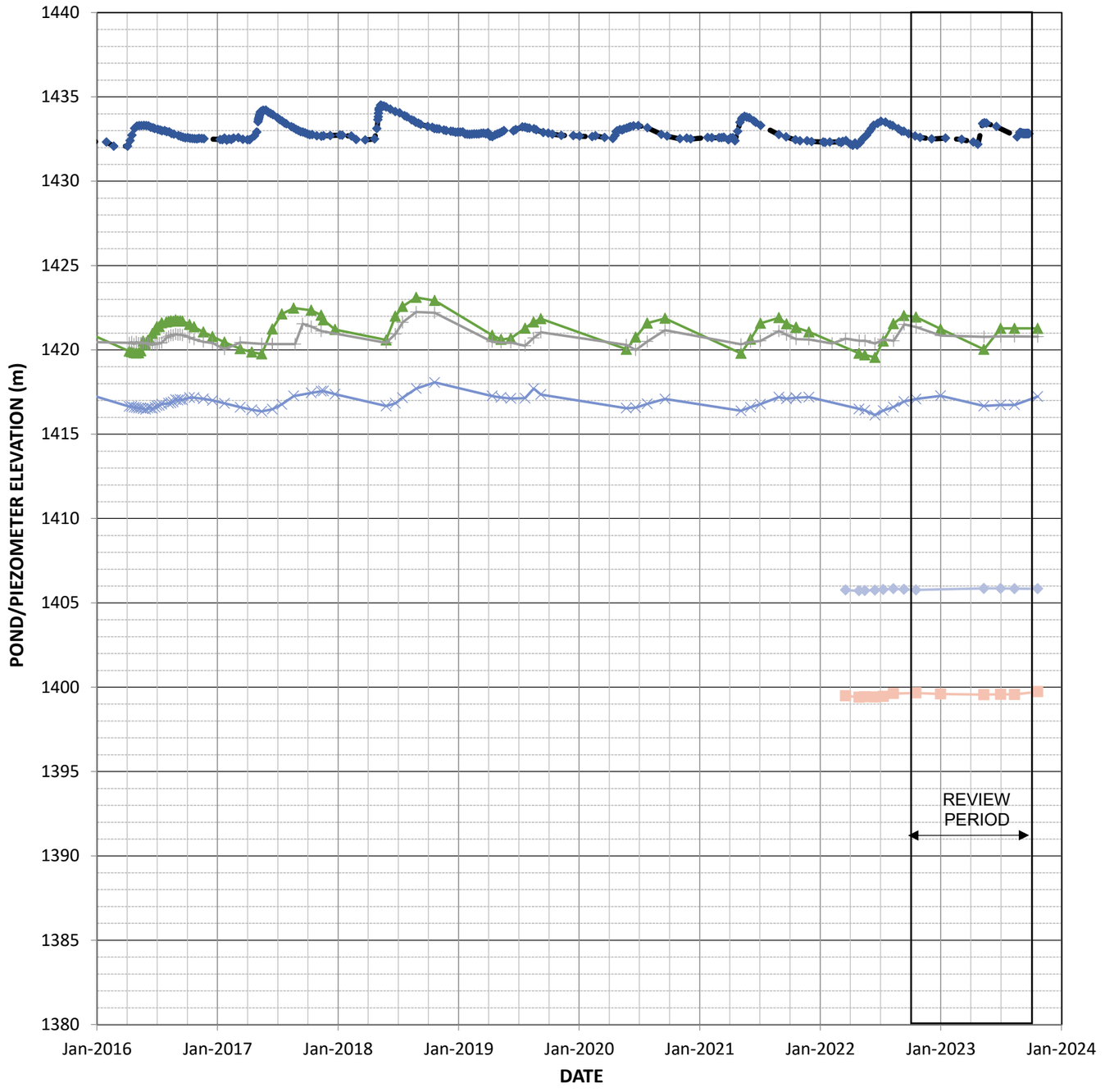
TITLE
HVC PROVIDED
FLOW SCHEMATIC FOR BETHLEHEM NO. 1 AND TROJAN TAILINGS STORAGE FACILITIES

SCALE	PROJECT No.	FIG. No.
NTS	M02341C62	6

FILE PATH: Z:\MV\CR\M02341CG2-HVC-2023 AFPR\700 DELIVERABLES\720 WORKING\2023 AFPR\TROJAN\FIGURES\DO NOT ISSUE - FOR PFD (FIGS)\211129 - FIG 6 PFD.XLSX - 2024-02-27 12:25



PIEZOMETER ID	2023 NOTIFICATION LEVEL THRESHOLDS VALUE (m)
TB-PS-02/P13-1	1423.4
TB-PS-01/P13-2	1418.6
P94-1	1423.6
TRJ-VWP19-06	NOTE 1
TRJ-VWP19-07	NOTE 1



NOTES:

1. THRESHOLDS ESTABLISHED FOR TRJ-VWP19-06 AND TRJ-VWP19-07 IN 2024 UPDATE OF OMS MANUAL BUT NONE WERE ACTIVE DURING REVIEW PERIOD WHILE COLLECTING BASELINE READINGS.
2. SECTIONS A AND B ARE SHOWN ON FIGURE 12.

LEGEND:

- TB-PS-02/P13-1 (TIP EL. 1409.5 m, CYCLONED SAND)
- TB-PS-01/P13-2 (TIP EL. 1413.0 m, CYCLONED SAND)
- P94-1 (TIP EL. UNKNOWN m, CYCLONE SAND)
- TRJ-VWP19-06 (TIP EL. 1405.7 m, CYCLONED SAND)
- TRJ-VWP19-07 (TIP EL. 1394.6 m, CYCLONED SAND)
- TROJAN POND LEVEL

CLIENT: Highland Valley Copper / Teck

Klohn Crippen Berger

PROJECT: TROJAN TAILINGS STORAGE FACILITY
2023 ANNUAL FACILITY PERFORMANCE REPORT

TITLE: TROJAN DAM PIEZOMETRIC DATA
YEARS 2016 TO 2023
IMPOUNDMENT

PROJECT No. M02341C62

FIG. No. 7

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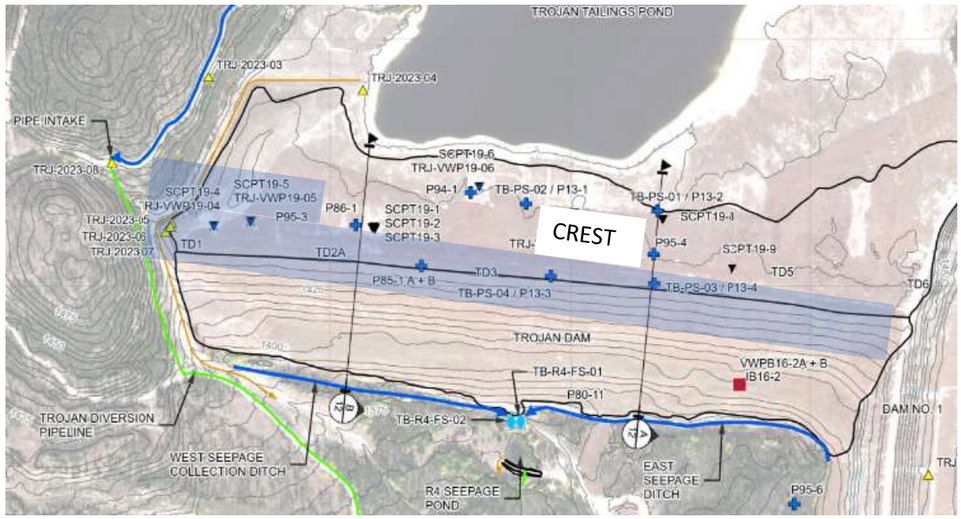
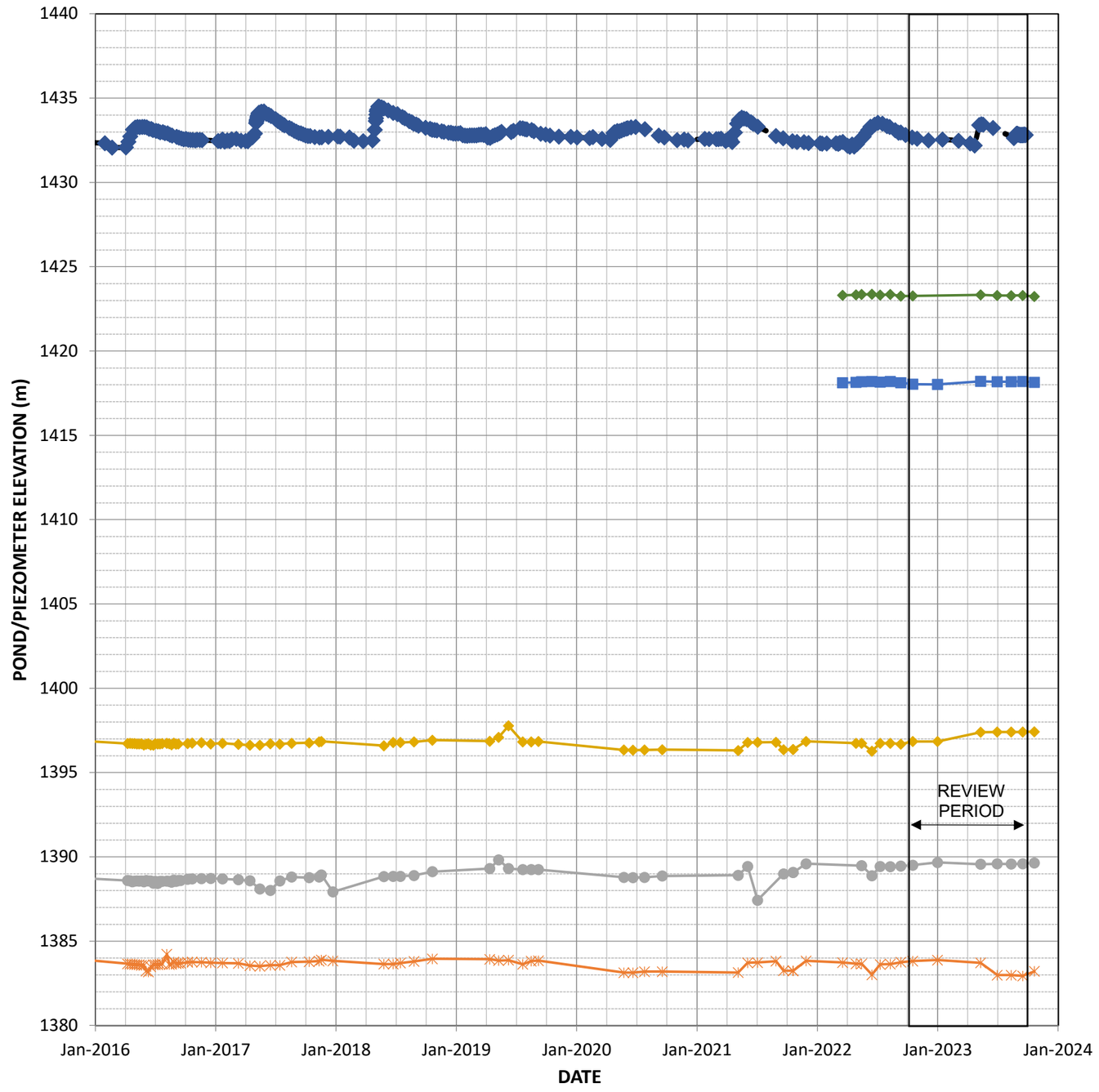


PIEZOMETER ID	2023 NOTIFICATION LEVEL THRESHOLDS VALUE (m)
P85-1A	1399.2
TB-PS-04/P13-3	1385.4
TB-PS-03/P13-4	1390.5
TRJ-VWP19-04	NOTE 1
TRJ-VWP19-05	NOTE 1



NOTES:

1. THRESHOLDS ESTABLISHED FOR TRJ-VWP19-04 AND TRJ-VWP19-05 IN 2024 UPDATE OF OMS MANUAL BUT NONE WERE ACTIVE DURING REVIEW PERIOD WHILE COLLECTING BASEOLINE READINGS.

LEGEND:

- P85-1A (TIP EL. 1388.1 m, FOUNDATION)
- TB-PS-04/P13-3 (TIP EL. 1376.2 m, SAND AND GRAVEL)
- TB-PS-03/P13-4 (TIP EL. 1376.6 m, GLACIAL TILL)
- TRJ-VWP19-04 (TIP EL. 1422.2 m, CYCLONED SAND)
- TRJ-VWP19-05 (TIP EL. 1418.0 m, CYCLONED SAND)
- TROJAN POND LEVEL

CLIENT: Highland Valley Copper / Teck

Klohn Crippen Berger

PROJECT: TROJAN TAILINGS STORAGE FACILITY
2023 ANNUAL FACILITY PERFORMANCE REPORT

TITLE: TROJAN DAM PIEZOMETRIC DATA
YEARS 2016 TO 2023
CREST

PROJECT No. M02341C62

FIG. No. 8

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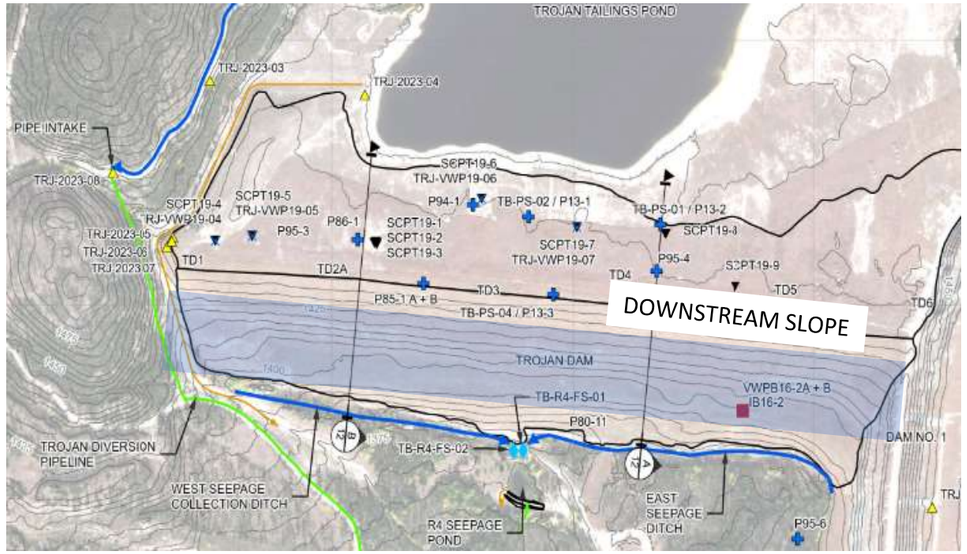

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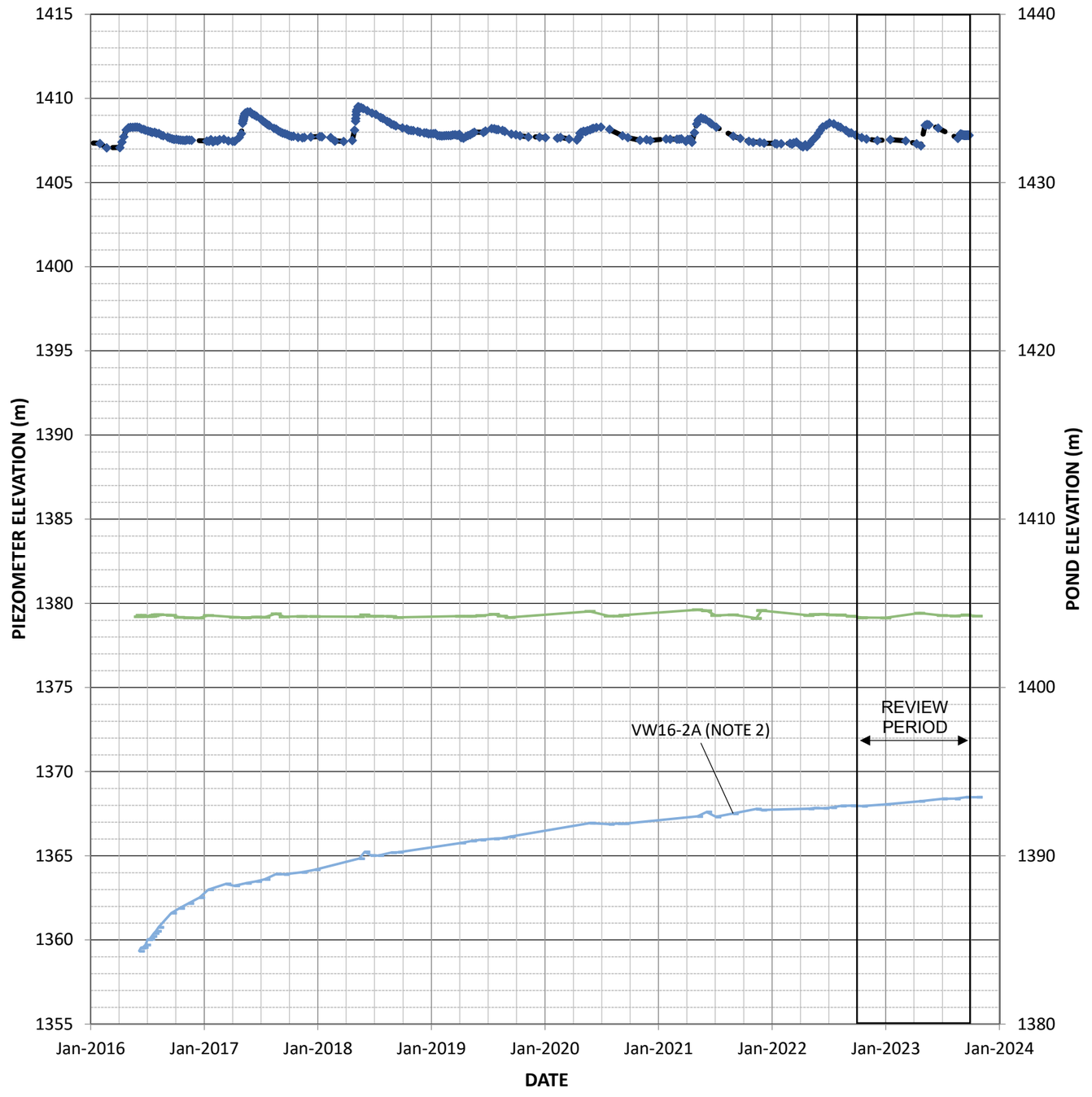
VW16-2B	1380.1



NOTES:

1. VW16-2A and 2B STOPPED RECORDING BAROMETRIC PRESSURE AND TEMPERATURE. THE LAST BAROMETRIC PRESSURE AND TEMPERATURE RECORDED WERE USED TO OBTAIN THE WATER ELEVATION.
2. VWP 16-2A WATER LEVEL IS STILL EQUILIBRATING AFTER INSTALLATION

LEGEND:

- VW16-2A (TIP EL. 1321.9 m, GLACIAL SEDIMENTS / DEBRIS) (NOTE 1)
- VW16-2B (TIP EL. 1373.4 m, GLACIAL TILL) (NOTE 1)
- TROJAN POND LEVEL

CLIENT: Highland Valley Copper / Teck

Klohn Crippen Berger

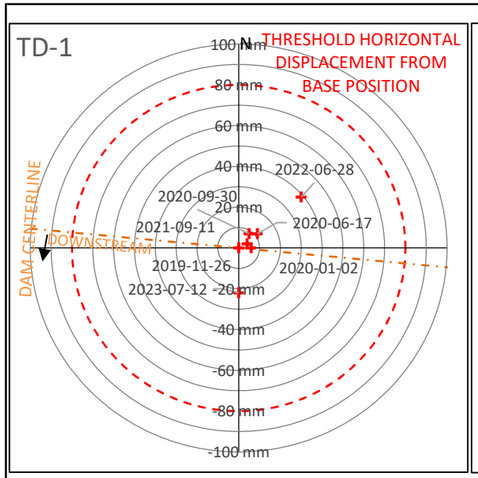
PROJECT: TROJAN TAILINGS STORAGE FACILITY
2023 ANNUAL FACILITY PERFORMANCE REPORT

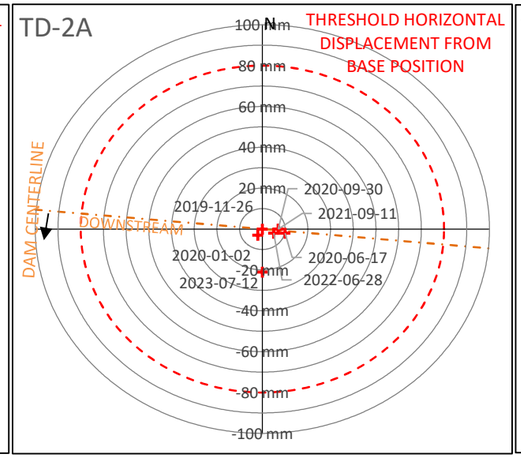
TITLE: TROJAN DAM PIEZOMETRIC DATA
YEARS 2016 TO 2023
DOWNSTREAM SLOPE

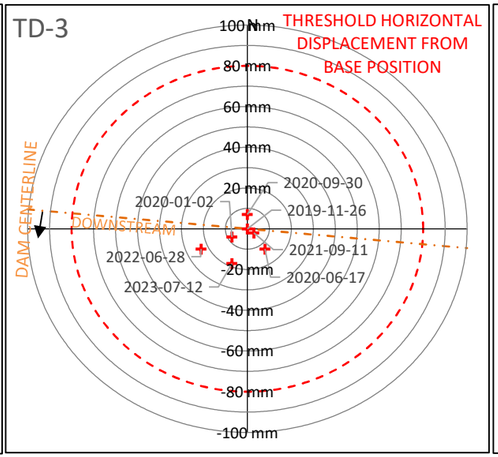
PROJECT No. M02341C62

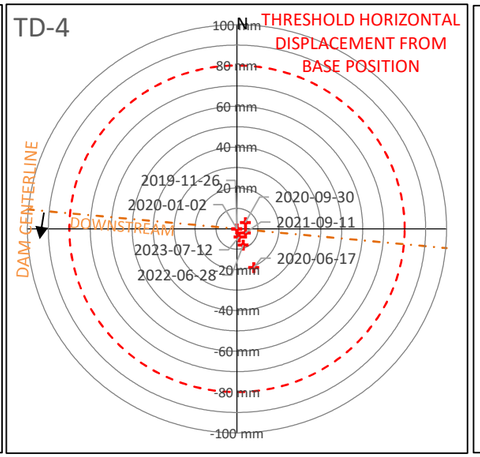
FIG. No. 9

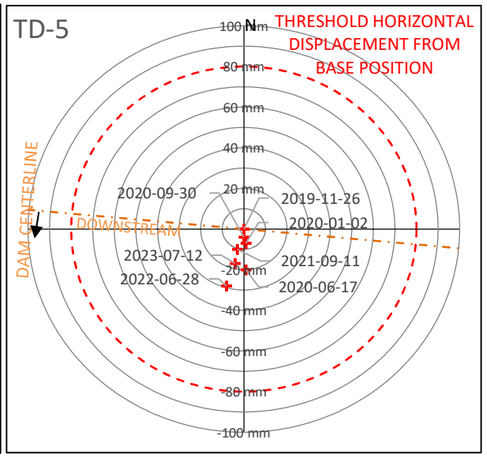
FILE PATH: Z:\MV\CRM\M02341C62-MVC-2023 AFPR\300 DESIGN\320 - PIEZOMETER DATA\TROJAN\231127 TROJAN PIEZO.XLSX - 2024-02-27 14:05



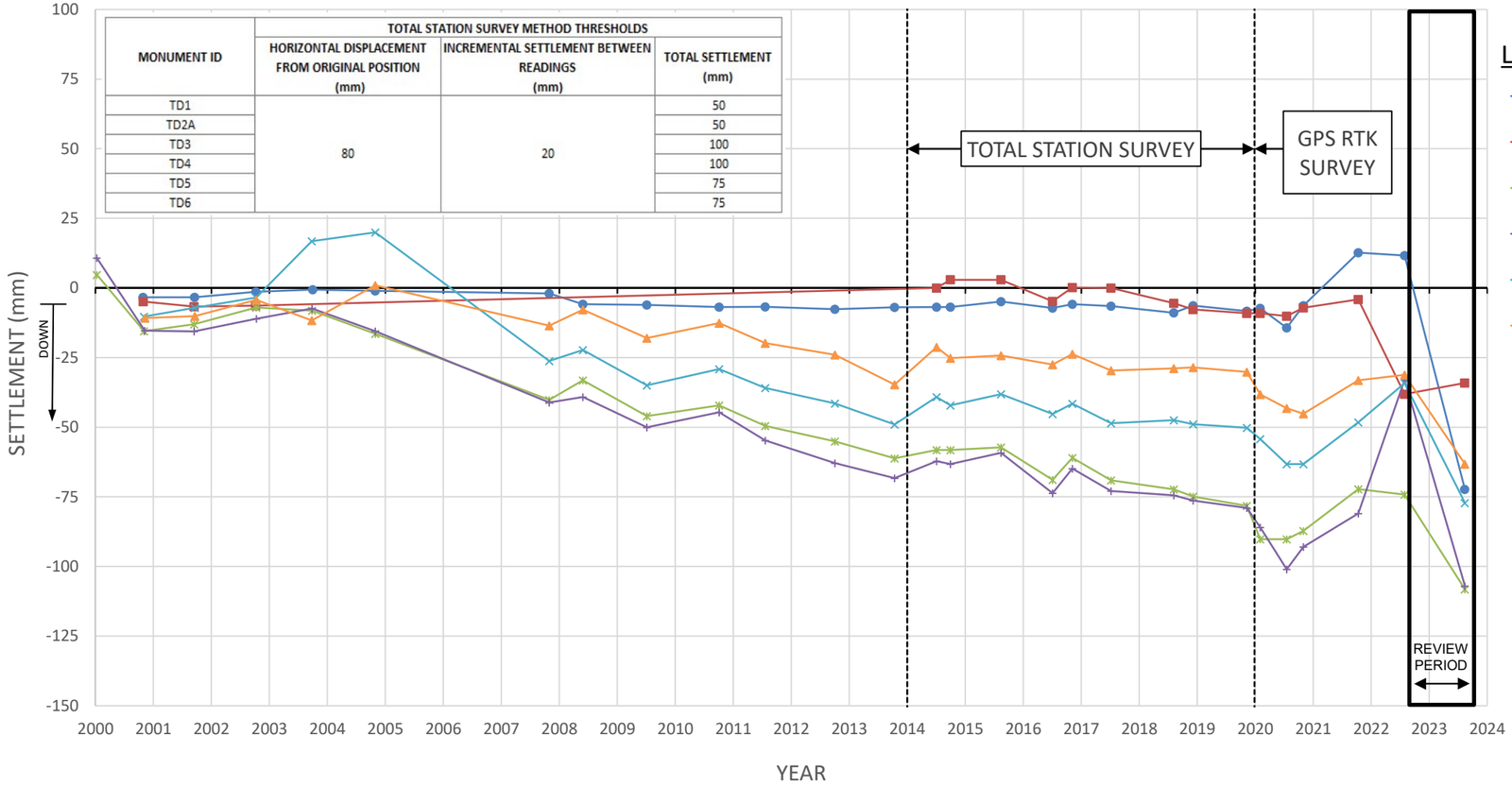






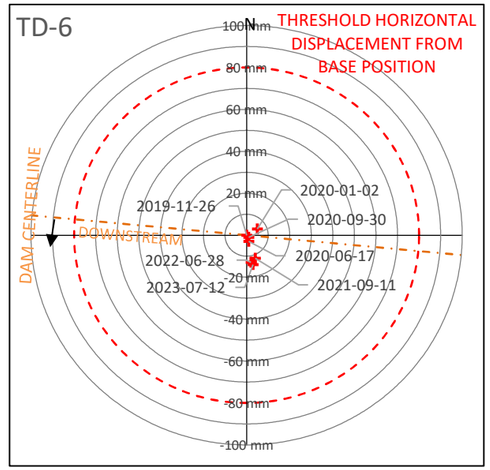


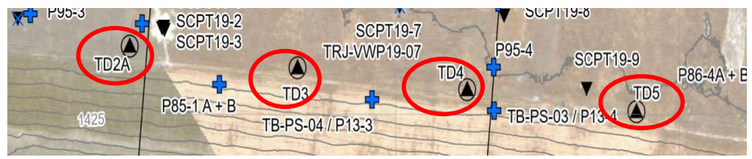
MONUMENT ID	TOTAL STATION SURVEY METHOD THRESHOLDS		
	HORIZONTAL DISPLACEMENT FROM ORIGINAL POSITION (mm)	INCREMENTAL SETTLEMENT BETWEEN READINGS (mm)	TOTAL SETTLEMENT (mm)
TD1	80	20	50
TD2A			50
TD3			100
TD4			100
TD5			75
TD6			75



LEGEND:

- TD-1
- TD-2/TD2A
- TD-3
- TD-4
- TD-5
- TD-6





GENERAL NOTES:

1. SURVEY METHOD CHANGED FROM TOTAL STATION TO GPS RTK ON NOVEMBER 26, 2019.
2. HORIZONTAL DISPLACEMENT PRIOR TO NOVEMBER 2019 NOT SHOWN. HORIZONTAL DISPLACEMENT BASELINES SET TO NOVEMBER 26, 2019 GPS RTK SURVEY READINGS.
3. REFER TO FIGURE 3 FOR MONUMENT LOCATIONS IN PLAN VIEW.
4. TD-1 RELOCATED AFTER OCTOBER 2001.
5. TD-1 2009 READING (NOT SHOWN IN PLAN PLOT) LOCATED 297 mm FROM INITIAL 1998 READING . READING WAS REVIEWED AND FOUND MORE LIKELY RELATED TO SURVEY ERROR THAN DISPLACEMENT.
6. 2021 SETTLEMENT PLOTTED BY ADDING INCREMENTAL DISPLACEMENT BETWEEN GPS RTK SURVEY READINGS TO CUMULATIVE TOTAL DISPLACEMNENT ON OCTOBER 9, 2019. THIS ASSUMES NO SETTLEMENT OCCURED BETWEEN OCTOBER 9 AND NOVEMBER 12, 2019.

CLIENT
Highland Valley Copper / Teck

Klohn Crippen Berger

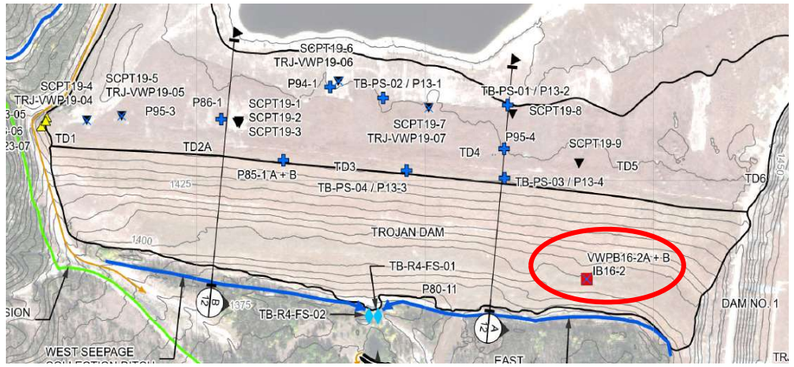
PROJECT
TROJAN TAILINGS STORAGE FACILITY
2023 ANNUAL FACILITY PERFORMANCE REPORT

TITLE
TROJAN DAM
SURVEY MONUMENT READINGS

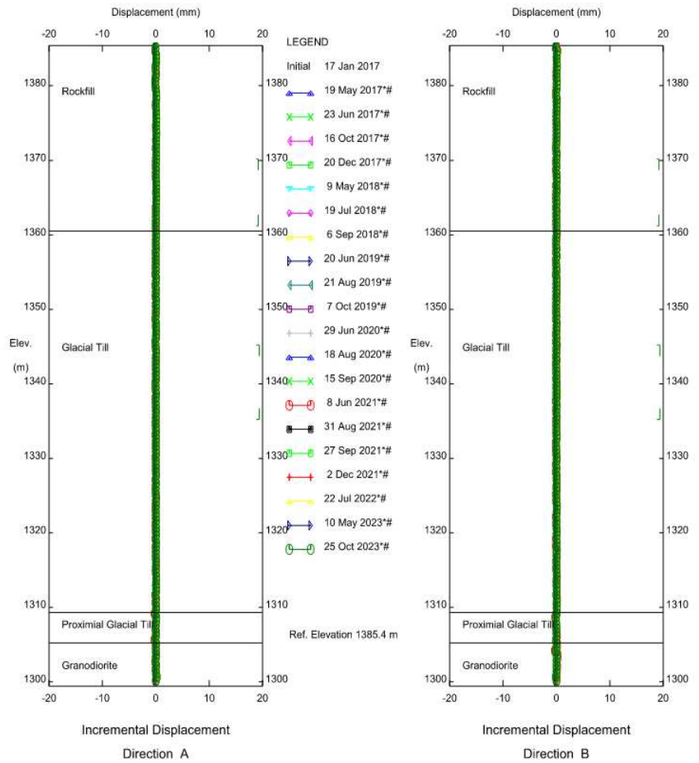
PROJECT No. M02341C62

FIG. No. 10

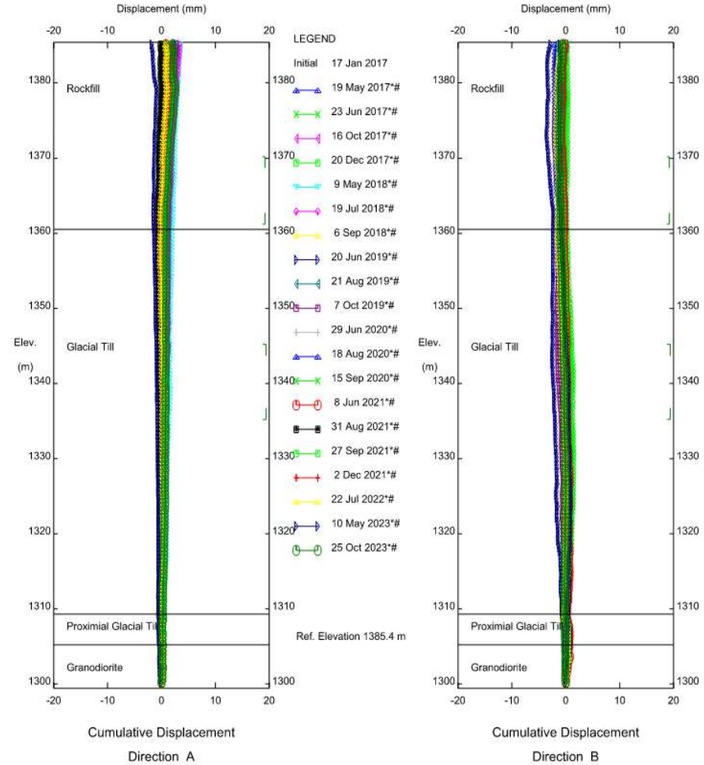
FILE PATH: Z:\MV\CR\M02341C62-HVC-2023 APR\300 DESIGN\340 DAM MOVEMENT MONITORING\343 SURVEY MONUMENTS\TROJAN\220908 TROJANDAMMONITORING.XLSM - 2024-02-27 12:32

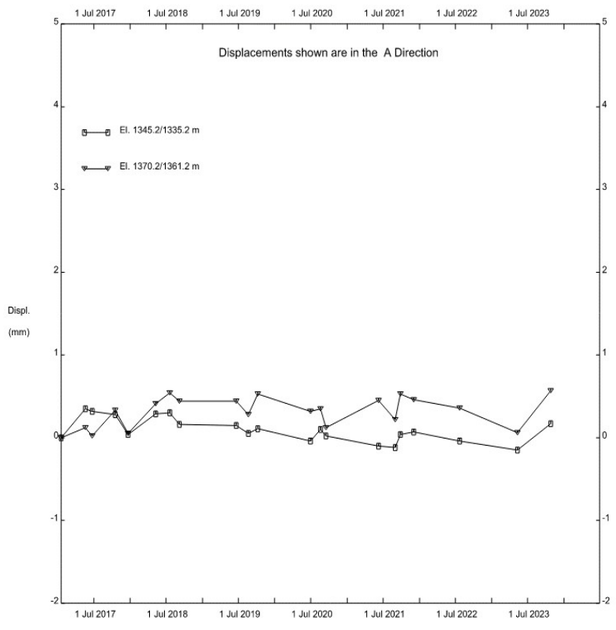


Incremental Displacement Profile

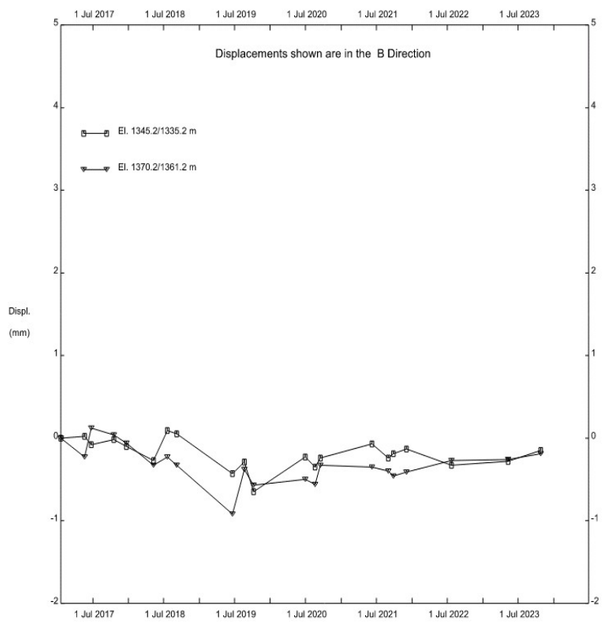


Cumulative Displacement Profile





CUMULATIVE DISPLACEMENT PROFILE VS. TIME "A" DIRECTION



CUMULATIVE DISPLACEMENT PROFILE VS. TIME "B" DIRECTION

NOTES:

1. IB16-2 was installed on April 29, 2016 and initialized on June 7, 2016.
2. Direction A is perpendicular to centreline: Direction B is parallel to centreline.

CLIENT: Highland Valley Copper / Teck

Klohn Crippen Berger

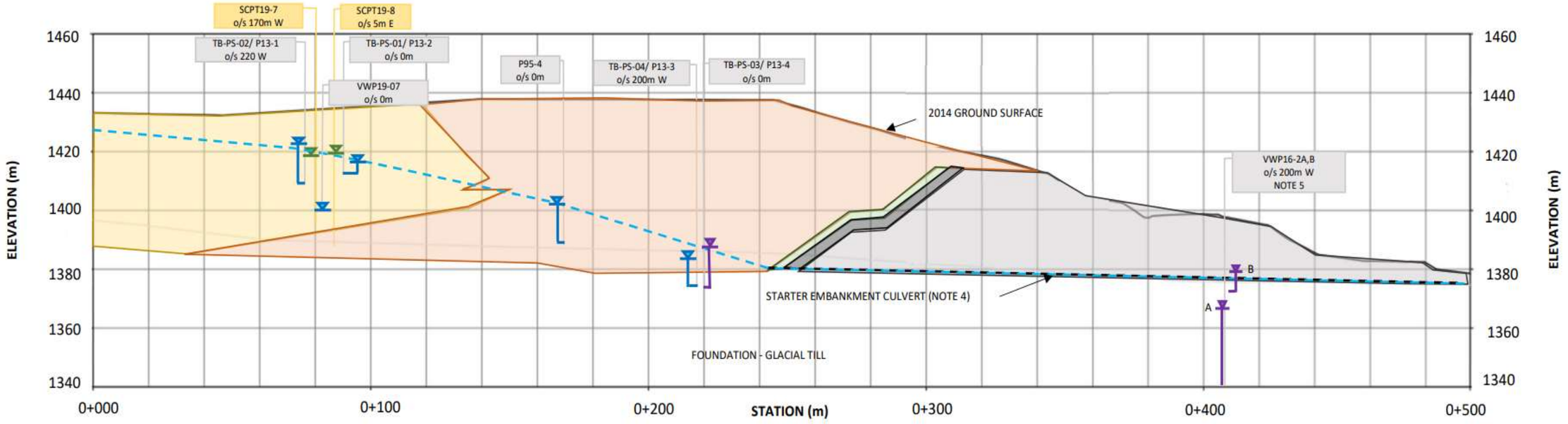
PROJECT: TROJAN TAILINGS STORAGE FACILITY
2023 ANNUAL FACILITY PERFORMANCE REPORT

TITLE: TROJAN DAM
INCLINOMETER DISPLACEMENT PROFILE
IB16-2

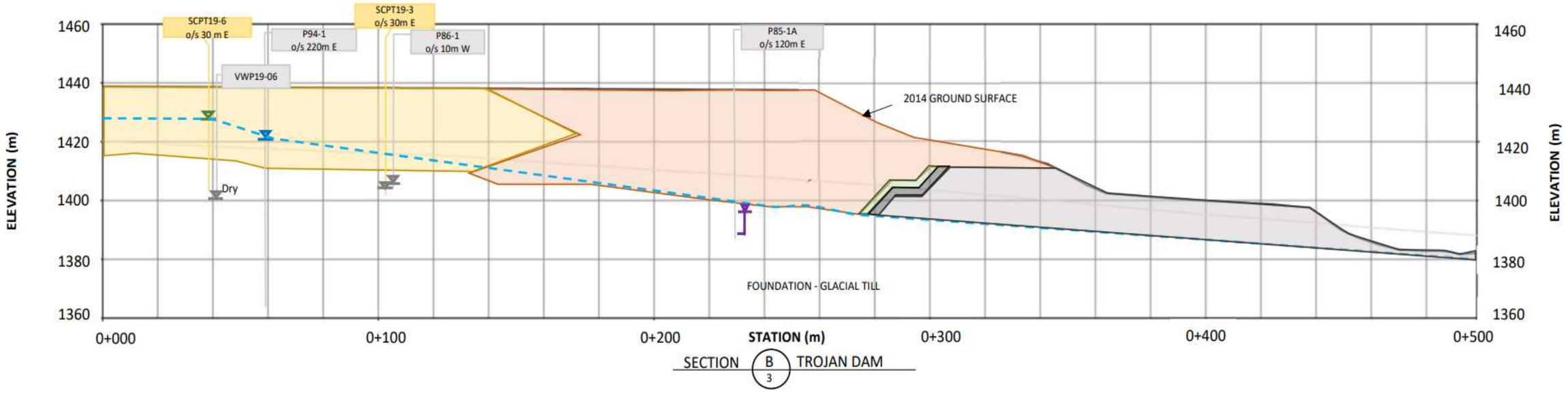
PROJECT No. M02341C62

FIG. No. 11

FILE PATH: Z:\MV\CR\M02341C62-HVC-2023 APR\300 DESIGN\340 DAM MOVEMENT MONITORING\341 INCLINOMETERS\221003 INCLINOMETER PLOTS (BETH AND TROJ).XLSX - 2024-02-27 12:29



SECTION A TROJAN DAM
3



SECTION B TROJAN DAM
3

NOTES:

1. THE LOCATIONS OF THE INSTRUMENTS OFF THE SECTION ARE APPROXIMATE.
2. DATUM WAS CHANGED FROM MINE GRID TO GCS WGS84 IN 2016.
3. INTERNAL GEOMETRY OF THE TROJAN EMBANKMENT WAS DELINIATED USING DRAWINGS FOUND IN THE FINAL DESIGN REPORT (KL 1987)
4. THERE IS A 24" CULVERT, 250 m TO 300 m LONG (MATERIAL UNKNOWN), BURIED BELOW THE STARTER DAM WHICH WAS USED TO DIVERT CREEK FLOWS DURING STARTER DAM CONSTRUCTION. THE UPSTREAM 15 m OF THE CULVERT WERE PLUGGED WITH CONCRETE PRIOR TO TAILINGS DEPOSITION IN THE IMPOUNDMENT BUT THE REST OF THE PIPE WAS LEFT OPEN.
5. VW16-2A TIP EL. IS 1321.9 m, VW16-2B TIP EL. IS 1373.4 m.

LEGEND

- TAILINGS
- CYCLONE SAND
- SAND AND GRAVEL FILTER
- SELECT ROCKFILL
- STARTER DAM ROCK FILL
- WATER ELEVATION AT FOUNDATION PIEZOMETER (AUG. 20:
- WATER ELEVATION AT CYCLONE SAND OR FILL PIEZOMETER (MAY. 2023)
- ELEVATION OF PIEZOMETRIC SURFACE FROM CPT IN CYCLONE SAND
- DRY PIEZOMETER / CPT
- INFERRED PIEZOMETRIC LINE - EXISITIN

CLIENT: Highland Valley Copper / Teck

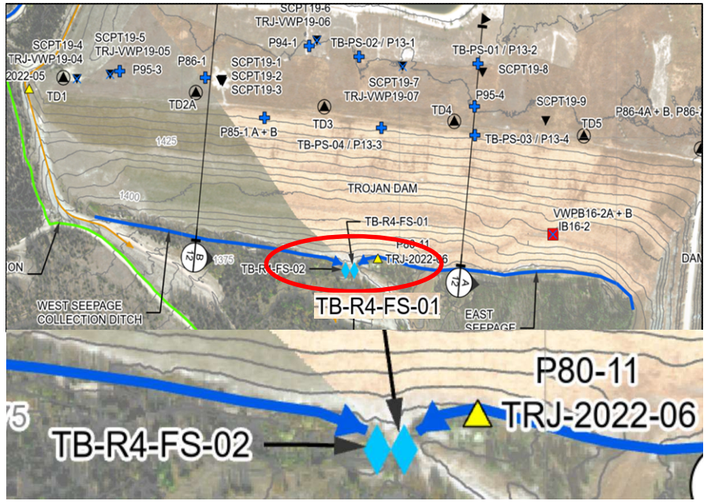
Klohn Crippen Berger

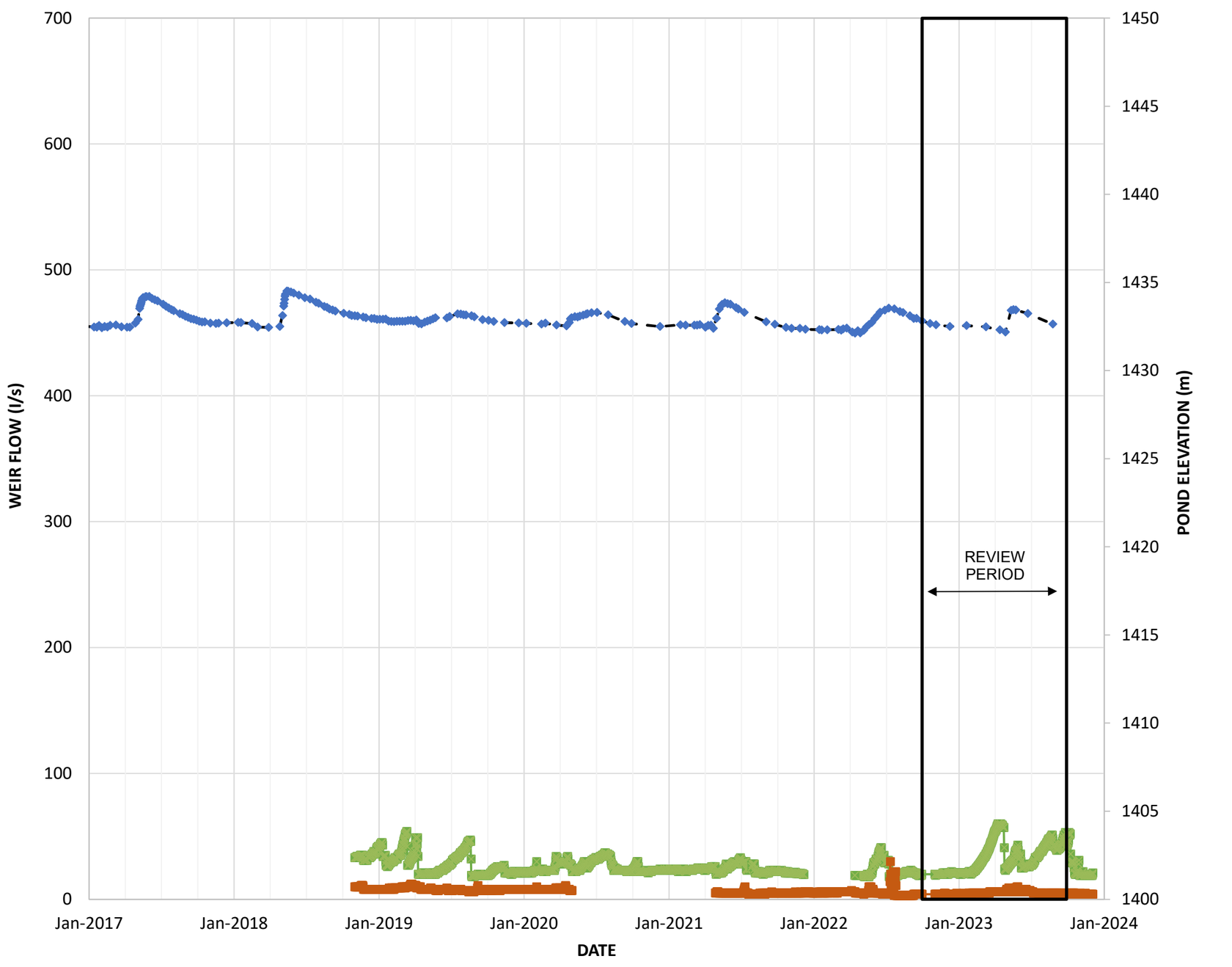
PROJECT: TROJAN TAILINGS STORAGE FACILITY
2023 ANNUAL FACILITY PERFORMANCE REPORT

TITLE: TROJAN DAM INSTRUMENTATION SECTIONS A AND B

SCALE	PROJECT No.	FIG. No.
NTS	M02341C62	12

FILE PATH: Z:\MV\GR\M02341CG2-HVC-2023 APPR\300 DESIGN\330 INSTRUMENTATION SECTIONS\TROJAN DAM SECTIONS\230104 FIGURE II-8.XLSX - 2024-02-27 12:27





LEGEND:

- TB-R4-FS-01 - FLOW
- TB-R4-FS-02 - FLOW
- TROJAN POND LEVEL

NOTES

1. PRELIMINARY FLOWS ARE CHECKED ANNUALLY BASED ON ANNUAL WEIR CALIBRATION VERIFICATION.
2. WEIR FLOW PLOTTED ON PRIMARY (LEFT) AXIS, TROJAN POND ELEVATION PLOTTED ON SECONDARY (RIGHT) AXIS

CLIENT: Highland Valley Copper / Teck

Klohn Crippen Berger

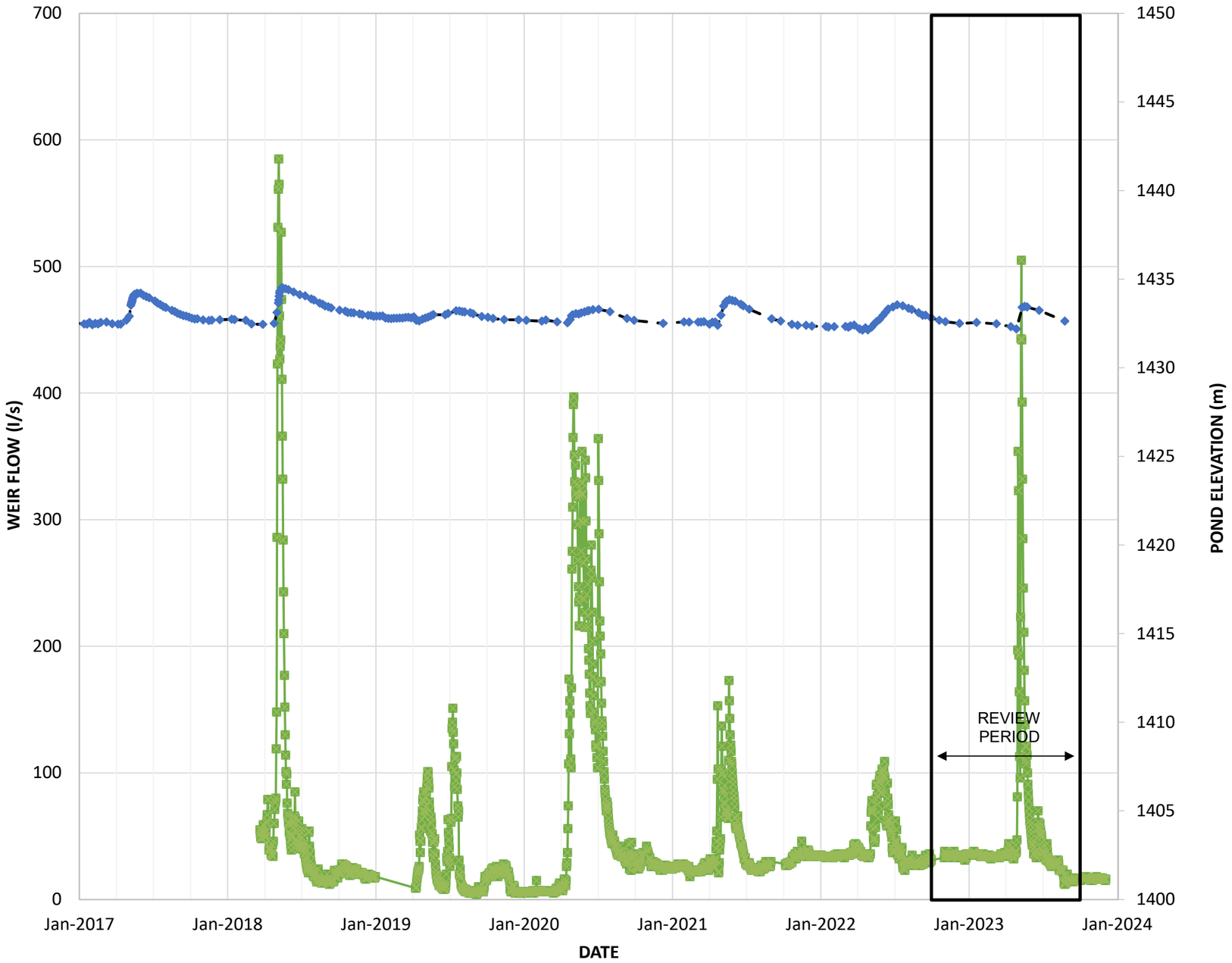
PROJECT: TROJAN TAILINGS STORAGE FACILITY
2023 ANNUAL FACILITY PERFORMANCE REPORT

TITLE: R4 SEEPAGE POND
WEIR FLOWS

PROJECT No. M02341C62

FIG. No. 13

FILE PATH: Z:\MV\CR\M02341C62-HVC-2023 APPR\300 DESIGN\350 SEEPAGE DATA\322 FIGURES\231114MASTER SHEET_LEGACY.XLSX - 2024-03-27 10:51



LEGEND:

- TB-LT-FS-01 - FLOW
- TROJAN POND LEVEL

NOTES:

1. PRELIMINARY FLOWS ARE CHECKED ANNUALLY BASED ON ANNUAL WEIR CALIBRATION VERIFICATION.
2. WEIR FLOW PLOTTED ON PRIMARY (LEFT) AXIS, TROJAN POND ELEVATION PLOTTED ON SECONDARY (RIGHT) AXIS

CLIENT: Highland Valley Copper / Teck

Klohn Crippen Berger

PROJECT: TROJAN TAILINGS STORAGE FACILITY
2023 ANNUAL FACILITY PERFORMANCE REPORT

TITLE: LOWER TROJAN DAM
WEIR FLOWS

PROJECT No.: M02341C62

FIG. No.: 14

FILE PATH: Z:\MV\CRM\M02341C62-HVC-2023 APPR\300 DESIGN\350 SEEPAGE DATA\322 FIGURES\231114MASTER SHEET_LEGACY.XLSX - 2024-02-27 10:51

APPENDIX I

Annual Facility Performance Report
Site Visit Checklists, Observations, and Photographs

APPENDIX I-A

Trojan Dam

Site Visit Checklist, Observations, and Photographs

Appendix I-A
Site Visit Checklist, Observations and Photographs
Trojan Dam

SITE VISIT CHECKLIST

Facility:	Trojan Dam	**Inspection Date:**	August 10, 2023 September 7, 2023
Consequence Classification:	Very High		
Weather:	Rainy	**Inspector(s):**	Rick Friedel, P.Eng. Cheryl Torres, P.Eng. (Aug 10) Harmit Mehta, EIT (Sep 7)
Freeboard (pond level to dam crest):	7.01 m, based on the Aug 10th		

Outlet Condition Survey

Description	Outlet Controls?	Was it Flowing?	Flow rate
Spillway Channel	N/A	☐ Yes ☒ No	N/A

Are the following components of your dam in ***SATISFACTORY CONDITION***?

(check one if applicable)

EMBANKMENT	Yes/No	SPILLWAY	Yes/No
U/S Beach	☒ Yes ☐ No	Debris Boom	☒ Yes ☐ No
Crest	☒ Yes ☐ No	Entrance	☒ Yes ☐ No
D/S Slope	☒ Yes ☐ No	Channel	☒ Yes ☐ No
D/S Toe	☒ Yes ☐ No	Channel Slopes	☒ Yes ☐ No
Drains	☒ Yes ☐ No		

Were any of the following ***POTENTIAL PROBLEM INDICATORS*** found?

INDICATOR	EMBANKMENT	SPILLWAY
Piping	☐ Yes ☒ No	☐ Yes ☒ No
Sinkholes	☐ Yes ☒ No	☐ Yes ☒ No
Seepage	☐ Yes ☒ No	☐ Yes ☒ No
External Erosion	☐ Yes ☒ No	☐ Yes ☒ No
Cracks	☐ Yes ☒ No	☐ Yes ☒ No
Settlement	☐ Yes ☒ No	☐ Yes ☒ No
Sloughing/Slides	☐ Yes ☒ No	☐ Yes ☒ No
Animal Activity	☐ Yes ☒ No	☐ Yes ☒ No
Excessive Growth	☐ Yes ☒ No	☐ Yes ☒ No
Excessive Debris	☐ Yes ☒ No	☐ Yes ☒ No

List and describe any deficiencies (all deficiencies require assessment and/or repair):

- No dam safety deficiencies were observed.
- Vegetation growth in spillway channel upstream of bedrock chute which was observed during the AFPR site visit includes seasonal growth. HVC scrubbed the bushes and cut the grass along the base of the spillway channel as part of routine maintenance after the site visit.

SITE VISIT OBSERVATIONS

Crest

Crest was observed to be in good physical condition with no indication of erosion or deterioration. Local low points (<1 m) and "hummocky" surface were observed. These features are related to both tailings deposition and grading for land reclamation. Freeboard is uncompromised by these features.

Left Abutment

There was no observation of excessive scour damage along dam abutment. There was no visual evidence of significant regrading of the haul road along the abutment that could reduce freeboard and minimum beach width under peak extreme flood.

Right Abutment

The right abutment was observed to be in good physical condition with no sign of deterioration or erosion. Spillway channel is excavated through bedrock and Glacial Till material, parallel to the dam abutment.

No notable visual change to surface erosion area near crest, at most western portion of the crest, initially referenced during 2018 Annual Facility Performance Review.

Downstream Slope

Downstream slope is well vegetated with grass and has no observed locations of concern or signs of adverse displacement (Photo I-A-1 and Photo I-A-2).

Toe Collection Ditches

Extensive vegetation was observed along the toe which provides a measure of erosion protection. Clear and turbidity-free seepage flow was observed through ditches and weirs. Weirs were observed to be in good condition with no sign of obstructions in either toe collection ditches.

A culvert was constructed below the starter dam to convey Trojan Creek flows during construction. The inlet of the culvert was plugged with concrete and the outlet was buried when the starter dam was resloped for reclamation. No evidence of potential issues of concern were observed in area of where the culvert outlet is believed to be buried (e.g., sinkholes or turbid seepage).

Seepage

No seepage was observed from the dam face, but seepage flow from underdrain was reporting to the toe ditches. This observation is consistent with historical performance and design intent.

Tailings Beach and Pond

No issues of concern were observed during the site vise. Elevation of the vegetated portion of the beach is approximately 2 m above the reservoir level (Photo I-A-3 and Photo I-A-4).

There was no indication of recent high-water levels where the pond has encroached into spillway approach channel or onto reclaimed beach surface (Photo I-A-3 and Photo I-A-4).

Spillway Inlet and Approach Channel

The debris boom was observed to be secured in place, with no obstructions present besides minor vegetation. Spillway inlet was observed to be in good condition with no signs of deterioration (Photo I-A-5).

Spillway Channel

The approach channel that connects the pond to the spillway channel is excavated through the tailings beach and vegetated. There was no evidence of scour or recent flow in the channel (Photo I-A-6 and Photo I-A-8).

Downstream of the approach channel, the spillway is excavated through Glacial Till along the natural slope, except through one outcrop of bedrock. This section of the spillway is at a very shallow grade with some vegetation to manage erosion. Near the right abutment of the dam, the spillway transitions to segment fully excavated in bedrock (Photo I-A-10). At the time of the site visit, vegetation growth (grass, bushes and small trees) had not yet been cleared as part of routine maintenance.

Downstream of the channel excavated in bedrock, the spillway channel is excavated in Glacial Till with riprap for erosion protection due to the steep grade. No major obstructions or deterioration were observed along the channel (Photo I-A-8 to Photo I-A-11).

Trojan Diversion Ditch

The Trojan Diversion Ditch channel has significant vegetation growth in areas (Photo I-A-14, and Photo I-A-15). The diversion is not relied upon for dam safety (i.e., is assumed to be breached for flood routing). However, is relied upon to function as designed to operate the Trojan TSF and manage water flows and water quality downstream. KCB has suggested HVC prepare a consolidated (and concise) operation and maintenance plan for the Trojan Diversion Ditch clarifies responsibilities and triggers for maintenance and operational requirements.

SITE VISIT PHOTOGRAPHS

LEGEND:

- TRJ = Trojan Tailings Facility
- TRJ-2023-## refers to 2023 AFPR waypoint shown on Figure 3
- All photographs taken during inspection on August 10 and September 07, 2023, except those provided by HVC after vegetation clearing completed.

Photo I-A-1 Overview of Trojan Dam downstream slopes from the Bethlehem Dam No. 1 crest. No observations of visible erosion or scour (TRJ-2023-01)

Photo I-A-2 Overview of Trojan Dam toe. No observations of visible erosion or significant change from the 2022 inspection (TRJ-2023-01).

Photo I-A-3 Overview of Trojan TSF beach and pond area, looking west (TRJ-2023-02).

Photo I-A-4 Overview of Trojan TSF beach and pond area, looking east from Trojan Diversion Ditch (TRJ-2023-03).

Photo I-A-5 Overview of pond, near spillway inlet, and vegetation-free perimeter beach (TRJ-2023-04).

Photo I-A-6 Trojan spillway inlet with debris boom secured and in good condition (TRJ-2023-04).

Photo I-A-7 Drone Photo –Trojan spillway inlet with debris boom secured and tailings beach.

Photo I-A-8 Approach channel, excavated through tailings beach, of spillway (TRJ-2023-04).

Photo I-A-9 Upper segment of spillway channel, excavated through Glacial Till. Vegetation growth was cleared following site visit (TRJ-2023-05).

Photo I-A-10 Overview of spillway channel excavated in bedrock (TRJ-2023-06).

Photo I-A-11 Spillway channel excavated in Glacial Till with riprap erosion protection (TRJ-2023-07).

Photo I-A-12 Valve 1 located along the Trojan Diversion Ditch. Valve was closed at time of site visit and is managed by HVC environment department (TRJ-2023-09).

Photo I-A-13 Open channel downstream of Trojan Diversion Ditch Valve 1. No sign of excessive scour or erosion damage. Weir measures flows into impoundment (TRJ-2023-09).

Photo I-A-14 Trojan Diversion Ditch in the segment that has no geomembrane liner. Vegetation growth along channel does not impact dam safety (TRJ-2023-10).

Photo I-A-15 Water ponded in the Trojan Diversion Ditch, near inlet to Trojan Diversion Pipeline, but no discharge. Gate has minor debris accumulation (TRJ-2023-08).

Photo I-A-16 Upstream portion of the Trojan Diversion Pipeline, near discharge from the Trojan Diversion Ditch, well supported with no leaks observed (TRJ-2023-08).

APPENDIX I-B

R4 Seepage Pond Dam

Site Visit Checklist, Observations, and Photographs

Appendix I-B
Site Visit Checklist, Observations and Photographs
R4 Seepage Pond Dam

SITE VISIT CHECKLIST

Facility:	Trojan R4 Seepage Pond Dam	**Inspection Date:**	Sep 07, 2023
Weather:	Cloudy	**Inspector(s):**	Rick Friedel, P.Eng. Harmit Mehta, EIT
Freeboard (pond level to dam crest):	0.96 m, based on maximum water elevations on April 28th from GeoExplorer		

Outlet Condition Survey

Description	Outlet Controls?	Was it flowing?	Flow rate	Visual Review?	Testing / Detailed Inspection?
Low Level Outlet	☒ Yes ☐ No	☒ Yes ☐ No	Not estimated	☒ Yes ☐ No	☐ Yes ☒ No
Spillway Channel	☐ Yes ☒ No	☐ Yes ☒ No	None	☒ Yes ☐ No	N/A
Original Outlet Pipe	N/A	☐ Yes ☒ No	N/A	☐ Yes ☒ No	☐ Yes ☒ No

Are the following components in ***SATISFACTORY CONDITION***?

(check one if applicable)

EMBANKMENT	Yes/No	LOW LEVEL OUTLET	Yes/No	SPILLWAY CHANNEL	Yes/No
U/S Slope	☒ Yes ☐ No	Outlet Pipe	☒ Yes ☐ No	Entrance	☒ Yes ☐ No
Crest	☒ Yes ☐ No	Outlet Channel	☒ Yes ☐ No	Channel	☒ Yes ☐ No
D/S Slope	☒ Yes ☐ No	Outlet Controls	☒ Yes ☐ No	Channel Slopes	☒ Yes ☐ No
D/S Toe	☒ Yes ☐ No				

ORIGINAL OUTLET PIPE	Yes/No
Entrance	☒ Yes ☐ No
Pipe	☒ Yes ☐ No

Were any of the following ***POTENTIAL PROBLEM INDICATORS*** found?

INDICATOR	EMBANKMENT	LOW LEVEL OUTLET	SPILLWAY CHANNEL
Piping	☐ Yes ☒ No	☐ Yes ☒ No	☐ Yes ☒ No
Sinkholes	☐ Yes ☒ No	☐ Yes ☒ No	☐ Yes ☒ No
Seepage	☐ Yes ☒ No	☐ Yes ☒ No	☐ Yes ☒ No
Erosion	☐ Yes ☒ No	☐ Yes ☒ No	☐ Yes ☒ No
Cracks	☐ Yes ☒ No	☐ Yes ☒ No	☐ Yes ☒ No
Settlement	☐ Yes ☒ No	☐ Yes ☒ No	☐ Yes ☒ No
Sloughing/Slides	☐ Yes ☒ No	☐ Yes ☒ No	☐ Yes ☒ No
Animal Activity	☐ Yes ☒ No	☐ Yes ☒ No	☐ Yes ☒ No
Excessive Growth	☐ Yes ☒ No	☐ Yes ☒ No	☐ Yes ☒ No
Excessive Debris	☐ Yes ☒ No	☐ Yes ☒ No	☐ Yes ☒ No

List and describe any deficiencies:

- No dam safety deficiencies were observed.

SITE VISIT OBSERVATIONS

Crest

No observed signs of deterioration, lateral movement, or cracking (Photo I-B-1).

Left and Right Abutments

Little vegetation at abutments. No signs of deterioration observed.

Downstream Slope

Tall grass and vegetation observed. No signs of deterioration or erosion (Photo I-B-3).

Pond

During site visit, the pond water level was observed to be greater than 0.5 m below the spillway invert which is typical for this time of the year (Photo I-B-2).

Spillway

No observed signs of recent flow, channel erosion, or deterioration. Minor vegetation present in the spillway inlet which is not a concern at this time (Photo I-B-4 and Photo I-B-5).

Low-level Outlet

Inlet with major debris and log-boom in place (Photo I-B-8). The log boom was partially submerged, and KCB suggested HVC replace this with a debris boom similar to the other ponds on site. This was done and HVC sent a photograph to confirm (Photo I-B-9).

The outlet valve cannot be hand turned. The need to close the valve is not a critical control for the structure.

Seepage

No observed signs of seepage during inspection.

SITE VISIT PHOTOGRAPHS

LEGEND:

- TRJ = Trojan Tailings Facility
- TRJ-2023-## refers to 2023 Annual Facility Performance Report (AFPR) waypoint shown on Figure 4
- All photographs taken during inspection on Sep 07, 2023

Photo I-B-3 Overview of R4 Seepage Pond Dam crest and downstream slope looking towards left abutment (TRJ-2023-11)

Photo I-B-4 Overview of R4 Seepage Pond Dam (TRJ-2023-12)

Photo I-B-5 Overview of downstream slope looking towards left abutment (TRJ-2023-13)

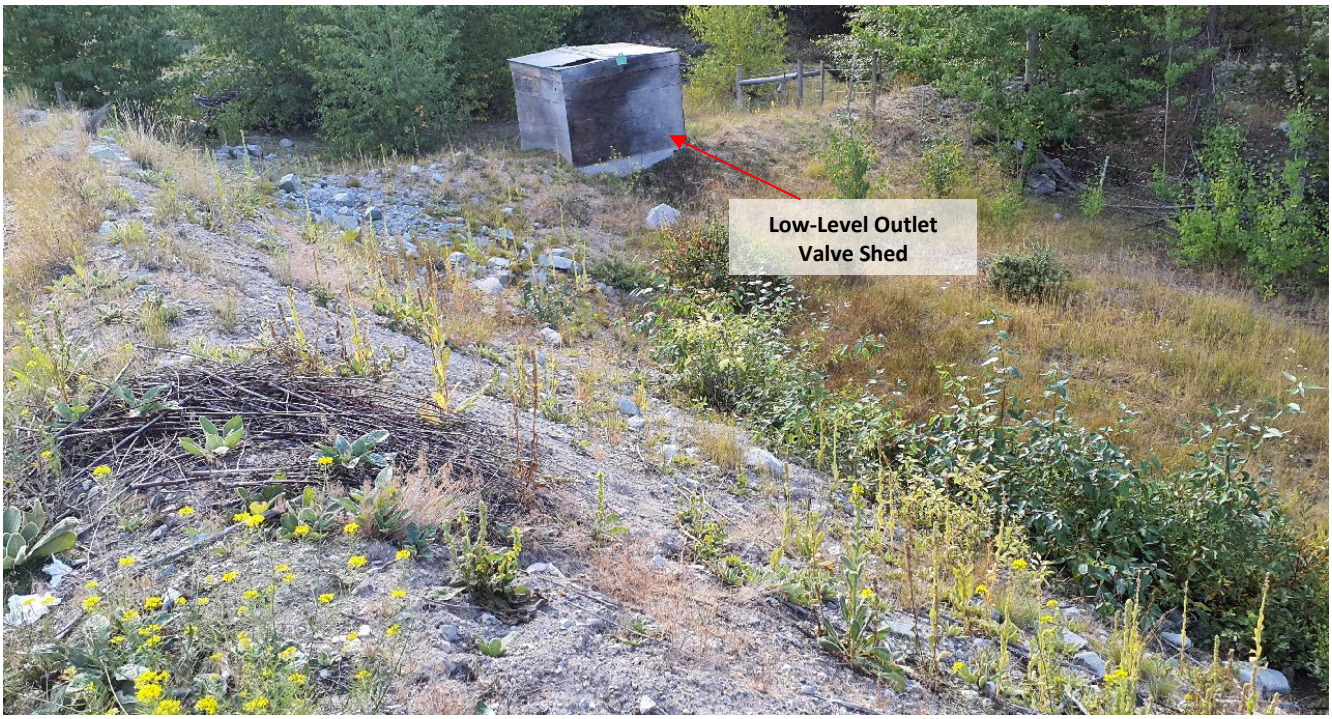


Photo I-B-6 Spillway inlet clear of vegetation, debris or obstruction (TRJ-2023-14).

Photo I-B-7 Spillway channel, with riprap erosion protection, downstream of crest. (TRJ-2023-14)

Photo I-B-8 **Overview of the pond and LLO inlet. The log-boom was partially submerged and KCB suggested this be replaced and HVC are planning to do so. There was debris accumulated on LLO inlet that was cleared as part of routine maintenance (TRJ-2023-12).**

Photo I-B-9 **Photograph provided by HVC showing that log-boom was replaced after site visit.**

APPENDIX I-C

Lower Trojan Dam
Site Visit Checklist, Observations, and Photographs

Appendix I-C
Site Visit Checklist, Observations and Photographs
Lower Trojan Pond

SITE VISIT CHECKLIST

Facility:	Lower Trojan Dm	**Inspection Date:**	Sep 07, 2023
Weather:	Cloudy	**Inspector(s):**	Rick Friedel, P.Eng. Harmit Mehta, EIT
Freeboard (pond level to dam crest):	1.41 m, based on maximum water elevations on Sep 7th GeoExplorer		

Outlet Condition Survey

Description	Outlet Controls?	Was it flowing?	Flow rate	Visual Review?	Testing / Detailed Inspection?
460 mm HDPE Outlet to Weir	☒ Yes ☐ No	☒ Yes ☐ No	Not Estimated	☒ Yes ☐ No	☐ Yes ☒ No
200 mm HDPE Low Level Outlet	N/A	N/A	Decommissioned	N/A	N/A
810 mm HDPE Spillway Pipe	☐ Yes ☒ No	☐ Yes ☒ No	N/A	☒ Yes ☐ No	N/A
Spillway Channel	N/A	☐ Yes ☒ No	N/A	☒ Yes ☐ No	N/A

Are the following components in ***SATISFACTORY CONDITION***?
(check one if applicable)

EMBANKMENT	Yes/No	OUTLET TO WEIR	Yes/No	LOW LEVEL OUTLET	Yes/No
U/S Slope	☒ Yes ☐ No	Outlet Pipe	☒ Yes ☐ No	Outlet Pipe	☒ Yes ☐ No
Crest	☒ Yes ☐ No	Outlet Channel	☒ Yes ☐ No	Outlet Channel	☒ Yes ☐ No
D/S Slope	☒ Yes ☐ No	Outlet Controls	☒ Yes ☐ No	Outlet Controls	☒ Yes ☐ No
D/S Toe	☒ Yes ☐ No				

SPILLWAY PIPE	Yes/No	SPILLWAY CHANNEL	Yes/No
Entrance	☒ Yes ☐ No	Entrance	☒ Yes ☐ No
Pipe	☒ Yes ☐ No	Channel	☒ Yes ☐ No
		Channel Slopes	☒ Yes ☐ No

Were any of the following ***POTENTIAL PROBLEM INDICATORS*** found?

INDICATOR	EMBANKMENT	LOW LEVEL OUTLET (Decommissioned)	OUTLET TO WEIR
Piping	☐ Yes ☒ No	☐ Yes ☒ No	☐ Yes ☒ No
Sinkholes	☐ Yes ☒ No	☐ Yes ☒ No	☐ Yes ☒ No
Seepage	☐ Yes ☒ No	☐ Yes ☒ No	☐ Yes ☒ No
Erosion	☐ Yes ☒ No	☐ Yes ☒ No	☐ Yes ☒ No
Cracks	☐ Yes ☒ No	☐ Yes ☒ No	☐ Yes ☒ No
Settlement	☐ Yes ☒ No	☐ Yes ☒ No	☐ Yes ☒ No
Sloughing/Slides	☐ Yes ☒ No	☐ Yes ☒ No	☐ Yes ☒ No
Animal Activity	☐ Yes ☒ No	☐ Yes ☒ No	☐ Yes ☒ No
Excessive Growth	☐ Yes ☒ No	☐ Yes ☒ No	☐ Yes ☒ No
Excessive Debris	☐ Yes ☒ No	☐ Yes ☒ No	☒ Yes ☐ No

INDICATOR	SPILLWAY PIPE	SPILLWAY CHANNEL
Piping	☐ Yes ☒ No	☐ Yes ☒ No
Sinkholes	☐ Yes ☒ No	☐ Yes ☒ No
Seepage	☐ Yes ☒ No	☐ Yes ☒ No
Erosion	☐ Yes ☒ No	☐ Yes ☒ No
Cracks	☐ Yes ☒ No	☐ Yes ☒ No
Settlement	☐ Yes ☒ No	☐ Yes ☒ No
Sloughing/Slides	☐ Yes ☒ No	☐ Yes ☒ No
Animal Activity	☐ Yes ☒ No	☐ Yes ☒ No
Excessive Growth	☐ Yes ☒ No	☐ Yes ☒ No
Excessive Debris	☐ Yes ☒ No	☐ Yes ☒ No

List and describe any deficiencies:

- No dam safety deficiencies observed.

SITE VISIT OBSERVATIONS

Crest

Crest is uneven and rises towards the spillway (Photo I-C-2 to Photo I-C-4). No visible sign of distress or concern. More than 80% of the crest surface was covered with short bushes and grass. No signs of erosion, deterioration, or cracking were observed.

Left and Right Abutment

Good physical condition. There was no sign of concentrated or progressing erosion observed.

Downstream Slope

Good physical condition. Approx. 10% of the slope near the downstream toe was covered with vegetation (Photo I-C-5). No signs of erosion or deterioration were observed. HDPE spillway pipe does not have a defined channel or means of toe erosion protection. However, no signs of toe erosion or scour were observed.

Impoundment and Pond

Pond level >0.5 m below the invert of spillway pipe which is typical for this time of the year. Basin is heavily vegetated (Photo I-C-1 and Photo I-C-10).

Spillway

No observed signs of recent flow, channel erosion, or deterioration were observed (Photo I-C-6 to Photo I-C-9). At the time of the site visit, there was dense seasonal grass and bushes growth over the base of the spillway channel and at inlet. HVC advised that the vegetation was cleared after site visit as part of routine maintenance.

Low-level Outlet

Debris boom is in good condition but required repositioning as it was not protecting intake of Low-level Outlet (LLO). Vegetation accumulated on LLO intake will be cleared as part of routine maintenance. Low-level outlet valve can be hand turned.

Seepage

None observed.

SITE VISIT PHOTOGRAPHS

LEGEND:

- TRJ = Trojan Tailings Facility.
- TRJ-2023-## refers to 2023 Annual Facility Performance Report (AFPR) waypoint shown on Figure 5.
- All photographs taken during inspection on Sep 07, 2023, except those provided by HVC after vegetation clearing completed.

Photo I-C-1 Overview of Lower Trojan Dam reservoir, prior to vegetation clearing. Replaced debris boom visible (TRJ-2023-15).

Photo I-C-2 Overview of Lower Trojan Dam reservoir, after vegetation clearing.

Photo I-C-3 Overview of the crest slope, prior to vegetation clearing (TRJ-2023-16).

Photo I-C-4 Overview of the crest slope, after vegetation clearing.

Photo I-C-5 View of downstream slope (TRJ-2023-17).

Photo I-C-6 View of spillway channel inlet, prior to vegetation clearing (TRJ-2023-18).

Photo I-C-7 View of spillway channel inlet, after vegetation clearing.

Photo I-C-8 Spillway channel looking toward south, prior to vegetation clearing (TRJ-2023-18).

Photo I-C-9 Spillway channel looking toward south, after vegetation clearing.

Photo I-C-10 Low-Level Outlet inlet, prior to vegetation clearing. HVC installed a new debris boom to protect the intake of LLO (TRJ-2023-15).