STATE OF UTAH
DIVISION OF WATER QUALITY
UTAH WATER QUALITY BOARD
SALT LAKE CITY, UTAH 84114-4870

GROUND WATER DISCHARGE PERMIT

In compliance with the provisions of the Utah Water Quality Act, Title 19, Chapter 5, Utah Code Annotated 1953, as amended, the Act,

KENNECOTT UTAH COPPER LLC
4700 DAYBREAK PARKWAY
SOUTH JORDAN, UTAH 84009

is granted a ground water discharge permit for the operation of the **Bingham Canyon Mine and Water Collection System** in Salt Lake County, Utah.

The Bingham Canyon Mine and Water Collection System is located on the following tracts of land (Salt Lake Base and Meridian):

Township 3 South, Range 2 West - Portions of Sections 17, 18, 19, 20, 21, 29, 30, 31, 32
Township 3 South, Range 3 West - Portions of Sections 11, 12, 13, 14, 22, 23, 24, 25, 26, 27, 33, 34, 35, 36
Township 4 South, Range 2 West - Portions of Sections 6 and 7
Township 4 South, Range 3 West - Portions of Sections 1, 2, 3, 9, 11, 12

The permit is a renewal of the original groundwater discharge permit issued May 1, 1999. The permit is based on representations made by the permittee and other information contained in the administrative record. It is the responsibility of the permittee to read and understand all provisions of this permit.

The facility shall be constructed and operated in accordance with conditions set forth in the permit and the Utah Ground Water Quality Protection Regulations.

This permit shall become effective on _____, 2020.

This permit and the authorization to operate shall expire at midnight on, _____, 2025.

_____
Erica Brown Gaddis, Ph.D.
Director
Utah Division of Water Quality

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I. CONSTRUCTION PERMIT ISSUANCE AND BEST AVAILABLE TECHNOLOGY (BAT) STANDARD

A. Authorized Construction

As part of this ground water discharge permit a construction permit is hereby issued to Kennecott as summarized below and detailed in Appendix J. Construction for this portion includes the extension of the Toe Drain from Copper IV to Yosemite which ties East Waste Rock and South Waste Rock.

B. Design and Construction

Under authority of the Utah Water Quality Act, Section 19-5-108(1) Utah Code Ann. 1953, as amended and Utah Administrative Code R317-1, the authorized facilities will be constructed in accordance with the engineering design plans and specifications attached as Appendix J.

Construction elements include:

1. Creation of a Toe Drain whereby the Copper IV existing Toe Drain will be extended to the Yosemite drainage. Construction drawings are included in Appendix J.

2. Existing detention basins for Copper IV will be modified so that the basins can control flood events for 25 and 100-year 24-hour storm events.

II. SPECIFIC PERMIT CONDITIONS

A. Ground Water Classification

The ground water classification for the uppermost aquifer in the area of the Bingham Canyon Mine and Water Collection System ranges from Class I to Class II groundwater. There are areas where ground water has been impacted by acidic water and water quality is degraded to Class III and Class IV. Ground water at each compliance monitoring well has been classified based on historical monitoring data.

B. Ground Water Protection Levels

Ground water Protection Levels for compliance monitoring wells for this permit are represented in Table 1.

C. Best Available Technology Performance Standard

1. The Best Available Technology (BAT) for the Bingham Canyon Mine and Water Collection System will be a Discharge Minimization approach designed, constructed and operated in accordance with approved designs and specifications (Part II Section E). The design for conveying mine impacted water consists of a combination of concrete cut-off walls, toe drains; french drains or seepage collection trenches, HDPE pipelines, collection boxes, and extraction wells. Meteoric precipitation is conveyed through either the HDPE pipelines or concrete lined ditches which also act as secondary containment mechanisms for the mine impacted water HDPE pipeline system in cases where flows exceed the pipeline capacity or where maintenance of the pipeline is required.

   The BAT for the Dry Fork area shall include operation and maintenance of two extraction wells, Mid-Valley well (COP2701) and the Picnic Flats well COG2865 (replacement for COG1172 which experienced biofouling issues), located up-gradient of Dry Fork dump. These wells are in place to capture water before it contacts the waste rock dumps and the underlying contaminated groundwater.

   Operation and maintenance of a series of three alluvial extraction wells down-gradient of the toe of the Bingham Canyon dump will include the following components. The primary well is Bingham Canyon Alluvial Well (ECG2787) located within Bingham Creek; the secondary alluvial extraction well, Curtis Springs (VWK83) is down-gradient of ECG2787 and also within the alluvial channel of Bingham Creek. A third alluvial well named

Copperton Channel (ECG1185) is located due north of Curtis Springs and intercepts water from an alluvial channel adjacent and north of Bingham Creek. Production from these wells is dependent upon 1) seasonal conditions, 2) available mine impacted water from within the alluvium, and 3) the influence of up-gradient wells on the yield of down-gradient wells.

Operating parameters and regulatory obligations related to Dry Fork wells are listed in Table 2 with additional information regarding Dry Fork management contained in Appendix G.

A series of down-gradient compliance monitoring wells screened in bedrock also monitor bedrock contamination from the Dry Fork and Bingham Canyon area. The wells are ECG2789A & B, ECG1100A & B and VWK93 which have established compliance limits. Monitoring wells ECG2866A & B, are scheduled for installation in 2020 to replace ECG2789A & B to accommodate the placement of a new conveyor belt being installed in 2020. With respect to the compliance monitoring wells, a remedial strategy is necessary to address bedrock groundwater contamination from Dry Fork under the guidance of Appendix C, G and the discretion of the Director.

BAT shall also include inspection and maintenance commitments included in the Compliance Monitoring Plan (Appendix A).

2. Best Available Technology for the Bluewater Repository is a low permeability clay liner and cap system as specified in Part II Section E Item 2. Only materials approved by the Director may be disposed of in the repository following analysis under the Waste Characterization Plan (Appendix B). Bluewater Repository and its footprint was permitted in 1991. Only a portion of the footprint was occupied through 2019 and it is anticipated the repository footprint will be expanded in the next several years within the original permitted footprint and in accordance with the permitted specifications.

3. The Best Available Technologies instituted for the Chalcopyrite Heap Leach Project (CHLP) consist of double lined HDPE facilities for the Heap, Pregnant Leach Solution (PLS) Pond and Raffinate Pond. Each facility incorporates two layers of 60 millimeter HDPE liner with independent leak collection and detection systems. Performance criteria are outlined in Appendix F. If the CHLP facilities listed here do not meet the performance criteria outlined in Appendix F, Kennecott shall refer to Part II Section H of this permit. The Chalcopyrite Heap Leach facility was dismantled in 2016. Reference to the facility remains in Appendix F to maintain BAT requirements that will be applicable should a similar facility be constructed in

the future.

4. Closure - The Bingham Canyon Mine and Water Collection System shall undergo closure in accordance with the requirements of the approved closure plan (Appendix D – Bingham Canyon Mine 2003 Reclamation and Water Management Plan, March 2003) submitted in conformance with Part II.J.3 of this permit.

5 Implementation of Best Management Practices - Kennecott Utah Copper LLC (Kennecott) shall operate the facilities specified in the Best Management Practices Plan as required under Appendix F of this permit.

D. Permitted Facilities

The Facilities authorized under this permit include:

1. The Bingham Canyon Mine and existing associated facilities: Bingham Canyon Mine maintenance facilities, South Area Water Services (SAWS), and the Bingham Canyon Water Treatment Plant (also permitted under the Utah Division of Drinking Water).

2. The East, South and West Side waste rock dumps and collection systems.

3. Pipelines, conveyance ditches, collection boxes, pump back wells and associated structures used to convey flows of meteoric and storm water that originate from Kennecott's waste rock piles adjacent to the Bingham Canyon Mine. The Large and Small Bingham Reservoirs are not included in this permit but are covered under separate ground water quality discharge permits.

4. Bluewater Repository – The repository is located on the north end of the east waste rock piles. As specified in Appendix B, the Bingham Canyon Mine and Water Collection System ground water quality discharge permit includes pertinent portions of the prior Bluewater Repository ground water quality discharge permit. Each segment of the repository includes a leachate collection system that routes flows to the leach collection pipeline.

5. SXEW (Solvent Extraction/Electrowinning) Facilities pursuant to approval of plans and specifications submitted in accordance with Part II.J.4 of this permit.

6. The Bingham Detention Basin constructed in 2020 and managed in accordance with Appendix A and under the general requirements for detention basins described in the operation and maintenance (O & M) manual attached as Appendix I.

E. Design and Construction

1. The Bingham Canyon Mine and Water Collection System is constructed according to the specifications, plans and drawings included in the permit application entitled:

a. Bingham Canyon Mine Eastside Collection Monitoring Network Ground Water Discharge Permit Application (revised) dated April 1996 (submitted June 13, 1996)

b. Geohydrology of the Dry Fork Region, Bingham Canyon Mine, Kennecott Utah Copper, May 1994 (submitted Feb. 25, 1997)

c. Supplemental application materials transmitted in letters of October 23, 1997 from Elaine Dorward-King, January 6, 1998 and August 31, 1998 from David J. Cline.

d. Contaminant Investigation and Corrective Action Plan for the Dry Fork Area, September 2002 (Submitted Sept. 26, 2002)

e. Supplemental application materials related to the Dry Fork area detailed in letters dated January 21, February 11 and March 10, 2003 (from Paula Doughty to the DWQ).

f. Supplemental Dry Fork Management Plan materials titled "Proposal to Relocate Dry Wells – Rio Tinto Kennecott Utah Copper (KUC) Bingham Canyon Mine Water Collection System Ground Water Discharge Permit No. UGW350010" dated September 22, 2008

g. Groundwater Discharge Permit Modification Application for East Waste Rock Extension, groundwater discharge permit UGW350010, submitted August 2012.

h. Groundwater Discharge Permit Modification Application for South Waste Rock Reclamation, groundwater discharge permit UGW350010, submitted November 2014.

i. Groundwater Discharge Permit Modification Application for an extension of the toe drain from Copper IV to Yosemite Drainage submitted August 2019.

j. Bingham Detention Basin construction drawings submitted March 2020.

2. The Bluewater North Repository segment and the Bluewater Main Repository segment are constructed according to the design specifications and drawings submitted May 17, 1991 as amended by Addendum No. 1 submitted June 6, 1991 and plans for expansion of the repository submitted December 18, 1992. These include:

a) *Clay Bottom Liner* - the bottom liner consists of a 12 inch thick clay layer with an in place hydraulic conductivity of no greater than 1 X 10^{-7} cm/sec.

b) *Seepage Collection System* - a seepage collection system constructed on the bottom clay liner consisting of a 4 inch minimum HDPE slotted pipe buried in 3/8 inch gravel surrounded by geo-textile and running the length of the landfill.

c) *Clay Barrier* - a 12 inch thick clay cap constructed on top of the tailings. The cap has a hydraulic conductivity no greater than 1 X 10^{-7} cm/sec.

d) *Clay Soil Layer* - a 34 inch clay soil layer placed on top of the 12 inch clay barrier. This layer has a hydraulic conductivity no greater than 1 x 10^{-4} cm/sec.

e) *Topsoil Layer* - An eight-inch layer of topsoil placed on top of the clay cap layers. This layer will be vegetated in accordance with reclamation requirements of the Division of Oil Gas and Mining.

f) *Run-on and Run-off Control* - Surface water run-on is controlled by site grading and ditches to direct drainage away from the repository.

F. Monitoring

1. General Provisions

a) *Future Modification of the Monitoring Network* - If at any time the Director determines the monitoring program to be inadequate for determining compliance with BAT, applicable permit limits or ground water protection levels, Kennecott shall submit within 30 days of receipt of written notice from the Director a modified monitoring plan that addresses the inadequacies noted by the Director.

Within 60 days of completion and development of any new or replacement compliance or operational monitoring well, Kennecott shall submit documentation demonstrating that the well is in

conformance with the EPA RCRA Ground Water Monitoring Technical Enforcement Guidance Document, 1986, OSWER-9950.1 (RCRA TEGD) Section 3.5.

b) *Compliance Monitoring Period* - Monitoring shall commence upon issuance of this permit and shall continue through the life of this permit. For compliance monitoring wells that are installed during the term of this permit, monitoring shall commence upon completion of the well installation and development as described in Part II. F. 1 (a).

c) *Laboratory Approval* - All water quality analyses shall be performed by a laboratory certified by the State of Utah to perform such analysis.

d) *Water Level Measurement* - In association with each well sampling event, water level measurements shall be made in each monitoring well prior to removal of any water from the well bore. These measurements will be collected from a permanent single reference point clearly marked on the top of the well or surface casing. Measurements will be made to the nearest 0.01 foot.

e) *Sampling Protocol* - Water quality samples will be collected and handled in conformance with the currently approved version of the Kennecott Ground Water Characterization and Monitoring Plan (GCMP, 2018). Alternative sampling methods may be considered (including low flow) with prior approval by the Director.

f) *Constituents Sampled* - The following analyses shall be performed on all water quality samples collected:

i) Field Measurements: pH, specific conductance, temperature
ii) Laboratory Analysis:

- Alkalinity
- Major Ions: (chloride, sulfate, sodium, potassium, magnesium, and calcium)
- Metals (dissolved): (arsenic, cadmium, chromium, copper, lead, selenium, and zinc)
- TDS

g) Analytical Procedures - Water sample analysis will be conducted according to test procedures specified under UCA R317-6-6.3.

2. Operational Monitoring

Operational Monitoring will be used to assess effectiveness of the water collection system including the following aspects:

a) Mine Impacted Water - Flow and water quality data from the water collection system.

b) Bluewater Repository Leachate Collection System - Water quality from the leachate collection system.

c) Tunnel Flows - Flows from the mine tunnels that underlie the Waste Rock Piles for the Bingham Canyon Mine.

d) Informational Wells – Table 3 lists the informational monitor wells that will be used to supplement compliance monitor wells down-gradient of the collection system and within the Dry Fork area.

e) Groundwater Extraction Rates – Annual volume of water removed from the three alluvial extraction wells down-gradient of Dry Fork (ECG2787, VWK83 and ECG1185) as well as Bingham Canyon cut-off wall and the two water capture wells up-gradient of Dry Fork (COP2701 and COG2865 which replaced COG1172).

3. Monitoring Frequency

a) *Well Monitoring Frequency* - All existing compliance monitoring wells scheduled for sampling are listed in Table 1. Compliance monitoring wells screened in alluvium will be sampled quarterly throughout the term of this permit, while compliance monitoring wells screened in bedrock, including those in the Dry Fork area, will be sampled semi-annually. Any newly drilled monitoring wells (to be used for compliance wells), will be sampled quarterly for 12 consecutive quarters (3 years) following installation to establish baseline groundwater quality. However, if a preexisting monitoring well has at least three years of data, the compliance limits for that well will be calculated and established. Following completion of 12 quarterly samples, monitoring shall change to a semi-annual (bedrock completion) or quarterly (alluvial completion) sampling frequency unless more frequent sampling is required under other terms of this permit.

b) *Operational Monitoring Frequency* - Operational monitoring including collection system flows, tunnel flows, informational wells, pumping rates from extraction wells and leachate collected from the Bluewater

Repository shall occur as specified in Appendix E of this permit.

4. Post-Closure Monitoring

Kennecott shall conduct post-closure monitoring in accordance with the approved post closure monitoring program that is submitted and approved with the closure plan (Bingham Canyon Mine 2003 Reclamation and Water Management Plan, March 2003) submitted in in conformance with Part II Section J item 3 of this permit.

G. Non- Compliance for Ground Water Protection Levels

1. Probable Out of Compliance - If the concentration of a pollutant from any compliance monitoring well sample exceeds the compliance limit (in the case of pH exceeds the higher or lower limit) (Table 1) Kennecott shall:

a. Notify the Director in writing within 30 days of receipt of the data;

b. Initiate monthly sampling for the compliance monitoring well(s) that have exceeded the compliance limit (Table 1), unless the Director determines that other periodic sampling is appropriate, for a period of two months or until the compliance status of the facility can be determined.

2. Out of Compliance Status

Out of compliance status exists when two or more consecutive samples from a compliance monitoring well exceed the compliance limit for a pollutant (Table 1). Upon determining that an out of compliance situation exists, Kennecott shall:

i) Notify the Director of the out of compliance status within 24 hours of discovery followed by a written notice within 5 days of the detection.

ii) Initiate monthly sampling unless the Director determines that other periodic sampling is appropriate until the facility is brought into compliance.

iii) Submit a Source Assessment and Compliance Schedule to the Director within 30 days of detection of the out of compliance status that outlines the following:

- Steps of action that will assess the source, extent, and potential dispersion of the contamination.
- Evaluation of potential remedial actions to restore and maintain ground water quality and ensure the compliance limits will not be exceeded at that compliance monitoring point.
- Measures to ensure best available technology will be re-established.

iv) Implement the Source Assessment and Compliance Schedule as directed by the Director.

H. Non- Compliance for Best Available Technology

1. Kennecott is required to maintain the Best Available Technology in accordance with the approved design and practice for this permit. Failure to maintain BAT or maintain the approved design and practice shall be a violation of this permit. In the event a compliance action is initiated against the permittee for violation of permit conditions relating to best available technology, Kennecott may affirmatively defend against that action by demonstrating the following:

a. Kennecott submitted notification in accordance with R317-6-6.13;

b. The failure was not intentional or caused by Kennecott's negligence, either in action or in failure to act;

c. Kennecott has taken adequate measures to meet permit conditions in a timely manner or has submitted for the Director's approval, an adequate plan and schedule for meeting permit conditions; and

d. The provisions of UCA 19-5-107 have not been violated.

I. Reporting Requirements

1. Reporting

a. *Monitoring Wells* - Water quality sampling results for compliance monitoring wells, shall be submitted quarterly to the Director as follows:

Quarter Sampled In		Results Due On
1st	(Jan., Feb., March)	May 15

2nd	(April, May, June)	August 15
3rd	(July, Aug., Sept.)	November 15
4th	(Oct., Nov., Dec.)	February 15

b. *Operational Monitoring* - Operational monitoring results and analysis, including results from collection sites, Bluewater Repository, tunnels, informational wells, extraction wells and surface water sites (seeps), shall be submitted in an annual report by March 31 of each year in accordance with the requirements of Appendix E.

c. Failure to submit reports within the time frame due shall be deemed as noncompliance and may result in enforcement action.

2. Delivery Requirements - the permittee shall electronically submit the required reports using a transmittal mechanism and format approved by the Director. If requested by the Director, hard copies shall also be submitted.

J. Compliance Schedule

1. Bluewater Main Repository – Within 180 days from the effective date of this permit, Kennecott shall submit revised design specifications and drawings for the clay cap and soil cover over the repository. Once approved by the Director, these revised design features shall replace those currently described under Part II.E.2. of this permit. Future construction of a clay liner or cap will conform to the Quality Assurance/Quality Control plan approved for the 2004 - 2010 groundwater discharge permit for the Bluewater Repository.

   For all construction of clay liner or cap that is completed at the Bluewater Main Repository during the term of the Bingham Canyon Mine and Water Collection System ground water discharge permit, an "As Built" report shall be submitted to the Director within 60 days of final completion of a segment of the repository documenting that the construction conformed to the Quality Assurance/Quality Control Plan.

2. *Permit Renewal Application Items* - As a part of the application for permit renewal each five years, Kennecott will include a water quality summary of the previous data collected for operational and compliance monitoring wells. Data from the Operational Monitoring program will be included in this summary. The summary will include an analysis of trends and any changes in the data over the life of the permit.

3. *Closure Plan* - Kennecott shall submit a conceptual closure plan for the Bingham Canyon Mine and Water Collection System for approval by the Director in conjunction with major changes and revisions, the approved

closure plan is attached in Appendix D of this permit. The plan will provide detail on all aspects of closure that are related to or have an impact on water quality. For any issues that require further study prior to finalizing aspects to the closure plan, details on what each study will include, and a schedule with milestones for each segment of the study shall be included in Kennecott's plan. The closure plan includes preliminary designs and a schedule to modify the waste rock dumps to minimize infiltration of meteoric water through the dumps.

The Closure Plan includes a post closure water quality monitoring plan that describes how post closure monitoring will be undertaken, including monitoring stations, frequency of monitoring, and parameters to be analyzed.

The conceptual closure plan will be updated to include any major updates or changes in the closure plan.

One year prior to final closure, Kennecott shall submit for approval by the Director, a final closure plan that addresses all aspects of closure that are related to or have an impact on water quality.

4. *SXEW Plans and Specifications* – Kennecott shall submit, for approval by the Director, plans and specifications for all future SXEW (Solvent Extraction/Electrowinning) operations associated with the Bingham Canyon Mine. Plans and specifications shall include the BAT proposed along with monitoring and maintenance measures to meet the requirements of this permit and the ground water quality discharge regulations. Plans and specifications shall be submitted 180 days prior to the planned date for commencement of construction of these facilities.

III. MONITORING, RECORDING AND REPORTING REQUIREMENTS

A. Representative Sampling. Samples collected in compliance with the monitoring requirements established under Part I shall be representative of the monitored activity.

B. Analytical Procedures. Water sample analysis must be conducted according to test procedures specified under UAC R317-6-6.3L, unless other test procedures have been specified in this permit.

C. Penalties for Tampering. The Act provides that any person who falsifies, tampers with, or knowingly renders inaccurate, any monitoring device or method required to be maintained under this permit shall, upon conviction, be punished by a fine of not more than $10,000 per violation, or by imprisonment for not more than six months per violation, or by both.

D. Reporting of Monitoring Results. Monitoring results obtained for each monitoring period specified in the permit, shall be submitted to the Director, Utah Division of Water Quality at the following address no later than 45 days after the end of the monitoring period (unless specified otherwise in this permit):

State of Utah
Division of Water Quality
Department of Environmental Quality
P.O. Box 144870
195 North 1950 West
Salt Lake City, Utah 84114-4870
Attention: Ground Water Protection Section
or
Electronic Reporting:
https://deq.utah.gov/water-quality/water-quality-electronic-submissions

E. Compliance Schedules. Reports of compliance or noncompliance with, or any progress reports on interim and final requirements contained in any Compliance Schedule of this permit shall be submitted no later than 14 days following each schedule date.

F. Additional Monitoring by the Permittee. If the permittee monitors any pollutant more frequently than required by this permit, using approved test procedures as specified in this permit, the results of this monitoring shall be included in the calculation and reporting of the data submitted. Such increased frequency shall also be indicated.

G. Records Contents. Records of monitoring information shall include:

1. The date, exact place, and time of sampling or measurements:
2. The individual(s) who performed the sampling or measurements;
3. The date(s) and time(s) analyses were performed;
4. The individual(s) who performed the analyses;
5. The analytical techniques or methods used; and,
6. The results of such analyses.

H. Retention of Records. The permittee shall retain records of all monitoring information, including all calibration and maintenance records and copies of all reports required by this permit, and records of all data used to complete the application for this permit, for a period of at least three years from the date of the sample, measurement, report or application. This period may be extended by request of the Director at any time.

I. Twenty-four Hour Notice of Noncompliance and Spill Reporting.

1. The permittee shall verbally report any noncompliance, or spills subject to the provisions of UCA 19-5-114, which may endanger public health or the environment as soon as possible, but no later than twenty-four (24) hours from the time the permittee first became aware of the circumstances. The report shall be made to the Utah Department of Environmental Quality 24 hour number, (801) 536-4123, or to the Division of Water Quality, Ground Water Protection Section at (801) 538-6146, during normal business hours (8:00 am - 5:00 pm Mountain Standard Time).

2. A written submission shall also be provided to the Director within five days of the time that the permittee becomes aware of the circumstances. The written submission shall contain:

   a. A description of the noncompliance and its cause;

   b. The period of noncompliance, including exact dates and times;

   c. The estimated time noncompliance is expected to continue if it has not been corrected; and,

   d. Steps taken or planned to reduce, eliminate, and prevent reoccurrence of the noncompliance.

3. Reports shall be submitted to the addresses in Part III D, Reporting of Monitoring Results.

J. Other Noncompliance Reporting. Instances of noncompliance not required to be reported within 24 hours, shall be reported at the time that monitoring reports for Part II.I are submitted.

K. Inspection and Entry. The permittee shall allow the Director, or an authorized representative, upon the presentation of credentials and other documents as may be required by law, to:

1. Enter upon the permittee's premises where a regulated facility or activity is located or conducted, or where records must be kept under the conditions of the permit;

2. Have access to and copy, at reasonable times, any records that must be kept under the conditions of this permit;

3. Inspect at reasonable times any facilities, equipment (including monitoring and control equipment), practices, or operations regulated or required under this permit; and,

4. Sample or monitor at reasonable times, for the purpose of assuring permit compliance or as otherwise authorized by the Act, any substances or parameters at any location.

IV. COMPLIANCE RESPONSIBILITIES

A. Duty to Comply. The permittee must comply with all conditions of this permit. Any permit noncompliance constitutes a violation of the Act and is grounds for enforcement action; for permit termination, revocation and re-issuance, or modification; or for denial of a permit renewal application. The permittee shall give advance notice to the Director of any planned changes in the permitted facility or activity, which may result in noncompliance with permit requirements.

B. Penalties for Violations of Permit Conditions. The Act provides that any person who violates a permit condition implementing provisions of the Act is subject to a civil penalty not to exceed $10,000 per day of such violation. Any person who willfully or negligently violates permit conditions is subject to a fine not exceeding $25,000 per day of violation. Any person convicted under Section 19-5-115(2) of the Act a second time shall be punished by a fine not exceeding $50,000 per day. Nothing in this permit shall be construed to relieve the permittee of the civil or criminal penalties for noncompliance.

C. Need to Halt or Reduce Activity not a Defense. It shall not be a defense for a permittee in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this permit.

D. Duty to Mitigate. The permittee shall take all reasonable steps to minimize or prevent any discharge in violation of this permit which has a reasonable likelihood of adversely affecting human health or the environment.

E. Proper Operation and Maintenance. The permittee shall at all times properly operate and maintain all facilities and systems of treatment and control (and related appurtenances) which are installed or used by the permittee to achieve compliance with the conditions of this permit. Proper operation and maintenance also includes adequate laboratory controls and quality assurance procedures. This provision requires the operation of back-up or auxiliary facilities or similar systems, which are installed by a permittee only when the operation is necessary to achieve compliance with the conditions of the permit.

V. GENERAL REQUIREMENTS

A. Planned Changes. The permittee shall give notice to the Director as soon as possible of any planned physical alterations or additions to the permitted facility. Notice is required when the alteration or addition could significantly change the nature of the facility or increase the quantity of pollutants discharged.

B. Anticipated Noncompliance. The permittee shall give advance notice of any planned changes in the permitted facility or activity, which may result in noncompliance with permit requirements.

C. Permit Actions. This permit may be modified, revoked and reissued, or terminated for cause. The filing of a request by the permittee for a permit modification, revocation and re-issuance, or termination, or a notification of planned changes or anticipated noncompliance, does not stay any permit condition.

D. Duty to Reapply. If the permittee wishes to continue an activity regulated by this permit after the expiration date of this permit, the permittee must apply for and obtain a permit renewal or extension. The application should be submitted at least 180 days before the expiration date of this permit.

E. Duty to Provide Information. The permittee shall furnish to the Director, within a reasonable time, any information which the Director may request to determine whether cause exists for modifying, revoking and reissuing, or terminating this permit, or to determine compliance with this permit. The permittee shall also furnish to the Director, upon request, copies of records required to be kept by this permit.

F. Other Information. When the permittee becomes aware that it failed to submit any relevant facts in a permit application, or submitted incorrect information in a permit application or any report to the Director, it shall promptly submit such facts or information.

G. Signatory Requirements. All applications, reports or information submitted to the Director shall be signed and certified.

1. All permit applications shall be signed as follows:

a. For a corporation: by a responsible corporate officer;

b. For a partnership or sole proprietorship: by a general partner or the proprietor, respectively.

c. For a municipality, State, Federal, or other public agency: by either a principal executive officer or ranking elected official.

2. All reports required by the permit and other information requested by the Director shall be signed by a person described above or by a duly authorized representative of that person. A person is a duly authorized representative only if:

a. The authorization is made in writing by a person described above and submitted to the Director, and,

b. The authorization specified either an individual or a position having responsibility for the overall operation of the regulated facility or activity, such as the position of plant manager, operator of a well or a well field, superintendent, position of equivalent responsibility, or an individual or position having overall responsibility for environmental matters for the company. (A duly authorized representative may thus be either a named individual or any individual occupying a named position.)

3. Changes to Authorization. If an authorization under Part V.G.2. is no longer accurate because a different individual or position has responsibility for the overall operation of the facility, a new authorization satisfying the requirements of Part V.G.2. must be submitted to the Director prior to or together with any reports, information, or applications to be signed by an authorized representative.

4. Certification. Any person signing a document under this section shall make the following certification:

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

H. Penalties for Falsification of Reports. The Act provides that any person who knowingly makes any false statement, representation, or certification in any record or

other document submitted or required to be maintained under this permit, including monitoring reports or reports of compliance or noncompliance shall, upon conviction be punished by a fine of not more than $10,000 per violation, or by imprisonment for not more than six months per violation, or by both.

I. Availability of Reports. Except for data determined to be confidential by the permittee, all reports prepared in accordance with the terms of this permit shall be available for public inspection at the offices of the Director. As required by the Act, permit applications, permits, effluent data, and ground water quality data shall not be considered confidential.

J. Property Rights. The issuance of this permit does not convey any property rights of any sort, or any exclusive privileges, nor does it authorize any injury to private property or any invasion of personal rights, nor any infringement of federal, state or local laws or regulations.

K. Severability. The provisions of this permit are severable, and if any provision of this permit, or the application of any provision of this permit to any circumstance, is held invalid, the application of such provision to other circumstances, and the remainder of this permit, shall not be affected thereby.

L. Transfers. This permit may be automatically transferred to a new permittee if:

1. The current permittee notifies the Director at least 30 days in advance of the proposed transfer date;

2. The notice includes a written agreement between the existing and new permittee containing a specific date for transfer of permit responsibility, coverage, and liability between them; and,

3. The Director does not notify the existing permittee and the proposed new permittee of his or her intent to modify, or revoke and reissue the permit. If this notice is not received, the transfer is effective on the date specified in the agreement mentioned in paragraph 2 above.

M. State Laws. Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the permittee from any responsibilities, liabilities, penalties established pursuant to any applicable state law or regulation under authority preserved by Section 19-5-117 of the Act.

N. Reopener Provision. This permit may be reopened and modified (following proper administrative procedures) to include the appropriate limitations and compliance schedule, if necessary, if one or more of the following events occurs:

1. If new ground water standards are adopted by the Board, the permit may be reopened and modified to extend the terms of the permit or to include pollutants covered by new standards. The permittee may apply for a variance under the conditions outlined in R317-6-6.4(D)

2. If alternate compliance mechanisms are required

3. If water quality of the facility is significantly worse than represented in the original permit application.

Table 1: Permit Limits for Dry Fork and Bingham Canyon Compliance Wells for UGW350010

Well ID	Screen Lithology	Sampling Frequency	Northing (ft)	Easting (ft)	pH	TDS mg/L	SO4 mg/L	Diss. Cd mg/L	Diss. Cu mg/L	Diss. Zn mg/L
BRG287	Bedrock	Semi-annually	14559	16105	6.19-8.5	3283	912	0.001	0.325	1.25
BRG921	Bedrock	Semi-annually	13190	16540	6.5-8.5	2291	896	0.001	0.325	1.25
BRG999	Bedrock	Semi-annually	14479	17043	6.5-8.5	1614	580	0.001	0.325	1.25
COG2806A	Bedrock	Semi-annually	17605	8389	6.5-8.5	495	43	0.001	0.325	1.25
COG2806B	Bedrock	Semi-annually	17605	8389	6.5-8.5	462	41	0.001	0.325	1.25
ECG1100A	Bedrock	Semi-annually	16058	12362	6.5-8.5	4148	2581	0.003	0.650	3.01
ECG1100B	Bedrock	Semi-annually	16058	12362	6.5-8.5	397	85	0.001	0.325	1.25
ECG1186	Alluvium	Quarterly	9646	18578	6.5-8.5	2002	875	0.001	0.325	1.25
ECG1187	Alluvium	Quarterly	7539	18457	6.5-8.5	1589	169	0.001	0.325	1.25
ECG1188	Alluvium	Quarterly	16105	22493	6.5-8.5	4181	1975	0.001	0.325	1.25
ECG1189	Alluvium	Quarterly	13054	19989	6.5-8.5	780	22	0.001	0.325	1.25
ECG1190	Alluvium	Quarterly	11715	19026	6.5-8.5	1092	71	0.001	0.325	1.25
ECG299	Bedrock	Semi-annually	13807	17474	4.36-8.5	4670	3230	0.020	2.51	2.78
ECG2866A	Bedrock	Quarterly	16309	11767	TBD	TBD	TBD	TBD	TBD	TBD
ECG2866B	Bedrock	Quarterly	16309	11767	TBD	TBD	TBD	TBD	TBD	TBD
ECG901	Bedrock	Semi-annually	13734	17716	6.5-8.5	1634	173	0.001	0.33	1.25
ECG902	Bedrock	Semi-annually	12180	17214	6.5-8.5	1311	332	0.001	0.325	1.25
ECG905	Bedrock	Semi-annually	10839	16434	6.06-8.5	2614	1477	0.001	0.325	1.25
ECG906	Bedrock	Semi-annually	9121	17481	6.5-8.5	4941	2480	0.003	0.325	1.25
ECG907	Bedrock	Semi-annually	7087	17875	6.5-8.5	2004	278	0.001	0.325	1.25
ECG916	Bedrock	Semi-annually	9692	15269	6.5-8.5	857	249	0.001	0.325	1.25
ECG917	Alluvium	Quarterly	6289	18385	6.5-8.5	1467	197	0.001	0.325	1.25
ECG924	Bedrock	Quarterly	661	16870	6.29-8.5	5850	2994	0.004	0.325	1.25
ECG925	Bedrock	Quarterly	1343	17470	6.39-8.5	3498	1365	0.001	0.325	1.25
ECG928	Bedrock	Semi-annually	5126	18358	6.5-8.5	930	76	0.001	0.325	1.25
ECG931	Bedrock	Semi-annually	-708	16395	6.39-8.5	5914	650	0.005	0.325	1.25
ECG932	Bedrock	Semi-annually	-2325	14914	6.5-8.5	816	170	0.001	0.325	1.25
ECG934	Bedrock	Semi-annually	-4704	14177	6.5-8.5	1131	423	0.001	0.325	1.25
ECG935	Bedrock	Semi-annually	-6210	13555	6.5-8.5	4572	2661	0.001	0.325	1.25
ECG936	Bedrock	Semi-annually	-6303	12389	6.35-8.5	5118	3071	0.003	0.325	1.25
ECG937	Bedrock	Semi-annually	-8174	11378	6.5-8.5	1345	461	0.001	0.325	1.25
ECG938	Bedrock	Semi-annually	-8909	9785	6.5-8.5	1016	261	0.001	0.325	1.25
LTG1191	Alluvium	Quarterly	3749	20548	6.15-8.5	5888	3590	0.087	0.325	22.38
K93	Bedrock	Semi-annually	16021	13562	6.5-8.5	480	39	0.050	0.100	0.06
VWP220	Bedrock	Semi-annually	10999	16234	6.5-8.5	2352	1050	0.005	0.325	1.25
VWP225	Bedrock	Semi-annually	11920	16886	6.5-8.5	1107	344	0.001	0.325	1.25
VWP228	Alluvium	Quarterly	-1491	13963	5.59-8.5	10370	7076	0.057	0.376	4.17
VWP244A	Alluvium	Quarterly	2266	16139	3.39-8.5	28567	21279	0.643	37.4	40.9
VWP244B	Bedrock	Semi-annually	2278	16124	6.34-8.5	6959	2389	0.009	0.650	2.50
VWP244C	Bedrock	Semi-annually	2285	16110	6.5-8.5	3876	1235	0.008	0.325	1.25
VWP248A	Alluvium	Quarterly	15485	17875	3.52-8.5	12329	8980	0.219	151.3	34.5
VWP248B	Bedrock	Semi-annually	15491	17849	3.90-8.5	5888	4089	0.172	22.1	17.7
ECG2859	Bedrock	Semi-annually	3485	17125	5.62-8.5	4945	2612	0.001	0.325	1.25

NOTES:
All units are mg/L; pH standard units
1) Compliance limits are based on 1.25 times the background concentration for TDS for class II and III ground water
2) For many wells cadmium, copper and zinc were predominantly non detects, compliance limits determined from the ground water quality standard.
3) Where the background concentrations is <detection, compliance limits are based on 0.25 times the ground water quality standard for Class II ground water and 0.50 times the ground water quality standard for Class III ground water for cadmium, copper and zinc
4) If background value exceeds the ground water quality standard; therefore, the Protection Level equals the background value
5) The Compliance Limits for IV ground water are the higher of the ground water quality standard, the mean *1.25 or the mean + 2 std. dev.
6) There is not a ground water quality standard for SO4
7) Compliance limits for sulfate were calculated as the higher of the mean+2 std. dev. or 1.25 times the mean
8) Range of pH values for Compliance Limits are based on the higher and lower limit of 6.5-8.5 and/or mean + and - 2 std. dev.
9) Coordinate system in KUCC True North southend map drawn in 1927 State Plane Utah central Zone
10) Limits were set using all available data for each individual well through 2008
11) If data shows an upward trend for TDS over past five years, the compliance limit as calculated in 2008 has been maintained

Table 2: Permit Conditions for Dry Fork Extraction Wells

Well ID & Name	General Location	Permit Condition
Up-gradient (Clean Water Capture)		
COP2701 (Mid-Valley)	300 ft. up-gradient of Dry Fork dump	- Keep surrounding alluvium substantially dewatered - Applies to both wells
COG2865 [2] (Picnic Flats)	1500 ft. up-gradient of Dry Fork dump	
Down-gradient (Alluvial Extraction)		
ECG2787 (Bingham Canyon Alluvial Well)	900 ft. down-gradient of Bingham Canyon dump	- Target pumping rate is 100 acre-feet/year based on a 3 year rolling average[1] - Pumping to continue until sulfate concentration <5000 mg/L - If sulfate concentration >5000 mg/L resume pumping
VWK83 (Curtis Springs)	3200 ft. down-gradient of Bingham Canyon dump	- Target pumping rate is 100 acre-feet/year based on a 3 year rolling average[1] - If alluvial well water level <92 feet then decrease pumping rate to match inflow - Pumping rate may be decreased or stopped to match inflow if it is determined that up-gradient alluvial pumping well(s) are diminishing available alluvial water - Pumping to continue until sulfate concentration <5000 mg/L - If sulfate concentration >5000 mg/L resume pumping
ECG1185 (Copperton Channel)	3500 ft. down-gradient of Bingham Canyon dump	- Pump alluvium at a rate consistent with available inflow of contaminated water - Pumping may cease if the quantity of alluvial water is less than the well can sustain
ECP2562 (Bingham Creek COW)	5600 ft. down-gradient of Bingham Canyon dump	- None specific to Dry Fork plume

Note:

[1] Target pumping rate is 100 acres-feet per year based upon a three year rolling average for both K83 and ECG2787 combined. The pumping rates for ECG2787 may influence available water that can be extracted from the alluvium by K83.

[2] COG2865 is a replacement for well COG1172 that was abandoned.

Table 3: Informational Wells for Permit #UGW350010

Well ID	Site Description	Screen Lithology	Sampling Frequency	Northing (ft)	Easting (ft)
ECG2787	Extraction well at the Mouth of Bingham Canyon	Alluvium	Annually	16133	12382
ECG1185	Copperton Channel Extraction Well	Alluvium	Annually	16909	14862
ECG1184	Monitor well at the Mouth of Butterfield Canyon	Alluvium	Annually	-1537	17816
ECG933	Saints Rest Drainage	Bedrock	Annually	-2975	14227
COP2701 (Mid Valley)	Upper Dry Fork Extraction Well	Alluvium	Annually	20135	2199
COG1172 (Picnic Flats)	Second Upper Dry Fork Extraction Well	Bedrock	Annually	20926	952
COG2865 (Replacement for COG1172)	Second Upper Dry Fork Extraction Well	Bedrock	Annually	20580	200
COG995 A&B	Monitor well at the Mouth of Bingham Canyon	Bedrock	Semi-Annually	16814	11056
ECG1106A	Monitor well at the Mouth of Bingham Canyon	Bedrock	Semi-Annually	16554	12240
ECG2853 A&B	Monitor well through toe of waste rock Bingham Canyon	Bedrock	Semi-Annually	15393	10177
K83 (Curtis Springs)	Extraction well at the mouth of Bingham Canyon	Alluvium	Annually	16031	14582

Note

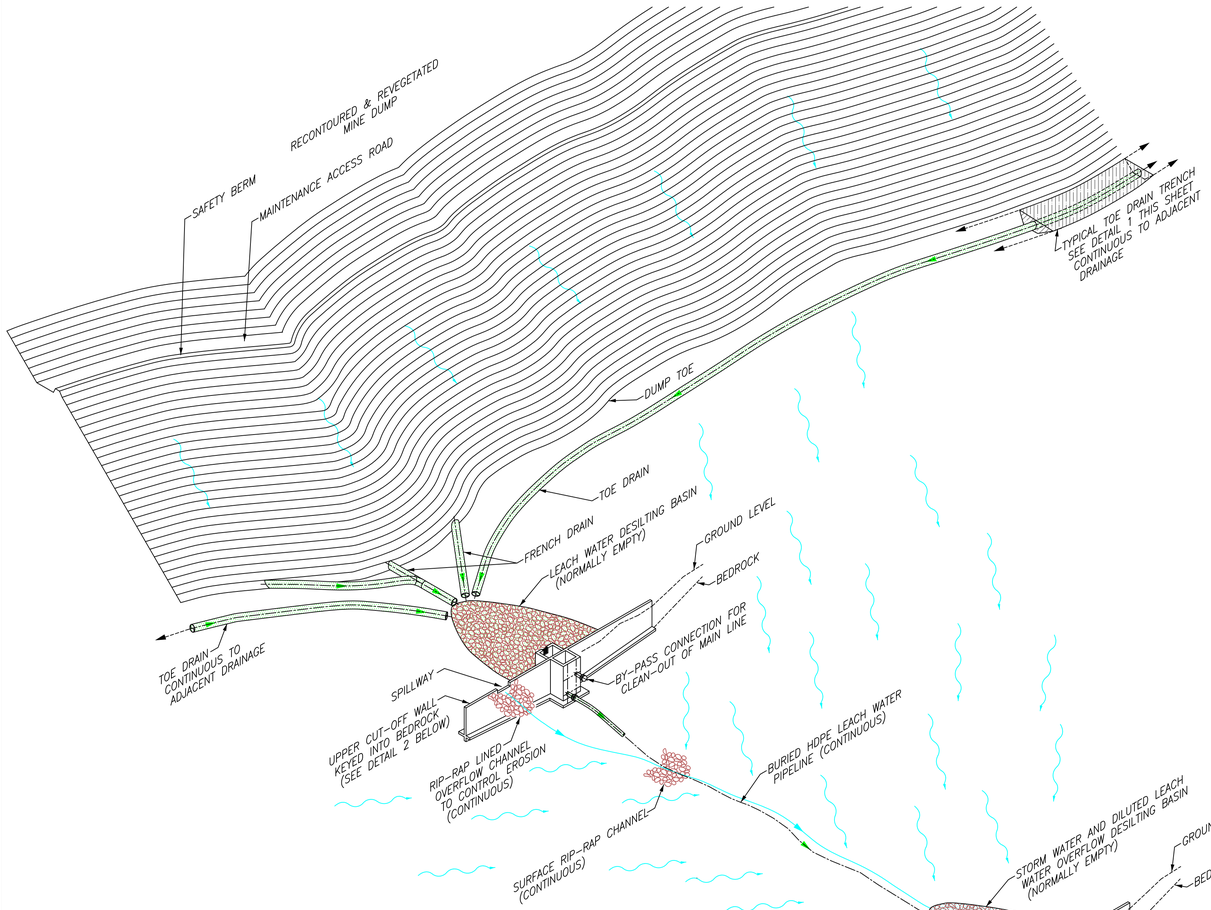
1) Coordinate system in KUCC True North southend map drawn in 1927 State Plane Utah Central Zone

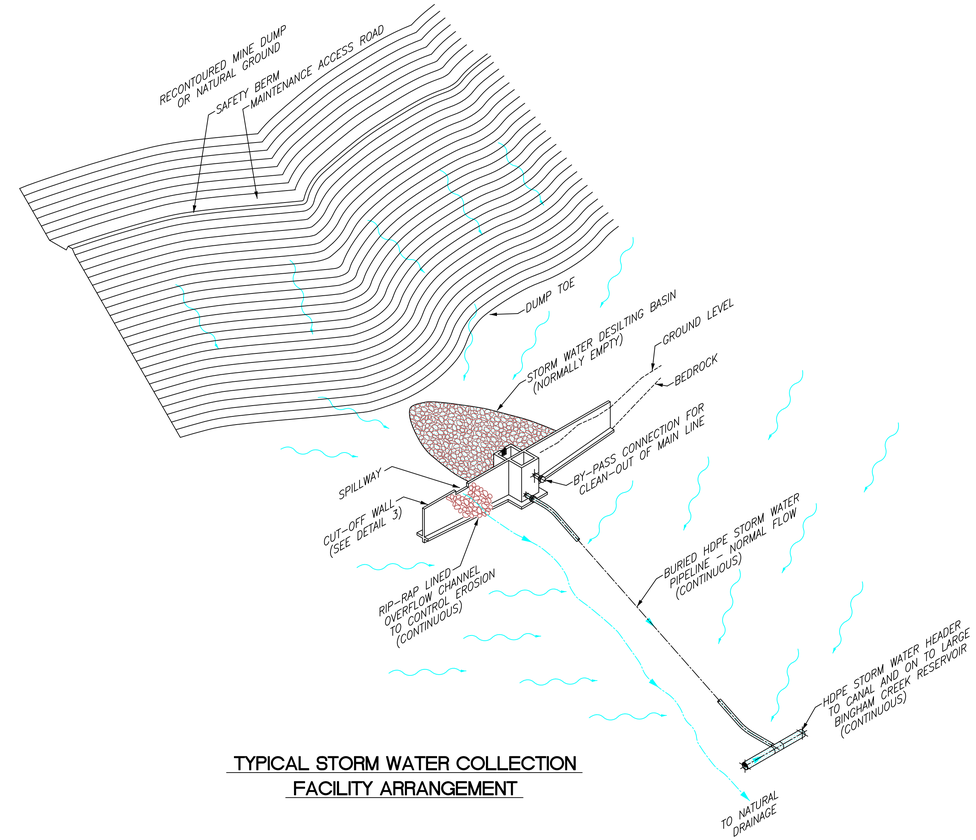
Table 4: Groundwater Discharge Permit #UGW350010 Sample Point Coordinates

	KUC True North		Lat-Long DMS		State Plane	
Sample ID	**Northing (ft)**	**Easting (ft)**	**Lattitude**	**Longitude**	**SP83 North (ft)**	**SP83 East (ft)**
ECP2562	15784	16905	40° 33' 37.97"	112° 5' 57.05"	7,373,491.80	1,473,936.80
ECP2682	15145	13910	40° 33' 31.68"	112° 6' 35.86"	7,372,875.60	1,470,937.10
MDP2679	14467	13613	40° 33' 24.98"	112° 6' 39.71"	7,372,199.60	1,470,635.40
ECP2709	12271	16656	40° 33' 3.26"	12° 6' 0.31" W	7,369,981.00	1,473,661.60
ECP2674	11022	16182	40° 32' 50.92"	112° 6' 6.45"	7,368,735.40	1,473,179.30
ECP2670	9391	15692	40° 32' 34.81"	112° 6' 12.82"	7,367,108.50	1,472,676.60
ECP2668	9189	15494	40° 32' 32.81"	112° 6' 15.38"	7,366,907.40	1,472,477.60
ECP2662	8733	15468	40° 32' 28.31"	112° 6' 15.72"	7,366,452.20	1,472,448.20
ECP1654	7792	16070	40° 32' 19.01"	112° 6' 7.93"	7,365,507.10	1,473,043.30
ECP2651	7084	16131	40° 32' 12.01"	112° 6' 7.15"	7,364,798.30	1,473,098.80
ECP2648	5204	16175	40° 31' 53.43"	112° 6' 6.60"	7,362,917.80	1,473,128.60
ECP2629	4127	16110	40° 31' 42.79"	112° 6' 7.45"	7,361,841.50	1,473,055.70
ECP2627	3223	15792	40° 31' 33.86"	112° 6' 11.57"	7,360,940.00	1,472,731.50
ECP2624	2349	15760	40° 31' 25.22"	112° 6' 12.00"	7,360,065.90	1,472,692.40
ECP2618	915	15607	40° 31' 11.05"	112° 6' 13.99"	7,358,633.00	1,472,529.00
ECP2616	-1302	12460	40° 30' 49.17"	112° 6' 54.75"	7,356,440.30	1,469,366.10
ECP2614	-2797	13156	40° 30' 34.39"	112° 6' 45.75"	7,354,939.90	1,470,050.90
ECP2612	-4318	13304	40° 30' 19.36"	112° 6' 43.84"	7,353,418.00	1,470,188.00
ECP2606	-5637	13598	40° 30' 6.33"	12° 6' 40.05"	7,352,097.40	1,470,471.80
ECP2605	-7876	9515	40° 29' 44.22"	112° 7' 32.91"	7,349,888.20	1,466,372.90
ECP2603	-8670	8481	40° 29' 36.38"	112° 7' 46.30"	7,349,102.10	1,465,332.90
ECP2601	-9483	6350	40° 29' 28.35"	112° 8' 13.88"	7,348,304.60	1,463,196.40
ECP2664	8990	16938	40° 32' 30.84"	112° 5' 56.68"	7,366,698.40	1,473,919.90
UPD010	-10026	10313	40° 29' 22.97"	112° 7' 22.59"	7,347,732.30	1,467,155.10
BMP2712	-1255	-2563	40° 30' 49.66"	112° 10' 9.26"	7,356,597.80	1,454,343.90
ECP2689	13680	7595	40° 33' 17.23"	112° 7' 57.68"	7,371,457.20	1,464,611.80
ECP2631	3569	17231	40° 31' 37.27"	112° 5' 52.94"	7,361,275.40	1,474,172.40
ECP2710	15715	14960	40° 33' 37.30"	112° 6' 22.25"	7,373,437.20	1,471,991.40
LWP2632	3736	17773	40° 31' 38.92"	112° 5' 45.92"	7,361,438.80	1,474,715.50
BRP292	14146	16561	40° 33' 21.79"	112° 6' 1.52"	7,371,856.80	1,473,580.80
BRP1476	13770	15740	40° 33' 18.08"	112° 6' 12.16"	7,371,486.90	1,472,757.10
COG1204A	16745	6868	40° 33' 47.52"	112° 8' 7.09"	7,374,527.50	1,463,907.20
COG1204B	16745	6868	40° 33' 47.52"	112° 8' 7.09"	7,374,527.50	1,463,907.20
ECG1100A	16058	12362	40° 33' 40.71"	112° 6' 55.91"	7,373,800.00	1,469,395.90
ECG1100B	16058	12362	40° 33' 40.71"	112° 6' 55.91"	7,373,800.00	1,469,395.90
K93	16005	13576	40° 33' 40.18"	112° 6' 40.18"	7,373,738.00	1,470,609.60
ECG2866A	16309	11767	--	--	7,374,053.20	1,468,806.50
ECG2866B	16309	11767	--	--	7,374,053.20	1,468,806.50
COG2806A	17605	8389	40° 33' 56.04"	112° 7' 47.36"	7,375,360.97	1,465,220.63
COG2806B	17605	8389	40° 33' 56.04"	112° 7' 47.36"	7,375,360.97	1,465,220.63
ECG1203	16124	12333	40° 33' 41.36"	112° 6' 56.28"	7,373,865.90	1,469,367.80
ECG1185	16909	14862	40° 33' 49.10"	112° 6' 23.51"	7,374,631.90	1,471,902.30
ECG1184	-1537	17816	40° 30' 46.81"	112° 5' 45.41"	7,356,165.30	1,474,719.80
ECG933	-2975	14227	40° 30' 32.62"	112° 6' 31.89"	7,354,753.50	1,471,120.20
COP2701	20224	2290	40° 34' 21.90"	112° 9' 6.40"	7,378,039.60	1,459,355.30
COG2865	20580	200	40.47321837	112.1574316	--	--
VWK83	16031	14582	40° 33' 40.43"	112° 6' 27.14"	7,373,756.50	1,471,616.20
BRG287	14559	16105	40° 33' 25.87"	112° 6' 7.42"	7,372,272.70	1,473,128.20
BRG921	13190	16540	40° 33' 12.34"	112° 6' 1.80"	7,370,900.60	1,473,552.80
BRG999	14479	17043	40° 33' 25.08"	112° 5' 55.27"	7,372,186.50	1,474,065.50
ECG1186	9646	18578	40° 32' 37.31"	112° 5' 35.43"	7,367,342.20	1,475,564.70
ECG1187	7539	18457	40° 32' 16.49"	112° 5' 37.02"	7,365,236.10	1,475,428.00
ECG1188	16105	22493	40° 33' 41.10"	112° 4' 44.64"	7,373,771.80	1,479,527.50

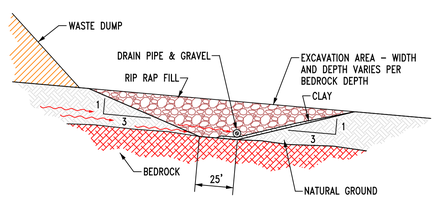
Table 5: Groundwater Discharge Permit #UGW350010 Sample Point Coordinates

	KUC True North		Lat-Long DMS		Utah State Plane	
Sample ID	**Northing (ft)**	**Easting (ft)**	**Lattitude**	**Longitude**	**SP83 North (ft)**	**SP83 East (ft)**
ECG1189	13054	19989	40° 33' 10.97"	112° 5' 17.12"	7,370,739.10	1,477,000.60
ECG1190	11715	19026	40° 32' 57.75"	112° 5' 29.61"	7,369,407.60	1,476,027.70
ECG2859	3485	17125	40.526835	112.098331	--	--
ECG299	13807	17474	40° 33' 18.43"	112° 5' 49.69"	7,371,510.70	1,474,491.70
ECG901	13734	17716	40.554962	112.096166	--	--
ECG902	12180	17214	40° 33' 2.36"	12° 5' 53.08"	7,369,886.20	1,474,219.10
ECG905	10839	16434	40° 32' 49.11"	112° 6' 3.19"	7,368,550.60	1,473,429.70
ECG907	7087	17875	40° 32' 12.03"	112° 5' 44.56"	7,364,788.60	1,474,842.90
P225	11920	16886	40° 32' 59.79"	112° 5' 57.33"	7,369,628.30	1,473,889.30
ECG916	9692	15269	40° 32' 37.78"	112° 6' 18.30"	7,367,411.90	1,472,255.50
ECG917	6289	18385	40° 32' 4.14"	12° 5' 37.96"	7,363,986.80	1,475,347.10
ECG928	5126	18358	40° 31' 52.86"	112° 5' 38.40"	7,362,831.63	1,475,302.28
ECG924	661	16870	40° 31' 8.54"	12° 5' 57.63"	7,358,370.50	1,473,790.70
ECG925	1343	17470	40° 31' 15.27"	112° 5' 49.86"	7,359,047.50	1,474,395.30
ECG931	-708	16395	40° 30' 55.01"	112° 6' 3.80"	7,357,004.60	1,473,305.00
ECG932	-2325	14914	40° 30' 39.04"	112° 6' 22.99"	7,355,398.50	1,471,812.00
ECG934	-4704	14177	40° 30' 15.54"	112° 6' 32.55"	7,353,025.40	1,471,057.50
ECG935	-6210	13555	40° 30' 0.66"	12° 6' 40.61"	7,351,523.90	1,470,424.60
ECG936	-6303	12389	40° 29' 59.75"	112° 6' 55.70"	7,351,439.80	1,469,258.30
ECG937	-8174	11378	40° 29' 41.27"	112° 7' 8.80"	7,349,576.80	1,468,233.40
ECG938	-8909	9785	40° 29' 34.01"	112° 7' 29.42"	7,348,853.20	1,466,635.30
LTG1191	3749	20548	40° 31' 39.02"	112° 5' 9.98"	7,361,430.60	1,477,490.80
P220	10999	16234	40° 32' 50.69"	112° 6' 5.78"	7,368,711.80	1,473,230.90
P228	-1491	13963	40° 30' 47.29"	112° 6' 35.29"	7,356,239.80	1,470,867.70
P244A	2266	16139	40° 31' 24.40"	112° 6' 7.09"	7,359,980.40	1,473,071.00
P244B	2278	16124	40° 31' 24.52"	112° 6' 7.28"	7,359,992.60	1,473,056.40
P244C	2285	16110	40° 31' 24.59"	112° 6' 7.46"	7,359,999.80	1,473,042.50
P248A	15485	17875	40° 33' 35.01"	112° 5' 44.48"	7,373,185.80	1,474,905.00
P248B	15491	17849	40° 33' 35.07"	112° 5' 44.82"	7,373,192.10	1,474,878.80
P272	3964	16571	40° 31' 41.18"	112° 6' 1.48"	7,361,675.50	1,473,515.60
ECP2786	-7263	5097	40° 29' 50.29"	112° 8' 30.10"	7,350,533.80	1,461,959.20
ECS2715	-7870	9688	40° 29' 44.28"	112° 7' 30.67"	7,349,893.10	1,466,546.00
LWS2717	3813	18837	40° 31' 39.67"	112° 5' 32.14"	7,361,507.60	1,475,780.10
ECS2718	6859	16099	40° 32' 9.79"	112° 6' 7.57"	7,364,573.90	1,473,064.80
ECG2787	16165	12323	40° 33' 41.76"	112° 6' 56.41"	7,373,906.50	1,469,358.10

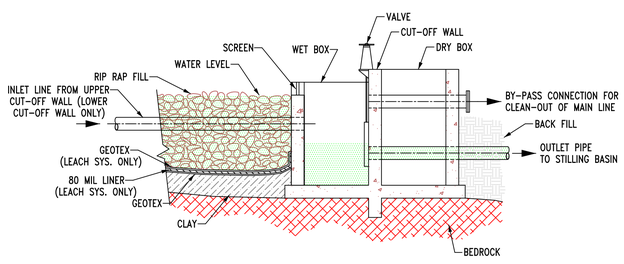




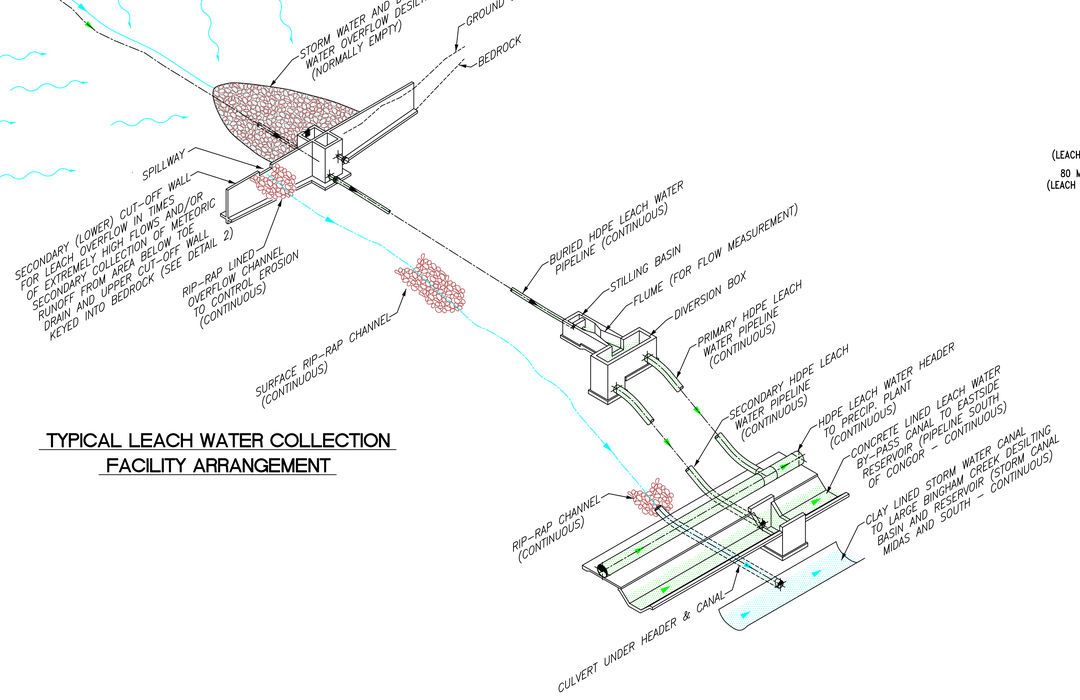
TYPICAL STORM WATER COLLECTION FACILITY ARRANGEMENT



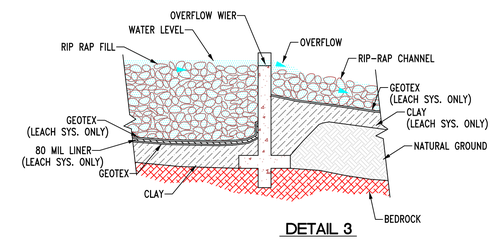
DETAIL 1
TYPICAL TOE DRAIN



DETAIL 2
TYP. CUT-OFF WALL CROSS SECTION



TYPICAL LEACH WATER COLLECTION FACILITY ARRANGEMENT



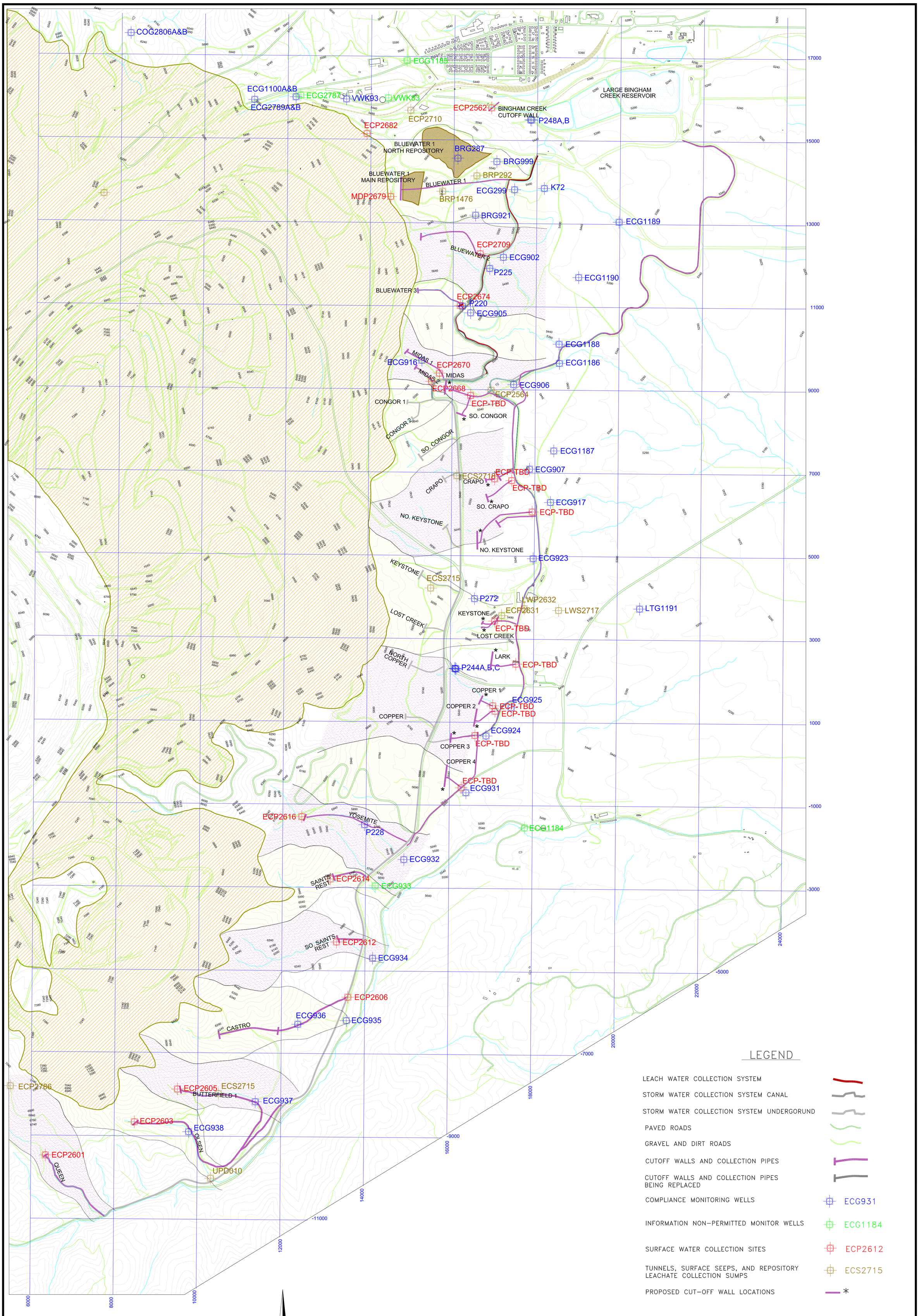
DETAIL 3
CROSS SECTION AT OVERFLOW WIER
FOR FLOWS IN EXCESS OF 10YR 24HR EVENT

LEGEND

- LEACH WATER
- STORM WATER
- COLLECTED LEACH WATER FLOW
- COLLECTED STORM WATER FLOW
- ALLUVIAL FLOW
- STORM AND SNOWMELT RUNOFF FLOW

PLANT PROJECTS GROUP			KENNECOTT UTAH COPPER
SCALE:	NONE	DATE	EASTSIDE COLLECTION SYSTEM GROUND WATER DISCHARGE PERMIT TYPICAL DRAINAGE FACILITY FOR LEACH AND STORM WATER COLLECTION
DESIGNED BY	RKC	8/18/93	
DRAWN BY	RKC	8/19/93	
CHECKED BY	JFC	8/25/93	
PROJECT ENGINEER			
PROJECT MANAGER			
Job No. ---		Dwg. No.	451-T-9080 REV 0

N:\451\45119080.dwg 07/25/96 07:43 kccampb



LEGEND

LEACH WATER COLLECTION SYSTEM	
STORM WATER COLLECTION SYSTEM CANAL	
STORM WATER COLLECTION SYSTEM UNDERGORUND	
PAVED ROADS	
GRAVEL AND DIRT ROADS	
CUTOFF WALLS AND COLLECTION PIPES	
CUTOFF WALLS AND COLLECTION PIPES BEING REPLACED	
COMPLIANCE MONITORING WELLS	ECG931
INFORMATION NON-PERMITTED MONITOR WELLS	ECG1184
SURFACE WATER COLLECTION SITES	ECP2612
TUNNELS, SURFACE SEEPS, AND REPOSITORY LEACHATE COLLECTION SUMPS	ECS2715
PROPOSED CUT-OFF WALL LOCATIONS	*

N

GRAPHIC SCALE

1000 0 500 1000 2000

(IN FEET)

Notes:
Topography from Bingham Canyon Mine flyover 2009 and Bingham Canyon Mine flyover 2000. (Aerographics, Inc.)

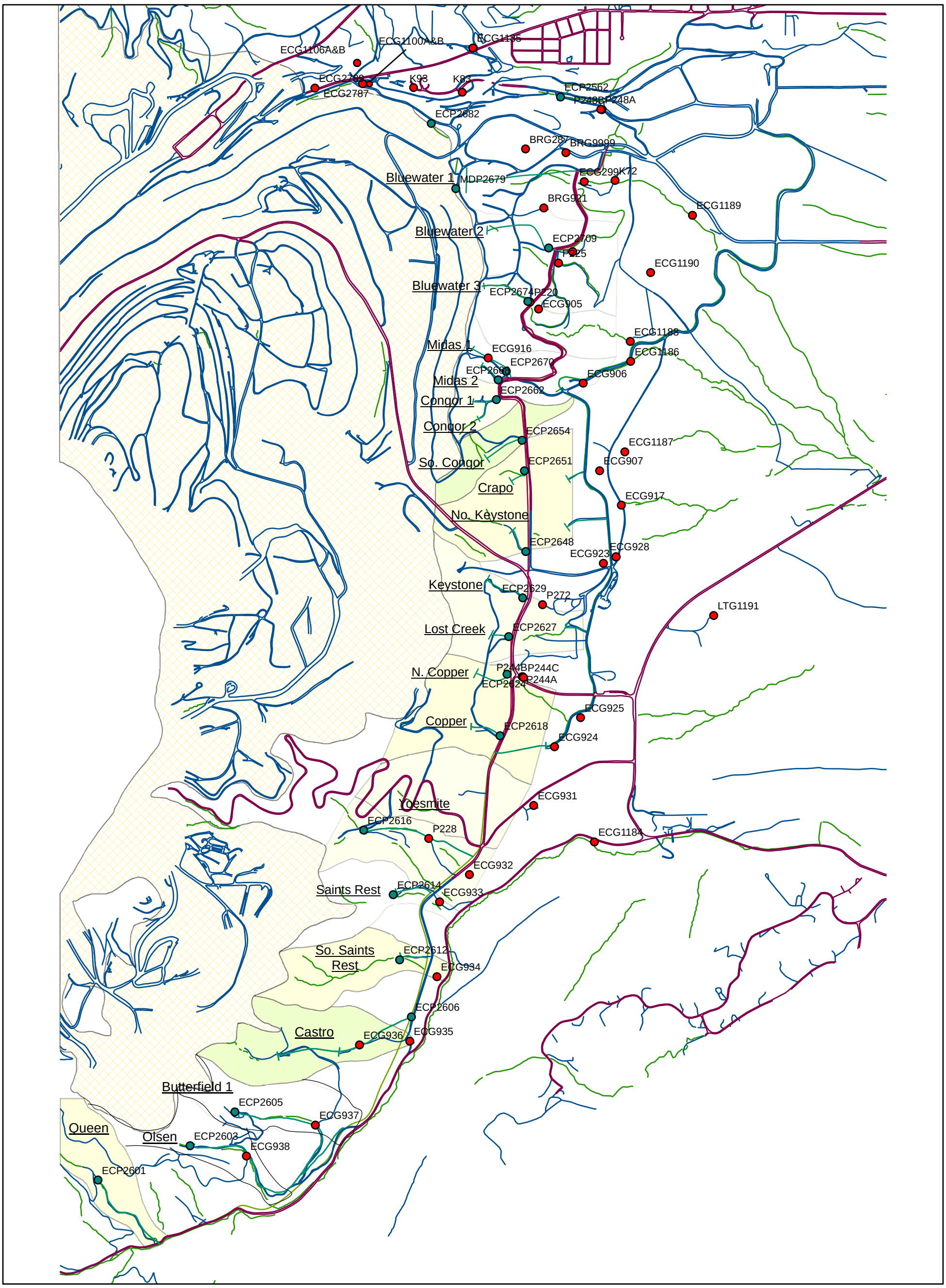
Coordinate system shown in KUCC True North, map drawn in Utah State Plane NAD27, central zone.

ENVIRONMENTAL RESTORATION GROUP		
SCALE: 1"=1000'		DATE
DESIGNED BY	VP	10/18/04
DRAWN BY	JI	5/11/10
CHECKED BY	ZK	5/2010
PROJECT ENGINEER		
PROJECT MANAGER		

KENNECOTT
UTAH COPPER

BINGHAM CANYON MINE AND WATER COLLECTION SYSTEM GROUNDWATER DISCHARGE PERMIT 2012 EWRE MODIFICATION

Job No. --- Dwg. No. 454-T-0119 REV 1 REV DATE 10/25/2012



Legend

ECG938 Monitoring Well

ECP2601 Surface Water Collection Site

KUC Road

Cutoff Walls and Collection Pipes

Storm Water Collection

Paved Roads

Drainages

Waste Rock

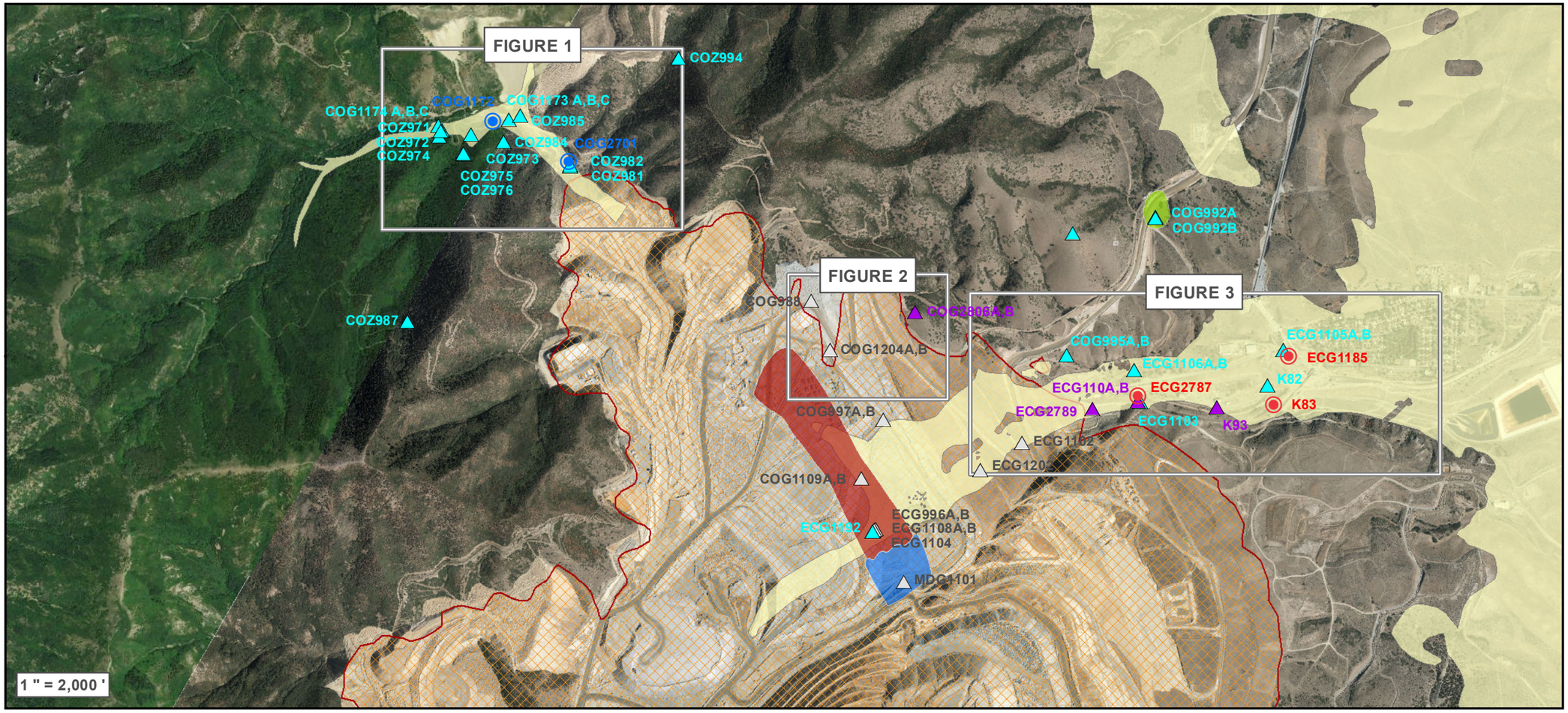
N
W E
S

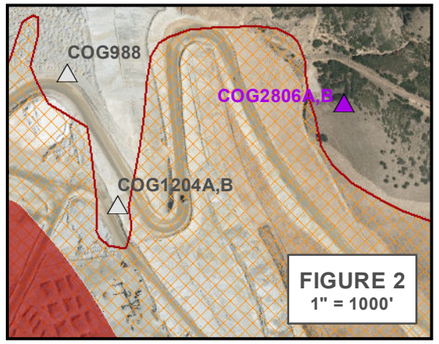
Rio Tinto

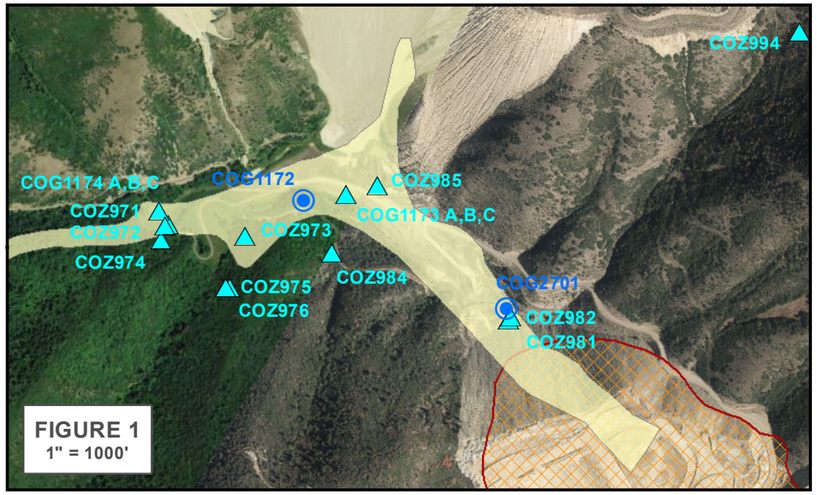
Bingham Canyon Mine and Water Collection System Groundwater Discharge Permit #UGW350010

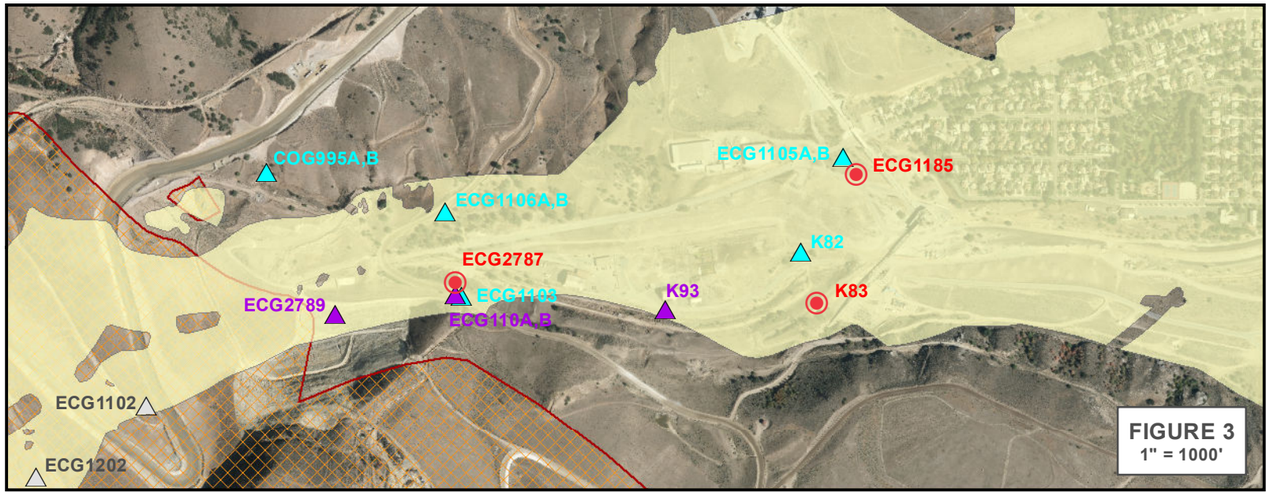
Drawing Number: 454-T-0118REV

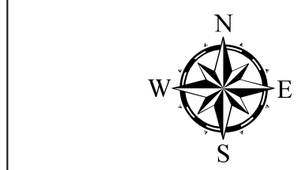
Date: September 15, 2014
Drawn By:
Project Mgr:
Rev:











LEGEND

- UPGRADIENT CLEAN WATER INTERCEPTOR WELL
- ALLUVIAL EXTRACTION WELL
- COMPLIANCE MONITORING WELL
- MONITORING WELL
- ABANDONED / BURIED WELL
- ALLUVIUM
- AREA OVERLAIN WITH WASTE ROCK
- GROUNDWATER IN BEDROCK WITH > 1000 SO4
- PERCHED WATER WITH > 500 SO4
- GROUNDWATER IN BEDROCK WITH 500-1000 SO4

Rio Tinto
Kennecott Copper

DATE: 1/23/2015 1:03:44 PM
CREATED BY: TERESA.COCKAYNE
PATH: \\USSLCAP117\GIS_PROJECTS\2015\20150123_DRYFORK_MANAGEMENTPLAN\DRYFORK_MANAGEMENTPLAN_FIG2.MXD
COORDINATE SYSTEM: NAD 1983 STATEPLANE UTAH CENTRAL FIPS 4302 FEET

FIGURE 2
DRY FORK MANAGEMENT PLAN
GROUNDWATER PERMIT

Appendix A

UGW#350010

KENNECOTT BINGHAM CANYON MINE AND WATER COLLECTION SYSTEM COMPLIANCE MONITORING PLAN

MONITORING REQUIREMENTS AND PLAN CONTENT

The Groundwater Quality Protection Regulations require a Compliance Monitoring Plan to demonstrate compliance with groundwater protection limits for the Bingham Canyon Mine and Water Collection System (WCS). The plan is required to evaluate groundwater flow directions, and water quality at the site and at compliance points. Many elements of the plan, particularly those dealing with site hydrogeology, hydro geochemistry, and background chemistry have been previously discussed in Sections 3 and 4 of the Water Collection Monitoring Network Groundwater Discharge Permit Application and the Water Collection Monitoring Network Groundwater Discharge Permit Application Addendum submitted to the Division of Water Quality (DWQ) in 2013. Kennecott Utah Copper LLC (KENNECOTT) has an existing general or operational, groundwater monitoring plan that is described in the currently approved Groundwater Characterization and Monitoring Plan (GCMP).

This Compliance Monitoring Plan for the Bingham Canyon Mine/Water Collection System includes:

- Monitoring strategy including criteria used in the selection of monitoring point locations and methods.
- Description of general monitoring program.
- Description of the compliance monitoring program, including compliance points monitoring parameters and standards.

Implementation of this plan will result in monitoring of the principal aquifer of the southwestern Jordan Valley to identify changes in conditions and to establish compliance criteria that will trigger response or investigative actions, should significant changes in ground water be identified.

MONITORING STRATEGY

Best Available Technology (BAT) Inspection, Maintenance, and Monitoring as well as groundwater monitoring have been selected as the compliance monitoring methods for the Bingham Canyon Mine and Water Collection System.

Appendix A

UGW#350010

BAT MAINTENANCE, INSPECTION, AND MONITORING PLAN

The BAT Monitoring Plan is intended to provide appropriate information to ensure that Kennecott meets the monitoring, compliance, and reporting requirements set by the DWQ for the Bingham Canyon Mine/ Water Collection System Ground Water Discharge Permit (GWDP). The purpose of these actions is to maintain the protection of groundwater provided by the WCS, and to reduce the mobility of potentially hazardous substances by preventing discharges to groundwater. The goal of this plan is to ensure that the Bingham Canyon Mine and WCS which include all of the structures contained within it for collecting and monitoring contact and waste rock contact water (WRCW) are maintained in working condition. Actions that will be conducted to ensure that the system is functional, compliant with operational and regulatory criteria, and meet BAT criteria include:

- Inspect and maintain sediment control structures;
- Inspecting and maintaining as necessary the de-silting/sedimentation basins within each drainage to ensure they are functioning as designed;
- Removing de-silting/sedimentation basin sediments as necessary to maintain proper function;
- Monitoring erosion controls and instituting new controls when necessary;
- Maintaining ditches, pipelines, flumes, and flow monitoring equipment;
- Monitoring flows and water quality parameters for each of the drainages; and
- Summarizing data generated from within the collection systems and items relevant to compliance issues.

Preventive maintenance, as governed by this plan, includes employee training, inspection of structures associated with the storm water collection system, good housekeeping practices, and maintenance responsibilities.

Detailed procedures that are followed regarding inspection and maintenance of cut-off walls and storm water detention basins are described in the Operation and Maintenance manuals that are attached as Appendix H and Appendix I to this permit.

Inspections

Frequency - Each cut-off wall, surface water and process water conveyance structures, surface water collection basins, pipelines and collection system component will be inspected quarterly. This may occur during routine maintenance or data collection visits.

Protocol - A standard inspection protocol will be followed for each inspection conducted. The inspection report form will be completed and signed by the inspector. The operational status of each structure will be noted along with any needed corrective actions or maintenance items. The physical condition of collection boxes and gratings, the accumulation of silt or sand in the de-silting/sedimentation areas, and/or the clogging of collection box gratings with debris will also be noted. Any necessary repairs or cleaning will be completed within 45 days of the date when inspected. Typically clogged drains or pipes are addressed as soon as practical by operational personnel. The completed inspection form will be reviewed by SAWS Operations and any maintenance or repair items will be completed within 45 days of the inspection.

Record keeping - Copies of each inspection performed will be maintained on file to document compliance with this program as specified in Section II H of the permit. Inspection reports will be available for review by DWQ representatives during compliance visits. A log of inspections completed each quarter will be included in the quarterly water quality sampling reports provided to the DWQ.

Spills and Overflows

Kennecott will respond to all overflow spills of mine waters or sediments as soon as they are discovered. DWQ will be notified in accordance with spill reporting requirements in the Permit (Part III.I.1). The cause of the spill or overflow will be corrected/repaired and reported to DWQ as required under Part III.I.2 of the Permit. Kennecott personnel will remove any standing water which may have accumulated during the event and place it back into the collection system. Inspections of all storm water collection structures will be conducted quarterly.

Debris that may cause a blockage of flow in the collection system will be removed. If a discharge is detected, field parameters (pH and conductivity) of the sample will be recorded and a sample of the overflow will be collected. Chemical analysis of overflow waters will be conducted as with regular monitoring. Any overflow will be contained immediately and placed back into the collection system. A field logbook will be used to record all field observations and sampling data as per Kennecott's Water Sampling SOP's. Any damage that occurred due to a breach or an overflow will be repaired to restore specifications of the approved design.

In the event of low pH water pooling in desilting/sedimentation basins, the water will be pumped into the nearest collection pipeline to prevent seepage to ground water. Appropriate equipment will be available at the site to respond to any emergency spill situations.

Appendix A

UGW#350010

Seeps

Seeps occur along the Bingham Canyon Mine waste rock disposal areas. Most occur naturally during times of heavy spring runoff due to super-saturated soils; however, the potential exists that seeps may occur due to leakage from the east side collection system. Kennecott will assess the collection system area for seeps on a quarterly basis. For each seep observed, Kennecott will determine if flows from the seep report to the cutoff wall/collection system. If Kennecott determines that flow from the seep(s) reports to the collection system, no further action is necessary. If Kennecott is unable to determine if seep flow reports to the collection system or determines that flows do not report to the collection system, a sample of seep water will be analyzed for pH and conductivity. Any seep that has a measured pH less than 4.5 and conductivity greater than 5,000 µmhos/cm. will cause Kennecott to take the following actions:

1. Obtain a water quality sample from the seep and analyze for the constituents noted in Part II, Section F, Item 1 (f) (Constituents Sampled).

2. Undertake one or more of the following corrective actions that will include the following, as appropriate, to assure flows report to either the leach collection or storm water collection system:

   a. Excavation and installation of perforated pipe into the seepage area with a collection system and piping to the collection system.

   b. Diversion of the seepage to toe drains, the wetlands header pipe, or other collection system structures, depending on their location.

   c. Construction of a temporary earthen dam and installation of a surface pipe to carry the water to the collection system.

   d. Installation of an additional cut-off wall.

3. Report the location, approximate flow rate, and water quality of each seep in the quarterly monitoring results required in the permit under Part II, Section I, item 1 (b).

Corrective action to contain seep flows with pH less than 4.5 and conductivity greater than 5,000 µmhos/cm will be completed within 45 days of discovery unless weather or permitting requirements prohibit. The DWQ will be notified of any such instance where more than 45 days will be taken to address a seep with poor water quality (pH<4.5 and conductivity > 5000). The notification will include the reason for delay in capturing seep waters and will provide a schedule when such action will be completed.

The prior actions will be performed to prevent leach water from potentially migrating offsite or to the principal aquifer of the southwestern Jordan Valley. Chemical analysis of seepage waters will be conducted during regular monitoring. A field logbook will be employed to record grab sample parameters, the date the seep was found, recent precipitation events that may have induced the seep, a visual description of the water, and an estimate of the seep discharge rate.

If a seep is found to have poor water quality (i.e. pH <4.5 and conductivity greater than 5,000 μmhos/cm), and after a reasonable amount of time it is determined to be a permanent seep, the seep will be added to the surface water sampling list.

WATER QUALITY MONITORING PROGRAM

Groundwater Sampling

A monitoring well network is utilized for compliance monitoring of the Bingham Canyon Mine and Water Collection System. The primary objective of the compliance wells is to measure any water quality impact that may influence the principal aquifer system from Kennecott operations. In as many locations as possible, wells have been selected to provide completions in the alluvial aquifer system immediately to the east of the waste rock dumps where at least 50 to 100 feet of saturated thickness exists. The remaining compliance wells are completed in bedrock because no saturated alluvial deposits exist in most areas, particularly in the southern portion of the East Side dumps, areas closer to the cutoff walls and in the Dry Fork area.

Compliance monitoring wells are located down gradient from each of the water collection facilities to monitor potential releases from the collection system into the principal aquifer and underlying bedrock. Compliance monitor wells located in the southern part of the waste rock disposal area monitor groundwater down gradient from the storm water collection system where active leaching did not occur.

The compliance well monitoring network is designed to achieve the following objectives:

1. Identify flow into the principal aquifer, which would cause the aquifer to exceed relevant permit requirements for any compliance parameter.

2. Sampling over a long period of time which allows historical trending of water quality in the area down gradient of the mine and waste rock disposal areas.

3. Provide samples of water for analysis, which accurately reflect the quality of water in the aquifer location in which they are completed.

4. Utilize wells completed in alluvium (where present) where there is between 50 and 100 feet of saturation. The screened interval will extend throughout the entire saturated interval.

5. Be constructed and completed in accordance with Kennecott's approved Groundwater Characterization and Monitoring Plan.

The compliance monitoring wells are listed in Table 1 of the GWDP for the Water Collection System. These wells are located in each major drainage and are intended to represent the most likely flow paths for meteoric or storm water that could potentially escape the cutoff wall system.

Well Installation Protocol

Current and all future operational and compliance wells are and will be constructed utilizing guidance approved in the EPA Resource Conservation and Recovery Act Ground Water Monitoring Technical Enforcement Guidance Document, EPA, 1986. Lithologic logs and well construction data for the new monitoring wells will be provided in accordance with permit requirements.

MONITORING TECHNIQUES AND DATA VALIDATION

All groundwater monitoring will be performed using the methods for sampling, analyses, and quality control specified in the GCMP and attachments.

If data outliers or quality assurance/quality control problems are identified, the sample will be retested, and the wells will be re-sampled within 30 days. If the results from the retesting or re-sampling show that the data is an outlier, normal monitoring will resume.

MONITORING FREQUENCY

Quarterly sampling and analysis will be performed for all compliance monitoring wells screened in alluvium. Compliance monitor wells screened in volcanic or Paleozoic bedrock will be sampled on a semi-annual basis (Table 1).

REPORTING and PARAMETERS

Groundwater samples from compliance monitoring wells will be analyzed for the parameters listed in the GWDP.

Kennecott will submit compliance groundwater monitoring data to the DWQ on a quarterly basis. The reports will include a summary of all monitoring data collected during the quarter. Field measurements (ground water levels, specific conductance, pH) and certificates of analysis will be provided.

Appendix B

UGW#350010

WASTE CHARACTERIZATION PLAN

KENNECOTT UTAH COPPER LLC
BLUEWATER 1 MAIN REPOSITORY

1.0 Scope

This waste characterization plan will be used to characterize the nature of any waste materials planned to be disposed in the Bluewater 1 Main Repository. Wastes already placed in the repository are representative of the Bingham Creek Tailings, previously provided.

As specified in Groundwater Discharge Permit #UGW350010, issued July 14th, 2010, the Bluewater 1 Main Repository may only accept tailings, sludge, soil and waste rock generated from mining activities. No organic chemicals will be permitted in the repository, although minor amounts of organic matter (grasses, leaves, sticks, etc…) may unavoidably be mixed with the large volume, low toxicity waste materials. This primary information will be supported by visual inspection and by a level of sampling and analysis appropriate to the extent and type of waste deposit.

2.0 Objectives

The objectives of the Waste Characterization Plan are as follows:

- Ensure, through knowledge and understanding of the waste genesis and visual inspection, that the waste materials do not contain synthetic organic chemicals;
- Characterize the nature of total metals and inorganic metals in the waste;
- Characterize the variability in composition of the waste with respect to total metals and inorganics; and
- Characterize the leachability of metals from the waste.

3.0 Criteria

As noted above, the primary method used to characterize the waste material will be the identification and knowledge of the process and processes that generated the waste material. Specifically, information regarding waste deposition patterns and potential migration pathways, as well as information supporting the hypothesis that only inorganic (i.e. no synthetic organic chemical) wastes are present will be evaluated. The waste must also fit within a broad definition of tailings, waste rock, soil and sludge from mining activities.

The second criteria that will be used to determine character of the waste will be the area and vertical extent of the waste deposit and its heterogeneity. The criteria will be based on visual inspection and sampling as necessary. The number of samples collected will be based on the size of the deposit, taking into account possibly variability with depth. In addition, the homogeneity or heterogeneity of the waste will also be judged to adjust the

number of sample to be collected and analyzed. The precise design of sampling grids and types and numbers of samples will be developed and submitted to the Utah Division of Water Quality (DWQ) on a case by case basis; however, the following sampling plan provides a representative approach for tailings and waste rock.

Approximately, the following number of grab or composite samples will be prepared and analyzed:

Estimated Waste Volume (cu yd)	Number of Samples
<100	1-3
100-1,000	5
1,000-10,000	15
>10,000	20

The number of samples will be adjusted accordingly depending on the degree of heterogeneity of the waste. Composite samples will consist of a minimum of three sub samples.

4.0 Sampling Methods

Two types of samples may be collected, grab samples and composite samples. The choice of sample type will be decided based on knowledge of the waste and visual inspection for heterogeneity. Grab samples will generally only be used for waste materials which are quite homogeneous, whereas composite samples will be used for more heterogeneous wastes. Based on the envisioned analytical suit, each grab or composite sample will contain approximately five pounds of waste material. All sampling will be performed in accordance with the Standard Operating Procedures in Kennecott Utah Copper LLC (KUC) Quality Assurance Standards. This includes the use of plastic sampling tools and appropriate decontamination methods. KUC's Health and Safety Standards will also be used for personnel protection.

Composite samples will be prepared by dividing the waste into approximately 100ft x 100ft grid. The grid size will be adjusted based on the extent of the waste deposit. A proportional volume of waste material will be collected from the center of each grid to the full depth of the waste deposit. The individual grab samples will be accumulated in a large container until the appropriate number of sub samples has been collected. Then material will be manually, but thoroughly mixed until homogenized. A sub sample will be collected from the homogenized mass for analysis.

5.0 Analytical Methods

Samples will be analyzed for total metals, total inorganics, and leaching characteristics. Since the waste will be placed in the Bluewater 1 Main Repository, and no organic waste will be placed in this disposal facility, there is not a likelihood of generating organic acids which could solubilize metals. Therefore, the Toxicity Characteristics Leaching procedure (TCLP, EPA Method 1311) is not appropriate for waste materials to be placed

in the Bluewater 1 Main repository. The Synthetic Precipitation Leaching Procedure (SPLP, EPA Method 1312) is more appropriate, and will be used as the principal method for assessing leachability. Nevertheless, both SPLP and TCLP methods will be performed on representative samples of the waste materials so that a worst-case assessment can be made.

Tables B1 and B2 list the specific analytical methods which will be used as reference. All methods for metals and leaching characteristics are based on EPA Method SW-846. The methods for conventional inorganics are also based on standard reference documents. The Practical Quantitation Limits (PQLs) are provided along with specific method references. All metals, except mercury, will be analyzed through acid digestion and Inductively Coupled Argon Plasma (ICP). Mercury analysis will be analyzed by cold vapor atomic adsorption to ensure the attainment of low detection limits.

Table B1. Standardized Preparation/Analytical Methods & Detection Limits for Analytes in Soils.

Total Metals	Method Index	Method Reference	Practical Quantitation Limit (mg/kg)
Arsenic	3050B	6010C	4
Barium	3050B	6010C	2
Cadmium	3050B	6010C	1
Chromium	3050B	6010C	2
Cobalt	3050B	6010C	1
Copper	3050B	6010C	5
Iron	3050B	6010C	1
Lead	3050B	6010C	3
Manganese	3050B	6010C	1
Mercury	3050B	7471A	0.10
Molybdenum	3050B	6010C	1
Nickel	3050B	6010C	1
Silver	3050B	6010C	5
Selenium	3050B	6010C	5
Zinc	3050B	6010C	5

Table B2. Standardized Preparation/Analytical Methods & Detection Limits for Leachable Metals in Soils.

EPA Method	Method Index	Method Reference	Practical Quantitation Limit (mg/L)
TCLP-1311			
Arsenic	1311/3010A	6010C	0.1
Barium	1311/3010A	6010C	0.1
Cadmium	1311/3010A	6010C	0.01
Chromium	1311/3010A	6010C	0.1
Lead	1311/3010A	6010C	0.05
Mercury	1311/3010A	7471A	0.0010
Selenium	1311/3010A	6010C	0.1
Silver	1311/3010A	6010C	0.1
SPLP-1312			
Arsenic	1312/3010A	6010C	0.1
Barium	1312/3010A	6010C	0.1
Cadmium	1312/3010A	6010C	0.01
Chromium	1312/3010A	6010C	0.1
Lead	1312/3010A	6010C	0.05
Mercury	1312/3010A	7471A	0.0010
Selenium	1312/3010A	6010C	0.1
Silver	1312/3010A	6010C	0.1

NOTE: Method Index/Method reference
(1) SW 846 "test Methods for Evaluating Solid Waste," 3rd Edition, November 1986.

APPENDIX C

UGW#350010

KENNECOTT BINGHAM CANYON MINE AND WATER COLLECTION SYSTEM CONTINGENCY AND CORRECTIVE ACTION PLAN

INTRODUCTION

This plan describes the contingency responses, procedures and corrective actions that Kennecott Utah Copper LLC (KUC) will follow, if triggered, under the Bingham Canyon Mine and Water Collection System Groundwater Discharge Permit.

CONTINGENCY PLAN

The Contingency Plan describes response actions which will be undertaken if an out of compliance status occurs for a compliance monitoring well.

Compliance Wells

In the event that the compliance limit is exceeded in a compliance monitoring well for two or more consecutive samples for a given parameter, the following steps will be taken:

a. KUC shall take reasonable and practical interim measures to stop the source and minimize the spread of any contaminants. These actions may include the following:

- Pumping the well at a steady flow for an extended period of time (pumping back) to determine whether there is any positive or negative impact on the water quality of the well.
- Installation of piezometer(s) (if applicable) to measure the hydraulic performance of the cut-off walls, drain systems, and other control structures.
- Drill a larger well or additional pump back wells, trenching with the addition of slurry or liners, excavating and pumping, or other actions if groundwater contamination is documented and persists.
- Other alternative remedial options which implement newer technologies or better address the source of the impact.

b. Investigate the source, nature, extent, and potential dispersion of contamination.

c. Submit a Source Assessment and Compliance Schedule in accordance with the

requirements of the ground water discharge permit.

CONTAMINATION INVESTIGATION

The Director shall evaluate the effectiveness of all Source Assessment and Compliance Schedule measures for compliance monitoring wells. If the Director determines that these efforts are not effectively addressing detected and or potential ground water contamination, KUC shall be notified and requested to submit a Source Contamination Investigation Plan. The Contaminant Investigation will conform to the requirements of UCA R317-6-6.15 D and may include an endangerment assessment. The endangerment assessment will be completed in the event that Alternate Corrective Action Concentration Limits or other standards are proposed.

The endangerment assessment will consider potential human and ecological receptors in evaluating potential adverse effects of the release. More specifically, the endangerment assessment will address:

- Potential routes of exposure and contaminant concentrations.
- Potential effects of the contaminant on humans (e.g. toxicity).
- Human populations at risk.
- Potential or actual adverse effects on affected plants, animals, ecosystems, and other natural resources.
- Potential or actual adverse effects on future uses of groundwater.

The endangerment assessment will take into consideration any down-gradient water users and supply wells within a two mile radius down and cross-gradient of the facility.

CORRECTIVE ACTION PLAN

If the Contamination Investigation identifies a potential risk that requires groundwater remediation, KUC will conduct a feasibility evaluation to examine the various options available for a formal Corrective Action Plan. The feasibility evaluation may include:

- Evaluating passive management or monitoring to assess whether natural processes reduce the contamination to levels below the permitted levels.

- Assessing the feasibility and effectiveness of extracting and treating groundwater using wells or drains.

- Examining the feasibility and effectiveness of isolating the contaminated groundwater by slurry walls, grout curtains, sheet piles, and/or capping.

- Evaluating in-situ chemical neutralization options.

- Petitioning the Water Quality Board for an Alternate Corrective Action Concentration Limits consistent with the potential risks identified.

Corrective Action Plans will be written in accordance with UCA R317-6-6.15 D and submitted for approval to the Division of Water Quality upon completion of the Contaminant Investigation.

APPENDIX D

UGW#350010

BINGHAM CANYON MINE AND WATER COLLECTION SYSTEM
CONCEPTUAL MINE CLOSURE PLAN

VERSTION DATE 2003

APPENDIX E

UGW#350010

BINGHAM CANYON MINE AND WATER COLLECTION SYSTEM OPERATIONAL MONITORING PLAN

MONITORING REQUIREMENTS AND PLAN CONTENT

Operational monitoring includes flow and quality sampling of meteoric and storm-water flow. Kennecott Utah Copper LLC (Kennecott) has an existing general, operational, and groundwater monitoring plan that is described in the Ground Water Characterization and Monitoring Plan (GCMP) Kennecott, 2014.

This Operational Monitoring Plan for the Bingham Canyon Mine/Water Collection System includes the Water Quality Sampling program.

WATER QUALITY MONITORING PROGRAM

Surface Water Sampling

Meteoric and Water Collection System - As a part of a continuing operational monitoring program, water quality samples from all drainages associated with the water collection system will be collected two times per year. The Water Collection System concrete drainage structures will be sampled once in April or May and again in September or October. The Surface Water Sample Sites Drawing (Figure 1 of the Permit) shows the current locations of the 23 operational surface water sample sites. There are 25 surface water sampling sites (refer to figure 454-T-0119).

Tunnels and Seeps - Additionally, quarterly flow and semiannual water quality samples will be collected for each of the flows from mine tunnels that underlie the Bingham Canyon Mine Waste Rock Piles. Surface seeps will also be sampled for semiannual flow and water quality. Refer to Appendix A for additional permit conditions related to surface seeps.

Table E-1 lists all current monitoring sites for the operational monitoring program and E-2 lists new and replaced cutoff walls installed during the EWRE.

Table E-3 lists the cutoff walls removed or moved during the SWRR project. The cutoff walls kept their designation descriptions.

Flow information for each surface water sample site will be provided in the annual report as part of the operational monitoring discussion.

All sampling will be performed in compliance with the protocols and standard operating practices specified in the current approved version of the GCMP and attachments. The water quality date will be provided in the annual report as part of the operational monitoring discussion.

Bluewater Repository - The leachate collection system sumps for the Bluewater Repository shall be

examined semi-annually. A semi-annual water quality sample will be collected of leachate flowing into each collection sump. Results from sampling will be reported in the annual operational monitoring report provided to the Utah Division of Water Quality (DWQ). Refer to Appendix B for additional permit conditions related to the repository.

MONITORING TECHNIQUES AND DATA VALIDATION

All monitoring will be performed using the methods for sampling, analyses, and quality control specified in the GCMP.

If data outliers or quality assurance/quality control problems are identified, the sample will be retested, and the wells will be re-sampled within 30 days. If the results from the retesting or re-sampling show that the data is an outlier, normal monitoring will resume.

REPORTING

Kennecott will submit compliance groundwater monitoring data to the DWQ on a quarterly basis. The reports will include a summary of all monitoring data collected during the quarter. Field measurements (groundwater levels, specific conductance, pH) and certificates of analysis will be provided.

Operational monitoring data for operational sites including cut-off walls, seeps, tunnels, Bluewater Repository, informational wells and extraction wells will be submitted to the DWQ in an annual report to be provided by March 31 each year. The annual report will contain results of monitoring in a tabular form with descriptive statistics such as: number of samples, average, standard deviation, maximum and minimum values for each site. Each site will be described with time series graphs of significant parameters over the period of record for that site; with analytical data reported from the past three years through the current reporting cycle A narrative description shall be included that describes any significant trends or observations on the data.

Table E-1

OPERATIONAL SURFACE SITES	NORTHING	EASTING	MONITORING FREQUENCY
WATER COLLECTION SYSTEM			
Bingham Ck. Cut-off wall (ECP2562)	15784	16905	Semiannual water quality and quarterly volumetric flow
Bluewater 1/2 Collection Box (ECP2682)	15145	13910	Semiannual water quality and quarterly volumetric flow
Bluewater 1 Flume (MDP2679)	14467	13613	Semiannual water quality and quarterly volumetric flow
Bluewater 2 Flume (ECP2709)	12271	16656	Semiannual water quality and quarterly volumetric flow
Bluewater 3 Flume (ECP2674)	11022	16182	Semiannual water quality and quarterly volumetric flow
Midas 1 Flume (ECP2670)	9391	15692	Semiannual water quality and quarterly volumetric flow
Midas 2 Flume (ECP2668)	9189	15494	Semiannual water quality and quarterly volumetric flow
Midas Flume (ECP2662)	8842	16582	Semiannual water quality and quarterly volumetric flow
South Congor Flume (ECP2654)	8840	16582	Semiannual water quality and quarterly volumetric flow
Crapo Flume (ECP2651)	6831	17037	Semiannual water quality and quarterly volumetric flow
South Crapo Flume (ECP2858)	6670	17332	Semiannual water quality and quarterly volumetric flow
North Keystone Flume (ECP2648)	6029	17716	Semiannual water quality and quarterly volumetric flow
Keystone and Lost Creek Flume (ECP2629)	3397	17201	Semiannual water quality and quarterly volumetric flow

OPERATIONAL SURFACE SITES	NORTHING	EASTING	MONITORING FREQUENCY
Copper 1 Flume (ECP2624)	1457	17078	Semiannual water quality and quarterly volumetric flow
Copper 2 Flume (ECP2857)	1205	17093	Semiannual water quality and quarterly volumetric flow
Copper 3 Flume (ECP2618)	629	16596	Semiannual water quality and quarterly volumetric flow
Copper 4 Flume (ECP2856)	-326	16111	Semiannual water quality and quarterly volumetric flow
Yosemite Cut-off wall (ECP2616)	-1302	12460	Semiannual water quality and quarterly volumetric flow
Saints Rest Cut-off wall (ECP2614)	-2797	13156	Semiannual water quality and quarterly volumetric flow
S. Saints Rest Cut-off wall (ECP2612)	-4318	13304	Semiannual water quality and quarterly volumetric flow
Castro Flume (ECP2606)	-5637	13598	Semiannual water quality and quarterly volumetric flow
Butterfield 1 Cut-off wall (ECP2605)	-7876	9515	Semiannual water quality and quarterly volumetric flow
Olsen Cut-off wall (ECP2603)	-8670	8481	Semiannual water quality and quarterly volumetric flow
Queens Cut-off wall (ECP2601)	-9483	6350	Semiannual water quality and quarterly volumetric flow
TUNNELS			
Old Bingham Tunnel (ECP2664)	8990	16938	Semiannual water quality and quarterly volumetric flow
Butterfield Tunnel (UPD010)	-10026	10313	Semiannual water quality and quarterly volumetric flow
Utah Metals Tunnel (BMP2712)	-1255	-2563	Semiannual water quality and quarterly volumetric flow
OPERATIONAL SURFACE SITES	**NORTHING**	**EASTING**	**MONITORING FREQUENCY**

Mascotte Tunnel (ECP2631)	3569	17231	Semiannual water quality and quarterly volumetric flow
5490 Tunnel (ECP2710)	15715	14960	Semiannual water quality and quarterly volumetric flow
Bingham Tunnel (LWP2632)	3736	17773	Semiannual water quality and quarterly volumetric flow
SURFACE SEEPS			
Butterfield 1 Seep (ECS2715)	-7980	10500	Semiannual water quality and semiannual volumetric flow
Upper Keystone Seep (ECS2716)	4220	15520	Semiannual water quality and semiannual volumetric flow
Lower Keystone Seep (LWS2717)	3700	18600	Semiannual water quality and semiannual volumetric flow
Crapo Seep (ECS2718)	6930	16130	Semiannual water quality and semiannual volumetric flow
Upper Queen Seep (ECS2786)	-7263	5097	Semiannual water quality and semiannual volumetric flow
REPOSITORY			
Bluewater 1 North Sump (BRP292)	14146	16561	Semiannual water quality
Bluewater 1 Main Sump (BRP1476)	13770	15740	Semiannual water quality

Note: Coordinate system in Kennecott True North, See Permit Table 4 for Lat/Long Coordinates TBD – the lat and long will change when the construction is complete. The permit will be modified to reflect those changes.

Table E-2
Original and New Cut-off Walls

Original Cut-off Wall (historic)	New Cut-off Wall (relocated)
Copper	Copper 4 Copper 3 Copper 2
North Copper	Copper 1 Lark
Lost Creek	Lost Creek
Keystone	Keystone
North Keystone	North Keystone South Crapo
Crapo	Crapo
South Congor 2	South Congor
Congor 1 Congor 2	Midas

Table E-3
Original and New Cut-off Walls

Original Cut-off Wall (historic)	New Cut-off Wall (relocated)
Yosemite	Upper Yosemite – Re-located ~500 feet down gradient of existing Yosemite cut-off wall Lower Yosemite – Located ~850' down gradient of Upper Yosemite cut-off wall
Castro	Upper wall breached and buried; lower Castro cut-off wall will remain in place
Butterfield 1	Butterfield 1 – Located ~1500' down gradient of existing cut-off wall
Olsen	Olsen – Located ~900' down gradient of existing cut-off wall

BINGHAM CANYON MINE AND WATER COLLECTION SYSTEM BEST MANAGEMENT PRACTICES PLAN

BINGHAM CANYON MINE SUPPORT FACILITIES,
SOLVENT EXTRACTION ELECTRONWINNING PLANT, PRECIPITATION PLANT,
AND BINGHAM CANYON WATER TREATMENT PLANT
GROUNDWATER DISCHARGE PERMIT #UGW350010

1.0 INTRODUCTION

Groundwater Discharge Permit #UGW350010 was originally granted for the Kennecott Utah Copper, LLC (Kennecott) Bingham Canyon Mine and Water Collection System on May 3, 1999 and comes up for renewal on 5-year intervals. The permit area includes the open pit, waste rock dumps, support shops and various water management facilities. The permit requires that Best Available Technology (BAT) be used in the construction of all facilities and that they are operated according to Best Management Practices (BMP).

The permit also requires a BMP plan for any facilities within the permit boundaries that have the potential to affect groundwater quality. These facilities include various mine support shops, the Solvent Extraction/Electrowinning Plant, South Area Water Services (SAWS) and the Bingham Canyon Water Treatment Plant. Most of these facilities are upgradient from the Kennecott groundwater and surface water collection systems. In compliance with the permit, this BMP plan describes the physical and operational controls that are employed to minimize groundwater contamination at these sites.

2.0 BEST AVAILABLE TECHNOLOGY

2.1 Mine Support Facilities

Mine support facilities are used for vehicle operations and maintenance and include the Maintenance Shops at the 6190-ft level, the Code 80 Fuel and Lube Area the Code 85 field maintenance lay down yard and the 6880 Lube Station. Petroleum products are used and stored in bulk at all of these sites. The Explosives Processing Plant also stores diesel and ammonium nitrate in bulk. Diesel fuel, gasoline, lubrication oils, petroleum distillate solvents and ethylene glycol are used on a regular basis around the mine for vehicle maintenance. Each of these facilities is designed to minimize the risk of release, and to contain and collect any materials that are released.

All storage tanks are provided with secondary containment systems. Tanks are either double-walled or located in concrete basins that are capable of holding 110 percent of the largest tank volume.

Oil/water separators are used to treat water which is contaminated with petroleum products before it is reused or piped to the process water circuit. The oil/water separators handle waters

from wash pads, secondary containments, refueling pads and sumps. The recovered petroleum product is removed from the oil/water separator and shipped offsite for recycling or treatment.

Concrete pads which slope to concrete collection sumps underlie all vehicle-refueling areas. Spills which occur during refueling are immediately recaptured.

Concrete pads underlie all shop floors. There are no drains on the shop floors and all sumps are concrete lined, so spilled materials are contained within the shop until they can be recovered.

Concrete pads which are sloped to concrete-lined settling basins underlie all vehicle wash areas. Wash water either flows through an oil/water separator and is reused at the pad or flows through an oil/water separator and is piped into Kennecott's process water circuit.

2.2 Solvent Extraction/Electrowinning Plant

The Solvent Extraction/Electrowinning (SXEW) pilot plant facility, located within the western edge of the Dry Fork dumps, was decommissioned in 2007 and 2008. The associated tank house and mixer/settlers were disassembled. Remaining is the lined leach pad containing low grade copper ore as well as the associated pregnant leach solution pond, raffinate pond and sulfuric acid tank with secondary containment. The leach pad covers approximately 420,000 square feet. From bottom to top, it is constructed of six inches of compacted clay, six inches of compacted silty sand and Low Density Polyethylene (LDPE) and PVC lines.

In 2011 the heap leach underwent modification. A portion of the original heap (300' x 70') was removed in order to accommodate the placement of fresh ore for a new test. Before the fresh ore was placed, the opened area was isolated from the existing heap by means of two 60 mil High Density Polyethylene (HDPE) plastic liners; a leak detection system was also installed. All process solutions will be handled from the leach pad through an independent collector system to a new set of PLS and raffinate ponds with capacities of 300,000 and 75,000 gallons, respectively, which are constructed with one foot of compacted clay beneath two layers of 60 millimeter HDPE liners and also include a leak detection system.

The process solutions are treated in a portable SXEW pilot plant (capacity of 40 gallons per minute) to more accurately simulate a commercial operation in terms of acid balance and metal recovery.

Performance criteria for the Heap, PLS pond and Raffinate pond are listed in Table F-1. Performance of BAT is tracked through weekly inspections and documentation of leak detection systems. If the head below the upper liner and in any of the three individual sumps exceeds maximum allowable head (MAH) outlined in table F-1 the sump in question will be evacuated of leachate at which time the leakage rate will begin to be measured. If the leakage rate is determined to be above the action leakage rate for a 24 hour period Kennecott will initiate reporting requirements as outlined in the permit under Part II Section H.

Table F-1: Chalcopyrite Heap Leach Ponds BAT Compliance GPD and GPM

Pond	Surface Area (acres)	Allowable Leakage Rate[1] (gpad)	Action Leakage Rate (gpd)	Action Leakage Rate (GPM)	Maximum Allowable Head in Leak Detection Sump (ft)
Raffinate Pond	0.15	1700	255	0.18	2
PLS Pond	0.37	1700	629	0.44	2
Heap	1.78	1700	3026	2.10	2

Notes:
gpad - Gallons per Acre per Day
ft - Feet
PLS - Pregnant Leach Solution
gpd – Gallons per Day
gpm – Gallons per Minute
[1] - Koerner, R. and Koerner, J 2009. Survey of U.S. State Regulations on Allowable Leakage Rates in Liquid Impoundments and Wastewater Ponds. Geosythetic Institute GRI White Paper #15, p 7. ALR for in-situ leach mines.

The remaining facility is constructed on top of the Dry Fork waste rock disposal area. The facility is upgradient from several extraction and monitoring wells, the Bingham Canyon/Dry Fork area and the Bingham Canyon cutoff wall.

Past testing for the heap leach pads included pilot scale leaching of sulfide ore to better understand the geochemistry of copper heap leaching. This facility has been incorporated into the Dry Fork waste rock disposal area. Planning is in place to use similar technology on top of the Dry Fork waste rock disposal area.

2.3 South Area Water Services (SAWS)

The SAWS facilities, including the administration buildings and water treatment structures are constructed on alluvial sands and gravels in Bingham Canyon. The underlying contact between permeable alluvial deposits and relatively impermeable volcanoclastic bedrock causes groundwater flow below the plant to move through the alluvium to the Bingham Cutoff wall where it is captured. There is an upward vertical groundwater gradient in the bedrock beneath the facility which inhibits contaminant movement out of the alluvium.

The SAWS facility area is paved with either concrete or asphalt, any waters spilled or released due to an upset condition report to a sump or a lined reservoir. Excess water may be routed to either the Bingham Creek Desilting Basin, Small or Large Reservoirs (GWDP#UGW350006). About 80 percent of the HDPE and stainless steel piping included in the SAWS facilities is above ground and/or over paved surfaces. Buried pipe is stainless steel or HDPE.

SAWS personnel oversee the operation and maintenance of the Bingham Canyon Mine Water Collection System, Desilting Basin, Large and Small Reservoirs and all associated piping and water collection and conveyance structures. There are flow meters and sump level indicators located at of these sites. In the most critical areas, level indicators alarm to a central control room if sumps become too full or pipe flow decreases significantly. This allows rapid shut-down or redirection of water flows in the event of an upset condition.

2.4 Bingham Canyon Water Treatment Plant

The Bingham Canyon Water Treatment Plant (Zone A RO Plant) is located southwest of the Large Bingham Reservoir. The process area is contained within a building with a sloped concrete floor, which drains to an HDPE lined trench system and then to a sump. The sump is serviced by a pump, which returns all the effluent collected in the trench to the Eastside Collection System. Flow into the trench occurs either from the membrane washing cycle or from flushing and draining of lines within the system; effluents are pumped from the sump as required. Overflow from the sump is routed to the Large Bingham Reservoir Desilting Basin. Effluents are not allowed to stand in the trench for any length of time beyond the inflow/pump-out period.

The trench system has an emergency overflow to Chamber 1 of the Desilting Basin of the Large Bingham Creek Reservoir in the event of a long-duration power outage that coincides with uncontrolled inflows.

3.0 INSPECTION AND MAINTENANCE PROCEDURES

Facilities which are in operation are monitored on a continuous basis. All operating mine facilities described in this Plan are operated 24 hours per day, 365 days per year and all areas are inspected at least once per day and generally once per shift by assigned employees. The assigned operators or inspectors are responsible for correcting any problems discovered in a timely manner. Maintenance and repairs are initiated in response to inspection results or according to preventive maintenance (PM) schedules.

PM schedules at the mine are tracked with a computerized maintenance program. Based upon operator inspections and preset maintenance intervals, this program assists in scheduling and planning PMs. Standard Operating Procedures (SOPs) are used by the employee or group of employees assigned the responsibility for completing the PM. After the PM is completed, a signed PM checklist is returned to the maintenance scheduler. The maintenance planner notes any items identified during the inspection that require additional repair. A work order is then written and the additional work scheduled. The work-order tracking system is intended to ensure that proper and complete implementation of required repairs occurs in a timely fashion. The system continues to remind maintenance planners periodically until the work-order job is completed and closed out.

The Zone A RO Plant is manned on a continuous basis, twenty-four hours a day 365 days per year. The operators are also responsible for routine inspection and maintenance of the facility.

3.1 Mine Support Facilities

All secondary containments around tanks are inspected weekly during the rainy season and after precipitation events. If there is no oil sheen and the water has a pH between 6.5 and 9, it may be discharged to the ground. Water with oil sheen is conveyed to an oil/water separator.

The integrity of tanks, secondary containments, concrete wash pads, refueling pads and waste storage pads are inspected monthly. Pumps, valves and pipes associated with bulk storage tanks are inspected annually.

Oil/water separators situated below grade and away from secondary containment are inspected at least quarterly and used oil is removed as required. Sludge levels are inspected at a minimum annually and sludge removed as required.

The waste storage pad is inspected weekly to insure the facility meets Environmental Protection Agency (EPA) guidelines which includes the containment of stored waste products.

3.2 Solvent Extraction/Electrowinning Facilities

During operation, all facilities associated with the SXEW plant are inspected on a daily basis. All observations are noted on a detailed log sheet.

3.3 South Area Water Services (SAWS)

All water collection and conveyance facilities that comprise the Bingham Canyon Mine Water Collection System, including drop boxes, junction boxes, diversion boxes, cutoff walls, valves, desilting basins, pipelines, sediment traps, canals, screens, weirs, and flumes are inspected on a quarterly basis as per the requirements of ground water discharge permit #UGW350010. Pumps and motors are maintained in accordance with the preventive maintenance schedules. If any deficiencies are found, they are corrected immediately or a work order is written for the required repairs. All structures associated with the Large and Small Reservoirs are inspected as per the requirements of ground water discharge permit #UGW350006.

3.4 Bingham Canyon Water Treatment Plant

During operation, the operators are responsible for the PM program, which is implemented at the beginning of each shift. PM consists of visual inspection of the equipment, its foundations and mounting assemblies, checks for excessive heat, noise or vibration, and inspection of associated piping for leaks and proper sealing. Pumps have lubricating fluids changed as directed by the manufacturer's instructions. Level control in the sump is checked annually to ensure that the controls activate at the appropriate levels.

After the PM is completed, the operator reports any deficiency. A work order is then written for implementation of the required repairs, which generally take place within seven days.

4.0 PERFORMANCE CRITERIA

4.1 Housekeeping

All facilities adhere to strict housekeeping standards. Housekeeping standards have been established for the principal purpose of ensuring consistent application of housekeeping throughout Kennecott. Kennecott's facility standards require floors to be washed at an interval necessary to keep them in a clean state. Floors are kept as dry as possible to minimize potential for slips and falls. Hoses, brooms and similar types of equipment are located in strategic areas to facilitate housekeeping. All containers must be in good condition, properly labeled and compatible with the stored material. Spilled materials must be promptly cleaned up and work areas kept reasonably free of grease, oil and other process materials. Area supervisors, through employee training and regular site inspections, enforce these standards. Kennecott supervisors are trained annually on the environmental aspects of proper housekeeping.

4.2 Spill Prevention, Response and Reporting

All mine facilities are included in the Spill Prevention, Control and Countermeasures (SPCC) Plan which is covered by the Clean Water Act and only regulates petroleum based material. This plan specifies physical and institutional controls to minimize the likelihood of spills, and identifies procedures to be followed in the event of a petroleum based spill. In general, spill response involves: 1) identifying the spilled material; 2) isolation of the spill immediately if it is safe to do so; 3) containing the spilled material as soon as safely possible; and 4) cleaning up and properly disposing of the spilled material and any contaminated soils or debris. Spill response kits are located at strategic locations at each facility. Employees are trained annually on the SPCC Plan.

A verbal report of noncompliance, or spills subject to the provisions of UCA 19-5-114 which may endanger public health or the environment, are made as soon as possible, but no later than twenty-four hours from the time Kennecott first becomes aware of the reportable incident. The report is made to the Utah Division of Environmental Quality 24-hour number, (801) 536-4123 or to the Division of Water Quality, Groundwater Protection Section at (801) 538-6146, during normal business hours. Other notifications required under RCRA or SARA are made if reportable quantities are exceeded. A written report containing specific details of the incident and Kennecott's response is required to be submitted within five days.

4.3 Materials Handling

Before new products are allowed on site, their material safety data sheets (MSDSs) are reviewed by procurement personnel as well as health, safety and environmental personnel as outlined in Kennecott's standard 14.2. An attempt is made to exclude chemicals that may pose health or environmental risks and which would be persistent in the environment if released. Existing product usage is also periodically reviewed to determine if less hazardous materials can be substituted.

Although the mine is regulated under the Mining Safety and Health Administration (MSHA), Kennecott enforces the Occupational Safety and Health Administration (OSHA) requirements for hazard communications at all facilities. The OSHA standards that are enforced for materials handling include:

- labels and (or) appropriate warnings are placed on all tanks and other containers
- MSDSs are maintained and readily available for all chemicals on site
- employees are informed and trained regarding chemical hazards and hazard communications
- contractor employers are informed concerning hazardous chemicals to which their employees may be exposed while working at the Bingham Canyon Water Treatment Plant
- material transfer operations are conducted in such a manner as to minimize the potential for spillage; chemicals are stored in compatible containers and tanks; containers are properly labeled with NFPA stickers.

4.4 Training

All new employees receive an overview of Kennecott's environmental policy and procedures, including training on housekeeping, hazard communication and SPCC requirements. Throughout the year all Kennecott employees receive site specific training on a variety of environmental topics including materials handling, waste handling, hazard communication and spill prevention and response.

4.5 Recordkeeping

Records that document compliance with the elements mentioned in the BMP are maintained for a minimum of three years. Copies of the required records for mine facilities are kept at the mine. Records for the water treatment plants are kept at Kennecott's Environmental Engineering Projects Group. Selected records are also maintained by the Environmental Department.

APPENDIX G

UGW#350010

Kennecott Bingham Canyon Mine and Water Collection System: Dry Fork Management Plan

Operational Plan Summary

This plan targets groundwater monitoring and controls of historic mine impacted waters in the Dry Fork area. The management of these waters is separated into three areas:

1. Clean water capture upgradient of Dry Fork area;
2. Bedrock groundwater monitoring; and
3. Alluvial extraction of Dry Fork/Bingham Creek area mine groundwater.

The plan is formatted into five sections and summarizes well "as-built" specifications, pumping rates, historic concentrations of key analytes and geologic and hydrogeolgic conditions where applicable. The five sections specifically addressed are:

1. Upgradient clean water capture;
2. Peripheral or lateral monitoring wells;
3. Alluvial pumping wells below the toe of Bingham Canyon waste rock disposal area;
4. Bedrock monitoring wells between Bingham Canyon waste rock disposal area and the Bingham Canyon cut-off wall; and
5. Bingham Canyon cut-off wall.

Historic Overview Including Geologic/Hydrologic Factors

Overview

Bedrock groundwater is known to have been impacted as a result of mining activities within the Dry Fork area. Efforts were made to monitor the extent of the contamination as well as extract contaminated water with sulfate concentrations in excess of 20,000 mg/l. During the extraction period which lasted between 1960s and 2003, the geologic, hydrologic conditions within the Dry fork area were studied extensively and are summarized in more detail below. Through various monitoring and extraction wells (Figure 2) the impacted groundwater was determined to be confined to Bingham Canyon and its alluvial and bedrock flow path impeded by local structures resulting in mine contact waters reporting to down canyon alluvium. Mining operations were modified in 2004 resulting in a change in Dry Fork plume management strategies. Kennecott placed waste rock in Bingham Canyon beginning in 1998 through the present, which covered most of the monitoring wells in Bingham Canyon. Monitoring is now performed from wells at the mouth of the canyon.

Geologic Conditions

The geology of the Dry Fork area consists of Paleozoic sedimentary bedrock which is heavily folded and faulted. Two large fold structures are known to exist within Dry Fork Canyon: the Copperton Anticline and the Copperton Overturn. The anticline is steeply dipping to the west and overturned on the east side. The Conger and Champion thrust faults cut across Bingham Canyon. These structures generally impose down gradient bedrock barriers which minimize the migration of ground water deeper into bedrock to the east where it could impact the Salt Lake Valley aquifer.

Hydrologic Conditions

Vertical head gradient at the confluence of Bingham Canyon and Dry Fork Canyon is predominantly upward and averages 0.026 ft/ft (not density corrected). The upward gradient is reflective of a compilation of piezometer data collected from locations within the canyon both historic and current. The lower and most eastern part of Bingham Canyon has an upwards gradient as large as 0.051 ft/ft (not density corrected). In these conditions, groundwater is reporting to alluvium where is can be captured in the alluvium pumping wells.

Waste rock was placed over approximately 100 feet of alluvial material in Bingham Canyon. Over this time period, the waste rock has drained meteoric water into the Bingham Canyon alluvial material and into bedrock. This change has affected the hydraulic gradient somewhat such that the upward gradient has decreased. Kennecott believes the alluvial material is not fully saturated and is partially influencing the water quality near the mouth of Bingham Canyon.

Monitoring Controls & Contingency Plan

Section 1: Upgradient Clean Water Capture

Two pumping wells are located upgradient of the Dry Fork dump area. The wells are COP2701 (Mid Valley Well) and COG1172 (Upper Dry Fork Well or Picnic Flats Well) as depicted in Figure 2. During 2020 well COG1172 will be replaced with a new extraction well (COG2865) located approximately 600 feet upgradient of COG1172. The purpose of the wells is to capture clean water upgradient of the Dry Fork waste rock area prior to coming into contact with waste rock contact water (WRCW) as well as minimize hydraulic head pressure created by upgradient groundwater sources in Dry Fork Canyon. Pumping on COP2701 began in the late 1990s, with an average monthly pumping rate of 130 gpm over the past 5 years when in use. Flow rates have ranged from approximately100 to over 500 gpm. Pumping of COG1172 was re-established in 2007 and was implemented to supplement COP2701. The average flow rate (5 year rolling average) for COG1172 based upon a monthly average is 50 gpm and has ranged between 40 to 70 gpm.

Table 1: Dry Fork Area Clean Water Capture Wells Summary Information

Well ID	COP2701	COG1172/Replacement Well COG2865
Alias	Mid Valley Well	Picnic Flats Well
General Location	300 ft upgradient of Dry Fork dump toe	1500 ft upgradient of COP2701
Coordinate (state plane 83)	N 7378029.3 E 1459357.4	N 7378749.7 E 1458019.9
Years in Service	25	12
Surface elevation	6241	6341
Total Depth (ft)	345	962.8
Screen interval (ft)	20-275	80 - 952
Screened Lithology	Quartzitic alluvium/Quartzite	Quartzitic alluvium/Quartzite
Pump capacity (gpm)	500	375
Average Monthly pumping rate (gpm)[1]	130	50
Average annual water volume removed (acre-feet)	200[2]	60[3]
Static Water Level (ft)	~110	100

[1]Average pumping rate based upon months when pump is in service
[2]Average volume based upon 5 year rolling average annual data
[3]Average volume based upon 5 year rolling average annual data

Section 2: Peripheral Monitoring Well Controls

Peripheral monitoring of the Dry Fork area is performed through compliance monitoring wells COG2806A&B. The wells are located north and east of the Dry Fork Canyon and Bingham Canyon intersect, as depicted in Figure 2, and both intervals are screened in quartzite. The wells are intended to monitor the potential lateral movement of mine impacted ground water originating from Dry Fork Canyon. Groundwater monitoring wells ECG1106A & B, located approximately 600 feet north of ECG2787 and drilled in bedrock, can also be used as monitoring the northern/eastern edge of the Dry Fork water quality. In addition, COG995A & B located adjacent and northwest of the waste rock and ECG2853 A & B located on the eastern extent of the waste rock in Bingham Canyon are also used to monitor changes in water quality. The COG995 and ECG2853 sites are completed in bedrock and each have shown minimal changes in water quality over the past five years.

Table 2: Peripheral Bedrock Monitoring Wells Summary Information

Well ID	COG2806A	COG2806B
General Location	NE corner of Dry Fork-Bingham Canyon Intersect	Same
Coordinate (state plane 83)	N 7375371.5 E 1468620.3	Same
Years in Service	4	Same

Casing elevation	6228.91	6228.67
Total Depth (ft)	800	1108
Screen interval (ft)	760-800	1068-1108
Screen Lithology	Limey Quartzite	Quartzite
Average DTW (ft)	691	695

Monitoring of contaminated waters to the immediate south is precluded by active waste rock placement and historic waste rock disposal areas. The east side collection system is located further south and east, which is comprised of a robust monitoring network of cut-off walls and monitoring wells. Bedrock groundwater contamination will be identified using these wells and operational control structures.

Section 3: Alluvial Controls

Down Gradient of Bingham Canyon Waste Rock Disposal Area

Groundwater impact to the alluvial material is controlled with three pumping wells situated between the toe of Bingham Canyon waste rock disposal area and the Bingham Canyon Cut-off Wall (COW) as depicted in Figure 2. Table 3 summarizes well statistics. The wells were placed to capture mine impacted water moving through alluvium and minimize water reporting to the Bingham Canyon COW. The goal of the wells is to maximize alluvial extraction before mine impacted waters can enter the bedrock, however pumping rates for individual wells may vary or cease all together based upon alluvial saturation conditions. There are no alluvial pumping wells located in Bingham Canyon between the Dry Fork pumping wells and ECG2789A & B. ECG2789A & B (ECG2866A & B) will be relocated in 2020 to accommodate installation of a new conveyor belt.

Table 3: Alluvial Pumping Wells Summary Information

Well ID	ECG2787[1]	K83	ECG1185
Alias	NA	Curtis Springs	Copperton Channel
General Location	900 feet east of dump toe	3200 feet east of dump toe	3500 feet east of dump toe
Coordinate (state plane 83)	N 7373909 E 1469365	N 7373754.9 E 1471616.3	N 7374630.6 E 1471905.2
Surface elevation	5496	5426	5509
Total Depth (ft)	130	109.8	200.7
Screen interval (ft)	75 – 129	46.5 – 96.5	130 – 200
Pump capacity (gpm)	260	300	30
Average Monthly pumping rate	120	200[2]	17
Average annual volume removed (acre-feet)	190	110	15
Average DTW (ft)	80	49[2]	144

[1] Well performance statistics based upon 2019 annual reporting.

[2] This well operates when needed based on groundwater flow. This well has only been operated approximately 10 months since2015 and monthly average is for months when pumped in 2019.

Section 4: Bedrock Controls

Down Gradient of Bingham Canyon Waste Rock Disposal Area

Five monitoring wells screened in bedrock act as early warning detection for impacts from Mine impacted water potentially impacting groundwater. The well locations are depicted in Figure 2.

Table 4a: Bedrock Monitoring Wells Summary Information

Well ID	ECG2789 A & B (to be replaced in 2020 with ECG2866)	ECG1100 A & B	K93
Comment	Paleozoic dual completion bedrock well ECG1202 replacement	Paleozoic dual completion bedrock well	Paleozoic-Volcanic Bedrock contact MDG1101 Replacement
General Location	Toe of Bingham Canyon dump	900 feet east of dump toe	2100 feet east of dump toe
Coordinate (state plane 83)	N 7373789 E 1468530	N 7373797 E 1469391.8	N 7373736.3 E 1470610.3
Year built	2009	1994 (mod. 1997)	1968
Surface elevation	5558	5511	5451
Total Depth (ft)	730	861	765
Screen interval (ft)			
A Completion	297 – 337	406 - 426	685 - 765
B Completion	675.7 – 715.7	828 - 857	NA
DTW (ft)			
A Completion	108.2	90.2	14.8
B Completion	108.3	83.4	NA

Table 4b: Permit Limits for Bedrock Compliance Monitoring Wells

Well ID	Screen Lithology	Sampling Frequency	pH	TDS (mg/l)	SO4 (mg/l)	Dissolved Cd (mg/l)	Dissolved Cu (mg/l)	Dissolved Zn (mg/l)
ECG1100A	Bedrock	Semi-annual	6.5-8.50	4148	2581	0.003	0.650	3.01
ECG1100B	Bedrock	Semi-annual	6.50-8.50	391	81	0.001	0.033	1.25
ECG2866A	Bedrock	Semi-annual	TBD	TBD	TBD	TBD	TBD	TBD
ECG2866B	Bedrock	Semi-annual	TBD	TBD	TBD	TBD	TBD	TBD
K93	Bedrock	Semi-annual	6.50-8.50	480	39	0.050	0.100	0.06

Bedrock Contamination Contingency Plan

The purpose of the bedrock monitoring wells is to monitor groundwater conditions relative to historic Dry Fork plume concentrations prior to 2003. The average sulfate concentration in the Dry Fork plume has been known to be 20,000 mg/l. The following contingency measures will be will be used as a guide if the sulfate concentrations in

bedrock as indicated by the above compliance monitoring wells reach historic levels and action levels:

- Evaluate potential risks to human health and the environment.
- Evaluate potential contamination to waters of the state.
- Assess the feasibility and effectiveness of extracting and treating ground water using wells or drains.
- Petitioning of the Water Quality Board for an alternative Corrective Action Concentration Limits consistent with the risks identified.

Corrective Action Plans will be written in accordance with UCA R317-6-6.15 D and submitted for approval to the DWQ upon completion of the Contamination Investigation.

Section 5: Bingham Creek Cut-off Wall

The Bingham Creek COW is a concrete structure which spans Bingham Canyon and is built into volcanic bedrock which has very low permeability. The wall is located approximately 5600 feet down canyon from the toe of the waste rock disposal area as depicted in Figure 2. The wall is designed to capture alluvial water migrating down Bingham Canyon not captured by the alluvial pumping wells up canyon. Water collected at the wall's sump is removed through pumping. Pumping rates fluctuate seasonally and can be dependant upon the effectiveness of the alluvial pumping wells in Bingham Canyon upgradient of the cutoff wall listed in Table 3.

Table 5: Bingham Creek Cut-off Wall Specifications

Site ID	ECP2562
Alias	Bingham Creek COW
General Location	5600 ft down gradient of dump toe
Coordinate (state plane)	N 7373492.5 E 1473938.0
Years in Service	1995 to present
Surface elevation	5353
Total Depth (ft)	110
Pump capacity (gpm)	900 total (2 pumps)
Average Monthly pumping rate	300[1]
Average annual volume removed (acre-feet)	513
Average DTW in sump (ft)	85

[1] Average monthly pumping rate based upon 2019 monthly data.

The Bingham Creek Cut-off wall spans approximately 375 feet across Bingham Creek channel and is approximately 100 feet deep and built into volcanic bedrock. The majority of the alluvial flow comes from the bottom 20 feet of coarse quartzitic gravel immediately above bedrock. Several previous borings/wells into the underlying volcanic bedrock were exposed during the excavation for the wall and water flowed upward from

the bedrock into the excavation area. Head measurements were not conducted on the upgradient flow. Water quality from the upward flow had conductivities measuring less than 2,000 umhos/cm. After the cutoff wall was completed, down gradient monitoring wells completed in alluvium and volcanic bedrock exhibited decreases in sulfate concentrations.

Reporting

Kennecott will follow guidelines set forth by permit # UGW350010 regarding compliance well monitoring and reporting and will be reported on a quarterly basis. Operational sites upgradient of the Dry Fork area will be sampled on an annual basis (if available to sample) for water quality. Operational sites below the Dry Fork area will be sampled on a semiannual basis for water quality. Water flow data, specifically average monthly pumping rates and corresponding annual totals will be tracked throughout the year for operational locations and reported in the annual report as well as associated water quality data.

APPENDIX H

UGW#350010

Operations & Maintenance Manual East Waste Rock Extension Water Collection System

Contents

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SECTION 1

Context and Purpose

1.1 Context

Rio Tinto Kennecott Copper (RTKC) and its Bingham Canyon Mine are required to effectively manage waste rock contact water (WRCW) and the discharge to groundwater, surface water, sediment and debris associated with the waste rock dumps on property. These requirements are outlined in Section 5 under the applicable permits associate with the operation. The agencies and permits are listed in Table 1.

Table 1-1. Applicable operating permits related to groundwater and surface water management

Agency	Permit
Utah Department of Environmental Quality - Division of Water Quality	Groundwater Discharge Permit No. UGW350010 Bingham Canyon Mine and Water Collection System
Utah Department of Environmental Quality - Division of Water Quality	UPDES Permit No. UT0000051 Storm Water Pollution Prevention Plan
Utah Department of Natural Resources - Division of Oil, Gas and Mining	Permit No. M/035/0002 Mining and Reclamation Plan

In order to best meet obligations to the public and regulatory agencies specifically related to the East Waste Rock Extension (EWRE) (Figure 1-1), an integrated system of toe drains, detention basins, cut-off walls and conveyance lines were constructed throughout 2015 and 2016 (Figures 1-2, 1-3, 1-4). The effort was completed to accommodate continuation of mining and waste rock placement while carefully managing the surface and groundwater capture and conveyance.

1.2 Purpose

This Operations and Maintenance (O&M) manual is designed to provide the operator with clear instructions and reference material for the proper care and upkeep of the EWRE project groundwater and surface water control infrastructure.

1.3 Disclaimer

This operation and maintenance manual was created to (1) fulfill the construction permit condition for the EWRE project which requires an O&M manual in order to operate the system, and (2) provide general guidance to the South Area Water Services (SAWS) operators and maintenance staff as part of the handover of the newly constructed capture system. This manual is applicable only to the infrastructure associated with the EWRE project.

SECTION 2

Design and Operation

2.1 Overview of EWRE Water Collection System

The EWRE water collection system affectively captures WRCW through a toe drain system on top of low-permeable bedrock and directly at the toe of the relaxed waste rock slope. The WRCW is moved by gravity through HDPE pipes and lined concrete structures. Secondary containment of all WRCW conveyance is in place down gradient of the cut-off walls to minimize the potential for a release of WRCW to the environment. The system is also designed to capture surface water (up to a 100 year-24-hour event) off of the face of the waste rock dump.

Key features of the EWRE water collection system include the following:

- The system captures surface and alluvial water (groundwater) up gradient of the cut-off walls; WRCW reporting to the toe of the waste rock is collected in subsurface toe drains filled with coarse quartzite, keyed into bedrock, and conveyed in a system of HDPE pipes (double contained down gradient of the cut-off wall) separate from surface water.
- The toe drain is the primary collection point for WRCW and the cut-off wall acts as the secondary collection point in the event the toe drain under performs.
- WRCW from the toe drains and all drainages from Copper 4 to Midas is transported via gravity to the Midas Pump Station (MPS), and then pumped to the existing ACC plant for copper recovery.
- The cut-off wall locations permit gravity flow from the cut-off wall collection piping via the down gradient collection system piping.
- Secondary containment and leak detection exists for all WRCW piping and structures down gradient of the cut-off walls.
- Storm water is collected in detention basins and released slowly to the storm water piping system so as not to overwhelm the associated piping and concrete lined canal.
- WRCW and storm water flows are recorded on data loggers using weirs, flumes and level indicators.
- WRCW water samples can be collected at the weir boxes.

A conceptual representation of the EWRE water collection system design is shown in Figure 2-1.

The collection system is described from top to bottom.

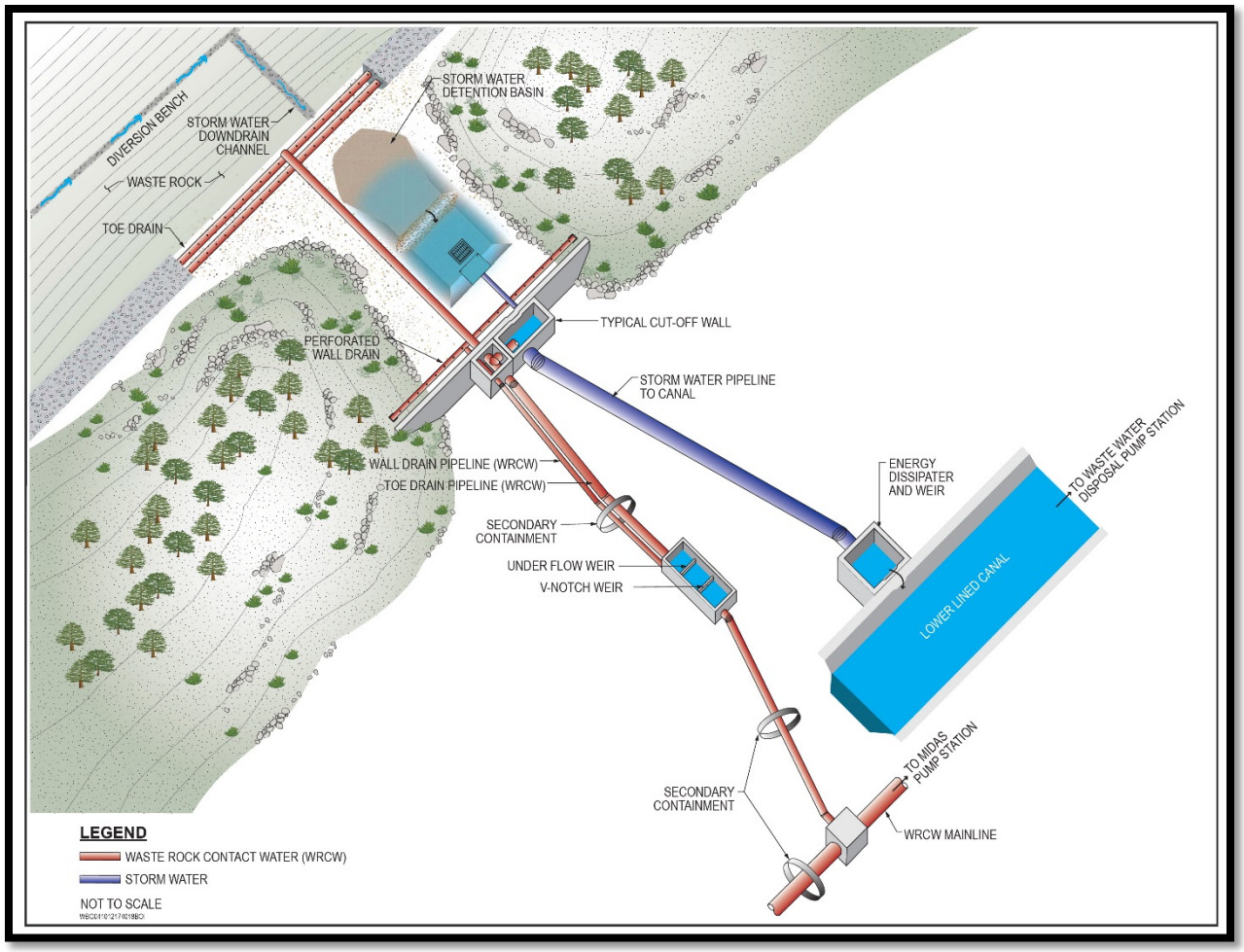


Figure 2-1. EWRE water collection system schematic (typical).

2.2 Typical Component Designs for the EWRE Water Collection System

The photographic representation of the typical water capture system components for the EWRE are shown on Figure 2-2. Specific details of the typical EWRE water collection system components are presented below.

2.2.1 Toe Drains

The toe drains are designed to intercept waste rock contact water (WRCW) moving along the bedrock contact as it reports directly from the toe of the waste rock. The toe drains are composed of two parallel, 12-inch-diameter perforated corrugated HDPE pipes placed along the lower permeability layer at the bedrock contact. There are three types of toe drains:

- Type 1 is a more robust design, clay down on the down gradient side of the toe drain is 8 feet thick, and was used primarily at drainage bottoms in the collection system where flow reporting from the waste rock is anticipated to be greatest and in cases where slope parallel with the toe drain is < 1% (Figure 2-3).
- Type 2 was used throughout the majority of the collection system and where flow from waste rock is anticipated to be less active and/or significantly diminished or slopes are ≥ 1%. Clay down gradient of the toe drain is 2 feet thick (Figure 2-3).

- Type 3 was used on steep slopes greater than 45 degrees and incorporated no imported clay. Type 3 was used where constructability of Type 2 toe drains was not achievable (Figure 2-4).

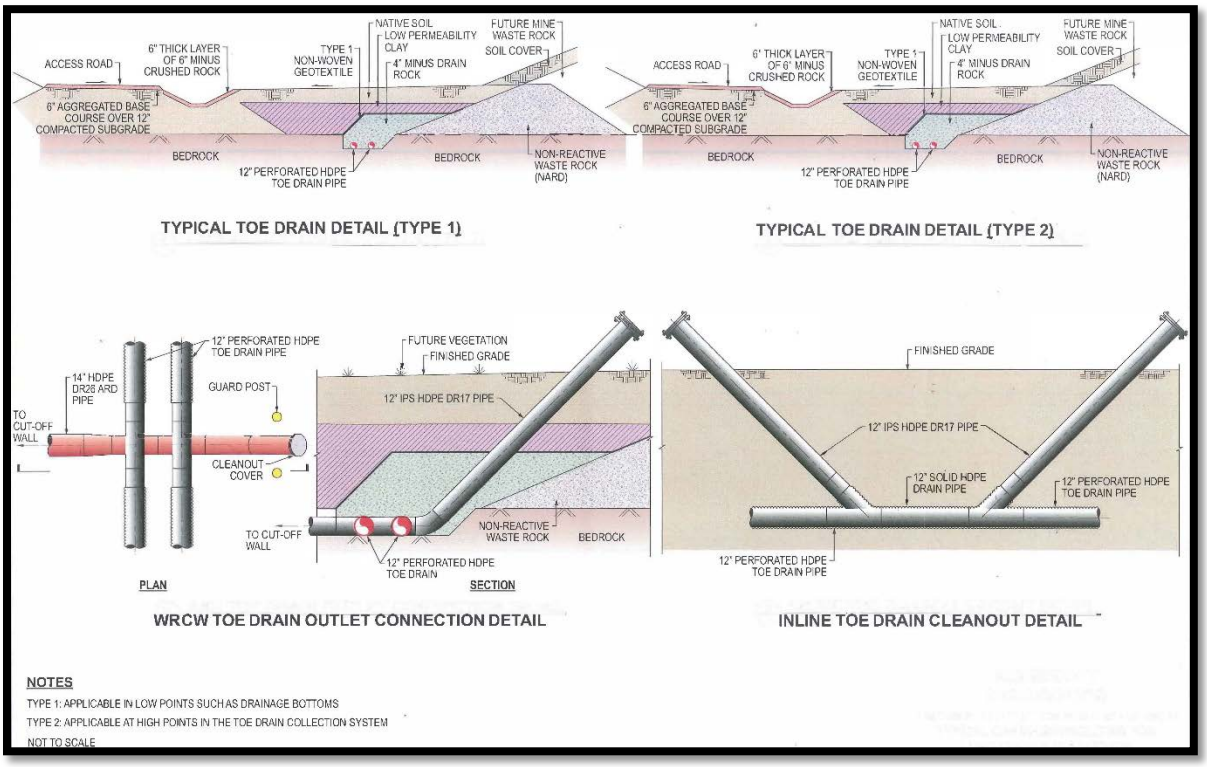
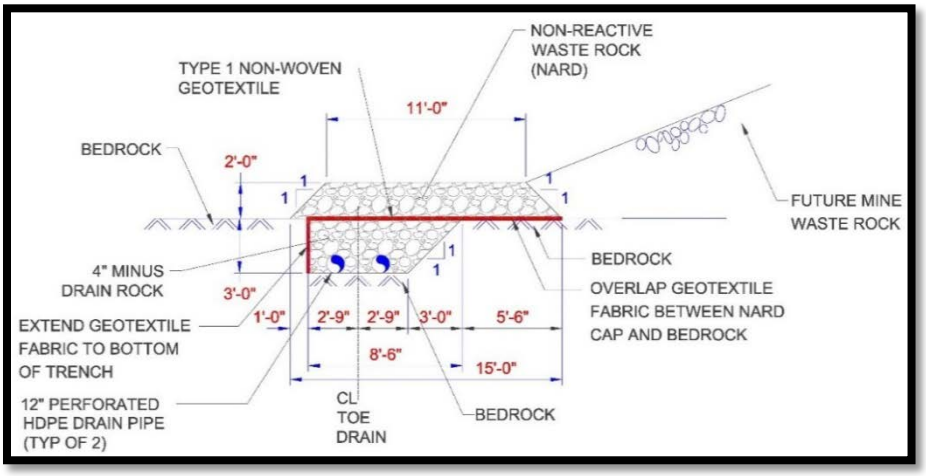


Figure 2-3. Type 1 and Type 2 toe drain details.



Note: This toe drain detail is applicable to ground slopes greater than 1:1 (45˚), such as the south slope of the Lost Creek drainage and the south slope of the Keystone drainage.

Figure 2-4. Type 3 toe drain detail.

Within each drainage basin, the perforated 8” toe drain piping connects to a solid wall 14-inch-diameter HDPE conveyance pipeline. This piping extends down gradient from the toe drain through the cut-off wall and reports to a collection weir box. Two oblique angled 14-inch-diameter capped HDPE pipe cleanouts are located approximately every 500-feet of toe drain, in addition to the cleanouts at branch connection. Photographs of the completed and ‘in construction’ toe drain are shown in Figures 2-5 and 2-6, respectively.

Figure 2-5. Typical toe drain showing clean-outs, rip-rap surface water ditch and the access road.

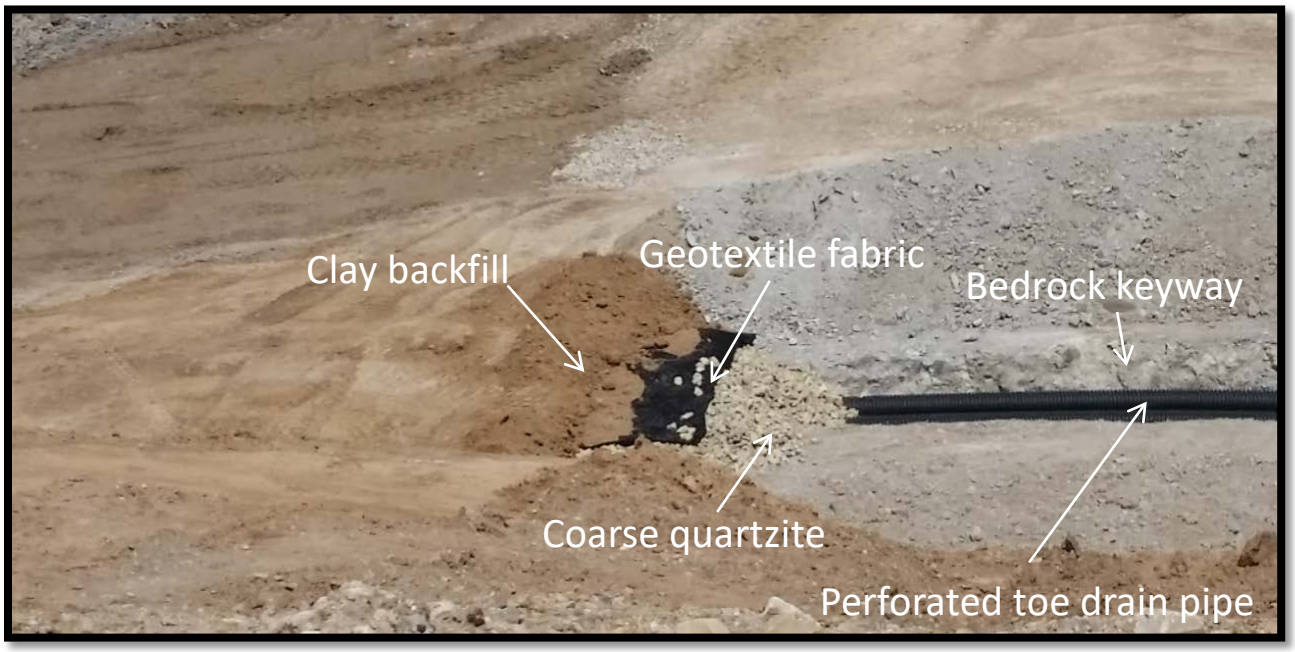


Figure 2-6. Typical toe drain under construction.

Upstream of the toe drain are finger drains built with coarse non-acidic (non-reactive) rock (quartzite) drainage (NARD) material. In most cases, the coarse quartizte fingers drains were keyed into bedrock; however, in a few locations, the finger drains were placed in drainage lows once all soils were removed to bedrock. The locations of the coarse quartzite finger drains are illustrated on the EWRE Geology, Seeps and Springs Map (Appendix A).

2.2.2 Storm Water Detention Basins

Storm water detention basins are located in all drainages associated with EWRE. The size of each detention basin was determined based on the modeled peak storm water flow rates reporting from the waste rock face. Basic design criteria used is based on a 100-year, 24-hour storm event and the planned, reclaimed waste rock and site topography. At a minimum, the storage provided in each detention basin will be sufficient to detain the estimated peak storm volume (Table 2-1).

The detention basins are designed to drain to a topographic low point, and are bounded at the inlet by a pervious rock embankment approximately 6 feet tall designed to capture sediment and debris. A primary outlet box is located at the basin's topographic low point. The detention basin is designed to drain in a 24-hour period. The primary outlet box is generally 4 feet tall, and includes a variably-sized inlet orifice (Table 2-1), a fiberglass top grate, and a 24-inch-diameter HDPE outlet pipe. The primary outlet box directs storm water into a 24-inch-diameter HDPE outlet pipe through the cut-off wall storm water collection vault and ultimately the canal. In the event the outlet box fails or cannot keep up with a given storm event, the detention basin embankment contains an emergency overflow (between 4 and 9 feet above the basin floor), which directs storm water via a pervious rip rap rock spillway to a second grated inlet on the wet-side of the cut-off wall.

The detention basins are slightly oversized to accommodate sediment buildup, and include a staff gauge near the topographic low to visually monitor sediment accumulation.

Table 2-1. Storm water detention basin dimensions

Basin	Basin Volume (acre-feet)	Average Basin Depth (feet)	Basin Floor Elevation (feet)	Outlet Box Top Elevation (feet)	Emergency Overflow Weir Elevation (feet)	Berm Top Elevation (feet)
Copper 4	6.3	6.7	5,635	5,642	5,644	5,645
Copper 3	1.9	3.3	5,635	5,639	5,640	5,641
Copper 2	2.8	5.7	5,610	5,617	5,618	5,620
Copper 1	2.3	4.3	5,603	5,607	5,608	5,610
Lost Creek	1.9	5.4	5,578	5,585	5,686	5,588
Keystone Upper	0.9	5.1	5,554	5,563	5,564	5,566
Keystone Lower	2.6	5.8	5,534	5,541	5,542	5,544
North Keystone	5.6	3.8	5,560	5,565	5,566	5,568
South Crapo	4.1	3.8	5,549	5,553	5,554	5,556
Crapo	1.9	4.4	5,525	5,532	5,533	5,535
South Congor	3.4	4.2	5,530	5,534	5,535	5,538
Midas	7.4	3.7	5,540	5,544	5,545	5,547

2.2.3 Cut-Off Walls

The cut-off walls are designed to serve as a secondary capture system for alluvial groundwater, with the toe drains functioning as the primary capture system. Figure 2-7 shows a typical cut-off wall in cross section.

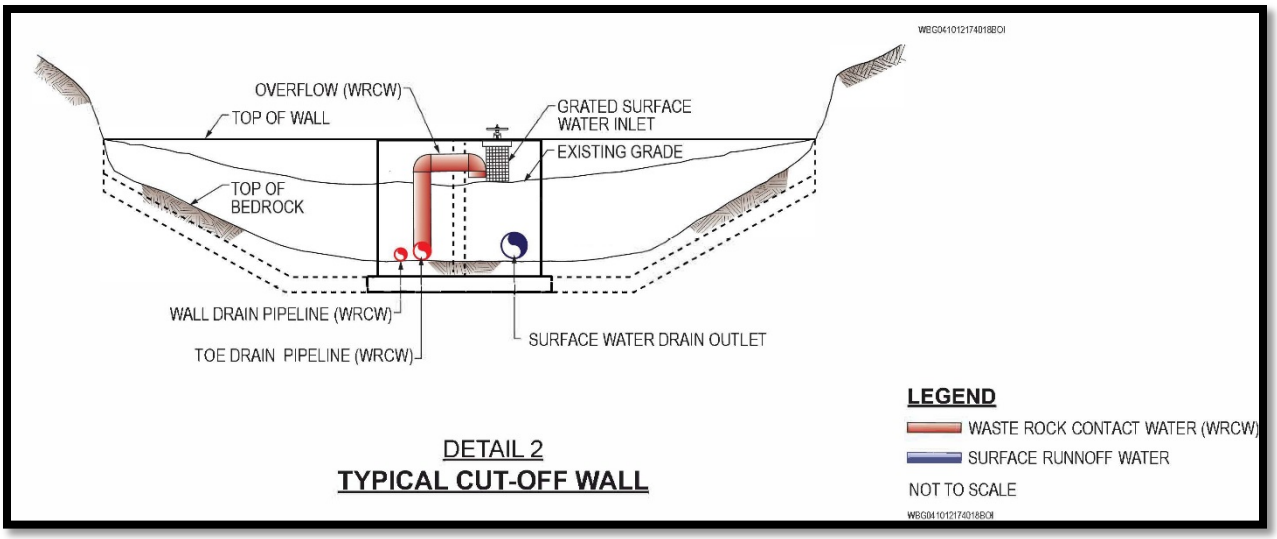


Figure 2-7. Typical cut-off wall.

Cut-off walls are located in each of the major drainages (Figures 1-2, 1-3, 1-4), and are keyed into bedrock for structural support and to enhance capture effectiveness. Additionally, the upgradient wet-side of the cut-off walls are protected from WRCW by a HDPE liner.

Three pipes pass through each cut-off wall:

1. A French drain with a perforated 8-inch-diameter HDPE pipe runs parallel to the base of each cut-off wall, along the surface of the bedrock. This French drain captures WRCW originating between the toe drain and the cut-off wall or WRCW in the event the toe drain under performs. The 8-inch-diameter HDPE pipe, passes through the valve vault at the cut-off wall, becomes double contained inside a 12-inch-diameter HDPE pipe at the cut-off wall and gravity drains to the weir box.
2. The 14-inch-diameter HDPE pipe from the toe drain, passes through the valve vault at the cut-off wall, becomes double contained inside a 24-inch-diameter HDPE pipe at the cut-off wall and gravity drains to the weir box.
3. The 24-inch-diameter HDPE pipe from the storm water detention basin outlet structure enters the cut-off wall storm water vault, passes through the storm water vault to exit via another 24-inch-diameter HDPE pipe, and gravity drains to the lower concrete lined canal. The water can be diverted to the storm water line in the event the 14-inch-diameter WRCW line requires repair (Figure 2-8).

Storm water arriving at the cut-off wall via the spillway overflows into the storm water vault, and is then carried through the cut-off wall and downgradient to the lower concrete lined canal via a 24-inch diameter HDPE pipe. Before storm water enters the canal, it passes through either a weir box or flume where flow is measured.

Figure 2-8. (A) WRCW by-pass valve located in each cut-off wall; (B) manipulated with valve tool; (C) valve tool attaches to valve stem for manipulation.

2.2.4 Weir Boxes

Waste rock contact water from the toe drain and the cut-off wall are comingled in weir boxes. A weir box is an HDPE lined concrete structure that includes a baffle for stilling the water, a V-notch weir (Figure 2-9) and level indicator for flow measurement, leak detection, and a data logger.

On the upgradient side of the weir box, WRCW reports from the 14-inch-diameter HDPE pipe from the toe drain (double contained within a 20-inch-diameter HDPE pipe) and the 8-inch-diameter HDPE pipe from the base of the cut-off wall (double contained within a 12-inch-diameter HDPE pipe). On the downgradient side of the weir box, a 14-inch-diameter HDPE pipe (double contained in a 20-inch-diameter HDPE pipe) of combine WRCW gravity drains to the WRCW main line.

Leak detection is located outside of the weir box in three (visible) vertical 18-inch-diameter HDPE pipes (Figures 2-10 and 2-11). The three 18-inch-diameter leak detection inspection pipes are connected to the secondary WRCW pipes and concrete weir box via 3-inch HDPE pipes. Signage in the field indicates which leak detection 18-inch-diameter HDPE pipe correlates to which respective pathway.

The real-time flow datalogger collects flow data at the V-notch weir or flume. The datalogger and digital station are powered by a solar panel (Figure 2-11). Data acquisition is acquired manually at the data logger (Figure 2-12).

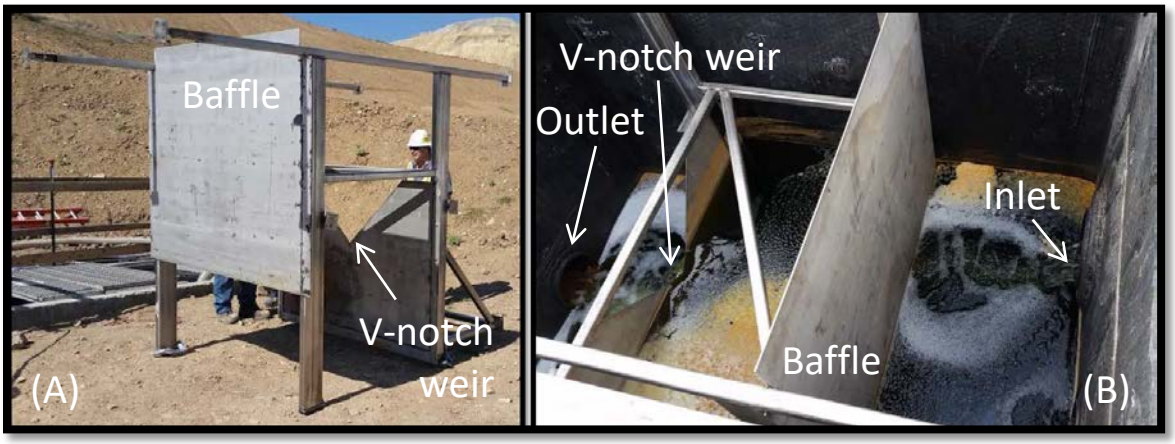


Figure 2-9. (A) Space frame with baffle and V-notch; (B) weir Box with space frame.

Figure 2-10. Lost Creek-Keystone weir box and carrier pipe leak detection.

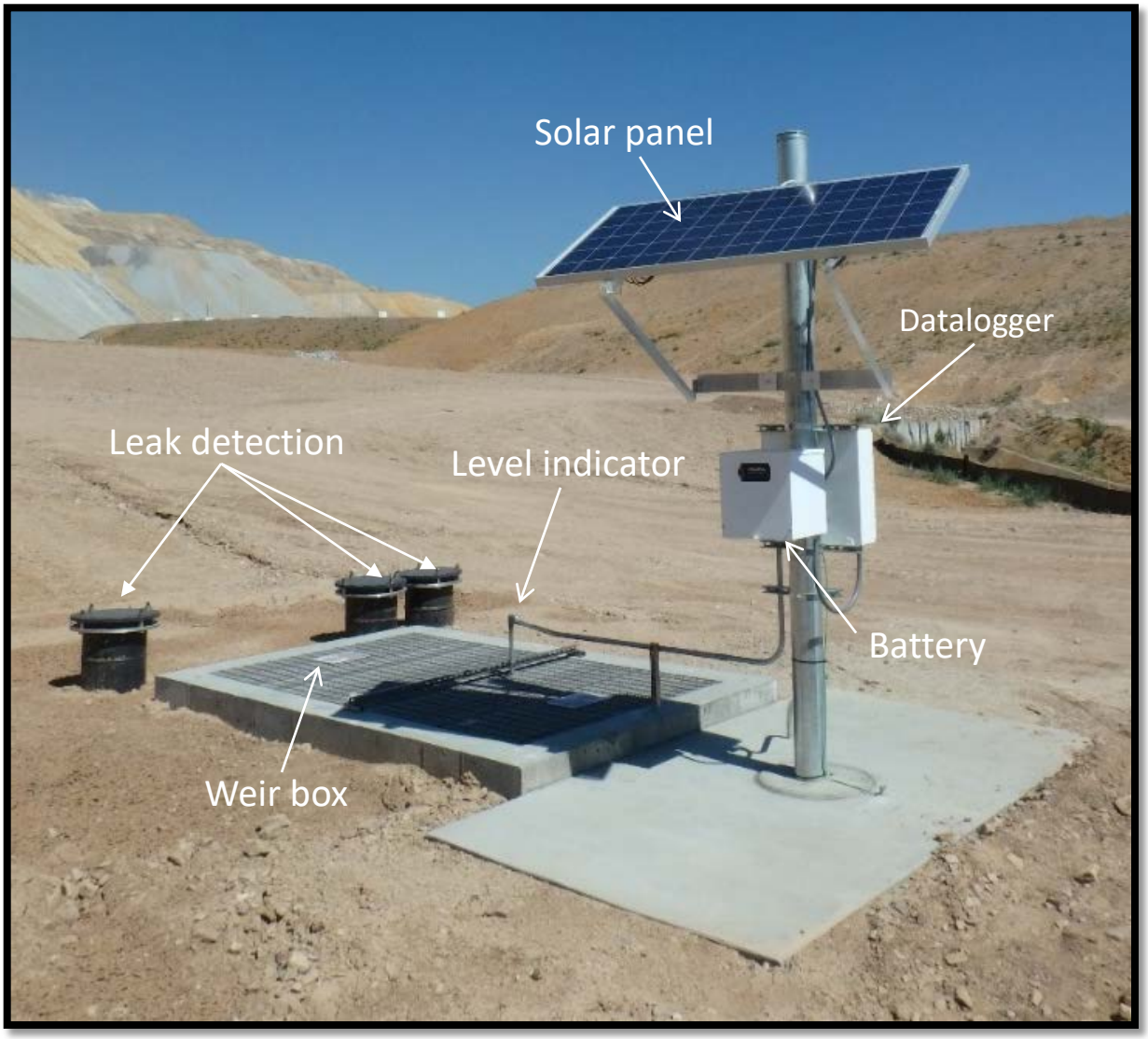


Figure 2-11. Photograph of a newly constructed weir box and auxiliary components.

Bolt penetrations through the weir liner are problematic to seal. A space frame (Figure 2-9A) was used to eliminate the need to penetrate the liner in order to mount the baffle and v-notch plates.

If water is found in the leak detection sumps, test water quality to determine if it matches WRCW characteristics and to rule out malfunctioning leak detection piping as displayed in Figures 2-10 and 2-11.

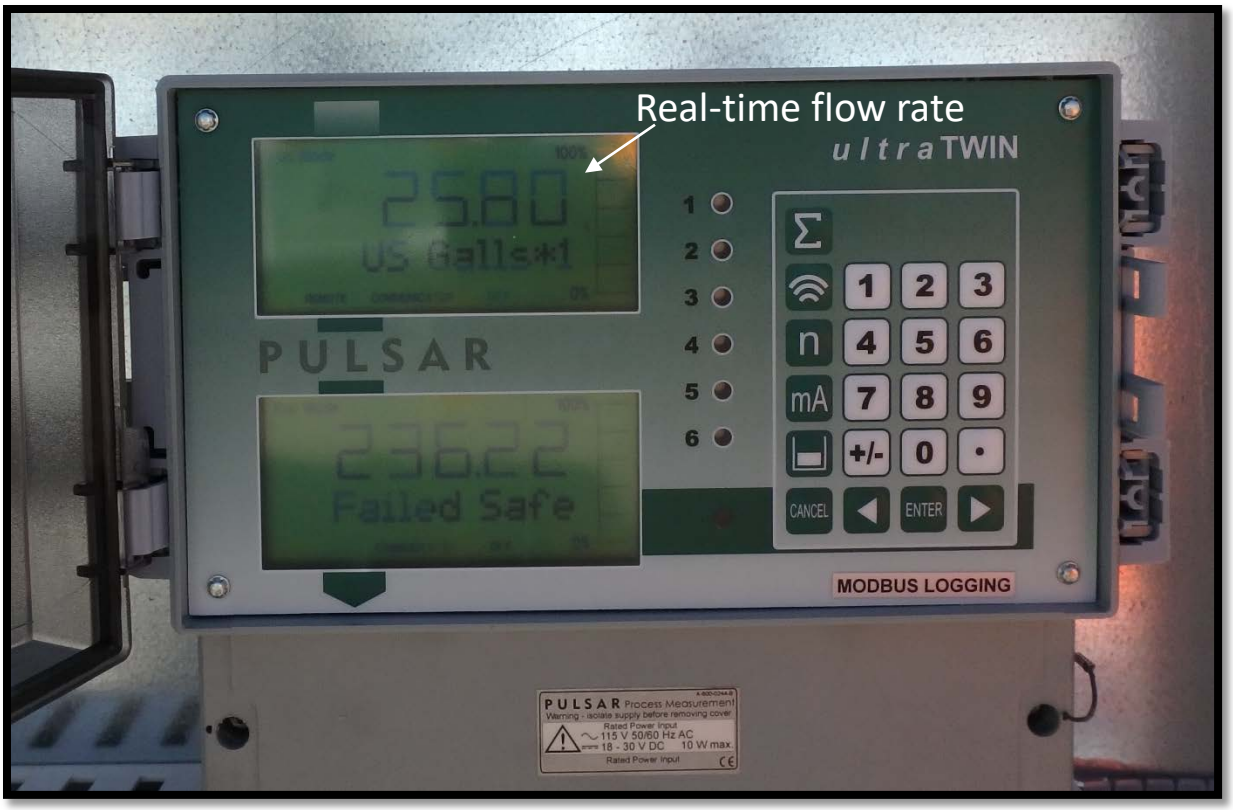


Figure 2-12. Typical datalogger display showing real-time flow rate through the weir V-notch.

2.2.5 Storm Water Weir/Flume and Lower Concrete Lined Canal

Water reporting from storm water detention basin outlet boxes is conveyed via 24-inch-diameter HDPE pipe through the cut-off walls to the lower concrete lined canal, which ultimately conveys flow to Zone 2 of the Large Reservoir. Storm water weirs and flumes with level indicators are present where the 24-inch-diameter HDPE pipe connects to the lower concrete lined canal. In some instances, the new system used historic existing branch canals. The lower concrete lined canal originates in the Copper 3 drainage (Figure 1-2). The EWRE system ties into the south dumps at the South Area Drainage (SAD) box. Storm water exits the SAD box via a 36-inch-diameter HDPE storm water overflow line. The line increases in diameter to a 42-inch line at the Copper 4 drainage. The Copper 4 drainage does not have a means of flow measurement and is connected via hard pipe at the Copper 4 deep branch connection. Water from south dumps and the Copper 4 drainage enter the lower concrete lined canal at an outlet box at the head of the canal. The canal is sized to manage storm water from all EWRE basin simultaneously during a 24-hour 100-year event.

2.2.6 Branch Connection Vault and WCRW Main Line

The WRCW branch connection vaults are situated parallel to the storm water main line and lower concrete lined canal, and receive WRCW from the dual contained 14-inch-diameter HDPE branch line(s) (Figure 2-13). The branch lines tie into the 16-inch-diameter HDPE WRCW main line pipe (double contained within a 24-inch-diameter HDPE pipe). This 16-inch-diameter HDPE pipe diameter increases in diameter to 24-inch at the Crapo branch connection vault.

A typical branch connection vault is accessible via a metal hatch (Figure 2-13). Dual containment of the WRCW main line

Opening the hatch and exposing the opening in the lid of the box **will require fall protection**.

Entering the vault will require conformance with **confined space entry** protocol.

and the weir box branch connection drain directly into the branch connection vault; thus, water flowing into the branch connection vault is indicative of a leak in the respective conveyance piping.

Many branch connection vaults contain automated leak detection sensor that are connected to strobe lights on the associated weir box datalogger station for the respective drainage basin. In the case of branch connection vaults that are located in close proximity to one another, such as Crapo and South Crapo, only one leak detection strobe is used per datalogger. A leak from a secondary pipe will enter the vault triggering the strobe once water comes in contact with the sensor. Water will continue down the secondary pipe associated with the outlet triggering each downstream probe as the water accumulates.

The main line pipe conveys WRCW from the EWRE water collection system, as well as flows from the existing system south of Copper 4, to the Midas Pump Station (MPS). The WRCW main line pipe is buried, and is located parallel to and adjacent to the existing lower concrete lined canal (Figures 1-2, 1-3, and 1-4).

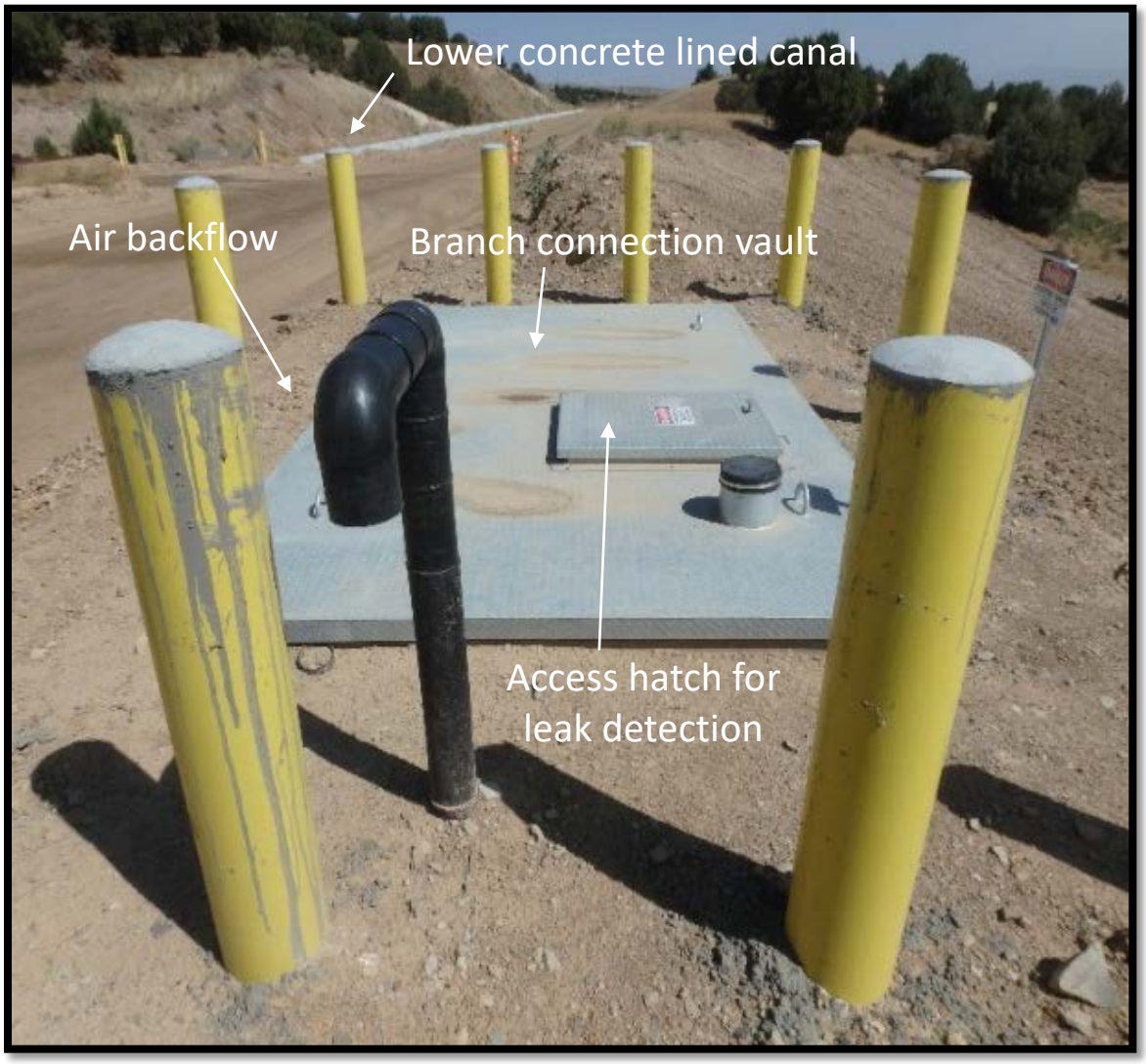


Figure 2-13. Photograph of a newly constructed WRCW branch connection vault.

2.2.7 Settling Basin

The WRCW Mainline terminates in the settling basin (Figure 2-14). The settling basin also receives inflow directly from the comingled flows of South Congor, Midas and the Old Bingham Tunnel (OBT). From the settling basin, the WRCW is conveyed to the MPS. In the event the MPS cannot receive additional

WRCW, WRCW in the settling basin can be diverted directly to the lower concrete lined canal. The settling basin also has a fail-safe overflow pipe that directs water to the lower concrete lined canal in the event the outlets of the settling basin are plugged or malfunctioning, thus preventing WRCW spills to ground. The settling basin is also equipped with leak detection for the HDPE liner, as well as the WRCW piping reporting to the settling basin.

Sediment accumulation in the settling basin is estimated to be considerable in the first one to two years of operation as the WRCW collection system (e.g., finger drains, toe drain, piping,) rinses free of fine sediment. Further guidance is provided in Section 3.2.10.

Figure 2-14. The WRCW Mainline terminates in the settling basin; from the settling basin, WRCW is conveyed to the Midas Pump Station.

Piping for specific components of the EWRE water collection system are detailed in Table 2-2. The table describes the function of each pipe, as well as the pipe diameter and dual lining diameter (if applicable). Figure 2-15 is a design drawing detailing the typical and atypical components of the EWRE water collection system.

Table 2-2. East Waste Rock Extension water collection system conveyance description and size

EWRE Water Collection Piping	Description of Piping	Pipe Diameter (inches)	DR Rating	Dual Lining Diameter (inches)	DR Rating
Toe Drain Pipe	Two parallel perforated HDPE pipes; union at tow drain branch connection	12	17	None	None
Toe Drain Clean Out Pipes	Two oblique capped HDPE pipes; each attached to single toe drain pipe	12	17	None	None
Toe Drain Branch Connection Pipe	Solid wall HDPE pipe; transitions at cut-off wall	14	26	None	None
Storm Water Outlet Box Inlet Orifice	Upgradient penetrating port through concrete	See Table 2-1	N/A	None	None
Storm Water Outlet Box Outlet Pipe	Downgradient penetrating pipe through concrete; terminates at storm water vault and lower concrete lined canal	24	26	None	None
Cut-off Wall French Drain Pipe	Perforated HDPE pipe; transitions at cut-off wall	8	26	None	None
Toe Drain WRCW from Cut-off Wall to Weir Box	Solid wall HDPE pipe; terminates at weir box	14	26	20	32.5
Cut-off Wall WRCW to Weir Box	Solid wall HDPE pipe; terminates at weir box	8	26	12	32.5
Weir Box Outlet Pipe	Solid wall HDPE pipe; terminates at branch connection vault	14	26	20	32.5
Branch Connection Vault Inlet from Weir Box	Solid wall HDPE pipe	14	26	20	32.5
Branch Connection Vault Outlet (WRCW main line upgradient of Crapo)	Solid wall HDPE pipe; terminates at settling basin	16	26	24	32.5
Branch Connection Vault Outlet (WRCW main line downgradient of Crapo)	Solid wall HDPE pipe; terminates at settling basin	24	26	36	32.5
Storm water main line from SAD box to Copper 4	Solid wall HDPE pipe	36	17	None	None
Storm water mainline from Copper 4 to lower concrete lined canal	Solid wall HDPE pipe	42	26	None	None

2.3 Atypical Designs of the EWRE Water Collection System

While the majority of the components present in each drainage are constructed identically, there are a few distinct differences within the drainages. These atypical design components are summarized in Table 2-3, and described in subsequent sections below.

Table 2-3. Atypical designs of the EWRE water collection system

Drainage	Unique Feature
Copper 4 (Section 2.3.1)	Storm water branch line ties into storm water mainline at storm water branch connection; no weir is present.
Copper 3 (Section 2.3.2)	Storm water branch line ties into canal at head of canal through pre-existing flume.
Copper 2 (Section 2.3.3)	1. Two toe drain branch lines report to the cut-off wall. 2. Storm water branch line ties into pre-existing branch canal and comingles with Copper 1 storm water flow; flow measured at pre-existing flume. 3. Branch vault leak detection light located on the Copper 1 datalogger station
Copper 1 (Section 2.3.4)	Storm water branch line ties into pre-existing branch canal and comingles with Copper 2 storm water flow; flow measured at pre-existing flume.
Lost Creek (Section 2.3.5)	1. WRCW branch lines comingle at Lost Creek/Keystone weir for one combined flow. 2. Storm water passes under Mine Access Road via HDPE pipe to storm water detention basin. 3. Commingled Lost Creek-Keystone storm water enters at pre-existing flume
Keystone (Section 2.3.5)	1. WRCW branch lines comingle at Lost Creek/Keystone weir for one combined flow. 2. Storm water passes under Mine Access Road via HDPE pipe to storm water detention basin. 3. Commingled Lost Creek-Keystone storm water enters at pre-existing flume 4. There are two detention basins in the drainage straddling the Bingham Tunnel
North Keystone (Section 2.3.6)	1. Finger drain of NARD material located west of Mine Access Road collects WRCW; this finger drain leads to HDPE pipe that passes under the Mine Access Road. The HDPE pipe under Mine Access Road opens into another NARD drain east of the Mine Access Road; this NARD drain leads to the toe drain. 2. Surface water from the Mine access road is captured in a rip rap basin and routed under the road, past the toe drain and reports to the detention basin. Care to properly abandon this pipe will be required before the waste rock is placed in this location to prevent the transport of WRCW across the toe drain.
South Crapo (Section 2.3.7)	None
Crapo (Section 2.3.8)	1. Storm water branch line ties into pre-existing branch canal; flow measured through pre-existing flume. 2. Storm water routed under the toe drain road via culvert. 3. The WRCW main line increases in pipe diameter from 16-inch-diameter to 24-inch-diameter 4. At branch connection diversion located downgradient of the Crapo branch connection vault permits WRCW to be segregated from the WCRW main line into the lower concrete lined canal.

South Congor (Section 2.3.9)	1. WRCW branch lines comingle at South Congor/Midas weir for one combined flow, which also includes flow from Old Bingham Tunnel. The flow from the Old Bingham Tunnel enters the weir below the V-Notch. No leak detection for flow from the Old Bingham Tunnel. 2. Combine WRCW flow goes direct to Settling Basin and not WRCW Mainline. 3. Storm water combined for South Congor and Midas; flows combine at weir.
Midas (Section 2.3.9)	1. WRCW branch lines comingle at the South Congor/Midas weir for one combined flow. 2. WRCW flow out of the weir box includes flow from the Old Bingham Tunnel (OBT). The OBT flow is not accounted for in the combined South Congor/Midas flow as OBT flow enters the weir box below the V-Notch. There is no leak detection for the OBT conveyance pipe. 3. Combine WRCW flow goes direct to Settling Basin and not WRCW Mainline. 4. Storm water combined for South Congor and Midas; flows combine at weir.

Structure	Unique Feature
WRCW Branch Vault (Station 2134+00) (Section 2.3.10)	1. Valve to divert WRCW to lower concrete lined canal.
South Area Dumps (SAD) Box (Section 2.3.11)	1. 16-inch-diameter pipe with 6-inch-diameter orifice accepts base flow (approximately 100 gallons per minute) water from the South Area Dumps. 2. Portal to access 32-inch-diameter HDPE WRCW pipe and insert “pig.”
Storm Water Inlet Structure at Canal (Section 2.3.12)	1. Energy dissipation structure that directs water from the 42-inch-diameter storm water pipe into the canal in the Copper 3 drainage.
Lower concrete lined canal (Section 2.3.13)	1. Curbing to extend top of canal near Copper 1 and Copper 2, where a flat grade of less than 1%.

2.3.1 Copper 4

Appendix B provides a photo log documenting the construction process of the Copper 4 drainage.

The one unique feature of the Copper 4 drainage basin is the following:

1. There is no storm water weir in the Copper 4 drainage; rather, the 24-inch-diameter HDPE storm water branch line ties directly into the 42-inch-diameter storm water mainline via a branch connection.

2.3.2 Copper 3

Appendix B provides a photo log documenting the construction process of the Copper 3 drainage.

The one unique feature of the Copper 3 drainage basin is the following:

1. Storm water in the Copper 3 drainage connects to the lower concrete lined canal through a pre-existing storm water flume, shown in Figure 2-16.

Figure 2-16. Storm water in the Copper 3 drainage connects to the lower concrete lined canal through a pre-existing storm water flume.

2.3.3 Copper 2

Appendix B provides a photo log documenting the construction process of the Copper 2 drainage.

The two unique features of the Copper 2 drainage basin are the following:

1. The Copper 2 cut-off wall is unique in that two branch lines from the toe drain report to the cut-off wall. This is due to two low-elevation sections in the toe drain above the Copper 2 drainage basin. The two toe drain branch lines comingle below the wall in a single branch connection to the Copper 2 weir box.
2. The Copper 2 storm water branch line and the Copper 1 storm water branch line connect in a storm water vault upgradient of a pre-existing branch canal (Figure 2-17) to the lower concrete lined canal. The comingled flow of Copper 2 and Copper 1 storm water flow is measured with a data logger installed in a pre-existing flume.

Figure 2-17. Copper 2 and Copper 1 storm water branch canal.

2.3.4 Copper 1

Appendix B provides a photo log documenting the construction process of the Copper 1 drainage.

The one unique feature of the Copper 1 drainage basin is the following:

1. The Copper 1 storm water branch line and the Copper 2 storm water branch line connect in a storm water vault upgradient of a pre-existing branch canal (Figure 2-17) to the lower concrete lined canal. The comingled flow of Copper 1 and Copper 2 storm water flow is measured with a datalogger installed in a pre-existing flume.

2.3.5 Lost Creek and Keystone

Appendix B provides photo logs documenting the construction process of the Lost Creek and Keystone drainages.

The Lost Creek and Keystone drainages basins are steeply incised drainages separated by a relatively narrow ridge. As such, the drainage basins are near to each other, and share three atypical design features. The three unique features of the Lost Creek and Keystone drainage basins are the following:

1. The WRCW branch lines from each respective cut-off wall comingle at a shared Lost Creek and Keystone weir box. As such, there are four dual-contained input pipes in the stilling portion of the weir box, five leak detection pipe surrounding the shared weir box, and the datalogger measures combined Lost Creek and Keystone WRCW flow through the V-notch.
2. Storm water and WRCW from upgradient portions of each respective drainage basin is conveyed under the Mine Access Road through a 24-inch-diameter HDPE pipe, and a 14-inch-diameter HDPE pipe, respectively. The 24-inch-diameter HDPE pipes drain into energy dissipation channels immediately upgradient of each respective storm water detention basin (Figures 2-18 and 2-19), and

the WRCW 14-inch-diameter HDPE pipe continues to the cut-off wall. The conveyance pipes under the MAR were installed through directional drilling boreholes.

3. The combined flow of the Lost Creek and Keystone storm water branch lines is measured with a datalogger installed in the pre-existing Lower Keystone flume that drains to the lower concrete lined canal.

Figure 2-18. Lost Creek drainage directional boring outlet.

Figure 2-19. Keystone drainage directional boring outlet.

4. Two detention basins were constructed in the Keystone drainage in an effort to avoid construction and impounding water atop the Bingham Tunnel (Figure 2-20). As a result, additional concrete inlet and outlet structures are incorporated into the surface water conveyance structures which are not typical of other EWRE detention basins.

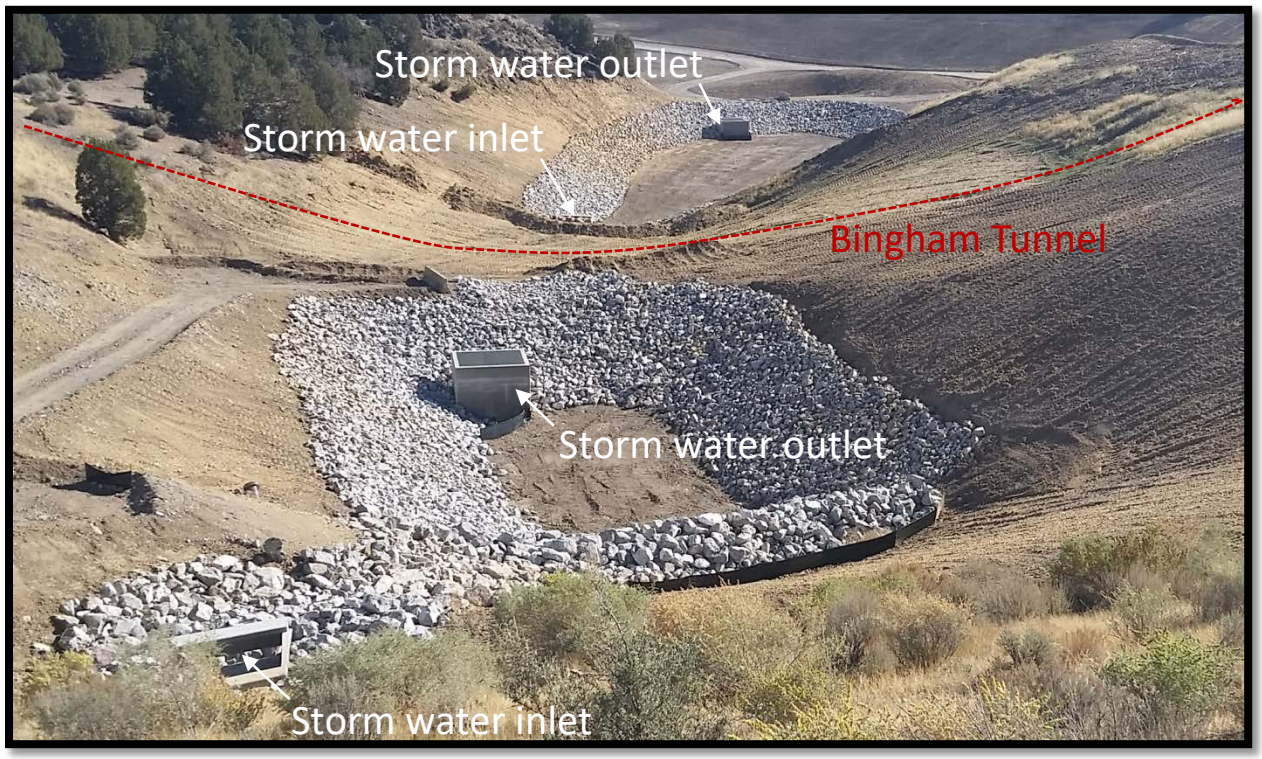


Figure 2-20. Keystone detention basins straddling the Bingham Tunnel.

2.3.6 North Keystone

Appendix B provides a photo log documenting the construction process of the North Keystone drainage.

The one unique feature of the North Keystone drainage basin is the following:

1. West of the Mine Access Road, in the upgradient portion of the North Keystone drainage basin, a coarse quartzite finger drain was installed to collect WRCW. This finger drain leads to a 14-inch-diameter HDPE pipe, which conveys the WRCW under the Mine Access Road. The 14-inch-diameter HDPE pipe opens into another coarse quartzite finger drain east of the Mine Access Road (Figure 2-21), which directs WRCW flow toward the North Keystone segment of toe drain.
2. The surface water drain moves water off the Mine Access Road, past the toe drain and into the North Keystone detention basin. The surface water conveyance pipe (Figure 2-22) will be covered by waste rock as part of the EWRE dump footprint, at which time the pipe will act as WRCW conveyance.

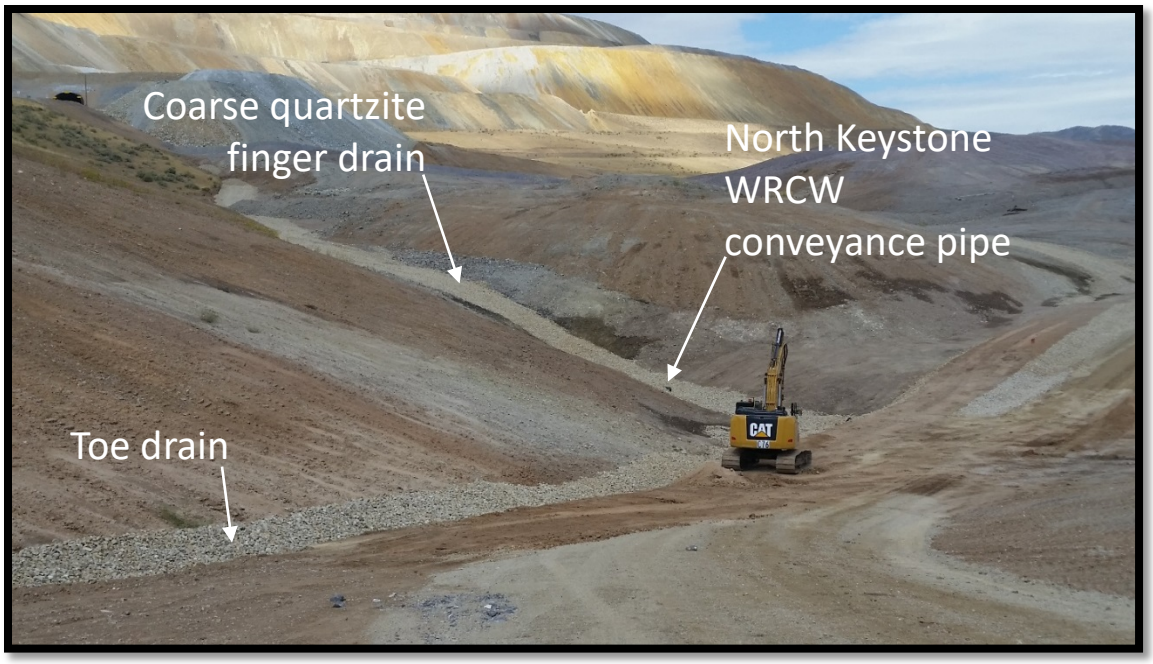


Figure 2-21. Photograph showing the 14-inch-diameter HPDE pipe conveying WRCW under the Mine Access Road in the North Keystone drainage basin. The coarse quartzite finger drain directs WRCW flow toward the North Keystone segment of toe drain.

IMPORTANT

The North Keystone storm water conveyance pipe must be properly abandoned in order to ensure WRCW is not conveyed across the toe drain and water collection system.

Figure 2-22. The North Keystone storm water conveyance pipe will eventually be covered by waste rock and will require proper abandonment to ensure effective WRCW capture.

2.3.7 South Crapo

Appendix B provides a photo log documenting the construction process of the South Crapo drainage.

No atypical water collection system design features are present in the South Crapo drainage basin.

2.3.8 Crapo

Appendix B provides a photo log documenting the construction process of the Crapo drainage.

There are four atypical features of the EWRE water collection system in the Crapo drainage basin. The four unique aspects are the following:

1. Storm water generated in upgradient areas of the Crapo drainage basin is routed under the toe drain road via culvert toward the Crapo storm water detention basin.
2. The Crapo storm water branch line ties into a pre-existing branch canal (Figure 2-23), where flow is measured with a datalogger installed in a pre-existing flume.
3. At the Crapo WRCW branch connection vault, the WCRW main line increases in pipe diameter from 16-inch-diameter to 24-inch-diameter. The WCRW main line remains 24-inch-diameter HDPE pipe to the settling basin.
4. At branch connection diversion located downgradient of the Crapo branch connection vault (Station 2134+00) permits WRCW to be segregated from the WCRW main line into the lower concrete lined canal (see Section 2.3.10). This feature will be used when repairs are necessary to the settling basin.

Figure 2-23. Photograph showing the Crapo storm water branch line connection to a pre-existing branch canal.

2.3.9 South Congor and Midas

Appendix B provides photo logs documenting the construction process of the South Congor and Midas drainages.

The South Congor and Midas drainages basins are steeply incised drainages separated by a relatively narrow ridge. As such, the drainage basins are near to each other, and share four atypical design features. The four unique features of the South Congor and Midas drainage basins are the following:

1. The WRCW branch lines from each respective cut-off wall comingle at a shared South Congor and Midas weir box. As such, there are four dual-contained input pipes in the stilling portion of the weir box, five leak detection pipe surrounding the shared weir box, and the datalogger measures combined South Congor and Midas WRCW flow through the V-notch.
2. The WRCW flow out of the weir box includes tunnel discharge from the Old Bingham Tunnel (OBT) (Figure 2-24). The OBT flow is not accounted for in the combined South Congor and Midas flow, as the OBT flow enters the weir box below the V-Notch. Additionally, no leak detection for the OBT conveyance pipe was installed.
3. The combine South Congor, Midas, and OBT WRCW is conveyed directly to the settling basin, by-passing the WRCW Mainline.
4. Storm water generated in the South Congor and Midas drainage basins is combined in a storm water weir; the combined South Congor and Midas storm water flow is discharged to the lower concrete lined canal.

Figure 2-24. Photograph showing tunnel discharge from the Old Bingham Tunnel (OBT). The tunnel discharge from the OBT is conveyed to the combined South Congor and Midas weir box, but enters below the V-notch flow measuring point.

2.3.10 WRCW Branch Vault Diversion Box (Station 2134+00)

This WRCW branch vault behaves similarly to all other WRCW vaults but in addition contains a gate valve that, once closed, will divert water into the lower concrete lined canal. The necessity of this feature became apparent during EWRE construction when repairs, modifications or maintenance was required at the Settling Basin. Access to the valve is inside the vault and requires a confined space entry.

Figure 2-25. WCRW branch vault (Station 2134+00) can divert water into the lower concrete lined canal when maintenance is required at the Settling Basin.

2.3.11 South Area Dumps (SAD) Box

The South Area Dump (SAD) box accepts water from the south dump drainages (Yosemite to Queen) via a 36-inch-diameter HDPE pipe (Figure 2-26). Base flow from the south dumps is typically less than 100 gallons per minute (gpm) and is accepted through the WRCW outlet line. The WRCW outlet is a 16-inch-diameter dual lined HDPE pipe with an 8-inch-diameter orifice. Should a storm event exceed the 100 gpm flow threshold into the SAD box, the comingled flow will rout through a 36-inch-diameter overflow pipe. The SAD box has an HDPE liner but does not have leak detection due to the chemical nature of the contact water. Contact water from the south dump drainages is of better water quality compared to contact water north of Copper 4 drainage.

Additionally, a port was installed upgradient of the connection box for pigging the line and temporarily stopping the flow for repairs or cleaning (Figure 2-26).

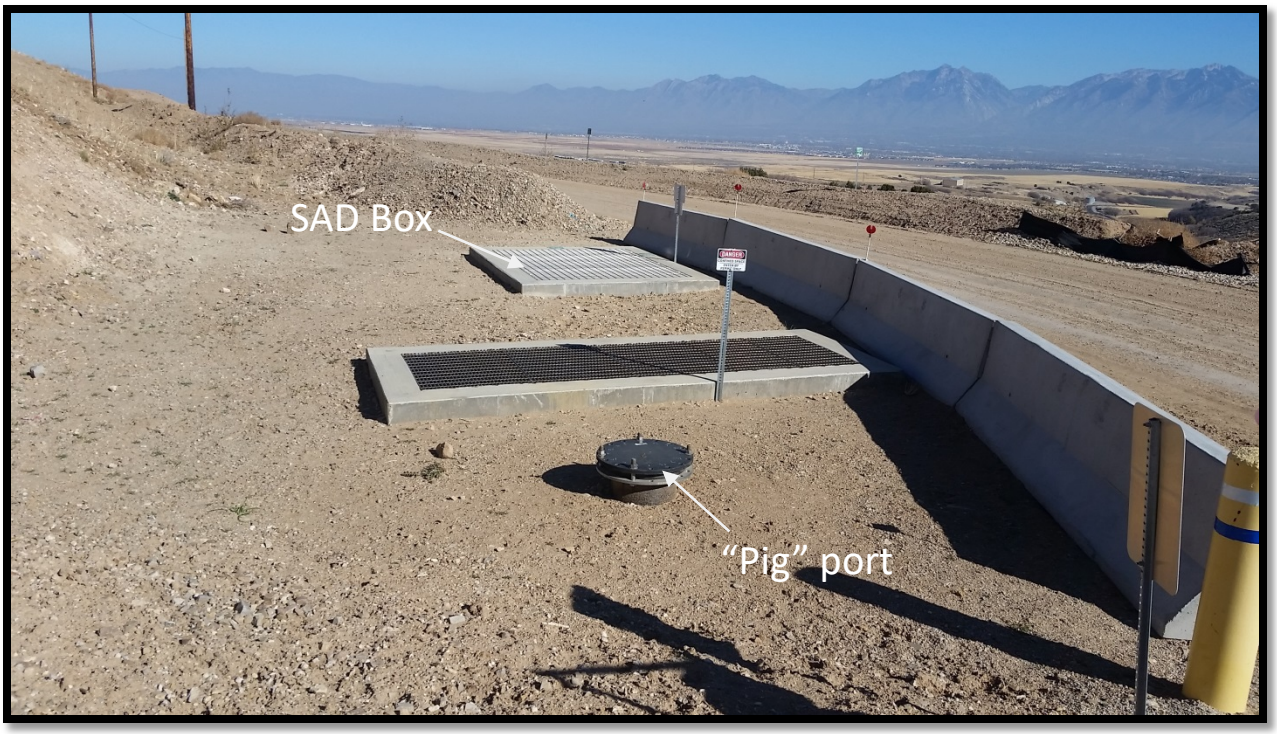


Figure 2-26. South Area Dump (SAD) box.

2.3.12 Storm Water Inlet Structure at Canal

The storm water inlet box (Figure 2-27) receives water from the south area dumps (Yosemite to Queen Drainages) via a 36-inch-diameter HDPE pipe and dissipates the energy of the water as it is introduced to the canal. The HDPE pipe is 36-inch-diameter from the SAD box to the Copper 4 branch line, at which time the HDPE pipe becomes 42-inch-diameter. A gate valve at the outlet structure allows for the drainage of standing water behind the structures energy dissipation baffle.

Figure 2-27. Storm water inlet structure by Copper 3.

2.3.13 Lower Concrete Lined Canal

The lower concrete lined canal was originally constructed in the 1990's and is permitted under groundwater discharge permit #UGW350010 to convey both storm water and process water under upset conditions. The lower concrete lined canal, while still functional, was refurbished as part of the EWRE project and modified in sections to accommodate the capacity needed under the modeled 100-year 24-hour storm event. Surface water reports to the lower concrete lined canal from the detention basins via HDPE pipe and/or sections of pre-existing branch canal. Water flow can be measured through pre-existing flumes or newly constructed weirs. Flow is recorded at the same data loggers that capture WRCW flow in the weir boxes.

SECTION 3

Inspection and Maintenance

3.1 Overview

Inspection frequency is guided by groundwater discharge permit # UGW350010. The groundwater discharge permit specifically **requires quarterly inspection**; however, best practice recommends inspection following large rain events. Table 3-1 provides inspection guidance and frequency.

Table 3-1. Inspection frequency and guidance

Inspection Type	Frequency	Guidance
UDWQ Groundwater Discharge Permit #UGW350010 [1]	Quarterly	Groundwater Discharge Permit # UGW350010
Significant precipitation event [2]	As Needed	Rainfall period ≥10 year-24 hour as indicated by the Copper drainage rain gage
Other	As Needed	Examples for inspection may include a Health and Safety incident, Dump/Slope movement, or at the request of regulatory agency

Notes:
[1] Required by the groundwater discharge permit

[2] Not required by the groundwater discharge permit. Refer UPDES Permit (0000051) Statement of Basis (p. 21) and Part I.E as well as 40 CFR 440.131(c) for guidance.

3.2 Guidance for Inspection

Inspection checklists for evaluating the primary and auxiliary components of the EWRE water collection system are provided in Appendix C. Final as-built drawings of each drainage basin the respective water collection system components are provided in Appendix D. The following sections are descriptions of what to assess and evaluate during the inspection process, conditions that may result in a need for maintenance, and potential mitigation and repair recommendations.

3.2.1 Dump Face

A visual inspection of the dump face (Figure 3-1) is required for each respective drainage basin. Examples of potential issues with the dump face may include the following:

- Erosional gullies and/or debris flows developing
- Seeps or wet spots observed
- Settling, bulging or slumping observed
- Horizontal or vertical cracks developing

If evidence of any of these items is observed on the dump face, document the findings in the inspection checklist, photograph, and notify RTKC Mine operations for support and resolution.

3.2.2 Down Drains

Visual inspection of the down drains is required for each respective drainage basin. Examples of potential issues with the down drains may include the following:

- Erosion and channel development along the sides of the down drain

If evidence of any of these items is observed on the down drains, document the findings in the inspection checklist, photograph, and notify RTKC Mine operations for servicing.

- Disturbed rip-rap channels altering drainage

Figure 3-1. Photographic overview of EWRE water collection system components.

3.2.3 Toe Drain

3.2.3.1 Access Road

Inspection of the toe drain access road (Figure 3-2) is required for each respective drainage basin. Examples of potential issues with the access road may include the following:

- Rutting related to weather and driving in wet conditions
- Channeling related to running water and erosion
- Maintenance of the surface water rip rap ditch adjacent to the access road

Mitigation may include redirecting surface water through engineered structures and/or regrading the access road.

3.2.3.2 Toe Drain Clean Outs

Inspection of the toe drain clean outs (Figure 3-2) is required for each respective drainage basin. Examples of potential issues with the clean outs may include the following:

- Access to the clean out port has changed due to rock, debris or erosion

Mitigation may include repair, removal of rock/debris, construction of a protective berm, and/or regrading the area around the clean out.

- The clean out cover or pipe is damaged (e.g., struck by debris or equipment)

3.2.3.3 Rip Rap Ditch and Energy Dissipation

Inspection of the rip rap ditch (Figure 3-2) and energy dissipation system (not installed as of October 31, 2016) are required for each respective drainage basin. Examples of potential issues with these components may include the following:

- Erosion along the sides of the rip rap channel
- Rip rap channel full of sediment and debris
- Rock in the rip rap channel has moved or is missing
- A significant volume of water is ponded in the rip rap channel

For design and maintenance support, contact the Facility Environmental Engineer

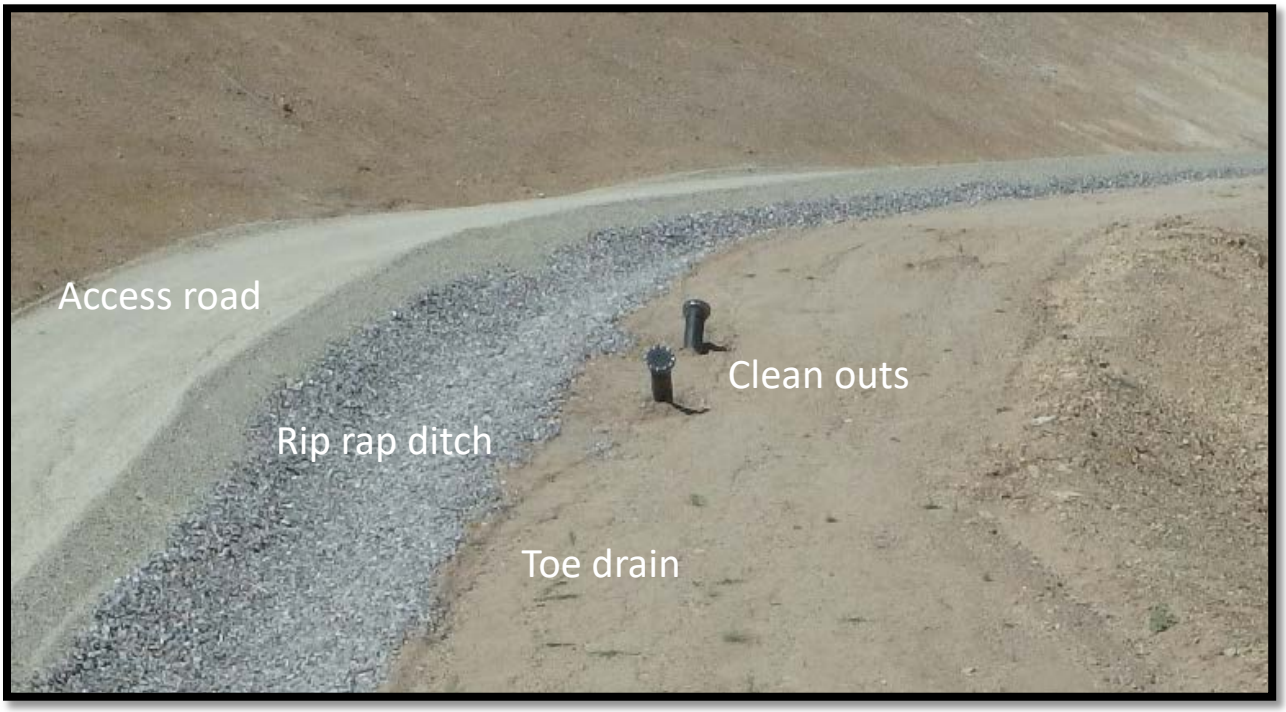


Figure 3-2. Photograph of a newly constructed segment of the toe drain; toe drain features include the clean outs, rip rap ditch and access road.

3.2.4 Storm Water Detention Basin

3.2.4.1 Check Dam Integrity

Inspection of the check dam (Figure 3-3) is required for each respective drainage basin. Examples of potential issues with the check dam may include the following:

- Erosion in upgradient portions of the drainage basin have caused excessive silting
- Check dam embankment material has moved or is missing
- The silt fence is damaged and/or full of sediment

Silt fence is advised to prevent silt plugging the desilting basin and outlet structure while **vegetation becomes established**.

3.2.4.2 Storm Water Detention Basin

Inspection of the storm water detention basin (Figure 3-3) is required for each respective drainage basin. Excess silt, sediment and debris can decrease basin capacity or lead to system failure (i.e., plugged outlets). A staff gauge is included in each basin to easily conduct visual observations. In addition, as built drawings (Appendix D), XML terrain files and AutoCAD design files (Appendix E), redline design drawings (Appendix F), and documentation of cut-off wall survey monuments (Appendix G) are all available for reconstruction of the detention basin to original design schematics. Examples of potential issues with the storm water detention basin may include the following:

- The storm water detention basin is not draining
- The storm water detention basin has excessive silt

The storm water detention basin may not be draining due to a blocked overflow structure, or it may be draining, but a seep/spring has developed in the basin. If a seep is identified, estimate the flow rate and report the finding to the Facility Environmental Engineer (Table 5-1).

If sediment is greater than 1.5 feet at the staff gauge, the storm water detention basin should be scheduled for sediment removal and clean out.

3.2.4.3 Outlet Box

Inspection of the outlet box (Figure 3-3) is required for each respective drainage basin. Examples of potential issues with the outlet box may include the following:

- The low flow orifice is blocked by sediment, vegetation or debris
- The silt fence is damaged and/or full of sediment

If the low flow orifice to the outlet box is blocked greater than 10 percent of the diameter, then the orifice requires cleanout maintenance.

3.2.4.4 Embankments and Spillway

Inspection of the embankments (Figure 3-3) and spillway (Figure 3-4) are required for each respective drainage basin. Examples of potential issues with these components may include the following:

- Displacement or movement of spillway or embankment material
- Embankment instability, potentially caused by burrowing animals/tunneling
- Erosion along the edges of the spillway or through the embankments

Potential maintenance to embankments and spillways may include removal/replacement of embankment and spillway material, especially if erosion along the edge of the rip-rap channel begins to develop.

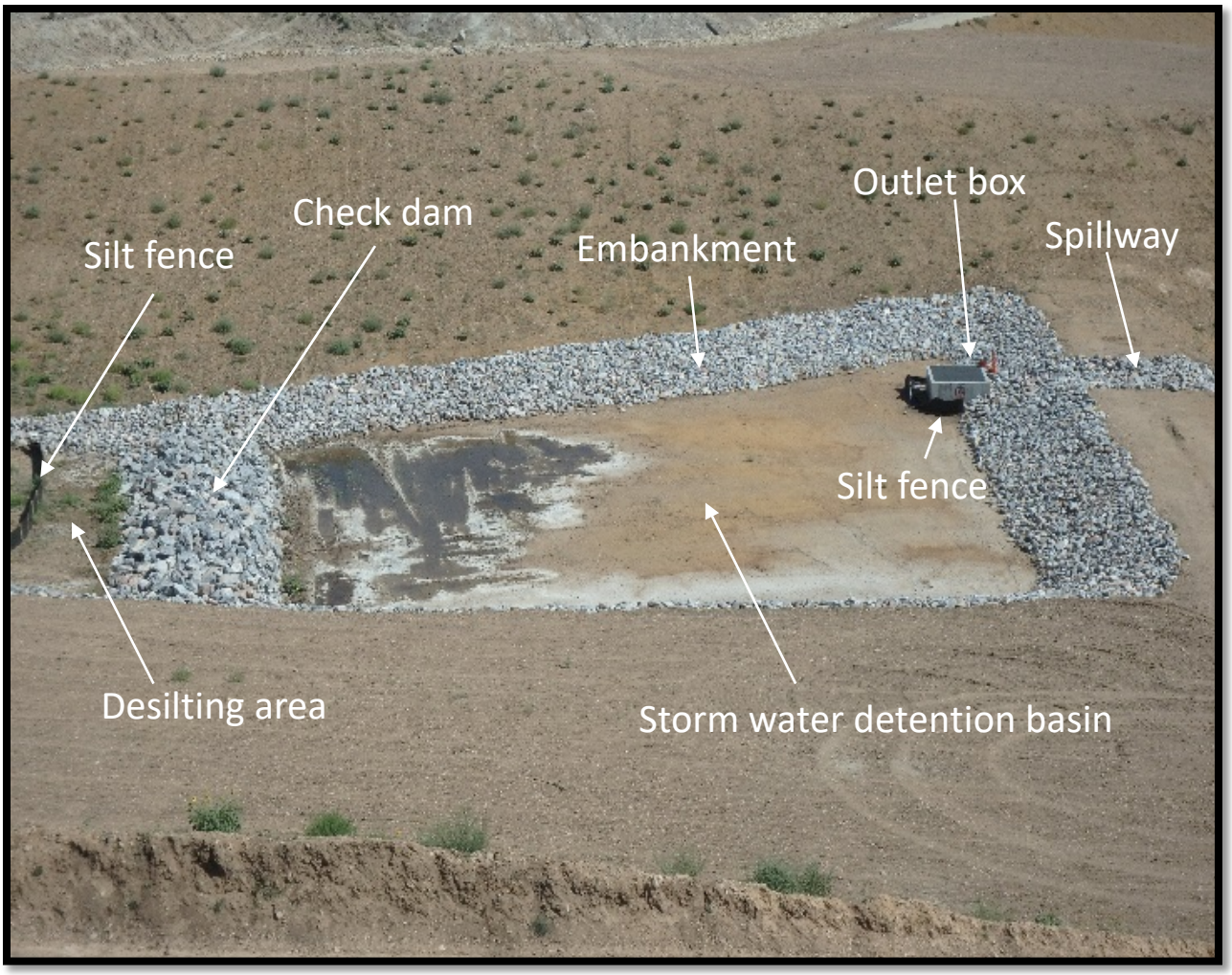


Figure 3-3. Photograph of a newly constructed storm water detention basin; features include desilting area, check dam, storm water detention basin, outlet box, spillway and silt fences.

Figure 3-4. Photograph of a newly constructed spillway. The spillway connects the storm water detention basin to the cut-off wall.

3.2.5 Cut-off Wall

Inspection of the cut-off walls (Figures 3-5 and 3-6) are required for each respective drainage basin. Examples of potential issues with the cut-off walls may include the following:

- Cracks have developed and/or are enlarging in the cut-off wall concrete
- The cut-off wall has been damaged (i.e., equipment strikes or storm debris)
- Sediment has built-up behind the wall
- Associated cut-off wall piping is plugged, damaged or broken (evidence of a problem will not likely be visible at the cut-off wall proper, but rather in other areas along the storm water or WRCW flow paths)
- The storm water inlet grate is damage or clogged by vegetation or debris
- Associated cut-off wall pipe valves are stiff, leaking or damaged

Figure 3-5. Photograph of a newly constructed cut-off wall. The spillway connects the storm water detention pond to the cut-off wall; the cut-off wall includes a storm water inlet grate and a valve vault.

3.2.6 Weir Box

3.2.6.1 Weir Box Integrity

Inspection of the weir box (Figure 3-7) is required for each respective drainage basin. Examples of potential issues with the weir box may include the following:

- The above ground concrete weir box curbing and/or surface grating is damage
- Weir box signage is missing or damaged
- Scale, debris, or sediment (at quantities that potentially may disrupt flow measurement) has accumulated in the weir box
- The weir box piping, liner, V-notch, and/or baffle is damaged
- The weir box piping has developed scale (at quantities that potentially may disrupt flow measurement)

In order to maintain accurate flow readings, it is recommended that level indicators be **calibrated approximately every six months**. In addition, the v-notch may begin to scale and require cleaning in order to accurately represent water level. Scale removal from the v-notch and calibration of the level indicator should be done in conjunction.

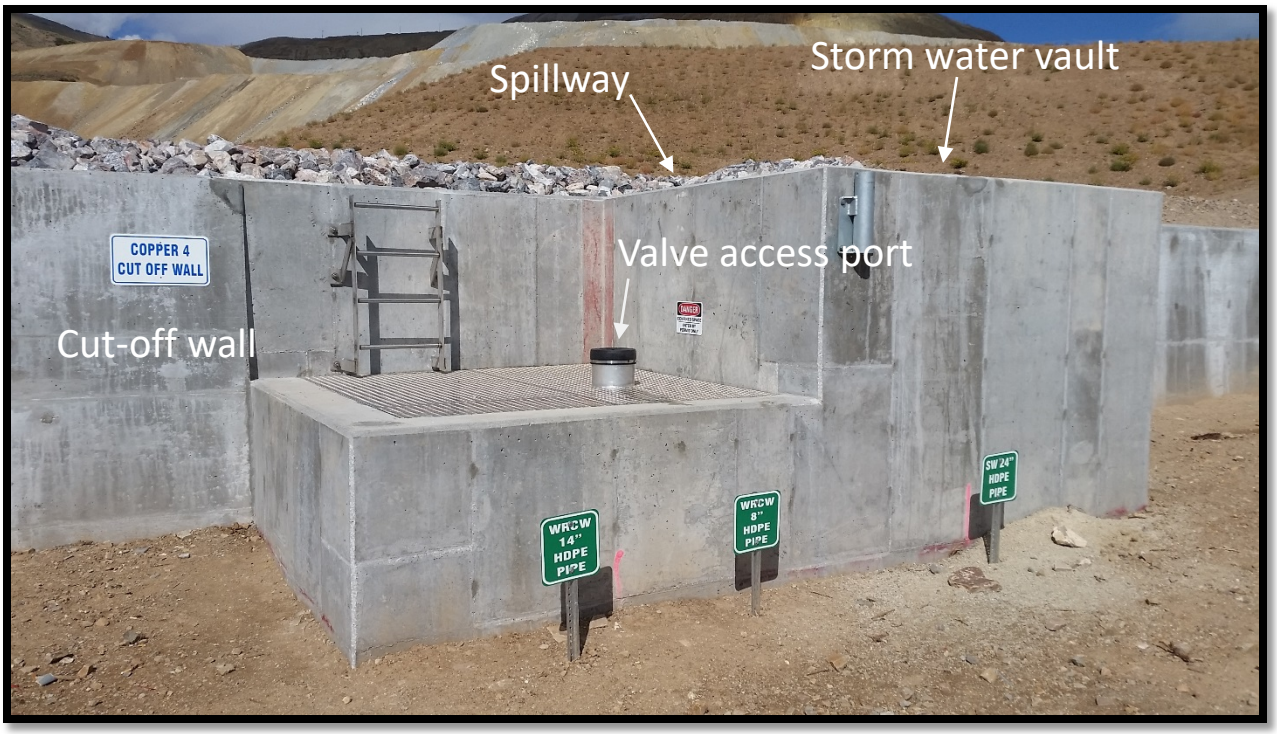


Figure 3-6. Photograph of a newly constructed cut-off wall. The valve port allows access to manipulate the WRCW flow valves.

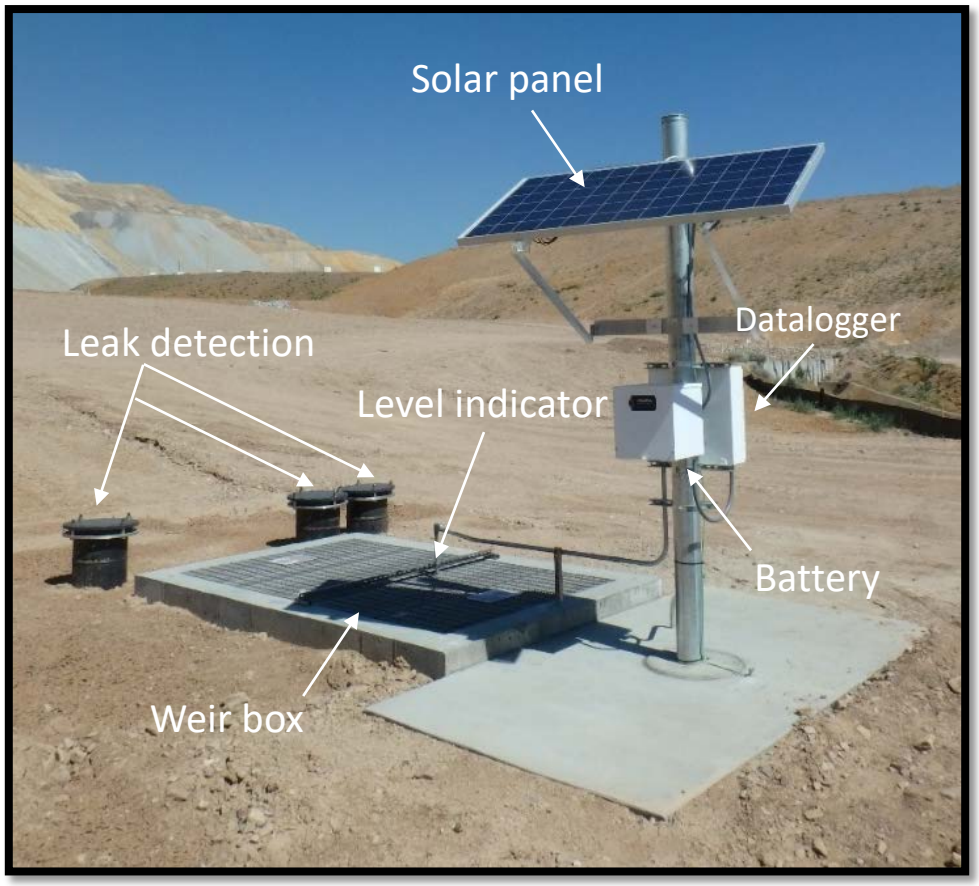


Figure 3-7. Photograph of a newly constructed weir box and auxiliary components.

3.2.6.2 Data Logger

Inspection of the data logger stations (Figure 3-7) is required. Visually inspect the components of the data logger station to identify wear and tear, broken or missing parts, and to confirm all display components are functional. During the inspection, examine the solar panel for damage and clean off dust. If the data logger is not functioning, operational troubleshooting may be required. See the Reference Links in Section 5 for guidance on the operation of the datalogger and service contact information.

3.2.6.3 Leak Detection Sump

Inspection of the leak detection sumps (Figure 3-7) should be performed quarterly, or if there is suspected pipe damage along the WRCW flow path. If water is detected in any of the leak detection sumps, notify the facility environmental engineer (Table 5-1) as sample collection will likely be required.

3.2.7 Branch Connection Vault

Inspection of the branch connection vault (Figure 3-8) is required for each respective drainage basin. Examples of potential issues with the branch connection vault may include the following:

- Presence of standing water inside the vault
- Presence of sediment inside the vault
- Damage to the metal hatch, vent pipe or bollards
- Leak detection sensor malfunction

Potential maintenance to the branch connection vault may include determining the source(s) of standing water and/or sediment, draining/cleaning the branch connection vault, and repair of any damaged components. If flowing water is observed in the branch connection vault, there is a break in the pipe upstream that will require immediate repair. Notify the facility environmental engineer (Table 5-1) if flowing water is observed.

The **leak detection sensor** should be **tested annually** to confirm functionality; in order to test the sensor and datalogger station strobe, the sensor must be submerged in water. **A confined space permit is required to enter the branch connection vault.**

3.2.8 Storm Water Vault, Lower Concrete Lined Canal and Datalogger Station

Inspection of the storm water vault, lower concrete lined canal, and datalogger station (if applicable) (Figure 3-9) is required for each respective drainage basin. Examples of potential issues with the storm water vault and lower concrete lined canal may include the following:

- Damage to or development of cracks in the concrete vault or canal
- Accumulation of sediment or debris
- Datalogger malfunction

Potential maintenance to the storm water vault and lower concrete lined canal may include concrete repair and debris/sediment clean out.

Inspect the components of the data logger station to identify wear and tear, broken or missing parts, and to confirm all display components are functional. Examine the solar panel for damage and clean off dust.

Calibration of the storm water level indicators is recommended **annually** in order to maintain accurate measurements.

If the data logger is not functioning, operational troubleshooting may be required (see reference links in Section 5 for service contact information).

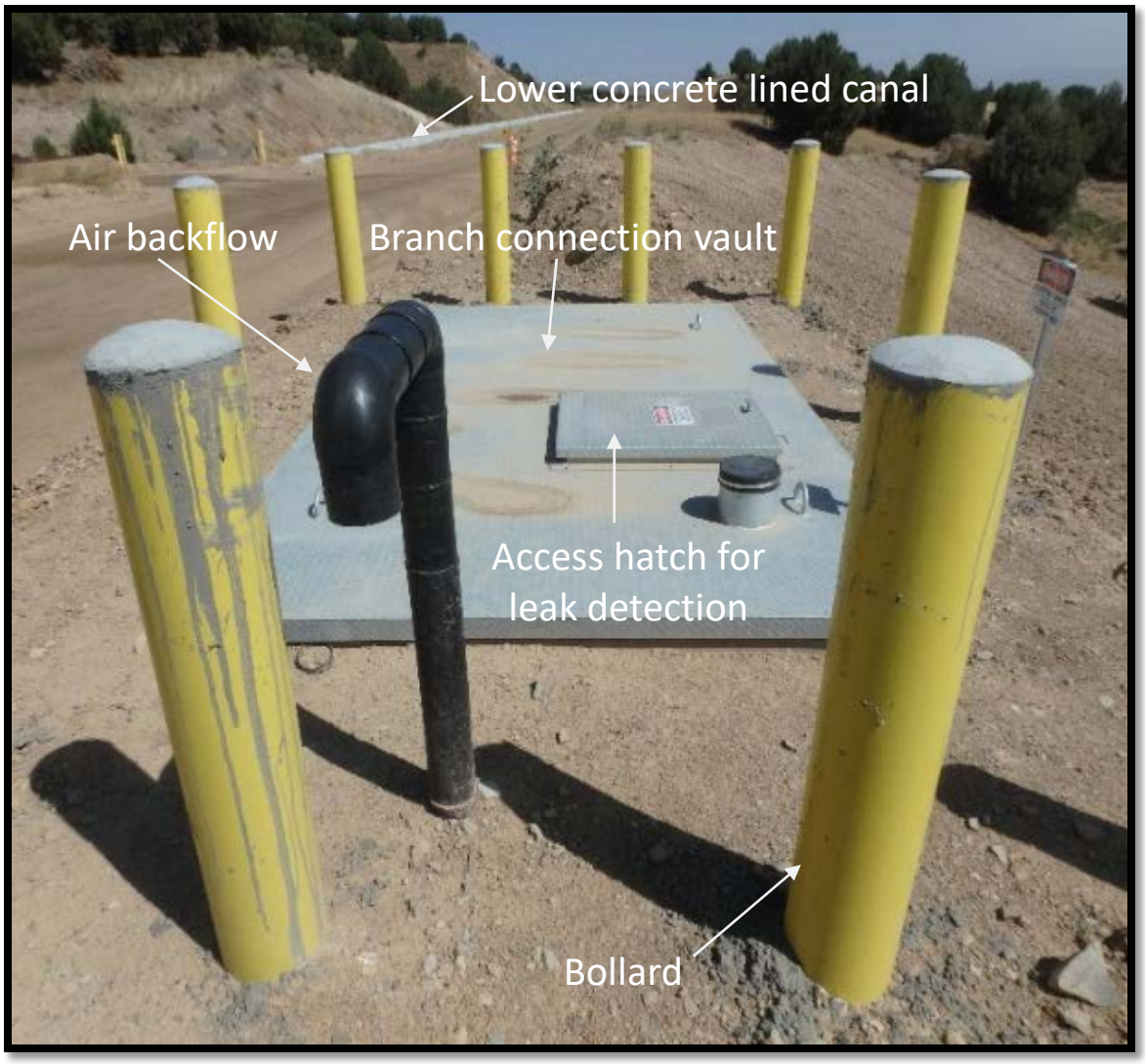


Figure 3-8. Photograph of a newly constructed WRCW branch connection vault.

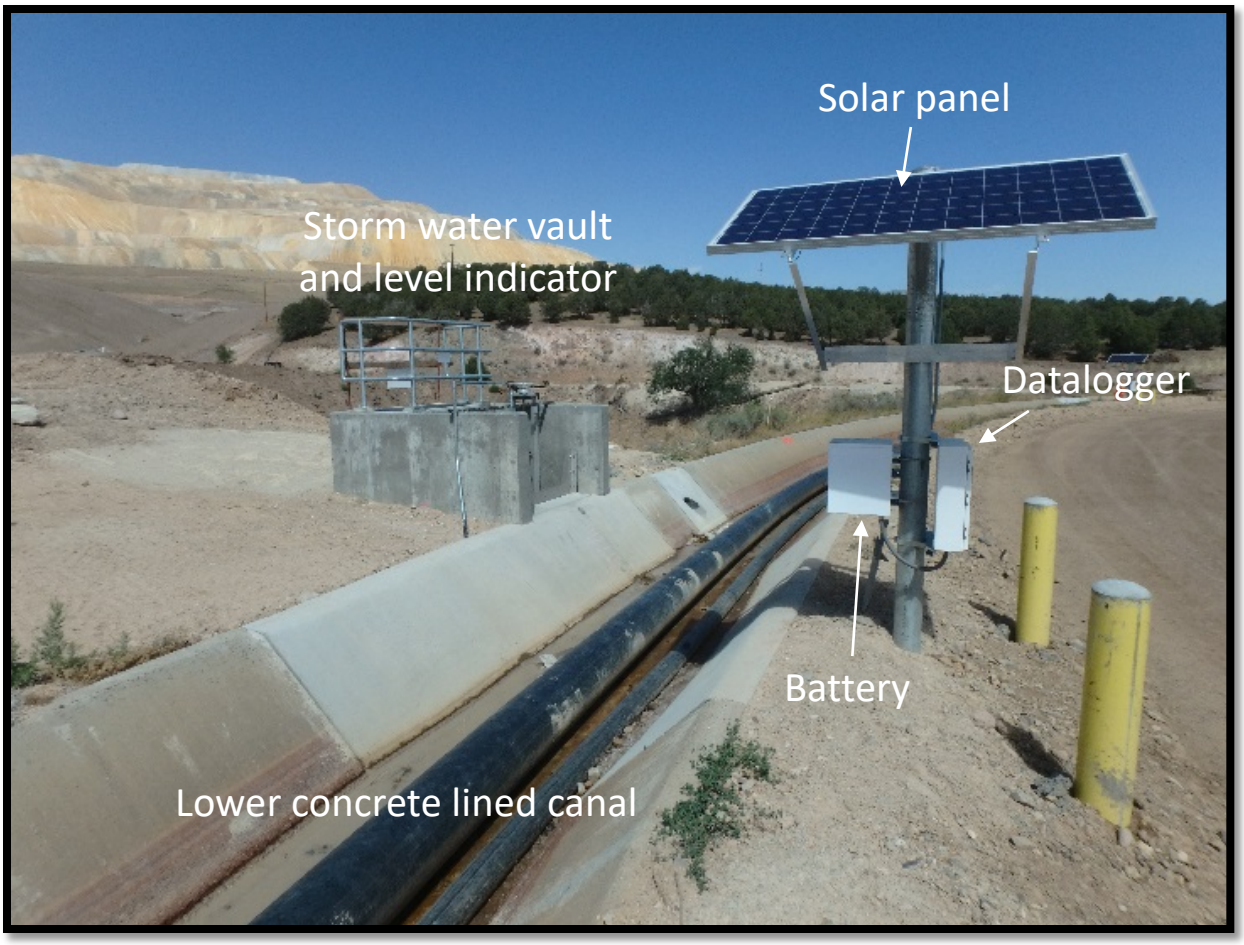


Figure 3-9. Photograph of a newly constructed storm water vault, level indicator and lower concrete lined canal.

3.2.9 Old Bingham Tunnel

Inspection of the Old Bingham Tunnel (OBT) is required. Examples of potential issues with the OBT may include the following:

- Collapse or failure of the tunnel entrance
- Accumulation of rock or debris in the tunnel discharge area
- Plugging of the tunnel discharge orifice

Potential maintenance to the OBT may include tunnel entrance repairs, excavation of rock and/or debris, and removing accumulated sediment from the discharge and drainage area.

Figure 3-10. Photo of the Old Bingham Tunnel (OBT) entrance.

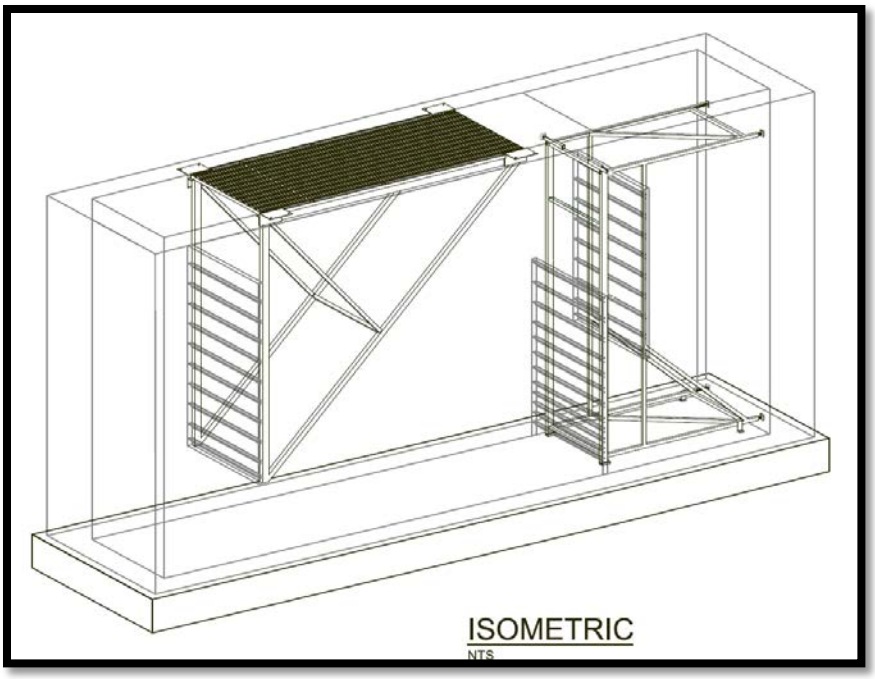
3.2.10 Settling Basin

The Settling Basin (Figure 3-11) should be drained and inspected on a quarterly basis for two years starting 4Q2016 to establish a performance baseline. In order to perform the inspection, the following steps need to be taken:

- Place the WRCW into bypass by closing the valve at the WRCW Branch Vault diversion (Station 2134+00). Cross reference section 2.3.10 for additional details.
- Pump down the Settling Basin in manual to low shut-off.
- Remove the remaining water; use of a vacuum truck is strongly recommended due to the likely presence of silt.
- Remove the excess silt and water with a vacuum truck. Consult with the facility environmental engineer for proper disposal of sediment and water.
- **IMPORTANT. When vacuuming, always keep separation between the hose intake and the liner so as not to damage the liner**. The corner welds are stronger and better anchored than the center liner; vacuuming should be preferentially focused in these areas. In order to maintain space between the hose tip and the liner, incorporate a basket or similar implement.

IMPORTANT

When vacuuming always keep separation between the hose intake and the liner so as not to damage the liner.



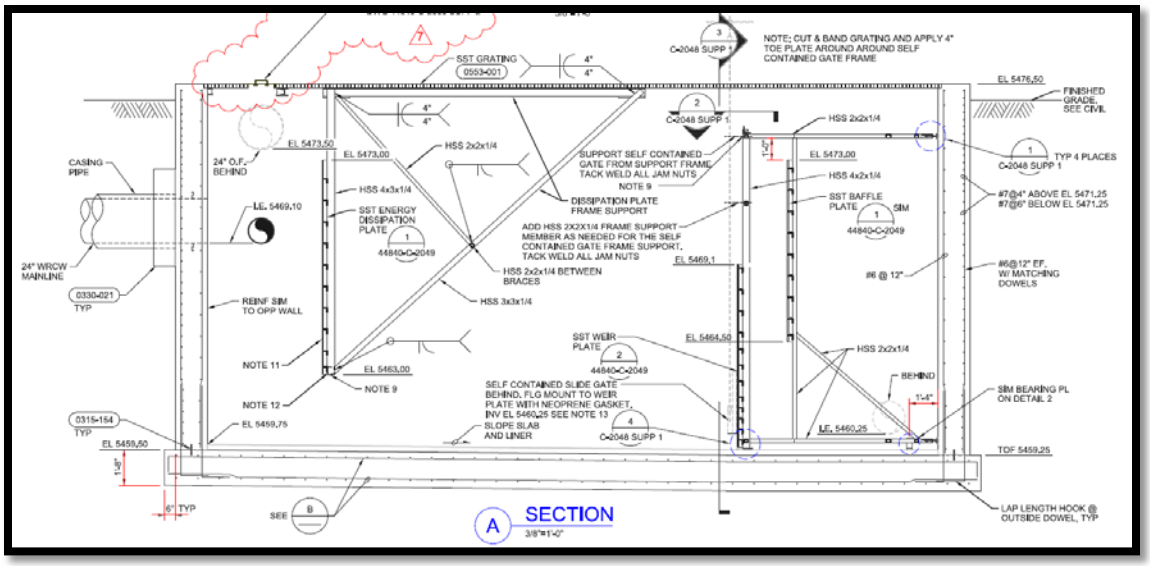


Figure 3-11. Settling Basin isometric projection and cross sectional view.

Examples of potential issues, other than accumulated sediment, occurring in the Settling Basin may include the following:

- The concrete Settling Basin curbing and/or surface grating is damage
- Signage is missing or damaged
- Scale or debris (at quantities that potentially may disrupt flow measurement) has accumulated in the Settling Basin
- The piping is damaged
- The piping has developed scale (at quantities that potentially may disrupt flow measurement)

3.2.11 Lower Concrete Lined Canal

The lower concrete lined canal (Figure 3-12) should be inspected for accumulation of sediment and debris and the elimination of sources (i.e., eroded embankments). Sediment and debris should be removed regularly in order to maintain design capacity and best performance. Should vegetation develop, remove in order to maintain best performance. Quarterly inspection should include observations for settling and cracking of the lower concrete lined canal sections. Minor cracks will not hinder performance but should be addressed in order to prevent deterioration of the structure and costlier repairs in the future.

Figure 3-12. Section of the lower concrete lined canal.

3.2.12 WRCW Branch Vault Diversion Box (WRCW Vault Station 2134+00)

The inspection of the branch vault diversion box (Station 2134+00) is similar to the inspection of typical WRCW vaults (See Section 3.2.7), and can be done in conjunction with the settling basin inspection since this is where the basin bypass is accomplished. This vault does not contain a leak detection sensor and associated strobe. In addition to criteria outlined in section 3.2.7, the valve requires exercise and associated bypass piping requires inspection for leaks or damage.

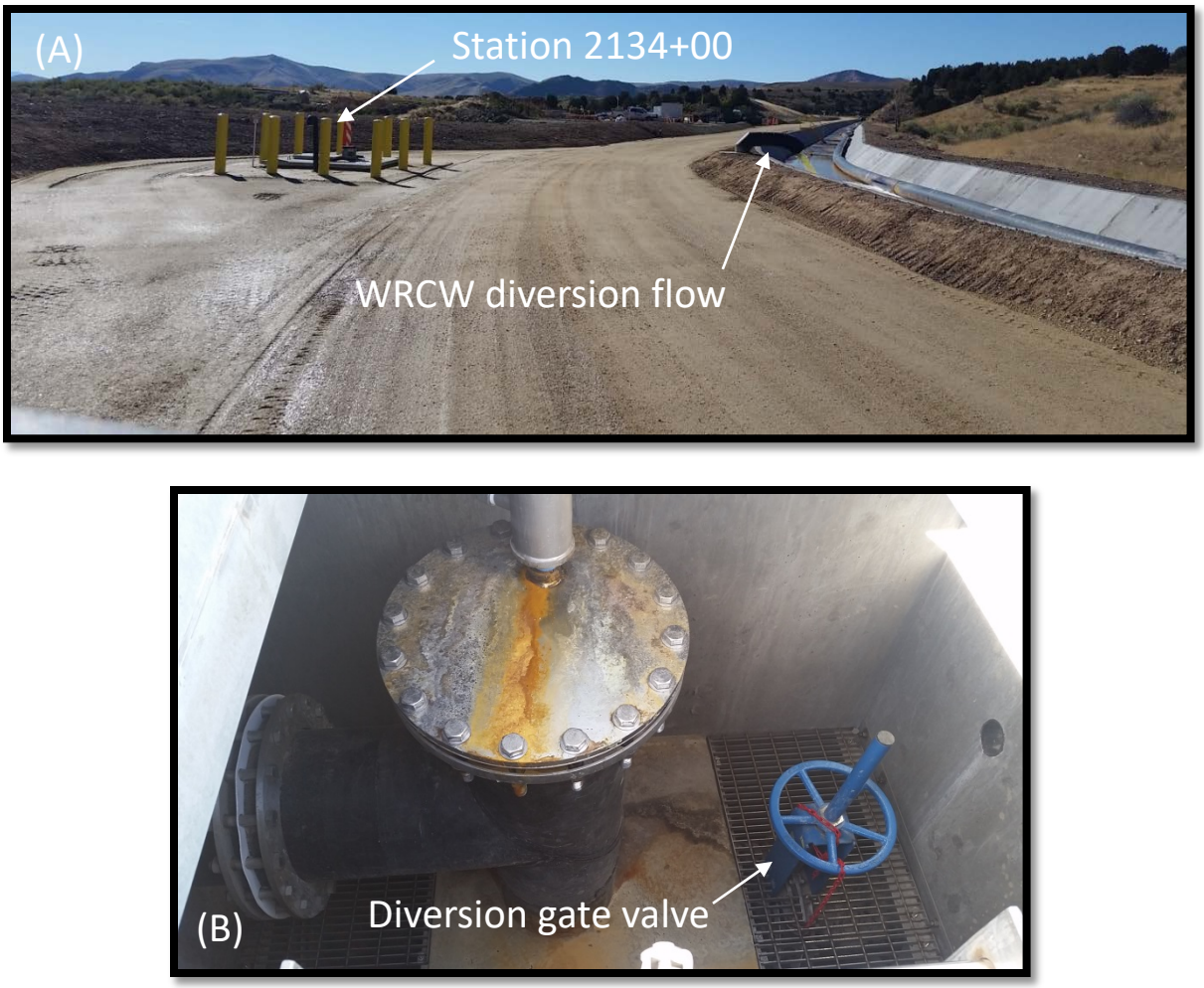


Figure 3-13. (A) WRCW branch vault diversion box (Station 2134+00); (B) diversion gate valve.

3.2.13 South Area Dumps (SAD) Box

The South Area Dump (SAD) Box does not have leak detection due to the relatively clean nature of the WRCW as compared to the WRCW reporting from the Copper drainages north. The important aspects to inspect in order to ensure proper function of the structure are:

- If sediment and debris are present in the box they should be removed immediately.
- Check for damage of the liner and pipe inlets/outlets due to sediment and debris.
- If scale is present it should be removed in order to preserve capacity.

IMPORTANT. When vacuuming always keep separation between the hose intake and the liner so as not to damage the liner.

3.2.14 Storm Water Inlet Structure at Lower Concrete Lined Canal

The storm water inlet structure at the lower concrete lined canal should require limited maintenance. Inspect for sediment and debris that could hinder capacity and full function of the structure. Large intense rain events will be of particular interest since this is about the only time the structure will have become active. Sediment and debris will need to be removed in order to maintain full functionality.

3.3 Compliance Sampling Locations and Frequency

Compliance points such as cut-off walls, weir boxes, seeps and tunnels are associated with the Bingham Canyon Mine Groundwater Discharge Permit #UGW350010, and are required to be sampled on various frequencies for water quality and flow rate (Figure 3-14). The installation of the cut-off walls and toe drain associated with the EWRE required updating many of these sample points, as the legacy system was replaced and the new collection system was installed.

Appendix H details the transition from the legacy east side collection system to the newly installed EWRE water collection system. The operational sample identification numbers (i.e. cut-off walls) were kept the same at the new weir boxes in cases where the legacy flow was traced to the corresponding new toe drain section, branch line and weir box. In cases where new drainages were intercepted not corresponding to the legacy system, a new identification number was assigned.

Incorporated into the new system is capture of WRCW primarily at the toe drain and secondarily at the cut-off wall. Both sources for a particular drainage are collected at a shared weir box. The sample reporting from the toe drain has an “A” designation while the sample from the cut-off wall has a “B” designation. During construction, water quality from the A and B sources was typically different, in that toe drain water was more characteristic of waste rock contact water, and cut-off wall water was more characteristic of fresh water. Based upon this information, the following guidance is derived:

- When the two water qualities mix in the weir box, and are introduced to an open environment with increased oxygen, water chemistry will change and increased mineral precipitation (i.e. scale) can be expected.
- If water quality is to suddenly diminish in the “B” sample reporting from the cut-off wall, toe drain functionality could be in question, although all potential sources need to be considered and investigated.

Typically, each weir represents a single drainage; however, flow from the Lost Creek-Keystone drainages merge into a single weir box, and flow from the South Congor-Midas drainages merge into a single weir box. Discharge water from the Old Bingham tunnel also enters the South Congor-Midas weir box, but can still be sampled at the tunnel opening. In all cases the curb is labeled with the sample identification number for easy identification, and a sample port grate allows for sample collection access.

A number of seeps were identified during the EWRE project. The locations of these seeps, as well as the geology, are shown on Figure 3-15. This seeps, springs and area geology map was constructed to provide documentation of the EWRE site prior to waste rock coverage.

SECTION 4

Training

4.1 General Requirements

Training for the operation of the basins consists of the following components:

- A complete read of the O&M and thorough review of the materials provided in the appendices;
- A site tour with a member of the construction team and/or operations team familiar with the basins and structures.

If, in the future, a knowledge gap is identified, contact a member of the RTKC Water Quality team (Table 5-1) and arrange for training support should knowledgeable members of the construction team or operations team not be available.

SECTION 5

Reference Information

5.1 UDWQ Construction Permit

The collection system design and specifications were reviewed and approved by Mr. Woodrow Campbell, P.E. of the Utah Department of Environmental Quality – Division of Water Quality. Eight periodic field visits were conducted during the construction activities, including a final inspection on October 25, 2016. The State inspection reports are included in Appendix I.

5.2 Dam Safety Permit

The embankments associated with the detention basins were reviewed and approved through the Utah Department of Natural Resources – Water Rights – Dam Safety. Under the advisement of the Assistant State Engineer, the basins were lumped together by drainage and issued a permit number accordingly. The combined basins per drainage are classified as a small dam – low hazard with cumulative capacities by drainage of less than 20 acre-feet.

5.3 Groundwater Discharge Permit

The EWRE collection system components are associated with the Bingham Canyon Mine and Water Collection System Groundwater Discharge Permit # UGW350010, under the sections Part 1.D.3 and Part 1.D.2.

5.4 Project Contacts

Should questions arise in the future that are not covered in this document, RTKC contacts are provided below.

Table 5-1. EWRE project contact information

Name	Title	Contact Information
Tom Gibson	Construction Manager	970-946-0641
Steve Ferris	Project Manager	385-246-6938
Rob Watson	Construction Superintendent	801-824-1146
Scott Bird	Manager – HSEC & Quality	801-699-8337
Jason Hill	Quality and Engineering	435-841-9413
Zeb Kenyon	Environmental Compliance and Quality	801-913-2356
Jason Doyle	Operations Manager - Tailings	801-652-0028
Guillermo Salcedo	Operations Supervisor - SAWS	801-232-1297
Brian Vinton	Principal Advisor – Water Quality	801-712-4597

Reference Links:

Datalogger Flow Monitoring Reference Material

The Pulsar Ultra Twin UL Instruction Manual (June 2011) is available at:

https://www.pulsar-pm.com/LinkClick.aspx?fileticket=BoFap_kwCtI%3d&tabid=771&portalid=0&mid=1111&language=en-GB

The Pulsar datalogger software is Ultra Log 5.1, and is available at:

https://www.pulsar-pm.com/support/downloads/software.aspx

Midas Pump Station Reference Material

The installation, operation and maintenance manual for the Goulds Pumps Model 3196 i-FRAME at the Midas Pump Station is available at:

https://www.gouldspumps.com/ittgp/medialibrary/goulds/website/Products/3196-i-FRAME/InstallationOperationMaintenance_3196_i_FRAME.pdf

5.5 Project Quality Assurance and Quality Control

Documentation of project quality assurance and quality control is provided in Appendix J. Quality Control was performed by Amec Foster Wheeler Environment and Infrastructure, Inc., and discrepancies were satisfactorily reported and corrected.

5.6 Revision History

To assist in future updates and revisions to the EWRE O&M Manual, the native Microsoft Word file is included in Appendix K.

Rev #	Description of Changes	Prepared by	Date
0	Original release of O&M to comply with UDWQ Permit #UGW350010 Permit to Construct, Condition #2	Zeb Kenyon, RT G&I	December 2016

Appendix A
EWRE Geology, Seeps, and Springs Map

Appendix B
Drainage Basin Photographic Logs

Appendix C
South Area Water Services East Side Collection System – East Waste Rock Extension Groundwater Discharge Permit Inspection and Supplemental Inspection Forms

Appendix D
Drainage Basin As-Built Drawings

Appendix E
XML Terrain Files and AutoCAD Design Files

Appendix F
Redline Design Drawings

Appendix G
Survey Monument Documentation

Appendix H
EWRE Compliance Monitoring Transition Documentation

Appendix I
State Inspection Reports

Appendix J
Quality Assurance and Quality Control Documentation

Appendix K
Operations and Maintenance Manual
Microsoft Word Document File

Appendix L
CH2M HILL Hydrology Report

APPENDIX I

UGW#350010

Operations & Maintenance Manual South Waste Rock Reclamation Detention Basins

Rio Tinto Kennecott Copper

Operations and Maintenance Manual

South Waste Rock Reclamation Detention Basins

Groundwater Discharge Permit #UGW350010

Bingham Canyon Mine and Water Collection System

November 2018

Revision 2

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Contents

Appendices

A. Detention Basin As-Built Specifications (Hardcopy & CD)
B. As-Built Survey & Drawings (Hard Copy & CD)
C. Inspection Checklist (Hard Copy & CD)
D. Photo Documentation (CD)
E. Hydro Report (CD)
F. Data Files (DWG & XML) (CD)
G. Quality Assurance Reports (CD)
H. Operations & Maintenance Manual (CD)

1.0 Context and Purpose

1.1 Context

Rio Tinto Kennecott Copper (RTKC) and the Bingham Canyon Mine are required to effectively manage surface water, sediment and debris associated with the waste rock dumps on property. These requirements are outlined in detail under the applicable permits associate with the operation. The agencies and permits are listed in Table 1.

Table 1. Applicable Operating Permits Related to Surface Water Management

Agency	Permit
Utah Department of Environmental Quality - Division of Water Quality	Groundwater Discharge Permit No. UGW350010 Bingham Canyon Mine and Water Collection System
Utah Department of Environmental Quality - Division of Water Quality	UPDES Permit No. UT0000051 Storm Water Pollution Prevention Plan
Utah Department of Natural Resources - Division of Oil, Gas and Mining	Permit No. M/035/0002 Mining and Reclamation Plan

In order to better meet our obligations to the public and regulatory agencies related to surface water management along the vicinity of the Bingham Canyon Mine south dump, the detention basins were designed and constructed between the fall of 2014 and fall of 2017. The effort increases basin capacity in conjunction with waste rock placement and subsequent reclamation activities thereby decreasing the risk of offsite release of waste rock contact water, sediment and debris.

1.2 Purpose

This Operations and Maintenance manual is designed to provide the operator with clear instructions and reference material for the proper care and upkeep of the detention basins associated with the south end waste rock placement facilities.

1.3 Disclaimer

This operation and maintenance manual was created to 1) fulfill the construction permit condition for basins constructed during 2014 through 2017 requiring an O&M manual in order to operate the system and 2) provide general guidance to the South Area Water Services (SAWS) operators and maintenance staff as part of the handover of the newly constructed basins. This manual is not all inclusive of the Bingham Canyon Mine Water Collection System originally constructed in the mid 1990's and modified in 2016 which included toe drains, french drains, cut-off walls, detention basins, and associated system of piping from Bingham Canyon to Queen cut-off wall.

2.0 Design & Operation

2.1 General Overview

The basins are designed to 1) receive surface water and sediment off the face of the dump and 2) passively move alluvial and waste rock contact water (WRCW) through the basin system where the waters are conveyed by pipe via gravity to the cut-off wall where the water then continues via pipe to the east side collection pipe and ultimately the Process Plant and/or Large Reservoir.

Key basin design criteria and operation:

- The basins are designed and sized appropriately to manage precipitation events above the cut-off wall for ≥25 year-24 hour rain event. In addition, basin capacity has been established below the cut-off wall so that the composite capacity for each respective drainage is ≥100 year-24 hour rain event;
- If the precipitation event is within the design criteria, basins are designed to route all water through the east side collection system piping;
- The basins are designed to gravity drain within a 24 hour period;
- All surface water for events not exceeding the design capacity will rout water via gravity into the east side collection system piping system (Under the current design, storm water that exceeds the basin capacity will report to Butterfield Canyon drainage);
- Basin design and capacity accounts for sedimentation but requires routine removal of the sediment in order to maintain minimum capacity.

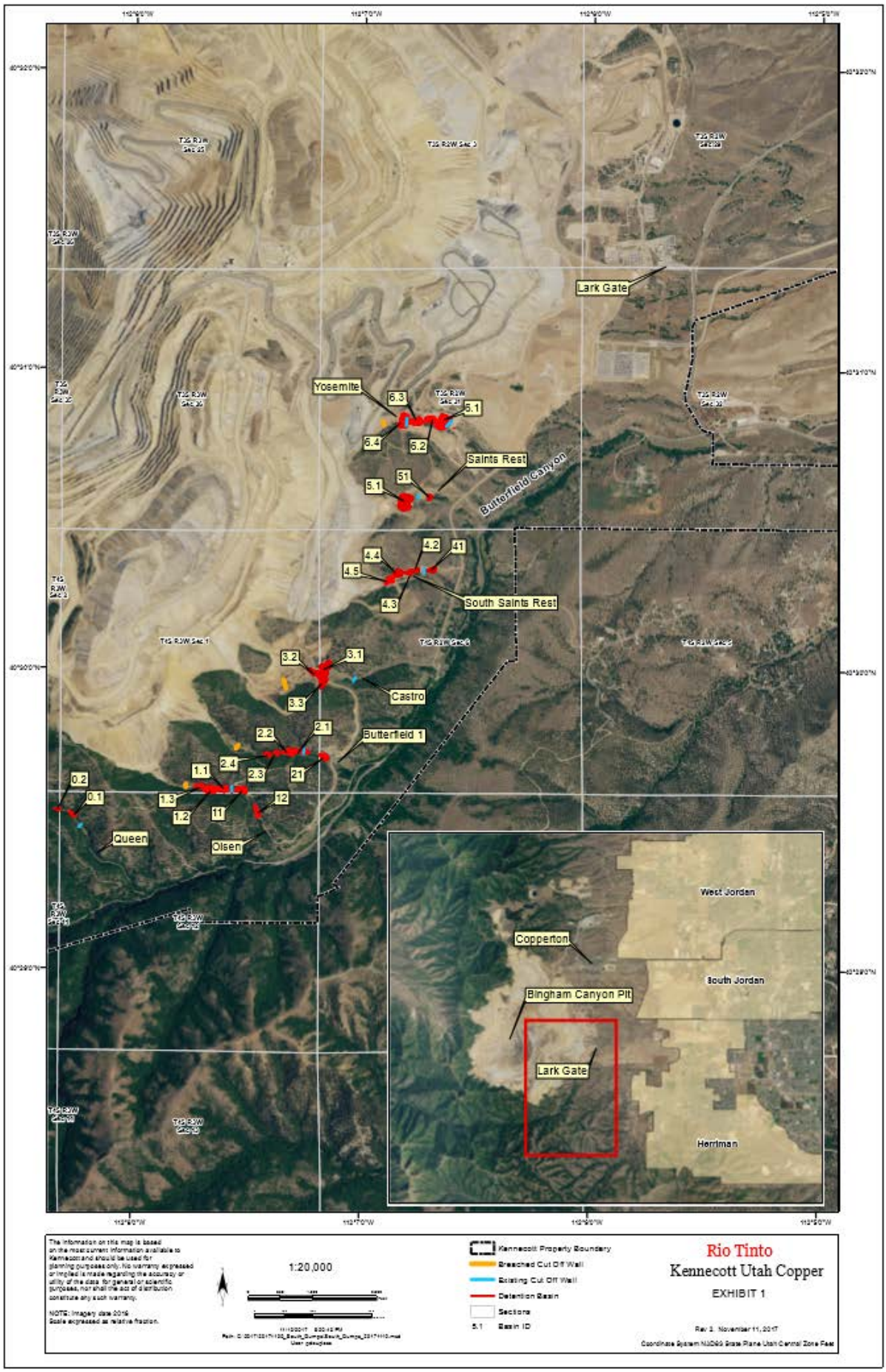
The basins are not designed or sized to:

- Manage large amounts of debris (waste rock, cover soils, vegetation);
- Receive water from the dump flattops;
- Operate without routine inspection and maintenance.

Additionally, the basins are designed to drain in a 24 hour period. Ponded water in excess of the 24 hour period should be addressed as soon as possible in order to minimize the potential infiltration of WRCW to ground.

Exhibit 1 is a basic overview map identifying South Dump detention basin locations and names. More detailed drawings are included in Appendix B and photographs of the completed detention basins are included in Appendix D.

In Order to accommodate detention basins and waste rock reclamation, the relocation of cut-off walls was required in three drainages. The new wall design is similar to the existing walls located in the SWRR drainages. The cut-off walls are keyed into bedrock in order to intercept WRCW. Perforated pipe runs along the footing of the wall in order to best facilitate and convey the WRCW capture. In most cases a French drain containing coarse non-reactive rock and perforated pipe extends along the top of bedrock from the original cut-off wall location to the new further facilitating the conveyance and capture of WRCW.


Lark Gate
Yosemite
6.3
5.1
5.4
5.2
Saints Rest
51
5.1
Butterfield Canyon
4.2
41
4.4
4.5
4.3
South Saints Rest
3.2
3.1
3.3
Castro
2.2
2.1
Butterfield 1
2.4
1.1
2.3
21
0.2
0.1
1.3
1.2
11
12
Queen
Olsen
West Jordan
Copperton
South Jordan
Bingham Canyon Pit
Lark Gate
Herriman
The information on this map is based on the most current information available to Kennecott and should be used for planning purposes only. No warranty expressed or implied is made regarding the accuracy or utility of the data for general or scientific purposes, nor shall the act of distribution constitute any such warranty.
NOTE: Imagery date 2016
Scale expressed as relative fraction.
1:20,000
Kennecott Property Boundary
Breached Cut Off Wall
Existing Cut Off Wall
Detention Basin
Sections
5.1 Basin ID
Rio Tinto
Kennecott Utah Copper
EXHIBIT 1
Rev 3. November 11, 2017
Coordinate System NAD83 State Plane Utah Central Zone Feet

2.2 Detention Basin Specifications

Detailed basin dimensions are provided in Appendix A. A summary of key basin dimensions for quick reference based upon as-built survey data are included below in Table 2. Basins per respective drainage are identified beginning with downstream locations and progressing upstream. Basins below the lower most cut-off wall in a specific drainage are identified as a whole number (i.e. 51) while basins above the lower most cut-off wall in a specific drainage are identified with a decimal point, increasing in value moving upstream (i.e. 3.1, 3.2).

Table 2. Overview of Detention Basin Specifications

Basin ID	Capacity (ac-ft)	Outlet Elevation (ft)	Spillway Elevation (ft)	Outlet Orifice Dimension[1] (in)	Peak Outflow 100yr-24hr (CFS)	Grate Material[2]
Yosemite						
6.1	2.17	5800.1	5809.5	12	4.20	Galvanized
6.2	3.52	5845.0	5864.1	6	4.17	Galvanized
6.3	2.36	5874.1	5892.0	8	7.11	Galvanized
6.4	0.90	5903.0	5913.6	12	18.78	Galvanized
Saints Rest						
51	0.73	5778.2	5786.4	8	2.61	Galvanized
5.1	3.79	5843.1	5857.0	6	3.15	Galvanized
South Saints Rest[3]						
41	0.52	5792.4	5800.8	8	2.00	Stainless
4.2	0.77	5827.8	5841.8	6	3.13	Stainless
4.3	0.87	5846.6	5858.7	6	3.28	Stainless
4.4	2.74	5871.4	5886.6	6	3.63	Stainless
4.5	2.20	6054.0	5918.8	10	7.67	Stainless
Castro						
3.1	4.87	6166.0	6179.6	6	2.60	Galvanized
3.2	4.45	6161.3	6179.0	6	2.70	Galvanized
3.3	10.16	6151.3	6172.0	6	2.90	Galvanized
Butterfield 1						
21	4.83	6054.0	6073.0	6	3.64	Galvanized
2.1	0.75	6113.1	6126.5	8	5.57	Galvanized
2.2	4.18	6161.1	6180.3	8	5.05	Galvanized
2.3	0.94	6195.3	6207.9	10	6.74	Galvanized
2.4	1.37	6222.4	6237.3	10	6.72	Galvanized
Olsen						
12	2.77	6146.4	6165.4	6	4.15	Galvanized
11	1.82	6220.0	6233.0	8	4.91	Galvanized
1.1	3.16	6275.5	6293.6	8	4.98	Galvanized
1.2	3.49	6307.9	6326.6	8	5.12	Galvanized
1.3	1.50	6340.0	6352.7	9	5.68	Galvanized
Queen						
0.1	2.03	6491.9	6511.0	7	5.62	Galvanized
0.2	1.35	6539.7	6559.0	7	6.04	Galvanized

Notes.

1 - All detention basin outlet structures (excluding 3.1 and combination cut-off walls) are constructed with the same dimensions and inlet/outlet pipe sizing, however each 18” lower outlet pipe has an orifice plate that varies in size and can be changed out to modify the performance of the outlet structure.

2 – Outlet structure grates are either stainless steel or galvanized steel based upon drainage water quality.

3 - Basin 4.1 was in the original design and resided on the ridge above 4.2 but was omitted during construction due to lack of capacity and difficulty to access and was later replaced with 4.5.

2.3 Cut-off Wall Design

The cut-off walls are designed to capture WRCW and convey that water via gravity to the contact water mainline. The wall accepts contact water from 1) a french drain (perforated pipe embedded in coarse non-reactive rock) leading up the drainage or 2) perforated pipe adjacent to the wall footing and atop bedrock. The contact water perforated piping is atop bedrock but below surface grade. This allows for segregation of contact water from storm water and optimum performance of the storm water basins. Ultimately contact water and storm water are comingled prior to entering the mainline collection pipe.

In some cases, the cut-off walls are designed to detain surface water and act as the lower embankment of the detention basin. The inlet box is slotted the entire height of the box. Water exits the box through an 18” outlet pipe. In the event the pipe at the bottom of the box plugs, water can exit through a 12” overflow pipe that routs water back into the primary 18” pipe. In the event both pipe outlets become plugged, water will exit over the wall through an overflow weir notch.

3.0 Inspection & Maintenance

3.1 Overview

The detention basins, although not designed to primarily capture and route waste rock contact water (WRCW), do play an important role in protecting the structures and piping that are designed to manage WRCW. If storm water, sediment and debris were to overwhelm cut-off walls and associated infrastructure, the potential for the release of WRCW to the environment would greatly increase. The detention basins are designed to minimize adverse impacts to the primary acid rock drainage (ARD) collection system as well as convey WRCW through and require routine inspection and maintenance.

Inspection frequency is guided by groundwater discharge permit # UGW350010. The permit only specifically requires quarterly inspection, however best practice recommends a more frequent inspection following large rain events. Table 3 provides inspection guidance and frequency.

Table 3. Inspection Frequency and Guidance

Inspection Type	Frequency	Guidance
UDWQ Groundwater Discharge Permit #UGW350010[1]	Quarterly	Appendix A, Groundwater Discharge Permit # UGW350010
Significant precipitation event[2]	Varies	Rain depth ≥10 year-24 hour as indicated by the Copper drainage rain gage

Notes.
1 – Required by groundwater discharge permit #UGW350010
2 – Not required by the groundwater discharge permit. Refer UPDES Permit (0000051) Statement of Basis (p. 21) and Part I.E as well as 40 CFR 440.131(c) for guidance

The inspection checklist for the south dump detention basins is discussed in section 3.3 and included in Appendix C.

3.2 Basin Components

The basins are fairly simple by design. Alluvial water, storm water and sediment report from the dump toe, face or the native hillside and enter the drainages containing the detention basins and cut-off walls. The water passes through the rock weir in front of the outlet structure while coarse sediment is trapped behind the rock weir. Water then exits the detention basin through the outlet structure. Peak flow for a given rain event is regulated by the outlet structure and appropriately sized orifice plates so as to not overwhelm the capacity of the main collection pipe along the east side collection road. If the detention basin is overwhelmed due to either the size of the precipitation event or sediment and debris plugging off outlets, water then exits the basin through the overflow weir, reporting to the next basin in line. The basins for each respective drainage are designed to manage up to a 100 year-24 hour rain event. By design, in some cases when rain events are large, water will exit some basins via the overflow weir and report to the next basin.

Flow diagrams for the drainages are located with the as-built drawings in Appendix B.

Exhibit 2. Basin Components Illustration

Key

1. Rock Weir. See dwg. # 10199-C-321.
2. Outlet Structure. See dwg. # 10199-C-322 & 10199-C-323.
3. Rip Rap Overflow Weir. See dwg. # 10199-C-321.
4. Basin Embankment. See dwg. # 10199-C-321.
5. Pipe Outlet. See dwg. # 10199-C-321.

3.2.1 Rock Weir:

The rock weirs are four (4) feet tall. They are designed to filter out medium to coarse particulate and prevent the concrete outlet structure from becoming plugged with sediment and debris. Sediment may accumulate behind the rock weir over several rain events and seasons. If sediment depth reaches two (2) feet behind the rock weir then the basin should be scheduled for sediment removal. Use of the digital terrain model (DTM) file will assist in achieving the basins original shape and capacity. Care should be taken to maintain the integrity of the rock weir. In the event of a significant precipitation event that overwhelms one or more detention basins, the rock weir can be dismantled to remove fine grained particles and reconstructed. Details regarding the rock weir specifications are found in Appendix B, drawing # 10199-C-124. If not all the rocks for the weir cannot be salvaged, material that meets specification may need to be sourced to supplement reconstruction. Generally, the rock used for the weir needs to be resistant to erosion and non-reactive with the water found in the drainage.

3.2.2 Outlet Structure:

All outlet grates and orifices must be inspected following significant storm events as outlined in Table 3. The grates and piping inlets (orifices) must be clear of vegetation, sediment and debris in order to function as designed. In order to combat outlet plugging from floating debris, the Yosemite drainage incorporated “T”s that will allow head pressure to push water through the submerged pipe inlet while sediment floats on the surface, reducing the potential of debris blocking the inlet. Water can also flow in from the top of the “T”. A clean out access pipe is also included immediately down gradient of the outlet structure.

3.2.3 Pipe Outlets:

Pipe outlets are within the outlet structure should remain free of excess sediment and debris in order to provide proper functionality. If the rip rap at or below the pipe outlet show signs of deterioration (i.e. rock movement, erosion adjacent to the channel, etc.) repairs must be made.

3.2.4 Rip Rap Overflow Weir:

The rip rap overflow weirs are designed to move water from out of the basin to the next containment structure without damaging the integrity of the embankment. In many cases and in larger rain events, the basins are designed to move water through the overflow weir in addition to the outlet structure. The overflow weir will also move water should the outlet structure become plugged by sediment and debris. If an overflow weir shows indications of erosion adjacent to the rock channel, at the inlet or outlet, repairs must be made.

3.2.5 Distribution Boxes:

The distribution boxes are designed to accept water from two sources (i.e. cut-off wall and sediment basins) and route the water through a common pipe into the main east side collection pipe. These boxes also provide access for pipe cleaning. The boxes must be kept clean, free of sediment and debris. The inspection schedule needs to be the same as the cut-off walls and basins.

3.3 Cut-off Wall Components

Cut-off wall components require inspection similar to the detention basin outlet structures. Some components (finger drains) are below grade and cannot be readily inspected. The cut-off wall manages both contact and non-contact water.

Exhibit 3. Cut-off Wall Components Illustration

Key

1. Concrete cut-off wall keyed into bedrock. See dwg. # 10199-C-305, 306, 315, 308 & 327.
2. Overflow weir notch. See dwg. # 10199-C-305, 306 & 315.
3. Surface water inlet box. See dwg. # 10199-C-327 & 328.
4. Hand wheel and slide gate valve. See dwg. # 10199-C-327.
5. Outlet box and piping. See dwg. # 10199-C-327.
6. Outlet pipe cleanout port. See dwg. # 10199-C-327.

3.3.1 Concrete Wall, Box and Valves

The concrete wall is keyed into bedrock and designed to facilitate in the capture of all water moving down the drainage, contact and non-contact water. The wall contains an overflow weir (notch in the wall) to allow overflow of storm water in the event the outlet box and associated piping are overwhelmed or plugged. The inlet box has grating from the ground surface to the top of the box allowing for the free flow of water into the box as sediment and debris accumulate against the grating. A hand wheel atop the box operates the slide gate valve on the low level inlet at the back of the inlet box. A secondary inlet pipe is located near the top of the inlet box in the event the low level inlet becomes inoperable.

3.3.2 Finger Drains and Contact Water Capture at Cut-off Wall

The information provided in this section pertains to finger drains installed at the toe of the reclaimed waste rock slope (and extending beyond) in the Yosemite, South Saints Rest, Butterfield 1 and Olsen drainages. These finger drains are designed to capture WRCW at the highest point in the drainage and direct that water to the cut-off wall and collection system. Where practical, a finger drain is installed from the location of the legacy cut-off wall to the new cut-off wall along the drainage bottom against bedrock. The finger drain is 8” perforated pipe embedded in 2” non-reactive rock and wrapped in geotextile to prevent fine silt from plugging the pipe and ability to accept water.

The newly installed cut-off walls in Yosemite, Butterfield 1 and Olsen drainages incorporated perforated pipe below grade to capture WRCW in conjunction with the concrete wall. Along the footing of each cut-off wall resides a 4” perforated pipe embedded in 2” non-reactive rock and wrapped in geotextile. All water collected at the wall will enter the coarse rock channel and perforated pipe and report to the 12” HDPE pipe. In the case of the Upper Yosemite cut-off wall, Butterfield 1 and Olsen, the piping system passes through the cut-off wall and ultimately reports to the main collection line. In the case of the Lower Yosemite cut-off wall, the 4” pipe reports to the inlet box where it comingles with the surface water that enters the box through the grate.

3.3.3 Storm Water Conveyance

Storm water enters the inlet box through the grating and enters the 12” collection pipe on the floor of the back wall of the box. The outlet pipe does not have an orifice plate but does contain a slide gate valve. The valve typically stays in the fully open position and is only closed for maintenance purposes. In the event the 12” pipe inlet were to become plugged, a secondary 12” pipe is located approximately 5’ below the top of the box. In the event both pipes were to become plugged or otherwise fail, storm water would exit pass through the overflow weir notch atop the wall and adjacent to the outlet box. A hatch resides on the down gradient side of the box to allow access to the associated piping. Immediately down gradient of the wall are cleanouts for the 12” inch pipe.

3.4 Inspection Checklist:

Detention basin inspections should be conducted on a routine basis in conjunction with inspections of the east side collection system. An inspection checklist for the south dump detention basins is included in Appendix C. In the event of a significant precipitation event, more frequent inspections are advised (See Table 3 for guidance).

3.5 Sediment Removal

There are two types of sediment deposition associated with the detention basins requiring maintenance, chronic and acute. Chronic sediment deposition includes sediment that can accumulate over multiple precipitation events occurring over weeks, months and even years. Acute sediment deposition may take place over one large rain event or several larger events in in a short period of time. In either case, maintenance will be required to remove the sediment and return the basin to its original capacity. A DTM file is provided that will assist the GIS equipped equipment to restore the basin to its original shape and capacity. If the DTM is not compatible with the selected contractor, detailed electronic as-built files are included with the O&M.

Care should be taken to not damage the outlet structures and piping. Use hand tools as needed to complete the close proximity maintenance.

4.0 Training

Training for the operation of the basins consists of the following components:

- A complete read of the O&M and thorough review of the materials provided in the Appendices;
- A site tour with a member of the construction team and/or operations team familiar with the cut-off walls, basins and associated structures.

If, in the future, a knowledge gap is identified, contact a member of the RTKC Water Quality team and arrange for training support should knowledgeable members of the construction team and operations team not be available.

5.0 Reference Information

5.1 UDWQ Construction Permit

The detention basin design and specifications were reviewed and approved by Mr. Woodrow Campbell, P.E. of the Utah Department of Environmental Quality – Division of Water Quality. Periodic field visits were conducted during the construction activities including three final inspections based upon project phasing and completion:

- Saints, South Saints and Castro detention basins - December 15, 2014 for.
- Yosemite detention basins and cut-off walls - 3Q2016.
- South Saints Rest detention basin 4.5, Butterfield 1 cut-off wall and detention basins, Olsen cut-off wall and detention basins and Queen detention basins - October 23, 2017.

5.2 Dam Safety Permit

The embankments associated with the detention basins were reviewed and approved through the Utah Department of Natural Resources – Water Rights – Dam Safety. Under the advisement of the Assistant State Engineer, the basins were lumped together by drainage and issued a permit number accordingly. The combined basins per drainage are classified as a small dam – low hazard with cumulative capacities by drainage of less than 20 acre-feet.

Drainage	Permit #	Water Rights
Yosemite	UT53811	a6714 (base water right 59-42)
Saints Rest	UT53799	
South Saints Rest	UT53800	
Castro	UT53802	
Butterfield 1	UT53803	
Olsen	UT53804	
Queen	UT53876	

5.3 Groundwater Discharge Permit

The detention basins and associated piping are considered a component of the groundwater control structures associated with the Bingham Canyon Mine and Water Collection System Groundwater Discharge Permit # UGW350010 under the sections Part 1.D.3 and Part 1.D.2 with additional detail provided in Appendix A.

5.4 Project Contacts

Name	Title	Contact Information
Engineering and Projects (Construction Team)		
Jared Barlow	Project Manager	(801) 569-6610
Dave Hales	Project Engineer/Design & Interface	(801) 569-7800
Zeb Kenyon	Project Engineer/Design & Permitting	(801) 569-6035
Operations Team (South Area Water Services)		
Jason Doyle	Superintendent – Tailings & Water Services	(801) 569-6856
Guillermo Salcedo	Supervisor – SAWS Operations	(801) 204-3511
Environmental Team (Permit and Compliance)		
Brian Vinton	Principle Advisor – Water Quality	(801) 569-7887

6.0 Revision History

Rev. #	Description of Change(s)	Prepared by	Date
0	Original release of O&M to capture basins completed in December 2014 for Saints Rest (5.1 & 51), South Saints Rest (4.4, 4.3, 4.2 & 41) and Castro (3.3, 3.2 & 3.1) and to fulfill DWQ construction permit obligations.	Zeb Kenyon, RT T&I	March 2015
1	Updated to incorporate basin and cut-off wall completion in Yosemite drainage and fulfill DWQ construction permit obligations.	Zeb Kenyon, Rio Tinto G&I	December 2016
2	Updated to incorporate basin and cut-off wall completion in South Saints Rest, Butterfield 1, Olsen and Queen drainages and fulfill DWQ construction permit obligations.	Zeb Kenyon, Rio Tinto G&I	November 2018

APPENDIX J

UGW#350010

Toe Drain Extension from East Waste Rock to South Waste Rock Reclamation Permit Modification and Construction Permit Plans and Specifications

State of Utah

GARY R. HERBERT
Governor

SPENCER J. COX
Lieutenant Governor

Department of
Environmental Quality

Alan Matheson
Executive Director

DIVISION OF WATER QUALITY
Walter L. Baker, P.E.
Director

Cassady Kristensen
Rio Tinto Kennecott
Environment Business Partner
4700 Daybreak Parkway
South Jordan, Utah 84009

Dear Ms. Kristensen:

Subject: **Construction Permit** for the Toe Drain Extension and Utility Re-Locates Burma Road Area

On March 27, 2020, the Division of Water Quality (DWQ) received the engineering plans for the Rio Tinto Kennecott Utah Copper (RTKC) Toe Drain Extension and Utility Re-Locates, Burma Road Area from Brian Vinton. The original submittal was basically to let Woodrow Campbell and Brian Hamos of DWQ look at the plans and start the discussion. The original plans had not been stamped by a Utah Certified Professional Engineer (P.E.). It was then decided to attach the Construction Permit to the Ground Water Discharge Permit Modification and have it go out as part of the Public Notice. On May 29, 2020 a new set of P.E. stamped drawing were sent to DWQ. On June 4, 2020 Brian Vinton also sent over the construction specifications for this project.

The following is a summary of the proposed major construction projects for this Construction Permit:

- Construction of a Toe Drain Extension and
- Removal and/or Relocation of Utility Lines.

The plans and specifications, as submitted, comply with *the Utah Water Quality Rules, (R317, Utah Administrative Code).* A **Construction Permit** is hereby issued as constituted by this letter, subject to the following conditions:

1. *Any revisions or modifications to the approved plans and specifications must be submitted to DWQ for review and approval, before construction or implementation thereof. Please submit any changes for review and approval directly to Woodrow Campbell, P.E., of the DWQ Ground Water Protection Section.*

2. *A written operations and maintenance manual, containing a description of the functioning of the facilities, an outline of routine maintenance procedures, and all checklists and maintenance logs needed for proper operation of the system, must be submitted and approved before the final inspection and operation of the system.*

3. *The approved facilities must not be placed in service unless DWQ has conducted a final inspection, reviewed and approved the As-Built Construction Certification Report, and provided written authorization to place the constructed facilities in service.*

The plans and specifications for this project have been stamped and signed by a Professional Engineer currently licensed to practice in the state of Utah. The construction design, inspection supervision, and written construction certification of all work associated with this Construction Permit must be performed by a Professional Engineer licensed to practice in the state of Utah.

This Construction Permit will expire one year from the date of its issuance, as evidenced by the date of this letter, unless substantial progress is made in constructing the approved facilities or the plans and specifications have been resubmitted and the construction permit is reissued. This permit does not relieve you, in any way, of your obligations to comply with other applicable local requirements.

Please contact Mr. Campbell at the beginning of construction to allow periodic inspections to be scheduled. Upon completion of the project, a final inspection and approval of the As-Built Construction Certification Report is required before the approval to operate the completed facilities can be issued. Please remain in contact with Mr. Campbell to schedule the final inspection. The Construction Certification Report with final as-built drawings must include test results for the following construction quality assurance and quality control (CQA/QC) elements:

Soil and Rock Placement

- Proctor Curves,
- Soil Classification,
- Field Compaction Testing, and
- Size Verification of Drain Rock.

Geotextile

- Geotextile Placement Log,
- Manufactures Certification including QA/QC Testing of the Rolls, and
- Professional Engineer Certification.

If we can be of further assistance, please contact Mr. Woodrow Campbell at wwcampbell@utah.gov or (801) 536-4353.

Sincerely,

Erica Brown Gaddis
Director

EBG/WWC/DJH

cc: Brian Vinton, Brian.Vinton@riotinto.com (via email, w/o encl.)
Nate Christensen, nchristensen@sunrise-eng.com (via email, w/o encl.)
Doug Bacon, DERR (via e-mail, w/o encl.)
Leslie Hepler, DOGM (via e-mail, w/o encl.)

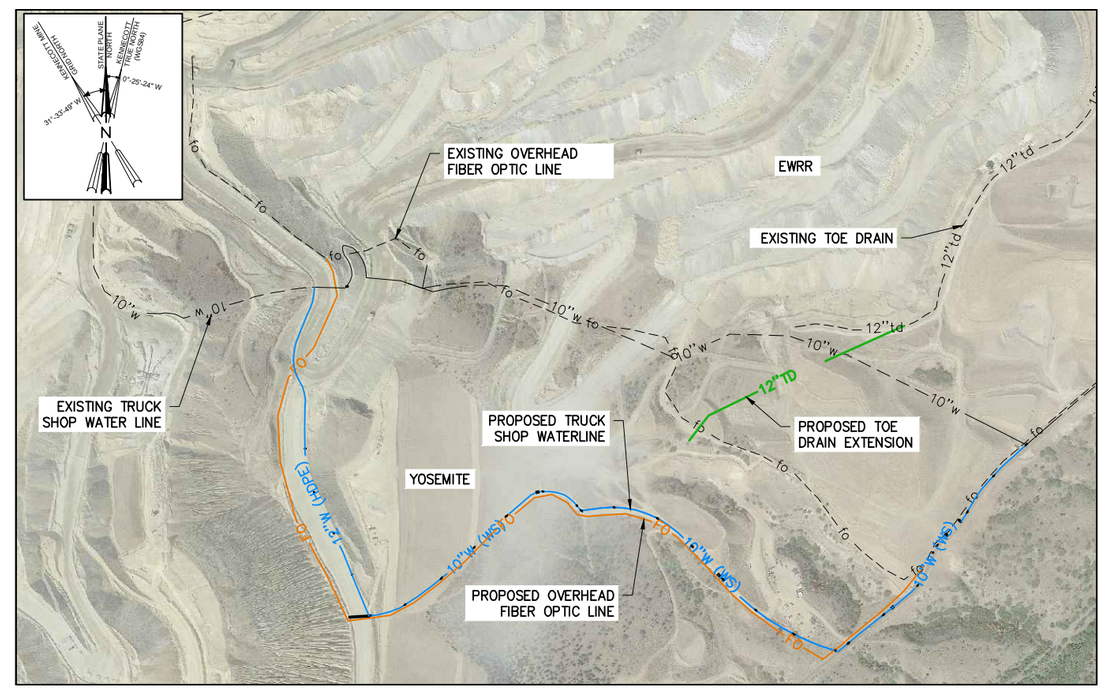
RIO TINTO KENNECOTT COPPER (RTKC)

SEW OPTIMIZATION

TOE DRAIN EXTENSION & UTILITY RE-LOCATES

SHEET INDEX

PROJECT LOCATION



AREA	NO.	DATE	REVISION	BY	CHK	APP
	B	7/16/19	ISSUED FOR REVIEW			
	A	7/12/19	ISSUED FOR REVIEW			

REFERENCE DRAWINGS | NUMBER | NOTES

PROFESSIONAL ENGINEER No. 9482425-2202 NATHAN A. CHRISTENSEN STATE OF UTAH 05/29/2020

NOTES

SUNRISE ENGINEERING

APPROVAL	DATE	SCALE:		DATE
		DESIGNED BY	N. CHRISTENSEN	7/12
		DRAWN BY	J. HOGGARD	7/12
		CHECKED BY	K. MILNE	7/15
		PROJECT ENGINEER	N. CHRISTENSEN	7/15
		PROJECT MANAGER	N. CHRISTENSEN	7/15

RIO TINTO

KENNECOTT
UTAH COPPER

SEW OPTIMIZATION
TD EXTENSION & UTILITY RE-LOCATES
LOCATION AND SHEET INDEX

Job No. | Dwg. No. G1 | REV.

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ABBREVIATIONS

AB	ANCHOR BOLT
ALUM.	ALUMINUM
∠	ANGLE
APPROX.	APPROXIMATELY
ASSY.	ASSEMBLY
@	AT
AV	ALTITUDE VALVE
B.M.	BENCH MARK
BF	BUTTERFLY VALVE
B.W.	BOTH WAYS
BTM.	BOTTOM
BLDG.	BUILDING
BVCS	BEGINNING VERTICAL CURVE STATION
BVCE	BEGINNING VERTICAL CURVE ELEVATION
CB	CHORD BEARING
CI	CAST IRON
℄	CENTER LINE
CLR.	CLEAR
CONC.	CONCRETE
CFM	CUBIC FEET per MINUTE
CFS	CUBIC FEET per SECOND
CV	CONTROL VALVE
CW	CONCRETE WALL
CY	CUBIC YARD
DEG. OR °	DEGREE
DIA. OR ø	DIAMETER
DL	DRAIN LINE
DWG.	DRAWING
DI	DUCTILE IRON
EA.	EACH
ELL.	ELBOW
ELEV.	ELEVATION
EP	END POINT
EVC	END OF VERTICAL CURVE
EVCE	END OF VERTICAL CURVE ELEVATION
EVCS	END OF VERTICAL CURVE STATION
EX.	EXISTING
EXIST.	EXISTING
EXP.	EXPANSION
E.G.	EXISTING GROUND
EWRR	EAST WASTE ROCK RECLAMATION
F.F.	FINISH FLOOR
FT OR '	FEET
F.G.	FINISH GRADE
FTG.	FITTING
FLG	FLANGE
GAL.	GALLON
GALV.	GALVANIZED
GB	GRADE BREAK
GSP OR GS	GALVANIZED STEEL PIPE
GI	GALVANIZED IRON PIPE
GA.	GAUGE
GPM	GALLONS per MINUTE
GCL	GEOSYNTHETIC CLAY LINER
GV	GATE VALVE
HORIZ.	HORIZONTAL
HB	HOSE BIB
HDPE	HIGH DENSITY POLY-ETHYLENE
IN. OR "	INCH
ID	INSIDE DIAMETER
INSUL.	INSULATION
INV.	INVERT
IPS	IRON PIPE SIZE
K	CURVE COEFFICIENT
L	LENGTH
LC	LENGTH OF CHORD ON HORIZONTAL CURVE
LF	LINEAR FEET
LVC	LENGTH OF VERTICAL CURVE
MH	MANHOLE
MFR.	MANUFACTURER
MAX.	MAXIMUM
MGD.	MILLION GALLONS PER DAY
MIN.	MINIMUM
MID.	MIDDLE POINT OF HORIZONTAL CURVE
MSM	MINE SALVAGE MATERIAL
NO. OR #	NUMBER
O.C.	ON CENTER
OD	OUTSIDE DIAMETER
PC	POINT OF CURVATURE
PT (ROAD)	POINT OF TANGENT
PL.	PLATE
PT	POINT
PVI	POINT OF VERTICAL INTERSECTION
PRV	PRESSURE REDUCING VALVE
PVC	POLYVINYL-CHLORIDE
LB. OR #	POUND
PSF	POUNDS per SQUARE FOOT
PSI	POUNDS per SQUARE INCH
⅊	PROPERTY LINE
R	RADIUS OF HORIZONTAL CURVE
RAD	RADIUS
RCP	REINFORCED CONCRETE PIPE
REQ'D.	REQUIRED
REV.	REVISION
R/W	RIGHT-OF-WAY
SCH.	SCHEDULE
SPEC.	SPECIFICATION
SQ.	SQUARE
SF	SQUARE FEET
SSM	SOIL SALVAGE MATERIAL
ST. STL.	STAINLESS STEEL
STD.	STANDARD
STA	STATION
T	TANGENT OF HORIZONTAL CURVE
TYP.	TYPICAL
UBC	UNTREATED BASE COURSE
U.N.O.	UNLESS OTHERWISE NOTED
VERT.	VERTICAL
WS	WELDED CARBON STEEL
W/	WITH

LEGEND

EXISTING

- WATERLINE — 10"w
- TOE DRAIN — 12"td
- FIBER OPTIC — fo
- CENTERLINE
- CONCRETE
- RIP RAP OR ROCK
- LANDSCAPED AREA
- GRAVEL ROAD
- EXISTING VALVE
- STORM DRAIN MANHOLE (SD)
- WATER MANHOLE (W)
- FIRE HYDRANT
- IRRIGATION BOX
- CATCH BASIN
- WATER METER
- SEWER MANHOLE (SS)
- POWERPOLE
- STREET LIGHT
- ELECTRIC BOX

PROPOSED

- 10" WATER LINE (WELDED CARBON STEEL) — 10"W (WS)
- 10" WATER LINE (HDPE PIPE) — 12"W (HDPE)
- 12" TOE DRAIN LINE — 12"TD
- OVERHEAD FIBER — FO
- CENTERLINE
- CONCRETE
- RIP RAP OR ROCK
- LANDSCAPED AREA
- GRAVEL ROAD
- PROPOSED VALVE
- 11.25° ELBOW
- 22.5° ELBOW
- 45° ELBOW
- 90° ELBOW
- TEE (SIZED BY WATER LINE)
- CROSS (SIZE AS REQ'D ON PLAN)
- FIRE HYDRANT
- WATER METER
- AIR VAC
- BLOW OFF
- REDUCER (SIZE AS REQ'D ON PLAN)

- CROSS REFERENCING — DETAIL DESIGNATION / DRAWING NUMBER
- CONSTRUCTION NOTES — TYPICAL OR ADDITIONAL NOTE / CONSTRUCTION NOTE #
- R.O.W. MARKER
- PROPERTY CORNER
- ALUM CAP U.E.L.S

AREA	NO.	DATE	REVISION	BY	CHK	APP
	B	7/16/19	ISSUED FOR REVIEW			
	A	7/12/19	ISSUED FOR REVIEW			

REFERENCE DRAWINGS | NUMBER | NOTES

PROFESSIONAL ENGINEER 05/29/2020 No. 9482425-2202 NATHAN A. CHRISTENSEN STATE OF UTAH

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		DRAWN BY	J. HOGGARD	7/12
		CHECKED BY	K. MILNE	7/15
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RIO TINTO

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SEW OPTIMIZATION
TD EXTENSION & UTILITY RE-LOCATES

ABBREVIATIONS & LEGEND

Job No. | Dwg. No. G2 | REV.

D:\Sunrise Engineering\KUCC\Toe Drain Extension\ETransmit\DRIVE_P\KUCC\06848 South East Waste Dumps\Civil Design Drawings\Sheets\1 - GENERAL.dwg Jul 16, 2019 9:49am nchristensen

GENERAL CONSTRUCTION NOTES

1. AS-BUILT TOPOGRAPHY WAS OBTAINED FROM RTKC. SUNRISE ENGINEERING PERFORMED A COORDINATE CONVERSION OF THE TOPOGRAPHY FROM MINE GRID NORTH TO UTAH STATE PLANE NAD83, NAVD 88 DATUM ON JUNE 18, 2019. EXISTING CONDITIONS MAY VARY FROM THOSE SHOWN ON THESE PLANS. PRIOR TO BID THE CONTRACTOR SHALL VERIFY EXISTING CONDITIONS, ADJUST WORK PLAN ACCORDINGLY, AND REVIEW WITH RTKC PRIOR TO BEGINNING CONSTRUCTION.
2. THE CONTRACTOR MUST SUBMIT IN WRITING ANY REQUESTS FOR MODIFICATIONS TO THE PLANS OR SPECIFICATIONS. SHOP DRAWINGS MUST BE SUBMITTED TO SUNRISE ENGINEERING
3. THESE DOCUMENTS HAVE BEEN PREPARED USING STANDARDS OF PROFESSIONAL CARE AND COMPLETENESS AS REQUIRED FOR THIS LOCALITY. THEY ASSUME THAT THE WORK DEPICTED WILL BE PERFORMED BY AN EXPERIENCED CONTRACTOR AND/OR WORKMEN WHO HAVE A WORKING KNOWLEDGE OF THE APPLICABLE CODE STANDARDS AND REQUIREMENTS AND OF INDUSTRY ACCEPTED STANDARD GOOD PRACTICE. AS NOT EVERY CONDITION OR ELEMENT IS (OR CAN BE) EXPLICITLY SHOWN ON THESE DRAWINGS, THE CONTRACTOR SHALL USE INDUSTRY ACCEPTED STANDARD GOOD PRACTICE FOR MISCELLANEOUS WORK NOT EXPLICITLY SHOWN.
4. EXISTING & FUTURE TOPOGRAPHY, STRUCTURES, AND SITE FEATURES ARE DEPICTED AS SCREENED AND/OR DASHED-LINED. NEW FINISH GRADE, STRUCTURES, AND SITE FEATURES ARE DEPICTED WITH HEAVY-LINES.
5. STAGING AREA FOR CONTRACTOR'S EMPLOYEE PARKING, CONTRACTOR'S TRAILERS AND ON-SITE STORAGE OF MATERIALS WILL BE DESIGNATED BY AND COORDINATED WITH RTKC.
6. PROVIDE TEMPORARY FENCING AS NECESSARY BASED ON RTKC REQUIREMENTS TO MAINTAIN SECURITY AT ALL TIMES.
7. SLOPE UNIFORMLY BETWEEN CONTOURS AND SPOT ELEVATIONS SHOWN. ANY SLOPE ROUNDING SHALL BE APPROVED BY RTKC.
8. CONTRACTOR SHALL TAKE ALL MEASURES TO POSITIVELY PRECLUDE EROSION MATERIALS FROM LEAVING THE SITE. CONTRACTOR TO SUBMIT EROSION CONTROL PLAN TO RTKC, FOR REVIEW AND APPROVAL PRIOR TO CONTRACTOR BEGINNING ANY WORK.
9. EXACT POINT OF MATCHING, TERMINATION AND OVERLAY, IF NECESSARY, MAY BE DETERMINED IN THE FIELD BY THE ENGINEER OF RECORD OR THE RESIDENT ENGINEER OVERSEEING THE PROJECT CONSTRUCTION.
10. ANY AMBIGUITIES OR DEFICIENCIES DISCOVERED ON THESE PLANS ARE TO BE RESOLVED BY THE ENGINEER OR ITS APPOINTED REPRESENTATIVE. ANY MODIFICATIONS TO THESE PLANS MADE BY ANYONE OTHER THAN THE ENGINEER OR ITS APPOINTED REPRESENTATIVE IS SOLELY RESPONSIBLE FOR THOSE MODIFICATIONS.
11. ALL WORK, TESTING AND MATERIALS SHALL CONFORM TO THE PROJECT CONSTRUCTION PLANS, SPECIFICATIONS, DETAILS, AND CONTRACT DOCUMENTS UNLESS SPECIFICALLY STATED OTHERWISE IN THESE PLANS. ALL WORK AND MATERIALS NOT IN CONFORMANCE WITH THESE PLANS AND SPECIFICATIONS ARE SUBJECT TO REMOVAL AND REPLACEMENT AT THE CONTRACTOR'S EXPENSE.
12. AN APPROVED SET OF PLANS AND SPECIFICATIONS SHALL BE AVAILABLE ON THE JOB SITE AT ALL TIMES.
13. THE CONTRACTOR SHALL OBTAIN ALL NECESSARY PERMITS PRIOR TO BEGINNING CONSTRUCTION. THE CONTRACTOR IS RESPONSIBLE FOR VERIFICATION OF EXISTING PERMITS, RENEWAL OF LAPSED PERMITS, AND OBTAINING ANY NEW PERMITS.
14. THE CONTRACTOR IS RESPONSIBLE FOR MAKING ARRANGEMENTS FOR INSPECTION AND TESTING.
15. THE CONTRACTOR IS RESPONSIBLE FOR HIS OWN TAKEOFF QUANTITIES. QUANTITIES IF SHOWN HEREON ARE ESTIMATES ONLY AND AS SUCH ARE NOT TO BE USED FOR BID PURPOSES. THE BID SCHEDULE OF VALUES IS THE GOVERNING QUANTITY DOCUMENT FOR THIS PROJECT.
16. THE CONTRACTOR IS RESPONSIBLE FOR THE NOTIFICATION OF THE PROPER AUTHORITY(S) IF THERE ARE OBSTRUCTIONS AND/OR EXISTING UTILITY CONFLICTS TO PROPOSED IMPROVEMENTS AS SHOWN ON THE CONSTRUCTION DRAWINGS. ANY EXISTING ITEM REMOVED TO FACILITATE CONSTRUCTION SHALL BE REPLACED IN THE SAME OR BETTER CONDITION AT THE CONTRACTOR'S EXPENSE.
17. THE CONTRACTOR IS RESPONSIBLE FOR TRAFFIC CONTROL ON AND AROUND THE CONSTRUCTION SITE IN ACCORDANCE WITH THE MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES FOR STREETS AND HIGHWAYS.
18. CONTRACTOR SHALL EXPOSE ALL TIE-IN POINTS TO VERIFY LOCATION PRIOR TO BEGINNING SUBSTANTIAL CONSTRUCTION ACTIVITIES.
19. THE CONTRACTOR CERTIFIES THAT THE CONTRACTOR HAS BEEN PROVIDED FULL OPPORTUNITY TO REVIEW THE CONSTRUCTION DOCUMENTS AND FIELD CONDITIONS SO AS TO ENSURE THAT THE CONTRACTOR FULLY UNDERSTANDS THE DESIGN INTENT SHOWN AND THAT ALL ELEMENTS FOR CONSTRUCTION SHOWN THEREON HAVE BEEN INCLUDED IN THE BID. BY SUBMITTING A BID ON THIS WORK, LABOR AND MATERIAL EXPRESSLY OR IMPLICITLY REQUIRED FOR THE PROJECT AND THAT ANY ERRORS OR OMISSIONS IN THE CONSTRUCTION DOCUMENTS HAVE BEEN BROUGHT TO THE ATTENTION OF THE ENGINEER IN A TIMELY MANNER SO AS TO ALLOW CORRECTIONS TO THE CONSTRUCTION DOCUMENTS BY WAY OF AN ADDENDUM. THE CONTRACTOR AGREES TO WAIVE ANY CLAIM FOR EXTRA COST OR DELAY RELATED TO ANY ERROR OR OMISSION ON THE CONSTRUCTION DOCUMENTS THAT REASONABLY SHOULD HAVE BEEN OBSERVED PRIOR TO COMMENCING WORK ON THE PROJECT.
20. DUE TO AVAILABILITY OF RECORD DRAWINGS AND DOCUMENTATION FROM RTKC, NOT ALL EXISTING UTILITIES ARE SHOWN ON THESE CONSTRUCTION DRAWINGS. IT IS THE RESPONSIBILITY ON THE CONTRACTOR TO IDENTIFY ANY POTENTIAL CONFLICT BETWEEN EXISTING UTILITIES (I.E. OVERHEAD POWER, ETC) AND PROPOSED IMPROVEMENTS PRIOR TO BEGINNING CONSTRUCTION AND NOTIFY RTKC SO A WORK PLAN CAN BE DEVELOPED.
21. ALL SIGNAGE SHOULD BE INSTALLED PER RTKC REQUIREMENTS. PROCUREMENT AND PURCHASE OF SIGNAGE SHOULD BE COORDINATED WITH RTKC PERSONNEL PRIOR TO BEGINNING CONSTRUCTION.

TOE DRAIN CONSTRUCTION NOTES

1. BEDROCK ELEVATIONS SHOWN ON THE DRAWINGS ARE APPROXIMATE AND BASED ON THE BEST AVAILABLE INFORMATION. ACTUAL BEDROCK ELEVATIONS MAY VARY FROM WHAT IS SHOWN. CONTRACTOR SHALL FIELD VERIFY THE ACTUAL BEDROCK ELEVATIONS DURING CONSTRUCTION AND ADJUST THE DESIGN DEPTH, LOCATION AND CONFIGURATION OF THE TOE DRAIN PIPES TO FIT THE ACTUAL CONDITIONS ENCOUNTERED DURING CONSTRUCTION.
2. EXISTING GROUND ELEVATIONS SHOWN ON THE PLANS ARE PRE-STRIPPED GROUND ELEVATIONS DATED JUNE 18, 2019. PRIOR TO CONSTRUCTION OF THE TOE DRAIN EXTENSION, OVERBURDEN MATERIAL OR TOPSOIL WILL BE STRIPPED AND REMOVED DOWN TO BEDROCK. THE STRIPPED SURFACE SHOULD BE SURVEYED AND CHECKED AGAINST DESIGN ELEVATIONS SHOWN IN THESE PLANS AND ADJUSTMENTS MADE AS DESCRIBED IN NOTE 1 ABOVE.
3. THE DEPTH OF THE PARALLEL TOE DRAIN PIPES MAY VARY FROM WHAT IS SHOWN IN THE PLANS DEPENDING ON FIELD CONDITIONS BUT SHALL MEET THE MINIMUM DOWNWARD SLOPE REQUIREMENT OF 0.5% ON ALL PERFORATED PIPES.
4. THE LOCATION OF TOE DRAIN CLEANOUTS MAY BE ADJUSTED IN THE FIELD TO SUIT ACTUAL CONDITIONS ENCOUNTERED DURING CONSTRUCTION. THE MAXIMIUM DISTANCE BETWEEN CLEANOUTS SHALL NOT EXCEED 1000 LF ON EACH OF THE 12" HDPE LINES. IN ORDER TO ACHIEVE THIS SPACING THE CLEANOUTS MAY BE STAGGERED BETWEEN EAST AND WEST LINES BY ALTERNATING EVERY 500 LF.
5. IN SOME INSTANCES BEDROCK MATERIAL MAY BE REMOVED UNDER THE TOE DRAIN INSTALLATION FOOTPRINT IN ORDER TO MAINTAIN CONSTANT SLOPE OF THE PIPE.
6. MINE SALVAGE MATERIAL (MSM) FOR THE TOE BERM DIRECTLY WEST OF THE TOE DRAIN PIPES WILL BE PROVIDED BY RTKC. PICKUP AND DELIVERY OF THE MATERIAL SHOULD BE COORDINATED WITH RTKC PERSONNEL.
7. ALL NEW TOE DRAIN PIPE MUST ALSO HAVE A PARALLEL ACCESS ROAD AND DRAINAGE SWALE ADJACENT TO IT IN ORDER TO PROVIDE ACCESS FOR FUTURE MAINTENANCE OF THE TOE DRAIN AND TOE DRAIN CLEANOUTS (SEE DETAIL DRAWINGS).

TOE DRAIN DESIGN CRITERIA

1. SYSTEM SIZED FOR 24-HOUR 100-YEAR DESIGN STORM EVENT WITH THE MAXIMUM POSSIBLE WATER COLLECTION BEING FROM BOTH ALLUVIAL AND METEORIC WATER TO MATCH EXISTING TOE DRAIN SYSTEM DESIGN
2. WASTE ROCK CONTACT WATER (WRCW) CHARACTERISTICS: pH = 2.0 (WORST CASE), MILD ABRASIVES, CONTAINS SULFURIC ACID
3. PIPING MATERIAL: 12" HDPE DR-17 PIPE
   (PERFORATED AND CORRUGATED FOR PARALLEL LINES, SOLID IPS FOR CLEANOUTS).
4. CLEANOUTS LOCATED EVERY 1000 FT (LOCATIONS ON EAST AND WEST LINES TO BE STAGGERED EVERY 500 FT).
5. MINIMUM DOWNWARD CONTINUOUS SLOPE 0.5%.
6. MAXIMUM POSSIBLE WATER COLLECTED: BOTH ALLUVIAL AND METEORIC.

AREA	NO.	DATE	REVISION	BY	CHK	APP
	B	7/16/19	ISSUED FOR REVIEW			
	A	7/12/19	ISSUED FOR REVIEW			

REFERENCE DRAWINGS | NUMBER | NOTES

PROFESSIONAL ENGINEER
05/23/2022
No. 9482425-2202
NATHAN A. CHRISTENSEN
STATE OF UTAH

NOTES

SUNRISE ENGINEERING

APPROVAL	DATE	SCALE:		DATE
		DESIGNED BY	N. CHRISTENSEN	7/12
		DRAWN BY	J. HOGGARD	7/12
		CHECKED BY	K. MILNE	7/15
		PROJECT ENGINEER	N. CHRISTENSEN	7/15
		PROJECT MANAGER	N. CHRISTENSEN	7/15

RIO TINTO

KENNECOTT
UTAH COPPER

SEW OPTIMIZATION
TOE DRAIN EXTENSION

TOE DRAIN NOTES & DESIGN CRITERIA

Job No. | Dwg. No. TD1 | REV.

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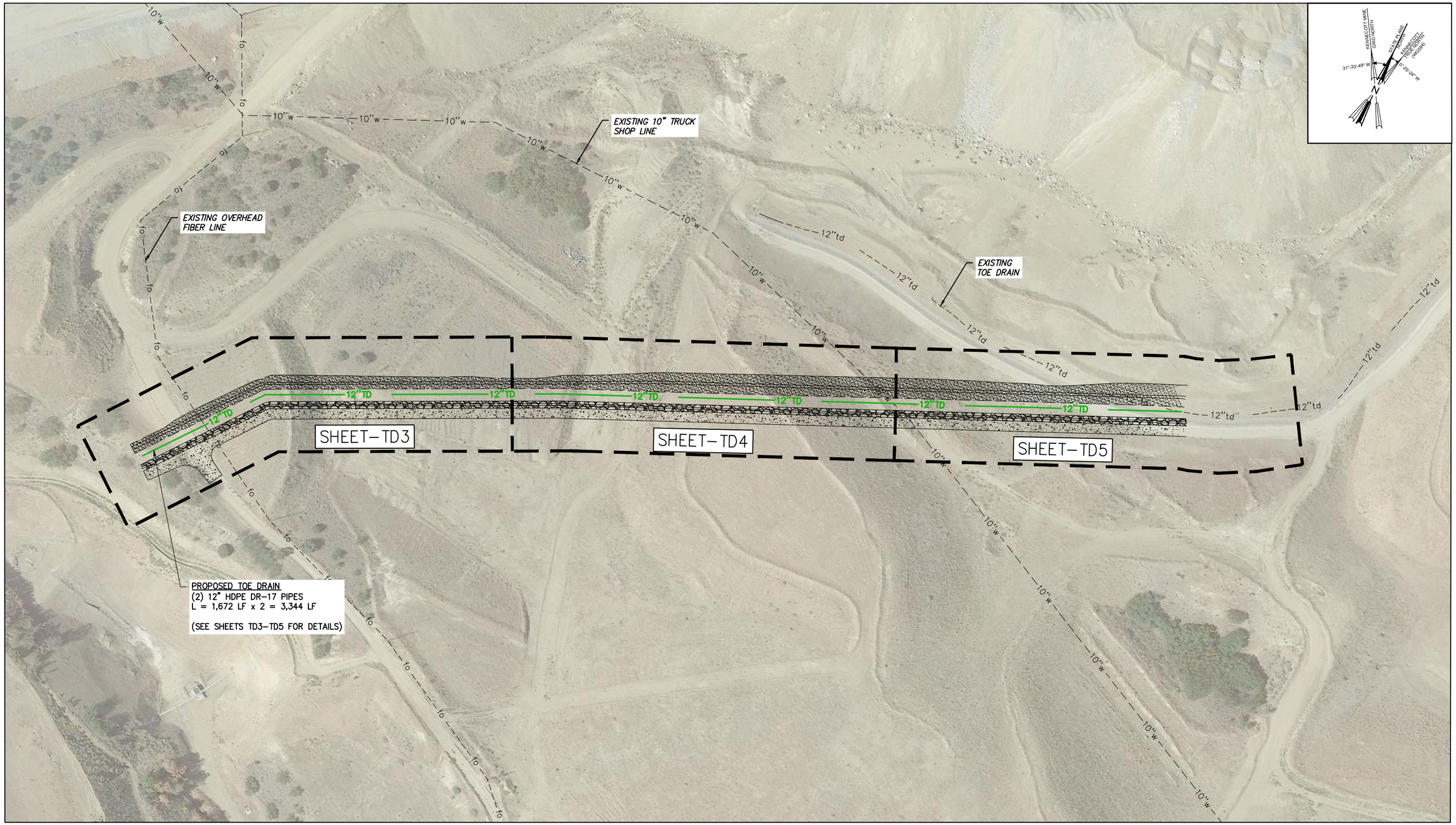

AREA	NO.	DATE	REVISION	BY	CHK	APP
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	A	7/12/19	ISSUED FOR REVIEW			

REFERENCE DRAWINGS

NUMBER

NOTES

SCALE
0 75' 150'
HORIZ: 1" = 150'

PROFESSIONAL ENGINEER
05/29/2020
No. 9482425-2202
NATHAN A. CHRISTENSEN
STATE OF UTAH

NOTES

SUNRISE ENGINEERING

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		DESIGNED BY	N. CHRISTENSEN	7/12
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		PROJECT ENGINEER	N. CHRISTENSEN	7/15
		PROJECT MANAGER	N. CHRISTENSEN	7/15

RO TRIBO

KENNECOTT
UTAH COPPER

SEW OPTIMIZATION
TOE DRAIN EXTENSION

TOE DRAIN INDEX

Job No. | Dwg. No. TD2 | REV.

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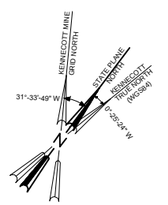
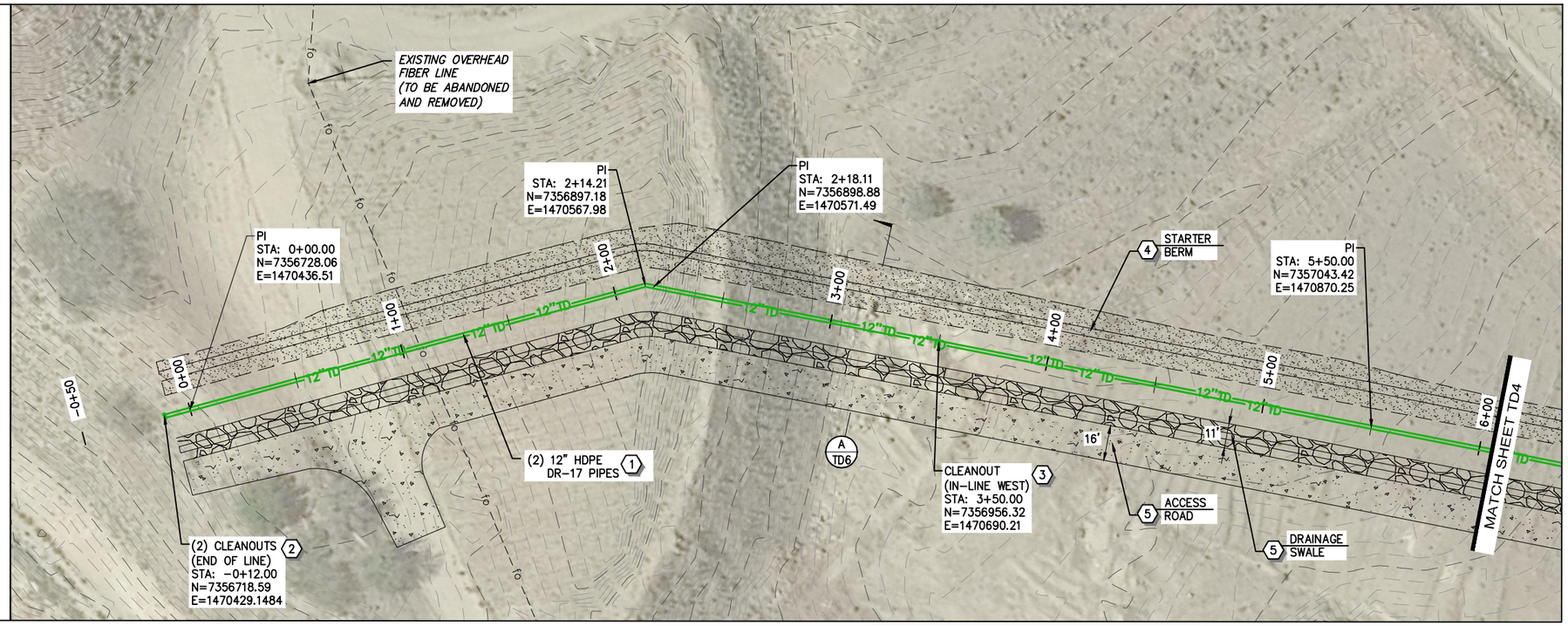
CONSTRUCTION NOTES

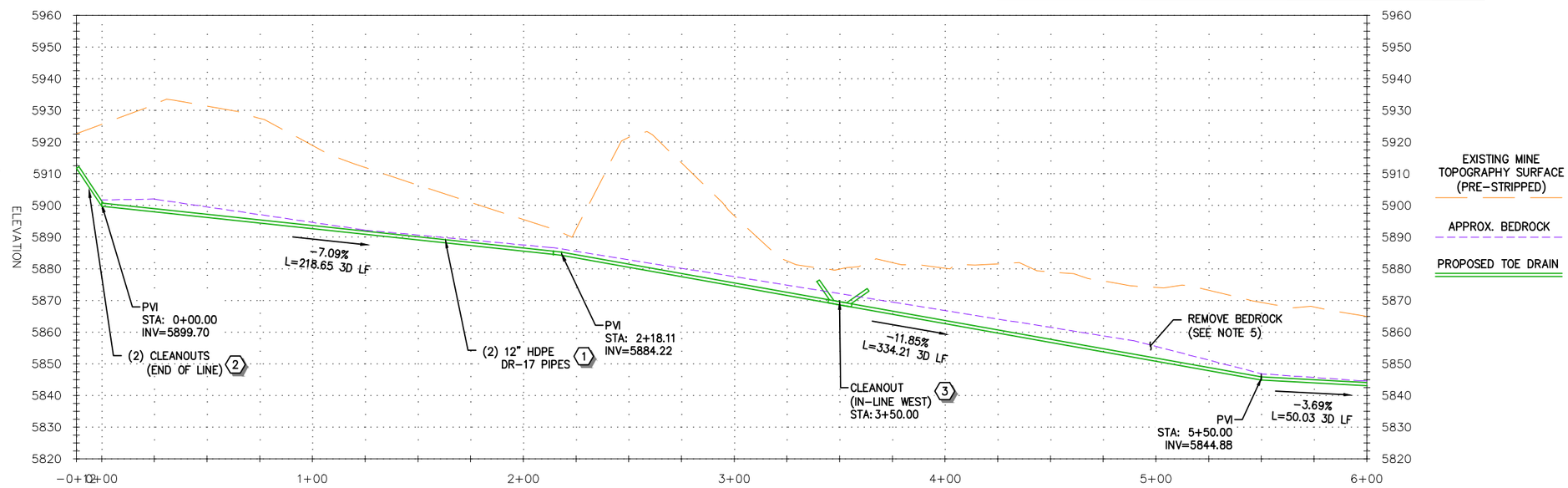
1. 12" HDPE DR-17 CORRUGATED AND PERFORATED (A / TD6)
2. INSTALL CLEANOUT END OF LINE (B / TD7)
3. INSTALL CLEAN OUT IN-LINE (A / TD7)
4. MSM STARTER BERM (A / TD6)
5. TOE DRAIN ACCESS ROAD (6" UBC OVER 12" SUBGRADE) (A / TD6)
6. DRAINAGE SWALE (6" THK 6" MINUS CRUSHED ROCK) (A / TD6)





NOTES:

1. BEDROCK ELEVATIONS SHOWN ON THE DRAWINGS ARE APPROXIMATE AND BASED ON THE BEST AVAILABLE INFORMATION. ACTUAL BEDROCK ELEVATIONS MAY VARY FROM WHAT IS SHOWN. CONTRACTOR SHALL FIELD VERIFY THE ACTUAL BEDROCK ELEVATIONS DURING CONSTRUCTION AND ADJUST THE DESIGN DEPTH, LOCATION AND CONFIGURATION OF THE TOE DRAIN PIPES TO FIT THE ACTUAL CONDITIONS ENCOUNTERED DURING CONSTRUCTION.
2. EXISTING GROUND ELEVATIONS SHOWN ON THE PLANS ARE PRE-STRIPPED GROUND ELEVATIONS DATED JUNE 18, 2019. PRIOR TO CONSTRUCTION OF THE TOE DRAIN EXTENSION, OVERBURDEN MATERIAL OR TOPSOIL WILL BE STRIPPED AND REMOVED DOWN TO BEDROCK. THE STRIPPED SURFACE SHOULD BE SURVEYED AND CHECKED AGAINST DESIGN ELEVATIONS SHOWN IN THESE PLANS AND ADJUSTMENTS MADE AS DESCRIBED IN NOTE 1 ABOVE.
3. THE DEPTH OF THE PARALLEL TOE DRAIN PIPES MAY VARY FROM WHAT IS SHOWN IN THE PLANS DEPENDING ON FIELD CONDITIONS BUT SHALL MEET THE MINIMUM DOWNWARD SLOPE REQUIREMENT OF 0.5% ON ALL PERFORATED PIPES.
4. THE LOCATION OF TOE DRAIN CLEANOUTS MAY BE ADJUSTED IN THE FIELD TO SUIT ACTUAL CONDITIONS ENCOUNTERED DURING CONSTRUCTION. THE MAXIMUM DISTANCE BETWEEN CLEANOUTS SHALL NOT EXCEED 1000 LF ON EACH OF THE 12" HDPE LINES. IN ORDER TO ACHIEVE THIS SPACING THE CLEANOUTS MAY BE STAGGERED BETWEEN EAST AND WEST LINES BY ALTERNATING EVERY 500 LF.
5. IN SOME INSTANCES BEDROCK MATERIAL MAY BE REMOVED UNDER THE TOE DRAIN INSTALLATION FOOTPRINT IN ORDER TO MAINTAIN CONSTANT SLOPE OF THE PIPE.



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	A	7/12/19	ISSUED FOR REVIEW			

REFERENCE DRAWINGS | NUMBER | NOTES

SCALE 0 30' 60'
HORIZ: 1" = 60'
VERT: 1" = 40'

PROFESSIONAL ENGINEER 8/12/2022 No. 9482425-2202 NATHAN A. CHRISTENSEN STATE OF UTAH

NOTES

SUNRISE ENGINEERING

APPROVAL	DATE	SCALE:		DATE
		DESIGNED BY	N. CHRISTENSEN	7/12
		DRAWN BY	J. HOGGARD	7/12
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		PROJECT ENGINEER	N. CHRISTENSEN	7/15
		PROJECT MANAGER	N. CHRISTENSEN	7/15

RIO TINTO

KENNECOTT UTAH COPPER

SEW OPTIMIZATION
TOE DRAIN EXTENSION

PLAN & PROFILE

Job No. | Dwg. No. TD3 | REV.

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CONSTRUCTION NOTES

1. 12" HDPE DR-17 CORRUGATED AND PERFORATED (A / TD6)
2. INSTALL CLEANOUT END OF LINE (B / TD7)
3. INSTALL CLEAN OUT IN-LINE (A / TD7)
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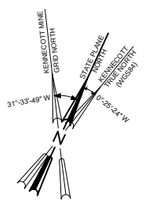

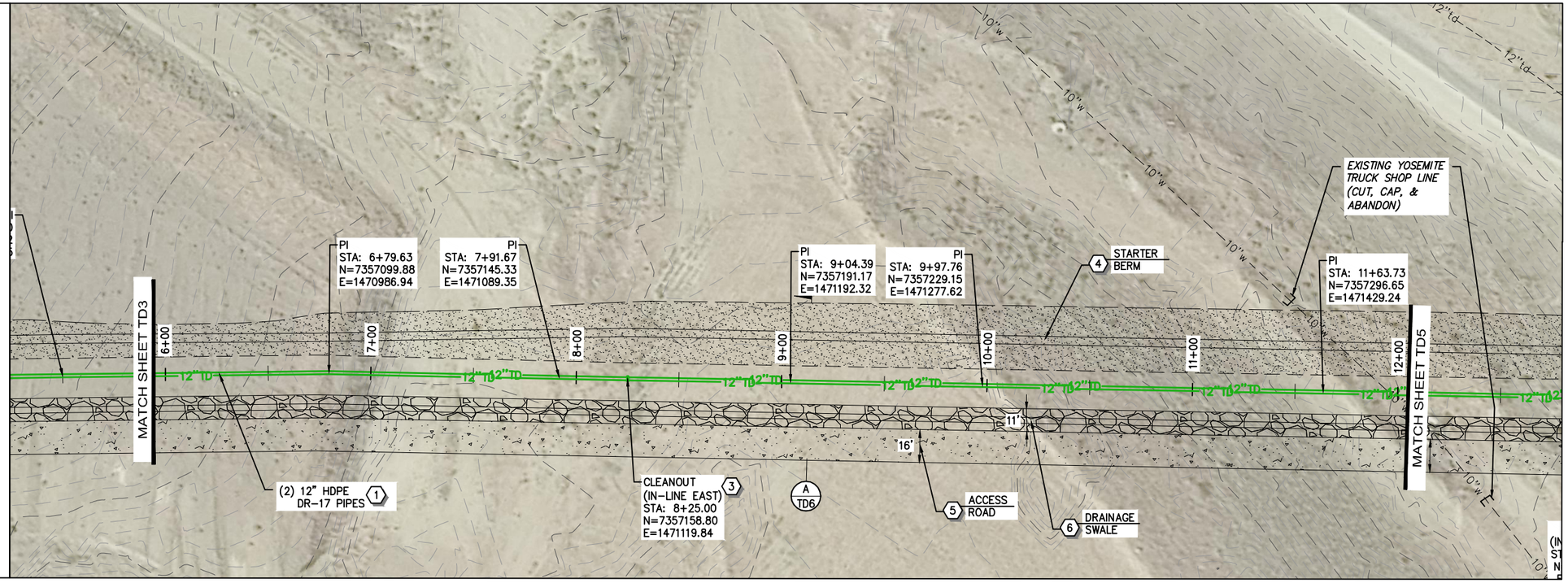

NOTES:

1. BEDROCK ELEVATIONS SHOWN ON THE DRAWINGS ARE APPROXIMATE AND BASED ON THE BEST AVAILABLE INFORMATION. ACTUAL BEDROCK ELEVATIONS MAY VARY FROM WHAT IS SHOWN. CONTRACTOR SHALL FIELD VERIFY THE ACTUAL BEDROCK ELEVATIONS DURING CONSTRUCTION AND ADJUST THE DESIGN DEPTH, LOCATION AND CONFIGURATION OF THE TOE DRAIN PIPES TO FIT THE ACTUAL CONDITIONS ENCOUNTERED DURING CONSTRUCTION.
2. EXISTING GROUND ELEVATIONS SHOWN ON THE PLANS ARE PRE-STRIPPED GROUND ELEVATIONS DATED JUNE 18, 2019. PRIOR TO CONSTRUCTION OF THE TOE DRAIN EXTENSION, OVERBURDEN MATERIAL OR TOPSOIL WILL BE STRIPPED AND REMOVED DOWN TO BEDROCK. THE STRIPPED SURFACE SHOULD BE SURVEYED AND CHECKED AGAINST DESIGN ELEVATIONS SHOWN IN THESE PLANS AND ADJUSTMENTS MADE AS DESCRIBED IN NOTE 1 ABOVE.
3. THE DEPTH OF THE PARALLEL TOE DRAIN PIPES MAY VARY FROM WHAT IS SHOWN IN THE PLANS DEPENDING ON FIELD CONDITIONS BUT SHALL MEET THE MINIMUM DOWNWARD SLOPE REQUIREMENT OF 0.5% ON ALL PERFORATED PIPES.
4. THE LOCATION OF TOE DRAIN CLEANOUTS MAY BE ADJUSTED IN THE FIELD TO SUIT ACTUAL CONDITIONS ENCOUNTERED DURING CONSTRUCTION. THE MAXIMIUM DISTANCE BETWEEN CLEANOUTS SHALL NOT EXCEED 1000 LF ON EACH OF THE 12" HDPE LINES. IN ORDER TO ACHIEVE THIS SPACING THE CLEANOUTS MAY BE STAGGERED BETWEEN EAST AND WEST LINES BY ALTERNATING EVERY 500 LF.
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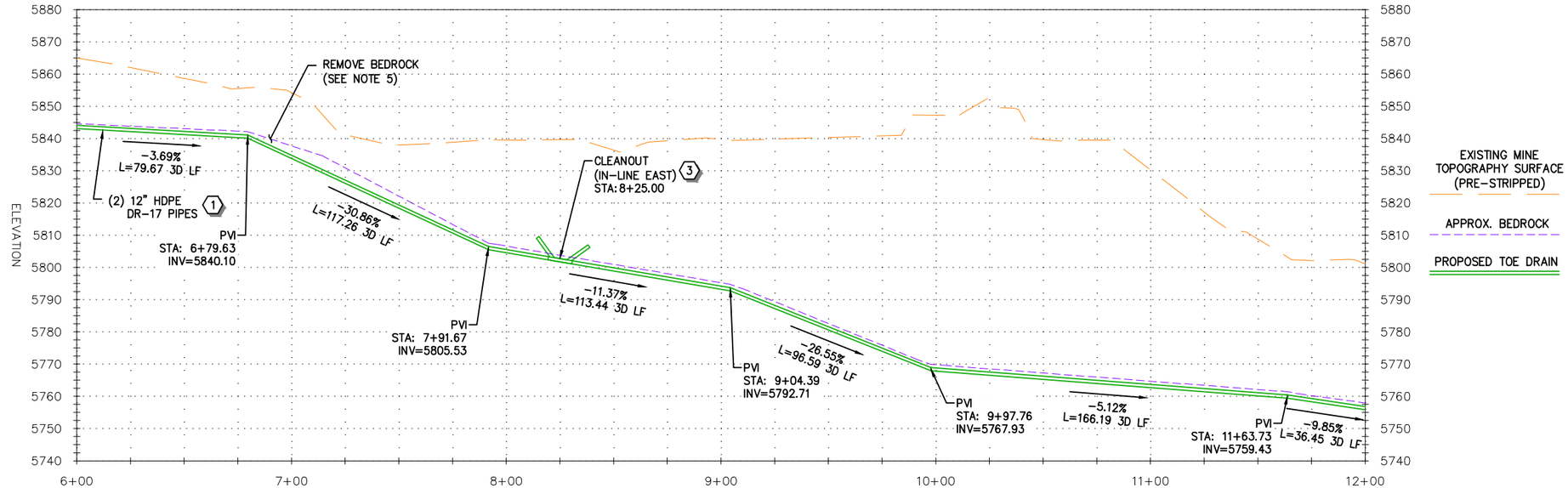

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REFERENCE DRAWINGS | NUMBER | NOTES

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HORIZ: 1" = 60'
VERT: 1" = 40'

PROFESSIONAL ENGINEER 12/12/2022 No. 9482425-2202 NATHAN A. CHRISTENSEN STATE OF UTAH

NOTES

SUNRISE ENGINEERING

APPROVAL	DATE	SCALE:		DATE
		DESIGNED BY	N. CHRISTENSEN	7/12
		DRAWN BY	J. HOGGARD	7/12
		CHECKED BY	K. MILNE	7/15
		PROJECT ENGINEER	N. CHRISTENSEN	7/15
		PROJECT MANAGER	N. CHRISTENSEN	7/15

QUILL OTB

KENNECOTT UTAH COPPER

SEW OPTIMIZATION
TOE DRAIN EXTENSION

PLAN & PROFILE

Job No. | Dwg. No. TD4 | REV.

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CONSTRUCTION NOTES

1. 12" HDPE DR-17 CORRUGATED AND PERFORATED (A / TD6)
2. INSTALL CLEANOUT END OF LINE (B / TD7)
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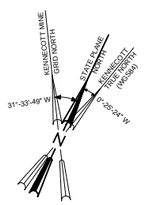

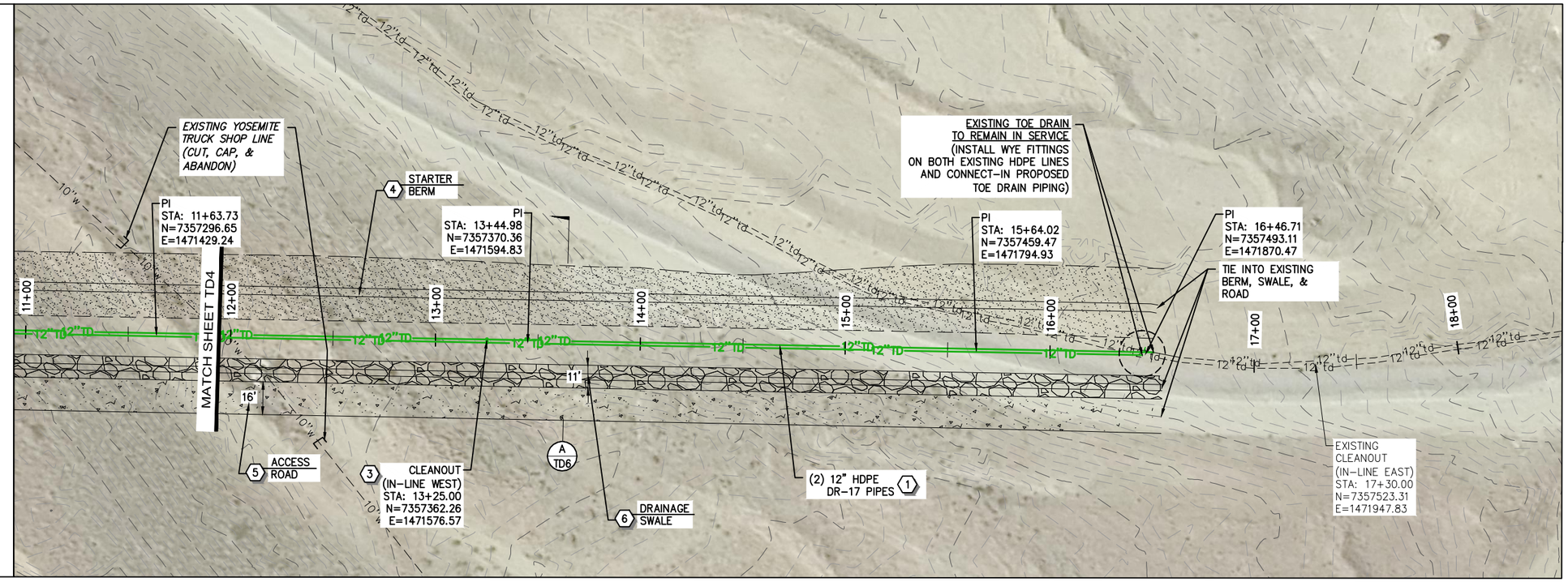

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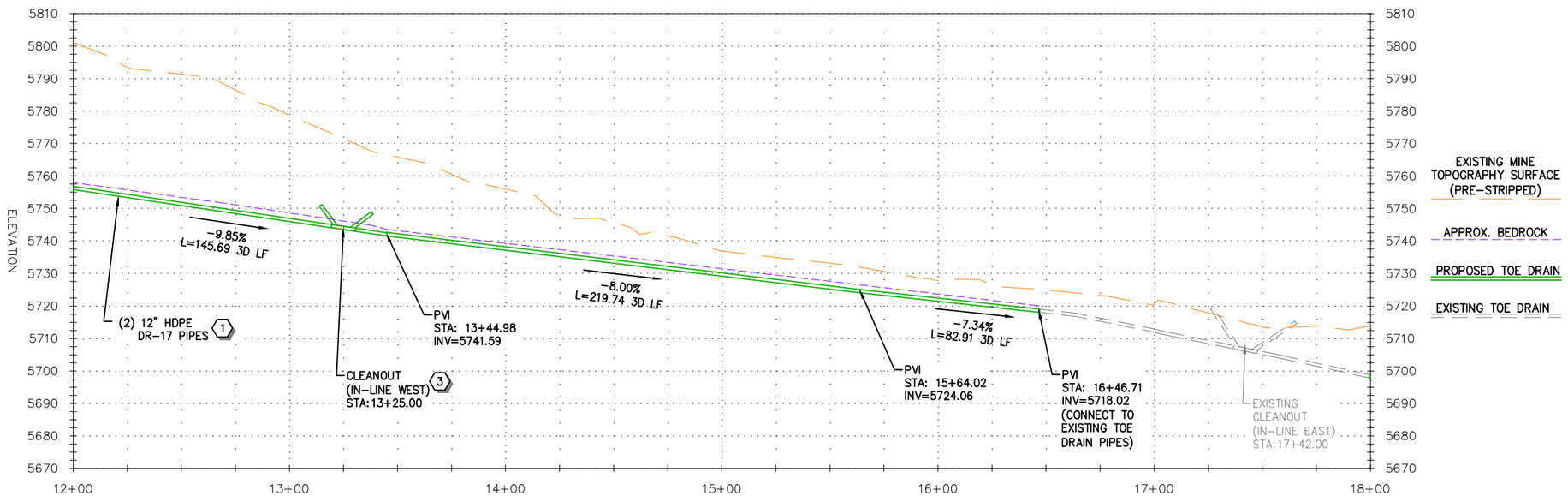

AREA	NO.	DATE	REVISION	BY	CHK	APP
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REFERENCE DRAWINGS | NUMBER | NOTES

SCALE 0 30' 60'
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PROFESSIONAL ENGINEER 8/12/2019 No. 9482425-2202 NATHAN A. CHRISTENSEN STATE OF UTAH

NOTES

SUNRISE ENGINEERING

APPROVAL	DATE	SCALE:		DATE
		DESIGNED BY	N. CHRISTENSEN	7/12
		DRAWN BY	J. HOGGARD	7/12
		CHECKED BY	K. MILNE	7/15
		PROJECT ENGINEER	N. CHRISTENSEN	7/15
		PROJECT MANAGER	N. CHRISTENSEN	7/15

SHEET 078

KENNECOTT
UTAH COPPER

SEW OPTIMIZATION
TOE DRAIN EXTENSION

PLAN & PROFILE

Job No. | Dwg. No. TD5 | REV.

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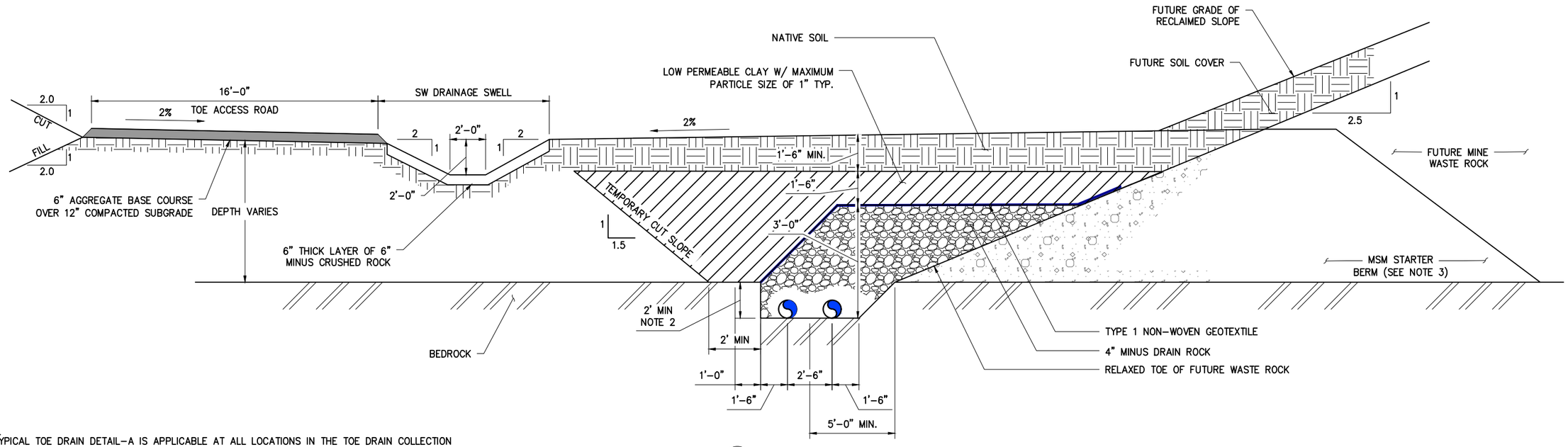

A TYPICAL TOE DRAIN DETAIL
~ NTS

NOTES:

1. TYPICAL TOE DRAIN DETAIL-A IS APPLICABLE AT ALL LOCATIONS IN THE TOE DRAIN COLLECTION SYSTEM.
2. THE DEPTH OF THE PARALLEL TOE DRAIN PIPES MAY VARY FROM WHAT IS SHOWN IN THE PLANS DEPENDING ON FIELD CONDITIONS BUT SHALL MEET THE MINIMUM DOWNWARD SLOPE REQUIREMENT OF 0.5% ON ALL PERFORATED PIPES.
3. MINE SALVAGE MATERIAL (MSM) WILL BE PROVIDED BY THE MINE; HOWEVER, DELIVERY SHOULD BE COORDINATED BETWEEN THE CONTRACTOR AND RTKC. CONTRACTOR WILL BE RESPONSIBLE FOR PLACEMENT AS SHOWN.
4. BEDROCK ELEVATIONS SHOWN ON THE DRAWINGS ARE APPROXIMATE AND BASED ON THE BEST AVAILABLE INFORMATION. ACTUAL BEDROCK ELEVATIONS MAY VARY FROM WHAT IS SHOWN. CONTRACTOR SHALL FIELD VERIFY THE ACTUAL BEDROCK ELEVATIONS DURING CONSTRUCTION AND ADJUST THE DESIGN DEPTH, LOCATION AND CONFIGURATION OF THE TOE DRAIN PIPES TO FIT THE ACTUAL CONDITIONS ENCOUNTERED DURING CONSTRUCTION.

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PROFESSIONAL ENGINEER
7/12/2019
No. 9482425-2202
NATHAN A. CHRISTENSEN
STATE OF UTAH

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SUNRISE ENGINEERING

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SHEET 078

KENNECOTT
UTAH COPPER

SEW OPTIMIZATION
TOE DRAIN EXTENSION
DETAILS

Job No. | Dwg. No. TD6 | REV.

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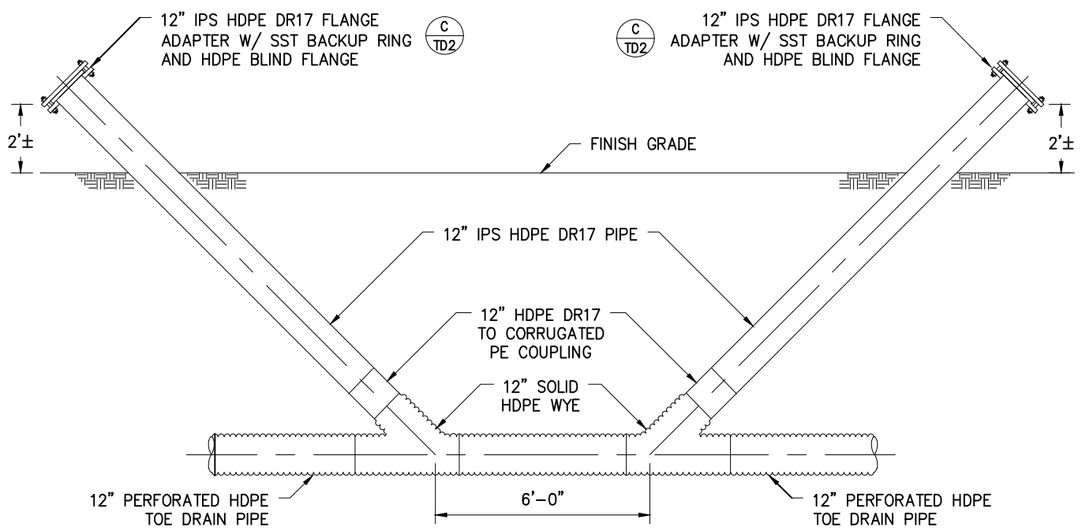
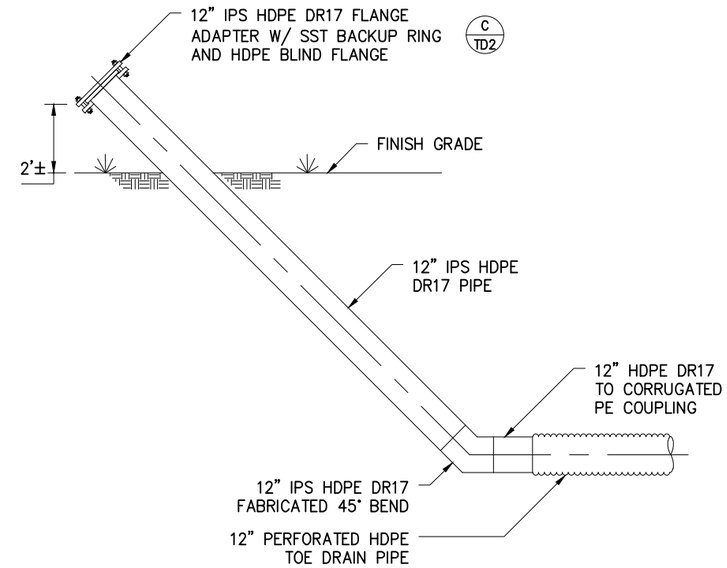


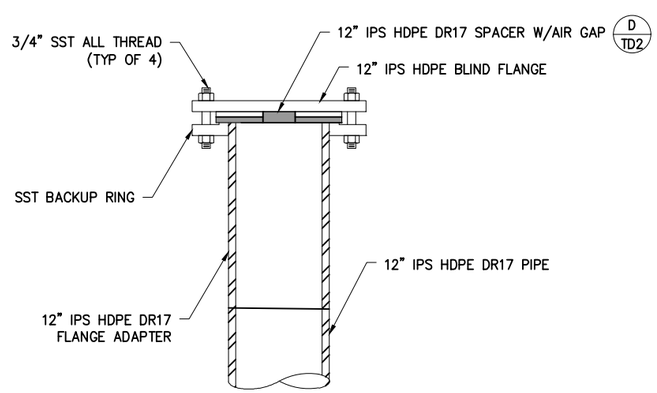
NOTES:

1. PROVIDE INLINE TOE DRAIN CLEANOUT AT 1000' MAXIMUM SPACING ON EACH 12" TOE DRAIN PIPE. STAGGER LOCATIONS SO CLEANOUT IS LOCATED EVERY 500' ON ALTERNATING TOE DRAIN LINES

A ~ INLINE TOE DRAIN CLEANOUT DETAIL
NTS



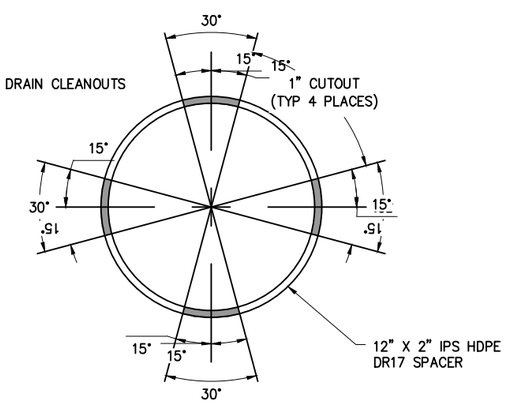
B ~ END OF LINE TOE DRAIN DETAIL
NTS



NOTE: USE AT TOE DRAIN CLEANOUTS

C ~ END OF LINE TOE DRAIN DETAIL
NTS

NOTE: USE AT TOE DRAIN CLEANOUTS



D ~ END OF LINE TOE DRAIN DETAIL
NTS

AREA	NO.	DATE	REVISION	BY	CHK	APP
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REFERENCE DRAWINGS | NUMBER | NOTES

PROFESSIONAL ENGINEER 05/29/2020 No. 9482425-2202 NATHAN A. CHRISTENSEN STATE OF UTAH

NOTES

SUNRISE ENGINEERING

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		PROJECT ENGINEER	N. CHRISTENSEN	7/15
		PROJECT MANAGER	N. CHRISTENSEN	7/15

810 TIMO

KENNECOTT
UTAH COPPER

SEW OPTIMIZATION
TOE DRAIN EXTENSION
DETAILS

Job No. | Dwg. No. TD7 | REV.

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GENERAL CONSTRUCTION NOTES

1. AS-BUILT TOPOGRAPHY WAS OBTAINED FROM RTKC. SUNRISE ENGINEERING PERFORMED A COORDINATE CONVERSION OF THE TOPOGRAPHY FROM MINE GRID NORTH TO UTAH STATE PLANE NAD83, NAVD 88 DATUM ON JUNE 18, 2019. EXISTING CONDITIONS MAY VARY FROM THOSE SHOWN ON THESE PLANS. PRIOR TO BID THE CONTRACTOR SHALL VERIFY EXISTING CONDITIONS, ADJUST WORK PLAN ACCORDINGLY, AND REVIEW WITH RTKC PRIOR TO BEGINNING CONSTRUCTION.
2. THE CONTRACTOR MUST SUBMIT IN WRITING ANY REQUESTS FOR MODIFICATIONS TO THE PLANS OR SPECIFICATIONS. SHOP DRAWINGS MUST BE SUBMITTED TO SUNRISE ENGINEERING
3. THESE DOCUMENTS HAVE BEEN PREPARED USING STANDARDS OF PROFESSIONAL CARE AND COMPLETENESS AS REQUIRED FOR THIS LOCALITY. THEY ASSUME THAT THE WORK DEPICTED WILL BE PERFORMED BY AN EXPERIENCED CONTRACTOR AND/OR WORKMEN WHO HAVE A WORKING KNOWLEDGE OF THE APPLICABLE CODE STANDARDS AND REQUIREMENTS AND OF INDUSTRY ACCEPTED STANDARD GOOD PRACTICE. AS NOT EVERY CONDITION OR ELEMENT IS (OR CAN BE) EXPLICITLY SHOWN ON THESE DRAWINGS, THE CONTRACTOR SHALL USE INDUSTRY ACCEPTED STANDARD GOOD PRACTICE FOR MISCELLANEOUS WORK NOT EXPLICITLY SHOWN.
4. EXISTING & FUTURE TOPOGRAPHY, STRUCTURES, AND SITE FEATURES ARE DEPICTED AS SCREENED AND/OR DASHED-LINED. NEW FINISH GRADE, STRUCTURES, AND SITE FEATURES ARE DEPICTED WITH HEAVY-LINES.
5. STAGING AREA FOR CONTRACTOR'S EMPLOYEE PARKING, CONTRACTOR'S TRAILERS AND ON-SITE STORAGE OF MATERIALS WILL BE DESIGNATED BY AND COORDINATED WITH RTKC.
6. PROVIDE TEMPORARY FENCING AS NECESSARY BASED ON RTKC REQUIREMENTS TO MAINTAIN SECURITY AT ALL TIMES.
7. SLOPE UNIFORMLY BETWEEN CONTOURS AND SPOT ELEVATIONS SHOWN. ANY SLOPE ROUNDING SHALL BE APPROVED BY RTKC.
8. CONTRACTOR SHALL TAKE ALL MEASURES TO POSITIVELY PRECLUDE EROSION MATERIALS FROM LEAVING THE SITE. CONTRACTOR TO SUBMIT EROSION CONTROL PLAN TO RTKC, FOR REVIEW AND APPROVAL PRIOR TO CONTRACTOR BEGINNING ANY WORK.
9. EXACT POINT OF MATCHING, TERMINATION AND OVERLAY, IF NECESSARY, MAY BE DETERMINED IN THE FIELD BY THE ENGINEER OF RECORD OR THE RESIDENT ENGINEER OVERSEEING THE PROJECT CONSTRUCTION.
10. ANY AMBIGUITIES OR DEFICIENCIES DISCOVERED ON THESE PLANS ARE TO BE RESOLVED BY THE ENGINEER OR ITS APPOINTED REPRESENTATIVE. ANY MODIFICATIONS TO THESE PLANS MADE BY ANYONE OTHER THAN THE ENGINEER OR ITS APPOINTED REPRESENTATIVE IS SOLELY RESPONSIBLE FOR THOSE MODIFICATIONS.
11. ALL WORK, TESTING AND MATERIALS SHALL CONFORM TO THE PROJECT CONSTRUCTION PLANS, SPECIFICATIONS, DETAILS, AND CONTRACT DOCUMENTS UNLESS SPECIFICALLY STATED OTHERWISE IN THESE PLANS. ALL WORK AND MATERIALS NOT IN CONFORMANCE WITH THESE PLANS AND SPECIFICATIONS ARE SUBJECT TO REMOVAL AND REPLACEMENT AT THE CONTRACTOR'S EXPENSE.
12. AN APPROVED SET OF PLANS AND SPECIFICATIONS SHALL BE AVAILABLE ON THE JOB SITE AT ALL TIMES.
13. THE CONTRACTOR SHALL OBTAIN ALL NECESSARY PERMITS PRIOR TO BEGINNING CONSTRUCTION. THE CONTRACTOR IS RESPONSIBLE FOR VERIFICATION OF EXISTING PERMITS, RENEWAL OF LAPSED PERMITS, AND OBTAINING ANY NEW PERMITS.
14. THE CONTRACTOR IS RESPONSIBLE FOR MAKING ARRANGEMENTS FOR INSPECTION AND TESTING.
15. THE CONTRACTOR IS RESPONSIBLE FOR HIS OWN TAKEOFF QUANTITIES. QUANTITIES IF SHOWN HEREON ARE ESTIMATES ONLY AND AS SUCH ARE NOT TO BE USED FOR BID PURPOSES. THE BID SCHEDULE OF VALUES IS THE GOVERNING QUANTITY DOCUMENT FOR THIS PROJECT.
16. THE CONTRACTOR IS RESPONSIBLE FOR THE NOTIFICATION OF THE PROPER AUTHORITY(S) IF THERE ARE OBSTRUCTIONS AND/OR EXISTING UTILITY CONFLICTS TO PROPOSED IMPROVEMENTS AS SHOWN ON THE CONSTRUCTION DRAWINGS. ANY EXISTING ITEM REMOVED TO FACILITATE CONSTRUCTION SHALL BE REPLACED IN THE SAME OR BETTER CONDITION AT THE CONTRACTOR'S EXPENSE.
17. THE CONTRACTOR IS RESPONSIBLE FOR TRAFFIC CONTROL ON AND AROUND THE CONSTRUCTION SITE IN ACCORDANCE WITH THE MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES FOR STREETS AND HIGHWAYS.
18. CONTRACTOR SHALL EXPOSE ALL TIE-IN POINTS TO VERIFY LOCATION PRIOR TO BEGINNING SUBSTANTIAL CONSTRUCTION ACTIVITIES.
19. THE CONTRACTOR CERTIFIES THAT THE CONTRACTOR HAS BEEN PROVIDED FULL OPPORTUNITY TO REVIEW THE CONSTRUCTION DOCUMENTS AND FIELD CONDITIONS SO AS TO ENSURE THAT THE CONTRACTOR FULLY UNDERSTANDS THE DESIGN INTENT SHOWN AND THAT ALL ELEMENTS FOR CONSTRUCTION SHOWN THEREON HAVE BEEN INCLUDED IN THE BID. BY SUBMITTING A BID ON THIS WORK, LABOR AND MATERIAL EXPRESSLY OR IMPLICITLY REQUIRED FOR THE PROJECT AND THAT ANY ERRORS OR OMISSIONS IN THE CONSTRUCTION DOCUMENTS HAVE BEEN BROUGHT TO THE ATTENTION OF THE ENGINEER IN A TIMELY MANNER SO AS TO ALLOW CORRECTIONS TO THE CONSTRUCTION DOCUMENTS BY WAY OF AN ADDENDUM. THE CONTRACTOR AGREES TO WAIVE ANY CLAIM FOR EXTRA COST OR DELAY RELATED TO ANY ERROR OR OMISSION ON THE CONSTRUCTION DOCUMENTS THAT REASONABLY SHOULD HAVE BEEN OBSERVED PRIOR TO COMMENCING WORK ON THE PROJECT.
20. DUE TO AVAILABILITY OF RECORD DRAWINGS AND DOCUMENTATION FROM RTKC, NOT ALL EXISTING UTILITIES ARE SHOWN ON THESE CONSTRUCTION DRAWINGS. IT IS THE RESPONSIBILITY ON THE CONTRACTOR TO IDENTIFY ANY POTENTIAL CONFLICT BETWEEN EXISTING UTILITIES (I.E. OVERHEAD POWER, ETC) AND PROPOSED IMPROVEMENTS PRIOR TO BEGINNING CONSTRUCTION AND NOTIFY RTKC SO A WORK PLAN CAN BE DEVELOPED.
21. ALL SIGNAGE SHOULD BE INSTALLED PER RTKC REQUIREMENTS. PROCUREMENT AND PURCHASE OF SIGNAGE SHOULD BE COORDINATED WITH RTKC PERSONNEL PRIOR TO BEGINNING CONSTRUCTION.

TRUCK SHOP WATER LINE CONSTRUCTION NOTES

1. WATER LINE MARKER SIGNS ARE REQUIRED ALONG THE YOSEMITE TRUCK SHOP WATER LINE RELOCATION PER THE DETAILS SHOWN ON THE PLANS.
2. CATHODIC PROTECTION TEST STATIONS AND ANODE BEDS ARE REQ'D FOR ALL WELDED STEEL PORTIONS OF THE WATER LINE. LOCATIONS ARE TO BE COORDINATED WITH RTKC PERSONNEL BUT ARE SHOWN FOR REFERENCE IN THESE PLANS.
3. THE WELDED STEEL WATER LINE WILL HAVE A MINIMUM BURIAL DEPTH OF 4-FT UNLESS BURIED WITHIN A HAUL ROAD FOOTPRINT, THAN THE BURIAL DEPTH MUST BE 8-FT MINIMUM PER RTKC WATER SERVICE REQUIREMENTS.
4. THE EXISTING TRUCK SHOP WATER LINE WILL BE CUT, CAPPED, AND ABANDONED IN PLACE.

TRUCK SHOP WATER LINE DESIGN CRITERIA

1.	APPROX. FLOW RATE OF EXISTING TRUCK SHOP LINE (FROM RTKC):	450 GPM
2.	APPROX. ELEVATION OF EXISTING TRUCK SHOP PUMP STATION	5443 FT
3.	ELEVATION OF EXISTING 6880 TANK	6880 FT
4.	APPROX. ELEVATION OF EXISTING WATER STAND	6540 FT
5.	INTERNAL DESIGN PRESSURE NEAR EXISTING PUMP STATION	622 PSI
6.	INTERNAL DESIGN PRESSURE AT CONNECTION BETWEEN EXISTING. AND PROPOSED TRUCK SHOP LINES	527 PSI
7.	INTERNAL DESIGN PRESSURE AT TRANSITION LOCATION BETWEEN PROPOSED WELDED STEEL PIPE AND PROPOSED HDPE PIPE	213 PSI
8.	WELDED STEEL PIPE MATERIAL PROPERTIES	FUSION BONDED EPOXY COATED EXTERIOR (AWWA C213) UNLINED INTERIOR (BARE STEEL) NOMINAL THICKNESS = ⅜" SCH. 40 PIPE ASTM A53/53M TYPE E OR S, GRADE B OR ENGINEER ALLOWED EQUAL FIELD WELDED JOINTS WITH FIELD TAPE COATING CATHODIC PROTECTION REQ'D

7. HDPE PIPE WILL BE (DR-9) AT 8-FT MIN BURIAL DEPTH WITHIN HAUL ROAD FOOTPRINT AND 4-FT MIN BURIAL DEPTH OUTSIDE OF HAUL ROAD FOOTPRINTS

OVERHEAD FIBER CONSTRUCTION NOTES

1. THESE PLANS SHOW APPROXIMATE LENGTHS AND LOCATIONS OF THE OVERHEAD FIBER LINE RELOCATION. THE DETAILED DESIGN FOR THE OVERHEAD FIBER LINE RELOCATION IS TO BE PROVIDED BY A REGISTERED COMMUNICATIONS DISTRIBUTION DESIGNER (RCDD) (NOT INCLUDED IN THIS DRAWING SET). THE CONTRACTOR SHALL SUBMIT THE FIBER LINE DETAILED DESIGN VIA SUBMITTAL TO RTKC PRIOR TO BEGINNING CONSTRUCTION.

AREA	NO.	DATE	REVISION	BY	CHK	APP
	B	7/16/19	ISSUED FOR REVIEW			
	A	7/12/19	ISSUED FOR REVIEW			

REFERENCE DRAWINGS | NUMBER | NOTES

PROFESSIONAL ENGINEER — 8/12/2020 — No. 9482425-2202 — NATHAN A. CHRISTENSEN — STATE OF UTAH

NOTES

SUNRISE ENGINEERING

APPROVAL	DATE	SCALE:		DATE
		DESIGNED BY	N. CHRISTENSEN	7/12
		DRAWN BY	J. HOGGARD	7/12
		CHECKED BY	K. MILNE	7/15
		PROJECT ENGINEER	N. CHRISTENSEN	7/15
		PROJECT MANAGER	N. CHRISTENSEN	7/15

QHELL 078

KENNECOTT
UTAH COPPER

SEW OPTIMIZATION
UTILITY RE-LOCATES

GENERAL & DESIGN CRITERIA

Job No. | Dwg. No. TS1 | REV.

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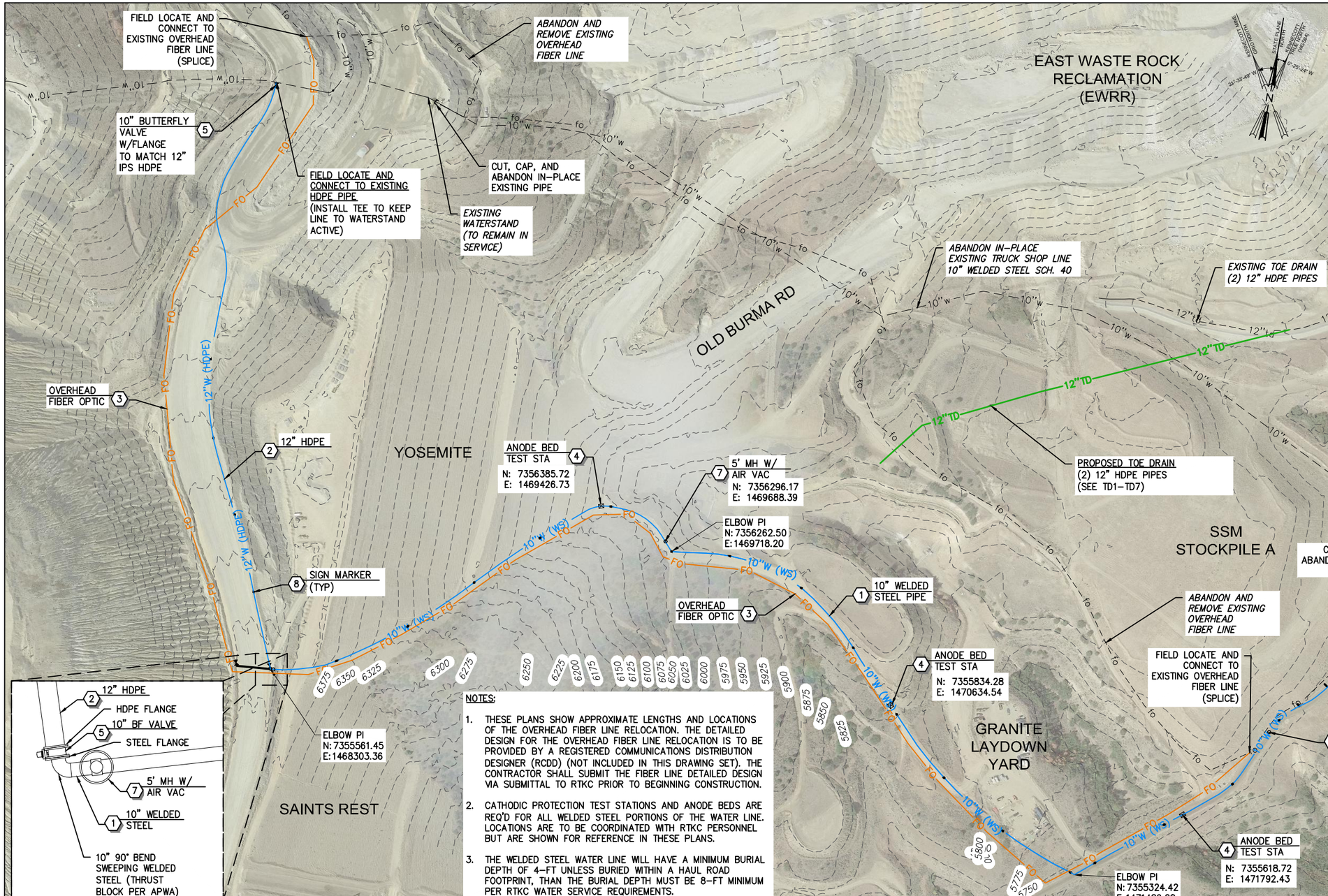

NOTES:

1. THESE PLANS SHOW APPROXIMATE LENGTHS AND LOCATIONS OF THE OVERHEAD FIBER LINE RELOCATION. THE DETAILED DESIGN FOR THE OVERHEAD FIBER LINE RELOCATION IS TO BE PROVIDED BY A REGISTERED COMMUNICATIONS DISTRIBUTION DESIGNER (RCDD) (NOT INCLUDED IN THIS DRAWING SET). THE CONTRACTOR SHALL SUBMIT THE FIBER LINE DETAILED DESIGN VIA SUBMITTAL TO RTKC PRIOR TO BEGINNING CONSTRUCTION.
2. CATHODIC PROTECTION TEST STATIONS AND ANODE BEDS ARE REQ'D FOR ALL WELDED STEEL PORTIONS OF THE WATER LINE. LOCATIONS ARE TO BE COORDINATED WITH RTKC PERSONNEL BUT ARE SHOWN FOR REFERENCE IN THESE PLANS.
3. THE WELDED STEEL WATER LINE WILL HAVE A MINIMUM BURIAL DEPTH OF 4-FT UNLESS BURIED WITHIN A HAUL ROAD FOOTPRINT, THAN THE BURIAL DEPTH MUST BE 8-FT MINIMUM PER RTKC WATER SERVICE REQUIREMENTS.

CONSTRUCTION NOTES

1. 10" WELDED STEEL PIPE (SEE NOTE 3) (ASTM A53/A53, SCHEDULE 40, TYPE E GRADE B OR ENGINEER ALLOWED EQUIVALENT) (FUSION BONDED EPOXY COATED PER AWWA C213) (UNLINED INTERIOR), THRUST BLOCKS PER APWA, LENGTH = 5,770 LF — A/TS5
2. 12" HDPE IPS DR-9 (THRUST BLOCKS PER APWA) LENGTH = 2340 LF — A/TS5
3. OVERHEAD FIBER LINE (SEE NOTE 1) LENGTH = 7,500 LF
4. CATHODIC PROTECTION (SEE NOTE 2) (TEST STATION & ANODE BED PER SPECIFICATIONS REQ'D)
5. 10" (250 LB) BUTTERFLY VALVE (CLASS 150 FLANGES) — A/TS4
6. 10" HIGH PRESSURE PERFORMANCE VALVE (ANSI CLASS 300) — A/TS4
7. 5' MANHOLE W/AIR VAC ASSEMBLY — A/TS3
8. WATERLINE MARKER SIGN 10"x14" ALUMINUM WITH UV COATING WHITE LETTERS AND GREEN BACKGROUND MOUNTED ON STD. 1.5" ROUND OR U-CHANNEL METAL POST SIGN SHALL READ "YOSEMITE TRUCK SHOP WATERLINE" PLACE MARKERS EVERY 300 LF AND AT EACH BEND AT A HEIGHT OF 5' (OFFSET FROM ℄ AS NEEDED)

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SCALE 0 200' 400'
HORIZ: 1" = 400'

PROFESSIONAL ENGINEER 05/23/2022 No. 9482425-2202 NATHAN A. CHRISTENSEN STATE OF UTAH

NOTES

SUNRISE ENGINEERING

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		CHECKED BY	K. MILNE	7/15
		PROJECT ENGINEER	N. CHRISTENSEN	7/15
		PROJECT MANAGER	N. CHRISTENSEN	7/15

RIO TINTO

KENNECOTT UTAH COPPER

SEW OPTIMIZATION
UTILITY RE-LOCATES
TRUCK SHOP WATER LINE & FIBER OPTIC REPLACEMENT

Job No. | Dwg. No. TS2 | REV.

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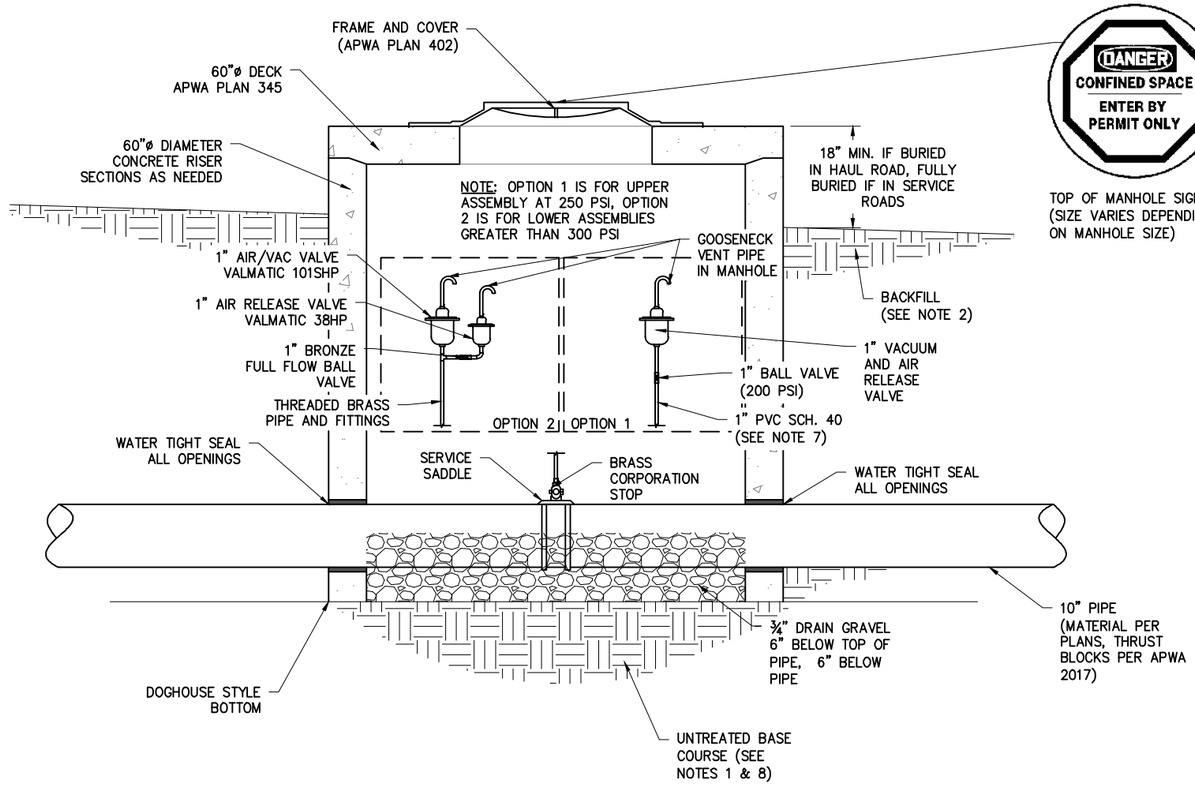

TOP OF MANHOLE SIGN (SIZE VARIES DEPENDING ON MANHOLE SIZE)

INSTALL SIGN ADJACENT TO EACH STRUCTURE 10"x14" ALUMINUM UV COATING ON STD. 1.5" ROUND OR U-CHANNEL STEEL POST. COORDINATE WITH KENNECOTT FOR SIGN HEIGHT AND LOCATION.

A AIRVAC CROSS SECTION
~ NTS-MODIFIED APWA PLAN 575

1. BASE COURSE: UNTREATED BASE COURSE, APWA SECTION 32 11 23. DO NOT USE GRAVEL AS A BASE COURSE WITHOUT ENGINEER'S PERMISSION
2. BACKFILL: COMMON NATIVE MINE MATERIAL PER RTKC FILL, MAXIMUM PARTICLE SIZE 2-INCHES NEAR STRUCTURE.
3. CONCRETE: CLASS 4000, APWA SECTION 03 30 04.
4. MANHOLE: RISER, ASTM C478.
5. REINFORCEMENT: DEFORMED, STEEL, ASTM A615. GIVE BARS AN EPOXY COATING AT LEAST 15 MILS THICK. MINIMUM STRESS YIELD STRENGTH OF STEEL TIE-DOWN BARS IS 70,000 KSI.
6. SMALL FITTINGS: BRASS. DO NOT USE GALVANIZED MATERIALS
7. PVC PIPE AND FITTINGS: SCHEDULE 40, APWA SECTION 33 05 07.
8. BASE COURSE AND BACKFILL PLACEMENT: MAXIMUM LIFT THICKNESS IS 8-INCHES BEFORE COMPACTION. COMPACTION IS 95% OR GREATER RELATIVE TO A MODIFIED PROCTOR DENSITY, APWA SECTION 31 23 26.
9. APPLY TAPE WRAP TO THE EXTERIOR OF ALL BURIED STEEL PIPE FITTINGS AND CONNECTION PER AWWA C209.
10. CONCRETE PACEMENT: APWA SECTION 03 30 10. PROVIDE 1/2-INCH RADIUS EDGES. APPLY A BROOM FINISH. APPLY A CURING AGENT.
11. SEAL MANHOLE JOINTS WATER-TIGHT AND GROUND FLUSH WITH INTERIOR WALL.
12. FOLLOW APPLICABLE AWWA AND NSF STANDARDS WHEN CONNECTING PIPING.

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REFERENCE DRAWINGS | NUMBER | NOTES

PROFESSIONAL ENGINEER 05.29.2020 No. 9482425-2202 NATHAN A. CHRISTENSEN STATE OF UTAH

NOTES

SUNRISE ENGINEERING

APPROVAL	DATE	SCALE:		DATE
		DESIGNED BY	N. CHRISTENSEN	7/12
		DRAWN BY	J. HOGGARD	7/12
		CHECKED BY	K. MILNE	7/15
		PROJECT ENGINEER	N. CHRISTENSEN	7/15
		PROJECT MANAGER	N. CHRISTENSEN	7/15

Rio Tinto

KENNECOTT
UTAH COPPER

SEW OPTIMIZATION
TRUCK SHOP LINE RE-LOCATION

DETAILS

Job No. | Dwg. No. TS3 | REV.

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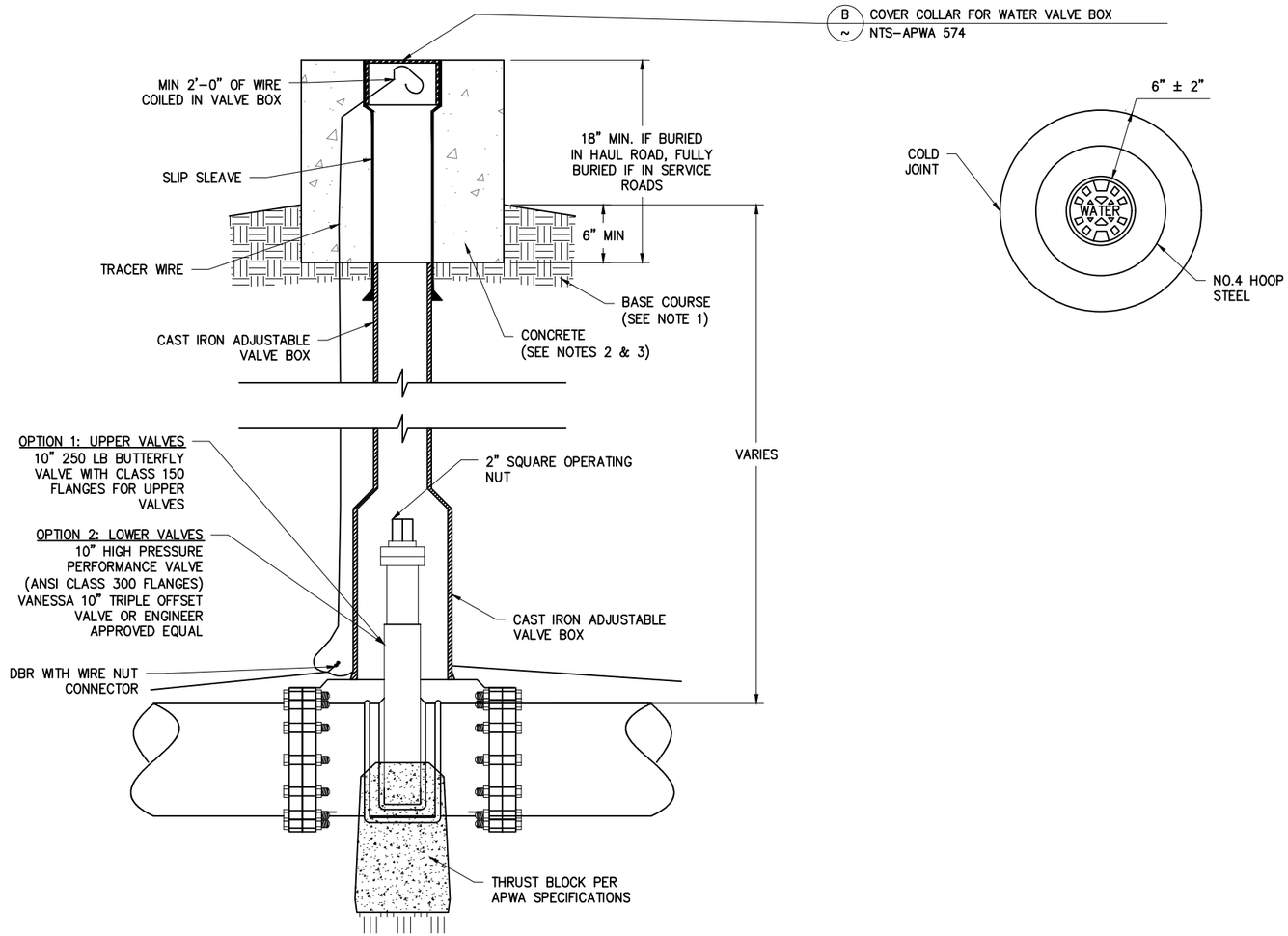

A
BUTTERFLY VALVE AND VALVE BOX ASSEMBLY
NTS-MODIFIED APWA PLAN 574

NOTES:

1. BASE COURSE: UNTREATED BASE COURSE, APWA SECTION 32 11 23. DO NOT USE GRAVEL AS A BASE COURSE WIHOUT ENGINEER'S PERMISSION.
2. CONCRETE: CLASS 4000, APWA SECTION 03 30 04
3. CONCRETE CURING AGENT: TYPE ID CLASS A (CLEAR WITH FUGITIVE DYE), MEMBRANE FORMING COMPOUND, APWA SECTION 03 39 00.
4. BASE COURSE: MAXIMUM LIFT THICKNESS IS 8-INCHES BEFORE COMPACTION. COMPACTION IS 95% OR GREATER RELATIVE TO A MODIFIED PROCTOR DENSITY, APWA SECTION 31 23 26

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PROFESSIONAL ENGINEER
05/29/2020
No. 9482425-2202
NATHAN A. CHRISTENSEN
STATE OF UTAH

NOTES

SUNRISE ENGINEERING

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		PROJECT ENGINEER	N. CHRISTENSEN	7/15
		PROJECT MANAGER	N. CHRISTENSEN	7/15

RIO TINTO

KENNECOTT
UTAH COPPER

SEW OPTIMIZATION
TRUCK SHOP LINE RE-LOCATION

DETAILS

Job No. | Dwg. No. TS4 | REV.

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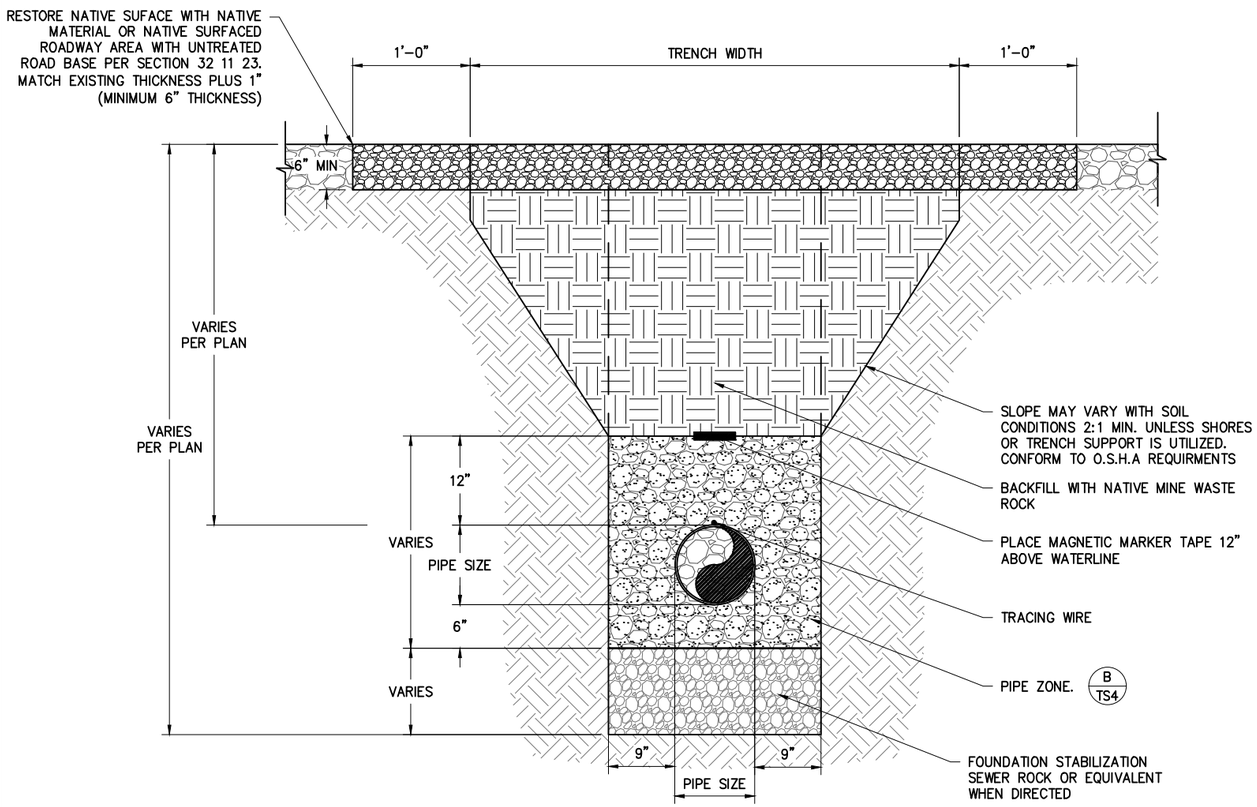
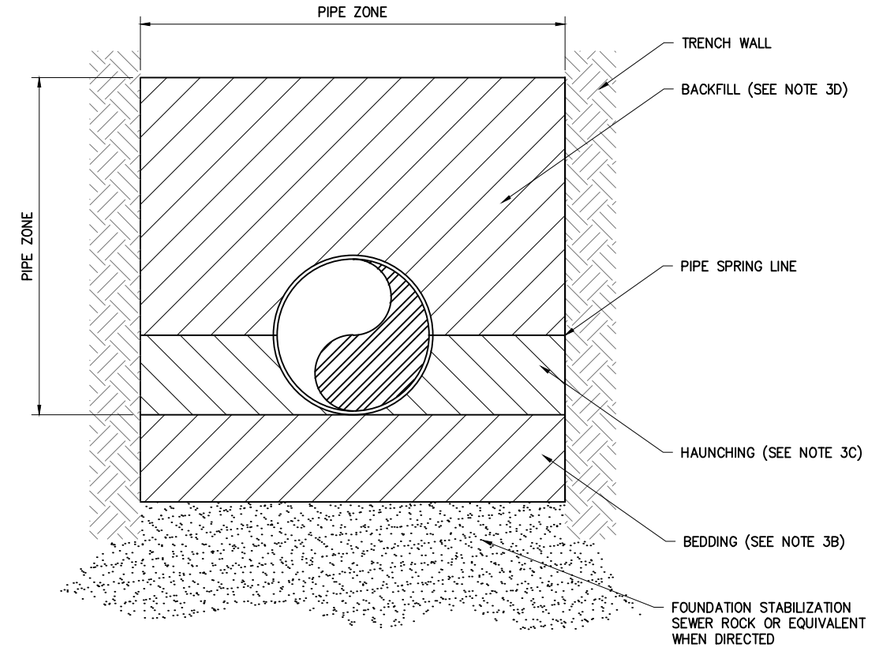


A ~ TYPICAL TRENCH DETAIL
NTS



B ~ TYPICAL TRENCH DETAIL
NTS

NOTES:

1. GENERAL

A. INSTALL THE PIPE IN THE CENTER OF THE TRENCH OR NO CLOSER THAN 9-INCHES FROM THE WALL OF THE PIPE TO THE WALL OF THE TRENCH.

2. PRODUCTS

B. BASE COURSE: UNTREATED BASE COURSE, APWA SECTION 32 11 23. DO NOT USE GRAVEL AS A BASE COURSE WITHOUT ENGINEER'S PERMISSION.

C. BACKFILL: COMMON FILL, APWA SECTION 31 05 13. MAXIMUM PARTICLE SIZE 2-INCHES. (USE NATIVE MINE MATERIALS)

D. CONCRETE: APWA SECTION 03 30 04.

E. STABILIZATION-SEPARATION GEOTEXTILE: MODERATE OR HIGH AT CONTRACTOR'S CHOICE, APWA SECTION 31 05 19.

3. EXECUTION

A. EXCAVATE THE PIPE ZONE: WIDTH IS MEASURED AT THE PIPE SPRING LINE AND INCLUDES ANY NECESSARY SHEATHING. PROVIDE WIDTH RECOMMENDED BY PIPE MANUFACTURER. FOLLOW MANUFACTURER'S RECOMMENDATIONS WHEN USING TRENCH BOXES.

B. BEDDING: FOLLOW APWA SECTION 33 05 20 REQUIREMENTS AND THE FOLLOWING PROVISIONS.

B.1. COMPACTED PIPE BEDDING. BEDDING MATERIAL SURROUNDING PIPE SHALL BE LESS THAN ¾" AND SHALL BE FREE OF LOAM AND ORGANIC MATTER.

B.2. MAXIMUM LIFT THICKNESS IS 8-INCHES.

B.3. BEDDING IMMEDIATELY UNDER THE PIPE SHOULD NOT BE COMPACTED, BUT LOOSELY PLACED.

B.4. COMPACTION IS 95 PERCENT OR GREATER RELATIVE TO A MODIFIED PROCTOR DENSITY, APWA SECTION 31 23 26.

B.5. WHEN USING CONCRETE, PROVIDE AT LEAST CLASS 2,000, APWA SECTION 03 30 04.

C. PIPE ZONE: DO NOT USE SEWER ROCK, PEA GRAVEL, OR RECYCLED RAP AGGREGATE IN THE PIPE ZONE. WATER JETTING IS NOT ALLOWED.

C.1. MAXIMUM LIFT THICKNESS IS 8-INCHES BEFORE COMPACTION. COMPACTION IS 95 PERCENT OR GREATER RELATIVE TO A MODIFIED PROCTOR DENSITY, APWA SECTION 31 23 26 UNLESS PIPE MANUFACTURER REQUIRES STRINGENT INSTALLATION.

C.2. SUBMISSION OF QUALITY CONTROL COMPACTION TEST RESULT DATA DEVELOPED FOR THE HAUNCH ZONE MAY BE REQUESTED BY ENGINEER AT ANY TIME. CONTRACTOR IS TO PROVIDE RESULTS OF TESTS IMMEDIATELY UPON REQUEST.

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REFERENCE DRAWINGS | NUMBER | NOTES

PROFESSIONAL ENGINEER No. 9482425-2202 NATHAN A. CHRISTENSEN STATE OF UTAH 05/29/2020

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SUNRISE ENGINEERING

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		PROJECT MANAGER	N. CHRISTENSEN	7/15

RIO TINTO

KENNECOTT
UTAH COPPER

SEW OPTIMIZATION
TRUCK SHOP LINE RE-LOCATION

DETAILS

Job No. | Dwg. No. TS5 | REV.

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