MONTANA RESOURCES, LLP
YANKEE DOODLE TAILINGS IMPOUNDMENT

DESIGN BASIS REPORT

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MONTANA RESOURCES, LLP
YANKEE DOODLE TAILINGS IMPOUNDMENT

DESIGN BASIS REPORT
VA101-126/12-1

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EXECUTIVE SUMMARY

Montana Resources, LLP is in the process of preparing a permit amendment application for continued use of the Yankee Doodle Tailings Impoundment (YDTI) to provide for continued mining beyond 2020. The proposed amendment considers the YDTI with embankments constructed to a crest elevation of 6,450 ft and commencing operation of the West Embankment Drain (WED). The amendment will provide for approximately 12 years of additional mine life. ▲R2

Knight Piésold Ltd. has prepared this Design Basis Report in support of the design and permit application to outline the basic criteria for the ongoing design, construction and operation of the impoundment. This report includes the overall objectives of the design and summarizes the guidelines and legislation, design philosophy, specific design criteria and other pertinent information for continued use of the YDTI. The principle design objectives are to:

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

The YDTI was originally constructed in 1963 and has been continuously constructed to EL. 6,400 ft using rockfill from the Berkeley Pit (until 1982) and from the Continental Pit (beginning in 1986). The YDTI comprises a valley-fill style impoundment created by a continuous rockfill embankment that for descriptive purposes is divided into three embankment sections (North-South, East-West, and West). The embankment design takes into account the following requirements:

- Staged development of the facility over the life of the project.
- Construction material provided by mining the Continental Pit to the maximum practical extent, with the balance provided from external borrow areas, if required to meet engineering objectives.
- Constructed using similar techniques, equipment and construction methodologies that have been adopted for past raises.
- The inclusion of monitoring features to confirm performance goals are achieved and design criteria and assumptions are met.

The YDTI relies on storm storage capacity to manage the Inflow Design Flood (IDF) during operations. The design flood will be the Probable Maximum Flood (PMF). The intent of adopting the PMF as the IDF for determining storm storage freeboard is to provide a design storm volume that is so great that it will not be exceeded, but not so great as to require excessive storage capacity. The selected design storm event is a combination of the 24 hour Probable Maximum Precipitation (PMP) combined with complete melt of the 1 in 100 year snowpack, and assuming full failure of the upstream Moulton Reservoirs. The PMF runoff volume was determined to be 19,000 acre-feet.

A site specific probabilistic and deterministic seismic hazard analysis was conducted as part of the YDTI engineering design work to demonstrate that the YDTI meets state-of-practice engineering design standards. A Magnitude of 6.5 was selected for the design earthquake. The peak ground acceleration (PGA) of the design earthquake was selected as follows:

- Median maximum credible earthquake (MCE) with a PGA of 0.45g for maximum normal operating conditions.
- 84th Percentile MCE with a PGA of 0.84g for long-term closure conditions.

This report provides a portion of the information supporting the continued use of the YDTI. The information presented in this report should be considered along with the additional information provided in subsequent reports. ▲R2

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ABBREVIATIONS

3D	three dimensional
ACC	Anaconda Copper Company
APEGBC	Association of Professional Engineers and Geoscientists of British Columbia
ARM	Administrative Rules of Montana
CDA	Canadian Dam Association
DEQ	Department of Environmental Quality
DSHA	Deterministic Seismic Hazard Assessment
EL	elevation
EPA	Environmental Protection Agency
FEMA	Federal Emergency Management Agency
HDPE	High Density Polyethylene
HsB	Horseshoe Bend
ICOLD	International Commission on Large Dams
IPCC	Intergovernmental Panel on Climate Change
IRP	Independent Review Panel
KP	Knight Piésold Ltd.
MCA	Montana Code Annotated
MCE	Maximum Credible Earthquake
MR	Montana Resources, LLP
MSHA	Mine Safety and Health Administration
N	North
NW	Northwest
NEHRP	National Earthquake Hazard Reduction Program
NID	National Inventory of Dams
NOAA	National Oceanic and Atmospheric Administration
PET	potential evapotranspiration
PGA	Peak Ground Acceleration
PMF	Probable Maximum Flood
PMP	Probable Maximum Precipitation
PSA	Peak Spectral Acceleration
PSHA	Probabilistic Seismic Hazard Assessment
RWS	Reclaim Water System
ROD	Record of Decision
SOL	setting out line
SWE	snow water equivalent
TAC	The Anaconda Company
TDS	Tailings Delivery System
UHS	uniform hazard spectra
USACE	United States Army Corps of Engineers
USGS	United States Geological Survey
W	West
WED	West Embankment Drain
WRCC	Western Regional Climate Center
WTP	Water Treatment Plant
YDTI	Yankee Doodle Tailings Impoundment

1 – INTRODUCTION

1.1 MINE LOCATION

Montana Resources, LLP (MR) operates an open pit copper and molybdenum mine located within the northeastern part of Butte, Montana. The operation includes a mill throughput of roughly 50,000 short tons per day and a small-scale leach operation.

The project is located in Butte, Silver Bow County, in Sections 5 and 6 Township 3 North (T3N), Range 7 West (R7W) and Sections 31 and 32 Township 4 North (T4N), Range 7 West (R7W) of the Montana Principal Meridian. The site 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 project location is shown on Figure 1.1.

1.2 PURPOSE AND SCOPE

This Design Basis Report outlines the basic criteria for the ongoing design, construction and operation of the Yankee Doodle Tailings Impoundment (YDTI) at the MR mine in Butte, Montana for the Design Document. The mine has the relevant operating permits for continued mining in the Continental Pit, mine rock disposal areas and ancillary facilities with the exception of the YDTI. This report, prepared by Knight Piésold Ltd. (KP), presents the overall objectives of the YDTI and summarizes the guidelines and legislation, design philosophy, specific design criteria and other pertinent information for the raising of the YDTI embankments to a crest elevation (EL.) of EL. 6,450 ft. ▲R2

All components related to the ongoing design, construction and operation of the YDTI will be prepared in accordance with the most recent and applicable design codes and regulations, where they exist. Other industry accepted guidelines and recommendations will be adopted, as appropriate.

1.3 INDEPENDENT REVIEW PANEL (IRP)

An IRP for the YDTI design has been selected. The IRP consists of three independent review engineers or specialists, as stipulated by Montana Code Annotated (MCA) Title 82 Chapter 4 Part 3 Section 76. The members of the MR IRP are as follows:

- Dr. Dirk Van Zyl.
- Dr. Leslie Smith.
- Mr. Jim Swaisgood.

1.4 ENGINEER OF RECORD

The requirement for an Engineer of Record (EOR) for the YDTI is described in MCA 82-4-375. The EOR is required to be a Professional Engineer licensed in the State of Montana. The EOR for the YDTI is currently Mr. Ken Brouwer, P.E., of Knight Piésold Ltd.

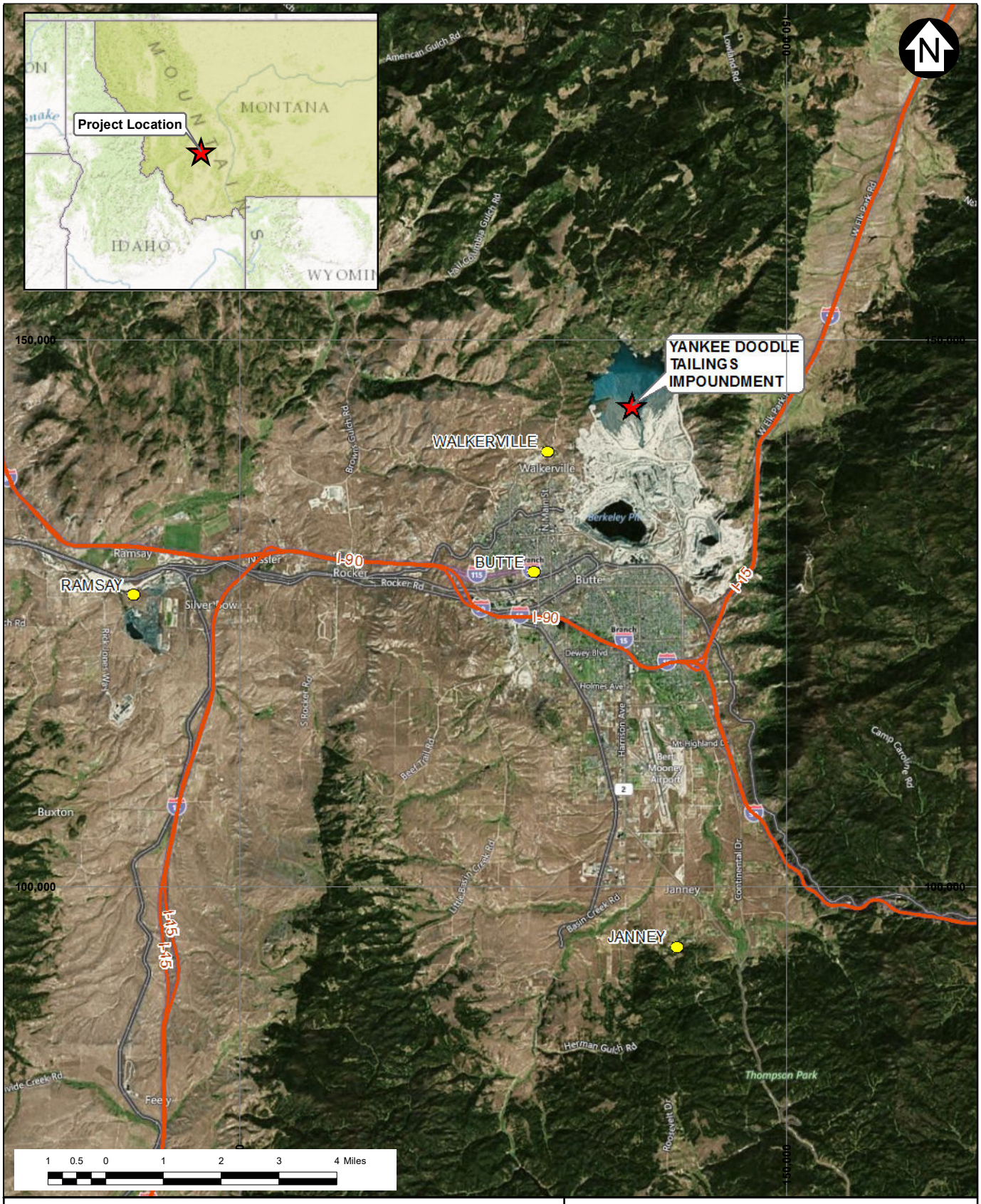
The EOR is responsible for the following:

- Review the design and other documents pertaining to the tailings storage facility.
- Certify and seal designs or other documents pertaining to the tailings storage facility submitted to the Montana Department of Environmental Quality (DEQ).

- Complete an annual inspection of the tailings storage facility.
- Notify the operator when credible evidence indicates the tailings storage facility is not performing as intended.
- Immediately notify the operator and the DEQ when credible evidence indicates that the tailings storage facility presents an imminent threat or a high potential for imminent threat to human health or the environment.

1.5 COORDINATE SYSTEM

The design of the YDTI references the site coordinate system known as the 'Anaconda Mine Grid' established by The Anaconda Company (TAC) in 1957. The Anaconda Mine Grid is based on the 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 GPS Site Coordinate System is based on the 'Anaconda Mine Grid' and utilizes International Feet.



LEGEND

- PROJECT LOCATION
- CITY
- ROAD

NOTES:

1. BASE MAP: (C) MICROSOFT BING MAPS.
2. COORDINATE GRID IS IN FEET. COORDINATE SYSTEM: MONTANA MINE GRID.
3. THIS FIGURE IS PRODUCED AT A NOMINAL SCALE OF 1:150,000 FOR 8.5x11 (LETTER) PAPER. ACTUAL SCALE MAY DIFFER ACCORDING TO CHANGES IN PRINTER SETTINGS OR PRINTED PAPER SIZE.

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED
0	09SEP'16	ISSUED WITH REPORT	KK	KK	DDF

MONTANA RESOURCES, LLP

YANKEE DOODLE TAILINGS IMPOUNDMENT

PROJECT LOCATION

Knight Piésold CONSULTING

P/A NO. VA101-126/12 | REF NO. 1

FIGURE 1.1 | REV 0

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1.6 GOVERNING STATE LEGISLATION AND REGULATIONS

1.6.1 Montana Code Annotated (MCA)

The legislation and regulations that govern the design and operation of tailings storage facilities in the State of Montana are summarized below. These requirements are collectively referred to as the Montana Regulations. ▲R2

MCA is a codification and compilation of existing Montana state general and permanent law. MCA is arranged topically and is continuously rearranged to maintain an orderly and logical arrangement. The laws governing tailings storage facility design, operation and reclamation are contained within Sections of Title 82 Chapter 4 Part 3 (MCA, 2015):

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

The legislative intent (MCA 82-4-301) is that tailings storage facilities are designed, operated, monitored, and closed in a manner that:

- Meets state-of-practice engineering design standards.
- Uses applicable, appropriate, and current technologies and techniques as are practicable given site-specific conditions and concerns.
- Provides protection of human health and the environment.

MCA 82-4-376 describes the design document requirements for a tailings storage facility and is the governing legislation for preparation of a design. ▲R2

The jurisdiction for regulation of tailings impoundments resides with the Montana Department of Environmental Quality (DEQ). Dams for tailings impoundments and water reservoirs subject to permits issued by DEQ are specifically exempt from provisions of the Montana Dam Safety Act (MCA 85-15-107), and therefore are not subject to dam hazard potential classification within the state (MCA 85-15-209). Dam hazard potential classification is not required because the governing legislation for new tailings storage facilities requires (unless approved otherwise by the IRP) that the design be sufficient to manage:

- The Probable Maximum Flood (PMF).
- The Maximum Credible Earthquake (MCE) or 1 in 10,000 year return period event, whichever is larger.

1.6.2 Administrative Rules of Montana (ARM)

The Administrative Rules of Montana (ARM) are department rules and regulations that implement, interpret or set law or policy in the State of Montana. The laws codified in MCA provide that departments charged with the responsibility of administering each part may from time to time promulgate rules in order to implement its terms and conditions. The ARM are set by the state agencies to implement the laws passed by Legislation.

Presently, the most applicable set of rules set by DEQ related to the project are ARM Chapter 17.24 Subchapter 1. These are the Rules and Regulations Governing the Hard Rock Mining Reclamation Act (ARM, 2015). The rules are subject to change and reorganization, and this chapter should be reviewed periodically to ensure compliance.

1.7 FEDERAL REGULATORY ENVIRONMENT

1.7.1 United States Army Corps of Engineers (USACE)

Federal regulatory involvement was initiated through the National Dam Inspection Act (Public Law 92-367) dated August 8, 1972, which directed the USACE to conduct inspections of non-federal dams and alert owners and the state to conditions that may constitute a danger to human life or property. The USACE inspections led to the development of a National Inventory of Dams (NID).

A delegation from USACE inspected the Yankee Doodle Tailings Dam on May 11, 1978 and issued their Phase 1 Inspection Report in February of 1980 (USACE, 1980). The operator of the YDTI at the time of the inspection was the Anaconda Copper Company (ACC). The inspection classified the impoundment as having a high downstream hazard potential due to the potential for loss of lives, high property damage, and severe impacts to the mining operation in the event of dam failure. The report recognized that there was no outlet capacity from the impoundment during a flood and recommended that ACC:

- Immediately develop, implement, and test an emergency warning plan.
- Conduct an engineering study to determine the PMF runoff volume, and modify the YDTI storage capacity to safely handle the PMF runoff.
- Conduct a thorough investigation and study of the embankment foundation conditions and install piezometers in the embankment and foundation to measure pore pressure conditions.
- Conduct and maintain on file seismic stability analyses of the embankments and foundations.

These recommendations were enacted in 1981 by ACC through a geotechnical and hydrologic study completed by International Engineering Company, Inc. (IECO, 1981). MR has periodically updated these studies since purchase of the property by commissioning analyses with a series of engineering consulting firms and completing a substantial amount of work in house with their own Engineering and Geology Department (MR, 1999). The engineering consulting firms that were engaged on the project since the USACE inspection included:

- Goldberg Geotechnical Consulting (Goldberg, 1990).
- Harding Lawson Associates (HLA, 1993).
- Knight Piésold Ltd. (2012 through present).

A series of re-authorizations have maintained the NID program. The most recent of these was reauthorized as part of the Water Resources Reform and Development Act of 2014. The NID includes the Yankee Doodle Tailings Dam (NID ID# MT01425) and indicates that it is a state regulated dam that falls under the jurisdiction of the DEQ (USACE, 2015). The USACE has not inspected the YDTI since the initial Phase 1 Inspection, and has not stated a regulatory interest since the initial inspection.

1.7.2 Mine Safety and Health Administration (MSHA)

MSHA is responsible for administering the provisions of the Federal Mine Safety and Health Act of 1977 (Mine Act) and enforcing compliance with mandatory safety and health standards. The Mine Act requires that the MSHA inspect surface mines at least twice per year.

1.7.3 Federal Emergency Management Agency (FEMA)

The Federal Emergency Management Agency (FEMA) of the U.S. Department of Homeland Security is the governing regulatory body responsible for preparing for, protecting against, responding to, recovering from and mitigating all hazards in the United States. FEMA has published a series of federal guidelines for dam safety. The guidelines provide recommendations for management practice to improve overall dam safety but are not intended as standards for technologies or design and are not mandated.

The Federal Guidelines for Dam Safety Risk Management (FEMA, 2015) provide recommendations for failure modes identification, risk analysis, risk assessment and risk management that will be considered for the YDTI.

1.8 INTERNATIONAL GUIDELINES

1.8.1 International Commission on Large Dams (ICOLD)

The International Commission on Large Dams (ICOLD) is a non-governing international professional organization dedicated to setting standards and guidelines to ensure that dams are built and operated safely, efficiently, economically, and in a manner that is environmentally sustainable and socially equitable.

ICOLD is the leading international resource in ensuring that dams are built without detrimental effects on the environment. ICOLD publishes recommendations and technical bulletins prepared by professional engineers, geologists and scientists to improve technical analysis and current design technology.

Recommendations provided by ICOLD for dam design parameters including factors of safety, design floods and seismic events, seepage control and runoff, risk analysis and performance monitoring are a source of guidance of good international engineering practice that will be considered.

1.8.2 Canadian Dam Association (CDA)

The Canadian Dam Association (CDA) is a non-regulatory organization of dam owners, operators, regulators and consultants. The CDA provides a forum for advancing the knowledge and practice related to dam safety, public safety and protection of the environment. The CDA has published Dam Safety Guidelines (CDA, 2013) that outline principles that are applicable to dams of all types, including mining dams.

The CDA published a complementary technical bulletin in 2014 entitled Application of Dam Safety Guidelines to Mining Dams (CDA, 2014). The bulletin was prepared by the CDA Mining Dams Committee, which has members representing a broad range of the mining community in Canada. Additional guidance (CDA, 2015) was provided subsequent to the initial release of the Mining Dams Technical Bulletin, and provides revisions to guidance related to geotechnical criteria. The focus was on the Canadian context, but the principles are generally applicable to mining dams in any jurisdiction. The CDA guidelines are considered as another source of international guidance of good engineering practice. It is understood that the CDA guidelines are currently under review and it will be prudent to review these updated guidelines when they become available. ▲R2

1.8.3 British Columbia Mine Code and Guidance Document ▲R2

A revision to the Health Safety and Reclamation Code for Mines in British Columbia (BC Mine Code) was published in July 2016. The revision of the BC Mine Code includes reference to a standalone Health Safety and Reclamation Code (HSRC) Guidance Document that provides additional guidance and context to owners, engineers, regulators, consultants and auditors on applying the BC Mine Code to tailings facilities. These documents are collectively referred to as the BC Regulations below. The BC Regulations apply regionally within BC, and also point to the CDA guidelines as a source of guidance that is updated regularly and generally reflects the standard of practice of the day. The CDA guidelines tend to be better recognized and adopted more globally.

The BC Regulations are generally similar to the Montana Regulations. The following is a list of some of the similarities between the requirements of the Montana and BC Regulations:

- Characterization of the geotechnical and hydrological conditions, and seismic hazard of a site.
- A minimum static factor of safety of 1.5 for normal operating conditions. Variances are allowed in both jurisdictions with appropriate justification and approval.
- An analysis of various potential failure modes and loading conditions.
- An assessment of alternatives and risks.
- An instrumentation and monitoring plan with a list of quantitative performance parameters.
- Periodic independent safety reviews.

Additional items can also be considered when comparing the Montana and BC Regulations including the following:

- The Montana Regulations do not require consequence classification to determine design flood and seismic design criteria, but rather the Montana Regulations adopt the most conservative approach at the outset for the design of tailings dams. Thus, the Montana criteria are more conservative or equivalent to the BC criteria.
- The BC Regulations define a maximum steepness of the downstream slope angle for tailings embankments as 2 horizontal to 1 vertical. The Montana Regulations do not identify a specific geometric constraint for dam slopes. The design basis for the YDTI embankment slopes is consistent with this BC requirement.
- The Montana Regulations identify an acceptable post-earthquake factor of safety and describe tolerable earthquake deformation as the prevention of loss of containment. The BC Regulations recognize and rely on the CDA guidelines. The Montana Regulations are generally consistent with the CDA guidelines (CDA, 2014 and 2015) for post-earthquake factors of safety and seismic deformation, and the BC Regulations do not specifically describe these conditions.

1.9 UNITS AND CONVERSIONS

1.9.1 Standard Units for the Project

The standard units for the design of the project will be the following U.S. Customary Units:

- Length: feet (ft).
- Diameter: inches (in).
- Area: acres.
- Volume: acre-feet (acre-ft).
- Fluid volume: million US gallons (Mgal).

- Mass: short tons (tons).
- Density: pounds per cubic foot (pcf).
- Pressure: pound-force per square foot (psf).
- Temperature: degrees Fahrenheit (°F).
- Power: horsepower (hp).
- Flow rate: gallons per minute (gpm).

1.9.2 Conversions to Other US Customary Units

Other U.S. Customary Units will also be used for preparation of the design. These units and conversion factors from the standard units (unless otherwise indicated) will be the following:

- Length: 1 ft = 12 inches (in).
- Length: 1 yard (yd.) = 3 ft.
- Length: 1 mile (mi) = 5,280 ft.
- Area: 1 acre = 43,560 square feet (sq. ft).
- Volume: 1 acre-ft = 43,560 cubic feet (ft^3).
- Volume: 1 acre-ft = 1,613 cubic yards (yd^3).
- Fluid volume: 1 Mgal = 1,000,000 gallons (gal).
- Mass: 1 ton = 2,000 pounds (lbs).
- Density: 1 short ton per cubic yard ($tons/yd^3$) = 74 pcf.
- Pressure: 1 pound-force per square inch (psi) = 144 psf.
- Pressure: 1 kilopound per square inch (ksi) = 1,000 psi.

1.9.3 Conversions to International System of Units (SI)

Typical conversion factors to the International System of Units (SI) from the standard units for the project are the following:

- Length: 1 ft = 0.305 meters (m).
- Length: 1 yd. = 0.914 m.
- Length: 1 mi = 1.61 kilometers (km).
- Diameter: 1 in = 25.4 millimeters (mm).
- Area: 1 acre = 4,047 square meters (m^2).
- Area: 1 acre = 0.405 hectare (ha).
- Volume: 1 acre-ft = 1,233 cubic meters (m^3).
- Volume: 1 yd^3 = 0.765 m^3.
- Volume: 1 ft^3 = 0.028 m^3.
- Fluid volume: 1 gal = 3.785 litres (L).
- Fluid volume: 1 Mgal = 3,785 m^3.
- Mass: 1 ton = 907 kilograms (kg).
- Mass: 1 ton = 0.907 tonnes (t).
- Density: 1 pcf = 16 kilograms per cubic meter (kg/m^3).
- Density: 1 pcf = 0.016 tonnes per cubic meter (t/m^3).
- Density: 1 $tons/yd^3$ = 1.19 tonnes per cubic meter (t/m^3).
- Pressure: 1 psf = 0.048 kilopascal (kPa).
- Pressure: 1 psi = 6.89 kilopascal (kPa).

- Power: 1 hp = 746 watts (W).
- Flow rate: 1 gpm = 0.227 cubic meters per hour (m^3/hr).
- Flow rate: 1 gpm = 0.063 litres per second (L/s).

2 – DESCRIPTION OF MINE FACILITIES

2.1 YANKEE DOODLE TAILINGS IMPOUNDMENT (YDTI)

The YDTI is the tailings storage facility for the mine. The YDTI was originally constructed in 1963 using rockfill from the Berkeley Pit and has been continuously constructed to EL. 6,400 ft using rockfill from the Berkeley Pit (until 1982) and from the Continental Pit (beginning in 1986). The YDTI comprises a valley-fill style impoundment created by a continuous rockfill embankment that for descriptive purposes is divided into three rockfill embankments according to the general geometry of each limb of the continuous embankment. These embankments are the:

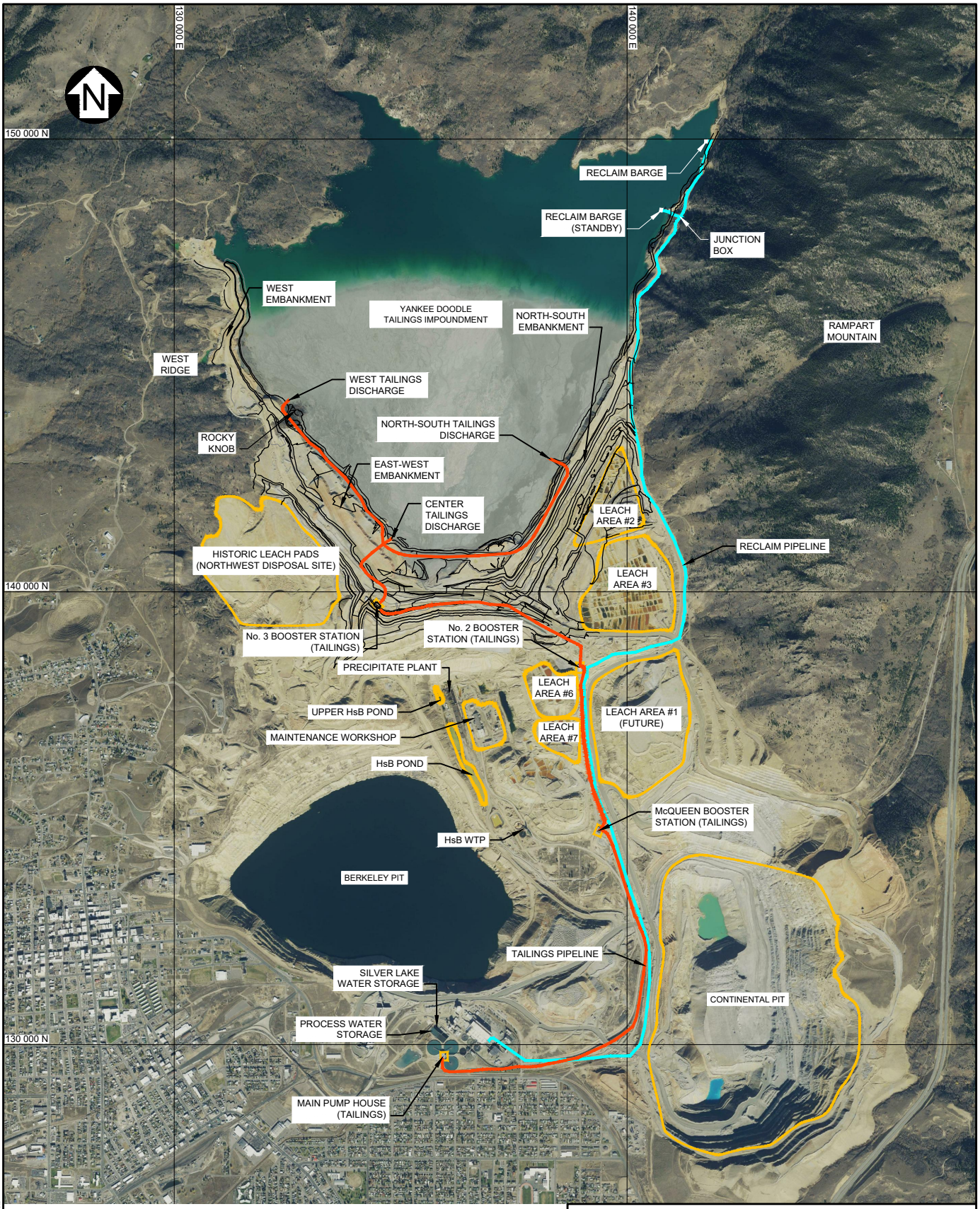
- North-South Embankment - The North-South Embankment forms the eastern to southeastern limb of the YDTI and runs approximately north to south in orientation. The North-South Embankment abuts onto the base of Rampart Mountain, forming the eastern battery limit of the Montana Resources mine site.
- East-West Embankment - The East-West Embankment forms the southwestern limb of the YDTI and runs approximately east to west in orientation. The East-West Embankment is constructed upstream of Horseshoe Bend and Berkeley Pit.
- West Embankment - The West Embankment forms the western limb of the YDTI and runs approximately north to south in orientation. The West Embankment is constructed into the side of the West Ridge and forms the western battery limit of the facility.

2.1.1 Battery Limits

The scope of this Design Basis Report is the YDTI, including the North-South Embankment, East-West Embankment and West Embankment. Other mine facilities are relevant to the YDTI and have an impact on the design of the YDTI, but are not the subject of the present design unless otherwise noted:

- Horseshoe Bend water collection pond (HsB Pond).
- Tailings Distribution System (TDS).
- Reclaim Water System (RWS).
- Silver Lake Make-up Water System.
- Continental Pit.
- Berkeley Pit.
- Concentrator.
- Leach Pads.
- Water Treatment Plant (WTP).
- Access and Haul Roads.

The locations of these mine facilities are shown on Figure 2.1, and described in the sections that follow.



NOTES:

1. COORDINATE SYSTEM AND ELEVATIONS ARE BASED ON ANACONDA MINE GRID.
2. IMAGERY FROM 2015 AIR PHOTO PROVIDED BY MONTANA RESOURCES.
3. EMBANKMENT TOPOGRAPHY FROM 2017 PROVIDED BY MONTANA RESOURCES ON MARCH 19, 2017.

SCALE A: 1500 0 1500 3000 4500 6000 7500 ft

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED
1	23JUN'17	ISSUED WITH REPORT	DDF	MJC	KJB

MONTANA RESOURCES, LLP

YANKEE DOODLE TAILINGS IMPOUNDMENT

MINE FACILITIES (MARCH 2017)

Knight Piésold CONSULTING

P/A NO. VA101-126/12

REF NO. 1

FIGURE 2.1

REV 1

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XREF FILE(S): dam topo 201703 IMAGE FILE(S): 2015_airphoto

2.2 OTHER FACILITIES

2.2.1 Horseshoe Bend (HsB) Pond

HsB Pond is located immediately downstream of the East-West Embankment of the YDTI and is utilized as the seepage collection facility for the impoundment. The area is shaped like an inverted 'U', bounded on both the east and west by historically leached mine rock. The east leach rock disposal sites are still actively leached, while the west side disposal sites have been decommissioned.

Seepage water flows through the free-draining rockfill embankments and discharges at the toe of the downstream slope. The seepage flow discharge occurs as a number of small seeps along the length of the toe of the East-West Embankment and North-South Embankment. The seepage flows are collected in surface drainage ditches, which convey the seepage water to a single drainage ditch on west side of the HsB area.

Several areas of smaller seepage flows discharge above the main HsB area on the bench at approximately EL. 5,950 ft. These seepage flows (known as Seep 10) are attributed to a preferential perched seepage flow path and began in approximately 1989. The seepage flow rate is approximately 200 GPM and has been relatively constant since it began. The Seep 10 flows are inferred to be from lateral drainage from the tailings into the more permeable rockfill, and ultimately follow a historic mine haul ramp alignment that was used for a decade from roughly 1972 to 1982 before daylighting. The seepage is collected in a ditch and the Seep 10 collection pond, and discharges from the collection pond over a v-notch weir (Seep 10 weir) into an HDPE pipeline. The pipeline conveys the flow down the lower embankment bench slope and combines it with the main HsB seepage flows. ▲R2

The majority of the YDTI seepage collects in a single surface drainage ditch and flows south to the Cell 10 pump. The pump conveys the flows to Cell 10 of the Precipitation Plant for processing. The seepage is directed downstream of the pump into the HsB Pond after processing. HsB Pond is a long, thin basin approximately 100 ft wide and 2,000 ft long. The seepage passes across a rectangular flow monitoring weir at the end of the HsB Pond. A diversion structure at the south end of HsB Pond directs the water (seepage) to the surge pond for the HsB water treatment plant (WTP).

The WTP effluent is conveyed to the Concentrator after treatment, and is pumped to the reclaim water line and incorporated into the process water system.

2.2.2 Tailings Distribution System

The Tailings Distribution System (TDS) comprises tailings pumps, booster stations, and pipelines. The TDS conveys tailings from the Concentrator to the YDTI. Four tailings pump stations are presently operating: the Main Tailings Pump House, McQueen Booster Station, No. 2 Booster Station, and No. 3 Booster Station. These stations provide the required pressure to pump the tailings up to the YDTI, a total elevation increase of approximately 870 ft.

Three tailings distribution pipelines (two operational and one standby) transport tailings to the YDTI. Approximately 17,000 ft (3.25 miles) of existing tailings distribution pipeline has been installed at the project site, including sections of 22 in. steel pipe, and 24 to 26 in. high density polyethylene (HDPE) pipe. The single walled tailings pipeline is installed on the ground surface and locally anchored with

mounds of overburden or pipe support trestles. The tailings slurry flow rate is approximately 18,000 gpm with a solids concentration (by weight) between 33% and 37%.

The pipelines are routed up to the YDTI such that there is positive drainage back to each of the pump stations, which are equipped with tailings drain-back discharge areas that are used if the tailings pipelines need to be drained or flushed. Drainage from each of the drain-back discharge areas is routed to flow into the site storm water drainage network.

Tailings were historically discharged into the YDTI at a single location at the southern point of the impoundment near Station 8+00W on the East-West Embankment. The design contemplates multiple discharge points to develop extensive drained tailings beaches adjacent to all three embankments. The changes to the tailings distribution system were made between 2016 and 2017, and eight discharge locations are presently operational. ▲R2

2.2.3 Reclaim Water System

Supernatant water is reclaimed for reuse in the mill process from the north-east end of the YDTI using floating barges. MR maintains two barge units in the supernatant pond. Each of the barges is equipped with four vertical turbine pump units (three operational and one standby). The barge pumps deliver approximately 14,000 gpm of reclaim water into a junction box 1,500 ft away (50 ft elevation increase) using two HDPE pipelines. Reclaim water discharges by gravity to the Mill from the junction box at an elevation decrease of approximately 810 ft over a distance of 5.1 miles.

The reclaim pipeline alignment follows the access road along the eastern edge of the YDTI. The reclaim pipeline enters the site pipeline corridor, which extends from the Mill to the YDTI, immediately south of the Tailings No. 2 Booster Station.

The reclaim water is initially transported from the junction box in two 36 in. diameter HDPE pipelines (0.7 miles long). Water is conveyed into a single 42 in. diameter HDPE pipeline as the pipeline grade increases. The final mile of reclaim pipeline (approximate) is downsized to a 36 in. steel pipeline for conveyance to the Mill facilities. The reclaim water is delivered to two locations at the Mill: the concentrator building for direct use in processing and the process water storage reservoirs.

2.2.4 Silver Lake Make-up Water System

Make-up and fresh water supply for the mine operations are taken from Silver Lake, which is located approximately 40 miles east of Butte. Fresh water is stored near the mill adjacent to the process water storage reservoirs. The mine operates in a water deficit condition and requires make-up water from Silver Lake to maintain operational objectives, including the mine site water balance. The volume of water contained in the YDTI pond at any time is affected by the amount of make-up water imported from Silver Lake.

2.2.5 Continental Pit

The Continental Pit is located approximately 3 miles southeast of the YDTI. It is currently being mined and is the primary source of rockfill for the YDTI embankments. The Continental Pit has sufficient reserves and the relevant operating permits for continued mining until at least 2031.

2.2.6 Berkeley Pit

The Anaconda Copper Mining Company began open pit mining at the Berkeley Pit in 1955 and operation of the YDTI began in 1963. The Berkeley Pit is located approximately 2.5 miles south of the YDTI. The initial YDTI embankment was constructed out of rockfill from the Berkeley Pit and was placed using mine haul trucks in 30 to 100 ft end-dumped lifts. Leach pads were constructed along the base of the east and west limbs of the embankment, and formed a buttress along the toe of the embankment.

Mining activity in the Berkeley Pit was reduced in the early 1980's due to low metal prices. Operations within the Berkeley Pit ceased in April 1982. The lowest point around the Berkeley Pit rim is at an elevation of approximately 5,500 ft.

The Berkeley Pit has gradually filled with groundwater and site runoff once mining operations ceased. The water in the pit is acidic and contains high concentrations of metals. The US EPA and the Montana Department of Health and Environmental Science prepared the Record of Decision (ROD) for the Mine Flooding Operable Unit of the Silver Bow Creek/Butte Area National Priorities List site in 1994. The ROD established a critical water level that marks the point where pumping and treating of Berkeley Pit water will begin and continue in perpetuity. The critical water level was set at 5,410 ft (USGS datum). It is estimated that the critical water level will be reached in 2023.

2.2.7 Concentrator

The Concentrator where mineral ore is processed and the concentrate is shipped off site for smelting is located approximately 3 miles south of the YDTI. Tailings are pumped from the mill location to the YDTI as a by-product of processing, and reclaim water is pumped back to the mill for use as process water.

2.2.8 Precipitation Plant and Associated Leach Pads

The project site has both active and decommissioned leach areas from current and historic leaching activity. Active leach pads are located downstream from the North-South Embankment and are actively used to recover copper from mineralized rock. The leach facilities include various ponds, and the recovered copper is sent off site for refining. The leach pads are no longer loaded, but continue to be leached for copper recovery. Decommissioned leach pads are located northwest of HsB Pond and have been capped as a rock storage area, which also provides a downstream buttress for the East-West Embankment.

2.2.9 Water Treatment Plant

The Water Treatment Plant (WTP) is located south of the HsB Pond and treats seepage water from the YDTI before it is recycled to the mill.

2.2.10 Access and Haul Roads

Access and haul roads are used for vehicle access between mine facilities or as construction access for new facilities. Numerous access and haul roads are located between the YDTI and mill location.

3 – CLIMATE CONDITIONS

3.1 INTRODUCTION

The project area is situated along the northeastern corner of the city limits of Butte, Montana. The mine site is bounded by the city of Butte to the south, Rampart Mountain to the east and the town of Walkerville to the west. The area to the north (upstream) of the project site consists of the catchments for Yankee Doodle, Dixie, and Silver Bow Creeks. The majority of the precipitation (rainfall and snowfall) that occurs on these catchments drains into the YDTI. Precipitation occurring in the Moulton Reservoir watershed (part of the large Yankee Doodle watershed) is collected in the Moulton Reservoirs. These two reservoirs are part of the Butte public water supply system.

The climate inputs were developed using the data measured at the Bert Mooney Airport for the period from 1895 through 2014, which are available from the Western Regional Climate Center (WRCC) website and the National Oceanic and Atmospheric Administration (NOAA) Climatic Data Center website. Annual snowpack data were obtained for on five regional snow survey sites that are operated by the US National Resource Conservation Service (NRCS) in the general vicinity of the YDTI, as shown on Figure 3.1. A summary of the available data is provided in the sections that follow, and additional detail is provided in the following appendices:

- Mean Climate Parameters – William M. Schafer Memorandum - Appendix A1.
- Mean Climate Parameters – KP Memorandum - Appendix A2.
- Extreme Precipitation Estimates – KP Memorandum - Appendix A3.
- Estimates of Return Period Snowpack – KP Memorandum - Appendix A4.

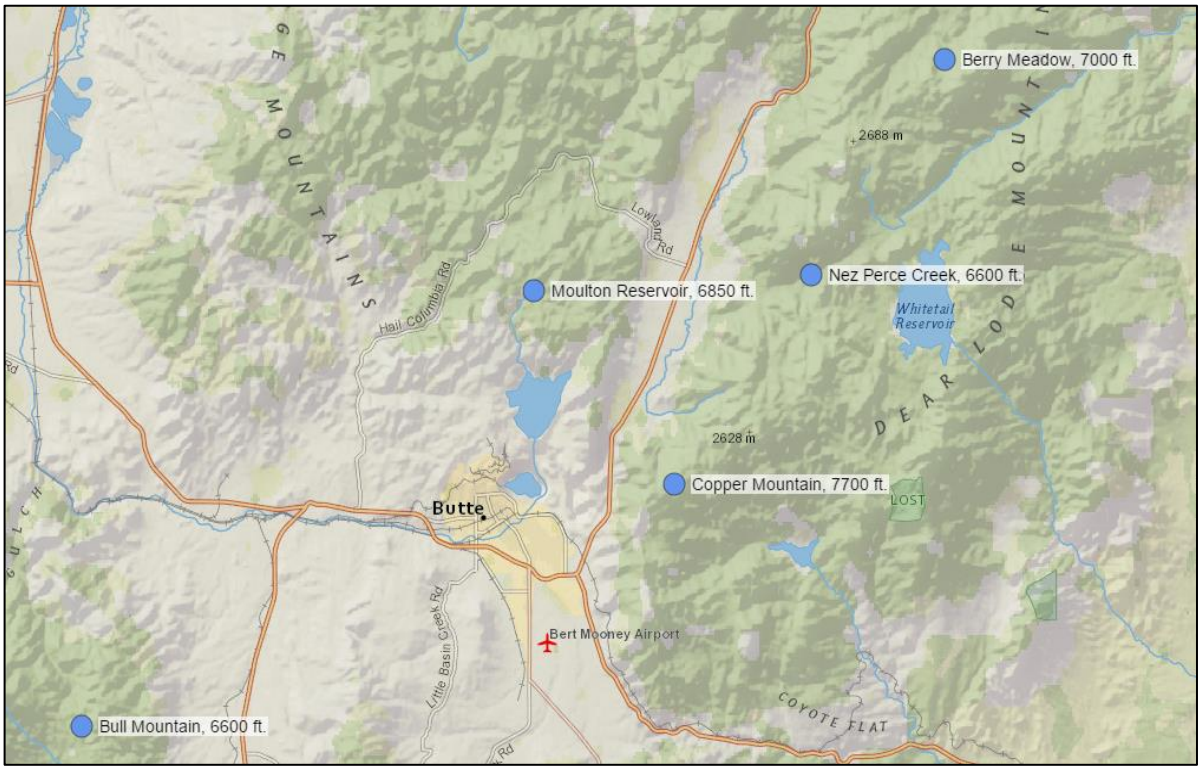


Figure 3.1 Location of Bert Mooney Airport and NRCS Snow Survey Sites

3.2 MEAN CLIMATE PARAMETERS

3.2.1 Temperature

The mean daily temperature for the project site is estimated to be 39°F, with an extreme daily high of 104°F and low of -63°F. Highest temperatures generally occur between July and August, and lowest temperatures typically occur between December and February. The estimated monthly distribution for temperatures at the project site is shown in Table 3.1.

Table 3.1 Daily Temperatures

Parameter	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Mean Temperature (°F)	15.2	19.4	27.3	37.7	47.3	56.1	65.0	62.9	52.1	41.0	26.9	17.3	39.0
Standard Deviation (°F)	7.6	6.7	5.9	4.1	3.5	3.5	3.1	3.0	3.8	3.9	5.7	6.1	-
Daily Maximum Temperature (°F)	28.0	32.7	41.9	48.3	57.4	66.0	72.0	69.5	60.0	49.5	40.2	31.6	-
Daily Minimum Temperature (°F)	-11.7	-0.6	14.2	22.1	39.0	48.5	55.3	55.7	40.0	32.1	8.7	-1.1	-
Extreme Maximum Temperature (°F)	57.8	62.2	71.2	86.6	94.4	102.2	104.4	104.4	97.8	88.8	72.2	67.8	104.4
Year	2005	1995	1994	1910	1919	1988	1936	2000	2000	2010	1999	1917	2000
Extreme Minimum Temperature (°F)	-58.8	-63.4	-45.6	-23.4	4.4	18.8	25.6	20.0	-2.2	-31.2	-52.2	-63.4	-63.4
Year	1937	1933	1948	1982	1975	1916	1971	1992	1926	1991	1959	1983	1983

3.2.2 Precipitation

The long-term mean annual precipitation for the project was estimated to be 15.9 inches, as presented in the memorandum “Reference Climatic Data for the Yankee Doodle Tailings Area near Butte, Montana,” dated May 2, 2016 by William M. Schafer (included in Appendix A1). This estimate is based on the Bert Mooney Airport data for the period from 1895 through 2014 and includes monthly factors to translate the airport values to the higher site location. This value supersedes the precipitation estimate of 12.7 inches presented in the KP memorandum “Mean Monthly Climate Parameters” Ref. No. VA15-03327, dated February 1, 2016. The distribution of precipitation into fractions of rainfall and snowfall was based on the long-term monthly average snowfall records (1894 - 2000) and assuming a snow water equivalent (SWE) of 10%. Furthermore, it was assumed that precipitation falls exclusively as rain from June through August and as snow from November through March, and that a mix of rain and snow occurs during the months of April, May, September and October. The monthly distribution for precipitation at the project site is shown in Table 3.2.

3.2.3 Sublimation

Sublimation is the process by which moisture is returned to the atmosphere directly from snow and ice without passing through the liquid phase (Liston and Sturm, 2004). Sublimation can play a significant role in the annual water balance in areas where winter precipitation comprises a large proportion of annual precipitation. For example, Liston and Sturm (2004) estimate that sublimation

can result in the loss of 10% - 50% of the total winter snowfall in Arctic regions. The YDTI is not situated in an Arctic region; however, snowfall does account for approximately 43% of the total precipitation, and the YDTI may be subjected to high winds that often result in blowing snow, which accordingly would aid sublimation. The sublimation for YDTI was therefore estimated to be approximately 35% of the total winter snowfall, which equates to 2.5 in. per year, as presented in the 2016 Schafer Memorandum included in Appendix A1. Sublimation losses have been distributed evenly from November through to March. Note that this estimate supersedes the values presented in the memorandum "Mean Monthly Climate Parameters" Ref. No. VA15-03327, dated February 1, 2016, which was prepared by KP and is included in Appendix A2.

3.2.4 Evapotranspiration

Monthly potential evapotranspiration (PET) was estimated for Bert Mooney Airport using the Penman-Monteith equation and the PET values were translated to potential pond evaporation at YDTI using the monthly factors presented in the 2016 Schafer Memorandum, which is included in Appendix A1. The estimated mean annual pond evaporation is 28.1 inches, which includes the November to March sublimation estimate of 2.5 inches. Note that these values supersede the values presented in the KP memorandum "Mean Monthly Climate Parameters," Ref. No. VA15-03327, dated February 1, 2016, which is included in Appendix A2.

The potential effects of climate change were not considered in the above analysis since historical climate records do not necessarily represent possible future conditions.

Table 3.2 Mean Monthly Precipitation and Evaporation

Parameter	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Precipitation (in.)	1.2	1.0	1.1	1.5	2.1	2.2	1.5	1.1	1.5	1.1	0.6	1.0	**15.9**
Rainfall Fraction (%)	0	0	0	30	80	100	100	100	90	54	0	0	**-**
Rainfall (in.)	0	0	0	0.5	1.7	2.2	1.5	1.1	1.4	0.6	0	0	**9.0**
Snowfall (SWE in.)	1.2	1.0	1.1	1.0	0.4	0	0	0	0.1	0.5	0.6	1.0	**6.9**
Sublimation (in.)	0.5	0.5	0.5	0	0	0	0	0	0	0	0.5	0.5	**2.5**
Snowmelt (%)	0	10	50	40	0	0	0	0	0	0	0	0	**100**
Pond Evaporation incl. Sublimation (in.)	0.5	0.5	0.5	2.1	3.0	3.7	5.4	4.9	3.3	3.2	0.5	0.5	**28.1**

3.3 RETURN PERIOD EXTREME PRECIPITATION

3.3.1 24 Hour Extreme Precipitation Estimates

Annual extreme precipitation data for the YDTI were determined from daily precipitation data from Bert Mooney Airport (1895 – 2014), which were available from the NOAA Climatic Data Center website.

Estimates of extreme precipitation for 24 hour events with return periods of 2, 5, 10, 25, 50, 100, 200, and 1,000 years are summarized in Table 3.3. The various return period events were determined using a Log-Pearson Type III distribution. Extreme precipitation depths for 24 hour storm

events were also obtained from the "Regional Analysis of Annual Precipitation Maxima in Montana – Water Resources Investigation Report 97-4004," as prepared by the U.S. Geological Survey (USGS, 1997). The design rainfall depths for the project were selected as the maximum of the USGS and Log-Pearson Type III distribution curve values, and are summarized in Table 3.3.

The potential effects of climate change are not directly considered in the above analysis since historical climate records do not necessarily represent possible future conditions. The general scientific consensus is that climate change is likely to cause increased temperatures and an increased frequency and intensity of rain storms in Montana (IPCC, 2007), which for the YDTI translates into an increased likelihood of both heavy precipitation events and smaller winter snowpack depths. Climate change is addressed by increasing the design storm depths by 15%, as this is a generally recommended factor for accounting for climate change effects on peak flow estimates (APEGBC, 2012).

The estimates discussed above are presented in the KP memorandum "Montana Resources – Extreme Precipitation Estimates" Ref. No. VA15-03332, dated February 1, 2016, which is included in Appendix A3. However, as discussed in Section 3.3.2, the latest mean annual precipitation (MAP) estimate of 15.9 inches/year is based on transposing the value from Bert Mooney Airport to YDTI, which accounts for potential orographic effects that previously were not considered in the KP estimate of 12.7 inches/year. To be consistent with the MAP update, the extreme precipitation values presented in VA15-03332 were similarly increased by the ratio of 15.9/12.7, in accordance with the finding that annual and extreme 24 hour precipitation are highly correlated (Cathcart, 2001).

Table 3.3 Estimated Extreme 24 Hour Precipitation Events

Return Period Frequency (Years)	2	5	10	25	50	100	200	1,000
Log-Pearson Type III (in.)	1.0	1.4	1.7	2.0	2.3	2.6	2.9	3.7
USGS Report 97-4004 (in.)	1.0	1.5	1.7	-	2.3	2.5	2.8	3.4
YDTI Project(1) (in.)	1.0	1.5	1.7	2.0	2.3	2.6	2.9	3.7
+ Climate Change (in.)	1.2	1.7	1.9	2.3	2.6	2.9	3.3	4.2
+ Site Uplift Factor (in.)	**1.5**	**2.1**	**2.4**	**2.8**	**3.3**	**3.6**	**4.1**	**5.3**

NOTES:
1. YDTI Project precipitation selected as the maximum between the Log-Pearson Type III and USGS Report 97-4004 values.

3.3.2 Probable Maximum Precipitation (PMP)

The Probable Maximum Precipitation (PMP) was determined according to procedures established by NOAA and published in its Hydrometeorological Report (HMR) No. 57 (Hansen et al., 1994). An 24 hour PMP with a depth of 14.4 inches was selected as the basis of the design for the YDTI and computed as described in Appendix B2. The purpose of the PMP and justification for selection of the 24 hour duration event is described further in Section 4.4.1 and Appendix B1.

The Montana Department of Natural Resources and Conservation Dam Safety Program issued an Extreme Storm Working Group Summary Report in December 2016 that presented the results of a comprehensive review of the state of the practice for computing hydrology for dams. This report was issued after the PMP was computed for the YDTI. KP has considered whether a site specific PMP is necessary since the embankment for the YDTI is considered high hazard with a significant downstream risk. KP concluded that the current PMP estimate based on HMR 57 is appropriate for the design basis, and likely larger than what would be determined by a site specific PMP analysis. Accordingly, derivation of a site specific PMP is not warranted. Additional detail is provided in Appendix B2.

3.3.3 Return Period Snowpack

Estimates of return period snowpack were derived from historical maximum annual snowpack data for the basin draining into the YDTI. There are five regional snow survey sites that are operated by the US National Resource Conservation Service (NRCS) in the general vicinity of the YDTI. The locations of these stations are shown on Figure 3.1. The most relevant station is Moulton Reservoir, which is located at the approximate median elevation of the drainage basin of the YDTI (el. 6,850 ft).

The Moulton Reservoir station is located in the YDTI drainage near the mid-elevation point. It has a long period of record, and the regional snowpack values are reasonably consistent through time and by location. The Moulton Reservoir snowpack values were selected as representative of basin average conditions in the YDTI basin. The computed mean (7.1 inches) and standard deviation (2.1 inches) values were fit to an Extreme Value Type 1 distribution using a frequency factor approach, with the factors selected according to the sample size of 40 years.

The estimated snowpack values are provided in Table 3.4 in terms of inches of snow water equivalent (SWE).

Table 3.4 Return Period Snowpack Estimates for the YDTI Watershed

Return Period	Frequency Factor	Maximum Snowpack SWE (in)
2	-0.164	**6.8**
5	0.838	**8.9**
10	1.495	**10.2**
15	1.866	**11.0**
20	2.126	**11.6**
25	2.326	**12.0**
50	2.943	**13.3**
100	3.554	**14.6**
200	4.210	**15.9**
500	5.001	**17.6**
1,000	5.576	**18.8**
10,000	7.580	**23.0**

NOTES:
1. Snowpack values are provided in terms of snow water equivalent (SWE).
2. Frequency factors are for an Extreme Value Type 1 distribution with a sample size of 40.

4 – YANKEE DOODLE TAILINGS IMPOUNDMENT DESIGN

4.1 PRINCIPLE OBJECTIVES

The YDTI will continue to provide secure storage of mine tailings resulting from on-going mine operations. The principle design objectives for the YDTI are to: ▲R2

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

The design will take into account the following requirements:

- Staged development of the facility over the life of the project.
- Construction material provided by mining the Continental Pit to the maximum practical extent, with the balance provided from external borrow areas, if required to meet engineering objectives.
- Constructed using similar techniques, equipment and construction methodologies that have been adopted for past raises.
- The inclusion of monitoring features to confirm performance goals are achieved and design criteria and assumptions are met.

4.2 STORAGE CAPACITY

The continued filling of the YDTI to an embankment crest of EL. 6,450 ft will result in a total facility tailings and water storage capacity of approximately 900 million cubic yards (M yd^3). This equates to approximately 560,000 acre-ft or 24 billion cubic feet (Bft^3). The relationship between the elevation of the tailings, and the capacity and surface area of the YDTI is shown on Figure 4.1. ▲R2

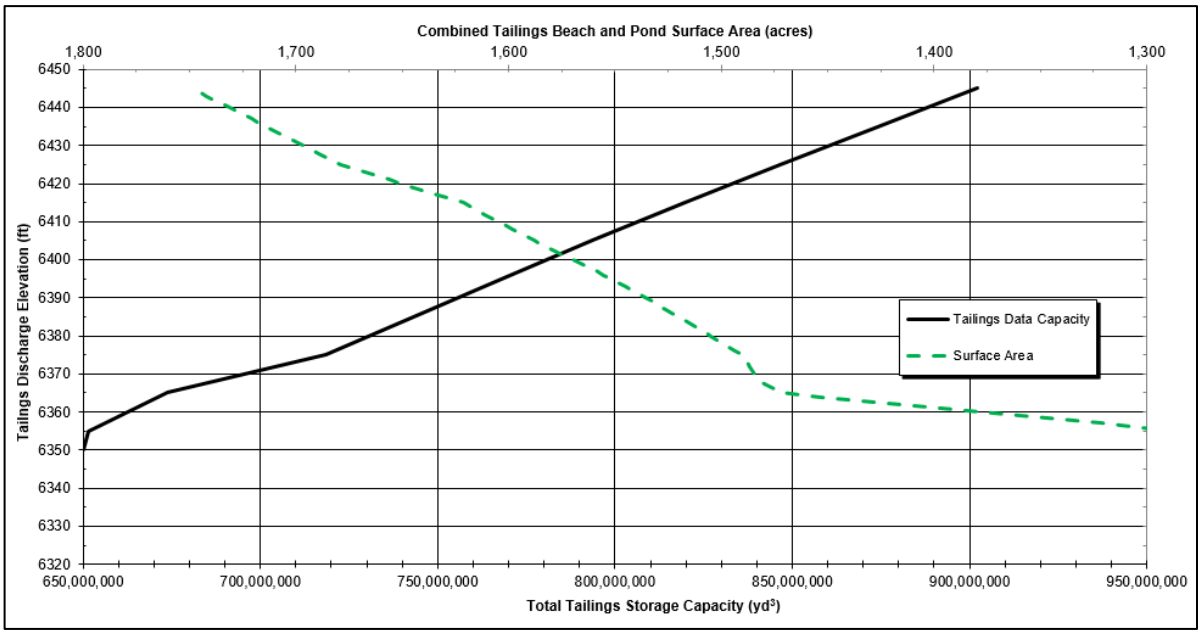


Figure 4.1 YDTI Elevation-Area-Capacity Curves ▲R2

The storage capacity was estimated using the three dimensional (3D) modelling tool, Muck 3D. The model incorporated specified beach slopes, tailings discharge points and discharge elevations to

determine the available storage capacity at various elevations. The capacity estimates were completed at 10 ft tailings discharge elevation intervals to generate the total storage capacity. The model was developed using the 2016 beach contours and pond bathymetry as a base surface, and was extended to a maximum tailings discharge elevation of 6,445 ft.

Existing beach slopes were examined using the 2015 aerial imagery and pond bathymetry to establish tailings beach slope criteria for modelling the storage capacity. The adopted beach slope criteria used in the 3D model are included in Table 4.1

Table 4.1 Beach Slope Criteria

Tailings Surface Type	Slope (%)	Beach Length (ft)
Sub-Aerial	1.2	400
	0.4	6,100
Sub-Aqueous	5	1,200
	1.3	Until Termination

4.3 FILLING SCHEDULE

▲R2

The nominal mill throughput (tailings production rate) for the mine is 50,000 short tons (tons) per day. Tailings production on an annual basis has ranged between about 17 and 18 million tons (dry) since 2004. The continued use of the YTDI with construction of the embankments to a crest of EL. 6,450 ft will create capacity for tailings storage until roughly Year 2031. A tailings production rate of 18 million tons per year was adopted for development of the filling schedule.

An initial settled dry density of the tailings of 85 pcf (1.15 tons/yd^3), which is equivalent to a saturated bulk density of 115 pcf, was adopted for the filling schedule. This provides a reasonably conservative estimate of storage capacity and subsequent filling rate for the YDTI. Long-term consolidation will increase the dry density of the tailings above the initial settled density thereby increasing the available storage capacity of the facility. Analysis of the CPT data collected between 2012 and 2015 indicates that the bulk density the consolidated tailings in the upper 300 ft is approximately 120 pcf (KP, 2017b), which corroborates the values used in the filling schedule.

The operating pond in the YDTI has ranged between 15,000 acre-ft and 30,000 acre-ft since 2007 based on annual pond bathymetry. A nominal operating pond allowance of 25,000 acre-ft was adopted for the purposes of the YDTI design layout. The target normal operating pond for the facility will be defined in subsequent analyses; however, a target value of roughly 15,000 acre-ft is anticipated in the long-term.

A filling schedule for the YDTI was developed considering the historical tailings production rate and operating pond volumes, and the initial settled density of the tailings. The filling schedule for the YDTI is shown in Table 4.2.

Table 4.2 Filling Schedule ▲R2

Year	Cumulative Tailings Storage (2)		Pond Allowance (3)	Total Storage
	Million tons	Million yd^3	Million yd^3	Million yd^3
2017 (1)	610.7	531.1	40.3	571.4
2018	628.7	546.7	40.3	587.0
2019	646.7	562.4	40.3	602.7
2020	664.7	578.0	40.3	618.3
2021	682.7	593.7	40.3	634.0
2022	700.7	609.3	40.3	649.6
2023	718.7	625.0	40.3	665.3
2024	736.7	640.6	40.3	680.9
2025	754.7	656.3	40.3	696.6
2026	772.7	671.9	40.3	712.3
2027	790.7	687.6	40.3	727.9
2028	808.7	703.2	40.3	743.6
2029	826.7	718.9	40.3	759.2
2030	844.7	734.5	40.3	774.9
2031	862.7	750.2	40.3	790.5

NOTES:
1. Includes storage for partial year from June 2017 aerial imagery until 2017 year end.
2. Tailings dry density for filling schedule development = 85 pcf (1.15 tons/yd^3).
3. Supernatant pond allowance for filling schedule development = 25,000 acre-ft.

A filling curve shown on Figure 4.2 was developed for the YDTI using the filling schedule and the capacity curve presented in Section 4.2. The figure shows the estimated tailings discharge elevation and associated pond elevation for each year between 2016 and 2031.

The rate of rise of the tailings will be approximately 6 ft per year, which is consistent with historical experience. The difference between the tailings discharge and supernatant pond elevation will typically be in excess of 20 ft. ▲R2

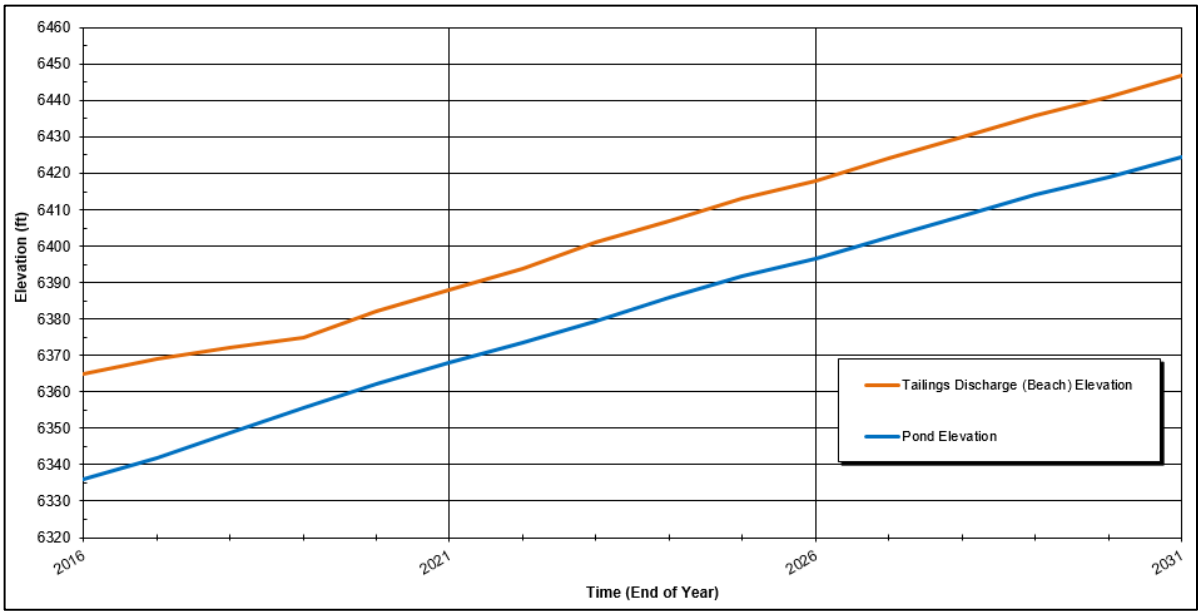


Figure 4.2 YDTI Filling Curve ▲R2

4.4 DESIGN FREEBOARD

4.4.1 Storm Storage Freeboard

The design freeboard will be comprised of storm storage freeboard and additional minimum freeboard for wave run-up. The legislation (MCA 82-4-376) indicates that for the design of an existing tailings storage facility of this size, the design must store or otherwise manage the probable maximum flood (PMF) event with sufficient freeboard for wave action in addition to the maximum normal operating water level of the facility, or that the design does not reduce the ability to store or otherwise manage the original facility design storm or flood events. ▲R2

The Inflow Design Flood (IDF) is the most severe flood that the YDTI will be designed to manage. The IDF is defined as the flood hydrograph entering the reservoir that is used to design and/or modify a specific dam and its appurtenant works; particularly for sizing the spillway and outlet works, and for evaluating maximum storage, height of dam, and freeboard requirements (FEMA, 2013).

The YDTI relies on storm storage capacity to manage the IDF during operations. The IDF for the YDTI is the PMF. The PMF is theoretically the largest flood resulting from a combination of the most severe meteorological and hydrologic conditions that could conceivably occur in a given area. The intent of adopting the PMF as the IDF for determining storm storage freeboard 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.

A design storm evaluation was completed considering historical storm event analyses with several alternative durations and methods for determining the PMF. The design storm event evaluation is included as Appendix B1.

The selected design storm event is a combination of 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 PMF runoff volume was determined to be 19,000 acre-ft.

The potential for climate change was addressed by increasing the PMF event for the closure phase by 15%, according to generally accepted engineering procedures (APEGBC, 2012). No adjustment was made to the PMF estimate for operations because of the relatively short period of operations. Therefore, the PMF runoff volume for closure has been increased to 20,000 acre-ft.

4.4.2 Minimum Freeboard

A minimum freeboard requirement of 5 ft will be incorporated in the YDTI design for wave run-up above and beyond the storm storage freeboard. Additional freeboard may be required to allow for crest settlement and fault displacement during the design earthquake event.

The surface area of the YDTI is approximately 1,300 acres and will increase to approximately 1,800 acres in the ultimate configuration. The minimum freeboard creates additional capacity in excess of 6,500 acre-ft. Embankment construction is completed staged lifts, and therefore the total actual freeboard will tend to be larger than the design freeboard until just before operations cease.

4.5 EMBANKMENT LIFTS

The preliminary timing for development of the EL. 6,450 ft lift of the YDTI embankments has been based on the filling schedule and the design freeboard requirements. Construction of the embankments will be completed as a continuous activity when rockfill is available from mine stripping operations. The delivery of embankment fill material will be scheduled to coincide with availability of rockfill from the mine on an annual basis to meet the staged lift requirements. The lift schedule is shown on Figure 4.3 for simplicity as an instantaneous lift completed by 2022. ▲R2

The actual timing required for the completion of the lift will depend on the actual tailings production, 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 sequencing evaluated periodically to confirm agreement with the design assumptions.

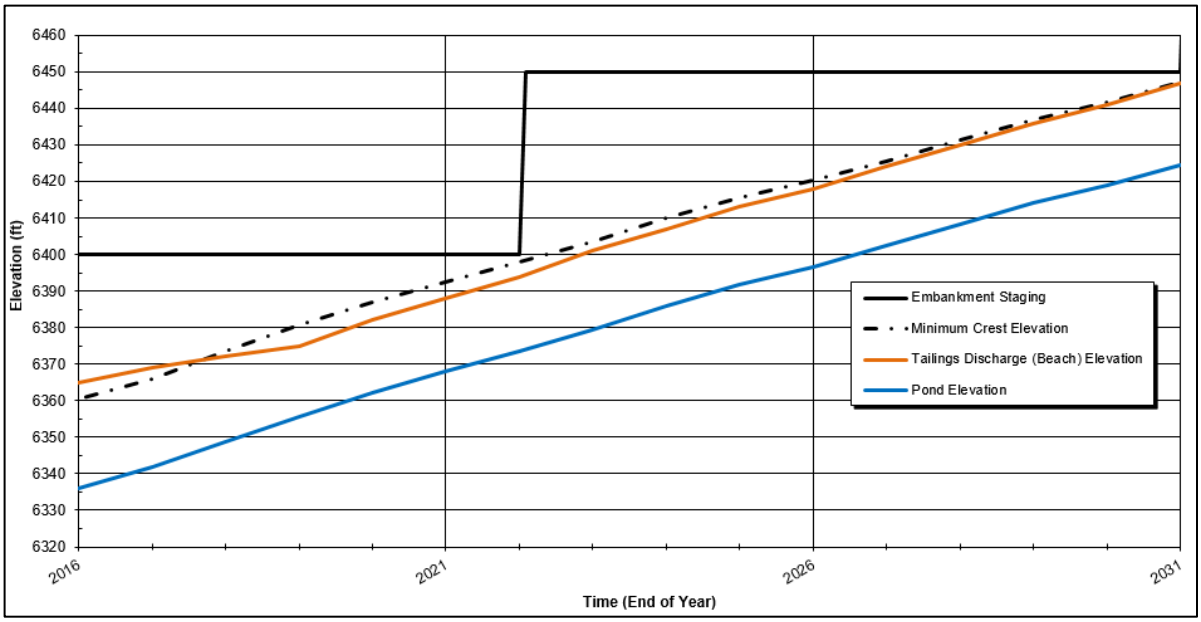


Figure 4.3 YDTI Embankment Lift Schedule ▲R2

4.6 HISTORICAL PRACTICES AND PRECEDENT

Historically the YDTI has been constructed by progressively placing rockfill to form the free-draining rockfill embankments. The rockfill comprises pit-run material end-dumped in 30 to 100 ft lifts and traffic compacted with the mine haul fleet. Ripping of the embankment surface has been commonly completed after the lift has been completed. The embankment design incorporated a zone of fine-grained material (alluvium) placed on the upstream face of the embankment to limit tailings migration into the rockfill.

The YDTI will continue to be constructed to elevation 6,450 feet with similar techniques and construction methodologies that have been adopted for past raises. ▲R2

The East-West and North-South embankments will continue to be constructed as free-draining rockfill embankments. The embankments will continue to be constructed from pit-run rockfill material end-dumped in 50 ft lifts and traffic compacted with the mine haul fleet.

The West Embankment incorporates a different design to the North-South and East-West Embankments. The West Embankment is a zoned rockfill embankment dam that incorporates a number of independent systems to contain seepage water within the YDTI. The seepage control features are designed in the foundation to provide drained conditions within the West Embankment. The design will maintain a groundwater piezometric surface similar to current conditions thereby preventing seepage from the YDTI migrating west past the property boundaries.

4.7 LEGACY CROSS SECTION CONVENTION

The design drawings included in this report reference a series of legacy cross section locations that have been historically used for the project. The cross sections most likely align with a historical setting out line for the embankments that is no longer consistent with the current design; however the legacy cross sections will be used for the on-going design in the interest of consistency for as-built

drawings and annual reporting. The convention begins with Station 0+00 at the interface between the North-South and East-West Embankments, and increase in station number in both directions. The stationing convention will use a directional suffix (e.g. N or W) to describe the location of the cross section (e.g. 8+00 N for 800 ft along the North-South Embankment). The actual stationing measured along the current setting out line (SOL) will not be equal to the stationing as referenced on the cross section due to differences in the historical and current setting out lines.

4.8 LAYOUT CRITERIA

4.8.1 North-South Embankment

The North-South Embankment will be constructed in a maximum lift thickness of 50 ft lift using the downstream embankment construction method. The SOL for the EL. 6,450 ft crest elevation will be aligned with the downstream edge of the structural portion of the crest. The upstream slope will be at angle of repose (1.3H:1V) and the downstream slope will be 2H:1V or flatter. The minimum embankment crest width will be 230 ft measured perpendicular from the SOL towards the impoundment at each lift. The zone of embankment fill generated by these layout criteria will comprise the structural portion of the embankment. A typical section showing these layout criteria is shown on Figure 4.4. ▲R2

A rock disposal site will be progressively developed over the existing leach pad areas located at the downstream toe of the North-South Embankment.

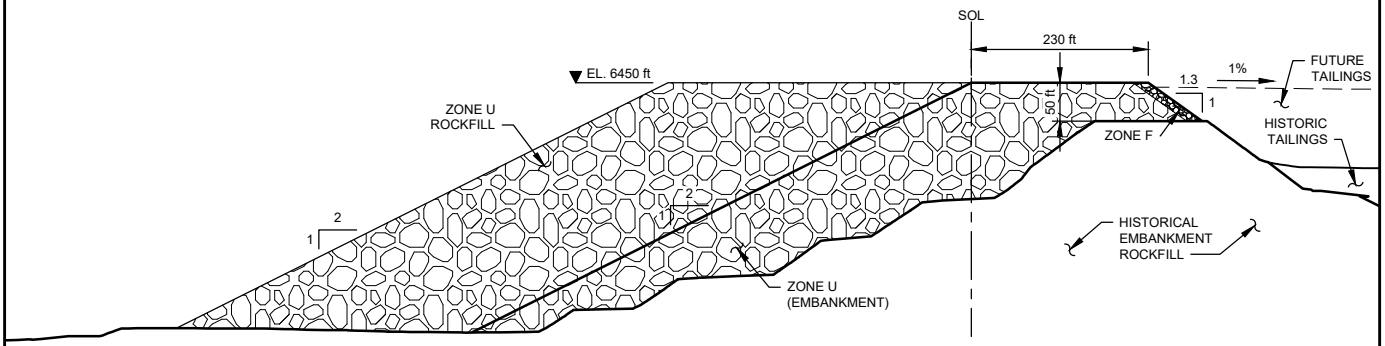
4.8.2 East-West Embankment

The East-West Embankment will be constructed in a maximum lift thickness of 50 ft using the centerline embankment construction method. The SOL for the EL. 6,450 ft crest elevation will be aligned with the downstream edge of the crest. The upstream slope will be at angle of repose (1.3H:1V) for each stage and the overall downstream slope will be 2H:1V or flatter (or 2.5H:1V in some areas). The minimum embankment crest width will be 230 ft measured perpendicular from the SOL towards the impoundment at each lift. The zone of embankment fill generated by these layout criteria will comprise the structural portion of the embankment. A typical section showing these layout criteria is shown in Figure 4.4. ▲R2

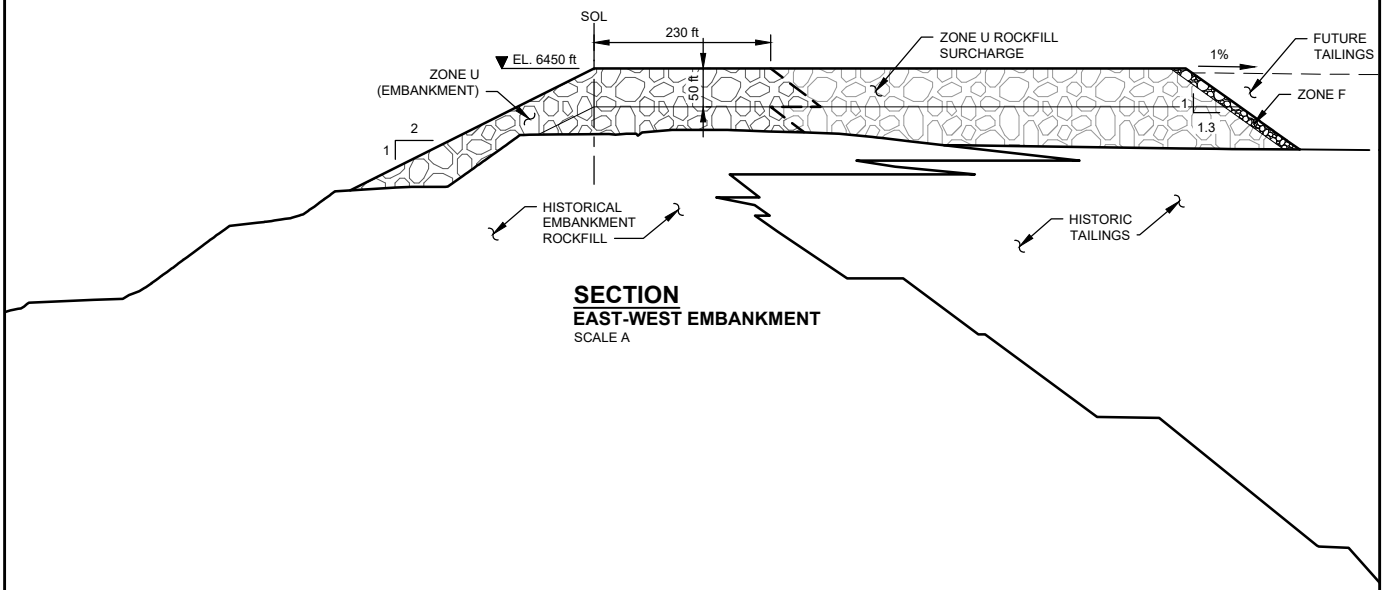
An allowance for additional rockfill placement in the area upstream of this zone will be included in the design to allow for placement of lower strength rockfill in a non-structural zone of the embankment.

The North-South and East-West Embankment lifts will be comprised of the following zones:

- **Zone U – Rockfill:** Zone U will be constructed in a manner that promotes free draining behavior. Zone U rockfill will be hauled and end-dumped by 240 ton haul trucks in approximately 50 ft thick horizontal lifts. Segregation will occur as the rock is end-dumped at the crest of each lift. The finer particles tend to accumulate near the top of the lift and the cobbles and boulders roll further down the slope and accumulate at the toe. Therefore, a segregated cobble and boulder layer typically forms at the bottom of each lift.
- **Zone F – Earthfill:** Zone F embankment fill will be placed to construct a separation zone between the tailings and the Zone U rockfill along the upstream face of the embankment. Zone F material will consist of variable alluvium to limit tailings migration into the rockfill.



SECTION
NORTH-SOUTH EMBANKMENT
SCALE A



SECTION
EAST-WEST EMBANKMENT
SCALE A

LEGEND:

	ZONE F - EARTHFILL
	ZONE U - ROCKFILL SURCHARGE
	ZONE U - ROCKFILL (EMBANKMENT)
	ZONE U - ROCKFILL
SOL	SETTING OUT LINE

SCALE A: 125 0 125 250 375 500 625 ft

NOTES:

1. COORDINATE SYSTEM AND ELEVATIONS ARE BASED ON MINE GRID.

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED
1	19MAY'17	ISSUED WITH REPORT	DDF	MJC	KJB

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YANKEE DOODLE TAILINGS IMPOUNDMENT

TYPICAL SECTIONS NORTH-SOUTH AND EAST-WEST EMBANKMENTS

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P/A NO. VA101-126/12 | REF NO. 1

FIGURE 4.4 | REV 1

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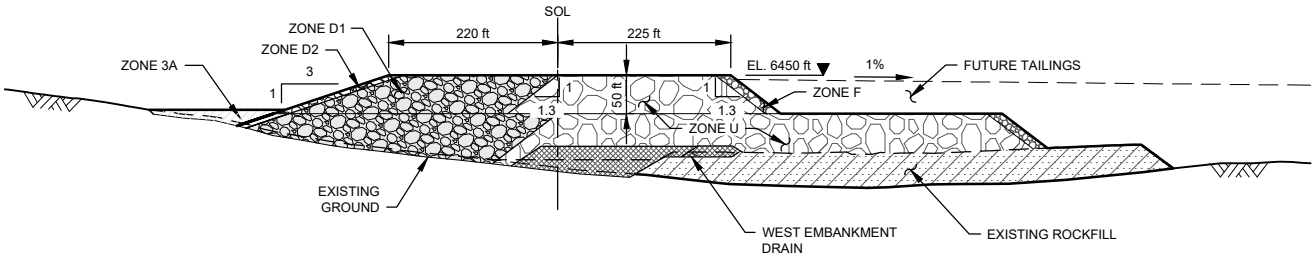
4.8.3 West Embankment

The West Embankment will be constructed in one stage by the downstream embankment construction method. The SOL for the EL. 6,450 ft crest elevation will offset 70 ft between Station 58+00 NW and 63+00 W to align with the interface between Zone U and Zone D1. The upstream slope will be at angle of repose (1.3H:1V) and the downstream slope will be 3H:1V or flatter. The minimum embankment crest width will be 230 ft measured perpendicular from the downstream edge of the crest towards the impoundment at each stage. The downstream edge of the crest will be maintained a minimum of 70 ft from the SOL at the completion of the EL. 6,450 ft lift. A typical section showing is shown on Figure 4.5. The typical section exceeds the minimum layout criteria described above. ▲R2

The West Embankment raises will be comprised of the following zones:

- **Zone U – Rockfill:** Zone U will be constructed in a manner that promotes free draining behavior. Zone U rockfill will be hauled and end-dumped by 240 ton haul trucks in approximately 50 ft thick horizontal lifts. Segregation will occur as the rock is end-dumped at the crest of each lift. The finer particles tend to accumulate near the top of the lift and the cobbles and boulders roll further down the slope and accumulate at the toe. Therefore, a segregated cobble and boulder layer typically forms at the bottom of the lift.
- **Zone D1 – Rockfill:** Zone D1 rockfill will be used to construct the downstream zone of the West Embankment. The design function of Zone D1 is to act as an impediment to horizontal migration of perched seepage flow towards the downstream face of the embankment and to encourage free draining behavior in Zone U such that seepage flows are ultimately collected in the West Embankment Drain.
- **Zone D2 – Earthfill:** Zone D2 embankment fill will be placed to provide a capping layer on the downstream slope of the embankment to promote runoff of meteoric water. Zone D2 material will typically consist of non-acid generating alluvium.
- **Zone F – Earthfill:** Zone F embankment fill will be placed to construct a separation zone between the tailings and the Zone U rockfill on the upstream face of the embankment. Zone F material will consist of variable alluvium to limit tailings migration into the rockfill.



SECTION
WEST EMBANKMENT
SCALE A

LEGEND:

- ZONE F - EARTHFILL
- ZONE U - ROCKFILL
- ZONE UA - ROCKFILL
- ZONE D1 - ROCKFILL
- ZONE D2 - ROCKFILL
- DRAIN POD / EXTRACTION BASIN / WEST EMBANKMENT DRAIN
- SECONDARY SEEPAGE COLLECTION DRAIN
- EXISTING ROCKFILL
- SOL — SETTING OUT LINE

SCALE A: 125 0 125 250 375 500 625 ft

NOTES:

1. COORDINATE SYSTEM AND ELEVATIONS ARE BASED ON MINE GRID.

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED
1	19MAY'17	ISSUED WITH REPORT	DDF	MJC	KJB

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YANKEE DOODLE TAILINGS IMPOUNDMENT

TYPICAL SECTION
WEST EMBANKMENT

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FIGURE 4.5 | REV 1

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5 – DESIGN EARTHQUAKE

5.1.1 General

The design earthquake has been selected to meet the obligations as stipulated in MCA 82-4-376 (2), (m), (i) and (l). The legislation requires a probabilistic and deterministic seismic evaluation for the area and assessment of peak horizontal ground acceleration. The legislation requires either of the following for an existing tailings storage facility:

- An analysis showing the proposed embankment configuration meets the minimum design requirements for a new tailings storage facility. ▲R2
- An analysis showing the proposed embankment configuration does not reduce the original design factors of safety and seismic event design criteria.

The requirement for a new tailings storage facility is for an analysis showing that the seismic response of the tailings storage facility does not result in the uncontrolled release of impounded materials when subject to the ground motion associated with the 1 in 10,000 year event, or the maximum credible earthquake (MCE), whichever is larger.

The seismic event design criteria for the YDTI have been updated periodically. The latest criteria preceding the recent seismic hazard assessment described below were developed by HLA (HLA, 1993). HLA prepared a deterministic estimate of the MCE for movement along the Continental Fault. The study defined the MCE as a Magnitude 6.5 event with a peak bedrock acceleration of 0.6 g.

MR chose to update the seismic event design criteria although it was not required by the legislation the permit amendment application. An updated seismic hazard analysis was considered prudent at this time to demonstrate that the YDTI meets state-of-practice engineering design standards due to the close proximity of the Continental Fault and developments in seismic hazard assessment methods since HLA completed their analysis in 1993.

5.1.2 Seismic Hazard Assessment

A site specific probabilistic and deterministic seismic hazard analysis was conducted as part of the YDTI engineering design work. The report (Al Atik, L. and Gregor, N., 2016) is included in the Site Characterization Report (KP, 2017a). The study included derivation of the following seismic response spectra:

- Probabilistic spectra with return periods of 475, 1,000, 2,475, and 10,000 years.
- Deterministic 50th (median) and 84th percentile response spectra for the MCE scenarios on the Continental fault with rupture distances of 1.2 and 0.1 km.

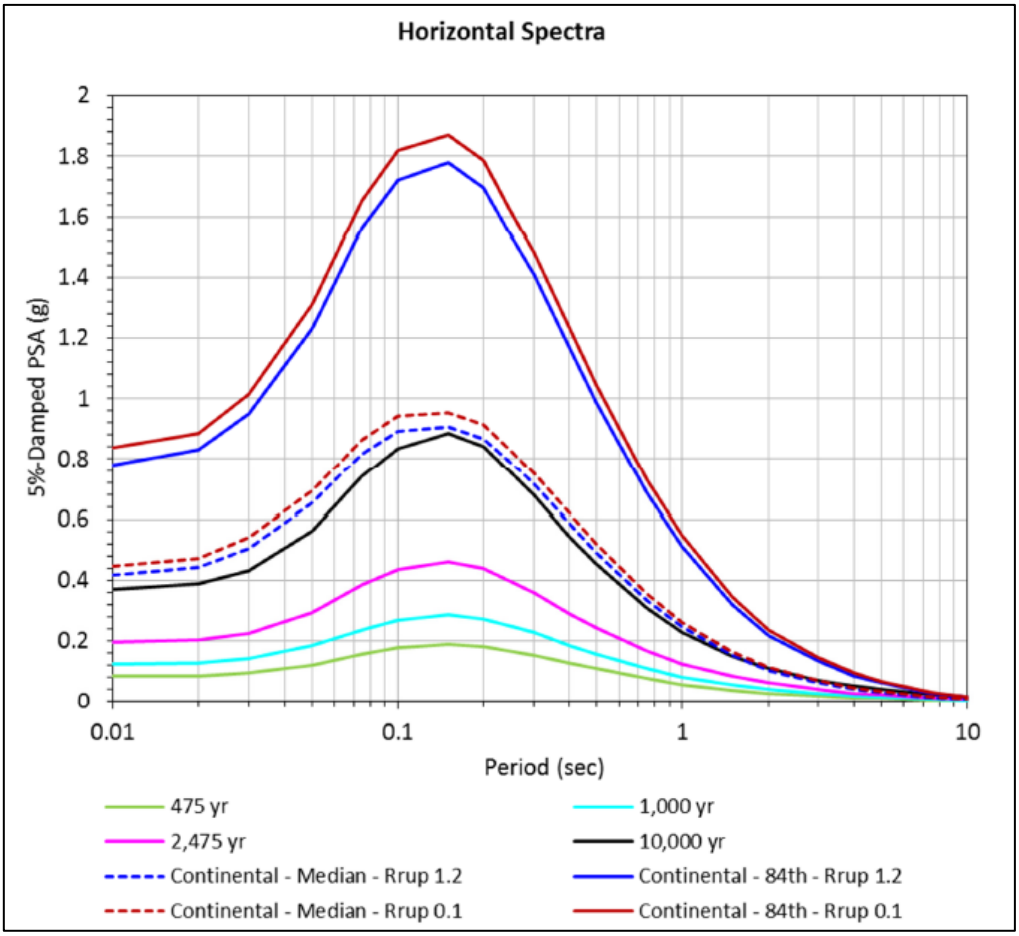
The resulting peak ground accelerations of the seismic hazard analyses are summarized in Table 5.1, and the horizontal design spectra for the YDTI are shown in Figure 5.1.

Table 5.1 Summary of Probabilistic and Deterministic Seismic Hazard Analysis

	Probabilistic UHS PSA (g)				Deterministic PSA (g) R_{rup} = 1.2 km		Deterministic PSA (g) R_{rup} = 0.1 km	
Return Period (Years)	475	1,000	2,475	10,000	Median	84th Percentile	Median	84th Percentile
PGA	0.08	0.12	0.20	0.37	0.42	0.78	0.45	0.84

NOTES:
1. Peak ground accelerations are for rock site conditions (Vs_{30} – 760 m/s).
2. Source: Table 6-2 of Al Atik, L. and Gregor, N., 2016.

Figure 5.1 shows the horizontal design spectra for the YDTI. The deterministically derived MCE spectra exceed those for the probabilistically derived 1 in 10,000 year event. The MCE was therefore selected as the design earthquake. The MCE with a rupture distance of 0.1 km produces spectral accelerations that are greater than the MCE with a rupture distance of 1.2 km. Therefore, the MCE based on a rupture distance of 0.1 km was conservatively chosen as the design earthquake.



NOTES:
1. Source: Figure 6-2 of Al Atik, L. and Gregor, N., 2016.

Figure 5.1 Probabilistic and Deterministic Horizontal Design Spectra

The legislation requires that the earthquake design ground motion is the larger of the 1 in 10,000 year return period or the MCE. The legislation does not provide additional direction related to how the MCE shall be defined. Recent federal seismic design provisions developed as part of the National Earthquake Hazard Reduction Program (NEHRP) and released by FEMA (FEMA, 2009) for new buildings and other structures define the MCE as the level of one standard deviation above the median (the 84th percentile). The FEMA guideline is an example of current practice for major building structures, but does not apply to dams.

ICOLD revised their guidelines for selecting seismic parameters for large dams in 2010 (ICOLD, 2010). These guidelines introduce the state of practice for high consequence dams as the greater of the MCE at the 84th percentile level or the 1 in 10,000 year return period event for what the guidelines term the safety evaluation earthquake. The ICOLD guidelines establish the safety evaluation earthquake as the earthquake for which there shall be no uncontrolled release of water, which is consistent with the performance requirements described in the Montana legislation. The ICOLD guidelines are source of guidance of good international engineering practice, and were considered in the selection of the design earthquake.

A Magnitude of 6.5 was selected for the design earthquake. The PGA of the design earthquake was selected as follows:

- Median MCE with a PGA of 0.45 g for maximum normal operating conditions.
- 84th Percentile MCE with a PGA of 0.84 g for long-term closure conditions.

The analysis demonstrating the seismic response of the facility, and describing the loading conditions, the relevant design earthquake for the analysis and methods of analysis is provided in the Stability Assessment Report (KP, 2017b).

6 – FACILITY DEVELOPMENT

6.1 GENERAL ▲R2

Phased general arrangements of the YDTI were prepared to show the planned configuration of the YDTI with an embankment crest of EL. 6,450 ft relative to the other mine facilities during key years in the life of the facility. The beach surfaces and pond extents shown on the general arrangements were estimated using the Muck3D computer software package. The modelling work used to demonstrate the long-term tailings deposition plan is described further in Appendix C. The design drawing package supporting the Design Document is included as Appendix D.

The long-term development of the tailings beaches will be achieved using a discharge configuration plan that is progressively expanded to eight discharge points. Initially, additional discharge locations will be constructed along the West Embankment to allow tailings to fill in the low areas (below the current supernatant pond) in the northwest end of the impoundment, and create a tailings beach adjacent to the West Embankment. Development of the tailings beach along the West Embankment will push the pond towards the North-South Embankment. Tailings will also being discharged from the North-South Embankment to prevent the supernatant pond from approaching the embankment. The beach will be progressively converted from a uniform fan to a U-shape configuration around the YDTI embankments. The transition between these configurations commenced in 2016 and will occur over a period of three years.

6.2 YEAR 2018

The Year 2018 arrangement shown on Figure 6.1 represents the end of the transitional period to the new configuration with eight discharge points. The embankments will be fully constructed to EL. 6,400 ft, and No. 3 Booster Station will be operational to convey tailings to the far ends of the North-South and West Embankment. The tailings discharge elevation will have reached EL. 6,372 ft and the pond will rise to approximately EL. 6,349 ft.

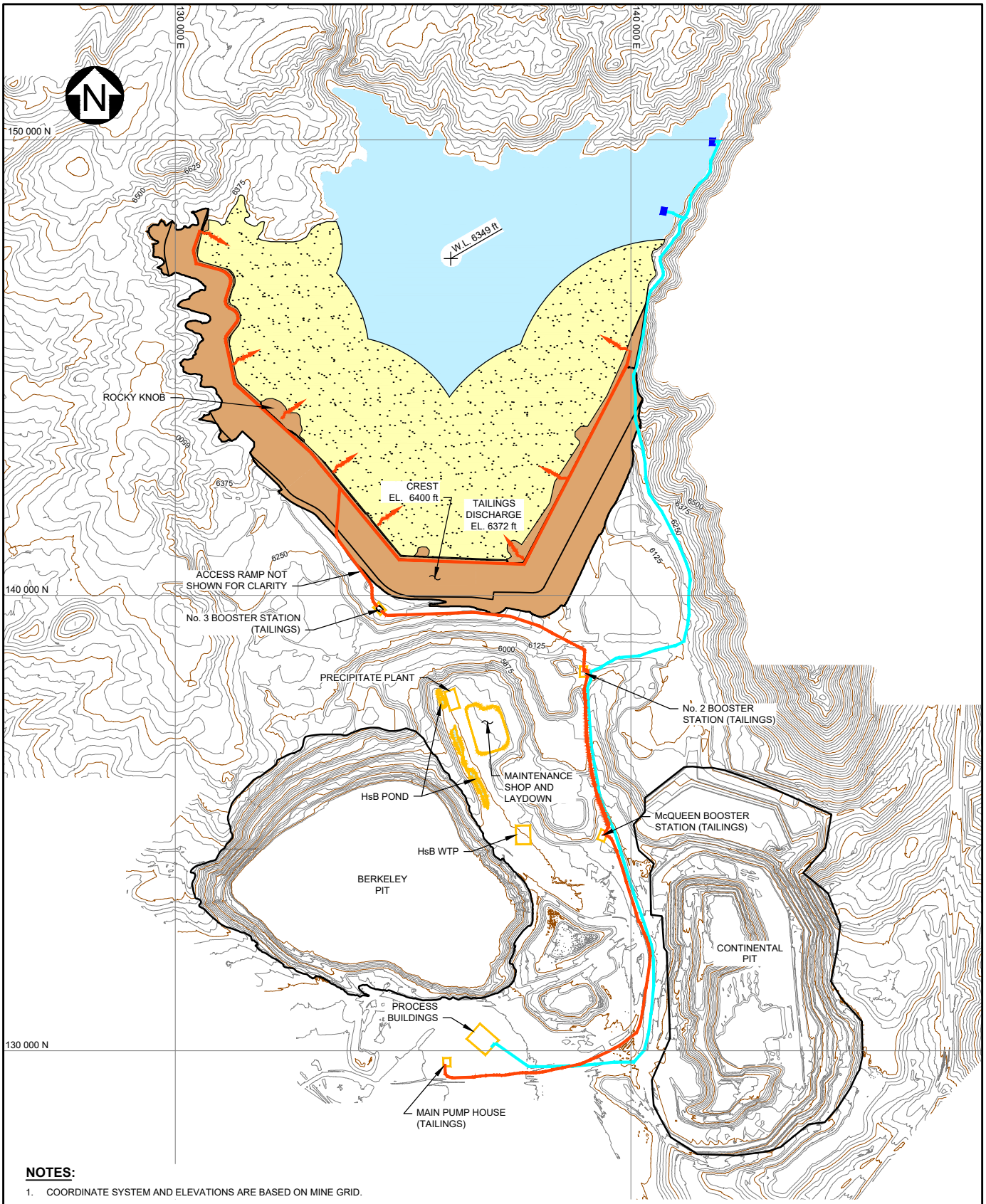
A jetty may be initiated as a contingency measure near the north end of the North-South Embankment to help manage the extents of the tailings beach in the northeast end of the impoundment. The jetty will be progressively developed as necessary to reduce the potential for sanding issues in the reclaim barge area. Jetty construction would continue concurrently with tailings deposition as the beach and pond levels rise in the impoundment. Other alternatives to manage the tailings beach and reduce the potential for sanding in the reclaim barge area may also be considered once beach development commences.

6.3 YEAR 2022

The Year 2022 arrangement shown on Figure 6.2 represents the completion of the embankment crest lift to EL. 6,450 ft. The tailings discharge elevation will have reached EL. 6,394 ft and the pond will be approximately EL. 6,374 ft. The extensive beaches will be maintained, and the beach configuration will lengthen from the discharge points incrementally. Development of the rock disposal site located at the toe of the North-South Embankment will commence.

6.4 YEAR 2031

The Year 2031 arrangement shown on Figure 6.3 represents the completion of filling of the impoundment. The embankment crest will remain at EL. 6,450 ft with tailings discharge along the beaches at EL. 6,445 ft. The extensive sloping beaches will provide freeboard and the pond will be near EL. 6,428 ft. The rock disposal site downstream of the North-South Embankment will be fully constructed filling the majority of the area between the embankment and natural ground to the East. Final reclamation and closure activities will be underway to transition the facility to achieve end land-use objectives.



NOTES:

1. COORDINATE SYSTEM AND ELEVATIONS ARE BASED ON MINE GRID.

LEGEND:

- TAILINGS BEACH
- EMBANKMENT FILL
- ROCK DISPOSAL SITE
- MINE WATER
- TAILINGS DEPOSITION
- TAILINGS PIPELINE
- RECLAIM PIPELINE
- RECLAIM BARGE

SCALE A: 1500 0 1500 3000 4500 6000 7500 ft

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED
1	19MAY'17	ISSUED WITH REPORT	DDF	KJM/MJC	KJB

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YANKEE DOODLE TAILINGS IMPOUNDMENT

GENERAL ARRANGEMENT PLAN - 2018

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P/A NO. VA101-126/12

REF NO. 1

FIGURE 6.1

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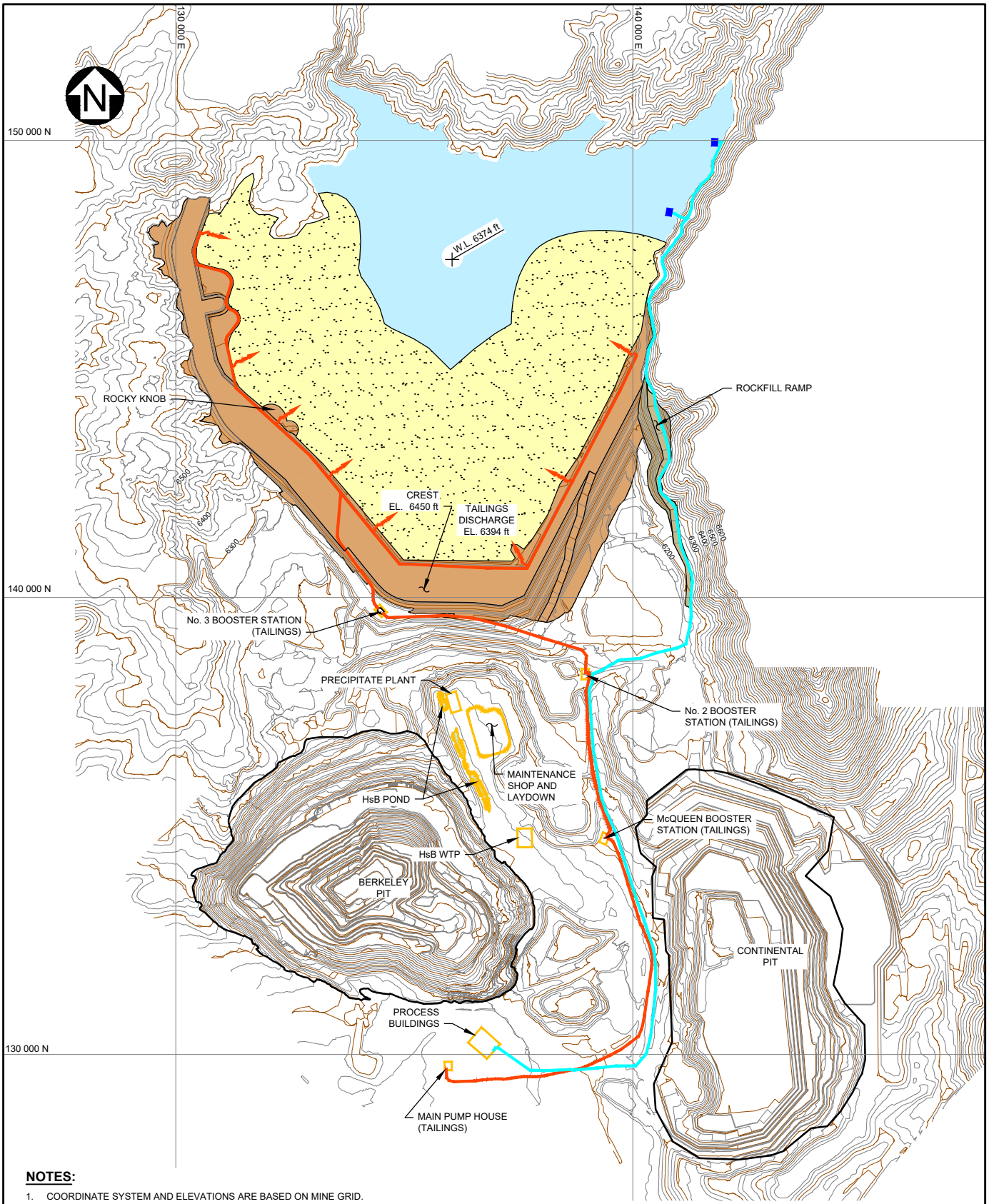

NOTES:

1. COORDINATE SYSTEM AND ELEVATIONS ARE BASED ON MINE GRID.

LEGEND:

- TAILINGS BEACH
- EMBANKMENT FILL
- ROCK DISPOSAL SITE
- MINE WATER
- TAILINGS DEPOSITION
- TAILINGS PIPELINE
- RECLAIM PIPELINE
- RECLAIM BARGE

SCALE A: 1500 0 1500 3000 4500 6000 7500 ft

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED
1	19MAY'17	ISSUED WITH REPORT	DDF	KJM/MJC	KJB

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YANKEE DOODLE TAILINGS IMPOUNDMENT

GENERAL ARRANGEMENT PLAN - 2022

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REF NO. 1

FIGURE 6.2

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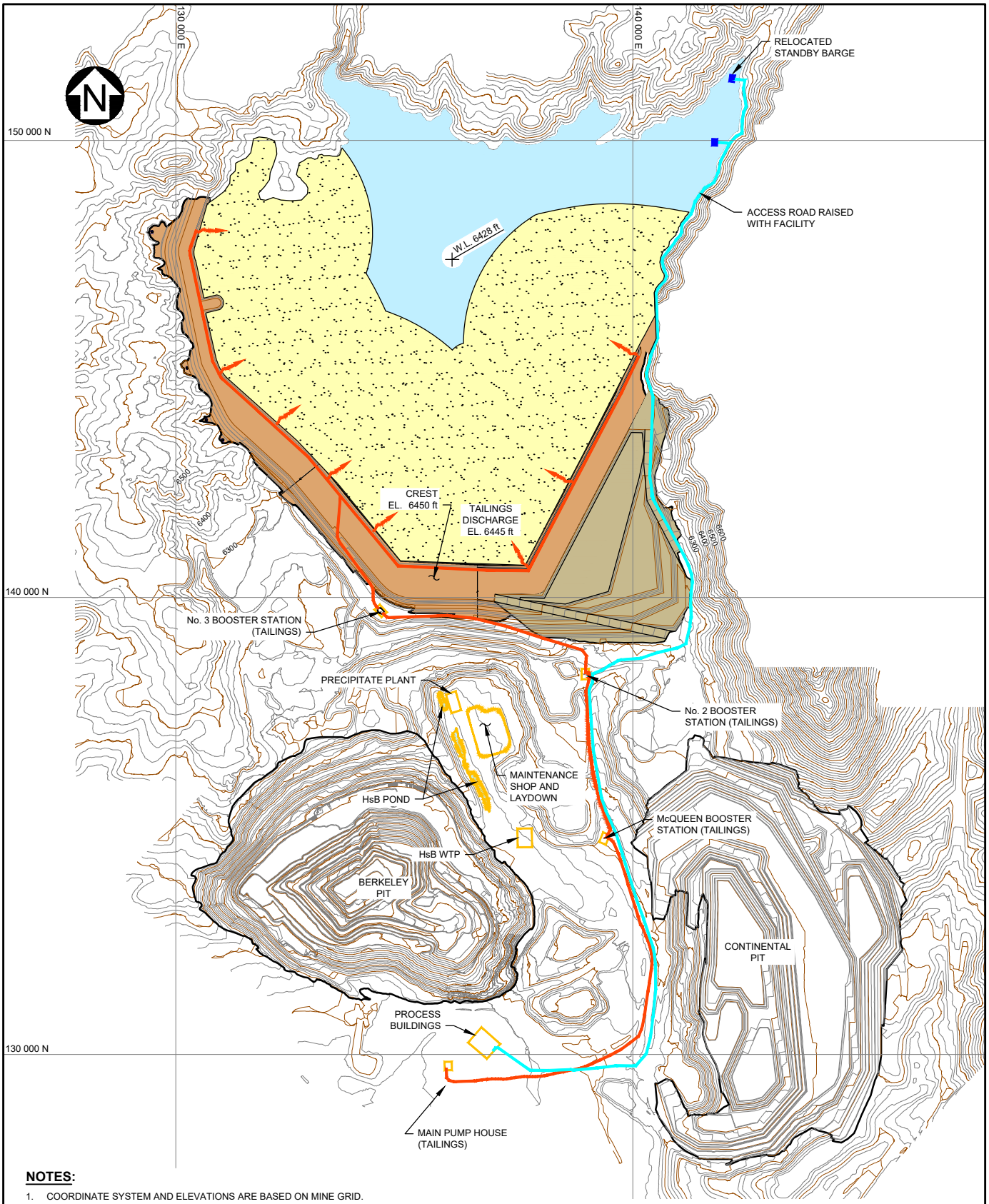

NOTES:

1. COORDINATE SYSTEM AND ELEVATIONS ARE BASED ON MINE GRID.

LEGEND:

- TAILINGS BEACH
- EMBANKMENT FILL
- ROCK DISPOSAL SITE
- MINE WATER
- TAILINGS DEPOSITION
- TAILINGS PIPELINE
- RECLAIM PIPELINE
- RECLAIM BARGE

SCALE A: 1500 0 1500 3000 4500 6000 7500 ft

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED
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YANKEE DOODLE TAILINGS IMPOUNDMENT

GENERAL ARRANGEMENT PLAN - 2031

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REF NO. 1

FIGURE 6.3

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7 – REFERENCES

Administrative Rules of Montana (ARM), 2015. Rule Chapter 17.24. Reclamation, Subchapter 1. Rules and Regulations Governing the Montana Hard Rock Mining Reclamation Act. Available at: http://www.mtrules.org/gateway/Subchapterhome.asp?scn=17%2E24.1

APEGBC, 2012. Professional Practice Guidelines – Legislated Flood Assessments in a Changing Climate in BC. Association of Professional Engineers and Geoscientists of British Columbia.

Al Atik, L. and Gregor, N., 2016. Seismic Hazard Assessment for the Yankee Doddle Tailings Impoundment Site, Butte, Montana.

Canadian Dam Association (CDA), 2007, revised 2013. Dam Safety Guidelines.

Canadian Dam Association (CDA), 2014. Technical Bulletin: Application of Dam Safety Guidelines to Mining Dams.

Canadian Dam Association (CDA), 2015. CDA – Revised Geotechnical Criteria, Memo by Small, A. and McLeod, H. ▲R2

Cathcart, J., 2001. "The Effects of Scale and Storm Severity on the Linearity of Watershed Response Revealed Through the Regional L-Moment Analysis of Annual Peak Flows." Ph.D. Thesis, Department of Forest Resources Management, University of British Columbia, Vancouver, BC, Canada.

Federal Emergency Management Agency (FEMA), 2004. Federal Guidelines for Dam Safety.

Federal Emergency Management Agency (FEMA), 2009. National Earthquake Hazard Reduction Program (NEHRP) Recommended Seismic Provisions for New Buildings and Other Structures, Building Seismic Safety Council, FEMA P-750, 2009 Edition.

Federal Emergency Management Agency (FEMA), 2013. Selecting and Accommodating Inflow Design Floods for Dams. US Department of Homeland Security, FEMA P-94, August 2013.

Federal Emergency Management Agency (FEMA), 2015. Federal Guidelines for Dam Safety Risk Management. US Department of Homeland Security, FEMA P-1025, January 2015.

Goldberg Geotechnical Consulting (Goldberg), 1990. Engineering Review: Yankee Doddle Tailings Dam, prepared for Montana Resources, Inc., July 31, 1990.

Hansen, E.M. and D. D. Fenn, P. Corrigan, J. L. Vogel, L. C. Schreiner and R. W. Stodt, 1994. Hydrometeorological Report No. 57 (HMR 57) - Probable Maximum Precipitation – Pacific Northwest States, National Oceanic and Atmospheric Service (NOAA), National Weather Service, Silver Spring, MD.

Harding Lawson Associates (HLA), 1993. Seismic Stability Evaluation: Yankee Doodle Tailings Dam, prepared for Montana Resources, April 9, 1993.

International Commission on Large Dams (ICOLD), 2010. Selecting Seismic Parameters for Large Dams: Guidelines, Bulletin 72 (Second Edition), 2010 Revision.

International Engineering Company, Inc. (IECO), 1981. Geotechnical and Hydrologic Studies: Yankee Doodle Tailings Dam, prepared for Anaconda Copper Company, August 1981.

IPCC, 2007. Climate Change 2007: Synthesis Report – Summary for Policy Makers. http://www.ipcc.ch/pdf/assessment-report/ar4/syr/ar4_syr_spm.pdf

Knight Piésold Ltd. (KP, 2017a). Yankee Doodle Tailings Impoundment, Site Characterization Report (KP Reference No. VA101-126/14-2), Vancouver, BC. ▲R2

Knight Piésold Ltd. (KP, 2017b). Yankee Doodle Tailings Impoundment, Stability Assessment Report (KP Reference No. VA101-126/12-2), Vancouver, BC. ▲R2

Liston and Sturm, 2004. The Role of Winter Sublimation in the Arctic Moisture Budget. Nordic Hydrology; 35 (4-5):325-334.

Miller, J.F., R.H. Frederick, R.J. Tracey, 1973. Precipitation-Frequency Atlas of the Western United States – Volume IX – Washington. National Oceanic and Atmospheric Administration, Washington, DC, USA.

Montana Resources (MR), 1999. Yankee Doodle Tailings Impoundment: Design and Construction, prepared by The Engineering and Geology Department, July 1997, revised March 1999.

Montana Code Annotated (MCA), 2015. Title 82: Minerals, Oil, and Gas, Chapter 4: Reclamation, Part 3: Metal Mine Reclamation. Accessed: November 2015. Available at: http://leg.mt.gov/bills/mca_toc/82_4_3.htm

NRCS, 2015. Natural Resources Conservation Service. US Department of Agriculture, Natural Water and Climate Center, http://www.wcc.nrcs.usda.gov/ SNOTEL.

United States Army Corps of Engineers (USACE), 1980. Phase 1 Inspection Report, National Dam Safety Program, Warm Springs Tailings Dams and Yankee Doodle Tailings Dam. Seattle District, U.S. Army Corps of Engineers, February 1980.

United States Army Corps of Engineers (USACE), 2015. National Inventory of Dams, Yankee Doodle Tailings Dam, NIDID MT01425. Accessed November 2015. Available at: http://nid.usace.army.mil/

United States Environmental Protection Agency (EPA), 1994. EPA Superfund Record of Decision: Silver Bow Creek / Butte Area, EPA ID: MTD980502777, Butte, MT, September 29, 1994.

U.S. Geological Survey (USGS), 1997. Regional Analysis of Annual Precipitation Maxima in Montana – Water-Resources Investigations Report 97-4004. Prepared in cooperation with Montana Department of Natural Resources and Conservation.

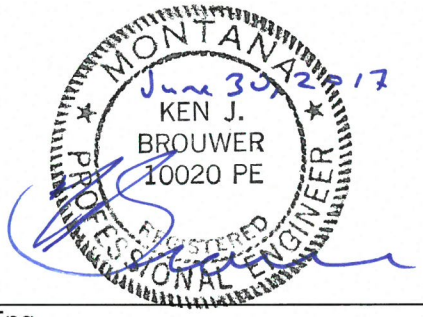
Western Regional Climate Center (WRCC). 2015. *Specialty Climate.* Available at: http://www.wrcc.dri.edu. Accessed August 2015.

8 – CERTIFICATION

This report was prepared and reviewed by the undersigned.

Prepared:

Daniel Fontaine, P.Eng.
Senior Civil Engineer | Associate



Reviewed:

Ken Brouwer, P.Eng.
President, Engineer of Record

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APPENDIX A

CLIMATE INPUTS

Appendix A1 Reference Climate Data
Appendix A2 Mean Climate Parameters
Appendix A3 Extreme Precipitation Estimates
Appendix A4 Return Period Snowpack

APPENDIX A1

REFERENCE CLIMATE DATA

(Pages A1-1 to A1-7)

Memorandum

May 6, 2016

To: Mr. Mark Thompson, Montana Resources LLP.
Bob Anderson, Hydrometrics
Roanna Stewart, Knight Piesold
Adrianne Yang, Golder

From: William M. Schafer, Schafer Limited LLC

Re: Reference Climatic Data for the Yankee Doodle Tailings Area near Butte, Montana

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Purpose and Scope

The purpose of this Memorandum is to describe the basis for selection of reference climate information used to characterize the Montana Resources LLP (MR) mine area near the Yankee Doodle Tailings (YDT). The YDT is located at an elevation of about 6,300 amsl (Figure 1) and is just northeast of Butte, Montana. The purpose of the climatic information is to assess potential hydrologic effects of the mine during operations and after closure. Methods used to assess hydrologic effects include but are not limited to water balance models, models evaluating the performance of soil Evapotranspiration or ET covers constructed on mine facilities to reduce infiltration of meteoric water, and calibration of groundwater and surface water flow models. Sufficient climate data is required to assess both historical and future variations in daily average precipitation, precipitation that occurs as snow, temperature, and potential evaporation and transpiration.

Climate Data Sources

Several sources of climate information were consulted as part of this effort including public data from the Western Regional Climate Center (WRCC 2016), and a water balance study performed by the Montana Bureau of Mines and Geology for MR in 2001 and 2002 (MBMG 2002). WRCC publishes data for most weather stations operated by the Federal government in the western US. Principal data sets acquired from WRCC included daily rainfall, snow, and maximum and minimum temperature from the Bert Mooney Airport (1895 to present) and Moulton Reservoir (1980 to 1986). More intensive data were obtained from a BLM station in Whitehall (2001 to present) for daily precipitation, maximum and minimum temperature plus relative humidity, solar radiation and wind speed. A summary of limited pan evaporation data was available for a few stations (Bozeman, Dillon and Canyon Ferry). The MBMG water balance provided the best available on-site evaporation data.

Two climate models were used to extrapolate climatic data in space and time: PRISM (2016) and CLIMGEN (WSU 2016). The PRISM model was developed at Oregon State University as a tool to spatially average meteorological data accounting for orographic and rain-shadow effects. PRISM was used to account for location adjustments in precipitation data between the airport and Butte and the YDT, a distance of a few miles and about 1,000 feet in elevation

gain. CLIMGEN was developed at Washington State University and allows site-calibrated meteorological data to be extrapolated in time, creating a continuous long-term synthetic data set.

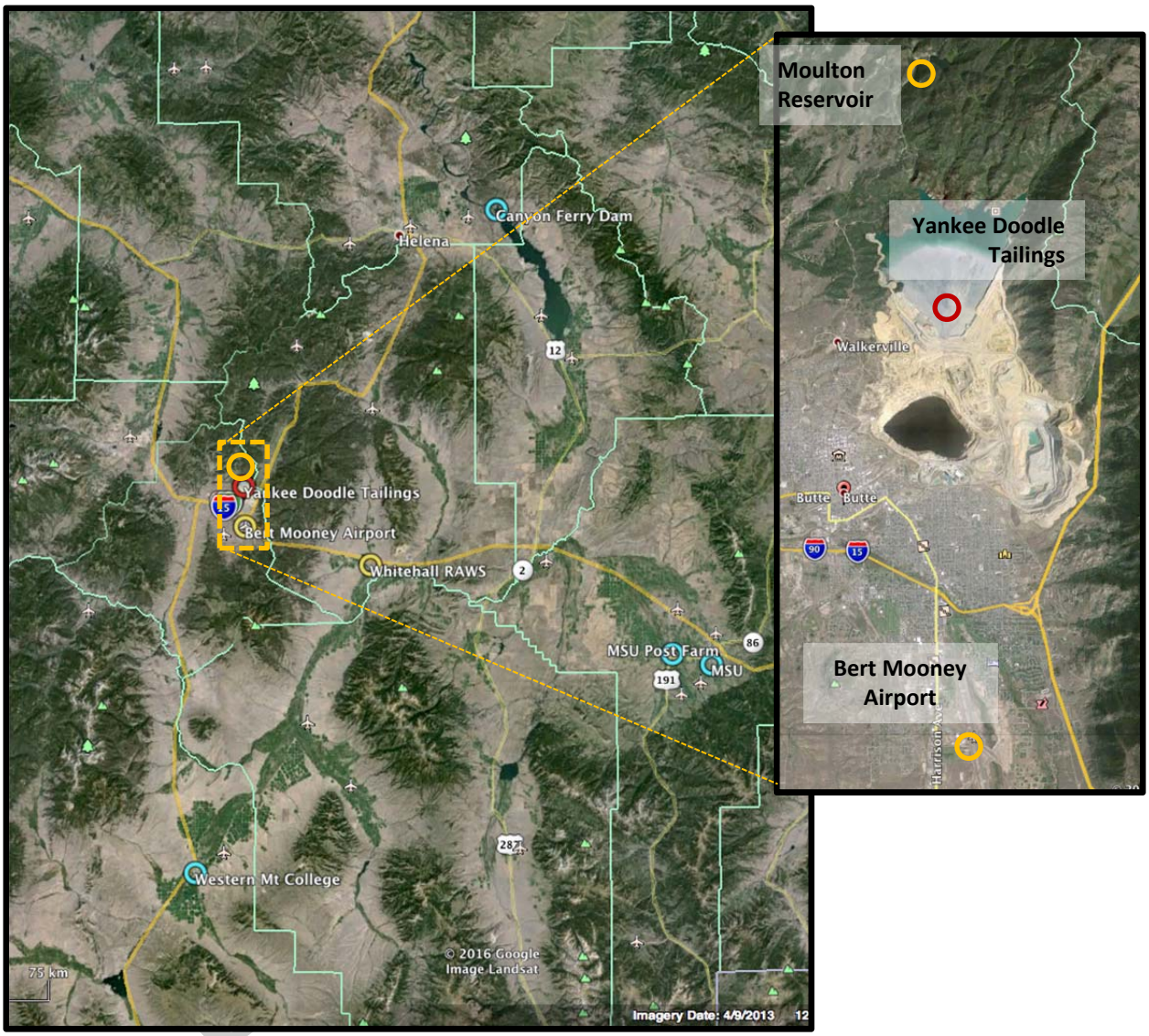


Figure 1. Location of climatic stations referenced in this report.

Approach

Development of a long-term climate data set for the YDT consisted of three steps,

- creation of a combined data set for the Bert Mooney Airport containing each of the necessary meteorological observations. Data were either collected at the airport location (precipitation and temperature) or were based on observations at nearby stations (solar radiation, relative humidity and wind from Whitehall),

- forecasting a long-term (200 year) synthetic data set (in CLIMGEN) representing daily average observations at the Airport, and

- adjusting the precipitation and evaporation estimates using PRISM to the YDT location.

Combined Climate Data for the Bert Mooney Airport

Daily average precipitation and maximum and minimum temperature data for January 1, 1915 to December 3, 2015 from the Bert Mooney Airport (Table 1) were combined with solar radiation, minimum and maximum relative humidity and wind speed from Whitehall for May 2001 to December 3, 2015. This combined data set was then modeled to extrapolate the data in time and spatially to adjust for elevation differences between the airport and the YDT area.

Temporal Extrapolation of a Synthetic Daily Climate Record

The CLIMGEN model uses statistical algorithms to simulate daily and seasonal rainfall and temperature distributions and can then use the site-specific statistical coefficients to extrapolate long-term climate records. All climatic parameters had an adequate period of record to facilitate analysis in CLIMGEN. A 200 year daily data set was created in CLIMGEN representing conditions at the Bert Mooney airport. Monthly precipitation matched closely for the airport data and the synthetic data (Figure 2). The distribution of annual rainfall for 100 years of actual data at the airport were compared to the synthetic data series in Figure 3. The annual rainfall quantities were ranked from smallest to largest and were normalized as a cumulative frequency distribution. The minimum (7 inches) maximum (20 inches) annual precipitation and the median (12.5 inches) were similar for actual and synthetic data. The synthetic data had fewer dry (< 10 inch) and wet (15 inch) rainfall years than the actual record.

Preliminary

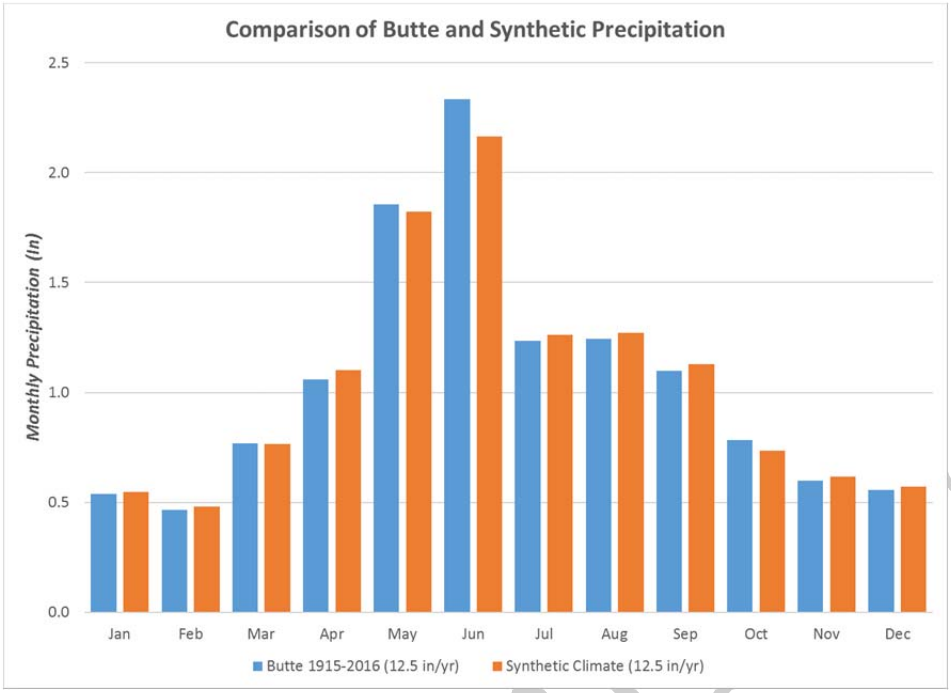


Figure 2. Comparison of monthly precipitation at Bert Mooney Airport to synthetic data.

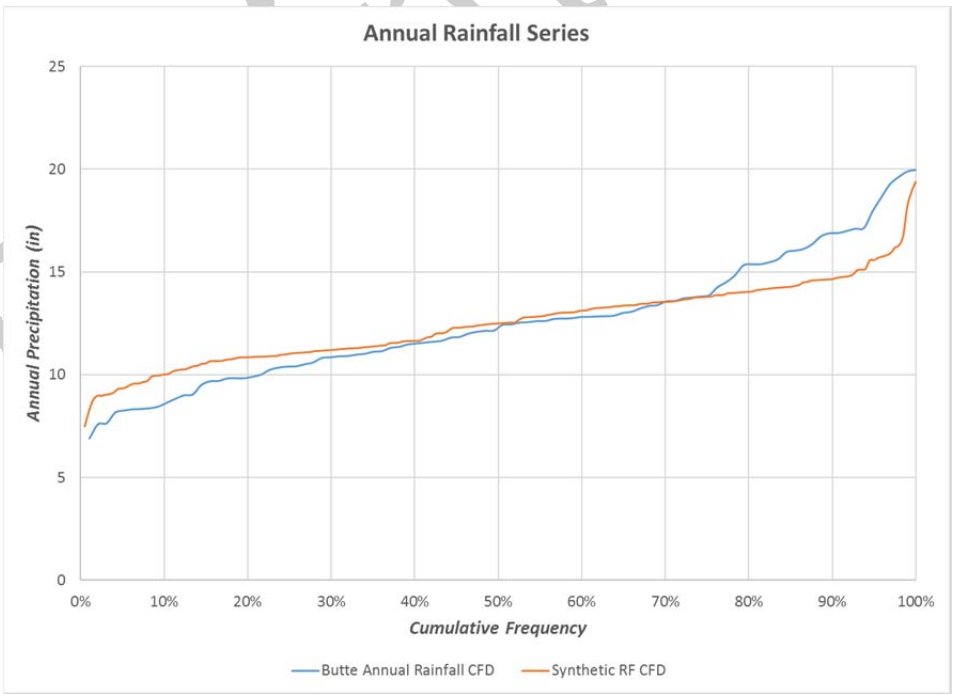


Figure 3. Comparison of annual precipitation at Bert Mooney Airport to synthetic data.

Spatial Adjustment of Climatic Data to YDT Area

The PRISM model was used to correct precipitation data by assessing predicted monthly precipitation at the airport versus the YDT area for a 20-year period of record. Estimated precipitation at YDT was divided by the Butte estimates to develop monthly correction coefficients (Table 1). Average annual precipitation at the YDT was found to be 15.92 inches compared to 12.47 inches at the airport. Differences were greatest in winter when frontal weather systems dominate and were smallest in summer when most rainfall occurs from convective storms. PRISM does not provide a means of adjusting evapotranspiration so ET calibration is discussed in the next section.

Estimating Reference Evapotranspiration

Direct observations of pan evaporation were only available from stations that were more than 60 miles from Butte and were not considered representative. On-site evaporation data collected from MBMG were infrequently recorded for a single year and did not provide adequate temporal detail to create a long-term daily climate record. Therefore, the Penman-Monteith equation (PME, Eqn [1]) was used to predict annual reference evapotranspiration for the Butte airport (FAO 2006).

The PME is widely used to estimate monthly evapotranspiration from a reference surface consisting of well-irrigated grass maintained at a canopy height of 12 cm. Evapotranspiration from irrigated grass will differ from pan evaporation or evaporation from a pond so adjustments are usually required. Since the magnitude of differences vary seasonally, monthly coefficients are often used to equate PME estimates to free water loss from ponds or lakes.

$$\lambda ET = \frac{\Delta(R_n - G) + \rho_a c_p \dfrac{(e_s - e_a)}{r_a}}{\Delta + \gamma\left(1 + \dfrac{r_s}{r_a}\right)} \qquad [1]$$

where Rn is the net radiation, G is the soil heat flux, (e_s - e_a) represents the vapor pressure deficit of the air, ρ_a is the mean air density at constant pressure, c_p is the specific heat of the air, Δ represents the slope of the saturation vapor pressure temperature relationship, γ is the psychrometric constant, and r_s and r_a are the (bulk) surface and aerodynamic resistances.

Estimated annual ET was 44 inches using the PME, which is slightly higher than the regional pan evaporation stations which averaged 36.8 inches from April to October. Pan evaporation data was not recorded for November through March and water loss for these months was estimated to be about 0.5 mm/d or 0.5 inches per month (Allen 1996). Data from Allen for snow cover conditions were mostly used to derive estimated sublimation.

Preliminary

MBMG also installed a Class A Evaporation Pan just north of the YDT, which recorded 36.6 inches of evaporation for March 2001 to October 2002. Class A pans are known to over-predict evaporation from lakes and reservoirs due to temperature and humidity effects. A pan coefficient of 0.7 is often used to adjust pan readings (Dunne and Leopold 1978) (Table 1). An estimated sublimation rate of 0.5 inches per month was used for the November-March time frame. Monthly coefficients were developed to adjust from the PME estimates to estimate estimated free water surface loss. The coefficients are low in winter and spring and increase through the summer and early fall time frame (Table 1). This seasonality is attributed to gradual warming of the pan through the year that tends to increase evaporation rate. The adjusted free water annual evaporation for the YDT area is 28.1 inches

Monthly average solar radiation, minimum and maximum relative humidity and wind speed are provided in Table2. A spreadsheet containing daily estimated values for precipitation, free water evaporation, temperature, solar radiation, relative humidity and wind speed are available upon request.

Table 1. Monthly average precipitation and evaporation for Bert Mooney Airport and YDT.

Month	Butte Airport Precipita-tion (in) 1915-2015	Multiplier derived from PRISM to convert from airport to YDT	Estimated Average Precipit-ation (in) at YDT	Poten-tial ET from PME (in)	Multiplier to adjust Potential ET from PME to Free Water Loss at YDT	Potential Free Water Evaporation adjusted to YDT (in)
Jan	0.55	224%	1.22	1.48	34%	**0.5**
Feb	0.48	200%	0.96	1.73	29%	**0.5**
Mar	0.77	138%	1.06	2.65	19%	**0.5**
Apr	1.10	133%	1.47	3.72	57%	2.12
May	1.82	117%	2.14	5.06	58%	2.95
Jun	2.17	103%	2.22	6.02	61%	3.70
Jul	1.26	121%	1.53	6.86	79%	5.43
Aug	1.27	87%	1.11	5.97	83%	4.93
Sep	1.13	135%	1.52	4.32	77%	3.34
Oct	0.74	144%	1.06	3.00	105%	3.16
Nov	0.62	101%	0.63	1.87	27%	**0.5**
Dec	0.57	174%	0.99	1.41	35%	**0.5**
Annual	**12.47**		**15.92**	**44.08**		**28.13**

Preliminary

Table 2. Monthly average temperature, solar radiation, relative humidity and wind speed for YDT area.

Month	Daily Maximum Temperature (Celsius)	Daily Minimum Temperature (Celsius)	Average Daily Solar Radiation (MJ/m^2)	Average Maximum Relative Humidity (%)	Average Minimum Relative Humidity (%)	Average Wind Speed (m/s)
Jan	-1.0	-14.7	6.7	95.2	30.5	3.6
Feb	1.6	-12.3	10.4	93.5	31.2	3.3
Mar	5.1	-8.4	14.8	91.1	31.1	3.5
Apr	10.4	-3.5	19.3	90.4	33.2	3.2
May	15.8	1.2	22.0	88.5	34.2	2.8
Jun	20.5	5.0	24.7	85.1	32.8	2.6
Jul	26.2	7.6	25.7	80.6	26.0	2.3
Aug	26.0	6.9	21.9	79.3	23.5	2.2
Sep	19.9	2.3	17.4	82.6	26.7	2.3
Oct	12.9	-2.8	11.5	87.4	29.6	2.8
Nov	4.4	-9.1	7.4	90.5	31.0	3.3
Dec	-0.3	-13.7	5.6	94.7	30.8	3.2
Annual Average	**11.8**	**-3.4**	**15.6**	**88.2**	**30.0**	**2.9**

Preliminary

References

Allen, R.G. 1996. Nongrowing Season Evaporation in Northern Utah. In Proceedings North American Water and Environment Congress, ASCE, Anaheim, CA, 1996

Dunne, Thomas and Luna B. Leopold. 1978. Water in Environmental Planning. Macmillan Publishers.

FAO. Revised 2006. FAO Irrigation and Drainage Paper No. 56. Crop Evapotranspiration. Rome.

PRISM Climate Group, Oregon State University, http://prism.oregonstate.edu, created 4 Feb 2004

MBMG. 2002. Water Budget for the Yankee Doodle Tailings Pond. Draft report from MBMG to Montana Resources LLP.

WRCC. 2016. Western Regional Climate Center historical climatic data. http://www.wrcc.dri.edu

WSU. 2016. CLIMGEN http://sites.bsyse.wsu.edu/cs_suite/ClimGen/help/index.htm

APPENDIX A2

MEAN CLIMATE PARAMETERS

(Pages A2-1 to A2-3)

MEMORANDUM

To:	Mr. Daniel Fontaine	Date:	February 1, 2016
Copy To:	Mr. Ken Brouwer	File No.:	VA101-00126/12-A.01
From:	Alana Shewan	Cont. No.:	VA15-03327
Re:	Mean Monthly Climate Parameters		

This memorandum has been prepared to present the average climate conditions for the Yankee Doodle Tailings Impoundment (YDTI) that will be used for the Montana Resources (MR) Amendment 10 Design Document application. The climate inputs were developed using the data measured at the Butte Bert Mooney Airport (1895 – 2014), which are available from the Western Regional Climate Center (WRCC) website and the National Oceanic and Atmospheric Administration (NOAA) Climatic Data Center website. The Butte Bert Mooney Airport is located approximately 5.5 miles south of the YDTI at an elevation of approximately 5,500 ft (NOAA). The climate conditions at the airport are assumed to be representative of the climate conditions at the YDTI due to their close proximity and being in the same geographical setting, therefore orographic effects are expected to be minimal.

The mean and extreme monthly temperature values are presented in Table 1.

Table 1 Mean and Extreme Temperatures

Parameter	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Mean Temperature (°F)	15.2	19.4	27.3	37.7	47.3	56.1	65.0	62.9	52.1	41.0	26.9	17.3	39.0
Standard Deviation (°F)	7.6	6.7	5.9	4.1	3.5	3.5	3.1	3.0	3.8	3.9	5.7	6.1	-
Daily Maximum Temperature (°F)	28.0	32.7	41.9	48.3	57.4	66.0	72.0	69.5	60.0	49.5	40.2	31.6	-
Daily Minimum Temperature (°F)	-11.7	-0.6	14.2	22.1	39.0	48.5	55.3	55.7	40.0	32.1	8.7	-1.1	-
Extreme Maximum Temperature (°F)	57.8	62.2	71.2	86.6	94.4	102.2	104.4	104.4	97.8	88.8	72.2	67.8	104.4
Year	2005	1995	1994	1910	1919	1988	1936	2000	2000	2010	1999	1917	2000
Extreme Minimum Temperature (°F)	-58.8	-63.4	-45.6	-23.4	4.4	18.8	25.6	20.0	-2.2	-31.2	-52.2	-63.4	-63.4
Year	1937	1933	1948	1982	1975	1916	1971	1992	1926	1991	1959	1983	1983

The mean monthly precipitation and evaporation values are presented in Table 2.

Table 2 Mean Monthly Precipitation and Evaporation

Parameter	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Precipitation (in)	0.6	0.5	0.8	1.1	1.9	2.3	1.2	1.2	1.1	0.8	0.6	0.6	**12.7**
Rainfall Fraction (%)	0	0	0	30	80	100	100	100	90	54	0	0	**-**
Rainfall (in)	0	0	0	0.3	1.5	2.3	1.2	1.2	1.0	0.4	0	0	**8.1**
Snowfall (SWE in)	0.6	0.5	0.8	0.8	0.4	0	0	0	0.1	0.4	0.6	0.6	**4.7**
Sublimation (in)	0.13	0.13	0.13	0.13	0	0	0	0	0	0.13	0.13	0.13	**0.9**
Snowmelt (%)	0	10	50	40	0	0	0	0	0	0	0	0	**100**
Pond Evaporation (in)	0	0	0.2	1.1	2.5	3.6	4.8	4.2	2.5	1.2	0.1	0	**20.2**

The long-term mean annual precipitation is estimated to be 12.7 in. The fractions of rainfall and snowfall to precipitation were based on the long-term monthly average snowfall records (1894 – 2000) and assuming a snow water equivalent (SWE) of 10%. It was assumed that precipitation falls exclusively as rain from June through August, as snow from November through March, and that a mix of rain and snow occurs during the months of April, May, September and October.

Sublimation is the process by which moisture is returned to the atmosphere directly from snow and ice without passing through the liquid phase (Liston and Sturm, 2004). In areas where winter precipitation comprises a large proportion of annual precipitation, sublimation can play a significant role in the annual water balance. For example, Liston and Sturm (2004) estimate that sublimation can result in the loss of 10% - 50% of the total winter snowfall in Arctic regions. The YDTI is not situated in an Artic region; however, snowfall does account for approximately 37% of the total precipitation, and the YDTI may be subjected to high winds that often result in blowing snow, which accordingly aids in sublimation. The sublimation for YDTI was therefore assumed to be 20% of the total winter snowfall and is equal to 0.9 in per year. Sublimation losses have been distributed evenly from October through to April.

The potential evapotranspiration (PET) was calculated using the empirical Thorthwaite equation and the long-term measured temperature record for Butte airport (1895 – 2015). The mean annual PET, which is considered to be approximately equal to pond evaporation, was calculated to be 20.2 inches. Previously, the Draft Remedial Investigation Report for the Butte Mine Flooding Operable Unit (BMFOU) Remedial Investigation presented the annual evaporation for the mine site as 23.75 in (Canonie Environmental Services, 1994). This information was based on only six months of measured evaporation pan data for the Moulton Reservoir from the Montana College of Mineral Science and Technology (Canonie Environmental Services, 1994). The Thorthwaite estimate is based on long-term measured data and was therefore selected to represent the long-term PET for the YDTI. The corresponding monthly calculations are presented in Table 2.

The potential effects of climate change are not considered in the above analysis since historical climate records do not necessarily represent possible future conditions. The purpose of this memorandum was to characterize existing climate conditions; therefore a climate change analysis was not completed.

We trust that this information is suitable for providing mean monthly estimates of climate data for the Amendment 10 Design Document application. Please contact the undersigned if you have any questions or concerns.

Prepared:

Alana Shewan, MASc., P.Eng. – Senior Engineer

Reviewed:

Jaime Cathcart, Ph.D., P.Eng. – Specialist Hydrotechnical Engineer | Associate

Approval that this document adheres to Knight Piésold Quality Systems:

References:

Canonie Environmental Services Corp. 1994. Butte Mine Flooding Operable Unit Remedial Investigation/Feasibility Study – Draft Remedial Investigation Report. Prepared for ARCO.

Liston and Sturm, 2004. The Role of Winter Sublimation in the Arctic Moisture Budget. Nordic Hydrology; 35 (4-5):325-334.

/as

APPENDIX A3

EXTREME PRECIPITATION ESTIMATES

(Pages A3-1 to A3-3)

MEMORANDUM

To:	Mr. Daniel Fontaine	Date:	February 1, 2016
Copy To:	Mr. Ken Brouwer	File No.:	VA101-00126/12-A.01
From:	Alana Shewan	Cont. No.:	VA15-03332
Re:	Montana Resources – Extreme Precipitation Estimates		

This memorandum presents the methodology used for estimating the extreme precipitation events for the Yankee Doodle Tailings Impoundment (YDTI) that will be used for the Montana Resources (MR) Amendment 10 Design Document application. This document presents values for 24 hr events with return periods of 2, 5, 10, 25, 50, 100, 200, and 1,000 years only – the probable maximum precipitation (PMP) estimations are presented in Knight Piésold's (KP) letter titled "Review of the PMF Estimate for the Yankee Doddle Tailings Impoundment" (KP, 2015).

Annual extreme precipitation data for YDTI were determined from daily precipitation data from Butte Bert Moody Airport (1895 – 2014), which are available from the National Oceanic and Atmospheric Administration (NOAA) Climatic Data Center website. The daily values were converted to equivalent 24 hour events using a standard scaling factor of 1.13 (Miller et al., 1973) and then plotted on Figure 1. This was done since daily precipitation accumulations represent a fixed 24 hour observation interval; therefore, these data may underestimate the precipitation that can accumulate in any 24 hour period. The result is a mean annual 24 hour extreme precipitation of 1.13 inches with a standard deviation of 0.43 inches.

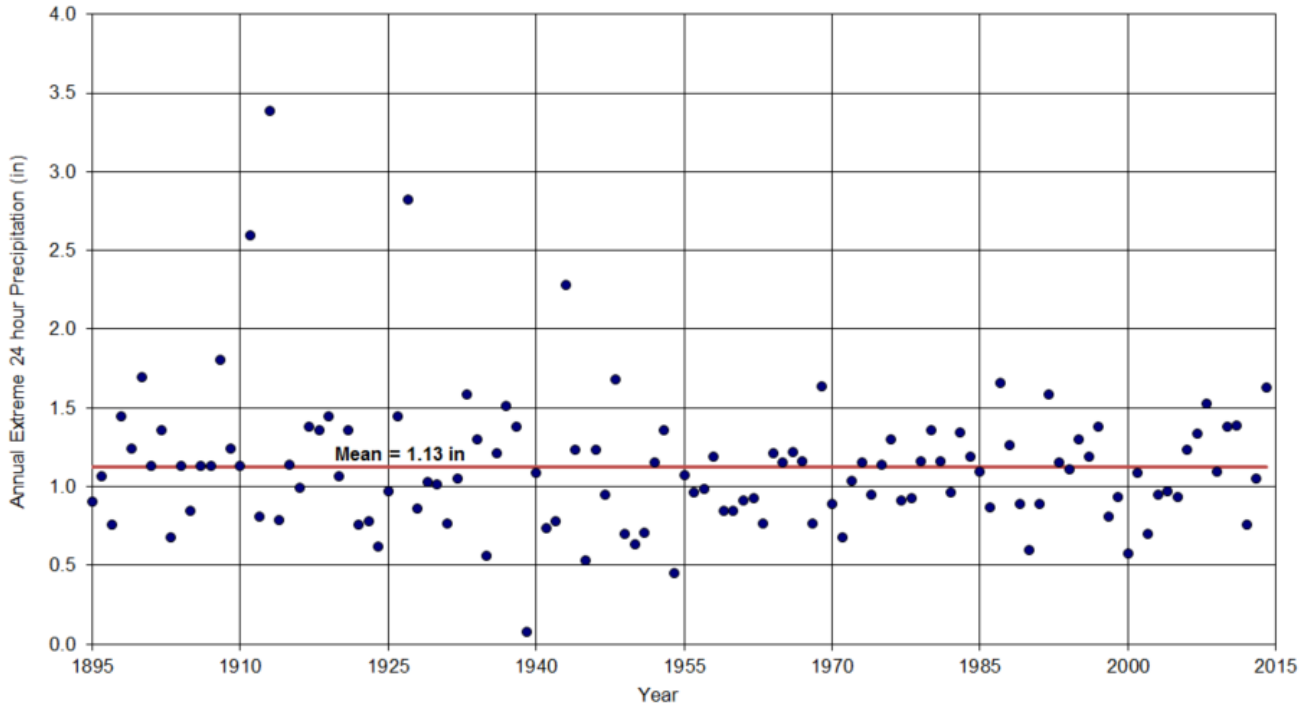


Figure 1 Annual 24 Hour Extreme Precipitation

The various return period 24 hour precipitation events were determined using a Log-Pearson Type III distribution and are summarized in Table 1. The Log-Pearson Type III probability curve and the observed data are shown on Figure 2.

Table 1 Estimated Extreme 24 Hour Precipitation Events

	2 yrs	5 yrs	10 yrs	25 yrs	50 yrs	100 yrs	200 yrs	1000 yrs
Log-Pearson Type III (inches)	1.0	1.4	1.7	2.0	2.3	2.6	2.9	3.7
USGS Report 97-4004 (inches)	1.0	1.5	1.7	-	2.3	2.5	2.8	3.4
YDTI Project[(1)] (inches)	1.0	1.5	1.7	2.0	2.3	2.6	2.9	3.7
+ Climate Change (inches)	**1.2**	**1.7**	**1.9**	**2.3**	**2.6**	**2.9**	**3.3**	**4.2**

NOTES:

1. YDTI Project precipitation selected as the maximum between the Log-Pearson Type III and USGS Report 97-4004 values.

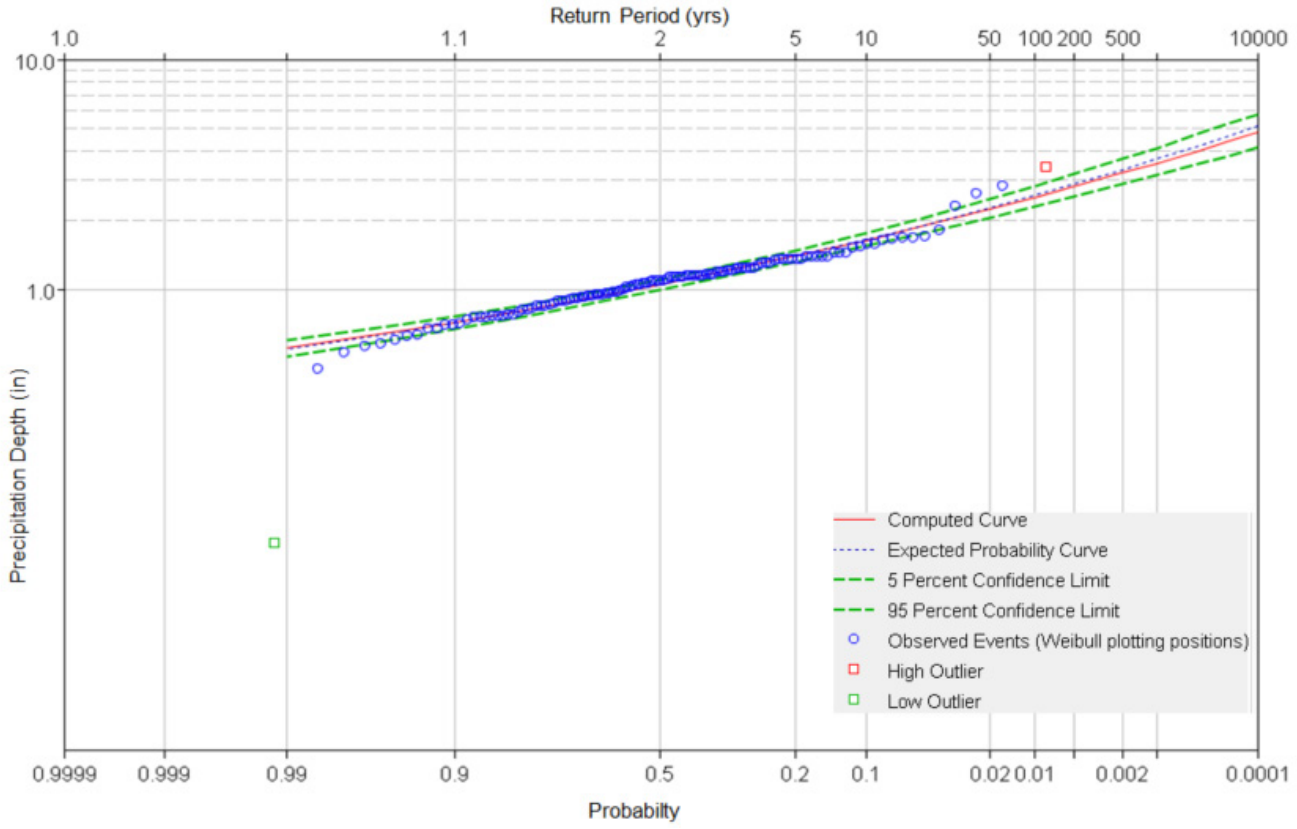


Figure 2 Log-Pearson Type III Frequency Distribution

It can be noted on Figure 2 that the four largest events on record all plot above the 95% confidence limit, which suggests that the curve may underestimated the larger return period events. However, the plot on Figure 1 indicates that all four events occurred in a relatively short 33 year period between 1911 and 1943, inclusive, and that the largest three events, which all register as having return periods of at least 100 years, all occurred in a 17 year period between 1911 and 1927. This clustering of the events, and the fact that they all occurred relatively early in the data record when data collection techniques were more rudimentary than they are today, suggests that one or more of them may be erroneous.

Extreme precipitation depths for 24 hour storm events were also obtained from the “Regional Analysis of Annual Precipitation Maxima in Montana – Water Resources Investigation Report 97-4004” prepared by the U.S.

Geological Survey (USGS, 1997). These values are also summarized in Table 1. The design rainfall depths for the project were selected as the maximum between the USGS and Log-Pearson Type III distribution curve values, and are summarized in Table 1.

The potential effects of climate change are not directly considered in the above analysis since historical climate records do not necessarily represent possible future conditions. The general scientific consensus is that climate change is likely to cause increased temperatures and an increased frequency and intensity of rain storms in Montana (IPCC, 2007), which for the YDTI translates into an increased likelihood of both heavy precipitation events and smaller winter snowpack depths. Climate change is addressed by increasing the design storm depths by 15%, as this is a generally recommended factor for accounting for climate change effects on peak flow estimates (APEGBC, 2012). The various return period 24 hour precipitation events accounting for climate change and are summarized in Table 1.

We trust that this information meets your current requirements. Please contact the undersigned with any questions or comments.

Prepared:

Alana Shewan, MASc., P.Eng. – Senior Engineer

Reviewed:

Jaime Cathcart, Ph.D., P.Eng. – Specialist Hydrotechnical Engineer / Associate

Approval that this document adheres to Knight Piésold Quality Systems:

References:

APEGBC, 2012. Professional Practice Guidelines – Legislated Flood Assessments in a Changing Climate in BC. Association of Professional Engineers and Geoscientists of British Columbia.

IPCC, 2007. Climate Change 2007: Synthesis Report – Summary for Policy Makers. http://www.ipcc.ch/pdf/assessment-report/ar4/syr/ar4_syr_spm.pdf

Knight Piésold Ltd, 2015. Review of the PMF Estimate for the Yankee Doodle Tailings Dam, Ref: VA15-03210, October 2, 2015.

Miller, J.F., R.H. Frederick, R.J. Tracey, 1973. Precipitation-Frequency Atlas of the Western United States – Volume IX – Washington. National Oceanic and Atmospheric Administration, Washington, DC, USA.

U.S. Geological Survey (USGS), 1997. Regional Analysis of Annual Precipitation Maxima in Montana – Water-Resources Investigations Report 97-4004. Prepared in cooperation with Montana Department of Natural Resources and Conservation.

/as

APPENDIX A4

ESTIMATES OF RETURN PERIOD SNOWPACK

(Pages A4-1 to A4-3)

MEMORANDUM

To:	Mr. Daniel Fontaine	Date:	February 2, 2016
		File No.:	VA101-00126/12-A.01
From:	Jaime Cathcart	Cont. No.:	VA16-00129
Re:	Montana Resources – Estimates of Return Period Snowpack		

This memorandum presents the methodology used to estimate return period annual maximum snowpack values for the basin draining into the Yankee Doodle Tailings Impoundment (YDTI). The estimated snowpack values are provided in Table 1 in terms of inches of snow water equivalent (SWE).

Table 1 Return Period Snowpack Estimates for the YDTI Watershed

Return Period	Frequency Factor	Maximum Snowpack SWE (in)
2	-0.164	6.8
5	0.838	8.9
10	1.495	10.2
15	1.866	11.0
20	2.126	11.6
25	2.326	12.0
50	2.943	13.3
100	3.554	14.6
200	4.210	15.9
500	5.001	17.6
1,000	5.576	18.8
10,000	7.580	23.0

NOTES:
1. SNOWPACK VALUES ARE PROVIDED IN TERMS OF SNOW WATER EQUIVALENT (SWE).
2. THE FREQUENCY FACTORS ARE FOR AN EXTREME VALUE TYPE 1 DISTRIBUTION WITH A SAMPLE SIZE OF 40.
3. THE COMPUTED VALUES WERE DERIVED ON THE BASIS OF HISTORICAL MAXIMUM ANNUAL SNOWPACK DATA FOR THE MOULTON RESERVOIR SNOW SURVEY STATION.

Historical maximum annual snowpack data from five snow survey sites operated by the US National Resource Conservation Service (NRCS) in the general vicinity of the YDTI were examined to determine maximum snowpack values for the YDTI watershed. The locations of these stations are shown on Figure 1. The most relevant station is Moulton Reservoir, which is located in the drainage basin of the YDTI at an elevation of 6,850 feet. This is the approximate median elevation of the basin. All of the regional stations shown are located at elevations between 6,600 feet and 7,700 feet.

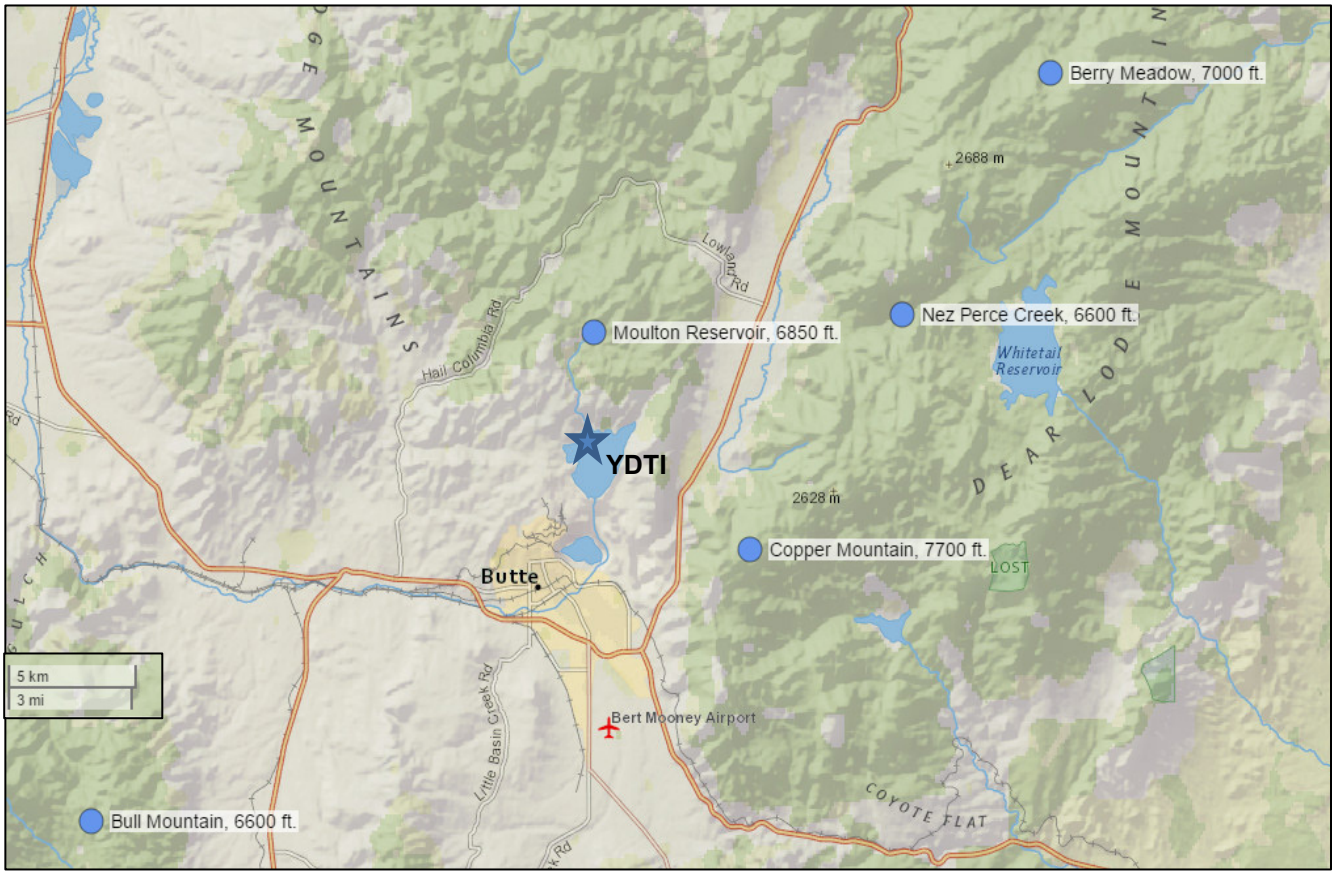


Figure 1 Regional Snow Survey Sites

A summary of the regional snowpack values is shown in Table 2. The data at all the stations are generally consistent, with the mean annual snowpack values ranging from approximately 6 to 11 inches. There appears to be a strong correlation between snowpack and basin elevation, with the highest station having the greatest snowpack and the lowest station having the smallest. The period of record values are very similar to those for the most recent 30 year climate normal period, although there is some indication of a slight trend of decreasing snowpack.

Table 2 Regional Annual Maximum Snowpack

Station				Annual Maximum Snowpack Statistics (SWE)					
Name	Number	Elevation (ft.)	Period of Record	Period of Record			1981-2010 Normal		
				mean (in.)	stdev (in.)	cv	mean (in.)	stdev (in.)	cv
Moulton Reservoir	12C20	6,850	1976 - 2015	7.1	2.1	0.30	7.1	2.2	0.31
Copper Mountain	12C21	7,700	1961 - 2015	11.7	3.0	0.26	11.0	2.8	0.25
Nez Perce Creek	12C22	6,600	1961 - 2015	6.8	2.3	0.34	5.9	1.8	0.31
Berry Meadow	12C23	7,000	1961 - 2012	7.5	2.5	0.33	6.4	1.7	0.27
Bull Mountain	12D08	6,600	1974 - 2015	6.2	2.3	0.37	5.7	2.1	0.37

Given that the Moulton Reservoir station is located in the YDTI drainage near the mid-elevation point, that it has a long period of record, and that the regional snowpack values are reasonably consistent through time and by location, the Moulton Reservoir snowpack values were selected as the most appropriate basis for estimating basin average snowpack conditions in the YDTI basin. The computed mean (7.1 inches) and standard deviation (2.1 inches) values were fit to an Extreme Value Type 1 distribution using a frequency factor approach, with the factors selected according to the sample size of 40 years. This distribution is commonly applied to extreme event datasets for hydrometeorological parameters including flow, rainfall and snowpack. The results indicate a 10 year annual maximum snowpack value of 10.2 inches and corresponding 100 year and 10,000 year values of 14.6 inches and 23.0 inches, respectively.

Prepared: PROFESSIONAL ENGINEER PROVINCE OF BRITISH COLUMBIA J. G. CATHCART Feb. 2, 2016

Jaime Cathcart, Ph.D., P.Eng. – Specialist Hydrotechnical Engineer | Associate

Reviewed:

Alana Shewan, MASc., P.Eng. – Senior Engineer

Approval that this document adheres to Knight Piésold Quality Systems:

/jc

APPENDIX B

DESIGN STORM EVENT EVALUATION

Appendix B1 Review of the PMF Estimate for the Yankee Doodle Tailings Impoundment
Appendix B2 Review of PMF Estimate in Light of Recommendations in the Extreme Storm Working Group Summary Report

APPENDIX B1

REVIEW OF THE PMF ESTIMATE FOR THE YANKEE DOODLE TAILINGS IMPOUNDMENT

(Pages B1-1 to B1-7)

March 10, 2016

File No.:VA101-00126/12-A.01
Cont. No.:VA15-03210

FS 64925
EMS 550121
OHS 550122

Mr. Mark Thompson
Environmental Manager
Montana Resources, LLP
600 Shields Avenue
Butte, Montana
USA, 59701

Dear Mark,

Re: Review of the PMF Estimate for the Yankee Doodle Tailings Impoundment

BACKGROUND AND SUMMARY

Montana Resources, LLP (MR) is required by State law (MCA 82-4-376) to prepare a design document to support the proposal to expand the Yankee Doodle Tailings Impoundment (YDTI). The design document must include an evaluation of a design storm event for operations and closure conforming to engineering best practices for the type of facility proposed, including:

- A rationale for the selection of the design storm event
- The magnitude of the design storm event
- The magnitude of the runoff generated by the design storm event to and around the impoundment, and
- Evidence that the dynamic nature of climatology was considered.

The legislation indicates that for the expansion of an existing tailings storage facility of this size, the design must store or otherwise manage the Probable Maximum Flood (PMF) event with sufficient freeboard for wave action in addition to the maximum operating water level of the facility, or that the expansion does not reduce the tailings storage facility's ability to store or otherwise manage the original facility design storm or flood events.

A design storm event evaluation was completed that considered historical storm event analyses and several alternative durations and methods for determining the PMF. The selected design storm event was the 24 hour Probable Maximum Precipitation (PMP) combined with complete melt of the 1 in 100 year snowpack, and assuming full failure of the upstream reservoirs. The evaluation determined the PMF runoff volume to be 19,000 acre-ft, and concluded that this value was suitably conservative for determining the storm storage allowance for the YDTI.

The potential for climate change was addressed by increasing the PMF event for the closure phase by 15%, according to generally accepted engineering procedures (APEGBC, 2012). No adjustment was made to the PMF estimate for operations because of the relatively short period of operations. The PMF runoff volume for closure was increased to 20,000 acre-ft.

DESIGN STORM EVENT EVALUATION

The existing YDTI is not equipped with an emergency spillway during operations but rather relies on storage to manage the Inflow Design Flood (IDF). The IDF is defined by FEMA (2013) as "The flood hydrograph entering the reservoir that is used to design and/or modify a specific dam and its appurtenant works; particularly for sizing the spillway and outlet works, and for evaluating maximum storage, height of dam, and freeboard requirements." State law (MCA, 2015) prescribes that for the expansion of the YTDI, the IDF should be the PMF. There is no strict regulatory standard specifying how the PMF should be determined, other than that it should involve the PMP, with consideration of coincident snowmelt, if applicable.

The most recent design flood evaluation for the YDTI was completed in 2013 as part of the Failure Modes Analysis Information Summary Report (KP, 2013). The report summarized three different estimates of the PMF volume that had been developed for the YDTI over the years, as presented in Table 1, and suggested that increasing the design flood storage requirement from 16,500 acre-ft to 22,000 acre-ft may be appropriate.

Table 1 Previous PMF Volume Estimates

Study Date	PMF Basis	Basin Area	Runoff Volume	Additional Volume	Total PMF Volume	Comment
1981 (IECO)	**24 hour PMP + 30 day melt of 2 x mean annual snowpack** 24 hour PMP = 9.5 in 30 day melt of 2 x mean annual snowpack = 16.2 in net snowmelt = 16.2 in - 5.7 in (infiltration and evapotranspiration) = 10.5 in	total = 8,832 acres pond = 768 acres	9.5 in x 8832 acres + 10.5 in x (8832-768) acres = 14,048 acre-ft	Failed reservoirs 540 acre-ft	14,820 acre-ft	There appears to be a slight error in the calculated volume, but it is immaterial.
2010 (MR)	**24 hour PMP + 30 day melt of 2 x mean annual snowpack** 24 hour PMP = 16.5 in net snowmelt = 10.5 in	not available	15,960 acre-ft	Failed reservoirs 540 acre-ft	16,500 acre-ft	A substantial increase in the PMP resulted in only a minor increase in the PMF volume. Using the 1981 areas would result in a volume of 19,740 acre-ft.
2012 (KP)	**24 hour PMP + complete melt of 10 yr snowpack** 24 hour PMP = 14.4 inches 10 yr snowpack = 18 inches	total = 7,907 acres pond = 1,536 acres	21,460 acre-ft	Failed reservoirs 540 acre-ft	22,000 acre-ft	No distinction was made between snowmelt on the basin and on the pond. Assumed 100% runoff.

NOTES:

1. IECO = International Engineering Company Inc.; MR = Montana Resources; KP = Knight Piésold Ltd.
2. All snowpack values are provided as snow water equivalent (SWE).

The three estimates in Table 1 all followed the commonly accepted deterministic procedure of calculating the PMF based on the 24 hour PMP plus snowmelt. However, the estimated PMF volumes are substantially different due to differences in estimated basin areas and how the PMP and snowmelt values were determined. For instance, the PMP for the 1981 analysis was determined according to procedures established by NOAA and published in its Hydrometeorological Report No. 43 (HMR 43) (USWB, 1966), while for the 2010 and 2012 analyses it was determined according to procedures in Hydrometeorological Report No. 57 (HMR 57) (Hansen et al., 1994), which supersedes HMR 43. The 2010 and 2012 PMP values are different because of differences in how the PMP isohyetal map in HMR 57 was interpreted. For the snowmelt values, the 1981 and 2010 analyses used a different criterion than the 2012 analysis; they used twice the mean annual snowmelt less monthly infiltration and evapotranspiration, while the 2012 analysis used the melt of the 10 year snowpack.

There is a lack of agreement in professional practice about the appropriate duration of the PMP and the appropriate magnitude of the snowmelt that must be considered in determining the PMF. The duration of the PMP event is of concern since longer durations generally produce greater inflow volumes, and without a spillway and its associated discharge capability, this equates to greater pond volumes. A 48 hour PMP has a greater depth than a 24 hour PMP, and a 72 hour PMP has a greater depth than a 48 hour PMP, but there is no clear directive as to what storm duration is most appropriate. Similarly, the magnitude of the snowpack is of concern because a larger snowpack generally produce larger melt volumes.

The intent of adopting the PMF as the IDF 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 evaluated in this assessment in an effort to address the question of design storm adequacy and reasonableness. Probabilistic estimates were compared with the deterministic PMF flood volume estimates of

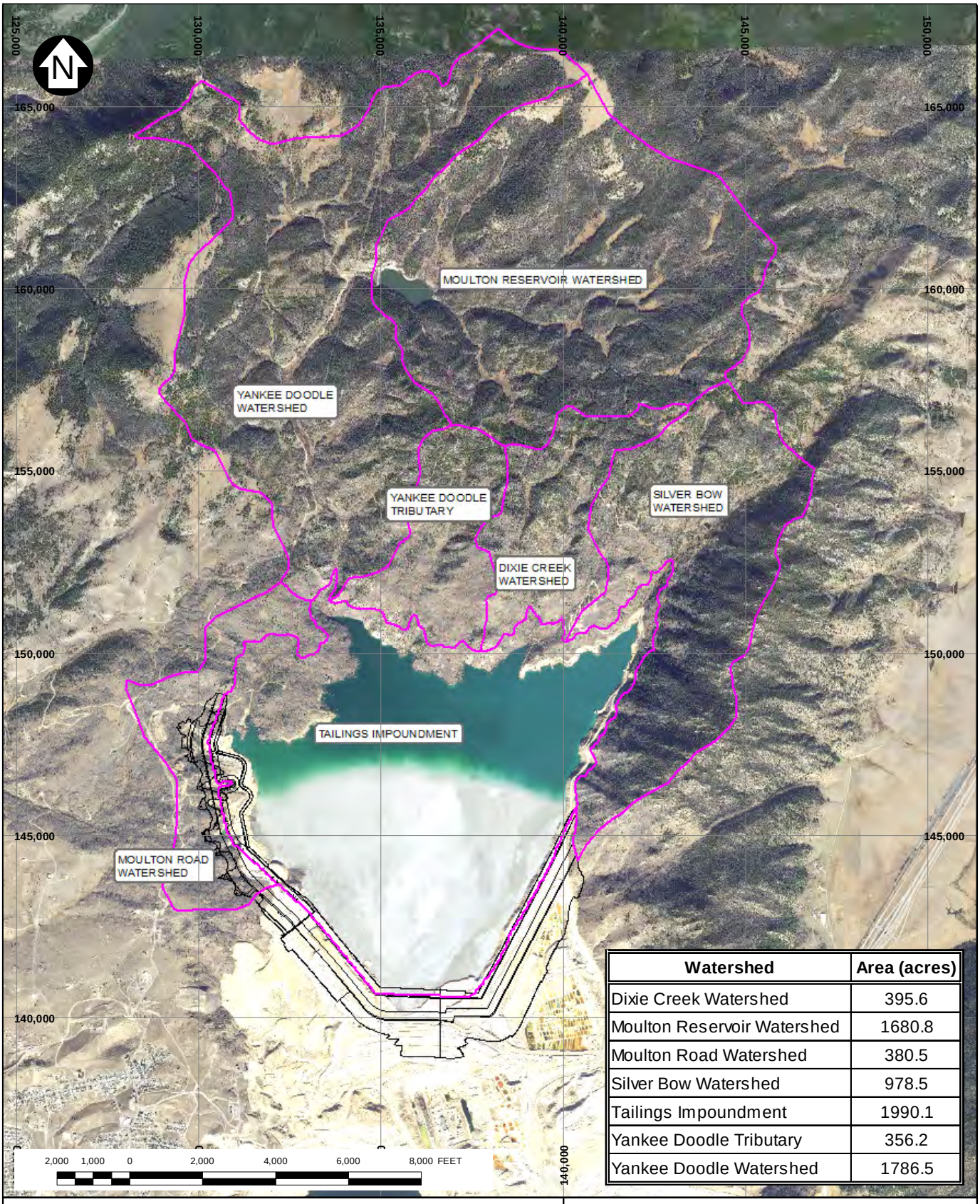
24 and 72 hour durations to see if there was any consistency in the values. This methodology was adopted to provide some historical context to the theoretical and deterministic PMP/PMF values. The computed values are summarized in Table 2, with all design storm volumes assuming 100% runoff from all areas. The catchment areas used in the analysis are delineated on Figure 1.

A brief description of each case is as follows:

- Case 1 is the 2012 PMF analysis by KP. It resulted in a design storm volume of 22,000 acre-ft. The snowpack estimate has since been updated (see Case 2) and the 2012 analysis is now considered obsolete.
- Case 2 includes an updated assessment of the 10 year snowpack snow water equivalent. A detailed review of the regional SNOTEL snowpack records (NRCS, 2015) and their relevance to the project site, particularly with regards to elevation, resulted in a substantially lower 10 year snow pack estimate and a corresponding reduction in the PMF volume.
- Case 3 uses the 100 year snowpack, rather than the 10 year snowpack, since the 100 year value is more commonly used. The 100 year value was estimated on the basis of the updated snowpack assessment, and it resulted in a 17% increase in the PMF volume relative to Case 2.
- Cases 4 and 5 use the 72 hour PMP rather than the 24 hour PMP, and are directly comparable to Cases 2 and 3. As discussed previously, the 72 hour PMP is sometimes used for determining storm freeboard for high hazard dams, but there is no strong rationale for its use in preference to the 24 hour PMP, other than it is more conservative from a dam safety perspective. Use of the 72 hour PMP results in an approximate 15% to 20% increase in the design storm volume over use of the 24 hour PMP.
- Case 6 represents an alternative method for computing the IDF, which emphasizes the snowmelt component as opposed to the rainfall component. The Canadian Dam Association's (CDA) Dam Safety Technical Bulletin: Hydrotechnical Considerations for Dam Safety (2007), suggest that the Spring PMF should be computed as the maximum of two cases:
    - *PMF computed with the spring PMP and snow accumulation with frequency of 1/100 year.*
    - *PMF computed with the Probable Maximum Snow Accumulation and a rainstorm with a frequency of 1/100 year.*

Note that there are no common methodologies for estimating the probable maximum snow accumulation, so the 10,000 year snowpack was computed as a surrogate. The design storm volume from this event is notably lower than those determined using the PMP.

- Case 7 represents a long duration low probability rainfall event. Despite the long duration, the storm volume amounts to only 30% to 40% of the PMF based estimates.
- Case 8 represents a long duration low probability runoff event. This runoff was calculated from the most applicable regional historical streamflow records available, and the range represents values from different streams. The values, which are all from the spring freshet period, are relatively low compared to the rainfall and snowpack values, and thereby suggest that abstraction and evaporation losses are extensive during extended high flow periods and that snowpack coverage is likely quite variable (primarily with elevation) throughout the regional watersheds.
- Case 9 represents the amount of runoff that could be expected in a year, with only a 1 in 1,000 year probability of occurrence. The upper end of the estimated range of this very unlikely event is 50% to 65% of the PMF based estimates.
- Case 10 represents the amount of precipitation that could be expected in a year, on average, and it assumes that 100% of it is converted into runoff and collects in the YDTI, which is not possible because of initial abstraction and evapotranspiration losses. This volume amounts to 40% to 50% of the PMF based estimates.
- Case 11 represents the amount of runoff that could be expected in a year, on average. Even the upper end of the regional range amounts to only 20% to 30% of the PMF based estimates.



Watershed	Area (acres)
Dixie Creek Watershed	395.6
Moulton Reservoir Watershed	1680.8
Moulton Road Watershed	380.5
Silver Bow Watershed	978.5
Tailings Impoundment	1990.1
Yankee Doodle Tributary	356.2
Yankee Doodle Watershed	1786.5

LEGEND:

CATCHMENT

FUTURE EMBANKMENT EXTENTS

NOTES:

1. BASE MAP: 2015 ORTHOIMAGERY PROVIDED BY MONTANA RESOURCES; MICROSOFT BING MAPS.

2. COORDINATE GRID IS IN FEET.
COORDINATE SYSTEM: ANACONDA MINE GRID.

3. THIS FIGURE IS PRODUCED AT A NOMINAL SCALE OF 1:45,000 FOR 8.5x11 (LETTER) PAPER. ACTUAL SCALE MAY DIFFER ACCORDING TO CHANGES IN PRINTER SETTINGS OR PRINTED PAPER SIZE.

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED
0	07MAR'16	ISSUED WITH LETTER	JGC	CAC	DDF

MONTANA RESOURCES, LLP

YANKEE DOODLE TAILINGS IMPOUNDMENT

REVIEW OF PMF ESTIMATE CATCHMENT AREAS

Knight Piésold CONSULTING

P/A NO. VA101-126/12 | REF NO. VA15-03210

FIGURE 1 | REV 0

SAVED: M:\1\101\00126\12\A\GIS\Figs\VA15-03210 - PMF Estimate\PMF_MineSiteLayout.mxd; Mar 07, 2016 1:54 PM; czembor

Table 2 Comparison of Design Storm Volumes

Type	Case	Design Storm Basis	Basin Area	Runoff Volume	Additional Volume	Design Storm Volume
PMF Volumes	1	**24 hr PMP + complete melt of 10 yr snowpack (2012 analysis)** 24 hr PMP = 14.4 inches 10 yr snowpack = 18 inches	total = 7,907 acres	21,460 acre-ft	Failed reservoirs 540 acre-ft	22,000 acre-ft
	2	**24 hr PMP + complete melt of 10 yr snowpack (updated analysis)** 24 hr PMP = 14.4 inches 10 yr snowpack = 10.2 inches	total = 7,600 acres	15,580 acre-ft	Failed reservoirs 540 acre-ft	~16,000 acre-ft
	3	**24 hr PMP + complete melt of 100 yr snowpack** 24 hr PMP = 14.4 inches 100 yr snowpack = 14.6 inches		18,360 acre-ft	Failed reservoirs 540 acre-ft	~19,000 acre-ft
	4	**72 hr PMP + complete melt of 10 yr snowpack** 72 hr PMP = 19.7 inches 10 yr snowpack = 10.2 inches		18,940 acre-ft	Failed reservoirs 540 acre-ft	~19,500 acre-ft
	5	**72 hr PMP + complete melt of 100 yr snowpack** 72 hr PMP = 19.7 inches 100 yr snowpack = 14.6 inches		21,720 acre-ft	Failed reservoirs 540 acre-ft	~22,000 acre-ft
	6	**24 hr 100 yr rainfall + complete melt of 10,000 yr snowpack** 24 hour 100 year rainfall = 2.5 inches 10,000 yr snowpack = 23.0 inches		16,150 acre-ft	Failed reservoirs 540 acre-ft	~17,000 acre-ft
Historical Probability Volumes	7	**1,000 yr 30 day rainfall** P = 9.2 inches		5,830 acre-ft	Failed reservoirs 540 acre-ft	~6,500 acre-ft
	8	**1,000 yr 30 day unit runoff** R = 1.2 to 7.5 inches (range of regional values)		760 acre-ft to 4,750 acre-ft	Failed reservoirs 540 acre-ft	~1,500 acre-ft to ~5,500 acre-ft
	9	**1,000 yr annual unit runoff** R = 5.3 to 16.0 inches (range of regional values)		3,360 acre-ft to 10,130 acre-ft	Failed reservoirs 540 acre-ft	~4,000 acre-ft to ~11,000 acre-ft
	10	**Mean annual precipitation** P = 12.8 inches		8,110 acre-ft	Failed reservoirs 540 acre-ft	~8,500 acre-ft
	11	**Mean annual unit runoff** R = 2.5 to 6.9 inches (range of regional values)		1,580 acre-ft to 4,370 acre-ft	Failed reservoirs 540 acre-ft	~2,000 acre-ft to ~5,000 acre-ft

DESIGN STORM EVENT SELECTION

These comparisons indicate that the PMF based volume estimates are extremely large relative to historical probability based rainfall and runoff event volumes, even for events of very long duration. For instance, the PMF volume for Case 3 is approximately equal to three times the volume of the 1 in 1,000 year 30 day rainfall and more than double the volume of the mean annual precipitation. It is therefore reasonable to conclude that the Case 3 volume, which was computed according to the essential de facto basis for estimating a PMF, provides a sufficiently conservative storm freeboard volume for the YDTI, provided the YDTI continues to be operated without an emergency spillway.

The selected design storm event was based on the 24 hour PMP combined with complete melt of the 1 in 100 year snowpack, and the assumption that the upstream reservoirs fail. The runoff volume for the PMF is 19,000 acre-ft. It is worth noting that although this volume is substantially less (3,000 acre-ft) than the previous design storm volume of 22,000 acre-ft, the reduction is not due to a lessening of the design criteria, but rather due to an update in the analysis of the snowpack estimate and a more accurate determination of the drainage area. In fact, the design criterion associated with this volume is more stringent than that used previously, since it involves the 100 year snowpack rather than the 10 year snowpack.

ADDRESSING CLIMATE VARIABILITY IN CLOSURE

Climate variability is considered in the determination of the design storm volume by using historical regional climate and snowpack records as the basis of the determination. However, the potential effects of climate change are not directly considered since historical records do not necessarily represent possible future conditions.

The general scientific consensus is that climate change is likely to cause temperatures and the frequency and intensity of rain storms to increase in Montana (IPCC, 2007), which for the YDTI translates into an increased likelihood of both heavy precipitation events and smaller winter snowpack depths. These two effects are directly relevant to the determination of the design storm volume, since they correspond to a possible increase in the PMP and a possible decrease in the snowpack runoff. It is not possible to quantify these effects with any confidence; however, since they are offsetting and because the design storm volume has considerable uncertainty, it seems reasonable to conclude that no climate change adjustment need be applied to the design storm volume.

Alternately, if a more conservative approach is desired during the closure phase of the project, it is recommended that the PMP component of the design storm volume be increased by 15%, as this is a generally recommended factor for accounting for climate change effects on peak flow estimates (APEGBC, 2012). This change would result in an increase of the Case 3 volume by increasing the 24 hr PMP from 14.4 inches to 16.6 inches, with a respective increase in storm storage volume of 1,000 acre-ft and a corresponding total storm storage volume of 20,000 acre-ft.

We trust that this information is suitable for your purposes. Please contact the undersigned if you have any questions or concerns.

Yours truly,
Knight Piésold Ltd.

PROFESSIONAL ENGINEER PROVINCE OF BRITISH COLUMBIA J. C. CATHCART

Prepared: March 10, 2016
Jaime Cathcart, Ph.D., P.Eng.
Specialist Hydrotechnical Engineer | Associate

Reviewed:
Daniel Fontaine, P.Eng.
Senior Engineer

Approval that this document adheres to Knight Piésold Quality Systems:

References:

APEGBC, 2012. Professional Practice Guidelines – Legislated Flood Assessments in a Changing Climate in BC. Association of Professional Engineers and Geoscientists of British Columbia. Available at: http://leg.mt.gov/bills/mca/82/4/82-4-376.htm

CDA, 2007. Canadian Dam Association, Technical Bulletin: Hydrotechnical Considerations for Dam Safety (2007).

FEMA, 2013. Federal Emergency Management Agency. Selecting and Accommodating Inflow Design Floods for Dams. US Department of Homeland Security, FEMA P-94, August 2013.

Hansen, E.M. and D. D. Fenn, P. Corrigan, J. L. Vogel, L. C. Schreiner and R. W. Stodt, 1994. Hydrometeorological Report No. 57 (HMR 57) - Probable Maximum Precipitation – Pacific Northwest States, National Oceanic and Atmospheric Service (NOAA), National Weather Service, Silver Spring, MD.

IPCC, 2007. Climate Change 2007: Synthesis Report – Summary for Policy Makers. http://www.ipcc.ch/pdf/assessment-report/ar4/syr/ar4_syr_spm.pdf

Knight Piésold Ltd. (KP, 2013). Montana Resources - Yankee Doodle Tailings Dam - Failure Modes Analysis Information Summary (Ref. No. VA101-126/7-1 Rev. 0) February 1, 2013.

Montana Code Annotated (MCA), 2015. Title 82: Minerals, Oil, and Gas, Chapter 4: Reclamation, Part 3: Metal Mine Reclamation, Section 76: Tailings storage facility - design document. Accessed: November 2015.

NRCS, 2015. Natural Resources Conservation Service. US Department of Agriculture, Natural Water and Climate Center, http://www.wcc.nrcs.usda.gov/ SNOTEL.

U.S. Weather Bureau (USWB), 1966: Probable Maximum Precipitation, Northwest States. Hydrometeorological Report Number 43 (HMR 43), Environmental Science Services Administration, U. S. Department of Commerce, Washington, DC, 228 pp.

APPENDIX B2

REVIEW OF PMF ESTIMATE IN LIGHT OF RECOMMENDATIONS IN THE EXTREME STORM WORKING GROUP SUMMARY REPORT

(Pages B2-1 to B2-3)

March 7, 2017

File No.:VA101-00126/16-A.01
Cont. No.:VA17-00410

FS 64925
EMS 550121
OHS 550122

Mr. Mark Thompson
Environmental Manager
Montana Resources, LLP
600 Shields Avenue
Butte, Montana
USA, 59701

Dear Mark,

Re: Review of PMF Estimate in Light of Recommendations in the Extreme Storm Work Group Summary Report

Introduction

The Montana Department of Natural Resources and Conservation (DNRC) Dam Safety Program issued an Extreme Storm Working Group Summary Report (ESWGSR) in December 2016 that presented the results of "a comprehensive review of the state of the practice for computing hydrology for dams." This report was issued after the Inflow Design Flood (IDF) was computed for the Yankee Doodle Tailings Impoundment (YDTI) for Montana Resources, LLP (MR). It was considered prudent at this time to evaluate the adequacy of the Probable Maximum Flood (PMF) estimate in light of the recommendations in the ESWGSR. The following summarizes the results of that evaluation.

PMF for the YDTI

The design storm evaluation for future development of the YDTI was presented in letter VA15-03210 (KP, 2016), which is included as Appendix B1 of the Design Basis Report (KP, 2017a). The IDF for the YDTI is the PMF, and was computed as the runoff volume from the 24 hour Probable Maximum Precipitation (PMP) combined with complete melt of the 1 in 100 year snowpack, and assuming full failure of the upstream reservoirs. The PMP used to calculate the IDF was determined following the standard of practice established in Hydrometeorological Report (HMR) No. 57, which is one of a series of HMR reports that were developed by the US Army Corps of Engineers (USACE). HMR 57 constitutes the current standard basis for determining PMP values in the Pacific Northwest of the United States.

The PMP was computed according to the procedure specified in HMR 57 (USACE, 1994). The 24 hr PMP of 14.4 inches was computed by adjusting the all season 24 hr PMP value of approximately 17 inches for Butte, Montana (from Map 3 – SE, an isohyetal map of PMP) by an April/May seasonal factor of 85%. The seasonal factor was interpreted for Butte from Figure 15.5 of HMR 57. Selection of the April/May seasonal period produces the maximum possible PMF runoff depth from the seasonal PMP and snowmelt combined.

Extreme Storm Working Group Summary Report

The summary report states that "The Group concluded that HMRs continue to provide the best information available and are a reasonable means for computing PMP depths in Montana for evaluating the capacity of existing dams to pass the IDF."However, it also states that "For design of new, or rehabilitation of existing, high hazard dams with significant downstream risk, a site specific PMP should be considered."

KP has considered whether a site specific PMP is necessary since the embankment for the YDTI is considered high hazard with a significant downstream risk. We have concluded that the current PMP estimate based on HMR 57 is appropriate for the design basis, and likely larger than what would be determined by a site specific

PMP analysis. Accordingly, derivation of a site specific PMP is not warranted. This conclusion is based on the following:

- The PMF flood volume, which is the result of the HMR 57 derived PMP combined with the 100 year snowpack, is extremely large. The discussion in KP letter VA15-03210 presents this flood volume in the context of extremely improbable climatic and runoff events, such as the 24 hr 100 year rainfall plus complete melt of the 10,000 year snowpack or the 1,000 year 30 day rainfall, and demonstrates the enormity of the PMF flood volume.
- The discussion of site specific PMP values in the ESWGSR suggests that a site specific PMP is likely to be smaller than an HMR based PMP value. This is evident in the following text: "As a consequence of failure increases (e.g., the design precipitation depth approaches the PMP), the engineer may determine that a site specific PMP is warranted…Factors such as the consequence of failure, the potential for a PMP based IDF to limit the number of alternatives that may be available at a specific site, and the potential for a PMP based IDF to result in a configuration that exceeds available funding shall be considered when evaluating the need for a site specific PMP study." These statements imply that a site specific PMP should be particularly considered when an HMR derived PMP results in an IDF that is challenging to accommodate.
- A review of various site specific PMP documents (Tomlinson, 2012; USNRC, 2015; AWA, 2014) indicates that site specific PMPs are generally smaller than HMR based PMPs.
- The YDTI is able to accommodate the derived PMF without any undue challenges, so the costs and potential difficulties associated with deriving a potentially lower PMP value are not merited at this time.

We trust that this discussion demonstrates that the PMF estimate for the YDTI is consistent with the recommendations presented in the Montana DNRC's Extreme Storm Working Group Summary Report.

Yours truly,
Knight Piésold Ltd.

PROFESSIONAL ENGINEER — PROVINCE OF BRITISH COLUMBIA — J. G. CATHCART

March 7, 2017

Prepared: _____
Jaime Cathcart, Ph.D., P.Eng.
Specialist Hydrotechnical Engineer | Associate

Reviewed: _____
Daniel Fontaine, P.Eng.
Senior Civil Engineer | Associate

Approval that this document adheres to Knight Piésold Quality Systems: ☒

References:

Applied Weather Associates (AWA), LLC, 2014. Probable Maximum Precipitation Study for Wyoming, Prepared for the Wyoming Water Development Office, Dec. 2014.

Knight Piésold Ltd. (KP, 2016). Review of the PMF Estimate for the Yankee Doodle Tailings Impoundment, VA15-03210, March 10, 2016.

Knight Piésold Ltd. (KP, 2017a). Yankee Doodle Tailings Impoundment, Design Basis Report (KP Reference No. VA101-126/12-1), Vancouver, British Columbia.

Tomlinson, E., 2012. Challenges in Determining the Probable Maximum Precipitation (PMP), presentation at the Extreme Storms Working Group, Washington DC, October 15, 2012. (https://acwi.gov/hydrology/minutes/AWA_Extreme_Storms_WorkingOct_15_2012-Revied.pdf)

US Nuclear Regulatory Commission (USNRC), 2015. Site Specific Probable Maximum Precipitation Estimates and Professional Judgement, presentation at the American Geophysical Union Fall Meeting 2015, San Francisco, CA. (https://www.nrc.gov/docs/ML1534/ML15344A466.pdf)

US Department of Army Corps of Engineers (USACE), 1994. Hydrometeorological Report No. 57: Probable Maximum Precipitation – Pacific Northwest States. National Weather Service. Silver Spring, MD, October 1994.

/jgc

APPENDIX C

LONG-TERM TAILINGS DEPOSITION PLAN ▲R2

(Pages C-1 to C-6)

June 22, 2017

File No.:VA101-00126/12-A.01
Cont. No.:VA17-00846

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

Dear Mark,

Re: Yankee Doodle Tailings Impoundment – Long-Term Tailings Deposition Plan

1 – INTRODUCTION

Montana Resources, LLP (MR) operate the Yankee Doodle Tailings Impoundment (YDTI) as part of their open pit copper and molybdenum mine operations in Butte, Montana. The YDTI has been used for mine tailings storage since 1963.

This letter describes the long-term tailings deposition plan for the YDTI from 2017 through 2031. The embankment is currently constructed to a crest elevation of approximately 6,400 ft. The deposition plan considers the YDTI with embankments constructed to a crest elevation of 6,450 ft, which provides a total facility tailings and water storage capacity of approximately 24 B ft^3. The plan was designed to develop extensive beaches around the impoundment and to manage the supernatant pond location away from the embankments. Beach development will be crucial to manage the location of the supernatant pond to prevent pond water from approaching the embankments.

2 – DEPOSITION MODELLING

Three-dimensional tailings deposition models were prepared using the Muck3D computer software package, which models tailings deposition using specified beach slopes, tailings discharge points, and tailings volumes. The models were developed using the June 2016 beach contours and bathymetric survey of the tailings pond as a base surface, and the conceptual design of the YDTI embankments with a crest elevation of 6,450 ft. All model iterations considered a nominal supernatant pond storage volume of 25,000 acre-ft.

The deposition modelling was completed on an annual basis from 2017 to 2021, and at five year intervals from 2021 through 2031. The model intervals were completed using the deposition volume beginning in June of the previous interval to June of the modelled year.

The approximate tailings storage volume at each interval was estimated based on the tailings throughput rate of 50,000 short tons per day and an initial settled dry density for the tailings of 85 pounds per cubic foot (pcf). The beach slopes were defined using two sub-aerial and two sub-aqueous beach slopes. The slopes were selected to be consistent with current deposition behaviour observed in the impoundment. The tailings discharge elevation, beach extents, and resulting supernatant pond configuration for each interval were modelled using these inputs.

3 – TAILINGS DEPOSITION PLAN

The key objective of the tailings deposition plan is to provide extensive beaches to isolate the supernatant pond from the YDTI embankments. The deposition model was developed based on the existing MR tailings discharge expansion plan. The MR expansion plan incorporates a progressively expanded discharge configuration, which commences with three discharge points and increases to eight in 2018.

A maximum of eight discharge points were applied in the deposition model, however additional discharge locations may be implemented in the future with minimal impact on the development of the tailings beach. Table 1 presents the number of discharge locations and the approximate discharge elevation at each model interval. The discharge configurations are described further in the sections below.

Table 1 Discharge Location Summary

Year (June of)	2017	2018	2019	2020	2021	2026	2031
Number of Discharge Locations	3	8	8	8	8	8	8
Tailings Discharge Elevation (ft)	6,358	6,361	6,369	6,375	6,382	6,413	6,445

3.1 CURRENT CONFIGURATION - THREE DISCHARGE LOCATIONS

The model assumes the existing three discharge locations will be utilized throughout 2017 until construction of the additional five distribution locations is complete in 2018. The beach development during this period is shown in Figure 1 – June 2017.

A discharge elevation of 6,358 ft is required to meet the tailings storage requirements during 2017. Beach development will follow the existing configuration and a consistent beach length from the discharge location will be maintained. The use of three discharge points will isolate the supernatant pond from the East-West Embankment and North-South Embankment. Maintaining or decreasing the current supernatant pond volume is the most crucial factor to the tailings beach development plan during this period.

3.2 FINAL CONFIGURATION – EIGHT DISCHARGE LOCATIONS

The final discharge configuration between 2018 and 2031 utilizes a total of eight discharge locations. The elevation of the tailings discharge locations were modelled increasing annually until 2021 and every five years thereafter until 2031, to meet the ongoing storage requirements while maintaining the planned tailings beach configuration. The approximate discharge elevations are shown in Table 1. The ultimate arrangement of the tailings beach around the impoundment is shown on Figure 3 – June 2031. Beach development extents for each interval in Table 1 are shown in Figures 1 through 3.

The northwest and northeast discharge locations will initially operate for a greater duration to develop beaches in existing low areas. Tailings discharge frequency will be become more evenly distributed between the discharge locations as the tailings beach develops. The volume and duration of tailings discharged from each location will vary depending on the year and beach conditions. Construction of the embankments will require periodic adjustment of the tailings pipeline route.

The sub-aerial beach area is expected to increase by approximately 30% during the filling of the impoundment due to the new eight-point discharge configuration. The beach length will initially decrease to approximately 2,500 ft in 2018 as the shape of the supernatant pond adjusts to the new tailings discharge configuration. The beach length will then gradually increase to 4,200 ft by 2031 and become more uniform around the impoundment embankments as tailings accumulate at the eight discharge locations. Comparison of Figures 1 through 3 shows the development and distribution of the beach between 2017 and 2031.

4 – CONCLUSIONS

The long-term tailings deposition plan presented in this letter was designed to develop extensive beaches around the impoundment and to manage the supernatant pond location away from the embankments. The plan demonstrates the required changes to the tailings discharge configuration and estimates beach development for

the YDTI constructed and filled to 6,450 ft. The resulting tailings beach configuration was based on defined tailings slopes and fixed deposition points. Beach development will be monitored to confirm continued agreement with the modelling assumptions.

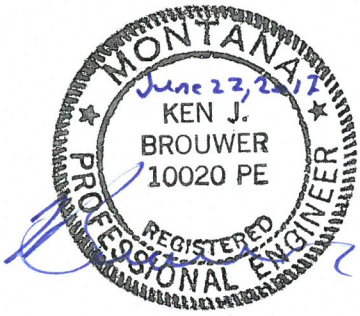
Eight discharge locations will provide adequate beach deposition during construction of the YDTI embankment raises, reliable beach development along the embankment, and increased operational flexibility without excessive capital costs or management requirements. Five additional discharge locations will be added to the existing three locations by the summer of 2018. Additional discharge locations may be implemented during tailings deposition without significant effects on beach development around the facility.

We trust this information meets your needs at this time. Please contact the undersigned with any questions or comments.

Yours truly,
Knight Piésold Ltd.

Prepared: _____
Mitchell Flynn, EIT
Junior Engineer

Reviewed: _____
Roanna Stewart, P.Eng
Senior Engineer



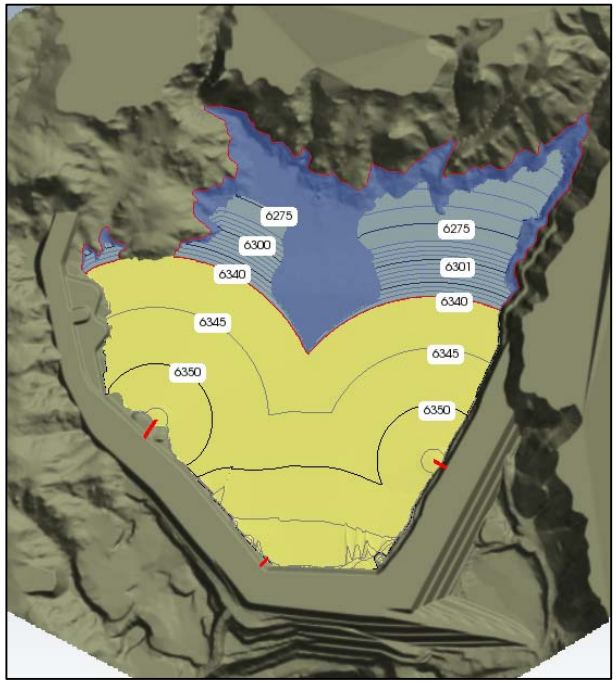
Reviewed: _____
Ken Brouwer, P.E.
President

Approval that this document adheres to Knight Piésold Quality Systems: KJB

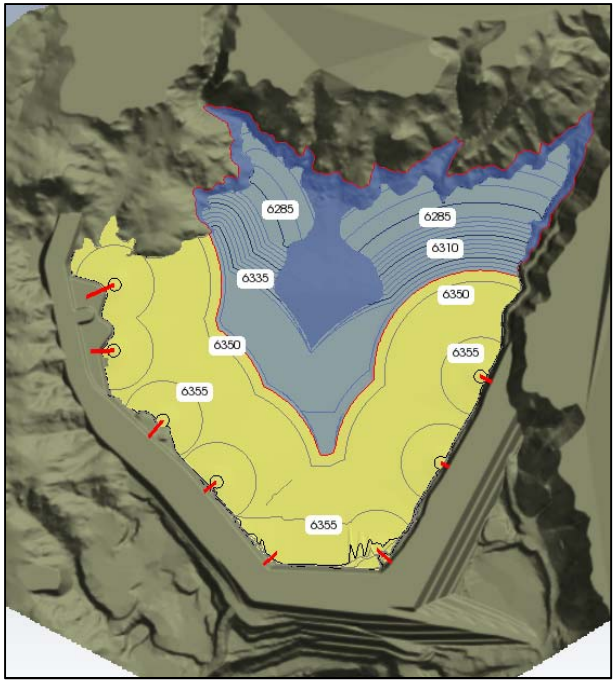
Attachments:

Figure 1 Rev 0	Tailings Deposition Plan – June 2017 – June 2019
Figure 2 Rev 0	Tailings Deposition Plan – June 2020 – June 2026
Figure 3 Rev 0	Tailings Deposition Plan – June 2031

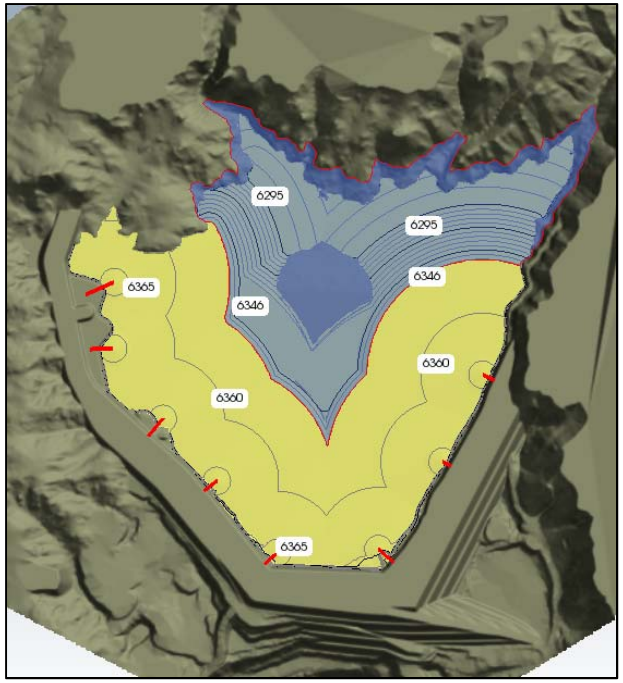
Copy To: Josh Shutey



June 2017
(Tailings Volume - 430 Mft³)



June 2018
(Tailings Volume - 859 Mft³)



June 2019
(Tailings Volume - 1,288 Mft³)

LEGEND:

- TAILINGS BEACH
- SUPERNATANT POND
- SPIGOT DISCHARGE LOCATION
- 5 FT CONTOURS

NOTES:
1. ALL OUTPUTS ARE BASED ON MUCK 3D MODELLING OUTPUTS.
2. TAILINGS VOLUMES INDICATE CUMULATIVE IMPOUNDMENT STORAGE STARTING IN 2017, NOT TOTAL IMPOUNDMENT STORAGE VOLUME.

REV	DATE	DESCRIPTION	PREP'D	RVW'D
0	22JUN'17	ISSUED WITH LETTER VA17-00846	MRF	RSS

MONTANA RESOURCES, LLP

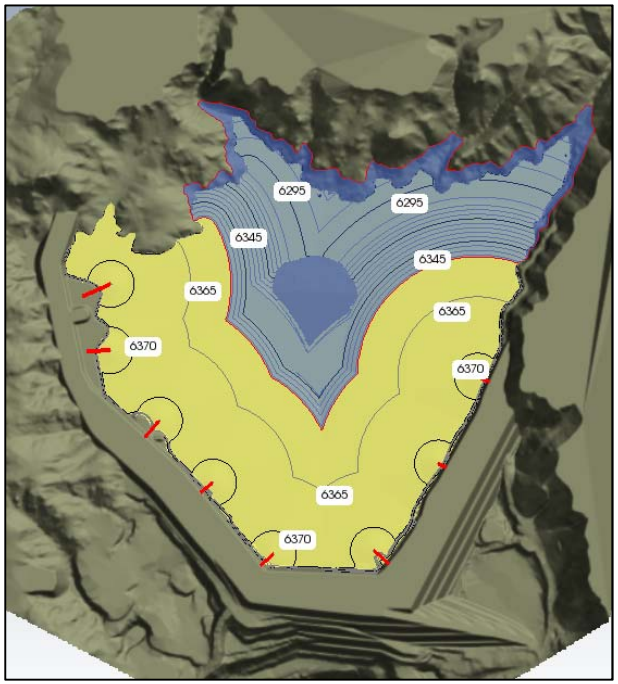
YANKEE DOODLE TAILINGS IMPOUNDMENT

TAILINGS DEPOSITION OUTPUTS
JUNE 2017 - JUNE 2019

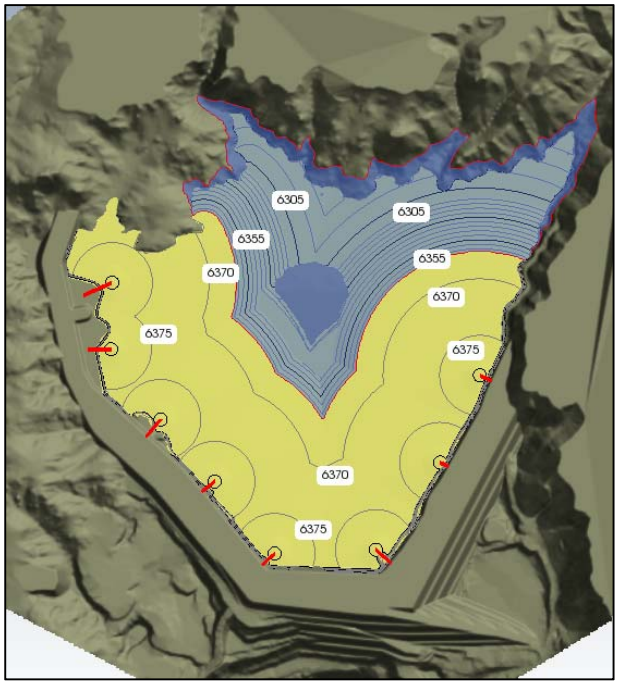
Knight Piésold CONSULTING

P/A NO. VA101-126/12 | REF. NO. VA17-00846

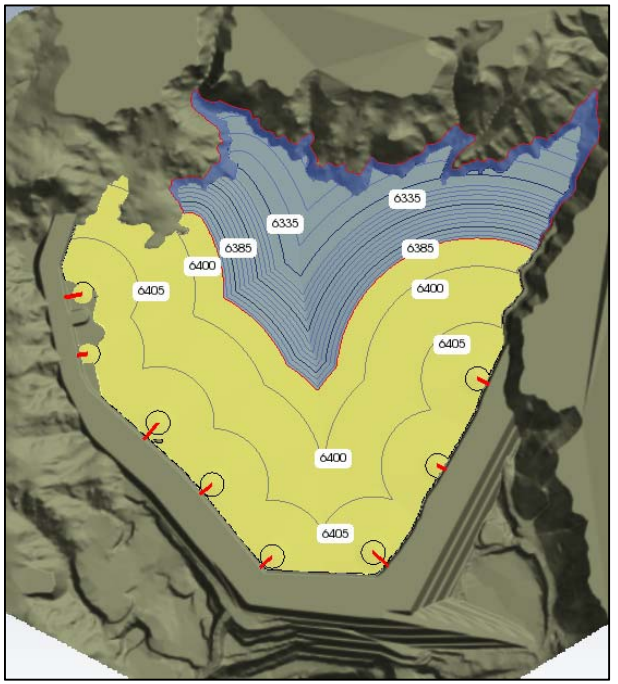
FIGURE 1 | REV 0



June 2020
(Tailings Volume - 1,717 Mft^3)



June 2021
(Tailings Volume - 2,147 Mft^3)



June 2026
(Tailings Volume - 4,297 Mft^3)

LEGEND:

- TAILINGS BEACH
- SUPERNATANT POND
- SPIGOT DISCHARGE LOCATION
- 5 FT CONTOURS

NOTES:
1. ALL OUTPUTS ARE BASED ON MUCK 3D MODELLING OUTPUTS.
2. TAILINGS VOLUMES INDICATE CUMULATIVE IMPOUNDMENT STORAGE STARTING IN 2017, NOT TOTAL IMPOUNDMENT STORAGE VOLUME.

REV	DATE	DESCRIPTION	PREP'D	RVW'D
0	22JUN'17	ISSUED WITH LETTER VA17-00846	MRF	RSS

MONTANA RESOURCES, LLP

YANKEE DOODLE TAILINGS IMPOUNDMENT

TAILINGS DEPOSITION OUTPUTS
JUNE 2020 - JUNE 2026

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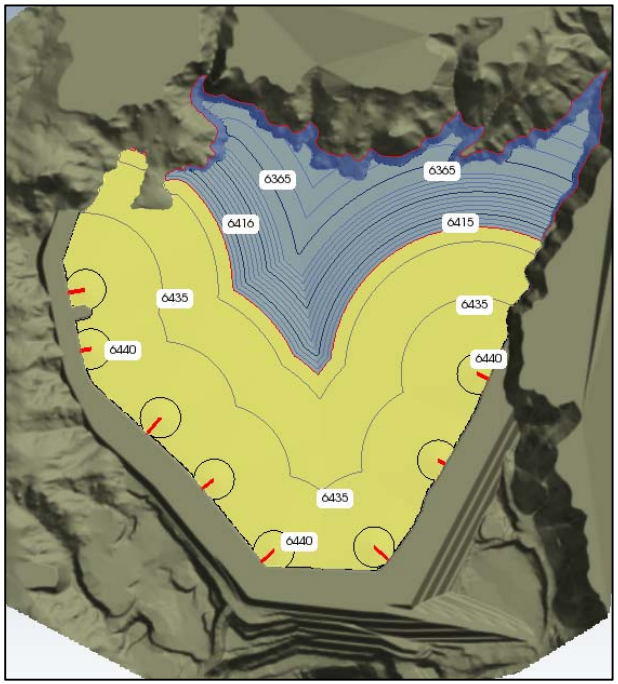
P/A NO. VA101-126/12 | REF. NO. VA17-00846

FIGURE 2 | REV 0



June 2031
(Tailings Volume - 6,701 Mft^3)

LEGEND:

- TAILINGS BEACH
- SUPERNATANT POND
- SPIGOT DISCHARGE LOCATION
- 5 FT CONTOURS

NOTES:
1. ALL OUTPUTS ARE BASED ON MUCK 3D MODELLING OUTPUTS.
2. TAILINGS VOLUMES INDICATE CUMULATIVE IMPOUNDMENT STORAGE STARTING IN 2017, NOT TOTAL IMPOUNDMENT STORAGE VOLUME.

REV	DATE	DESCRIPTION	PREP'D	RVW'D
0	22JUN'17	ISSUED WITH LETTER VA17-00846	MRF	RSS

MONTANA RESOURCES, LLP

YANKEE DOODLE TAILINGS IMPOUNDMENT

TAILINGS DEPOSITION OUTPUTS
JUNE 2031

Knight Piésold CONSULTING

P/A NO. VA101-126/12 | REF. NO. VA17-00846

FIGURE 3 | REV 0

APPENDIX D

DESIGN DRAWING PACKAGE – 6450 FT EMBANKMENT CREST ▲R2

(Pages D-1 to D-34)

Knight Piésold CONSULTING

TABLE D.1

MONTANA RESOURCES, LLP
YANKEE DOODLE TAILINGS IMPOUNDMENT

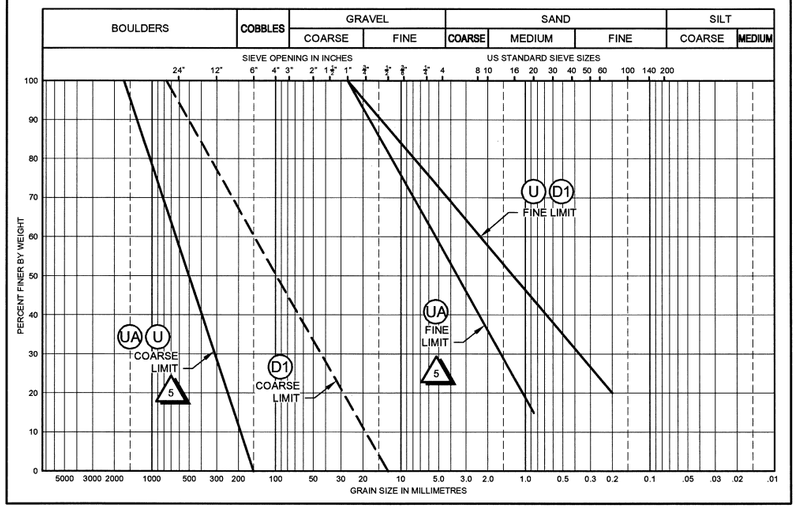
DESIGN BASIS REPORT
DRAWING LIST

Drawing Number	Rev.	Revision Date	Drawing Status	Drawing Title
MR-C0011	5	13-Dec-16	Issued For Construction	Fill Material Specifications
MR-C2015	0	9-Nov-16	Not For Construction	6400 Crest - General Arrangement
MR-C2020	1	13-Jun-17	Not For Construction	6450 Crest - General Arrangement
MR-C2110	1	13-Jun-17	Not For Construction	West Embankment - 6450 Crest - Plan
MR-C2129	1	15-Jun-17	Not For Construction	West Embankment - 6450 Crest - Sections 53+00 NW and 58+00 NW
MR-C2130	1	15-Jun-17	Not For Construction	West Embankment - 6450 Crest - Sections 60+00 W and 69+50 W
MR-C2131	1	22-Jun-17	Not For Construction	West Embankment - 6450 Crest - Sections 78+50 W and 82+80 W
MR-C2132	1	15-Jun-17	Not For Construction	West Embankment - 6450 Crest - Sections 95+00 W and 108+40 W
MR-C2310	1	16-Jun-17	Not For Construction	East-West Embankment - 6450 Crest - Plan
MR-C2330	1	16-Jun-17	Not For Construction	East-West Embankment - 6450 Crest - Section 0+00
MR-C2331	1	16-Jun-17	Not For Construction	East-West Embankment - 6450 Crest - Section 03+00 W
MR-C2332	1	16-Jun-17	Not For Construction	East-West Embankment - 6450 Crest - Section 08+00 W
MR-C2333	1	19-Jun-17	Not For Construction	East-West Embankment - 6450 Crest - Section 12+00 W
MR-C2334	1	19-Jun-17	Not For Construction	East-West Embankment - 6450 Crest - Section 18+00 NW
MR-C2335	1	19-Jun-17	Not For Construction	East-West Embankment - 6450 Crest - Section 23+00 NW
MR-C2336	1	19-Jun-17	Not For Construction	East-West Embankment - 6450 Crest - Section 28+00 NW
MR-C2337	1	19-Jun-17	Not For Construction	East-West Embankment - 6450 Crest - Sections 33+00 NW and 38+00 NW
MR-C2338	1	19-Jun-17	Not For Construction	East-West Embankment - 6450 Crest - Sections 43+00 NW and 48+00 NW
MR-C2410	1	20-Jun-17	Not For Construction	North-South Embankment - 6450 Crest - Plan
MR-C2440	1	20-Jun-17	Not For Construction	North-South Embankment - 6450 Crest - Section 3+00 N
MR-C2441	1	20-Jun-17	Not For Construction	North-South Embankment - 6450 Crest - Section 08+00 N
MR-C2442	1	20-Jun-17	Not For Construction	North-South Embankment - 6450 Crest - Section 13+00 N
MR-C2443	1	20-Jun-17	Not For Construction	North-South Embankment - 6450 Crest - Section 18+00 N and 23+00 N
MR-C2444	1	20-Jun-17	Not For Construction	North-South Embankment - 6450 Crest - Section 28+00 N and 33+00 N
MR-C2445	1	20-Jun-17	Not For Construction	North-South Embankment - 6450 Crest - Section 38+00 N and 43+00 N
MR-C2446	1	20-Jun-17	Not For Construction	North-South Embankment - 6450 Crest - Section 48+00 N and 53+00 N
MR-C2447	1	20-Jun-17	Not For Construction	North-South Embankment - 6450 Crest - Section 58+00 N and 63+00 N
MR-C2910	1	30-Jun-17	Not For Construction	West Embankment - 6450 Crest - Instrumentation Plan
MR-C2911	0	30-Jun-17	Not For Construction	West Embankment - 6450 Crest - Instrumentation Details
MR-C2920	1	30-Jun-17	Not For Construction	East-West Embankment - 6450 Crest - Instrumentation Plan
MR-C2921	0	30-Jun-17	Not For Construction	East-West Embankment - 6450 Crest - Instrumentation Details
MR-C2930	1	30-Jun-17	Not For Construction	North-South Embankment - 6450 Crest - Instrumentation Plan
MR-C2931	0	30-Jun-17	Not For Construction	North-South Embankment - 6450 Crest - Instrumentation Details

M:\1\01\00126\12\A\Report\1 - Design Basis Report\Rev 2\Appendix D\[Table D.1 - Drawing List.xlsx]ALL DWGS

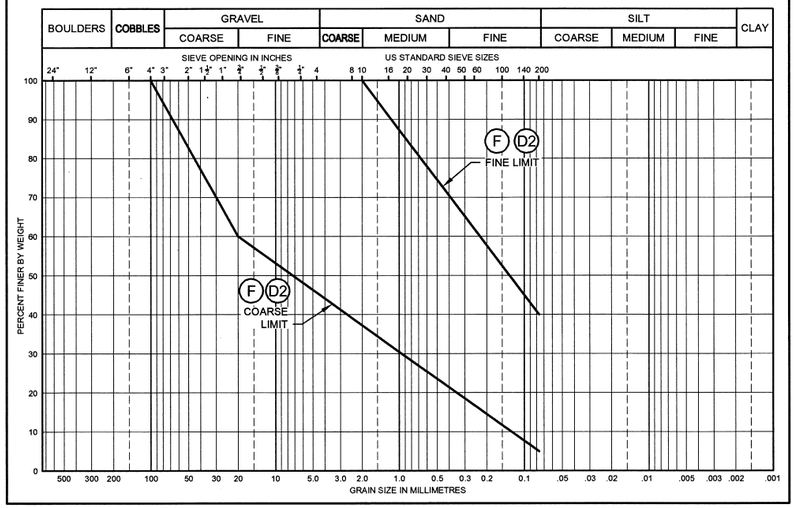
REV	DATE	DESCRIPTION	PREP'D	RVW'D
1	30JUN'17	ISSUED WITH REPORT VA101-126/12-1	JRG	DDF

UNIFIED SOIL CLASSIFICATION SYSTEM



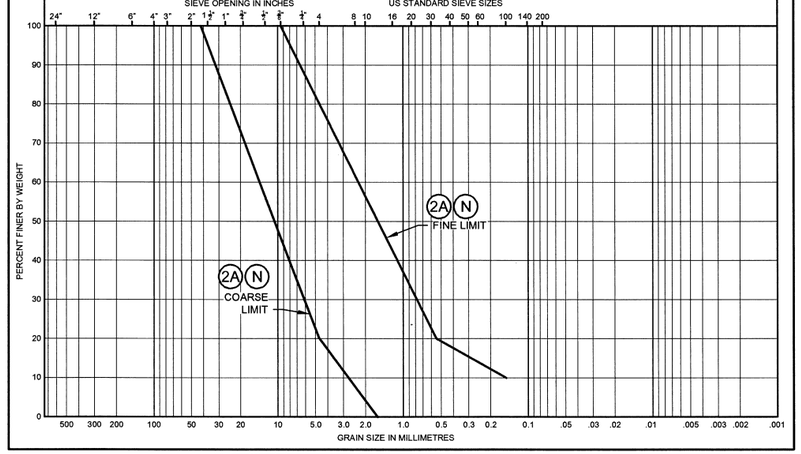
ZONE U / ZONE D1 / ZONE UA

UNIFIED SOIL CLASSIFICATION SYSTEM



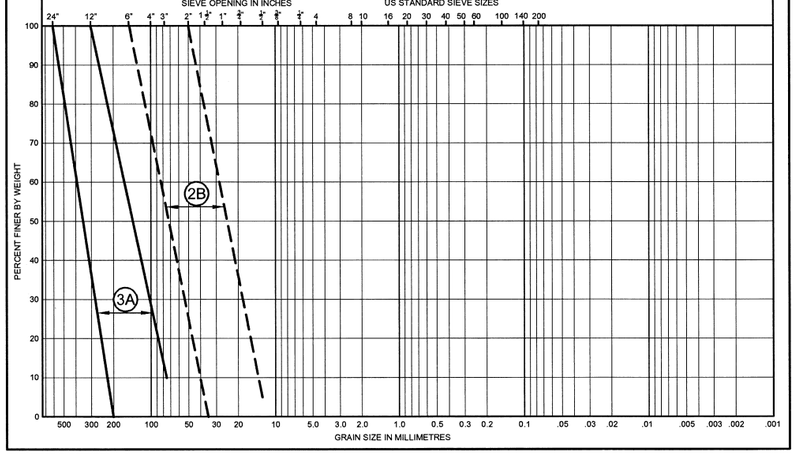
ZONE F / ZONE D2

UNIFIED SOIL CLASSIFICATION SYSTEM



ZONE N - INSTRUMENTATION BEDDING /
ZONE 2A - FILTER

UNIFIED SOIL CLASSIFICATION SYSTEM



ZONE 2B - TRANSITION /
ZONE 3A - DRAIN ROCK

MATERIAL PLACEMENT AND COMPACTION REQUIREMENTS

ZONE AND MATERIAL TYPE	PLACING AND COMPACTION REQUIREMENTS
ZONE F - UPSTREAM EARTHFILL	FILL MATERIAL SHALL CONSIST OF ALLUVIUM, FREE OF LOAM, TREE STUMPS, ROOTS, AND OTHER DELETERIOUS OR ORGANIC MATTER. THE MATERIAL SHALL BE END-DUMPED. THE MAXIMUM END DUMPED HEIGHT SHALL BE A MAXIMUM OF 50 ft. THE MATERIAL SHALL CONTAIN A BROAD RANGE OF WELL-GRADED SOILS ACROSS THE ENTIRE SPECIFIED GRAIN SIZE ENVELOPE.
ZONE U - UPSTREAM ROCKFILL	FILL MATERIAL SHALL CONSIST OF HARD, DURABLE, FRESH TO MODERATELY WEATHERED ROCKFILL MATERIAL AND SHALL BE END DUMPED IN 50 ft LIFTS . FILL MATERIAL WILL BE TRAFFIC COMPACTED BY THE MINE HAUL FLEET, EQUALLY DISTRIBUTED OVER THE ENTIRE LAYER WIDTH. THE MATERIAL SHALL CONTAIN A BROAD RANGE OF WELL-GRADED SOILS ACROSS THE ENTIRE SPECIFIED GRAIN SIZE ENVELOPE. COMPACTED RUNNING SURFACES WILL BE CROSS RIPPED PRIOR TO PLACING SUCCESSIVE LIFTS.
ZONE UA - PROTECTIVE CAP	FILL MATERIAL SHALL CONSIST OF HARD, DURABLE, FRESH TO MODERATELY WEATHERED ROCKFILL MATERIAL AND SHALL BE PLACED AND SPREAD IN 5 ft. LIFTS. FILL MATERIAL WILL BE DOZER COMPACTED. THE MATERIAL SHALL CONTAIN A BROAD RANGE OF WELL-GRADED SOILS ACROSS THE ENTIRE SPECIFIED GRAIN SIZE ENVELOPE. COMPACTED RUNNING SURFACES WILL BE CROSS RIPPED PRIOR TO PLACING SUCCESSIVE LIFTS.
ZONE D1 - DOWNSTREAM ROCKFILL	FILL MATERIAL SHALL CONSIST OF HARD, DURABLE, FRESH TO MODERATELY-WEATHERED ROCKFILL MATERIAL AND SHALL BE PLACED AND SPREAD IN MAXIMUM 3 ft LIFTS PRIOR TO COMPACTION. MATERIAL SHALL HAVE A RELATIVELY LOW ACID GENERATING POTENTIAL. MATERIAL SHALL BE TRAFFIC COMPACTED BY THE MINE HAUL FLEET, EQUALLY DISTRIBUTED OVER THE ENTIRE LAYER WIDTH. WHERE THE WORKING AREA DOES NOT PERMIT THE USE OF THE MINE HAUL FLEET COMPACTION SHALL CONSIST OF A MINIMUM OF 6 PASSES OF A 12.5 METRIC TON (DRUM WEIGHT) SMOOTH DRUM VIBRATORY ROLLER, UNLESS OTHERWISE NOTED. THE METHOD SPECIFICATION SHALL BE VERIFIED BY COMPLETING A TEST FILL AT THE DIRECTION OF THE ENGINEER. THE FILL SHALL BE PLACED IN A MANNER TO ENSURE NO SEGREGATION. MATERIAL SHALL CONTAIN A BROAD RANGE OF WELL-GRADED SOILS ACROSS THE ENTIRE SPECIFIED GRAIN SIZE ENVELOPE.
ZONE D2 - DOWNSTREAM EARTHFILL	FILL MATERIAL SHALL CONSIST OF NON-ACID GENERATING ALLUVIUM FREE OF LOAM, TREE STUMPS, ROOTS AND OTHER DELETERIOUS OR ORGANIC MATTER. MATERIAL SHALL BE PLACED AND SPREAD IN 3 ft LIFTS WITH 2 PASSES OF THE SPECIFIED SMOOTH DRUM VIBRATORY ROLLER
ZONE N - INSTRUMENTATION BEDDING	FILL MATERIAL SHALL CONSIST OF HARD, DURABLE, FRESH OR NON-WEATHERED MATERIAL. BEDDING TO BE PLACED AND SPREAD IN 1' THICK LIFTS. NOMINAL COMPACTION.
ZONE 2A - FILTER MATERIAL	FILTER MATERIAL SHALL CONSIST OF HARD, DURABLE, FRESH OR NON-WEATHERED MATERIAL. FILTER MATERIAL TO BE PLACED AND SPREAD IN 2' THICK LIFTS AND COMPACTED WITH 2 PASSES OF THE SPECIFIED SMOOTH DRUM VIBRATORY ROLLER.
ZONE 2B - TRANSITION MATERIAL	TRANSITION MATERIAL SHALL CONSIST OF HARD, DURABLE, FRESH OR NON-WEATHERED MATERIAL. TRANSITION MATERIAL TO BE PLACED AND SPREAD IN MAXIMUM 2' THICK LIFTS AND COMPACTED WITH 2 PASSES OF THE SPECIFICED SMOOTH DRUM VIBRATORY ROLLER
ZONE 3A - DRAIN ROCK	DRAIN ROCK SHALL CONSIST OF HARD, DURABLE, FRESH OR NON-WEATHERED ROCK FILL. DRAIN ROCK TO BE PLACED AND SPREAD IN 3' THICK LIFTS AND COMPACTED WITH 2 PASSES OF THE SPECIFIED SMOOTH DRUM VIBRATORY ROLLER OR AS DIRECTED BY THE ENGINEER. (5)

NOTES:

1. THESE MATERIAL PLACEMENT AND COMPACTION REQUIREMENTS APPLY TO ALL COMPONENTS OF THE WORKS EXCEPT WHERE NOTED OTHERWISE.
2. THE MAXIMUM DIMENSION OF ANY PARTICLE SHALL NOT EXCEED 2/3 OF THE MAXIMUM LIFT THICKNESS.
3. THIS DRAWING SHALL BE READ WITH ACCOMPANYING DRAWINGS AND CONSTRUCTION MANAGEMENT PLAN. QUALITY CONTROL AND RECORD TESTING SHALL BE UNDERTAKEN AT THE FREQUENCIES IDENTIFIED IN THE CONSTRUCTION MANAGEMENT PLAN. THE OWNER OR IT'S CONTRACTOR SHALL IMMEDIATELY CONTACT THE ENGINEER SHOULD UNCERTAINTIES ARISE WITH THE CONSTRUCTION DRAWINGS AND / OR TECHNICAL SPECIFICATIONS CONTAINED IN THE CONSTRUCTION MANAGEMENT PLAN.

– DISCLAIMER –

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ISSUED FOR CONSTRUCTION

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED	APPROVED
5	13DEC'16	ZONE UA GRADATION LIMITS UPDATED	ACR	RM	DDF	KJB
4	20JUN'16	ZONE 3A GRADATION LIMITS UPDATED	ACR	RM	DDF	KJB
3	23MAR'16	ISSUED FOR CONSTRUCTION	ACR	ABN	DDF	KJB
2	17DEC'15	ISSUED FOR CONSTRUCTION	ACR	ABN	KJB	KJB
1	20NOV'15	ISSUED FOR CONSTRUCTION	ACR	ABN	KJB	KJB
0	21OCT'15	ISSUED FOR CONSTRUCTION	ACR	ELG/ABN	KJB	KJB

REVISIONS

DRG. NO.	DESCRIPTION

REFERENCE DRAWINGS

KEN J. BROUWER 10020 PE Dec 14, 2016 REGISTERED PROFESSIONAL ENGINEER

Knight Piésold CONSULTING

MONTANA RESOURCES, LLP

YANKEE DOODLE TAILINGS IMPOUNDMENT

FILL MATERIAL SPECIFICATIONS

PROJECT NO.	DRAWING NO.	REVISION
VA101-126/13	MR-C0011	5

SAVED: M:\1\101\00126\13\A\Acad\DWG\MR-C0011\MR-C0011_r5, 12/14/2016 8:26:19 AM, RMCLELLAN PRINTED: 12/14/2016 8:27:37 AM, MR-C0011, RMCLELLAN
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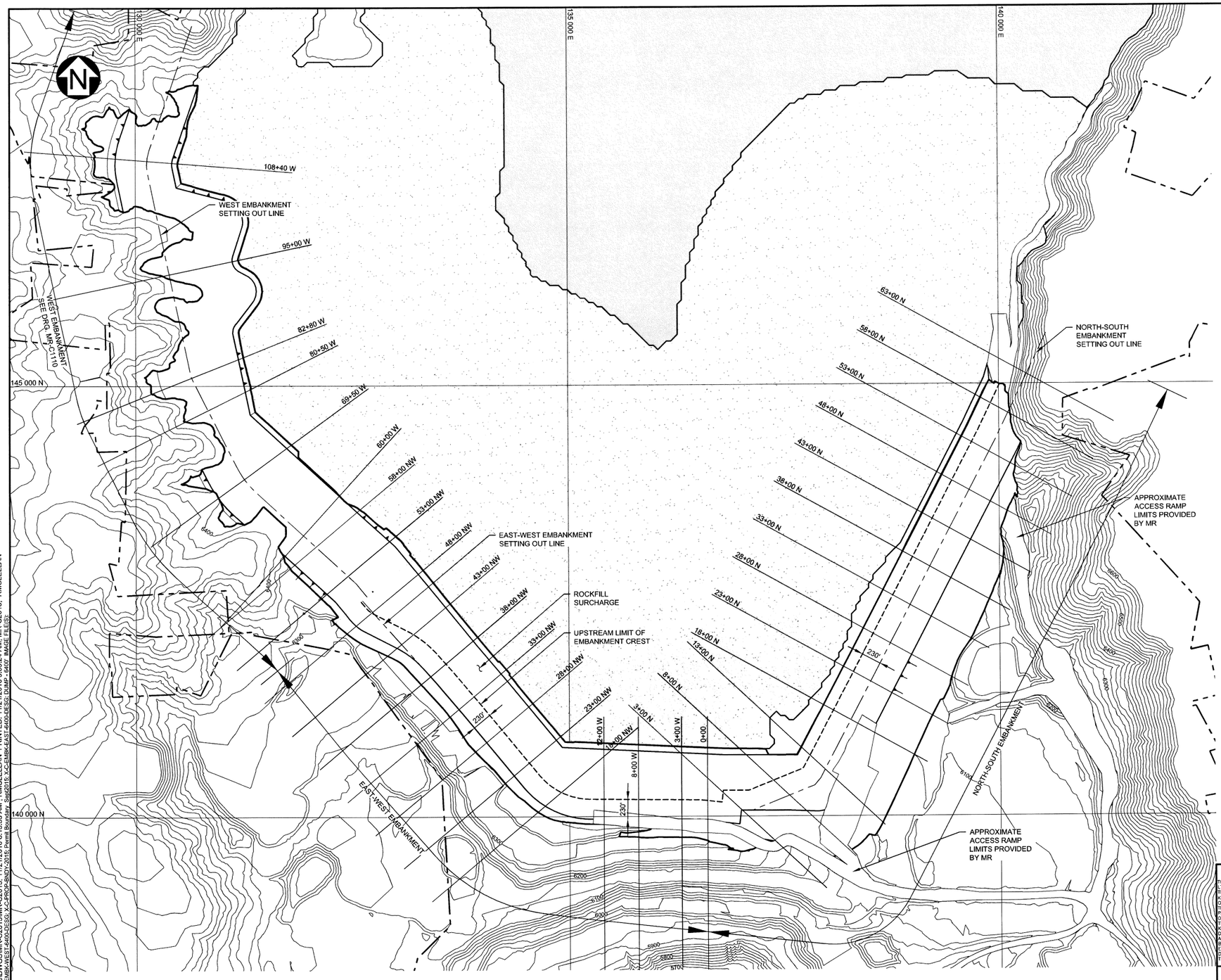

LEGEND:

- PROPERTY BOUNDARY
- TAILINGS BEACH

NOTES:

1. COORDINATE GRID IS ANACONDA MINE GRID.
2. GROUND CONTOUR INTERVAL IS 20 FEET.
3. EMBANKMENT CREST IS 230' WIDE.
4. EMBANKMENT STAGING IS BASED ON PRELIMINARY DESIGN. NOT FOR CONSTRUCTION.

NOT FOR CONSTRUCTION

SCALE A: 500 0 500 1000 1500 2000 2500 3000 ft

– DISCLAIMER –

THIS DRAWING WAS PREPARED BY KNIGHT PIÉSOLD LTD. FOR THE ACCOUNT OF THE CLIENT LISTED ON THIS DRAWING. THE MATERIAL ON IT REFLECTS KNIGHT PIÉSOLD'S BEST JUDGEMENT IN THE LIGHT OF THE INFORMATION AVAILABLE TO IT AT THE TIME OF PREPARATION. ANY USE WHICH A THIRD PARTY MAKES OF THIS DRAWING, OR ANY RELIANCE ON OR DECISIONS TO BE MADE BASED ON IT, ARE THE RESPONSIBILITY OF SUCH THIRD PARTIES. KNIGHT PIÉSOLD ACCEPTS NO RESPONSIBILITY FOR DAMAGES, IF ANY, SUFFERED BY THE THIRD PARTY AS A RESULT OF DECISIONS MADE OR ACTIONS BASED ON THIS DRAWING. COPIES RESULTING FROM ELECTRONIC TRANSFER OR REPRODUCTION OF THIS DRAWING ARE UNCONTROLLED AND MAY NOT BE THE MOST RECENT

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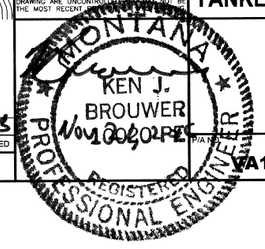
MONTANA RESOURCES, LLP

YANKEE DOODLE TAILINGS IMPOUNDMENT

6400 CREST GENERAL ARRANGEMENT

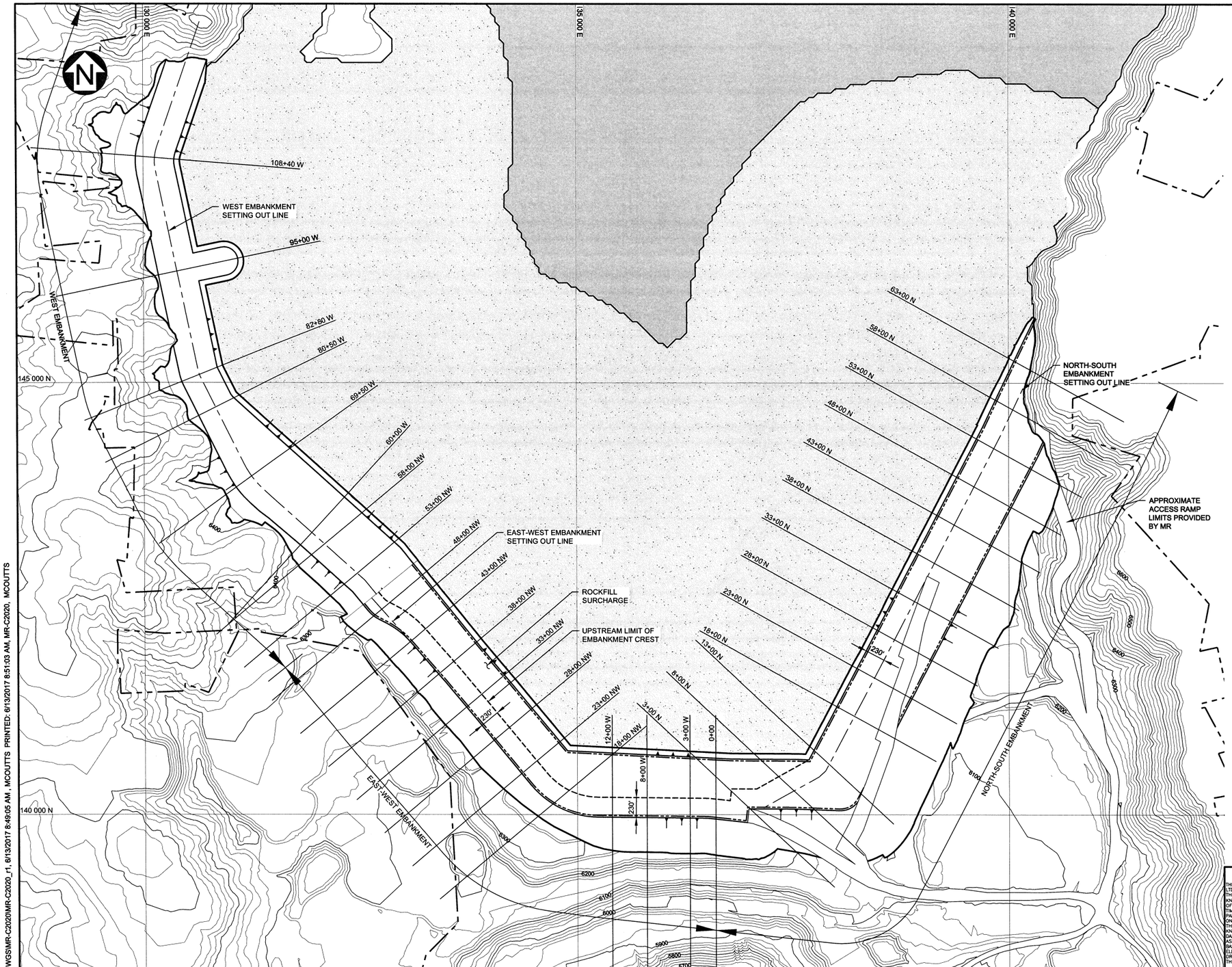


P/A NO.	DRAWING NO.	REVISION
VA101-126/12	MR-C2015	0

REFERENCE DRAWINGS	
MR-C1110	WEST EMBANKMENT - 6400 CREST - PLAN
DRG. NO.	DESCRIPTION

REVISIONS							
REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED	APPROVED
0	09NOV'16	NOT FOR CONSTRUCTION	JRG	RM	DOF	KJB

SAVED: M:\101\00\126\12\AA\acad\DWGS\MR-C2015.MR-C2015. 11/21/2016 8:15:33 AM . RMCLELLAN PRINTED: 11/21/2016 9:59:24 AM. MR-C2015. RMCLELLAN
XREF FILES) 2015 Contours - 20' XC-EMBKMENT-6400-2630 XC-PWDFILE-2015 Pond Bottom Surface 2015 XC-Embankment-6400-2630 Outline - 6400 - BASE FILES)



LEGEND:

PROPERTY BOUNDARY

TAILINGS BEACH

NOTES:

1. COORDINATE GRID IS ANACONDA MINE GRID.
2. GROUND CONTOUR INTERVAL IS 20 FEET.
3. EMBANKMENT CREST IS 230' WIDE.
4. EMBANKMENT STAGING IS BASED ON PRELIMINARY DESIGN. NOT FOR CONSTRUCTION.

NOT FOR CONSTRUCTION

SCALE A 500 0 500 1000 1500 2000 2500 3000 ft

– DISCLAIMER –

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Knight Piésold
CONSULTING

MONTANA RESOURCES, LLP

YANKEE DOODLE TAILINGS IMPOUNDMENT

6450 CREST
GENERAL ARRANGEMENT

MONTANA
KEN J. BROUWER
10020 PE
Jun 21, 2017
REGISTERED PROFESSIONAL ENGINEER

DRG. NO.	DESCRIPTION
REFERENCE DRAWINGS	

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED	APPROVED
REVISIONS						

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED	APPROVED
1	13JUN'17	NOT FOR CONSTRUCTION	DDF	MJC	JRG	KJB
0	09NOV'16	NOT FOR CONSTRUCTION	JRG	ABN	DDF	KJB
REVISIONS						

DRAWING NO.	DRAWING NO.	REVISION
VA101-126/12	MR-C2020	1

SAVED: M:\1\01\00126\12\A\Acad\DWGS\MR-C2020\MR-C2020_r1, 6/13/2017 8:49:05 AM , MCOUTTS PRINTED: 6/13/2017 8:51:03 AM, MR-C2020, MCOUTTS
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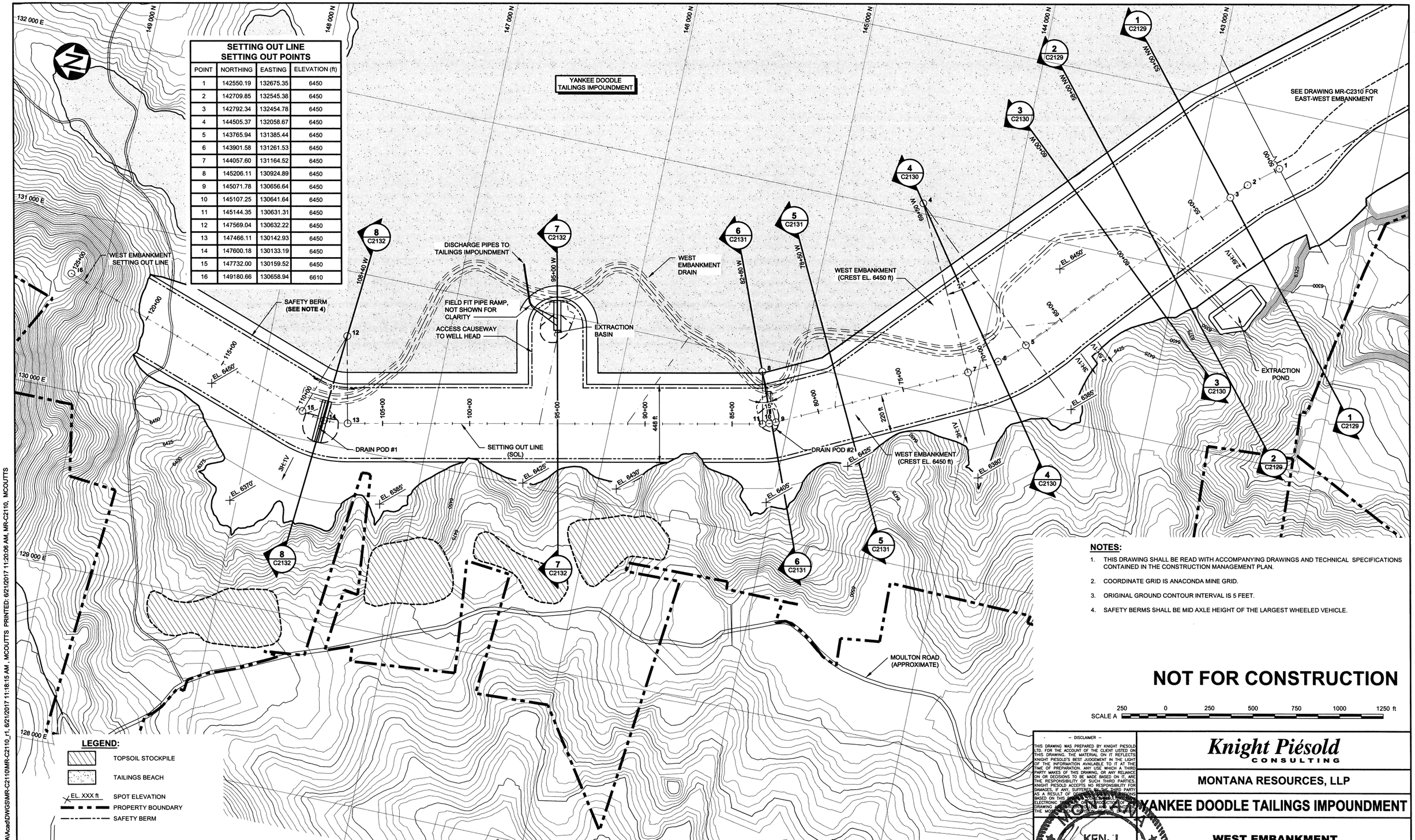

SETTING OUT LINE SETTING OUT POINTS			
POINT	NORTHING	EASTING	ELEVATION (ft)
1	142550.19	132675.35	6450
2	142709.85	132545.38	6450
3	142792.34	132454.78	6450
4	144505.37	132058.67	6450
5	143765.94	131385.44	6450
6	143901.58	131261.53	6450
7	144057.60	131164.52	6450
8	145206.11	130924.89	6450
9	145071.78	130656.64	6450
10	145107.25	130641.64	6450
11	145144.35	130631.31	6450
12	147569.04	130632.22	6450
13	147466.11	130142.93	6450
14	147600.18	130133.19	6450
15	147732.00	130159.52	6450
16	149180.66	130658.94	6610

NOTES:

1. THIS DRAWING SHALL BE READ WITH ACCOMPANYING DRAWINGS AND TECHNICAL SPECIFICATIONS CONTAINED IN THE CONSTRUCTION MANAGEMENT PLAN.
2. COORDINATE GRID IS ANACONDA MINE GRID.
3. ORIGINAL GROUND CONTOUR INTERVAL IS 5 FEET.
4. SAFETY BERMS SHALL BE MID AXLE HEIGHT OF THE LARGEST WHEELED VEHICLE.

NOT FOR CONSTRUCTION

SCALE A 250 0 250 500 750 1000 1250 ft

LEGEND:

- TOPSOIL STOCKPILE
- TAILINGS BEACH
- EL. XXX ft SPOT ELEVATION
- PROPERTY BOUNDARY
- SAFETY BERM

DRG. NO.	DESCRIPTION
MR-C2132	WEST EMBANKMENT - 6450 CREST - SECTIONS 95+50 W AND 108+40 W
MR-C2131	WEST EMBANKMENT - 6450 CREST - SECTIONS 78+50 W AND 82+80 W
MR-C2130	WEST EMBANKMENT - 6450 CREST - SECTIONS 60+00 W AND 69+50 W
MR-C2129	WEST EMBANKMENT - 6450 CREST - SECTIONS 53+00 NW AND 58+00 NW

REFERENCE DRAWINGS

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED	APPROVED
1	13JUN'17	NOT FOR CONSTRUCTION	DDF	NSD/MJC	JRG	KJB
0	09NOV'16	NOT FOR CONSTRUCTION	ACR	RM	DDF	KJB

REVISIONS

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MONTANA KEN J. BROUWER 10020 PE Jun 21/17 REGISTERED PROFESSIONAL ENGINEER

Knight Piésold CONSULTING

MONTANA RESOURCES, LLP

YANKEE DOODLE TAILINGS IMPOUNDMENT

WEST EMBANKMENT
6450 CREST
PLAN

VA101-126/12	DRAWING NO. MR-C2110	REVISION 1

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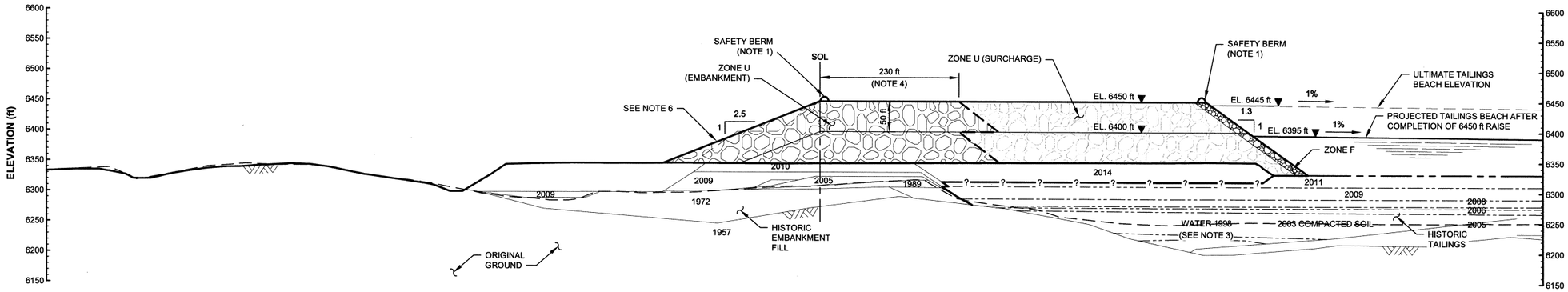
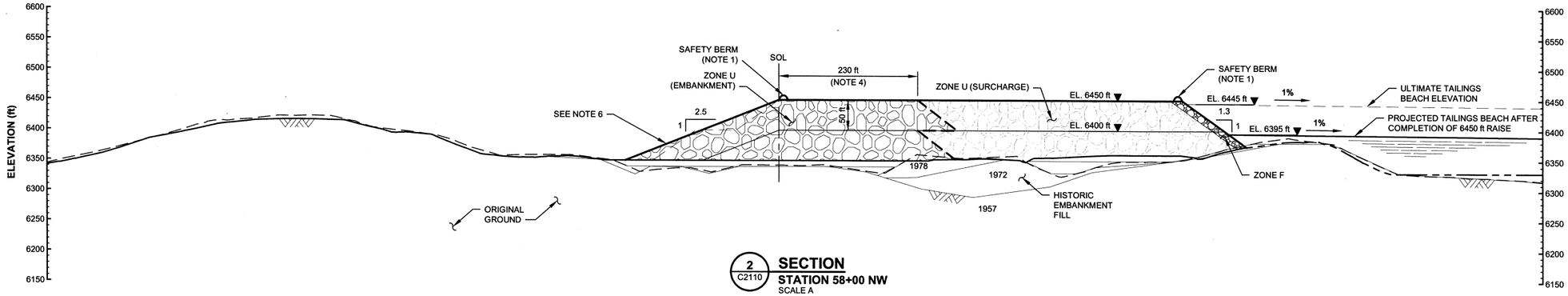


1 C2110 **SECTION**
STATION 53+00 NW
SCALE A



2 C2110 **SECTION**
STATION 58+00 NW
SCALE A

LEGEND:

- ZONE F - EARTHFILL
- ZONE U - ROCKFILL (SURCHARGE)
- ZONE U - ROCKFILL (EMBANKMENT)
- SOL — SETTING OUT LINE
- 2014 SURVEY (TAILINGS)
- 2002 SURVEY
- 1972 — HISTORIC TAILINGS SURFACE
- 1972 — DATE OF EMBANKMENT RAISE

NOTES:

1. SAFETY BERMS SHALL BE MID AXLE HEIGHT OF THE LARGEST WHEELED VEHICLE.
2. REFER TO DRG. NO. MR-C0011 FOR FILL MATERIAL SPECIFICATIONS.
3. WATER WAS PONDED IN THIS LOCATION IN 1998.
4. 230 ft IS THE CREST WIDTH MEASURED PERPENDICULAR TO THE EMBANKMENT FROM THE SETTING OUT LINE.
5. EMBANKMENT STAGING IS BASED ON PRELIMINARY DESIGN. NOT FOR CONSTRUCTION.
6. DOWNSTREAM SLOPES TO BE CONCURRENTLY RECLAIMED WHEN AND WHERE PRACTICAL.

NOT FOR CONSTRUCTION

SCALE A 100 0 100 200 300 400 500 ft

DRG. NO.	DESCRIPTION
MR-C2110	WEST EMBANKMENT - 6450 CREST - PLAN
MR-C2010	6450 CREST - GENERAL ARRANGEMENT

REFERENCE DRAWINGS

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED	APPROVED

REVISIONS

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED	APPROVED
1	15JUN'17	NOT FOR CONSTRUCTION	DDF	NSD/MJC	JRG	KJB
0	09NOV'16	NOT FOR CONSTRUCTION	ACR	ABN	DDF	KJB

REVISIONS

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MONTANA RESOURCES, LLP

YANKEE DOODLE TAILINGS IMPOUNDMENT

WEST EMBANKMENT 6450 CREST SECTIONS 53+00 NW AND 58+00 NW

PROJECT NO.	DRAWING NO.	REVISION
VA101-126/12	MR-C2129	1

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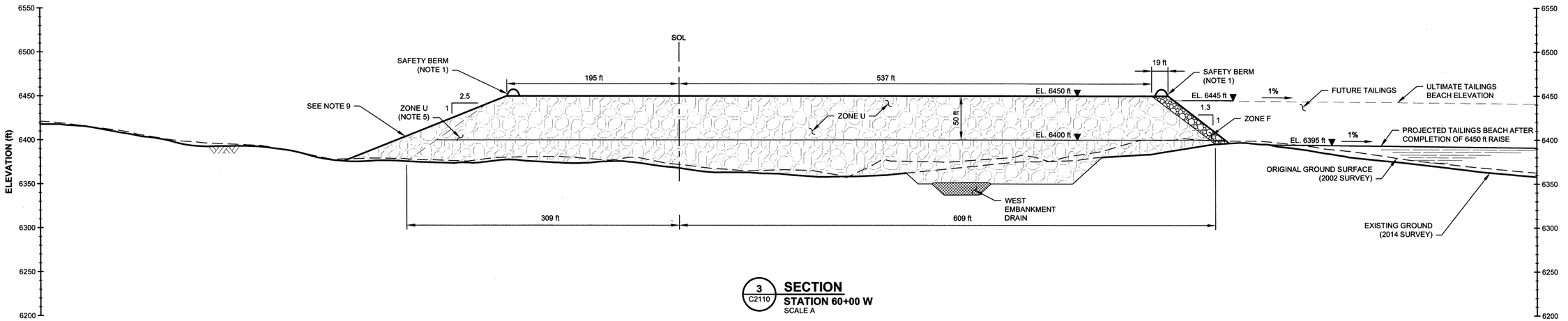
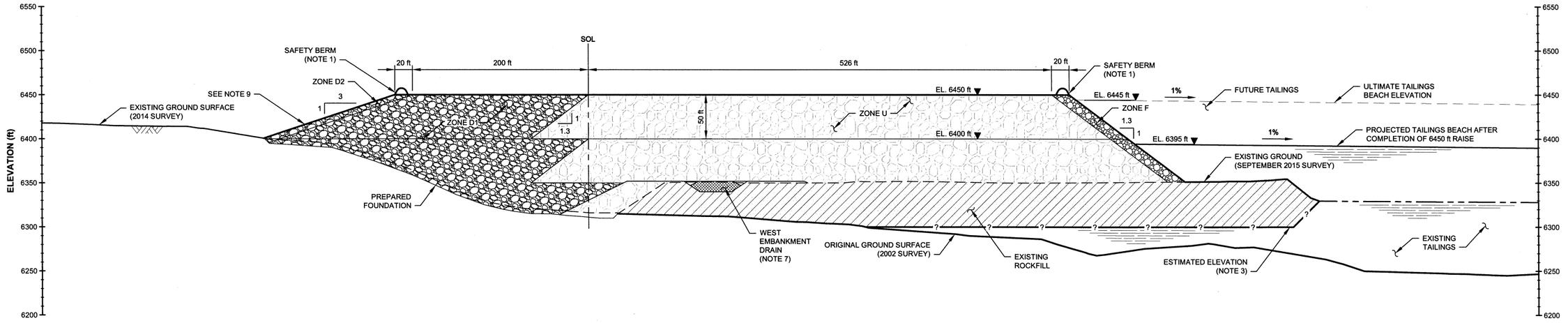


3 / C2110 SECTION
STATION 60+00 W
SCALE A



4 / C2110 SECTION
STATION 69+50 W
SCALE A

LEGEND:

- ZONE F - EARTHFILL
- ZONE U - ROCKFILL
- ZONE D1 - ROCKFILL
- ZONE D2 - ROCKFILL
- DRAIN POD / EXTRACTION BASIN/ WEST EMBANKMENT DRAIN
- SECONDARY SEEPAGE COLLECTION DRAIN
- EXISTING ROCKFILL
- SOL — SETTING OUT LINE

NOTES:

1. SAFETY BERMS SHALL BE MID AXLE HEIGHT OF THE LARGEST WHEELED VEHICLE.
2. REFER TO DRG. NO. MR-C0011 FOR FILL MATERIAL SPECIFICATIONS.
3. ELEVATION OF EXISTING TAILINGS AND EXISTING ROCKFILL INTERFACE ESTIMATED AT EL. 6300'.
4. ZONE UA - PROTECTIVE CAP NOT SHOWN FOR CLARITY.
5. ZONE U - ROCKFILL MATERIAL TO BE PLACED WEST OF THE SETTING OUT LINE UP TO STA. 63+00.
6. ZONE D1 - ROCKFILL TO BE PLACED WEST OF THE SETTING OUT LINE FROM STA. 63+00.
7. WEST EMBANKMENT DRAIN ZONATION NOT SHOWN FOR CLARITY. REFER TO SPECIFIC DETAIL DRAWING FOR MATERIALS.
8. EMBANKMENT STAGING IS BASED ON PRELIMINARY DESIGN. NOT FOR CONSTRUCTION.
9. DOWNSTREAM SLOPES TO BE CONCURRENTLY RECLAIMED WHEN AND WHERE PRACTICAL.

NOT FOR CONSTRUCTION

SCALE A: 50 0 50 100 150 200 250 300 ft

DRG. NO.	DESCRIPTION
MR-C2110	WEST EMBANKMENT - 6450 CREST - PLAN
MR-C2010	6450 CREST - GENERAL ARRANGEMENT

REFERENCE DRAWINGS

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED	APPROVED
1	15JUN'17	NOT FOR CONSTRUCTION	DDF	NSD/MJC	JRG	KJB
0	09NOV'16	NOT FOR CONSTRUCTION	ACR	SIR/ABN	DDF	KJB

REVISIONS

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KEN J. BROUWER 10020 PE Jun 21, 2017 REGISTERED PROFESSIONAL ENGINEER

Knight Piésold CONSULTING

MONTANA RESOURCES, LLP

YANKEE DOODLE TAILINGS IMPOUNDMENT

WEST EMBANKMENT 6450 CREST SECTIONS 60+00 W AND 69+50 W

PROJECT NO.	DRAWING NO.	REVISION
VA101-126/12	MR-C2130	1

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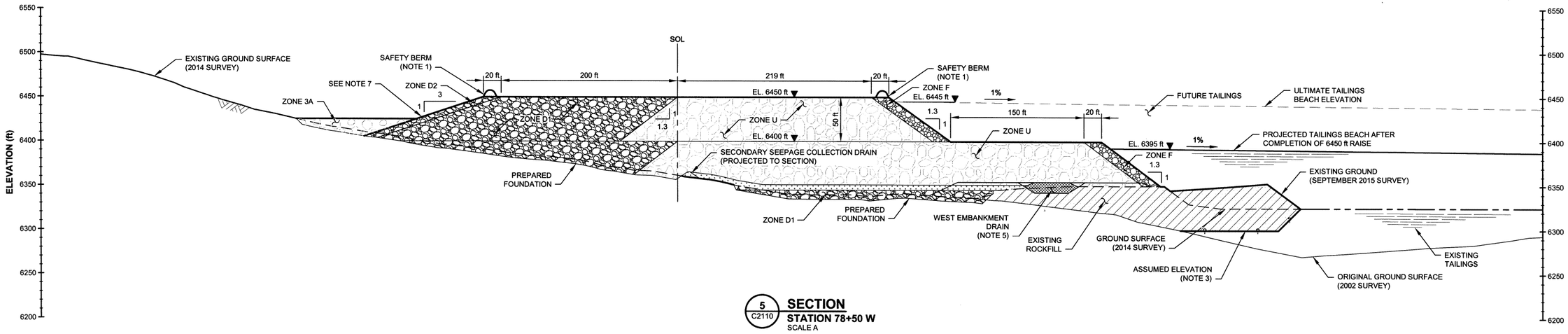
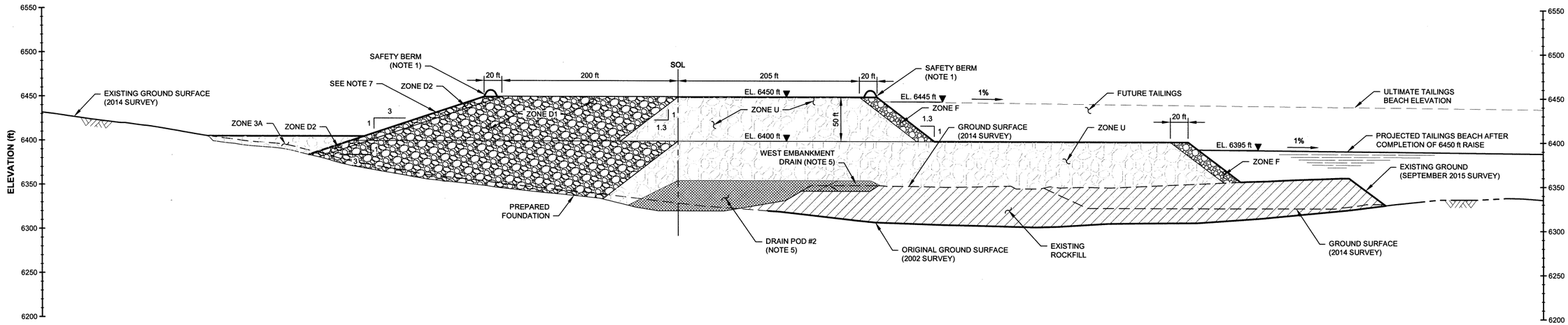


5 / C2110 SECTION
STATION 78+50 W
SCALE A



6 / C2110 SECTION
STATION 82+80 W
SCALE A

NOT FOR CONSTRUCTION

SCALE A 50 0 50 100 150 200 250 300 ft

LEGEND:

- ZONE F - EARTHFILL
- ZONE U - ROCKFILL
- ZONE 3A - DRAIN ROCK
- ZONE D1 - ROCKFILL
- ZONE D2 - ROCKFILL
- DRAIN POD / EXTRACTION BASIN / WEST EMBANKMENT DRAIN
- SECONDARY SEEPAGE COLLECTION DRAIN
- EXISTING ROCKFILL
- SOL SETTING OUT LINE

NOTES:

1. SAFETY BERMS SHALL BE MID AXLE HEIGHT OF THE LARGEST WHEELED VEHICLE.
2. REFER TO DRG. NO. MR-C0011 FOR FILL MATERIAL SPECIFICATIONS.
3. ELEVATION OF EXISTING TAILINGS AND EXISTING ROCKFILL INTERFACE ESTIMATED AT EL. 6300'.
4. ZONE UA - PROTECTIVE CAP NOT SHOWN FOR CLARITY
5. WEST EMBANKMENT DRAIN AND DRAIN POD ZONATION NOT SHOWN FOR CLARITY. REFER TO SPECIFIC DETAIL DRAWING FOR MATERIALS.
6. EMBANKMENT STAGING IS BASED ON PRELIMINARY DESIGN. NOT FOR CONSTRUCTION.
7. DOWNSTREAM SLOPES TO BE CONCURRENTLY RECLAIMED WHEN AND WHERE PRACTICAL.

DRG. NO.	DESCRIPTION
MR-C2110	WEST EMBANKMENT - 6450 CREST - PLAN
MR-C2010	6450 CREST - GENERAL ARRANGEMENT

REFERENCE DRAWINGS

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED	APPROVED
1	22JUN'17	NOT FOR CONSTRUCTION	DDF	NSD/MJC	KBS	KJB
0	09NOV'16	NOT FOR CONSTRUCTION	ACR	ABN/RM	DDF	KJB

REVISIONS

– DISCLAIMER –
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KEN J. BROUWER 10020 PE June 21, 2017 REGISTERED PROFESSIONAL ENGINEER

Knight Piésold CONSULTING

MONTANA RESOURCES, LLP

YANKEE DOODLE TAILINGS IMPOUNDMENT

WEST EMBANKMENT
6450 CREST
SECTIONS 78+50 W AND 82+80 W

PROJECT NO. VA101-126/12 | DRAWING NO. MR-C2131 | REVISION 1

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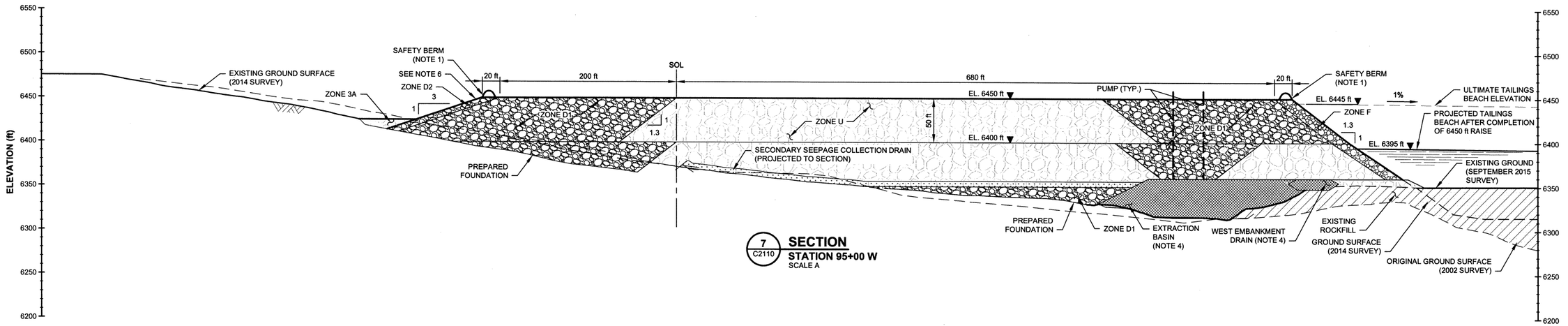
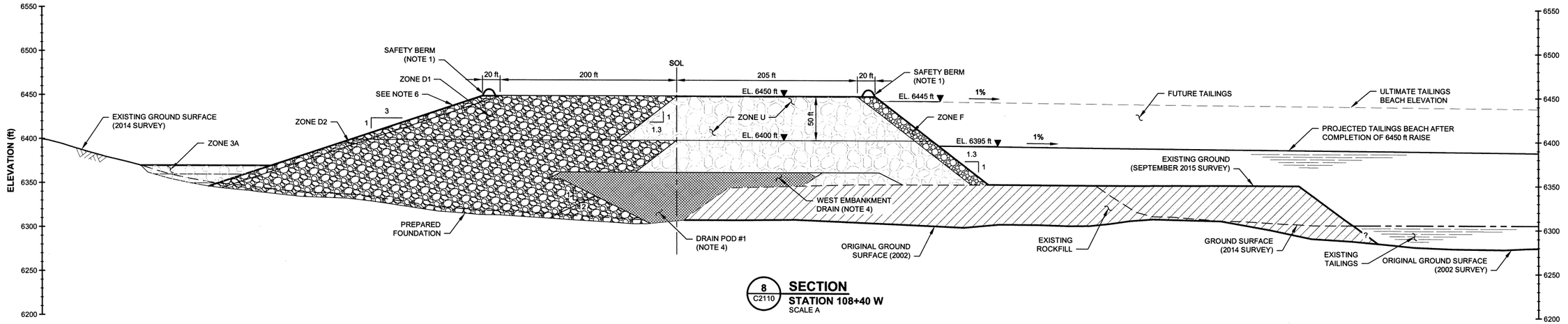


7 / C2110 **SECTION**
STATION 95+00 W
SCALE A



8 / C2110 **SECTION**
STATION 108+40 W
SCALE A

NOT FOR CONSTRUCTION

SCALE A: 50 0 50 100 150 200 250 300 ft

LEGEND:

- ZONE F - EARTHFILL
- ZONE U - ROCKFILL
- ZONE D2 - EARTHFILL
- ZONE D1 - ROCKFILL
- ZONE 3A - DRAIN ROCK
- DRAIN POD / EXTRACTION BASIN / WEST EMBANKMENT DRAIN
- SEEPAGE COLLECTION DRAIN
- EXISTING ROCKFILL
- SOL — SETTING OUT LINE

NOTES:

1. SAFETY BERMS SHALL BE MID AXLE HEIGHT OF THE LARGEST WHEELED VEHICLE.
2. REFER TO DRG. NO. MR-C0011 FOR FILL MATERIAL SPECIFICATIONS.
3. ZONE UA - PROTECTIVE CAP NOT SHOWN FOR CLARITY.
4. WEST EMBANKMENT DRAIN, DRAIN POD, AND EXTRACTION BASIN ZONATION NOT SHOWN FOR CLARITY. REFER TO SPECIFIC DETAIL DRAWINGS FOR MATERIALS.
5. EMBANKMENT STAGING IS BASED ON PRELIMINARY DESIGN. NOT FOR CONSTRUCTION.
6. DOWNSTREAM SLOPES TO BE CONCURRENTLY RECLAIMED WHEN AND WHERE PRACTICAL.

DRG. NO.	DESCRIPTION
MR-C2110	WEST EMBANKMENT - 6450 CREST - PLAN
MR-C2010	6450 CREST - GENERAL ARRANGEMENT

REFERENCE DRAWINGS

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED	APPROVED

REVISIONS

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED	APPROVED
1	15JUN'17	NOT FOR CONSTRUCTION	DDF	NSD/MJC	JRG	KJB
0	09NOV'16	NOT FOR CONSTRUCTION	ACR	ABN/RM	DDF	KJB

REVISIONS

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KEN J. BROUWER 10020 PE June 21, 2017 REGISTERED PROFESSIONAL ENGINEER

Knight Piésold CONSULTING

MONTANA RESOURCES, LLP

YANKEE DOODLE TAILINGS IMPOUNDMENT

WEST EMBANKMENT 6450 CREST SECTIONS 95+00 W AND 108+40 W

PROJECT NO.	DRAWING NO.	REVISION
VA101-126/12	MR-C2132	1

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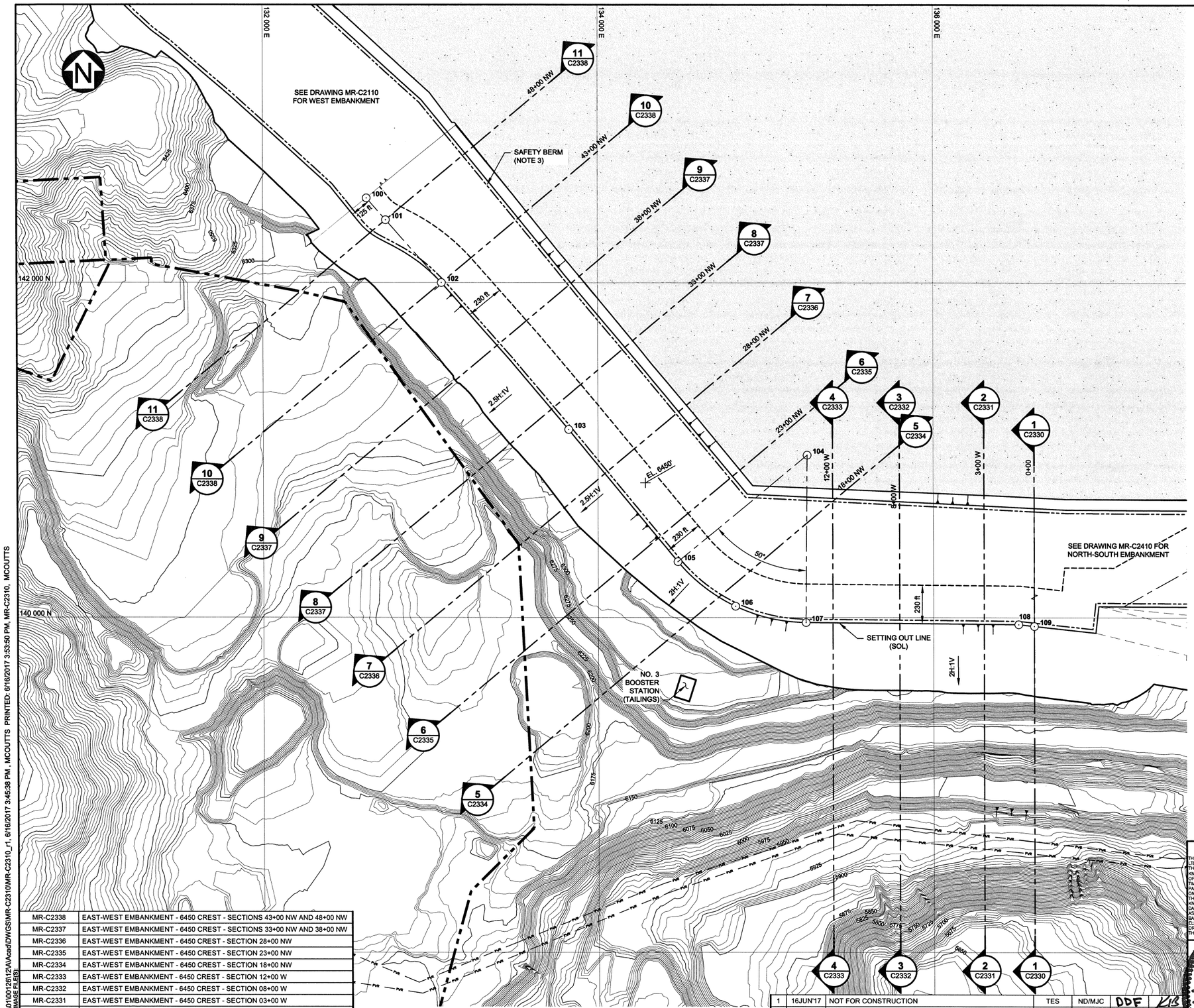

SETTING OUT LINE SETTING OUT POINTS			
POINT	NORTHING	EASTING	ELEVATION (ft)
100	142505.99	132621.06	6450
101	142375.62	132736.05	6450
102	142000.45	133066.80	6450
103	141123.55	133824.37	6450
104	140970.52	135247.23	6450
105	140334.01	134475.97	6450
106	140067.89	134816.83	6450
107	139970.56	135238.19	6450
108	139959.10	136505.33	6450
109	139948.82	136600.00	6450

LEGEND:

- TAILINGS BEACH
- PROPERTY BOUNDARY
- SAFETY BERM
- TRANSMISSION LINE

NOTES:

1. THIS DRAWING SHALL BE READ WITH ACCOMPANYING DRAWINGS AND TECHNICAL SPECIFICATIONS CONTAINED IN THE CONSTRUCTION MANAGEMENT PLAN.
2. COORDINATE GRID IS ANACONDA MINE GRID.
3. SAFETY BERMS SHALL BE MID AXLE HEIGHT OF THE LARGEST WHEELED VEHICLE.
4. EMBANKMENT CREST IS 230 FEET WIDE.
5. EMBANKMENT STAGING IS BASED ON PRELIMINARY DESIGN. NOT FOR CONSTRUCTION.

NOT FOR CONSTRUCTION

SCALE A 300 0 300 600 900 1200 1500 ft

DRG. NO.	DESCRIPTION
MR-C2338	EAST-WEST EMBANKMENT - 6450 CREST - SECTIONS 43+00 NW AND 48+00 NW
MR-C2337	EAST-WEST EMBANKMENT - 6450 CREST - SECTIONS 33+00 NW AND 38+00 NW
MR-C2336	EAST-WEST EMBANKMENT - 6450 CREST - SECTION 28+00 NW
MR-C2335	EAST-WEST EMBANKMENT - 6450 CREST - SECTION 23+00 NW
MR-C2334	EAST-WEST EMBANKMENT - 6450 CREST - SECTION 18+00 NW
MR-C2333	EAST-WEST EMBANKMENT - 6450 CREST - SECTION 12+00 W
MR-C2332	EAST-WEST EMBANKMENT - 6450 CREST - SECTION 08+00 W
MR-C2331	EAST-WEST EMBANKMENT - 6450 CREST - SECTION 03+00 W
MR-C2330	EAST-WEST EMBANKMENT - 6450 CREST - SECTION 0+00

REFERENCE DRAWINGS

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED	APPROVED
1	16JUN'17	NOT FOR CONSTRUCTION	TES	ND/MJC	DDF	KJB
0	09NOV'16	NOT FOR CONSTRUCTION	JRG	ABN	DDF	KJB

REVISIONS

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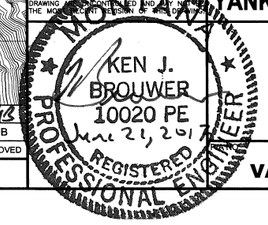

Knight Piésold CONSULTING

MONTANA RESOURCES, LLP

YANKEE DOODLE TAILINGS IMPOUNDMENT

EAST-WEST EMBANKMENT 6450 CREST PLAN

DRAWING NO.	REVISION
VA101-126/12	MR-C2310 — 1

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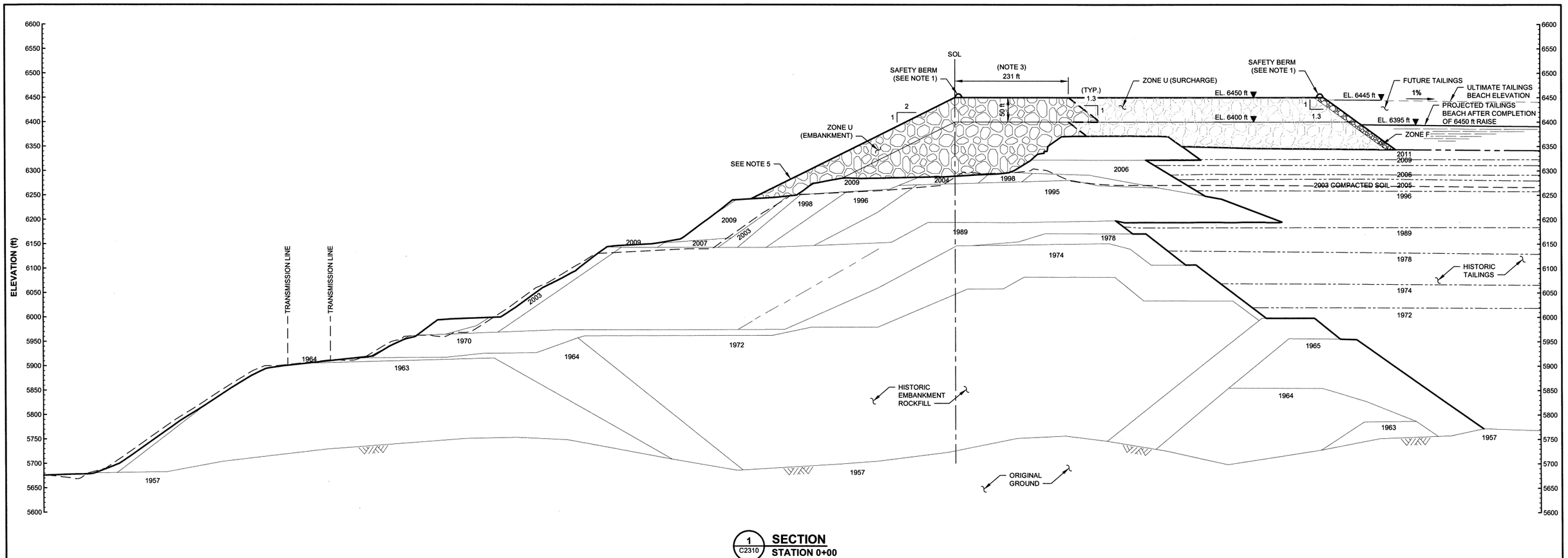

1 C2310 **SECTION**
STATION 0+00
SCALE A

NOT FOR CONSTRUCTION

SCALE A 100 0 100 200 300 400 500 ft

LEGEND:

- ZONE F - EARTHFILL
- ZONE U - ROCKFILL (SURCHARGE)
- ZONE U - ROCKFILL (EMBANKMENT)
- SOL — SETTING OUT LINE
- 2014 SURVEY (TAILINGS)
- 2002 SURVEY
- 1972 — HISTORIC TAILINGS SURFACE
- 1972 — DATE OF EMBANKMENT RAISE

NOTES:

1. SAFETY BERMS SHALL BE MID AXLE HEIGHT OF THE LARGEST WHEELED VEHICLE.
2. REFER TO DRG. NO. MR-C0011 FOR FILL MATERIAL SPECIFICATIONS.
3. NOTED WIDTH EXCEEDS 230 FEET AS SECTION IS NOT PERPENDICULAR TO EMBANKMENT CREST.
4. EMBANKMENT STAGING IS BASED ON PRELIMINARY DESIGN. NOT FOR CONSTRUCTION.
5. DOWNSTREAM SLOPES TO BE CONCURRENTLY RECLAIMED WHEN AND WHERE PRACTICAL.

DRG. NO.	DESCRIPTION
MR-C2310	EAST-WEST EMBANKMENT - 6450 CREST - PLAN

REFERENCE DRAWINGS

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED	APPROVED
1	16JUN'17	NOT FOR CONSTRUCTION	TES	ND/MJC	DDF	KJB
0	09NOV'16	NOT FOR CONSTRUCTION	JRG	ABN	DDF	KJB

REVISIONS

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MONTANA
KEN J. BROUWER
10020 PE
June 21, 2017
REGISTERED PROFESSIONAL ENGINEER

Knight Piésold
CONSULTING

MONTANA RESOURCES, LLP

YANKEE DOODLE TAILINGS IMPOUNDMENT

EAST-WEST EMBANKMENT
6450 CREST
SECTION 0+00

DRAWING NO.	REVISION
VA101-126/12	MR-C2330	1

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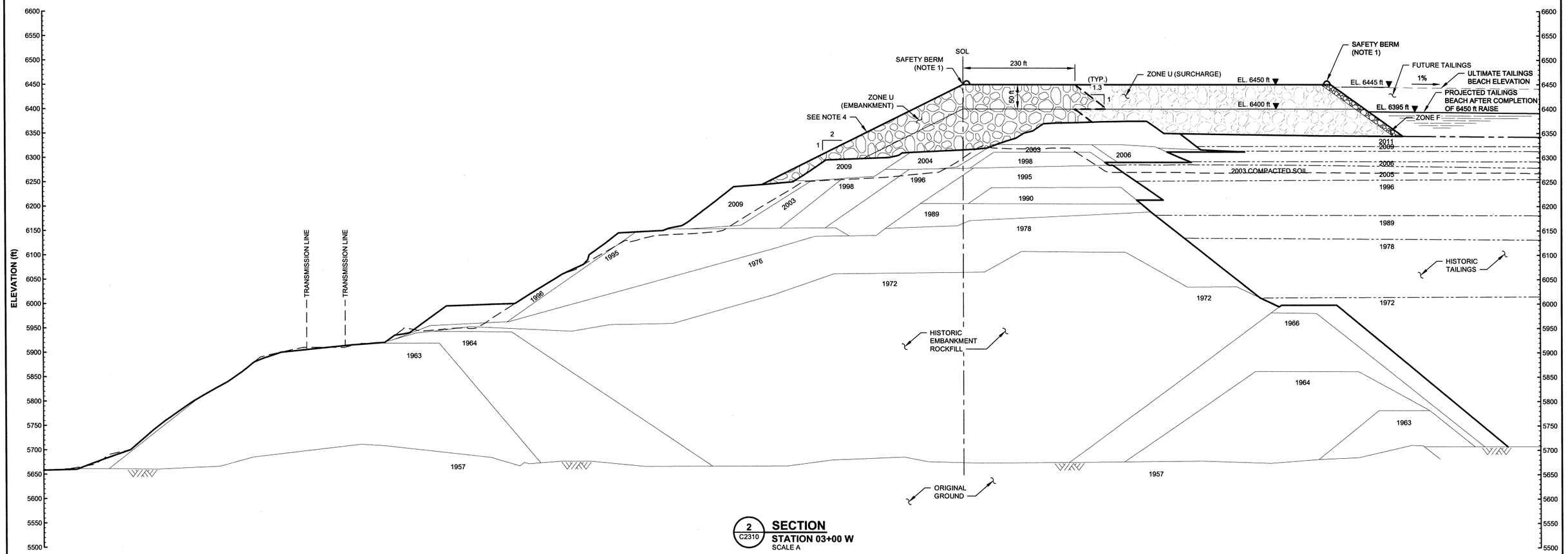

2 C2310 SECTION
STATION 03+00 W
SCALE A

LEGEND:

- ZONE F - EARTHFILL
- ZONE U - ROCKFILL (SURCHARGE)
- ZONE U - ROCKFILL (EMBANKMENT)
- SOL — SETTING OUT LINE
- 2014 SURVEY (TAILINGS)
- 2002 SURVEY
- 1972 — HISTORIC TAILINGS SURFACE
- 1972 — DATE OF EMBANKMENT RAISE

NOTES:

1. SAFETY BERMS SHALL BE MID AXLE HEIGHT OF THE LARGEST WHEELED VEHICLE.
2. REFER TO DRG. NO. MR-C0011 FOR FILL MATERIAL SPECIFICATIONS.
3. EMBANKMENT STAGING IS BASED ON PRELIMINARY DESIGN. NOT FOR CONSTRUCTION.
4. DOWNSTREAM SLOPES TO BE CONCURRENTLY RECLAIMED WHEN AND WHERE PRACTICAL.

NOT FOR CONSTRUCTION

SCALE A: 100 0 100 200 300 400 500 ft

– DISCLAIMER –
THIS DRAWING WAS PREPARED BY KNIGHT PIÉSOLD LTD. FOR THE ACCOUNT OF THE CLIENT LISTED ON THIS DRAWING. THE MATERIAL ON IT REFLECTS KNIGHT PIÉSOLD'S BEST JUDGEMENT IN THE LIGHT OF THE INFORMATION AVAILABLE TO IT AT THE TIME OF PREPARATION. ANY USE WHICH A THIRD PARTY MAKES OF THIS DRAWING, OR ANY RELIANCE ON OR DECISIONS TO BE MADE BASED ON IT, ARE THE RESPONSIBILITY OF SUCH THIRD PARTIES. KNIGHT PIÉSOLD ACCEPTS NO RESPONSIBILITY FOR DAMAGES, IF ANY, SUFFERED BY ANY THIRD PARTY AS A RESULT OF DECISIONS MADE OR ACTIONS BASED ON THIS DRAWING. ANY REPRODUCTION OF ELECTRONIC MASTER. REPRODUCTION OF THIS DRAWING IS CONTROLLED AND ONLY THE MOST RECENT REVISION OF THIS DRAWING

KEN J. BROUWER 10020 PE June 21, 2017
REGISTERED PROFESSIONAL ENGINEER

Knight Piésold CONSULTING

MONTANA RESOURCES, LLP

YANKEE DOODLE TAILINGS IMPOUNDMENT

EAST-WEST EMBANKMENT
6450 CREST
SECTION 03+00 W

DRAWING NO.	REVISION
MR-C2331	1

VA101-126/12

DRG. NO.	DESCRIPTION
MR-C2310	EAST-WEST EMBANKMENT - 6450 CREST - PLAN

REFERENCE DRAWINGS

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED	APPROVED
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0	09NOV'16	NOT FOR CONSTRUCTION	JRG	ABN	DDF	KJB

REVISIONS

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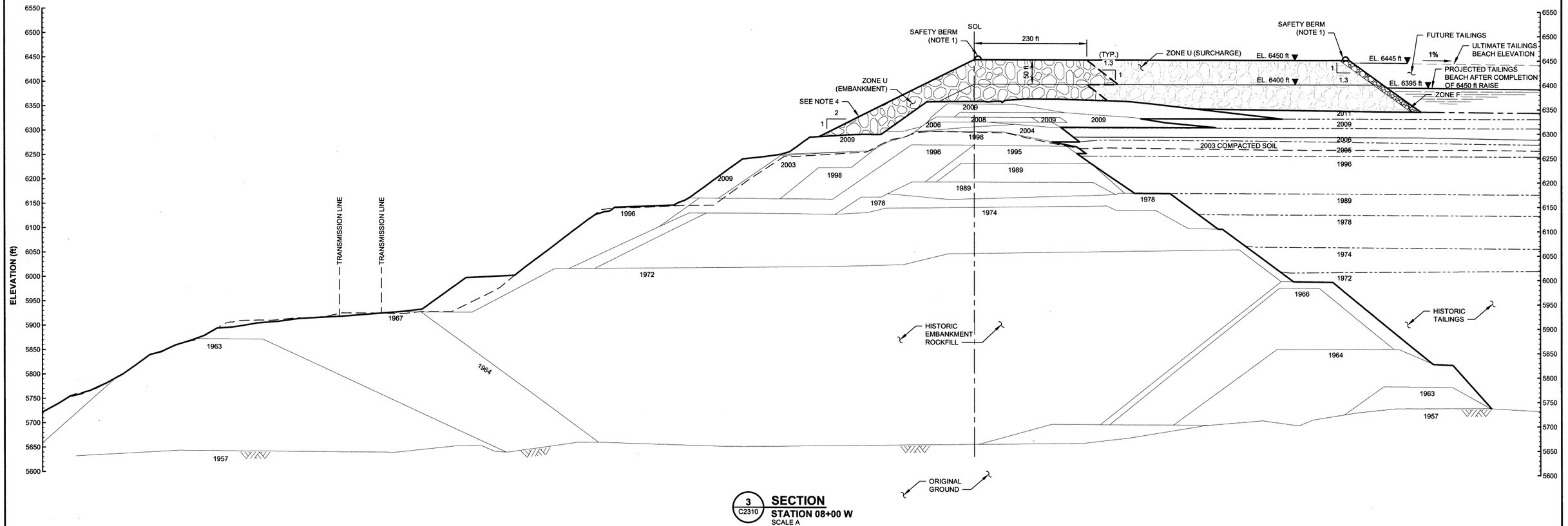

3 C2310 **SECTION**
STATION 08+00 W
SCALE A

NOT FOR CONSTRUCTION

SCALE A 100 0 100 200 300 400 500 ft

LEGEND:

- ZONE F - EARTHFILL
- ZONE U - ROCKFILL (SURCHARGE)
- ZONE U - ROCKFILL (EMBANKMENT)
- SOL — SETTING OUT LINE
- 2014 SURVEY (TAILINGS)
- 2002 SURVEY
- 1972 — HISTORIC TAILINGS SURFACE
- 1972 — DATE OF EMBANKMENT RAISE

NOTES:

1. SAFETY BERMS SHALL BE MID AXLE HEIGHT OF THE LARGEST WHEELED VEHICLE.
2. REFER TO DRG. NO. MR-C0011 FOR FILL MATERIAL SPECIFICATIONS.
3. EMBANKMENT STAGING IS BASED ON PRELIMINARY DESIGN. NOT FOR CONSTRUCTION.
4. DOWNSTREAM SLOPES TO BE CONCURRENTLY RECLAIMED WHEN AND WHERE PRACTICAL.

DRG. NO.	DESCRIPTION
MR-C2310	EAST-WEST EMBANKMENT - 6450 CREST - PLAN

REFERENCE DRAWINGS

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED	APPROVED
1	16JUN'17	NOT FOR CONSTRUCTION	TES	ND/MJC	DDF	KJB
0	09NOV'16	NOT FOR CONSTRUCTION	JRG	ABN	DDF	KJB

REVISIONS

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MONTANA
KEN J. BROUWER
10020 PE
Jun 21, 2017
REGISTERED PROFESSIONAL ENGINEER

Knight Piésold
CONSULTING

MONTANA RESOURCES, LLP

YANKEE DOODLE TAILINGS IMPOUNDMENT

EAST-WEST EMBANKMENT
6450 CREST
SECTION 08+00 W

DRG. NO.	DRAWING NO.	REVISION
VA101-126/12	MR-C2332	1

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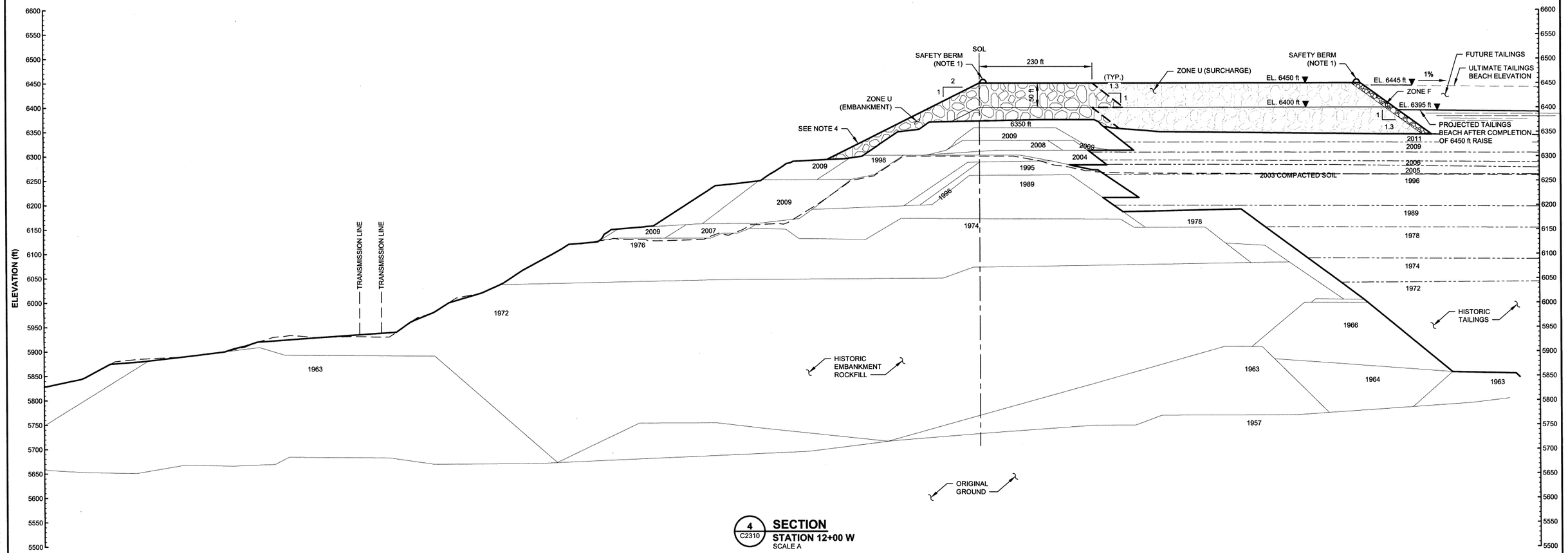

4 C2310 **SECTION**
STATION 12+00 W
SCALE A

NOT FOR CONSTRUCTION

SCALE A 100 0 100 200 300 400 500 ft

LEGEND:

- ZONE F - EARTHFILL
- ZONE U - ROCKFILL (SURCHARGE)
- ZONE U - ROCKFILL (EMBANKMENT)
- SOL — SETTING OUT LINE
- 2014 SURVEY (TAILINGS)
- 2002 SURVEY
- 1972 — HISTORIC TAILINGS SURFACE
- 1972 — DATE OF EMBANKMENT RAISE

NOTES:

1. SAFETY BERMS SHALL BE MID AXLE HEIGHT OF THE LARGEST WHEELED VEHICLE.
2. REFER TO DRG. NO. MR-C0011 FOR FILL MATERIAL SPECIFICATIONS.
3. EMBANKMENT STAGING IS BASED ON PRELIMINARY DESIGN. NOT FOR CONSTRUCTION.
4. DOWNSTREAM SLOPES TO BE CONCURRENTLY RECLAIMED WHEN AND WHERE PRACTICAL.

DRG. NO.	DESCRIPTION
MR-C2310	EAST-WEST EMBANKMENT - 6450 CREST - PLAN

REFERENCE DRAWINGS

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED	APPROVED
1	19JUN'17	NOT FOR CONSTRUCTION	TES	ND/MJC	DDF	KJB
0	09NOV'16	NOT FOR CONSTRUCTION	JRG	ABN	DDF	KJB

REVISIONS

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KEN J. BROUWER
10020 PE
June 21, 2017
REGISTERED PROFESSIONAL ENGINEER

Knight Piésold
CONSULTING

MONTANA RESOURCES, LLP

YANKEE DOODLE TAILINGS IMPOUNDMENT

EAST-WEST EMBANKMENT
6450 CREST
SECTION 12+00 W

VA101-126/12	DRAWING NO. MR-C2333	REVISION 1

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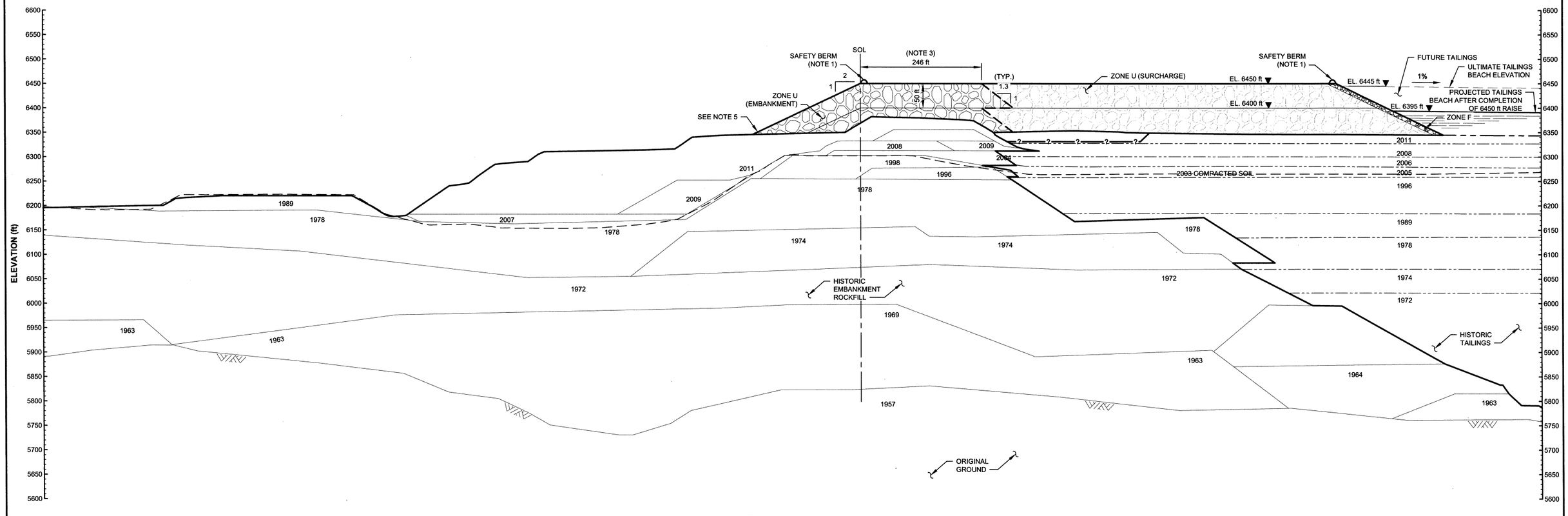

5 C2310 **SECTION**
STATION 18+00 NW
SCALE A

LEGEND:

- ZONE F - EARTHFILL
- ZONE U - ROCKFILL (SURCHARGE)
- ZONE U - ROCKFILL (EMBANKMENT)
- SOL — SETTING OUT LINE
- 2014 SURVEY (TAILINGS)
- 2002 SURVEY
- 1972 — HISTORIC TAILINGS SURFACE
- 1972 — DATE OF EMBANKMENT RAISE

NOTES:

1. SAFETY BERMS SHALL BE MID AXLE HEIGHT OF THE LARGEST WHEELED VEHICLE.
2. REFER TO DRG. NO. MR-C0011 FOR FILL MATERIAL SPECIFICATIONS.
3. NOTED WIDTH EXCEEDS 230 FEET AS SECTION IS NOT PERPENDICULAR TO EMBANKMENT CREST.
4. EMBANKMENT STAGING IS BASED ON PRELIMINARY DESIGN. NOT FOR CONSTRUCTION.
5. DOWNSTREAM SLOPES TO BE CONCURRENTLY RECLAIMED WHEN AND WHERE PRACTICAL.

NOT FOR CONSTRUCTION

SCALE A: 100 0 100 200 300 400 500 ft

DRG. NO.	DESCRIPTION
MR-C2310	EAST-WEST EMBANKMENT - 6450 CREST - PLAN

REFERENCE DRAWINGS

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED	APPROVED
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0	09NOV'16	NOT FOR CONSTRUCTION	JRG	ABN	DDF	KJB

REVISIONS

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PROFESSIONAL ENGINEER — KEN J. BROUWER — 10020 PE — Jun 21, 2017 — REGISTERED

Knight Piésold CONSULTING

MONTANA RESOURCES, LLP

YANKEE DOODLE TAILINGS IMPOUNDMENT

EAST-WEST EMBANKMENT 6450 CREST SECTION 18+00 NW

VA101-126/12	DRAWING NO. MR-C2334	REVISION 1

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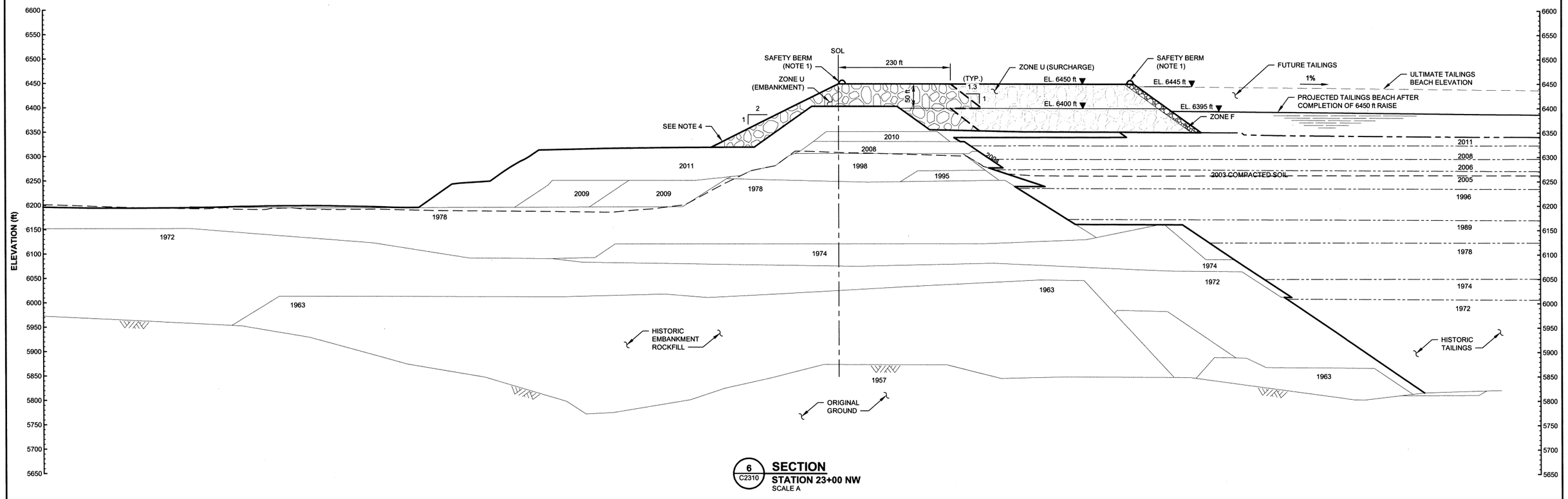

6 C2310 **SECTION**
STATION 23+00 NW
SCALE A

NOT FOR CONSTRUCTION

SCALE A 100 0 100 200 300 400 500 ft

LEGEND:

- ZONE F - EARTHFILL
- ZONE U - ROCKFILL (SURCHARGE)
- ZONE U - ROCKFILL (EMBANKMENT)
- SOL — SETTING OUT LINE
- 2014 SURVEY (TAILINGS)
- 2002 SURVEY
- 1972 — HISTORIC TAILINGS SURFACE
- 1972 — DATE OF EMBANKMENT RAISE

NOTES:

1. SAFETY BERMS SHALL BE MID AXLE HEIGHT OF THE LARGEST WHEELED VEHICLE.
2. REFER TO DRG. NO. MR-C0011 FOR FILL MATERIAL SPECIFICATIONS.
3. EMBANKMENT STAGING IS BASED ON PRELIMINARY DESIGN. NOT FOR CONSTRUCTION.
4. DOWNSTREAM SLOPES TO BE CONCURRENTLY RECLAIMED WHEN AND WHERE PRACTICAL.

– DISCLAIMER –
THIS DRAWING WAS PREPARED BY KNIGHT PIESOLD LTD. FOR THE ACCOUNT OF THE CLIENT LISTED ON THIS DRAWING. THE MATERIAL ON IT REFLECTS KNIGHT PIESOLD'S BEST JUDGEMENT IN THE LIGHT OF THE INFORMATION AVAILABLE TO IT AT THE TIME OF PREPARATION. ANY USE WHICH A THIRD PARTY MAKES OF THIS DRAWING, OR ANY RELIANCE ON OR DECISIONS TO BE MADE BASED ON IT, ARE THE RESPONSIBILITY OF SUCH THIRD PARTIES. KNIGHT PIESOLD ACCEPTS NO RESPONSIBILITY FOR DAMAGES, IF ANY, SUFFERED BY THE THIRD PARTY AS A RESULT OF [illegible] ACTIONS BASED ON THIS DRAWING. COPY FREE [illegible] ELECTRONIC TRANSFER OR REPRODUCTION OF THIS DRAWING [illegible] THE MOST RECENT REVISION OF THIS DRAWING.

MANITOBA
June 21, 2017
KEN J. BROUWER
10020 PE
REGISTERED PROFESSIONAL ENGINEER

Knight Piésold
CONSULTING

MONTANA RESOURCES, LLP

YANKEE DOODLE TAILINGS IMPOUNDMENT

EAST-WEST EMBANKMENT
6450 CREST
SECTION 23+00 NW

DRG. NO.	DESCRIPTION
MR-C2310	EAST-WEST EMBANKMENT - 6450 CREST - PLAN

REFERENCE DRAWINGS

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED	APPROVED
1	19JUN'17	NOT FOR CONSTRUCTION	TES	ND/MJC	DDF	KJB
0	09NOV'16	NOT FOR CONSTRUCTION	JRG	ABN	DDF	KJB

REVISIONS

DRAWING NO.	REVISION
VA101-126/12	MR-C2335	1

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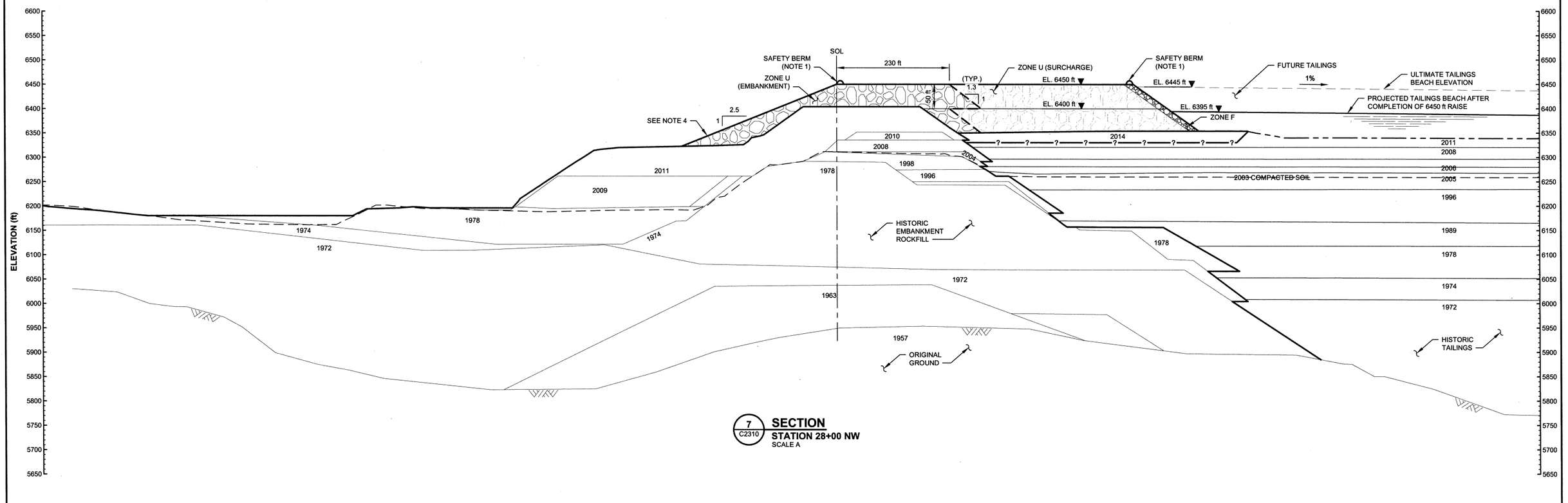

7 C2310 **SECTION**
STATION 28+00 NW
SCALE A

NOT FOR CONSTRUCTION

SCALE A 100 0 100 200 300 400 500 ft

LEGEND:

- ZONE F - EARTHFILL
- ZONE U - ROCKFILL (SURCHARGE)
- ZONE U - ROCKFILL (EMBANKMENT)
- SOL — SETTING OUT LINE
- 2014 SURVEY (TAILINGS)
- 2002 SURVEY
- 1972 — HISTORIC TAILINGS SURFACE
- 1972 — DATE OF EMBANKMENT RAISE

NOTES:

1. SAFETY BERMS SHALL BE MID AXLE HEIGHT OF THE LARGEST WHEELED VEHICLE.
2. REFER TO DRG. NO. MR-C0011 FOR FILL MATERIAL SPECIFICATIONS.
3. EMBANKMENT STAGING IS BASED ON PRELIMINARY DESIGN. NOT FOR CONSTRUCTION.
4. DOWNSTREAM SLOPES TO BE CONCURRENTLY RECLAIMED WHEN AND WHERE PRACTICAL.

DRG. NO.	DESCRIPTION
MR-C2310	EAST-WEST EMBANKMENT - 6450 CREST - PLAN

REFERENCE DRAWINGS

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED	APPROVED
1	19JUN'17	NOT FOR CONSTRUCTION	TES	ND/MJC	DDF	KJB
0	09NOV'16	NOT FOR CONSTRUCTION	JRG	ABN	DDF	KJB

REVISIONS

– DISCLAIMER –
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KEN J. BROUWER
10020 PE
Jun 21, 2017
REGISTERED PROFESSIONAL ENGINEER

Knight Piésold
CONSULTING

MONTANA RESOURCES, LLP

YANKEE DOODLE TAILINGS IMPOUNDMENT

EAST-WEST EMBANKMENT
6450 CREST
SECTION 28+00 NW

DWG NO.	DRAWING NO.	REVISION
VA101-126/12	MR-C2336	1

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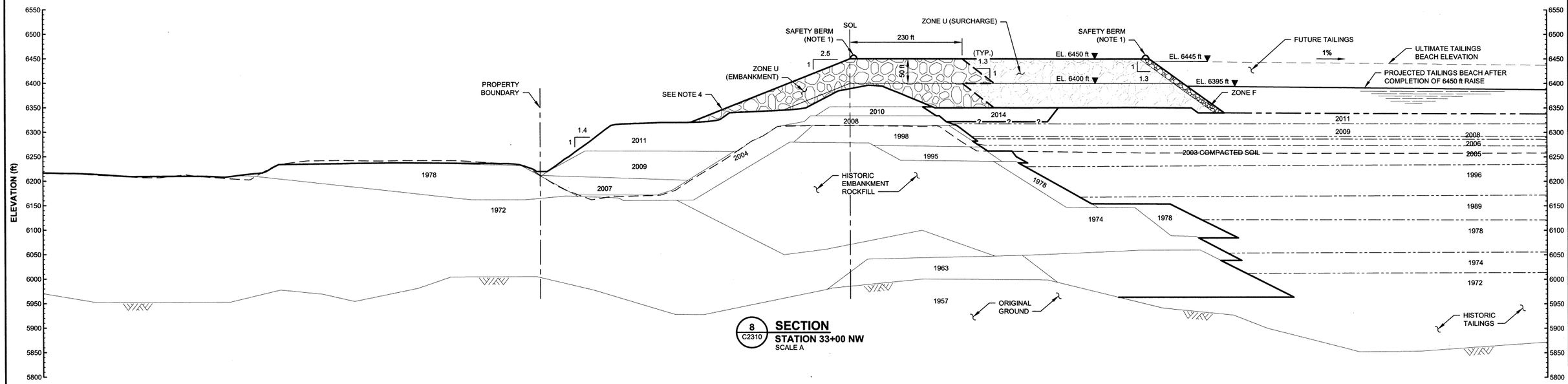
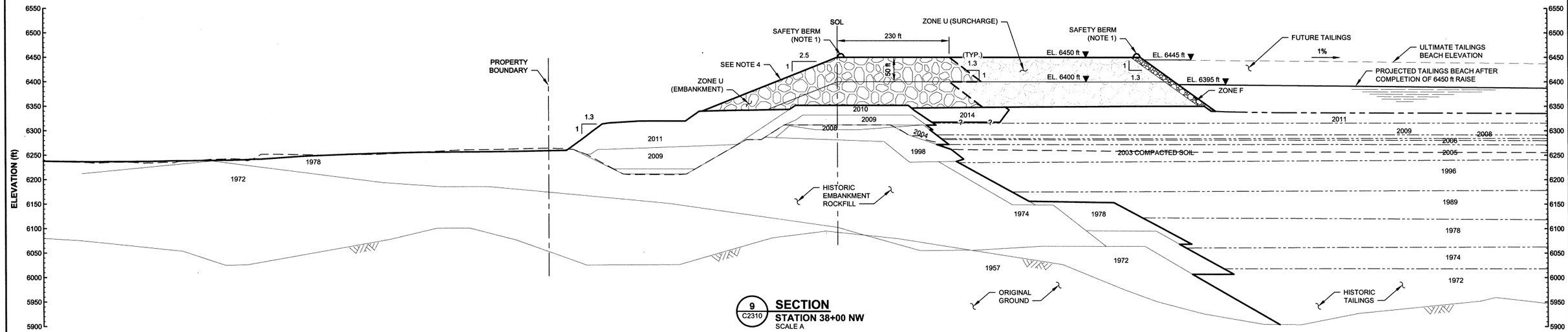


8 C2310 SECTION
STATION 33+00 NW
SCALE A



9 C2310 SECTION
STATION 38+00 NW
SCALE A

SCALE A: 100 0 100 200 300 400 500 ft

LEGEND:

- ZONE F - EARTHFILL
- ZONE U - ROCKFILL (SURCHARGE)
- ZONE U - ROCKFILL (EMBANKMENT)
- SOL — SETTING OUT LINE
- 2014 SURVEY (TAILINGS)
- 2002 SURVEY
- 1972 — HISTORIC TAILINGS SURFACE
- 1972 — DATE OF EMBANKMENT RAISE

NOTES:

1. SAFETY BERMS SHALL BE MID AXLE HEIGHT OF THE LARGEST WHEELED VEHICLE.
2. REFER TO DRG. NO. MR-C0011 FOR FILL MATERIAL SPECIFICATIONS.
3. EMBANKMENT STAGING IS BASED ON PRELIMINARY DESIGN. NOT FOR CONSTRUCTION.
4. DOWNSTREAM SLOPES TO BE CONCURRENTLY RECLAIMED WHEN AND WHERE PRACTICAL.

NOT FOR CONSTRUCTION

– DISCLAIMER –
THIS DRAWING WAS PREPARED BY KNIGHT PIESOLD LTD. FOR THE ACCOUNT OF THE CLIENT LISTED ON THIS DRAWING. THE MATERIAL ON IT REFLECTS KNIGHT PIESOLD'S BEST JUDGEMENT IN THE LIGHT OF THE INFORMATION AVAILABLE TO IT AT THE TIME OF PREPARATION. ANY USE WHICH A THIRD PARTY MAKES OF THIS DRAWING, OR ANY RELIANCE ON OR DECISIONS TO BE MADE BASED ON IT, ARE THE RESPONSIBILITY OF SUCH THIRD PARTIES. KNIGHT PIESOLD ACCEPTS NO RESPONSIBILITY FOR DAMAGES, IF ANY, SUFFERED BY ANY THIRD PARTY AS A RESULT OF DECISIONS MADE OR ACTIONS BASED ON THIS DRAWING. ONLY THE ORIGINAL ELECTRONIC FILE OR PRINTOUT OF DRAWING (CONTROLLED AND MARKED AS SUCH) IS THE VALID REPRESENTATION OF THE DRAWING.

KEN J. BROUWER 10020 PE Jun 21, 2017 PROFESSIONAL ENGINEER REGISTERED

Knight Piésold CONSULTING

MONTANA RESOURCES, LLP

YANKEE DOODLE TAILINGS IMPOUNDMENT

EAST-WEST EMBANKMENT
6450 CREST
SECTIONS 33+00 NW AND 38+00 NW

VA101-126/12 | DRAWING NO. MR-C2337 | REVISION 1

REFERENCE DRAWINGS	
DRG. NO.	DESCRIPTION
MR-C2310	EAST-WEST EMBANKMENT - 6450 CREST - PLAN

REVISIONS						
REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED	APPROVED

REVISIONS						
REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED	APPROVED
1	19JUN'17	NOT FOR CONSTRUCTION	TES	ND/MJC	DDF	KJB
0	09NOV'16	NOT FOR CONSTRUCTION	JRG	ABN	DDF	KJB

SAVED: M:\1\101\00126\12\A\Acad\DWGS\MR-C2337\MR-C2337_r1, 6/19/2017 11:54:13 AM, MCOUTTS PRINTED: 6/19/2017 11:55:30 AM, MR-C2337, MCOUTTS
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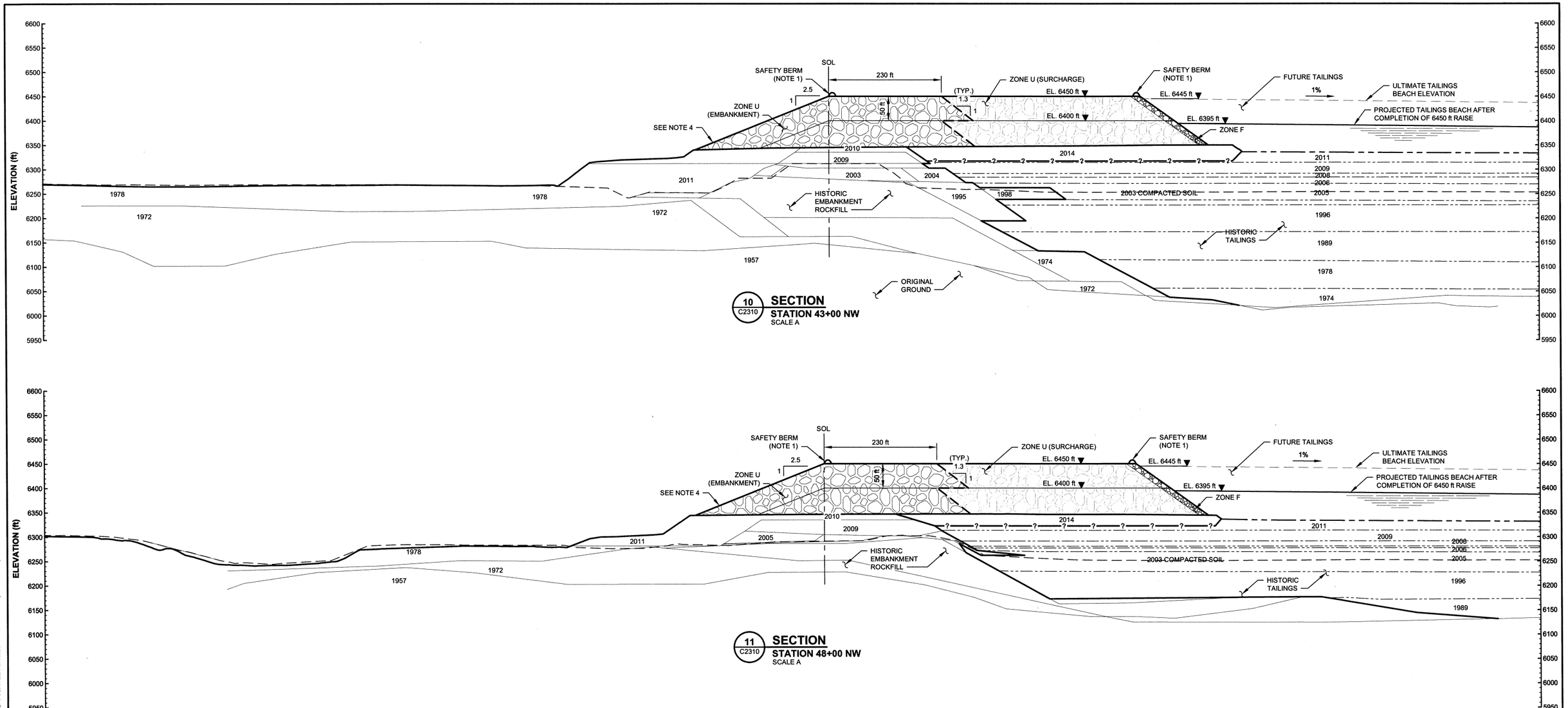

NOT FOR CONSTRUCTION

SCALE A 100 0 100 200 300 400 500 ft

LEGEND:

- ZONE F - EARTHFILL
- ZONE U - ROCKFILL (SURCHARGE)
- ZONE U - ROCKFILL (EMBANKMENT)
- SOL — SETTING OUT LINE
- 2014 SURVEY (TAILINGS)
- 2002 SURVEY
- 1972 — HISTORIC TAILINGS SURFACE
- 1972 — DATE OF EMBANKMENT RAISE

NOTES:

1. SAFETY BERMS SHALL BE MID AXLE HEIGHT OF THE LARGEST WHEELED VEHICLE.
2. REFER TO DRG. NO. MR-C0011 FOR FILL MATERIAL SPECIFICATIONS.
3. EMBANKMENT STAGING IS BASED ON PRELIMINARY DESIGN. NOT FOR CONSTRUCTION.
4. DOWNSTREAM SLOPES TO BE CONCURRENTLY RECLAIMED WHEN AND WHERE PRACTICAL.

– DISCLAIMER –

THIS DRAWING WAS PREPARED BY KNIGHT PIESOLD LTD. FOR THE ACCOUNT OF THE CLIENT LISTED ON THIS DRAWING. THE MATERIAL ON IT REFLECTS KNIGHT PIESOLD'S BEST JUDGEMENT IN THE LIGHT OF THE INFORMATION AVAILABLE TO IT AT THE TIME OF PREPARATION. ANY USE WHICH A THIRD PARTY MAKES OF THIS DRAWING, OR ANY RELIANCE ON OR DECISIONS TO BE MADE BASED ON IT, ARE THE RESPONSIBILITY OF SUCH THIRD PARTIES. KNIGHT PIESOLD ACCEPTS NO RESPONSIBILITY FOR DAMAGES, IF ANY, SUFFERED BY THE THIRD PARTY AS A RESULT OF DECISIONS MADE OR ACTIONS BASED ON THIS DRAWING. NO PART OF THIS DRAWING MAY BE REPRODUCED OR STORED IN ELECTRONIC FORM WITHOUT THE WRITTEN APPROVAL OF THE MONTANA DEPARTMENT OF ENVIRONMENTAL QUALITY.

KEN J. BROUWER 10020 PE June 21, 2017 REGISTERED PROFESSIONAL ENGINEER

Knight Piésold CONSULTING

MONTANA RESOURCES, LLP

YANKEE DOODLE TAILINGS IMPOUNDMENT

EAST-WEST EMBANKMENT 6450 CREST SECTIONS 43+00 NW AND 48+00 NW

VA101-126/12 | DRAWING NO. MR-C2338 | REVISION 1

REFERENCE DRAWINGS		
DRG. NO.	DESCRIPTION	
MR-C2310	EAST-WEST EMBANKMENT - 6450 CREST - PLAN	

REVISIONS							
REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED	APPROVED	
1	19JUN'17	NOT FOR CONSTRUCTION	TES	ND/MJC	DDF	KJB	
0	09NOV'16	NOT FOR CONSTRUCTION	JRG	ABN	DDF	KJB	

REVISIONS							
REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED	APPROVED	
1	19JUN'17	NOT FOR CONSTRUCTION	TES	ND/MJC	DDF	KJB	
0	09NOV'16	NOT FOR CONSTRUCTION	JRG	ABN	DDF	KJB	

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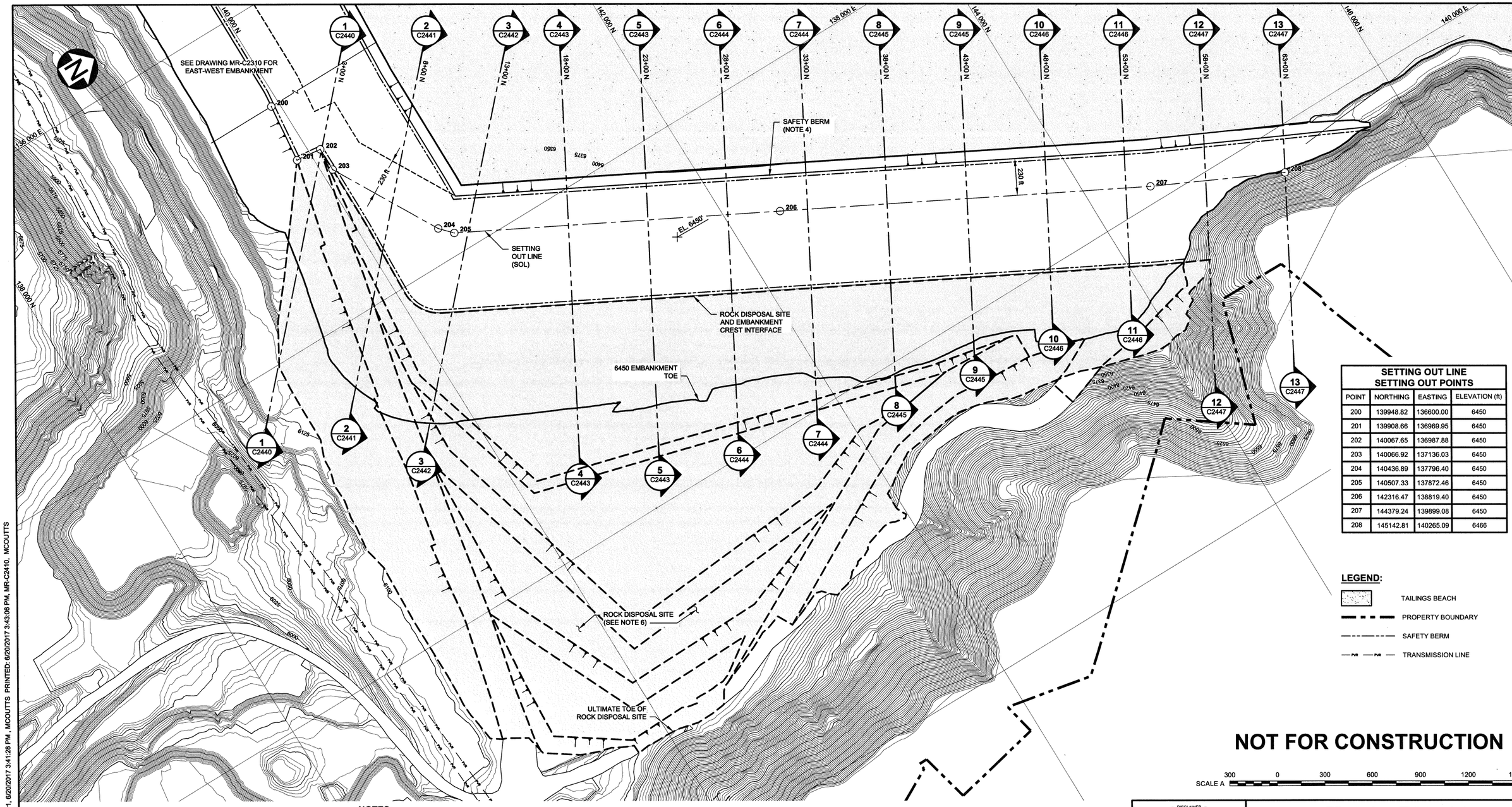

SETTING OUT LINE SETTING OUT POINTS			
POINT	NORTHING	EASTING	ELEVATION (ft)
200	139948.82	136600.00	6450
201	139908.66	136969.95	6450
202	140067.65	136987.88	6450
203	140066.92	137136.03	6450
204	140436.89	137796.40	6450
205	140507.33	137872.46	6450
206	142316.47	138819.40	6450
207	144379.24	139899.08	6450
208	145142.81	140265.09	6466

LEGEND:

- TAILINGS BEACH
- PROPERTY BOUNDARY
- SAFETY BERM
- TRANSMISSION LINE

NOTES:

1. THIS DRAWING SHALL BE READ WITH ACCOMPANYING DRAWINGS AND TECHNICAL SPECIFICATIONS CONTAINED IN THE CONSTRUCTION MANAGEMENT PLAN.
2. COORDINATE GRID IS ANACONDA MINE GRID.
3. ORIGINAL GROUND CONTOUR INTERVAL IS 5 FEET.
4. SAFETY BERMS SHALL BE MID AXLE HEIGHT OF THE LARGEST WHEELED VEHICLE.
5. EMBANKMENT CREST IS AT LEAST 230 FEET WIDE.
6. ROCK DISPOSAL SITE LOCATION AND LAYOUT PROVIDED BY MR IN NOVEMBER 2015.
7. EMBANKMENT STAGING IS BASED ON PRELIMINARY DESIGN. NOT FOR CONSTRUCTION.

NOT FOR CONSTRUCTION

SCALE A 300 0 300 600 900 1200 1500 ft

REFERENCE DRAWINGS	
DRG. NO.	DESCRIPTION
MR-C2447	NORTH-SOUTH EMBANKMENT - 6450 CREST - SECTION 58+00 N AND 63+00 N
MR-C2446	NORTH-SOUTH EMBANKMENT - 6450 CREST - SECTION 48+00 N AND 53+00 N
MR-C2445	NORTH-SOUTH EMBANKMENT - 6450 CREST - SECTION 38+00 N AND 43+00 N
MR-C2444	NORTH-SOUTH EMBANKMENT - 6450 CREST - SECTION 28+00 N AND 33+00 N
MR-C2443	NORTH-SOUTH EMBANKMENT - 6450 CREST - SECTION 18+00 N AND 23+00 N
MR-C2442	NORTH-SOUTH EMBANKMENT - 6450 CREST - SECTION 13+00 N
MR-C2441	NORTH-SOUTH EMBANKMENT - 6450 CREST - SECTION 08+00 N
MR-C2440	NORTH-SOUTH EMBANKMENT - 6450 CREST - SECTION 03+00 N

REVISIONS							
REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED	APPROVED
1	20JUN'17	NOT FOR CONSTRUCTION	TES	MJC	DDF	KJB
0	09NOV'16	NOT FOR CONSTRUCTION	JRG	ABN	DDF	KJB

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MONTANA
KEN J. BROUWER 10020 PE
Jun 21, 2017
REGISTERED PROFESSIONAL ENGINEER

Knight Piésold CONSULTING

MONTANA RESOURCES, LLP

YANKEE DOODLE TAILINGS IMPOUNDMENT

NORTH-SOUTH EMBANKMENT 6450 CREST PLAN

PROJECT NO.	DRAWING NO.	REVISION
VA101-126/12	MR-C2410	1

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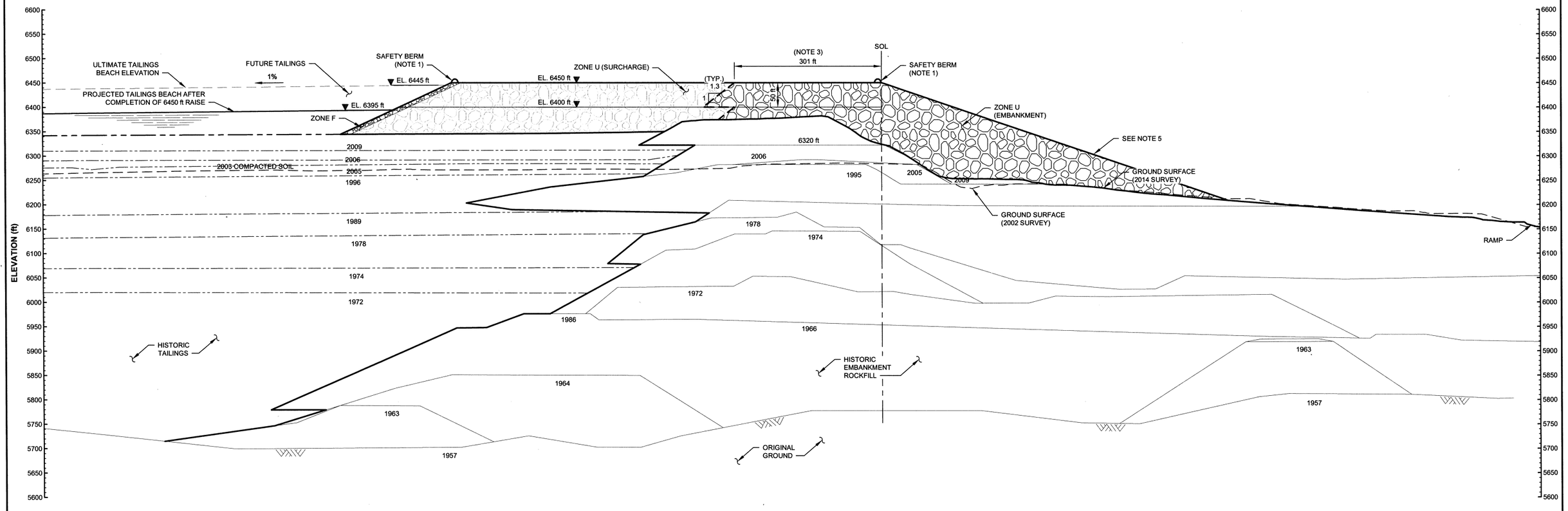

1 C2410 **SECTION**
STATION 03+00 N
SCALE A

NOT FOR CONSTRUCTION

SCALE A 100 0 100 200 300 400 500 ft

LEGEND:

- ZONE F - EARTHFILL
- ZONE U - ROCKFILL (SURCHARGE)
- ZONE U - ROCKFILL (EMBANKMENT)
- SOL — SETTING OUT LINE
- 2014 SURVEY (TAILINGS)
- 2002 SURVEY
- 1972 — HISTORIC TAILINGS SURFACE
- 1972 — DATE OF EMBANKMENT RAISE

NOTES:

1. SAFETY BERMS SHALL BE MID AXLE HEIGHT OF THE LARGEST WHEELED VEHICLE.
2. REFER TO DRG. NO. MR-C0011 FOR FILL MATERIAL SPECIFICATIONS.
3. NOTED WIDTH EXCEEDS 230 FEET AS SECTION IS NOT PERPENDICULAR TO EMBANKMENT CREST.
4. EMBANKMENT STAGING IS BASED ON PRELIMINARY DESIGN. NOT FOR CONSTRUCTION.
5. ROCK DISPOSAL SITE NOT SHOWN FOR CLARITY. FINAL DOWNSTREAM SLOPES TO BE CONCURRENTLY RECLAIMED WHEN AND WHERE PRACTICAL.

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Knight Piésold
CONSULTING

MONTANA RESOURCES, LLP

YANKEE DOODLE TAILINGS IMPOUNDMENT

MONTANA
KEN J. BROUWER
10020 PE
Jun 21, 2017
REGISTERED PROFESSIONAL ENGINEER

NORTH-SOUTH EMBANKMENT
6450 CREST
SECTION 3+00 N

DRG. NO.	DESCRIPTION
MR-C2410	NORTH-SOUTH EMBANKMENT - 6450 CREST - PLAN

REFERENCE DRAWINGS

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED	APPROVED
1	20JUN'17	NOT FOR CONSTRUCTION	TES	MJC	DDF	KJB
0	09NOV'16	NOT FOR CONSTRUCTION	JRG	ABN	DDF	KJB

REVISIONS

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED	APPROVED

REVISIONS

DRAWING NO.	REVISION
VA101-126/12	MR-C2440	1

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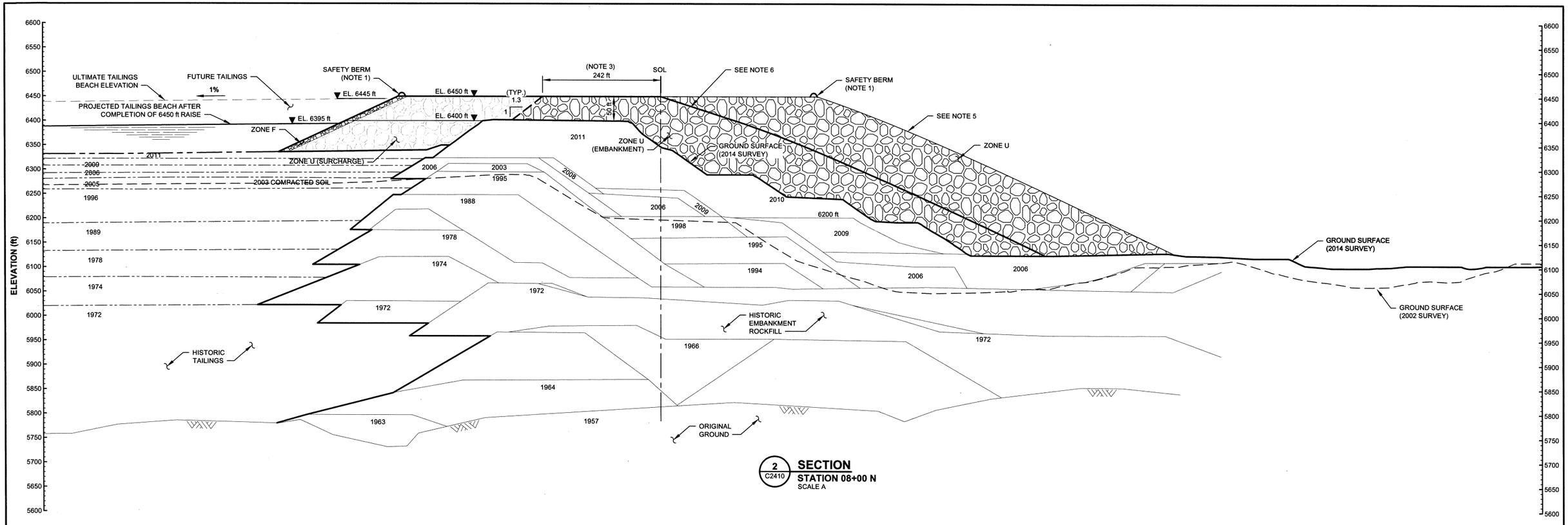

2 C2410 **SECTION**
STATION 08+00 N
SCALE A

NOT FOR CONSTRUCTION

SCALE A 100 0 100 200 300 400 500 ft

LEGEND:

- ZONE F - EARTHFILL
- ZONE U - ROCKFILL (SURCHARGE)
- ZONE U - ROCKFILL
- SOL — SETTING OUT LINE
- 2014 SURVEY (TAILINGS)
- 2002 SURVEY
- 1972 — HISTORIC TAILINGS SURFACE
- 1972 — DATE OF EMBANKMENT RAISE

NOTES:

1. SAFETY BERMS SHALL BE MID AXLE HEIGHT OF THE LARGEST WHEELED VEHICLE.
2. REFER TO DRG. NO. MR-C0011 FOR FILL MATERIAL SPECIFICATIONS.
3. NOTED WIDTH EXCEEDS 230 FEET AS SECTION IS NOT PERPENDICULAR TO EMBANKMENT CREST.
4. EMBANKMENT STAGING IS BASED ON PRELIMINARY DESIGN. NOT FOR CONSTRUCTION.
5. ROCK DISPOSAL SITE NOT SHOWN FOR CLARITY. FINAL DOWNSTREAM SLOPES TO BE CONCURRENTLY RECLAIMED WHEN AND WHERE PRACTICAL.
6. LIMIT OF MINIMUM STRUCTURAL PORTION OF EMBANKMENT.

DRG. NO.	DESCRIPTION
MR-C2410	NORTH-SOUTH EMBANKMENT - 6450 CREST - PLAN

REFERENCE DRAWINGS

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED	APPROVED
1	20JUN'17	NOT FOR CONSTRUCTION	TES	MJC	DDF	KJB
0	09NOV'16	NOT FOR CONSTRUCTION	JRG	ABN	DDF	KJB

REVISIONS

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MONTANA
KEN J. BROUWER
10020 PE
Jun 21, 2017
REGISTERED PROFESSIONAL ENGINEER

Knight Piésold
CONSULTING

MONTANA RESOURCES, LLP

YANKEE DOODLE TAILINGS IMPOUNDMENT

NORTH-SOUTH EMBANKMENT
6450 CREST
SECTION 8+00 N

DRAWING NO.	REVISION
VA101-126/12	MR-C2441	1

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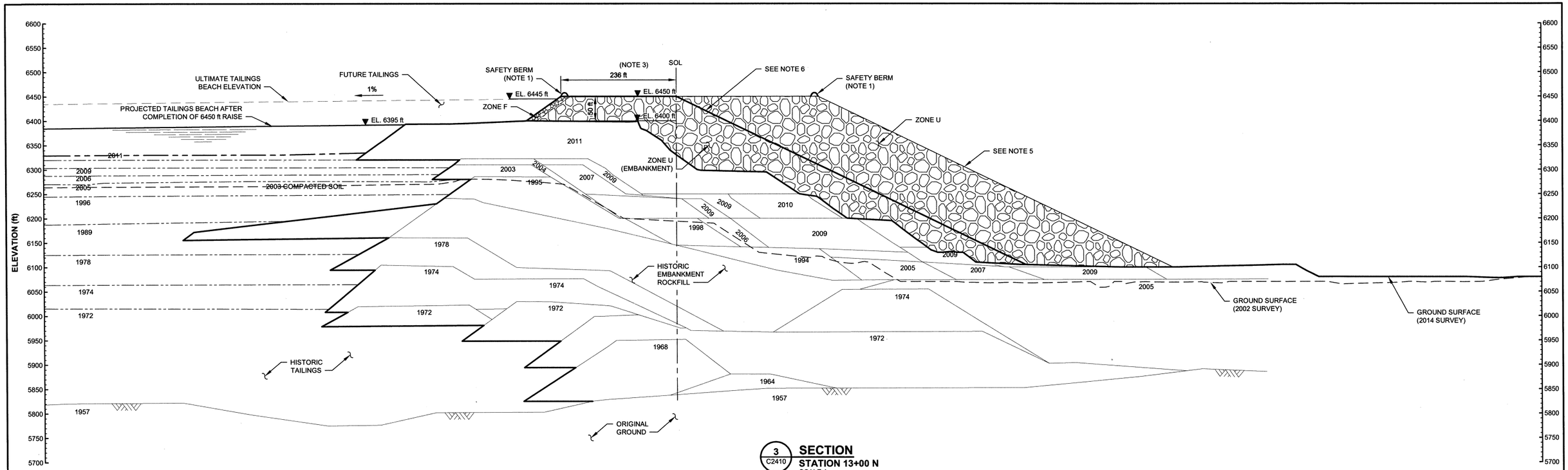

3 C2410 **SECTION**
STATION 13+00 N
SCALE A

NOT FOR CONSTRUCTION

SCALE A 100 0 100 200 300 400 500 ft

LEGEND:

- ZONE F - EARTHFILL
- ZONE U - ROCKFILL
- SOL — SETTING OUT LINE
- 2014 SURVEY (TAILINGS)
- 2002 SURVEY
- 1972 — HISTORIC TAILINGS SURFACE
- 1972 — DATE OF EMBANKMENT RAISE

NOTES:

1. SAFETY BERMS SHALL BE MID AXLE HEIGHT OF THE LARGEST WHEELED VEHICLE.
2. REFER TO DRG. NO. MR-C0011 FOR FILL MATERIAL SPECIFICATIONS.
3. NOTED WIDTH EXCEEDS 230 FEET AS SECTION IS NOT PERPENDICULAR TO EMBANKMENT CREST.
4. EMBANKMENT STAGING IS BASED ON PRELIMINARY DESIGN. NOT FOR CONSTRUCTION.
5. ROCK DISPOSAL SITE NOT SHOWN FOR CLARITY. FINAL DOWNSTREAM SLOPES TO BE CONCURRENTLY RECLAIMED WHEN AND WHERE PRACTICAL
6. LIMIT OF MINIMUM STRUCTURAL PORTION OF EMBANKMENT.

DRG. NO.	DESCRIPTION
MR-C2410	NORTH-SOUTH EMBANKMENT - 6450 CREST - PLAN

REFERENCE DRAWINGS

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED	APPROVED
1	20JUN'17	NOT FOR CONSTRUCTION	TES	MJC	DDF	KJB
0	09NOV'16	NOT FOR CONSTRUCTION	JRG	ABN	DDF	KJB

REVISIONS

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MONTANA KEN J. BROUWER 10020 PE Jun 21, 2017 REGISTERED PROFESSIONAL ENGINEER

Knight Piésold
CONSULTING

MONTANA RESOURCES, LLP

YANKEE DOODLE TAILINGS IMPOUNDMENT

NORTH-SOUTH EMBANKMENT
6450 CREST
SECTION 13+00 N

DRG. NO.	DRAWING NO.	REVISION
VA101-126/12	MR-C2442	1

SAVED: M:\1\01\00126\12\A\Acad\DWGS\MR-C2442\MR-C2442_r1, 6/20/2017 4:00:16 PM , MCOUTTS PRINTED: 6/20/2017 4:05:13 PM, MR-C2442, MCOUTTS
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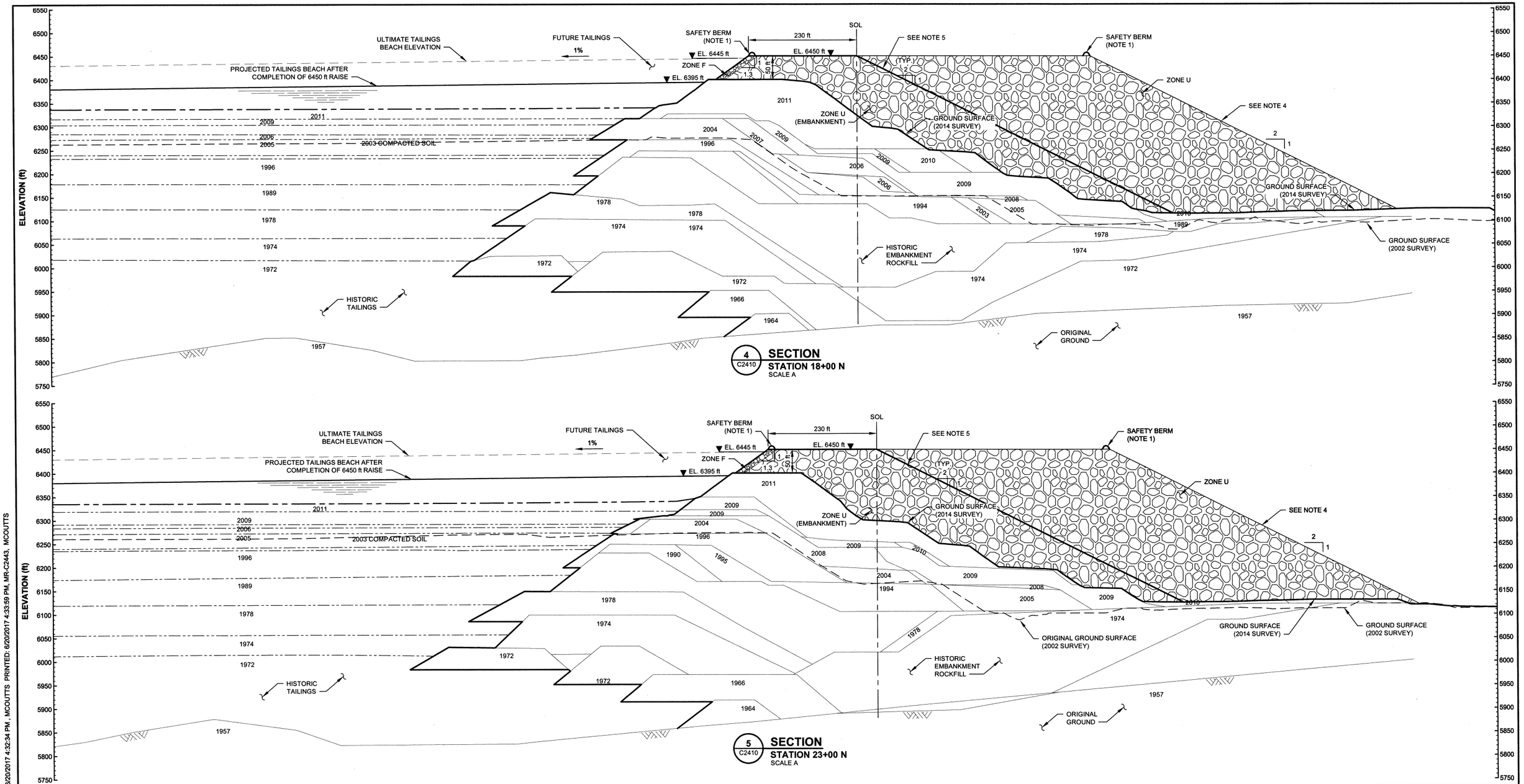

4 C2410 **SECTION**
STATION 18+00 N
SCALE A

5 C2410 **SECTION**
STATION 23+00 N
SCALE A

NOTES:

1. SAFETY BERMS SHALL BE MID AXLE HEIGHT OF THE LARGEST WHEELED VEHICLE.
2. REFER TO DRG. NO. MR-C0011 FOR FILL MATERIAL SPECIFICATIONS.
3. EMBANKMENT STAGING IS BASED ON PRELIMINARY DESIGN. NOT FOR CONSTRUCTION.
4. ROCK DISPOSAL SITE NOT SHOWN FOR CLARITY. FINAL DOWNSTREAM SLOPES TO BE CONCURRENTLY RECLAIMED WHEN AND WHERE PRACTICAL.
5. LIMIT OF MINIMUM STRUCTURAL PORTION OF EMBANKMENT.

LEGEND:

- ZONE F - EARTHFILL
- ZONE U - ROCKFILL
- SOL — SETTING OUT LINE
- 2014 SURVEY (TAILINGS)
- 2002 SURVEY
- 1972 — HISTORIC TAILINGS SURFACE
- 1972 — DATE OF EMBANKMENT RAISE

NOT FOR CONSTRUCTION

SCALE A: 100 0 100 200 300 400 500 ft

MR-C2410	NORTH-SOUTH EMBANKMENT - 6450 CREST - PLAN
DRG. NO.	DESCRIPTION

REFERENCE DRAWINGS

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED	APPROVED
1	20JUN'17	NOT FOR CONSTRUCTION	TES	MJC	DDF	KJB
0	09NOV'16	NOT FOR CONSTRUCTION	JRG	ABN	DDF	KJB

REVISIONS

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KEN J. BROUWER 10020 PE Jun 21, 2017 REGISTERED PROFESSIONAL ENGINEER

Knight Piésold CONSULTING

MONTANA RESOURCES, LLP

YANKEE DOODLE TAILINGS IMPOUNDMENT

NORTH-SOUTH EMBANKMENT 6450 CREST SECTIONS 18+00 N AND 23+00 N

VA101-126/12 | DRAWING NO. MR-C2443 | REVISION 1

SAVED: M:\1101\00126\12\A\acad\DWGS\MR-C2443\MR-C2443_r1, 6/20/2017 4:32:34 PM , MCOUTTS PRINTED: 6/20/2017 4:33:59 PM, MR-C2443, MCOUTTS
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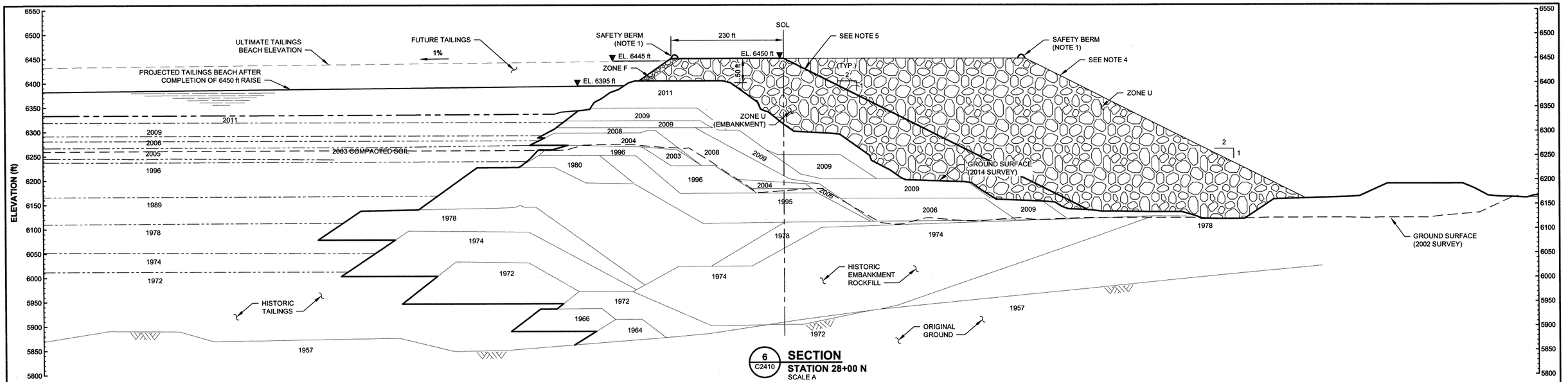
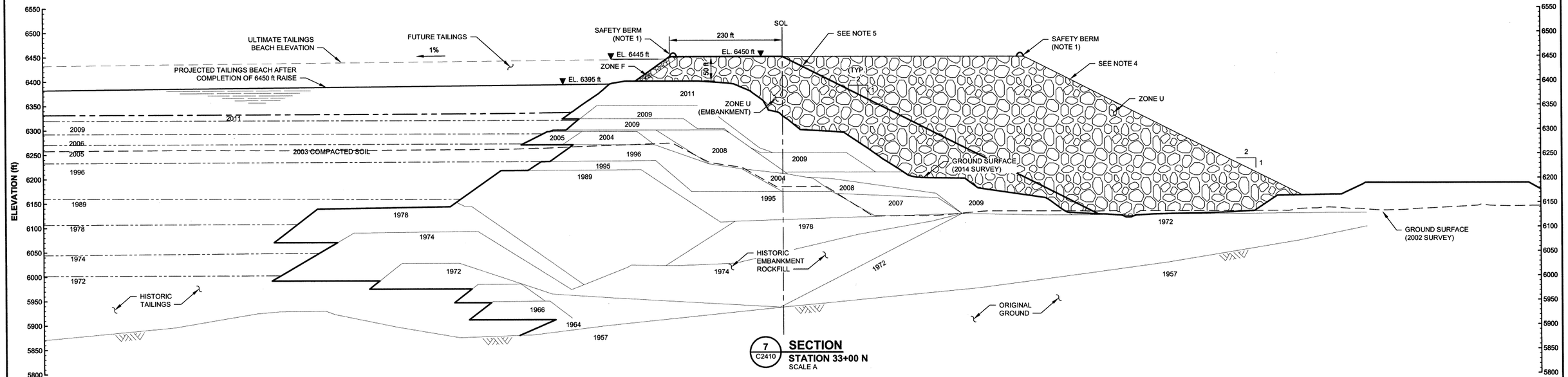


6 C2410 **SECTION**
STATION 28+00 N
SCALE A



7 C2410 **SECTION**
STATION 33+00 N
SCALE A

NOTES:

1. SAFETY BERMS SHALL BE MID AXLE HEIGHT OF THE LARGEST WHEELED VEHICLE.
2. REFER TO DRG. NO. MR-C0011 FOR FILL MATERIAL SPECIFICATIONS.
3. EMBANKMENT STAGING IS BASED ON PRELIMINARY DESIGN. NOT FOR CONSTRUCTION.
4. ROCK DISPOSAL SITE NOT SHOWN FOR CLARITY. FINAL DOWNSTREAM SLOPES TO BE CONCURRENTLY RECLAIMED WHEN AND WHERE PRACTICAL.
5. LIMIT OF MINIMUM STRUCTURAL PORTION OF EMBANKMENT.

LEGEND:

- ZONE F - EARTHFILL
- ZONE U - ROCKFILL
- SOL — SETTING OUT LINE
- 2014 SURVEY (TAILINGS)
- 2002 SURVEY
- 1972 — HISTORIC TAILINGS SURFACE
- 1972 — DATE OF EMBANKMENT RAISE

SCALE A: 100 0 100 200 300 400 500 ft

NOT FOR CONSTRUCTION

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Knight Piésold CONSULTING

MONTANA RESOURCES, LLP

YANKEE DOODLE TAILINGS IMPOUNDMENT

NORTH-SOUTH EMBANKMENT 6450 CREST SECTIONS 28+00 N AND 33+00 N

REFERENCE DRAWINGS	
MR-C2410	NORTH-SOUTH EMBANKMENT - 6450 CREST - PLAN
DRG. NO.	DESCRIPTION

REVISIONS						
REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED	APPROVED
1	20JUN'17	NOT FOR CONSTRUCTION	TES	MJC	DDF	KJB
0	09NOV'16	NOT FOR CONSTRUCTION	JRG	ABN	DDF	KJB

PROJECT NO.	DRAWING NO.	REVISION
VA101-126/12	MR-C2444	1

SAVED: M:\1\101\00126\12\A\Acad\DWGS\MR-C2444\MR-C2444_r1, 6/20/2017 4:40:36 PM , MCOUTTS PRINTED: 6/20/2017 4:42:35 PM, MR-C2444, MCOUTTS
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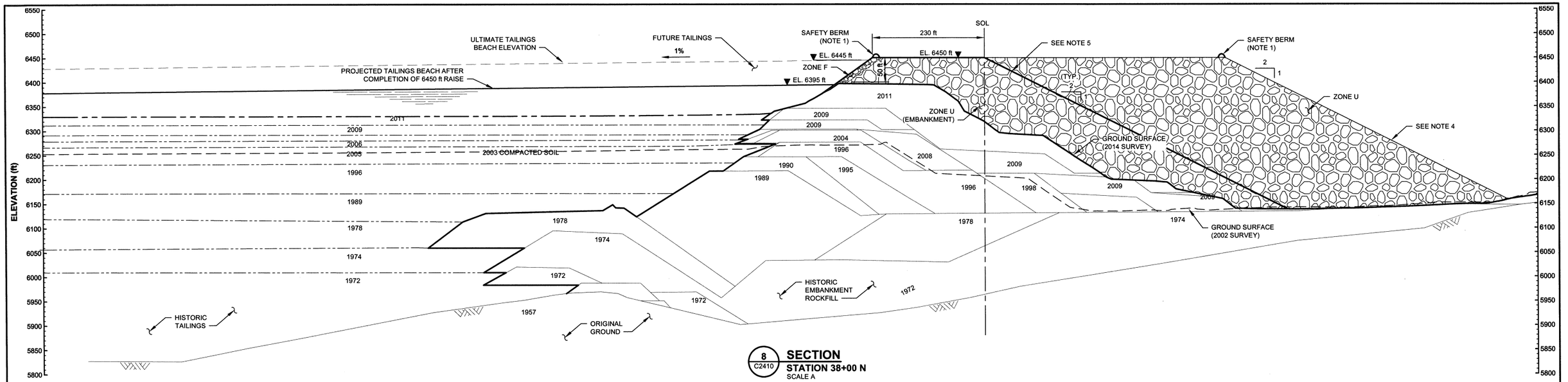
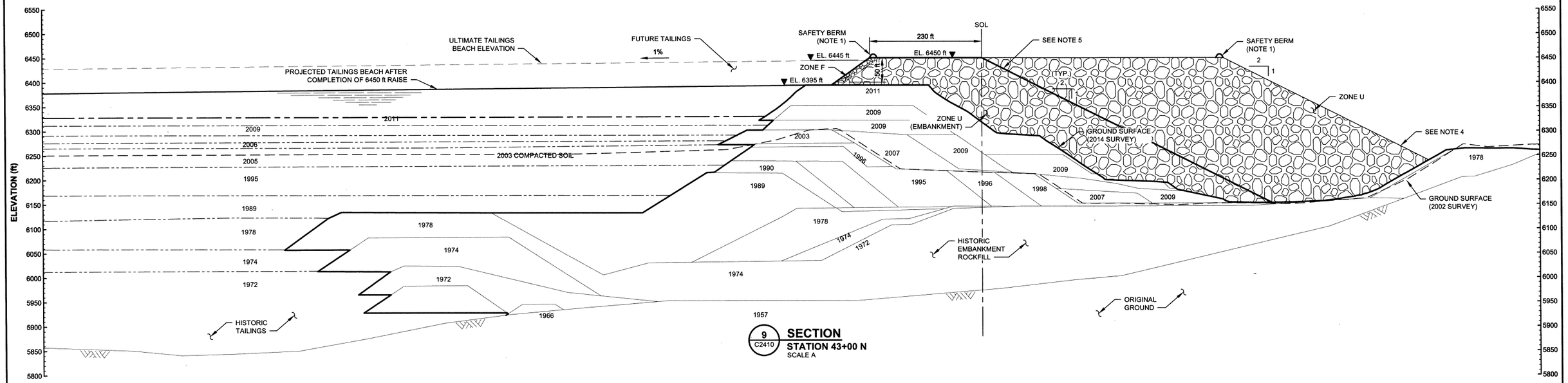


8 C2410 **SECTION**
STATION 38+00 N
SCALE A



9 C2410 **SECTION**
STATION 43+00 N
SCALE A

NOTES:

1. SAFETY BERMS SHALL BE MID AXLE HEIGHT OF THE LARGEST WHEELED VEHICLE.
2. REFER TO DRG. NO. MR-C0011 FOR FILL MATERIAL SPECIFICATIONS.
3. EMBANKMENT STAGING IS BASED ON PRELIMINARY DESIGN. NOT FOR CONSTRUCTION.
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5. LIMIT OF MINIMUM STRUCTURAL PORTION OF EMBANKMENT.

LEGEND:

- ZONE F - EARTHFILL
- ZONE U - ROCKFILL
- SOL — SETTING OUT LINE
- 2014 SURVEY (TAILINGS)
- 2002 SURVEY
- 1972 — HISTORIC TAILINGS SURFACE
- 1972 — DATE OF RAISE

NOT FOR CONSTRUCTION

SCALE A: 100 0 100 200 300 400 500 ft

DRG. NO.	DESCRIPTION
MR-C2410	NORTH-SOUTH EMBANKMENT - 6450 CREST - PLAN

REFERENCE DRAWINGS

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED	APPROVED
1	20JUN'17	NOT FOR CONSTRUCTION	TES	MJC	DDF	KJB
0	09NOV'16	NOT FOR CONSTRUCTION	JRG	ABN	DDF	KJB

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MONTANA
KEN J. BROUWER
10020 PE
JUNE 21, 2017
REGISTERED PROFESSIONAL ENGINEER

Knight Piésold
CONSULTING

MONTANA RESOURCES, LLP

YANKEE DOODLE TAILINGS IMPOUNDMENT

NORTH-SOUTH EMBANKMENT
6450 CREST
SECTIONS 38+00 N AND 43+00 N

PROJECT NO.	DRAWING NO.	REVISION
VA101-126/12	MR-C2445	1

SAVED: M:\1\01\00126\12\A\Acad\DWGS\MR-C2445\MR-C2445_r1, 6/20/2017 4:49:17 PM, MCOUTTS PRINTED: 6/20/2017 4:49:47 PM, MR-C2445, MCOUTTS
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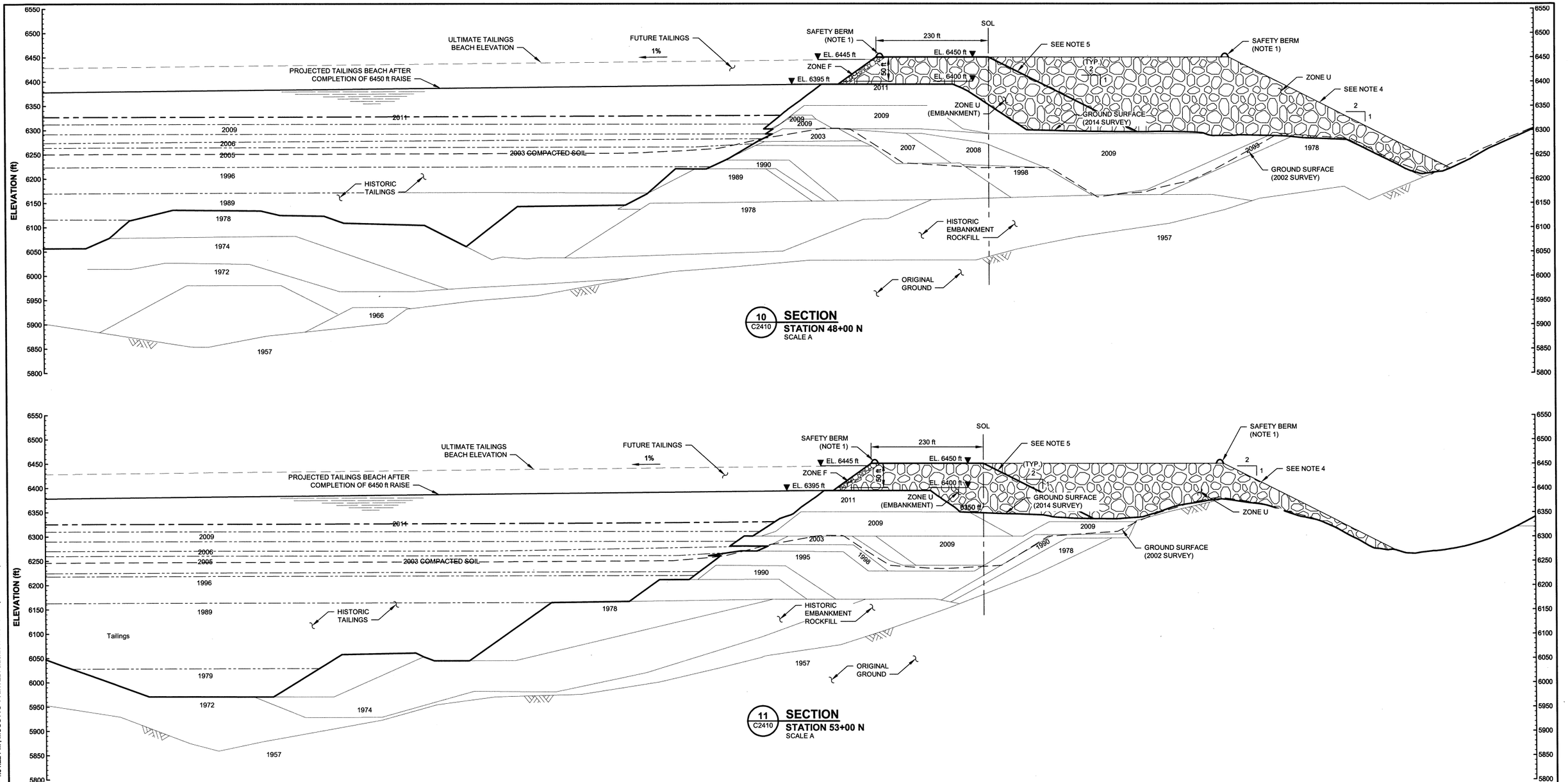

10 / C2410 SECTION
STATION 48+00 N
SCALE A

11 / C2410 SECTION
STATION 53+00 N
SCALE A

NOTES:

1. SAFETY BERMS SHALL BE MID AXLE HEIGHT OF THE LARGEST WHEELED VEHICLE.
2. REFER TO DRG. NO. MR-C0011 FOR FILL MATERIAL SPECIFICATIONS.
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5. LIMIT OF MINIMUM STRUCTURAL PORTION OF EMBANKMENT.

LEGEND:

- ZONE F - EARTHFILL
- ZONE U - ROCKFILL
- SOL — SETTING OUT LINE
- 2014 SURVEY (TAILINGS)
- 2002 SURVEY
- 1972 — HISTORIC TAILINGS SURFACE
- 1972 — DATE OF RAISE

NOT FOR CONSTRUCTION

SCALE A: 100 0 100 200 300 400 500 ft

DRG. NO.	DESCRIPTION
MR-C2410	NORTH-SOUTH EMBANKMENT - 6450 CREST - PLAN

REFERENCE DRAWINGS

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED	APPROVED

REVISIONS

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED	APPROVED
1	20JUN'17	NOT FOR CONSTRUCTION	TES	MJC	DDF	KJB
0	09NOV'16	NOT FOR CONSTRUCTION	JRG	ABN	DDF	KJB

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MONTANA
KEN J. BROUWER
10020 PE
Jun 21, 2017
REGISTERED PROFESSIONAL ENGINEER

Knight Piésold CONSULTING

MONTANA RESOURCES, LLP

YANKEE DOODLE TAILINGS IMPOUNDMENT

NORTH-SOUTH EMBANKMENT 6450 CREST SECTIONS 48+00 N AND 53+00 N

PROJECT NO.	DRAWING NO.	REVISION
VA101-126/12	MR-C2446	1

SAVED: M:\101\100\126\12\A\Acad\DWGS\MR-C2446\MR-C2446_r1, 6/20/2017 4:54:22 PM, MCOUTTS PRINTED: 6/20/2017 4:54:57 PM, MR-C2446, MCOUTTS
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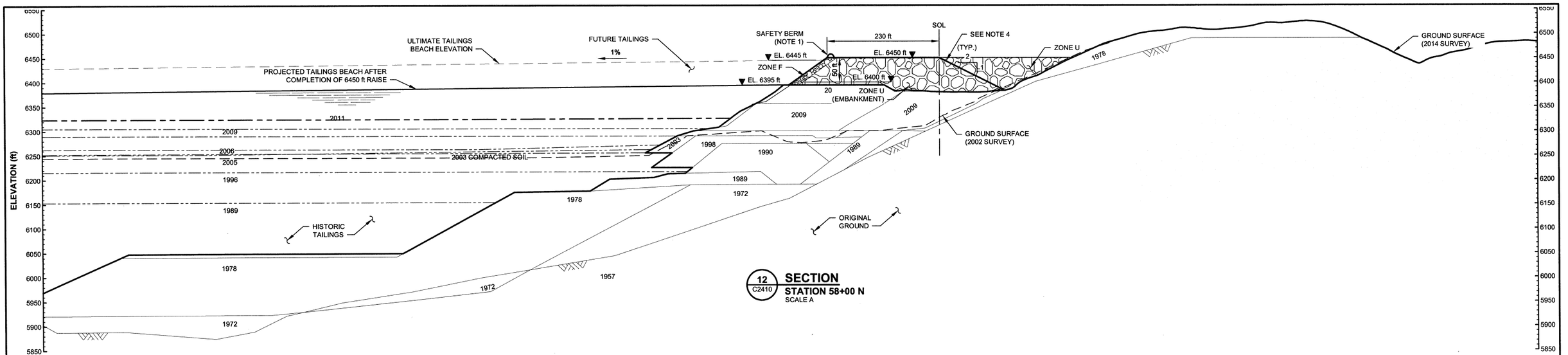
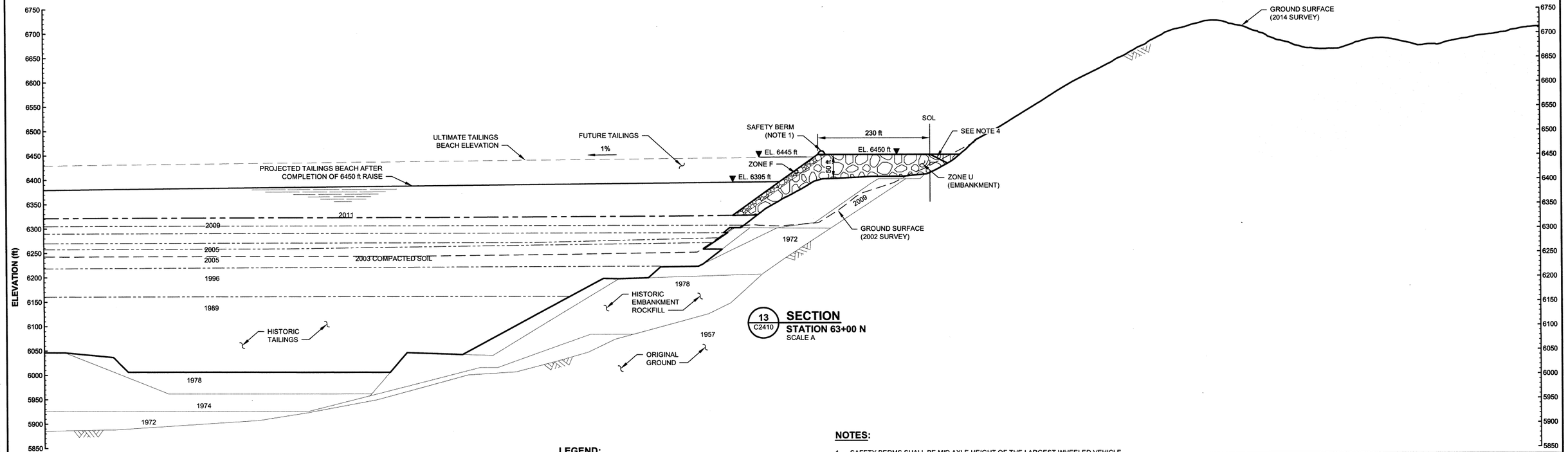


12 C2410 **SECTION**
STATION 58+00 N
SCALE A



13 C2410 **SECTION**
STATION 63+00 N
SCALE A

LEGEND:

- ZONE F - EARTHFILL
- ZONE U - ROCKFILL
- 2014 SURVEY (TAILINGS)
- 2002 SURVEY
- 1972 HISTORIC TAILINGS SURFACE
- 1972 DATE OF RAISE

NOTES:

1. SAFETY BERMS SHALL BE MID AXLE HEIGHT OF THE LARGEST WHEELED VEHICLE.
2. REFER TO DRG. NO. MR-C0011 FOR FILL MATERIAL SPECIFICATIONS.
3. EMBANKMENT STAGING IS BASED ON PRELIMINARY DESIGN. NOT FOR CONSTRUCTION.
4. LIMIT OF MINIMUM STRUCTURAL PORTION OF EMBANKMENT.

NOT FOR CONSTRUCTION

SCALE A 100 0 100 200 300 400 500 ft

DRG. NO.	DESCRIPTION
MR-C2410	NORTH-SOUTH EMBANKMENT - 6450 CREST - PLAN

REFERENCE DRAWINGS

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED	APPROVED

REVISIONS

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED	APPROVED
1	20JUN'17	NOT FOR CONSTRUCTION	TES	MJC	DDF	KJB
0	09NOV'16	NOT FOR CONSTRUCTION	JRG	ABN	DDF	KJB

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MONTANA
KEN J. BROUWER
10020 PE
Jun 21, 2017
REGISTERED PROFESSIONAL ENGINEER

Knight Piésold CONSULTING

MONTANA RESOURCES, LLP

YANKEE DOODLE TAILINGS IMPOUNDMENT

NORTH-SOUTH EMBANKMENT 6450 CREST SECTIONS 58+00 N AND 63+00 N

PROJECT NO.	DRAWING NO.	REVISION
VA101-126/12	MR-C2447	1

SAVED: M:\101\0012612\AA\acad\DWGS\MR-C2447\MR-C2447_r1, 6/20/2017 4:56:20 PM , MCOUTTS PRINTED: 6/20/2017 4:57:47 PM, MR-C2447, MCOUTTS
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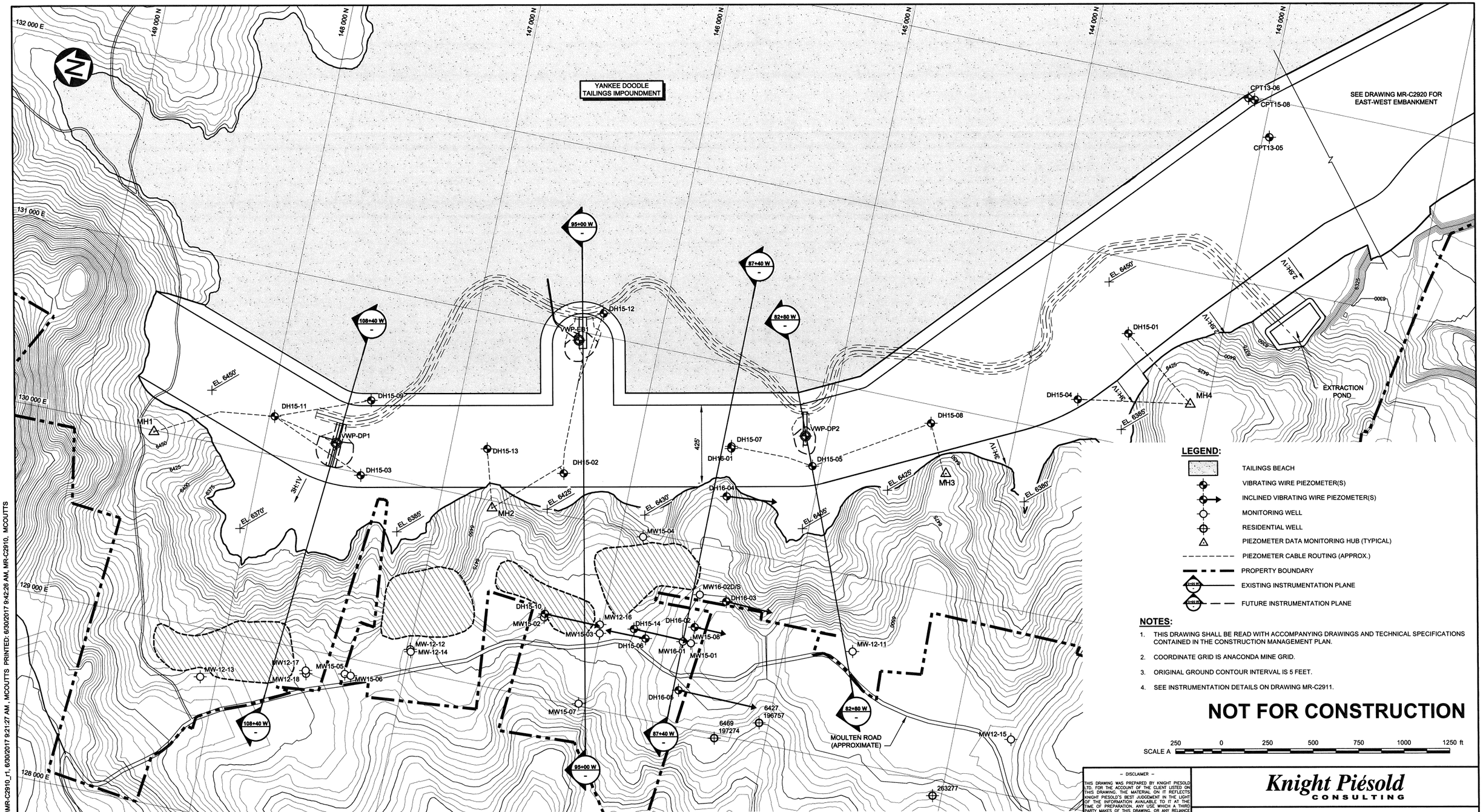

LEGEND:

- TAILINGS BEACH
- VIBRATING WIRE PIEZOMETER(S)
- INCLINED VIBRATING WIRE PIEZOMETER(S)
- MONITORING WELL
- RESIDENTIAL WELL
- PIEZOMETER DATA MONITORING HUB (TYPICAL)
- PIEZOMETER CABLE ROUTING (APPROX.)
- PROPERTY BOUNDARY
- EXISTING INSTRUMENTATION PLANE
- FUTURE INSTRUMENTATION PLANE

NOTES:

1. THIS DRAWING SHALL BE READ WITH ACCOMPANYING DRAWINGS AND TECHNICAL SPECIFICATIONS CONTAINED IN THE CONSTRUCTION MANAGEMENT PLAN.
2. COORDINATE GRID IS ANACONDA MINE GRID.
3. ORIGINAL GROUND CONTOUR INTERVAL IS 5 FEET.
4. SEE INSTRUMENTATION DETAILS ON DRAWING MR-C2911.

NOT FOR CONSTRUCTION

SCALE A 250 0 250 500 750 1000 1250 ft

DRG. NO.	DESCRIPTION
MR-C2920	EAST-WEST EMBANKMENT - 6450 CREST - INSTRUMENTATION PLAN
MR-C2911	WEST EMBANKMENT - 6450 CREST - INSTRUMENTATION DETAILS

REFERENCE DRAWINGS

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED	APPROVED
1	30JUN'17	NOT FOR CONSTRUCTION	JDZ	NSD/MJC	DDF	KJB
0	09NOV'16	NOT FOR CONSTRUCTION	ACR	RM	DDF	KJB

REVISIONS

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KEN J. BROUWER 19020 PE June 30, 2017 REGISTERED PROFESSIONAL ENGINEER

Knight Piésold CONSULTING

MONTANA RESOURCES, LLP

YANKEE DOODLE TAILINGS IMPOUNDMENT

WEST EMBANKMENT 6450 CREST INSTRUMENTATION PLAN

P/NO.	DRAWING NO.	REVISION
VA101-126/12	MR-C2910	1

SAVED: M:\1\101\00126\12\AA\cad\DWGS\MR-C2910\MR-C2910_r1, 6/30/2017 9:21:27 AM , MCOUTTS PRINTED: 6/30/2017 9:42:26 AM, MR-C2910, MCOUTTS
XREF FILE(S): IMAGE FILE(S):

Plane	Location	Piezometer ID	Type	Easting	Northing	Monitoring Elevation/Interval (feet)	Installed
82+80 W	DH15-05	VW1	Vibrating Wire - In Drillhole	130540	145048	6144	Yes
		VW2	Vibrating Wire - In Drillhole			6209	Yes
		VW3	Vibrating Wire - In Drillhole			6269	Yes
82+80 W	DRAIN POD #2	VWP-DP2	Vibrating Wire - In trench	130693	145117	6324	Yes
82+80 W	MW12-11	-	Standpipe	129596	144633	6387 - 6321	Yes
87+40 W	DH15-07	VW1	Vibrating Wire - In Drillhole	130556	145500	6243	Yes
		VW2	Vibrating Wire - In Drillhole			6321	Yes
		VW3	Vibrating Wire - In Drillhole			6366	Yes
87+40 W	DH15-14	VW1	Vibrating Wire - In Drillhole	129473	145824	5872	Yes
		VW2	Vibrating Wire - In Drillhole			6012	Yes
		VW3	Vibrating Wire - In Drillhole			6093	Yes
		VW4	Vibrating Wire - In Drillhole			6218	Yes
		VW5	Vibrating Wire - In Drillhole			6368	Yes
87+40 W	DH16-01	VW1	Vibrating Wire - In Drillhole	145499	130544	6020	Yes
		VW2	Vibrating Wire - In Drillhole			6071	Yes
		VW3	Vibrating Wire - In Drillhole			6111	Yes
		VW4	Vibrating Wire - In Drillhole			6191	Yes
87+40 W	DH16-02	VW1	Vibrating Wire - In Drillhole	145500	129551	6084	Yes
		VW2	Vibrating Wire - In Drillhole			6169	Yes
		VW3	Vibrating Wire - In Drillhole			6326	Yes
87+40 W	DH16-03	VW1	Vibrating Wire - In Drillhole	145360	129723	5799	Yes
		VW2	Vibrating Wire - In Drillhole			5841	Yes
		VW3	Vibrating Wire - In Drillhole			6009	Yes
		VW4	Vibrating Wire - In Drillhole			6099	Yes
		VW5	Vibrating Wire - In Drillhole			6177	Yes
87+40 W	DH16-04	VW1	Vibrating Wire - In Drillhole	145471	130284	5674	Yes
		VW2	Vibrating Wire - In Drillhole			5817	Yes
		VW3	Vibrating Wire - In Drillhole			6026	Yes
		VW4	Vibrating Wire - In Drillhole			6206	Yes
		VW5	Vibrating Wire - In Drillhole			6324	Yes
		VW6	Vibrating Wire - In Drillhole			6376	Yes
87+40 W	DH16-05	VW1	Vibrating Wire - In Drillhole	145518	129197	5621	Yes
		VW2	Vibrating Wire - In Drillhole			5754	Yes
		VW3	Vibrating Wire - In Drillhole			5870	Yes
		VW4	Vibrating Wire - In Drillhole			5955	Yes
		VW5	Vibrating Wire - In Drillhole			6129	Yes
		VW6	Vibrating Wire - In Drillhole			6210	Yes
		VW7	Vibrating Wire - In Drillhole			6339	Yes
87+40 W	MW15-01	-	Standpipe	129461	145503	6334 - 6274	Yes
87+40 W	MW15-04	-	Standpipe	129975	145875	6273 - 6216	Yes
87+40 W	MW15-08	-	Standpipe	129461	145503	6393 - 6363	Yes
87+40 W	MW16-01	-	Standpipe	129461	145548	6024 - 5983	Yes
87+40 W	MW16-02D	-	Standpipe	129730	145508	6018 - 5946	Yes
87+40 W	MW16-02S	-	Standpipe	129730	145508	6262 - 6233	Yes
Off plane	MW12-12	-	Standpipe	129116	146996	6317 - 6276	Yes
Off plane	MW12-14	-	Standpipe	129104	146991	6387 - 6327	Yes
Off plane	MW12-15	-	Standpipe	129303	143689	6371 - 6319	Yes
Off plane	MW15-05	-	Standpipe	128912	147317	6289 - 6227	Yes
Off plane	MW15-06	-	Standpipe	128909	147284	6133 - 6069	Yes

Plane	Location	Piezometer ID	Type	Easting	Northing	Monitoring Elevation/Interval (feet)	Installed
95+00 W	DH15-02	VW1	Vibrating Wire - In Drillhole	130226	146367	6142	Yes
		VW2	Vibrating Wire - In Drillhole			6282	Yes
		VW3	Vibrating Wire - In Drillhole			6342	Yes
95+00 W	DH15-06	VW1	Vibrating Wire - In Drillhole	129435	145752	6053	Yes
		VW2	Vibrating Wire - In Drillhole			6093	Yes
		VW3	Vibrating Wire - In Drillhole			6157	Yes
		VW4	Vibrating Wire - In Drillhole			6283	Yes
		VW5	Vibrating Wire - In Drillhole			6393	Yes
95+00 W	DH15-10	VW1	Vibrating Wire - In Drillhole	129456	146314	5866	Yes
		VW2	Vibrating Wire - In Drillhole			5970	Yes
		VW3	Vibrating Wire - In Drillhole			6083	Yes
		VW4	Vibrating Wire - In Drillhole			6223	Yes
		VW5	Vibrating Wire - In Drillhole			6374	Yes
95+00 W	DH15-12	VW1	Vibrating Wire - In Drillhole	131122	146329	6198	Yes
		VW2	Vibrating Wire - In Drillhole			6248	Yes
		VW3	Vibrating Wire - In Drillhole			6298	Yes
95+00 W	EXTRACTION BASIN	VWP-EB1	Vibrating Wire - In trench	130953	146431	6313	Yes
95+00 W	MW12-16	-	Standpipe	129460	146011	6354 - 6297	Yes
95+00 W	MW15-02	-	Standpipe	129436	146315	6342 - 6284	Yes
95+00 W	MW15-03	-	Standpipe	129412	146003	6152 - 6098	Yes
95+00 W	MW15-07	-	Standpipe	129014	146038	6315 - 6262	Yes
108+40 W	DH15-03	VW1	Vibrating Wire - In Drillhole	129989	147449	6128	Yes
		VW2	Vibrating Wire - In Drillhole			6198	Yes
		VW3	Vibrating Wire - In Drillhole			6258	Yes
108+40 W	DH15-09	VW1	Vibrating Wire - In Drillhole	130401	147474	6117	Yes
		VW2	Vibrating Wire - In Drillhole			6187	Yes
		VW3	Vibrating Wire - In Drillhole			6247	Yes
108+40 W	DRAIN POD #1	VWP-DP1	Vibrating Wire - In trench	130134	147613	6312	Yes
108+40 W	MW12-13	-	Standpipe	128736	148088	6349 - 6290	Yes
108+40 W	MW12-17	-	Standpipe	128888	147529	6323 - 6278	Yes
108+40 W	MW12-18	-	Standpipe	128871	147524	6397 - 6358	Yes
Off plane	CPT13-05	VW1	Vibrating Wire - In CPT probe hole	132803	142965	6234	Yes
Off plane	CPT13-06	VW1	Vibrating Wire - In CPT probe hole	132989	143119	6300	Yes
Off plane	CPT15-08	VW1	Vibrating Wire - In CPT probe hole	132987	143084	6248	Yes
		VW2	Vibrating Wire - In CPT probe hole			6273	Yes
Off plane	DH15-01	VW1	Vibrating Wire - In Drillhole	131599	143505	6214	Yes
		VW2	Vibrating Wire - In Drillhole			6283	Yes
		VW3	Vibrating Wire - In Drillhole			6338	Yes
Off plane	DH15-04	VW1	Vibrating Wire - In Drillhole	131191	143705	6153	Yes
		VW2	Vibrating Wire - In Drillhole			6221	Yes
		VW3	Vibrating Wire - In Drillhole			6281	Yes
Off plane	DH15-08	VW1	Vibrating Wire - In Drillhole	130901	144460	6214	Yes
		VW2	Vibrating Wire - In Drillhole			6249	Yes
		VW3	Vibrating Wire - In Drillhole			6334	Yes
Off plane	DH15-11	VW1	Vibrating Wire - In Drillhole	130209	147971	6177	Yes
		VW2	Vibrating Wire - In Drillhole			6242	Yes
		VW3	Vibrating Wire - In Drillhole			6302	Yes
Off plane	DH15-13	VW1	Vibrating Wire - In Drillhole	130272	146801	6256	Yes
		VW2	Vibrating Wire - In Drillhole			6311	Yes
		VW3	Vibrating Wire - In Drillhole			6361	Yes

NOTES:

1. THIS DRAWING SHALL BE READ WITH ACCOMPANYING DRAWINGS AND CONSTRUCTION MANAGEMENT PLAN.
2. ADDITIONAL DETAILS INCLUDING GROUND SURFACE ELEVATION AT THE TIME OF INSTALLATION AND AZIMUTH AND DIP FOR INCLINED INSTALLATIONS ARE PROVIDED IN THE SITE CHARACTERIZATION REPORT.
3. COORDINATE GRID IS ANACONDA MINE GRID.
4. THE MONITORING INTERVAL OF MONITORING WELLS CORRESPONDS TO THE LOCATION OF THE SAND PACK FILTER AS INDICATED ON INSTALLATION LOGS. INSTANCES IN WHICH THIS INFORMATION WAS UNAVAILABLE, THE MONITORING INTERVAL WAS ASSIGNED BASED ON THE SCREENED INTERVAL PROVIDED BY MONTANA RESOURCES.

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KEN J. BROUWER 10020 PE June 30, 2017 REGISTERED PROFESSIONAL ENGINEER

MR-C2910	WEST EMBANKMENT - 6450 CREST - INSTRUMENTATION PLAN
DRG. NO.	DESCRIPTION

REFERENCE DRAWINGS

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED	APPROVED

REVISIONS

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED	APPROVED
0	30JUN'17	NOT FOR CONSTRUCTION	JDZ	MJC	DDF	ZJB

REVISIONS

Knight Piésold CONSULTING

MONTANA RESOURCES, LLP

YANKEE DOODLE TAILINGS IMPOUNDMENT

WEST EMBANKMENT 6450 CREST INSTRUMENTATION DETAILS

PROJECT NO.	DRAWING NO.	REVISION
VA101-126/12	MR-C2911	0

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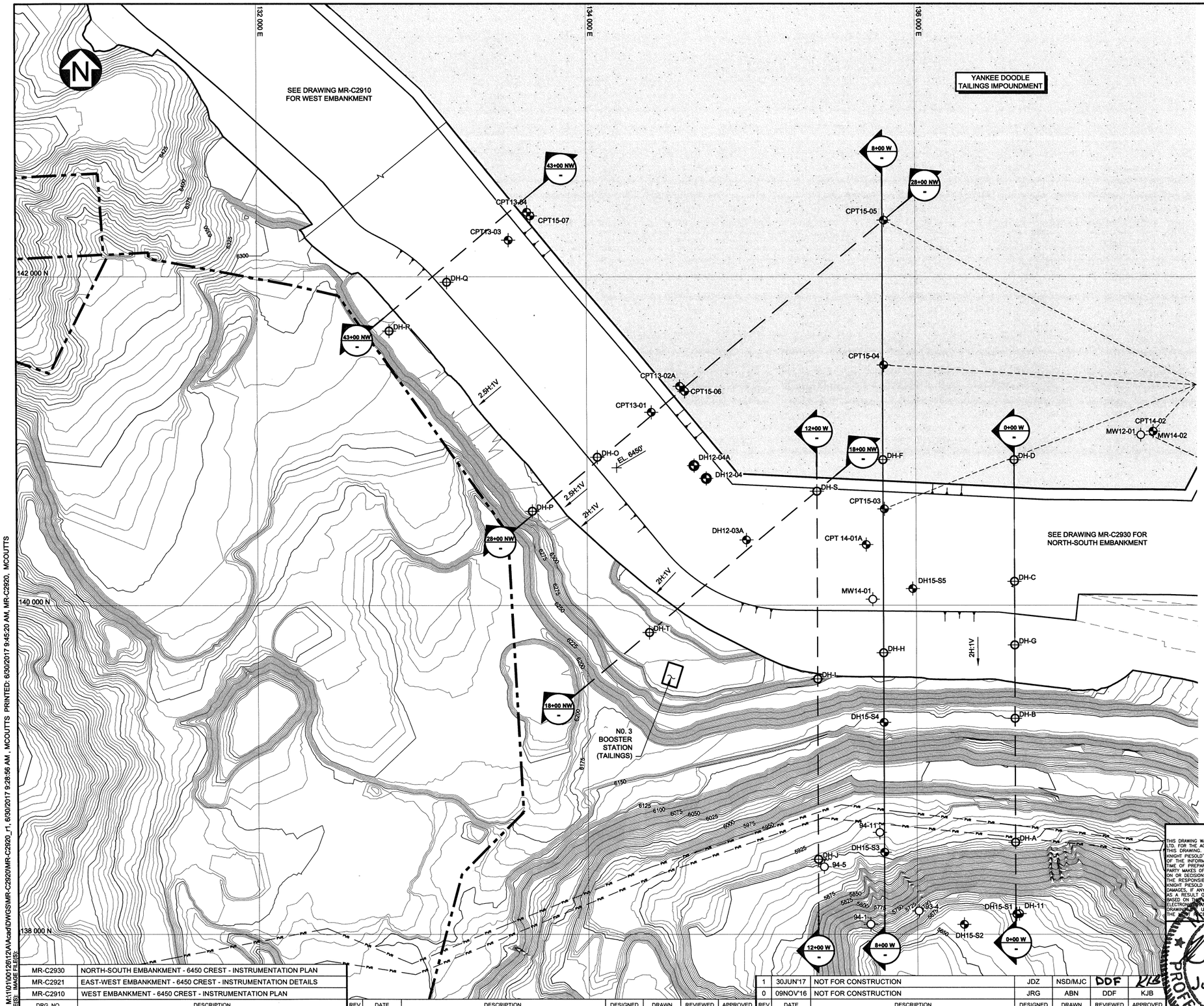
XREF FILES: IMAGE FILES():



LEGEND:

- TAILINGS BEACH
- DH-A FUTURE INSTRUMENTATION SITE
- VIBRATING WIRE PIEZOMETER
- MONITORING WELL
- PIEZOMETER DATA MONITORING HUB (TYPICAL)
- PIEZOMETER CABLE ROUTING (APPROX.)
- PROPERTY BOUNDARY
- TRANSMISSION LINE
- EXISTING INSTRUMENTATION PLANE
- FUTURE INSTRUMENTATION PLANE

NOTES:

1. THIS DRAWING SHALL BE READ WITH ACCOMPANYING DRAWINGS AND CONSTRUCTION MANAGEMENT PLAN.
2. COORDINATE GRID IS ANACONDA MINE GRID.
3. SEE INSTRUMENTATION DETAILS ON DRAWING MR-C2921.

NOT FOR CONSTRUCTION

SCALE A 300 0 300 600 900 1200 1500 ft

DRG. NO.	DESCRIPTION
MR-C2930	NORTH-SOUTH EMBANKMENT - 6450 CREST - INSTRUMENTATION PLAN
MR-C2921	EAST-WEST EMBANKMENT - 6450 CREST - INSTRUMENTATION DETAILS
MR-C2910	WEST EMBANKMENT - 6450 CREST - INSTRUMENTATION PLAN

REFERENCE DRAWINGS

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED	APPROVED
1	30JUN'17	NOT FOR CONSTRUCTION	JDZ	NSD/MJC	DDF	KJB
0	09NOV'16	NOT FOR CONSTRUCTION	JRG	ABN	DDF	KJB

REVISIONS

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KEN J. BROUWER
10020 PE
June 30, 2017
REGISTERED PROFESSIONAL ENGINEER

Knight Piésold
CONSULTING

MONTANA RESOURCES, LLP

YANKEE DOODLE TAILINGS IMPOUNDMENT

EAST-WEST EMBANKMENT
6450 CREST
INSTRUMENTATION PLAN

PLAN	DRAWING NO.	REVISION
VA101-126/12	MR-C2920	1

SAVED: M:\1\01\00126\12\A\Acad\DWGS\MR-C2920\MR-C2920_r1, 6/30/2017 9:28:56 AM , MCOUTTS PRINTED: 6/30/2017 9:45:20 AM, MR-C2920, MCOUTTS
XREF FILE(S): IMAGE FILE(S):

Plane	Location	Piezometer ID	Type	Easting	Northing	Monitoring Elevation/Interval (feet)	Installed
0+00 W	DH-A	-	Vibrating Wire - In Drillhole	136600	138559	TBD	No
0+00 W	DH-B	-	Vibrating Wire - In Drillhole	136600	139313	TBD	No
0+00 W	DH-C	-	Vibrating Wire - In Drillhole	136600	140146	TBD	No
0+00 W	DH-D	-	Vibrating Wire - In Drillhole	136600	140700	TBD	No
0+00 W	DH-G	-	Vibrating Wire - In Drillhole	136600	139760	TBD	No
0+00 W	DH-11	-	Standpipe	136623	138126	5606 - 5596	Yes
0+00 W	DH15-S1	VW1	Vibrating Wire - In Drillhole	136606	138123	5608.6	Yes
		VW2	Vibrating Wire - In Drillhole			5640.6	Yes
		VW3	Vibrating Wire - In Drillhole			5652.6	Yes
0+00 W	DH15-S2	VW1	Vibrating Wire - In Drillhole	136286	138060	5600.0	Yes
		VW2	Vibrating Wire - In Drillhole			5620.0	Yes
		VW3	Vibrating Wire - In Drillhole			5640.0	Yes
8+00 W	93-4	-	Standpipe	136010	138141	5668 - 5658	Yes
8+00 W	94-1	-	Standpipe	135716	138061	5678 - 5660	Yes
8+00 W	94-11	-	Standpipe	135773	138619	5668 - 5632	Yes
8+00 W	CPT14-01A	VW1	Vibrating Wire - In CPT probe hole	135697	140370	6264	Yes
8+00 W	CPT15-03	VW1	Vibrating Wire - In CPT probe hole	135808	140587	6060	Yes
		VW2	Vibrating Wire - In CPT probe hole			6167	Yes
		VW3	Vibrating Wire - In CPT probe hole			6268	Yes
8+00 W	CPT15-04	VW1	Vibrating Wire - In CPT probe hole	135808	141462	6011	Yes
		VW2	Vibrating Wire - In CPT probe hole			6166	Yes
		VW3	Vibrating Wire - In CPT probe hole			6264	Yes
8+00 W and 28+00 NW	CPT15-05	VW1	Vibrating Wire - In CPT probe hole	135810	142344	6016	Yes
		VW2	Vibrating Wire - In CPT probe hole			6158	Yes
		VW3	Vibrating Wire - In CPT probe hole			6256	Yes
8+00 W	DH-F	-	Vibrating Wire - In Drillhole	135800	140700	TBD	No
8+00 W	DH-H	-	Vibrating Wire - In Drillhole	135800	139712	TBD	No
8+00 W	DH15-S3	VW1	Vibrating Wire - In Drillhole	135802	138498	5611	Yes
8+00 W	DH15-S4	VW1	Vibrating Wire - In Drillhole	135801	139288	5625	Yes
		VW2	Vibrating Wire - In Drillhole			5725	Yes
8+00 W	DH15-S5	VW1	Vibrating Wire - In Drillhole	135979	140102	5666	Yes
		VW2	Vibrating Wire - In Drillhole			5848	Yes
		VW3	Vibrating Wire - In Drillhole			6023	Yes
		VW4	Vibrating Wire - In Drillhole			6213	Yes
8+00 W	MW14-01	-	Standpipe	135735	140037	6358 - 5653	Yes
12+00 W	94-5	-	Standpipe	135435	138410	5683 - 5659	Yes
12+00 W	DH-I	-	Vibrating Wire - In Drillhole	135400	139553	TBD	No
12+00 W	DH-J	-	Vibrating Wire - In Drillhole	135400	138456	TBD	No
12+00 W and 18+00 NW	DH-S	-	Vibrating Wire - In Drillhole	135400	140695	TBD	No
18+00 NW	DH-T	-	Vibrating Wire - In Drillhole	134376	139836	TBD	No
18+00 NW	DH12-03A	VW1	Vibrating Wire - In Drillhole	134973	140399	6147	Yes
28+00 NW	CPT13-01	VW1	Vibrating Wire - In CPT probe hole	134393	141175	6161	Yes
28+00 NW	CPT13-02A	VW1	Vibrating Wire - In CPT probe hole	134567	141334	6192	Yes
28+00 NW	CPT15-06	VW1	Vibrating Wire - In CPT probe hole	134597	141303	6154	Yes
		VW2	Vibrating Wire - In CPT probe hole			6248	Yes
28+00 NW	DH-O	-	Vibrating Wire - In Drillhole	134063	140902	TBD	No
28+00 NW	DH-P	-	Vibrating Wire - In Drillhole	133671	140573	TBD	No
43+00 NW	CPT13-03	VW1	Vibrating Wire - In CPT probe hole	133531	142222	6187	Yes
43+00 NW	CPT13-04	VW1	Vibrating Wire - In CPT probe hole	133644	142393	6289	Yes
43+00 NW	CPT15-07	VW1	Vibrating Wire - In CPT probe hole	133663	142371	6152	Yes
		VW2	Vibrating Wire - In CPT probe hole			6200	Yes
43+00 NW	DH-Q	-	Vibrating Wire - In Drillhole	133153	141967	TBD	No
43+00 NW	DH-R	-	Vibrating Wire - In Drillhole	132800	141670	TBD	No
Off Plane	CPT14-02	VW1	Vibrating Wire - In CPT probe hole	137447	141062	5936	Yes
Off Plane	DH12-04	VW1	Vibrating Wire - In Drillhole	134728	140773	6195	Yes
Off Plane	DH12-04A	VW1	Vibrating Wire - In Drillhole	134654	140851	6246	Yes
Off Plane	MW12-01	-	Standpipe	137371	141038	5961 - 5856	Yes
Off Plane	MW14-02	-	Standpipe	137447	141060	5921-5901	Yes

NOTES:

1. THIS DRAWING SHALL BE READ WITH ACCOMPANYING DRAWINGS AND CONSTRUCTION MANAGEMENT PLAN.
2. THE COMPLETION DETAILS FOR MW14-02 ARE UNCERTAIN, THIS TABLE ASSUMES THE MONITORING INTERVAL OF THE WELL IS LOCATED IN THE LOWER 20 FEET.
3. ADDITIONAL DETAILS INCLUDING GROUND SURFACE ELEVATION AT THE TIME OF INSTALLATION ARE PROVIDED IN THE SITE CHARACTERIZATION REPORT.
4. COORDINATE GRID IS ANACONDA MINE GRID.
5. THE MONITORING INTERVAL OF MONITORING WELLS CORRESPONDS TO THE LOCATION OF THE SAND PACK FILTER AS INDICATED ON INSTALLATION LOGS. INSTANCES IN WHICH THIS INFORMATION WAS UNAVAILABLE, THE MONITORING INTERVAL WAS ASSIGNED BASED ON THE SCREENED INTERVAL PROVIDED BY MONTANA RESOURCES.

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KEN J. BROUWER 10020 PE REGISTERED PROFESSIONAL ENGINEER

Knight Piésold CONSULTING

MONTANA RESOURCES, LLP

YANKEE DOODLE TAILINGS IMPOUNDMENT

EAST-WEST EMBANKMENT 6450 CREST INSTRUMENTATION DETAILS

DRAWING NO.	REVISION
MR-C2921	0

PROJECT NO. VA101-126/12

MR-C2920	EAST-WEST EMBANKMENT - 6450 CREST - INSTRUMENTATION PLAN
DRG. NO.	DESCRIPTION

REFERENCE DRAWINGS

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED	APPROVED

REVISIONS

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED	APPROVED
0	30JUN'17	NOT FOR CONSTRUCTION	JDZ	MJC	DDF	KJB

REVISIONS

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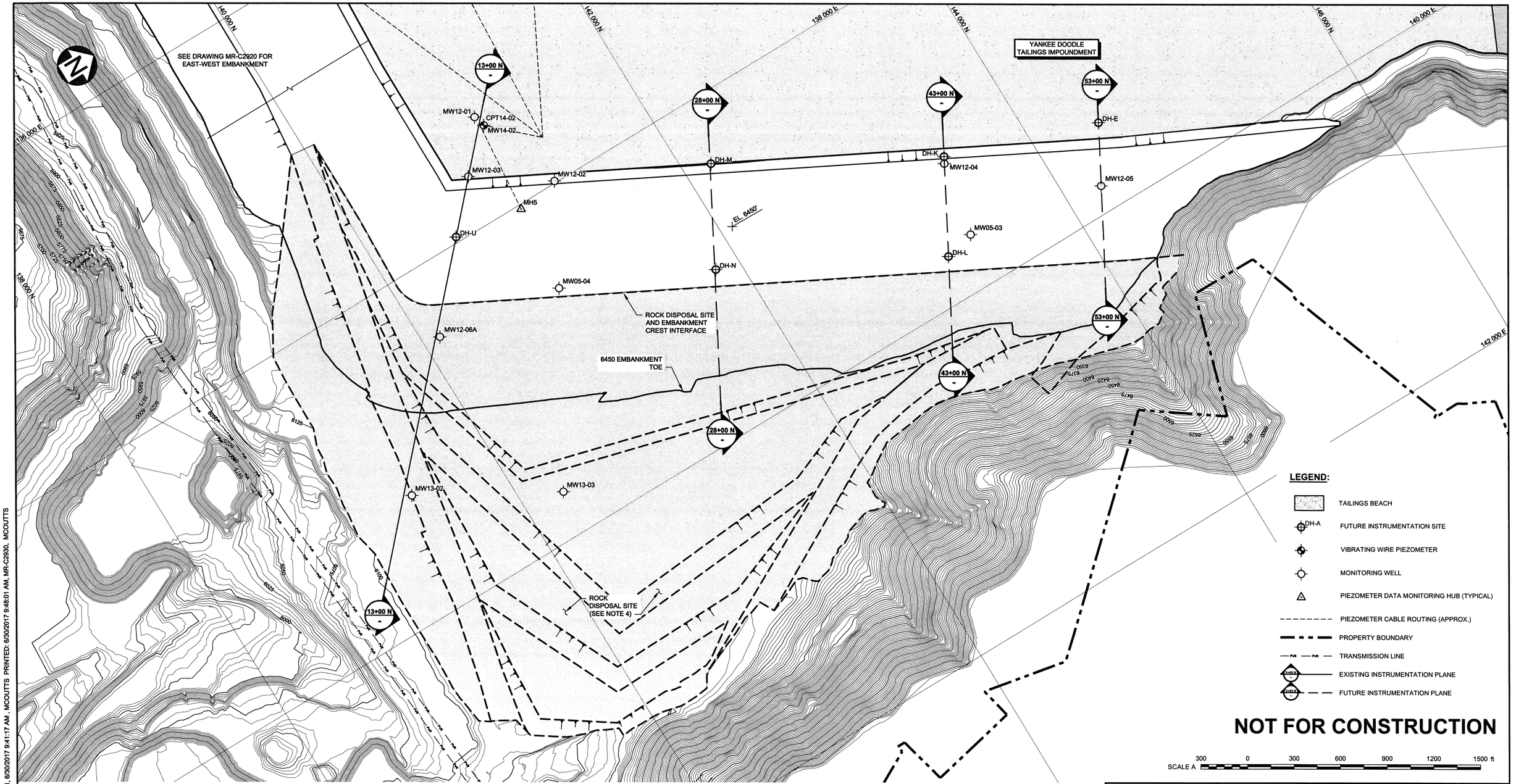
XREF FILE(S): IMAGE FILE(S):



NOT FOR CONSTRUCTION

SCALE A 300 0 300 600 900 1200 1500 ft

NOTES:

1. THIS DRAWING SHALL BE READ WITH ACCOMPANYING DRAWINGS AND CONSTRUCTION MANAGEMENT PLAN.
2. COORDINATE GRID IS ANACONDA MINE GRID.
3. ORIGINAL GROUND CONTOUR INTERVAL IS 5 FEET.
4. ROCK DISPOSAL SITE LOCATION AND LAYOUT PROVIDED BY MONTANA RESOURCES IN NOVEMBER 2015.
5. SEE INSTRUMENTATION DETAILS ON DRAWING MR-C2931.

DRG. NO.	DESCRIPTION
MR-C2931	NORTH-SOUTH EMBANKMENT - 6450 CREST - INSTRUMENTATION DETAILS
MR-C2920	EAST-WEST EMBANKMENT - 6450 CREST - INSTRUMENTATION PLAN
MR-C2910	WEST EMBANKMENT - 6450 CREST - INSTRUMENTATION PLAN

REFERENCE DRAWINGS

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED	APPROVED
1	30JUN'17	NOT FOR CONSTRUCTION	JDZ	MJC	DDF	KJB
0	09NOV'16	NOT FOR CONSTRUCTION	JRG	ABN	DDF	KJB

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KEN J. BROUWER 10020 PE June 30, 2017 REGISTERED PROFESSIONAL ENGINEER

Knight Piésold CONSULTING

MONTANA RESOURCES, LLP

YANKEE DOODLE TAILINGS IMPOUNDMENT

NORTH-SOUTH EMBANKMENT
6450 CREST
INSTRUMENTATION PLAN

DRAWING NO.	REVISION
VA101-126/12	MR-C2930	1

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XREF FILE(S): IMAGE FILE(S):

Plane	Location	Piezometer ID	Type	Easting	Northing	Monitoring Elevation/Interval (feet)	Installed
13+00 N	DH-U	-	Vibrating Wire - In Drillhole	137965	140534	TBD	No
13+00 N	CPT 14-02	VW1	Vibrating Wire - In CPT probe hole	137447	141060	5936	Yes
13+00 N	MW12-01	-	Standpipe	137371	141038	5961 - 5856	Yes
13+00 N	MW12-03	-	Standpipe	137675	140804	5907 - 5807	Yes
13+00 N	MW12-06A	-	Standpipe	138457	140112	5886 - 5866	Yes
13+00 N	MW13-02	-	Standpipe	139230	139426	5888 - 5828	Yes
13+00 N	MW14-02	-	Standpipe	137447	141060	5921 - 5901	Yes
28+00 N	DH-M	-	Vibrating Wire - In Drillhole	138414	142175	TBD	No
28+00 N	DH-N	-	Vibrating Wire - In Drillhole	139008	141846	TBD	No
43+00 N	DH-K	-	Vibrating Wire - In Drillhole	139090	143365	TBD	No
43+00 N	DH-L	-	Vibrating Wire - In Drillhole	139651	143054	TBD	No
43+00 N	MW05-03	-	Standpipe	139664	143356	6051 - 6013	Yes
43+00 N	MW12-04	-	Standpipe	139190	143452	6071 - 6039	Yes
53+00 N	DH-E	-	Vibrating Wire - In Drillhole	139479	144435	TBD	No
53+00 N	MW12-05	-	Standpipe	139834	144238	6214 - 6194	Yes
Off plane	MW05-4	-	Standpipe	138588	140926	5933 - 5886	Yes
Off plane	MW12-02	-	Standpipe	137987	141261	5961 - 5856	Yes
Off plane	MW13-03	-	Standpipe	139714	140266	5969 - 5949	Yes

NOTES:

1. THIS DRAWING SHALL BE READ WITH ACCOMPANYING DRAWINGS AND CONSTRUCTION MANAGEMENT PLAN.
2. THE COMPLETION DETAILS FOR MW14-02 ARE UNCERTAIN, THIS TABLE ASSUMES THE MONITORING INTERVAL OF THE WELL IS LOCATED IN THE LOWER 20 FEET.
3. ADDITIONAL DETAILS INCLUDING GROUND SURFACE ELEVATION AT THE TIME OF INSTALLATION ARE PROVIDED IN THE SITE CHARACTERIZATION REPORT.
4. COORDINATE GRID IS ANACONDA MINE GRID.
5. THE MONITORING INTERVAL OF MONITORING WELLS CORRESPONDS TO THE LOCATION OF THE SAND PACK FILTER AS INDICATED ON INSTALLATION LOGS. INSTANCES IN WHICH THIS INFORMATION WAS UNAVAILABLE, THE MONITORING INTERVAL WAS ASSIGNED BASED ON THE SCREENED INTERVAL PROVIDED BY MONTANA RESOURCES.

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KEN J. BROUWER 10020 PE June 30, 2017 REGISTERED PROFESSIONAL ENGINEER

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MONTANA RESOURCES, LLP

YANKEE DOODLE TAILINGS IMPOUNDMENT

NORTH-SOUTH EMBANKMENT 6450 CREST INSTRUMENTATION DETAILS

DRAWING NO.	REVISION
VA101-126/12	MR-C2931	0

MR-C2930	NORTH-SOUTH EMBANKMENT - 6450 CREST - INSTRUMENTATION PLAN
DRG. NO.	DESCRIPTION

REFERENCE DRAWINGS

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED	APPROVED

REVISIONS

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED	APPROVED
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