Montana Resources 6560 Amendment Report

IRP REVIEW

Report of the Independent Review Panel

Design Document for Expansion of Yankee Doodle Tailings Impoundment to El. 6560 Ft.

Montana Resources, LLP

Butte Montana

Final Report May 18 2025

Panel Members:

Dr. Peter Robertson, P.E.

Dr. Leslie Smith, P. Geo.

Dr. Dirk van Zyl, P.E.

1. Introduction

1.1 6560 Foot Amendment

As part of the process to obtain approval for expansion of the Yankee Doodle Tailings Impoundment (YDTI) to a crest elevation of 6560 ft, the Montana Code Annotated (MCA) requires the Independent Review Panel (IRP) for YDTI to undertake a review of the 6560 Amendment Design Document prepared for this expansion. The same process was followed in 2017 when the IRP reviewed the Design Report for the now completed raise to El. 6450 ft., which provides tailings storage capacity through approximately 2034. The proposed raise provides tailings storage capacity for the remaining life of mine ore reserves, currently envisioned to be in about 2056 at current rates of production. The charge of the Panel is to provide an evaluation indicating whether the proposed expansion to El. 6560 ft. has been designed, and will be operated, monitored, and closed using the most applicable, appropriate, and current technologies and techniques practicable, given site-specific conditions and concerns. For later reference, Figure 1 illustrates the YDTI and surrounding waste rock disposal sites at the end of life of the mine.

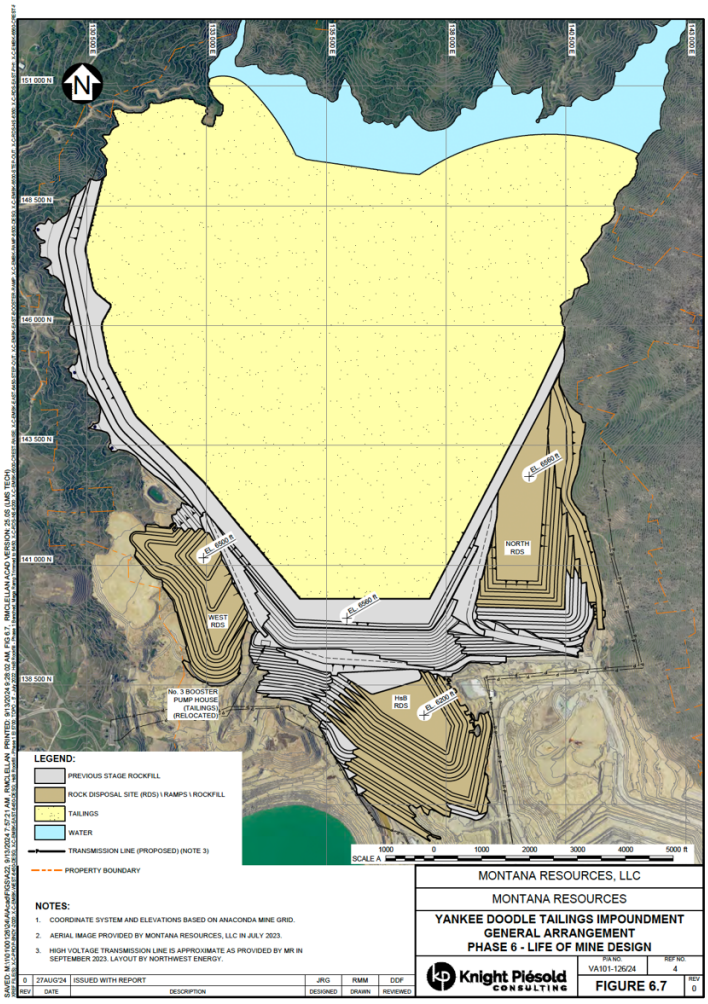


Figure 1. – Visualization of the YDTI at completion of the raise to El 6560 ft.

Section 82-4-377 of MCA requires that the Panel review the design document, and the underlying analysis and assumptions for consistency with code requirements. The Panel has formed its opinions on the basis of: (i) consideration of the design concepts as presented in the Design Report, (ii) site investigations undertaken after 2017 to further the understanding of the geologic, geotechnical and hydrogeologic conditions of the surficial and bedrock units in the area, (iii) site investigations undertaken after 2017 to further characterize the geotechnical properties of the existing YDTI embankments and tailings deposit, (iv) analyses undertaken to demonstrate the expansion will meet the required factors of safety for embankment stability for both static conditions and ground motion due to earthquake loading conditions, and (v) measures to be implemented in the expansion to contain process waters and tailings. The Panel has evaluated the reasonableness of the

concepts, assumptions, and assessments contained in the Design Report, but it is outside the scope of the Panel to independently reproduce design calculations.

In accord with the Design Report, elevations referenced in this report are based on the ACC (Anaconda Copper Company) datum.

1.2 Activities of the Panel

The IRP was formed in 2015. Each year, the Panel has received updates on the EoR Annual Inspection Reports, site investigations and data analysis reports, construction activities, and performance monitoring. Site tours for the IRP are scheduled annually. One member of the IRP (P. Robertson) participated in the 2022 YDTI risk assessment (Knight Piésold, 2023).

The Panel notes that the embankment site investigation and instrument installation program staged over a five-year period from 2018 to 2022 has contributed to substantive improvements in the characterization of the properties of the embankment materials, in the determination of hydrologic conditions within the embankments, and in the deployment of monitoring systems.

The Design Report for the proposed 6560 ft raise is composed of 10 separate documents (including the Seismic Hazard Assessment). The IRP was provided with these reports issued as final between September 2024 and March 2025. Prior to their release, often at the recent annual meetings, MR provided progress updates on their content as the reports were being developed.

1.3 Organization of the IRP Report

Knight Piésold Ltd. (KP) is the Engineer of Record firm for the YDTI and serves as the Designer of Record for the proposed expansion. This IRP report is structured in terms of the ten KP reports and one report of the Seismic Hazard Assessment consultants with Appendices that, taken together, constitute the Design Document.

- YDTI Evaluation of Tailings Management Technology
- YDTI Design Basis Report
- YDTI Life of Mine Design Report
- YDTI Climate Conditions Report
- YDTI Stability Assessment Report
- YDTI Seismic Hazard Assessment
- YDTI Water Balance Model Report

- YDTI Tailings and Water Management Report
- YDTI Construction Management Plan
- YDTI Dam Breach Inundation Study
- YDTI Failure Modes and Effects Assessment

All elevations are referenced to the Anaconda Copper Company vertical datum, which is approximately 53 feet higher than NADVD 1988.

2. Evaluation of Tailings Management Technology

KP has provided an evaluation of the tailings management technologies. Candidate options for tailings and waste rock management were identified by the team that included tailings management techniques and tailings management technologies. A number of options were identified and evaluated to make sure that they have the volumetric capacities and were implementable. A screening followed which resulted in a number of options that could be implemented. Table 1 provides a summary of the implementable options that were advanced to a Multiple Accounts Analysis (MAA).

Table 1

Tailings Management Options Advanced to MAA

Candidate	Tailings Storage			Rockfill Storage	
	Technology	Location	Methodology	Location	Methodology
1	Conventional slurry	YDTI	Crest raise, multipoint discharge	On-surface, in pit	Embankment construction and Rock Disposal Sites, excess into Continental Pit
2	Conventional slurry	YDTI	YDTI footprint expansion and crest raise, multipoint discharge	On-surface, in pit	Embankment construction and Rock Disposal Sites, excess into Continental Pit
3	Conventional slurry	YDTI	Crest raise, multipoint discharge	On-surface, in pit	Embankment construction and Rock Disposal Sites, excess into Continental Pit
		Berkeley Pit	Multipoint discharge		
4	Conventional slurry	YDTI	Crest raise, multipoint discharge	On-surface, in pit	Embankment construction and Rock Disposal Sites, excess into Continental Pit
	Filtered	Berkeley Pit	Filtered tailings		
5	Filtered	YDTI	Filtered tailings	On-surface, in pit	Rock Disposal Sites, Continental Pit

The MAA considered the following categories in the evaluation:

- Safety and environment
- Technical execution
- Economic
- Closure

The MAA results and sensitivity analysis resulted in selecting Candidate 1 – Conventional slurry deposited in the YDTI with crest raise and multipoint discharge.

The Panel concur with the methodology used as well as the outcomes. The approach is consistent with standard industry practice and standard level of care for tailings management projects.

3. Design Basis Report

The basic design criteria for continued construction of the YDTI embankments beyond 6450 ft. to El 6560 ft. are provided in the Design Basis Report (KP, 2024). The 110 ft. centerline raise will be constructed in two or more lifts, using free draining rockfill and a maximum lift height of 50 ft. In association with the embankment raise, three Rock Disposal Sites (RDS) will be configured to enhance embankment stability. These are the existing Horse Shoe Bend (HsB) and North RDS facilities and a new West RDS (formerly Northwest Dumps). The downstream slope of the TSF embankments will be no steeper than 2:5H:1V for the raise to 6500 ft, and no steeper than 3H:1V for the final raise to 6560 ft. Minimum factor of safety stability requirements set by the Montana code form the basis for the design of the embankment raise.

Somewhat different design specifications are applied to the West Embankment in terms of lift height and material properties of the rock. A key objective of the West Embankment design is to aid in maintaining hydrodynamic containment on the west side of the valley, with reliance on the West Embankment Drain (WED). The West Embankment can be raised to El 6560 ft. without significant disturbance beyond the existing downstream toe. It is to be raised using centerline construction on the existing wide platform. No modifications are required for the WED.

The embankment raise requires the design to meet the maximum creditable earthquake or the 1:10,000-year return period event, whichever is greater. Similarly, the probable maximum flood must be accommodated by water storage within the TSF, while preserving the freeboard requirement. A permanent spillway will be built during active closure of the facility. These same conditions applied to the currently approved 6450 design.

A modest revision has been made in the magnitude of the inflow design flood (IDF). The IDF was selected as the 24-hour PMP event plus complete melt of the 1:100-year return period snowpack. The previous estimate of the IDF corresponded to a runoff volume of 19,000 acre-ft. For the 6560 design the IDF runoff volume has been increased to 20,000 acre-ft (KP, 2024). Account has been taken of a larger PMP total at higher elevations within the basin. The required freeboard to meet regulations for the 6560 raise is approximately 15 feet. With the construction practice of using 50 ft lifts, freeboard requirements do not become a potential issue until late in the life of the 6560 embankment.

The IRP considers the Design Basis Report meets its intended purpose and the content is consistent with standard industry practice. Additional details on the design are incorporated in the companion Life of Mine (LOM) Report, which forms an integral part of the Amendment application.

4. Life of Mine Design Report

KP has evaluated the LOM storage requirements for tailings and waste rock based on the Montana Resources 2022 Reserve Report. The mine waste management plan has been divided into 6 phases, which progresses through 2056 for the 6560 Amendment (Figure 2).

- Phase 1: Ongoing construction activities to be completed prior to the permit amendment,
- Phase 2: EL. 6,500 ft Embankment Crest Raise, starting in 2028,
- 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, starting in 2039,
- Phase 6: Final Life of Mine (Prior to Closure).

The Phase 2 raise is intended to begin in 2028. As is the case currently, detailed scheduling of the embankment raises at the TSF and waste rock placement in the Rock Disposal Sites to buttress the TSF is directly linked to the timing of suitable non-ore rock available at the Continental Pit. The LOM plan relies heavily on designs adopted and construction experience gained in the 6450 raise.

The performance objectives for the raised tailings storage facility remain the same as those now in place:

- Maintain a large tailings beach adjacent to the upstream embankment,
- The embankments and adjacent beaches remain well-drained with hydraulic heads below prescribed values,
- Freeboard requirements are met,

- Embankment geometry remains consistent with design criteria.

A refinement is planned for the alluvium placement methodology on the upstream face of the embankment raise, which the Panel supports.

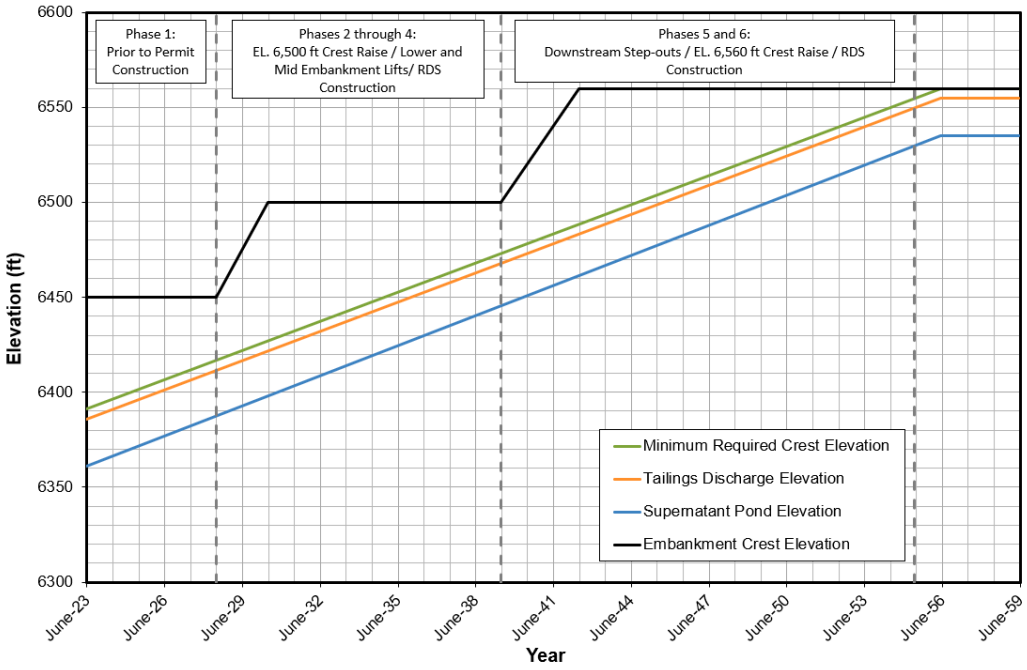
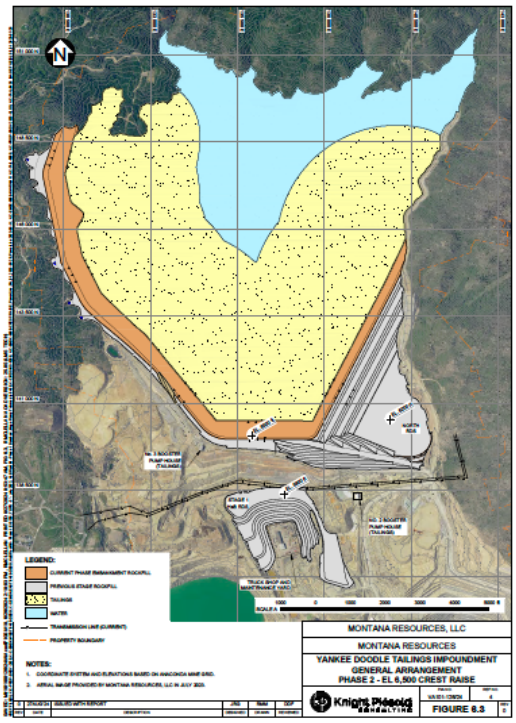


Figure 2. Proposed embankment raise schedule

The LOM report incorporates an effective suite of figures that illustrate the construction and infill sequence. Figure 3 shows the layout of construction plans for Phases 2 -6.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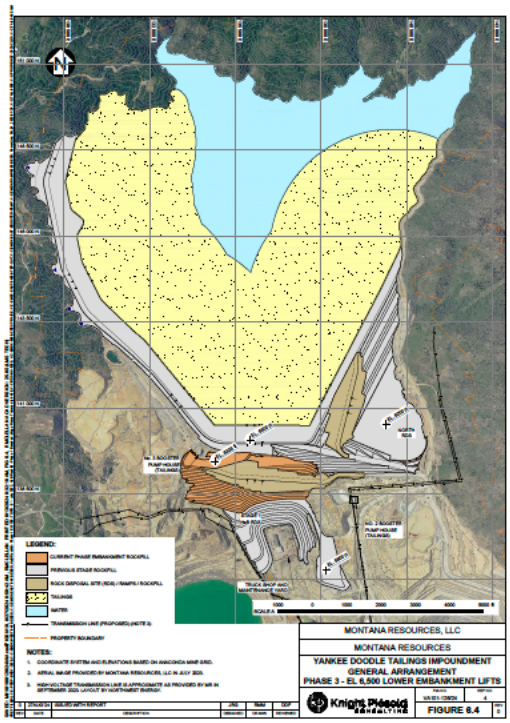
YANKEE DOODLE TAILINGS IMPOUNDMENT
GENERAL ARRANGEMENT
PHASE 2 - EL 6,500 CREST RAISE
Knight Piésold CONSULTING
FIGURE 8.3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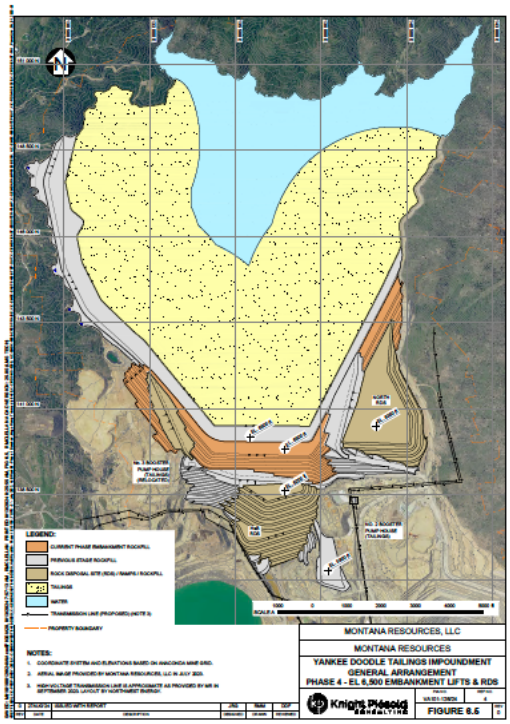
GENERAL ARRANGEMENT
PHASE 3 - EL 6,500 LOWER EMBANKMENT LIFTS
Knight Piésold CONSULTING
FIGURE 8.4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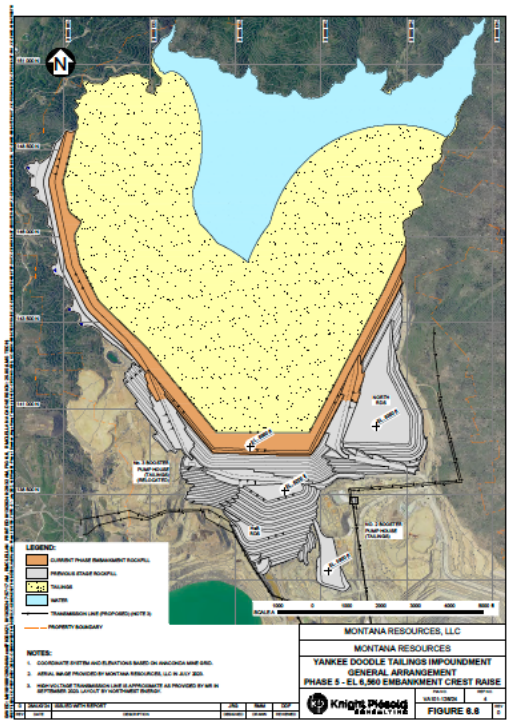
MONTANA RESOURCES
YANKEE DOODLE TAILINGS IMPOUNDMENT
GENERAL ARRANGEMENT
PHASE 4 - EL 6,500 EMBANKMENT LIFTS & RDS
Knight Piésold CONSULTING
FIGURE 8.5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PHASE 5 - EL 6,560 EMBANKMENT CREST RAISE
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FIGURE 8.6

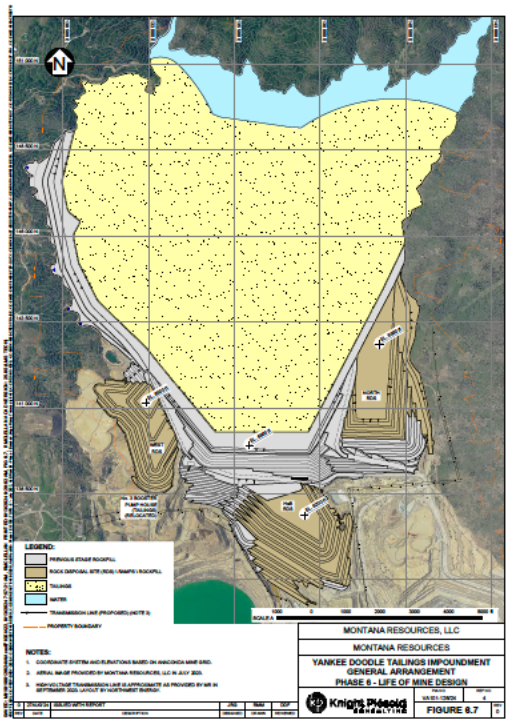


Figure 3. Schematic Representation of 6 Phase Raise Plan for YDTI

The closure plan is the same in concept as that in the approved 6450 permit, requiring a soil cover with re-vegetation, surface drainage features to route overland flow, and a pond (<5000 acre-ft) with a shoreline expected to transition to wetland over time. A closure spillway must be constructed to protect the embankments during extreme storm events. The Panel agrees with the view expressed by Knight Piésold that with continued mining through Phase 6, expansion of the Rock Disposal Sites serving as buttresses will enhance the long-term stability of the North South and East West embankments. It is important that a basic description of a feasible closure plan is included in the Amendment Report. The IRP considers the level of detail provided is appropriate for a closure of the TSF that might not be implemented until the years following 2056. Progressive closure of the facility should be advanced in a timely manner, as conditions and plans allow that to be the case.

5. Climate Conditions Report

The 6560 Amendment relies upon the KP Climate Conditions Report released in September 2021. That assessment was based on long-term data available up to 2020. The IRP considers the 2021 document provides a reasonable basis for design of the 6560 raise. At

the time of the next periodic review, the IRP requests confirmation that the climatic conditions experienced in the period from 2021 to 2024 at the on-site and regional stations were near normal and thus not expected to lead to a material change in the climate statistics (e.g. 24-hour extreme precipitation events). It is considered good practice to update the climate statistics if an infrequent, large storm event were to occur at the mine site.

The effects of climate change on the magnitude of extreme precipitation events were considered in the 2021 report and the Panel agrees with the assessment that was undertaken.

6. Seismic Hazard Assessment

The seismic hazard assessment study updates previous seismic hazard models, incorporating new geological and seismological data. A probabilistic seismic hazard analysis (PSHA) was conducted to estimate ground motion levels at key locations. Various earthquake scenarios, including local and regional sources, were considered. The study integrates historical earthquake records, recent geophysical surveys, and site-specific ground motion models and account for soil and rock conditions affecting seismic wave propagation. The methodology follows international best practices, including logic tree frameworks to address uncertainties.

The updated seismic hazard maps show revised ground shaking intensities for different probability levels. Some locations exhibit higher-than-previously-estimated seismic risk due to updated fault activity data and recommendations for infrastructure resilience are provided based on these findings. The revised seismic hazard model provides improved estimates of earthquake risk, critical for infrastructure design and emergency planning. The study highlights specific regions where risk mitigation measures should be prioritized. Recommendations include continued monitoring, periodic reassessment, and incorporating the latest scientific advancements into future hazard models. The study was completed consistent with current industry standards and the IRP concur with the findings.

7. Stability Assessment

KP performed stability analyses that are summarized in their report “Stability Assessment Report for 6,560 Amendment Design Document” for the Yankee Doodle Tailings Impoundment (YDTI). The report evaluates the stability of the tailings impoundment, focusing on the proposed permit amendment that aims to raise the maximum embankment height to 6,560 feet. The assessment covers static stability, liquefaction potential, and dynamic earthquake response.

The objective of the report is to support continued mining operations by raising the embankment height in stages, facilitating mining until the mid-2050s. The report provides supporting analyses for compliance with regulatory safety requirements and evaluates potential risks.

In the KP stability analyses the embankment's response to normal operating conditions, earthquakes, and post-earthquake conditions have been considered under steady state seepage for static limit equilibrium, liquefaction potential and dynamic earthquake response and displacement. The report also summarizes the evaluation of the extensive historical database and monitoring data that was used to inform the design assessment and develop input parameters for the analyses.

The YDTI is a valley-filled impoundment consisting of a large continuous rockfill embankment with a long extensive tailings beach. Stability is governed by the embankment rockfill and the underlying saturated overburden soils. Although the tailings are the weakest material, the stability is not sensitive to the tailing's strength due to the significant width of the rockfill embankment. The report identifies the central pedestal area as the critical location for stability due to the presence of saturated overburden soils below the downstream toe as well as being the highest embankment section.

KP identify two main hydrogeologic regimes, an upper regime in the tailings and a lower regime that subdivides the rockfill within the embankment near its base. The basal saturated zone is thickest at the upstream face and thins towards the original ground surface at the downstream toe. The two regimes are linked with a vertical transition near the upstream face of the embankment to form a single continuous surface. A cross section illustrating the interpreted hydrogeologic regimes is shown in Figure 4. The IRP concurs with this schematic interpretation.

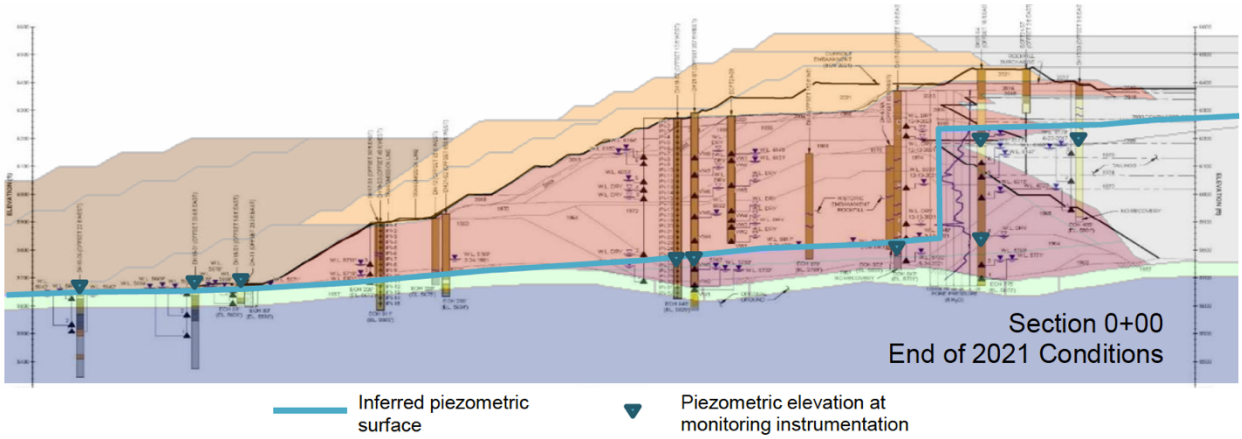


Figure 4. Cross section showing interpretation of the phreatic surface at station 0+00, overlain on the monitored pore pressure conditions from the end of 2021, as presented in the Data Analysis Report.

Screening-level assessments by KP indicate the overburden soils and rockfill are potentially contractive at large strains, which focused the strength evaluation on the undrained condition. Under current normal operating conditions, the materials are behaving in a drained manner. However, events in the future could trigger undrained behavior, such as earthquakes. These future events have a low probability of occurrence and were evaluated within a risk-informed framework during the Risk Assessment done in 2021-2022. All potential failure modes were characterized within the acceptable region of risk and mitigation measures were suggested to further reduce risks. Details were provided in the 2022 Risk Assessment Report.

Slope stability was assessed by KP along five sections through the main dam using limit equilibrium (LE) for both 2- and 3- dimensions for normal operating and post-earthquake conditions. Acceptable target factors of safety (FS) were achieved for both loading conditions and at all sections analysed for potential full-height failure surfaces. The analyses identify that small bench-scale and shallow slips are possible but are unlikely to lead to a loss of containment due to the relative size of the embankment. The report analyzes the impact of a Maximum Credible Earthquake (MCE), including potential liquefaction. Deformation caused by earthquakes are considered manageable, with no significant loss of containment predicted. The analyses also demonstrated the effectiveness of infilling the Horseshoe Bend (HsB) area and the need to refine the configuration and fill sequencing. The IRP concur with the results from the stability analyses and the associated 2022 Risk Assessment report.

The stability report identifies several areas of uncertainty, mainly related to material behavior and monitoring conditions. These uncertainties could affect the rigor and

confidence in future evaluations. The key points of uncertainty include:

Material Response (Contractive vs. Dilative Behavior)

The mechanical response of the critical materials (overburden and rockfill) shows a mix of dilative and contractive behaviors. There is some uncertainty regarding whether these materials will behave in a contractive or dilative manner under load, particularly during seismic events. Evidence of 'microstructure' (cementation or interlocking of particles) in the overburden and rockfill also complicates the reliability of empirical correlations used to estimate the undrained shear strength. This leads to some uncertainty in strength parameters, as the presence of microstructure could result in strength loss at large strains.

Residual Strength of the Soil Units

The undrained residual strength of the overburden and rockfill is uncertain, especially under post-earthquake conditions. Although the rockfill exhibited no strength loss in laboratory testing, the overburden's strength may decrease after cyclic loading (such as during an earthquake), but the extent of this loss remains somewhat uncertain.

Piezometric Conditions (Water Pressure)

There is some uncertainty in the piezometric conditions at the upstream face of the dam. The monitoring data has some limitations, and better characterization of the pore pressure regime is needed, as it can significantly affect the stability analysis, particularly during and after seismic events.

Dynamic Analysis and Earthquake Response

Although the report includes seismic analysis, it acknowledges that the data available for the rockfill used in dynamic (earthquake) testing is limited. This poses a challenge in accurately predicting the response of the embankment during earthquakes, particularly in terms of liquefaction potential and displacement patterns. The dynamic properties of the rockfill, especially at the upstream face, remain uncertain, and further cyclic testing is suggested by KP to improve understanding of these properties.

Material Testing and Site Investigation Gaps

The report points out that additional laboratory testing and site investigations are needed to refine the characterization of the materials used in the embankment. Specifically, ongoing, and future site investigations are necessary to address these gaps, as part of a five-year site characterization plan.

These uncertainties are highlighted as areas where further investigation, testing, and monitoring will be necessary to improve the confidence in the dam's stability under both static and dynamic conditions. The stability report recommends refining material characterization and monitoring piezometric conditions (water pressure within the embankment).

The IRP considers the Stability Assessment Report meets its intended purpose and the content is generally consistent with standard industry practice. The IRP also supports the ongoing further investigation, testing and monitoring suggested by KP to improve confidence and reduce uncertainties. The IRP concur with the need to refine the configuration and fill sequencing of rockfill, especially in the Horseshoe Bend area.

8. YDTI Water Balance Model Report

The YDTI water balance model, developed using the Goldsim platform, is used to track process water transfer volumes, schedule volumes to be sent to the water treatment plant and predict future storage volumes in the YDTI. The model incorporates a detailed accounting for water inputs to YDTI (e.g. rainfall/snow melt) and water losses (e.g. evaporation, seepage to groundwater). KP has calibrated the water balance model to data available between 2004 and 2023. Figure 5 shows the calibrated model achieves a reasonable match to historical data on pond volume.

Predictive simulations have been run for the remaining life of the known ore reserves (to 2057) and for a closure period extending to 2123. For the remaining operational period, the current strategy of holding the TSF water volume to 15000 acre-ft $\pm$ a 3000 acre-ft normal seasonal fluctuation has been carried forward. The water balance model is stochastic to account for future variability in month-by-month rainfall totals, dry climatic cycles, and wet climatic cycles. A stochastic formulation provides the 5 percentile and 95 percentile curves seen in Figure 5 that quantify the uncertainty in future forecasts of pond volume. The water balance simulations indicate the pond volume can be successfully managed within the desired range by adjustments in either or both water inputs from Silver Lake and water volumes sent to the treatment plant for offsite discharge. It is expected that in the absence of an extreme flood scenario, the YDTI pond for the remaining operational period of the facility can be maintained well away from the three embankments. Because of the flexibility provided by controls on water imports and rates of water treatment/release, there is effectively no difference in the range of storage volumes associated with the El. 6450 facility through 2034 and the El. 6560 facility through 2057.

Two closure scenarios have been considered: (i) active closure from 2057 to 2076, where the YDTI pond would be drawn down to ~ 5000 acre-ft in the first several years after the end of mining and water transfers would continue to facilitate the Butte Mine Flooding Operable Unit (BMFOU) remedy, followed by passive closure from 2077 – 2123 with no pumped inflows or outflows; and (ii) passive closure beginning immediately after the end of mining in 2057.

The forecast water volume for Scenarios 1 and 2 are shown in Figure 5 and 6, respectively. The principal difference between Scenario 1 and 2 is the time required to draw down the YDTI to its target closure volume of about 5000 acre-ft. These curves also indicate the range in YDTI pond volume that could occur in the closure period for the normal variation in climatic cycles.

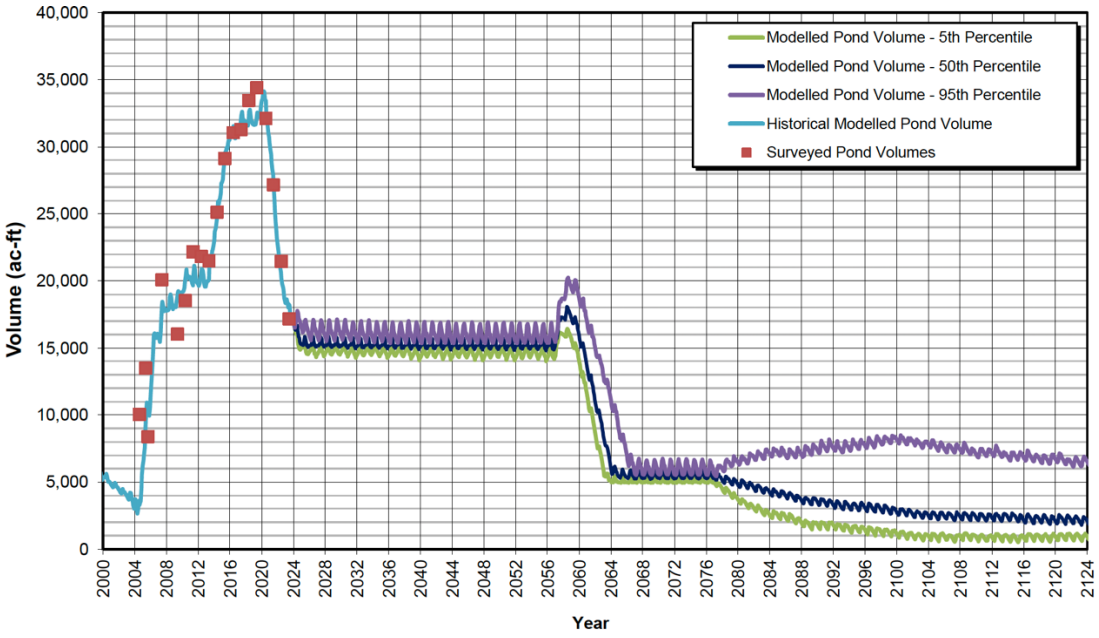


Figure 5. Water balance model calibration and forecast for Scenario 1

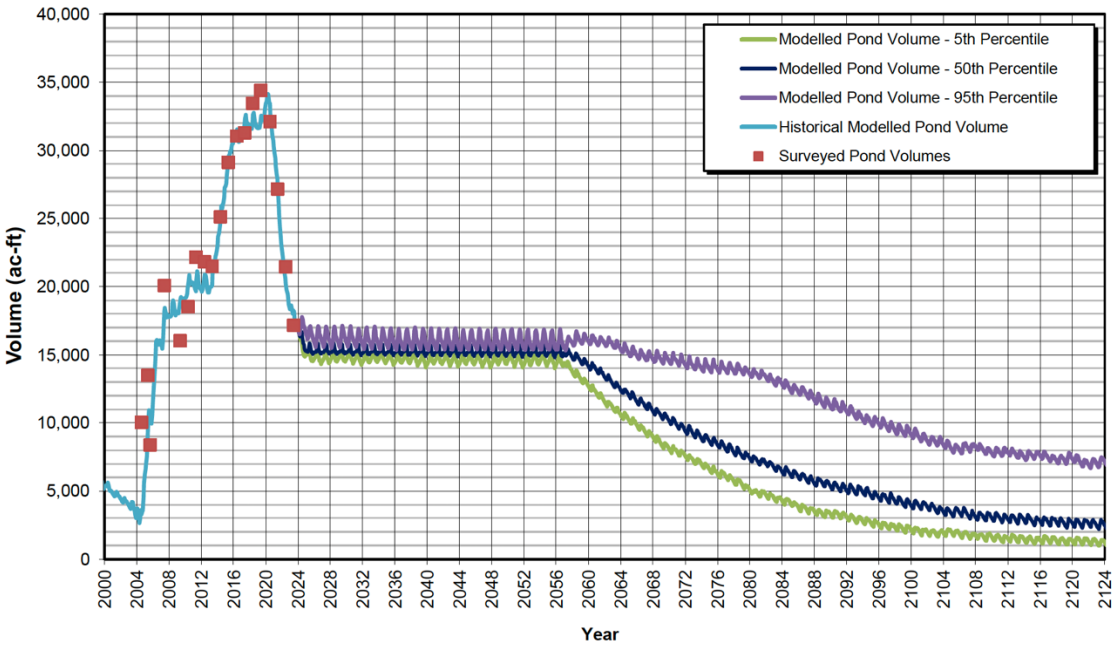


Figure 6. - Water balance model forecast for Scenario 2.

The IRP considers an effective water balance model has been developed and applied for the YDTI and an effective strategy has been outlined to manage water storage volumes in the YDTI for the El. 6560 operating period, and to assess conditions in the following closure period.

9. Tailings and Water Management Report

9.1 Introduction

The tailings and water management plan for operation of the YDTI beyond 2034 is similar to the system in place today, with accommodation for the changes needed due to higher embankment elevations and construction of the three RDSs. The Tailings and Water Management report is intended to satisfy 4 requirements in the Montana code:

- Description of the chemical and physical properties of the materials and solutions stored in YDTI,
- Description of how undesirable constituents contained in the impoundment will be isolated from the environment,
- Description of the planned storm water controls,
- Description of the preliminary QPP's for future operating conditions.

These requirements are addressed for the remaining operating period of the mine, the active closure period, and for passive closure.

9.2 Tailings Properties

Tailings material is mostly sand and silt size with traces of clay size particles. For 67 samples of tailings tested the percentage of sand size particles range from 25% to 84% and the fines contents range from 16% to 75%. The average specific gravity is 2.69 and the material is non-plastic.

The drained shear strength of the tailings applied for slope stability analysis is 32 degrees and the undrained residual shear strength ratio is taken as 0.05.

The Panel finds that the properties of the YDTI tailings is consistent with copper tailings at many other copper mines in the world.

The historical production rate at Montana Resources from 2004 to 2023 ranges from 15.6 to 18.4 million tons per year with an average of 17.2 million tons per year.

9.3 Proposed Facility Development

Tailings deposited in-situ density has been measured at 85 pcf and this value has been used to calculate storage capacity in the YDTI. Tailings consolidation was not included in calculating the storage capacity of the YDTI and the estimates are therefore conservative.

Table 2 lists the inputs used for the deposition model throughout the mine life.

Table 2

Inputs Used for Tailings Deposition Model

Criteria	Units	Value
Nominal Milling Rate (Yearly)	Mt/yr	18
Total Tonnage in Reserves[1]	Mt	570
Average Initial Settled Tailings Dry Density	pcf	85
Tailings Beach Slope - Above Water	%	0.5
Tailings Beach Slope - Below Water	%	4.0
Operating Pond Volume	ac-ft	15,000
Minimum Dry Freeboard	ft	5

Note(s):

1. Estimated reserves tonnage as of December 31, 2022 (MR, 2023a).

9.4 Performance Monitoring Requirements

There are a large number of monitoring instrumentation in the YDTI embankment and beach area. In the Life of Mine Design Report KP provides a summary of the instrumentation. Instrumentation includes:

- Nested vibrating wire piezometers installed at 60 locations
- Instrumented and manually surveyed inclinometers
- Elexon Geo4Sight instrumentation to measure pore pressure and angular deformation
- Global Navigation Satellite System for instrumented survey monuments as well as manually surveyed survey-monuments
- Geophysical casings to facilitate borehole nuclear magnetic resonance testing
- Two seismic switches installed to monitor seismic event driven ground movements
- Ultra-sonic seepage monitoring instruments to monitor seepage discharge at Seep 10 and the HSB area

The majority of the instrumentation is available to KP and MR via a remote monitoring system that was installed in 2017 and has been progressively expanded since then.

The Panel considers the YDTI very well instrumented when compared to other dams of this extent and height. Further instrumentation is planned for the 6560 extension to maintain the excellent monitoring record.

9.5 Water Quality

The chemistry of the YDTI pond is monitored twice per year and a continuous data base that extends back to 2002 is available to characterize temporal trends in solute concentration. These data along with the site-wide water balance model have been used to formulate and calibrate a water quality model for the process water pool to forecast the evolution of water quality for closure conditions from 2056 – 2123 (Schafer Limited LLC, 2025).

Although the tailings are potentially acid generating (PAG), laboratory test data (humidity cells) indicate the lag time to acidification of tailings exposed to oxygen is substantially longer than ten years. Two samples of tailings collected on the YDTI beach yielded a sulphide pyrite content of 1.3 to 1.4%, but the tailings were determined to be at the lower end of reactivity typically associated with pyrite. Therefore, although there are extensive exposed beach deposits, the current pond water chemistry is largely determined by the chemistry of the process water (pH of 11.7) with a pH of the pond in the range of 9 – 11.

Schafer Limited LLC (2025) has used the water quality model to predict solute concentrations in the YDTI water pool during the active and passive closure period. A broad suite of solutes has been considered. The model is based on conventional numerical methods that rely on tracking water inflow and outflows to the YDTI from a number of different sources, using representative solute concentrations unique to each inflow stream to estimate mass loading, mixing of water within the water pool, and accounting for equilibrium geochemical reactions between the solutes and solid phases to calculate a resulting water chemistry in the pond through time. Elevated solute concentrations in some water sources (e.g., WED) are included in the calculations. One of the key assumptions made for the closure scenario is that surface runoff from the cover will not contact PAG tailings and instead will have a similar water quality to natural runoff.

The principal conclusions of the water quality study are:

- Water quality in the YDTI remnant pond is predicted to gradually improve during the closure period as it transitions from a system dominated by tailings slurry discharge to one dominated by freshwater inflows. For example, the sulphate concentration is forecast to decline from approximately 2000 mg/l in 2024 to 500 mg/l in 2080.
- Copper and zinc concentrations are unlikely to exceed current values in the closure period.

The IRP considers a reasonable approach has been developed to derive estimates of pond water chemistry for the closure period. It is recognized that accurate forecasts are challenging given the complexity of all the processes that interact to influence future water quality. Standard practice in these situations is to use ongoing observations of water chemistry trends during the many years prior to facility closure to undertake routine updates of the water quality model and re-forecast pond chemistry changes as required.

9.6 Hydrodynamic Containment

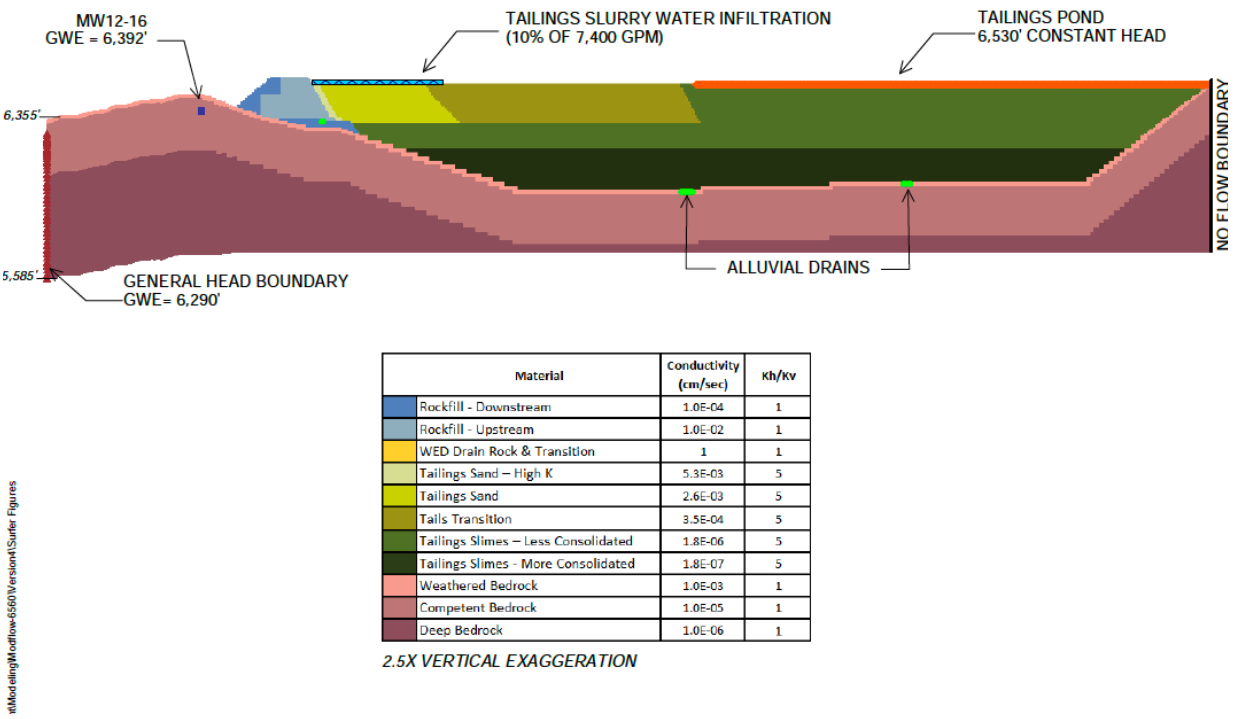
Appendix D in the Tailings and Water Management Report addresses the issue of hydrodynamic containment of water in the process water pond and tailings pore water. Hydrodynamic containment within the confines of the valley hosting the YDTI is a key project objective. Containment of groundwater impacted by the tailings is maintained by elevated terrain to the west, east and north of YDTI, with seepage interception to the south in the Horseshoe Bend area. For the 2017 Permit 10 application, the IRP accepted this condition could be maintained through 2033 provided the West Embankment Drain continues to function at intended.

Two factors are key in maintaining hydrodynamic containment along the West Ridge. First, the lowest elevation of the water table along the West Ridge groundwater divide is

approximately El 6400 ft. The TSF pond is currently at El. 6370 ft. There is sufficient natural groundwater recharge along the West Ridge to create a groundwater mound and hydraulic gradient directed toward the tailings facility that prevents groundwater originating within the YDTI from entering the adjacent valley to the west. Second, hydraulic head values in the vicinity of the WED are being held at the elevation of the drain (6350 m in the area adjacent to the potentiometric low along the ridge), confirming performance of the WED as intended, with the WED acting as a hydraulic sink that intercepts tailings contact water.

For the proposed El. 6560 embankment raise and LOM tailings deposition plan, the pond elevation in the YDTI will eventually rise above the topographic divide along the central section of West Ridge and substantially above the elevation of natural hydrodynamic containment at ~6400 ft. Hydrometrics has updated the two-dimensional hydrogeology model used previously in assessing hydrodynamic containment along the West Ridge for the 6450 ft raise (Hydrometrics, 2017). Model refinements include: (i) incorporation in the calibration of the model the observed response of the groundwater system following construction of the WED drain in 2019, and (ii) the increase in flow at the WED drain following addition of the 12" spigot deposition system in early 2022. This additional information enhances the reliability in the evaluation of hydrodynamic containment for the proposed 6560 ft. TSF geometry. The model also provides insight to the current proportion of water discharging into the WED that originates from the tailings pond, in comparison to natural groundwater recharge in the area.

Figure 7 shows the revised two-dimensional model domain, hydrostratigraphic units, and assigned boundary conditions for active deposition with the YDTI tailings facility embankments at El. 6450 ft. and a pond elevation of 6530 ft. The WED drain within the west embankment is assumed to be fully functional.



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

Figure 7. Two-dimensional model of groundwater flow on western side of YDTI (by Hydrometrics), at completion of 6560 raise

The IRP considers the updated 2D model is fit for purpose to examine the potential impact on hydrodynamic containment along West Ridge following raising the TSF by 110 ft, with an ultimate pond elevation of 6530 ft. Key elements incorporated in the model are:

- The local head control beneath the West Embankment exerted by the WED.
- The contrast in hydraulic conductivity built into the West Embankment (Zones U and D1), which promotes downward drainage of tailings contact water toward the WED.
- An extensive tailings beach in front of the West Embankment, with hydraulic conductivity varying with distance from the spigot discharge point and with depth within the tailings deposit. The finer-grained tailings beach, more distance from the embankment, serves to reduce the flow of open pond water toward the West Embankment.
- Higher recharge rates than on natural ground occur on the tailings beach due to the slurry water discharged with the tailings.
- The head boundary condition in the valley to the west is set at El. 6290 ft (based on local well data), which is 60 ft below the invert elevation of the WED drain, allowing for the possibility of westward migration of tailings water if that were a condition that

could develop in the model. The adoption of this boundary condition is important in not biasing the model outcome.

The simulations and sensitivity cases Indicate that with the WED functional, hydrodynamic containment along the West Ridge can be maintained throughout the operating life of the YDTI to an embankment height of 6560 ft and pond elevation of 6530 ft (Figure 8). The IRP considers the model analysis provides a sound basis to support this conclusion.

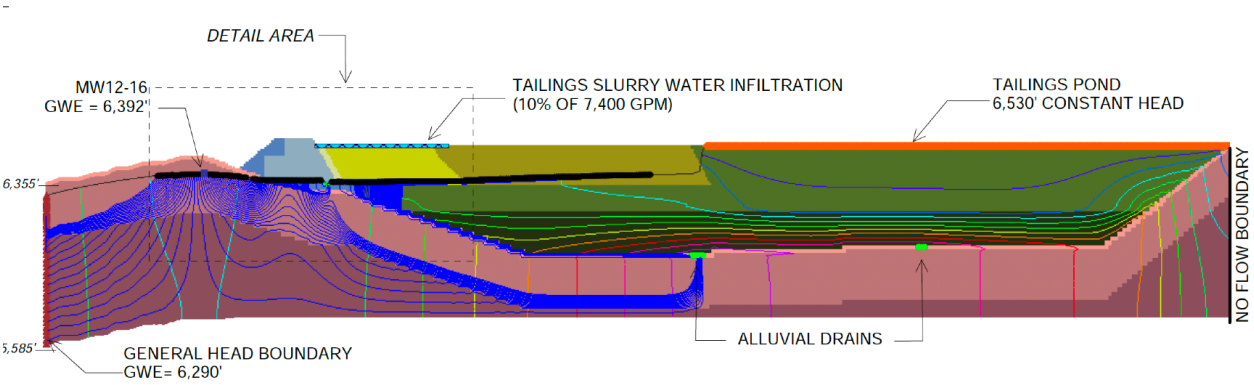


Figure 8. Projected hydraulic head distribution and groundwater path lines for 6560 scenario (from Hydrometrics, 2024)

Hydrometrics has considered the limitations inherent in using a two-dimensional model to assess hydrodynamic containment along the West Ridge, within the context of the three-dimensional geometry of the groundwater flow system beneath the YDTI. The scope of Hydrometrics interpretations is focused on examining if an embankment raise to El 6560 ft might challenge hydrodynamic containment in the region of the potentiometric low along the West Ridge, with the WED in place. Beyond the zone of influence of the WED on water flow through the tailings deposit, water is expected to infiltrate slowly downward through the tailings toward the underlying permeable alluvial deposits in the historic drainage channels and then flow southward toward discharge sites in the Horseshoe Bend area. The three-dimensional component of the flow is represented through the alluvial drains in the old valley floor.

Fundamental to the utility of this simplified representation of the flow system is the recognition that: (i) the 6700 ft long WED controls the hydraulic response to a rising pond level in the region of West Ridge, and (ii) there is groundwater recharge on the West Ridge equal to about 15% of annual precipitation. A sensitivity analysis on the assigned value of the groundwater recharge rate along West Ridge indicated that a 20% reduction in the natural recharge rate (from a calibrated value of 15% of annual precipitation to 12%) would

lead to a decline in the water table elevation at its low point of about 7 ft (from 6392 ft to 6385 ft), with a hydraulic gradient from the western ridge crest toward the WED being maintained.

The simulations and sensitivity cases incorporated in the Hydrometrics report indicate that with the WED functional, hydrodynamic containment along the West Ridge can be maintained throughout the operating life of the YDTI to an embankment height of 6560 ft and pond elevation of 6530 ft. As noted in the report, ongoing monitoring of water levels in the many piezometers distributed along the West Ridge as the pond level in the TSF rises year after year will provide field data to routinely check the validity of this conclusion, with adequate time available to implement mitigation measures if required.

Hydrometrics provided a summary report on the augmented recharge tests they carried out in 2022 at a number of well locations along the West Ridge (November 2024). The Panel considers the data supports an interpretation that, at a conceptual level, it would be feasible to implement a temporary, augmented recharge system to enhance groundwater mounding in the West Ridge, should a circumstance ever arise where hydrodynamic containment was being challenged.

10. Construction Management Plan

A construction management plan has been prepared by KP that also includes the specifications for construction. The approach being proposed for QA/QC is similar to that used over the last number of years for the construction of the YDTI embankments and other components. This approach has shown that high quality construction can be achieved using the mine fleet for delivery and compaction of rockfill. The Panel previously observed the procedures and fully accepted these in the past. The proposed approach is acceptable to the Panel.

11. Dam Breach Assessment

A hypothetical dam breach assessment has been completed for the configuration of the YDTI at design capacity, an enlarged Continental Pit in its final configuration, and the North and HsB RDS facilities at design capacity. A breach of the North South embankment, initiated by dam failure during the PMF event was assumed to define the outflow hydrograph of tailings and water. The movement of the flood wave, flood routing, and the extent of the inundation zone was then modeled. The IRP notes that there has been considerable advancement in the state of practice in dam breach assessment and inundation zone mapping methodologies since the Amendment 6450 Design Report was submitted in 2017.

The assumed location of the breach and the projected inundation zone are shown in Figure 9 for the base case parameter set. KP has long considered a potential breach of the North South embankment to be a more credible failure mode than a failure of the East-West or West embankments and rock buttresses, although this view is distinct from the likelihood of a breach event occurring. The IRP considers the chosen breach location and specified breach mechanism are sufficient to inform Montana Resources and KP on the potential consequences of a YDTI dam breach when the TSF reaches full capacity and to aid in response planning. A sunny day failure of the YDTI would be expected to lead to a much smaller tailings inundation zone, given the projected location of the pond well away from any embankment when the TSF reaches capacity, and the consequent substantially lower mobility of the tailings mass. For the purpose of impact assessment from a hypothetical breach, it is considered sufficient by the IRP to focus on the flood-induced scenario for the 6560 permit amendment.

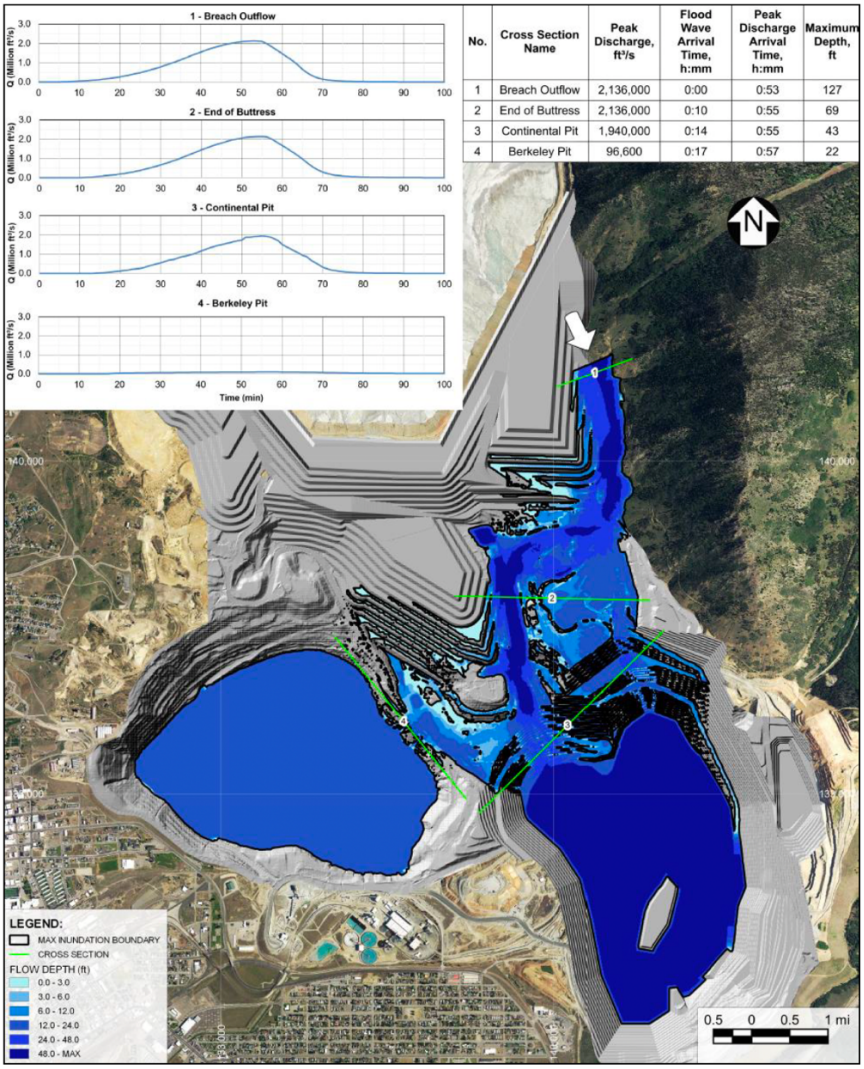
KP adopted a number of conservative assumptions in deriving the inundation maps:

- The YDTI was assumed to hold 38,000 acre-ft (43 Mm^3) of free water at the initiation of the dam breach (the maximum operating pond volume plus the seasonal high volume increase, plus a PMF volume of 20,000 acre-ft).
- The Continental and Berkeley Pits were assumed to contain the full volume of runoff from the PMF event at the time the dam breach is initiated.
- The breach leads to erosion through the full embankment height to the elevation of natural ground at the breach location (~ El. 6300 ft).
- Tailings are both eroded by the water flowing out of the impoundment and part of the tailings deposit liquefies and flows as the embankment is down cut.
- The mobilized mixture of water and tailings was assigned a solids concentration of 30% by volume and a relatively high flowability (given by its yield stress and viscosity).
- The total projected outflow volume (tailings plus water) could be as much as 100 Mm^3.
- The mobilized tailings mass was modeled as a non-Newtonian fluid to estimate downstream mobility.

KP used state of practice guidelines and procedures to model a breach of the North South Embankment and the subsequent mobilization of the tailings.

As Figure 9 shows, a sufficient storage volume is present in the two open pits to contain all the mobilized tailings and pond water released in this simulation, even when the pits hold the projected surface water runoff from the surrounding area due to the PMF event. The tailings and pond water remain within the property boundaries. No flow paths are

projected to develop where tailings bypass the two open pits. Most of the tailings and pond water that is mobilized ends up in the Continental Pit. The corridor between the YDTI and Ramparts Mountain, as well as the area to the immediate south have peak flows that would lead to loss of life if any individuals in the area were not evacuated prior to or in the early minutes after the start of the breach. This information will need to be incorporated in the Emergency Response Plan that would be relevant to the time period represented by this breach scenario.



No.	Cross Section Name	Peak Discharge, ft³/s	Flood Wave Arrival Time, h:mm	Peak Discharge Arrival Time, h:mm	Maximum Depth, ft
1	Breach Outflow	2,136,000	0:00	0:53	127
2	End of Buttress	2,136,000	0:10	0:55	69
3	Continental Pit	1,940,000	0:14	0:55	43
4	Berkeley Pit	96,600	0:17	0:57	22

Figure 9. Projected inundation zone for a hypothetical breach of the North South Embankment, occurring as the El 6560 ft raise reaches its design capacity

The IRP considers that the dam breach assessment and inundation mapping fulfill the requirements for the Design Report.

12. Failure Modes and Effects Assessment

The Failure Modes and Effects Assessment (FMEA) conducted by KP identifies and evaluates potential failure risks associated with the expansion. The study did not assess the probability of failure but instead analyzes possible failure modes and their consequences to support risk management and design improvements. The failure modes assessed during the FMEA were generally based on the potential failure modes (PFMs) previously identified, developed, and evaluated during the 2022 Risk Assessment. The PFMs included the potential for occurrence of earthquakes, severe flooding, fill and foundation material degradation, on-going construction and operations activities, and other geologic and environmental hazards. Recommended safety enhancements from the 2022 Risk Assessment are being implemented on site and will continue during ongoing mine operations.

The main failure modes evaluated were:

- Flood-related failures: Instability, overtopping, internal erosion, and uncontrolled seepage.
- Seismic events: Instability and embankment deformation due to earthquakes.
- Construction-related failures: Instability and deformations during ongoing construction.
- Material degradation: Weathering and induced strain weakening of the embankment.
- Operational upsets: Pipeline failures and unexpected structural impacts.
- Geological and environmental hazards: Landslides, droughts, fire, wind-related issues.

Risks were assessed using a likelihood-consequence matrix and were assigned during a collaborative session involving KP staff. The resulting failure modes relative to the East-West and North-South Embankment generally remained the same or improved between the Prior to Permit and Life of Mine arrangements. Select PFMs along the West Embankment increased in likelihood due to increasing embankment height above the West Ridge, potential impacts on the operability of the WED, and the potential for seepage flows to impact the groundwater system along the West Ridge. The construction of the extensive downstream RDS will provide improved resistance to limit potential for instability

and corresponding reductions in likelihood for instability related PFMs around the YDTI. The relocation of the maintenance yard and truck maintenance workshop contemplated in the design, and identified in the 2022 Risk Assessment, is a key mitigation that will further reduce the potential consequences associated with large-scale failure modes due to the relocation of the permanent workers out of the HsB area and buttressing of the embankment. The construction of the closure spillway will further reduce the likelihood of several flood-induced PFMs for the long-term following closure.

Most failure modes had a low to negligible likelihood but moderate to catastrophic consequences. Design improvements (e.g., reinforcement and drainage systems) are expected to reduce some risks.

Mitigation measures evaluated included:

- For flooding risks: Expansion of spillways, embankment reinforcements, and flood containment within adjacent open pits.
- For seismic risks: Rock disposal sites (RDS) and embankment stabilization efforts reduce failure likelihood.
- For construction risks: Phased embankment raising and controlled material placement.
- For operational risks: Monitoring and contingency plans for tailings pipeline failures and seepage control.

The main areas of uncertainty in the assessment are:

Severe Flooding and Overtopping:

- Extreme precipitation events could challenge current freeboard estimates but are considered unlikely.
- Future climate variability may introduce unknown flood risks.

Seismic Event Modeling:

- Earthquake-induced deformations remain somewhat uncertain, particularly for the West Embankment.
- Liquefaction potential and strain accumulation in foundation materials require further ongoing assessment.

Long-Term Stability of Material Degradation:

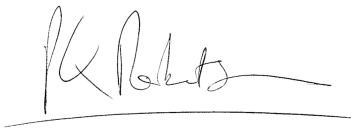
- Tailings consolidation and acidic drainage effects could alter embankment stability over time.
- The long-term effectiveness of mitigation measures like the West Embankment Drain (WED) is not fully predictable.

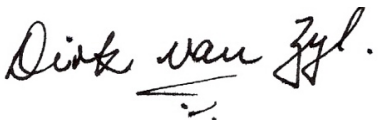
The FMEA provides a structured assessment of potential failure modes for the YDTI expansion, supporting regulatory compliance and design improvements. While most risks are mitigated through engineering controls, uncertainties remain in extreme weather events, seismic impacts, and long-term material behavior. Continuous monitoring and adaptive management will be crucial in ensuring the facility's safety throughout its operational life and in the post-closure period.

The IRP considers the Failure Modes and Effects Assessment (FMEA) conducted by KP meets its intended purpose and the content is generally consistent with standard industry practice.

13. Summary Statement

The IRP has reviewed the YDTI 6560 Amendment Design Document Submission and considers that it meets all requirements of the Montana Code Annotated 82-4-376. The work undertaken to support the embankment raise is comprehensive and consistent with the expected standard of practice for an embankment raise at an existing tailings storage facility. No changes to the Design Report are recommended.





Peter Robertson Leslie Smith Dirk van Zyl