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VA101-126/23-2

YANKEE DOODLE TAILINGS IMPOUNDMENT
2020 ANNUAL INSPECTION REPORT

Rev	Description	Date
0	Issued in Final	February 11, 2021

EXECUTIVE SUMMARY

This Annual Inspection Report (AIR) was prepared by Knight Piésold Ltd. (KP). The annual inspection site visit was completed by Mr. Allen Gipson (P.E. in Colorado and Wyoming) on behalf of Mr. Ken Brouwer, P.E., the Engineer of Record (EOR), due to public health restrictions relating to travel associated with the COVID-19 pandemic. Mr. Gipson was accompanied during the site inspection on October 15, 2020 by Mr. Mike Harvie (Manager of Engineering and Geology) of MR. The 2020 AIR references information contained in historical and more recent reports, discussions with MR staff, observations made by Ken Brouwer, P.E. and Daniel Fontaine, P.E. during visual inspections and review of the available monitoring data, and observations made by others during various visual inspections of the impoundment. Mr. Brouwer has been the EOR for the YDTI since September 22, 2015. It is intended that Mr. Fontaine will replace Mr. Brouwer as the EOR within the next year. Mr. Brouwer will remain available to the KP and MR team as the Principal technical reviewer.

The report provides an overview of the observations and changes to the YDTI facilities since the last annual inspection and covers the YDTI, including the associated embankments, tailings distribution works, reclaim water systems, monitoring devices, stormwater diversions, and other ancillary structures associated with the operation, maintenance, and surveillance of the YDTI. The following items are provided in this report:

- Site observations made during visual inspections of the impoundment, videos collected using an Unmanned Aerial Vehicle (UAV), and information collected by the operational Interferometric Synthetic-Aperture Radar (InSAR) monitoring program.
- Discussion of the Quantitative Performance Parameters (QPPs).
- Discussion of recent important trends and additional future considerations.
- Identification of recommended actions required for ongoing operation and maintenance of the facility.

Construction continued to progress at the YDTI since the previous annual inspection site visit was conducted in 2019. The construction activities were routinely monitored and reviewed by the EOR and KP by means of weekly inspection reports, Monthly Quality Control progress reports, and Quarterly Inspections by the approved designate of the EOR. The facility was observed to be in good condition throughout 2020. Construction of the West Embankment to EL. 6,400 ft was completed during 2020, and the associated construction completion report is in progress. The downstream step-out along the North-South Embankment was largely completed to EL. 6,400 ft except on the southern end where deactivation of the current mine haul ramp is required prior to advancing construction further in this area. Minor settlement cracking was monitored. Fill placement for the recently permitted EL. 6,450 ft embankment lift was advanced along both the East-West and West Embankments. Tailings beaches continued to be well established along all the embankments, and tailings discharge and beach monitoring protocols continued to be well managed.

The YDTI continues to be developed and operated in a manner consistent with the designs, the QPPs, and the operating protocols established for the facility. A risk assessment (KP, 2018c) was undertaken during preparation of the design document associated with continued construction of the embankments to a crest elevation of 6,450 ft. It was recognized that design and operating enhancements could provide further opportunities for risk mitigation, and these enhancements continue to be progressively implemented at the YDTI taking advantage of the best practicable new technologies and techniques to enhance dam safety. The risk assessment also identified opportunities to utilize the observational method during ongoing development of the facility, which was noted to be particularly relevant for the current transitional period between implementing the modifications to the tailings distribution system and achieving a new steady-state condition associated with the revised discharge strategy. There was uncertainty identified in the risk assessment due to the reliance on modelling predictions and observational monitoring related to several factors was planned, including tailings beach development, pore pressure changes within the embankment, and water inventory changes. The trends related to these factors are regularly discussed in the quarterly and annual surveillance reporting, and a status update related to each is provided in this report.

A Corrective Action Plan was prepared by MR in response to the 2019 AIR recommendations on January 31, 2020. The Corrective Action Plan identified the actions proposed or already undertaken to address the 2019 recommendations. All recommendations were addressed, and the Corrective Action Plan was implemented successfully.

KP has identified the following recommendations in 2020 for consideration during 2021:

- **Maintain reductions in freshwater use from the Silver Lake Water System to the extent reasonably practicable and continue the Pilot Project to incrementally reduce the water inventory in the YDTI supernatant pond towards the target of approximately 15,000 acre-ft.**
- **Modify the tailings distribution system by extending Line 2 to allow discharge at location NS-1 and NS-2 when the EL. 6,450 ft raise of the embankment is completed adjacent to these discharge locations.**
- **Further develop the construction sequence and dumping plan for the EL. 6,450 ft lift, focused on the next 12 to 24 months, including a more detailed summary of the sequence and anticipated progress of embankment construction on approximately a quarterly basis.**
- **Cease recirculation of barren leach water to the rock disposal sites (RDSs) directly adjacent to the YDTI embankments over the next several years.**
- **Develop an updated five-year plan that includes consideration for continued phased site investigation, installation of additional monitoring instrumentation, and potential replacement of non-functional or abandoned monitoring instruments.**

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ABBREVIATIONS

ACC	Anaconda Copper Company
AIR	Annual Inspection Report
ARCO	Atlantic Richfield Company
DAR	Data Analysis Report
E	East
EAP	Emergency Action Plan
EL	Elevation
EOR	Engineer of Record
ftbgs	feet below ground surface
HDPE	High-Density Polyethylene
HsB	Horseshoe Bend
HsBCS	Horseshoe Bend Capture System
InSAR	Interferometric Synthetic-Aperture Radar
IRP	Independent Review Panel
KP	Knight Piésold Ltd.
MBMG	Montana Bureau of Mines and Geology
MDEQ	Montana Department of Environmental Quality
MCA	Montana Code Annotated
MR	Montana Resources, LLP
N	North
NMR	Nuclear Magnetic Resonance
Q	Quarter
QPPs	Quantitative Performance Parameters
RDS	Rockfill Disposal Site
RMS	Remote Monitoring System
S	South
SLWS	Silver Lake Water System
Stn	Station
TOMS	Tailings Operations, Maintenance, and Surveillance
tons	Short Tons
TSX	TerraSAR-X
UAV	Unmanned Aerial Vehicle
VWP	Vibrating Wire Piezometer
W	West
WED	West Embankment Drain
WET	Water and Environmental Technologies
YDTI	Yankee Doodle Tailings Impoundment

1.0 INTRODUCTION

1.1 BACKGROUND

Montana Resources, LLP (MR) operates an open pit copper and molybdenum mine in Butte, Montana. MR has owned and operated the mine site since the 1980's and is currently mining the Continental Pit at a nominal concentrator throughput rate of approximately 49,000 tons per day. The property was acquired from Atlantic Richfield Company (ARCO) and the former Anaconda Copper Company (ACC) who had previously mined the Berkeley Pit since 1955. The key components of the MR facilities include the:

- Continental Pit
- Mill and processing facilities (the Concentrator)
- Yankee Doodle Tailings Impoundment (YDTI)
- Leach facilities
- Precipitation Plant

Tailings produced from the process are stored in the YDTI. The YDTI was originally constructed in 1963 and the embankments have been continuously constructed to elevation (EL.) 6,400 ft using rockfill from the Berkeley Pit (until 1982) and from the Continental Pit (beginning in 1986). The YDTI comprises a valley-fill style impoundment created by a continuous rockfill embankment that for descriptive purposes is divided into three embankment sections: the North-South (N-S) Embankment, the East-West (E-W) Embankment, and the West (W) Embankment. The current maximum embankment height is approximately 750 ft along the southern end of the impoundment upstream of the Horseshoe Bend (HsB) area. The HsB area is shaped like an inverted 'U', bounded to both the east and west by historically leached mine rock and to the north by the East-West Embankment. The HsB area contains infrastructure related to YDTI seepage collection and mine leach operations along with miscellaneous mine buildings, including the truck maintenance workshop. The project arrangement is shown on Figure 1.1.

The MR facilities, mine operations, and YDTI operational procedures are described in additional detail in the MR report entitled *'Yankee Doodle Tailings Impoundment – Tailings Operations, Maintenance and Surveillance (TOMS)* Manual' (MR/KP, 2020). The best practices employed at the site continue to progressively evolve, taking advantage of the best practicable new technologies and techniques to enhance dam safety. The design, construction, operation, maintenance, and surveillance of the YDTI involves a multidisciplinary team of professionals. The team works closely together to achieve the fundamental objective of ongoing continuous improvement of the safety of the impoundment.

The jurisdiction for the YDTI resides with the Montana Department of Environmental Quality (MDEQ). The YDTI is not subject to dam hazard potential classification within the State (Montana Code Annotated (MCA) 85-15-209) as embankments for tailings impoundments and water reservoirs subject to permits issued by MDEQ are specifically exempt from provisions of the Montana Dam Safety Act (MCA 85-15-107). MR currently holds four MDEQ operating permits, two of which apply specifically to the YDTI area. An amendment to the operating permit was approved in August 2019 to allow for continued use of the YDTI, which will be facilitated by continued construction of the embankment to a crest elevation of 6,450 ft and operation of the West Embankment Drain (WED). The final permit was issued in early 2020.

NOTES:

1. COORDINATE SYSTEM AND ELEVATIONS ARE BASED ON ANACONDA MINE GRID.
2. AERIAL IMAGERY FROM JULY 9, 2020 PROVIDED BY MONTANA RESOURCES, LLP.

SCALE A: 1500 0 1500 3000 4500 6000 7500 ft

MONTANA RESOURCES, LLP

YANKEE DOODLE TAILINGS IMPOUNDMENT

PROJECT ARRANGEMENT

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FIGURE 1.1 REV 0

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SAVED: M:\1\01\00126\23\A\Acad\FIGS\A22, 1/26/2021 8:19:24 AM , RMCLELLAN PRINTED: 2/11/2021 10:21:35 AM, FIG 1.1, RMCLELLAN
XREF FILE(S): 5ft_01_2020 IMAGE FILE(S): 2020 Aerial Photo

1.2 SCOPE OF REPORT

This Annual Inspection Report (AIR) was prepared by Knight Piésold Ltd. (KP) and complies with MCA 82-4-381: Annual Inspections. The report provides an overview of the observations of the YDTI facilities and covers the YDTI, including the associated embankments, tailings distribution works, reclaim water systems, monitoring devices, stormwater diversions, and other ancillary structures associated with the operation, maintenance, and surveillance of the YDTI. The following items are provided in this report:

- Site observations made during visual inspections of the impoundment, videos collected using an Unmanned Aerial Vehicle (UAV), and information collected by the operational Interferometric Synthetic-Aperture Radar (InSAR) monitoring program.
- Discussion of the Quantitative Performance Parameters (QPPs).
- Discussion of recent important trends and additional future considerations.
- Identification of recommended actions required for ongoing operation and maintenance of the facility.

The structure of this report is generally consistent with the scope of the last several inspection reports (KP, 2018a; KP, 2019a; KP, 2020a). KP began the practice of preparing an annual Data Analysis Report (DAR) on the instrumentation and monitoring records for the YDTI separately from the AIR beginning in 2017 (KP, 2018b; KP 2019b; KP, 2020b) and that approach remains unchanged for 2020. The 2020 DAR will be prepared in 2021 to present the YDTI instrumentation and monitoring records for the 2020 calendar year when the necessary records are available.

The 2020 AIR references information contained in historical and more recent reports, discussions with MR staff, observations made by Ken Brouwer, P.E. and Daniel Fontaine, P.E. during visual inspections and review of the available monitoring data, and observations made by others during various visual inspections of the impoundment. Mr. Brouwer has been the Engineer of Record (EOR) for the YDTI since September 22, 2015. It is intended that Mr. Fontaine will replace Mr. Brouwer as the EOR within the next year. Mr. Brouwer will remain available to the KP and MR team as the Principal technical reviewer.

1.3 REFERENCE COORDINATE SYSTEM AND DATUM

Coordinates and elevations in this report are referenced to the site coordinate system known as the ‘Anaconda Mine Grid’ established by The Anaconda Company (TAC) in 1957. The Anaconda Mine Grid is based on the ACC Datum established in 1915. The MR Site Coordinate System is based on the Anaconda Mine Grid and utilizes International Feet. All elevations are stated in Anaconda Mine Grid coordinates with respect to the ACC Vertical Datum unless specifically indicated otherwise.

2.0 SITE INSPECTION

2.1 GENERAL

The EOR annual inspection took place on October 15, 2020. The observations made during the annual inspection are considered in this report along with other sources of information to confirm that the facility continues to be developed and operated in a manner consistent with the designs, QPPs, and the operating protocols established for the facility. Key additional inspections of the YDTI completed during 2020 and discussed in this report include the following:

- Videos were collected using an UAV in May and June 2020 following flight paths around the YDTI and associated facilities prescribed by KP.
- Mike Harvie (Manager of Engineering and Geology) of MR, performed the four quarterly construction field reviews as the official designate of the EOR in 2020. The Q1 field review was performed on March 30-31, Q2 on June 26, Q3 on September 16-18, and Q4 on December 9-10.
- Surface displacements are monitored remotely using InSAR, which provides millimeter precision satellite-based displacement measurements approximately every 14 days. The operational inSAR displacement monitoring program uses satellite data from 2-Dimensional TerraSAR-X satellites to monitor vertical and line-of-sight displacement.

Other inspections of the YDTI completed during 2020 that generally informed the summary and conclusions presented herein also include the following:

- Weekly inspections of active YDTI construction areas are performed by the MR Engineering Department. The inspections are summarized in weekly inspection reports provided to KP to document construction progress and used to track quantities of materials placed by the MR Operations Department.
- The MR Engineering Department performs a detailed inspection of the facility at least monthly and documents the inspection using an inspection log template from the TOMS Manual (MR/KP, 2020). Copies of the associated records are provided to the EOR periodically.
- Monitoring of 2020 site investigation activities was performed by Kevin Davenport, P.Eng., Jesse Collison, P.Geo., and Mark Alban, E.I.T. of KP between approximately February 16 and March 11.
- Monitoring of 2020 site investigation activities was performed by Mr. Michael Peet of Hydrometrics, Inc. between July 13, and September 12 (on behalf of KP due to public health restrictions relating to travel associated with the COVID-19 pandemic). Mr. Peet was supported by Kevin Davenport of KP (based in Vancouver, British Columbia, Canada) for the duration of the program.

MR also routinely monitors piezometric conditions, surface and subsurface deformations, the supernatant pond elevation, tailings delivery system usage, beach elevation at tailings discharge locations, and flowrates at several water management locations. Real-time piezometric records and flow rates at the Seep 10 Weir are available to MR and KP via the web-based RMS. The RMS uses a series of alerts to continuously evaluate for QPP trigger exceedances and to provide status updates that inform system maintenance needs. Surveillance data is comprehensively reviewed by KP on a quarterly and annual basis, and summary reports are provided to MR, MDEQ, and the IRP. The following surveillance reporting completed in 2020 was considered in conjunction with observations from the various inspections listed above to inform the discussion and conclusions contained in this report:

- The 2019 DAR (KP, 2020b), which summarized the monitoring and instrumentation data for the impoundment for the 2019 calendar year.
- Quarterly piezometric monitoring updates summarizing the piezometric data for QPP monitoring sites for Q1, Q2, and Q3 2020.
- Quarterly summaries of water monitoring data, including the supernatant pond elevation, tailings beach development records, and flow records for Q1, Q2, and Q3 2020.

2.2 MEANS OF OBSERVATION

2.2.1 AERIAL DRONE SURVEY

Aerial videos of the YDTI were collected by Water and Environmental Technologies (WET) using an UAV in late May and early June 2020. The desired flight paths were outlined by KP and the video footage captured by the UAV was used to prepare a comprehensive series of site tour videos to support the site inspection requirement of the Periodic Review of the YDTI completed by the Independent Review Panel (IRP) in 2020 (IRP, 2020). The site tour videos were reviewed by KP and the EOR. Select images extracted from the site tour videos are included in Appendix A (Photos 1 to 21) to document construction progress and conditions observed in mid-2020.

2.2.2 ANNUAL INSPECTION

The annual inspection was completed by Mr. Allen Gipson (P.E. in Colorado and Wyoming) on behalf of Mr. Ken Brouwer, P.E., the EOR, due to public health restrictions relating to travel associated with the COVID-19 pandemic. Mr. Gipson was accompanied during the annual inspection on October 15, 2020 by Mr. Mike Harvie (Manager of Engineering and Geology) of MR. The MDEQ accepted the proposed plan outlined by Mr. Brouwer for Mr. Gipson to complete the 2020 annual inspection of the YDTI by proxy on behalf of Mr. Brouwer. The relevant correspondence with MDEQ in this regard is included in Appendix B1 for reference. The following summarizes the process undertaken to facilitate the annual inspection by Mr. Gipson and to collect his visual observations in support of this report:

- Mr. Gipson was provided an overview of the YDTI and objectives of the annual site inspection during Microsoft Teams videoconference on September 28, 2020, which was attended by Mr. Gipson, Mr. Brouwer, Daniel Fontaine, Roanna Dalton, and Kevin Davenport of KP.
- KP provided Mr. Gipson with access to recent relevant information related to the performance of the facility, including copies of the 2019 EOR Annual Inspection Report (KP, 2020a), 2019 Data Analysis Report (KP, 2020b), and quarterly monitoring reports from 2020 available at the time.
- Mr. Brouwer and KP provided Mr. Gipson and Mr. Harvie with specific instructions for the annual inspection on October 7, including a map of recommended locations to include in the site tour and details related to items to review and observations expected at these locations based on previous inspections and recent construction activities.
- Mr. Gipson provided a summary of his observations to Mr. Brouwer on the afternoon of October 15 via a Microsoft Teams videoconference, which was also attended by Daniel Fontaine and Roanna Dalton.

Mr. Gipson provided videos captured during the inspection to document the locations inspected and conditions observed. Snowfall occurring just prior to the inspection limited visual quality of the collected videos; however, the Q3 Construction Field Review (KP, 2020c) completed one month previously (between September 16 and 18, 2020) included snow-free photographs for comparison. Select images extracted from the videos submitted by Mr. Gipson are included in Appendix A (Photos 22 to 74) to document conditions during the site visit. An overview of the facility observed from the Sentintel-2 satellite image on October 7, 2019 is included on Figure 2.1 along with the supernatant pond and tailings discharge point elevations from October 12, 2019.

2.2.3 2020 QUARTERLY CONSTRUCTION FIELD REVIEWS

Mike Harvie (Manager of Engineering and Geology) of MR, performed the four quarterly construction field reviews as the official designate of the EOR in 2020 due to the ongoing COVID-19 pandemic and associated travel restrictions. The Q1 field review was performed on March 30-31, Q2 on June 26, Q3 on September 16-18, and Q4 on December 9-10. KP provided a variety of directions and resources to Mr. Harvie prior to each quarterly construction field review. Mr. Harvie provided photos, videos, and other documents that were reviewed by KP to inform the opinions and conclusions provided in the quarterly field review letters.

The Q3 2020 Construction Field Review (KP, 2020c) was completed in mid-September by Mr. Harvie. A copy of the summary letter describing the field review, including description of the active construction areas and field observations, is included as Appendix B2. The summary letter includes snow-free photographs of site conditions one month prior to the annual inspection.

2.2.4 INSAR MONITORING

Surface displacements are monitored remotely using InSAR, which provides millimeter precision satellite-based displacement measurements approximately every 14 days. The operational InSAR displacement monitoring program for the YDTI uses satellite data from 2-Dimensional TerraSAR-X (TSX) satellites to monitor vertical and line-of-sight displacement. The TSX imagery is collected by TRE Altamira, who is responsible for periodic processing of the data to prepare historical ground displacement analyses (approximately twice each year).

The first ground displacement analysis for the YDTI, performed using the high-resolution TSX imagery, was prepared in July 2020 by TRE Altamira (TRE, 2020) and is included in Appendix B3. This initial analysis was based on imagery collected between June 2019 and June 2020. The report presents time series data of observed embankment displacement for five selected cross sections along the East-West and three east-west trending sections through the central pedestal area of the East-West Embankment. The highest settlement rates were observed within the rockfill surcharge area. Lower rates of settlement were observed at the embankment crest and within the downstream embankment shell, with rates slowing towards the downstream toe of the embankments. The observed settlement rates are on the order of several inches per year near the embankment crest.

The observed settlement trends discussed above are consistent with expectations for the embankments at the YDTI. A longer period of record and incorporation of data from other surface and subsurface monitoring devices will be required to further analyze displacement trends. Additional discussion will be provided in the 2020 DAR when the necessary records for the full 2020 calendar year are available.

NOTES:

1. TAILINGS DISCHARGE AND SUPERNATANT POND ELEVATIONS WERE SURVEYED ON OCTOBER 12, 2020. ALL ELEVATIONS ARE RELATIVE TO THE ANACONDA DATUM.
2. SENTINEL-2 VISIBLE SATELLITE IMAGE TAKEN ON OCTOBER 7, 2020.

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YANKEE DOODLE TAILINGS IMPOUNDMENT

SENTINEL-2 SATELLITE IMAGERY
FACILITY OVERVIEW
OCTOBER 7, 2020

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FIGURE 2.1 REV 0

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2.3 OBSERVED CONDITION AND CHANGES

2.3.1 CONSTRUCTION PROGRESS AND CHANGES SINCE LAST INSPECTION

Construction continued to progress at the YDTI since the previous Annual Inspection visit was conducted in 2019. The construction activities were routinely monitored and reviewed by the EOR by means of weekly inspection reports, Monthly Quality Control progress reports, and Quarterly Inspections by the approved designate of the EOR. The facility was observed to be in good condition throughout 2020. The active construction areas during 2020 and facility changes noted below are illustrated on Figures 2.2 to 2.4. The main construction activities at the YDTI since the 2019 Annual Inspection included the following:

- The downstream step-out along the North-South Embankment was largely completed to EL. 6,400 ft except on the southern end where deactivation of the current mine haul ramp is required prior to advancing construction further in this area. Minor settlement cracking was monitored. The tailings pipeline corridor along the crest of North-South Embankment was regraded to facilitate local modifications to the pipeline and adjustments to Line 3 discharge points as recommended in the 2019 Annual Inspection Report (KP, 2020a).
- Construction of the new tailings pipeline access ramp along the East-West Embankment was completed and tailings discharge pipelines were realigned along it. Minor settlement cracking was observed near the outside edge of the ramp in the general vicinity of drillhole DH20-S1, which continues to be monitored by MR. InSAR monitoring indicates settlement rates of approximately 3 inches/year between June 2019 and June 2020 at targets upstream and downstream of this area of cracking.
- Tailings discharge at NS-3 and the new NS-4 location were established for Line 3 on the North-South Embankment. An extension of Line 2 to the NS-1 discharge location was planned, but not completed by the date of the site visit for the Annual Inspection.
- Three (3) new geotechnical drillholes were advanced along Section 8+00W of the East-West Embankment to further evaluate geotechnical and hydrogeological conditions within the central pedestal area. Two locations (DH20-01 and DH20-S1) were used to facilitate additional Nuclear Magnetic Resonance (NMR) testing within the embankment fill and underlying foundation materials following success of this testing method in 2019. Piezometric and deformation monitoring instrumentation was installed at two locations and included the following equipment:
  - DH20-S1 included installation of six (6) nested fibre optic piezometers at depths ranging from 190 to 640 ft below ground surface (ftbgs).
  - DH20-S2 included installation of eight (8) vibrating wire piezometers at depths ranging from 200 to 710 ftbgs. In addition, 45 Geo4Sight tilt sensors and 78 Geo4Sight combination tilt/pore pressure sensors were installed with spacing between sensors ranging from 6 to 18 ft. Pore pressure sensors are installed every 6 ft within the embankment fill and every 18 ft within the overlying tailings mass.
- Construction along the West Embankment continued, with Contractor (Mungus Company Inc.) construction activities largely completed prior to 2020. Construction materials were provided and placed predominantly by MR mine equipment during 2020. Ongoing fill placement included selective placement of materials in 5 ft thick lifts in Zone D1. Construction of the West Embankment to EL. 6,400 ft was completed during 2020, and the associated construction completion report is in progress.
- Fill placement for the recently permitted EL. 6,450 ft embankment lift was advanced along both the East-West and West Embankments.

- The Extraction Pond Dewatering System was commissioned and operated during the past year. The final alignment of the overflow pipelines and associated erosion protection measures are yet to be completed.
- Construction work commenced for planned (2021) realignment of the Reclaim Water Pipeline and includes widening the access road along the north abutment of the North-South Embankment.
- Tailings beaches are well established along all the embankments. Tailings discharge and beach monitoring protocols continued to be well managed.

NOTES:

1. AERIAL IMAGERY FROM JULY 9, 2020 PROVIDED BY MONTANA RESOURCES, LLP.

2. CONSTRUCTION AREAS ARE ESTIMATED TO REPRESENT ACTIVE AREAS DURING 2020.

MONTANA RESOURCES, LLP

YANKEE DOODLE TAILINGS IMPOUNDMENT

2020 ANNUAL INSPECTION REPORT
NORTH-SOUTH EMBANKMENT
APPROXIMATE CONSTRUCTION AREAS

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FIGURE 2.2 REV 0

REV	DATE	DESCRIPTION	PREP'D	RVW'D
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NOTES:

1. AERIAL IMAGERY FROM JULY 9, 2020 PROVIDED BY MONTANA RESOURCES, LLP.
2. CONSTRUCTION AREAS ARE ESTIMATED TO REPRESENT ACTIVE AREAS DURING 2020.

REV	DATE	DESCRIPTION	PREP'D	RVW'D
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MONTANA RESOURCES, LLP

YANKEE DOODLE TAILINGS IMPOUNDMENT

2020 ANNUAL INSPECTION REPORT
EAST-WEST EMBANKMENT
APPROXIMATE CONSTRUCTION AREAS

Knight Piésold CONSULTING

P/A NO. VA101-126/23 | REF. NO. 2

FIGURE 2.3 | REV 0

NOTES:

1. AERIAL IMAGERY FROM JULY 9, 2020 PROVIDED BY MONTANA RESOURCES, LLP.

2. CONSTRUCTION AREAS ARE ESTIMATED TO REPRESENT ACTIVE AREAS DURING 2020.

REV	DATE	DESCRIPTION	PREP'D	RVW'D
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MONTANA RESOURCES, LLP

YANKEE DOODLE TAILINGS IMPOUNDMENT

2020 ANNUAL INSPECTION REPORT
WEST EMBANKMENT
APPROXIMATE CONSTRUCTION AREAS

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FIGURE 2.4 REV 0

2.3.2 HORSESHOE BEND AREA WATER MANAGEMENT SYSTEMS

HsB is an area located downstream of the YDTI that receives runoff from the surrounding disturbed and undisturbed catchment areas and seepage from the YDTI. The primary HsB area water management systems and features are shown on Figure 2.5. Sources contributing to seepage from the YDTI facility includes tailings slurry water that percolates into the tailings beach, meteoric recharge to the tailings surface, and seepage from the supernatant pond. Groundwater discharges downstream (south) of the facility in the following four areas:

- Number 10 Seep (Seep 10)
- Leach Seeps (reporting to Houligan Pond and the Precipitation Plant circuit)
- Historical Drain
- HsB Seeps (north of the Precipitation Plant and reporting to the upper HsB area.

The flows collected at Seep 10 are conveyed to the upper HsB area where they combine with the HsB Seeps, flows from the historical drain, and local runoff prior to the #10 Cell Pump. The pump conveys the flows to the #10 Cell of the Precipitation Plant for processing. The #10 Cell discharge pipe flow is measured using a calibrated Parshall flume (the Precipitation Flume) prior to discharging to the HsB Pond.

Leaching of uncrushed low grade rockfill occurs in the area immediately south of the YDTI. Leach activities on the northeast leach pads are currently active, while the west and southeast pads are currently inactive. Pregnant leach solution and drainage from precipitation and runoff are collected in surface drainage ditches along the east and northeast side of the HsB area. The surface ditches convey the water to one of either three pre-processing storage ponds: Houligan, Surge, or Holding. Leach solution is discharged from these ponds to the Precipitation Plant for processing. The barren leach solution is acidified prior to pumping back to the leach areas. The leach operation is a gaining system and the system configuration for the barren solution recirculation pumps results in overflow to the HsB Pond. This flow is measured using a calibrated weir plate with water level measurement (the Precipitation Weir) prior to discharge to the HsB Pond.

The HsB Pond is a long, narrow basin approximately 100 ft wide and 2,000 ft long. Flow rates in the HsB area have been measured regularly since 1996 using a weir established by the Montana Bureau of Mines and Geology (MBMG). Flow through the HsB Pond is continuously measured using a weir plate and level meter near the south end of the pond.

The HsB area water management systems generally functioned normally throughout the year with some observed changes to flow routing upstream of the HsB Weir. However, flowrates measured at the Precipitation Weir were substantially lower than those measured since 2017, which was attributed to changes in the water management at Houligan Pond. Some flow (unmeasured) is currently bypassing the Precipitation Plant via a weir on the southern end of Houligan Pond and flows southward before discharging to the HsB Pond. Flowrates at Seep 10 have been measured since April 2019 using an ultrasonic lookdown sensor to automatically measure the stilling pond level near the weir. The trend of the Seep 10 flows observed during 2020 is similar to the 2019 trend, with lower flowrates observed in the beginning of the year, increasing during Q2 and reaching a peak throughout late Q2 and Q3 (KP, 2020e) indicating some seasonal variation in flows collected in this location. Average monthly flowrates at the HsB Weir through Q3 2020 were similar to those observed since 2018.

A diversion structure at the south end of the pond diverts water by gravity to either the Equalization Basin or the HsB Water Treatment Plant (HsB WTP) Influent Pump House. Flows reaching the Equalization Basin are recovered using the Horseshoe Bend Capture System (HsBCS). The HsBCS flows are conveyed via two HsBCS pump houses and metered into the tailings (which have additional lime to facilitate treatment of this water) at a manifold after the No. 3 (Tailings) Booster Pump House. The combined flow is discharged into the YDTI, and the supernatant pond provides residence time for water treatment objectives to be achieved. Flows directed to the Influent Pump House are transferred to the HsB WTP before being conveyed to the Concentrator for incorporation into the tailings circuit and additional treatment at the YDTI.

2.3.3 BERKELEY PIT PUMPING SYSTEM

Berkeley Pit water is pumped using the Berkeley Pit Pumping System (BPPS), consisting of a floating barge system and land-based pump house, to the #5 and #6 Cells in the Precipitation Plant. Approximately 3 MGPD of Berkeley Pit water is treated and introduced into the site water management system when the BPPS is operating. The flow is discharged from the Precipitation Plant in a High-Density Polyethylene (HDPE) pipeline and conveyed by pipeline along the west side of the HsB Pond to a small transfer pond and pump located to the west of the HsB Weir. Flow is pumped from this pond to either the Equalization Pond or the HsB WTP Influent Pump House. A secondary discharge pipeline from the #5 and #6 Cells also allows for flow to be discharged directly to the HsB Pond.

A leak was observed from the bulkhead at the Precipitation Plant where the discharge pipelines exit the plant during the 2019 annual inspection and additional repairs were recommended following the inspection. The bulkhead was replaced in 2020, which has substantially decreased leakage at this location.

2.3.4 PILOT PROJECT DISCHARGE

A new water management strategy was implemented at the site in 2019 as part of a pilot project associated with the Butte Mine Flooding Operable Unit (BMFOU) of Superfund. The Berkeley Pit Pilot Project (the Pilot Project) facilitates the treatment and release of up to 10 million gallons per day (MGPD) of water from the YDTI. The water is further treated at a Polishing Plant and the effluent is released near the confluence of Blacktail and Silver Bow Creeks. One goal of the pilot project is to progressively reduce the YDTI supernatant pond volume to approximately 15,000 to 20,000 acre-ft over the next 3 to 5 years.

The Polishing Plant began operating on September 30, 2019 (the day of the EOR 2019 annual inspection). The Pilot Project has resulted in a net volume deficit of approximately 677 million gallons (2,080 acre-ft) since it was commissioned and has had a notable impact on reducing the rise of the supernatant pond water elevation at the YDTI. The elevation of the supernatant pond measured at the end of September 2020 was only 0.5 ft higher than the measured elevation at the end of September 2019, compared to a rate of rise of approximately 6 ft/year observed from 2015 to 2019. The annual bathymetric survey and assessment of the YDTI supernatant pond volume was undertaken during Q3 2020 between June 22 and July 9. The evaluation of the survey data indicated an estimated pond volume of approximately 32,100 acre-ft, which corresponds to a 2,300 acre-ft decrease in the estimated pond volume compared to the previous bathymetric survey conducted on July 9, 2019 (KP, 2020e). The Pilot Project is not entirely within MR's control and a variety of factors and interruptions are possible that could impact the timeline; however, the EOR is pleased with the progress achieved since late 2019.

NOTES:

1. AERIAL IMAGERY FROM JULY 9, 2020 PROVIDED BY MONTANA RESOURCES, LLP.

REV	DATE	DESCRIPTION	PREP'D	RVW'D
0	11FEB'21	ISSUED WITH REPORT	DDF	KJB

MONTANA RESOURCES, LLP

YANKEE DOODLE TAILINGS IMPOUNDMENT

2020 ANNUAL INSPECTION REPORT
HORSESHOE BEND (HsB) AREA
WATER MANAGEMENT

Knight Piésold CONSULTING

P/A NO. VA101-126/23

REF. NO. 2

FIGURE 2.5

REV 0

2.4 QUANTITATIVE PERFORMANCE PARAMETERS

2.4.1 GENERAL

The ongoing development and operation of the YDTI considers continuously achieving four key performance objectives as fundamental requirements for maintaining consistency with the design of the facility. These objectives incorporate the following:

- The YDTI supernatant pond remains separated from the embankments by large tailings beaches.
- The embankments and adjacent tailings beaches remain well drained, and piezometric elevations within the embankments remain below prescribed levels.
- Sufficient freeboard is maintained at all times to manage risks associated with extreme floods and seismic events.
- The embankment geometry, including downstream slope angle and crest width, remains consistent with the design criteria.

QPPs were selected during development of the MR TOMS Manual (MR/KP, 2020) to enable a high-level comparative assessment with the performance objectives listed above. The QPPs are intended to be easily measured and evaluated on-site without complex calculation. QPPs are therefore a good reference to quickly assess the performance of the YDTI. The QPPs from the MR TOMS Manual are included in Table 2.1 of this report for reference.

Table 2.1 Quantitative Performance Parameters

Location	QPP	Value
YDTI Supernatant Pond	Total Freeboard	> 22 ft
YDTI Tailings Beach	Minimum beach length	> 200 ft
YDTI Embankments	Downstream Overall Slope	No steeper than 2H:1V
	Minimum Crest Width	> 200 ft
East-West Embankment Piezometers	Water level: MW94-08	< 5,680 ft
	Water level: MW94-11	< 5,693 ft
	Water level: DH15-S3 VW1	< 5,690 ft
	Water level: DH15-S4 VW1	< 5,740 ft
	Water level: DH15-S4 VW2	< 5,800 ft
	Water level: DH15-S5 VW1	< 5,785 ft
	Water level: DH17-S1 VW2	< 5,741 ft
	Water level: DH17-S2 VW2	< 5,869 ft
	Water level: DH18-S3 VW3	< 6,044 ft
North-South Embankment Piezometers	Water level: MW12-01	< 5,940 ft
	Water level: MW12-05	< 6,200 ft
	Water level: DH18-S1 VW2	< 6,010 ft
	Water level: DH18-S2 VW2	< 6,029 ft
West Embankment Piezometers	Water level: VWP-DP1	< 6,374 ft
	Water level: VWP-DP2	< 6,366 ft
	Water level: DH15-12 VW1	< 6,372 ft
	Water level: DH15-12 VW2	< 6,372 ft
	Water level: DH15-12 VW3	< 6,372 ft

NOTES:

1. TABLE 2.1 ABOVE REPRODUCED FROM TABLE 5.1 OF THE TAILINGS OPERATIONS, MAINTENANCE AND SURVEILLANCE (TOMS) MANUAL (MR/KP, 2020).

Several of the QPPs are related to piezometric conditions. A quarterly instrumentation summary (KP, 2020d) presenting the piezometric data collected through the third quarter (Q3) 2020 for key monitoring sites with designated QPPs is included in Appendix C1 and summarized in this section. A plan view showing the location of the piezometric QPP sites is included in Appendix C1. The remainder of the QPPs are geometric conditions related to the embankment, including pond freeboard and minimum beach length. Geometric QPPs were evaluated using the weekly supernatant pond elevation measurements, aerial survey data collected in July 2020, satellite imagery, and visual observations during the various inspections. A quarterly summary (KP, 2020e) presenting key performance records for Q3 2020 associated with the YDTI water management systems, including the supernatant pond elevation and approximate tailings beach length, is included in Appendix C2.

2.4.2 PIEZOMETRIC

MR routinely monitors piezometric conditions using more than 250 monitoring instruments at over 100 locations within the YDTI embankments, tailings mass, HsB area, and surrounding areas as part of their operational surveillance plan for the tailings facility as described in the TOMS Manual (MR/KP, 2020).

Real-time piezometric records and flow rates at the Seep 10 Weir are available to MR and KP via the web-based Remote Monitoring System (RMS). The RMS uses a series of alerts to continuously evaluate for QPP trigger exceedances and to provide status updates that inform system maintenance needs. Advanced plotting and reporting tools were implemented in 2019 to visualize the real-time data (piezometric level, change in level, sensor status, etc.)

No piezometric trigger elevation exceedances were observed at QPP monitoring sites since the last annual inspection. Several QPP sensors generated erroneous exceedance alert notifications throughout the year that were triggered by temporary equipment malfunction. These events were promptly investigated by MR and KP personnel, and in-situ conditions were confirmed with subsequent automated readings or through manual data collection. QPP data collection and availability via the RMS experienced minor interruptions during 2020 with causes including battery depletion, minor hardware problems, water damaged hardware, and temporary loss of communication. Outages were identified regularly during weekly monitoring reviews and scheduled for repair depending on the nature of the outage.

The majority of QPP sites within the basal saturated zone of the East-West Embankment continued to display slightly decreasing piezometric trends since the last annual inspection. The rates of decrease at these sites have continued to slow and several sites have stabilized or recorded slightly increasing piezometric conditions. The continued decreasing trend within the embankment rockfill is interpreted to result from continued use of multiple discharge points instead of the historical (pre-2016) practice of using a single, central discharge location. The current deposition strategy is inferred to have resulted in desaturation within a significant portion of the central tailings mass adjacent to the East-West Embankment as compared to historical conditions. The slowing rate of decrease suggests that pore pressures within the central section of the East-West Embankment may be approaching a new steady-state condition associated with enhanced discharge strategies in place since 2016.

QPP sites within the embankment rockfill at the North-South Embankment continued to exhibit relatively constant or slightly increasing piezometric elevations, but piezometric elevations remain well below the established trigger elevations. The increases in pore pressures at the QPP sites are inferred to be associated with continued tailings discharge along the North-South Embankment, including relocation of discharge location NS-3 and commissioning of an additional new discharge location (NS-4) at the location shown on Figure 2.2. Minor piezometric fluctuations associated with construction of the North-South Embankment step-out were observed by both QPP and non-QPP sites within the basal saturated zone and foundation due to construction of four embankment lifts from mid-2019 through Q1 2020, as described previously (KP, 2020b). The last lift, up to EL. 6,400 ft, was completed in April 2020 and resulted in construction induced pore pressure increases of up to approximately 25 ft within the foundation at one non-QPP location. Pore water pressures began to dissipate following lift placement and recovered to pre-6,400 ft lift conditions by September 2020. Minor pore pressure responses (increases followed by dissipation) were observed by QPP sensors within the basal saturated zone of the embankment, with magnitudes typically less than approximately 1 ft.

Piezometric elevations within the foundation of the West Embankment have been relatively constant through 2020 following the increasing trend observed from 2015 through 2018 that was attributed to increasing supernatant pond and tailings elevations resulting from ongoing operations. Piezometric conditions remain stable due to the draining influence of the WED, which is now lower than the adjacent tailings beach surface and the YDTI pond, which has been pushed 2,000 ft away to the east as a result of tailings beach development.

2.4.3 GEOMETRIC

The crest width of the East-West Embankment remains unchanged in relation to observations from the past two annual inspections. The apparent width of the East-West Embankment is exaggerated by the rockfill surcharge that was extended over the tailings beach area in 2015 and 2016. The current width along this section of the embankment, including the embankment crest and surcharge ranges between approximately 400 ft and 900 ft. The narrowest portion of the crest exists at the central pedestal area where the primary mine haul ramp presently crosscuts the downstream side of the East-West Embankment. The current embankment construction schedule envisages infilling the existing mine haul ramp during 2021. An outer ramp was constructed in 2018 and 2019 to relocate the tailings distribution pipelines and a new primary mine haul ramp was constructed on the downstream side of the North-South Embankment.

The minimum crest width along the North-South Embankment ranges from approximately 300 ft in the vicinity of Station (Stn.) 13+00N to over 700 ft near Stn. 33+00N. The crest width is measured by KP at the embankment freeboard compliance elevation (EL. 6,382 ft), which is based on the YDTI pond elevation (EL. 6,360 ft) plus the 22 ft of freeboard requirement. The crest width is presently exaggerated along the northern half of the embankment due to construction of the downstream step-out of the embankment, which more than doubled the crest width along much of the embankment.

The downstream slope geometry has been developed by incorporating 50 to 70 ft wide benches between successive 50 to 100 ft high angle of repose rockfill lifts along the embankment. This configuration has resulted in overall downstream slopes of approximately 2H:1V of flatter.

The lowest point on the embankment crest indicated by MR is located along the East-West Embankment where the tailings discharge pipelines cross the top of the dam just above the No. 3 Tailings Booster Pump House. The elevation at this location was determined by MR to be EL. 6,397 ft in January 2020. The maximum allowable pond elevation based on the lowest point of the embankment crest and freeboard QPP (22 ft) is approximately 6,375 ft, which is approximately 15 ft higher than the actual operating pond elevation during 2020. This confirms that freeboard allowances were maintained (with significant contingency) throughout 2020.

3.0 TRENDS AND ADDITIONAL CONSIDERATIONS

3.1 REVIEW OF IMPORTANT TRENDS

3.1.1 GENERAL

The YDTI continues to be developed and operated in a manner consistent with the designs, the QPPs, and the operating protocols established for the facility. A risk assessment (KP, 2018c) was undertaken during preparation of the design document associated with continued construction of the embankments to a crest elevation of 6,450 ft. The risk assessment identified potential failure modes and the factors affecting likelihood and consequences associated with each failure mode. It was recognized that design and operating enhancements could provide further opportunities for risk mitigation, and these enhancements continue to be progressively implemented at the YDTI, taking advantage of the best practicable new technologies and techniques to enhance dam safety. Risk mitigation opportunities incorporated into the design and operating procedures of the YDTI since 2015 include:

- Modifications to the tailings distribution system for improved beach development along all three embankments.
- Stress densification of tailings below the rockfill surcharge to strengthen tailings adjacent to the East-West Embankment, improve seismic performance of the facility, and reduce potential flowability of the underlying tailings mass.
- Water management changes, including substantial reductions to freshwater use from the Silver Lake Water System (SLWS) and development of the Pilot Project to facilitate additional water inventory reductions within the YDTI supernatant pond.
- Continued investigation of the geotechnical and hydrogeological conditions within the embankment rockfill, tailings, and foundation materials underlying the embankment following a phased investigation plan developed by KP.
- Expansion of the piezometric monitoring network and development of surface and subsurface deformation monitoring programs.
- Automation of monitoring systems that are at the leading end of practice (IRP, 2020).
- Improved data analysis frequency and reporting rigor.
- Updates to the MR Emergency Action Plan (EAP).

The risk assessment also identified opportunities to utilize the observational method during ongoing development of the facility, which was noted to be particularly relevant for the transitional period between implementing the modifications to the tailings distribution system and achieving a new steady-state condition associated with the revised discharge strategy. There was uncertainty identified due to the reliance on modelling predictions related to tailings beach development and water balance modelling, and foreseeable deviations were considered along with the planned observational monitoring related to several factors, including tailings beach development, pore pressure changes within the embankment, and water inventory changes. The trends related to these factors are regularly discussed in the quarterly and annual surveillance reporting, and a status update related to each is provided briefly below.

3.1.2 TAILINGS BEACH DEVELOPMENT

Tailings were historically discharged into the YDTI at a single location at the southern end of the impoundment near Section 8+00W on the East-West Embankment. Changes to the tailings distribution system were made between 2016 and 2017 with three discharge locations operational as of March 2017. Five additional discharge points were commissioned later in 2017 for a total of eight discharge locations. MR implemented a newly developed tailings operating philosophy and associated surveillance protocols during 2018 to guide and prioritize tailings beach development. Tailings beach development has generally progressed in a manner consistent with the design objectives and modelling predictions with the beach transitioning from a deltaic fan shape to a ‘U-shape’. A ninth discharge location was added at the northern end of West Embankment in January 2019 to displace water that was pooling in the northwest corner of the facility and aid in beach development along the West Embankment.

Surveillance of the facility through 2019 indicated that the shortest tailings beach length is typically observed at the northern end of the North-South Embankment and there was a location halfway between the two northernmost discharge points where the beach surface is relatively low due to the longer distance between the discharge points along this section of the embankment. Beach development along the North-South Embankment was recognized as a key risk factor in the risk assessment and related to the potential for piping initiated by natural flooding. The risk assessment identified that improving uniformity of the tailings beach adjacent to the embankments is a potential mitigation measure and thus beach development is monitored closely as part of the surveillance plans for the facility. Beach development continues to be reviewed frequently to inform design and operating enhancements that could provide further opportunities for risk mitigation. Adjustments to the tailings distribution system were recommended in the 2019 AIR (KP, 2020a) and included relocation of discharge location NS-3 closer to NS-2 and extending Line 3 to include a new discharge point, NS-4, located further to the north than the existing location of NS-3. These changes were implemented in August 2020 and are currently operational.

The 2019 AIR recommendation (#2) also included a second part related to considering extension of Line 2 (which currently services the East-West Embankment) to allow discharge at location NS-1 and possibly NS-2 in the future. It is recognized that the ability to discharge from either of two lines or at two locations concurrently along the North-South Embankment would improve flexibility for operations and enhance beach development along this embankment. MR evaluated options for adjustment of Line 2 in 2020 and concluded that it would not be practicable to complete the extension of Line 2 until the EL. 6,450 ft raise of the embankment is completed adjacent to discharge locations NS-1 and NS-2. A deferral notification was provided to the EOR by MR and is included in Appendix D1. The deferral notification suggests that the implementation schedule for this realignment should be extended until approximately Q3 2022 based on the current construction schedule. The deferred implementation of the extension of Line 2 is reasonable based on current site conditions. The recommendation will be maintained in this report and implemented in 2021 or 2022 when it is practicable to do so.

3.1.3 EMBANKMENT PIEZOMETRIC CONDITIONS

The conceptual hydrogeological model for the YDTI embankments presented in the Site Characterization Report (KP, 2017) suggests that a basal saturated zone exists within the bottom 50 to 150 ft of embankment rockfill and that isolated perched saturated zones exist within the overlying rockfill. Site investigation programs completed since 2016 (KP, 2018d; KP, 2019c; KP, 2019d; KP, 2020f; KP, 2020g) and piezometric data collected (KP, 2018b; KP, 2019b; KP, 2020b; KP, 2020d) continue to refine and corroborate this conceptual hydrogeological model. The piezometric monitoring network has been expanded significantly, and piezometric data collection was automated using the RMS beginning in 2018 to provide real-time data to MR and KP at approximately 250 monitoring instruments at over 100 sites. All new piezometric monitoring sites are integrated directly with the RMS during installation.

Piezometric conditions within the East-West Embankment and central tailings mass have reached an approximate equilibrium in response to the changes to the tailings discharge practices initiated in late 2016. Piezometric elevations within the embankment and tailings mass generally decreased from 2017 to 2019, with the rate of decrease slowing during 2019 and piezometric elevations now relatively stable at most sites (KP, 2020b). Average monthly flow rates observed at the HsB Weir have generally decreased and month-to-month variability reduced since late 2017, other than during the commissioning period for the Pilot Project. Flowrates observed at Seep 10 decreased beginning in the second half of 2017. Flowrates at Seep 10 have been measured automatically since April 2019, and preliminary trends show seasonal variation indicating that flows collected at this location are likely influenced to some extent by meteoric recharge.

Piezometric monitoring sites within the embankment rockfill at the North-South Embankment generally indicate relatively constant piezometric elevations or slightly increasing piezometric elevations since 2018. Fluctuations in piezometric elevations within the North-South Embankment and underlying foundation materials have been attributed to nearby tailings discharge and construction of the downstream step-out of the embankment in 2019 and early 2020. Piezometric elevations within the foundation of the West Embankment have been relatively constant through 2019 and 2020 following an increasing trend from 2015 to 2019 that was attributed to increasing supernatant pond and tailings elevations resulting from ongoing operations. Piezometric conditions through Q3 2020 continued to remain stable due to the draining influence of the WED (KP, 2020b; KP, 2020d).

3.1.4 WATER INVENTORY CHANGES

The YDTI supernatant pond provides a source of water to support continuous mill operations and the elevation of the pond surface rises as the volume of tailings in the facility increases. The risk assessment (KP, 2018c) identified that reducing the normal operating pond volume towards a target volume of approximately 15,000 acre-ft would reduce risks associated with facility performance following natural flooding. MR implemented changes to the Silver Lake Water Supply (SLWS) use practices in 2016 and 2017 as part of the goal of gradually reducing the operating pond volume (KP, 2020b) and substantially reduced freshwater and make-up water demands for ore processing. MR and KP recognized that changing SLWS practices was an achievable way to influence the water inventory in the YDTI and that other opportunities existed to further reduce water stored within the facility.

The water inventory (estimated during the annual bathymetric survey) increased marginally in 2018 and 2019 despite the changes to SLWS practices. The increases were attributed to the implementation of the revised tailings deposition strategy beginning in 2017 when tailings discharge was concentrated on the northern ends of the West and North-South Embankments to promote development of tailings beaches in these areas. Monitoring data indicated that the focused deposition on the northern ends of the embankments likely caused additional pond water accumulation resulting from the rapidly accumulating surcharge load consolidating the underlying fine tailings on the northern side of the impoundment and the release of interstitial water from the tailings voids on the southern end where tailings discharge occurred less frequently compared to historical practices (KP, 2020h).

The Pilot Project began discharging YDTI water off site in September 2019 and has resulted in a net volume deficit of approximately 2,080 acre-ft through Q3 2020. The elevation of the supernatant pond measured at the end of September 2020 was only 0.5 ft higher than the measured elevation at the end of September 2019, compared to a rate of rise of approximately 6 ft/year observed previously. The annual bathymetric survey and assessment of the YDTI supernatant pond volume in 2020 indicated an estimated pond volume of approximately 32,100 acre-ft, which corresponds to a 2,300 acre-ft decrease in the estimated pond volume compared to the previous bathymetric survey conducted in 2019.

Updated water balance modelling undertaken in 2020 (KP, 2020h) incorporated a sensitivity analysis related to effluent discharge associated with the Pilot Project. The analysis indicates that the target pond volume of approximately 15,000 acre-ft can be achieved over the next 2 to 10 years (depending on the net deficit achieved) if the Pilot Project continues. The Pilot Project is not entirely within MR's control and a variety of factors and interruptions are possible that could impact the timeline.

3.2 ADDITIONAL CONSIDERATIONS

Fill placement for the recently permitted EL. 6,450 ft embankment lift began along both the East-West and West Embankments in 2020. MR has internally developed a dumping plan, which is integrated with their 2021 budget mine plan to support construction of the embankment lift during 2021. The dumping plan also includes provisional allowance for continued construction in 2022 to complete the lift along the East-West and North-South Embankments. It is understood that the planned sequence of construction is generally as follows:

- Fill placement will continue along the West Embankment until construction is substantially complete in this area, and concurrently fill placement will occur along the East-West Embankment to the northwest of the No.3 (Tailings) Booster Pump House.
- Fill placement will then occur in the central pedestal area of the East-West Embankment to infill the existing mine haul ramp up to approximately EL. 6,400 ft.
- Access for on-going construction of the EL. 6,450 ft lift with then occur via the new mine haul ramp along the downstream side of the North-South Embankment. Construction of the East-West and North-South Embankment lifts to crest EL. 6,450 ft will occur concurrently thereafter until completion.

KP recommends that the construction sequence and dumping plan for the EL. 6,450 ft lift be further evaluated in consideration of the construction materials balance with a particular focus on the next 12 to 24 months, including developing a summary of the sequence and anticipated progress of embankment construction on approximately a quarterly basis.

MR has also developed a preliminary 10-year forecast mine plan associated with continued operations between 2021 and 2031. The long range mine plan indicates that approximately 120 million tons of rockfill will be released during mining between 2023 and 2031 following construction of the EL. 6,450 ft embankment lift. The rockfill release schedule between 2023 and 2031 should be further evaluated while considering potential future embankment construction needs and opportunities for selective and strategic placement of rockfill to further improve embankment stability and support reclamation objectives as identified in the risk assessment (KP, 2018c). Site investigation programs were completed in the HsB area in 2018 (KP, 2019d) and 2019 (KP, 2020g) to evaluate geotechnical and hydrogeological conditions. Engineering work is underway related to the design of a Rockfill Disposal Site (RDS) and foundation drainage measures that may be proposed for the HsB area at the downstream toe of the East-West

Embankment. Construction of a rockfill disposal site in this area would require decommissioning of the Precipitation Plant and a cessation of leaching operations to facilitate dewatering of the associated pregnant leach solution collection ponds.

KP recommends that MR cease recirculating barren leach water to the RDSs adjacent to the YDTI embankments over the next several years. Stopping recirculation will assist in lowering the phreatic surface within the RDS and piezometric pressures within the foundation materials of the HsB area and help reduce flow rates of pregnant leach solution collected in the HsB area ponds while incorporating the circulating leach flows into the site water balance.

4.0 RECOMMENDATIONS AND ACTIONS

4.1 2019 RECOMMENDATIONS AND ACTIONS

The 2019 AIR identified the following recommendations for consideration during 2020:

- Maintain reductions in freshwater use from the Silver Lake Water System to the extent reasonably practical and use the BMFOU pilot project to incrementally reduce the water inventory in YDTI supernatant pond towards the target of approximately 15,000 acre-ft.
- Relocate tailings discharge location NS-3 closer to NS-2 and extend Line 3 to include a new discharge point, NS 4, located further to the north than the current location of NS-3. In addition, extend Line 2 to allow discharge at location NS-1 while considering the potential for further extension to NS-2 in the future.
- Periodically inspect the dormant settlement cracking along the North-South Embankment tailings discharge corridor and the cracking near the Terramac access road along the East-West Embankment tailings discharge corridor. Relocate the tailings pipeline(s) along the discharge corridor and regrade the surface to improve drainage and stability as required if active cracking or erosion begins to undermine the pipeline.
- Repair the leaks from the bulkhead at the Precipitation Plant where the discharge pipelines exit the #5 and #6 Cells to the extent reasonably practicable.
- Look for opportunities to establish flow monitoring systems to directly monitor the seepage flow rates in the HsB area upstream of the Precipitation Plant.

MR issued a Corrective Action Plan (CAP) in response to the 2019 AIR recommendations on January 31, 2020, which is included as Appendix D2. The CAP identified the actions proposed or already undertaken to address the five recommendations. The MR actions completed in 2020 to address each of the 2019 recommendations were as follows:

1. *Maintain reductions in freshwater use from the Silver Lake Water System to the extent reasonably practical and use the BMFOU pilot project to incrementally reduce the water inventory in YDTI supernatant pond towards the target of approximately 15,000 acre-ft.*

COMPLETED. MR continued to operate with reduced freshwater and make-up water from the SLWS. Short periods of increased SLWS usage were associated with dusting events and maintenance activities at the Concentrator. The Pilot Project operated throughout the year resulting in a net volume deficit at the YDTI of approximately 677 million gallons (2,080 acre-ft) between September 2019 and September 2020.

2. *Relocate tailings discharge location NS-3 closer to NS-2 and extend Line 3 to include a new discharge point, NS 4, located further to the north than the current location of NS-3. In addition, extend Line 2 to allow discharge at location NS-1 while considering the potential for further extension to NS-2 in the future.*

COMPLETED. Discharge location NS-3 was relocated closer to NS-2 and Line 3 was extended to include a new discharge point, NS-4, located further to the north than the previous location of NS-3. These changes were implemented in August 2020 and are currently operational. MR evaluated options for adjustment of Line 2 in 2020 and concluded that it would not be practicable to complete the extension of Line 2 until the EL. 6,450 ft raise of the embankment is completed adjacent to discharge locations NS-1 and NS-2. A deferral notification was provided to the EOR by MR and is included in Appendix D1. The deferred implementation of the extension of Line 2 is reasonable based on current site conditions. The recommendation will be maintained in this report and implemented in 2021 or 2022.

3. *Periodically inspect the dormant settlement cracking along the North-South Embankment tailings discharge corridor and the cracking near the Terramac access road along the East-West Embankment tailings discharge corridor. Relocate the tailings pipeline(s) along the discharge corridor and regrade the surface to improve drainage and stability as required if active cracking or erosion begins to undermine the pipeline.*

COMPLETED. The dormant settlement cracking was periodically inspected throughout the year. The northern half of the North-South Embankment tailings discharge corridor was regraded during adjustments to the discharge locations along Line 3. No other regrading was required based on the observed conditions.

4. *Repair the leaks from the bulkhead at the Precipitation Plant where the discharge pipelines exit the #5 and #6 Cells to the extent reasonably practicable.*

COMPLETED. The bulkhead was replaced in 2020, which has substantially decreased leakage at this location.

5. *Look for opportunities to establish flow monitoring systems to directly monitor the seepage flow rates in the HsB area upstream of the Precipitation Plant.*

COMPLETED. MR reviewed the existing flow monitoring systems and opportunities to monitor seepage flows upstream of the Precipitation Plant during 2020 and concluded that further instrumentation would be not practicable at this time due to the dynamic nature of water management practices within the HsB area.

KP agrees with this conclusion at the present time and is also including a recommendation in this report related to gradual termination of leaching operations over the next several years. A cessation of leaching operations will alter the surface water flows within HsB and may provide improved opportunities to adjust future drainage management and flow monitoring within the HsB area.

4.2 2020 RECOMMENDATIONS

The YDTI continues to be developed and operated in a manner consistent with the designs, the QPPs, and the operating protocols established for the facility. The best practices employed at the site continue to progressively evolve, taking advantage of the best practicable new technologies and techniques to enhance dam safety. The design, construction, operation, maintenance, and surveillance of the YDTI involves a multidisciplinary team of professionals. The team works closely together to achieve the fundamental objective of ongoing continuous improvement of the safety of the impoundment.

KP has identified the following recommendations in 2020 for consideration during 2021:

- **Maintain reductions in freshwater use from the Silver Lake Water System to the extent reasonably practicable and continue the Pilot Project to incrementally reduce the water inventory in the YDTI supernatant pond towards the target of approximately 15,000 acre-ft.**
- **Modify the tailings distribution system by extending Line 2 to allow discharge at location NS-1 and NS-2 when the EL. 6,450 ft raise of the embankment is completed adjacent to these discharge locations.**

- **Further develop the construction sequence and dumping plan for the EL. 6,450 ft lift focused on the next 12 to 24 months, including a more detailed summary of the sequence and anticipated progress of embankment construction on approximately a quarterly basis.**
- **Cease recirculation of barren leach water to the rock disposal sites (RDSs) directly adjacent to the YDTI embankments over the next several years.**
- **Develop an updated five-year plan that includes consideration for continued phased site investigation, installation of additional monitoring instrumentation, and potential replacement of non-functional or abandoned monitoring instruments.**

5.0 REFERENCES

Independent Review Panel (IRP, 2020). Report of the Independent Review Panel – Periodic Review No. 1 of Yankee Doodle Tailings Impoundment, dated September 12, 2020.

Knight Piésold Ltd. (KP, 2017). Site Characterization Report (KP Reference No. VA101-126/14-2 Rev 2), August 11, 2011.

Knight Piésold Ltd. (KP, 2018a). 2017 Annual Inspection Report (KP Reference No. VA101-126/16-3 Rev 0), dated February 9, 2018.

Knight Piésold Ltd. (KP, 2018b). 2017 Data Analysis Report (KP Reference No. VA101-126/16-5 Rev 0), dated July 20, 2018.

Knight Piésold Ltd. (KP, 2018c). Dam Breach Risk Assessment (KP Reference No. VA101-126/12-3 Rev 3), March 12, 2018.

Knight Piésold Ltd. (KP, 2018d). 2017 Geotechnical Site Investigation Report (KP Reference No. VA101-126/16-2 Rev 0), May 2, 2018.

Knight Piésold Ltd. (KP, 2019a). 2018 Annual Inspection Report (KP Reference No. VA101-126/19-2 Rev 1), dated January 31, 2019.

Knight Piésold Ltd. (KP, 2019b). 2018 Data Analysis Report (KP Reference No. VA101-126/19-4 Rev 0), dated August 15, 2019.

Knight Piésold Ltd. (KP, 2019c). 2018 Embankment Geotechnical Site Investigation Report (KP Reference No. VA101-126/19-1 Rev 0), May 22, 2019.

Knight Piésold Ltd. (KP, 2019d). 2018 Horseshoe Bend Geotechnical Site Investigation Report (KP Reference No. VA101-126/20-1 Rev 0), May 27, 2019.

Knight Piésold Ltd. (KP, 2020a). 2019 Annual Inspection Report (KP Reference No. VA101-126/21-2 Rev 0), dated January 31, 2020.

Knight Piésold Ltd. (KP, 2020b). 2019 Data Analysis Report (KP Reference No. VA101-126/21-3 Rev 0), dated August 28, 2020.

Knight Piésold Ltd. (KP, 2020c). 2020 Q3 Construction Field Review Summary (KP Reference No. VA20-02161), dated November 4, 2020.

Knight Piésold Ltd. (KP, 2020d). Q3 2020 – YDTI Quarterly Piezometric Monitoring Update (KP Reference No. VA20-02198), dated November 5, 2020.

Knight Piésold Ltd. (KP, 2020e). Q3 2020 – YDTI Quarterly Water Data Summary (KP Reference No. VA20-02219), dated December 17, 2020.

Knight Piésold Ltd. (KP, 2020f). 2019 Embankment Geotechnical Site Investigation Report (KP Reference No. VA101-126/21-1 Rev 0), July 16, 2020.

Knight Piésold Ltd. (KP, 2020g). 2019 Horseshoe Bend Geotechnical Site Investigation Report (KP Reference No. VA101-126/22-1 Rev 0), December 1, 2020.

Knight Piésold Ltd. (KP, 2020h). Updated Yankee Doodle Tailings Impoundment Water Balance Model with Calibration Period Extended to December 2019 (KP Reference No. VA20-00440 Rev 0), dated May 29, 2020.

Montana Resources and Knight Piésold Ltd. (MR/KP, 2020). Yankee Doodle Tailings Impoundment – Tailings Operations, Maintenance and Surveillance (TOMS) Manual, Rev 4, dated May 13, 2020.

6.0 CERTIFICATION

This report was prepared and reviewed by the undersigned.

MONTANA
2021-02-11
DANIEL DYLAN FONTAINE
No. 59785 PE
LICENSED
PROFESSIONAL ENGINEER

Prepared:

Daniel Fontaine, P.E.
Specialist Engineer | Associate

MONTANA
KEN J. BROUWER
10020 PE
REGISTERED
PROFESSIONAL ENGINEER

Reviewed:

Ken Brouwer, P.E. 2021-02-11
Principal Engineer | Engineer of Record

Approval that this document adheres to the Knight Piésold Quality System:

APPENDIX A

Site Photos

(Pages A-1 to A-38)

2020 ANNUAL INSPECTION REPORT

AERIAL DRONE SURVEY (JUNE 2020)

PHOTO 1 – North-South Embankment downstream shell, looking northwest from southeast end of YDTI at the new mine haul ramp.

PHOTO 2 – North-South Embankment downstream shell, looking northwest towards the top of the new mine haul ramp at EL. 6,400 ft

2020 ANNUAL INSPECTION REPORT

AERIAL DRONE SURVEY (JUNE 2020)

PHOTO 3 – Old Reclaim Barge.

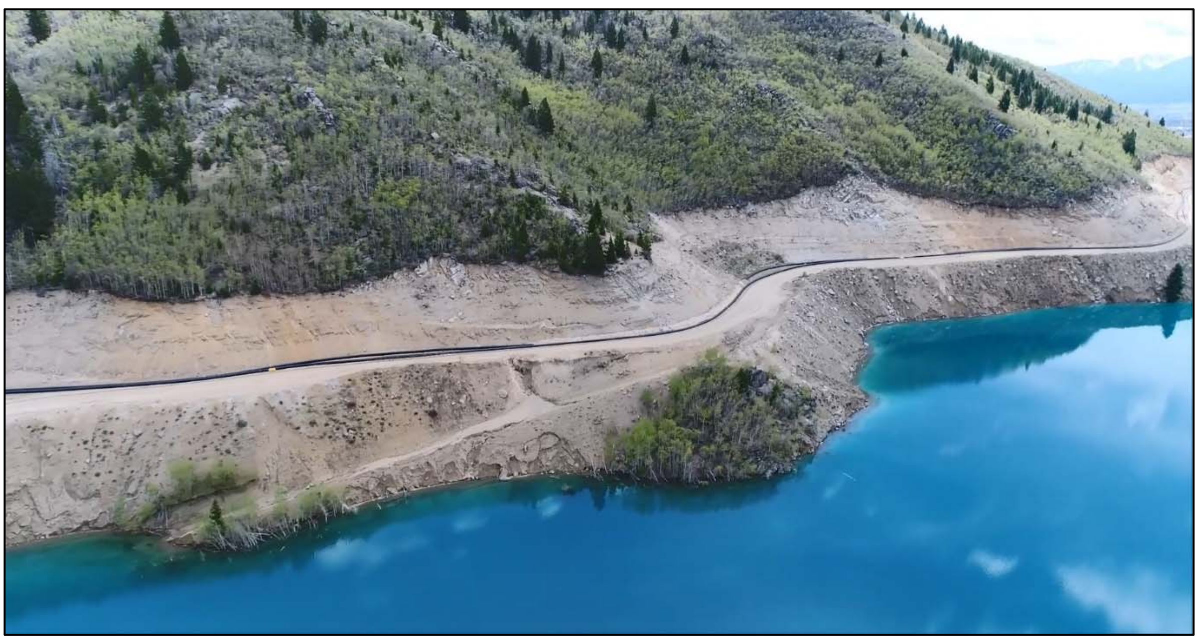

PHOTO 4 – Reclaim water pipeline road.

PHOTO 5 – Tailings beach beyond the northern end of the North-South Embankment near former position of tailings discharge location, NS-3, looking southeast.

PHOTO 6 – Tailings beach and supernatant pond interface, looking northwest from the reclaim water pipeline road.

PHOTO 7 – Upstream side of the North-South Embankment between discharge locations NS-2 (left side) and NS-1 (right side), looking southeast.

PHOTO 8 – Discharge location NS-1 along the North-South Embankment facing southeast.

PHOTO 9 – Central pedestal area of the East-West Embankment, looking northeast.

PHOTO 10 – East-West Embankment downstream slope, Number 10 Seep bench area, HsB and Leach Seeps area, looking north.

2020 ANNUAL INSPECTION REPORT

AERIAL DRONE SURVEY (JUNE 2020)

PHOTO 11 – East-West Embankment and rockfill surcharge near discharge location EW-2, looking north.

PHOTO 12 – East-West Embankment downstream slope along the northwest dumps area.

PHOTO 13 – East-West Embankment upstream face at discharge location EW-1 facing west.

PHOTO 14 – Upstream side of the East-West Embankment located west of No. 3 (Tailings) Booster Pump House, facing ramp for placement of the EL. 6,450 ft lift

PHOTO 15 – East-West Embankment upstream side at discharge location EW-2.

PHOTO 16 – East-West Embankment upstream side facing southwest near the Extraction Pond.

PHOTO 17 – West Embankment upstream interface north of Rocky Knob, looking northwest towards discharge location RK-2.

PHOTO 18 – Northern end of the West Embankment, upstream interface, looking northwest near discharge location RK-3.

2020 ANNUAL INSPECTION REPORT

AERIAL DRONE SURVEY (JUNE 2020)

PHOTO 19 – West Embankment downstream shell with ramp up to EL. 6,450 ft, looking southeast.

PHOTO 20 – Overview of WED Extraction Pond.

AERIAL DRONE SURVEY (JUNE 2020)

PHOTO 21 – Overview of the HsB Area, looking north.

PHOTO 22 – Snow-covered slope of North-South Embankment downstream side, looking north.

PHOTO 23 – Snow-covered North-South Embankment at step-out, looking north.

2020 ANNUAL INSPECTION REPORT

ANNUAL INSPECTION PHOTOS (OCTOBER 15, 2020)

PHOTO 24 – Newer Reclaim Barge.

PHOTO 25 – Older Reclaim Barge.

PHOTO 26 – Snow-covered North-South Embankment, tailings discharge line, and tailings beach near discharge location NS-4, looking south.

PHOTO 27 – Snow-covered North-South Embankment and tailings beach near discharge location NS-3, looking north.

PHOTO 28 – Tailings flow over snow-covered tailings beach between the North-South and East-West Embankments.

PHOTO 29 – East-West Embankment in HsB Area at downstream toe of maximum section, looking west.

PHOTO 30 – Seepage (leach seeps) along the downstream toe of the East-West Embankment in HsB Area, looking east.

PHOTO 31 – Combined seepage (leach seeps) going towards Precipitation Plant in HsB Area at downstream toe of East-West Embankment maximum section, looking west.

PHOTO 32 – Snow-covered tailings discharge pipeline valve near discharge location EW-1, and construction of a new EL. 6,450 ft lift on East-West Embankment near discharge location EW-2.

PHOTO 33 – Close-up of construction of EL. 6,450 ft lift on East-West Embankment near discharge location EW-2.

ANNUAL INSPECTION PHOTOS (OCTOBER 15, 2020)

PHOTO 34 – Rocky Knob and tailings discharge location RK-1, looking south.

PHOTO 35 – Tailings flow from discharge location RK-1 over snow-covered tailings beach.

PHOTO 36 – Riser pipes from the Extraction Basin along the West Embankment, EL. 6,450 ft lift construction in the background.

PHOTO 37 – Upstream face of recently construction EL. 6,450 ft lift along the West Embankment.

PHOTO 38 – Recently constructed EL. 6,450 ft lift at northern end of West Embankment.

PHOTO 39 – Discharge location RK-4.

PHOTO 40 – Overview of the snow-covered West Embankment from the West Ridge topsoil stockpile.

PHOTO 41 – Overview of the YDTI supernatant pond from the West Ridge topsoil stockpile.

PHOTO 42 – Downstream side of the West Embankment at the northern end looking northeast. Zone U fill placement to EL. 6,450 ft completed; Zone D1 remains to be placed on the downstream side.

PHOTO 43 – Snow-covered WED Extraction Pond looking southeast.

PHOTO 44 – Snow-covered WED Extraction Pond emergency overflow pipelines.

PHOTO 45 – Snow-covered WED Extraction Pond emergency overflow pipelines, boulders for energy dissipation and final alignment of pipeline discharge remains to be completed.

PHOTO 46 – Overview of the HsB Area, looking south from No. 3 (Tailings) Booster Pump House viewpoint.

PHOTO 47 – Holding Pond in the HsB Area, looking southeast from No. 3 (Tailings) Booster Pump House viewpoint.

PHOTO 48 – Surge Pond in the HsB Area, looking southeast from No. 3 (Tailings) Booster Pump House viewpoint.

PHOTO 49 – Houligan Pond in the HsB Area, looking south from No. 3 (Tailings) Booster Pump House viewpoint.

PHOTO 50 – Upper HsB Pond in the HsB Area, looking south from No. 3 (Tailings) Booster Pump House viewpoint.

PHOTO 51 – HsB Pond in the HsB Area, looking south from No. 3 (Tailings) Booster Pump House viewpoint.

PHOTO 52 – Seepage at the Number 10 Seep bench area, looking northwest.

PHOTO 53 – Seepage at the Number 10 Seep bench area, looking east.

PHOTO 54 – Number 10 Seep collection area inflow.

PHOTO 55 – Number 10 Seep stilling pond inflow.

PHOTO 56 – Number 10 Seep V-notch weir and automated level sensor connected to the RMS.

PHOTO 57 – Number 10 Seep V-notch weir staff gauge reading slightly below 0.4.

PHOTO 58 – Overview of Number 10 Seep stilling pond.

PHOTO 59 – Slope at northwest corner of HsB Area, looking east from Number 10 Seep area.

PHOTO 60 – Continental Pit, looking southeast from Sunflower Hill repeater.

PHOTO 61 – Berkeley Pit, looking southwest from Sunflower Hill repeater.

PHOTO 62 – Muddler Pump operating with a small overflow to the HsB Pond.

PHOTO 63 – Houligan Pond outflow.

PHOTO 64 – Seepage collection area at the west side of the Upper HsB Area.

PHOTO 65 – Bulkhead replacement for discharge lines from the #5 and #6 Cells.

PHOTO 66 – Precipitation Plant Recirculation Pump House. There is overflow seen at the head tank under the stairs.

PHOTO 67 – Precipitation Plant overflow weir.

2020 ANNUAL INSPECTION REPORT

ANNUAL INSPECTION PHOTOS (OCTOBER 15, 2020)

PHOTO 68 – Cell 10 Pump with overflow bypassing.

PHOTO 69 – Culvert discharging flow from Upper HsB area to Cell 10 pump area.

PHOTO 70 – Inlet of Parshall flume providing measurement of Cell 10 discharge flow.

PHOTO 71 – Outlet of Parshall flume providing measurement of Cell 10 discharge flow.

PHOTO 72 – West side of the Upper HsB Pond.

PHOTO 73 – HsB Pond and Weir.

PHOTO 74 – Flow through the HsB Weir.

APPENDIX B

Site Inspection Details

APPENDIX B1

DEQ Response to Annual Inspection Proposal

(Pages B1-1 to B1-13)

October 6, 2020

Ken Brouwer, P.E.
Knight Piésold Ltd.
Suite 1400 - 750 West Pender Street
Vancouver, British Columbia
Canada, V6C 2T8

Sent by email to: kbrouwer@knightpiesold.com

RE: 2020 Engineer of Record Site Inspection for Montana Resources, LLP; Operating Permits No. 00030 and 00030A

Dear Mr. Brouwer:

The Montana Department of Environmental Quality (DEQ) has reviewed the correspondence you provided on September 21, 2020, regarding the site inspection to be conducted in 2020 for the tailings storage facility (TSF) at Montana Resources, LLP (MR). As the designated Engineer of Record (EOR), you are required to conduct an annual inspection of the facility during the operations conducted under Operating Permits No. 00030 and 00030A, in accordance with Section 82-4-381, Montana Code Annotated (MCA).

Due to the ongoing COVID-19 pandemic and associated health restrictions relating to travel, you have been precluded from visiting the MR operations to conduct an inspection and these conditions will likely persist through the end of 2020. You have instead proposed to have Mr. Allen Gipson, P.E. conduct the inspection of the facility to address the annual requirement. The description of his experience and the resume you provided demonstrate that Mr. Gipson is a suitably qualified engineer, with the appropriate expertise to conduct an effective inspection of the tailings storage facility.

DEQ understands your proposal to include that:

- you will review the specifics of the TSF at MR with Mr. Gipson prior to the site visit;
- you and Mr. Gipson will review recent and relevant drone video footage;
- you will agree on general expectations as well as the timing and locations for his visual inspection of the TSF at MR;
- Mr. Gipson will be accompanied by mine personnel from MR that are suitably familiar with the TSF;
- Mr. Gipson will endeavor to communicate with you during his site inspections, as practicable and appropriate, and he will also collect video footage as and where necessary during the inspection.

DEQ accepts the plan that you have outlined for the inspection to be conducted during the week of October 12, 2020. As EOR, you will retain the responsibility for the preparation of the annual inspection report using the information, observations, and photos or videos obtained during Mr. Gipson's site inspection.

The EOR shall submit the report to MR and DEQ and provide immediate notification if the tailings impoundment presents the potential for an imminent threat to human health or the environment (82-4-381(2), MCA). If the report contains recommendations for the operator, MR shall prepare a corrective action plan to be verified by the EOR and MR shall submit the verified plan and implementation schedule to DEQ within 120 days following the date of the inspection (82-4-381(3), MCA).

Please contact me if you have any questions.

Sincerely,

Dan Walsh
Chief, Hard Rock Mining Bureau
Department of Environmental Quality
PO Box 200901
Helena, MT 59620-0901
(406) 444-6791 or dwalsh@mt.gov

E-file: 00030.5

Electronic cc:
Mark Thompson (MR); mthompson@montanaresources.com
Herb Rolfes (DEQ); hrolfes@mt.gov
Garrett Smith (DEQ); gsmith5@mt.gov

September 21, 2020

Knight Piésold Ltd.
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Mr. Dan Walsh
Bureau Chief
Montana Department of Environmental Quality - Hard Rock Mining Bureau
1520 E. 6th Avenue
Helena, Montana
USA, 59601

Dear Mr. Walsh,

RE: 2020 EOR Site Inspections

The Montana legislation requires that the engineer of record (EOR) inspect a tailings storage facility (TSF) annually during operation (MCA 82-4-381. Annual Inspections). The EOR must also prepare a report (Annual Inspection Report or AIR) describing the scope of the inspection and actions recommended to ensure the TSF is properly operated and maintained. The AIR is to be submitted to the operator and to the department (MDEQ).

As you are aware, I am the Engineer of Record for several TSFs in Montana, and under normal circumstances, I would personally visit each of these sites at some point during the 2020 calendar year. However, the current COVID-19 pandemic and the associated public health restrictions relating to travel have prevented me from visiting the Montana TSF sites so far this year, and it is also unlikely that I will be able to travel to these Montana sites before year end. I am writing to propose an alternative arrangement, that is acceptable to me as the EOR, and is hopefully also acceptable to MDEQ.

I am proposing that Mr. Allen Gipson (PE) will conduct the 2020 TSF inspections at each of the TSF sites, as a suitably qualified representative of the EOR. Mr. Gipson is a highly respected and well qualified colleague, who has over 50 years of relevant design and operating experience. He is an international expert who would meet the technical requirements for an EOR as outlined in the Montana legislation, and he also has equivalent Professional Engineering certifications for Colorado and Wyoming. A copy of his resume is attached.

I will retain responsibility for the preparation of the AIR. Mr. Gipson will review specifics of each of the TSFs with me prior to the site visit; we will review recent and relevant drone video footage, and will agree on general expectations as well as the timing and locations for his visual inspection at each facility. He will be accompanied by mine personnel (from the operator) that are suitably familiar with the respective TSFs.

Mr. Gipson has conducted numerous such dam safety inspections during his long and distinguished career. He indicates that he would endeavor to communicate with me during his site inspections, as practicable and appropriate, and would also utilize a Camcorder to obtain video footage as and where necessary during the inspections.

We have selected the week of October 12, 2020 for the Annual Inspections. Mr. Gipson is planning to visit four TSFs during the week, including the Montana Resources TSF near Butte, plus the East Boulder TSF near Big Timber, and the Nye and Hertzler TSFs near Columbus. I am the EOR for each of these TSFs and will rely on Mr. Gipson's observations in the preparation of the respective AIRs for these facilities.

Knight Piésold CONSULTING

Please feel free to inform me if you have any concerns or suggested modifications for the proposed procedures for these 2020 Annual Inspections.

Best Regards,
Knight Piésold Ltd.

Prepared: Ken Brouwer, P.E.
Principal

Reviewed: Dan Fontaine, P.E.
Specialist Engineer | Associate

Reviewed: Craig Hall, P.Eng.
Specialist Geotechnical Engineer
Associate

Approval that this document adheres to the Knight Piésold Quality System: KJB

Attachments:
Resume: Allen Gipson

Copy To: Mark Thompson (Montana Resources), Matt Wolfe (East Boulder Mine), Randy Weimer (Stillwater Mine)

/kjb

ALLEN H. GIPSON, JR., P.E.
CONSULTING ENGINEER

SUMMARY

Mr. Gipson is a Senior Consultant in Knight Piésold's Denver, Colorado practice. He is a geotechnical engineer and geologist with nearly 50 years of experience in design, construction and operation of tailing management facilities, heap leach projects, and water and process fluid retention ponds and dams. The tailing management facilities range in size to over 1 billion tons and embankment heights in the range of 1000 feet. He has also coordinated site selection studies for major projects. In addition, Mr. Gipson has also provided forensic evaluations and remedial designs for several dozen projects. He has been the responsible professional on hundreds of projects throughout the United States and in Peru, Honduras, Bolivia, Chile, Panama, Kazakhstan, Spain, Sweden, Mali, Burkina Faso, Ghana, Cameroon, Sierra Leon, Saudi Arabia, New Caledonia, Brazil, Panama, Fiji, Canada, and Chile. He is a licensed professional engineer in Colorado, and Wyoming and a licensed professional geologist in Wyoming.

Mr. Gipson has organized and presented short courses on seepage and engineering geology to the Association of State Dam Safety officials. He has conducted safety evaluations on a number of dams and responded to emergency situations on seven dams. On two of the dams, reservoir drawdown commenced immediately and, at another, immediate temporary repairs were undertaken. He has provided litigation support for a number of projects. Mr. Gipson has also worked as a senior reviewer on numerous projects both within and outside Knight Piésold.

His experience includes geotechnical engineering, engineering geology, water resources, design, construction, and multi-disciplinary project management. He has dealt with personnel from many agencies including the New Mexico State Engineer's Office, the Environmental Protection Agency, the Nevada Department of Environmental Quality, the Nevada Division of Water Resources, the Colorado State Engineer's Office, the Colorado Division of Mines, the Alaska Division of Dam safety, the Tampa Bay Regional Planning Council, the Hillsboro County Board of County Commissioners, the Colorado Department of Public Health and Environment, the Wyoming State Engineer's Office, and the Wyoming Industrial Siting Council and numerous others.

Brief summaries of typical projects Mr. Gipson has participated are presented below. The projects are categorized under the following headings:

- Phosphate Experience Including Phospho-Gypsum Storage Facilities
- Forensic Studies and Litigation Support
- Tailing Storage Facilities
- Heap Leach Pads
- Water Storage Dams
- Hazardous Waste and Lined Ponds
- Reclamation/Closure
- Geotechnical Investigations

EDUCATION

M.Sc. Civil Engineering, University of Kansas, USA, 1970
B.Sc. Civil Engineering, University of Kansas, USA, 1968
B.Sc. Geology, University of Kansas, USA, 1967
Post Masters Studies at the Colorado School of Mines in Rock Mechanics and Engineering Geology

REGISTRATION/CERTIFICATIONS/TRAINING/AFFILIATION

Professional Engineer in Colorado and Wyoming.
Professional Geologist in Wyoming
Chi Epsilon, National Civil Engineering Fraternity
Mining and Metallurgical Society of America

PROFESSIONAL EXPERIENCE

Following are descriptions of a few of the typical projects Mr. Gipson has worked on throughout his career.

Phosphate Experience Including Phospho-Gypsum Storage Facilities

- **Gypsum Stack Expansion, Wyoming, USA –** Geotechnical and hydrological investigations, laboratory testing, stability analyses, and design recommendations for the expansion of an existing cross-valley gypsum stack to five years of storage capacity. The phosphoric acid plant produces 250,000 tons per year of P205, and generates about 1,250,000 tons per year of gypsum. The stack was originally designed as an HDPE-lined cross-valley structure covering 400 acres, with a 3,800-foot- long, 50-foot-high starter dike. As an interim measure, the existing stack will be redesigned as a four-sided facility covering about 140 acres with 50 acres of process water ponds. The interim stack will have an overall height of 110 feet. Recommended design criteria developed for the interim stack included a sub-aerial deposition system, decant system near the middle of the separation dike, embankment raises and perimeter drains. For SF Phosphates.
- **Existing 300-Acre Gypsum Field, Tampa, Florida, USA –** Mr. Gipson provided geotechnical investigations to evaluate the stability of the existing field and future raises. He also provided hydrologic services to minimize seepage losses from the field. Following construction of a covered ditch around the toe and a “herringbone” shallow drainpipe system on the slopes the slopes were covered with topsoil and grassed. The field was constructed to about a height of 350 feet.
- **Lateral Expansion Existing 300-Acre Gypsum Field, Tampa, Florida, USA –** An alternate to increase gypsum storage was to expand north and east sides of an existing active gypsum field as an alternate gypsum storage field to gain an additional 100 acres of land for gypsum storage. The existing field is 120 to 150 feet high with an enclosed perimeter dike crest length of approximately 11,000 feet. The planned height of the existing and expanding gypsum field will be about 350 feet, and deposition in the alternate storage field was planned to begin in about 1985.

  Mr. Gipson evaluated the suitability of the site for the proposed expansion, the effects of the expansion on the existing gypsum disposal field and potential seepage from the expanded field, and recommendations on how to handle the seepage. Recommendations on gypsum slurry deposition and decanting in the expansion area were also presented. For Gardinier, Inc.
- **326-Acre Gypsum Field, Tampa, Florida, USA –** Mr. Gipson directed geotechnical and hydrological consulting engineering services for the proposed field. The field was designed to be underlain by a clayey soil lining overlain by a leachate collection and detection system. The slurry fluid used to transport the waste had a pH of about 2.0. This work includes: (1) extensive field and laboratory work; (2) evaluation of surface depressions (possible sink holes), subsurface water conditions, pond lining and monitoring system alternatives embankment drain systems; (3) slope stability and seepage analyses; and (4) design for the gypsum field. He also provided assistance to Gardinier, Inc. during project permitting.
- **Technical Witness for Design and Permitting 326 Acre Gypsum Field, Florida, USA –** Served as the design engineer and key technical witness for the design and permitting for a new phosphogypsum disposal field within the city limits of Tampa, Florida. Permits for the project needed to be obtained from the Environmental Protection Agency, Tampa Bay Regional Planning Council, Hillsboro County Board of County Commissioners, and Southwest Florida Water Management District. Mr. Gipson made presentations to the Environmental Protection Agency and Southwest Florida Water Management District in support of the project for Gardinier, Inc. He attended meetings with the Tampa Bay Regional Planning Council and provided testimony for the Hillsborough County Board of County Commissioners in meetings attended by over 1,500 people. Project permitting was delayed during a two-year period due to the arrest of three of the five members of the Hillsborough County Board of County Commissioners for accepting bribes. All necessary permits for the project were obtained, and the project is in operation. For Gardinier, Inc., Tampa, Florida.
- **238-Acre Gypsum Field, Tampa, Florida, USA –** The planned field included a lined base, extensive internal drains, and a leachate detection and collection system. The ultimate height was to be about 200 feet. Mr. Gipson directed geotechnical and hydrological services for the proposed field, including extensive field and laboratory work; evaluation of surface depressions (possible sinkholes), subsurface soil and water conditions; seepage control, and monitoring procedures; as well as slope stability and seepage analysis. For Gardinier, Inc.
- **116-Acre Gypsum Field, Tampa, Florida, USA –** Gypsum was planned to be deposited hydraulically behind a small starter dam using a peripheral pipe system, and subsequent raises made using the sedimented gypsum near the perimeter. The design included a lined base, extensive internal drains, and a leachate detection and collection system. The gypsum field is to reach a planned height of about 200 feet.

  Mr. Gipson directed geotechnical and hydrological services for the proposed field, including extensive field and laboratory work; evaluation of surface depressions (karst limestone), subsurface soil and water conditions; a study of seepage control and monitoring system alternatives, stability and seepage analyses. The planned site was eliminated from consideration after investigations indicated that the continuity of the clay layer beneath the site had been compromised by “sinkhole” activity in the underlying karst limestone. For Gardinier, Inc.

- **Gypsum Disposal Fields 2 and 3, Pasadena, Texas, USA –** Mr. Gipson directed geotechnical investigations including extensive field and laboratory work to evaluate the stability to the existing fields and recommend procedures for raises to Field No.3. The facility was founded on high plasticity clays. The recommendations include provisions for a sub drain system. For Olin Corporation.
- **Design Investigation for Raising Gypsum Fields, near Nichols, Florida, USA –** Investigations and design for revising operations on three existing gypsum fields. For Conserv.
- **Gypsum Stack Commissioning Consultation, USA –** Consultation on a gypsum field that experienced excessive seepage and localized foundation liquefaction during start-up. Client confidential.
- **Due Diligence Study near Bartow, Florida, USA –** Environmental and hazardous waste assessment of gypsum fields on W.R. Grace property for a potential buyer of the property. Client Confidential.
- **Slope Failure Consultation, South Central, USA –** Consultation on stability of a failed slope on a gypsum field. Client Confidential.
- **Alafia River Ship Channel, near Tampa, Florida, USA –** Geotechnical investigations, designs, plans and specifications, and construction observation services for a dredged spoil storage area to contain material from cleaning and deepening the channel. For Gardinier, Inc.
- **Phosphatic Clay Settling Areas, near Fort Meade, Florida, USA –** Investigations, resident engineering, and construction observation services for six phosphatic clay settling areas. Each settling area covered about one square mile of land. Perimeter dikes constructed of silty sand were up to 75 feet high. For Gardinier, Inc.
- **Gypsum Field Consultation, Israel –** Mr. Gipson was retained to provide on overview of the stability and operational aspects of the existing slurry deposited gypsum disposal and newly implemented dry stacking operations. Client Rotem Fertilizer.

Forensic Studies and Litigation Support

- **Summitville Heap Leach Pad, Colorado, USA –** Mr. Gipson was retained to provide litigation support related to a claim that the design and construction of the leach pad was not performed in accordance with commonly accepted design practice and the construction was not performed in accordance with the plans and technical specifications. The Owner was sued by the EPA and in turn filed suits against his design and construction team. Remediation costs were more than $200,000,000. A detailed review of the design and construction documents by Mr. Gipson supported the refutation of the claim. For Washington Construction Company.
- **Telluride Airport Slope Failure, Colorado, USA –** The 80-foot-high slope for the runway failed and the material from the failure flowed downslope about 1500 feet across a State highway and destroyed a concrete plant and waste handling station on the valley floor at the toe of the slope. A claim for the damages was filed with USF&G. USF&G filed suites against the parties involved with the design and construction of the earth fill for the runway. A review of the geotechnical report, designs and construction by Mr. Gipson demonstrated that the airport designer had not followed the recommendations in the geotechnical report and thus the airport designer was at fault. The claim against USF&G was dismissed. For USF&G Insurance.
- **Rapid City Airport Expansion Construction, Rapid City, South Dakota, USA –** During construction, a number of differing site conditions were encountered by the earthworks contractor including the presence of oversize material in the borrow area that were not identified in the geotechnical investigation. The oversize material needed to be removed from the fill. That added additional cost to remove the oversize material from the fill to meet specification requirements. The cost to remove the materials was over and above the bid price. Mr. Gipson reviewed the related documents and prepared a report that supported the contractors claim. The contractor prevailed in his claim.
- **Geomembrane Lined Process Water Pond –** Mr. Gipson provided consultation on the repair of a geomembrane lined pond with a height of about 75 feet and perimeter of about 2 kilometers. On first filling the pond leaked excessively. Initial attempts to reduce the leakage were unsuccessful. The liner and foundation were examined and a number of construction defects were found including rocks to half meter in size directly below the liner, a small landslide in the bedding material, liner placed directly on sharp angular bedrock immediately below portions of the liner and small sharp-edged stones that had punctured the liner. Well over 500 patches had been placed in attempts to reduce the initial seepage. To remedy the situation the existing geomembrane liner and out of specification bedding removed and replaced with material meeting the specification. The remedial construction has been completed and the pond partially filled. No significant leakage has been reported. Client and location confidential.
- **Douglas Dam, Fort Collins, Colorado, USA –** Emergency response to turbid seepage from Douglas Dam. The dam is located above Fort Collins a town of about 40,000 people. The dam was an old structure with a history of previous raises, replacements and repairs. The dam retained an 8,400 acre-foot reservoir. Seepage was located in the embankment above the toe and outlet at the maximum section. Emergency drawdown of the reservoir was undertaken with construction of a reverse filter over the seep to control material migration. The subsequent investigations found that the foundation for an old clay tile pipe outlet had not removed. The concrete foundation for the pipe had been founded on wooden piling driven into the soft clay foundation. A clean cobble layer

had been placed to support access for the outlet construction and had not been removed. The seepage noted on the downstream face had flowed through the cobles beneath the dam and exited on the downstream face. The outlet foundation and cobble were removed as part of the reconstruction and a slurry cutoff wall constructed beneath the new dam to bedrock. For Windsor Irrigation and Ditch Company.

- **Tailing Dam, Colorado, USA –** The water pond on this 50-foot-high tailing pond was inadvertently allowed to fill to the point it abutted the relatively pervious dam. As a result, there was a large flow of wat through the dam. The Owner attempted to stem the flow by dumping soil along the upstream face of the dam to no avail. Mr., Gipson was asked to examine the situation and offer an opinion on remedial action. First it was suggested that soil placement be discontinued as it was not reducing the flow. Secondly, since the flow was not removing material from the dam it was apparent that the flow was not affecting the integrity of the dam itself. Thus, the recommendation was made to lower the water pool to it's design limits away from the face of the dam. Client confidential.

Tailing Storage Facilities

- **Twin Creeks Mines, Juniper Tailing Facility Expansion, Nevada, USA –** In 1994 and 1995, Project Manager overseeing site investigations, water balance, conceptual and final design, and design report including QA/QC for expanding the capacity of an 8,000,000-ton gold tailing storage facility by 50,000,000 tons. The designs include consideration for expanding the tailing storage facility to 70,000,000 tons, ultimately covering about 570 acres. The facility includes subaerial tailing deposition and a maximum tailing production rate of 15,500 tons per day.

  From 1996 through 2001, Principal-in-Charge of developing alternative designs for either a ten-stage horizontal and vertical expansion of the tailing storage facility to a 97,000,000-ton capacity or an eight-stage vertical expansion of the tailing storage facility to a 53,000-ton capacity.
- **Quebrada Honda Tailing Storage Facility, Southern Peru –** Toquepala and Cuajone are two open-pit copper mines producing approximately 150,000 tonnes per day. Each facility uses the Quebrada Honda Tailing Storage Facility. Quebrada Honda is being constructed as an embankment dam using cycloned tailing placed in cells to construct the 4-km-long, 120-meter-high embankment to store 880,000,000 tons of tailing. A raise rate analysis for operations to use as a measure for construction progress, a seepage and stability analysis leading to the recommendation for construction of a drain beneath the downstream shell, and an audit for Raise 1 were performed. In conjunction with the raise rate analysis, hydrologic aspects of the project, the capacity of the launder-to-carry tailing from the expansion project, and consultation on cyclone performance and embankment construction were reviewed. Mr. Gipson was the Principal-in-Charge for this work. For Southern Peru Copper Corporation.
- **San Cristóbal Project, Tailing Storage Facility, Nor Lipez Province, Bolivia –** Principal-in-Charge for a siting study and conceptual designs for the tailing storage facility was undertaken including a site reconnaissance of potential tailing storage facility locations near two proposed mill sites. Only one site could be located that would be capable of storing all the 240,000,000 tons of tailing generated over the life of the project at a reasonable cost. This site was the preferred site because it was located in a playa lake with no natural outlet. A hydrologic characterization study of the dry lake area indicated that it was geologically and hydrologically unlikely that tailing or leachate from the tailing would be discharged outside the playa lake during or after tailing deposition at the site. A report on the hydrologic site characterization was prepared and submitted to the Bolivian government for review and comment. A favorable response was received regarding the selected site. A water balance model of the playa lake was used to demonstrate if and when it might be necessary to control water entering the playa lake or pump back water for conservation. For Apex Silver Mines Corporation.
- **Sukhaybarat Gold Mine, Saudi Arabia –** Site reconnaissance, geotechnical investigations, laboratory testing, analysis, conceptual design, and final report for evaluating alternatives for developing a synthetically lined tailing facility to control seepage for an 80,000-ounce- per-year gold mine. The lined facility was constructed on the existing tailing. For Saudi Company for Precious Metals.
- **Mayflower Tailing Dam, Climax, Colorado, USA –** Geotechnical investigations and design report for the 560-foot-high upstream method tailing dam. For Climax Molybdenum Company.
- **Iowa Gulch Tailing Dam, Leadville, Colorado, USA –** Emergency response to a clear water seep on the dam, which was about 100 feet high at the maximum section. The seep occurred near the toe where the dam was about 40 feet high. Reservoir drawdown commenced immediately. The seep was attributed to excessive clear water against the upstream face of the raise dike. For Asarco, Inc.
- **Planned Molybdenum Mine, Crested Butte, Colorado, USA –** Preliminary investigations and designs for a tailing dam for the proposed 400-foot-high molybdenum mining and milling operation near the facility. For AMAX Inc.

Heap Leach Pads

- **Walter Creek Heap Leach Pad, Fairbanks, Alaska, USA –** Project Manager for the investigation, design, construction engineering and quality assurance/quality control (QA/QC) for an 800-foot-high, valley fill, heap leach pad with a 110-foot-high rockfill dam to retain an in-heap solution pond. For Fairbanks Gold Mining Inc.
- **Toquepala and Cuajone Copper Leaching and SX-EW Operations, Peru –** Project Manager for hydrologic and geotechnical design criteria and conceptual designs for the stormwater dam (over 30 meters in height), PLS, sediment and storm water ponds, and a 15.1 –million-tonne HDPE heap leach facility. For Southern Peru Copper Corp.
- **Toquepala SX/EW Project, Southern Peru –** For the initial Toquepala SX/EW project, Mr. Gipson was the responsible professional for providing geologic, hydrologic, and geotechnical investigations to develop design parameters and conceptual designs for the Toquepala and Totoral sediment, PLS, and storm water ponds. Knight Piésold provided consultation on grouting the PLS and storm water pond foundations. The Toquepala storm water dam has a height of 120 feet, crest length of 500 feet, and spillway cut into rock on the right abutment. Currently, the client is expanding the Toquepala SX/EW operations, and to support that expansion, Knight Piésold has performed geologic, hydrologic, and geotechnical investigations and prepared designs and technical specifications for construction of the 3,250 Sediment and PLS Pond and Northwest Sediment Pond. Resident engineering geologic services have been provided during construction of the grout curtain to provide technical input as to grout hole spacing, grouting interval, injection pressure, and grout mix. Part-time observation of the earthworks construction was also provided. For Southern Peru Copper Corporation.
- **Cuajone Heap Leach Facility, Southern Peru –** Work at the Cuajone facility included development of designs for a 15.1-million-tonne heap leach facility and associated PLS and storm water ponds. The design included a geologic reconnaissance, development of hydrologic design parameters, and geotechnical investigations. Foundation design criteria were also developed for primary and secondary crushers, an ore stockpile, a 200-tonne storage bin, and an agglomerator product stockpile. For Southern Peru Copper Corporation.
- **No. 3 Copper Leach Dump, Tyrone, New Mexico, USA –** Geotechnical investigations and construction observation for expansion of a lined heap leach facility. For Phelps Dodge Corporation.
- **Sipán Heap Leach Project, Phase 2 Expansion, near Pampa Cuyoc, Peru –** Project Manager for design of an 80 meter-high heap leach pad with lined surface area of 143,000 square meters. The site is located at an elevation of 3,500 meters. For Compañia Minera Sipán, S.A.

Water Storage Dams

- **Conga Project, Peru –** Project Director for investigations and designs for two water storage dams and two sediment control dams. One of the sediment control dams and one of the water storage dams were constructed during this period. Both were constructed during the wet season. The water storage dam was designed with an earthen core on the upstream face underlain by a cutoff trench beneath the upstream toe. Soils planned for use in the core were too wet to compact to the specified density. After taking considerable effort to process and place a few lifts of compacted fill in the bottom of the cutoff trench the design was changed to replace the earthen core with an 80 mil HDPE. The design change proved effective and the construction was completed on schedule and under budget. For Minera Yanacocha.
- **Clear Creek Project, Jefferson County, Colorado, USA –** Engineering geologic evaluations, geotechnical analyses, and site selection for water storage and hydropower project. Six concrete arch, ten gravity concrete and ten earth or rockfill dams to heights of 560 feet high were considered along with underground power house and associated tunnels. For Colorado Water and Power Development Authority.
- **Clinton Gulch Dam, near Climax, Colorado, USA** – Field investigations, laboratory testing, analysis, design, plans, and specifications for the 170-foot high rockfill dam. For Climax Molybdenum Company.
- **Halligan Reservoir Expansion, City of Fort Collins, Colorado, USA –** Engineering and environmental feasibility evaluation to expand Halligan Reservoir from 6,400 acre-feet to 15,000, 25,000 or 40,000 acre-feet. Three locations were considered for roller-compacted concrete, concrete arch, or earth-rockfill dams at dam heights ranging from 100 to 180 feet. The work included designs and cost estimates for 27 options. For the City of Fort Collins.
- **Button Rock Dam, Longmont, Colorado, USA –** Geologic and engineering feasibility evaluation for raising a 210 foot-high earth-rock dam to heights of 250, 280, 310, or 340 feet. Earth-rock and roller- compacted concrete saddle dams to 130 feet were considered. Work included designs and cost estimates. For the City of Longmont.

- **Stagecoach Dam near Steamboat Springs, Colorado, USA –** Technical assistance for investigations and designs of a 150-foot-high roller- compacted concrete dam impounding 33,000 acre-feet of water. For Upper Tampa Water Conservancy District.
- **Upper Gunnison-Uncompahgre Basin, Colorado, USA –** Engineering geology and geotechnical engineering feasibility study multi-use water project including recreation, irrigated agriculture, livestock production, and municipal and industrial uses. The study considered 28 dam and reservoir sites. For Colorado Water and Power Development Authority.
- **Douglas Dam, above Fort Collins, Colorado, USA –** Emergency response to turbid seepage from Douglas Dam, located above a town of 40,000. The dam is an old structure with a history of previous raises and repairs. The dam retained an 8,400 acre-foot reservoir. The seepage was located in the embankment above the toe and outlet at the maximum section. Emergency drawdown of the reservoir was undertaken with construction of a reverse filter over the seep to control material migration. Investigations and analyses indicated the integrity of the structure in the vicinity of the outlet works of the maximum section was questionable, and it was decided to remove and replace the dam.
- **Soda Lakes Dams, near Morrison, Colorado, USA –** Safety evaluations for dams that are earth-fill structures. The work included field investigations and analyses to evaluate embankment stability and make recommendations for upgrading the spillway for the upper dam. For the Denver Water Board.
- **Las Campanas West Course Lakes, New Mexico, USA –** Geotechnical investigation, hydrologic analysis, and design for surface-water diversion structures and one soil-lined and four synthetically-lined lakes for use in irrigation of the fairways, greens, and tees of the west course. Three of the lake embankments are cross-valley embankments; two surround the perimeter of the lakes. The surface water diversion structures consist of culverts and open channels designed for 100-year/24-hour precipitation events. For Las Campanas Limited Partnership.

Hazardous Waste and Lined Ponds

- **San Cristóbal Project, Solid Waste Storage Facilities, San Cristóbal, Bolivia –** Mr. Gipson was the Principal-in-Charge for investigations and designs for development of waste storage facilities for the mine operations. The project requires storage for approximately 12,600 cubic meters (m3) of conventional solid waste, 5,500 m3 of dangerous solid waste, and 109,500 m3 construction, salvage, and plant demolition. Knight Piésold was retained by Minera San Cristóbal to provide a characterization of the waste, develop final designs, plans, and technical specifications for construction of the waste storage facilities.

  As part of the work, Knight Piésold conducted a site investigation within the locality of the proposed storage facilities to evaluate the geologic, hydrologic, and geotechnical conditions of the site. The site investigation provided information to develop the geotechnical parameters and define the physical properties of the near-surface materials.

  The conformance to the regulatory standards for solid and dangerous waste disposal according to Bolivian Regulations, Bolivian Environmental laws (Reglamentos a la Ley de Medio Ambiente), the Estudio de Evalución de Impacto Ambiental, World Bank, and International Finance Corporation standards were followed during the siting, data acquisition, and design the waste storage facilities. For Apex Silver Mines Corporation.
- **Porta Bella Redevelopment Project, Santa Clarita, California, USA –** Mr. Gipson is the Principal-in-Charge for providing owner representative services and contractor oversight in the development of the Porta Bella site located on 1,000 rolling acres in Santa Clarita, Los Angeles County, California. The site is the former Whittaker-Bermite Facility that manufactured and tested explosives, munitions, and solid rocket fuels from the early 1900s until 1987 when the facility ceased operations.

  Chemicals of potential concern associated with the site include ammonium perchlorate, a solid rocket fuel oxidizer, nitroaromatic (explosive) compounds, organic solvents, and various metal compounds. Unexploded ordinance clearance is also being addressed. Remediation of the site is being conducted in accordance with California EPA, Department of Toxic Substances Control (DTSC) procedures and standards to allow future commercial and residential development.

  To expedite the DTSC approval process, the site has been divided into manageable operable units based on watershed flow for site investigations and remedial actions. As each operable unit is remediated and certified as “clean” by the DTSC, the entire operable unit will be developed in accordance with the Master Plan approved by the City of Santa Clarita. The Master Plan includes single and multiple residential units, business park development, light industrial development, open space, schools and recreational areas, and several roads connecting to adjacent major streets and highways. For Remediation Financial, Inc.
- **Client Confidential –** Investigations and designs for a double-lined 6,000,000-gallon pond to collect acidic pregnant fluid from a copper leach operation. The lining system included 80-mil HDPE primary and secondary linings separated by an HDPE geodrain.
- **Bio-Ecology Site, Texas, USA –** Review of remediation designs, plans, and specifications for a double-lined hazardous waste landfill with a leachate collection and detection system. For Texas Department of Water Resources.

- **Wastewater Retention Pond, Tampa Florida, USA** – Investigations, design construction observation, and QA/QC for a 238-acre-lined pond designed to contain water with a pH of 1.5 to 2.0. For Gardinier, Inc.
- **California Gulch Superfund Site, Leadville, Colorado, USA –** Between 1992 and 1993, consultation services were provided to Asarco, Inc. related to mine wastepile stabilization and reclamation. The work included stability analyses, capping designs, and runoff and stream diversion. Overall responsibility included negotiations with the EPA for establishing acceptance of work on completed operation units. For Asarco, Inc.
- **Hazardous Waste Landfill, Texas, USA –** In 1982, a double-lined landfill was being designed for containment of hazardous waste. The cell included primary and secondary HDPE liners with a leachate collection and removal system. The ultimate facility included a cap. Provided senior review of the designs for the hazardous closure facility. For Bio-Ecology Superfund Site, Texas.
- **Cyanide and Mercury Cleanup Alternatives –** Served as Principal-in-Charge for the evaluation of a cyanide and mercury plume emanating from a tailing storage facility located in an arid climate. The work involved a review of previous work by others and evaluation of cleanup alternatives. For Confidential Client.
- **Evaluation of Remedial Measures –** In 1997, Mr. Gipson was responsible for the evaluation of remedial measures to collect and pump or treat PLS flowing in an alluvial channel under land in relatively impervious bedrock. The study included methods to intercept and collect seepage as well as pump seepage back to the operations or, alternatively, treat the seepage with a passive treatment system for release. For Confidential Client.
- **Dioxin Remediation, New Jersey, USA –** Responsible for oversight of the project manager who was responsible for the development of a 17-volume work plan for the remediation of a dioxin-contaminated site in New Jersey. The work plan development budget was approximately $5 million. For Confidential Client.
- **Radioactive Site Cleanup, Pennsylvania, USA –** Responsible for the oversight of capping a radioactive site. The radioactive waste was created from a processing plant in Washington Bottoms. Because of the explosive nature of the materials, the waste was capped in place. Oversight of the borrow materials and QA/QC during the construction process were performed. The construction costs of the project totaled approximately $3 million. For Amax.
- **Hazardous Waste Management, Ohio, USA –** Provided project management oversight for remediation of a hazardous waste site on the Lake Erie shoreline. This project was approximately $5 million in construction costs. The project included management of budgets, schedules, and personnel.

Reclamation/Closure

- **Keystone Mine near Crested Butte, Colorado, USA –** Investigations, analysis, design, plans, and specifications, resident engineering, and construction observation services including QA/QC testing for a buttressing fill and related drainage diversion to stabilize four existing tailing dams. The design included a collection system and lined pond to collect acid mine drainage from the mine workings and tailing dams for treatment to remove heavy metals and neutralize the pH prior to release. For AMAX Inc.
- **Big Springs Mine Heap Leach Pad and Tailing Storage Facility Reclamation, Northeastern Nevada, USA –** Principal-in-Charge for design and QA/QC for the closure of this gold processing facility in northeastern Nevada. Two major aspects of the closure involved developing grading and cover system designs and specifications for the heap leach and tailing storage facilities. Plans were selected based on the results of hydrologic modeling and cost analyses of several alternatives. The project also developed a general site-grading plan, performed a stability analysis, and completed designs for short-term sediment control structures.

  For the tailing storage facility reclamation, the selected grading plan included using primarily tailing in a general balanced cut/fill approach. The constructability of the plan was confirmed by conducting tests that included excavating and characterizing tailing at depth within the facility and completing two test pads. The overall grading plan incorporated an overbuild design for areas where fill material would be placed. The balanced cut/fill approach resulted in significant cost reductions compared to approaches that would use only fill materials to create the desired grade. For AngloGold (Jerritt Canyon) Corp.

Geotechnical Investigations

- **Hidalgo Copper Smelter near Lordsburg, New Mexico, USA –** Geotechnical investigations, laboratory testing, analysis, report preparation for use in site selection for the Hidalgo Copper Smelter. Two sites were evaluated and compared on the basis of foundation conditions. For Phelps Dodge Corporation.
- **Tyrone Mine, New Mexico, USA –** Geotechnical investigations and construction observation services for expansion of the SX-EW facility including founding the facilities on highly variable foundations from granite on one hand to about 50 feet of waste rock fill on the other. For Phelps Dodge Corporation.

- **Island Copper Mine near Port Hardy, British Columbia, Canada –** Geotechnical investigations and designs for a 3,000-foot-long slurry wall cutoff through open-work mine rock dump for expansion of the open pit copper mine.
- **Colorado Ute Power Company near Craig, Colorado, USA –** Geotechnical investigations to evaluate a landslide in a clay shale cut slope and to develop design criteria for remedial measures for a power station.
- **Comanche Stream Electric Generating Station, Pueblo, Colorado, USA –** Identification of bearing materials for foundation and monitoring earthwork contractor's performance for conformance with plans and specifications for the Comanche Steam Electric Generating Station and appurtenant structures. For Public Service Company.

WORK HISTORY

Knight Piésold and Co.., Denver, Co., Senior Consultant and Project Director, 1993 to 2001 and 2003 - Present
Consulting Engineer, Denver, CO, 2002
Woodward-Clyde Consultants, Vice President, 1970 - 1993

PUBLICATIONS AND PRESENTATIONS

Gipson, Jr., A.H., 2000, "E-Technology Revolutionizes Environmental and Engineering Services for the Owner," Presented at the Forbes Magazine E-Business in the Construction Industry Conference, Washington, D.C., December 14-15.

Gipson, Jr., A.H., 2000, "Tailing Dams Defined, Described and Compared to Water Dams," Tailing Dams 2000, a Joint ASDSO/USCOLD Specialty Conference, Las Vegas, Nevada, March.

Gipson, Jr., A.H., 1998, "Tailing Disposal – The last 10 years and future trends," Tailing and Mine Waste '98, The Fifth International Conference on Tailings and Mine Waste, Fort Collins, Colorado, January.

Gipson, Jr., A.H., and J.G. Deschamps, 1996, "Soil Box Able to Test 700-Foot Heap Leach Heights," Randol Gold Forum, Olympic Valley, California, April 21-24.

Wildeman, T.J., J.J. Gusek, A.H. Gipson, Jr., and G. McClelland, 1995, "Planning and Design Concepts for Mine/Mill Closure," Two-day Short Course Presented at 1995 Annual Meeting, Society for Mining, Metallurgy and Exploration, Denver, Colorado, March 4-5.

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Gipson, Jr., A.H., 1985, "Permeability Testing on Clayey Soil and Silty Sand-bentonite Mixture using Acid Liquor," Hydraulic Barriers in Soil and Rock, American Society for Testing and Materials, STP 874, September.

Gipson, Jr., A.H., 1983, "Investigation, Design and Construction of Buttressing Fill for Failed Keystone Mine Tailing Dams," Presentation at American Society of Civil Engineers, Geotechnical Section, Denver, Colorado.

Gipson, Jr., A.H., 1981, "Design Considerations for Hazardous Waste Land Fills," Presentation at Seventeenth Annual Intermountain Minerals Conference, Vail, Colorado.

Gipson, Jr., A.H., 1979, “Phosphatic Clay Waste Storage Tailing Dams,” Presentation at Woodward-Clyde Consultants Professional Development Seminar, Berkeley, California.

Gipson, Jr., A.H., 1979, “Pond Linings,” Presentation at Woodward-Clyde Consultants Professional Development Seminar, Berkeley, California.

Gipson, Jr., A.H., 1970, “Controlled Rate of Strain Testing of Undisturbed Soil Samples,” Master's Thesis, University of Kansas, Lawrence, Kansas.

APPENDIX B2

2020 Quarterly Construction Field Reviews

(Pages B2-1 to B2-29)

November 4, 2020

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Dear Mark,

RE: 2020 Q3 Construction Field Review Summary

1.0 INTRODUCTION

A Construction Field Review of the Yankee Doodle Tailings Impoundment (YDTI) was completed for the third quarter (Q3) of 2020 by Mr. Mike Harvie (Montana Resources, LLP (MR) Mining Engineering Department) between September 16th and 18th, 2020. This was the third quarterly field review completed in 2020 by Mr. Harvie as a designate of the Engineer of Record (EOR) due to restrictions relating to the ongoing COVID-19 pandemic. The previous 2020 Q1 and Q2 field reviews completed by Mr. Harvie are summarized in Knight Piésold Ltd. (KP) letters (KP, 2020a and 2020b).

The quarterly Construction Field Review is intended to observe construction progress, review construction practices, and provide recommendations for priority actions. The field review is a visual inspection and does not constitute supervision of construction and does not represent a guarantee that all deficient or non-conforming works have been identified. The field review is completed on a quarterly basis to satisfy the Engineer quarterly inspection frequency as outlined in the Earthworks Inspection and Test Plan in Table 3.4 of the Construction Management Plan (CMP) (KP, 2018).

A collection of photos and videos gathered during the field review, along with the summary checklist included as Table 1, were provided to KP by Mr. Harvie. Select photos from the field review are included in the attached Photo Log with approximate locations shown on Figure 1. The photos and videos were visually compared by KP to similar information collected during previous field reviews to inform the opinions and conclusions presented in this letter. Weekly construction progress reports, completed by MR to satisfy the inspection requirements outlined in the CMP (KP, 2018), were also reviewed to assist in the development of this summary.

2.0 FIELD OBSERVATIONS

2.1 NORTH-SOUTH EMBANKMENT

As summarized in the Q2 summary letter, the downstream step-out has been completed up to EL. 6,400 ft along most of the North-South Embankment, except at the southern end. No additional materials were placed along the downstream step-out during Q3. An overview of the downstream edge of the embankment is shown on Photo 1.

The tailings pipeline corridor along the North-South Embankment has been regraded and Line 3 extended as described in the 2019 EOR Annual Inspection Report (AIR) (KP, 2020c). This included the relocation of discharge NS-3 and implementation of the new discharge location NS-4. Photo 2 shows the beach conditions and supernatant pond location as viewed from the new NS-4 discharge location, which was active during the field review. The updated configuration of the tailings discharge locations is shown on Figures 1 and 2. The extension of Line 2 to NS-1 as recommended in the 2019 EOR AIR (KP, 2020c) is still to be completed.

Relocation of the tailings reclaim water pipeline began in August and is expected to continue though Q4. The relocation of the pipeline requires the widening of the access road at the northern end of the embankment. Construction progress of the widening is shown on Photo 3 and the approximate construction area is shown on Figure 2.

Dormant settlement cracking along the tailings discharge corridor along the upstream side of the embankment crest was reviewed and appears similar to the 2020 Q2 field review. An example of the settlement cracking is shown on Photo 4. Intermittent cracking along the downstream edge of the embankment crest, which is consistent with previously identified cracking as summarized in previous quarterly field reviews (2019, 2020a, 2020b) and 2019 EOR AIR (KP, 2020c), was observed, with an example shown on Photo 5. MR is to continue to monitor any additional cracking and/or propagation of the existing cracks. MR is to continue to inform KP of any changing conditions.

Tailings discharge records indicate that all locations along the North-South Embankment were active since the previous field review. The approximate beach elevations at the discharge points at the time of the field review and the change in elevation since the previous field review are provided below. Note, as described above, discharge NS-3 was relocated since the 2020 Q2 field review, and NS-4 is a new location.

- NS-1: EL. 6,385.2 ft (increase of 0.8 feet from EL. 6,384.4 ft)
- NS-2: EL. 6,380.9 ft (increase of 3.9 feet from EL. 6,377.0 ft)
- NS-3: EL. 6,378.5 ft (discharge location relocated this quarter)
- NS-4: EL. 6,368.6 ft (new discharge location this quarter)

The elevation difference between NS-1 and NS-4 was approximately 16.6 ft at the end of Q3. The construction and implementation of the new NS-4 discharge location is expected to further infill the tailings beach at the northern end of the embankment and will reduce the beach to crest elevation differential of the North-South Embankment discharge locations. Use of this additional discharge location is expected to further extend the beach length between the supernatant pond and embankment.

2.2 EAST-WEST EMBANKMENT

Construction of the EL. 6,450 ft lift of the East-West Embankment resumed in early July. Embankment construction began during Q2 west of the Booster #3 (Tailings) Pump House and has progressed towards the West Embankment. Approximate construction limits are shown on Figure 3 and a general indication of progress is shown on Photo 6.

The downstream edge of the pipeline ramp, shown on Photos 7 and 8, shows signs of minor settlement cracking at intermittent locations along the loosely placed downstream berm. MR is to continue to monitor the downstream edge of the pipeline ramp for any additional cracking or the propagation of the existing cracks.

The tailings pipelines, partially relocated along the central portion of the pipeline ramp during Q2, are still to be relocated along the eastern end of the embankment. The connection of the East-West Embankment and North-South Embankment downstream step-outs is still to be completed (shown on Photo 9) following relocation of the tailings pipelines and after deactivation of the existing haul road.

The over-steepened cut slope at the Terramac access ramp along the tailings discharge corridor is shown on Photo 10. This area is still being monitored by MR as recommended in the 2019 AIR (KP, 2020c) and the MR Corrective Action Plan (CAP) (MR, 2020). The condition of the slopes is unchanged and appears to be consistent with observations provided in the previous field reviews.

Records indicate that discharge location EW-2 was in operation since the last field review. The elevation difference between the EW discharge locations was approximately 2.6 ft, which is less than the 3.8 ft difference recorded during the 2020 Q2 field review. The approximate beach elevations at the discharge points and the change in elevation since the previous field review are as follows:

- EW-1: EL. 6,386.8 ft (increase of 0.0 feet from EL. 6,386.8 ft)
- EW-2: EL. 6,384.2 ft (increase of 1.2 feet from EL. 6,383.0 ft)

2.3 WEST EMBANKMENT

Areas of active construction along the West Embankment during Q3 are shown on Figure 4.

Zone D1 lifts were placed along the western edge of the temporary sump (Photo 11) to complete the EL. 6,400 ft lift. A 15 ft extension of the Extraction Basin well riser pipes was completed; however, fill placement around the well risers has not yet been advanced and the fill surface remains at approximately EL. 6,411 ft. The well risers, at an approximate elevation of 6,428 ft, are shown on Photo 12.

The construction of the EL. 6,450 lift of the West Embankment commenced in Q2 and continued throughout Q3. An overview of the EL. 6,450 construction progress as viewed from the northern end of the West Embankment is shown on Photo 13. Mungas Construction Inc. (Mungas) completed various minor works along the West Embankment during Q3, including topsoil and vegetation removal and extensions of secondary seepage collection drains.

The Extraction Pond Dewatering System installed on the floating barge was operating at approximately 350 gallons per minute (gpm) at the time of the field review, which is consistent with flowrates measured at this location since commissioning in late 2019. Construction of the EL. 6,450 ft embankment required the temporary shut down of the dewatering system and the relocation of the Extraction Pond pipeline. The quarterly trends will be summarized and presented in the Q3 Water Management Summary document currently in progress. An overview of the Extraction Pond is shown on Photo 14. The welding and placement of the emergency overflow pipelines from the Extraction Pond is still to be completed as described in previous field reviews. Additional large boulders for energy dissipation are still required at the emergency overflow discharge structure at the outlet of the emergency overflow pipelines.

Discharge location RK-3 was active at the time of the field review and tailings discharge records indicate that all discharge locations were used since the last field review. Discharge location RK-4 was disconnected during Q3, as shown on Photo 15, during the ongoing construction of the EL. 6,450 ft embankment lift. It is expected that this discharge location and tailings discharge corridor will be realigned and re-established. The approximate beach elevations at the discharge points at the time of the field review and the change in elevation since the previous field review are as follows:

- RK-1: EL. 6,380.8 ft (increase of 1.0 feet from EL. 6,379.8 ft)
- RK-2: EL. 6,377.2 ft (increase of 3.2 feet from EL. 6,374.0 ft)

- RK-3: EL. 6,373.8 ft (increase of 2.3 feet from EL. 6,371.5 ft)
- RK-4: EL. 6,371.3 ft (increase of 0.2 feet from EL. 6,371.1 ft)

The elevation difference between RK-1 and RK-4 was approximately 9.5 ft, which is slightly greater than the difference of 8.7 ft at the time of the 2020 Q2 field review.

2.4 SEEP 10 AREA AND HORSESHOE BEND

The flow comparisons presented within this section are based on visual observations and are intended to provide a general comparison of the current conditions (at the time of the field review) with conditions observed during the previous 2020 quarterly reviews. The quarterly trends and flowrates for Seep 10, Horseshoe Bend (HsB) Weir, and Precipitation Plant overflows are also summarized and presented in the Q3 Water Management Summary document currently in progress. Beginning in Q4 of 2020 the visual observations, descriptions, and photos will be included only in the Quarterly Water Management Summary and will not be presented in the quarterly Construction Field Review unless the field review identifies the need for general maintenance or priority action.

The HsB seepage flow paths and collection ditches at the toe of the East-West Embankment viewed from the Seep 10 bench are shown on Photos 16 and 17. The conditions observed were generally consistent with previous field reviews. The overflow from the Surge Pond, shown on Photo 18, continues to flow and cut around the weir. This flow, along with the weir overflow, is collected in a pipe downstream of the weir and is discharged into the Houligan Pond.

The condition of the Seep 10 flow paths, surface collection ditches, and stilling pond appear generally consistent with previous field reviews, as shown on Photos 19 through 21. The ultrasonic lookdown level sensor installed at the Seep 10 weir was reported to be operating normally and the reading on the staff gauge at the time of the field review was approximately 0.4 as shown on Photo 22.

The following observations can be made from our review of photos of the Precipitation Plant, and the HsB Upper and Lower Pond areas:

- The HsB Upper and Lower Pond areas and seepage inflows appear to be in similar condition as previous field reviews as shown on Photos 23 and 24.
- The Cell 10 pump area shows signs of a minor overflow towards the HsB Lower Pond at the time of the field review, as shown on Photo 25. Maintenance should be performed to stop this overflow bypass.
- The Cell 10 return flow flume is shown on Photo 26 and appears to be operating normally.
- The HsB Weir at the downstream end of the HsB Pond, as shown on Photo 27, appears to be in good operating condition. The water level at the weir appears consistent with the level observed during the 2020 Q2 field review.
- The intake to the Equalization Basin, shown on Photo 28, appears to be operating normally and was not overflowing to the Berkeley Pit.
- The Berkeley Pit return flow pipeline was actively discharging to the HsB Water Treatment Plant Transfer Pond, as shown on Photo 29.
- The Muddler Pump area, shown on Photo 30, appears to be operating normally with no overflow to the HsB Lower Pond.

MR is to continue to monitor the flow conditions adjacent to the Precipitation Plant and at the HsB Pond areas for any changes in flows or new seepage locations.

2.5 OTHER ITEMS

Weekly and monthly quality reports were discussed with MR throughout Q3, including during regular weekly meetings between KP and MR. Completion of several MR Weekly Construction Reports lagged but have recently been provided at the start of Q4. Several Monthly Quality Reports were also late; however, MR has made significant progress in recent weeks.

MR requested a field instruction from KP to detail a potential procedure to increase the Zone D1 lift thickness. The proposed method specification includes placement of Zone D1 in approximately 10 ft lifts with traffic compaction by the 240 ton (CAT793D) mine haul fleet, equally distributed over the lift. KP provided a draft procedure to MR in early Q4 (KP, 2020d). It is anticipated that the method specification will be applied to a trial pad area during 2020 Q4 or 2021 Q1.

Monitoring for embankment movement and piezometric levels within the YDTI embankments continues to be completed by KP and MR in accordance with the Tailings Operations, Maintenance and Surveillance (TOMS) Manual (MR/KP, 2020) using several concurrent monitoring programs. These programs include real-time monitoring of piezometric levels and in-place inclinometer instrumentation data via the Sensemetrics system, periodic review of beach development using Sentinel-2 satellite images, and collection of high resolution Interferometric Synthetic Aperture Radar (InSAR) data. The 2020 Q3 Piezometric Monitoring Update letter is developed separately, and provides a summary of the piezometric data collected at key monitoring sites during the quarter.

3.0 SUMMARY AND RECOMMENDATIONS

The 2020 Q3 Construction Field Review was completed by Mr. Mike Harvie of MR on behalf of the EOR. COVID-19 travel restrictions prevented KP from visiting the site. The EOR is satisfied with Mr. Harvie's detailed inspection and commends MR for their excellent observations and communications during this review. It is anticipated that the Q4 field review will also need to be completed using a similar procedure as COVID-19 travel restrictions and safety protocols are not expected to improve during Q4.

Construction of the downstream step-out along the North-South Embankment was not advanced during Q3, with further construction in this area deferred until the current mine haul ramp is deactivated and tailings pipelines relocated. Realignment of the Reclaim Water Pipeline, including the widening of the access road at the north end of the North-South Embankment, is ongoing.

Construction of the EL. 6,450 lift continued along both the East-West and West Embankment and 5 ft lifts of Zone D1 were placed in the area west of the temporary extraction pond during this quarter. A 15 ft extension of the Extraction Basin well riser pipes was completed; and fill placement around the well risers continues.

Minor settlement cracking continues to be visible along the downstream edge of the EL. 6,400 ft North-South Embankment crest. Recent settlement cracking was also visible along the downstream edge of the new pipeline ramp that has been constructed along the East-West Embankment. The cracking in both locations is minor and similar to what was previously observed along the EL. 6,400 crest of the North-South Embankment during construction of the lower downstream step-out lifts during 2019.

Dormant cracks were inspected; along the North-South Embankment tailings discharge corridor and along the over-steepened slope adjacent to the Terramac access road on the East-West Embankment. MR should continue to monitor these areas as described in the CAP (MR, 2020) to identify any propagation of the existing cracks or the development of new cracking.

Regrading of the North-South Embankment tailings discharge corridor, the realignment of discharge location NS-3, and the extension of Line 3 to include a new discharge location (NS-4) has been completed. NS-4 is operational and these modifications to the tailings discharge system will provide improved discharge flexibility along the embankment. Discharge locations along the West Embankment are adjusted as appropriate during construction of the EL. 6,450 ft embankment and discharge location RK-4 is currently disconnected; however, it is expected that the tailings discharge corridor and discharge locations will be re-established after embankment construction is complete in this area. The effects of these operational changes will continue to be identified during the weekly tailings beach surveys, and will continue to be used to assist in monitoring tailings beach development. The extension of Line 2 to NS-1 as recommended in the 2019 EOR AIR (KP, 2020c) is still pending.

The Extraction Pond Dewatering System is operating regularly; however, installation of the overflow pipelines from the Extraction Pond have not yet been completed. Flow conditions throughout Seep 10, around the Precipitation Plant, and in the HsB area appear visually comparable to previous field reviews. A detailed review of flow records will be summarized in the Q3 Water Management Summary document, which is currently in progress.

We trust this letter appropriately summarizes the construction activities and conditions during Q3 of 2020 based on the information (photos, videos, and descriptions) provided by MR. This review validates that embankment construction progressed as expected during 2020 Q3 and continued to conform with procedures and specifications outlined in the Construction Management Plan (KP, 2018) and Issued for Construction Design Drawings.

The information, descriptions and conclusions presented are based on a visual assessment of the provided information and does not constitute supervision of construction and does not represent a guarantee that all deficient or non-conforming works have been identified.

Yours truly,
Knight Piésold Ltd.

PROFESSIONAL ENGINEER
PROVINCE OF BRITISH COLUMBIA
J. R. R. GILLESPIE
42239
2020-11-04

MONTANA
2020-11-04
DANIEL DYLAN FONTAINE
No. 59785 PE
LICENSED
PROFESSIONAL ENGINEER

Prepared: ______________________ Reviewed: ______________________

Jason Gillespie, P.Eng.
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Daniel Fontaine, P.E.
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MONTANA
KEN J. BROUWER
10020 PE
REGISTERED
PROFESSIONAL ENGINEER
2020-11-05

Reviewed: ______________________

Ken Brouwer, P.E.
Principal

Approval that this document adheres to the Knight Piésold Quality System: KJB

Attachments:

Table 1 Rev 0	2020 Q3 Construction Field Review – Checklist
Figure 1 Rev 0	2020 Q3 Construction Field Review – General Arrangement and Photo Location Map
Figure 2 Rev 0	2020 Q3 Construction Field Review – North-South Embankment Approximate Construction Areas
Figure 3 Rev 0	2020 Q3 Construction Field Review – East-West Embankment Approximate Construction Areas
Figure 4 Rev 0	2020 Q3 Construction Field Review – West Embankment Approximate Construction Areas
Photo Log	

References:

Knight Piésold Ltd. (KP, 2018). Yankee Doodle Tailings Impoundment: Construction Management Plan (KP Reference No. VA101-126/12-5 Rev. 3). May 1, 2018.

Knight Piésold Ltd. (KP, 2019). 2019 Q4 Construction Field Review Summary (KP Reference No. VA19-02154). December 12, 2019.

Knight Piésold Ltd. (KP, 2020a). 2020 Q1 Construction Field Review Summary (KP Reference No. VA20-00803). May 7, 2020.

Knight Piésold Ltd. (KP, 2020b). 2020 Q2 Construction Field Review Summary (KP Reference No. VA20-01468). September 11, 2020.

Knight Piésold Ltd. (KP, 2020c). Yankee Doodle Tailings Impoundment 2019 Annual Inspection Report (KP Reference No. VA101-126/21-2 Rev. 0). January 31, 2020.

Knight Piésold Ltd. (KP, 2020d). Field Instruction: Zone D1 10 ft Lift Test Fill (KP Reference No. VA20-01546). Draft. October 7, 2020.

Montana Resource, LLP and Knight Piésold Ltd. (MR/KP, 2020). 2020 Tailings Operations, Maintenance and Surveillance (TOMS) Manual (Reference No. VA101-126/23-1), Rev 4, dated May 13, 2020.

Montana Resources, LLP. (MR, 2020). 2019 Annual Engineer of Record Inspection Report for Yankee Doodle Tailings Impoundment and Corrective Action Plan for Recommendations. MT, USA, January 31, 2020.

Copy To: Mike Harvie

Montana Resources

Knight Piésold CONSULTING

TABLE 1

MONTANA RESOURCES, LLP
YANKEE DOODLE TAILINGS IMPOUNDMENT

2020 CONSTRUCTION FIELD REVIEW CHECKLIST

Date: 9/16/20 to 9/18/20 **Time:** Varies

Inspectors:

Name: Mike Harvie | Title: Manager of Engineering & Geology | Signature: MH

Inspection Type: DAILY | WEEKLY | MONTHLY | OTHER EVENT (Specify): | Q3 Quarterly Inspection

Weather Conditions: Precipitation (24 hr.): none | Wind Speed: **0-10**

Temperature (°F): **60's** | Sky (circle): Clear | Partly Cloudy | Cloudy | **SMOKEY**

Instrumentation Data Collected: Yes No **Details:**

Samples Collected: Yes No **Details:**

WEST EMBANKMENT

LOCATION	INSPECTION COMPLETED	ITEM	ITEM PRESENT YES	ITEM PRESENT NO	PHOTO	COMMENTS
Crest of Dam	✓	Cracking, Subsidence, Depressions		X	X	
		Erosion		X		
		Lateral Deformation		X		
Upstream Face	✓	Cracking, Subsidence, Depressions		X		
		Erosion		X		
		Pipeline Corridor		X	X	
Downstream Face	✓	Cracking, Subsidence, Depressions		X		
		Erosion		X		
		Seeps, Damp or Soft areas		X		
Active Embankment Construction	✓	Location and Elevation Reviewed	X		X	6450, no active dumping during inspection
		Surface Preparation	X		X	6400 Ripped

EAST-WEST EMBANKMENT

LOCATION	INSPECTION COMPLETED	ITEM	ITEM PRESENT YES	ITEM PRESENT NO	PHOTO	COMMENTS
Crest of Dam	✓	Cracking, Subsidence, Depressions		X		
		Erosion		X		
		Lateral Deformation		X		
Upstream Face	✓	Cracking, Subsidence, Depressions		X		
		Erosion		X		
		Pipeline Corridor	X		X	old settlement at Terramac access ramp, no progression
Downstream Face	✓	Cracking, Subsidence, Depressions		X		
		Erosion		X		
		Seeps, Damp or Soft areas		X		
Seep 10 Bench	✓	Overview of HsB Photo		X	X	
	✓	Seep 10 Stilling Basin		X	X	
	✓	Seep 10 V-Notch Weir		X	X	
	✓	Seep 10 Inflows		X	X	
Active Embankment Construction	✓	Location and Elevation Reviewed	X		X	6450
		Surface Preparation	X		X	6400 Ripped
Pipe Ramp Construction	✓	Cracking, Subsidence, Depressions	X		X	some minor settlement cracking along downstream edgeof pipe ramp
		Erosion		X		
		Survey Stake Locations for Expansion		X		

NORTH-SOUTH EMBANKMENT

LOCATION	INSPECTION COMPLETED	ITEM	ITEM PRESENT YES	ITEM PRESENT NO	PHOTO	COMMENTS
Crest of Dam	✓	Cracking, Subsidence, Depressions		X	X	
		Erosion		X		
		Lateral Deformation		X		
Upstream Face	✓	Cracking, Subsidence, Depressions		X	X	
		Erosion		X		
		Pipeline Corridor	X		X	Old settlement between 3-2/3-3, no progression
Downstream Face	✓	Cracking, Subsidence, Depressions	X		X	Old settlement at top of ramp, no progression
		Erosion		X	X	
		Seeps, Damp or Soft areas		X		
Active Embankment Construction	✓	Location and Elevation Reviewed	X			No activity
		Surface Preparation	X			

Montana Resources

Knight Piésold CONSULTING

TABLE 1

MONTANA RESOURCES, LLP
YANKEE DOODLE TAILINGS IMPOUNDMENT

2020 CONSTRUCTION FIELD REVIEW CHECKLIST

YANKEE DOODLE TAILINGS IMPOUNDMENT						
LOCATION	INSPECTION COMPLETED	ITEM	ITEM PRESENT		PHOTO	COMMENTS
			YES	NO		
General	✓	Pond Elevation and Location Reviewed				6358.56, decreased by 0.39 ft since August 27th
	✓	Lowest Crest Elevation Determined				Above Station 3, Tailings Lines
Tailings Discharges	✓	Active Discharge Locations	X		X	Discharges 1-3 (RK-3), 3-5 (NS-4)
		Pipeline leakage		X		
		Pipeline wear/damage		X		
Reclaim Water Pipeline	✓	Pipeline wear/damage		X		
		Pipeline leakage		X		

HORSESHOE BEND				
LOCATION	INSPECTION COMPLETED	ITEM	PHOTO	COMMENTS
Horseshoe Bend and Precipitation Plant	✓	Upper HSB Pond	X	
	✓	Lower HsB Pond	X	
	✓	HsB Pump and Water Level	X	
	✓	HsB Seepage to Upper Pond	X	
	✓	HsB Seepage to Hooligan Pond	X	
	✓	Precipitation Plant Overflow Box Leak	X	
	✓	Precipitation Plant Overflow/Cell 10 Pump	X	
	✓	HsB Weir	X	
	✓	Muddler Pump and Overflow	X	
	✓	Leach Pump Head Tank (Weir)	X	
	✓	BMFOU Pilot Project Facilities		

Additional Notes:

Extraction Pond operating properly over last month, Emergency Pipelines are not installed. Pipelines need to be fused and placed.

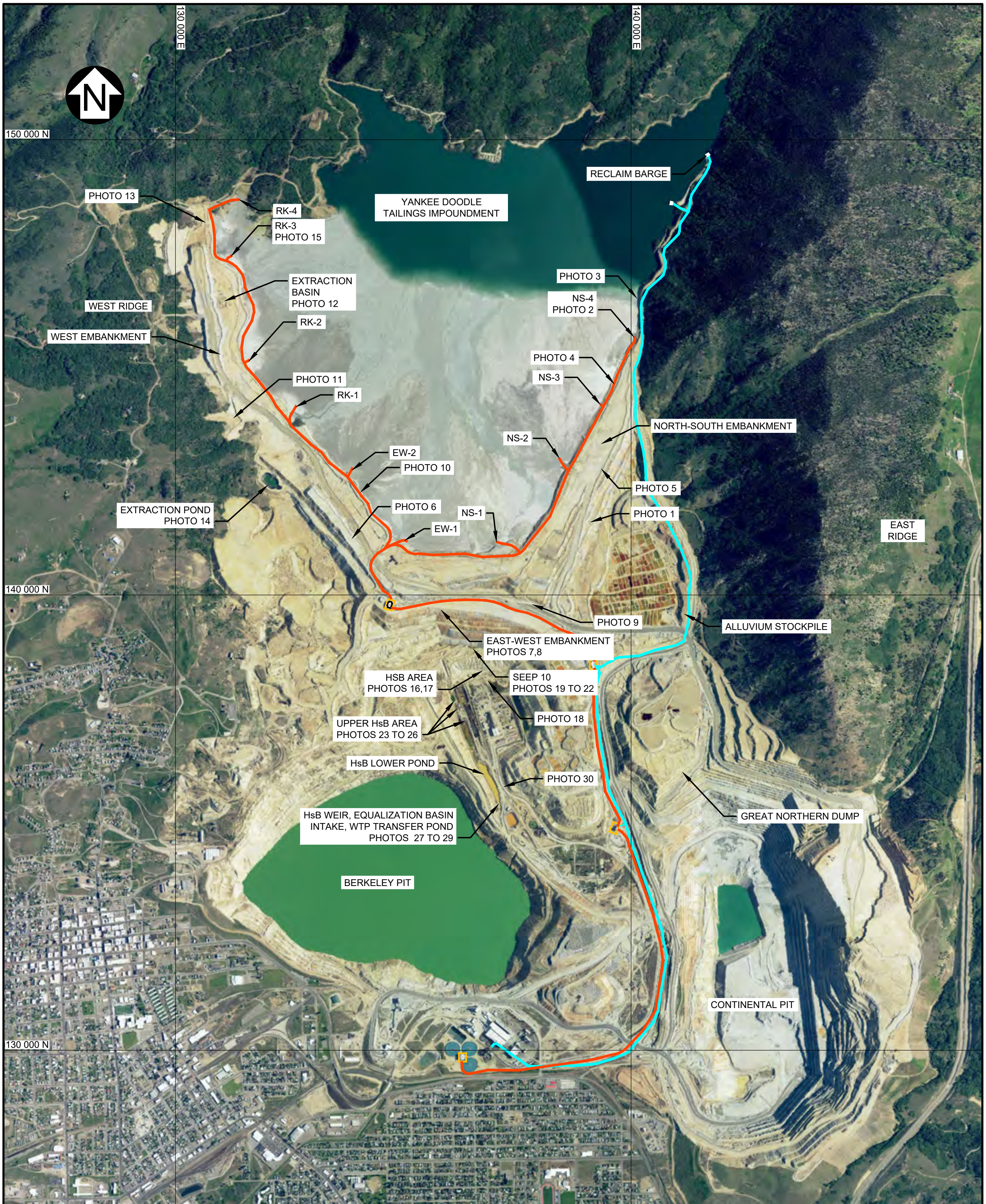
Second fifteen foot extensions on Extraction Basin Riser Pipes were completed. Awaiting placement of fill materials around pipes.

\\KPL\VA-Prj$\1\01\00126\23\A\Correspondence\VA20-02161 Q3 Construction Field Review\Attachments\Checklist\[Q3 2020 Inspection Log.xlsx]Q3 Field Review

NOTES:

1. CHECKLIST COMPLETED BY MR REPRESENTATIVE MIKE HARVIE AND REVIEWED BY KP.

0	04NOV'20	ISSUED WITH LETTER VA20-02161	JRG	DDF
REV	DATE	DESCRIPTION	PREP'D	RVW'D



NOTES:

1. COORDINATE SYSTEM AND ELEVATIONS ARE BASED ON ANACONDA MINE GRID.
2. PHOTO LOCATIONS CORRESPOND TO PHOTO LOG ISSUED WITH 2020 Q3 QUARTERLY CONSTRUCTION FIELD REVIEW SUMMARY.
3. AERIAL IMAGERY FROM JULY 9, 2020 PROVIDED BY MONTANA RESOURCES, LLP.

SCALE A: 1500 0 1500 3000 4500 6000 7500 ft

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED
0	02NOV'20	ISSUED WITH LETTER	JRG	RMM	DDF

MONTANA RESOURCES, LLP

YANKEE DOODLE TAILINGS IMPOUNDMENT

2020 Q3 CONSTRUCTION FIELD REVIEW GENERAL ARRANGEMENT AND PHOTO LOCATION MAP

Knight Piésold CONSULTING

P/A NO.	REF NO.
VA101-126/23	VA20-02161

FIGURE 1 REV 0

SAVED: \\KPL\VA-Prj$\1\01\00126\23\A\Acad\FIGS\A15, 10/23/2020 1:56:18 PM , JGILLESPIE PRINTED: 11/2/2020 11:23:16 AM, FIG 1, RMCLELLAN
XREF FILE(S): 5ft_01_2020 IMAGE FILE(S): 2020 Aerial Photo

NOTES:

1. AERIAL IMAGERY FROM JULY 9, 2020 PROVIDED BY MONTANA RESOURCES, LLP.

2. CONSTRUCTION AREAS ARE ESTIMATED TO REPRESENT ACTIVE AREAS DURING Q3 OF 2020.

REV	DATE	DESCRIPTION	PREP'D	RVW'D
0	04NOV'20	ISSUED WITH LETTER	JRG	DDF

MONTANA RESOURCES, LLP

YANKEE DOODLE TAILINGS IMPOUNDMENT

2020 Q3 CONSTRUCTION FIELD REVIEW
NORTH-SOUTH EMBANKMENT
APPROXIMATE CONSTRUCTION AREAS

Knight Piésold CONSULTING

P/A NO.	REF. NO.
VA101-126/23	VA20-02161

FIGURE 2 REV 0

NOTES:

1. AERIAL IMAGERY FROM JULY 9, 2020 PROVIDED BY MONTANA RESOURCES, LLP.
2. CONSTRUCTION AREAS ARE ESTIMATED TO REPRESENT ACTIVE AREAS DURING Q3 OF 2020.

REV	DATE	DESCRIPTION	PREP'D	RVW'D
0	04NOV'20	ISSUED WITH LETTER	JRG	DDF

MONTANA RESOURCES, LLP

YANKEE DOODLE TAILINGS IMPOUNDMENT

2020 Q3 CONSTRUCTION FIELD REVIEW
EAST-WEST EMBANKMENT
APPROXIMATE CONSTRUCTION AREAS

Knight Piésold CONSULTING

P/A NO. VA101-126/23

REF. NO. VA20-02161

FIGURE 3

REV 0

NOTES:

1. AERIAL IMAGERY FROM JULY 9, 2020 PROVIDED BY MONTANA RESOURCES, LLP.

2. CONSTRUCTION AREAS ARE ESTIMATED TO REPRESENT ACTIVE AREAS DURING Q3 OF 2020.

MONTANA RESOURCES, LLP

YANKEE DOODLE TAILINGS IMPOUNDMENT

2020 Q3 CONSTRUCTION FIELD REVIEW
WEST EMBANKMENT
APPROXIMATE CONSTRUCTION AREAS

Knight Piésold CONSULTING

P/A NO. VA101-126/23

REF. NO. VA20-02161

FIGURE 4

REV 0

REV	DATE	DESCRIPTION	PREP'D	RVW'D
0	04NOV'20	ISSUED WITH LETTER	JRG	DDF

2020 Q3 CONSTRUCTION FIELD REVIEW
PHOTO LOG

PHOTO 1 – North-South Embankment – Downstream step-out overview

PHOTO 2 – North-South Embankment – Tailings discharge NS-4 and supernatant pond location

2020 Q3 CONSTRUCTION FIELD REVIEW PHOTO LOG

PHOTO 3 – North-South Embankment – Road widening to accommodate realignment of the Reclaim Water Pipeline

PHOTO 4 – North-South Embankment – Example of cracking along the upstream edge of the tailings discharge corridor

2020 Q3 CONSTRUCTION FIELD REVIEW
PHOTO LOG

PHOTO 5 – North-South Embankment – Downstream edge of Haul Ramp showing minor settlement cracking along EL 6,400 lift

PHOTO 6 – East-West Embankment – EL 6,450 ft construction progress

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2020 Q3 CONSTRUCTION FIELD REVIEW PHOTO LOG

PHOTO 7 – East-West Embankment – Downstream edge of pipeline ramp showing minor settlement cracking

PHOTO 8 – East-West Embankment – Downstream edge of pipeline ramp showing minor settlement cracking

2020 Q3 CONSTRUCTION FIELD REVIEW
PHOTO LOG

PHOTO 9 – East-West Embankment – Corner to be completed between East-West and North-South Embankments viewed from the haul road

PHOTO 10 – East-West Embankment – Over steepened cut slopes on Terramac access ramp

2020 Q3 CONSTRUCTION FIELD REVIEW
PHOTO LOG

PHOTO 11 – West Embankment – EL 6,400 ft Zone D1 Material near Temporary Extraction Pond location

PHOTO 12 – West Embankment – Extraction Basin well risers

2020 Q3 CONSTRUCTION FIELD REVIEW PHOTO LOG

PHOTO 13 – West Embankment – EL 6,450 ft construction progress

PHOTO 14 – West Embankment – Extraction Pond

PHOTO 15 – West Embankment – Line 1, Valve 3 disconnected from RK-4 at RK-3 discharge location

PHOTO 16 – Horseshoe Bend (HsB) Area – Leach seeps along toe of East-West Embankment viewed from Seep 10 bench.

2020 Q3 CONSTRUCTION FIELD REVIEW PHOTO LOG

PHOTO 17 – HsB Area – Leach seeps along toe of East-West Embankment viewed from Seep 10 bench

PHOTO 18 – HsB Area – Surge Pond overflow

2020 Q3 CONSTRUCTION FIELD REVIEW
PHOTO LOG

PHOTO 19 – Seep 10 area

PHOTO 20 – Seep 10 area

2020 Q3 CONSTRUCTION FIELD REVIEW
PHOTO LOG

PHOTO 21 – Seep 10 Stilling Pond

PHOTO 22 – Seep 10 Weir Staff Gauge reading approximately 0.4

Knight Piésold CONSULTING

2020 Q3 CONSTRUCTION FIELD REVIEW PHOTO LOG

PHOTO 23 – HsB Area – HsB Upper Pond area

PHOTO 24 – HsB Area – HsB Upper Pond area

2020 Q3 CONSTRUCTION FIELD REVIEW PHOTO LOG

PHOTO 25 – HsB Area – Cell #10 Pump, minor overflow to HsB Lower Pond

PHOTO 26 – HsB Area – Cell 10 Return Water Flume

2020 Q3 CONSTRUCTION FIELD REVIEW
PHOTO LOG

PHOTO 27 – HsB Area – HsB Weir

PHOTO 28 – HsB Area – Equalization Basin Intake

2020 Q3 CONSTRUCTION FIELD REVIEW PHOTO LOG

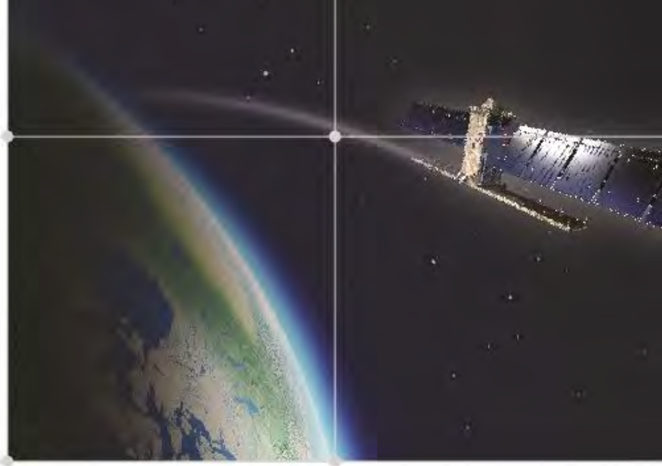
PHOTO 29 – HsB Area – HsB Water Treatment Plant Transfer Pond

PHOTO 30 – HsB Area – Muddler Pump and overflow pipeline

APPENDIX B3

InSAR Monitoring Analysis Report

(Pages B3-1 to B3-50)



InSAR Analysis of Ground Displacement over Butte Mine

Technical Report

June 2020

TRE ALTAMIRA
A CLS Group Company

Report Specifications

Client:	**Knight Piesold Ltd.**
Attention:	Kevin Davenport, Senior Engineer
Address:	Suite 1400 - 750 West Pender Street Vancouver British Columbia Canada V6C 2T8

Reference:	
Title:	InSAR Analysis of Ground Displacement over Butte Mine
TRE ALTAMIRA Delivery Reference:	JO19-1128-CA REP 1.0
Client Reference (PO):	8-326227/Supplier #502431

Prepared by:	**TRE ALTAMIRA Inc.**
Author(s):	Mark Shumski
Approved by:	Giacomo Falorni
Date:	14 August 2020
Version:	1.1

Executive Summary

This report describes the results of the historical ground displacement InSAR analysis over Montana Resources' Butte operations, in Montana. TRE Altamira used its SqueeSAR® algorithm to process high-resolution TerraSAR-X (TSX) images to analyze ground displacement.

The TSX imagery was acquired from 2 orbits to provide 2-D (vertical and E-W) ground displacement. Imagery was not collected from mid-October to mid-April due to the presence of snow at the site. Available imagery in both orbits starts in early June 2019 and runs until mid-October before resuming after the winter period for 2 additional months prior to the processing in early June 2020. The full period covered by this analysis was 01 June 2019 – 09 June 2020 in the ascending orbit and 03 June 2019 – 11 June 2020 in the descending orbit.

The following points summarize the findings:

- Overall rates of vertical motion range from -7.40 in/yr to -0.13 in/yr:
- Settlement is seen along five sections on the North-South and East-West Embankments . The highest rates of vertical motion along each section measure as follows:
    - Section 8+00 W: -5.50 in/yr
    - Section 0+00: -7.40 in/yr
    - Section 43+00 NW: -2.12 in/yr
    - Section 28+00 NW: -3.41 in/yr
    - Section 21+00 W: -3.41 in/yr
- Displacement rates are generally lowest near the toe of the embankments and are listed below:
    - Section 8+00 W: -0.15 in/yr
    - Section 0+00: -0.13 in/yr
    - Section 43+00 NW: -1.09 in/yr
    - Section 28+00 NW: -2.97 in/yr
    - Section 21+00 W: -0.14 in/yr
- Horizontal displacement ranged from 2.06 in/yr of eastward motion at the crest of Section 28+00 NW to 2.65 in/yr of westward motion at the toe of Section 28+00 NW.

- Cross-sections show the following total cumulative displacement:
    - Mid-Bench:
        - -5.25 in of settlement,
        - 1.5 inches of westward motion.
    - Seep 10 Bench:
        - -1.75 inches of settlement,
        - 0.6 inches of westward motion.
    - Toe of Embankment
        - -0.50 inches of settlement,
        - 0.60 inches of westward motion.

TerraSAR-X image acquisitions over the site are currently proceeding with an 11-day revisit frequency in both the ascending and descending orbits.

Table of Contents

Acronyms and Abbreviations

AOI	Area of Interest
ATS	Average Time Series
CS	Cross-Section
DS	Distributed Scatterer(s)
GIS	Geographic Information System
InSAR	Interferometric Synthetic Aperture Radar
LOS	Line of Sight
MP	Measurement Point
PS	Permanent Scatterer(s)
SAR	Synthetic Aperture Radar
SNT	Sentinel Satellite
SqueeSAR®	The most recent InSAR algorithm patented by TRE
TS	Time Series
YDTI	Yankee Doodle Tailings Impoundment

1. Introduction

Knight Piésold has contracted TRE Altamira Inc. (TREA) on behalf of Montana Resources (MR) to carry out an InSAR assessment over MR's Butte, Montana Operations. TREA used its proprietary SqueeSAR algorithm and high-resolution TSX imagery to identify ground movement between 2019 – 2020, with particular focus on the Yankee Doodle Tailings Impoundment.

1.1. Area of Interest

The mine site is located directly northeast of the town of Butte, Montana, USA. The 32.56 mi^2 area of interest (AOI) (Figure 1) is predominantly industrial with large mining pits and related infrastructure occupying a large portion of the AOI. The mine is located in mostly forested alpine terrain and grassland, with the town of Butte, Montana occupying the bottom portion of the AOI. The high radar reflectivity of the mine site and man-made structures within Butte are conducive to the application of InSAR.

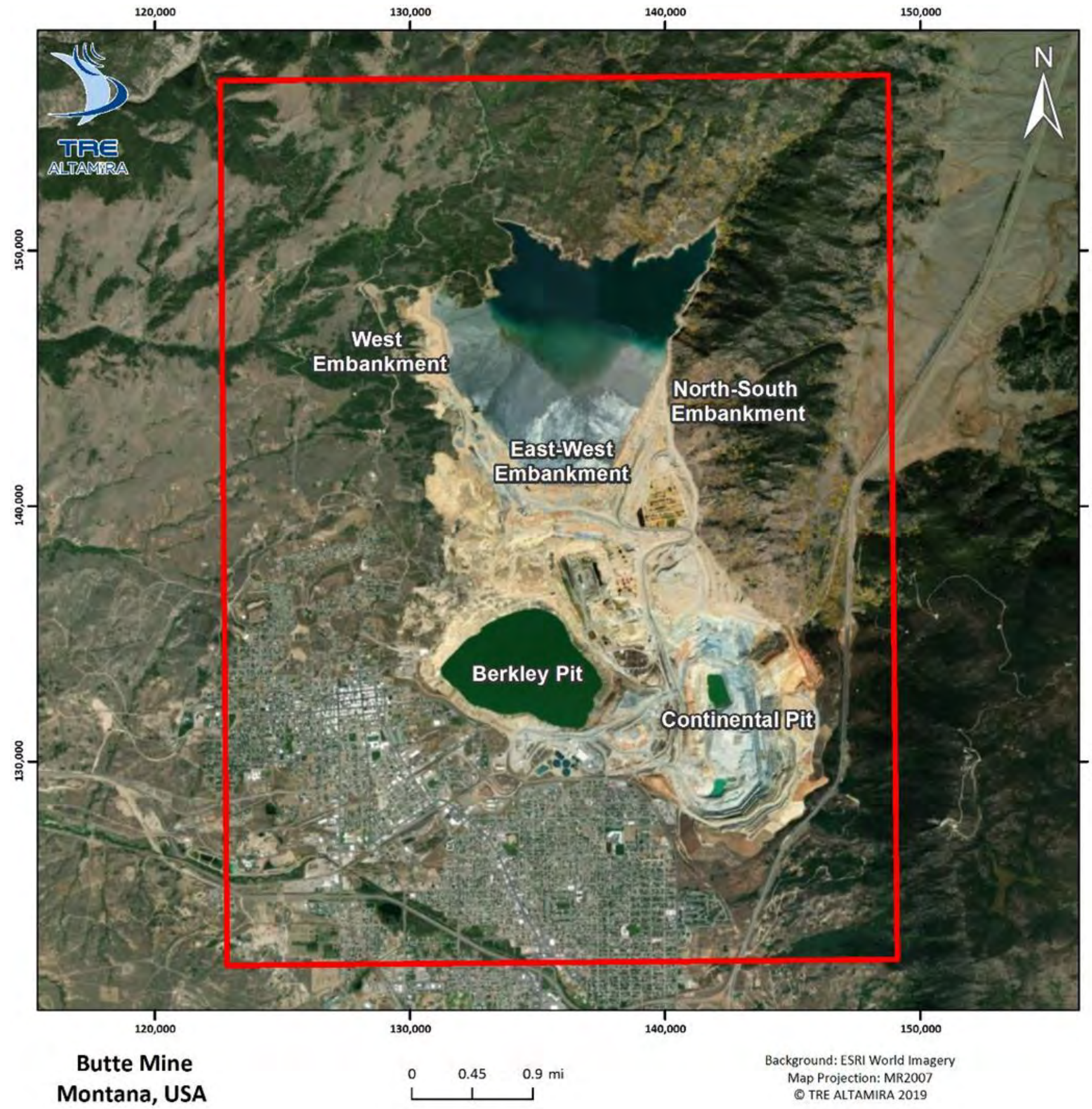


Figure 1: Butte area of interest.

2. Radar Data

The radar data available over Butte consists of high-resolution images acquired by the TSX satellite (Table 1) from both the ascending (satellite travelling from south to north and imaging to the east) and descending (satellite travelling from north to south and imaging to the west) orbits between June 2019 and June 2020. The archive consists of 18 ascending and 16 descending images collected at an 11-day interval (Figure 2). Appendix 2 provides additional information on the satellite acquisition parameters. Winter images were not acquired due to the presence of snow.

Table 1: Satellite acquisition parameters and image acquisition information.

Satellite	Pixel Resolution	Orbit	LOS Angle (Θ)	# of Images	Date Range
TSX	3m x 3m	Ascending	40.0°	18	01 June 2019 – 09 June 2020
		Descending	29.8°	16	03 June 2019 – 11 June 2020

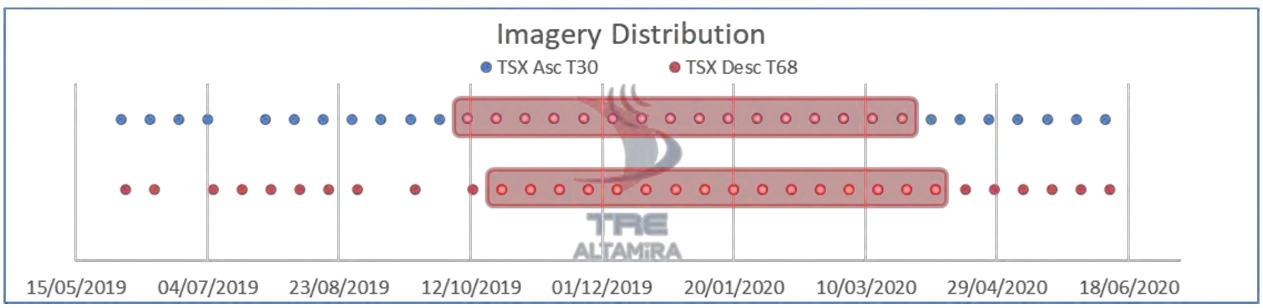


Figure 2: Temporal distribution of TSX radar images.

3. Overview of Results

This section provides a summary of the techniques used and a general overview of the results, while Section 4 describes areas of displacement in more detail.

3.1. SqueeSAR Analysis

SqueeSAR identifies measurement points (MPs) from objects on the ground that display a stable return to the satellite in every image of the archive. The MPs belong to two different families (Figure 3):

- Permanent Scatterers (PS): point-wise radar targets characterized by highly stable signal returns (e.g. buildings, rocky outcrops, linear infrastructures, etc.)
- Distributed Scatterers (DS): patches of ground exhibiting a lower but homogenous radar signal return (e.g. rangeland, debris fields, arid areas, etc.). DS therefore refer to small areas covering several pixels rather than to a single target or object on the ground. For clarity of presentation and ease of interpretation, DS are represented as individual points.

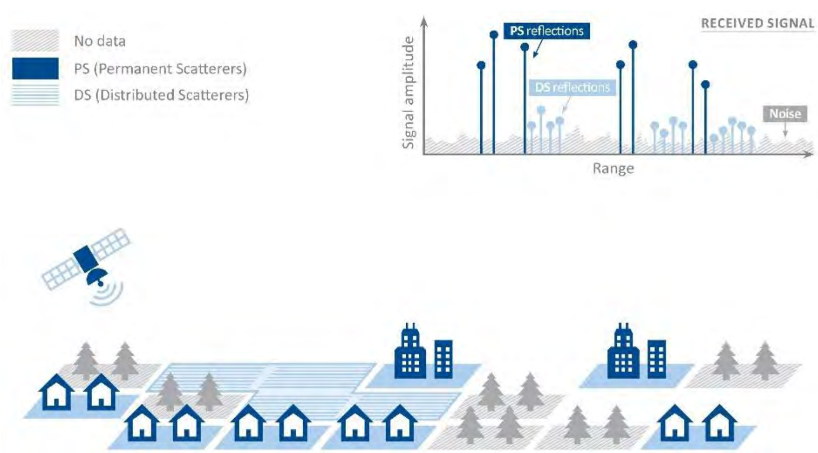


Figure 3: Schematic of PS and DS radar targets.

In InSAR analyses, all measurements are 1-D readings along the sensor's line-of-sight (LOS) as the true vector of displacement is projected onto the LOS. The same displacement will produce different readings when viewed from different angles (Figure 4). The LOS displacement rates are calculated from a linear regression of the ground movement measured over the entire period covered by the satellite images. Each measurement point corresponds to a Permanent Scatterer (PS) or a Distributed Scatterer (DS), and color-coded according to its annual rate of movement and direction:

- In LOS analysis, negative values (red) indicate surface displacement away from the satellite, while positive values (blue) indicate surface displacement towards the satellite.

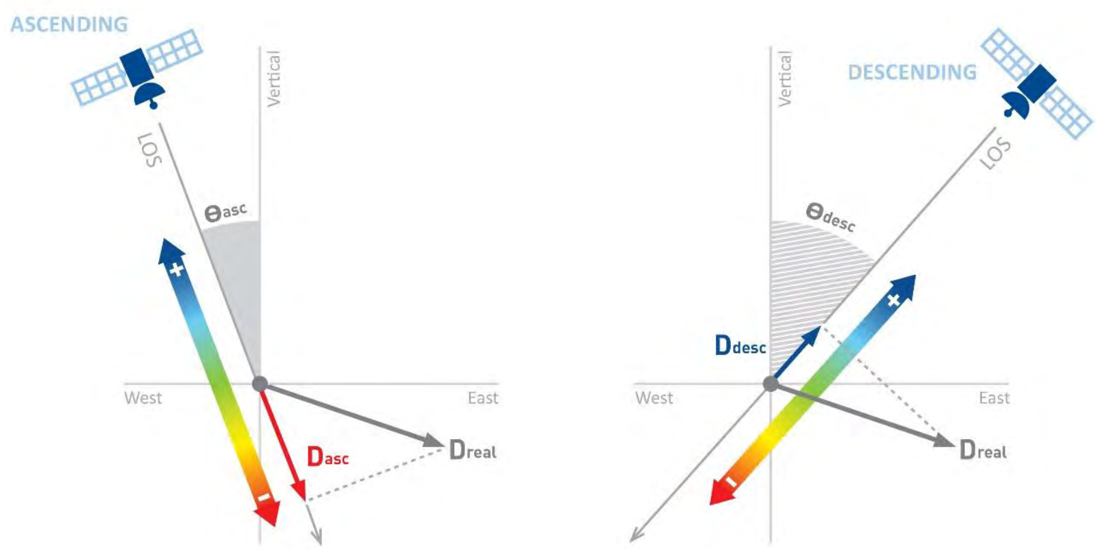


Figure 4: SqueeSAR measures the projection of real movement (D_{real}) onto the LOS. The same real movement (D_{real}) will produce a different reading from a different LOS (e.g. ascending or descending orbit).

Displacement measurements obtained by the SqueeSAR algorithm are differential in space and time. Measurements are spatially related to the reference point, and temporally to the date of the first available satellite image. The reference point is assumed to be motionless and selected for its radar properties and motion behavior.

The trigonometric combination of SqueeSAR results obtained from different orbits (i.e. ascending and descending), over the same area and overlapping period, produces 2-D (vertical and east-west) measurements of ground movement (Figure 5) in a gridded format. A grid is used as different measurement points are identified from the ascending and descending orbits. Thus, MPs that fall within a same cell are averaged and a new unique, derived time series of displacement is obtained for each grid cell.

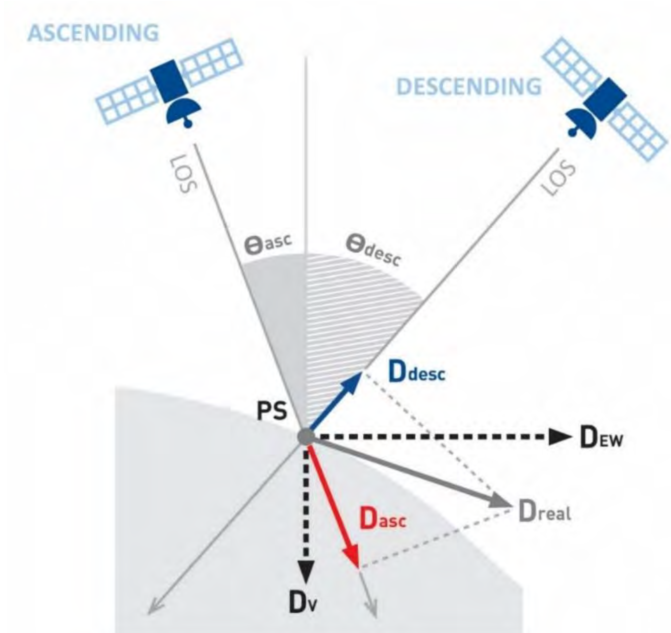


Figure 5: Example of motion decomposition combining ascending and descending acquisitions geometry.

Average annual displacement rates in a 2-D analysis are calculated from a linear regression of the ground movement measured over the entire period of the analysis and all measurements are relative to a reference point. Each point is color-coded according to the direction and magnitude of movement:

- In the vertical direction, negative values (red) indicate downward movement (i.e. subsidence), while positive values (blue) indicate upward movement (i.e. uplift).
- In the east-west direction, negative values (red) indicate westward motion, while positive values (blue) indicate eastward motion.

3.2. 2-D Results

The 2-D processing used the temporally overlapping images (03 June 2019 to 09 June 2020) and spatially overlapping coverage of the LOS (ascending and descending) data to obtain true vertical and east-west horizontal movements with millimetre precision. Figure 6 shows the vertical displacement rates while Figure 7 shows the horizontal (east-west) displacement rates over the YDTI as measured from the 2019 - 2020 TSX data in in/yr. Figure 8 and Figure 9 show the cumulative displacement over the YDTI in the vertical and horizontal directions in inches.

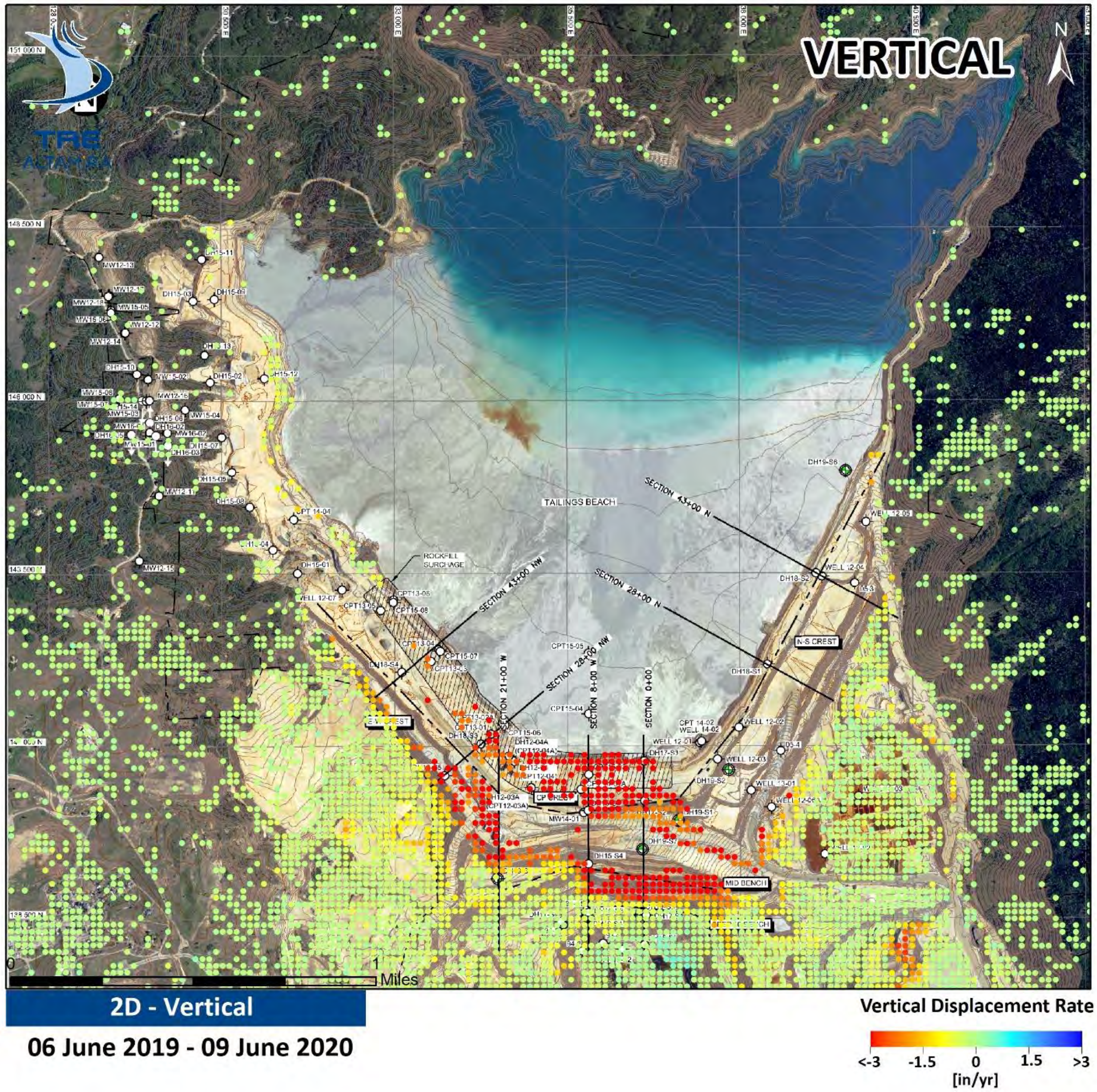


Figure 6: Overview of the vertical displacement rate over the YDTI.

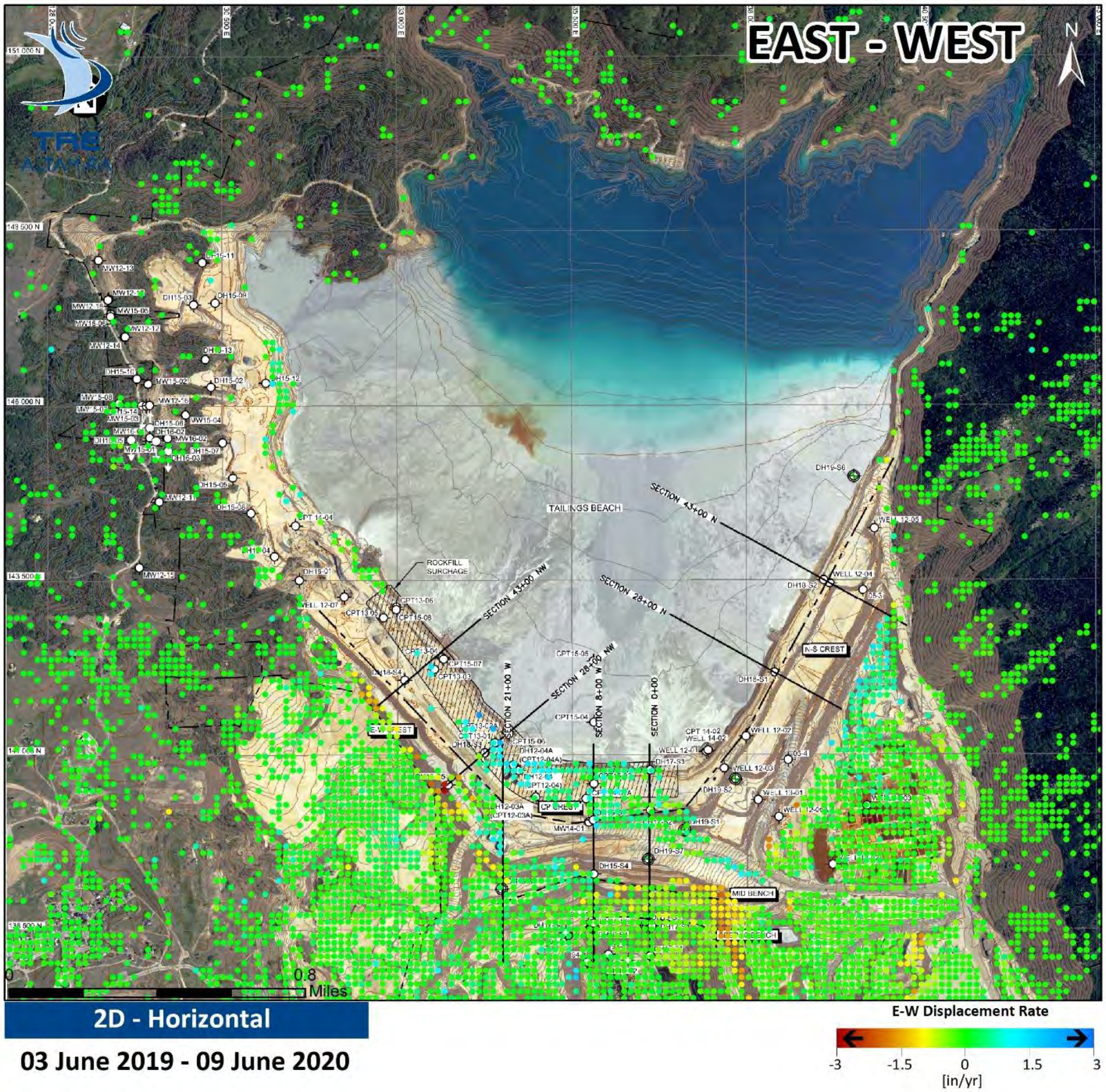


Figure 7: Overview of the east-west displacement rate over the YDTI.

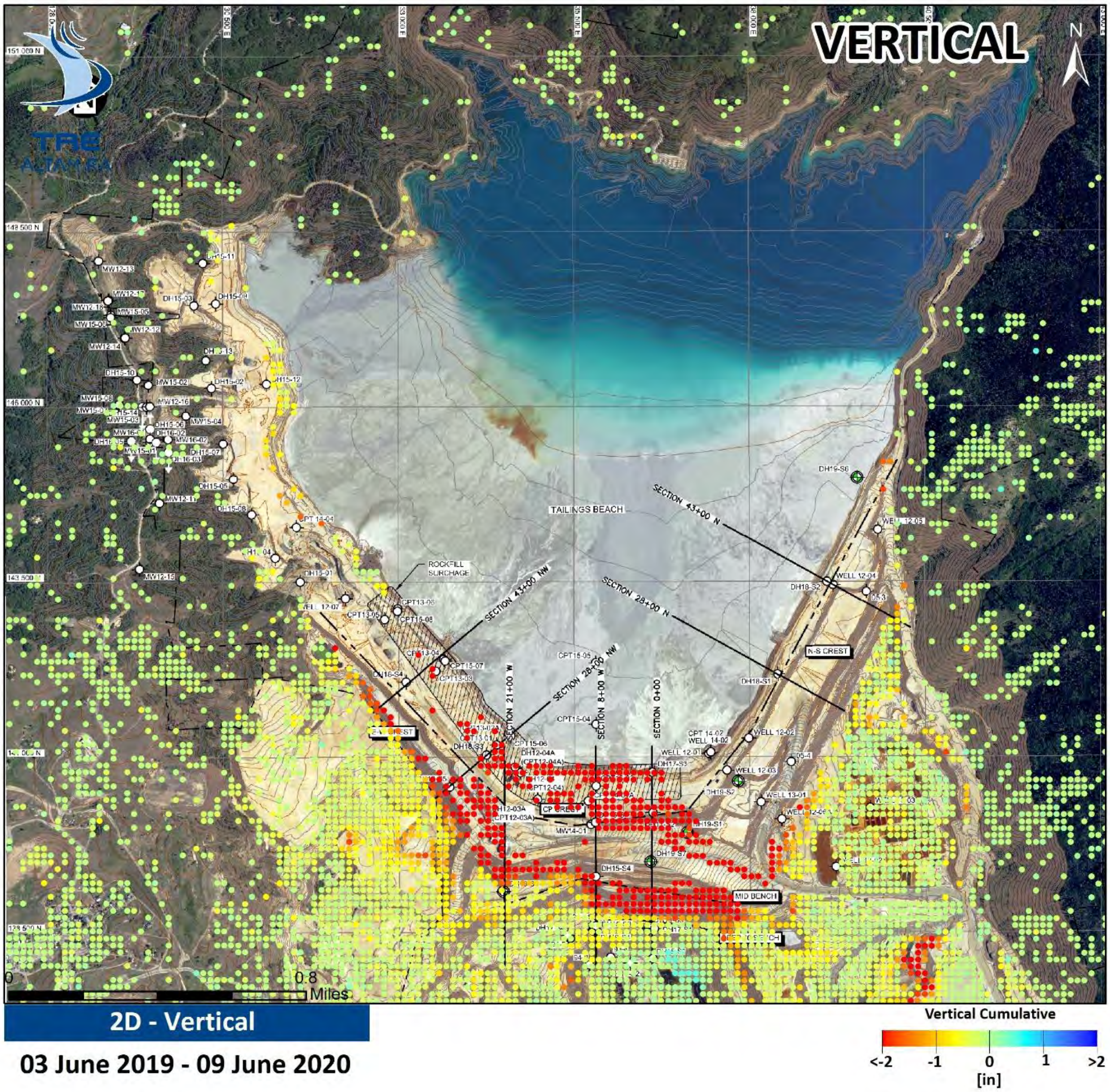


Figure 8: Overview of the cumulative vertical displacement over the YDTI.

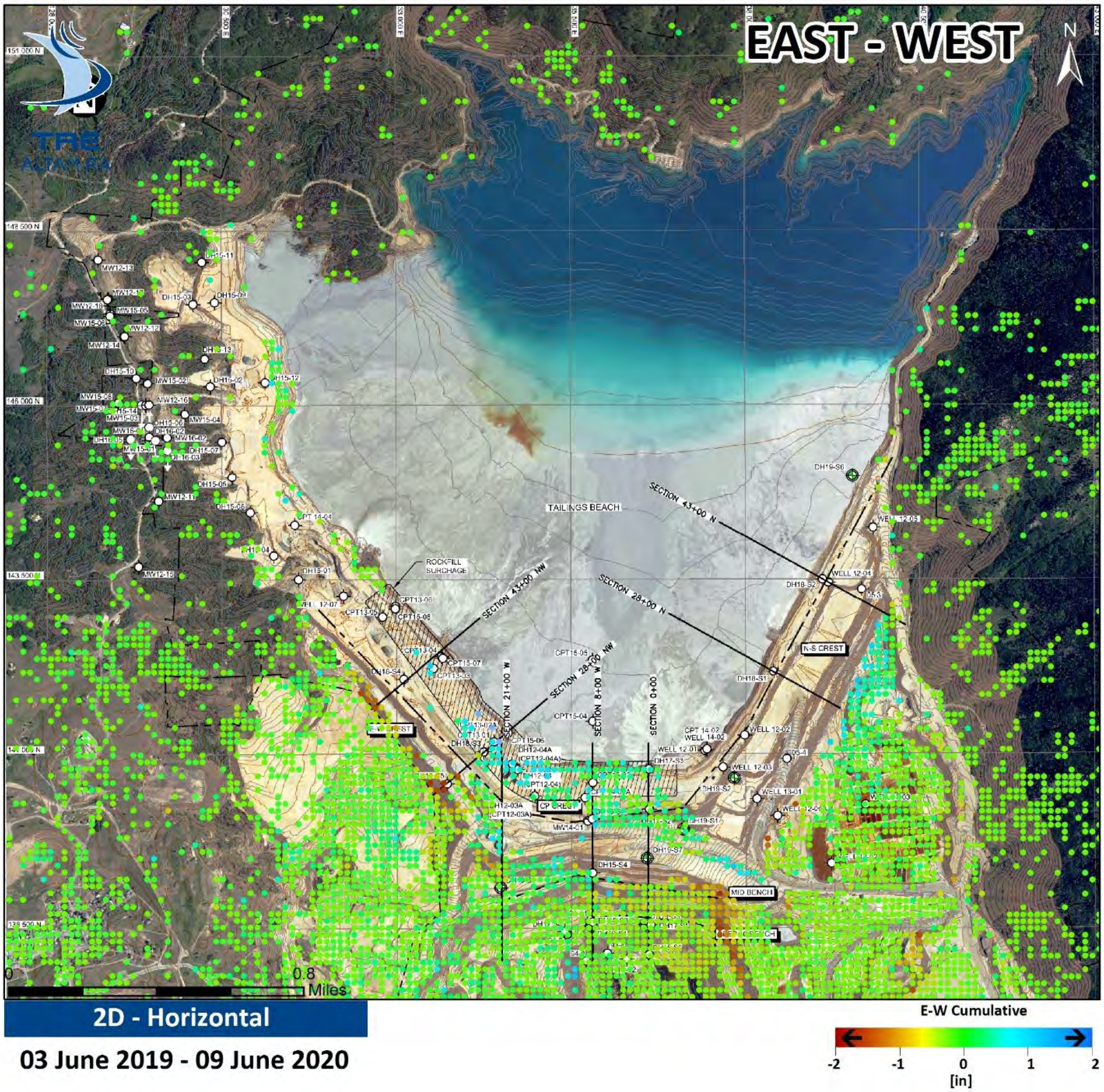


Figure 9: Overview of the east-west cumulative displacement over the YDTI.

3.3. LOS Results

The LOS displacement rates, measured in inches per year, for the ascending and descending LOS data are shown in Figure 10 and Figure 11, respectively. These data are used as input to produce 2-D (vertical and east-west) results. They generally provide a higher density of measurement points. Further observations are described in Section 4. Cumulative displacement measured in inches is shown in Figure 14 and Figure 15 for the ascending and descending analyses, respectively.

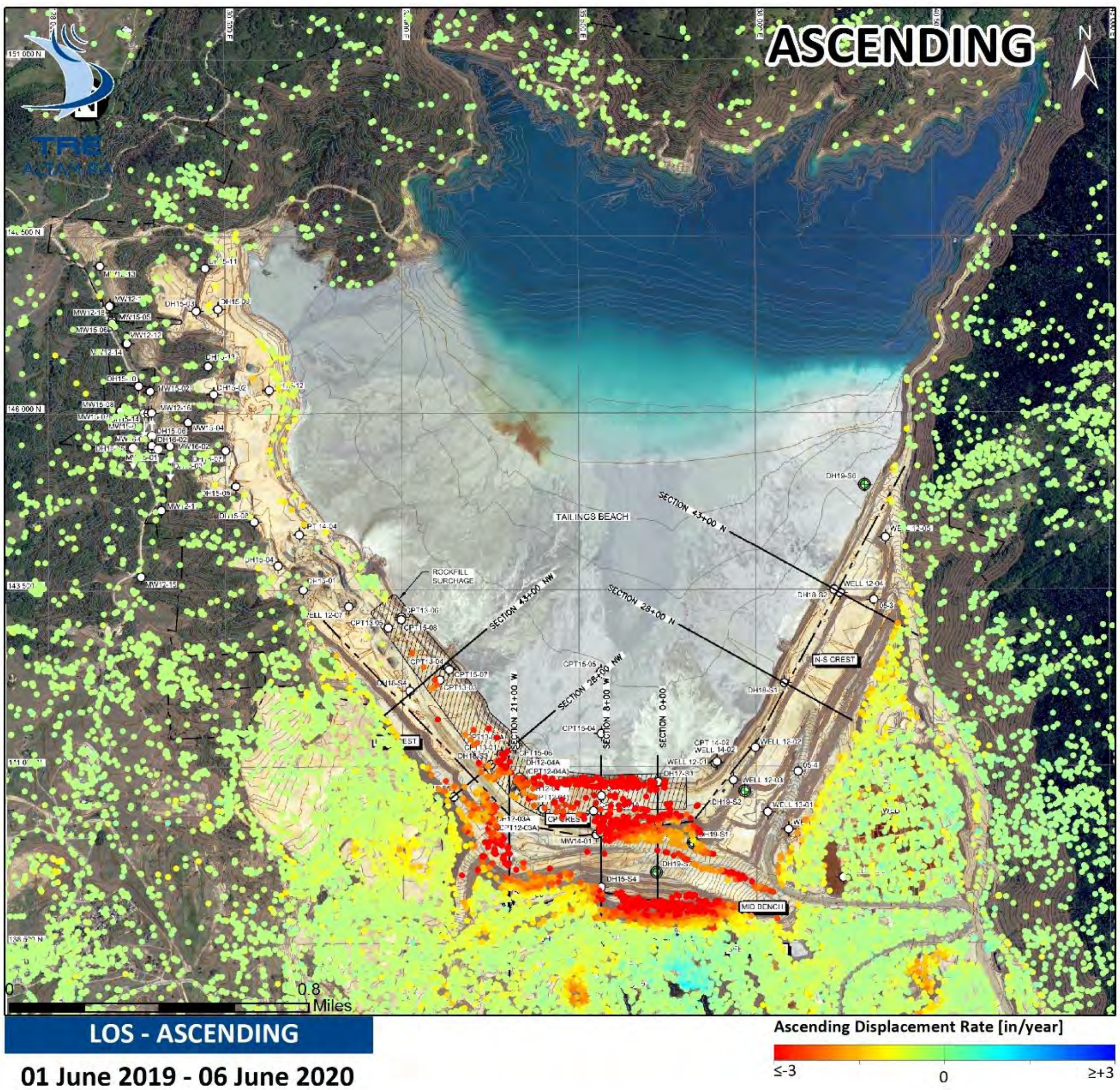


Figure 10: Overview of the ascending LOS displacement rates over the YDTI.

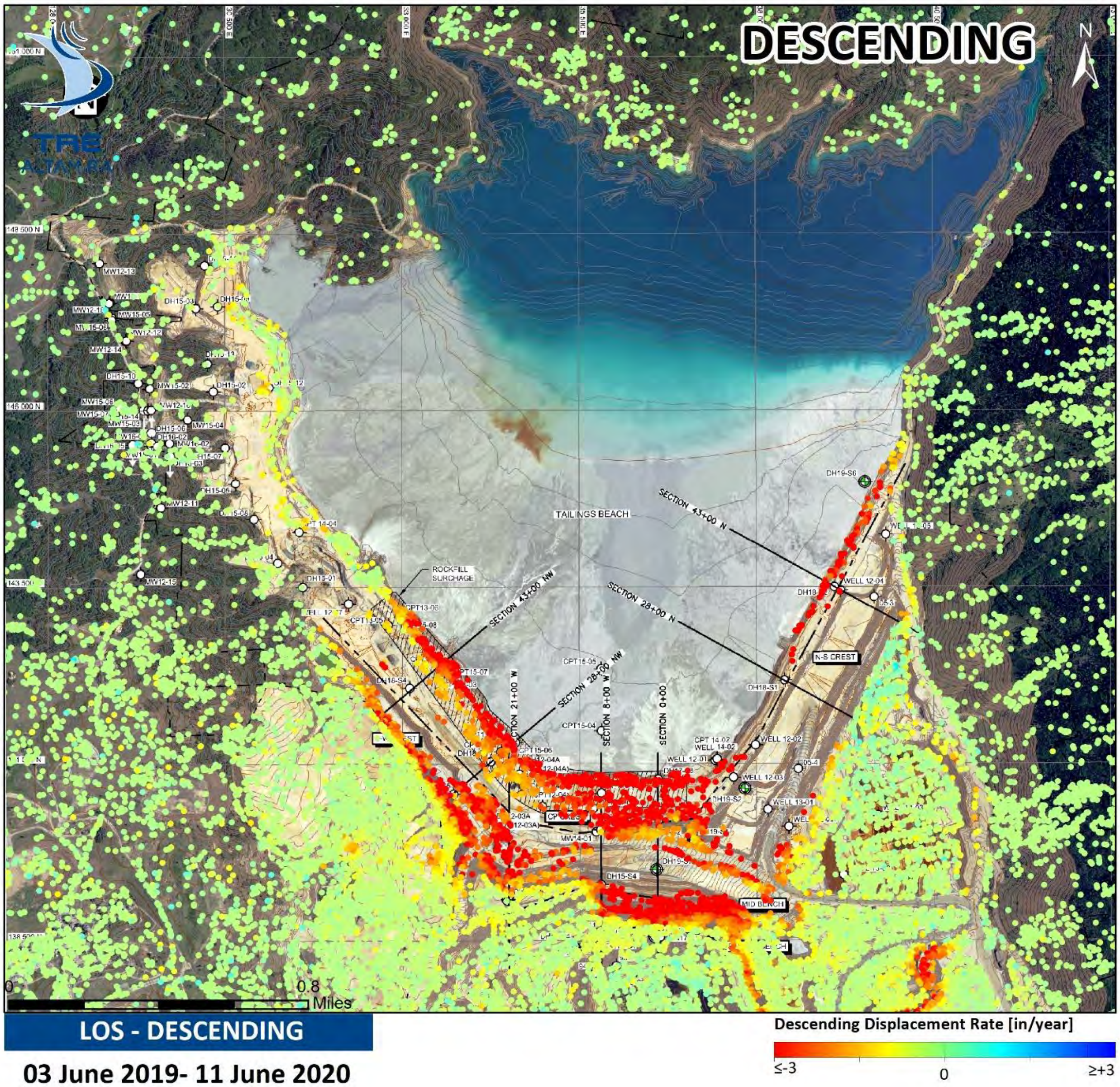


Figure 11: Overview of the displacement rates observed by the descending dataset over the YDTI.

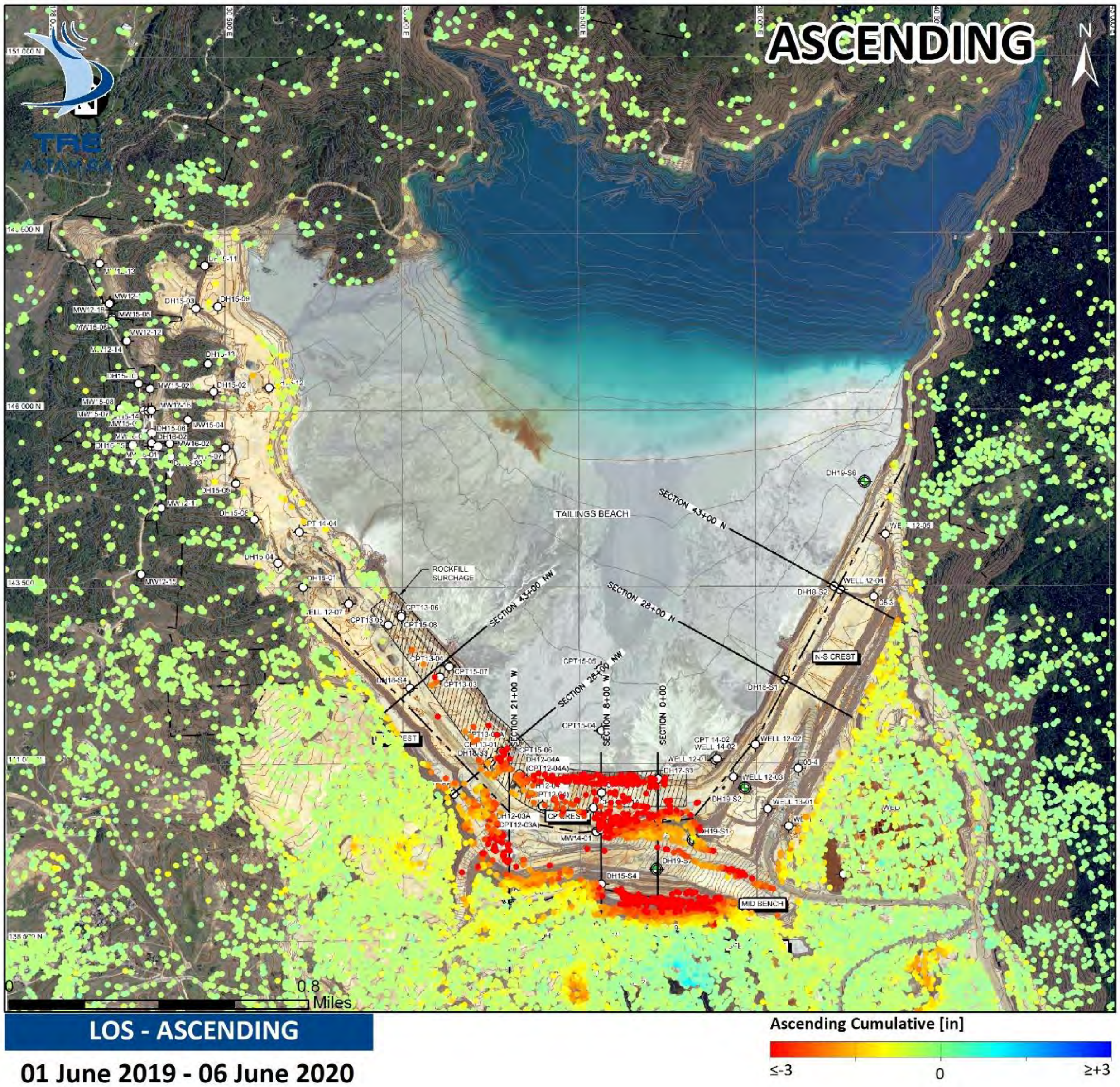


Figure 12: Overview of the cumulative displacement observed by the ascending dataset over the YDTI.

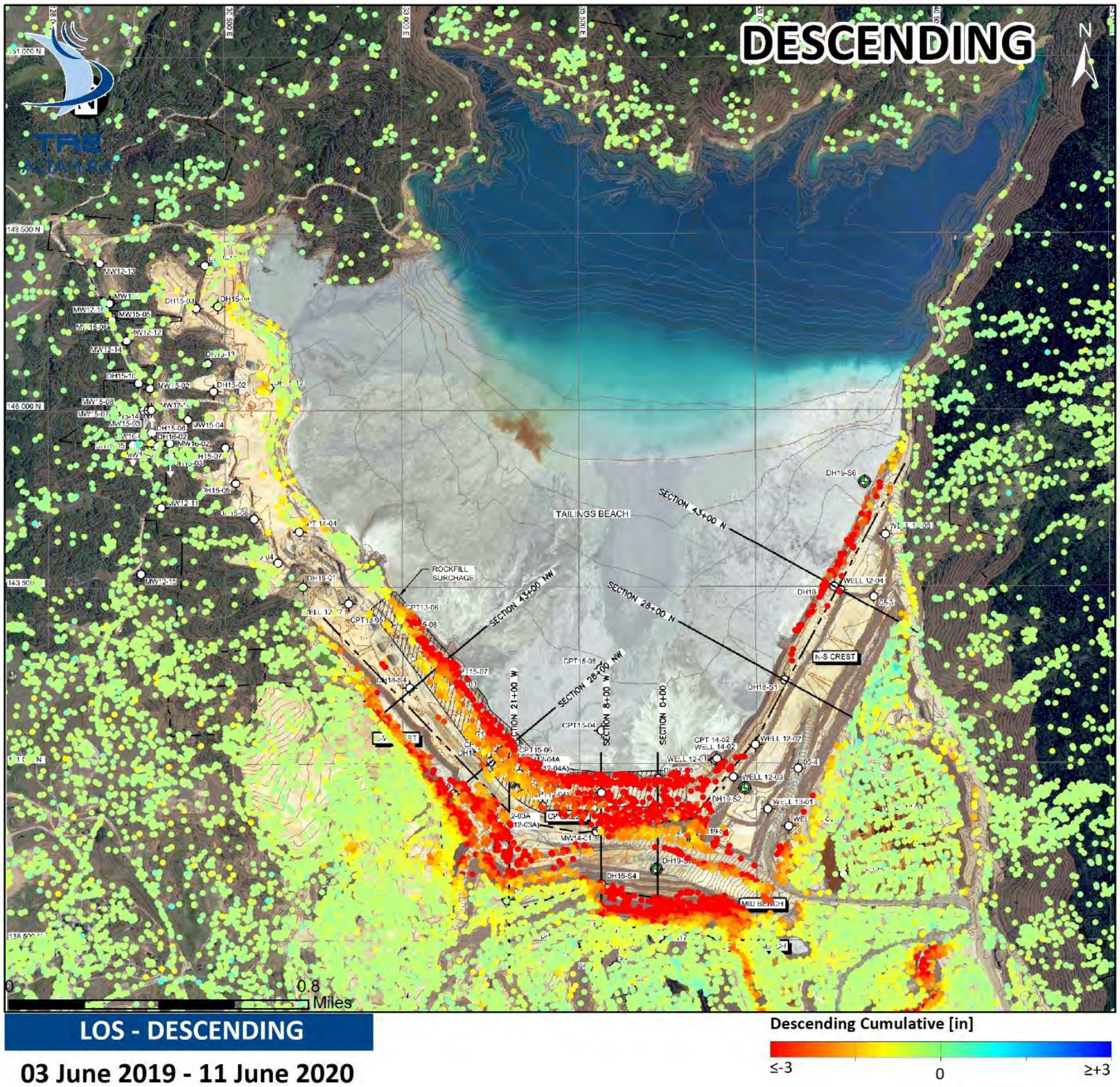


Figure 13: Overview of the cumulative displacement observed by the descending dataset over the YDTI.

3.4. Point Density and Precision

The TSX LOS SqueeSAR analysis provided a density of 3,227 MPs/mi^2 in the ascending orbit, and 3,122 MPs/mi^2 in the descending orbit (Table 2). The precision of the measurements, as indicated by the average standard deviation values, is ±0.05 and ±0.04 in/yr, respectively. The density and precision of the SqueeSAR measurement points is expected to continue improving as more images are acquired.

Table 2: Properties of the 2019 – 2020 SNT LOS analyses.

Attribute	Ascending	Descending
Date Range	01 June 2019 – 09 June 2020	05 March 2017 – 05 July 2019
N. of Images	18	16
Total points (PS + DS) **Number of PS** **Number of DS**	104,843 100,4042 4,047	101,4788 96,299 4,788
Average Point Density (pts/mi^2)	3,227	3,112
Average Displacement Rate Standard Deviation (in/yr)	±0.05	±0.04
Reference Point Location	138322.52 E 125622.78 N	135948.10 E 137871.34 N

The 2-D analysis provided a density of 799 MPs/mi^2. The precision of the measurements, as indicated by the average standard deviation values, is ±0.05 in/yr (Table 3).

Table 3: Properties of the 2017 – 2019 2-D analysis.

Attribute	Vertical/ East-West
Date Range	03 June 2019 – 09 June 2019
N. of Images	32
Total Measurement Points	25,974
Average Point Density (pts/mi^2)	799
Average Displacement Rate Standard Deviation (in/yr)	±0.05
Reference Point Location	130207.82 E 134877.40 N

4. Analysis

The analysis of the YDTI is broken into 2 parts. The first consists of single time series plots using the 2-D vertical and east-west datasets. The time series are positioned along 7 strategic sections across the YDTI as requested by the client. The second part consists of a collection of cross-sections over several strategic embankment crests, benches, and one rock fill surcharge area.

4.1. Time Series Analysis

4.1.1. Section 8+00 W

The analysis of six time series along Section 8+00 W indicated that the highest displacement rates were observed within the rockfill surcharge (Figure 14). Vertical displacement ranged from -5.50 in/yr within the rockfill surcharge upstream of the embankment to -2.95 in/yr at the crest of the embankment and 0.15 in/yr at the toe of the embankment. Horizontal displacement ranged from 1.35 in/yr towards the east at SEC8W-3 (Figure 16) to 0.01 in/yr E at SEC8W-6. Time series plots are shown in Figure 15 and Figure 16.

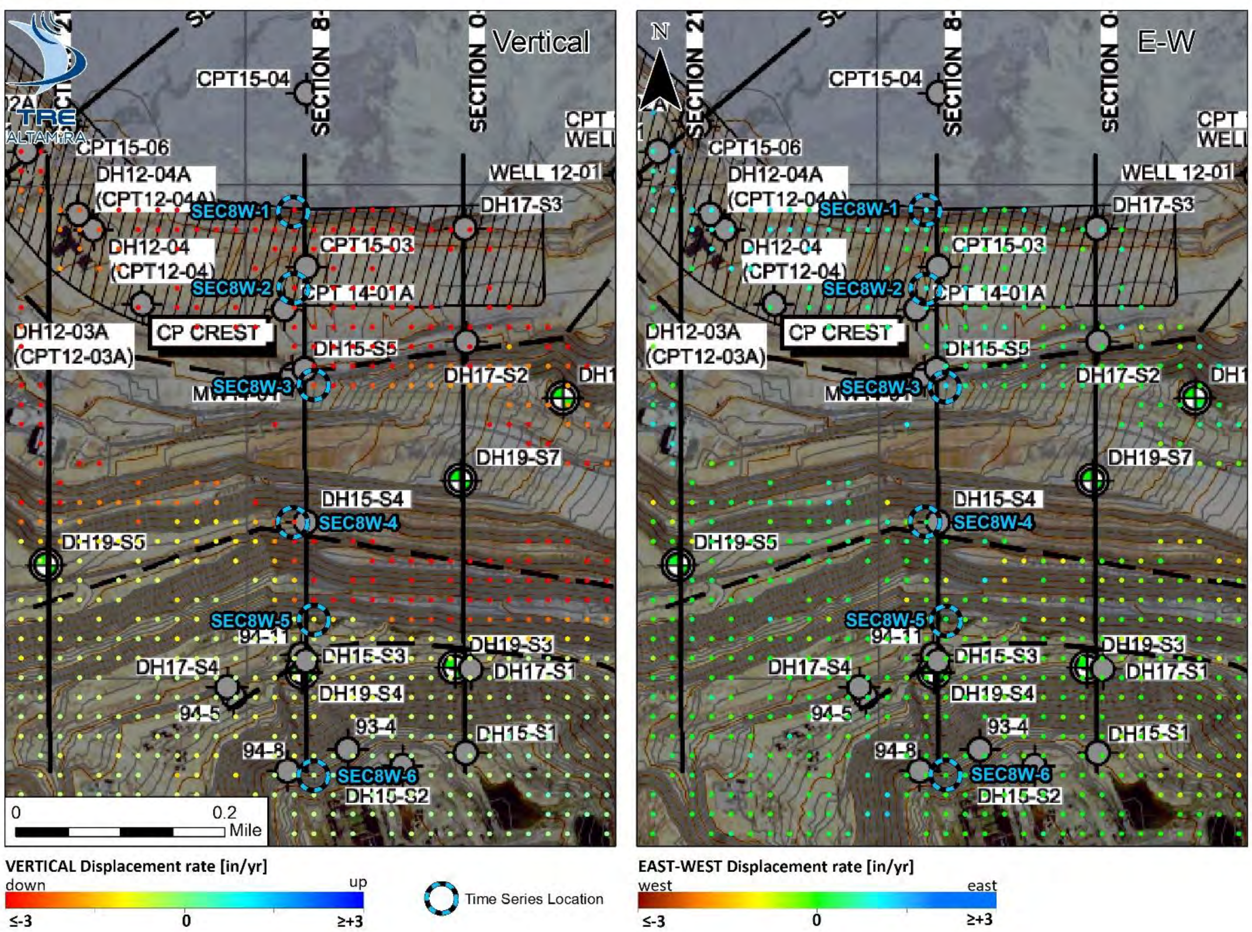
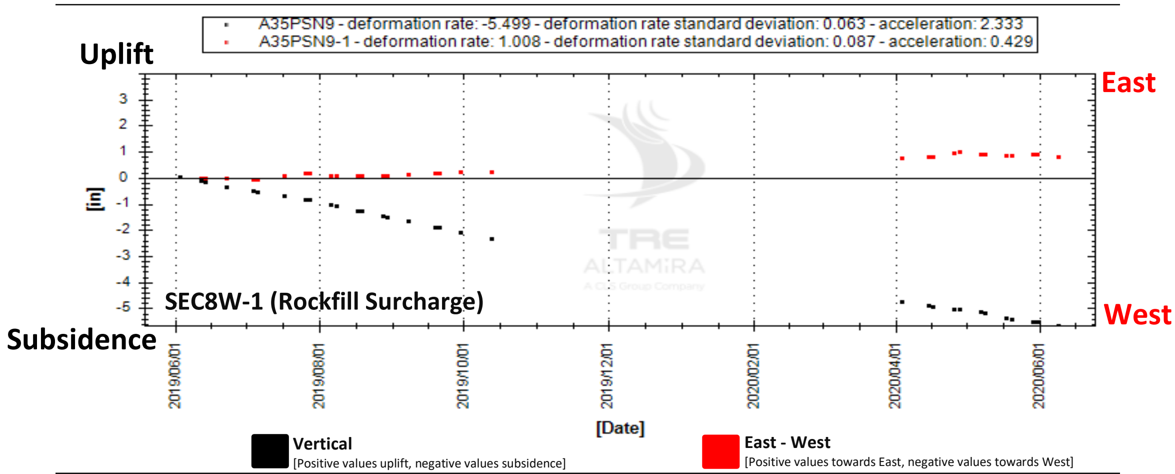
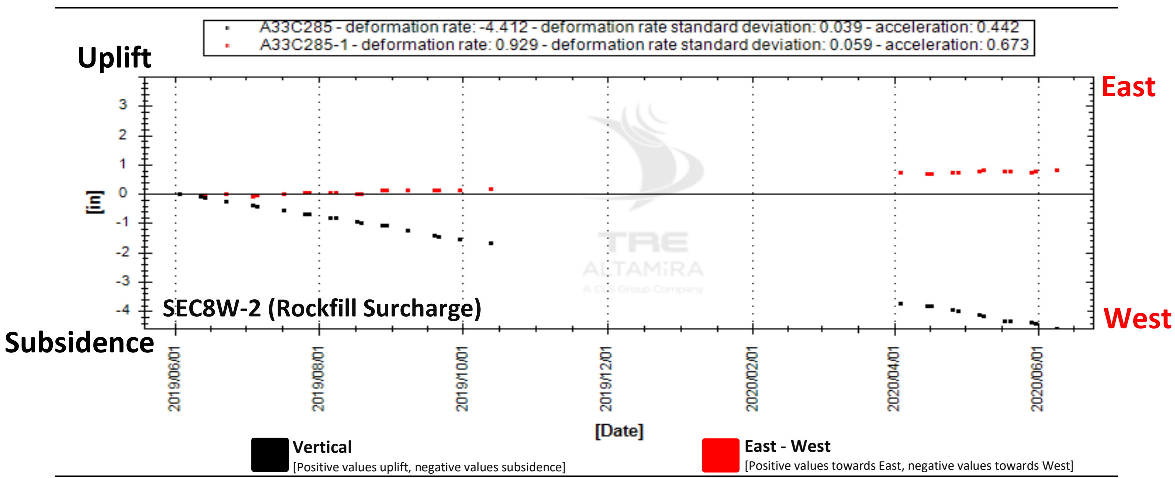


Figure 14: Location of TS analyzed along the Sec 8+00 W transect. Vertical displacement is represented in the left panel while the right panel shows the east-west movement.





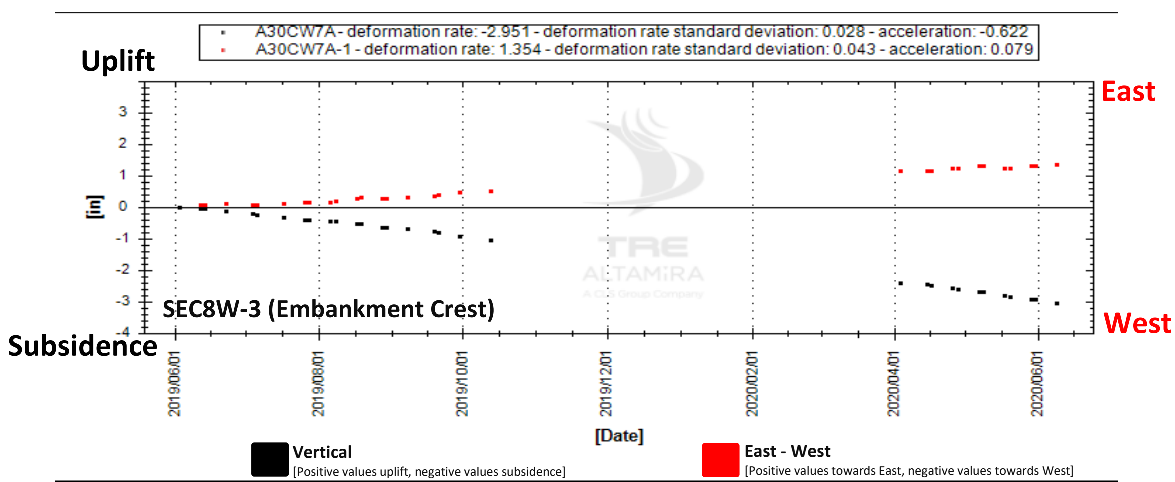


Figure 15: SEC8W-1 – SEC8W-3 displacement time series. Black represents the vertical displacement while red represents the E-W horizontal component of the motion.

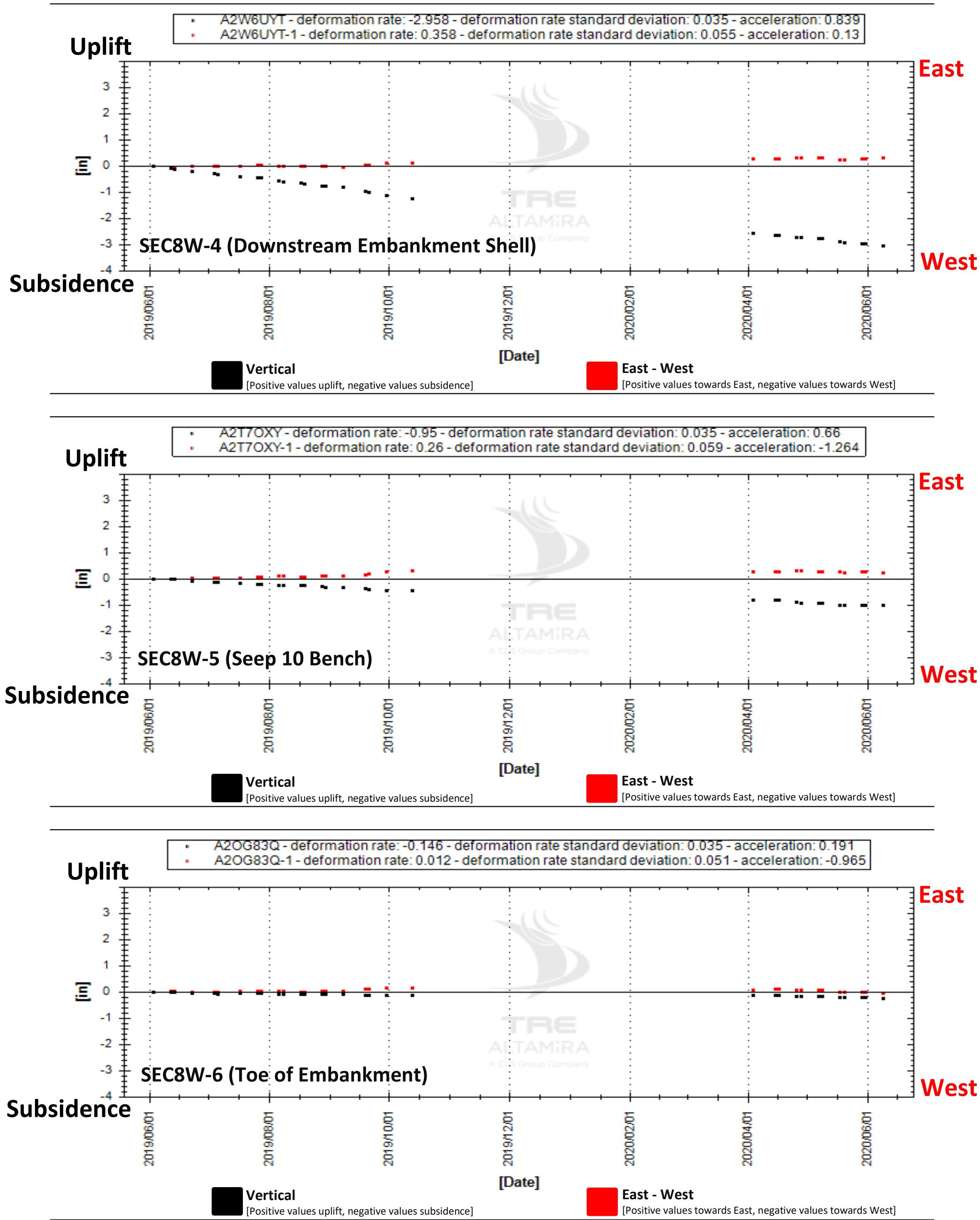


Figure 16: SEC8W-4 – SEC8W-6 displacement time series. Black represents the vertical displacement while red represents the E-W horizontal component of the motion.

4.1.2. Section 0+00

Six time series were used to analyze displacement along Section 0+00 (Figure 17). Vertical displacement ranged from -7.40 in/yr at SEC0-4 within the recently constructed tailings pipeline ramp (Figure 18) to -0.13 in/yr at the toe of the embankment (Figure 19). Motion of up to -3.89 in/yr was observed at the crest of the embankment. Eastward motion of up to 0.67 in/yr occurred near the top of the escarpment.

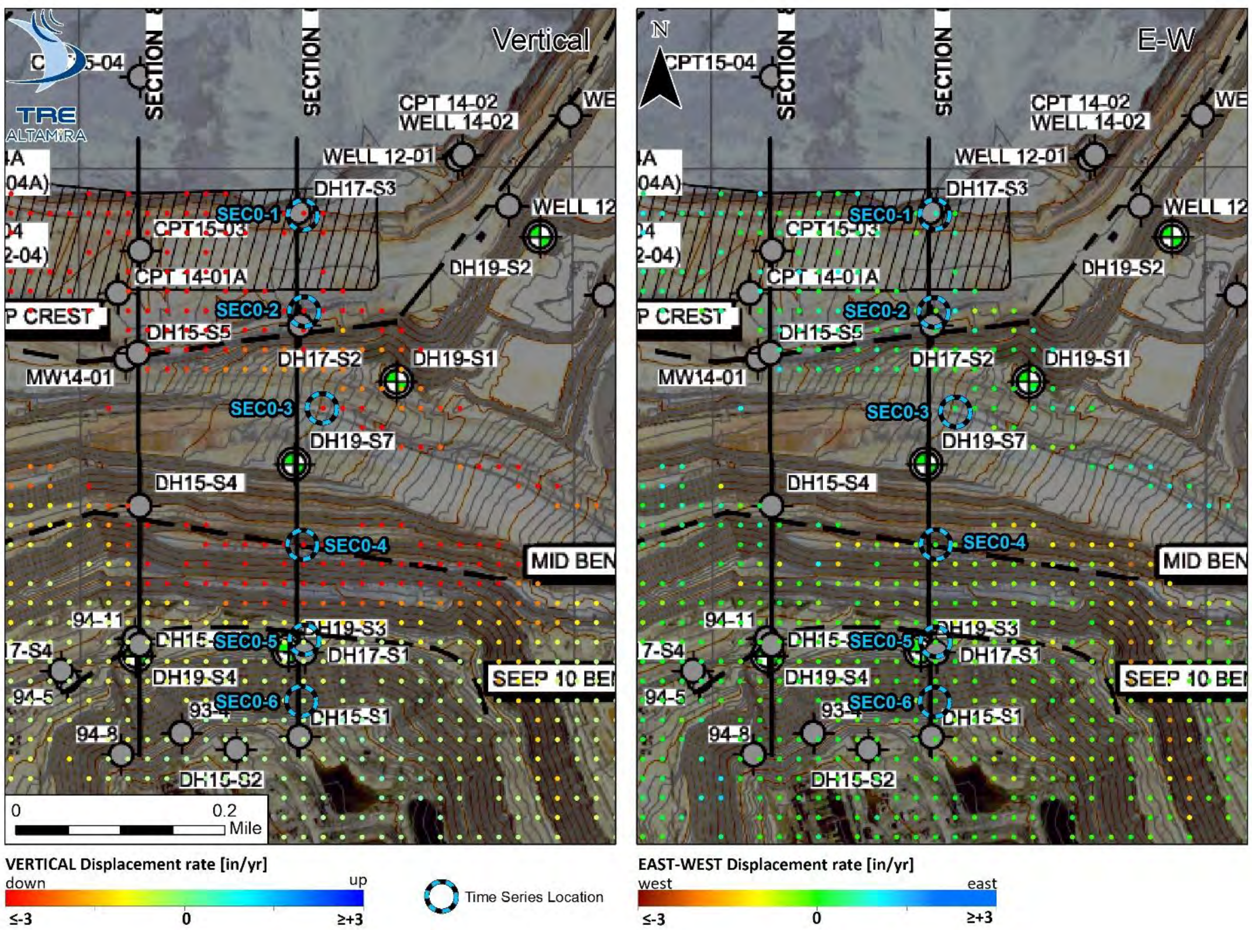


Figure 17: Location of TS analyzed along the Sec 0+00 W transect. Vertical displacement is represented in the left panel while the right panel shows the east-west movement.

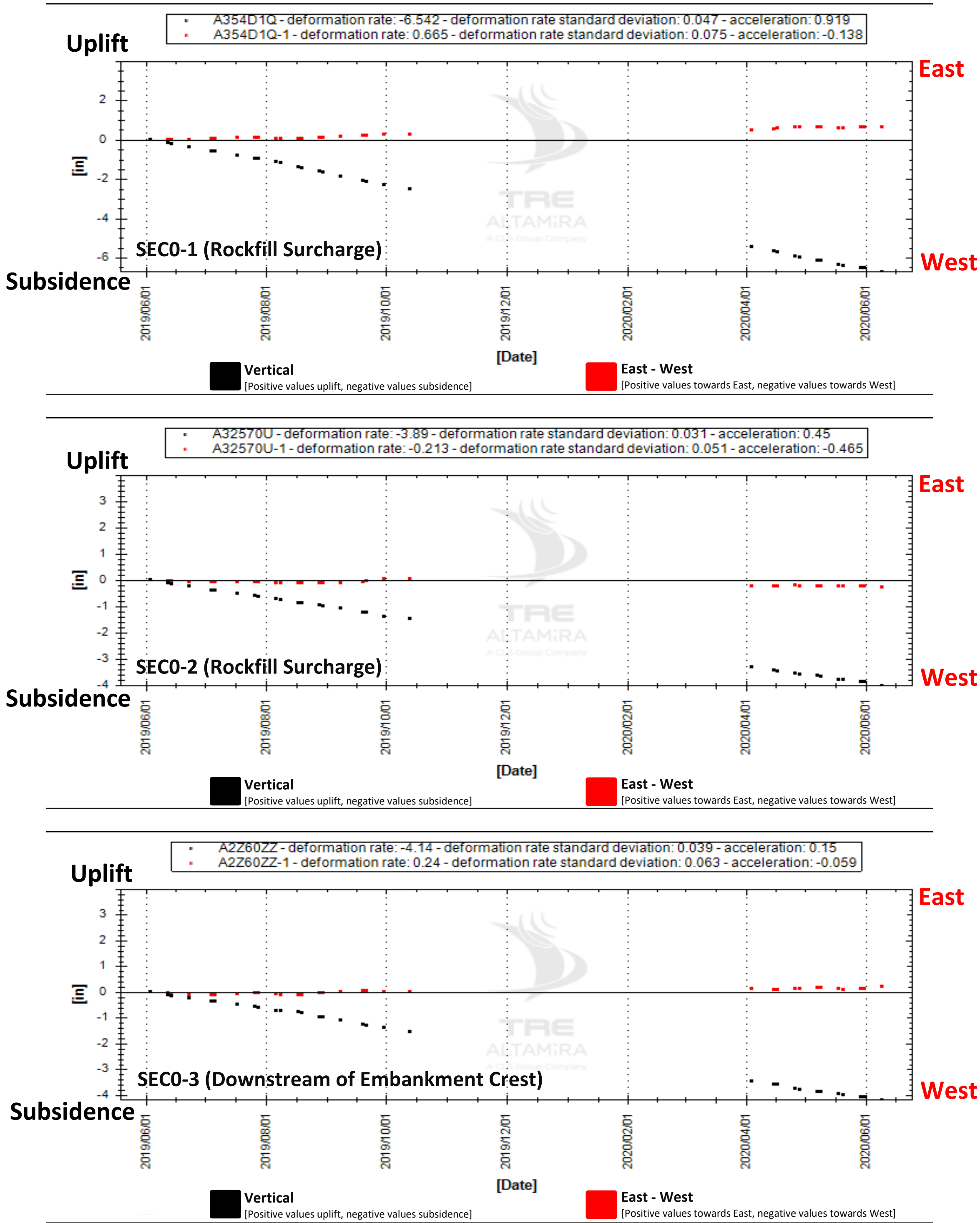


Figure 18: SEC0-1 – SEC0-3 displacement time series. Black represents the vertical displacement while red represents the E-W horizontal component of the motion.

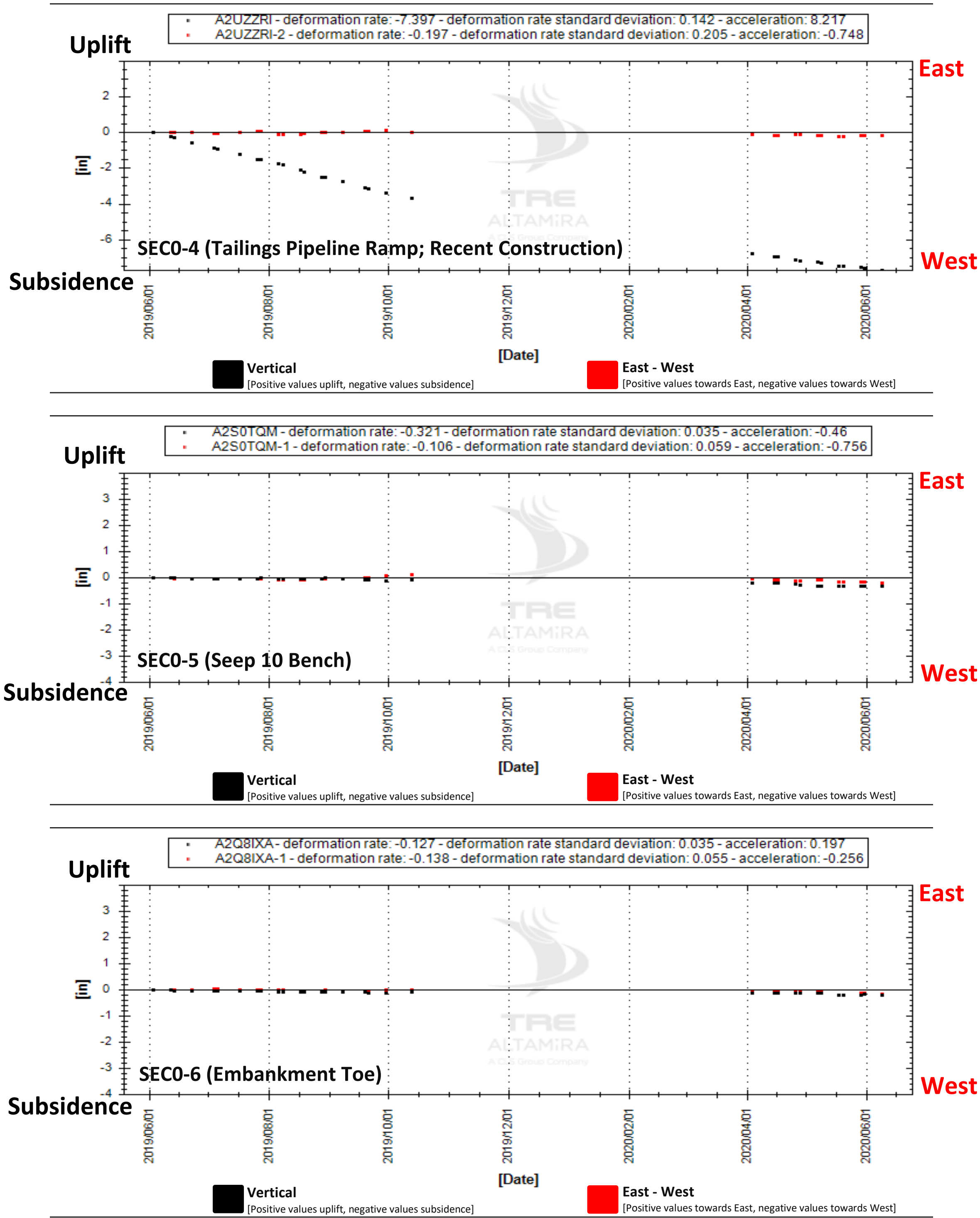


Figure 19: SEC0-4 – SEC0-6 displacement time series. Black represents the vertical displacement while red represents the E-W horizontal component of the motion.

4.1.3. Section 43+00 NW

Movement along Section 43+00 NW (Figure 20) was analyzed by plotting the vertical and east-west motion (SEC43NW-1 – SEC43NW-5; Figure 21 to Figure 22). The highest rates of displacement occurred within the rockfill surcharge (rockfill over tailings material) with up to -2.12 in/yr of settlement associated with 0.98 in/yr of eastward motion. Rates of displacement decrease closer to the toe of the embankment, with-1.10 in/yr of subsidence and 0.68 in/yr of westward motion observed. No data are available for the embankment crest (showed with a dashed line on Figure 20) due to recent construction activity.

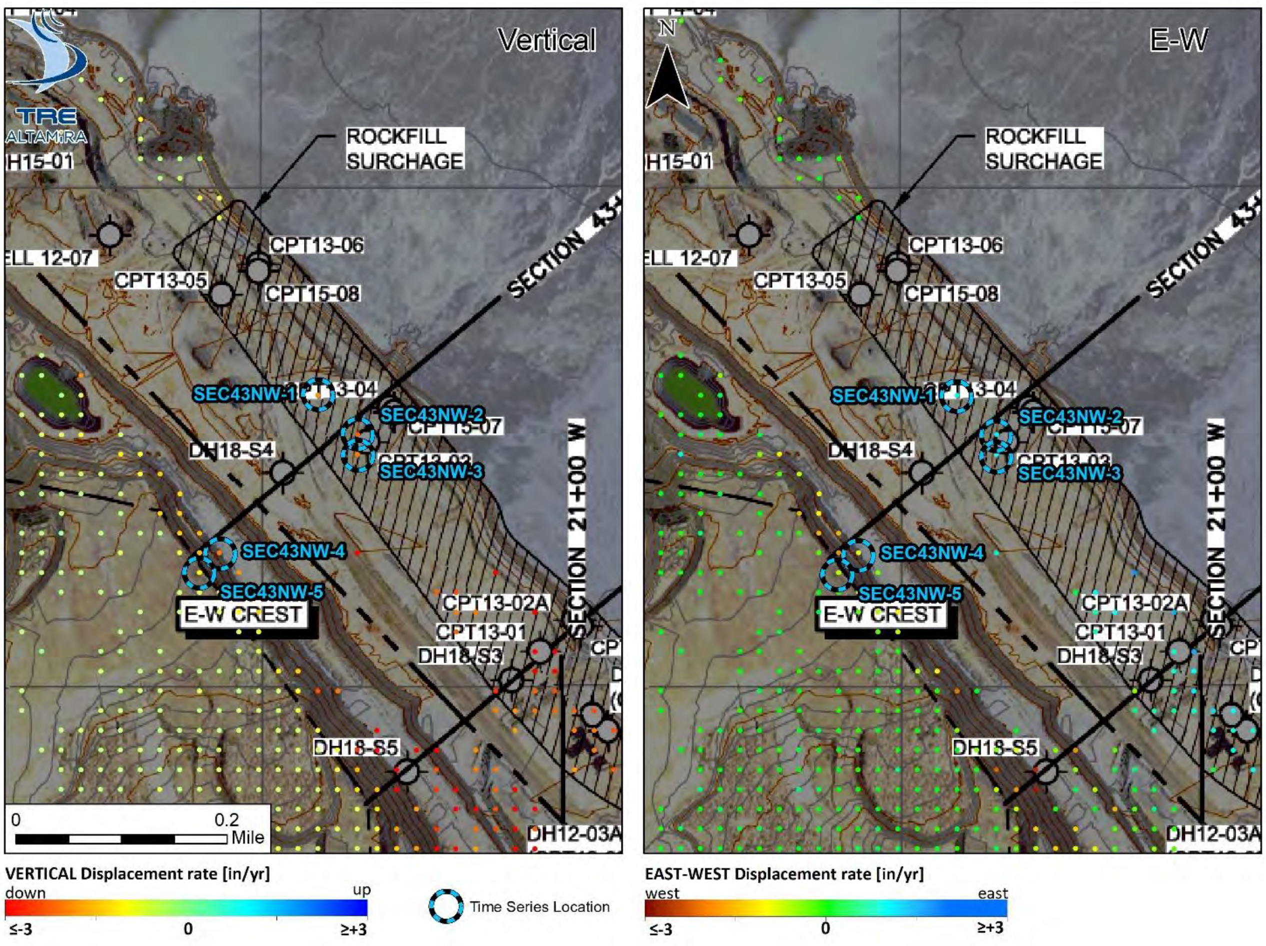
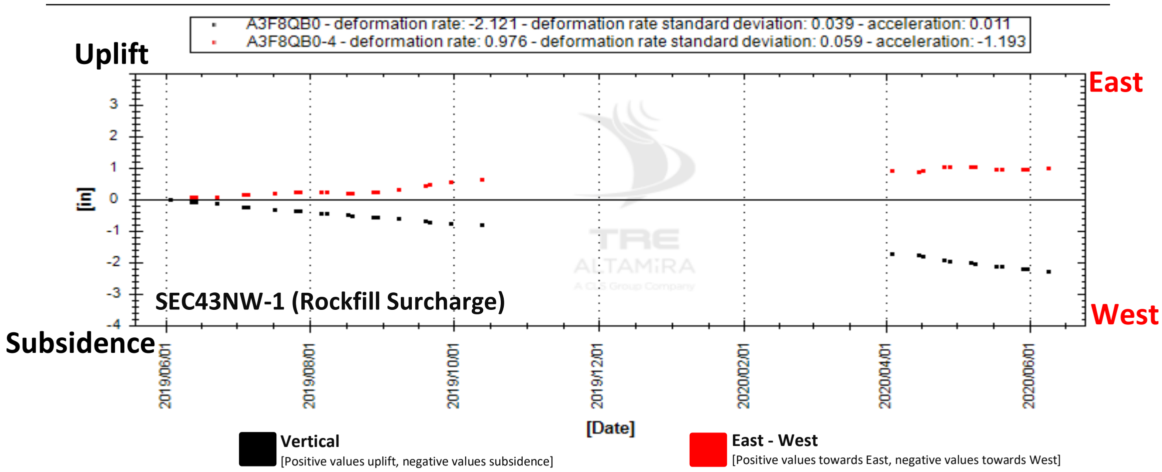
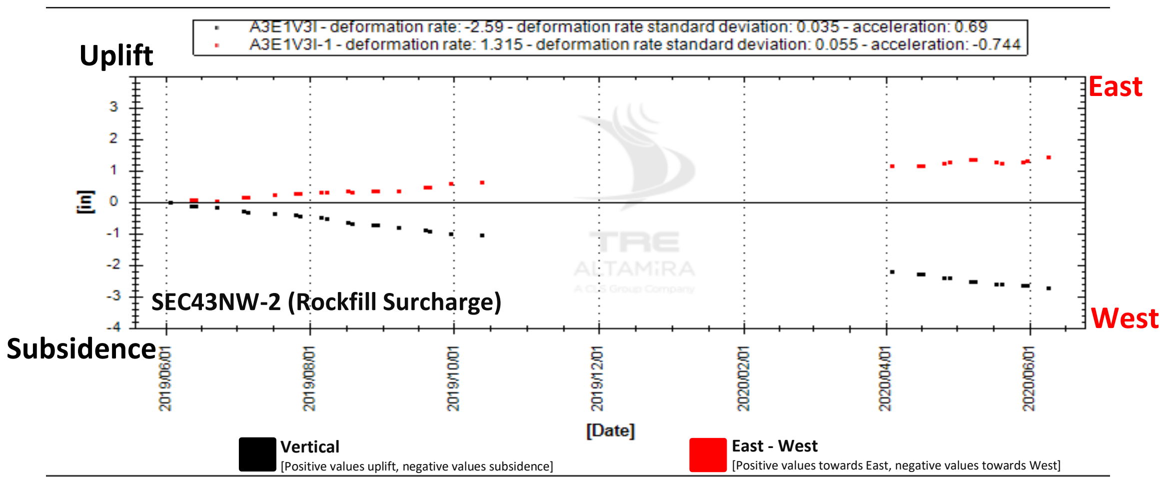


Figure 20: Location of TS analyzed along the Sec 43+00 NW transect. Vertical displacement is represented in the left panel while the right panel shows the east-west movement.





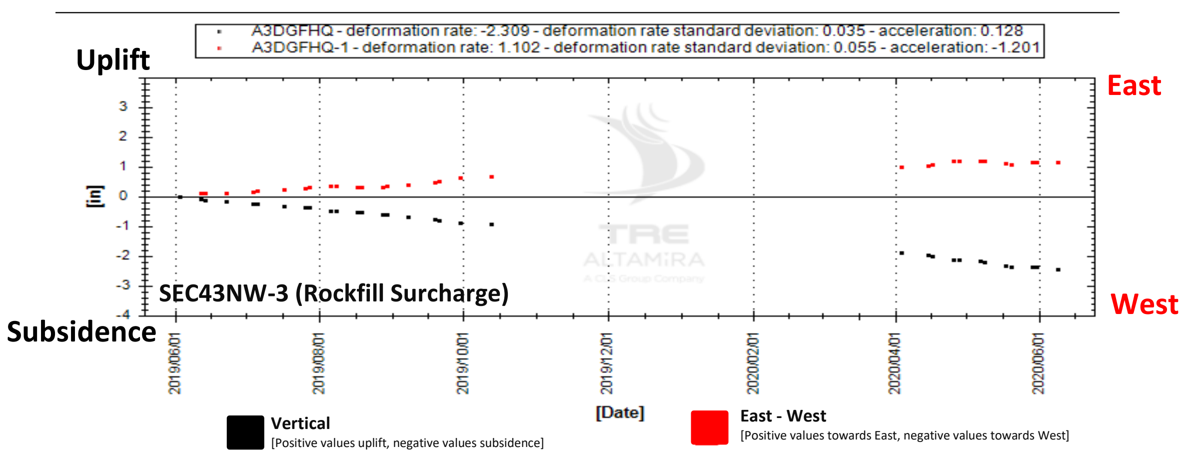
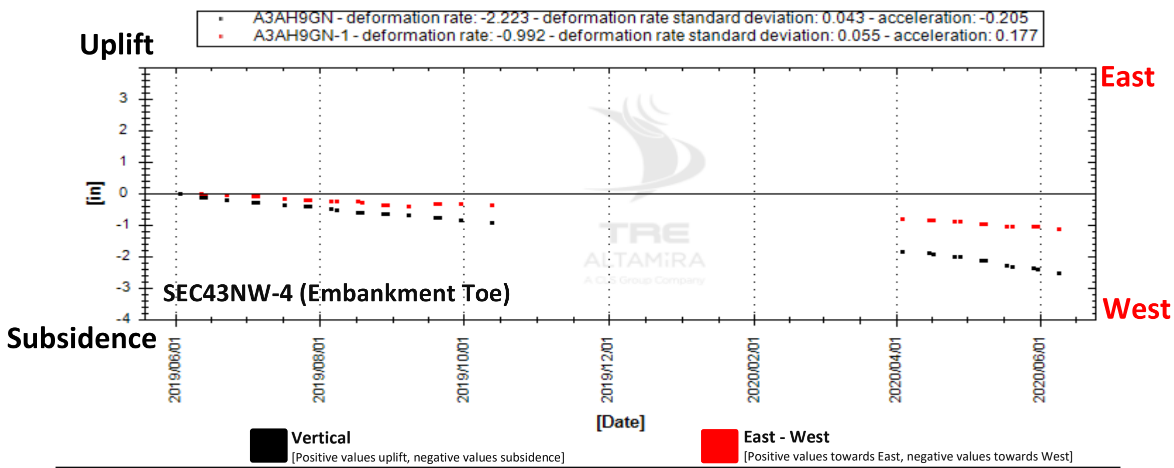


Figure 21: SEC43NW-1 – SEC43NW-3 displacement time series. Black represents the vertical displacement while red represents the E-W horizontal component of the motion.



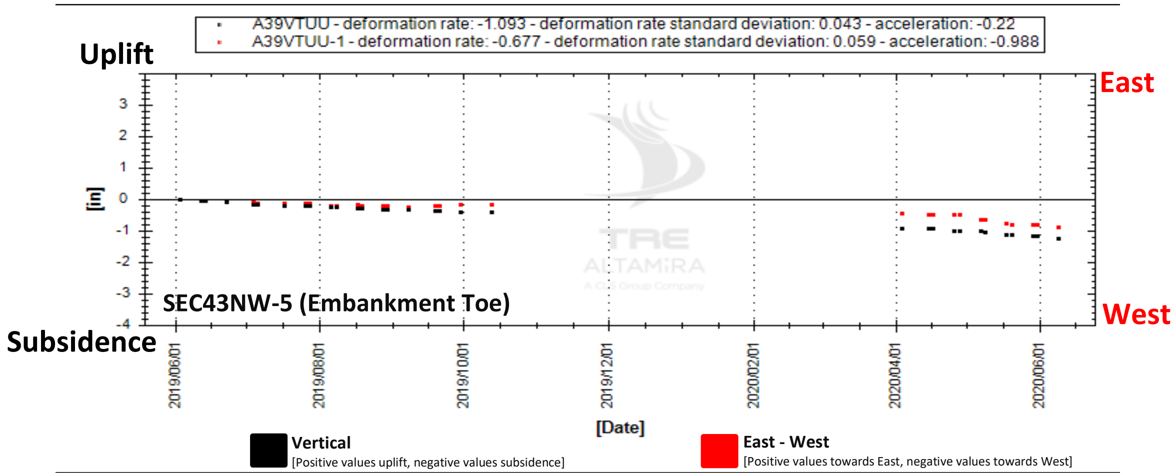


Figure 22: SEC43NW-4 and SEC43NW-5 displacement time series. Black represents the vertical displacement while red represents the E-W horizontal component of the motion.

4.1.4. Section 28+00 NW

Three time series were selected to examine displacement along the 28+00 NW transect (Figure 23). Motion north of the piezometric monitoring site DH18-S5 showed up to -3.41 in/yr of vertical motion, and 2.07 in/yr of westward motion (SEC28NW-1; Figure 24). Near the toe of the embankment, -3.66 in/yr of vertical motion was observed along with 2.65 in/yr of westward motion (SEC28NW-3; Figure 24). No data are available for the embankment crest (shown with a dashed line on Figure 23) due to recent construction activity.

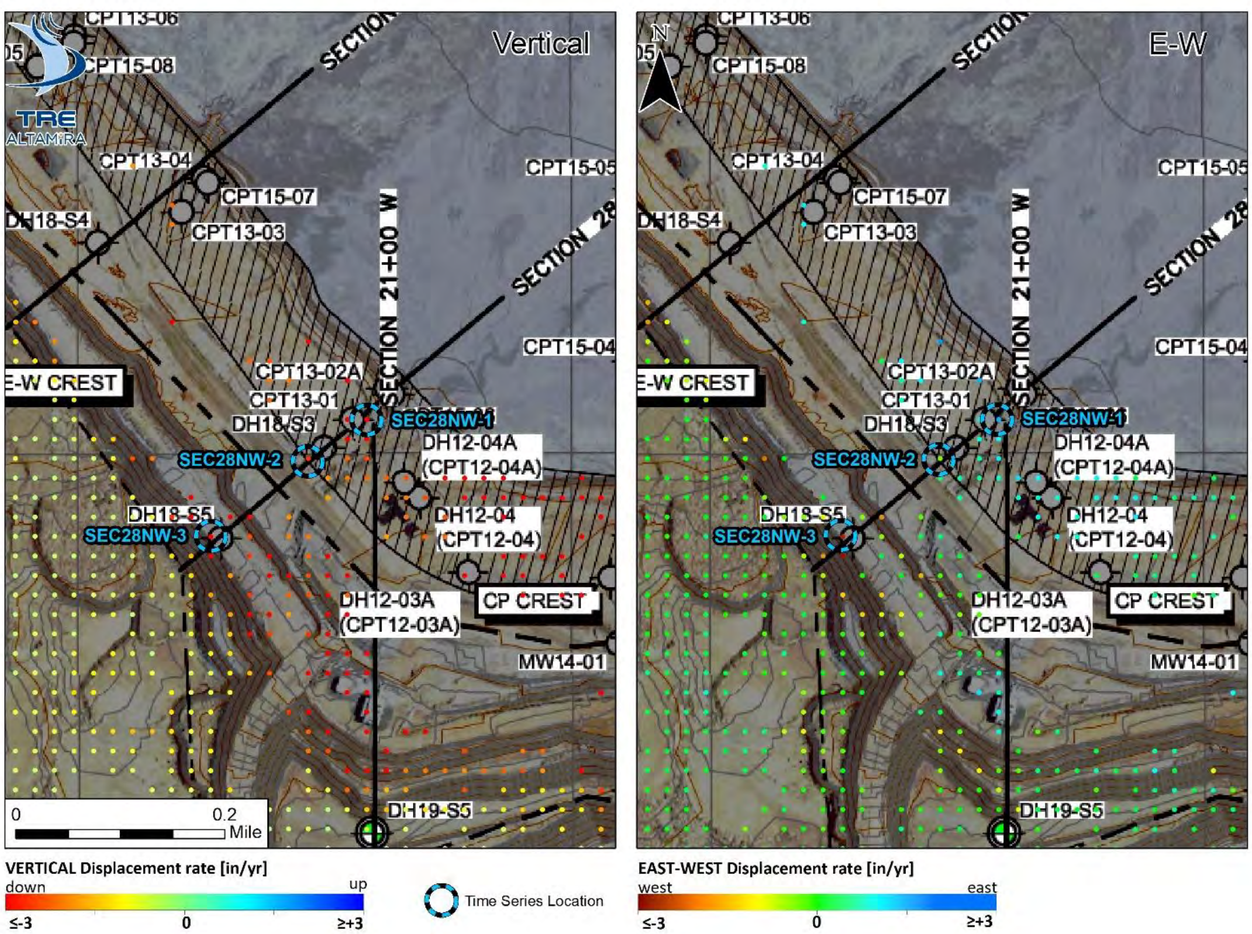


Figure 23: Location of TS analyzed along the Sec 28+00 NW transect. Vertical displacement is represented in the left panel while the right panel shows the east-west movement.

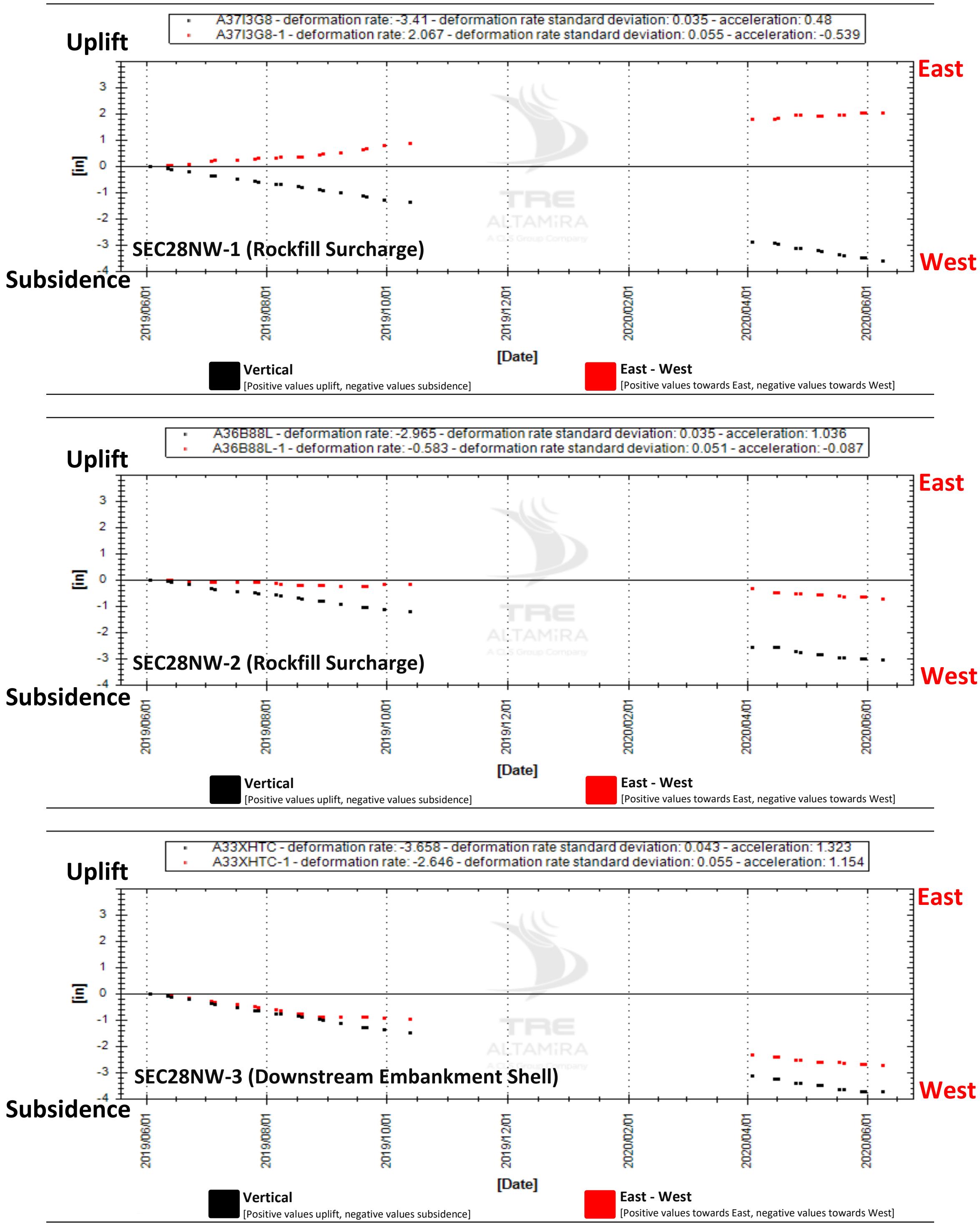


Figure 24: SEC28NW-1 – SEC28NW-3 displacement time series. Black represents the vertical displacement while red represents the E-W horizontal component of the motion.

4.1.5. Section 21+00 W

Section 21+00W was analyzed using six time series (Figure 25). Motion at the rockfill surcharge upstream of the embankment reached -3.41 in/yr verticallly and 2.07 in/yr in an eastward direction. Motion of up to -3.49 in/yr was monitored at the embankment crest. The toe of the embankment shows the lowest rate of motion with -0.14 in/yr of vertical movement and 0.13 in/yr of westward motion

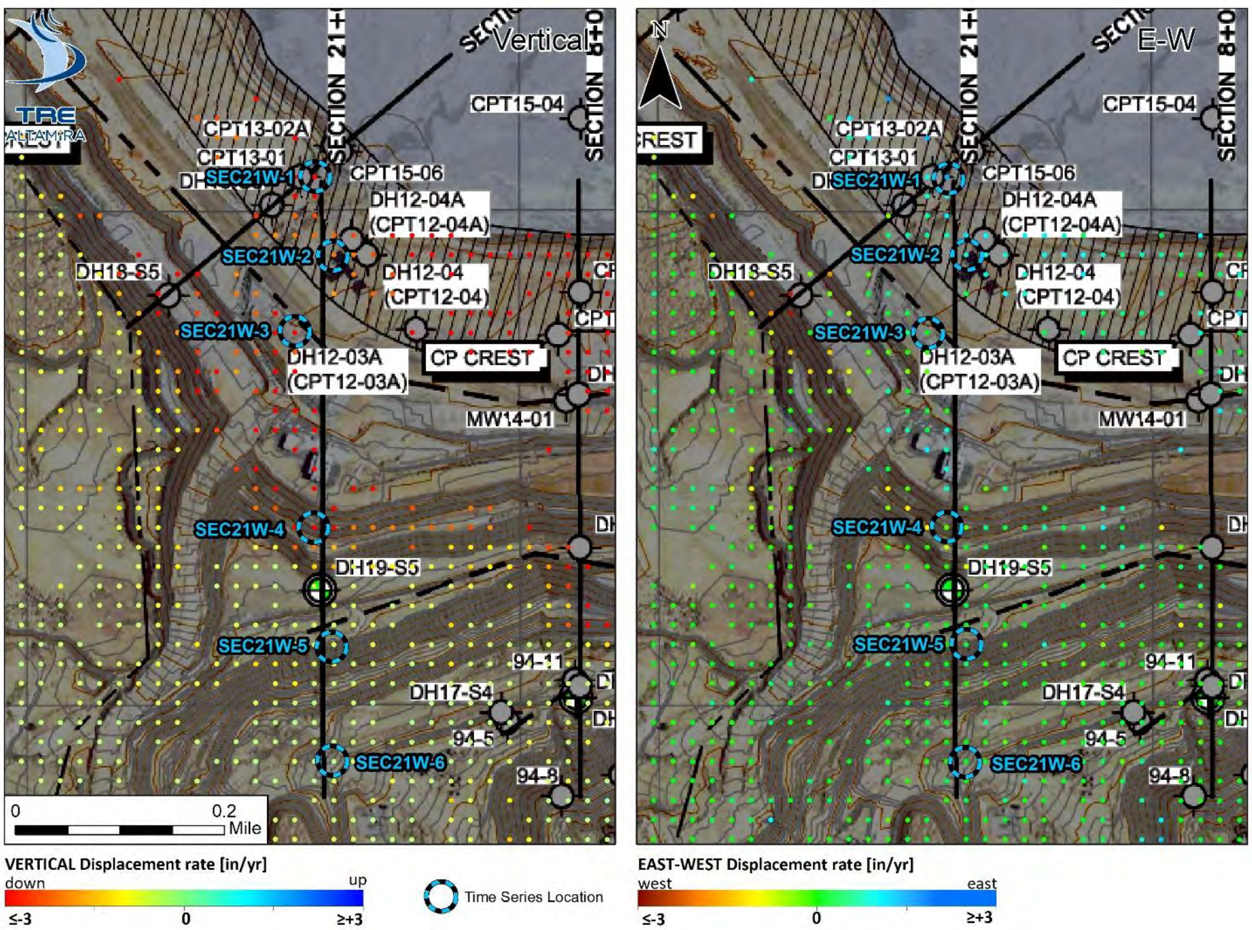


Figure 25: Location of TS analyzed along the Sec 21+00 W transect. Vertical displacement is represented in the left panel while the right panel shows the east-west movement.

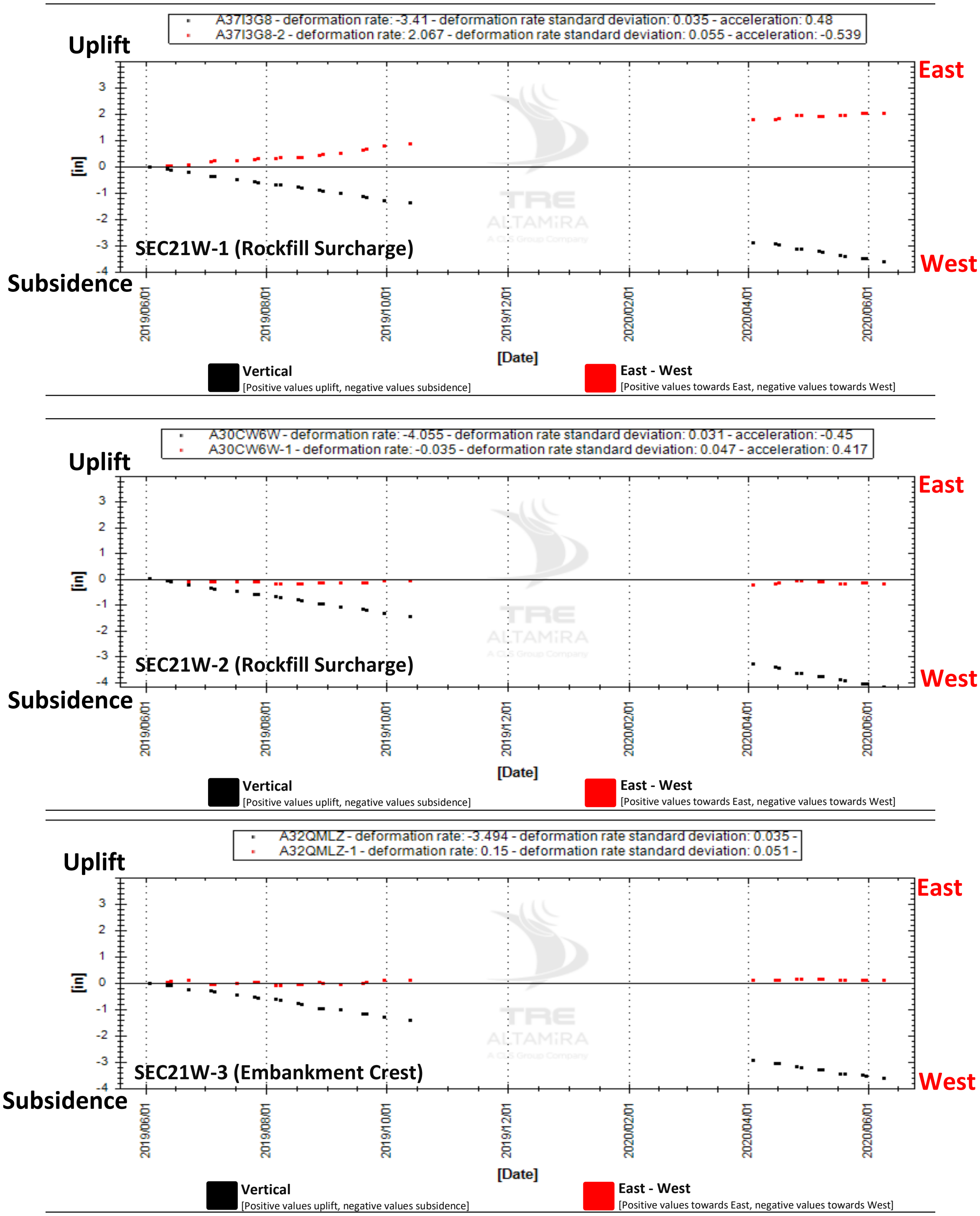
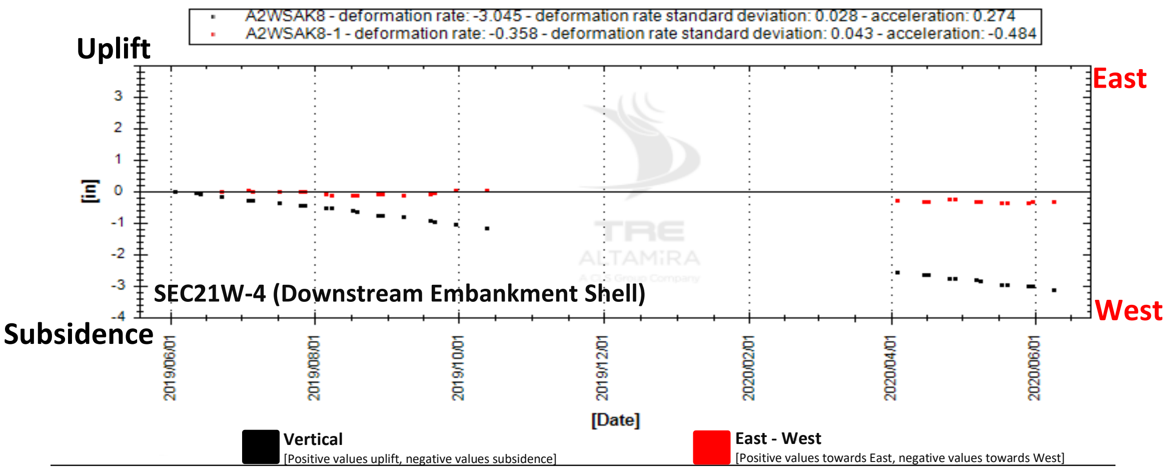
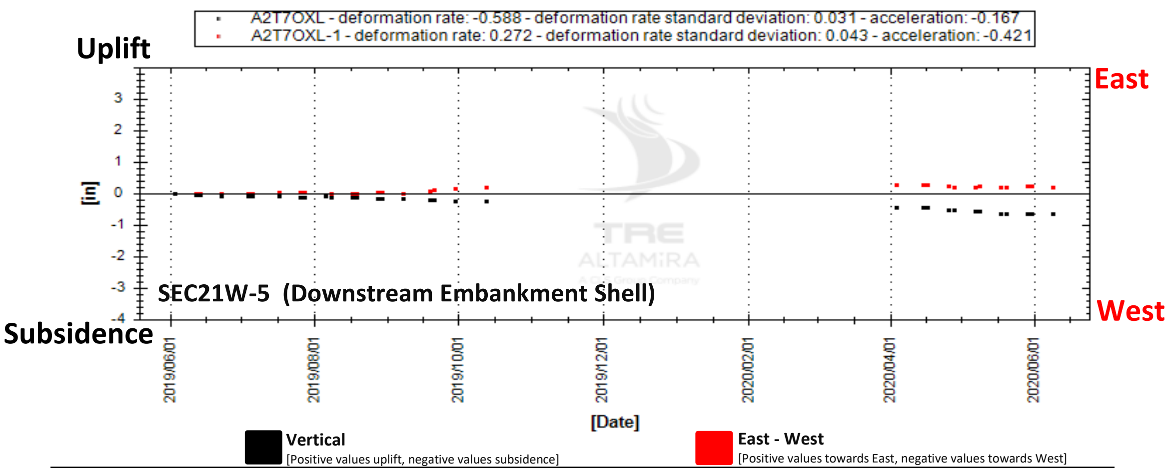


Figure 26: SEC21W-1 - SEC21W-3 displacement time series. Black represents the vertical displacement while red represents the E-W horizontal component of the motion.





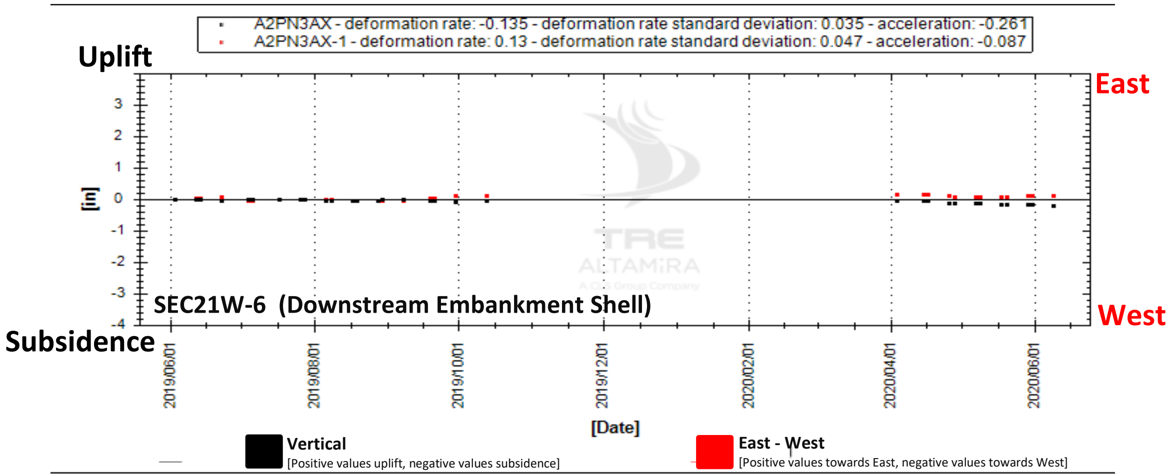


Figure 27: SEC21W-4 - SEC21W-6 displacement time series. Black represents the vertical displacement while red represents the E-W horizontal component of the motion.

4.2. Cross-Section Analysis

Six cross-sections were created over key features of the YDTI using the 2-D datasets (Figure 28 and Figure 29). The cross-section profiles were produced using a coherence-weighted average of all measurement points identified within 250 ft of the cross-section line, meaning that all measurement points within a 500 ft buffer were used to produce the profiles.

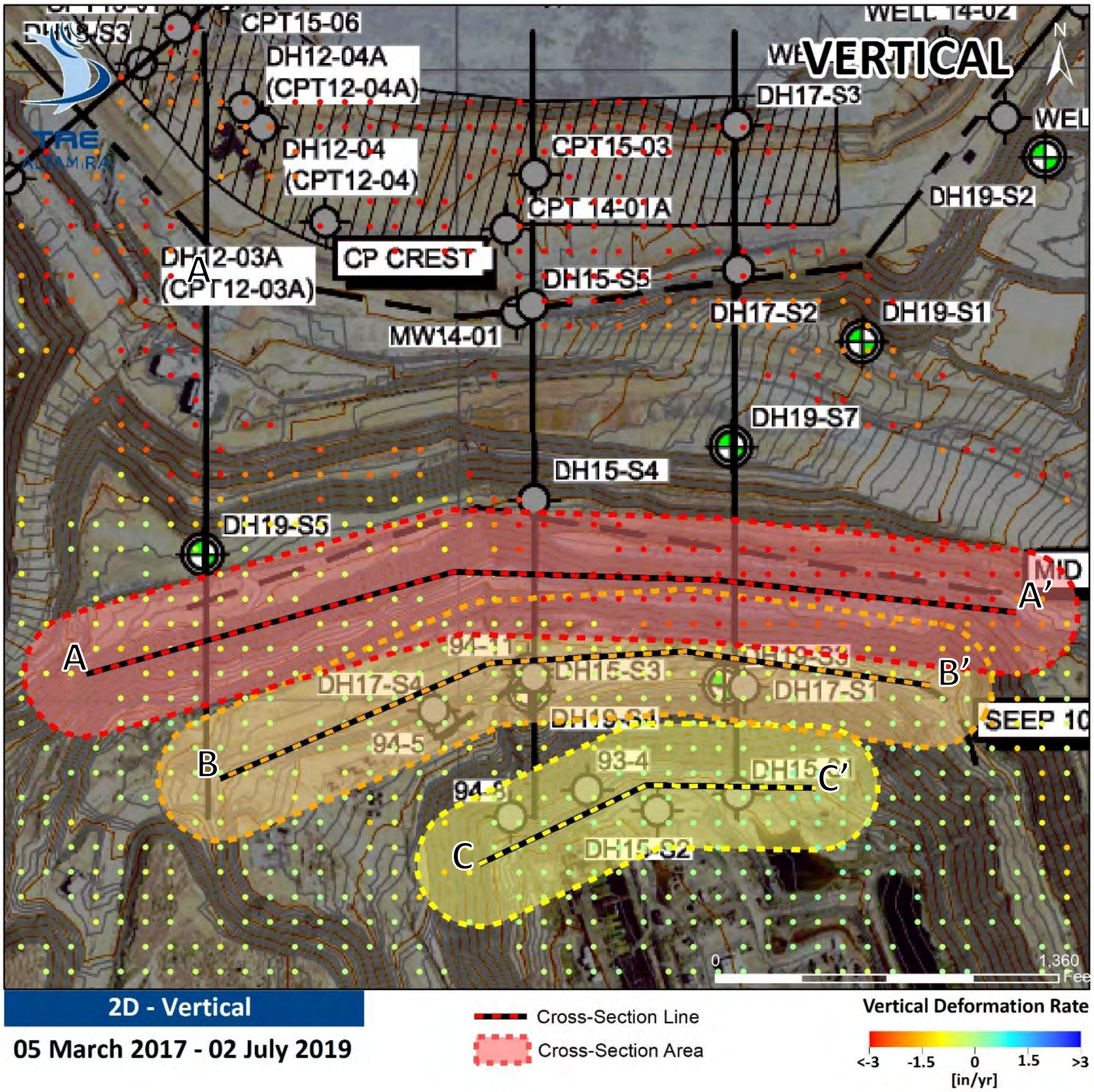


Figure 28: Cross-section locations over the YDTI using the vertical displacement dataset.

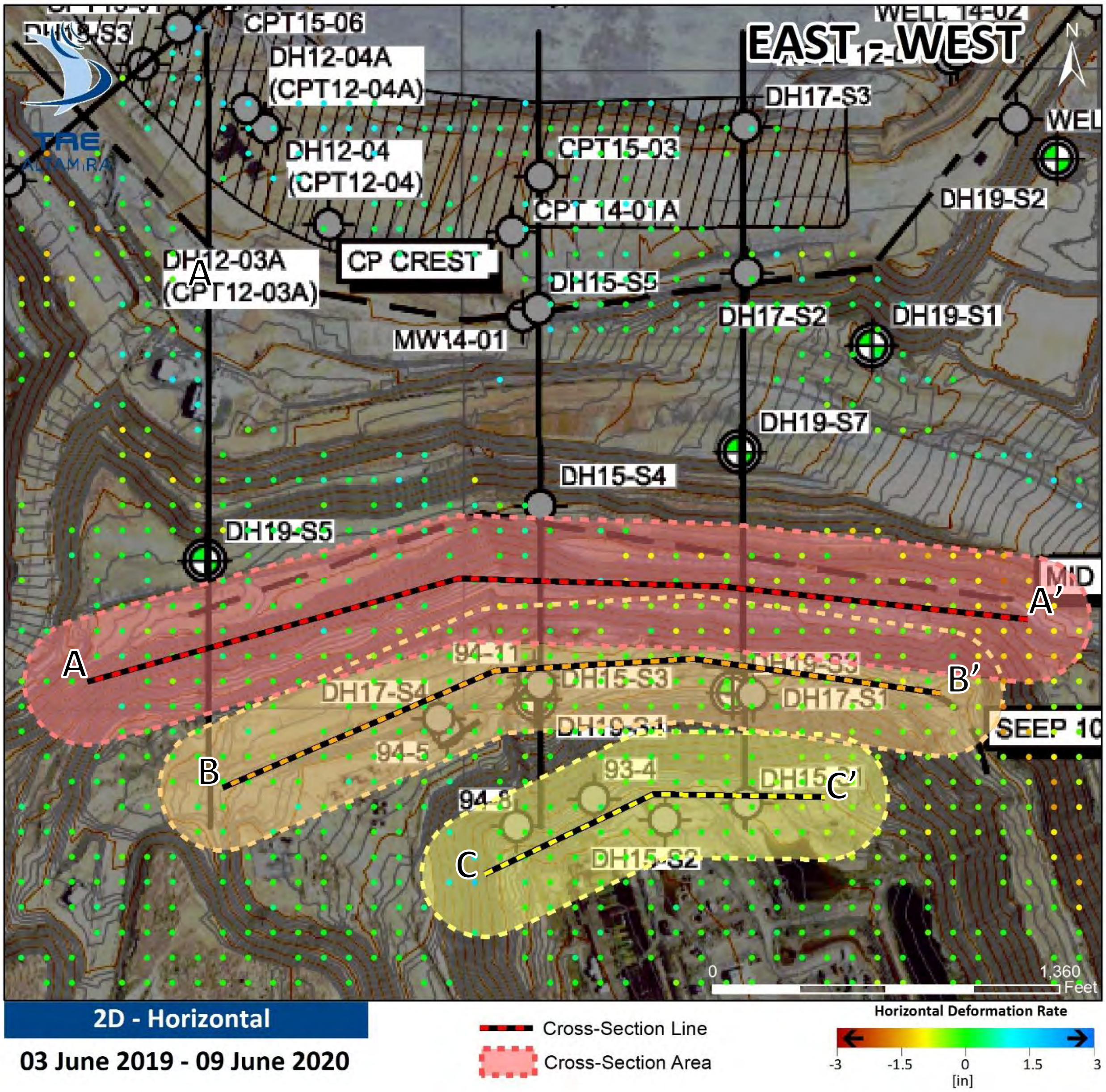


Figure 29: Cross-section locations over the YDTI superimposed on the east-west displacement dataset.

In the cross-section graphs, vertical motion is represented by green lines while E-W movement is illustrated with blue lines. Findings in the cross-section results include:

- A-A': Vertical motion reaches up to -5.25 inches at the 1300 ft mark. Horizontal motion reaches 1.50 inches of westward motion at the 0 ft mark.
- B-B': Vertical motion of up to -1.75 inches of settlement at the 900 ft mark. Horizontal motion reaches a maximum of 0.60 inches of westward motion at the 0 ft mark.
- C-C': Settlement of up to -0.50 inches at the 0 ft mark and uplift reaches +0.30 inches at the 1400 ft mark. East-West motion reaches up to 0.5 inches of eastward motion at the 0 ft mark and 0.6 inches of westward motion at the 1400 ft mark.

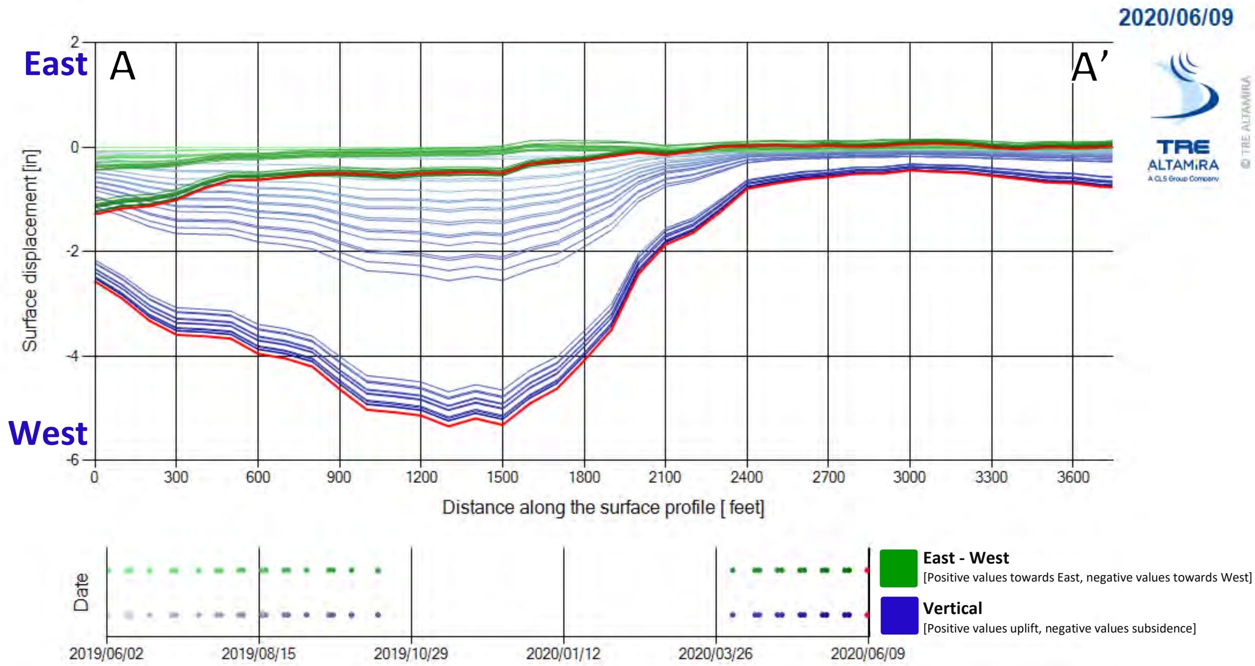


Figure 30: Evolution of the surface profile over the A-A' cross-section. Green lines represent the vertical motion, while blue lines represent the E-W movement. Red lines represent the last image in the dataset.

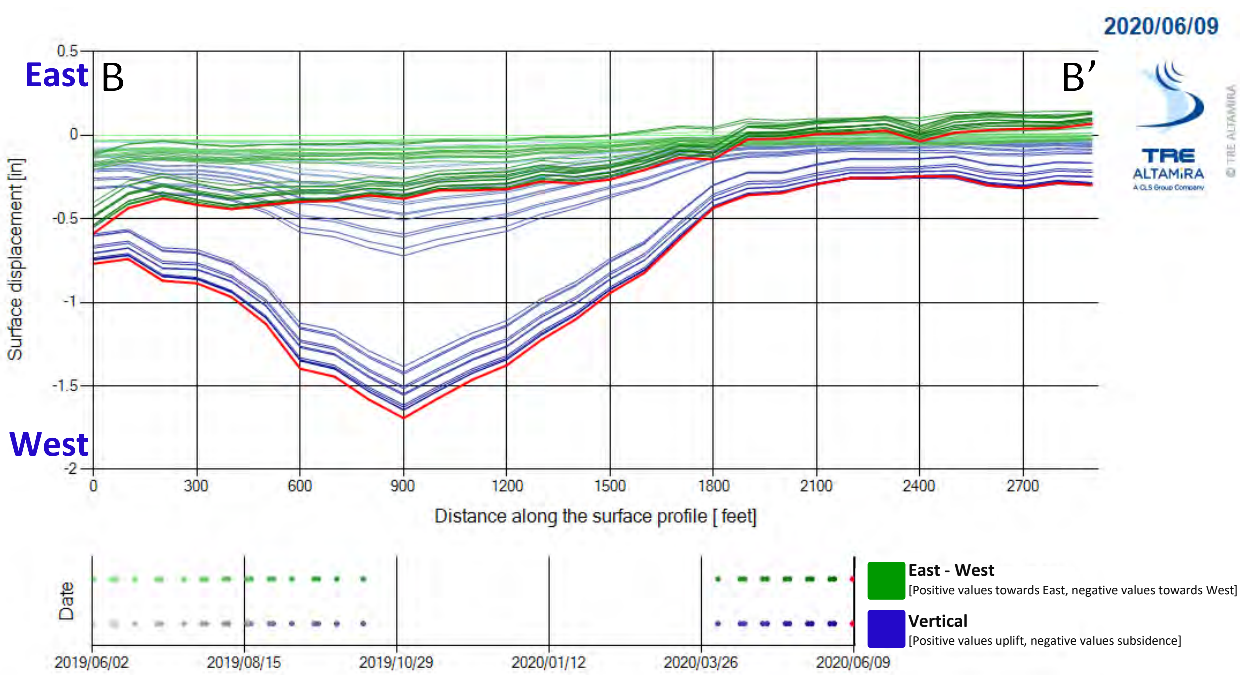


Figure 31: Evolution of the surface profile over the B-B' cross-section. Green lines represent the vertical motion, while blue lines represent the E-W movement. Red lines represent the last image in the dataset.

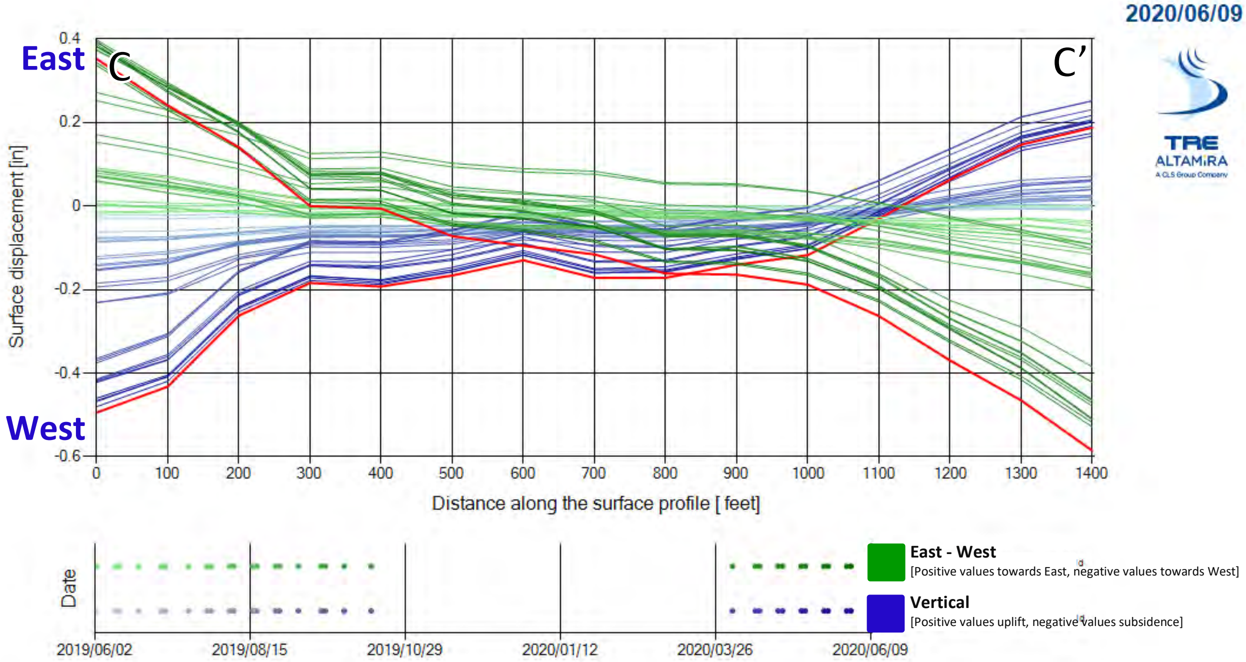


Figure 32: Evolution of the surface profile over the C-C' cross-section. Green lines represent the vertical motion, while blue lines represent the E-W movement. Red lines represent the last image in the dataset.

5. Summary and Recommendations

Using a combination of time series and cross-sections TRE Altamira provided a summary of historical displacement of the Yankee Doodle Tailings Impoundment at Montana Resources. Movement along five sections within the North-South and East-West Embankments are showing consistent settlement of several inches per year near the crest, with rates slowing down towards the toe of the embankments.

Due to ongoing construction operations on the YDTI, an optimal point density was not obtainable over all areas. To increase the coverage in this area, TREA recommends re-establishing a baseline SqueeSAR assessment once construction over the areas of highest importance is complete. The integration of radar imagery acquired by the PAZ satellite (a clone of TSX) would increase the increase the frequency of the image acquisitions, thus allowing a more robust stack of images to be built up prior to the next SqueeSAR processing at the end of September 2020. The installation of corner reflectors would provide a solution for year-round measurements, including during the winter, at specific locations.

Appendix 1: Delivered Files

List of Deliverables

Table 4 list the deliverables including the present report, the InSAR data files and an updated version of the TRE toolbar, a software tool for assisting with the loading, viewing and interrogation of the data in ESRI ArcGIS 10.x software (For set-up procedure and functionalities, see the attached manual *TREToolbarSetup_5.0.pdf*).

Table 4: List of deliverables.

Description	File name
SqueeSAR Data	**Ascending (LOS):** BUTTE_TSX_T30_A_Imperial_LocalGrid.shp **Descending (LOS):** BUTTE_TSX_T68_D_Imperial_LocalGrid.shp **2-D:** Vertical: BUTTE_TSX_VERT_JUN2020_Imperial_LocalGrid.shp East-West: BUTTE_TSX_EAST_JUN2020_Imperial_LocalGrid.shp
MXD project file containing all the data (ESRI ArcGIS version 10.0 and 10.6)	BUTTE_JUNE2020.mxd BUTTE_JUNE2020_V10.1.mxd
Technical Report	Butte_InSAR_Report_June_2020.pdf
TRE Toolbar (ESRI® ArcGIS 10.x)	TREToolbar_5.0 TREToolbarSetup_5.0.pdf

Database Structure

The SqueeSAR vector data are delivered in a shapefile format and projected to the local mine coordinates (MR2007). The shapefile of each elaboration contains details about the measurement points identified, including displacement rate, elevation, cumulative displacement and quality index. The information associated within the database files (dbf) are described in Table 5.

Table 5: Description of the fields contained in the database of the vector data. *Field is only present in LOS data sets.

Field	Description
CODE	Measurement Point (MP) identification code.
HEIGHT*	Topographic Elevation referred to WGS84 ellipsoid of the measurement point [ft].
H_STDEV*	Height standard deviation of the measurement point [ft].
VEL	MP displacement rate [in/yr].

- **Ascending LOS:** Positive values correspond to motion toward the satellite (i.e. uplift and/or westward movement); negative values correspond to motion away from the satellite (i.e. downward and/or eastward movement).
- **Descending LOS:** Positive values correspond to motion toward the satellite (i.e. uplift and/or eastward movement); negative values correspond to motion away from the satellite (i.e. downward and/or westward movement).
- **Vertical (VEL_V):** Positive values indicate uplift; negative values indicate downward movement.
- **E-W Horizontal (VEL_E):** Positive values indicate eastward movement; negative values westward movement.

V_STDEV	Displacement rate standard deviation [in/yr].
ACC*	Acceleration rate [in/yr^2].
A_STDEV*	Standard deviation of the acceleration value [in/yr^2].
COHERENCE*	Quality measure between 0 and 1.
STD_DEF*	Displacement time series error bar [in]
EFF_AREA*	This parameter represents the effective extension of the area [ft^2] covered by Distributed Scatterers (DS). For permanent scatterers (PS), its value is set to 0.
Dyyyymmdd	Series of columns that contain the displacement values of successive acquisitions relative to the first acquisition available [in].

TREmaps

TREmaps® is our proprietary online GIS platform to view and interrogate the InSAR datasets. TREmaps has been completely revamped to include features and functionality previously available only within the TRE ArcGIS toolbar. Little or no training is required, and no specialized GIS software is necessary. With internet access, the platform allows data to be overlaid on an optical image and to perform various operations on the data.

Functionalities include:

- Time-Series tool to view the history of displacement for each measurement point
- Average Time-Series tool to view the average history of displacement for a group of selected points.
- Cross-section tool to view the evolution of the ground surface over time
- Data download and data export (of subsets of data) to common formats (SHP, KML, GeoDB, CSV)
- Dynamic filtering tool to filter a subset of the results by a specified time period
- Client data integration.

TREmaps is hosted by Microsoft Azure, with all the advantages of data security and the cloud-based environment, with minimal downtime and robust internet connectivity. TREmaps runs directly on most Internet browsers and is accessed through a secure client login.

To log in, please go to:

https://tremaps5.tre-altamira.com/treaviewer

For assistance on any of the functions, please click the Help icon on the viewer or go to:

https://site.tre-altamira.com/tremaps-getting-started/

Appendix 2: Additional Radar Data Details

InSAR-based approaches measure surface displacement on a one-dimensional plane, along the satellite line-of-sight (LOS). The LOS angle varies depending on the satellite and on the acquisition parameters while another important angle, between the orbit direction and the geographic North, is nearly constant.

An ascending orbit denotes a satellite travelling from south to north and imaging to the east, while a descending orbit indicates a satellite travelling from north to south and imaging to the west. Table 6 lists the values of the angles for this study, while Figure 33 and Figure 34 show the geometry of the image acquisitions over the site for the ascending and descending orbits, respectively. The symbol Θ (theta) represents the angle the LOS forms with the vertical and δ (delta) the angle formed with the geographic north.

Table 6: Satellite viewing angles for the study.

Satellite	Wavelength	Orbit	Beam Mode/ Track	Symbol	Angle
Sentinel	X-Band 3.11 cm	Ascending	30	**θ**	40°
				δ	8.73°
		Descending	68	**θ**	29.75°
				δ	12.07°

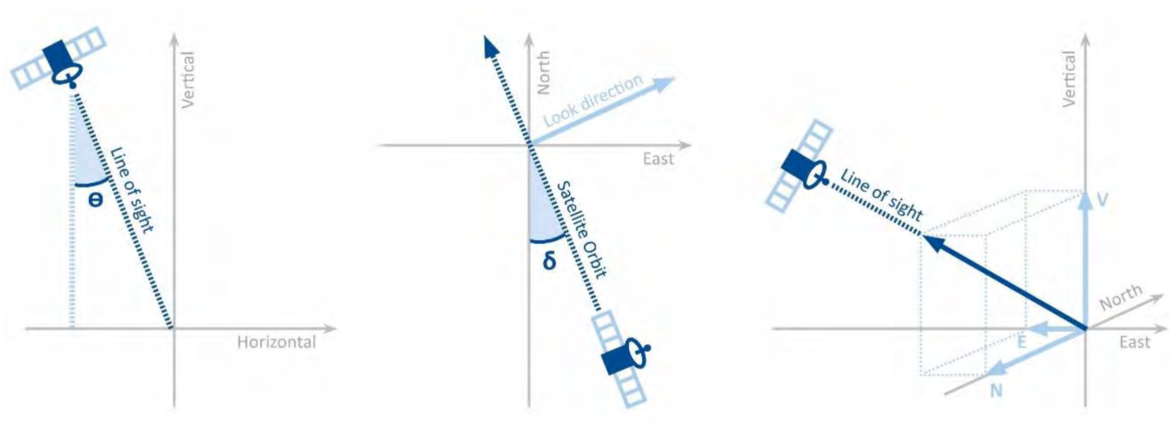


Figure 33: Geometry of the image acquisitions along the ascending orbit.

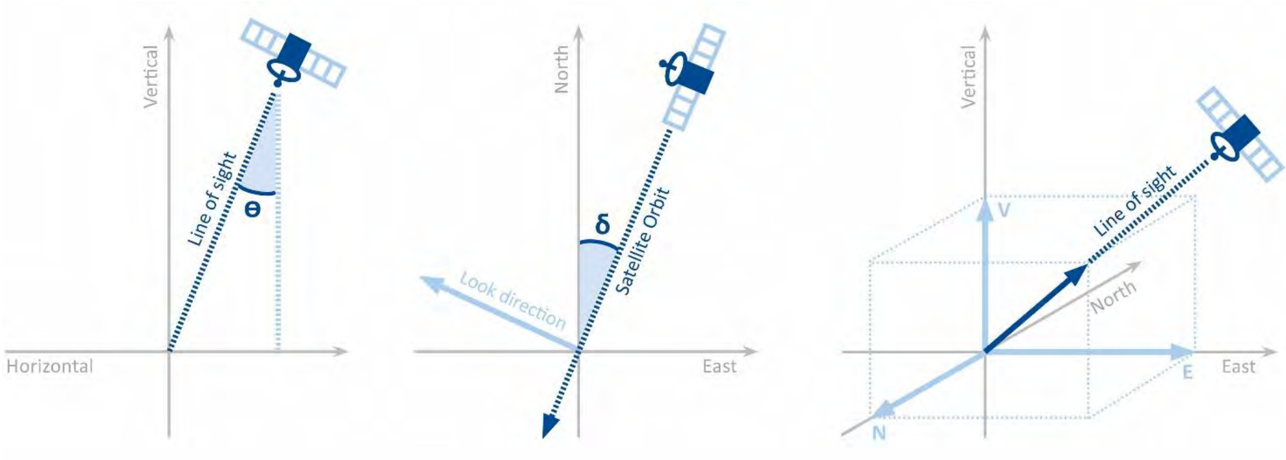
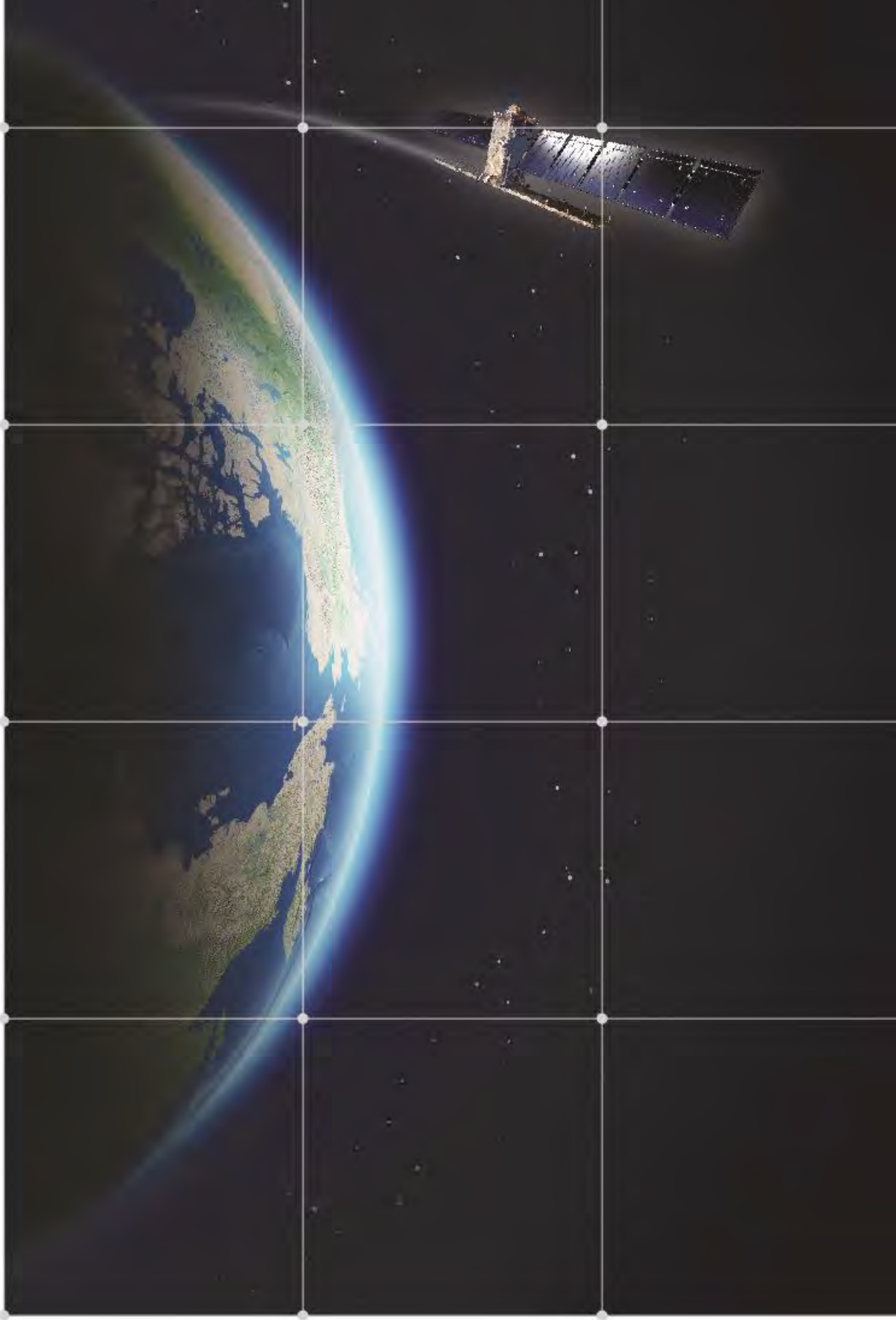


Figure 34: Geometry of the image acquisitions along the descending orbit.

Table 7 and **Error! Reference source not found.** list all the radar images used for the data processing.

Table 7: Radar images acquired over the site by the Sentinel satellite in the ascending orbit.

TerraSAR-X Ascending			TerraSAR-X Descending		
Count	Image Date	Frequency	Count	Image Date	Frequency
1	**01/06/2019**		1	**03/06/2019**	
2	**12/06/2019**	11	2	**14/06/2019**	11
3	**23/06/2019**	11	3	**06/07/2019**	22
4	**04/07/2019**	11	4	**17/07/2019**	11
5	**26/07/2019**	22	5	**28/07/2019**	11
6	**06/08/2019**	11	6	**08/08/2019**	11
7	**17/08/2019**	11	7	**19/08/2019**	11
8	**28/08/2019**	11	8	**30/08/2019**	11
9	**08/09/2019**	11	9	**21/09/2019**	22
10	**19/09/2019**	11	10	**13/10/2019**	22
11	**30/09/0219**	11	11	**17/04/2020**	187
12	**04/04/2020**	187	12	**28/04/2020**	11
13	**15/04/2020**	11	13	**09/05/2020**	11
14	**26/04/2020**	11	14	**20/05/2020**	11
15	**07/05/2020**	11	15	**31/05/2020**	11
16	**18/05/2020**	11	16	**11/06/2020**	11
17	**29/05/2020**	11			
18	**09/062020**	11			



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APPENDIX C

Q3 2020 Monitoring Data Summaries

Appendix C1 Q3 2020 Piezometric Monitoring Summary
Appendix C2 Q3 2020 Quarterly Water Data Summary

APPENDIX C1

Q3 2020 Piezometric Monitoring Summary

(Pages C1-1 to C1-13)

November 5, 2020

Mr. Mike Harvie
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Dear Mike,

RE: Q3 2020 – YDTI Quarterly Piezometric Monitoring Update

1.0 INTRODUCTION

Montana Resources, LLP (MR) operates an open pit copper and molybdenum mine in Butte, Montana. Tailings produced from the process are stored within the Yankee Doodle Tailings Impoundment (YDTI), which is a valley-fill style impoundment contained within rockfill embankments. MR routinely monitors piezometric conditions within the YDTI embankments, tailings mass, and surrounding areas as part of their operational surveillance plan for the tailings facility, as described in the TOMS Manual (MR/KP, 2020). Real-time piezometric records are available to KP via a remote monitoring system (RMS), and these records are comprehensively reviewed on a quarterly basis to evaluate the performance of the YDTI in conjunction with observations made during periodic inspections. This letter provides a quarterly summary of piezometric data collected during the third quarter (Q3) of 2020 for key monitoring sites.

2.0 OVERVIEW OF PIEZOMETRIC MONITORING NETWORK

Pore pressures are monitored at 108 active instrumentation locations at the YDTI and in the West Ridge and Horseshoe Bend (HsB) areas. Locations of the piezometric monitoring sites are shown on Figure 1. These sites include 39 standpipe piezometers/monitoring wells and 69 drillholes with vibrating wire piezometers (VWPs). Most existing standpipe piezometers and monitoring wells have been outfitted for continuous monitoring by suspending a VWP sensor within the PVC riser and connecting the sensor to the RMS.

Select standpipe piezometers and VWPs have piezometric elevations assigned as Quantitative Performance Parameters (QPPs) in the TOMS Manual and are used to routinely assess the performance of the YDTI. These QPPs specify a piezometric ‘trigger elevation’ at or above which a Level 1 Unusual Occurrence would be triggered, as specified in Table 5.1 of the TOMS Manual (MR/KP, 2020). Trigger elevations assigned to each QPP site are reevaluated by KP on an annual basis. Table 1 summarizes the piezometric QPPs that are presently in use at the YDTI. This letter discusses data from the QPP sites during Q3 2020. Discussion of data from the remaining monitoring sites is completed annually and will be presented in the 2020 Data Analysis Report following Q4 2020.

QPP data collection and availability via the RMS generally experienced only minor interruptions during Q3 2020 with causes including battery depletion, minor hardware problems, water damaged hardware, and temporary loss-of-communication. Outages were identified regularly during weekly monitoring reviews. Data from drillhole DH15-S5 (VW1) are unavailable throughout the majority of September 2020 due to a water damaged data logger. Data from all sensors at DH15-12 (VW1, VW2, and VW3) were not available during the majority of July 2020 due to a suspected logger connectivity issue. Monitoring coverage at these sites has been re-established following replacement of the data loggers and the sites are now operating properly.

3.0 UPDATED QPP NETWORK FOR 2020

The piezometric QPP monitoring network was expanded in the 2020 TOMS update to include an additional eight (8) pore pressure monitoring instruments bringing the total number of QPP sensors to 18. The QPP network expansion was implemented to improve the spatial coverage of QPP monitoring throughout the East-West and North-South Embankments using the numerous pore pressure monitoring sites installed between 2017 and 2019 in these areas. Monitoring well MW14-01 was discontinued as a QPP site following abandonment of the well in Q4 2019, which resulted from a riser blockage. Monitoring coverage in this area has been replaced by establishing a QPP for an adjacent sensor in drillhole DH15-S5 (VW1). The current active QPP network is shown on Figure 1 and details are summarized in Table 1.

Trigger elevations for the new embankment QPP monitoring locations have been specified as approximately 20 ft above the maximum recorded piezometric elevation since the installation of each site. Trigger elevations specified for sensors VWP-DP1 and VWP-DP2 installed within the West Embankment Drain (WED) are specified as the maximum allowable hydraulic grade line established in the WED design basis.

4.0 SUMMARY OF Q3 2020 QPP PIEZOMETRIC CONDITIONS

4.1 GENERAL

No piezometric trigger elevation exceedances were observed at QPP monitoring sites during Q3 2020. A high-level summary of QPP piezometric data and monitoring instrumentation status is provided in Table 1. Piezometric data recorded at QPP sites within the East-West, North-South, and West Embankments are shown relative to the trigger elevations on Figures 2 through 6. Piezometric conditions and quarterly piezometric elevation change along the East-West Embankment Section 8+00W are presented graphically on Figure 7.

4.2 EAST-WEST EMBANKMENT

The majority of QPP sites within the basal saturated zone of the East-West Embankment have continued to display slightly decreasing piezometric trends during Q3 2020. This continues the long-term decreasing trend monitored from 2017 through Q2 2020. The rates of decrease at these sites have continued to slow and several sites have stabilized or recorded slightly increasing piezometric conditions during Q3 2020. One QPP monitoring well sensor (MW94-11) and five QPP drillhole sensors (DH15-S3 VW1, DH15-S4 VW1 and VW2, DH17-S1 VW2, DH18-S3 VW3) have monitored decreasing piezometric elevations throughout Q3 2020. The magnitude of quarterly decrease during Q3 2020 ranges from approximately 0.1 to 0.8 ft. Two QPP sensors in drillholes DH15-S5 (VW1) and DH17-S2 (VW2) as well as another QPP sensor in monitoring well MW94-8 showed minor quarterly increases in Q3 2020. These increases ranged from 0.1 ft to 0.5 ft.

The continued decreasing trend within the embankment rockfill is interpreted to result from continued use of multiple tailings discharge points instead of the historical (pre-2016) practice of using a single, central discharge location. The updated deposition strategy is inferred to have resulted in desaturation within a significant portion of the central tailings mass adjacent to the East-West Embankment as compared to historical conditions. A reduction in tailings slurry-based water recharge has influenced drainage interaction with the adjacent embankment resulting in decreasing piezometric pressures. The slowing rate of decrease suggests that pore pressures within the central section of the East-West Embankment may be approaching a new steady-state condition associated with the discharge strategies in place since 2016. The minor increases in pore water pressure monitored at two sites (DH15-S5 and DH17-S2) beneath the embankment crest during Q3 2020 may be a response to predominant use of tailings discharge locations in the vicinity of the central pedestal area (EW-2, EW-3 and NS-1), which account for 36% of the Q3 discharge and 44% of the 2020 discharge from January 1 to September 30, 2020.

4.3 NORTH-SOUTH EMBANKMENT

QPP sites within the embankment rockfill at the North-South Embankment have previously indicated relatively constant or slightly increasing piezometric elevations since 2018. Pore water pressures monitored during Q3 2020 have generally exhibited a continuation of this increasing trend. Piezometric elevations monitored within the basal saturated zone at drillholes DH18-S1 (VW2) and DH18-S2 (VW2) increased by approximately 0.6 and 0.8 ft during Q3 2020. Monitoring well MW12-01 recorded a very slight quarterly decrease of approximately 0.1 ft during Q3 2020, which is inferred to result from the significantly decreased tailings discharge from NS-1 in Q2 and Q3 as compared with Q1 2020. Monitoring well MW12-05 has been historically unsaturated, indicating that the piezometric elevation is below the bottom of the well screen (less than 6,198 ft elevation). This site continues to measure unsaturated conditions indicating that the well remains unsaturated (dry) through Q3 2020.

Minor piezometric fluctuations associated with construction of the North-South Embankment step-out were observed by both QPP and non-QPP sites within the basal saturated zone and foundation due to construction of four lifts from mid-2019 through Q1 2020, as described in KP (2020). The last lift, up to EL. 6,400 ft, was completed in April 2020. The largest pore pressure response to construction was observed in the alluvial foundation material at drillhole DH18-S1 (VW1) on Section 28+00N (non-QPP site). The EL. 6,400 ft lift resulted in a construction induced pore pressure increase of approximately 25 ft and subsequent partial dissipation at this site. Pore water pressures at VW1 (DH18-S1) began to dissipate following the EL. 6,400 lift placement, which continued throughout Q1, Q2, and Q3 2020. The average rate of pore pressure decrease during Q3 2020 was approximately 3 ft/month and pore pressures recovered to pre-6,400 lift conditions by the end of September 2020. Minor pore pressure dissipation following EL. 6,400 lift construction was observed at DH18-S1 (VW2), DH18-S2 (VW2) and MW12-01 (VW1) within the basal system, with magnitudes of decrease ranging between 0.2 and 0.5 ft. KP will continue to monitor conditions at DH18-S1, DH18-S2, MW12-01, and MW12-05 as dissipation continues following EL. 6,400 lift construction. Piezometric pressures recorded at both DH18-S1 (VW2) and DH18-S2 (VW2) remain approximately 20 ft below the QPP 'trigger elevation' and measured pressures recorded at MW12-01 remain greater than 25 ft below the QPP 'trigger elevation'. The increases in pore pressures at sites DH18-S1 (VW2) and DH18-S2 (VW2) during Q3 are inferred to be associated with continued tailings discharge along the North-South Embankment, including commissioning of an additional new discharge location (NS-4) at the location shown on Figure 1.

4.4 WEST EMBANKMENT AND DRAIN

Piezometric elevations within the foundation of the West Embankment have been relatively constant through 2019 and 2020 following an increasing trend from 2015 through 2018 that was attributed to increasing supernatant pond and tailings elevations resulting from ongoing operations. Piezometric conditions throughout Q3 2020 have continued to remain stable due to the draining influence of the West Embankment Drain (WED). The invert elevation of the WED is now lower than the YDTI pond. Three QPP sensors installed within the foundation in drillhole DH15-12 recorded stable piezometric conditions throughout Q3 2020. Piezometric elevations from the uppermost two sensors (VW2 and VW3) are approximately coincident with the WED drain invert elevation indicating that the drain is controlling pore pressures within the embankment foundation. Pore water pressures monitored within the WED in Drain Pods 1 and 2 (VWP-DP1 and VWP-DP2, respectively) have also remained relatively constant throughout Q3 2020. Sensors installed in drillhole DH15-12 are presently more than 20 feet below the TOMS QPP trigger elevations. Sensors installed in Drain Pods 1 and 2 remain more than 30 feet below the trigger elevations.

5.0 CONCLUSIONS

Piezometric elevations within the embankment rockfill and tailings mass of the YDTI are available in real-time using the RMS and are monitored by KP and MR. KP provides an analysis of monitoring data on a quarterly basis for a subset of the monitoring sites specified as QPP sites within the TOMS Manual. The quarterly evaluations along with an assessment of conditions and trends at all piezometric monitoring sites will be included in a comprehensive annual data analysis report following the end of 2020. There were no QPP exceedances during Q3 2020.

The piezometric QPP monitoring network was revised in 2020 to include an additional eight (8) pore pressure monitoring instruments, which improved the spatial coverage of the QPP network along the North-South and East-West Embankments. Two QPP monitoring sites (all three sensors at DH15-12 and one at DH15-S5) required data logger replacement in Q3 2020 to remedy data outages caused by hardware malfunction. Functionality of these sites has been restored.

The piezometric monitoring network and monitoring protocols for the YDTI are being progressively upgraded. Additional pore pressure monitoring sites were recently installed as part of a 2020 Embankment Geotechnical Site Investigation Program. These monitoring sites will further expand the spatial coverage of the monitoring network. Monitoring protocols will be progressively updated to take advantage of the automation capabilities of the RMS.

We trust this letter meets your needs at this time. Please do not hesitate to contact the undersigned with any questions.

Yours truly,
Knight Piésold Ltd.

Prepared:	Colin Phang, E.I.T. Junior Engineer	Prepared:	2020-11-05 Kevin Davenport, P.Eng. Senior Engineer
Reviewed:	2020-11-05 Daniel Fontaine, P.E. Specialist Engineer | Associate	Reviewed:	2020-11-05 Ken Brouwer, P.E. Principal

Approval that this document adheres to the Knight Piésold Quality System: KJB

Attachments:

Table 1 Rev 0	Summary of Piezometric Quantitative Performance Parameter (QPP) Monitoring
Figure 1 Rev 0	Active Piezometric Instrumentation and Monitoring Sites
Figure 2 Rev 0	Summary of Measured Piezometric Elevations vs. QPP Triggers East-West Embankment
Figure 3 Rev 0	Summary of Measured Piezometric Elevations vs. QPP Triggers East-West Embankment
Figure 4 Rev 0	Summary of Measured Piezometric Elevations vs. QPP Triggers North-South Embankment
Figure 5 Rev 0	Summary of Measured Piezometric Elevations vs. QPP Triggers West Embankment
Figure 6 Rev 0	Summary of Measured Piezometric Elevations vs. QPP Triggers West Embankment
Figure 7 Rev 0	Piezometric Conditions Along East-West Embankment Section 8+00W (Looking West)

References:

Knight Piésold Ltd. (KP, 2020). 2019 Data Analysis Report (KP Reference No. VA101-126/21-4 Rev 0), dated August 28, 2020.

Montana Resources and Knight Piésold (MR/KP, 2020). Yankee Doodle Tailings Impoundment – Tailings Operations, Maintenance and Surveillance (TOMS) Manual, Rev 4, dated May 2020.

Copy To: Mark Thompson, Amanda Griffith (Montana Resources)

Knight Piésold CONSULTING

TABLE 1

MONTANA RESOURCES, LLP
YANKEE DOODLE TAILINGS IMPOUNDMENT

Q3 2020 INSTRUMENTATION SUMMARY
SUMMARY OF PIEZOMETRIC QUANTITATIVE PERFORMANCE PARAMETER (QPP) MONITORING

Print Nov/05/20 8:21:02

Monitoring Region	QPP Instrumentation Site	Monitoring Site Type [1]	Piezometric Trigger Elevation (ft)	Maximum Piezometric Elevation Recorded Q3 2020 (ft)	Exceeded Trigger Elevation During Q3 2020 (Yes/No)	Comments
East-West Embankment	MW94-08	VWP Sensor	5,680	5,670	No	-
	MW94-11	VWP Sensor	5,693	5,675	No	-
	DH15-S3 VW1	VWP Sensor	5,690	5,668	No	-
	DH15-S4 VW1	VWP Sensor	5,740	5,717	No	-
	DH15-S4 VW2	VWP Sensor	5,800	5,774	No	-
	DH15-S5 VW1	VWP Sensor	5,785	5,764	No	Sensor added for 2020 QPP Monitoring[3] Data outage during September[4]
	DH17-S1 VW2	VWP Sensor	5,741	5,721	No	Sensor added for 2020 QPP Monitoring[3]
	DH17-S2 VW2	VWP Sensor	5,969	5,849	No	Sensor added for 2020 QPP Monitoring[3]
	DH18-S3 VW3	VWP Sensor	6,044	6,025	No	Sensor added for 2020 QPP Monitoring[3]
North-South Embankment	MW12-01	VWP Sensor	5,940	5,911	No	-
	MW12-05	VWP Sensor	6,200	Unsaturated	No	-
	DH18-S1 VW2	VWP Sensor	6,010	5,990	No	Sensor added for 2020 QPP Monitoring[3]
	DH18-S2 VW2	VWP Sensor	6,029	6,010	No	Sensor added for 2020 QPP Monitoring[3]
West Embankment	VWP-DP1	VWP Sensor	6,374	6,341	No	Sensor added for 2020 QPP Monitoring[3]
	VWP-DP2	VWP Sensor	6,366	6,335	No	Sensor added for 2020 QPP Monitoring[3]
	DH15-12 VW1	VWP Sensor	6,372	6,349	No	Data outage during July 2020[5]
	DH15-12 VW2	VWP Sensor	6,372	6,350	No	Data outage during July 2020[5]
	DH15-12 VW3	VWP Sensor	6,372	6,349	No	Data outage during July 2020[5]

\\KPL\VA-Prj$\1\01\00126\23\A\Correspondence\VA20-02198 - Q3 2020 - YDTI Quarterly Piezometric Monitoring Update\[QPP Compliance Figures and Table Q3_r0.xlsx]Table 1 - QPP Evaluation

NOTES:
1. PIEZOMETRIC DATA FROM THE VWP SITES ARE COLLECTED CONTINUOUSLY USING DATA LOGGERS AND A REMOTE MONITORING SYSTEM.
2. THE SPECIFIED QPP TRIGGER ELEVATION FOR MW12-05 WAS UPDATED FROM 6,195 ft. TO 6,200 ft. IN THE 2018 REVISION OF THE TOMS MANUAL (MR/KP, 2018).
3. THE PIEZOMETRIC QPP NETWORK WAS EXPANDED TO INCLUDE ADDITIONAL SENSORS DURING THE MOST RECENT TOMS UPDATE (MR/KP, 2020).
4. DATA FROM DRILLHOLE DH15-S5 ARE UNAVAILABLE THROUGHOUT THE MAJORITY OF SEPTEMBER 2020 DUE TO A WATER-DAMAGED DATA LOGGER.
5. DATA FROM DRILLHOLE DH15-12 ARE UNAVAILABLE THROUGHOUT THE MAJORITY OF JULY 2020 DUE TO A COMMUNICATION HARDWARE ISSUE.

REV	DATE	DESCRIPTION	PREP'D	RVW'D
0	05NOV'20	ISSUED WITH LETTER VA20-02198	CYP	KTD

PLAN

SCALE A

LEGEND:

- PIEZOMETRIC MONITORING SITE
- WELL NOT ACCESSIBLE (BURIED OR ABANDONED)
- QUANTITATIVE PERFORMANCE PARAMETER INSTRUMENT LOCATION
- IN-PLACE INCLINOMETER SITE
- GEOPHYSICAL TEST SITE
- TAILINGS PIPELINE
- PROPERTY LINE

NOTES:

1. COORDINATE SYSTEM AND ELEVATIONS BASED ON ANACONDA MINE GRID.
2. QPP = QUANTITATIVE PERFORMANCE PARAMETER.
3. AERIAL IMAGERY FROM JULY 9, 2020 PROVIDED BY MONTANA RESOURCES, LLP.

SCALE A 500 0 500 1000 1500 2000 2500 ft

MONTANA RESOURCES, LLP

YANKEE DOODLE TAILINGS IMPOUNDMENT

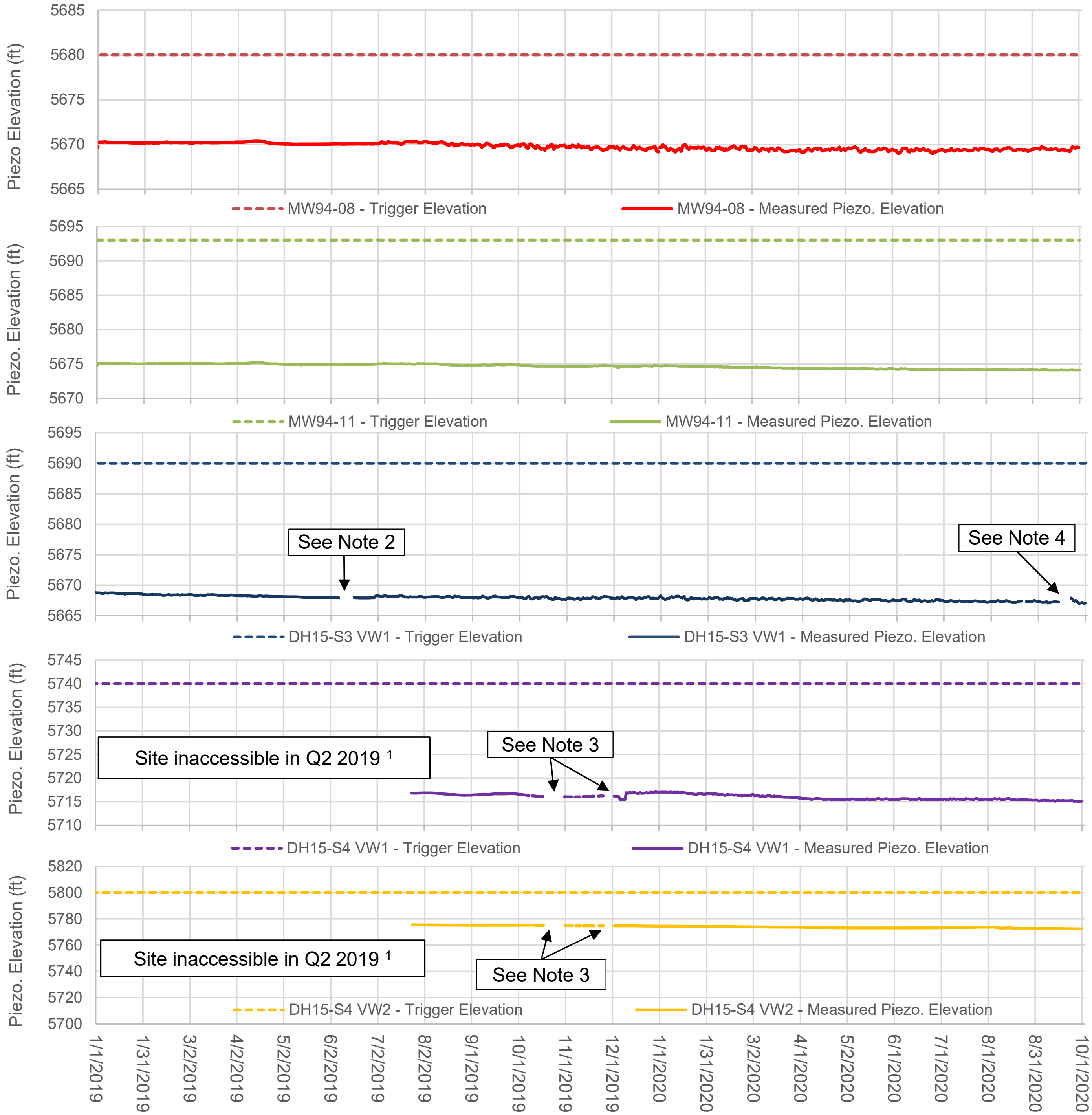
ACTIVE PIEZOMETRIC INSTRUMENTATION AND MONITORING SITES

Knight Piésold CONSULTING

P/A NO.	REF NO.
VA101-126/23	VA20-02198

FIGURE 1 REV 0

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED
0	03NOV'20	ISSUED WITH LETTER	CYP	RMM	KTD



NOTES:

1. NO DATA ARE SHOWN FROM DEC 20, 2017 TO JULY 25, 2019 FOR DH15-S4 VW1 AND VW2 AS MR STAFF WERE UNABLE TO CONNECT THE INSTRUMENTATION WITH THE REMOTE MONITORING SYSTEM DUE TO SITE INACCESSIBILITY.
2. NO DATA WERE COLLECTED BY DH15-S3 VW1 FROM JUNE 7, 2019 TO JUNE 16, 2019 DUE TO INSUFFICIENT BATTERY VOLTAGE
3. NO DATA WERE COLLECTED BY DH15-S4 VW1 AND VW2 DUE TO POWER SUPPLY ISSUES OCTOBER 19 TO 31 AND NOVEMBER 27, 2019 TO DECEMBER 3, 2019. SENSORS MOVED NEW LOGGER.
4. NO DATA WERE COLLECT BY DH15-S3 VW1 FROM SEPTEMBER 15 TO SEPTEMBER 21, 2020 DUE TO DEPLETED GEONET BATTERY, WHICH WAS SUBSEQUENTLY REPLACED.

MONTANA RESOURCES, LLP

YANKEE DOODLE TAILINGS IMPOUNDMENT

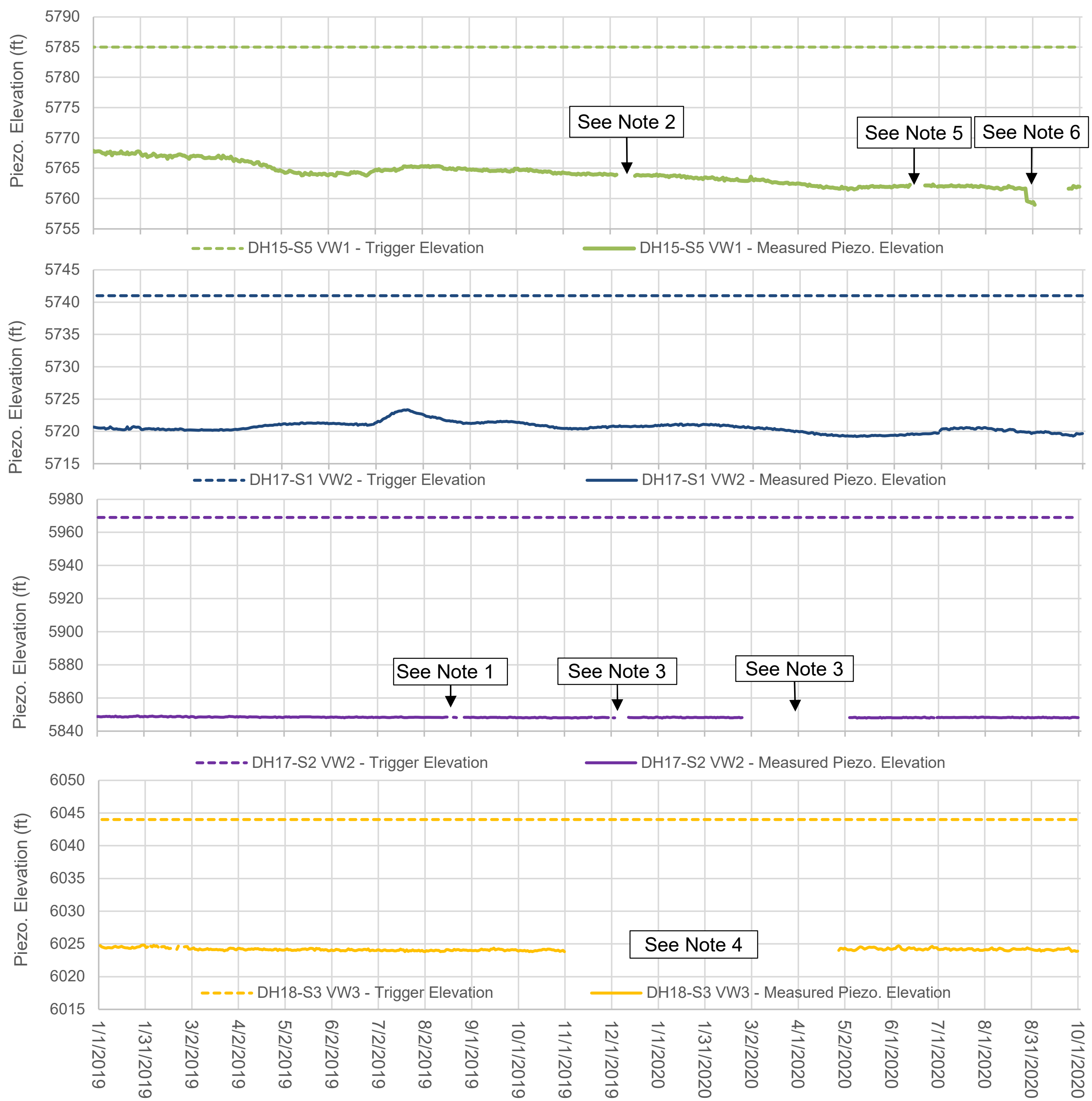
SUMMARY OF MEASURED PIEZOMETRIC ELEVATIONS VS. QPP TRIGGERS EAST-WEST EMBANKMENT

Knight Piésold CONSULTING

P/A NO.	REF. NO.
VA101-126/23	VA20-02198

FIGURE 2 REV 0

REV	DATE	DESCRIPTION	PREP'D	RVW'D
0	02NOV'20	ISSUED WITH LETTER	CYP	KTD



NOTES:

1. NO DATA WERE COLLECTED BY DH17-S2 VW2 FROM AUGUST 17, 2019 TO AUGUST 29, 2019 DUE TO AN UNKNOWN HARDWARE ISSUE.
2. NO DATA WERE COLLECTED BY DH15-S5 VW1 FROM DECEMBER 7 TO 17, 2019 DUE TO A DATA LOGGER ISSUE. THE SENSOR WAS SUBSEQUENTLY CONNECTED TO A REPLACEMENT DATA LOGGER.
3. NO DATA WERE COLLECTED BY DH17-S2 VW2 DUE TO THREAD POWER SUPPLY ISSUES FROM FROM DECEMBER 1 TO 12, 2019 AND FEBRUARY 25, 2020 TO MAY 7, 2020.
4. NO DATA WERE COLLECTED BY DH18-S3 VW1 FROM NOVEMBER 1, 2019 TO FEBRUARY 3, 2020 AND FEBRUARY 4 TO APRIL 30, 2020 DUE TO SUSPECTED HARDWARE DAMAGE.
5. NO DATA WERE COLLECTED BY DH15-S5 VW1 DUE TO LOGGER POWER SUPPLY ISSUES FROM JUNE 13, 2020 TO JUNE 23, 2020.
6. NO DATA WERE COLLECTED BY DH15-S5 VW1 DUE TO WATER DAMAGED DATA LOGGER FROM SEPTEMBER 2 TO SEPTEMBER 24, 2020. THE DATA LOGGER WAS SUBSEQUENTLY REPLACED.

MONTANA RESOURCES, LLP

YANKEE DOODLE TAILINGS IMPOUNDMENT

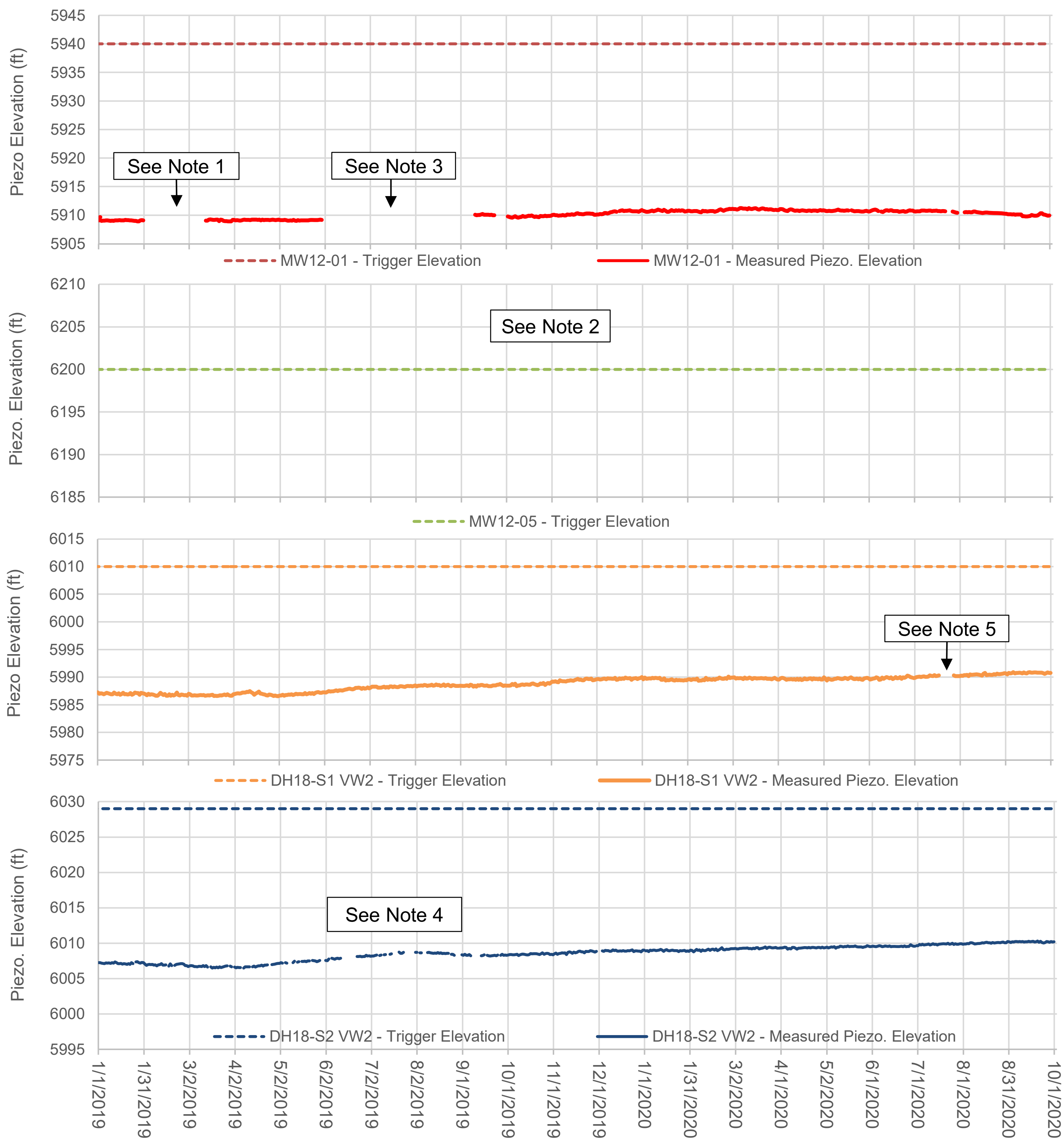
SUMMARY OF MEASURED PIEZOMETRIC ELEVATIONS VS. QPP TRIGGERS
EAST-WEST EMBANKMENT

Knight Piésold CONSULTING

P/A NO.	REF. NO.
VA101-126/23	VA20-02198

FIGURE 3 REV 0

0	02NOV'20	ISSUED WITH LETTER	CYP	KTD
REV	DATE	DESCRIPTION	PREP'D	RVW'D



NOTES:

1. MW12-01 BECAME UNSATURATED ON FEBRUARY 1 TO MARCH 13, 2019.
2. NO DATA WERE COLLECTED BY MW12-05. STANDPIPE WAS AND REMAINS UNSATURATED (DRY).
3. NO DATA WERE COLLECTED BY MW12-01 FROM MAY 31 TO SEPTEMBER 11, 2019 DUE TO DATA LOGGER EQUIPMENT FAILURE.
4. ERRONEOUS NOISE WAS RECORDED IN THE DATA BY DH18-S2 VW2. THESE DATA HAVE BEEN OMITTED FOR CLARITY.
5. NO DATA WERE COLLECTED BY DH18-S1 VW2 FROM JULY 27 TO JULY 29, 2020 DUE TO UNKNOWN SENSOR ISSUE.

REV	DATE	DESCRIPTION	PREP'D	RVW'D
0	02NOV'20	ISSUED WITH LETTER	CYP	KTD

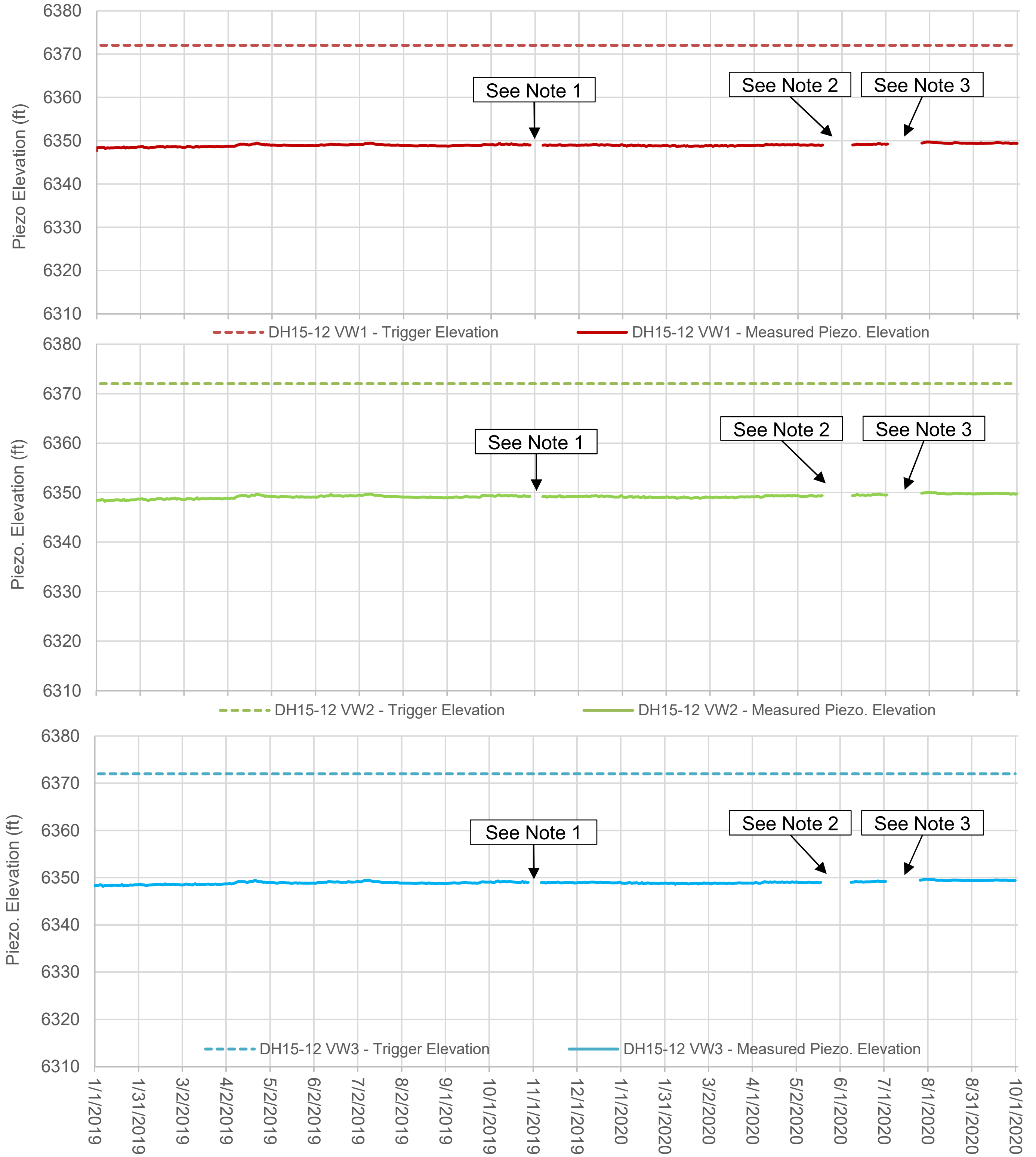
MONTANA RESOURCES, LLP

YANKEE DOODLE TAILINGS IMPOUNDMENT

SUMMARY OF MEASURED PIEZOMETRIC ELEVATIONS VS. QPP TRIGGERS NORTH-SOUTH EMBANKMENT

Knight Piésold CONSULTING

P/A NO.	REF. NO.	
VA101-126/23	VA20-02198	
FIGURE 4		REV 0



NOTES:

1. NO DATA WERE COLLECTED BY DH15-12 VW1, VW2, AND VW3 OCTOBER 30, 2019 TO NOVEMBER 6, 2019 DUE TO CONNECTIVITY ISSUE.
2. NO DATA WERE COLLECTED BY DH15-12 VW1, VW2, AND VW3 FROM MAY 19 TO JUNE 9, 2020 DUE TO SUSPECTED LOGGER CONNECTIVITY ISSUE.
3. NO DATA WERE COLLECTED BY DH15-12 VW1, VW2, AND VW3 FROM JULY 3 TO DUE TO JULY 26, 2020 SUSPECTED LOGGER CONNECTIVITY ISSUE.

0	02NOV'20	ISSUED WITH LETTER	CYP	KTD
REV	DATE	DESCRIPTION	PREP'D	RVW'D

MONTANA RESOURCES, LLP

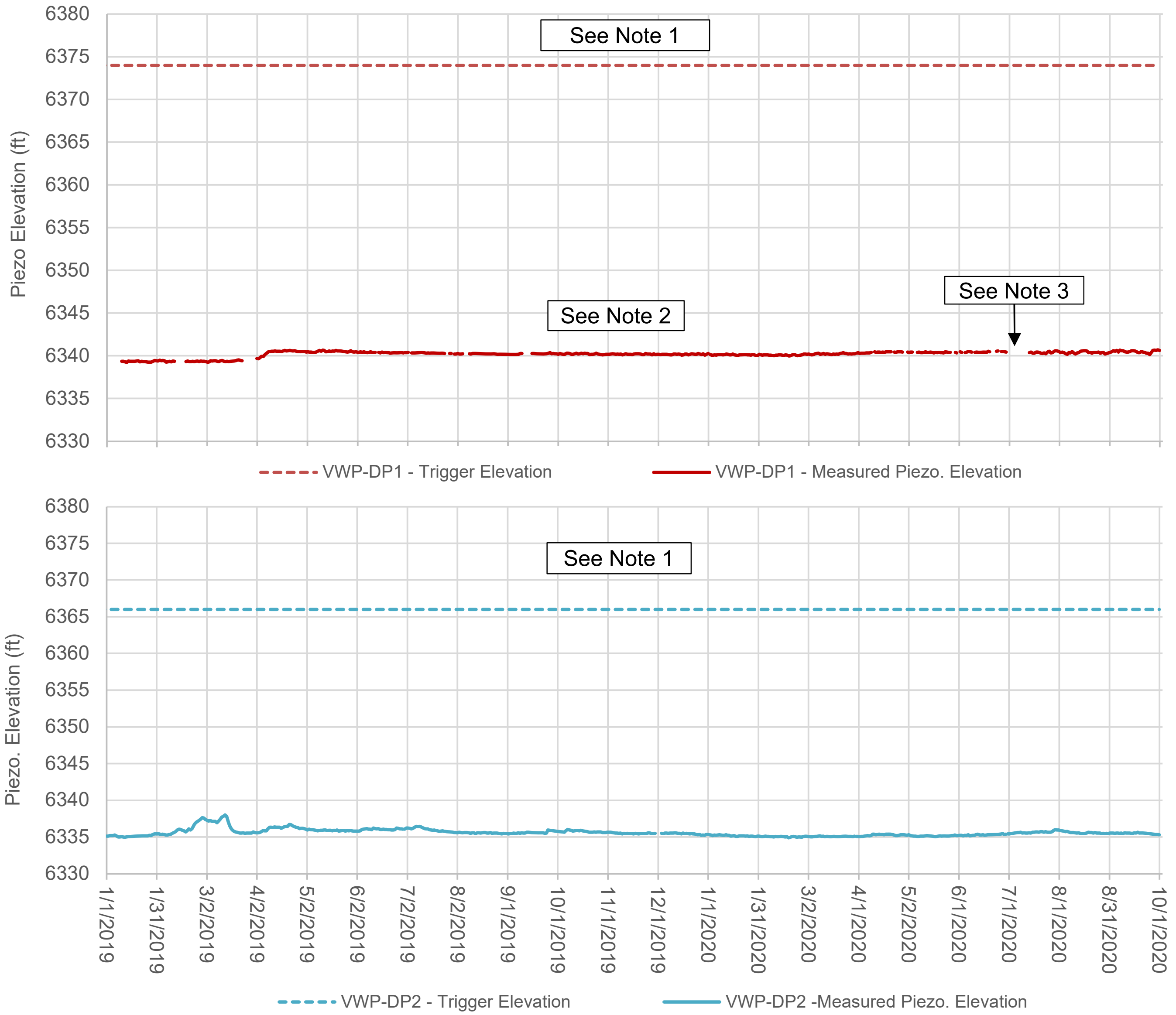
YANKEE DOODLE TAILINGS IMPOUNDMENT

SUMMARY OF MEASURED PIEZOMETRIC ELEVATIONS VS. QPP TRIGGERS WEST EMBANKMENT

Knight Piésold CONSULTING

P/A NO.	REF. NO.
VA101-126/23	VA20-02198

FIGURE 5 REV 0



NOTES:

1. TRIGGER ELEVATIONS FOR SENSORS INSTALLED IN THE DRAIN PODS HAVE BEEN SPECIFIED AT THE ALLOWABLE HYDRAULIC GRADE LINE.
2. PERIODIC DATA OUTAGES OCCUR AT VWP-DP1 DUE TO INTERMITTENT BATTERY VOLTAGE ISSUES.
3. NO DATA RECORDED BY VWP-DP1 FROM JULY 1 TO JULY 14, 2020 DUE TO COMMUNICATION OUTAGE AT DATA LOGGER. REPLACEMENT EQUIPMENT HAS BEEN INSTALLED.

0	02NOV'20	ISSUED WITH LETTER	CYP	KTD
REV	DATE	DESCRIPTION	PREP'D	RVW'D

MONTANA RESOURCES, LLP

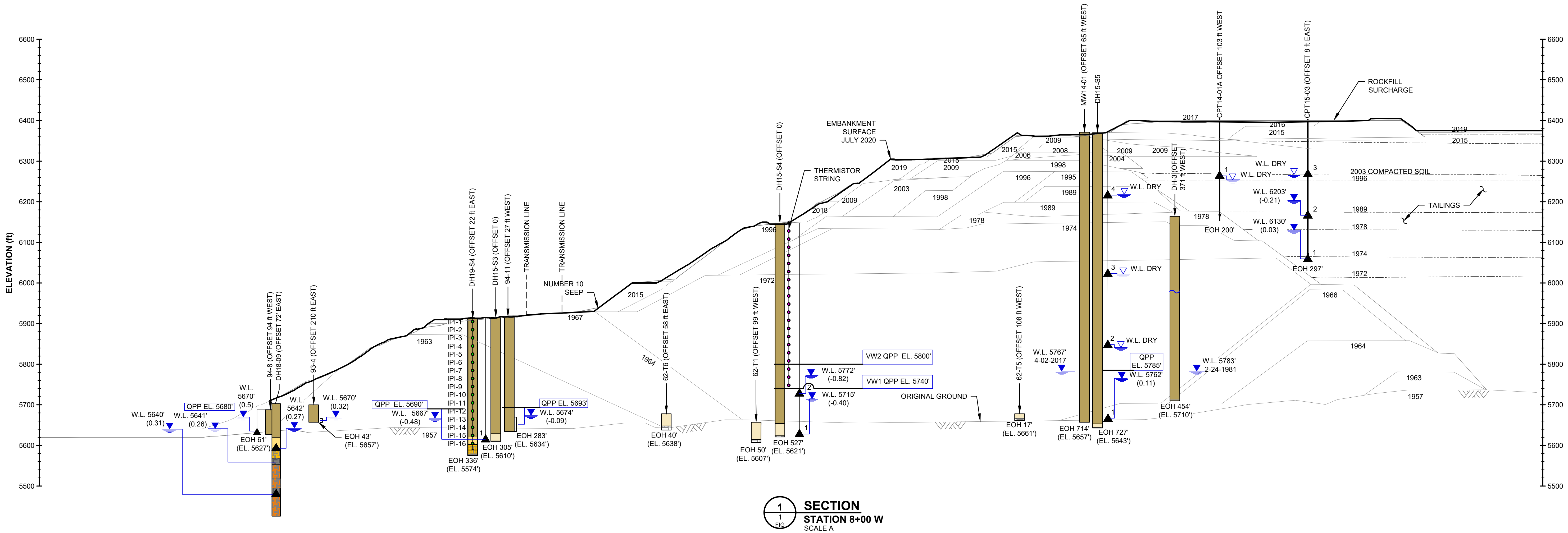
YANKEE DOODLE TAILINGS IMPOUNDMENT

SUMMARY OF MEASURED PIEZOMETRIC ELEVATIONS VS. QPP TRIGGERS WEST EMBANKMENT

Knight Piésold CONSULTING

P/A NO.	REF. NO.
VA101-126/23	VA20-02198

FIGURE 6 REV 0



SECTION 1
STATION 8+00 W
SCALE A

NOTES:

1. COORDINATE SYSTEM IS ANACONDA MINE GRID.
2. DIMENSIONS AND ELEVATIONS ARE IN FEET, UNLESS NOTED OTHERWISE.
3. PIEZOMETRIC LEVELS (W.L.) SHOWN USING END OF Q3 2020 READINGS (SEPTEMBER 30, 2020), UNLESS OTHERWISE INDICATED.
4. CHANGE IN WATER LEVEL FOR QPP SITES IS RELATIVE TO END OF Q2 2020.
5. MONITORING WELL MW14-01 ABANDONED DUE TO RISER BLOCKAGE DURING Q4 2019, RESULTING IN ERRONEOUS DATA. DATA OMITTED FOR CLARITY.
6. QPP STANDS FOR QUANTITIVE PERFORMANCE PARAMETER.

LEGEND:

- TAILINGS
- EMBANKMENT FILL
- ALLUVIUM
- RECENT ALLUVIUM
- HIGHLY ALTERED BEDROCK
- HIGHLY WEATHERED BEDROCK
- MODERATELY WEATHERED BEDROCK
- BEDROCK
- W.L. XXX — QUARTERLY PIEZOMETRIC ELEVATION CHANGE (±X.X feet) SINCE LAST QUARTER
- VIBRATING WIRE PIEZOMETER
- THERMISTOR
- INCLINOMETER SENSOR
- SOL — SETTING OUT LINE
- 1972 — HISTORICAL TAILINGS SURFACE
- 1972 — DATE OF EMBANKMENT RAISE

SCALE A: 125 0 125 250 375 500 625 ft

MONTANA RESOURCES, LLP

YANKEE DOODLE TAILINGS IMPOUNDMENT

PIEZOMETRIC CONDITIONS ALONG EAST-WEST EMBANKMENT SECTION 8+00W (LOOKING WEST)

Knight Piésold CONSULTING

P/A NO.	REF NO.
VA101-126/23	VA20-02198

FIGURE 7 REV 0

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED
0	03NOV'20	ISSUED WITH LETTER	CYP	RMM	KTD

SAVED: \\KPL\VA-Prj$\1\01\00126\23\A\Acad\FIGS\B12, 10/29/2020 11:27:31 AM , RMCLELLAN PRINTED: 11/3/2020 7:26:16 AM, FIG 7, RMCLELLAN
XREF FILE(S): Sections IMAGE FILE(S):

APPENDIX C2

Q3 2020 Quarterly Water Data Summary

(Pages C2-1 to C2-26)

December 17, 2020

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Mr. Mark Thompson
Vice President - Environmental Affairs
Montana Resources, LLP
600 Shields Avenue
Butte, Montana
USA, 59701

Dear Mark,

RE: Q3 2020 – YDTI Quarterly Water Data Summary

1.0 INTRODUCTION

Montana Resources, LLP (MR) operates an open pit copper and molybdenum mine in Butte, Montana. Tailings produced from the process are stored in the Yankee Doodle Tailings Impoundment (YDTI), which is a valley-fill style impoundment enclosed by a rockfill embankment. MR's operational surveillance plan for the impoundment, as described in the Tailings Operations, Maintenance and Surveillance (TOMS) Manual (MR/KP, 2020), requires routine monitoring of the supernatant pond elevation and flowrates at several water management locations. Supernatant pond data and flow records are submitted to Knight Piésold Ltd. (KP) approximately quarterly, and these records are reviewed to evaluate the performance of the YDTI in conjunction with observations made during periodic inspections of the impoundment.

This letter presents a summary of the MR YDTI water management data from the third quarter (Q3) of 2020, including July 1 to September 30, 2020. The purpose of this letter is to review the performance records associated with the YDTI water management systems and identify if any operational changes are recommended. The Q3 letter includes a summary of data related to the following:

- YDTI supernatant pond elevation and surveyed volume
- Tailings beach elevations at the discharge points
- Silver Lake Water System (SLWS) flowrates
- Horseshoe Bend (HsB) Weir flowrates
- Seep 10 flowrates
- Precipitation Plant Overflow flowrates
- West Embankment Drain (WED) Extraction Pond flowrates

2.0 YDTI SUPERNATANT POND

2.1 SUPERNATANT POND MONITORING

The YDTI supernatant pond is located on the northern side of the YDTI and is constrained by natural topography to the north and east, and the tailings beach to the south and west. MR manually measures the YDTI supernatant pond elevation on a weekly basis and surveys the pond annually to evaluate subaqueous beach slopes and estimate the pond volume. The elevation of the pond surface typically rises at a rate of six to seven feet per year as the volume of tailings stored in the facility increased. Minor changes in pond elevation also occur due to climatic/seasonal changes in pond volume (e.g. precipitation/runoff, evaporation, development/melt of winter ice).

The Berkeley Pit Pilot Project (the Pilot Project) was commissioned in September 2019 as part of the Superfund Butte Mine Flooding Operable Unit (BMFOU) activities on site and introduced a new water management strategy to the facility. One objective of the Pilot Project is to reduce the pond volume to approximately 15,000 acre-ft over the next three to five years. Consequently, the rate of change of the YDTI supernatant pond elevation will be affected by the Pilot Project when compared to previous years. A more detailed description of the Pilot Project is presented in the TOMS Manual (MR/KP, 2020).

2.2 2020 BATHYMETRIC SURVEY

The annual bathymetric survey and assessment of the YDTI supernatant pond volume was undertaken during Q3 2020 during the period from June 22 through July 9. The evaluation of the survey data indicated an estimated YDTI pond volume of approximately 32,100 acre-ft. This volume corresponds to a 2,300 acre-ft (7%) decrease in the estimated pond volume compared to the previous bathymetric survey conducted on July 9, 2019. The pond area was estimated to be approximately 610 acres, which corresponds to a decrease of 160 acres (21%) compared to the previous 2019 survey.

2.3 POND WATER ELEVATION

The last pond water elevation recorded for the Q3 monitoring period was 6358.48 ft on September 30, 2020, which equates to a pond elevation reduction of approximately 2 ft during Q3. The average Q3 pond elevation change measured over the previous three years was an increase of 0.2 ft. The elevation measured at the end of September 2020 is only slightly higher than the elevation of 6358.05 ft at the end of September 2019, indicating an annual change of less than 0.5 ft between these two measurements. The reduction in pond elevation in Q3 2020 is largely attributed to operation of the Pilot Project (detailed further in next section). The monthly supernatant pond water elevation changes from Q1 2015 through Q3 2020 are shown on Figure 2.1.

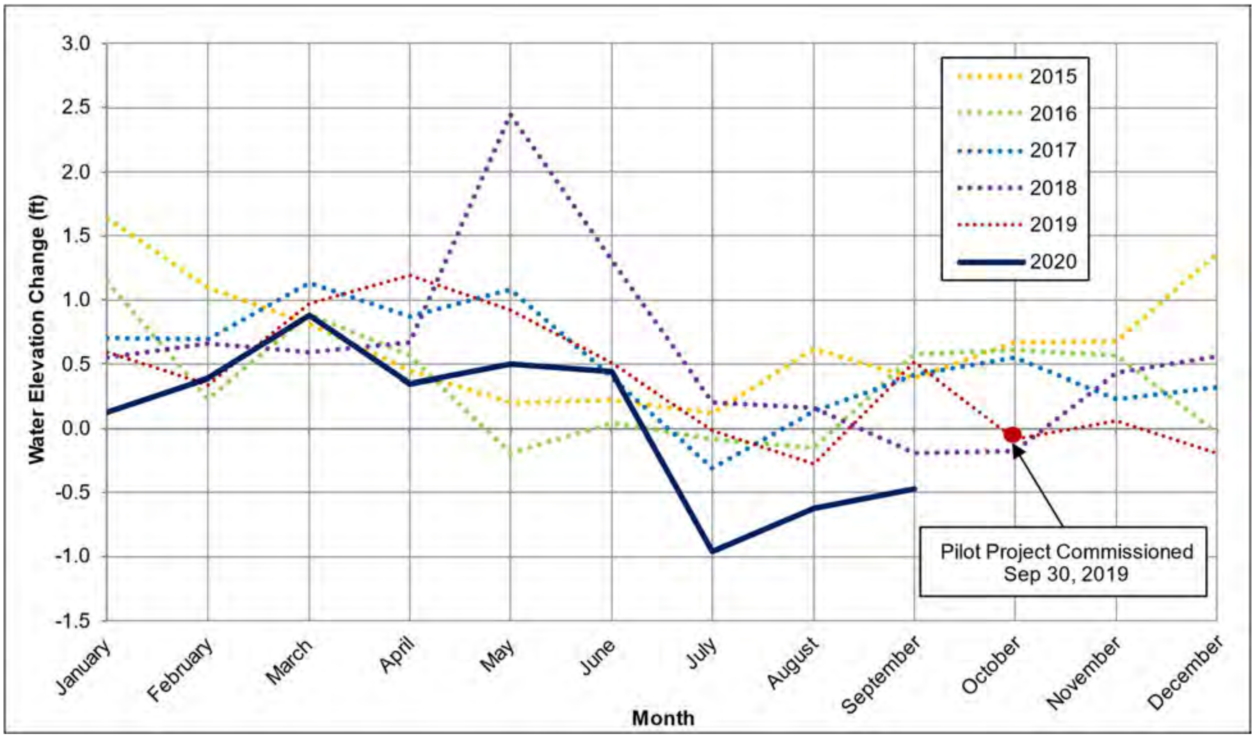


Figure 2.1 Monthly YDTI Pond Water Elevation Change

2.4 PILOT PROJECT DISCHARGE

Approximately 554 million gallons (1,700 ac-ft) of water was removed from the YDTI and discharged offsite during Q3 and approximately 335 million gallons (1,030 ac-ft) of Berkeley Pit water was treated and introduced to the YDTI during the same period. These two system flows resulted in a YDTI supernatant pond volume deficit of approximately 219 million gallons (670 ac-ft) during Q3 2020. The Pilot Project has resulted in a net volume deficit of approximately 677 million gallons (2,080 ac-ft) since it was commissioned in September 2019.

The Pilot Project's net volume deficit to date represents approximately 12% of Pilot Project's target total YDTI volume deficit to reduce the supernatant pond volume to 15,000 acre-ft. The monthly pond water elevation from Q1 2017 through Q3 2020 is shown on Figure 2.2, highlighting the effect of Pilot Project operations on the rise of the supernatant pond water elevation since late 2019 compared to the trend in the years preceding this operational change.

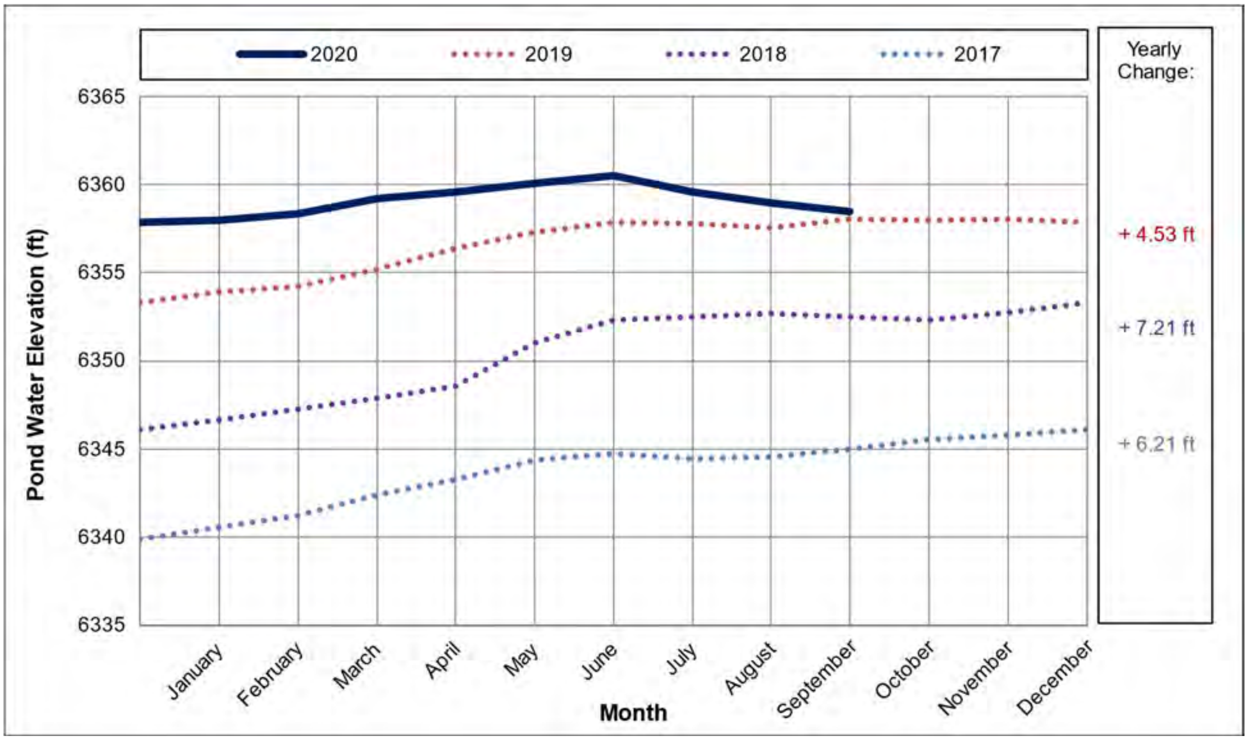


Figure 2.2 Monthly YDTI Pond Water Elevation

3.0 YDTI TAILINGS BEACH

3.1 TAILINGS DISCHARGE LOCATIONS

MR manually measures the YDTI tailings discharge elevations on a weekly basis. The two active tailings discharge lines used each week are selected based on the beach survey results and other external factors, such as the wind forecast, tailings line maintenance, and embankment construction projects around the discharge lines. Tailings discharge scheduling continues to focus on maintaining extensive tailings beaches adjacent to all three of the embankments.

Several changes were made to Tailings Discharge Line 3 in Q3 2020; tailings discharge location NS-3 was relocated closer to NS-2 and a new discharge location NS-4 was added in August at the northern end of the North-South Embankment. The positions of the ten discharge locations at the end of Q3 are shown on Figure 3.1. Tailings discharge records indicate that tailings were distributed from all three YDTI embankments during Q3 2020, and all ten discharge locations were used.

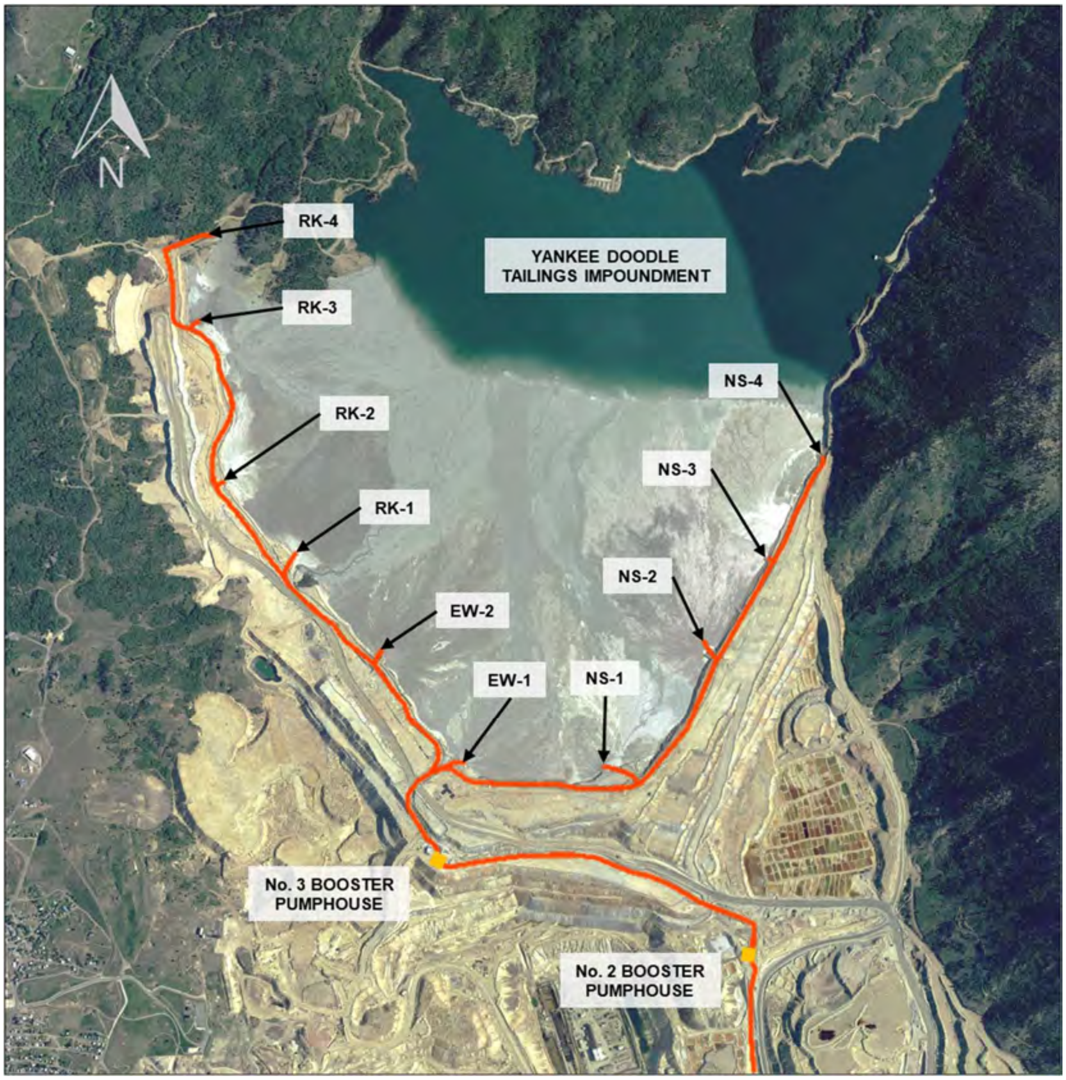


Figure 3.1 YDTI Tailings Discharge Locations

3.2 TAILINGS BEACH ELEVATIONS

The tailings beach elevations at each of the discharge locations are shown on Figure 3.2. The elevation difference between the lowest discharge elevation (NS-4) and the pond surface was approximately 11 ft at the end of Q3 2020. The lowest discharge elevation during Q3 was at the new NS-4 discharge location located at northern end of the North-South Embankment. The lowest discharge elevation prior to the installation of NS-4 was located at RK-3 and RK-4 at the northern end of the West Embankment. The location of the lowest discharge point identifies the area of the facility where the pond may initially contact the embankment in the event the pond elevation increases due to an increase in pond volume (e.g. flooding).

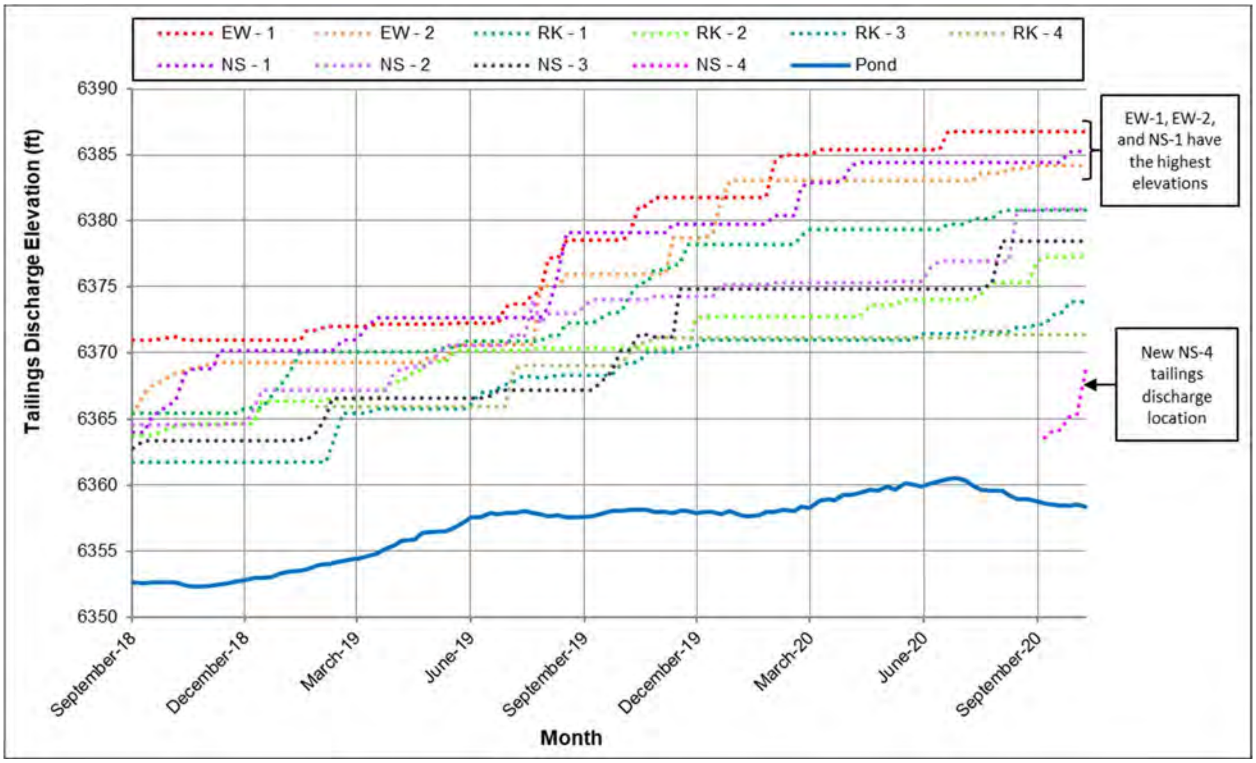


Figure 3.2 Tailings Discharge Elevations

3.3 TAILINGS BEACH LENGTH

Images captured by the Sentinel-2 satellite are reviewed twice per month to remotely observe the shape of the tailings beach and position of the supernatant pond relative to the embankments. The shortest Q3 beach length was observed at the northern end of the North-South Embankment at the end of Q3 and estimated to be approximately 1,400 ft. This is 200 ft (17%) longer than the Q2 beach length, which can be attributed to the reduction in pond volume and water surface area. An overview of the facility observed from the Sentinel-2 satellite images at the end of July, August, and September 2020 are presented in the attached figures.

3.4 TAILINGS BEACH SLOPE

Topographic data from the annual bathymetric and aerial surveys are used to determine the YDTI tailings beach slopes, both above and below water, from each discharge location. The 2020 bathymetric and aerial surveys were both undertaken during the first week of July. Note, these surveys were conducted prior to completing the changes to Tailings Discharge Line 3.

The average beach-above-water (BAW) slope, excluding discharge location NS-3, was 0.4%. This is a 23% reduction to the BAW slope since 2019, which is likely attributed to the pond receding in the facility and a longer beach length. The average beach-below-water (BBW) slope, excluding NS-3, is 5.2% which is similar to the BBW slope calculated in 2019.

The NS-3 slopes are slightly steeper than the slopes observed at the other discharge locations due to the proximity of the spigot to the supernatant pond. This trend was identified in 2019 and will likely also apply to the tailing beach slopes at the new NS-4 location.

The development of the tailings beach between June 2019 and June 2020 is represented visually with the basin isopach plot shown on Figure 3.4. The majority of the tailings beach recorded an elevation change of less than 6 ft since June 2019. The highest rate of tailings accumulation during this period was recorded at the margin of the supernatant pond near the northern end of the West Embankment and to a lesser extent elsewhere along the margin of and below the pond. The high rate of rise is due to preferential use of the tailings discharge points RK-3 and RK-4 during the last 12 months.

The subaerial tailings beach at the north ends of the North-South and West Embankment experienced a smaller change (0 ft to 3 ft) in elevation compared to the other subaerial beach areas. This is likely due to continued consolidation of the underlying finer-grained tailings that are being covered with coarser 'whole' tailings resulting from use of multiple tailings discharge locations since 2017.

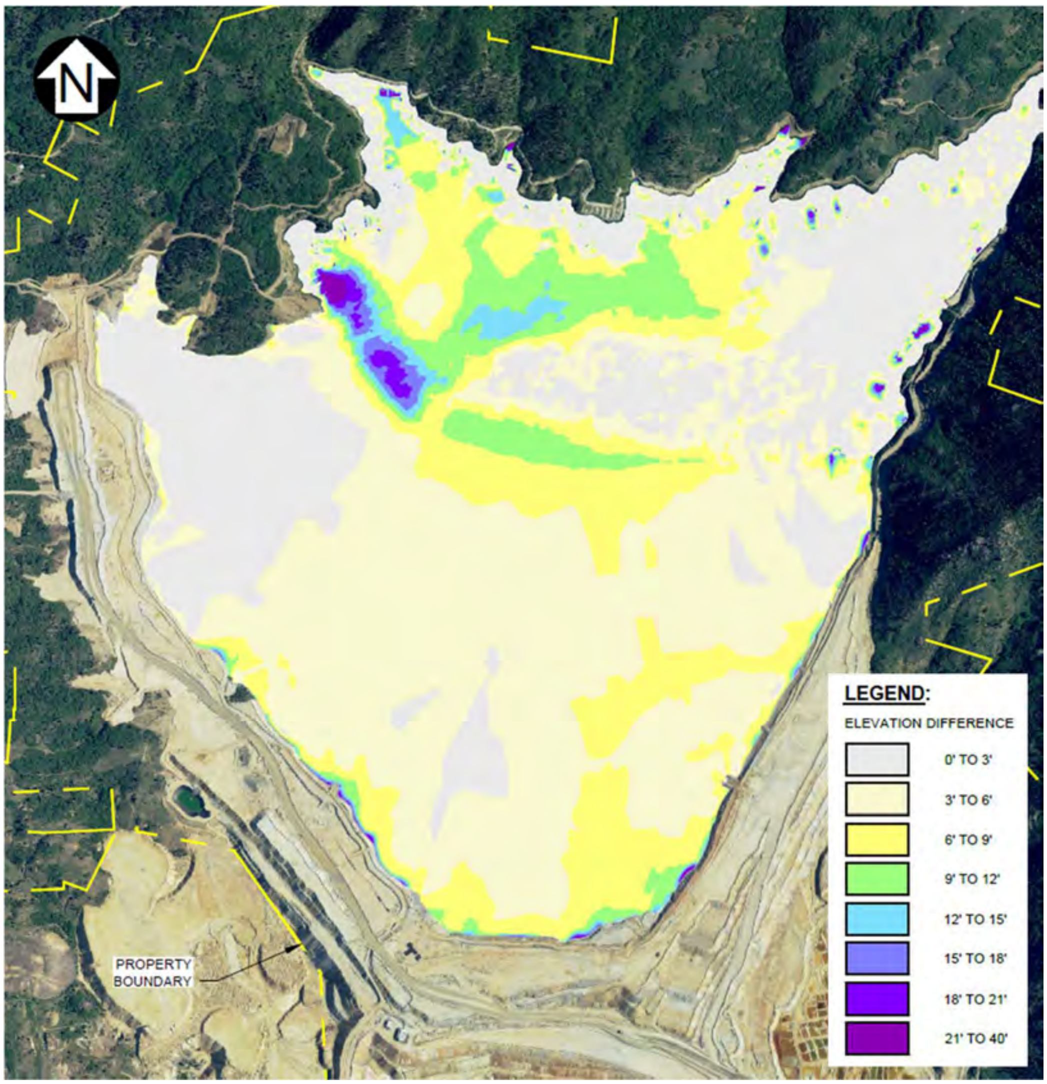


Figure 3.3 2019-2020 Basin Filling Isopach

4.0 SILVER LAKE WATER SUPPLY SYSTEM FLOWRATE

Water from the SLWS is used to meet both the operational freshwater and make-up water requirements. MR implemented changes to their SLWS use practices in April 2016, which immediately reduced the daily make-up water flowrates by more than 50%. MR has continued to operate with reduced freshwater and make-up water demands in Q3 2020.

The flowrates since the implementation of the new SLWS practices are presented on Figure 4.1. SLWS flows in July and August 2020 were relatively constant at an average rate of 580 gpm (0.84 Mgpd), which is comparable to the average Q3 flowrate from the previous 3 years. The September 2020 average flowrate was approximately 910 gpm (1.31 Mgpd), which is a 34% increase compared to the average Q3 flowrate from the previous three years. This increase is due to a period of higher than usual SLWS usage from September 17 to 28, averaging approximately 1300 gpm (1.9 Mgpd), when the SLWS was used for maintenance and filling the No. 3 thickener at the Concentrator. The average SLWS flowrate during Q3 remained below the target maximum flowrate of 1 Mgpd even when considering the higher than usual flows in September.

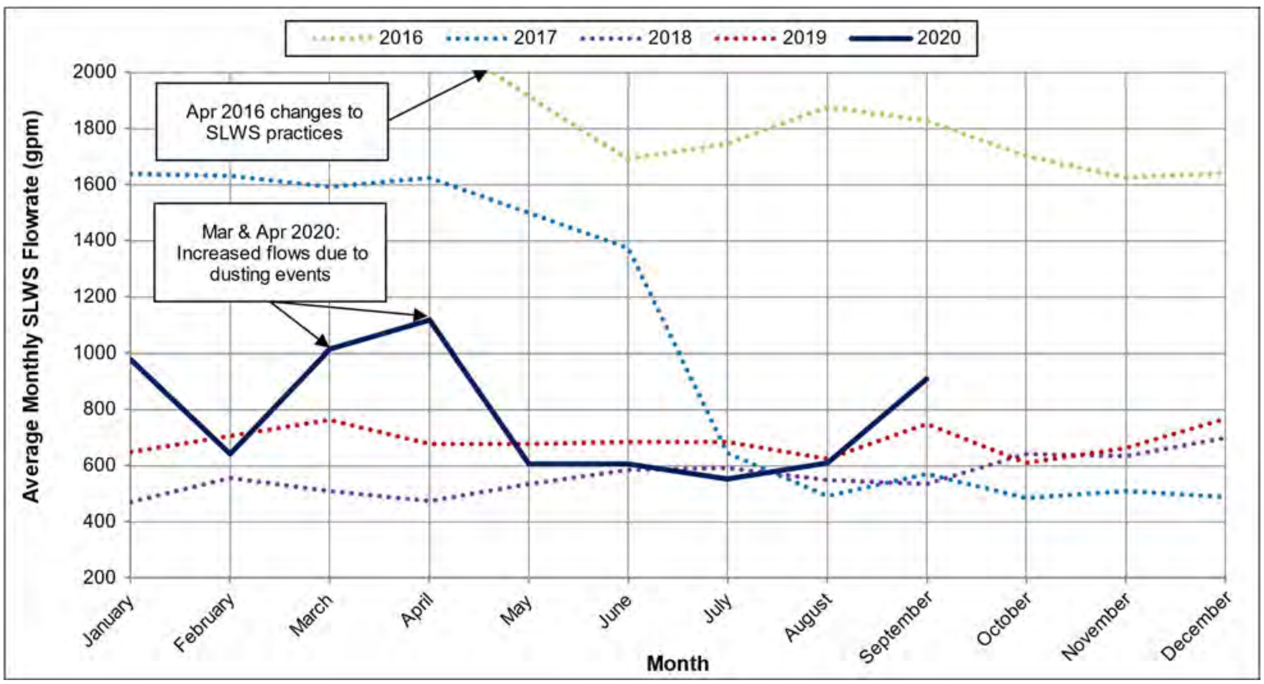


Figure 4.1 Average Monthly SLWS Flowrate

5.0 HSB WEIR FLOWRATE

Seepage from the YDTI flows south through the HsB area and joins with the Precipitation Plant overflow discharge and localized surface runoff in the HsB Pond before passing over the HsB Weir. The HsB Weir incorporates a weir plate and level meter near the south end of the pond, where flows are recorded in 15-minute intervals. The average monthly HsB Weir flowrates from Q1 2015 through Q3 2020 are presented on Figure 5.1.

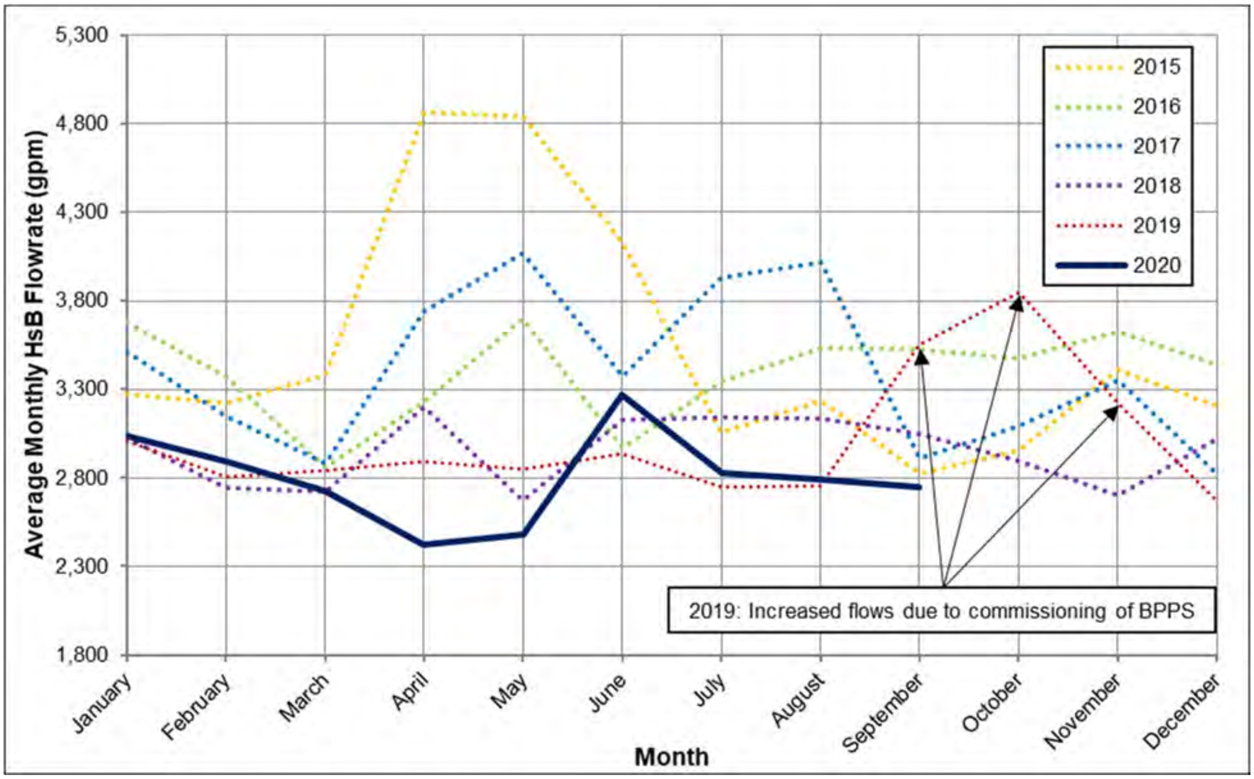


Figure 5.1 Average Monthly HsB Weir Flowrate

The average HsB Weir flowrate during Q3 2020 was approximately 2,790 gpm. The Q3 2020 flows are approximately 370 gpm (12%) lower than the Q3 average over the previous three years, excluding the increased flows during the commissioning of the Berkeley Pit Pumping System (BPPS). The average Q3 flowrate has remained relatively steady for the previous three years.

6.0 SEEP 10 FLOWRATE

Several smaller seeps, known as the Number 10 Seep (Seep 10), daylight on the EL 5,900 ft bench above the HsB seepage collection area approximately 250 ft higher than the downstream toe of the embankment. These localized flows have been attributed to a historical service corridor that conveys some tailings seepage as perched flows through the embankment to Seep 10.

The seepage is collected in a small pond on top of the EL 5,900 ft bench and is routed to the HsB seepage collection area via a pipe. The Seep 10 flows are measured using an ultrasonic lookdown level sensor that was installed in April 2019 to automatically measure the stilling pond level near the weir. The sensor was connected to the Remote Monitoring System (RMS) using a Sensemetrics ThreadX device on April 30, 2019.

The average Seep 10 flowrate in Q3 2020 was approximately 130 gpm, which is a comparable to the Q3 flowrates observed during the previous two years. The trend of the Seep 10 flows observed during 2020 is similar to the 2019 trend. Lower flowrates were observed in the beginning of the year, increasing during Q2, and reaching a peak throughout late Q2 and Q3. The average monthly Seep 10 flowrates from Q1 2015 through Q3 2020 are shown on Figure 6.1.

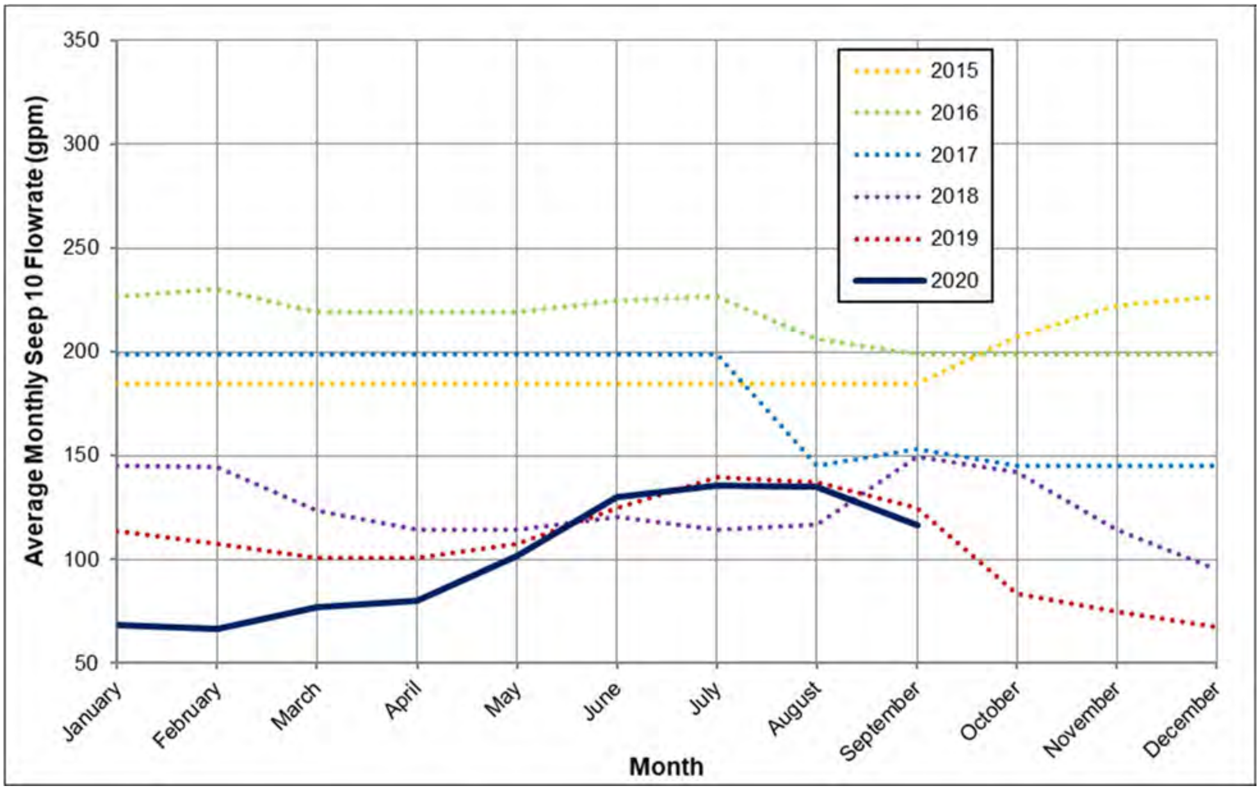


Figure 6.1 Average Monthly Flowrates at Seep 10

7.0 PRECIPITATION PLANT OVERFLOW FLOWRATE

The Precipitation Plant overflow is generated at the Precipitation Plant pump house after flows have been discharged from the 'tin can' processing cells. Processed water is directed to the Precipitation Plant recirculation pumps, and any flow greater than the capacity of the pumps is directed out of the system via the Precipitation Plant overflow pipeline into the HsB Pond. The Precipitation Plant overflow discharge rate is determined by:

- Inflows (leach water, seepage, precipitation)
- Outflow (recirculation pump station flowrate)

The discharge flowrate is measured using a calibrated overflow weir plate with water level measurement, and monitoring began at this location in 2017. Flow recording at this location can be used to provide insight into the HsB area seepage flow and water management changes.

The average monthly Precipitation Plant overflow flowrates from February 2017 through Q3 2020 are shown on Figure 7.1. The average Q3 flowrate was approximately 790 gpm lower (79%) than those measured in Q3 of the previous three years. Overflow flowrates in Q1 and Q2 2020 were similarly reduced compared to the previous three years.

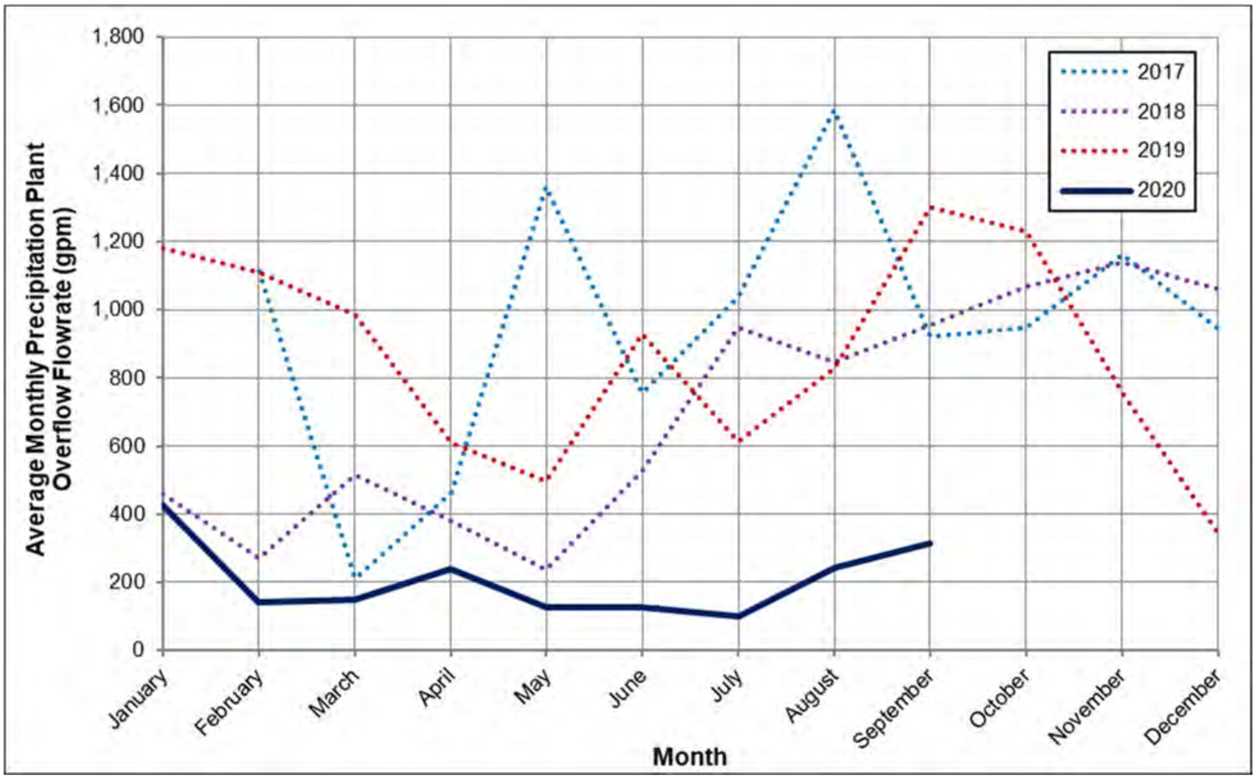


Figure 7.1 Average Monthly Precipitation Plant Overflow Flowrate

The reduction in flows can be attributed to changes to the water management strategy around the precipitation plant. A portion of the water reporting to Hooligan Pond is currently by-passing the Precipitation Plant via a weir and pipe (Photo 7.1) and discharging into the southern end of the HsB Pond (Photos 7.2 A and B). The flow is currently unmeasured. This diversion results in lesser flows contributing to the recirculation pump house head tanks, and therefore, lower overflow flowrates.

Water was also observed during Q3 2020 overflowing from the Precipitation Plant recirculation pump house head tank and draining to the adjacent HsB Pond (Photo 7.3). This unmeasured flow also reduces the contributing flows to the precipitation plant recirculation pump and overflow. Overflow at this location has been observed intermittently since Q4 2019.

Photo 7.1 Bypass Flow at Hooligan Pond Weir

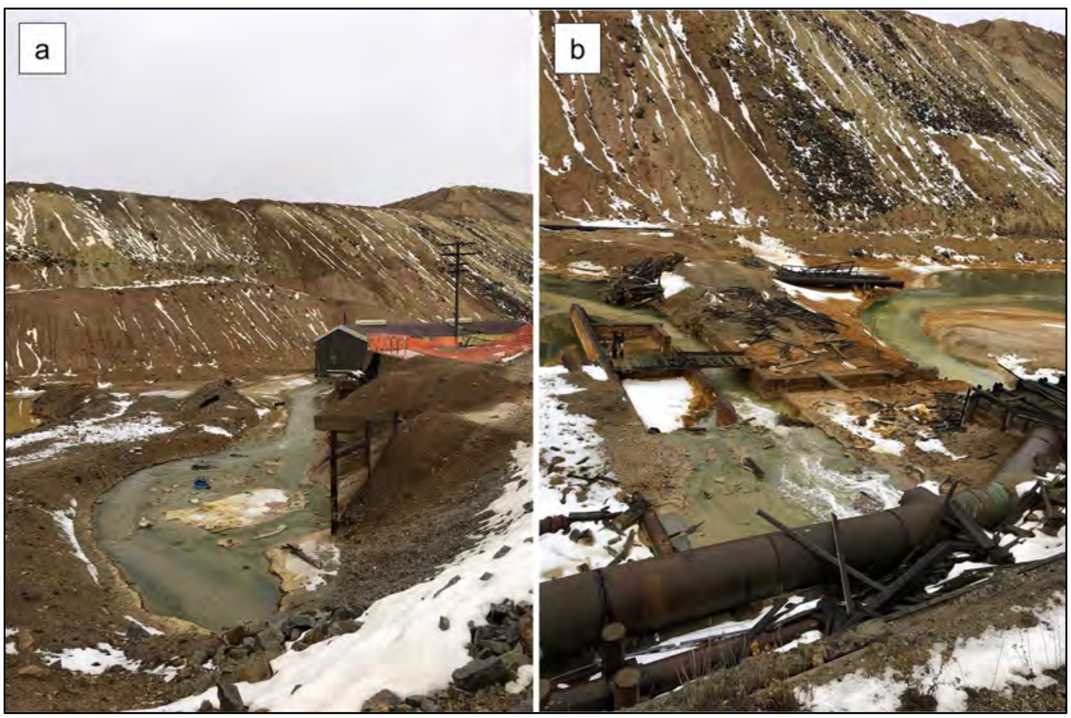


Photo 7.2 Bypass Flow Discharging into HsB Pond at Locations A and B

Photo 7.3 Precipitation Plant Recirculation Pump House. Water is overflowing from the head tank under the stairs.

8.0 WED EXTRACTION POND DEWATERING SYSTEM

The WED and several other seepage control features have been included in the West Embankment to maintain hydrodynamic containment of the YDTI seepage as the supernatant pond elevation rises above the groundwater elevation at the Potentiometric Low. Hydrodynamic containment will be achieved by keeping piezometric elevations along the west side of the YDTI below the Potentiometric Low in the West Ridge to preclude migration of seepage across the ridgeline.

The Extraction Pond forms the gravity outlet of the WED. The Extraction Pond Dewatering System, which includes a floating barge and pump system, began operating on November 20, 2019. The Extraction Pond Dewatering System returns water collected in the WED to the YDTI via a pipeline that discharges at RK-1. The flows are measured using an inline totalizing flowmeter. When operating correctly, the recorded flowrates have typically been between 175 gpm to 600 gpm since the system was commissioned.

The average daily flowrate for the Extraction Pond Dewatering System in Q3 2020 is shown on Figure 8.1. The average flowrate during this period was approximately 350 gpm, which is comparable to the average flowrate since the commissioning of the system. Two instances of unusual flows occurred during Q3 2020, both instances were associated with maintenance or relocation of the Extraction Pond discharge pipeline.

The average weekly flowrate of the Extraction Pond Dewatering System since it began operating on November 20, 2019 is shown on Figure 8.2. A longer period of data collection is required before any trends or seasonal changes can be determined. A period of erroneous data was recorded in March and April 2020 due to the pumps cycling on and off. Data from this period is excluded from Extraction Pond Dewatering System flow analysis.

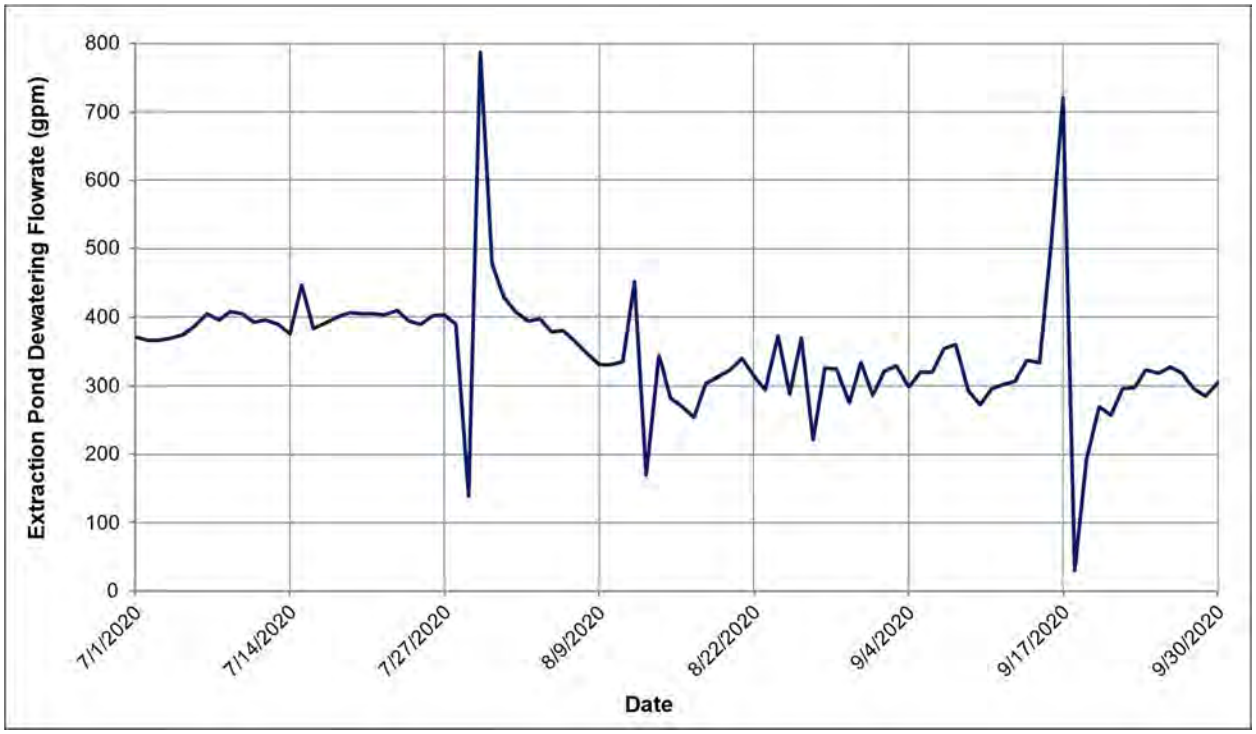


Figure 8.1 Extraction Pond Dewatering System Daily Flowrate (Q3 2020)

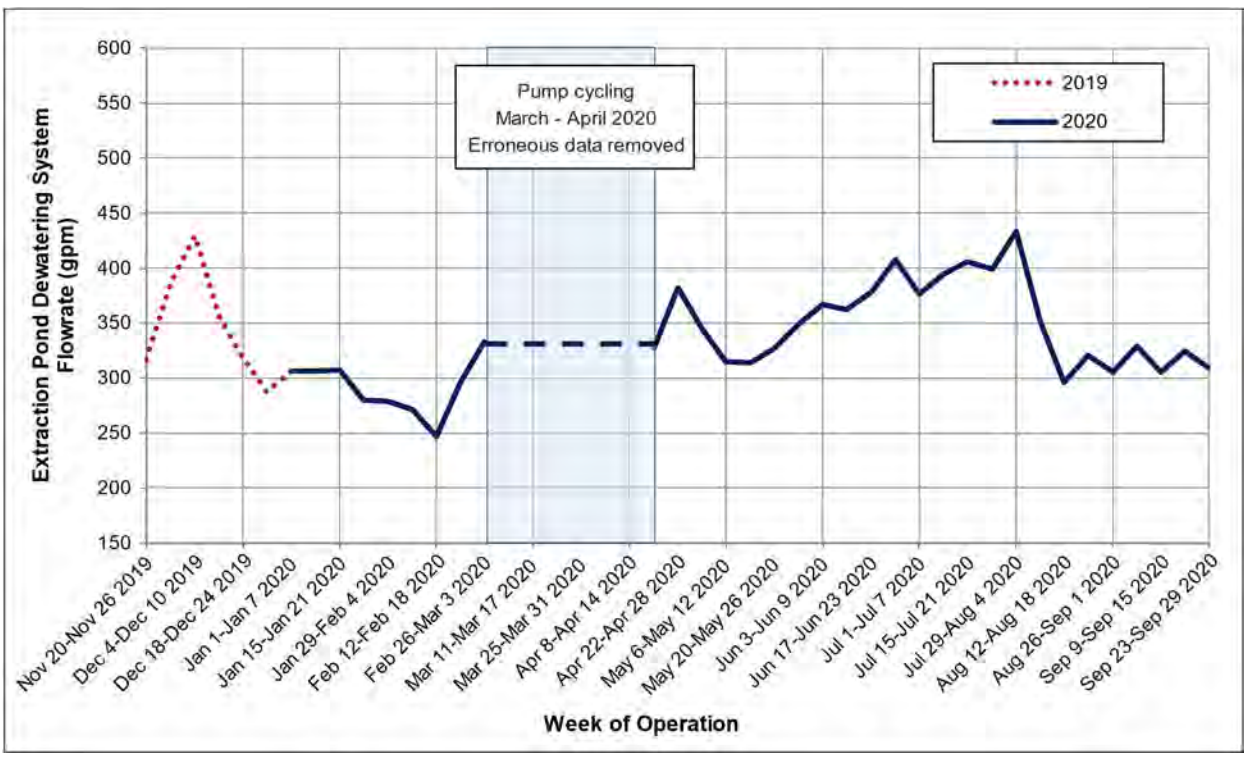


Figure 8.2 Extraction Pond Dewatering System Weekly Flowrate

9.0 CONCLUSIONS

The following observations were derived from the analysis of the Q3 2020 YDTI water data records:

- The YDTI supernatant pond elevation decreased by approximately 2 ft. This is mainly attributed to the operation of the BMFOU Pilot Project, which resulted in a net deficit of 219 million gallons (670 ac-ft) of water in Q3 2020.
- The YDTI supernatant pond volume was estimated to be 32,100 ac-ft from bathymetric data in July 2020. This corresponds to a 2,300 ac-ft (7%) decrease compared to the pond volume in July 2019.
- The YDTI supernatant pond area was estimated to be 610 acres from the bathymetric data in July 2020. This corresponds to a 160 acre (21%) decrease compared to the pond area in July 2019.
- SLWS flows averaged approximately 1 Mgpd in Q3 2020. This is similar to the average Q3 flowrates for the previous three years.
- HsB Weir flowrates were steady throughout Q3 2020, averaging approximately 2,790 gpm. This is 370 gpm (12%) lower than the Q3 average over the previous three years.
- Seep 10 flowrates in Q3 2020 were similar to those recorded in Q3 2019, averaging approximately 130 gpm. The monthly Seep 10 flowrate trends observed in 2019 and 2020 since installation of ultrasonic lookdown level sensor to automatically measure the stilling pond level near the weir include lower flowrates at the beginning of the year and increasing flows during Q2, which reach a peak throughout late Q2 and Q3.
- Extraction Pond Dewatering System flowrates averaged approximately 350 gpm in Q3 2020, which is comparable to the average flowrates since the implementation of the system.

We trust that this letter meets your needs at this time. Please do not hesitate to contact the undersigned with any questions.

Yours truly,
Knight Piésold Ltd.

Prepared: Lena Choi, E.I.T.
Junior Engineer

MONTANA
2020-12-17
DANIEL DYLAN FONTAINE
No. 59785 PE
LICENSED
PROFESSIONAL ENGINEER

Reviewed: Daniel Fontaine, P.E.
Specialist Engineer | Associate

MONTANA
KEN J. BROUWER
50020 PE
REGISTERED
PROFESSIONAL ENGINEER
2020-12-17

Reviewed: Ken Brouwer, P.E.
Principal

Approval that this document adheres to the Knight Piésold Quality System: KJB

Attachments:

Figure A.1 Rev 0 Tailings Beach Assessment – July 28, 2020
Figure A.2 Rev 0 Tailings Beach Assessment – August 27, 2020
Figure A.3 Rev 0 Tailings Beach Assessment – October 5, 2020
Photo Log

References:

Montana Resources and Knight Piésold Ltd. (MR/KP, 2020). Yankee Doodle Tailings Impoundment – Tailings Operations, Maintenance and Surveillance (TOMS) Manual, Rev 4, dated May 2020.

/lc

NOTES:

1. TAILINGS DISCHARGE AND SUPERNATANT POND ELEVATIONS WERE SURVEYED ON JULY 28, 2020. ALL ELEVATIONS ARE RELATIVE TO THE ANACONDA DATUM.
2. SENTINEL-2 VISIBLE SATELLITE IMAGE TAKEN ON JULY 27, 2020.

REV	DATE	DESCRIPTION	PREP'D	RVW'D
0	16DEC'20	ISSUED WITH LETTER	LC	RSD

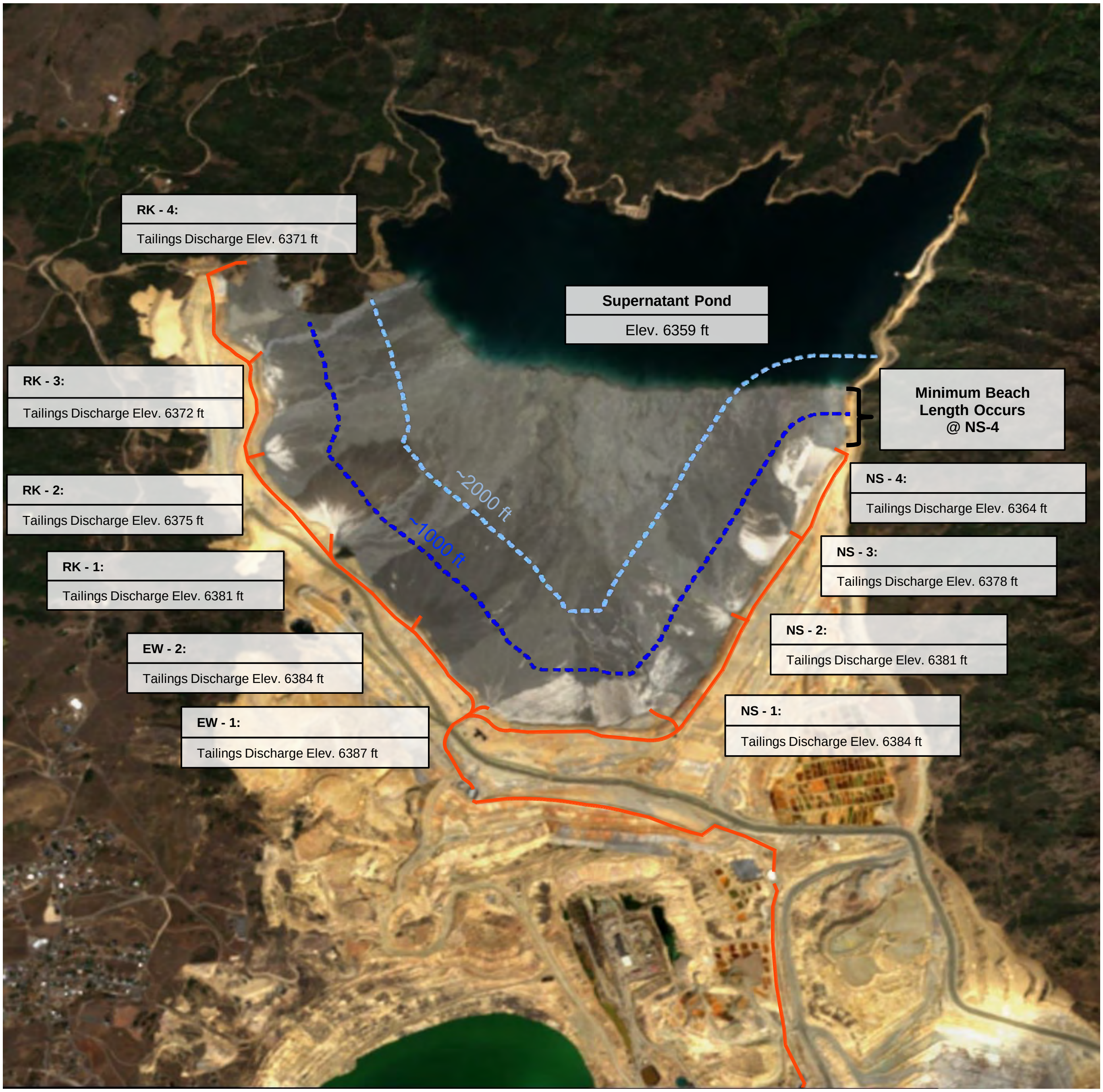
MONTANA RESOURCES, LLP.

YANKEE DOODLE TAILINGS IMPOUNDMENT

SENTINEL-2 SATELLITE IMAGERY
TAILINGS BEACH ASSESSMENT
JULY 28, 2020

Knight Piésold CONSULTING

P/A NO.	REF. NO.	
VA101-126/23	VA20-02219	
FIGURE A.1		REV 0



NOTES:

1. TAILINGS DISCHARGE AND SUPERNATANT POND ELEVATIONS WERE SURVEYED ON AUGUST 27, 2020. ALL ELEVATIONS ARE RELATIVE TO THE ANACONDA DATUM.
2. SENTINEL-2 VISIBLE SATELLITE IMAGE TAKEN ON AUGUST 28, 2020.
3. TAILINGS DISCHARGE LOCATION NS-3 WAS RELOCATED CLOSER TO NS-2.
4. TAILINGS DISCHARGE LOCATION NS-4 WAS ADDED AT THE END OF THE NORTH-SOUTH EMBANKMENT.

REV	DATE	DESCRIPTION	PREP'D	RVW'D
0	16DEC'20	ISSUED WITH LETTER	LC	RSD

MONTANA RESOURCES, LLP.

YANKEE DOODLE TAILINGS IMPOUNDMENT

SENTINEL-2 SATELLITE IMAGERY
TAILINGS BEACH ASSESSMENT
AUGUST 27, 2020

Knight Piésold CONSULTING

P/A NO.	REF. NO.	
VA101-126/23	VA20-02219	
FIGURE A.2		REV 0

NOTES:

1. TAILINGS DISCHARGE AND SUPERNATANT POND ELEVATIONS WERE SURVEYED ON OCTOBER 5, 2020. ALL ELEVATIONS ARE RELATIVE TO THE ANACONDA DATUM.
2. SENTINEL-2 VISIBLE SATELLITE IMAGE TAKEN ON OCTOBER 7, 2020.

REV	DATE	DESCRIPTION	PREP'D	RVW'D
0	16DEC'20	ISSUED WITH LETTER	LC	RSD

MONTANA RESOURCES, LLP.

YANKEE DOODLE TAILINGS IMPOUNDMENT

SENTINEL-2 SATELLITE IMAGERY
TAILINGS BEACH ASSESSMENT
OCTOBER 5, 2020

Knight Piésold CONSULTING

P/A NO.	REF. NO.	
VA101-126/23	VA20-02219	
FIGURE A.3		REV 0

Q3 2020 – YDTI QUARTERLY WATER DATA SUMMARY
PHOTO LOG

PHOTO 1 – Sep 16, 2020 – Flow through HsB Weir.

PHOTO 2 – Sep 16, 2020 – Seep 10 Stilling Pond.

Q3 2020 – YDTI QUARTERLY WATER DATA SUMMARY
PHOTO LOG

PHOTO 3 – Sep 16, 2020 – Seep 10 Weir and Staff Gauge.

PHOTO 4 – Sep 16, 2020 – Seep 10 Staff Gauge reading slightly below 0.4.

Q3 2020 – YDTI QUARTERLY WATER DATA SUMMARY
PHOTO LOG

PHOTO 5 – Oct 30, 2020 – Precipitation Plant Recirculation Pump House. Water is overflowing from the head tank under the stairs.

PHOTO 6 – Oct 15, 2020 – Precipitation Plant Recirculation Pump House head tank water level. Water is approximately 1 ft below the top of the concrete separators.

Q3 2020 – YDTI QUARTERLY WATER DATA SUMMARY PHOTO LOG

PHOTO 7 – Oct 30, 2020 – Flow through Precipitation Plant overflow weir.

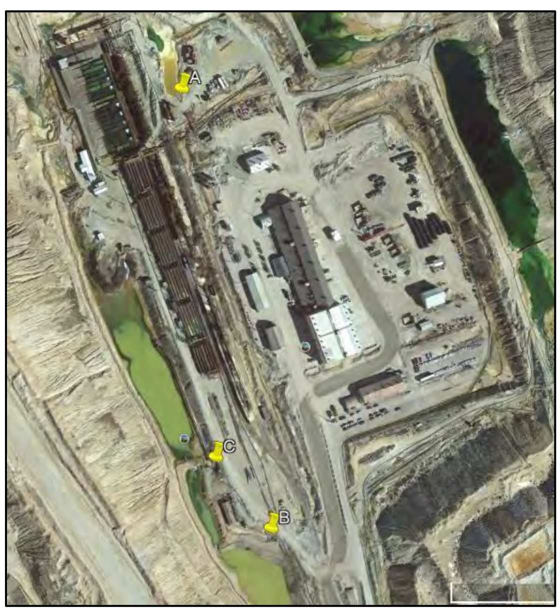


PHOTO 8 – Relevant locations regarding Hooligan Pond bypassing flows. A) Hooligan Pond; B) first discharge location; C) second discharge location.

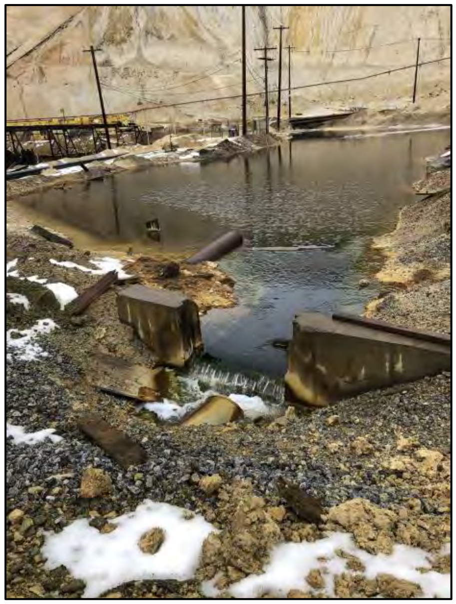


PHOTO 9 – Nov 18, 2020 – Hooligan Pond bypassing flows location A: Hooligan Pond and bypassing flow through weir.

PHOTO 10 – Nov 18, 2020 – Hooligan Pond bypassing flows location A: close-up of flow bypassing through weir.

Q3 2020 – YDTI QUARTERLY WATER DATA SUMMARY PHOTO LOG

PHOTO 11 – Nov 18, 2020 – Hooligan Pond bypassing flows location B: flow at first discharge location in HsB Pond area.

PHOTO 12 – Nov 18, 2020 – Hooligan Pond bypassing flows location B: flow at second discharge location in HsB Pond area.

Knight Piésold CONSULTING

Q3 2020 – YDTI QUARTERLY WATER DATA SUMMARY PHOTO LOG

PHOTO 13 – Sep 16, 2020 – WED Extraction Pond and Dewatering System.

APPENDIX D

Correction Action Plan Documentation

APPENDIX D1

MR 2019 Corrective Action 2 Deferral Notification

(Pages D1-1 to D1-2)

Montana Resources

Montana Resources, LLP
600 Shields Ave.
Butte, Montana USA 59701
(406) 496-3200
(406) 723-9542 fax
www.montanaresources.com

December 18, 2020

Knight Piésold Limited
Attn: Ken Brouwer
Suite 1400, 750 West Pender Street
Vancouver, BC V6C 2T8

Re: 2019 Yankee Doodle Tailings Impoundment Correction Action Plan – Corrective Action 2 Deferral Notification

This letter has been prepared to notify the Mr. Ken Brouwer, the Engineer of Record (EOR) for the Yankee Doodle Tailings Impoundment (YDTI), that one of the Corrective Actions presented in the Corrective Action Plan (CAP) on January 31, 2020 will be deferred until 2021. Montana Resources, LLP (MR) prepared the 2019 CAP and implementation schedule to address the five Recommendations identified by the EOR in the 2019 Annual EOR Inspection Report for the YDTI (KP, 2020).

MR have completed the Corrective Actions for Recommendations 1, 3, 4 and 5. The 2-part Corrective Action for Recommendation 2 however will not be completed in its entirety in 2020. Recommendation 2 and MR's Corrective Action included the following:

> ***Recommendation 2:* Relocate discharge location NS-3 closer to NS-2 and extend Line 3 to include a new discharge point, NS-4, located further to the north than the current location of NS-3. In addition, extend Line 2 to allow discharge at location NS-1 while considering the potential for further extension to NS-2 in the future.**
>
> *Corrective Action 2: MR agrees that adjusting the location of NS-3 and constructing an additional discharge point (NS-4) located a few hundred feet further along the North-South Embankment (as shown on Figure 1 below) would enhance beach development at the northern end of the embankment. MR will make these adjustments to Line 3 during Q2 or Q3 2020.*
>
> *MR recognizes that the ability to discharge from either of two lines or at two locations concurrently along the North-South Embankment would improve flexibility for operations and enhance beach development along the embankment. MR will evaluate options for adjusting Line 2 to allow discharge at NS-1 and NS-2, and will make adjustments to the system in 2020 provided that a reasonably practicable option is identified with no detrimental impact to operations.*

MR completed the Part 1 of Corrective Action 2 in August 2020 with the relocation of NS-3 closer to NS-2 and installation of NS-3, a new tailings discharge location at the northern end of the N-S embankment.

The second part of Corrective Action 2, which includes the adjustment of Line 2 to allow discharge at NS-1 and NS-2, however will not be complete. MR evaluated options for the adjustment of this line in 2020. The evaluation included consideration of the realignment alternatives, and the current embankment construction schedule and sequencing. MR determined that realignment of Line 2 would not be worthwhile or practicable during 2020 due to the embankment construction that is currently occurring along the East-West Embankment and is proposed to continue adjacent to NS-1 and NS-2 in 2021-22. MR propose the Line 2 realignment be deferred until the 6450 raise on the YDTI embankment is completed in the embankment sections adjacent to NS-1 and NS-2 so the line does not have to be removed and replaced twice. MR anticipate the construction will be complete in this area in mid-2022, and Line 2 can then be realigned in Q2 of 2022, and complete by Q3.

If there are any questions or concerns regarding this deferral, please contact me at (406) 496-3215.

Sincerely,

Mike Harvie
Manager of Engineering and Geology
Montana Resources, LLP

Copy to: Garrett Smith, MDEQ
Daniel Fontaine, KP
Roanna Dalton, KP

APPENDIX D2

MR 2019 Corrective Action Plan

(Pages D2-1 to D2-6)

600 Shields Ave.
Butte, Montana 59701

January 31, 2020

Montana Department of Environmental Quality
Hard Rock Mining Bureau
Attn: Herb Rolfes
P.O. Box 200901
Helena, MT 59620

Re: 2019 Annual Engineer of Record Inspection Report for Yankee Doodle Tailings Impoundment and Corrective Action Plan for Recommendations

Dear Mr. Rolfes:

The Engineer of Record (EOR) annual inspection of the Montana Resources, LLP (MR) Yankee Doodle Tailings Impoundment (YDTI) was conducted from September 30 to October 1, 2019 by the EOR for the YDTI, Mr. Ken Brouwer, P.E. of Knight Piésold Ltd (KP), who was accompanied by Daniel Fontaine, P.E. of KP and Mike Harvie (Manager of Engineering and Geology) of MR.

The EOR annual inspection is required under Section 82-4-381 of the Montana Code Annotated (MCA), which also requires the mine operator to prepare a Corrective Action Plan (CAP) summarizing the recommendations of the EOR and an implementation schedule for the corrective actions. KP prepared the 'Yankee Doodle Tailings Impoundment – 2019 Engineer of Record Annual Inspection Report' (AIR), following the inspection.

This letter documents MR's CAP in response to the five recommendations presented by the EOR:

1. Maintain reductions in freshwater use from the Silver Lake Water System to the extent reasonably practical and use the BMFOU pilot project to incrementally reduce the water inventory in YDTI supernatant pond towards the target of approximately 15,000 acre-ft.
2. Relocate tailings discharge location NS-3 closer to NS-2 and extend Line 3 to include a new discharge point, NS-4, located further to the north than the current location of NS-3. In addition, extend Line 2 to allow discharge at location NS-1 while considering the potential for further extension to NS-2 in the future.
3. Periodically inspect the dormant settlement cracking along the North-South Embankment tailings discharge corridor and the cracking near the Terramac access road along the East-West Embankment tailings discharge corridor. Relocate the tailings pipeline(s) along the discharge corridor and regrade the surface to improve drainage and stability as required if cracking or erosion begins to undermine the pipeline.
4. Repair the leaks from the bulkhead at the Precipitation Plant where the discharge pipelines exit the #5 and #6 Cells to the extent reasonably practicable.

Montana Resources

600 Shields Ave.
Butte, Montana 59701

5. Look for opportunities to establish flow monitoring system(s) to directly monitor the seepage flow rates in the HsB area upstream of the Precipitation Plant.

MR has developed the following CAP that is expected to effectively address the recommendations contained in the AIR.

1. **Maintain reductions in freshwater use from the Silver Lake Water System to the extent reasonably practical and use the BMFOU pilot project to incrementally reduce the water inventory in YDTI supernatant pond towards the target of approximately 15,000 acre-ft.**

MR continued to operate with reduced freshwater use in 2019, with a daily average SLWS flowrate of approximately 1.0 MGPD, which is comparable with the average flowrate since mid-2017. MR anticipates that a daily average use of approximately 1 MGPD of freshwater can be continued in 2020. MR will continue to evaluate its operation for opportunities to reduce freshwater use in 2020 and will implement additional measures if practical, provided there are no detrimental impacts to operations.

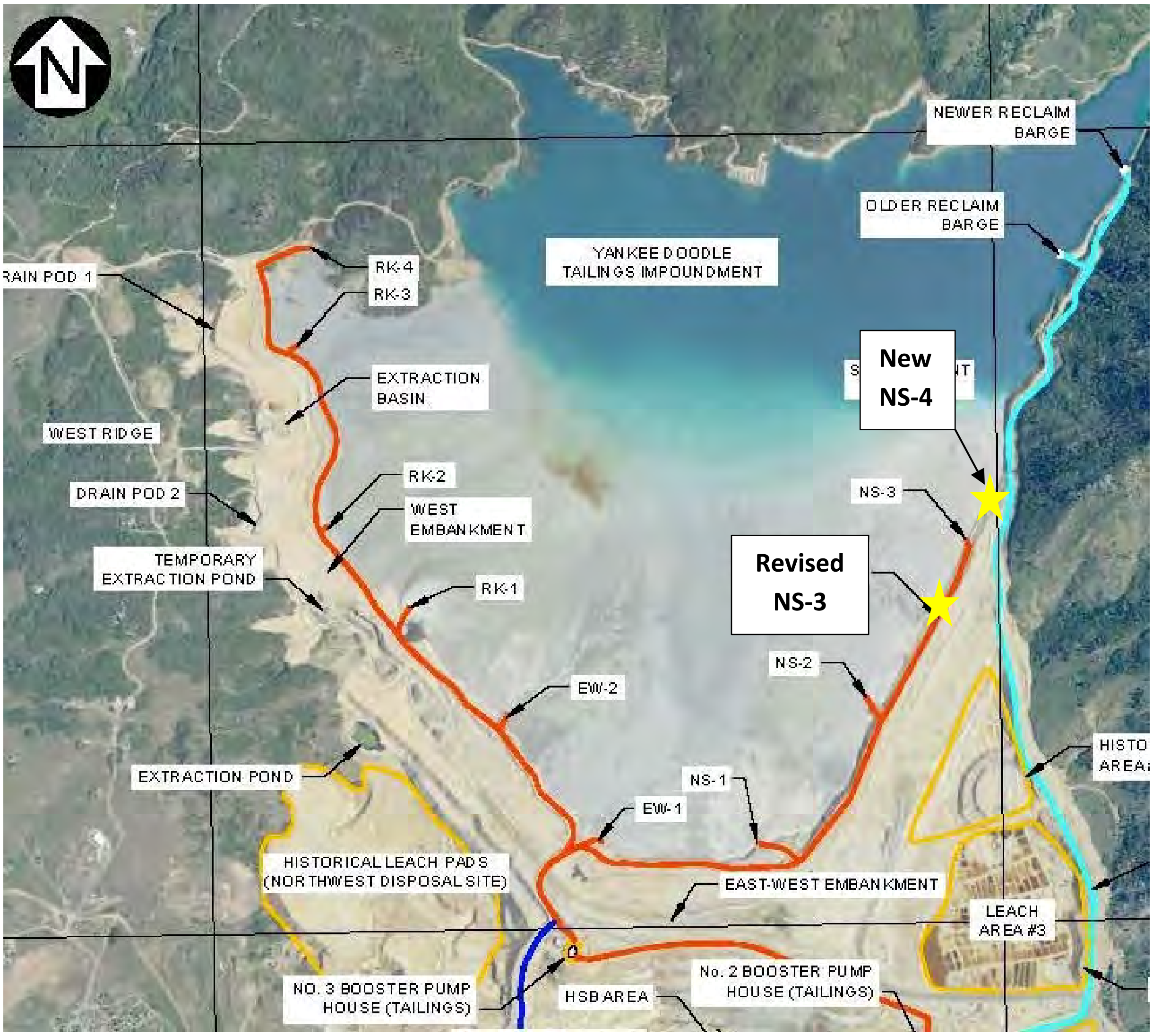
In conjunction with it's Superfund responsibilities, MR identified an opportunity to treat and discharge YDTI supernatant water off-site in 2018. The pilot study for the proposed system was constructed in 2019 with off-site discharge occurring on September 30, 2019. The pilot study facilitates the treatment and release of up to 10 million gallons per day (MGPD) of water from the YDTI. Approximately 430 M gallons (over 1,300 acre-ft) of water was removed and discharged from the YDTI during Q4 2019, which has demonstrated that the water treatment concept is sound. Approximately 3 MGPD of Berkeley Pit water was treated and introduced into the system during the same time period. MR is optimistic that the YDTI supernatant pond target inventory of approximately 15,000 acre-ft can be achieved over the next 3 to 5 years through a combination of the discharging water from the YDTI using the pilot project and continuing to operate the concentrator with reduced freshwater use. However, the pilot project is not entirely within MR's control due to a variety of factors and interruptions are possible that could impact the timeline.

2. **Relocate discharge location NS-3 closer to NS-2 and extend Line 3 to include a new discharge point, NS-4, located further to the north than the current location of NS-3. In addition, extend Line 2 to allow discharge at location NS-1 while considering the potential for further extension to NS-2 in the future.**

MR agrees that adjusting the location of NS-3 and constructing an additional discharge point (NS-4) located a few hundred feet further along the North-South Embankment (as shown on Figure 1 below) would enhance beach development at the northern end of the embankment. MR will make these adjustments to Line 3 during Q2 or Q3 2020.

MR recognizes that the ability to discharge from either of two lines or at two locations concurrently along the North-South Embankment would improve flexibility for operations and enhance beach development along the embankment. MR will evaluate options for adjusting Line 2 to allow discharge at NS-1 and NS-2, and will make adjustments to the system in 2020 provided that a reasonably practicable option is identified with no detrimental impact to operations.

Figure 1: YDTI North-South Embankment Discharge Location Adjustments



3. **Periodically inspect the dormant settlement cracking along the North-South Embankment tailings discharge corridor and the cracking near the Terramac access road along the East-West Embankment tailings discharge corridor. Relocate the pipeline(s) along the discharge corridor and regrade the surface to improve drainage and stability as required if cracking or erosion begins to undermine the pipeline.**

MR will inspect the dormant settlement cracking along the tailings discharge corridor when snow free conditions allow. Some sections of the discharge corridor may be regrading during adjustment of the pipelines to incorporate the new discharge locations and pipeline extensions discussed in Recommendation #2. MR will periodically inspect other areas of dormant settlement cracking that are not regraded and evaluate the need for aperture pins on significant cracks to determine if movement is recurring and if adjustment to the tailings pipelines is appropriate.

4. **Repair the leaks from the bulkhead at the Precipitation Plant where the discharge pipelines exit the #5 and #6 Cells to the extent reasonably practicable.**

The Berkeley Pit Pumping System (BPPS), Horseshoe Bend Capture System (HsB CS), and Horseshoe Bend Water Treatment Plant (HsB WTP) collectively pump and treat the HsB flows and Berkeley Pit (BP) flows in their current pilot project configuration. HsB WTP flows are conveyed to the Concentrator for incorporation into the tailings circuit for additional treatment at the YDTI. HsB CS flows are metered into the tailings (which have additional lime to facilitate treatment of this HsB water) and discharged into the YDTI where the supernatant pond provides residence time for water treatment objectives to be achieved. The water is further treated at a Polishing Plant and the effluent is released near the confluence of Blacktail and Silver Bow Creeks. The pilot project facilitates the treatment and release of up to 10 million gallons per day (MGPD) of water from the YDTI, which results in a net reduction of water in the YDTI supernatant pond.

Since there is some BP water transferred to the HsB CS via pumped overflows and seepage, the “leakage” rates can be estimated by subtracting the HsB WTP flows from the BPPS flows. However, the combined flows from the HsB area and the BP are similarly treated and transferred to YDTI through the tailings circuit regardless of how they are routed.

MR completed maintenance on the bulkhead in Q4 2019 to limit leakage and further work in January 2020. Recent comparison of flow measurements between the HsB WTP and BPPS indicate that the “leakage” has been limited to less than approximately 2% to 4%, which is considered the practicable limit for these systems.

5. **Look for opportunities to establish flow monitoring system(s) to directly monitor the seepage flow rates in the HsB area upstream of the Precipitation Plant.**

MR recognizes the value of establishing flow monitoring systems in the northern part of the HsB area that directly measure the magnitude and variability of seepage flow rates near the downstream toe of the embankment as one component of the overall HsB area flows. MR will evaluate options for adjustments to the flow monitoring systems in the HsB area during 2020 and implement changes to the monitoring systems if reasonably practicable solutions are identified.

Montana Resources

600 Shields Ave.
Butte, Montana 59701

If there are any questions or concerns regarding the CAP and schedule please contact me at (406) 496-3211.

Sincerely,

Mark Thompson

Vice President of Environmental Affairs
Montana Resources, LLP

Attachments:

A. Engineer of Record – Verification

Montana Resources

600 Shields Ave.
Butte, Montana 59701

ATTACHMENT A:

Engineer of Record (EOR) Verification

I have reviewed and verify that the corrective actions proposed by MR should reasonably be expected to effectively address the recommendations contained in the 2019 Engineer of Record Annual Inspection Report.

MONTANA KEN J. BROUWER 10020 PE REGISTERED PROFESSIONAL ENGINEER 2020-01-31

Reviewed: ______________________________

Ken Brouwer, P.E.
Principal, Knight Piésold Ltd.