Klohn Crippen Berger

Teck Highland Valley Copper Partnership

2023 Annual Facility Performance Report

Highland Tailings Storage Facility

M02341C62.730

March 2024

March 28, 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
Highland Tailings Storage Facility

We are pleased to submit the final of the Highland Tailings Storage Facility 2023 Annual Facility Performance Report (AFPR).

The review period for the AFPR is from December 2022 through November 2023.

Yours truly,

KLOHN CRIPPEN BERGER LTD.

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

RF:cd

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Teck Highland Valley Copper Partnership

2023 Annual Facility Performance Report

Highland 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 Highland Tailings Storage Facility (TSF). The AFPR review period is from December 2022 to November 2023.

The Highland TSF is on the Highland Valley Copper Mine Site (HVC Mine Site), 6.5 km northwest of the operating Highland Mill. The Highland TSF is the primary active tailings storage facility for the Highland Valley Copper Mine, which is owned and operated by HVC.

Based on the information reviewed to support this AFPR, KCB concludes the Highland TSF was operated and performed as expected, and consistent with the permitted design[1] during the review period.

The Highland TSF Structures

The review covers the following structures, which comprise the Highland TSF:

- The L-L Dam is a cycloned sand dam with a vertically raised, central low permeability core zone and underdrainage beneath the downstream slope.
- The H-H Dam is an earthfill dam constructed of local borrow and pit waste materials. The H-H Dam is supported downstream by mine waste dumps.
- The 24 Mile TSF stores overflow tailings from the H-H Pumphouse. The facility is surrounded by waste dumps; a portion of the tailings area is being covered by the 24 Mile Waste Dump. The exposed area, where tailings were discharged during the review period, is referred to as the 24 Mile TSF.
- Seepage and sediment ponds downstream of the L-L Dam collect mine-affected surface water and seepage for reclaim back to the impoundment with no off-site discharge.

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[2]).

Operation and Construction

HVC report approximately 37.3 million tonnes (Mt) of tailings were discharged into the Highland TSF or used to construct L-L Dam during 2023. The facility was operated with flood storage and tailings storage capacity exceeding the design requirements.

[1] KCB. 2020. “Highland Tailings Storage Facility 2019 Design Update: L-L Dam and H-H Dam.” April 17.
[2] EMLI. 2022. “Health, Safety and Reclamation Code for Mines in British Columbia, Revised.” November.

The L-L Dam crest was raised (2.5 m) to the planned El. 1274.5, which is 4.5 m below the permitted ultimate crest. The H-H Dam crest varies to match the predicted tailings beach profile. The raise height varied from 2.0 m to 7.3 m; the crest level at the end of construction ranged from El. 1285.0 m at the west abutment, El. 1296.2 m at the east abutment and a crest low point of El. 1283.1 m at Sta. 0+800. The crest raise and construction at both dams was sufficient to meet or exceed tailings storage and other design requirements.

The 2023 construction at the L-L Dam and the H-H Dam met the design intent and complied with the Issued for Construction specifications and drawings. There are no outstanding non-compliances that require further action.

Governance and Surveillance

The Operations, Maintenance and Surveillance (OMS) Manual, including the Emergency Preparedness and Response Plan (EPRP), was reviewed by the TSF QP and the EoR during the review period and an updated version will be issued in 2024. The 2022 version of the OMS Manual[3] was current during the review period and is used as the reference document for this AFPR.

On December 5, 2023, participants from HVC's operation and management team, including the TSF QP, participated in a simulated exercise to test the Highland TSF EPRP. The EoR was a remote participant in this exercise.

The Highland TSF surveillance program includes visual inspections, measured behaviour from more than 275 instruments (e.g., piezometers, inclinometers, and Sondex), pond level readings, and a Trigger-Action-Response Plan (TARP). HVC executed the surveillance program, in accordance with the OMS Manual.

The instrumentation at each dam includes appropriate redundancy so that the surveillance controls are maintained as intended, even during temporary loss of service for some instruments. To maintain redundancy and to expand the coverage of the surveillance program at the H-H Dam, one replacement inclinometer and six new piezometers were installed during the review period.

HVC installed piezometers at the South Dam to address an AFPR recommendation (LL-2022-02, Table 1). This work was completed in March 2024, outside of the review period, but is noted so the status of recommendations (Table 1) is reflective of report issuance. HVC were unable to install a replacement inclinometer for LL-I15-24 as planned, so the associated recommendation (LL-2021-01, Table 1) remains open. However, HVC has secured the equipment and related contractors to complete this in April 2024. Not installing the inclinometer as planned does not represent a gap related to dam safety but is required to increase inclinometer redundancy at the Valley Buttress Berm (VBB).

[3] Teck Highland Valley Copper Partnership (HVC). 2022. "Highland Tailings Storage Facility – Operation, Maintenance, and Surveillance Manual." October.

2022 Dam Safety Review

HVC commissioned Envis to complete a Dam Safety Review (DSR) of the Highland TSF in 2022 and the final report was issued in 2023[4]. The DSR did not identify any deficiencies or non-conformances, as defined by the HSRC guidance document[5], in relation to the design, construction, maintenance and operation of the Highland TSF. The next DSR is to commence in 2027 (i.e., 5-year frequency).

The DSR included seven recommendations assigned a Priority 4 (i.e., as best management practice improvements). These recommendations have been reviewed by KCB and HVC, and an action plan prepared to address them. Two of the DSR recommendations were closed during the review period.

Highland TSF Performance

Both dams are expected to respond to increased loading from construction and to rising tailings and pond levels. The performance of each dam was reviewed monthly by the EoR based on measured behaviour and other surveillance observations. In addition, routine engineering reviews were completed by the EoR when instrumentation readings were exceeded defined thresholds. The threshold exceedances during the review period were localized responses, generally related to construction or an operational activity, that were greater than expected. The responses, however, were still within design assumptions, did not indicate a significant deviation in terms of dam performance, and did not trigger or warrant mitigation action.

KCB made the following key observations regarding the L-L Dam and the H-H Dam performance during the review period:

1. Performance reviews by the EoR completed monthly or initiated by an instrument threshold exceedance or visual observations, did not identify an issue of dam safety concern or unacceptable performance.
2. Over the review period, the pond rose 2.0 m, and the L-L Dam crest was raised by 2.5 m. The pond rise was greater than the previous year but within the typical range.
3. At the end of the review period, the Highland TSF had approximately 180 Mm^3 of storage available below the minimum flood freeboard level (El. 1272.5 m). This is sufficient to store 2024 forecasted tailings production and more than two Inflow Design Flood[6] (IDF) events.
4. HVC maintained minimum beach widths required in the design throughout the review period.
5. The vertical distance between the tailings surface and the crest of the H-H Dam, referred to as the buffer, was maintained greater than the 1 m permit requirement. At the end of the review period, the buffer ranged from 4.8 m to 10.0 m along the dam crest.

[4] Envis. 2023. “Highland Tailings Storage Facility 2022 Comprehensive Dam Safety Review.” July 10.
[5] Ministry of Energy and Mines (MEM). 2016. “Guidance Document - Health, Safety and Reclamation Code for Mines in British Columbia, Version 1.0, Updated July 2016.”
[6] The IDF for Highland TSF is 120-hour duration Probable Maximum Flood and requires 50.3 Mm^3 of flood storage.

6. The magnitude and pattern of deformation measured at the L-L Dam and the H-H Dam was consistent with expected behaviour in response to construction activities during the review period, specifically:
    a. Deformations were measured in the L-L Dam foundation below the upper portions of the downstream shell, as expected, but they did not extend to the toe (i.e., deformations are contained). At the H-H Dam, deformations were measured in the downstream rockfill as a response to settlement and fill loading.
    b. Consistent with past performance and expected performance, the deformation rate in some dam fill and foundation units increased during loading (i.e., fill placement), and then decreased to the expected range for non-loading periods, after loading was completed.
    c. The magnitude and deformation pattern measured within the Lower-Glaciolacustrine at the Valley Buttress Berm agree with those predicted by the calibrated stress-deformation model and expected based on the design. The measured deformation rates were below triggers that would initiate implementation of the Contingency Case.
7. Measured piezometric levels at the L-L Dam and the H-H Dam were consistent with expected behaviour for construction and operational activities during the review period, specifically:
    a. Measured piezometric levels downstream of the core zone at each dam were significantly lower than upstream levels. For example, at the highest section of the L-L Dam (i.e., the Valley Buttress Berm) the piezometric level in the dam fill upstream of the core zone is more than 130 m higher than the piezometric level in the dam fill downstream of the core zone. This demonstrates that the core zone is an effective low-permeability seepage barrier as assumed in the design.
    b. Piezometric response at the L-L Dam was consistent with expected performance and was governed by typical seasonal trends, response to hydraulic placement, and beaching. One exception was at the North Buttress Berm where piezometric rise was greater than expected because there had not been hydraulic fill placement in that area since 2015. Although greater than expected, the piezometric levels remained consistent with design analysis assumptions. Temporary piezometric responses measured as a response to hydraulic placement of cycloned sand at the North Buttress Berm and other segments of the dam attenuated after construction was completed.
    c. Piezometric response at the H-H Dam was consistent with expected performance. Piezometric levels in the foundation were consistent with expectations. Piezometric response in the dam fill, downstream of the centreline, was greater than expected but within levels assumed in design analysis. This correlated to the 24 Mile TSF pond level being maintained above operating targets due to a temporary loss of reclaim pumping from the pond. Overall, the piezometric levels in the dam fill did not have a measurable impact on deformations at the H-H Dam.

Design Basis and Failure Mode Reviews

The design basis and failure modes were reviewed by HVC and KCB; the review concluded the following:

- there had been no significant change to conditions (e.g., infrastructure, land use) downstream of the Highland TSF during the review period;
- potential failure modes are appropriately characterized and managed by existing controls; and
- the current IDF and earthquake design ground motion (EDGM) for each of the Highland TSF structures meet or exceed the equivalent requirements under the HSRC.

The Canadian Dam Association (CDA) Dam Safety Guidelines[7] 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. Consequence of a hypothetical failure is not related to the likelihood of a failure, but rather to the potential impact resulting from a failure if it did occur.

An "Extreme" consequence category, as defined by CDA Dam Safety Guidelines, has been assigned to the L-L Dam, "Very High" to the H-H Dam and "Low" to the 24 Mile TSF. The seepage and sediment ponds downstream of L-L Dam have all been assigned a "Significant" consequence category.

Recommendations

The status of dam safety recommendations identified during past AFPRs are summarized in Table 1. Closed recommendations are shown in *italics*. Installation of new seepage weirs was deferred from 2023 to 2024, after freshet. However, flowmeters were installed at the Seepage Water Reclaim Pond (SWRP) to track flows pumped from the downstream collection pond into the impoundment. As discussed earlier, the replacement of an inclinometer at the L-L Dam (LL-I15-24) is to be completed in April 2024.

Four new recommendations were added during this review (Table 2) and were assigned either Priority 3 or Priority 4 as they are considered good practice activities or improvements to existing processes, but not required to address an existing dam safety concern. Two are related to improving data management and processing of inclinometer readings. The other two are related to adding the following information to the OMS Manual: a process to estimate the Highland TSF pond volume; and an updated forecast for 24 Mile TSF flood storage.

[7] CDA. 2013. "Dam Safety Guidelines 2007 (Revised 2013)".

Table 1 Previous Recommendations Related to Facility Performance – Status Update

ID No.	Performance Area	Recommended Action	Priority[1]	Deadline (Status)
L-L Dam				
LL-2019-02	Surveillance	HVC to install new seepage weirs along the downstream toe after the SWRP has been replaced and the L-L Dam constructed to the ultimate toe (DSR recommendation LL-2017-06).	3	Q4 2021 – Open; location of new weirs defined and installations planned for 2024
LL-2021-01	Surveillance	HVC to install a replacement inclinometer for LL-I15-24 at the VBB.	3	Q4 2022 – Open; equipment procured, and installation scheduled for April 2024
LL-2022-01	*Maintenance*	*HVC to repair the L-L Dam Weather Station to measure precipitation and temperature at the Highland TSF.*	*4*	*Q1 2024 – CLOSED; data collection from climate station resumed*
LL-2022-02	*Surveillance*	*HVC to install additional piezometer monitoring points at the South Dam to increase monitoring coverage area. Locations to be agreed upon with the EoR.*	*4*	*August 2024 – CLOSED; piezometers were installed in March 2024*
H-H Dam – No Open Recommendations				

Notes:
1. Recommendation priority guidelines, specified by Teck 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.

Table 2 2023 AFPR Recommendations Related to Facility Performance

ID No.	Performance Area	Recommended Action	Priority[1]	Deadline
L-L Dam				
LL-2023-01	Water Balance	HVC to define the method used to estimate the Highland TSF pond volume between bathymetric surveys in the OMS Manual.	4	Q1 2025
LL-2023-02	Surveillance	HVC to implement updated procedure for processing of inclinometer readings and add to OMS Manual and apply to previous readings to ensure consistency. This applies to inclinometers at both the L-L Dam and H-H Dam.	3	Q3 2024
LL-2023-03	Surveillance	HVC to complete spiral corrections surveys of all down-hole inclinometer casings.	3	Q1 2025
24 Mile TSF				
24M-2023-01	Flood Storage	HVC to include a forecast of flood storage within 24 Mile TSF in the Highland TSF OMS Manual that projects, if and/or when the perimeter crest of 24 Mile TSF needs to be raised to maintain IDF flood storage compliance.	4	Q1 2025

Notes:
1. Refer to Notes for Table 1.

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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 2022 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 Highland Tailings Storage Facility (TSF). The review period for this document is December 2022 to November 2023.

The Highland TSF comprises the structures summarized in Table 1.1 and is the primary active tailings storage facility for operations during the review period. The facility is on the Highland Valley Copper Mine Site (HVC Mine Site). Refer to Figure 1 for an overview of the HVC Mine Site and to Figure 2 and Figure 6 for layouts of the L-L Dam and H-H Dam, respectively.

Table 1.1 Highland TSF Structures

Structure	Function
L-L Dam	Cross-valley retaining dam at the northwest end of the Highland TSF.
H-H Dam	Cross-valley retaining dam at the southeast end of the Highland TSF.
24 Mile TSF	Receives seepage from the H-H Dam and acts as storage for tailings from the H-H Pumphouse. This facility makes up the southern portion of the 24 Mile Emergency TSF, which has been used historically to store tailings and is now partially covered by the 24 Mile Waste Dump.
Seepage Water Reclaim Pond (SWRP)	Primary collection pond downstream of the L-L Dam for water from local runoff and flow from sediment ponds and seepage ponds. Water is pumped from the facility back into the impoundment.
Seepage Pond 2	Collects overflow from Sediment Pond 2, local runoff, and dam seepage. Discharges via gravity pipe/ditch to the SWRP.
Sediment Pond 1	Temporary storage of overflow and sediments from the L-L Dam downstream hydraulic cell construction. Since 2021 construction, the pond was subdivided into two sub-cells: North and South. Discharges via gravity pipe to the SWRP.
Sediment Pond 2	Temporary storage of overflow and sediments from the L-L Dam downstream hydraulic cell construction. Discharges via gravity pipe to the SWRP.
Sediment Pond 4	Contingency storage for overflow and sediments from the L-L Dam downstream hydraulic cell construction. This pond was not required for this purpose during the review period but did store local runoff. Discharges via overflow culvert to the SWRP.

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 facility;
- 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 at the site during the review period.

The AFPR site visit was completed by KCB representative Mr. Friedel (EoR) on September 7, 2023, and included a member of HVC's Dam Safety team.

The Highland TSF is operated under the following permits:

- British Columbia Ministry of Energy, Mines and Low Carbon Innovation (EMLI) M-11 Permit (EMLI 2021) – this permit covers the approved mine life and related operations, including the tailings facilities.
- British Columbia Ministry of Environment (MOE) Water Licenses 46527 and 46528 – these licences allow the diversion and storage of water from Pukaist Creek on Crown Land.
- British Columbia MOE Effluent Permit PE376 (MECCS 2023) – this permit allows the storage of tailings and effluent in the Highland TSF.

2 FACILITY DESCRIPTION

2.1 Highland TSF

The HVC Mine Site (Figure 1) is approximately 14 km west of Logan Lake in the British Columbia Interior. The Highland TSF is approximately 6.5 km northwest of the operating Highland Mill and is approximately 10 km long.

Tailings are retained in the Highland TSF by the L-L Dam (northwest end) and the H-H Dam (southeast end), which are built across the Highland Valley at each end of the facility. The H-H Dam is constructed of local borrow and waste materials from the Valley Pit, while the L-L Dam is constructed of local borrow materials, processed filter materials, and cycloned tailings sand. Construction of the Highland TSF began in 1971 with the J-J Starter Dam, approximately halfway between the H-H Dam and the L-L Dam. In 1972, the H-H Starter Dam was built, followed by the L-L Starter Dam between 1976 and 1979. By 1991, the tailings level between the H-H Dam and the L-L Dam rose above the crest of the J-J Dam.

Tailings slurry is discharged from the Highland Mill to the H-H Pumphouse at the toe of the H-H Dam. From the pumphouse, tailings are pumped to the various spigot points at the H-H Dam or to the L-L Cyclone House, which distributes tailings at the L-L Dam. Tailings are periodically discharged from the H-H Pumphouse to the 24 Mile TSF downstream of the H-H Dam.

The majority of the tailings have historically been, and continue to be, discharged from spigots near the east and west abutments of the H-H Dam. As a result, the tailings beach slopes from the H-H Dam towards the tailings pond, which is more than 7 km away, near the L-L Dam. No significant ponding occurs at the H-H Dam. Tailings are also spigotted from the L-L Dam to maintain a tailings beach between the tailings pond and the dam core. Water from the tailings pond is recirculated, via floating barges, back to the Highland Mill for use in processing.

Sections 2.2, 2.3, and 2.4 include additional information for the L-L Dam, the H-H Dam, and the 24 Mile TSF, respectively. General information regarding each retaining structure and those that manage water and sediment downstream of the L-L Dam are summarized in Table 2.1.

Table 2.1 Containment Facilities at the Highland TSF (as of November 2023)

Structure [1]	Containment or Design Type	Crest Length (m)	Est. Crest El. (m)	Max Downstream Slope Height (m)
L-L Dam	Cycloned sand dam with a low permeability core zone and underdrain below the downstream slope. The dam has been raised using the centreline method.	2,980	1274.5	169.5
H-H Dam	Granular fill dam raised using the centreline method, primarily constructed of pit waste fills and supported by waste dumps downstream. A low permeability core zone was raised partially through the dam.	1,800	1283.5 to 1291.0	44.0 [2]
24 Mile TSF	Tailings are stored below existing ground, encapsulated on all sides by waste dumps.	n/a	1225.0 [3]	n/a [4]
SWRP	A portion of the pond is formed by excavation into natural ground with an embankment on the west side. The embankment is glacial till with downstream sand and gravel filter. The pond is unlined.	95	1103.2	5.0
Seepage Pond 2	Excavated into natural ground on three sides, with a homogenous glacial till embankment on the north side of the pond. The pond is lined with geomembrane.	80	1116.6	1.8
Sediment Pond 1	Excavated into natural ground. The excavation has been backfilled with compacted sand and gravel to El. 1102.0 m. Containment is provided by natural ground, the L-L Dam toe, and internal berms.	700 (North) 600 (South)	1104.2	2.5
Sediment Pond 2	Excavated into natural ground on three sides, with a homogeneous glacial till embankment on the south side. The pond is lined with geomembrane.	100	1126.9	10.0
Sediment Pond 4	Excavated into natural ground with a compacted glacial till berm to provide separation from the SWRP.	n/a	1104.0	<2.0

Notes:
1. Refer to Table 1.1 for the function of each structure.
2. Measured from the existing crest to downstream toe or top of downstream buttress. The maximum dam height, measured from existing crest to original ground along the centreline, is approximately 63.0 m.
3. Minimum elevation of surrounding waste dumps that provide containment and prevent overflow onto the Roman Haul Road towards the Valley Pit.
4. The crest of the waste dump providing containment to the 24 Mile TSF is more than 1 km wide and there are no credible failure modes for the dump that could result in an uncontrolled release of tailings downstream (KCB 2018).

2.2 L-L Dam

The permitted design for the L-L Dam is based on the Highland TSF 2019 Design Update (KCB 2020a), which received regulatory approval in June 2021 (EMLI 2021). The configuration of the L-L Dam based on the October 2023 aerial image provided by HVC is shown in Figure 2.

The L-L Dam is divided into six design segments based on foundation conditions (Figure 2):

- South Dam;
- Valley Buttress Berm (VBB);
- Valley Buttress Berm Extension (VBBE);
- North Buttress Berm (NBB);
- North Dam Bedrock; and
- North Dam Upper-Glaciolacustrine (U-GLU).

The geologic and geotechnical characterization of the L-L Dam foundation is summarized in the geological and geotechnical characterization report (KCB 2022c), which is consistent with the requirements recommended by the Site Characterization for Dam Foundations in BC professional practice document (APEGBC 2016).

The overall downstream slope, measured from the downstream edge of the crest and the downstream toe, is 2.5H:1V except where foundation conditions govern the need for additional buttressing (i.e., VBB, VBBE, NBB, and North Dam U-GLU).

Figure 2.1 shows a typical schematic section through the VBB. General construction staging of the VBB through 2023 is shown in Figure 2.2. Figure 2.3 shows the crest elevation over the life of the structure.

The dam includes a low permeability core zone of compacted glacial till for seepage control; the core zone is keyed into the foundation and extends vertically to the existing crest. The Starter Dam crest has been raised using the centreline method, with the core supported by compacted cycloned sand on the downstream side and a combination of compacted cycloned sand and tailings beach on the upstream side. The majority of the cycloned sand fill in the dam has been placed hydraulically, rather than by conventional construction equipment.

The downstream cycloned sand shell is underlain by a sand and gravel blanket drain with gravel underdrains to increase drainage capacity. The purpose of the underdrainage system is to: maintain low piezometric pressures in the downstream shell; intercept upward seepage from the natural ground; and to promote downward drainage during hydraulic placement of the cycloned sand dam fill. The majority of seepage intercepted by the underdrainage system flows towards the low point of the natural valley and discharges from the dam at the VBB toe. Some seepage discharges from the gravel underdrains that daylight at the toe of the VBBE but is collected by drains that report to the SWRP.

Seepage from the impoundment through the foundation (i.e., flow that is not intercepted by the underdrainage system) is managed by HVC as part of the Sulphate Adaptive Management Plan (SAMP). The SAMP system includes a diversion of Woods Creek flow around the Highland TSF to Pukaist Creek and a network of interception wells downstream of the L-L Dam. Neither component of the SAMP system is considered a design feature of the L-L Dam (KCB 2020a) but are requirements of HVC under the conditions of the M11 Permit (EMLI 2021). Water quality monitoring is reported by HVC in a separate report as discussed in Section 5.4.

The purpose of the downstream seepage and sediment ponds is to collect mine-affected surface water and seepage with no off-site discharge. The SWRP, downstream of the VBB toe, is the primary collection pond where water reports and is then pumped into the Highland TSF impoundment via a pipeline.

Figure 2.1 End of 2023 Configuration and Schematic Section Through the VBB of the L-L Dam

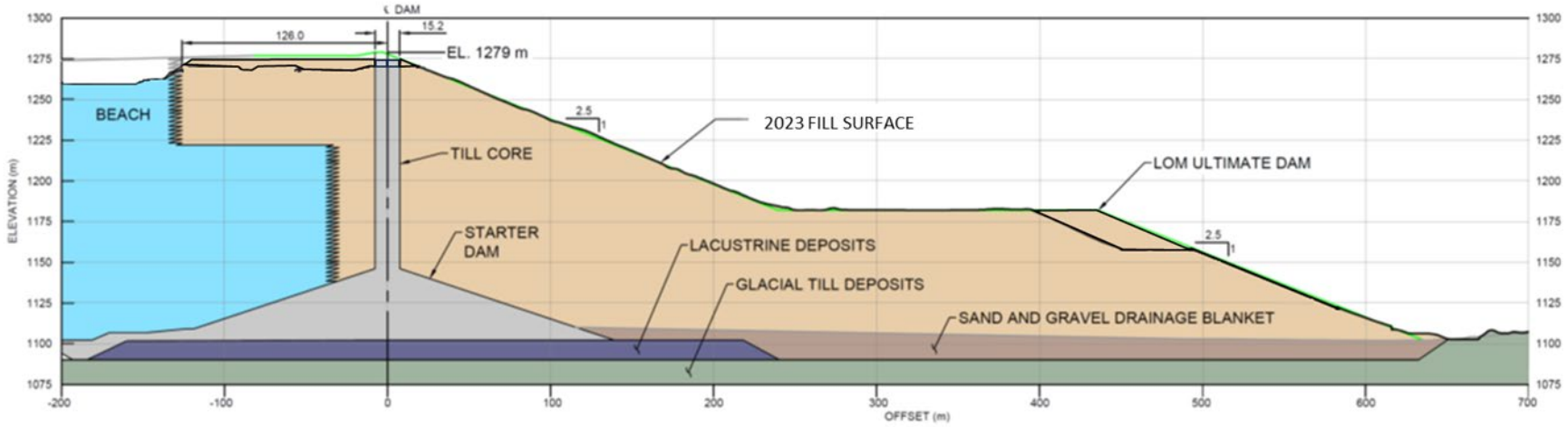


Figure 2.2 Schematic Construction Sequence, through 2023, at the VBB of the L-L Dam

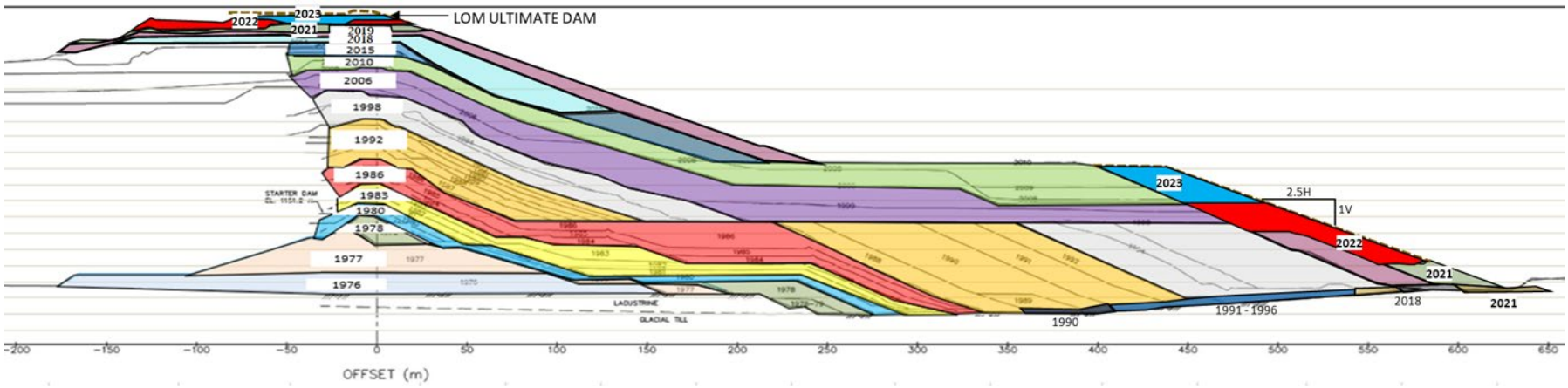
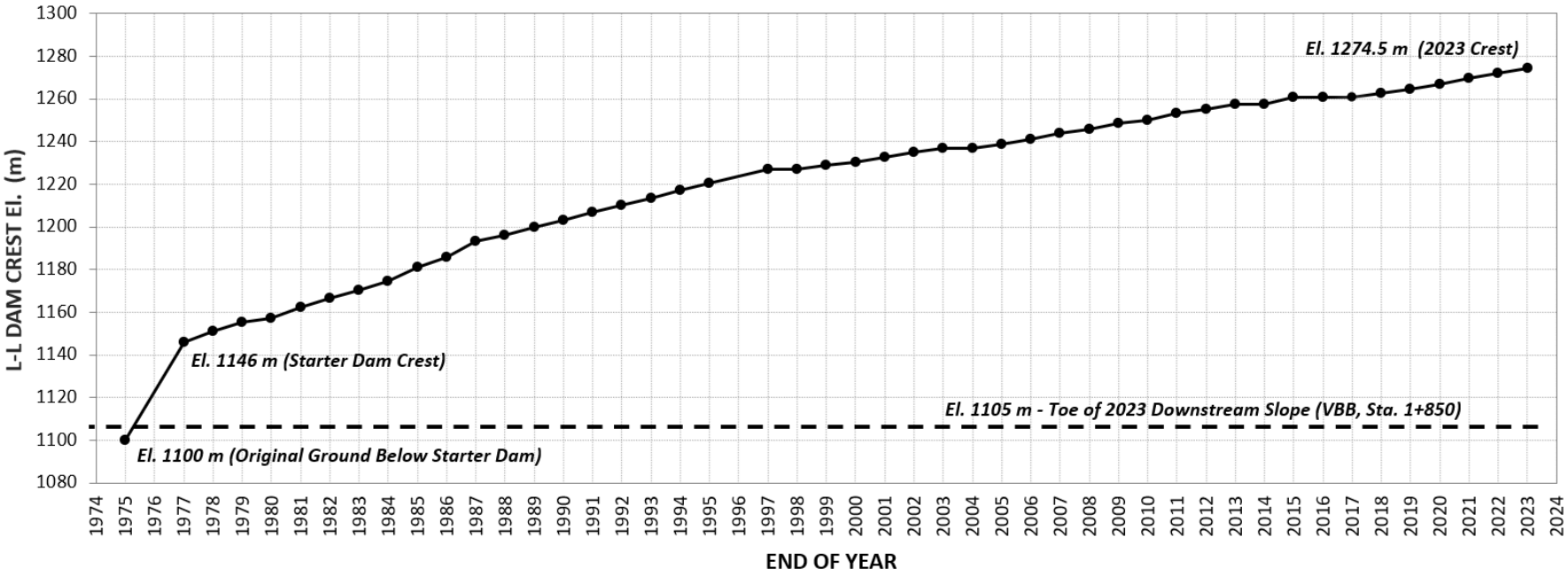


Figure 2.3 L-L Dam Crest Elevation vs. Time



2.3 H-H Dam

Similar to the L-L Dam, the permitted design for the H-H Dam is based on the Highland TSF 2019 Design Update (KCB 2020a), which received regulatory approval in June 2021 (EMLI 2021). The configuration of the H-H Dam based on the October 2023 aerial image provided by HVC is shown in Figure 6. Figure 2.4 shows a typical schematic section near station (Sta.) 1+400 of the H-H Dam centreline. Figure 2.5 shows the crest elevation over the life of the structure.

No overtopping concern is present at the H-H Dam because the crest is higher than the L-L Dam crest (9 m at the end of the review period) and the tailings beach slopes away from the dam. The H-H Dam crest is sloped to match the forecasted beach profile immediately upstream of the dam.

The dam crest has been raised using the centreline method with a low-permeability core zone and sand-and-gravel filter zone, supported by granular fills on the upstream and downstream sides. The low-permeability core, constructed of glacial till, was keyed into the foundation and elevated with each raise until it was no longer required by design (KCB 2020a). The last raise to the core was during the 2020 crest raise. The sand-and-gravel filter zone was built over the core during the 2021 crest raise (Figure 2.4) and will continue to be raised to the ultimate crest to prevent the migration of tailings into the downstream shell and waste dumps.

The majority of the downstream shell is constructed of pit waste placed by the HVC mining fleet. Waste dumps built downstream of the H-H Dam have raised the existing ground up to 40 m above the original ground level. Near Sta. 1+400, the original ground is approximately 38 m below the toe of the existing downstream slope, as shown in Figure 2.4. The downstream waste dumps are also relied upon for stability, and the permitted design (KCB 2020a) defines minimum buttressing requirements to be met by the 24 Mile Waste Dump.

Seepage from the H-H Dam reports to the 24 Mile TSF or is intercepted by the H-H Gland Wells, near the toe of the downstream slope (Figure 7), both of which supply water to the H-H Pumphouse.

Figure 2.4 End of 2023 Configuration and Schematic Section Through the H-H Dam Near Sta. 1+400

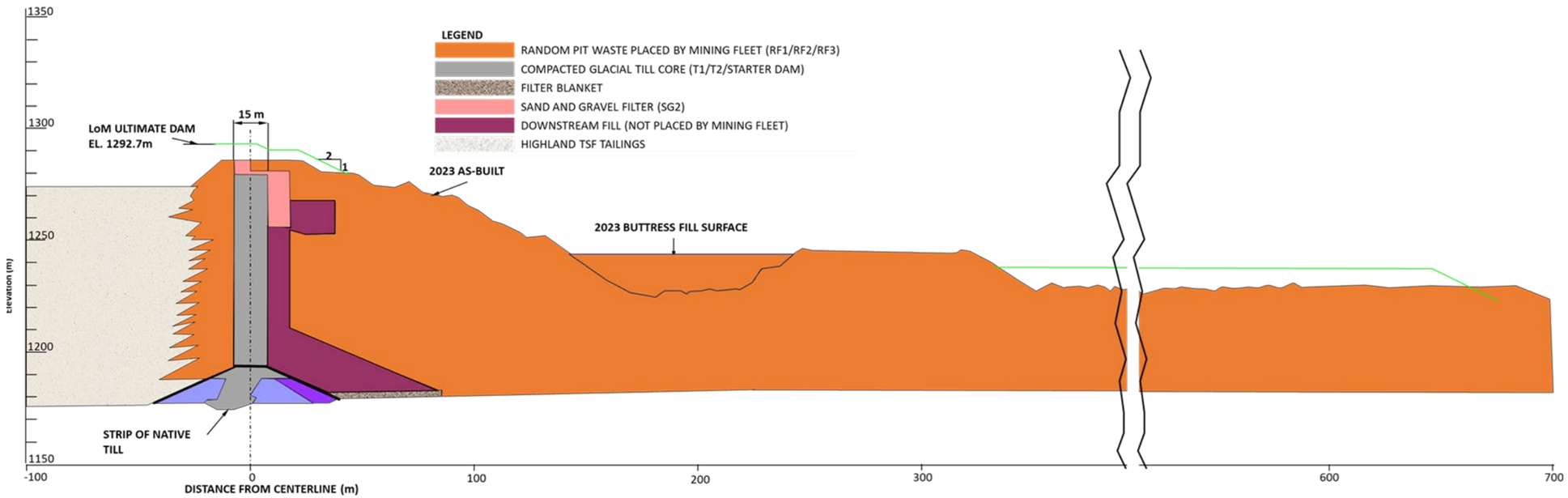
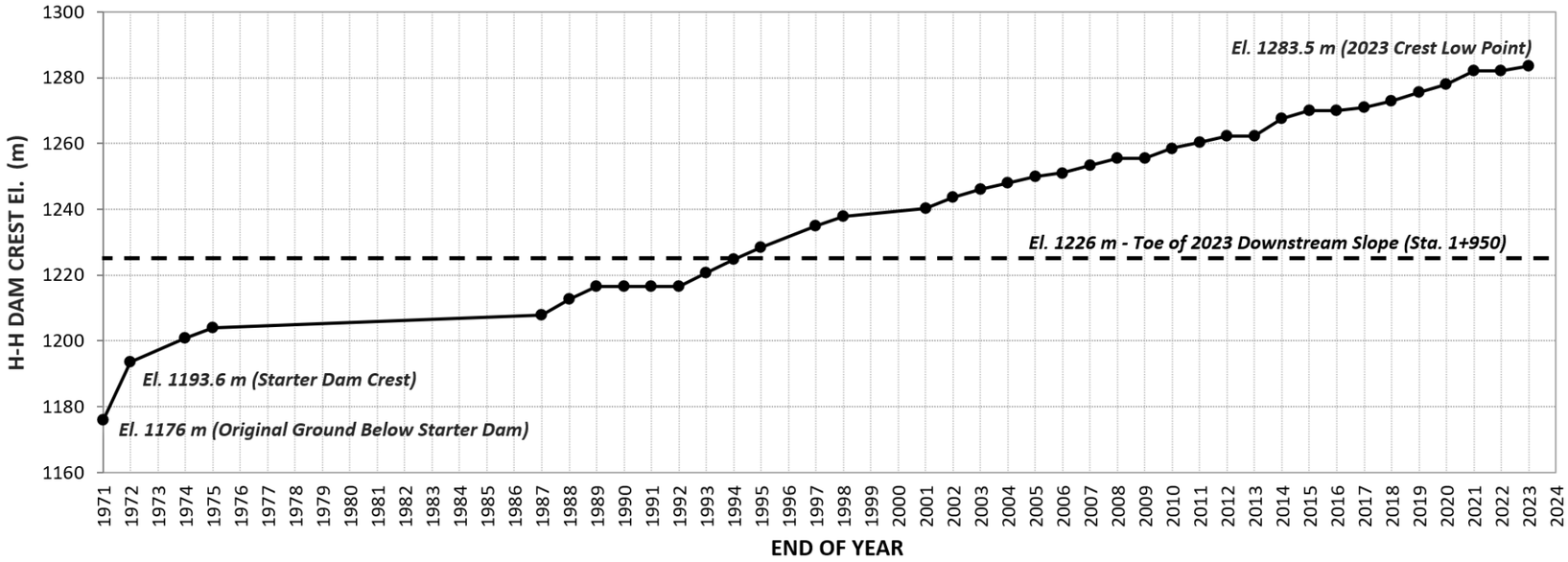


Figure 2.5 H-H Dam Crest Low Point Elevation vs. Time



2.4 24 Mile TSF

The 24 Mile Emergency TSF is downstream of the H-H Dam (Figure 2.6) and has been used to store overflow tailings from the H-H Pumphouse during upset conditions. Tailings, approximately 20 m thick, are contained by waste dumps around the perimeter.

Starting in 2019, HVC began capping the northern end of the 24 Mile Emergency TSF with waste rock, which has segregated the area into the following (Figure 2.6):

- 24 Mile Waste Dump – The northern portion of the 24 Mile Emergency TSF, which is being capped with waste rock. The dump provides stabilization to the H-H Dam and minimum buttress requirements are defined in the permitted design (KCB 2020a).
- 24 Mile TSF – The southern portion of the 24 Mile Emergency TSF is uncapped and is used to store overflow tailings from the H-H Pumphouse and surface runoff. This area must be capped at the end of operations (KCB 2020a).

Figure 2.6 Plan View of the 24 Mile TSF (October 2023)

3 2023 OPERATIONS

3.1 Tailings Deposition and Available Storage

The maximum permitted ore throughput allowed by the M11 Permit (EMLI 2021) is 200,000 tonnes per day (tpd) calculated on an annual average basis. During 2023, the Highland Mill generated approximately 37.3 million tonnes (Mt) of tailings or approximately 103,000 tpd (Table 3.1).

Estimates of tailings deposition during 2023 are summarized in Table 3.1. Highland TSF tailings spigot locations are shown in Figure 3.1. In addition, a portion of the tailings were cycloned and used as fill to construct the L-L Dam as per design. Some tailings were discharged into the 7-Day Pond TSF, located near the Highland Mill and the edge of the Valley Pit, during upset conditions at the mill. During upset conditions at the H-H Pumphouse tailings are discharged into the 24 Mile TSF which was approximately 0.5 Mm^3 during the review period.

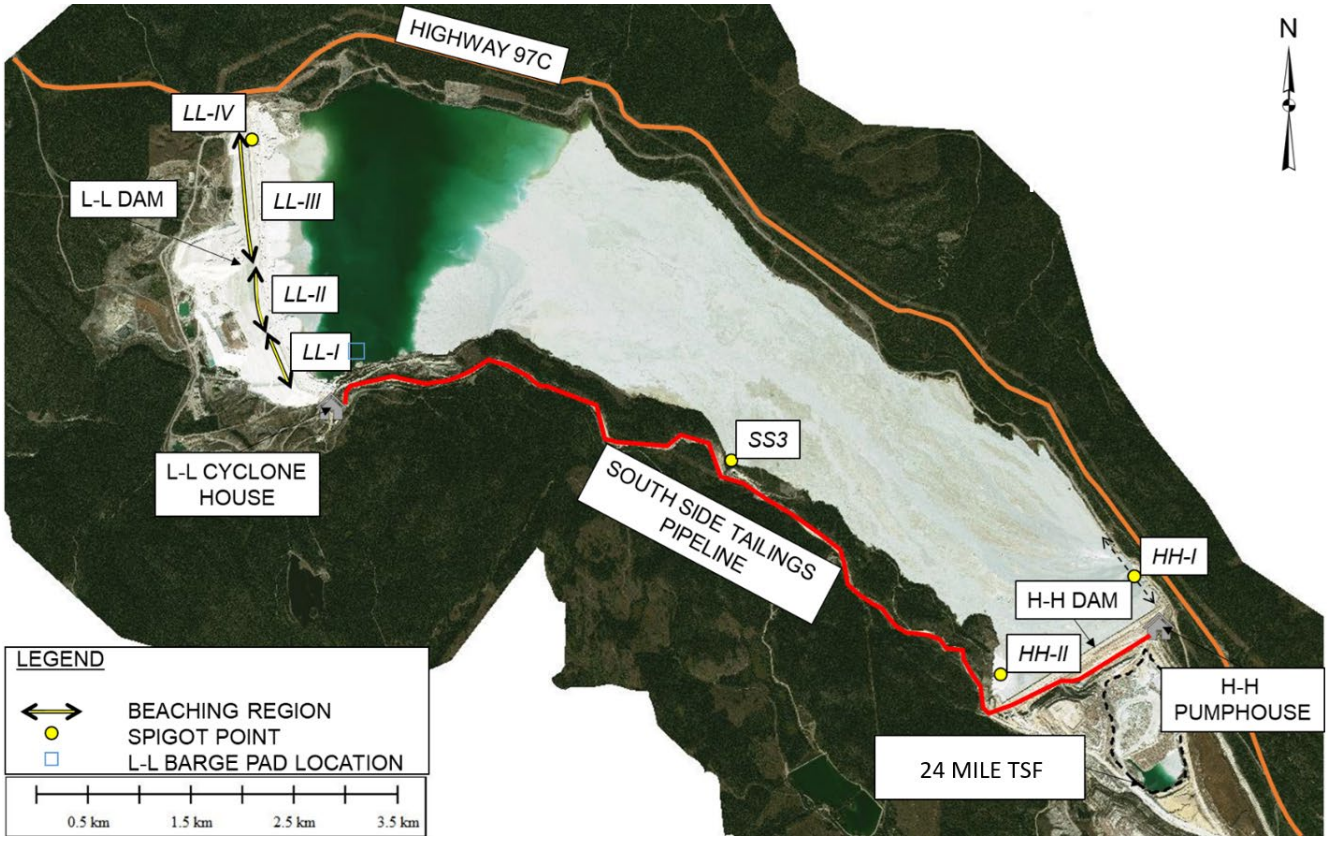
Table 3.1 2023 Tailings Deposition Summary

Discharge Area[1]	Spigot Location(s)[1]	Notes	Tailings Discharged (dry weight – Mt)[2]
HIGHLAND TSF			
H-H Dam	HH-I, HH-II	H-H Dam abutments	31.9
L-L Dam Beaching	LL-I, LL-II, LL-III, LL-IV	Cyclone overflow, underflow or whole tailings (via the bypass) are discharged from the crest to build beach	
L-L Dam Cycloned Sand Fill	n/a	Cycloned sand placed in the dam	4.9
24 Mile TSF	n/a	Overflow from the H-H Pumphouse	0.5 [3]
7-Day Pond	n/a	Overflow from the Highland Mill	<0.01
		Total 2023 Tailings:	37.3

Notes:
1. Refer to Figure 3.1 for spigot locations.
2. Tailings discharge quantities are provided by HVC, and estimates are based on the process-flow diagram.
3. Estimated tailings deposited from bathymetric surveys and comparison with stage-storage curves.

Based on deposition modelling (KCB 2023b), the dam crests at the end of 2023 are sufficient to store the 50.1 Mt of tailings forecast to be produced by the Highland Mill during 2024 and to maintain the flood storage and freeboard required by the design.

Figure 3.1 2023 Highland TSF Spigot Locations



3.2 2023 Dam Construction Activities

The 2023 crest raise at the L-L Dam was 2.5 m to El. 1274.5 m, which is 4.5 m below the permitted ultimate crest. The H-H Dam crest is non-linear along the crest to match the predicted tailings beach profile and the 2023 raise height varied from 2.0 m to 7.0 m. At the end of construction, the H-H Dam crest ranged from El. 1285.0 m at the west abutment, El. 1283.5 m near Sta. 0+800 (low point) and El. 1296.1 m at the east abutment. The crests at both dams are sufficient to provide storage for 2024 tailings storage, with contingency, and comply with design requirements.

The 2023 L-L Dam and H-H Dam Construction Summary Report is a record of the 2023 construction activities at the dams and can be referenced for further information. This report was being prepared at the time of writing this AFPR and will be submitted to the EMLI prior to March 31, 2024. General activities completed at the L-L Dam are summarized in Table 3.2, and the main work areas are shown in Figure 8. General activities completed at the H-H Dam are summarized in Table 3.3, and the main work areas are shown in Figure 9.

Overall, 2023 construction at the L-L Dam and the H-H Dam met the design intent and complied with the Issued for Construction specifications and drawings, copies of which are included in the 2023 L-L Dam and H-H Dam Construction Summary Report.

In addition to the activities summarized in Table 3.2 and Table 3.3, the accumulated sediments from the temporary on-dam sediment storage cells at the L-L Dam were excavated and placed in the waste pile upstream of the north abutment. The designated Glacial Till borrow areas were developed and managed.

Table 3.2 Summary of 2023 Construction Activities at the L-L Dam

Construction Activity[1]	Dam Area				
	North Dam (Bedrock and U-GLU)	NBB	VBBE	VBB	South Dam
Glacial Till Core Raise	✓	✓	✓	✓	✓
Upstream Cycloned Sand Placement (Hydraulic/Mechanical)	✓	✓	✓	✓	✓
Downstream Cycloned Sand Placement (Hydraulic/Mechanical)	x	✓	✓	✓	x
Abutment Preparation (includes key-in of core zone)	✓	n/a	n/a	n/a	✓
Foundation Preparation / Underdrainage	x	x	x	x	x

Notes:
1. Location of construction activities are shown in Figure 8.

Table 3.3 Summary of 2023 Construction Activities at the H-H Dam

Construction Activity[1]	Dam Area
Upstream Pit Waste Rockfill (RF2) – by Contractor	✓
Sand and Gravel Filter – by Contractor	✓
Abutment Preparation – by Contractor	✓
Downstream Crest and Slope Pit Waste Rockfill (RF2) – by Contractor and HVC Mining Fleet	✓
24 Mile Waste Dump Placement (RF3) by HVC Mining Fleet	✓

Notes:
1. Location of construction activities are shown in Figure 9.

3.3 Dam Safety Incidents

During the review period, no incidents that could have compromised the integrity of either dam or that required remedial actions be taken were observed by KCB, reported by HVC, or initiated through the Trigger-Action-Response Plan (TARP).

4 2023 WATER MANAGEMENT

4.1 Climate Overview

HVC provided climate data from the Shula Weather Station[8] for the review period to KCB. The station is in the base of the Witches Brook drainage, approximately 6.5 km southeast of the Highland TSF at El. 1208 m.

The L-L Dam Weather Station has been the primary reference for precipitation magnitudes and trends at the Highland TSF. However, that station has been offline since early August 2022. As discussed in the 2022 AFPR (KCB 2023c) the overall trends at the Shula Weather Station are similar to those at the L-L Dam Weather Station. However, there are differences in precipitation magnitude measured at each station and KCB recommended that HVC repair the L-L Dam Weather Station to monitor precipitation and temperature. HVC report that near the end of 2023, the climate station was repaired and resumed data collection.

The Historical Average Lornex Synthetic Record data (Golder 2021) is used to establish average climate trends for the HVC Mine Site and was used for comparison to the Highland TSF climate during the review period. The climate data from the Kamloops Pratt Road Weather Station (Environment and Climate Change Canada station 116C8P0), approximately 60 km northeast of the Shula Weather Station at El. 729 m, was also used for a comparison to regional precipitation trends.

Table 4.1 summarizes the monthly precipitation during the review period for the referenced climate stations and data sets. The Lornex historical averages, based on the Lornex Synthetic Record data, and the Shula Weather Station data have been corrected based on the appropriate temperature and precipitation factors for the Highland TSF area 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 Highland TSF during the review period are as follows:

- Precipitation followed a similar monthly precipitation pattern to the Lornex historical averages and Kamloops Pratt Road weather station, but annual precipitation was 16% below the historical average.
- Precipitation at the Shula Weather Station was 50% or less of the historical average value during January, March, April, October, and November. February, May, and June recorded precipitation more than 15% above the historical average. This precipitation trend is generally consistent with values measured at the Kamloops Pratt Road weather station as well.

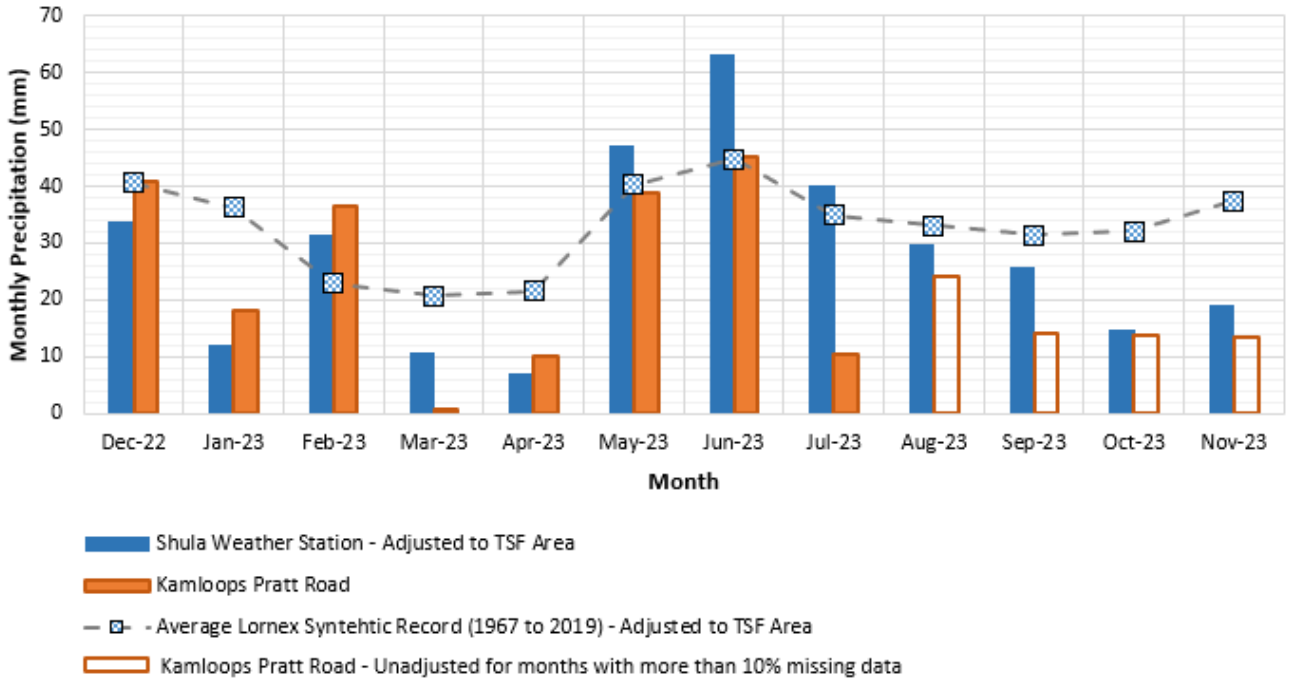
[8] The data provided was raw data, and HVC have advised that the routine quality assurance/quality control review has not been completed at the time of this assessment.

Table 4.1 Monthly Precipitation During the Review Period

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
Dec 2022	100	100	34	41	41
Jan 2023	100	100	12	36	18
Feb 2023	100	93	31	23	37
Mar 2023	100	100	11	21	1
Apr 2023	100	100	7	22	10
May 2023	100	94	47	40	39
Jun 2023	100	80	63	45	45
Jul 2023	100	100	40	35	10
Aug 2023	100	100	30	33	24
Sep 2023	100	63	26	31	14
Oct 2023	100	87	15	32	14
Nov 2023	100	59	19	37	13
Review Period Total	-	-	**333**	**396**	**266**

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

Figure 4.1 Highland TSF Monthly Precipitation Summary During the Review Period



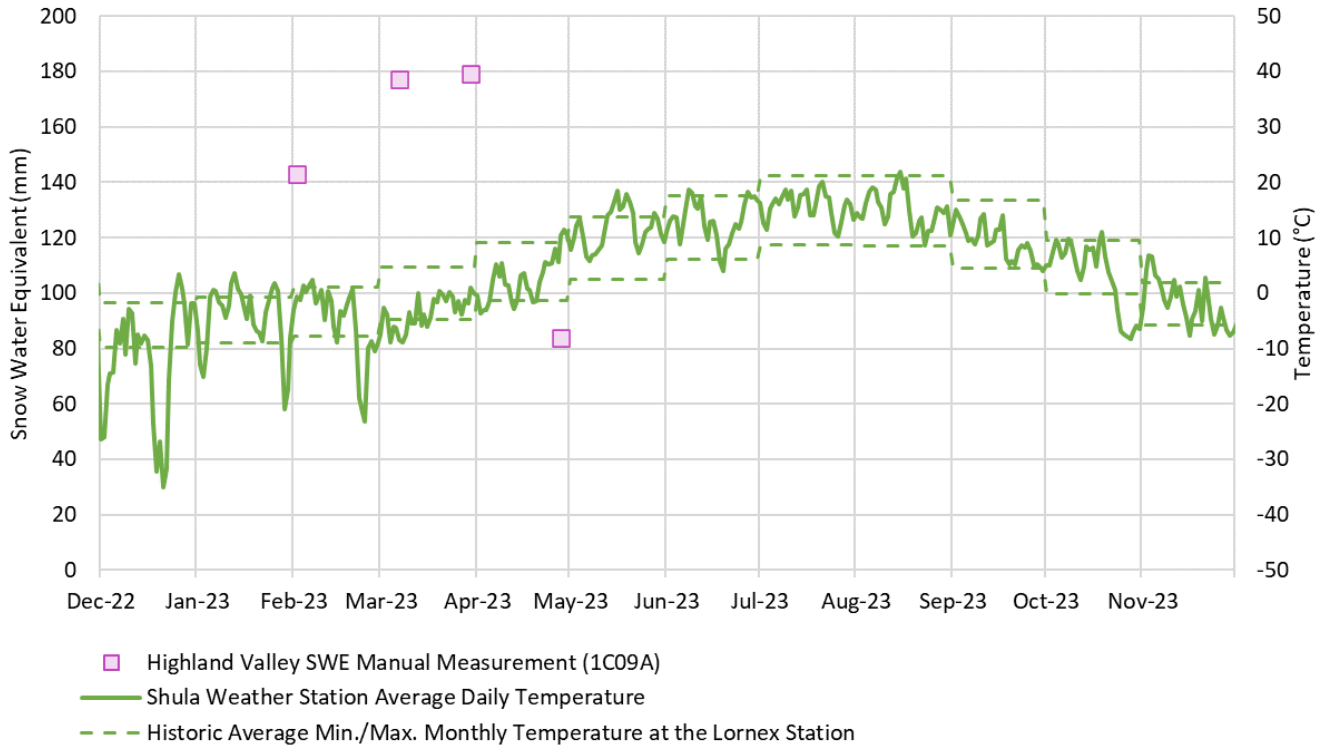
Observations related to high-precipitation storm events based on the Shula Weather Station data, corrected to the Highland TSF area, for the review period are as follows:

- 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 24-hour precipitation events occurred on June 19, 2023 (21.7 mm), July 12, 2023 (25.3 mm), and August 31, 2023 (23.3 mm).

Seasonal snowpack depth is measured monthly at the Highland Valley Snow Survey Station (Station No: 1C09A) shown on Figure 1, near the Bethlehem No. 1 TSF. 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. Overall observations regarding precipitation trends at the Highland TSF during the review period are as follows:

- The daily temperatures recorded at the Shula Weather Station between October 2022 and November 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; the maximum measured snowpack over the review period (179 mm) was approximately equivalent to a 10-year return period snowpack (169 mm) (Golder 2020).
- Snowmelt began in April and continued into June. This coincides with temperatures consistently above freezing and is also consistent with the snowmelt trends presented in the Spring Extreme Events and Wind Analysis report (Golder 2020).
- Consistent with previous site observations, temperature, not precipitation, is the primary factor that drove snowmelt. Snowmelt began in April when precipitation was only 32% of the historic average.

Figure 4.2 Measured Temperature and Snowpack: December 2021 and July 2022



Notes:
1. Measured at the Highland Valley Snow Survey 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).

4.2 Water Balance

HVC operates the Highland TSF water balance as a closed system (i.e., no surface discharges) integrated with the site-wide water management plan. Mill water reclaim, evaporation, and entrainment are the major sources of water loss from the Highland TSF. Seasonal climate fluctuations have the greatest influence on pond volume changes. Pond volumes are typically decreasing except during freshet. The magnitude of freshet and pit dewatering, pumped to the Highland TSF, typically have the greatest impact on the annual change in pond volume.

HVC manages the Highland TSF tailings pond to maintain volumes within a target range of 8 Mm^3 to 25 Mm^3 as described in the OMS Manual (HVC 2022). If the pond volume is outside this target range, the dam is still in compliance with design, provided that flood storage, freeboard, and beach width criteria are being met.

The Highland TSF water balance is integrated into the site-wide water balance that is maintained by HVC. Figure 10 shows the process-flow diagram specific to the Highland TSF. HVC uses the water balance to forecast pond volumes. These predictions are used to inform assumptions in tailings deposition and crest rate-of-rise planning. HVC measures pond volume twice a year using bathymetric surveys. In addition, they track pond volume between survey dates based on measured level, and an assumed tailings accumulation rate since the last bathymetric survey. These are used to track against water balance forecasts and to support model calibrations. Figure 4.3 plots the Highland TSF pond volumes since December 2018 (measured and estimated) and the pond volume forecast[9] from the water balance for the review period provided by HVC.

The estimated pond volume at the end of the review period was 22.5 Mm^3 which is within the typical range over the past five years. Relative to the start of the review period, the estimated pond volume increased 2.7 Mm^3 (Table 4.2) but was within the typical pond volume range as shown on Figure 4.3.

There was good agreement between estimated pond volumes during the review period and those predicted by the model (Figure 4.3). The general pattern from both was consistent with typical seasonal fluctuation. The large increase in the estimated pond volume at the start of June 2023 is due to the effects of freshet (i.e., increase in pond volume) and a new bathymetric survey being applied. The volume of the pond is estimated based on pond level and an assumed shape of the pond basin below the water. The shape of the pond changes over time as tailings settle in the basin. To account for this, HVC completes two bathymetric surveys of the pond each year. To account for change over time between surveys, an average rate of rise to the base of the pond is assumed in the pond volume calculation.

However, a correction to the estimated pond volume is typically required following each bathymetric survey. The pond volume corrections do not have a direct impact on dam performance because compliance with design criteria is assessed based on other factors not specifically tied to a pond volume (e.g., pond level, beach width).

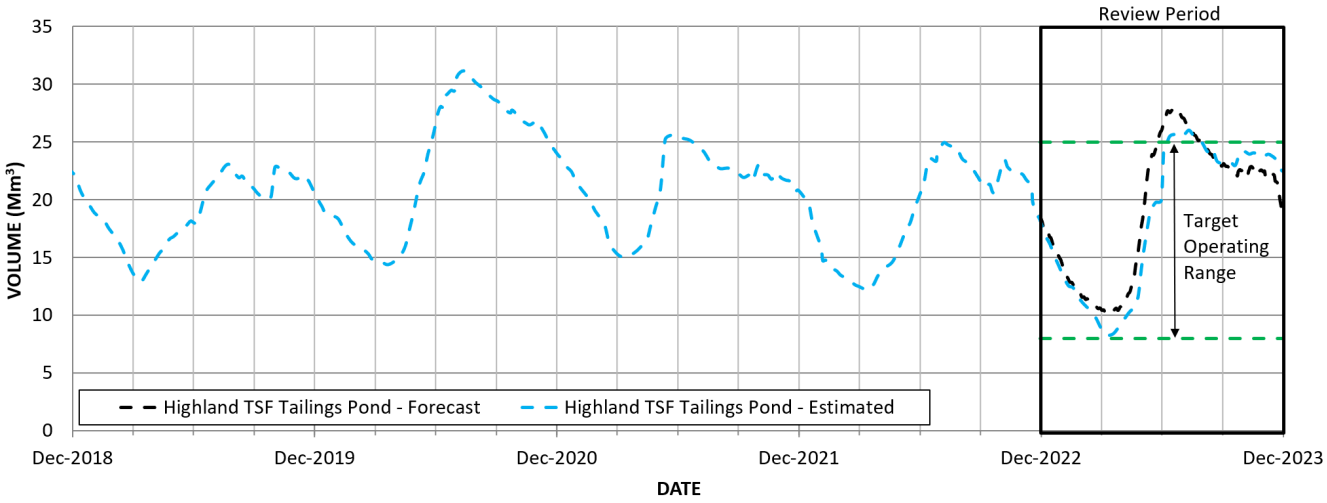
KCB recommends that into the next update of the OMS Manual, HVC documents the process to estimate pond volumes based on pond level, how estimated pond volumes are corrected based on bathymetric surveys (both future and previous estimates) and how pond volumes are integrated with the Highland TSF water balance.

The maximum pond volume was less than forecasted by the HVC water balance and was within the HVC defined target operating range except during June 2023 and July 2023; during this period the maximum estimated pond volume was 26 Mm^3. During this time the Highland TSF was operated with flood storage, freeboard and beach width that met, or exceeded, design requirements. Therefore, even though the pond volume was outside of the target operating range, it did not have an impact on design compliance. In addition, there was no measurable impact on dam performance.

Section 5.2.1 includes further discussion on pond levels within the Highland TSF during the review period.

[9] Pond volume forecast being used by HVC in November 2022 is shown. Forecast was based on the predictive modelling using the site-wide integrated water balance, assuming average climatic conditions.

Figure 4.3 Highland TSF Pond Volume: December 2018 through November 2023



Note: Pond volume forecast being used by HVC in November 2022 is shown. Forecast was based on the predictive modelling using the site-wide integrated water balance, assuming average climatic conditions.

Table 4.2 Change in Pond Volume During the Review Period for the Highland TSF

Metric		Volume (Mm^3)
Estimated Pond Volume Based on Pond Level and Assumed Tailings Deposition Rate Since the Most Recent Bathymetric Survey	Pond volume on November 18, 2022	19.8
	Pond volume on December 1, 2023	22.5
	Est. Annual Change in Pond Volume	+2.7

4.3 Flood Management

The Inflow Design Flood (IDF) required under the HSRC (EMLI 2022) and details regarding the selected design flood for each of the Highland TSF structures are summarized in Table 4.3. The results of flood-routing analysis at each structure are discussed below:

- All the structures can safely manage or store the applicable IDF without off-site discharge.
- Flood requirements for Sediment Ponds 1 and 4 are not reported, as both drain directly into the SWRP before overtopping the perimeter crest and are included in flood routing for the SWRP. Sediment Pond 2 is included in the flood routing for Seepage Pond 2 and not reported separately.
- The SWRP relies on pumping to maintain water levels year-round. During the IDF, the pond may inundate the surrounding area, mainly Sediment Pond 1 (KCB 2020a), potentially impacting HVC operations. However, the downstream public road (El. 1108.0 m) prevents an off-site discharge.

Table 4.3 Flood Management Summary for the Highland TSF Structures

Facility	Routed or Stored (Outflow)	Inflow Design Flood[1]	Design Event	Design Outflow / Stored Volume
Highland TSF	Stored	PMF	PMF 120-hour	50.3 Mm^3
24 Mile TSF	Stored	1/3 between 1,000-year and PMF	1/3 between 1,000-year and PMF 72-hour	3.2 Mm^3
Seepage Pond 2	Routed (Pipe)[3]	Between 100-year and 1,000-year	100-year, 24-hour[2]	1.5 m^3/s [2]
SWRP	Routed / Stored[5]	Between 100-year and 1,000-year	100-year, 72-hour[4]	0.3 Mm^3 [4]

Notes:
1. The IDF events meet the requirements under the HSRC (EMLI 2022) as discussed in Section 7.1.
2. Based on most recent Seepage Pond 2 flood routing (KCB 2022b).
3. Seepage Pond 2 outflows are routed to the SWRP.
4. Stored volume for existing SWRP is scaled based on the proposed Seepage Pond 4 (KCB 2020a).
5. During the IDF, some water would be reclaimed back to the Highland TSF, but the majority of flow would be stored.

5 2023 DAM SURVEILLANCE SUMMARY

5.1 Surveillance Program

The 2022 version of the OMS Manual was applicable during the review period and is used as the reference document for this AFPR. The OMS Manual (HVC 2022), including the EPRP, was reviewed by the TSF QP and the EoR during the review period and an updated version will be issued in 2024. HVC completed the Highland TSF surveillance activities defined in the OMS Manual (HVC 2022) at the specified frequencies as summarized in Table 5.1.

The following reviews of measured behaviour and performance are routine activities in the surveillance program:

- HVC Weekly Surveillance Review Meeting – A summary of routine inspections, surveillance data, and activities at the Highland TSF is reviewed by the HVC Tailings Group, including the TSF QP, during a weekly intra-departmental meeting.
- Monthly EoR Surveillance Reviews – The EoR completes a monthly review of the L-L Dam and the H-H Dam surveillance information, which is documented in a Routine Monitoring Review (RMR) memo. The RMR includes discussion of: construction and beaching activity; comments on general instrumentation trends and exceedances; changes to instrumentation (e.g., repairs/replacement, operational status); and includes a register of short-term actions related to instrumentation and monitoring.
- Routine EoR Review of Localized Response – A localized deviation from historic or expected behaviour at an instrument will trigger the first level of the TARP, referred to as Notification Level. An exceedance of the Notification Level does not represent a dam safety concern or unacceptable performance, but requires the EoR to do the following:
  - assess the cause for the measured response (e.g., faulty instrument, change in soil behaviour, change in loading or operational activity such as beaching);
  - review the measured response in nearby instruments to identify whether the response is localized or regional;
  - confirm the behaviour does not indicate unacceptable behaviour and/or if a higher TARP level should be triggered;
  - recommend appropriate follow-up actions, if any, (e.g., repeat reading, confirm recent activity in area, revise thresholds or triggers based on new interpretation); and
  - document the review.
- Tailings Review Board (TRB) Presentations – The EoR presents a summary of the interpreted performance to the HVC TRB at each meeting (three during the review period) to keep the TRB apprised of the status and to give them an opportunity to provide feedback. Based on the information presented at each meeting, the TRB concurred with the EoR's interpretation that the structures are performing as intended.

The DSR commissioned by HVC during 2022 was completed and a final report issued in July 2023 (Envis 2023). Section 7.3 summarizes the findings and recommendations.

Table 5.1 Summary of Highland TSF Surveillance Activities During the Review Period

Monitoring Activity	Facility	Minimum Frequency[1]	Documentation	Review Period Compliance[1]	Notes for the Review Period
Inspections					
Routine Visual Inspections [2]	L-L Dam / H-H Dam	Weekly	HVC Inspection Reports	Yes (refer to Notes)	Copy of each visual inspection provided to KCB to support his AFPR.
	24 Mile TSF / Waste Dump	Quarterly			
	Sediment and Water Ponds	Monthly			
Event-Driven Visual Inspections	L-L Dam / H-H Dam / 24 Mile TSF / Sediment and Water Ponds	When triggered [3]	HVC Inspection Reports	N/A	No event-driven inspections were triggered.
EOR Visual Inspection	Highland TSF	Quarterly	AFPR	Yes	Dates: March 9, April 10, September 7, and October 26.
Annual Facility Performance Report	Highland TSF	Annual	AFPR	Yes	This report.
Dam Safety Review (DSR)	Highland TSF	Every 5 years	DSR Report	Yes	HVC commissioned DSR in 2022; report was finalized in 2023. Next required in 2027.
Visual Inspection of Beach Length	L-L Dam	Weekly (visual)	HVC Inspection Reports	Yes	At the end of the review period, HVC added beach width confirmation to their weekly surveillance review meeting.
Instrumentation Monitoring					
Pond Level	Highland TSF / 24 Mile TSF	Weekly	Pond Level Tracking Register	Yes	Pond level readings at SWRP and Seepage Pond 2 converted from visual to instrumented pond level readings in 2022.
	Sediment Pond 1 and Sediment Pond 2	Monthly and weekly during freshet			
	SWRP and Seepage Pond 2	Monthly and weekly during freshet	GeoExplorer Database		
Instrumentation – Piezometers	L-L Dam / H-H Dam	Varies [4]	GeoExplorer Database	Yes	There were temporary periods where some piezometers and inclinometers were out of service. However, due to redundancy throughout the system, there was no period when the dam did not have adequate functional instrumentation to monitor performance.
Instrumentation – Inclinometers	L-L Dam / H-H Dam	Varies [4]	GeoExplorer Database	Yes	
Instrumentation – Sondex (Settlement)	H-H Dam	Every 2 Months	Sondex Tracking Register	Yes	–
Instrumentation – Seepage Weirs	L-L Dam	Weekly	HVC Inspection Reports	Yes	–
Surveys					
Construction Record Surveys	L-L Dam / H-H Dam / 24 Mile TSF	Annually	Construction Record Report and Drawings	Yes	Issued as a separate report.
Tailings Pond Bathymetric Surveys	Highland TSF	Twice per year	Facility Performance Report	Yes	Surveys completed on June 5, 2023 and September 25 2023.
Tailings Level (Buffer)	H-H Dam	Weekly	HVC Inspection Reports	Yes	Additional monitoring location added along crest (Sta. 2+270 until October 2023, then moved to Sta. 2+300)
Survey of Beach Length	L-L Dam	Twice per year	HVC Inspection Reports	Yes	Aerial images completed in June and September 2023.

Notes:
1. As defined in OMS Manual (HVC 2022).
2. Visual inspections include pond level measurements and observations for evidence of unusual conditions and/or dam safety concerns (e.g., settlement, sinkholes, slope sloughing, erosion, seepage, piping, etc.).
3. 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 site; and rainfall event greater than the 10-year, 24-hour duration storm: 40 mm (Golder 2020).
4. The monitoring frequency of instruments is defined by the EoR and varies based on several factors such as monitoring purpose, location, and instrument type.

Instrumentation System and Health

Table 5.2 summarizes the functional geotechnical instruments at the L-L Dam and H-H Dam. The number of instruments is sufficient to demonstrate the dam behaviour is within acceptable limits and consistent with design. Instrument locations are shown in Figure 3, Figure 4, Figure 5, and Figure 7. The instrumentation system includes sufficient redundancy to mitigate the impact of an instrument loss.

New instruments installed at the H-H Dam during the review period are summarized in Table 5.3. Instrument installations were planned to be completed during the review period at the L-L Dam to address two AFPR recommendations (Table 8.1): two new piezometers at the South Dam; and reinstating an inclinometer (LL-I15-24) at the VBB. HVC installed the piezometers at the South Dam in March 2024 which is outside of the review period. Therefore, these are not reported in Table 5.3 and not discussed in the South Dam performance summary (Section 5.2.3.3). The installations are mentioned since the associated recommendation (LL-2022-02) has been noted as closed in Table 8.1. HVC has secured the equipment and related contractors to complete the installation of the LL-I15-24 replacement inclinometer in April 2024. Not installing the replacement inclinometer is required for inclinometer redundancy at the VBB and does not represent a gap related to dam safety.

During the review period, KCB and HVC reviewed the standpipe piezometers at the L-L Dam. The majority are either older (i.e., installed in the 1980s or 1990s) or are groundwater monitoring wells. During this review, HVC and KCB identified 19 standpipes that were not required for L-L Dam surveillance and were decommissioned and removed from the monitoring program. Prior to decommissioning an instrument, the EoR reviewed each piezometer and confirmed that the loss of each instrument would not have significant impact on the L-L Dam surveillance program or result in the loss of monitoring data important to ongoing design or model calibrations. Typically, each decommissioned standpipe piezometer met one or more of the following criteria:

- the instrument was redundant (i.e., had a nearby automated piezometer in the same unit and was measuring a similar piezometric level);
- the instrument was providing readings that could not be relied upon as accurate (e.g., the instrument had a blockage in the casing or the casing was damaged below ground); and/or
- the instrument was not collecting information relevant to the performance of the L-L Dam.

At the H-H Dam, 11 piezometers stopped functioning during the review period. All of these instances were as a result of damage during construction or the instrument failed for some other reason. The H-H Dam design is most sensitive to the piezometric levels downstream of the centreline in the Mid-Segment (Sta. 1+250 to Sta. 1+950). The loss of piezometers outside of this area did not have a significant impact on a critical control or verification assumed in the permitted design (KCB 2020a) or risk assessment.

Based on a review by HVC and KCB of piezometer coverage, six additional piezometers were installed at the end of the review period (Table 5.3). These are included in the number of piezometers reported in Table 5.2 but are not shown on Figure 7 or summary plots in Appendix III-B because insufficient readings were collected during the review period to inform the AFPR. These instruments were included in the 2024 update to the OMS Manual.

In addition to the new piezometer installations, five piezometers installed in the beach upstream of the dam were added to the routine surveillance program. These piezometers were installed during a 2018 cone penetration testing (CPT) program.

Table 5.2 Active Geotechnical Instrumentation at the L-L Dam and H-H Dam (November 2023)

Instrument	Type	Reading [1]	L-L Dam		H-H Dam	
			No.	Total	No.	Total
Piezometers	Standpipe	Manual	44	196	0	39
	Converted Standpipe to Vibrating Wire	Automated	53		39	
	Vibrating Wire	Automated	99		0	
Inclinometers	Down-Hole Casing	Manual	14	36	0	5
	ShapeArray (SAA or SAAV) [2]	Automated	22		5	
Settlement	Sondex [3]	Manual	0	0	4	4
Seepage Weir	–	Manual	2	2	0	0

Notes:
1. Automated readings are transmitted through the remote monitoring system to increase data capture and summarize instrumentation.
2. SAA/SAAV are installed in down-hole casing inclinometers over the elevation range defined by the EoR to target the monitoring zone.
3. Sondex settlement monitoring systems were installed at the HH17 series inclinometers.

Table 5.3 Geotechnical Instruments Installed at the H-H Dam During the Review Period

Design Segment	Instrument Type	Instrument ID	Target Monitoring Unit	Primary Purpose
H-H DAM				
Mid-Segment (Buttress)	Vibrating Wire Piezometer	HH-VWP23-01A	Glacial Till	Three holes at the toe of H-H Dam were to provide additional piezometers within waste dump and foundation.
		HH-VWP23-01B	Pit Waste Fill	
		HH-VWP23-02A	Glacial Till	
		HH-VWP22-02B	Pit Waste Fill	
		HH-VWP23-03A	Fan Deposits	
		HH-VWP23-03B	Pit Waste Fill	
	Standard Inclinometer	HH-I23-07	Pit Waste Fill / Foundation	The hole at the crest of H-H Dam was to supplement inclinometer coverage on the dam

Trigger-Action-Response Plan

The Highland TSF surveillance program includes a TARP with four levels that represent conditions of potentially increasing concern ranging from a routine engineering review to a design assumption

deviation, up to initiation of the EPRP. The TARP defines what actions must be taken, within what timeframe, and who is responsible if a defined level is exceeded. Triggers define when a TARP level has been exceeded. Triggers and related instrument threshold values were reviewed and updated by the EoR during the review period.

Instrumentation triggers for the first level of the TARP, referred to as the Notification Level, are based on exceedance of the threshold value at a single instrument. Instrumentation triggers for all other levels of the TARP require an exceedance at multiple instruments and potentially other observations of unusual performance (e.g., visual observation), indicative of a regional rather than a localized response.

No TARP levels, other than the Notification Level, were triggered during the review period. Notification Level exceedances at each dam are summarized in Sections 5.2.3.1 and 5.3.2.1. As discussed above, these exceedances should not be interpreted as an indicator of unacceptable performance or a dam safety concern.

5.2 L-L Dam Performance Summary

5.2.1 Pond Levels and Freeboard

Figure 5.1 plots the measured Highland TSF tailings pond elevation and the L-L Dam crest since December 2018. Figure 5.2 plots pond level and estimated pond volume during the review period. Relative to the annual change measured during the previous five review periods (i.e., December to November), the pond level changes during this review period (Table 5.4) were as follows:

- The peak pond level was 0.9 m higher than the peak pond level measured during 2022; and
- The pond level rose 2.0 m over the review period, which is greater than the average annual rise (1.3 m) but within the measured range for the past 5 years. This is consistent with the 2.7 Mm^3 increase in estimated pond volume (Table 4.2).

Table 5.4 Highland TSF Changes in Pond Elevation During the Review Period

Annual Measured Change (Relative to Prior Year)	Reporting Period	Range of Annual Pond Level Change Over The Past 5 Years (Assuming Dec. to Nov. Review Period)
Peak Pond Level	0.9 m	0.4 m to 2.4 m (avg. 1.3 m)
Pond Level at End of Review Period	2.0 m	0.6 m to 2.4 m (avg. 1.3 m)

Figure 5.1 Highland TSF Tailings Pond and Crest Elevations: Dec. 2018 to Nov. 2023

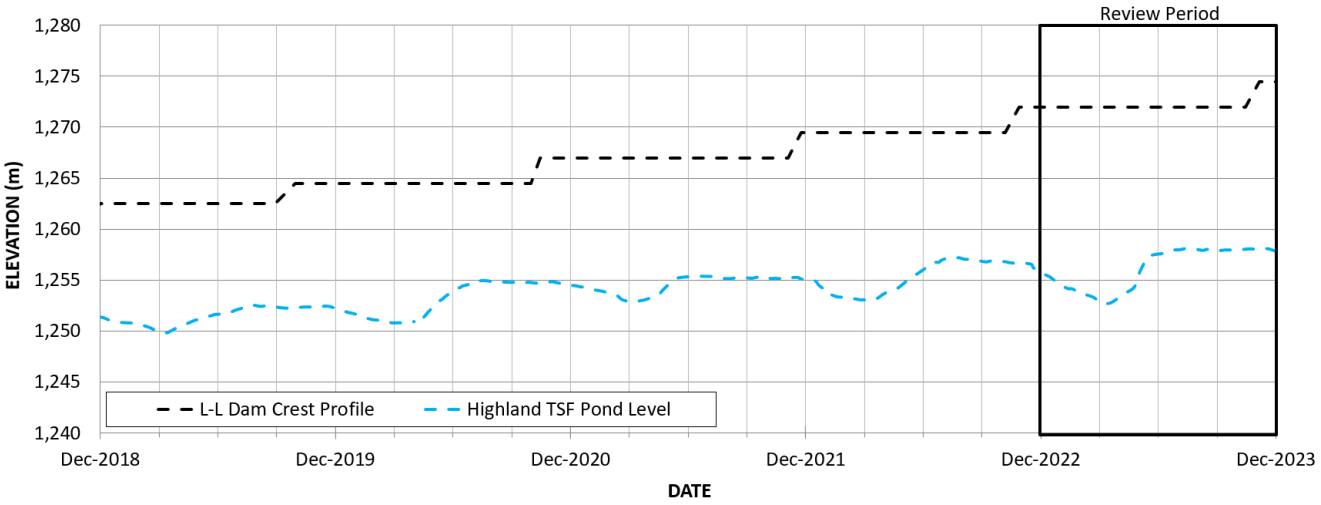
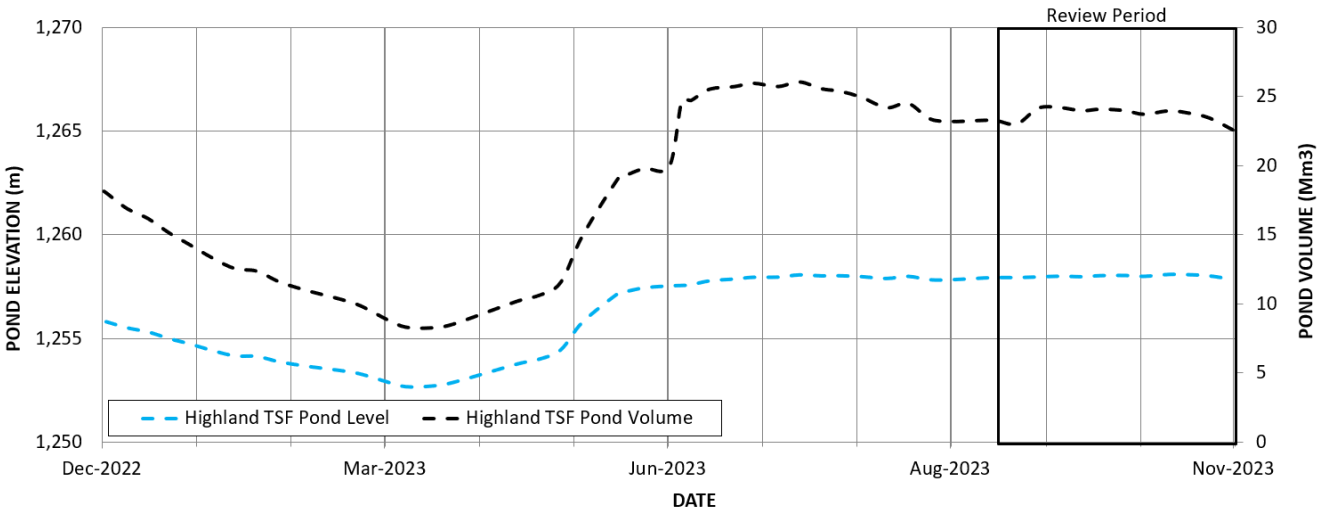


Figure 5.2 Highland TSF Pond Elevation and Estimated Volume During the Review Period



The minimum freeboard measured during the review period at the L-L Dam and the downstream ponds are summarized in Table 5.5. Minimum freeboard requirements were met at all facilities during the review period. The minimum freeboard measured at the L-L Dam (12.3 m) was measured in July at peak pond level, prior to completion of the 2023 crest raise. The freeboard at the L-L Dam at the end of the review period (16.5 m) was 0.5 m greater than at the start of the review period.

Table 5.5 Summary of Freeboard Requirements and Minimum During the Review Period

Facility	Minimum Freeboard		
	Required During IDF[1]	Predicted During Peak Design Flood Level	Observed During the Review Period
Highland TSF (L-L Dam)	2.0 m	8.6 m [2]	12.3 m [3]
Seepage Pond 2	0.5 m	0.5 m	1.5 m
Sediment Pond 2	0.5 m	0.5 m	1.5 m
Seepage Water Reclaim Pond	0.5 m	see Note 4	5.0 m

Notes:
1. Refers to the minimum vertical distance between peak pond level during the IDF and the low point of the crest.
2. The minimum estimated freeboard at the L-L Dam, if the IDF had occurred at peak 2023 pond level (July 2023) and the L-L Dam crest elevation at the time (El. 1272.0 m).
3. Based on peak 2023 pond level (El. 1258.1 m, November 2023) and the L-L Dam crest elevation at the time (El. 1272.0 m).
4. During the IDF, water from the SWRP would flood the adjacent area, mainly Sediment Pond 1, potentially impacting HVC operations but resulting in no off-site discharge. The peak flood level during the IDF (El. 1105.3 m) is 2.7 m below the elevation required to discharge off-site (El. 1108.0 m, crest of downstream Laura Lake public road).

HVC has defined pond alert levels for the downstream sediment and seepage ponds that, if exceeded, trigger escalating action to mitigate flooding-related risks (e.g., increased monitoring, active measures to drawdown pond level). All alert levels are defined in the revised OMS Manual (HVC 2022), and none were exceeded at any of the ponds during the review period.

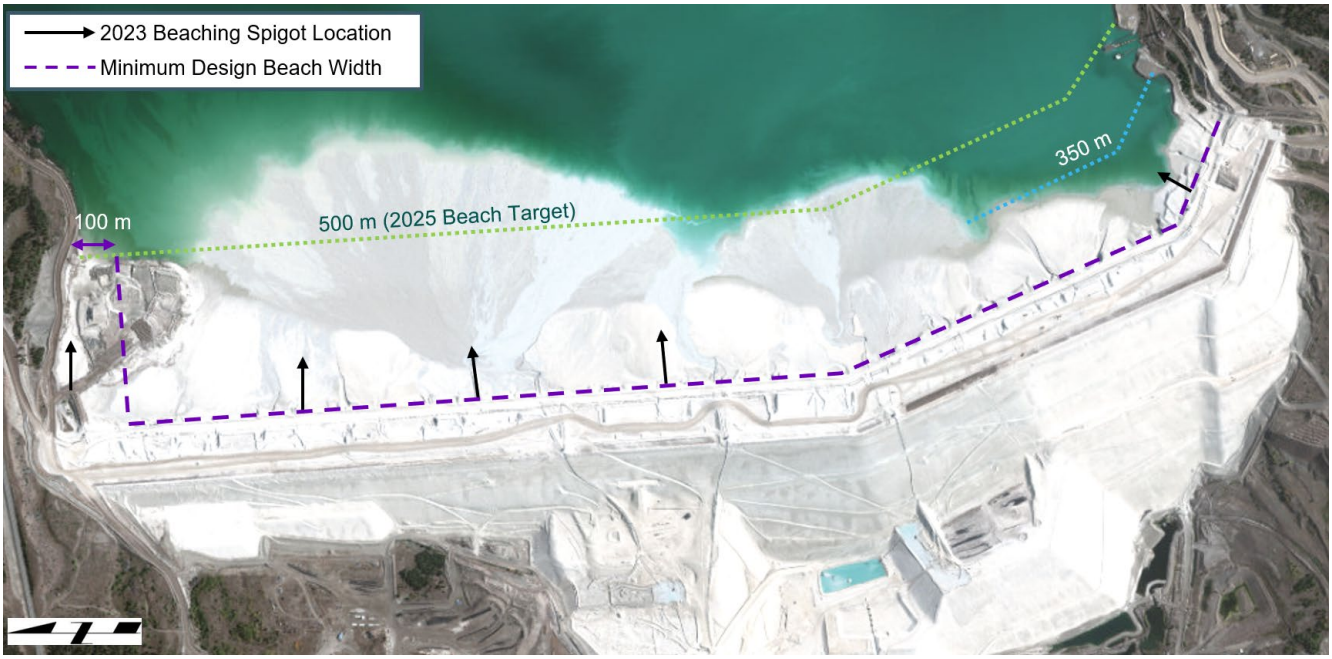
5.2.2 Beach Width

The minimum beach widths required by the design (KCB 2020a), under normal operating pond levels, were met throughout the review period (Figure 5.3): 500 m (minimum) at the north abutment, and 126 m (minimum) along the remainder of the crest.

The increased beach width at the north abutment is required to reduce seepage flows and gradients through the foundation in this area (see Section 7.4.2). During the review period, the beach width requirement was maintained by a combination of spigotted tailings and a waste pile of foundation preparation spoils and overflow sediments from hydraulic placement.

HVC is targeting a 500 m-wide beach along the length of the dam, exceeding design requirements, as a further risk reduction measure. During September 2023 (Figure 5.3), the pond level was approximately 0.2 m below the peak pond level, and the beach width north of Sta. 1+600 was at, or near, the 500 m target. Beach development at the South Dam is limited by the location of the reclaim barge, which is scheduled to be relocated in 2024.

Figure 5.3 Status of the L-L Dam Beach as of September 2023



5.2.3 Instrumentation Trends

5.2.3.1 Overview

This section provides an overview of measured piezometric and deformation behaviour at the L-L Dam, based on instrumentation readings, during the review period. November 2023 instrumentation readings are shown on select design cross sections of the L-L Dam (Figure 11 to Figure 19). The L-L Dam instrumentation system is summarized in Table 5.2. Summary plots of instrumentation readings are included in Appendix II-A (piezometers) and Appendix II-B (inclinometers).

The accuracy of manually read down-hole casing inclinometers reported by the manufacturer is +/-2 mm over a 25 m length. This can be significant when interpreting typical deformation rates measured at the L-L Dam (<1 mm/month). Inclinometer plots are interpreted by HVC and KCB as part of routine surveillance. Deformation rates are typically calculated based on the most recent three or more readings. This helps to filter out the influence of outlier readings related to the measurement method. Over the past five years, HVC has started to use in-place ShapeArrays (SAAV) at priority monitoring locations (e.g., near the dam toe or used to implement the Observational Method at the VBB), which have demonstrated a higher accuracy in practice (i.e., less variance between readings).

5.2.3.2 Instrument Threshold Exceedances

During the review period, threshold value exceedances were measured at 16 instruments. Each of the exceedances were reviewed by the EoR, as per the OMS Manual (HVC 2022) and none were elevated to a higher level of the TARP or required mitigative action at the dam.

Following EoR review, eight of the instrument exceedances were confirmed to be not representative of dam behaviour of the dam and were the result of a measurement reading error, incorrect tip elevation applied to the reading, or a processing error.

The remaining eight were confirmed as Notification Level exceedances; all measured by piezometers. As discussed in Section 5.1, exceedance of a Notification Level does not represent a dam safety concern or unacceptable performance but requires a review by the EoR. None of the exceedances were elevated to a higher level of the TARP or required mitigative action be taken at the dam.

A discussion of the exceedances at each instrument, not related to measurement error, is included in the performance summary of the corresponding dam segment in the following sections.

5.2.3.3 South Dam

On Figures 11 and 12, the November 2023 instrumentation readings near Sta. 1+050 and Sta. 1+200 are projected onto a dam cross section. As shown in Figure 8, the only construction activity in the South Dam segment during the review period was a crest raise and foundation preparation at the abutment. The downstream shell has been built to ultimate configuration.

Piezometers

Measured piezometric levels at the South Dam are shown on Figure II-A-1 and Figure II-A-2 (past 2 years) and Figure II-A-101 and Figure II-A-102 (past 5 years) in Appendix II-A.

Overall behaviour during the review period was consistent with the expected behaviour and conditions assumed in the design. Seepage through the dam generally flows north, within the underdrain system, towards the VBB and the downstream collection ponds.

South of Sta. 1+100

Figure 5.4 plots measured response at select piezometers near Sta. 1+050 since December 2021 to show typical behaviour in this segment of the dam. Since downstream hydraulic placement was completed near the south abutment in 2019, piezometric levels have generally fluctuated similar to the pond level upstream and near the core zone. As expected, the piezometric levels upstream of the core zone fluctuate more than the response measured downstream of the core zone in the dam fill or foundation (e.g., response at LL-VWP02-04 compared to LL-VWP02-03 and LL-VWP10-11A).

Where these instruments are located, the starter dam was initially raised entirely with glacial till fill (i.e., no hydraulic cycloned sand). Piezometer LL-VWP17-03C is installed within the glacial till fill downstream of the centreline. The piezometric level measured by LL-VWP17-03C is more similar to the piezometric level upstream of the core zone (LL-VWP02-04) compared to other piezometers in the downstream shell. Therefore, LL-VWP17-03C is inferred to be representative of the piezometric level measured within the glacial till fill core zone.

The beach width upstream of the South Dam has fluctuated over the past three years: approximately 225 m in 2021; approximately 170 m in 2022; and approximately 200 m during this review period. However, the measured piezometric response, relative to pond level change, was similar during this period (Figure II-A-102). This suggests that the core zone, and not the beach, is acting as the primary seepage control measure at the south abutment and the beach width fluctuations have not had a significant impact on downstream piezometric response.

Sta. 1+100 to Sta. 1+600

Piezometers in this segment of the dam were relatively stable throughout the review period, which is consistent with expected performance now that downstream hydraulic placement has been completed in this area of the dam.

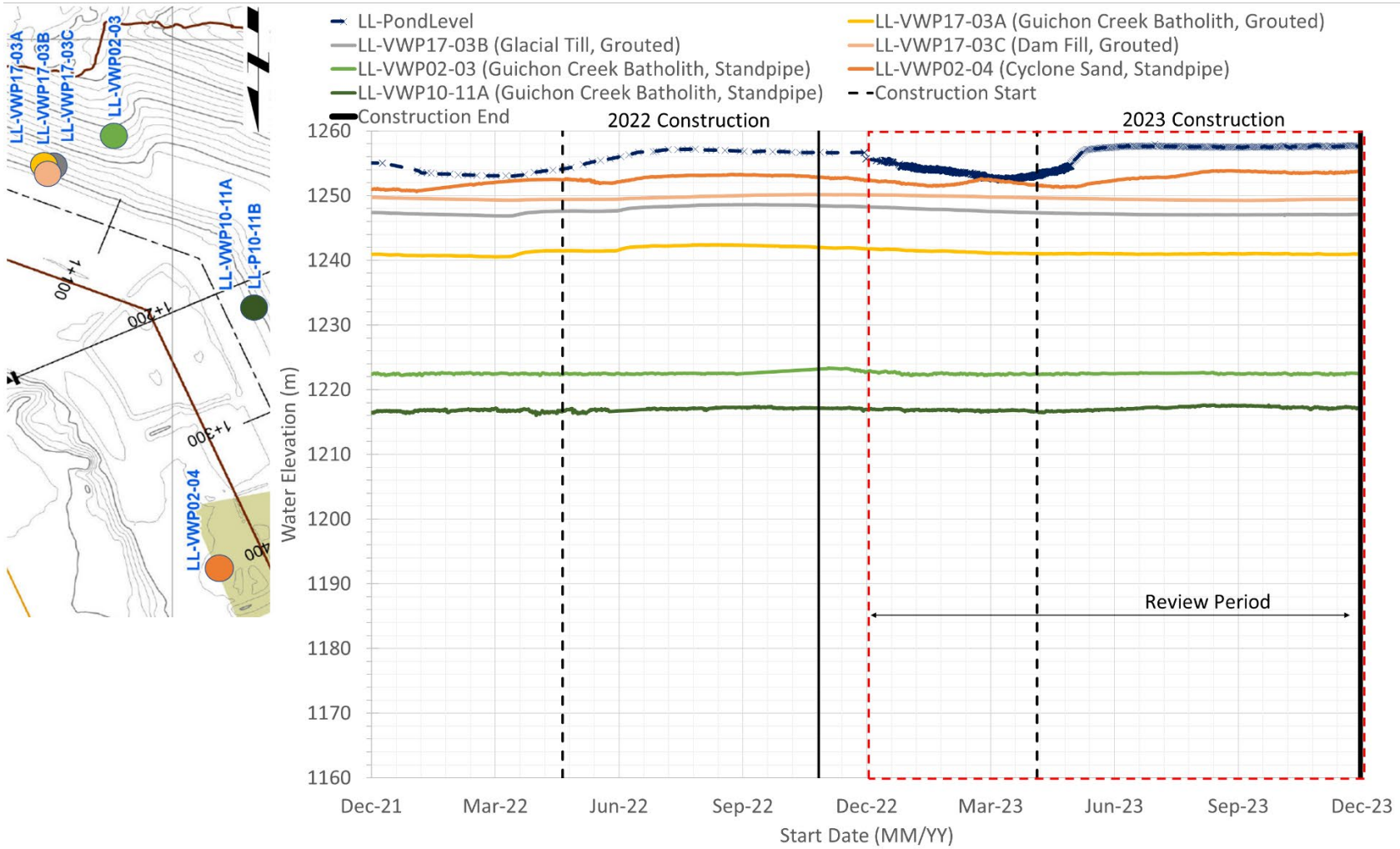
Inclinometers

A summary of inclinometer readings from December 2021 to November 2023 are shown on Figure II-B-1 and Figure II-B-2 in Appendix II-B.

Inclinometers located in the South Dam (LL-I10-01 and LL-I10-08) target deformation near the base of the fill and in the foundation above bedrock. Measured deformations were consistent with typical behaviour through the review period, with no defined shear or deformation zones of concern.

In some cases, the inclinometer casing has been raised through the dam fill by placing an outer corrugated pipe around the casing to separate it from the dam fill. This prevents compaction and settlement of the fill from damaging the casing, which was a reoccurring issue in the past. Some inclinometers raised in this manner, for example, LL-I10-01 (refer to Figure II-B-1), indicate deformation through the compacted fill. However, this is due to the inclinometer casing moving within the open annulus between it and the outer pipe. This is not reflective of actual deformations within the fill, which is compacted to the target density confirmed by quality control and quality assurance testing.

Figure 5.4 Measured Piezometric Response at the South Dam (Sta. 1+050): December 2021 to November 2023



5.2.3.4 Valley Buttress Berm

On Figure 13, the November 2023 instrumentation readings near Sta. 1+850 are projected onto a dam cross section. As shown in Figure 8, construction activity in the VBB area during 2023 included a crest raise and hydraulic fill placement at the downstream toe. The downstream shell of the VBB has now been completed to the ultimate configuration.

Piezometers

Measured piezometric levels at the VBB are shown on Figure II-A-3 to Figure II-A-6 (past 2 years) and Figure II-A-103 to Figure II-A-106 (past 5 years).

Overall behaviour during the review period was consistent with the expected behaviour, based on construction activity and the conditions assumed in the design. The drainage blanket at the VBB is the low point of the L-L Dam, where the majority of seepage through the downstream shell reports and discharges to the downstream collection ponds.

Measured piezometric levels since December 2021 from select piezometers in the drainage blanket at the VBB are shown in Figure 5.5. Piezometric levels in these units were steady or dissipated during the review period. Hydraulic placement at the toe of the VBB, the primary seepage area for the drainage blanket, reversed the dissipation trend and resulted in a modest rise measured by the piezometers. Piezometric levels at the end of the review period were lower than at the start. Overall, the piezometric levels in the drainage blanket and Lacustrine unit are consistent with historic levels for similar levels of hydraulic placement activity.

The piezometric level measured in the drainage blanket, nearest to the core zone (e.g., LL-VWP17-06E, Figure 5.5) is more than 140 m lower than the pond level and more than 130 m lower than the piezometric level measured upstream of the core zone (e.g., LL-VWP02-04, Figure 5.4). This demonstrates the core zone and cutoff into the foundation is an effective seepage control and is performing as per design.

The Lacustrine unit is present below the L-L Starter Dam but has been excavated from the cycloned sand shell. Historically, piezometric response in the Lacustrine unit has been similar to that of the drainage blanket and that pattern continued during the review period. This is because the drainage blanket was placed against the excavation face of the Lacustrine unit, leading to both materials being hydraulically connected through horizontal flow.

Piezometric levels within the Glacial Till and Lower Sand and Gravel continued to show no response to rising pond levels (Figure II-A-6). Shallow Glacial Till piezometers near the VBB toe did measure a piezometric rise during hydraulic placement at the VBB and VBBE. A similar response was measured during 2022 hydraulic placement. The piezometric response was interpreted to be due to the presence of the gravel Major Drain that was excavated in the Glacial Till during 2021 through this area.

The piezometric response in the Glacial Till is not associated with loading, because the dam fill load at these locations is less than the preconsolidation pressure, and some of the instruments are downstream of the active placement area. The stability of the VBB is not sensitive to the magnitude of piezometric response measured in the Glacial Till and the piezometric rise measured during the review period was less than measured during 2022. When hydraulic placement was completed, the piezometric levels started to dissipate.

Pore pressures in the Upper-Glaciolacustrine (U-GLU) and Lower-Glaciolacustrine (L-GLU) at the VBB have typically responded to construction loading once the applied load of the dam is near or exceeds the preconsolidation pressure applied by the glacier. When the applied dam load is significantly less than the preconsolidation pressure, no significant pore pressure response to loading has been measured.

One piezometer (LL-VWP15-24B) in the L-GLU measured a piezometric rise during fill placement at the VBB toe between May 2023 and August 2023. When fill placement activities temporarily moved away from the area or were completed for the year, piezometric pressures at LL-VWP15-24B dissipated. The maximum piezometric rise measured was approximately 2.2 m, with nearly half of it dissipating by the end of the review period. The piezometric rise did not exceed the Notification Level threshold and the ratio of piezometric response to fill load was less than is assumed in design analysis. A temporary increase in deformation rate was measured during this period at the inclinometers nearest to the piezometer (LL-I15-27 and LL-I17-10, Figure 5), as discussed below.

There was no loading of the upper slope or the mid-bench of the VBB during the review period. Consistent with expected performance, piezometric levels in this area were steady, or continued dissipating pore pressure induced during previous loading in 2018 and 2019 (Figure 5.7).

Figure 5.5 Measured Piezometric Response at the VBB Dam Fill and Shallow Foundation: December 2021 to November 2023

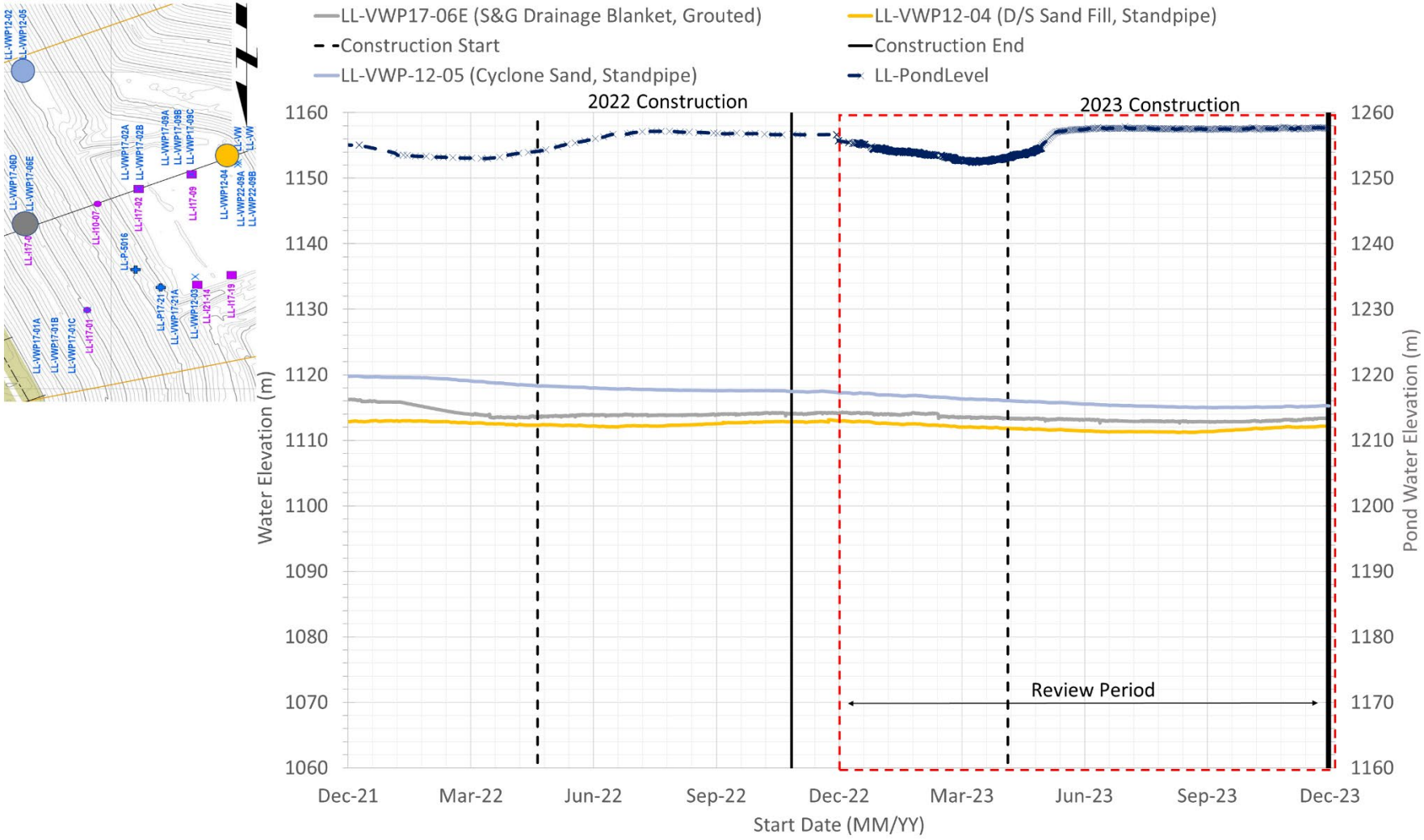


Figure 5.6 Measured Piezometric Response at the VBB L-GLU and U-GLU Near Dam Toe: December 2021 to November 2023

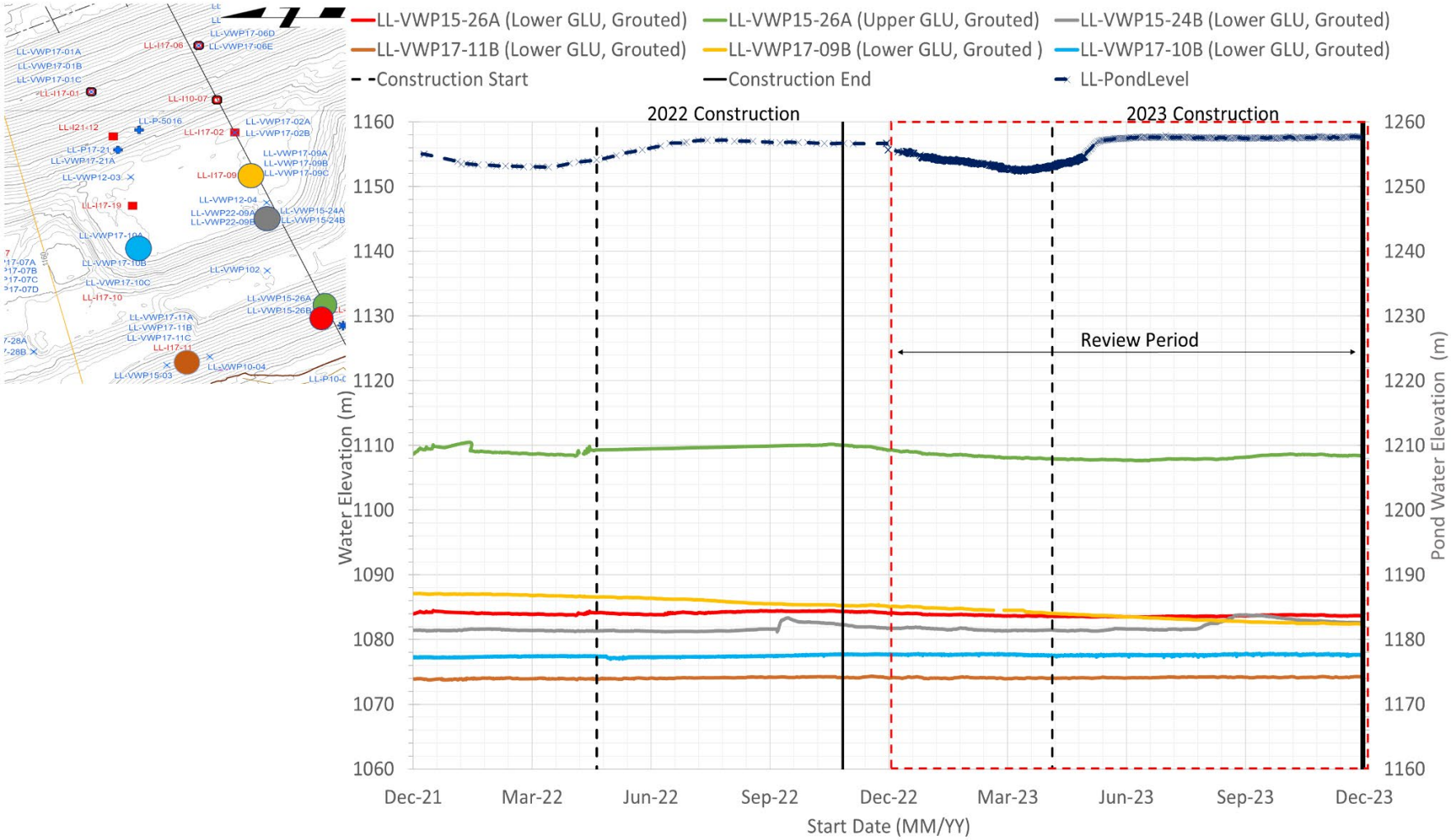
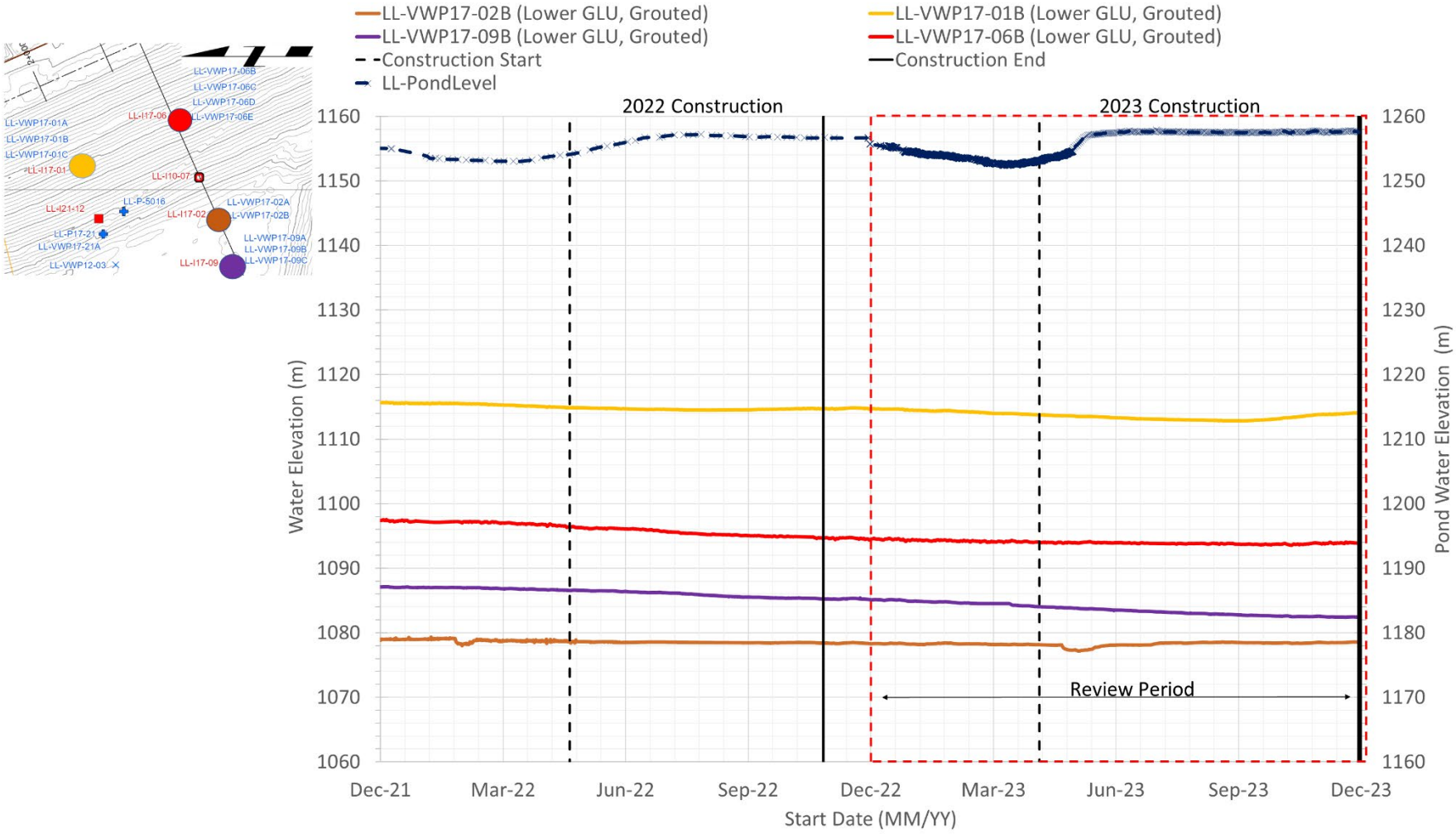


Figure 5.7 Measured Piezometric Response at the VBB L-GLU Below Upper Slope: December 2021 to November 2023



Inclinometers

A summary of inclinometer readings from December 2021 to November 2023 are shown on Figure II-B-3 to Figure II-B-12 in Appendix II-B.

The permitted design of the VBB (KCB 2020a) is governed by the L-GLU, which is continuous beneath the VBB. Based on a calibrated stress-deformation model, ongoing deformations in the L-GLU are expected by the Contingency Case Threshold Inclinometers (yellow zone) shown in Figure 5.8. These deformations are not expected to progress to the toe (i.e., referred to as the deformations being contained). Therefore, negligible deformations are expected to be measured by the Downstream Inclinometers (red zone) shown in Figure 5.8. This is consistent with measured behaviour summarized in Table 5.6 and shown on Figure II-B-3 to Figure II-B-12, which show a significant difference in behaviour measured by inclinometers within the yellow and red zones shown in Figure 5.8.

The magnitude of deformation measured within the L-GLU during the review period was also consistent with expectations based on predictions from the stress-deformation modelling and recent deformation trends. Deformations measured by the Contingency Case Threshold Inclinometers below the upper slope are related to crest raise and increased load from the rising tailings level in the impoundment.

Figure 5.8 VBB Inclinometer Location ID

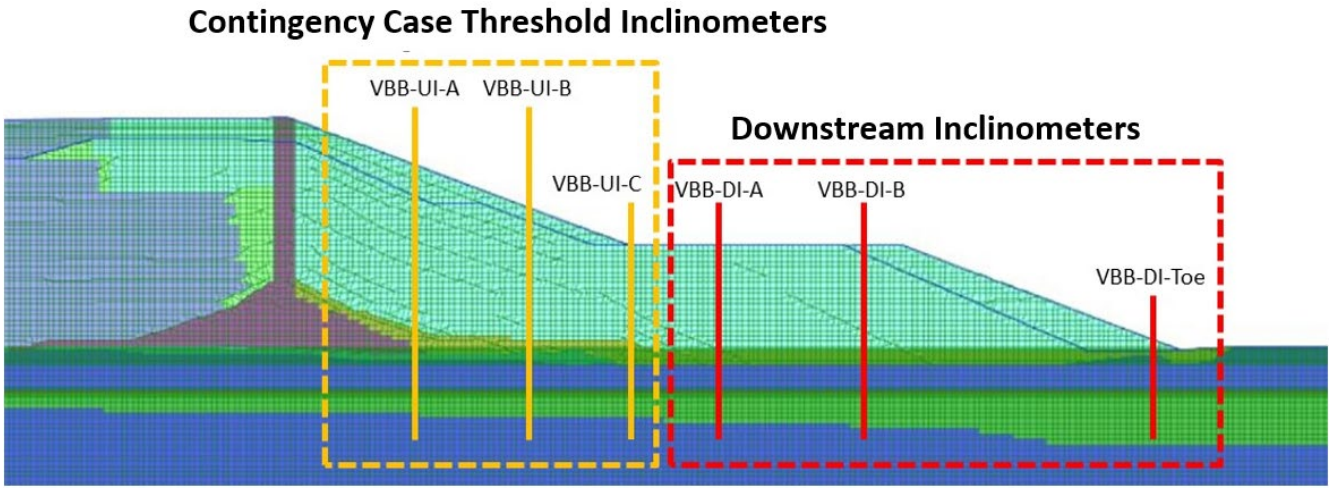


Table 5.6 Summary of Average Deformation Rate in the VBB Foundation L-GLU

Inclinometer	Measurement	Average 2021 Deformation Rate	Average 2022 Deformation Rate	Average 2023 Deformation Rate
Contingency Case Threshold Inclinometers				
LL-I17-06	SAAV	4 mm/year	5 mm/year	4 mm/year
LL-I17-01	SAAV	3 mm/year	3 mm/year	2 mm/year
LL-I10-07	Manual/SAAV	4 mm/year	0 to 2 mm/year	0 mm/year
LL-I17-02	Manual	0 mm/year	0 mm/year	0 mm/year
Downstream Inclinometers				
LL-I17-09	Manual	0 mm/year	0 mm/year	0 mm/year
LL-I17-19	Manual	1 mm/year	1 mm/year	1 mm/year
LL-I17-10	Manual/SAAV	n/a	0 mm/year	0 mm/year
LL-I15-27	SAAV	0 mm/year	0 mm/year	0 mm/year
LL-I17-11	SAAV	0 mm/year	0 mm/year	0 mm/year

Starting in October 2022, the deformation rate measured in the L-GLU by LL-I17-01 and LL-I17-06 had reduced and this continued through the review period. The reduction coincides with additional fill being placed at the VBB toe. Placing additional weight at the toe is interpreted to have reduced movements below the upper slope. This is consistent with expected performance based on design.

As mentioned above, during loading at the VBB toe, a temporary piezometric rise was measured at LL-VWP15-24B (Figure 5.6). During the same loading period, a temporary increase in deformation rate within the L-GLU was measured at LL-I15-27 and LL-I17-10 (Figure 5) near the fill placement area. The increased deformation rate did not exceed Notification Level thresholds and attenuated after loading was complete. The deformation was a response to loading and not development of a shear plane within the L-GLU.

Since mid-2022, inclinometer LL-I10-07 has been measuring outlier behaviour in the Glacial Till and Lacustrine deposits. A SAAV is installed at this location. HVC investigated the outlier readings with the SAAV manufacturer Measurand. They confirmed that the SAAV is working within the acceptable limits of the device but, based on their experience, they believe compression stresses acting on the casing is resulting in a bent/helix shape that extends through the Lacustrine and underlying Glacial Till. KCB reviewed their interpretation and agreed this seems reasonable as there are no other indicators from nearby instruments or loading that this deformation is related to shear within these units. This feature does not appear to extend through the L-GLU that is underlying the Glacial Till at LL-I10-07. Based on this, deformations through the Lacustrine and Glacial Till at LL-I10-07 are not monitored for indication of dam performance.

Status of Observational Method Implementation

The design of the VBB (KCB 2020a) is based on two interpretations of the L-GLU deposit beneath the dam:

- Most Likely Case (MLC); and
- Reasonably Worse Case (RWC).

The VBB design is stable with acceptable performance (i.e., deformations within the L-GLU are contained) for MLC and RWC conditions. The VBB meets the factor of safety (FOS) criteria specified by the HSRC (EMLI 2022) under MLC conditions (KCB 2020a). If measured deformations within the L-GLU are appreciably less favourable than those predicted by the calibrated stress-deformation model under MLC conditions, an extension to the VBB, referred to as the Contingency Case, is to be built. The sole purpose of the Contingency Case is to raise the FOS to meet the HSRC (EMLI 2022) criteria. Implementation of this design approach is based on the Observational Method (Peck 1969) as described in the design report (KCB 2020a).

The deformation rates summarized in Table 5.6 remain consistent with predictions for MLC conditions and were below triggers that would initiate construction of the Contingency Case.

5.2.3.5 Valley Buttress Berm Extension

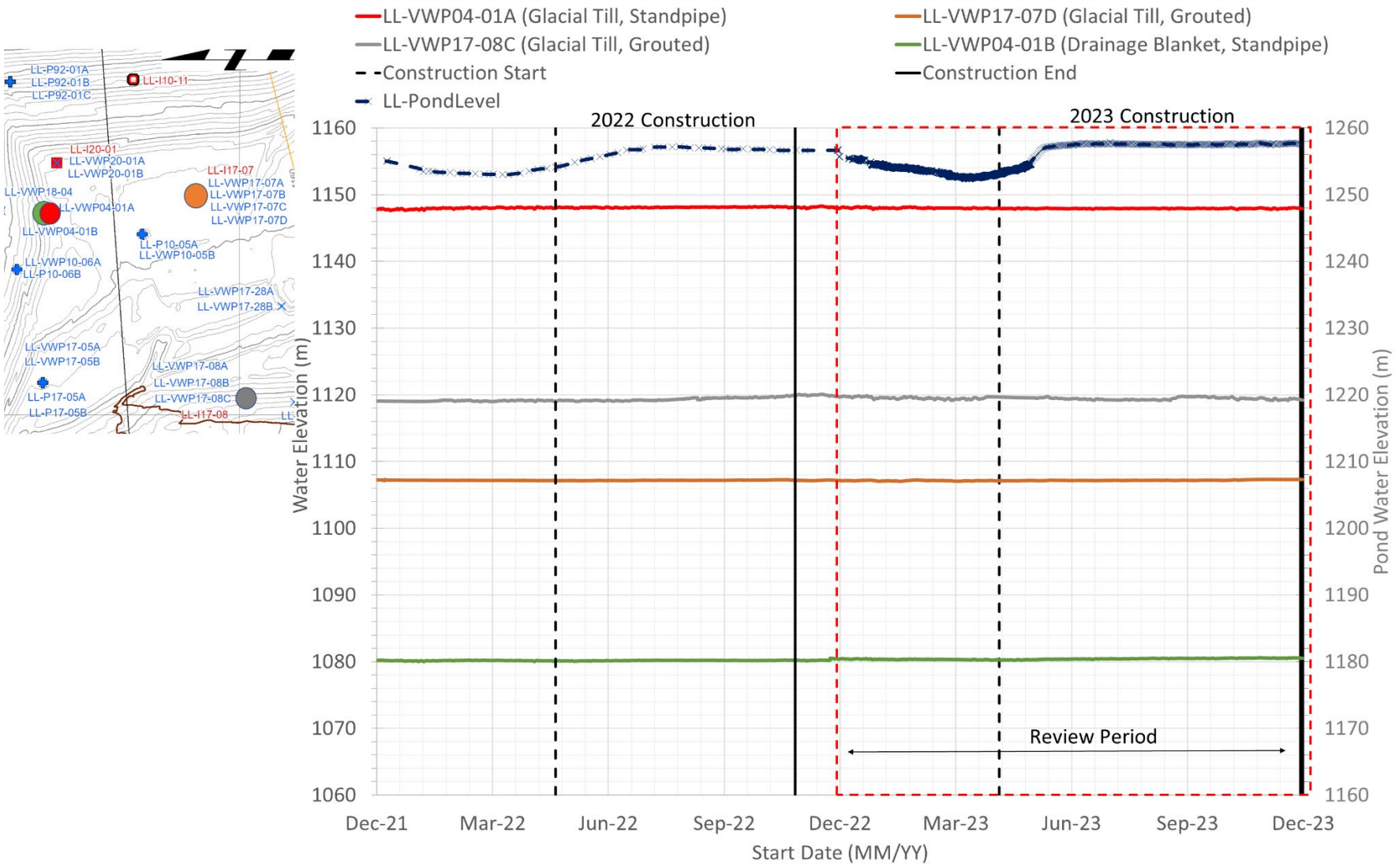
On Figure 14, the November 2023 instrumentation readings near Sta. 2+250 are projected onto a dam cross section. As shown in Figure 8, construction activity in the VBBE area during 2023 included a crest raise, hydraulic fill placement at the downstream toe, and operation of the temporary on-dam sediment storage cell.

Piezometers

Measured piezometric levels at the VBBE are shown on Figures II-A-7 and II-A-8 (past 2 years) and Figures II-A-107 and II-A-108 (past 5 years) in Appendix II-A. Overall behaviour during the review period was consistent with the expected behaviour and conditions assumed in the design. Seepage through the VBBE downstream shell is generally south, towards the VBB, following natural topography.

Measured piezometric level of select typical piezometers at the VBBE since December 2021 are shown in Figure 5.9. The piezometric levels in the VBBE dam fill and foundation remained steady throughout the review period with no Notification Level threshold exceedances. Temporary piezometric responses were measured at some piezometers near the on-dam temporary sediment cell which was in use at the time. Temporary rises were followed by a period of dissipation. Piezometric levels in the dam fill and foundation at the VBBE at the start and end of the review period were similar. One exception was LL-VWP15-02, which measured piezometric pressure dissipation from 2022 construction activity throughout the year.

Figure 5.9 Measured Piezometric Response in the Foundation of the VBBE: December 2021 to November 2023



Inclinometers

A summary of inclinometer readings from December 2021 to November 2023 are shown on Figure II-B-13 to Figure II-B-16 in Appendix II-B.

Measured deformations at the VBBE were consistent with typical behaviour through the review period, with no defined shear or deformation zones of concern. The measured inclinometer response continues to support the interpretation that the mudstone layers present in the NBB foundation do not extend beneath the VBBE.

Based on the geologic characterization, Glaciolacustrine (GLU) deposits are present in the VBBE foundation but are not continuous. Consistent with that interpretation, a lens of GLU is identified between the bedrock and the Lower Sand and Gravel at inclinometer LL-I10-11 (located mid-slope). This is characterized as a lens, not a continuous layer, as it cannot be traced in adjacent drillholes or inclinometers (e.g., LL-I17-07 and LL-I17-08). During the review period, less than 1 mm of movement was measured within this zone, which is less than that measured during 2022 but consistent with historic performance.

5.2.3.6 North Buttress Berm

On Figure 15 and Figure 16, the November 2023 instrumentation readings near Sta. 2+564 and Sta. 2+690 are projected onto a dam cross section. As shown in Figure 8, construction activity in the NBB area during 2023 included a crest raise, placement at the toe and mid-bench, and operation of the temporary on-dam sediment storage cell.

Piezometers

Measured piezometric levels at the NBB are shown on Figure II-A-9 to Figure II-A-11 (past 2 years) and Figure II-A-109 to Figure II-A-111 (past 5 years). Overall behaviour during the review period was with conditions assumed in the design. However, a greater than expected piezometric rise was measured in the foundation, beneath the downstream slope hydraulic placement areas. Following review by the EoR, this piezometric response is consistent with geology and measured performance when hydraulic fill placement was most recently placed in this area during 2015.

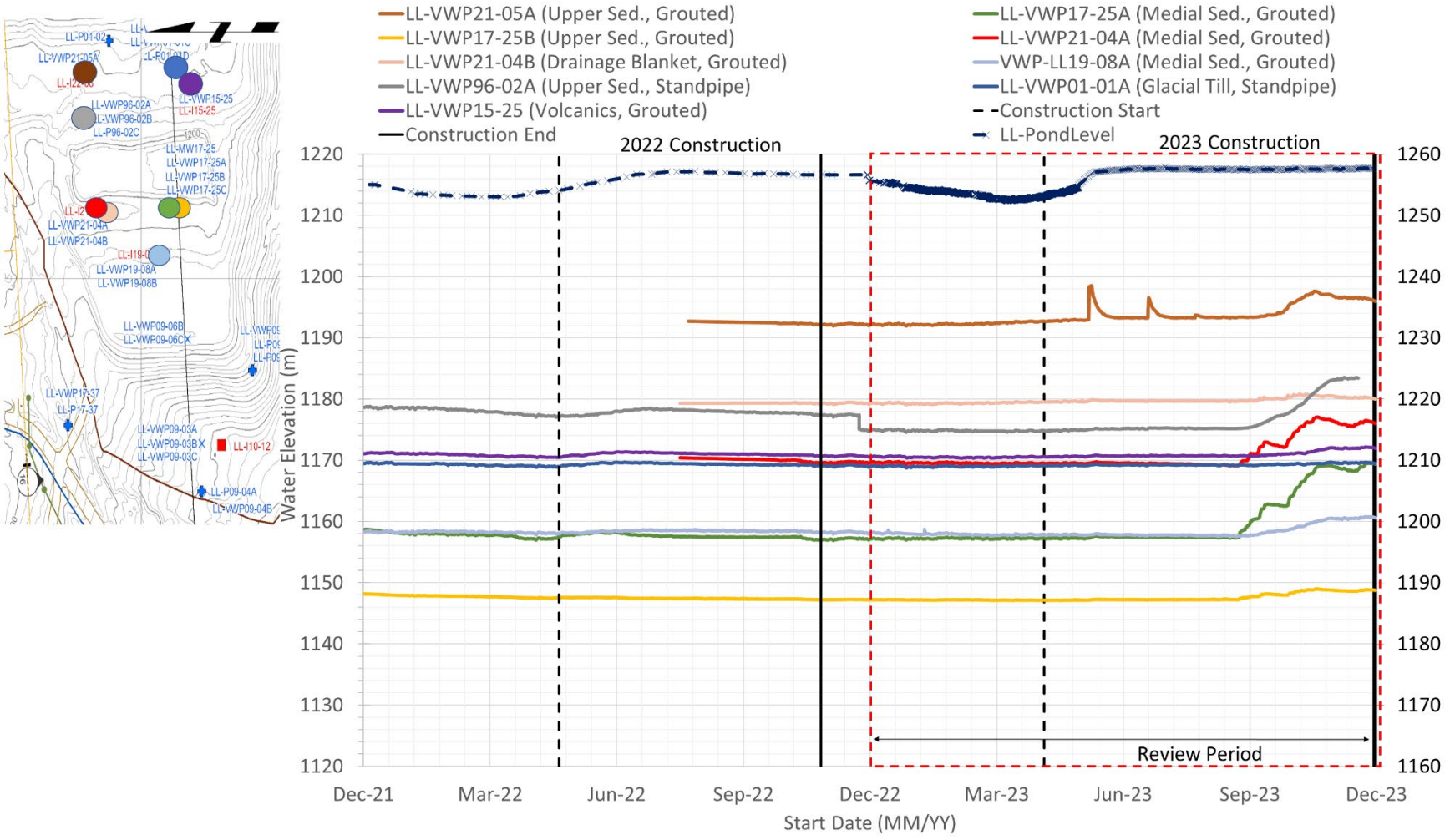
Prior to August 2023, piezometric levels in the foundation remained generally steady, which is consistent with the past several years. Temporary piezometric rises were measured at LL-VWP21-05A (refer to Figure 5.10) installed in the Upper Sedimentary bedrock unit when water was temporarily ponded in a low area on the north side of the NBB.

Hydraulic placement commenced at the NBB in late August 2023. Shortly after, a piezometric rise was measured by several piezometers in the foundation below and downslope of the hydraulic placement area (refer to Figure 5.10). This rise continued through to the end of the review period as hydraulic placement continued. Similar to other areas of the dam, when hydraulic placement temporarily stopped piezometric levels would dissipate.

The piezometric rise measured during the review period in the Glacial Till and in the Volcanic bedrock was less than 5 m. This is consistent with the magnitude of piezometric rise measured during hydraulic placement in 2015. There is an area of the foundation, below the hydraulic placement area at the NBB mid-bench, where the dam fill is constructed directly on bedrock. In this area, a larger piezometric rise was measured in the Sedimentary bedrock units, from 2 m up to 12 m at LL-VWP17-25A (Figure 5.10). Even with this magnitude of piezometric rise, they remain consistent with those assumed in design analysis (i.e., piezometric level was assumed to be at original ground level) and the overall direction of seepage gradients in the foundation remains unchanged.

This piezometric response to hydraulic placement was the cause for six of the Notification Level exceedances during the review period.

Figure 5.10 Measured Piezometric Response in the Foundation of the NBB Upstream of Hydraulic Placement: December 2021 to November 2023



Inclinometers

A summary of inclinometer readings from December 2021 to November 2023 are shown on Figure II-B-17 to Figure II-B-25 in Appendix II-B.

Deformation along discrete shear planes within the mudstone layers has been measured in the foundation near the upper bench of the downstream slope (e.g., LL-I17-24) since the early 1990s and based on design are expected to continue. The mudstone layers are within the Medial Sedimentary bedrock unit and govern the design of the NBB. The NBB buttress is required to increase shear resistance along the mudstone layers.

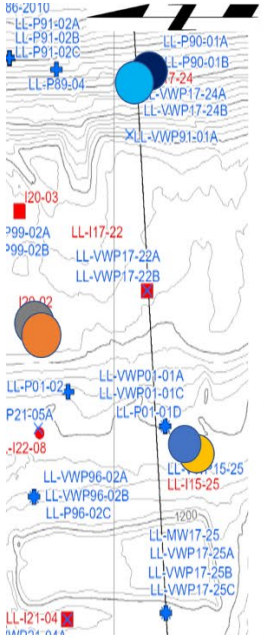
Typically, deformation rates increase temporarily during construction loading, and then decrease after loading is completed. Deformations measured along the known mudstone layers, referred to as Zone A and Zone B, at LL-I17-24 followed this pattern during the review period (Figure 5.11 and Table 5.7). Deformation along these layers has been measured since the 1990s and is expected to continue based on design and deformation modelling. No new deformation zones were measured at this location.

Other inclinometers installed in the upper NBB slope, downstream of LL-I17-24, include LL-I20-03, LL-I20-02, LL-I17-22, LL-I22-08 and LL-I15-25. Mudstone layers have been logged at each of these locations, except LL-I17-22 where the Medial Sedimentary unit is interpreted to have been eroded away and infilled with Glacial Till (Figure 15). These inclinometers are measuring deformations characteristic of a mudstone layer (i.e., along a thin shear plane similar to LL-I17-24). For example, the deformations measured across the length of the Volcanics and Medial Sedimentary bedrock units at LL-I20-02 and LL-I15-25 are plotted on Figure 5.11. The deformations at LL-I20-02 and LL-I15-25 over the review period are much less than the Zone A and Zone B mudstone layers at LL-I17-24 and are measured over vertical lengths of 15 m or more (Figure II-B-19 and Figure II-B-22). In contrast, the deformations along the Zone A and Zone B mudstone layers at LL-I17-24 are measured along discrete planes (Figure II-B-21).

Starting in October 2023, deformation was measured in the Volcanic bedrock unit at LL-I15-25 as shown on Figure 5.11. There as ongoing hydraulic placement on the mid-bench of the NBB near this instrument during this period. However, the direction of movement was predominantly in the upstream direction (i.e., negative direction along the A-axis of Figure II-B-19). The overall movement is characteristic of a casing “tilt” rather than movement along a discrete plane. Based on these observations the deformation measured at LL-I15-25 is interpreted as a localized impact of fill placement on the casing itself rather a shear movement in the foundation.

The only location below the upper NBB slope where measured deformation appeared characteristic of a mudstone layer (i.e., along a defined plane) was at LL-I22-08 near El. 1166 m (Figure II-B-25). However, this was measured in the Volcanic bedrock, above the Medial Sedimentary, where mudstone layers have not been identified. In addition, despite the inclinometer being within the mid-bench hydraulic placement area (Figure 4), the deformation rate did not fluctuate with loading which would be expected if this was a mudstone layer. Therefore, further monitoring will be required to confirm whether this is a mudstone layer.

Figure 5.11 NBB Inclinometers Foundation Deformation Upper Slope: December 2021 to November 2023



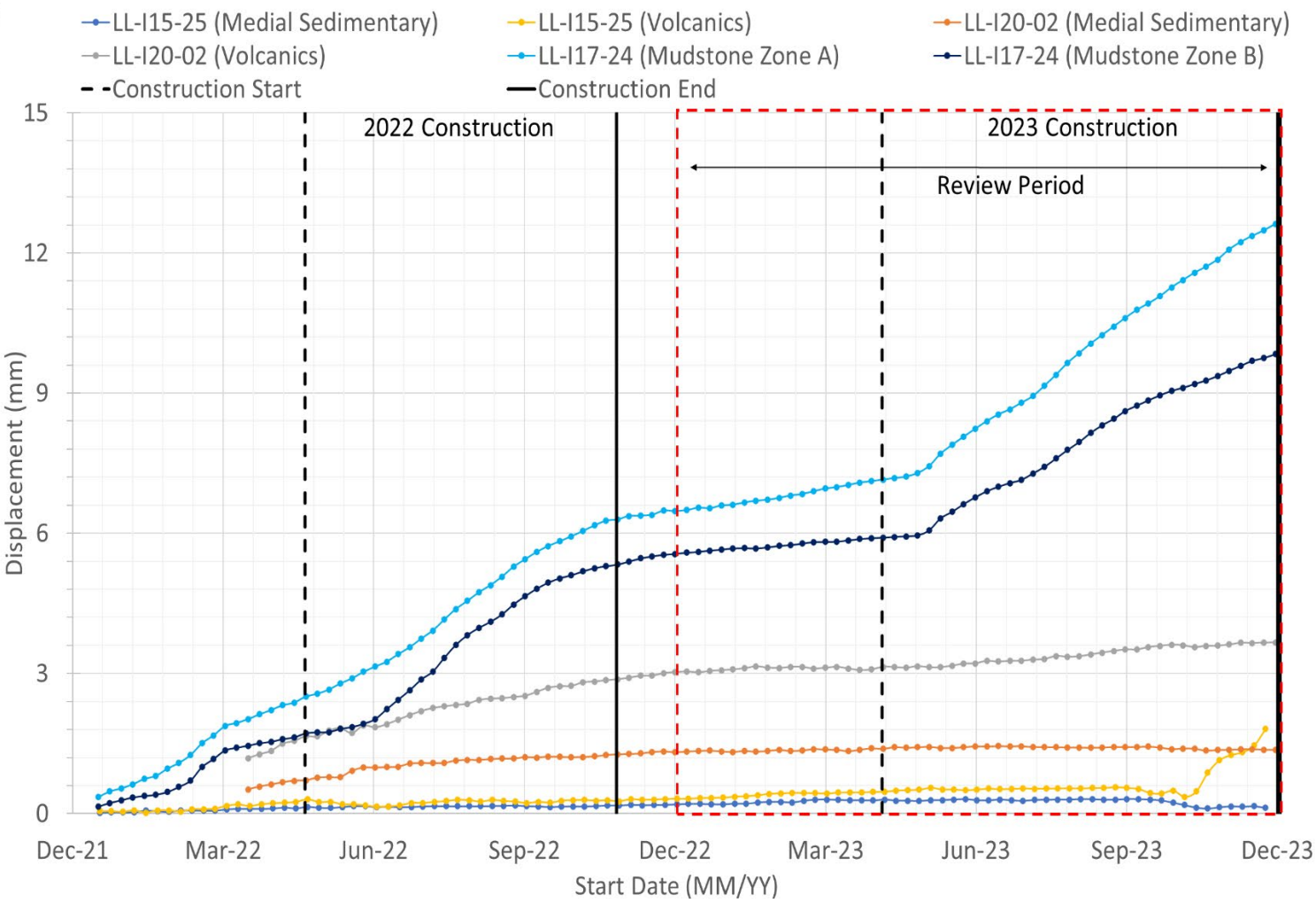


Table 5.7 Summary of Deformation Rates Measured in the Foundation Below the Upper NBB Slope

Instrument Name	Geological Unit	Measurement Elevation (m)	2022 No Construction – Typical Rate	2022 Construction – Maximum Rate	2023 No Construction – Typical Rate	2023 Construction – Maximum Rate
LL-I15-25	Volcanics	1165.0 to 1143.0	<0.1 mm/month	<0.1 mm/month	<0.1 mm/month	1.9 mm/month
LL-I15-25	Medial Sedimentary	1143.0 to 1136.0	<0.1 mm/month	<0.1 mm/month	<0.1 mm/month	<0.1 mm/month
LL-I20-02(1)	Volcanics	1171.0 to 1133.0	<0.1 mm/month	0.4 mm/month	<0.1 mm/month	0.2 mm/month
LL-I20-02(1)	Medial Sedimentary	1133.0 to 1112.0	<0.1 mm/month	0.2 mm/month	<0.1 mm/month	<0.1 mm/month
LL-I17-24	Mudstone Zone A	1160.0 to 1151.0	0.1 mm/month	0.9 mm/month	0.2 mm/month	0.8 mm/month
LL-I17-24	Mudstone Zone B	1121.0 to 1112.0	0.2 mm/month	1.0 mm/month	<0.1 mm/month	0.7 mm/month

Notes:
1. SAAV at LL-I20-02 was installed and monitoring started in January 2022.

Three inclinometers are installed in the lower portion of the NBB (i.e., LL-I21-04, LL-I19-08 and LL-I10-12). These instruments are downstream of the mid-bench fill placement where up to 15 m of fill was placed during 2023 construction. This magnitude of fill placement was expected to induce some deformation in the foundation. The magnitude deformation was expected to: reduce towards the toe; not increase deformation rates further upstream of the loading area; and attenuate after loading. Deformations were measured in the Medial Sedimentary units at LL-I21-04, LL-I19-08 and LL-I10-12 (Figure 5.12) and were consistent with the expected response.

Measured deformation across the bedrock units at LL-I21-04, LL-I19-08 and LL-I10-12 are plotted on Figure 5.12. All three of the inclinometers plotted on Figure 5.12 are manually read which have less accuracy in the readings compared to SAAVs which is the reason for the greater variability in the data (e.g., LL-I21-04) compared to the inclinometers plotted on Figure 5.11. Each of these inclinometers had to be raised multiple times during the year to keep them above the rising fill. These raises impacted some of the readings. For example, LL-I21-04 was raised to high and had to be cut down. After the casing was cutdown the reading had to be rebaselined and that is why no cumulative movement reading is plotted for LL-I21-04 during November 2023 on Figure 5.12. However, the number of and accuracy of the manual readings is adequate for the intended purpose and meets the needs of the surveillance program.

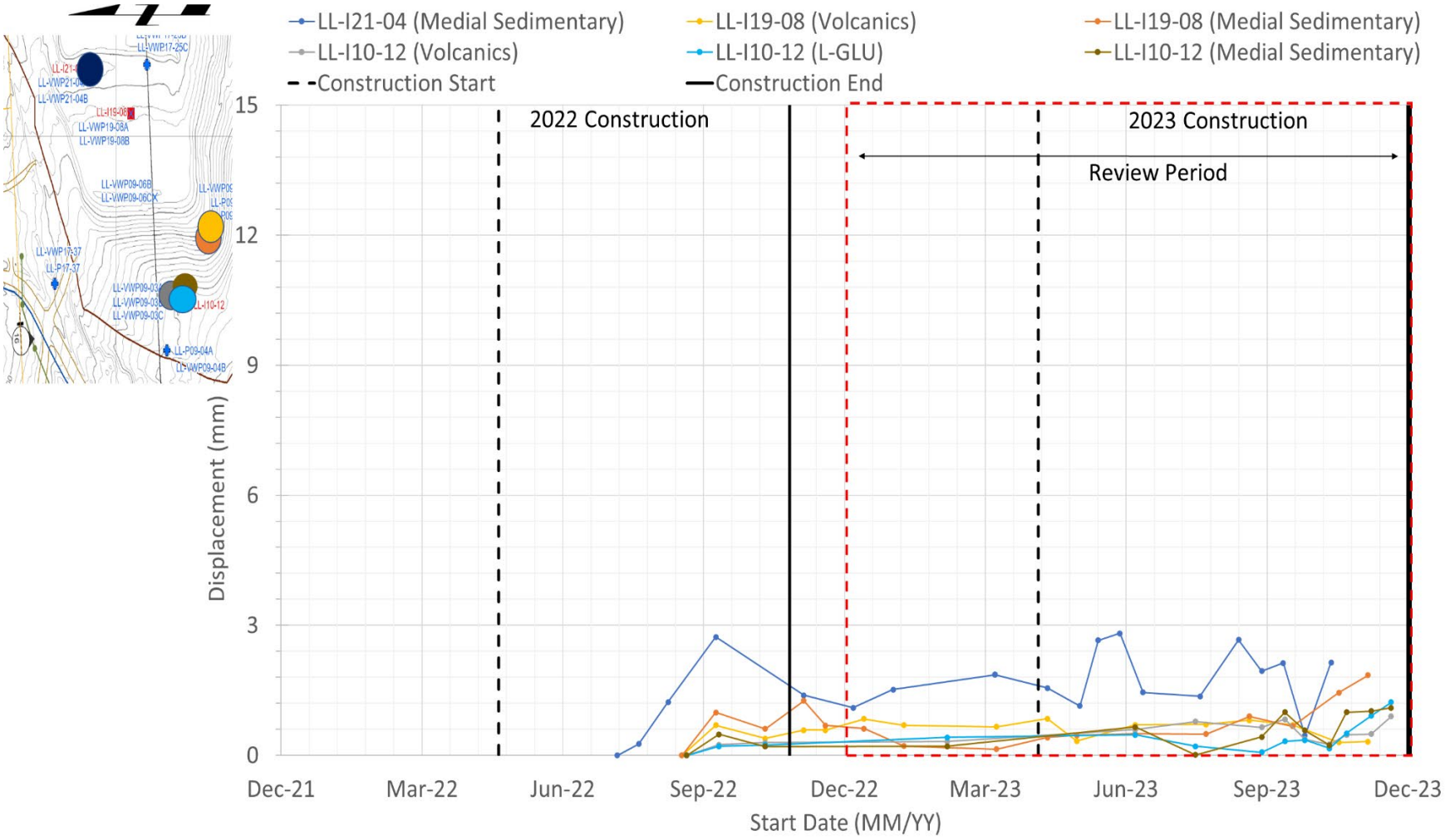
Deformations in the lower portion of the NBB were relatively level prior to October 2023 and the overall magnitude of movement is less than was measured further upslope (Figure 5.11). Starting in October 2023 increased deformation was measured in the Medial Sedimentary unit between El. 1130 m and El. 1140 m at LL-I21-04 and LL-I19-08. This is interpreted as a response to loading, likely along a mudstone layer. As discussed above, this type of response is not unexpected based on the magnitude of loading. The same magnitude of response was not measured near the toe, at LL-I10-12. None of the deformation rates. The magnitude of deformations that started in October are small (<2 mm) and did not exceed threshold values. The deformations are also within the reading accuracy of a manual inclinometer but based on the timing of the response and where the movement occurred KCB interpret there was a minor response in the Medial Sedimentary unit to loading.

A layer of L-GLU is present near the toe of the NBB that is monitored by LL-I10-12. The layer is not continuous further upslope and is not intercepted by any other inclinometers at the NBB. An increase in deformation rate was measured in the L-GLU starting in October 2023. This is the same time when fill placement was ongoing at both the mid-bench and the toe of NBB. Based on the measured response to loading at the VBB, localized deformation in the L-GLU at LL-I10-12 was expected and did not exceed threshold values.

The casing for LL-I10-12 was raised 12 m between September and November to stay ahead of fill placement. During these raises, the inclinometer readings above El. 1160 m were impacted and are no longer considered representative of actual deformation (Figure II-B-18). KCB and HVC are investigating this with hope to resolve the discrepancy. This impacts readings above the primary zone of monitoring interest and does not impact the overall value of LL-I10-12 as a tool to monitor dam performance. There is more variability in the LL-I10-12 readings within the L-GLU monitoring zone starting in October 2023 which could be related to the casing raises. However, it is reasonable to assume that there was deformation in the L-GLU during this period as a response to loading.

Fill placement at the NBB continued into December 2023, after the end of this AFPR review period. Readings measured after the review period show that this response did attenuate after was loading completed as expected.

Figure 5.12 NBB Inclinometers Foundation Deformation Lower Slope: December 2021 to November 2023



5.2.3.7 North Dam Bedrock

On Figures 17 and 18, the November 2023 instrumentation readings near Sta. 2+800 and Sta. 3+300 are projected onto a dam cross section. As shown in Figure 8, the only construction activity in the North Dam Bedrock area during the review period was a crest raise. The downstream slope was built to the ultimate configuration in 2022.

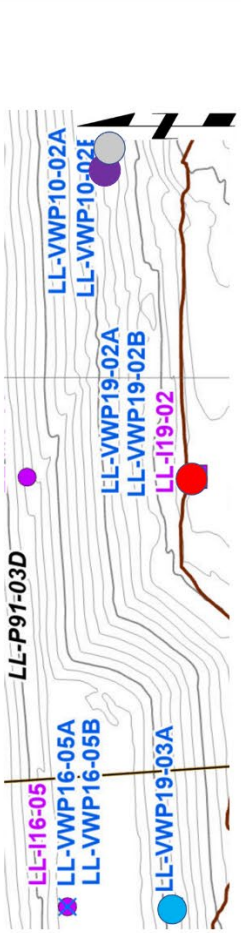
Piezometers

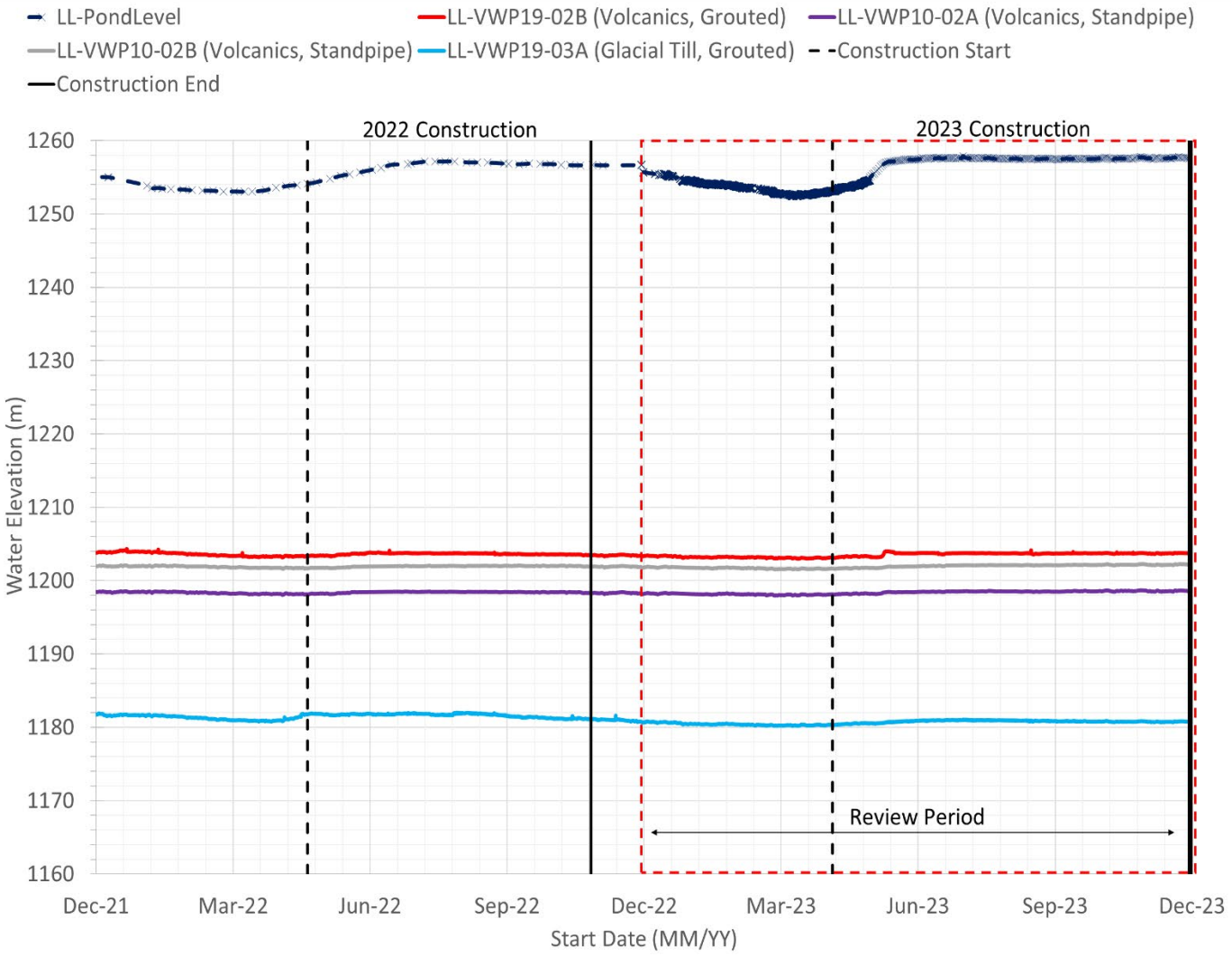
Measured piezometric levels at the North Dam Bedrock are shown on Figure II-A-12 and Figure II-A-13 (past 2 years) and Figure II-A-112 to Figure II-A-113 (past 5 years) in Appendix II-A. Overall behaviour during the review period was consistent with conditions assumed in the design.

Seepage through the North Dam Bedrock downstream shell is generally south, towards the VBB, following natural topography.

Figure 5.13 plots measured piezometric levels since December 2021 from select piezometers in the North Dam Bedrock foundation. The piezometric levels in the foundation downstream of the shell remain steady except during downstream hydraulic placement, of which there was none during the review period. Similar to the VBB, VBBE and NBB, piezometers in the foundation have not shown a rising trend with pond level in the impoundment (Figure II-A-112). The minor rise (~1 m) measured during the review period at some of the piezometers shown on Figure 5.13 (e.g., LL-VWP19-02B) is a seasonal response during freshet.

Figure 5.13 Measured Piezometric Response in the Foundation of North Dam Bedrock: December 2021 to November 2023





Inclinometers

A summary of inclinometer readings from December 2021 to November 2023 are shown on Figure II-B-26 to Figure II-B-31 in Appendix II-B.

Similar to the NBB, the Medial Sedimentary bedrock unit with mudstone layers is present in the North Dam Bedrock foundation. In comparison to the NBB, the mudstone layers in the North Dam Bedrock foundation are overlain by a thicker zone of Volcanic bedrock and glacial overburden that stabilizes the downstream slope without additional buttressing. Throughout the review period, no shear zones were measured within the Volcanic or Medial Sedimentary bedrock units at LL-I19-01 or LL-I19-02, near the dam toe of the slope, which is consistent with expected behaviour.

Deformation along the mudstone layers at the North Dam Bedrock inclinometers measured since December 2021 are plotted in Figure 5.14, and typical deformation rates are summarized in Table 5.8. The measured deformation rates did not exceed Notification Level thresholds, which are set based on rates measured during previous loading periods.

During the review period, the measured magnitude of deformation and response to loading is greater at the inclinometers nearest to the crest (LL-I98-03 and LL-I99-05) than LL-I98-02 which is farther downstream. Deformation rates along each mudstone layer attenuated after 2023 crest loading. This is consistent with expected behaviour.

North of Sta. 3+000, at LL-I10-03 and LL-I19-02, potential mudstone layers within the Medial Sedimentary bedrock are deeper and do not influence the dam design. No deformations characteristic of a mudstone layer has been measured in the foundation to date.

Figure 5.14 North Dam Bedrock Inclinometers Deformation Along Mudstone Layers: December 2021 to November 2023

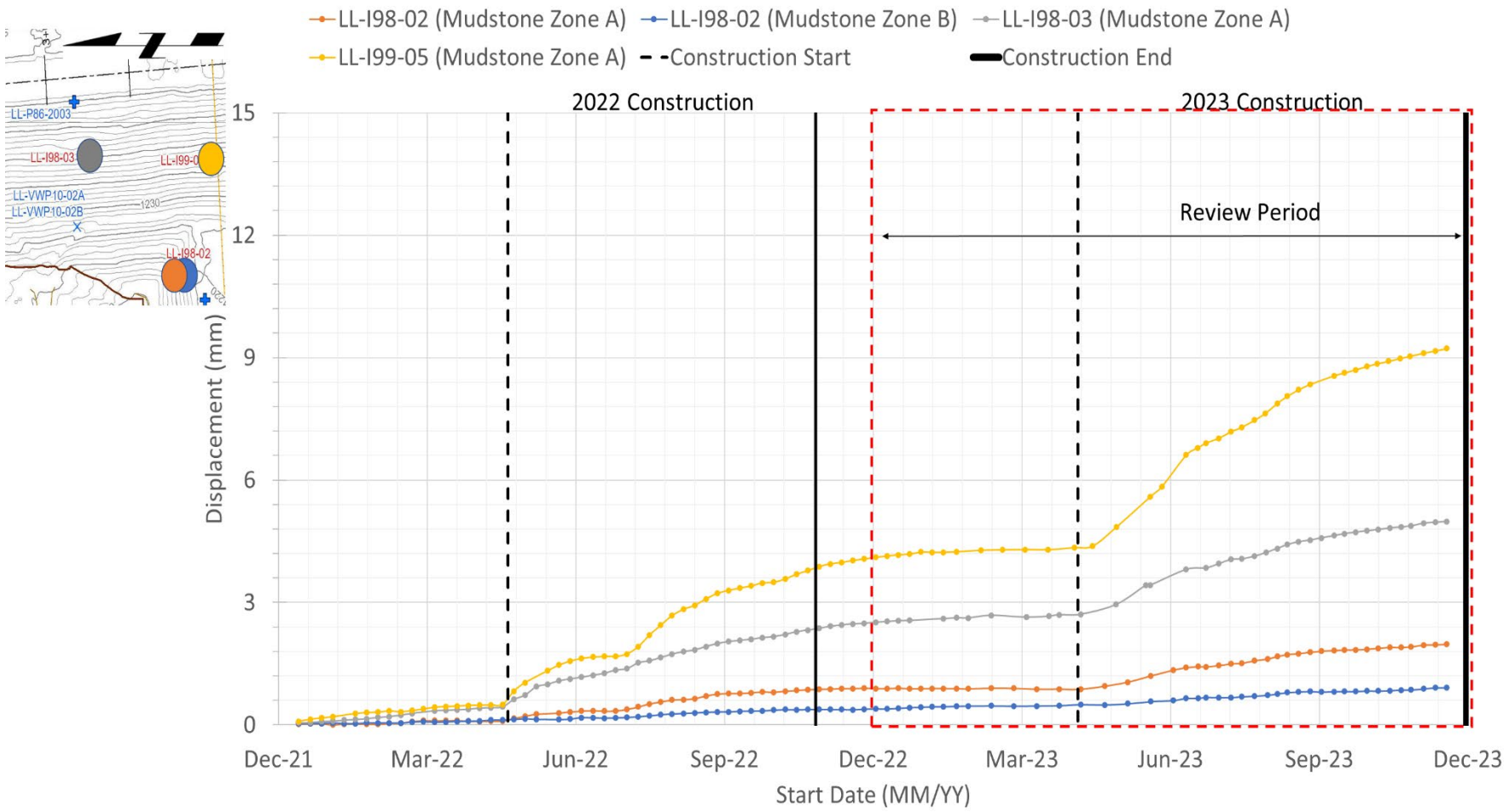


Table 5.8 Summary of North Dam Bedrock Deformation Rates Along Mudstone Layers: December 2021 to November 2023

Instrument Name	Geological Unit	Measurement Elevation (m)	2022 No Construction – Typical Rate	2022 Construction – Maximum Rate	2023 No Construction – Typical Rate	2023 Construction – Maximum Rate
LL-I99-05	Mudstone Zone A	1156.0 to 1148.0	<0.1 mm/month	1.1 mm/month	<0.1 mm/month	1.2 mm/month
LL-I98-02	Mudstone Zone A	1136.0 to 1132.0	<0.1 mm/month	0.2 mm/month	<0.1 mm/month	0.2 mm/month
LL-I98-02	Mudstone Zone B	1113.0 to 1107.1	<0.1 mm/month	0.1 mm/month	<0.1 mm/month	0.1 mm/month
LL-I98-03	Mudstone Zone A	1112.0 to 1109.0	<0.1 mm/month	0.6 mm/month	<0.1 mm/month	0.5 mm/month

5.2.3.8 North Dam U-GLU

On Figure 19, the November 2023 instrumentation readings near Sta. 3+630 are projected onto a dam cross section. As shown in Figure 8, construction activity in the North Dam U-GLU segment during the review period was a crest raise and foundation preparation at the abutment. The downstream slope was built to ultimate configuration in 2022.

Piezometers

Measured piezometric levels at the North Dam U-GLU segment are shown on Figure II-A-14 to Figure II-A-17 (2 years) and Figure II-A-114 to Figure II-A-117 (5 years).

North of approximately Sta. 3+400, near the north abutment, piezometric levels downstream of the core zone respond to pond level fluctuations. In addition, the piezometric levels in the foundation are similar in all foundation units and upward gradients are measured as some locations. These conditions and response are not measured in any other segment of the L-L Dam downstream of the core zone.

This response is expected because north of approximately Sta. 3+600, the core zone is not keyed into Glacial Till or bedrock due to the depth of excavation required. In recognition of this, a minimum beach width (500 m) at the north abutment is specified in the design (KCB 2020a) to reduce seepage gradients through the foundation and piezometric rise downstream of the core zone. The minimum beach was maintained throughout the review period as discussed in Section 5.2.2. The drainage blanket below the downstream shell acts as a filter to prevent internal erosion upwelling within the dam footprint and manages piezometric rise into the dam fill.

Annual piezometric rise measured in the foundation upstream of the core zone was similar to the magnitude of pond level rise (~0.9 m/year); e.g., LL-VWP16-08C on Figure 5.15 and LL-VWP13-11 on Figure 5.16. Downstream of the core zone the annual piezometric rise was approximately 50% of pond level rise; e.g., LL-VWP16-04B on Figure 5.15 and LL-VWP16-04A on Figure 5.16. This is consistent with trends observed since 2018.

Foundation piezometric levels near the north abutment, upstream and downstream of the core zone, also show a temporary response when beaching and upstream cycloned sand placement is completed north of approximately Sta. 3+400. During both activities, the beach surface near the dam is wetted and the flow path length through the foundation is much shorter than from the pond. This is typically a more sudden rate of rise and dissipation relative to pond fluctuations; e.g., refer to LL-VWP16-08C and LL-VWP17-12 on Figure 5.15 during May and June in 2022.

Starting in February 2023, beaching and upstream placement was ongoing near the north abutment. This caused a piezometric rise in the foundation, upstream of the core zone, even though the pond level was dropping; e.g., LL-VWP16-08C and LL-VWP16-04B on Figure 5.15, as well as LL-VWP13-11 and LL-VWP16-04A on Figure 5.16.

Piezometric response to pond level fluctuations, as well as beaching and upstream placement, downstream of the core zone is not observed south of approximately Sta. 3+500. In this area, the core zone has been keyed into the Glacial Till. For example, LL-VWP16-05A and LL-VWP19-03 near Sta. 3+350 (Figure 5.17) do not show the same annual piezometric rise that is measured by piezometers plotted on Figure 5.15 and Figure 5.16.

A Notification Level exceedance was measured at one piezometer (LL-P98-01A) in this segment during the review period. This piezometer is near the north abutment (Sta. 3+640), installed immediately downstream of the core zone in the Glacial Till and fluctuates to changes in pond level. The piezometric level at this instrument was following expected behaviour and conditions assumed in design. The exceedance occurred as the 2023 threshold update was in progress. When the threshold update was complete and an updated Notification Level applied, the instrument was no longer exceeding.

Figure 5.15 Measured Piezometric Response in the U-GLU Near the North Abutment: December 2021 to November 2023

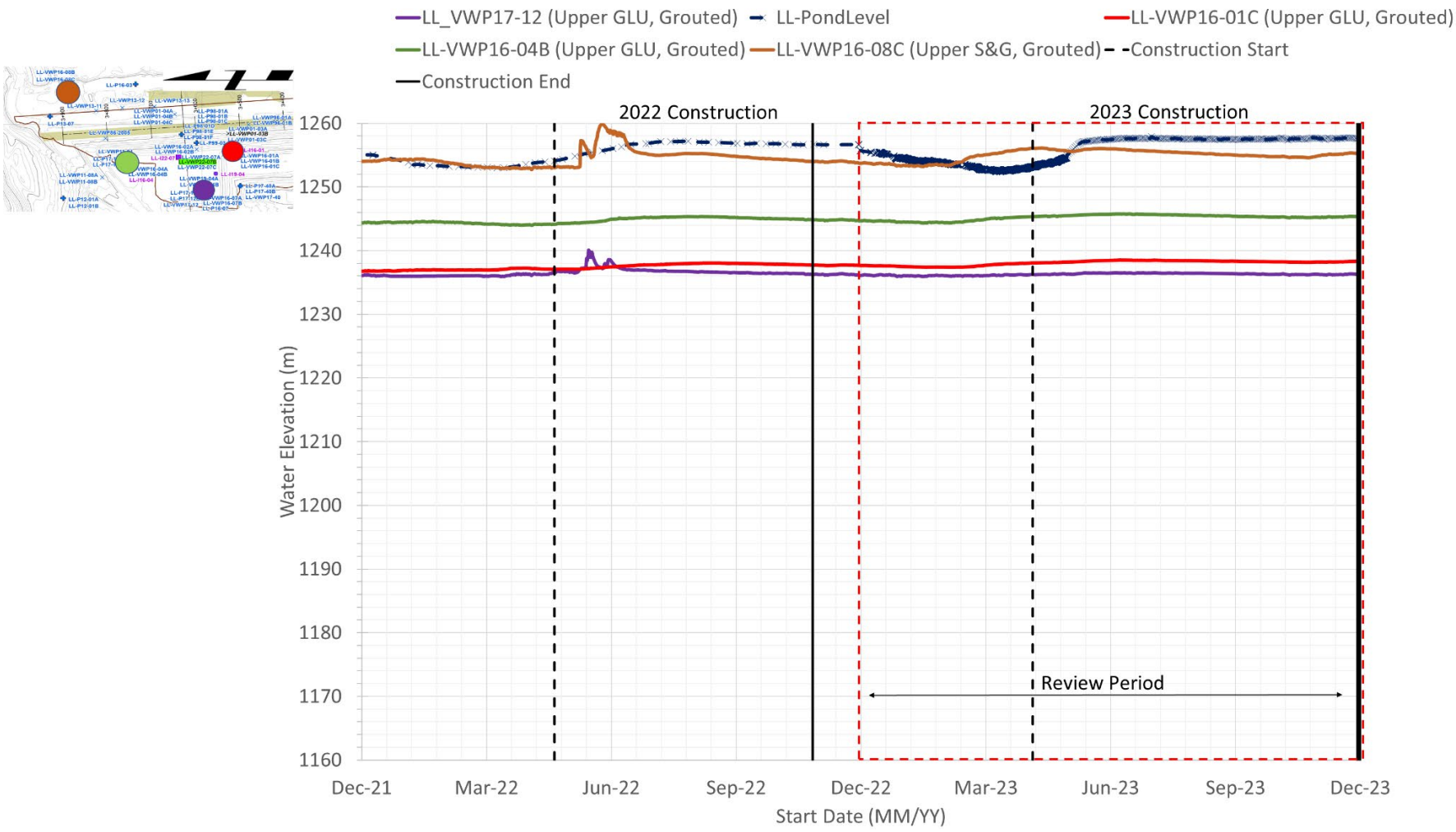


Figure 5.16 Measured Piezometric Response Near the North Abutment (North of Sta. 3+500): December 2021 to November 2023

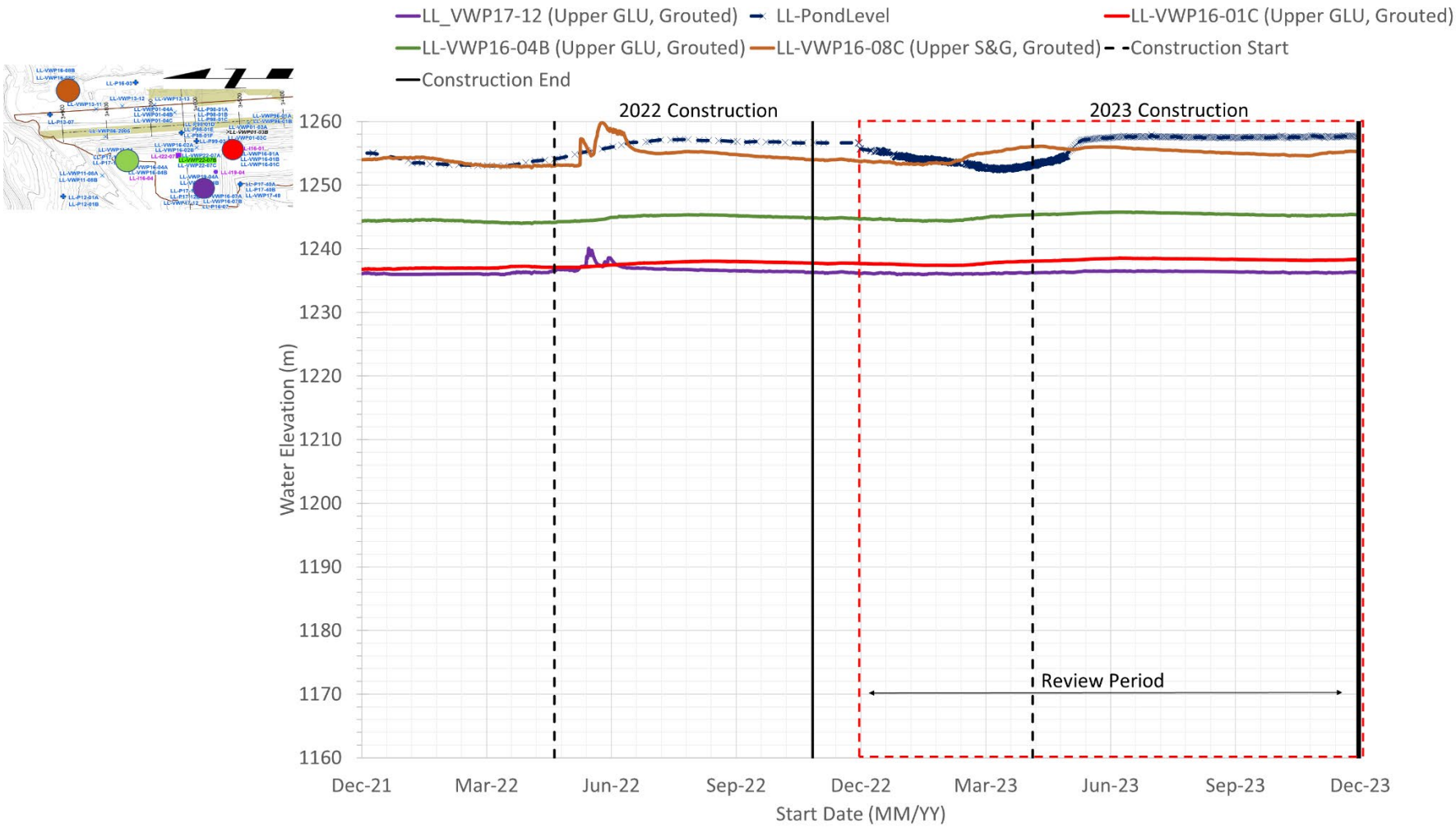
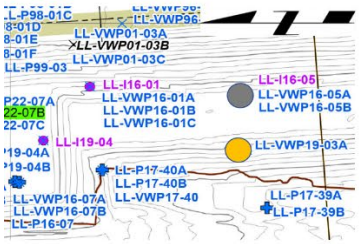
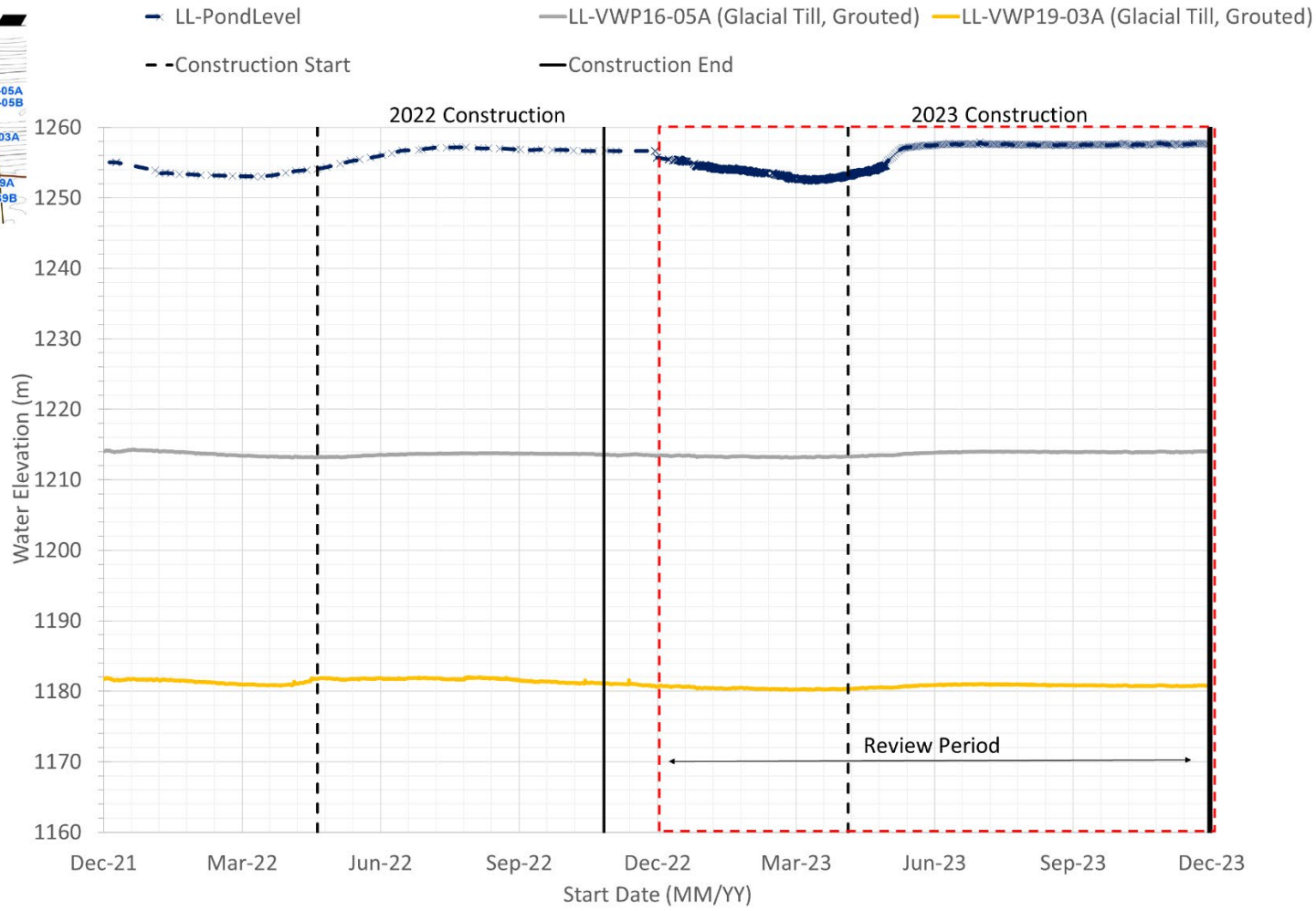


Figure 5.17 Measured Piezometric Response Near Sta. 3+350: December 2021 to November 2023





Inclinometers

A summary of inclinometer readings from December 2021 to November 2023 are shown on Figure II-B-32 and Figure II-B-36 in Appendix II-B.

In response to changes in loading conditions, some horizontal deformation is expected within the U-GLU. The U-GLU governs the dam design in this segment. South of approximately Sta. 3+600, the U-GLU was excavated from the downstream 30 m to 40 m of the dam footprint. North of Sta. 3+600, the U-GLU was too deep to remove during foundation preparation, which has been accounted for in the design by specifying a wider buttress in this area.

The measured deformation rates in the U-GLU during the review period were 0.1 mm/month or less. This is consistent with the measured response even during periods of construction loading. Deformations in the U-GLU in this segment of the dam have consistency been less than those measured in the L-GLU at the VBB. No defined deformation zones were identified at the inclinometers nearest to the toe, where the U-GLU is present (LL-I16-04) or is not present (LL-I19-03 and LL-I19-04), indicating that deformations that may be occurring are contained as per the design.

Deformations are observed in the compacted cycloned sand fill at some of the inclinometers. This deformation is primarily related to deformation of the casing within an outer protective casing that is placed around the instrument as it is raised through the fill.

5.2.4 Seepage

Flow measurements, since December 2018, from seepage weirs installed downstream of the L-L Dam are shown in Figure 25. Note that two seepage weirs were removed when the toe of the dam was built to the ultimate downstream extent. As discussed in Section 7.3, HVC had planned to install new seepage weirs along the downstream toe in 2023; however, the locations were identified but installations were deferred to 2024. This recommendation has been outstanding since 2019 but was deferred until the ultimate downstream toe and collection ditches were established. Delaying the weir installations into 2024 does not have an impact on dam performance or critical controls but this data is important for tracking seepage trends and for groundwater model calibrations.

Seepage from the L-L Dam downstream slope is monitored by HVC as part of routine visual inspections and no observations of turbid flow from the dam fill or other unsatisfactory conditions were reported. Summary of the two active seepage weirs during the review period are as follows:

LL–FS-01

- Measures seepage flow from a major drain that discharges on the south side of the NBB and surface water flow from the dam slopes and local catchment, which is routed to Seepage Pond 2.
- Flow rates were within the typical range of flows with a typical base flow between 14 L/s and 38 L/s. The peak flow rates at LL–FS-01 were up to 72 L/s, which occurred at the end of the review period (i.e., not freshet) and was due to hydraulic placement. Weir flows typically respond to hydraulic placement that increases seepage through the dam, but the rates during this review period were higher than previous construction responses because placement was at the NBB and VBBE which is close to the weir. When hydraulic placement is further away from the weirs the flows are attenuated as they flow through the L-L Dam drainage blanket.

LL–FS-04

- Measures discharge from Seepage Pond 2, which is routed to the SWRP.
- Flow rates were similar to the typical range of flow rates. The typical base flow was similar to LL–FS-01. This makes sense as the primary flow into Seepage Pond 2, while there is no hydraulic placement ongoing, is flow from LL–FS-01.
- The peak flow rates at LL–FS-04 were up to 161 L/s, which are associated with increased seepage from hydraulic placement (refer to discussion for LL–FS-01) as well as overflows from hydraulic placement cells reporting to Seepage Pond 2, routed through Sediment Pond 2.

5.3 H-H Dam Performance Summary

5.3.1 Vertical Buffer Above the Tailings Surface

There is no risk of overtopping at the H-H Dam (Section 2.3). Therefore, freeboard is not an applicable metric at the H-H Dam. The M-11 permit (EMLI 2021) requires that a minimum 1 m buffer[10] be maintained throughout operations. HVC targets maintaining a minimum 2 m buffer along the dam when planning crest raises. Buffer values from the November 17, 2023, survey are shown in Figure 5.18, as well as the buffer present at the start of the review period. During the review period, HVC added another buffer monitoring point near the east abutment (Sta. 2+300).

During the review period, the buffer was greater than the 1 m minimum requirement but was less than HVC's 2 m target between April 2023 and June 2023. In response, to increase the buffer by 1 m while the 2023 crest raise was completed, HVC constructed a rockfill berm along the upstream edge of the crest. This plan was reviewed and approved by the EoR prior to constructing the berm.

Figure 5.19 plots tailings beach elevations near the upstream face of the H-H Dam at the monitoring stations along the crest, since December 2018. The tailings beach rate of rise had been relatively steady since mid-2020 before starting to level off in February 2023. This was due to HVC shifting the spigot location near the H-H Dam east abutment further away from the dam. Following that shift, the tailings were deposited on the leeward side of the tailings mound (i.e., the opposite side relative to H-H Dam) and flowed directly towards the pond with no deposition occurring near the dam crest. This was an expected change based on the planned move of the deposition point. A similar shift occurred in 2018 and beach levels remained relatively level until mid-2020 when the deposition point was moved closed to H-H Dam.

[10] Vertical distance between the tailings surface at the upstream dam face and the dam crest in that area.

Figure 5.18 H-H Dam Tailings Buffer – November 17, 2023, Tailings Beach

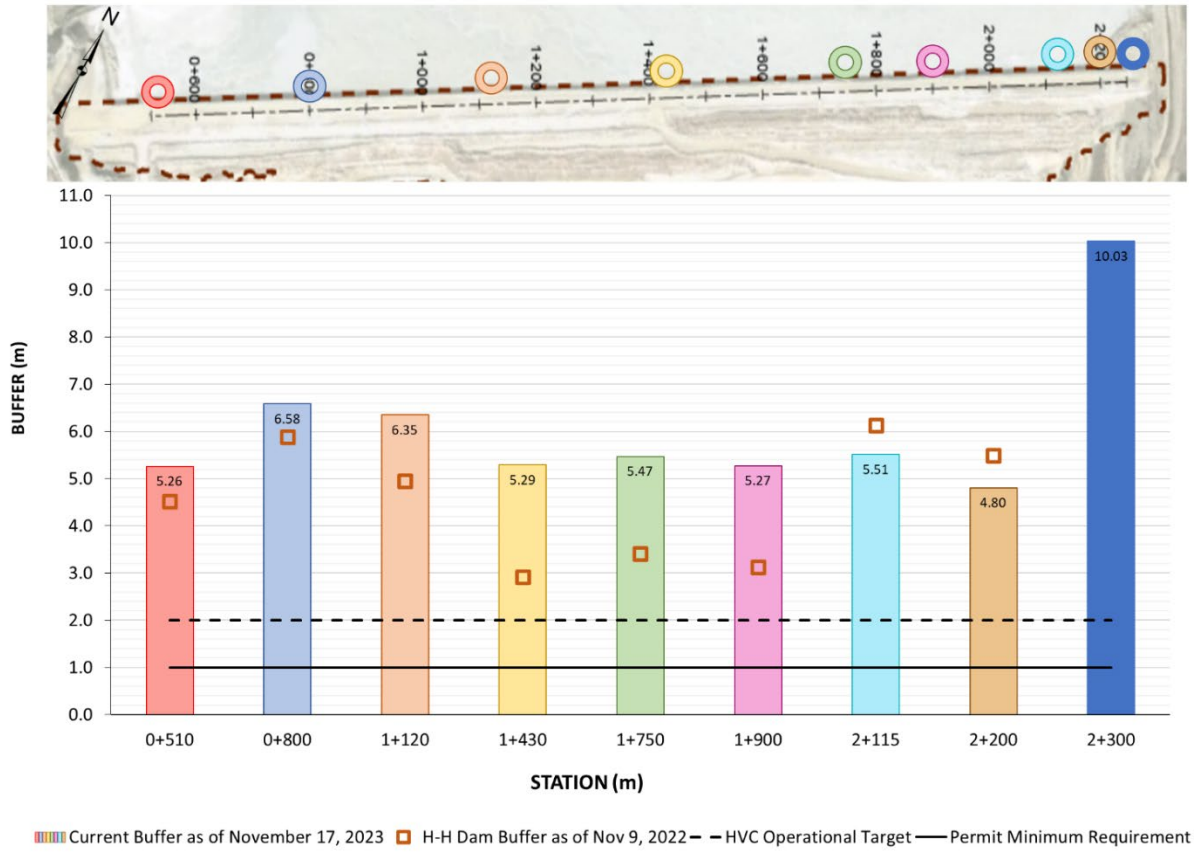
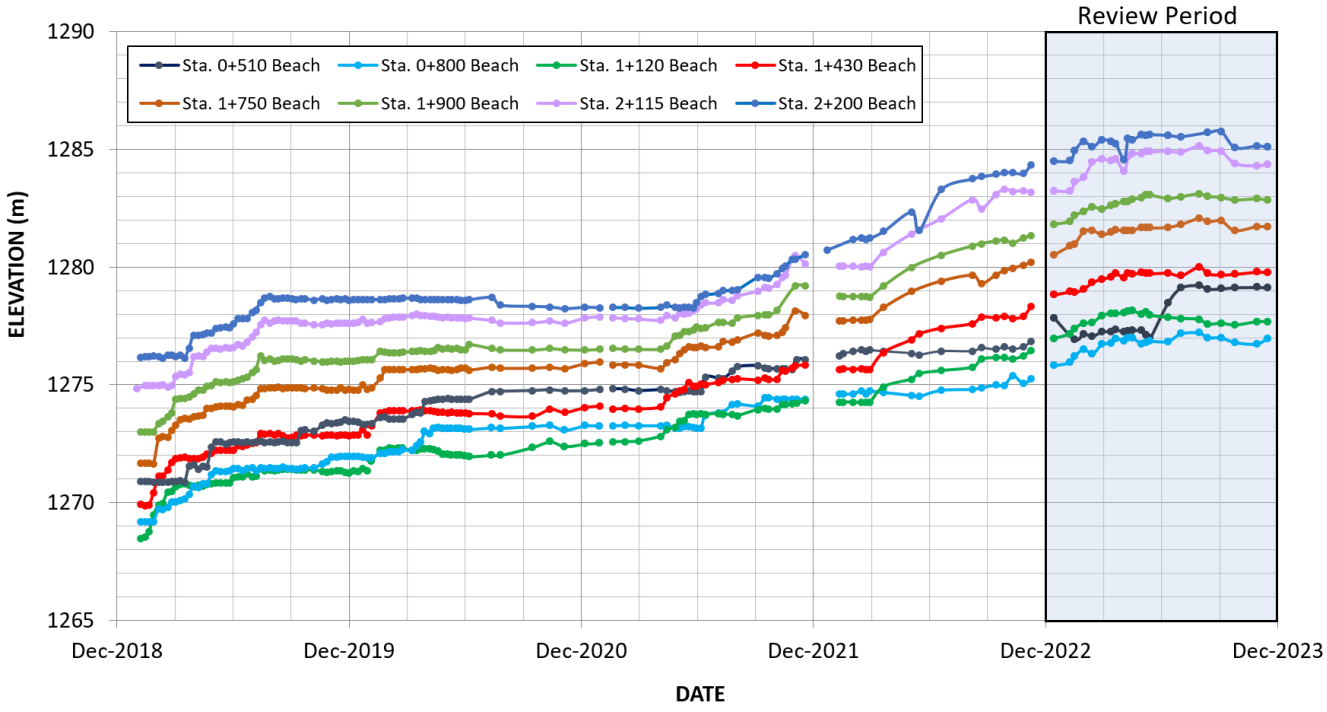


Figure 5.19 H-H Dam Tailings Beach Elevations Along the Crest: Dec. 2018 to Nov.2023



5.3.2 Instrumentation Trends

5.3.2.1 Overview

This section provides an overview of general piezometric and deformation behaviour at the H-H Dam, based on instrument readings during the review period. On Figures 20 to 24, the November 2023 instrumentation readings are shown on select cross sections of the H-H Dam. Instrumentation installed at the H-H Dam is summarized in Table 5.2. Summary plots of instrumentation readings are included in Appendix III-A (piezometers) and Appendix III-B (inclinometers).

5.3.2.2 Instrument Threshold Exceedances

During the review period, threshold values exceedances were measured at 7 instruments. Each of the exceedances were reviewed by the EoR, as per the OMS Manual (HVC 2022) and none were elevated to a higher level of the TARP or required mitigative action be taken at the dam. Following EoR review, two were confirmed to be related to the measurement reading or a processing error and were not representative of the actual behaviour of the dam.

The remaining five exceedances included four Notification Level exceedances (one inclinometer and three piezometers) and one T1 threshold exceedance. As discussed in Section 5.1, exceedance of a Notification Level does not represent a dam safety concern or unacceptable performance but requires a review by the EoR. The T1 level of the TARP (level two of four levels) is one above Notification Level. In order to trigger the T1 level of the TARP, the T1 threshold value must be exceeded at multiple piezometers as defined in the OMS Manual (HVC 2022); since only one piezometer had exceeded a T1 threshold value, the T1 level of the TARP was not triggered.

One of the piezometer exceedances was related to a seasonal response during freshet. The others were related to piezometric levels downstream of the H-H Dam centreline being greater than predicted and delays in placement of the downstream buttress, as discussed in Section 5.3.2.3.

5.3.2.3 Piezometers

Measured piezometric levels at the H-H Dam are shown on Figure III-A-1 to Figure III-A-5 (past 2 years) and Figure II-A-101 to Figure II-A-105 (past 5 years).

Piezometric levels in the dam fill and the foundation downstream of the centreline are governed by the groundwater in the natural valley, seepage from Highland TSF, infiltration through the waste dumps (i.e., I-9 Dump and 24 Mile Waste Dump) as well as periodic inflows into the 24 Mile TSF (e.g., overflow slurry from H-H Pumphouse). There are also three dewatering activities operated in this area: H-H Gland Wells (Well No. 5 and Well No. 7, Figure 7); reclaim pumping from 24 Mile TSF; and the Valley Pit depressurization wells approximately 1.5 km south of 24 Mile TSF. The overall groundwater flow direction in this area is southeast towards the Valley Pit.

The piezometric response near the H-H Dam, in areas that influence design, can be linked to fluctuations in pumping from H-H Gland Wells and pond level in the 24 Mile TSF. The pond level in 24 Mile TSF can be interpreted to reflect the groundwater level in the adjacent waste dumps rather than a separate water source. Depending on the time of year and ratio of inflows into 24 Mile TSF

and reclaim pumping, the pond in 24 Mile TSF may be acting as a sink or a source of water downstream of the dam.

Although the 24 Mile TSF pond is not the primary contributor or governing factor for piezometric levels downstream of the dam, monitoring since 2017 has shown that fluctuations in piezometric levels in the dam fill and foundation, downstream of the core zone, can be correlated to the 24 Mile TSF pond level.

While the H-H Gland Wells are in operation, piezometric response in the dam fill and foundation units responds to fluctuations in the 24 Mile TSF pond level. When gland well pumping is suspended or reduced, piezometric levels in the Glacial Till and underlying foundation units rise. No piezometric response has been measured to date in the dam fill due to fluctuations in H-H Gland Well pumping. Pumping of the wells is not a design requirement as the H-H Dam design analysis is based on piezometric levels that assume the H-H Gland Wells are not operating.

As shown on Figure 5.20 and Figure 5.21, H-H Gland Wells were operated consistently throughout the review period. Consistent with expected behaviour, piezometric levels in the Glacial Till and underlying foundation units fluctuated when there was a disruption in pumping (Figure 5.20). However, no similar response was measured in dam fill (Figure 5.21). HVC increased the H-H Gland Well pumping rate to approximately 1,075 gpm, from approximately 1,000 gpm, during the review period. No significant change in piezometric level was observed.

As discussed in Section 5.4, pond level rise in the 24 Mile TSF during the review period was approximately 5 m to El. 1209 m and was greater than expected; the pond level was outside of HVC's target operating range.

The greater than expected increase in the 24 Mile TSF pond level coincided with a greater than expected piezometric rise measured in the dam fill downstream of the centreline (Figure 5.22). This resulted in Notification Level threshold value exceedances at two piezometers (HH-VWWP15-15C and HH-VWP21-07) and one T1 Level threshold value exceedance at HH-VWP17-17C during June 2023.

As discussed in Section 5.3.2.2, a single exceedance of a T1 threshold value does not trigger the T1 level of the TARP. The T1 level of the TARP would be triggered if the measured performance of either dam suggests that the structure may not comply with design criteria. For example, the T1 level of the TARP would be triggered if multiple piezometers in an area are measuring levels greater than the piezometric level required to meet factor of safety design criteria (e.g., >1.5 under static loading). However, if a single piezometer is measuring a level above this threshold, but all other piezometers in the area are below that level, the T1 level of the TARP would not be automatically triggered. Rather, the exceedance would be reviewed by the EoR to assess the cause, evaluate the potential impact of that response, and to confirm the dam remains in compliance with design criteria. This was the process followed for the T1 threshold value exceedance at HH-VWP17-17C.

In July 2023, one month following the T1 threshold exceedance, HVC raised the H-H Dam buttress around the piezometer and KCB issued revised Notification Level and T1 threshold values. The piezometric level at HH-VWP17-17C was less than the revised Notification Level and remained so for the duration of the review period.

Overall, the piezometric levels in the dam fill did not have a measurable impact on deformations or other aspects of H-H Dam performance. At ultimate configuration, the H-H Dam design is based on piezometric levels in the downstream dam fill more than 10 m greater than those measured during the review period. The impacts of the greater than expected piezometer rise was accommodated by HVC revising interim construction milestones, which were reviewed by the EoR.

The H-H Dam buttress has not been completed east of approximately Sta. 1+870. The remaining length of buttress (~100 m) will be completed in 2024 after the Line 5 Drain Line and associated building is removed. The section where the buttress has not been completed is confined by the buttress to the west and the rising native ground to the east. At the request of HVC, the EoR completed a three-dimensional stability analysis of this area (KCB 2023a). Based on this analysis, the T1 Level threshold value for the piezometer in this area (HH-VWP21-07) was revised. This was done as a proactive measure in case piezometric levels continue to rise in 2024, prior to completion of the buttress. In addition, HVC installed the additional piezometers in the downstream buttress, as recommended by the EoR, to increase monitoring coverage and replace instruments lost during buttress placement (Section 5.1).

Figure 5.20 H-H Dam Piezometric Response in Glacial Till and Underlying Units: December 2021 to November 2023

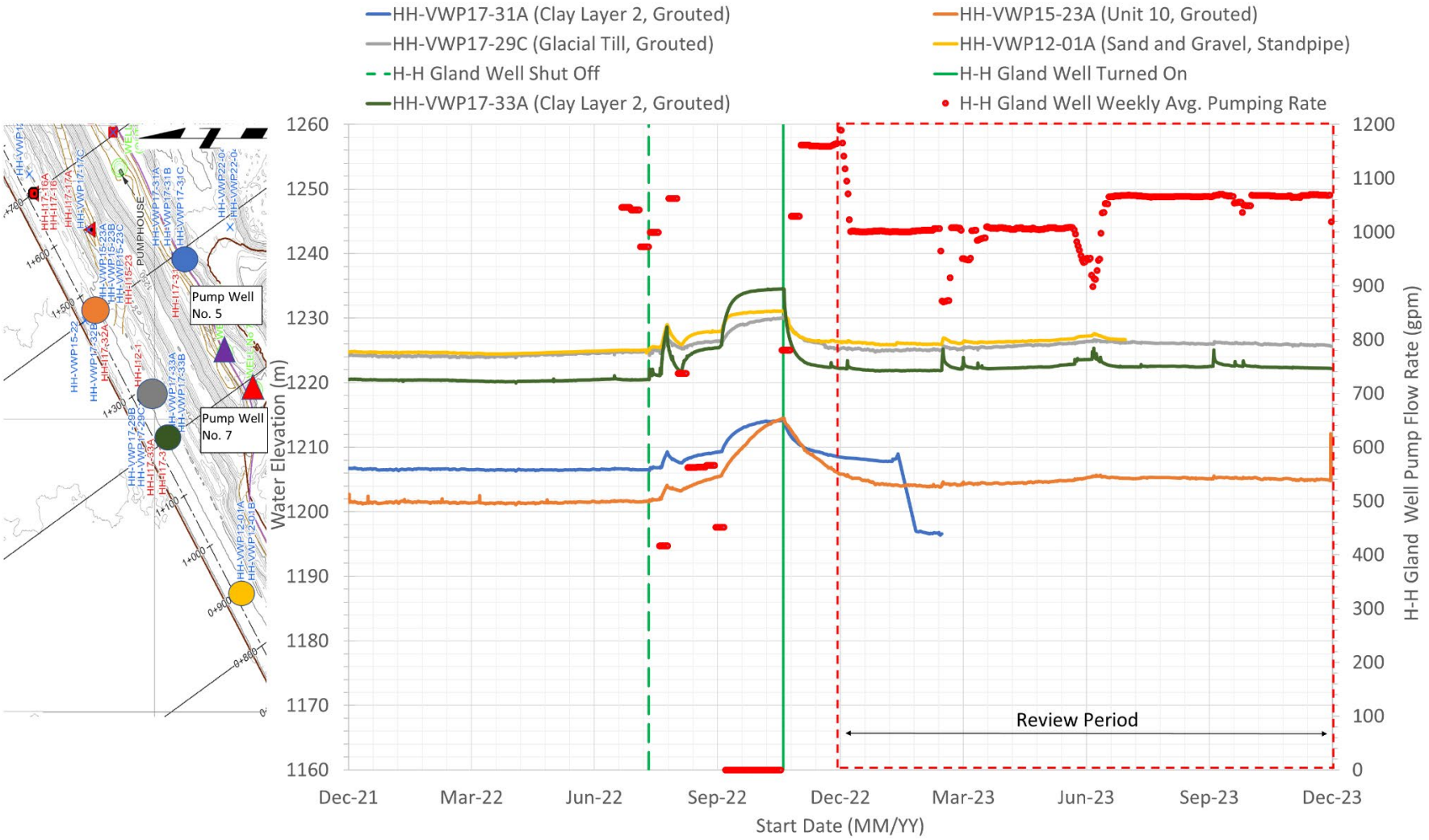


Figure 5.21 H-H Dam Piezometric Response in the Dam Fill and Foundation Above Glacial Till: December 2021 to November 2023

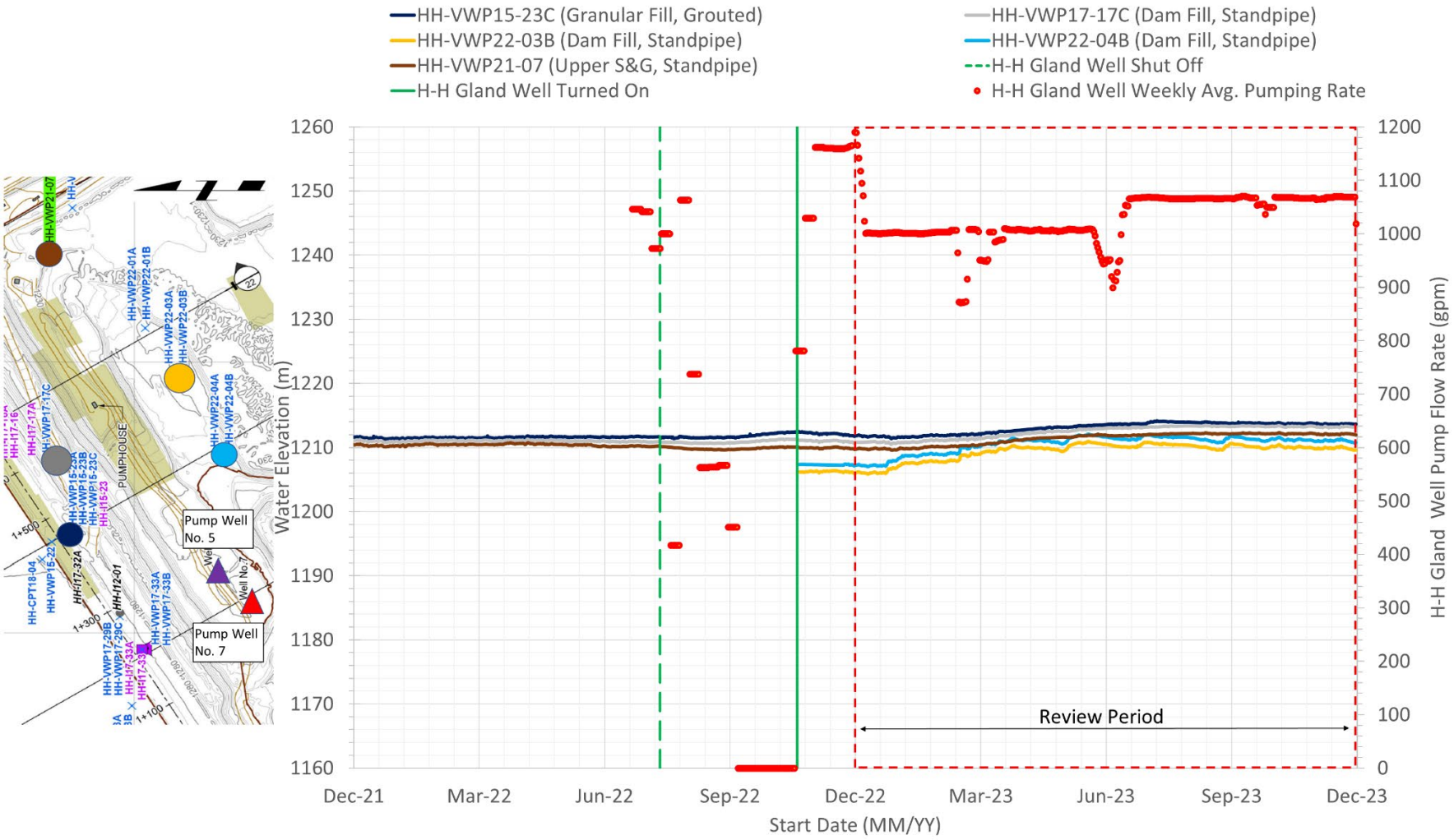
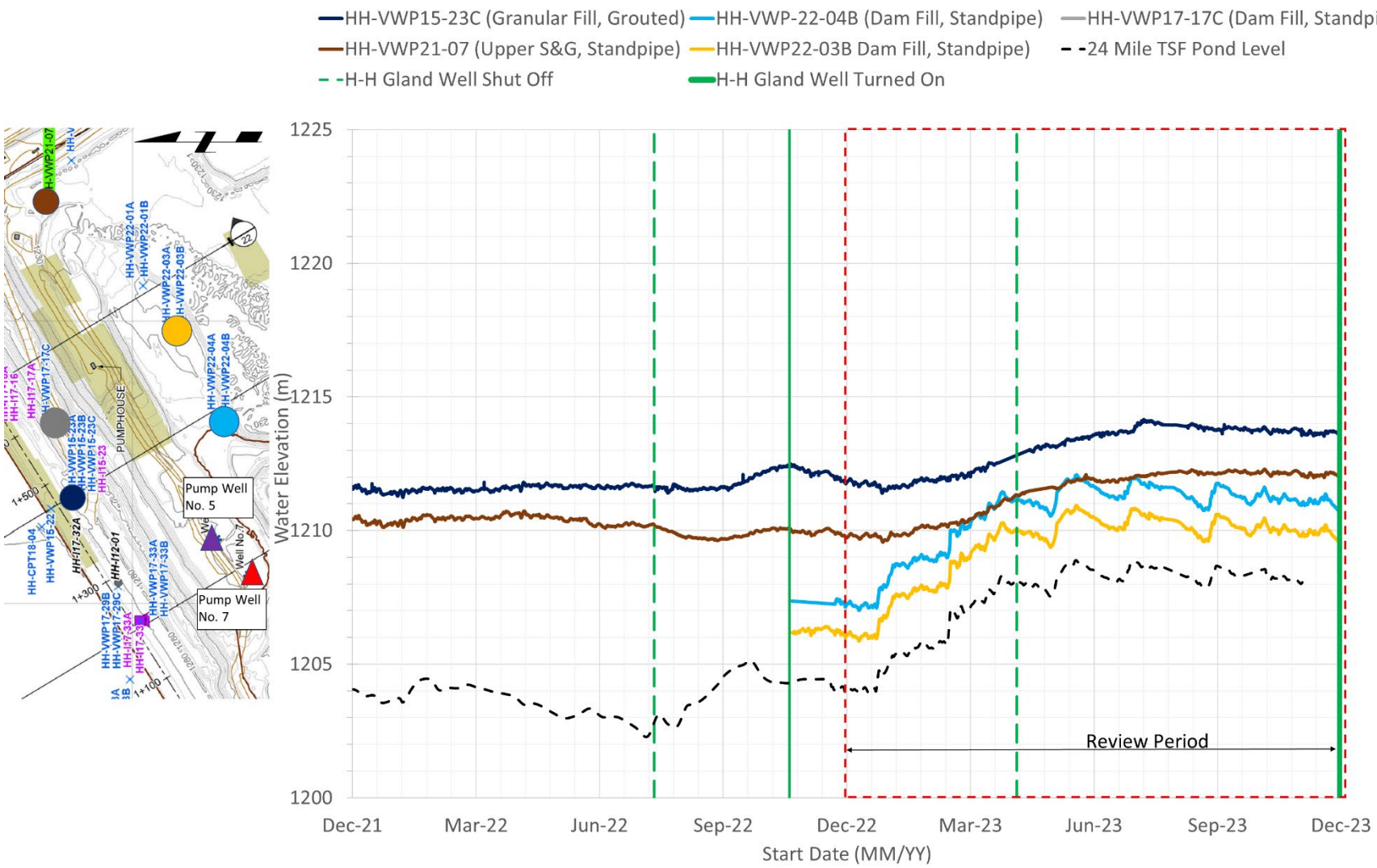


Figure 5.22 H-H Dam Piezometric Response in the Dam Fill and 24 Mile TSF Pond Level: December 2021 to November 2023



5.3.2.4 Inclinometers and Settlement

A summary of inclinometer readings from December 2021 to November 2023 are shown on Figure III-B-1 to Figure III-A-7 in Appendix III-B.

Horizontal deformations in the H-H Dam fill are interpreted as a response to settlement in the downstream fill, which was placed by the mining fleet in thick lifts (up to 10 m). Consistent with this interpretation, locations where the largest settlements are measured (e.g., HH-I17-16) correspond to the areas where horizontal deformations are also largest (Figure 5.23). In comparison, the least amount of settlement and horizontal deformation in the fill has been measured at HH-I17-33. As expected, the peak horizontal deformation rates during the review period were higher than during 2022 (Table 5.9) when there was not construction on the H-H Dam crest and downstream slope.

The measured horizontal deformations (<1 mm/month to 4.5 mm/month) and settlements (<50 mm) in the fill during the review period are within the lower range of those observed since the instruments were installed. This is consistent with construction activity during the review period that was primarily constrained to the crest as the majority of the downstream slope, other than the buttress, has already been constructed to ultimate shell.

This magnitude of deformation can be accommodated by the structure without compromising design function. There were no visual observations of significant cracking or deformation of the fill over the crest area.

No shear deformation zones within the natural foundation were measured along the dam, which is consistent with historic and expected future behaviour.

Figure 5.23 Measured Horizontal Deformation Within Downstream Fill at HH-I17-16: December 2021 to November 2023

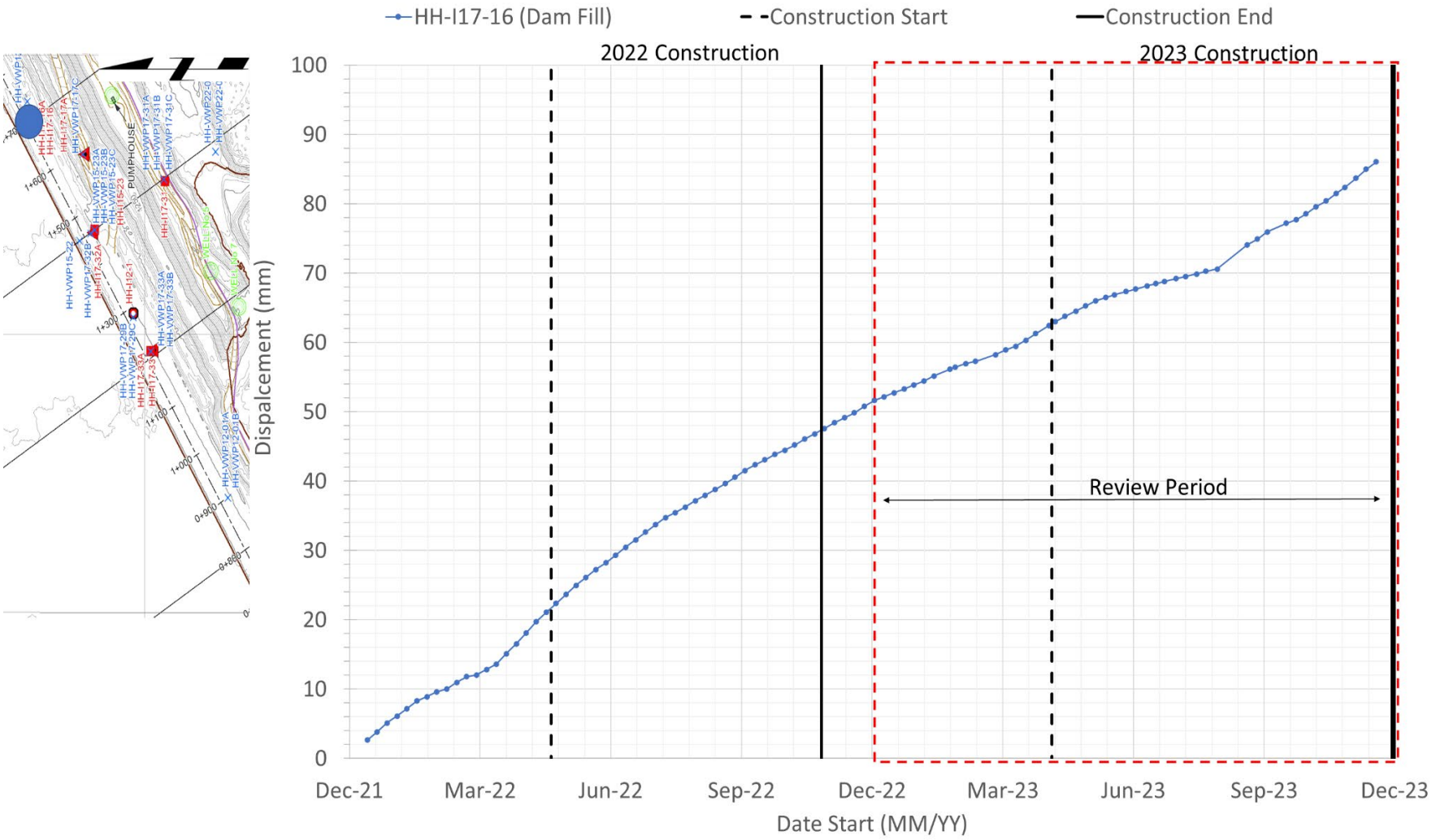


Table 5.9 Typical Horizontal Deformation Rates Within Downstream Fill: HH-I17-16

Instrument Name	Geological Unit	Measurement Elevation (m)	2022 No Construction – Typical Rate	2023 No Construction – Typical Rate	2023 Construction – Maximum Rate
HH-I17-16	Dam Fill	1245.1 to 1190.1	2.6 mm/month	1.8 mm/month	4.5 mm/month

5.4 24 Mile TSF Pond Level and Freeboard

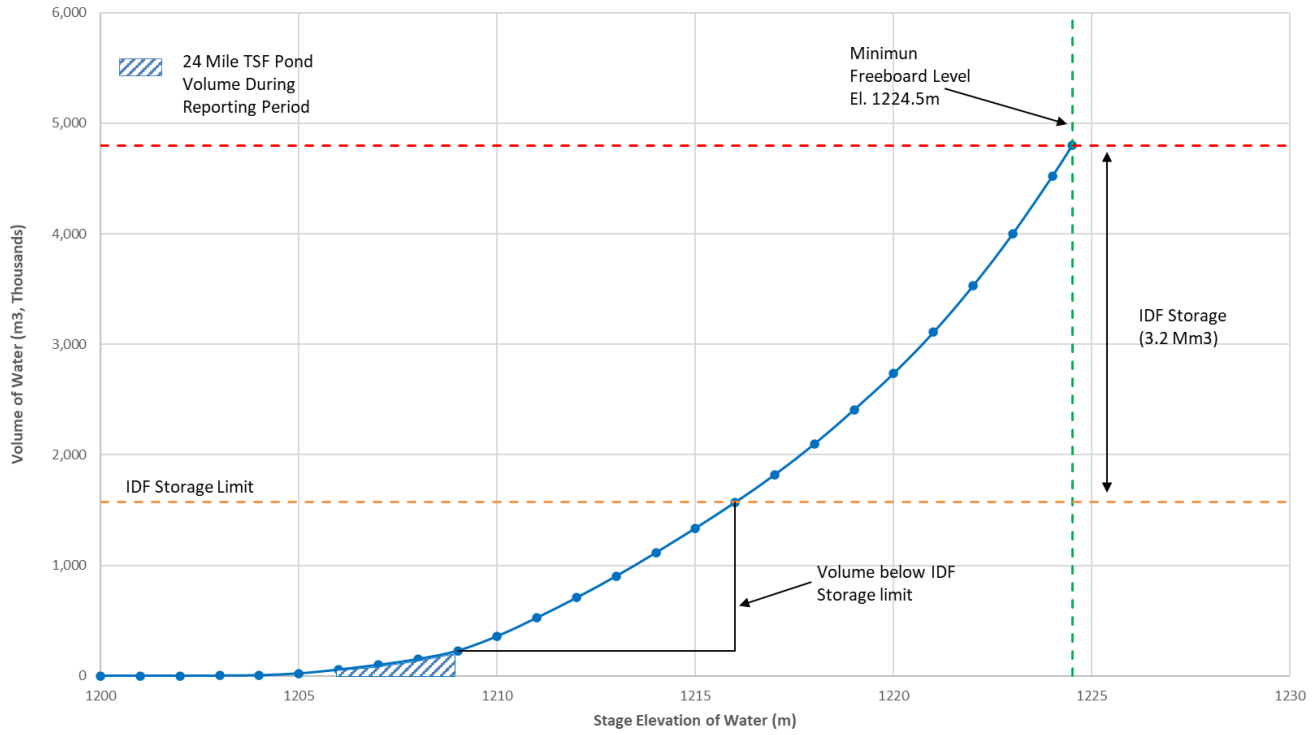
The 24 Mile TSF pond level rose approximately 5 m, to a peak El. 1209 m, during the review period (Figure 5.22). This was greater than expected and the pond level was outside of HVC's target operating range. From mid-2020 to the start of the review period, the 24 Mile TSF pond levels had been maintained within a similar operating range (El. 1204 m to El. 1207 m). During the first half of 2023 the reclaim barge system was out of operation resulting in the greater than expected pond rise. A temporary diesel pumping system was installed in mid-2023 and operated until the replacement electrical pump reclaim system was installed at the end of the review period.

The 24 Mile TSF must be operated with sufficient capacity to store the IDF (3.2 Mm^3, refer to Table 4.3) with freeboard (0.5 m) below the perimeter crest level (El. 1225 m). The perimeter crest is defined by the surrounding pit waste and there is excess capacity to store the forecasted tailings and IDF volume without requiring routine crest raises such as those at the L-L Dam and the H-H Dam. Figure 5.24 shows the stage-storage relationship within the 24 Mile TSF based on the November 2023 survey, as well as the pond level range during the review period and IDF storage requirement. Although the pond level was greater than expected, there was still more than 1 Mm^3 of excess capacity, in addition to the IDF requirement, below the freeboard level (El. 1224.5 m).

Assuming the storage capacity below the freeboard level is reduced by approximately 0.5 Mm^3 annually, the 24 Mile TSF could approach the IDF flood requirement in 2 to 3 years. Flood storage can by increased by raising the low point of the 24 Mile TSF perimeter as described in the 24 Mile TSF flood routing review (KCB 2020c).

The flood storage in the 24 Mile TSF is reduced as additional tailings are deposited and additional waste is placed in the surrounding area. A life-of-mine forecast of flood storage was prepared to predict whether a raise the perimeter area would be required. However, KCB recommends HVC update this forecast based on existing conditions and that it be added to the OMS Manual during the next review and update of the document.

Figure 5.24 24 Mile TSF Pond Level and Storage Capacity During Reporting Period



5.5 Water Quality

HVC's Water Quality Monitoring and Reporting Plan, approved under the PE376 permit (MECCS 2023), specifies minimum water quality sampling requirements at the HVC Mine Site, including downstream of the Highland TSF. A revision to the PE376 permit was issued to HVC on July 27, 2023. In the permit revision, subsurface seepage to Pukaist Creek from the Highland TSF was added to the permit as an authorized discharge.

Water sampling activities and quality 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 the Ministry of Mines prior to March 31, 2024. This report, when available, should be referred to for monitoring data and for a discussion of the results. HVC has confirmed that the water quality monitoring requirements, related to the Highland TSF, were met during the review period.

With regards to the operation of the Highland TSF, there were no surface discharges from the impoundment or downstream collection ponds. The primary seepage controls (i.e., core zone, tailings beach, downstream collection ditch, and ponds) were in place, and instrumentation measurements suggest they performed consistent with expectations during the review period. SAMP operation during the review period is documented in the 2023 annual SAMP report that is prepared by an appropriately qualified professional.

6 2023 SITE VISIT VISUAL OBSERVATIONS

Observations made during the AFPR site visit (September 7, 2023) to support the AFPR, together with copies of the field observation forms and select photographs, are included in Appendix I. Select observations are summarized as follows:

L-L Dam

- The facility was observed to be in good physical condition with no significant visual change or issues of concern. This is consistent with other surveillance observations and data at the time.
- As discussed in Section 5.2.2, the minimum beach requirement at the north abutment (>500 m) and along the remainder of the dam crest (>126 m) were met.
- Active construction areas during the site visits included hydraulic fill placement at the downstream shell of the NBB and core zone raise at the South Dam. The temporary on-dam sediment cells at the VBBE, as well as Sediment Pond 1 and Sediment Pond 2, were in operation.
- The VBB downstream slope had recently been completed to the ultimate configuration. Following this, the L-L Dam downstream slope has been constructed to ultimate configuration except at the VBBE and NBB.
- Downstream surface water and sediment ponds were being operated within operating pond limits.

H-H Dam

- The facility was observed to be in good physical condition with no significant visual change or issues of concern. This is consistent with other surveillance observations and data at the time.
- The 2023 crest raise was ongoing. There was no active placement by the HVC mining fleet at the H-H Dam buttress or the 24 Mile Waste Dump areas during the site visit, but significant fill had been placed earlier in the year.
- The H-H Dam buttress was constructed along the downstream slope of the Mid-Segment up to approximately Sta. 1+870. The remaining section of the buttress, approximately 100 m to Sta. 1+970, will be completed in 2024 after the Line 5 Drain Line and associated building is removed.
- Water levels in the 24 Mile TSF were above HVC operating targets at the time of the site visit. This was related to temporary disruptions in reclaim pumping. HVC established a temporary diesel pumping system and replaced it with a more permanent electrical pumping system after the site visit. Although pond levels were above operating targets, the available flood storage exceeded requirements.

7 2023 DAM SAFETY ASSESSMENT

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 7.4.1), 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.

HVC 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.*

An "Extreme" consequence category, as defined by CDA Dam Safety Guidelines, has been assigned to the L-L Dam, "Very High" to the H-H Dam and "Low" to the 24 Mile TSF. The seepage and sediment ponds downstream of L-L Dam have all been assigned a "Significant" consequence category. 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 IDF and earthquake design ground motion (EDGM) for each of the facilities meet or exceed the equivalent requirements under the HSRC (EMLI 2022).

7.2 Design Basis

No significant changes were made to the design basis memorandum, included in the permitted design report (KCB 2020a), that impact design compliance during the review period. Throughout the review period, the Highland TSF was operated in compliance with design and regulatory criteria defined in the permitted design report (KCB 2020a).

7.3 Status of Dam Safety Review Recommendations

HVC commissioned Envis to complete a Dam Safety Review (DSR) of the Highland TSF in 2022 and the final report was issued in 2023. The DSR did not identify any deficiencies or non-conformances, as defined by the HSRC Guidance Document (MEM 2016), in relation to the design, construction, maintenance and operation of either dam.

The DSR included seven recommendations assigned a Priority 4[11]. These recommendations have been reviewed by KCB and HVC and an action plan prepared to address them; refer to Appendix IV. Two of the DSR recommendations were closed during the review period:

- A standard operating procedures document was prepared for inclinometer data processing (HTSF-DSR-01); and
- A knowledge base of key documents related to the Highland TSF was prepared as part of HVC's GISTM compliance activities (HTSF-DSR-07).

7.4 Failure Modes

7.4.1 2023 Failure Mode Review

Potential failure modes and risk assessment for the Highland 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.

Where applicable, qualitative performance objectives to measure the effectiveness of those controls have been defined in the surveillance program and integrated with the TARPs. There were no changes during the review period that would alter this conclusion.

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

[11] Best Management Practice – Further improvements are necessary to meet industry best practices or reduce potential risks.

7.4.2 L-L Dam

Overtopping

To manage overtopping risks, the Highland TSF is designed to store the 120-hour duration PMF (50.3 Mm^3) (Table 4.3) with 2 m of flood freeboard to account for wave run-up, settlement, and added contingency. The duration of the design flood (120-hour) is longer than required by the HSRC (EMLI 2022) for facilities that store floods (i.e., 72-hour).

At the end of the review period, the following factors also significantly reduce the potential for overtopping:

- At the end of the review period, the pond level was 16.5 m below the L-L Dam crest, and the Highland TSF had approximately 180 Mm^3 of storage available below the flood freeboard level (El. 1272.5 m). Both values are greater than were present at the start of the review period. This is sufficient to store forecasted tailings to be produced in 2024 and more than two IDF events. This far exceeds minimum design and regulatory flood requirements.
- Even under extreme flood conditions, the pond is separated from the downstream slope at the flood freeboard level by a wide crest (>130 m).

With such robust and redundant controls and level of supervision, the potential for overtopping under existing conditions is negligible.

Internal Erosion and Piping – Through Dam Fill

The L-L Dam includes controls that restrict the required conditions for internal erosion to develop and/or propagate through the dam fill:

- Interfaces between fill zones within the dam were designed to be filter compatible so that finer particles cannot be washed through coarser dam fills, and comprehensive quality control/quality assurance programs are in place to confirm fills placed in the dam meet the design intent.
- The low-permeability core, upstream tailings beach, and downstream underdrainage system maintain low seepage gradients in the downstream shell of the dam, which reduces the seepage flow and gradient in the downstream shell.

With these controls in place, the potential for internal erosion through the dam that develops into an overall breach and release of tailings is negligible.

Internal Erosion and Piping – Through Foundation

The L-L Dam includes controls that restrict the required conditions for internal erosion to develop and/or propagate through the foundation:

- The core zone is keyed into Glacial Till or intact bedrock where practicable (refer to the discussion below).

- Where the core zone is not keyed into Glacial Till or intact bedrock, a minimum 500 m beach width is specified to reduce seepage flows and gradients through the foundation:
  - At the North Dam U-GLU segment, where the core zone was not keyed into Glacial Till or bedrock, the minimum 500 m beach was maintained and the seepage gradients through the foundation, near the dam, were <0.1 m. This is less than the lower bound estimate of critical seepage gradient required for the progression of internal erosion (KCB 2020a).
- The blanket drain below the downstream shell is filter compatible with the foundation to prevent any internal erosion through the foundation that daylights within the dam footprint.
- The Low-Level Outlet (LLO) close to the south abutment was decommissioned, which included surrounding the downstream outlet with filter-compatible fill to prevent the progression of internal erosion (KCB 2014).

Slope Stability – Static and Seismic Loading

Compliance with slope stability design and regulatory criteria is checked by KCB prior to the construction of each crest raise, with consideration for material behaviour under changing load (e.g., strain softening, compression), construction-related response (e.g., increased seepage through dam fill, pore pressure generation) and performance under the EDGM (10,000-year return period event).

Characterization of dam fill and foundation soil behaviour is informed by the L-L Dam geologic and geotechnical site characterization (KCB 2022c), which has been developed to supplement knowledge of the dam's historical performance over its +40-year life. The characterization meets the requirements of the Site Characterization for Dam Foundations in BC professional practice document (APEGBC 2016) and has been independently reviewed.

Surveillance observations and measured performance during the review period (Section 5.2.3) concluded dam performance was consistent with expected behaviour based on design and historic measured behaviour.

7.4.3 H-H Dam

Internal Erosion and Piping

The H-H Dam includes similar controls to the L-L Dam, which restrict the required conditions for internal erosion to develop through the dam fill, with one exception. There is no sand and gravel filter separating the glacial till in the dam core from the coarse random fill between El. 1216.7 m and El. 1255.5 m (>26 m below the existing crest).

KCB assessed the risk of internal erosion leading to a structural failure developing due to this gap in the filter, using the method defined by the International Commission on Large Dams (ICOLD 2017). The assessment concluded the existing controls (e.g., upstream tailings beach, >7 km setback from the free water pond, low seepage gradient) would be effective in restricting the progression of any internal erosion along the interface in question (KCB 2020a).

In addition, no indicators of internal erosion (e.g., sinkholes in the dam core, upstream fills, or in the tailings beach) have been recorded throughout the life of the structure.

As a result, the risk of internal erosion leading to a failure that would result in the uncontrolled release of tailings is considered negligible for the existing structure.

Slope Stability – Static and Seismic Loading

Compliance with slope stability design and regulatory criteria is checked by KCB prior to the construction of each crest raise, with consideration for activity in the 24 Mile TSF and the 24 Mile Waste Dump, material behaviour under changing load (e.g., strain softening, compression), piezometric response (e.g., H-H Gland Well pumping, downstream piezometric rise) and performance under the EDGM (5,000-year return period event).

The geological and geotechnical characterization of the H-H Dam (KCB 2020b), which informs stability analyses, meets the requirements of the dam foundation site characterization professional practice document (APEGBC 2016), similar to the L-L Dam.

Surveillance observations and measured performance during the review period (Section 5.3.2), concluded dam performance was consistent with expected behaviour based on design and historic measured behaviour.

7.4.4 24 Mile TSF

Overtopping

To manage overtopping risks, the 24 Mile TSF is operated with sufficient capacity to store the IDF (3.2 Mm^3) with 0.5 m of flood freeboard. The IDF event is 1/3rd between 1,000-year and PMF 72-hour duration event.

At the end of the review period, the pond level in the 24 Mile TSF (El. 1208.0 m) was 17 m below the perimeter containment level and had approximately 4.6 Mm^3 of storage up to the minimum flood freeboard level (0.5 m). This is sufficient to store approximately 1.5 IDF events (Table 4.3) without exceeding the design freeboard. This exceeds minimum design or regulatory flood requirements.

7.5 Emergency Preparedness and Response

The Highland 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 went through a routine update that was issued in 2024. The Highland TSF EPRP is appropriate for the conditions during the review period 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 and management team, including the TSF QP, participated in a simulated exercise to test the Highland TSF EPRP. The EoR, participated as a remote participant in this exercise.

8 SUMMARY

Based on the review of measured performance and observations summarized herein, the Highland TSF performed as expected, and within design requirements, during the review period from December 2022 to November 2023.

The status of dam safety recommendations identified during past AFPRs are summarized in Table 8.1. Closed recommendations are shown in *italics*. HVC installed flowmeters at the SWRP to track flows reclaimed into the impoundment, but installation of new seepage weirs was deferred from 2023 to 2024, after freshet. As discussed in Section 5.1, the replacement of an inclinometer at the L-L Dam (LL-I15-24) was not completed as planned, but HVC has secured the necessary equipment and contractors to complete the work in April 2024.

Four new recommendations were added during this review (Table 8.2). Two are related to improving data management and processing of inclinometer readings. The other two are related to adding the following information to the OMS Manual: a process to estimate the Highland TSF pond volume; and an updated forecast for 24 Mile TSF flood storage. All of these are assigned either Priority 3 or 4, as they are considered best practice activities or related to improving tracking of future conditions.

Two of the seven Priority 4 recommendations from the DSR (Envis 2023) issued during the review period have been closed; refer to Section 7.3. Work activities to address the remaining recommendations are planned to be completed over the next two years as described in Appendix IV.

Table 8.1 Previous Recommendations Related to Facility Performance – Status Update

ID No.	Performance Area	Recommended Action	Priority[1]	Deadline (Status)
L-L Dam				
LL-2019-02	Surveillance	HVC to Install new seepage weirs along the downstream toe after the SWRP has been replaced and the L-L Dam constructed to the ultimate toe (DSR recommendation LL-2017-06).	3	Q4 2021 – Open; location of new weirs defined and installations planned for 2024
LL-2021-01	Surveillance	HVC to Install a replacement inclinometer for LL-I15-24 at the VBB.	3	Q4 2022 – Open; equipment procured, and installation scheduled for April 2024
LL-2022-01	*Maintenance*	*HVC to repair the L-L Dam Weather Station to measure precipitation and temperature at the Highland TSF.*	*4*	*Q1 2024 – CLOSED; data collection from climate station resumed*
LL-2022-02	*Surveillance*	*HVC to install additional piezometer monitoring points at the South Dam to increase monitoring coverage area. Locations to be agreed upon with the EoR.*	*4*	*August 2024 – CLOSED; piezometers were installed in March 2024*
H-H Dam – No Open Recommendations				

Notes:

1. Recommendation priority guidelines, specified by Teck 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.

Table 8.2 2023 AFPR Recommendations Related to Facility Performance

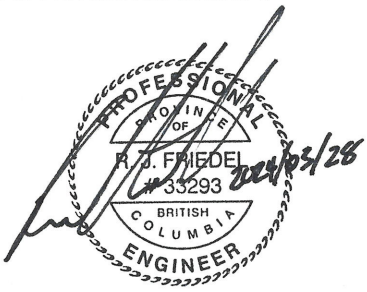
ID No.	Performance Area	Recommended Action	Priority[1]	Deadline
L-L Dam				
LL-2023-01	Water Balance	HVC to define the method used to estimate the Highland TSF pond volume between bathymetric surveys in the OMS Manual.	4	Q1 2025
LL-2023-02	Surveillance	HVC to implement updated procedure for processing of inclinometer readings and add to OMS Manual and apply to previous readings to ensure consistency. This applies to inclinometers at both the L-L Dam and H-H Dam.	3	Q3 2024
LL-2023-03	Surveillance	HVC to complete spiral corrections surveys of all down-hole inclinometer casings.	3	Q1 2025
24 Mile TSF				
24M-2023-01	Flood Storage	HVC to include a forecast of flood storage within 24 Mile TSF in the Highland TSF OMS Manual that projects, if and/or when the perimeter crest of 24 Mile TSF needs to be raised to maintain IDF flood storage compliance.	4	Q1 2025

Notes:
1. Refer to Notes for Table 1.

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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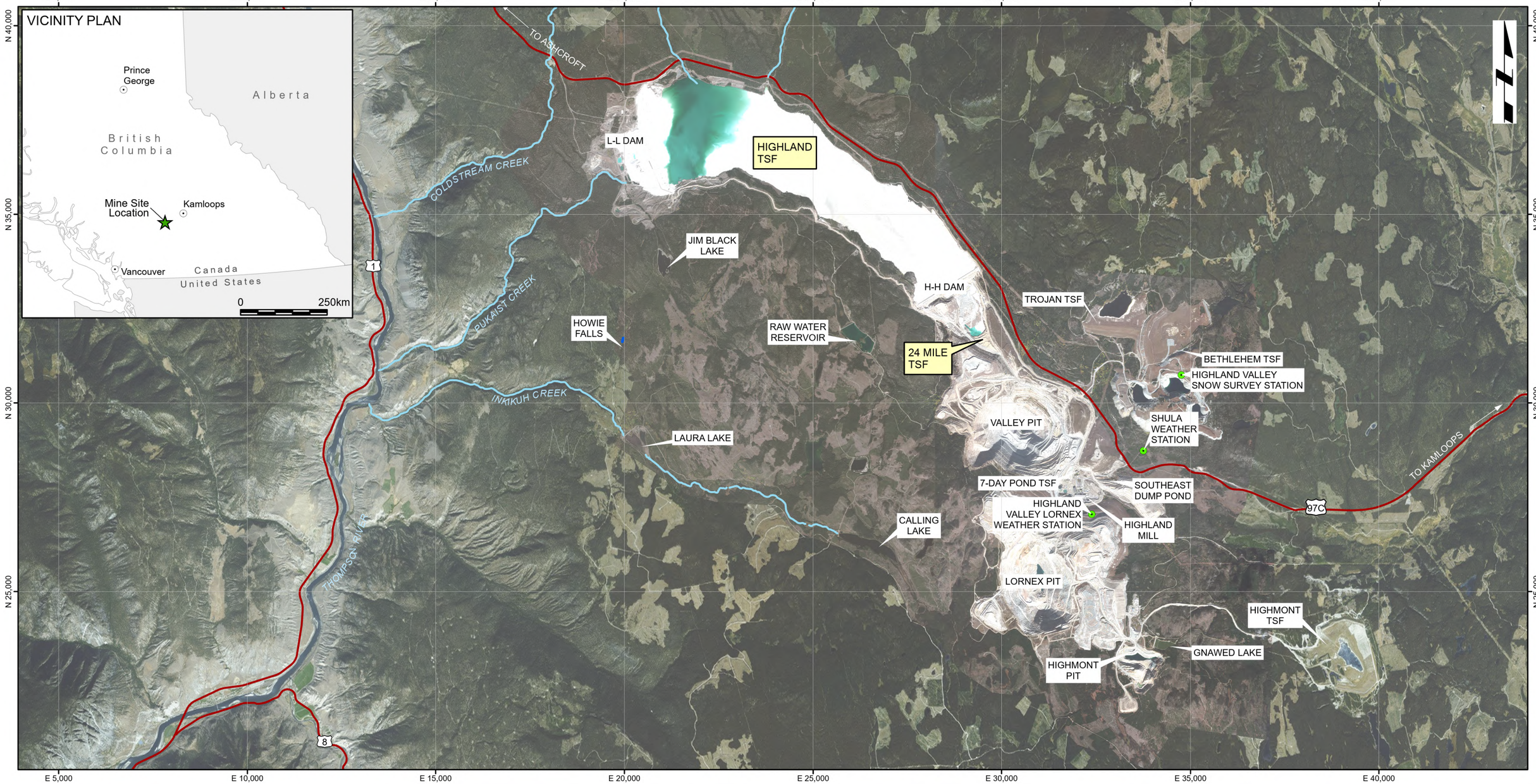
FIGURES



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 THE ESRI, WORLD IMAGERY MAP SERVICE.

NOT FOR CONSTRUCTION

SCALE 0 5km

CLIENT: Highland Valley Copper / Teck

Klohn Crippen Berger

PROJECT: HIGHLAND TAILINGS STORAGE FACILITY
2023 ANNUAL FACILITY PERFORMANCE REPORT

TITLE: MINE SITE PLAN

SCALE	PROJECT No.	FIG No.
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E 21,500 E 21,000 E 20,500 E 20,000 E 19,500

100 m

MINIMUM BEACH REQUIRED = 500 m

MINIMUM BEACH REQUIRED = 126 m

NORTH DAM U-GLU

NORTH DAM BEDROCK

NORTH BUTTRESS BERM

VALLEY BUTTRESS BERM EXTENSION

VALLEY BUTTRESS BERM

SOUTH DAM

3+900 3+800 3+700 3+600 3+500 3+400 3+300 3+200 3+100 3+000 2+900 2+800 2+700 2+600 2+500 2+400 2+300 2+200 2+100 2+000 1+900 1+800 1+700 1+600 1+500 1+400 1+300 1+200 1+100 1+050 1+000 0+900

LL-2023-01 LL-2023-02 LL-2023-03 LL-2023-04 LL-2023-05 LL-2023-06 LL-2023-07

11 12 13 14 15 16 17 18 19

NORTH DAM BUTTRESS

NORTH BUTTRESS BERM TEMPORARY ON-DAM SEDIMENT CELL

VALLEY BUTTRESS BERM EXTENSION TEMPORARY ON-DAM SEDIMENT CELL

SEDIMENT POND 1 NORTH CELL

SEDIMENT POND 1 SOUTH CELL

SEEPAGE WATER RECLAIM POND

SEDIMENT POND 2

SEDIMENT POND 4

SEEPAGE POND 2

LEGEND

- WAYPOINT (LL-2023-xx)
- ULTIMATE DAM FOOTPRINT - MODIFIED BASE CASE
- DESIGN MINIMUM - NORMAL OPERATING BEACH
- INSTRUMENT SECTION
- ACTIVE HYDRAULIC PLACEMENT SEDIMENT POND
- 3+900 L-L DAM CENTERLINE

NOTES:

1. PROJECTION: HVC MINE GRID.
2. IMAGERY FROM HVC OBTAINED OCTOBER, 2023.

NOT FOR CONSTRUCTION

SCALE 0 250m

CLIENT: Highland Valley Copper / Teck

Klohn Crippen Berger

PROJECT: HIGHLAND TAILINGS STORAGE FACILITY
2023 ANNUAL FACILITY PERFORMANCE REPORT

TITLE: L-L DAM PLAN
OCTOBER 2023

SCALE	PROJECT No	FIG No.
AS SHOWN	M02341C62	2

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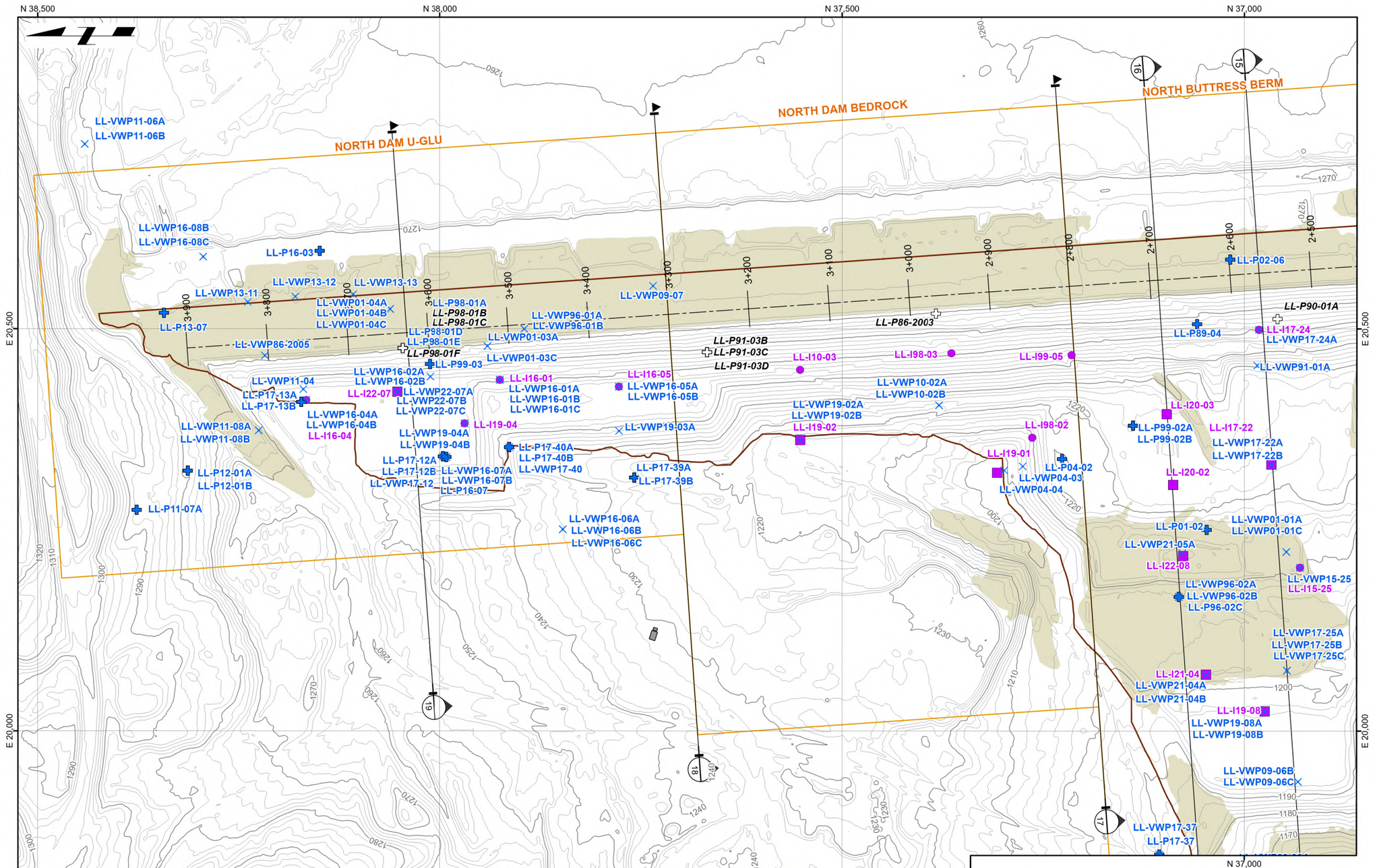

NOTES:

1. TOPOGRAPHY PROVIDED BY TECK HIGHLAND VALLEY COPPER PARTNERSHIP, SURVEY DATED OCTOBER 2023.
2. STATUS OF ACTIVE PIEZOMETERS FOR REPORTING PERIOD IS SHOWN ON PLAN. ACTIVE PIEZOMETERS SATISFY ONE OF THE FOLLOWING CRITERIA: CURRENTLY READING AN ACTIVE WATER LEVEL, OR DRY OR PLUGGED <20 m ABOVE TIP ELEVATION. DEFUNCT INSTRUMENTS NOT SHOWN.

NOT FOR CONSTRUCTION

SCALE 0 250m

CLIENT: Highland Valley Copper / Teck

Klohn Crippen Berger

PROJECT: HIGHLAND TAILINGS STORAGE FACILITY
2023 ANNUAL FACILITY PERFORMANCE REPORT

TITLE: L-L DAM
INSTRUMENTATION LOCATION PLAN
NORTH DAM

SCALE	PROJECT No.	FIG No.
AS SHOWN	M02341C62	3

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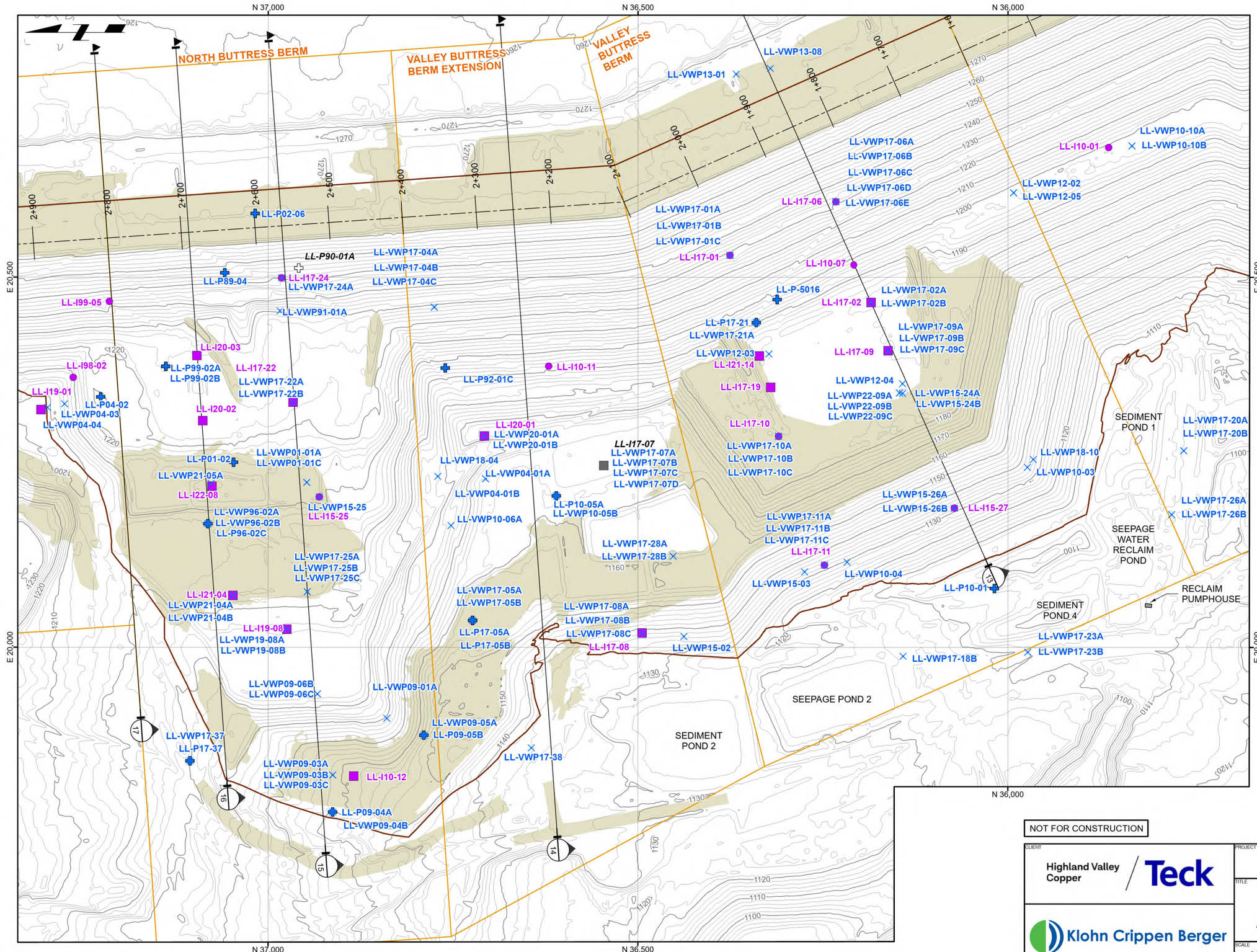

LEGEND

INSTRUMENT WITH DATA
- VIBRATING WIRE PIEZOMETER
- STANDPIPE PIEZOMETER
- SAA OR SAAV INCLINOMETER
- MANUAL INCLINOMETER

INSTRUMENT WITHOUT DATA
- STANDPIPE PIEZOMETER
- MANUAL INCLINOMETER

DESIGN AND CONSTRUCTION DATA
- ULTIMATE DAM FOOTPRINT
- SUB DAM
- CONTOUR (10 m)
- CONTOUR (2 m)
- FILL PLACEMENT AREA (APRIL - NOVEMBER)

INSTRUMENT SECTION
- 3+900
- L-L DAM CENTERLINE

NOTES:

1. TOPOGRAPHY PROVIDED BY TECK HIGHLAND VALLEY COPPER PARTNERSHIP, SURVEY DATED OCTOBER 2023.
2. STATUS OF ACTIVE PIEZOMETERS FOR REPORTING PERIOD IS SHOWN ON PLAN. ACTIVE PIEZOMETERS SATISFY ONE OF THE FOLLOWING CRITERIA: CURRENTLY READING AN ACTIVE WATER LEVEL, OR DRY OR PLUGGED <20 m ABOVE TIP ELEVATION. DEFUNCT INSTRUMENTS NOT SHOWN.

NOT FOR CONSTRUCTION

SCALE 0 250m

CLIENT: Highland Valley Copper / Teck

Klohn Crippen Berger

PROJECT: HIGHLAND TAILINGS STORAGE FACILITY
2023 ANNUAL FACILITY PERFORMANCE REPORT

TITLE: L-L DAM
INSTRUMENTATION LOCATION PLAN
NORTH BUTTRESS BERM AND
VALLEY BUTTRESS BERM EXTENSION

SCALE	PROJECT No.	FIG No.
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N 36,500
N 36,000
N 35,500
E 21,000
E 20,500
E 20,000

SOUTH DAM
VALLEY BUTTRESS BERM
VALLEY BUTTRESS BERM EXTENSION
SEDIMENT POND 1
SEDIMENT POND 4
SEEPAGE WATER RECLAIM POND
RECLAIM PUMPHOUSE
TW STOCKPILE A

LL-VWP13-05
LL-VWP17-03A
LL-VWP17-03B
LL-VWP17-03C
LL-VWP02-03
LL-VWP02-04
LL-VWP10-11A
LL-P10-11B
LL-I10-08
LL-VWP13-08
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LL-VWP17-08C
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LL-VWP15-02
LL-VWP17-18B
LL-VWP17-23A
LL-VWP17-23B
LL-P17-05A
LL-P17-05B

LEGEND

INSTRUMENT WITH DATA
- VIBRATING WIRE PIEZOMETER
- STANDPIPE PIEZOMETER
- SAA OR SAAV INCLINOMETER
- MANUAL INCLINOMETER

INSTRUMENT WITHOUT DATA
- MANUAL INCLINOMETER

DESIGN AND CONSTRUCTION DATA
- ULTIMATE DAM FOOTPRINT
- SUB DAM
- CONTOUR (10 m)
- CONTOUR (2 m)
- FILL PLACEMENT AREA (APRIL - NOVEMBER)

INSTRUMENT SECTION

3+900 L-L DAM CENTERLINE

NOTES:

1. TOPOGRAPHY PROVIDED BY TECK HIGHLAND VALLEY COPPER PARTNERSHIP, SURVEY DATED OCTOBER 2023.
2. STATUS OF ACTIVE PIEZOMETERS FOR REPORTING PERIOD IS SHOWN ON PLAN. ACTIVE PIEZOMETERS SATISFY ONE OF THE FOLLOWING CRITERIA: CURRENTLY READING AN ACTIVE WATER LEVEL, OR DRY OR PLUGGED <20 m ABOVE TIP ELEVATION. DEFUNCT INSTRUMENTS NOT SHOWN.

NOT FOR CONSTRUCTION

SCALE 0 250m

CLIENT: Highland Valley Copper / Teck

Klohn Crippen Berger

PROJECT: HIGHLAND TAILINGS STORAGE FACILITY
2023 ANNUAL FACILITY PERFORMANCE REPORT

TITLE: L-L DAM
INSTRUMENTATION LOCATION PLAN
VALLEY BUTTRESS BERM
AND SOUTH DAM

SCALE	PROJECT No.	FIG No.
AS SHOWN	M02341C62	5

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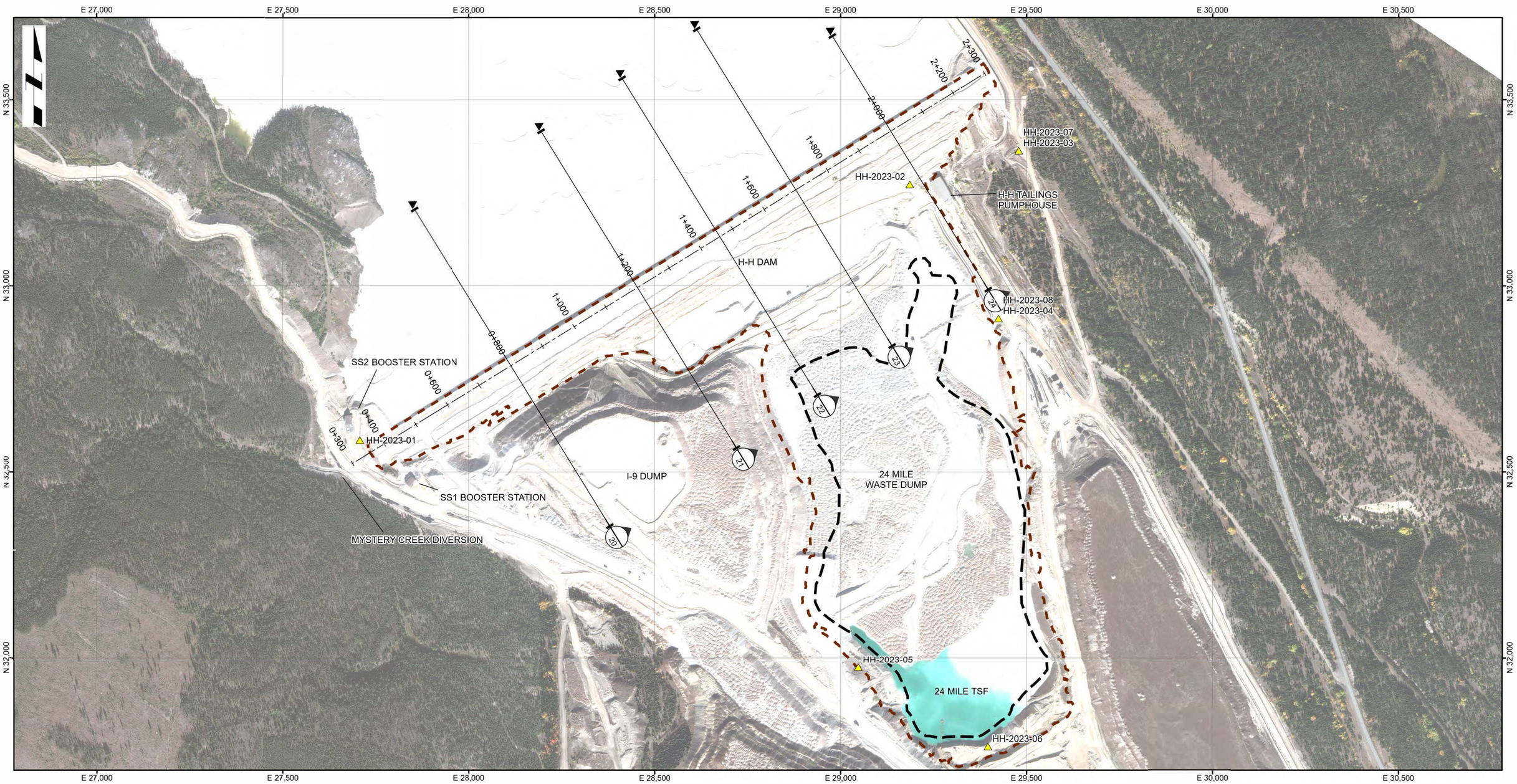

LEGEND

- WAYPOINT (HH-2023-xx)
- ULTIMATE DAM AND BUTTRESS FOOTPRINT
- 24 MILE EMERGENCY TSF EXTENT
- 3+900 H-H DAM CENTERLINE
- INSTRUMENT SECTION

NOTES:

1. PROJECTION: HVC MINE GRID.
2. IMAGERY FROM TECK OBTAINED OCTOBER, 2023.

NOT FOR CONSTRUCTION

SCALE 0 250m

CLIENT: Highland Valley Copper / Teck

PROJECT: HIGHLAND TAILINGS STORAGE FACILITY
2023 ANNUAL FACILITY PERFORMANCE REPORT

TITLE: H-H DAM PLAN
OCTOBER 2023

Klohn Crippen Berger

SCALE	PROJECT No	FIG No.
AS SHOWN	M02341C62	6

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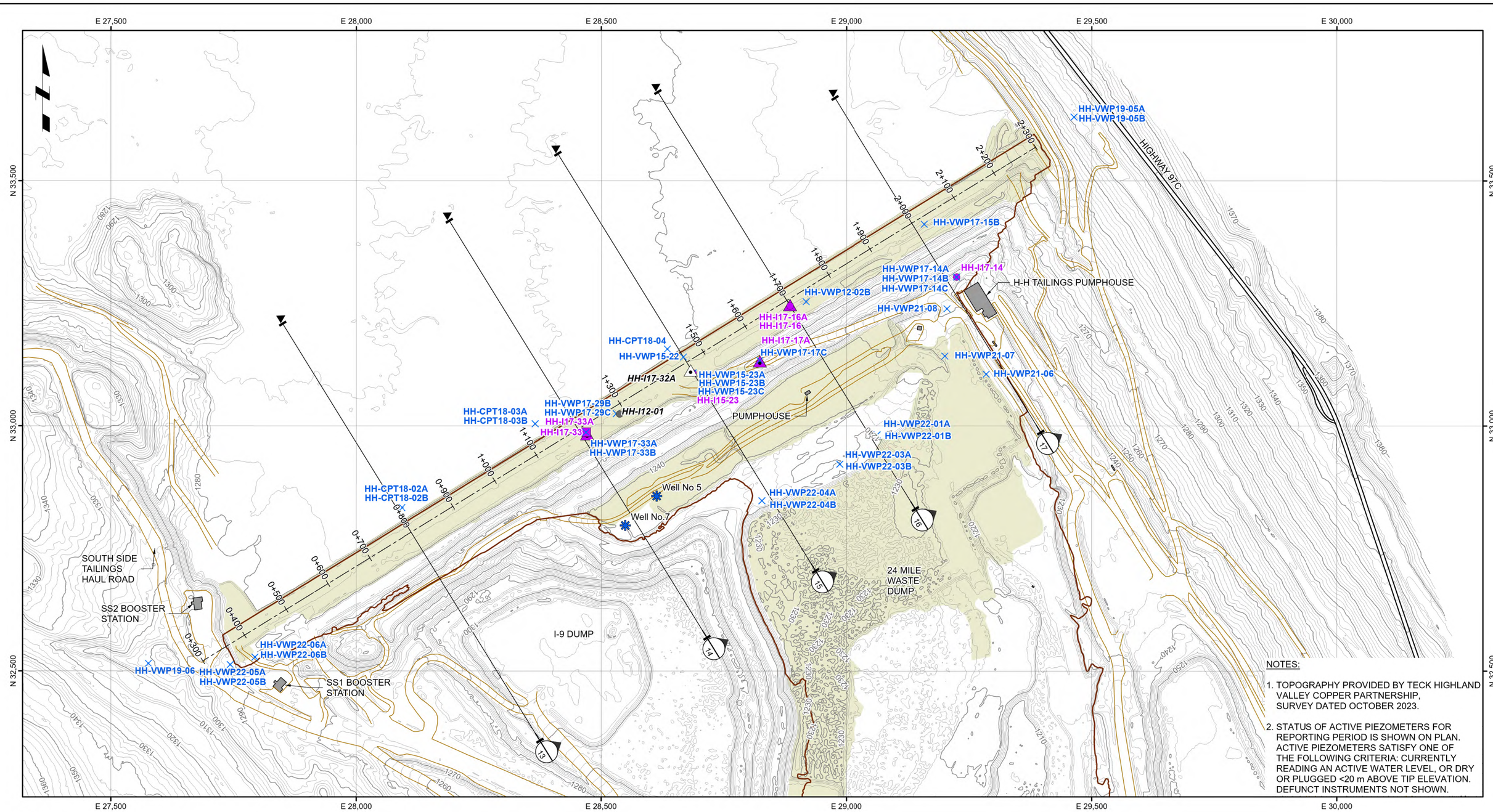

NOTES:

1. TOPOGRAPHY PROVIDED BY TECK HIGHLAND VALLEY COPPER PARTNERSHIP, SURVEY DATED OCTOBER 2023.
2. STATUS OF ACTIVE PIEZOMETERS FOR REPORTING PERIOD IS SHOWN ON PLAN. ACTIVE PIEZOMETERS SATISFY ONE OF THE FOLLOWING CRITERIA: CURRENTLY READING AN ACTIVE WATER LEVEL, OR DRY OR PLUGGED <20 m ABOVE TIP ELEVATION. DEFUNCT INSTRUMENTS NOT SHOWN.

LEGEND

INSTRUMENT WITH DATA
- VIBRATING WIRE PIEZOMETER
- SAA OR SAAV INCLINOMETER
- MANUAL INCLINOMETER
- SONDEX SETTLEMENT MONITORING SYSTEM

MONITORING WELL

INSTRUMENT WITHOUT DATA
- SAA OR SAAV INCLINOMETER
- SONDEX SETTLEMENT MONITORING SYSTEM

DESIGN AND CONSTRUCTION DATA
- ULTIMATE DAM AND BUTTRESS FOOTPRINT
- HAUL ROAD EDGE (2022)
- PUBLIC ROAD EDGE
- CONTOUR (10 m)
- CONTOUR (2 m)

AFPR FILL PLACEMENT AREA (APRIL - NOVEMBER)

INSTRUMENT SECTION

3+900 H-H DAM CENTERLINE

NOT FOR CONSTRUCTION

SCALE 0 250m

CLIENT: Highland Valley Copper / Teck

Klohn Crippen Berger

PROJECT: HIGHLAND TAILINGS STORAGE FACILITY
2023 ANNUAL FACILITY PERFORMANCE REPORT

TITLE: H-H DAM
INSTRUMENTATION LOCATION PLAN

SCALE	PROJECT No.	FIG No.
AS SHOWN	M02341C62	7

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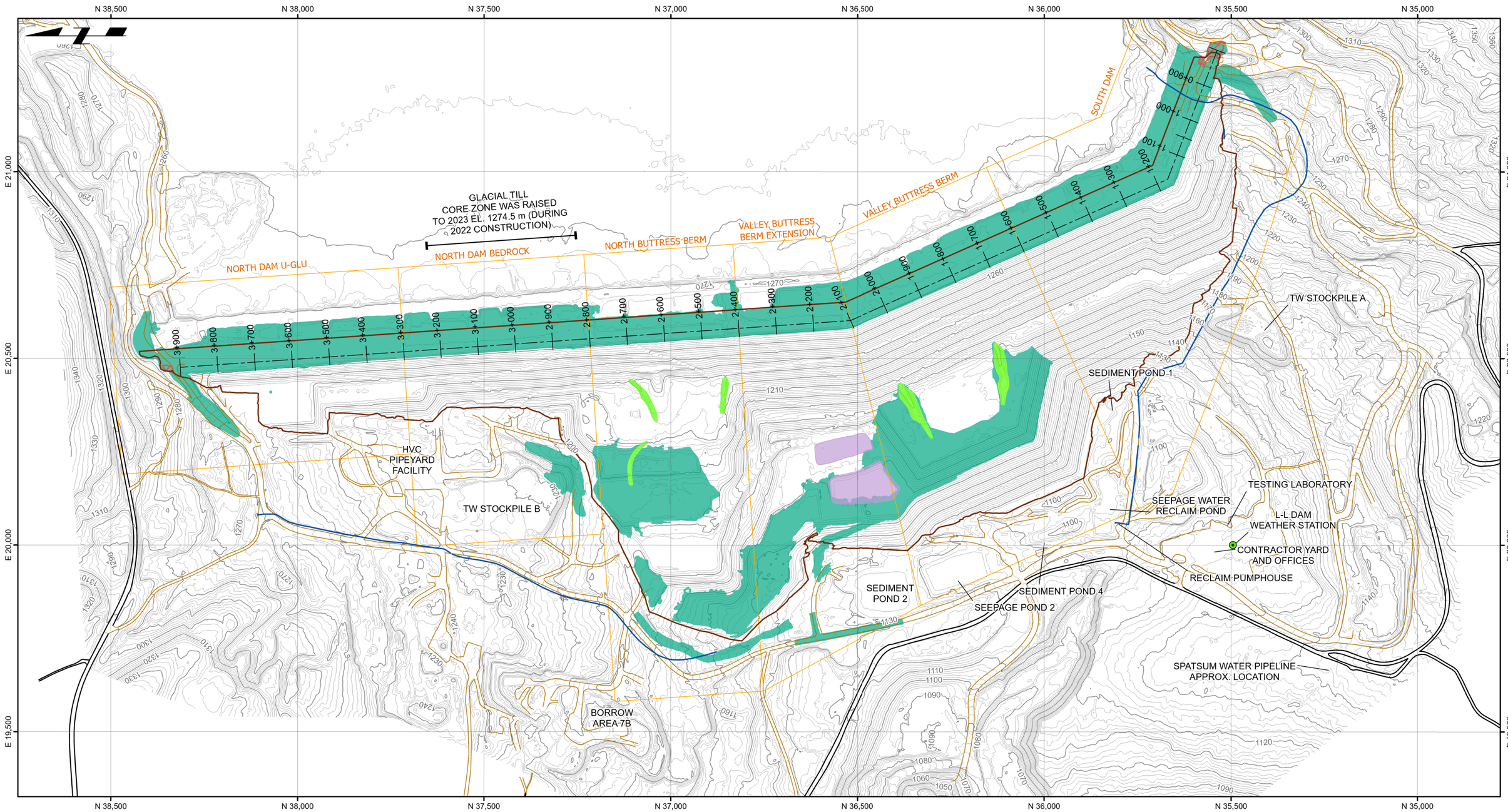

LEGEND

- SURFACE WATER RECLAIM PIPELINE
- ULTIMATE DAM FOOTPRINT
- SUB DAM
- HAUL ROAD EDGE (2022)
- PUBLIC ROAD EDGE
- CONTOUR (10 m)
- CONTOUR (2 m)
- ACTIVE HYDRAULIC PLACEMENT SEDIMENT POND
- FOUNDATION PREPARATION
- PIPE GRADE
- CYCLONED SAND FILL PLACEMENT
- 3+900 — L-L DAM CENTERLINE

NOTES:

1. TOPOGRAPHY FROM HVC OBTAINED OCTOBER, 2023.

NOT FOR CONSTRUCTION

SCALE 0 250m

CLIENT: Highland Valley Copper / Teck

PROJECT: HIGHLAND TAILINGS STORAGE FACILITY
2023 ANNUAL FACILITY PERFORMANCE REPORT

TITLE: L-L DAM
2023 CONSTRUCTION WORK AREAS

Klohn Crippen Berger

SCALE	PROJECT No.	FIG No.
AS SHOWN	M02341C62	8

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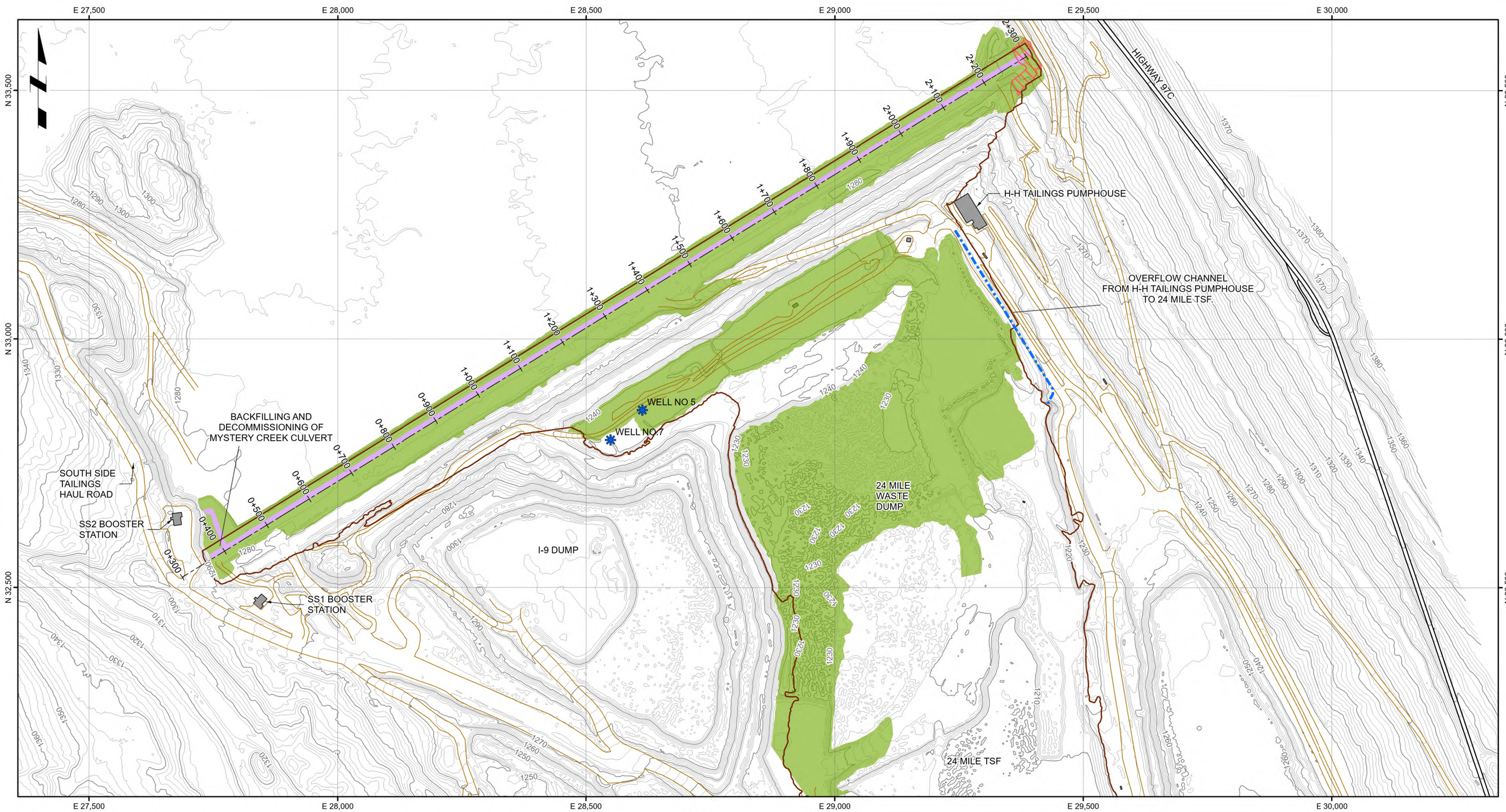

LEGEND

- MONITORING WELL
- ULTIMATE DAM AND BUTTRESS FOOTPRINT
- HAUL ROAD EDGE (2022)
- PUBLIC ROAD EDGE
- CONTOUR (10 m)
- CONTOUR (2 m)
- 3+900 — H-H DAM CENTERLINE
- FOUNDATION PREPARATION
- SAND AND GRAVEL FILTER
- ROCKFILL

NOTES:

1. TOPOGRAPHY FROM HVC OBTAINED OCTOBER, 2023.
2. WASTE ROCK PLACED BY HVC MINING FLEET DURING REVIEW PERIOD BUT AREA NOT SHOWN.

NOT FOR CONSTRUCTION

SCALE 0 250m

CLIENT: Highland Valley Copper / Teck

Klohn Crippen Berger

PROJECT: HIGHLAND TAILINGS STORAGE FACILITY
2023 ANNUAL FACILITY PERFORMANCE REPORT

TITLE: H-H DAM
2023 CONSTRUCTION WORK AREAS

SCALE	PROJECT No.	FIG No.
AS SHOWN	M02341C62	9

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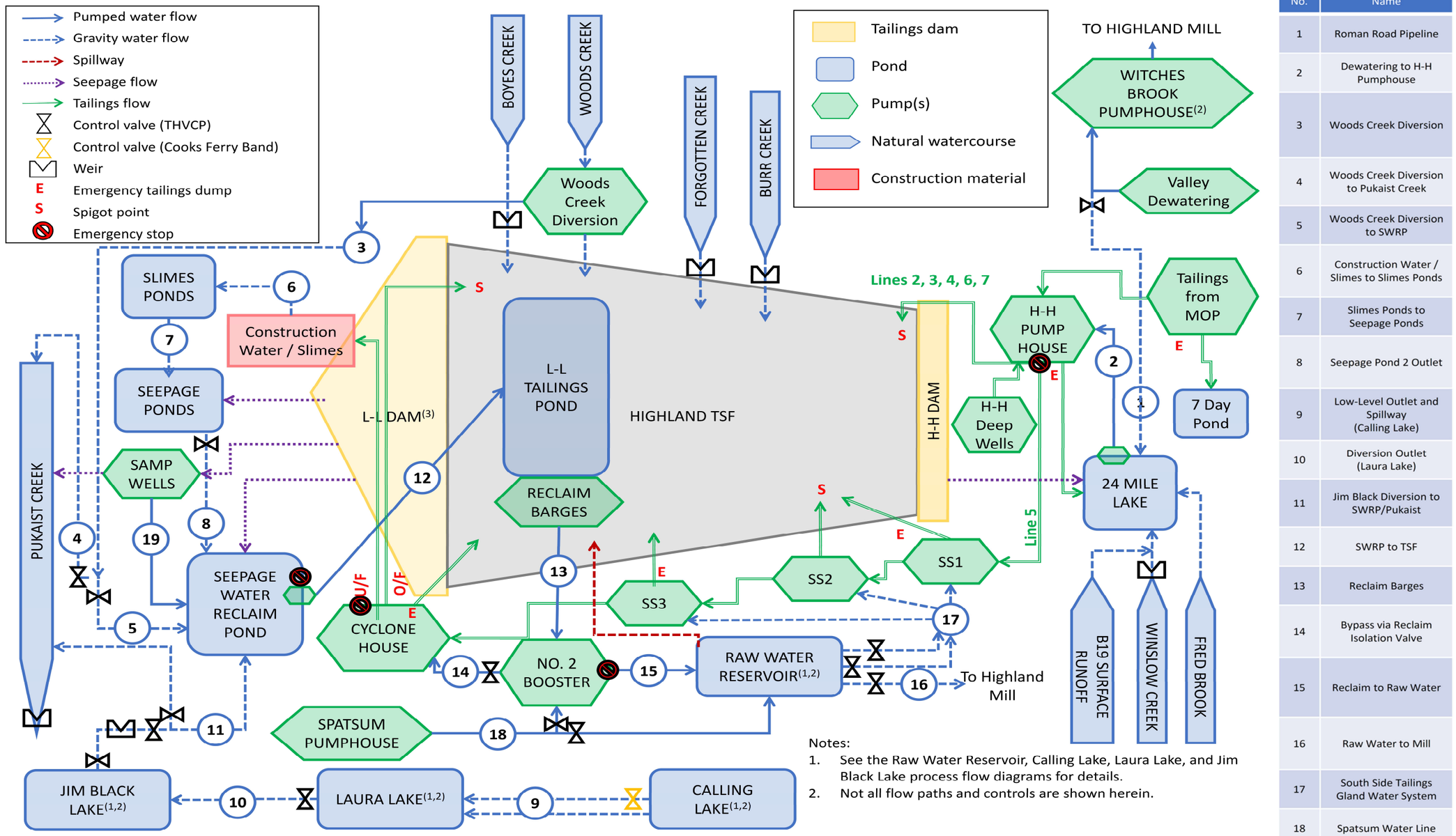


No.	Name
1	Roman Road Pipeline
2	Dewatering to H-H Pumphouse
3	Woods Creek Diversion
4	Woods Creek Diversion to Pukaist Creek
5	Woods Creek Diversion to SWRP
6	Construction Water / Slimes to Slimes Ponds
7	Slimes Ponds to Seepage Ponds
8	Seepage Pond 2 Outlet
9	Low-Level Outlet and Spillway (Calling Lake)
10	Diversion Outlet (Laura Lake)
11	Jim Black Diversion to SWRP/Pukaist
12	SWRP to TSF
13	Reclaim Barges
14	Bypass via Reclaim Isolation Valve
15	Reclaim to Raw Water
16	Raw Water to Mill
17	South Side Tailings Gland Water System
18	Spatsum Water Line
19	SAMP Wells

Notes:
1. See the Raw Water Reservoir, Calling Lake, Laura Lake, and Jim Black Lake process flow diagrams for details.
2. Not all flow paths and controls are shown herein.

NOTES:

1. FLOW SHEMATIC PROVIDED BY HVC FOR 2022 AFPR.

NOT FOR CONSTRUCTION

CLIENT: Highland Valley Copper / Teck

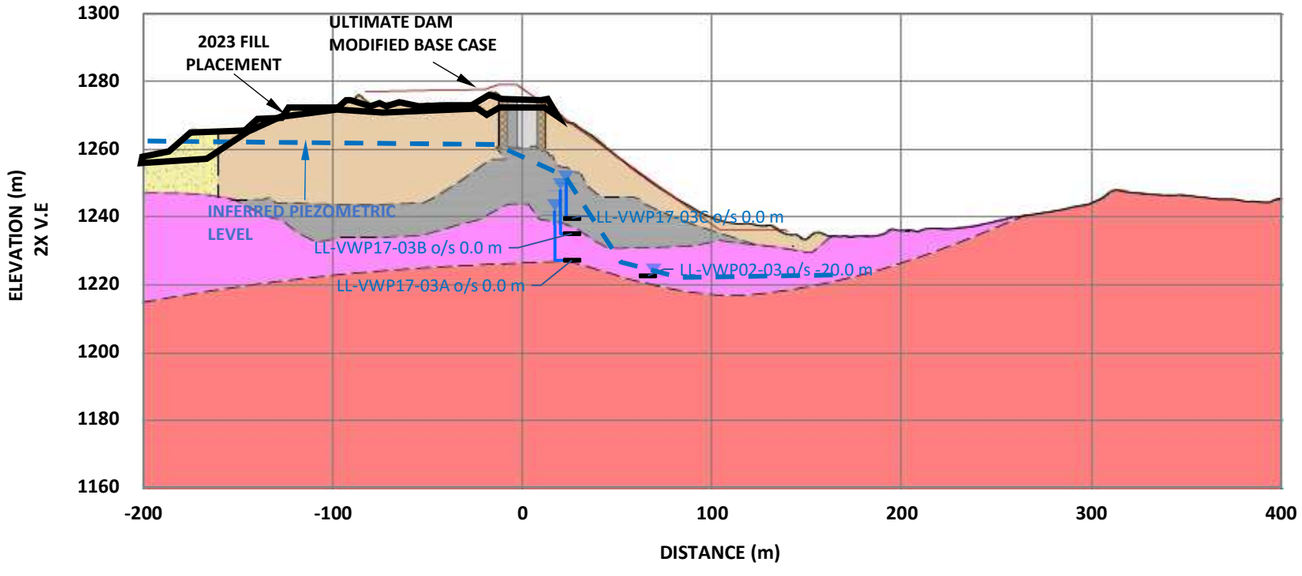
Klohn Crippen Berger

PROJECT: HIGHLAND TAILINGS STORAGE FACILITY
2023 ANNUAL FACILITY PERFORMANCE REPORT

TITLE: FLOW SCHEMATIC FOR HIGHLAND TSF

SCALE	PROJECT No.	FIG. No.
NTS	M02341C62	10

FILE PATH: \\NT-KLOHN.COM\PROJDATA\WVCR\M02341C62-HVC 2023 AFPR\700 DELIVERABLES\720 WORKING\2023 AFPR\HIGHLAND\FIGURES\FIGURE FILES\INSTRUMENTATION SECTION FILES AND FIGURE 10\240227 FIGURE TEMPLATE.XLSX - 2024-03-15 13:13



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LEGEND

- 2022 GROUND SURFACE (NOTE 6)
- FUNCTIONAL INCLINOMETER
- PIEZOMETER TIP
- WATER EL. AS OF NOVEMBER 30, 2023

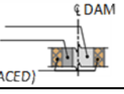
LOWER STRENGTH FOUNDATION UNITS INTERCEPTS (NOTE 4) :

- MOVEMENT ZONE: RATE < NOTIFICATION LEVEL (NL)
- MOVEMENT RATE ≥ NL

- DAM FILL
- TAILINGS
- GLACIAL TILL
- GUICHON CREEK BATHOLITH

TILL CORE

T1: SANDY TILL
T2: CLAY TILL
S2: TAILINGS SAND (MECHANICALLY PLACED)



NOT FOR CONSTRUCTION

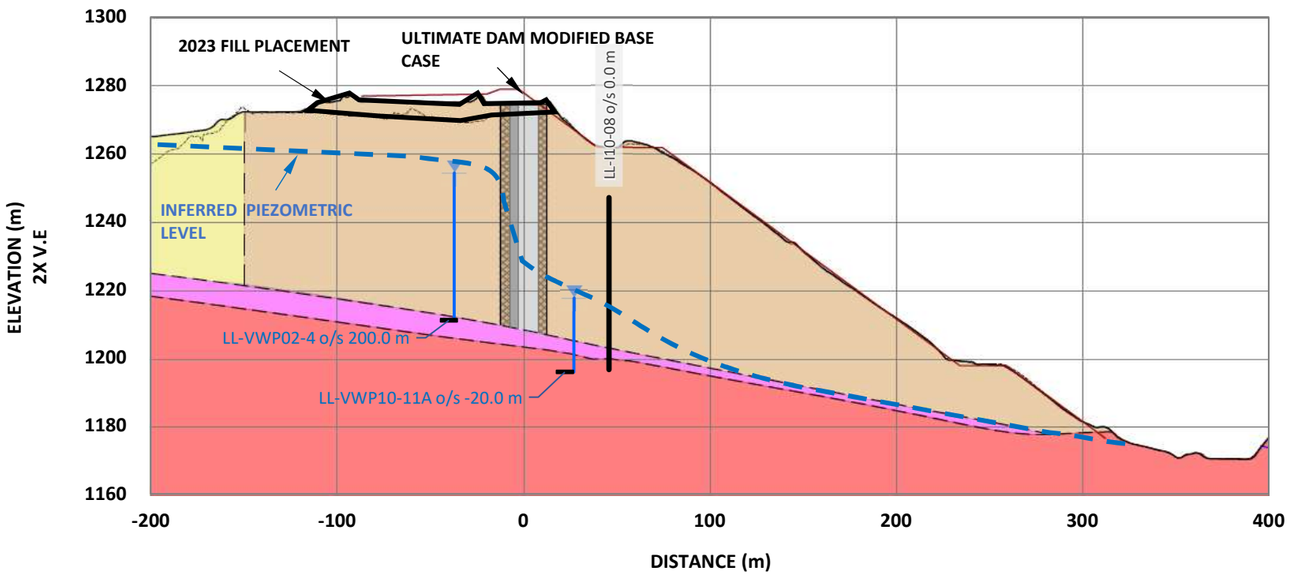
CLIENT: Highland Valley Copper / Teck

Klohn Crippen Berger

PROJECT: HIGHLAND TAILINGS STORAGE FACILITY
2023 ANNUAL FACILITY PERFORMANCE REPORT

TITLE: L-L DAM
INSTRUMENTATION SECTION - Sta. 1+050
NOVEMBER 2023

SCALE	PROJECT No.	FIG. No.
NTS	M02341C62	11



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LEGEND

- 2022 GROUND SURFACE (NOTE 6)
- FUNCTIONAL INCLINOMETER
- PIEZOMETER TIP
- WATER EL. AS OF NOVEMBER 30, 2023

LOWER STRENGTH FOUNDATION UNITS INTERCEPTS (NOTE 4) :

- MOVEMENT ZONE: RATE < NOTIFICATION LEVEL (NL)
- MOVEMENT RATE ≥ NL

- DAM FILL
- TAILINGS
- GLACIAL TILL
- GUICHON CREEK BATHOLITH

TILL CORE
T1: SANDY TILL
T2: CLAY TILL
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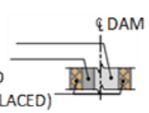


NOT FOR CONSTRUCTION

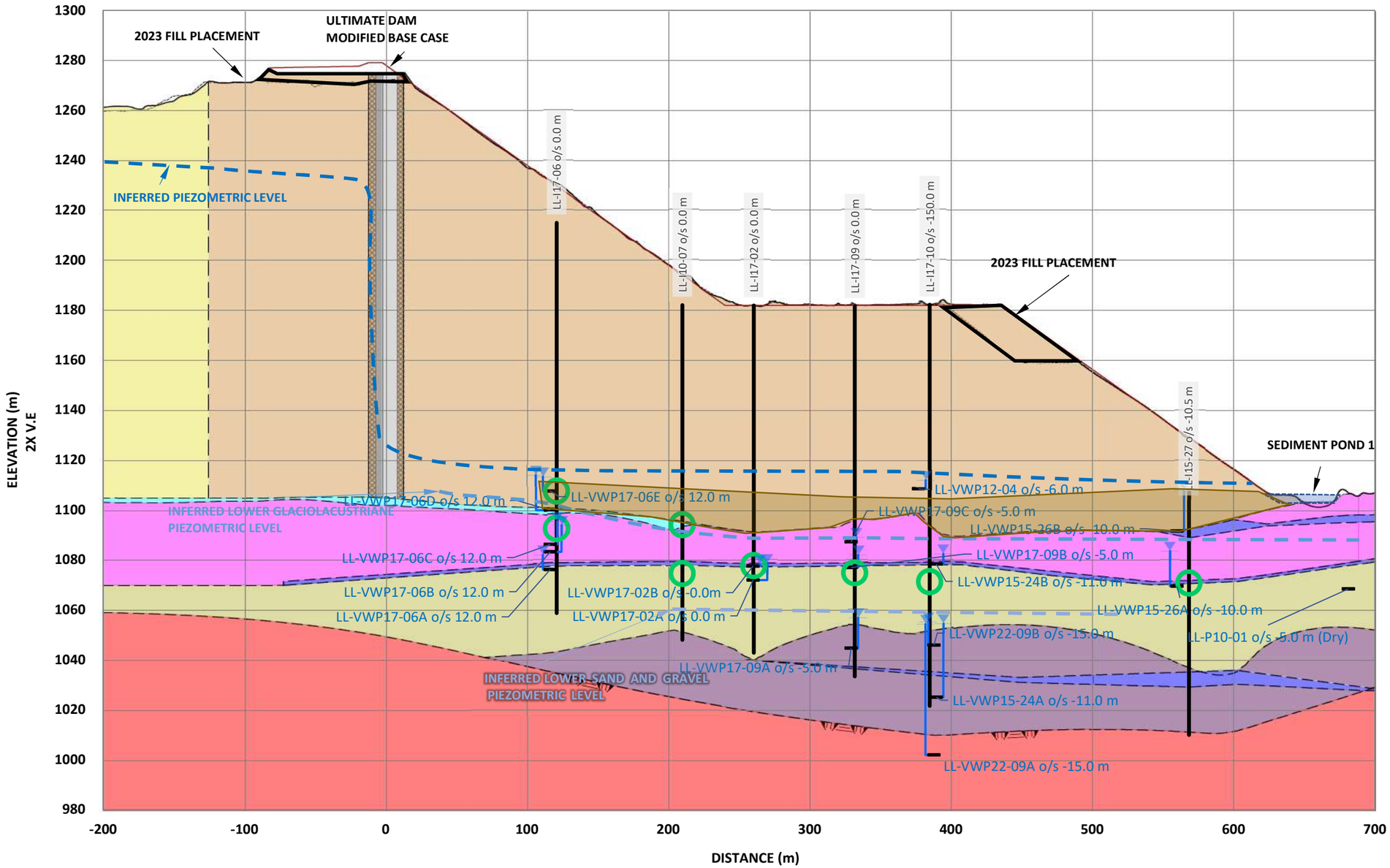
CLIENT
Highland Valley Copper / Teck

Klohn Crippen Berger

PROJECT
HIGHLAND TAILINGS STORAGE FACILITY
2023 ANNUAL FACILITY PERFORMANCE REPORT

TITLE
L-L DAM
INSTRUMENTATION SECTION - Sta. 1+200
NOVEMBER 2023

SCALE	PROJECT No.	FIG. No.
NTS	M02341C62	12



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LEGEND

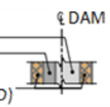
- 2022 GROUND SURFACE (NOTE 5)
- FUNCTIONAL INCLINOMETERS
- PIEZOMETER TIP
- WATER ELEVATION AS OF NOVEMBER 30, 2023
- INFERRED TOP AND BOTTOM OF DRAINAGE BLANKET

LOWER STRENGTH FOUNDATION UNITS INTERCEPTS (NOTE 4):

- MOVEMENT ZONE: RATE < NOTIFICATION LEVEL (NL)
- MOVEMENT RATE ≥ NL

- DAM FILL
- TAILINGS
- LACUSTRINE
- GLACIOLACUSTRINE (GLU)
- GLACIAL TILL
- LOWER SAND AND GRAVEL
- LOWER TILL/GRAVEL
- GUICHON CREEK BATHOLITH

TILL CORE
T1: SANDY TILL
T2: CLAY TILL
S2: TAILINGS SAND
(MECHANICALLY PLACED)



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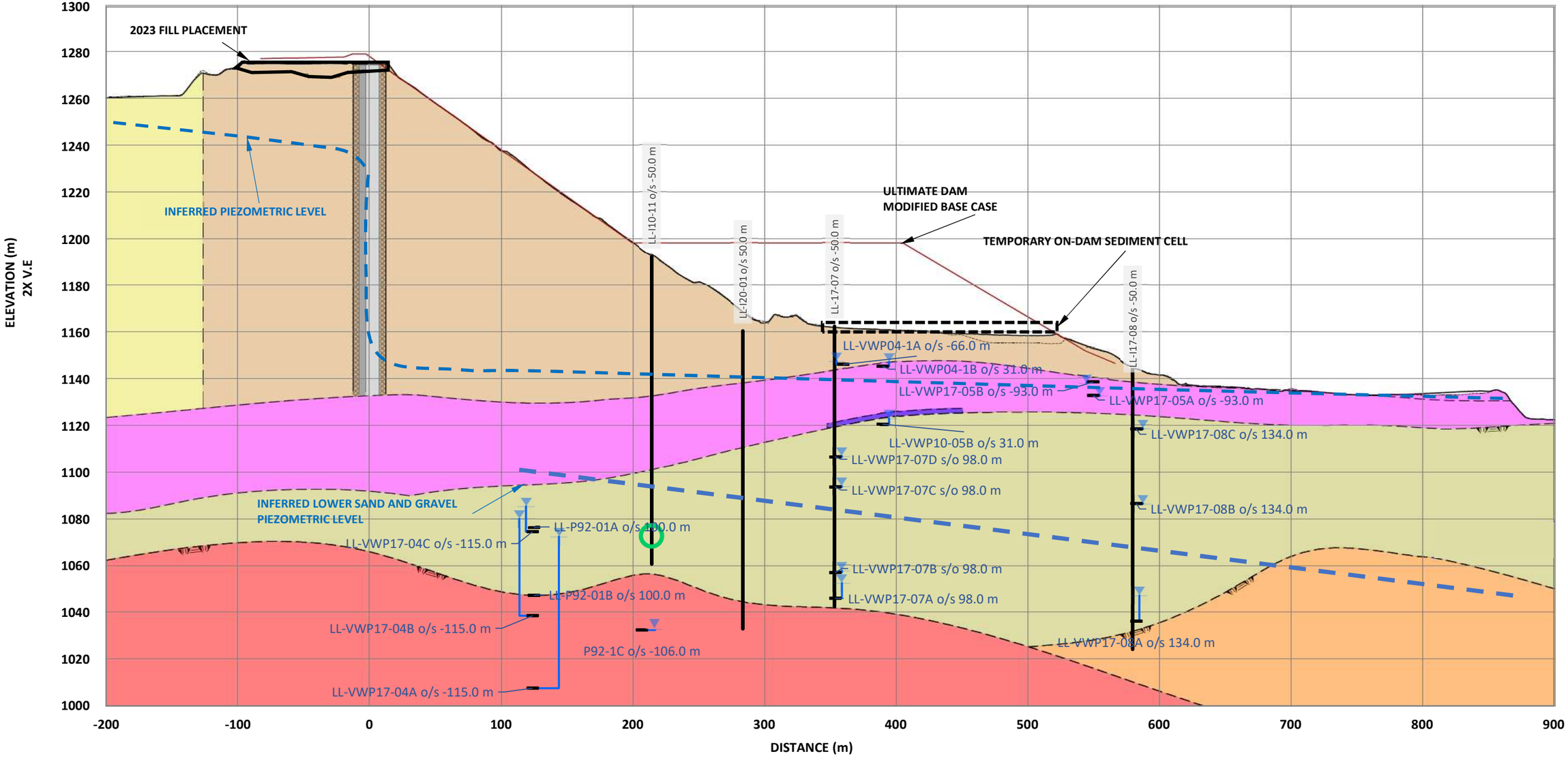
PROJECT
HIGHLAND TAILINGS STORAGE FACILITY
2023 ANNUAL FACILITY PERFORMANCE REPORT

TITLE
L-L DAM
INSTRUMENTATION SECTION - Sta. 1+850
NOVEMBER 2023

SCALE	PROJECT No.	FIG. No.
NTS	M02341C62	13



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LEGEND

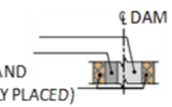
- 2022 GROUND SURFACE (NOTE 6)
- FUNCTIONAL INCLINOMETER
- PIEZOMETER TIP
- WATER EL. AS OF NOVEMBER 30, 2023

LOWER STRENGTH FOUNDATION UNITS INTERCEPTS (NOTE 4) :

- MOVEMENT ZONE: RATE < NOTIFICATION LEVEL (NL)
- MOVEMENT RATE ≥ NL

- DAM FILL
- TAILINGS
- UPPER SAND AND GRAVEL
- GLACIOLACUSTRINE (GLU)
- GLACIAL TILL
- LOWER SAND AND GRAVEL
- BASAL SEDIMENTARY
- GUICHON CREEK BATHOLITH

TILL CORE
T1: SANDY TILL
T2: CLAY TILL
S2: TAILINGS SAND (MECHANICALLY PLACED)



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CLIENT
Highland Valley Copper / Teck

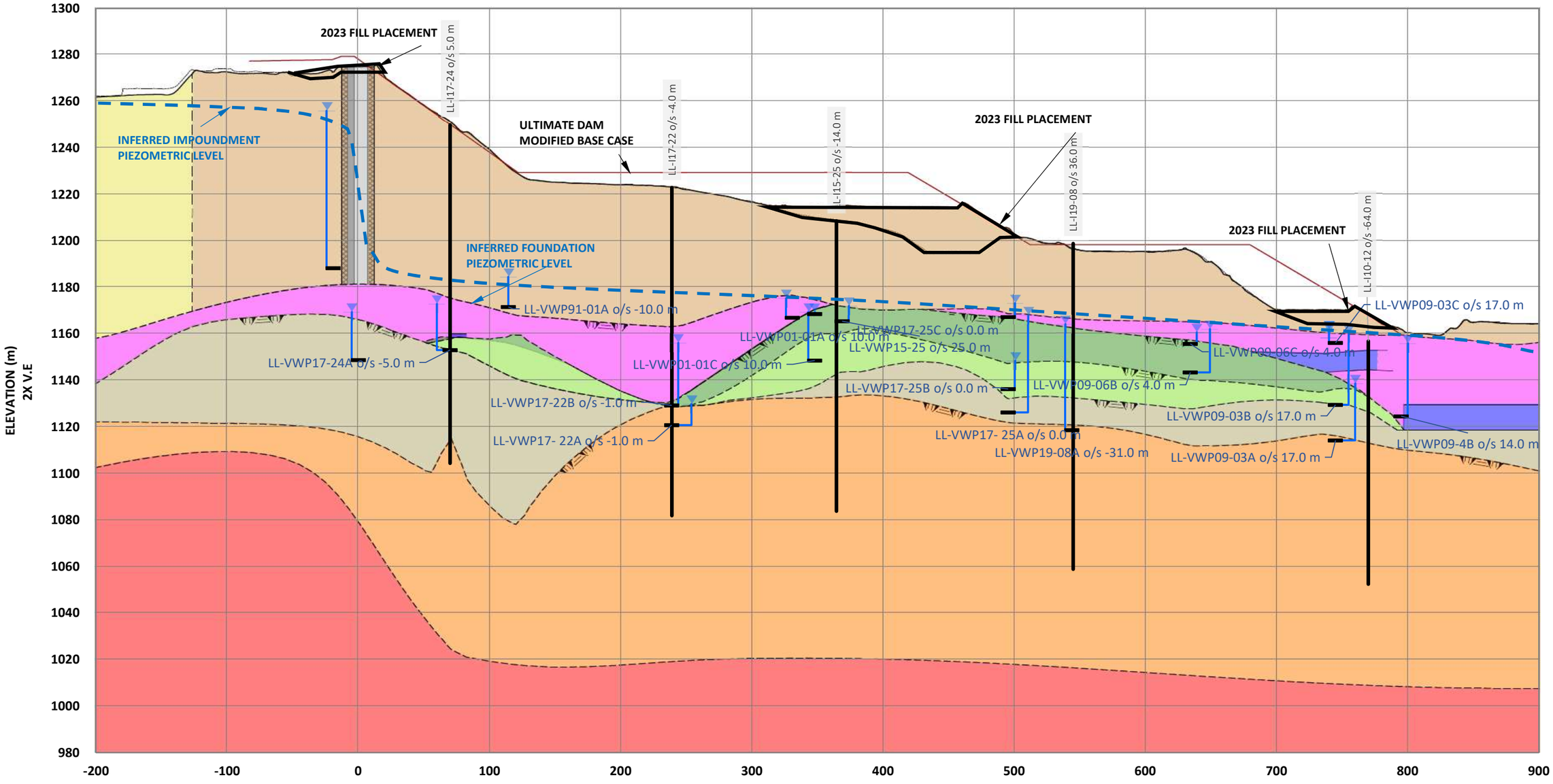
Klohn Crippen Berger

PROJECT
HIGHLAND TAILINGS STORAGE FACILITY
2023 ANNUAL FACILITY PERFORMANCE REPORT

TITLE
L-L DAM
INSTRUMENTATION SECTION - Sta. 2+250
NOVEMBER 2023

SCALE	PROJECT No.	FIG. No.
NTS	M02341C62	14

FILE PATH: \\INT.KLOHN.COM\PROJDATA\MV\CR\M02341C62-HVC-2023 APPR\700 DELIVERABLES\720 WORKING\2023 APPR\HIGHLAND\FIGURES\FIGURE FILES\INSTRUMENTATION SECTION FILES AND FIGURE 10\240227 FIGURE TEMPLATE.XLSX - 2024-03-06 14:55



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LEGEND

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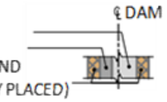
- FUNCTIONAL INCLINOMETER
- PIEZOMETER TIP
- WATER EL. AS OF NOVEMBER 30, 2023

LOWER STRENGTH FOUNDATION UNITS INTERCEPTS (NOTE 4) :

- MOVEMENT ZONE: RATE < NOTIFICATION LEVEL (NL)
- MOVEMENT RATE ≥ NL

- DAM FILL
- TAILINGS
- GLACIOLACUSTRINE (GLU)
- GLACIAL TILL
- EOCENE VOLCANICS
- UPPER SEDIMENTARY
- MEDIAL SEDIMENTARY
- BASAL SEDIMENTARY
- GUICHON CREEK BATHOLITH

TILL CORE
T1: SANDY TILL
T2: CLAY TILL
S2: TAILINGS SAND (MECHANICALLY PLACED)



NOT FOR CONSTRUCTION

CLIENT
Highland Valley Copper / Teck

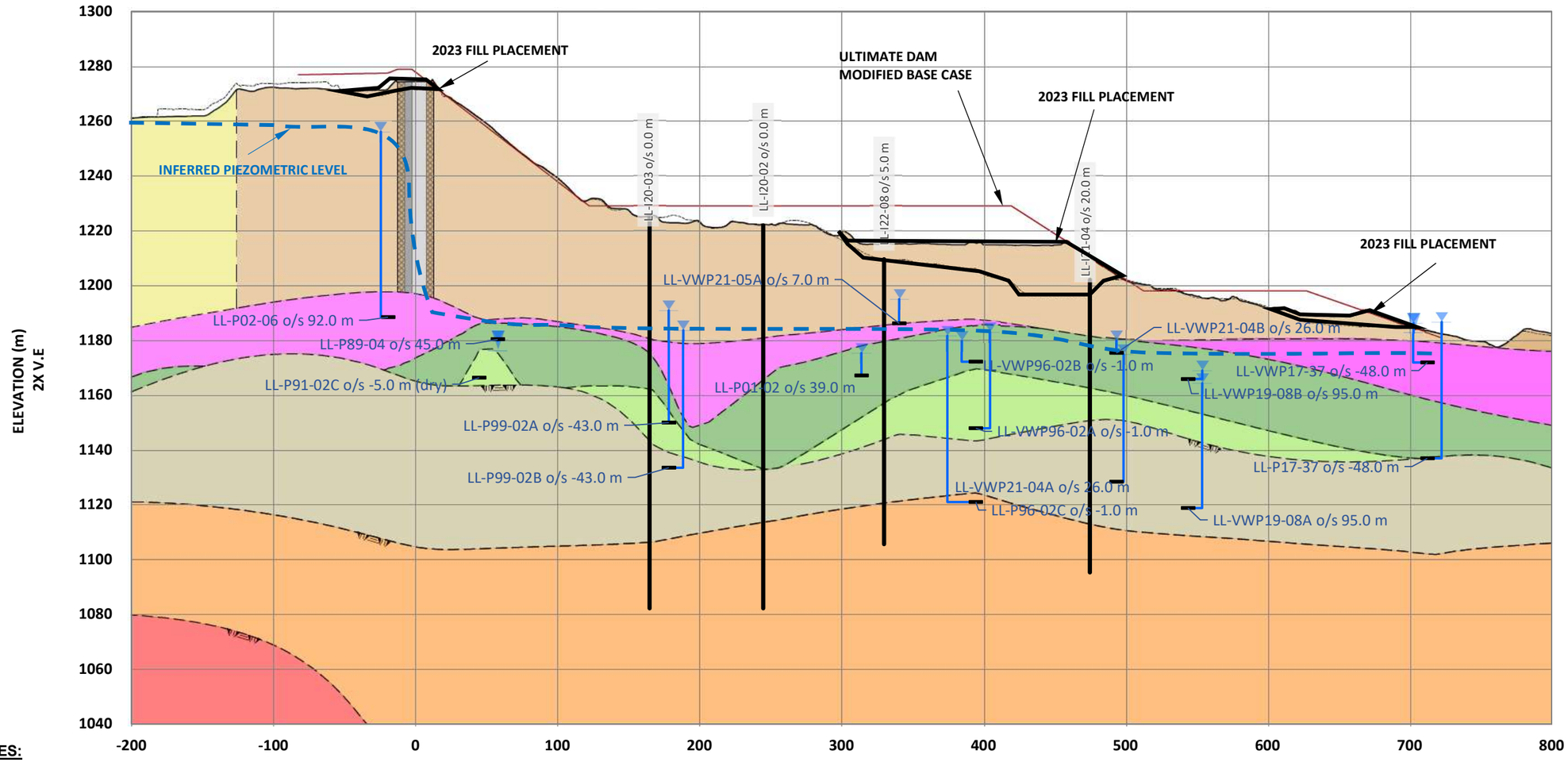
Klohn Crippen Berger

PROJECT
HIGHLAND TAILINGS STORAGE FACILITY
2023 ANNUAL FACILITY PERFORMANCE REPORT

TITLE
L-L DAM
INSTRUMENTATION SECTION - Sta. 2+564
NOVEMBER 2023

SCALE	PROJECT No.	FIG. No.
NTS	M02341C62	15

FILE PATH: \\NT.KLOHN.COM\PROJDATA\WI\VCR\M02341C62-HVC-2023 AFPRY\700 DELIVERABLES\720 WORKING\2023 AFPRY\HIGHLAND\FIGURES\FIGURE FILES\INSTRUMENTATION SECTION FILES AND FIGURE 10\240227 FIGURE TEMPLATE.XLSX - 2024-03-06 14:55



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LEGEND

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- FUNCTIONAL INCLINOMETER
- PIEZOMETER TIP
- WATER EL. AS OF NOVEMBER 30, 2023

LOWER STRENGTH FOUNDATION UNITS INTERCEPTS (NOTE 4) :

- MOVEMENT ZONE: RATE < NOTIFICATION LEVEL (NL)
- MOVEMENT RATE ≥ NL

- DAM FILL
- TAILINGS
- GLACIAL TILL
- EOCENE VOLCANICS
- UPPER SEDIMENTARY
- MEDIAL SEDIMENTARY
- BASAL SEDIMENTARY
- GUICHON CREEK BATHOLITH

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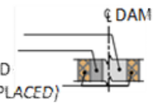

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CLIENT: Highland Valley Copper / Teck

Klohn Crippen Berger

PROJECT: HIGHLAND TAILINGS STORAGE FACILITY
2023 ANNUAL FACILITY PERFORMANCE REPORT

TITLE: L-L DAM
INSTRUMENTATION SECTION - Sta. 2+690
NOVEMBER 2023

SCALE	PROJECT No.	FIG. No.
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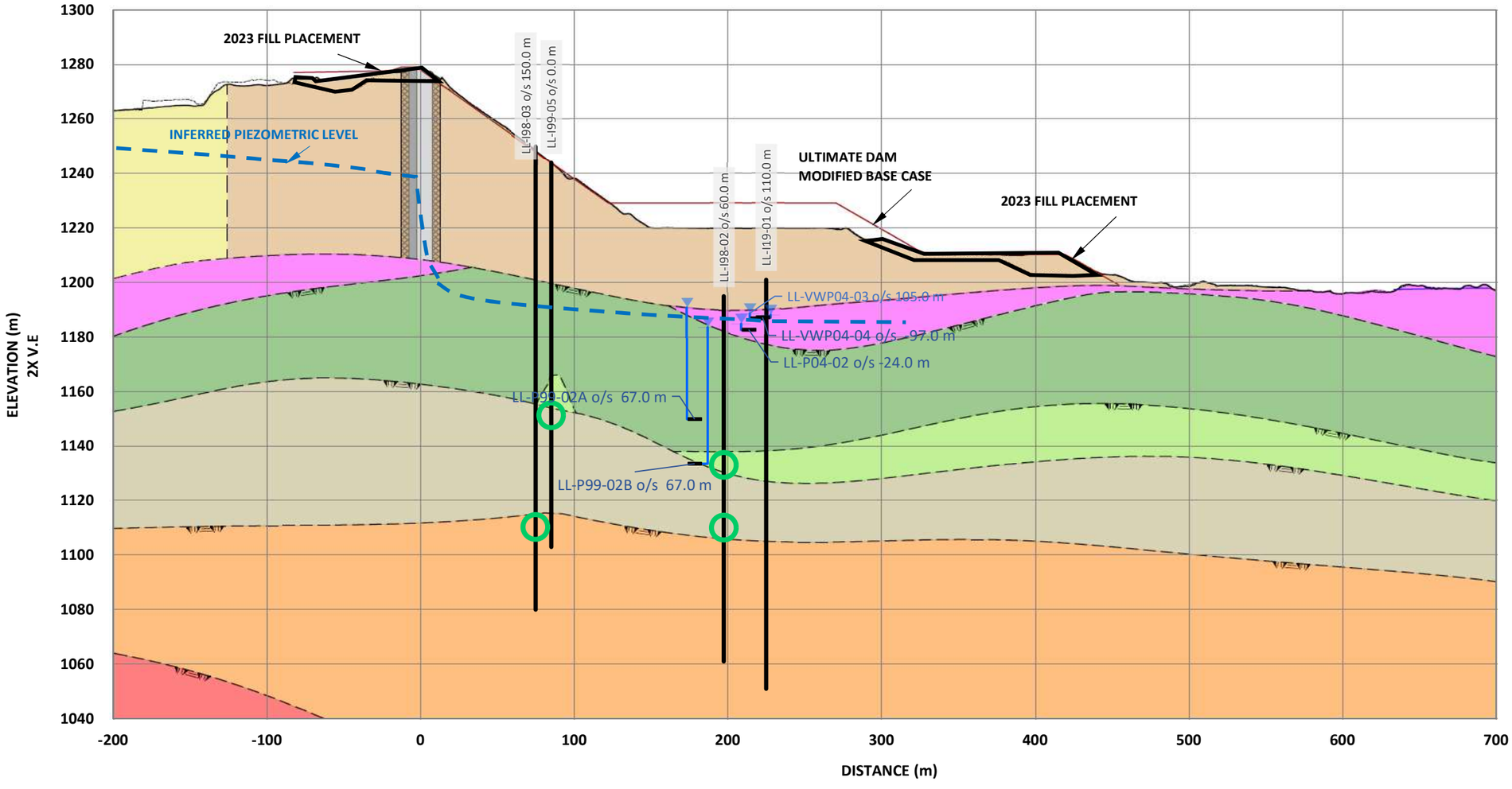

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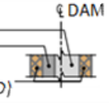

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Klohn Crippen Berger

PROJECT
HIGHLAND TAILINGS STORAGE FACILITY
2023 ANNUAL FACILITY PERFORMANCE REPORT

TITLE
L-L DAM
INSTRUMENTATION SECTION - Sta. 2+800
NOVEMBER 2023

SCALE	PROJECT No.	FIG. No.
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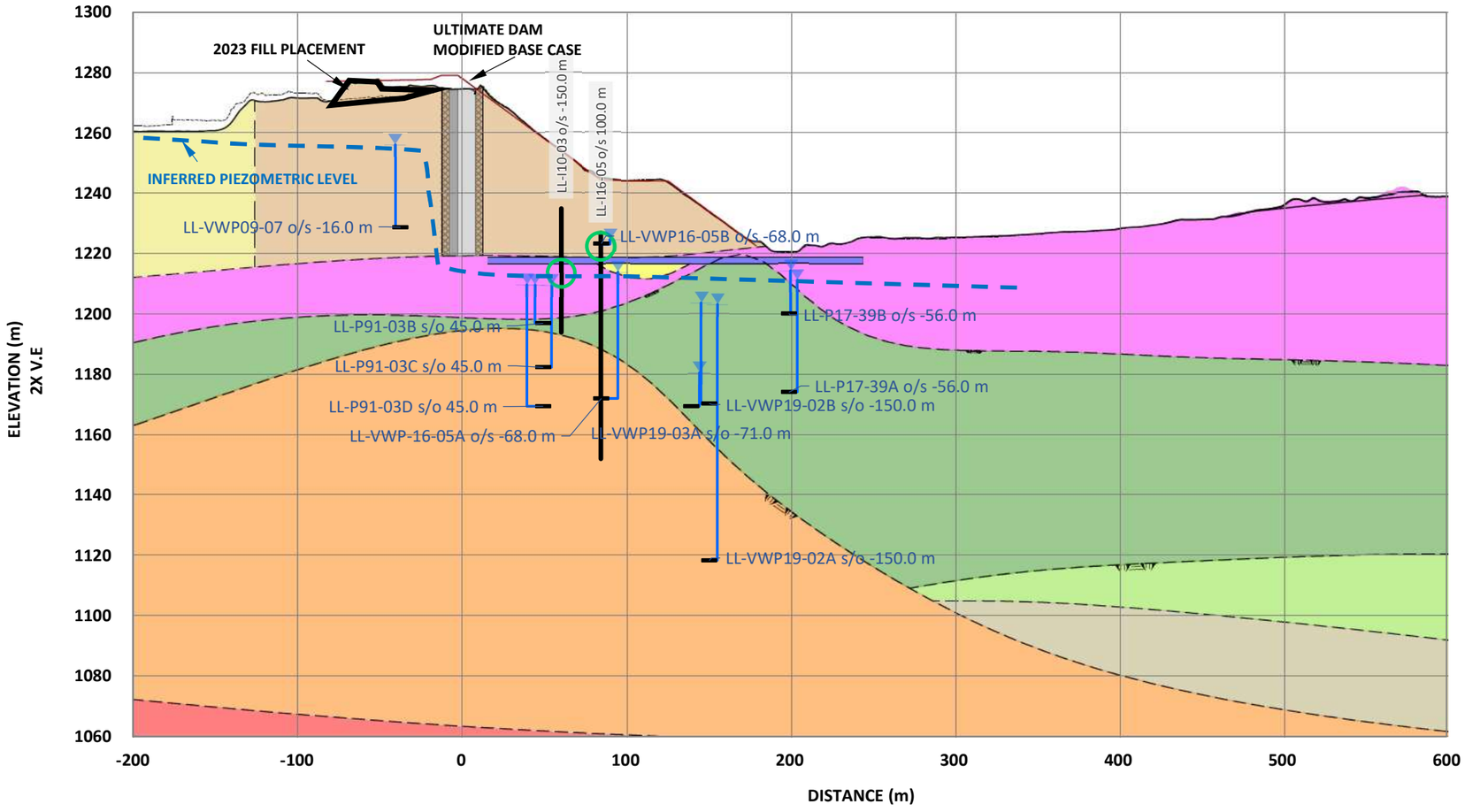

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- PIEZOMETER TIP
- WATER EL. AS OF NOVEMBER 30, 2023

LOWER STRENGTH FOUNDATION UNITS INTERCEPTS (NOTE 4) :

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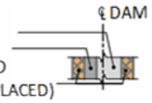


NOT FOR CONSTRUCTION

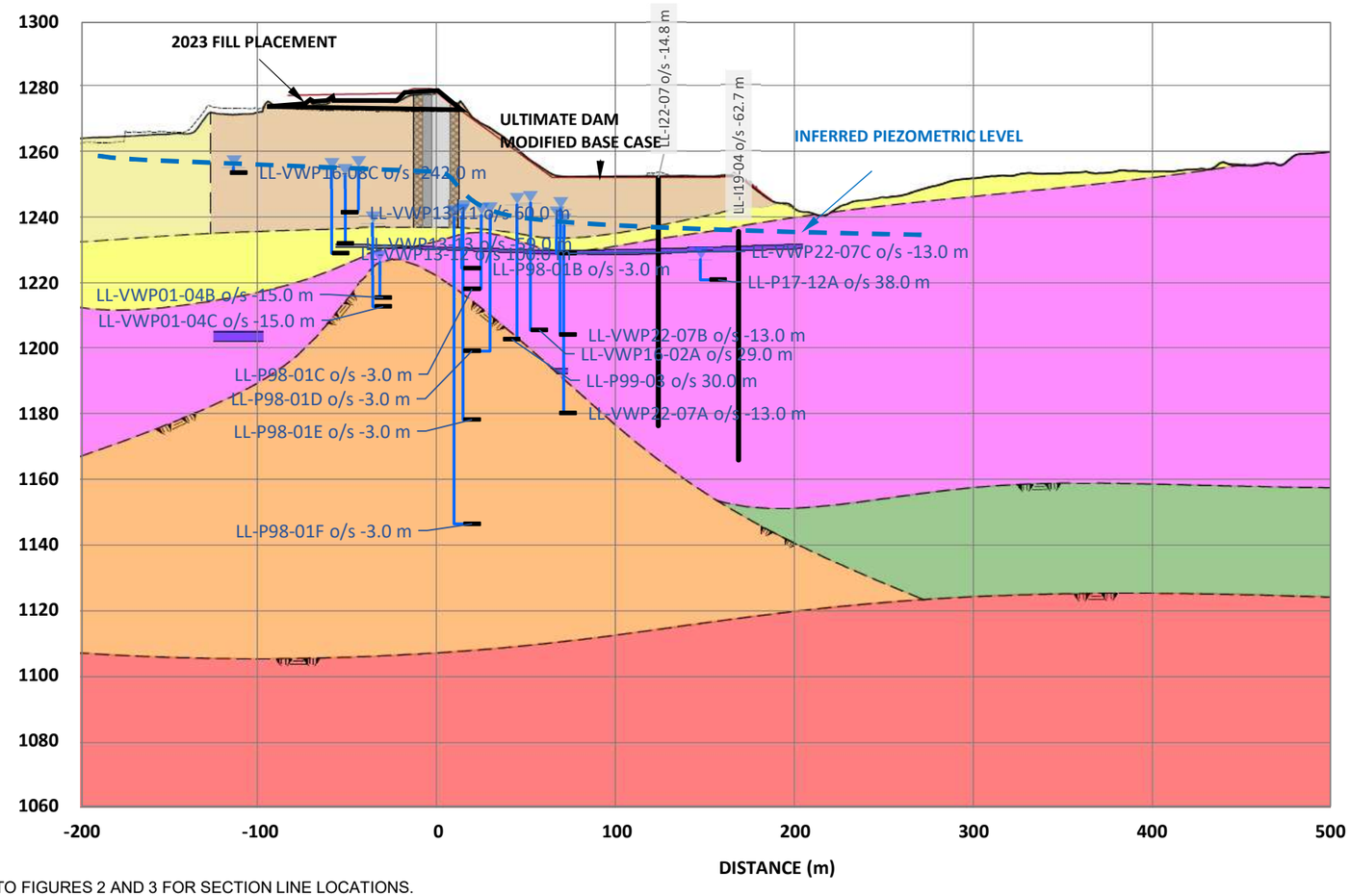
CLIENT: Highland Valley Copper / Teck

Klohn Crippen Berger

PROJECT: HIGHLAND TAILINGS STORAGE FACILITY
2023 ANNUAL FACILITY PERFORMANCE REPORT

TITLE: L-L DAM
INSTRUMENTATION SECTION - Sta. 3+300
NOVEMBER 2023

SCALE	PROJECT No.	FIG. No.
NTS	M02341C62	18



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LEGEND

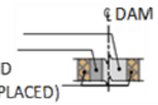
- 2022 GROUND SURFACE (NOTE 6)
- FUNCTIONAL INCLINOMETER
- PIEZOMETER TIP
- WATER EL. AS OF NOVEMBER 30, 2023

LOWER STRENGTH FOUNDATION UNITS INTERCEPTS (NOTE 4) :

- MOVEMENT ZONE: RATE < NOTIFICATION LEVEL (NL)
- MOVEMENT RATE ≥ NL

- DAM FILL
- TAILINGS
- UPPER SAND AND GRAVEL
- GLACIOLACUSTRINE (GLU)
- GLACIAL TILL
- EOCENE VOLCANICS
- UPPER SEDIMENTARY
- MEDIAL SEDIMENTARY
- BASAL SEDIMENTARY
- GUICHON CREEK BATHOLITH

TILL CORE
T1: SANDY TILL
T2: CLAY TILL
S2: TAILINGS SAND
(MECHANICALLY PLACED)



NOT FOR CONSTRUCTION

CLIENT
Highland Valley Copper / Teck

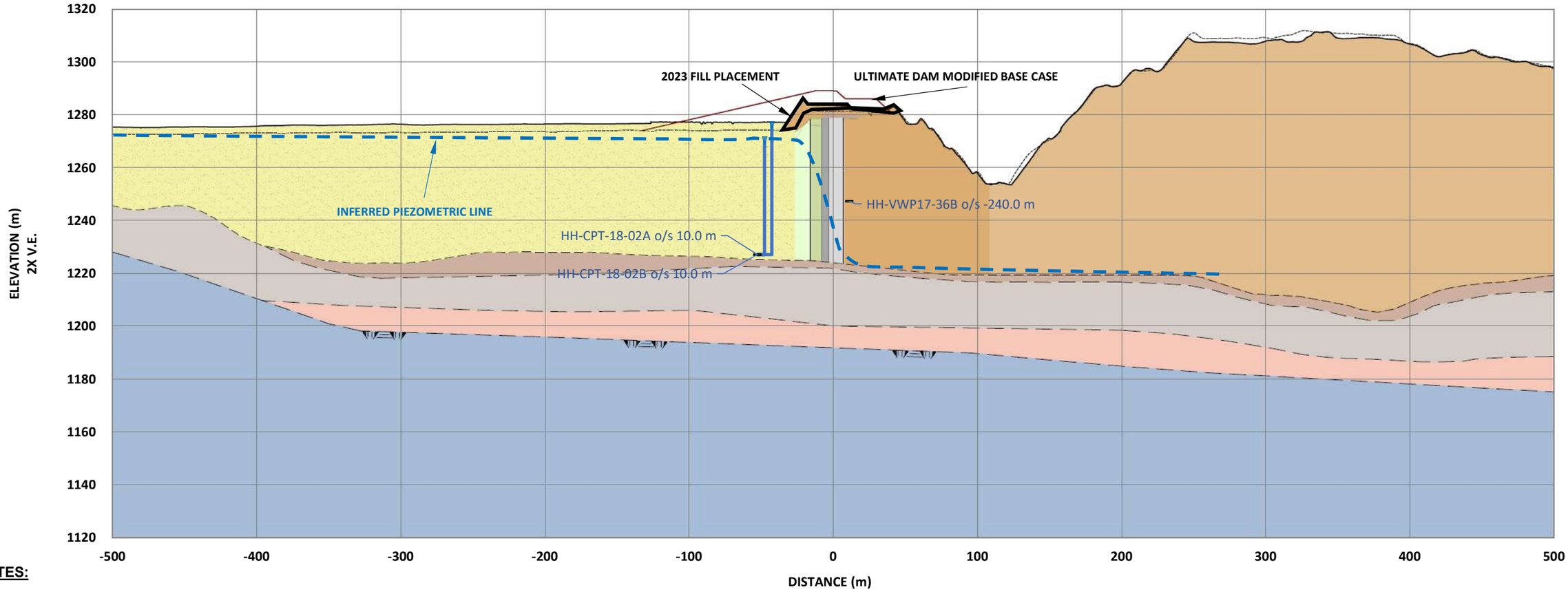
Klohn Crippen Berger

PROJECT
HIGHLAND TAILINGS STORAGE FACILITY
2023 ANNUAL FACILITY PERFORMANCE REPORT

TITLE
L-L DAM
INSTRUMENTATION SECTION - Sta. 3+630
NOVEMBER 2023

SCALE	PROJECT No.	FIG. No.
NTS	M02341C62	19

FILE PATH: \\INT.KLOHN.COM\PROJDATA\WI\VCR\M02341C62-HVC-2023 AFPR\700 DELIVERABLES\720 WORKING\2023 AFPR\HIGHLAND\FIGURES\FIGURE FILES\INSTRUMENTATION SECTION FILES AND FIGURE 10\240227 FIGURE TEMPLATE.XLSX - 2024-03-06 14:55



NOTES:

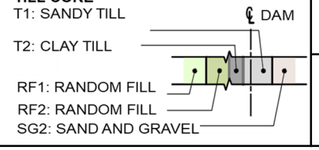
1. REFER TO FIGURES 6 AND 7 FOR SECTION LINE LOCATIONS.
2. THE LOCATIONS OF THE INSTRUMENTS OFF THE SECTION ARE APPROXIMATE.
3. NEGATIVE OFFSETS ARE IN FRONT OF THE SECTION, POSITIVE OFFSETS ARE BEYOND THIS SECTION.
4. NO CREST RAISE OCCURED AT THE H-H DAM DURING 2022.
5. IN SOME AREAS, THE 2022 GROUND SURFACE (NOVEMBER 2022) IS HIGHER THAN THE 2023 GROUND SURFACE. THIS IS DUE TO MINOR REWORKING OF THE AREA (E.G. STOCKPILES OR SLOPE REGRADING) OUTSIDE OF THE FINAL DAM CONFIGURATION.

LEGEND

- 2022 GROUND SURFACE (NOTE 5)
- FUNCTIONAL INCLINOMETER
- PIEZOMETER TIP
- H-H GLAND WATER WELL
- WATER EL. AS OF NOVEMBER 30, 2023

- DAM FILL
- TAILINGS
- SAND AND GRAVEL
- GLACIAL TILL
- GLACIOLACUSTRINE
- FAN/ BASAL
- UNIT 10
- GRANODIORITE BEDROCK

TILL CORE



NOT FOR CONSTRUCTION

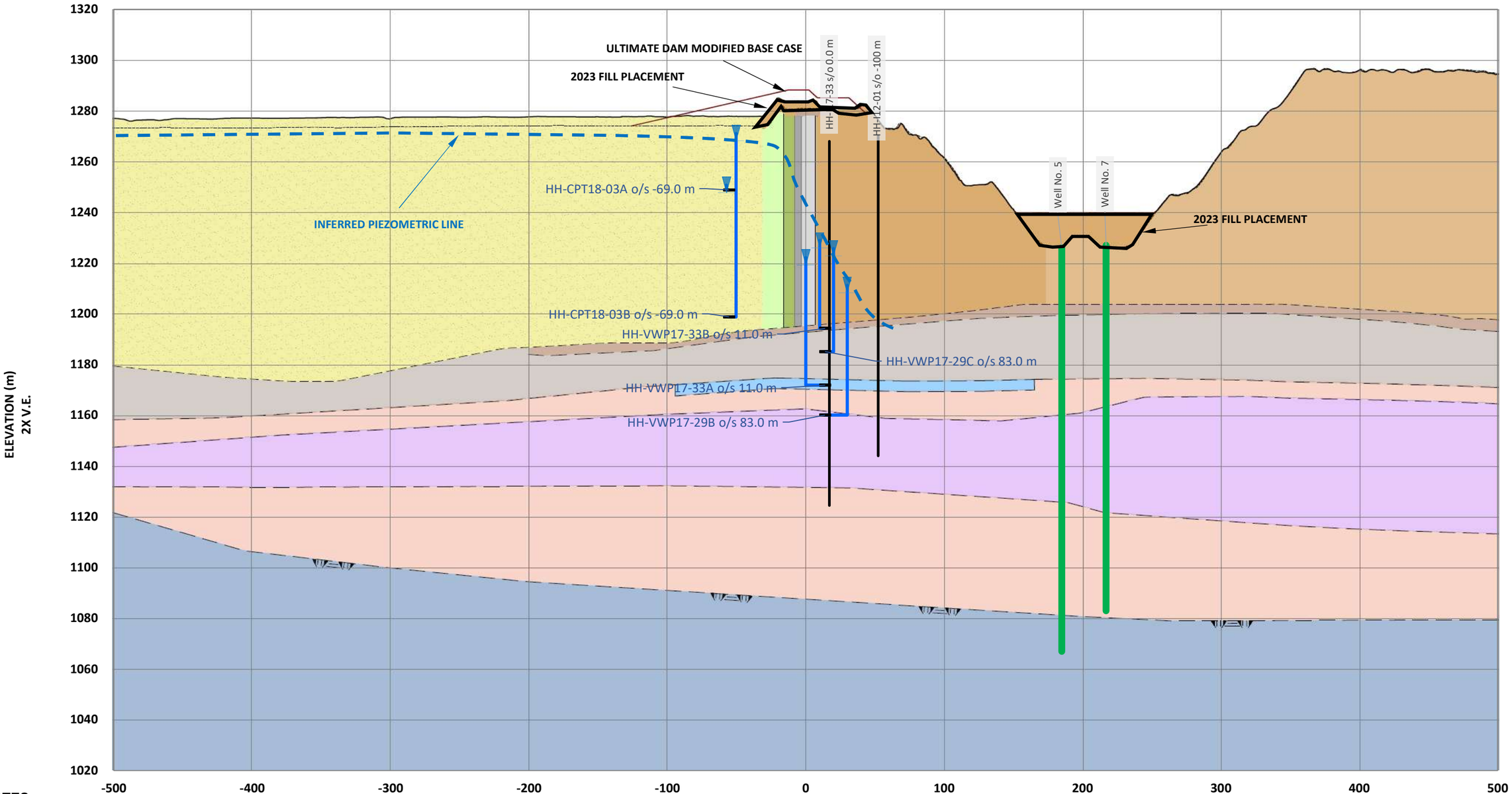
CLIENT: Highland Valley Copper / Teck

Klohn Crippen Berger

PROJECT: HIGHLAND TAILINGS STORAGE FACILITY 2023
ANNUAL FACILITY PERFORMANCE REPORT

TITLE: H-H DAM
INSTRUMENTATION SECTION - Sta. 0+800
NOVEMBER 2023

SCALE	PROJECT No.	FIG. No.
NTS	M02341C62	20



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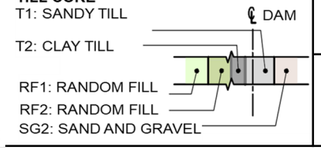
- FUNCTIONAL INCLINOMETER
- PIEZOMETER TIP
- H-H GLAND WATER WELL
- WATER EL. AS OF NOVEMBER 30, 2023

- DAM FILL
- TAILINGS
- SAND AND GRAVEL
- GLACIAL TILL
- GLACIOLACUSTRINE
- FAN/ BASAL
- UNIT 10
- GRANODIORITE BEDROCK

TILL CORE



NOT FOR CONSTRUCTION

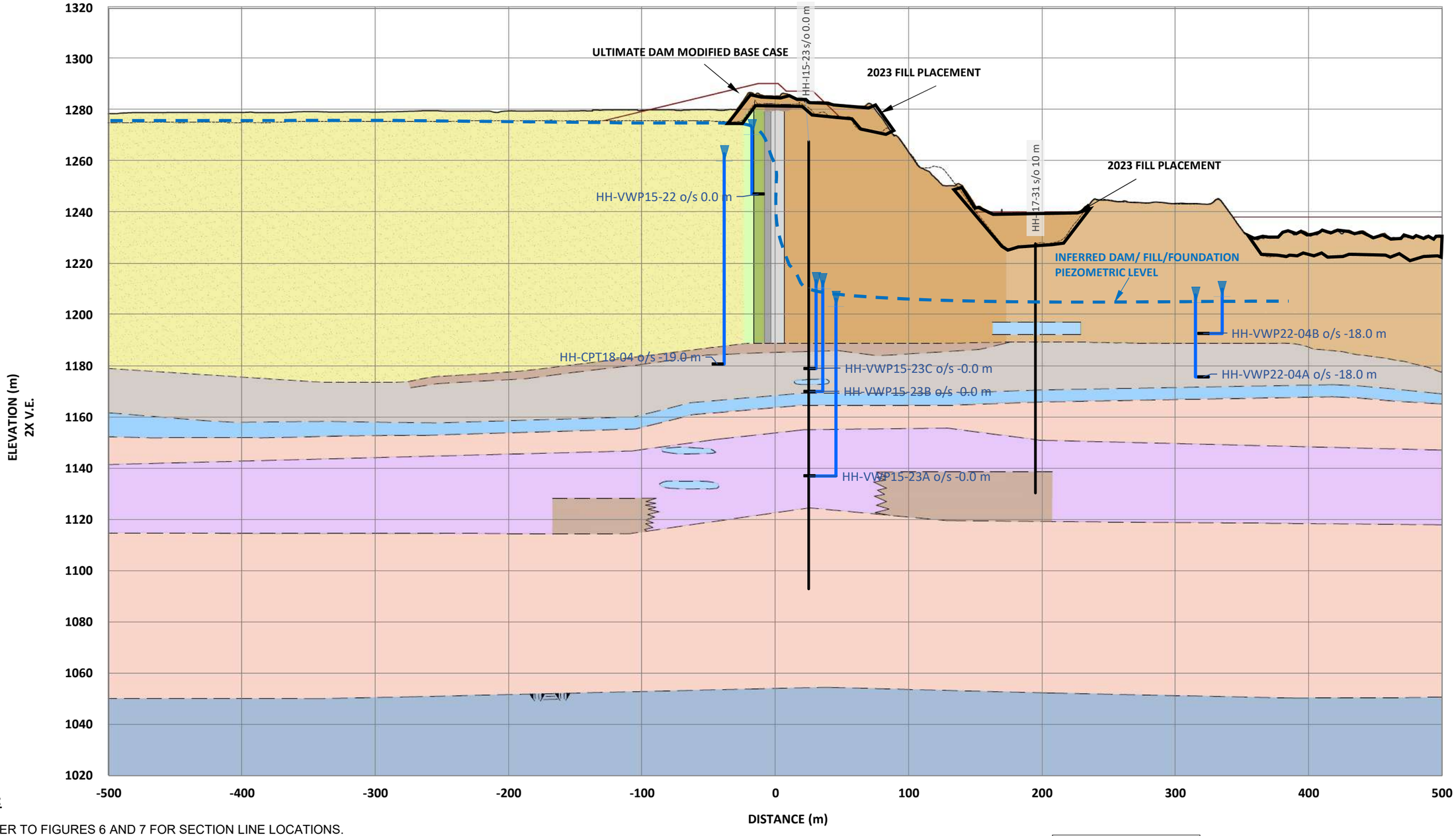
CLIENT: Highland Valley Copper / Teck

Klohn Crippen Berger

PROJECT: HIGHLAND TAILINGS STORAGE FACILITY 2023
ANNUAL FACILITY PERFORMANCE REPORT

TITLE: H-H DAM
INSTRUMENTATION SECTION - Sta. 1+200
NOVEMBER 2023

SCALE	PROJECT No.	FIG. No.
NTS	M02341C62	21



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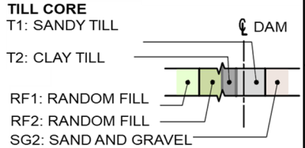
LEGEND

- 2022 GROUND SURFACE (NOTE 5)
- FUNCTIONAL INCLINOMETER
- PIEZOMETER TIP
- H-H GLAND WATER WELL
- WATER EL. AS OF NOVEMBER 30, 2023

- DAM FILL
- TAILINGS
- SAND AND GRAVEL
- GLACIAL TILL
- GLACIOLACUSTRINE
- FAN/ BASAL
- UNIT 10
- GRANODIORITE BEDROCK

TILL CORE



NOT FOR CONSTRUCTION

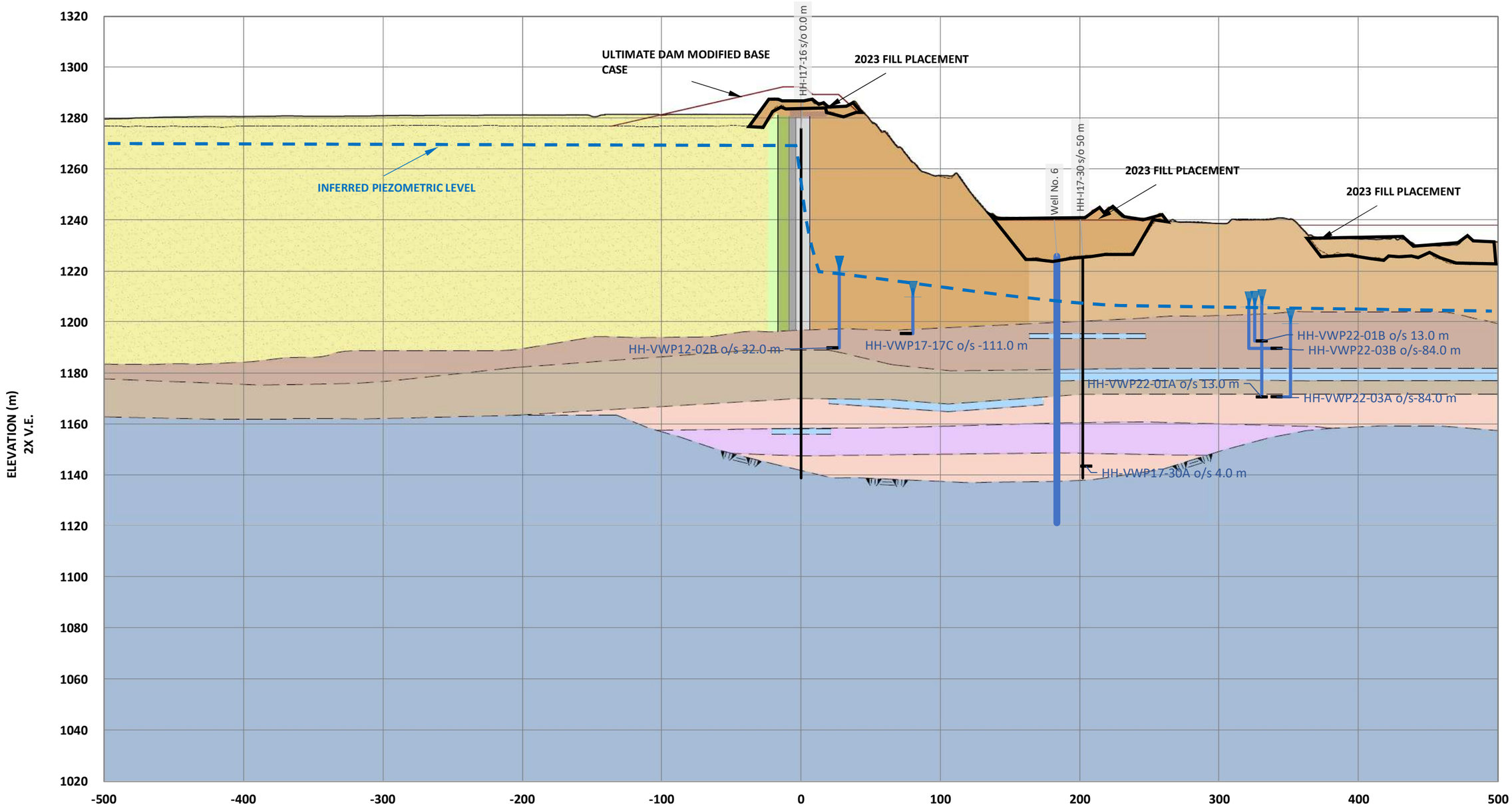
CLIENT: Highland Valley Copper / Teck

Klohn Crippen Berger

PROJECT: HIGHLAND TAILINGS STORAGE FACILITY 2023
ANNUAL FACILITY PERFORMANCE REPORT

TITLE: H-H DAM
INSTRUMENTATION SECTION - Sta. 1+460
NOVEMBER 2023

SCALE	PROJECT No.	FIG. No.
NTS	M02341C62	22



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LEGEND

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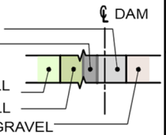
- PIEZOMETER TIP
- H-H GLAND WATER WELL
- WATER EL. AS OF NOVEMBER 30, 2023

- DAM FILL
- TAILINGS
- SAND AND GRAVEL
- GLACIAL TILL
- GLACIOLACUSTRINE
- FAN/ BASAL
- UNIT 10
- GRANODIORITE BEDROCK

TILL CORE

T1: SANDY TILL
T2: CLAY TILL
RF1: RANDOM FILL
RF2: RANDOM FILL
SG2: SAND AND GRAVEL



NOT FOR CONSTRUCTION

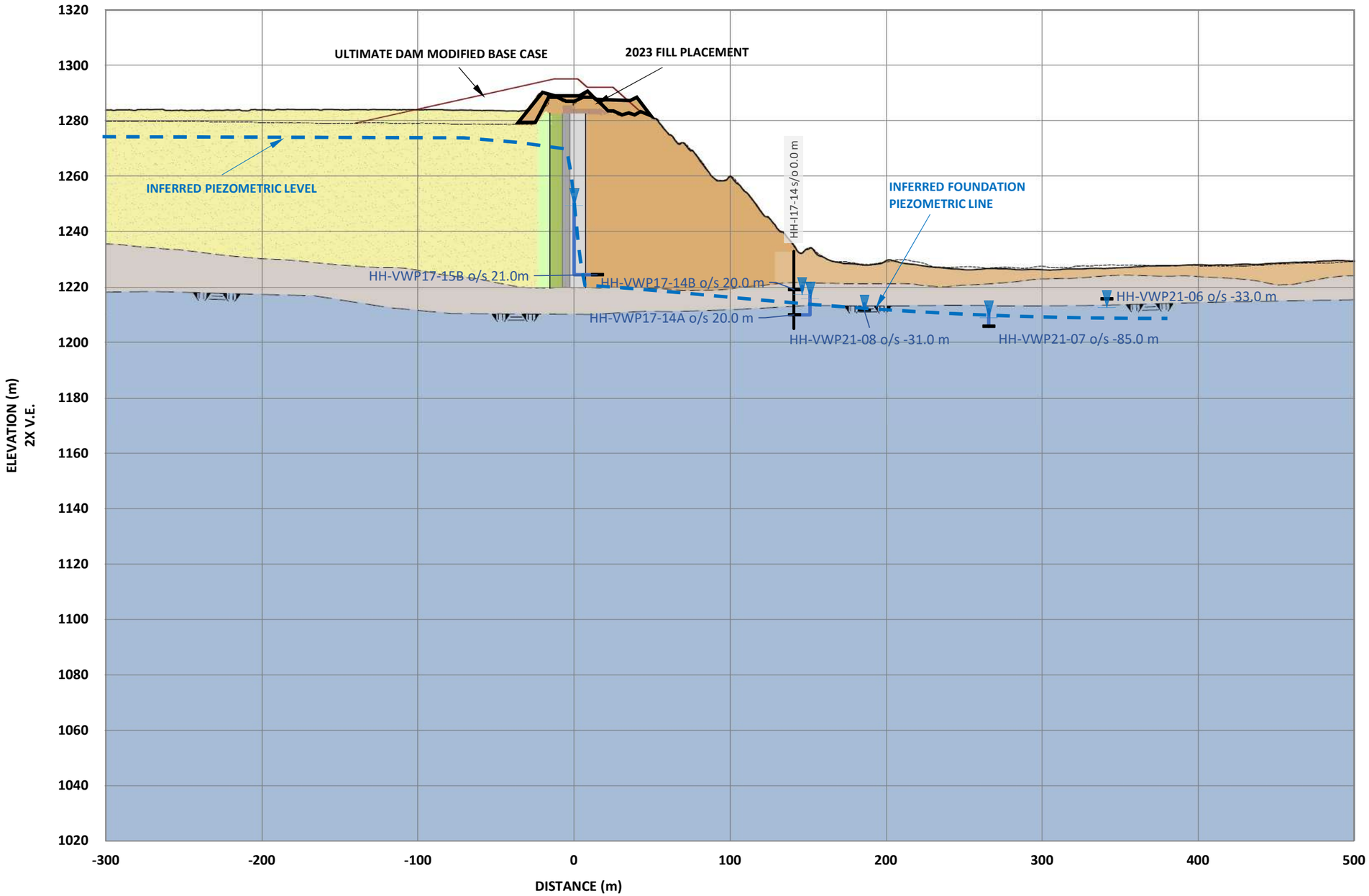
CLIENT
Highland Valley Copper / Teck

Klohn Crippen Berger

PROJECT
HIGHLAND TAILINGS STORAGE FACILITY 2023
ANNUAL FACILITY PERFORMANCE REPORT

TITLE
H-H DAM
INSTRUMENTATION SECTION - Sta. 1+700
NOVEMBER 2023

SCALE	PROJECT No.	FIG. No.
NTS	M02341C62	23



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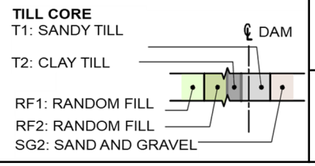
- GRANODIORITE BEDROCK

TILL CORE



NOT FOR CONSTRUCTION

CLIENT
Highland Valley Copper / Teck

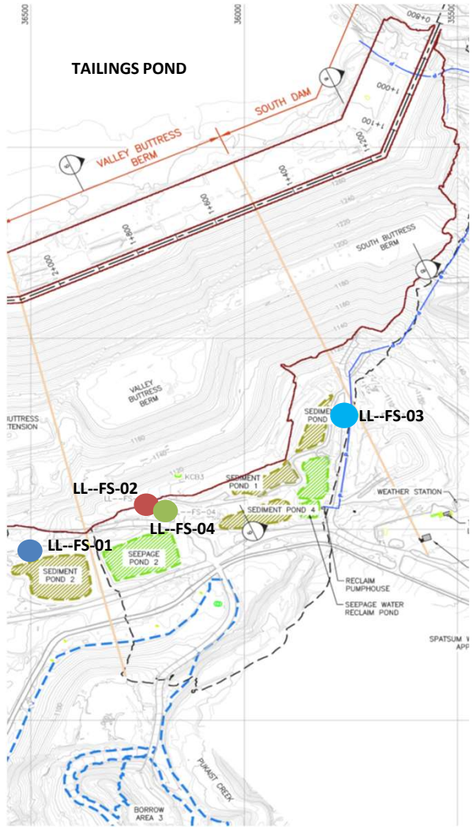
Klohn Crippen Berger

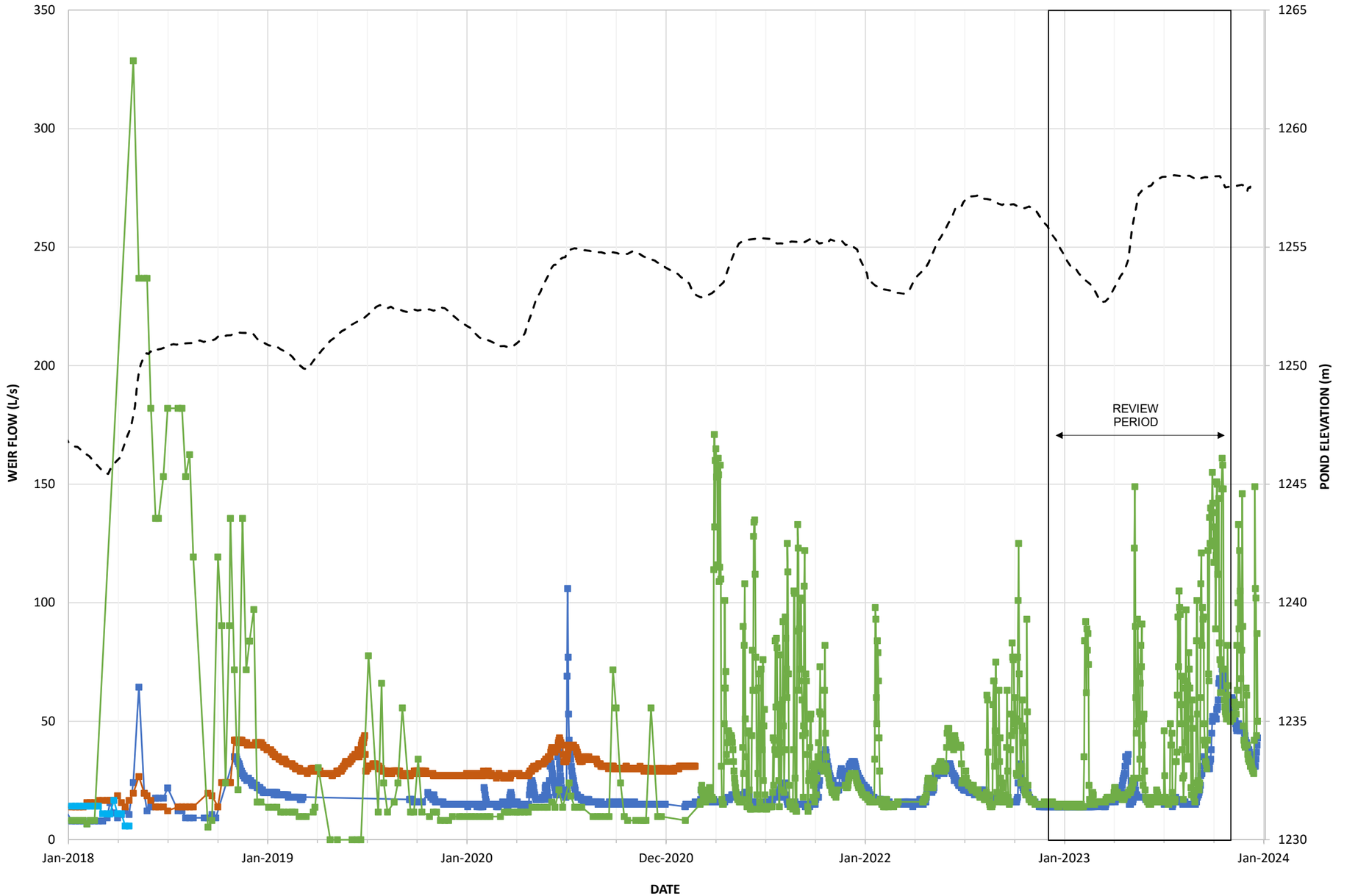
PROJECT
HIGHLAND TAILINGS STORAGE FACILITY 2023
ANNUAL FACILITY PERFORMANCE REPORT

TITLE
H-H DAM
INSTRUMENTATION SECTION - Sta. 2+000
NOVEMBER 2023

SCALE	PROJECT No.	FIG. No.
NTS	M02341C62	24

FILE PATH: \\VNT.KLOHN.COM\PROJDATA\MTV\CR\M02341C62-HVC-2023 AFPR\700 DELIVERABLES\720 WORKING\2023 AFPR\HIGHLAND\FIGURES\FIGURE FILES\INSTRUMENTATION SECTION FILES AND FIGURE 10\240227 FIGURE TEMPLATE.XLSX - 2024-03-15 13:13





LEGEND:

- LL-FS-01 - FLOW
- LL-FS-02 - FLOW (NOTE 4)
- SEEPAGE FROM VBB TOE (LL-FS-03 minus LL-JBL-FS-01) (NOTE 2)
- LL-FS-04 - FLOW (NOTE 3)
- HIGHLAND TSF TAILINGS POND EL.

NOTES:
1. PRELIMINARY FLOWS ARE CHECKED ANNUALLY BASED ON ANNUAL WEIR CALIBRATION VERIFICATION.
2. AS OF JUNE 2018, THE SEEPAGE POND WAS BACKFILLED AND THERE WAS NO SEEPAGE REPORTING TO LL-FS-03.
3. VALVE OF LL-FS-04 WAS REPORTED CLOSED FROM APRIL 26, 2019 TO MAY 31, 2019 TO AID IN DREDGING.
4. LL-FS-02 WAS REMOVED IN 2020 DURING DOWNSTREAM FOUNDATION PREPARATION.

NOT FOR CONSTRUCTION

CLIENT: Highland Valley Copper / Teck
Klohn Crippen Berger

PROJECT: HIGHLAND TAILINGS STORAGE FACILITY
2023 ANNUAL FACILITY PERFORMANCE REPORT

TITLE: L-L DAM
POND LEVEL AND SEEPAGE FLOWS
YEARS 2018 TO 2023

PROJECT No. M02341C62 | FIG No. 25

March 5, 2024
Z:\MVCR\M02341C62-HVC-2023 AFPR\300 Design\350 Seepage Data\322 Figures\[Master Sheet_HIGHLAND.xlsx]LL Fig 27

APPENDIX I

Annual Facility Performance Report

Site Visit Checklist, Observations, and Photographs

APPENDIX I-A

L-L Dam

Site Visit Checklist, Observations, and Photographs

Appendix I-A
Annual Facility Performance Report Site Visit Checklist, Observations and Photographs – L-L Dam

SITE VISIT CHECKLIST

Facility:	L-L Dam	**Site Visit Date:**	September 7, 2023
Weather:	Sunny	**Completed By:**	Rick Friedel, P.Eng. Harmit Mehta, EIT
Freeboard (pond level to dam crest):	Freeboard ~14.1 m based on Q2 2022 bathymetry survey (based on Sept. 8, 2023 pond level)		

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

EMBANKMENT	Yes/No
U/S slope	☒ Yes ☐ No
Crest	☒ Yes ☐ No
D/S Slope	☒ Yes ☐ No
D/S Toe	☒ Yes ☐ No

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

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

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

- No dam safety concerns observed.

Comments / Notes:

- Refer to Site Visit Observations and Photos for further notes.

SITE VISIT OBSERVATIONS

Tailings Beach and Pond

Beach width during the site visit met minimum beach requirements in design, 500 m at North Abutment (Photo I-A-1 and Photo I-A-2).

Photo I-A-2 and Photo I-A-3 include similar photos of the beach area for comparison of change between the 2022 AFPR site visit (October 19, 2022) to the 2023 AFPR site visit. The beach upstream of the South Dam has been widened and there is a tailings beach separating the pond level from the edge of the elevated upstream cycloned sand fill zone. Refer to Section 5.2.2 of the main text for discussion of beach width.

Based on the measured pond level (El. 1257.9 m) nearest to the site visit date (September 8, 2023) the pond was 14.1 m below the minimum dam crest at that time (El. 1272.0 m). The 2023 crest raise to El. 1274.5 m was completed after the site visit.

Crest and Upstream Slope

No visual indicators of concern or unusual behavior, such as excessive erosion or deformation were observed (Photo I-A-1 to Photo I-A-3).

Upstream of the South Dam crest (Photo I-A-3), where the beach width is narrowest, the upstream edge of the fill zone was stepped and slope regraded to reduce risk of localized instability of the slope. Both controls were effective and no signs of slumping into the impoundment was observed.

No active hydraulic placement during site visit.

Downstream Slope - North Dam U-GLU and North Dam Bedrock

No visual indicators of concern or unusual behavior were observed. The downstream slope in these segments of the dam have been built to ultimate configuration.

Downstream Slope - North Buttress Berm (NBB)

No visual indicators of concern or unusual behavior were observed (Photo I-A-6). Hydraulic cycloned sand placement was ongoing on the mid-bench during the site visit (Photo I-A-5).

Downstream Slope - Valley Buttress Berm Extension (VBBE) and Valley Buttress Berm (VBB)

No visual indicators of concern or unusual behavior were observed (Photo I-A-7). Hydraulic cycloned sand placement had recently completed in the area and the VBB downstream slope had been completed to the ultimate configuration.

Downstream Slope – South Dam

No visual indicators of concern or unusual behavior were observed. The downstream slope in this segment of the dam have been built to ultimate configuration. During the site visit, the raise of the core zone was in progress, advancing towards the South Abutment (Photo I-A-4).

Seepage from Dam Toe

Where observed, seepage from the dam fill was primarily from the underdrains and was clear with no turbidity. All water reports to a downstream collection pond and is reclaimed back to the impoundment via the Seepage Water Reclaim Pond.

Seepage and Sediment Ponds

All seepage and sediment ponds were observed to be in good physical condition with no significant visual change or issues of concern. During 2023 construction, Sediment Pond 1, Sediment Pond 2 and the temporary on-dam cell at the VBBE and NBB were in operation supporting hydraulic cycloned sand placement.

SITE VISIT PHOTOGRAPHS

LEGEND:

- LL = L-L Dam.
- LL-2023-## refers to 2023 AFPR waypoints shown on Figure 2.
- Photographs were taken during inspection on September 7, 2023.

Photo I-A-1 Tailings beach at north abutment was >500 m wide during the site visit as required by design. (LL-2023-01)

Photo I-A-2 Tailings beach and upstream hydraulic placement cells along North Dam U-GLU and North Dam Bedrock segments during 2022 and 2023 AFPR site visits. (LL-2023-01)

Photo I-A-3 Tailings beach and upstream cycloned sand hydraulic placement cells along South Dam and VBB segments during 2022 and 2023 AFPR site visits. (LL-2023-02)

Photo I-A-4 South Dam core zone raise in progress (looking north). (LL-2022-03)

Photo I-A-5 Overview of hydraulic cycloned sand fill placement at the mid-bench of the NBB downstream slope (looking north). (LL-2023-04)

Photo I-A-6 Overview of the NBB downstream slope, above active fill placement, secondary cyclones at the crest and underflow pipes over the slope (looking east). (LL-2023-05)

Photo I-A-7 Overview of VBB and downstream sediment and seepage ponds looking east from dam toe. (LL-2023-06)

Photo I-A-8 Overview of Sediment Pond 2 (right) and Seepage Pond 2 (left) downstream of the VBBE. (LL-2023-07)

APPENDIX I-B

H-H Dam

Site Visit Checklist, Observations, and Photographs

Appendix I-B
Annual Facility Performance Report Site Visit Checklist, Observations and Photographs – H-H Dam

SITE VISIT CHECKLIST

Facility:	H-H Dam	**Site visit Date:**	September 7, 2023
Weather:	Sunny	**Inspector(s):**	Rick Friedel, P.Eng. Harmit Mehta, EIT.
Minimum observed buffer height (delta level to dam crest):	Variable along dam crest ranging from 2.8 m to 7.3 m based on September 5, 2023 survey and buffer calculation completed by HVC.		

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

EMBANKMENT	Yes/No
U/S slope	☒ Yes ☐ No
Crest	☒ Yes ☐ No
D/S Slope	☒ Yes ☐ No
D/S Toe	☒ Yes ☐ No

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

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

List and describe any deficiencies (all deficiencies require assessment and/or repair):
- No dam safety concerns observed.

Comments / Notes:
- Refer to Site Visit Observations and Photos for further notes.

SITE VISIT OBSERVATIONS

Tailings Beach

Tailings beach near the H-H Dam was dry with no ponding during the site visit.

Based on the September 5, 2023 beach survey the buffer[1] along the H-H Dam crest ranged from 2.8 m to 7.3 m which is significantly greater than the minimum specified in design (1 m) and greater than HVC's operating target (2 m). Active tailings discharge from east spigots at the time of the visit.

Crest

No visual indicators of concern or unusual behavior, such as excessive erosion, deformation, or seepage from the rockfill slope. The H-H Dam dam crest was ongoing at the time of the site visit.

West Abutment

No visual indicators of concern or unusual behavior were observed.

East Abutment

No visual indicators of concern or unusual behavior were observed (Photo I-B-4 and I-B-5). The East Abutment was prepared up to the ultimate dam crest level.

Downstream Slope and Buttress Area

No visual indicators of concern or unusual behavior (Photo I-B-3 and I-B-5). In preparation for 2023 fill placement in the buttress by the mining fleet, prior to the site visit, the infrastructure relocations started in 2022 (e.g., power lines and pipelines) were completed.

The downstream buttress was constructed along the downstream slope of the Mid-Segment up to approximately Sta. 1+870. The remaining section (~100 m) will be completed in 2024 after the Line 5 Drain Line and associated building is removed.

Seepage

No seepage was observed at the toe of the H-H Dam. Seepage flows through downstream waste rock towards the 24 Mile Waste Dump and 24 Mile TSF.

24 Mile Waste Dump

No active dumping in the 24 Mile Waste Dump at the time of the site visit but additional pit waste was placed (Photo I-B-3 and Photo I-B-6) that prioritized construction of the ultimate dam buttress shape.

[1] Buffer is the vertical distance between the tailings surface and H-H Dam crest at that location.

24 Mile TSF

Water levels in 24 Mile TSF were above HVC operating targets at the time of the site visit. This was related to temporary disruptions in reclaim pumping. HVC established a temporary diesel pumping system and replaced it with a more permanent electrical pumping system after the site visit. Although pond levels were above operating targets the available flood storage exceeded requirements.

SITE VISIT PHOTOGRAPHS

LEGEND:

- HH = H-H Dam.
- HH-2023-## refers to 2023 AFPR waypoints shown on Figure 6.
- All photographs taken during the site visit on September 07, 2023.

Photo I-B-1 Overview of H-H Dam crest and upstream beach area, looking northeast, from the West Abutment. There was no localized ponding near the dam crest at the time of the site visit. (HH-2023-01)

Photo I-B-2 H-H Dam crest area looking east, from west abutment. Active fill placement was ongoing during site visit. (HH-2023-01)

Photo I-B-3 H-H Dam downstream slope, buttress areas, 24 Mile Waste Dump and I-9 Waste Dump, looking west. Power lines along the toe of slope were relocated to allow 2023 buttress fill placement along toe of the downstream slope. (HH-2023-03)

Photo I-B-4 Downstream slope of the East Segment of H-H Dam, looking east. Lock block wall at the toe is not a structural component of the dam. (HH-2023-02)

Photo I-B-5 Downstream slope of the East Segment of H-H Dam, looking west. (HH-2023-03)

Photo I-B-6 North end of 24 Mile TSF, 24 Mile Waste Dump that has been placed over tailings (foreground) and I-9 Dump (background) downstream of H-H Dam. (HH-2023-04)

Photo I-B-7 24 Mile TSF diesel pump reclaim barge system. This was temporary and replaced by electric pumps after site visit. (HH-2023-05)

Photo I-B-8 24 Mile TSF pond and tailings beach, looking south towards H-H Dam downstream slope. I-9 Dump on left. (HH-2023-06)

Photo I-B-9 Discharge channel to convey tailings slurry flows from HH Pumphouse to 24 Mile TSF. (HH-2023-08)

APPENDIX II

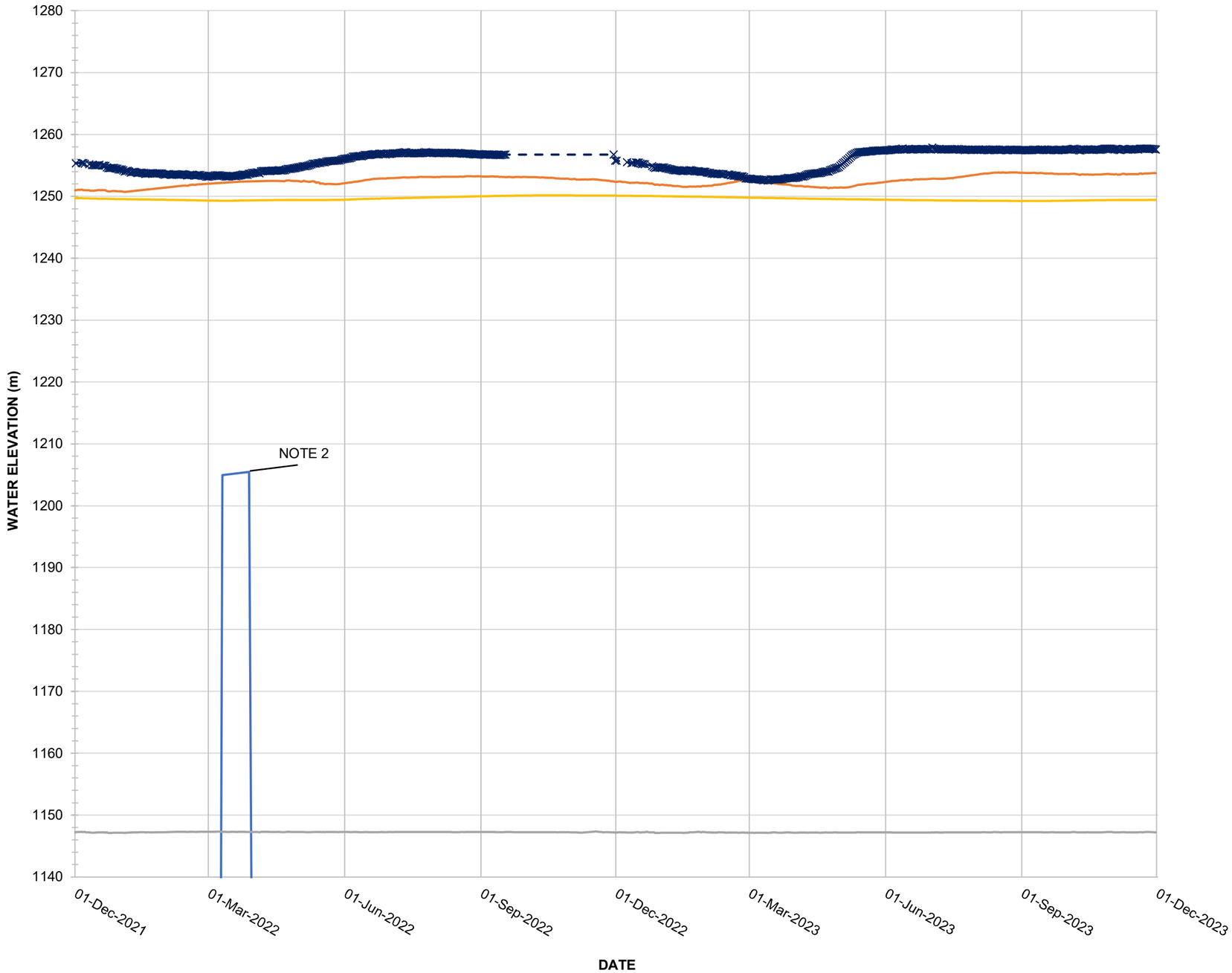
L-L Dam Instrumentation Summary

APPENDIX II-A

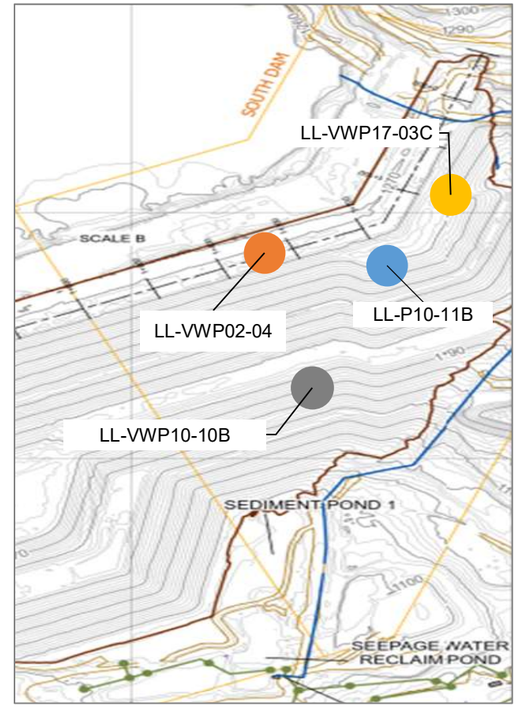
L-L Dam Piezometer Plots

L-L DAM PIEZOMETER PLOTS:

December 1, 2021 to November 30, 2023



INSET INSTRUMENT VIEW



LEGEND

- LL-P10-11B (Cyclone Sand)
- LL-VWP02-04 (Cyclone Sand)
- LL-VWP10-10B (Drainage Blanket)
- LL-VWP17-03C (Drainage Blanket)
- L-L TAILINGS POND

NOTES

1. HVC PROVIDES DRY READINGS ELEVATIONS AS El. -8000 m.
2. LL-P10-11B WAS REPORTED DRY ON 2022-01-27, READ POSITIVE PORE PRESSURES IN MARCH 2022 AND RETURNED TO DRY STATUS AS OF 2022-06-05.

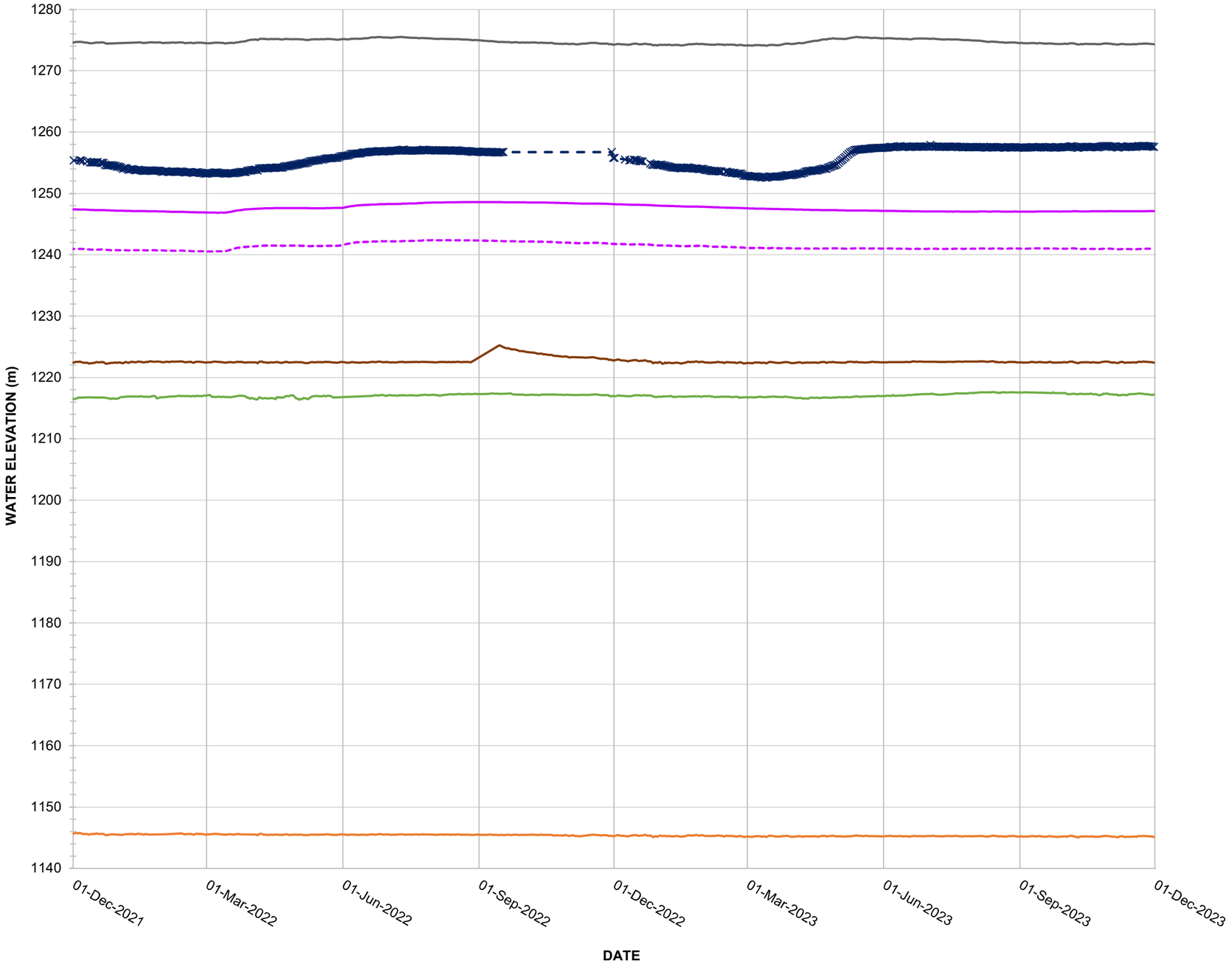
CLIENT: Highland Valley Copper / Teck

Klohn Crippen Berger

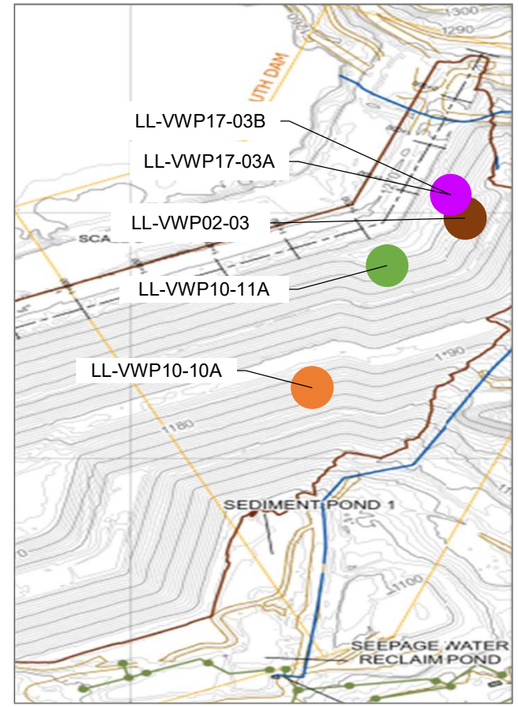
PROJECT: HIGHLAND TAILINGS STORAGE FACILITY
2023 ANNUAL FACILITY PERFORMANCE REPORT

TITLE: L-L DAM
SOUTH DAM
DAM FILL
2022 TO 2024 PIEZOMETER PLOTS

SCALE	PROJECT No.	FIG. No.
AS SHOWN	M02341C62	II-A-1



INSET INSTRUMENT VIEW



LEGEND

- LL-VWP02-03 (Guichon Creek Batholith)
- LL-VWP10-10A (Guichon Creek Batholith)
- LL-VWP10-11A (Guichon Creek Batholith)
- LL-VWP13-05 (Guichon Creek Batholith)
- LL-VWP17-03A (Guichon Creek Batholith)
- LL-VWP17-03B (Glacial Till)
- L-L TAILINGS POND

NOTES

1. LL-VWP13-05 IS LOCATED TO THE RIGHT OF THE DEPICTED INSET FIGURE.

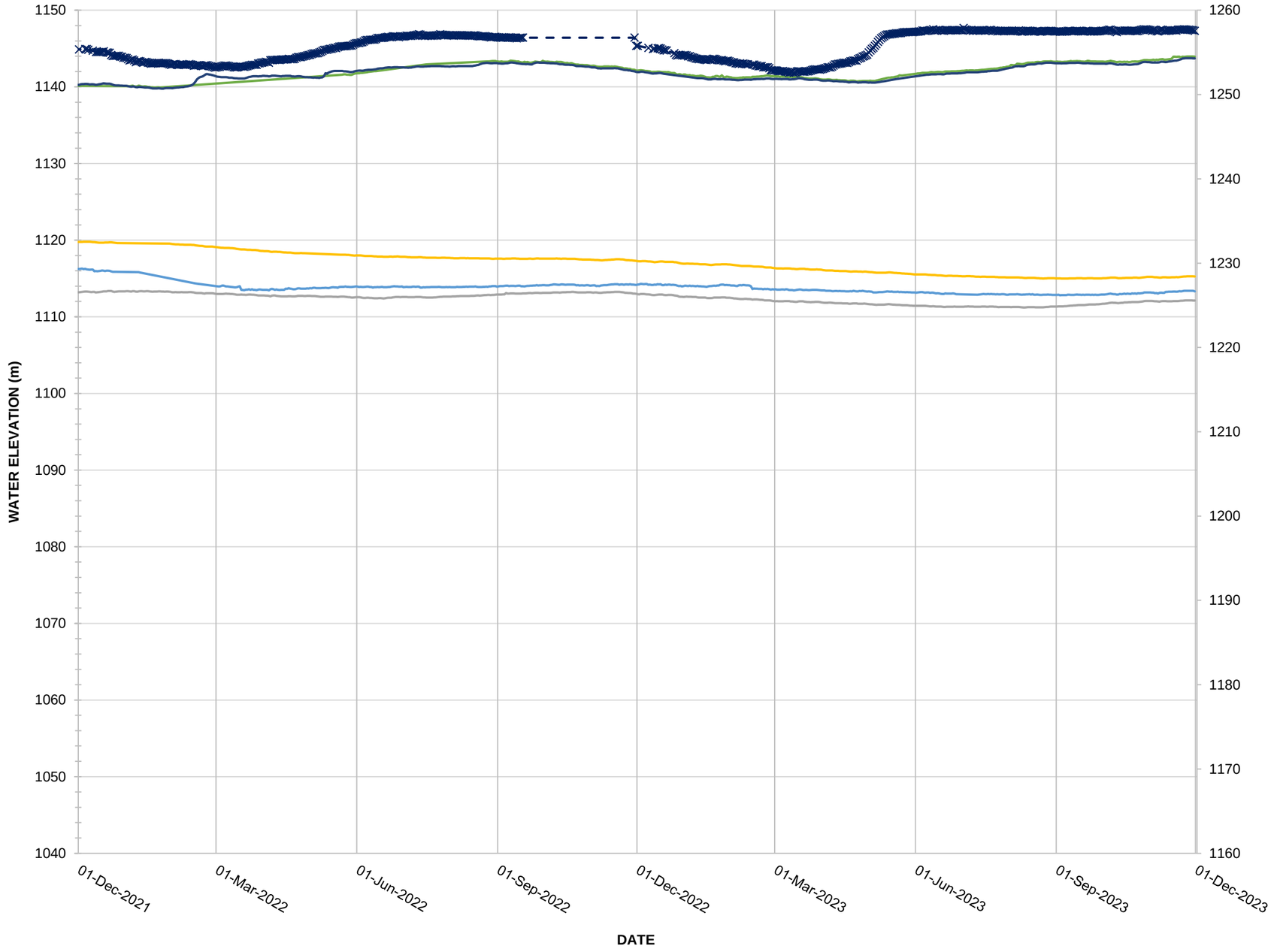
CLIENT: Highland Valley Copper / Teck

Klohn Crippen Berger

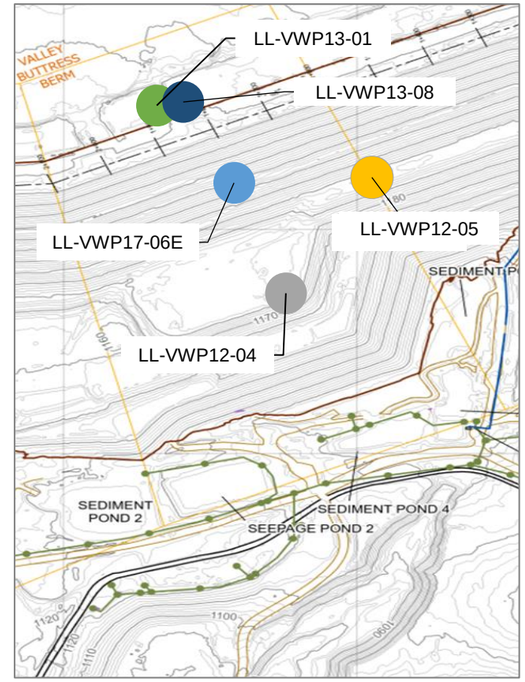
PROJECT: HIGHLAND TAILINGS STORAGE FACILITY
2023 ANNUAL FACILITY PERFORMANCE REPORT

TITLE: L-L DAM
SOUTH DAM
GRANODIORITE, FOUNDATION ROCK, AND GLACIAL TILL
2022 TO 2024 PIEZOMETER PLOTS

SCALE	PROJECT No.	FIG. No.
AS SHOWN	M02341C62	II-A-2



INSET INSTRUMENT VIEW



LEGEND

- LL-VWP12-04 (Cyclone Sand)
- LL-VWP12-05 (Cyclone Sand)
- LL-VWP17-06E (Drainage Blanket)
- LL-VWP13-01 (Cyclone Sand)
- LL-VWP13-08 (Cyclone Sand)
- L-L TAILINGS POND

NOTES

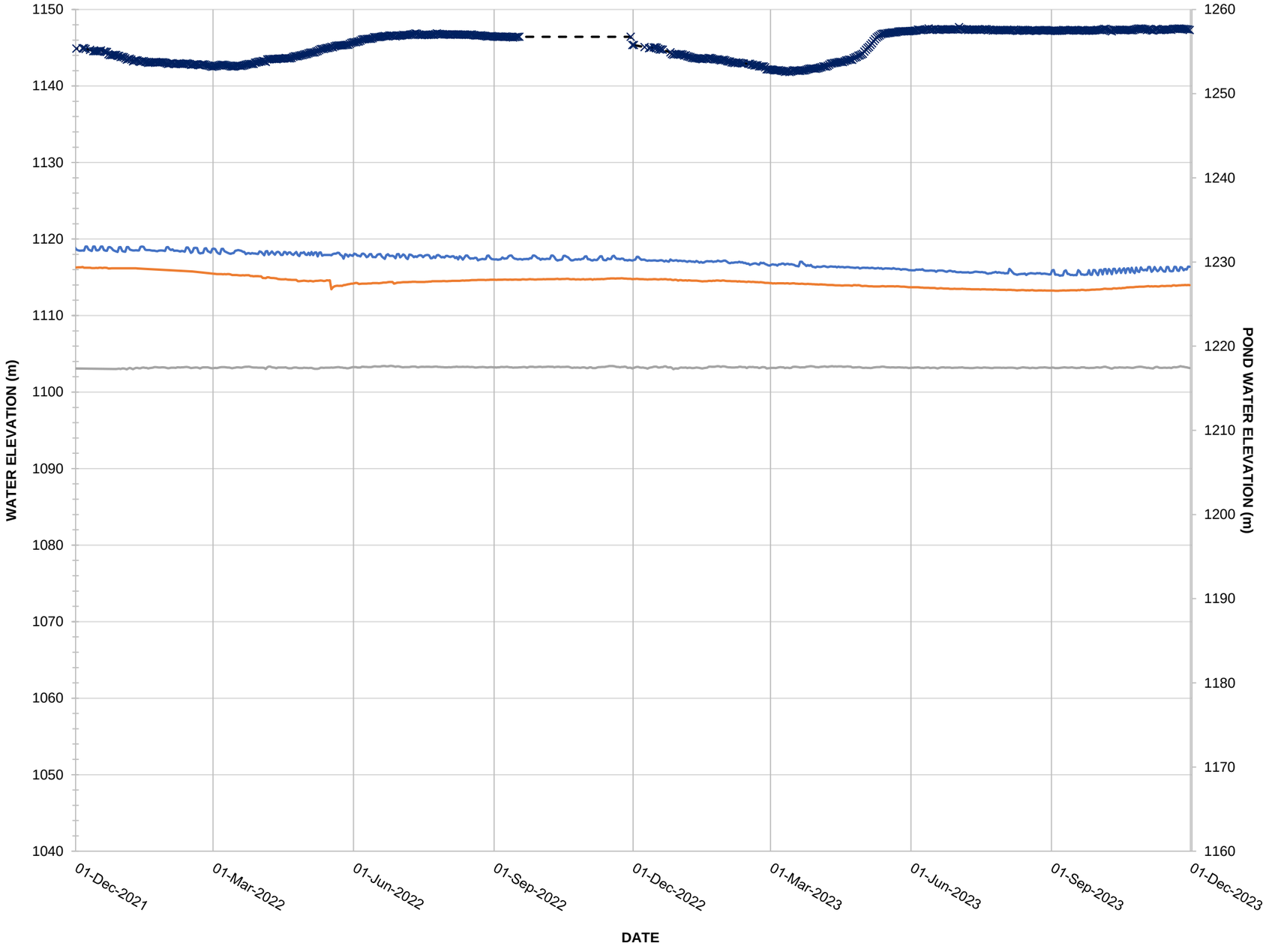
CLIENT: Highland Valley Copper / Teck

Klohn Crippen Berger

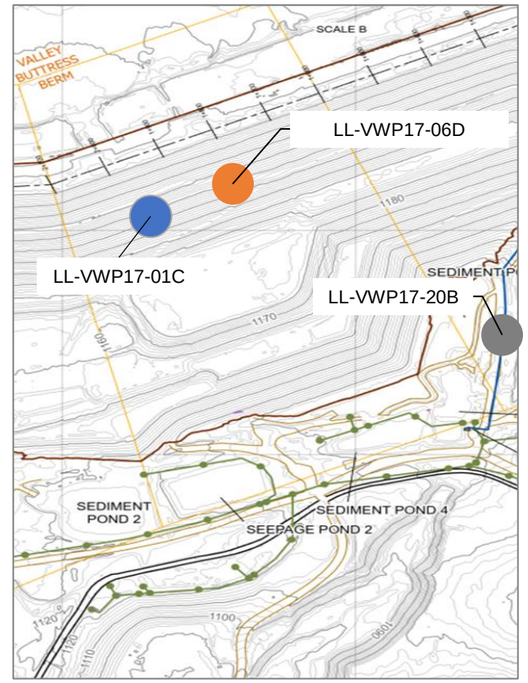
PROJECT: HIGHLAND TAILINGS STORAGE FACILITY
2023 ANNUAL FACILITY PERFORMANCE REPORT

TITLE: L-L DAM
VALLEY BUTTRESS BERM
DAM FILL
2022 TO 2024 PIEZOMETER PLOTS

SCALE	PROJECT No.	FIG. No.
AS SHOWN	M02341C62	II-A-3



INSET INSTRUMENT VIEW

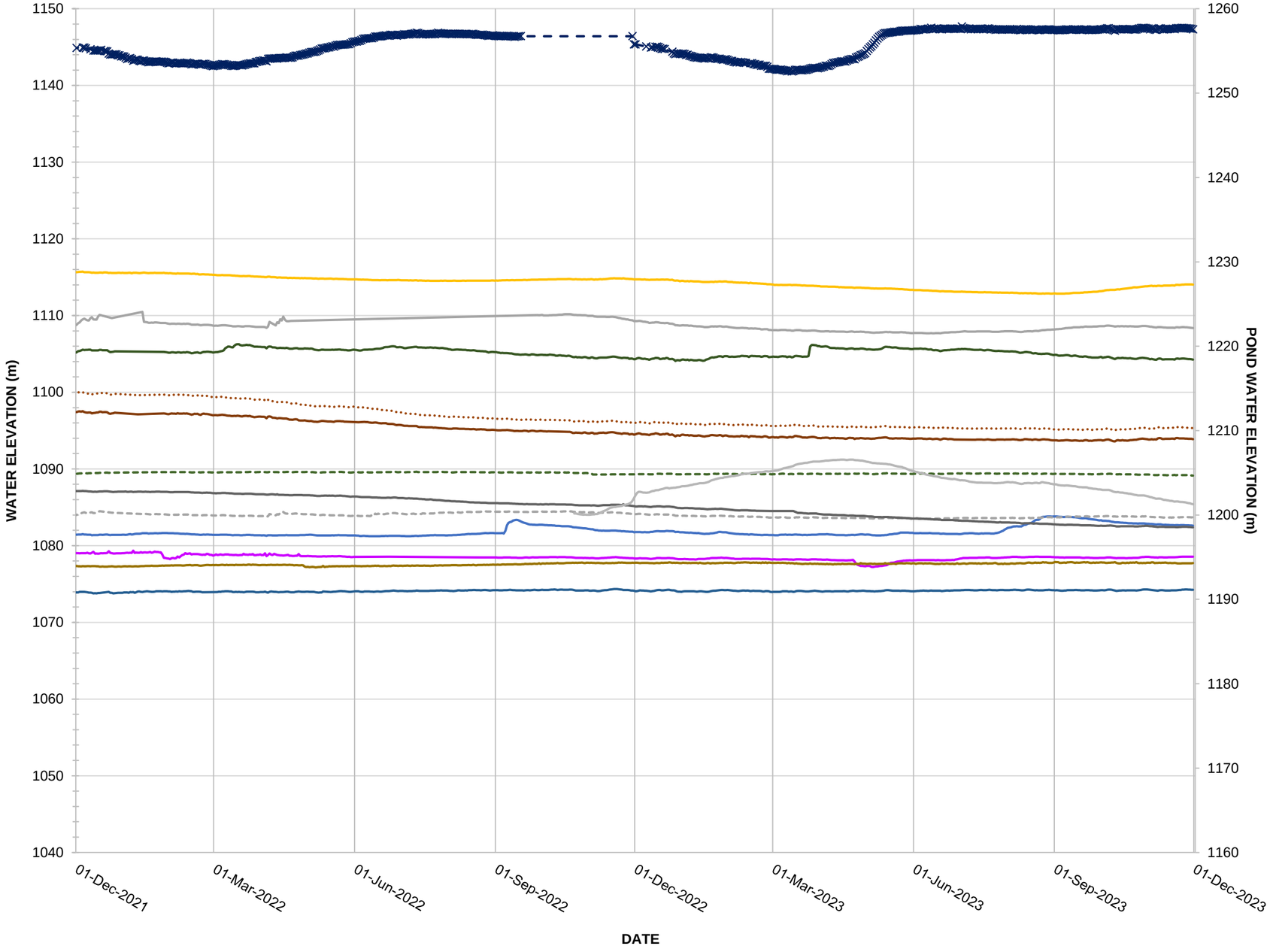


LEGEND

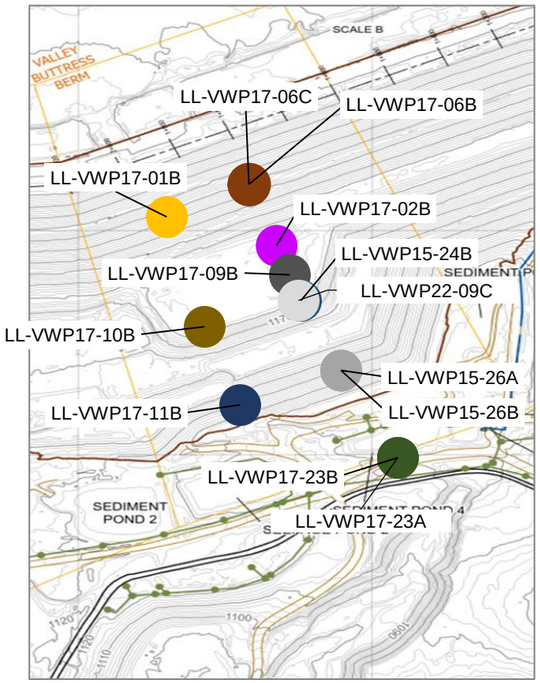
- LL-VWP17-01C (Lacustrine)
- LL-VWP17-06D (Lacustrine)
- LL-VWP17-20B (Lacustrine)
- L-L TAILINGS POND

NOTES

CLIENT: Highland Valley Copper / Teck	PROJECT: HIGHLAND TAILINGS STORAGE FACILITY 2023 ANNUAL FACILITY PERFORMANCE REPORT		
Klohn Crippen Berger	TITLE: L-L DAM VALLEY BUTTRESS BERM LACUSTRINE 2022 TO 2024 PIEZOMETER PLOTS		
	SCALE: AS SHOWN	PROJECT No.: M02341C62	FIG. No.: II-A-4



INSET INSTRUMENT VIEW



LEGEND

- LL-VWP15-24B (Lower Glaciolacustrine)
- LL-VWP15-26A (Lower Glaciolacustrine)
- LL-VWP15-26B (Upper Glaciolacustrine)
- LL-VWP17-01B (Lower Glaciolacustrine)
- LL-VWP17-02B (Lower Glaciolacustrine)
- LL-VWP17-06B (Lower Glaciolacustrine)
- LL-VWP17-06C (Lower Glaciolacustrine)
- LL-VWP17-09B (Lower Glaciolacustrine)
- LL-VWP17-10B (Lower Glaciolacustrine)
- LL-VWP17-11B (Lower Glaciolacustrine)
- LL-VWP17-23A (Lower Glaciolacustrine)
- LL-VWP17-23B (Upper Glaciolacustrine)
- LL-VWP22-09C (Lower Glaciolacustrine)
- L-L TAILINGS POND

NOTES

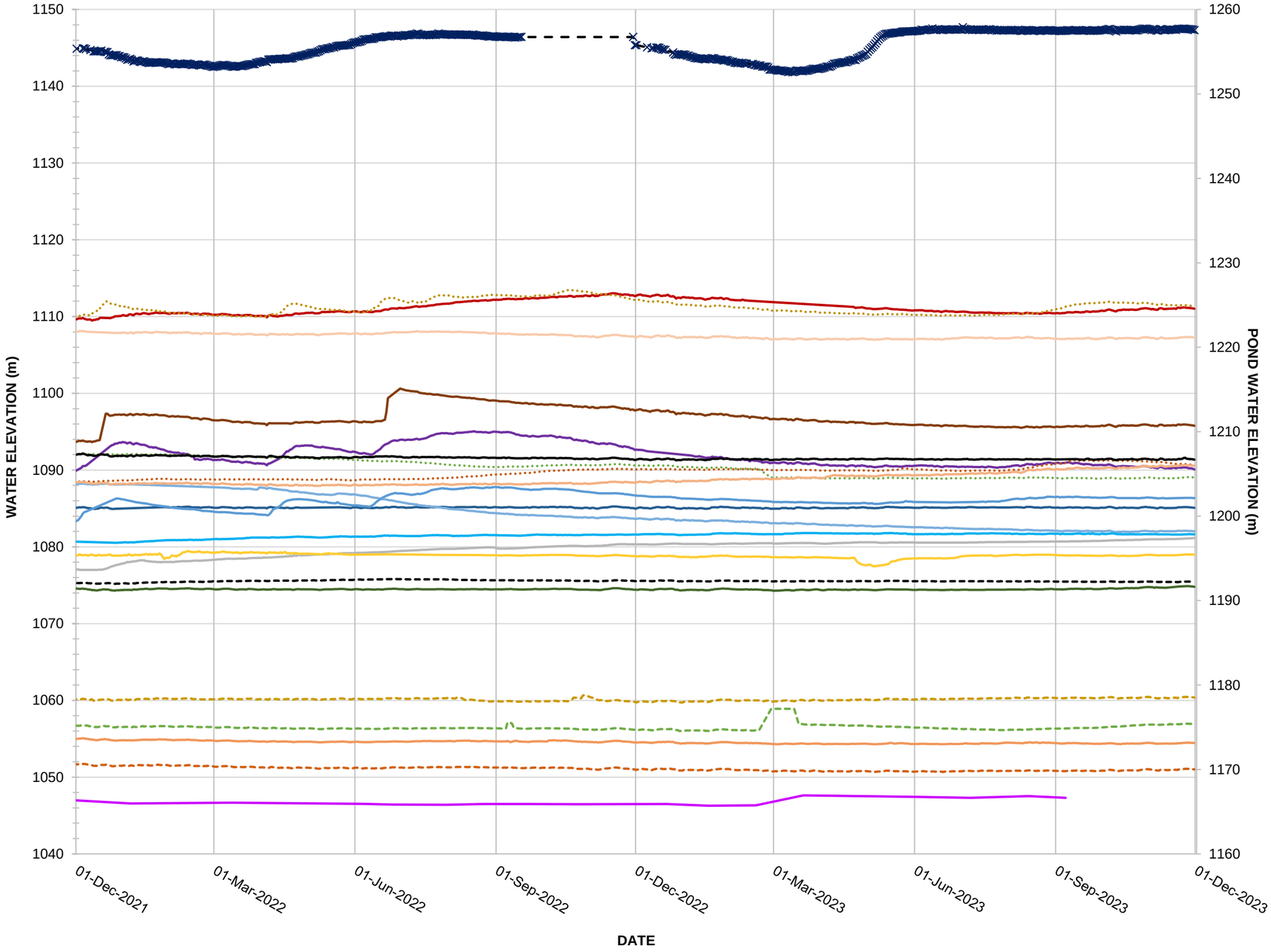
CLIENT: Highland Valley Copper / Teck

Klohn Crippen Berger

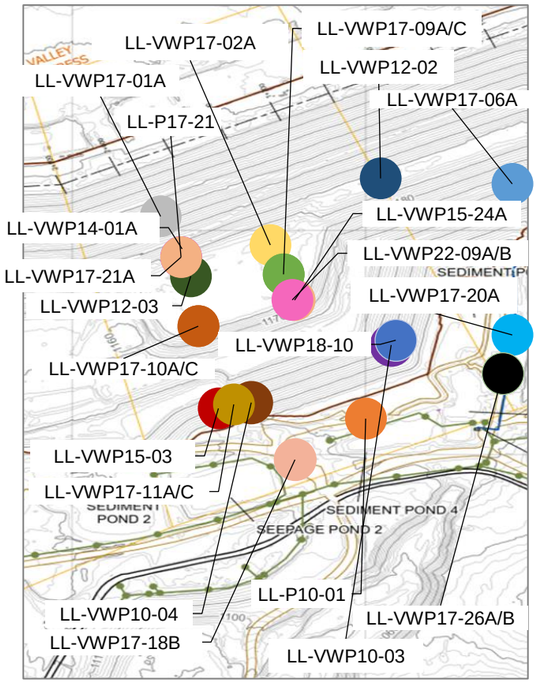
PROJECT: HIGHLAND TAILINGS STORAGE FACILITY
2023 ANNUAL FACILITY PERFORMANCE REPORT

TITLE: L-L DAM
VALLEY BUTTRESS BERM
GLACIOLACUSTRINE
2022 TO 2024 PIEZOMETER PLOTS

SCALE	PROJECT No.	FIG. No.
AS SHOWN	M02341C62	II-A-5



INSET INSTRUMENT VIEW



LEGEND

- LL-P10-01 (Lower Sand and Gravel)
- LL-P17-21 (Lower Sand and Gravel)
- LL-VWP10-03 (Glacial Till)
- LL-VWP10-04 (Glacial Till)
- LL-VWP12-02 (Glacial Till)
- LL-VWP12-03 (Lower Sand and Gravel)
- LL-VWP15-03 (Glacial Till)
- LL-VWP15-24A (Lower Till/Gravel)
- LL-VWP17-01A (Lower Sand and Gravel)
- LL-VWP17-02A (Lower Sand and Gravel)
- LL-VWP17-06A (Lower Sand and Gravel)
- LL-VWP17-09A (Lower Till/Gravel)
- LL-VWP17-09C (Glacial Till)
- LL-VWP17-10A (Deep Glaciolacustrine)
- LL-VWP17-10C (Glacial Till)
- LL-VWP17-11A (Lower Sand and Gravel)
- LL-VWP17-11C (Glacial Till)
- LL-VWP17-18B (Glacial Till)
- LL-VWP17-20A (Glacial Till)
- LL-VWP17-21A (Lower Glaciolacustrine)
- LL-VWP17-26A (Guichon Creek Batholith)
- LL-VWP17-26B (Glacial Till)
- LL-VWP18-10 (Glacial Till)
- LL-VWP22-09A (Guichon Creek Batholith)
- LL-VWP22-09B (Lower Till/Gravel)
- L-L TAILINGS POND

NOTES

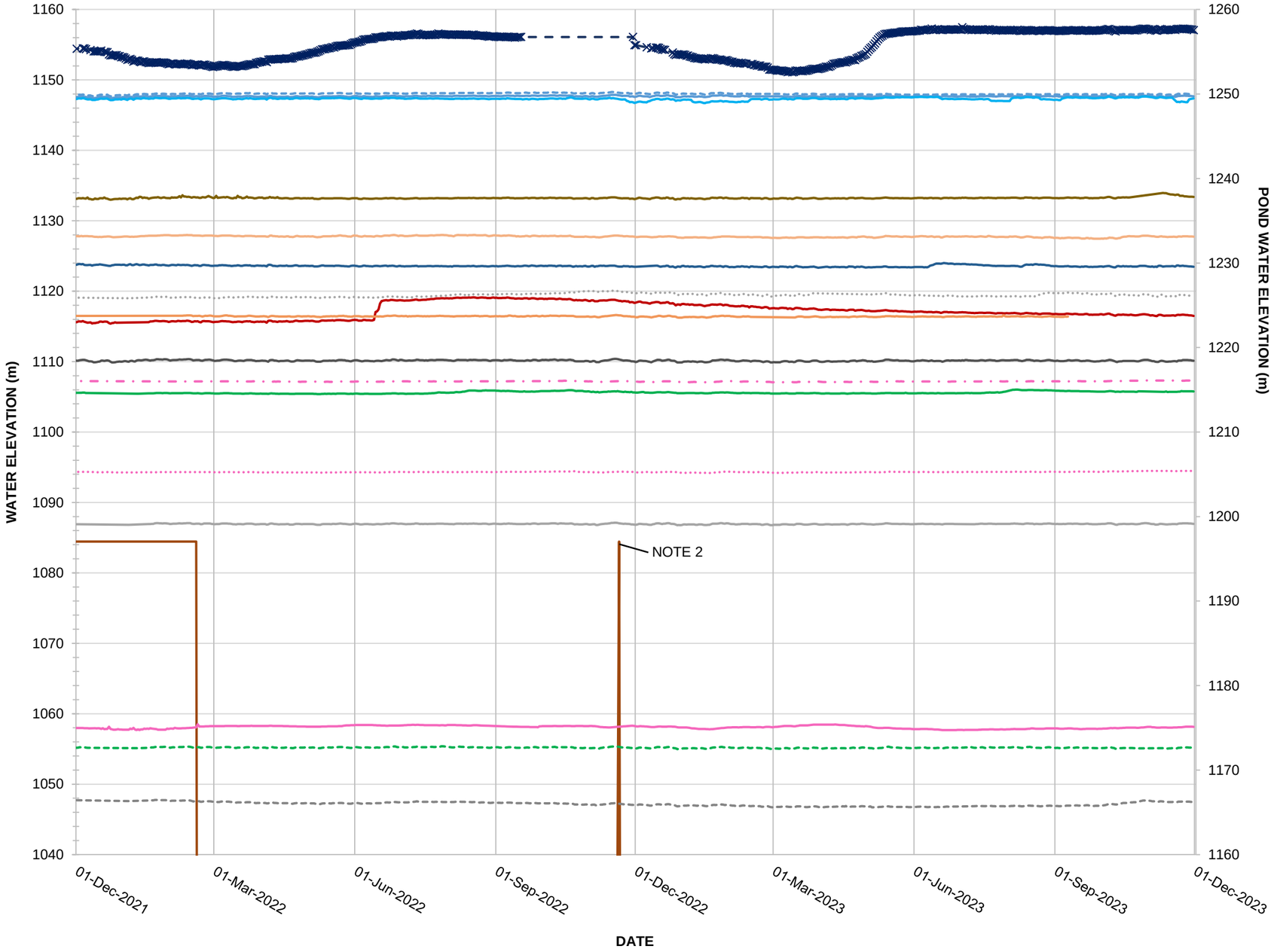
CLIENT: Highland Valley Copper / Teck

Klohn Crippen Berger

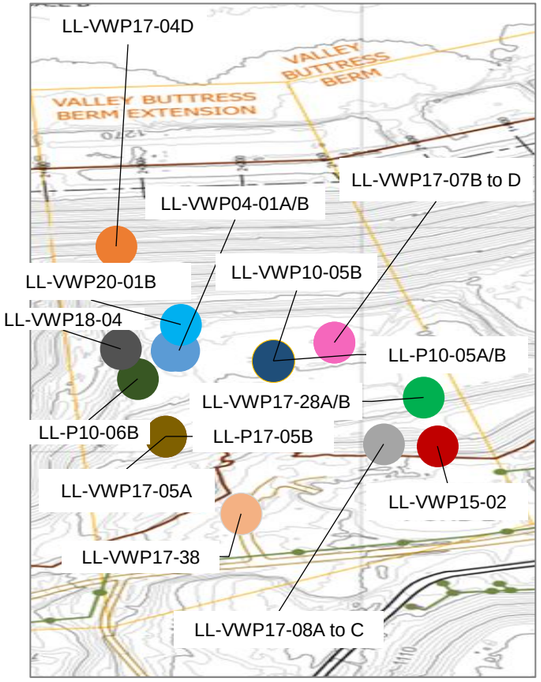
PROJECT: HIGHLAND TAILINGS STORAGE FACILITY
2023 ANNUAL FACILITY PERFORMANCE REPORT

TITLE: L-L DAM
VALLEY BUTTRESS BERM
GLACIAL TILL, SAND AND GRAVEL
2022 TO 2024 PIEZOMETER PLOTS

SCALE	PROJECT No.	FIG. No.
AS SHOWN	M02341C62	II-A-6



INSET INSTRUMENT VIEW



LEGEND

- LL-P10-05A (Lower Sand and Gravel)
- LL-P10-06B (Defunct)
- LL-P17-05B (Lower Sand and Gravel)
- LL-VWP04-01A (Glacial Till)
- LL-VWP04-01B (Drainage Blanket)
- LL-VWP10-05B (Glacial Till)
- LL-VWP15-02 (Glacial Till)
- LL-VWP17-04D (Lower Sand and Gravel)
- LL-VWP17-05A (Glacial Till)
- LL-VWP17-07B (Lower Sand and Gravel)
- LL-VWP17-07C (Lower Glaciolacustrine)
- LL-VWP17-07D (Glacial Till)
- LL-VWP17-08A (Lower Till/Gravel)
- LL-VWP17-08B (Lower Sand and Gravel)
- LL-VWP17-08C (Glacial Till)
- LL-VWP17-28A (Lower Sand and Gravel)
- LL-VWP17-28B (Glacial Till)
- LL-VWP17-38 (Glacial Till)
- LL-VWP18-04 (Lower Sand and Gravel)
- LL-VWP20-01B (Glacial Till)
- L-L TAILINGS POND

NOTES

1. HVC PROVIDES DRY READINGS ELEVATIONS AS El. -8000 m.
2. LL-P17-05B WAS REPORTED DRY ON 2022-03-12, READ POSITIVE PORE PRESSURES ON 2022-11-20 AND RETURNED TO DRY AT THE NEXT READING.

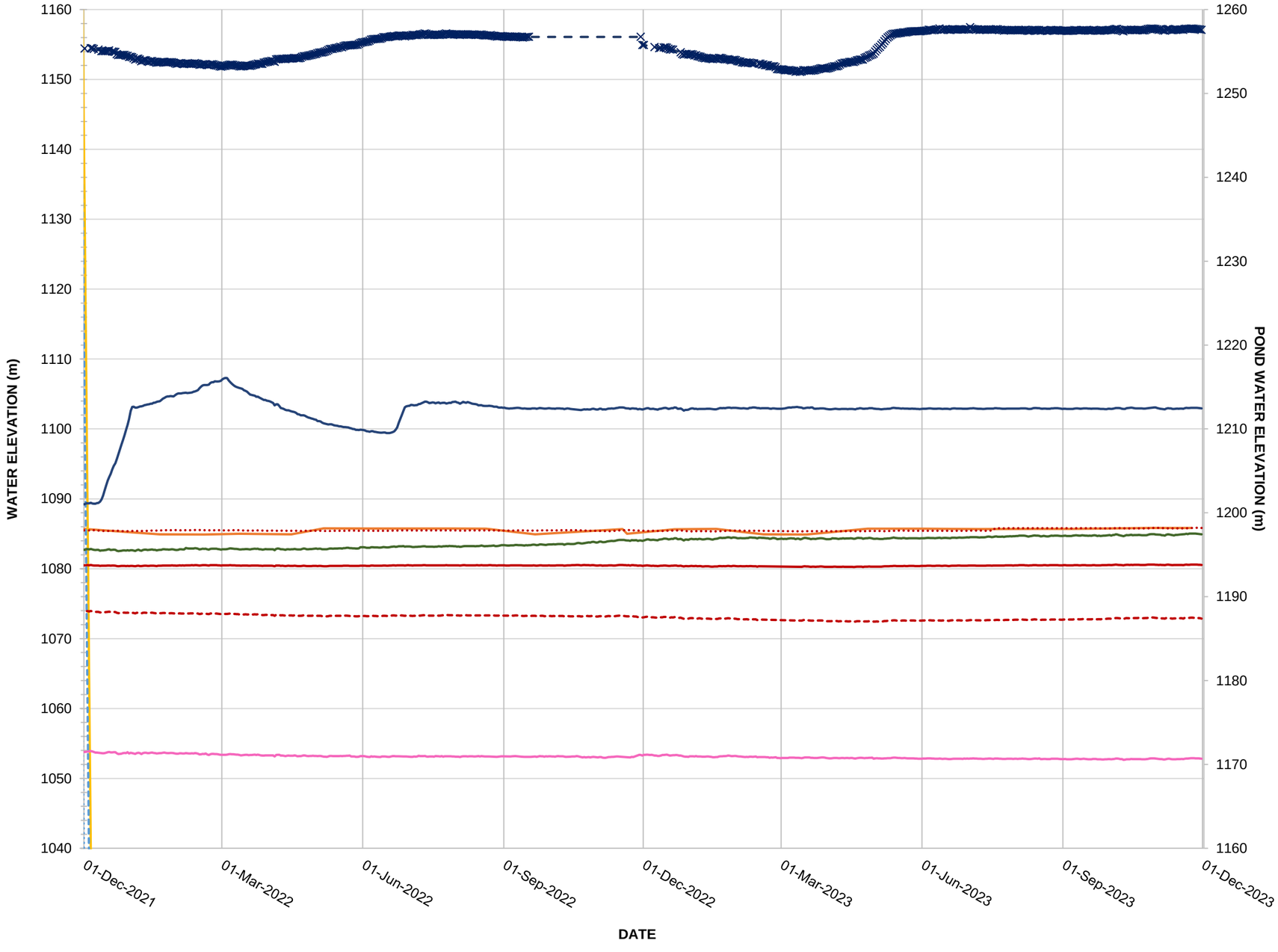
CLIENT: Highland Valley Copper / Teck

Klohn Crippen Berger

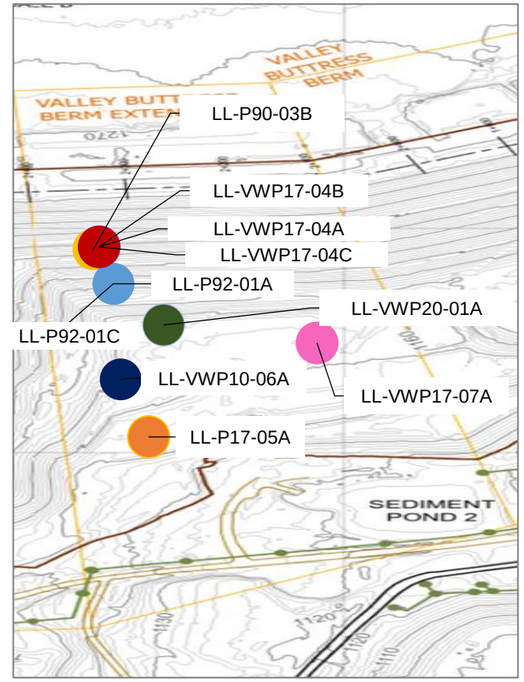
PROJECT: HIGHLAND TAILINGS STORAGE FACILITY
2023 ANNUAL FACILITY PERFORMANCE REPORT

TITLE: L-L DAM
VALLEY BUTTRESS BERM EXTENSION
OVERBURDEN AND DAM FILL
2022 TO 2024 PIEZOMETER PLOTS

SCALE	PROJECT No.	FIG. No.
AS SHOWN	M02341C62	II-A-7



INSET INSTRUMENT VIEW



LEGEND

- LL-P17-05A (Eocene Basal Sedimentary)
- LL-P90-03B (Defunct)
- LL-P92-01A (Defunct)
- LL-P92-01C (Eocene Basal Sedimentary)
- LL-VWP10-06A (Eocene Basal Sedimentary)
- LL-VWP17-04A (Eocene Basal Sedimentary)
- LL-VWP17-04B (Eocene Basal Sedimentary)
- LL-VWP17-04C (Eocene Basal Sedimentary)
- LL-VWP17-07A (Guichon Creek Batholith)
- LL-VWP20-01A (Eocene Basal Sedimentary)
- L-L TAILINGS POND

NOTES

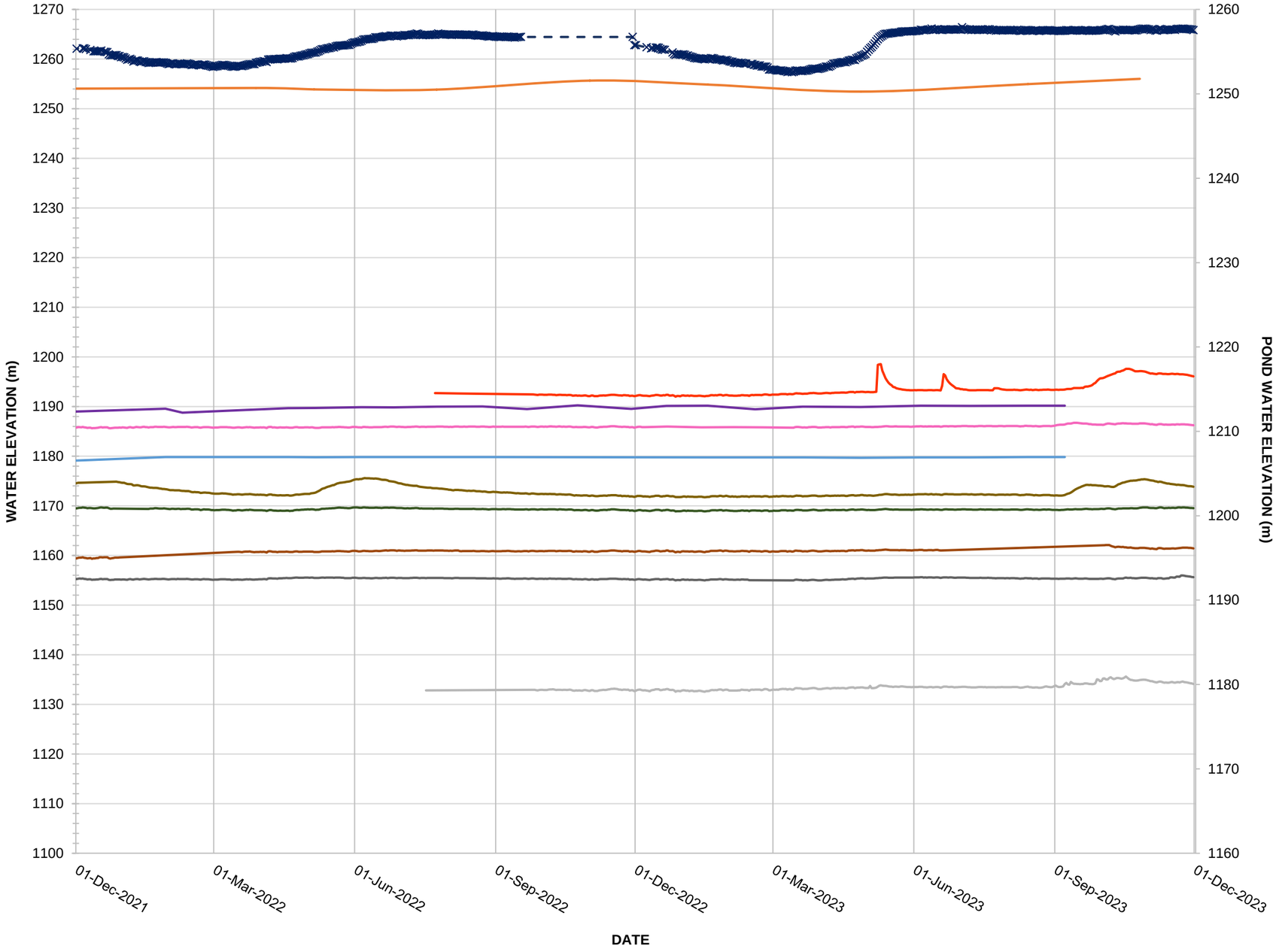
CLIENT: Highland Valley Copper / Teck

Klohn Crippen Berger

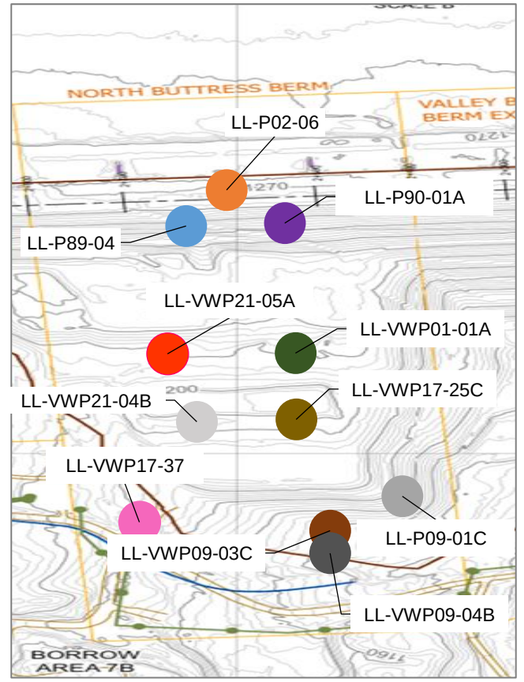
PROJECT: HIGHLAND TAILINGS STORAGE FACILITY
2023 ANNUAL FACILITY PERFORMANCE REPORT

TITLE: L-L DAM
VALLEY BUTTRESS BERM EXTENSION
FOUNDATION ROCK
2022 TO 2024 PIEZOMETER PLOTS

SCALE	PROJECT No.	FIG. No.
AS SHOWN	M02341C62	II-A-8



INSET INSTRUMENT VIEW

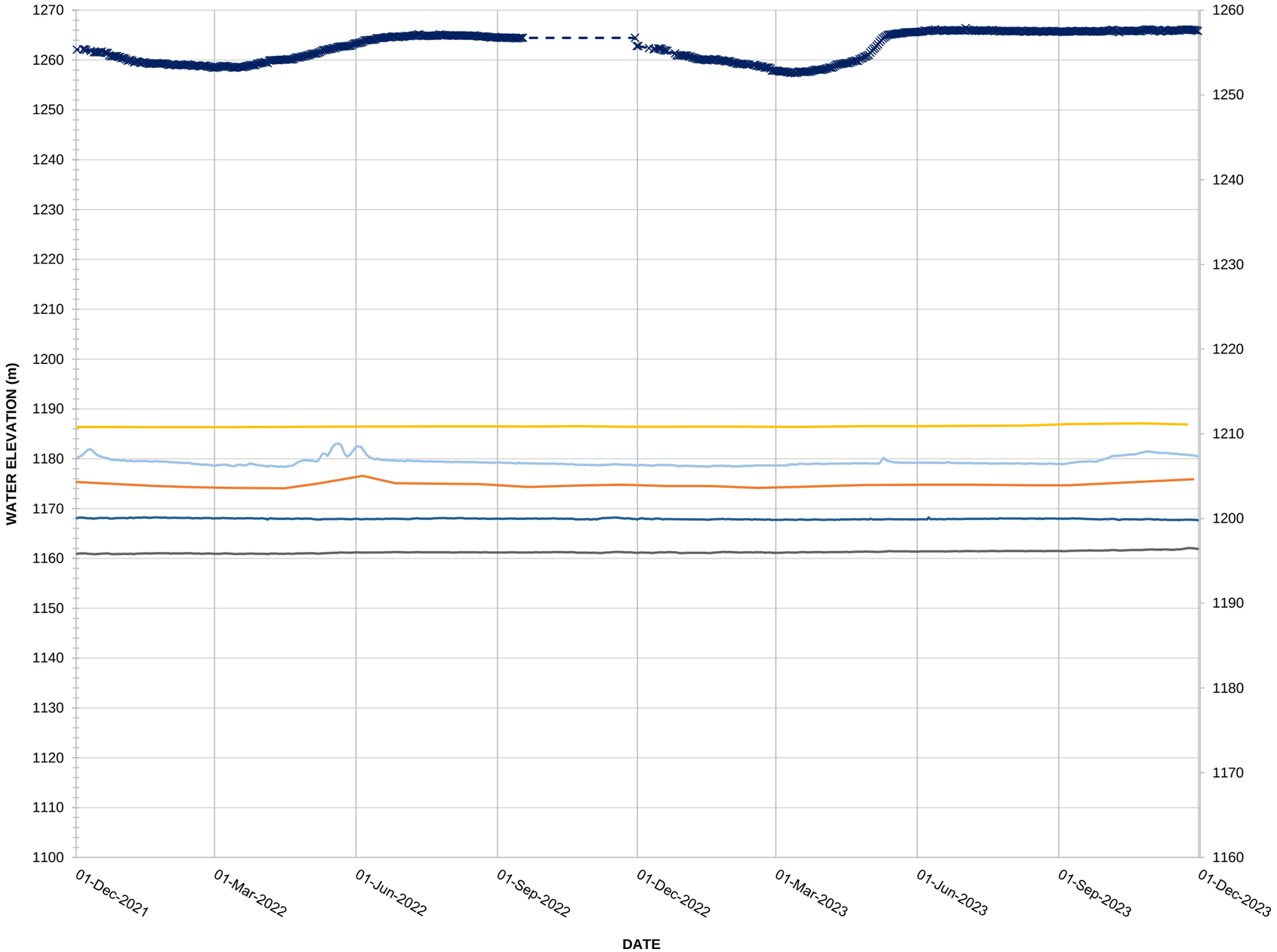


LEGEND

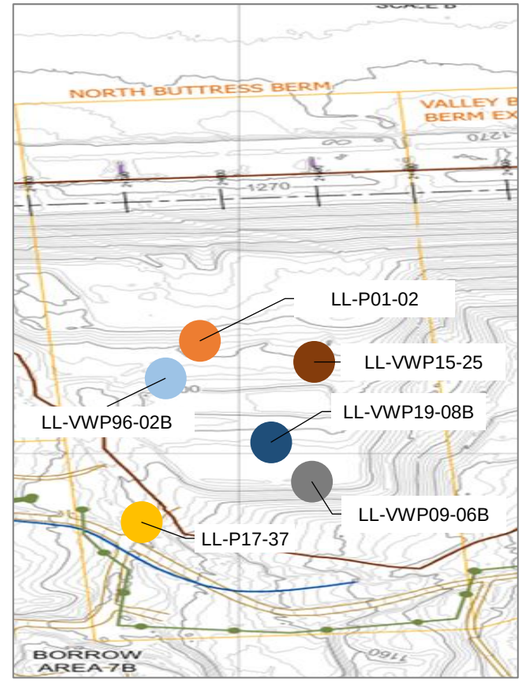
- LL-P02-06 (Cyclone Sand)
- LL-P09-01C (Defunct)
- LL-P89-04 (Cyclone Sand)
- LL-P90-01A (Glacial Till)
- LL-VWP01-01A (Glacial Till)
- LL-VWP09-03C (Lower Glaciolacustrine)
- LL-VWP09-04B (Lower Glaciolacustrine)
- LL-VWP17-25C (Glacial Till)
- LL-VWP17-37 (Glacial Till)
- LL-VWP21-05A (Eocene Upper Sedimentary)
- LL-VWP21-04B (Drainage Blanket)
- L-L TAILINGS POND

NOTES

CLIENT	Highland Valley Copper / Teck
	Klohn Crippen Berger
PROJECT	HIGHLAND TAILINGS STORAGE FACILITY 2023 ANNUAL FACILITY PERFORMANCE REPORT
TITLE	L-L DAM NORTH BUTTRESS BERM OVERBURDEN 2022 TO 2024 PIEZOMETER PLOTS
SCALE	AS SHOWN
PROJECT No.	M02341C62
FIG. No.	II-A-9



INSET INSTRUMENT VIEW



LEGEND

- LL-P01-02 (Eocene Volcanics)
- LL-P17-37 (Eocene Volcanics)
- LL-VWP09-06B (Eocene Volcanics)
- LL-VWP19-08B (Eocene Volcanics)
- LL-VWP96-02B (Eocene Volcanics)
- L-L TAILINGS POND

NOTES

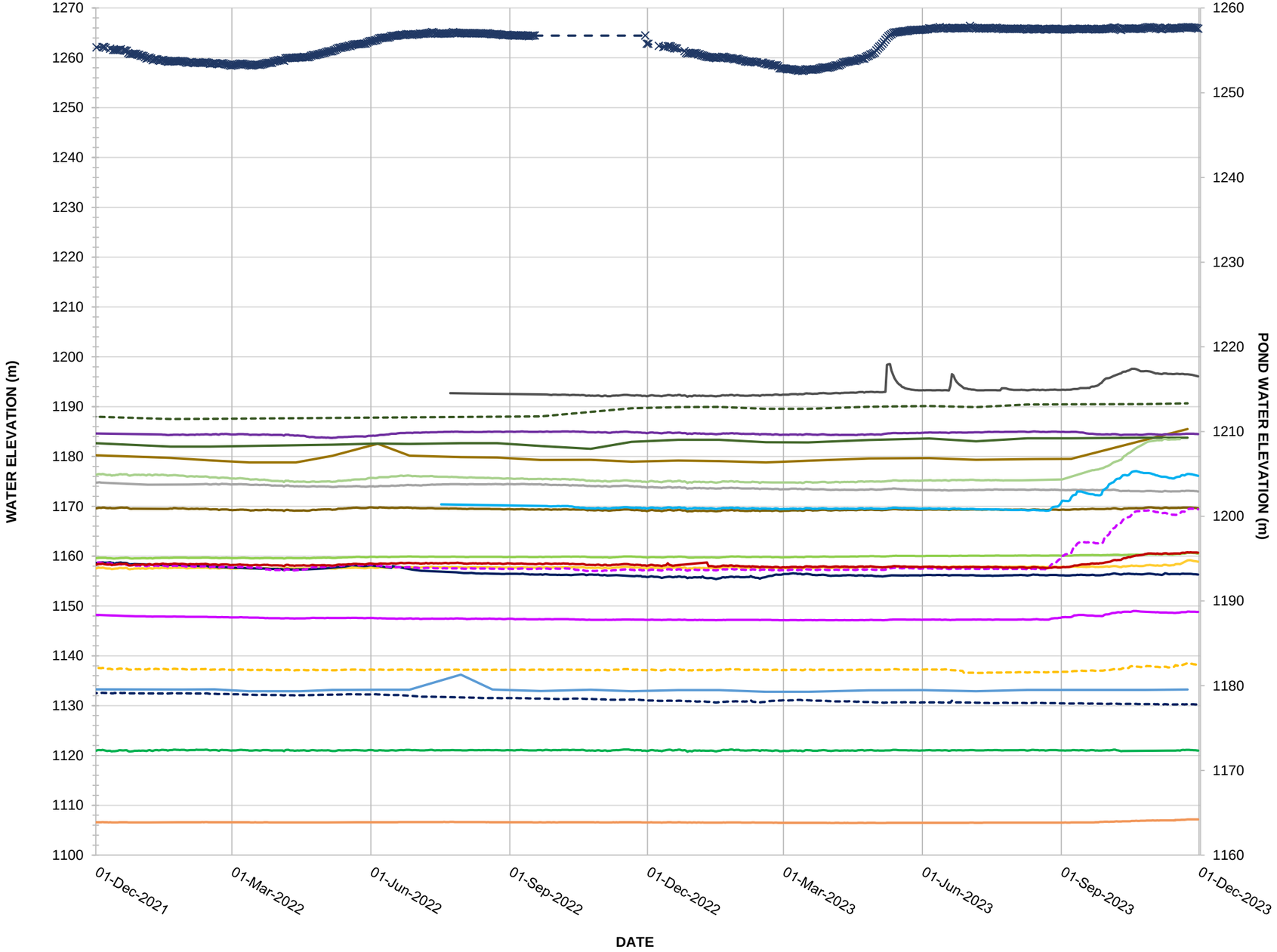
CLIENT: Highland Valley Copper / Teck

Klohn Crippen Berger

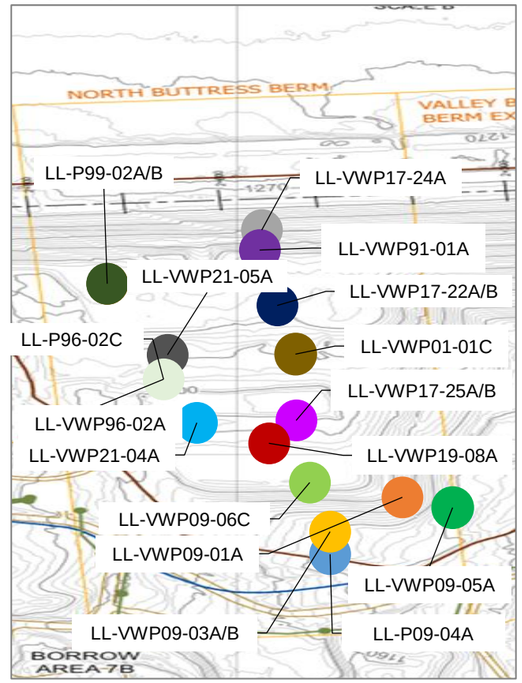
PROJECT: HIGHLAND TAILINGS STORAGE FACILITY
2023 ANNUAL FACILITY PERFORMANCE REPORT

TITLE: L-L DAM
NORTH BUTTRESS BERM
VOLCANICS
2022 TO 2024 PIEZOMETER PLOTS

SCALE	PROJECT No.	FIG. No.
AS SHOWN	M02341C62	II-A-10



INSET INSTRUMENT VIEW



LEGEND

- LL-P09-04A (Eocene Medial Sedimentary)
- LL-P96-02C (Eocene Basal Sedimentary)
- LL-P99-02A (Eocene Upper Sedimentary)
- LL-P99-02B (Eocene Upper Sedimentary)
- LL-VWP01-01C (Eocene Upper Sedimentary)
- LL-VWP09-01A (Eocene Basal Sedimentary)
- LL-VWP09-03A (Eocene Basal Sedimentary)
- LL-VWP09-03B (Eocene Upper Sedimentary)
- LL-VWP09-05A (Eocene Medial Sedimentary)
- LL-VWP09-06C (Eocene Medial Sedimentary)
- LL-VWP17-22A (Eocene Basal Sedimentary)
- LL-VWP17-22B (Eocene Basal Sedimentary)
- LL-VWP17-24A (Eocene Upper Sedimentary)
- LL-VWP17-25A (Eocene Medial Sedimentary)
- LL-VWP17-25B (Eocene Upper Sedimentary)
- LL-VWP19-08A (Eocene Medial Sedimentary)
- LL-VWP21-04A (Eocene Medial Sedimentary)
- LL-VWP21-05A (Eocene Upper Sedimentary)
- LL-VWP91-01A (Eocene Upper Sedimentary)
- LL-VWP96-02A (Eocene Upper Sedimentary)
- L-L TAILINGS POND

NOTES

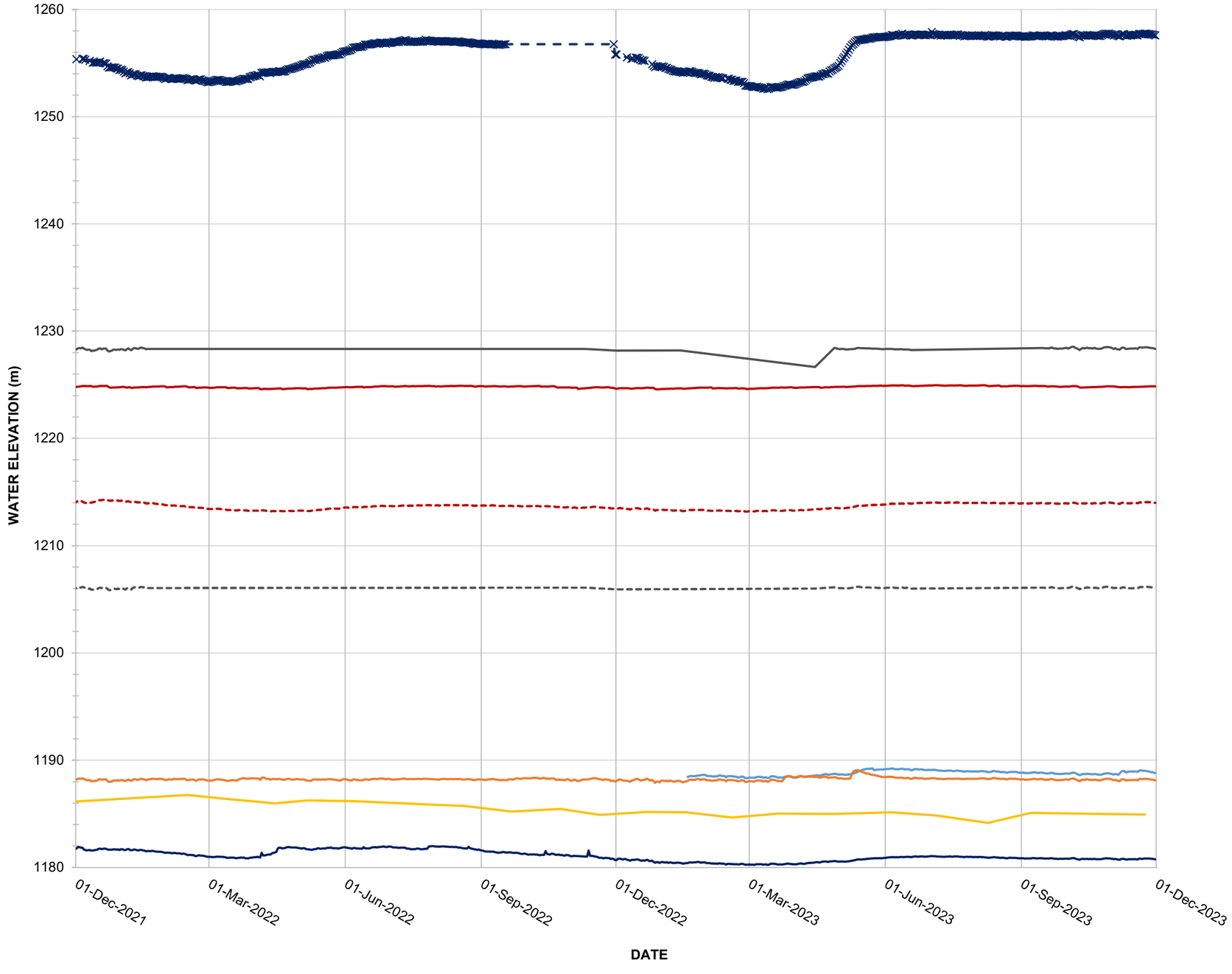
CLIENT: Highland Valley Copper / Teck

Klohn Crippen Berger

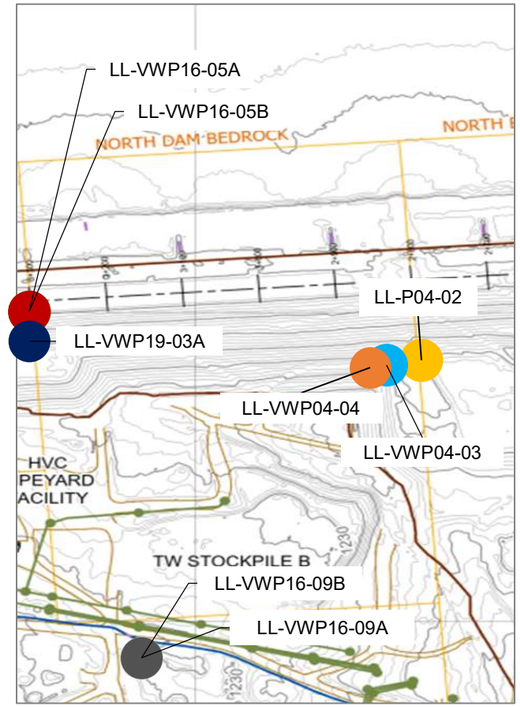
PROJECT: HIGHLAND TAILINGS STORAGE FACILITY
2023 ANNUAL FACILITY PERFORMANCE REPORT

TITLE: L-L DAM
NORTH BUTTRESS BERM
SEDIMENTARY
2022 TO 2024 PIEZOMETER PLOTS

SCALE	PROJECT No.	FIG. No.
AS SHOWN	M02341C62	II-A-11



INSET INSTRUMENT VIEW

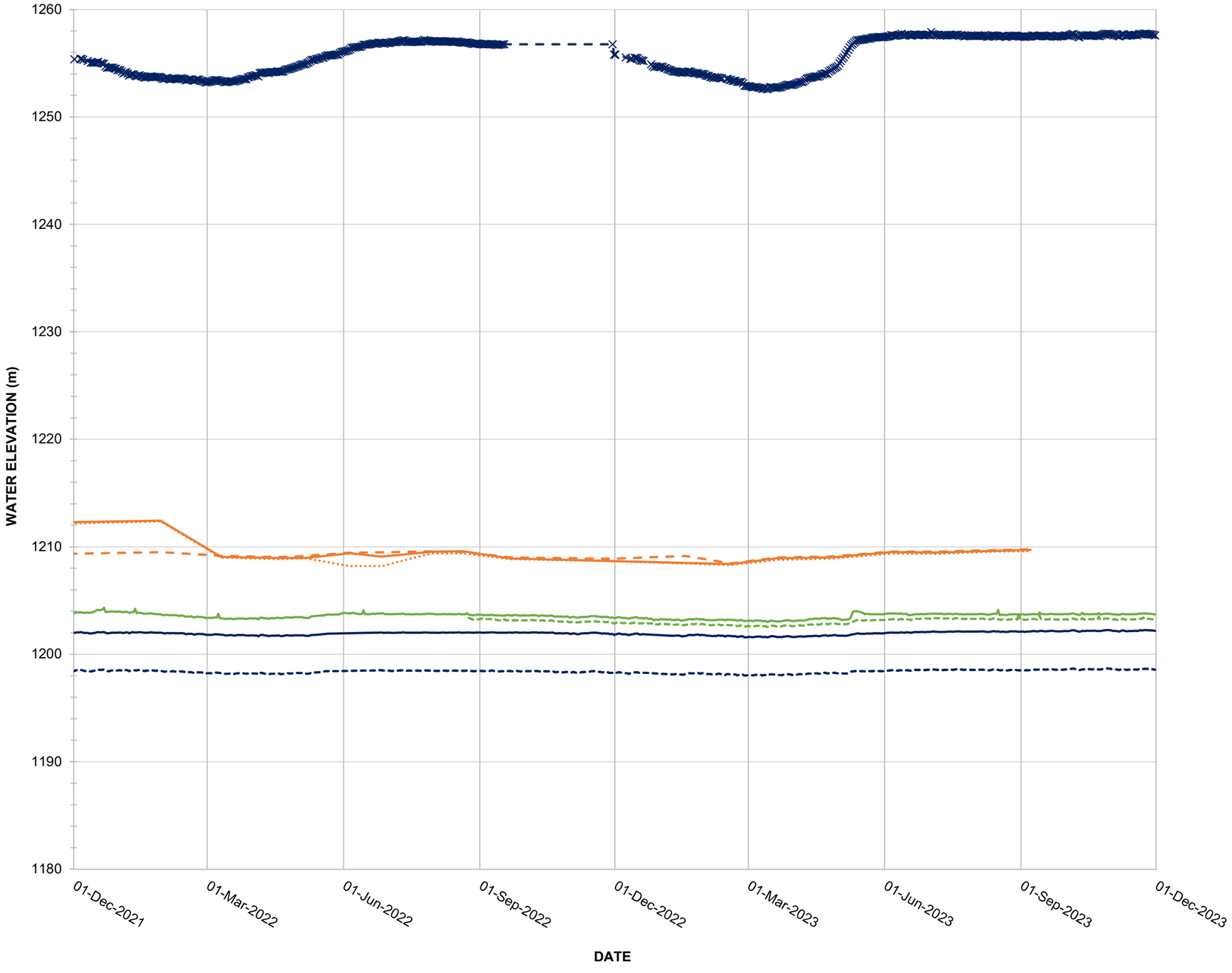


LEGEND

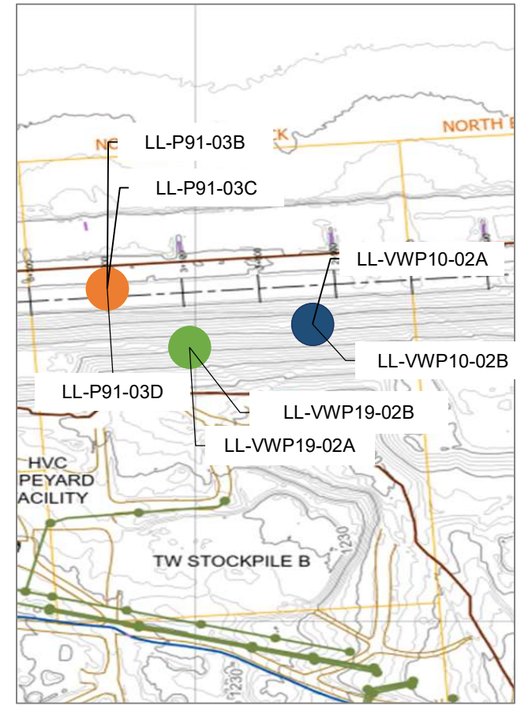
- LL-P04-02 (Glacial Till)
- LL-VWP04-03 (Glacial Till)
- LL-VWP04-04 (Glacial Till)
- LL-VWP16-05A (Glacial Till)
- LL-VWP16-05B (Upper Glaciolacustrine)
- LL-VWP16-09A (Glacial Till)
- LL-VWP16-09B (Glacial Till)
- LL-VWP19-03A (Glacial Till)
- L-L TAILINGS POND

NOTES

CLIENT: Highland Valley Copper / Teck	PROJECT: HIGHLAND TAILINGS STORAGE FACILITY 2023 ANNUAL FACILITY PERFORMANCE REPORT
Klohn Crippen Berger	TITLE: L-L DAM NORTH DAM BEDROCK GLACIAL TILL, SAND, AND UPPER GLU 2022 TO 2024 PIEZOMETER PLOTS
	SCALE: AS SHOWN · PROJECT No.: M02341C62 · FIG. No.: II-A-12



INSET INSTRUMENT VIEW



LEGEND

- LL-P91-03B (Eocene Volcanics)
- LL-P91-03C (Eocene Volcanics)
- LL-P91-03D (Eocene Volcanics)
- LL-VWP10-02A (Eocene Volcanics)
- LL-VWP10-02B (Eocene Volcanics)
- LL-VWP19-02A (Eocene Volcanics)
- LL-VWP19-02B (Eocene Volcanics)
- L-L TAILINGS POND

NOTES

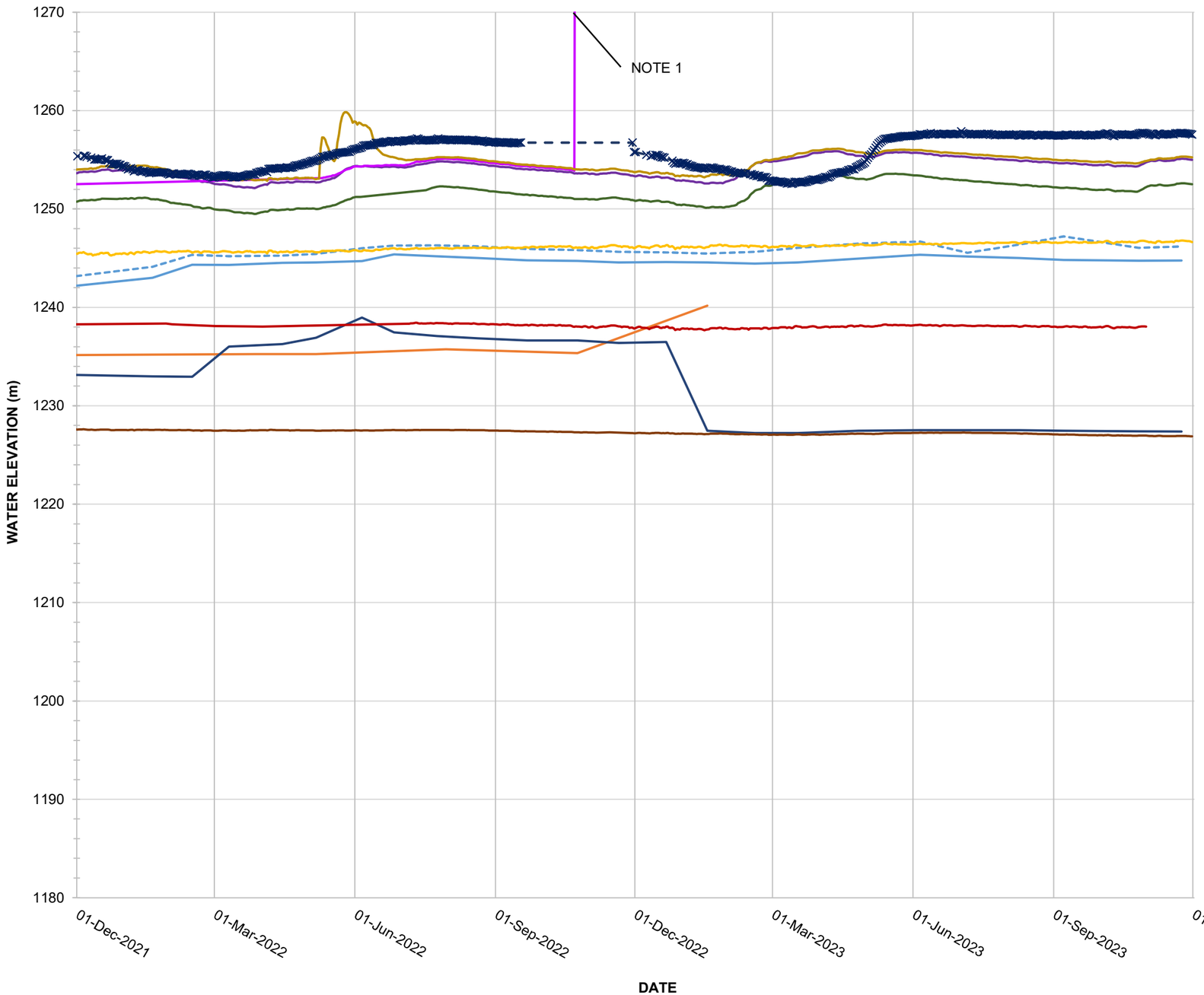
CLIENT: Highland Valley Copper / Teck

Klohn Crippen Berger

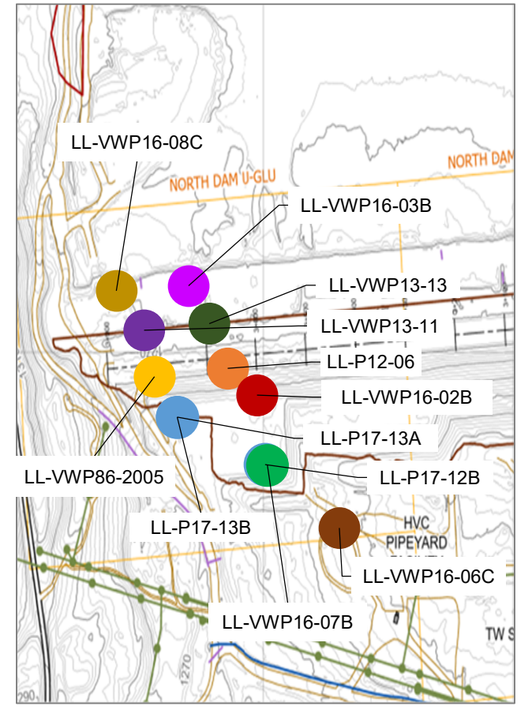
PROJECT: HIGHLAND TAILINGS STORAGE FACILITY
2023 ANNUAL FACILITY PERFORMANCE REPORT

TITLE: L-L DAM
NORTH DAM BEDROCK
VOLCANICS
2022 TO 2024 PIEZOMETER PLOTS

SCALE	PROJECT No.	FIG. No.
AS SHOWN	M02341C62	II-A-13



INSET INSTRUMENT VIEW



LEGEND

- LL-P12-06 (Defunct)
- LL-P17-12B (Upper Sand and Gravel)
- LL-P17-13A (Upper Sand and Gravel)
- LL-P17-13B (Upper Sand and Gravel)
- LL-VWP13-11 (Upper Sand and Gravel)
- LL-VWP13-13 (Upper Sand and Gravel)
- LL-VWP16-02B (Upper Sand and Gravel)
- LL-VWP16-03B (Defunct)
- LL-VWP16-06C (Upper Sand and Gravel)
- LL-VWP16-08C (Upper Sand and Gravel)
- LL-VWP86-2005 (Upper Sand and Gravel)
- L-L TAILINGS POND

NOTES

1. LL-VWP16-03B REPORTED A 219.5 m JUMP IN PORE WATER PRESSURES ON 2022-10-24. FOLLOWING THIS JUMP, THE WATER LEVELS DID NOT DISSIPATE AND SURROUNDING INSTRUMENTS IN SIMILAR GEOLOGICAL UNITS DID NOT EXHIBIT THE SAME BEHAVIOR. THE INSTRUMENT WAS MARKED AS DEFUNCT ON 2022-10-11.

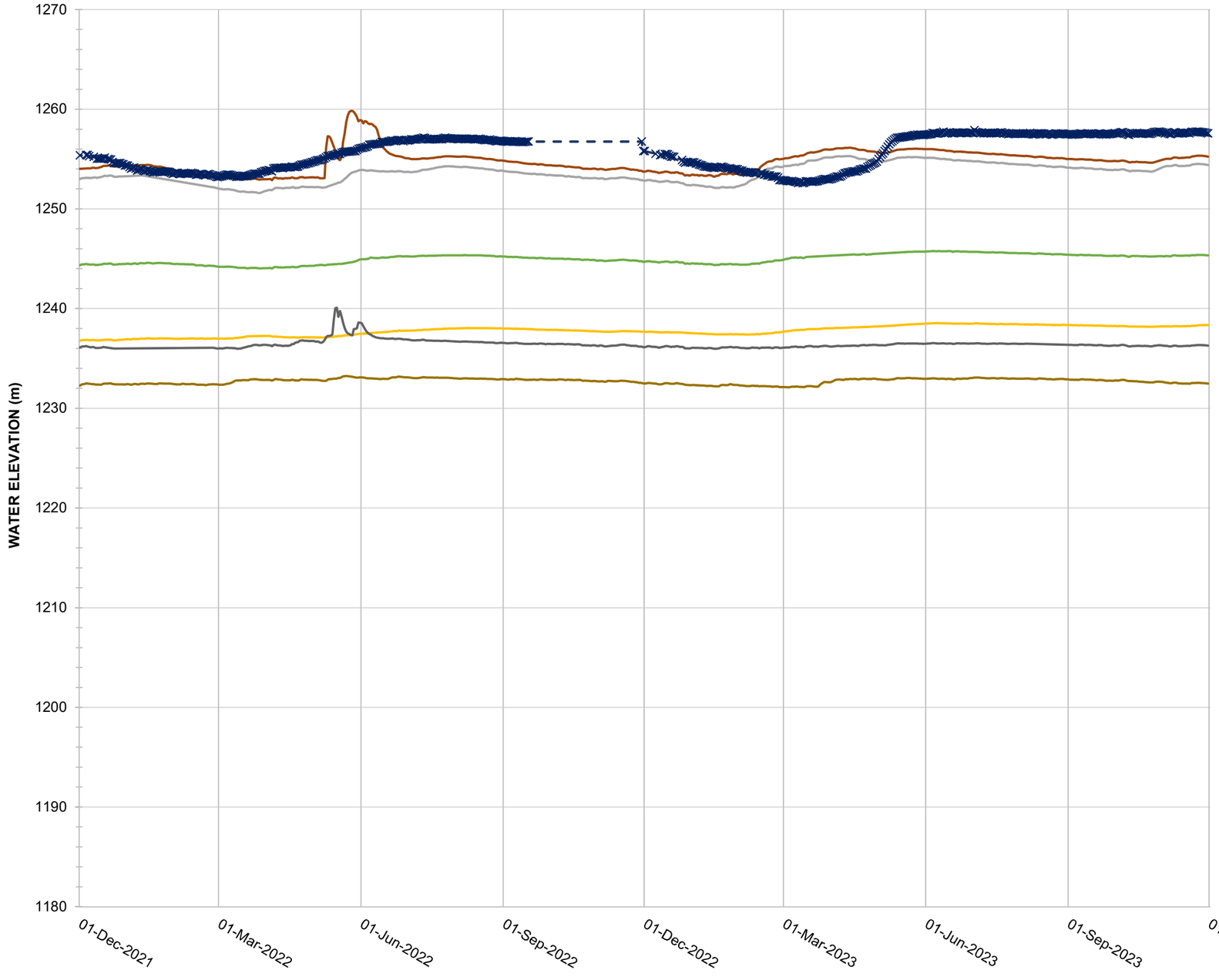
CLIENT: Highland Valley Copper / Teck

Klohn Crippen Berger

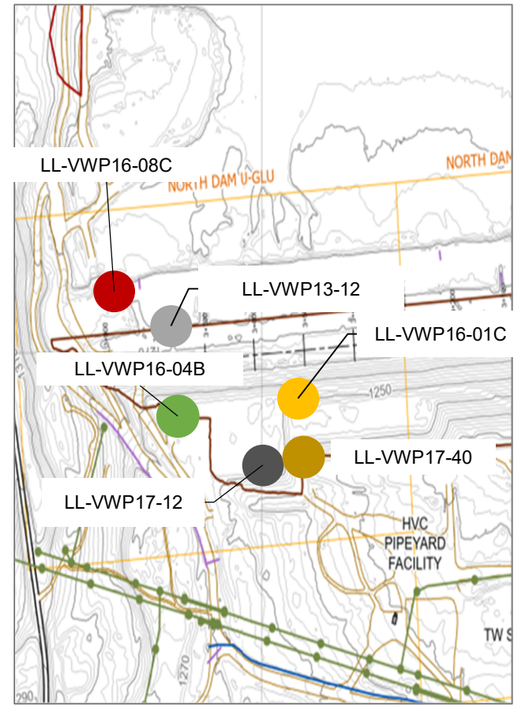
PROJECT: HIGHLAND TAILINGS STORAGE FACILITY
2023 ANNUAL FACILITY PERFORMANCE REPORT

TITLE: L-L DAM
NORTH DAM UPPER GLACIOLACUSTRINE
SAND AND GRAVEL
2022 TO 2024 PIEZOMETER PLOTS

SCALE	PROJECT No.	FIG. No.
AS SHOWN	M02341C62	II-A-14



INSET INSTRUMENT VIEW



LEGEND

- LL-VWP13-12 (Upper Glaciolacustrine)
- LL-VWP16-01C (Upper Glaciolacustrine)
- LL-VWP16-04B (Upper Glaciolacustrine)
- LL-VWP16-08C (Upper Sand and Gravel)
- LL-VWP17-12 (Upper Glaciolacustrine)
- LL-VWP17-40 (Upper Glaciolacustrine)
- L-L TAILINGS POND

NOTES

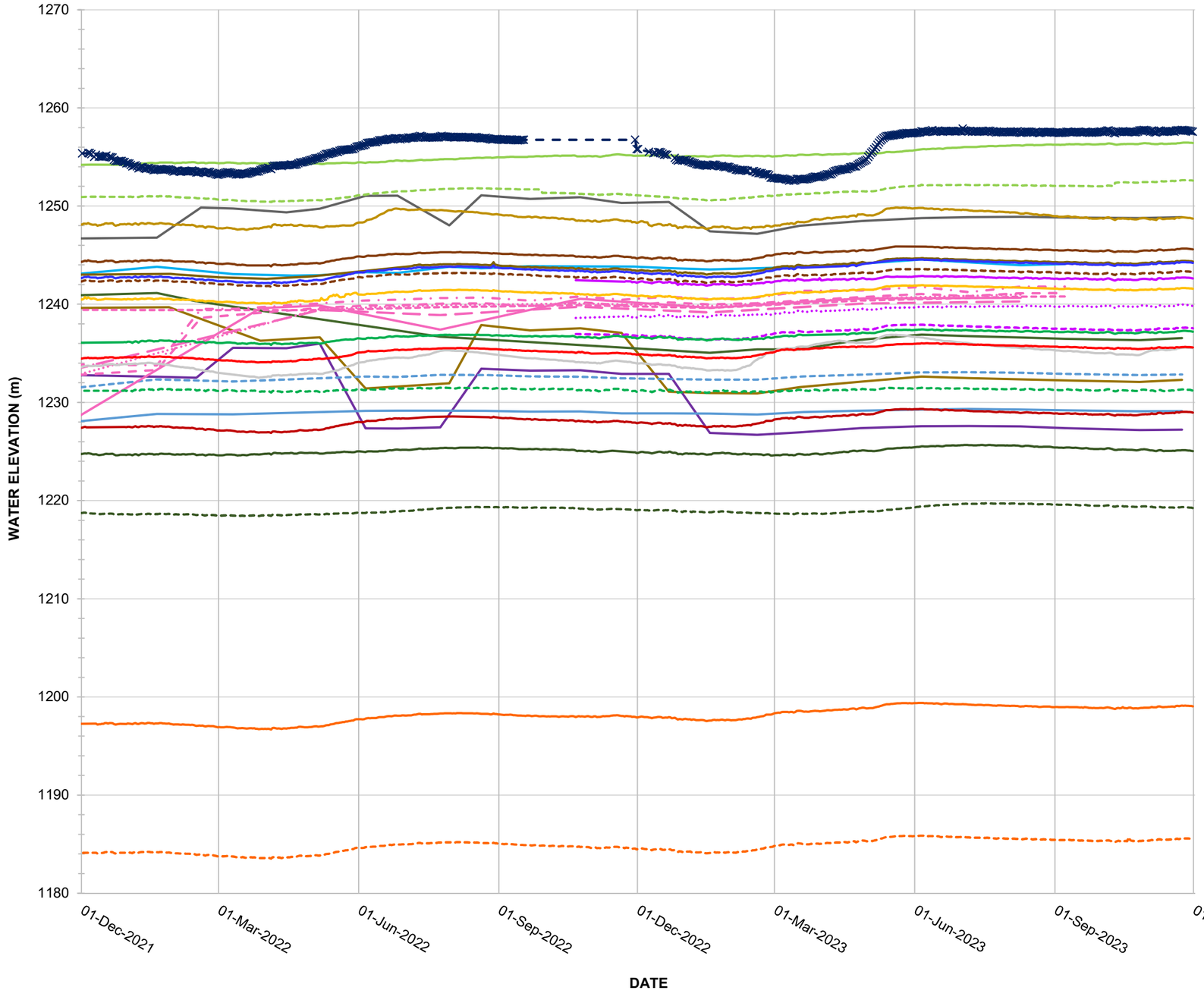
CLIENT: Highland Valley Copper / Teck

Klohn Crippen Berger

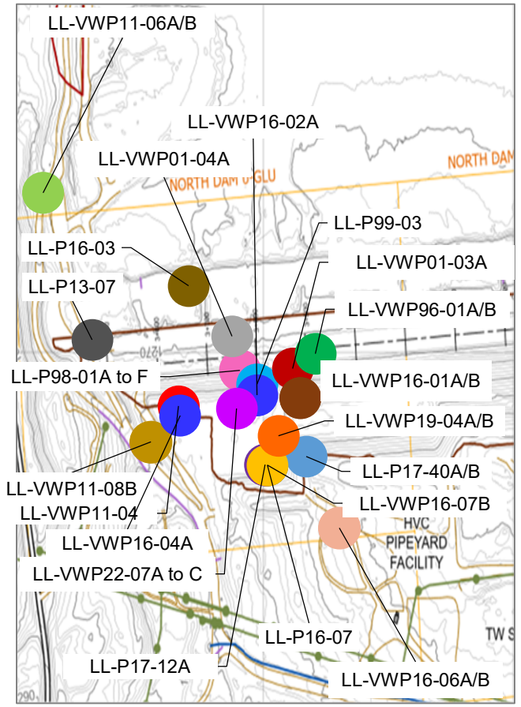
PROJECT: HIGHLAND TAILINGS STORAGE FACILITY
2023 ANNUAL FACILITY PERFORMANCE REPORT

TITLE: L-L DAM
NORTH DAM UPPER GLACIOLACUSTRINE
GLACIOLACUSTRINE
2022 TO 2024 PIEZOMETER PLOTS

SCALE	PROJECT No.	FIG. No.
AS SHOWN	M02341C62	II-A-15



INSET INSTRUMENT VIEW



LEGEND

- LL-P13-07 (Glacial Till)
- LL-P16-03 (Glacial Till)
- LL-P16-07 (Glacial Till)
- LL-P17-12A (Glacial Till)
- LL-P17-40A (Glacial Till)
- LL-P17-40B (Glacial Till)
- LL-P98-01A (Glacial Till)
- LL-P98-01B (Glacial Till)
- LL-P98-01C (Glacial Till)
- LL-P98-01D (Glacial Till)
- LL-P98-01E (Glacial Till)
- LL-P98-01F (Glacial Till)
- LL-P99-03 (Glacial Till)
- LL-VWP01-03A (Glacial Till)
- LL-VWP01-04A (Glacial Till)
- LL-VWP11-04 (Glacial Till)
- LL-VWP11-06A (Glacial Till)
- LL-VWP11-06B (Glacial Till)
- LL-VWP11-08B (Glacial Till)
- LL-VWP16-01A (Glacial Till)
- LL-VWP16-01B (Glacial Till)
- LL-VWP16-02A (Glacial Till)
- LL-VWP16-04A (Glacial Till)
- LL-VWP16-06A (Glacial Till)
- LL-VWP16-06B (Glacial Till)
- LL-VWP16-07B (Glacial Till)
- LL-VWP19-04A (Glacial Till)
- LL-VWP19-04B (Glacial Till)
- LL-VWP22-07A (Glacial Till)
- LL-VWP22-07B (Glacial Till)
- LL-VWP22-07C (Glacial Till)
- LL-VWP96-01A (Glacial Till)
- LL-VWP96-01B (Glacial Till)
- L-L TAILINGS POND

NOTES

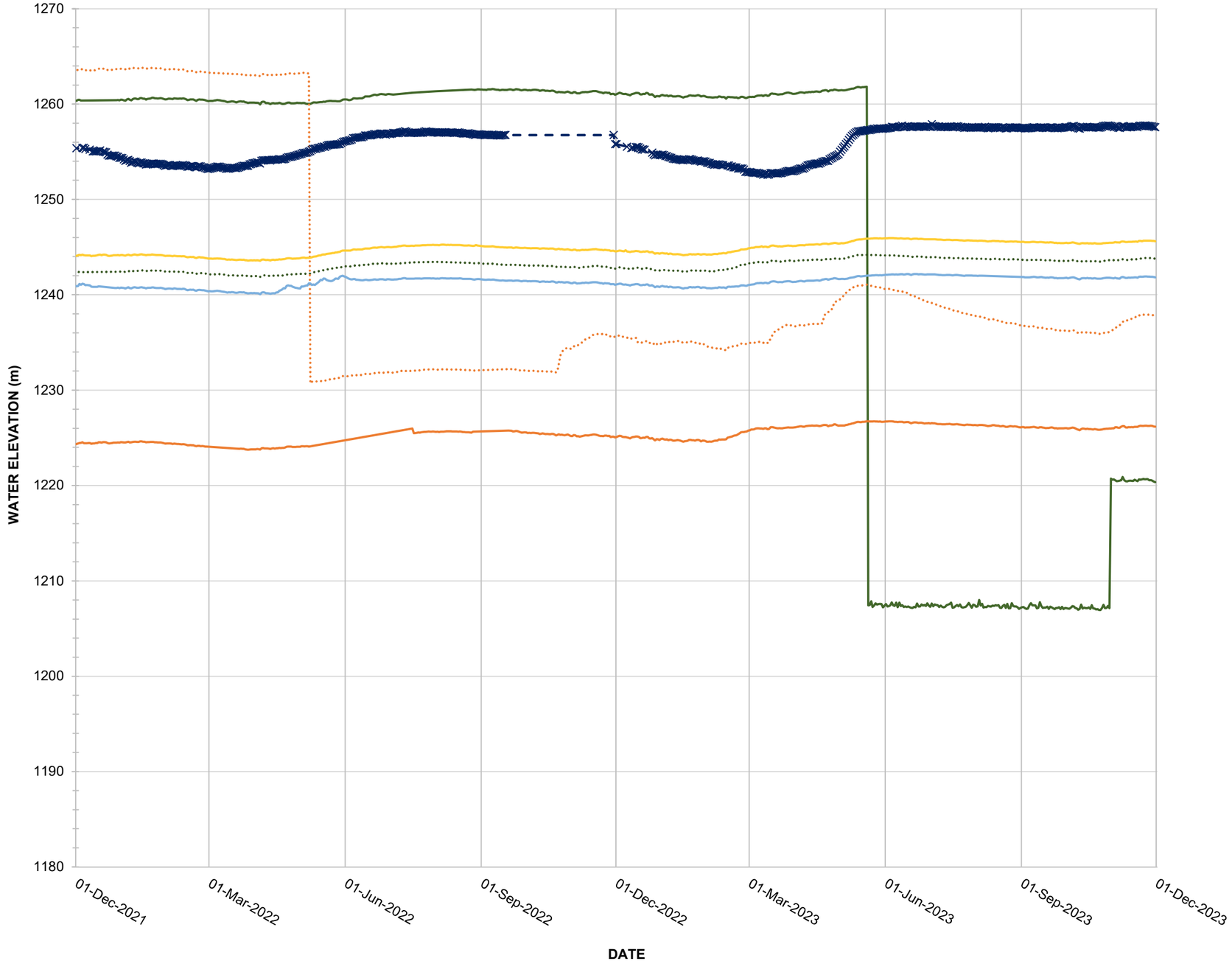
CLIENT: Highland Valley Copper / Teck

Klohn Crippen Berger

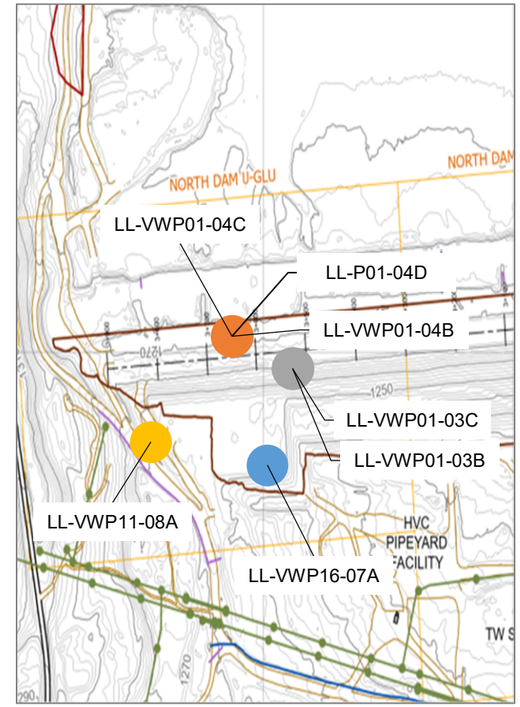
PROJECT: HIGHLAND TAILINGS STORAGE FACILITY
2023 ANNUAL FACILITY PERFORMANCE REPORT

TITLE: L-L DAM
NORTH DAM UPPER GLACIOLACUSTRINE
GLACIAL TILL
2022 TO 2024 PIEZOMETER PLOTS

SCALE	PROJECT No.	FIG. No.
AS SHOWN	M02341C62	II-A-16



INSET INSTRUMENT VIEW



LEGEND

- LL-P01-04D (Defunct)
- LL-VWP01-03B (Eocene Basal Sedimentary)
- LL-VWP01-03C (Eocene Basal Sedimentary)
- LL-VWP01-04B (Eocene Basal Sedimentary)
- LL-VWP01-04C (Eocene Basal Sedimentary)
- LL-VWP11-08A (Guichon Creek Batholith)
- LL-VWP16-07A (Eocene Basal Sedimentary)
- L-L TAILINGS POND

NOTES

CLIENT: Highland Valley Copper / Teck

Klohn Crippen Berger

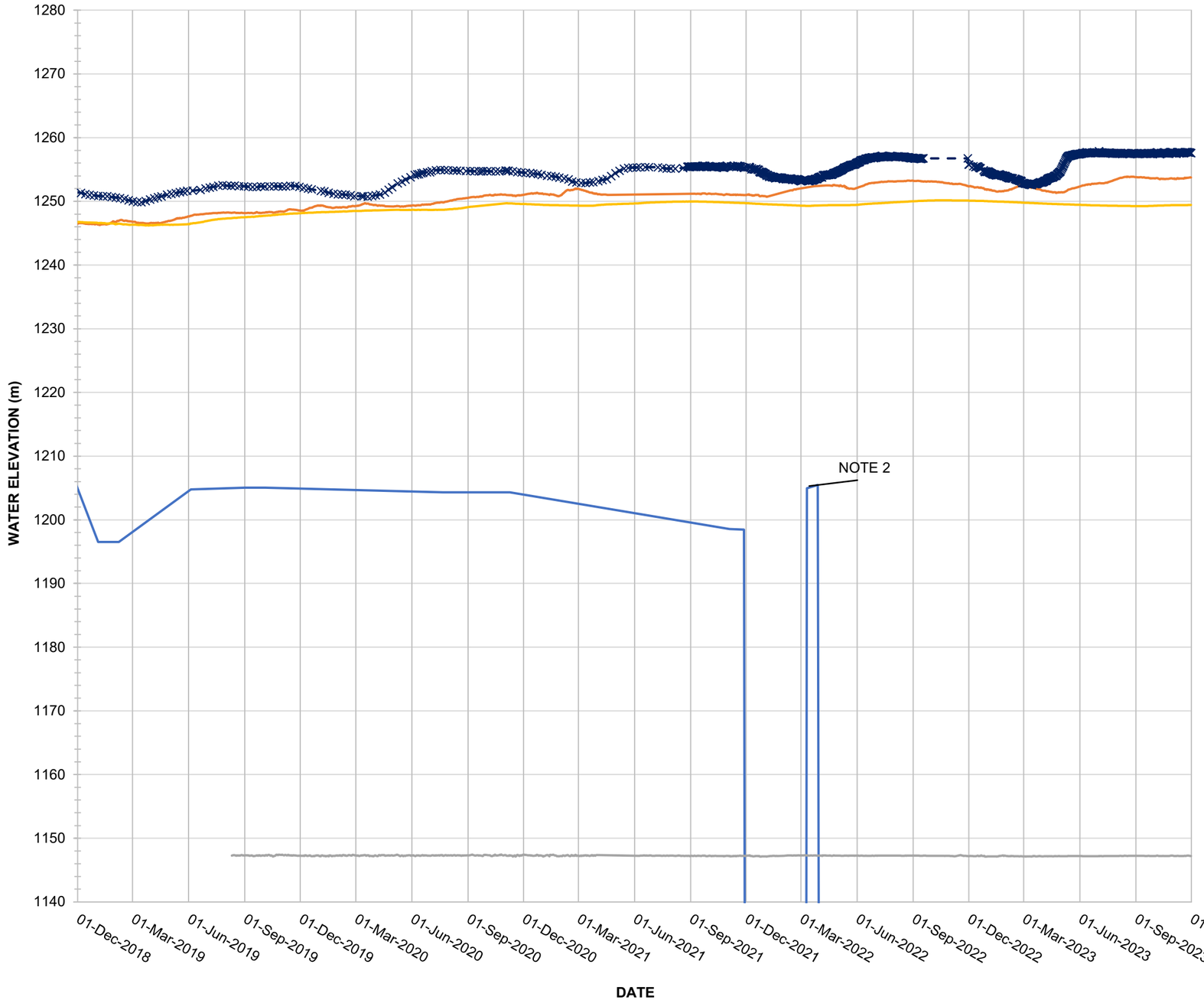
PROJECT: HIGHLAND TAILINGS STORAGE FACILITY
2023 ANNUAL FACILITY PERFORMANCE REPORT

TITLE: L-L DAM
NORTH DAM UPPER GLACIOLACUSTRINE FOUNDATION ROCK
2022 TO 2024 PIEZOMETER PLOTS

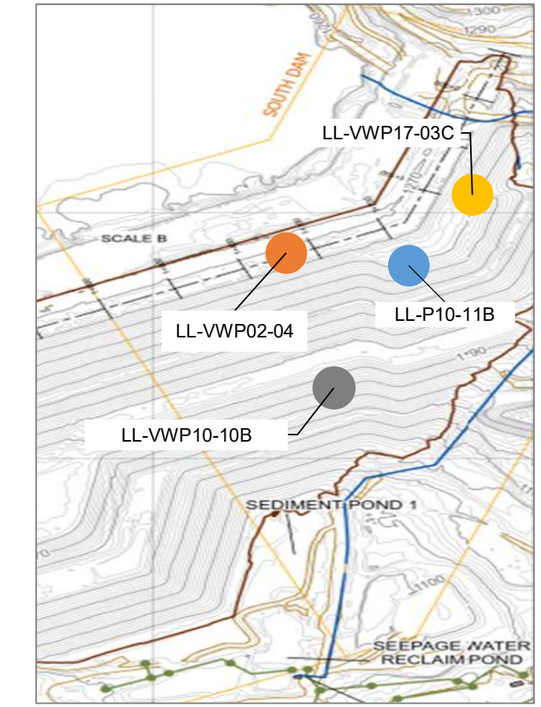
SCALE	PROJECT No.	FIG. No.
AS SHOWN	M02341C62	II-A-17

L-L DAM PIEZOMETER PLOTS:

December 1, 2018 to November 30, 2023



INSET INSTRUMENT VIEW



LEGEND

- LL-P10-11B (Cyclone Sand)
- LL-VWP02-04 (Cyclone Sand)
- LL-VWP10-10B (Drainage Blanket)
- LL-VWP17-03C (Drainage Blanket)
- L-L TAILINGS POND

NOTES

1. HVC PROVIDES DRY READINGS ELEVATIONS AS El. -8000 m.
2. LL-P10-11B WAS REPORTED DRY ON 2022-01-27, READ POSITIVE PORE PRESSURES IN MARCH 2022 AND RETURNED TO DRY STATUS AS OF 2022-06-05.

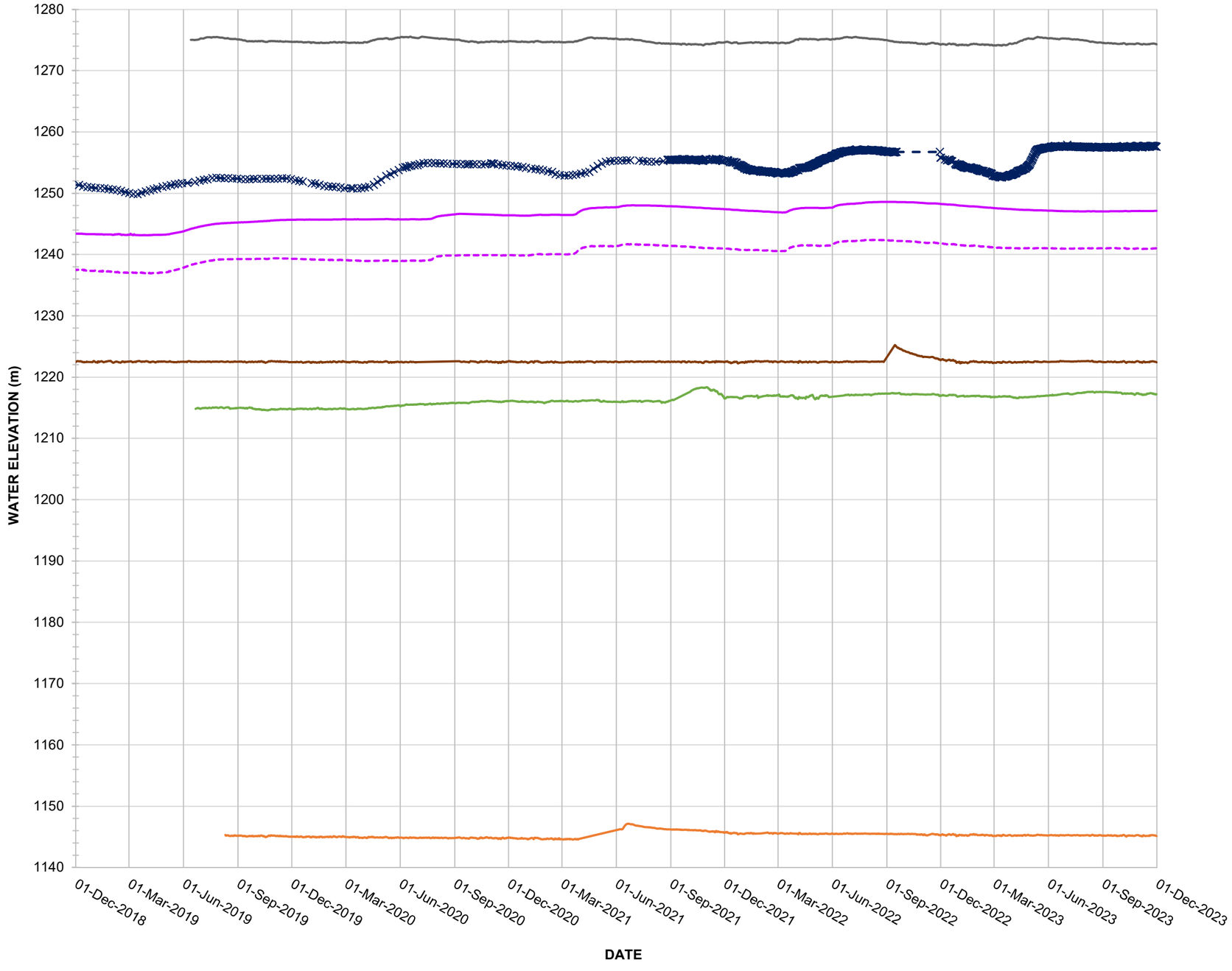
CLIENT: Highland Valley Copper / Teck

Klohn Crippen Berger

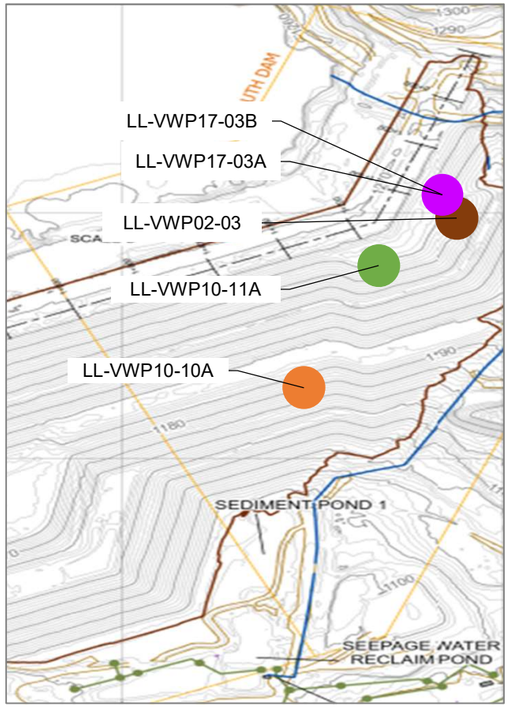
PROJECT: HIGHLAND TAILINGS STORAGE FACILITY
2023 ANNUAL FACILITY PERFORMANCE REPORT

TITLE: L-L DAM
SOUTH DAM
DAM FILL
2019 TO 2024 PIEZOMETER PLOTS

SCALE	PROJECT No.	FIG. No.
AS SHOWN	M02341C62	II-A-101



INSET INSTRUMENT VIEW



LEGEND

- LL-VWP02-03 (Guichon Creek Batholith)
- LL-VWP10-10A (Guichon Creek Batholith)
- LL-VWP10-11A (Guichon Creek Batholith)
- LL-VWP13-05 (Guichon Creek Batholith)
- LL-VWP17-03A (Guichon Creek Batholith)
- LL-VWP17-03B (Glacial Till)
- L-L TAILINGS POND

NOTES

1. LL-VWP13-05 IS LOCATED TO THE RIGHT OF THE DEPICTED INSET FIGURE.

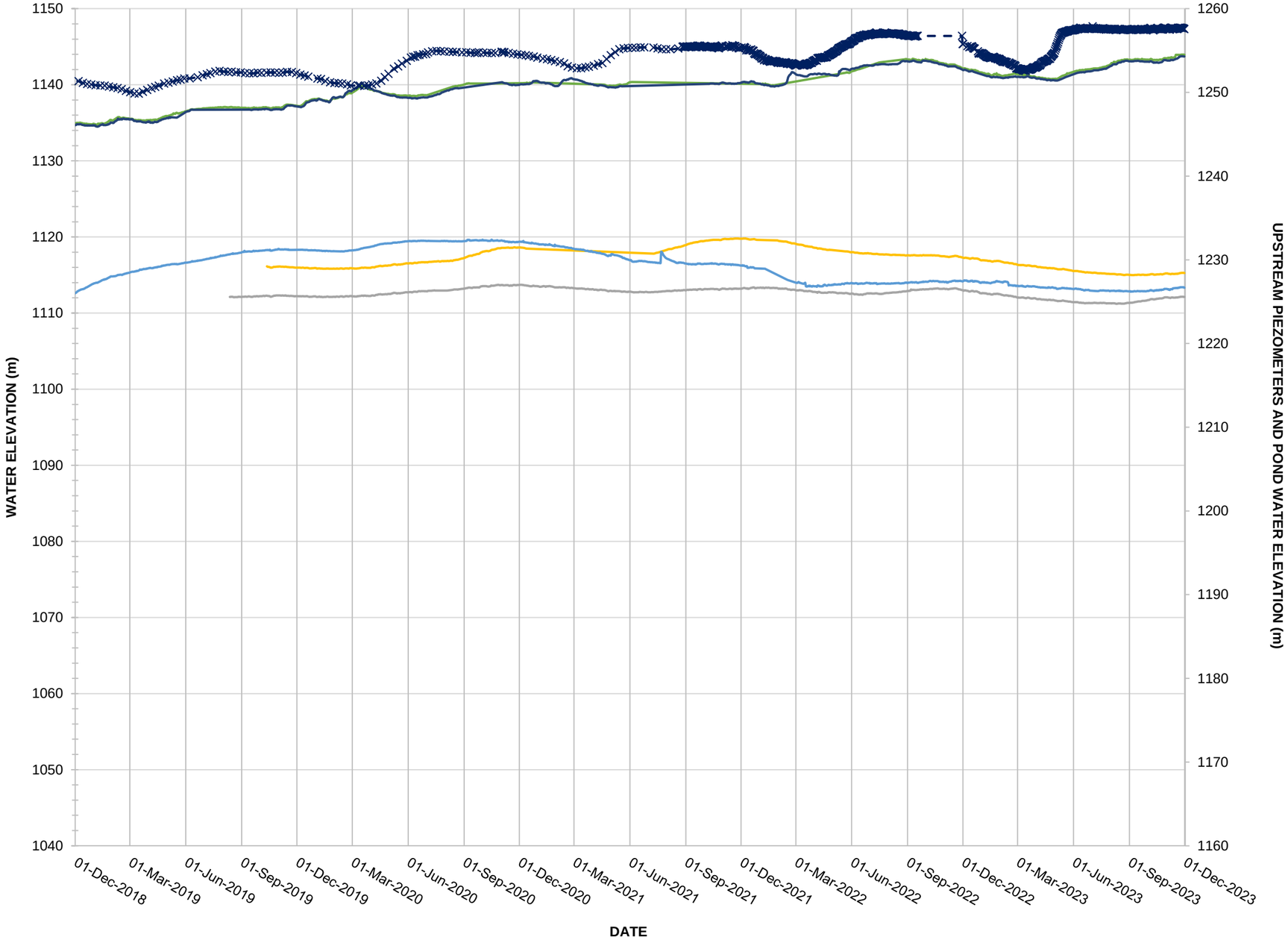
CLIENT: Highland Valley Copper / Teck

Klohn Crippen Berger

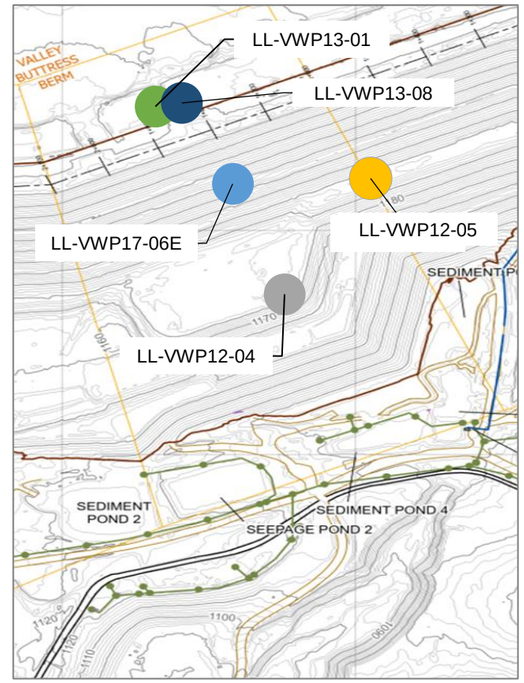
PROJECT: HIGHLAND TAILINGS STORAGE FACILITY
2023 ANNUAL FACILITY PERFORMANCE REPORT

TITLE: L-L DAM
SOUTH DAM
GRANODIORITE, FOUNDATION ROCK, AND GLACIAL TILL
2019 TO 2024 PIEZOMETER PLOTS

SCALE	PROJECT No.	FIG. No.
AS SHOWN	M02341C62	II-A-102



INSET INSTRUMENT VIEW



LEGEND

- LL-VWP12-04 (Cyclone Sand)
- LL-VWP12-05 (Cyclone Sand)
- LL-VWP17-06E (Drainage Blanket)
- LL-VWP13-01 (Cyclone Sand)
- LL-VWP13-08 (Cyclone Sand)
- L-L TAILINGS POND

NOTES

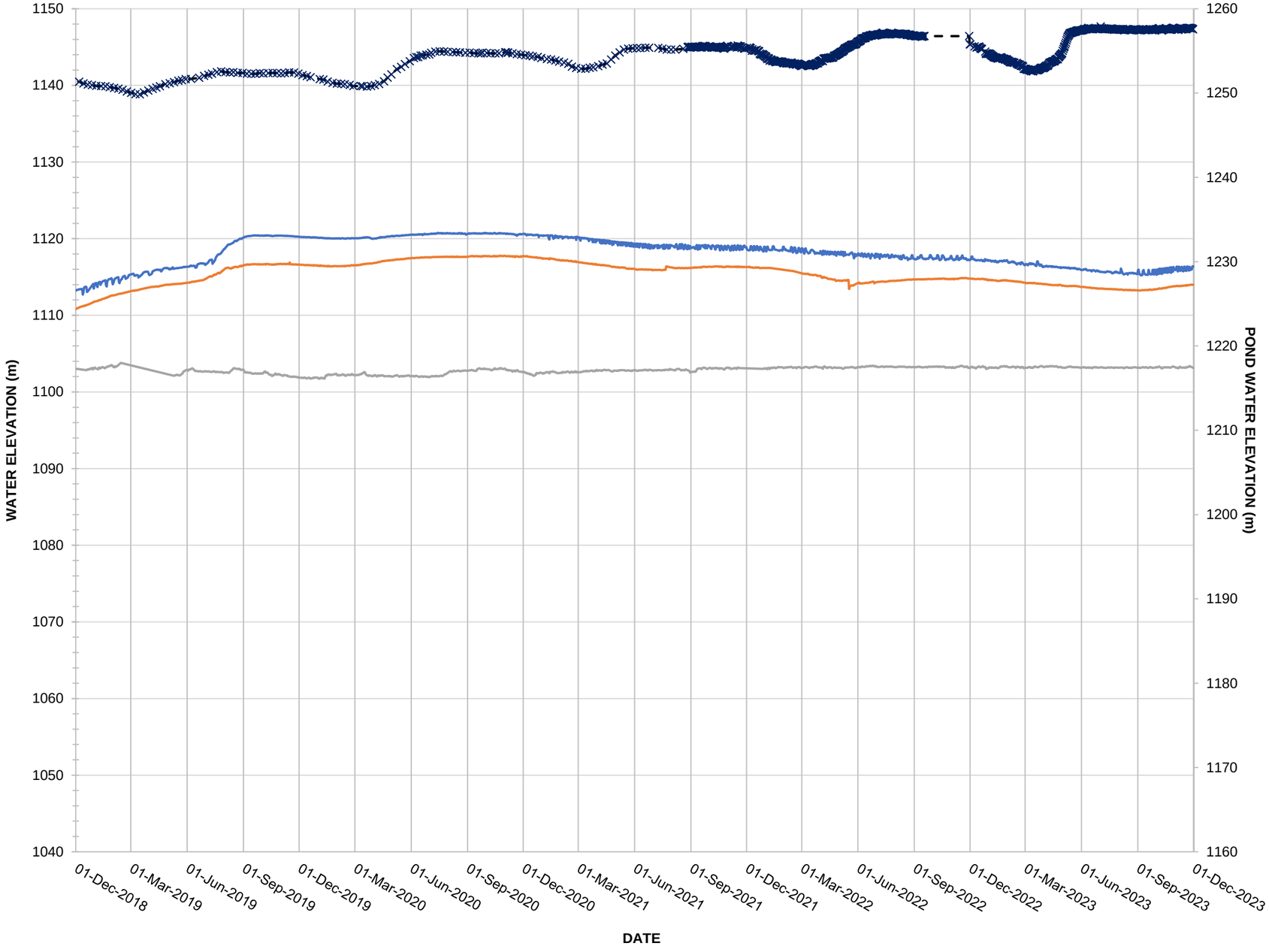
CLIENT: Highland Valley Copper / Teck

Klohn Crippen Berger

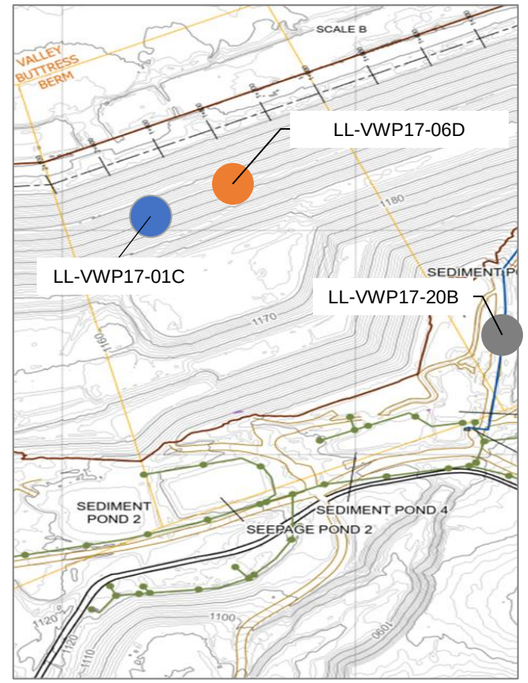
PROJECT: HIGHLAND TAILINGS STORAGE FACILITY
2023 ANNUAL FACILITY PERFORMANCE REPORT

TITLE: L-L DAM
VALLEY BUTTRESS BERM
DAM FILL
2019 TO 2024 PIEZOMETER PLOTS

SCALE	PROJECT No.	FIG. No.
AS SHOWN	M02341C62	II-A-103



INSET INSTRUMENT VIEW

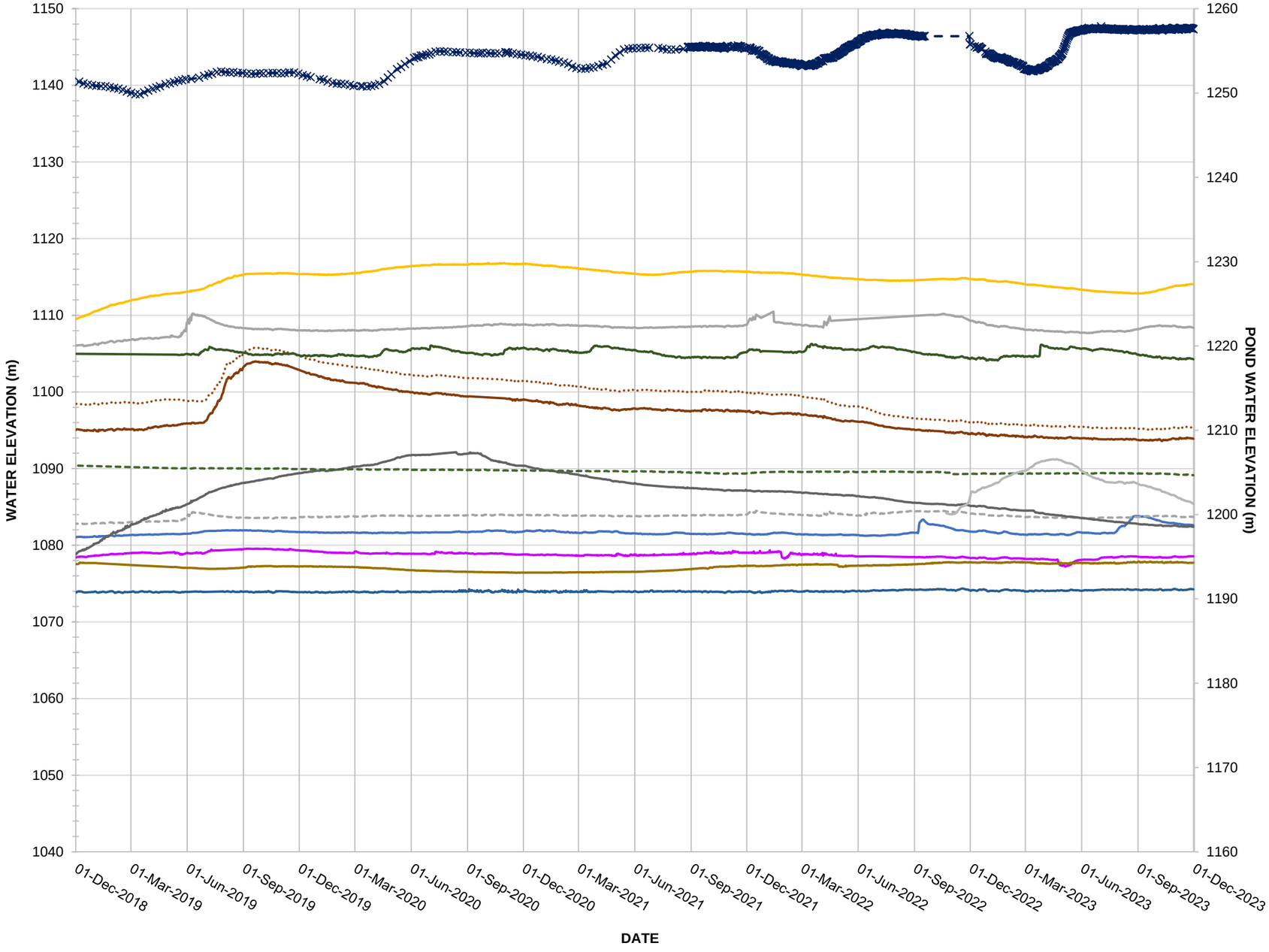


LEGEND

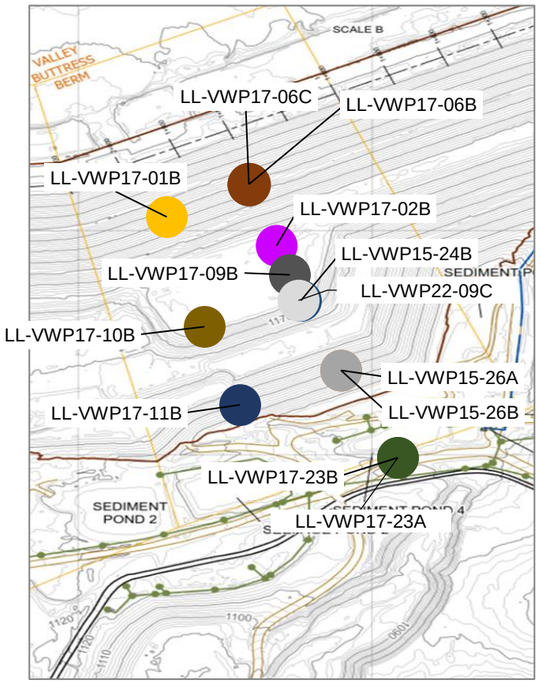
- LL-VWP17-01C (Lacustrine)
- LL-VWP17-06D (Lacustrine)
- LL-VWP17-20B (Lacustrine)
- L-L TAILINGS POND

NOTES

CLIENT: Highland Valley Copper / Teck	PROJECT: HIGHLAND TAILINGS STORAGE FACILITY 2023 ANNUAL FACILITY PERFORMANCE REPORT		
Klohn Crippen Berger	TITLE: L-L DAM VALLEY BUTTRESS BERM LACUSTRINE 2019 TO 2024 PIEZOMETER PLOTS		
	SCALE: AS SHOWN	PROJECT No.: M02341C62	FIG. No.: II-A-104



INSET INSTRUMENT VIEW



LEGEND

- LL-VWP15-24B (Lower Glaciolacustrine)
- LL-VWP15-26A (Lower Glaciolacustrine)
- LL-VWP15-26B (Upper Glaciolacustrine)
- LL-VWP17-01B (Lower Glaciolacustrine)
- LL-VWP17-02B (Lower Glaciolacustrine)
- LL-VWP17-06B (Lower Glaciolacustrine)
- LL-VWP17-06C (Lower Glaciolacustrine)
- LL-VWP17-09B (Lower Glaciolacustrine)
- LL-VWP17-10B (Lower Glaciolacustrine)
- LL-VWP17-11B (Lower Glaciolacustrine)
- LL-VWP17-23A (Lower Glaciolacustrine)
- LL-VWP17-23B (Upper Glaciolacustrine)
- LL-VWP22-09C (Lower Glaciolacustrine)
- L-L TAILINGS POND

NOTES

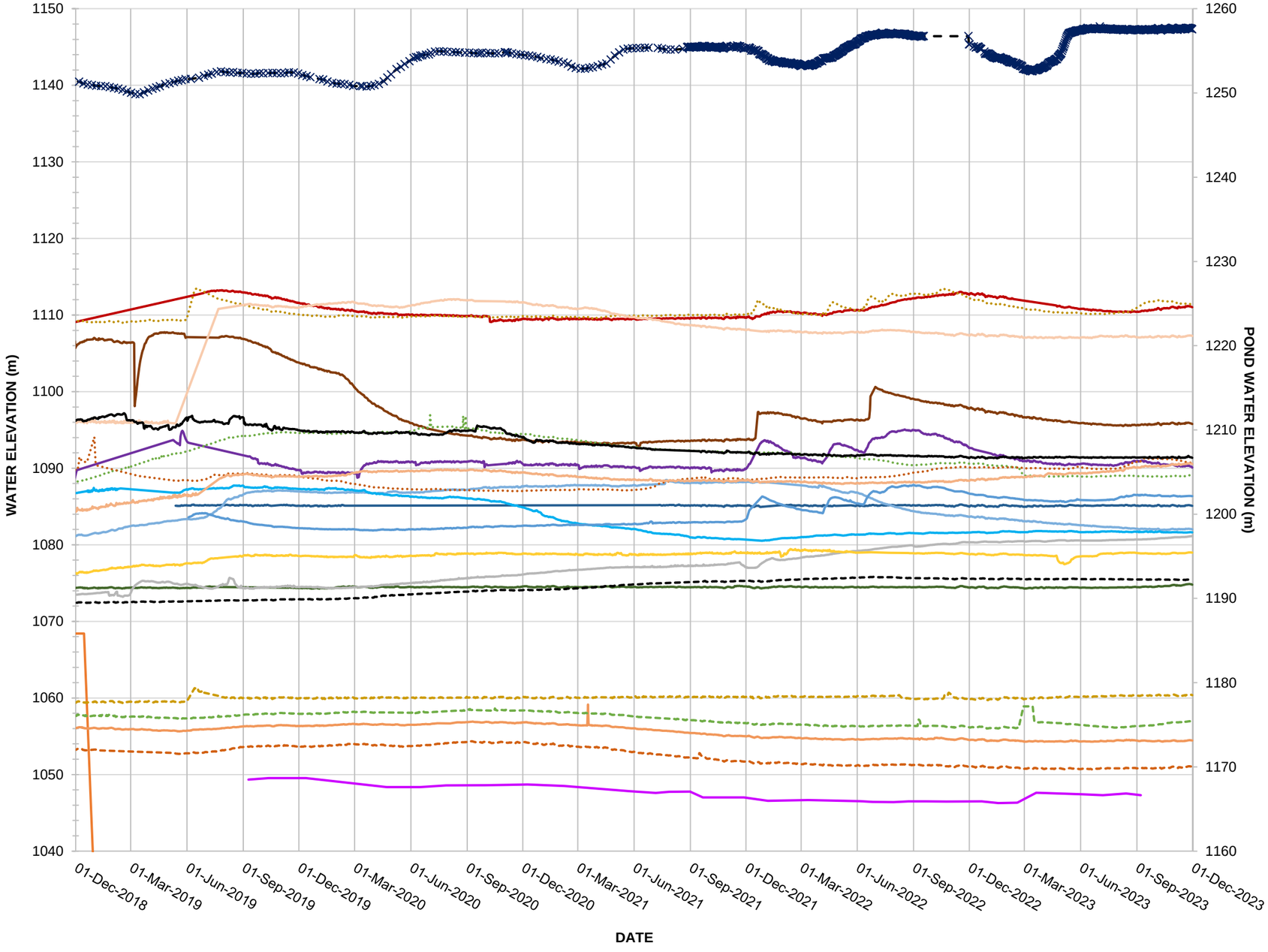
CLIENT: Highland Valley Copper / Teck

Klohn Crippen Berger

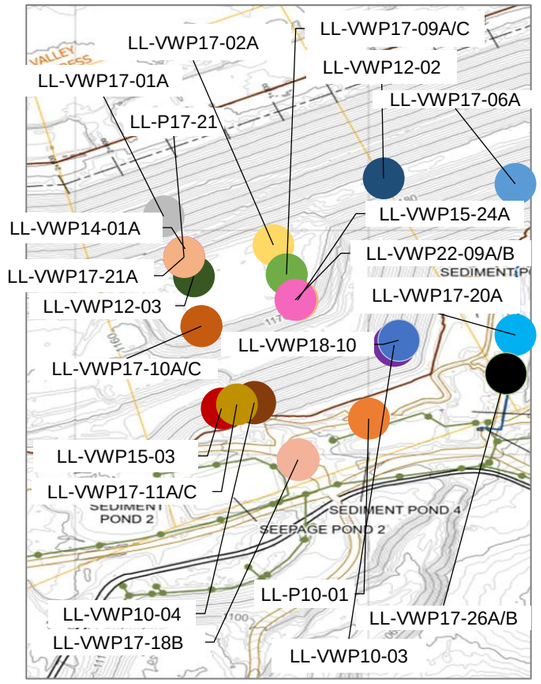
PROJECT: HIGHLAND TAILINGS STORAGE FACILITY
2023 ANNUAL FACILITY PERFORMANCE REPORT

TITLE: L-L DAM
VALLEY BUTTRESS BERM
GLACIOLACUSTRINE
2019 TO 2024 PIEZOMETER PLOTS

SCALE	PROJECT No.	FIG. No.
AS SHOWN	M02341C62	II-A-105



INSET INSTRUMENT VIEW



LEGEND

- LL-P10-01 (Lower Sand and Gravel)
- LL-P17-21 (Lower Sand and Gravel)
- LL-VWP10-03 (Glacial Till)
- LL-VWP10-04 (Glacial Till)
- LL-VWP12-02 (Glacial Till)
- LL-VWP12-03 (Lower Sand and Gravel)
- LL-VWP15-03 (Glacial Till)
- LL-VWP15-24A (Lower Till/Gravel)
- LL-VWP17-01A (Lower Sand and Gravel)
- LL-VWP17-02A (Lower Sand and Gravel)
- LL-VWP17-06A (Lower Sand and Gravel)
- LL-VWP17-09A (Lower Till/Gravel)
- LL-VWP17-09C (Glacial Till)
- LL-VWP17-10A (Deep Glaciolacustrine)
- LL-VWP17-10C (Glacial Till)
- LL-VWP17-11A (Lower Sand and Gravel)
- LL-VWP17-11C (Glacial Till)
- LL-VWP17-18B (Glacial Till)
- LL-VWP17-20A (Glacial Till)
- LL-VWP17-21A (Lower Glaciolacustrine)
- LL-VWP17-26A (Guichon Creek Batholith)
- LL-VWP17-26B (Glacial Till)
- LL-VWP18-10 (Glacial Till)
- LL-VWP22-09A (Guichon Creek Batholith)
- LL-VWP22-09B (Lower Till/Gravel)
- L-L TAILINGS POND

NOTES

CLIENT: Highland Valley Copper / Teck

Klohn Crippen Berger

PROJECT: HIGHLAND TAILINGS STORAGE FACILITY
2023 ANNUAL FACILITY PERFORMANCE REPORT

TITLE: L-L DAM
VALLEY BUTTRESS BERM
GLACIAL TILL, SAND AND GRAVEL
2019 TO 2024 PIEZOMETER PLOTS

SCALE	PROJECT No.	FIG. No.
AS SHOWN	M02341C62	II-A-106

WATER ELEVATION (m)

POND WATER ELEVATION (m)

1160
1150
1140
1130
1120
1110
1100
1090
1080
1070
1060
1050
1040

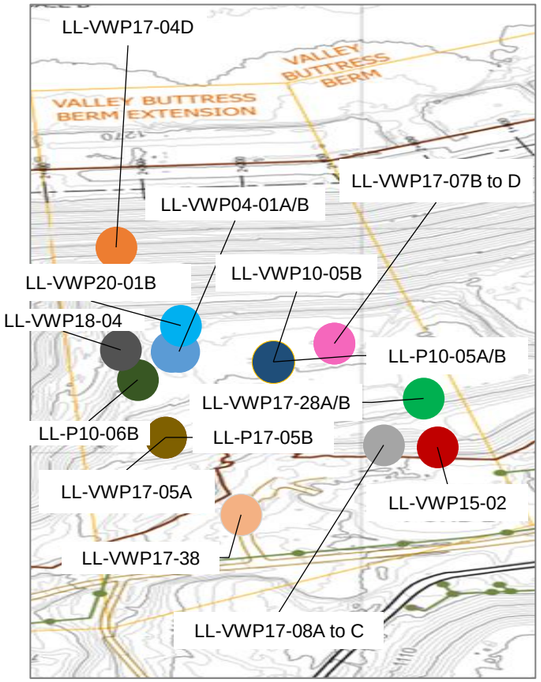
1260
1250
1240
1230
1220
1210
1200
1190
1180
1170
1160

NOTE 2

01-Dec-2018
01-Mar-2019
01-Jun-2019
01-Sep-2019
01-Dec-2019
01-Mar-2020
01-Jun-2020
01-Sep-2020
01-Dec-2020
01-Mar-2021
01-Jun-2021
01-Sep-2021
01-Dec-2021
01-Mar-2022
01-Jun-2022
01-Sep-2022
01-Dec-2022
01-Mar-2023
01-Jun-2023
01-Sep-2023
01-Dec-2023

DATE

INSET INSTRUMENT VIEW



LEGEND

- LL-P10-05A (Lower Sand and Gravel)
- LL-P10-06B (Defunct)
- LL-P17-05B (Lower Sand and Gravel)
- LL-VWP04-01A (Glacial Till)
- LL-VWP04-01B (Drainage Blanket)
- LL-VWP10-05B (Glacial Till)
- LL-VWP15-02 (Glacial Till)
- LL-VWP17-04D (Lower Sand and Gravel)
- LL-VWP17-05A (Glacial Till)
- LL-VWP17-07B (Lower Sand and Gravel)
- LL-VWP17-07C (Lower Glaciolacustrine)
- LL-VWP17-07D (Glacial Till)
- LL-VWP17-08A (Lower Till/Gravel)
- LL-VWP17-08B (Lower Sand and Gravel)
- LL-VWP17-08C (Glacial Till)
- LL-VWP17-28A (Lower Sand and Gravel)
- LL-VWP17-28B (Glacial Till)
- LL-VWP17-38 (Glacial Till)
- LL-VWP18-04 (Lower Sand and Gravel)
- LL-VWP20-01B (Glacial Till)
- L-L TAILINGS POND

NOTES

1. HVC PROVIDES DRY READINGS ELEVATIONS AS El. -8000 m.
2. LL-P17-05B WAS REPORTED DRY ON 2022-03-12, READ POSITIVE PORE PRESSURES ON 2022-11-20 AND RETURNED TO DRY STATUS AS OF 2022-12-21.

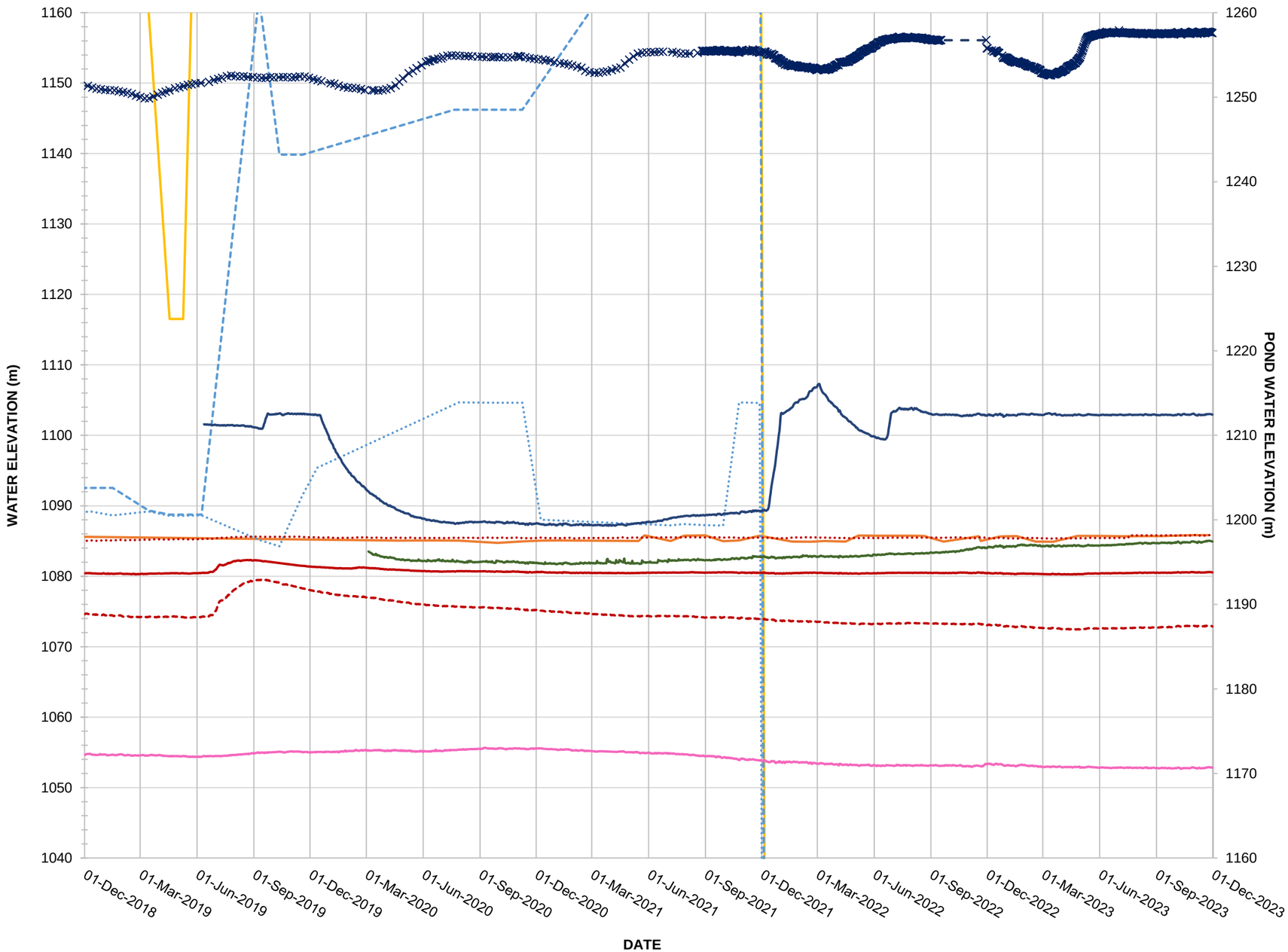
CLIENT: Highland Valley Copper / Teck

Klohn Crippen Berger

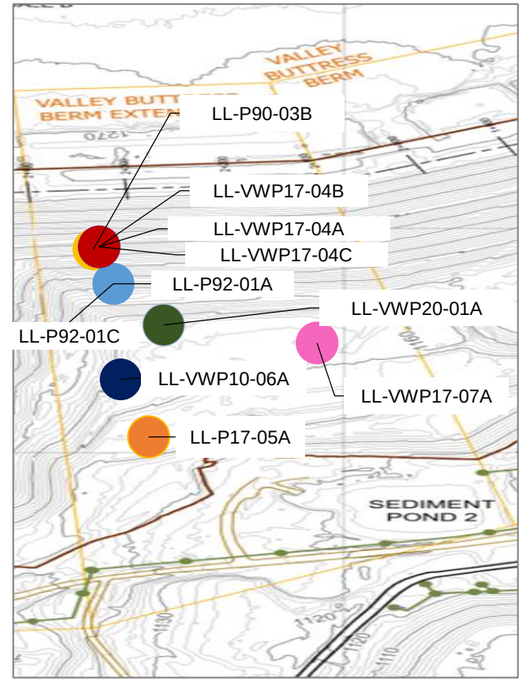
PROJECT: HIGHLAND TAILINGS STORAGE FACILITY
2023 ANNUAL FACILITY PERFORMANCE REPORT

TITLE: L-L DAM
VALLEY BUTTRESS BERM EXTENSION
OVERBURDEN AND DAM FILL
2019 TO 2024 PIEZOMETER PLOTS

SCALE	PROJECT No.	FIG. No.
AS SHOWN	M02341C62	II-A-107



INSET INSTRUMENT VIEW



LEGEND

- LL-P17-05A (Eocene Basal Sedimentary)
- LL-P90-03B (Defunct)
- LL-P92-01A (Defunct)
- LL-P92-01C (Eocene Basal Sedimentary)
- LL-VWP10-06A (Eocene Basal Sedimentary)
- LL-VWP17-04A (Eocene Basal Sedimentary)
- LL-VWP17-04B (Eocene Basal Sedimentary)
- LL-VWP17-04C (Eocene Basal Sedimentary)
- LL-VWP17-07A (Guichon Creek Batholith)
- LL-VWP20-01A (Eocene Basal Sedimentary)
- L-L TAILINGS POND

NOTES

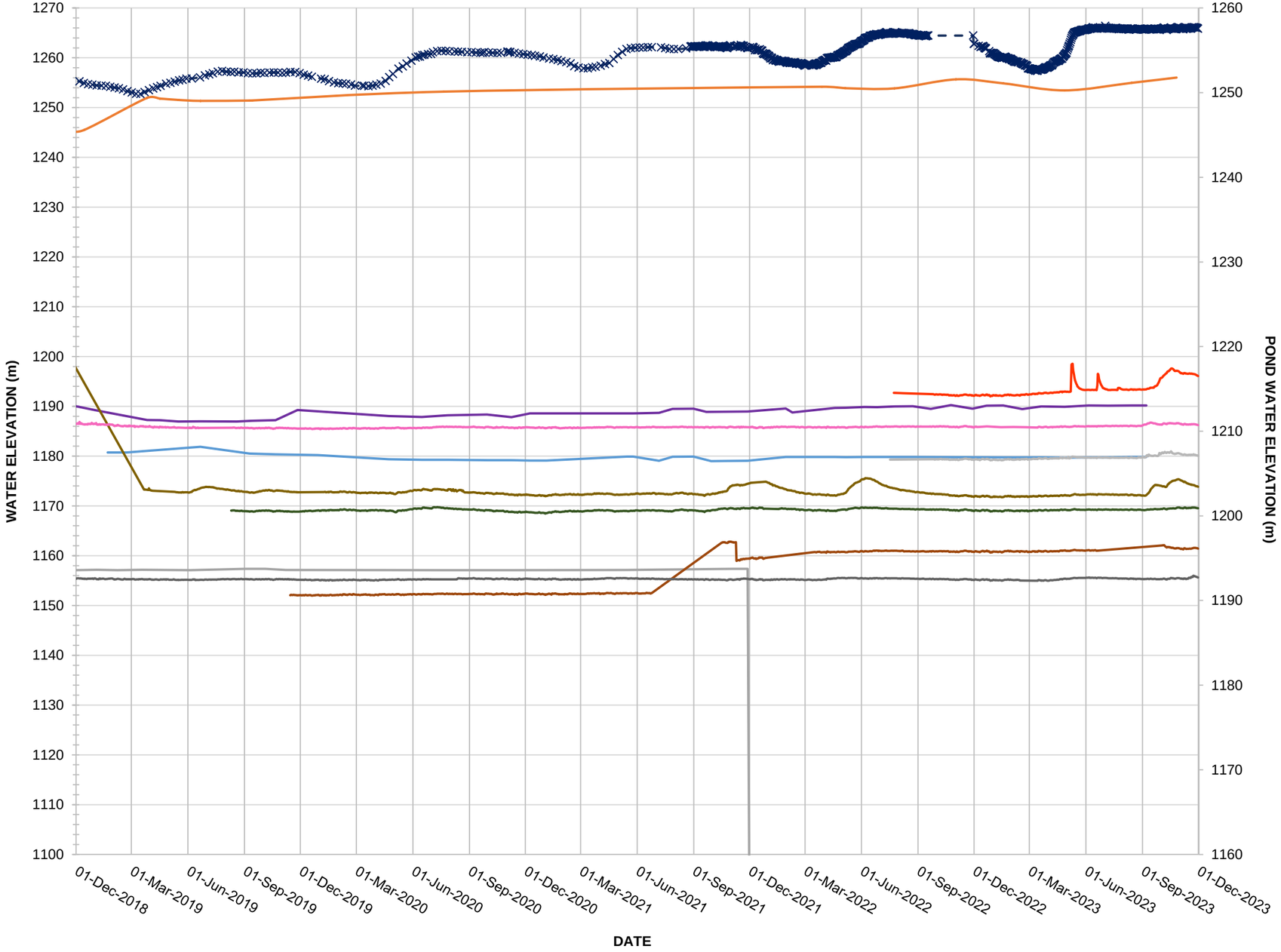
CLIENT: Highland Valley Copper / Teck

Klohn Crippen Berger

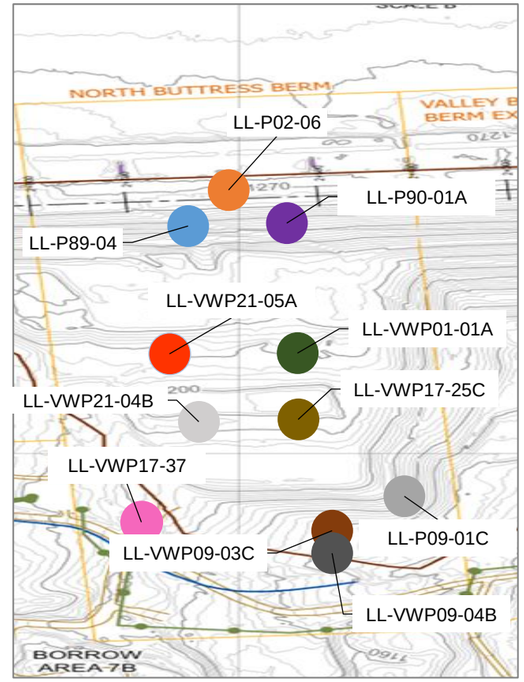
PROJECT: HIGHLAND TAILINGS STORAGE FACILITY
2023 ANNUAL FACILITY PERFORMANCE REPORT

TITLE: L-L DAM
VALLEY BUTTRESS BERM EXTENSION
FOUNDATION ROCK
2019 TO 2024 PIEZOMETER PLOTS

SCALE	PROJECT No.	FIG. No.
AS SHOWN	M02341C62	II-A-108



INSET INSTRUMENT VIEW



LEGEND

- LL-P02-06 (Cyclone Sand)
- LL-P09-01C (Defunct)
- LL-P89-04 (Cyclone Sand)
- LL-P90-01A (Glacial Till)
- LL-VWP01-01A (Glacial Till)
- LL-VWP09-03C (Lower Glaciolacustrine)
- LL-VWP09-04B (Lower Glaciolacustrine)
- LL-VWP17-25C (Glacial Till)
- LL-VWP17-37 (Glacial Till)
- LL-VWP21-04B (Drainage Blanket)
- LL-VWP21-05A (Eocene Upper Sedimentary)
- L-L TAILINGS POND

NOTES

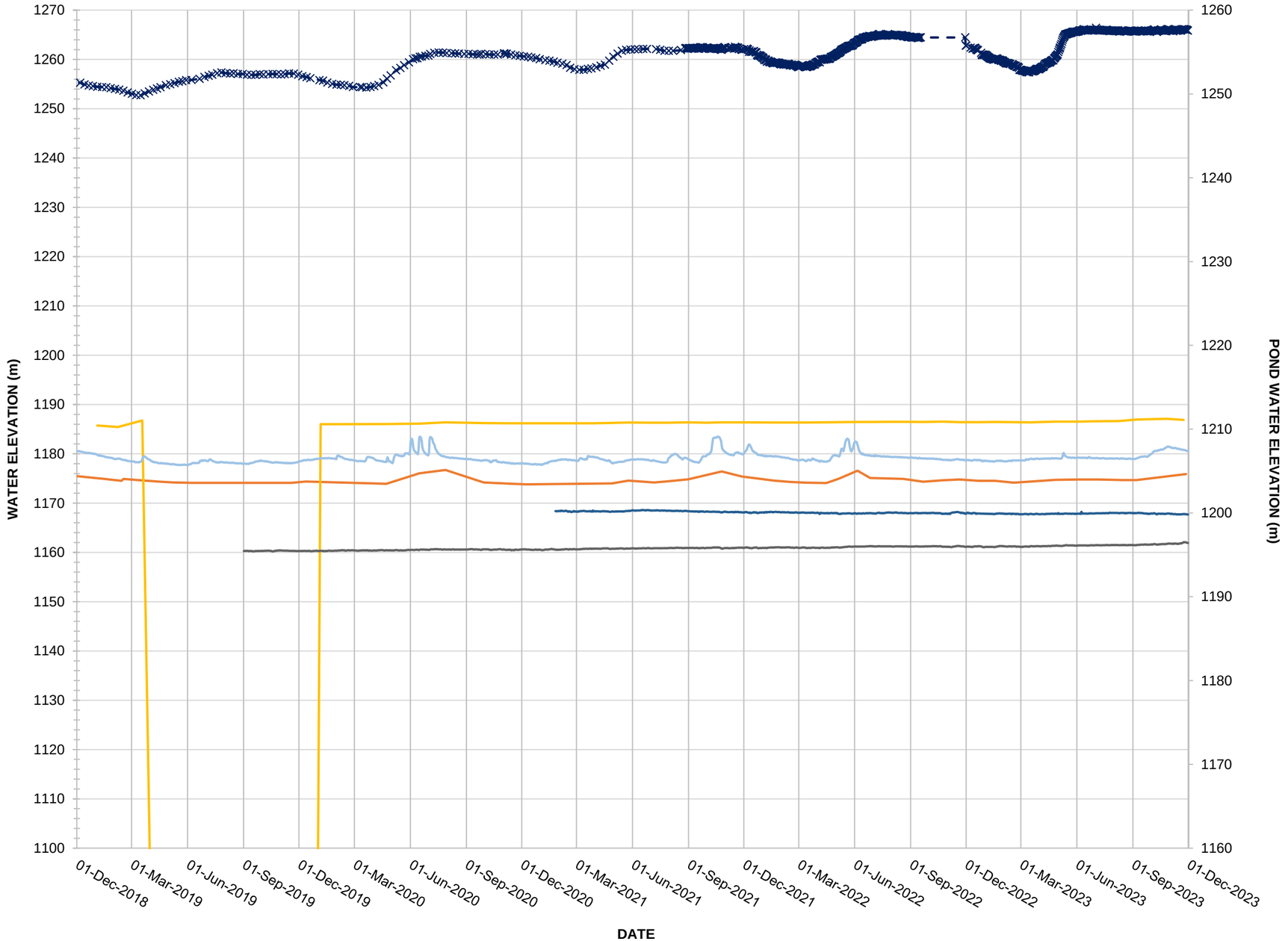
CLIENT: Highland Valley Copper / Teck

Klohn Crippen Berger

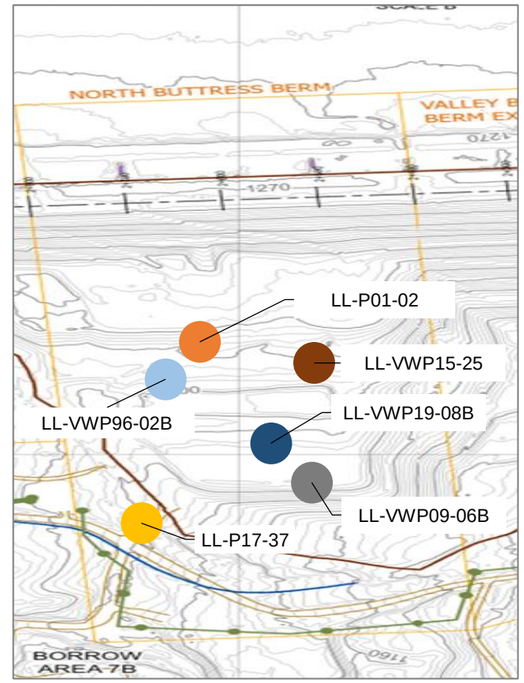
PROJECT: HIGHLAND TAILINGS STORAGE FACILITY
2023 ANNUAL FACILITY PERFORMANCE REPORT

TITLE: L-L DAM
NORTH BUTTRESS BERM
OVERBURDEN
2019 TO 2024 PIEZOMETER PLOTS

SCALE	PROJECT No.	FIG. No.
AS SHOWN	M02341C62	II-A-109



INSET INSTRUMENT VIEW



LEGEND

- LL-P01-02 (Eocene Volcanics)
- LL-P17-37 (Eocene Volcanics)
- LL-VWP09-06B (Eocene Volcanics)
- LL-VWP19-08B (Eocene Volcanics)
- LL-VWP96-02B (Eocene Volcanics)
- L-L TAILINGS POND

NOTES

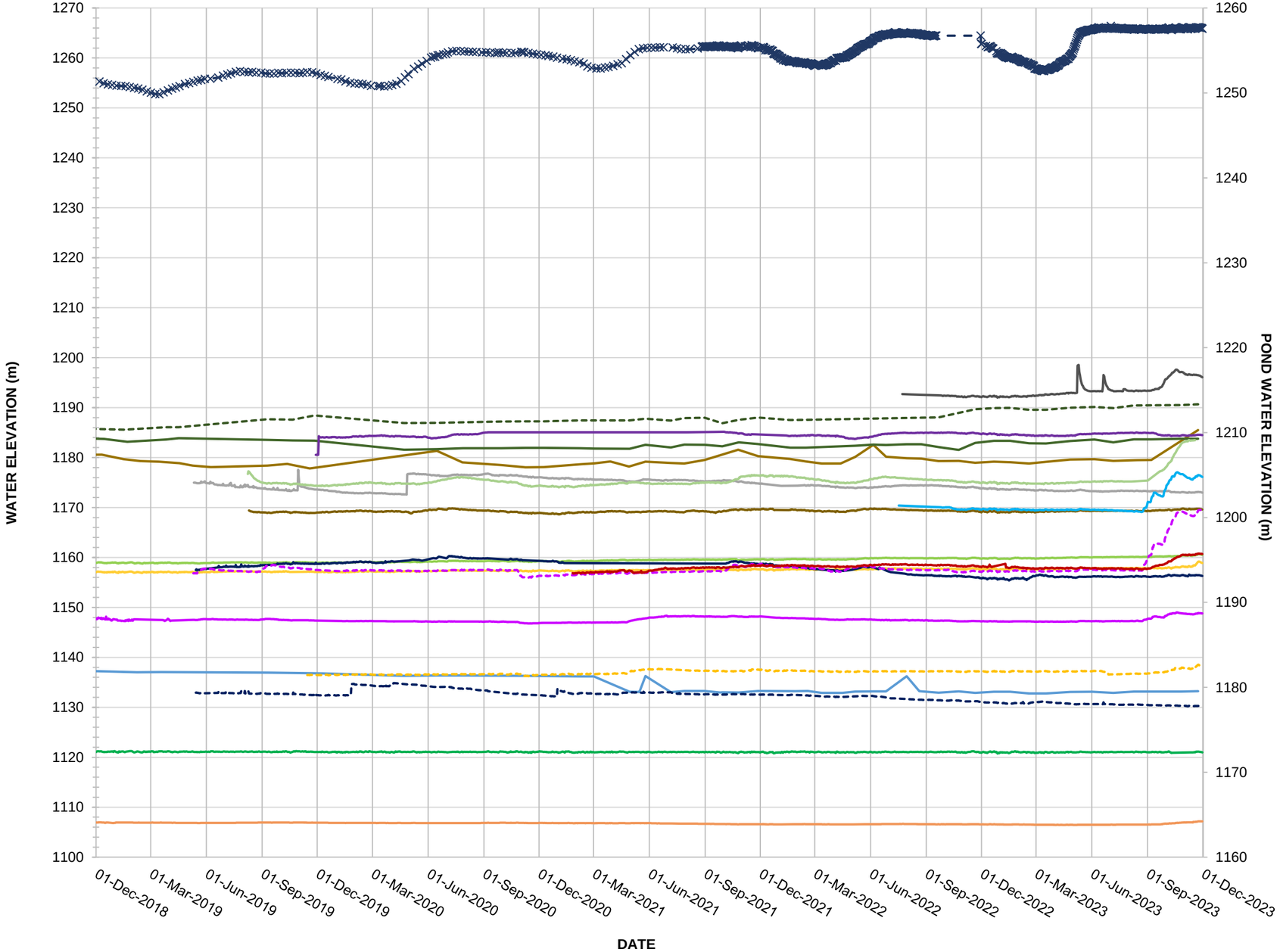
CLIENT: Highland Valley Copper / Teck

Klohn Crippen Berger

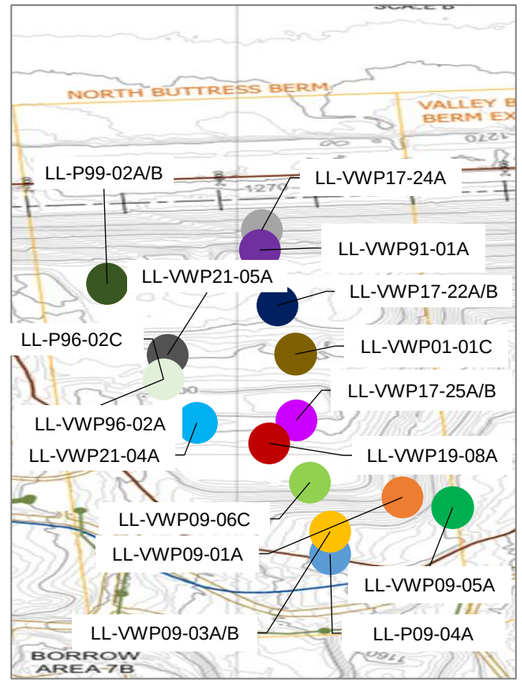
PROJECT: HIGHLAND TAILINGS STORAGE FACILITY
2023 ANNUAL FACILITY PERFORMANCE REPORT

TITLE: L-L DAM
NORTH BUTTRESS BERM
VOLCANICS
2019 TO 2024 PIEZOMETER PLOTS

SCALE	PROJECT No.	FIG. No.
AS SHOWN	M02341C62	II-A-110



INSET INSTRUMENT VIEW



LEGEND

- LL-P09-04A (Eocene Medial Sedimentary)
- LL-P96-02C (Eocene Basal Sedimentary)
- LL-P99-02A (Eocene Upper Sedimentary)
- LL-P99-02B (Eocene Upper Sedimentary)
- LL-VWP01-01C (Eocene Upper Sedimentary)
- LL-VWP09-01A (Eocene Basal Sedimentary)
- LL-VWP09-03A (Eocene Basal Sedimentary)
- LL-VWP09-03B (Eocene Upper Sedimentary)
- LL-VWP09-05A (Eocene Medial Sedimentary)
- LL-VWP09-06C (Eocene Medial Sedimentary)
- LL-VWP17-22A (Eocene Basal Sedimentary)
- LL-VWP17-22B (Eocene Basal Sedimentary)
- LL-VWP17-24A (Eocene Upper Sedimentary)
- LL-VWP17-25A (Eocene Medial Sedimentary)
- LL-VWP17-25B (Eocene Upper Sedimentary)
- LL-VWP19-08A (Eocene Medial Sedimentary)
- LL-VWP21-04A (Eocene Medial Sedimentary)
- LL-VWP21-05A (Eocene Upper Sedimentary)
- LL-VWP91-01A (Eocene Upper Sedimentary)
- LL-VWP96-02A (Eocene Upper Sedimentary)
- L-L TAILINGS POND

NOTES

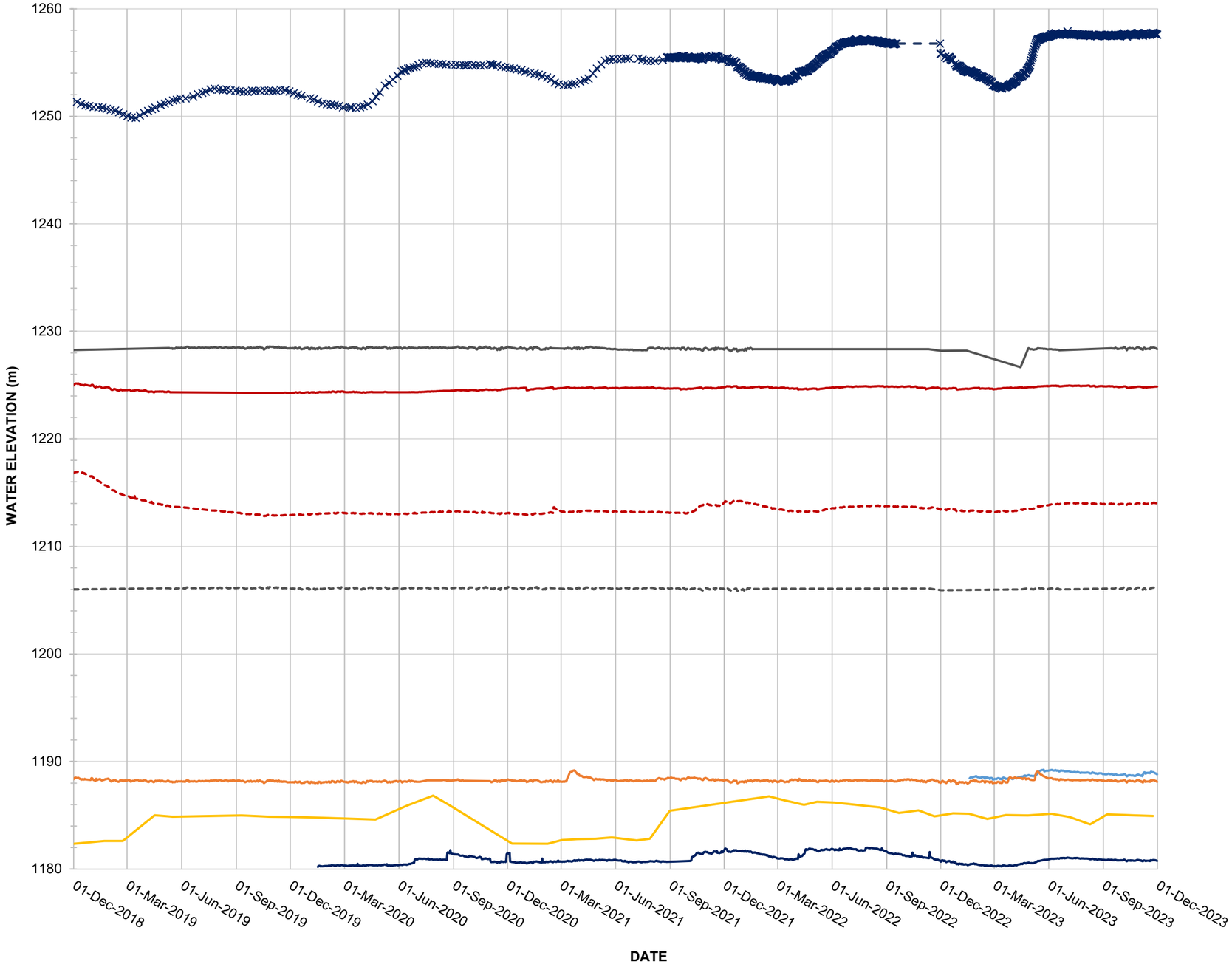
CLIENT: Highland Valley Copper / Teck

Klohn Crippen Berger

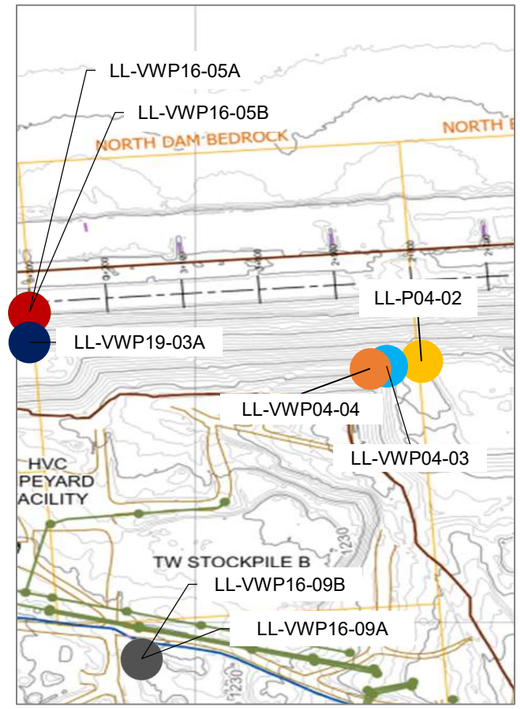
PROJECT: HIGHLAND TAILINGS STORAGE FACILITY
2023 ANNUAL FACILITY PERFORMANCE REPORT

TITLE: L-L DAM
NORTH BUTTRESS BERM
SEDIMENTARY
2019 TO 2024 PIEZOMETER PLOTS

SCALE	PROJECT No.	FIG. No.
AS SHOWN	M02341C62	II-A-111



INSET INSTRUMENT VIEW



LEGEND

- LL-P04-02 (Glacial Till)
- LL-VWP04-03 (Glacial Till)
- LL-VWP04-04 (Glacial Till)
- LL-VWP16-05A (Glacial Till)
- LL-VWP16-05B (Upper Glaciolacustrine)
- LL-VWP16-09A (Glacial Till)
- LL-VWP16-09B (Glacial Till)
- LL-VWP19-03A (Glacial Till)
- L-L TAILINGS POND

NOTES

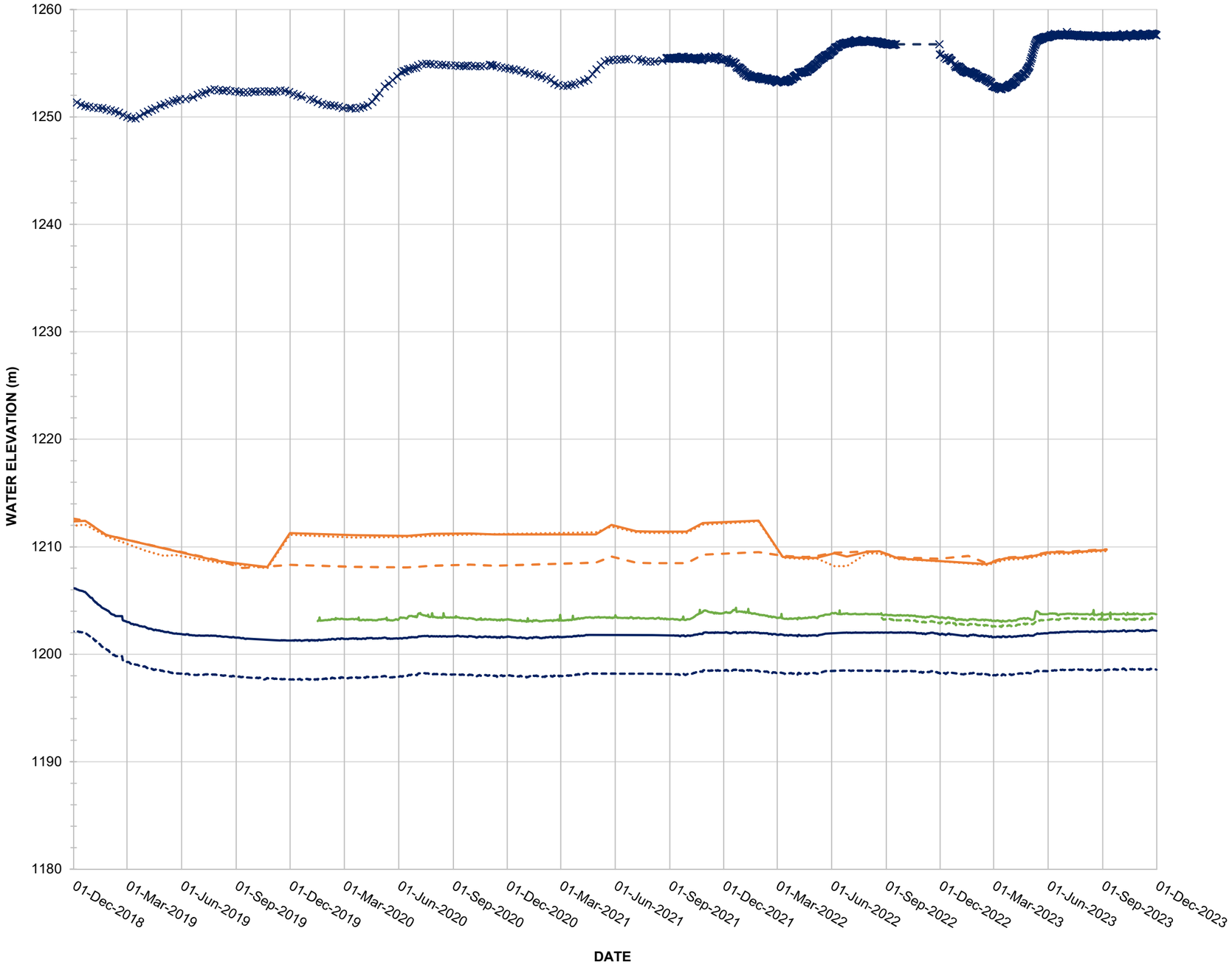
CLIENT: Highland Valley Copper / Teck

Klohn Crippen Berger

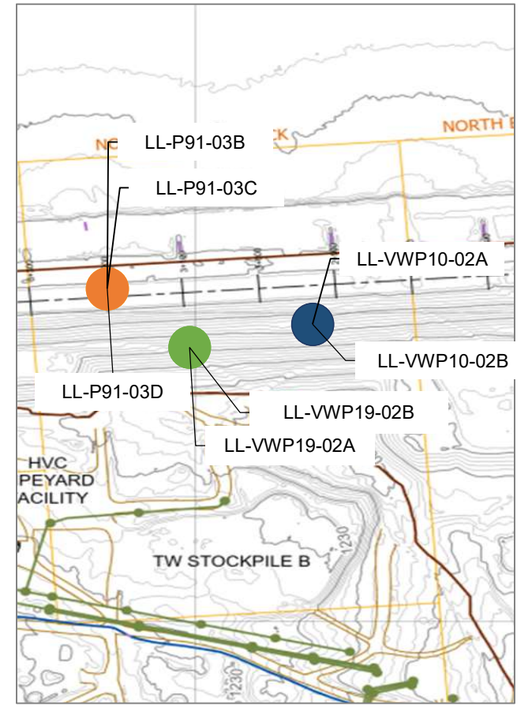
PROJECT: HIGHLAND TAILINGS STORAGE FACILITY
2023 ANNUAL FACILITY PERFORMANCE REPORT

TITLE: L-L DAM
NORTH DAM BEDROCK
GLACIAL TILL, SAND, AND UPPER GLU
2019 TO 2024 PIEZOMETER PLOTS

SCALE	PROJECT No.	FIG. No.
AS SHOWN	M02341C62	II-A-112



INSET INSTRUMENT VIEW



LEGEND

- LL-P91-03B (Eocene Volcanics)
- LL-P91-03C (Eocene Volcanics)
- LL-P91-03D (Eocene Volcanics)
- LL-VWP10-02A (Eocene Volcanics)
- LL-VWP10-02B (Eocene Volcanics)
- LL-VWP19-02A (Eocene Volcanics)
- LL-VWP19-02B (Eocene Volcanics)
- L-L TAILINGS POND

NOTES

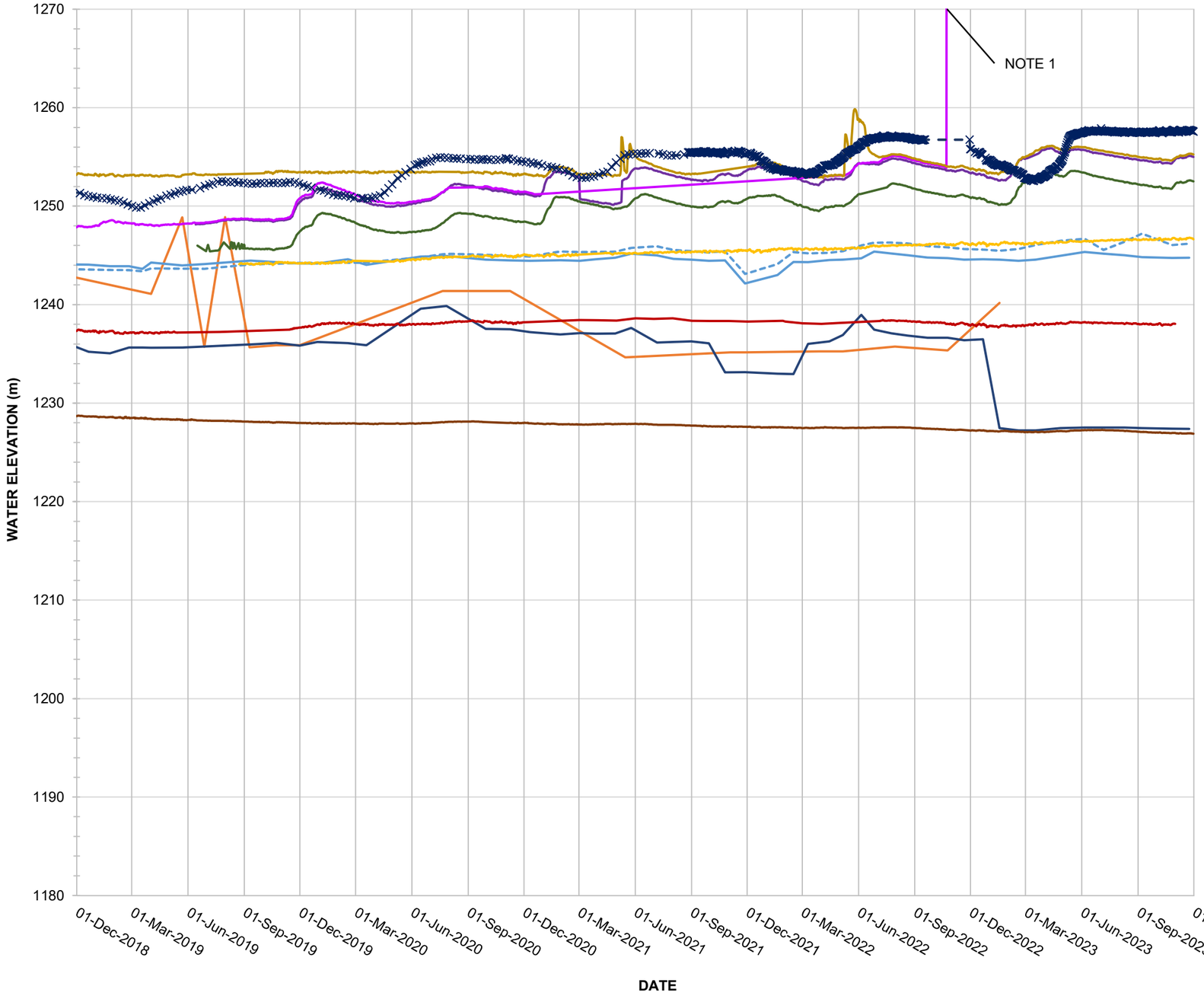
CLIENT: Highland Valley Copper / Teck

Klohn Crippen Berger

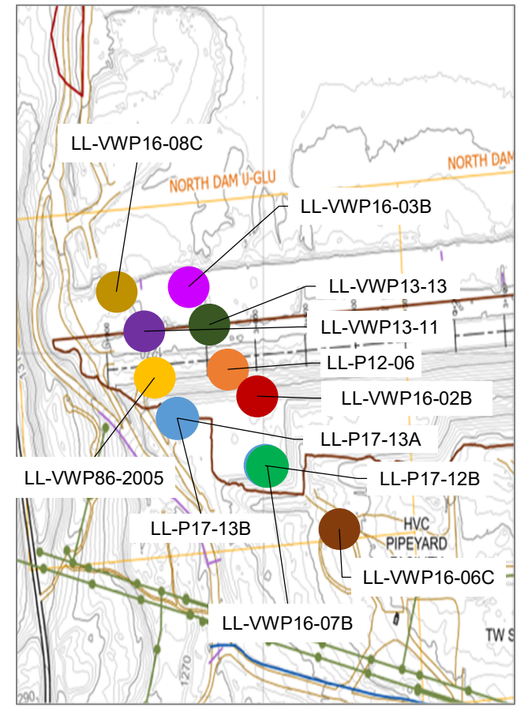
PROJECT: HIGHLAND TAILINGS STORAGE FACILITY
2023 ANNUAL FACILITY PERFORMANCE REPORT

TITLE: L-L DAM
NORTH DAM BEDROCK
VOLCANICS
2019 TO 2024 PIEZOMETER PLOTS

SCALE	PROJECT No.	FIG. No.
AS SHOWN	M02341C62	II-A-113



INSET INSTRUMENT VIEW



LEGEND

- LL-P12-06 (Defunct)
- LL-P17-12B (Upper Sand and Gravel)
- LL-P17-13A (Upper Sand and Gravel)
- LL-P17-13B (Upper Sand and Gravel)
- LL-VWP13-11 (Upper Sand and Gravel)
- LL-VWP13-13 (Upper Sand and Gravel)
- LL-VWP16-02B (Upper Sand and Gravel)
- LL-VWP16-03B (Defunct)
- LL-VWP16-06C (Upper Sand and Gravel)
- LL-VWP16-08C (Upper Sand and Gravel)
- LL-VWP86-2005 (Upper Sand and Gravel)
- L-L TAILINGS POND

NOTES

1. LL-VWP16-03B REPORTED A 219.5 m JUMP IN PORE WATER PRESSURES ON 2022-10-24. FOLLOWING THIS JUMP, THE WATER LEVELS DID NOT DISSIPATE AND SURROUNDING INSTRUMENTS IN SIMILAR GEOLOGICAL UNITS DID NOT EXHIBIT THE SAME BEHAVIOR. THE INSTRUMENT WAS MARKED AS DEFUNCT ON 2022-10-11.

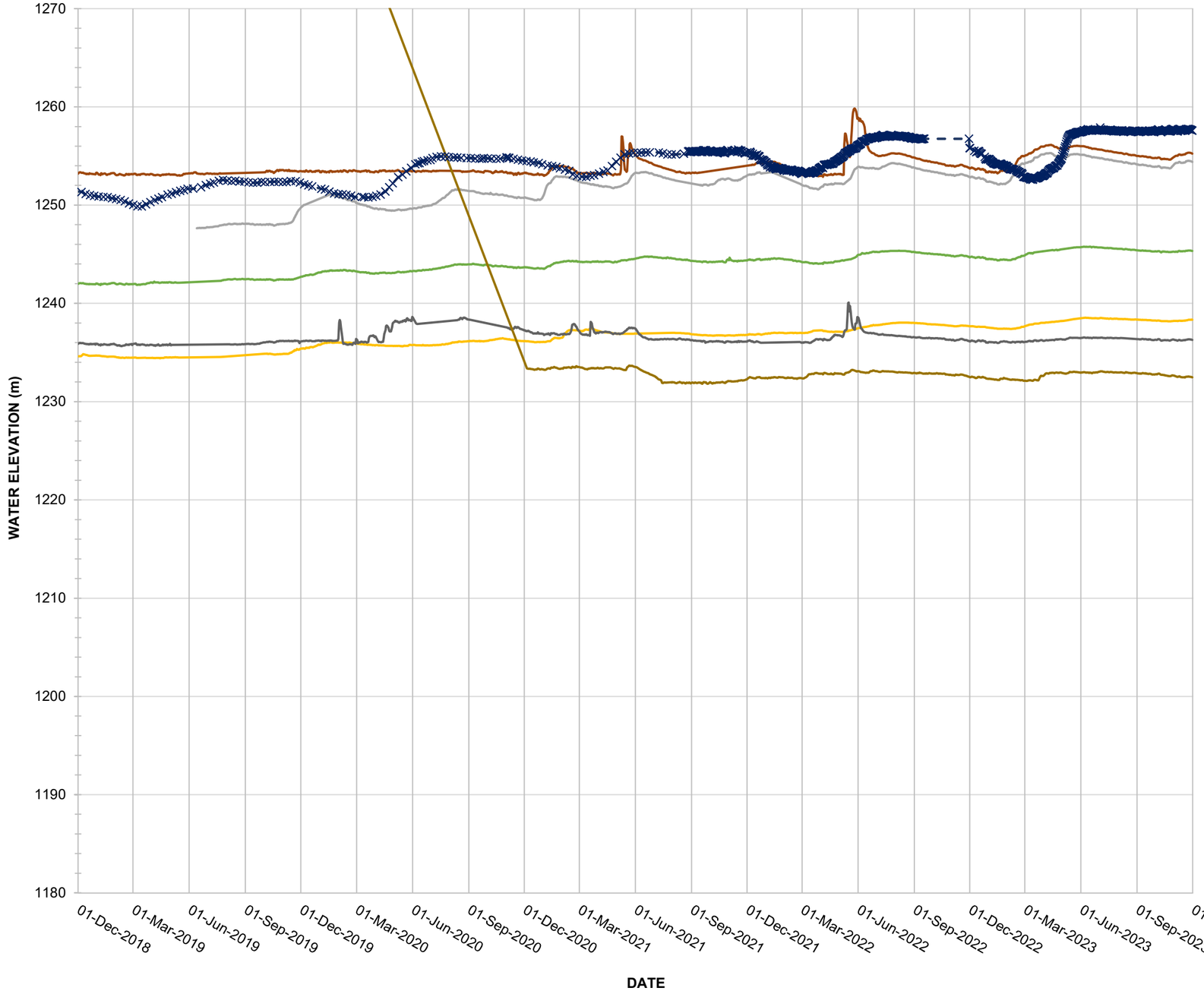
CLIENT: Highland Valley Copper / Teck

Klohn Crippen Berger

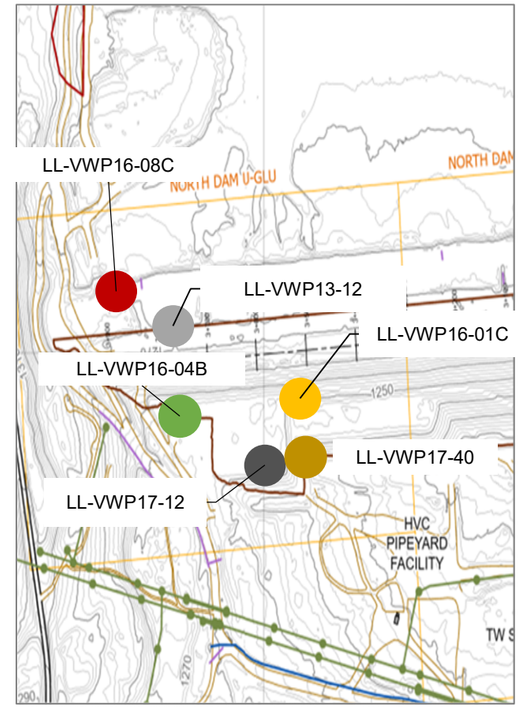
PROJECT: HIGHLAND TAILINGS STORAGE FACILITY
2023 ANNUAL FACILITY PERFORMANCE REPORT

TITLE: L-L DAM
NORTH DAM UPPER GLACIOLACUSTRINE
SAND AND GRAVEL
2019 TO 2024 PIEZOMETER PLOTS

SCALE	PROJECT No.	FIG. No.
AS SHOWN	M02341C62	II-A-114



INSET INSTRUMENT VIEW



LEGEND

- LL-VWP13-12 (Upper Glaciolacustrine)
- LL-VWP16-01C (Upper Glaciolacustrine)
- LL-VWP16-04B (Upper Glaciolacustrine)
- LL-VWP16-08C (Upper Sand and Gravel)
- LL-VWP17-12 (Upper Glaciolacustrine)
- LL-VWP17-40 (Upper Glaciolacustrine)
- L-L TAILINGS POND

NOTES

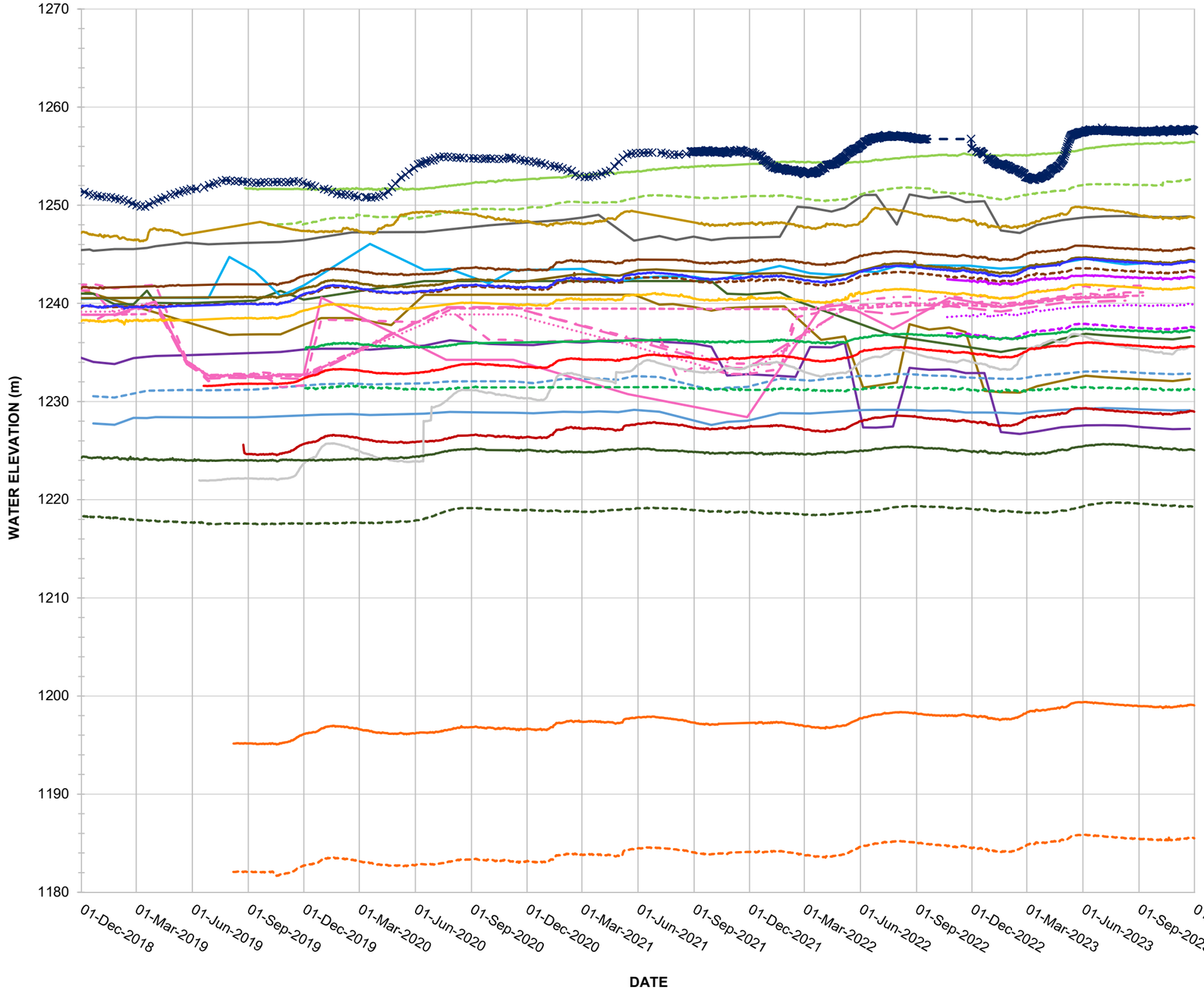
CLIENT: Highland Valley Copper / Teck

Klohn Crippen Berger

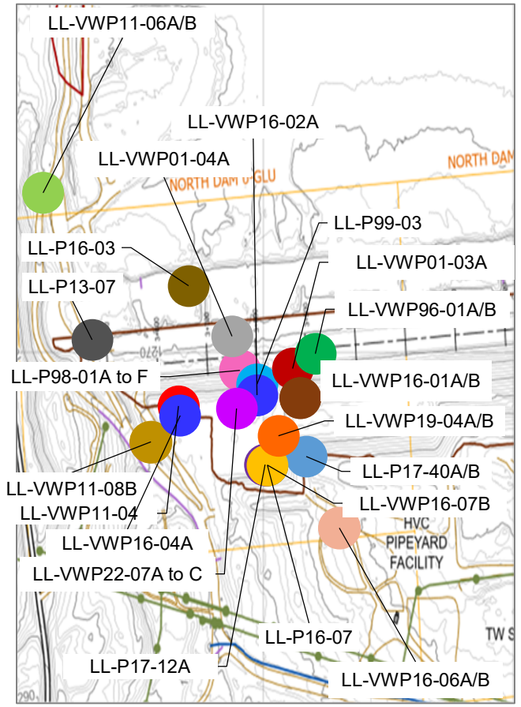
PROJECT: HIGHLAND TAILINGS STORAGE FACILITY
2023 ANNUAL FACILITY PERFORMANCE REPORT

TITLE: L-L DAM
NORTH DAM UPPER GLACIOLACUSTRINE
GLACIOLACUSTRINE
2019 TO 2024 PIEZOMETER PLOTS

SCALE	PROJECT No.	FIG. No.
AS SHOWN	M02341C62	II-A-115



INSET INSTRUMENT VIEW



LEGEND

- LL-P13-07 (Glacial Till)
- LL-P16-03 (Glacial Till)
- LL-P16-07 (Glacial Till)
- LL-P17-12A (Glacial Till)
- LL-P17-40A (Glacial Till)
- LL-P17-40B (Glacial Till)
- LL-P98-01A (Glacial Till)
- LL-P98-01B (Glacial Till)
- LL-P98-01C (Glacial Till)
- LL-P98-01D (Glacial Till)
- LL-P98-01E (Glacial Till)
- LL-P98-01F (Glacial Till)
- LL-P99-03 (Glacial Till)
- LL-VWP01-03A (Glacial Till)
- LL-VWP01-04A (Glacial Till)
- LL-VWP11-04 (Glacial Till)
- LL-VWP11-06A (Glacial Till)
- LL-VWP11-06B (Glacial Till)
- LL-VWP11-08B (Glacial Till)
- LL-VWP16-01A (Glacial Till)
- LL-VWP16-01B (Glacial Till)
- LL-VWP16-02A (Glacial Till)
- LL-VWP16-04A (Glacial Till)
- LL-VWP16-06A (Glacial Till)
- LL-VWP16-06B (Glacial Till)
- LL-VWP16-07B (Glacial Till)
- LL-VWP19-04A (Glacial Till)
- LL-VWP19-04B (Glacial Till)
- LL-VWP22-07A (Glacial Till)
- LL-VWP22-07B (Glacial Till)
- LL-VWP22-07C (Glacial Till)
- LL-VWP96-01A (Glacial Till)
- LL-VWP96-01B (Glacial Till)
- L-L TAILINGS POND

NOTES

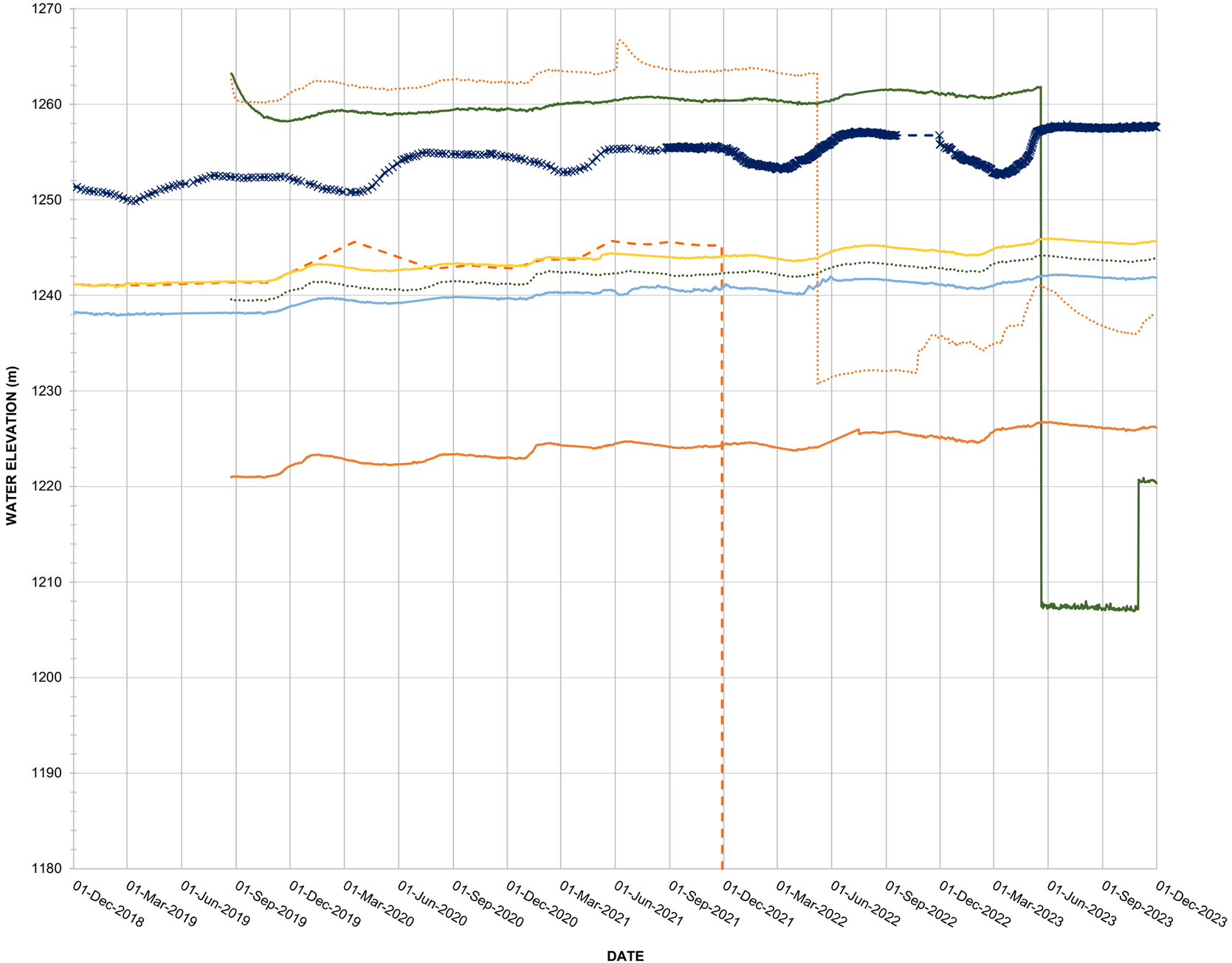
CLIENT: Highland Valley Copper / Teck

Klohn Crippen Berger

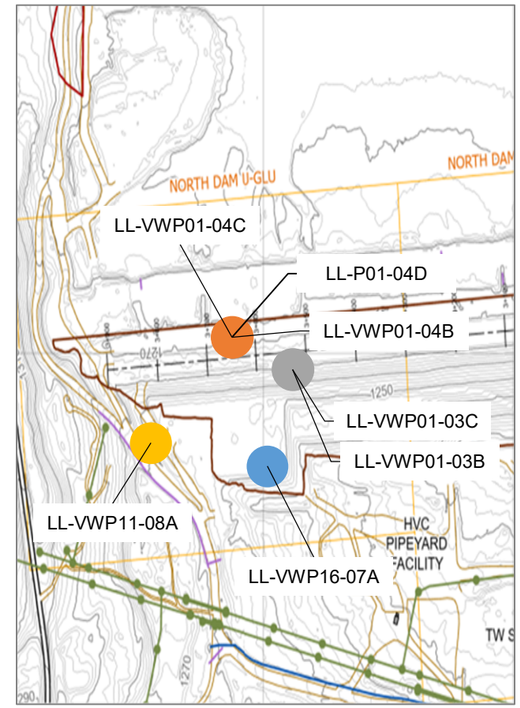
PROJECT: HIGHLAND TAILINGS STORAGE FACILITY
2023 ANNUAL FACILITY PERFORMANCE REPORT

TITLE: L-L DAM
NORTH DAM UPPER GLACIOLACUSTRINE
GLACIAL TILL
2019 TO 2024 PIEZOMETER PLOTS

SCALE	PROJECT No.	FIG. No.
AS SHOWN	M02341C62	II-A-116



INSET INSTRUMENT VIEW



LEGEND

- LL-P01-04D (Defunct)
- LL-VWP01-03B (Eocene Basal Sedimentary)
- LL-VWP01-03C (Eocene Basal Sedimentary)
- LL-VWP01-04B (Eocene Basal Sedimentary)
- LL-VWP01-04C (Eocene Basal Sedimentary)
- LL-VWP11-08A (Guichon Creek Batholith)
- LL-VWP16-07A (Eocene Basal Sedimentary)
- L-L TAILINGS POND

NOTES

CLIENT: Highland Valley Copper / Teck

Klohn Crippen Berger

PROJECT: HIGHLAND TAILINGS STORAGE FACILITY
2023 ANNUAL FACILITY PERFORMANCE REPORT

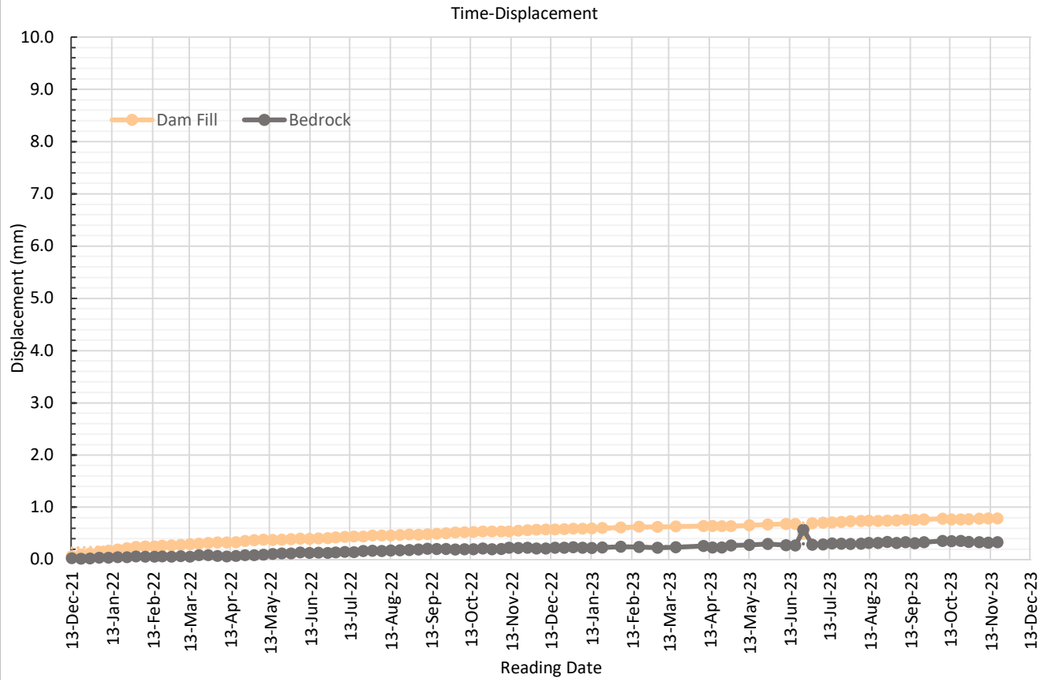
TITLE: L-L DAM
NORTH DAM UPPER GLACIOLACUSTRINE
FOUNDATION ROCK
2019 TO 2024 PIEZOMETER PLOTS

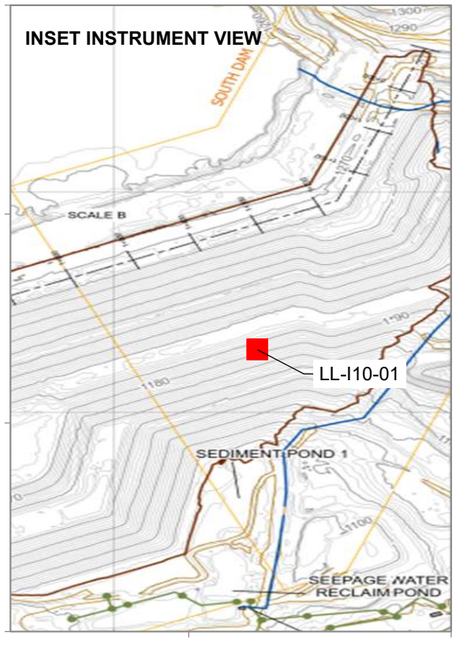
SCALE	PROJECT No.	FIG. No.
AS SHOWN	M02341C62	II-A-117

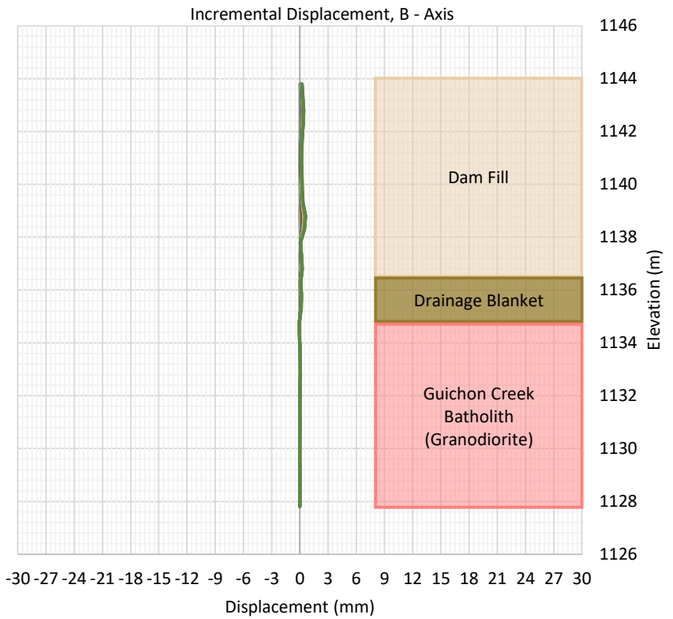
APPENDIX II-B

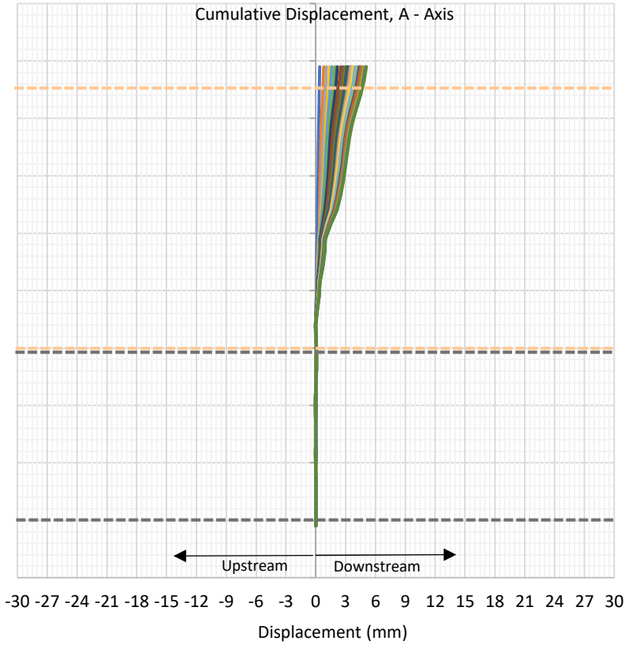
L-L Dam Inclinometer Plots

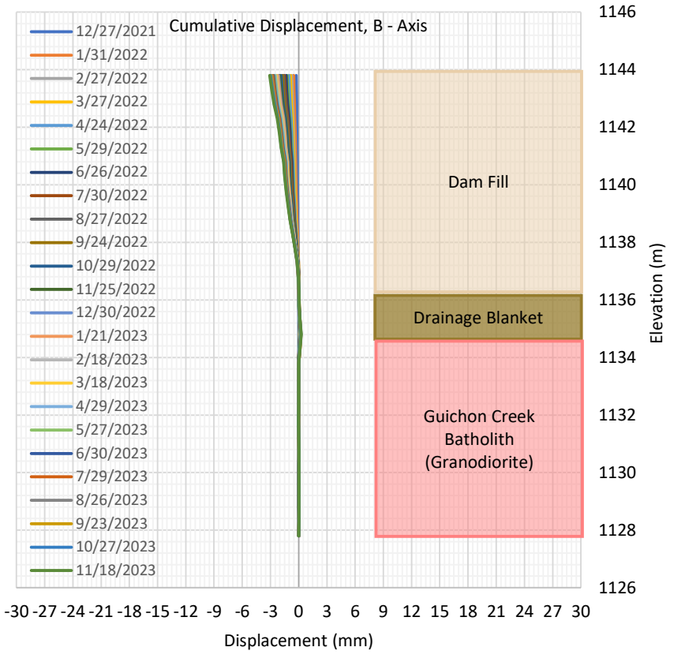
South Dam











NOTES

1. DATA PROCESSED AND PROVIDED BY HVC
2. LAST READING OF EACH MONTH PLOTTED ON THE INCREMENTAL AND CUMULATIVE PROFILES.
3. X-AXIS, Y-AXIS, AND LEGEND IS THE SAME FOR THE INCREMENTAL AND CUMULATIVE PROFILES.
4. INCREMENTAL DISPLACEMENT PROFILES ARE BASED ON READINGS WITHIN ONE WEEK OF THE CUMULATIVE PROFILES.

Geological Unit	EL. Range (m)	NL(mm/month)	T1 (mm/month)	T2 (mm/month)	Colour Code
Dam Fill	1143.0-1134.0	2.0	N/A	N/A	
Bedrock	1134.0-1128.0	2.0	N/A	N/A	

Station	Baseline Reading	Instrument Type
1+480	2021-12-13	SAAV

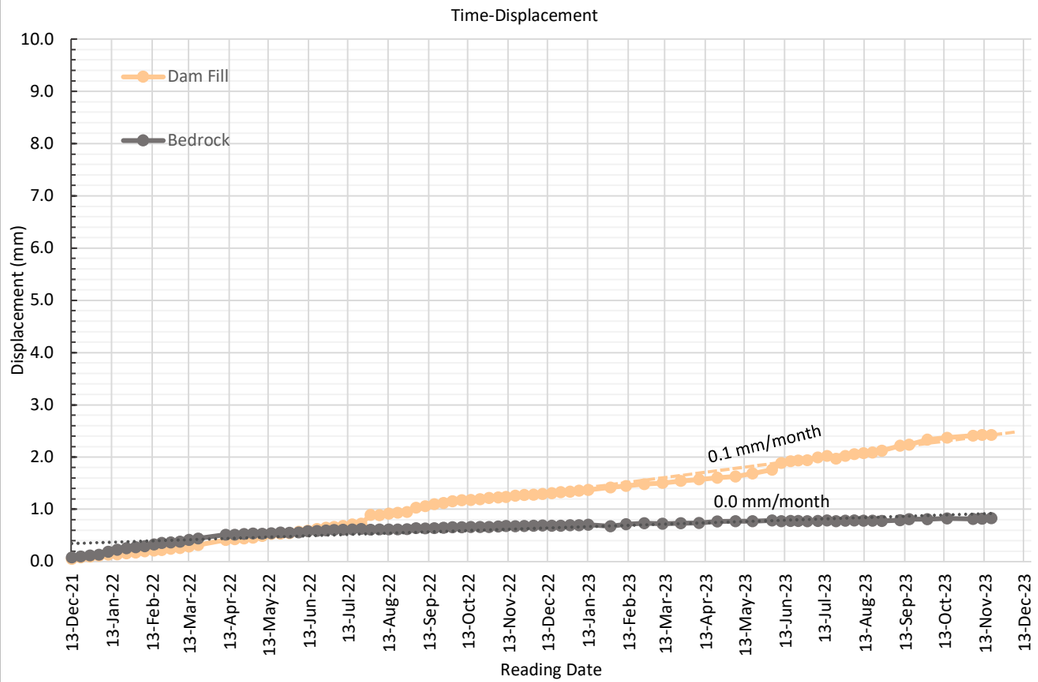
CLIENT
Highland Valley Copper / Teck

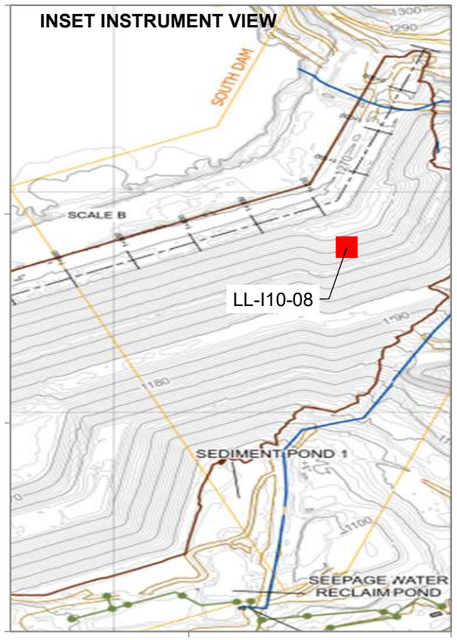
Klohn Crippen Berger

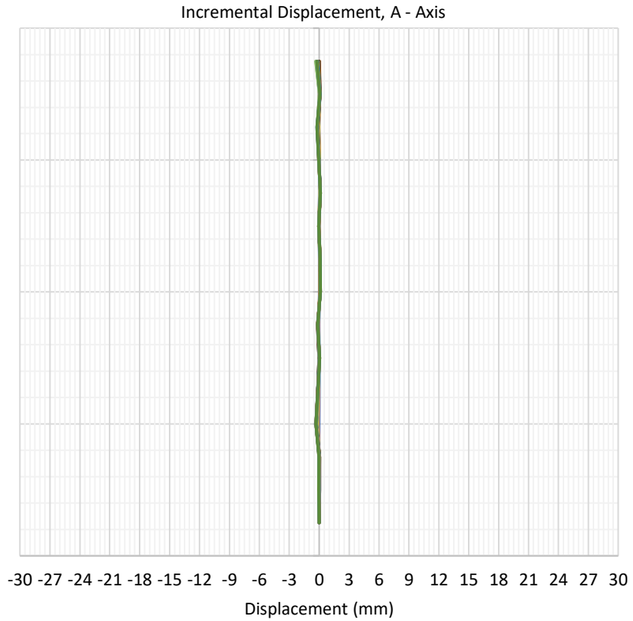
PROJECT
HIGHLAND TAILINGS STORAGE FACILITY
2023 ANNUAL FACILITY PERFORMANCE REPORT

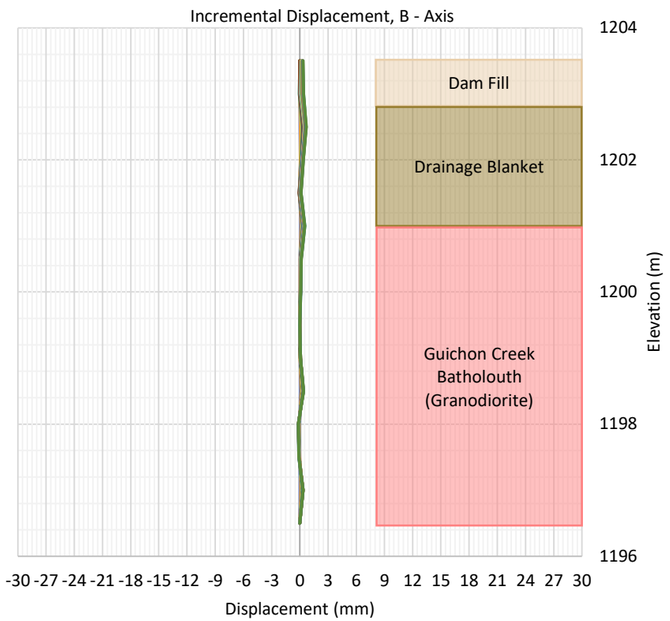
TITLE
LL DAM INCLINOMETER PLOTS
LL-I10-01(SOUTH DAM)
DEC. 2021 TO NOV. 2023

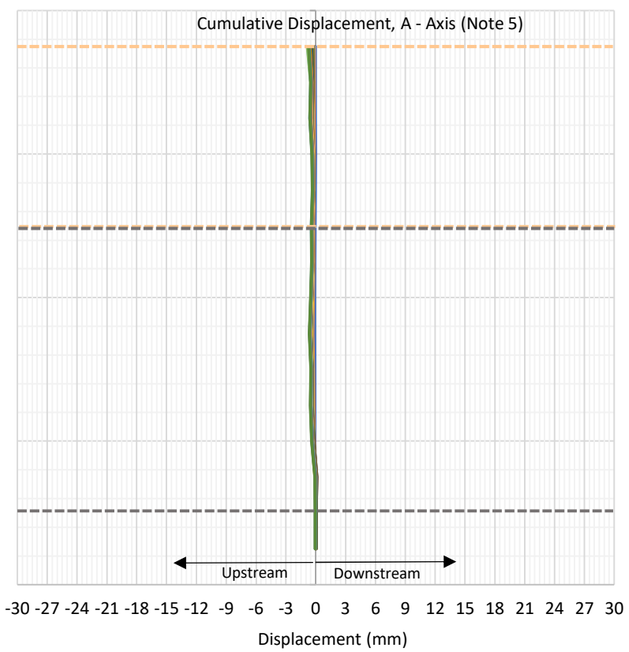
SCALE	PROJECT No.	FIG. No.
NTS	M02341C62	II-B-1

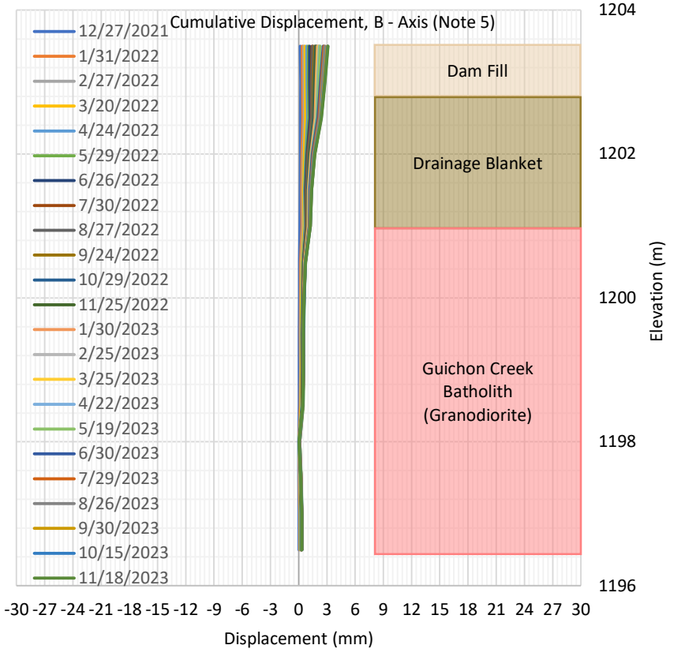












NOTES

1. DATA PROCESSED AND PROVIDED BY HVC
2. LAST READING OF EACH MONTH PLOTTED ON THE INCREMENTAL AND CUMULATIVE PROFILES.
3. X-AXIS, Y-AXIS, AND LEGEND IS THE SAME FOR THE INCREMENTAL AND CUMULATIVE PROFILES.
4. INCREMENTAL DISPLACEMENT PROFILES ARE BASED ON READINGS WITHIN ONE WEEK OF THE CUMULATIVE PROFILES.
5. AZIMUTH CORRECTIONS HAVE NOT BEEN APPLIED TO THIS INSTRUMENT.

Geological Unit	EL. Range (m)	NL(mm/month)	T1 (mm/month)	T2 (mm/month)	Colour Code
Dam Fill	1203.5-1201.0	1.0	N/A	N/A	
Bedrock	1201.0-1197.0	1.5	N/A	N/A	

Station	Baseline Reading	Instrument Type
1+200	2021-12-13	SAAV

CLIENT
Highland Valley Copper / Teck

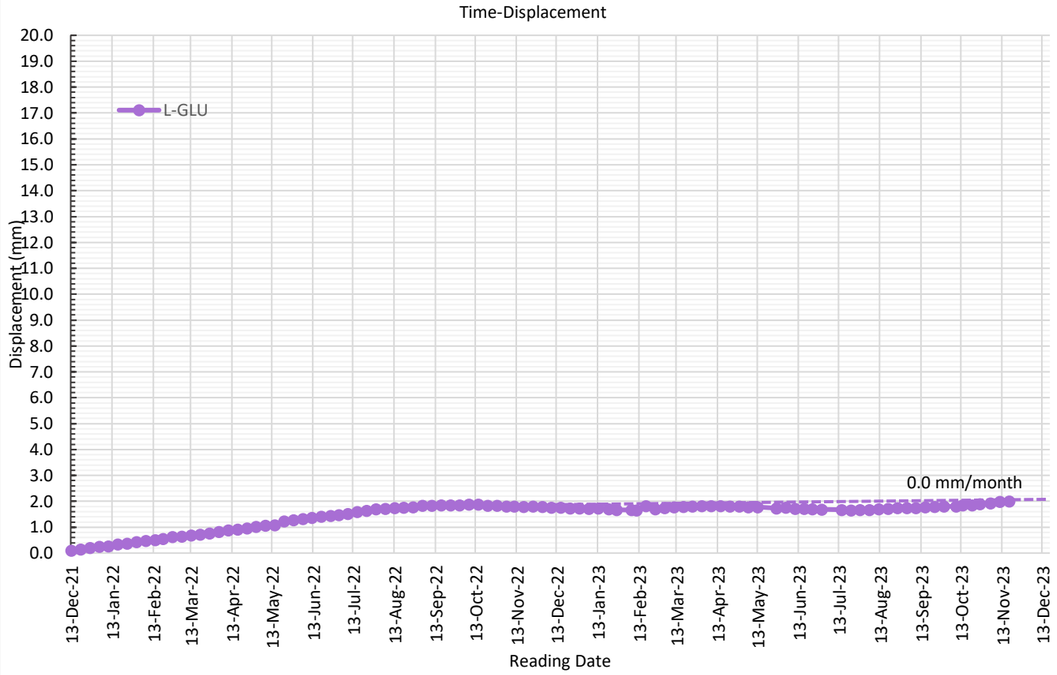
Klohn Crippen Berger

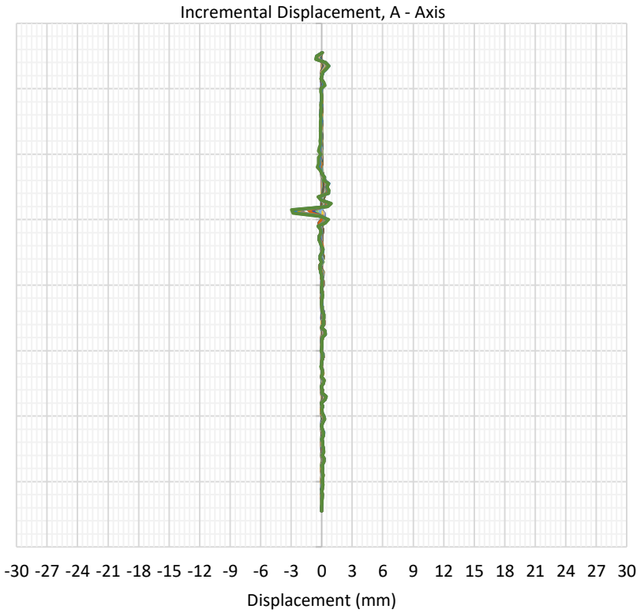
PROJECT
HIGHLAND TAILINGS STORAGE FACILITY
2023 ANNUAL FACILITY PERFORMANCE REPORT

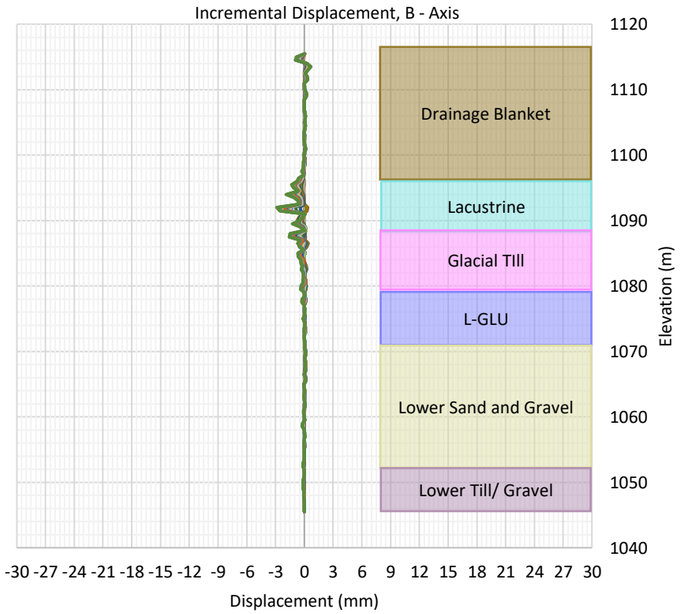
TITLE
LL DAM INCLINOMETER PLOTS
LL-I10-08 (SOUTH DAM)
DEC. 2021 TO NOV. 2023

SCALE	PROJECT No.	FIG. No.
NTS	M02341C62	II-B-2

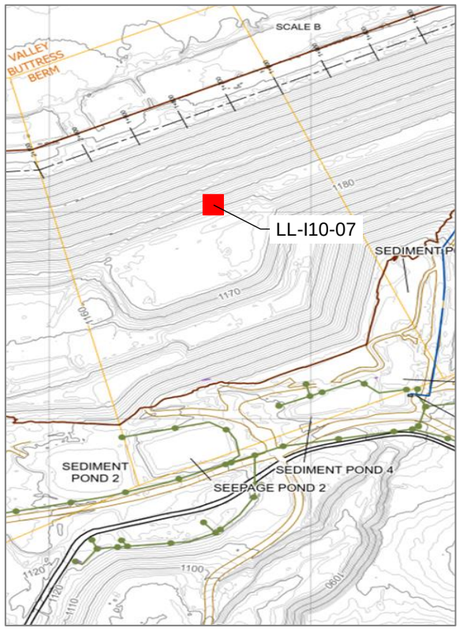
Valley Buttress Berm

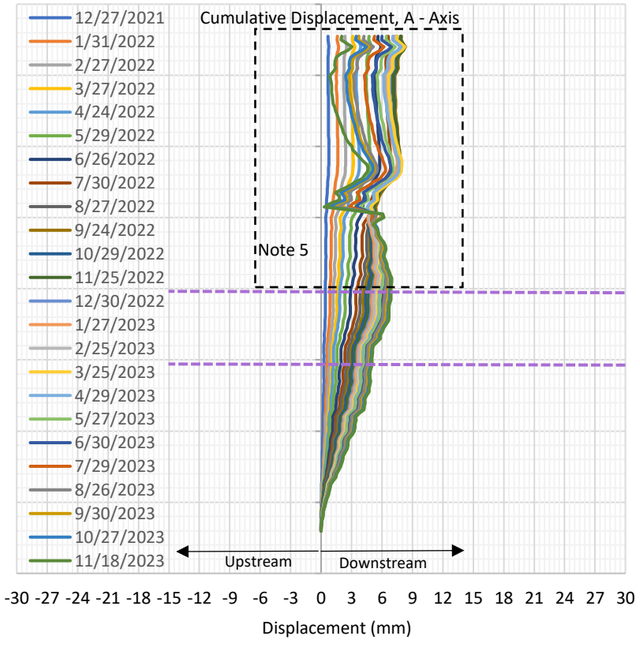


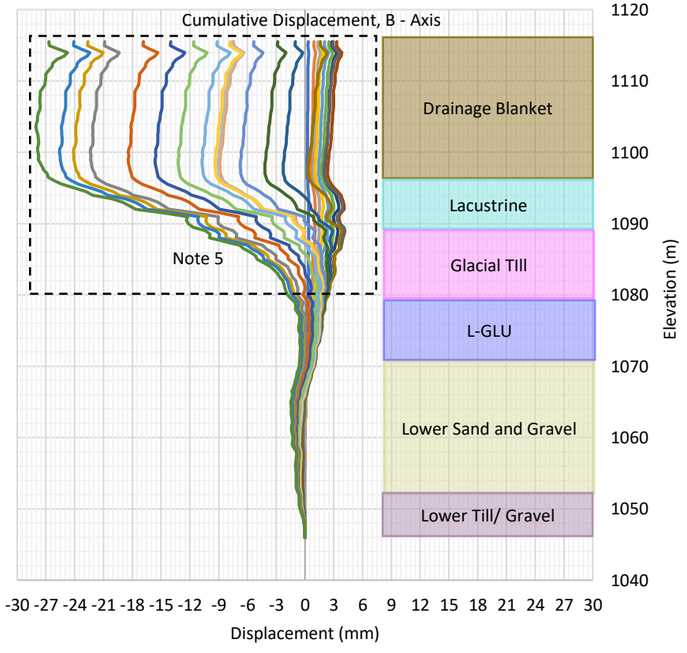




INSET INSTRUMENT VIEW







Geological Unit	EL. Range (m)	NL(mm/month)	T1 (mm/month)	T2 (mm/month)	Colour Code
L-GLU	1079.5-1069.5	0.25	0.6	N/A	

Station	Baseline Reading	Instrument Type
1+850	2021-12-13	SAAV

NOTES

1. DATA PROCESSED AND PROVIDED BY HVC
2. LAST READING OF EACH MONTH PLOTTED ON THE INCREMENTAL AND CUMULATIVE PROFILES.
3. X-AXIS, Y-AXIS, AND LEGEND IS THE SAME FOR THE INCREMENTAL AND CUMULATIVE PROFILES.
4. INCREMENTAL DISPLACEMENT PROFILES ARE BASED ON READINGS WITHIN ONE WEEK OF THE CUMULATIVE PROFILES.
5. BASED ON DISCUSSIONS AND REVIEW OF SAAV WITH MANUFACTURER, MEASURAND, ABOVE INSTRUMENT IS MEASURE A BENT/HELIX SHAPE OF THE CASING ABOVE APPROXIMATELY EL. 1080 M CAUSED BY COMPRESSION STRESSES. THIS IS NOT REPRESENTATIVE OF MOVEMENT RELATED TO DAM PERFORMANCE AND NO MONITORING ZONE HAS BEEN DEFINED.

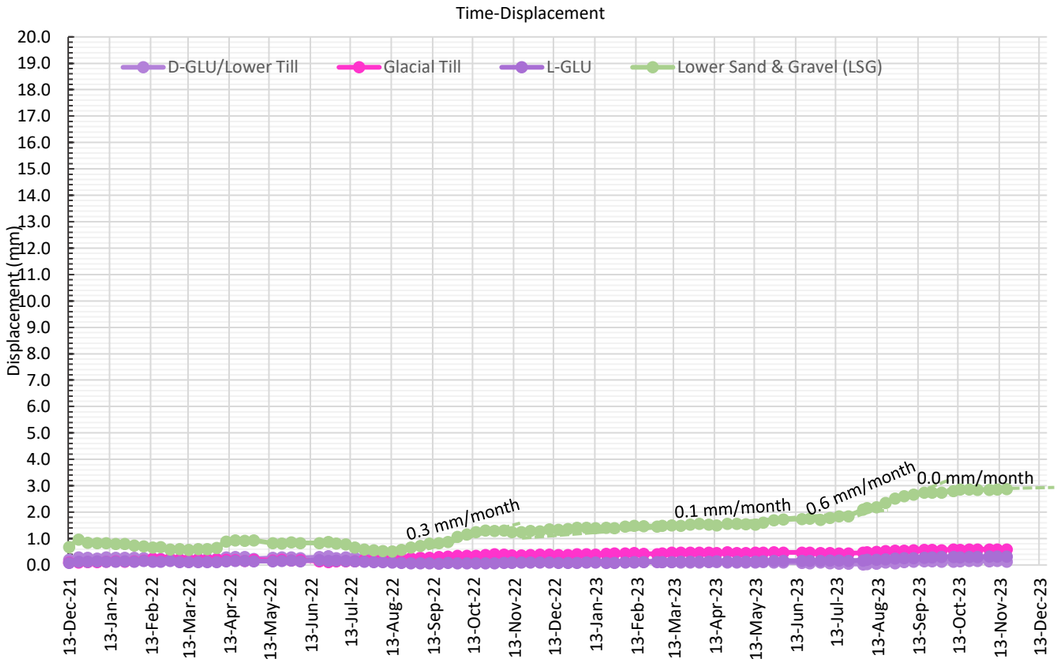
CLIENT
Highland Valley Copper / Teck

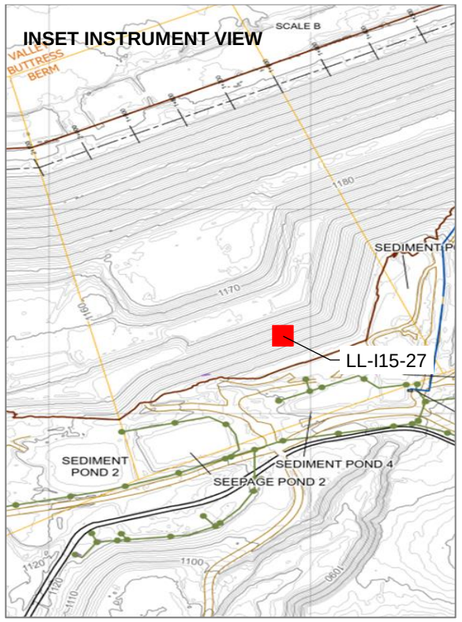
Klohn Crippen Berger

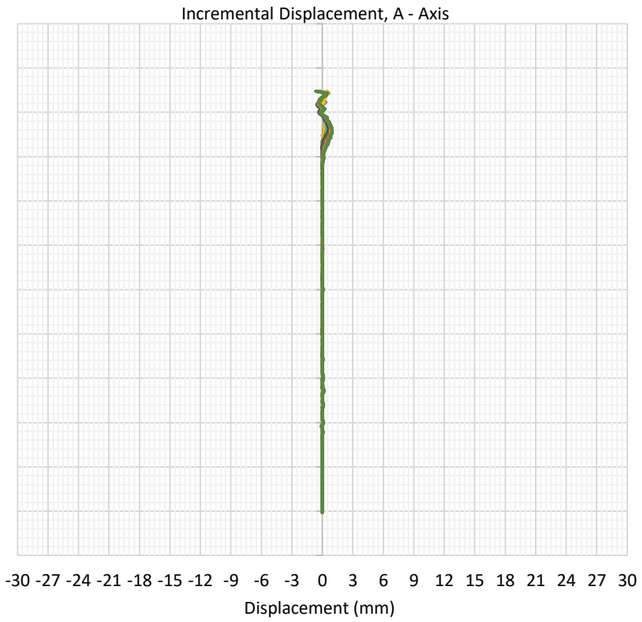
PROJECT
HIGHLAND TAILINGS STORAGE FACILITY
2023 ANNUAL FACILITY PERFORMANCE REPORT

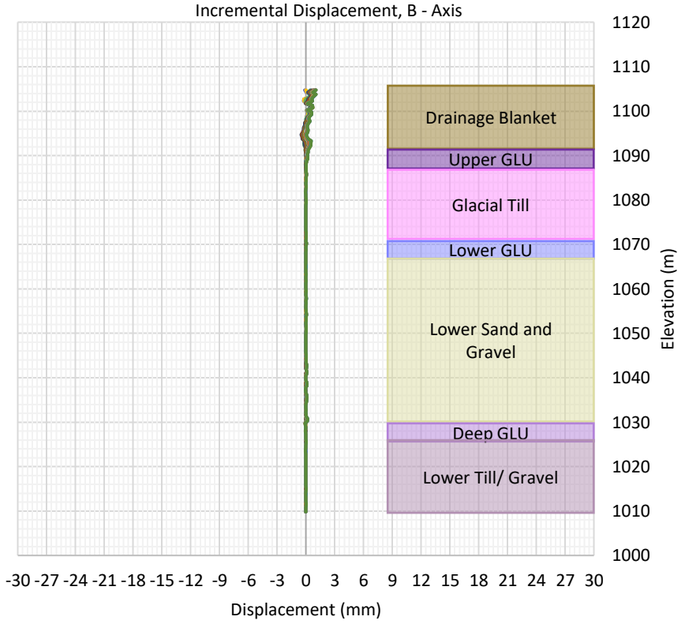
TITLE
LL DAM INCLINOMETER PLOTS
LL-I10-07 (VBB)
DEC. 2021 TO NOV. 2023

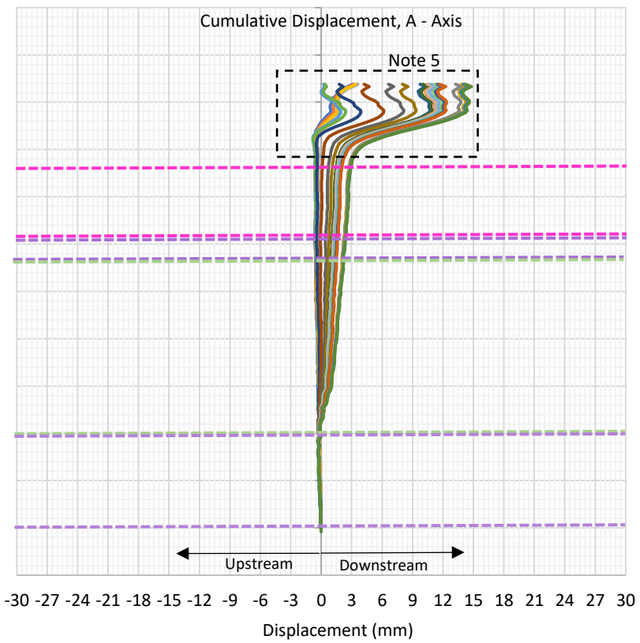
SCALE	PROJECT No.	FIG. No.
NTS	M02341C62	II-B-3

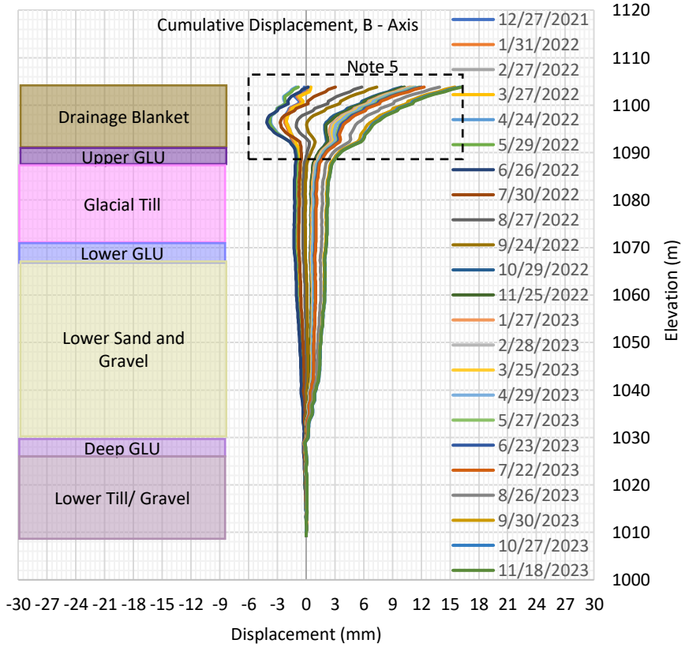












NOTES

1. DATA PROCESSED AND PROVIDED BY HVC
2. LAST READING OF EACH MONTH PLOTTED ON THE INCREMENTAL AND CUMULATIVE PROFILES.
3. X-AXIS, Y-AXIS, AND LEGEND IS THE SAME FOR THE INCREMENTAL AND CUMULATIVE PROFILES.
4. INCREMENTAL DISPLACEMENT PROFILES ARE BASED ON READINGS WITHIN ONE WEEK OF THE CUMULATIVE PROFILES.
5. MOVEMENT IN THE COMPACTED DRIANAGE BLANKET WAS A LOCALISED RESPONSE AT THE END OF DRILLING AS THE CASING WAS LEFT IN THE GROUND DURING INSTALLATION. REFER TO SECTION 5.2.3.4 OF MAIN TEXT.

Monitoring Zone	EL. Range (m)	NL(mm/month)	T1 (mm/month)	T2 (mm/month)	Colour Code
Glacial Till	1086.0-1072.0	2.0	N/A	N/A	
L-GLU	1072.0-1067.0	0.4	0.8	1.6	
LSG	1067.0-1030.0	2.0	N/A	N/A	
D-GLU/Lower Till	1030.0-1011.0	2.0	N/A	N/A	

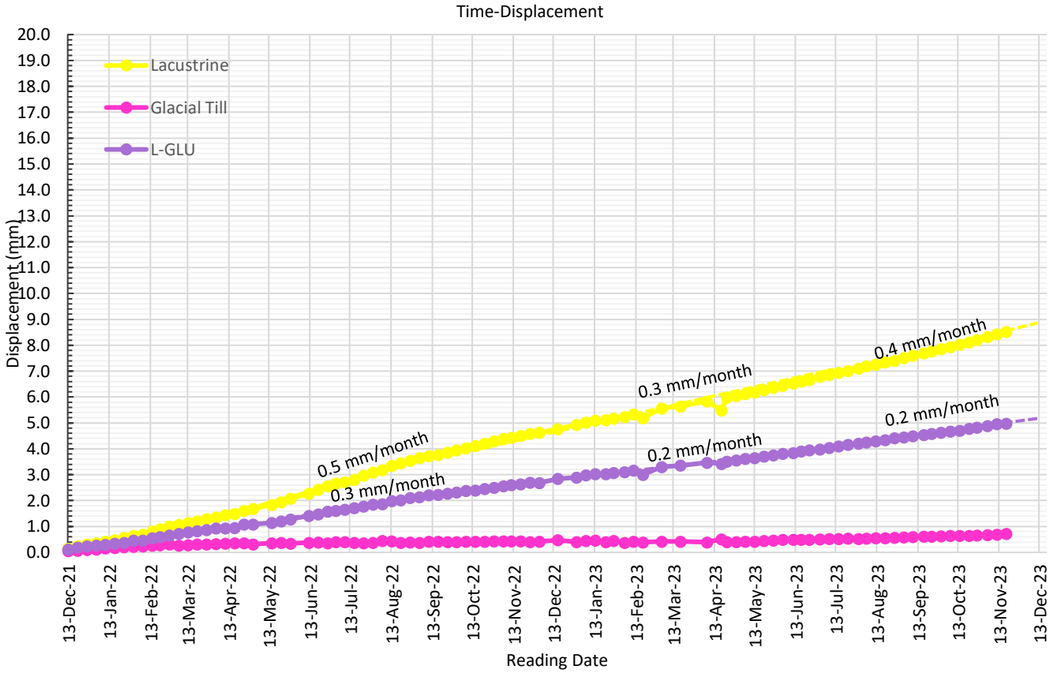
Station	Baseline Reading	Instrument Type
1+900	2021-12-13	SAAV

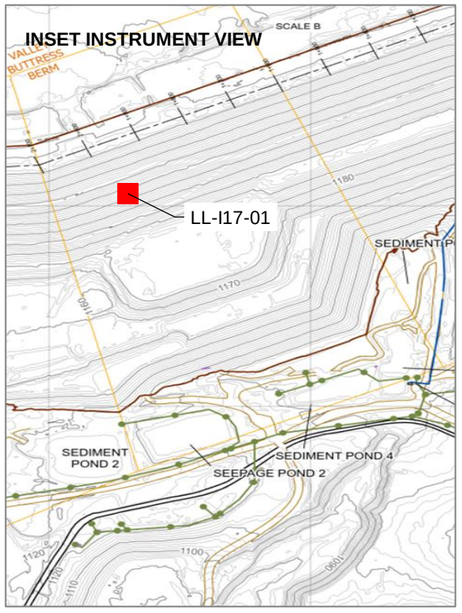
CLIENT
Highland Valley Copper / Teck
Klohn Crippen Berger

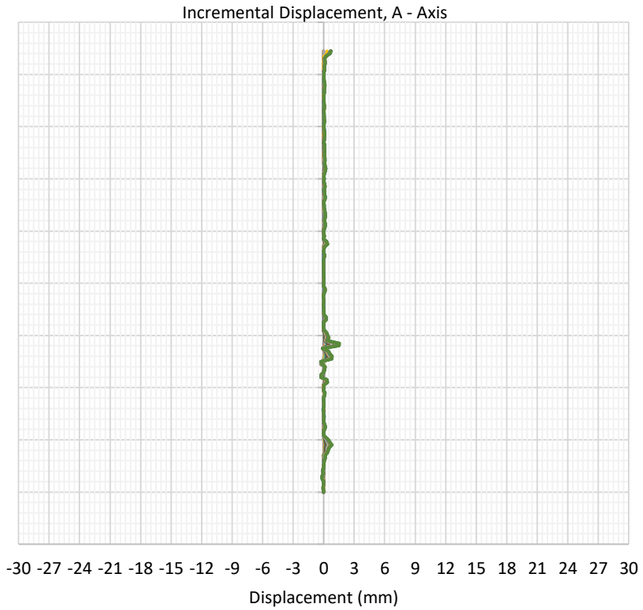
PROJECT
HIGHLAND TAILINGS STORAGE FACILITY
2023 ANNUAL FACILITY PERFORMANCE REPORT

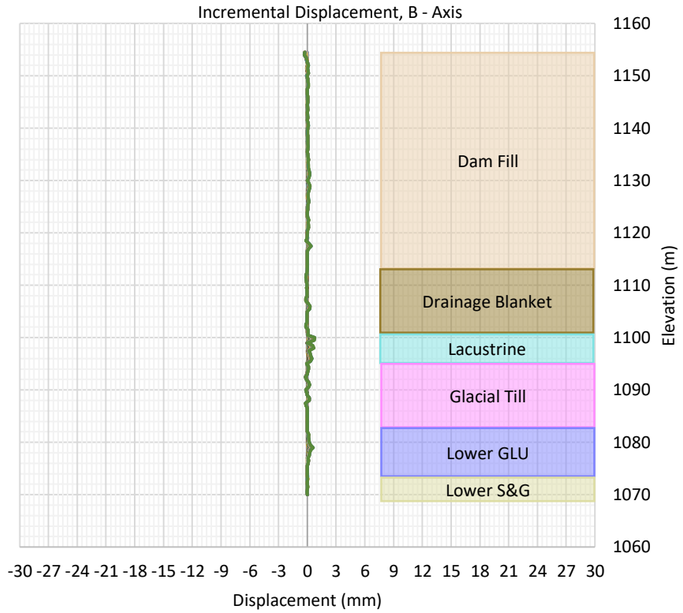
TITLE
LL DAM INCLINOMETER PLOTS
LL-I15-27 (VBB)
DEC. 2021 TO NOV. 2023

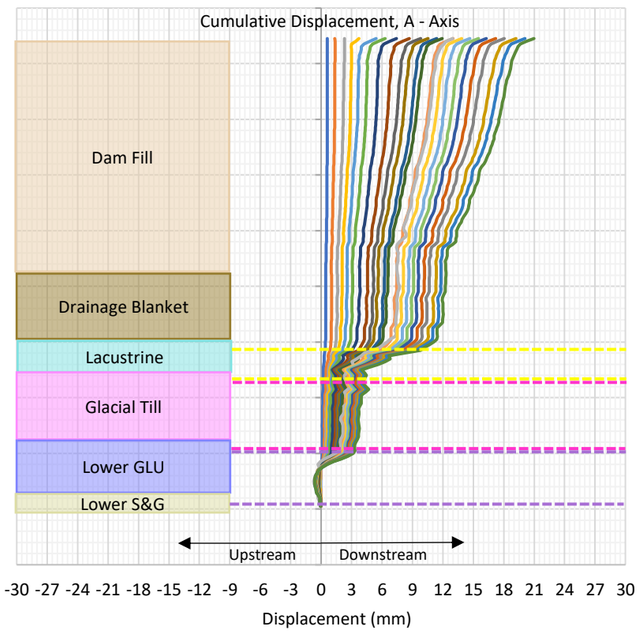
SCALE	PROJECT No.	FIG. No.
NTS	M02341C62	II-B-4

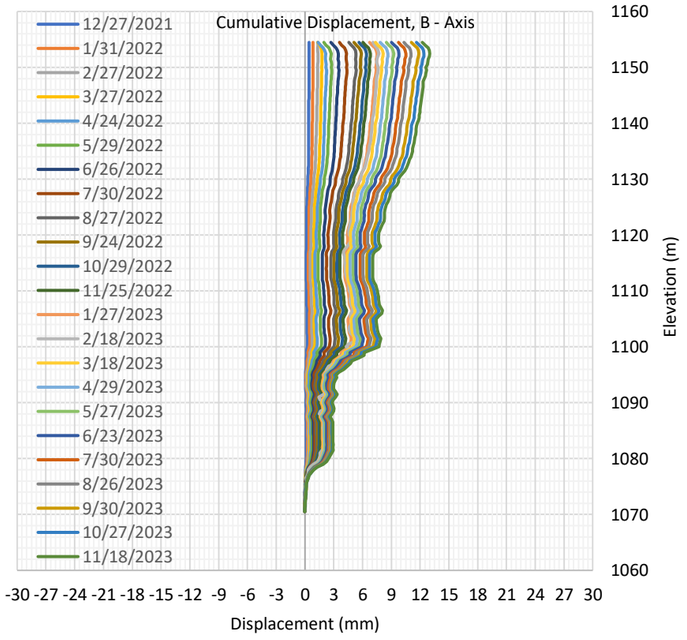












NOTES

1. DATA PROCESSED AND PROVIDED BY HVC
2. LAST READING OF EACH MONTH PLOTTED ON THE INCREMENTAL AND CUMULATIVE PROFILES.
3. X-AXIS, Y-AXIS, AND LEGEND IS THE SAME FOR THE INCREMENTAL AND CUMULATIVE PROFILES.
4. INCREMENTAL DISPLACEMENT PROFILES ARE BASED ON READINGS WITHIN ONE WEEK OF THE CUMULATIVE PROFILES.

Geological Unit	EL. Range (m)	NL(mm/month)	T1 (mm/month)	T2 (mm/month)	Colour Code
Lacustrine	1100.5-1094.0	0.6	N/A	N/A	
Glacial Till	1094.0-1082.5	2.0	N/A	N/A	
L-GLU	1082.5-1073.5	0.4	0.5	N/A	

Station	Baseline Reading	Instrument Type
2+000	2021-12-13	SAAV

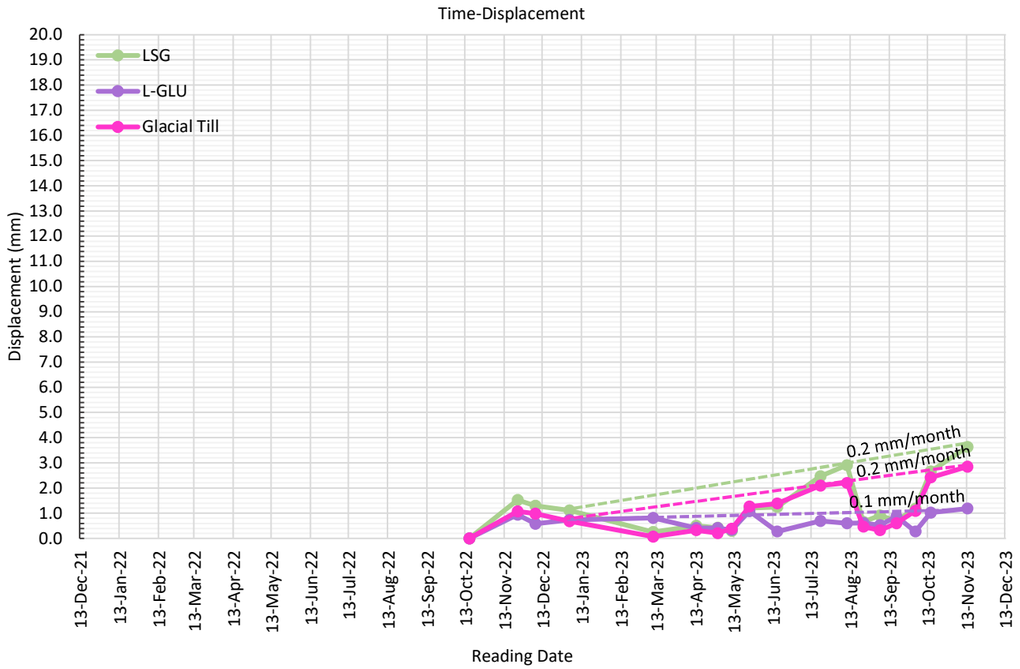
CLIENT
Highland Valley Copper / Teck

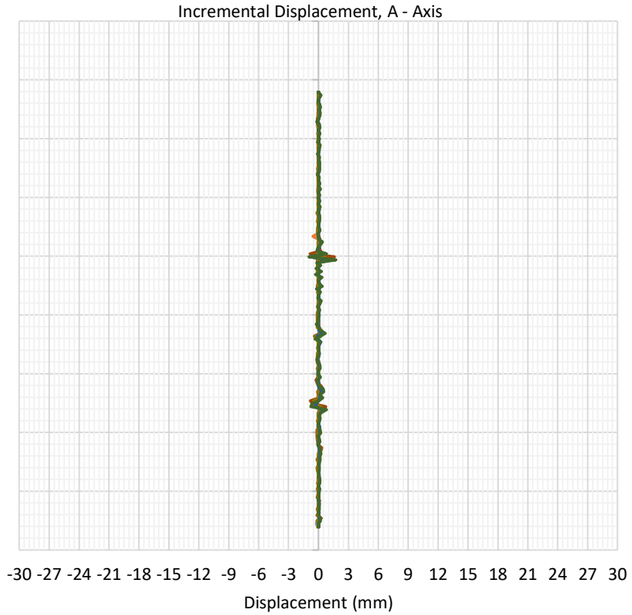
Klohn Crippen Berger

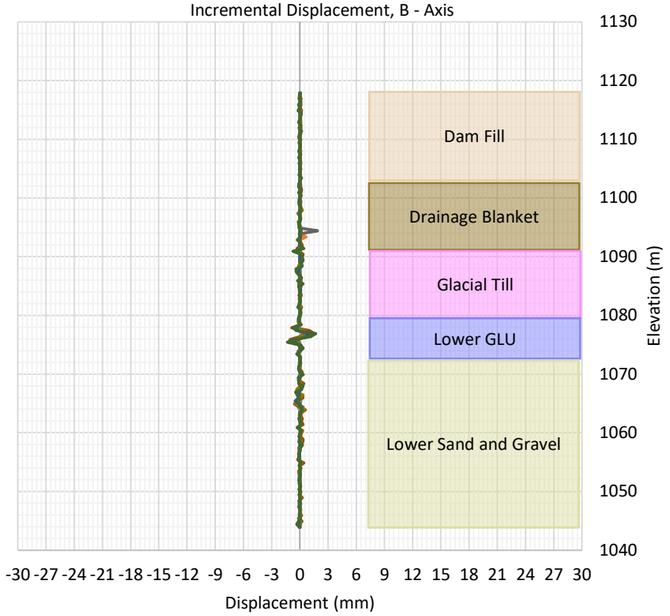
PROJECT
HIGHLAND TAILINGS STORAGE FACILITY
2023 ANNUAL FACILITY PERFORMANCE REPORT

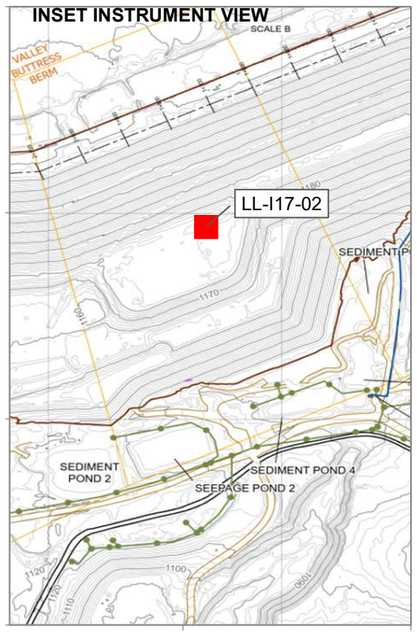
TITLE
LL DAM INCLINOMETER PLOTS
LL-I17-01 (VBB)
DEC. 2021 TO NOV. 2023

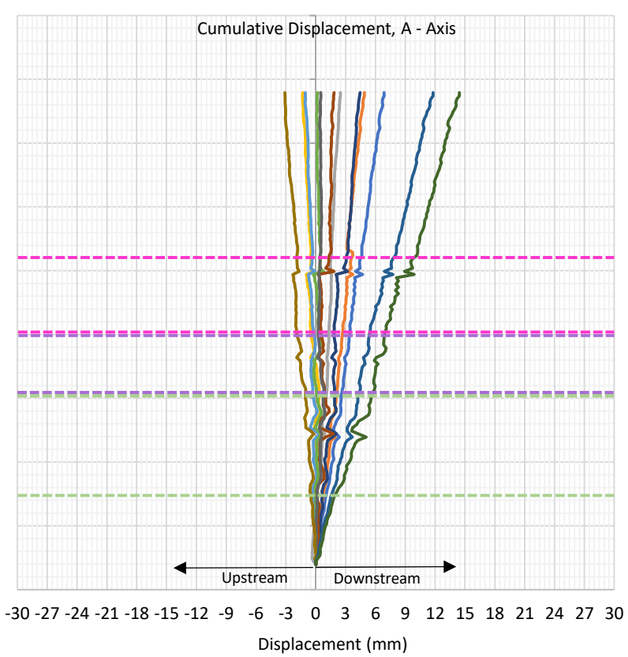
SCALE	PROJECT No.	FIG. No.
NTS	M02341C62	II-B-5

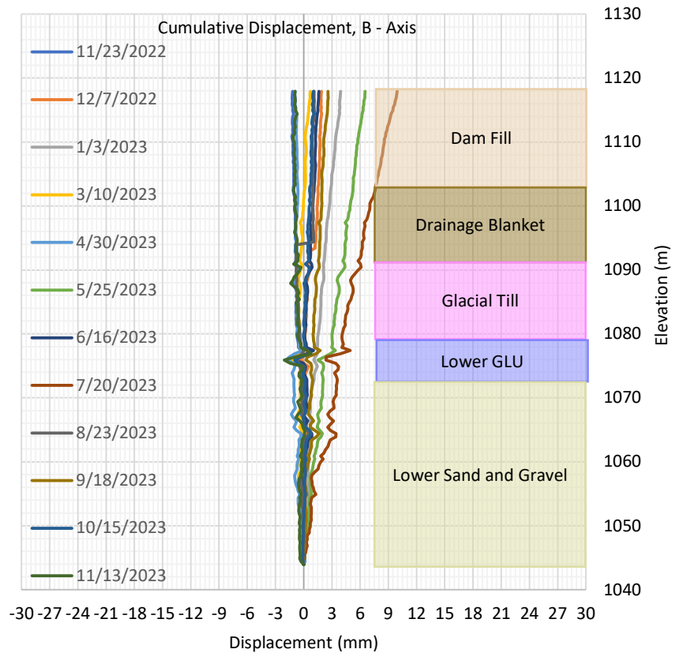












NOTES

1. DATA PROCESSED AND PROVIDED BY HVC
2. LAST READING OF EACH MONTH PLOTTED ON THE INCREMENTAL AND CUMULATIVE PROFILES.
3. X-AXIS, Y-AXIS, AND LEGEND IS THE SAME FOR THE INCREMENTAL AND CUMULATIVE PROFILES.
4. DATA SHOWN ON THE PLOTS IS AFTER THE INSTRUMENT WAS BASELINED. HVC HAVE MONITORED THIS INSTRUMENT PRIOR TO THE BASELINE AND MET THE READING FREQUENCY.

Geological Unit	EL. Range (m)	NL(mm/month)	T1 (mm/month)	T2 (mm/month)	Colour Code
Glacial Till	1092.0-1080.0	2.0	N/A	N/A	
L-GLU	1080.0-1071.0	1.0	N/A	N/A	
LSG	1071.0-1055.4	2.0	N/A	N/A	

Station	Baseline Reading	Instrument Type
1+850	2022-10-16	SI

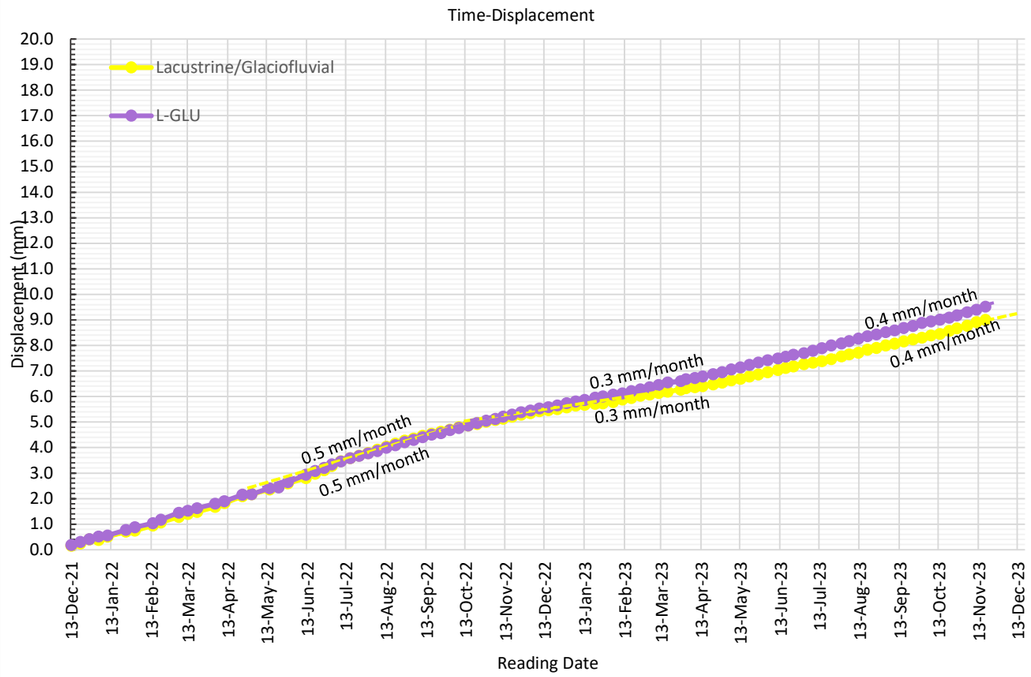
CLIENT
Highland Valley Copper / Teck

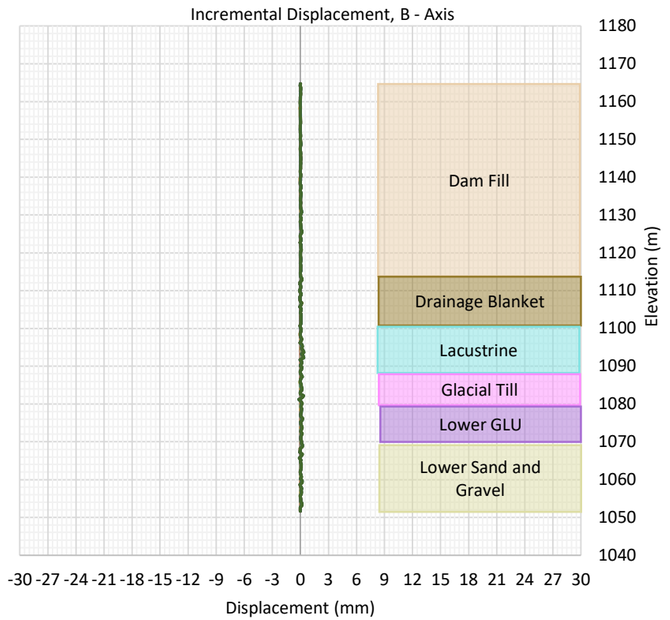
Klohn Crippen Berger

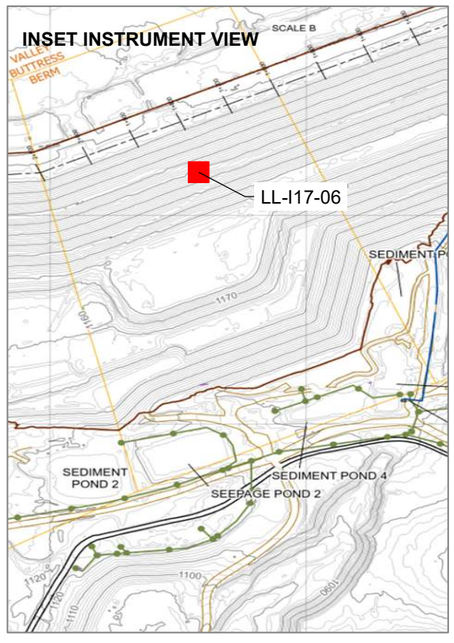
PROJECT
HIGHLAND TAILINGS STORAGE FACILITY
2023 ANNUAL FACILITY PERFORMANCE REPORT

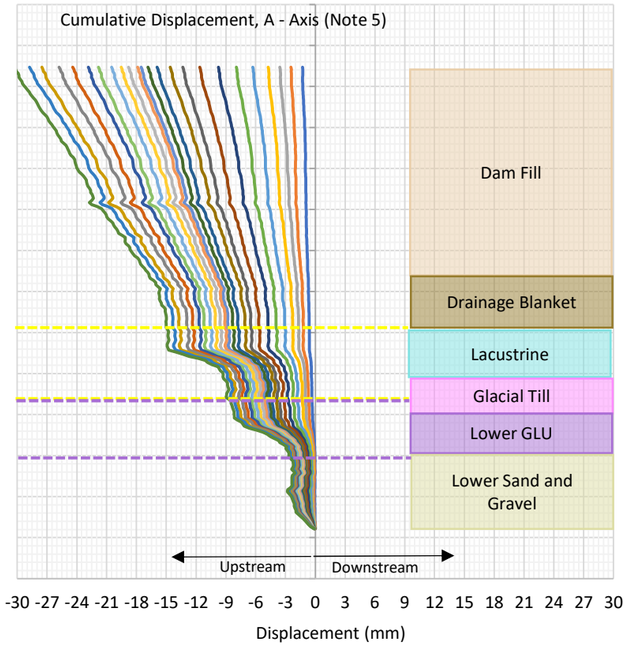
TITLE
LL DAM INCLINOMETER PLOTS
LL-I17-02 (VBB)
DEC. 2021 TO NOV. 2023

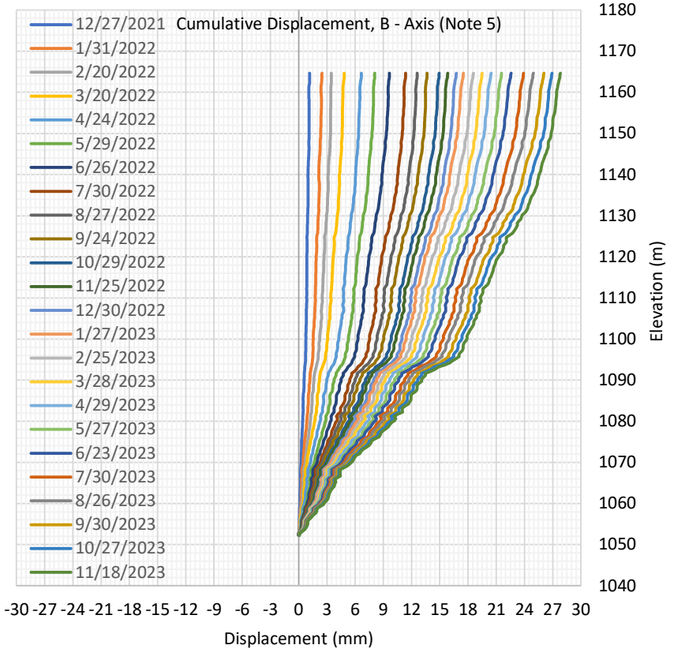
SCALE	PROJECT No.	FIG. No.
NTS	M02341C62	II-B-6











NOTES

1. DATA PROCESSED AND PROVIDED BY HVC
2. LAST READING OF EACH MONTH PLOTTED ON THE INCREMENTAL AND CUMULATIVE PROFILES.
3. X-AXIS, Y-AXIS, AND LEGEND IS THE SAME FOR THE INCREMENTAL AND CUMULATIVE PROFILES.
4. INCREMENTAL DISPLACEMENT PROFILES ARE BASED ON READINGS WITHIN ONE WEEK OF THE CUMULATIVE PROFILES.
5. AZIMUTH CORRECTION HAS NOT BEEN APPLIED TO THIS INSTRUMENT

Geological Unit	EL. Range (m)	NL(mm/month)	T1 (mm/month)	T2 (mm/month)	Colour Code
Lacustrine	1101.2-1084.2	0.8	N/A	N/A	
L-GLU	1084.2-1068.2	0.5	1.0	N/A	

Station	Baseline Reading	Instrument Type
1+840	2021-12-13	SAAV

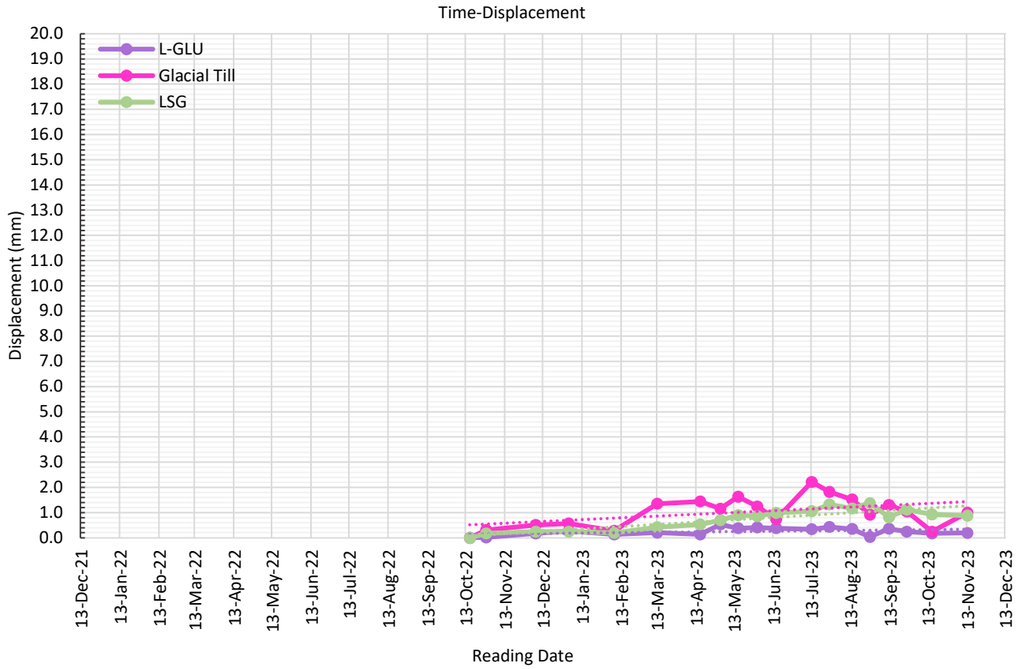
CLIENT
Highland Valley Copper / Teck

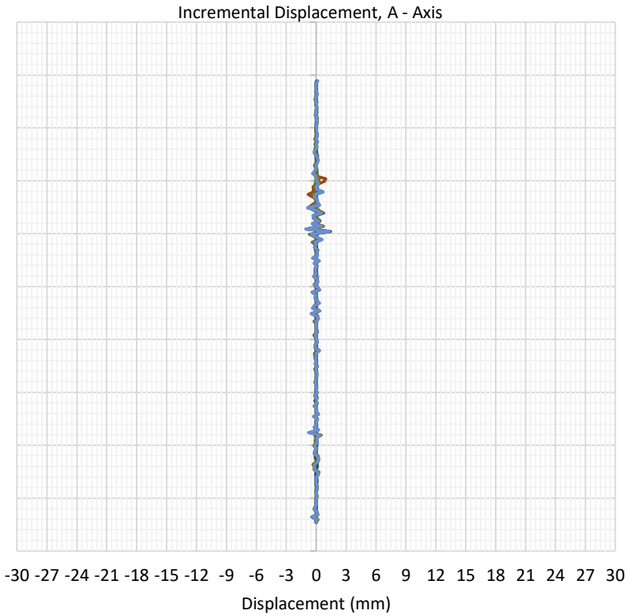
Klohn Crippen Berger

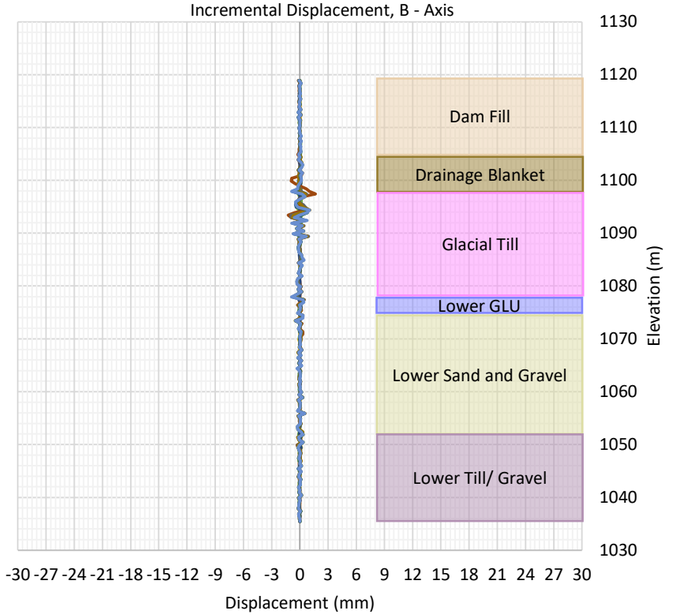
PROJECT
HIGHLAND TAILINGS STORAGE FACILITY
2023 ANNUAL FACILITY PERFORMANCE REPORT

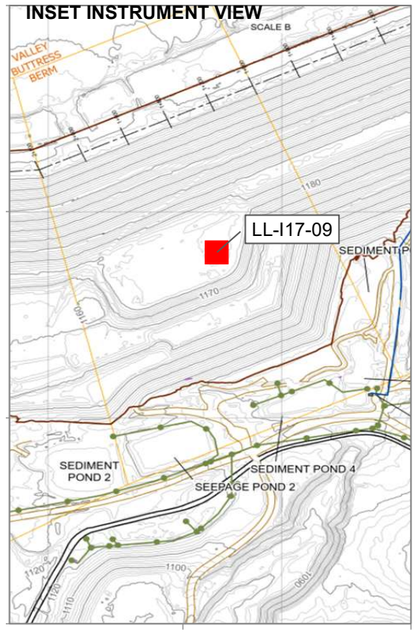
TITLE
LL DAM INCLINOMETER PLOTS
LL-I17-06 (VBB)
DEC. 2021 TO NOV. 2023

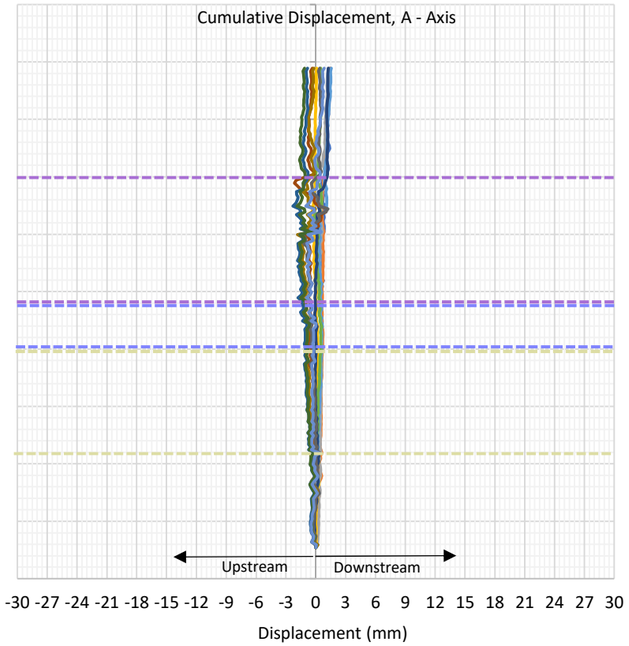
SCALE	PROJECT No.	FIG. No.
NTS	M02341C62	II-B-7

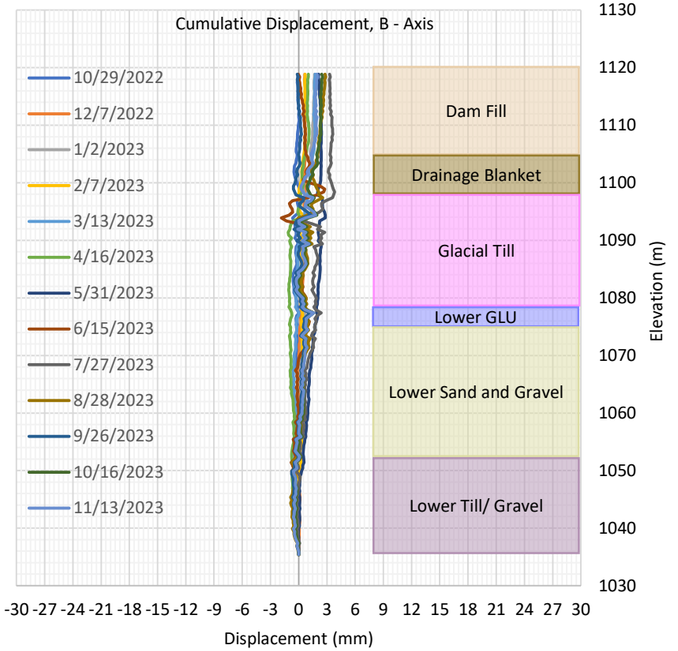












NOTES

1. DATA PROCESSED AND PROVIDED BY HVC
2. LAST READING OF EACH MONTH PLOTTED ON THE INCREMENTAL AND CUMULATIVE PROFILES.
3. X-AXIS, Y-AXIS, AND LEGEND IS THE SAME FOR THE INCREMENTAL AND CUMULATIVE PROFILES.
4. DATA SHOWN ON THE PLOTS IS AFTER THE INSTRUMENT WAS BASELINED. HVC HAVE MONITORED THIS INSTRUMENT PRIOR TO THE BASELINE AND MET THE READING FREQUENCY

Geological Unit	EL. Range (m)	NL(mm/month)	T1 (mm/month)	T2 (mm/month)	Colour Code
Glacial Till	1100.0-1078.0	2.0	N/A	N/A	
L-GLU	1078.0-1070.9	1.0	2.0	N/A	
LSG	1070.0-1052.0	2.0	N/A	N/A	

Station	Baseline Reading	Instrument Type
1+850	2022-10-16	SI

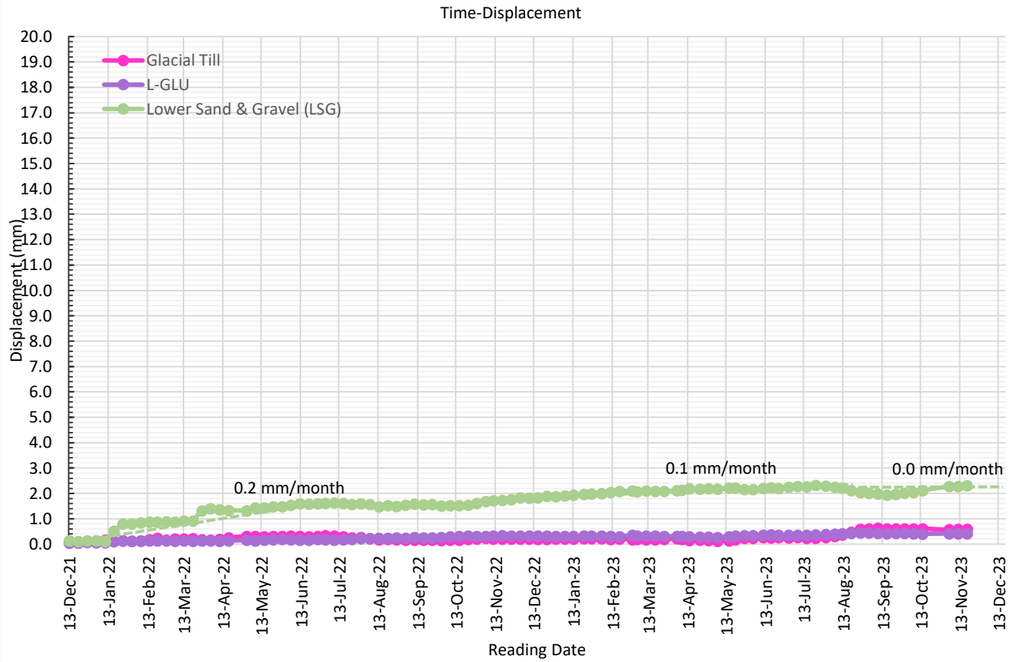
CLIENT
Highland Valley Copper / Teck

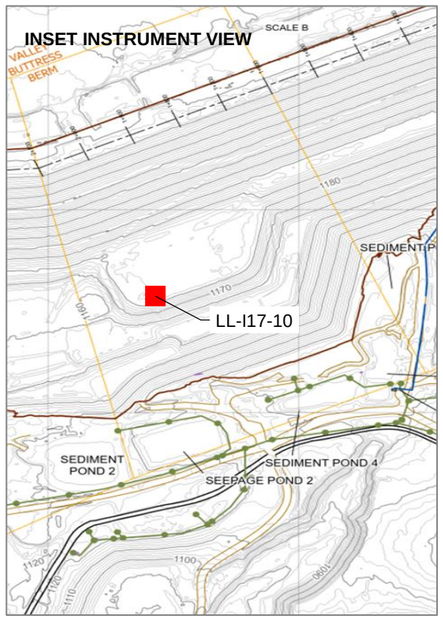
Klohn Crippen Berger

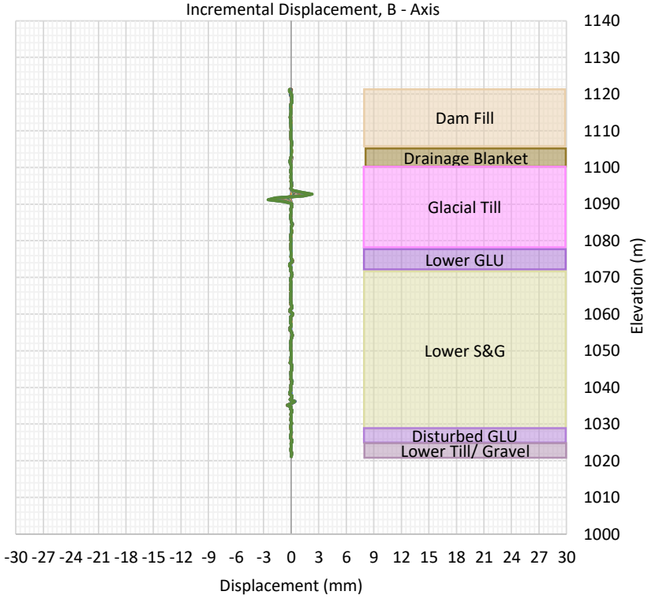
PROJECT
HIGHLAND TAILINGS STORAGE FACILITY
2023 ANNUAL FACILITY PERFORMANCE REPORT

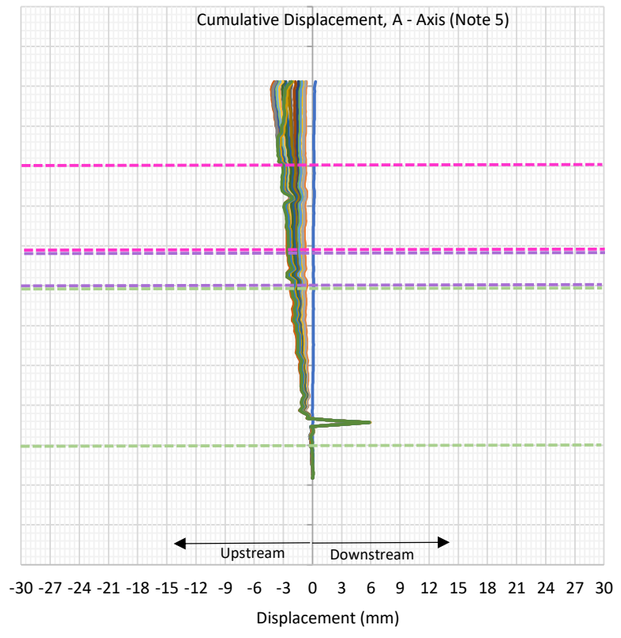
TITLE
LL DAM INCLINOMETER PLOTS
LL-I17-09 (VBB)
DEC. 2021 TO NOV. 2023

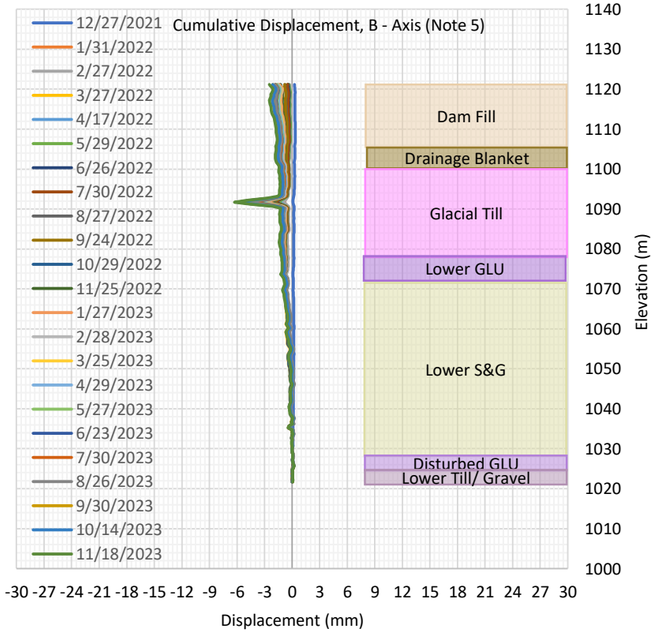
SCALE	PROJECT No.	FIG. No.
NTS	M02341C62	II-B-8











NOTES

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3. X-AXIS, Y-AXIS, AND LEGEND IS THE SAME FOR THE INCREMENTAL AND CUMULATIVE PROFILES.
4. INCREMENTAL DISPLACEMENT PROFILES ARE BASED ON READINGS WITHIN ONE WEEK OF THE CUMULATIVE PROFILES.
5. AZIMUTH CORREACTION HAS NOT BEEN APPLIED TO THIS INSTRUMENT.

Geological Unit	EL. Range (m)	NL(mm/month)	T1 (mm/month)	T2 (mm/month)	Colour Code
Glacial Till	1100.0-1079.0	2.0	N/A	N/A	
L-GLU	1079.0-1070.0	0.5	1.0	2.0	
LSG	1070.0-1030.0	2.0	N/A	N/A	

Station	Baseline Reading	Instrument Type
2+040	2021-12-13	SAAV

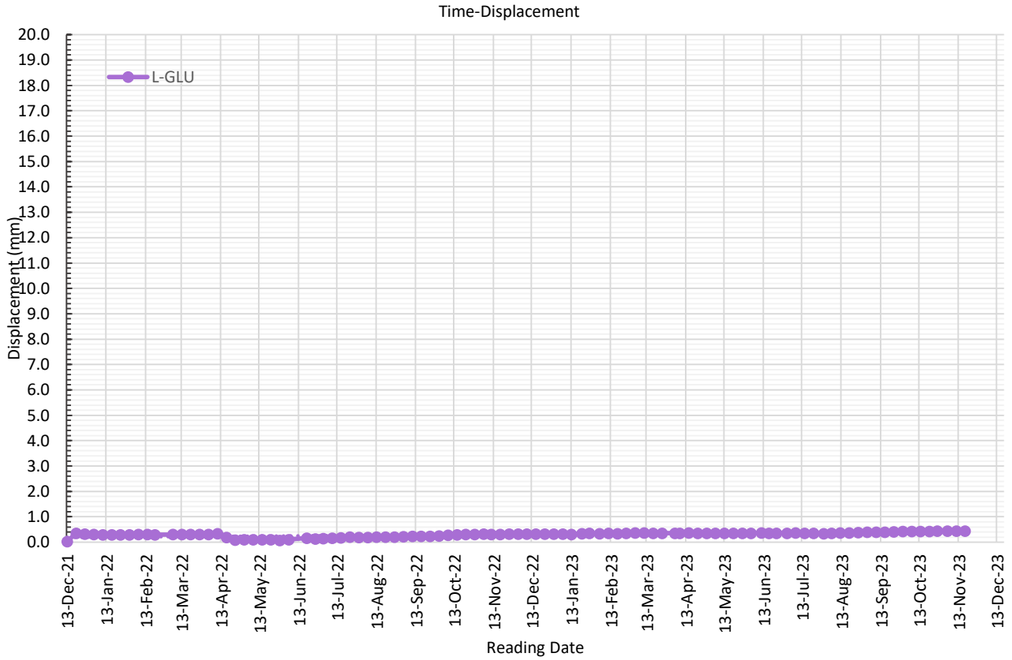
CLIENT
Highland Valley Copper / Teck

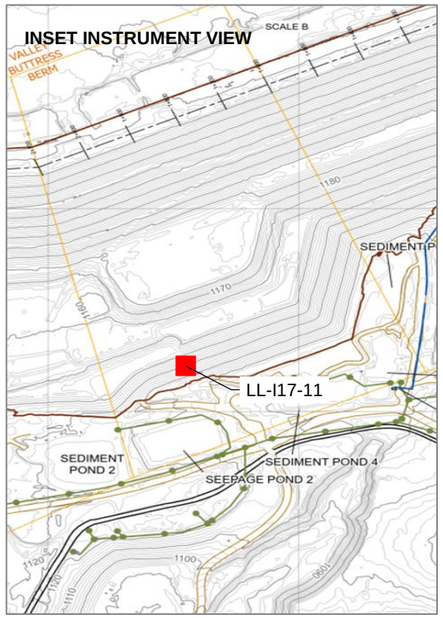
Klohn Crippen Berger

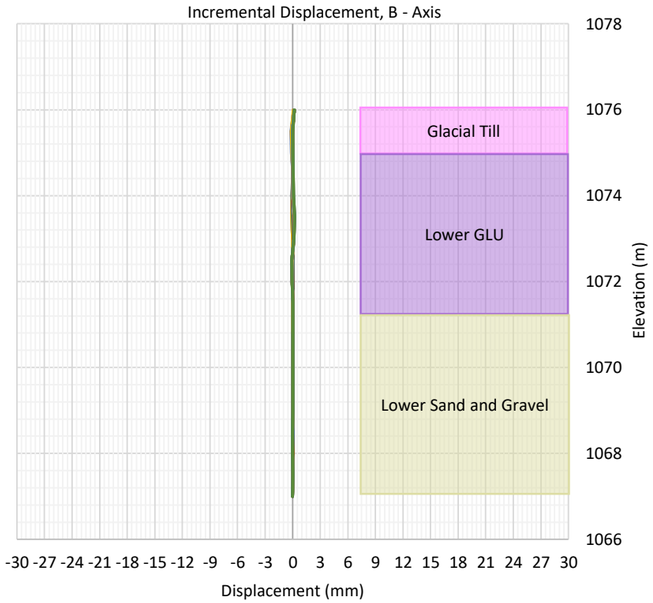
PROJECT
HIGHLAND TAILINGS STORAGE FACILITY
2023 ANNUAL FACILITY PERFORMANCE REPORT

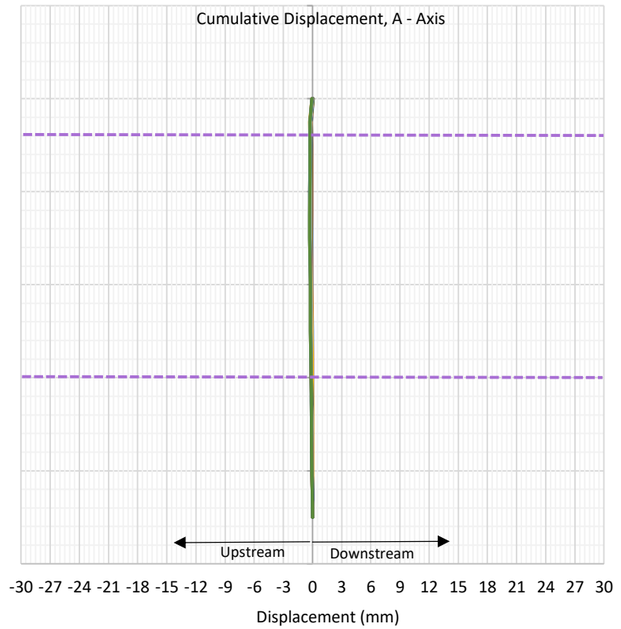
TITLE
LL DAM INCLINOMETER PLOTS
LL-I17-10 (VBB)
DEC. 2021 TO NOV. 2023

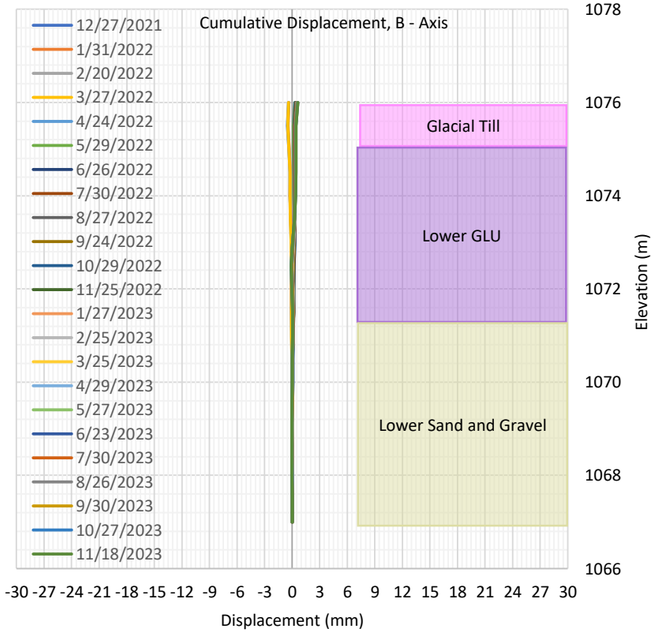
SCALE	PROJECT No.	FIG. No.
NTS	M02341C62	II-B-9











NOTES

1. DATA PROCESSED AND PROVIDED BY HVC
2. LAST READING OF EACH MONTH PLOTTED ON THE INCREMENTAL AND CUMULATIVE PROFILES.
3. X-AXIS, Y-AXIS, AND LEGEND IS THE SAME FOR THE INCREMENTAL AND CUMULATIVE PROFILES.
4. INCREMENTAL DISPLACEMENT PROFILES ARE BASED ON READINGS WITHIN ONE WEEK OF THE CUMULATIVE PROFILES.

Geological Unit	EL. Range (m)	NL(mm/month)	T1 (mm/month)	T2 (mm/month)	Colour Code
L-GLU	1075.2-1070.0	0.4	0.8	1.6	

Station	Baseline Reading	Instrument Type
2+060	2021-12-13	SAAV

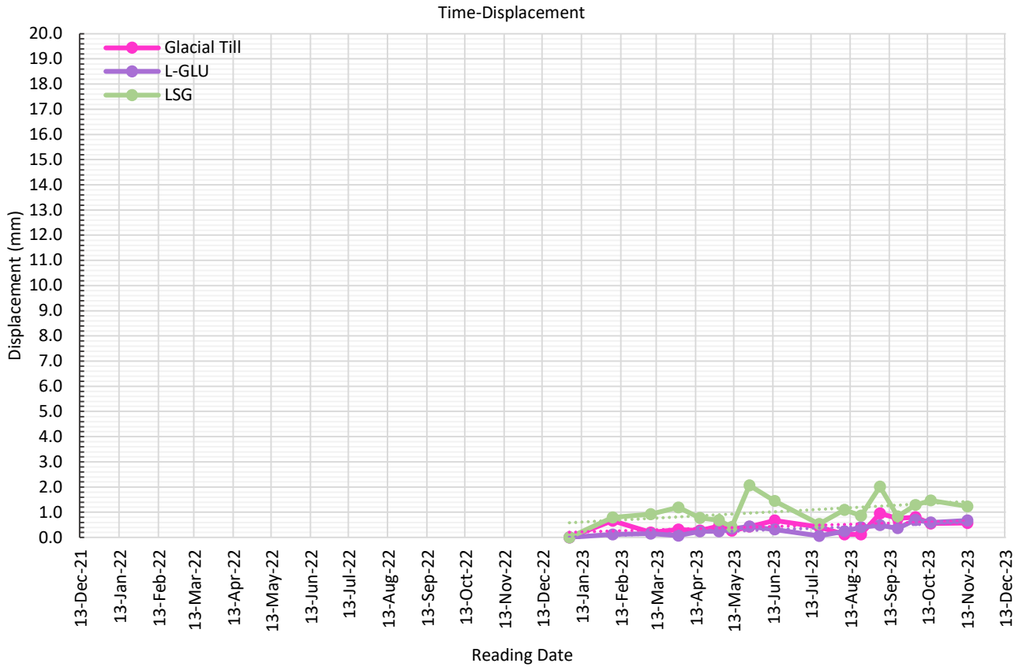
CLIENT: Highland Valley Copper / Teck

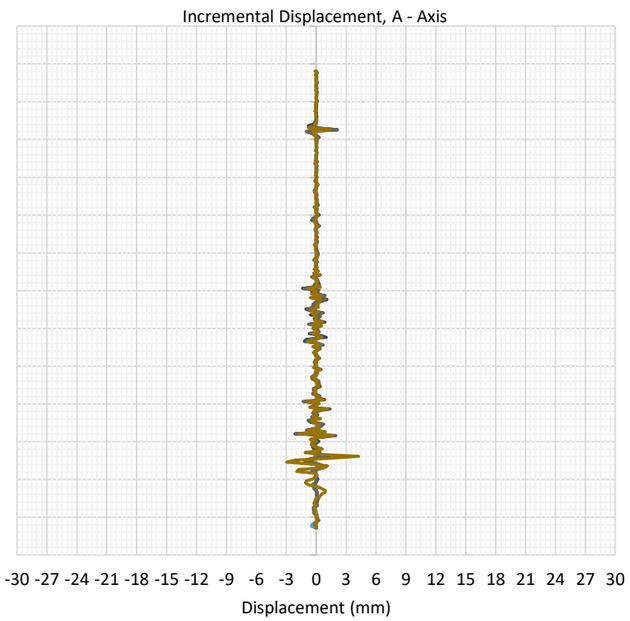
Klohn Crippen Berger

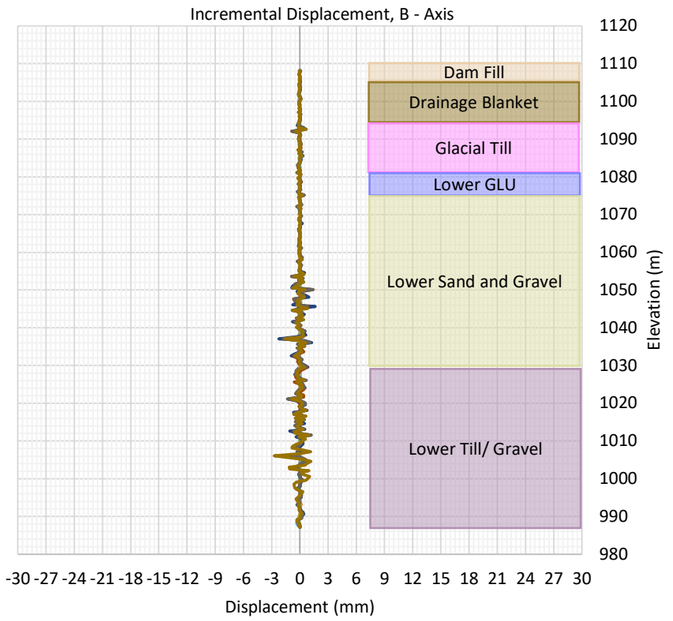
PROJECT: HIGHLAND TAILINGS STORAGE FACILITY
2023 ANNUAL FACILITY PERFORMANCE REPORT

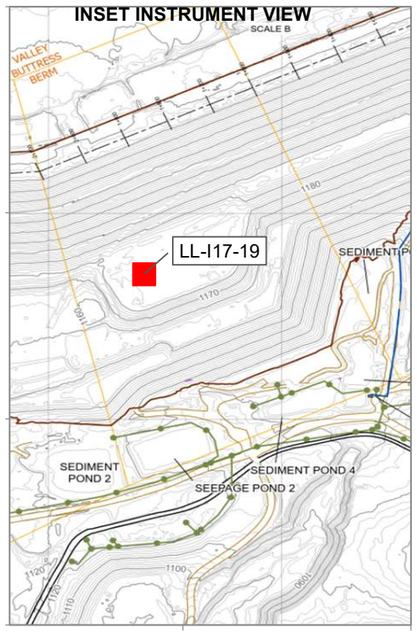
TITLE: LL DAM INCLINOMETER PLOTS
LL-I17-11 (VBB)
DEC. 2021 TO NOV. 2023

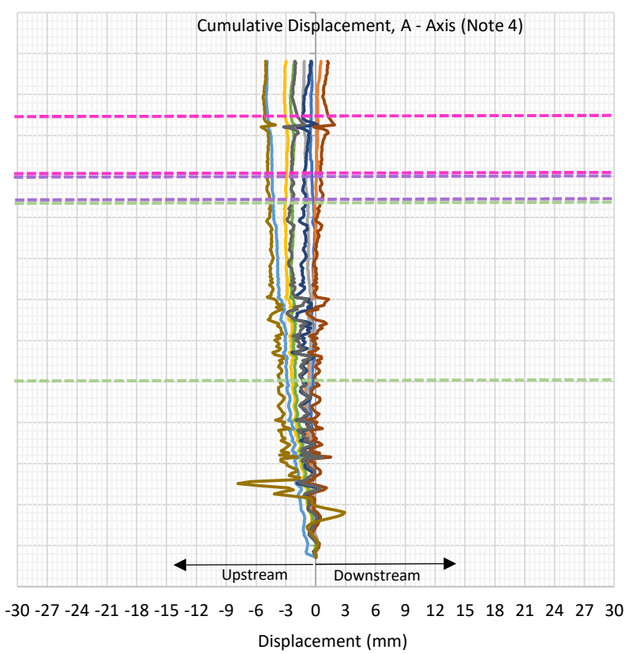
SCALE	PROJECT No.	FIG. No.
NTS	M02341C62	II-B-10

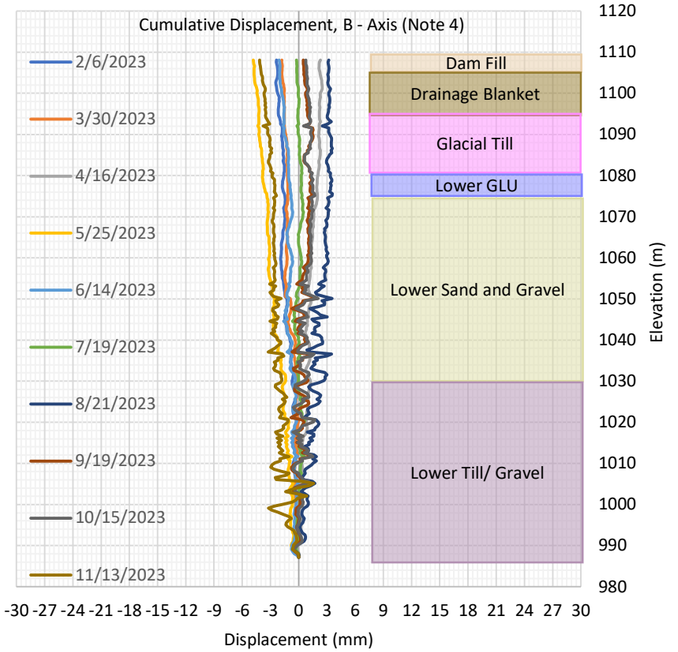












NOTES

1. DATA PROCESSED AND PROVIDED BY HVC
2. LAST READING OF EACH MONTH PLOTTED ON THE INCREMENTAL AND CUMULATIVE PROFILES.
3. X-AXIS, Y-AXIS, AND LEGEND IS THE SAME FOR THE INCREMENTAL AND CUMULATIVE PROFILES.
4. AZIMUTH CORRECTION HAS NOT BEEN APPLIED TO THIS INSTRUMENT.
5. DATA SHOWN ON THE PLOTS IS AFTER THE INSTRUMENT WAS BASELINED. HVC HAVE MONITORED THIS INSTRUMENT PRIOR TO THE BASELINE AND MET THE READING FREQUENCY.

Geological Unit	EL. Range (m)	NL(mm/month)	T1 (mm/month)	T2 (mm/month)	Colour Code
Glacial Till	1095.0-1081.0	2.0	N/A	N/A	
L-GLU	1081.0-1075.0	1.0	2.0	N/A	
LSG	1075.0-1030.0	2.0	N/A	N/A	

Station	Baseline Reading	Instrument Type
2+000	2022-05-20	SI

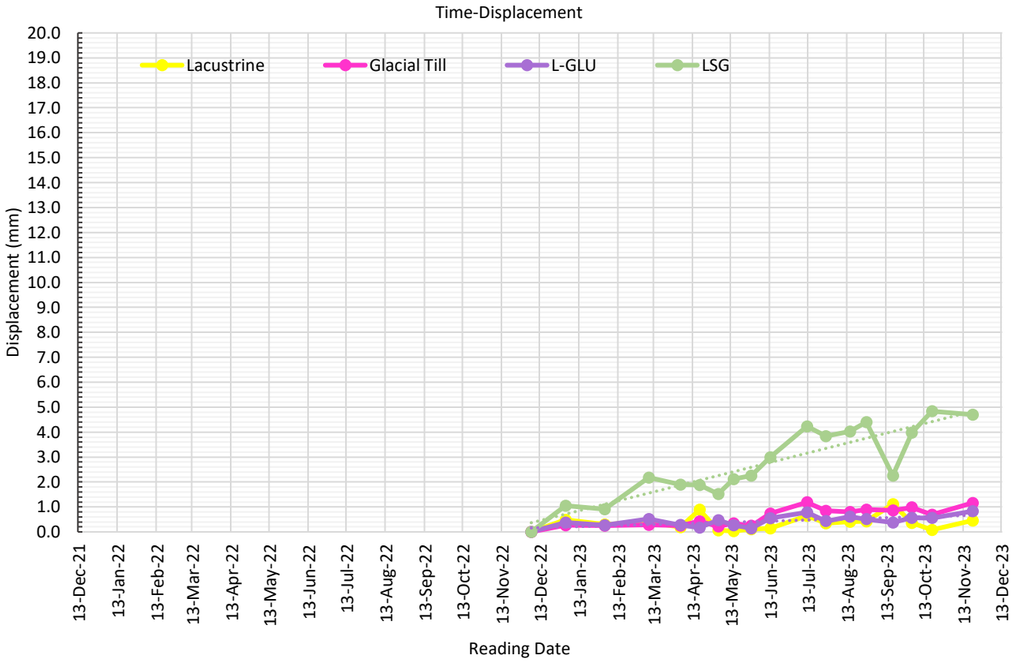
CLIENT
Highland Valley Copper / Teck

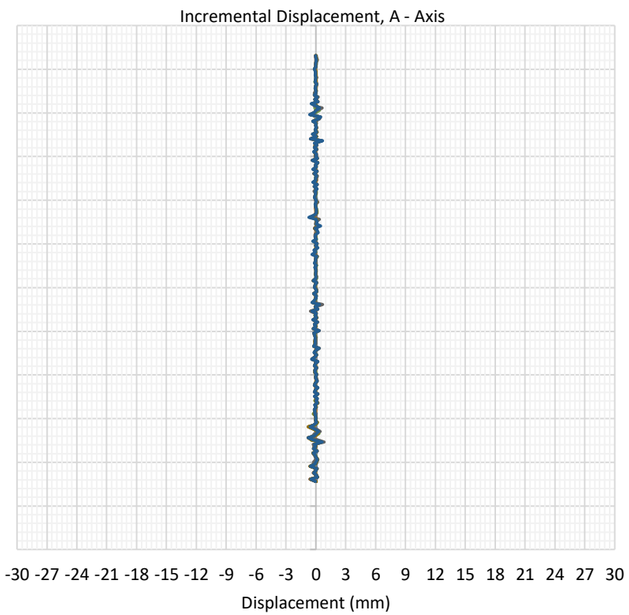
Klohn Crippen Berger

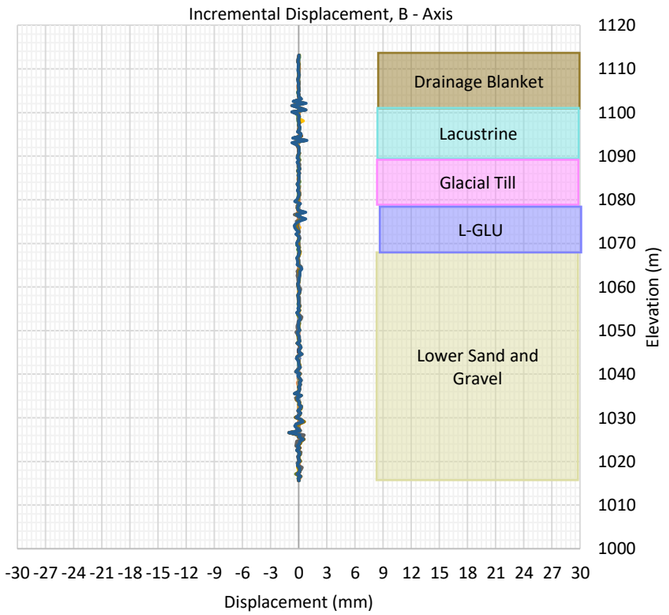
PROJECT
HIGHLAND TAILINGS STORAGE FACILITY
2023 ANNUAL FACILITY PERFORMANCE REPORT

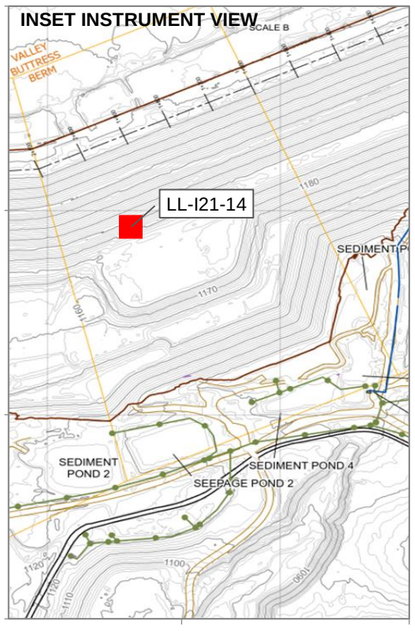
TITLE
LL DAM INCLINOMETER PLOTS
LL-I17-19 (VBB)
DEC. 2021 TO NOV. 2023

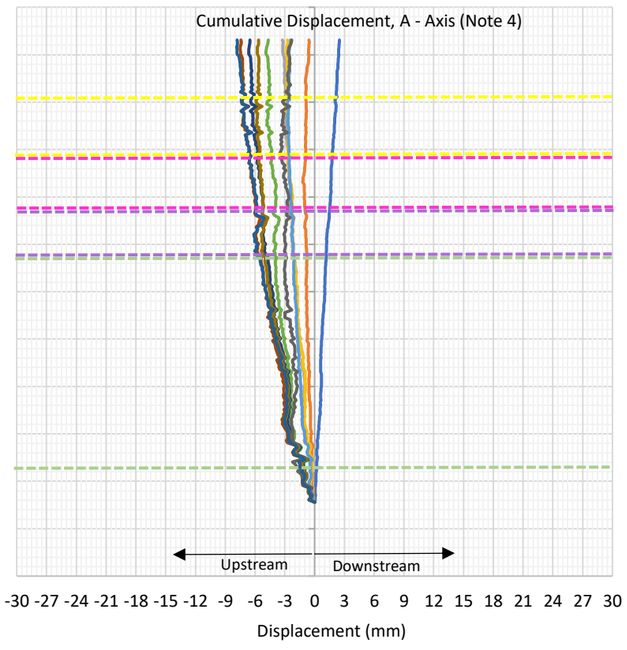
SCALE	PROJECT No.	FIG. No.
NTS	M02341C62	II-B-11

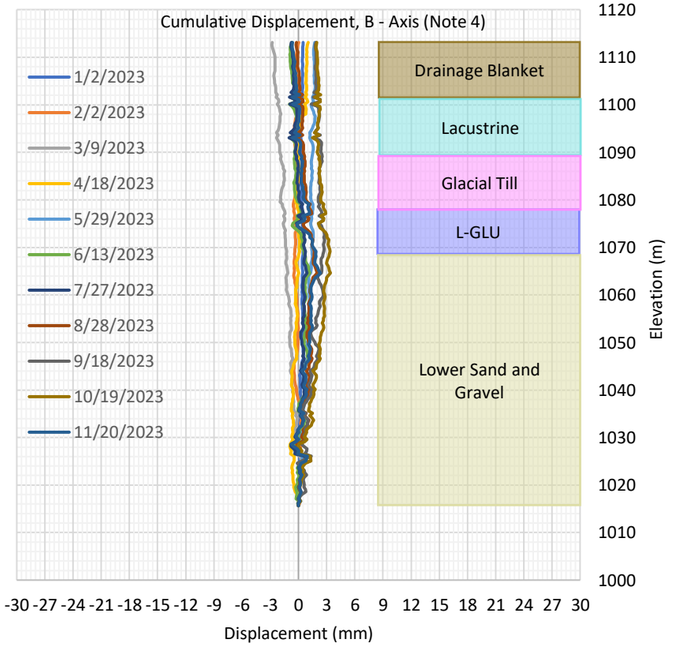












NOTES

1. DATA PROCESSED AND PROVIDED BY HVC
2. LAST READING OF EACH MONTH PLOTTED ON THE INCREMENTAL AND CUMULATIVE PROFILES.
3. X-AXIS, Y-AXIS, AND LEGEND IS THE SAME FOR THE INCREMENTAL AND CUMULATIVE PROFILES.
4. AZIMUTH CORRECTION HAS NOT BEEN APPLIED TO THIS INSTRUMENT.
5. DATA SHOWN ON THE PLOTS IS AFTER THE INSTRUMENT WAS BASELINED. HVC HAVE MONITORED THIS INSTRUMENT PRIOR TO THE BASELINE AND MET THE READING FREQUENCY.
6. GEOLOGY PRESENTED WAS LOGGED FOR LL-I10-06.

Geological Unit	EL. Range (m)	NL(mm/month)	T1 (mm/month)	T2 (mm/month)	Colour Code
Lacustrine	1101.0-1089.0	5.0	N/A	N/A	
Glacial Till	1089.0-1078.0	2.0	N/A	N/A	
L-GLU	1078.0-1068.0	1.0	N/A	N/A	
LSG	1068.0-1023.0	2.0	N/A	N/A	

Station	Baseline Reading	Instrument Type
2+000	2022-12-06	SI

CLIENT
Highland Valley Copper / Teck

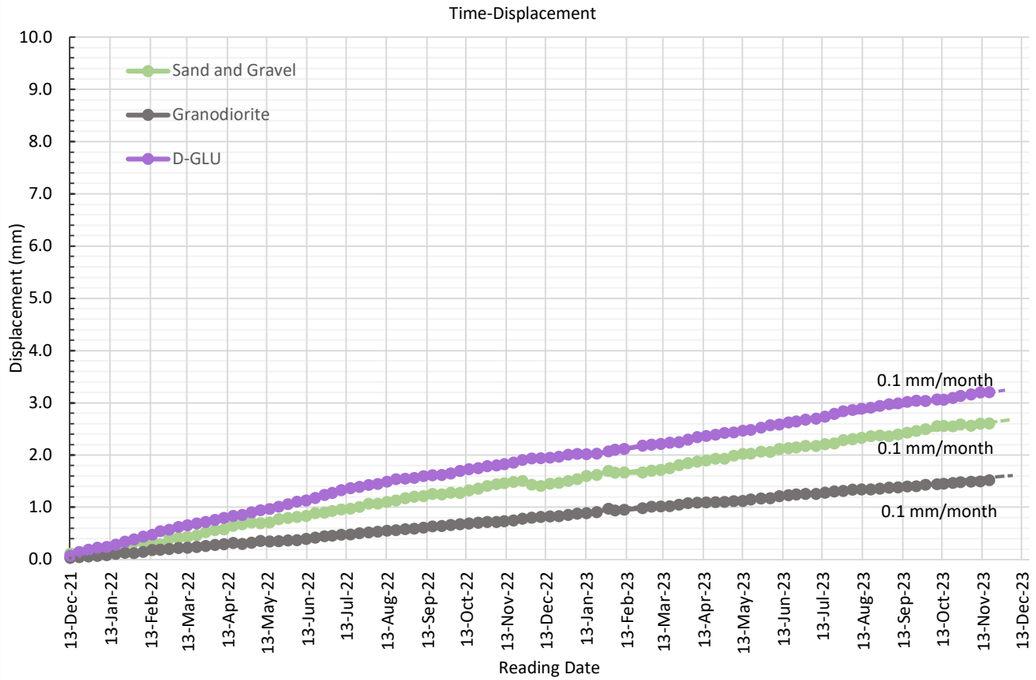
Klohn Crippen Berger

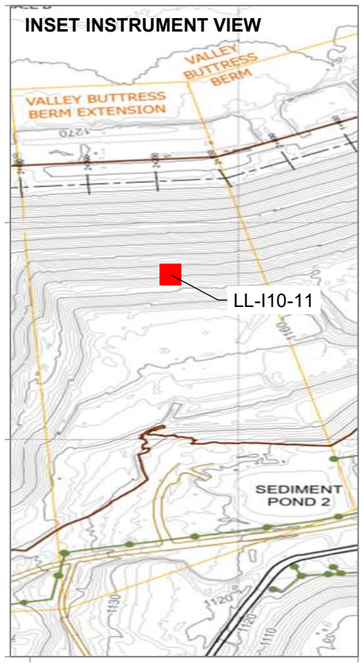
PROJECT
HIGHLAND TAILINGS STORAGE FACILITY
2023 ANNUAL FACILITY PERFORMANCE REPORT

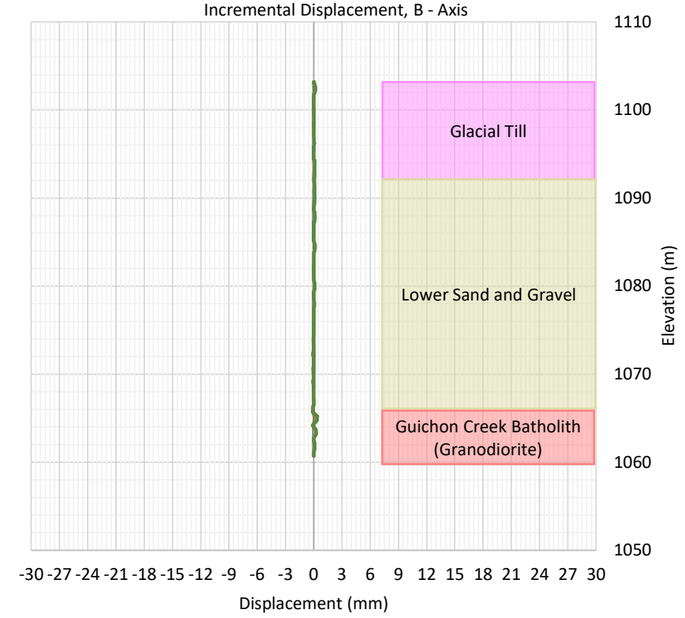
TITLE
LL DAM INCLINOMETER PLOTS
LL-I21-14 (VBB)
DEC. 2021 TO NOV. 2023

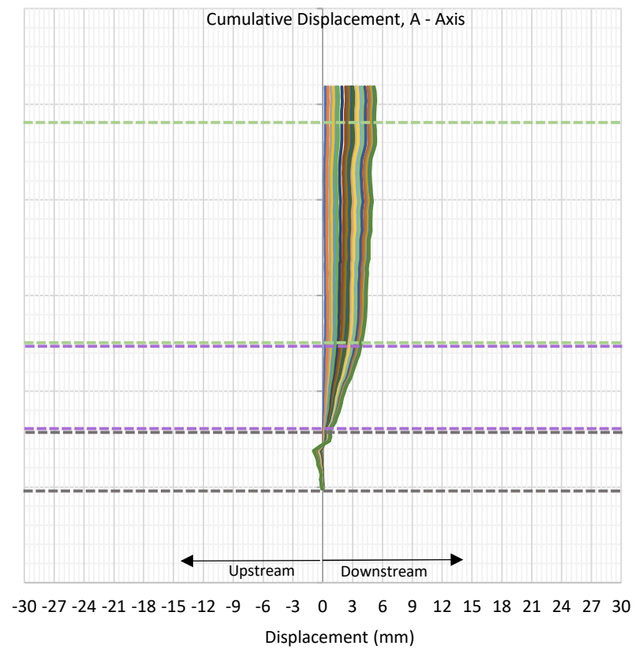
SCALE	PROJECT No.	FIG. No.
NTS	M02341C62	II-B-12

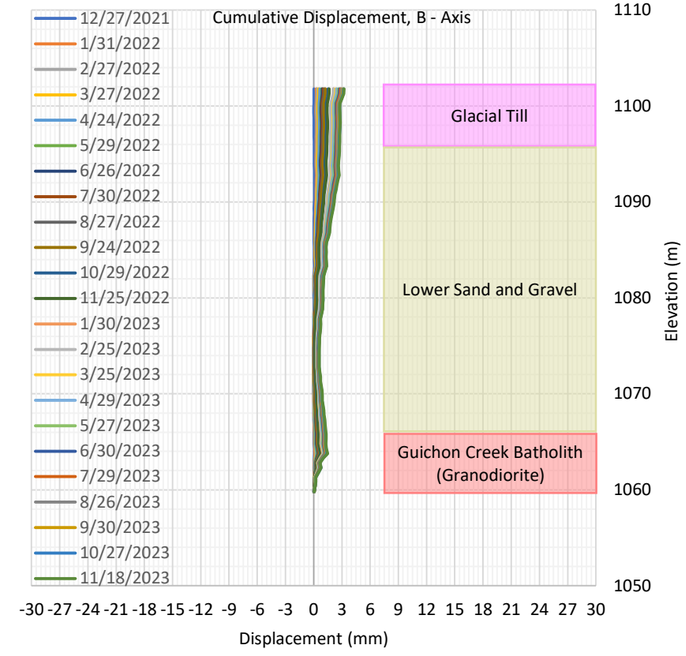
Valley Buttress Berm Extension











NOTES

1. DATA PROCESSED AND PROVIDED BY HVC
2. LAST READING OF EACH MONTH PLOTTED ON THE INCREMENTAL AND CUMULATIVE PROFILES.
3. X-AXIS, Y-AXIS, AND LEGEND IS THE SAME FOR THE INCREMENTAL AND CUMULATIVE PROFILES.
4. INCREMENTAL DISPLACEMENT PROFILES ARE BASED ON READINGS WITHIN ONE WEEK OF THE CUMULATIVE PROFILES.

Geological Unit	EL. Range (m)	NL(mm/month)	T1 (mm/month)	T2 (mm/month)	Colour Code
LSG	1098.0-1075.0	2.0	N/A	N/A	
D-GLU	1075.0-1066.0	0.2	N/A	N/A	
Granodiorite	1066.0-1059.8	2.0	N/A	N/A	

Station	Baseline Reading	Instrument Type
2+200	2021-12-13	SAAV

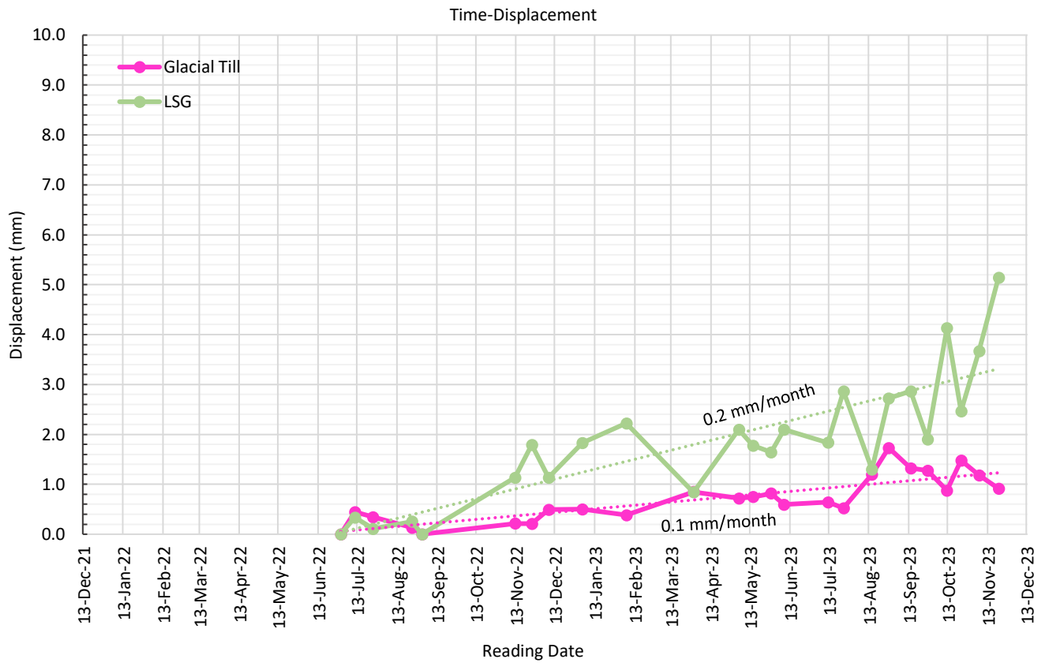
CLIENT
Highland Valley Copper / Teck

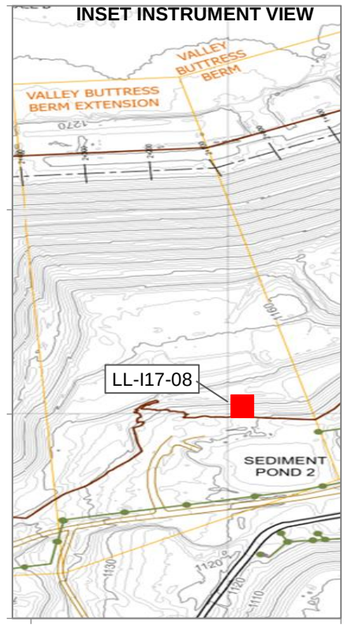
Klohn Crippen Berger

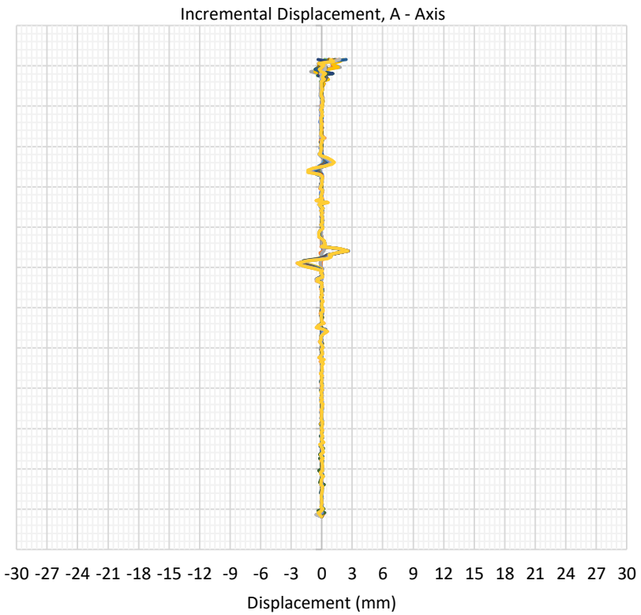
PROJECT
HIGHLAND TAILINGS STORAGE FACILITY
2023 ANNUAL FACILITY PERFORMANCE REPORT

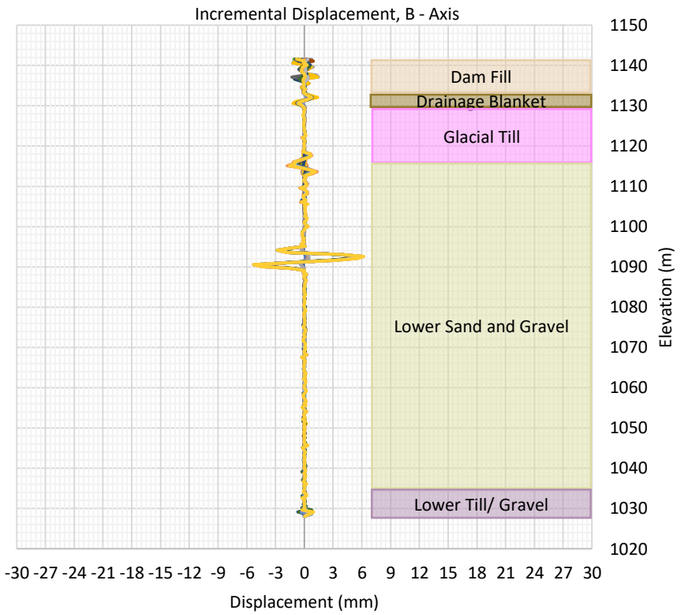
TITLE
LL DAM INCLINOMETER PLOTS
LL-I10-11 (VBBE)
DEC. 2021 TO NOV. 2023

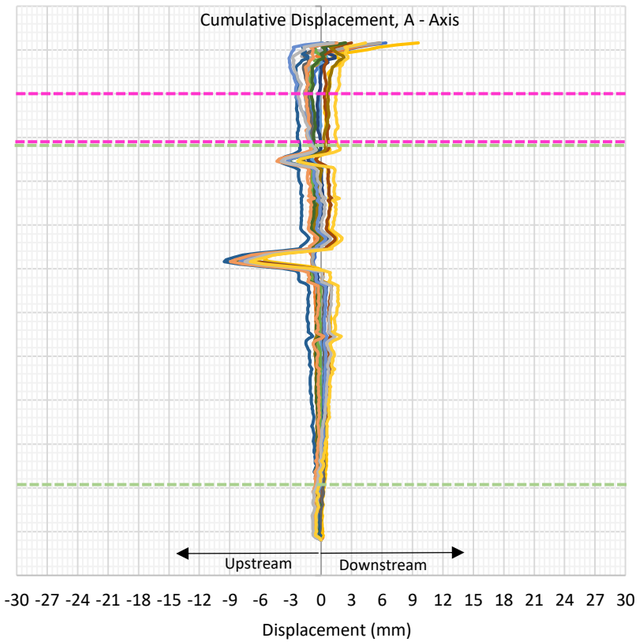
SCALE	PROJECT No.	FIG. No.
NTS	M02341C62	II-B-13

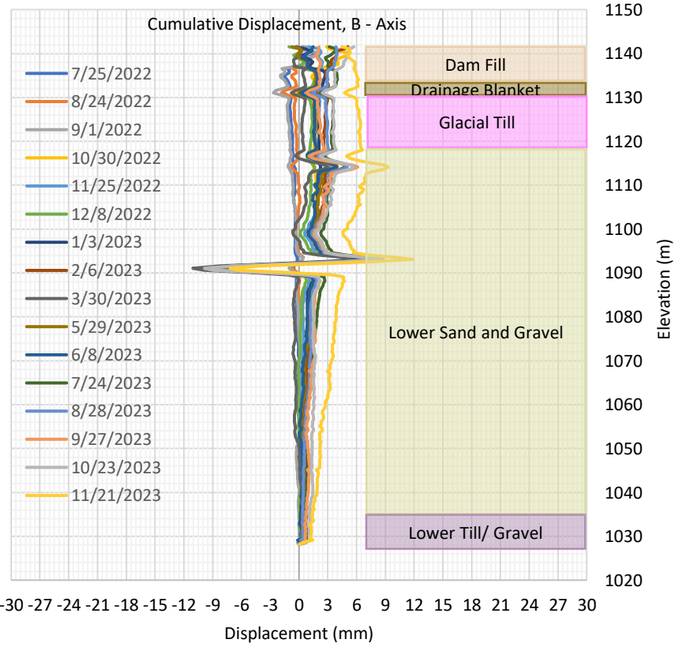












NOTES

1. DATA PROCESSED AND PROVIDED BY HVC
2. LAST READING OF EACH MONTH PLOTTED ON THE INCREMENTAL AND CUMULATIVE PROFILES.
3. X-AXIS, Y-AXIS, AND LEGEND IS THE SAME FOR THE INCREMENTAL AND CUMULATIVE PROFILES.
4. DATA SHOWN ON THE PLOTS IS AFTER THE INSTRUMENT WAS BASELINED. HVC HAVE MONITORED THIS INSTRUMENT PRIOR TO THE BASELINE AND MET THE READING FREQUENCY.

Geological Unit	EL. Range (m)	NL(mm/month)	T1 (mm/month)	T2 (mm/month)	Colour Code
Glacial Till	1130.0-1118.0	2.0	N/A	N/A	
LSG	1118.0-1040.0	2.0	N/A	N/A	

Station	Baseline Reading	Instrument Type
2+150	2022-07-11	SI

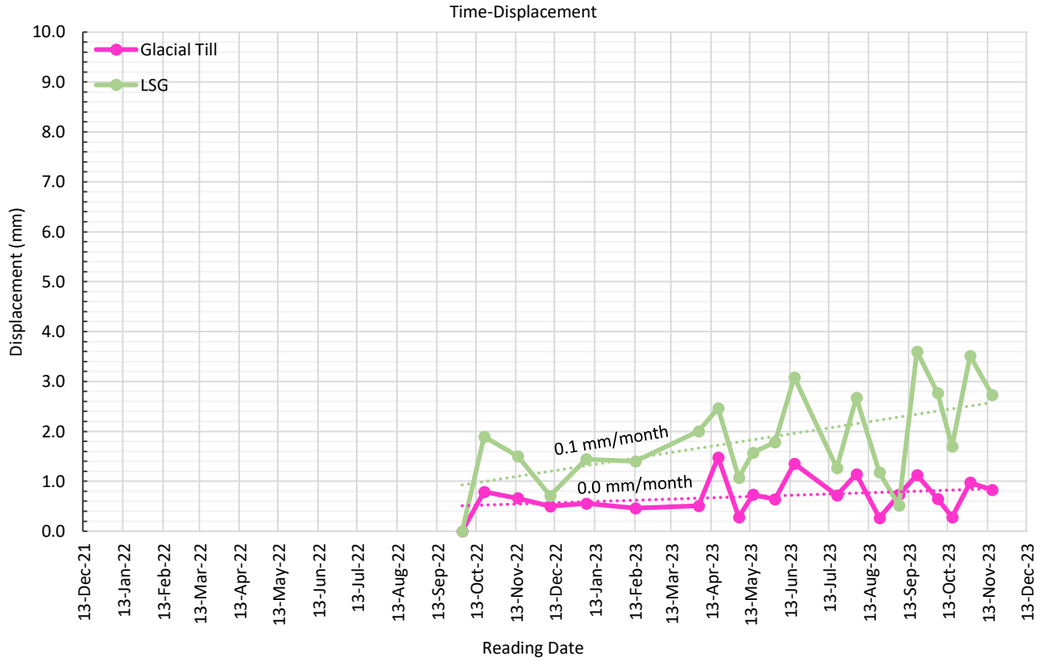
CLIENT: Highland Valley Copper / Teck

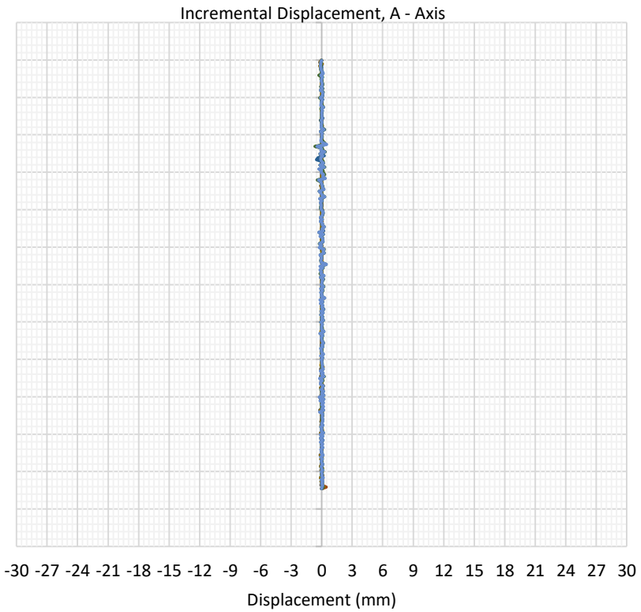
Klohn Crippen Berger

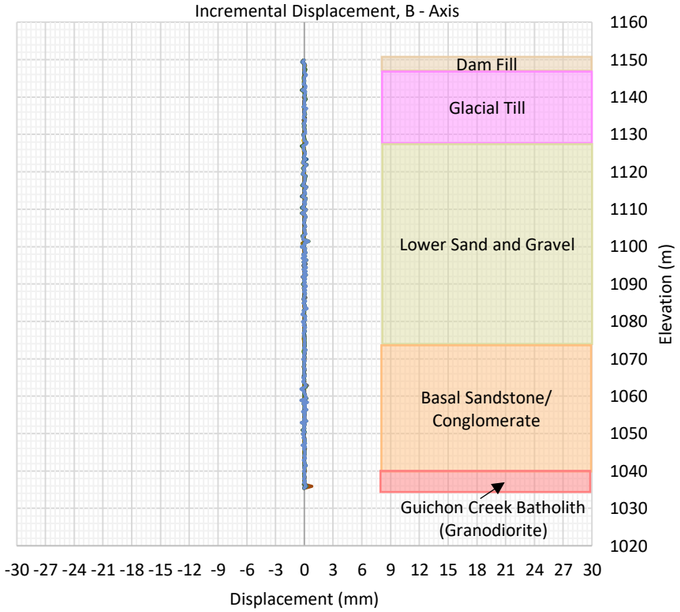
PROJECT: HIGHLAND TAILINGS STORAGE FACILITY
2023 ANNUAL FACILITY PERFORMANCE REPORT

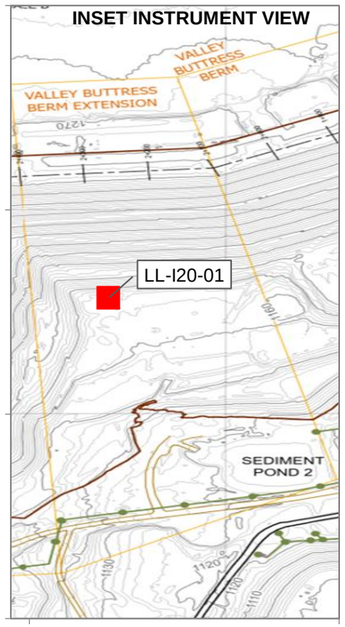
TITLE: LL DAM INCLINOMETER PLOTS
LL-I17-08 (VBBE)
DEC. 2021 TO NOV. 2023

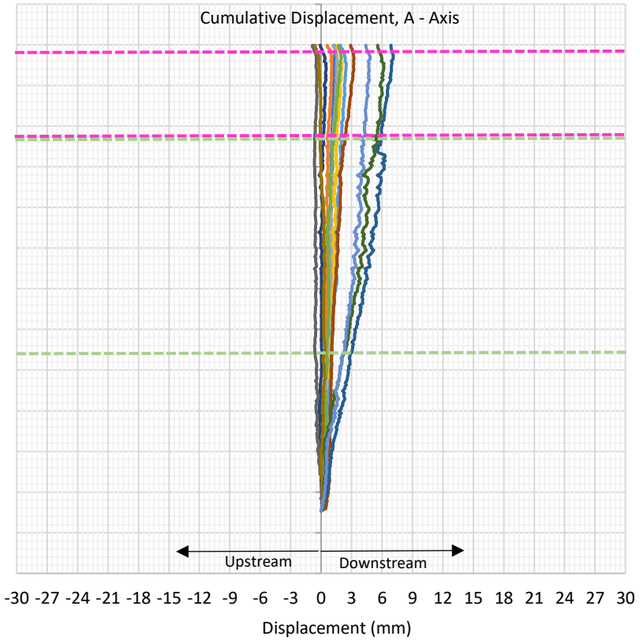
SCALE	PROJECT No.	FIG. No.
NTS	M02341C62	II-B-14

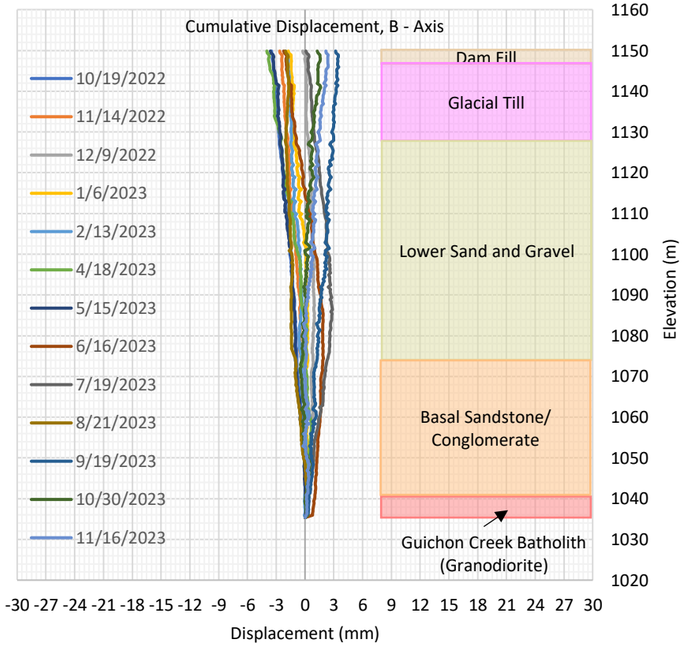












NOTES

1. DATA PROCESSED AND PROVIDED BY HVC
2. LAST READING OF EACH MONTH PLOTTED ON THE INCREMENTAL AND CUMULATIVE PROFILES.
3. X-AXIS, Y-AXIS, AND LEGEND IS THE SAME FOR THE INCREMENTAL AND CUMULATIVE PROFILES.
4. DATA SHOWN ON THE PLOTS IS AFTER THE INSTRUMENT WAS BASELINED. HVC HAVE MONITORED THIS INSTRUMENT PRIOR TO THE BASELINE AND MET THE READING FREQUENCY.

Geological Unit	EL. Range (m)	NL(mm/month)	T1 (mm/month)	T2 (mm/month)	Colour Code
Glacial Till	1148.0-1128.0	2.0	N/A	N/A	
LSG	1128.0-1074.0	2.0	N/A	N/A	

Station	Baseline Reading	Instrument Type
2+350	2022-10-02	SI

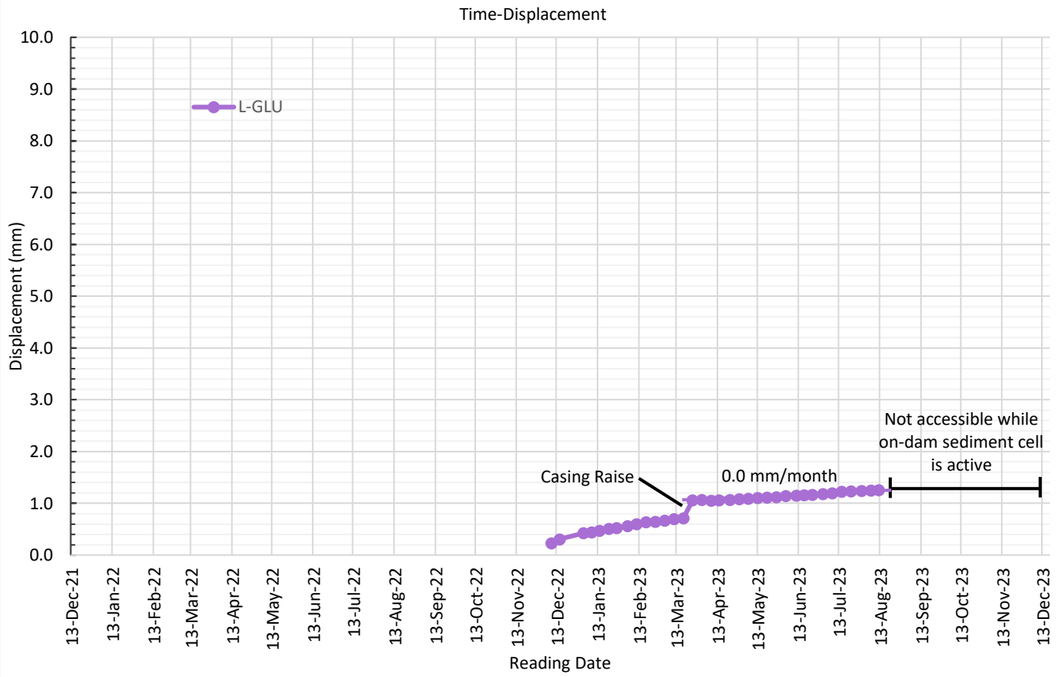
CLIENT
Highland Valley Copper / Teck

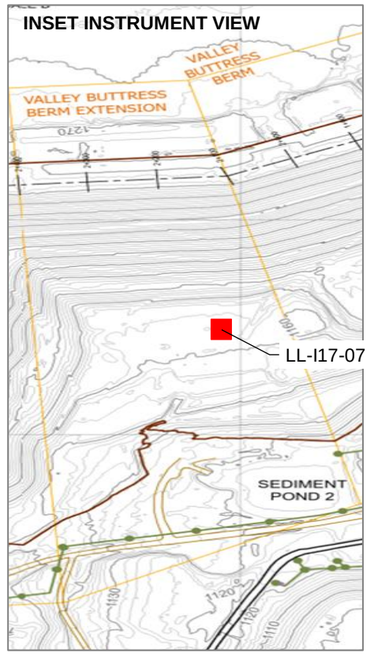
Klohn Crippen Berger

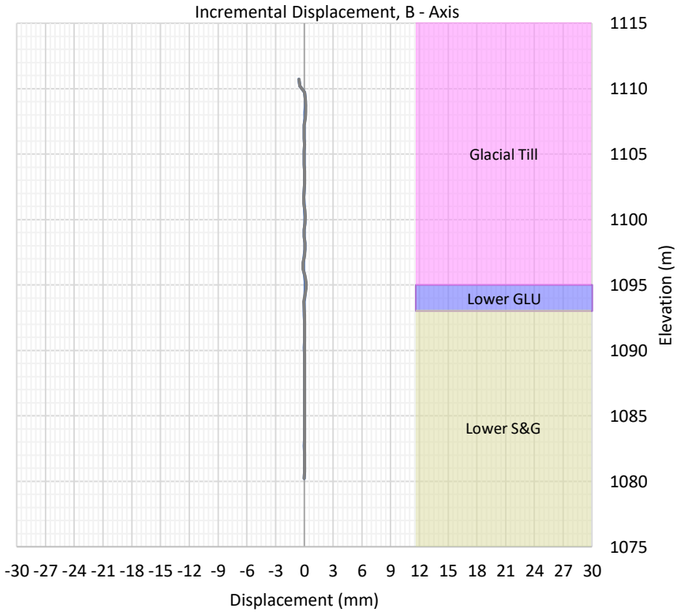
PROJECT
HIGHLAND TAILINGS STORAGE FACILITY
2023 ANNUAL FACILITY PERFORMANCE REPORT

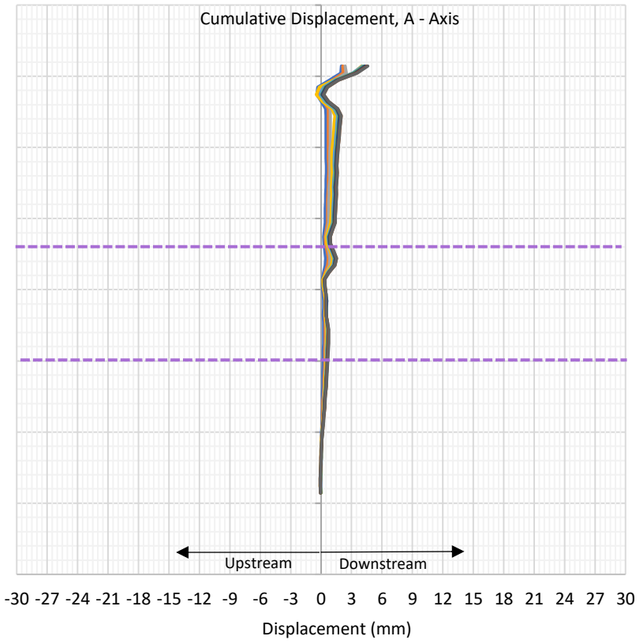
TITLE
LL DAM INCLINOMETER PLOTS
LL-I20-01 (VBBE)
DEC. 2021 TO NOV. 2023

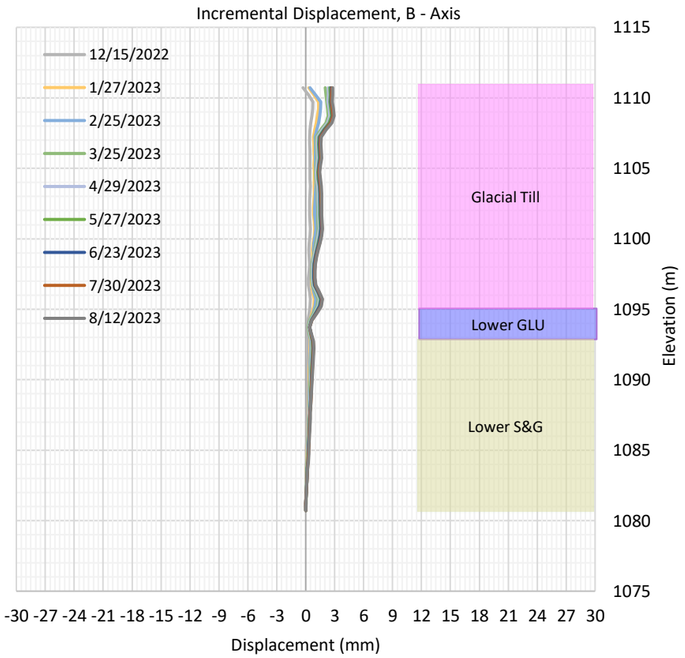
SCALE	PROJECT No.	FIG. No.
NTS	M02341C62	II-B-15











Geological Unit	EL. Range (m)	NL(mm/month)	T1 (mm/month)	T2 (mm/month)	Colour Code
L-GLU	1098.0-1090.0	0.6	N/A	N/A	

Station	Baseline Reading	Instrument Type
2+175	2022-12-08	SAAV

NOTES

1. DATA PROCESSED AND PROVIDED BY HVC
2. LAST READING OF EACH MONTH PLOTTED ON THE INCREMENTAL AND CUMULATIVE PROFILLES.
3. X-AXIS, Y-AXIS, AND LEGEND IS THE SAME FOR THE INCREMENTAL AND CUMULATIVE PROFILES.
4. INCREMENTAL DISPLACEMENT PROFILES ARE BASED ON READINGS WITHIN ONE WEEK OF THE CUMULATIVE PROFILE
5. INSTRUMENT WAS CONVERETED TO SAAV.
6. HVC NOTE THAT THE INSTRUMENT WAS NOT ACCESSIBLE TOWARDS THE END OF 2023.

CLIENT
Highland Valley Copper / Teck

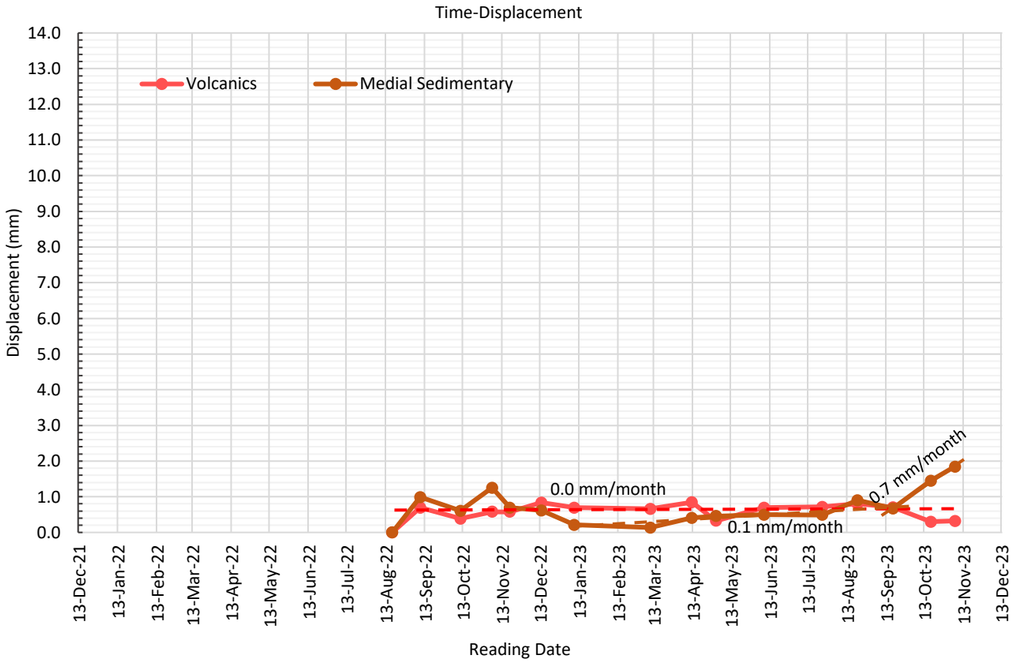
Klohn Crippen Berger

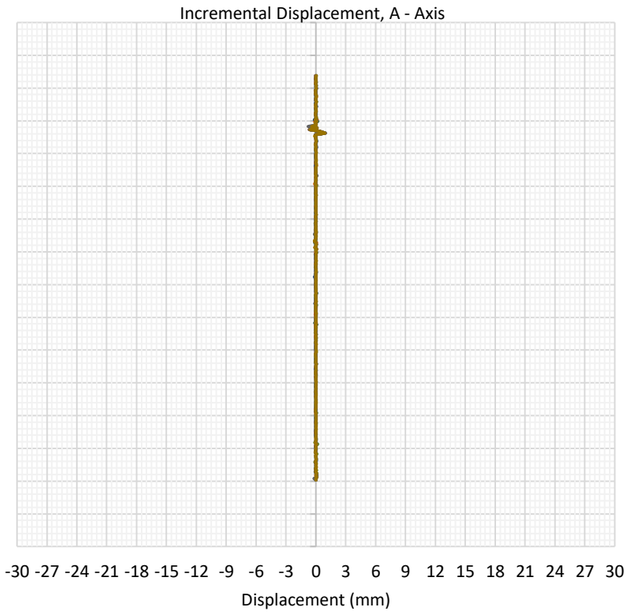
PROJECT
HIGHLAND TAILINGS STORAGE FACILITY
2023 ANNUAL FACILITY PERFORMANCE REPORT

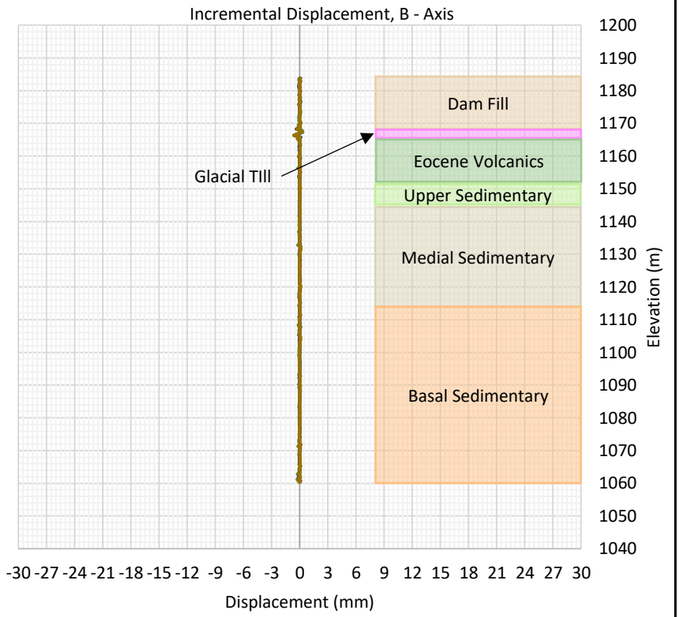
TITLE
LL DAM INCLINOMETER PLOTS
LL-I17-07 (VBBE)
DEC. 2021 TO NOV. 2023

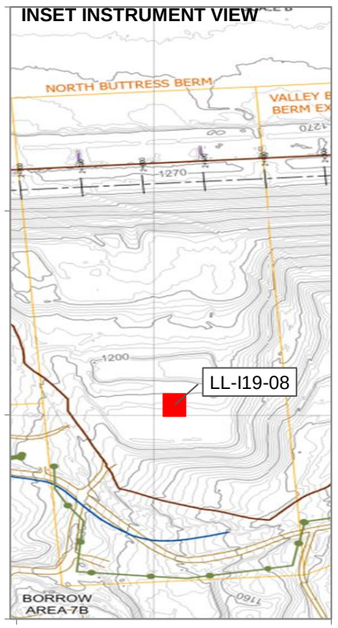
SCALE	PROJECT No.	FIG. No.
NTS	M02341C62	II-B-16

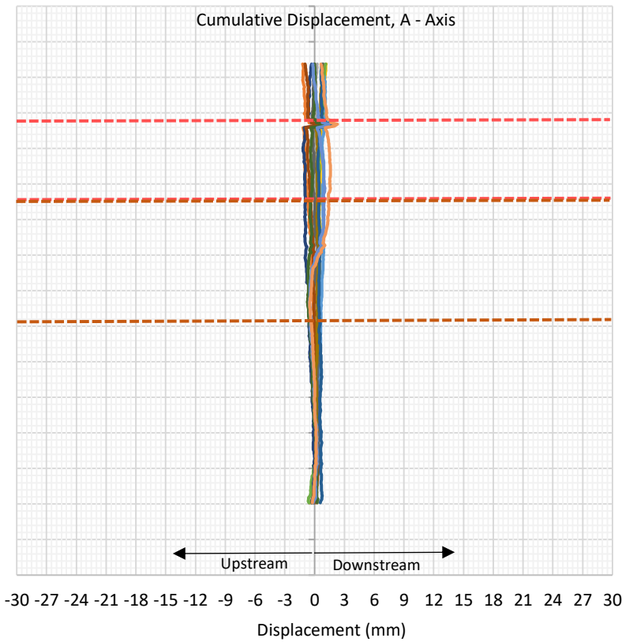
North Buttress Berm

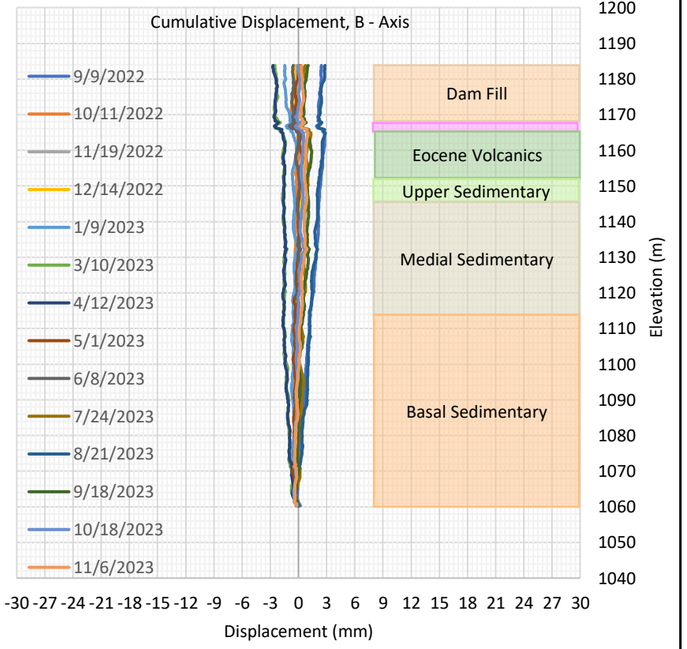












NOTES

1. DATA PROCESSED AND PROVIDED BY HVC
2. LAST READING OF EACH MONTH PLOTTED ON THE INCREMENTAL AND CUMULATIVE PROFILES.
3. X-AXIS, Y-AXIS, AND LEGEND IS THE SAME FOR THE INCREMENTAL AND CUMULATIVE PROFILES.
4. DATA SHOWN ON THE PLOTS IS AFTER THE INSTRUMENT WAS BASELINED. HVC HAVE MONITORED THIS INSTRUMENT PRIOR TO THE BASELINE AND MET THE READING FREQUENCY.
5. A SKEW ANGLE OF 349 DEGREES HAS BEEN APPLIED TO THIS INSTRUMENT.

Geological Unit	EL. Range (m)	NL(mm/month)	T1 (mm/month)	T2 (mm/month)	Colour Code
Volcanics	1168.0-1146.0	2.0	N/A	N/A	
Medial Sedimentary	1146.0-1112.0	2.0	N/A	N/A	

Station	Baseline Reading	Instrument Type
2+570	2022-08-18	SI

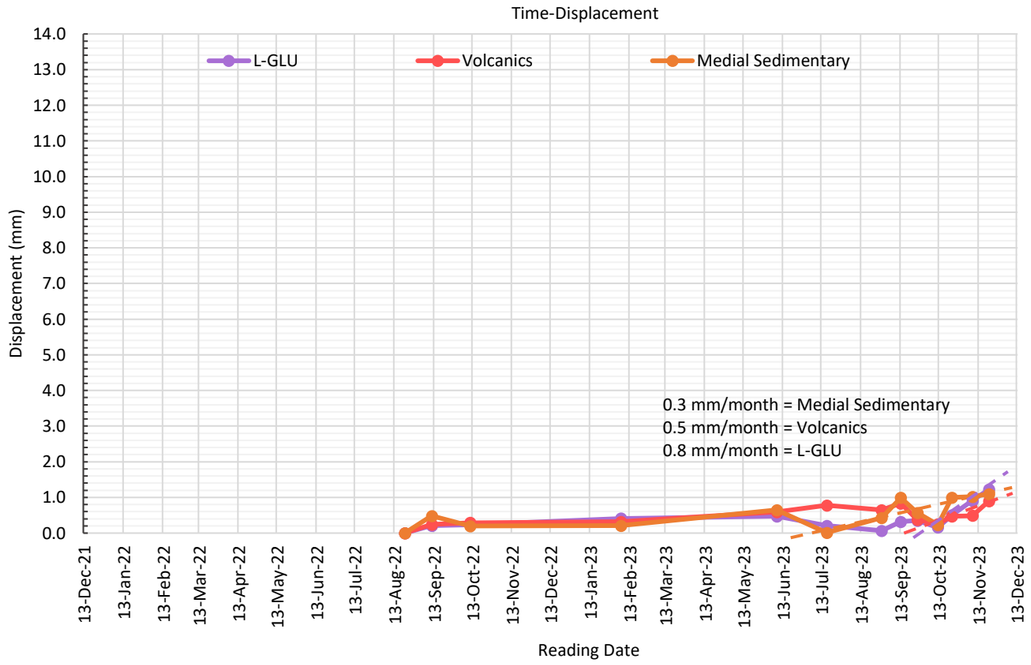
CLIENT: Highland Valley Copper / Teck

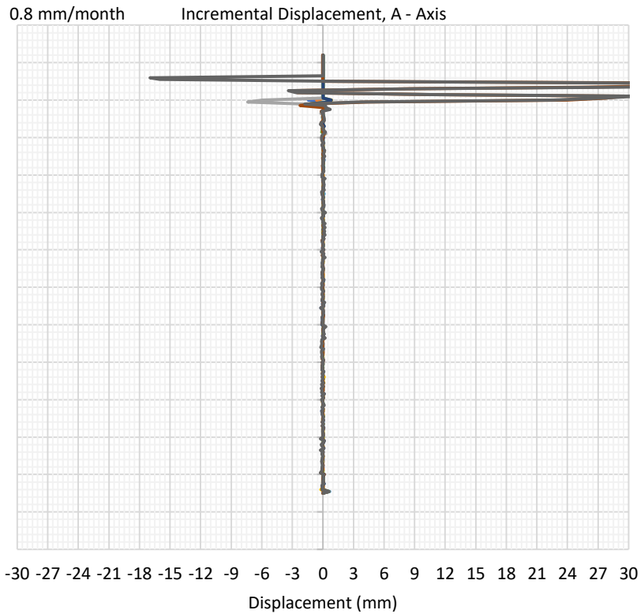
Klohn Crippen Berger

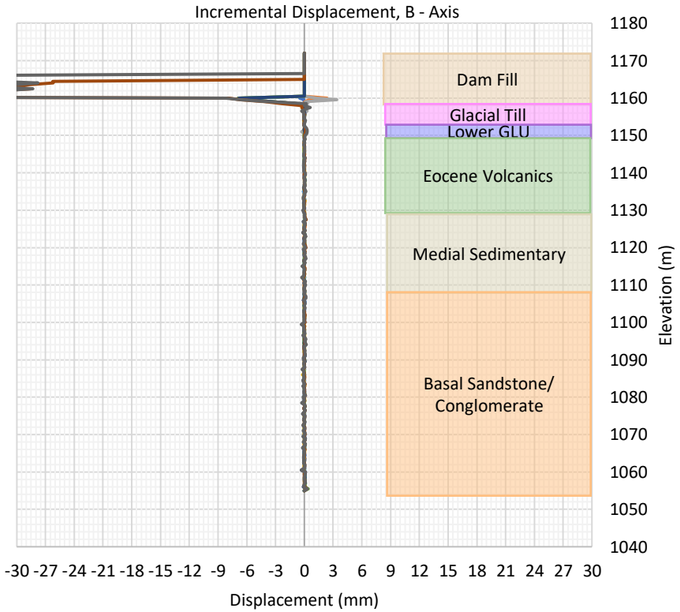
PROJECT: HIGHLAND TAILINGS STORAGE FACILITY
2023 ANNUAL FACILITY PERFORMANCE REPORT

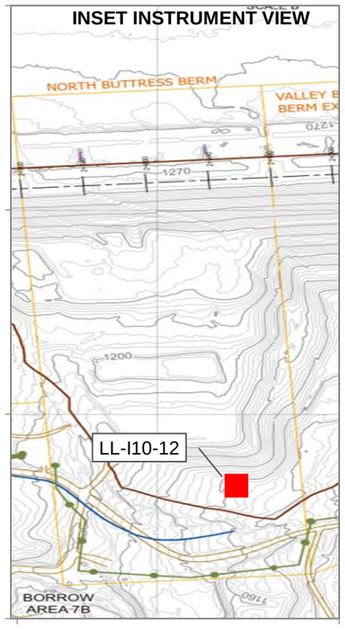
TITLE: LL DAM INCLINOMETER PLOTS
LL-I19-08 (NBB)
DEC. 2021 TO NOV. 2023

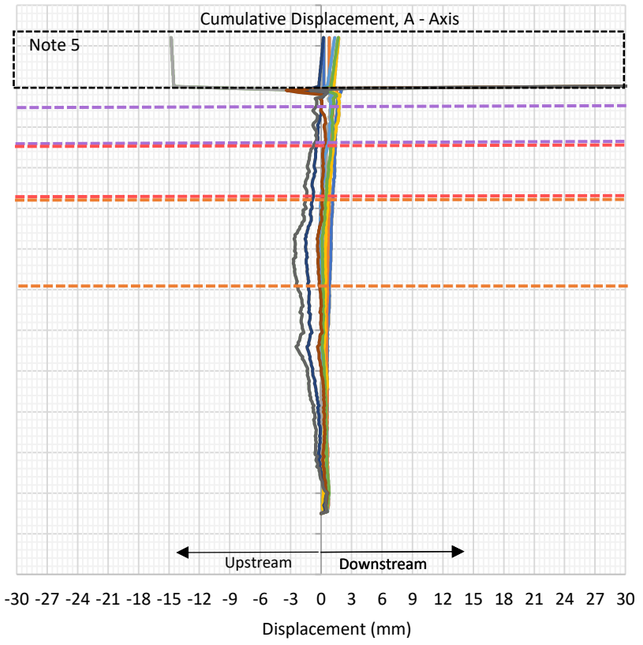
SCALE	PROJECT No.	FIG. No.
NTS	M02341C62	II-B-17

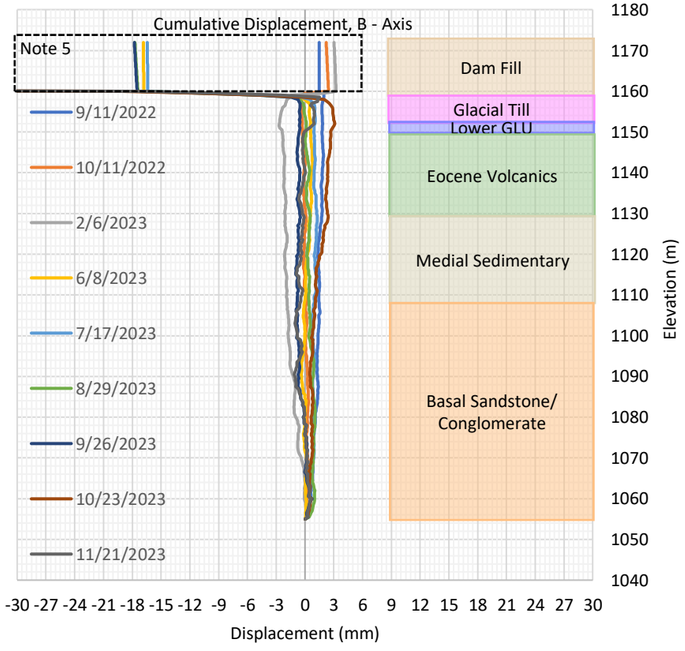












NOTES

1. DATA PROCESSED AND PROVIDED BY HVC
2. LAST READING OF EACH MONTH PLOTTED ON THE INCREMENTAL AND CUMULATIVE PROFILES.
3. X-AXIS, Y-AXIS, AND LEGEND IS THE SAME FOR THE INCREMENTAL AND CUMULATIVE PROFILES.
4. A SPIRAL CORRECTION AND A SKEW ANGLE OF 4 DEGREES HAS BEEN APPLIED TO THIS INSTRUMENT.
5. READINGS ABOVE EL. 1160 m ARE NOT REFLECTIVE OF ACTUAL MOVEMENT AND SHOULD BE IGNORED.

Geological Unit	EL. Range (m)	NL(mm/month)	T1 (mm/month)	T2 (mm/month)	Colour Code
L-GLU	1154.5-1147.5	1.0	2.0	N/A	
Volcanics	1147.9-1132.9	2.0	N/A	N/A	
Medial Sed.	1132.9-1110.9	2.0	N/A	N/A	

Station	Baseline Reading	Instrument Type
2+500	2022-08-21	SI

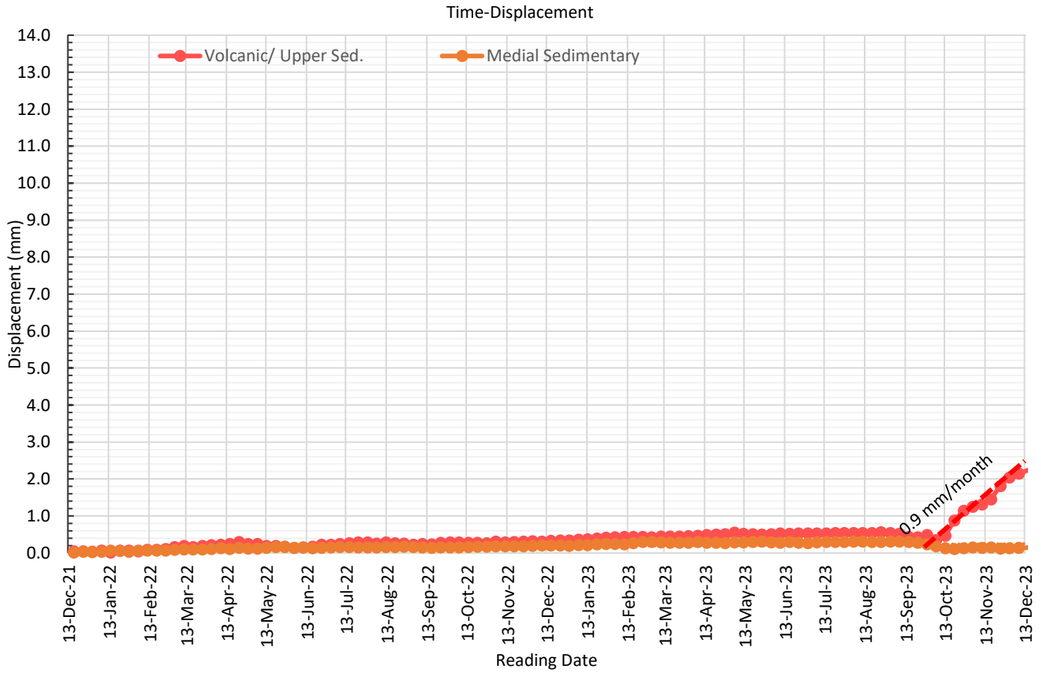
CLIENT
Highland Valley Copper / Teck

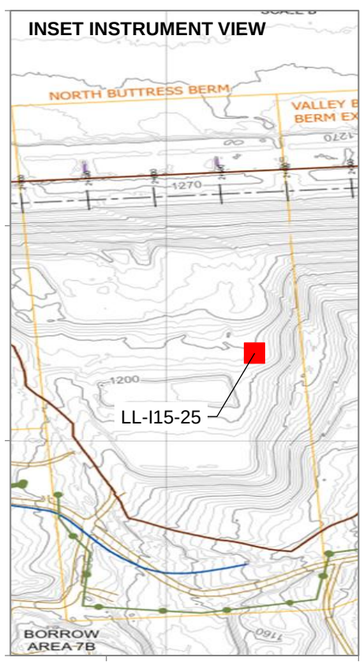
Klohn Crippen Berger

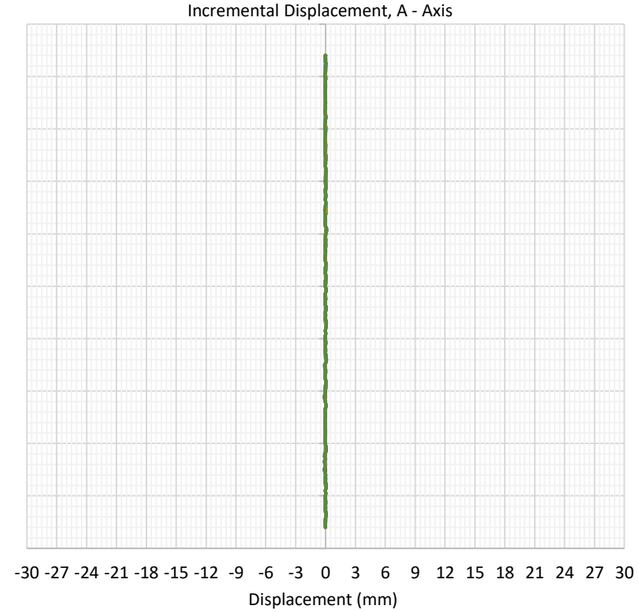
PROJECT
HIGHLAND TAILINGS STORAGE FACILITY
2023 ANNUAL FACILITY PERFORMANCE REPORT

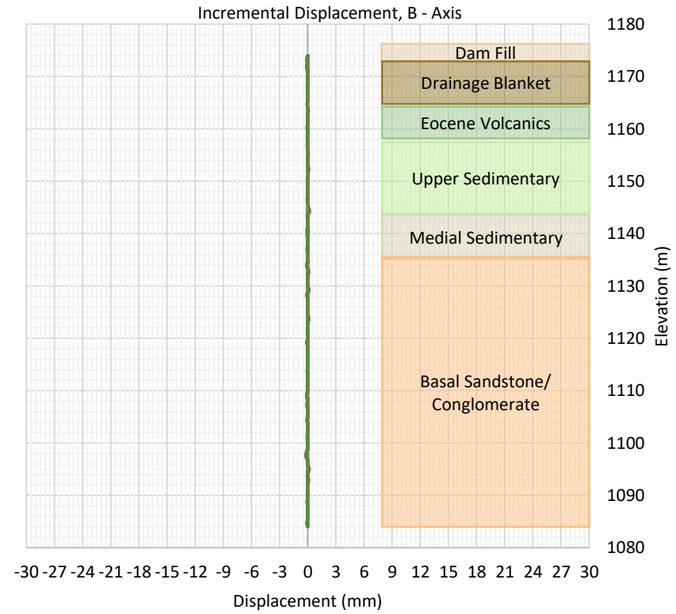
TITLE
LL DAM INCLINOMETER PLOTS
LL-I10-12 (NBB)
DEC. 2021 TO NOV. 2023

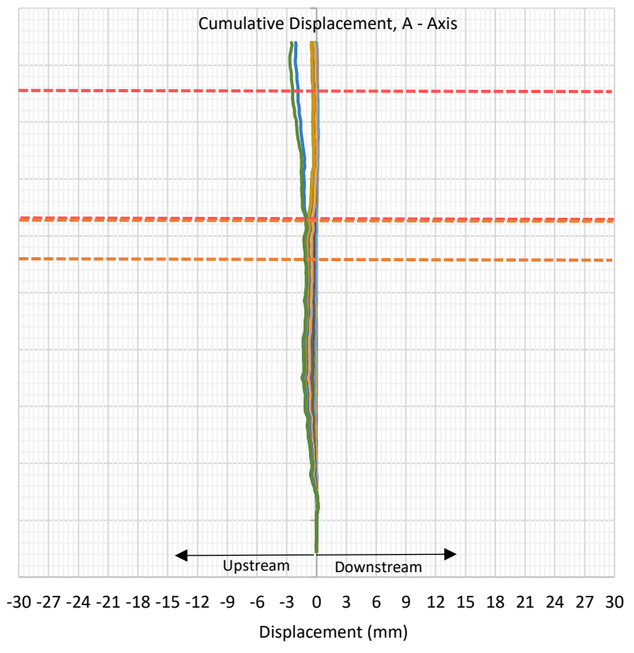
SCALE	PROJECT No.	FIG. No.
NTS	M02341C62	II-B-18

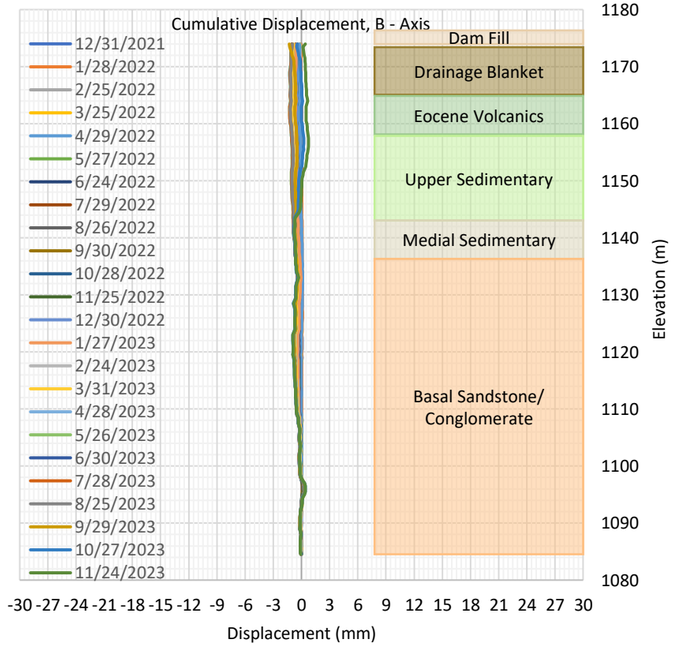












NOTES

1. DATA PROCESSED AND PROVIDED BY HVC
2. LAST READING OF EACH MONTH PLOTTED ON THE INCREMENTAL AND CUMULATIVE PROFILES.
3. X-AXIS, Y-AXIS, AND LEGEND IS THE SAME FOR THE INCREMENTAL AND CUMULATIVE PROFILES.
4. AN AZIMUTH CORRECTION OF 334 DEGREES HAS BEEN APPLIED TO THIS INSTRUMENT.

Geological Unit	EL. Range (m)	NL(mm/month)	T1 (mm/month)	T2 (mm/month)	Colour Code
Volcanic/Up. Sed.	1165.0-1143.0	2.0	N/A	N/A	
Medial Sed.	1143.0-1136.0	1.0	N/A	N/A	

Station	Baseline Reading	Instrument Type
2+550	2021-12-13	SAAV

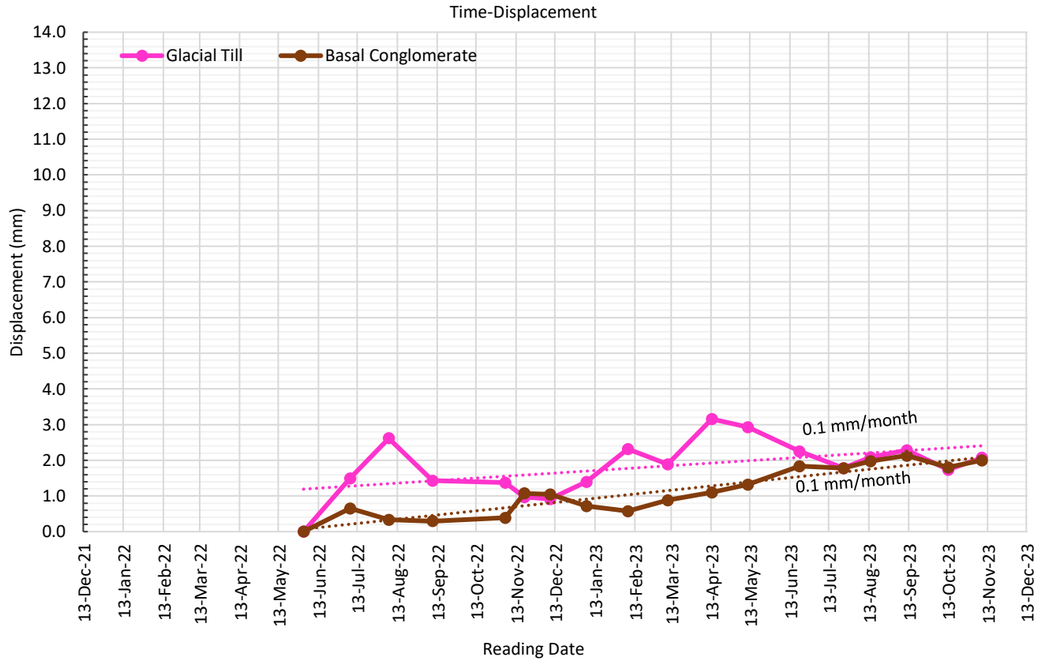
CLIENT
Highland Valley Copper / Teck

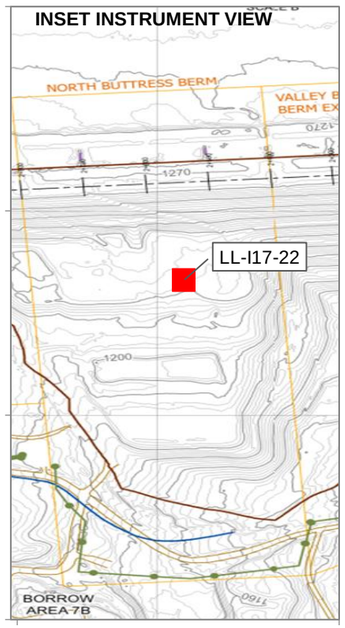
Klohn Crippen Berger

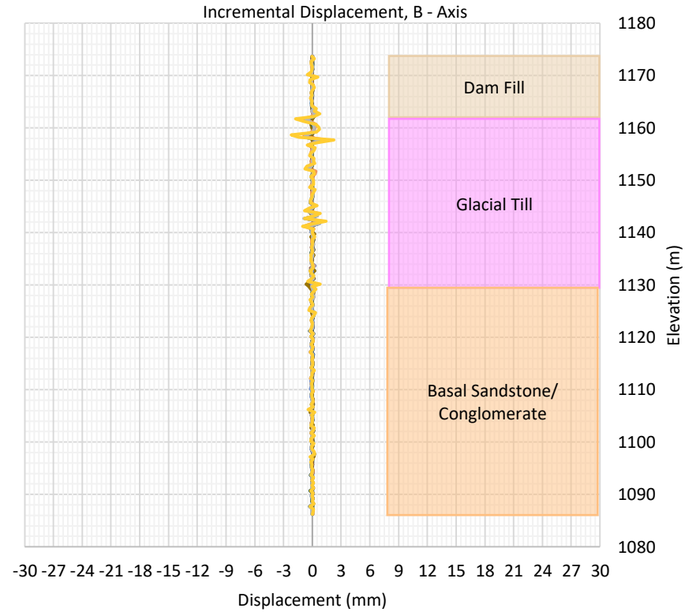
PROJECT
HIGHLAND TAILINGS STORAGE FACILITY
2023 ANNUAL FACILITY PERFORMANCE REPORT

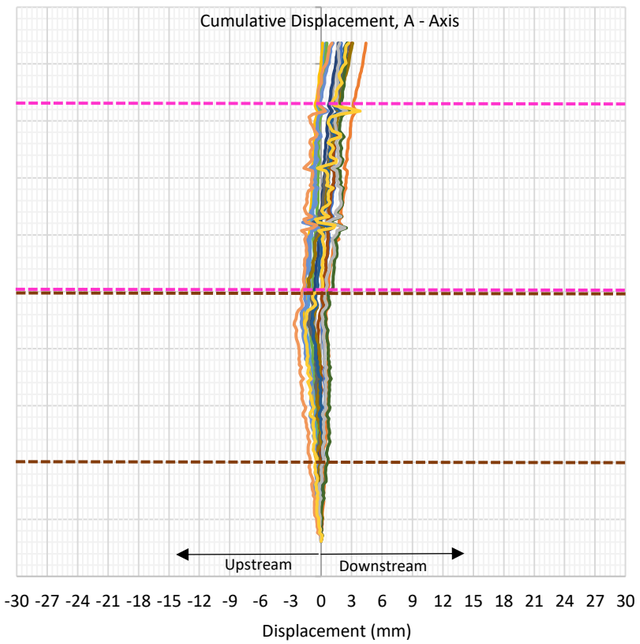
TITLE
LL DAM INCLINOMETER PLOTS
LL-I15-25 (NBB)
DEC. 2021 TO NOV. 2023

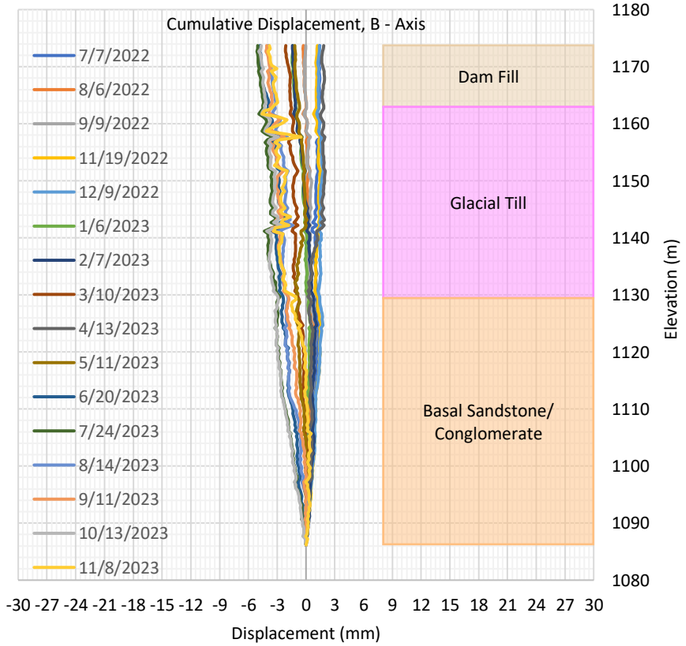
SCALE	PROJECT No.	FIG. No.
NTS	M02341C62	II-B-19











NOTES

1. DATA PROCESSED AND PROVIDED BY HVC
2. LAST READING OF EACH MONTH PLOTTED ON THE INCREMENTAL AND CUMULATIVE PROFILES.
3. X-AXIS, Y-AXIS, AND LEGEND IS THE SAME FOR THE INCREMENTAL AND CUMULATIVE PROFILES.
4. DATA SHOWN ON THE PLOTS IS AFTER THE INSTRUMENT WAS BASELINED. HVC HAVE MONITORED THIS INSTRUMENT PRIOR TO THE BASELINE AND MET THE READING FREQUENCY.
5. A SPIRAL CORRECTION AND A SKEW ANGLE OF 348 DEGREES HAS BEEN APPLIED TO THIS INSTRUMENT.

Geological Unit	EL. Range (m)	NL(mm/month)	T1 (mm/month)	T2 (mm/month)	Colour Code
Glacial Till	1163.0-1130.0	2.0	N/A	N/A	
Basal Conglomerate	1130.0-1100.0	2.0	N/A	N/A	

Station	Baseline Reading	Instrument Type
2+570	2022-06-01	SI

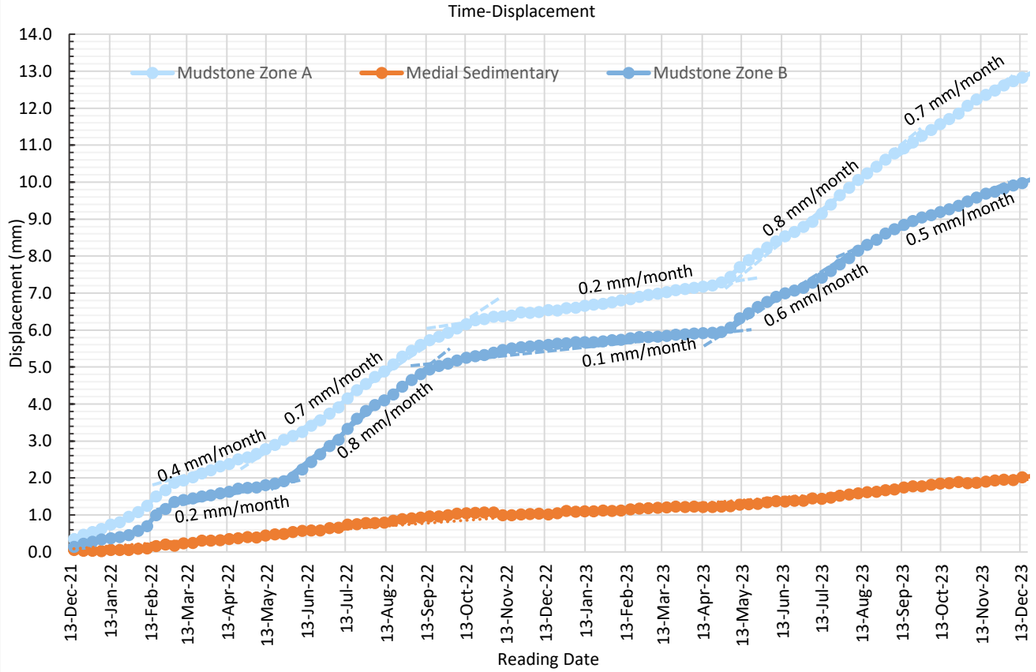
CLIENT
Highland Valley Copper / Teck

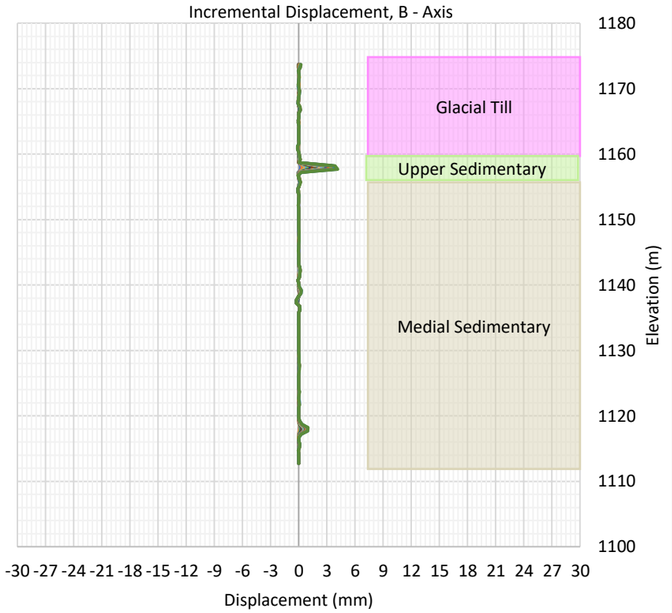
Klohn Crippen Berger

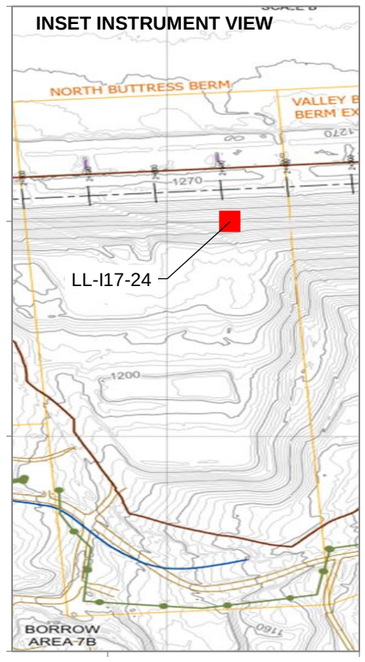
PROJECT
HIGHLAND TAILINGS STORAGE FACILITY
2023 ANNUAL FACILITY PERFORMANCE REPORT

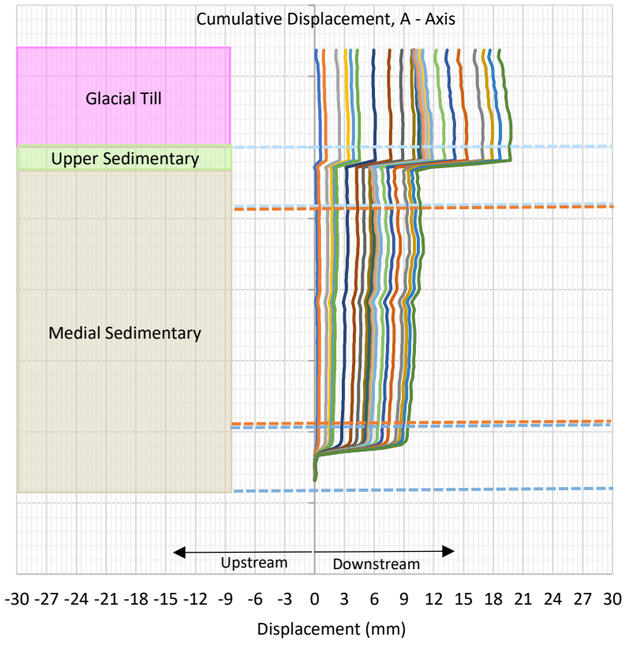
TITLE
LL DAM INCLINOMETER PLOTS
LL-I17-22 (NBB)
DEC. 2021 TO NOV. 2023

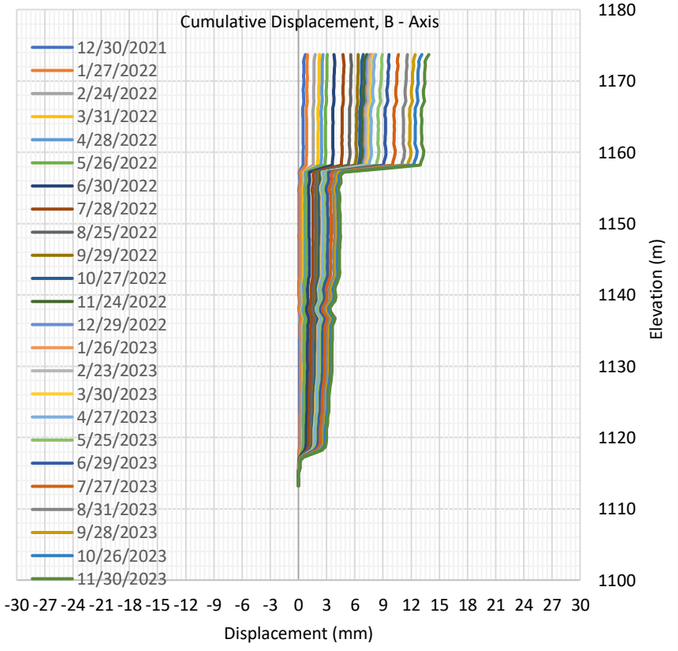
SCALE	PROJECT No.	FIG. No.
NTS	M02341C62	II-B-20











NOTES

1. DATA PROCESSED AND PROVIDED BY HVC
2. LAST READING OF EACH MONTH PLOTTED ON THE INCREMENTAL AND CUMULATIVE PROFILES.
3. X-AXIS, Y-AXIS, AND LEGEND IS THE SAME FOR THE INCREMENTAL AND CUMULATIVE PROFILES.
4. AN AZIMUTH CORRECTION OF 357 DEGREES HAS BEEN APPLIED TO THIS INSTRUMENT.

Geological Unit	EL. Range (m)	NL(mm/month)	T1 (mm/month)	T2 (mm/month)	Colour Code
Mudstone Zone A	1160.0-1151.0	1.3	4.0	N/A	
Medial Sed.	1151.0-1121.0	1.0	N/A	N/A	
Mudstone Zone B	1121.0-1112.0	1.3	4.5	N/A	

Station	Baseline Reading	Instrument Type
2+575	2021-12-13	SAAV

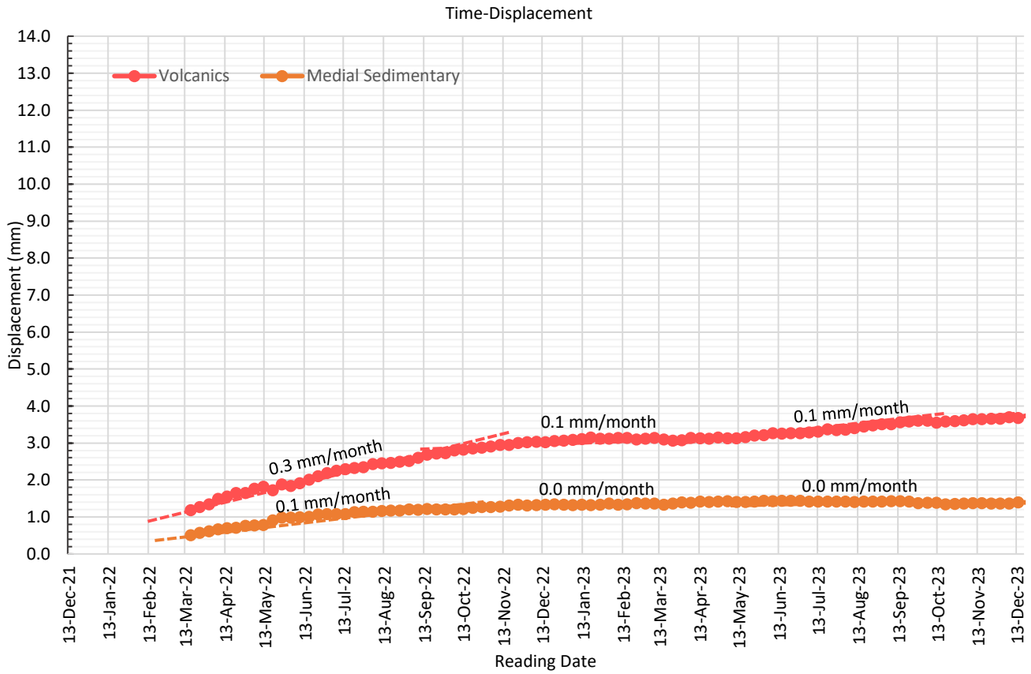
CLIENT
Highland Valley Copper / Teck

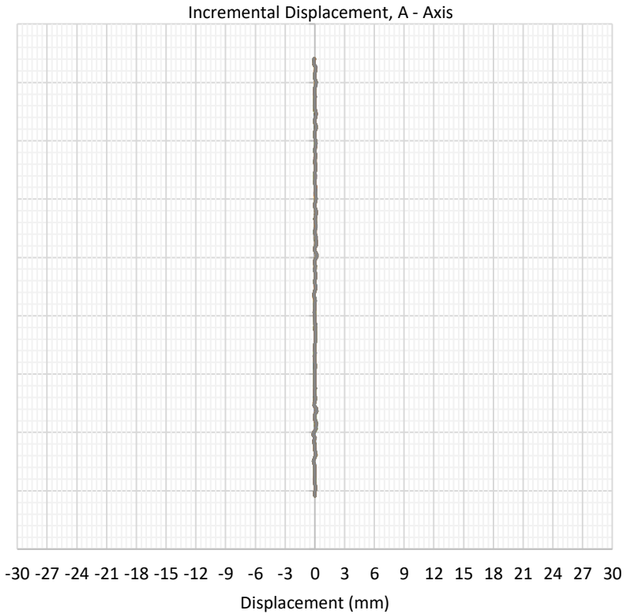
Klohn Crippen Berger

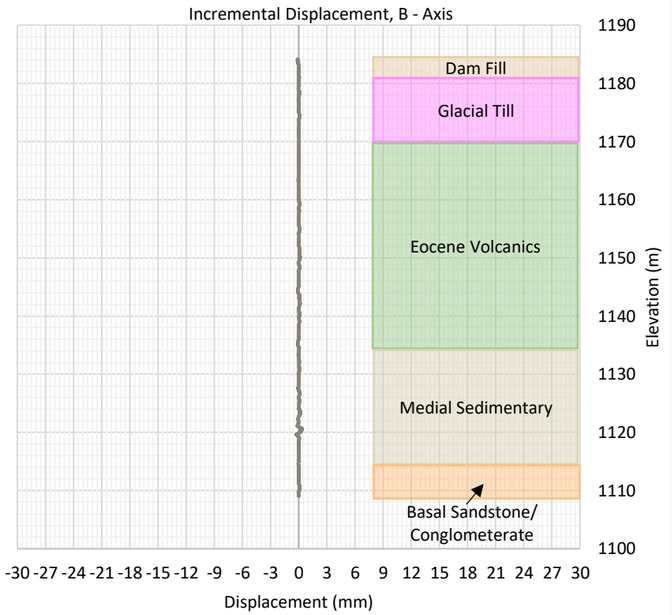
PROJECT
HIGHLAND TAILINGS STORAGE FACILITY
2023 ANNUAL FACILITY PERFORMANCE REPORT

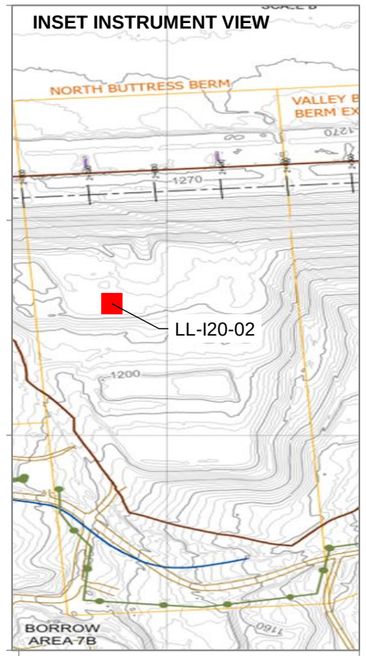
TITLE
LL DAM INCLINOMETER PLOTS
LL-I17-24 (NBB)
DEC. 2021 TO NOV. 2023

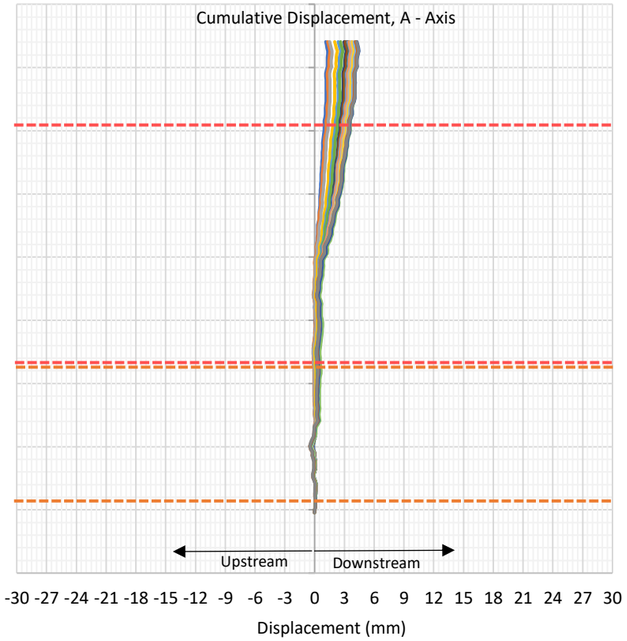
SCALE	PROJECT No.	FIG. No.
NTS	M02341C62	II-B-21

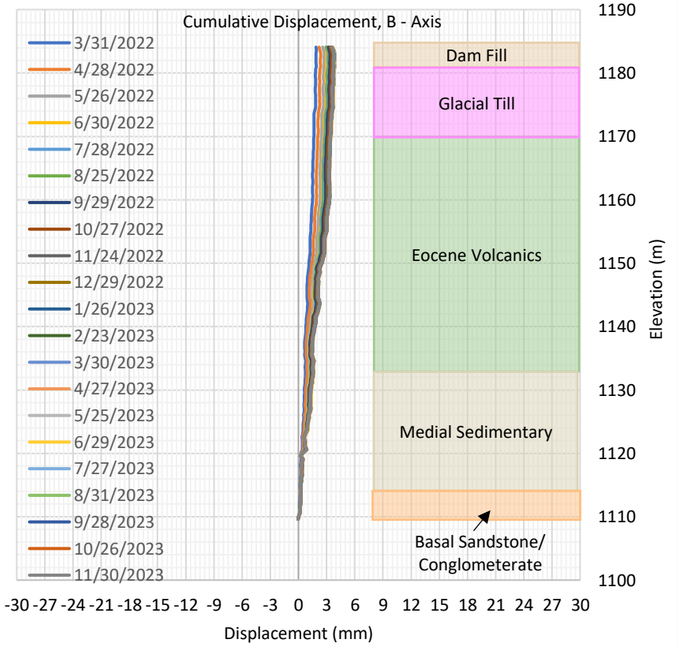












NOTES

1. DATA PROCESSED AND PROVIDED BY HVC
2. LAST READING OF EACH MONTH PLOTTED ON THE INCREMENTAL AND CUMULATIVE PROFILES.
3. X-AXIS, Y-AXIS, AND LEGEND IS THE SAME FOR THE INCREMENTAL AND CUMULATIVE PROFILES.
4. AN AZIMUTH CORRECTION OF 16 DEGREES HAS BEEN APPLIED TO THIS INSTRUMENT.

Geological Unit	EL. Range (m)	NL(mm/month)	T1 (mm/month)	T2 (mm/month)	Colour Code
Volcanics	1171.0-1133.0	2.0	N/A	N/A	
Medial Sed.	1133.0-1112.0	1.0	N/A	N/A	

Station	Baseline Reading	Instrument Type
2+700	2022-03-03	SAAV

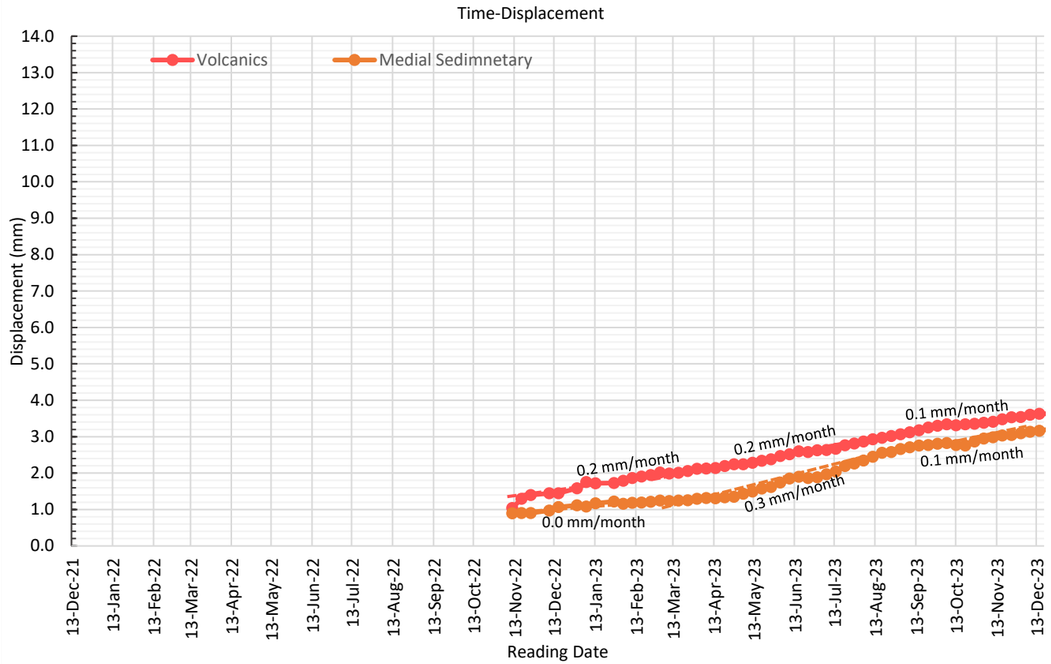
CLIENT
Highland Valley Copper / Teck

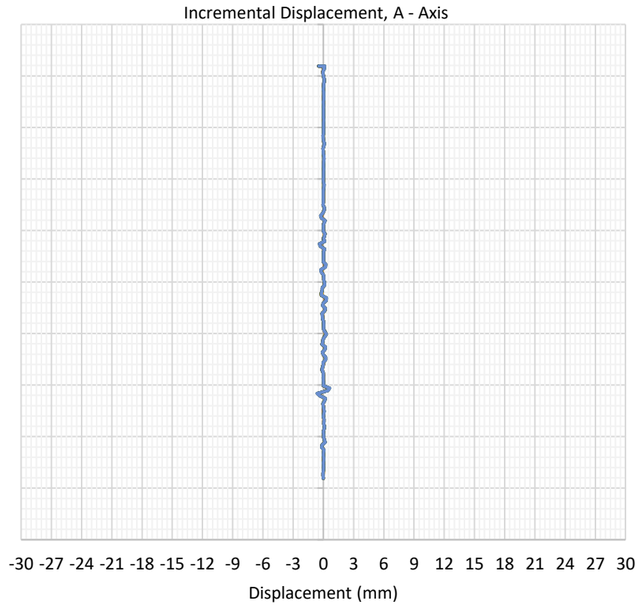
Klohn Crippen Berger

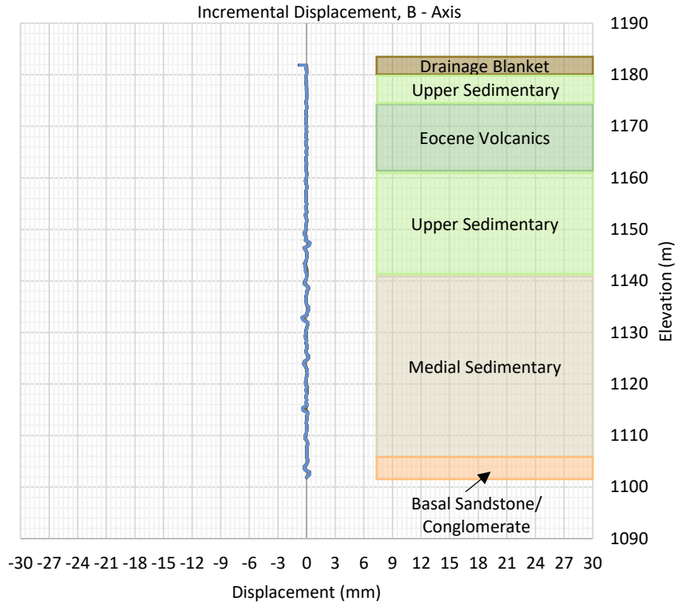
PROJECT
HIGHLAND TAILINGS STORAGE FACILITY
2023 ANNUAL FACILITY PERFORMANCE REPORT

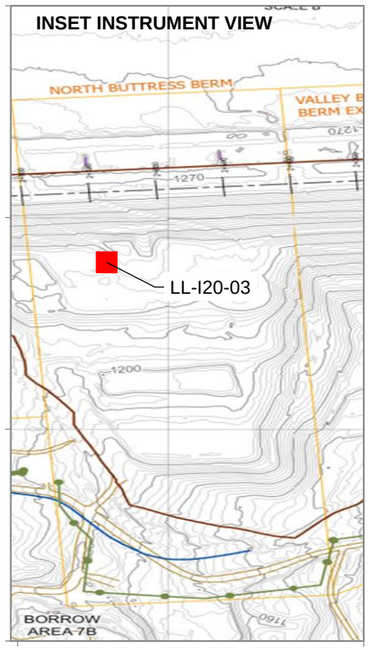
TITLE
LL DAM INCLINOMETER PLOTS
LL-I20-02 (NBB)
DEC. 2021 TO NOV. 2023

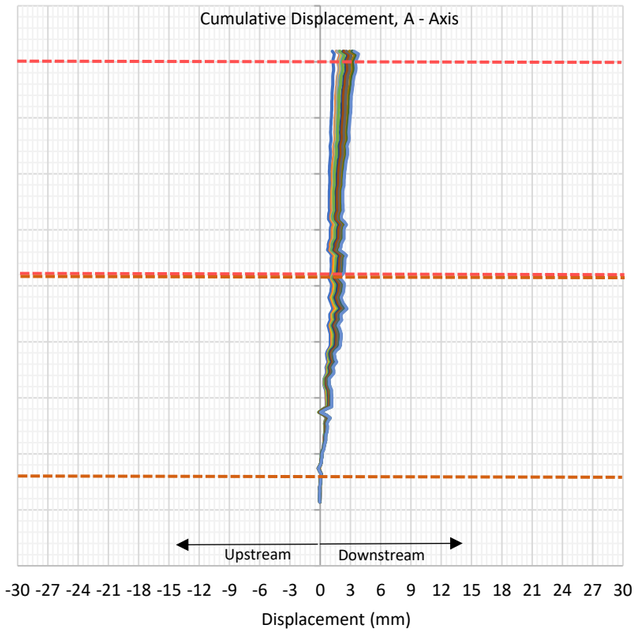
SCALE	PROJECT No.	FIG. No.
NTS	M02341C62	II-B-22

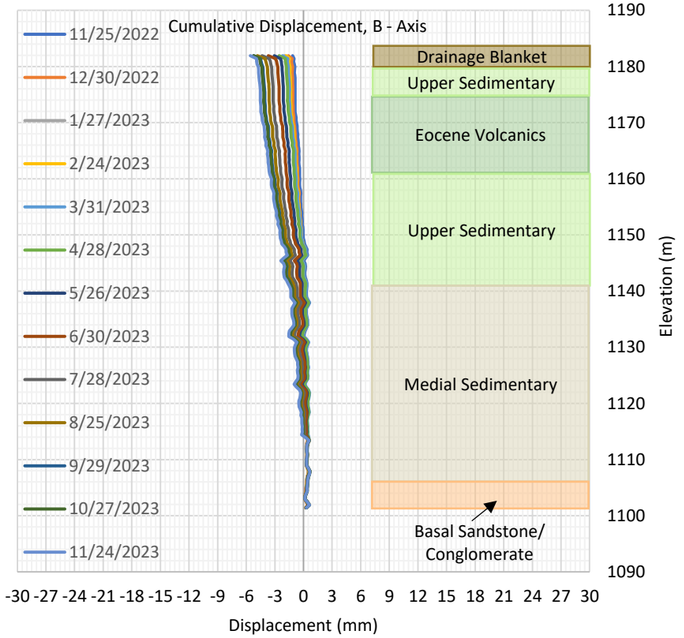












Geological Unit	EL. Range (m)	NL(mm/month)	T1 (mm/month)	T2 (mm/month)	Colour Code
Volcanics	1181.0-1142.0	2.0	N/A	N/A	
Medial Sed	1142.0-1106.0	1.0	N/A	N/A	

Station	Baseline Reading	Instrument Type
2+700	2022-10-07	SAAV

NOTES

1. DATA PROCESSED AND PROVIDED BY HVC
2. LAST READING OF EACH MONTH PLOTTED ON THE INCREMENTAL AND CUMULATIVE PROFILES.
3. X-AXIS, Y-AXIS, AND LEGEND IS THE SAME FOR THE INCREMENTAL AND CUMULATIVE PROFILES.
4. AN AZIMUTH CORRECTION OF 39 DEGREES HAS BEEN APPLED TO THIS INSTRUMENT.

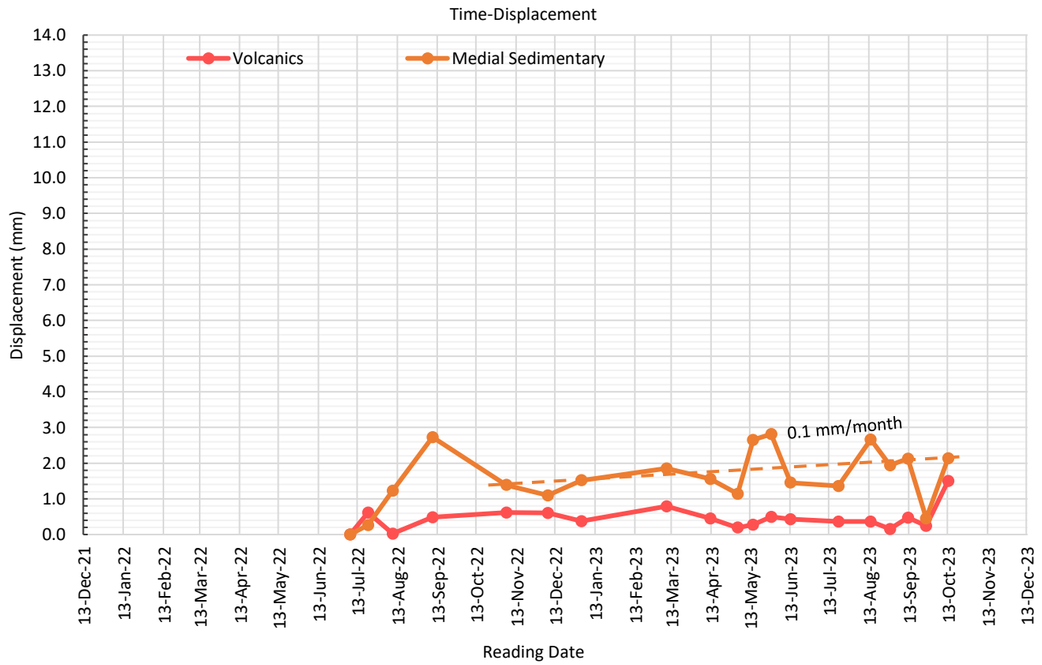
CLIENT
Highland Valley Copper / Teck

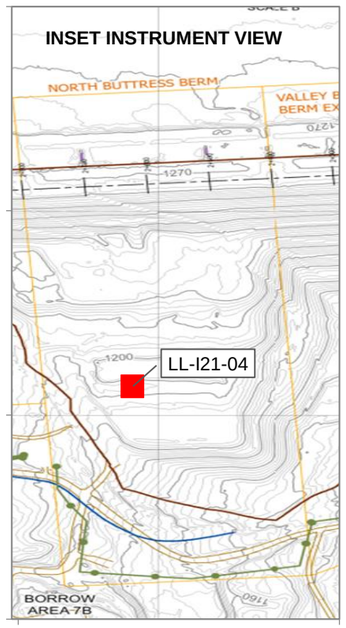
Klohn Crippen Berger

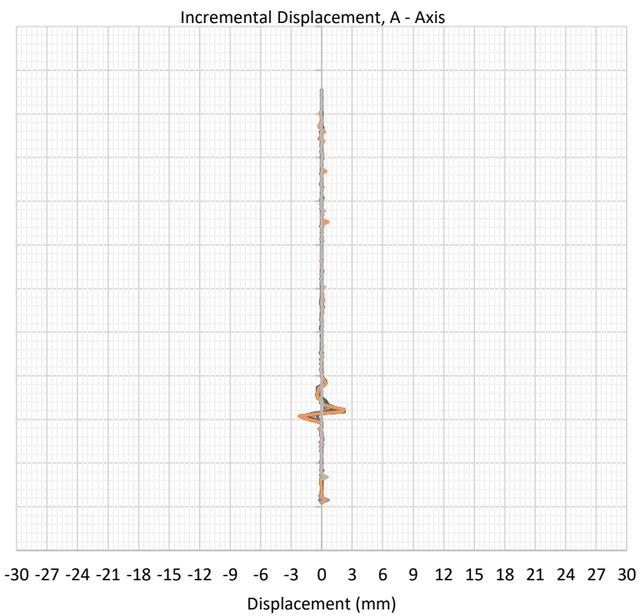
PROJECT
HIGHLAND TAILINGS STORAGE FACILITY
2023 ANNUAL FACILITY PERFORMANCE REPORT

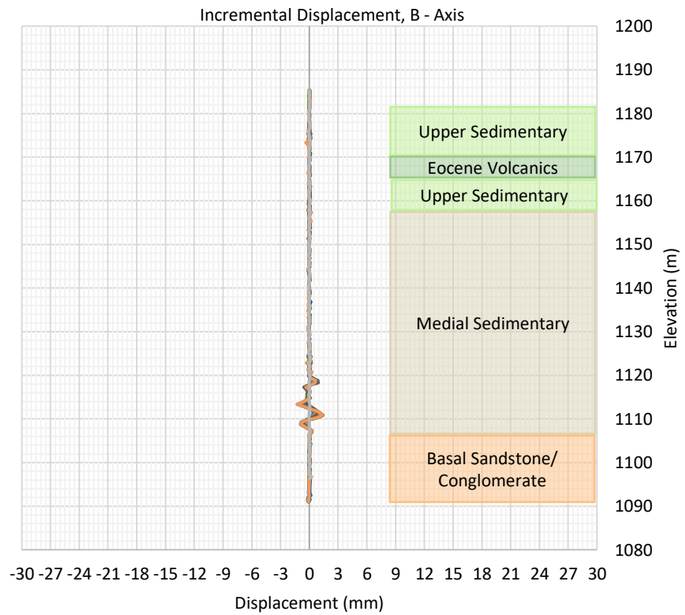
TITLE
LL DAM INCLINOMETER PLOTS
LL-I20-03 (NBB)
DEC. 2021 TO NOV. 2023

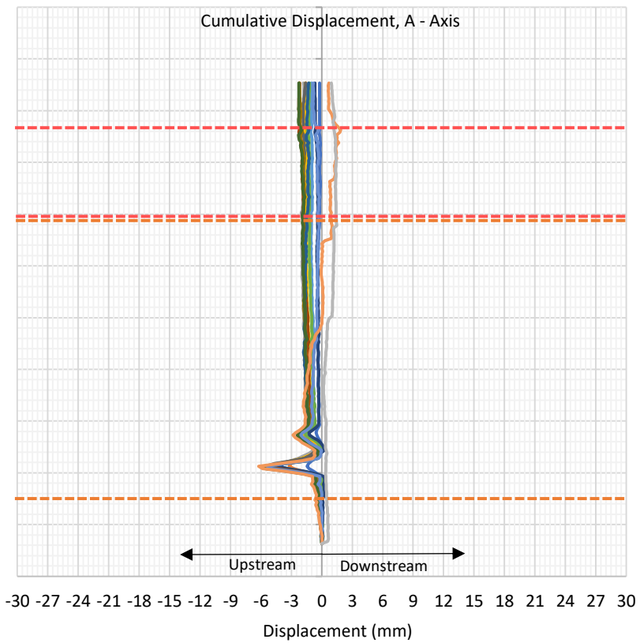
SCALE	PROJECT No.	FIG. No.
NTS	M02341C62	II-B-23

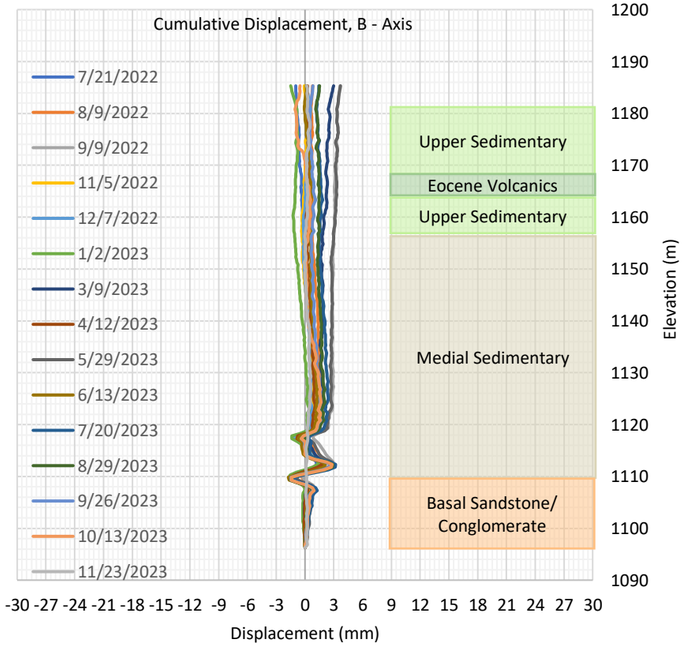












NOTES

1. DATA PROCESSED AND PROVIDED BY HVC
2. LAST READING OF EACH MONTH PLOTTED ON THE INCREMENTAL AND CUMULATIVE PROFILES.
3. X-AXIS, Y-AXIS, AND LEGEND IS THE SAME FOR THE INCREMENTAL AND CUMULATIVE PROFILES.
4. A SPIRAL CORRECTION AND A SKEW ANGLE OF 352 DEGREES HAS BEEN APPLIED TO THIS INSTRUMENT.
5. THE INSTRUMENT CASING HAD TO BE CUT AFTER A RAISE IN OCTOBER WHICH REQUIRED THE INSTRUMENT TO BE REBASELINED AFTER. FOR THIS REASON, THE NOVEMBER 23, 2023 READING IS BASED ON A DIFFERENT BASELINE COMPARED TO OTHER READINGS. HOWEVER THE READING IS PLOTTED ON THE PROFILE PLOTS TO SUPPORT INTERPRETATION OF POTENTIAL MOVEMENT ZONES THAT APPEARED IN THE OCTOBER 13, 2023 READING.

Geological Unit	EL. Range (m)	NL(mm/month)	T1 (mm/month)	T2 (mm/month)	Colour Code
Volcanics	1176.0-1156.0	2.0	N/A	N/A	
Med. Sedimentary	1156.0-1105.0	2.0	N/A	N/A	

Station	Baseline Reading	Instrument Type
2+590	2022-05-29	SI

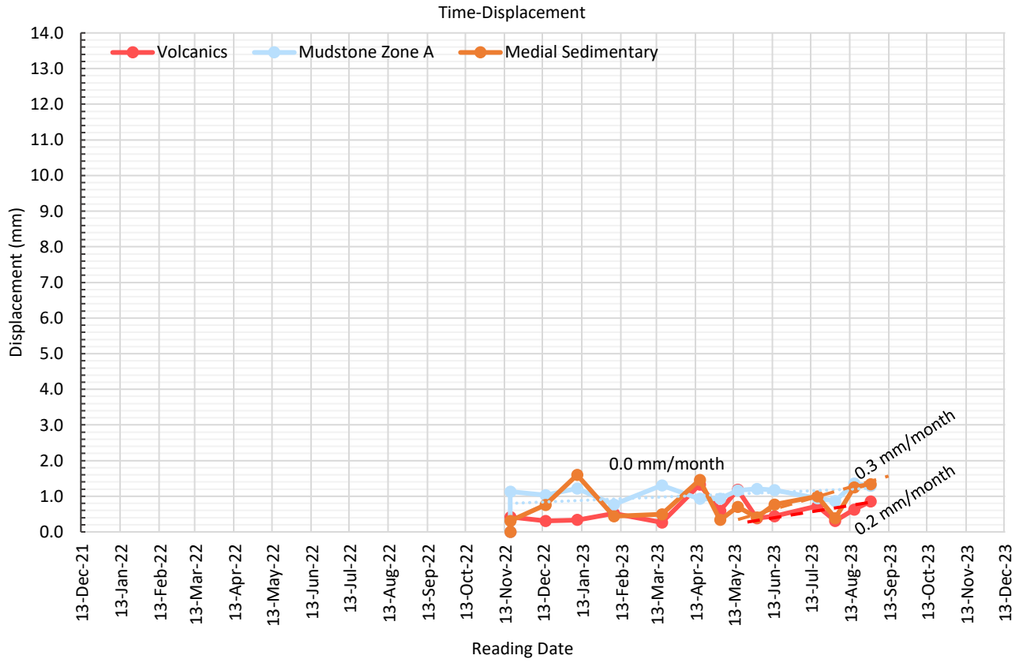
CLIENT: Highland Valley Copper / Teck

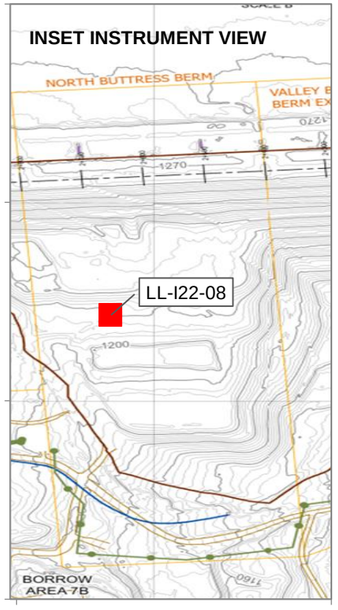
Klohn Crippen Berger

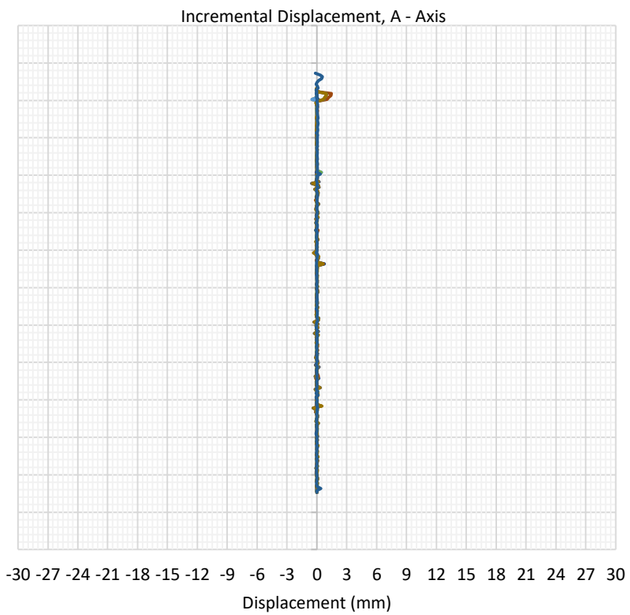
PROJECT: HIGHLAND TAILINGS STORAGE FACILITY
2023 ANNUAL FACILITY PERFORMANCE REPORT

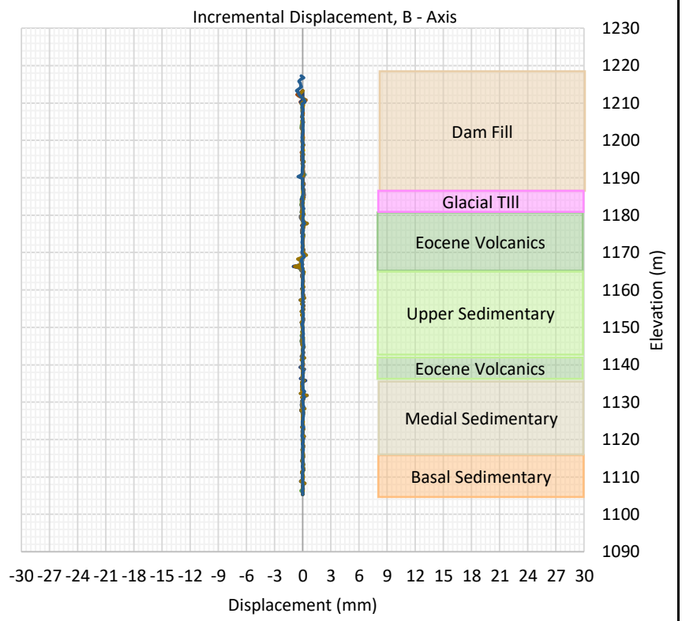
TITLE: LL DAM INCLINOMETER PLOTS
LL-I21-04 (NBB)
DEC. 2021 TO NOV. 2023

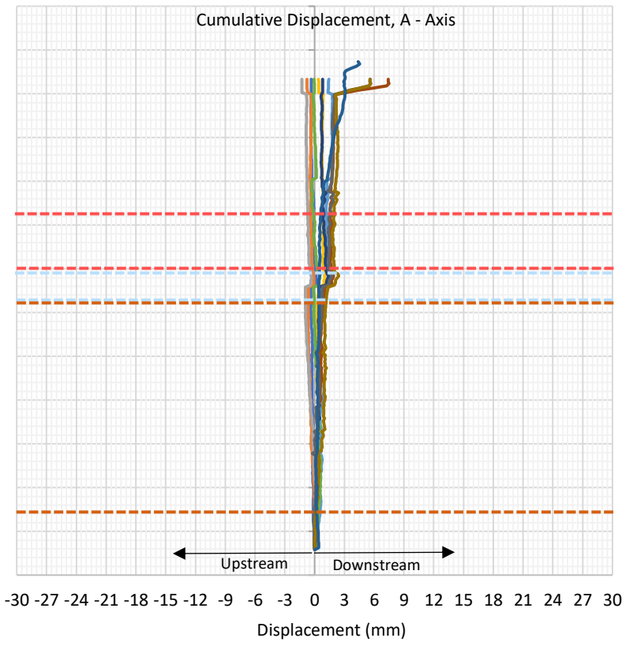
SCALE	PROJECT No.	FIG. No.
NTS	M02341C62	II-B-24

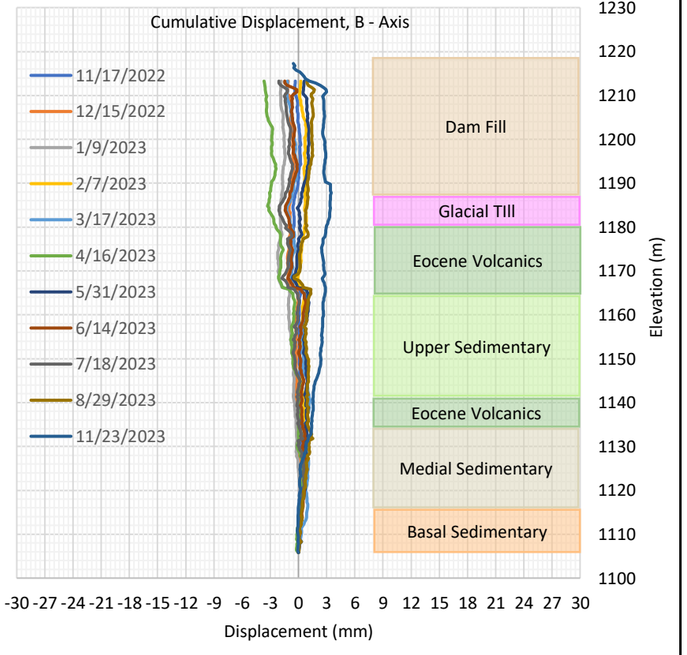












NOTES

1. DATA PROCESSED AND PROVIDED BY HVC
2. LAST READING OF EACH MONTH PLOTTED ON THE INCREMENTAL AND CUMULATIVE PROFILES.
3. X-AXIS, Y-AXIS, AND LEGEND IS THE SAME FOR THE INCREMENTAL AND CUMULATIVE PROFILES.
4. A SPIRAL CORRECTION AND A SKEW ANGLE OF 348 DEGREES HAS BEEN APPLIED TO THIS INSTRUMENT.
5. THE INSTRUMENT CASING WAS DAMAGED AND HAD TO BE REPAIRED IN SEPTEMBER 2023. AFTER THE REPAIR WAS COMPLETED IN OCTOBER 2023, THE INSTRUMENT WAS REBASELINED FOR THIS REASON, THE NOVEMBER 23, 2023 READING IS BASED ON A DIFFERENT BASELINE COMPARED TO OTHER READINGS. HOWEVER THE READING IS PLOTTED ON THE PROFILE PLOTS TO SUPPORT INTERPRETATION OF POTENTIAL MOVEMENT ZONES THAT MAY HAVE OCCERED AFTER DURING CONSTRUCTION LOADING IN NOVEBER 2023.

Geological Unit	EL. Range (m)	NL(mm/month)	T1 (mm/month)	T2 (mm/month)	Colour Code
Volcanics	1182.0-1168.0	2.0	N/A	N/A	
Mudstone Zone A	1168.0-1162.0	1.0	2.0	N/A	
Medial Sedimentary	1162.0-1114.0	2.0	N/A	N/A	

Station	Baseline Reading	Instrument Type
2+570	2022-11-17	SI

CLIENT
Highland Valley Copper / Teck

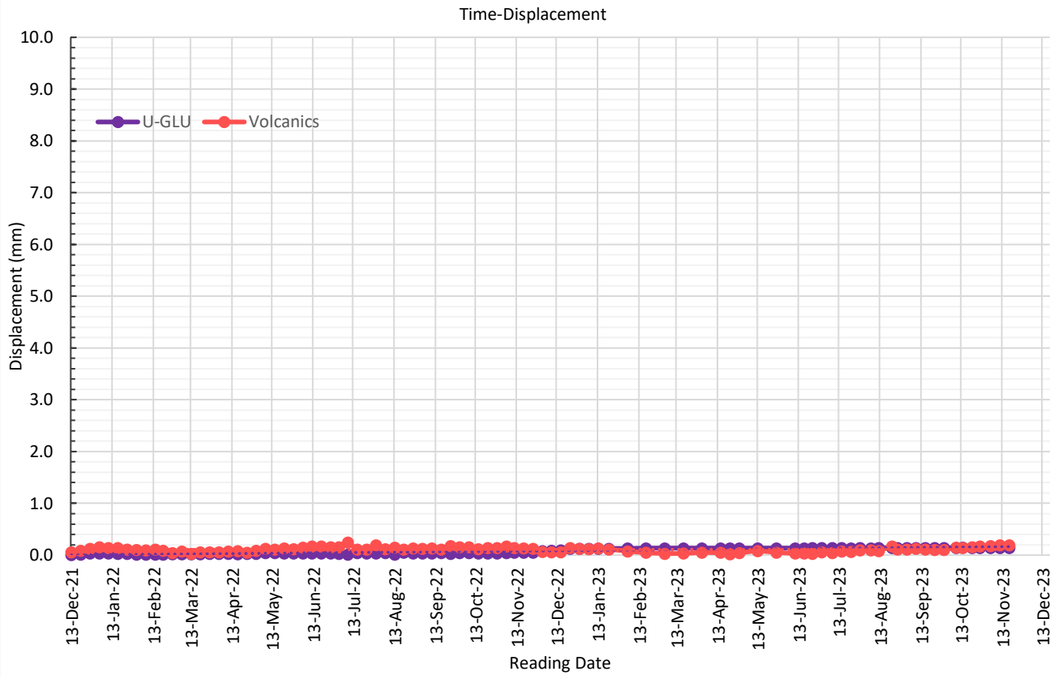
Klohn Crippen Berger

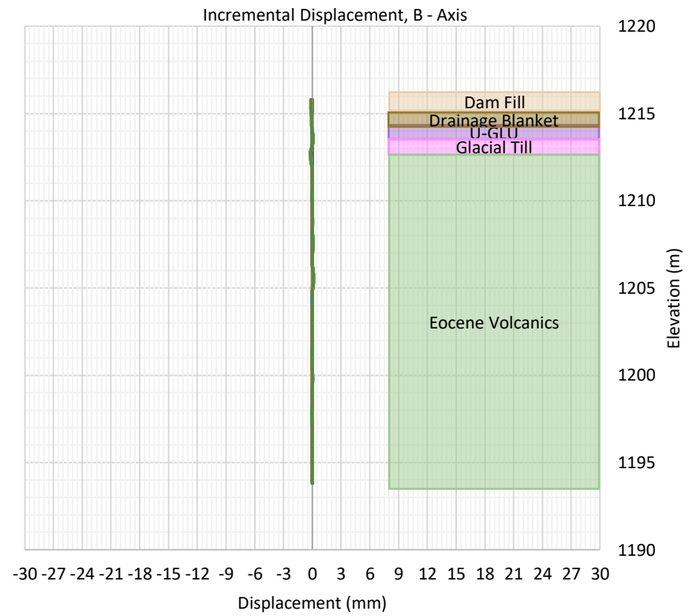
PROJECT
HIGHLAND TAILINGS STORAGE FACILITY
2023 ANNUAL FACILITY PERFORMANCE REPORT

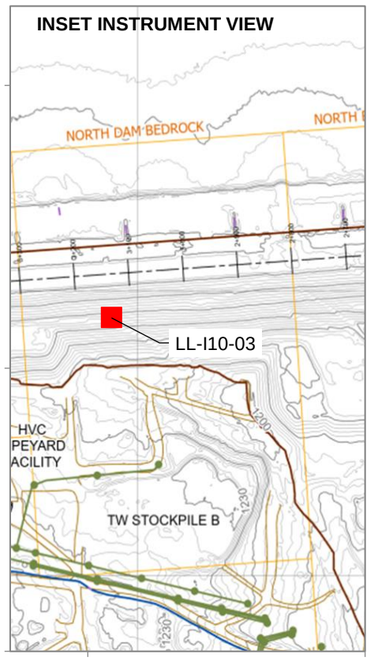
TITLE
LL DAM INCLINOMETER PLOTS
LL-I22-08 (NBB)
DEC. 2021 TO NOV. 2023

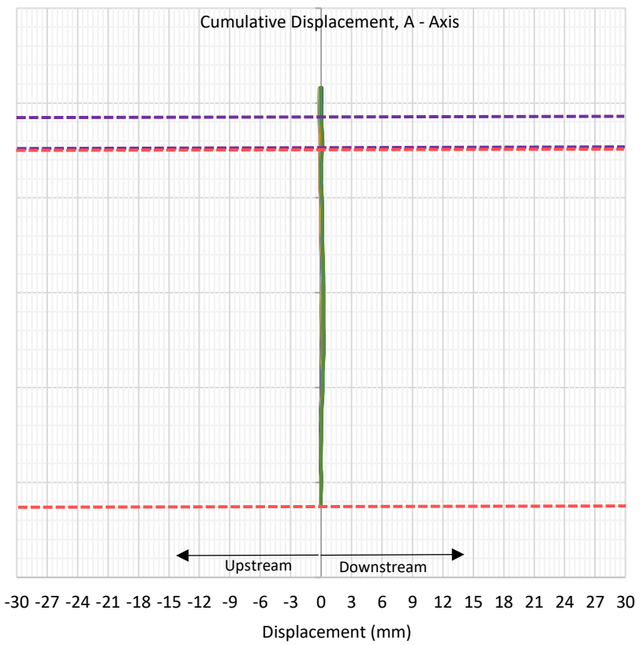
SCALE	PROJECT No.	FIG. No.
NTS	M02341C62	II-B-25

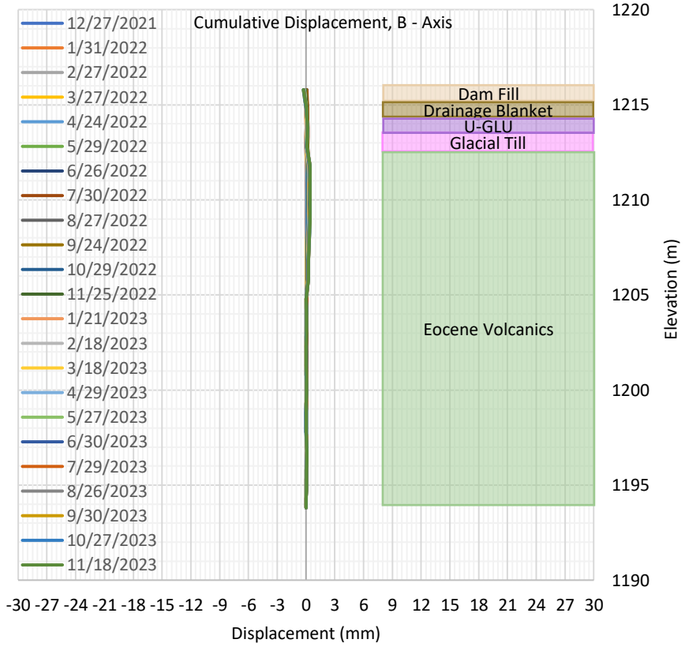
North Dam Bedrock











NOTES

1. DATA PROCESSED AND PROVIDED BY HVC
2. LAST READING OF EACH MONTH PLOTTED ON THE INCREMENTAL AND CUMULATIVE PROFILES.
3. X-AXIS, Y-AXIS, AND LEGEND IS THE SAME FOR THE INCREMENTAL AND CUMULATIVE PROFILES.
4. INCREMENTAL DISPLACEMENT PROFILES ARE BASED ON READINGS WITHIN ONE WEEK OF THE CUMULATIVE PROFILES.

Geological Unit	EL. Range (m)	NL(mm/month)	T1 (mm/month)	T2 (mm/month)	Colour Code
U-GLU	1214.3-1212.8	0.5	N/A	N/A	
Volcanics	1212.8-1193.8	2.0	N/A	N/A	

Station	Baseline Reading	Instrument Type
3+150	2021-12-13	SAAV

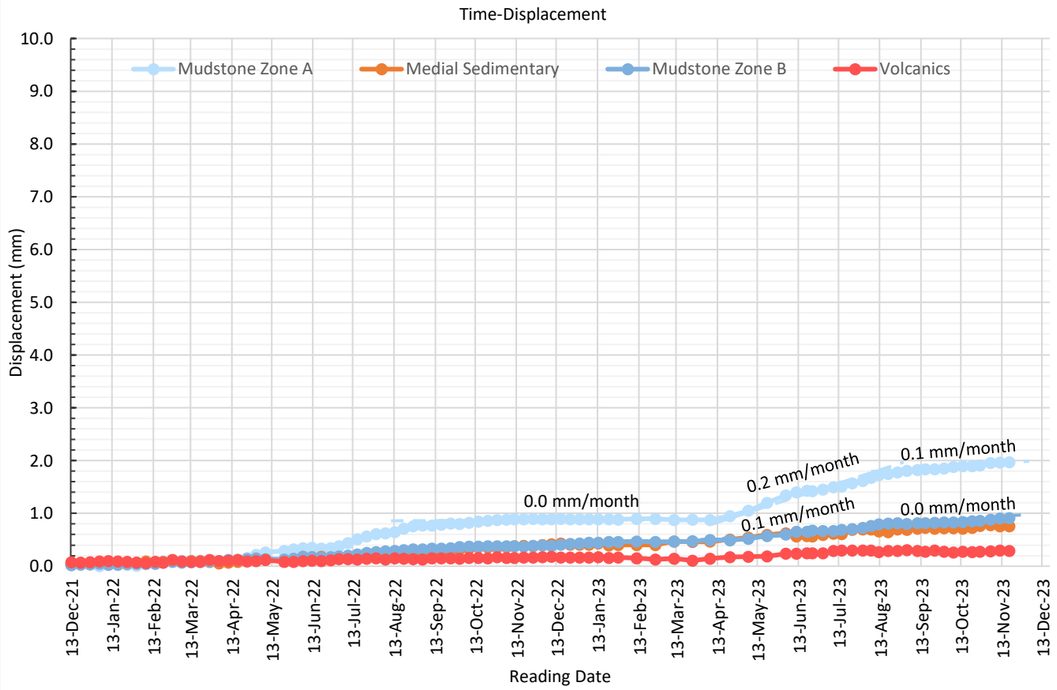
CLIENT
Highland Valley Copper / Teck

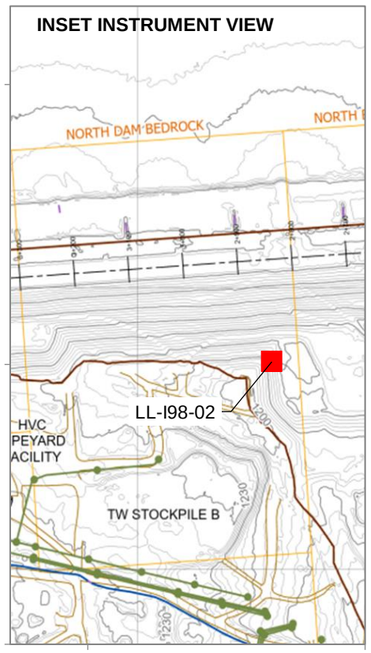
Klohn Crippen Berger

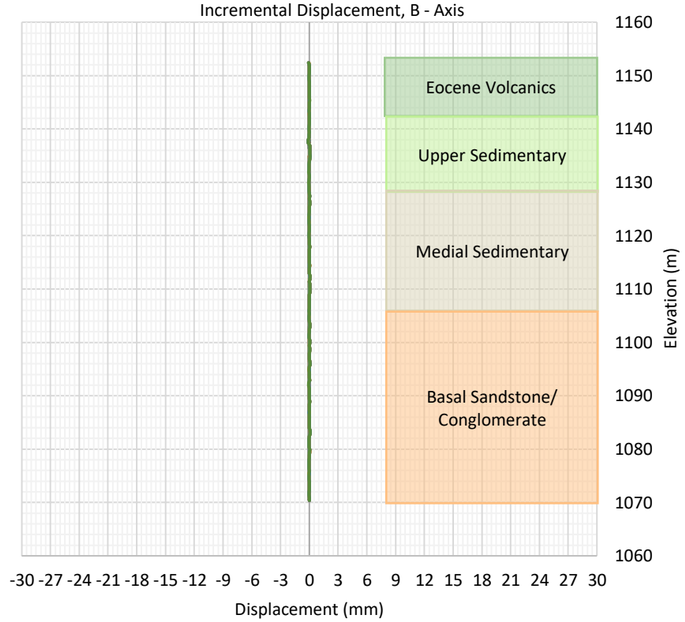
PROJECT
HIGHLAND TAILINGS STORAGE FACILITY
2023 ANNUAL FACILITY PERFORMANCE REPORT

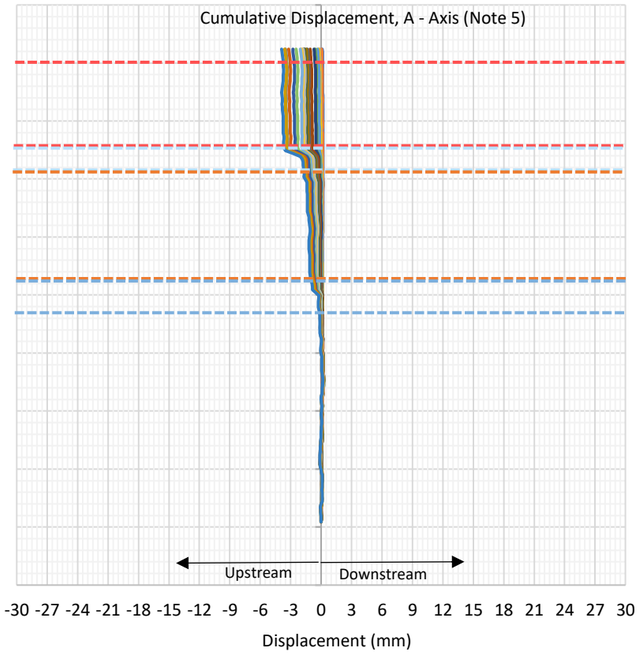
TITLE
LL DAM INCLINOMETER PLOTS
LL-I10-03 (NORTH DAM BEDROCK)
DEC. 2021 TO NOV. 2023

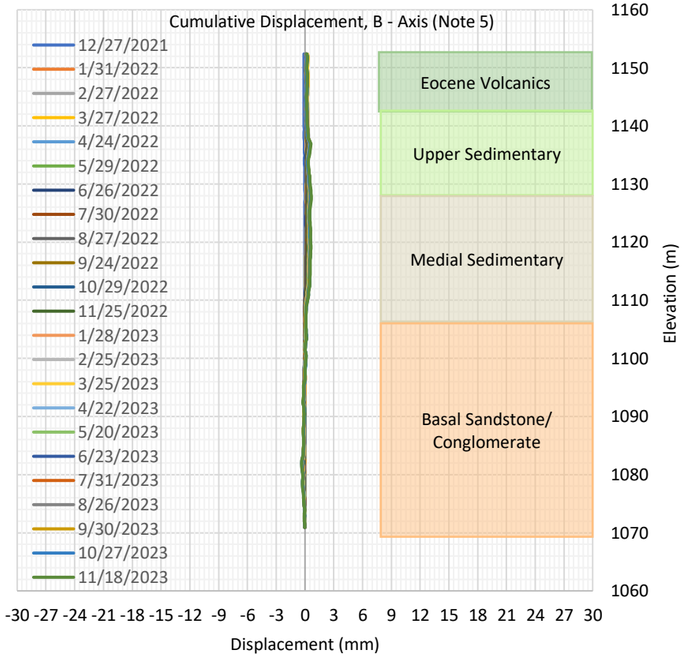
SCALE	PROJECT No.	FIG. No.
NTS	M02341C62	II-B-26











NOTES

1. DATA PROCESSED AND PROVIDED BY HVC
2. LAST READING OF EACH MONTH PLOTTED ON THE INCREMENTAL AND CUMULATIVE PROFILES.
3. X-AXIS, Y-AXIS, AND LEGEND IS THE SAME FOR THE INCREMENTAL AND CUMULATIVE PROFILES.
4. INCREMENTAL DISPLACEMENT PROFILES ARE BASED ON READINGS WITHIN ONE WEEK OF THE CUMULATIVE PROFILES.
5. AZIMUTH CORRECTION HAS NOT BEEN APPLIED TO THIS INSTRUMENT.

Geological Unit	EL. Range (m)	NL(mm/month)	T1 (mm/month)	T2 (mm/month)	Colour Code
Volcanics	1150.0-1136.0	2.0	N/A	N/A	
Mudstone Zone A	1136.0-1132.0	0.5	1.8	3.6	
Medial Sed.	1132.0-1113.0	2.0	N/A	N/A	
Mudstone Zone B	1113.0-1107.0	0.5	1.8	3.6	

Station	Baseline Reading	Instrument Type
2+860	2021-12-13	SAAV

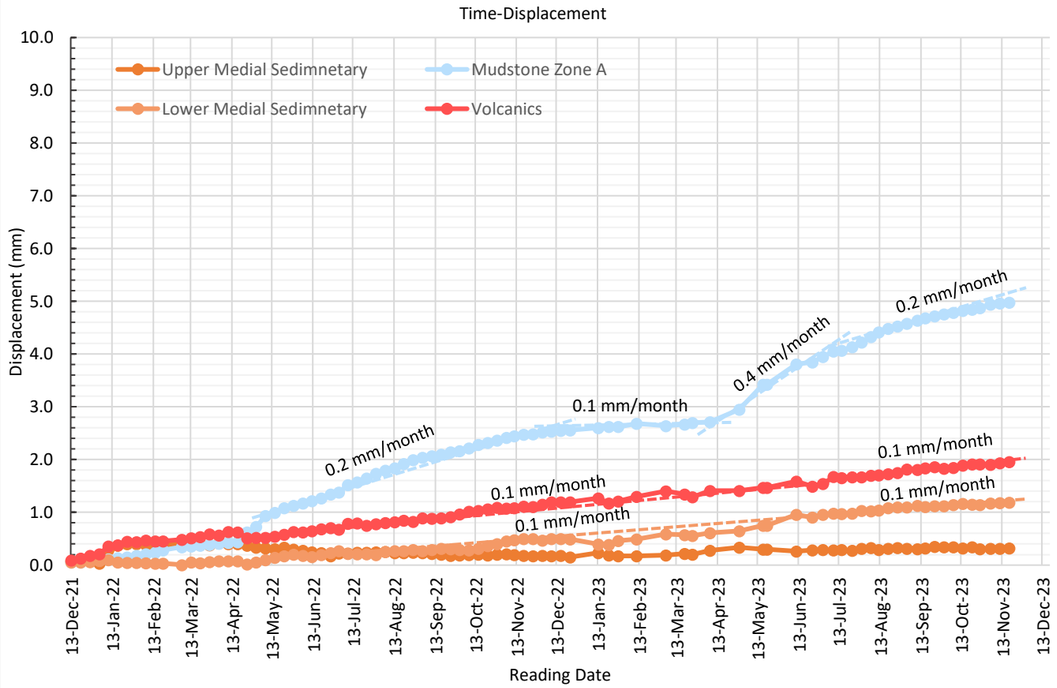
CLIENT
Highland Valley Copper / Teck

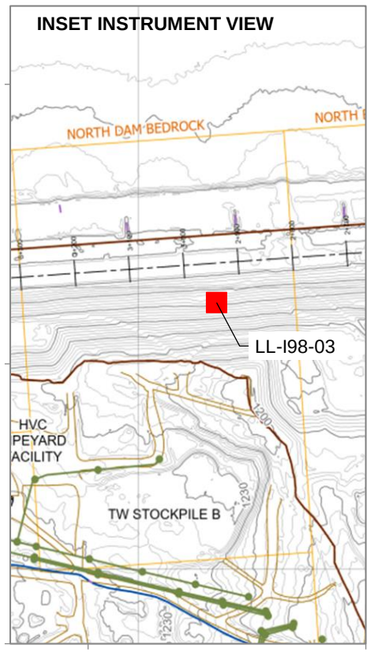
Klohn Crippen Berger

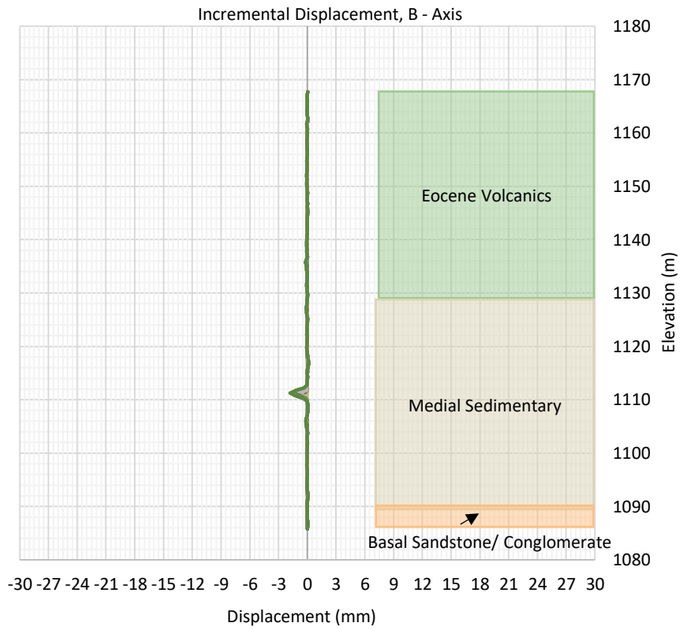
PROJECT
HIGHLAND TAILINGS STORAGE FACILITY
2023 ANNUAL FACILITY PERFORMANCE REPORT

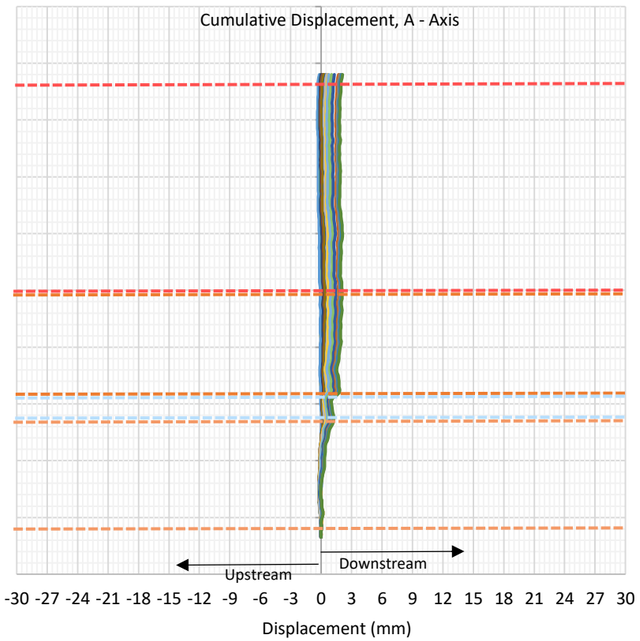
TITLE
LL DAM INCLINOMETER PLOTS
LL-I98-02 (NORTH DAM BEDROCK)
DEC. 2021 TO NOV. 2023

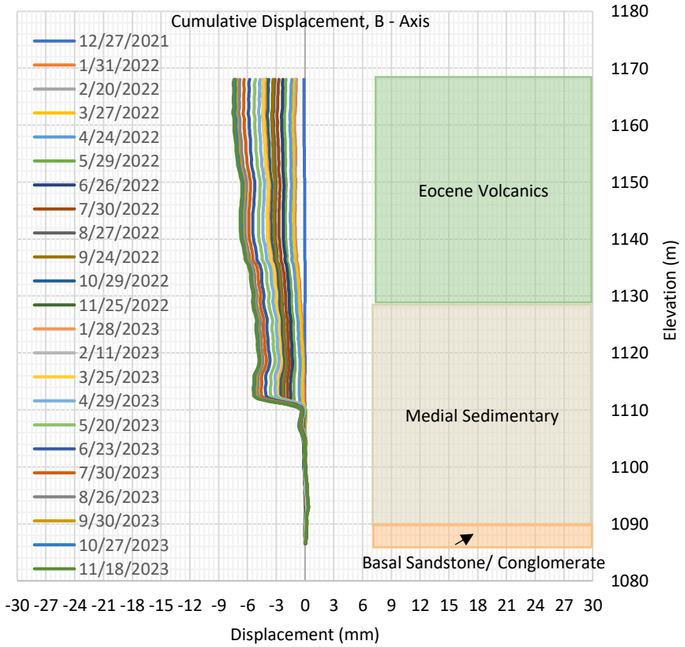
SCALE	PROJECT No.	FIG. No.
NTS	M02341C62	II-B-27











NOTES

1. DATA PROCESSED AND PROVIDED BY HVC
2. LAST READING OF EACH MONTH PLOTTED ON THE INCREMENTAL AND CUMULATIVE PROFILES.
3. X-AXIS, Y-AXIS, AND LEGEND IS THE SAME FOR THE INCREMENTAL AND CUMULATIVE PROFILES.
4. INCREMENTAL DISPLACEMENT PROFILES ARE BASED ON READINGS WITHIN ONE WEEK OF THE CUMULATIVE PROFILES.

Geological Unit	EL. Range (m)	NL(mm/month)	T1 (mm/month)	T2 (mm/month)	Colour Code
Volcanic	1166.0-1131.0	2.0	N/A	N/A	
Upper Medial Sed.	1131.0-1113.0	2.0	N/A	N/A	
Mudstone Zone A	1113.0-1109.0	1.0	1.9	3.8	
Lower Medial Sed.	1109.0-1090.0	2.0	N/A	N/A	

Station	Baseline Reading	Instrument Type
2+950	2021-12-13	SAAV

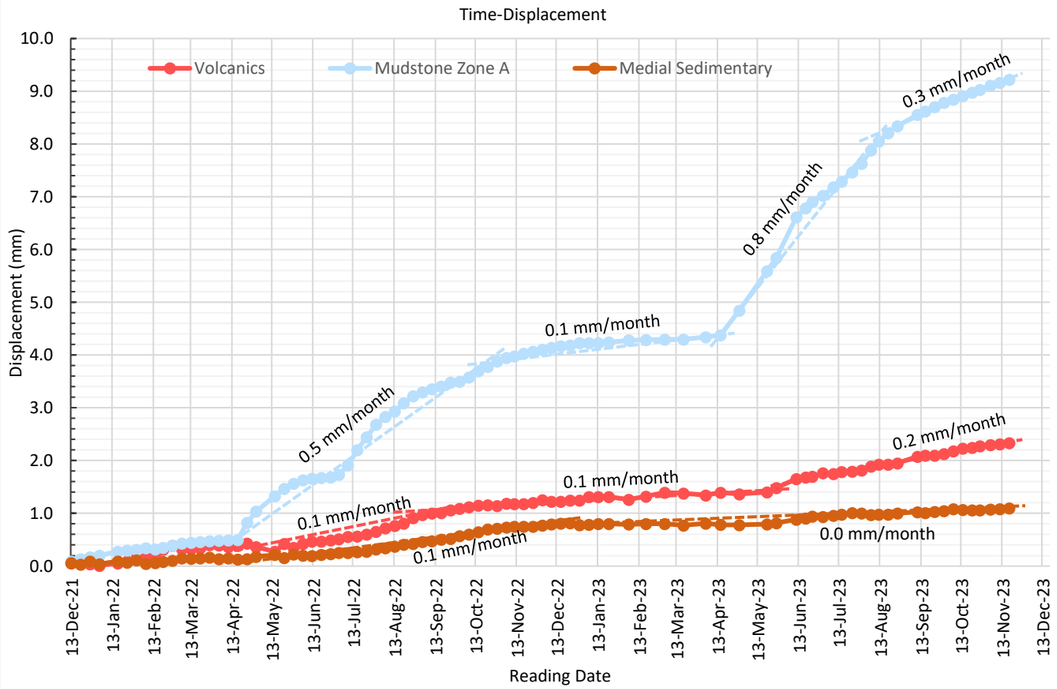
CLIENT
Highland Valley Copper / Teck

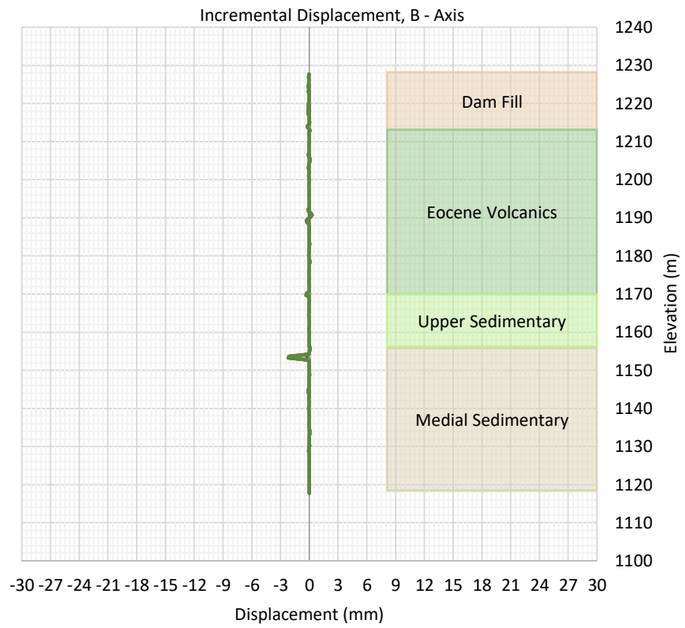
Klohn Crippen Berger

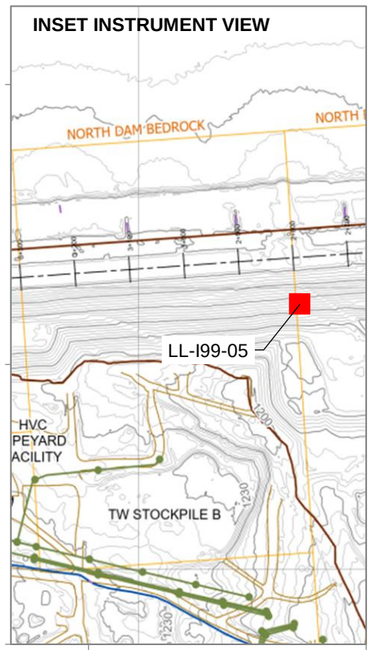
PROJECT
HIGHLAND TAILINGS STORAGE FACILITY
2023 ANNUAL FACILITY PERFORMANCE REPORT

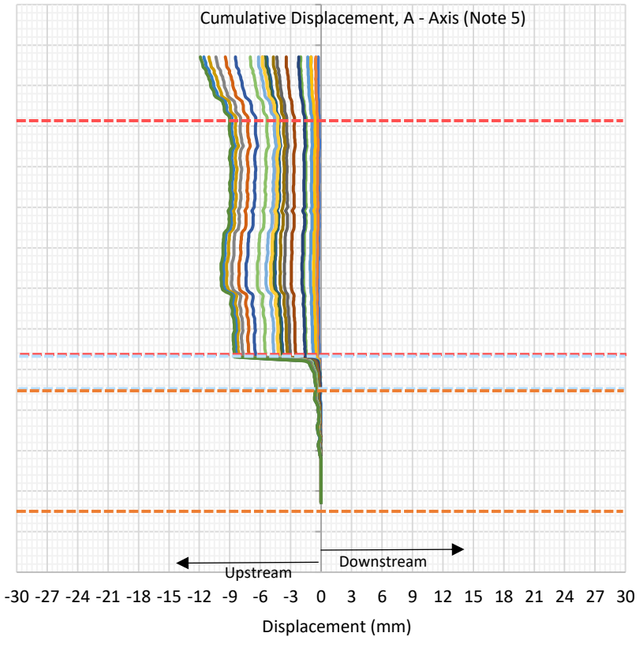
TITLE
LL DAM INCLINOMETER PLOTS
LL-I98-03 (NORTH DAM BEDROCK)
DEC. 2021 TO NOV. 2023

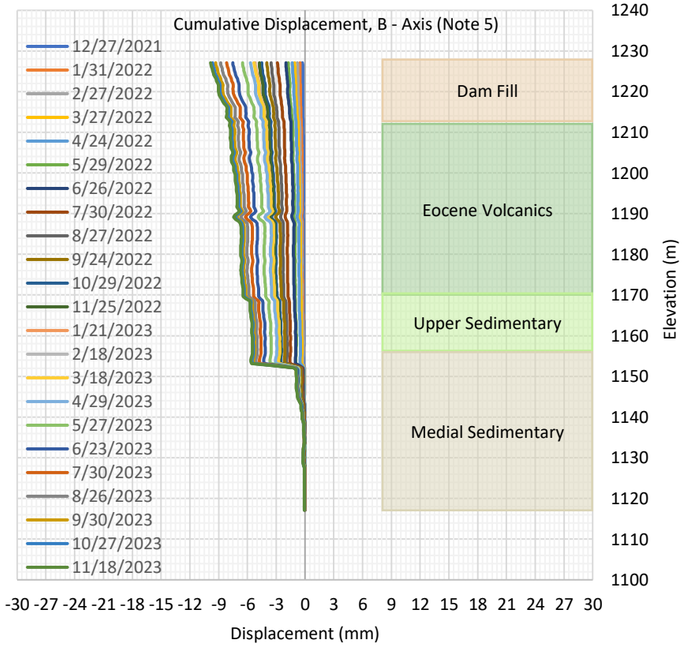
SCALE	PROJECT No.	FIG. No.
NTS	M02341C62	II-B-28











Geological Unit	EL. Range (m)	NL(mm/month)	T1 (mm/month)	T2 (mm/month)	Colour Code
Volcanics	1212.0-1156.0	2.0	N/A	N/A	
Mudstone Zone A	1156.0-1148.0	1.2	1.9	3.8	
Medial Sed.	1148.0-1118.0	2.0	N/A	N/A	

Station	Baseline Reading	Instrument Type
2+800	2021-12-13	SAAV

NOTES

1. DATA PROCESSED AND PROVIDED BY HVC
2. LAST READING OF EACH MONTH PLOTTED ON THE INCREMENTAL AND CUMULATIVE PROFILES.
3. X-AXIS, Y-AXIS, AND LEGEND IS THE SAME FOR THE INCREMENTAL AND CUMULATIVE PROFILES.
4. INCREMENTAL DISPLACEMENT PROFILES ARE BASED ON READINGS WITHIN ONE WEEK OF THE CUMULATIVE PROFILES.
5. AZIMUTH CORRECTION HAS NOT BEEN APPLIED TO THIS INSTRUMENT.

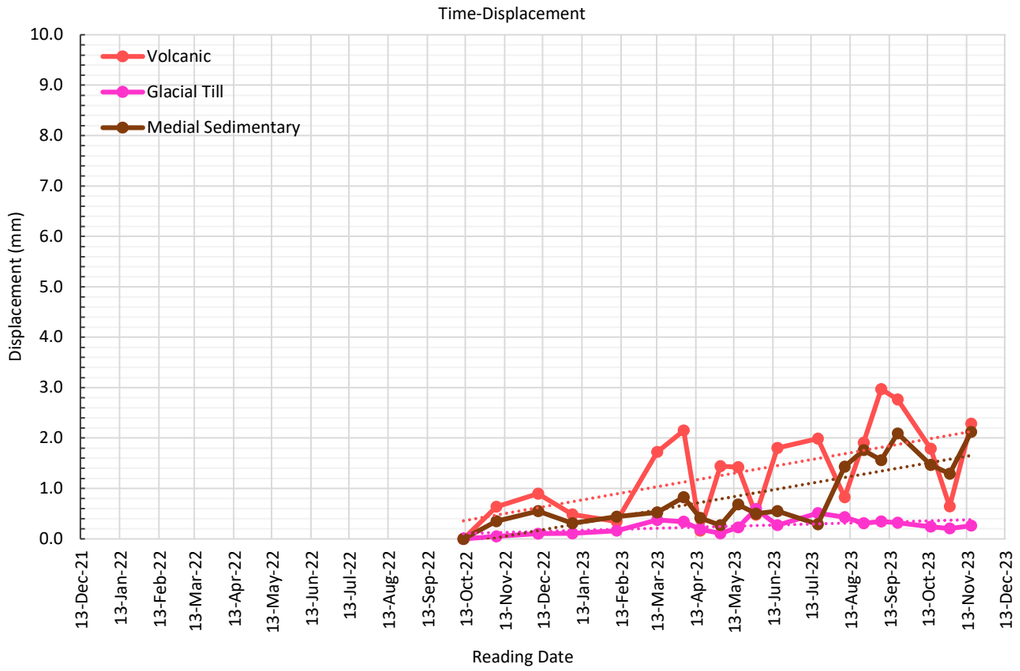
CLIENT
Highland Valley Copper / Teck

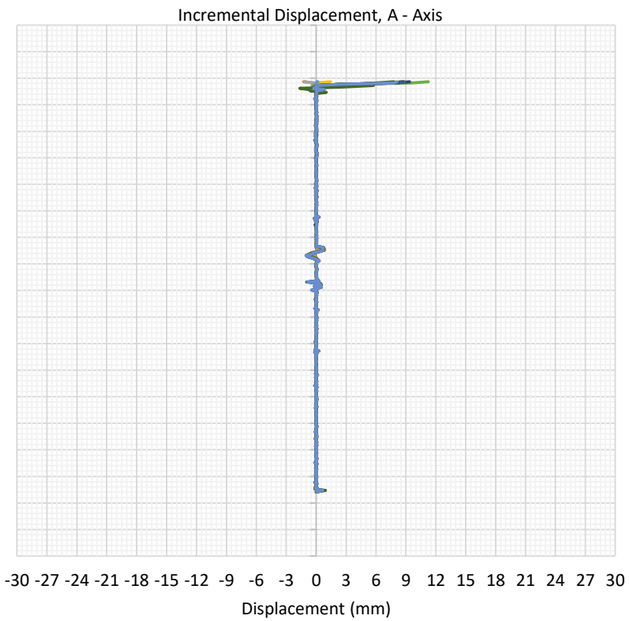
Klohn Crippen Berger

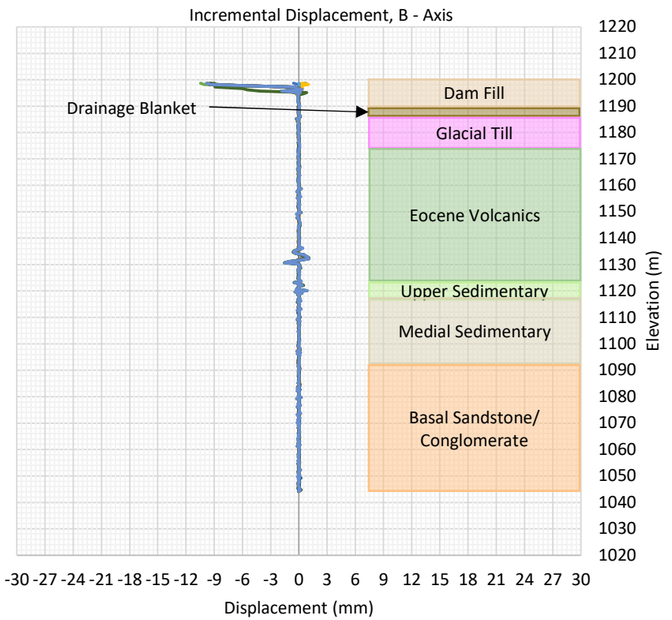
PROJECT
HIGHLAND TAILINGS STORAGE FACILITY
2023 ANNUAL FACILITY PERFORMANCE REPORT

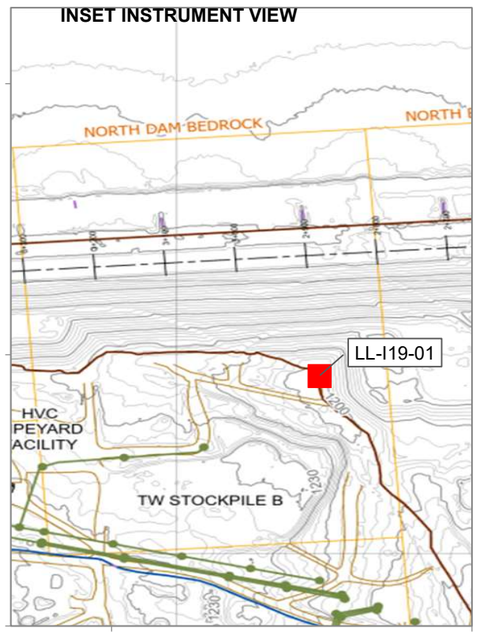
TITLE
LL DAM INCLINOMETER PLOTS
LL-I99-05 (NORTH DAM BEDROCK)
DEC. 2021 TO NOV. 2023

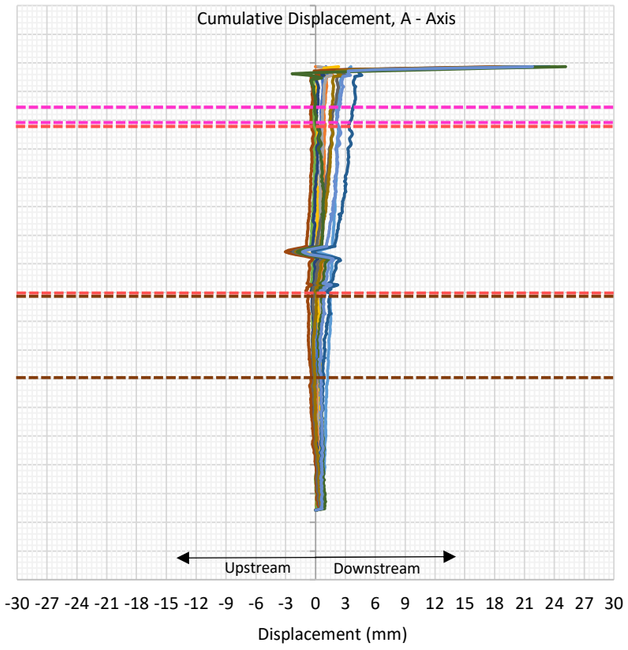
SCALE	PROJECT No.	FIG. No.
NTS	M02341C62	II-B-29

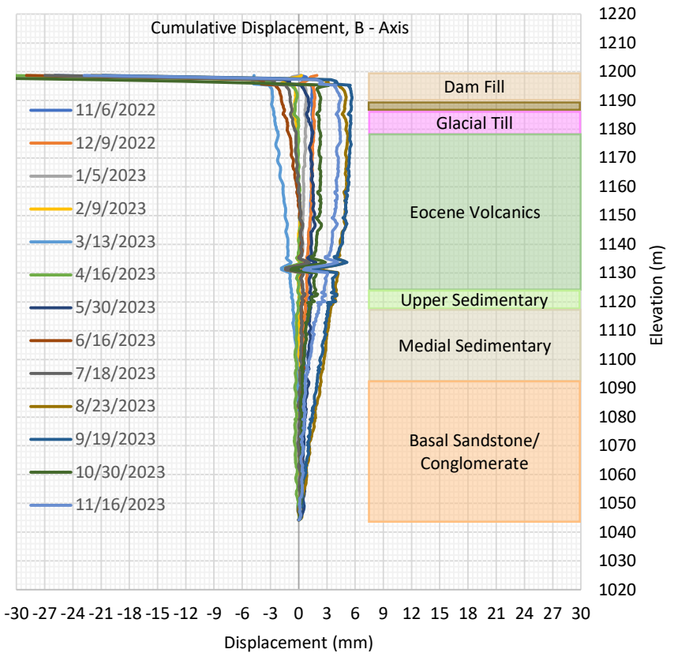












NOTES

1. DATA PROCESSED AND PROVIDED BY HVC
2. LAST READING OF EACH MONTH PLOTTED ON THE INCREMENTAL AND CUMULATIVE PROFILES.
3. X-AXIS, Y-AXIS, AND LEGEND IS THE SAME FOR THE INCREMENTAL AND CUMULATIVE PROFILES.
4. DATA SHOWN ON THE PLOTS IS AFTER THE INSTRUMENT WAS BASELINED. HVC HAVE MONITORED THIS INSTRUMENT PRIOR TO THE BASELINE AND MET THE READING FREQUENCY.

Geological Unit	EL. Range (m)	NL(mm/month)	T1 (mm/month)	T2 (mm/month)	Colour Code
Glacial Till	1184.0-1179.0	1.5	N/A	1.0	
Volcanic	1179.0-1120.0	1.0	N/A	N/A	
Medial Sedimentary	1120.0-1090.0	1.0	1.5	2.0	

Station	Baseline Reading	Instrument Type
2+900	2022-10-11	SI

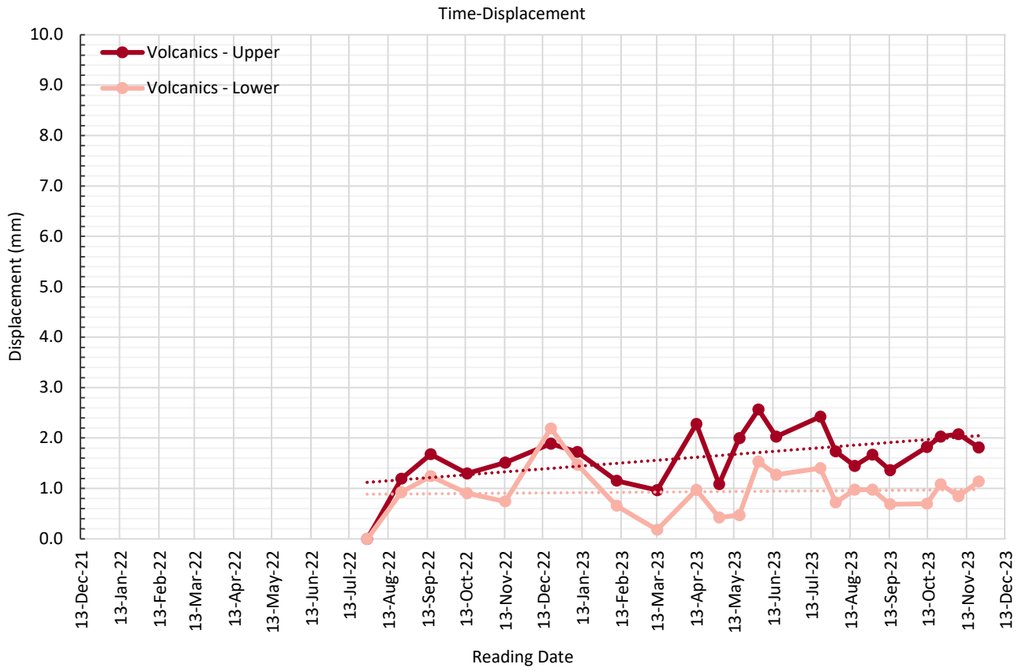
CLIENT
Highland Valley Copper / Teck

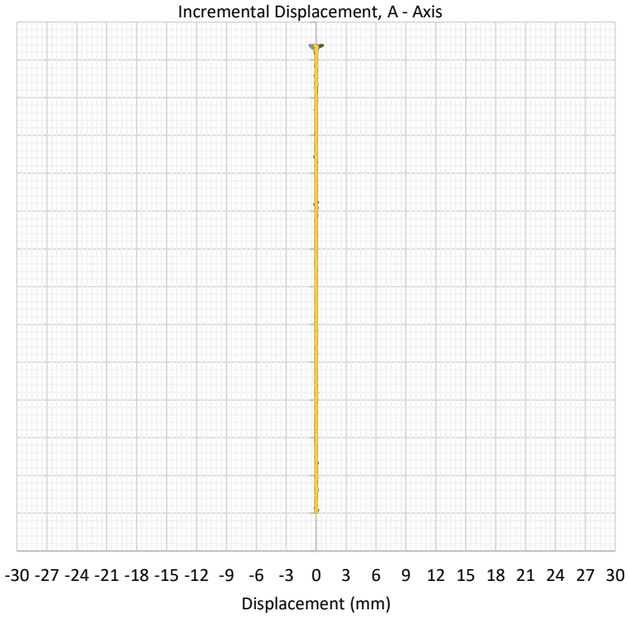
Klohn Crippen Berger

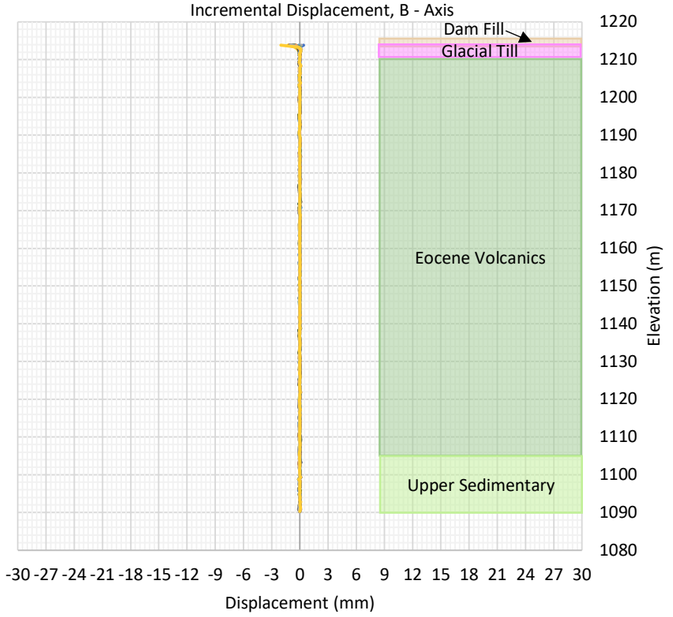
PROJECT
HIGHLAND TAILINGS STORAGE FACILITY
2023 ANNUAL FACILITY PERFORMANCE REPORT

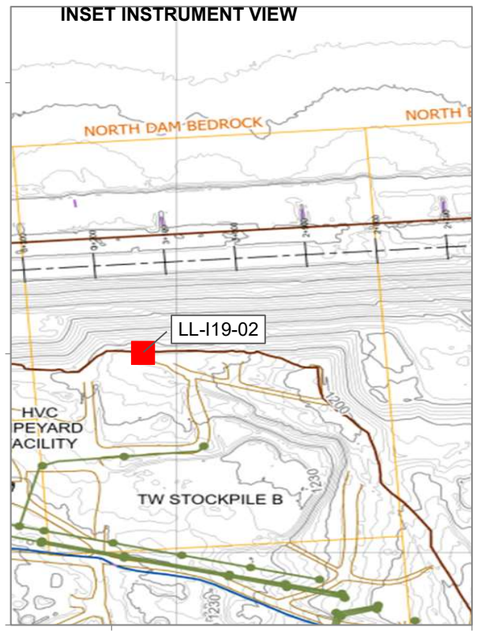
TITLE
LL DAM INCLINOMETER PLOTS
LL-I19-01 (NORTH DAM BEDROCK)
DEC. 2021 TO NOV. 2023

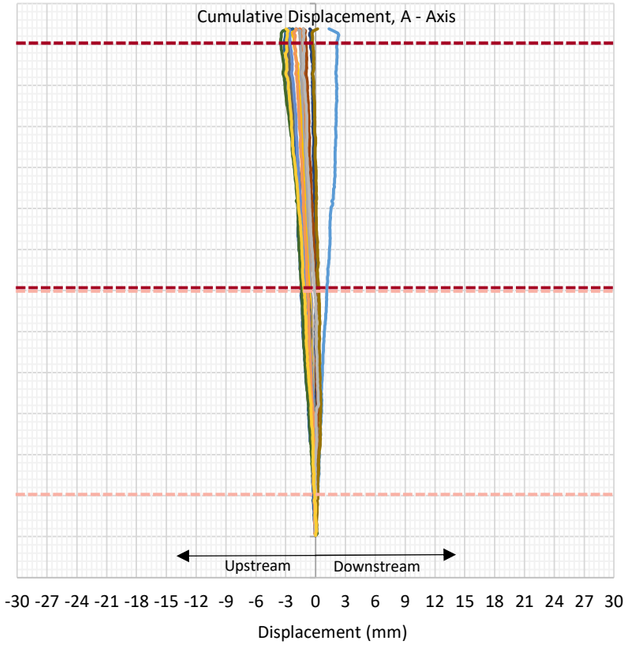
SCALE	PROJECT No.	FIG. No.
NTS	M02341C62	II-B-30

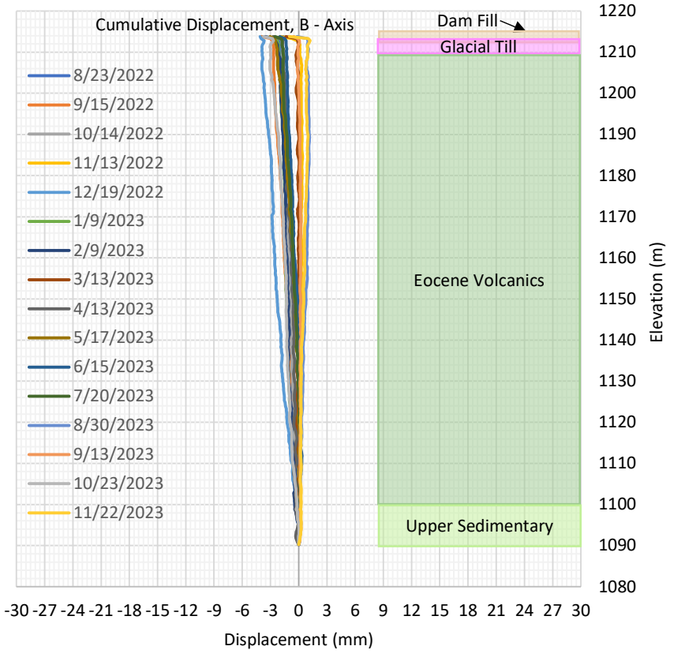












NOTES

1. DATA PROCESSED AND PROVIDED BY HVC
2. LAST READING OF EACH MONTH PLOTTED ON THE INCREMENTAL AND CUMULATIVE PROFILES.
3. X-AXIS, Y-AXIS, AND LEGEND IS THE SAME FOR THE INCREMENTAL AND CUMULATIVE PROFILES.
4. DATA SHOWN ON THE PLOTS IS AFTER THE INSTRUMENT WAS BASELINED. HVC HAVE MONITORED THIS INSTRUMENT PRIOR TO THE BASELINE AND MET THE READING FREQUENCY.

Geological Unit	EL. Range (m)	NL(mm/month)	T1 (mm/month)	T2 (mm/month)	Colour Code
Volcanics - Upper	1210.0-1150.0	1.0	N/A	N/A	
Volcanics - Lower	1150.0-1100.0	1.0	N/A	N/A	

Station	Baseline Reading	Instrument Type
3+150	2022-07-27	SI

CLIENT
Highland Valley Copper / Teck

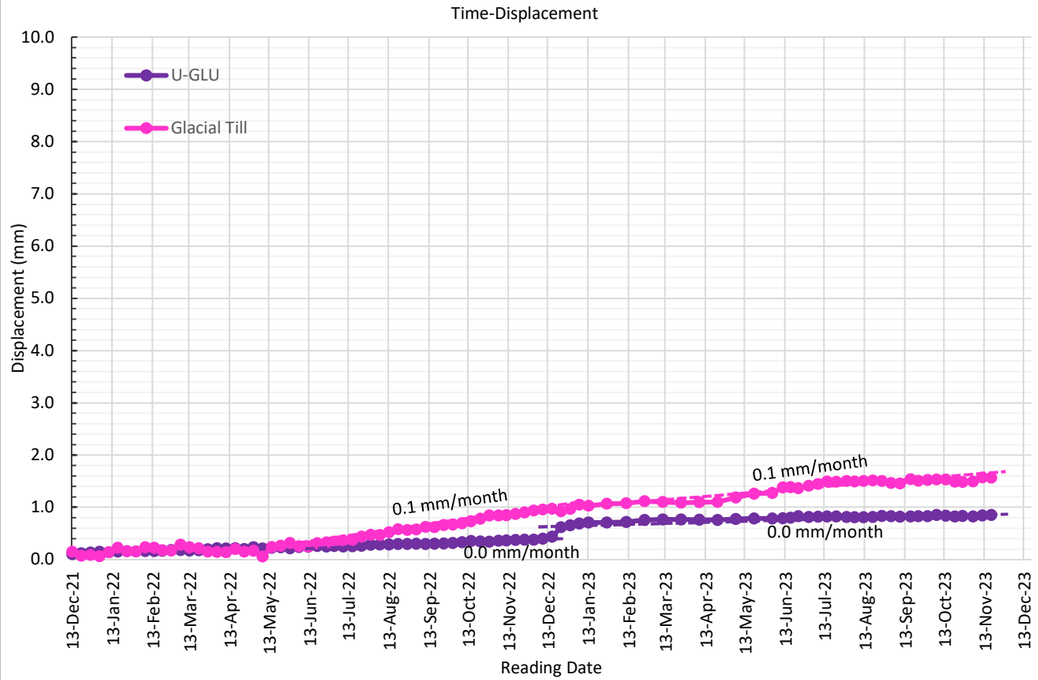
Klohn Crippen Berger

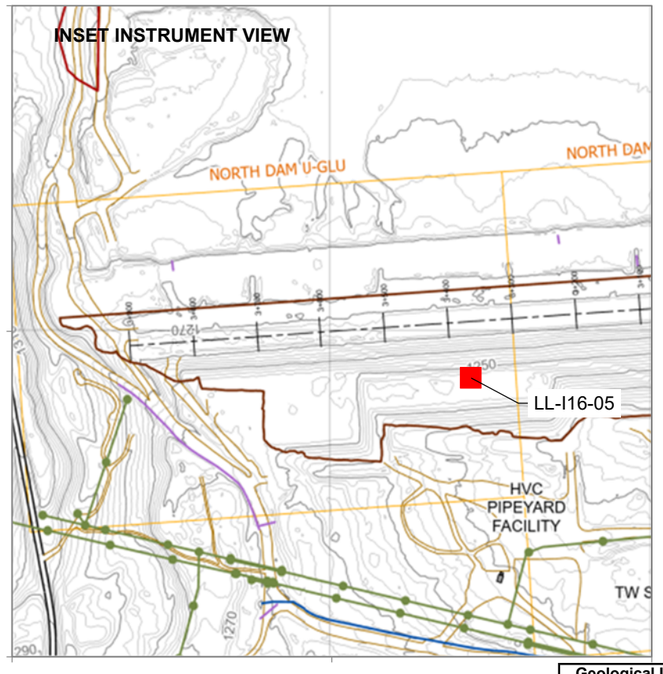
PROJECT
HIGHLAND TAILINGS STORAGE FACILITY
2023 ANNUAL FACILITY PERFORMANCE REPORT

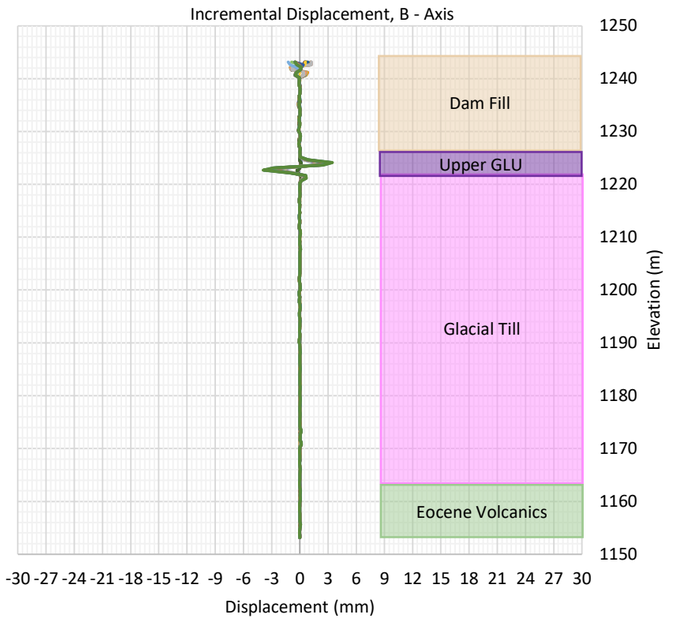
TITLE
LL DAM INCLINOMETER PLOTS
LL-I19-02 (NORTH DAM BEDROCK)
DEC. 2021 TO NOV. 2023

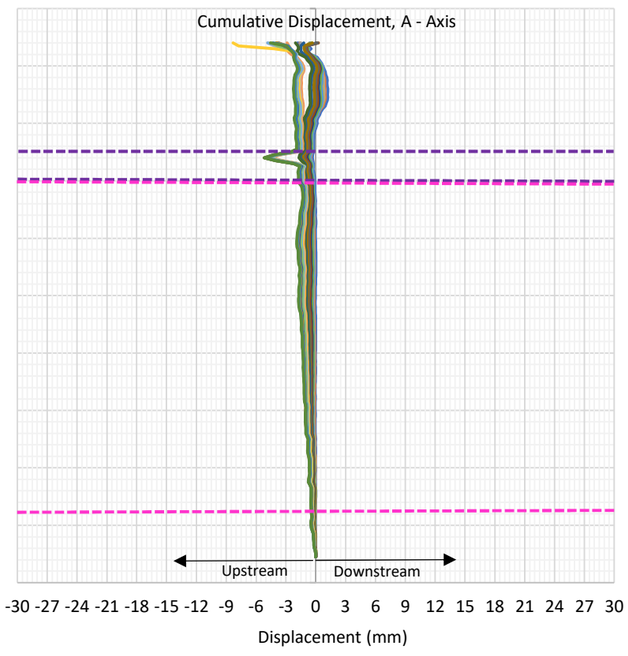
SCALE	PROJECT No.	FIG. No.
NTS	M02341C62	II-B-31

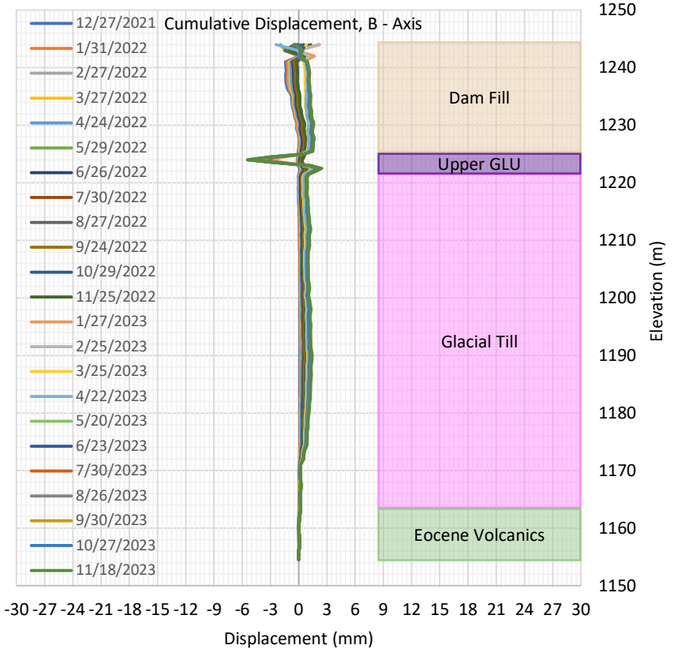
North Dam Upper Glaciolacustrine











NOTES

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3. X-AXIS, Y-AXIS, AND LEGEND IS THE SAME FOR THE INCREMENTAL AND CUMULATIVE PROFILES.
4. INCREMENTAL DISPLACEMENT PROFILES ARE BASED ON READINGS WITHIN ONE WEEK OF THE CUMULATIVE PROFILES.

Geological Unit	EL. Range (m)	NL(mm/month)	T1 (mm/month)	T2 (mm/month)	Colour Code
U-GLU	1225.0-1220.0	0.5	1.0	2.5	
Glacial Till	1220.0-1162.0	2.0	N/A	N/A	

Station	Baseline Reading	Instrument Type
3+400	2021-12-13	SAAV

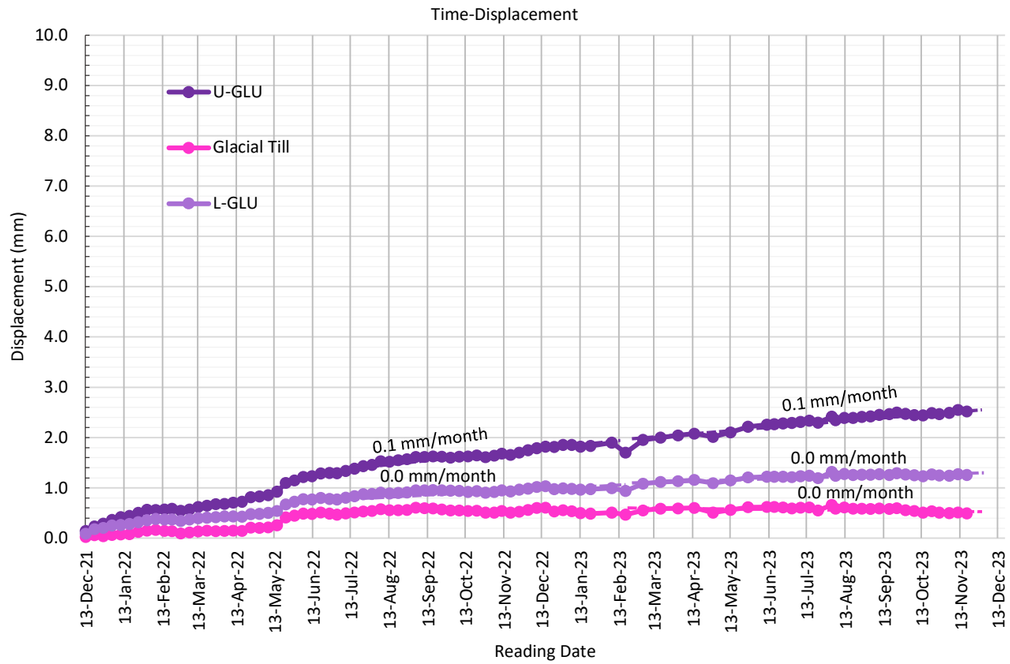
CLIENT
Highland Valley Copper / Teck

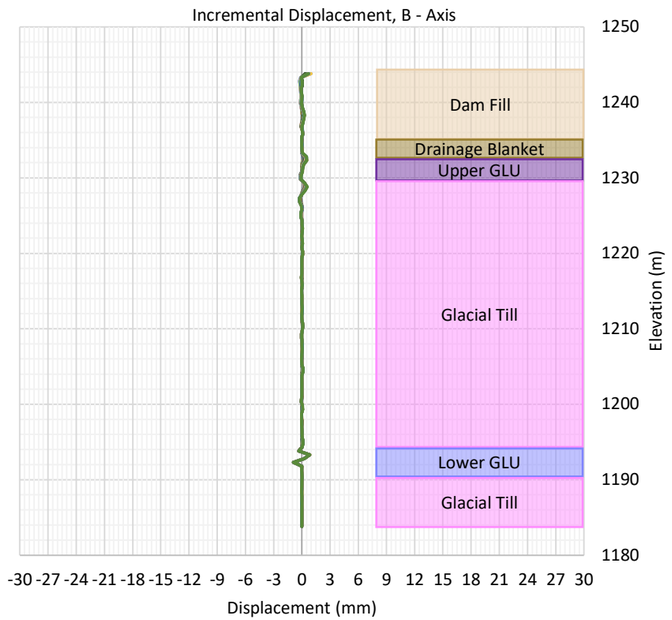
Klohn Crippen Berger

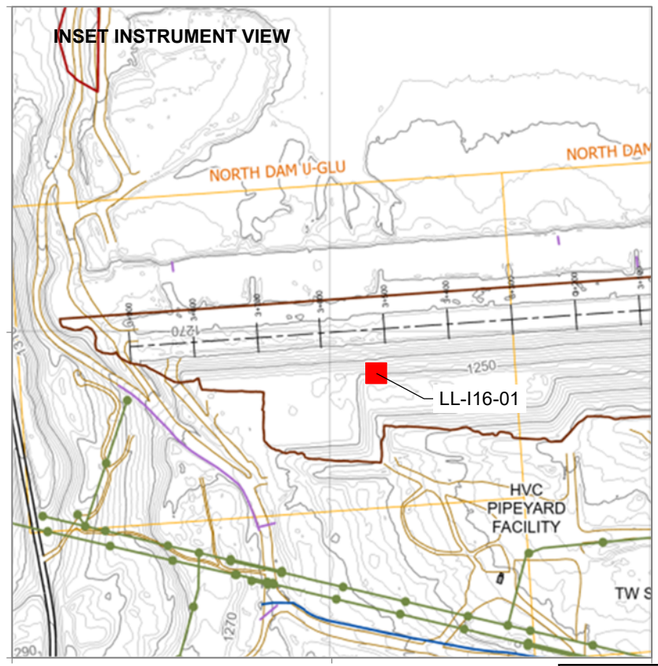
PROJECT
HIGHLAND TAILINGS STORAGE FACILITY
2023 ANNUAL FACILITY PERFORMANCE REPORT

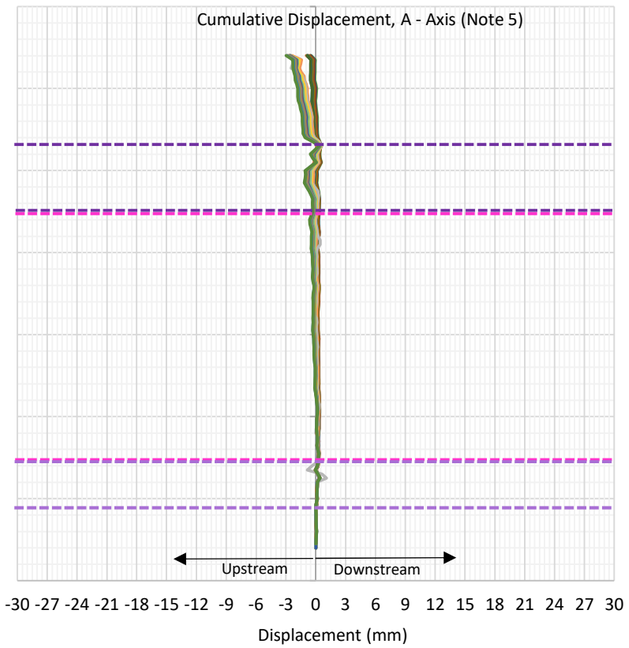
TITLE
LL DAM INCLINOMETER PLOTS
LL-I16-05 (NORTH DAM U-GLU)
DEC. 2021 TO NOV. 2023

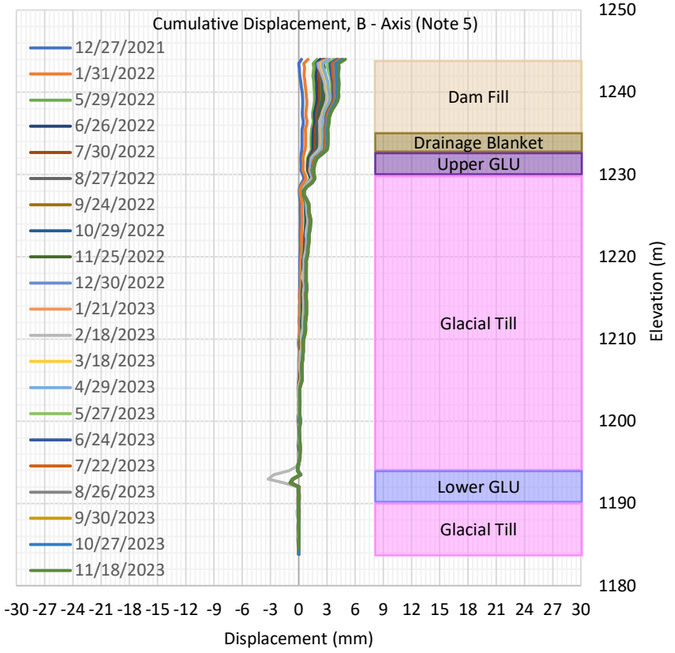
SCALE	PROJECT No.	FIG. No.
NTS	M02341C62	II-B-32











NOTES

1. DATA PROCESSED AND PROVIDED BY HVC
2. LAST READING OF EACH MONTH PLOTTED ON THE INCREMENTAL AND CUMULATIVE PROFILES.
3. X-AXIS, Y-AXIS, AND LEGEND IS THE SAME FOR THE INCREMENTAL AND CUMULATIVE PROFILES.
4. INCREMENTAL DISPLACEMENT PROFILES ARE BASED ON READINGS WITHIN ONE WEEK OF THE CUMULATIVE PROFILES.
5. AZIMUTH CORRECTION HAS NOT BEEN APPLIED TO THIS INSTRUMENT

Geological Unit	EL. Range (m)	NL(mm/month)	T1 (mm/month)	T2 (mm/month)	Colour Code
U-GLU	1233.0-1225.0	0.5	1.0	2.5	
Glacial Till	1225.0-1195.0	2.0	N/A	N/A	
L-GLU	1195.0-1189.0	0.5	1.0	2.5	

Station	Baseline Reading	Instrument Type
3+510	2021-12-13	SAAV

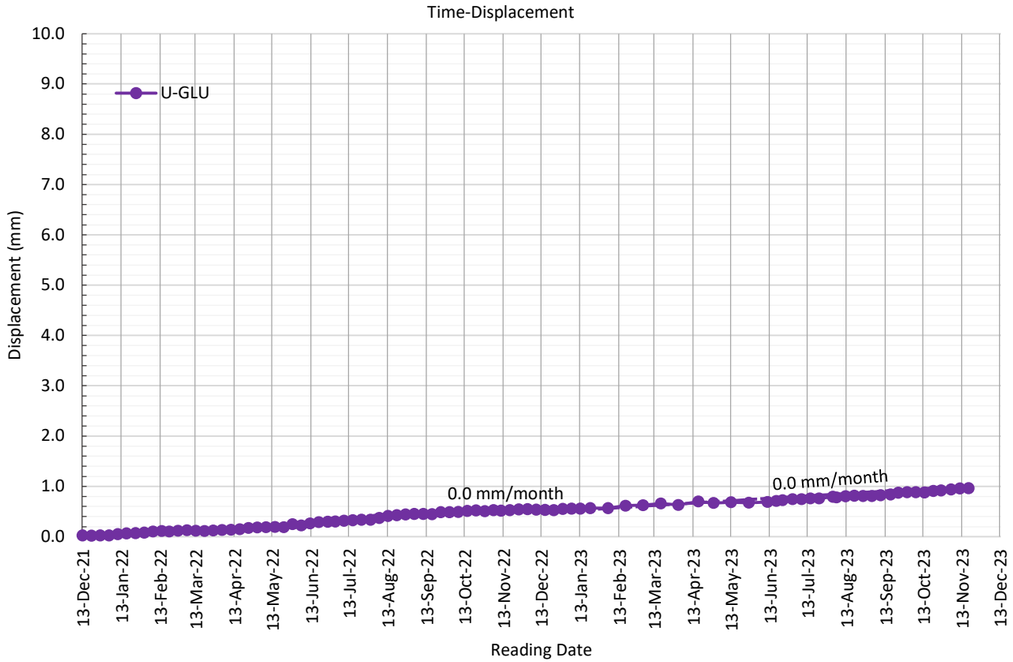
CLIENT
Highland Valley Copper / Teck

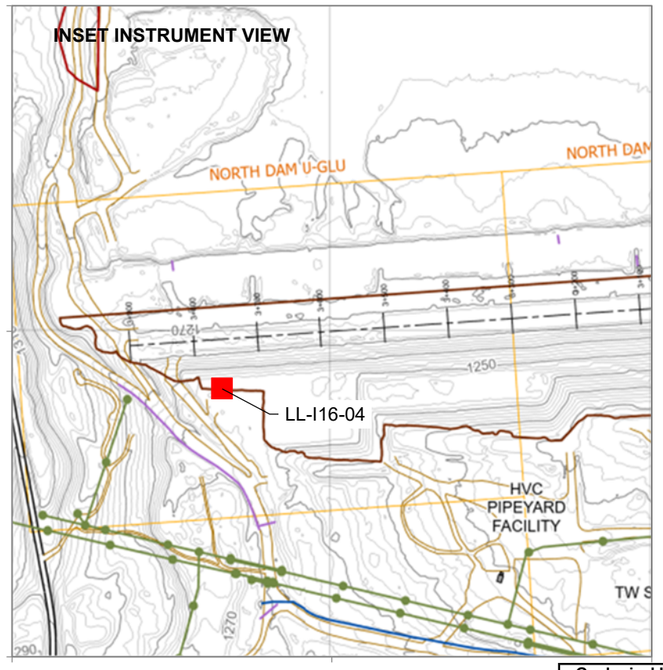
Klohn Crippen Berger

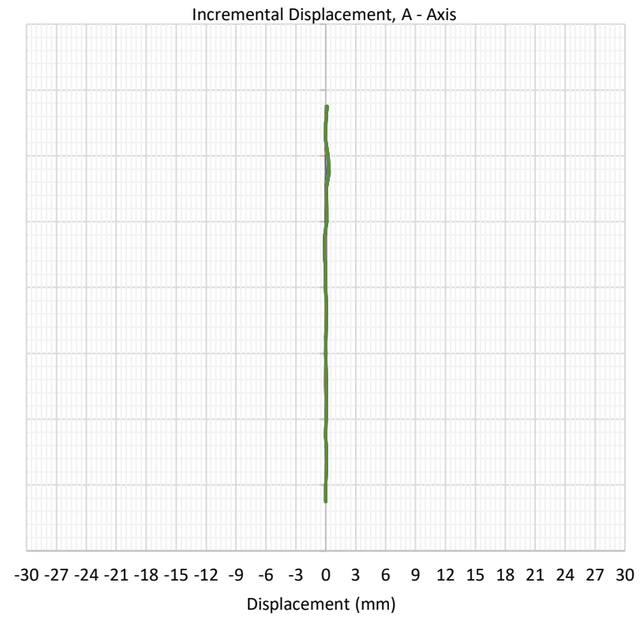
PROJECT
HIGHLAND TAILINGS STORAGE FACILITY
2023 ANNUAL FACILITY PERFORMANCE REPORT

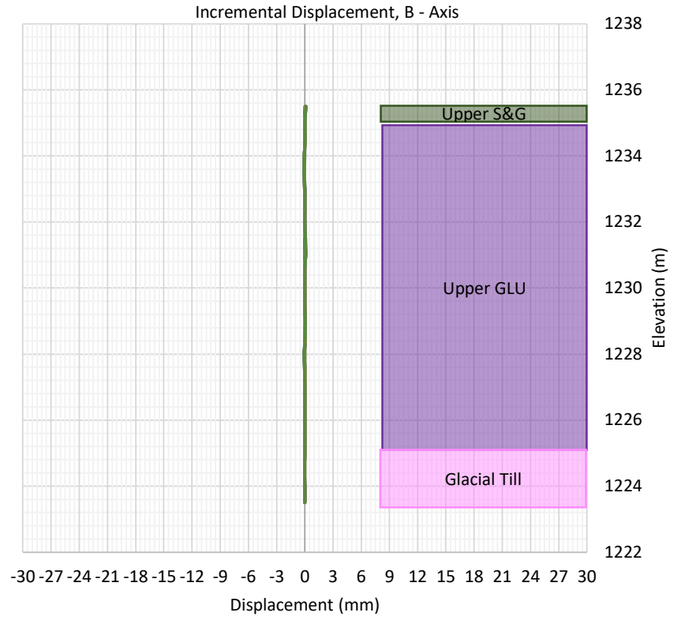
TITLE
LL DAM INCLINOMETER PLOTS
LL-I16-01 (NORTH DAM U-GLU)
DEC. 2021 TO NOV. 2023

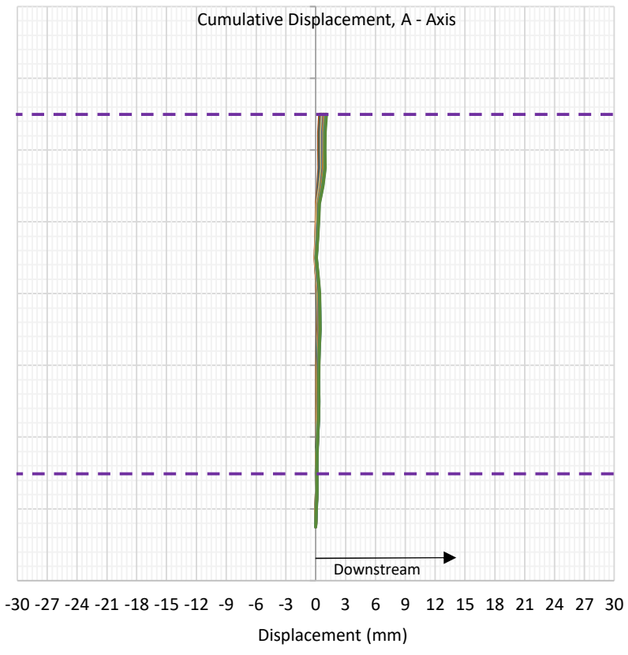
SCALE	PROJECT No.	FIG. No.
NTS	M02341C62	II-B-33

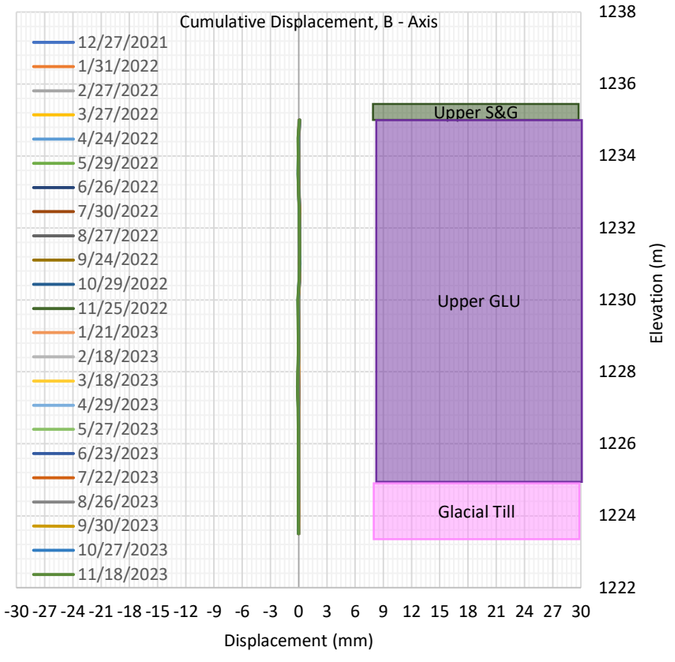












Geological Unit	EL. Range (m)	NL(mm/month)	T1 (mm/month)	T2 (mm/month)	Colour Code
U-GLU	1235.0-1225.5	0.5	1.0	2.5	

Station	Baseline Reading	Instrument Type
3+750	2021-12-13	SAAV

NOTES

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4. INCREMENTAL DISPLACEMENT PROFILES ARE BASED ON READINGS WITHIN ONE WEEK OF THE CUMULATIVE PROFILES.

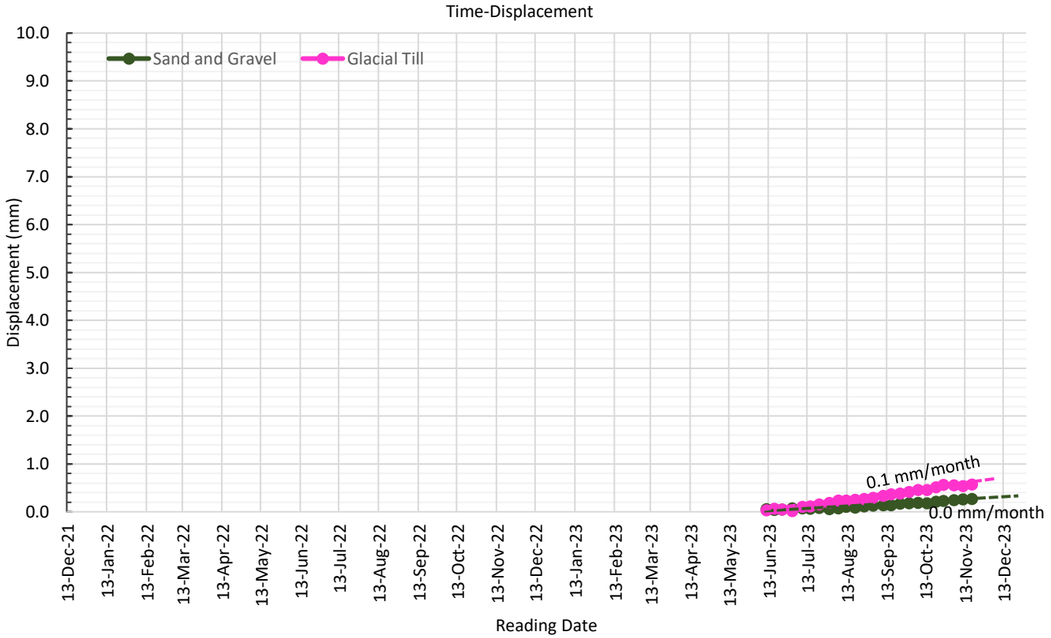
CLIENT
Highland Valley Copper / Teck

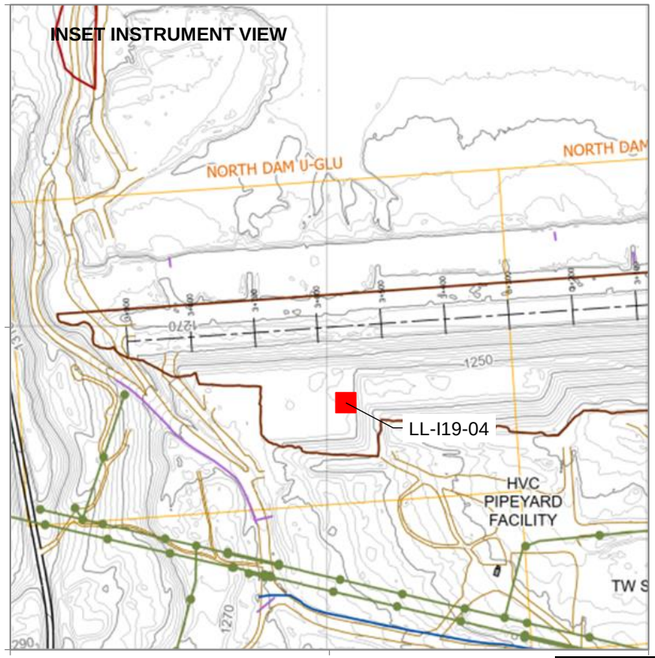
Klohn Crippen Berger

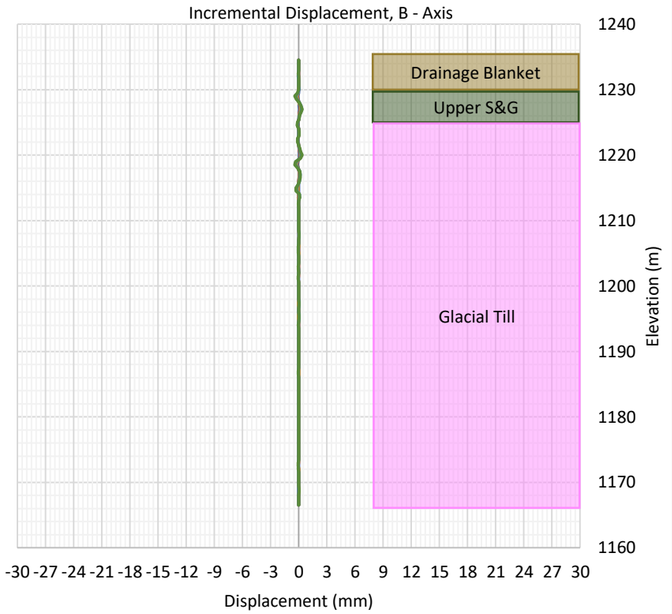
PROJECT
HIGHLAND TAILINGS STORAGE FACILITY
2023 ANNUAL FACILITY PERFORMANCE REPORT

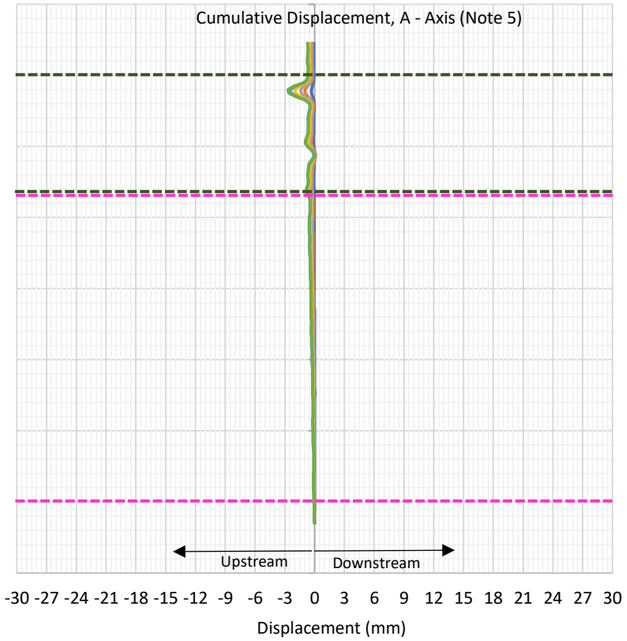
TITLE
LL DAM INCLINOMETER PLOTS
LL-I16-04 (NORTH DAM U-GLU)
DEC. 2021 TO NOV. 2023

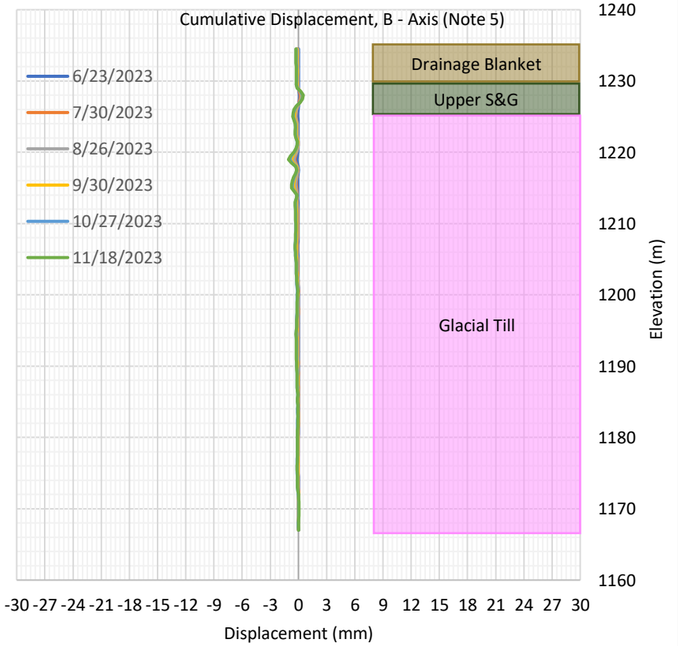
SCALE	PROJECT No.	FIG. No.
NTS	M02341C62	II-B-34











NOTES

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5. AZIMUTH CORRECTION HAS NOT BEEN APPLIED TO THIS INSTRUMENT.

Geological Unit	EL. Range (m)	NL(mm/month)	T1 (mm/month)	T2 (mm/month)	Colour Code
Sand & Gravel	1230.0-1213.0	2.0	N/A	N/A	
Glacial Till	1213.0-1170.0	2.0	N/A	N/A	

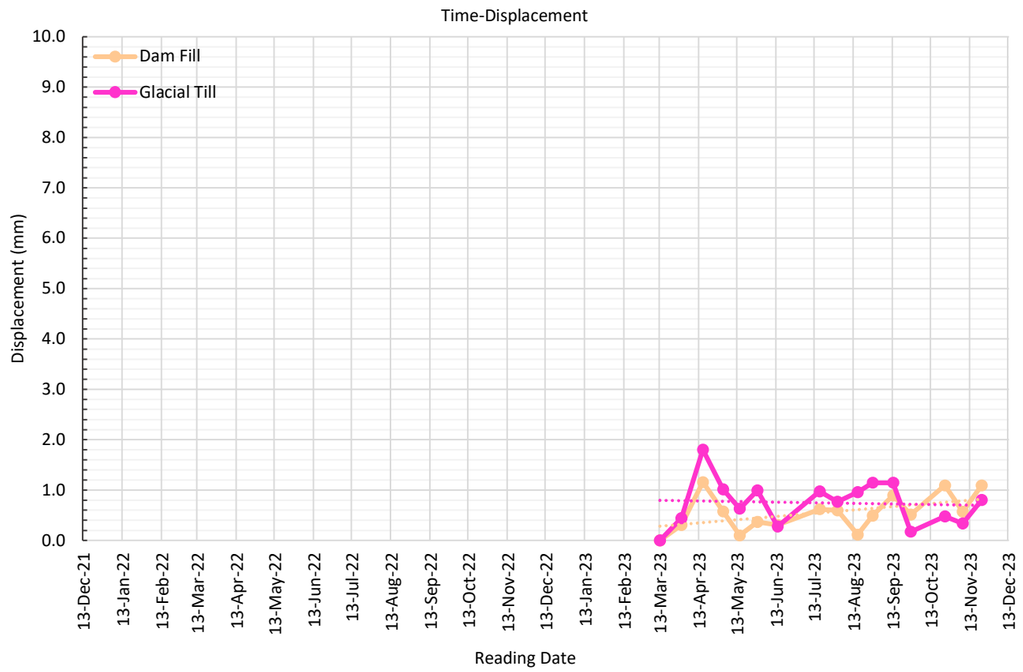
Station	Baseline Reading	Instrument Type
3+350	2023-06-11	SAAV

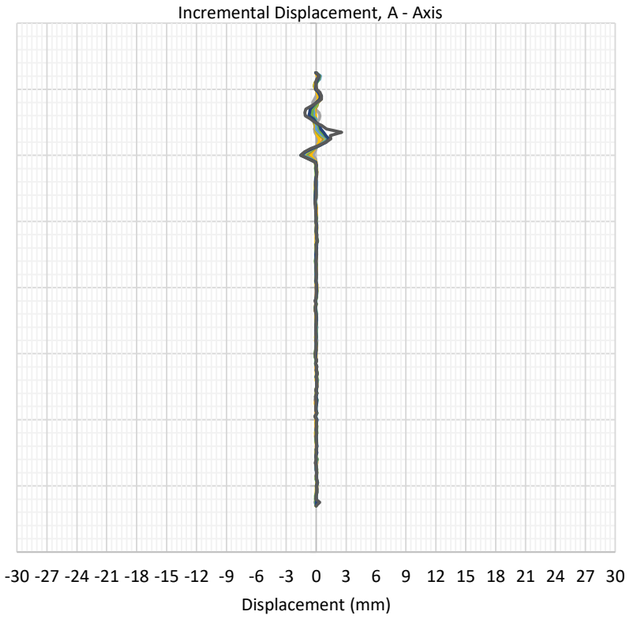
CLIENT
Highland Valley Copper / Teck
Klohn Crippen Berger

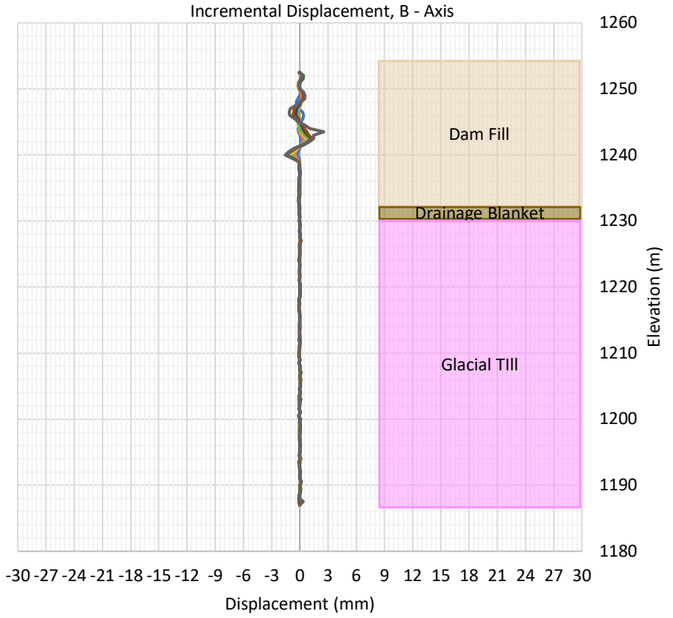
PROJECT
HIGHLAND TAILINGS STORAGE FACILITY
2023 ANNUAL FACILITY PERFORMANCE REPORT

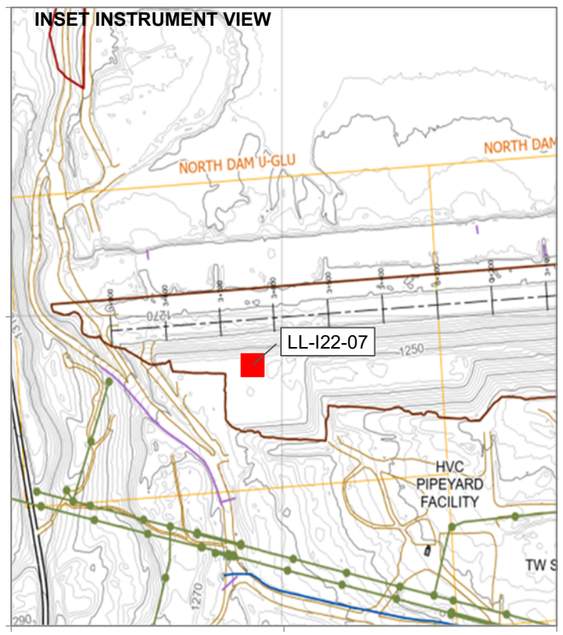
TITLE
LL DAM INCLINOMETER PLOTS
LL-I19-04 (NORTH DAM U-GLU)
DEC. 2021 TO NOV. 2023

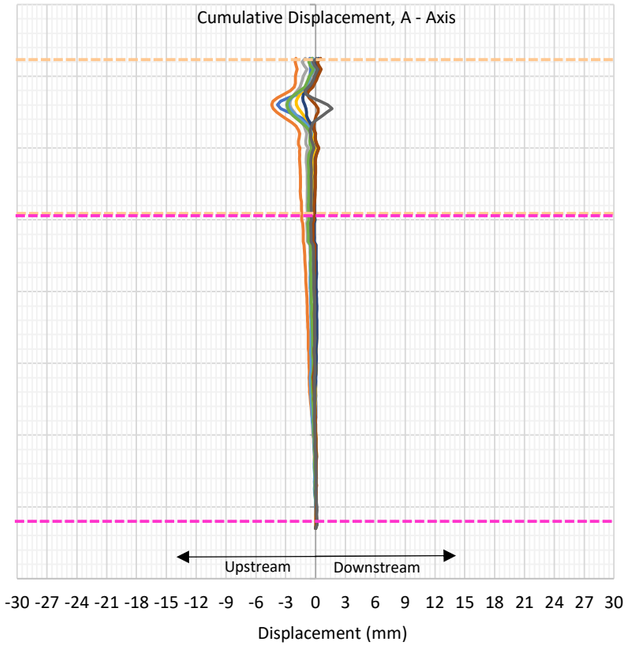
SCALE	PROJECT No.	FIG. No.
NTS	M02341C62	II-B-35

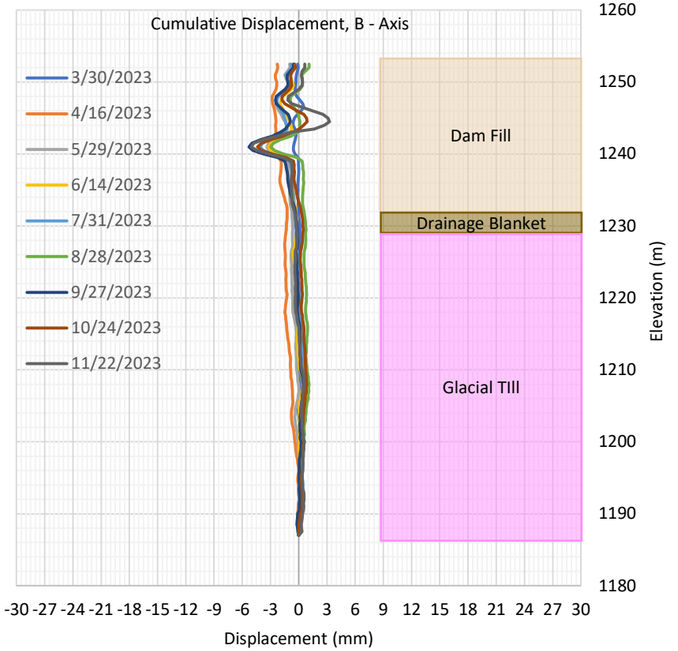












NOTES

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3. X-AXIS, Y-AXIS, AND LEGEND IS THE SAME FOR THE INCREMENTAL AND CUMULATIVE PROFILES.

Geological Unit	EL. Range (m)	NL(mm/month)	T1 (mm/month)	T2 (mm/month)	Colour Code
Dam Fill	1252.5-1230.5	2.0	N/A	N/A	
Glacial Till	1230.5-1188.5	2.0	N/A	N/A	

Station	Baseline Reading	Instrument Type
2+590	2023-03-13	SI

CLIENT
Highland Valley Copper / Teck

Klohn Crippen Berger

PROJECT
HIGHLAND TAILINGS STORAGE FACILITY
2023 ANNUAL FACILITY PERFORMANCE REPORT

TITLE
LL DAM INCLINOMETER PLOTS
LL-I22-07 (North Dam U-GLU)
DEC. 2021 TO NOV. 2023

SCALE	PROJECT No.	FIG. No.
NTS	M02341C62	II-B-36

APPENDIX III

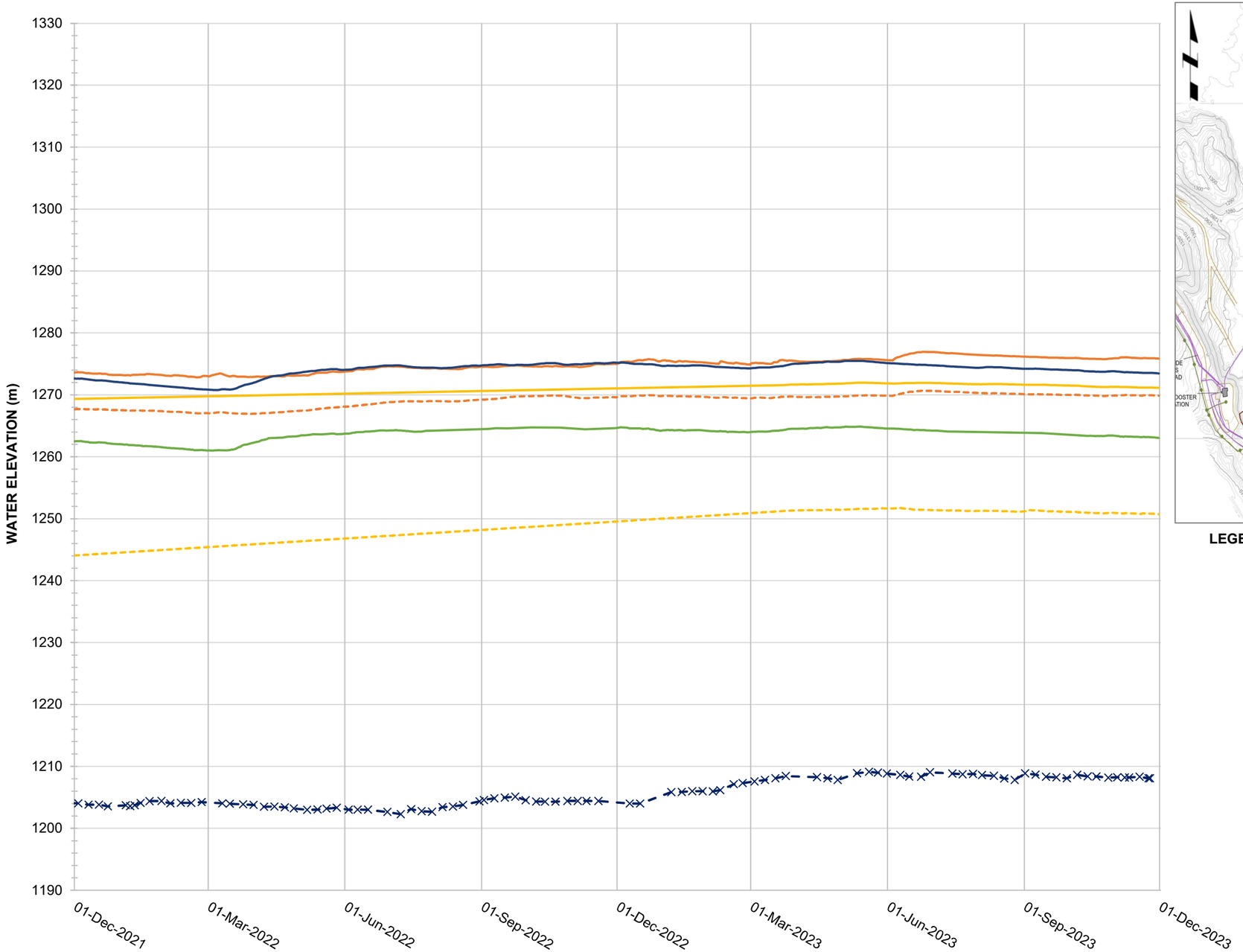
H-H Dam Instrumentation Summary

APPENDIX III-A

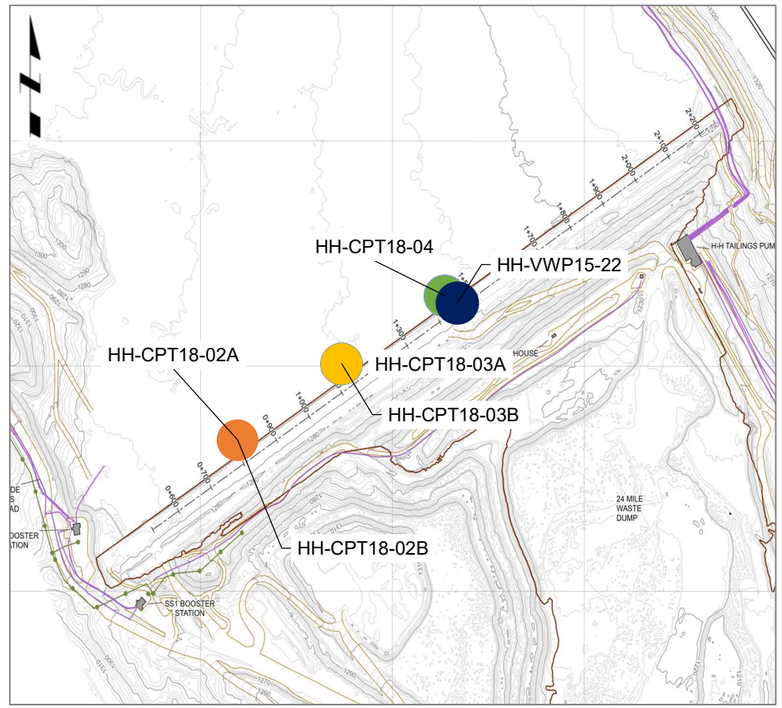
H-H Dam Piezometer Plots

H-H DAM PIEZOMETER PLOTS:

December 1, 2021 to November 30, 2023



INSET INSTRUMENT VIEW



LEGEND

- HH-CPT18-02A (Tailings)
- HH-CPT18-02B (Tailings)
- HH-CPT18-03A (Tailings)
- HH-CPT18-03B (Tailings)
- HH-CPT18-04 (Tailings)
- HH-VWP15-22 (Dam Fill - Rockfill)
- 24 MILE LAKE POND LEVEL

NOTES

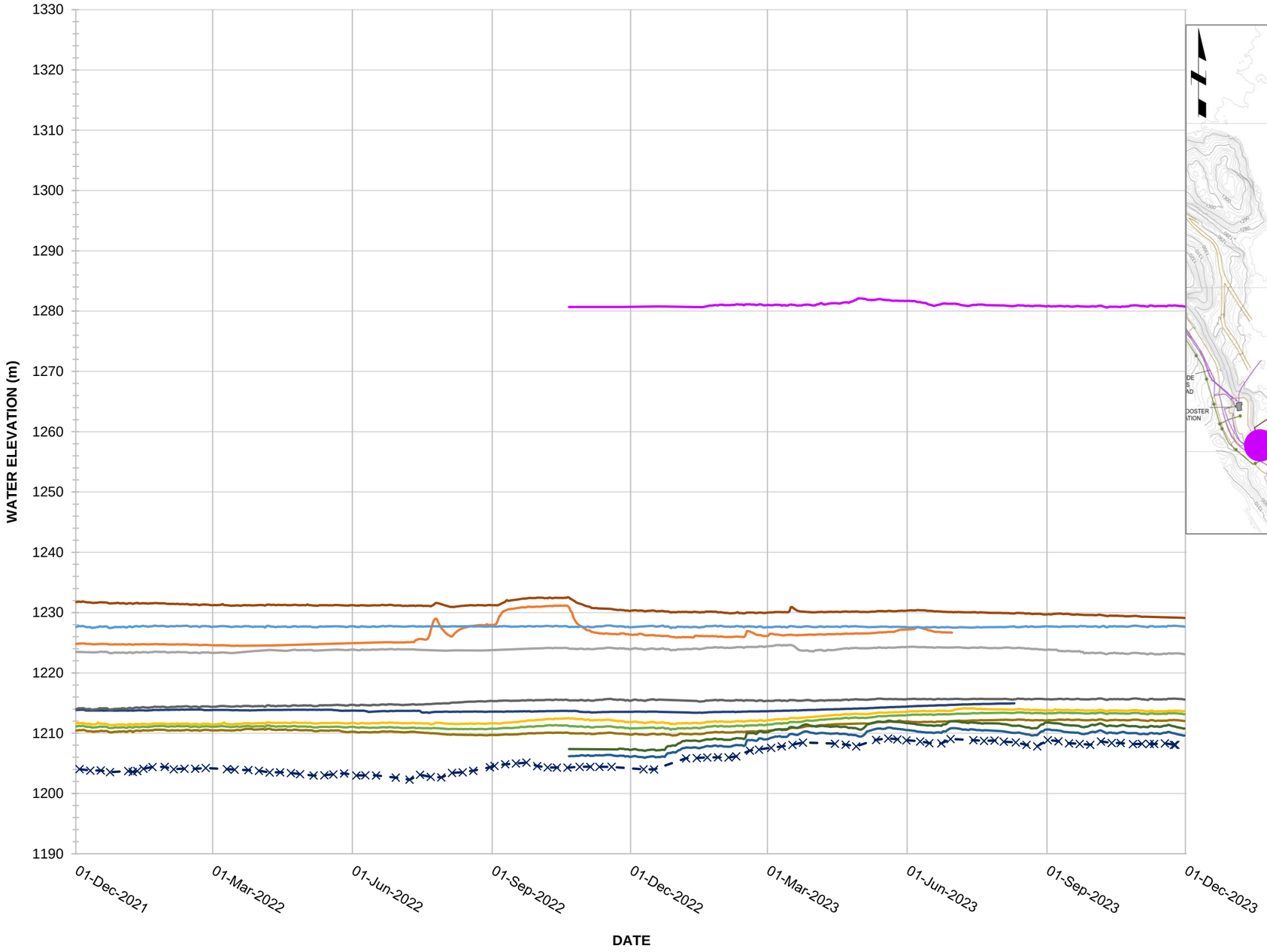
CLIENT: Highland Valley Copper / Teck

Klohn Crippen Berger

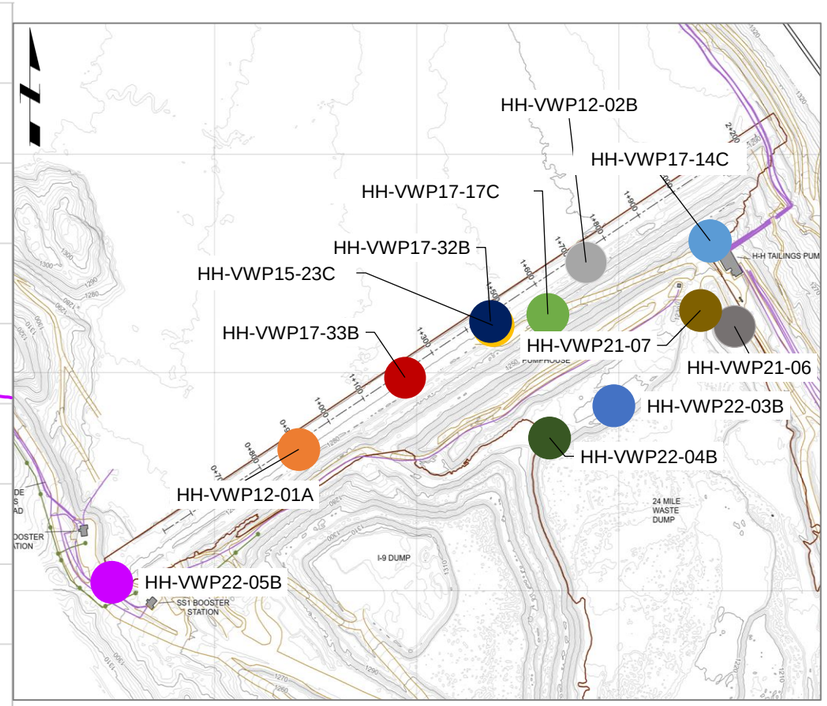
PROJECT: HIGHLAND TAILINGS STORAGE FACILITY
2023 ANNUAL FACILITY PERFORMANCE REPORT

TITLE: H-H DAM
UPSTREAM OF CORE
2022 TO 2024 PIEZOMETER PLOTS

SCALE	PROJECT No.	FIG. No.
AS SHOWN	M02341C62	III-A-1



INSET INSTRUMENT VIEW



LEGEND

- HH-VWP12-01A (Defunct)
- HH-VWP12-02B (Glacial Till)
- HH-VWP15-23C (Dam Fill - Sand and Gravel)
- HH-VWP17-14C (Dam Fill - Rockfill)
- HH-VWP17-17C (Dam Fill - Rockfill)
- HH-VWP17-32B (Defunct)
- HH-VWP17-33B (Upper Sand and Gravel)
- HH-VWP21-06 (Upper Sand and Gravel)
- HH-VWP21-07 (Upper Sand and Gravel)
- HH-VWP22-03B (Dam Fill - Rockfill)
- HH-VWP22-04B (Dam Fill - Rockfill)
- HH-VWP22-05B (Dam Fill - Rockfill)
- 24 MILE TSF

NOTES

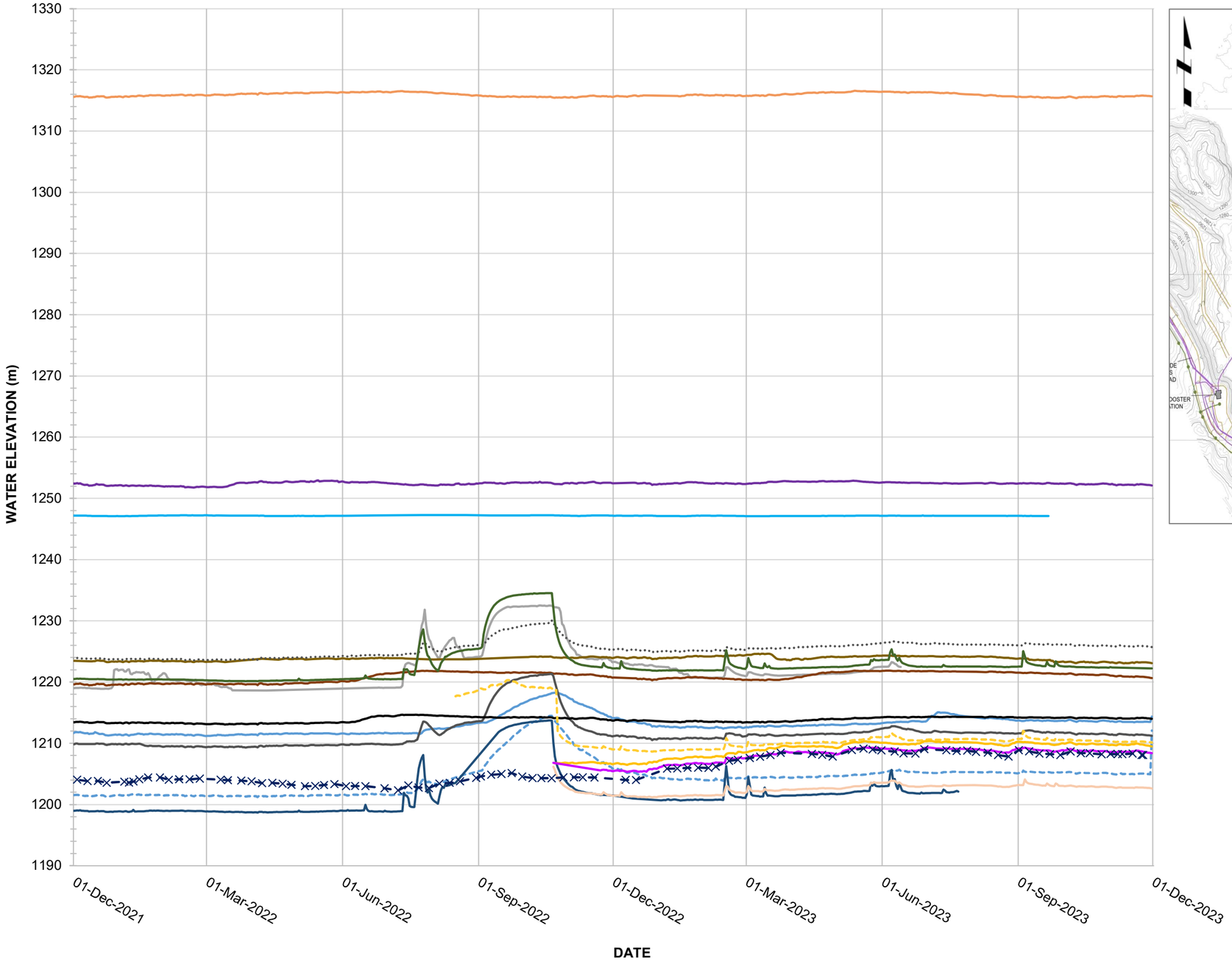
CLIENT: Highland Valley Copper / Teck

Klohn Crippen Berger

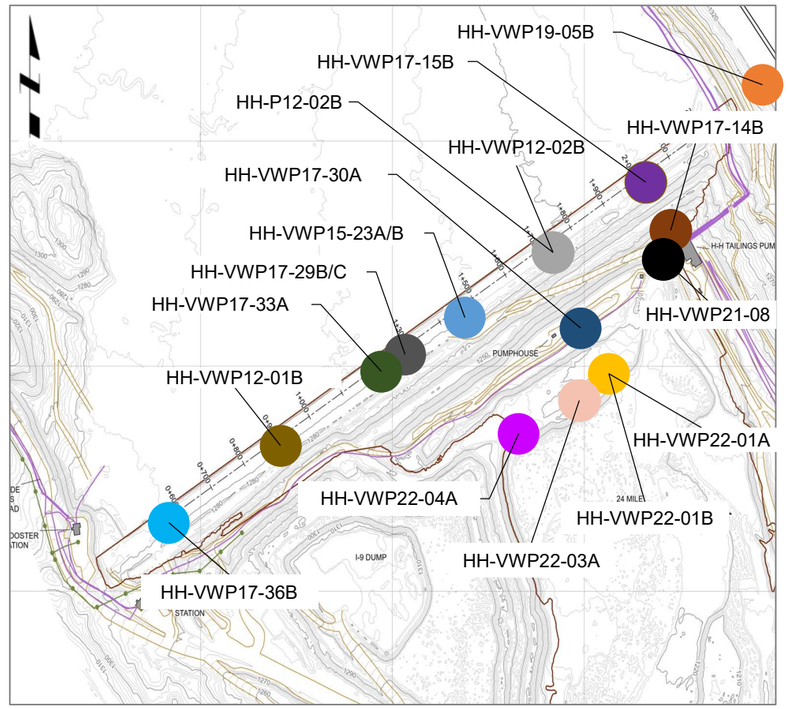
PROJECT: HIGHLAND TAILINGS STORAGE FACILITY
2023 ANNUAL FACILITY PERFORMANCE REPORT

TITLE: H-H DAM
DAM FILL AND SAND & GRAVEL
2022 TO 2024 PIEZOMETER PLOTS

SCALE	PROJECT No.	FIG. No.
AS SHOWN	M02341C62	III-A-2



INSET INSTRUMENT VIEW



LEGEND

- HH-P12-02B (Defunct)
- HH-VWP12-01B (Defunct)
- HH-VWP12-02B (Glacial Till)
- HH-VWP15-23A (Unit 10)
- HH-VWP15-23B (Upper Sand and Gravel)
- HH-VWP17-14B (Glacial Till)
- HH-VWP17-15B (Glacial Till)
- HH-VWP17-29B (Fan Unit)
- HH-VWP17-29C (Glacial Till)
- HH-VWP17-30A (Defunct)
- HH-VWP17-33A (Clay Layer 2)
- HH-VWP17-36B (Defunct)
- HH-VWP19-05B (Granodiorite Bedrock)
- HH-VWP21-08 (Glacial Till)
- HH-VWP22-01A (Fan Unit)
- HH-VWP22-01B (Glacial Till)
- HH-VWP22-03A (Clay Layer 2)
- HH-VWP22-04A (Glacial Till)
- 24 MILE TSF

NOTES

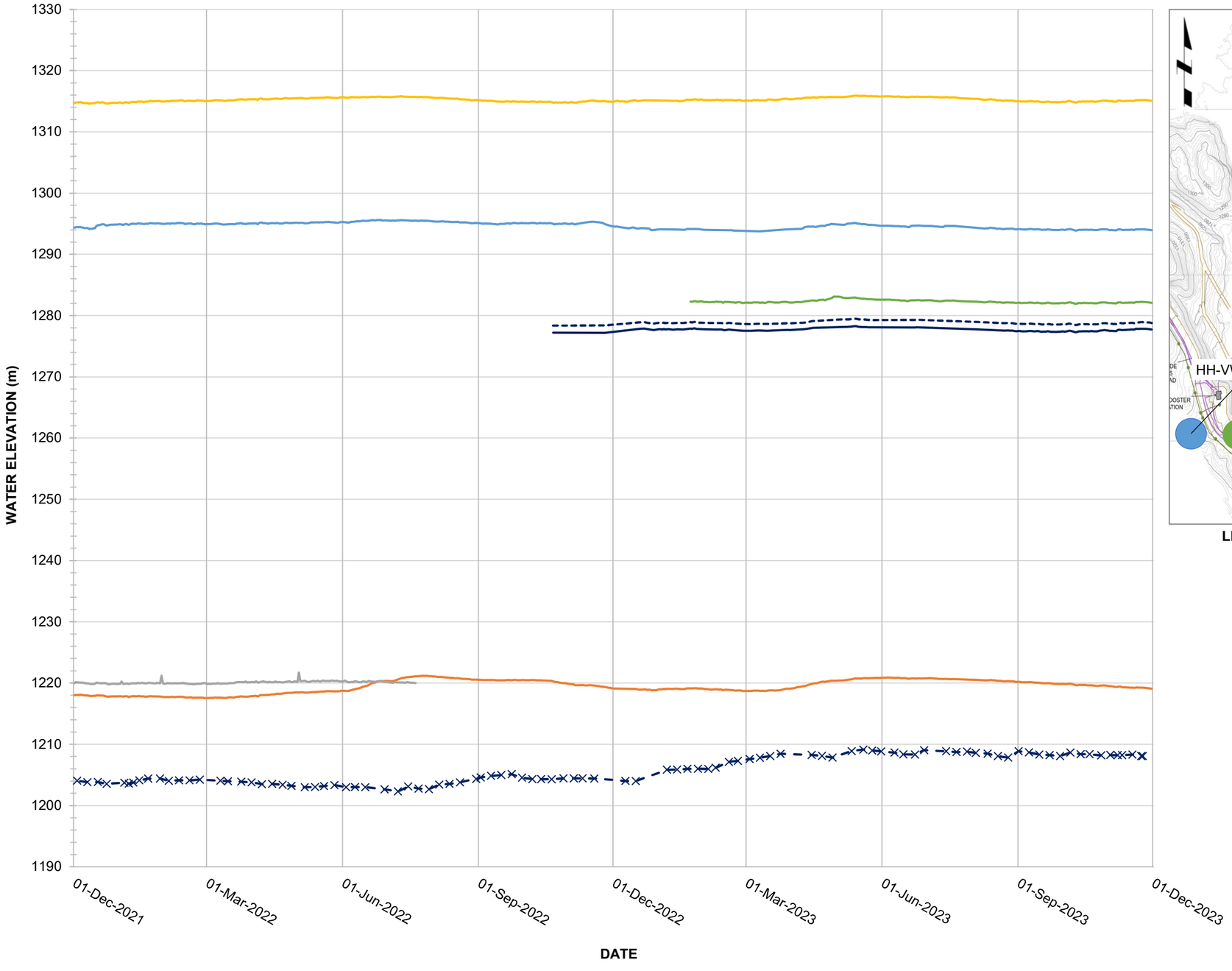
CLIENT: Highland Valley Copper / Teck

Klohn Crippen Berger

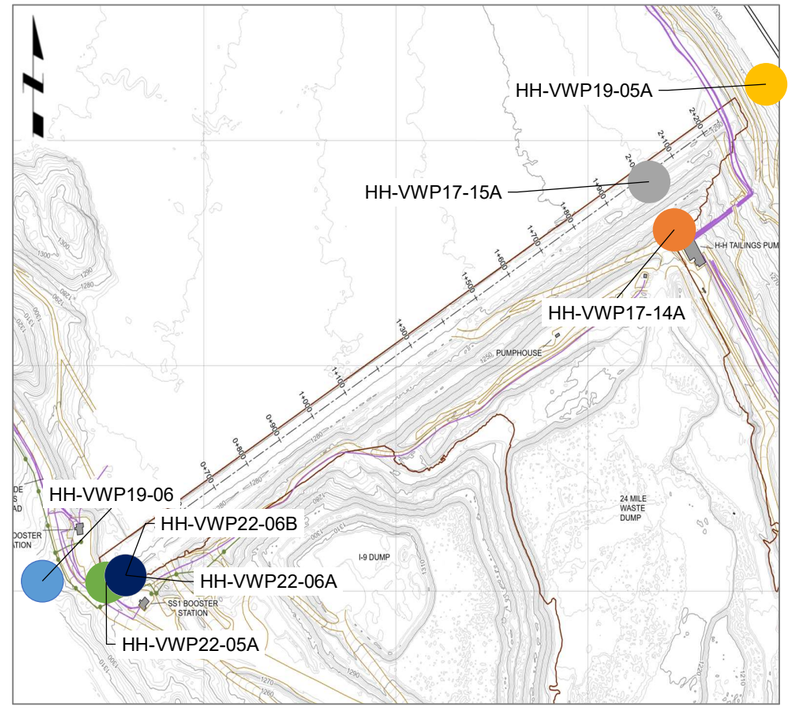
PROJECT: HIGHLAND TAILINGS STORAGE FACILITY
2023 ANNUAL FACILITY PERFORMANCE REPORT

TITLE: H-H DAM
GLACIAL TILL, CLAY, AND STRATIFIED SEDIMENT
2022 TO 2024 PIEZOMETER PLOTS

SCALE	PROJECT No.	FIG. No.
AS SHOWN	M02341C62	III-A-3



INSET INSTRUMENT VIEW



LEGEND

- HH-VWP17-14A (Granodiorite Bedrock)
- HH-VWP17-15A (Defunct)
- HH-VWP19-05A (Glacial Till)
- HH-VWP19-06 (Granodiorite Bedrock)
- HH-VWP22-05A (Granodiorite Bedrock)
- HH-VWP22-06A (Granodiorite Bedrock)
- HH-VWP22-06B (Granodiorite Bedrock)
- 24 MILE LAKE POND LEVEL

NOTES

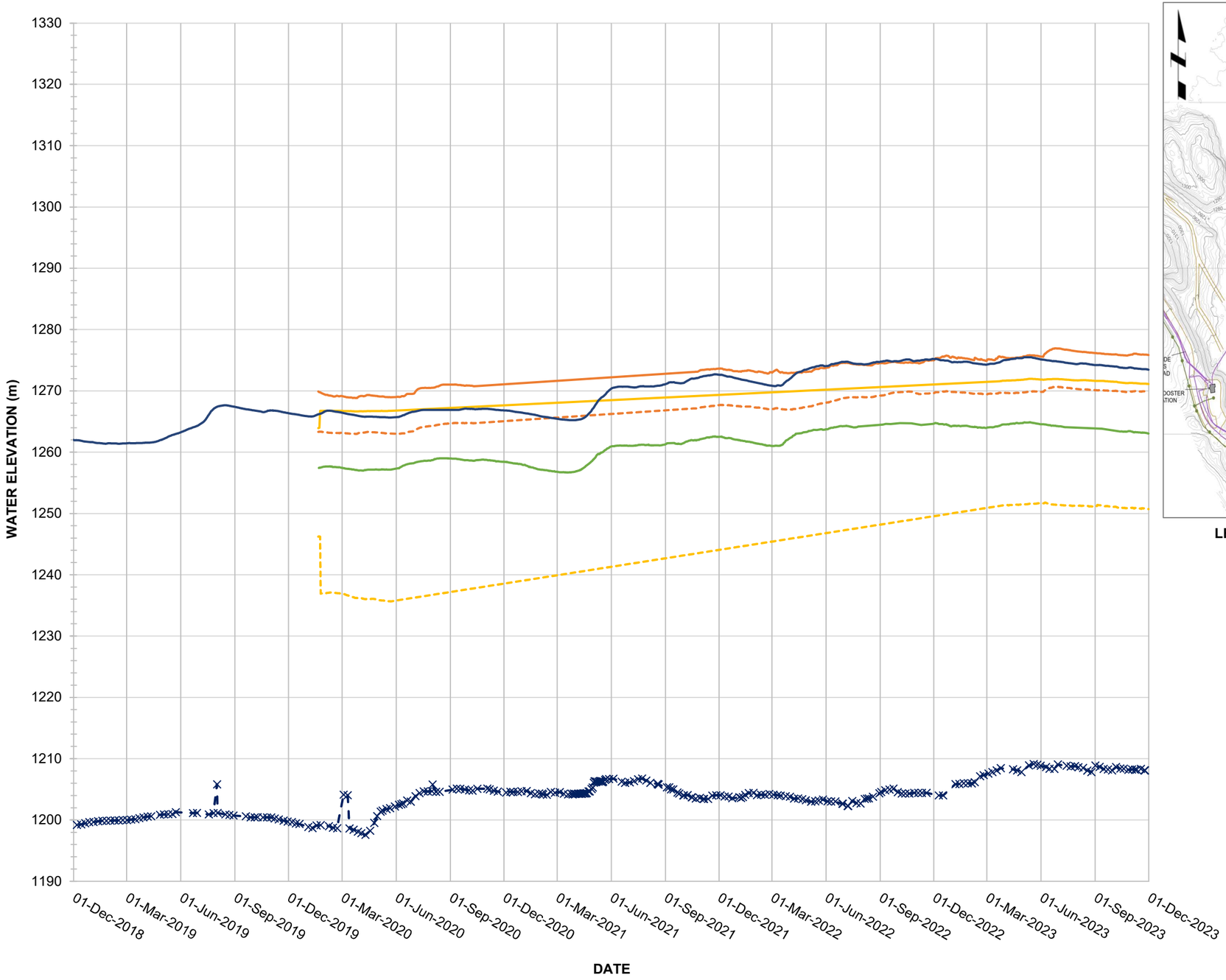
CLIENT: Highland Valley Copper / Teck

Klohn Crippen Berger

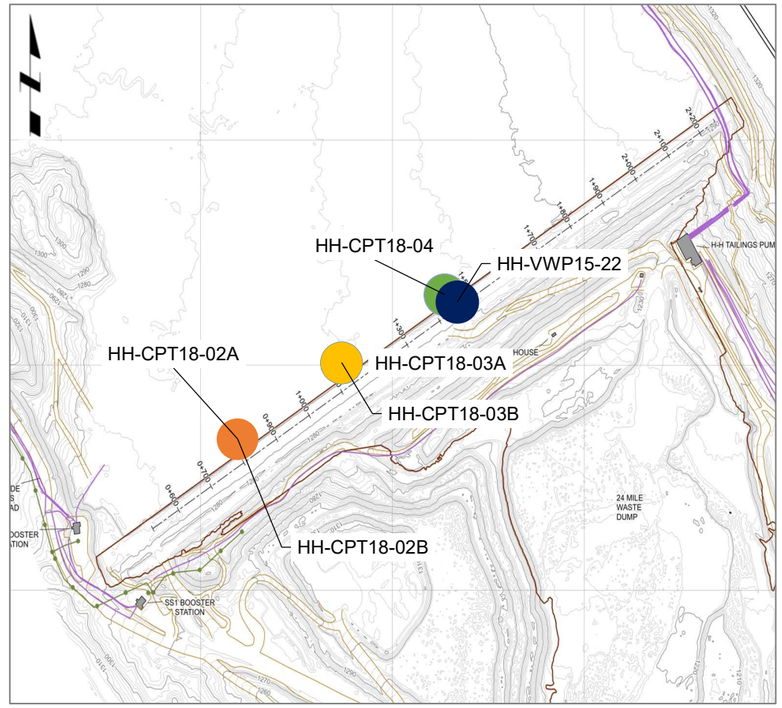
PROJECT: HIGHLAND TAILINGS STORAGE FACILITY
2023 ANNUAL FACILITY PERFORMANCE REPORT

TITLE: H-H DAM
FOUNDATION ROCK
2022 TO 2024 PIEZOMETER PLOTS

SCALE	PROJECT No.	FIG. No.
AS SHOWN	M02341C62	III-A-4



INSET INSTRUMENT VIEW



LEGEND

- HH-CPT18-02A (Tailings)
- HH-CPT18-02B (Tailings)
- HH-CPT18-03A (Tailings)
- HH-CPT18-03B (Tailings)
- HH-CPT18-04 (Tailings)
- HH-VWP15-22 (Dam Fill - Rockfill)
- 24 MILE LAKE POND LEVEL

NOTES

CLIENT: Highland Valley Copper / Teck

Klohn Crippen Berger

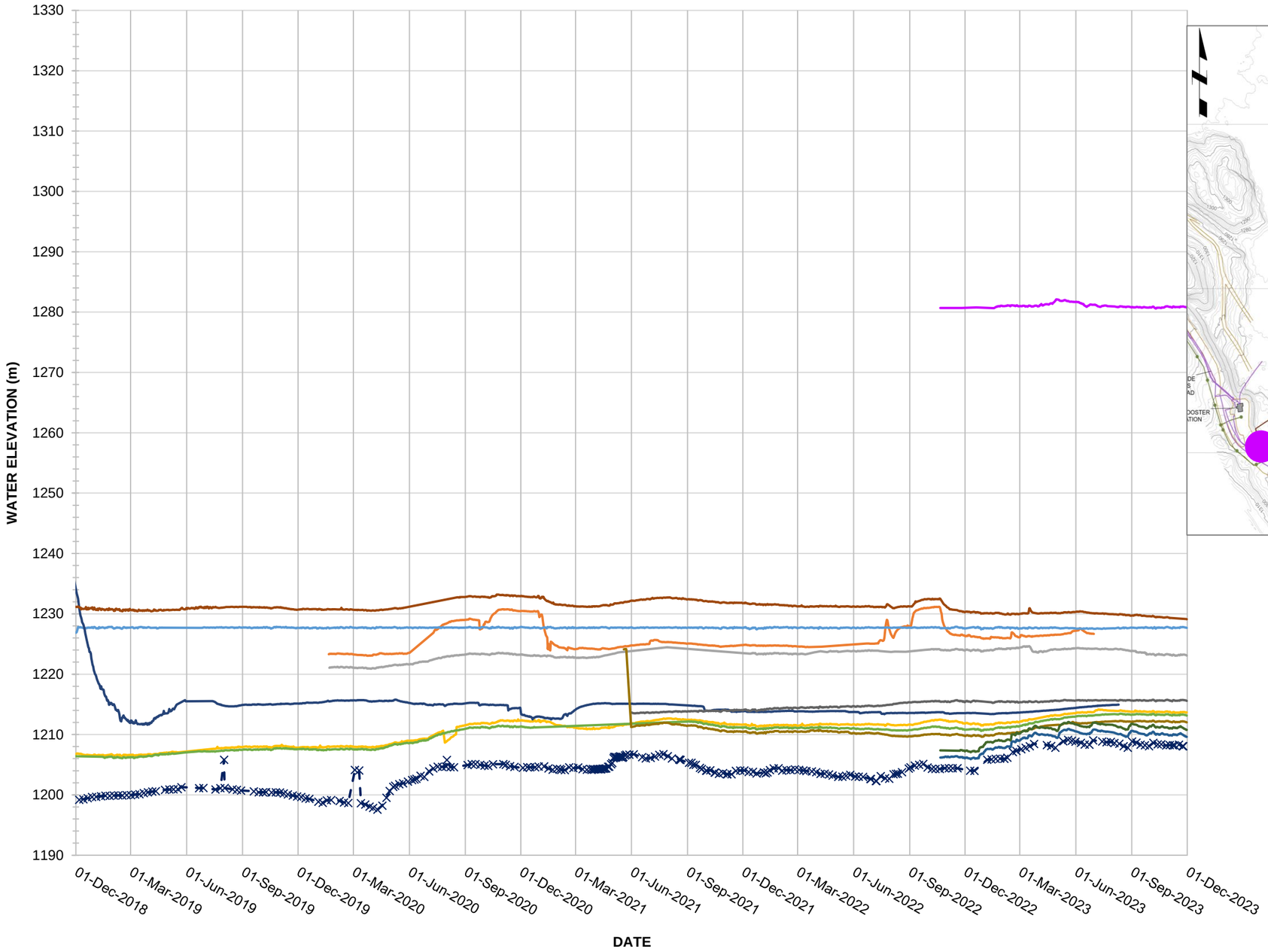
PROJECT: HIGHLAND TAILINGS STORAGE FACILITY
2023 ANNUAL FACILITY PERFORMANCE REPORT

TITLE: H-H DAM
UPSTREAM OF CORE
2019 TO 2024 PIEZOMETER PLOTS

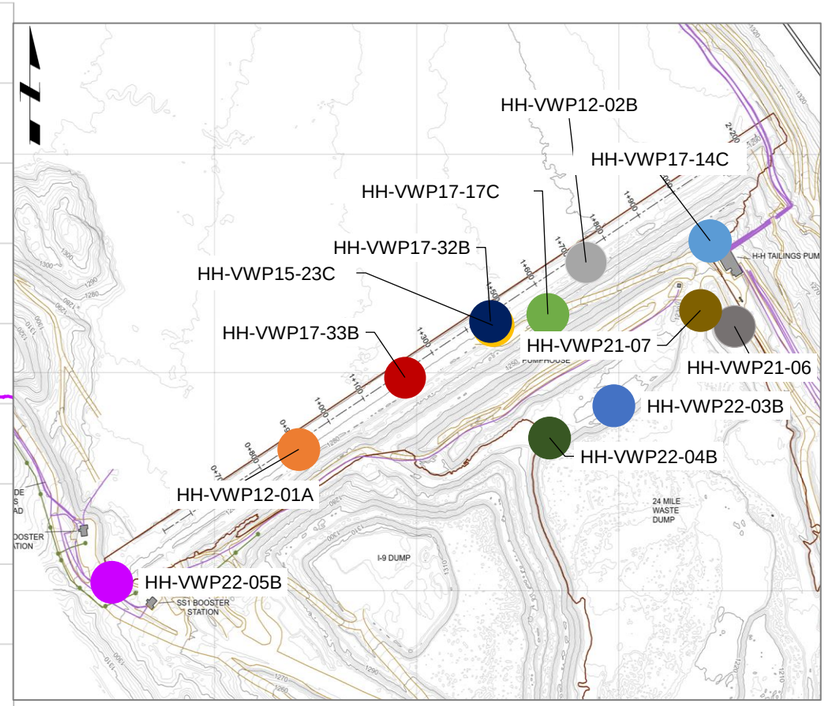
SCALE	PROJECT No.	FIG. No.
AS SHOWN	M02341C62	III-A-101

H-H DAM PIEZOMETER PLOTS:

December 1, 2018 to November 30, 2023



INSET INSTRUMENT VIEW



LEGEND

- HH-VWP12-01A (Defunct)
- HH-VWP12-02B (Glacial Till)
- HH-VWP15-23C (Dam Fill - Sand and Gravel)
- HH-VWP17-14C (Dam Fill - Rockfill)
- HH-VWP17-17C (Dam Fill - Rockfill)
- HH-VWP17-32B (Defunct)
- HH-VWP17-33B (Upper Sand and Gravel)
- HH-VWP21-06 (Upper Sand and Gravel)
- HH-VWP21-07 (Upper Sand and Gravel)
- HH-VWP22-03B (Dam Fill - Rockfill)
- HH-VWP22-04B (Dam Fill - Rockfill)
- HH-VWP22-05B (Dam Fill - Rockfill)
- 24 MILE TSF

NOTES

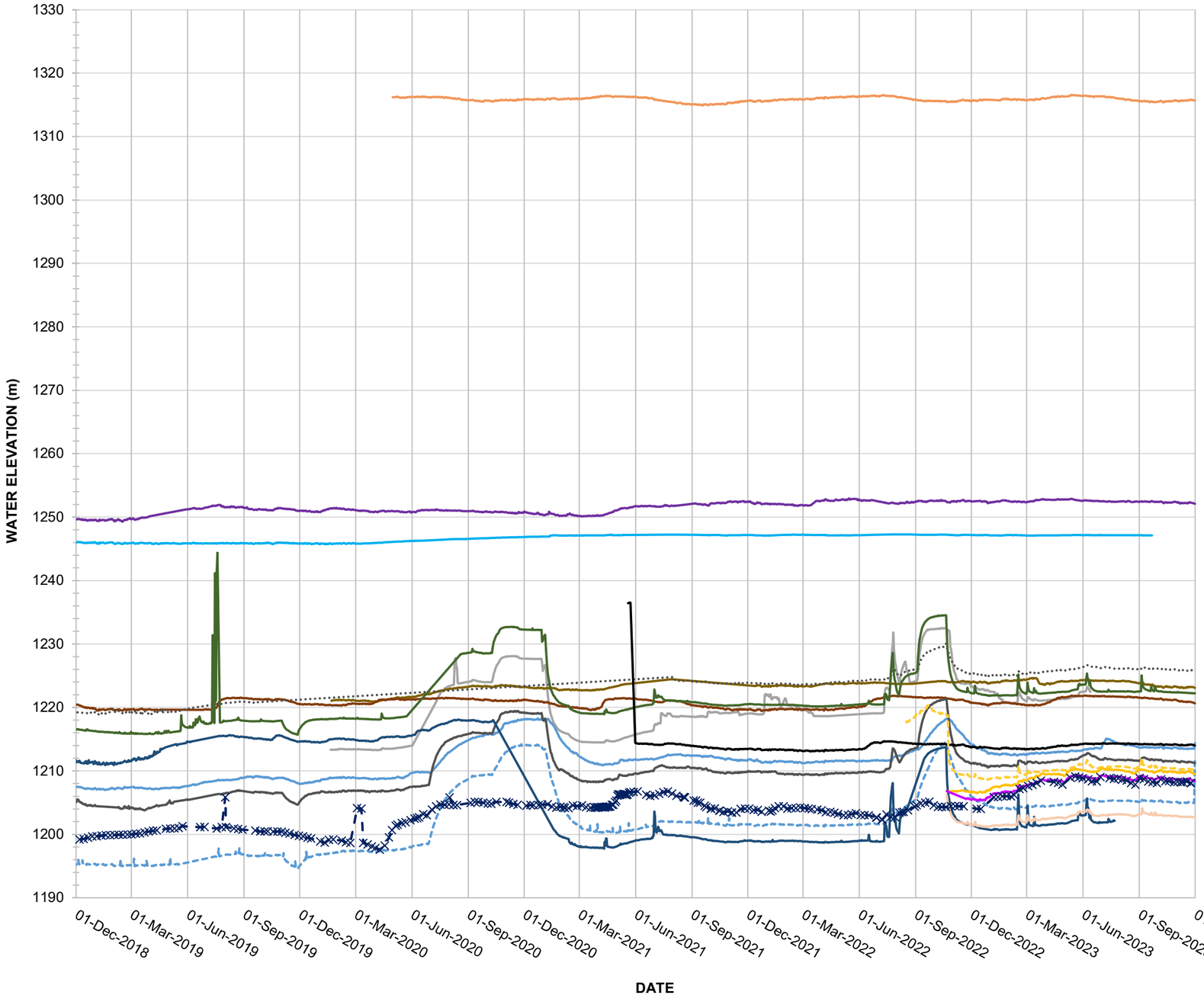
CLIENT: Highland Valley Copper / Teck

Klohn Crippen Berger

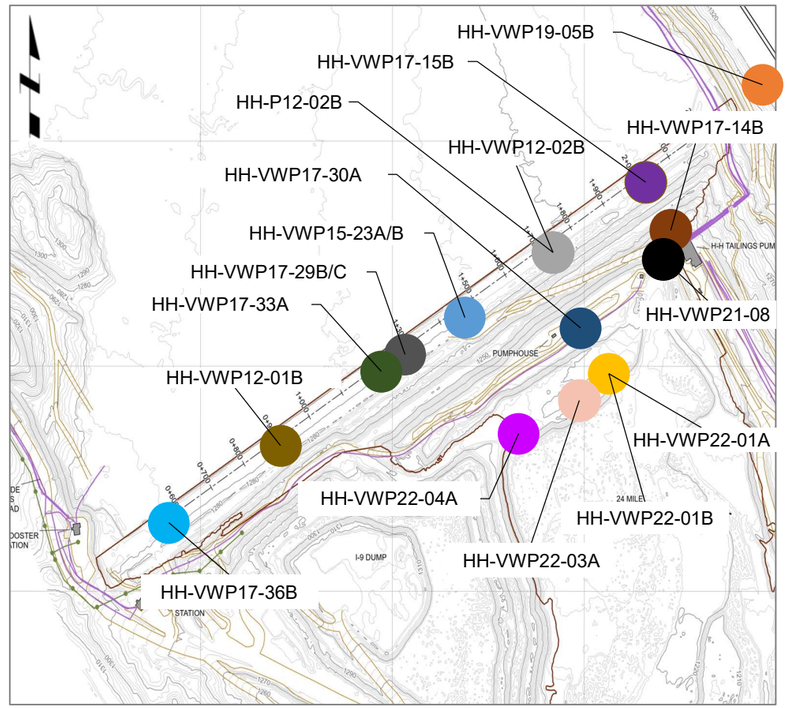
PROJECT: HIGHLAND TAILINGS STORAGE FACILITY
2023 ANNUAL FACILITY PERFORMANCE REPORT

TITLE: H-H DAM
DAM FILL AND SAND & GRAVEL
2019 TO 2024 PIEZOMETER PLOTS

SCALE	PROJECT No.	FIG. No.
AS SHOWN	M02341C62	III-A-102



INSET INSTRUMENT VIEW



LEGEND

- HH-VWP12-01B (Defunct)
- HH-VWP12-02B (Glacial Till)
- HH-VWP15-23A (Unit 10)
- HH-VWP15-23B (Upper Sand and Gravel)
- HH-VWP17-14B (Glacial Till)
- HH-VWP17-15B (Glacial Till)
- HH-VWP17-29B (Fan Unit)
- HH-VWP17-29C (Glacial Till)
- HH-VWP17-30A (Defunct)
- HH-VWP17-33A (Clay Layer 2)
- HH-VWP17-36B (Defunct)
- HH-VWP19-05B (Granodiorite Bedrock)
- HH-VWP21-08 (Glacial Till)
- HH-VWP22-01A (Fan Unit)
- HH-VWP22-01B (Glacial Till)
- HH-VWP22-03A (Clay Layer 2)
- HH-VWP22-04A (Glacial Till)
- 24 MILE TSF

NOTES

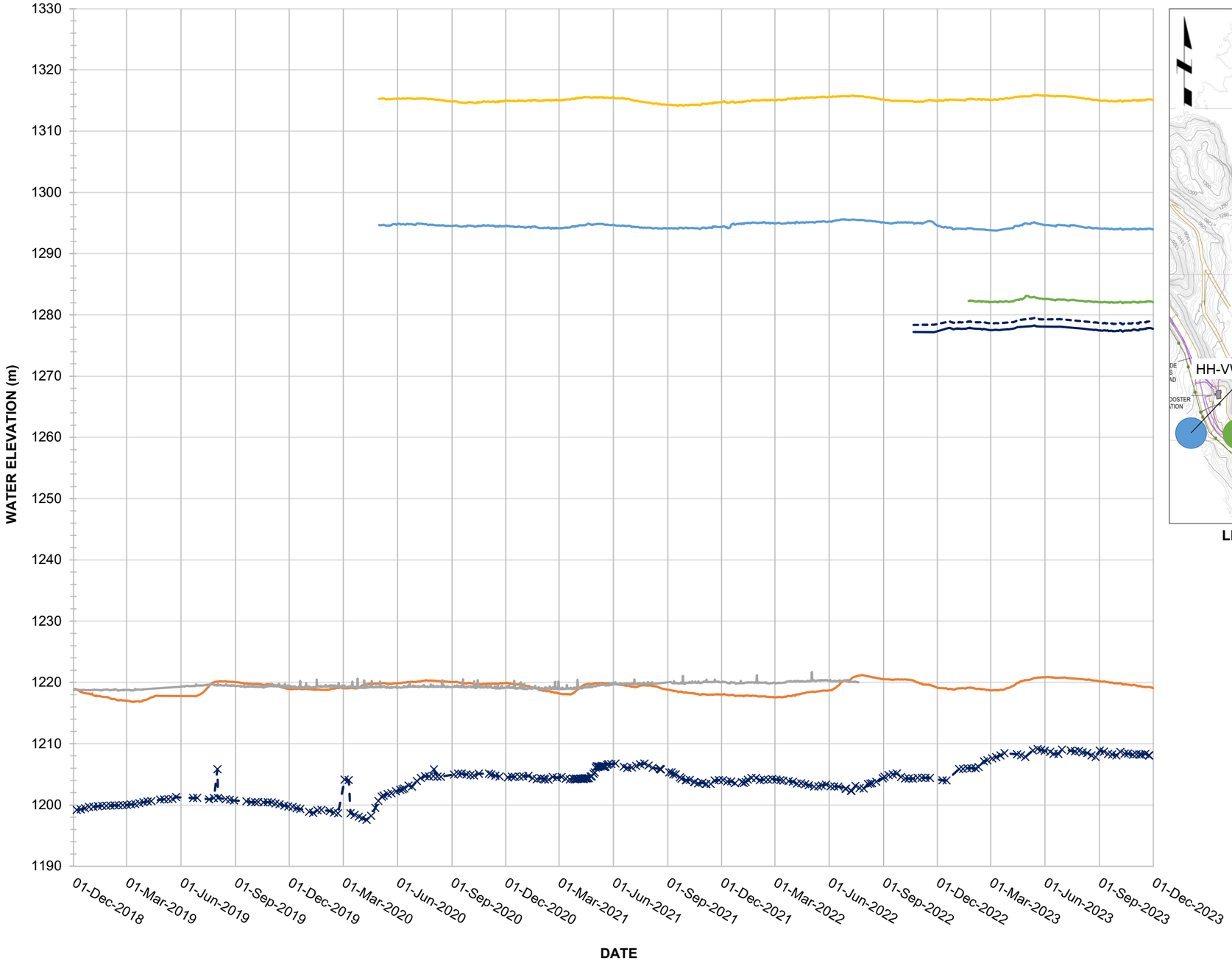
CLIENT: Highland Valley Copper / Teck

Klohn Crippen Berger

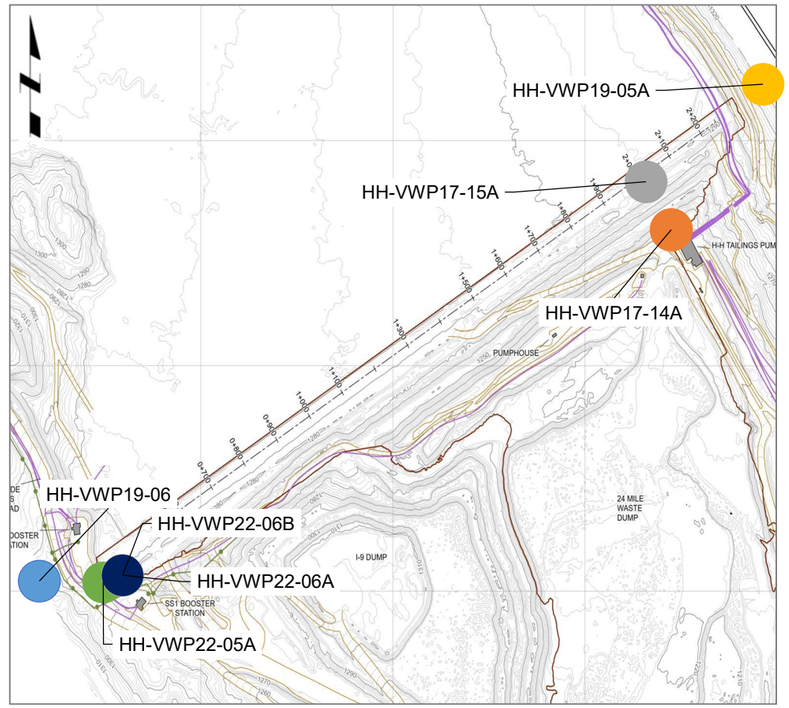
PROJECT: HIGHLAND TAILINGS STORAGE FACILITY
2023 ANNUAL FACILITY PERFORMANCE REPORT

TITLE: H-H DAM
GLACIAL TILL, CLAY, AND STRATIFIED SEDIMENT
2019 TO 2024 PIEZOMETER PLOTS

SCALE	PROJECT No.	FIG. No.
AS SHOWN	M02341C62	III-A-103



INSET INSTRUMENT VIEW



LEGEND

- HH-VWP17-14A (Granodiorite Bedrock)
- HH-VWP17-15A (Defunct)
- HH-VWP19-05A (Glacial Till)
- HH-VWP19-06 (Granodiorite Bedrock)
- HH-VWP22-05A (Granodiorite Bedrock)
- HH-VWP22-06A (Granodiorite Bedrock)
- HH-VWP22-06B (Granodiorite Bedrock)
- 24 MILE LAKE POND LEVEL

NOTES

CLIENT: Highland Valley Copper / Teck

Klohn Crippen Berger

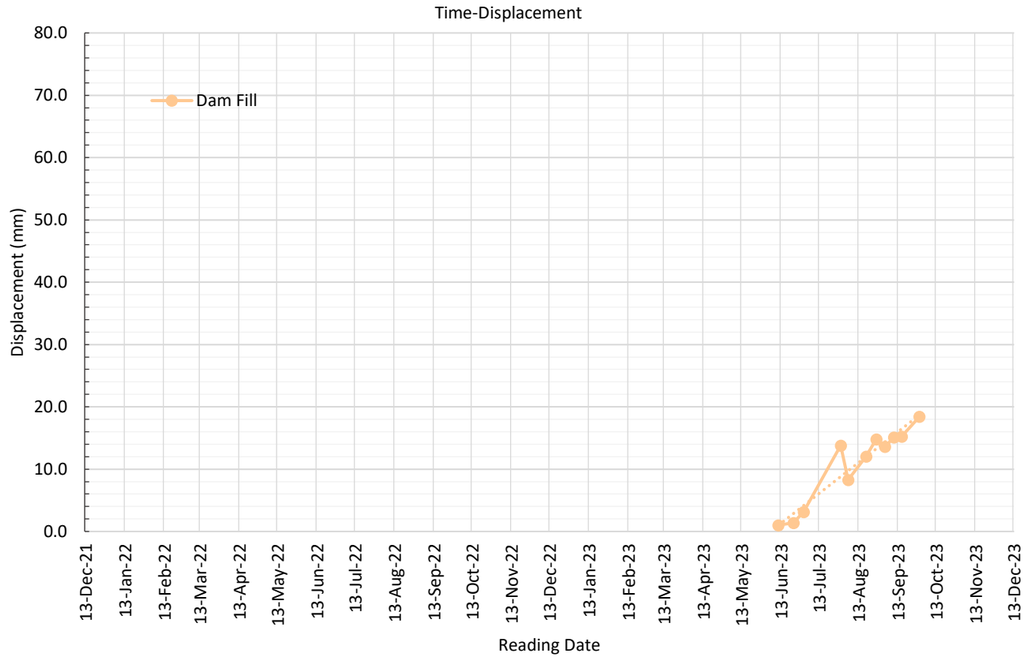
PROJECT: HIGHLAND TAILINGS STORAGE FACILITY
2023 ANNUAL FACILITY PERFORMANCE REPORT

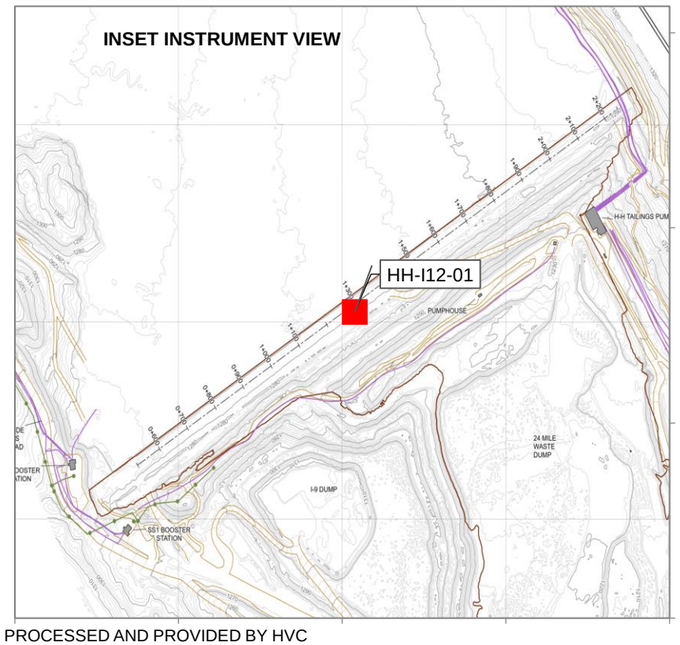
TITLE: H-H DAM
FOUNDATION ROCK
2019 TO 2024 PIEZOMETER PLOTS

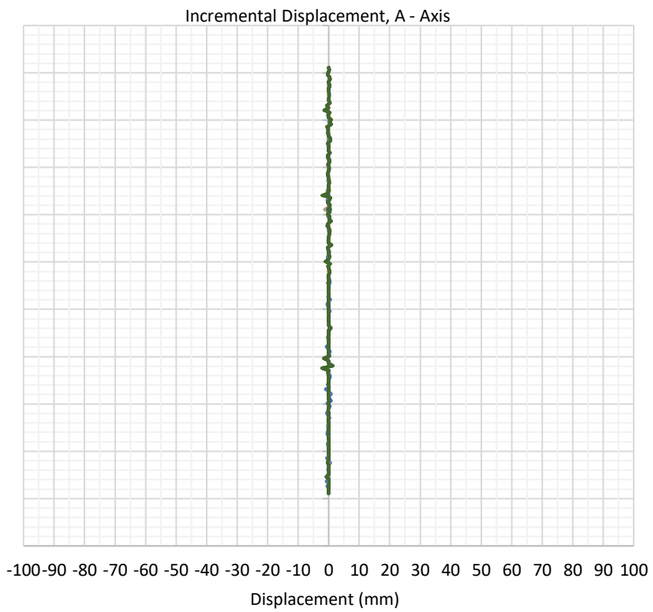
SCALE	PROJECT No.	FIG. No.
AS SHOWN	M02341C62	III-A-104

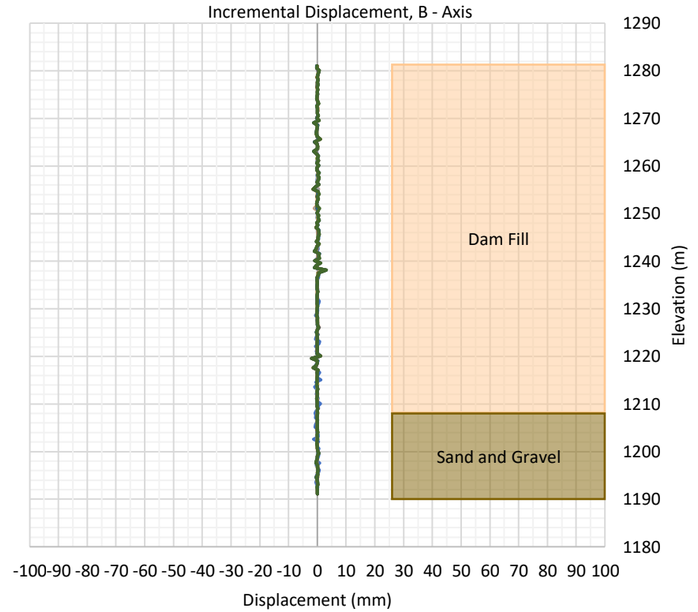
APPENDIX III-B

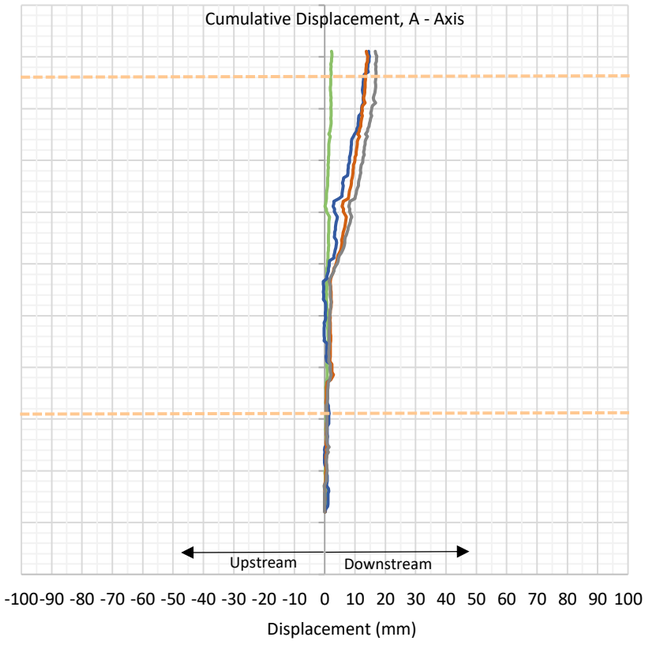
H-H Dam Inclinometer Plots

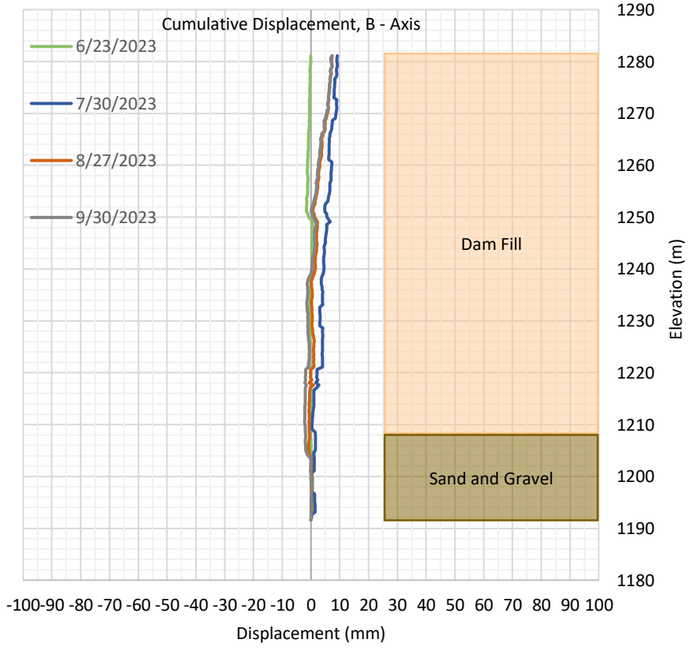












NOTES

1. DATA PROCESSED AND PROVIDED BY HVC
2. LAST READING OF EACH MONTH PLOTTED ON THE INCREMENTAL AND CUMULATIVE PROFILES.
3. X-AXIS, Y-AXIS, AND LEGEND IS THE SAME FOR THE INCREMENTAL AND CUMULATIVE PROFILES.
4. INCREMENTAL DISPLACEMENT PROFILES ARE BASED ON READINGS WITHIN ONE WEEK OF THE CUMULATIVE PROFILES.
5. THERE WERE PROCESSING AND READING ERRORS ASSOCIATED WITH HH-I12-01 STARTING IN EARLY 2023. THESE WERE THOUGHT TO BE RESOLVED IN JUNE AND READING RESUMED. HOWEVER, SUBSEQUENT INVESTIGATIONS HAVE INDICATED THAT PROBLEMS PERSISTED AND WERE NOT FULLY RESOLVED UNTIL DECEMBER 2023. READINGS PLOTTED ON THIS FIGURE ARE NOW BELIEVED TO NO LONGER BE REPRESENTATIVE OF ACTUAL BEHAVIOUR.

Geological Unit	EL. Range (m)	NL(mm/month)	T1 (mm/month)	T2 (mm/month)	Colour Code
Dam Fill	1276.1-1211.1	6.0	N/A	N/A	

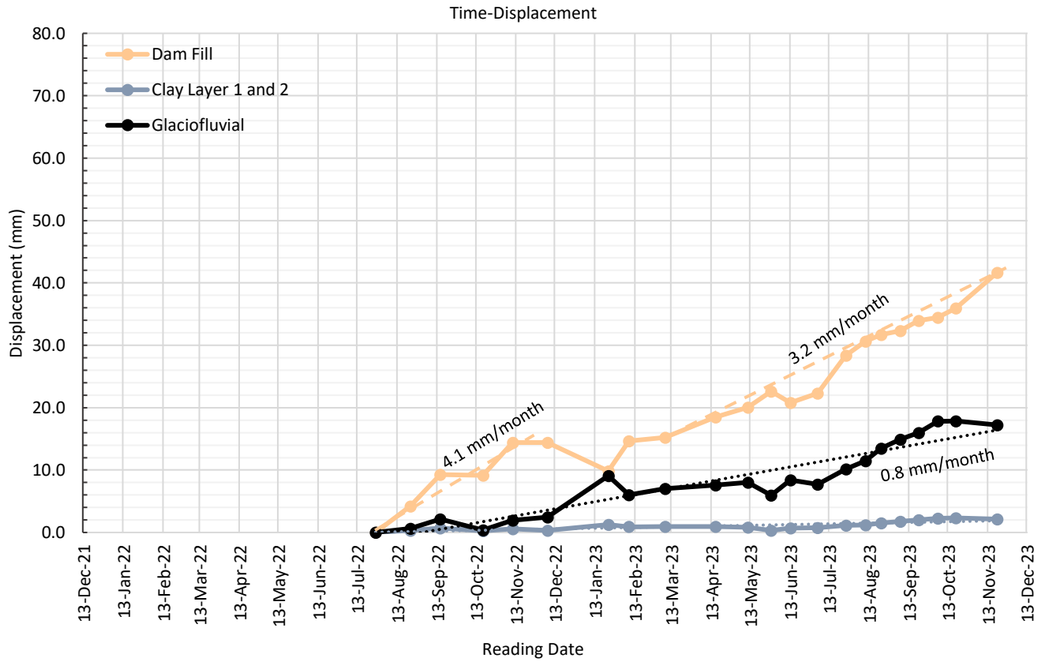
Station	Baseline Reading	Instrument Type
1+275	2023-06-11	SAAV

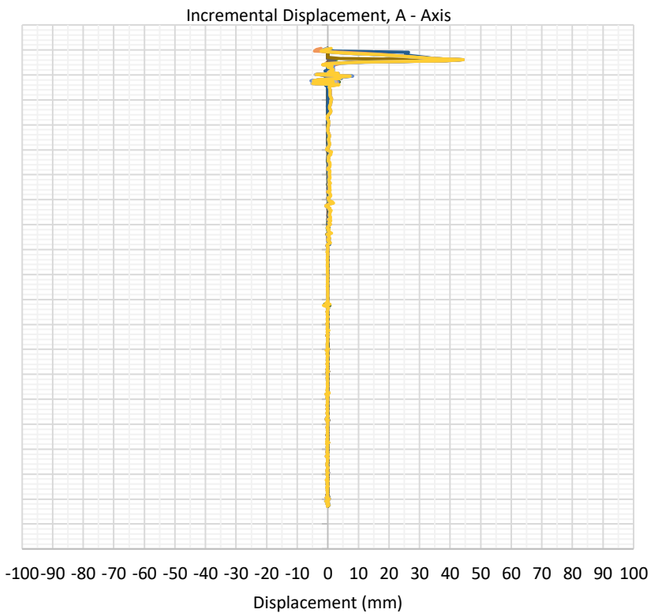
CLIENT
Highland Valley Copper / Teck
Klohn Crippen Berger

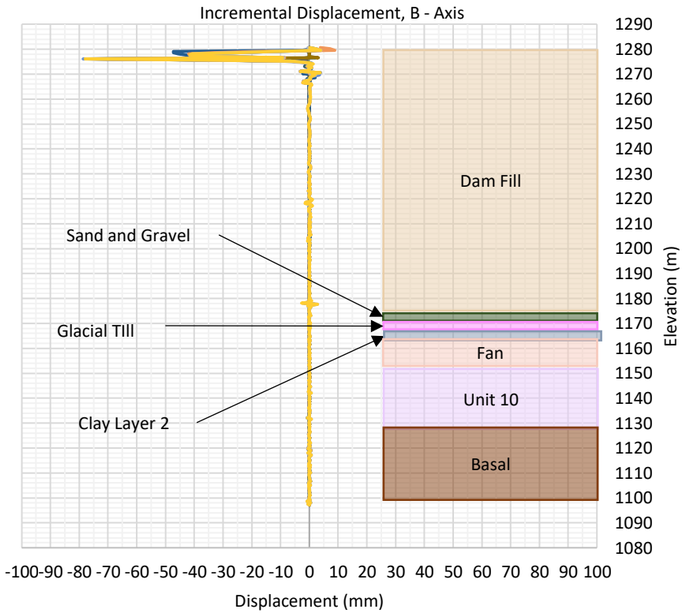
PROJECT
HIGHLAND TAILINGS STORAGE FACILITY
2023 ANNUAL FACILITY PERFORMANCE REPORT

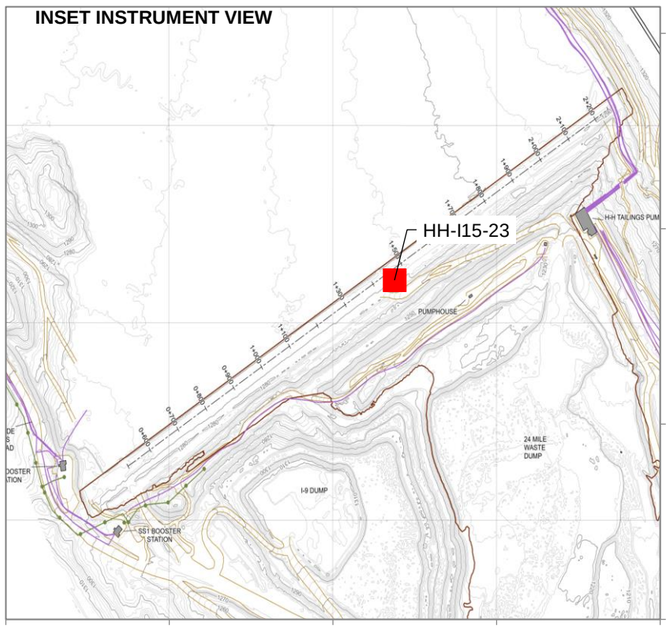
TITLE
HH DAM INCLINOMETER PLOTS
HH-I12-01 (MID SEGMENT)
DEC. 2021 TO NOV. 2023

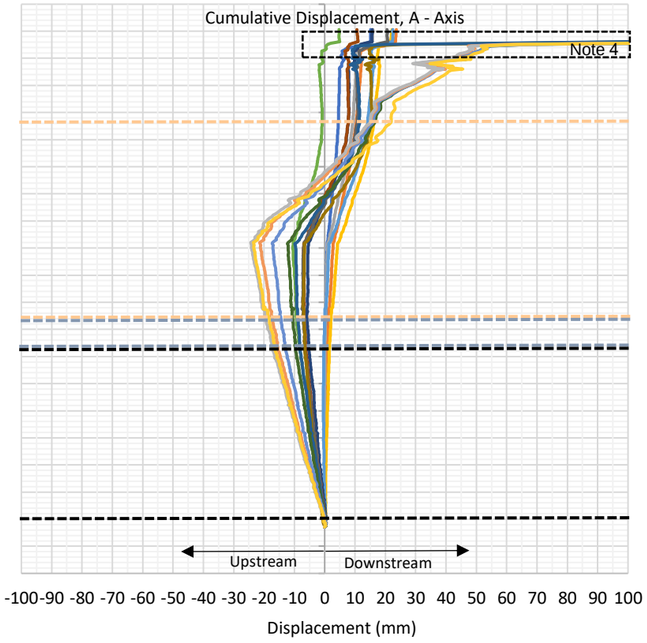
SCALE	PROJECT No.	FIG. No.
NTS	M02341C62	III-B-1

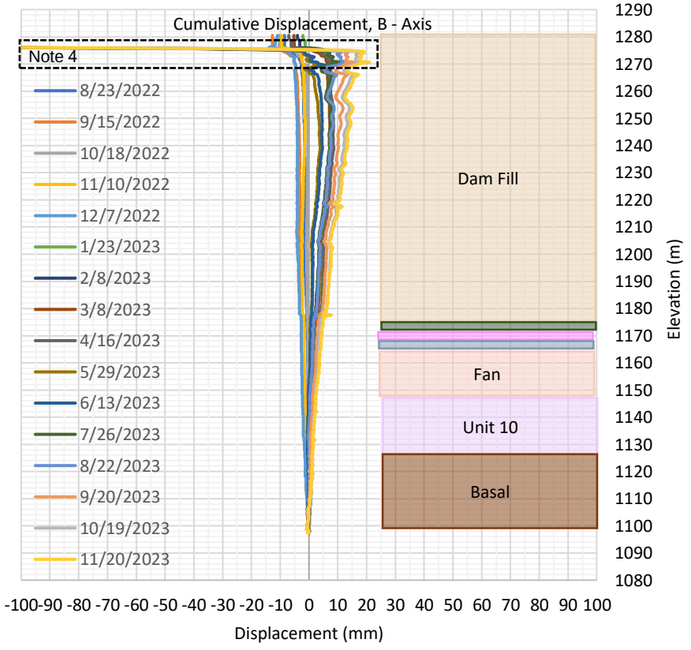












NOTES

1. DATA PROCESSED AND PROVIDED BY HVC
2. LAST READING OF EACH MONTH PLOTTED ON THE INCREMENTAL AND CUMULATIVE PROFILES.
3. X-AXIS, Y-AXIS, AND LEGEND IS THE SAME FOR THE INCREMENTAL AND CUMULATIVE PROFILES.
4. READINGS ABOVE EL. 1272.0 m ARE NOT REFLECTIVE OF ACTUAL MOVEMENT AND SHOULD BE IGNORED.

Geological Unit	EL. Range (m)	NL(mm/month)	T1 (mm/month)	T2 (mm/month)	Colour Code
Dam Fill	1249.7-1176.7	10.0	N/A	N/A	
Clay Layer 1 and 2	1176.7-1165.7	1.0	3.0	N/A	
Glaciofluvial	1165.7-1100.7	3.0	N/A	N/A	

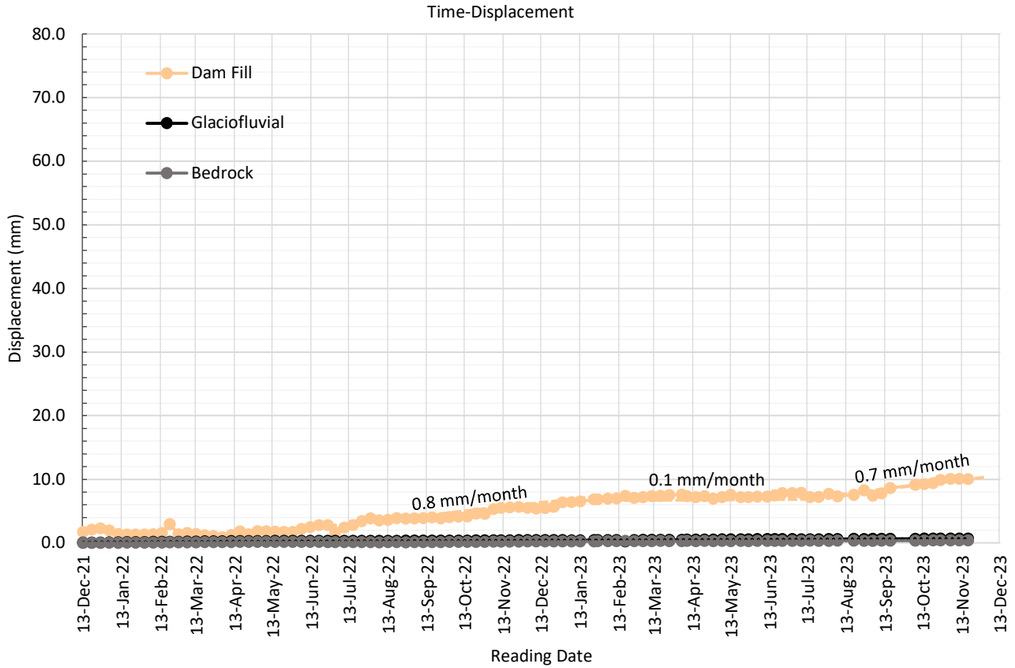
Station	Baseline Reading	Instrument Type
1+460	2022-07-27	SI

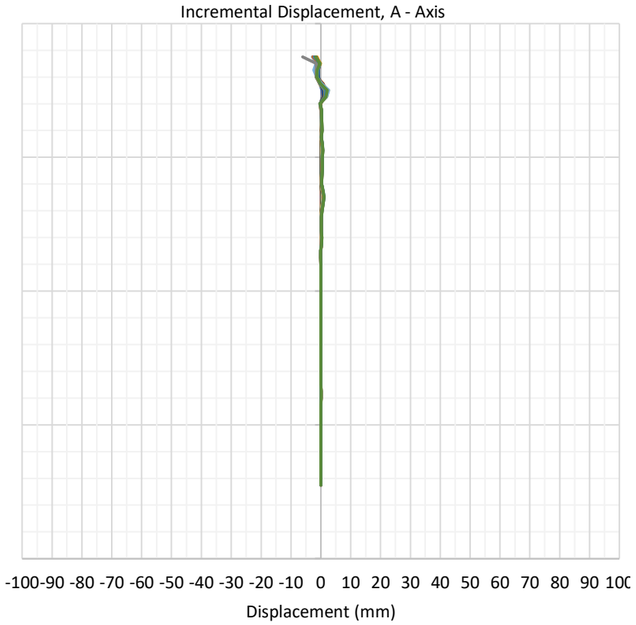
CLIENT
Highland Valley Copper / Teck
Klohn Crippen Berger

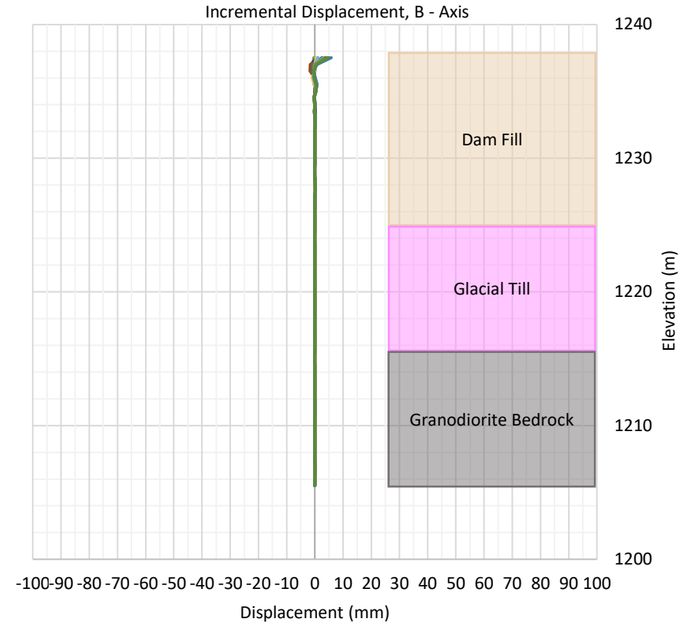
PROJECT
HIGHLAND TAILINGS STORAGE FACILITY
2023 ANNUAL FACILITY PERFORMANCE REPORT

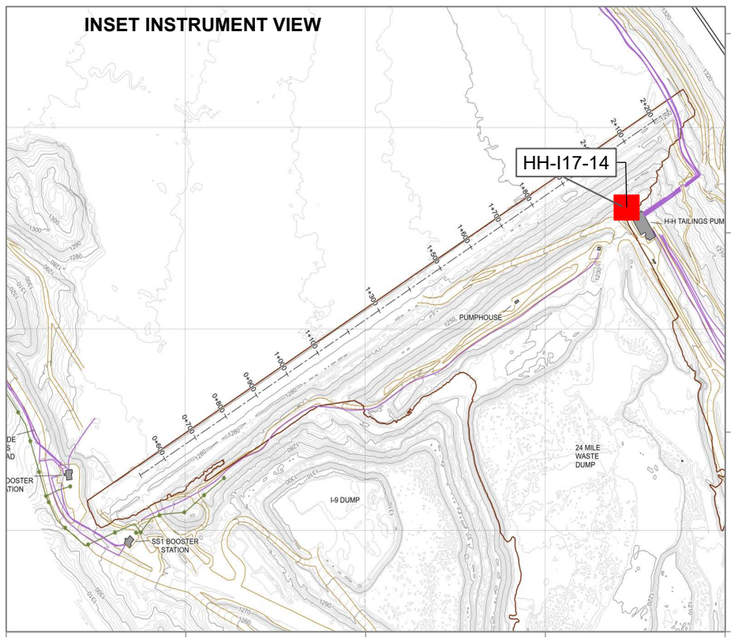
TITLE
HH DAM INCLINOMETER PLOTS
HH-I15-23 (MID SEGEMENT)
DEC. 2021 TO NOV. 2023

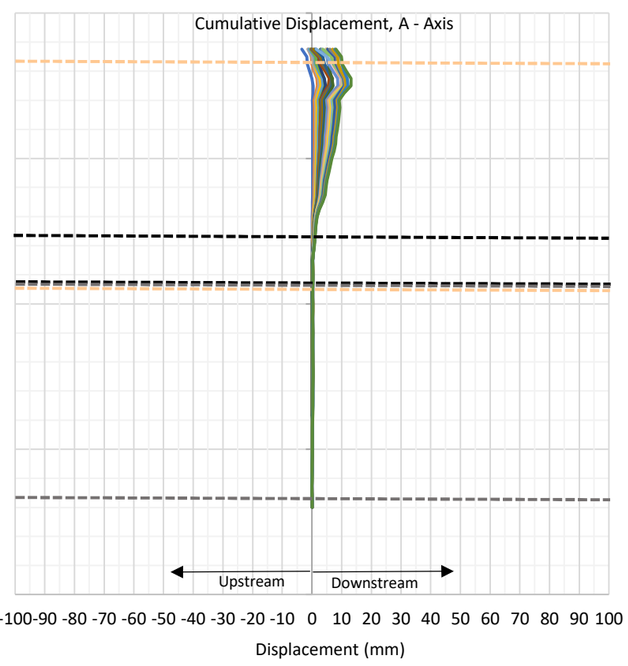
SCALE	PROJECT No.	FIG. No.
NTS	M02341C62	III-B-2

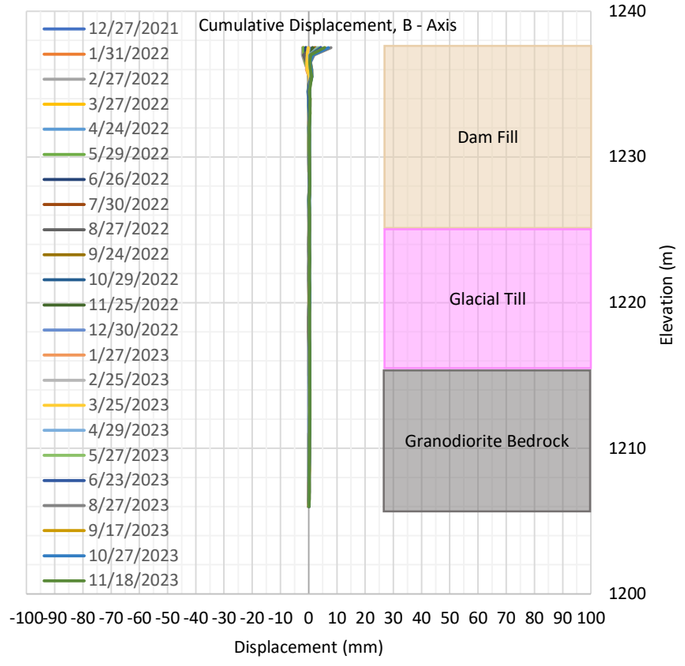












NOTES

1. DATA PROCESSED AND PROVIDED BY HVC
2. LAST READING OF EACH MONTH PLOTTED ON THE INCREMENTAL AND CUMULATIVE PROFILES.
3. X-AXIS, Y-AXIS, AND LEGEND IS THE SAME FOR THE INCREMENTAL AND CUMULATIVE PROFILES.
4. INCREMENTAL DISPLACEMENT PROFILES ARE BASED ON READINGS WITHIN ONE WEEK OF THE CUMULATIVE PROFILES.

Geological Unit	EL. Range (m)	NL(mm/month)	T1 (mm/month)	T2 (mm/month)	Colour Code
Dam Fill	1236.5-1221.0	6.0	N/A	N/A	
Glaciofluvial	1224.5-1221.5	1.0	N/A	N/A	
Bedrock	1215.5-1206.5	3.0	N/A	N/A	

Station	Baseline Reading	Instrument Type
2+000	2021-12-13	SAAV

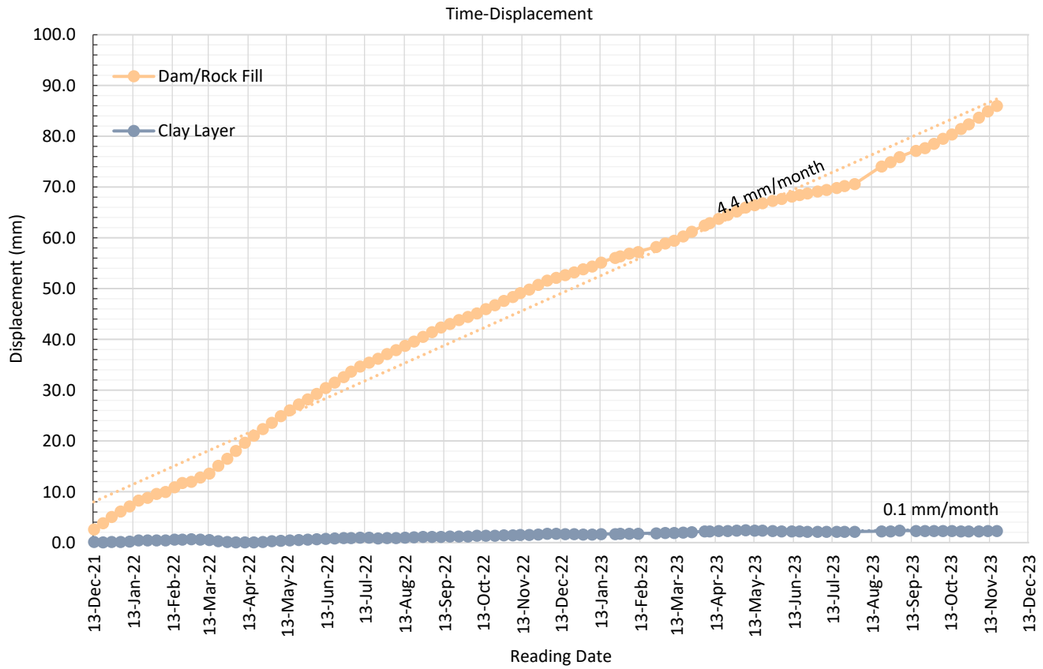
CLIENT
Highland Valley Copper / Teck

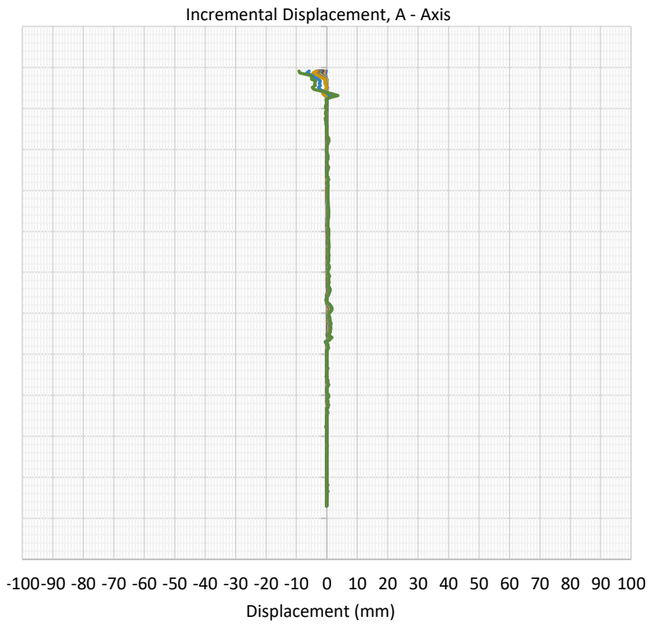
Klohn Crippen Berger

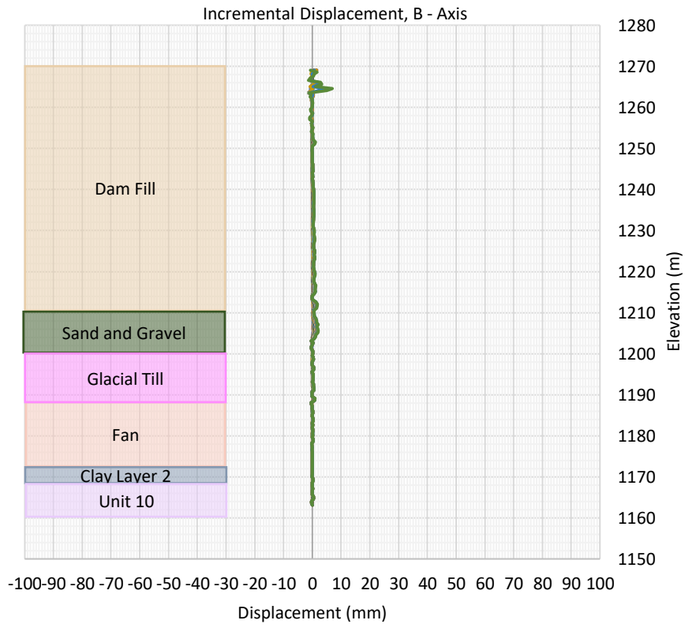
PROJECT
HIGHLAND TAILINGS STORAGE FACILITY
2023 ANNUAL FACILITY PERFORMANCE REPORT

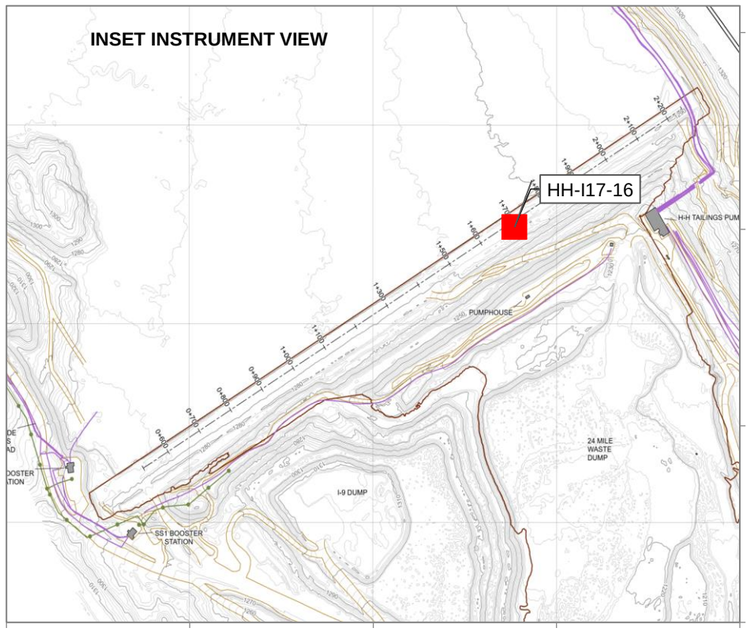
TITLE
HH DAM INCLINOMETER PLOTS
HH-I17-14 (EAST SEGMENT)
DEC. 2021 TO NOV. 2023

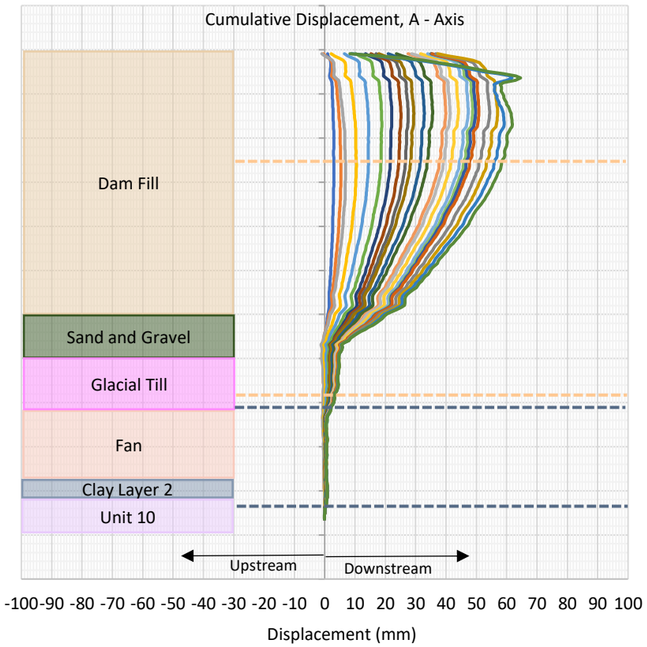
SCALE	PROJECT No.	FIG. No.
NTS	M02341C62	III-B-3

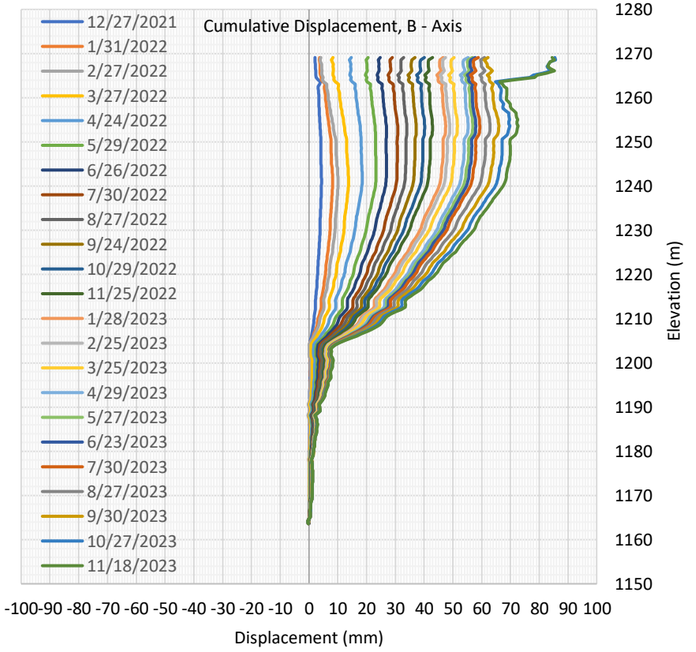












NOTES

1. DATA PROCESSED AND PROVIDED BY HVC
2. LAST READING OF EACH MONTH PLOTTED ON THE INCREMENTAL AND CUMULATIVE PROFILES.
3. X-AXIS, Y-AXIS, AND LEGEND IS THE SAME FOR THE INCREMENTAL AND CUMULATIVE PROFILES.
4. INCREMENTAL DISPLACEMENT PROFILES ARE BASED ON READINGS WITHIN ONE WEEK OF THE CUMULATIVE PROFILES.
5. THE INSTRUMENT WAS RAISED ON OCTOBER 18, 2023, WHICH REQUIRED THE COMPRESSION CAP TO BE REMOVED TEMPORARILY. THIS IS THE CAUSE OF THE CHANGE IN DEFORMATION SHOWN BETWEEN THE SEPTEMBER AND OCTOBER 2023 READINGS ABOVE EL. 1264.0. THIS CHANGE IS NOT REFLECTIVE OF ACTUAL DEFORMATION OF THE FILL. THERE WAS NO INCREMENTAL CHANGE IN READINGS BETWEEN THE READINGS AFTER THE COMPRESSION CAP WAS PLACED BACK ON.

Geological Unit	EL. Range (m)	NL(mm/month)	T1 (mm/month)	T2 (mm/month)	Colour Code
Dam/Rock Fill	1245.1-1190.0	10.0	N/A	N/A	
Clay Layer 2	1188.0-1166.6	1.0	3.0	N/A	

Station	Baseline Reading	Instrument Type
1+700	2021-12-09	SAAV

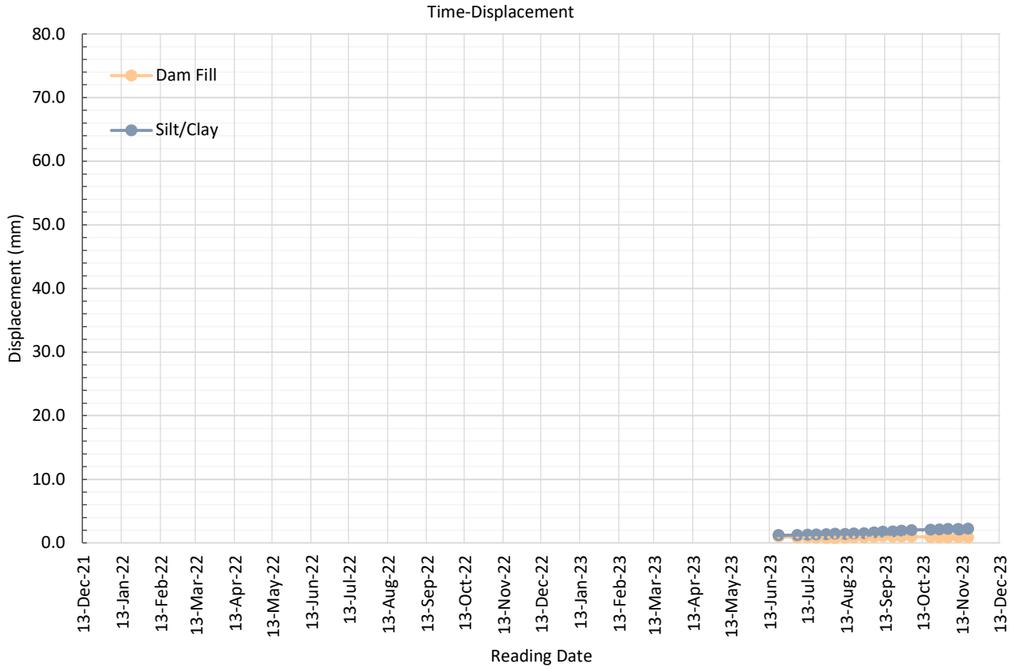
CLIENT
Highland Valley Copper / Teck

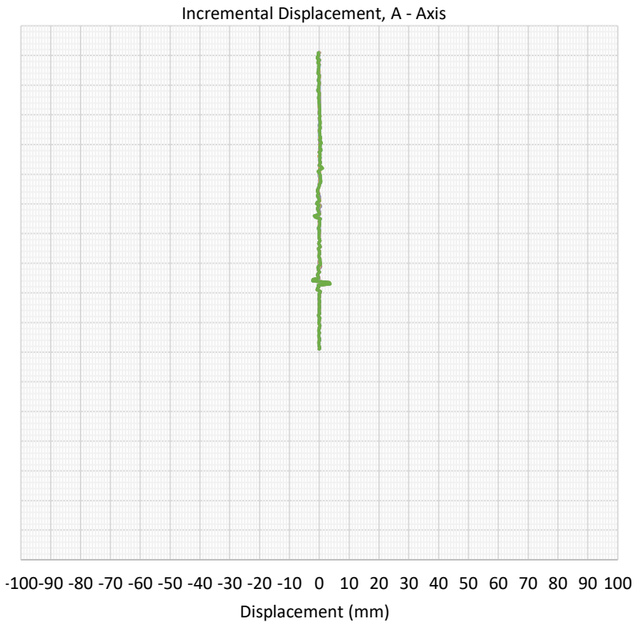
Klohn Crippen Berger

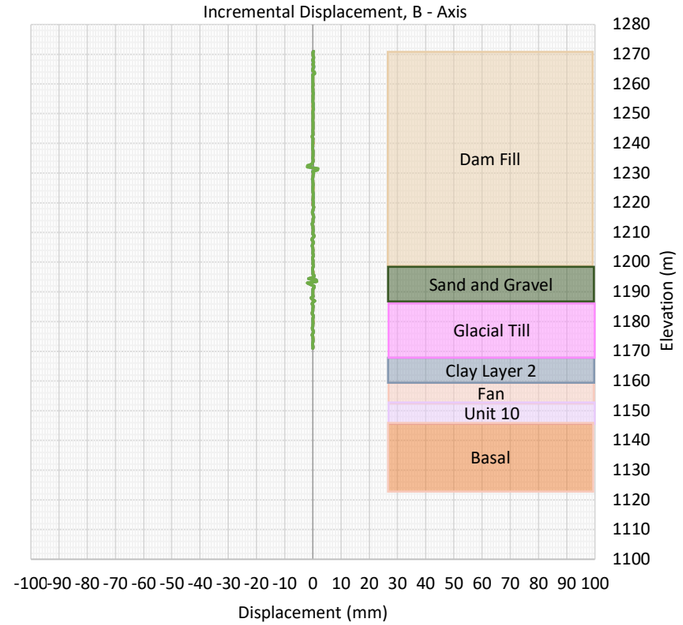
PROJECT
HIGHLAND TAILINGS STORAGE FACILITY
2023 ANNUAL FACILITY PERFORMANCE REPORT

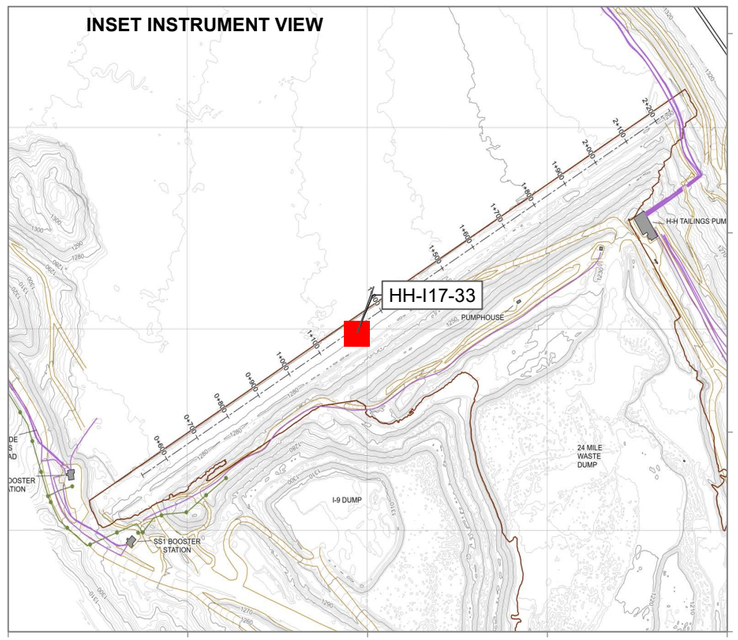
TITLE
HH DAM INCLINOMETER PLOTS
HH-I17-16 (MID SEGMENT)
DEC. 2021 TO NOV. 2023

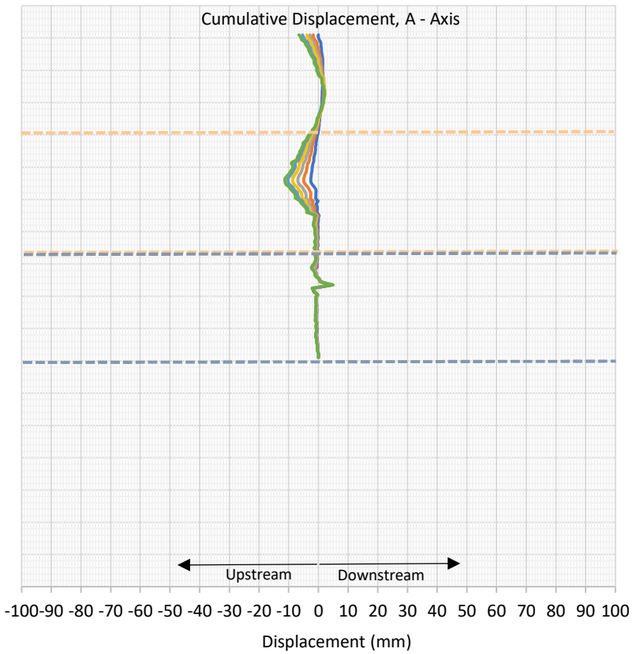
SCALE	PROJECT No.	FIG. No.
NTS	M02341C62	III-B-4

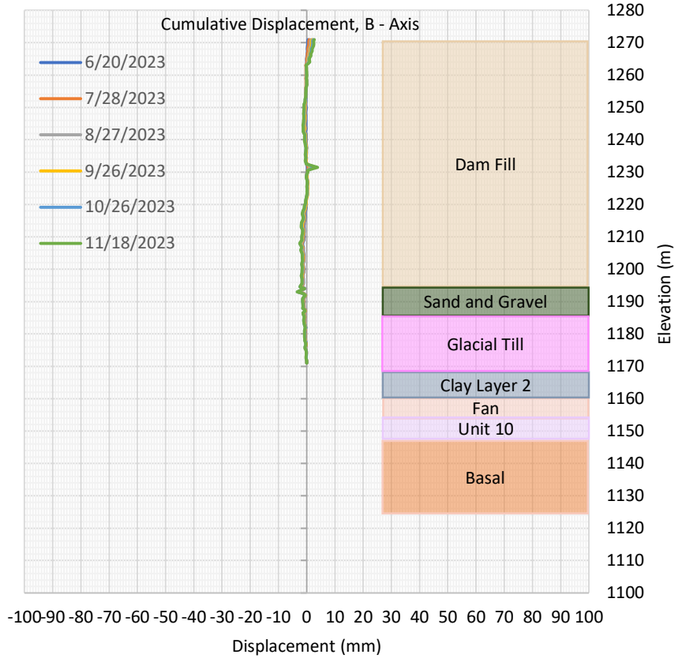












NOTES

1. DATA PROCESSED AND PROVIDED BY HVC
2. LAST READING OF EACH MONTH PLOTTED ON THE INCREMENTAL AND CUMULATIVE PROFILES.
3. X-AXIS, Y-AXIS, AND LEGEND IS THE SAME FOR THE INCREMENTAL AND CUMULATIVE PROFILES.
4. INCREMENTAL DISPLACEMENT PROFILES ARE BASED ON READINGS WITHIN ONE WEEK OF THE CUMULATIVE PROFILES.

Geological Unit	EL. Range (m)	NL(mm/month)	T1 (mm/month)	T2 (mm/month)	Colour Code
Dam Fill	1241.5-1204.5	6.0	N/A	N/A	
Silt/Clay	1204.5-1168.5	1.0	3.0	N/A	

Station	Baseline Reading	Instrument Type
1+200	2023-06-20	SAAV

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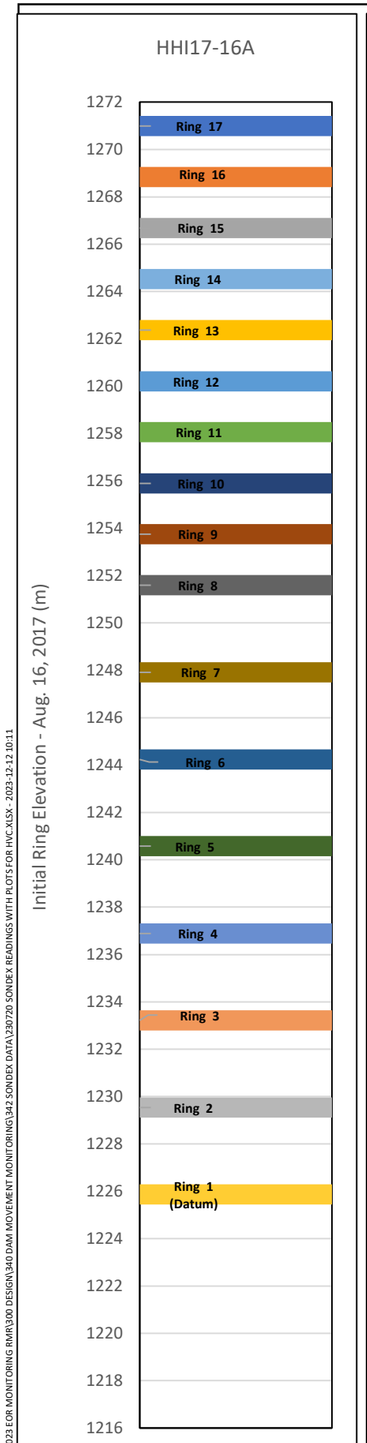
PROJECT
HIGHLAND TAILINGS STORAGE FACILITY
2023 ANNUAL FACILITY PERFORMANCE REPORT

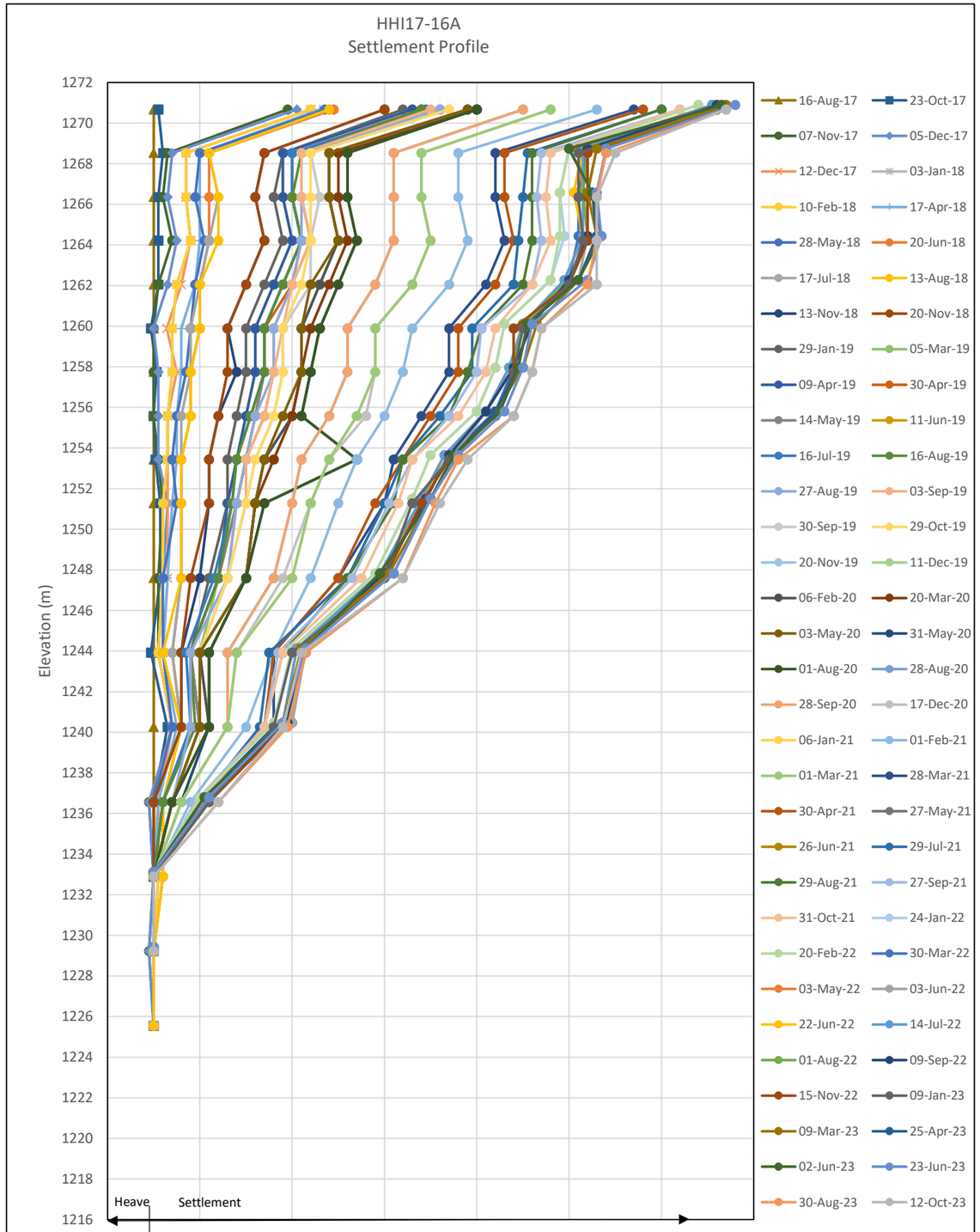
TITLE
HH DAM INCLINOMETER PLOTS
HH-I17-33 (MID SEGMENT)
DEC. 2021 TO NOV. 2023

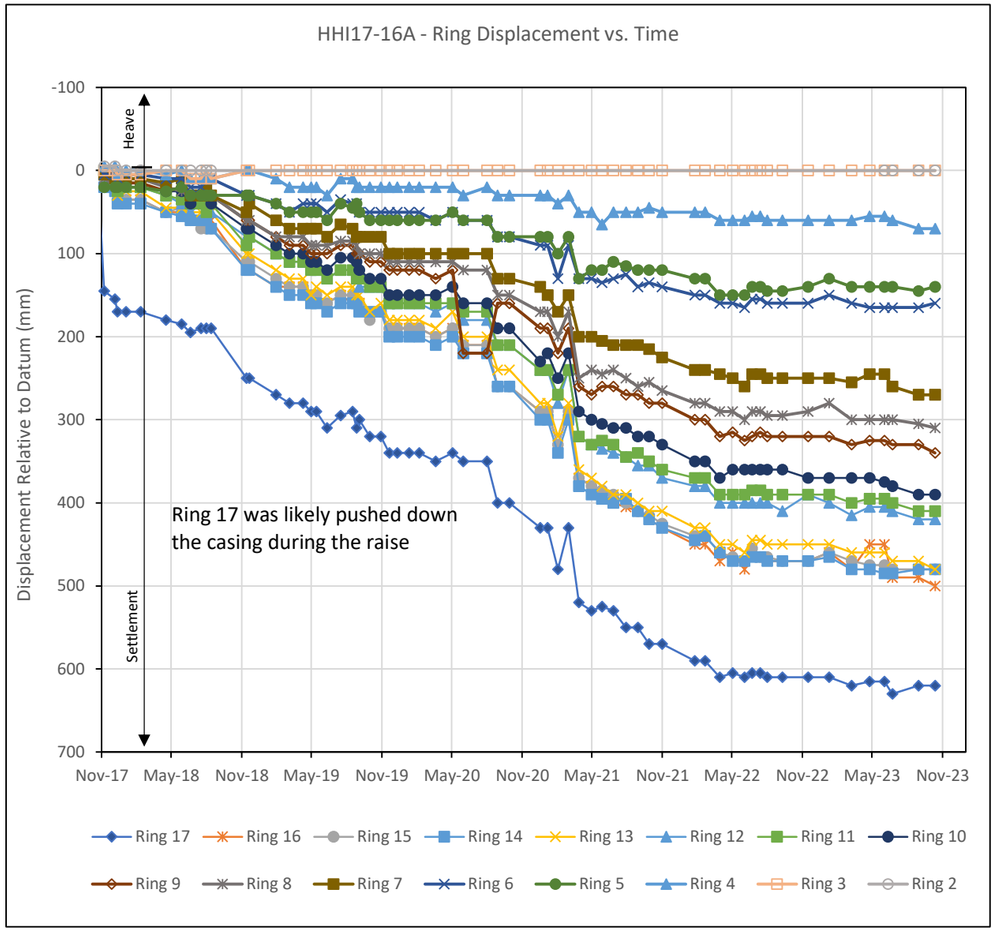
SCALE	PROJECT No.	FIG. No.
NTS	M02341C62	III-B-5

APPENDIX III-C

H-H Dam Sondex Plots







Notes:

1. Ring displacements are calculated relative to the initial elevations for each ring. The datum is the bottom ring (Ring 1).
2. Positive displacements represent settlement. Negative displacements represent heave.
3. The Ring 12 reading from December 11, 2017 was not consistent with readings in the rings above and below, due to a suspected data entry error. The reading was adjusted to match the trends of Ring 11 and Ring 13.
4. Data from October 09, and 30, 2018 were not consistent with other readings and not showed here.
5. No readings recorded for Ring 1 and 2 after October 09, 2018
6. Data from November 28, 2021, and December 30, 2021, appeared to be outliers and are not shown here

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PROJECT
HIGHLAND TAILINGS STORAGE FACILITY
2023 ANNUAL FACILITY PERFORMANCE REPORT

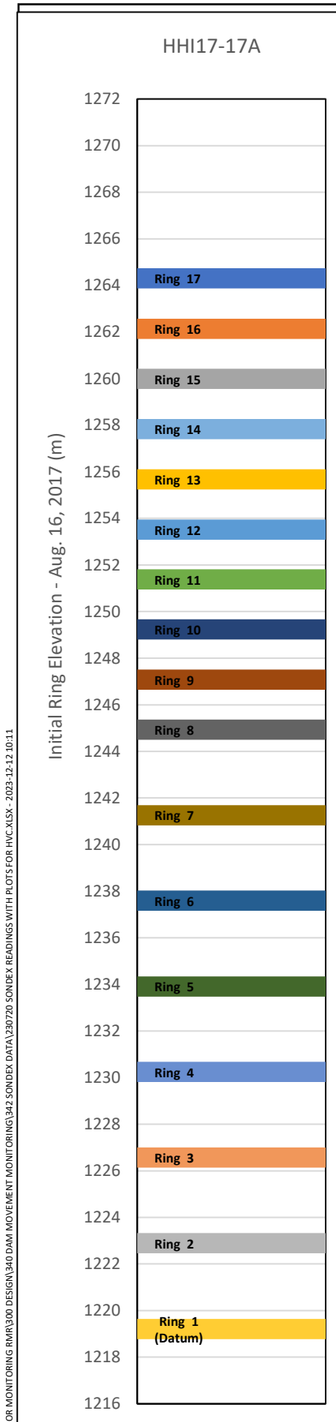
TITLE
H-H DAM VERTICAL DISPLACEMENTS
HH-I17-16A (SONDEX) - NOVEMBER 2023

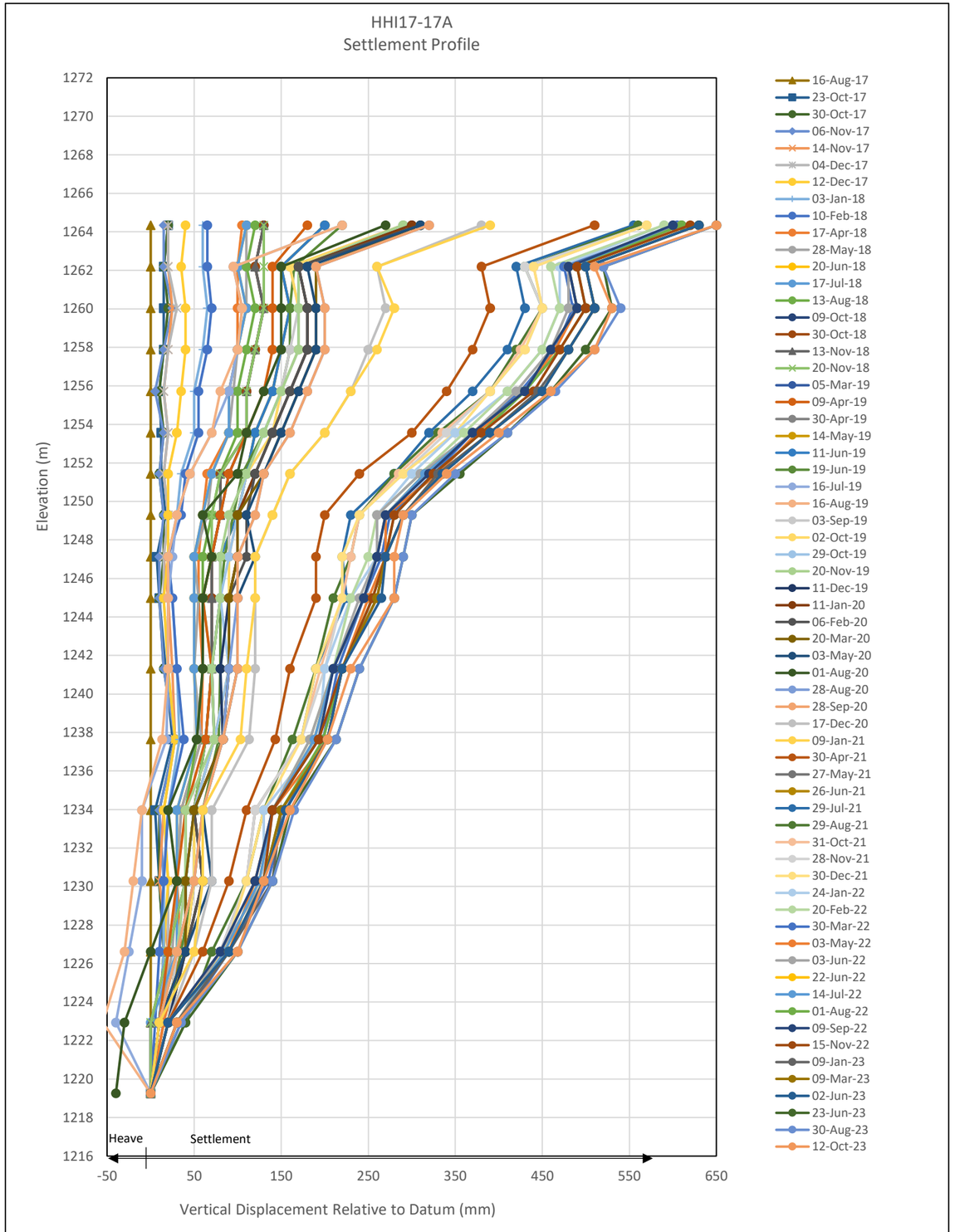
Klohn Crippen Berger

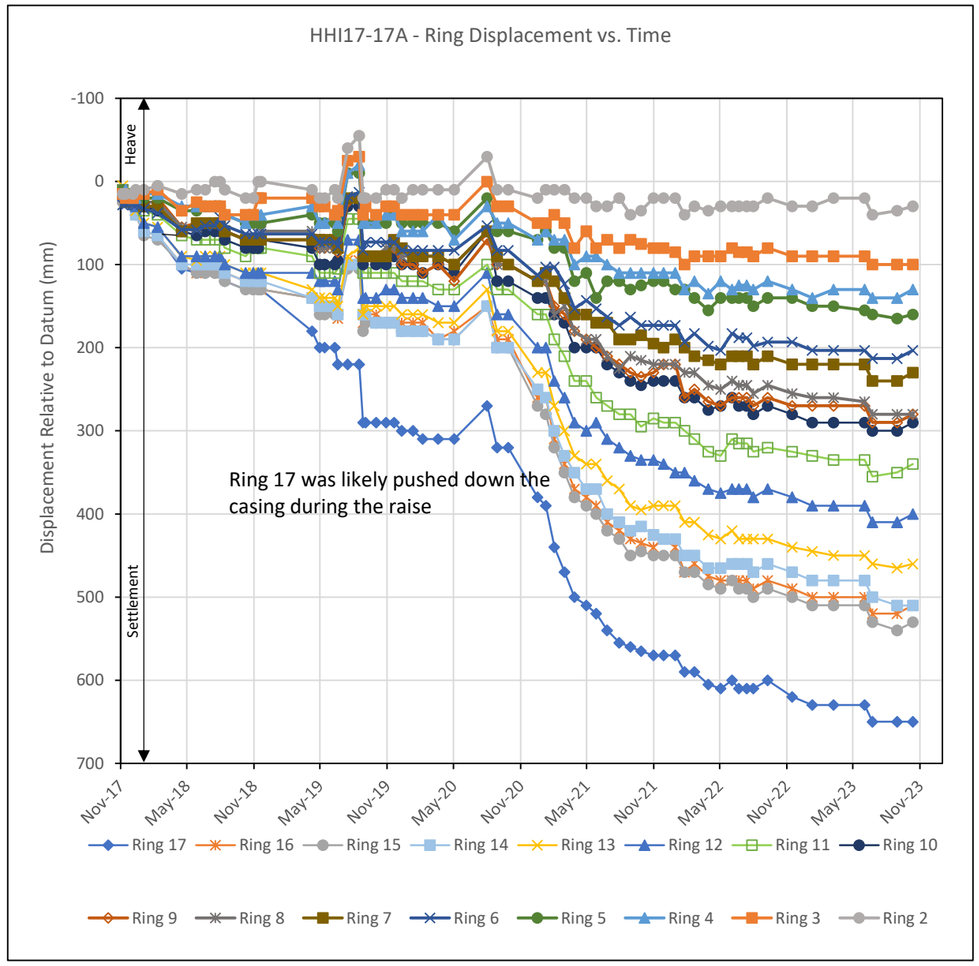
PROJECT No.
M02341C62

FIG No.
III-C-1

FILE PATH: Z:\MV\CR\M02341C63-HVC-2023 EOR MONITORING RMR\300 DESIGN\340 DAM MOVEMENT MONITORING\342 SONDEX DATA\230720 SONDEX READINGS WITH PLOTS FOR HVC.XLSX - 2023-12-12 10:11







Notes:

1. Ring displacements are calculated relative to the initial elevations for each ring. The datum is the bottom ring (Ring 1).
2. Positive displacements represent settlement. Negative displacements represent heave.
3. The following readings were not consistent with readings in the rings above and below, due to suspected data entry errors. The readings were adjusted to match the trends of adjacent rings:
   -Ring 5 (December 11, 2017, January 3, 2018, February 10, 2018)
   -Ring 6 (January 3, 2018)
4. Data from March 05, 2019 were not consistent with other readings and not showed here

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PROJECT
HIGHLAND TAILINGS STORAGE FACILITY
2023 ANNUAL FACILITY PERFORMANCE REPORT

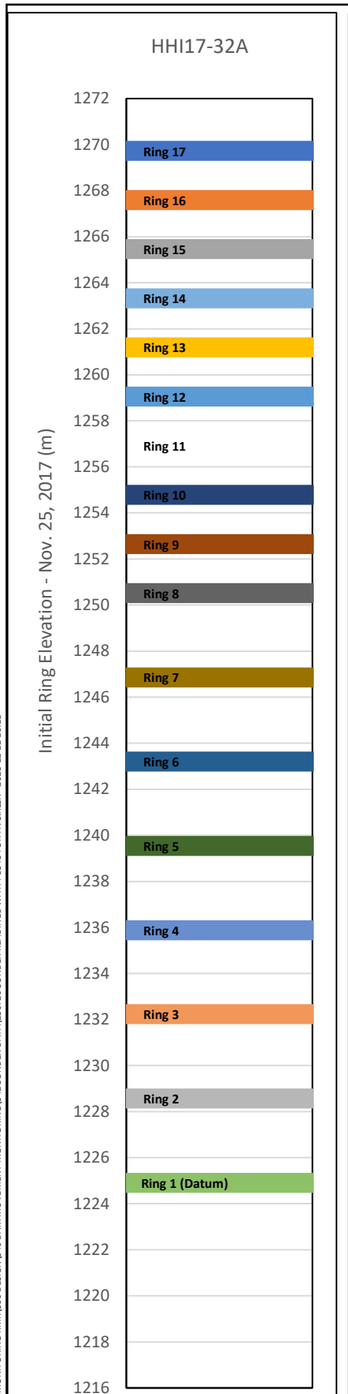
TITLE
H-H DAM VERTICAL DISPLACEMENTS
HH-I17-17A (SONDEX) - NOVEMBER 2023

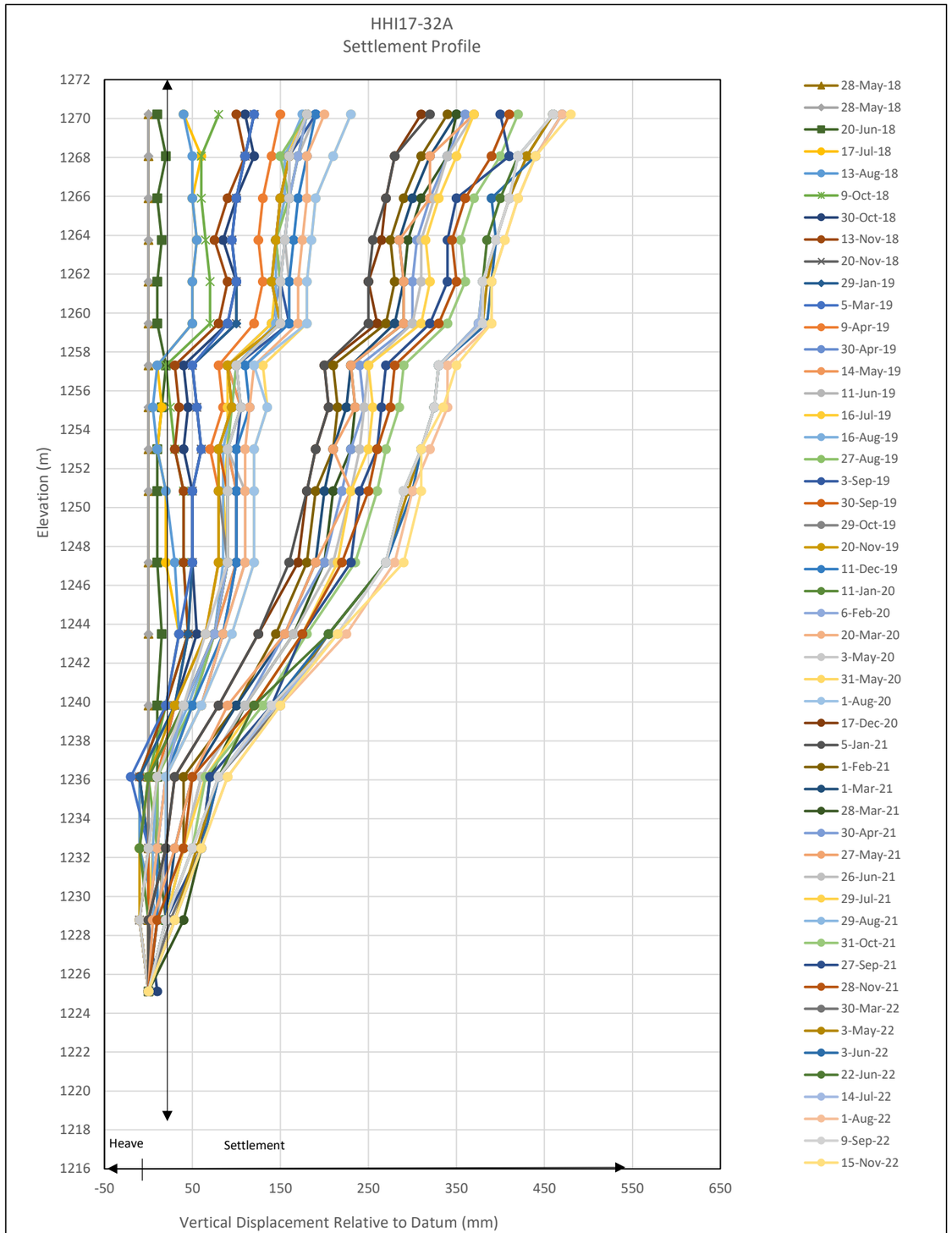
Klohn Crippen Berger

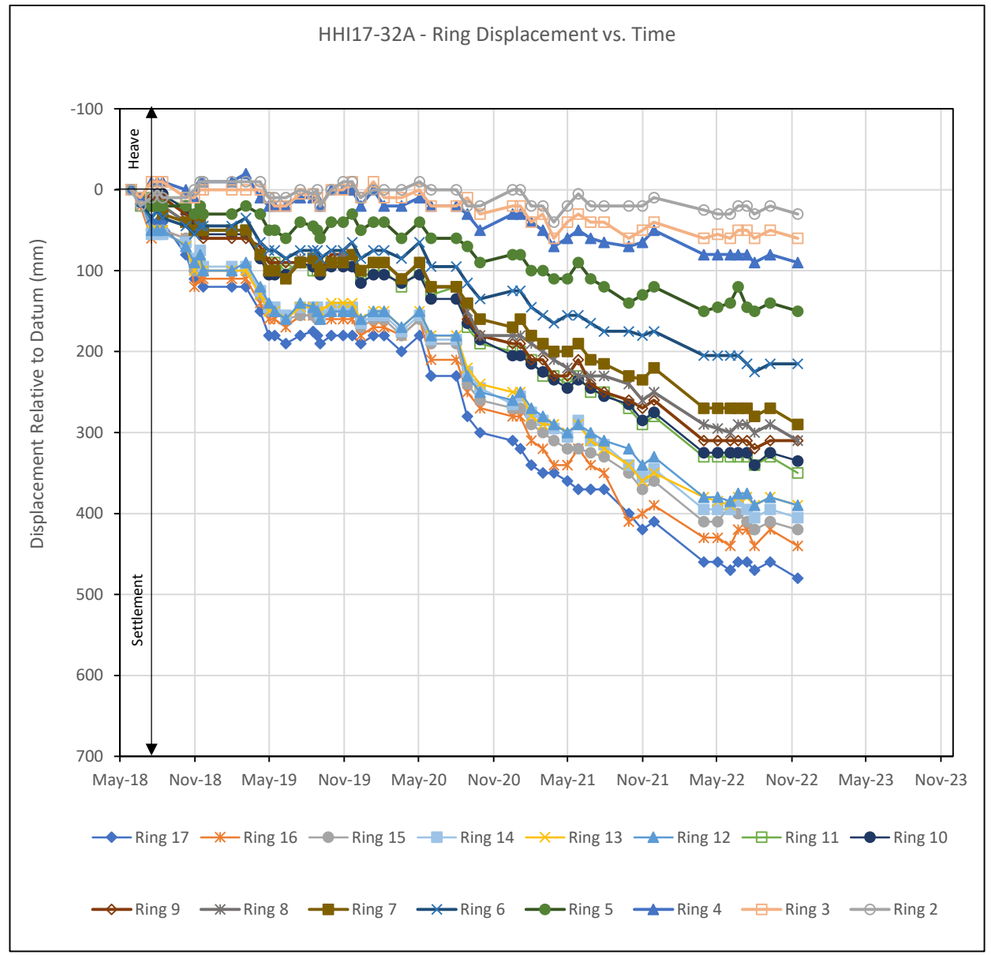
PROJECT No.
M02341C62

FIG No.
III-C-2

FILE PATH: Z:\MV\VCR\M02341C63-HVC-2023 ECOR MONITORING RMR\300 DESIGN\340 DAM MOVEMENT MONITORING\342 SONDEX DATA\230720 SONDEX READINGS WITH PLOTS FOR HVC.XLSX - 2023-12-12 10:11







Notes:

1. Ring displacements are calculated relative to the initial elevations for each ring. The datum is the bottom ring (Ring 1).
2. Positive displacements represent settlement. Negative displacements represent heave.
3. Readings of October 30, and November 13, 2018 were not consistent and are adjusted.
4. The baseline reading of vertical displacement plot is May 28, 2018.
5. Data from August 29, 2021 appeared to be outliers and are not shown here.
6. Readings from September 27, 2021, onwards were not consistent for Ring 13 and are adjusted.

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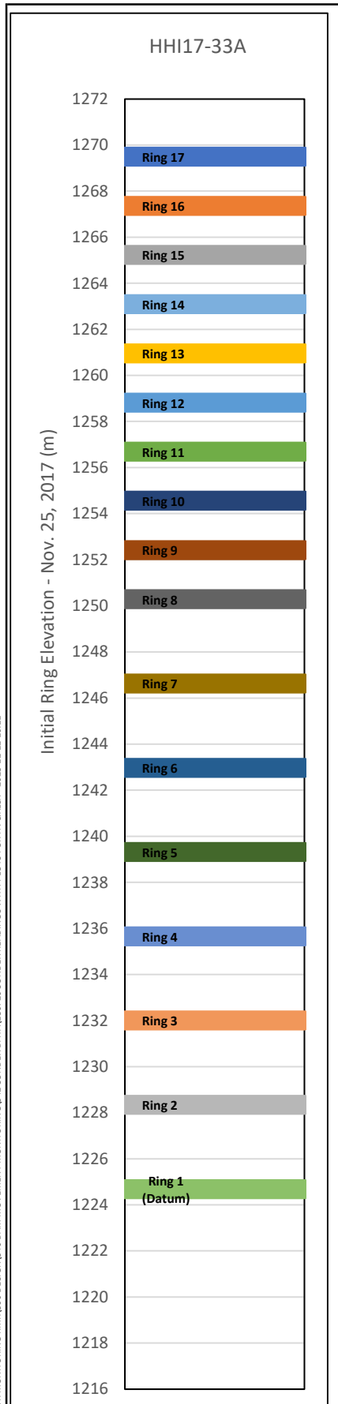
PROJECT
HIGHLAND TAILINGS STORAGE FACILITY
2023 ANNUAL FACILITY PERFORMANCE REPORT

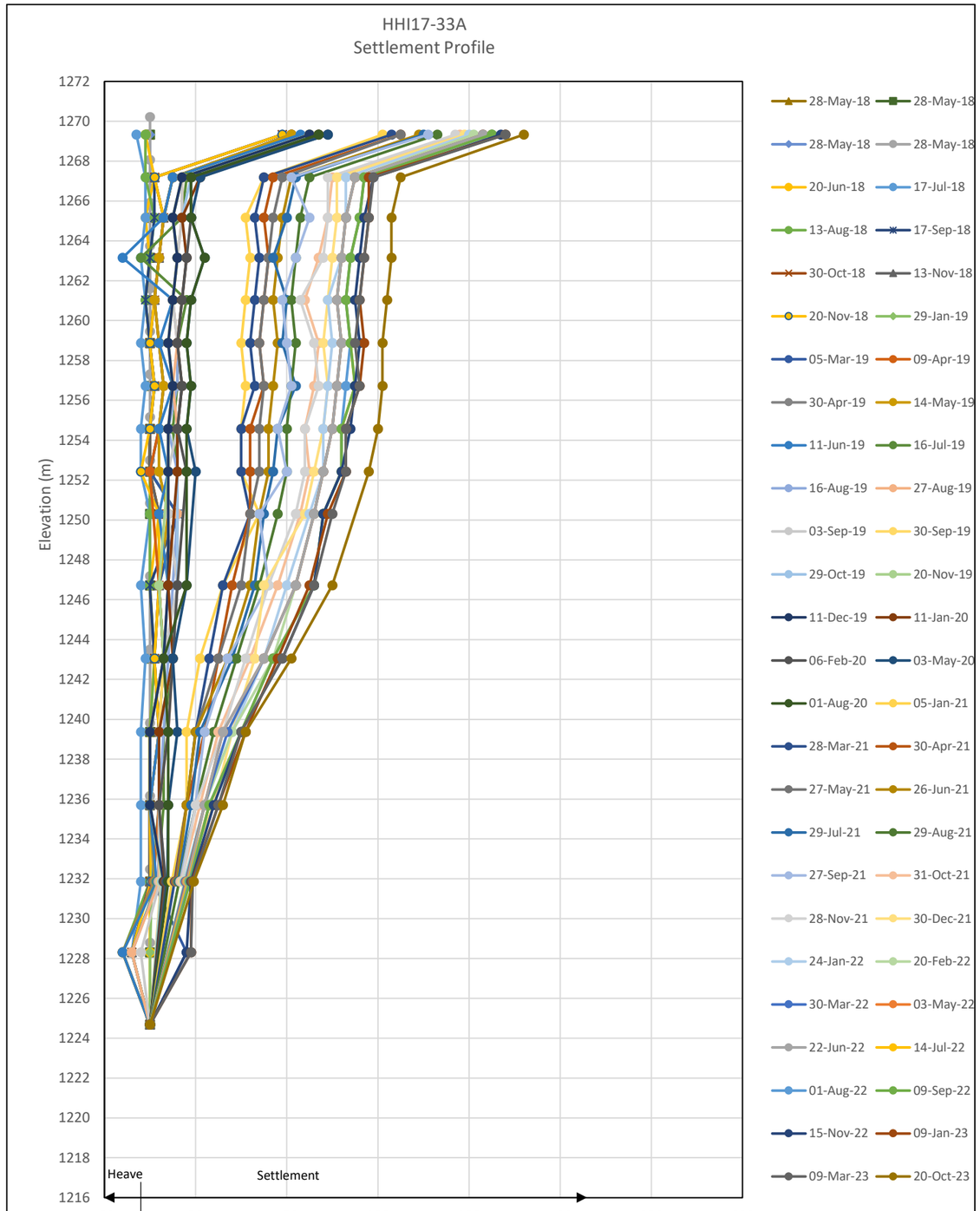
TITLE
H-H DAM VERTICAL DISPLACEMENTS
HH-I17-32A (SONDEX) - NOVEMBER 2023

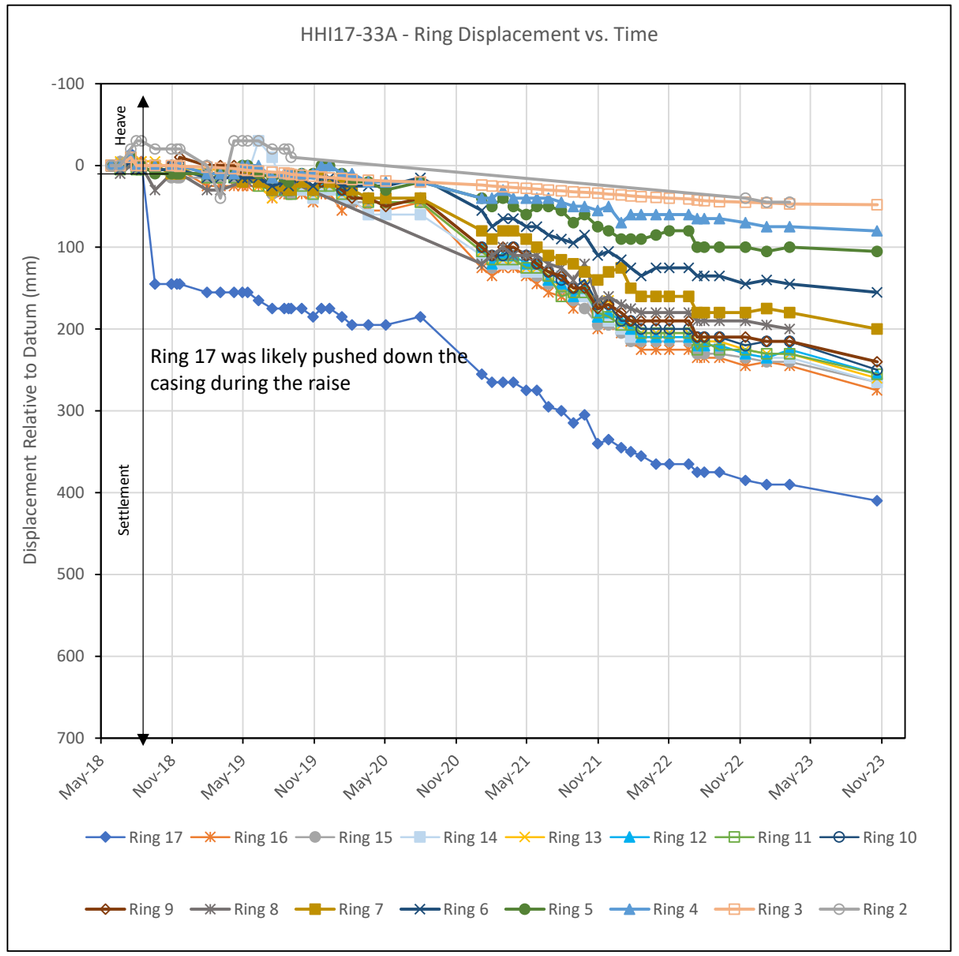
PROJECT No.
M02341C63

FIG No.
III-C-3

FILE PATH: Z:\M\VCR\M02341G63-HVC-2023 EOR MONITORING RMR\300 DESIGN\340 DAM MOVEMENT MONITORING\342 SONDEX DATA\230720 SONDEX READINGS WITH PLOTS FOR HVC.XLSX - 2023-12-12 10:11







Notes:
1. Ring displacements are calculated relative to the initial elevations for each ring. The datum is the bottom ring (Ring 1).
2. Positive displacements represent settlement. Negative displacements represent heave.
3. Data from August 28, 2020 and September 28, 2020 appeared to be outliers and are not shown here.
4. Data for Ring 3 not available since September 17, 2018.
5. Data for Ring 2 and Ring 8 not available since September 30, 2019

Reading of Ring 3 in September 2018 is suspected to error. This ring became off-line after this date.

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HIGHLAND TAILINGS STORAGE FACILITY
2023 ANNUAL FACILITY PERFORMANCE REPORT

TITLE
H-H DAM VERTICAL DISPLACEMENTS
HH-I17-33A (SONDEX) - NOVEMBER 2023

PROJECT No.
M02341C63

FIG No.
III-C-4

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APPENDIX IV

2022 Dam Safety Review Recommendations and Action Plan

Appendix IV
Dam Safety Review Recommendations

Table IV-1 March 2024 STATUS of 2022 Highland TSF Dam Safety Review[1] Recommendations

ID (Topic)	Priority[2]	Summary of Finding and Recommendation[3]	Response / Close-out and March 2024 Status
HTSF-DSR-01 (Performance Monitoring)	*4*	***Summary of Finding:*** *Interpretation of inclinometer data is partially explained but is not clearly documented. In some cases, values plotted are significantly different.*	***Completed Action:*** *A written procedure for inclinometer processing, including application or corrections, was prepared and will be adopted on site during 2024.*
		Recommendation: *Clearly define and document the procedure for filtering and processing inclinometer data. Could be included as an appendix to OMS.*	***March 2024 Status:*** *CLOSED*
HTSF-DSR-02 (*Filter Performance*)	4	**Summary of Finding:** The design report notes that the specified L-L Dam Filter Gravel gradation does not meet current filter design standards. Analyses indicated that material would not cause internal erosion to perpetuate (Foster and Fell 2001).	**Proposed Action:** Include discussion of this in the 2024 risk assessment review and present summary to the Tailings Review Board for comment and feedback whether further action is required.
		Recommendation: Perform a risk review to determine if additional investigations and/or analyses are warranted.	**March 2024 Status:** Planned to be included in November 2024 Tailings Review Board meeting.
HTSF-DSR-03 (*Core-Cracking Sensitivity*)	4	**Summary of Finding:** Slope stability analysis with elevated piezometric levels for core cracking scenarios at the L-L Dam are stated to be greater than 1.5 but the stability analyses results are not reported. Internal erosion could still occur with migration of particles within the body of the dam, even with toe filter mitigation. More detailed development of potential of this possible mechanism could improve understanding of risk level.	**Proposed Action:** Prepare a letter report documenting stability analysis assuming core cracking scenario piezometric levels and discussion of how internal erosion hazards are managed under this scenario.
		Recommendation: Complete additional sensitivity analyses for higher piezometric levels that demonstrate the conclusion that the impact of core cracking would not significantly impact expected performance.	**March 2024 Status:** Letter to be completed by end of Q2 2025.
HTSF-DSR-04 (*L-L Dam Breach Assessment*)	4	**Summary of Finding:** Existing Dam Breach Assessment (DBA) for the L-L Dam is considered out-of-date, although still considered adequate. Modelling and prediction tools are more advanced than the 1-D HEC-RAS modelling done and an updated guidance document was issued by the Canadian Dam Association in 2021. The current assumption that released tailings will show a Newtonian behavior is highly conservative for tailings runout modeling. The L-L Dam DBA report does not include information about the credible failure mode selection.	**Proposed Action:** HVC are planning to start update to L-L Dam DBA in 2024.
		Recommendation: Update DBA criteria and methodology in accordance with the 2021 Technical Bulletin of the Canadian Dam Association. Use 2-dimensional modelling tool (such as Flo-2D or similar). Identify failure mode(s) and resulting dam breach hydrographs as input to inundation modelling, for ERP purposes.	**March 2024 Status:** L-L Dam DBA to be finalized by end of Q1 2025

ID (Topic)	Priority[2]	Summary of Finding and Recommendation[3]	Response / Close-out and March 2024 Status
HTSF-DSR-05 (*H-H Dam Breach Assessment*)	4	**Summary of Finding:** Existing DBA for the H-H Dam is considered out-of-date. The study assumes that the failure at H-H Dam would affect the total length of the dam and would mobilize tailings behind it, however it does not mention the potential effects of the I-9 Dump that could retain a significant amount of tailings (especially if they are considered to be non-liquefiable).	**Proposed Action:** HVC are planning to plan update to the H-H Dam DBA if any credible catastrophic failure modes are present at the end of 2024.
		Recommendation: Update DBA for H-H Dam, including consideration of rheology of re-mobilized tailings, and containment potential of I-9 Dump.	**March 2024 Status: HVC to confirm need for** H-H Dam DBA by end of 2024 and then complete, if required in 2025.
HTSF-DSR-06 (*OMS Manual*)	4	**Summary of Finding:** Operation, Maintenance and Surveillance (OMS) Manual, and Emergency Preparedness Plan do not include a documented distribution list. Relative to the MAC guidelines for OMS manuals, the following points are missing or incomplete: ▪ Quality management plan is limited to dam construction issues. ▪ Quality management plan is limited to dam construction issues. ▪ It is unclear who could replace whom in the case of holidays, accidents, illnesses, renunciations, etc. ▪ Communities of interest (COI) perspectives. ▪ Impacts are not detailed in the Manual regarding future plans and how they impact the tailings facility. Impacts are not detailed in the OMS Manual regarding future plans and how they impact the tailings facility.	**Proposed Action:** OMS Manual updates are in progress with some being addressed by 2024 update. Remaining will be addressed in next OMS Manual update.
		Recommendation: Update OMS and/or Tailings Management System (TMS) to address aspects indicated. In most cases, the aspects indicated would likely involve referencing separate documents. Include and document the distribution of each Version of the OMS and/or TMS.	**March 2024 Status:** All items to be included in OMS Manual by end of Q2 2025. When complete, HVC will prepare a close-out letter to document where these updated have been completed.
HTSF-DSR-07 (TSF Knowledge Base)	*4*	***Summary of Finding:*** *The quantity of technical documentation is extensive, and was not observed to be well-classified or referenced. This generates potential for using outdated or incorrectly applied information, or omitting the use of most relevant data and analyses.*	***Completed Action:*** *A knowledge base of key documents related to the Highland TSF was prepared as part of HVC's GISTM compliance activities.*
		Recommendation: *Develop a clearly categorized and referenced TSF Knowledge Base; maintain up to date using a Document Control / Bibliographic type of system.*	***March 2024 Status:*** *CLOSED*

Notes:
1. Envis. 2023. "Highland Tailings Storage Facility 2022 Comprehensive Dam Safety Review." July 10.
2. Recommendation priority guidelines used in DSR:
   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.
3. Findings has been summarized from text in DSR report.
4. KCB (2020). "Highland Tailings Storage Facility 2019 Design Update: L-L Dam and H-H Dam". April 17.