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VA101-126/24-8

MONTANA RESOURCES
YANKEE DOODLE TAILINGS IMPOUNDMENT - TAILINGS AND WATER MANAGEMENT REPORT FOR 6,560 AMENDMENT DESIGN DOCUMENT

Rev	Description	Date
0	Issued in Final	March 12, 2025

Knight Piésold CONSULTING

Management System Certified By:
bsi
ISO 9001 Quality Management Systems CERTIFIED FS 64925
ISO 14001 Environmental Management CERTIFIED EMS 550121
ISO 45001 Occupational Health and Safety Management CERTIFIED OHS 550122

EXECUTIVE SUMMARY

Montana Resources, LLC (MR) is in the process of preparing a permit amendment application (the 6,560 Amendment Application) for continued development of the Yankee Doodle Tailings Impoundment (YDTI) above the currently permitted maximum embankment crest elevation of 6,450 ft to facilitate continued operation of the mine after approximately 2034. The YDTI will continue to provide secure storage of mine tailings resulting from on-going mine operations. The YDTI embankments will continue to be progressively constructed with non-ore rockfill generated during open pit development.

The principal objectives for the YDTI design are to:

- Provide secure tailings and operating pond storage.
- Progressively improve the surface reclamation potential of the YDTI and surrounding facilities.
- Protect regional groundwater and surface waters.

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

The ongoing construction and operation of the YDTI also considers the following requirements related to tailings and water management:

- Continuous tailings discharge into the YDTI, and water reclaim from the supernatant pond to the mill to support mine operations.
- Control, collection, and conveyance of mine contact water (i.e. water that comes in contact with mine waste) from the YDTI area for recycling as process water to the maximum practicable extent.
- Manage inflows and outflows to maintain a normal operational YDTI pond water inventory target of approximately 15,000 acre-feet (ac-ft) +/- 3,000 ac-ft (for seasonal fluctuations).
- Staged adjustment to tailings and water management infrastructure.
- The inclusion of monitoring features to confirm performance goals are achieved and design criteria are met.

The YDTI tailings delivery and surface water management systems during ongoing YDTI development are anticipated to have similar general configurations and operating philosophies as the current system configurations. This report presents a summary of the system updates and/or changes that may be required as part of the proposed amendment and ongoing construction of the YDTI embankments up to a maximum of EL. 6,560 ft.

The primary dam safety and flood management feature of the YDTI during operations is its ability to store the runoff volume from severe flooding, up to and including the Probable Maximum Flood (PMF) event, within the YDTI. The minimum freeboard design criteria for the YDTI during operations comprises storm storage freeboard to safely manage floods and additional minimum freeboard allowance for wave run-up. A spillway will be constructed for YDTI closure to manage potential for severe flooding through a combination of storage and controlled release of flow above a specified maximum pond volume. The spillway will facilitate the release of excess water from the impoundment to control the maximum elevation and extent of the pond thus preventing water pooling adjacent to the embankment during potential extreme storm events in the long-term.

One principal design objective for the YDTI is to protect regional groundwater and surface waters during operations and in the long-term following closure. Hydrodynamic containment of undesirable constituents (i.e. tailings and mine affected water) stored at the YDTI within the mine site area is achieved through two primary controls as follows:

- The Berkeley Pit acts as a regional groundwater sink limiting the potential for off-site groundwater/surface impacts. The Berkeley Pit is located within the Butte Mine Flooding Operable Unit (BMFOU) and subject to Environmental Protection Agency (EPA) jurisdiction and requirements. To prevent a reversal of the hydraulic gradient (allowing water to leave the pit), the Berkeley Pit is required to be maintained as a regional groundwater sink.
- The West Embankment is constructed along the side of the West Ridge and forms the western battery limit of the facility. The West Embankment incorporates the West Embankment Drain (WED) and several other seepage control features, which will maintain hydrodynamic containment of YDTI seepage as the supernatant pond elevation rises above the lowest groundwater elevations in the West Ridge.

Groundwater modelling to demonstrate West Ridge hydrodynamic containment for the 6,560 Design Document is summarized in this report. Hydrometrics, Inc. developed a two-dimensional cross-sectional model of groundwater flow at the YDTI and West Ridge. The model evaluates four scenarios, including three for calibration purposes and one for predictive purposes. Results of the predictive model for the YDTI constructed to EL. 6,560 ft demonstrate the West Embankment and WED are expected to function as intended with hydrodynamic containment maintained along the West Ridge.

The YDTI components and associated facilities must be inspected and maintained regularly to detect any changes to the condition and performance of the facilities, and to identify any potentially hazardous conditions that need to be promptly addressed. Surveillance activities must be performed to verify that the performance and operational objectives for the YDTI are continuously being achieved. These surveillance activities include site observations and inspections, collection of site monitoring data, and remote sensing techniques.

Preliminary tailings and water management Quantitative Performance Parameters (QPPs) were prepared for ongoing development of the YDTI up to EL. 6,560 ft. Active QPPs are formally presented in the Tailings Operations, Maintenance and Surveillance (TOMS) Manual. The QPPs are regularly reviewed and revised when required as part of annual updates to the TOMS Manual. The preliminary QPPs presented in this report may be incorporated into future versions of the TOMS Manual, when appropriate, and updated thereafter during regular reviews of the TOMS Manual.

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ABBREVIATIONS

ACC .... Anaconda Copper Company
ac-ft .... acre-feet
AGP .... acid generation potential
ANP .... acid neutralization potential
AR .... Atlantic Richfield Company
BMFOU .... Butte Mine Flooding Operable Unit
BPPS .... Berkeley Pit Pumping System
EL .... elevation
EPA .... Environmental Protection Agency
ft .... feet
gpm .... gallons per minute
GPS .... Global Positioning System
HDPE .... high density polyethylene
HsB .... Horseshoe Bend
HsB CS .... Horseshoe Bend Capture System
HsB WTP .... Horseshoe Bend Water Treatment Plant
Hydrometrics .... Hydrometrics, Inc.
IDF .... Inflow Design Flood
KP .... Knight Piésold Ltd.
MCA .... Montana Code Annotated
MGD .... million gallons per day
MR .... Montana Resources, LLC
MTPH .... Main Tailings Pump House
NOAA .... National Oceanic and Atmospheric Administration
pcf .... pounds per cubic foot
PMF .... Probable Maximum Flood
PMP .... Probable Maximum Precipitation
QPP .... Quantitative Performance Parameter
RDS .... rock disposal site(s)
Schafer .... Schafer Limited LLC
Seep 10 .... Number 10 Seep
SLWS .... Silver Lake Water System
SWE .... snow water equivalent
TDS .... Tailings Delivery System
TOMS Manual .... Tailings Operations Maintenance and Surveillance Manual
the Design Document .... 6,560 Amendment Design Document
WED .... West Embankment Drain
WTP .... Water Treatment Plant
YDTI .... Yankee Doodle Tailings Impoundment

1.0 INTRODUCTION

1.1 GENERAL

Montana Resources, LLC (MR) operates the Montana Resources open pit copper and molybdenum mine located in Butte, Montana. The ore throughput at the mill and processing facilities is approximately 49,000 short tons per day. The tailings from ore processing are conveyed to the Yankee Doodle Tailings Impoundment for disposal and permanent storage. The mine is located in Butte, Silver Bow County and is bounded by Interstate 15 and the Continental Divide on the east, Moulton Reservoir Road on the west, and Farrell Street, Continental Drive and Shields Avenue to the south.

The key components of the MR facilities, as shown on Figure 1.1, include the following:

- Yankee Doodle Tailings Impoundment (YDTI)
- Berkeley Pit
- Continental Pit
- Mill and processing facilities (the Concentrator)
- Horseshoe Bend (HsB) Area and associated facilities

The Amendment 10 permit was approved in August 2019 to allow for continued use of the YDTI to a crest elevation (EL.) of 6,450 feet (ft) and operation of the West Embankment Drain (WED). The YDTI is a valley-fill style impoundment with a continuous rockfill embankment that for descriptive purposes is divided into three segments, as shown on Figure 1.1 and described below. The EL. 6,450 ft embankment lift has been substantially completed and provides sufficient tailings storage capacity to support mining and ore processing until approximately December 2034.

- The North-South Embankment abuts the base of Rampart Mountain, which forms the eastern limit of the mine site.
- The East-West Embankment is situated immediately upstream of the HsB Area. The HsB Area currently contains infrastructure related to YDTI seepage collection and miscellaneous mine buildings, including the truck shop and maintenance yard.
- The West Embankment abuts the West Ridge, which forms the western limit of the mine site, and incorporates several seepage control features, such as the WED, to maintain hydrodynamic containment of YDTI seepage as the supernatant pond rises above the lowest groundwater elevations in the West Ridge.

The current maximum embankment height is approximately 800 ft along the southern end of the impoundment. The 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. The elevation of the pond surface rises as the volume of tailings stored in the facility increases, and the pond provides a source of water to support continuous mill operations and facilitate water treatment strategies associated with the ongoing Butte Mine Flooding Operable Unit (BMFOU) remedy.

The North Rock Disposal Site (North RDS) and associated mine haul ramp system is currently being progressively developed along the downstream side of the North-South Embankment. Historical seepage collection ponds in the HsB area were decommissioned beginning in 2022, and construction of the Stage 1 HsB Drainage System was substantially completed during 2024. Construction of the Stage 1 HsB RDS to approximately EL. 5,900 ft is underway along the downstream side of the East-West Embankment along the maximum dam section. Construction of these features will be ongoing over the next several years.

1.2 PURPOSE AND SCOPE

The EL. 6,450 ft embankment provides sufficient tailings storage capacity to support mining and ore processing until approximately December 2034. MR is preparing a permit amendment application (the 6,560 Amendment Application) to facilitate continued operation of the mine thereafter, with time to construct the next embankment lift, by aligning approval for tailings storage at the YDTI with the remaining ore reserves. The permit amendment application process requires the permit applicant (MR) to submit a design document when expansion of an existing facility is proposed.

Knight Piésold Ltd. (KP) is developing the 6,560 Amendment Design Document (the Design Document) to support the 6,560 Amendment Application. The Design Document presents the plan to progressively raise the crest elevation of the YDTI embankments to a maximum design crest of EL. 6,560 ft in two or more lifts to support continued mining and ore processing. The Design Document comprises a series of technical reports covering the subject areas and content to meet the requirements specified in Montana State law as well as evaluating opportunities for continued risk reduction to enhance safety as part of the fundamental objective for on-going continuous improvement of the safety of the YDTI. The laws governing tailings storage facility design, operation and reclamation are contained within sections of Montana Code Annotated (MCA) Title 82 Chapter 4 Part 3 (MCA, 2023).

- Title 82: Minerals, Oil, and Gas
    - Chapter 4: Reclamation
        - Part 3: Metal Mine Reclamation

This report has been prepared by KP to outline key design criteria and infrastructure required for tailings and water management throughout the proposed life of mine contemplated in the Design Document. It includes descriptions related to the following requirements of MCA 82-4-376:

- Chemical and physical properties of the materials and solutions stored in the YDTI.
- How undesirable constituents contained in the impoundment will be isolated from the environment.
- Storm water controls (i.e. diversions, storage, freeboard), and how extreme storm events will be managed.
- Preliminary Quantitative Performance Parameters (QPPs) related to tailings and water management for future operating conditions described in this report.

The information provided in this report includes consideration of the YDTI the embankments progressively raised to EL. 6,560 ft. The report does not include consideration of water management for other mine facilities not directly associated with the proposed tailings impoundment raise. These facilities include the Concentrator, Precipitation Plant, Continental Pit, Berkeley Pit and rock disposal sites (RDS) not adjacent to the YDTI.

NOTES:

1. AERIAL IMAGE PROVIDED BY MONTANA RESOURCES, LLC IN AUGUST 2024.
2. INSET IMAGE OF HORSESHOE BEND (HsB) AREA PROVIDED BY WATER AND ENVIRONMENTAL TECHNOLOGIES IN NOVEMBER 2024.

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED
0	11MAR'25	ISSUED WITH REPORT	DDF	RMM	JRG

MONTANA RESOURCES, LLC

MONTANA RESOURCES

YANKEE DOODLE TAILINGS IMPOUNDMENT CURRENT GENERAL ARRANGEMENT

Knight Piésold CONSULTING

P/A NO.	REF NO.
VA101-126/24	8

FIGURE 1.1 REV 0

SAVED: M:\1\01\00126\24\A\Acad\FIGS\A28, 2/25/2025 11:38:58 AM , RMCLELLAN PRINTED: 3/11/2025 10:55:26 AM, FIG 1.1, RMCLELLAN
XREF FILE(S): 5ft_01_2024-08-07; West Embankment Drain - Stage 1; west embankment drain - stage 2; 2024-11-13 HsB Rock Disposal Aerial Image IMAGE FILE(S): 5ft_01 2024-11-13 HSB Rock Disposal Aerial Image_3in

1.3 ADDITIONAL REFERENCE REPORTS

The governing regulations and design requirements for the Design Document are summarized in the Design Basis Report (KP, 2024a). This report includes the evaluation and selection of the design storm event for the YDTI. The selected design storm event was the Probable Maximum Flood (PMF), comprising the runoff generated by the 24-hour Probable Maximum Precipitation (PMP) combined with complete melt of the 1 in 100-year snowpack, and assuming failure of the upstream Moulton Reservoirs. The determination of the PMP depth and 100-year snowpack and assessment of climate change are described in the Climate Conditions Report (KP, 2021a).

The proposed life of mine development sequence for the YDTI embankments and RDS up to EL. 6,560 ft is presented separately in the Life of Mine Design Report (KP, 2024b). The phased designs of the embankment and RDS were developed considering the layout and construction criteria presented in the Life of Mine Design Report. The timing required for the completion of each phase will depend on a variety of factors. The filling of the YDTI will be monitored throughout operations, and construction timing will be adjusted as required. Refer to the Life of Mine Design Report for additional design details.

A standalone water balance model report was prepared to simulate the supply and demand for water from the supernatant pond to support site water management (KP, 2024c). The model simulates the supply and demand for water at the mine on a month-by-month basis during recent mining operations and the resulting water inventory stored within the tailings impoundment during future operations (modelled through 2056) and closure (modelled from 2057 through 2123). This report includes a description of planned water, seepage, and process solution routing and management during construction, operations and closure. The water balance model contemplates two closure periods referred to as active and passive closure. The active closure period considers active management of water during the first 20 years of closure. Pumped inflows to the YDTI and pumped discharges from the YDTI pond to the Polishing Plant to facilitate the BMFOU remedy are assumed to continue during this period. Passive closure assumes all pumped inflows to and outflows from the YDTI are terminated and the BMFOU remedy is managed elsewhere.

The following two additional reference reports provide background and design information relevant to this report:

- **West Embankment Drain Design Report** (KP, 2017): Describes the design basis and design features of the West Embankment, including the tailings seepage management features supporting continued construction of the YDTI that were incorporated into the detailed design of the West Embankment up to crest EL. 6,400 ft.
- **Horseshoe Bend Rock Disposal Site – Stage 1 Drainage System Report** (KP, 2021b). Describes design basis and details of the Stage 1 Drainage System underlying the Stage 1 HsB RDS.

1.4 COORDINATE SYSTEM

The YDTI references the site coordinate system known as the ‘Anaconda Mine Grid’ established by The Anaconda Company in 1957. The Anaconda Mine Grid is based on the Anaconda Copper Company (ACC) Datum established in 1915. All elevations are stated in Anaconda Mine Grid coordinates with respect to the ACC Vertical Datum unless specifically indicated otherwise. The Montana Resources Global Positioning System (GPS) Site Coordinate System is based on the ‘Anaconda Mine Grid’ and utilizes International Feet.

2.0 SITE CONDITIONS

2.1 PHYSIOGRAPHIC SETTING

The MR mine operations and YDTI are located in the Upper Silver Bow Basin. The Upper Silver Bow Basin is a drainage basin that consists of a relatively flat alluvial valley surrounded by mountains (KP, 2017b). The basin is bounded on the east by a steep ridge, known locally as the East Ridge, which in several places exceeds 8,000 ft in altitude and is dissected by numerous small streams. The alluvial-filled central valley is approximately 3.5 miles wide and 7 miles long. The alluvium in the valley is derived from weathering and erosion of rocks from the adjacent mountains. Surface slopes on the alluvium steepen rapidly toward the surrounding mountains. Terraces within the valley alluvium may have resulted from increased stream competence during pluvial conditions, but other geologic factors, such as faulting, may have contributed to the present valley topography (Botz, 1969).

The YDTI is located approximately two miles northeast of Butte, Montana and is immediately to the north of the Berkeley Pit. The YDTI lies in the northern end of the basin near the historical confluence of Yankee Doodle Creek and Silver Bow Creek. Yankee Doodle Creek drains the northwestern portion of the up-slope basin, and Silver Bow Creek drains the eastern portion. A smaller drainage, Dixie Creek, drains a small basin between the two. Vegetation cover in the drainage basins includes grasses, sagebrush, and forests of pine and aspen. The soil mantle is thin over the majority of the basin.

The YDTI is bordered on all sides except the south by mountainous terrain. The eastern slopes are the steep terrain of Rampart Mountain rising up to the Continental Divide. Rampart Mountain is the upthrown side of the Continental Fault, which traces along the eastern edge of the YDTI along the valley floor (IECO, 1981). The West Ridge slopes are a relatively low ridgeline of rolling hills with elevations of approximately 6,550 ft.

2.2 CLIMATE CONDITIONS

A review of relevant climate data for the YDTI was undertaken in 2021, and the results of the review are presented in the Climate Conditions Report (KP, 2021a), which is a component of the Design Document. The review included evaluating data from the following three climate stations:

- Butte Bert Mooney Airport climate station (data period: 1895 to 2021)
- MR Mine climate station (data period: 2014 to 2021)
- National Oceanic and Atmospheric Administration (NOAA) Moulton Reservoir climate station (data period: 1980 to 1986)

The analysis of the above climate data indicated that temperature and precipitation are influenced by orographic effects with generally higher precipitation and lower temperatures observed at higher elevations. A summary of the key parameters considered representative of climate conditions in the YDTI area and upslope drainages is presented below.

- The mean annual temperature for the YDTI and upslope drainage areas are estimated to be 41°F and 34.5°F, respectively. Highest temperatures generally occur between July and August, and lowest temperatures typically occur between December and February.

- The long-term mean annual precipitation for the YDTI and upslope drainage areas was estimated to be 15.9 inches and 22.2 inches, respectively. The rainfall/snowfall distribution was estimated to be 56% rain and 44% snow for the YDTI and 44% rain and 56% snow for the upslope areas.
- The estimated mean annual pond evaporation is 28.1 inches, which includes the November to March sublimation estimate of approximately 2.5 inches.

Estimated extreme precipitation values for the YDTI and upslope drainage areas were also developed to support the Design Document. A summary of the key values is presented below:

- The 100-year return period 24-hour precipitation for the YDTI and upslope drainage areas was estimated to be 3.0 and 3.6 inches, respectively.
- The 24-hr Spring PMP for the YDTI and upslope drainage areas was estimated to be 14.4 and 19.9 inches, respectively.
- Snowpack is expressed in terms of inches of snow water equivalent (SWE). The 100-year return period maximum snowpack for the YDTI and upslope drainage areas was estimated to be 11.3 and 14.6 inches, respectively.

2.3 WATER AND TAILINGS CHARACTERIZATION

A review of the chemical and physical properties of the water and tailings currently stored in and entering the YDTI was undertaken to provide a general characterization of the material stored in the impoundment. The data available to support the review is summarized in Appendix A, and a summary of the conclusions is provided below.

Surface water quality sampling is undertaken regularly at three locations up-gradient of the YDTI within the Yankee Doodle, Dixie, and Silver Bow Creek watersheds. Sampling is also conducted from the YDTI supernatant pond near the water reclaim pump barges. Creek inflows to the YDTI from the three upstream watersheds are dominantly calcium and bicarbonate type with hardnesses classed between soft and very soft. The supernatant pond water is very hard, basic to very basic water with good buffering capacity, and the dominant ion types include calcium and sulfate. Copper, molybdenum and zinc are enriched in the supernatant water compared to the inflows from the upstream watersheds.

Characterization of the tailings in the impoundment was undertaken using data from site investigation programs conducted between 2015 and 2021 as well as regular geochemical analysis (whole element scan of tailings solids) conducted by MR on a quarterly basis since approximately 2005. The following summarizes the physical and chemical properties of the tailings contained in the YDTI:

- Samples collected from the tailings mass in 2021 indicate a 50^{th}-percentile particle size distribution of approximately 62% sand and 38% fines (silt and clay). The average specific gravity of the tailings was 2.69. Atterberg limits typically show tailings to be non-plastic in the subaerial beach areas. Moisture content ranged from 5% to 34% with the moisture content generally below the corresponding liquid limit.
- Tailings stored within the YDTI are basic with an acid generation potential (AGP) to acid neutralization potential (ANP) ratio (AGP/ANP) less than 1, indicating potential for acid generation. Kinetic testing of the tailings indicates the lag time to onset of acidic conditions for exposed tailings would be approximately 10 to 20 years on average (Schafer, 2025).

3.0 DEVELOPMENT OBJECTIVES AND EXISTING INFRASTRUCTURE

3.1 OBJECTIVES

The YDTI will continue to provide secure storage of mine tailings resulting from ongoing mine operations, with construction materials provided from non-ore rockfill generated during open pit development. The principal design objectives for the YDTI are to:

- Provide secure tailings and operating pond storage.
- Progressively improve the surface reclamation potential of the YDTI and surrounding facilities.
- Protect regional groundwater and surface waters.

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

The development of the YDTI embankments and adjacent RDS considers the design and operational objectives outlined above with the goal of continuous improvement in safety and enhancement of stability through slope flattening and progressive buttressing of the facility embankments. These progressive improvements are made possible by continued mining at the site.

The ongoing construction and operation of the YDTI also considers the following requirements related to tailings and water management:

- Continuous tailings discharge into the YDTI and water reclaim from the supernatant pond to the mill to support mine operations.
- Control, collection, and conveyance of contact water for recycling as process water to the maximum practicable extent.
- Manage inflows and outflows to maintain a normal operational YDTI pond water inventory target of approximately 15,000 acre-feet (ac-ft) +/- 3,000 ac-ft (for seasonal fluctuations).
- Staged adjustment to tailings and water management infrastructure.
- The inclusion of monitoring features to confirm performance goals are achieved and design criteria are met.

3.2 TAILINGS DELIVERY SYSTEM

The Tailings Delivery System (TDS) currently comprises three tailings delivery pipelines (two operational and one standby) and four tailings pump houses (the Main Tailings Pump House (MTPH), McQueen Booster Pump House, No. 2 Booster Pump House (Tailings), and No. 3 Booster Pump House (Tailings)) to transport tailings from the Mill to the YDTI at a rate of approximately 18,000 gallons per minute (gpm). Tailings are pumped to a total elevation gain of approximately 950 ft using up to 13 pump stages. The 21,000 ft tailings delivery pipelines are constructed from a combination of 22-inch steel, 24-inch high-density polyethylene (HDPE) pipe and 26-inch HDPE pipe. The single walled tailings pipelines are generally installed on the ground surface and locally anchored with mounds of overburden or pipe supports. The general arrangement of the TDS is shown on Figure 3.1.

The TDS is currently configured to facilitate tailings discharge from a combination of ‘single-point’ (24-inch and 26-inch nominal diameter) and ‘multiple-point’ (12-inch nominal diameter) discharge spigots located along the three embankment limbs. Generally, Tailings Line 1 conveys tailings to the West Embankment, Tailings Line 2 conveys tailings to the west limb of the East-West Embankment, and Tailings Line 3 conveys tailings to the east limb of the East-West Embankment and the North-South Embankment. There is some overlap between the discharge lines and the discharge locations, which provides flexibility for depositing tailings into the facility.

Discharge point usage is controlled by hydraulically actuated knife gate valves located at each discharge location along the pipeline alignment. The tailings discharge schedule is managed by MR and is based on the objective to develop extensive tailings beaches adjacent to each of the three embankments.

The tailings delivery pipelines are designed with gradients that enable positive drainage back to the pump houses. The pump houses are equipped with tailings drain back discharge systems that are used if the tailings pipelines need to be drained or flushed. The drain back systems are routed to flow into a drainage network. In the unlikely event of a pipe leak, tailings slurry will flow adjacent to the pipeline and drain into the nearest drainage ditch or other designated on-site containment.

The standby tailings pipeline can be used intermittently to facilitate conveyance of additional make-up water from the Silver Lake Water System (SLWS) to the YDTI. The SLWS supply line is connected to the tailings pipeline at the Concentrator, and the tailings pump houses can be used to deliver the water to the YDTI.

3.3 WATER MANAGEMENT SYSTEMS

Water currently enters the YDTI from direct precipitation, runoff from contributing catchments, and pumped inflows from tailings slurry water, treated BMFOU waters, the WED, and the Woodville watershed runoff. The supernatant pond provides a source of water to support continuous mill operations and facilitate water treatment strategies associated with the ongoing BMFOU remedy. Water is pumped from the YDTI pond to either the Concentrator for incorporation as process water or to the Polishing Plant for treatment and discharge off-site.

Flows from Continental Pit dewatering, the Berkeley Pit depressurization wells, Polishing Plant filter backwash, and Concentrator catchment runoff are directed to the Concentrator for incorporation in ore processing. The SLWS provides fresh water for the HsB Water Treatment Plant (WTP) and the Concentrator operations.

The following water management systems have been implemented to meet the water management requirements at the YDTI. Refer to the Water Balance Report (KP, 2024c) for details related to the assumed water routing, interactions and quantity estimates for the Design Document.

- Supernatant Pond: The supernatant pond is located on the northeast side of the YDTI and is constrained by natural topography to the north and east and the tailings beach to the south and west. Fluctuations in the supernatant pond volume typically occur seasonally due to precipitation/runoff, higher summer evaporation rates, and development/melt of winter ice. MR and Atlantic Richfield Company (AR) have been discharging YDTI water off-site using the Polishing Plant since September 2019 in effort to reduce the stored volume of the supernatant pond to a recommended target of approximately 15,000 ac-ft. The drawdown to this volume was completed in 2024, and the pond is now being maintained with a maximum normal operating pond volume of approximately 18,000 ac-ft (comprising 15,000 ac-ft nominal operating pond plus 3,000 ac-ft for normal seasonal fluctuations).
- Water Reclaim System: The water reclaim system supplies water for use in the mill process and treatment/discharge at the Polishing Plant. Supernatant water is reclaimed from the northeast end of the YDTI using two floating pump barges (North Barge and South Barge). Each barge is equipped with three vertical turbine pump units. Generally, three to four (of the six) pump units are operational at any time. The water is initially conveyed from the pond within HDPE pipelines around the YDTI along a pipe bench and access road along Rampart Mountain at approximately EL. 6,500 ft. Thereafter, the reclaim pipeline generally follows adjacent to the haul road system to reach the Concentrator area and Polishing Plant. The total pipeline length to the Concentrator is over 5 miles with an elevation decrease of over 800 ft. The offtake to supply reclaim water to the Polishing Plant is located near the McQueen (Tailings) Booster Pump House. The water reclaim systems are capable of concurrently conveying approximately 14,000 gpm to the Concentrator and up to 7,000 gpm (as required) to the Polishing Plant.
- West Embankment Drain System: The WED is located within the foundation of the West Embankment and was designed to maintain hydrodynamic containment of YDTI seepage as the supernatant pond elevation rises above the lowest groundwater elevations in the West Ridge. The WED system consists of a subsurface aggregate drain that drains to the Extraction Pond, the gravity outlet of the WED (KP, 2017). Additional installed/uninstalled measures (Extraction Basin and drain pods) were also included in the design and may be implemented to help manage flows within the drain. Water collected in the Extraction Pond is pumped back to the YDTI. The WED has a design capacity of approximately 4,500 gpm. The Extraction Pond Dewatering System currently conveys approximately 600 to 800 gpm back to the YDTI. The WED pumping rates are generally consistent throughout the year with no seasonal flowrate trends observed to date. The variation in the flowrate can vary depending on tailings discharge practices in the area.
- Horseshoe Bend Drainage System: The HsB area receives seepage from the YDTI and runoff from the surrounding disturbed and undisturbed catchment areas. The seepage flows and precipitation runoff collected within the HsB area are conveyed to the HsB Pond. Construction of the Stage 1 HsB RDS Drainage System commenced in 2022 and was substantially completed in late 2024. The drainage system includes a foundation layer, rock drains, and perimeter ditches intended to convey groundwater and precipitation runoff under the Stage 1 HsB RDS to the HsB Pond (KP, 2021b). The Number 10 Seep (Seep 10) collection system also forms part of the Stage 1 Drainage System. Flows from several smaller seeps, which daylight approximately 250 ft above the main HsB area, are collected with this system and conveyed to the HsB Pond. The updated Seep 10 collection system was constructed in 2024.

- Berkeley Pit Pumping System (BPPS): The Berkeley Pit is located within the BMFOU of the Silver Bow Creek/Butte Area National Priorities List Site and subject to Environmental Protection Agency (EPA) jurisdiction and requirements. To prevent a reversal of the hydraulic gradient (allowing water to leave the pit), EPA and the State determined that the water level in the Berkeley Pit must be maintained below a Protective Water Level of approximately 5,466 ft (ACC Datum). Incorporation of Berkeley Pit water into the site water balance commenced in September 2019 as part of a pilot project associated with the BMFOU. The BPPS conveys water from the Berkeley Pit to the HsB area where it can be managed or treated by other water management systems (described below) depending on the prevailing system configuration at the time. The Berkeley Pit operating level is currently being managed at approximately EL. 5,412 ft (ACC Datum). Water is currently conveyed to the YDTI at an annual average flowrate of approximately 2,100 to 2,500 gpm.
- HsB Water Treatment Plant (HsB WTP) and HsB Capture System (HsB CS): Water collected in the HsB area or conveyed by the BPPS to the HsB area is directed to treatment at the HsB WTP or HsB CS. The HsB WTP effluent is directed to the Concentrator for incorporation as process water and delivered to the YDTI. The HsB CS flows are conveyed via two HsB CS pump houses and metered into the tailings (which have additional lime to facilitate treatment of this water) at a manifold after the No. 3 Booster Pump House (Tailings). The combined flow is discharged into the YDTI. The supernatant pond provides residence time for water treatment objectives to be achieved.
- Polishing Plant: Discharge of water from the YDTI is facilitated by pumping supernatant pond water via the water reclaim system to the Polishing Plant for polishing treatment and off-site discharge. The Polishing Plant has been operated regularly since being commissioned in 2019. The Polishing Plant is sized to facilitate inflow of up to 7,000 gpm (10 million gallons per day (MGD)) of water from the YDTI depending on prevailing climate conditions and influent chemistry.
- Ancillary surface water runoff management systems: The YDTI receives surface water runoff from three upslope undisturbed watersheds: Yankee Doodle Creek, Dixie Creek, and Silver Bow Creek. The surface runoff is conveyed via natural drainages into the northern end of the YDTI. No engineered flow control or water management systems have been applied to these drainages. Two other watersheds, Moulton Road watershed and Woodville watershed, also contribute to the YDTI. The surface runoff from Moulton Road watershed drains eastward towards the toe of the West Embankment. The water infiltrates into the embankment and is collected in the WED and is conveyed to the WED Extraction Pond, which is then pumped back to the YDTI. The surface runoff from the Woodville watershed is conveyed in a pipe to the McQueen Booster Pump House and pumped with the tailings to the YDTI. Surface water runoff management for the remainder of the site (downstream of the YDTI) is managed primarily in surface water collection ditches adjacent to mine roads, the water is ultimately routed to the Berkeley Pit, Continental Pit, or the Concentrator for reuse in ore processing.

The existing YDTI water management systems operating on site are shown on Figure 3.2.

NOTES:

1. AERIAL IMAGE PROVIDED BY MONTANA RESOURCES, LLC IN AUGUST 2024.
2. INSET IMAGE OF HORSESHOE BEND (HsB) AREA PROVIDED BY WATER AND ENVIRONMENTAL TECHNOLOGIES IN NOVEMBER 2024.
3. TAILINGS DISCHARGE SPIGOT LOCATIONS ARE OMITTED FROM DRAWING FOR CLARITY.

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED
0	11MAR'25	ISSUED WITH REPORT	DDF	RMM	JRG

MONTANA RESOURCES, LLC

MONTANA RESOURCES

YANKEE DOODLE TAILINGS IMPOUNDMENT
EXISTING TAILINGS DELIVERY SYSTEM
GENERAL ARRANGEMENT

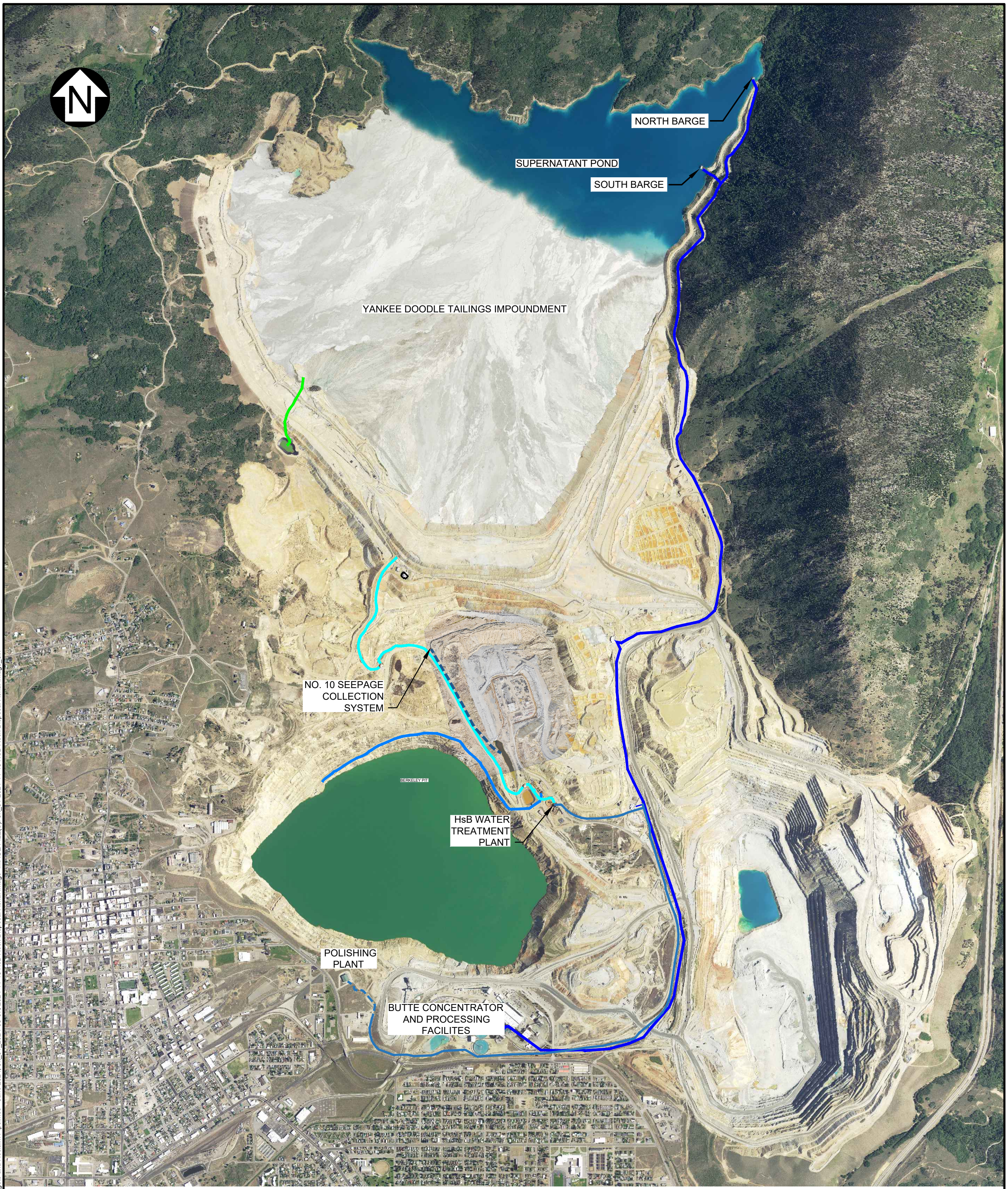
Knight Piésold CONSULTING

P/A NO.	REF NO.
VA101-126/24	8

FIGURE 3.1 REV 0

SAVED: M:\1\01\00126\24\A\Acad\FIGS\A61, 2/25/2025 11:36:31 AM , RMCLELLAN PRINTED: 3/11/2025 10:55:43 AM, FIG 3.1, RMCLELLAN
XREF FILE(S): Tailings and Reclaim Pipelines; 5ft_01_2024-08-07; 2024-11-13 HsB Rock Disposal Aerial Image IMAGE FILE(S): 5ft_01 2024-11-13 HsB Rock Disposal Aerial Image_3in

SAVED: M:\1\01\00126\24\A\Acad\FIGS\VA62, 3/11/2025 10:09:50 AM , RMCLELLAN PRINTED: 3/11/2025 10:56:28 AM, FIG 3.2, RMCLELLAN
XREF FILE(S): 2024-04-10 HsB Rock Disposal with Aug 2023 Image; Tailings Spigots and Reclaim Pipelines - June 2024; 5ft_01 2024-08-07; 2024-11-13 HsB Rock Disposal Aerial Image IMAGE FILE(S): 5ft_01 2024-11-13 HSB Rock Disposal Aerial Image_3in



SCALE A: 1500 0 1500 3000 4500 6000 7500 ft

LEGEND:

- RETURN WATER SYSTEM
- BERKELEY PIT PUMPING SYSTEM
- EXTRACTION POND DEWATERING SYSTEM
- HsB CAPTURE SYSTEM
- RETURN WATER CONNECTED TO POLISHING PLANT
- NO. 10 SEEPAGE COLLECTION SYSTEM

NOTES:

1. AERIAL IMAGE PROVIDED BY MONTANA RESOURCES, LLC IN AUGUST 2024.
2. INSET IMAGE OF HORSESHOE BEND (HsB) AREA PROVIDED BY WATER AND ENVIRONMENTAL TECHNOLOGIES IN NOVEMBER 2024.

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED
0	11MAR'25	ISSUED WITH REPORT	DDF	RMM	JRG

MONTANA RESOURCES, LLC

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YANKEE DOODLE TAILINGS IMPOUNDMENT EXISTING WATER MANAGEMENT SYSTEMS GENERAL ARRANGEMENT

Knight Piésold CONSULTING

P/A NO.	REF NO.	REV
VA101-126/24	8	0

FIGURE 3.2

4.0 PROPOSED FACILITY DEVELOPMENT

4.1 GENERAL

Construction of the embankments and RDS will be completed as a continuous activity as rockfill is available from mine operations. The delivery of embankment construction materials will be scheduled to meet phased lift construction requirements. The timing required for the completion of each phase will depend on rockfill availability, tailings production rates, variability of the tailings density throughout the facility, final beach slopes, and the supernatant pond area and volume. The filling of the YDTI will be monitored throughout operations, and construction timing will be adjusted as required. The proposed phases are described in the Life of Mine Design Report (KP, 2024b) and are summarized as:

- Phase 1: Ongoing construction activities to be completed prior to the permit amendment (Prior to Permit)
- Phase 2: EL. 6,500 ft Embankment Crest Raise
- Phase 3: EL. 6,500 ft Lower Embankment Lifts
- Phase 4: EL. 6,500 ft Embankment Lifts and RDS Expansions
- Phase 5: EL. 6,560 ft Embankment Crest Raise
- Phase 6: Final Life of Mine (Prior to Closure)

Staged adjustment of the tailings delivery system and various water management systems will be required periodically during ongoing development of the facility to facilitate continued mine operations. A summary of these anticipated adjustments and approximate timing is provided in the sections that follow.

4.2 TAILINGS DELIVERY SYSTEM

4.2.1 DESIGN CRITERIA

The primary objectives of the TDS during the future operations period contemplated in the Design Document continue to include the following:

- Reliable and safe conveyance of tailings to the YDTI supporting ongoing mine operations and mineral processing.
- Operational flexibility to control discharge locations and facilitate development of extensive tailings beaches along all three embankments.

The design criteria presented in Table 4.1 were developed with consideration of the current tailings delivery system configuration and the proposed raise of the YDTI embankments up to a maximum of EL. 6,560 ft.

Table 4.1 Tailings Delivery System – Design Basis Criteria

CRITERIA DESCRIPTION	UNITS	VALUE	BASIS	DETAILS & COMMENTS
1.0 FACILITY DETAILS				
MR Concentrator				
Concentrator Availability	%	100	MR	Estimate
Mine Production Rate	Mton/yr	18	MR	
Design Mill Throughput	tpd	49,000	calculated	+20% allowance on infrastructure
Main Tailings Pump House - Elevation	ft	5,520	MR	ACC Datum
YDTI				
McQueen Booster Pump House - Elevation	ft	5,660	MR	ACC Datum
No. 2 Booster Pump House - Elevation	ft	5,970	MR	ACC Datum
No. 3 Booster Pump House - Elevation	ft	6,305	MR	ACC Datum
Existing Embankment Elevation	ft	6,450	MR	ACC Datum
Maximum Embankment Design Elevation	ft	6,560	MR	ACC Datum
Tailings Discharge Point Configuration	-	30 points	MR	Including at least ten 24-inch or 26-inch discharge spigots for end of pipe discharge and regularly distributed 12-inch discharge spigots
2.0 GENERAL TAILINGS PROPERTIES				
Tailings Properties				
Solids Specific Gravity	-	2.8	MR	
Solids Mass Concentration (Existing)	wt/wt	33%	MR	Concentrator discharges tailings slurry at solids concentration of 37%. Tailings slurry enters the YDTI at a solids concentration of 33%
Slurry Flowrate	MGD	28.2	calculated	
Density – slurry [1]	pcf	79.2	calculated	
Tailings Discharge Philosophy	-	Sub-aerial, multiple point	KP	Discharge at a minimum of two locations simultaneously

Note(s):

1. Slurry density is expressed in pounds per cubic foot (pcf).

4.2.2 FUTURE CONFIGURATION AND DESIGN CONSIDERATIONS

The TDS required during ongoing YDTI development is anticipated to have a similar general configuration and operating philosophy as the current tailings system. The design flowrate and characteristics of the tailings slurry are expected to be reasonably similar to current conditions.

The existing TDS (pump houses and pipelines) from the Concentrator to the YDTI embankment crest are anticipated to be suitable for ongoing mine operations until around the mid-2030s. The layout of Stage 1 HsB RDS, lower embankment lifts, and embankment crest raise to EL. 6,500 ft associated with Phases 1 to 3 of the development sequence generally avoids the existing pump houses and pipelines. Discharge pipelines and offtakes along the embankment crest will need to be moved up to the EL. 6,500 ft crest following construction of the lift with additional adjustments in the future each time the crest elevation is raised.

Phase 3 of the development sequence includes construction of a new pipeline ramp system and service corridor along the downstream side of the East-West Embankment during widening of the lower portions of the embankment. A new tailings pump house pad will also be constructed to the south of the existing No. 3 Booster Pump House (Tailings) at a similar elevation. Future relocation of the No. 3 Booster Pump House (Tailings) is anticipated to be required for embankment construction above EL. 6,500 ft along with moving the delivery pipelines to the new ramp system. Phase 4 of the development plan includes rebuild/relocation of the No. 3 Booster Pump House (Tailings). The pump house will be constructed at a similar elevation (EL. 6305 ft) approximately 800 ft southwest of the existing pump house location. A fifth tailings booster pump house may also be required for conveyance of tailings to the north ends of the West and North-South Embankments once constructed up to EL. 6,560 ft depending on the length and grade of the distribution pipelines along the crest.

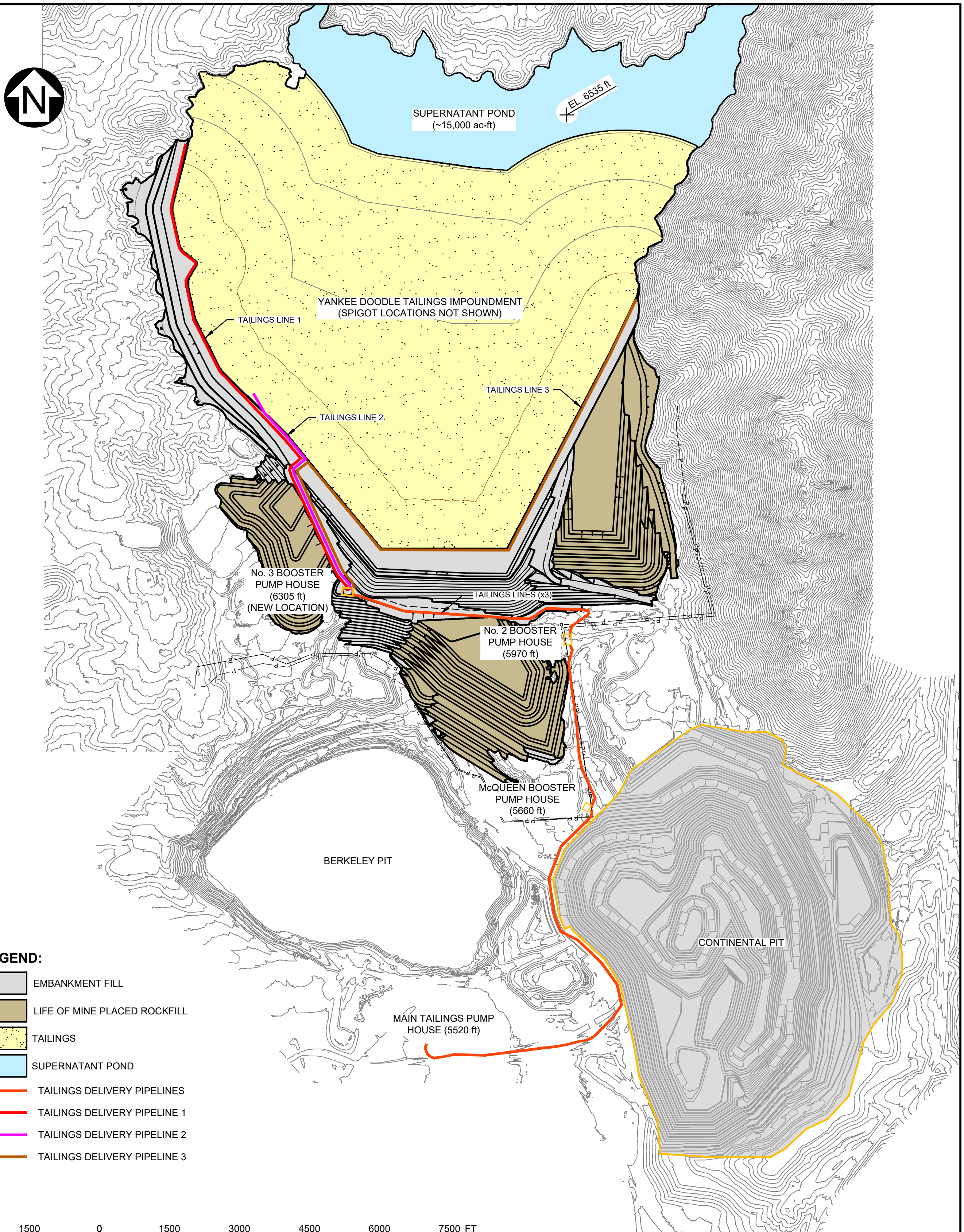
The existing infrastructure and services prior to the No. 2 Booster Pump House (Tailings) are expected to remain the same as existing operations until they are impacted by the westward expansion of the Continental Pit into the Central Zone.

The total length of YDTI embankment crest is not going to substantially increase in the future with a final crest length of approximately 17,400 ft. The existing tailings discharge configuration with approximately 30 discharge spigots into the YDTI should remain suitable for developing the extensive, drained tailings beaches directly adjacent to the embankment. Beach development will be regularly evaluated during future operations to determine if adjustments to the tailings discharge locations and practices are required to meet design objectives.

The general arrangement of the TDS for the YDTI embankments constructed up to EL. 6,560 ft, including the new conceptual alignment of the tailings pipeline corridor and conceptual location of the new No. 3 Booster Pump House (Tailings), is presented on Figure 4.1.

4.2.3 CLOSURE REQUIREMENTS

The TDS will not operate beyond the active operations phase. The existing TDS infrastructure will be decommissioned and removed as part of closure and reclamation activities unless any infrastructure is determined to be required to facilitate closure activities.



LEGEND:

- EMBANKMENT FILL
- LIFE OF MINE PLACED ROCKFILL
- TAILINGS
- SUPERNATANT POND
- TAILINGS DELIVERY PIPELINES
- TAILINGS DELIVERY PIPELINE 1
- TAILINGS DELIVERY PIPELINE 2
- TAILINGS DELIVERY PIPELINE 3

SCALE A: 1500 0 1500 3000 4500 6000 7500 FT

NOTES:

1. A FOURTH TAILINGS PUMP HOUSE MAY BE REQUIRED. TAILINGS DELIVERY SYSTEM 6,560 ft DESIGN REVIEW TO BE UNDERTAKEN IN FUTURE.

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YANKEE DOODLE TAILINGS IMPOUNDMENT
FUTURE TAILINGS DELIVERY SYSTEM
GENERAL ARRANGEMENT

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P/A NO.	REF NO.
VA101-126/24	8

FIGURE 4.1 REV 0

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED
0	11MAR'25	ISSUED WITH REPORT	DDF	RMM	JRG

SAVED: M:\1\01\00126\24\A\Acad\FIGS\A63, 3/11/2025 10:09:13 AM , RMCLELLAN PRINTED: 3/11/2025 10:56:01 AM, FIG 4.1, RMCLELLAN

XREF FILE(S): 5ft_01_2023-07-26; 2024-04-10 HsB Rock Disposal with Aug 2023 Image; Tailings and Reclaim Pipelines; X-C-EMBK-WEST-6450-DESG; X-C-EMBK-EAST-6450-DESG; HsB Rockfill - Phase 1 El 5700; HsB Rockfill - Phase 1 Benched; Mega Ramp Trimmed to 6450; X-C-RDS-NS-6200; X-C-EMBK-6500-CREST-RAISE; X-C-EMBK-EAST-6450-STEP-OUT; X-C-EMBK-EAST-BOOSTER-RAMP; X-C-EMBK-RAMP-6500-DESG; X-C-EMBK-6500-STEP-OUT; X-C-RDS-NS-6350; X-

4.3 WATER MANAGEMENT SYSTEMS

4.3.1 DESIGN CRITERIA

The objectives of the YDTI water management systems during the future operations period contemplated in the Design Document continue to include the following:

- Protect regional groundwater and surface waters.
- Control, collection, and conveyance of contact water for recycling as process water to the maximum practicable extent.
- Manage inflows and outflows to maintain a normal operational YDTI pond water inventory target of approximately 15,000 ac-ft +/- 3,000 ac-ft (for seasonal fluctuations).

The design criteria presented in Table 4.2 were developed with consideration for the current surface water management systems and the implications on the systems with the proposed raise of the YDTI embankments up to a maximum of EL. 6,560 ft.

Table 4.2 YDTI Water Management Systems – Design Basis Criteria

CRITERIA DESCRIPTION	UNITS	VALUE	SOURCE	DETAILS & COMMENTS
1.0 FACILITY DETAILS				
MR Concentrator				
Concentrator Availability	%	100	MR	Estimate
Mine Production Rate	Mton/yr	18	MR	
Design Mill Throughput	tpd	49,000	calculated	+20% allowance on infrastructure
Concentrator - Elevation	ft	5,520	MR	ACC Datum
YDTI				
Maximum Embankment Design Elevation	ft	6,560	MR	ACC Datum
Nominal Operating Pond Volume	ac-ft	15,000	MR	+/- 3,000 ac-ft for seasonal fluctuations
Inflow Design Flood	ac-ft	20,000	calculated	Containment of the PMF volume comprising the 24-hour PMP combined with complete melt of the 1 in 100-year snowpack (KP, 2024a)
Return Water Pumping Capacity	MGD	30	MR	Concentrator and Polishing Plant requirements
WED Extraction Pond Dewatering System Capacity	gpm	4,500	KP	Equivalent to WED design basis flow rate presented in KP (2017)

Note(s):

1. Water management system design basis criteria shown above exclude systems associated other mine facilities not directly associated with the proposed tailings impoundment raise (e.g. Continental Pit, the Concentrator, and SLWS) and current BMFOU activities (e.g. HsB WTP, HsB CS, BPPS, and Polishing Plant).

4.3.2 FUTURE CONFIGURATIONS AND DESIGN CONSIDERATIONS

The YDTI surface water management systems during ongoing YDTI development are anticipated to have a similar general configuration and operating philosophy as the current system configurations. The following section presents a summary of the system updates and/or changes that may be required as part of the proposed amendment and ongoing construction of the YDTI embankments up to a maximum of EL. 6,560 ft. The general arrangement of the water management systems for the YDTI with embankments and RDS constructed up to EL. 6,560 ft is shown on Figure 4.2.

Supernatant Pond:

- The supernatant pond will remain generally in the same location and will be constrained by natural topography to the north and east and the tailings beach to the south and west.
- The elevation of the pond will gradually rise as the volume of tailings stored in the facility increases.
- Water inventory will be maintained within the target normal operating range using the water management systems currently available or additional systems, if required.

Water Reclaim System:

- The water reclaim system pump barges will remain in a similar position in the northeast area of the supernatant pond. Barge relocations maybe required periodically as the water level rises in the pond.
- The intake elevation at the pump barges will gradually increase along with the water level of the pond.
- The same system configuration will continue to operate with two floating pump barges and HDPE discharge pipeline.
- A new pipe bench access road or other conveyance corridor will be required for the return water pipeline to facilitate raising the embankment crest above EL. 6,500 ft.

WED System:

- The WED will continue to passively drain to the Extraction Pond through operations.
- The position of the Extraction Pond on the west side of the East-West Embankment will be preserved. The Extraction Pond Dewatering System will be maintained and adjusted as required to accommodate future embankment crest raises.
- The Extraction Basin well casings will continue to be raised as the West Embankment crest is raised to enable pump installation and operation, if required. Installation of this contingency WED dewatering system (two pumping wells in the Extraction Basin) will only occur if required for WED operations or to maintain hydrodynamic containment along the West Ridge.

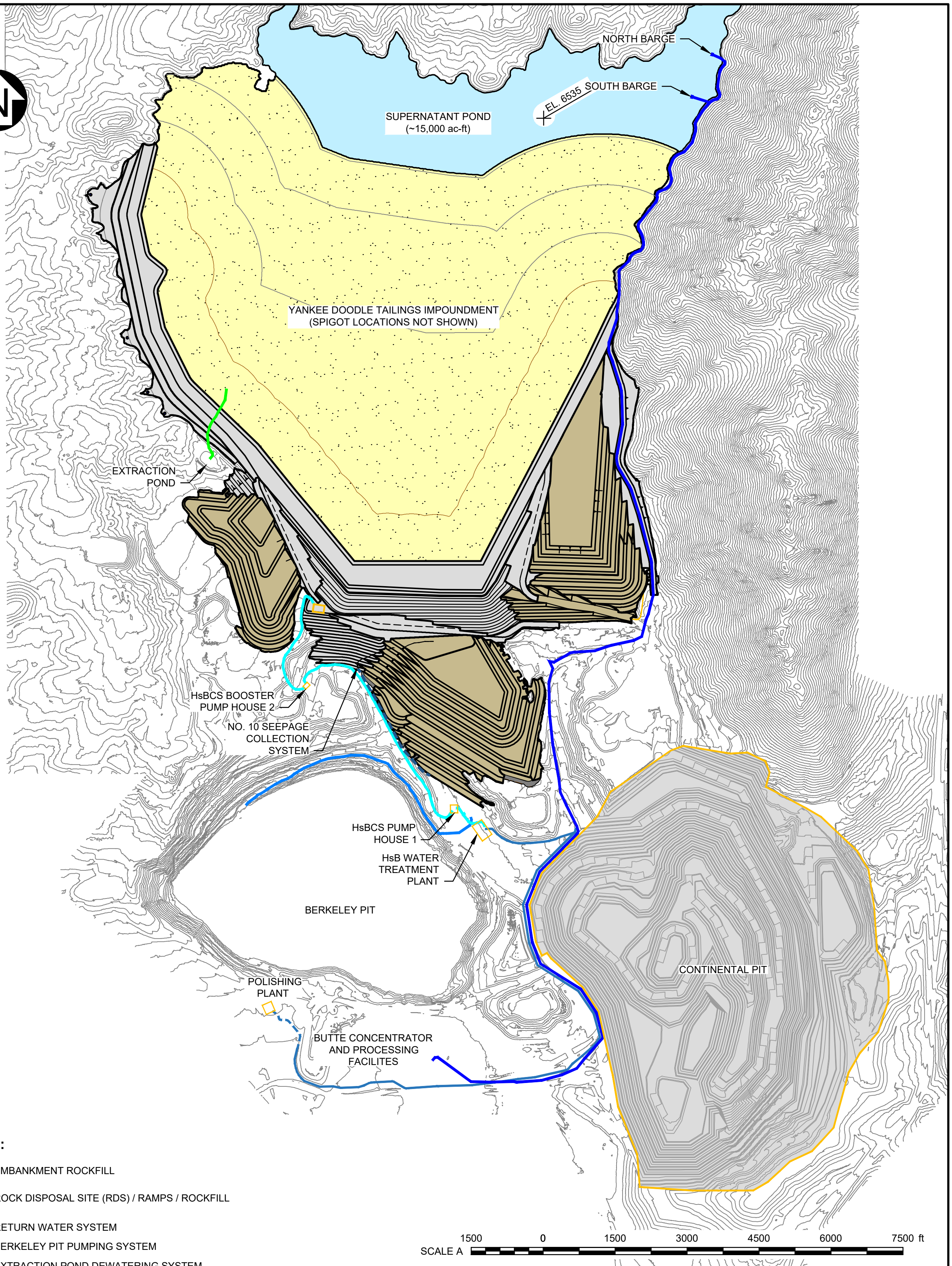
HsB Drainage System:

- The Stage 1 HsB Drainage System will continue to operate throughout operations and in closure.
- The HDPE lined ditch that collects and conveys flows along the Seep 10 bench to the transition pond will be converted to a rock drain prior to placement of embankment fill in the lower embankment lifts associated with Phase 3. The Seep 10 transition pond, discharge weir and pipeline to HsB Pond will continue to operate.

- The Stage 2 HsB Drainage System construction will include extension of the existing foundation layer, extension of one or more rock drains to provide engineered drainage capacity under the Stage 2 HsB RDS footprint and conversion of the perimeter ditches to secondary drains. The conceptual arrangement of the Stage 2 HsB Drainage System, including the Seep 10 bench rock drain described above, is shown on Figure 4.3.
- The detailed design of the Seep 10 and Stage 2 HsB drainage systems will be prepared in the future when required.

Surface Water Runoff Management Systems:

- The existing ancillary surface water management systems (e.g. minor roadside ditches, etc.) will be maintained similar to current conditions or adjusted as required to support future mine operations.



LEGEND:

- EMBANKMENT ROCKFILL
- ROCK DISPOSAL SITE (RDS) / RAMPS / ROCKFILL
- RETURN WATER SYSTEM
- BERKELEY PIT PUMPING SYSTEM
- EXTRACTION POND DEWATERING SYSTEM
- HsB CAPTURE SYSTEM
- RETURN WATER CONNECTED TO POLISHING PLANT
- NO. 10 SEEPAGE COLLECTION SYSTEM

NOTES:

1. TOPOGRAPHY PROVIDED BY MONTANA RESOURCES, LLC IN AUGUST 2024.

MONTANA RESOURCES, LLC

MONTANA RESOURCES

YANKEE DOODLE TAILINGS IMPOUNDMENT FUTURE WATER MANAGEMENT SYSTEMS GENERAL ARRANGEMENT

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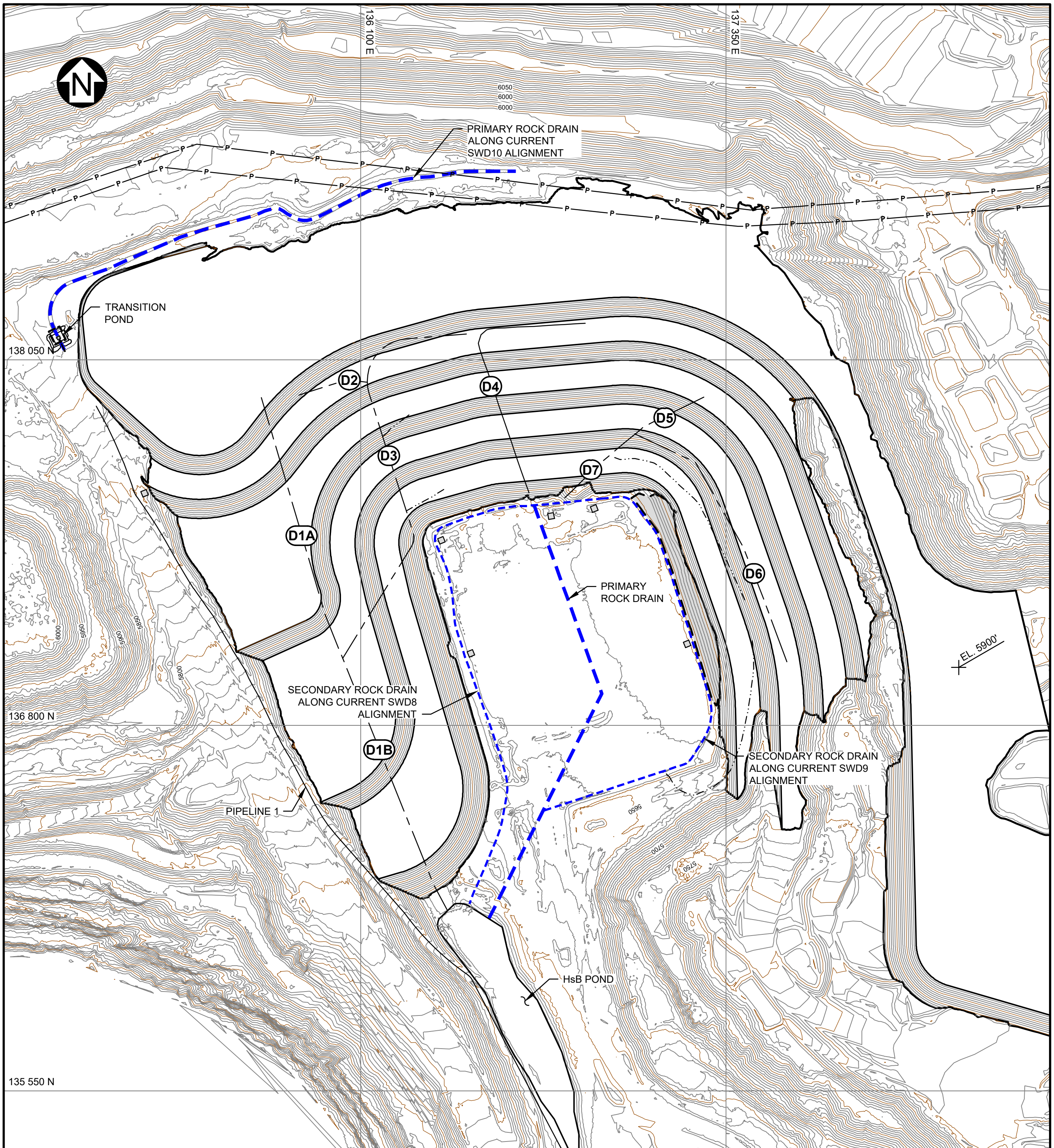
P/A NO.	REF NO.
VA101-126/24	8

FIGURE 4.2 REV 0

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED
0	11MAR'25	ISSUED WITH REPORT	DDF	RMM	JRG



LEGEND:

- STAGE 1 HsB ROCK DISPOSAL SITE (ZONE U)
- STAGE 2 PRIMARY ROCK DRAIN
- STAGE 2 SECONDARY ROCK DRAIN
- STAGE 1 ROCK DRAIN
- STAGE 1 SECONDARY ROCK DRAIN
- PIPELINE - ALIGNMENT
- P — HIGH VOLTAGE TRANSMISSION LINE
- Dx STAGE 1 ROCK DRAIN IDENTIFICATION

SCALE A: 250 0 250 500 750 1000 1250 ft

NOTES:

1. COORDINATE SYSTEM AND ELEVATIONS ARE BASED ON ANACONDA MINE GRID.
2. EXISTING GROUND TOPOGRAPHY BASED ON LIDAR SURVEY PROVIDED BY MONTANA RESOURCES, LLC DATED JULY 2024 AND DRONE SURVEY DATA OF THE HSB AREA PROVIDED BY WATER AND ENVIRONMENTAL TECHNOLOGIES DATED OCTOBER 2024.

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YANKEE DOODLE TAILINGS IMPOUNDMENT
STAGE 2 HsB DRAINAGE SYSTEM
CONCEPTUAL ARRANGEMENT

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VA101-126/24	8

FIGURE 4.3 REV 0

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED
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SAVED: M:\1\01\00126\24\A\Acad\FIGS\A65, 3/11/2025 10:04:46 AM , RMCLELLAN PRINTED: 3/11/2025 10:57:12 AM, FIG 4.3, RMCLELLAN ACAD VERSION: 25.0S (LMS TECH)

4.3.3 CLOSURE REQUIREMENTS

The surface water management system changes that would be required as part of the YDTI closure activities include the following:

Supernatant Pond:

- Active Closure: The supernatant pond will be actively drawn down over a period of several years to a target volume of approximately 5,000 ac-ft. The pond inventory will be maintained at approximately 5,000 ac-ft (with seasonal fluctuations) for the remaining years of the Active Closure period.
- Passive Closure: The supernatant pond volume will passively drain down to a natural equilibrium volume with seasonal fluctuations.
- A closure spillway will be constructed for the YDTI on the east side of the facility to prevent overtopping of the YDTI embankment crest and to limit the potential for water to pool directly adjacent to the embankment in the event of severe natural flooding. Additional details related to the spillway concept are presented in Appendix B1. The spillway is not intended for routine water discharge and likely will never convey flow.

Water Reclaim System:

- Active Closure: The water reclaim system pump barges used during operations will remain in the same position within the supernatant pond and pump water solely to the Polishing Plant for final treatment and off-site discharge.
- Passive Closure: The water reclaim system (pump barges and pipelines) will be decommissioned.

WED and Extraction Pond Dewatering System:

- The WED will continue to passively drain to the Extraction Pond in closure.
- Active Closure: Water collected in the WED will continue to be pumped back to the supernatant pond via the Extraction Pond Dewatering System.
- Passive Closure: The Extraction Pond Dewatering System may be decommissioned or adjusted to support passive closure conditions. Water collected in the WED will be conveyed to the HsB area and managed with other BMFOU waters. A preliminary configuration for the WED gravity discharge corridor was prepared as part of the Design Document and details related to the concept are presented in Appendix B2. The gravity discharge configuration presented is conceptual, and detailed design of the gravity discharge system will be developed as part of BMFOU remedy activities.

4.4 EXTREME STORM EVENT MANAGEMENT

4.4.1 DESIGN STORM EVENT

The Inflow Design Flood (IDF) is an extreme flood hydrograph that is assumed to potentially flow into the impoundment. The IDF is the most severe flood that the YDTI will be designed to manage. The IDF was selected to be the PMF, consistent with MCA 82-4-376 (2) (cc) (i) and the current design approach of the facility. Selection of the PMF is considered good engineering practice due to the long-term design life of the facility and is in accordance with international guidelines.

The selected design basis PMF event for the YDTI is the runoff generated by the 24-hour PMP combined with complete melt of the 1 in 100-year snowpack, and assuming full failure of the upstream Moulton Reservoirs. The determination of the PMP depth and 100-year snowpack and assessment of climate change are described in the Climate Conditions Report (KP, 2021a). The estimated 24-hour PMF volume was approximately 20,000 acre-ft (KP, 2024a).

The intent of adopting the PMF is to provide a design storm volume that is so great that it will never be exceeded, but not so great as to require excessive storage capacity. Historical rainfall and streamflow datasets were also evaluated in an effort to address the question of design storm adequacy and reasonableness (KP, 2021a; KP, 2016). The estimated runoff volumed from the 1 in 1,000-year return period 30-day rainfall is approximately 7,200 ac-ft (KP, 2024a). The comparison between these two events (as well as the PMF event and other historical datasets) indicates that the PMF-based IDF volume estimate is extremely large relative to historical probability-based rainfall and runoff event volumes.

4.4.2 ONGOING OPERATIONS

The primary dam safety and flood management feature of the YDTI during operations is its ability to store the runoff volume from severe flooding, up to and including the PMF event, within the facility. The minimum freeboard design criteria for the YDTI during operations comprises storm storage freeboard to safely manage floods and additional minimum freeboard allowance for wave run-up. The overall freeboard design criteria consider the following requirements:

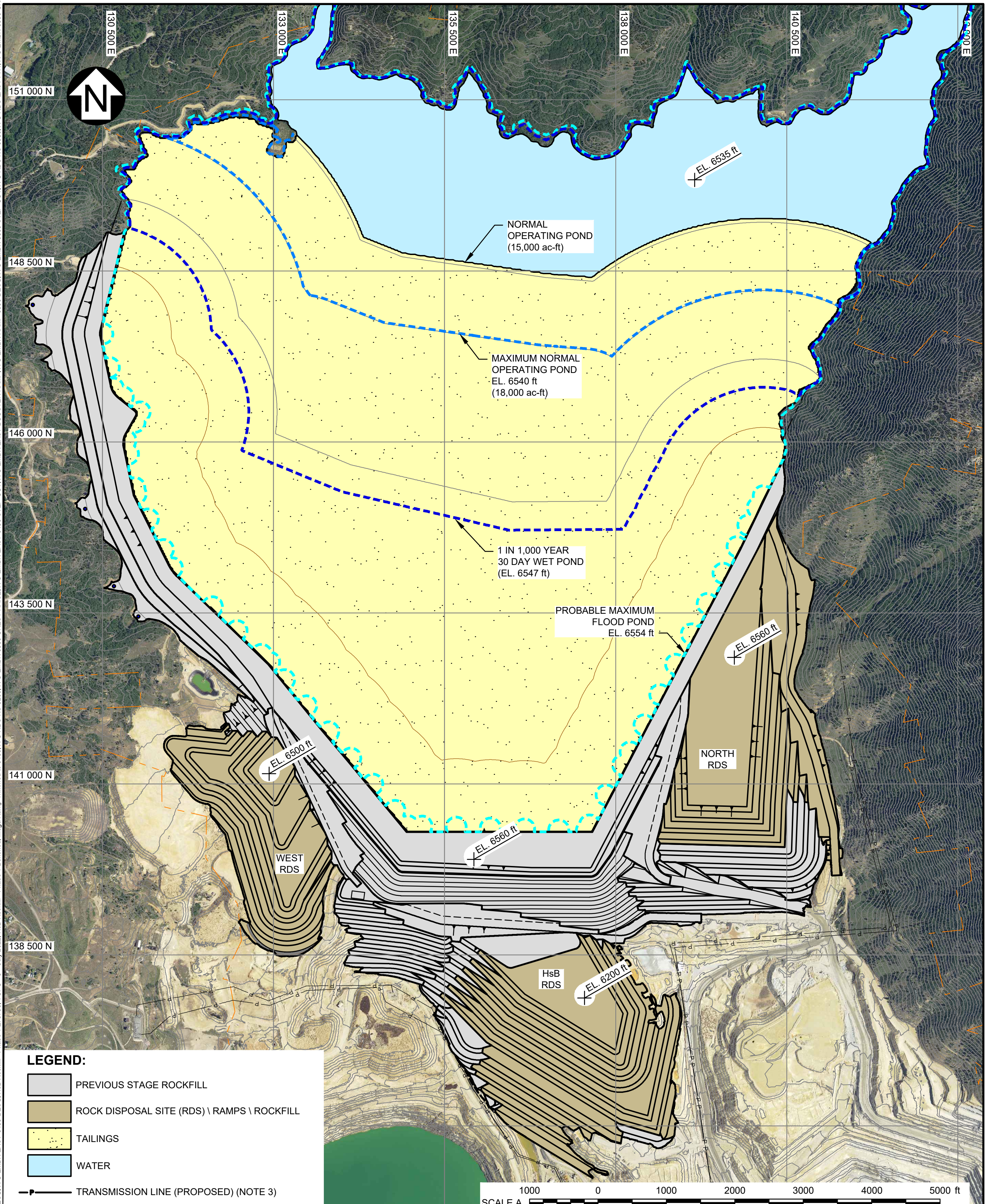
- Storage of a maximum normal operating pond volume of approximately 18,000 acre-ft (comprising 15,000 ac-ft nominal operating pond plus 3,000 ac-ft for normal seasonal fluctuation) prior to the design storm event.
- Containment of the 24-hour PMF volume of 20,000 ac-ft (i.e., the design storm event).
- A minimum dry freeboard requirement of 5 ft for wave action above and beyond the storm storage freeboard.

The freeboard required for storage of the PMF will vary depending on the evolving surface and pond area of the facility during ongoing operations but is expected to be approximately 15 ft throughout the period contemplated in the Design Document. The surface area of the YDTI is approximately 1,850 acres at EL. 6,450 ft and will increase to approximately 2,150 acres at EL. 6,560 ft. The 5 ft minimum dry freeboard requirement creates an additional 9,250 to 10,750 acre-ft of capacity in addition to the storm storage freeboard. Embankment construction will be completed in up to 50 ft high stage lifts, and therefore the total actual freeboard will tend to be much larger than the design freeboard until just before operations cease.

A general arrangement of the YDTI for the life of mine configuration showing the tailings beach inundation extents and pond elevations for the 1 in 1,000-year 30-day rainfall and PMF is included as Figure 4.4.

4.4.3 CLOSURE

A spillway will be constructed for YDTI closure to manage potential for severe flooding through a combination of storage and controlled release of flow above a specified maximum pond volume. The spillway will facilitate the release of excess water from the impoundment to control the maximum elevation and extent of the pond thus preventing water pooling adjacent to the embankment during potential extreme storm events in the long-term. The spillway will be constructed during reclamation and will only discharge water when the storage volume exceeds approximately 18,000 ac-ft. The closure spillway is intended as a contingency system to prevent overtopping and limiting water pooling during severe and subsequent storm events. A general arrangement of the YDTI for the closure configuration showing the potential maximum tailings beach inundation extents for events up to and including the PMF is included as Figure 4.5.



LEGEND:

- PREVIOUS STAGE ROCKFILL
- ROCK DISPOSAL SITE (RDS) \ RAMPS \ ROCKFILL
- TAILINGS
- WATER
- TRANSMISSION LINE (PROPOSED) (NOTE 3)
- PROPERTY BOUNDARY

NOTES:

1. COORDINATE SYSTEM AND ELEVATIONS BASED ON ANACONDA MINE GRID.
2. AERIAL IMAGE PROVIDED BY MONTANA RESOURCES, LLC IN AUGUST 2024.

MONTANA RESOURCES, LLC

MONTANA RESOURCES

YANKEE DOODLE TAILINGS IMPOUNDMENT
LIFE OF MINE ARRANGEMENT
EXTREME STORM EVENT MANAGEMENT

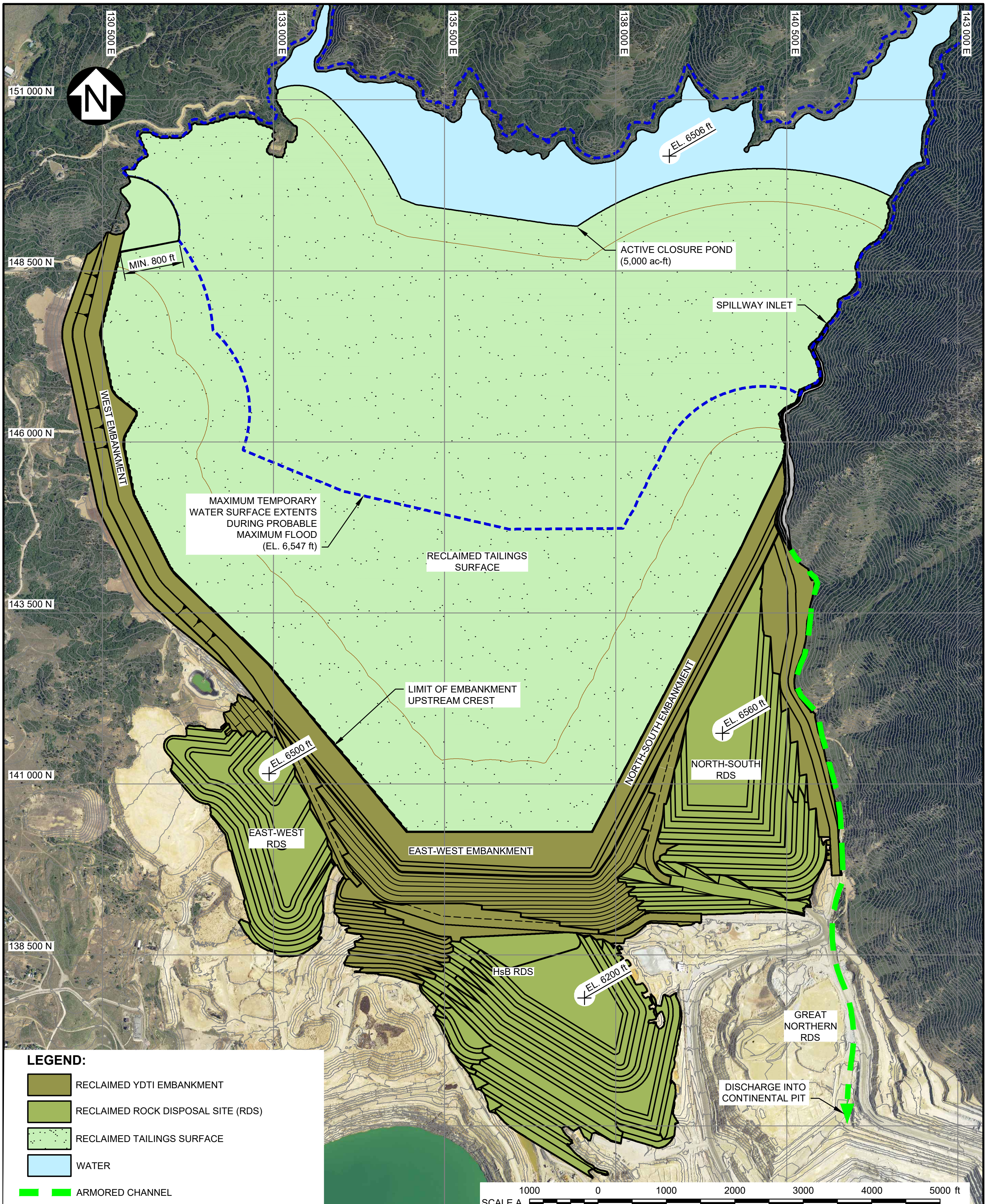
Knight Piésold CONSULTING

P/A NO.	REF NO.
VA101-126/24	8

FIGURE 4.4 REV 0

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED
0	11MAR'25	ISSUED WITH REPORT	DDF	RMM	JRG

SAVED: M:\1\01\00126\24\A\Acad\FIGS\A67, 3/11/2025 10:58:25 AM, FIG 4.4, RMCLELLAN PRINTED: 3/11/2025 10:03:57 AM, RMCLELLAN ACAD VERSION: 25.0S (LMS TECH)



NOTES:

1. COORDINATE SYSTEM AND ELEVATIONS BASED ON ANACONDA MINE GRID.
2. AERIAL IMAGE PROVIDED BY MONTANA RESOURCES, LLC IN AUGUST 2024.

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED
0	11MAR'25	ISSUED WITH REPORT	DDF	RMM	JRG

MONTANA RESOURCES, LLC

MONTANA RESOURCES

YANKEE DOODLE TAILINGS IMPOUNDMENT CLOSURE ARRANGEMENT EXTREME STORM EVENT MANAGEMENT

Knight Piésold CONSULTING

P/A NO. VA101-126/24

REF NO. 8

FIGURE 4.5

REV 0

SAVED: M:\1\01\00126\24\A\Acad\FIGS\A66, 3/11/2025 10:00:17 AM , RMCLELLAN PRINTED: 3/11/2025 10:57:56 AM, FIG 4.5, RMCLELLAN ACAD VERSION: 25.0S (LMS TECH)

5.0 WATER QUALITY AND HYDRODYNAMIC CONTAINMENT

5.1 PREDICTED POND WATER BALANCE AND WATER QUALITY

A water quality model was developed by Schafer Limited LLC (Schafer) to simulate the water quality of the YDTI supernatant pond during operations and closure. The simulations include the operations period for completeness; however, the focus is on predicting the evolving water quality in the pond following closure and long-term quality in the remnant pond contained in the YDTI during passive closure. The water quality model is based on the water routing and flow estimates from the water balance model for the YDTI (KP, 2024c) and includes consideration for both closure scenarios contemplated in the water balance model (further described below). Details of the mass load model including input assumptions, calibration, and model results are summarized in a technical memorandum (Schafer, 2025), which is included as Appendix C.

The water balance model indicates that the YDTI supernatant pond can be maintained near its target pond volume of 15,000 +/- 3,000 ac-ft during future operations. Surplus conditions in the facility can be readily managed by temporarily increasing the active treatment and discharge via the Polishing Plant. Similarly, water inventory can be restored following temporary deficit conditions by temporarily reducing the rate of withdrawals to (and through) the Polishing Plant. These results demonstrate that the active water management systems at site allow operational control of the YDTI pond inventory.

The water balance and mass load models consider two scenarios for the closure period:

Scenario #1: Active and Passive Closure

Active Closure: Assumes active management of water during the first 20 years of closure. Pumped inflows to the YDTI and pumped discharges from the YDTI pond to the Polishing Plant to facilitate the BMFOU remedy are assumed to continue.

Passive Closure: All pumped inflows to and outflows from the YDTI assumed to be terminated. The BMFOU remedy is assumed to be managed elsewhere.

Scenario #2: Passive Closure Only

Assumes the site transitions into Passive Closure immediately after the end of operations and all pumped inflows to and outflows from the YDTI are terminated. The BMFOU remedy is assumed to be managed elsewhere.

Continuation of management of water in the YDTI is expected to cause a temporary increase in water inventory during the initial 3 to 5 years of closure under Scenario #1. The increased water inventory is primarily associated with the pumping and recirculation of various flows to the YDTI. The model estimates active drawdown of the facility to a target stored water volume of 5,000 ac-ft can be achieved within 10 years of closure in Scenario #1. In Scenario #2, the estimated time required to achieve the same volume of 5,000 ac-ft of stored water under average climate conditions is approximately 35 years.

During the passive closure phase in both scenarios, the YDTI pond volume will be governed by the hydrometeorological balance of the facility, which is in an overall deficit. The pond volume is expected to decrease over time, with the rate of decrease gradually declining as the pond surface area gets smaller resulting in reduced evaporation from the pond. The pond volume is expected to reach an equilibrium condition by the end of the closure period under both closure scenarios, with direct precipitation on the pond and inflow runoff from surrounding areas being approximately equivalent to evaporation from the pond. The long-term passive closure pond volumes are expected to range from approximately 500 ac-ft in very dry conditions to 7,000 ac-ft in very wet conditions with a 50th-percentile pond volume of approximately 2,000 ac-ft.

The key results and conclusions from the kinetic testing and water quality simulations (Schafer, 2025) include the following:

- Tailings are continuously placed during mine operations so that only relatively fresh tailings exist in the zone of oxidation near the tailings surface. Water running off the facility is likely to be dominated by excess process water that is collected in the pond. As a result, chemical loading during operations is best represented by process water chemistry.
- Water contacting the tailings beach after tailings beach cover placement during closure will interact with the cover soil layer rather than the tailings, and runoff quality should generally resemble natural runoff. Other sources of inflow include runoff from upgradient catchment areas and precipitation on the pond. Water quality in the remnant pond is predicted to gradually improve during the closure period.
- After operations end in 2056, the following trends related to key contaminants of concern are predicted by the model:
  - pH of the pond is expected to gradually decline from 10 to approximately 7.
  - Sulfate levels may remain near 1,600 mg/L during active closure phase in Scenario 1 and then rapidly decline once passive closure commences. The simulation of passive closure in Scenario 2 indicates sulfate levels will drop to less than 500 mg/L by 2080 and less than 100 mg/L by 2100. Both models show similar sulfate trends after about 2080 or so.
  - The model tends to overestimate both copper and zinc concentrations compared to the calibration period, and it is inferred that concentrations are similarly overestimated for future operations/closure periods. The overestimates of these parameters are attributed to model simplifications, and additional details are presented in Schafer (2025). Schafer concludes that it is unlikely that copper and zinc will exceed levels currently observed in the pond following closure. Most other modeled metal levels are predicted to be at or near detection limits.

5.2 KEY ENVIRONMENTAL CONTROLS

One principal design objective for the YDTI is to protect regional groundwater and surface waters during operations and in the long-term following closure. Hydrodynamic containment of undesirable constituents (i.e. tailings and mine affected water) stored at the YDTI within the mine site area is achieved through two primary controls as follows:

- The Berkeley Pit acts as a regional groundwater sink limiting the potential for off-site groundwater/surface impacts. The Berkeley Pit is located within the BMFOU and subject to EPA jurisdiction and requirements. To prevent a reversal of the hydraulic gradient (allowing water to leave the pit), the water level at East Camp Points of Compliance must be maintained below a Protective Water Level of 5,466 ft (ACC Datum). The BPPS currently conveys water from the Berkeley Pit to the HsB area. Water collected in the HsB area or conveyed by the BPPS to the HsB area is directed to treatment at the HsB WTP or HsB CS. Either system arrangement results in Berkeley Pit water being conveyed to the YDTI. The supernatant pond provides residence time for water treatment objectives to be achieved. Off-site discharge of water from the YDTI is facilitated by final treatment at the Polishing Plant. The Berkeley Pit operating level is currently being managed at approximately EL. 5,412 ft (ACC Datum) with this water management strategy.
- The West Embankment is constructed along the side of the West Ridge and forms the western battery limit of the facility. The West Embankment incorporates the WED and several other seepage control features, which will maintain hydrodynamic containment of YDTI seepage as the supernatant pond elevation rises above the lowest groundwater elevations in the West Ridge. Additional groundwater modelling to demonstrate West Ridge hydrodynamic containment for the 6,560 Amendment is further described below.

5.3 WEST RIDGE HYDRODYNAMIC CONTAINMENT

Hydrometrics, Inc. (Hydrometrics) developed a two-dimensional cross-sectional model of groundwater flow at the YDTI and West Ridge for the Design Document. One purpose of the model was to further evaluate the ability of the West Embankment and WED to maintain hydrodynamic containment for the proposed continued construction and operation of the YDTI up to a design crest of EL. 6,560 ft. The model evaluates four scenarios, including three for calibration purposes and one for predictive purposes. Results of the predictive model for the YDTI constructed to EL. 6,560 ft demonstrate the West Embankment and WED are expected to function as intended with hydrodynamic containment maintained along the West Ridge. A sensitivity analysis was also performed on three parameters judged to be of particular importance to the predictions. Results show the model responding as expected to these changes with water levels at the WED remaining near the WED invert elevation of EL. 6,350 ft and hydrodynamic containment being maintained along the West Ridge under all sensitivity analysis simulations. Additional details are provided in Hydrometrics (2025a), which is included as Appendix D1.

Additional installed/uninstalled contingency measures (e.g., the Extraction Basin and drain pods) were included in the initial design of the WED (KP, 2017) and can be implemented to help manage flows within the drain if required in the future to maintain hydrodynamic containment. The Extraction Basin well casings will continue to be raised as the West Embankment crest is raised to enable pump installation and operation, if required. Installation of this contingency WED dewatering system (two pumping wells in the Extraction Basin) will only occur if required for WED operations or to maintain hydrodynamic containment along the West Ridge. Installation of pumps at the Extraction Basin could double the total installed extraction capacity for the drain when combined with the pumping system at the Extraction Pond. This system also provides an alternative pumping location if maintenance is required at the Extraction Pond and/or could be used to reduce hydraulic pressure near the potentiometric low, if required.

Augmented recharge of the West Ridge groundwater system was also identified as a potential contingency measure for hydrodynamic containment, if needed in the future. Hydrometrics completed augmented recharge testing in 2016 and 2022 to evaluate the response of the groundwater systems along the West Ridge, including the deep fracture system and groundwater potentiometric low. The recharge testing indicated that augmented recharge could be a viable mitigation measure to increase groundwater levels in the central West Ridge area where groundwater levels are the lowest. Hydrometrics developed conceptual recharge plans for each of the tested areas to support the Design Document. Additional details related to the testing program, analysis and conclusions of the evaluation are provided in Hydrometrics (2024), which is included as Appendix D2.

Groundwater level and water quality data collected as part of the YDTI operational monitoring programs continues to indicate the West Embankment, WED, and tailings discharge plans are working as intended to maintain hydrodynamic containment along the West Ridge. A summary these environmental monitoring programs and updated monitoring results are described separately in a baseline report prepared by Hydrometrics (Hydrometrics, 2025b) to support the 6,560 Amendment Application. These monitoring programs should be continued to assess performance and maintenance of hydrodynamic containment in the future.

6.0 PERFORMANCE MONITORING REQUIREMENTS

6.1 PRELIMINARY QUANTITATIVE PERFORMANCE PARAMETERS

Preliminary tailings and water management QPPs for ongoing development of the YDTI up to EL. 6,560 ft are summarized in Table 6.1. The Preliminary QPPs will be reviewed (and revised, if required) during preparation of the IFC designs with the latest versions incorporated into revisions to the Tailings, Operation, Maintenance and Surveillance (TOMS) Manual (MR/KP, 2023). The preliminary QPPs presented in this report may be incorporated into future versions of the TOMS Manual, when appropriate, and updated thereafter during regular reviews of the TOMS Manual.

Table 6.1 Preliminary Water Management QPPs – Operations

Performance Category	Location	QPP	Value
Water Management	Supernatant Pond	Volume [1]	< 18,000 acre-ft
	Supernatant Pond	Total Freeboard [2]	> 20 ft
Tailings Management	Tailings Beach	Minimum Beach Length [3]	> 800 ft
		Minimum Dry Freeboard [2]	> 5 ft

Note(s):

1. The pond volume requirement is based on maximum normal operating conditions. Closure pond volume requirements are discussed in KP (2024b).
2. Total freeboard includes 15 ft of storm storage freeboard for the PMF combined with minimum dry freeboard of 5 ft. Additional discussion is provided in KP (2024a).
3. The minimum beach length of 800 ft allows time to respond and mitigate water approaching the embankment.

6.2 MONITORING AND SURVEILLANCE REQUIREMENTS

The YDTI components and associated facilities must be inspected and maintained regularly to detect any changes to the condition and performance of the facilities, and to identify any potentially hazardous conditions that need to be promptly addressed. Surveillance activities are performed to verify that the performance objectives for the facility and operational objectives of mine are continuously being achieved. These surveillance activities include site observations and inspections, collection of site monitoring data, and remote sensing techniques. A summary of routine operational surveillance requirements for the YDTI tailings and water management systems during future operations is provided in Table 6.2.

The maintenance and inspection responsibilities for the various MR facility components will be presented in the latest TOMS Manual for the YDTI.

Table 6.2 Tailings and Water Management Operational Surveillance Requirements

Location	Inspection	Frequency[1]
Supernatant Pond	Measure pond water level	monthly
	Sample supernatant pond and analyze chemical properties	twice annually
	Evaluate pond water inventory	annually
	Complete bathymetric survey of the pond	annually
Tailings Beach	Inspect beach surface for dusting risk/potential	daily
	Survey of tailings beach elevation near discharge points	monthly
	Review remote sensing data to assess changes in beach length	monthly
	Collect aerial image and topographic survey of the facility	annually
Tailings Delivery System	Visually inspect the tailings pipelines for leaks, discharge points to confirm functionality, and observed discharge flow direction.	daily
	Record tailings line and discharge point use	daily
	Sample tailings slurry and analyze index properties	quarterly
	Record mill throughput and estimated tailings production	annually
Water Management Systems	Record flowrates at YDTI and HsB water management systems	daily
Site Wide Water Management	Observe surface drainage ditches and culverts for erosion, blockage, or damage.	periodically

Note(s):

1. The frequencies provided above are minimum expected for good practice. Additional details will be developed and included in regular updates to the TOMS Manual. The schedule may be modified should circumstances temporarily preclude monitoring at the desired frequency.

7.0 REFERENCES

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Knight Piésold Ltd. (KP, 2024a). Yankee Doodle Tailings Impoundment – Design Basis Report for 6,560 Amendment Design Document (KP Reference No. VA101-126/24-1 Rev 0), dated September 20, 2024.

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Knight Piésold Ltd. (KP, 2024c). Yankee Doodle Tailings Impoundment – Water Balance Model Report for 6,560 Amendment Design Document (KP Reference No. VA101-126/24-4 Rev A), dated December 13, 2024.

Montana Code Annotated (MCA, 2023). *Title 82: Minerals, Oil, and Gas, Chapter 4: Reclamation, Part 3: Metal Mine Reclamation*. Available at:

https://leg.mt.gov/bills/mca/title_0820/chapter_0040/part_0030/sections_index.html

Montana Resources and Knight Piésold Ltd. (MR/KP, 2023). Yankee Doodle Tailings Impoundment – Tailings Operations, Maintenance and Surveillance (TOMS) Manual, Rev 6, December 4, 2023.

Schafer Limited LLC (Schafer, 2025). Yankee Doodle Tailings Pool Water Quality Prediction. Technical Memorandum to Mark Thompson, dated February 3, 2025.

8.0 CERTIFICATION

This report was prepared and reviewed by the undersigned.

Prepared:

Daniel Fontaine, P.E.
Specialist Engineer | Associate
YDTI Engineer of Record

Reviewed:

Jason Gillespie, P.Eng.
Senior Engineer

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

APPENDIX A

Water and Tailings Characterization

(Pages A-1 to A-14)

APPENDIX A
WATER AND TAILINGS CHARACTERISTICS

1.0 INTRODUCTION

The laws governing tailing storage facility design, operation and reclamation are contained within sections of Montana Code Annotated (MCA) Title 82 Chapter 4 Part 3. The design document requirements are described in MCA 82-4-376 (MCA, 2023), which is the governing regulation for preparation of the 6,560 Amendment Design Document (the Design Document). This appendix presents a description of the chemical and physical properties of the tailings and water currently stored in and entering the YDTI as required by MCA 82-4-376 (2) (o). The summary is based on the available testing data provided by MR.

The ore throughput at the mill and processing facilities is approximately 49,000 short tons per day. Tailings from ore processing are conveyed to the YDTI for disposal and permanent storage. The YDTI comprises a valley-fill style impoundment created by a continuous rockfill embankment. The tailings beach is formed by discharge and deposition of tailings slurry from discharge locations distributed along the YDTI embankments. The drained tailings beach is considered part of the impoundment containment system, which collectively with the rockfill embankment, contains the supernatant pond along the north side of the facility.

The total surface area of the YDTI (beach and pond) was approximately 1,550 acres as of 2023, and the subaerial beach and supernatant pond areas were estimated to be approximately 1,100 and 450 acres, respectively (KP, 2024a). The surface area of the YDTI is expected to increase to approximately 2,150 acres for the EL. 6,560 ft configuration (KP, 2024b).

2.0 WATER QUALITY

2.1 MONITORING LOCATIONS

The Yankee Doodle, Dixie, and Silver Bow Creek watersheds are located up-gradient of the YDTI. Water quality sampling locations have been established for each creek. The sampling locations and corresponding creeks are identified as follows:

- WQ-10, North Silver Bow Creek – Silver Bow Creek Watershed, north of the YDTI
- WQ-11, Yankee Doodle Creek – Yankee Doodle Creek Watershed, north of the YDTI
- WQ-15, Dixie Creek – Dixie Creek Watershed, north of the YDTI

Water quality sampling of the supernatant pond is undertaken at one location, identified as follows:

- WQ-9A, Yankee Doodle Tailings Pond – located near the YDTI reclaim water pump barges

2.2 MONITORING FREQUENCY AND ANALYTES

Water quality samples have been typically collected twice a year in June/July and October/November since 2015. The sampling events have generally targeted high flow months (early summer) and low flow months (late fall).

Samples have generally been analyzed for physical parameters, ions, nutrients, and total metals. Some analyses however have results reported as “NA” (not applicable) or “ND” (not detected), indicating that they were not analyzed for the given parameter, or the concentration was below the laboratory detection limit. Sufficient data has been reported to calculate basic summary statistics and to assess trends for most parameters.

The quality assurance and quality control (QA/QC) data checks were the responsibility of MR for the water quality program. KP has summarized the data provided by MR with only cursory review for potentially anomalous data. Preliminary review of the data identified the October 2016 supernatant pond (W9A) results for aluminium, arsenic, copper, iron, lead, manganese, rubidium and silicon values to be potentially anomalous. The complete data set from this October 2016 sampling event was therefore removed from the water quality data when creating the summary tables presented herein.

2.3 REFERENCE GUIDELINES

Physical parameters in water are generally not considered directly for toxic properties but may affect the toxicity of other parameters in water, such as metals. Water hardness, which consists of compounds of calcium, magnesium, and other ions, can modify the toxicity of some metals by reducing the bioavailability to aquatic life receptors. Water is classified as very soft, soft, moderately hard, hard, and very hard for hardness concentration ranges of 0-60 mg/L CaCO3, 61-120 mg/L CaCO3, 121-180 mg/L CaCO3, and >180 mg/L CaCO3, respectively (USGS, 2016). The pH of water can affect biological receptors directly or indirectly by affecting the toxicity of other parameters in water. Alkalinity is a measure of the buffering capacity of water, which reduces the sensitivity of pH to acidic inputs (US EPA, 1986).

Nutrient parameters may be nitrogen- or phosphorus-based and are used to define the structure of aquatic ecosystems. Changes in nutrient concentrations, such as nutrient over-enrichment, can result in major changes to the biological diversity of an ecosystem. In freshwater systems, phosphorus is generally the limiting nutrient that controls biological productivity and is used to define the trophic status. Water bodies containing low concentrations of total phosphorus (0.035 mg/L) are defined as eutrophic and often support uncontrolled plant growth and low biodiversity. Total phosphorus concentrations in the moderate ranges are categorized as mesotrophic or meso-eutrophic (CCME, 2004).

Metal concentrations in each water body were typically compared with laboratory detection limits (DLs) and concentrations exceeding detection limits are summarized herein. The upgradient flows are collected within the YDTI supernatant pond, combined with other flows managed at the YDTI, and incorporated into the site water balance for ore processing. Sample concentrations for many metals ranged from below detection limits to several orders of magnitude above them. Metals listed in the discussion of water quality at each location were generally based on the number of samples that were reported above the detection limit.

2.4 REVIEW FINDINGS

Qualitative descriptions of the water quality results for each sampling location are summarized in the following section. A summary of the available water quality data is included in the attached tables.

Upgradient Watersheds

Silver Bow, Yankee Doodle and Dixie Creeks are upstream of the mine area and are therefore not impacted by current mining activities.

Silver Bow Creek

- The mean water hardness in Silver Bow Creek (WQ-10) is considered soft, with all samples between 79 and 115 mg/L hardness. The mean ion concentrations are shown on Figure A2.1.

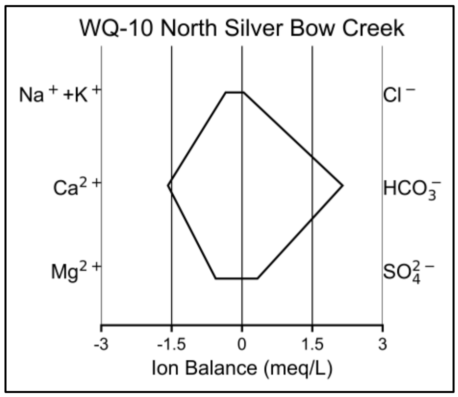


Figure A2.1 Silver Bow Creek – Stiff Plot

- Total phosphorus concentrations were within the meso-eutrophic or eutrophic classification ranges, with several samples in the eutrophic range.
- Nitrogen-based nutrients were below the detection limit.
- Metal concentrations were generally below the detection limits except for aluminum, arsenic, iron, copper, manganese, magnesium, molybdenum, potassium, sodium, silicon, rubidium and strontium.

A summary of water quality data collected by MR between June 2015 and October 2023 is provided in Table A.1.

Yankee Doodle Creek

- The water hardness in Yankee Doodle Creek ranges between very soft and soft, with all samples between 38 to 82 mg/L hardness. The mean ion concentrations are shown in Figure A2.2.

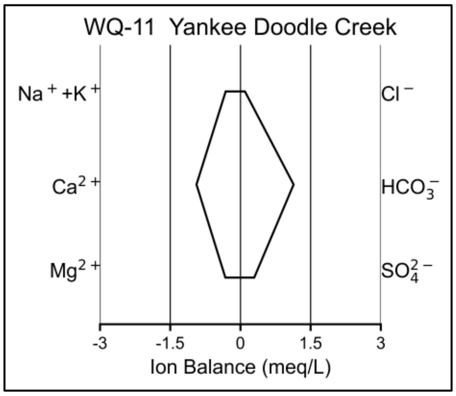


Figure A2.2 Yankee Doodle Creek – Stiff Plot

- Total phosphorus concentrations vary within the oligotrophic and mesotrophic ranges.
- Nitrogen-based nutrients were all below the detection limit.
- Metal concentrations were generally measured below the detection limits except for aluminum, arsenic, calcium, copper, iron, lead, magnesium, manganese, mercury, potassium, rubidium, silicon, sodium and strontium.

A summary of water quality data collected by MR between June 2015 and October 2023 is provided in Table A.2.

Dixie Creek

- The water hardness in Dixie Creek is soft, with samples ranging between 80 and 114 mg/L. The mean ion concentrations are shown in Figure A2.3.

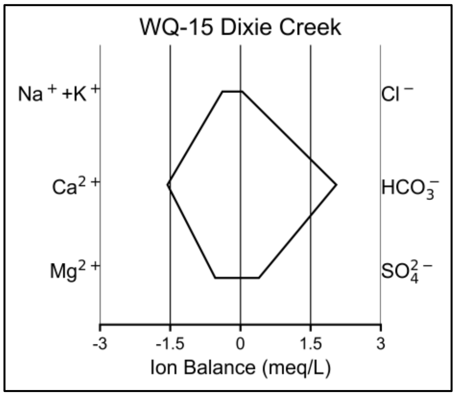


Figure A2.3 Dixie Creek – Stiff Plot

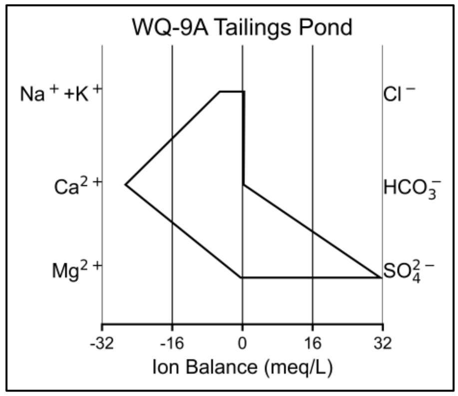
- Phosphorus concentrations generally classify as meso-eutrophic to eutrophic.
- Nitrogen samples taken were generally at the detection limit, with the three samples above the detection limit reporting values below 0.08 mg/L.
- Metal concentrations reporting above the detection limits included aluminum, arsenic, calcium, copper, iron, lead, magnesium, manganese, potassium, rubidium, silicon, sodium, strontium, and uranium.

A summary of water quality data collected by MR between June 2015 and October 2023 is provided in Table A.3.

Yankee Doodle Tailings Impoundment – Supernatant Pond

Water quality reported in the tailings supernatant pond is notably different than the upgradient watersheds, as expected. A summary of the YDTI water quality data is provided in Table A.4.

- The supernatant pond water is very hard (mean hardness 1,369 mg/L), basic to very basic water with good buffering capacity. The dominant ion pair includes sulfate (mean 1,520 mg/L) and calcium (mean 541 mg/L). The mean ion concentrations are shown on Figure A2.4.



Note(s):

1. The x-axis scale is not the same as the upgradient plots.

Figure A2.4 YDTI Supernatant Pond – Stiff Plot

- Total dissolved solids (TDS) are very high (median 2,300 mg/L).
- Phosphorus concentrations are classified as meso-eutrophic to eutrophic.
- Nitrogen concentrations ranged between 0.11 to 0.69 mg/L.
- The analytes with concentrations greater in the supernatant pond than the upgradient watersheds include calcium, chloride, fluoride, copper (since 2022), molybdenum, nitrate and nitrite, potassium, rubidium, selenium, sodium, strontium, sulphate, total dissolved solids and tungsten.

3.0 TAILINGS PROPERTIES

3.1 DATA COLLECTION

A total of 19 drillholes have intersected tailings materials within the YDTI during the annual site investigation (SI) programs conducted between 2015 through 2021. The number of drillholes, samples collected, and corresponding reference data report for each program are summarized below.

- 2015 SI: 8 drillholes with 6 samples collected (KP, 2017)
- 2017 SI: 1 drillhole with 49 samples collected (KP, 2018)
- 2019 SI: 1 drillhole with 4 samples collected (KP, 2020)
- 2020 SI: 1 drillhole with 18 samples collected (KP, 2021)
- 2021 SI: 8 drillholes with 92 samples collected (KP, 2023)

The tailings samples collected represent a reasonable range of tailings depths, spatial locations within the YDTI, and tailings age to support characterization of the physical characteristics of the stored materials.

3.2 PHYSICAL PROPERTIES

The laboratory data from the tailings samples collected during the 2021 SI were used to summarize the physical properties of the tailings contained within the YDTI. Additional details related to the site investigation program, including the laboratory test results, seismic cone penetration testing (SCPT) data interpretation, piezometric conditions, and comparison to conditions encountered during previous investigations are included in the associated site investigation report (KP, 2023).

Particle Size Distribution

Tailings material predominantly comprised sand with some silt and traces of clay. The 50th-percentile grain size distribution of the tailings comprised approximately 62% sand and 38% fines (silt and clay). The sand content ranged from 25 to 84% and fines content ranged from 75 to 16% for the 67 tailings samples subjected to testing.

Specific Gravity

Specific gravity laboratory testing was completed on 37 tailings samples. Measured tailings specific gravities ranged between 2.45 and 3.02 with an average of approximately 2.69. There was no discernible trend in specific gravity associated with increased depth, tailings age or change in spatial location.

Atterberg Limits

Atterberg limits testing was completed on 38 tailings samples. Generally, the tailings samples were non-plastic with 34 samples observed to have no plasticity. Three of the four remaining samples plotted on the left side of the plasticity chart A-line in a range indicating clay-like behavior with low plasticity.

Moisture Content

Measured tailings moisture contents ranged between 5 and 34%, with an average of approximately 19% for the 67 tailings samples tested. Gravimetric moisture contents were observed to be slightly higher in drillholes within the surface 130 feet below ground surface (ftbgs) within the non-loaded tailings along the North-South Embankment. The moisture contents were generally below the corresponding Liquid Limit (LL).

3.3 RHEOLOGICAL DATA

Rheological analysis of two YDTI tailings samples was conducted in 2022 by Patterson and Cooke (P&C, 2022). The composite tailings samples were collected from drill core generated during site investigation of the tailings beach adjacent to the North-South Embankment. The locations were selected to represent the tailings adjacent to the YDTI embankments. The composite samples were prepared to represent two different depths within the tailings mass to enable comparison between the historically deposited finer tailings and the more recently deposited coarser tailings. The results of the rheology testing are included along with additional assessment of the tailings physical properties in a separate report (KP, 2024c).

3.4 GEOCHEMICAL PROPERTIES

Tailings samples have typically undergone geochemical analysis (whole element scan of tailings solids) on a quarterly basis since 2005 with some additional data dating back to 1998. Data collected by MR since 2017 was reviewed, and a summary of tailings chemistry data reported by MR since 2017 is provided in Table A.5. The following observations were made:

- Acid neutralization potential (ANP) vs. acid generation potential (AGP) ratios ranged from 0.22 to 1.07 with an average of 0.43, indicating the tailings are potentially acid generating.
- pH is basic, ranging from 8.4 to 9.9 with an average of 9.

Detailed geochemical studies of the tailings, including the results of kinetic tests conducted on YDTI tailings by Schafer Limited LLC (Schafer) and typical process water chemistry, can be found in Schafer (2025) included in Appendix C. The findings of the tailings kinetic testing indicate that typical Continental Pit tailings have the potential to become acidic if exposed for approximately 10 to 20 years following deposition (for average ANP and AGP in tailings).

4.0 SUMMARY

MR typically conducts sampling and water quality analyses for the upstream watersheds and YDTI supernatant pond twice per year. The following summarizes the chemical and physical properties of the water and tailings currently stored in or entering the YDTI:

- Creek inflows to the YDTI from the three upstream watersheds are dominantly Ca^{2+} $[HCO_3]^-$ type with hardness classed between soft and very soft.
- Tailings water sampled within the pond is very hard with Ca^{2+} and $[SO_4]^{2-}$ as the dominant ion types. Copper, molybdenum and zinc are highly enriched in the tailings water compared to the inflows from the undisturbed upstream watersheds.
- Samples collected from the tailings mass during the 2021 SI indicate a 50th-percentile particle size distribution of approximately 62% sand and 38% fines (silt and clay). The average specific gravity of the tailings was 2.69. Atterberg limits typically show tailings to be non-plastic in the subaerial beach areas. Moisture content ranged from 5% to 34% with the moisture content generally below the corresponding LL.
- Tailings stored within the YDTI are basic with an AGP/ANP ratio less than 1, indicating potential for acid generation. Kinetic testing of the tailings indicates the lag time to onset of acidic conditions for exposed tailings would be approximately 10 to 20 years on average.

5.0 REFERENCES

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6.0 ATTACHMENTS

Table A.1 Rev 0	WQ10 – North Silver Bow Creek Water Chemistry
Table A.2 Rev 0	WQ11 – Yankee Doodle Creek Water Chemistry
Table A.3 Rev 0	WQ15 – Dixie Creek Water Chemistry
Table A.4 Rev 0	WQ9A – Yankee Doodle Tailings Pond Water Chemistry
Table A.5 Rev 0	Yankee Doodle Tailings Impoundment Tailings Chemistry

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TABLE A.1

MONTANA RESOURCES, LLC
MONTANA RESOURCES

WQ10 - NORTH SILVER BOW CREEK
WATER CHEMISTRY

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Analyte	Units	Sample Count	Below Detection Limit	NA	Min	5th Percentile	50th Percentile	Mean	95th Percentile	Max
Field and Lab Parameters										
Field pH	s.u.	18	0	0	7.69	7.75	7.97	8	8.3	8.7
Field Specific Conductivity	umhos/cm	18	0	0	131	169	241	232	265	269
Flow	Gallons Per Min	18	0	0	0.085	0.151	46	65	182	251
Water Temperature	Deg C	18	0	0	1.43	1.66	7.8	6.65	12.3	13.1
pH	s.u.	18	0	0	8	8	8	8.02	8.1	8.1
Specific Conductivity	umhos/cm	18	0	0	190	204	247	242	274	280
pH Measurement Temp	Deg C	10	0	0	12	12.2	15.7	15.3	17.5	17.9
Oxidation Reduction Potential	Millivolts	7	0	0	59.4	60.2	71	90.9	182	227
Dissolved Oxygen	mg/L	18	0	0	8.08	8.12	9.38	9.56	11	11.9
Total Dissolved Solids	mg/L	18	0	0	110	122	154	152	173	181
Total Suspended Solids	mg/L	18	15	0	10	10.7	17	32.3	64.7	70
Anions										
Chloride	mg/L	16	13	0	1	1	1	1.3	1.82	1.91
Fluoride	mg/L	18	1	0	0.1	0.1	0.1	0.101	0.108	0.114
Sulfate	mg/L	18	0	0	10.3	10.9	16	15.9	21.1	27.6
Hydroxide as OH	mg/L	2	2	0	-	-	-	-	-	-
Carbonates										
Alkalinity as CaCO3	mg/L	18	0	0	79	88.9	110	108	120	120
Bicarbonate as HCO3	mg/L	16	0	0	96	114	135	131	140	140
Carbonate as CO3	mg/L	14	13	0	6	6	6	6.00	6	6
Bicarbonate as CaCO3	mg/L	2	0	0	90.7	91.1	94.9	94.8	98.6	99
Nutrients										
Nitrate + Nitrite as N	mg/L	14	14	0	-	-	-	-	-	-
Phosphorus	mg/L	14	3	0	0.01	0.01	0.02	0.0306	0.0985	0.117
Metals										
Aluminum	mg/L	20	13	0	0.026	0.0266	0.035	0.0409	0.071	0.083
Antimony	mg/L	18	17	0	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006
Arsenic	mg/L	18	0	0	0.002	0.002	0.00239	0.00267	0.00415	0.005
Boron	mg/L	18	17	0	0.0125	0.0125	0.0125	0.0125	0.0125	0.0125
Cadmium	mg/L	18	18	0	-	-	-	-	-	-
Calcium	mg/L	18	0	0	25	25.9	33	31.6	35	35
Chromium	mg/L	18	17	0	0.00398	0.00398	0.00398	0.00398	0.00398	0.00398
Copper	mg/L	18	0	0	0.001	0.001	0.002	0.00204	0.0033	0.005
Iron	mg/L	18	0	0	0.03	0.0555	0.1	0.122	0.242	0.25
Lead	mg/L	18	12	0	0.000285	0.000289	0.0004	0.000381	0.000475	0.0005
Lithium	mg/L	18	17	0	0.00978	0.00978	0.00978	0.00978	0.00978	0.00978
Magnesium	mg/L	18	0	0	5	5	7	6.79	8	8
Manganese	mg/L	18	1	0	0.009	0.0098	0.0185	0.0223	0.0486	0.051
Mercury	mg/L	18	17	0	0.00004	0.00004	0.00004	0.00004	0.00004	0.00004
Molybdenum	mg/L	18	0	0	0.0017	0.0017	0.00205	0.00222	0.00345	0.0043
Nickel	mg/L	18	18	0	-	-	-	-	-	-
Potassium	mg/L	18	1	0	2	2.35	3	3.03	4	4
Rubidium	mg/L	18	0	0	0.0001	0.00095	0.0014	0.00141	0.00202	0.0021
Selenium	mg/L	18	18	0	-	-	-	-	-	-
Silicon	mg/L	17	0	0	8.21	8.28	9.4	9.3	10.2	10.6
Silver	ppm	17	17	0	-	-	-	-	-	-
Sodium	mg/L	18	0	0	5	5.41	6	6.19	7	7
Strontium	mg/L	18	0	0	0.17	0.187	0.215	0.215	0.242	0.25
Thallium	mg/L	18	18	0	-	-	-	-	-	-
Tungsten	mg/L	18	16	0	0.0001	0.000107	0.000168	0.000168	0.000228	0.000235
Uranium	mg/L	18	0	0	0.0018	0.0024	0.00355	0.00356	0.00484	0.0056
Vanadium	mg/L	18	18	0	-	-	-	-	-	-
Zinc	mg/L	18	18	0	-	-	-	-	-	-

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NOTES:

1. IF INSUFFICIENT DATA EXIST FOR STATISTICS "-" IS DISPLAYED

0	12MAR'25	ISSUED WITH REPORT VA101-00126\24-8	EB	DDF
REV	DATE	DESCRIPTION	PREP'D	RVW'D

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TABLE A.2

MONTANA RESOURCES, LLC
MONTANA RESOURCES

WQ11 - YANKEE DOODLE CREEK
WATER CHEMISTRY

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Analyte	Units	Sample Count	Below Detection Limit	NA	Min	5th Percentile	50th Percentile	Mean	95th Percentile	Max
Field and Lab Parameters										
Field pH	s.u.	18	0	0	7.21	7.30	7.8	7.87	8.73	8.98
Field Specific Conductivity	umhos/cm	18	0	0	88	102.00	156	151	215	218
Flow	Gallons Per Min	18	0	2	0.071	0.10	31.7	175	626	770
Water Temperature	Deg C	18	0	0	0.09	0.27	7.7	6.3	13	13.5
pH	s.u.	18	0	0	7.6	7.69	7.8	7.84	8	8
Specific Conductivity	umhos/cm	18	0	0	98	108.00	164	157	217	218
pH Measurement Temp	Deg C	10	0	0	10.8	12.10	15.7	15.1	17.2	17.4
Oxidation Reduction Potential	Millivolts	9	0	0	1.3	13.70	77	81.5	173	197
Dissolved Oxygen	mg/L	18	0	0	7.44	7.72	10.1	10	11.7	12.3
Total Dissolved Solids	mg/L	18	0	0	92	94.60	120	119	150	151
Total Suspended Solids	mg/L	18	18	0	-	-	-	-	-	-
Anions										
Chloride	mg/L	18	1	0	1	1	3	3.44	6.3	7
Fluoride	mg/L	18	11	0	0.1	0.1	0.1	0.1	0.1	0.1
Sulfate	mg/L	18	0	0	6	6.83	13	14.2	24.7	39.8
Hydroxide as OH	mg/L	2	2	0	-	-	-	-	-	-
Carbonates										
Alkalinity as CaCO3	mg/L	18	0	0	33	39	57.1	56.7	74.5	77
Bicarbonate as HCO3	mg/L	16	0	0	39	46.5	71.5	69.4	91	94
Carbonate as CO3	mg/L	14	14	0	-	-	-	-	-	-
Bicarbonate as CaCO3	mg/L	2	0	0	42.5	43.4	51.4	51.4	59.3	60.2
Nutrients										
Nitrate + Nitrite as N	mg/L	14	14	0	-	-	-	-	-	-
Phosphorus	mg/L	14	0	0	0.04	0.04	0.06	0.0759	0.158	0.211
Metals										
Aluminum	mg/L	20	3	0	0.007	0.007	0.016	0.0967	0.413	0.594
Antimony	mg/L	18	16	0	0.000319	0.000338	0.00051	0.000509	0.000681	0.0007
Arsenic	mg/L	18	0	0	0.00381	0.00397	0.006	0.00611	0.0093	0.011
Boron	mg/L	18	17	0	0.0123	0.0123	0.0123	0.0123	0.0123	0.0123
Cadmium	mg/L	18	17	0	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Calcium	mg/L	18	0	0	11	12.7	19	18.8	25.2	26
Chromium	mg/L	18	14	0	0.001	0.001	0.00165	0.00257	0.00544	0.00599
Copper	mg/L	18	0	0	0.001	0.00185	0.004	0.00472	0.0102	0.011
Iron	mg/L	18	0	0	0.11	0.11	0.538	0.499	0.9	1.18
Lead	mg/L	18	11	0	0.000333	0.000353	0.0004	0.000576	0.00101	0.0011
Lithium	mg/L	18	17	0	0.00644	0.00644	0.00644	0.00644	0.00644	0.00644
Magnesium	mg/L	18	1	0	3	3	4	3.9	5	5
Manganese	mg/L	18	0	0	0.007	0.00955	0.02	0.0201	0.0351	0.041
Mercury	mg/L	18	11	0	0.0000054	0.00000558	0.000008	0.0000126	0.0000314	0.000038
Molybdenum	mg/L	18	0	0	0.0008	0.0008	0.001	0.00106	0.00151	0.00158
Nickel	mg/L	18	18	0	-	-	-	-	-	-
Potassium	mg/L	18	1	0	1.78	1.96	2	2.05	2.2	3
Rubidium	mg/L	18	1	0	0.0003	0.00038	0.0007	0.000759	0.0015	0.0015
Selenium	mg/L	18	18	0	-	-	-	-	-	-
Silicon	mg/L	18	0	0	10.5	10.9	13	12.8	14.2	14.4
Silver	ppm	18	18	0	-	-	-	-	-	-
Sodium	mg/L	18	0	0	4	4	6	6.02	8	8
Strontium	mg/L	18	0	0	0.05	0.0585	0.1	0.0974	0.14	0.14
Thallium	mg/L	18	18	0	-	-	-	-	-	-
Tungsten	mg/L	18	10	0	0.0001	0.0001	0.000279	0.000382	0.00105	0.0014
Uranium	mg/L	18	0	0	0.0006	0.000665	0.00115	0.00125	0.00225	0.0025
Vanadium	mg/L	18	18	0	-	-	-	-	-	-
Zinc	mg/L	18	16	0	0.00577	0.00593	0.00739	0.00738	0.00884	0.009

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NOTES:

1. IF INSUFFICIENT DATA EXIST FOR STATISTICS "-" IS DISPLAYED

0	12MAR'25	ISSUED WITH REPORT VA101-00126\24-8	EB	DDF
REV	DATE	DESCRIPTION	PREP'D	RVW'D

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TABLE A.3

MONTANA RESOURCES, LLC
MONTANA RESOURCES

WQ15 - DIXIE CREEK
WATER CHEMISTRY

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Analyte	Units	Sample Count	Below Detection Limit	NA	Min	5th Percentile	50th Percentile	Mean	95th Percentile	Max
Field and Lab Parameters										
Field pH	s.u.	18	0	0	7.02	7.1	7.95	7.89	8.7	8.73
Field Specific Conductivity	umhos/cm	18	0	0	178	190	236	233	263	266
Flow	Gallons Per Min	18	0	0	0.055	0.0726	14	26.8	80.4	123
Water Temperature	Deg C	18	0	0	1.5	2.01	7.05	6.42	11.8	13.1
pH	s.u.	18	0	0	7.8	7.89	8	8.03	8.1	8.1
Specific Conductivity	umhos/cm	18	0	0	188	207	240	240	271	276
pH Measurement Temp	Deg C	10	0	0	12.5	12.7	15.7	15.5	17.9	18.2
Oxidation Reduction Potential	Millivolts	7	0	0	83.4	84.7	88.6	121	219	240
Dissolved Oxygen	mg/L	18	0	0	7.71	8.22	9.52	9.69	11.4	11.6
Total Dissolved Solids	mg/L	18	0	0	114	122	156	156	184	192
Total Suspended Solids	mg/L	18	16	0	18	18.5	22.5	22.5	26.6	27
Anions										
Chloride	mg/L	16	10	0	1	1	1	1.38	2.71	3.28
Fluoride	mg/L	18	4	0	0.1	0.1	0.1	0.103	0.113	0.137
Sulfate	mg/L	18	0	0	9.27	9.89	18	19	30.3	37.8
Hydroxide as OH	mg/L	2	2	0	-	-	-	-	-	-
Carbonates										
Alkalinity as CaCO3	mg/L	18	0	0	80	86.2	100	101	120	120
Bicarbonate as HCO3	mg/L	16	0	0	97	107	125	125	150	150
Carbonate as CO3	mg/L	14	13	0	2	2	2	2	2	2
Bicarbonate as CaCO3	mg/L	2	0	0	87.3	87.8	92.8	92.8	97.7	98.2
Nutrients										
Nitrate + Nitrite as N	mg/L	14	11	0	0.01	0.01	0.01	0.033	0.0721	0.079
Phosphorus	mg/L	14	4	0	0.01	0.01	0.02	0.0333	0.1	0.133
Metals										
Aluminum	mg/L	20	9	0	0.006	0.0065	0.018	0.0285	0.0685	0.079
Antimony	mg/L	18	15	0	0.000356	0.00037	0.0005	0.000585	0.00086	0.0009
Arsenic	mg/L	18	0	0	0.004	0.00471	0.007	0.00745	0.0142	0.015
Boron	mg/L	18	17	0	0.033	0.033	0.033	0.033	0.033	0.033
Cadmium	mg/L	18	16	0	0.00008	0.000082	0.0001	0.0001	0.000118	0.00012
Calcium	mg/L	18	0	0	25	25.9	31.5	31.2	35.2	36
Chromium	mg/L	18	15	0	0.002	0.002	0.00203	0.00284	0.00425	0.0045
Copper	mg/L	18	0	0	0.001	0.001	0.00312	0.00441	0.0142	0.015
Iron	mg/L	18	0	0	0.03	0.0385	0.117	0.262	1.16	1.64
Lead	mg/L	18	12	0	0.000328	0.000346	0.000527	0.000997	0.00225	0.0024
Lithium	mg/L	18	17	0	0.0127	0.0127	0.0127	0.0127	0.0127	0.0127
Magnesium	mg/L	18	0	0	5	5	7	6.53	7	7
Manganese	mg/L	18	1	0	0.01	0.01	0.029	0.07	0.287	0.58
Mercury	mg/L	18	15	0	0.0000061	0.00000611	0.0000062	0.0000184	0.0000393	0.000043
Molybdenum	mg/L	18	0	0	0.0015	0.0015	0.00195	0.00205	0.00283	0.003
Nickel	mg/L	18	18	0	-	-	-	-	-	-
Potassium	mg/L	18	1	0	2	2	2	2.25	3	3
Rubidium	mg/L	18	0	0	0.0005	0.0005	0.000731	0.000797	0.0016	0.0016
Selenium	mg/L	18	18	0	-	-	-	-	-	-
Silicon	mg/L	19	0	0	9.57	9.78	11.2	11.2	12.9	13.5
Silver	ppm	19	18	0	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002
Sodium	mg/L	18	0	0	5	5.85	8	7.49	9	9
Strontium	mg/L	18	0	0	0.14	0.149	0.197	0.196	0.232	0.24
Thallium	mg/L	18	18	0	-	-	-	-	-	-
Tungsten	mg/L	18	15	0	0.0005	0.000539	0.000892	0.000765	0.000901	0.000902
Uranium	mg/L	18	0	0	0.0035	0.00384	0.00723	0.00781	0.0114	0.0116
Vanadium	mg/L	18	18	0	-	-	-	-	-	-
Zinc	mg/L	18	17	0	0.011	0.011	0.011	0.011	0.011	0.011

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NOTES:

1. IF INSUFFICIENT DATA EXIST FOR STATISTICS "-" IS DISPLAYED

REV	DATE	DESCRIPTION	PREP'D	RVW'D
0	12MAR'25	ISSUED WITH REPORT VA101-00126\24-8	EB	DDF

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TABLE A.4

MONTANA RESOURCES, LLC
MONTANA RESOURCES

WQ9A - YANKEE DOODLE TAILINGS POND
WATER CHEMISTRY

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Analyte	Units	Sample Count	Below Detection Limit	NA	Min	5th Percentile	50th Percentile	Mean	95th Percentile	Max
Field and Lab Parameters										
Field pH	s.u.	16	-	0	8.78	9.12	10.1	9.98	11	11.2
Field Specific Conductivity	umhos/cm	16	-	0	2040	2080	2560	2570	3040	3090
Flow	Gallons Per Min	11	-	0	-	-	-	-	-	-
Water Temperature	Deg C	16	-	0	7.4	7.63	11.3	12.1	17	17.9
pH	s.u.	16	-	0	9	9.3	9.85	9.91	10.6	10.7
Specific Conductivity	umhos/cm	16	-	0	2130	2180	2490	2590	3130	3190
pH Measurement Temp	Deg C	10	-	0	12.4	12.6	15.9	15.5	17.2	17.4
Oxidation Reduction Potential	Millivolts	6	-	0	37.8	45.9	103	99.9	145	147
Dissolved Oxygen	mg/L	16	-	0	4.16	4.25	6.6	6.36	7.78	8.14
Total Dissolved Solids	mg/L	16	-	0	1870	1890	2300	2390	3020	3060
Total Suspended Solids	mg/L	16	-	0	15	15	15	15	15	15
Anions										
Chloride	mg/L	16	-	0	8	9.5	13	14.6	21.5	23
Fluoride	mg/L	16	-	0	0.911	1.1	1.95	2	3.05	3.2
Sulfate	mg/L	16	-	0	1070	1150	1540	1520	1950	1980
Hydroxide as OH	mg/L	2	-	0	10.3	10.4	11.3	11.2	12.1	12.2
Carbonates										
Alkalinity as CaCO3	mg/L	16	-	0	21	25.5	32	35.3	58.8	61
Bicarbonate as HCO3	mg/L	12	-	0	2	3.6	16	17.9	37.6	46
Carbonate as CO3	mg/L	14	-	0	5	6.2	15	16.5	33.4	34
Bicarbonate as CaCO3	mg/L	2	-	0	-	-	-	-	-	-
Nutrients										
Nitrate + Nitrite as N	mg/L	14	-	0	0.11	0.162	0.475	0.438	0.658	0.69
Phosphorus	mg/L	14	-	0	0.01	0.01	0.02	0.0322	0.0848	0.103
Metals										
Aluminum	mg/L	17	-	0	0.01	0.0204	0.0585	0.0621	0.105	0.156
Antimony	mg/L	16	-	0	0.0005	0.00051	0.0006	0.000567	0.0006	0.0006
Arsenic	mg/L	16	-	0	0.001	0.00168	0.00316	0.00308	0.00425	0.005
Boron	mg/L	16	-	0	0.0119	0.0119	0.0119	0.0119	0.0119	0.0119
Cadmium	mg/L	16	-	0	0.00009	0.000113	0.000225	0.000372	0.00113	0.00207
Calcium	mg/L	16	-	0	391	428	531	541	678	716
Chromium	mg/L	16	-	0	0.002	0.00205	0.00245	0.00326	0.00503	0.00532
Copper	mg/L	16	-	0	0.002	0.002	0.007	0.00787	0.0195	0.021
Iron	mg/L	17	-	0	0.02	0.0255	0.0542	0.0703	0.158	0.18
Lead	mg/L	16	-	0	0.000375	0.0004	0.0006	0.000555	0.00068	0.0007
Lithium	mg/L	16	-	0	-	-	-	-	-	-
Magnesium	mg/L	16	-	0	1	1	2	4.43	11.2	17
Manganese	mg/L	16	-	0	0.002	0.0026	0.01	0.0211	0.058	0.07
Mercury	mg/L	16	-	0	0.000006	0.0000078	0.000024	0.000024	0.0000402	0.000042
Molybdenum	mg/L	16	-	0	0.81	0.904	1.09	1.08	1.2	1.22
Nickel	mg/L	16	-	0	0.00717	0.00732	0.00864	0.00864	0.00995	0.0101
Potassium	mg/L	16	-	0	32	33.5	37.7	38	42.3	43
Rubidium	mg/L	16	-	0	0.0278	0.0296	0.0352	0.042	0.0627	0.0709
Selenium	mg/L	16	-	0	0.003	0.003	0.004	0.00416	0.00535	0.0064
Silicon	mg/L	16	-	0	2.3	3.65	6.45	6.29	8.9	9.2
Silver	ppm	16	-	0	-	-	-	-	-	-
Sodium	mg/L	16	-	0	79	82	94	96.9	111	116
Strontium	mg/L	16	-	0	1.59	1.65	2.06	2.36	3.5	3.79
Thallium	mg/L	16	-	0	-	-	-	-	-	-
Tungsten	mg/L	16	-	0	0.0099	0.0109	0.026	0.0262	0.0412	0.0436
Uranium	mg/L	16	-	0	0.000157	0.000243	0.0004	0.00111	0.0033	0.0054
Vanadium	mg/L	16	-	0	-	-	-	-	-	-
Zinc	mg/L	16	-	0	0.0128	0.0129	0.0134	0.0134	0.0139	0.014

M:\1\01\00126\24\A\Data\Task 880 - Tailings and Water Management\make tables and figs\[Tables_for_Appendix.xlsx]A.4 - YDTI Pond

NOTES:

1. IF INSUFFICIENT DATA EXIST FOR STATISTICS "-" IS DISPLAYED

REV	DATE	DESCRIPTION	PREP'D	RVW'D
0	12MAR'25	ISSUED WITH REPORT VA101-00126\24-8	EB	DDF

Knight Piésold CONSULTING

TABLE A.5

MONTANA RESOURCES, LLC
MONTANA RESOURCES

YANKEE DOODLE TAILINGS IMPOUNDMENT
TAILINGS CHEMISTRY

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Element	Units	Average	Std. Dev.	Percentile		
				5th	50th	95th
Major Elements						
Fe	wt. %	2.1	0.3	1.6	2.0	2.7
Al	wt. %	1.2	0.2	1.0	1.2	1.5
Ca	wt. %	0.8	0.1	0.6	0.8	1.0
Mg	wt. %	0.7	0.1	0.5	0.7	0.9
K	wt. %	0.7	0.1	0.5	0.7	0.9
Si	wt. %	0.1	0.1	0.0	0.1	0.5
Na	wt. %	0.0	0.1	0.0	0.0	0.2
Minor Elements						
Pb	ppm	31.8	17.2	16.1	25.5	84.5
Cu	ppm	462.0	97.7	333.0	440.0	718.0
Mo	ppm	69.6	13.0	44.7	71.0	95.4
Sb	ppm	24.5	0.5	-	24.5	-
As	ppm	4.9	2.0	2.1	5.0	10.7
Ba	ppm	74.2	7.2	61.0	74.5	86.7
Bi	ppm	22.3	35.3	1.0	2.0	107.0
Cd	ppm	0.6	0.2	-	0.6	-
Cr	ppm	12.3	1.9	10.0	12.0	18.0
Co	ppm	10.9	1.4	8.5	10.9	13.0
Mn	ppm	372.0	75.3	243.0	389.0	488.0
Ni	ppm	7.5	1.2	6.0	7.1	10.4
P	ppm	474.0	70.8	377.0	469.0	665.0
Sr	ppm	29.1	8.2	17.5	27.7	41.6
Sn	ppm	9.6	13.0	-	2.5	-
Ti	ppm	791.0	99.8	593.0	803.0	979.0
V	ppm	49.4	6.0	37.2	49.5	59.1
Zn	ppm	167.0	53.6	74.1	177.0	267.0
Se	ppm	1.0	0.0	-	1.0	-

M:\1\01\00126\24\A\Data\Task 880 - Tailings and Water Management\make tables and figs\[Tables_for_Appendix.xlsx]A.5 - YDTI Tails

NOTES:

1. ANALYTES DO NOT SUM TO 100 %.
2. VALUES REPORTED AS "-" DO NOT HAVE ENOUGH ABOVE DETECTION LIMIT DATA FOR FULL STATISTICS TO BE CALCULATED.
3. ppm IS BY WEIGHT, EQUIVALENT TO $\mu g \cdot g^{-1}$.

0	12MAR'25	ISSUED WITH REPORT VA101-00126\24-8	EB	DDF
REV	DATE	DESCRIPTION	PREP'D	RVW'D

APPENDIX B

Closure Configurations for Select Water Management Systems

Appendix B1
Closure Spillway – Design Criteria and Configuration

Appendix B2
West Embankment Drain (WED) Gravity Discharge Corridor: Preliminary Configuration

APPENDIX B1

Closure Spillway – Design Criteria and Configuration

(Pages B1-1 to B1-9)

MEMORANDUM

`Date:	September 18, 2024	**File No.:**	VA101-00126/24-A.01
		Cont. No.:	VA24-01275
To:	Mr. Daniel Fontaine		
From:	André Van den Berg, Roanna Dalton		
Re:	**6,560 Amendment Design Document: Closure Spillway – Design Criteria and Configuration**		

1.0 INTRODUCTION

Montana Resources, LLC (MR) is preparing a permit amendment application (6,560 Amendment Application) for continued used of the Yankee Doodle Tailings Impoundment (YDTI). The proposed amendment considers raising the crest elevation (EL.) of the YDTI embankments to a maximum of EL. 6,560 ft in two or more lifts to facilitate continued mining until the mid-2050s. The permit amendment application process requires the permit applicant (MR) to submit a design document related to the proposed facility expansion. The laws governing tailing storage facility design, operation and reclamation are contained within sections of Montana Code Annotated (MCA) Title 82 Chapter 4 Part 3. The design document requirements are described in MCA 82-4-376 (MCA, 2023), which is the governing regulation for preparation of the 6,560 Amendment Design Document (the Design Document).

This memorandum presents the design criteria and preliminary configuration for a closure spillway that considers the YDTI with a crest of EL. 6,560 ft. The detailed design of the closure spillway will be completed as part of the closure activities once the final YDTI configuration is known. It is not practical to develop the final design of the closure spillway until the final configuration of the YDTI embankments and tailings beach at the end of operations is known.

The existing Continental Mine Reclamation Plan (CMRP) (MR, 2023) includes a closure spillway to enhance the long-term safety of the YDTI following closure. The spillway presented in this memorandum adopts the same general configuration and similar functionality to the CMRP spillway; however, it considers an updated intake elevation and alignment to accommodate the YDTI embankment crest raised to EL. 6,560 ft.

The design of the YDTI and spillway references the site coordinate system known as the ‘Anaconda Mine Grid’ established by The Anaconda Company in 1957. The Anaconda Mine Grid is based on the Anaconda Copper Company (ACC) Datum established in 1915. All elevations are stated in Anaconda Mine Grid coordinates with respect to the ACC Vertical Datum unless specifically indicated otherwise.

2.0 SPILLWAY DESIGN OBJECTIVES AND REQUIREMENTS

The principal design objectives for the closure spillway are to prevent overtopping of the embankment crest and to limit the potential for water to pool directly adjacent to the embankment in the event of severe natural flooding (KP, 2024a). The closure spillway is a contingency emergency water management measure.

The primary dam safety and flood management feature of the YDTI during operations is its ability to store the runoff volume from severe flooding, up to and including the Probable Maximum Flood (PMF) event, within the facility. A spillway will be constructed for YDTI closure to manage potential for severe flooding through a combination of storage and controlled release of flow above a specified maximum pond volume. The spillway will not be operated as a routine water discharge system and likely will never convey flow.

The design of the closure spillway takes into consideration the following requirements:

- To contain a passive closure steady-state pond volume (design starting condition) of up to 5,000 acre-ft (ac-ft)
- To contain runoff from severe flooding up to a maximum pond volume of 18,000 ac-ft within the YDTI without discharge through the spillway
- To manage the PMF volume exceeding the above allowances through temporary storage in the YDTI and controlled release of the temporarily stored water through the closure spillway, and
- To maintain a 'dry zone' with a minimum horizontal length of 800 ft between the upstream embankment crest and the maximum ponded water surface.

3.0 SPILLWAY DESIGN INPUTS AND DESIGN CRITERIA

3.1 PASSIVE CLOSURE STEADY-STATE POND

The design criteria for the spillway considers the storage of water in the remnant closure pond during passive closure combined with a sequence of severe natural flooding. A pond volume of 5,000 ac-ft was selected to be a reasonable and conservative starting condition for the closure spillway design. This starting condition is consistent with the preliminary Quantitative Performance Parameters (QPPs) for passive closure (KP, 2024a).

3.2 DESIGN STORM EVENTS

An evaluation of design storm events for the YDTI and associated contributing catchment areas was prepared for the Design Document (KP, 2024b). Climate change effects were considered in the design storm event evaluations.

The following storm events were considered for the closure spillway design:

- The PMF volume to be managed was estimated to be approximately 20,000 ac-ft. The PMF volume was defined as the 24-hour Probable Maximum Precipitation (PMP) combined with complete melt of the 1 in 100-year snowpack and the volume from Moulton Reservoirs located upstream, assuming it fails during the PMF.
- The runoff volume from the 1 in 1,000-year 24-hour storm was estimated to be approximately 2,800 acre-ft.
- The runoff volume from the 1 in 1,000-year 30-day rainfall was estimated to be approximately 7,200 acre-ft.

3.3 POST-CLOSURE CONFIGURATION

The post-closure YDTI configuration consists of the embankment crest raised to EL. 6,560 ft and the facility filled with tailings up to a maximum tailings discharge elevation adjacent to the embankments of 6,555 ft. The tailings beach surface has a gradually sloping beach, which provides on-beach water storage. The tailings beach surface was modelled as part of the tailings deposition and storage capacity evaluation supporting the proposed life of mine development plan for the YDTI (KP, 2024a).

3.4 SPILLWAY DESIGN CRITERIA

The spillway design was developed with the following design criteria:

- YDTI water storage capacity before spillway discharge commences = 18,000 ac-ft
- Temporary water storage during spillway operation = 7,000 ac-ft
- Minimum channel grade = -0.5%
- Minimum freeboard = 0.5 ft
- Assumed base width = 10 ft
- Side slopes (Rampart Mountain) = 1V:0.58H
- Side slopes (embankment fill) = 1V:1.35H
- Discharge into the Continental Pit

The side slopes of 1V:0.58V (Rampart Mountain) and 1V:1.35H (rockfill) used for the conceptual spillway plan were provided by MR and are based on their site experience when constructing the 6,500 Return Water Line Access Road.

4.0 SPILLWAY CONFIGURATION

4.1 SPILLWAY LOCATION

Key considerations for the spillway design included the inlet elevation, the spillway alignment and the dimensions of the spillway discharge channel. The northern end of the North-South Embankment was determined to be the most favourable location for the closure spillway inlet as it provides the shortest, direct alignment to the Continental Pit. The spillway route was selected to safely direct flows around the embankment towards the Continental Pit, which is the intended final containment location for the hypothetical spillway discharge. The positioning of the spillway at this location is consistent with the existing CMRP (MR, 2023).

The spillway will be excavated into bedrock along Rampart Mountain. The intake location and channel alignment are presented on attached Figure A.1.

4.2 INLET DETAILS

The spillway will incorporate a trapezoidal weir inlet with bottom width and side slopes identical to those of the spillway channel itself. The spillway inlet design parameters include:

- Inlet base length of 10 ft
- Notch angle of 60 degrees
- Inlet invert elevation of 6,540 ft

The inlet invert elevation was selected based on the estimated water surface elevation resulting from the storage of 18,000 ac-ft of water above the modelled tailings beach at the end of operations.

4.3 CHANNEL DETAILS

The spillway was modelled as a trapezoidal channel cut into bedrock along the western slope of Rampart Mountain around the abutment of the North-South Embankment. The channel design parameters include:

- Minimum channel base width of 10 ft
- Minimum freeboard of 0.5 ft
- Manning's roughness coefficient of 0.04 (rock-lined channel)

The channel was modelled with a minimum grade of -0.5% to facilitate flow while minimizing the depth of rock cut required to maintain the grade. This grade was maintained until the spillway channel was safely beyond the embankment alignment.

The spillway will transition into an armored channel routed along the east toe of the YDTI Reclaim Access Ramp, across the Great Northern rock disposal site (RDS) and discharges into the Continental Pit. The armoring will protect the downstream toe of the reclaim access ramp from erosion should the spillway convey flow. The alignment of the overland channel may require minor regrading in some sections to provide the minimum spillway grade of -0.5%. The preliminary spillway alignment and typical sections are presented on Figures A.1 and A.2, respectively.

4.4 MAXIMUM TEMPORARY POND WATER ELEVATION AND ESTIMATED SPILLWAY FLOW

In the extremely unlikely event that the PMF occurs, the runoff volume from the storm event will be managed by a combination of temporary retention in the YDTI and gradual discharge through the spillway. The volume temporarily retained in the facility would be progressively discharged through the spillway following the storm event.

The retention in the facility would result in the water level temporarily rising in the YDTI. The level of rise in the facility would depend on the event inflow hydrograph of the storm event, the YDTI attenuation, and the discharge rate of the spillway channel.

A hydraulic model was created to model the temporary pond surface elevations that would occur during the PMF event with the spillway operating. The YDTI spillway was modelled assuming the maximum temporary water elevation of 6,547 ft to estimate the maximum flow rate and flow depth in the spillway channel. The model accounted for tailwater effects and resulted in the following estimates:

- Maximum depth of water above spillway intake crest = 7 ft
- Tailwater depth (spillway channel flow depth) = 6 ft
- Maximum flow rate = 490 cfs
- Maximum velocity = 6 fps

The spillway was conservatively designed for the flow rate and flow depth resulting from the maximum temporary water elevation. Design optimization opportunities for the closure spillway may be considered once the facility closure is scheduled and the YDTI closure configuration is known.

An elevation-area-capacity curve of the water storage capacity in the YDTI was developed to estimate maximum water levels for the design pond and storm volumes. This relationship is presented on Figure 4.1.

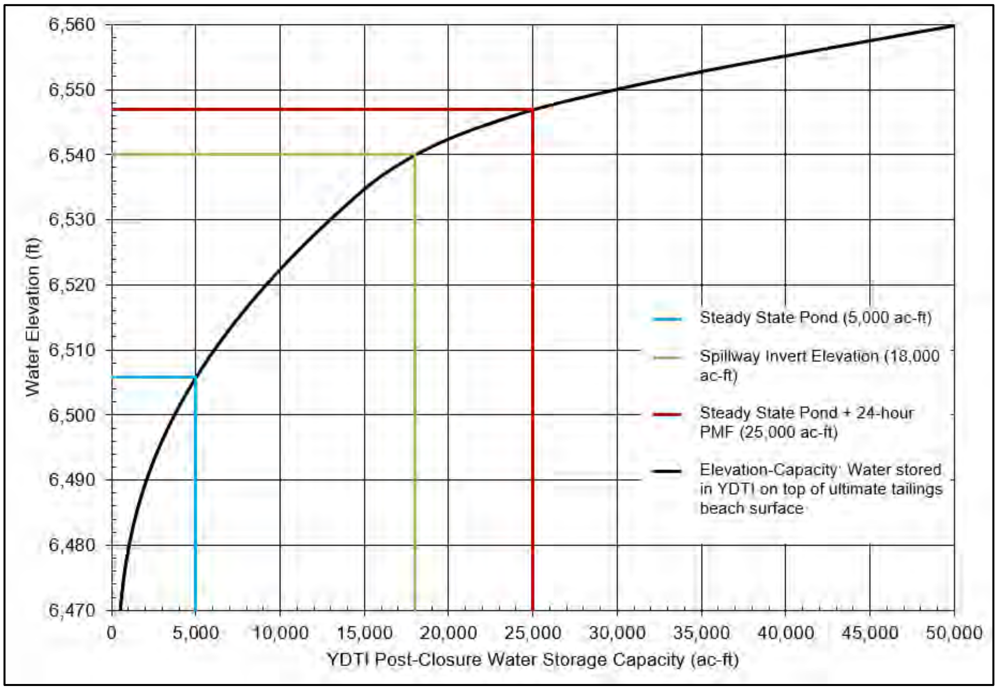


Figure 4.1 YDTI Elevation-Area-Capacity Post-Closure

4.5 WEST EMBANKMENT CLOSURE PUSH-OUT

The flood inundation model of the post-closure beach surface identified a 600 ft section along the northern end of the West Embankment with a dry beach length of less than 800 ft when the pond was at the maximum temporary water elevation of 6,547 ft. This condition resulted from tailings deposition modelling that was adjusted to develop a final beach configuration that created hydraulic connectivity between the pond and the freshwater inflows from the northern upstream watersheds.

A West Embankment rockfill ‘push-out’ will be incorporated into the closure plan prior to surface reclamation to locally infill this area above the tailings beach at closure. This would result in a closure configuration with the required ‘dry zone’ of a minimum horizontal length of 800 ft between the upstream embankment crest and the maximum ponded water surface. The closure push-out would tie into the upstream West Embankment crest at approximately EL. 6,555 ft and would be graded at a slope of approximately 1% in a fan-shape towards the northeast to an elevation of approximately 6,547 ft (or lower) before transitioning to a 2H:1V slope. Surface water drainage from the closure push-out would remain in the YDTI.

The conceptual layout of the rockfill push-out is presented on Figure A.1. The total volume of rockfill to construct the push-out was estimated to be approximately 180,000 cubic yards.

5.0 CONCLUSIONS

The post-closure spillway in the YDTI serves as a contingency system preventing overtopping and limiting water pooling during severe and subsequent storm events. The spillway is not intended for routine water discharge and likely will never convey flow.

The trapezoidal spillway channel was designed to intake water from the YDTI, north of the North-South Embankment, and discharge to the Continental Pit. The spillway will be cut into Rampart Mountain for a length of approximately 3,800 ft and utilize an armored channel and overland flow path once the spillway is downstream of the embankment toe.

The closure spillway was designed to manage the PMF event in addition to the assumed maximum passive closure steady-state pond volume within the YDTI while maintaining a minimum 'dry zone' horizontal length from the embankments of 800 ft at all times. The spillway inlet invert elevation is 6,540 ft and the maximum spillway channel flow depth is 6 ft. The design maximum YDTI water elevation is 6,547 ft and the maximum resultant spillway flow rate is approximately 490 cfs.

We trust that the information provided in this memorandum meets your present needs. If you have questions or concerns, please contact the undersigned.

Yours truly,
Knight Piésold Ltd.

REGISTERED PROFESSIONAL ENGINEER
105369PE
2024-09-24
OREGON
JULY 09, 2024
ROANNA SOPHIE DALTON
EXPIRES: 12/31/2025

Prepared:		Reviewed:	
	André Van den Berg, P.Eng. Project Engineer		Roanna Dalton, P.E. Specialist Engineer | Associate

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

Attachments:

Figure A.1 Rev 0 — 6,560 Amendment Closure Spillway – General Arrangement
Figure A.2 Rev 0 — 6,560 Amendment Conceptual Closure Spillway – Typical Sections

References

Knight Piésold Ltd. (KP, 2018). Closure Spillway: Design Criteria and Conceptual Configuration (File No. VA101-00126/12-A.01, KP Cont. No. VA18-00426), dated March 12, 2018.

Knight Piésold Ltd. (KP, 2020). 5-Year Bond Review: Updated Closure Spillway Conceptual Configuration (File No. VA101-00126/23-A.01, KP Cont. No. VA20-01723), DRAFT dated September 22, 2020.

Knight Piésold Ltd. (KP, 2024a). Yankee Doodle Tailings Impoundment – Life of Mine Design Report for 6,560 Amendment Design Document (KP Reference VA101-126/24-4, Rev A), dated June 27, 2024.

Knight Piésold Ltd. (KP, 2024b). 6,560 Amendment Design Document: Yankee Doodle Tailings Impoundment – Updated Inflow Design Flood Volumes (File No. VA101-00126/24-A.01, KP Cont. No. VA24-01321), dated July 10, 2024.

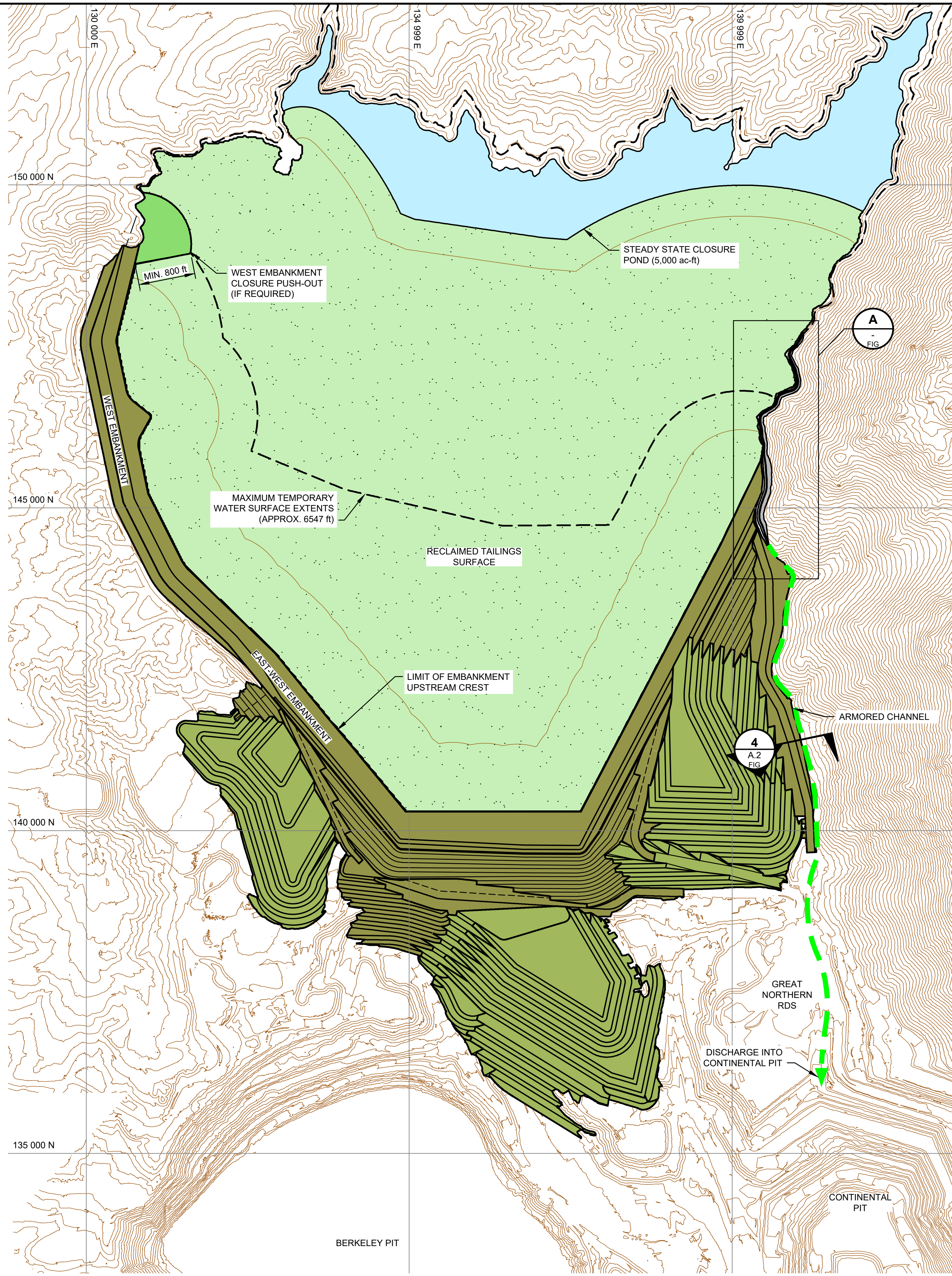
Montana Code Annotated (MCA), 2023. *Title 82: Minerals, Oil, and Gas, Chapter 4: Reclamation, Part 3: Metal Mine Reclamation*. Available at: https://leg.mt.gov/bills/mca/title_0820/chapter_0040/part_0030/sections_index.html

Montana Resources (MR, 2023). Continental Mine Reclamation Plan, dated January 2023.

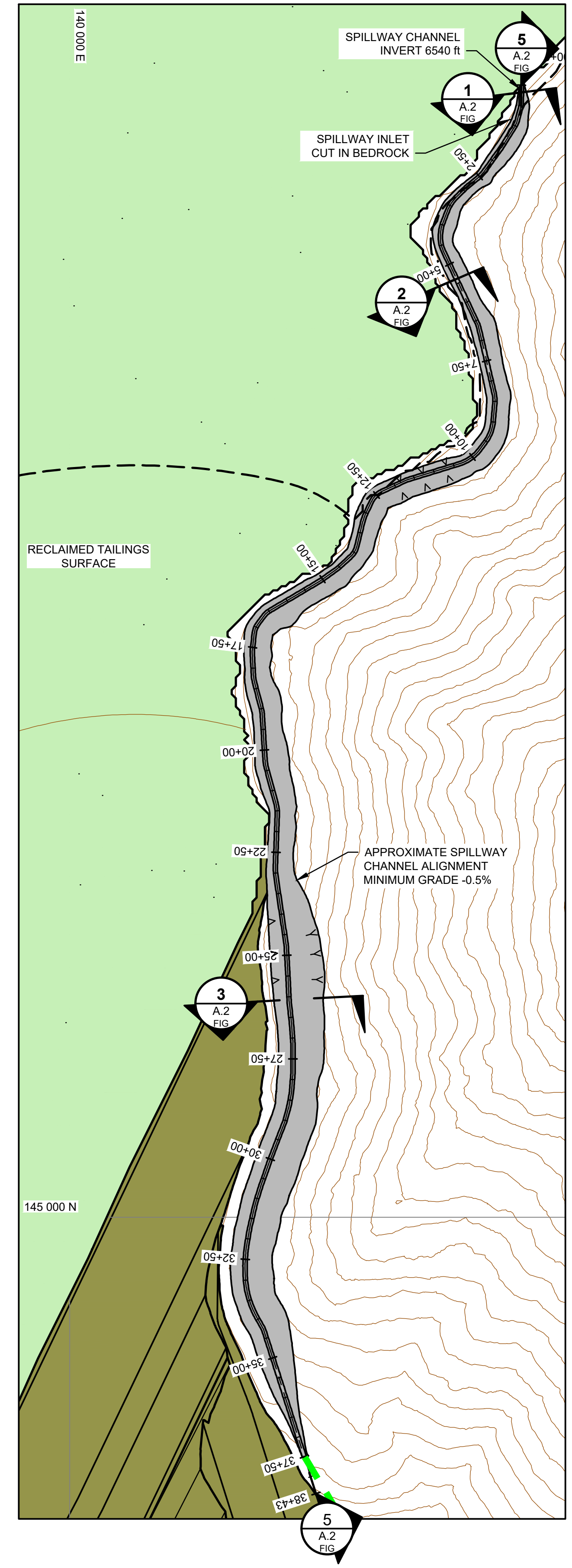
Westech Environmental Services, Inc. (Westech), 2024. Preliminary Closure Plan Yankee Doodle Tailings Impoundment 6,560 ft Embankment Elevation. Draft. January 17, 2024. Helena, MT.

/av

SAVED: M:\1\01\00126\24\A\Acad\FIGS\B14, 9/17/2024 4:13:48 PM , RMCCLELLAN PRINTED: 9/19/2024 8:30:43 AM, FIG A.1, RMCCLELLAN ACAD VERSION: 25.0S (LMS TECH)



PLAN
SCALE A



A
FIG
DETAIL
SPILLWAY
SCALE B

LEGEND:

- WATER
- RECLAIMED YDTI EMBANKMENT
- RECLAIMED ROCK DISPOSAL SITE (RDS)
- RECLAIMED TAILINGS SURFACE
- RECLAIMED ROCKFILL PUSHOUT
- SPILLWAY CONSTRUCTED IN BEDROCK
- ARMORED CHANNEL

NOTES:

1. COORDINATE SYSTEM AND ELEVATIONS BASED ANACONDA MINE GRID.
2. TOPOGRAPHY PROVIDED BY MONTANA RESOURCES, LLC IN SEPTEMBER 2023.
3. FUTURE EMBANKMENT AND ROCK DISPOSAL SITE LAYOUT BASED ON DRAWINGS AND INFORMATION PRESENTED IN THE DESIGN REPORT (KP REF VA101-126/24-4).
4. CONTOUR INTERVAL IS 25 ft.
5. DIMENSIONS AND ELEVATIONS ARE IN FEET, UNLESS NOTED OTHERWISE.
6. TAILINGS SURFACE SHOWN IS ESTIMATED USING TAILINGS DEPOSITION SOFTWARE.
7. RESLOPING OF THE YDTI EMBANKMENTS AND RDS DURING RECLAMATION ARE NOT SHOWN. SURFACES ARE TO BE RESLOPED AS DETAILED IN THE RECLAMATION PLAN.
8. THE ARMORED OVERLAND CHANNEL ALIGNMENT MAY REQUIRE MINOR REGRADING IN SOME SECTIONS TO PROVIDE THE MINIMUM SPILLWAY GRADE OF -0.5%.

SCALE B: 200 0 200 400 600 800 1000 ft
SCALE A: 1000 0 1000 2000 3000 4000 5000 ft

MONTANA RESOURCES, LLC

MONTANA RESOURCES

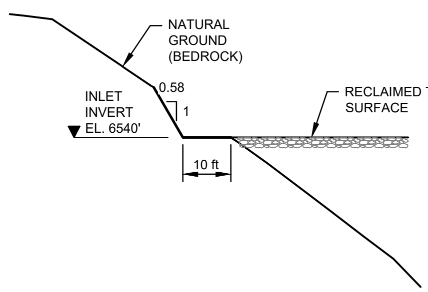
YANKEE DOODLE TAILINGS IMPOUNDMENT
6,560 AMENDMENT CLOSURE SPILLWAY
GENERAL ARRANGEMENT

Knight Piésold CONSULTING

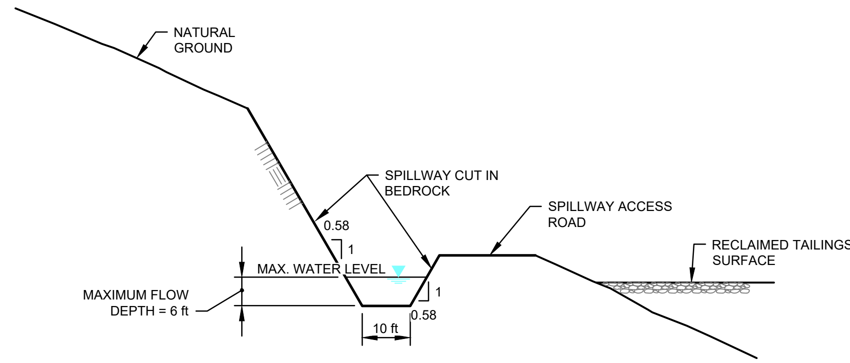
P/A NO.	REF NO.
VA101-126/24	VA24-01275

FIGURE A.1 REV 0

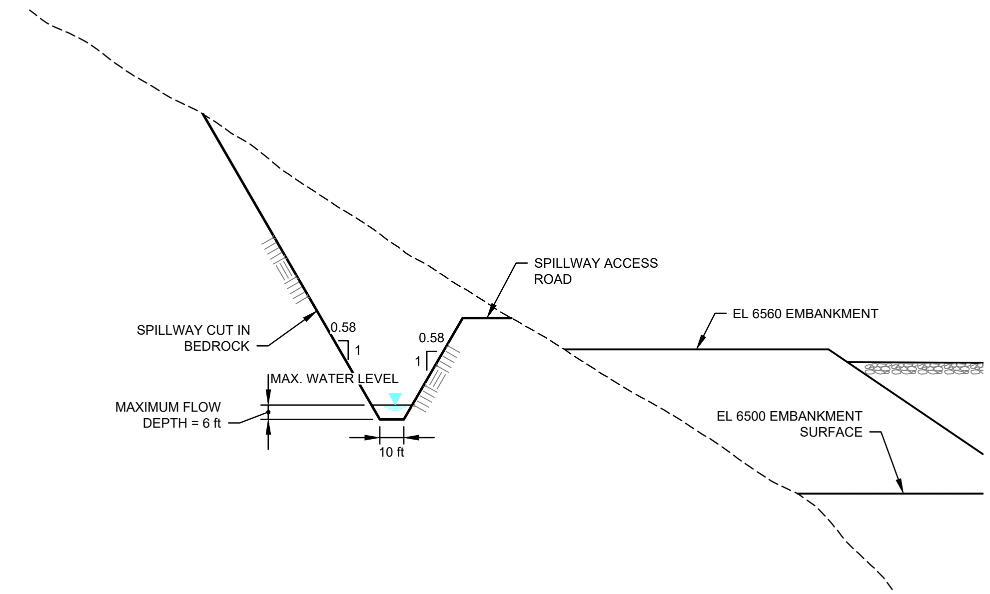
REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED
0	18SEP'24	ISSUED WITH MEMO	AV	RMM	RSD



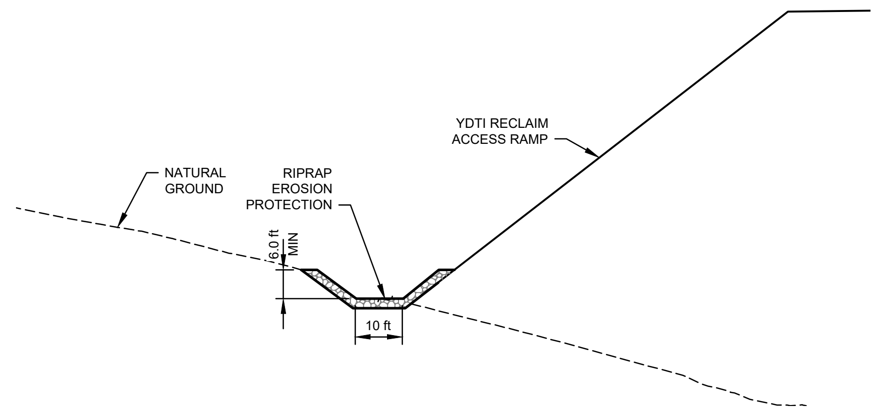
1 A.1 FIG SECTION
TYPICAL SECTION (SPILLWAY INLET)
SCALE C



2 A.1 FIG SECTION
TYPICAL SECTION (CUT INTO BEDROCK)
SCALE C



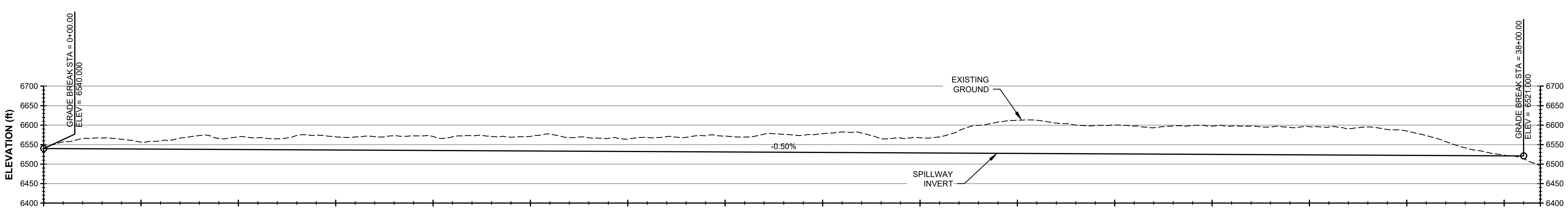
3 A.1 FIG SECTION
TYPICAL SECTION (THROUGH EMBANKMENT)
SCALE B



4 A.1 FIG SECTION
TYPICAL ARMORED CHANNEL
SCALE C

NOTES:

1. COORDINATE SYSTEM AND ELEVATIONS BASED ON ANACONDA MINE GRID.
2. DIMENSIONS AND ELEVATIONS ARE IN FEET, UNLESS NOTED OTHERWISE.
3. CUT/FILL SLOPES BASED OFF MR RETURN LINE CONSTRUCTION EXPERIENCE.
4. MINIMUM SPILLWAY CHANNEL DEPTH OF 6 ft TO BE MAINTAINED ALONG CHANNEL ALIGNMENT.



5 A.1 FIG SECTION
PROFILE OF SPILLWAY SEGMENT CUT INTO BEDROCK
SCALE A

SCALE B 20 0 20 40 60 80 100 ft
SCALE B 40 0 40 80 120 160 200 ft
SCALE A 150 0 150 300 450 600 750 ft

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REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED

MONTANA RESOURCES, LLC

MONTANA RESOURCES

YANKEE DOODLE TAILINGS IMPOUNDMENT
6,560 AMENDMENT CONCEPTUAL CLOSURE SPILLWAY
TYPICAL SECTIONS

Knight Piésold CONSULTING

P/A NO. VA101-126/24 | REF NO. VA24-01275

FIGURE A.2 | REV 0

SAVED: M:\1\01\00126\24\A\Acad\FIGS\B15, 7/30/2024 6:45:00 AM , RMCLELLAN PRINTED: 9/18/2024 8:31:33 AM, FIG A.2, RMCLELLAN ACAD VERSION: 25.0S (LMS TECH)
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APPENDIX B2

West Embankment Drain (WED) Gravity Discharge Corridor: Preliminary Configuration

(Pages B2-1 to B2-5)

Knight Piésold CONSULTING

Management System Certified By: bsi ISO 9001 Quality Management Systems CERTIFIED | ISO 14001 Environmental Management CERTIFIED | ISO 45001 Occupational Health and Safety Management CERTIFIED

FS 64925 EMS 550121 OHS 550122

MEMORANDUM

Date:	September 18, 2024	**File No.:**	VA101-00126/24-A.01
		Cont. No.:	VA24-01507
To:	Mr. Daniel Fontaine		
From:	Connor Tetzlaff, Roanna Dalton		
Re:	**6,560 Amendment Design Document: West Embankment Drain (WED) Gravity Discharge Corridor: Preliminary Configuration**		

1.0 INTRODUCTION

Montana Resources, LLC (MR) is preparing a permit amendment application (6,560 Amendment Application) for continued used of the Yankee Doodle Tailings Impoundment (YDTI). The proposed amendment considers raising the crest elevation (EL.) of the YDTI embankments to a maximum of EL. 6,560 ft in two or more lifts to facilitate continued mining until the mid-2050s. The permit amendment application process requires the permit applicant (MR) to submit a design document related to the proposed facility expansion. The laws governing tailing storage facility design, operation and reclamation are contained within sections of Montana Code Annotated (MCA) Title 82 Chapter 4 Part 3. The design document requirements are described in MCA 82-4-376 (MCA, 2023), which is the governing regulation for preparation of the 6,560 Amendment Design Document (the Design Document).

This memorandum presents the preliminary configuration for the West Embankment Drain (WED) gravity discharge corridor. A discharge corridor is planned during passive closure to enable gravity conveyance of the water collected in the WED to the Horseshoe Bend (HsB) area.

The WED is a subsurface aggregate drain constructed along the upstream toe of the West Embankment of the YDTI. The WED was constructed to maintain hydrodynamic containment of YDTI seepage as the supernatant pond elevation rises above the minimum groundwater elevation along the West Ridge. The drain, which was commissioned in November 2019, is approximately 7,000 ft long and graded at a decline from north to south. The Extraction Pond forms the gravity outlet of the WED, and the collected water is pumped back into the YDTI during operations.

The discharge from the WED in perpetuity post-closure of the YDTI will be managed as part of the Butte Mine Flooding Operable Unit (BMFOU) remedy that was established under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). The WED flows will be gravity conveyed to the HsB area and will be treated with other HsB Area flows as part of the remedy. This memorandum does not identify the method of gravity flow conveyance, but achievable options include an open channel or pipeline. The final determination and detailed design of the conveyance method will be incorporated in the BMFOU remedy process.

The preliminary alignment of the WED gravity discharge corridor presented in this memorandum references the site coordinate system known as the ‘Anaconda Mine Grid’ established by The Anaconda Company in 1957. The Anaconda Mine Grid is based on the Anaconda Copper Company (ACC) Datum established in 1915. All elevations are stated in Anaconda Mine Grid coordinates with respect to the ACC Vertical Datum unless specifically indicated otherwise.

2.0 GRAVITY CONVEYANCE CORRIDOR

2.1 DESIGN BASIS

The requirement for a gravity discharge corridor from the Extraction Pond or WED to the HsB area in perpetuity was considered when developing the life of mine design footprint for the West RDS. The West RDS is located on the west side of the YDTI adjacent to the East-West Embankment. The West RDS footprint design allows for development of a discharge corridor to facilitate drainage from the Extraction Pond to the 7% ramp, and ultimately discharging into the HsB Pond.

The following design criteria and objectives were considered for developing the gravity discharge corridor design:

- Design flowrate of 5,300 gpm
- Inlet: Extraction Pond via the outlet pipes or future modification of the pond
- Outlet: Discharge to HsB Pond
- Minimization of earthworks to the extent reasonably practicable
- A corridor alignment located within the MR property

The design flowrate was selected to be consistent with the design flow capacity of the existing Extraction Pond overflow pipes, which are sized to pass a peak flow consisting of the WED design flowrate (4,500 gpm (KP, 2017)), direct precipitation into the pond catchment from a 1 in 200 year 24-hour storm event and annual snowmelt. The ultimate design flowrate selected for the BMFOU remedy design may be adjusted based on observed flows over time.

2.2 ALIGNMENT

The proposed gravity discharge corridor starts at the Extraction Pond. The WED currently daylights on the north side slope of the Extraction Pond and two overflow pipes are positioned in the east berm of the pond. The overflow pipes were constructed to facilitate emergency discharge from the pond to prevent overtopping of the pond embankment. The closure gravity discharge system may be connected to the terminus of the WED on the north side slope of the pond or to the downstream end of the Extraction Pond overflow pipes. Direct discharge from the WED terminus into the closure gravity discharge system would likely require pond decommissioning and minor WED modification to enable connection.

The alignment of the gravity discharge corridor traverses around the west side of the West RDS. The alignment may pass over the lower lifts or along the toe of the RDS to the 7% ramp. The gravity discharge corridor will descend down the 7% ramp alignment until it diverts from the road alignment and descends down the east slope of the ramp and discharges into the HsB Pond. The conceptual alignment for the gravity discharge corridor is shown in Figure A.1.

The conceptual gravity discharge corridor alignment selected maintains a constant negative grade towards the HsB Area to provide gravity conveyance of the water. Minor civil regrading of the existing ground at the terminus of the WED and transitional area to direct flows into the gravity conveyance system will be required to maintain the minimum design grade.

2.3 CONCEPTUAL CONFIGURATION

A hydraulic analysis of the conceptual configuration of the gravity discharge corridor was undertaken to evaluate the ability of the alignment to achieve the required design and performance criteria. A conceptual width of 50 ft was estimated for the gravity drainage corridor. This includes 20 ft road width for light vehicle access and 30 ft width for the gravity conveyance system.

The preliminary design flow capacity of 5,300 gallons per minute (gpm) was evaluated for the hydraulic analysis as per the gravity corridor design criteria outlined in Section 2.1. The hydraulic analysis identified the following corridor design details:

Table 2.1 WED Gravity Discharge Corridor Details

Description	Details
Total corridor length	12,200 ft
Minimum corridor grade[1]	0.5%

Note(s):

1. A steeper corridor grade may be required in the first section (approximately 1,000 ft) of the corridor to minimize impact on the discharge flow characteristics of the WED at the terminus. Further hydraulic modelling evaluation is required during detailed design.

2.4 DISCHARGE INTO HSB AREA

The gravity discharge corridor will terminate at the HsB Pond. Energy dissipation systems may be required at the discharge end at the HsB Pond to dissipate energy and reduce mobilization of sediments as the grade of the discharge end of the corridor is steep.

3.0 CLOSING

The proposed WED gravity discharge corridor presented in this memorandum meets the design and performance criteria for design of a gravity conveyance system from the WED in perpetuity. The gravity discharge corridor configuration presented in this memorandum is conceptual. The detailed design of the gravity discharge system for the WED will be developed as part of the BMFOU remedy.

We trust that the information provided in this letter meets your present needs. If you have questions or concerns, please contact the undersigned.

Yours truly,
Knight Piésold Ltd.

REGISTERED PROFESSIONAL ENGINEER
105369PE
OREGON
JULY 09, 2024
ROANNA SOPHIE DALTON
2024-09-24
EXPIRES: 12/31/2025

Prepared:	Connor Tetzlaff, EIT Junior Engineer	Reviewed:	Roanna Dalton, P.E. Specialist Engineer | Associate

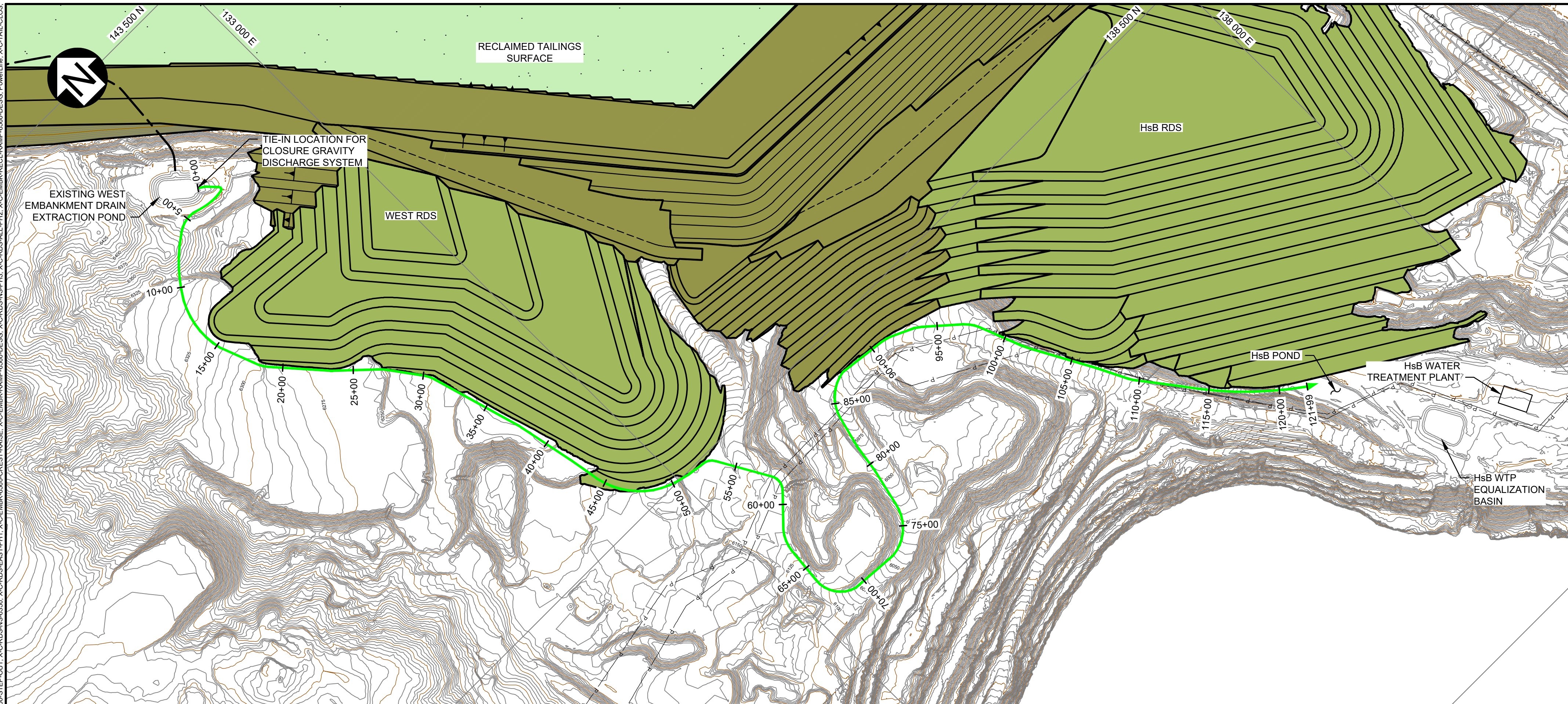
Approval that this document adheres to the Knight Piésold Quality System: RSD

Attachments:

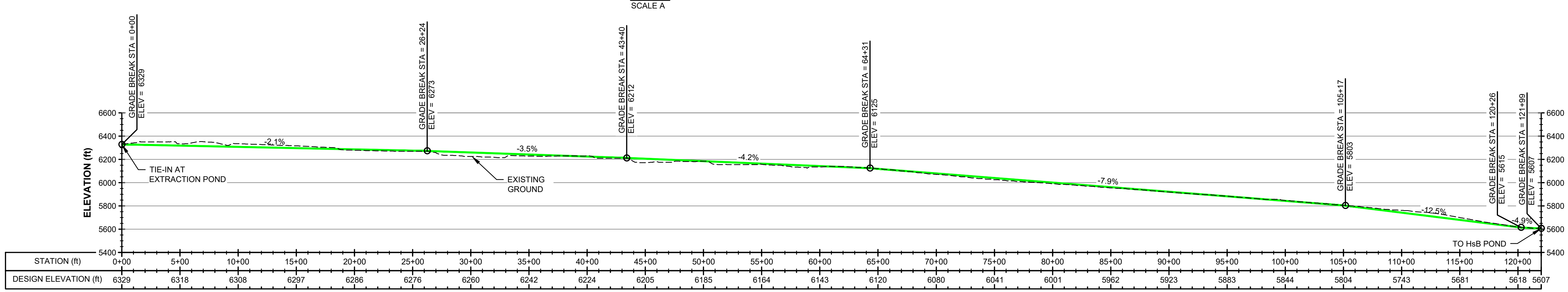
Figure A.1 Rev 0 West Embankment Drain Gravity Discharge Corridor – Plan and Profile

References:

Knight Piésold Ltd. (KP, 2017). West Embankment Drain Design Report (KP Reference VA101-126/13-3, Rev 2), dated September 6, 2017.



PLAN
SCALE A



PROFILE
SCALE A

LEGEND:

- EMBANKMENT FILL
- LIFE OF MINE PLACED ROCKFILL
- RECLAIMED TAILINGS SURFACE
- WED GRAVITY DISCHARGE CORRIDOR
- WEST EMBANKMENT DRAIN (CENTERLINE)

NOTES:

1. COORDINATE SYSTEM AND ELEVATIONS BASED ON ANACONDA MINE GRID.
2. TOPOGRAPHY PROVIDED BY MONTANA RESOURCES, LLC IN SEPTEMBER 2023.
3. FUTURE EMBANKMENT AND ROCK DISPOSAL SITE LAYOUT BASED ON DRAWINGS AND INFORMATION PRESENTED IN THE DESIGN REPORT (KP REF VA101-126/24-4).

SCALE A: 500 0 500 1000 1500 2000 2500 ft

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED
0	18SEP'24	ISSUED WITH MEMO VA24-01507	CAT	RMM	RSD

MONTANA RESOURCES, LLC

MONTANA RESOURCES

PASSIVE CLOSURE
WEST EMBANKMENT DRAIN GRAVITY DISCHARGE CORRIDOR - PLAN AND PROFILE

Knight Piésold CONSULTING

P/A NO. VA101-126/24 | REF NO. VA24-01507

FIGURE A.1 REV 0

SAVED: M:\1\01\00126\24\A\Acad\FIGS\B09, 9/17/2024 4:13:40 PM , RMCLELLAN PRINTED: 9/18/2024 8:29:32 AM, FIG A.1, RMCLELLAN ACAD VERSION: 25.0S (LMS TECH)

APPENDIX C

Yankee Doodle Tailings Pool Water Quality Prediction

(Pages C-1 to C-68)

Technical Memorandum

3 February 2025

To: Mark Thompson, MR

From: Bill Schafer, Schafer Limited LLC

Re: Yankee Doodle Tailings Pool Water Quality Prediction

Purpose and Scope

The purpose of this memorandum is to simulate the pool of water impounded behind the Montana Resources LLP (MR) Yankee Doodle Tailings impoundment (YDTI). The simulation focuses on predicting water quality in the pool during the post-closure period starting after the currently forecast end of operations in 2056 and extending a further 67 years until 2123.

Two closure options are considered in this analysis:

- An active water management closure option (Scenario 1) where water from a variety of sources around the mine area will be pumped to the YDTI for 20 years following the end of MR mine operations and water will be withdrawn from the pool and directed through the Polishing Plant prior to discharge in Silver Bow Creek.
- A passive water management option (Scenario 2) where all mine influenced water inputs to the YDTI pool will terminate after the end of MR mine operations.

Yankee Doodle Tailings Water Quality Model Formulation

Model Formulation

The model developed for this simulation consists of three components: a water balance, calculated mass loading, and an equilibrium geochemical model.

Water Balance

The water balance was developed by Knight Piesold Vancouver for the time period from 1986 through 2123, encompassing the entire 38-year historical operating period and nearly 100 years of future conditions. Individual flows are shown for the active and passive closure options in Figure 1. The water balance is described in more detail in Knight Piesold (2024). Some of the inflows shown for YDTI are combined with the tailings slurry in the MR mill rather than pumped separately to YDTI. These include (inflow from Horseshoe Bend water treatment plant (HsB WTP), inflow from Berkeley Pit Pumping System, inflow from Berkeley Pit Dewatering Wells, Continental Pit Dewatering, Polishing Plant Filter Backwash, and pumped inflows from MR Concentrator Area). These inputs were modeled as direct inputs to the YDTI in order to account for and maintain the chemical loading from these source waters.

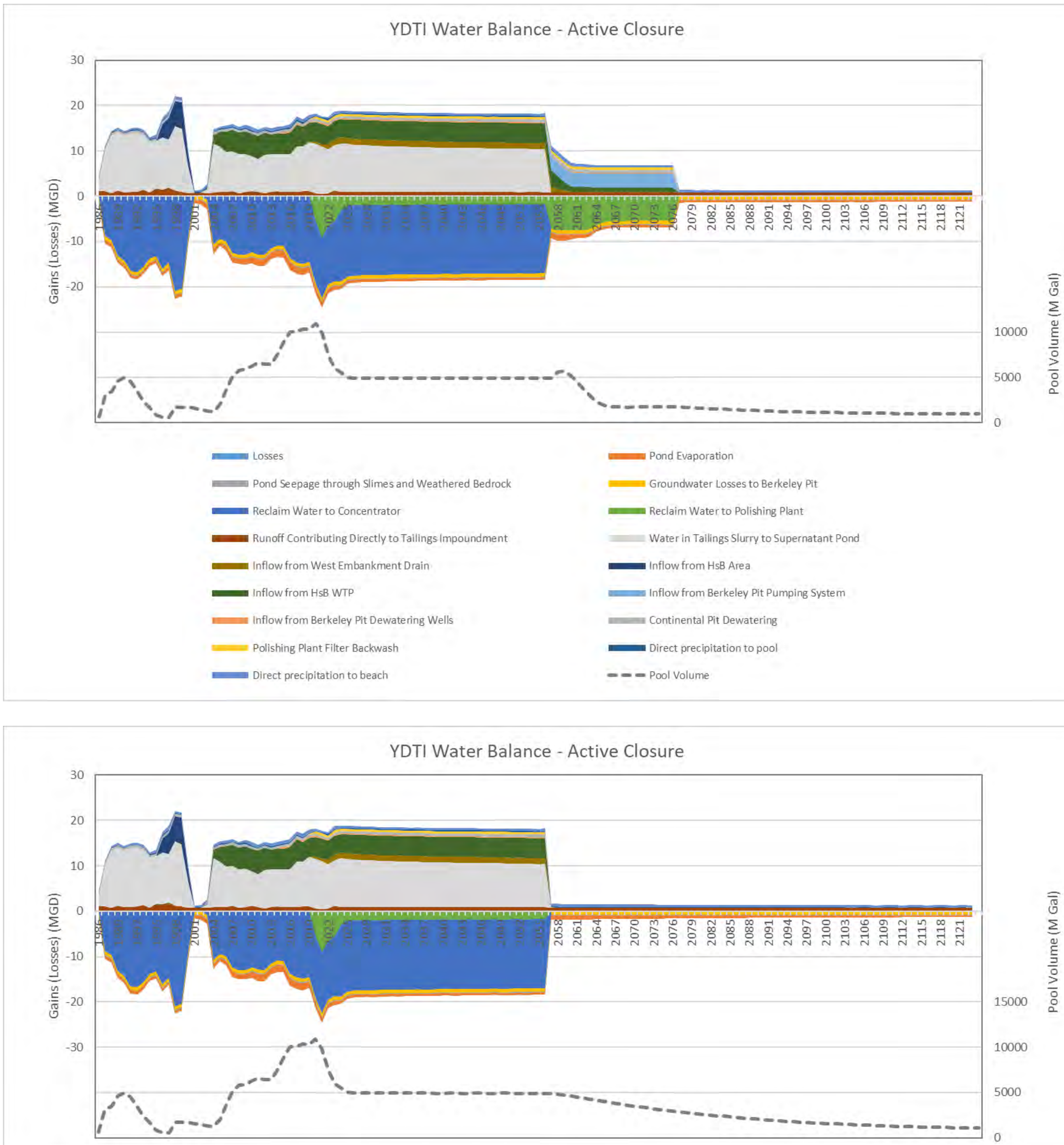


Figure 1. Water balance gains and losses for scenario 1, active closure (above) and scenario 2, passive closure (below).

Mass Load Model

A mass load with annual time steps was created based on the water balance gains and losses by multiplying flows by 365.25. Each of the source waters were simulated with a representative chemical input as shown in Tables 1 and 2. Table 1 shows representative water quality while Table 2 shows how these were assigned to create the mass load model. Pool water quality was calculated for each constituent in 138 annual time steps. The influent water volume and load was calculated by summing the product of flow and concentration of each source water and then adding these loads to the previous pool volume and load. Volume was decreased to account for evaporation with no change in load. Finally, seepage losses and process water return flows were allocated by reducing pool volume and load proportionally (e.g., while maintaining the constituent concentration).

The mass loads were computed for one constituent at a time. Constituents modeled included: Pool Volume (ML), TDS, Aluminum, Antimony, Arsenic, Bicarbonate as HCO_3, (Carbonate and Alkalinity as $CaCO_3$), Boron, Cadmium, Calcium, Chloride, Chromium, Copper, Fluoride, Iron, Lead, Lithium, Magnesium, Manganese, Mercury, Molybdenum, Nickel, Nitrate Nitrogen as N, Phosphorus, Potassium, Selenium, Silica, Silver, Sodium, EC, Strontium, Sulfate, Thallium, Uranium, Vanadium, and Zinc. The pH and Redox potential (mv) values were based entirely on later PHREEQC simulations of the mass load based mixtures of water with specified constraints for partial pressure of oxygen and carbon dioxide. See section on equilibrium modeling for more details.

Table 1. Water quality of representative solutions that may be directed to the YDTI.

Constituent (mg/L)	Tailings Slurry	Extraction Basin	Precipitation	WED Extraction Pond 2020/21	YDTI-NE (WQ-9A)	Groundwater Average	HsB WTP	Cont Pit South Sump	Cont Pit North Sump	Upgradient SW (Ave WQ-15, WQ-10, WQ-	WED Groundwater (June 2017)	Silver Lake Water	Tailings Contact Water	Tailings Contact Water + Calcite.
Solution Number	1	2	3	4	5	6	7	8	9	10	11	12	13	14
pH (S.U.)	11.7	4.6	5.3	3.4	10.4	7.3	10.0	6.4	4.7	8.0	7.5	7.0	7.2	7.2
Aluminum	0.00	16.20	0.00	35.60	0.02	0.01	0.03	5.34	2.79	0.04	0.01	0.01	0.17	0.17
Antimony	0.001	0.001	0.000	0.001	0.001	0.001	0.007	0.001	0.001	0.001	0.001	0.001	0.002	0.002
Arsenic	0.009	0.001	0.000	0.001	0.002	0.008	0.004	0.002	0.004	0.005	0.013	0.000	0.001	0.001
Bicarbonate as HCO3	2	3	0	2	13	102	33	61	37	109	124		31	35
Boron	0.05	0.05	0.00	0.05	0.05	0.05	0.00	0.02	0.09	0.02	0.05	0.05		
Cadmium	0.0002	0.2430	0.0000	0.2620	0.0002	0.0001	0.0013	0.0308	0.1654	0.0001	0.0000	0.0001	0.0001	0.0001
Calcium	656	409	0	413	661	34	841	435	465	27	40	34	106	650
Carbonate as CO3	60	2	0	2	10	4	0	0	0	4	4	0		
Chloride	14.0	11.0	0.1	12.0	13.0	12.0	13.4	10.9	8.5	2.9	14.6	1.0	14.3	14.3
Chromium	0.0010	0.0010	0.0000	0.0030	0.0010	0.0010	0.0020	0.0023	0.0030	0.0028	0.0010	0.0010	0.0005	0.0005
Copper	0.0040	39.5000	0.0000	31.0000	0.0020	0.0030	0.0032	9.5165	25.0479	0.0036	0.0011	0.0015	0.0106	0.0106
Fluoride	2.3	0.6	0.0	0.2	3.2	0.1	1.5	2.9	2.6	0.1	0.1	0.1	0.5	0.5
Iron	0.03	25.50	0.00	19.50	0.02	0.04	0.02	3.53	4.74	0.29	0.03	0.01	0.06	0.06
Iron, Ferrous	0.02	25.00	0.00	19.20	0.02	0.03	0.00			0.00	0.03	0.00		
Lead	0.0027	0.0074	0.0000	0.0072	0.0003	0.0003	0.0026	0.0017	0.0022	0.0006	0.0003	0.0001	0.0001	0.0001
Lithium	0.10	0.10	0.00	0.10	0.10	0.10	0.00	0.06	0.06	0.01	0.10	0.10	0.01	0.01

Constituent (mg/L)	Tailings Slurry	Extraction Basin	Precipitation	WED Extraction Pond 2020/21	YDTI-NE (WQ-9A)	Groundwater Average	HsB WTP	Cont Pit South Sump	Cont Pit North Sump	Upgradient SW (Ave WQ-15, WQ-10, WQ-	WED Groundwater (June 2017)	Silver Lake Water	Tailings Contact Water	Tailings Contact Water + Calcite,
Solution Number	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Magnesium	1.0	60.0	0.0	83.0	6.0	8.2	91.8	46.2	64.0	5.8	9.5	8.0	2.4	2.4
Manganese	0.002	13.400	0.000	19.600	0.003	0.015	0.036	8.827	10.692	0.035	0.013	0.008	0.096	0.096
Mercury	0.0100	0.0100	0.0000	0.0100	0.0100	0.0010	0.0004	0.0001	0.0001	0.0000	0.0001	0.0048	0.0002	0.0002
Molybdenum	1.560	0.001	0.000	0.000	1.160	0.010	0.004	0.704	0.203	0.002	0.004	0.010		
Nickel	0.002	0.063	0.000	0.112	0.002	0.002	0.002	0.052	0.088	0.002	0.002	0.001	0.008	0.008
Nitrate+Nitrite as N		0.0	0.7	0.1	0.7	0.6	0.1	0.2	0.2	0.0	0.9	0.1	66.6	66.6
Potassium	50.0	16.0	0.0	19.0	40.0	3.4	17.3	7.5	6.8	2.4	4.2	1.2	11.4	11.4
Rubidium	0.042	0.040	0.000	0.040	0.041	0.000	0.000	0.027	0.027	0.001	0.001	0.001		
Selenium	0.004	0.001	0.000	0.001	0.004	0.000	0.006	0.001	0.002	0.001	0.001	0.001	0.001	0.001
Silicon	7.9	16.0	0.0	18.2	4.2	9.5	0.8	9.8	11.6	11.2	10.2	10.0	2.8	2.8
Silver	0.0002	0.0002	0.0000	0.0002	0.0002	0.0000	0.0005	0.0018	0.0014	0.0002	0.0002	0.0002	0.0002	0.0002
Sodium	105	66	0	79	103	9	83	36	37	7	11	2	12	12
Specific Conductivity	3,530	2,540	2	3,010	3,040	299	4,368	2,209	2,533	205	352	89	567	2,363
Strontium	5.2	1.4	0.0	1.6	3.4	0.2	1.0	2.1	2.9	0.2	0.3	0.1		
Sulfate	1,610	1,690	0	1,930	1,820	41	2,536	1,301	1,615	16	45	11	262	1,332
Thallium	0.000	0.000	0.000	0.001	0.000	0.000	0.005	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Total Diss. Solids	2,780	2,510	1	2,940	2,930	200	3,931	2,039	2,454	143	233	113	510	2,127
Total Susp, Solids	10	10	0	10	10	13	22	23	24	28	15	57		
Uranium	0.000	0.073	0.000	0.053	0.000	0.010	0.001	0.089	0.127	0.004	0.014	0.004	0.012	0.012
Vanadium	0.010	0.010	0.000	0.010	0.010	0.010	0.000	#DIV/0!	0.010	0.010	0.010	0.010	0.010	0.010
Zinc	0.008	22.100	0.000	36.300	0.008	0.040	0.139	5.085	15.349	0.009	0.044	0.007	0.007	0.007
Alkalinity	704	12	0	10	80	180	64	100	61	192	216	0	51	57
Acidity	1	686	0	690	1	1	1	119	134	6	1	0	2	2

Table 2. Water quality assignment to each water balance source term.

Inflows	Solution	WQ Source
Direct Precipitation on Pond/Beach		Separated into two flows based on proportional area of pool and beach
Direct precipitation to pool	3	Precipitation
Direct precipitation to beach	Varies [2]	Tailings Contact Water + Calcite, Gypsum
Runoff Contributing Directly to Tailings Impoundment	10	Upgradient SW (Ave WQ-15, WQ-10, WQ-11)
Water in Tailings Slurry to Supernatant Pond	Varies [1]	Tailings Slurry WQ Varies (see footnote 1)
Inflow from West Embankment Drain	4	WED Extraction Pond 2020/21
Inflow from HsB Area	6	Groundwater Average
Inflow from HsB WTP	7	HsB WTP
Inflow from Berkeley Pit Pumping System	7	HsB WTP
Inflow from Berkeley Pit Dewatering Wells	6	Groundwater Average
Continental Pit Dewatering	9	Cont Pit North Sump WQ 8A
Polishing Plant Filter Backwash	1	Tailings Slurry
Pumped Inflows from MR Concentrator Area	6	Groundwater Average
Silver Lake to YDTI	12	Silver Lake Water
Reference Pool Water Quality	5	WQ 9A

1 - The process water component was predicted from the tailings pool water quality from the previous time step. Additional major ions as shown below were added to the tailings pool water to represent ore rinse off and reagent additions during processing.

Constituent	*Increase (mg/L) due to ore rinse off*
Calcium	*89.7*
Sodium	*30*
Chloride	*2*
Sulfate	*340*

2 - Runoff from beach during the historic period and remaining operations (1986-2056) assumed to be 80% of the pool water quality from the previous time step to represent partial dilution by rainfall. For the first 10 years after closure (2057-2066) the contact water was based on the HCT as described in the Tech Memo (Solution 14, HCT solution average plus Calcite and Gypsum). In later post closure a cover will be placed. After cover placement, beach runoff is the same water quality as in the upgradient Silver Bow Creek basin (Solution 10).

Tailings Contact Water Simulation

Interaction between exposed tailings deposited in the beach with either meteoric water or process solution is an important geochemical process that may affect water quality in the pool. A detailed review of the geochemistry of tailings and samples of other representative rock materials is presented in Attachment 1. New data was collected for this purpose including a series of kinetic tests conducted on samples of YDTI tailings collected in early 2023. The objectives of the kinetic testing program were:

- To understand the potential for tailings to become acidic (there is potential for acidification but delayed many years),
- To predict the amount of time after deposition that tailings would acidify (likely 10 to 20 years for average ANP and AGP in tailings),
- To assess the geochemical nature of water coming into contact with tailings (varies through mining and closure stage),
- and to simulate the chemical load contribution from tailings beach runoff to long-term water quality in the pool impounded within the Yankee Doodle tailings after closure (considered in this memo).

Humidity cell tests (ASTM 2018) were conducted for two samples collected from the YDTI beach (one near a discharge point and one ner the pool margin) and 1 whole tailings. All samples remained neutral in pH during the 64 weeks of testing (Figure 2). Further, sulfate release diminished during the tests to a near steady-state of about 10 mg/L, representing a very slow rate of oxidation, corresponding to release of less than 3 % of the sulfide sulfur per year (Figure 3). When the rate of ANP and AGP deletion was evaluated (Figure 4), more than 4 years of testing in the humidity cell would likely have been required to remove all carbonates (e.g. to reach 0 ANP) and allowing development of acidic pH. When adjusting lab behavior to field conditions (lower temperatures, more likely chemical encapsulation, and slower kinetics), the lag period until development of low pH in the tailings beach would likely be 10 to 20 years after the end of deposition. Geochemical studies suggested that after closure, tailings contact water would likely resemble average long-term HCT solution (average of weeks 40 to 64) with suitable adjustments for the likely presence of secondary minerals. Humidity cells are leached with large amounts of water so that secondary minerals such as Gypsum and Calcite are removed. Leaching is much less pronounced in field conditions. Consequently, both Calcite and Gypsum were assumed to be present in the tailings. Dissolution of these minerals was added to the average HCT solution in PHREEQC (Parkhurst and d'Appelo, 1995) to derive a representative contact water (Solution 14, Table 1). Refer to Attachment 1 for a more detailed discussion of tailings geochemistry and chemical interactions with contact water.

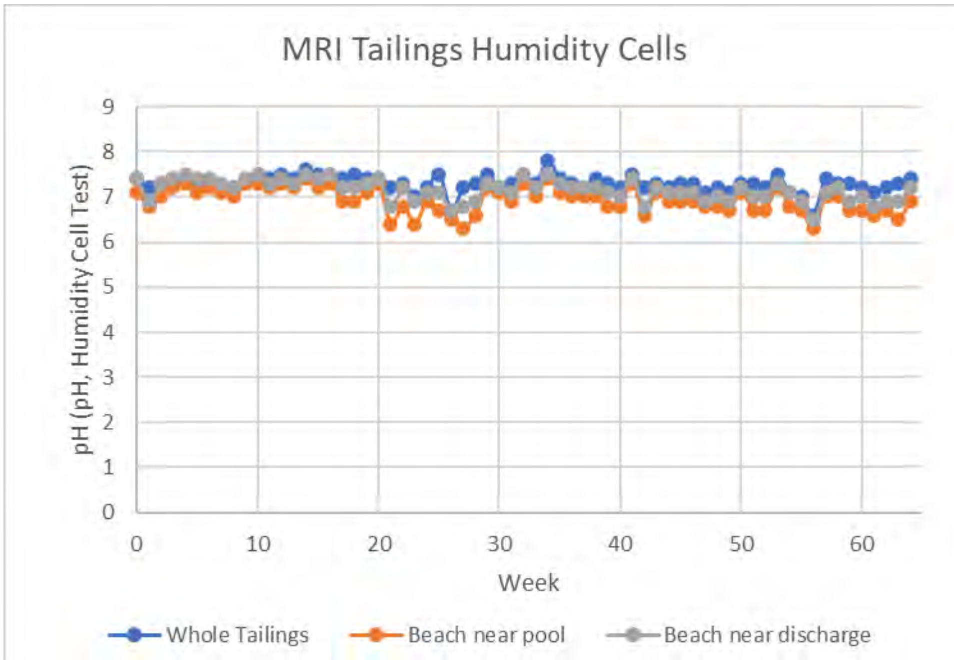


Figure 2. pH in humidity cell tests.

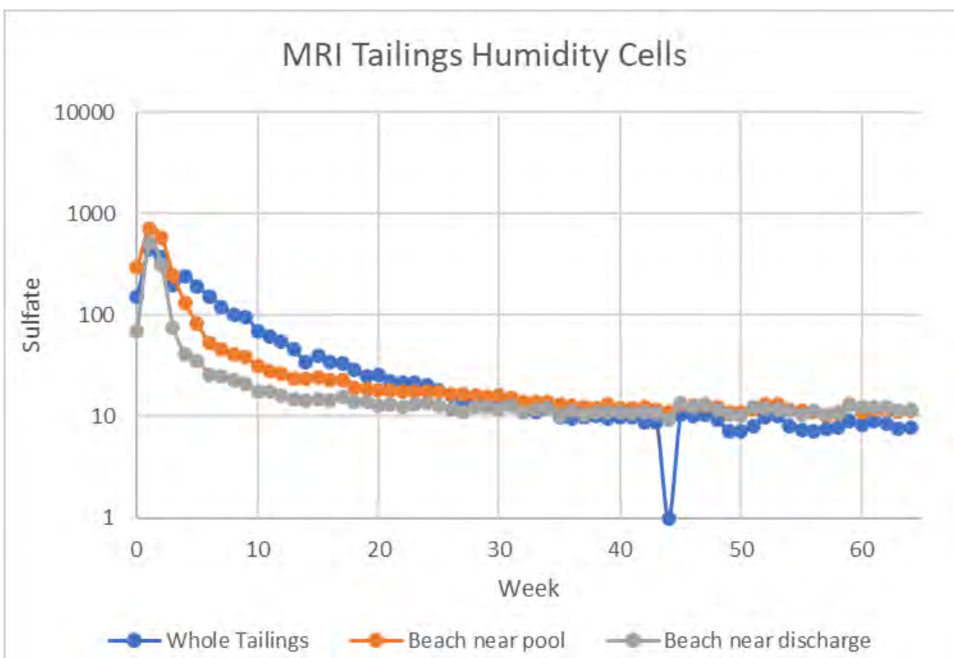


Figure 3. Sulfate in humidity cell tests.

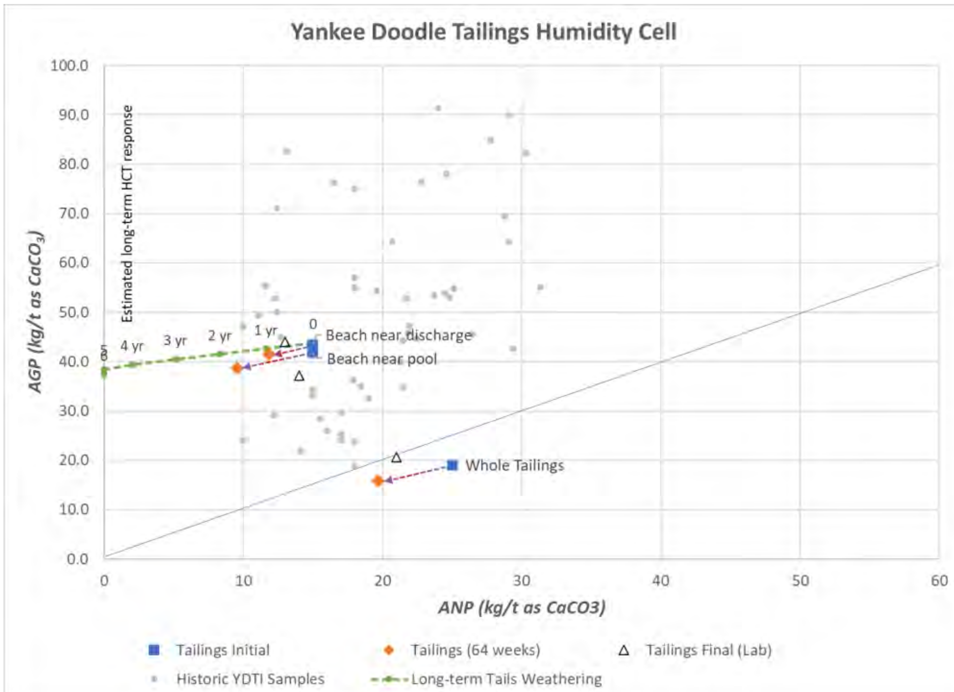


Figure 4. Changes in ANP and AGP in HCT samples through time.

Geochemical Equilibrium

While the mass load model provides a first approximation of pool water quality, it suffers from a few shortcomings. Formation of secondary minerals such as Gypsum and Calcite may alter major ion levels. Elevated metal loading in some source waters such as the West Embankment Drain and Continental Pit dewatering are likely to form mineral precipitates such as Ferrihydrite or sorb onto oxide surfaces. Finally, it is difficult to account for important reagent additions such as lime in a mass load model.

For these reasons, a mineral equilibrium geochemical model (PHREEQC, Parkhurst and d'Appelo 1995) was used to account for reagent addition and formation of solid phases. Some of the controlling assumptions used in PHREEQC are summarized below:

- Add 5 pounds of lime per ton to process water. The actual addition is closer to 3 pounds per ton, but this rate underpredicted the final pH in the pool.
- The partial pressure (fugacity) of oxygen was maintained at 10^{-40}. This creates a redox level in the pool that is realistic and is able to shift with changing pH as in natural systems. Redox averaged 290 to 330 mv when pH was near neutral as was 130 to 160 mv when pH was near 10).

- The partial pressure (fugacity) of carbon dioxide was maintained at 10^{-3}. During post-operational periods after 2056, appropriate for a natural lake setting where some organic matter decomposition occurs. The pCO_2 may be lower (as low as 10^{-4}) during summer daytime hours due to photosynthesis and would cause pH to rise. The pCO_2 was set at 10^{-8} through 2056 to account for the non-equilibrium conditions attributed to lime addition. Only limited gas exchange occurs from the pool during operations, which enables the pH to remain elevated to 10 or above.

- A number of low-temperature mineral species were allowed to precipitate (Table 3) though only a subset of these minerals actually formed in any simulation.

- Sorption onto Ferrihydrite was permitted using equilibrium reactions described by Dzombek and Morel (1990).

Table 3. Mineral solids allowed to precipitate in PHREEQC and quantities of solids that actually form in the simulation.

Mineral Species	Formula	Formed?	Average amount formed mg/L/yr [1]
Alunite	KAl3(SO4)2(OH)6		
Anglesite	PbSO4		
Basaluminite	Al4(SO4)(OH)10•5(H2O)		
Birnessite	(Na,Ca,K)x(Mn+4,Mn+3)2O4•1.5(H2O)		
Bixbyite	(Mn+++,Fe+++)2O3		
Brucite	Mg(OH)2	X	33.4
Calcite	CaCO3	X	29.5
Cerussite	PbCO3		
CO2(g)			
Dolomite(ordered)	(Ca,Mg)CO3		
FeAsO4:2H2O			
Ferrihydrite	Fe(OH)3	X	6.5
FeS(ppt)			
FeSbO4			
Fluorite	CaF2		
Gibbsite	Al(OH)3	X	5.5
Gypsum	CaSO4•2(H2O)	X	208.7
Hausmannite	Mn+2Mn+32O4		
Hydrocerussite	Pb3(CO3)2(OH)2		
Hydrozincite(LLNL)	Zn5(CO3)2(OH)6		
Jurbanite	Al(SO4)(OH)•5(H2O)		
Lime	CaO	1	
Magnesite	MnCO3	X	34.4
Manganite	MnO(OH)		
O2(g)			
Otavite	CdCO3		0.007
Pyrolusite	MnO2		
Rhodochrosite	MnCO3		
Siderite	FeCO3		
Smithsonite	ZnCO3		
Zincite	(Zn,Mn)O	X	3.5
ZnCO3:1H2O			
ZnCO3:H2O(WATEQ)			
Spertiniite [2]	Cu(OH)2	X	5.66

1 – results for scenario 1

2 – used for a special simulation case of active closure

Calibration

Comparison of predicted and measured water quality shows the nature of the model calibration to actual conditions. Pool pH is strongly influenced by added lime in the

PHREEQC simulation and the maintenance of low carbon dioxide fugacity necessitated to match the actual strongly basic pH (Figure 5). Overall pH agreement is good, especially in the later calibration period from 2005 to present.

Predicted sulfate (Figure 6) is fairly low at low pond volumes as occurs in early operation (1986) and again during a temporary shutdown in 2000/2001. The model shows a rapid rise in sulfate as pool level increases. Trends in measured sulfate suggests a slower rate of sulfate increase as pool volume rises. In simulations and measured trends, sulfate tends to stabilize around 1,600 to 2,000 mg/L. Sulfate stabilizes at this level partly in response to solid phase control by Gypsum and Calcite precipitation. Sulfate would normally reach higher levels (e.g. 2,500 to 3,000 mg/) in the presence of Gypsum, but it's solubility is suppressed because of the abundance of calcium added through Lime inputs (Figure 7). Since the product of calcium and sulfate is dictated by the formation of Gypsum, higher calcium induces lower sulfate.

Predicted sodium closely matches measured sodium (Figure 8), but the model overpredicts magnesium (Figure 9). Although small amounts of Magnesite ($MgCO_3$) and Brucite ($Mg(OH)_2$) are predicted to form, it is not enough to significantly lower magnesium levels at the predicted pH of the pool (~ pH 10). However, in the process circuit, the pH is likely to be significantly higher, creating conditions more suitable to Brucite scale formation. This mechanism, not simulated in the YDTI model, is likely the cause of magnesium removal. Consequently, the model overpredicts magnesium for all operational time periods.

Similarly, the model overpredicts copper (Figure 10) and zinc for operational time periods. It's unclear why the model underpredicts copper and zinc removal in the YDTI. The primary load sources; Continental Pit dewatering at 25 mg/L and the West Embankment Drain (31 mg/L) far exceed the iron inputs (4 and 20 mg/L), which may cause copper to overwhelm the sorption capacity of the Ferrihydrite that forms. Aluminum oxides may provide a second sorbent that further reduces copper and zinc levels, but that are not accounted for in the model. Alternatively, copper/zinc removal by formation of oxides or carbonates may also be underestimated. For example, if the simulation is run while allowing Spertiniite ($Cu(OH)_2$) to precipitate then the copper level is maintain in all years to about 0.01 mg/L or less. This mineral phase was not specified in most simulations because it is unclear whether Spertiniite, a rare mineral known as a blue green to azure salt in areas with alkaline groundwater, is likely to form at ambient temperatures in the tailings. Whatever the reasons, the model overpredicts soluble copper and zinc in the YDTI pool by a significant margin.

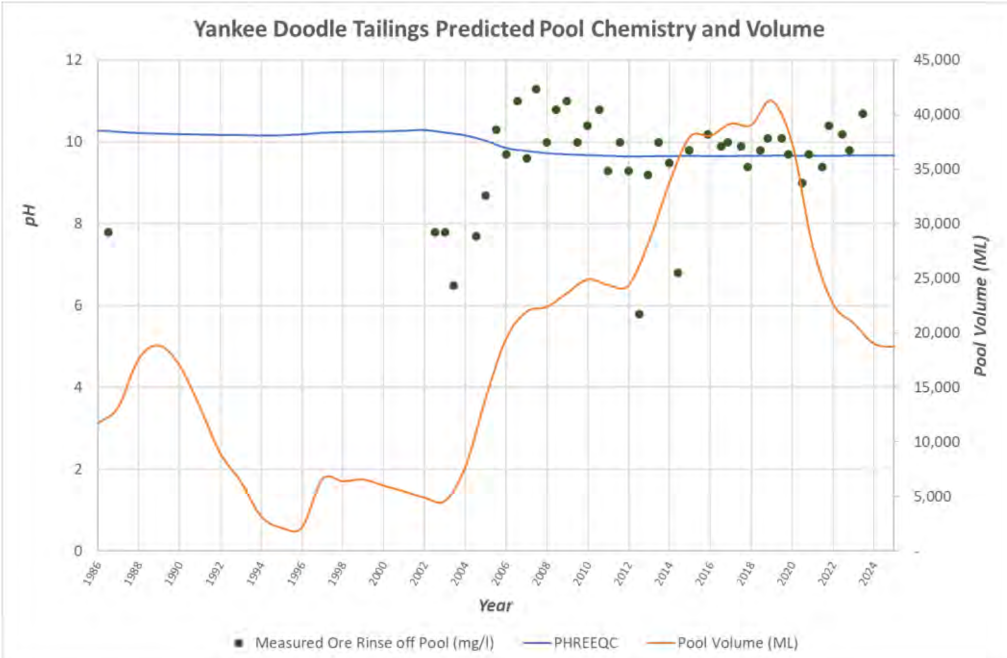


Figure 5. Comparison of YDTI pool measured and predicted pH for the calibration period.

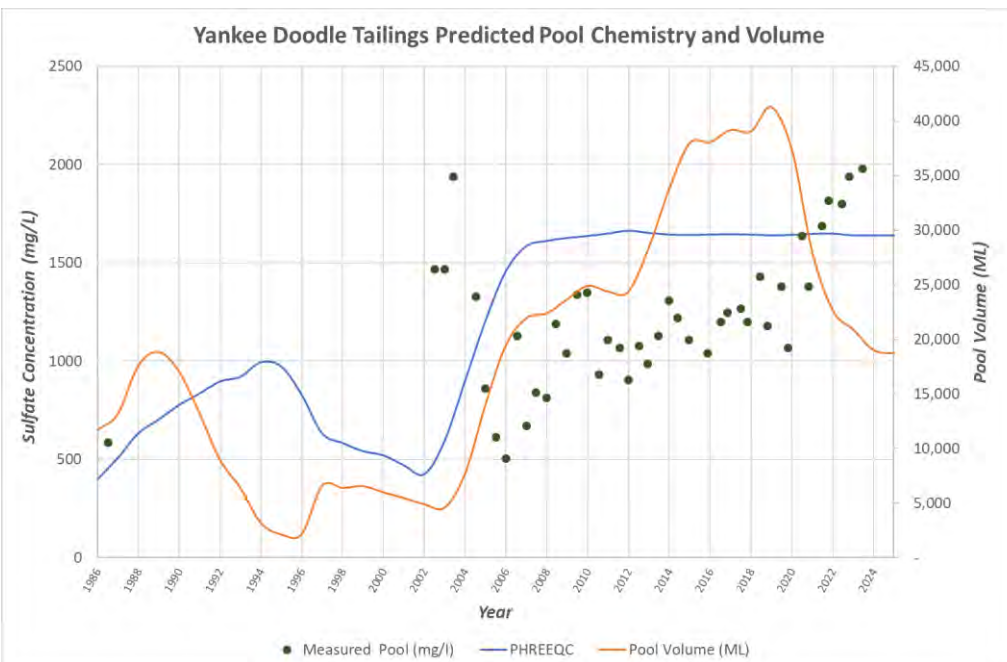


Figure 6. Comparison of YDTI pool measured and predicted sulfate for the calibration period.

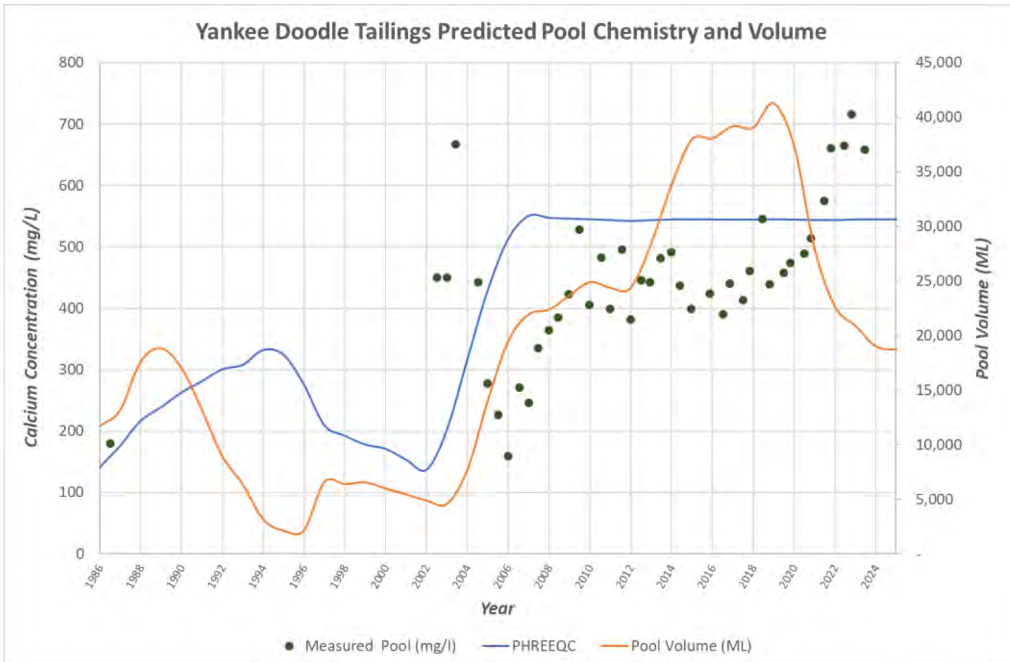


Figure 7. Comparison of YDTI pool measured and predicted calcium for the calibration period.

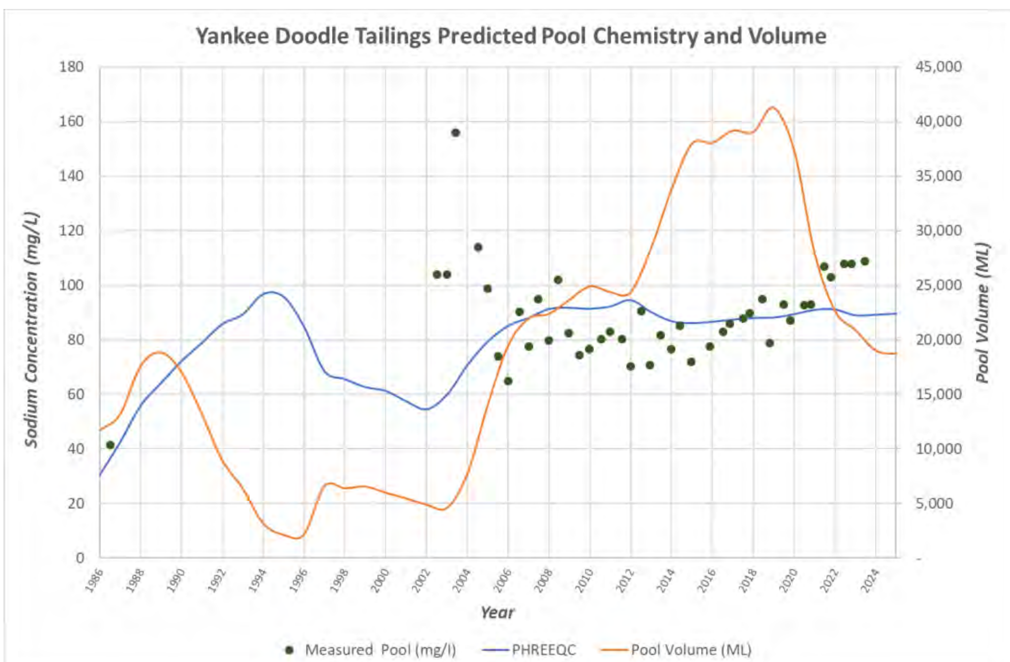


Figure 8. Comparison of YDTI pool measured and predicted sodium for the calibration period.

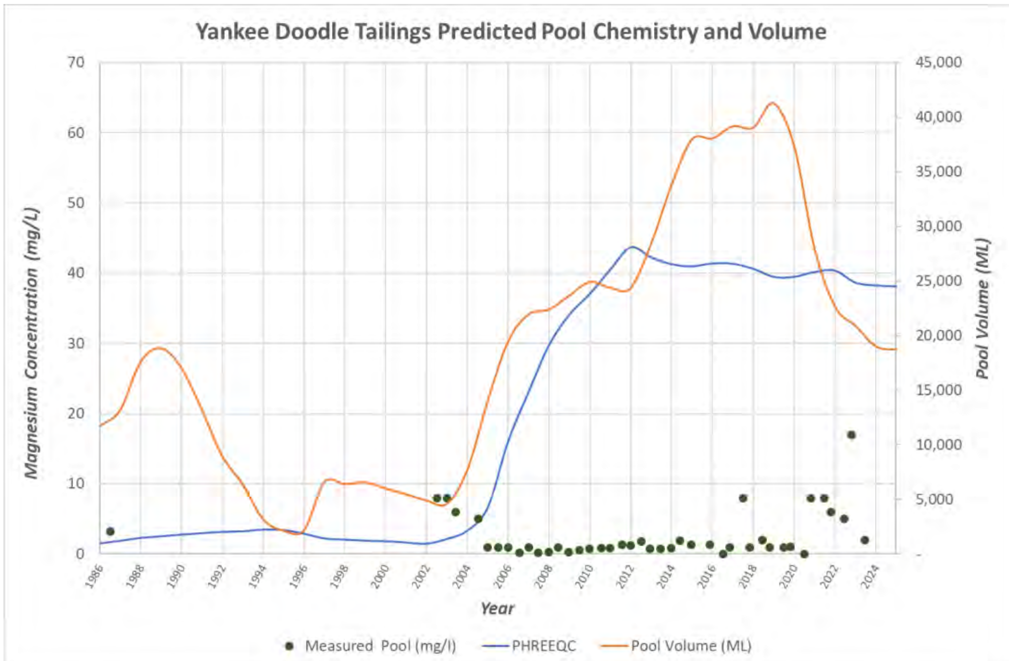


Figure 9. Comparison of YDTI pool measured and predicted magnesium for the calibration period.

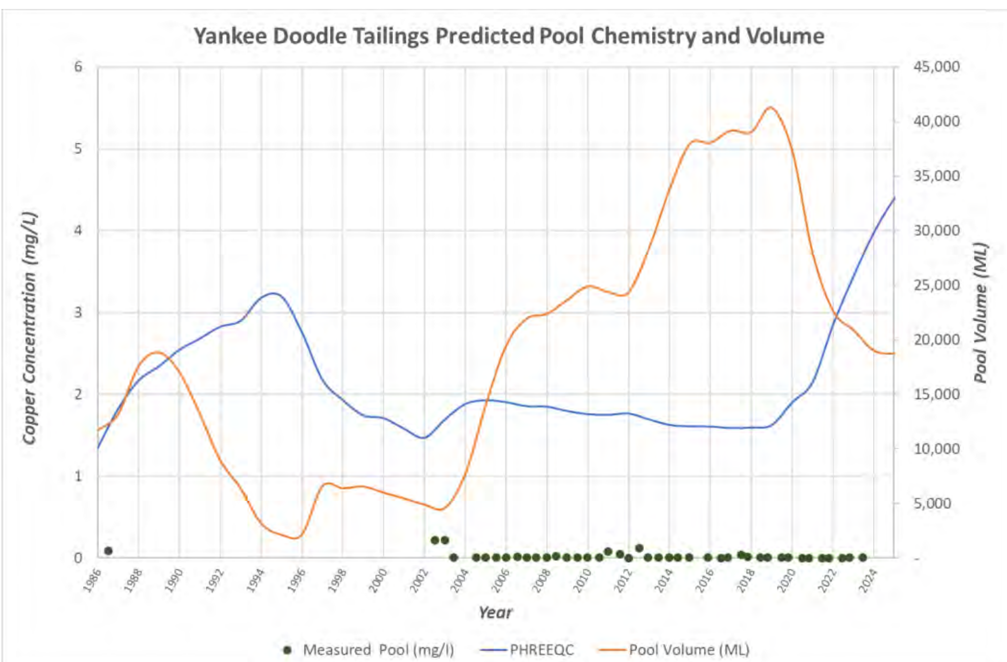


Figure 10. Comparison of YDTI pool measured and predicted copper for the calibration period.

Pool Water Quality Prediction in Closure

Water Sources During Operational, Active and Passive Closure Periods

The two simulations for active and passive closure differ in their water management approach for the 20 years following the end of operations in 2056. During operations, about 16 to 20 million gallons per day (MGD) of water is directed to the YDTI. In this example from 2024 (Figure 11), about 60 % of the 19 MGD of inflow is from the fluids in the tailings stream that report to the pool. The tailings deposited on the beach also retain a significant amount of fluid as residual water but the interstitial water does not influence the pool water balance. Other significant inputs include discharge from the HsB WTP, water pumped form the West Embankment Drain, runoff from upper Silver Bow Creek drainage basin, Continental Pit dewatering, Polishing Plant filter backwash, and other lesser flows. Losses from the pool include water returned to the mill, water routed to the Polishing Plant, evaporation, and seepage losses.

After operations end in 2056, several source waters will continue to be pumped to the pool for the active closure case (Figure 12 and 13). Early in the active water management period about 8.5 MGD of water will be dominated by treated water from the HsB WTP (including HsB spring water and water pumped out of the Berkeley Pit to maintain a protective water level, Continental Pit dewatering, West Embankment Drain, runoff from upper Silver Bow and from the beach, Polishing Plant filter backwash, and other minor flows. During the first few years of closure, the HsB WTP may not have enough capacity to treat all of the water collected at HsB springs in addition to the Berkeley Pit water pumped to it. If that is the case, some of the excess water will be combined with treated water in the YDTI pipeline and lime will be added to address residual acidity in the untreated portion of water. Project inflows, especially from HsB springs, decrease in the first few years of the active closure period to about 6.5 MGD (Figure 13) but the proportions from different sources remain similar. Pool losses balance inflows and include water routed to the Polishing Plant, evaporation, and seepage losses.

In the passive closure option, inputs after 2056 are runoff from the beach and upper Silver Bow drainage basin, and rainfall that are balanced by evaporation and seepage losses. These are the same inputs that exist for the active closure option after 2075.

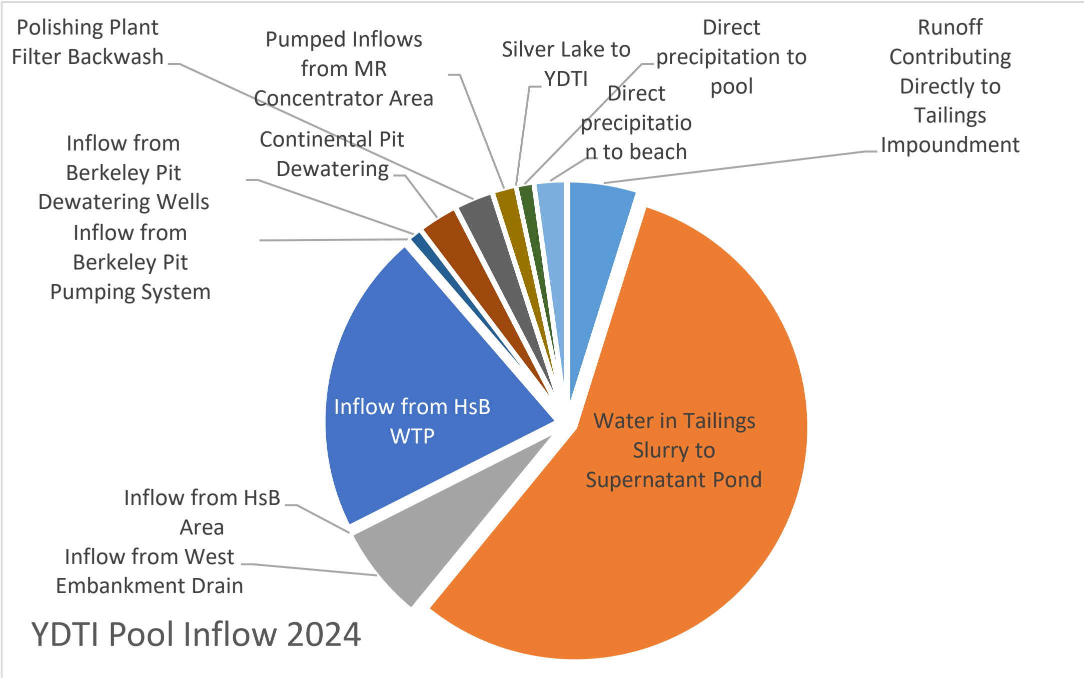


Figure 11. Water balance inflows to the YDTI pool 2024.

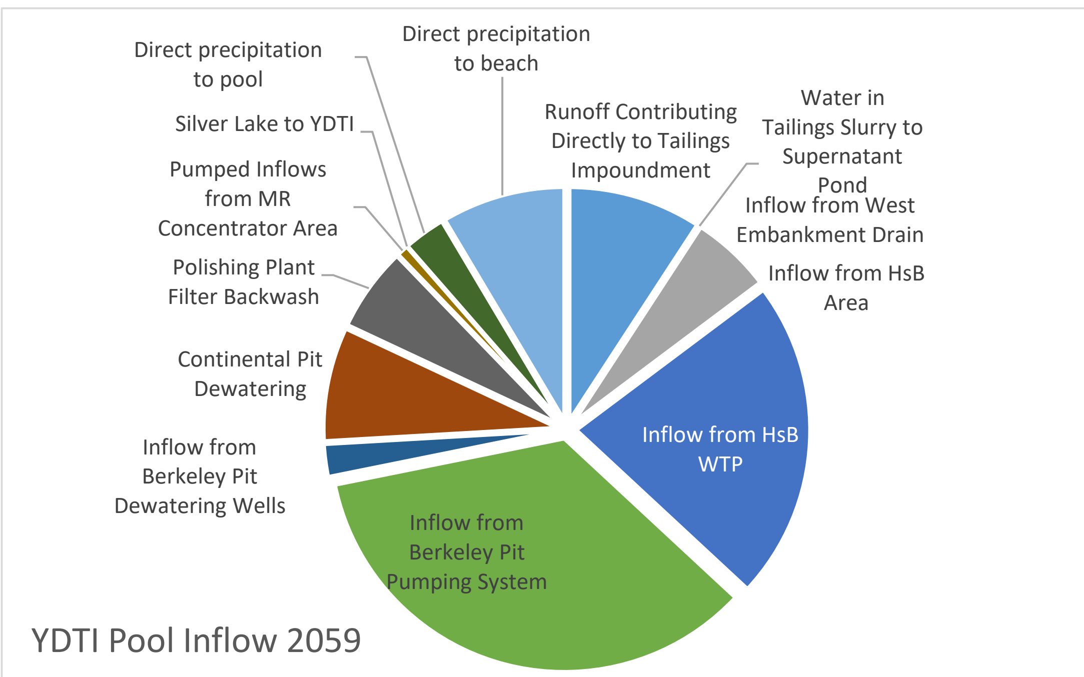


Figure 12. Water balance inflows to the YDTI pool 2059.

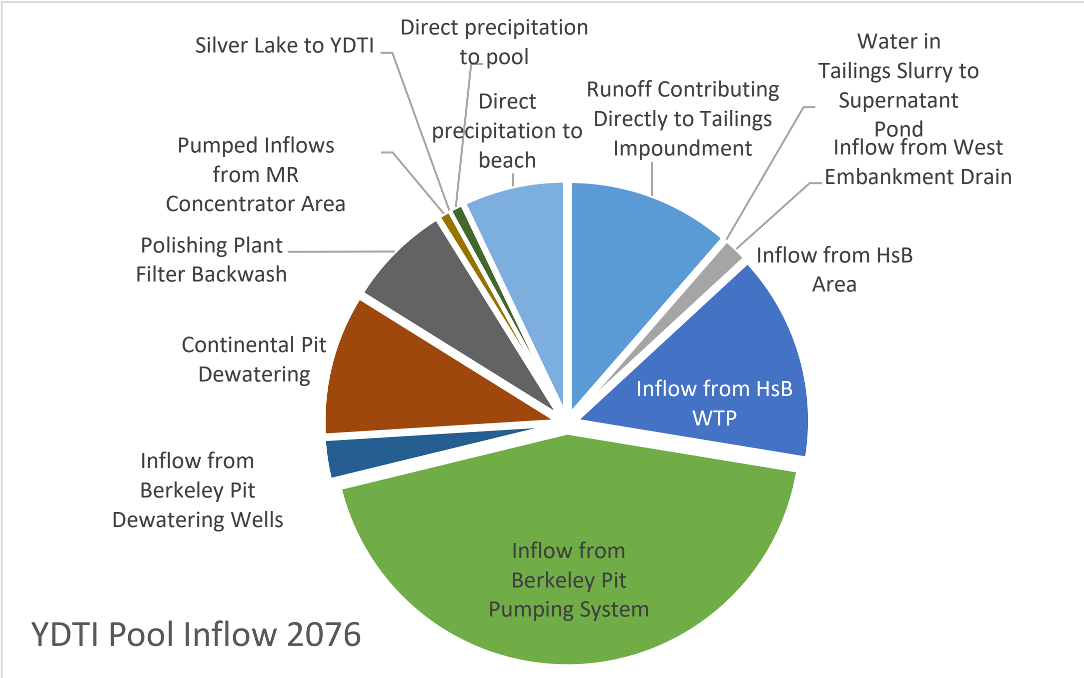


Figure 13. Water balance inflows to the YDTI pool 2076.

Water Quality Results

The pool volume (Figure 14) will drop rapidly from about 18,000 ML (14,500 ac ft) to around 7,000 ML (5,700 ac ft) after 2056 because process water inputs are eliminated but withdrawal by the Polishing Plant will continue. At the end of active water management, the pool will gradually decline to 4,000 ML (3,200 ac ft) over 40 years. For the passive case, the decline in water level is much slower so that same equilibrium level will be reached at about the same time for both cases (in 2120).

The modeled pH in the pool (Figure 15) declines from 10 to around 7.5 within a year or two after suspension of mine closure. This outcome in the model is the result of assuming that lime use is suspended and further assumes that carbon dioxide will immediately react with residual hydroxide ion in the pool. The model achieves this rapid pH decline owing to a change of the assumed controlling partial pressure of carbon dioxide from 10^{-8} to 10^{-3}. The actual rate of pH change in the pool is a kinetically slow process that is not simulated in the model. The actual rate of pH decrease post-closure will depend on the rate at which carbon dioxide moves from air to water in the pool to drive the carbonation reaction (equation 1). Since this kinetic process is not simulated in the model the pH drop may require more than a year as suggested by the model results. Under current operating conditions, the alkaline pool pH is quite persistent, suggesting that high pH will potentially last in post closure for many years.

$$OH^{-} + CO_2 = HCO_3^{-} \qquad [1]$$

Sulfate (Figure 16) remains near 1,600 mg/L during the active closure period while in passive closure the sulfate declines slowly to less than 500 mg/L by about 2080 and less than 100 mg/L by 2100. Sulfate drops quickly after the end of active closure so that after 2080, the two cases have similar sulfate trends.

As mentioned in the calibration section, the model tends to overestimate both copper and zinc concentrations (Figure 17 and 18) so the modeled trends in these metals should be viewed with caution. Copper (simulated at 5 mg/L at closure) and zinc concentrations (simulated at 0.3 mg/L at closure) decrease gradually in the model over about 30 years to reach levels found in ambient surface waters. In reality, the high simulated copper and zinc model concentrations are likely the result of the model's inability to capture the full complexity of the water management system. Although significant loads of copper and zinc exist within the flows directed to the YDTI, the majority of the loading is contained in WED flow and Continental Pit dewatering, both of which are directed to the HsB WTP. The 2-stage water treatment system used to remove copper and zinc among other metals is not fully simulated by the model used in this report. This simplification is the reason that copper and zinc, among other constituents, are overpredicted during the calibration period (1986 – 2024) and are likely overestimated for future time periods in the model. Historic copper measurements in the pool averaged 0.024 mg/L and zinc 0.04 mg/L between 2001 and present.

Early post-closure is only time when WED and Continental Pit flows may not be run through the HsB WTP because the cumulative collected flows may briefly exceed plant capacity. Some amount of excess water will be combined with treated water and lime will be added as needed to maintain pH control in the mixture. No lime addition was simulated during early closure in the model, however. Therefore, it is unlikely during post closure that copper or zinc will exceed levels currently observed in the pool. Most other modeled metal levels are at or near detection levels.

During the closure period, the water quality in the pool will be routinely monitored and if unsuitable water quality conditions develop owing to cessation or reduction in lime addition, then pool pH will be managed by increasing lime addition. Other water management options may also be used to optimize pool water quality during post closure to insure that water fed to the Polishing Plant can be successfully treated before final discharge to Silver bow Creek.

Tables 4 through 6 show results for critical time periods for major ions and several trace metals. Complete results are in Attachment 2.

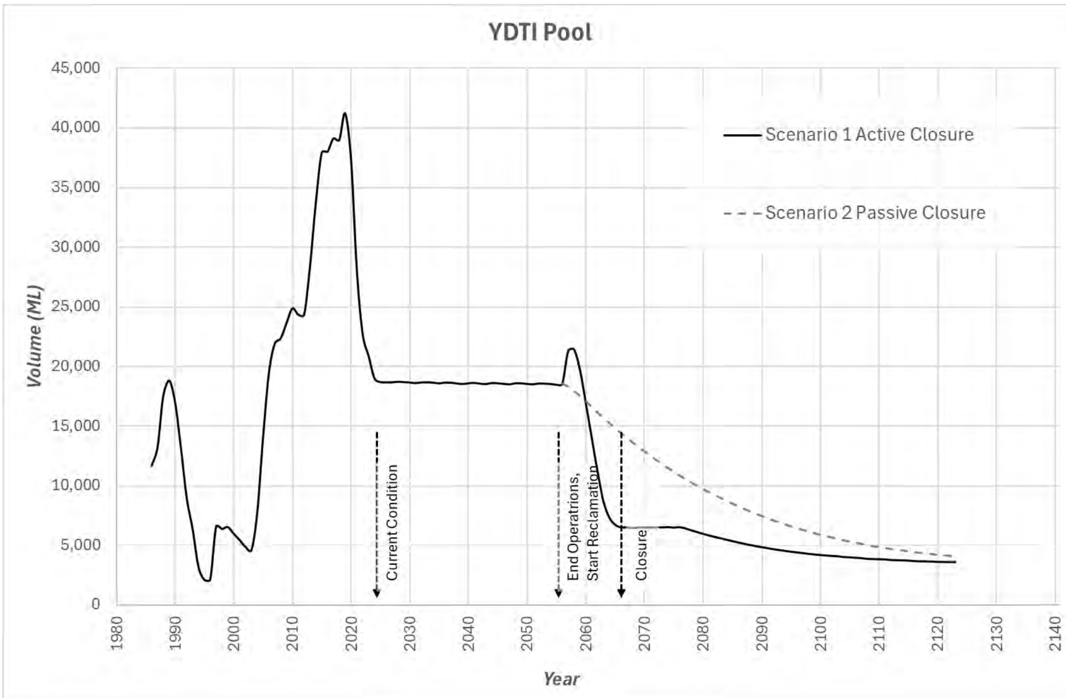


Figure 14. YDTI pool water level.

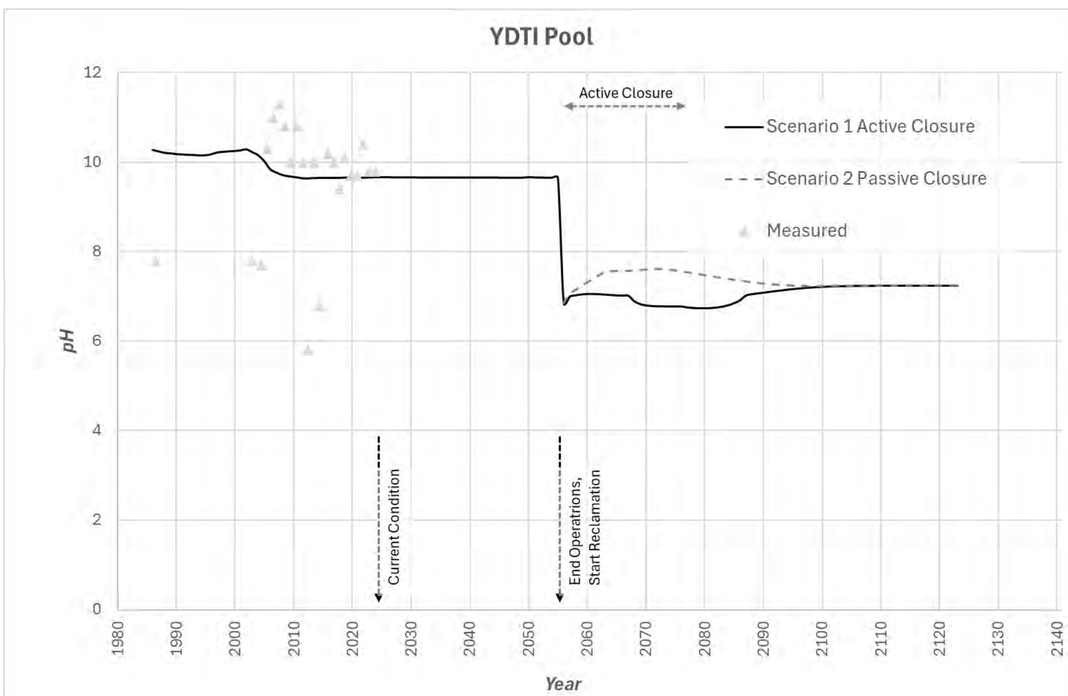


Figure 15. Simulated YDTI pool pH.

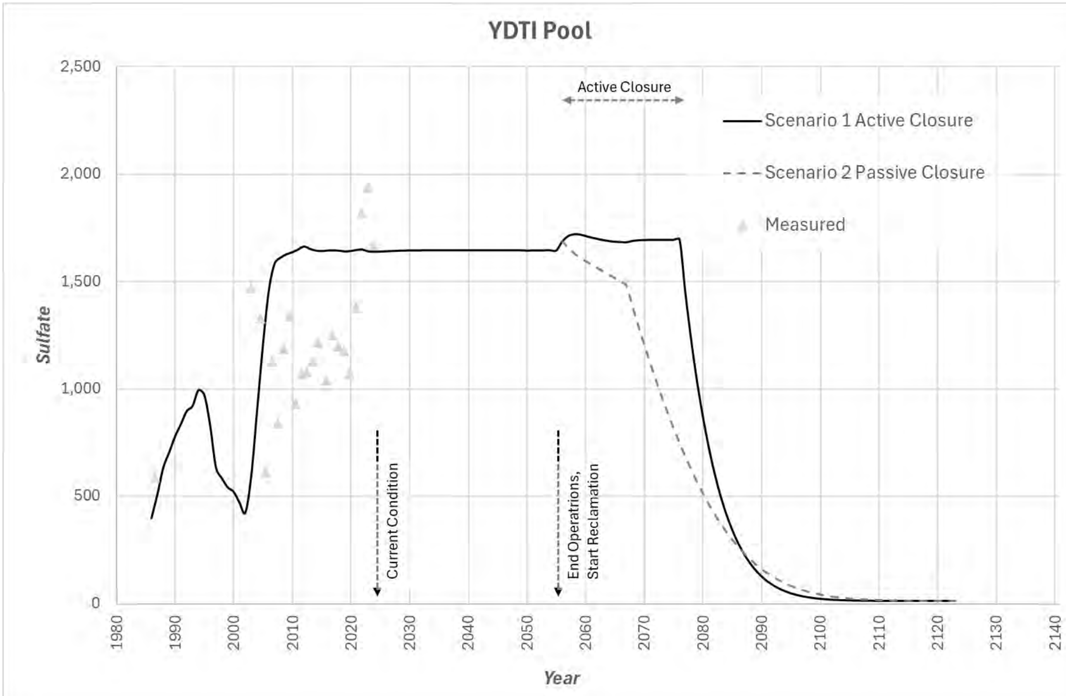


Figure 16. Simulated YDTI pool sulfate.

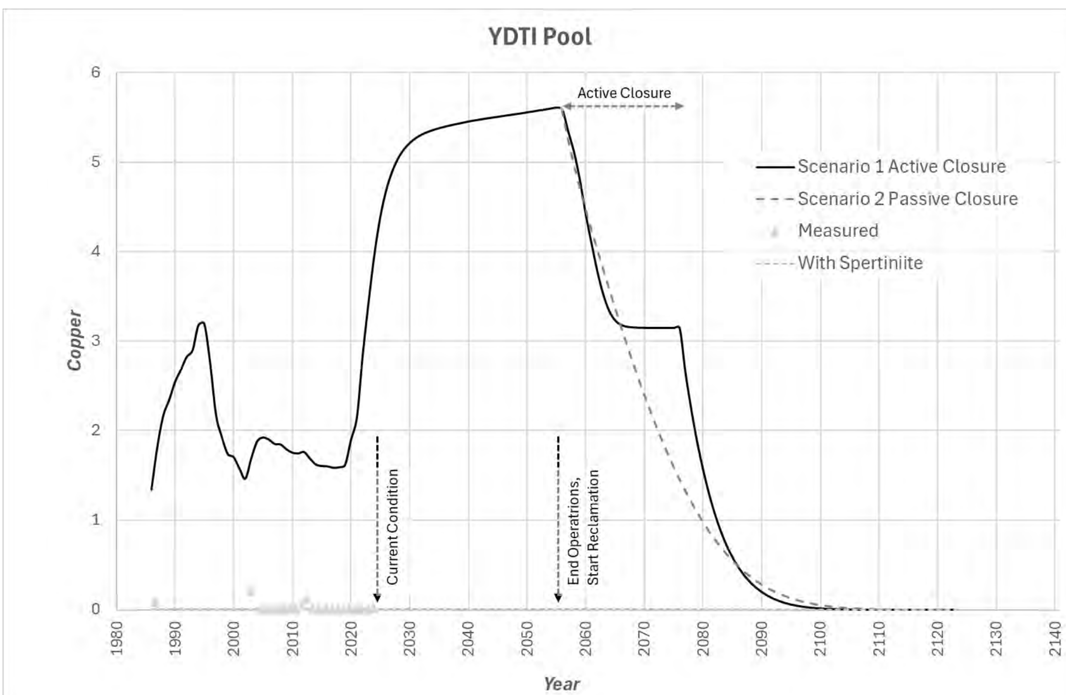


Figure 17. Simulated YDTI pool copper.

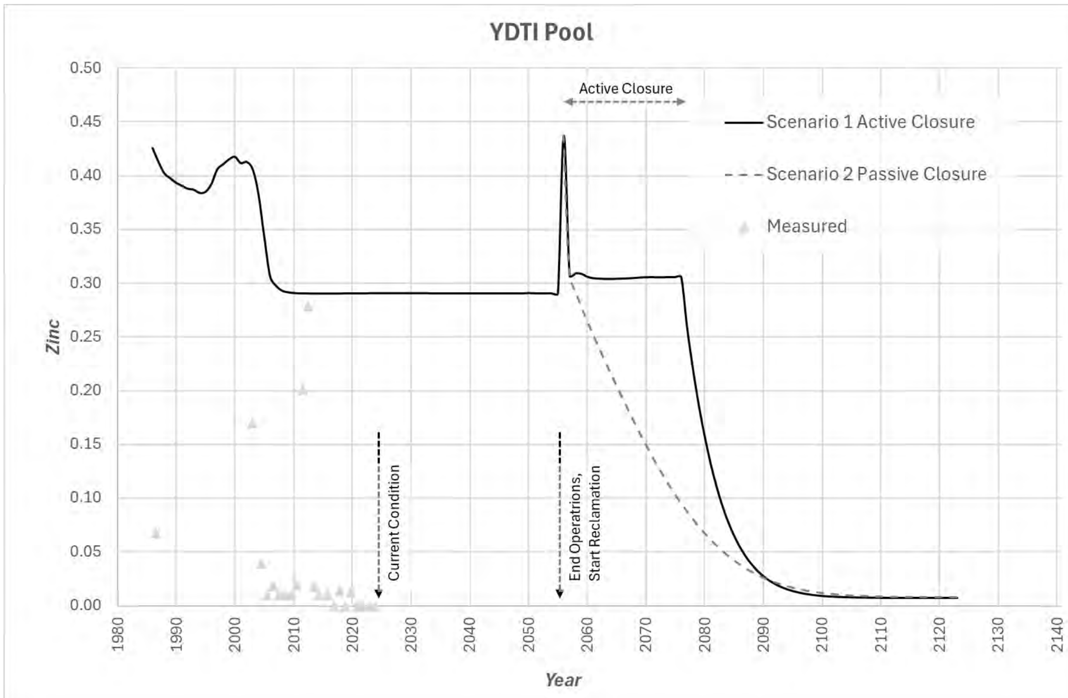


Figure 18. Simulated YDTI pool zinc.

Table 4. Predicted major ion levels in YDTI pool water for different simulation periods.

1	Date	pH	TDS	Volume (ML)	Calcium	Magnesium	Sodium	Potassium	Sulfate	Alkalinity as CaCO3	Chloride
Begin MR Operations	1986	10.3	593	11,678	141	1	31	7	399	28.6	6.3
Shutdown Period	2000	10.3	782	5,981	171	2	61	4	522	32.1	13.5
Current	2023	9.7	2,347	20,869	545	39	89	13	1,641	18.6	12.1
End Operations	2054	9.7	2,357	18,544	545	40	88	14	1,646	25.9	12.1
Active Closure											
Early Active Period	2064	7.0	2,421	7,358	544	57	70	17	1,689	29.4	13.0
Later Active Period	2075	6.8	2,415	6,496	544	63	67	16	1,695	15.9	11.6
Post Closure	2120	7.2	75	3,620	14	0	6	2	14	36.5	12.7
Passive Closure											
Early Active Period	2064	7.6	2,274	15,246	561	6	64	14	1,531	100.9	13.5
Later Active Period	2075	7.6	1,254	11,159	304	3	34	9	819	96.6	9.0
Post Closure	2120	7.3	77	4,186	14	0	6	2	15	36.8	13.1
Measured 2001 to 2023	Average	9.5	2,079	-	446	3	89	32	1,232	-	13.5

Table 5. Predicted trace metal levels in YDTI pool water for different simulation periods.

	Date	Aluminum	Iron	Manganese	Copper	Cadmium	Lead	Nickel	Zinc
Begin MR Operations	1986	0.342	0.003	0.004	1.34	0.004	0.002	0.009	0.43
Shutdown Period	2000	0.215	0.003	0.005	1.71	0.005	0.000	0.008	0.42
Current	2023	0.091	0.001	0.103	3.44	0.028	0.001	0.014	0.29
End Operations	2054	0.089	0.001	0.107	5.60	0.047	0.001	0.022	0.29
Active Closure									
Early Active Period	2064	0.002	0.001	0.152	3.34	0.025	0.002	0.014	0.30
Later Active Period	2075	0.003	0.001	0.169	3.15	0.023	0.002	0.013	0.31
Post Closure	2120	0.001	0.001	0.0004	0.002	0.000	0.000	0.002	0.01
Passive Closure									
Early Active Period	2064	0.002	0.000	0.0166	3.597	0.008	0.001	0.018	0.22
Later Active Period	2075	0.002	0.000	0.0081	1.602	0.004	0.001	0.010	0.10
Post Closure	2120	0.001	0.001	0.0004	0.002	0.000	0.000	0.002	0.01
Measured	Average	0.227	0.697	0.105	0.027	0.03	0.004	0.014	0.04

Table 6. Predicted minor trace metal levels in YDTI pool water for different simulation periods.

	Date	Fluorine	Antimony	Arsenic	Mercury	Selenium	Thallium	Uranium
Begin MR Operations	1986	0.29	0.000	0.0000	0.0018	0.002	0.035	0.01
Shutdown Period	2000	0.19	0.001	0.0009	0.0001	0.001	0.001	0.02
Current	2023	0.53	0.004	0.0000	0.0014	0.003	0.003	0.01
End Operations	2054	0.59	0.003	0.0000	0.0021	0.002	0.002	0.02
Active Closure								
Early Active Period	2064	0.75	0.005	0.0000	0.0013	0.004	0.003	0.02
Later Active Period	2075	0.83	0.005	0.0000	0.0012	0.004	0.003	0.02
Post Closure	2120	0.02	0.000	0.0022	0.0000	0.001	0.000	0.00
Passive Closure								
Early Active Period	2064	0.03	0.003	0.0012	0.0014	0.002	0.002	0.02
Later Active Period	2075	0.01	0.002	0.0016	0.0007	0.001	0.001	0.01
Post Closure	2120	0.02	0.000	0.0022	0.0000	0.001	0.000	0.00
Measured	Average	1.971	NM	0.001	NM	0.01	0.155	NM

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Parkhurst, David L. 1995. User's guide to PHREEQC : a computer program for speciation, reaction-path, advective-transport, and inverse geochemical calculations. Lakewood, Colo. : Denver, CO :U.S. Dept. of the Interior, U.S. Geological Survey ; Earth Science Information Center, Open-File Reports Section.

Attachment 1 Geochemical Characteristics of Tailings

Sample Collection and Tailings Characteristics

Three tailings samples used for this study included a whole tailings, which was collected as a slurry in the mill. Both solids and decant fluids were analyzed (Table 1 and 2). Two grab samples were collected from the beach: one near the spigot point on the west side of the impoundment (TB-010623-02) and one near the pool (TB-010623-01).

The whole tailings sample (Figure 2) had a slightly positive Net Neutralization Potential (NNP), which is the difference between the Acid Neutralization Potential (ANP in kg/t as $CaCO_3$) minus the Acid Generation Potential (AGP in kg/t as $CaCO_3$). The whole tailings had considerably lower pyritic sulfur and higher ANP than most historic tailings samples collected between 1998 and 2017. As such, the kinetic test results were expected to be more benign than might be expected from average Continental Pit tailings. The beach tailings were similar to historic tests and were on the low end of ANP, making them more typical of worst-case Continental Pit tailings. Results of static tests on Continental and Berkeley Pit waste rock samples used for kinetic tests (Newbrough and Gammons, 2002) are also shown for comparison (Figure 2). Continental tailings and waste rock were similar while Berkeley Pit had close to 3 times higher pyrite and lower ANP than Continental samples.

Static test results for samples from the beach near the spigot point and the pool were geochemically similar except for higher sulfate near the pool, probably as a result of evaporative accumulation of salts from the pool fringe. The similar pyrite levels in these two samples indicates that little if any preferential segregation of sulfides occurs near the discharge point. At some mines, preferential settling of sulfides has been observed, likely caused by the higher specific gravity of sulfides. All tailings samples had similar gradation with more than 99- % of material passing a 35 mesh sieve (500 micron). The near-pool sample had slightly more fines with 24 % finer than 270 mesh (50 micron) versus 15 % finer than 50 micron size in whole tailings and the sample near the spigot point.

The process water associated with the whole tailings sample was typical of process water at MR showing a slightly alkaline pH (8.6 S.U.), moderate TDS (2560 mg/L), calcium-sodium-sulfate type water, and generally low to non-detectable metals (Table 3). Process water chemistry was similar to historical conditions for the Continental Mill process.

Figure 1. Location of whole tailings, and beach samples near spigot and near-pool.

Table 1. Static test results for pre and post test conditions.

CLIENTID	MTPH-011823-01 (Whole tailings)		TB-010623-01 (Beach near pool)		TB-010623-02 (Beach near spigot)	
	Pre	**Post**	**Pre**	**Post**	**Pre**	**Post**
Acid Generation Potential (non sulfate Sulfur)	19.1	20.6	41.9	44.1	43.4	37.2
Acid Neutralization Potential	25.0	20.6	15.0	13	15	14
Acid-Base Potential (non sulfate Sulfur)	5.9	0.4	-26.9	-31.1	-26.4	-23.2
Net Acid Generation Procedure pH	4.5	4.3	2.7	2.7	2.6	2.8
Net Neutralization Potential	3.8	1.3	-40.9	-40.1	-30.3	-32.3
Neutralization Potential as $CaCO_3$	2.5	2.1	1.5	1.3	1.5	1.4
pH, Saturated Paste	7.7	7.9	7.8	7.7	7.5	8
Sulfur HCl Residue	0.61	0.66	1.34	1.41	1.39	1.19
Sulfur HNO3 Residue		0.01	0.02	0.01	0.02	0.01
Sulfur Organic Residual		0.01	0.02	0.01	0.02	0.01
Sulfur Pyritic Sulfide	0.61	0.66	1.32	1.4	1.37	1.19
Sulfur Sulfate	0.07	0.01	0.45	0.29	0.06	0.29
Sulfur Total	0.68	0.63	1.79	1.7	1.45	1.48
Total Sulfur minus Sulfate	0.61	0.66	1.34	1.41	1.39	1.19

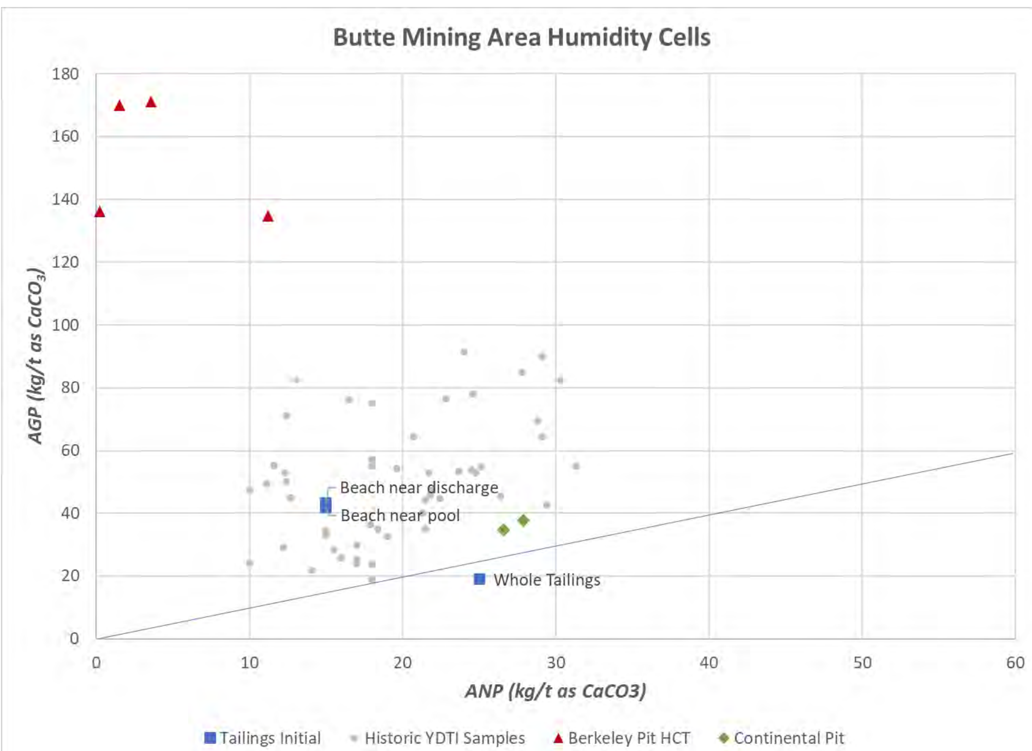

Figure 2. Comparison of Yankee Doodle tailings samples to historic quarterly tests (1998 – 2017), and humidity cell tests on Berkeley Pit and Continental waste rock (Newbrough and Gammons, 2002)

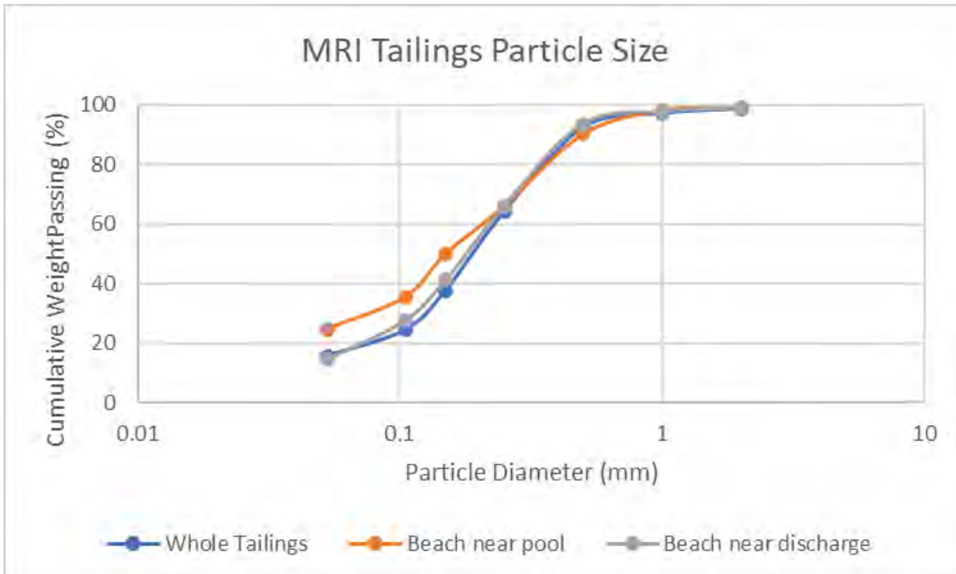

Figure 3. Gradation curves for tailings samples.

Table 2. Process water quality for sample MTPH-011823-01.

Constituent (mg/L unless otherwise shown)	**MTPH-011823-01**
pH S.U.	8.6
Conductivity @25C uS/cm	2560
Total Alkalinity	41.9
Acidity as CaCO3	12
Hardness as CaCO3 (dissolved)	1380
Calcium	553
Magnesium	0.4
Sodium	105
Potassium	42.1
Sulfate	1500
Bicarbonate as CaCO3	16.8
Carbonate as CaCO3	25.1
Chloride	54.6
Fluoride	0.85
Silica	20.5
Nitrate/Nitrite as N	0.525
Nitrogen, total Kjeldahl	0.8
Total Nitrogen, calc	1.3
Aluminum	<0.1
Antimony	<0.0008
Arsenic	<0.00144
Barium	<0.029
Beryllium	<0.00016
Cadmium	<0.0001
Chromium	<0.001
Cobalt	<0.04
Copper	<0.02

Constituent (mg/L unless otherwise shown)	MTPH-011823-01
Iron	<0.12
Lead	<0.0002
Lithium	<0.016
Manganese	<0.00002
Mercury	<0.0002
Nickel	<0.016
Selenium	0.00481
Silver	<0.0002
Thallium	<0.0002
Uranium	<0.00022
Vanadium	<0.02
Zinc	<0.012

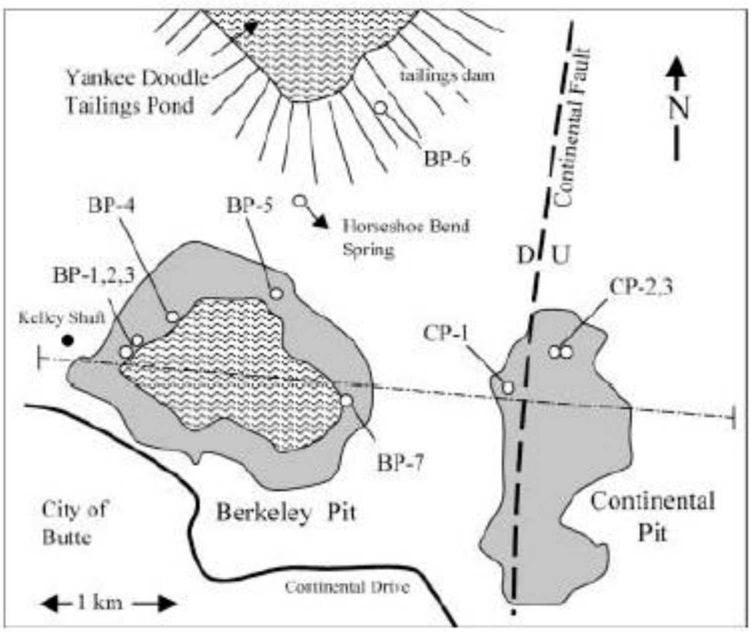

Figure 4. Map from Newbrough and Gammons showing location of humidity cell samples.

Humidity Cell Test Results

The humidity cell tests were conducted for 64 weeks at ACZ Lab using standard methods (ASTM 2018). One liter of solution was added each week to rinse the 1 kg sample and pH, Eh, TDS, sulfate, acidity, alkalinity, calcium, magnesium, and iron were measured. A complete suite of metals and major ions (Acidity as CaCO3, Aluminum, Antimony, Arsenic, Barium, Beryllium, Bicarbonate as CaCO3, Cadmium, Calcium, Carbonate as CaCO3, Chloride, Cobalt, Conductivity, Copper, Fluoride, Hardness as CaCO3, Hydroxide as CaCO3, Iron, Lithium, Magnesium, Manganese, Mercury, Nickel, Nitrate/Nitrite as N, Nitrogen, total Kjeldahl, Oxidation Reduction Potential (Eh),pH (pH, SU), Potassium, Residue, Filterable

(TDS) @180C, Selenium, Silica, Silver, Sodium, Sulfate, Thallium, Total Alkalinity, Total Nitrogen, Uranium, Vanadium, and Zinc) were measured in weeks 0, 1, 2, 4 and every 4^{th} week thereafter.

Major Ion Chemistry

All tailings samples in this study remained neutral in pH for more than a year of testing (Figure 5). Solutions extracted during testing had very low to non-detectable levels of metals, were moderately alkaline, and had initially moderate levels of major ions (mostly sulfate, calcium and sodium) that declined through the tests and transitioned to a calcium bicarbonate dominated water.

Alkalinity in HCT samples (Figure 6) generally averaged 20 mg/L in the sample from near the spigot point, to 40 mg/L in the whole tailings and near-pool sample. Initial alkalinity in all tests was slightly lower the first few weeks of the test. Total dissolved solids (TDS, Figure 7) ranged from 1,000 to 2,000 mg/L through about week 5 as process solution and soluble weathering products (likely gypsum) were rinsed from the samples. After week 10, TDS stabilized around 50 to 60 mg/L where calcium and bicarbonate were the primary ions.

Sulfate levels (Figure 8) peaked at 400 to 700 mg/L in initial weeks as process solution and sulfide oxidation by-products were rinsed from the samples and then decreased to a steady release of 10 to 20 mg/L. Calcium (Figure 9) was the primary cation in solution and served as a sulfate counter-ion. Initial calcium levels were around 150 to 250 mg/L and decreased in the long-term to about 20 mg/L. Magnesium (Figure 11) was fairly low throughout the HCTs indicating minor release of magnesium from primary minerals in Continental Pit tailings. Bicarbonate (Figure 11) remained elevated at 20 to 40 mg/L throughout the test indicating gradual dissolution of calcite at rates higher than would be dictated by the rate of acid release due to sulfide oxidation. During initial weeks of the tests, a small amount of sodium (Figure 12) and chloride (Figure 13) were released but were virtually absent after week 8.

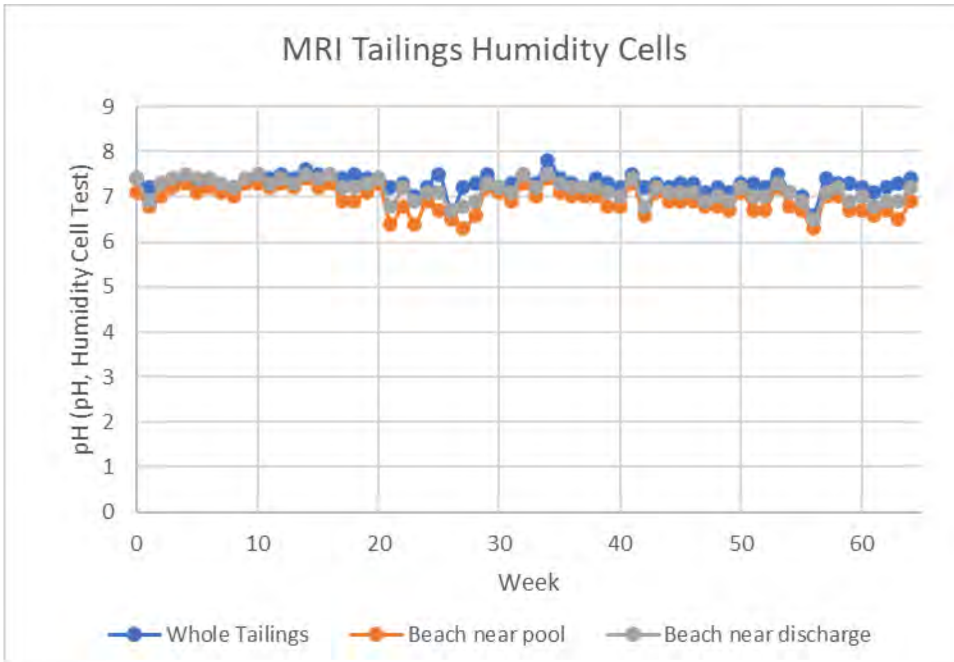

Figure 5. pH in humidity cell tests.

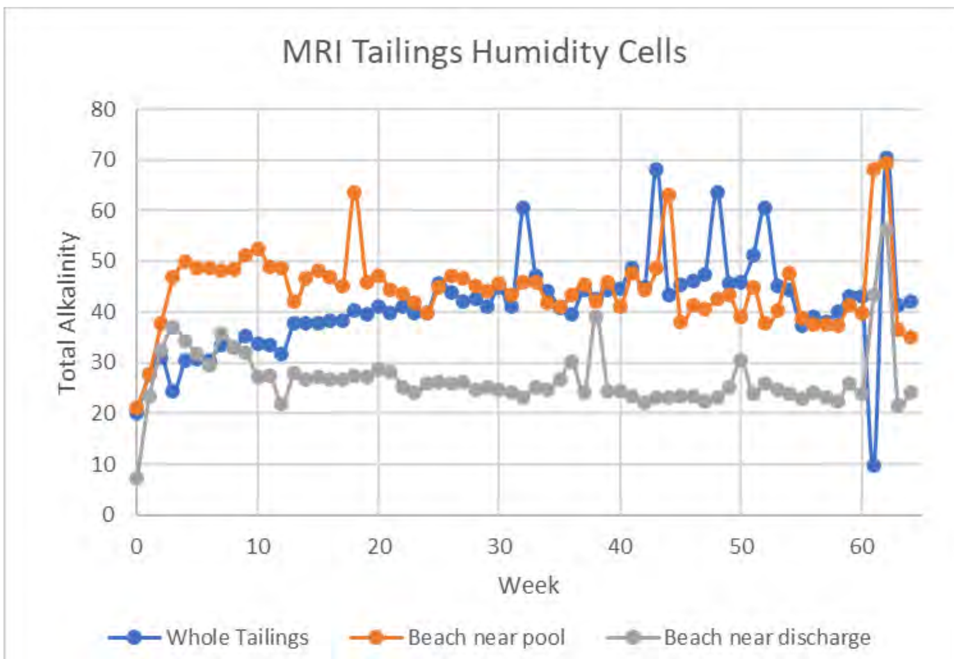

Figure 6. Alkalinity in humidity cell tests.

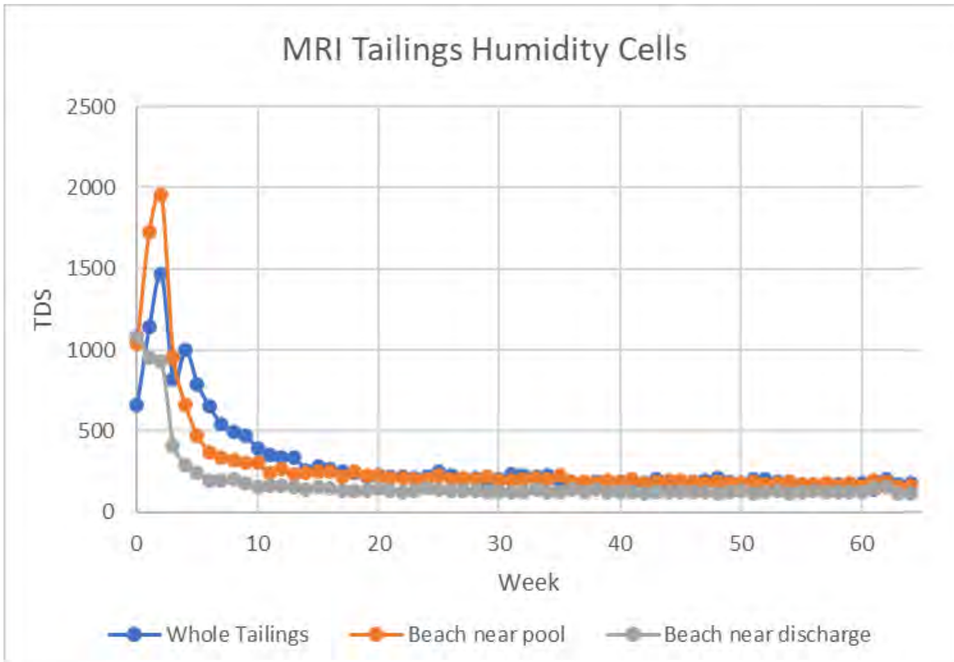

Figure 7. Total Dissolved Solids in humidity cell tests.

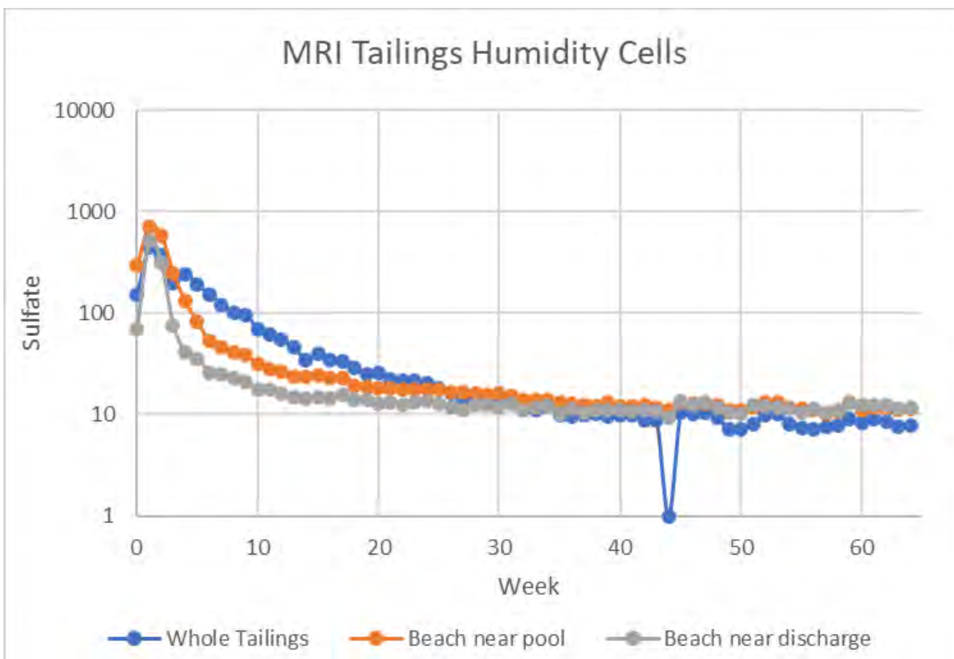

Figure 8. Sulfate in humidity cell tests.

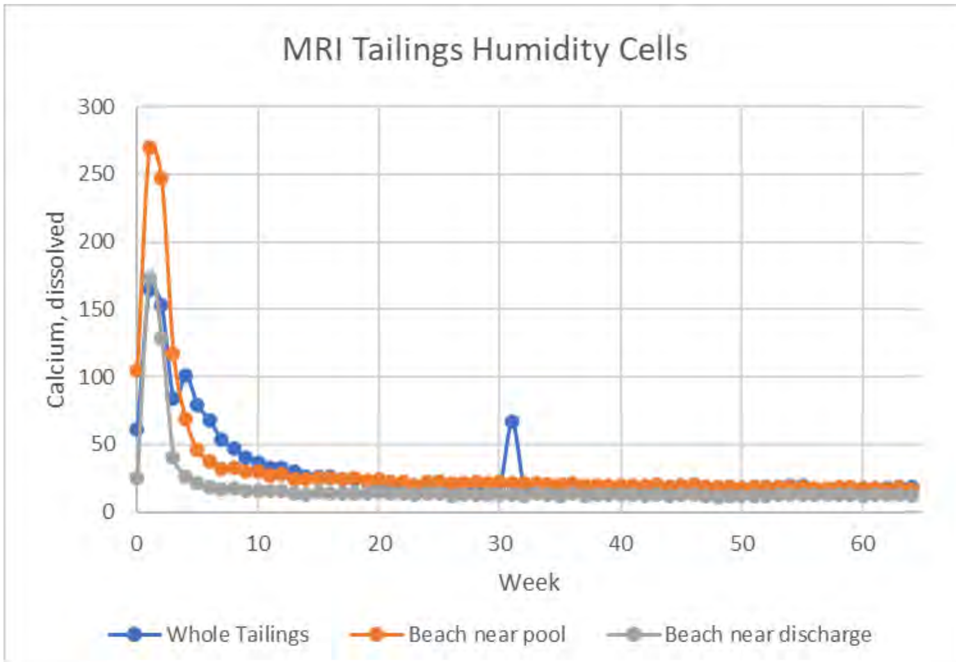

Figure 9. Calcium in humidity cell tests.

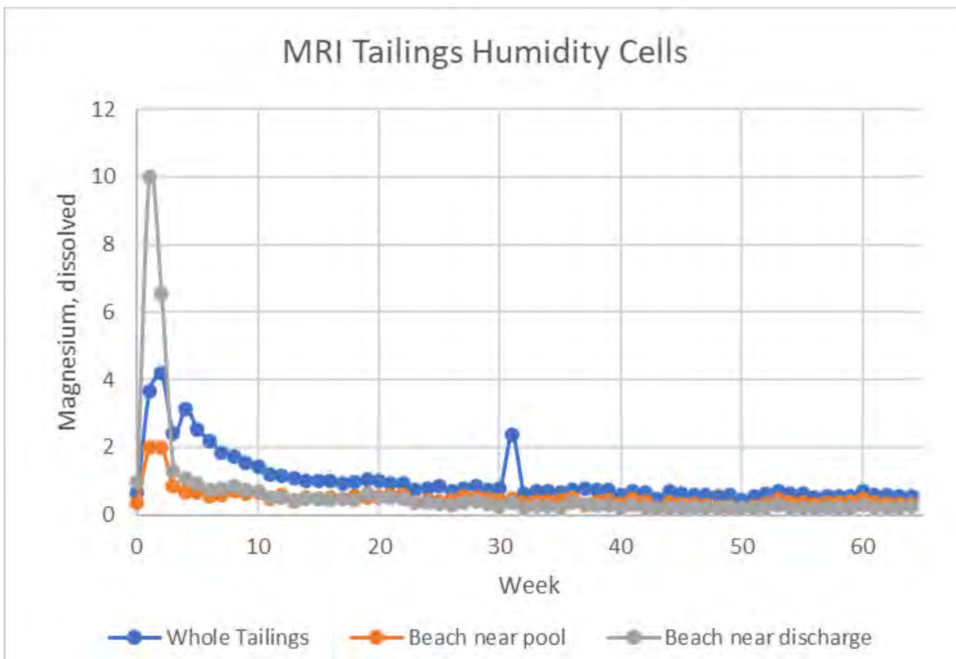

Figure 10. Magnesium in humidity cell tests.

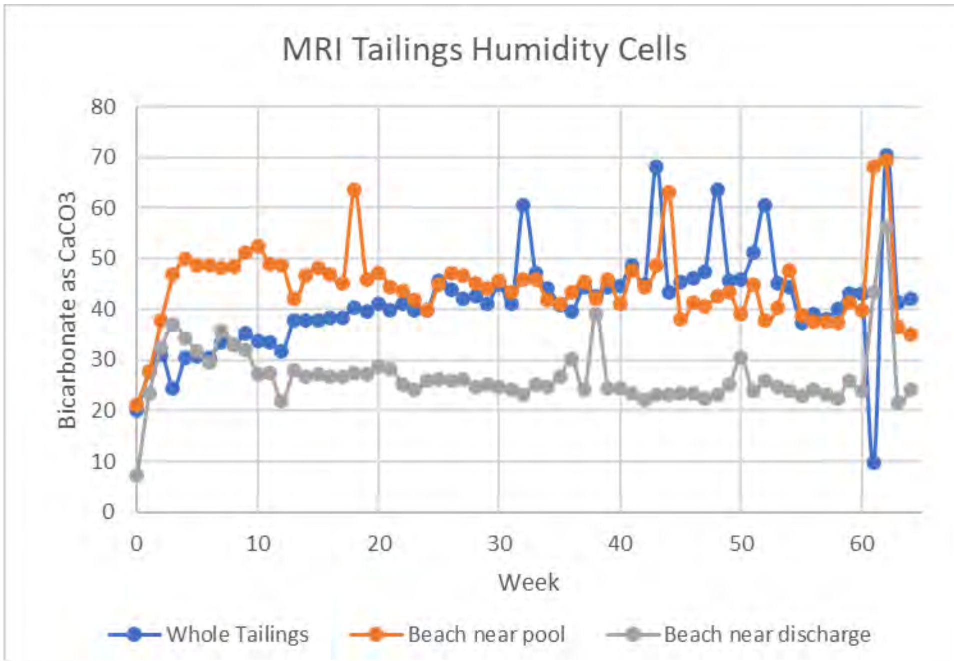

Figure 11. Bicarbonate in humidity cell tests.

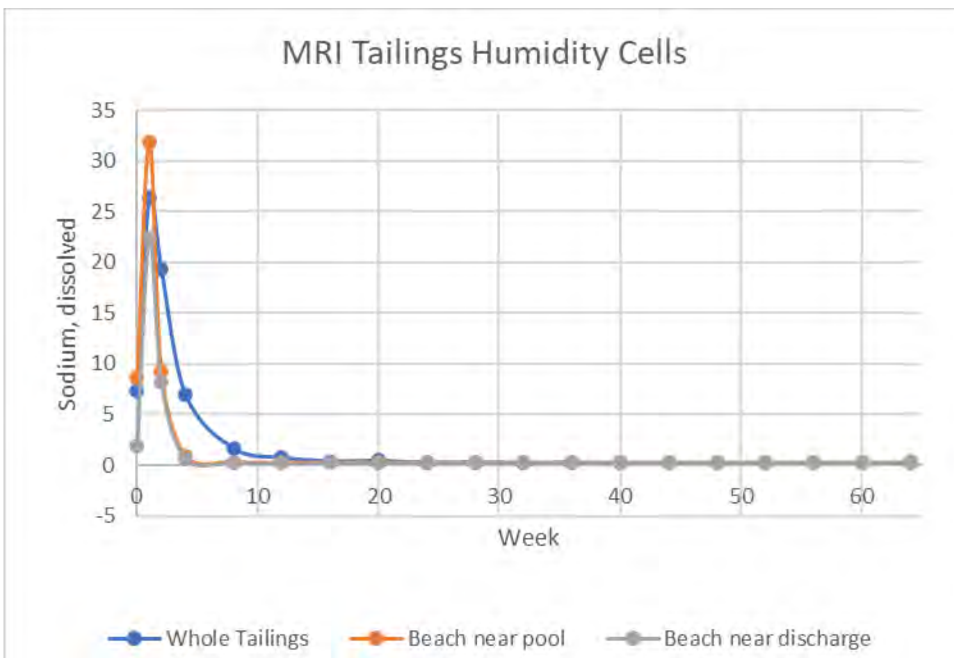

Figure 12. Sodium in humidity cell tests.

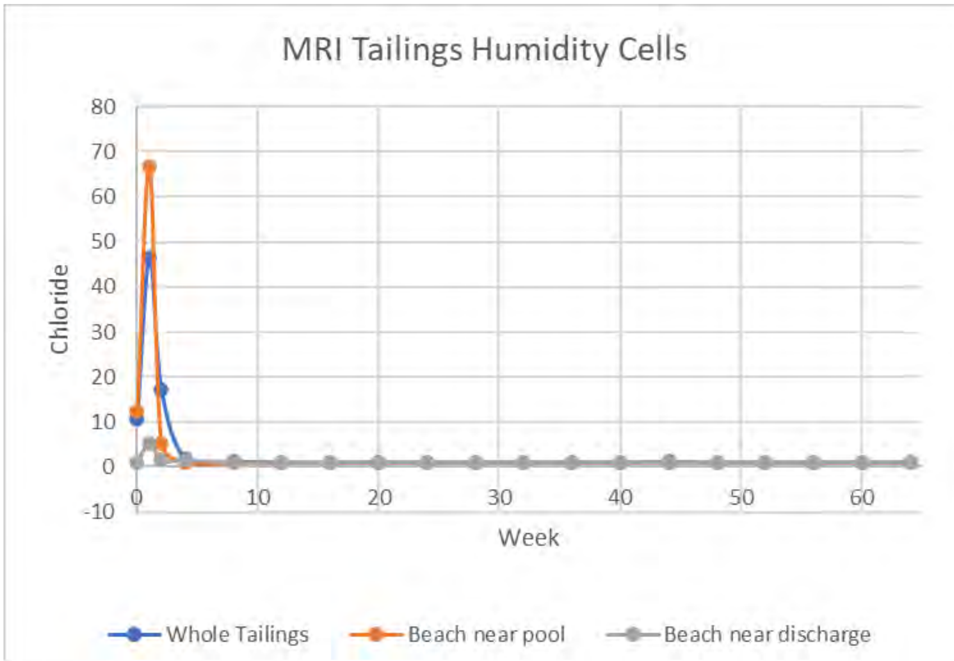

Figure 13. Chloride in humidity cell tests.

Inferred Pyrite Oxidation Rate and Likely Solid Phase Controls on Contact Water

The quantity of major ions in humidity cell leachates can be used to infer important processes occurring in the sample matrix such as the rate of sulfide oxidation, the pace of ANP and AGP depletion, and the likely source of ANP. Figure 14 shows the inferred rate of sulfide oxidation based on the amount of sulfate detected. The oxidation rate is shown as a "turnover rate" that implies that pyrite follows first order decay kinetics in alkaline solutions. Authors differ on this topic. Pyrite reaction kinetics are more complex owing to different reaction pathways being possible at different pH ranges and also because of complexity caused by potential restriction of oxygen diffusion across varying water content and because of potential accumulation of iron oxyhydroxides near the pyrite particle at alkaline pH. Despite these complexities, the assumed first order decay provides a useful first approximation of long-term sulfide reaction.

The initial turnover rate was near 1 % release per week from remaining pyritic sulfur. Turnover rate quickly decreased over 10 weeks and approached a plateau of 0.05 % per week. The initial rate overestimates sulfide oxidation because most of the initial sulfur release is from dissolved sulfate in interstitial water or from dissolution of gypsum. The longer-term turnover rate is considered more reflective of sulfide behavior in Continental Pit ore and is consistent with high temperature pyrite. Pyritic sulfur turnover rate in humidity cell tests conducted on Nevada epithermal gold deposits ranges up to 1 %/week and higher; more than 20 times the rate observed in the Yankee Doodle tailings. These results indicate that sulfides in Continental ore are at the low end of reactivity of sulfides from different geologic settings. As a result.

long-term oxidation of sulfides in the Yankee Doodle tailings can be expected to remain very slow.

The inferred rate of depletion in ANP and AGP was estimated from soluble sulfate and calcium in the humidity cell extracts (Figure 15). According to the stoichiometry of sulfide oxidation [1] and acid neutralization in [2], the ratio of ANP and AGP depletion should be 1:1. If acid neutralization follows [3], the ratio would be 2:1 ANP:AGP. In the humidity cell tests, the ANP:AGP depletion rates start at about 1:1, probably because most calcium and sulfate in the early test phase is from gypsum that has a 1:1 Ca:S molar ratio as in [1 and 2]. Later in the test the ANP:AGP ratio climbs to a ratio of between 3 and 5 depending on the sample. These higher ANP depletion rates likely indicate that calcite is being depleted **both** by acid neutralization and due to simple calcite dissolution not driven acid neutralization. The high leaching environment in the humidity cell tests greatly overestimates the calcite dissolution that would occur under field conditions.

The estimated ANP and AGP depletion over 64 weeks of testing are presented graphically in Figure 16. The estimated final ANP based on the depletion rate slightly underestimates the ANP measured at the close of the test, indicating that some calcium may be released from a non-carbonate minerals such as feldspar. Average ANP and AGP depletion rates were extrapolated over a longer duration for a hypothetical tailings starting ANP of 15 kg/t as CaCO3 and AGP of 44. The depletion curve shows that ANP would be fully depleted allowing acidic conditions to develop after about 5 years of humidity cell testing.

The depletion rate in the humidity cell test would be much faster than under field conditions. The cold field temperatures in winter would virtually stop acid production in winter (decreasing depletion rate by 50 %), and rates would be slower even for the remainder of the year because average April to September temperature (53 F, NOAA – Burt Mooney Airport) is still lower than lab conditions (72 F) (decreasing rates another 25 %). Consequently, field pH in average tailings material at about 25 % of the lab HCT rate would not be likely become acidic until 20 years of weathering. Owing to variations in sulfide and ANP content, some materials may trigger somewhat earlier (in 10 years over a portion of the beach). At closure, the beach is likely to be covered with a cover-soil layer before acidification could occur. After cover placement, oxidation would be further reduced due to reduced oxygen flux and any acidity that develops would be separated from contact water by the cover layer.

$$FeS_2 + 15/4\ O_2 + 7/2\ H_2O => Fe(OH)_3^{-1} + 2SO_4^{-2}\ 4\ H^+ \qquad [1]$$

$$4\ H^+ + 2CaCO_3 = 2\ CO_2 + 2\ H_2O + 2\ Ca^{+2} \qquad [2]$$

$$4\ H^+ + 4CaCO_3 = 4\ HCO_3^{-1} + 4\ Ca^{+2} \qquad [3]$$

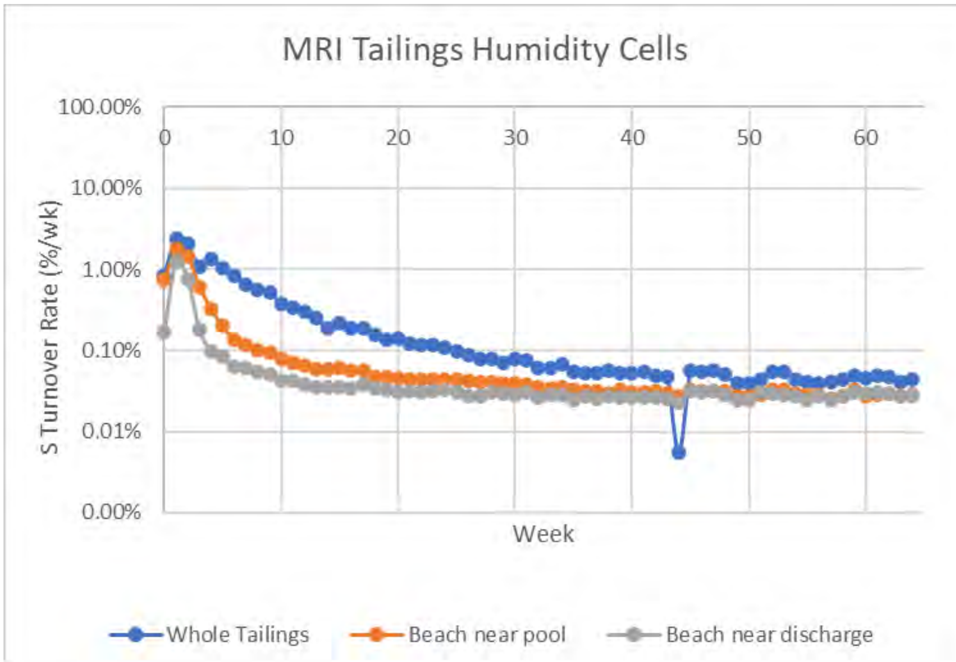

Figure 14. Sulfide sulfur turnover rate in humidity cell tests.

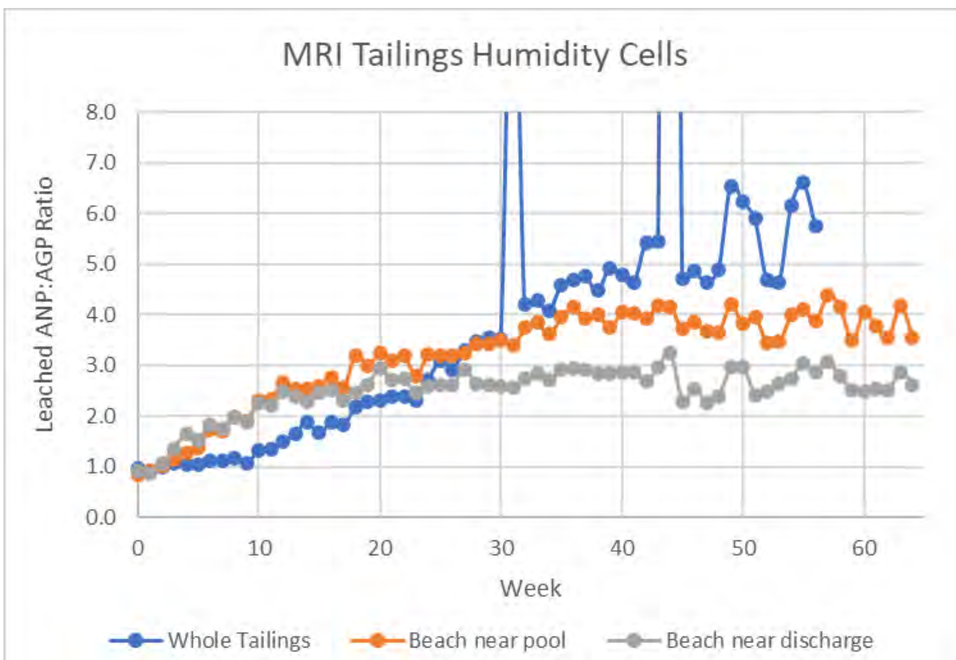

Figure 15. Ratio of estimated ANP over AGP depletion rate in humidity cell tests.

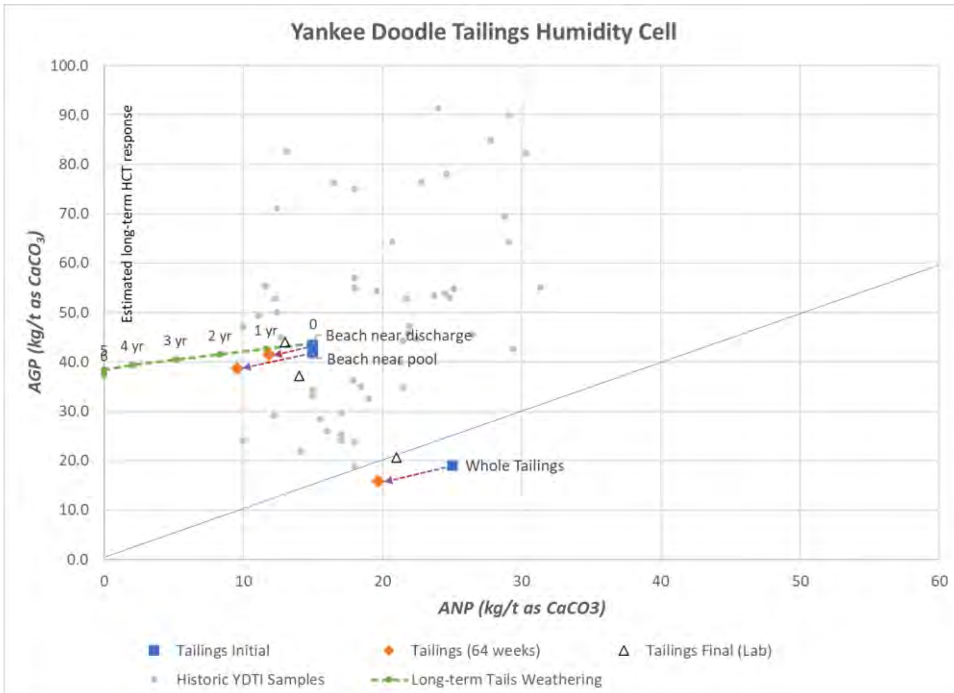

Figure 16. Changes in ANP and AGP in HCT samples through time.

Comparison to Berkeley and Continental Waste Rock

Newbrough and Gamons (2002) ran humidity cell tests on 4 samples of Berkeley Pit waste and 2 Continental wastes (Figure 17 and 8). Comparison with the Yankee Doodle tailings results are useful because many contact waters around Butte such as the Berkeley Pit and Horseshoe Springs are influenced by the Berkeley-type waste rock. The Yankee Doodle tailings HCT solutions were much higher in pH and lower in sulfate than the Berkeley wastes indicating that Berkeley Pit and Horseshoe Springs are not a useful analogue of water contacting the Yankee Doodle tailings beach, even after years of oxidation. The tailings would be expected to have much lower acidity, sulfate and metals than these waters.

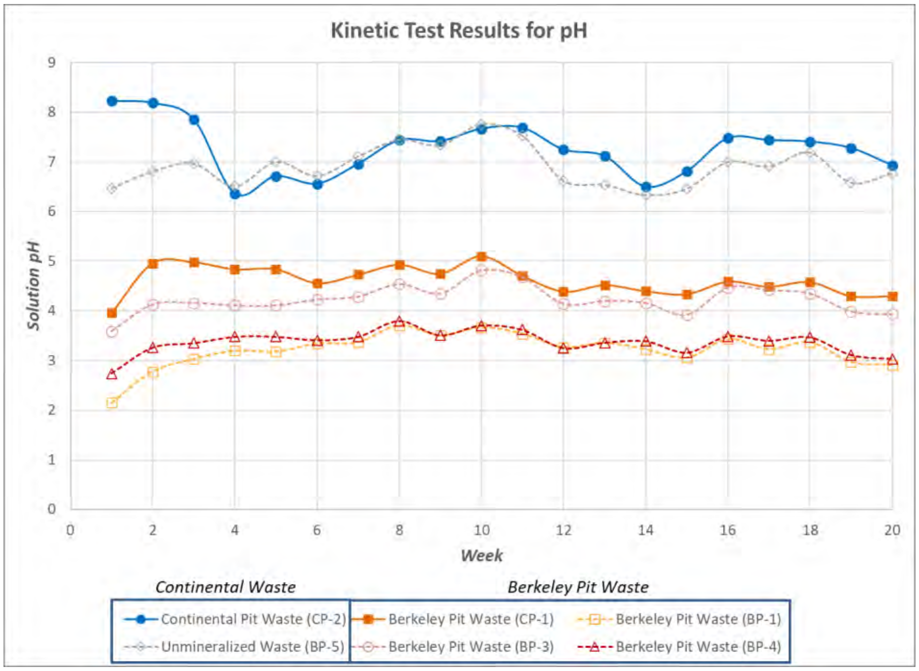

Figure 17. Solution pH in Newbrough and Gammons HCT samples.

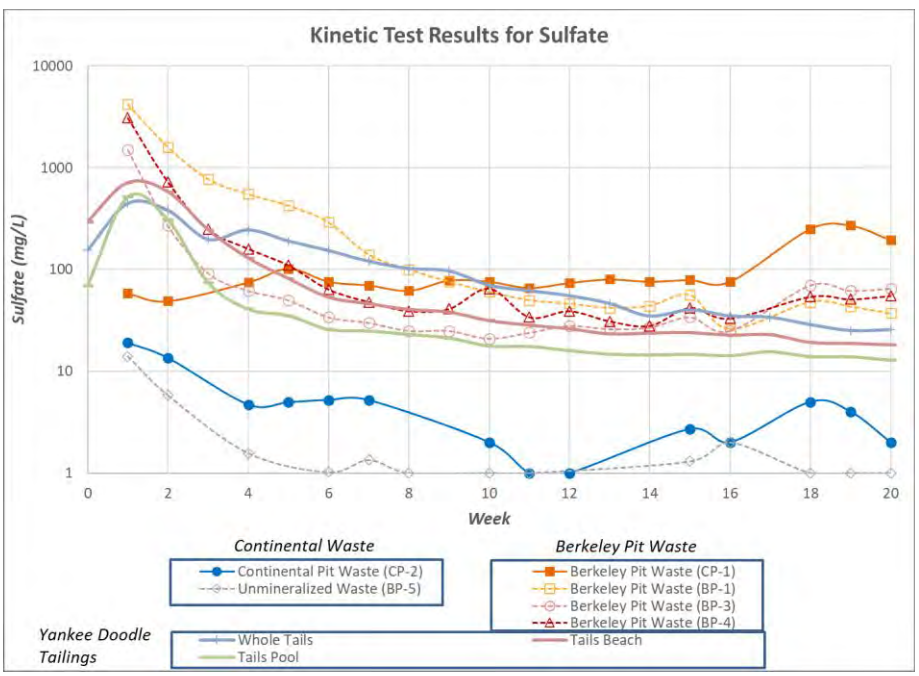

Figure 18. Sulfate in Newbrough and Gammons HCT samples.

Trace Metals

Weekly trends in several metals (Antimony, Arsenic, Fluoride, Manganese, Selenium, Silica, And Uranium) are shown in Figures 19 through 24). These metals and silica were present at low and decreasing levels during the HCTs. Remaining metals (Aluminum, Barium, Beryllium, Cadmium, Chromium, Cobalt, Copper, Iron, Lead, Lithium, Magnesium, Mercury, Nickel, Silver, Thallium, And Vanadium) were generally below detection level with the possible exception of the first few weeks of testing.

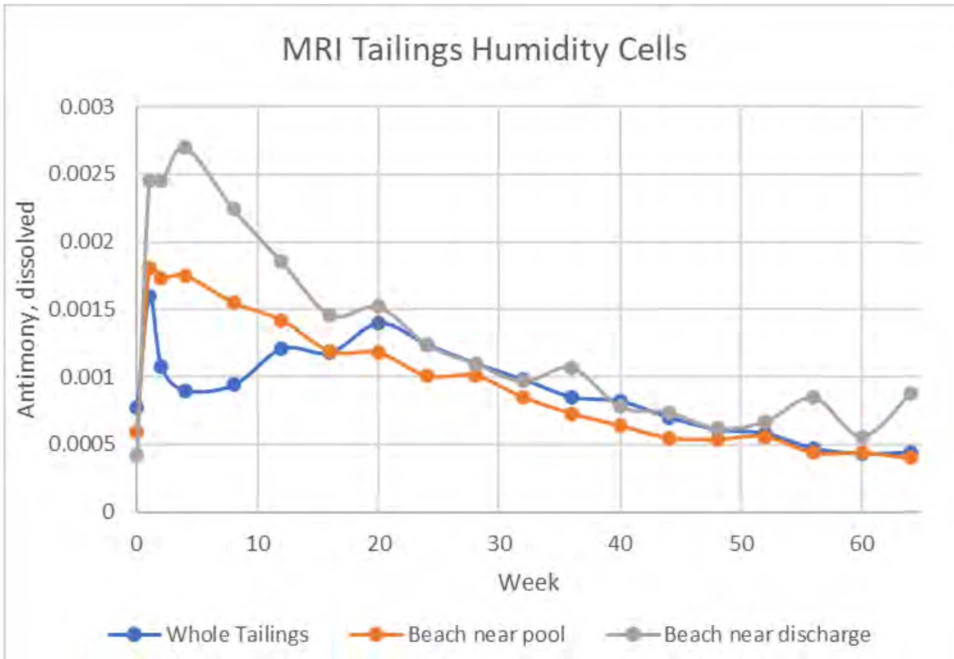

Figure 19. Antimony in humidity cell tests.

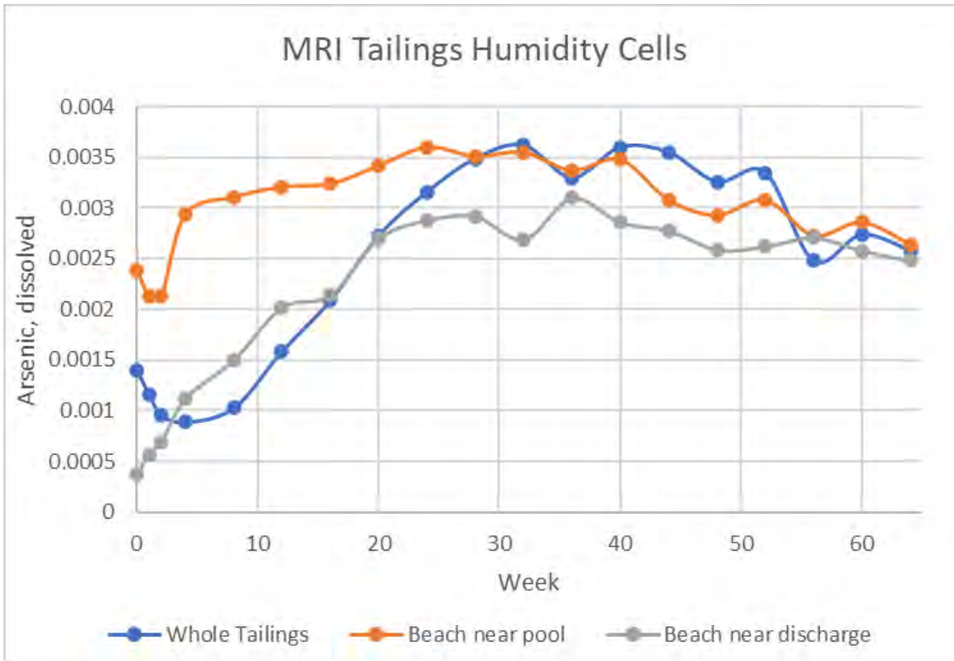

Figure 20. Arsenic in humidity cell tests.

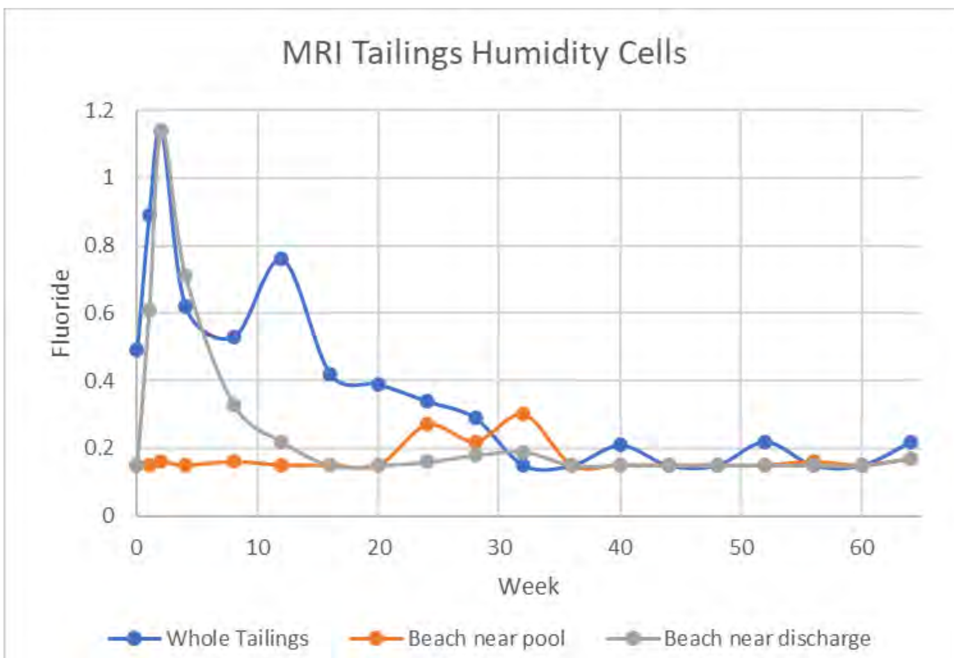

Figure 21. Fluoride in humidity cell tests.

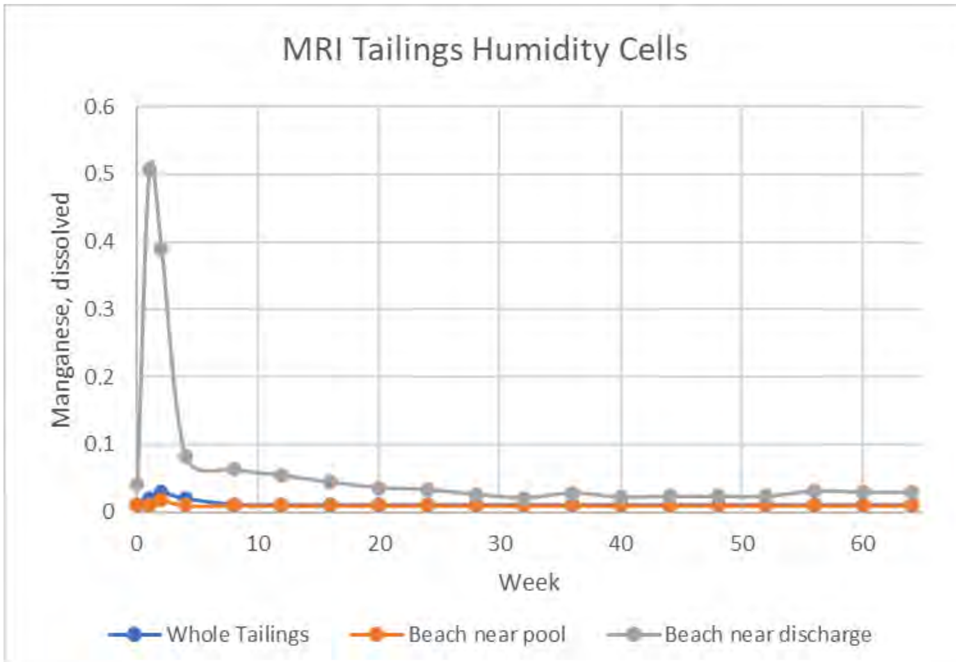

Figure 22. Manganese in humidity cell tests.

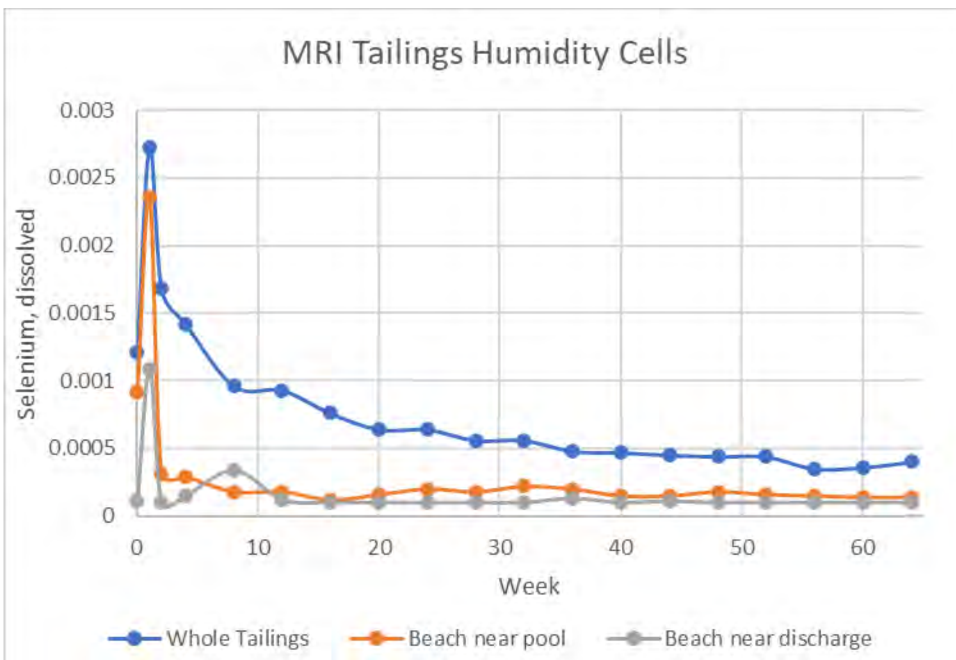

Figure 23. Selenium in humidity cell tests.

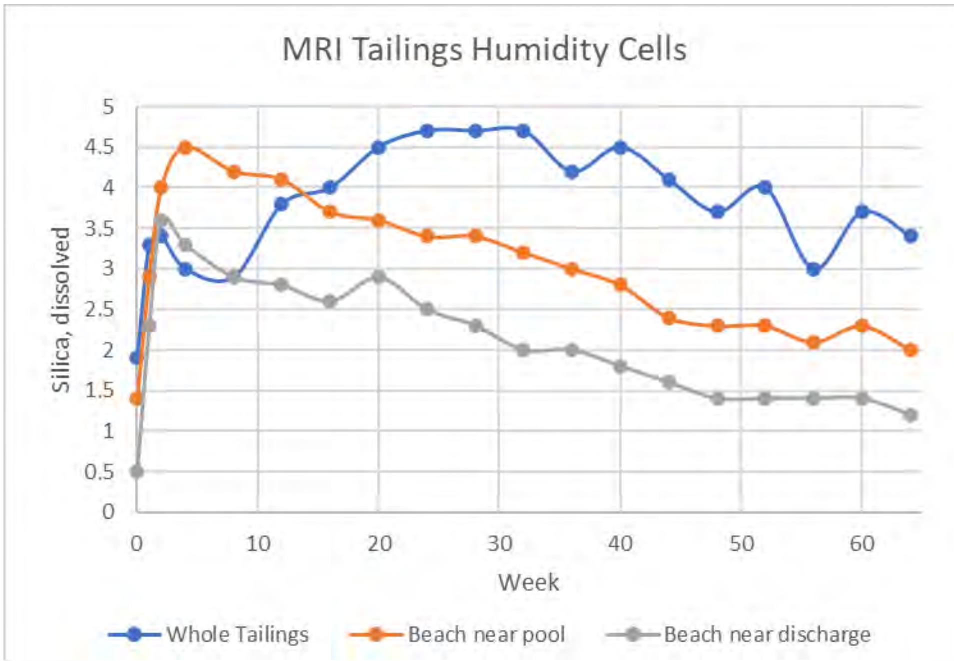

Figure 24. Silica in humidity cell tests.

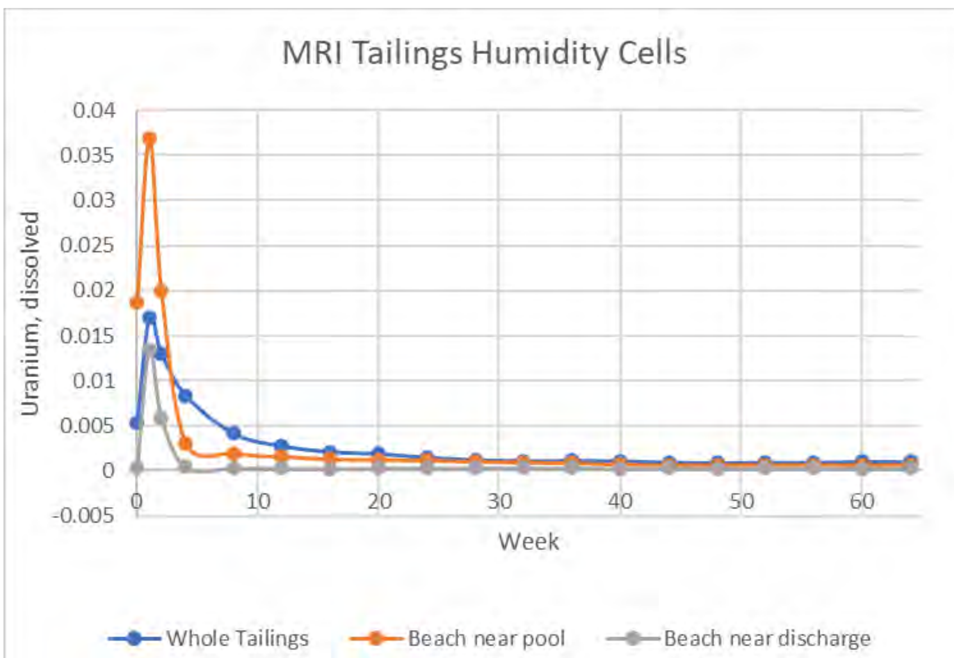

Figure 25. Uranium in humidity cell tests.

Simulating Beach Contact Water in Post Closure

Operational Period

Tailings are continuously placed during mine operation so that only relatively fresh tailings exist in the zone of oxidation near the tailings surface. Additionally, any water running off the facility is likely to be dominated by excess process water that is collected in the pool. As a result, chemical loading during this phase is best represented by process water chemistry.

Early Closure Stage

After closure, the process water component will be gradually removed by precipitation and contact water chemistry could be represented by the load release measured in the humidity cells. It is probable that humidity cells underestimate the major ion concentrations during this phase because HCT tests have a much higher leaching rate than occurs under field conditions. However, the overall balance of ions, the alkaline pH, and the low metals should persist during the first 5 to 10 years after closure. For this early post-closure stage, runoff water could be simulated by using average HCT water quality in PHREEQC, and the higher expected major ion contribution could be simulated by adding a solid phase gypsum in PHREEQC (Table 3).

Long-Term Post Closure

After cover placement water contacting the tailings beach will interact with the cover soil layer rather than the tailings and runoff water quality should resemble natural runoff.

Table 3. Water quality used to simulate runoff from the Yankee Doodle Tailings beach for different time periods.

Constituent	Process Solution MTPH-011823-01	HCT Beach Tails Average week 40 - 64	HCT Beach Tails Average week 40 – 64 plus gypsum	Upgradient SW (Ave WQ-15, WQ-10, WQ-11)
pH	8.6	6.9	6.9	7.6
Conductivity @25C	2560	86	86	206
TDS @ 180 oC	2321	54	2217	141
Total Alkalinity	42	35	35	86
Acidity as CaCO3	12	2	2	-34
Calcium	553	16	649	28
Magnesium	0	0	0	6
Sodium	105	0	0	7
Potassium	42	1	1	3
Sulfate	1500	12	1526	18
Bicarbonate as CaCO3	17	35	35	96
Carbonate as CaCO3	25.1	0	0	0
Chloride	54.60	1.00	1.00	1.00
Fluoride	0.85	0.15	0.15	0.14

Nitrate/Nitrite as N	0.53	0.02	0.02	0.10
Nitrogen, total Kjeldahl	0.8	0.2	0.2	NA
Total Nitrogen, calc	1.3	0.1	0.1	NA
Aluminum	0.100	0.080	0.080	1.69
Antimony	0.001	0.001	0.001	0.000
Arsenic	0.001	0.003	0.003	0.007
Barium	0.029	0.009	0.009	0.000
Beryllium	0.0002	0.0001	0.0001	0.0000
Cadmium	0.0001	0.0001	0.0001	0.0034
Chromium	0.001	0.001	0.001	NA
Cobalt	0.040	0.020	0.020	0.000
Copper	0.020	0.010	0.010	0.011
Iron	0.120	0.060	0.060	2.443
Lead	0.0002	0.0001	0.0001	0.0009
Lithium	0.016	0.008	0.008	NA
Manganese	0.020	0.018	0.018	0.045
Mercury	0.0002	0.0002	0.0002	NA
Nickel	0.016	0.008	0.008	0.150
Selenium	0.005	0.000	0.000	0.005
Silica	20.50	1.89	1.89	11.13
Silver	0.0002	0.0001	0.0001	NA
Thallium	0.0002	0.0001	0.0001	0.0151
Uranium	0.0002	0.0005	0.0005	0.0000
Vanadium	0.020	0.010	0.010	NA
Zinc	0.012	0.006	0.006	0.583

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ASTM. 2018. D5744-18 - Standard Test Method for Laboratory Weathering of Solid Materials Using a Humidity Cell. DOI: 10.1520/D5744-18.

Montana Resources LLP. Various years. Quarterly static test samples from the Yankee Doodle Tailings impoundment Annual reports (1998 to 2017) submitted to Montana DEQ.

Newbrough, P. and C.H. Gammons. 2002. An experimental study of water– rock interaction and acid rock drainage in the Butte mining district, Montana. Environmental Geology (2002) 41:705–719. DOI 10.1007/s00254-001-0453-3

Attachment 2

Water Quality Results

Scenario 1 – Active Water Management

Scenario 2 – Passive Closure

Table. Run 4 - Predicted chemistry in the YDTI Pool for active closure.

Date	Year	pH	Eh (mv)	Volume (ML)	TDS	pH	Aluminum	Antimony	Arsenic	Bicarbonate	Boron	Cadmium	Calcium	Carbonate	Chlorine	Chromium	Copper	Fluorine	Iron
1/1/1986	1	10.3	119	11678	593	10.27	0.34	0.0005	0.0000	0.25	0.027	0.00	140.91	0.22	6.31	0.001	1.345	0.288	0.0028
1/1/1987	2	10.2	121	13174	750	10.24	0.32	0.0005	0.0000	0.24	0.029	0.00	176.08	0.19	7.13	0.001	1.821	0.232	0.0026
1/1/1988	3	10.2	122	17564	930	10.21	0.30	0.0005	0.0000	0.22	0.029	0.01	216.55	0.18	7.88	0.001	2.167	0.249	0.0025
1/1/1989	4	10.2	123	18828	1,032	10.20	0.29	0.0005	0.0000	0.22	0.028	0.01	238.85	0.17	8.30	0.001	2.343	0.222	0.0024
1/1/1990	5	10.2	124	17026	1,138	10.18	0.29	0.0004	0.0000	0.21	0.028	0.01	262.75	0.16	8.70	0.001	2.543	0.214	0.0024
1/1/1991	6	10.2	125	13199	1,221	10.18	0.28	0.0004	0.0000	0.21	0.027	0.01	281.19	0.16	8.99	0.001	2.681	0.227	0.0023
1/1/1992	7	10.2	125	8964	1,309	10.17	0.28	0.0004	0.0000	0.20	0.027	0.01	300.72	0.15	9.30	0.001	2.826	0.255	0.0023
1/1/1993	8	10.2	125	6365	1,344	10.16	0.28	0.0004	0.0000	0.20	0.026	0.01	308.05	0.15	9.47	0.001	2.899	0.286	0.0023
1/1/1994	9	10.2	126	3169	1,449	10.15	0.27	0.0004	0.0000	0.20	0.027	0.01	332.10	0.15	9.94	0.001	3.180	0.323	0.0022
1/1/1995	10	10.2	126	2117	1,419	10.16	0.27	0.0004	0.0000	0.20	0.027	0.01	324.49	0.15	9.92	0.001	3.196	0.366	0.0022
1/1/1996	11	10.2	124	2155	1,217	10.18	0.28	0.0004	0.0000	0.21	0.031	0.01	275.77	0.16	10.91	0.001	2.758	0.351	0.0023
1/1/1997	12	10.2	122	6577	937	10.22	0.28	0.0005	0.0001	0.23	0.035	0.01	209.34	0.18	11.58	0.001	2.180	0.302	0.0025
1/1/1998	13	10.2	121	6379	869	10.23	0.25	0.0005	0.0003	0.23	0.037	0.01	192.52	0.19	12.39	0.001	1.930	0.249	0.0026
1/1/1999	14	10.2	120	6542	811	10.24	0.22	0.0005	0.0006	0.24	0.039	0.00	178.13	0.20	13.02	0.001	1.743	0.237	0.0027
1/1/2000	15	10.3	120	5981	782	10.25	0.21	0.0005	0.0009	0.24	0.041	0.00	171.05	0.20	13.47	0.001	1.708	0.192	0.0027
1/1/2001	16	10.3	119	5454	710	10.27	0.21	0.0006	0.0011	0.25	0.041	0.00	153.43	0.22	13.07	0.002	1.579	0.027	0.0028
1/1/2002	17	10.3	118	4884	645	10.29	0.20	0.0006	0.0015	0.26	0.043	0.00	137.19	0.23	12.88	0.002	1.468	0.033	0.0029
1/1/2003	18	10.2	122	4583	888	10.22	0.23	0.0011	0.0006	0.23	0.043	0.01	202.11	0.18	13.23	0.002	1.692	0.211	0.0026
1/1/2004	19	10.2	126	7679	1,319	10.15	0.25	0.0017	0.0001	0.20	0.034	0.01	316.61	0.15	12.38	0.002	1.882	0.466	0.0022
1/1/2005	20	10.0	133	14018	1,751	10.02	0.20	0.0024	0.0001	0.15	0.027	0.01	429.77	0.09	12.38	0.002	1.927	0.557	0.0017
1/1/2006	21	9.8	144	19471	2,102	9.85	0.14	0.0030	0.0000	0.10	0.023	0.01	513.03	0.04	12.67	0.002	1.903	0.564	0.0011
1/1/2007	22	9.8	148	21928	2,277	9.77	0.12	0.0035	0.0000	0.08	0.020	0.01	550.83	0.03	12.78	0.002	1.854	0.532	0.0010
1/1/2008	23	9.7	151	22356	2,311	9.72	0.10	0.0039	0.0000	0.08	0.018	0.01	547.73	0.02	12.98	0.002	1.849	0.529	0.0009
1/1/2009	24	9.7	153	23649	2,330	9.69	0.10	0.0041	0.0000	0.07	0.016	0.01	546.18	0.02	12.92	0.002	1.795	0.538	0.0008
1/1/2010	25	9.7	154	24880	2,342	9.67	0.09	0.0043	0.0000	0.07	0.015	0.01	545.30	0.02	12.88	0.002	1.757	0.522	0.0008
1/1/2011	26	9.7	155	24358	2,358	9.65	0.09	0.0045	0.0000	0.06	0.014	0.01	544.02	0.02	12.99	0.002	1.748	0.520	0.0007
1/1/2012	27	9.6	156	24347	2,377	9.64	0.09	0.0047	0.0000	0.06	0.013	0.01	542.48	0.02	13.16	0.002	1.764	0.548	0.0007
1/1/2013	28	9.6	156	28406	2,360	9.65	0.09	0.0045	0.0000	0.06	0.015	0.01	543.92	0.02	12.49	0.002	1.692	0.504	0.0007
1/1/2014	29	9.6	156	33767	2,348	9.65	0.09	0.0044	0.0000	0.06	0.016	0.01	545.00	0.02	12.03	0.002	1.625	0.460	0.0007
1/1/2015	30	9.7	155	37938	2,345	9.65	0.09	0.0044	0.0000	0.06	0.016	0.01	545.25	0.02	12.01	0.002	1.608	0.414	0.0007
1/1/2016	31	9.6	156	38042	2,348	9.65	0.09	0.0044	0.0000	0.06	0.016	0.01	545.00	0.02	12.13	0.002	1.605	0.394	0.0007
1/1/2017	32	9.6	156	39142	2,349	9.65	0.09	0.0044	0.0000	0.06	0.015	0.01	544.82	0.02	12.19	0.002	1.588	0.411	0.0007
1/1/2018	33	9.7	155	39019	2,348	9.65	0.09	0.0043	0.0000	0.06	0.015	0.01	544.88	0.02	12.22	0.002	1.594	0.387	0.0007
1/1/2019	34	9.7	155	41242	2,343	9.66	0.09	0.0042	0.0000	0.07	0.014	0.01	545.17	0.02	12.15	0.002	1.622	0.396	0.0007
1/1/2020	35	9.7	155	37380	2,347	9.66	0.09	0.0041	0.0000	0.07	0.015	0.01	544.80	0.02	12.19	0.002	1.900	0.399	0.0007
1/1/2021	36	9.7	155	27977	2,354	9.66	0.09	0.0041	0.0000	0.06	0.015	0.02	544.15	0.02	12.29	0.002	2.147	0.425	0.0007
1/1/2022	37	9.7	155	22654	2,357	9.66	0.09	0.0040	0.0000	0.06	0.016	0.02	544.02	0.02	12.27	0.002	2.845	0.479	0.0007

Table. Run 4 - Predicted chemistry in the YDTI Pool for active closure.

Date	Year	pH	Eh (mv)	Volume (ML)	TDS	pH	Aluminum	Antimony	Arsenic	Bicarbonate	Boron	Cadmium	Calcium	Carbonate	Chlorine	Chromium	Copper	Fluorine	Iron
1/1/2023	38	9.7	155	20869	2,347	9.66	0.09	0.0037	0.0000	0.07	0.017	0.03	545.05	0.02	12.06	0.002	3.439	0.528	0.0008
1/1/2024	39	9.7	155	19006	2,347	9.67	0.09	0.0036	0.0000	0.07	0.017	0.03	545.09	0.02	12.04	0.002	3.975	0.550	0.0008
1/1/2025	40	9.7	155	18700	2,348	9.67	0.09	0.0035	0.0000	0.07	0.018	0.04	545.03	0.02	12.07	0.002	4.392	0.571	0.0008
1/1/2026	41	9.7	155	18683	2,350	9.67	0.09	0.0034	0.0000	0.07	0.019	0.04	544.87	0.02	12.13	0.002	4.685	0.578	0.0008
1/1/2027	42	9.7	155	18682	2,353	9.66	0.09	0.0034	0.0000	0.07	0.019	0.04	544.71	0.02	12.18	0.002	4.893	0.580	0.0008
1/1/2028	43	9.7	155	18729	2,355	9.66	0.09	0.0034	0.0000	0.07	0.019	0.04	544.58	0.02	12.22	0.002	5.040	0.581	0.0008
1/1/2029	44	9.7	155	18700	2,356	9.66	0.09	0.0034	0.0000	0.07	0.019	0.04	544.50	0.02	12.25	0.002	5.143	0.581	0.0008
1/1/2030	45	9.7	155	18673	2,357	9.66	0.09	0.0034	0.0000	0.07	0.019	0.04	544.46	0.02	12.26	0.002	5.215	0.582	0.0007
1/1/2031	46	9.7	155	18618	2,357	9.66	0.09	0.0034	0.0000	0.07	0.019	0.04	544.44	0.02	12.26	0.002	5.268	0.582	0.0007
1/1/2032	47	9.7	155	18677	2,357	9.66	0.09	0.0034	0.0000	0.07	0.020	0.05	544.42	0.02	12.26	0.002	5.308	0.584	0.0007
1/1/2033	48	9.7	155	18689	2,358	9.66	0.09	0.0034	0.0000	0.07	0.020	0.05	544.43	0.02	12.26	0.002	5.337	0.584	0.0007
1/1/2034	49	9.7	155	18663	2,358	9.66	0.09	0.0034	0.0000	0.07	0.020	0.05	544.45	0.02	12.25	0.002	5.361	0.584	0.0007
1/1/2035	50	9.7	155	18596	2,357	9.66	0.09	0.0034	0.0000	0.07	0.020	0.05	544.47	0.02	12.24	0.002	5.380	0.584	0.0007
1/1/2036	51	9.7	155	18661	2,357	9.66	0.09	0.0034	0.0000	0.07	0.020	0.05	544.47	0.02	12.24	0.002	5.398	0.586	0.0007
1/1/2037	52	9.7	155	18653	2,357	9.66	0.09	0.0034	0.0000	0.07	0.020	0.05	544.48	0.02	12.23	0.002	5.414	0.585	0.0007
1/1/2038	53	9.7	155	18591	2,357	9.66	0.09	0.0034	0.0000	0.07	0.020	0.05	544.50	0.02	12.22	0.002	5.428	0.586	0.0007
1/1/2039	54	9.7	155	18541	2,357	9.66	0.09	0.0034	0.0000	0.07	0.020	0.05	544.52	0.02	12.22	0.002	5.441	0.587	0.0007
1/1/2040	55	9.7	155	18604	2,357	9.66	0.09	0.0034	0.0000	0.07	0.020	0.05	544.52	0.02	12.21	0.002	5.455	0.588	0.0007
1/1/2041	56	9.7	155	18635	2,357	9.66	0.09	0.0034	0.0000	0.07	0.020	0.05	544.53	0.02	12.20	0.002	5.467	0.588	0.0007
1/1/2042	57	9.7	155	18571	2,357	9.66	0.09	0.0034	0.0000	0.07	0.020	0.05	544.54	0.02	12.20	0.002	5.478	0.588	0.0007
1/1/2043	58	9.7	155	18537	2,357	9.66	0.09	0.0034	0.0000	0.07	0.020	0.05	544.56	0.02	12.19	0.002	5.488	0.589	0.0007
1/1/2044	59	9.7	155	18626	2,357	9.66	0.09	0.0034	0.0000	0.07	0.020	0.05	544.57	0.02	12.18	0.002	5.498	0.590	0.0007
1/1/2045	60	9.7	155	18600	2,357	9.66	0.09	0.0034	0.0000	0.07	0.020	0.05	544.58	0.02	12.18	0.002	5.508	0.590	0.0007
1/1/2046	61	9.7	155	18553	2,357	9.66	0.09	0.0034	0.0000	0.07	0.020	0.05	544.60	0.02	12.17	0.002	5.518	0.590	0.0007
1/1/2047	62	9.7	155	18510	2,357	9.66	0.09	0.0034	0.0000	0.06	0.020	0.05	544.62	0.02	12.17	0.002	5.527	0.591	0.0007
1/1/2048	63	9.7	155	18603	2,357	9.66	0.09	0.0034	0.0000	0.06	0.020	0.05	544.63	0.02	12.16	0.002	5.537	0.593	0.0007
1/1/2049	64	9.7	155	18597	2,357	9.66	0.09	0.0034	0.0000	0.06	0.020	0.05	544.64	0.02	12.16	0.002	5.547	0.592	0.0007
1/1/2050	65	9.7	154	18547	2,357	9.67	0.09	0.0034	0.0000	0.07	0.020	0.05	544.19	0.02	12.15	0.002	5.558	0.592	0.0008
1/1/2051	66	9.7	155	18515	2,357	9.66	0.09	0.0034	0.0000	0.07	0.020	0.05	544.47	0.02	12.15	0.002	5.568	0.593	0.0007
1/1/2052	67	9.7	155	18582	2,357	9.66	0.09	0.0034	0.0000	0.07	0.020	0.05	544.58	0.02	12.14	0.002	5.579	0.595	0.0007
1/1/2053	68	9.7	155	18569	2,357	9.66	0.09	0.0034	0.0000	0.06	0.020	0.05	544.63	0.02	12.14	0.002	5.589	0.594	0.0007
1/1/2054	69	9.7	155	18544	2,357	9.66	0.09	0.0034	0.0000	0.06	0.020	0.05	544.66	0.02	12.14	0.002	5.600	0.595	0.0007
1/1/2055	70	9.7	155	18487	2,357	9.66	0.09	0.0034	0.0000	0.06	0.020	0.05	544.68	0.02	12.13	0.002	5.610	0.595	0.0007
1/1/2056	71	6.8	321	18558	2,417	6.85	0.00	0.0034	0.0000	10.07	0.020	0.05	542.11	0.00	12.16	0.002	5.588	0.599	0.0003
1/1/2057	72	7.0	312	21286	2,453	7.00	0.00	0.0041	0.0000	14.47	0.019	0.05	540.99	0.01	12.73	0.002	5.348	0.600	0.0007
1/1/2058	73	7.0	310	21443	2,464	7.03	0.00	0.0045	0.0000	15.50	0.019	0.04	540.51	0.01	13.11	0.002	5.116	0.525	0.0006
1/1/2059	74	7.1	309	19770	2,464	7.05	0.00	0.0047	0.0000	16.27	0.019	0.04	540.77	0.01	13.35	0.002	4.805	0.483	0.0006

Table. Run 4 - Predicted chemistry in the YDTI Pool for active closure.

Date	Year	pH	Eh (mv)	Volume (ML)	TDS	pH	Aluminum	Antimony	Arsenic	Bicarbonate	Boron	Cadmium	Calcium	Carbonate	Chlorine	Chromium	Copper	Fluorine	Iron
1/1/2060	75	7.1	308	16997	2,455	7.06	0.00	0.0048	0.0000	16.65	0.019	0.04	541.57	0.01	13.41	0.002	4.420	0.475	0.0006
1/1/2061	76	7.1	308	14085	2,445	7.06	0.00	0.0048	0.0000	16.68	0.019	0.03	542.39	0.01	13.36	0.002	4.089	0.516	0.0007
1/1/2062	77	7.1	308	11250	2,436	7.06	0.00	0.0048	0.0000	16.41	0.019	0.03	543.05	0.01	13.26	0.002	3.776	0.582	0.0007
1/1/2063	78	7.1	309	8725	2,428	7.05	0.00	0.0048	0.0000	16.12	0.019	0.03	543.70	0.01	13.13	0.002	3.522	0.658	0.0007
1/1/2064	79	7.0	310	7358	2,421	7.04	0.00	0.0048	0.0000	15.75	0.019	0.03	544.25	0.01	12.98	0.002	3.340	0.747	0.0007
1/1/2065	80	7.0	310	6746	2,416	7.03	0.00	0.0048	0.0000	15.45	0.019	0.02	544.59	0.01	12.86	0.002	3.235	0.808	0.0007
1/1/2066	81	7.0	310	6513	2,414	7.03	0.00	0.0047	0.0000	15.28	0.019	0.02	544.80	0.01	12.79	0.002	3.184	0.838	0.0007
1/1/2067	82	7.0	310	6517	2,413	7.02	0.00	0.0047	0.0000	15.20	0.019	0.02	544.88	0.01	12.76	0.002	3.164	0.851	0.0007
1/1/2068	83	6.9	318	6457	2,414	6.90	0.00	0.0047	0.0000	11.43	0.019	0.02	544.26	0.01	12.11	0.002	3.156	0.827	0.0007
1/1/2069	84	6.8	321	6504	2,414	6.84	0.00	0.0046	0.0000	9.88	0.019	0.02	544.01	0.00	11.83	0.002	3.152	0.830	0.0006
1/1/2070	85	6.8	323	6506	2,415	6.81	0.00	0.0046	0.0000	9.23	0.019	0.02	543.90	0.00	11.72	0.002	3.151	0.828	0.0006
1/1/2071	86	6.8	324	6512	2,415	6.79	0.00	0.0046	0.0000	8.96	0.019	0.02	543.86	0.00	11.67	0.002	3.150	0.828	0.0006
1/1/2072	87	6.8	324	6519	2,415	6.79	0.00	0.0046	0.0000	8.84	0.019	0.02	543.84	0.00	11.65	0.002	3.150	0.827	0.0006
1/1/2073	88	6.8	324	6510	2,415	6.79	0.00	0.0046	0.0000	8.79	0.019	0.02	543.84	0.00	11.64	0.002	3.149	0.827	0.0006
1/1/2074	89	6.8	325	6540	2,415	6.79	0.00	0.0046	0.0000	8.77	0.019	0.02	543.82	0.00	11.64	0.002	3.151	0.828	0.0006
1/1/2075	90	6.8	325	6496	2,415	6.79	0.00	0.0046	0.0000	8.76	0.019	0.02	543.83	0.00	11.63	0.002	3.149	0.826	0.0006
1/1/2076	91	6.8	325	6534	2,415	6.79	0.00	0.0046	0.0000	8.75	0.019	0.02	543.82	0.00	11.63	0.002	3.150	0.828	0.0006
1/1/2077	92	6.8	326	6427	2,062	6.76	0.00	0.0040	0.0002	8.26	0.019	0.02	466.76	0.00	13.23	0.002	2.647	0.032	0.0007
1/1/2078	93	6.8	327	6266	1,755	6.75	0.00	0.0034	0.0004	7.97	0.019	0.02	398.85	0.00	13.34	0.002	2.234	0.015	0.0008
1/1/2079	94	6.7	327	6119	1,486	6.75	0.00	0.0030	0.0005	7.78	0.019	0.01	339.55	0.00	13.42	0.002	1.875	0.015	0.0008
1/1/2080	95	6.7	327	5967	1,257	6.74	0.00	0.0026	0.0005	7.69	0.019	0.01	288.83	0.00	13.47	0.002	1.567	0.015	0.0009
1/1/2081	96	6.7	327	5838	1,058	6.75	0.00	0.0022	0.0006	7.71	0.018	0.01	244.73	0.00	13.50	0.002	1.300	0.016	0.0010
1/1/2082	97	6.8	326	5711	889	6.76	0.00	0.0019	0.0007	7.86	0.018	0.01	207.25	0.00	13.53	0.002	1.074	0.016	0.0011
1/1/2083	98	6.8	325	5598	745	6.78	0.00	0.0017	0.0007	8.17	0.018	0.01	175.32	0.00	13.53	0.002	0.882	0.016	0.0012
1/1/2084	99	6.8	323	5477	625	6.81	0.00	0.0015	0.0008	8.70	0.018	0.01	148.67	0.00	13.53	0.002	0.722	0.016	0.0014
1/1/2085	100	6.9	320	5361	525	6.86	0.00	0.0013	0.0009	9.57	0.018	0.00	126.27	0.00	13.52	0.002	0.589	0.017	0.0017
1/1/2086	101	6.9	316	5249	443	6.92	0.00	0.0012	0.0010	11.09	0.018	0.00	107.55	0.00	13.51	0.003	0.478	0.017	0.0020
1/1/2087	102	7.0	310	5141	376	7.03	0.00	0.0010	0.0011	13.99	0.018	0.00	91.97	0.01	13.49	0.003	0.387	0.017	0.0015
1/1/2088	103	7.1	308	5038	318	7.06	0.00	0.0009	0.0012	14.96	0.018	0.00	76.96	0.01	13.46	0.003	0.312	0.017	0.0014
1/1/2089	104	7.1	307	4942	270	7.08	0.00	0.0008	0.0013	15.46	0.018	0.00	64.31	0.01	13.43	0.003	0.251	0.018	0.0013
1/1/2090	105	7.1	306	4854	230	7.09	0.00	0.0008	0.0014	16.00	0.017	0.00	53.96	0.01	13.40	0.003	0.200	0.018	0.0012
1/1/2091	106	7.1	305	4771	198	7.11	0.00	0.0007	0.0014	16.56	0.017	0.00	45.58	0.01	13.37	0.002	0.159	0.018	0.0012
1/1/2092	107	7.1	304	4688	172	7.13	0.00	0.0007	0.0015	17.13	0.017	0.00	38.83	0.01	13.32	0.002	0.126	0.018	0.0011
1/1/2093	108	7.1	303	4615	152	7.14	0.00	0.0006	0.0016	17.71	0.017	0.00	33.40	0.01	13.29	0.002	0.099	0.019	0.0011
1/1/2094	109	7.2	303	4542	135	7.16	0.00	0.0006	0.0016	18.29	0.017	0.00	29.10	0.01	13.25	0.002	0.078	0.019	0.0010
1/1/2095	110	7.2	302	4477	122	7.17	0.00	0.0006	0.0017	18.84	0.017	0.00	25.68	0.01	13.22	0.002	0.061	0.019	0.0010
1/1/2096	111	7.2	301	4415	112	7.19	0.00	0.0006	0.0017	19.35	0.017	0.00	22.97	0.01	13.17	0.002	0.047	0.019	0.0010

Table. Run 4 - Predicted chemistry in the YDTI Pool for active closure.

Date	Year	pH	Eh (mv)	Volume (ML)	TDS	pH	Aluminum	Antimony	Arsenic	Bicarbonate	Boron	Cadmium	Calcium	Carbonate	Chlorine	Chromium	Copper	Fluorine	Iron
1/1/2097	112	7.2	300	4356	104	7.20	0.00	0.0005	0.0018	19.82	0.017	0.00	20.86	0.01	13.13	0.002	0.037	0.020	0.0009
1/1/2098	113	7.2	300	4296	97	7.21	0.00	0.0005	0.0018	20.25	0.017	0.00	19.21	0.01	13.10	0.002	0.029	0.020	0.0009
1/1/2099	114	7.2	299	4242	92	7.21	0.00	0.0005	0.0019	20.61	0.017	0.00	17.92	0.01	13.07	0.002	0.022	0.020	0.0009
1/1/2100	115	7.2	299	4194	89	7.22	0.00	0.0005	0.0019	20.92	0.017	0.00	16.92	0.01	13.04	0.002	0.017	0.020	0.0009
1/1/2101	116	7.2	298	4155	86	7.23	0.00	0.0005	0.0019	21.20	0.017	0.00	16.16	0.01	13.02	0.002	0.013	0.020	0.0009
1/1/2102	117	7.2	298	4121	83	7.23	0.00	0.0005	0.0020	21.44	0.017	0.00	15.57	0.01	13.01	0.002	0.010	0.021	0.0009
1/1/2103	118	7.2	298	4092	82	7.24	0.00	0.0005	0.0020	21.63	0.017	0.00	15.12	0.01	13.01	0.002	0.008	0.021	0.0008
1/1/2104	119	7.2	298	4025	80	7.24	0.00	0.0005	0.0020	21.71	0.017	0.00	14.75	0.01	12.97	0.002	0.006	0.020	0.0008
1/1/2105	120	7.2	298	3998	79	7.24	0.00	0.0005	0.0021	21.82	0.017	0.00	14.47	0.01	12.95	0.002	0.005	0.021	0.0008
1/1/2106	121	7.2	298	3968	78	7.24	0.00	0.0005	0.0021	21.93	0.017	0.00	14.27	0.01	12.94	0.002	0.004	0.021	0.0008
1/1/2107	122	7.2	297	3941	78	7.25	0.00	0.0005	0.0021	22.01	0.017	0.00	14.12	0.01	12.94	0.002	0.004	0.021	0.0008
1/1/2108	123	7.2	297	3878	77	7.25	0.00	0.0005	0.0021	21.99	0.017	0.00	13.97	0.01	12.90	0.002	0.003	0.021	0.0008
1/1/2109	124	7.2	297	3860	77	7.25	0.00	0.0005	0.0021	22.03	0.017	0.00	13.87	0.01	12.88	0.002	0.003	0.022	0.0008
1/1/2110	125	7.2	297	3839	76	7.25	0.00	0.0005	0.0022	22.08	0.017	0.00	13.81	0.01	12.87	0.002	0.003	0.022	0.0008
1/1/2111	126	7.2	297	3827	76	7.25	0.00	0.0005	0.0022	22.11	0.017	0.00	13.76	0.01	12.87	0.002	0.003	0.022	0.0008
1/1/2112	127	7.2	297	3779	76	7.25	0.00	0.0005	0.0022	22.07	0.016	0.00	13.68	0.01	12.83	0.002	0.002	0.021	0.0008
1/1/2113	128	7.2	297	3761	76	7.25	0.00	0.0005	0.0022	22.09	0.016	0.00	13.65	0.01	12.82	0.002	0.002	0.022	0.0008
1/1/2114	129	7.2	297	3745	76	7.25	0.00	0.0005	0.0022	22.11	0.016	0.00	13.64	0.01	12.82	0.002	0.002	0.022	0.0008
1/1/2115	130	7.2	297	3729	76	7.25	0.00	0.0005	0.0022	22.13	0.016	0.00	13.63	0.01	12.82	0.002	0.002	0.022	0.0008
1/1/2116	131	7.2	297	3684	75	7.25	0.00	0.0005	0.0022	22.08	0.016	0.00	13.58	0.01	12.79	0.002	0.002	0.022	0.0008
1/1/2117	132	7.2	297	3670	75	7.25	0.00	0.0005	0.0022	22.09	0.016	0.00	13.57	0.01	12.78	0.002	0.002	0.022	0.0008
1/1/2118	133	7.2	297	3661	75	7.25	0.00	0.0005	0.0022	22.11	0.016	0.00	13.57	0.01	12.78	0.002	0.002	0.023	0.0008
1/1/2119	134	7.2	297	3657	75	7.25	0.00	0.0005	0.0022	22.12	0.016	0.00	13.57	0.01	12.77	0.002	0.002	0.023	0.0008
1/1/2120	135	7.2	297	3620	75	7.25	0.00	0.0005	0.0022	22.07	0.016	0.00	13.53	0.01	12.75	0.002	0.002	0.022	0.0008
1/1/2121	136	7.2	297	3615	75	7.25	0.00	0.0005	0.0022	22.08	0.016	0.00	13.53	0.01	12.74	0.002	0.002	0.023	0.0008
1/1/2122	137	7.2	297	3607	75	7.25	0.00	0.0005	0.0022	22.10	0.016	0.00	13.54	0.01	12.74	0.002	0.002	0.023	0.0008
1/1/2123	138	7.2	297	3609	75	7.25	0.00	0.0005	0.0022	22.11	0.016	0.00	13.54	0.01	12.74	0.002	0.002	0.023	0.0008

Table. Run 4 - Predicted chemistry in the YDTI Pool for active closure.

Date	Ferrous Iron	Lead	Lithium	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Nitrogen	Phosphorus	Potassium	Selenium	Silicon	Silver	Sodium	EC	Strontium	Sulfur	Thallium
1/1/1986	0.0000	0.0017	0.045	1.50	0.004	0.0018	0.015	0.009	0.24	0.08	7.22	0.002	3.16	0.0002	30.56	926.78	0.75	399.43	0.04
1/1/1987	0.0005	0.0019	0.043	1.86	0.005	0.0016	0.019	0.011	0.24	0.07	6.73	0.002	3.30	0.0002	42.53	1172.87	0.75	508.61	0.04
1/1/1988	0.0005	0.0019	0.041	2.28	0.006	0.0014	0.021	0.012	0.23	0.07	6.26	0.002	3.26	0.0002	55.87	1453.90	0.74	633.71	0.03
1/1/1989	0.0005	0.0018	0.038	2.51	0.006	0.0012	0.022	0.012	0.22	0.06	5.72	0.002	3.22	0.0002	64.16	1612.18	0.71	704.26	0.03
1/1/1990	0.0004	0.0017	0.036	2.75	0.007	0.0011	0.024	0.012	0.21	0.06	5.31	0.002	3.17	0.0002	72.25	1778.59	0.69	778.47	0.03
1/1/1991	0.0004	0.0015	0.034	2.94	0.008	0.0009	0.025	0.013	0.20	0.06	4.85	0.002	3.09	0.0002	78.88	1908.30	0.66	836.37	0.02
1/1/1992	0.0004	0.0014	0.032	3.14	0.008	0.0008	0.026	0.013	0.19	0.05	4.43	0.002	3.03	0.0003	85.78	2045.24	0.64	897.42	0.02
1/1/1993	0.0003	0.0012	0.030	3.22	0.008	0.0006	0.026	0.013	0.19	0.05	3.99	0.001	3.03	0.0003	89.32	2100.09	0.60	921.80	0.02
1/1/1994	0.0003	0.0011	0.029	3.46	0.009	0.0005	0.028	0.013	0.19	0.05	3.74	0.001	3.05	0.0003	96.77	2264.78	0.61	994.92	0.01
1/1/1995	0.0003	0.0009	0.028	3.38	0.009	0.0004	0.028	0.013	0.19	0.05	3.42	0.001	3.18	0.0003	95.81	2217.86	0.58	973.70	0.01
1/1/1996	0.0002	0.0007	0.039	2.88	0.007	0.0003	0.025	0.011	0.31	0.06	3.39	0.001	3.53	0.0003	84.93	1901.80	0.52	830.55	0.01
1/1/1997	0.0001	0.0005	0.051	2.20	0.006	0.0002	0.020	0.009	0.43	0.07	3.42	0.001	3.89	0.0003	68.61	1464.13	0.46	633.32	0.00
1/1/1998	0.0001	0.0004	0.058	2.03	0.005	0.0002	0.018	0.008	0.50	0.08	3.46	0.001	4.02	0.0003	65.65	1358.82	0.43	585.13	0.00
1/1/1999	0.0001	0.0004	0.064	1.88	0.005	0.0001	0.017	0.008	0.56	0.08	3.51	0.001	4.10	0.0003	62.73	1266.79	0.42	543.12	0.00
1/1/2000	0.0001	0.0004	0.068	1.81	0.005	0.0001	0.017	0.008	0.59	0.08	3.61	0.001	4.27	0.0003	61.33	1222.11	0.42	522.38	0.00
1/1/2001	0.0001	0.0004	0.065	1.62	0.004	0.0001	0.016	0.007	0.59	0.09	3.76	0.001	4.80	0.0003	57.58	1109.64	0.42	471.97	0.00
1/1/2002	0.0001	0.0005	0.064	1.45	0.004	0.0001	0.015	0.007	0.60	0.09	4.00	0.001	5.49	0.0003	54.58	1008.09	0.42	425.70	0.00
1/1/2003	0.0002	0.0006	0.060	2.13	0.005	0.0002	0.017	0.008	0.57	0.09	5.19	0.002	5.78	0.0003	59.90	1388.40	0.51	595.95	0.00
1/1/2004	0.0002	0.0006	0.044	3.31	0.009	0.0002	0.018	0.009	0.42	0.07	5.97	0.002	4.55	0.0004	70.70	2060.64	0.56	900.77	0.00
1/1/2005	0.0002	0.0008	0.034	6.62	0.017	0.0002	0.019	0.009	0.33	0.06	7.36	0.003	3.68	0.0004	79.41	2735.37	0.63	1206.97	0.00
1/1/2006	0.0003	0.0010	0.027	16.04	0.042	0.0002	0.019	0.008	0.27	0.06	8.81	0.003	3.11	0.0004	85.16	3284.75	0.71	1459.18	0.00
1/1/2007	0.0003	0.0011	0.023	23.05	0.061	0.0002	0.018	0.008	0.23	0.06	9.75	0.003	2.75	0.0004	88.02	3557.21	0.75	1585.32	0.00
1/1/2008	0.0003	0.0012	0.020	29.73	0.079	0.0002	0.018	0.008	0.20	0.05	10.58	0.004	2.42	0.0004	91.34	3611.62	0.79	1612.55	0.00
1/1/2009	0.0003	0.0013	0.017	34.10	0.091	0.0002	0.018	0.008	0.18	0.05	11.07	0.004	2.18	0.0004	91.78	3641.00	0.81	1627.96	0.00
1/1/2010	0.0004	0.0013	0.015	37.06	0.099	0.0002	0.018	0.008	0.17	0.05	11.44	0.004	2.05	0.0004	91.43	3658.97	0.83	1637.59	0.00
1/1/2011	0.0004	0.0014	0.014	40.51	0.108	0.0002	0.017	0.008	0.16	0.05	11.93	0.004	1.92	0.0005	92.26	3684.55	0.85	1650.50	0.00
1/1/2012	0.0004	0.0014	0.013	43.69	0.116	0.0003	0.018	0.008	0.15	0.05	12.31	0.004	1.78	0.0005	94.61	3713.53	0.87	1664.59	0.00
1/1/2013	0.0004	0.0014	0.016	42.26	0.113	0.0005	0.017	0.007	0.14	0.05	11.73	0.004	1.87	0.0004	90.21	3687.16	0.83	1653.43	0.00
1/1/2014	0.0004	0.0013	0.019	41.29	0.110	0.0006	0.017	0.007	0.13	0.05	11.37	0.004	1.96	0.0004	86.85	3668.09	0.81	1645.35	0.00
1/1/2015	0.0004	0.0013	0.020	40.99	0.109	0.0007	0.017	0.007	0.13	0.05	11.33	0.004	1.97	0.0004	86.15	3663.66	0.80	1643.37	0.00
1/1/2016	0.0004	0.0013	0.019	41.39	0.110	0.0006	0.017	0.007	0.14	0.05	11.44	0.004	1.94	0.0004	86.66	3668.32	0.81	1645.50	0.00
1/1/2017	0.0004	0.0013	0.018	41.35	0.110	0.0006	0.017	0.007	0.14	0.05	11.44	0.004	1.88	0.0004	87.45	3670.65	0.81	1646.45	0.00
1/1/2018	0.0004	0.0013	0.017	40.64	0.108	0.0005	0.017	0.007	0.14	0.05	11.34	0.004	1.84	0.0004	88.06	3668.02	0.80	1644.94	0.00
1/1/2019	0.0003	0.0013	0.017	39.49	0.105	0.0005	0.021	0.007	0.14	0.04	11.25	0.004	1.81	0.0004	88.22	3661.12	0.80	1641.37	0.00
1/1/2020	0.0003	0.0012	0.018	39.48	0.105	0.0007	0.036	0.008	0.13	0.04	11.68	0.004	1.83	0.0004	89.44	3667.05	0.85	1643.49	0.00
1/1/2021	0.0003	0.0011	0.018	40.18	0.107	0.0008	0.051	0.009	0.13	0.04	12.18	0.003	1.82	0.0004	91.01	3678.79	0.91	1648.45	0.00
1/1/2022	0.0003	0.0011	0.021	40.37	0.108	0.0011	0.064	0.012	0.12	0.04	12.66	0.003	1.96	0.0004	91.16	3683.26	0.97	1649.67	0.00

Table. Run 4 - Predicted chemistry in the YDTI Pool for active closure.

Date	Ferrous Iron	Lead	Lithium	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Nitrogen	Phosphorus	Potassium	Selenium	Silicon	Silver	Sodium	EC	Strontium	Sulfur	Thallium
1/1/2023	0.0003	0.0011	0.023	38.66	0.103	0.0014	0.073	0.014	0.12	0.04	12.78	0.003	2.15	0.0004	89.03	3666.76	0.99	1641.14	0.00
1/1/2024	0.0003	0.0011	0.025	38.26	0.102	0.0016	0.080	0.016	0.12	0.04	13.02	0.003	2.28	0.0004	89.25	3666.78	1.02	1640.33	0.00
1/1/2025	0.0003	0.0011	0.026	38.13	0.101	0.0017	0.086	0.018	0.11	0.04	13.24	0.002	2.39	0.0004	89.61	3668.74	1.05	1640.58	0.00
1/1/2026	0.0003	0.0012	0.027	38.34	0.102	0.0018	0.089	0.019	0.11	0.04	13.45	0.002	2.46	0.0004	89.98	3672.57	1.08	1641.94	0.00
1/1/2027	0.0003	0.0012	0.028	38.61	0.103	0.0019	0.092	0.020	0.11	0.04	13.63	0.002	2.52	0.0004	90.27	3676.24	1.09	1643.36	0.00
1/1/2028	0.0003	0.0012	0.028	38.85	0.103	0.0020	0.094	0.020	0.11	0.03	13.76	0.002	2.55	0.0004	90.50	3679.24	1.11	1644.58	0.00
1/1/2029	0.0003	0.0012	0.028	39.03	0.104	0.0020	0.095	0.020	0.11	0.03	13.85	0.002	2.58	0.0004	90.58	3681.13	1.12	1645.36	0.00
1/1/2030	0.0003	0.0012	0.028	39.17	0.104	0.0020	0.096	0.021	0.11	0.03	13.91	0.002	2.60	0.0004	90.56	3682.30	1.12	1645.85	0.00
1/1/2031	0.0003	0.0013	0.029	39.29	0.105	0.0021	0.096	0.021	0.11	0.03	13.95	0.002	2.61	0.0004	90.50	3683.01	1.13	1646.16	0.00
1/1/2032	0.0003	0.0013	0.029	39.39	0.105	0.0021	0.097	0.021	0.11	0.03	13.98	0.002	2.61	0.0004	90.43	3683.55	1.13	1646.41	0.00
1/1/2033	0.0003	0.0013	0.029	39.46	0.105	0.0021	0.097	0.021	0.11	0.03	13.99	0.002	2.62	0.0004	90.31	3683.69	1.13	1646.49	0.00
1/1/2034	0.0003	0.0013	0.029	39.52	0.105	0.0021	0.097	0.021	0.11	0.03	14.00	0.002	2.62	0.0004	90.16	3683.63	1.14	1646.48	0.00
1/1/2035	0.0003	0.0013	0.029	39.57	0.105	0.0021	0.097	0.021	0.11	0.03	14.01	0.002	2.62	0.0004	90.00	3683.46	1.14	1646.44	0.00
1/1/2036	0.0003	0.0013	0.029	39.64	0.106	0.0021	0.097	0.021	0.11	0.03	14.02	0.002	2.62	0.0004	89.90	3683.60	1.14	1646.53	0.00
1/1/2037	0.0003	0.0013	0.029	39.70	0.106	0.0021	0.097	0.022	0.11	0.03	14.02	0.002	2.62	0.0004	89.79	3683.61	1.14	1646.57	0.00
1/1/2038	0.0003	0.0013	0.029	39.75	0.106	0.0021	0.097	0.022	0.11	0.03	14.03	0.002	2.62	0.0004	89.65	3683.48	1.14	1646.54	0.00
1/1/2039	0.0003	0.0013	0.029	39.80	0.106	0.0021	0.097	0.022	0.11	0.03	14.03	0.002	2.63	0.0004	89.52	3683.37	1.14	1646.52	0.00
1/1/2040	0.0003	0.0013	0.029	39.87	0.106	0.0021	0.097	0.022	0.11	0.03	14.03	0.002	2.62	0.0004	89.45	3683.61	1.14	1646.66	0.00
1/1/2041	0.0003	0.0013	0.029	39.91	0.106	0.0021	0.097	0.022	0.11	0.03	14.03	0.002	2.62	0.0004	89.35	3683.54	1.14	1646.66	0.00
1/1/2042	0.0003	0.0013	0.029	39.95	0.106	0.0021	0.097	0.022	0.11	0.03	14.04	0.002	2.63	0.0004	89.24	3683.41	1.15	1646.63	0.00
1/1/2043	0.0003	0.0013	0.029	39.98	0.106	0.0021	0.098	0.022	0.11	0.03	14.04	0.002	2.63	0.0004	89.12	3683.22	1.15	1646.56	0.00
1/1/2044	0.0003	0.0013	0.029	40.01	0.107	0.0021	0.098	0.022	0.11	0.03	14.03	0.002	2.63	0.0004	89.06	3683.23	1.15	1646.58	0.00
1/1/2045	0.0003	0.0013	0.029	40.04	0.107	0.0021	0.098	0.022	0.11	0.03	14.03	0.002	2.63	0.0004	88.98	3683.08	1.15	1646.54	0.00
1/1/2046	0.0003	0.0013	0.029	40.06	0.107	0.0021	0.098	0.022	0.11	0.03	14.03	0.002	2.63	0.0004	88.89	3682.96	1.15	1646.50	0.00
1/1/2047	0.0003	0.0013	0.029	40.08	0.107	0.0021	0.098	0.022	0.11	0.03	14.03	0.002	2.63	0.0004	88.78	3682.71	1.15	1646.40	0.00
1/1/2048	0.0003	0.0013	0.029	40.11	0.107	0.0021	0.098	0.022	0.11	0.03	14.03	0.002	2.63	0.0004	88.73	3682.72	1.15	1646.42	0.00
1/1/2049	0.0003	0.0013	0.029	40.14	0.107	0.0021	0.098	0.022	0.11	0.03	14.03	0.002	2.63	0.0004	88.65	3682.62	1.15	1646.40	0.00
1/1/2050	0.0003	0.0013	0.029	37.96	0.101	0.0021	0.098	0.022	0.11	0.03	14.03	0.002	2.63	0.0004	92.79	3683.28	1.15	1645.29	0.00
1/1/2051	0.0003	0.0013	0.029	39.25	0.104	0.0021	0.098	0.022	0.11	0.03	14.03	0.002	2.63	0.0004	90.26	3682.67	1.16	1645.85	0.00
1/1/2052	0.0003	0.0013	0.029	39.84	0.106	0.0021	0.098	0.022	0.11	0.03	14.03	0.002	2.63	0.0004	89.20	3682.74	1.16	1646.25	0.00
1/1/2053	0.0003	0.0013	0.029	40.10	0.107	0.0021	0.098	0.022	0.11	0.03	14.03	0.002	2.63	0.0004	88.69	3682.62	1.16	1646.36	0.00
1/1/2054	0.0003	0.0013	0.029	40.23	0.107	0.0021	0.098	0.022	0.11	0.03	14.03	0.002	2.63	0.0004	88.43	3682.59	1.16	1646.42	0.00
1/1/2055	0.0003	0.0013	0.029	40.30	0.107	0.0021	0.098	0.022	0.11	0.03	14.03	0.002	2.63	0.0004	88.26	3682.45	1.16	1646.40	0.00
1/1/2056	0.0004	0.0015	0.029	51.04	0.958	0.0021	0.098	0.022	0.11	0.03	14.07	0.002	2.64	0.0004	88.38	3776.81	1.16	1687.56	0.00
1/1/2057	0.0004	0.0016	0.027	60.47	0.161	0.0020	0.097	0.022	2.10	0.03	15.81	0.002	2.56	0.0004	82.93	3832.42	1.23	1712.77	0.00
1/1/2058	0.0004	0.0016	0.026	63.26	0.169	0.0020	0.101	0.021	3.43	0.04	16.76	0.003	2.53	0.0005	80.33	3850.71	1.28	1721.33	0.00
1/1/2059	0.0004	0.0016	0.026	63.09	0.168	0.0018	0.110	0.020	4.52	0.04	17.33	0.003	2.50	0.0005	78.36	3849.69	1.32	1720.22	0.00

Table. Run 4 - Predicted chemistry in the YDTI Pool for active closure.

Date	Ferrous Iron	Lead	Lithium	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Nitrogen	Phosphorus	Potassium	Selenium	Silicon	Silver	Sodium	EC	Strontium	Sulfur	Thallium
1/1/2060	0.0004	0.0017	0.025	61.41	0.164	0.0017	0.121	0.019	5.27	0.04	17.58	0.003	2.46	0.0005	76.21	3835.20	1.35	1712.95	0.00
1/1/2061	0.0004	0.0017	0.024	59.93	0.160	0.0016	0.130	0.017	5.63	0.04	17.67	0.004	2.41	0.0005	74.18	3819.86	1.37	1705.70	0.00
1/1/2062	0.0004	0.0016	0.023	58.91	0.157	0.0015	0.136	0.016	5.71	0.04	17.67	0.004	2.35	0.0005	72.51	3806.63	1.38	1699.85	0.00
1/1/2063	0.0004	0.0016	0.023	57.89	0.154	0.0014	0.141	0.015	5.71	0.04	17.59	0.004	2.30	0.0005	71.02	3793.61	1.39	1694.11	0.00
1/1/2064	0.0004	0.0016	0.022	57.15	0.152	0.0013	0.144	0.014	5.58	0.04	17.47	0.004	2.26	0.0005	69.79	3782.64	1.39	1689.41	0.00
1/1/2065	0.0004	0.0016	0.022	56.75	0.151	0.0013	0.146	0.014	5.43	0.04	17.37	0.004	2.23	0.0005	69.01	3775.60	1.39	1686.50	0.00
1/1/2066	0.0004	0.0016	0.022	56.50	0.151	0.0012	0.146	0.014	5.33	0.04	17.30	0.004	2.22	0.0005	68.55	3771.40	1.39	1684.75	0.00
1/1/2067	0.0004	0.0016	0.022	56.42	0.150	0.0012	0.147	0.014	5.28	0.04	17.27	0.004	2.21	0.0005	68.37	3769.77	1.39	1684.10	0.00
1/1/2068	0.0004	0.0016	0.021	60.37	0.161	0.0012	0.147	0.013	2.33	0.04	16.75	0.004	2.15	0.0005	67.75	3771.76	1.39	1690.62	0.00
1/1/2069	0.0004	0.0016	0.021	62.06	0.165	0.0012	0.147	0.013	1.07	0.04	16.53	0.004	2.12	0.0005	67.48	3772.62	1.39	1693.34	0.00
1/1/2070	0.0004	0.0016	0.021	62.79	0.167	0.0012	0.147	0.013	0.54	0.04	16.44	0.004	2.11	0.0005	67.38	3773.16	1.39	1694.57	0.00
1/1/2071	0.0004	0.0016	0.021	63.10	0.168	0.0012	0.147	0.013	0.31	0.04	16.40	0.004	2.11	0.0005	67.34	3773.42	1.39	1695.10	0.00
1/1/2072	0.0004	0.0016	0.021	63.23	0.169	0.0012	0.147	0.013	0.22	0.04	16.38	0.004	2.11	0.0005	67.32	3773.50	1.39	1695.32	0.00
1/1/2073	0.0004	0.0016	0.021	63.26	0.169	0.0012	0.147	0.013	0.18	0.04	16.37	0.004	2.11	0.0005	67.29	3773.29	1.39	1695.29	0.00
1/1/2074	0.0004	0.0016	0.021	63.32	0.169	0.0012	0.147	0.013	0.16	0.04	16.38	0.004	2.11	0.0005	67.32	3773.65	1.39	1695.48	0.00
1/1/2075	0.0004	0.0016	0.021	63.30	0.169	0.0012	0.147	0.013	0.15	0.04	16.37	0.004	2.11	0.0005	67.30	3773.42	1.39	1695.39	0.00
1/1/2076	0.0004	0.0016	0.021	63.33	0.169	0.0012	0.147	0.013	0.15	0.04	16.37	0.004	2.10	0.0005	67.31	3773.58	1.39	1695.48	0.00
1/1/2077	0.0004	0.0014	0.020	51.36	0.134	0.0011	0.136	0.011	0.20	0.04	14.51	0.003	2.53	0.0005	58.41	3221.90	1.23	1442.18	0.00
1/1/2078	0.0003	0.0012	0.018	41.90	0.107	0.0009	0.115	0.010	0.23	0.04	12.63	0.003	2.89	0.0004	50.37	2741.51	1.07	1222.48	0.00
1/1/2079	0.0003	0.0011	0.017	33.68	0.085	0.0008	0.097	0.008	0.27	0.05	10.98	0.003	3.20	0.0004	43.35	2322.35	0.92	1030.76	0.00
1/1/2080	0.0003	0.0010	0.015	26.69	0.067	0.0007	0.082	0.007	0.30	0.05	9.57	0.002	3.46	0.0003	37.34	1964.05	0.80	866.83	0.00
1/1/2081	0.0002	0.0009	0.014	20.64	0.051	0.0006	0.068	0.006	0.32	0.05	8.34	0.002	3.68	0.0003	32.12	1652.76	0.69	724.35	0.00
1/1/2082	0.0002	0.0007	0.013	15.53	0.038	0.0005	0.057	0.006	0.34	0.05	7.30	0.002	3.86	0.0003	27.67	1388.58	0.60	603.33	0.00
1/1/2083	0.0002	0.0007	0.013	11.24	0.028	0.0004	0.047	0.005	0.35	0.05	6.41	0.002	4.02	0.0003	23.89	1163.85	0.52	500.25	0.00
1/1/2084	0.0002	0.0006	0.012	7.72	0.019	0.0003	0.039	0.004	0.37	0.05	5.66	0.002	4.14	0.0003	20.72	976.94	0.46	414.30	0.00
1/1/2085	0.0001	0.0005	0.011	4.85	0.012	0.0003	0.032	0.004	0.38	0.05	5.04	0.001	4.24	0.0002	18.06	820.63	0.40	342.05	0.00
1/1/2086	0.0001	0.0004	0.011	2.62	0.006	0.0002	0.027	0.004	0.38	0.05	4.51	0.001	4.33	0.0002	15.84	691.57	0.36	281.72	0.00
1/1/2087	0.0001	0.0004	0.010	1.11	0.003	0.0002	0.022	0.003	0.39	0.05	4.08	0.001	4.39	0.0002	13.98	587.24	0.32	231.53	0.00
1/1/2088	0.0001	0.0003	0.010	0.83	0.002	0.0001	0.018	0.003	0.39	0.05	3.71	0.001	4.44	0.0002	12.44	496.76	0.29	189.96	0.00
1/1/2089	0.0001	0.0003	0.010	0.70	0.002	0.0001	0.015	0.003	0.39	0.05	3.41	0.001	4.48	0.0002	11.16	421.32	0.26	155.63	0.00
1/1/2090	0.0001	0.0002	0.010	0.59	0.002	0.0001	0.012	0.002	0.40	0.04	3.16	0.001	4.51	0.0002	10.11	359.62	0.24	127.45	0.00
1/1/2091	0.0001	0.0002	0.009	0.50	0.001	0.0001	0.010	0.002	0.40	0.04	2.96	0.001	4.53	0.0002	9.25	309.65	0.22	104.51	0.00
1/1/2092	0.0000	0.0002	0.009	0.43	0.001	0.0001	0.008	0.002	0.40	0.04	2.79	0.001	4.54	0.0002	8.55	269.41	0.21	85.96	0.00
1/1/2093	0.0000	0.0001	0.009	0.37	0.001	0.0001	0.007	0.002	0.39	0.04	2.65	0.001	4.55	0.0002	7.98	237.03	0.19	70.92	0.00
1/1/2094	0.0000	0.0001	0.009	0.32	0.001	0.0000	0.006	0.002	0.39	0.04	2.54	0.001	4.55	0.0002	7.53	211.37	0.18	58.90	0.00
1/1/2095	0.0000	0.0001	0.009	0.28	0.001	0.0000	0.005	0.002	0.39	0.04	2.45	0.001	4.55	0.0002	7.16	190.93	0.18	49.25	0.00
1/1/2096	0.0000	0.0001	0.009	0.25	0.001	0.0000	0.004	0.002	0.39	0.04	2.38	0.001	4.55	0.0002	6.85	174.77	0.17	41.58	0.00

Table. Run 4 - Predicted chemistry in the YDTI Pool for active closure.

Date	Ferrous Iron	Lead	Lithium	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Nitrogen	Phosphorus	Potassium	Selenium	Silicon	Silver	Sodium	EC	Strontium	Sulfur	Thallium
1/1/2097	0.0000	0.0001	0.009	0.23	0.001	0.0000	0.004	0.002	0.39	0.04	2.32	0.001	4.54	0.0002	6.61	162.12	0.17	35.51	0.00
1/1/2098	0.0000	0.0001	0.009	0.21	0.001	0.0000	0.003	0.002	0.39	0.04	2.28	0.001	4.54	0.0002	6.43	152.28	0.16	30.73	0.00
1/1/2099	0.0000	0.0001	0.009	0.20	0.001	0.0000	0.003	0.002	0.38	0.04	2.24	0.001	4.53	0.0002	6.27	144.54	0.16	26.96	0.00
1/1/2100	0.0000	0.0001	0.008	0.19	0.001	0.0000	0.002	0.002	0.38	0.04	2.21	0.001	4.53	0.0002	6.15	138.52	0.16	24.01	0.00
1/1/2101	0.0000	0.0001	0.008	0.18	0.000	0.0000	0.002	0.002	0.38	0.04	2.18	0.001	4.52	0.0002	6.06	133.92	0.15	21.71	0.00
1/1/2102	0.0000	0.0001	0.008	0.17	0.000	0.0000	0.002	0.002	0.38	0.04	2.17	0.001	4.52	0.0002	5.99	130.42	0.15	19.93	0.00
1/1/2103	0.0000	0.0001	0.008	0.17	0.000	0.0000	0.002	0.002	0.38	0.04	2.15	0.001	4.52	0.0002	5.93	127.75	0.15	18.56	0.00
1/1/2104	0.0000	0.0000	0.008	0.16	0.000	0.0000	0.002	0.002	0.38	0.04	2.14	0.001	4.51	0.0002	5.88	125.43	0.15	17.50	0.00
1/1/2105	0.0000	0.0000	0.008	0.16	0.000	0.0000	0.002	0.002	0.37	0.04	2.13	0.001	4.50	0.0002	5.84	123.74	0.15	16.66	0.00
1/1/2106	0.0000	0.0000	0.008	0.16	0.000	0.0000	0.002	0.002	0.37	0.04	2.12	0.001	4.50	0.0002	5.81	122.52	0.15	16.03	0.00
1/1/2107	0.0000	0.0000	0.008	0.16	0.000	0.0000	0.002	0.002	0.37	0.04	2.12	0.001	4.50	0.0002	5.79	121.62	0.15	15.56	0.00
1/1/2108	0.0000	0.0000	0.008	0.16	0.000	0.0000	0.002	0.002	0.37	0.04	2.11	0.001	4.48	0.0002	5.76	120.59	0.15	15.16	0.00
1/1/2109	0.0000	0.0000	0.008	0.15	0.000	0.0000	0.002	0.002	0.37	0.04	2.10	0.001	4.48	0.0002	5.74	119.94	0.15	14.86	0.00
1/1/2110	0.0000	0.0000	0.008	0.15	0.000	0.0000	0.002	0.002	0.37	0.04	2.10	0.001	4.47	0.0002	5.73	119.53	0.15	14.65	0.00
1/1/2111	0.0000	0.0000	0.008	0.15	0.000	0.0000	0.002	0.002	0.37	0.04	2.10	0.001	4.47	0.0002	5.72	119.23	0.15	14.48	0.00
1/1/2112	0.0000	0.0000	0.008	0.15	0.000	0.0000	0.002	0.002	0.37	0.04	2.09	0.001	4.46	0.0002	5.70	118.68	0.15	14.33	0.00
1/1/2113	0.0000	0.0000	0.008	0.15	0.000	0.0000	0.002	0.002	0.36	0.04	2.09	0.001	4.46	0.0002	5.69	118.47	0.15	14.23	0.00
1/1/2114	0.0000	0.0000	0.008	0.15	0.000	0.0000	0.002	0.002	0.36	0.04	2.08	0.001	4.45	0.0002	5.69	118.35	0.15	14.16	0.00
1/1/2115	0.0000	0.0000	0.008	0.15	0.000	0.0000	0.002	0.002	0.36	0.04	2.08	0.001	4.46	0.0002	5.69	118.29	0.15	14.11	0.00
1/1/2116	0.0000	0.0000	0.008	0.15	0.000	0.0000	0.002	0.002	0.36	0.04	2.08	0.001	4.44	0.0002	5.67	117.93	0.15	14.04	0.00
1/1/2117	0.0000	0.0000	0.008	0.15	0.000	0.0000	0.002	0.002	0.36	0.04	2.08	0.001	4.44	0.0002	5.67	117.83	0.14	14.00	0.00
1/1/2118	0.0000	0.0000	0.008	0.15	0.000	0.0000	0.002	0.002	0.36	0.04	2.08	0.001	4.44	0.0002	5.66	117.80	0.14	13.97	0.00
1/1/2119	0.0000	0.0000	0.008	0.15	0.000	0.0000	0.002	0.002	0.36	0.04	2.08	0.001	4.44	0.0002	5.66	117.79	0.14	13.96	0.00
1/1/2120	0.0000	0.0000	0.008	0.15	0.000	0.0000	0.002	0.002	0.36	0.04	2.07	0.001	4.43	0.0002	5.65	117.49	0.14	13.92	0.00
1/1/2121	0.0000	0.0000	0.008	0.15	0.000	0.0000	0.002	0.002	0.36	0.04	2.07	0.001	4.42	0.0002	5.64	117.43	0.14	13.89	0.00
1/1/2122	0.0000	0.0000	0.008	0.15	0.000	0.0000	0.002	0.002	0.36	0.04	2.07	0.001	4.43	0.0002	5.65	117.51	0.14	13.90	0.00
1/1/2123	0.0000	0.0000	0.008	0.15	0.000	0.0000	0.002	0.002	0.36	0.04	2.07	0.001	4.43	0.0002	5.65	117.51	0.14	13.89	0.00

Table. Run 4 - Predicted chemistry in the YDTI Pool for active closure.

Date	TDS	Uranium	Vanadium	Zinc	Alkalinity as CaCO3	2.308124385	Mass H2O	Calcite (mg/L)	Ferrihydrite	Gypsum	Otavite	Rhodochrosite	Hydrozincite	Magnesite	Lime Use (t)
1/1/1986	593.14	0.009	0.0000	0.426	28.61		11,678	20	3.68	-	0.01	-	-	20.17	0.66
1/1/1987	750.64	0.012	0.0000	0.413	29.61		13,174	42	4.19	-	0.02	-	-	24.29	2.37
1/1/1988	930.49	0.014	0.0000	0.402	29.79		17,564	38	4.02	-	0.02	-	-	22.41	2.51
1/1/1989	1031.79	0.015	0.0000	0.398	29.89		18,828	43	3.91	-	0.02	-	-	22.22	2.36
1/1/1990	1138.30	0.016	0.0000	0.394	30.03		17,026	44	4.10	-	0.02	-	-	23.00	2.55
1/1/1991	1221.31	0.016	0.0000	0.391	30.04		13,199	62	5.43	-	0.03	-	-	30.54	3.40
1/1/1992	1308.95	0.017	0.0000	0.388	30.11		8,964	93	7.97	-	0.04	-	-	44.69	5.05
1/1/1993	1344.06	0.018	0.0000	0.387	30.25		6,365	144	10.86	-	0.06	-	-	62.75	6.61
1/1/1994	1449.46	0.019	0.0000	0.384	30.98		3,169	243	19.66	-	0.12	-	-	113.21	11.99
1/1/1995	1419.43	0.019	0.0000	0.385	31.44		2,117	459	30.71	-	0.19	-	-	185.63	17.18
1/1/1996	1217.15	0.019	0.0000	0.392	31.94		2,155	790	31.89	-	0.20	-	-	239.90	18.43
1/1/1997	937.05	0.018	0.0001	0.406	32.25		6,577	363	9.08	-	0.05	-	-	89.30	5.59
1/1/1998	869.64	0.018	0.0002	0.411	31.86		6,379	480	9.34	-	0.05	-	-	106.99	7.68
1/1/1999	810.75	0.018	0.0003	0.415	31.57		6,542	487	7.99	-	0.04	-	-	103.57	7.28
1/1/2000	782.15	0.018	0.0005	0.418	32.10		5,981	243	3.69	-	0.02	-	-	50.96	3.36
1/1/2001	710.17	0.018	0.0009	0.412	33.12		5,454	31	0.31	-	0.00	-	-	4.17	-
1/1/2002	645.18	0.017	0.0013	0.413	34.81		4,884	39	0.39	-	0.00	-	-	5.27	-
1/1/2003	888.57	0.018	0.0004	0.407	34.92		4,583	41	1.30	-	0.00	-	-	34.08	0.63
1/1/2004	1318.81	0.017	0.0001	0.384	30.55		7,679	128	5.53	-	0.02	-	-	147.37	4.87
1/1/2005	1750.64	0.015	0.0000	0.343	24.56		14,018	-	3.12	-	-	-	-	112.31	2.46
1/1/2006	2102.24	0.014	0.0000	0.306	18.77		19,471	-	2.09	-	-	-	-	71.84	1.58
1/1/2007	2276.61	0.013	0.0000	0.298	16.51		21,928	-	1.80	98.87	-	-	-	60.31	1.39
1/1/2008	2311.44	0.013	0.0000	0.293	15.02		22,356	-	1.63	441.04	-	-	-	50.76	1.33
1/1/2009	2330.24	0.012	0.0000	0.292	14.01		23,649	-	1.53	422.60	-	-	-	47.93	1.22
1/1/2010	2341.74	0.012	0.0000	0.291	13.43		24,880	-	1.37	410.94	-	-	-	43.37	1.06
1/1/2011	2358.11	0.011	0.0000	0.291	12.96		24,358	-	1.33	513.38	-	-	-	40.86	1.03
1/1/2012	2376.66	0.011	0.0000	0.291	12.61		24,347	-	1.38	616.06	-	-	-	40.07	1.21
1/1/2013	2359.78	0.011	0.0000	0.291	12.54		28,406	-	1.20	255.99	-	-	-	34.47	1.02
1/1/2014	2347.58	0.010	0.0000	0.291	12.46		33,767	-	0.99	178.25	-	-	-	29.17	0.84
1/1/2015	2344.74	0.010	0.0000	0.291	12.46		37,938	-	0.85	194.08	-	-	-	26.21	0.75
1/1/2016	2347.72	0.010	0.0000	0.291	12.39		38,042	-	0.85	243.99	-	-	-	26.36	0.76
1/1/2017	2349.22	0.010	0.0000	0.291	12.26		39,142	-	0.89	252.38	-	-	-	27.78	0.89
1/1/2018	2347.54	0.010	0.0000	0.291	12.29		39,019	-	0.89	222.91	-	-	-	27.53	0.88
1/1/2019	2343.12	0.010	0.0000	0.291	12.42		41,242	-	1.08	187.04	-	-	-	27.30	0.91
1/1/2020	2346.91	0.011	0.0000	0.291	13.31		37,380	-	2.57	251.28	-	-	-	28.75	1.01
1/1/2021	2354.42	0.011	0.0000	0.291	14.02		27,977	-	3.68	381.43	-	-	-	35.71	1.30
1/1/2022	2357.29	0.012	0.0000	0.291	16.38		22,654	-	8.04	362.04	-	-	-	44.15	1.48

Table. Run 4 - Predicted chemistry in the YDTI Pool for active closure.

Date	TDS	Uranium	Vanadium	Zinc	Alkalinity as CaCO3	2.308124385	Mass H2O	Calcite (mg/L)	Ferrihydrite	Gypsum	Otavite	Rhodochrosite	Hydrozincite	Magnesite	Lime Use (t)
1/1/2023	2346.73	0.013	0.0000	0.291	18.63		20,869	-	10.98	240.08	-	-	-	55.45	1.67
1/1/2024	2346.74	0.014	0.0000	0.291	20.52		19,006	-	13.81	309.73	-	-	-	60.35	1.95
1/1/2025	2348.00	0.014	0.0000	0.291	21.99		18,700	-	15.21	315.34	-	-	-	61.73	1.96
1/1/2026	2350.44	0.015	0.0000	0.291	23.00		18,683	-	16.00	333.67	-	-	-	62.13	1.93
1/1/2027	2352.79	0.015	0.0000	0.291	23.71		18,682	-	16.54	345.54	-	-	-	62.31	1.91
1/1/2028	2354.72	0.016	0.0000	0.291	24.19		18,729	-	16.89	352.41	-	-	-	62.22	1.90
1/1/2029	2355.92	0.016	0.0000	0.291	24.54		18,700	-	17.17	354.60	-	-	-	62.34	1.90
1/1/2030	2356.67	0.016	0.0000	0.291	24.77		18,673	-	17.32	355.22	-	-	-	62.31	1.88
1/1/2031	2357.13	0.016	0.0000	0.291	24.95		18,618	-	17.47	355.72	-	-	-	62.39	1.88
1/1/2032	2357.47	0.016	0.0000	0.291	25.07		18,677	-	17.52	354.77	-	-	-	62.15	1.88
1/1/2033	2357.56	0.016	0.0000	0.291	25.16		18,689	-	17.55	352.24	-	-	-	62.04	1.86
1/1/2034	2357.52	0.016	0.0000	0.291	25.23		18,663	-	17.59	350.08	-	-	-	62.00	1.86
1/1/2035	2357.42	0.016	0.0000	0.291	25.30		18,596	-	17.65	348.63	-	-	-	62.07	1.85
1/1/2036	2357.51	0.016	0.0000	0.291	25.34		18,661	-	17.64	347.98	-	-	-	61.76	1.85
1/1/2037	2357.51	0.016	0.0000	0.291	25.39		18,653	-	17.65	346.65	-	-	-	61.69	1.84
1/1/2038	2357.43	0.017	0.0000	0.291	25.43		18,591	-	17.69	345.57	-	-	-	61.77	1.84
1/1/2039	2357.36	0.017	0.0000	0.291	25.47		18,541	-	17.72	344.91	-	-	-	61.79	1.83
1/1/2040	2357.51	0.017	0.0000	0.291	25.51		18,604	-	17.70	345.25	-	-	-	61.48	1.83
1/1/2041	2357.46	0.017	0.0000	0.291	25.54		18,635	-	17.67	342.80	-	-	-	61.36	1.82
1/1/2042	2357.38	0.017	0.0000	0.291	25.57		18,571	-	17.72	342.46	-	-	-	61.49	1.82
1/1/2043	2357.26	0.017	0.0000	0.291	25.60		18,537	-	17.73	341.25	-	-	-	61.52	1.82
1/1/2044	2357.27	0.017	0.0000	0.291	25.63		18,626	-	17.69	340.13	-	-	-	61.22	1.81
1/1/2045	2357.17	0.017	0.0000	0.291	25.66		18,600	-	17.71	338.95	-	-	-	61.28	1.81
1/1/2046	2357.10	0.017	0.0000	0.291	25.69		18,553	-	17.73	338.58	-	-	-	61.32	1.81
1/1/2047	2356.94	0.017	0.0000	0.291	25.72		18,510	-	17.75	337.23	-	-	-	61.40	1.81
1/1/2048	2356.94	0.017	0.0000	0.291	25.75		18,603	-	17.69	336.21	-	-	-	61.09	1.80
1/1/2049	2356.88	0.017	0.0000	0.291	25.78		18,597	-	17.69	335.14	-	-	-	61.07	1.80
1/1/2050	2357.30	0.017	0.0000	0.291	26.02		18,547	-	17.72	339.58	-	-	-	73.92	1.79
1/1/2051	2356.91	0.017	0.0000	0.291	25.93		18,515	-	17.73	333.87	-	-	-	61.17	1.79
1/1/2052	2356.95	0.017	0.0000	0.291	25.91		18,582	-	17.70	334.98	-	-	-	60.90	1.79
1/1/2053	2356.88	0.017	0.0000	0.291	25.92		18,569	-	17.71	333.77	-	-	-	60.93	1.78
1/1/2054	2356.86	0.017	0.0000	0.291	25.94		18,544	-	17.71	333.73	-	-	-	60.90	1.78
1/1/2055	2356.77	0.017	0.0000	0.291	25.97		18,487	-	17.74	333.28	-	-	-	61.03	1.78
1/1/2056	2417.16	0.018	0.0000	0.437	18.87		18,558	-	17.79	367.39	-	-	-	-	-
1/1/2057	2452.75	0.017	0.0000	0.307	27.65		21,286	-	7.56	552.20	-	-	-	7.63	-
1/1/2058	2464.45	0.017	0.0000	0.309	29.71		21,443	-	5.63	504.86	-	-	-	12.21	-
1/1/2059	2463.80	0.017	0.0000	0.309	31.15		19,770	-	3.95	462.18	-	-	-	14.86	-

Table. Run 4 - Predicted chemistry in the YDTI Pool for active closure.

Date	TDS	Uranium	Vanadium	Zinc	Alkalinity as CaCO3	2.308124385	Mass H2O	Calcite (mg/L)	Ferrihydrite	Gypsum	Otavite	Rhodochrosite	Hydrozincite	Magnesite	Lime Use (t)
1/1/2060	2454.52	0.018	0.0000	0.306	31.72		16,997	-	2.87	431.22	-	-	-	17.16	-
1/1/2061	2444.71	0.018	0.0000	0.305	31.62		14,085	-	3.11	469.26	-	-	-	19.24	-
1/1/2062	2436.24	0.017	0.0000	0.304	30.92		11,250	-	3.55	571.73	-	-	-	23.28	-
1/1/2063	2427.91	0.017	0.0000	0.304	30.21		8,725	-	4.29	699.51	-	-	-	29.55	-
1/1/2064	2420.89	0.017	0.0000	0.304	29.41		7,358	-	4.89	790.80	-	-	-	33.83	-
1/1/2065	2416.38	0.017	0.0000	0.304	28.76		6,746	-	5.28	842.49	-	-	-	36.16	-
1/1/2066	2413.70	0.017	0.0000	0.304	28.41		6,513	-	5.49	863.43	-	-	-	37.37	-
1/1/2067	2412.65	0.017	0.0000	0.305	28.24		6,517	-	5.49	862.78	-	-	-	37.22	-
1/1/2068	2413.93	0.016	0.0000	0.305	20.99		6,457	-	5.51	582.30	-	-	-	13.50	-
1/1/2069	2414.48	0.016	0.0000	0.305	18.01		6,504	-	5.48	576.61	-	-	-	13.31	-
1/1/2070	2414.82	0.016	0.0000	0.306	16.78		6,506	-	5.48	577.89	-	-	-	13.32	-
1/1/2071	2414.99	0.016	0.0000	0.306	16.26		6,512	-	5.47	577.72	-	-	-	13.31	-
1/1/2072	2415.04	0.016	0.0000	0.306	16.03		6,519	-	5.46	576.53	-	-	-	13.24	-
1/1/2073	2414.91	0.016	0.0000	0.306	15.94		6,510	-	5.47	575.60	-	-	-	13.30	-
1/1/2074	2415.14	0.016	0.0000	0.306	15.91		6,540	-	5.44	576.35	-	-	-	13.22	-
1/1/2075	2414.99	0.016	0.0000	0.306	15.89		6,496	-	5.48	577.65	-	-	-	13.36	-
1/1/2076	2415.09	0.016	0.0000	0.306	15.88		6,534	-	5.45	575.69	-	-	-	13.19	-
1/1/2077	2062.02	0.014	0.0003	0.259	14.82		6,427	-	0.21	-	-	-	-	8.32	-
1/1/2078	1754.56	0.013	0.0004	0.220	14.19		6,266	-	0.22	-	-	-	-	7.13	-
1/1/2079	1486.30	0.011	0.0005	0.186	13.74		6,119	-	0.22	-	-	-	-	7.26	-
1/1/2080	1256.99	0.010	0.0006	0.158	13.48		5,967	-	0.23	-	-	-	-	7.31	-
1/1/2081	1057.77	0.009	0.0007	0.133	13.42		5,838	-	0.24	-	-	-	-	7.49	-
1/1/2082	888.69	0.008	0.0008	0.111	13.61		5,711	-	0.24	-	-	-	-	7.56	-
1/1/2083	744.87	0.007	0.0009	0.093	14.07		5,598	-	0.25	-	-	-	-	7.63	-
1/1/2084	625.24	0.007	0.0010	0.078	14.91		5,477	-	0.25	-	-	-	-	7.54	-
1/1/2085	525.20	0.006	0.0011	0.065	16.34		5,361	-	0.25	-	-	-	-	7.43	-
1/1/2086	442.60	0.006	0.0012	0.055	18.86		5,249	-	0.26	-	-	-	-	7.09	-
1/1/2087	375.83	0.005	0.0014	0.046	23.72		5,141	-	0.27	-	-	-	-	6.19	-
1/1/2088	317.93	0.005	0.0016	0.039	25.27		5,038	7	0.27	-	-	-	-	3.30	-
1/1/2089	269.65	0.005	0.0017	0.033	26.03		4,942	7	0.28	-	-	-	-	3.06	-
1/1/2090	230.16	0.005	0.0018	0.028	26.85		4,854	8	0.28	-	-	-	-	3.13	-
1/1/2091	198.18	0.004	0.0020	0.024	27.73		4,771	8	0.29	-	-	-	-	3.19	-
1/1/2092	172.42	0.004	0.0021	0.020	28.61		4,688	7	0.29	-	-	-	-	3.22	-
1/1/2093	151.70	0.004	0.0022	0.018	29.53		4,615	7	0.30	-	-	-	-	3.29	-
1/1/2094	135.27	0.004	0.0023	0.016	30.44		4,542	7	0.30	-	-	-	-	3.33	-
1/1/2095	122.20	0.004	0.0024	0.014	31.32		4,477	7	0.31	-	-	-	-	3.39	-
1/1/2096	111.85	0.004	0.0024	0.013	32.13		4,415	7	0.31	-	-	-	-	3.43	-

Table. Run 4 - Predicted chemistry in the YDTI Pool for active closure.

Date	TDS	Uranium	Vanadium	Zinc	Alkalinity as CaCO3	2.308124385	Mass H2O	Calcite (mg/L)	Ferrihydrite	Gypsum	Otavite	Rhodochrosite	Hydrozincite	Magnesite	Lime Use (t)
1/1/2097	103.76	0.004	0.0025	0.012	32.89		4,356	7	0.31	-	-	-	-	3.48	-
1/1/2098	97.46	0.004	0.0026	0.011	33.57		4,296	7	0.32	-	-	-	-	3.51	-
1/1/2099	92.51	0.004	0.0027	0.010	34.15		4,242	8	0.32	-	-	-	-	3.57	-
1/1/2100	88.66	0.004	0.0027	0.009	34.65		4,194	8	0.33	-	-	-	-	3.61	-
1/1/2101	85.71	0.004	0.0028	0.009	35.10		4,155	8	0.33	-	-	-	-	3.68	-
1/1/2102	83.47	0.004	0.0028	0.009	35.48		4,121	8	0.34	-	-	-	-	3.73	-
1/1/2103	81.76	0.004	0.0029	0.008	35.79		4,092	8	0.34	-	-	-	-	3.77	-
1/1/2104	80.27	0.004	0.0029	0.008	35.91		4,025	8	0.33	-	-	-	-	3.68	-
1/1/2105	79.19	0.004	0.0029	0.008	36.10		3,998	8	0.35	-	-	-	-	3.83	-
1/1/2106	78.41	0.004	0.0029	0.008	36.27		3,968	8	0.35	-	-	-	-	3.86	-
1/1/2107	77.84	0.004	0.0030	0.008	36.40		3,941	8	0.35	-	-	-	-	3.90	-
1/1/2108	77.18	0.004	0.0030	0.008	36.37		3,878	8	0.34	-	-	-	-	3.81	-
1/1/2109	76.76	0.004	0.0030	0.008	36.44		3,860	8	0.36	-	-	-	-	3.97	-
1/1/2110	76.50	0.004	0.0030	0.008	36.51		3,839	8	0.36	-	-	-	-	3.99	-
1/1/2111	76.31	0.004	0.0030	0.008	36.57		3,827	8	0.37	-	-	-	-	4.03	-
1/1/2112	75.96	0.004	0.0030	0.008	36.49		3,779	8	0.36	-	-	-	-	3.93	-
1/1/2113	75.82	0.004	0.0030	0.008	36.53		3,761	8	0.37	-	-	-	-	4.06	-
1/1/2114	75.74	0.004	0.0030	0.008	36.57		3,745	8	0.37	-	-	-	-	4.09	-
1/1/2115	75.71	0.004	0.0030	0.008	36.60		3,729	9	0.37	-	-	-	-	4.11	-
1/1/2116	75.47	0.004	0.0030	0.008	36.51		3,684	8	0.36	-	-	-	-	4.03	-
1/1/2117	75.41	0.004	0.0030	0.008	36.54		3,670	9	0.38	-	-	-	-	4.15	-
1/1/2118	75.39	0.004	0.0030	0.008	36.56		3,661	9	0.38	-	-	-	-	4.19	-
1/1/2119	75.39	0.004	0.0030	0.008	36.59		3,657	9	0.38	-	-	-	-	4.21	-
1/1/2120	75.19	0.004	0.0030	0.008	36.49		3,620	9	0.37	-	-	-	-	4.11	-
1/1/2121	75.16	0.004	0.0030	0.008	36.51		3,615	9	0.38	-	-	-	-	4.22	-
1/1/2122	75.21	0.004	0.0030	0.008	36.54		3,607	9	0.38	-	-	-	-	4.24	-
1/1/2123	75.21	0.004	0.0030	0.008	36.56		3,609	9	0.39	-	-	-	-	4.26	-

Table. Run 5 - Predicted chemistry in the YDTI Pool for passive closure.

Date	Year	pH	Eh (mv)	Volume (ML)	TDS	pH	Aluminum	Antimony	Arsenic	Bicarbonate	Boron	Cadmium	Calcium	Carbonate	Chlorine	Chromium	Copper	Fluorine	Iron
1/1/1986	1	10.3	119	11678	593	10.27	0.34	0.0005	0.0000	0.25	0.027	0.00	140.91	0.22	6.31	0.001	1.345	0.288	0.0028
1/1/1987	2	10.2	121	13174	750	10.24	0.32	0.0005	0.0000	0.24	0.029	0.00	176.08	0.19	7.13	0.001	1.821	0.232	0.0026
1/1/1988	3	10.2	122	17564	930	10.21	0.30	0.0005	0.0000	0.22	0.029	0.01	216.55	0.18	7.88	0.001	2.167	0.249	0.0025
1/1/1989	4	10.2	123	18828	1,032	10.20	0.29	0.0005	0.0000	0.22	0.028	0.01	238.85	0.17	8.30	0.001	2.343	0.222	0.0024
1/1/1990	5	10.2	124	17026	1,138	10.18	0.29	0.0004	0.0000	0.21	0.028	0.01	262.75	0.16	8.70	0.001	2.543	0.214	0.0024
1/1/1991	6	10.2	125	13199	1,221	10.18	0.28	0.0004	0.0000	0.21	0.027	0.01	281.19	0.16	8.99	0.001	2.681	0.227	0.0023
1/1/1992	7	10.2	125	8964	1,309	10.17	0.28	0.0004	0.0000	0.20	0.027	0.01	300.72	0.15	9.30	0.001	2.826	0.255	0.0023
1/1/1993	8	10.2	125	6365	1,344	10.16	0.28	0.0004	0.0000	0.20	0.026	0.01	308.05	0.15	9.47	0.001	2.899	0.286	0.0023
1/1/1994	9	10.2	126	3169	1,449	10.15	0.27	0.0004	0.0000	0.20	0.027	0.01	332.10	0.15	9.94	0.001	3.180	0.323	0.0022
1/1/1995	10	10.2	126	2117	1,419	10.16	0.27	0.0004	0.0000	0.20	0.027	0.01	324.49	0.15	9.92	0.001	3.196	0.366	0.0022
1/1/1996	11	10.2	124	2155	1,217	10.18	0.28	0.0004	0.0000	0.21	0.031	0.01	275.77	0.16	10.91	0.001	2.758	0.351	0.0023
1/1/1997	12	10.2	122	6577	937	10.22	0.28	0.0005	0.0001	0.23	0.035	0.01	209.34	0.18	11.58	0.001	2.180	0.302	0.0025
1/1/1998	13	10.2	121	6379	869	10.23	0.25	0.0005	0.0003	0.23	0.037	0.01	192.52	0.19	12.39	0.001	1.930	0.249	0.0026
1/1/1999	14	10.2	120	6542	811	10.24	0.22	0.0005	0.0006	0.24	0.039	0.00	178.13	0.20	13.02	0.001	1.743	0.237	0.0027
1/1/2000	15	10.3	120	5981	782	10.25	0.21	0.0005	0.0009	0.24	0.041	0.00	171.05	0.20	13.47	0.001	1.708	0.192	0.0027
1/1/2001	16	10.3	119	5454	710	10.27	0.21	0.0006	0.0011	0.25	0.041	0.00	153.43	0.22	13.07	0.002	1.579	0.027	0.0028
1/1/2002	17	10.3	118	4884	645	10.29	0.20	0.0006	0.0015	0.26	0.043	0.00	137.19	0.23	12.88	0.002	1.468	0.033	0.0029
1/1/2003	18	10.2	122	4583	888	10.22	0.23	0.0011	0.0006	0.23	0.043	0.01	202.11	0.18	13.23	0.002	1.692	0.211	0.0026
1/1/2004	19	10.2	126	7679	1,319	10.15	0.25	0.0017	0.0001	0.20	0.034	0.01	316.61	0.15	12.38	0.002	1.882	0.466	0.0022
1/1/2005	20	10.0	133	14018	1,751	10.02	0.20	0.0024	0.0001	0.15	0.027	0.01	429.77	0.09	12.38	0.002	1.927	0.557	0.0017
1/1/2006	21	9.8	144	19471	2,102	9.85	0.14	0.0030	0.0000	0.10	0.023	0.01	513.03	0.04	12.67	0.002	1.903	0.564	0.0011
1/1/2007	22	9.8	148	21928	2,277	9.77	0.12	0.0035	0.0000	0.08	0.020	0.01	550.83	0.03	12.78	0.002	1.854	0.532	0.0010
1/1/2008	23	9.7	151	22356	2,311	9.72	0.10	0.0039	0.0000	0.08	0.018	0.01	547.73	0.02	12.98	0.002	1.849	0.529	0.0009
1/1/2009	24	9.7	153	23649	2,330	9.69	0.10	0.0041	0.0000	0.07	0.016	0.01	546.18	0.02	12.92	0.002	1.795	0.538	0.0008
1/1/2010	25	9.7	154	24880	2,342	9.67	0.09	0.0043	0.0000	0.07	0.015	0.01	545.30	0.02	12.88	0.002	1.757	0.522	0.0008
1/1/2011	26	9.7	155	24358	2,358	9.65	0.09	0.0045	0.0000	0.06	0.014	0.01	544.02	0.02	12.99	0.002	1.748	0.520	0.0007
1/1/2012	27	9.6	156	24347	2,377	9.64	0.09	0.0047	0.0000	0.06	0.013	0.01	542.48	0.02	13.16	0.002	1.764	0.548	0.0007
1/1/2013	28	9.6	156	28406	2,360	9.65	0.09	0.0045	0.0000	0.06	0.015	0.01	543.92	0.02	12.49	0.002	1.692	0.504	0.0007
1/1/2014	29	9.6	156	33767	2,348	9.65	0.09	0.0044	0.0000	0.06	0.016	0.01	545.00	0.02	12.03	0.002	1.625	0.460	0.0007
1/1/2015	30	9.7	155	37938	2,345	9.65	0.09	0.0044	0.0000	0.06	0.016	0.01	545.25	0.02	12.01	0.002	1.608	0.414	0.0007
1/1/2016	31	9.6	156	38042	2,348	9.65	0.09	0.0044	0.0000	0.06	0.016	0.01	545.00	0.02	12.13	0.002	1.605	0.394	0.0007
1/1/2017	32	9.6	156	39142	2,349	9.65	0.09	0.0044	0.0000	0.06	0.015	0.01	544.82	0.02	12.19	0.002	1.588	0.411	0.0007
1/1/2018	33	9.7	155	39019	2,348	9.65	0.09	0.0043	0.0000	0.06	0.015	0.01	544.88	0.02	12.22	0.002	1.594	0.387	0.0007
1/1/2019	34	9.7	155	41242	2,343	9.66	0.09	0.0042	0.0000	0.07	0.014	0.01	545.17	0.02	12.15	0.002	1.622	0.396	0.0007
1/1/2020	35	9.7	155	37380	2,347	9.66	0.09	0.0041	0.0000	0.07	0.015	0.01	544.80	0.02	12.19	0.002	1.900	0.399	0.0007
1/1/2021	36	9.7	155	27977	2,354	9.66	0.09	0.0041	0.0000	0.06	0.015	0.02	544.15	0.02	12.29	0.002	2.147	0.425	0.0007
1/1/2022	37	9.7	155	22654	2,357	9.66	0.09	0.0040	0.0000	0.06	0.016	0.02	544.02	0.02	12.27	0.002	2.845	0.479	0.0007

Table. Run 5 - Predicted chemistry in the YDTI Pool for passive closure.

Date	Year	pH	Eh (mv)	Volume (ML)	TDS	pH	Aluminum	Antimony	Arsenic	Bicarbonate	Boron	Cadmium	Calcium	Carbonate	Chlorine	Chromium	Copper	Fluorine	Iron
1/1/2023	38	9.7	155	20869	2,347	9.66	0.09	0.0037	0.0000	0.07	0.017	0.03	545.05	0.02	12.06	0.002	3.439	0.528	0.0008
1/1/2024	39	9.7	155	19006	2,347	9.67	0.09	0.0036	0.0000	0.07	0.017	0.03	545.09	0.02	12.04	0.002	3.975	0.550	0.0008
1/1/2025	40	9.7	155	18700	2,348	9.67	0.09	0.0035	0.0000	0.07	0.018	0.04	545.03	0.02	12.07	0.002	4.392	0.571	0.0008
1/1/2026	41	9.7	155	18683	2,350	9.67	0.09	0.0034	0.0000	0.07	0.019	0.04	544.87	0.02	12.13	0.002	4.685	0.578	0.0008
1/1/2027	42	9.7	155	18682	2,353	9.66	0.09	0.0034	0.0000	0.07	0.019	0.04	544.71	0.02	12.18	0.002	4.893	0.580	0.0008
1/1/2028	43	9.7	155	18729	2,355	9.66	0.09	0.0034	0.0000	0.07	0.019	0.04	544.58	0.02	12.22	0.002	5.040	0.581	0.0008
1/1/2029	44	9.7	155	18700	2,356	9.66	0.09	0.0034	0.0000	0.07	0.019	0.04	544.50	0.02	12.25	0.002	5.143	0.581	0.0008
1/1/2030	45	9.7	155	18673	2,357	9.66	0.09	0.0034	0.0000	0.07	0.019	0.04	544.46	0.02	12.26	0.002	5.215	0.582	0.0007
1/1/2031	46	9.7	155	18618	2,357	9.66	0.09	0.0034	0.0000	0.07	0.019	0.04	544.44	0.02	12.26	0.002	5.268	0.582	0.0007
1/1/2032	47	9.7	155	18677	2,357	9.66	0.09	0.0034	0.0000	0.07	0.020	0.05	544.42	0.02	12.26	0.002	5.308	0.584	0.0007
1/1/2033	48	9.7	155	18689	2,358	9.66	0.09	0.0034	0.0000	0.07	0.020	0.05	544.43	0.02	12.26	0.002	5.337	0.584	0.0007
1/1/2034	49	9.7	155	18663	2,358	9.66	0.09	0.0034	0.0000	0.07	0.020	0.05	544.45	0.02	12.25	0.002	5.361	0.584	0.0007
1/1/2035	50	9.7	155	18596	2,357	9.66	0.09	0.0034	0.0000	0.07	0.020	0.05	544.47	0.02	12.24	0.002	5.380	0.584	0.0007
1/1/2036	51	9.7	155	18661	2,357	9.66	0.09	0.0034	0.0000	0.07	0.020	0.05	544.47	0.02	12.24	0.002	5.398	0.586	0.0007
1/1/2037	52	9.7	155	18653	2,357	9.66	0.09	0.0034	0.0000	0.07	0.020	0.05	544.48	0.02	12.23	0.002	5.414	0.585	0.0007
1/1/2038	53	9.7	155	18591	2,357	9.66	0.09	0.0034	0.0000	0.07	0.020	0.05	544.50	0.02	12.22	0.002	5.428	0.586	0.0007
1/1/2039	54	9.7	155	18541	2,357	9.66	0.09	0.0034	0.0000	0.07	0.020	0.05	544.52	0.02	12.22	0.002	5.441	0.587	0.0007
1/1/2040	55	9.7	155	18604	2,357	9.66	0.09	0.0034	0.0000	0.07	0.020	0.05	544.52	0.02	12.21	0.002	5.455	0.588	0.0007
1/1/2041	56	9.7	155	18635	2,357	9.66	0.09	0.0034	0.0000	0.07	0.020	0.05	544.53	0.02	12.20	0.002	5.467	0.588	0.0007
1/1/2042	57	9.7	155	18571	2,357	9.66	0.09	0.0034	0.0000	0.07	0.020	0.05	544.54	0.02	12.20	0.002	5.478	0.588	0.0007
1/1/2043	58	9.7	155	18537	2,357	9.66	0.09	0.0034	0.0000	0.07	0.020	0.05	544.56	0.02	12.19	0.002	5.488	0.589	0.0007
1/1/2044	59	9.7	155	18626	2,357	9.66	0.09	0.0034	0.0000	0.07	0.020	0.05	544.57	0.02	12.18	0.002	5.498	0.590	0.0007
1/1/2045	60	9.7	155	18600	2,357	9.66	0.09	0.0034	0.0000	0.07	0.020	0.05	544.58	0.02	12.18	0.002	5.508	0.590	0.0007
1/1/2046	61	9.7	155	18553	2,357	9.66	0.09	0.0034	0.0000	0.07	0.020	0.05	544.60	0.02	12.17	0.002	5.518	0.590	0.0007
1/1/2047	62	9.7	155	18510	2,357	9.66	0.09	0.0034	0.0000	0.06	0.020	0.05	544.62	0.02	12.17	0.002	5.527	0.591	0.0007
1/1/2048	63	9.7	155	18603	2,357	9.66	0.09	0.0034	0.0000	0.06	0.020	0.05	544.63	0.02	12.16	0.002	5.537	0.593	0.0007
1/1/2049	64	9.7	155	18597	2,357	9.66	0.09	0.0034	0.0000	0.06	0.020	0.05	544.64	0.02	12.16	0.002	5.547	0.592	0.0007
1/1/2050	65	9.7	154	18547	2,357	9.67	0.09	0.0034	0.0000	0.07	0.020	0.05	544.19	0.02	12.15	0.002	5.558	0.592	0.0008
1/1/2051	66	9.7	155	18515	2,357	9.66	0.09	0.0034	0.0000	0.07	0.020	0.05	544.47	0.02	12.15	0.002	5.568	0.593	0.0007
1/1/2052	67	9.7	155	18582	2,357	9.66	0.09	0.0034	0.0000	0.07	0.020	0.05	544.58	0.02	12.14	0.002	5.579	0.595	0.0007
1/1/2053	68	9.7	155	18569	2,357	9.66	0.09	0.0034	0.0000	0.06	0.020	0.05	544.63	0.02	12.14	0.002	5.589	0.594	0.0007
1/1/2054	69	9.7	155	18544	2,357	9.66	0.09	0.0034	0.0000	0.06	0.020	0.05	544.66	0.02	12.14	0.002	5.600	0.595	0.0007
1/1/2055	70	9.7	155	18487	2,357	9.66	0.09	0.0034	0.0000	0.06	0.020	0.05	544.68	0.02	12.13	0.002	5.610	0.595	0.0007
1/1/2056	71	6.8	321	18558	2,417	6.85	0.00	0.0034	0.0000	10.07	0.020	0.05	542.11	0.00	12.16	0.002	5.588	0.599	0.0003
1/1/2057	72	7.1	309	18290	2,388	7.06	0.00	0.0033	0.0002	16.29	0.020	0.05	543.66	0.01	12.30	0.002	5.268	0.036	0.0008
1/1/2058	73	7.1	303	17939	2,357	7.15	0.00	0.0032	0.0004	20.08	0.020	0.04	544.55	0.02	12.43	0.002	4.984	0.029	0.0008
1/1/2059	74	7.2	298	17525	2,337	7.23	0.00	0.0032	0.0005	24.48	0.020	0.04	547.47	0.02	12.61	0.002	4.726	0.030	0.0009

Table. Run 5 - Predicted chemistry in the YDTI Pool for passive closure.

Date	Year	pH	Eh (mv)	Volume (ML)	TDS	pH	Aluminum	Antimony	Arsenic	Bicarbonate	Boron	Cadmium	Calcium	Carbonate	Chlorine	Chromium	Copper	Fluorine	Iron
1/1/2060	75	7.3	293	17078	2,323	7.32	0.00	0.0031	0.0007	29.58	0.021	0.03	551.38	0.03	12.80	0.002	4.484	0.030	0.0009
1/1/2061	76	7.4	289	16621	2,311	7.39	0.00	0.0031	0.0008	35.49	0.021	0.02	555.02	0.05	12.98	0.002	4.252	0.031	0.0007
1/1/2062	77	7.5	284	16147	2,300	7.47	0.00	0.0030	0.0010	42.53	0.021	0.01	558.27	0.07	13.17	0.002	4.031	0.031	0.0006
1/1/2063	78	7.6	279	15687	2,291	7.56	0.00	0.0030	0.0011	51.43	0.021	0.01	561.37	0.10	13.37	0.002	3.813	0.033	0.0005
1/1/2064	79	7.6	278	15246	2,273	7.57	0.00	0.0029	0.0012	53.27	0.021	0.01	561.35	0.11	13.53	0.003	3.597	0.034	0.0005
1/1/2065	80	7.6	278	14816	2,250	7.57	0.00	0.0029	0.0013	53.45	0.021	0.01	554.74	0.11	13.68	0.003	3.386	0.034	0.0005
1/1/2066	81	7.6	278	14409	2,224	7.58	0.00	0.0028	0.0015	53.69	0.021	0.01	547.01	0.11	13.81	0.003	3.178	0.035	0.0005
1/1/2067	82	7.6	278	14005	2,198	7.58	0.00	0.0028	0.0016	53.92	0.021	0.01	539.25	0.11	13.92	0.003	2.977	0.036	0.0005
1/1/2068	83	7.6	277	13614	2,065	7.59	0.00	0.0026	0.0016	54.84	0.021	0.01	505.52	0.12	13.23	0.003	2.781	0.007	0.0004
1/1/2069	84	7.6	277	13236	1,936	7.60	0.00	0.0025	0.0016	55.81	0.021	0.01	472.85	0.12	12.56	0.003	2.591	0.008	0.0004
1/1/2070	85	7.6	276	12863	1,812	7.61	0.00	0.0024	0.0017	56.84	0.021	0.01	441.47	0.12	11.91	0.003	2.408	0.008	0.0004
1/1/2071	86	7.6	276	12497	1,693	7.61	0.00	0.0022	0.0016	57.93	0.021	0.01	411.42	0.13	11.29	0.003	2.233	0.008	0.0004
1/1/2072	87	7.6	275	12147	1,578	7.62	0.00	0.0021	0.0016	58.78	0.021	0.00	382.89	0.13	10.69	0.003	2.064	0.008	0.0004
1/1/2073	88	7.6	276	11813	1,465	7.61	0.00	0.0020	0.0016	57.08	0.021	0.00	355.44	0.12	10.10	0.003	1.901	0.008	0.0004
1/1/2074	89	7.6	276	11477	1,358	7.60	0.00	0.0019	0.0016	55.56	0.021	0.00	329.53	0.11	9.55	0.003	1.748	0.009	0.0004
1/1/2075	90	7.6	277	11159	1,254	7.59	0.00	0.0018	0.0016	53.86	0.021	0.00	304.37	0.11	9.02	0.003	1.602	0.009	0.0004
1/1/2076	91	7.6	278	10846	1,155	7.57	0.00	0.0017	0.0015	51.10	0.021	0.00	279.61	0.10	8.51	0.003	1.463	0.009	0.0004
1/1/2077	92	7.5	280	10549	1,060	7.55	0.00	0.0016	0.0015	48.43	0.021	0.00	256.05	0.08	9.12	0.003	1.332	0.009	0.0005
1/1/2078	93	7.5	281	10257	971	7.53	0.00	0.0015	0.0015	45.90	0.021	0.00	233.97	0.08	9.68	0.003	1.209	0.010	0.0005
1/1/2079	94	7.5	282	9980	887	7.50	0.00	0.0014	0.0014	43.47	0.021	0.00	213.13	0.07	10.20	0.003	1.093	0.010	0.0005
1/1/2080	95	7.5	283	9703	809	7.48	0.00	0.0013	0.0014	41.17	0.021	0.00	193.78	0.06	10.67	0.003	0.985	0.010	0.0005
1/1/2081	96	7.5	285	9448	735	7.46	0.00	0.0012	0.0014	38.98	0.020	0.00	175.53	0.05	11.10	0.003	0.884	0.010	0.0006
1/1/2082	97	7.4	286	9198	667	7.44	0.00	0.0012	0.0014	36.94	0.020	0.00	158.69	0.05	11.49	0.003	0.791	0.011	0.0006
1/1/2083	98	7.4	287	8963	603	7.42	0.00	0.0011	0.0014	35.02	0.020	0.00	143.05	0.04	11.84	0.003	0.705	0.011	0.0006
1/1/2084	99	7.4	288	8724	546	7.40	0.00	0.0010	0.0014	33.25	0.020	0.00	128.80	0.04	12.15	0.003	0.626	0.011	0.0006
1/1/2085	100	7.4	290	8493	493	7.38	0.00	0.0010	0.0014	31.63	0.020	0.00	115.75	0.03	12.43	0.003	0.554	0.011	0.0007
1/1/2086	101	7.4	291	8266	445	7.36	0.00	0.0009	0.0014	30.16	0.020	0.00	103.86	0.03	12.68	0.003	0.489	0.012	0.0007
1/1/2087	102	7.3	292	8046	401	7.34	0.00	0.0009	0.0014	28.82	0.020	0.00	93.05	0.03	12.90	0.003	0.430	0.012	0.0007
1/1/2088	103	7.3	293	7834	361	7.32	0.00	0.0008	0.0014	27.60	0.020	0.00	83.23	0.02	13.07	0.003	0.376	0.012	0.0007
1/1/2089	104	7.3	294	7632	325	7.31	0.00	0.0008	0.0014	26.53	0.019	0.00	74.37	0.02	13.23	0.003	0.328	0.012	0.0008
1/1/2090	105	7.3	295	7439	293	7.29	0.00	0.0008	0.0014	25.58	0.019	0.00	66.40	0.02	13.36	0.003	0.284	0.013	0.0008
1/1/2091	106	7.3	295	7254	264	7.28	0.00	0.0007	0.0015	24.76	0.019	0.00	59.28	0.02	13.47	0.003	0.246	0.013	0.0008
1/1/2092	107	7.3	296	7072	238	7.27	0.00	0.0007	0.0015	24.05	0.019	0.00	52.97	0.02	13.55	0.003	0.211	0.013	0.0008
1/1/2093	108	7.3	297	6903	216	7.26	0.00	0.0007	0.0015	23.46	0.019	0.00	47.37	0.02	13.62	0.003	0.181	0.013	0.0008
1/1/2094	109	7.3	297	6735	196	7.25	0.00	0.0007	0.0015	22.98	0.019	0.00	42.47	0.02	13.67	0.003	0.154	0.014	0.0008
1/1/2095	110	7.2	297	6579	178	7.25	0.00	0.0006	0.0016	22.60	0.019	0.00	38.16	0.02	13.71	0.003	0.131	0.014	0.0009
1/1/2096	111	7.2	298	6427	163	7.24	0.00	0.0006	0.0016	22.30	0.019	0.00	34.41	0.02	13.72	0.003	0.111	0.014	0.0009

Table. Run 5 - Predicted chemistry in the YDTI Pool for passive closure.

Date	Year	pH	Eh (mv)	Volume (ML)	TDS	pH	Aluminum	Antimony	Arsenic	Bicarbonate	Boron	Cadmium	Calcium	Carbonate	Chlorine	Chromium	Copper	Fluorine	Iron
1/1/2097	112	7.2	298	6281	149	7.24	0.00	0.0006	0.0016	22.09	0.018	0.00	31.18	0.01	13.73	0.003	0.093	0.015	0.0009
1/1/2098	113	7.2	298	6136	138	7.24	0.00	0.0006	0.0017	21.95	0.018	0.00	28.40	0.01	13.73	0.003	0.078	0.015	0.0009
1/1/2099	114	7.2	298	5998	128	7.24	0.00	0.0006	0.0017	21.87	0.018	0.00	26.01	0.01	13.72	0.003	0.065	0.015	0.0009
1/1/2100	115	7.2	298	5870	120	7.24	0.00	0.0006	0.0017	21.83	0.018	0.00	23.98	0.01	13.71	0.003	0.054	0.015	0.0009
1/1/2101	116	7.2	298	5752	113	7.24	0.00	0.0006	0.0018	21.85	0.018	0.00	22.25	0.01	13.70	0.003	0.044	0.016	0.0009
1/1/2102	117	7.2	298	5640	107	7.24	0.00	0.0006	0.0018	21.90	0.018	0.00	20.80	0.01	13.69	0.003	0.037	0.016	0.0009
1/1/2103	118	7.2	298	5535	102	7.24	0.00	0.0005	0.0019	21.97	0.018	0.00	19.59	0.01	13.68	0.003	0.030	0.016	0.0008
1/1/2104	119	7.2	298	5400	98	7.24	0.00	0.0005	0.0019	21.96	0.018	0.00	18.56	0.01	13.64	0.003	0.024	0.016	0.0008
1/1/2105	120	7.2	298	5305	94	7.24	0.00	0.0005	0.0019	22.04	0.018	0.00	17.70	0.01	13.60	0.002	0.020	0.017	0.0008
1/1/2106	121	7.2	297	5208	91	7.25	0.00	0.0005	0.0020	22.12	0.018	0.00	17.00	0.01	13.58	0.002	0.016	0.017	0.0008
1/1/2107	122	7.2	297	5116	89	7.25	0.00	0.0005	0.0020	22.19	0.018	0.00	16.42	0.01	13.56	0.002	0.013	0.017	0.0008
1/1/2108	123	7.2	297	4995	86	7.25	0.00	0.0005	0.0020	22.17	0.017	0.00	15.91	0.01	13.51	0.002	0.011	0.017	0.0008
1/1/2109	124	7.2	297	4920	85	7.25	0.00	0.0005	0.0020	22.23	0.017	0.00	15.50	0.01	13.46	0.002	0.009	0.018	0.0008
1/1/2110	125	7.3	297	4843	83	7.25	0.00	0.0005	0.0021	22.28	0.017	0.00	15.18	0.01	13.43	0.002	0.007	0.018	0.0008
1/1/2111	126	7.3	297	4777	82	7.25	0.00	0.0005	0.0021	22.33	0.017	0.00	14.92	0.01	13.41	0.002	0.006	0.019	0.0008
1/1/2112	127	7.3	297	4680	81	7.25	0.00	0.0005	0.0021	22.28	0.017	0.00	14.67	0.01	13.35	0.002	0.005	0.018	0.0008
1/1/2113	128	7.3	297	4615	80	7.25	0.00	0.0005	0.0021	22.31	0.017	0.00	14.49	0.01	13.31	0.002	0.004	0.019	0.0008
1/1/2114	129	7.3	297	4552	80	7.25	0.00	0.0005	0.0022	22.34	0.017	0.00	14.35	0.01	13.29	0.002	0.004	0.019	0.0008
1/1/2115	130	7.3	297	4489	79	7.25	0.00	0.0005	0.0022	22.37	0.017	0.00	14.24	0.01	13.27	0.002	0.003	0.019	0.0008
1/1/2116	131	7.3	297	4403	78	7.25	0.00	0.0005	0.0022	22.31	0.017	0.00	14.11	0.01	13.22	0.002	0.003	0.019	0.0008
1/1/2117	132	7.3	297	4348	78	7.25	0.00	0.0005	0.0022	22.32	0.017	0.00	14.03	0.01	13.18	0.002	0.003	0.020	0.0008
1/1/2118	133	7.3	297	4300	78	7.25	0.00	0.0005	0.0022	22.33	0.017	0.00	13.97	0.01	13.16	0.002	0.003	0.020	0.0008
1/1/2119	134	7.3	297	4258	78	7.25	0.00	0.0005	0.0022	22.34	0.017	0.00	13.92	0.01	13.14	0.002	0.002	0.020	0.0008
1/1/2120	135	7.3	297	4186	77	7.25	0.00	0.0005	0.0022	22.27	0.017	0.00	13.84	0.01	13.09	0.002	0.002	0.020	0.0008
1/1/2121	136	7.3	297	4148	77	7.25	0.00	0.0005	0.0022	22.28	0.017	0.00	13.81	0.01	13.06	0.002	0.002	0.020	0.0008
1/1/2122	137	7.3	297	4109	77	7.25	0.00	0.0005	0.0022	22.30	0.017	0.00	13.79	0.01	13.05	0.002	0.002	0.021	0.0008
1/1/2123	138	7.3	297	4081	77	7.25	0.00	0.0005	0.0022	22.30	0.017	0.00	13.77	0.01	13.04	0.002	0.002	0.021	0.0008

Table. Run 5 - Predicted chemistry in the YDTI Pool for passive closure.

Date	Ferrous Iron	Lead	Lithium	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Nitrogen	Phosphorus	Potassium	Rubidium	Selenium	Silicon	Silver	Sodium	EC	Strontium	Sulfur
1/1/1986	0.0000	0.0017	0.045	1.50	0.004	0.0018	0.015	0.009	0.24	0.08	7.22	0.000	0.002	3.16	0.0002	30.56	926.78	0.75	399.43
1/1/1987	0.0005	0.0019	0.043	1.86	0.005	0.0016	0.019	0.011	0.24	0.07	6.73	0.000	0.002	3.30	0.0002	42.53	1172.87	0.75	508.61
1/1/1988	0.0005	0.0019	0.041	2.28	0.006	0.0014	0.021	0.012	0.23	0.07	6.26	0.000	0.002	3.26	0.0002	55.87	1453.90	0.74	633.71
1/1/1989	0.0005	0.0018	0.038	2.51	0.006	0.0012	0.022	0.012	0.22	0.06	5.72	0.000	0.002	3.22	0.0002	64.16	1612.18	0.71	704.26
1/1/1990	0.0004	0.0017	0.036	2.75	0.007	0.0011	0.024	0.012	0.21	0.06	5.31	0.000	0.002	3.17	0.0002	72.25	1778.59	0.69	778.47
1/1/1991	0.0004	0.0015	0.034	2.94	0.008	0.0009	0.025	0.013	0.20	0.06	4.85	0.000	0.002	3.09	0.0002	78.88	1908.30	0.66	836.37
1/1/1992	0.0004	0.0014	0.032	3.14	0.008	0.0008	0.026	0.013	0.19	0.05	4.43	0.000	0.002	3.03	0.0003	85.78	2045.24	0.64	897.42
1/1/1993	0.0003	0.0012	0.030	3.22	0.008	0.0006	0.026	0.013	0.19	0.05	3.99	0.000	0.001	3.03	0.0003	89.32	2100.09	0.60	921.80
1/1/1994	0.0003	0.0011	0.029	3.46	0.009	0.0005	0.028	0.013	0.19	0.05	3.74	0.000	0.001	3.05	0.0003	96.77	2264.78	0.61	994.92
1/1/1995	0.0003	0.0009	0.028	3.38	0.009	0.0004	0.028	0.013	0.19	0.05	3.42	0.000	0.001	3.18	0.0003	95.81	2217.86	0.58	973.70
1/1/1996	0.0002	0.0007	0.039	2.88	0.007	0.0003	0.025	0.011	0.31	0.06	3.39	0.000	0.001	3.53	0.0003	84.93	1901.80	0.52	830.55
1/1/1997	0.0001	0.0005	0.051	2.20	0.006	0.0002	0.020	0.009	0.43	0.07	3.42	0.000	0.001	3.89	0.0003	68.61	1464.13	0.46	633.32
1/1/1998	0.0001	0.0004	0.058	2.03	0.005	0.0002	0.018	0.008	0.50	0.08	3.46	0.000	0.001	4.02	0.0003	65.65	1358.82	0.43	585.13
1/1/1999	0.0001	0.0004	0.064	1.88	0.005	0.0001	0.017	0.008	0.56	0.08	3.51	0.000	0.001	4.10	0.0003	62.73	1266.79	0.42	543.12
1/1/2000	0.0001	0.0004	0.068	1.81	0.005	0.0001	0.017	0.008	0.59	0.08	3.61	0.000	0.001	4.27	0.0003	61.33	1222.11	0.42	522.38
1/1/2001	0.0001	0.0004	0.065	1.62	0.004	0.0001	0.016	0.007	0.59	0.09	3.76	0.000	0.001	4.80	0.0003	57.58	1109.64	0.42	471.97
1/1/2002	0.0001	0.0005	0.064	1.45	0.004	0.0001	0.015	0.007	0.60	0.09	4.00	0.000	0.001	5.49	0.0003	54.58	1008.09	0.42	425.70
1/1/2003	0.0002	0.0006	0.060	2.13	0.005	0.0002	0.017	0.008	0.57	0.09	5.19	0.000	0.002	5.78	0.0003	59.90	1388.40	0.51	595.95
1/1/2004	0.0002	0.0006	0.044	3.31	0.009	0.0002	0.018	0.009	0.42	0.07	5.97	0.000	0.002	4.55	0.0004	70.70	2060.64	0.56	900.77
1/1/2005	0.0002	0.0008	0.034	6.62	0.017	0.0002	0.019	0.009	0.33	0.06	7.36	0.000	0.003	3.68	0.0004	79.41	2735.37	0.63	1206.97
1/1/2006	0.0003	0.0010	0.027	16.04	0.042	0.0002	0.019	0.008	0.27	0.06	8.81	0.000	0.003	3.11	0.0004	85.16	3284.75	0.71	1459.18
1/1/2007	0.0003	0.0011	0.023	23.05	0.061	0.0002	0.018	0.008	0.23	0.06	9.75	0.000	0.003	2.75	0.0004	88.02	3557.21	0.75	1585.32
1/1/2008	0.0003	0.0012	0.020	29.73	0.079	0.0002	0.018	0.008	0.20	0.05	10.58	0.000	0.004	2.42	0.0004	91.34	3611.62	0.79	1612.55
1/1/2009	0.0003	0.0013	0.017	34.10	0.091	0.0002	0.018	0.008	0.18	0.05	11.07	0.000	0.004	2.18	0.0004	91.78	3641.00	0.81	1627.96
1/1/2010	0.0004	0.0013	0.015	37.06	0.099	0.0002	0.018	0.008	0.17	0.05	11.44	0.000	0.004	2.05	0.0004	91.43	3658.97	0.83	1637.59
1/1/2011	0.0004	0.0014	0.014	40.51	0.108	0.0002	0.017	0.008	0.16	0.05	11.93	0.000	0.004	1.92	0.0005	92.26	3684.55	0.85	1650.50
1/1/2012	0.0004	0.0014	0.013	43.69	0.116	0.0003	0.018	0.008	0.15	0.05	12.31	0.000	0.004	1.78	0.0005	94.61	3713.53	0.87	1664.59
1/1/2013	0.0004	0.0014	0.016	42.26	0.113	0.0005	0.017	0.007	0.14	0.05	11.73	0.000	0.004	1.87	0.0004	90.21	3687.16	0.83	1653.43
1/1/2014	0.0004	0.0013	0.019	41.29	0.110	0.0006	0.017	0.007	0.13	0.05	11.37	0.000	0.004	1.96	0.0004	86.85	3668.09	0.81	1645.35
1/1/2015	0.0004	0.0013	0.020	40.99	0.109	0.0007	0.017	0.007	0.13	0.05	11.33	0.000	0.004	1.97	0.0004	86.15	3663.66	0.80	1643.37
1/1/2016	0.0004	0.0013	0.019	41.39	0.110	0.0006	0.017	0.007	0.14	0.05	11.44	0.000	0.004	1.94	0.0004	86.66	3668.32	0.81	1645.50
1/1/2017	0.0004	0.0013	0.018	41.35	0.110	0.0006	0.017	0.007	0.14	0.05	11.44	0.000	0.004	1.88	0.0004	87.45	3670.65	0.81	1646.45
1/1/2018	0.0004	0.0013	0.017	40.64	0.108	0.0005	0.017	0.007	0.14	0.05	11.34	0.000	0.004	1.84	0.0004	88.06	3668.02	0.80	1644.94
1/1/2019	0.0003	0.0013	0.017	39.49	0.105	0.0005	0.021	0.007	0.14	0.04	11.25	0.000	0.004	1.81	0.0004	88.22	3661.12	0.80	1641.37
1/1/2020	0.0003	0.0012	0.018	39.48	0.105	0.0007	0.036	0.008	0.13	0.04	11.68	0.000	0.004	1.83	0.0004	89.44	3667.05	0.85	1643.49
1/1/2021	0.0003	0.0011	0.018	40.18	0.107	0.0008	0.051	0.009	0.13	0.04	12.18	0.000	0.003	1.82	0.0004	91.01	3678.79	0.91	1648.45
1/1/2022	0.0003	0.0011	0.021	40.37	0.108	0.0011	0.064	0.012	0.12	0.04	12.66	0.000	0.003	1.96	0.0004	91.16	3683.26	0.97	1649.67

Table. Run 5 - Predicted chemistry in the YDTI Pool for passive closure.

Date	Ferrous Iron	Lead	Lithium	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Nitrogen	Phosphorus	Potassium	Rubidium	Selenium	Silicon	Silver	Sodium	EC	Strontium	Sulfur
1/1/2023	0.0003	0.0011	0.023	38.66	0.103	0.0014	0.073	0.014	0.12	0.04	12.78	0.000	0.003	2.15	0.0004	89.03	3666.76	0.99	1641.14
1/1/2024	0.0003	0.0011	0.025	38.26	0.102	0.0016	0.080	0.016	0.12	0.04	13.02	0.000	0.003	2.28	0.0004	89.25	3666.78	1.02	1640.33
1/1/2025	0.0003	0.0011	0.026	38.13	0.101	0.0017	0.086	0.018	0.11	0.04	13.24	0.000	0.002	2.39	0.0004	89.61	3668.74	1.05	1640.58
1/1/2026	0.0003	0.0012	0.027	38.34	0.102	0.0018	0.089	0.019	0.11	0.04	13.45	0.000	0.002	2.46	0.0004	89.98	3672.57	1.08	1641.94
1/1/2027	0.0003	0.0012	0.028	38.61	0.103	0.0019	0.092	0.020	0.11	0.04	13.63	0.000	0.002	2.52	0.0004	90.27	3676.24	1.09	1643.36
1/1/2028	0.0003	0.0012	0.028	38.85	0.103	0.0020	0.094	0.020	0.11	0.03	13.76	0.000	0.002	2.55	0.0004	90.50	3679.24	1.11	1644.58
1/1/2029	0.0003	0.0012	0.028	39.03	0.104	0.0020	0.095	0.020	0.11	0.03	13.85	0.000	0.002	2.58	0.0004	90.58	3681.13	1.12	1645.36
1/1/2030	0.0003	0.0012	0.028	39.17	0.104	0.0020	0.096	0.021	0.11	0.03	13.91	0.000	0.002	2.60	0.0004	90.56	3682.30	1.12	1645.85
1/1/2031	0.0003	0.0013	0.029	39.29	0.105	0.0021	0.096	0.021	0.11	0.03	13.95	0.000	0.002	2.61	0.0004	90.50	3683.01	1.13	1646.16
1/1/2032	0.0003	0.0013	0.029	39.39	0.105	0.0021	0.097	0.021	0.11	0.03	13.98	0.000	0.002	2.61	0.0004	90.43	3683.55	1.13	1646.41
1/1/2033	0.0003	0.0013	0.029	39.46	0.105	0.0021	0.097	0.021	0.11	0.03	13.99	0.000	0.002	2.62	0.0004	90.31	3683.69	1.13	1646.49
1/1/2034	0.0003	0.0013	0.029	39.52	0.105	0.0021	0.097	0.021	0.11	0.03	14.00	0.000	0.002	2.62	0.0004	90.16	3683.63	1.14	1646.48
1/1/2035	0.0003	0.0013	0.029	39.57	0.105	0.0021	0.097	0.021	0.11	0.03	14.01	0.000	0.002	2.62	0.0004	90.00	3683.46	1.14	1646.44
1/1/2036	0.0003	0.0013	0.029	39.64	0.106	0.0021	0.097	0.021	0.11	0.03	14.02	0.000	0.002	2.62	0.0004	89.90	3683.60	1.14	1646.53
1/1/2037	0.0003	0.0013	0.029	39.70	0.106	0.0021	0.097	0.022	0.11	0.03	14.02	0.000	0.002	2.62	0.0004	89.79	3683.61	1.14	1646.57
1/1/2038	0.0003	0.0013	0.029	39.75	0.106	0.0021	0.097	0.022	0.11	0.03	14.03	0.000	0.002	2.62	0.0004	89.65	3683.48	1.14	1646.54
1/1/2039	0.0003	0.0013	0.029	39.80	0.106	0.0021	0.097	0.022	0.11	0.03	14.03	0.000	0.002	2.63	0.0004	89.52	3683.37	1.14	1646.52
1/1/2040	0.0003	0.0013	0.029	39.87	0.106	0.0021	0.097	0.022	0.11	0.03	14.03	0.000	0.002	2.62	0.0004	89.45	3683.61	1.14	1646.66
1/1/2041	0.0003	0.0013	0.029	39.91	0.106	0.0021	0.097	0.022	0.11	0.03	14.03	0.000	0.002	2.62	0.0004	89.35	3683.54	1.14	1646.66
1/1/2042	0.0003	0.0013	0.029	39.95	0.106	0.0021	0.097	0.022	0.11	0.03	14.04	0.000	0.002	2.63	0.0004	89.24	3683.41	1.15	1646.63
1/1/2043	0.0003	0.0013	0.029	39.98	0.106	0.0021	0.098	0.022	0.11	0.03	14.04	0.000	0.002	2.63	0.0004	89.12	3683.22	1.15	1646.56
1/1/2044	0.0003	0.0013	0.029	40.01	0.107	0.0021	0.098	0.022	0.11	0.03	14.03	0.000	0.002	2.63	0.0004	89.06	3683.23	1.15	1646.58
1/1/2045	0.0003	0.0013	0.029	40.04	0.107	0.0021	0.098	0.022	0.11	0.03	14.03	0.000	0.002	2.63	0.0004	88.98	3683.08	1.15	1646.54
1/1/2046	0.0003	0.0013	0.029	40.06	0.107	0.0021	0.098	0.022	0.11	0.03	14.03	0.000	0.002	2.63	0.0004	88.89	3682.96	1.15	1646.50
1/1/2047	0.0003	0.0013	0.029	40.08	0.107	0.0021	0.098	0.022	0.11	0.03	14.03	0.000	0.002	2.63	0.0004	88.78	3682.71	1.15	1646.40
1/1/2048	0.0003	0.0013	0.029	40.11	0.107	0.0021	0.098	0.022	0.11	0.03	14.03	0.000	0.002	2.63	0.0004	88.73	3682.72	1.15	1646.42
1/1/2049	0.0003	0.0013	0.029	40.14	0.107	0.0021	0.098	0.022	0.11	0.03	14.03	0.000	0.002	2.63	0.0004	88.65	3682.62	1.15	1646.40
1/1/2050	0.0003	0.0013	0.029	37.96	0.101	0.0021	0.098	0.022	0.11	0.03	14.03	0.000	0.002	2.63	0.0004	92.79	3683.28	1.15	1645.29
1/1/2051	0.0003	0.0013	0.029	39.25	0.104	0.0021	0.098	0.022	0.11	0.03	14.03	0.000	0.002	2.63	0.0004	90.26	3682.67	1.16	1645.85
1/1/2052	0.0003	0.0013	0.029	39.84	0.106	0.0021	0.098	0.022	0.11	0.03	14.03	0.000	0.002	2.63	0.0004	89.20	3682.74	1.16	1646.25
1/1/2053	0.0003	0.0013	0.029	40.10	0.107	0.0021	0.098	0.022	0.11	0.03	14.03	0.000	0.002	2.63	0.0004	88.69	3682.62	1.16	1646.36
1/1/2054	0.0003	0.0013	0.029	40.23	0.107	0.0021	0.098	0.022	0.11	0.03	14.03	0.000	0.002	2.63	0.0004	88.43	3682.59	1.16	1646.42
1/1/2055	0.0003	0.0013	0.029	40.30	0.107	0.0021	0.098	0.022	0.11	0.03	14.03	0.000	0.002	2.63	0.0004	88.26	3682.45	1.16	1646.40
1/1/2056	0.0004	0.0015	0.029	51.04	0.958	0.0021	0.098	0.022	0.11	0.03	14.07	0.000	0.002	2.64	0.0004	88.38	3776.81	1.16	1687.56
1/1/2057	0.0004	0.0015	0.029	44.21	0.117	0.0020	0.097	0.022	3.08	0.03	14.06	0.000	0.002	2.85	0.0004	84.57	3730.76	1.12	1659.54
1/1/2058	0.0004	0.0014	0.028	37.42	0.099	0.0019	0.092	0.021	5.85	0.03	13.94	0.000	0.002	3.05	0.0004	80.94	3683.23	1.07	1632.25
1/1/2059	0.0004	0.0014	0.027	31.09	0.082	0.0018	0.088	0.020	8.56	0.03	13.88	0.000	0.002	3.25	0.0004	77.71	3652.08	1.03	1611.86

Table. Run 5 - Predicted chemistry in the YDTI Pool for passive closure.

Date	Ferrous Iron	Lead	Lithium	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Nitrogen	Phosphorus	Potassium	Rubidium	Selenium	Silicon	Silver	Sodium	EC	Strontium	Sulfur
1/1/2060	0.0004	0.0013	0.027	25.17	0.066	0.0017	0.083	0.020	11.22	0.03	13.84	0.000	0.002	3.46	0.0004	74.72	3630.43	0.98	1595.21
1/1/2061	0.0003	0.0013	0.027	19.70	0.052	0.0017	0.079	0.019	13.75	0.03	13.81	0.000	0.002	3.66	0.0004	71.85	3611.01	0.94	1578.96
1/1/2062	0.0003	0.0013	0.026	14.70	0.039	0.0016	0.075	0.019	16.20	0.04	13.79	0.000	0.002	3.86	0.0004	69.13	3593.69	0.91	1562.75
1/1/2063	0.0003	0.0012	0.026	10.12	0.027	0.0015	0.071	0.018	18.67	0.04	13.77	0.000	0.002	4.05	0.0004	66.45	3579.52	0.87	1546.37
1/1/2064	0.0003	0.0012	0.025	6.25	0.017	0.0014	0.067	0.018	21.03	0.04	13.74	0.000	0.002	4.24	0.0004	63.77	3552.44	0.83	1531.37
1/1/2065	0.0003	0.0011	0.025	5.78	0.015	0.0014	0.064	0.017	23.26	0.04	13.69	0.000	0.002	4.41	0.0004	61.13	3515.82	0.79	1515.21
1/1/2066	0.0003	0.0011	0.025	5.72	0.015	0.0013	0.060	0.017	25.39	0.04	13.63	0.000	0.002	4.58	0.0004	58.51	3475.72	0.76	1497.63
1/1/2067	0.0003	0.0011	0.024	5.66	0.015	0.0012	0.056	0.016	27.40	0.04	13.56	0.000	0.002	4.73	0.0004	55.96	3435.01	0.72	1479.74
1/1/2068	0.0003	0.0010	0.023	5.71	0.017	0.0011	0.053	0.015	25.66	0.04	12.86	0.000	0.002	4.80	0.0004	52.81	3226.94	0.69	1385.84
1/1/2069	0.0003	0.0010	0.022	5.76	0.018	0.0011	0.049	0.015	23.97	0.04	12.17	0.000	0.002	4.87	0.0004	49.74	3025.31	0.65	1294.72
1/1/2070	0.0003	0.0009	0.022	5.80	0.020	0.0010	0.046	0.014	22.35	0.04	11.51	0.000	0.002	4.93	0.0004	46.79	2831.67	0.62	1207.14
1/1/2071	0.0002	0.0009	0.021	5.85	0.018	0.0009	0.043	0.013	20.79	0.05	10.88	0.000	0.002	4.99	0.0004	43.96	2646.12	0.59	1123.12
1/1/2072	0.0002	0.0009	0.020	5.50	0.014	0.0009	0.040	0.012	19.28	0.05	10.26	0.000	0.002	5.04	0.0004	41.21	2466.48	0.56	1041.81
1/1/2073	0.0002	0.0008	0.019	4.63	0.012	0.0008	0.037	0.011	17.83	0.05	9.67	0.000	0.002	5.08	0.0003	38.57	2288.88	0.53	963.62
1/1/2074	0.0002	0.0008	0.019	3.83	0.010	0.0007	0.034	0.011	16.46	0.05	9.11	0.000	0.001	5.12	0.0003	36.07	2121.35	0.50	889.79
1/1/2075	0.0002	0.0008	0.018	3.18	0.008	0.0007	0.031	0.010	15.15	0.05	8.57	0.000	0.001	5.15	0.0003	33.66	1959.92	0.48	818.94
1/1/2076	0.0002	0.0007	0.017	2.93	0.007	0.0006	0.029	0.009	13.91	0.05	8.06	0.000	0.001	5.17	0.0003	31.39	1804.62	0.45	752.01
1/1/2077	0.0002	0.0007	0.017	2.69	0.007	0.0006	0.026	0.009	12.72	0.05	7.57	0.000	0.001	5.19	0.0003	29.21	1656.14	0.43	686.85
1/1/2078	0.0002	0.0006	0.016	2.46	0.006	0.0005	0.024	0.008	11.61	0.05	7.11	0.000	0.001	5.21	0.0003	27.18	1516.94	0.40	625.79
1/1/2079	0.0002	0.0006	0.015	2.25	0.006	0.0005	0.022	0.007	10.57	0.05	6.67	0.000	0.001	5.22	0.0003	25.25	1385.50	0.38	568.19
1/1/2080	0.0002	0.0006	0.015	2.05	0.005	0.0004	0.020	0.007	9.60	0.05	6.26	0.000	0.001	5.23	0.0003	23.46	1263.46	0.36	514.77
1/1/2081	0.0001	0.0005	0.014	1.86	0.005	0.0004	0.018	0.006	8.68	0.05	5.88	0.000	0.001	5.23	0.0003	21.76	1148.24	0.34	464.37
1/1/2082	0.0001	0.0005	0.014	1.68	0.004	0.0003	0.017	0.006	7.83	0.05	5.52	0.000	0.001	5.23	0.0003	20.20	1041.87	0.32	417.85
1/1/2083	0.0001	0.0005	0.013	1.52	0.004	0.0003	0.015	0.005	7.05	0.05	5.19	0.000	0.001	5.22	0.0003	18.74	943.03	0.31	374.67
1/1/2084	0.0001	0.0005	0.013	1.37	0.003	0.0003	0.014	0.005	6.33	0.05	4.88	0.000	0.001	5.22	0.0002	17.40	852.99	0.29	335.36
1/1/2085	0.0001	0.0004	0.013	1.24	0.003	0.0002	0.012	0.005	5.67	0.05	4.60	0.000	0.001	5.21	0.0002	16.18	770.45	0.28	299.33
1/1/2086	0.0001	0.0004	0.012	1.11	0.003	0.0002	0.011	0.004	5.07	0.05	4.35	0.000	0.001	5.19	0.0002	15.06	695.20	0.27	266.49
1/1/2087	0.0001	0.0004	0.012	1.00	0.003	0.0002	0.010	0.004	4.53	0.05	4.11	0.000	0.001	5.18	0.0002	14.04	626.76	0.25	236.63
1/1/2088	0.0001	0.0003	0.012	0.90	0.002	0.0002	0.009	0.004	4.03	0.05	3.90	0.000	0.001	5.16	0.0002	13.10	564.55	0.24	209.51
1/1/2089	0.0001	0.0003	0.011	0.80	0.002	0.0002	0.008	0.004	3.58	0.05	3.70	0.000	0.001	5.14	0.0002	12.25	508.35	0.23	185.00
1/1/2090	0.0001	0.0003	0.011	0.72	0.002	0.0001	0.007	0.003	3.18	0.05	3.52	0.000	0.001	5.12	0.0002	11.49	457.77	0.22	162.93
1/1/2091	0.0001	0.0003	0.011	0.64	0.002	0.0001	0.006	0.003	2.82	0.05	3.36	0.000	0.001	5.10	0.0002	10.80	412.62	0.22	143.22
1/1/2092	0.0001	0.0002	0.011	0.58	0.001	0.0001	0.006	0.003	2.49	0.05	3.22	0.000	0.001	5.08	0.0002	10.18	372.49	0.21	125.71
1/1/2093	0.0001	0.0002	0.010	0.52	0.001	0.0001	0.005	0.003	2.21	0.05	3.09	0.000	0.001	5.05	0.0002	9.62	336.84	0.20	110.11
1/1/2094	0.0000	0.0002	0.010	0.46	0.001	0.0001	0.005	0.003	1.95	0.05	2.97	0.000	0.001	5.03	0.0002	9.14	305.64	0.19	96.44
1/1/2095	0.0000	0.0002	0.010	0.42	0.001	0.0001	0.004	0.003	1.73	0.05	2.87	0.000	0.001	5.00	0.0002	8.70	278.20	0.19	84.39
1/1/2096	0.0000	0.0001	0.010	0.38	0.001	0.0001	0.004	0.002	1.53	0.05	2.78	0.000	0.001	4.98	0.0002	8.31	254.25	0.18	73.87

Table. Run 5 - Predicted chemistry in the YDTI Pool for passive closure.

Date	Ferrous Iron	Lead	Lithium	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Nitrogen	Phosphorus	Potassium	Rubidium	Selenium	Silicon	Silver	Sodium	EC	Strontium	Sulfur
1/1/2097	0.0000	0.0001	0.010	0.34	0.001	0.0001	0.004	0.002	1.36	0.05	2.69	0.000	0.001	4.95	0.0002	7.98	233.54	0.18	64.73
1/1/2098	0.0000	0.0001	0.010	0.31	0.001	0.0000	0.003	0.002	1.22	0.05	2.62	0.000	0.001	4.93	0.0002	7.68	215.78	0.18	56.86
1/1/2099	0.0000	0.0001	0.009	0.29	0.001	0.0000	0.003	0.002	1.09	0.05	2.56	0.000	0.001	4.90	0.0002	7.43	200.48	0.17	50.06
1/1/2100	0.0000	0.0001	0.009	0.26	0.001	0.0000	0.003	0.002	0.98	0.05	2.50	0.000	0.001	4.88	0.0002	7.20	187.40	0.17	44.22
1/1/2101	0.0000	0.0001	0.009	0.25	0.001	0.0000	0.003	0.002	0.89	0.05	2.46	0.000	0.001	4.86	0.0002	7.01	176.31	0.17	39.23
1/1/2102	0.0000	0.0001	0.009	0.23	0.001	0.0000	0.002	0.002	0.81	0.05	2.42	0.000	0.001	4.84	0.0002	6.85	166.99	0.17	35.00
1/1/2103	0.0000	0.0001	0.009	0.22	0.001	0.0000	0.002	0.002	0.74	0.05	2.38	0.000	0.001	4.83	0.0002	6.71	159.18	0.16	31.43
1/1/2104	0.0000	0.0001	0.009	0.21	0.001	0.0000	0.002	0.002	0.68	0.05	2.35	0.000	0.001	4.80	0.0002	6.58	152.47	0.16	28.48
1/1/2105	0.0000	0.0001	0.009	0.20	0.001	0.0000	0.002	0.002	0.63	0.05	2.32	0.000	0.001	4.78	0.0002	6.47	146.84	0.16	25.92
1/1/2106	0.0000	0.0001	0.009	0.19	0.001	0.0000	0.002	0.002	0.59	0.05	2.30	0.000	0.001	4.77	0.0002	6.38	142.27	0.16	23.82
1/1/2107	0.0000	0.0001	0.009	0.18	0.001	0.0000	0.002	0.002	0.56	0.05	2.28	0.000	0.001	4.75	0.0002	6.31	138.51	0.16	22.09
1/1/2108	0.0000	0.0001	0.009	0.18	0.000	0.0000	0.002	0.002	0.53	0.04	2.26	0.000	0.001	4.73	0.0002	6.23	135.10	0.16	20.65
1/1/2109	0.0000	0.0001	0.009	0.17	0.000	0.0000	0.002	0.002	0.50	0.04	2.24	0.000	0.001	4.71	0.0002	6.17	132.34	0.16	19.42
1/1/2110	0.0000	0.0001	0.009	0.17	0.000	0.0000	0.002	0.002	0.48	0.04	2.22	0.000	0.001	4.70	0.0002	6.12	130.18	0.15	18.44
1/1/2111	0.0000	0.0001	0.009	0.17	0.000	0.0000	0.002	0.002	0.46	0.04	2.21	0.000	0.001	4.68	0.0002	6.08	128.41	0.15	17.64
1/1/2112	0.0000	0.0000	0.009	0.16	0.000	0.0000	0.002	0.002	0.45	0.04	2.20	0.000	0.001	4.66	0.0002	6.03	126.65	0.15	16.97
1/1/2113	0.0000	0.0000	0.009	0.16	0.000	0.0000	0.002	0.002	0.44	0.04	2.19	0.000	0.001	4.65	0.0002	5.99	125.39	0.15	16.42
1/1/2114	0.0000	0.0000	0.009	0.16	0.000	0.0000	0.002	0.002	0.43	0.04	2.18	0.000	0.001	4.63	0.0002	5.96	124.40	0.15	15.99
1/1/2115	0.0000	0.0000	0.009	0.16	0.000	0.0000	0.002	0.002	0.42	0.04	2.17	0.000	0.001	4.63	0.0002	5.94	123.64	0.15	15.65
1/1/2116	0.0000	0.0000	0.009	0.16	0.000	0.0000	0.002	0.002	0.41	0.04	2.16	0.000	0.001	4.61	0.0002	5.91	122.67	0.15	15.34
1/1/2117	0.0000	0.0000	0.008	0.16	0.000	0.0000	0.002	0.002	0.41	0.04	2.15	0.000	0.001	4.59	0.0002	5.88	122.05	0.15	15.10
1/1/2118	0.0000	0.0000	0.008	0.16	0.000	0.0000	0.002	0.002	0.40	0.04	2.15	0.000	0.001	4.58	0.0002	5.87	121.59	0.15	14.91
1/1/2119	0.0000	0.0000	0.008	0.16	0.000	0.0000	0.002	0.002	0.40	0.04	2.14	0.000	0.001	4.58	0.0002	5.85	121.22	0.15	14.77
1/1/2120	0.0000	0.0000	0.008	0.15	0.000	0.0000	0.002	0.002	0.39	0.04	2.13	0.000	0.001	4.56	0.0002	5.83	120.59	0.15	14.62
1/1/2121	0.0000	0.0000	0.008	0.15	0.000	0.0000	0.002	0.002	0.39	0.04	2.13	0.000	0.001	4.55	0.0002	5.81	120.26	0.15	14.51
1/1/2122	0.0000	0.0000	0.008	0.15	0.000	0.0000	0.002	0.002	0.38	0.04	2.13	0.000	0.001	4.54	0.0002	5.80	120.10	0.15	14.43
1/1/2123	0.0000	0.0000	0.008	0.15	0.000	0.0000	0.002	0.002	0.38	0.04	2.12	0.000	0.001	4.54	0.0002	5.79	119.91	0.15	14.37

Table. Run 5 - Predicted chemistry in the YDTI Pool for passive closure.

Date	Thallium	TDS	TSS	Tungsten	Uranium	Vanadium	Zinc	Alkalinity as CaCO3	2.30812385	Mass H2O	Calcite (mg/L)	Ferrihydrite	Gypsum	Otavite	Rhodochrosite	Hydrozincite	Magnesite	Lime Use (t)
1/1/1986	0.04	593.14	0.00	0.000	0.009	0.0000	0.426	28.61		11,678	20	3.68	-	0.01	-	-	20.17	0.66
1/1/1987	0.04	750.64	0.00	0.000	0.012	0.0000	0.413	29.61		13,174	42	4.19	-	0.02	-	-	24.29	2.37
1/1/1988	0.03	930.49	0.00	0.000	0.014	0.0000	0.402	29.79		17,564	38	4.02	-	0.02	-	-	22.41	2.51
1/1/1989	0.03	1031.79	0.00	0.000	0.015	0.0000	0.398	29.89		18,828	43	3.91	-	0.02	-	-	22.22	2.36
1/1/1990	0.03	1138.30	0.00	0.000	0.016	0.0000	0.394	30.03		17,026	44	4.10	-	0.02	-	-	23.00	2.55
1/1/1991	0.02	1221.31	0.00	0.000	0.016	0.0000	0.391	30.04		13,199	62	5.43	-	0.03	-	-	30.54	3.40
1/1/1992	0.02	1308.95	0.00	0.000	0.017	0.0000	0.388	30.11		8,964	93	7.97	-	0.04	-	-	44.69	5.05
1/1/1993	0.02	1344.06	0.00	0.000	0.018	0.0000	0.387	30.25		6,365	144	10.86	-	0.06	-	-	62.75	6.61
1/1/1994	0.01	1449.46	0.00	0.000	0.019	0.0000	0.384	30.98		3,169	243	19.66	-	0.12	-	-	113.21	11.99
1/1/1995	0.01	1419.43	0.00	0.000	0.019	0.0000	0.385	31.44		2,117	459	30.71	-	0.19	-	-	185.63	17.18
1/1/1996	0.01	1217.15	0.00	0.000	0.019	0.0000	0.392	31.94		2,155	790	31.89	-	0.20	-	-	239.90	18.43
1/1/1997	0.00	937.05	0.00	0.000	0.018	0.0001	0.406	32.25		6,577	363	9.08	-	0.05	-	-	89.30	5.59
1/1/1998	0.00	869.64	0.00	0.000	0.018	0.0002	0.411	31.86		6,379	480	9.34	-	0.05	-	-	106.99	7.68
1/1/1999	0.00	810.75	0.00	0.000	0.018	0.0003	0.415	31.57		6,542	487	7.99	-	0.04	-	-	103.57	7.28
1/1/2000	0.00	782.15	0.00	0.000	0.018	0.0005	0.418	32.10		5,981	243	3.69	-	0.02	-	-	50.96	3.36
1/1/2001	0.00	710.17	0.00	0.000	0.018	0.0009	0.412	33.12		5,454	31	0.31	-	0.00	-	-	4.17	-
1/1/2002	0.00	645.18	0.00	0.000	0.017	0.0013	0.413	34.81		4,884	39	0.39	-	0.00	-	-	5.27	-
1/1/2003	0.00	888.57	0.00	0.000	0.018	0.0004	0.407	34.92		4,583	41	1.30	-	0.00	-	-	34.08	0.63
1/1/2004	0.00	1318.81	0.00	0.000	0.017	0.0001	0.384	30.55		7,679	128	5.53	-	0.02	-	-	147.37	4.87
1/1/2005	0.00	1750.64	0.00	0.000	0.015	0.0000	0.343	24.56		14,018	-	3.12	-	-	-	-	112.31	2.46
1/1/2006	0.00	2102.24	0.00	0.000	0.014	0.0000	0.306	18.77		19,471	-	2.09	-	-	-	-	71.84	1.58
1/1/2007	0.00	2276.61	0.00	0.000	0.013	0.0000	0.298	16.51		21,928	-	1.80	98.87	-	-	-	60.31	1.39
1/1/2008	0.00	2311.44	0.00	0.000	0.013	0.0000	0.293	15.02		22,356	-	1.63	441.04	-	-	-	50.76	1.33
1/1/2009	0.00	2330.24	0.00	0.000	0.012	0.0000	0.292	14.01		23,649	-	1.53	422.60	-	-	-	47.93	1.22
1/1/2010	0.00	2341.74	0.00	0.000	0.012	0.0000	0.291	13.43		24,880	-	1.37	410.94	-	-	-	43.37	1.06
1/1/2011	0.00	2358.11	0.00	0.000	0.011	0.0000	0.291	12.96		24,358	-	1.33	513.38	-	-	-	40.86	1.03
1/1/2012	0.00	2376.66	0.00	0.000	0.011	0.0000	0.291	12.61		24,347	-	1.38	616.06	-	-	-	40.07	1.21
1/1/2013	0.00	2359.78	0.00	0.000	0.011	0.0000	0.291	12.54		28,406	-	1.20	255.99	-	-	-	34.47	1.02
1/1/2014	0.00	2347.58	0.00	0.000	0.010	0.0000	0.291	12.46		33,767	-	0.99	178.25	-	-	-	29.17	0.84
1/1/2015	0.00	2344.74	0.00	0.000	0.010	0.0000	0.291	12.46		37,938	-	0.85	194.08	-	-	-	26.21	0.75
1/1/2016	0.00	2347.72	0.00	0.000	0.010	0.0000	0.291	12.39		38,042	-	0.85	243.99	-	-	-	26.36	0.76
1/1/2017	0.00	2349.22	0.00	0.000	0.010	0.0000	0.291	12.26		39,142	-	0.89	252.38	-	-	-	27.78	0.89
1/1/2018	0.00	2347.54	0.00	0.000	0.010	0.0000	0.291	12.29		39,019	-	0.89	222.91	-	-	-	27.53	0.88
1/1/2019	0.00	2343.12	0.00	0.000	0.010	0.0000	0.291	12.42		41,242	-	1.08	187.04	-	-	-	27.30	0.91
1/1/2020	0.00	2346.91	0.00	0.000	0.011	0.0000	0.291	13.31		37,380	-	2.57	251.28	-	-	-	28.75	1.01
1/1/2021	0.00	2354.42	0.00	0.000	0.011	0.0000	0.291	14.02		27,977	-	3.68	381.43	-	-	-	35.71	1.30
1/1/2022	0.00	2357.29	0.00	0.000	0.012	0.0000	0.291	16.38		22,654	-	8.04	362.04	-	-	-	44.15	1.48

Table. Run 5 - Predicted chemistry in the YDTI Pool for passive closure.

Date	Thallium	TDS	TSS	Tungsten	Uranium	Vanadium	Zinc	Alkalinity as CaCO3	2.308124385	Mass H2O	Calcite (mg/L)	Ferrihydrite	Gypsum	Otavite	Rhodochrosite	Hydrozincite	Magnesite	Lime Use (t)
1/1/2023	0.00	2346.73	0.00	0.000	0.013	0.0000	0.291	18.63		20,869	-	10.98	240.08	-	-	-	55.45	1.67
1/1/2024	0.00	2346.74	0.00	0.000	0.014	0.0000	0.291	20.52		19,006	-	13.81	309.73	-	-	-	60.35	1.95
1/1/2025	0.00	2348.00	0.00	0.000	0.014	0.0000	0.291	21.99		18,700	-	15.21	315.34	-	-	-	61.73	1.96
1/1/2026	0.00	2350.44	0.00	0.000	0.015	0.0000	0.291	23.00		18,683	-	16.00	333.67	-	-	-	62.13	1.93
1/1/2027	0.00	2352.79	0.00	0.000	0.015	0.0000	0.291	23.71		18,682	-	16.54	345.54	-	-	-	62.31	1.91
1/1/2028	0.00	2354.72	0.00	0.000	0.016	0.0000	0.291	24.19		18,729	-	16.89	352.41	-	-	-	62.22	1.90
1/1/2029	0.00	2355.92	0.00	0.000	0.016	0.0000	0.291	24.54		18,700	-	17.17	354.60	-	-	-	62.34	1.90
1/1/2030	0.00	2356.67	0.00	0.000	0.016	0.0000	0.291	24.77		18,673	-	17.32	355.22	-	-	-	62.31	1.88
1/1/2031	0.00	2357.13	0.00	0.000	0.016	0.0000	0.291	24.95		18,618	-	17.47	355.72	-	-	-	62.39	1.88
1/1/2032	0.00	2357.47	0.00	0.000	0.016	0.0000	0.291	25.07		18,677	-	17.52	354.77	-	-	-	62.15	1.88
1/1/2033	0.00	2357.56	0.00	0.000	0.016	0.0000	0.291	25.16		18,689	-	17.55	352.24	-	-	-	62.04	1.86
1/1/2034	0.00	2357.52	0.00	0.000	0.016	0.0000	0.291	25.23		18,663	-	17.59	350.08	-	-	-	62.00	1.86
1/1/2035	0.00	2357.42	0.00	0.000	0.016	0.0000	0.291	25.30		18,596	-	17.65	348.63	-	-	-	62.07	1.85
1/1/2036	0.00	2357.51	0.00	0.000	0.016	0.0000	0.291	25.34		18,661	-	17.64	347.98	-	-	-	61.76	1.85
1/1/2037	0.00	2357.51	0.00	0.000	0.016	0.0000	0.291	25.39		18,653	-	17.65	346.65	-	-	-	61.69	1.84
1/1/2038	0.00	2357.43	0.00	0.000	0.017	0.0000	0.291	25.43		18,591	-	17.69	345.57	-	-	-	61.77	1.84
1/1/2039	0.00	2357.36	0.00	0.000	0.017	0.0000	0.291	25.47		18,541	-	17.72	344.91	-	-	-	61.79	1.83
1/1/2040	0.00	2357.51	0.00	0.000	0.017	0.0000	0.291	25.51		18,604	-	17.70	345.25	-	-	-	61.48	1.83
1/1/2041	0.00	2357.46	0.00	0.000	0.017	0.0000	0.291	25.54		18,635	-	17.67	342.80	-	-	-	61.36	1.82
1/1/2042	0.00	2357.38	0.00	0.000	0.017	0.0000	0.291	25.57		18,571	-	17.72	342.46	-	-	-	61.49	1.82
1/1/2043	0.00	2357.26	0.00	0.000	0.017	0.0000	0.291	25.60		18,537	-	17.73	341.25	-	-	-	61.52	1.82
1/1/2044	0.00	2357.27	0.00	0.000	0.017	0.0000	0.291	25.63		18,626	-	17.69	340.13	-	-	-	61.22	1.81
1/1/2045	0.00	2357.17	0.00	0.000	0.017	0.0000	0.291	25.66		18,600	-	17.71	338.95	-	-	-	61.28	1.81
1/1/2046	0.00	2357.10	0.00	0.000	0.017	0.0000	0.291	25.69		18,553	-	17.73	338.58	-	-	-	61.32	1.81
1/1/2047	0.00	2356.94	0.00	0.000	0.017	0.0000	0.291	25.72		18,510	-	17.75	337.23	-	-	-	61.40	1.81
1/1/2048	0.00	2356.94	0.00	0.000	0.017	0.0000	0.291	25.75		18,603	-	17.69	336.21	-	-	-	61.09	1.80
1/1/2049	0.00	2356.88	0.00	0.000	0.017	0.0000	0.291	25.78		18,597	-	17.69	335.14	-	-	-	61.07	1.80
1/1/2050	0.00	2357.30	0.00	0.000	0.017	0.0000	0.291	26.02		18,547	-	17.72	339.58	-	-	-	73.92	1.79
1/1/2051	0.00	2356.91	0.00	0.000	0.017	0.0000	0.291	25.93		18,515	-	17.73	333.87	-	-	-	61.17	1.79
1/1/2052	0.00	2356.95	0.00	0.000	0.017	0.0000	0.291	25.91		18,582	-	17.70	334.98	-	-	-	60.90	1.79
1/1/2053	0.00	2356.88	0.00	0.000	0.017	0.0000	0.291	25.92		18,569	-	17.71	333.77	-	-	-	60.93	1.78
1/1/2054	0.00	2356.86	0.00	0.000	0.017	0.0000	0.291	25.94		18,544	-	17.71	333.73	-	-	-	60.90	1.78
1/1/2055	0.00	2356.77	0.00	0.000	0.017	0.0000	0.291	25.97		18,487	-	17.74	333.28	-	-	-	61.03	1.78
1/1/2056	0.00	2417.16	0.00	0.000	0.018	0.0000	0.437	18.87		18,558	-	17.79	367.39	-	-	-	-	-
1/1/2057	0.00	2387.69	0.00	0.000	0.017	0.0004	0.309	31.31		18,290	-	0.09	-	-	-	-	11.58	-
1/1/2058	0.00	2357.27	0.00	0.000	0.017	0.0007	0.293	38.89		17,939	-	0.09	-	-	-	-	12.93	-
1/1/2059	0.00	2337.33	0.00	0.000	0.017	0.0011	0.279	47.51		17,525	-	0.09	-	0.00	-	-	12.92	-

Table. Run 5 - Predicted chemistry in the YDTI Pool for passive closure.

Date	Thallium	TDS	TSS	Tungsten	Uranium	Vanadium	Zinc	Alkalinity as CaCO3	2.308124385	Mass H2O	Calcite (mg/L)	Ferrihydrite	Gypsum	Otavite	Rhodochrosite	Hydrozincite	Magnesite	Lime Use (t)
1/1/2060	0.00	2323.48	0.00	0.000	0.017	0.0014	0.265	57.31		17,078	-	0.09	-	0.02	-	-	12.81	-
1/1/2061	0.00	2311.05	0.00	0.000	0.017	0.0016	0.253	68.45		16,621	-	0.10	-	0.01	-	-	12.41	-
1/1/2062	0.00	2299.96	0.00	0.000	0.017	0.0019	0.240	81.52		16,147	-	0.10	2.82	0.01	-	-	11.95	-
1/1/2063	0.00	2290.89	0.00	0.000	0.017	0.0022	0.228	97.86		15,687	-	0.10	5.59	0.01	-	-	11.51	-
1/1/2064	0.00	2273.56	0.00	0.000	0.017	0.0025	0.217	100.91		15,246	9	0.10	-	0.00	-	-	10.25	-
1/1/2065	0.00	2250.12	0.00	0.000	0.017	0.0028	0.205	100.87		14,816	26	0.11	-	-	-	-	1.67	-
1/1/2066	0.00	2224.46	0.00	0.000	0.017	0.0030	0.193	100.92		14,409	28	0.11	-	-	-	-	0.65	-
1/1/2067	0.00	2198.40	0.00	0.000	0.016	0.0033	0.182	100.98		14,005	29	0.11	-	-	-	-	0.68	-
1/1/2068	0.00	2065.24	0.00	0.000	0.016	0.0030	0.171	102.10		13,614	2	0.10	-	-	-	-	-	-
1/1/2069	0.00	1936.20	0.00	0.000	0.015	0.0028	0.160	103.31		13,236	2	0.10	-	-	-	-	-	-
1/1/2070	0.00	1812.27	0.00	0.000	0.014	0.0027	0.150	104.61		12,863	2	0.11	-	-	-	-	-	-
1/1/2071	0.00	1693.52	0.00	0.000	0.014	0.0025	0.140	106.02		12,497	2	0.11	-	-	-	-	-	-
1/1/2072	0.00	1578.55	0.00	0.000	0.013	0.0024	0.130	106.99		12,147	-	0.11	-	-	-	-	1.02	-
1/1/2073	0.00	1464.89	0.00	0.000	0.012	0.0023	0.121	103.38		11,813	-	0.12	-	-	-	-	2.55	-
1/1/2074	0.00	1357.66	0.00	0.000	0.012	0.0022	0.112	100.12		11,477	-	0.12	-	-	-	-	2.57	-
1/1/2075	0.00	1254.35	0.00	0.000	0.011	0.0021	0.103	96.57		11,159	1	0.12	-	-	-	-	2.31	-
1/1/2076	0.00	1154.96	0.00	0.000	0.010	0.0021	0.095	91.19		10,846	4	0.13	-	-	-	-	1.38	-
1/1/2077	0.00	1059.93	0.00	0.000	0.010	0.0020	0.088	86.03		10,549	4	0.13	-	-	-	-	1.43	-
1/1/2078	0.00	970.84	0.00	0.000	0.009	0.0020	0.080	81.15		10,257	4	0.13	-	-	-	-	1.47	-
1/1/2079	0.00	886.72	0.00	0.000	0.009	0.0020	0.074	76.50		9,980	4	0.14	-	-	-	-	1.52	-
1/1/2080	0.00	808.61	0.00	0.000	0.008	0.0019	0.067	72.14		9,703	4	0.14	-	-	-	-	1.55	-
1/1/2081	0.00	734.87	0.00	0.000	0.008	0.0019	0.062	68.00		9,448	4	0.15	-	-	-	-	1.61	-
1/1/2082	0.00	666.80	0.00	0.000	0.008	0.0019	0.056	64.17		9,198	4	0.15	-	-	-	-	1.65	-
1/1/2083	0.00	603.54	0.00	0.000	0.007	0.0019	0.051	60.59		8,963	4	0.15	-	-	-	-	1.70	-
1/1/2084	0.00	545.92	0.00	0.000	0.007	0.0019	0.046	57.30		8,724	4	0.16	-	-	-	-	1.73	-
1/1/2085	0.00	493.09	0.00	0.000	0.007	0.0019	0.042	54.31		8,493	5	0.16	-	-	-	-	1.78	-
1/1/2086	0.00	444.93	0.00	0.000	0.006	0.0019	0.038	51.60		8,266	5	0.17	-	-	-	-	1.83	-
1/1/2087	0.00	401.12	0.00	0.000	0.006	0.0020	0.035	49.15		8,046	5	0.17	-	-	-	-	1.88	-
1/1/2088	0.00	361.31	0.00	0.000	0.006	0.0020	0.031	46.92		7,834	5	0.17	-	-	-	-	1.93	-
1/1/2089	0.00	325.34	0.00	0.000	0.006	0.0020	0.029	44.96		7,632	5	0.18	-	-	-	-	1.99	-
1/1/2090	0.00	292.97	0.00	0.000	0.005	0.0021	0.026	43.23		7,439	5	0.18	-	-	-	-	2.04	-
1/1/2091	0.00	264.08	0.00	0.000	0.005	0.0021	0.024	41.74		7,254	5	0.19	-	-	-	-	2.10	-
1/1/2092	0.00	238.40	0.00	0.000	0.005	0.0021	0.022	40.45		7,072	5	0.19	-	-	-	-	2.14	-
1/1/2093	0.00	215.58	0.00	0.000	0.005	0.0022	0.020	39.37		6,903	5	0.20	-	-	-	-	2.20	-
1/1/2094	0.00	195.61	0.00	0.000	0.005	0.0022	0.018	38.50		6,735	5	0.20	-	-	-	-	2.25	-
1/1/2095	0.00	178.05	0.00	0.000	0.005	0.0023	0.017	37.79		6,579	5	0.21	-	-	-	-	2.31	-
1/1/2096	0.00	162.72	0.00	0.000	0.005	0.0024	0.015	37.23		6,427	5	0.21	-	-	-	-	2.36	-

Table. Run 5 - Predicted chemistry in the YDTI Pool for passive closure.

Date	Thallium	TDS	TSS	Tungsten	Uranium	Vanadium	Zinc	Alkalinity as CaCO3	2.308124385	Mass H2O	Calcite (mg/L)	Ferrihydrite	Gypsum	Otavite	Rhodochrosite	Hydrozincite	Magnesite	Lime Use (t)
1/1/2097	0.00	149.47	0.00	0.000	0.004	0.0024	0.014	36.83		6,281	6	0.22	-	-	-	-	2.41	-
1/1/2098	0.00	138.10	0.00	0.000	0.004	0.0025	0.013	36.55		6,136	6	0.22	-	-	-	-	2.46	-
1/1/2099	0.00	128.31	0.00	0.000	0.004	0.0025	0.012	36.38		5,998	6	0.23	-	-	-	-	2.53	-
1/1/2100	0.00	119.94	0.00	0.000	0.004	0.0026	0.012	36.28		5,870	6	0.23	-	-	-	-	2.58	-
1/1/2101	0.00	112.84	0.00	0.000	0.004	0.0026	0.011	36.29		5,752	6	0.24	-	-	-	-	2.66	-
1/1/2102	0.00	106.87	0.00	0.000	0.004	0.0027	0.011	36.34		5,640	6	0.25	-	-	-	-	2.73	-
1/1/2103	0.00	101.88	0.00	0.000	0.004	0.0027	0.010	36.44		5,535	6	0.25	-	-	-	-	2.79	-
1/1/2104	0.00	97.58	0.00	0.000	0.004	0.0028	0.010	36.41		5,400	6	0.25	-	-	-	-	2.75	-
1/1/2105	0.00	93.97	0.00	0.000	0.004	0.0028	0.009	36.52		5,305	6	0.26	-	-	-	-	2.89	-
1/1/2106	0.00	91.05	0.00	0.000	0.004	0.0029	0.009	36.64		5,208	6	0.27	-	-	-	-	2.94	-
1/1/2107	0.00	88.65	0.00	0.000	0.004	0.0029	0.009	36.75		5,116	6	0.27	-	-	-	-	3.01	-
1/1/2108	0.00	86.46	0.00	0.000	0.004	0.0029	0.009	36.71		4,995	6	0.27	-	-	-	-	2.96	-
1/1/2109	0.00	84.70	0.00	0.000	0.004	0.0030	0.009	36.79		4,920	7	0.28	-	-	-	-	3.11	-
1/1/2110	0.00	83.32	0.00	0.000	0.004	0.0030	0.008	36.88		4,843	7	0.29	-	-	-	-	3.17	-
1/1/2111	0.00	82.19	0.00	0.000	0.004	0.0030	0.008	36.95		4,777	7	0.29	-	-	-	-	3.23	-
1/1/2112	0.00	81.05	0.00	0.000	0.004	0.0030	0.008	36.87		4,680	7	0.29	-	-	-	-	3.18	-
1/1/2113	0.00	80.25	0.00	0.000	0.004	0.0030	0.008	36.92		4,615	7	0.30	-	-	-	-	3.31	-
1/1/2114	0.00	79.62	0.00	0.000	0.004	0.0030	0.008	36.96		4,552	7	0.30	-	-	-	-	3.37	-
1/1/2115	0.00	79.13	0.00	0.000	0.004	0.0031	0.008	37.00		4,489	7	0.31	-	-	-	-	3.42	-
1/1/2116	0.00	78.51	0.00	0.000	0.004	0.0031	0.008	36.90		4,403	7	0.31	-	-	-	-	3.37	-
1/1/2117	0.00	78.11	0.00	0.000	0.004	0.0031	0.008	36.92		4,348	7	0.32	-	-	-	-	3.51	-
1/1/2118	0.00	77.82	0.00	0.000	0.004	0.0031	0.008	36.94		4,300	7	0.32	-	-	-	-	3.57	-
1/1/2119	0.00	77.58	0.00	0.000	0.004	0.0031	0.008	36.96		4,258	8	0.33	-	-	-	-	3.62	-
1/1/2120	0.00	77.18	0.00	0.000	0.004	0.0031	0.008	36.84		4,186	7	0.32	-	-	-	-	3.56	-
1/1/2121	0.00	76.96	0.00	0.000	0.004	0.0031	0.008	36.85		4,148	8	0.33	-	-	-	-	3.68	-
1/1/2122	0.00	76.86	0.00	0.000	0.004	0.0031	0.008	36.88		4,109	8	0.34	-	-	-	-	3.73	-
1/1/2123	0.00	76.74	0.00	0.000	0.004	0.0031	0.008	36.88		4,081	8	0.34	-	-	-	-	3.77	-

APPENDIX D

West Ridge Hydrodynamic Containment

Appendix D1
Yankee Doodle Tailings Impoundment 6560 Amendment Groundwater Model

Appendix D2
Montana Resources Continental Mine West Ridge Augmented Recharge Testing Program

APPENDIX D1

Yankee Doodle Tailings Impoundment 6560 Amendment Groundwater Model

(Pages D1-1 to D1-38)

YANKEE DOODLE TAILINGS IMPOUNDMENT

6560 AMENDMENT GROUNDWATER MODEL

Prepared for:
Montana Resources, LLC
600 Shields Avenue
Butte, Montana 59701

Prepared by:

Hydrometrics, Inc.
3020 Bozeman Avenue
Helena, Montana 59601

January 2025

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YANKEE DOODLE TAILINGS IMPOUNDMENT

6560 AMENDMENT GROUNDWATER MODEL

1.0 INTRODUCTION

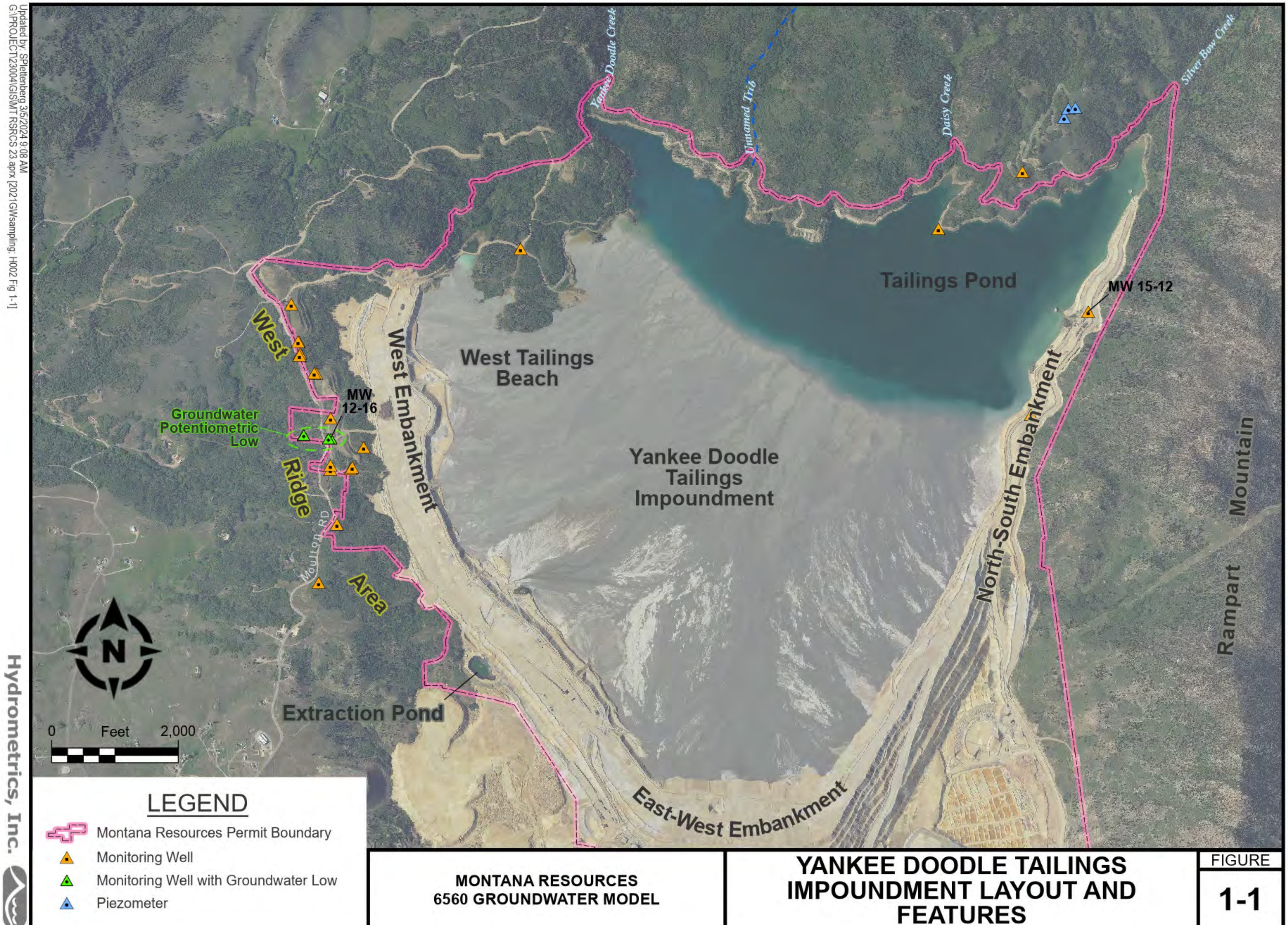
Montana Resources, LLC (MR) operates the open pit copper and molybdenum Continental Mine near the city of Butte in Silver Bow County, Montana. Mine tailings produced through the ore milling process are stored in the Yankee Doodle Tailings Impoundment (YDTI). To accommodate future mining operations, MR intends to increase the storage capacity of the impoundment by increasing the permitted impoundment elevation to 6,560 feet ACC[1] from the currently permitted 6,450 elevation. The modified impoundment would have a maximum pond level of approximately 6,535 feet.

To evaluate the YDTI performance under the proposed 6,560 raise, in terms of maintaining hydrodynamic containment (i.e., preventing water quality impacts outside of the mine permit boundary), Hydrometrics developed a two-dimensional steady state cross sectional groundwater model for a portion of the YDTI. This report presents details of the model development and results, as well as relevant background information on the YDTI.

1.1 SITE AND PROJECT BACKGROUND

The YDTI occupies a drainage bottom with engineered embankments, the North-South, East-West and West Embankments (Figure 1-1), on three sides. The higher topography and groundwater elevations to the north, east and west naturally maintain hydrodynamic containment within the impoundment due to the positive hydraulic gradients from the ridge crests towards the impoundment. The lower elevation area to the south, referred to as Horseshoe Bend, receives seepage through the East-West and North-South Embankments, where the seepage is captured and treated at MR's water treatment plant and diverted to the mine process water circuit.

[1] All elevations presented in this memorandum are referenced to the Anaconda Copper Company (ACC) vertical datum, which is approximately 53 feet higher than NAVD 1988.



MONTANA RESOURCES
6560 GROUNDWATER MODEL

YANKEE DOODLE TAILINGS IMPOUNDMENT LAYOUT AND FEATURES

FIGURE 1-1

Topographic and groundwater elevations west of the YDTI, an area referred to as the West Ridge, are higher than the YDTI but lower than the high elevation uplands to the north and east. Due to the lower elevation, the West Ridge has been the focus of detailed site characterization programs dating back to 2012. The purpose of the site characterization was to ensure that the West Ridge geologic and hydrologic conditions, along with the engineered controls within the West Embankment, will maintain hydrodynamic containment under the currently permitted 6,450 and future conditions.

Results of the site characterization programs show that the West Ridge is comprised of Butte Quartz Monzonite (BQM) granitic bedrock overlain by highly to completely weathered, decomposed bedrock with unconsolidated alluvium/colluvium in drainage bottoms (Hydrometrics, 2017; Knight Piésold (KP), 2017a; Hydrometrics, 2018a). Trenching and drilling identified several gouge-filled geologic structures cross-cutting the West Ridge which act as restrictions to groundwater flow. Groundwater levels recorded from bedrock drillholes and monitoring wells show the potentiometric surface along the ridge crest ranges from about 6,500 feet in the north and south portions of the ridge, to about 6,400 feet in the central ridge area. The lower potentiometric level in the central ridge area, documented by water levels in monitoring well MW12-16 (and adjacent MW15-03), is referred to as the West Ridge potentiometric low (Figure 1-1). Groundwater levels within the potentiometric low area are about 40 feet higher than the current tailings pond elevation of 6,360 feet.

To promote hydrodynamic containment under future impoundment conditions, a number of engineered features have been incorporated into the West Embankment design and operations. First, the West Embankment, initially constructed in 2017, is underlain by a seepage collection trench referred to as the West Embankment Drain (WED). The WED is constructed of high permeability drain rock and is intended to capture potential westward seepage from the impoundment. The WED extends along the length of the West Embankment and gravity drains to an extraction pond (Figure 1-1) at the south end of the WED, with the captured water pumped back to the impoundment. Second, the West Embankment is constructed to promote downward drainage to the WED of tailings water seepage into the embankment upstream face. In addition, MR began development of a tailings beach along the west side of the impoundment in 2018 (Figure 1-1) to prevent ponding of tailings water near the West Embankment. Together, these engineered controls and tailings management practices reduce the potential for westward migration of tailings water. Based on groundwater level and water quality monitoring results through 2023, the West Embankment and WED are functioning as intended.

To further evaluate groundwater flow patterns in the vicinity of the West Embankment and WED under current and future conditions, a two-dimensional groundwater flow model was developed. Objectives of the 6,560 West Embankment/WED groundwater model include:

- Evaluating current and future flow conditions in the vicinity of the WED;
- Determining source(s) of flow (West Ridge groundwater, tailings water) to the WED; and
- Evaluating the ability of the West Embankment and WED to maintain hydrodynamic containment under the proposed 6,560 raise.

The remainder of this report describes specific site features and operational practices relevant to the 6,560 groundwater modeling, the groundwater model design, development and results, with summary and conclusions presented at the end.

1.2 RELEVANT FEATURES OF THE YDTI

Several features such as geologic units, engineering design, and YDTI management practices are relevant to the 6,560 model design and development. These features are described in detail in other technical reports and are summarized below.

1.2.1 Geologic Units at the YDTI

The geology of the West Ridge and YDTI area is critical to maintaining current and future hydrodynamic containment and has been well documented through previous site characterization programs. Key geologic features of the area incorporated into the groundwater model include:

- Weathered Bedrock Unit: The weathered bedrock unit includes the surficial bedrock extending from the West Ridge crest eastward beneath the YDTI. In the groundwater model, the weathered bedrock unit includes the alluvium/colluvium, completely weathered bedrock and highly weathered bedrock described in KP, 2017a. Reported thicknesses of the subunits comprising the weathered bedrock unit range from 0 feet on topographic highs to up to 70 feet in drainage bottoms along the West Ridge east slope. Infiltration tests performed on the unconsolidated and completely weathered bedrock subunits yielded hydraulic conductivity values ranging from $1.06*10^{-3}$ to $1.76*10^{-2}$ cm/sec (3 to 50 ft/day) with one test in the completely weathered bedrock, representative of the unit within model domain, at the low end of this range (KP, 2017a). Due to its higher hydraulic conductivity than the underlying more competent bedrock, the weathered bedrock layer acts as a preferential flowpath for shallow groundwater and tailings slurry water infiltration and strongly influences groundwater and tailings water flow in the vicinity of the West Embankment and WED.

- Competent Bedrock: Underlying the weathered bedrock is relatively hard, competent BQM bedrock. For modeling purposes, the Competent Bedrock unit includes the moderately weathered and competent bedrock subunits described in KP, 2017a. Based on core drilling, the moderately weathered bedrock thickness exceeds 100 feet in most places. Beneath the moderately weathered bedrock is the slightly weathered to fresh BQM bedrock. The deeper bedrock exhibits the original rock fabric and reduced fracturing in most places, and extends beyond the 500-foot maximum depth of drilling. Based on aquifer pumping tests and drillhole packer tests, the Competent Bedrock hydraulic conductivity ranges from less than $1.0*10^{-6}$ to $6*10^{-4}$ cm/sec (0.0028 to 1.70 ft/day) and decreases with depth due to increased lithostatic pressure.

- Silver Bow Creek and Yankee Doodle Creek Alluvium: The YDTI overlies the original Silver Bow Creek and Yankee Doodle Creek and tributary drainages and associated alluvium. The former creek channels extend from north of the impoundment, beneath the accumulated tailings and East-West Embankment, to Horseshoe Bend south of the impoundment. Due to the higher alluvium hydraulic conductivity ($1.06*10^{-3}$ to $1.76*10^{-2}$ cm/sec, 3 to 50 ft/day) compared to the overlying tailings slimes, the alluvium acts as a drain beneath the tailings, conveying pond and tailings seepage southward to Horseshoe Bend where the seepage is captured and treated at MR's water treatment plant. The alluvium is in direct contact with the northern portion of the tailings pond, and is believed to convey pond drainage beneath the tailings to Horseshoe Bend. The alluvium is also connected to and acts as a drain for lateral drainage through the weathered bedrock unit.

- Tailings: With initiation of tailings discharge along the West Embankment in 2018, a tailings beach has been developed along the West Embankment toe (Figure 1-1). As of 2023, the west beach extends eastward from the embankment 4,000 to 5,000 feet, and is comprised of sand-size tailings near the embankment toe, grading to fine grained tailings slimes more distal from the embankment. The coarser sand tailings allow slurry water to infiltrate near the embankment while the tailings slimes form a low permeability zone between the tailings pond and embankment. KP (2017a) estimated "order of magnitude" hydraulic conductivity values for the tailings sand and slimes based on normalized soil behavior and/or pore pressure dissipation testing. Test results indicate hydraulic conductivity values for the tailings sand, with varying silt content, ranging from $1.06*10^{-4}$ to $1.06*10^{-6}$ (0.30 to 0.003 ft/day) while the tailings slimes range from $7.06*10^{-7}$ to $2.82*10^{-7}$ cm/sec (0.002 to 0.0008 ft/day). Hydrometrics (1994) performed two slug tests and five seepage pit tests on the sand size tailings near the East-West Embankment with hydraulic conductivity values ranging from $7.7*10^{-4}$ to $6.11*10^{-3}$ cm/sec (2.0 to 17.3 ft/day). The tailings are divided into multiple zones with differing hydraulic properties in the groundwater model.

An additional geologic feature of importance identified through the West Ridge site characterization programs is a deep fracture system located south of the groundwater potentiometric low. During the initial site investigations, groundwater levels in the deep fracture system were some of the lowest recorded along the West Ridge crest, but water levels have since rebounded to over 6,400 feet, slightly higher than the potentiometric low levels. Since the deep fracture system is located outside of the model domain, it is not represented or expected to influence the two dimensional groundwater model results.

1.2.2 West Embankment and West Embankment Drain

The West Embankment and WED were designed and constructed as part of the 6450 raise to promote hydrodynamic containment along the West Ridge. The embankment is constructed of higher permeability earthen material (Zone U) on the upstream side and lower permeability material (Zone D1) on the downstream side to promote downward drainage of tailings water seepage into the embankment face to the underlying WED. Based on construction specifications (KP, 2016), Zone U and Zone D1 materials are estimated to have hydraulic conductivity values of $1.0*10^{-2}$ and $1.0*10^{-4}$ cm/sec (28 and 0.28 ft/day), respectively, and are represented as such in the groundwater model.

The WED underlies the upstream side of the West Embankment and intercepts potential leakage of tailings water beneath the embankment and drainage from the Zone U embankment fill. The WED is comprised of coarse (3-inch to 24-inch, D_{50} = 10-inch) drain rock with a maximum design capacity of 4,500 gpm (KP, 2017b). The WED slopes to the south at a 0.25% grade with an invert elevation of 6,350 east of the groundwater potentiometric low. The WED gravity drains to the lined extraction pond (Figure 1-1) where the collected water is pumped back to the tailings pond. Based on construction specifications, the WED drain rock was assigned a hydraulic conductivity of 1.0 cm/sec (2,830 ft/day) in the model.

1.2.3 Tailings Discharge

Considerable effort has been placed on accurately depicting the West Embankment tailings discharge configuration and schedule in the model due to the potential for infiltration of tailings slurry water to recharge the WED. As of 2018, tailings slurry has been discharged from four 26-inch lines positioned along the upstream toe of the West Embankment, with an additional 12-inch discharge line added in 2022 (Figure 1-2). Current discharge points along the West Embankment include:

- Four 26-inch discharge lines: Discharge Line 1 is on the West Embankment adjacent to the WED and north of Rocky Knob. Discharge Line 1 discharges from spigots 1-1, 1-2, 1-3, and 1-4. Discharge Line 2 is on the southwest portion of the west beach, largely south of the WED. However, Spigot 2-3 is located near Spigot 1-1 and adjacent to the WED. When in operation, slurry is discharged from only one 26-inch spigot at a time.
- 12-inch discharge line: An additional tailings discharge line (12-inch discharge Zone 1) was added to the West Embankment in January 2022. The 12-inch line feeds six discharge points along the length of the West Embankment (Figure 1-2). When in operation, slurry is discharged from all six points along the 12-inch line.

MR maintains detailed records on the tailings discharge schedule for the various lines and spigots along the West Embankment. Based on these schedules, the average tailings discharge rate and the water-fraction of the tailings discharge were determined to simulate slurry water application and infiltration to the west beach in the model. The water-fraction calculation is based on the following details and approximations.

- The total tailings discharge rate of 18,000 gpm is discharged through two lines at a time with each line discharging 9,000 gpm.
- The tailings solids have a specific gravity of 2.8 and the tailings slurry is 33% solids by weight.

Based on these details, the water-fraction of the tailings slurry discharge was calculated to be 85% by volume of the total slurry discharge, or 15,300 gpm.

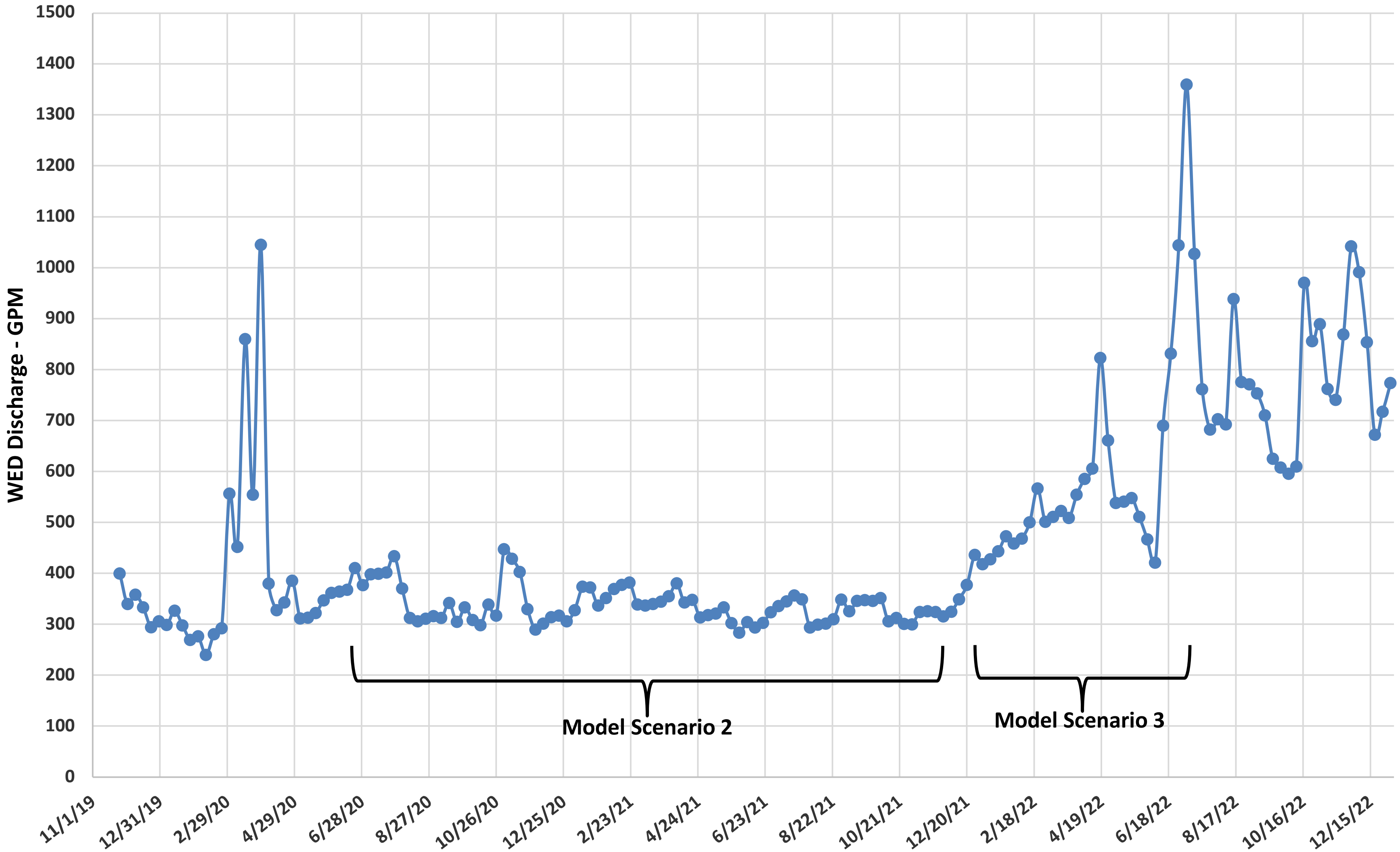
The average discharge rate along the West Embankment was determined for each model period by first summing the total operation hours of the West Embankment spigots, excluding Spigot 2-3 (see Section 1.3, below), and multiplying by the 7,650 gpm water-fraction discharge rate to determine a total discharged volume. The average discharge rate was calculated as the total discharged volume divided by the total time of the discharge period for each scenario.

YANKEE DOODLE TAILINGS IMPOUNDMENT 6560 AMENDMENT GROUNDWATER MODEL	TAILINGS SLURRY DISCHARGE LOCATIONS	Figure 1-2

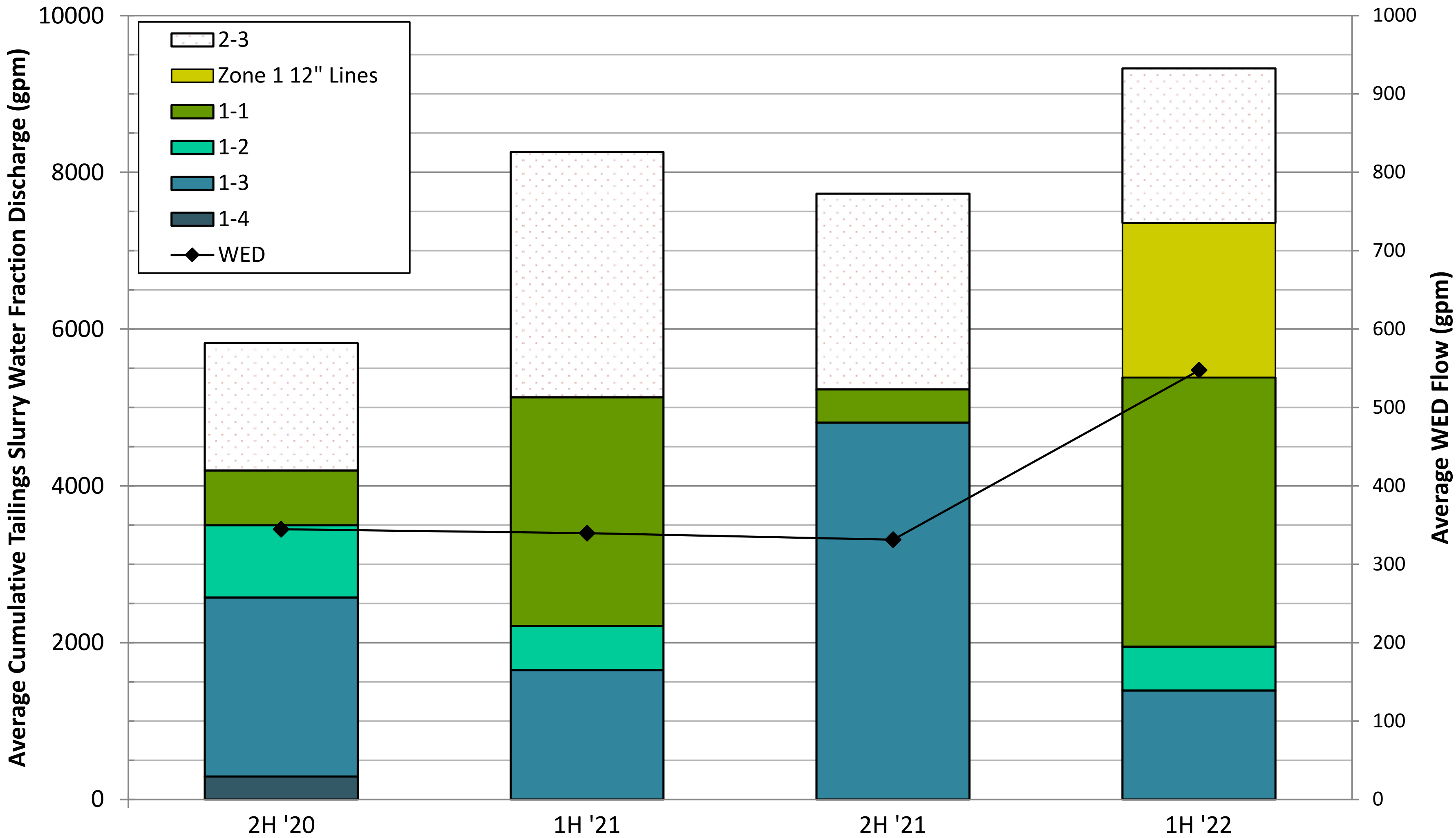
1.3 WEST EMBANKMENT DRAIN FLOW

Simulation of measured WED flow rates is a key component of the model development and utility. WED flow rates were determined from records maintained by MR of daily extraction pond pumping volumes. Figure 1-3 shows the WED flows, presented as weekly averages to reduce the short-term variability and noise in the daily WED flow data. WED flows were relatively constant from November 2019 through December 2021, then increased steadily through 2022.

The WED flow trends were compared to the West Embankment tailings discharge schedules to evaluate potential correlations between the WED flows and tailings discharge. Figure 1-4 shows the average tailings discharge (water fraction) on a semiannual basis for the individual spigots from July 2020 through December 2022. The WED flow correlates well with the cumulative flow from 24-inch line spigots 1-1 through 1-4, with less correlation with spigot 2-3 discharge. This suggests that infiltration of spigots 1-1 through 1-4 discharge water contributes to the WED flow with little or no contribution from spigot 2-3 discharge. While spigots 1-1 and 2-3 are located close to each other (Figure 1-2), discharge from spigot 1-1 flows northeast and discharge flow from spigot 2-3 flows east/southeast away from the WED recharge area. As shown in Figure 1-4, the increase in WED flow during the first half of 2022 correlates well with addition of the 12-inch tailings line in January 2022. The correlation between the WED flow and 12-inch discharge lines is further indicated during the second half of 2022 when the 12-inch line discharge and WED flow increased but the total tailings discharge decreased. The WED flow and tailings discharge data indicate that discharge from most West Embankment tailings spigots contributes to the WED flow, with the flow rate particularly responsive to introduction of the 12-inch tailings discharge line in 2022. It should be noted that other factors may also affect the rate of tailings water recharge to the WED, such as the spigot elevations relative to the coarser fill material at the base of each embankment lift. Since the groundwater modeling was conducted, WED flows have largely stabilized in the 600 to 700 gpm range, suggesting the spigot elevation relative to coarser embankment fill layers may influence WED flow rates.



YANKEE DOODLE TAILINGS IMPOUNDMENT 6560 AMENDMENT GROUNDWATER MODEL	WEEKLY AVERAGE WED FLOWS	Figure 1-3



YANKEE DOODLE TAILINGS IMPOUNDMENT 6560 AMENDMENT GROUNDWATER MODEL	SEMI-ANNUAL AVERAGE TAILINGS SLURRY DISCHARGE AND WED FLOW	Figure 1-4

2.0 GROUNDWATER MODEL DESIGN AND DEVELOPMENT

Four different scenarios were simulated with the 6,560 cross sectional groundwater model representing differing impoundment conditions. Three of the scenarios represent past or current impoundment conditions where model results were compared to documented conditions as a check on the model's ability to simulate actual field conditions. The fourth scenario included predictive simulations of the proposed 6,560 raise conditions based on the field condition-verified Scenarios 1 through 3 results. The four model scenarios represent different impoundment construction phases and WED and tailings discharge flow rates, and include:

1) Scenario 1, Background conditions: Represents documented conditions in 2017, prior to West Embankment and WED construction, with a tailings pond elevation of 6,340 feet and no west tailings beach.
2) Scenario 2, July 2020 through December 2021: Represents YDTI and West Ridge conditions with the West Embankment, WED and west tailings beach in place, a stable pond elevation of 6,360 feet, relatively constant WED flow of about 350 gpm (Figure 1-3), and average West Embankment tailings discharge water fraction of about 4,800 gpm (Figure 1-4). The tailings discharge is through the 24-inch lines only (no 12-inch line) and excludes spigot 2-3 since discharge from that spigot is not believed to contribute significantly to WED flow (Section 1.3).
3) Scenario 3, First Half 2022: Similar to Scenario 2 with a pond elevation of 6,360 feet, a larger west tailings beach, WED flow averaging 550 gpm, and tailing discharge through the 24-inch and 12-inch discharge lines totaling an average of about 7,400 gpm along the West Embankment.
4) Scenario 4, Proposed 6,560 Raise: Predictive simulations of WED flow, West Ridge potentiometric low groundwater levels, and hydrodynamic containment status with a tailings pond elevation of 6,530 feet, and the same tailings discharge rates and configuration as Scenario 3.

Throughout the development process, model details and progress were shared with the project team (MR, KP, and Independent Review Panel personnel) through a series of virtual meetings and PowerPoint presentations. Recommendations and feedback provided through these discussions were incorporated into the various model iterations.

2.1 MODEL DEVELOPMENT, DOMAIN, AND BOUNDARY CONDITIONS

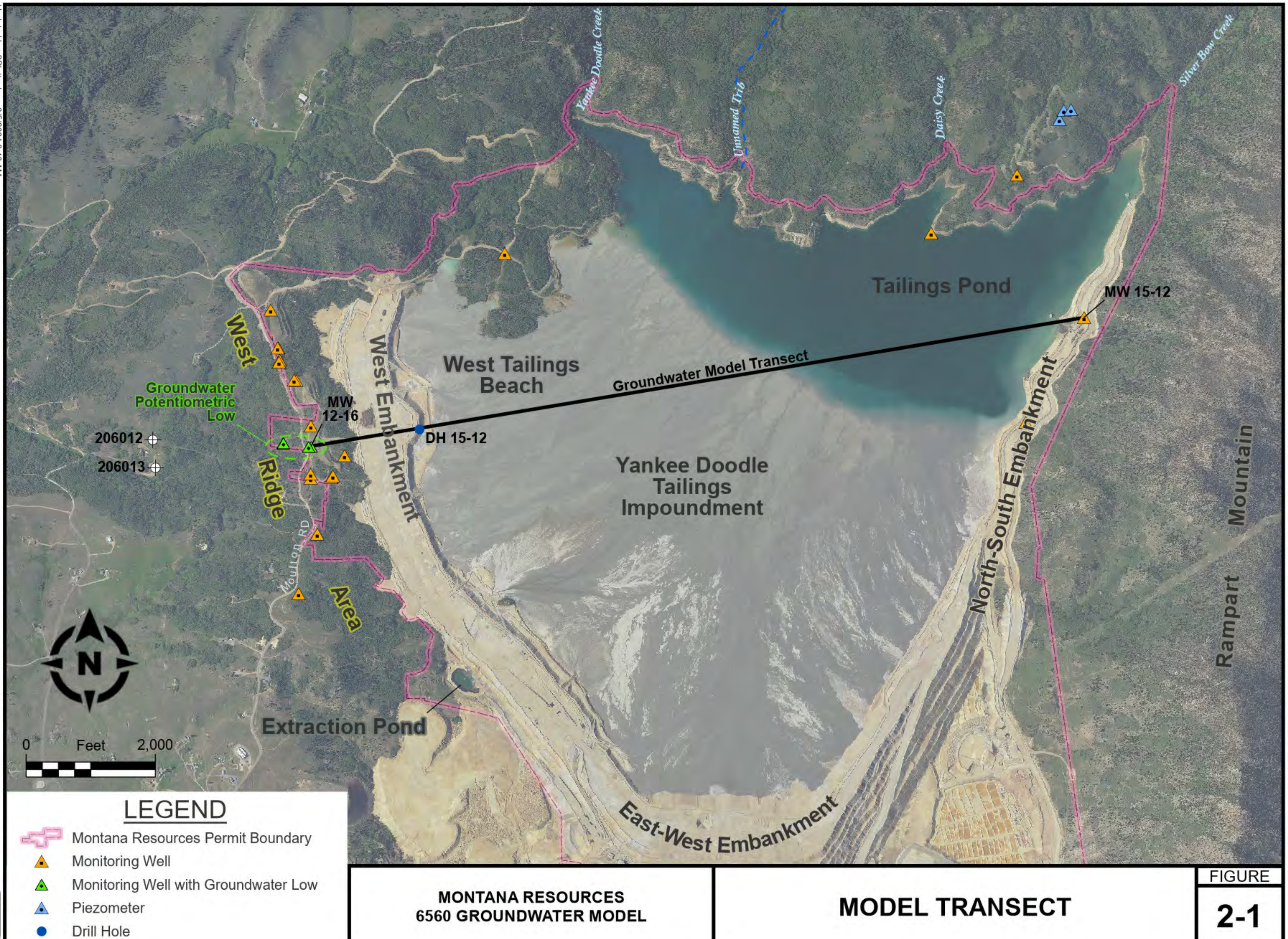
The 6,560 groundwater model is a two-dimensional steady state cross sectional model generated with the Modflow NWT modeling package and the GMS graphical user interface (version 10.7.3). The model builds upon previous modeling completed for the 6,450 level YDTI raise (Hydrometrics, 2017). It should be noted that the purpose of the 6,560 model is to evaluate the groundwater flow field in the vicinity of the West Embankment/WED and the east side of the West Ridge under future tailings pond and beach conditions. Due to certain limitations intrinsic to two-dimensional models simulating three-dimensional flow fields, this analysis is not intended to be a quantitative representation of future groundwater flow for the YDTI or West Ridge. However, the simulation results do provide a good assessment of the anticipated performance of the WED at maintaining hydrodynamic containment, and the predicted conditions can be compared to future monitoring results and observations as one tool in determining if the West Embankment and WED are performing as expected.

2.1.1 Model Domain

The model domain includes a cross section extending from the West Ridge crest, eastward approximately 12,000 feet to the east side of the tailings impoundment (Figure 2-1). The domain extends through the groundwater potentiometric low (MW12-16), the West Embankment and WED, west tailings beach and the tailings pond, ending at monitoring well MW15-12 on the east. The west boundary coincides closely with the location of a northwest-southeast trending gouge filled geologic structure identified as a restriction to westward groundwater flow (DH16-03-7W shear, Hydrometrics, 2017). The structure is not represented in the model, which adds a level of conservatism to the models evaluation of hydrodynamic containment. The domain extends from a maximum elevation of 6,560 feet, corresponding to the ultimate proposed West Embankment elevation, to a minimum of 5,585 feet, approximately 500 feet below the YDTI base. The WED invert elevation along the model transect is about 6,350 feet.

2.1.2 Boundary Conditions

Boundary conditions are summarized on Table 2-1. The western model boundary is simulated as a general head boundary referencing two residential wells (GWIC IDs 206012 and 206013, Figure 2-1) approximately 2,400 feet west of the West Ridge crest. The conductance of the general head boundary is 0.019 ft^2/day and the elevation set at 6,290 feet based on water level measurements from the two residential wells. The general head boundary elevation is 60 feet lower than the WED invert elevation allowing for westward flow of tailings water below the WED (i.e., loss of hydrodynamic containment) if modeled conditions dictate.



Hydrometrics, Inc.

MONTANA RESOURCES 6560 GROUNDWATER MODEL	MODEL TRANSECT	FIGURE 2-1

TABLE 2-1. MODEL BOUNDARY CONDITIONS AND FEATURES

Model Boundary	Boundary Type	Notes
West Boundary	General Head	Located 2,400 feet west of model transect. Conductance 0.019 ft^2/day; Elevation 6,290.
East Boundary	No Flow	Outside model focus area.
Bottom Boundary	No Flow	500 feet below impoundment base
Tailings Pond	Constant Head	6,340 for model Scenario 1 6,360 for Scenarios 2 and 3 6,530 for Scenario 4
West Ridge Potentiometric Low	Recharge	2.38", 15% of annual precipitation
West Ridge slopes, West Embankment	Recharge	1.58”, 10% of annual precipitation
Tailings Beach	Recharge	10% sand tailings, 4% fine tailings
West Embankment Drain	Drain Cell	Invert 6,350; Conductance 10,000 ft^2/day.
Silver Bow and Yankee Doodle Creek Alluvium	Drain Cells	Represents alluvial drainages beneath tailings pile. Conductance 283 ft^2/day.

The pond elevation is simulated as a constant head boundary with nodes added at the pond surface corresponding to the surveyed or predicted pond elevation for each modeled scenario (6,340, 6,360 and 6,530). The eastern boundary and bottom boundary are simulated as no-flow boundaries. Surfaces along the tailings beach, West Embankment and West Ridge are simulated as recharge boundaries.

The WED is simulated as a head-dependent boundary (drain) with an invert elevation of 6,350. The drain conductance is 10,000 ft^2/day based on descriptions of the WED fill material (3-inch to 24-inch washed rounded cobbles and boulders, KP, 2017b), and design capacity (4,500 gpm).

Alluvium of the Yankee Doodle Creek and Silver Bow Creek drainages extends from north to south beneath the YDTI and affects impoundment drainage (Section 1.2.1). Drainage through the alluvial deposits, which run perpendicular to the east-west model transect, is simulated with a head-dependent boundary (drain) at the location of the Yankee Doodle and Silver Bow Creek alluvium in the model transect (Figure 2-2). The alluvial drain heads are based on the elevation at the drain locations of a straight line drawn from the tailings pond on the north to Horseshoe Bend on the south, both hydraulically connected to the alluvial drainages. This assumes a linear decrease in head from north to south through the alluvium, the ramifications of which were evaluated in a sensitivity analysis (Section 3.5). The alluvial drain conductance

(283 ft^2/day) was calculated based on the alluvium hydraulic conductivity (2.83 ft/day), and drain cell dimensions.

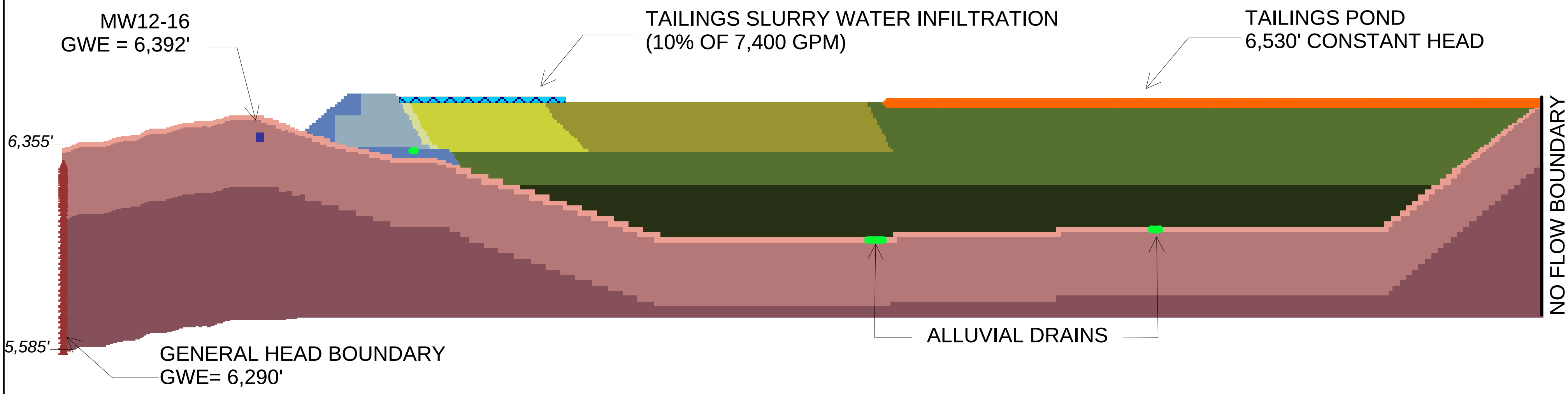
2.2 MODEL HYDROLOGIC PROPERTIES

The hydrologic properties of geologic and construction materials within the model domain are presented in Figure 2-2 and Table 2-2. Hydrologic properties such as material hydraulic conductivity were determined based on empirical data collected during previous site characterization programs (Section 1.2), comparison of model results to documented field conditions, and best professional judgement. All parameter refinements were made during model Scenarios 1 through 3 development based on measured values of WED flow, tailings discharge and groundwater elevations. The final Scenario 3 parameters were maintained in the Scenario 4 6,560 predictive simulations.

Hydraulic conductivity (K) values for the natural earthen materials were obtained from prior site investigations (Hydrometrics, 2017; KP, 2017a). The shallow surficial geologic unit, referred to as weathered bedrock, comprises the alluvium, colluvium, completely weathered bedrock and highly weathered bedrock described in KP, 2017a. The weathered bedrock unit ranges from 10 to 40 feet thick in the model and averages 20 feet thick. Based on test pit and infiltration tests performed on these materials (Section 1.2.1), with slight adjustments during model development, the weathered bedrock unit was assigned a hydraulic conductivity of $1.0*10^{-3}$ cm/sec (2.83 ft/day).

Beneath the weathered bedrock unit is the more competent granitic bedrock. Based on aquifer pumping test and drillhole packer test results, and model development, the upper 200 feet of competent bedrock was assigned a K of $1.0*10^{-5}$ cm/sec (0.028 ft/day) and $1.0*10^{-6}$ cm/sec (0.0028 ft/day) below 200 feet. The lower K below 200 feet is indicated by results of a limited number of deeper packer tests performed below 200 feet (Figure 3.14, KP, 2017a), and typical of bedrock aquifers due to increased lithostatic pressure with depth.

Initial K values for the West Embankment Zone U and Zone D1, and WED materials, were determined from the embankment design specifications (KP, 2017b). The upstream Zone U material was assigned a K of $1.0*10^{-2}$ cm/sec (28.3 ft/day) and the downstream Zone D1 $1.0*10^{-4}$ cm/sec (0.283 ft/day). The WED drain rock was assigned a K value of 1.0 cm/sec (2,830 ft/day). These values remained constant throughout the modeling process.



Material	Conductivity (cm/sec)	Kh/Kv
Rockfill - Downstream	1.0E-04	1
Rockfill - Upstream	1.0E-02	1
WED Drain Rock & Transition	1	1
Tailings Sand – High K	5.3E-03	5
Tailings Sand	2.6E-03	5
Tails Transition	3.5E-04	5
Tailings Slimes – Less Consolidated	1.8E-06	5
Tailings Slimes - More Consolidated	1.8E-07	5
Weathered Bedrock	1.0E-03	1
Competent Bedrock	1.0E-05	1
Deep Bedrock	1.0E-06	1

2.5X VERTICAL EXAGGERATION

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Z X

YANKEE DOODLE TAILINGS IMPOUNDMENT
6560 AMENDMENT GROUNDWATER MODEL

MODEL DOMAIN CROSS SECTION (SCENARIO 4)

FIGURE 2-2

TABLE 2-2. MODEL INPUT - HYDROLOGIC PROPERTIES

Model Unit	Hydraulic Conductivity (K)		Kh / Kv	Parameter Source
	cm/sec	ft/day		
Weathered Bedrock	1.0E-03	2.83	1	Includes completely/highly weathered bedrock and alluvium/colluvium from KP, 2017a. 2.83 ft/day is lower end of range of infiltration test results which represent weathered bedrock present in model domain (no higher K alluvium/colluvium). Model unit 20 feet thick.
Competent bedrock - Upper 200 feet	1.0E-05	0.028	1	Aquifer pumping tests and drillhole packer test results, KP, 2017a.
Competent bedrock - Below 200 feet	1.0E-06	0.003	1	Aquifer pumping tests and drillhole packer test results, KP, 2017a.
West Embankment Upstream Fill - Zone U	1.0E-02	28.3	1	Material design specifications; West Embankment Drain Design Report, KP, 2017b.
West Embankment Downstream Fill - Zone D1	1.0E-04	0.283	1	Material design specifications; West Embankment Drain Design Report, KP, 2017b.
West Embankment Drain (WED)	1.0E+00	2830	1	Material design specifications; West Embankment Drain Design Report, KP, 2017b.
Tailings Beach Zone 1; within 280 feet of West Embankment toe	5.3E-03	15	5	Tailings beach seepage pit and slug test results (Hydrometrics, 1994); adjusted to match field conditions.
Tailings Beach Zone 2; 500 feet downstream of Zone 1	2.6E-03	7.5	5	Tailings beach seepage pit and slug test results (Hydrometrics, 1994); adjusted to match field conditions.
Tailings Beach Transition Zone	3.5E-04	1.0	5	Normalized soil behavior type and pore pressure dissipation testing. KP, 2017a; adjusted to match field conditions.
Less Consolidated Slimes	1.8E-06	0.005	5	Normalized soil behavior type and pore pressure dissipation testing. KP, 2017a; adjusted to match field conditions.
More Consolidated Slimes	1.8E-07	0.0005	5	Best professional judgement and field conditions comparison.

Tailings within the west beach were separated into five different zones to represent the transition from sand sized tailings deposited near the West Embankment to the more distal tailings slimes, and an increase in tailings density with depth (Figure 2-2). Tailings sands in tailings zone 1, extending 280 feet east from the West Embankment toe, were assigned a K of $5.3*10^{-3}$ cm/sec (15 ft/day), and beach sands in zone 2, extending 500 feet beyond zone 1, $2.6*10^{-3}$ cm/sec (7.5 ft/day). Finer grained silty tailings in the transition zone between beach sands and slimes were assigned a K value of $3.5*10^{-4}$ cm/sec (1.0 ft/day). The tailings slimes between the transition zone and tailings pond were further divided into a shallow zone above 120 feet and a deeper more compact zone, with K values of $1.8*10^{-6}$ cm/sec (0.005 ft/day) and $1.8*10^{-7}$ cm/sec (0.0005 ft/day), respectively.

All earthen and construction materials were treated as isotropic (Kh/Kv=1) except for the tailings which were assigned a Kh/Kv of 5 to reflect the stratification and presence of finer grained silty layers within the tailings package (Table 2-2).

2.3 MODEL RECHARGE

Recharge boundaries were applied over the model surface to simulate precipitation recharge to the West Ridge and YDTI, and recharge from tailings slurry water infiltration into the west tailings beach as described below.

2.3.1 Precipitation Recharge

Annual precipitation in the YDTI area is approximately 15.9 inches (KP, 2021) with a portion of annual precipitation recharging the West Ridge groundwater and YDTI. Annual precipitation recharge of 1.58 inches (10% of annual precipitation) was applied to the West Ridge east and west slopes. A higher recharge rate was applied to the groundwater potentiometric low along the ridge crest to simulate precipitation recharge as well as lateral groundwater inflow to the potentiometric low from the north and south. The potentiometric low recharge rate was adjusted to reproduce the 2016-2017 groundwater elevation in monitoring well MW12-16 resulting in a recharge rate of 2.38 inches. Other modeled precipitation recharge rates include 10% of annual precipitation for the West Embankment and tailings sands, and 4% for the fine grained tailings transition zone (Table 2-2).

2.3.2 Tailings Slurry Water Recharge

Infiltration of tailings slurry water was previously identified as a potential source of recharge to the WED based on correlations between tailings discharge rates along the West Embankment and WED flow (Section 1.3). To simulate this potential recharge mechanism in the model, the tailings beach is treated as a recharge boundary. As noted in Section 1.3, the water content of the tailings slurry was calculated to be about 85% by volume of the 9,000 gpm of tailings slurry discharged from each line, or 7,650 gpm water, when operating. Average slurry water discharge rates for each scenario accounting for actual discharge schedules are provided in Table 2-3.

During model Scenarios 1 through 3 simulations, beach recharge rates were varied to obtain a best match to documented WED flows, with a 10% slurry water recharge rate providing the best match to measured WED flows and tailings beach saturation levels (Table 2-3) of approximately 60 feet below the tailings surface (KP, 2020). The remaining 90% of tailings slurry water drains to the tailings pond, is taken up as storage in the tailings pile, infiltrates the tailings pile and flows to the alluvial drains or south towards Horseshoe Bend, or is lost to evaporation.

Of the 10% slurry water recharge, 95% infiltrates within tailings beach Zone 1 (within 280 feet of the West Embankment), and 5% infiltrates in tailings beach Zone 2 (500 feet outward from Zone 1).

TABLE 2-3. MODELED WEST EMBANKMENT AVERAGE TAILINGS SLURRY DISCHARGE AND INFILTRATION RATES

Model Scenario	Average Tailings Discharge, Water Fraction (gpm)	Tailings Infiltration (gpm)	Site Conditions
Scenario 1: *2017*	NA	NA	Prior to West Embankment, WED and west tailings beach. Pond elevation 6,340.
Scenario 2: *7/2020 – 12/2021*	4,800	480	West Embankment, WED and tailings beach in place. Tailings discharged through 24-inch lines only. Pond elevation 6,360.
Scenario 3: *1/2022 – 6/2022*	7,400	740	12-inch tailings discharge line added. Pond elevation 6,360.
Scenario 4: *6,560 Predictive Simulations*	7,400	740	Embankment raised to 6,560. Scenario 3 tailings discharge and infiltration rates applied. Pond elevation 6,530.

All values in gallons per minute
NA – Not Applicable

2.4 MODEL PARAMETER TARGETS

The model's ability to simulate actual measured field conditions was assessed by comparing model results with four target properties:

- Groundwater elevations at the West Ridge potentiometric low;
- WED flow rate;
- WED flow sources (i.e., groundwater verses tailings water); and
- Silver Bow and Yankee doodle Creek alluvial drain flow rates.

The model's ability to simulate groundwater elevations at the potentiometric low is critical to the model utility since groundwater levels along the West Ridge relative to levels at the WED are a key factor in maintaining hydrodynamic containment. Target groundwater elevations at the potentiometric low are based on water levels at monitoring well MW12-16 measured during the Scenario 1, 2, and 3 time periods. Likewise, target values for WED flow are based on measured flow rates (approximated from daily extraction pond pumping volumes, Figure 1-4) maintained by MR. Targets for sources of flow and relative contributions to the WED are based on a geochemical evaluation completed by Schafer Limited (2018 and 2023) which found the WED flow is comprised of approximately 25% West Ridge groundwater and 75% tailings water.

Measured target values for flow through the Silver Bow Creek and Yankee Doodle Creek alluvium beneath the tailings pile are not available so best estimates were made based on available information. Flow through the alluvial drains flows southward beneath the tailings and East-West Embankment to Horseshoe Bend. Other sources to the approximately 3,000 gpm flow to the Horseshoe Bend water treatment plant include leach pad drainage, groundwater discharge to the area, seepage of tailings water through the East-West Embankment as well as other potential sources. Based on the number of other sources, flow through the Yankee Doodle and Silver Bow Creek alluvium beneath the YDTI is believed to be a relatively small component of the Horseshoe Bend flow. Therefore, a target value for the alluvial drains was set at less than 10% of the total Horseshoe Bend flow, or less than 300 gpm, based on best professional judgement. Based on the limited empirical data for this target, the alluvium drainage target was given less weight in assessing model results, and the significance of alluvial drain properties in the model results was assessed in the model sensitivity analysis (Section 3.5).

3.0 MODEL RESULTS

Results for the four model scenarios are presented below. Table 3-1 includes the model results verses target values for model Scenarios 1, 2, and 3.

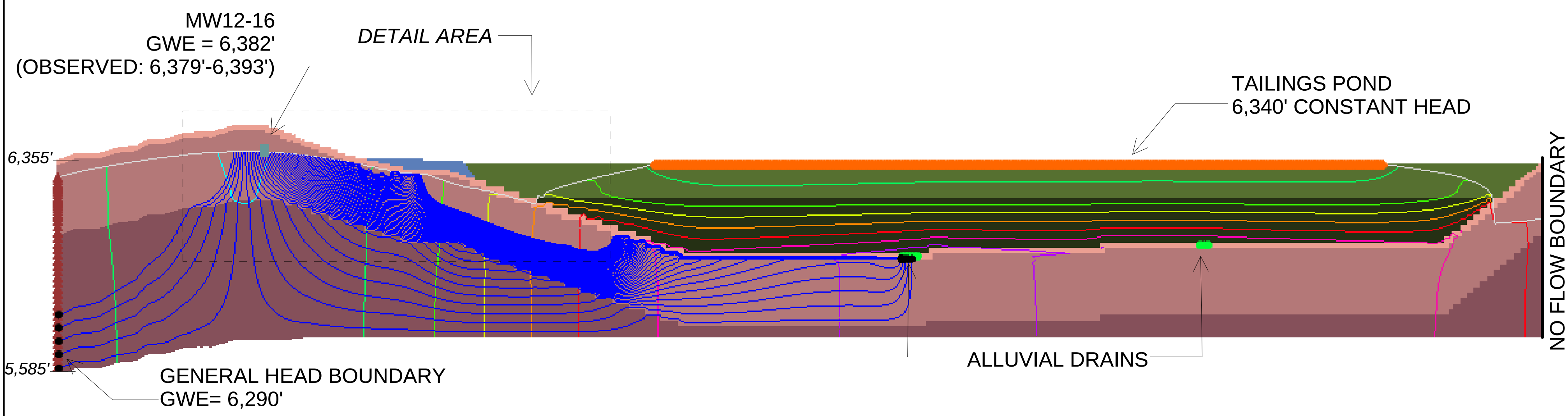
3.1 SCENARIO 1: BACKGROUND CONDITION (2017)

Figure 3-1 shows the groundwater potentiometric surface and particle tracking generated by MODFLOW for conditions in 2017, prior to the construction of the West Embankment/WED and development of the west tailings beach. During this period, the pond elevation was approximately 6,340 feet.

The potentiometric surface shows a west to east groundwater flow direction from the West Ridge groundwater potentiometric low towards the tailings pond, similar to potentiometric maps constructed from measured groundwater levels (Hydrometrics, 2017). Groundwater flows eastward through the weathered bedrock layer beneath the tailings slimes, and to the Yankee Doodle and Silver Bow Creek alluvium underlying the slimes. From there, the water flows southward to Horseshoe Bend.

The model results meet the model parameter targets for groundwater elevation at MW12-16 (potentiometric low) and flow to the alluvial drains (Table 3-1). The groundwater elevation at the groundwater potentiometric low is 6,382 feet compared to a range of 6,379 to 6,393 feet (average 6,389 feet) measured at monitoring well MW12-16 during 2017. Flow to the two alluvial drains totaled approximately 0.16 gpm within the 10-foot wide model domain, equating to approximately 160 gpm for the approximately 10,000-foot alluvial drain length. This value is less than the assumed 300 gpm target taken to be 10% of the total Horseshoe Bend flow. As noted above, the alluvial drain flow target is not well constrained by empirical data and is evaluated further in the sensitivity analysis (Section 3.5). The WED flow and WED flow source targets do not apply to Scenario 1 since the WED had not been constructed in 2017.

Figure 3-1 shows the particle tracks for Scenario 1, prior to construction of the WED or discharge to the Western Embankment. The majority of eastward flow from the West Ridge crest in this scenario occurs through the upper 200 feet of competent bedrock (24 gpm), compared to 3 gpm through the deep bedrock and 2 gpm through the weathered bedrock. Overall, the Scenario 1 model results approximate the 2017 groundwater flow patterns and applicable target values indicating the model can reproduce documented conditions along the two-dimensional model transect.



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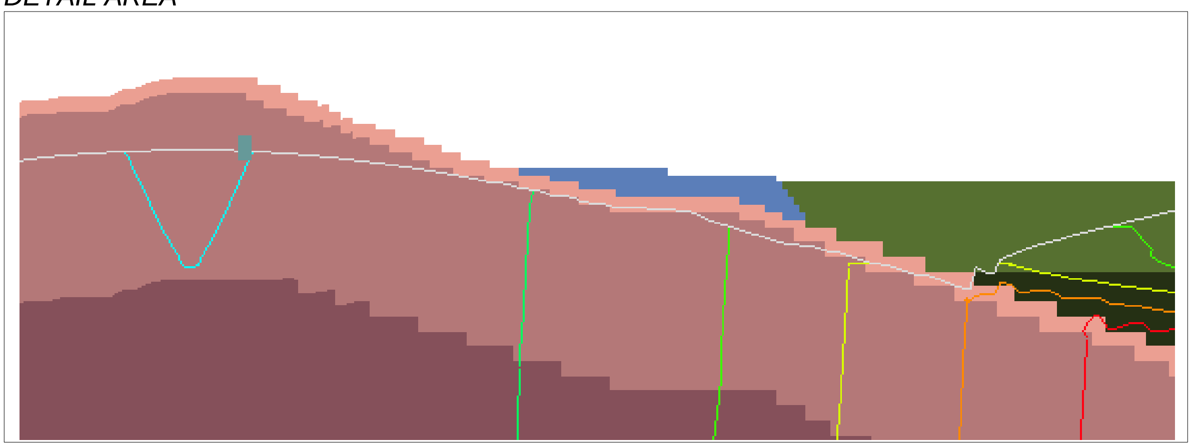

Material
Rockfill - Downstream
Rockfill - Upstream
WED Drain Rock & Transition
Tailings Sand – High K
Tailings Sand
Tails Transition
Tailings Slimes – Less Consolidated
Tailings Slimes - More Consolidated
Weathered Bedrock
Competent Bedrock
Deep Bedrock

Potentiometric Head (ft)
6480
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2.5X VERTICAL EXAGGERATION

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YANKEE DOODLE TAILINGS IMPOUNDMENT
6560 AMENDMENT GROUNDWATER MODEL

SCENARIO 1
POTENTIOMETRIC SURFACE &
PARTICLE TRACKING

FIGURE
3-1

TABLE 3-1. MODEL SCENARIO 1, 2, AND 3 TARGET VALUES AND RESULTS

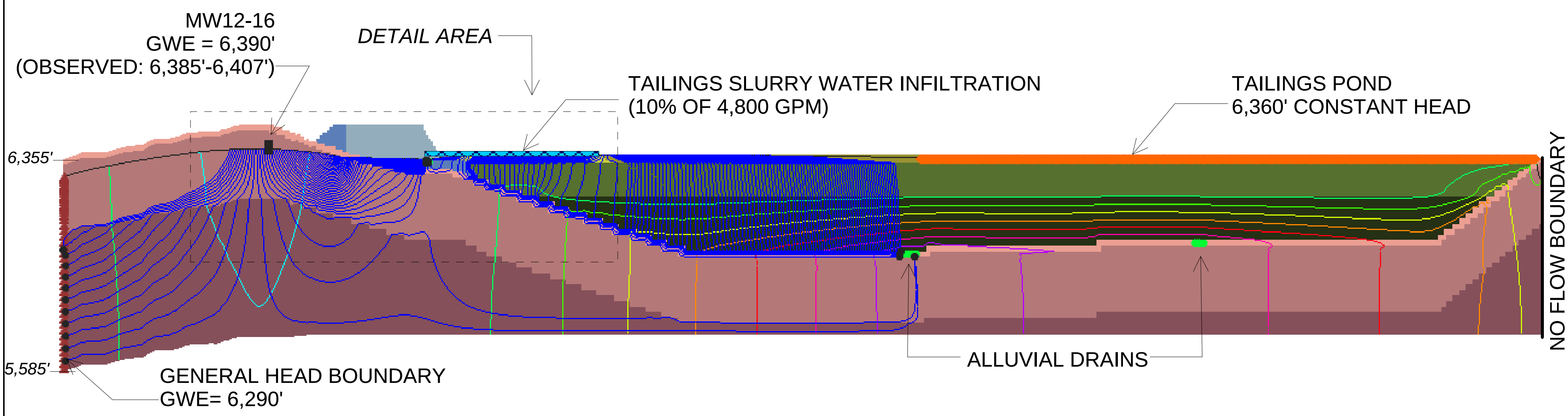
Target Parameter		Model Scenario 1	Model Scenario 2	Model Scenario 3
Potentiometric Low Groundwater Elevation - feet	*Target Value*	*6379-6393*	*6397-6405*	*6393-6397*
	Model Result	6390	6390	6391
WED Flow - gpm	*Target Value*	*NA*	*340*	*550*
	Model Result	NA	327	585
WED Flow Source %Groundwater/%Tailings water	*Target Value*	*NA*	*25%/75%*	*25%/75%*
	Model Result	NA	15%/85%	17%/83%
Alluvial Drain Flow - gpm	*Target Value*	*300*	*300*	*300*
	Model Result	160	490	460

3.2 SCENARIO 2: JULY 2020 - DECEMBER 2021

Scenario 2 depicts impoundment conditions from mid-2020 through 2021 when the West Embankment, WED and west beach were in place, WED flows were a relatively consistent 350 gpm, and tailings were being discharged along the West Embankment through the 24-inch line only. The tailings pond elevation throughout this period was approximately 6,360 feet. Scenario 2 included recharge on the sand beach equivalent to approximately 10% of the average tailings slurry water discharge (Table 2-3).

Figure 3-2 shows the model-generated potentiometric surface and particle tracking for Scenario 2. Similar to Scenario 1, the model shows a general flow pattern from the West Ridge crest eastward towards the YDTI, mimicking potentiometric patterns generated from groundwater level measurements from this time period.

The model results approximate the parameter targets for groundwater elevation at MW12-16, WED flow rates and sources, and flow to the alluvial drains (Table 3-1). The modeled groundwater elevation at MW12-16 (6,390) is slightly less than the range of groundwater elevations (6,397 to 6,405) measured during the Scenario 2 period. The modeled WED flow of 327 gpm closely approximates the average flow rate of 340 gpm. Model results show the WED flow consists of 15% West Ridge groundwater (and 85% tailings water), compared to the target of 10% to 30% groundwater based on the prior geochemistry based evaluation (Schafer, 2018). The modeled alluvial drain flow is 0.049 gpm within the 10-foot wide model domain, or 490 gpm upscaled for the 1,000-foot drainage length beneath the impoundment. Overall, the model results compare reasonably well to the model target values and indicate hydrodynamic containment along the West Ridge is maintained.



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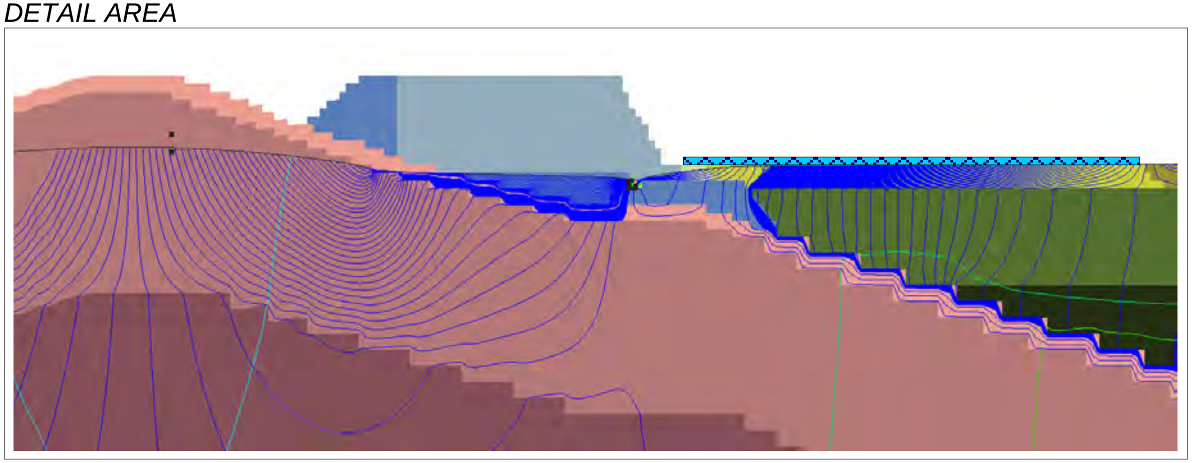

Material
Rockfill - Downstream
Rockfill - Upstream
WED Drain Rock & Transition
Tailings Sand – High K
Tailings Sand
Tails Transition
Tailings Slimes – Less Consolidated
Tailings Slimes - More Consolidated
Weathered Bedrock
Competent Bedrock
Deep Bedrock

Potentiometric Head (ft)
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2.5X VERTICAL EXAGGERATION

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YANKEE DOODLE TAILINGS IMPOUNDMENT
6560 AMENDMENT GROUNDWATER MODEL

SCENARIO 2
POTENTIOMETRIC OUTPUT
& PARTICLE TRACKING

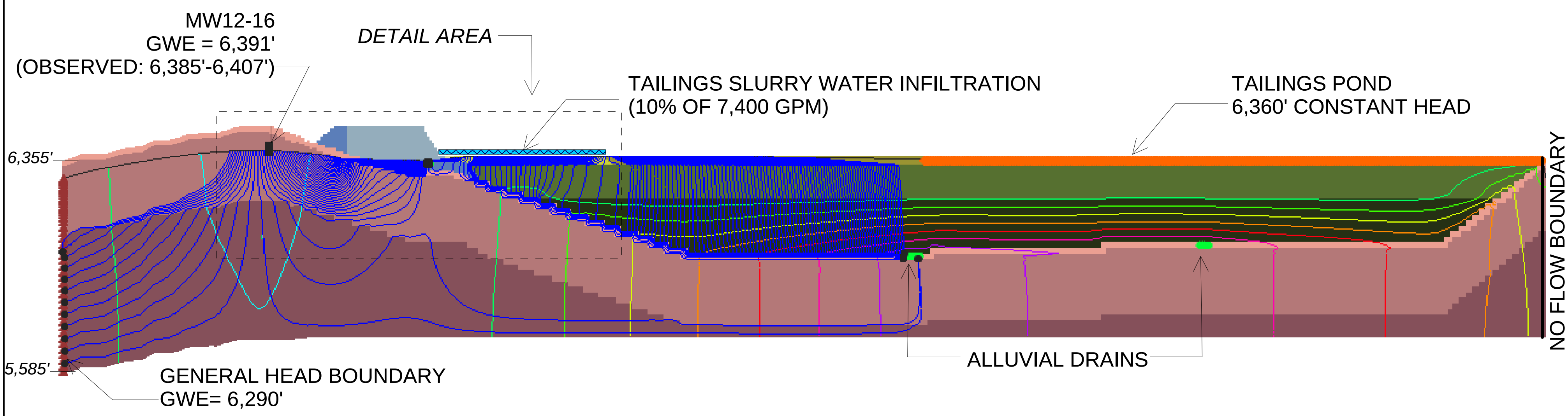
FIGURE
3-2

Particle tracking (Figure 3-2) shows the infiltrated tailings slurry water within the model cross section reports primarily to the WED either directly through the tailings pile and weathered bedrock unit, or vertically through the West Embankment Zone U fill. Tailings slurry water also infiltrates vertically through the tailings to the weathered bedrock unit and eastward to the Yankee Doodle and Silver Bow Creek alluvial drains, which drain southward to Horseshoe Bend. The majority of eastward groundwater flow from the West Ridge is through the weathered bedrock (150 gpm), with 15 gpm flow through the upper 200 feet of competent bedrock and 2 gpm through the deeper bedrock (Figure 3-2). The head at the WED is approximately 6,350 feet, closely matching heads measured in the four drillhole DH15-12 vibrating wire piezometers (range 6,349 to 6,350) located adjacent to the WED along the model transect (Figure 2-2).

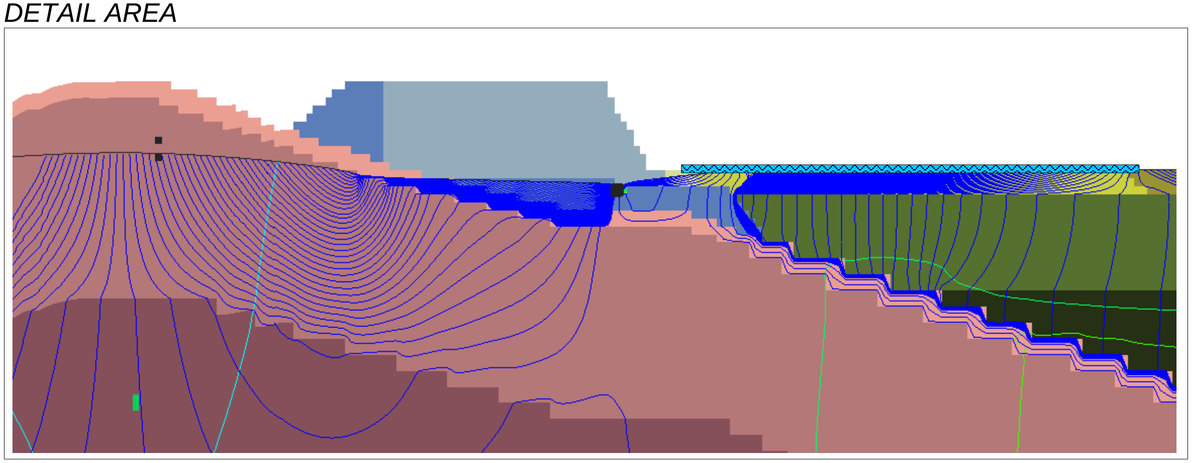
3.3 SCENARIO 3: JANUARY 2022 - JUNE 2022

Figure 3-3 shows the model-generated groundwater potentiometric map and particle tracking for the January 2022 through June 2022 period, with the West Embankment, WED and west tailings beach in place. During this period, tailings slurry discharge to the west beach and WED flows were higher than under Scenario 2 and relatively constant (7,350 gpm and 550 gpm, respectively) and the pond elevation was approximately 6,360 feet. Tailings discharge occurred through the 24-inch line and the newly installed 12-inch lines as opposed to the 24-inch line only under Scenario 2 (Section 1.2.3). This simulation included recharge on the sand beach equivalent to approximately 10% of the average tailings slurry discharge, same as Scenario 2 (Table 2-3).

The model results meet the model parameter targets for groundwater elevation at the groundwater potentiometric low, WED flow rates and sources, and flow to the alluvial drains (Table 3-1). The modeled groundwater elevation at the potentiometric low (6,391) compares well with the 6,393 to 6,397 range of measured water levels at MW12-16 during the Scenario 3 period. The modeled WED flow of 585 gpm is close to the average measured flow of 550 gpm. Model results indicate 17% of WED flow is derived from West Ridge groundwater and 83% tailings water, compared to the 10% to 30% groundwater source target. Model results include 0.046 gpm flow to the alluvial drains within the 10-foot wide model domain, or 460 gpm for the 1,000-foot drain length. Overall, the model generated potentiometric map and target values comparison show the Scenario 3 model replicates the January through June 2022 field conditions reasonably well including maintenance of hydrodynamic containment.



DETAIL AREA



Material
Rockfill - Downstream
Rockfill - Upstream
WED Drain Rock & Transition
Tailings Sand – High K
Tailings Sand
Tails Transition
Tailings Slimes – Less Consolidated
Tailings Slimes - More Consolidated
Weathered Bedrock
Competent Bedrock
Deep Bedrock

Potentiometric Head (ft)
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2.5X VERTICAL EXAGGERATION

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YANKEE DOODLE TAILINGS IMPOUNDMENT
6560 AMENDMENT GROUNDWATER MODEL

SCENARIO 3
POTENTIOMETRIC SURFACE
& PARTICLE TRACKING

FIGURE
3-3

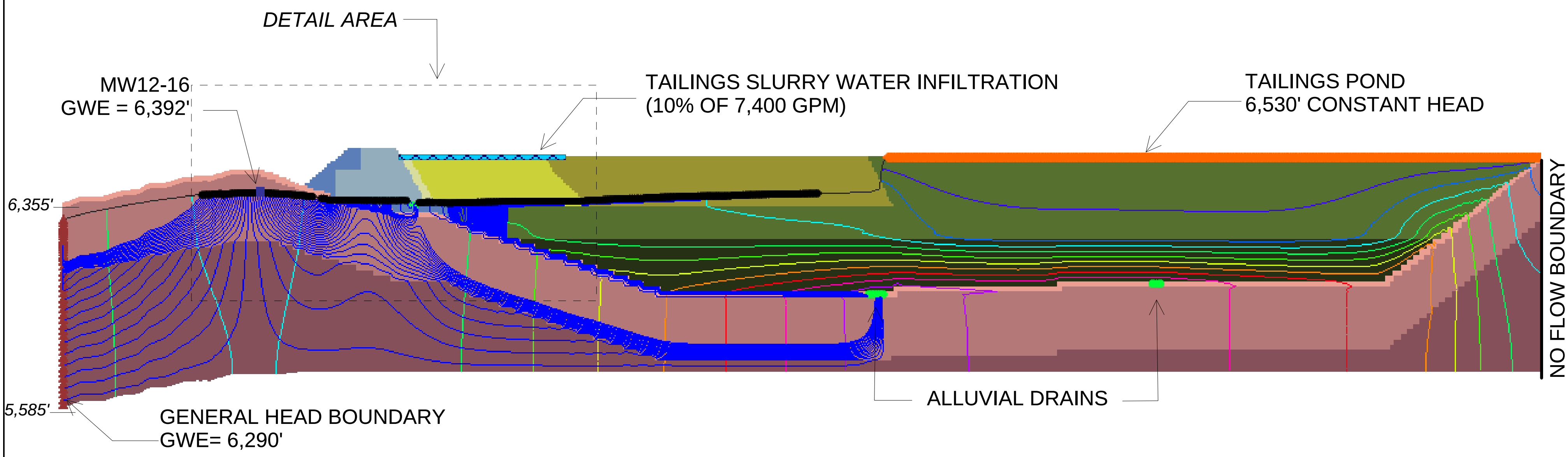
The particle tracking (Figure 3-3) shows that tailings slurry water infiltration follows similar flow paths as described for Scenario 2, with tailings water flowing primarily to the WED or to the alluvial drains through the weathered bedrock. Groundwater flow through the weathered bedrock in the vicinity of the WED is 150 gpm, with 15 gpm flow through the upper 200 feet of competent bedrock (15 gpm), and 2 gpm through the deeper bedrock. The head at the WED is approximately 6,350 feet, closely matching heads measured in the drillhole DH15-12 vibrating wire piezometers (range 6,349 to 6,350) located adjacent to the WED along the model transect (Figure 2-2).

3.4 SCENARIO 4: PROPOSED 6560 RAISE

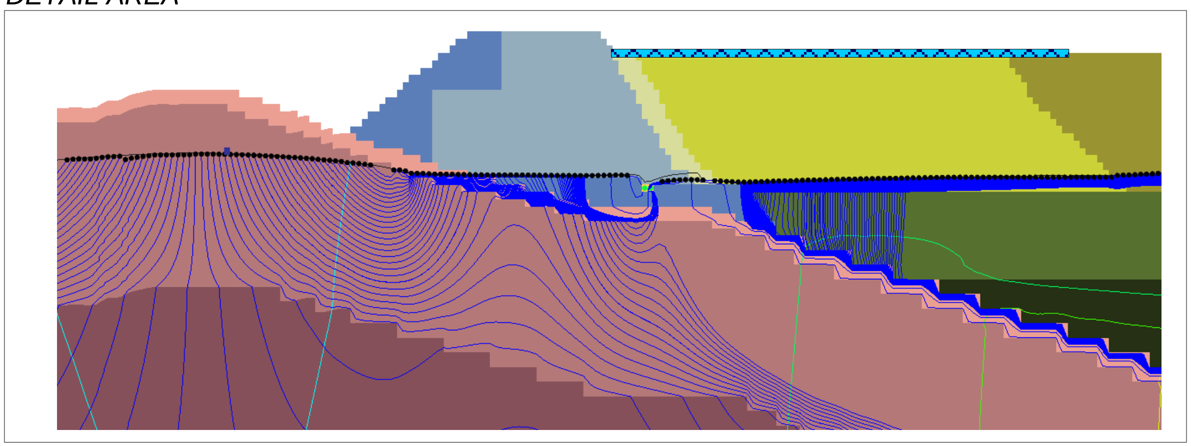
The Scenario 1 through 3 model results indicate that the two-dimensional cross-sectional model can reproduce documented hydrologic conditions along the model transect prior to and after construction of the West Embankment, WED and west tailings beach. For Scenario 4, the Scenario 3 model input parameters and tailings discharge and infiltration rates (7,400 gpm slurry water fraction and 740 gpm infiltration, respectively), were maintained to simulate conditions under the proposed 6,560 embankment and 6,535 tailings pond elevation, and evaluate the system's ability to maintain hydrodynamic containment under the proposed conditions.

Figure 3-4 shows the potentiometric profile map generated by MODFLOW for Scenario 4. The potentiometric profile shows that tailings slurry water infiltration follows similar flow paths as described for Scenarios 2 and 3, with tailings water flowing primarily to the WED or to the alluvial drains through the weathered bedrock. Tailings water flow to the WED occurs through the tailings pile to the weathered bedrock unit, then westward to the drain (or eastward to the alluvial drains), or vertically through the Zone U West Embankment fill material to the WED. Modeled groundwater flow through the weathered bedrock in the vicinity of the WED is 144 gpm, with 16 gpm and 2 gpm flowing through the upper 200 feet of competent bedrock and the deeper bedrock, respectively. The head at the upstream side of the WED remains approximately 6,350 feet, equal to the WED invert elevation, with the head at the groundwater potentiometric low 6,392 feet, indicating a continued positive hydraulic gradient between the West Ridge crest and the YDTI WED. The predicted WED flow is 600 gpm compared to maximum design WED flow of 4,500 gpm.

The Scenario 4 model results suggest that tailings slurry water and groundwater flow under the proposed 6,560 raise conditions will be similar to current conditions represented by model Scenarios 2 and 3, and hydrodynamic containment will be maintained under the 6,560 scenario. Continued monitoring of groundwater levels and groundwater quality adjacent to



DETAIL AREA



Material
Rockfill - Downstream
Rockfill - Upstream
WED Drain Rock & Transition
Tailings Sand – High K
Tailings Sand
Tails Transition
Tailings Slimes – Less Consolidated
Tailings Slimes - More Consolidated
Weathered Bedrock
Competent Bedrock
Deep Bedrock

Potentiometric Head (ft)
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YANKEE DOODLE TAILINGS IMPOUNDMENT
6560 AMENDMENT GROUNDWATER MODEL

SCENARIO 4
POTENTIOMETRIC SURFACE
& PARTICLE TRACKING

FIGURE
3-4

the West Embankment and WED, and WED flow conditions, should continue to be monitored to confirm that hydrologic conditions along the West Embankment and West Ridge support these findings into the future.

It should be noted that the Scenario 4 simulation includes the tailings pond in the model domain when in fact the pond will be located north of the model domain at that time. Although this makes Scenario 4 deviate from expected field conditions, the pond was retained in the model domain since the precise timing of the northward pond migration is not known. Including the pond in the model domain lends a level of conservatism to the Scenario 4 predictive simulations.

3.5 MODEL SENSITIVITY ANALYSIS

A sensitivity analysis was performed on the 6,560 projected model scenario (Scenario 4) for select model parameters shown to strongly influence model results, may be less well constrained by empirical data, or may play a larger role in maintaining hydrodynamic containment. Due to the strong controls imparted on tailings seepage and groundwater flow to the WED and the alluvial drains, the weathered bedrock hydraulic conductivity was decreased by 50% and increased by 25% in separate model simulations to evaluate the impacts on comparability to the model target values and hydrodynamic containment. Due to the limited empirical data, the heads in the alluvial drains were raised 100 feet, from 6,000 and 6,040 feet to 6,100 and 6,140 feet for the two drains to evaluate the model response. Finally, the recharge rate at the West Ridge potentiometric low was reduced by 20% to evaluate effects on the groundwater potentiometric low water level and hydrodynamic containment.

As shown in Table 3-2, decreasing the weathered bedrock hydraulic conductivity by 50% (from 2.84 to 1.42 ft/day) resulted in a one foot increase in the groundwater potentiometric low water level (6,392 to 6,393 feet), a 12% increase in WED flow, and 27% decrease in alluvial drain flow. A 25% increase in the weathered bedrock hydraulic conductivity resulted in no change at the groundwater potentiometric low, a 3% decrease in WED flow and 15% increase in alluvial drain flows. These results show the importance of the weathered bedrock in conveying tailings water and shallow groundwater to the various drains, with a higher hydraulic conductivity allowing more water to flow eastward towards the alluvial drains thus reducing the WED flow.

TABLE 3-2. 6560 MODEL (SCENARIO 4) SENSITIVITY ANALYSIS RESULTS

Decrease Weathered Bedrock Unit Hydraulic Conductivity 50%			
	Scenario 4 Results	**Sensitivity Results**	**Difference**
Drain Flows	497	364	-27%
WED Flows	603	678	12%
Potentiometric Low GWE	6,392[1]	6,393[1]	0%
Increase Weathered Bedrock Unit Hydraulic Conductivity 25%			
	Scenario 4 Results	**Sensitivity Results**	**Difference**
Drain Flows	497	570	15%
WED Flows	603	583	-3%
Potentiometric Low GWE	6,392[1]	6,392[1]	0%
Alluvial Drains: Increased Drain Heads by 100 feet			
	Scenario 4 Results	**Sensitivity Results**	**Difference**
Drain Flows	497	432	-13%
WED Flows	603	651	8%
Potentiometric Low GWE	6,392[1]	6,392[1]	0%
Decrease Recharge at Potentiometric Low by 20%			
	Scenario 4 Results	**Sensitivity Results**	**Difference**
Drain Flows	497	513	3%
WED Flows	603	618	2%
Potentiometric Low GWE	6,392[1]	6,385[1]	0.1%[2]

1. The groundwater elevation at the WED for all model simulations and sensitivity analyses is approximately 6,350 feet.
2. The 0.1% difference represents the change in the potentiometric low groundwater elevation (6,392 versus 6,385). The difference in the potentiometric low groundwater elevation minus the WED groundwater elevation (42 feet versus 35 feet) is 17%.

Increasing the head in the alluvial drain cells by 100 feet had no affect on the groundwater potentiometric low groundwater elevation, an 8% increase in the WED flow, and 13% decrease in the alluvial drain flow. These results are conceptually intuitive, as a higher head in the alluvial drains should decrease flow to the drains and increase flow to the WED. Decreasing recharge at the West Ridge potentiometric low by 20% resulted in a decline of seven feet in the potentiometric low groundwater level, a 3% increase in WED flow and 2.5% increase in the alluvial drain flow. The sensitivity analysis results show a positive hydraulic gradient between the West Ridge potentiometric low and WED and hydrodynamic containment maintained under all sensitivity scenarios.

4.0 SUMMARY AND DISCUSSION

4.1 MODEL SUMMARY

Hydrometrics developed a two-dimensional cross sectional model of the groundwater flow at the YDTI and West Ridge. The purpose of the model was to further evaluate groundwater and tailings slurry water recharge to the WED, and the ability of the West Embankment and WED to maintain hydrodynamic containment under the proposed 6,560 embankment raise. Four scenarios were modeled including: Scenario 1: 2017 YDTI Conditions; Scenario 2: July 2020-December 2021 Conditions; Scenario 3: January 2022 through June 2022; and Scenario 4: Proposed 6,560 Raise Predictive Simulations. Scenario 1 represents conditions prior to construction of the West Embankment and WED and development of the west beach. Scenarios 2 and 3 represent different time periods with the West Embankment, WED and west beach in place and differing tailings discharge rates and WED flows. Model input parameters including hydraulic conductivity and tailings recharge rates were varied within preset ranges during model Scenarios 1 through 3 to most closely approximate measured or estimated target values of WED flow, groundwater potentiometric low groundwater elevations, alluvial drain flows, and proportional sources of flow to the WED.

The model results for Scenarios 1 through 3 showed good matches to the target values as applicable to each scenario. Results for all three scenarios closely match field conditions with groundwater and tailings water levels at the WED being near the WED invert elevation of 6,350 and hydrodynamic containment being maintained, as is indicated by current groundwater level and water quality data. Results for the Scenario 4 6,560 predictive simulations, utilizing the Scenario 3 tailings discharge rates along the west beach, also showed the West Embankment and WED functioning as designed with hydrodynamic containment maintained along the West Ridge.

A sensitivity analysis was performed on three parameters which strongly influence WED flow (weathered bedrock hydraulic conductivity), are less well constrained by empirical data (hydraulic heads within the Silver Bow Creek and Yankee Doodle Creek alluvial drains beneath the tailings pile), or may be of particular importance for maintaining hydrodynamic containment (West Ridge groundwater recharge rates and associated groundwater elevations). For the sensitivity analysis, the weathered bedrock hydraulic conductivity was decreased by 50% and increased by 25%, hydraulic heads in the alluvial drains increased by 100 feet, and the West Ridge groundwater recharge rate decreased by 20% to evaluate effects on the WED flow, potentiometric low groundwater elevations, alluvial drain flows and hydrodynamic containment. Results show the model responding as expected to these changes with water levels at the WED remaining near the WED invert elevation of 6,350 and hydrodynamic containment being maintained along the West Ridge under all sensitivity analysis simulations.

4.2 DISCUSSION OF RESULTS

The 6,560 groundwater modeling results meet the model objectives of assessing hydrologic conditions at the West Embankment and WED, defining sources of flow to the WED, and evaluating the system's ability to maintain hydrodynamic containment under the proposed 6,560 raise conditions. In addition to these objectives, the modeling effort revealed other details of the WED and YDTI hydrology. For example, the model results suggest that the primary source of tailings water flow to the WED is infiltration of tailings slurry water as opposed to leakage from the tailings pond, with the vast majority of tailings slurry infiltration and recharge to the WED (95%) occurring within 300 feet of the West Embankment. This is consistent with the increase in WED flow between 2020 and 2023 when tailings discharge along the West Embankment increased although the tailings pond elevation remained a near constant 6,360.

Due to the proximity to the embankment toe, and current beach height above the WED at the model transect (30 to 40 feet), tailings water flow to the WED follows a near vertical flowpath, with some flow to the WED draining vertically downward through the embankment Zone U1 material. With a vertical hydraulic gradient approaching unity, the impoundment elevation should have little effect on tailings seepage rates to the WED.

Also of interest is the proportion of sources of flow to the WED in the model, which closely approximates percentages determined through prior evaluations. The Scenario 2 model results indicate approximately 15% of the 350 gpm WED flow, or about 53 gpm, is derived from West Ridge groundwater. The 15% modeled groundwater contribution is within the range of 15% to 25% groundwater contribution (75% to 85% tailings water) determined through geochemical evaluations of source flows to the WED (Schafer, 2018 and 2023). The 53 gpm modeled groundwater contribution is also similar to previous hydrologic evaluations which estimated a groundwater contribution of 60 gpm to the WED (Hydrometrics, 2018b). The similarity in the groundwater contribution obtained through the various evaluations supports the model results, and provides an estimate of WED flows (50 to 60 gpm) once tailings discharge to the impoundment ends and the tailings pile drains down to an equilibrium level.

4.3 MODELING LIMITATIONS AND RECOMMENDATIONS

As with all groundwater flow models, the YDTI two-dimensional groundwater model is an approximation of a complex natural and engineered physical system. As such, certain limitations in a model's ability to simulate field conditions must be acknowledged. Although many of the model input parameters such as geology, hydraulic conductivity, and water levels are based on detailed site characterization programs or design documents, variations from these documented conditions can occur, particularly in fractured bedrock groundwater systems. Conversely, close replication of target values in the model including potentiometric low groundwater elevations, WED flows and WED flow sources, lends a level of confidence to the model results. The sensitivity analysis results, where the model responded as expected to changes in hydraulic conductivities or drain heads, further provides some credibility to the model results. As such, the 6,560 groundwater model is considered suitable for addressing the modeling objectives of evaluating hydrologic conditions and the ability for hydrodynamic containment to be maintained under the proposed 6,560 raise scenario.

The fact that the 6,560 impoundment conditions will not be realized for several years provides an opportunity to monitor impoundment conditions as impoundment development proceeds. Complete buildout for the currently permitted 6450 level will occur around 2032, with the 6,560 expansion to occur after that. Therefore, the West Ridge groundwater and YDTI conditions should continue to be closely monitored as required under current monitoring programs to verify that hydrologic conditions follow those predicted by the model and results of other evaluations. West Ridge groundwater elevations and water quality should continue to be monitored as currently occurring, with emphasis placed on the groundwater potentiometric low and groundwater elevations at drillhole DH15-12 and other points adjacent to the WED. Continued monitoring of tailings discharge rates along the West Embankment and corresponding WED flows may provide further insight into the sources and mechanisms of flow to the WED. Continuation of the current monitoring programs will allow future field conditions to be compared to predictive model results, and other relevant evaluations, to ensure the hydrologic system is responding as expected to currently proposed developments.

5.0 REFERENCES

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APPENDIX D2

Montana Resources Continental Mine West Ridge Augmented Recharge Testing Program

(Pages D2-1 to D2-46)

MONTANA RESOURCES CONTINENTAL MINE WEST RIDGE AUGMENTED RECHARGE TESTING PROGRAM

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November 2024

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MONTANA RESOURCES CONTINENTAL MINE WEST RIDGE AUGMENTED RECHARGE TESTING PROGRAM

1.0 INTRODUCTION

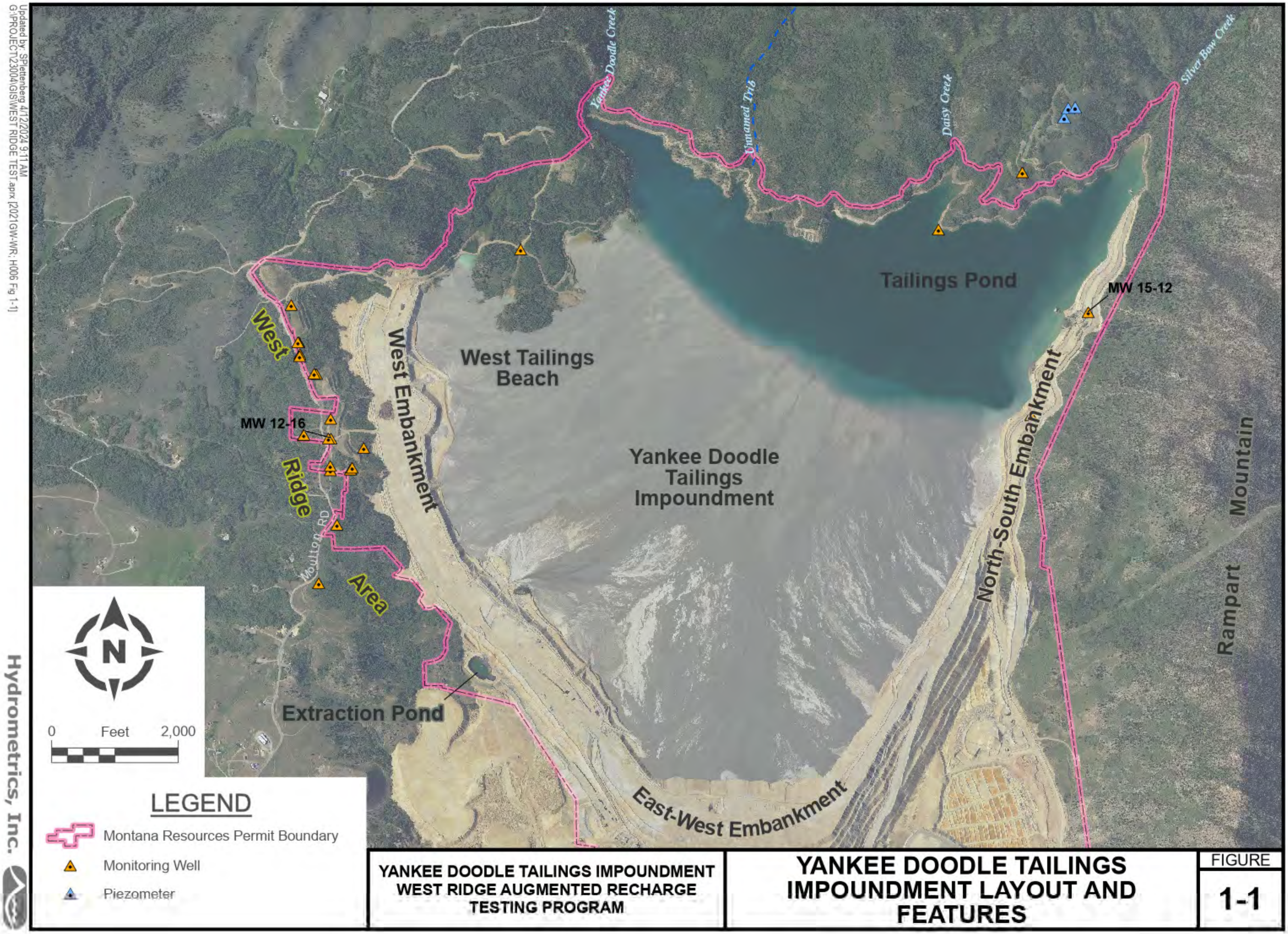
Montana Resources, LLC (MR) operates the open pit copper and molybdenum Continental Mine near Butte, Montana. Mine tailings produced through the ore milling process are stored in the Yankee Doodle Tailings Impoundment (YDTI). To accommodate future mining operations, MR intends to increase the storage capacity of the impoundment by increasing the permitted impoundment elevation to 6,560 feet ACC[1] from the currently permitted 6,450 elevation. The modified impoundment will have a maximum pond elevation of approximately 6,535 feet.

Hydrometrics conducted several managed or augmented groundwater recharge tests west of the YDTI in 2022 to evaluate the bedrock aquifer response to augmented recharge, and the feasibility of using augmented recharge to maintain hydrodynamic containment (i.e., preventing water quality impacts outside of the mine permit boundary) in the future, if necessary. This report presents the 2022 augmented recharge testing program procedures and results.

1.1 SITE AND PROJECT BACKGROUND

The YDTI occupies a drainage bottom with engineered embankments, the North-South, East-West and West Embankments (Figure 1-1), on three sides. The higher topography and groundwater elevations to the north, east and west naturally maintain hydrodynamic containment within the impoundment due to the positive hydraulic gradients from the ridge crests towards the impoundment. The lower elevation area to the south, referred to as Horseshoe Bend, receives seepage through the East-West and North-South Embankments, where the seepage is captured and treated at MR's water treatment plant for use in the mine process water circuit.

[1] All elevations presented in this memorandum are referenced to the Anaconda Copper Company (ACC) vertical datum, which is approximately 53 feet higher than NAVD 1988.



YANKEE DOODLE TAILINGS IMPOUNDMENT
WEST RIDGE AUGMENTED RECHARGE
TESTING PROGRAM

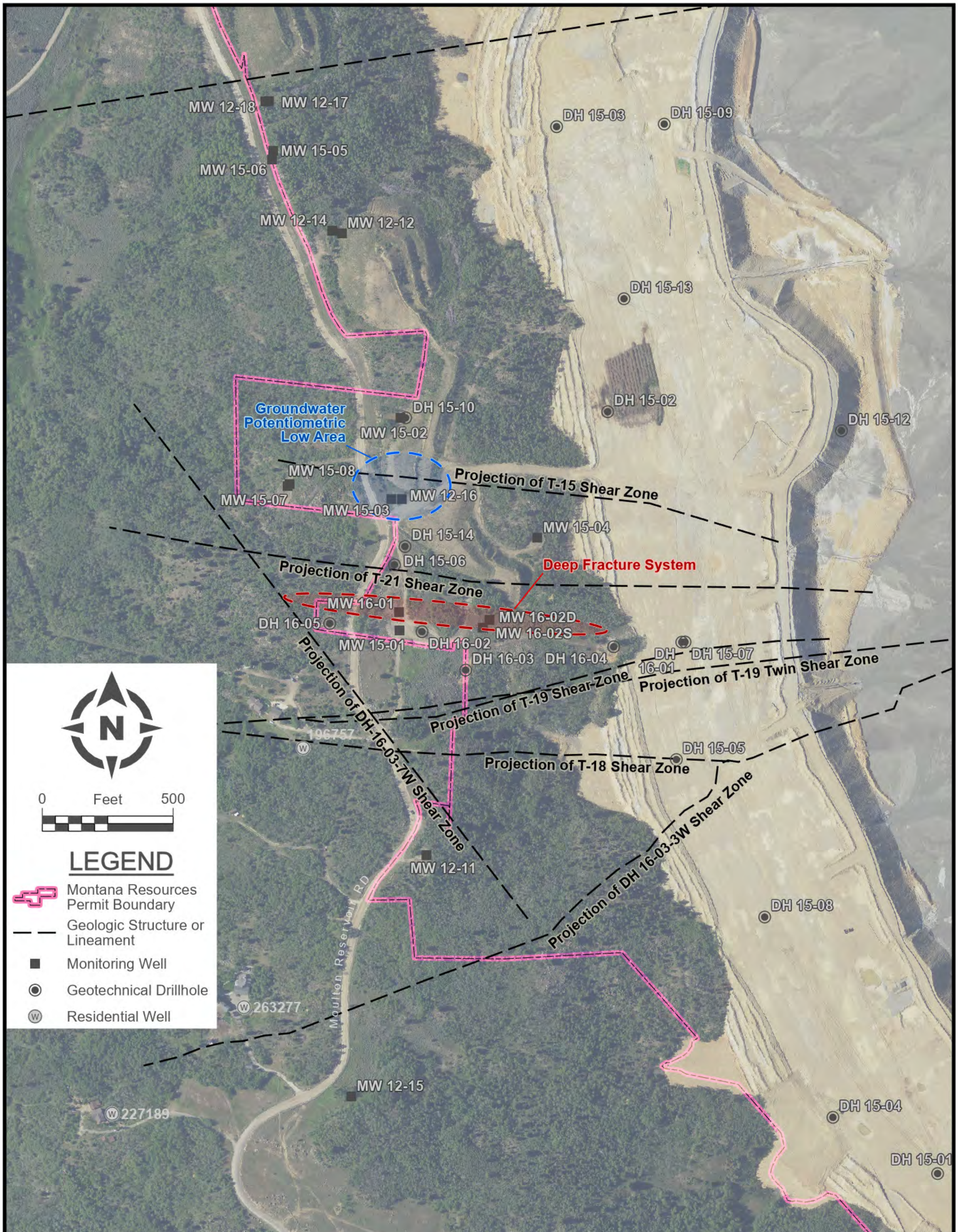
YANKEE DOODLE TAILINGS IMPOUNDMENT LAYOUT AND FEATURES

FIGURE 1-1

Topographic and groundwater elevations west of the YDTI, an area referred to as the West Ridge, are higher than the YDTI but lower than the high elevation uplands to the north and east. Due to the lower elevation, the West Ridge has been the focus of detailed site characterization programs dating back to 2012 (Hydrometrics, 2017; Knight Piésold, 2017). The purpose of the site characterization was to ensure that the West Ridge geologic and hydrologic conditions, along with the engineered controls incorporated into the West Embankment design, will maintain hydrodynamic containment under the currently permitted 6,450 elevation and future conditions.

Groundwater monitoring in bedrock drillholes and monitoring wells show groundwater elevations along the West Ridge crest range from about 6,500 feet in the north and south portions of the ridge, to about 6,400 feet in the central ridge area. The lower potentiometric level in the central ridge area, documented by water levels in monitoring wells MW12-16 and MW15-03 is referred to as the West Ridge potentiometric low (Figure 1-2). A second feature in the central ridge area, termed the deep fracture system, also exhibits lower groundwater levels of approximately 6,400 feet with the top of the fracture system located approximately 450 feet below ground surface (bgs) at the West Ridge crest. Groundwater levels within the potentiometric low area and deep fracture system are both about 40 feet higher than the current tailings pond elevation of 6,360 feet.

To promote hydrodynamic containment under future impoundment conditions, a number of engineered features have been incorporated into the West Embankment design and operations. First, the West Embankment, initially constructed in 2017, is underlain by a seepage collection trench referred to as the West Embankment Drain (WED). The WED is constructed of high permeability drain rock and is intended to capture potential westward subsurface seepage from the impoundment. The WED extends along the length of the West Embankment and gravity drains to an extraction pond (Figure 1-1) at the south end of the WED, with the captured water pumped back to the impoundment. Second, the West Embankment is constructed to promote downward drainage to the WED of tailings water seepage into the embankment upstream face. In addition, MR began development of a tailings beach along the west side of the impoundment in 2018 (Figure 1-1) to prevent ponding of tailings water near the West Embankment. Together, these engineered controls and tailings management practices reduce the potential for westward migration of tailings water, thus promoting hydrodynamic containment. Based on extensive groundwater level and water quality monitoring results through 2023, the West Embankment and WED are functioning as intended.



YANKEE DOODLE TAILINGS IMPOUNDMENT
WEST RIDGE AUGMENTED RECHARGE
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WEST RIDGE GROUNDWATER MONITORING NETWORK AND HYDROLOGIC FEATURES

FIGURE **1-2**

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Hydrometrics, Inc.

1.2 RECHARGE TESTING GOALS AND OBJECTIVES

The goal of the 2022 West Ridge groundwater recharge testing program is to determine if augmented recharge can be used to ensure future hydrodynamic containment along the west side of the YDTI under the currently proposed 6,560 YDTI expansion, if necessary. Specific program objectives include:

1. Assess the groundwater response to augmented recharge within the deep fracture system in the central West Ridge area, for comparison to recharge testing performed in 2016 when the fracture system groundwater levels were approximately 78 feet lower than current levels.
2. Assess the groundwater response to augmented recharge in the central West Ridge area groundwater potentiometric low.
3. Assess the groundwater response to augmented recharge in the south and north portions of the West Ridge where groundwater levels are up to 100 feet higher than in the central ridge area.
4. Evaluate if augmented recharge is a viable means of promoting hydrodynamic containment if needed in the future.

It should be noted that the recharge tests were designed to assess groundwater responses to recharge in various portions of the West Ridge, and not for estimating hydraulic conductivity or other bedrock hydrologic properties. That information was previously obtained through more than 100 aquifer tests performed on the West Ridge bedrock system during the previous site characterization programs (Hydrometrics, 2017; Knight Piésold, 2017).

2.0 RECHARGE TESTING LOCATIONS, PROCEDURES AND SCHEDULE

2.1 RECHARGE TESTING LOCATIONS

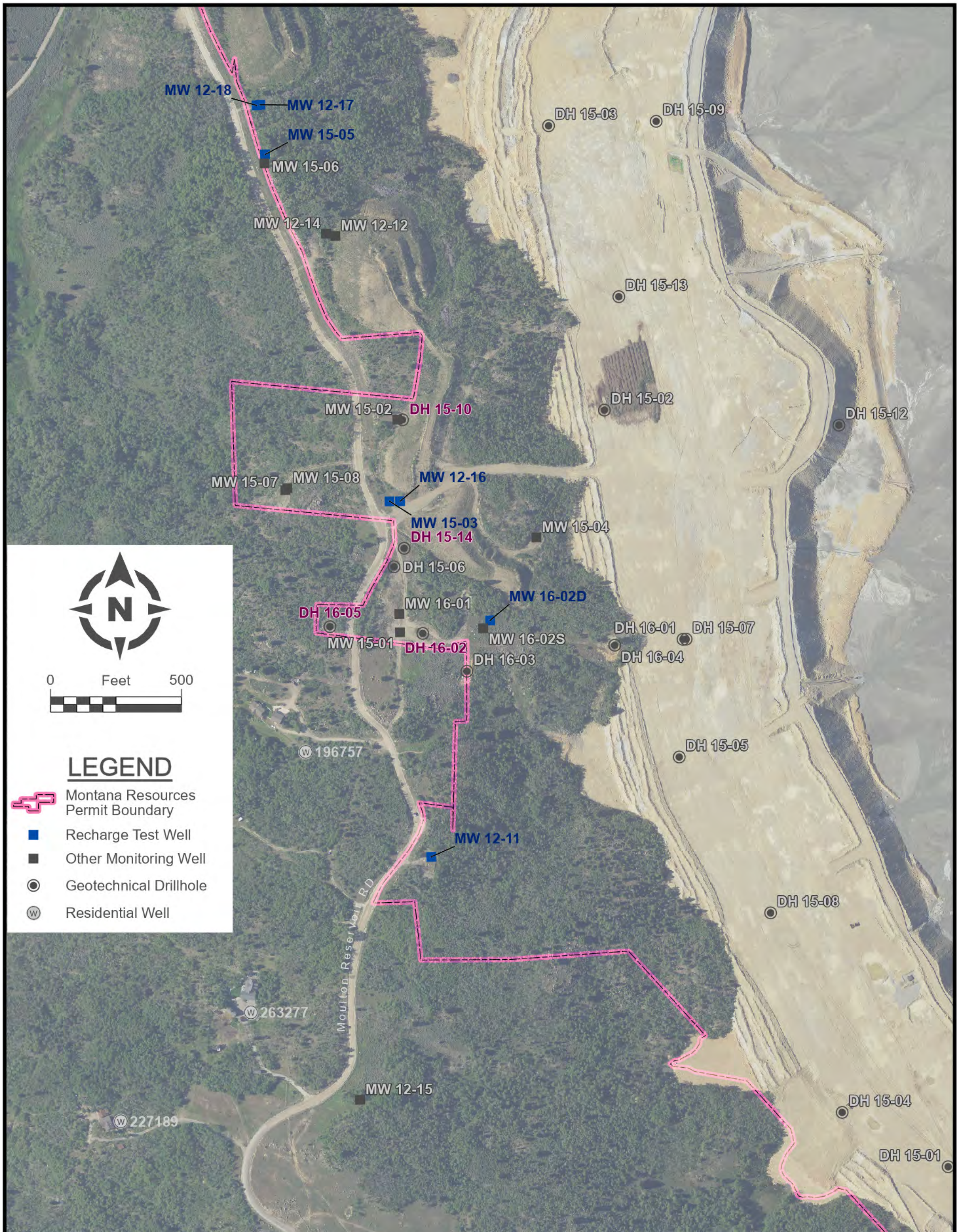
Augmented recharge testing was conducted on seven monitoring wells between August 24th and September 2nd, 2022 with test wells shown on Figure 2-1 and listed in Table 2-1. The test wells were selected to provide information on the deep fracture system response to recharge under the current higher groundwater elevations (about 78 feet higher than 2016 testing conditions), the response to recharge in the groundwater potentiometric low area, and the recharge response in the northern and southern portions of the ridge. The test well locations are also intended to provide information on the response to recharge at different depths, with test well depths ranging from 115 feet to 549 feet bgs (Table 2-1). All test wells are completed within the Butte quartz monzonite granitic bedrock and screened entirely within the bedrock saturated zone.

In addition to the test wells, groundwater levels were monitored in nearby monitoring wells and geotechnical bedrock drillholes. The monitoring wells and core holes are instrumented with vibrating wire piezometers (VWPs) for continuous water level recording with VWPs installed and grouted in at multiple depths in the core holes. The VWPs recorded hydrostatic pressure at 15 minute intervals before, during and after recharge testing.

TABLE 2-1. 2022 AUGMENTED RECHARGE TEST WELLS

Test Well	Location	Ground Elevation feet ACC	Screen Interval feet bgs	Test Date
MW16-02D	Central Ridge Deep Fracture System	6497.9	489-549	8/24/22-8/27/22
MW12-16	Central Ridge Potentiometric Low	6485.6	141-191	8/31/22-9/2/22
MW15-03	Central Ridge Potentiometric Low	6484.8	345-385	8/29/22-8/31/22
MW12-11	South Ridge	6519.9	145-195	8/29/22-8/31/22
MW12-17	North Ridge	6471.6	155-195	8/24/22-8/26/22
MW12-18	North Ridge	6471.0	80-115	8/26/22-8/27-22
MW15-05	North Ridge	6466.1	240-290	8/31/22-9/1/22

bgs – Below Ground Surface
ACC – Anaconda Copper Company vertical datum.



YANKEE DOODLE TAILINGS IMPOUNDMENT WEST RIDGE AUGMENTED RECHARGE TESTING PROGRAM	AUGMENTED RECHARGE TEST SITES	FIGURE 2-1

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G:\PROJECT\23004\GIS\WEST RIDGE TEST.aprx [2021GW-AUGM; H007 Fig 2-1]

Hydrometrics, Inc.

2.2 RECHARGE TESTING PROCEDURES

Recharge testing procedures involved gravity draining water into each test well and monitoring the water level response in the test well and nearby observation wells and drillholes. The feed water was gravity drained from a 2,200-gallon water truck or two 1,500-gallon water totes, with the recharge water obtained from the Butte-Silver Bow municipal water system. The water truck and totes, previously used for potable water handling only, were pressure washed, disinfected and thoroughly rinsed prior to use and filled from a nearby city hydrant. Prior to recharge testing, rinse water from the washed water truck and totes was sampled and analyzed at Alpine Analytical Laboratories in Helena for a suite of metals and other parameters, with all rinse water constituents less than applicable water quality standards (see lab results, Appendix A). The West Ridge recharge testing program was "authorized by rule" by the U.S. EPA Region 8 Underground Injection Control Program.

Recharge flow rates were measured volumetrically (with a bucket and stopwatch) several times during each test, with flow rates decreasing as the water level in the storage vessels decreased. In some cases, depending on the length of the test, recharge stopped when the storage vessels were fully drained and had to be refilled. Average flow rates for each test were determined by dividing the total volume of recharge water added by the test duration, with the manual flow measurements used to assess recharge rate trends. Water levels were recorded at 15 minute intervals with the VWPs with periodic manual water level measurements also recorded. All information including flow measurements, water level measurements, truck and tote filling times, total volumes of water added and test start and stop times was recorded on field forms (Appendix B). Site surveys were performed in the testing area, including along Moulton Reservoir Road and Bull Run Gulch Road, for signs of hillside seepage caused by the recharge tests with no seepage observed.

2.3 TESTING SCHEDULE

The testing program began on August 24th and ended on September 2nd, 2022 (Table 2-1). Individual test durations ranged from 28 hours at well MW12-18 located in the northern portion of the West Ridge, to 96 hours at MW12-16 located within the groundwater potentiometric low, with the duration of each test determined by the groundwater response. Using both the water truck and totes allowed two tests to be conducted simultaneously in different portions of the West Ridge.

3.0 RECHARGE TESTING RESULTS

Details for each recharge test are presented below. Table 3-1 includes a summary of the recharge test results with test field forms included in Appendix B.

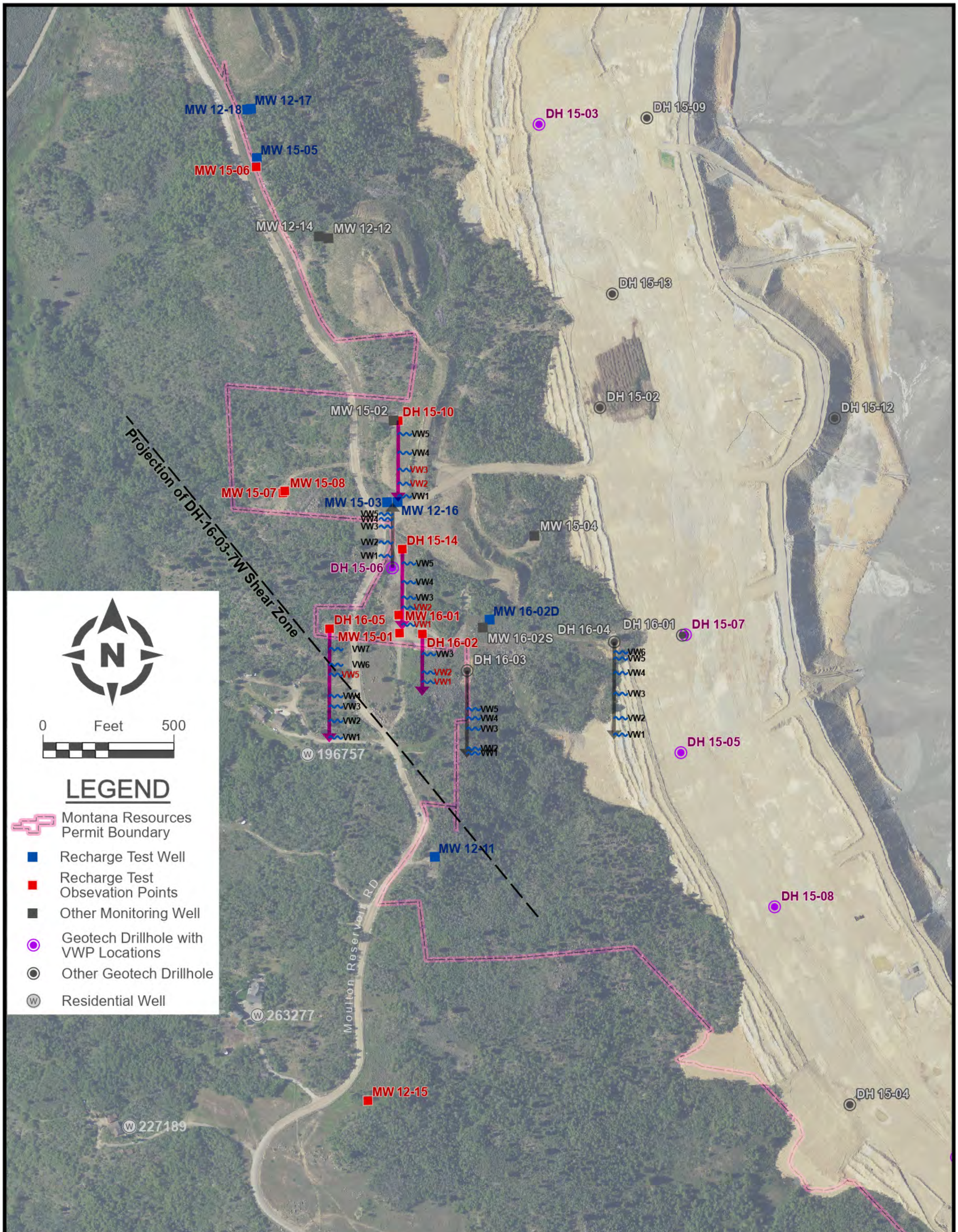
3.1 MW16-02D RECHARGE TEST

Monitoring well MW16-02D is completed in the central ridge deep fracture system at a depth of 489 to 549 feet bgs. The recharge test occurred from August 24th through August 27th, 2022 with a duration of 80.8 hours. A total of 11,520 gallons of potable water were gravity fed into the well from the two 1,500-gallon totes for an average recharge rate of 2.4 gallons per minute (gpm). Manual flow measurements ranged from 1.5 to 4.3 gpm. Observation wells/VWPs for the MW16-02D test include monitoring well MW16-01, drillhole DH15-14 VWP1 and VWP2, drillhole DH16-02 VWP1 and VWP2, and DH16-05 VWP5 (Table 3-1, Figure 3-1). All observation points are completed within the deep fracture system except DH16-05 VWP-5, which is located west of a northwest-southeast oriented shear zone (DH16-03 7W Shear) which intersects the angled drillhole north of VWP-5 (Figure 3-1).

The water level in recharge well MW16-02D increased by 79.4 feet in response to the 2.4 gpm recharge rate (Table 3-1, Figure 3-2), within about 21.5 feet of ground surface. The water level in monitoring well MW16-01, completed in the deep fracture system 250 feet west of the recharge well, increased 36.04 feet. Responses at other observation points within the fracture system ranged from 40.32 feet at DH15-14 VWP2 (located 250 feet northwest) to 14.18 feet at DH15-14 VWP1 (located 240 feet west of the recharge well). DH15-14 VWP-1 is located 611 feet bgs, about 140 feet deeper than VWP-2, where the fracture density and transmissivity of the fracture system are lower, accounting for the smaller response at VWP-1. DH16-05 VWP5, located 765 feet southwest of the recharge well and west of the low permeability 7W shear zone, showed no discernable response to the recharge test, supporting previous conclusions that the 7W shear acts as a western boundary to the fracture system (Hydrometrics, 2017). Water levels at all responding observation points were increasing at the end of the 80 hour recharge test, and recovery rates were slow with water levels remaining above pretest levels six weeks after recharge ended (Figure 3-2). This indicates greater water level increases can be achieved and sustained through longer-term, intermittent augmented recharge of a few gpm within the deep fracture system.

TABLE 3-1. SUMMARY OF 2022 WEST RIDGE RECHARGE TESTS

Test Well	Location	Ground Elevation	Screen Interval	Test Date	Test Duration hours	Total Recharge Volume gallons	Average Recharge Rate gpm	Water Level Increase feet	Observation Wells	Distance from Test Well/Depth - feet	Water Level Increase - feet
MW16-02D	Central Ridge Deep Fracture System	6497.9	489-549	8/24/22-8/27/22	80.8	11,520	2.4	79.4	MW16-01	250' West/517'	36.04
									DH15-14 VWP1	240' West/611'	14.18
									DH15-14 VWP2	250' West/471'	40.32
									DH16-02 VWP1	300' SSW/438'	17.07
									DH16-02 VWP2	240' SW/350'	15.90
									DH16-05 VWP5	765' SW/379'	0.00
MW15-03	Central Ridge Groundwater Potentiometric Low	6484.8	345-385	8/29/22-8/31/22	46	1,450	0.53	54.0	MW12-16	10' East/141-191'	0.65
									MW15-07	430' West/162-202'	1.8
									MW15-08	430' West/82-102'	0.2
									DH15-10 VWP2	60' North/511'	1.4
									DH15-10 VWP3	100' North/398'	8.0
MW12-16	Central Ridge Groundwater Potentiometric Low	6485.6	141-191	8/31/22-9/2/22	96	5,260	0.91	55.0	MW15-03	10' West/345-385'	1.0
									MW15-07	440' West/162-202'	<0.10
									MW15-08	440' West/82-102'	<0.15
									DH15-10 VWP2	60' North/511'	<0.10
									DH15-10 VWP3	100' North/398'	<0.10
MW12-11	South Ridge	6519.9	145-195	8/29/22-8/31/22	43.4	565	0.22	53.0	MW12-15	850'SW/150-200'	0.00
									MW15-01	950'N/182-222'	0.00
MW12-17	North Ridge	6471.6	155-195	8/24/22-8/26/22	46	816	0.30	39.0	MW12-18	5' SW/80-115'	0.20
MW12-18	North Ridge	6471.0	80-115	8/26/22-8/27-22	28	5,114	3.0	7.1	MW12-17	5' NE/155-195'	<0.10
MW15-05	North Ridge	6466.1	240-290	8/31/22-9/3/22	69.8	3,545	0.85	13.6	MW15-06	10' S/350-400'	1.15



YANKEE DOODLE TAILINGS IMPOUNDMENT WEST RIDGE AUGMENTED RECHARGE TESTING PROGRAM

RECHARGE TEST WELLS AND OBSERVATION POINTS

FIGURE 3-1

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Hydrometrics, Inc.

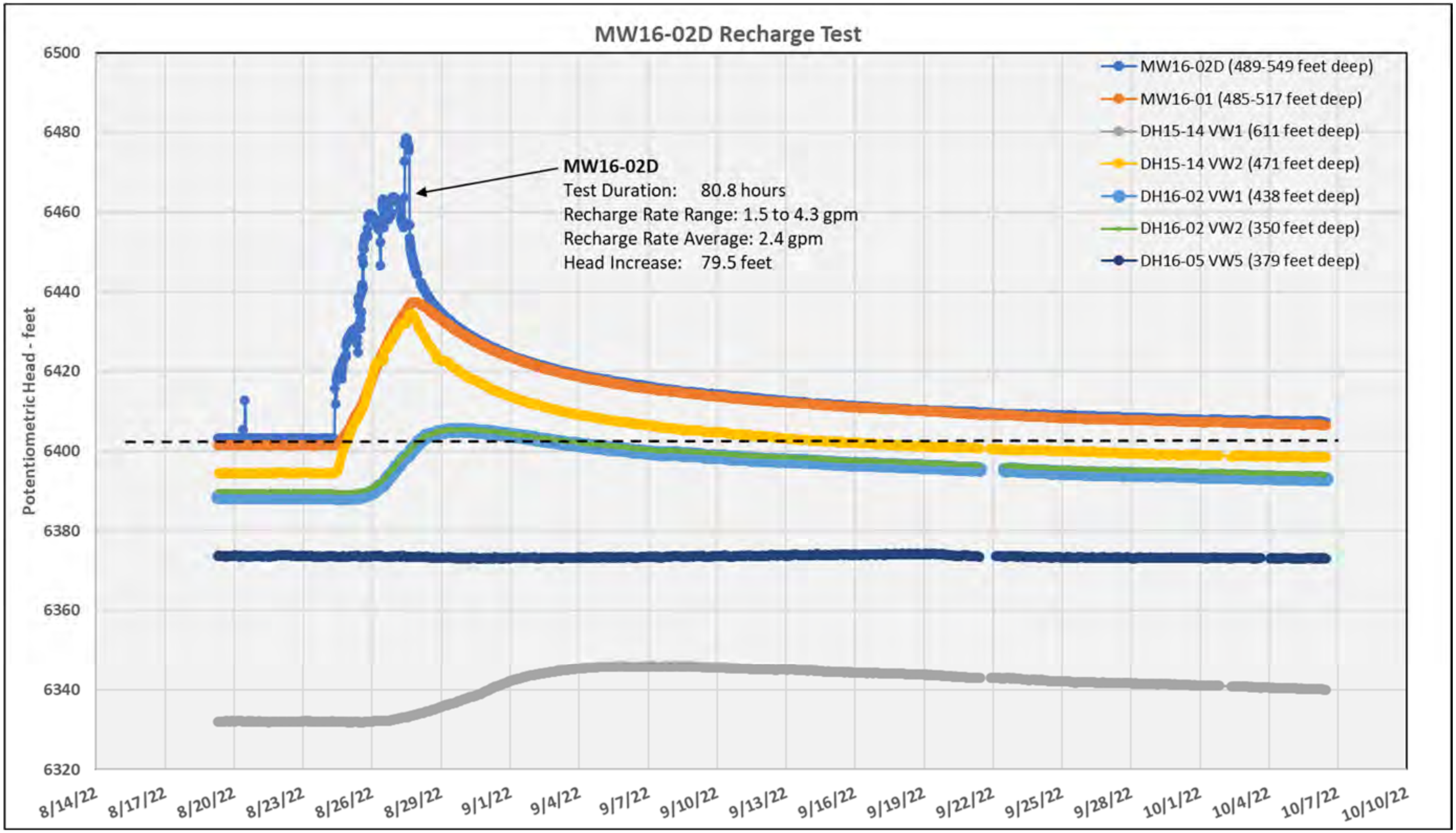

FIGURE 3-2. GROUNDWATER LEVEL RESPONSES TO MW16-02D RECHARGE TEST

Table 3-2 includes a comparison of the October 2016 and August 2022 MW16-02D recharge test details and results. The average recharge rates for the two tests are similar (2.3 and 2.4 gpm), although the 2016 test duration and total recharge volume are greater. Water level increases in the recharge well (MW16-02D) and observation points compare well accounting for the longer duration of the 2016 test. As shown in Table 3-2, water level increases after 80 hours of recharge in 2016 closely approximate the water level increases recorded at the end of the 80 hour 2022 recharge test. This close correlation in test results indicate the fracture system hydraulics are similar under both 2016 and 2022 conditions despite the pre-test fracture system water levels being 78 feet higher in 2022.

The 2016 and 2022 recharge test results are also consistent with observations from a 14 day aquifer pumping test conducted on MW16-02D where water level drawdown of 95 feet was recorded within the fracture system with little or no drawdown recorded outside the fracture system boundaries (Hydrometrics, 2017). The recharge test results are consistent with the previously developed conceptual model of the deep fracture system having a low hydraulic conductivity and storativity, and limited hydraulic connectivity with the surrounding bedrock due to the bounding low permeability shear zones to the north, south, west and overlying the fracture zone (Hydrometrics, 2017).

TABLE 3-2. 2016 AND 2022 MW16-02D RECHARGE TEST COMPARISON

	October 2016 Test	***October 2016 Increase after 80 hours***	**August 2022 Test**
Recharge Well	MW16-02D	---	MW16-02D
Starting Groundwater Elevation - feet	6325	---	6403
Test Duration - hours	144	---	80
Average Recharge Rate - gpm	2.3	---	2.4
Recharge Volume - gallons	19,935	---	11,563
Water Level Increases (Monitoring Depth)			
MW16-02D (489-549 feet)	95	*85*	79
MW16-01 (485-517 feet)	40	*34*	36
DH15-14 VW1 (611 feet)	35	*15*	14
DH15-14 VW2 (471 feet)	50	*40*	40
DH16-02 VW1 (438 feet)	NA	*NA*	17
DH16-02 VW2 (350 feet)	NA	*NA*	16
DH16-05 VW5 (379 feet)	-1.1	*-0.7*	0.0

NA - Not Available; VWPs malfunctioning.

Negative values indicate background water level decline.

Monitoring Depth - depth of monitoring point below ground surface.

3.2 MW12-16/MW15-03 RECHARGE TESTS

Individual recharge tests were conducted on monitoring wells MW12-16 and MW15-03, both completed in the central West Ridge area groundwater potentiometric low (Figure 2-1). MW12-16 is completed from 141 to 191 feet and MW15-03 from 345 to 385 feet bgs.

The MW15-03 recharge test occurred from August 29th to August 31st, 2022 with a total recharge time of 46 hours. A total of 1,450 gallons of potable water was gravity drained into the well with an average recharge rate of 0.53 gpm. Observation points included monitoring wells MW12-16, MW15-07 and MW15-08, and drillhole vibrating wire piezometers DH15-10 VWP2 and VWP3 (Figure 3-1, Table 3-1). Water level increases ranged from 54 feet in recharge well MW15-03 to 0.2 feet at well MW15-08 located 430 feet west of the recharge well (Figure 3-3). Like the other recharge tests, the largest water level increases occurred at monitoring points completed at similar depths as the recharge well (345 to 385 feet bgs). For example, the water level at DH15-10 VW3 at a depth of 398 feet and located 100 feet north of the recharge well increased 8.0 feet, while the water level at monitoring well MW12-16, completed from 141 to 191 feet and located 10 feet east of the recharge well, increased only 0.65 feet. This indicates an apparent anisotropy within the bedrock with average horizontal hydraulic conductivity greater than vertical hydraulic conductivity. This apparent anisotropy may be due to the presence of shallow dipping low permeability shear zones within the bedrock as documented in previous investigations (Hydrometrics, 2017), as opposed to properties intrinsic to the granitic bedrock. Similar to the MW16-02D recharge test, water levels were increasing at the end of the recharge period (Figure 3-3), indicating greater water level increases could be achieved through longer-term augmented recharge.

The MW12-16 recharge test occurred from August 31st through September 2nd, 2022 for a total recharge time of 96 hours (Table 3-1). A total of 5,260 gallons were gravity drained into the well with an average recharge rate of 0.91 gpm. Observation points included monitoring wells MW15-03, MW15-07, MW15-08, and drillhole vibrating wire piezometers DH15-10 VWP2 and VWP3 (Figure 3-1, Table 3-1). Water level increases ranged from 55 feet at recharge well MW12-16, to less than 0.15 feet at four of the five observation points (Table 3-1). Observation points showing a less than 0.10-foot response are either located considerable distance (440 feet or more) from the recharge well, or at greater depths (approximately 400 to 500 feet) compared to the recharge well screen interval of 141 to 191 feet bgs. Monitoring well MW15-03 located 10 feet west of the recharge well and completed at 345 to 385 feet, showed the only discernable response with a water level increase of about one foot.

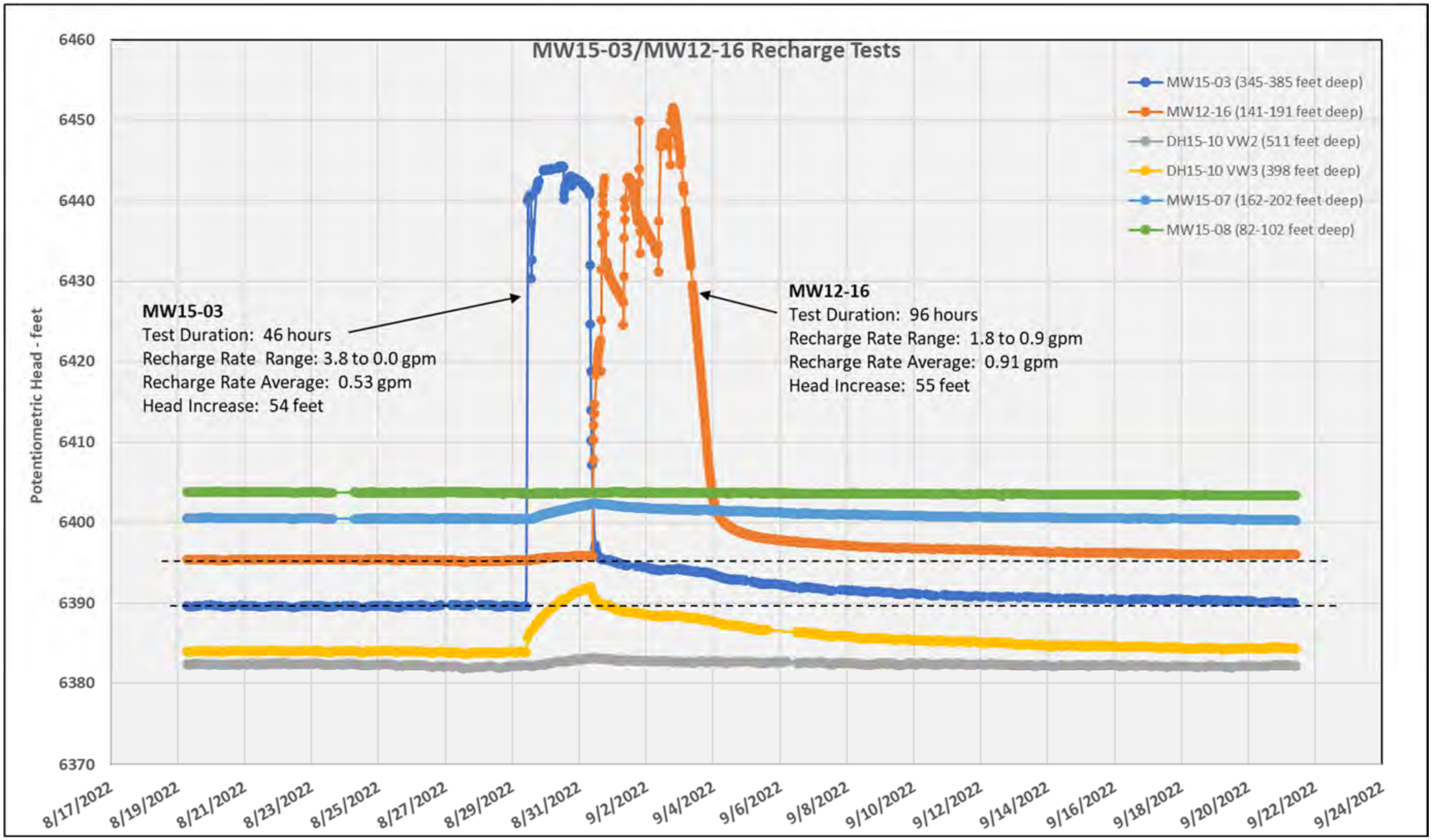

FIGURE 3-3. GROUNDWATER LEVEL RESPONSES TO MW15-03 AND MW12-16 RECHARGE TESTS

Water levels in MW12-16 and MW15-03 test wells and observation points all declined more rapidly after testing than observed in the MW16-02D deep fracture system recharge test, with all monitoring points in the groundwater potentiometric low area recharge tests reaching 90% recovery within 21 hours and near pre-test levels within two weeks of the end of recharge. This is consistent with a higher bedrock storativity and less confinement by low permeability shear zones in the groundwater potentiometric low area as compared to the deep fracture system. The MW15-03 and MW12-16 recharge test results show that augmented recharge may be a viable means of increasing groundwater levels within the groundwater potentiometric low to promote hydrodynamic containment, if needed in the future. Augmented recharge in this area would likely require recharge through multiple wells completed at two or more depths.

3.3 MW12-11 RECHARGE TEST

Monitoring well MW12-11 is located in the southern portion of the West Ridge and is completed in granitic bedrock from 145 to 195 feet bgs. The recharge test was conducted from August 29th through August 31st, 2022 with a test duration of 43.4 hours. A total of 565 gallons of water was added to the well for an average recharge rate of 0.22 gpm. Observation points included MW12-15 located 850 feet southwest and MW15-01 located 950 feet north of the recharge well, the two closest wells to MW12-11.

The water level in recharge well MW12-11 increased 53 feet in response to the 0.22 gpm average recharge rate (Figure 3-4). Water level recovery was relatively rapid in MW12-11 with water levels recovering to near pretest levels within two days of the end of recharge. No water level response was detected in observation wells MW15-01 and MW12-15 although water level responses were not anticipated due to the distance of these wells (>800 feet) from the recharge well. However, the relatively rapid recovery in MW12-11 indicates some level of interconnectivity within the bedrock and that groundwater levels peripheral to MW12-11 can be increased through augmented recharge delivered through multiple wells at very low recharge rates.

3.4 MW12-17 AND MW12-18 RECHARGE TESTS

Monitoring Wells MW12-17 and MW12-18 are located five feet apart in the northern portion of the West Ridge (Figure 2-1). Both wells are completed in granitic bedrock with MW12-17 screened from 155 to 195 feet bgs and MW12-18 screened from 80 to 115 feet bgs. Initially, recharge testing was only proposed for MW12-17, with a supplemental test conducted on MW12-18 to provide additional information on recharge responses at various depths.

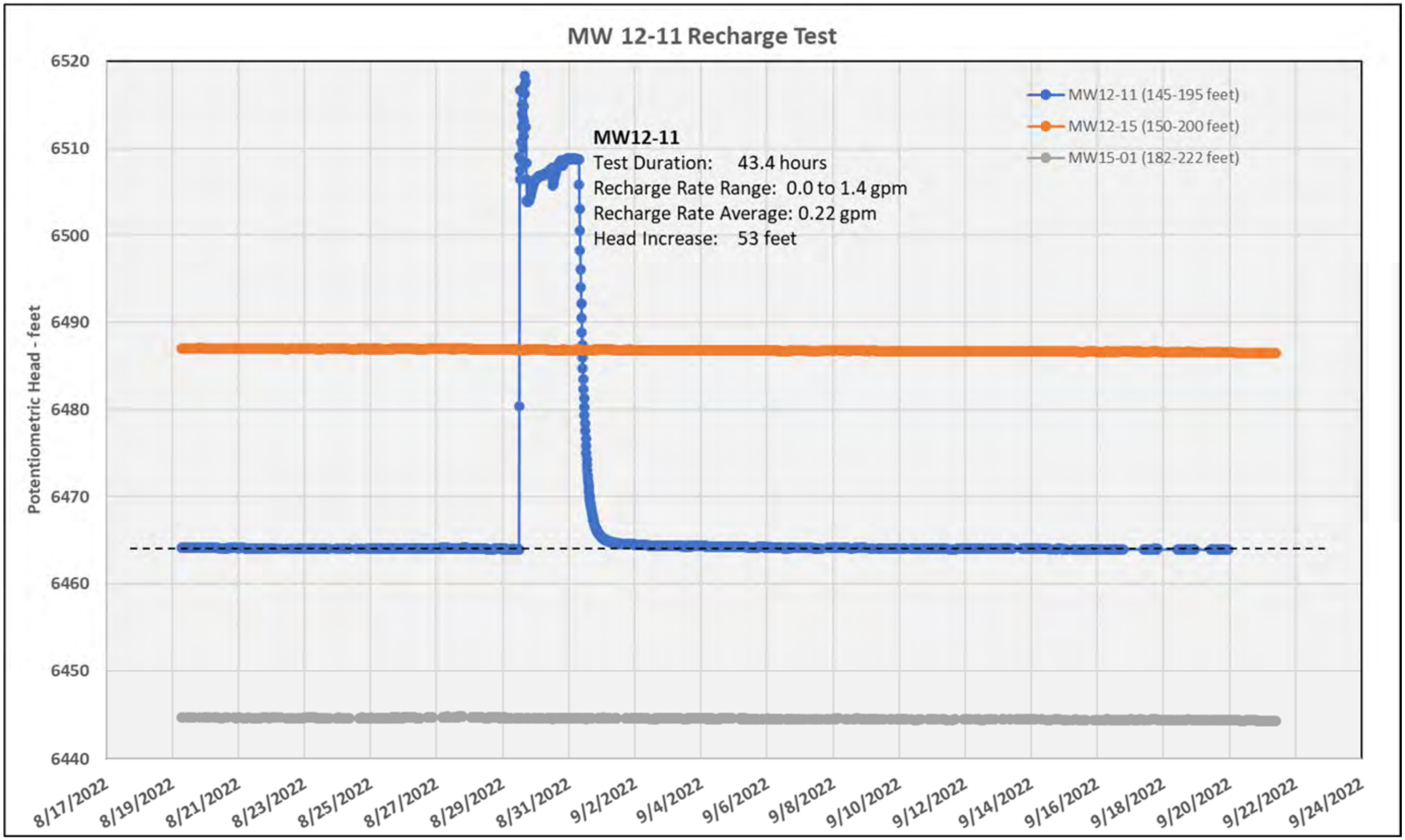

FIGURE 3-4. GROUNDWATER LEVEL RESPONSES TO MW12-11 RECHARGE TEST

The MW12-17 recharge test was conducted from August 24th through August 26th, 2022 with a recharge duration of 46 hours. A total of 816 gallons of water was added to the well for an average recharge rate of 0.30 gpm, with monitoring well MW12-18 monitored as an observation well. The water level in recharge well MW12-17 increased 39 feet in response to the 0.30 gpm average recharge rate (Figure 3-5). The water level increase and post-recharge recovery were relatively rapid, indicating a relatively low bedrock hydraulic conductivity, but adequate bedrock fracturing and interconnectivity to allow for drainage and dissipation of the 816 gallons added during the recharge phase of the test. Water levels at nearby observation well MW12-18 increased approximately 0.20 feet. The minimal increase observed at the shallower observation well is consistent with observations at other paired well recharge tests where water level responses appear to propagate horizontally at a greater magnitude than vertically.

Although not initially planned, a short-term recharge test was also conducted on shallow well MW12-18 on August 26th and 27th. The recharge duration was 28 hours with a total of 5,114 gallons gravity drained into the well for an average recharge rate of 3.0 gpm (Table 3-1). The water level in MW12-18 increased 7.1 feet during the test with no discernable change at deeper well MW12-17. The 3.0 gpm recharge rate was the highest achievable of all the recharge tests without overtopping the well casing, and the 7.1-foot water level increase the lowest recorded in any of the recharge wells. This indicates a higher bedrock hydraulic conductivity at MW12-18 than the other recharge wells, with a greater recharge rate required to raise water levels should augmented recharge be required in the future.

3.5 MW15-05 RECHARGE TEST

Monitoring well MW15-05 is located in the north portion of the West Ridge and is completed at 240 to 290 feet bgs (Figure 2-1). The MW15-05 recharge test occurred from August 31st to September 3rd, 2022 with a total recharge duration of 69.8 hours. The total recharge volume was 3,545-gallons for an average recharge rate of 0.85 gpm (Table 3-1). MW15-06, located about 10 feet south of the recharge well and completed from 350 to 400 feet bgs (about 100 feet deeper than the recharge well), served as an observation well for the MW15-05 recharge test.

The water level in recharge well MW15-05 increased 13.6 feet in response to the 0.85 gpm recharge rate. The water level response was rapid at both the start and end of recharge, with 90% water level recovery within 4.25 hours and 100% recovery within 94 hours of the end of the test, indicating relatively rapid dissipation of recharge water to the surrounding bedrock (Figure 3-6). The water level increased 1.15 feet in observation well MW15-06. The relatively

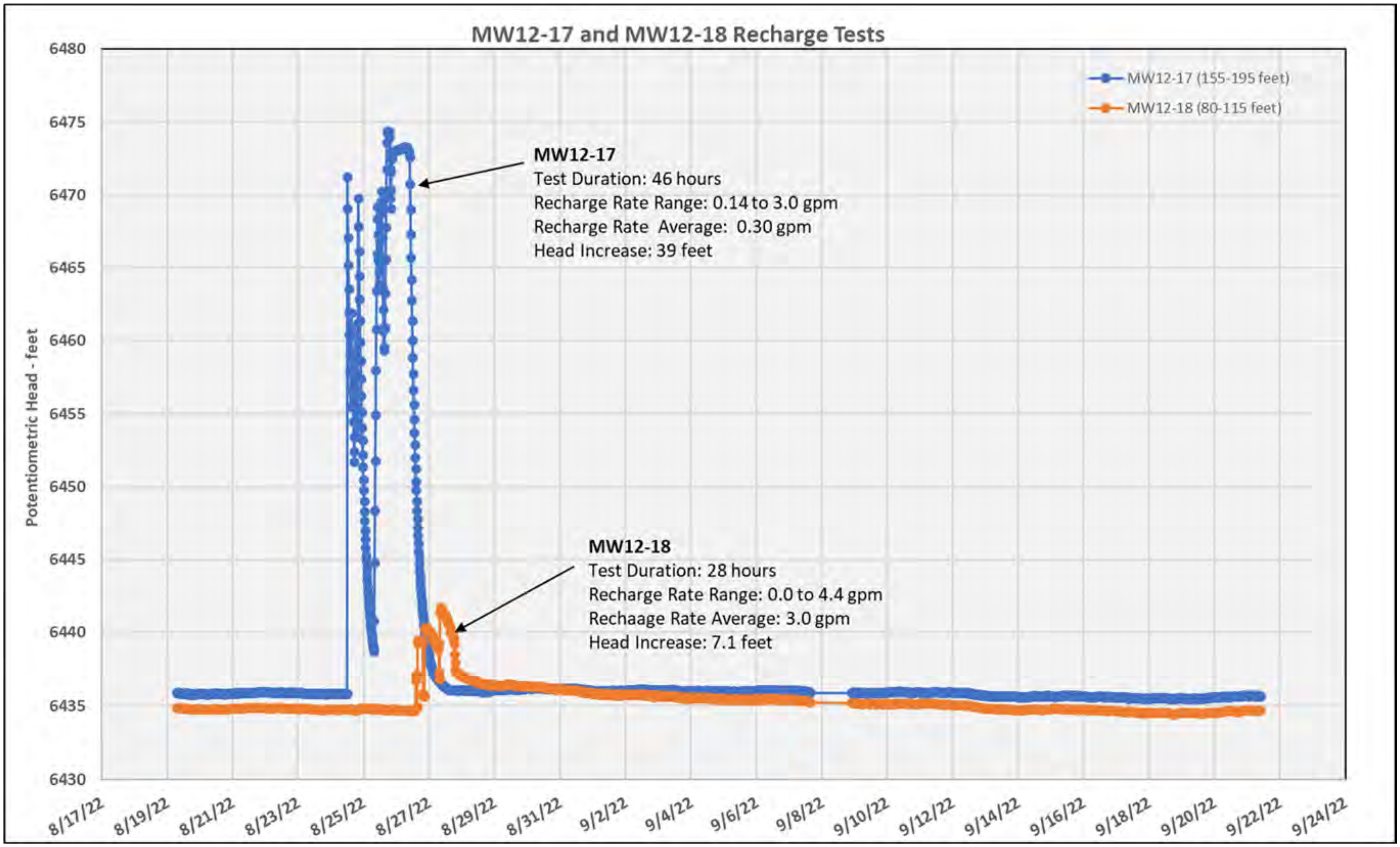

FIGURE 3-5. GROUNDWATER LEVEL RESPONSES TO MW12-17 AND MW12-18 RECHARGE TESTS

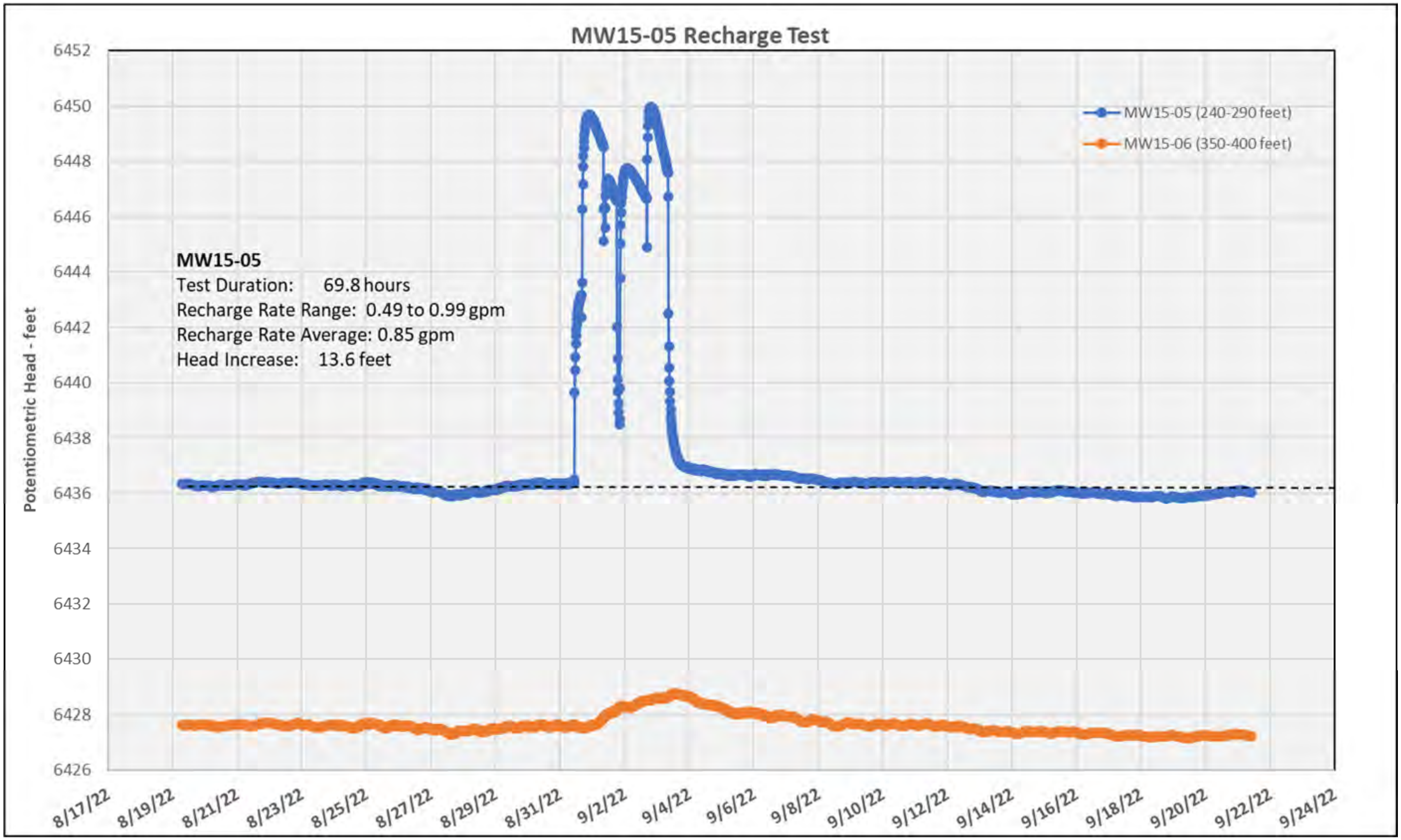

FIGURE 3-6. GROUNDWATER LEVEL RESPONSES TO MW15-05 RECHARGE TEST

rapid post-test drain down in the recharge well and water level response in the deeper observation well observed during the 69.8 hour recharge test suggests that groundwater levels in the vicinity of MW15-05 could be increased both laterally and vertically by tens of feet through longer-term and likely intermittent augmented recharge delivered through multiple wells completed at varying depths.

4.0 SUMMARY AND DISCUSSION

Results of the 2022 augmented recharge tests show that West Ridge groundwater levels can be increased by tens of feet through managed recharge of less than one to a few gpm added to the bedrock groundwater system through multiple recharge wells completed at different depths. Based on the recharge test results, conceptual augmented recharge plans for each of the areas tested are presented in Table 4-1.

In the deep fracture system, water level increases ranged from approximately 14 feet to 80 feet at a wide array of observation points completed within the fracture system in response to the 2.4 gpm, 80 hour recharge test. Groundwater levels outside of the fracture system showed no significant response to the recharge, including DH16-05 VWP5 located west of the fracture system, consistent with the current conceptual model of the fracture system being bounded on the north, south, west and above by low permeability shear zones. The slow water level decline following recharge, with water levels remaining above pretest levels more than 40 days after recharge ended, indicates fracture system augmented recharge could occur intermittently as required to maintain the desired water level increase. Based on the significant (40 foot) water level increase observed 250 feet from the recharge well (Table 3-1), augmented recharge could likely be achieved with one recharge well, although two wells would be recommended to spread out water level mounding and for redundancy. The recharge wells would be completed from approximate elevation 5,850 to 6,000 feet (500 to 650 feet bgs), to span the fracture system vertical interval (Table 4-1). The 2022 deep fracture system recharge test results are similar to the 2016 test results despite water levels being 78 feet higher in 2022 than 2016, indicating augmented recharge can be effective at raising fracture system water levels at various ambient groundwater levels. The maximum achievable groundwater level increase within the fracture system is about 90 feet (6,496 feet), or about five feet bgs. However, greater potentiometric heads may be achievable within the fracture system, if required, through use of a pressurized recharge system.

Water levels within the groundwater potentiometric low can be increased locally by 50 feet or more from the current 6,400-foot level, and likely to near ground level (6,485 feet) with intermittent or continuous recharge of approximately five gpm delivered through multiple recharge wells. Based on the MW12-16 and MW15-03 recharge tests, water level increases laterally and vertically from the recharge well were limited to eight feet or less (Table 3-1), likely due in part to the numerous east-west trending low permeability shear zones in the area (Figure 1-2). This indicates multiple recharge wells completed at different depths would be required to raise water levels through the potentiometric low area. Longer-term recharge testing would be required to evaluate the water level response to long-term recharge (groundwater levels were still increasing at the end of the 96 hour MW12-16 and 46 hour MW15-03 recharge tests), but a preliminary conceptual design includes six recharge wells, three completed from 150 to 200 feet and three from 350 to 400 feet, with recharge rates of 0.5 to one gpm each (Table 4-1).

TABLE 4-1. CONCEPTUAL AUGMENTED RECHARGE PLAN DETAILS

LOCATION	RECHARGE WELL FIELD	RECHARGE RATES	RECHARGE SCHEDULE	COMMENTS
Deep Fracture System	Two wells competed from 5850 to 6000 feet (500 to 650 feet bgs).	One gpm each well; two gpm total.	Intermittent recharge, less than 50% of time.	Maximum water level increase approximately 90 feet (6495 elev.); five feet below ground surface.
Groundwater Potentiometric Low	Six wells, three completed from 150 to 200 feet bgs and three from 350 to 400 feet bgs.	0.5 to one gpm each; three to six gpm total.	Intermittent to full-time recharge depending on response and recharge rate.	Maximum water level increase approximately 80 feet (6480 elev.); five feet below ground surface.
Northern West Ridge	Multiple wells closely spaced and at varying depths.	0.5 to two gpm each well.	Intermittent to full-time recharge depending on response and recharge rate.	Maximum water level increase 25 to 35 feet (6460 to 6470 elev.); five feet below ground surface.
Southern West Ridge	Multiple wells completed at varying depths.	0.5 to one gpm each well.	Intermittent to full-time recharge depending on response and recharge rate.	Maximum water level increase 20 to 30 feet (6410 elev.); five feet below ground surface.

Results from the MW12-17/MW12-18 and MW15-05 recharge tests indicate augmented recharge in the northern West Ridge area would require multiple wells completed at different depths. Water level increases in observation wells and VWPs in this area were 1.15 feet or less, indicating recharge wells would have to be relatively closely spaced to achieve a significant uniform groundwater level increase.

The recharge response in the south ridge area is limited to data collected from recharge well MW12-11. No response was recorded in observation wells MW12-15 and MW15-01, not unexpectedly due to their distance from the recharge well (850 and 950 feet, respectively). The rapid and significant water level increase in recharge well MW12-11 (53 feet) in response to the 0.22 gpm recharge rate, and the post testing recovery rate (nine hours to 90% recovery), indicate a low bedrock transmissivity with adequate fracture interconnectivity to drain the 565 gallons of recharge water. This suggests multiple wells relatively closely spaced would be required in the south ridge area to raise water levels uniformly throughout the southern ridge. However, the relatively high ambient groundwater elevations in the south portion of the ridge, approximately 6,500 feet at MW12-15, make the south ridge area the least likely to require augmented recharge.

In summary, the 2022 recharge testing indicates that augmented recharge could be a viable mitigation measure to increase groundwater levels in the central West Ridge area groundwater potentiometric low and deep fracture system, where groundwater levels are lowest. Augmented recharge in both areas could be achieved with a reasonable number of recharge wells and combined recharge rates of 10 gpm or less introduced intermittently. Maximum groundwater elevations of 6,480 to 6,495 feet are achievable in the central ridge area, with further increases limited by topography. Augmented recharge may also be viable in the north and south portions of the ridge although a higher density of recharge wells would be required. More detailed testing would be required to further assess the optimum recharge wellfield configuration and recharge rates and schedules, and the long-term viability of augmented recharge in the north and south ridge areas where ambient groundwater levels are highest.

Groundwater level and water quality data collected as part of MR's operational monitoring program indicates the West Embankment, WED and tailings discharge and management plan are working as intended to maintain hydrodynamic containment along the West Ridge. Other West Ridge evaluations, including a groundwater model simulating groundwater and tailings water flow along the West Embankment and West Ridge (Hydrometrics, 2024), suggest that these design and operational features should continue to maintain hydrodynamic containment under the proposed 6560 YDTI embankment raise. Hydrologic monitoring focused on the West Embankment and West Ridge should be continued, as currently planned, to assess the system performance and maintenance of hydrodynamic containment in the future.

5.0 REFERENCES

Hydrometrics, Inc., 2017. Hydrologic Evaluation of the Yankee Doodle Tailings Impoundment West Ridge Area, Silver Bow County, Montana. Prepared for Montana Resources, LLP. July 2017.

Hydrometrics, Inc., 2024. Yankee Doodle Tailings Impoundment 6560 Amendment Groundwater Model. Prepared for Montana Resources, LLP. November 2024.

Knight Piésold Consulting (KP), 2017. Montana Resources, LLP Yankee Doodle Tailings Impoundment Site Characterization Report, Rev 2. Prepared for Montana Resources, LLP. August 11, 2017.

APPENDIX A

PRE-TESTING WATER TRUCK AND TOTE RINSATE
WATER SAMPLE ANALYTICAL RESULTS

Alpine Analytical Laboratory

1315 Cherry, Helena, MT 59601 *(406)449-6282*

Client: **Hydrometrics, Inc**

Sample ID: **MR-TOT-2208-002**
Project ID: MR Recharge Testing
Site ID: 12020.003,601

Water Tote Sample

Date Reported: 23-Aug-22

Chain of Custody #: 4201

Laboratory ID: 04J350
Condition: Intact

Date / Time Sampled: 22-Aug-22 @ 08:20
Date / Time Received: 22-Aug-22 @ 10:34

Parameter	AR	MCL	Detection Limits	Analyzed Date/Time	Analyzed By	Method Reference
pH, s.u.	7.7	NR	0.1	22-Aug-22 @ 13:45	CE	EPA 150.2
Specific Conductance, umhos/cm	184	NR	1	22-Aug-22 @ 13:50	CE	EPA 120.1
Fluoride, mg/L	<0.1	4.0	0.1	22-Aug-22 @ 14:11	CE	EPA 300.0
Total Phosphorous, mg/L	0.36	NR	0.05	22-Aug-22 @ 17:20	CE	EPA 365.2
BiCarbonate, mg/L	63.4	NR	1	22-Aug-22 @ 13:45	CE	SM 2320 B
Carbonate, mg/L	<1	NR	1	22-Aug-22 @ 13:45	CE	SM 2320 B
Total Suspended Solids, mg/L	<1	NR	10	22-Aug-22 @ 17:10	CE	SM 2540 D
Total Dissolved Solids, mg/L	130	NR	10	23-Aug-22 @ 13:55	CE	SM 2540 C

Cations

Parameter	AR, mg/L	meq/L	MCL, mg/L	DL, mg/L	Analyzed Date/Time	By	Method Reference
Sodium	9.7	0.42	NR	5	22-Aug-22 @ 15:56	CE	EPA 200.7
Potassium	2.0	0.10	NR	5	22-Aug-22 @ 15:56	CE	EPA 200.7
Calcium	16.4	0.82	NR	5	22-Aug-22 @ 15:04	CE	EPA 200.7
Magnesium	4.51	0.37	NR	5	22-Aug-22 @ 15:04	CE	EPA 200.7
Total Cations		1.71					

Anions

Parameter	AR, mg/L	meq/L	MCL, mg/L	DL, mg/L	Analyzed Date/Time	By	Method Reference
Alkalinity	63.4	1.27	NR	1	22-Aug-22 @ 13:45	CE	SM 2320 B
Chloride	3.70	0.10	NR	1	22-Aug-22 @ 14:11	CE	EPA 300.0
Sulfate	24.0	0.50	NR	1	22-Aug-22 @ 14:11	CE	EPA 300.0
Nitrate + Nitrite as N	0.04	0.00	10	0.03	22-Aug-22 @ 14:11	CE	EPA 300.0
Total Anions		1.88					
Cation/Anion Balance, %		-4.61%					

Low - Level Metal Scan / Method Reference - 200.7-200.8

Parameter	AR	MCL	DL	Parameter	AR	MCL	DL
Arsenic, mg/L	0.001	0.010	0.001	Molybdenum, mg/L	0.001	NR	0.001
Aluminum, mg/L	0.061	NR	0.005	Nickel, mg/L	0.002	NR	0.002
Antimony, mg/L	<0.0005	0.006	0.0005	Selenium, mg/L	<0.001	0.050	0.001
Boron, mg/L	<0.1	NR	0.1	Silver, mg/L	<0.0002	NR	0.0002
Cadmium, mg/L	<0.00003	0.005	0.00003	Strontium, mg/L	0.08	NR	0.02
Chromium, mg/L	<0.001	0.100	0.001	Thallium, mg/L	<0.002	0.002	0.0002
Copper, mg/L	0.005	1.30	0.001	Tungsten, mg/L	0.001	NR	0.001
Iron, mg/L	0.46	NR	0.02	Uranium, mg/L	<0.0003	0.030	0.0003
Lead, mg/L	<0.0003	0.015	0.0003	Vanadium, mg/L	<0.1	NR	0.1
Lithium, mg/L	<0.1	NR	0.1	Zinc, mg/L	0.013	NR	0.008
Manganese, mg/L	<0.001	NR	0.01	Silicon, mg/L	7.53	NR	0.1
Mercury, mg/L	<0.0001	0.002	0.0001				

Comments:

MCL - Maximum Contaminant Limit for Drinking Water Standards **AR -** Analytical Result **NR** - Not Regulated

References:

SM - Standard Methods for the Examination of Water and Wastewater, APHA/AWWA/WEF, 18th ed., 1992.
Methods for Chemical Analysis of Water and Wastes, 20th Edition.

Reviewed by: CE

Alpine Analytical Laboratory

1315 Cherry, Helena, MT 59601 (406)449-6282

Client: Hydrometrics, Inc

Sample ID: MR-WT-2208-003

Water Truck Sample

Project ID: MR Recharge Testing

Site ID: 12020.003,601

Date Reported: 23-Aug-22

Chain of Custody #: 4201

Laboratory ID: 04J351	**Date / Time Sampled:** 22-Aug-22 @ 09:02
Condition: Intact	**Date / Time Received:** 22-Aug-22 @ 10:34

Parameter	AR	MCL	Detection Limits	Analyzed Date/Time	By	Method Reference
pH, s.u.	8.1	NR	0.1	22-Aug-22 @ 13:45	CE	EPA 150.2
Specific Conductance, umhos/cm	180	NR	1	22-Aug-22 @ 13:50	CE	EPA 120.1
Fluoride, mg/L	<0.1	4.0	2.0	22-Aug-22 @ 14:26	CE	EPA 300.0
Total Phosphorous, mg/L	0.21	NR	0.05	22-Aug-22 @ 17:20	CE	EPA 365.2
BiCarbonate, mg/L	67.3	NR	1	22-Aug-22 @ 13:45	CE	SM 2320 B
Carbonate, mg/L	<1	NR	1	22-Aug-22 @ 13:45	CE	SM 2320 B
Total Suspended Solids, mg/L	<1	NR	10	22-Aug-22 @ 17:10	CE	SM 2540 D
Total Dissolved Solids, mg/L	116	NR	10	23-Aug-22 @ 13:55	CE	SM 2540 C

Cations

Parameter	AR, mg/L	meq/L	MCL, mg/L	DL, mg/L	Analyzed Date/Time	By	Method Reference
Sodium	9.7	0.42	NR	5	22-Aug-22 @ 15:56	CE	EPA 200.7
Potassium	2.0	0.10	NR	5	22-Aug-22 @ 15:56	CE	EPA 200.7
Calcium	16.0	0.80	NR	5	22-Aug-22 @ 15:04	CE	EPA 200.7
Magnesium	4.27	0.35	NR	5	22-Aug-22 @ 15:04	CE	EPA 200.7
Total Cations		1.67					

Anions

Parameter	AR, mg/L	meq/L	MCL, mg/L	DL, mg/L	Analyzed Date/Time	By	Method Reference
Alkalinity	67.3	1.35	NR	1	22-Aug-22 @ 13:45	CE	SM 2320 B
Chloride	3.28	0.09	NR	1	22-Aug-22 @ 14:26	CE	EPA 300.0
Sulfate	24.7	0.51	NR	1	22-Aug-22 @ 14:26	CE	EPA 300.0
Nitrate + Nitrite as N	0.04	0.00	10	0.03	22-Aug-22 @ 14:26	CE	EPA 300.0
Total Anions		1.96					
Cation/Anion Balance, %		-7.85%					

Low - Level Metal Scan / Method Reference - 200.7- 200.8

Parameter	AR	MCL	DL	Parameter	AR	MCL	DL
Arsenic, mg/L	0.001	0.010	0.001	Molybdenum, mg/L	0.004	NR	0.001
Aluminum, mg/L	0.047	NR	0.005	Nickel, mg/L	<0.002	NR	0.002
Antimony, mg/L	<0.0005	0.006	0.0005	Selenium, mg/L	<0.001	0.050	0.001
Boron, mg/L	<0.1	NR	0.1	Silver, mg/L	<0.0002	NR	0.0002
Cadmium, mg/L	<0.00003	0.005	0.00003	Strontium, mg/L	0.08	NR	0.02
Chromium, mg/L	<0.001	0.100	0.001	Thallium, mg/L	<0.002	0.002	0.0002
Copper, mg/L	0.002	1.30	0.001	Tungsten, mg/L	0.001	NR	0.001
Iron, mg/L	0.81	NR	0.02	Uranium, mg/L	<0.0003	0.030	0.0003
Lead, mg/L	0.0006	0.015	0.0003	Vanadium, mg/L	<0.1	NR	0.1
Lithium, mg/L	<0.1	NR	0.1	Zinc, mg/L	0.008	NR	0.008
Manganese, mg/L	0.03	NR	0.01	Silicon, mg/L	6.74	NR	0.1
Mercury, mg/L	<0.0001	0.002	0.0001				

Comments:

MCL - Maximum Contaminant Limit for Drinking Water Standards **AR -** Analytical Result **NR** - Not Regulated

References:

SM - Standard Methods for the Examination of Water and Wastewater, APHA/AWWA/WEF, 18th ed., 1992.
Methods for Chemical Analysis of Water and Wastes, 20th Edition.

Reviewed by: CE

APPENDIX B

RECHARGE TEST DATA COLLECTION FIELD FORMS

MONTANA RESOURCES 2022 AUGMENTED RECHARGE TEST WATER LEVEL MEASUREMENT FIELD FORM

Test Well: MW 16-02D

Observation Wells: MW 16-02S, MW 16-01

Test Well Water Level Measurements (minimum 3 measurements/day):

Date	Time	Depth to Water feet	Date	Time	Depth to Water - feet
8/24/2022	8:06	97.17	8/25/2022	15:00	49.1
8/24/2022	9:18	84.1	8/25/2022	16:09	47.2
8/24/2022	9:51	87.12	8/25/2022	19:38	43.6
8/24/2022	10:42	83.42	8/26/2022	7:48	46.6
8/24/2022	11:05	82.56	8/26/2022	8:07	50.9
8/24/2022	15:39	79.12	8/26/2022	8:46	49.2
8/24/2022	16:06	82.7	8/26/2022	10:14	46.1
8/24/2022	20:49	76.8	8/26/2022	11:48	44.4
8/25/2022	8:15	69.62	8/26/2022	16:34	40.9
8/25/2022	9:35	63.5	8/27/2022	9:08	44.4
8/25/2022	11:45	67.55	8/27/2022	9:35	34.36
8/25/2022	12:11	67.61	8/27/2022	9:44	29.6
8/25/2022	12:47	60.8	8/27/2022	9:59	24.3
8/25/2022	13:55	48.5	8/27/2022	10:11	22.65

Observation Well Measurements (minimum one/day):

Well	Time	Date	Depth to Water - feet
MW16-02S	8:03	8/24/2022	56.08
MW16-02S	11:13	8/24/2022	56.08
MW16-01	11:26	8/24/2022	101.31
MW16-01	15:30	8/24/2022	100.27
MW16-02S	15:36	8/24/2022	56.01
MW16-02S	8:17	8/25/2022	56.01
MW16-01	10:20	8/25/2022	92.56
MW16-02S	12:09	8/25/2022	56.02
MW16-02S	15:02	8/25/2022	55.99
MW16-02S	7:52	8/26/2022	55.95
MW16-01	8:56	8/26/2022	79
MW16-02S	9:46	8/27/2022	55.85
MW16-01	9:51	8/27/2022	68.2

Comments/Observations:

Total recharge volume	11,520	gallons
Recharge start time	8/24/22 8:43	
Recharge end time	8/27/22 17:30	After 17:00 - let run until empty
Recharge duration	4847	minutes
	80.78	hours
Average Q	2.4	gpm

MONTANA RESOURCES 2022 AUGMENTED RECHARGE TEST FLOW MEASUREMENT AND SEEP SURVEY FIELD FORM

Test Well: MW16-02D

FLOW MEASUREMENTS

For each measurement, record time to fill container 3 times, and take average of 3 measurements:

Date	Time	Time to Fill Container - seconds				Recharge Rate-gpm	Comments
		Time 1	Time 2	Time 3	Average Time		
8/24/2022	8:38	109	104	103	105.33	2.8	Start
8/24/2022	9:20	130	131	132	131	2.3	SWL decreasing
8/24/2022	10:00	111	112	111	111.33	2.7	SWL recovering
8/24/2022	16.06	151	143.3	143.9	146.06	2.1	Totes down by 1000 gallons-flow check
8/25/2022	8:23	157			157	1.9	check flow - 1240 gallons in totes
8/25/2022	9:05	98	100.9	102.5	100.47	3.0	bump up flow at 8:30
8/25/2022	12:15	145			145	2.1	flow check
8/25/2022	12:18	94.9			94.9	3.2	increase flow, volume in totes 775 gal
8/25/2022	14:02	96.8			96.8	3.1	After partial filling totes, flow increased to 4.5 gpm so reduced to 3.09 gpm
8/25/2022	15:06	79			79	3.8	After 2nd partial fill of totes, full.
8/26/2022	8:11	203.4			203.4	1.5	Will increase flow
8/26/2022	8:34	116	116.5	112.8	115.1	2.6	Adjusted flow from 1.47 gpm
8/26/2022	11:24	97	96	99.4	97.63	3.1	after refilled totes
8/26/2022	16:39	111.1			111.1	2.7	flow check
8/26/2022	19.57	100.7			100.7	3.0	
8/27/2022	9.32	69.3			69.3	4.3	
8/27/2022	10:00	73			73	4.1	
8/27/2022	17:00	0					Totes gravity flow until empty

SEEPAGE SURVEY

Note any surface water seepage observed, estimated flow, and any changes from pre-testing conditions.

Date: 8/24/2022

Survey Start Time: 8:43

Survey End Time: 17:00 on 8/27/22 run till empty

Moulton Reservoir Road Survey: No seepage observed.

Bull Run Gulch Road Survey: No seepage observed.

MONTANA RESOURCES 2022 AUGMENTED RECHARGE TEST WATER LEVEL MEASUREMENT FIELD FORM

Test Well: MW15-03

Observation Wells: MW12-16

Test Well Water Level Measurements (minimum 3 measurements/day):

Date	Time	Depth to Water feet
8/29/2022	9:23	97.82
8/29/2022	13:25	46.35
8/30/2022	12:38	42.9
8/30/2022	12:56	47.28
8/30/2022	18:42	44
8/30/2022	18:49	45.3
8/31/2022	7:28	46.05
8/31/2022	7:45	54.9

Observation Well Measurements (minimum one/day):

Well	Time	Date	Depth to Water - feet
MW12-16	12:44	8/30/2022	92.45
MW12-16	8:50	8/31/2022	92.28

Comments/Observations:

Total recharge volume	1450	gallons
Recharge start time	8/29/22 10:06	
Recharge end time	8/31/22 7:45	
	2739	minutes
Total recharge time	45.65	hours
Average Q	0.53	gpm

MONTANA RESOURCES 2022 AUGMENTED RECHARGE TEST FLOW MEASUREMENT AND SEEP SURVEY FIELD FORM

Test Well: MW15-03

FLOW MEASUREMENTS

For each measurement, record time to fill container and take average of 3 measurements:

Date	Time	Time to Fill Container - seconds				Recharge Rate-gpm	Comments
		Time 1	Time 2	Time 3	Average Time		
8/29/2022	10:03	78.8	76	78.6	77.8	3.85	
8/29/2022	10:19					0	reset flow
8/29/2022	10:40	207	216.8	220	214.6	1.39	
8/29/2022	11:09					0.5	set flow at 0.5 gpm
8/29/2022	13:47	45.8			45.8	0.65	
8/29/2022	18:49	60.7			60.7	0.494	check flow
8/30/2022	12:46	64.3	57.2	58.9	60.13	0.499	
8/30/2022	18:47	60.9			60.9	0.494	flow check

SEEPAGE SURVEY

Note any surface water seepage observed, estimated flow, and any changes from pre-testing conditions.

Date: 8/29/2022
Survey Start Time: 10:06
Survey End Time: 8/30/2022 13:00

Moulton Reservoir Road Survey: No seepage observed.

Bull Run Gulch Road Survey: No seepage observed.

MONTANA RESOURCES 2022 AUGMENTED RECHARGE TEST WATER LEVEL MEASUREMENT FIELD FORM

Test Well: MW12-16

Observation Wells: MW15-03 (Recharge testing just prior to this test)

Test Well Water Level Measurements (minimum 3 measurements/day):

Date	Time	Depth to Water feet	Date	Time	Depth to Water - feet
8/31/2022	9:11	92.28	9/1/2022	4:55	61.1
8/31/2022	11:39	71.33	9/1/2022	12:34	45.45
8/31/2022	11:59	71.1	9/1/2022	18:42	46.72
8/31/2022	14:00	66.8	9/1/2022	19:18	38.3
8/31/2022	15:26	65.42	9/2/2022	8:02	54.7
8/31/2022	15:59	57.8	9/2/2022	8:57	52.1
8/31/2022	18:04	45.18	9/2/2022	13:30	39.4
8/31/2022	18:36	54.72	9/2/2022	17:00	42.1
8/31/2022	18:43	51.7	9/3/2022	9:14	58.52
8/31/2022	18:46	50.2			
8/31/2022	19:00	56			
8/31/2022	19:02	55.85			
9/1/2022	7:35	60.71			

Observation Well Measurements (minimum one/day):

Well	Time	Date	Depth to Water - feet
MW15-03	Recovering from previous recharge test.		
MW15-03	19:40	9/1/2022	93.8
MW15-03	8:55	9/2/2022	93.3

Comments/Observations:

Total Gallons Used	5260	gallons
Recharge start time	8/31/22 9:34	
Recharge end time	9/3/22 10:00	
Recharge duration	5786	minutes
	96.4	hours
Average Q	0.91	gpm

MONTANA RESOURCES 2022 AUGMENTED RECHARGE TEST FLOW MEASUREMENT AND SEEP SURVEY FIELD FORM

Test Well: MW12-16

FLOW MEASUREMENTS

For each measurement, record time to fill container 3 times and take average of 3 measurements:

Date	Time	Time to Fill Container - seconds				Recharge Rate-gpm	Comments
		Time 1	Time 2	Time 3	Average Time		
8/31/22	9:34	209	207.1	206	207.37	0.87	
8/31/22	15:33	67.8	66.8	64.1	66.23	1.81	used 2 gallon graduation on bucket
8/31/22	18:34	113	114	113.5	113.5	1.59	used 3 gallon graduation on bucket
8/31/22	18:46	60.1	58.5	56.6	58.36	1.02	used 1 gallon graduation on bucket
9/1/22	7:39	114.7	117.9	115.2	115.93	1.55	used 3 gallon graduation on bucket
9/1/22	19:25	96.9	96.9	97.4	97.06	1.24	used 2 gallon graduation on bucket
9/2/22	8:02	122	120	119.7	120.6	1.00	used 2 gallon graduation on bucket
9/2/22	8:41	71.3	71	70.3	70.865	1.69	used 2 gallon graduation on bucket

SEEPAGE SURVEY

Note any surface water seepage observed, estimated flow, and any changes from pre-testing conditions.

Date: 8/31/2022
Survey Start Time: 9:34
Survey End Time: 9/3/22 after 09:30

Moulton Reservoir Road Survey: No seepage observed.
Bull Run Gulch Road Survey: No seepage observed.

MONTANA RESOURCES 2022 AUGMENTED RECHARGE TEST WATER LEVEL MEASUREMENT FIELD FORM

Test Well: MW12-11

Observation Wells: MW-12-15, MW15-01

Test Well Water Level Measurements (minimum 3 measurements/day):

Date	Time	Depth to Water feet
8/29/2022	11:30	58.82
8/29/2022	12:25	0
8/29/2022	14:02	14.29
8/29/2022	14:42	9.38
8/29/2022	16:28	3.6
8/29/2022	17:33	18.6
8/30/2022	12:25	16.92
8/30/2022	18:58	13.85
8/30/2022	19:06	14.6

Observation Well Measurements (minimum one/day):

Well	Time	Date	Depth to Water - feet
Manual measurements not taken due to observation well distance from recharge well.			

Comments/Observations:

Total Gallons Used	565	gallons
Recharge start time	8/29/22 11:53	11:53
Recharge end time	8/31/22 7:16	7:16
Recharge duration	2603	minutes
	43.4	hours
Average Q	0.22	gpm

MONTANA RESOURCES 2022 AUGMENTED RECHARGE TEST FLOW MEASUREMENT AND SEEP SURVEY FIELD FORM

Test Well: MW12-11

FLOW MEASUREMENTS

For each measurement, record time to fill container 3 times, and take average of 3 measurements:

Date	Time	Time to Fill Container - seconds				Recharge Rate-gpm	Comments
		Time 1	Time 2	Time 3	Average Time		
8/29/22	11:53	44.4	42.5	42.8	43.23	1.38	used 1 gallon graduated bucket
8/29/22	12:25	stop recharge; water attop of casing.				0	
8/29/22	12:42	94	89	86	89.67	0.334	used 0.5 gallon graduated bucket
8/29/22	13:31	53.4	55.6	54.2	54.4	0.55	used 0.5 gallon graduated bucket
8/29/22	13:47	45.8			45.8	0.65	used 0.5 gallon graduated bucket
8/29/22	14:17	stop recharge;water increasing too fast.				0	
8/29/22	14:24	59.7	63.4	60.6	61.23	0.49	used 0.5 gallon graduated bucket
8/29/22	14:51	85.1	75.1	82.5	81.07	0.37	used 0.5 gallon graduated bucket
8/29/22	16:48	180.1	206	216	200.7	0.149	used 0.5 gallon graduated bucket
8/29/22	17:21	140.9	140.4	139	140.1	0.21	used 0.5 gallon graduated bucket
8/30/22	12:20	231.9	232.6	227.8	230.76	0.13	used 0.5 gallon graduated bucket

SEEPAGE SURVEY

Note any surface water seepage observed, estimated flow, and any changes from pre-testing conditions.

Date: 8/29/2022
Survey Start Time: 11:53
Survey End Time: 07:16 on 8/31/22

Moulton Reservoir Road Survey: No seepage observed.
Bull Run Gulch Road Survey: No seepage observed.

MONTANA RESOURCES 2022 AUGMENTED RECHARGE TEST WATER LEVEL MEASUREMENT FIELD FORM

Test Well: MW12-17

Observation Wells: MW12-18

Test Well Water Level Measurements (minimum 3 measurements/day):

Date	Time	Depth to Water feet	Date	Time	Depth to Water - feet
8/24/2022	11:54	38.67*	8/24/2022	18:10	13.3
8/24/2022	12:16	3.12	8/24/2022	19:58	21.55
8/24/2022	12:25	4.25	8/24/2022	20:01	2.6
8/24/2022	14:06	15.07	8/25/2022	7:34	35.71
8/24/2022	14:47	18.8	8/25/2022	10:29	4.56
8/24/2022	14:57	14.47	8/25/2022	11:25	11.24
8/24/2022	15:07	11.44	8/25/2022	15:21	13.72
8/24/2022	0	0	8/25/2022	19:09	TOC
8/24/2022	17:09	21.51	8/25/2022	19:58	4.4
8/24/2022	17:30	22.61	8/26/2022	9:06	1.15
8/24/2022	17:52	16.71			

* before starting test

Observation Well Measurements (minimum one/day):

Well	Time	Date	Depth to Water - feet
MW12-18	11:56	8/24/2022	38.75
MW12-18	12:27	8/24/2022	38.76
MW12-18	14:10	8/24/2022	38.75
MW12-18	15:11	8/24/2022	38.74
MW12-18	17:09	8/24/2022	38.73
MW12-18	20:10	8/24/2022	38.75
MW12-18	15:41	8/25/2022	38.75
MW12-18	9:10	8/26/2022	38.76

Comments/Observations:

Total Gallons Used	816	gallons
Recharge start Time	8/24/2022 12:04	
Recharge end time	8/26/2022 10:00	
Total Recharge Time	2756	minutes
	45.9	hours
Average Q	0.30	gpm

MONTANA RESOURCES 2022 AUGMENTED RECHARGE TEST FLOW MEASUREMENT AND SEEP SURVEY FIELD FORM

Test Well: MW12 - 17

FLOW MEASUREMENTS

For each measurement, record time to fill container 3 times and take average of 3 measurements:

Date	Time	Time to Fill Container - seconds				Recharge Rate-gpm	Comments
		Time 1	Time 2	Time 3	Average Time		
8/24/2022	12:01	102.1	101	98	100.33	2.99	3 gallon bucket check
8/24/2022	14:44	138.8	149	145	144.26	0.415	1 gallon graduated bucket used
8/24/2022	17:30	117.3	111	116	114.76	0.261	0.5 gallon graduated bucket used
8/25/2022	7:50	126	133	140	133	0.225	0.5 gallon graduated bucket used
8/25/2022	11:20	216	213	215	214.6	0.139	0.5 gallon graduated bucket used
8/25/2022	15:32	170	167	171	169.33	0.177	start after truck filled
8/25/2022	19:56	181			181	0.166	lightening very close, took one reading

SEEPAGE SURVEY

Note any surface water seepage observed, estimated flow, and any changes from pre-testing conditions.

Date: 8/24/2022

Survey Start Time: 12:04

Survey End Time: 10:00 on 8/26/22

Moulton Reservoir Road Survey: No seepage observed.
Bull Run Gulch Road Survey: No seepage observed.

MONTANA RESOURCES 2022 AUGMENTED RECHARGE TEST WATER LEVEL MEASUREMENT FIELD FORM

Test Well: MW12-18

Observation Wells: MW12-17

Test Well Water Level Measurements (minimum 3 measurements/day):

Date	Time	Depth to Water feet
8/26/2022	14:56	35.97
8/26/2022	15:06	35.88
8/26/2022	15:50	33.58
8/26/2022	16:18	33.5
8/26/2022	19:00	33.6
8/27/2022	7:16	33.55
8/27/2022	8:13	36.3

Observation Well Measurements (minimum one/day):

Well	Time	Date	Depth to Water - feet	
MW12-17	19:10	8/26/2022	32.54	Level decreasing
MW12-17	7:19	8/27/2022	38.64	

Comments/Observations: The recharge test at MW12-17 was performed prior to testing MW12-18. As a result, water levels in this well do not necessarily reflect any changes due to MW12-18.

Total Gallons Used	5114	gallons
Recharge start time	8/26/22 14:24	
Recharge end time	8/27/22 18:30	
Total recharge time	1686	minutes
	28.1	hours
Average Q	3.0	gpm

MONTANA RESOURCES 2022 AUGMENTED RECHARGE TEST FLOW MEASUREMENT AND SEEP SURVEY FIELD FORM

Test Well: MW12-18

FLOW MEASUREMENTS

For each measurement, record time to fill container and take average of 3 measurements:

Date	Time	Time to Fill Container - seconds				Recharge Rate-gpm	Comments
		Time 1	Time 2	Time 3	Average Time		
8/26/2022	14:24	145.6	145.6	144	145.06	2.06	
8/26/2022	15:25	72	73.4	74.6	73.33	4.09	start at 15:34
8/26/2022	20:27	70	68	68.2	68.73	4.36	
8/27/2022	7:33	- Truck Empty-				0	
8/27/2022	8:10	68.6	69	68.2	68.6	4.37	let go to zero, approx. 300 gallons were in tank

SEEPAGE SURVEY

Note any surface water seepage observed, estimated flow, and any changes from pre-testing conditions.

Date: 8/26/2022
Survey Start Time: 14:24
Survey End Time: let go to zero flow - 8/27/22

Moulton Reservoir Road Survey: No seepage observed.
Bull Run Gulch Road Survey: No seepage observed.

MONTANA RESOURCES 2022 AUGMENTED RECHARGE TEST WATER LEVEL MEASUREMENT FIELD FORM

Test Well: MW15-05

Observation Wells: MW15-06

Test Well Water Level Measurements (minimum 3 measurements/day):

Date	Time	Depth to Water feet	Date	Time	Depth to Water - feet
8/31/2022	10:23	35.2	9/1/2022	8:10	22.87
8/31/2022	10:57	32.8	9/1/2022	8:44	25.36
8/31/2022	11:07	31.56	9/1/2022	9:11	25.05
8/31/2022	11:27	30.6	9/1/2022	9:54	25.05
8/31/2022	12:11	29.72	9/1/2022	10:03	24.94
8/31/2022	13:44	28.76	9/1/2022	12:53	24.2
8/31/2022	16:13	28.36	9/1/2022	20:34	30.75
8/31/2022	16:36	26.78	9/2/2022	9:19	25.15
8/31/2022	16:39	26.2	9/2/2022	13:37	24.61
8/31/2022	17:51	22.95	9/2/2022	16:34	24.8
8/31/2022	19:11	22.16	9/3/2022	8.29	24.7

Observation Well Measurements (minimum one/day):

Well	Time	Date	Depth to Water - feet
MW5-06	10:27	8/31/2022	40.6
MW5-06	8:33	9/1/2022	40.24
MW5-06	12:58	9/1/2022	40.09
MW5-06	13:42	9/2/2022	39.81
MW5-06	8:53	9/3/2022	39.61

Comments/Observations:

Total Gallons Used	3545	Gallons
Survey start Time	8/31/2022	10:44
Survey end time	9/3/2022	8:30
Total Time	4186	minutes
	69.8	hours
Average flow (gpm)	0.85	gpm

MONTANA RESOURCES 2022 AUGMENTED RECHARGE TEST FLOW MEASUREMENT AND SEEP SURVEY FIELD FORM

Test Well: MW15-05

FLOW MEASUREMENTS

For each measurement, record time to fill container 3 times, and take average of 3 measurements:

Date	Time	Time to Fill Container-seconds				Recharge Rate-gpm	Comments
		Time 1	Time 2	Time 3	Average Time		
8/31/22	10:44	201.2	209.3	215.4	208.6	0.57	used 2 gallon graduated bucket
8/31/22	16:15					0.49	
8/31/22	16:27					0.99	
9/1/22	8:18	83.9	91	83.9	86.26	0.69	
9/1/22	9:34	74.9			74.9	0.8	
9/1/22	20:30	71.9			71.9	0.837	1 gallon bucket graduation
9/2/22	16:36					0.69	Flow check, will increase flow
9/2/22	16:48					0.91	final flow

SEEPAGE SURVEY

Note any surface water seepage observed, estimated flow, and any changes from pre-testing conditions.

Date: 8/31/2022
Survey Start Time: 10:44
Survey End Time: during night on 9/2/22

Moulton Reservoir Road Survey: No seepaage observed.
Bull Run Gulch Road Survey: No seepage observed.