Midnite Mine Superfund Site
100 Percent Design

Appendix H – Demolition

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LIST OF ACRONYMS

ACM	asbestos-containing material
BMP	Best Management Practice
BODR	Basis of Design Report
CD	Consent Decree
CSZ	Construction Support Zone
DMC	Dawn Mining Company LLC
DOE	U.S. Department of Energy
EPA	U.S. Environmental Protection Agency
GSR	Green and Sustainable Remediation
MA	Mine Area
Newmont	Newmont USA Limited
RAO	Remedial Action Objective
RD/RA	Remedial Design/Remedial Action
Site	Midnite Mine Superfund Site
SOW	Statement of Work
SWMP	Stormwater Management Plan
Tribe	Spokane Tribe of Indians
WTP	Water Treatment Plant

H1.0 INTRODUCTION

This appendix to the *Midnite Mine Superfund Site Basis of Design Report* (BODR) outlines the procedures for demolition of existing structures within the Mine Area (MA) at the Midnite Mine Superfund Site (Site), and disposal of these materials. These procedures are based upon descriptions and experience for similar demolition work with closures associated with the U.S. Department of Energy (DOE) and U.S. Environmental Protection Agency (EPA) rules and regulations.

This appendix:

- Demonstrates that the design will attain the applicable standards identified in the Consent Decree (CD)
- Describes the overall demolition equipment and procedures for various tasks
- Presents the demolition sequence for Site structures
- Presents Green and Sustainable Remediation (GSR) considerations

H2.0 PERFORMANCE STANDARDS

The Performance Standards presented herein are defined in the *Consent Decree Statement of Work* (CD SOW; EPA, 2011), and were developed to confirm attainment of the Remedial Action Objectives (RAOs) of the Selected Remedy. The performance standards include both general and specific standards applicable to the Selected Remedy work elements and associated work components. All of the Performance Standards for the Midnite Mine RA, as well as a summary of where or how they are addressed in the RD, are summarized on Table 4-6 of the BODR. The general and specific Performance Standards related to facilities demolition and disposal are listed and discussed below.

Table H-1 – Performance Standards Applicable to Construction Support Facilities

Performance Standard No. in CD SOW	Performance Standard	Comments
2.3.11	Buildings, facilities, structures, and equipment not needed for remediation shall be demolished, disposed, or otherwise removed in a timely manner as determined during Remedial Design.	The (Remedial Design/Remedial Action) RD/RA schedule included in Appendix X of the BODR show the anticipated timing for demolition/disposal of buildings, facilities, structures, and equipment not needed for the remediation. All non-essential buildings, facilities, structures, and equipment will be demolished and disposed of in selected areas of the waste portion of the backfill in Pits 3 and 4 during the course of the RA. Site materials-containing asbestos (which is not contaminated by radioactive materials) and hazardous materials will be disposed of off-site in accordance with applicable county, state, and federal regulations.
2.3.18	Best Management Practices (BMPs) shall be used as specified below during all construction activities to minimize the transport of disturbed material by water, wind erosion or vehicles. The Settling Defendants shall develop a catalog of BMPs that shall be used at the Site and shall identify the primary activities requiring those BMPs. The BMP catalog shall be comprehensive and is subject to the review and approval of EPA. The minimum BMPs that must be contained in the BMP catalog are presented below. The Settling Defendants shall include these BMPs in the BMP catalog along with additional BMPs that may be necessary to complete the Work. A Stormwater Management Plan (SWMP) shall be prepared which contains the BMP catalog and identifies BMPs and specific sediment control measures to be employed before, during, and after construction.	The SWMP is included in Appendix O of the BODR, and it includes the proposed BMPs to be used during the RA, including the demolition activities. This document includes specific BMPs for sediment and stormwater control before, during, and after construction.
2.3.18. A	The Work shall be conducted in a manner that minimizes the generation of fugitive dust. If the application of water or other dust suppressants to Work Areas is used to control the generation and migration of fugitive dust, such application of dust suppressants shall comply with the following requirements: i. . Subject to EPA approval, water treated to meet the Water Treatment Plant discharge limits may be used for dust suppression in the Work Area, provided it will not result in releases to surface water or adversely affect worker health and safety. ii. Application of dust suppressants shall be performed in a manner that minimizes surface water runoff, over spray of chemical suppressants into surface water bodies, wetlands or other sensitive habitats, and/or generation of muddy conditions.	The RA contractor(s) will meet this Performance Standard through compliance with specific Technical Specifications that describe dust suppression methods and procedures, and will be subject to EPA review and approval. The Technical Specifications for the project are provided in Appendix K. For most of the RA construction activities (including demolition activities), it is anticipated that if dust suppression is required, it will consist of watering (i.e., spraying) as the structures are demolished. Dust suppressant additives may be added to permanent non-paved access roads or haul roads, subject to prior EPA approval.

H3.0 ENGINEERING DESIGN DRAWINGS

The engineering design drawings are contained in Volume II of the BODR. The drawings related to demolition include:

Sheet Number	Description
8-1	Demolition Plan – Midnite Mine Site
8-2	Demolition Plan – East Access Road
8-3	Demolition and Removal Plan – Construction Support Facilities
8-4	Plan View – Demolition Debris Disposal Zones
8-5	Pit 4 – Demolition Debris Disposal Zone Sections
8-6	Pit 3 – Demolition Debris Disposal Zone Sections (1 of 2)
8-7	Pit 3 – Demolition Debris Disposal Zone Sections (2 of 2)

H4.0 STRUCTURES IDENTIFIED FOR DEMOLITION

The locations of existing facilities and structures to be demolished in the MA are shown in Drawings 8-1 and 8-2. These facilities include: (1) the existing water treatment plant (WTP) equipment and structures, (2) the existing buildings on the west side of the Site, (3) the seepage collection facilities in the MA drainages, (4) surface pipelines, (5) buried culverts, (6) overhead power lines, (7) interim decontamination facilities and (8) temporary property fencing. Other buried structures requiring demolition may be identified during the RD process.

In addition, some of the structures in the Construction Support Zone (CSZ) discussed in Appendix B may require dismantling/removal and/or demolition/disposal at the end of the RA. Drawing 8-3 depicts the construction support facilities. These facilities include the following:

- Fencing associated with the construction support facilities
- Crew meeting/lunch trailers
- Construction offices
- Storage trailers
- Maintenance/electrical shop
- Decontamination office
- Locker, shower and laundry building
- Construction fuel and water storage and delivery systems

- Ambulance garage
- Safety/Emergency Services office
- Restroom trailers

H5.0 DEMOLITION EQUIPMENT, TASKS, AND PROCEDURES

During the RA, a subcontractor specializing in materials characterization and disposal will be contracted to evaluate the buildings and other infrastructure identified in H4.0. This contractor will characterize and identify the types of materials that will be generated during demolition, then depending on the characterization assist with segregation and disposal of the materials generated during demolition either on or off-site. This subcontractor will prepare a disposal plan prior for the work that describes the processes to be used during this phase of the demolition process. During the actual demolition, any equipment or materials that are salvageable and can be verified to be uncontaminated by the selected RA contractor may be removed or recycled and not disposed in the MA. Facilities in the CSZ may have a salvage value or recycling opportunities as described in H4.0. This strategy is reflected in the Technical Specifications.

Demolition of the MA facilities consists of use of mechanized equipment specially designed and equipped for demolition work to minimize manual labor and potential occupational exposures. Dust suppression techniques will be used to minimize generation of dust during demolition activities. The RA contractor(s) will comply with specific technical specifications (in Appendix K) and the Health and Safety Plan (Appendix L) that describe dust suppression methods and procedures and are subject to EPA review and approval.

H5.1 TYPICAL DEMOLITION EQUIPMENT

The equipment typically used for demolition is described below. Actual equipment used for the Midnite RA will depend on the selected RA contractor and actual demolition schedule.

Hydraulic shear. This is a hydraulically operated attachment on the end of the arm of a track-mounted excavator or crane. This shear is used to cut piping, I-beams, tanks and other steel into pieces that will fit into trucks.

Grapple. This is a hydraulically operated attachment on the end of the arm of the track-mounted excavator or crane. The grapple is either an excavator bucket with a thumb, or a grasping attachment with several “fingers.” The grapple is used to load dismantled pieces of piping, tanks, and concrete into trucks.

Hydraulic excavator. A hydraulic excavator is used to load dismantled pieces of piping, tanks, and concrete onto trucks for transport to the area for temporary storage or the disposal location. Also, excavator buckets with different widths may be used to excavate solids from tanks or cemented soils from around deeper foundations or pilings.

Front-end loader. In areas with smooth ground conditions and free from debris that may damage rubber tires, a front-end loader will be used to load soil, dismantled pieces of piping, tanks, or concrete into trucks.

Concrete shear. This is a hydraulically operated attachment on the end of the arm of a track-mounted excavator or crane. The concrete shear is similar to the steel shear, used to break concrete walls, slabs, and other facilities that will fit into the jaws of the shear. The shear breaks the concrete into pieces that can be loaded into trucks.

Concrete impactor. For concrete foundations that cannot be broken with the concrete shear, a concrete impactor is used. This is another attachment on the end of the arm of a track-mounted excavator or crane. The impactor uses a vibratory tip (similar to a jack-hammer) to break concrete into pieces that can be loaded into trucks. Alternatively, a wrecking ball may be used to break up thick foundations.

Trucks. Haul trucks are used to transport dismantled equipment, concrete, and soils to the area for temporary storage or the disposal location.

Water truck. A water truck or similar rubber-tired watering equipment is routinely used for dust suppression to wet haul roads from the specific demolition site to the area for temporary storage or the disposal location.

Other targeted spraying methods will be used during demolition activities. This will include wetting structures before or during demolition, and spraying during loading or dumping of debris.

Grader. A road grader or blade is used to smooth haul roads and other work surfaces on a routine basis.

Off-Site Disposal Truck. In the event that materials are identified that must be transported off-site for proper disposal, a truck specifically designed for off-site disposal will be identified and used. The truck will be property placarded prior shipment.

H5.2 DEMOLITION TASKS AND PROCEDURES

The general demolition activities for these facilities will include the following discrete tasks.

1) Inspection of structures or facilities for the presence of asbestos containing materials (ACMs) or hazardous materials.

2) Preparation of structures or facilities for demolition including removal and proper off-site disposal of any ACMs or hazardous materials.

3) Demolition of the above-ground portion structures or facilities.

4) Demolition of foundations and below-ground features.

5) Loading and hauling of demolition debris.

6) Placement and compaction of demolition debris.

These tasks and the equipment and procedures necessary to complete them are presented below.

H5.2.1 Preparation for Demolition

Several pre-demolition activities will be completed prior to actual demolition of the structures and other facilities. These activities will be conducted by a specialty contractor as discussed in H5.0. Demolition preparation activities are outlined below.

1) Facilities will be inspected for the presence of ACMs and hazardous materials.

2) If ACMs or contamination associated with hazardous materials are identified by the specialty contractor, this material will be segregated and transported for off-Site disposal in compliance with applicable Stevens County, Washington State and Federal regulations. All other demolition materials and debris will be backfilled in the pits on-Site.

3) Utilities for individual structures will be disconnected, and utility lines will be removed when no longer needed.

4) Water lines will be drained to appropriate locations for storage and treatment.

5) Structures and other facilities to be demolished will be assessed from a structural stability standpoint to determine the method and direction of demolition for safe delivery of the structure to the ground for cutting or breaking of debris, loading, and removal.

H5.2.2 Above-Ground Structure Removal

This will consist of dismantling of above-ground structures or facilities, using the equipment listed above. The dismantled structures may be removed for recycling or reuse or the structure debris will be broken, cut or compressed into sizes appropriate for loading into the trucks for transport of the demolition debris to the pits.

Depending on the type of structure or facility, demolition may be conducted with associated equipment and structures remaining inside. For safety or material handling efficiency, the equipment may be removed prior to the structure being demolished. This decision will be made by the RA contractor in consultation and with approval from the DMC/Newmont and the EPA.

H5.2.3 Below-Ground Feature Removal

After above-ground structures and facilities have been demolished and removed from the demolition area, then removal of concrete foundations and other below-ground features will be conducted. The concrete will be broken into pieces of suitable size for loading into trucks.

Depending on the thickness and extent of concrete floor slabs and foundations, the equipment used for breaking up concrete may be a concrete shear or concrete impactor, a hydraulic excavator, and/or equivalent equipment.

H5.2.4 Loading and Hauling of Demolition Debris

Demolition debris from above-ground or below-ground activities will be loaded into haul trucks, using the equipment listed above. Because of the wide variety in shape and size of the demolition debris, the following guidelines are used in sizing, handling and disposing of debris.

1) Material will be cut or dismantled into pieces that can be safely lifted or carried with the equipment being used. Material will also be cut or dismantled to minimize void spaces after disposal.

2) A front-end loader, hydraulic excavator, or equivalent equipment will be utilized to crush or compact compressible materials. These materials will be laid out in a staging area or other approved area to facilitate crushing or compacting with equipment.

3) Pipe or conduit with an opening or diameter larger than 12 inches that cannot be crushed will be filled with grout or similar approved material prior to disposal.

4) Tanks and vats will be handled according to the wall material and wall thickness. Tanks will be crushed or compacted if possible. Tanks that cannot be crushed will be dismantled, if feasible. Tanks that cannot be crushed or dismantled will be transported to the disposal area, filled with grout or similar approved material, and buried.

H5.2.5 Placement and Compaction of Demolition Debris

The objective for placement and compaction of demolition debris in the disposal area is to minimize void spaces and reduce the potential for settlement after placement and compaction. The techniques for placement of debris in Pits 3 and 4 are outlined below.

Compressible materials are to be crushed and then covered with backfill material, and incompressible materials are to be placed in the disposal area, with the void spaces outside of the materials filled with soils. Internal void spaces of incompressible materials are to be filled with backfill material where possible, or grout if necessary.

The debris is to be spread in a layer such that structural shapes or other large pieces do not lie across or on top of each other, to prevent nesting. The material to be used for filling voids around the debris (unclassified waste) is to be spread in loose layers over the debris, and worked into and around the debris materials until the void spaces are minimized. A sufficient lift thickness of fill material should be placed over the debris so that the surface is accessible with tracked equipment. The fill material will then be walked with tracked equipment to compress the debris as much as possible into the underlying backfill. After this initial compression step if additional fill is necessary, a lift of fill can be added and compacted with compaction equipment.

Materials such as pipe and tubing have a varying degree of compressibility, depending on the diameter and wall thickness. Pipe with a 12-inch diameter or larger and is not compressible is to be filled with grout or granular material for burial, and pipe with smaller diameter is to be crushed before burial.

Vessels and tanks will either be crushed (if thin-walled and compressible) or cut open (if thick-walled and incompressible). Vessels that are to be cut open and filled, will be placed in the disposal area such that fill can also be placed around them and compacted. Thick-walled tanks or vessels that cannot be cut open due to cutting difficulties or worker health concerns will be placed in the designated zones of demolition debris disposal in Pit 3 or 4 (shown in the Section 8 drawings). For these tanks or vessels, interior voids spaces would be filled with cement grout.

Metallic debris will be placed by sizes so that larger pieces are not stacked on top of each other at angles that create void spaces. Large structural shapes will either be laid edge to edge so that they can be covered by fill material or they will be spaced far enough apart that equipment can operate between them to compact fill. Long structural (incompressible) members will be oriented horizontally. The specified maximum demolition debris dimensions of 30 cubic feet, 20 feet for debris, and 10 feet for pipe are outlined in the references cited (DOE, 1995, 2000). However, demolition debris is typically sized for the haulage equipment and often the individual pieces of debris will be less than these maximum dimensions in order to fit in trucks. Using the methods discussed above for debris placement in the disposal area and controlling the lift thickness will minimize the potential for excessive void spaces and settlement.

H6.0 DEMOLITION SEQUENCING

Due to construction sequencing, demolition of some structures must occur before a suitable disposal site within Pit 4 has been prepared. In these situations, demolition debris will be stockpiled until a suitable disposal area within the waste backfill can be prepared.

It is anticipated that structures and facilities will be demolished/removed in the following order:

Anticipated Demolition Order	Facility or Structure	Schedule
1	Existing structures and culverts in the proposed construction support facilities area (west edge of the Western Drainage)	Early Works
2	Stormwater storage pond and other facilities on the surface of the South Waste Rock Pile	Phase 1
3	Pipelines and structure in the Western Drainage below the toe of the South Waste Rock Pile	Phase 2
4	Existing WTP and appurtenant structures	Phase 2
5	Pump houses and pipelines in the Eastern and Far East Drainages	Phase 2
6	Pump houses, pipelines, and other facilities in the Central and Western Drainages, including those associated with the Pollution Control Pond	Phase 3
7	Structures and fencing associated with construction support facilities and Site perimeter	Phase 3

Buried pipelines and other non-essential utilities not identified on the drawings will be removed during the course of the RA as they are encountered. Culverts and power-lines will be removed as necessary and in a manner that prevents interruption of surface water management or power supply to operating facilities.

As shown on Drawing 8-3, the new WTP and associated ponds, access control trailer, and WTP perimeter fence will remain in place. The locations for disposal of material in Pits 3 and 4 are within selected portions of the unclassified waste zones as shown on Drawings 8-4 through 8-7.

H7.0 GREEN AND SUSTAINABLE REMEDIATION CONSIDERATIONS

The GSR considerations for the demolition activities include: (1) Construction Materials and Equipment (characteristics and manufacturing considerations), (2) Construction Methods, and (3) Low Impact/Sustainability measures undertaken during construction.

H7.1 Construction Material Considerations

With respect to the demolition there is some salvageable equipment in the existing WTP that can be reused. A number of components in the existing WTP will likely be salvaged and reused in the new WTP, including the filter press, membrane squeeze tank, pumps, and control panels. The applicable chemicals at the existing WTP, namely barium chloride and polymer, will be transferred to the new WTP for use and not otherwise disposed. This equipment and chemical re-use will reduce new material requirements, and reduce the material sent for disposal. Other equipment and materials from facilities specified to be demolished will be disposed in the on-Site waste pits during the RA, which will reduce any exposure risks due to potential residual contamination.

H7.2 Construction Methods

The demolition equipment used for the construction support facilities will be appropriately sized to reduce fuel consumption and greenhouse gas emissions, and to minimize stormwater erosion during these activities.

Dust suppression will be used in the area and on the access roads to decrease visible dust related emissions. WTP effluent water may be used for dust suppression when available during demolition and construction activities. To minimize water use, organic dust suppressant additives such as lignin sulfonate are anticipated during demolition and construction activities. Use of dust suppressants will be coordinated with and approved by the Tribe.

A schedule for diesel construction equipment emission standards requirements is included in the technical specifications (Specification 01585 – Green and Sustainable Practices) for use during the Midnite RA (including demolition activities) and will be adopted by the selected RA Contractor. The demolition contractor or subcontractor, will be instructed to comply with the

requirements in this specification. On-Site vehicle speeds will be restricted to accommodate safe roadway conditions based on roadway grade, roadway soil conditions, roadway congestion, and the need to limit air emissions caused by roadway fugitive dust. These dust emission shall be controlled on-site through use of chemical dust suppressant and/or water applications to roadways. Ultra-low sulfur diesel will be used in demolition equipment and support vehicles.

Materials to be demolished will be cut and/or dismantled to minimize void spaces for transportation and disposal. This methodology will minimize the number of truckloads required for transport of demolition debris and therefore reduce diesel fuel consumption and greenhouse gas emissions.

The Stormwater Management Plan (SWMP; included in Appendix O) identifies BMPs and specific sediment control measures that will be employed before, during, and after construction for both sediment and stormwater control.

H7.3 Low Impact Development/Sustainability

Access road routes from the demolition location to the disposal location have been assessed to minimize Site disruption and vehicle mileage. Please note that on-Site disposal of the demolition debris will result in a much lower carbon footprint than off-Site disposal.

H8.0 REFERENCES

U.S. Department of Energy (DOE), 1995. Uranium Mill Tailings Remedial Action Project, Slick Rock, Colorado Subcontract Documents. U.S. Department of Energy, Albuquerque, New Mexico. October 1. DOE/AL/62350—21F-Rev. 1-Attachment.

U.S. Department of Energy (DOE), 2000. WSSRAP Disposal Facility Technical Specifications, Section 2300: Waste Removal, Handling, and Placement. WP-437, Disposal Cell Construction. May 15.

U.S. Environmental Protection Agency (EPA), 2011. Consent Decree Statement of Work for the Remedial Action for the Midnite Mine Superfund Site, Spokane Indian Reservation, Washington. Civil Action No. CV-05-020-JLQ. United States of America, Plaintiff v. Dawn Mining Company, LLC and Newmont USA Limited, Defendants. August.

Midnite Mine Superfund Site
100 Percent Design

Appendix I – Water Treatment Plant Chemical Precipitation Process

Appendix I has not been updated for the 100% design and is not included in this 100% BODR. As communicated to the EPA on May 20, 2014, Appendix I and the effluent pipeline designs have been placed on hold until the Midnite NPDES permit is reissued.

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Midnite Mine Superfund Site
100 Percent Design

Appendix J – Influent and Effluent Pipelines

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Attachment J-2 Summary of 2013 Blue Creek Geotechnical Investigation Report

Attachment J-3 Geohazard Evaluation Proposed Water Treatment Discharge Pipeline Alignment

Attachment J-4 Letter Requesting Delay in Schedule

LIST OF ACRONYMS

bgs	below ground surface
BODR	Basis of Design Report
BMP	Best Management Practice
BPA	Backfilled Pit Areas
CD	Consent Decree
CSZ	Construction Support Zone
EPA	U.S. Environmental Protection Agency
gpm	gallons per minute
GSR	Green and Sustainable Remediation
HDPE	High Density Polyethylene
in	inches
LiDAR	light detection and ranging
NPDES	National Pollutant Discharge Elimination System
PCP	Pollution Control Pond
RA	Remedial Action
RAO	Remedial Action Objectives
RD	Remedial Design
ROD	Record of Decision
SOW	Scope of Work
SWMP	Storm Water Management Plan
Tribe	Spokane Tribe of Indians
WTP	Water Treatment Plant

J1.0 INTRODUCTION

This appendix to the *Midnite Mine Superfund Site Basis of Design Report* (BODR) presents the design details for the influent and effluent pipelines that will be used to convey impacted water from the backfilled pits to the new Water Treatment Plant (WTP) and treated water from the WTP to the Spokane River Arm of Lake Roosevelt. This appendix also includes the location and design for the diffuser that will be constructed at the terminal end of the pipeline to aid with mixing the treated effluent and lake water. A detailed discussion of the alignments and their design calculations are included in the Influent and Effluent Pipeline Hydraulic Calculations attachment (Attachment J-1).

This appendix contains:

- Demonstration that the design will attain the applicable Performance Standard identified in the Consent Decree's Statement of Work (CD SOW, EPA 2011b) and in Section J2.0 below
- Discussion of the proposed pipeline routes and alignment modifications.
- Influent and effluent pipeline design calculations, assumptions, and parameters
- Diffuser location and design
- Green and Sustainable Remediation (GSR) considerations

Currently, additional water quality data is being collect in support of the NPDES permit application process. On May 20, 2014, a letter was sent to the EPA requesting a delay in the design of the WTP since the design of the WTP cannot be finalized until the discharge limits for the reissued NPDES permit are known. <u>As part of this request, a delay to the design of the effluent pipeline from the new WTP to Lake Roosevelt also was</u>. The delay in the design of the effluent line was approved in a letter from EPA dated July 8, 2014. It must be noted that, although effluent sections have not been removed from this appendix, they have not been updated since the 60% Basis of Design Report (MWH, 2013b). Headings in delayed portions of this document have been annotated with the text "Not Updated" so the reviewer understands the situation and status of each. Also, in *Volume II: Part 2 of 2 Design Drawing, Section 10 – Influent and Effluent Pipeline Designs*, the effluent pipeline drawings in the 100% submittal have been annotated with a watermark indicating that the 60% effluent pipeline design has not been updated and the note: "*The effluent pipeline drawings*

and design have not been updated in this design submittal. The effluent pipeline drawings will be revised concurrently with the new WTP design once the NPDES permit is reissued and the discharge limits are established" has been added to the general notes section on Sheet 10-1. EPA's letter approving the delay of the design is included in Attachment J-4: Letter Requesting Delay in Schedule.

It also should be noted that the existing WTP currently treats water from April through October and without winterization of the existing WTP, a new or winterized WTP must be in place by November 2019 because of issues related to water storage as the existing pits are backfilled and covered (given the anticipated construction schedule, which begins in 2016). This means that an alternative design for winterization of the existing WTP must begin *by November 2018* if the new WTP is not anticipated to be on-line by November 2019.

J2.0 COMPLIANCE WITH PERFORMANCE STANDARDS

The Performance Standards presented herein are defined in the CD SOW, and were developed to define attainment of the Remedial Action Objectives (RAOs) of the Selected Remedy. The Performance Standards include both general and specific standards applicable to the Selected Remedy work elements and associated work components. All of the Performance Standards associated with the Midnite Mine remedy are summarized on Table 4-6 of the 100% Basis of Design Report (100% BODR). This master table lists each performance standard, and summarizes where or how each is addressed in this BODR. The Performance Standards identified in the CD SOW for the influent and effluent pipelines are discussed below.

J2.1 INFLUENT PIPELINES

There two Performance Standards applicable to the influent pipeline as stated below:

2.3.24 *"All water requiring treatment shall be conveyed to and treated at the water treatment plant operating at the time of conveyance."*

2.4.3.3.2 B. *"Water collection and conveyance facilities shall be provided with capacities and in locations to be determined in the remedial design."*

This appendix depicts the proposed route of the influent pipelines at the beginning of construction, at the beginning of Phase 2 of construction, at the beginning of Phase 3 of construction, at the end of construction, and the final permanent configuration (post-remediation). Influent pipeline alignments are designed using groundwater flow rates presented

in the Groundwater Investigations Report (MGC, 2011); although exact routes and sizing may be altered in the future as the RD progresses and flows from the individual groundwater sources are more reliably known.

This appendix provides calculations for capacities of the final influent pipelines and depicts the proposed routes of influent piping necessary at the beginning of each of the three phases of construction as well as the post-construction phase. The proposed influent pipeline alignments were selected, in part, to minimize habitat and environmental impacts by remaining entirely in the disturbed area. Alignments were also selected to avoid working areas, but are subject to change as more information is obtained throughout the life of the project.

J2.2 EFFLUENT PIPELINE – (NOT UPDATED)

With regard to the effluent pipeline, there is a single Performance Standard applicable to the effluent pipeline as stated below.

> *"The pipeline to the discharge location of the WTP and the discharge outfall shall be sited in coordination with the Tribe, shall not interfere with the functioning of existing structures (e.g. roads, culverts, bridges), and constructed as determined in RD."*

This appendix provides calculations for capacities of the effluent pipelines and depicts the proposed route of this pipeline.

Coordination with the Spokane Tribe - The proposed pipeline alignment has been coordinated with the Spokane Tribe of Indians (Tribe) as follows:

- The Tribe concurred with the Selected Remedy in the ROD, which includes long-term discharge of treated water to the Spokane River Arm of Lake Roosevelt via a conveyance pipeline aligned along Blue Creek.
- The Tribe participated in technical meetings where general and specific remedial design topics were discussed, including the proposed alignment of the effluent pipeline along Blue Creek.
- Prior to performing pre-design investigations along the proposed pipeline alignment, an application for a ground disturbance permit was submitted to the Spokane Tribal Heritage Protection Officer for review and approval. In addition, a Tribal representative was present for all pre-design excavation activities to confirm

culturally significant items were not encountered or removed along the proposed pipeline alignment.

- The Tribe has reviewed the 30 percent effluent alignment and will review this 60 percent pipeline design submittal and provide feedback to the EPA and MWH.
- An access agreement to allow construction, monitoring and maintenance along the pipeline route is being discussed with the Tribe. These on-going negotiations to obtain a pipeline corridor access agreement are detailed in Appendix N.

The alignment was selected to avoid interference with existing structures and minimize habitat and environmental disruption. The selected alignment is designed to be within planned or existing unpaved roads along the majority of the alignment, thereby minimizing the required clearing and grubbing of native flora associated with the earthwork. The only section of the alignment that is not within an unpaved roadway is a short segment along the shoulder of the Ford-Wellpinit Road (West End Road) before it enters a small jeep road toward Blue Creek and at the mouth of Blue Creek were the pipeline will be buried adjacent to the Blue Creek channel above the low water level and will be place on the lake bottom below the low water level of Lake Roosevelt.

J3.0 PRE-DESIGN INVESTIGATIONS

In order to locate the best alignments and meet the requirements of the performance standards, initial investigations were performed. The investigations and how they relate to the influent and effluent pipelines is described below.

J3.1 INFLUENT PIPELINES

The influent pipelines will mostly traverse land that will be remediated (i.e., disturbed) and reclaimed at the end of remediation. As such, the influent pipes during construction will be temporary and frequently relocated throughout the remedial action (RA) process. Due to the highly variable nature of these pipelines and their alignments, much of the design of the intermediate pipelines will take place in the field as the land surface changes. Because of this, no initial investigations have been planned for the influent pipelines.

J3.2 EFFLUENT PIPELINES – (NOT UPDATED)

During the fall of 2013, a geotechnical investigation was performed where 25 test pits were excavated along the proposed effluent pipeline alignment. The information from this

investigation is summarized in a document titled, *Summary of 2013 Blue Creek Geotechnical Investigation Report* (Attachment J-2). Information and data include:

- Soil and rock depths along the corridor
- Groundwater depths within the proposed pipeline excavation
- Excavatability characteristics of materials encountered
- Compressibility and support characteristics of pipe foundation materials
- Suitability of excavated materials for pipe backfill

The report indicates that excavation will occur in alluvial and colluvial materials. The colluvium will be more difficult to excavate. Both materials will be suitable for backfill. It is also noted that large boulders may be encountered and could require other excavation equipment or design modifications. Such modifications will require the approval of the field engineer and an engineering change notice for EPA approval. The results of the report are covered in greater detail in section J6.2.2

J4.0 ENGINEERING DRAWINGS

The influent pipelines, effluent pipeline, and diffuser engineering drawings are contained in Volume II of the BODR and each drawing contains the information presented in the description and notes below. These drawings include:

Sheet Number	Description
10-1	Pipelines - General Sheet
10-2	Overall Final Pipelines Plan
10-3	Overall Influent Pipelines Plan – Start of Phase 1
10-4 through 10-8	Phase 1 Influent Pipelines Plan and Profiles
10-9	Overall Influent Pipelines Plan – Start of Phase 2
10-10 through 10-27	Phase 2 Influent Pipelines Plan and Profiles
10-28	Overall Influent Pipelines Plan – End of Phase 3
10-29 through 10-44	Start of Phase 3 Influent Pipelines Plan and Profiles
10-45	Overall Influent Pipelines Plan – End of Phase 3
10-46 through 10-55	End of Phase 3 Influent Pipelines Plan and Profiles
10-56	Influent Pipelines Plan – Permanent
10-57 through 10-62	Permanent Influent Pipelines Plan and Profiles
10-63	Overall Effluent Pipeline Plan –Permanent
10-64 through 10-81	Permanent Effluent Pipeline Plan and Profiles
10-82 through 10-93	Typical Details and Sections

As noted in Section J1.1, the effluent pipeline and diffuser designs have been put on hold and are not updated in this submittal. The drawings associated with the effluent pipeline are not updated in *Volume II: Part 2 of 2 Design Drawings, Section 10 – Influent and Effluent Pipeline Design* of the BODR.

J5.0 PIPELINE ROUTE AND ALIGNMENT

J5.1 INFLUENT PIPELINES

Initially, mine-effected water will be piped directly from Pit 4, Pit 3, and the Backfilled Pit Areas (BPA) to the existing WTP for treatment. The existing WTP will be operated until the new WTP is operational. It is assumed that the new WTP will be constructed near the end of Phase 1 of the RA. This assumption is based on the timely receipt of the reissued NPDES permit and finalization of the WTP treatment processes.

During much of the RA, influent pipelines will be temporary and located within the footprint of the RA, and will be relocated regularly as remediation progresses so their locations will be temporary in nature. Alignments for the temporary influent pipelines cannot be chosen accurately until the topography is defined during construction. However, proposed alignments were selected for the influent pipelines at the beginning of each of the phases in order to portray the overall piping system as it evolves through three phases of construction. Temporary and final influent pipeline details are located in Section 10 of the drawings.

There are three primary water sources that must be treated during construction and at the completion of the RA. These sources are: Pit 3, Pit 4, and one BPA well, as depicted on Figure J-1. Future dewatering trenches in the Eastern, Western, and Central drainages are also depicted on Figure J-1. The figure also shows the locations of the existing and the future WTPs.

Figure J-1 – Water Source Locations

J5.1.1 Influent Pipelines - Beginning of Construction/Start of Phase 1

Initially, the existing pipelines will be used to convey water from Pit 4 and Pit 3 to the existing WTP. At the beginning of construction, the mine-effected water in Pit 4 will be pumped directly to Pit 3 as shown in Figure J-2 to dewater the pit. Also, water will be piped directly from the BPA to Pit 3 and from the existing seep collection system to the Pollution Control Pond (PCP) and into Pit 3, as the system is currently operated. The water then will be pumped directly from Pit 3 to the existing WTP. The existing WTP will be operated until the new WTP is constructed near the end of the RA Phase 1. The layouts of the proposed pipeline configurations at the beginning of Phase 1 are shown in Figure J-2, below.

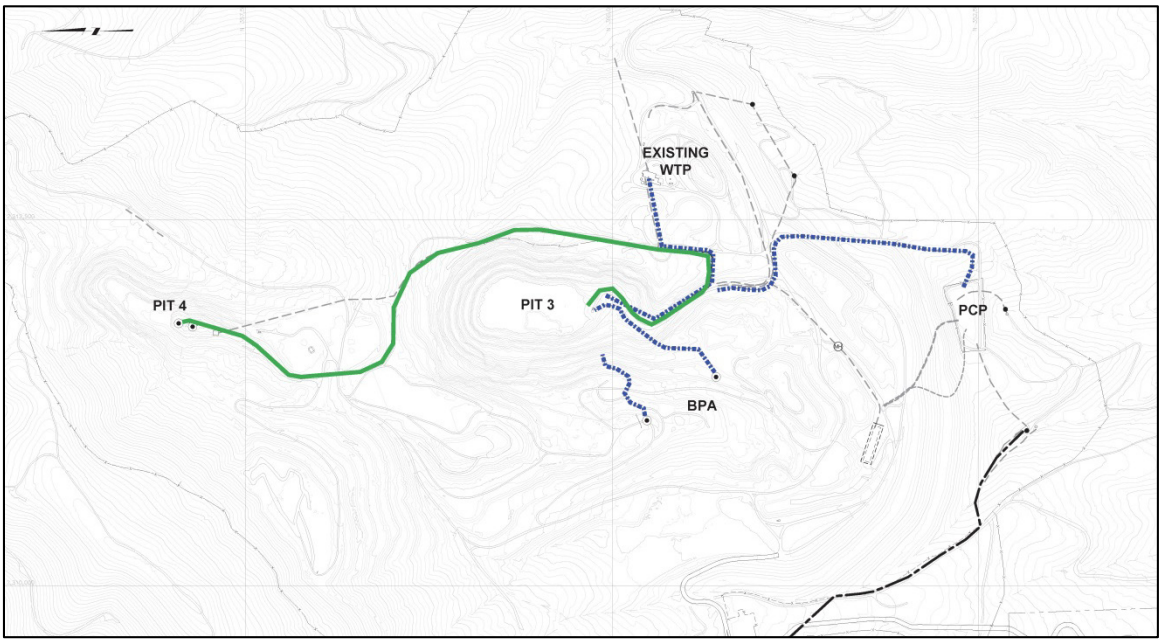

Figure J-2 – Start of Phase 1 Influent Pipelines

Figure J-2 shows the following influent water sources and pipelines:

- The existing lines to and from Pit 3 (shown in dashed blue) that will not require modification.
- The existing seep dewatering systems along the southern margin of the mined area to the PCP and from Pit 4 to the existing WTP (shown in dashed black).
- As construction begins, a new drain pipe (shown in dash-dot black) to be installed from the collection sump in the Construction Support Zone (CSZ) down to the existing seep

dewatering system. The pipeline will drain stormwater and runoff from the decontamination pad for treatment.

- As construction begins, a new influent pipeline (shown in green) to be installed from Pit 4. This pipeline will run up the Pit 4 access road and discharge into Pit 3 as Pit 4 is dewatered early in the construction process.

It is important to note that at the end of Phase 1, the South Storage Pond (South Pond) will be constructed. The water storage capacity of the South Pond will allow Pit 3 to be backfilled. Extraction trenches will be installed in the Eastern, Central, and Western drainages to dewater the shallow alluvial system downgradient from the mined area. Prior to Phase 2, pipelines to the South Pond from Pit 4, Pit 3, the BPA well, and the PCP will have to be installed.

J5.1.2 Influent Pipelines - Start of Phase 2

At the Start of Phase 2, Pit 4 will be backfilled and have its final cover, complete dewatering will begin in Pit 3, and mine-effected water will be piped directly to the newly constructed South Pond for storage, prior to treatment. The new alluvial groundwater extraction trenches in the Western, Central, and Eastern drainages also will be operating with associated pipeline discharges to the PCP. Treatment will occur at the newly constructed WTP unless the NPDES permitting process causes a delay. Should the new WTP construction be delayed, the existing WTP will be utilized, as described in the Introduction - Section J1.0. Under either scenario, year-around treatment will be required. The layouts of the proposed influent pipelines at the beginning of Phase 2, assuming the new WTP is in operation, are shown in Figure J-3, below.

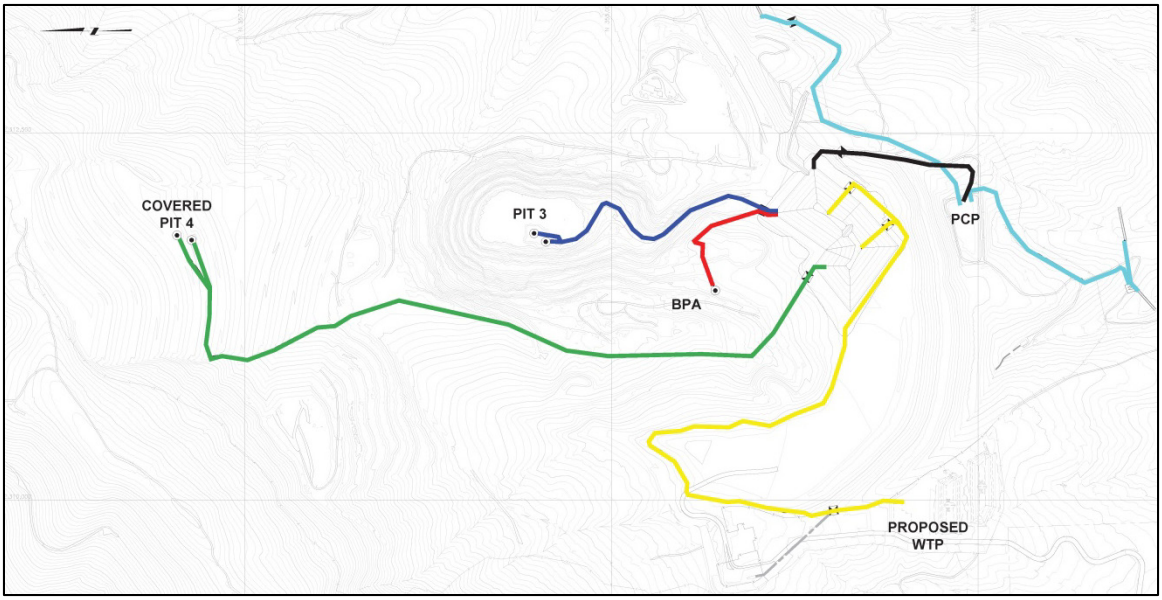

Figure J-3 – Start of Phase 2 Influent Pipelines

Figure J-3 shows the following influent water sources and pipelines:

- Water from the BPA well (shown in red) will be pumped directly to the new South Pond.
- A new pipe (shown in green) will be installed from the Pit 4 underdrain and waste rock dewatering wells (4 wells total) and will run along the west side of the pits down to the South Pond.
- The temporary Pit 3 pipeline from the underdrain and dewatering wells (shown in dark blue) will discharge into the South Pond.
- The new extraction trenches from each of the drainages (shown in light blue) will be routed to the PCP. The Central and Western Drainages will be pumped to a single wet well, and then to the PCP. The Eastern Drainage will be pumped directly to the PCP.
- Once all pit water has been collected into the South Pond, pumps will lift the water and carry it down a single pipeline (shown in yellow) to the new WTP.

It is important to note that at the end of Phase 2, the West Storage Pond (West Pond) will be constructed so that the South Pond and the mine wastes underlying the pond can be removed. A pipeline will be installed from the West Pond to the new WTP. Prior to Phase 3, pipelines from Pit 4, Pit 3, and the BPA well to the West Pond will also have to be installed. The Eastern

Drainage extraction trench will be rerouted down to the extraction trench wet well where water from all three trenches will be pumped into the main influent pipeline from the West Pond. The pipeline from support zone collection sump will also drain into this main line.

J5.1.3 Influent Pipelines - Start of Phase 3

As Phase 2 ends and Phase 3 starts, the South Pond will be replaced by a smaller West Pond as more areas are remediated. Precipitation shed from these areas is clean which results in an overall decrease in the Site water storage requirements. The equalization pond at the WTP will receive water from the West Pond and will operate year-round. Pit 4 and the alluvial extraction trenches will be pumped to the West Pond. Pit 3 and the BPA pipelines join together before entering the West Pond. The layouts of the proposed influent pipelines are shown in Figure J-4, below.

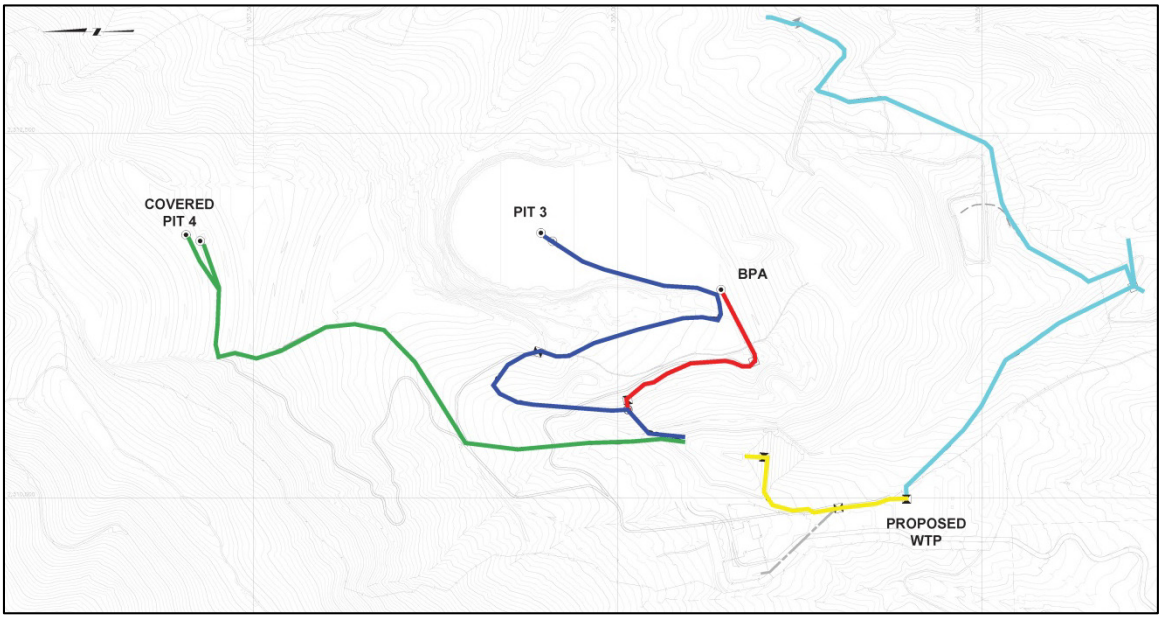

Figure J-4 – Start of Phase 3 Influent Pipelines

Figure J-4 depicts the following influent water sources and pipelines:

- The BPA well (shown in red) will connect to the Pit 3 pipeline (shown in dark blue) which runs to the West Pond. The Pit 3 pipeline will be modified to run up the west wall of the pit where the future Pit 3 cover access road will be located and then head to the West Pond.

- The Pit 4 pipeline (shown in green) will be installed along the cover access road from the Pit 4 wells and run toward the west side of the pit. The pipe will then turn south to the West Pond.
- The extraction trenches (shown in light blue) will be collected at a single wet well and pumped directly to the West Pond.
- Once all pit water has been conveyed to the West Pond, pumps will push the water down a single pipeline (shown in yellow) to the equalization pond at the new WTP.

J5.1.4 Influent Pipelines - End of Phase 3 (End of Construction Period)

At the end of Phase 3, the existing temporary influent pipelines will not require additional relocation. However, a new seepage collection system will be installed at the toe of the Pit 3 cover to drain via a gravity pipeline to a new wet well. Water from this wet well will then be pumped to the BPA wet well and then drain by gravity to the West Pond. The West Pond will remain in place as long as necessary post remediation to contain possible seasonal fluctuations in surface water and groundwater flows and until the hydrogeology and character of all water sources can be verified. It is estimated that the West Pond could remain in place for 10 to 15 years following the end of the construction period. The layouts of the proposed pipelines are shown in Figure J-5, below.

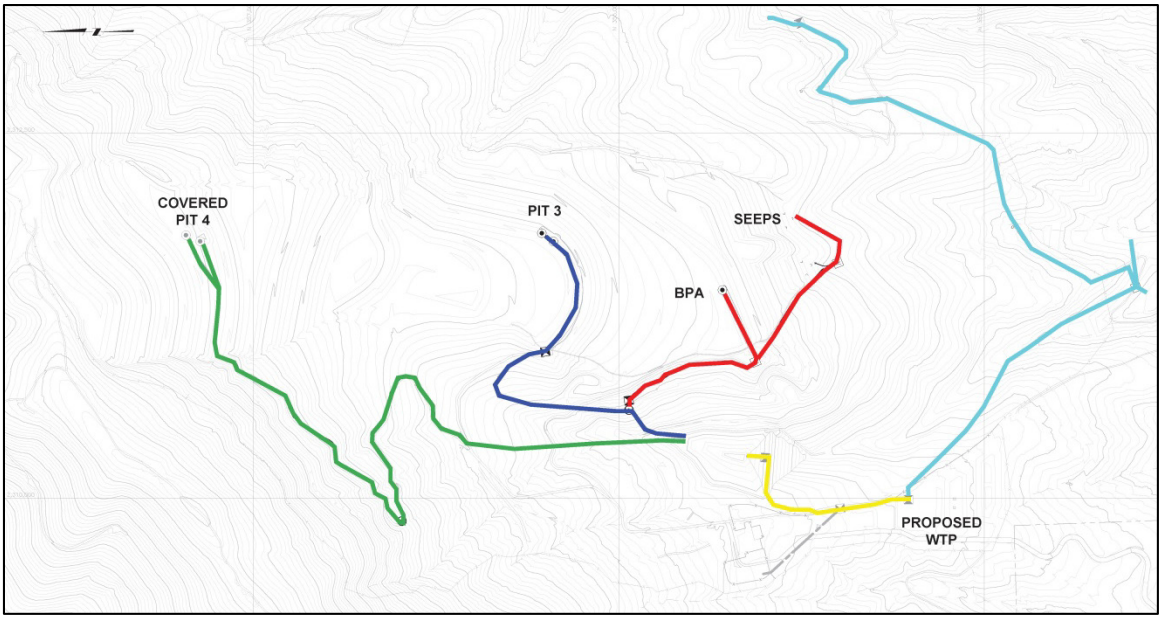

Figure J-5 – End of Phase 3 Influent Pipelines

Figure J-5 depicts the following influent water sources and pipelines:

- The BPA well will continue discharging via an influent pipeline (shown in red) into a wet well where it will be combined with flow from the seepage collection drains.
- This wet well discharge will connect to the Pit 3 pipeline (shown in dark blue) that runs to the West Pond.
- Pit 4 pipeline (shown in green) will be modified to follow the access road from Pit 4.
- The extraction trenches (shown in light blue) will continue to be pumped to the West Pond.
- Once all the extracted water has been conveyed to the West Pond, pumps will lift the water and carry it down a single pipeline (shown in yellow) to an equalization pond at the new WTP.

It is important to note that, prior to removing the West Pond at some time following the end of construction, pipelines will be installed to enable water to bypass the West Pond and run from Pit 4, Pit 3, the BPA well, and the Pit 3 seepage collection directly to the WTP equalization pond. This will be done by rerouting the Pit 4 pipeline to follow access roads and then connection to the Pit 3 pipeline prior to reaching the WTP.

J5.1.5 Permanent Influent Pipelines

Once the influent discharges to the Western Pond are stable, the Western Pond and groundwater trenches will be decommissioned as described in Appendix E. The water from all the various pits and wells then will be routed directly to the equalization pond at the WTP site. The layouts of the proposed pipelines are shown in Figure J-6, below.

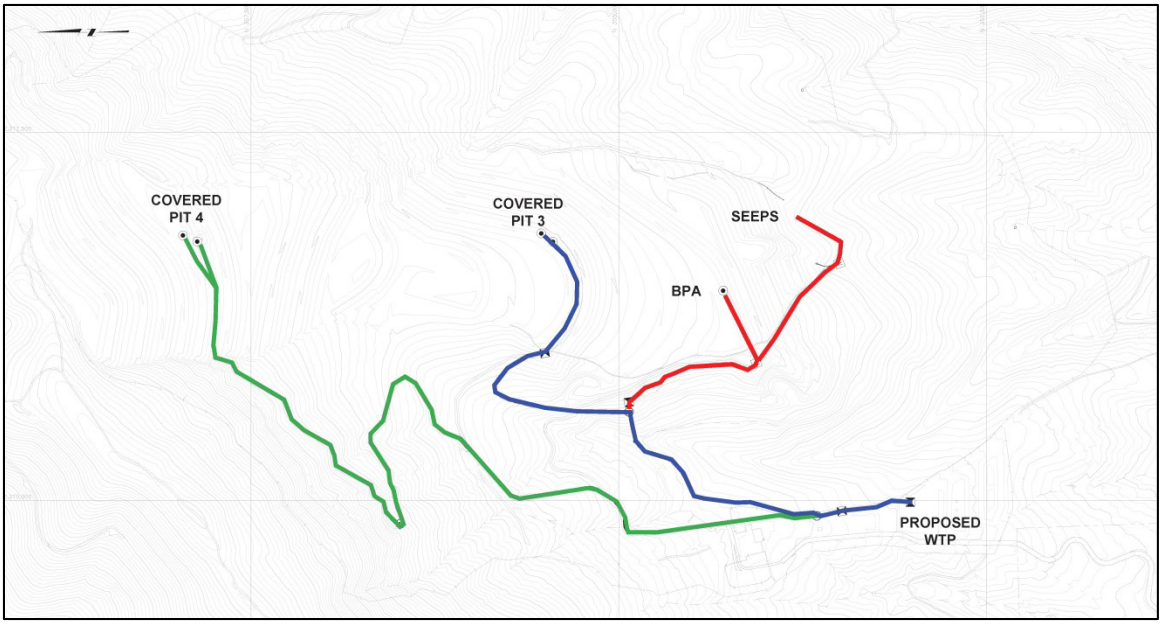

Figure J-6 – Permanent Influent Pipelines

Figure J-6 depicts the following permanent influent water sources and pipelines:

- The BPA well will discharge via an influent pipeline (shown in red) into a wet well where it will be combined with flow from the seepage collection drains.
- The dewatering trenches (shown in light blue) will discharge into a combined wet well. The water that accumulates in the wet well will then be pumped into the combined pipeline from the pits at the WTP bench.
- The Pit 4 alignment (shown in green) and Pit 3 alignment (shown in dark blue) will be extended and joined into a single pipeline just prior to reaching the new WTP. This collection pipeline will discharge groundwater into the equalization pond located adjacent to the new WTP before it is treated by the WTP and discharged to Lake Roosevelt.

These final alignments of influent pipelines are positioned to:

1) Provide the most direct route to the WTP holding pond to minimize materials used in construction
2) Minimize the amount of pressure in the lines pumped from the backfilled pits to the equalization pond at the WTP

3) Allow ease of access to the pipeline over the long term so that maintenance is convenient

J5.2 EFFLUENT PIPELINE – (NOT UPDATED)

The selected effluent pipeline alignment is depicted on Figure J-7 from the new WTP location to Lake Roosevelt. The alignment (shown in blue) is approximately 5.5 miles long and begins at the location of the new WTP. A detailed evaluation of the pipeline alignment is included in Attachment J-1 – the Influent and Effluent Pipeline Hydraulic Calculations.

The pipeline progresses from the new WTP south along what will be the alignment of the proposed future Midnite Mine Access Road until it encounters the Ford-Wellpinit Road. After passing under the Ford-Wellpinit Road, the pipeline continues downhill in a southerly direction along an unnamed, unpaved 4x4 road until intersecting the Blue Creek Road (BIA Hwy 55). The Blue Creek Road then is followed to the confluence of Blue Creek with the Spokane Arm of Lake Roosevelt. Figure J-8 depicts a closer view of where the pipe enters the lake and the diffuser will be installed. The diffuser is located in the bottom of the Spokane River channel.

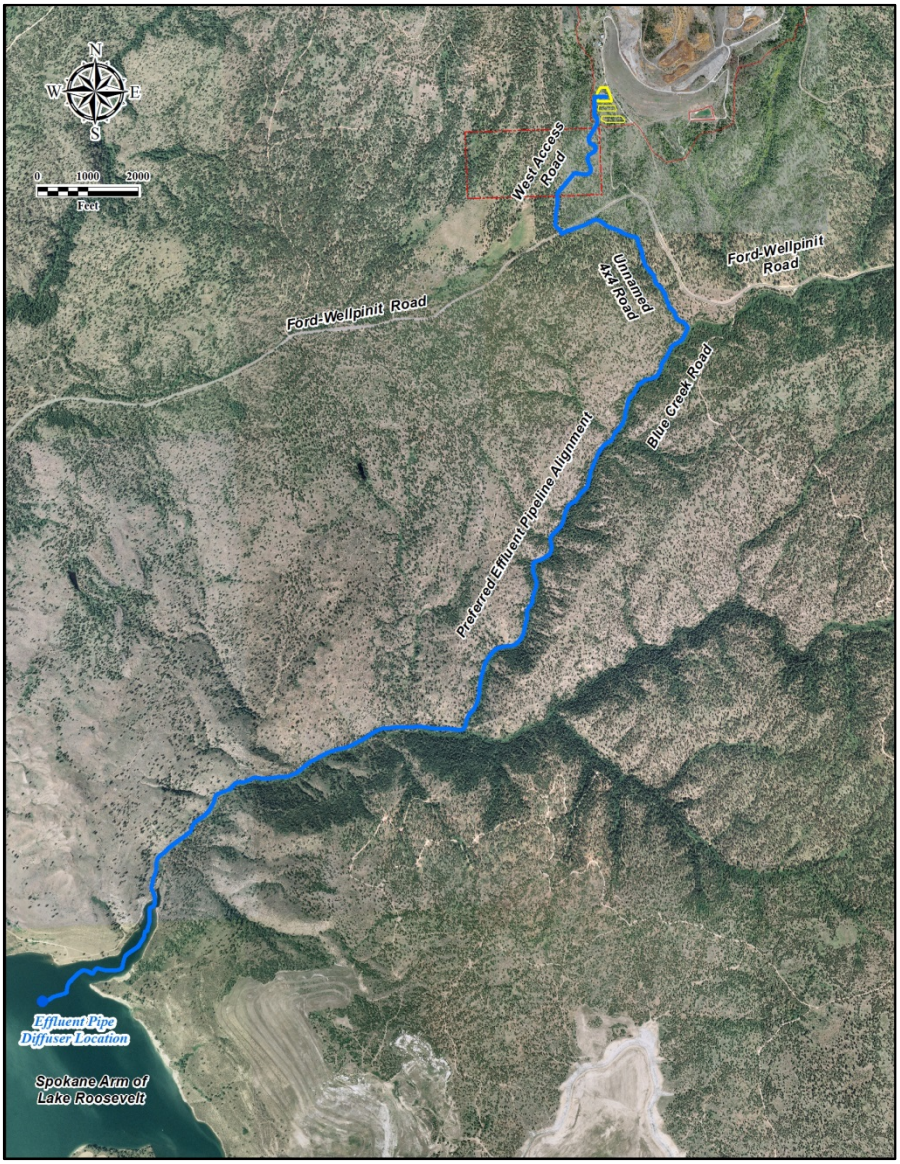

Figure J-7 – Selected Blue Creek Effluent Pipeline Alignment

Figure J-8 – Blue Creek Effluent Pipeline Diffuser Location

While the primary goal of the pipeline is to transport water from the WTP to Lake Roosevelt, it also is very important to minimize any impact that could occur during pipeline construction to the surrounding area, including existing structures and native habitat. In order to accomplish this objective, the selected pipeline route will be located within existing roadways and already affected areas as much as possible. In addition to minimizing the environmental impact, by placing the pipeline along roadways, the pipeline will be more accessible for future monitoring and maintenance post construction.

It should be noted that negotiations currently underway with the Tribe regarding the pipeline construction and the necessary Tribal access agreement for the proposed alignment. Those negotiations could alter the final location of the pipeline; however, a site visit was conducted in the summer of 2013 and the lower pipeline location and position of the outfall was discussed and agreed upon. It is anticipated that the access agreement with the Tribe for the pipeline

alignment will be finalized prior to the 90%design so that any changes that might be necessary can incorporated in the 90% design.

J6.0 PIPELINE DESIGN INFORMATION

J6.1 PERMANENT INFLUENT PIPELINE

The temporary influent pipelines will be installed initially on the remediated surfaces prior to final reclamation. As the construction progresses, these lines will be moved regularly to allow the remediation to progress unimpeded. As a result, temporary topographic surfaces will be established and geotechnical conditions will be evaluated as construction progresses.

The influent pipeline drawings depict dual-walled pipelines for temporary piping during construction. However, the Field Engineer may permit single wall piping when crossing contaminated materials and in locations where potential leaks would not be detrimental to any remediated areas. All influent pipelines crossing remediated areas will require dual-wall containment pipe.

When construction is completed in areas of the Site where the influent pipeline will pass, topography and geotechnical data will be updated to provide “as-built” design information for evaluation of the final influent pipeline designs. If necessary, the designs provided herein may be revised based on the most current data. If substantially different from this design, the hydraulic requirements of the final pipeline alignments will be calculated using the remediated surfaces to determine the slopes of the finished grades and possible vertical inflection points along the pipelines. Elevations of the final topography will be used to determine pumping requirements to reach the new WTP. When construction is complete, the permanent influent pipelines will be dual-walled pipe to prevent any discharge of contaminated water within the remediated Site.

It is anticipated that pumped flows will vary throughout the construction period as elevations are modified. Because these values will not be fixed until the final alignments, sizing for temporary influent pipelines has been selected based only on the final grading and pipeline design.

J6.1.1 Influent Hydraulic Design and Modeling

To complete the hydraulic design of the influent pipelines at the end of construction, modeling was conducted using the SWMM 5.0 software (EPA, 2011a). This model is used to calculate the depths, pressures, flows, velocities, and necessary pipe sizes throughout the system. An in-

depth discussion of the hydraulic model and alternative alignments is included in the Influent and Effluent Pipeline Hydraulic Calculations in Attachment J-1.

Influent Assumptions – The influent pipelines carry varying flows in each of the pipes depicted in each of the construction phases on Figure J-1 through J-6. Maximum flows from Pit 4 during construction were assumed to be approximately 68 gpm for the overliner waste dewatering system and 128 gpm for the underliner drain system. Maximum flows from Pit 3 during construction were assumed to be 228 gpm for the overliner waste dewatering system and 366 gpm for the underliner drain system, and combined flows from the BPA extraction wells were assumed to be 40 gpm. The reasoning behind these flows is described in greater detail in Appendix D. The three extraction trench flows are assumed to be 15 gpm each based on the calculations in Attachment G-1 which, under a worst case scenario from seasonal variation, could provide flows up to 45 gpm to the system. The Pit 3 toe seepage collection will be minimal and was assumed to be 5 gpm from each toe for a total of 10 gpm.

This provides a potential flow in the influent pipelines much higher than the assumed 500 gpm maximum WTP total throughput assumed in the WTP design (see Appendix I of the 60% Basis of Design Report [MWH, 2013b]), however, the higher flows are only expected to occur for only short periods of time. In all cases, there will be various ponds, at various times during the RA, upstream of the WTP that provide equalization of the mine affected water flows prior to treatment. Over the long term, flows into these water sources are expected to decrease and the Western Pond will not be decommissioned until the WTP is capable of handling observed flows.

Influent pipe diameters range from a nominal 2-inch to 6-inch High Density Polyethylene (HDPE) pipe. The pipe was sized to minimize the pressure in the pipelines and to limit the number of different pipe diameters used in the system. Pipe diameters were not increased to provide extra capacity for precipitate buildup that might occur over time. However, discussion with the current plant operators indicate no chemical precipitation or scaling has been observed in the piping for the existing WTP and it is expected that the composition of the water during the project will be similar to the current WTP.

A 5-foot minimum depth to the pipe invert was used to meet the required four feet of cover to avoid freezing conditions in all pipelines operating year-round (WSWRG, 2006). This criterion was determined using several available technical sources of potential soil frost depths, plus practical experience by the current WTP operators at the Midnite Mine that indicates a minimum cover of four feet will be necessary to avoid freezing conditions.

Influent Results - All influent lines are assumed to be pressurized and will require dual-walled HDPE pipe to prevent leaks from leaving the unremediated areas of the Site. All high points in the pipelines will require the installation of air/vacuum relief valves so that air does not collect in the top of the pipe and so that siphons cannot occur. The proposed alignments maintain positive or negative grades as much as possible to prevent the need for additional appurtenances and valves. Because the lines are pressurized, the actual slopes of the pipes are unimportant and maintain a depth of 5-ft everywhere. However, grades were maintained to allow water captured in the annular space of the dual-walled pipe to be drained to an inspection point. Diameters were chosen to reduce the required pressure to deliver water from the pits to the equalization ponds and ultimately the WTP.

Influent Conclusions – The selected diameters (i.e., 2-inch through 6-inch) and pipeline alignments at the end of construction (minimize the pressure head required at the pumps and will reduce the number of flanges and fittings where leaks could occur. Leaks will be captured in a dual-walled pipe and delivered to one of the various ponds for treatment. Pipe sizing, locations, and details are shown in Section 10 of the drawings.

J6.1.2 Influent Leak Detection and Flow Monitoring

The primary method of preventing releases from the influent piping will be through the use of dual-walled pipe. Any possible leakage from influent piping will be reduced by:

- Minimization of pressure in the influent lines.
- Through the use of fuse-welded HDPE piping. When using fuse-welded piping there will be fewer joints where leaks can develop.

In addition, influent pipelines will be inspected regularly. Manholes will be placed at a maximum of every 2,500 feet along the permanent influent pipeline alignments. Visual inspections of flows will be performed regularly through inspections at each influent pipeline manhole. These manholes will allow workers to visually inspect the flows out of the inner pipe, which conveys the water, and check the annular space between the inner and outer pipes for possible leaks (from either the inner or outer pipe surfaces). Any significant flow in the annular space will indicate a leak in the upstream section of pipe that will be investigated. These monitoring methods and procedures are discussed in the Remedial Action Operation, Maintenance and Monitoring Plan prepared for water management activities at the Site (Appendix P).

During the RA, the temporary influent pipelines are not designed with manholes as discussed above for the permanent influent pipeline. This is because these pipelines will be regularly moved and it is not practical to install manholes on temporary lines. However, the temporary pipelines will be dual-walled to prevent leaks. During construction, workers regularly will inspect the annular space and flows at major storage locations (e.g., where the water enters the South Pond) to evaluate whether or not a leak may be occurring. In addition, when temporarily pipelines are uncovered and moved during construction, the fuse-welded joints along the pipeline length will be visually inspected for external signs of leaks or cracks in the outer wall of the pipe before it is anchored into its new location. If leaks or cracks are found, welds and/or pipeline sections will be replaced. Construction workers will also be required to travel the temporary alignments and check for external signs of a leak, such as saturated soil or ground settlement. If a leak is suspected, sections of pipe will be replaced until the leak is eliminated.

It should be noted that visual inspections must be performed while the pumps are running. When the system is not running, it will be impossible to verify leaks in the annular space of the dual walled pipe.

J6.2 EFFLUENT PIPELINE – (NOT UPDATED)

The effluent pipeline was designed using inputs consisting of topographic data and geotechnical investigations which are used to perform hydraulic modeling of the pipeline in order to design the gravity flow lines. A geotechnical investigation of the pipeline alignment was performed and showed that the selected alignment would be adequate for installing a pipeline. Modeling was performed using topographic light detection and ranging (LiDAR) data that was collected in 2010 (Tetra Tech, 2010). Discussions of the effluent pipeline design considerations used for the effluent alignment are presented below.

J6.2.1 Topographic Investigations – (Not Updated)

During the summer of 2010, a LiDAR survey of the Site was performed along the entire length of Blue Creek from the Site down to the Lake Roosevelt. These elevation data were used to generate contours which were inputs to the hydraulic design of the pipeline.

J6.2.2 Geotechnical Investigations and Design – (Not Updated)

As part of the geotechnical studies at the site, a potholing investigation was performed to locate potential geologic obstacles along the pipeline alignment in 2013. The results of this

investigation are summarized in a report entitled *Summary of 2013 Blue Creek Geotechnical Investigation – November 2013, Rev 0* (MWH, 2013a) and included as part of Attachment J-2.

The following summarizes the results of the geotechnical investigation:

- For engineering and construction purposes, the deposits of alluvium and colluvium can be considered to have similar properties. The colluvium has slightly higher fines content than the alluvium. The colluvium was difficult to excavate, but is suitable for pipeline support. The alluvium was easy to excavate and would be suitable for reuse as construction material after processing.
- Weathered bedrock was encountered at shallow depths ranging from 4 to 4.5 feet bgs at locations near the north end of the pipeline alignment. The bedrock is typically weathered and friable and was rippable to a depth of 6-inches with conventional excavation equipment.
- Boulders were encountered along the pipeline alignment. These may affect excavation, depending on pipeline depths and boulder locations and depths.

The following are recommendations for excavation and construction of the pipeline based on the results of this investigation:

- The undisturbed native soils are suitable for support of the proposed pipeline with little settlement if construction disturbance is minimized. It will be important to provide adequate compaction of native or backfill materials in the pipe zone particularly along the sides and below the pipe haunches to reduce deflections of the pipe with loading from the soil placed above the pipe.
- Some processing of excavated soil (depending on location) will be required to remove large aggregate (>3-inch) that could damage piping material due to the development of large point loads during backfilling.
- Boulders within the alluvium or shallow bedrock that cannot be excavated will need to be removed with a hydraulic hammer attached to the excavator arm if the boulder is large enough to span the planned width of the trench.
- Field observation and evaluation of subsurface conditions by a field engineer or geologist may be required during pipeline excavation to evaluate when weathered

bedrock has been reached and if the anticipated excavation depths match the conditions encountered in the field.

J6.2.3 Geologic Hazard Investigation – (Not Updated)

A geologic hazard investigation of the pipeline route along Blue Creek was conducted during the summer of 2012 to better understand the hazards along the pipeline route that could impede its construction and/or operation. Attachment J-3 includes *Geohazard Evaluation Proposed Water Treatment Discharge Pipeline Alignment* (Plumlee, 2012).

Based on information presented in this report and additional visual inspections of the pipeline route, the effluent pipeline alignment has been modified in the 60 percent design to avoid these areas entirely and it is not anticipated that any additional investigation will be necessary.

J6.2.4 Hydraulic Design and Modeling – (Not Updated)

To complete the hydraulic design, modelling was conducted using the SWMM 5.0 software (EPA, 2011a). This model is used to calculate the depths, pressures, flows, velocities, and necessary pipe sizes throughout the effluent pipeline system. An in-depth discussion of the hydraulic model and alternative alignments is included in the Influent and Effluent Pipeline Hydraulic Calculations in Attachment J-1.

Assumptions – The effluent pipeline was designed to carry a maximum flow rate of 500 gpm flow, based on the WTP design (see Appendix I of the 60% Basis of Design Report [MWH, 2013b]). This flow is anticipated to decrease over time and could eventually be as low as 50 gpm. Both flows were modeled.

Pipe diameters use a nominal 6-inch HDPE pipe through the upper reaches of the pipeline and then transition to an 8-inch diameter HDPE pipe down to Lake Roosevelt. The pipe was sized to maintain gravity flow as much as possible and to limit the number of different pipe diameters used in the system. Gravity flows are maintained where possible to prevent leaks as might occur if the pipeline were pressurized. In general, the pipeline only will be partially filled at 500 gpm and at 50 gpm the flows will be at the very bottom of the pipe.

Pipe diameters were not increased to provide extra capacity for precipitate buildup that might occur over time. Discussion with the current plant operators indicate no chemical precipitation or scaling has been observed in the effluent piping from the existing WTP and it is expected that the composition of the effluent water from the new WTP will be similar to the current WTP.

A 5-foot minimum depth to the pipe invert was used to meet the required four feet of cover to avoid freezing conditions in the pipelines (WSWRG, 2006). This criterion was determined using several available technical sources of potential soil frost depths, plus practical experience by the current WTP operators at the Midnite Mine that indicate a minimum cover of four feet will be necessary to avoid freezing conditions.

Manholes will be spaced at a maximum of 2,500 feet apart and buried cleanouts will be spaced at a maximum of 400 feet. The manhole and cleanout positioning will be implemented at appropriate intervals to provide necessary access to the pipeline for monitoring and maintenance. Manhole locations are shown in Section 10 of the drawings and cleanout locations will be field located. The manhole spacing also allows sediments, generated during pipeline construction and maintenance, to be trapped in the manholes and removed during pipe cleaning.

Results - The selected pipeline alignment travels downhill for the most part. In a few sections where adverse slopes occur in the existing terrain, pipeline depths are increased up to a maximum of 14 feet in order to maintain downward pipe slopes. By adjusting the depth of the pipe and the pipe diameters, pressurized sections are avoided in the pipeline. Pressurized segments were avoided to prevent the need for additional leak detection in the effluent pipeline as discussed below in Section J6.2.5. Pipe sizing and depths are included in Section 10 of the drawings.

Conclusions - The selected pipe diameters, based on the calculations, allow the pipeline to maintain gravity flows in the calculations and are sufficient to handle flows throughout the life of the pipeline. The pipe sizing and depth of emplacement also helps to prevent pressurization in the pipeline. The upper 3.3 miles of pipe will be 6-in nominal diameter pipe and the remaining pipe will be 8-in nominal diameter pipe. These diameters also help maintain pipe depths at 5 feet for over 80 percent of the alignment and reached a maximum depth of 14 feet for only approximately 500 feet. As discussed above, manholes will be spaced at a maximum of 2,500 feet apart, for a total of 12 manholes and buried, unidirectional cleanouts will be spaced as needed at a maximum of 400 feet.

By avoiding adverse slopes in the pipeline, which can pressurize these sections, by maintaining a downward grade and increasing pipe diameters, the effluent pipeline can maintain gravity flow throughout the alignment (i.e., the pipeline is only partially filled and acts like an open channel).

This greatly reduces the risk of a leak occurring and combined with the fact that the effluent water will be treated, prevents the need for leak detection.

In addition, the manholes and cleanouts will allow regular surveys to be performed on the pipeline to check for possible leaks or the issues that might lead to leaks. The methods for checking for leaks are discussed below in J6.2.5.

J6.2.5 Leak Detection and Flow Monitoring – (Not Updated)

Following water treatment in the new WTP, the effluent leaves meeting most of the Tribal standards and even if a leak does occur, it does not pose a significant threat to the environment. However the effluent pipeline is designed and will be operated to minimize the potential for leaks as described below.

As pressure rises within a pipe, the volume of water that can escape through a leak also increases. Pipeline leaks can be minimized by designing a gravity flow system where the pipe is not pressurized. To reduce the possible leakage and eliminate the need for secondary containment (such as dual–walled piping), the effluent pipeline is designed and will be constructed of sufficiently sized single-walled HDPE pipe which allows water in the pipeline to flow freely by gravity (i.e., the pipe is not full or pressurized). Leak risks are further reduced through the use of fuse-welded HDPE piping and since there will be fewer joints using this material, there are fewer locations where leaks might develop.

During the operation of the effluent pipeline, there will be regular inspections the pipeline manholes and the entire alignment. Manholes will be placed at a maximum of every 2,500 feet along the pipeline where visual inspections of flows can and will be performed. While travelling along the alignment, workers also will check for indications of leaks such as saturation or settling of the ground surface in the roadway where the pipeline is buried.

The combination of visual inspections of flow in the manholes and for settlement in the ground surface along the effluent pipeline corridor (as necessary), along with gravity flow in this pipeline system, should eliminate the need for additional monitoring methods. These monitoring methods and procedures are discussed in the Remedial Action Operation, Maintenance and Monitoring Plan prepared for water management activities at the Site (Appendix P).

J7.0 DIFFUSER DESIGN INFORMATION – (NOT UPDATED)

The effluent pipeline will discharge to the lowest part of the Spokane River Arm of Lake Roosevelt. This will be done via a single-port diffuser at the end of the effluent pipeline and a detailed description of its design is included in Attachment J-1 of this appendix. The 6-inch port will discharge approximately 4 feet above the lake bottom and will discharge at an angle of 45 degrees above horizontal to prevent any scouring that might occur to the lake bed. A "duckbill" valve will be installed on the end of the diffuser to prevent sediments from entering the pipe. Flow rates are also expected to decrease from a maximum of 500 gpm down to less than 50 gpm over time as the various pits are backfilled and covered. The location and details of the diffuser are shown in Figure J-3 and in Section 10 of the drawings.

J8.0 ADDITIONAL CONSTRUCTION CONSIDERATIONS

During construction of the various pipelines, soil may be encountered which requires remediation. Such soils will be removed and placed within the pits. Particularly near Lake Roosevelt, between the low and high water levels, it will be assumed that all excavated material is contaminated and will be placed within the backfilled pits. All backfill for these sections of pipe will require clean, imported fill.

J9.0 GREEN AND SUSTAINABLE REMEDIATION CONSIDERATIONS

Below are GSR considerations for Appendix J – Influent and Effluent Pipelines. GSR considerations were evaluated for: 1) Construction Materials (characteristics and manufacturing considerations), 2) Construction Methods, and 3) Low Impact Development/Sustainability measures undertaken during construction.

J9.1 CONSTRUCTION MATERIAL CONSIDERATIONS

Flexible HDPE piping will be utilized as the construction material for the influent and effluent pipelines. The use of HDPE as the pipeline material was in part selected for its GSR attributes. HDPE is less costly to transport and will require fewer truckloads over other pipe materials (e.g., metallic) because it weighs significantly less and smaller diameter pipes can be nested within larger pipes. HDPE fused joints are less likely to leak than any other connection. HDPE also is flexible so that during the RA temporary HDPE pipelines will be easy to re-route. HDPE yields a longer life expectancy because it does not rust or scour and is highly resistant to mineral tuberculation. HDPE also has a high chemical resistance yielding a superior piping material for

this application with respect to environmental reliability as well as longevity of the material of construction.

J9.2 CONSTRUCTION METHODS/MINIMIZE DISTURBANCE

The length of each temporary influent pipeline alignment will be optimized and repeated movement of the lines will be minimized to the extent possible.

The final alignments of influent and effluent pipelines are positioned to:

1) Provide the optimum routes to minimize material procurement, handling, hauling, and installation (i.e. in most cases the shortest distance),
2) Ensure, to the extent possible, gravity flow of water, which significantly improves its sustainability and reliability, and
3) Allow ease of access to the pipeline segments over the long term so that maintenance activities cause minimal disturbance and are easy to accomplish.

The construction equipment used for all pipeline installations, as well as the trench width, as applicable, will be minimized (appropriately sized) to reduce fuel consumption and greenhouse gases emissions while minimizing site disturbance during installation activities.

The effluent pipeline is designed to move water by gravity flow. Neither the installation of additional electrical lines nor the continual use of electricity is required for this flow of water to reach Lake Roosevelt. The gravity flow design also enhances reliability of the system because it is not dependent on a continuous electrical supply for operation or the proper operation of pumping equipment. If the gravity flow pipe for the treatment plant effluent develops a leak, the amount of discharged water will be minimized which enhances its long-term environmental reliability.

J9.3 LOW IMPACT DEVELOPMENT/SUSTAINABILITY

The influent pipeline corridor is wholly within the site boundary which will be disturbed during the RA; therefore additional land disturbance is minimal for the construction of the permanent influent pipeline routes.

The effluent pipeline is aligned within or along planned or existing traffic corridors. This greatly reduces the environmental impact of the installation and maintenance of the pipeline. Use of these traffic corridors minimizes habitat destruction and disruption and allows for easy access

during routine or emergency maintenance. Again, the effluent pipeline is designed to move water by gravity flow, which provides a highly sustainable and reliable pipeline.

Grading will be conducted to divert clean stormwater from the mining impacted areas and collect potentially impacted stormwater for treatment. The Storm Water Management Plan (SWMP; included in Appendix O) identifies Best Management Practices (BMPs) and specific sediment control measures that will be employed before, during, and after construction for both sediment and storm water control. The Surface Water and Sediment Controls will be used to shed clean water away from contaminated areas thereby reducing the volume of mine-impacted water requiring treatment and will contain contaminated water within the contaminated areas preventing recontamination of remediated areas.

Disturbed areas will be graded to conform to original drainage patterns and to restore the natural pre-existing landscape to the extent practicable. Permanent pipelines will be installed in segments and, when a segment is completed including backfill and final grading, it will immediately be revegetated, as described in the Revegetation Plan in Attachment D-12 of Appendix D. Revegetation efforts with an approved native seed mix will be conducted to restore habitat, improve infiltration, and reduce soil erosion.

J9.0 REFERENCES

Miller Geotechnical Consultants (MGC), 2011 Midnite Mine Design Investigation Report: Groundwater Investigations, Revision 2. Prepared for U.S. EPA on behalf of Dawn Mining Company and Newmont USA Limited. June 9.

MWH Americas, Inc. (MWH), 2013a. Summary of 2013 Blue Creek Geotechnical Investigation Report. November 13.

MWH Americas, Inc. (MWH), 2013b. Midnite Mine Superfund Site, 60 Percent Design Basis of Design Report. December 16.

Plumlee, P., 2012. “Geohazard Evaluation Proposed Water Treatment Discharge Pipeline Alignment”. November.

Tetra Tech, Inc. (Tetra Tech), 2010. Survey Design Investigation Report. Prepared for U.S. EPA on behalf of Dawn Mining Company and Newmont USA Limited. August 6.

U.S. Environmental Protection Agency (EPA), 2011a. Program SWMM 5.0, March.

U.S. Environmental Protection Agency (EPA), 2011b. Midnite Mine Consent Decree, Civil Action No. CV-05-020-JLQ, August.

Washington State Water Reuse Group (WSWRG), 2006. Pipeline Separation Design & Installation Reference Guide. July.

Attachment J-1

Blue Creek Effluent Pipeline Hydraulic Calculations

ATTACHMENT J-1

INFLUENT AND EFFLUENT PIPELINE HYDRAULIC CALCULATIONS

Revisioning					
Rev.	**Date**	**Description**	**By**	**Checked**	**Date**
0	*12/19/12*	*30% Design Submittal Effluent Pipeline Hydraulic Calculations*	*J. Dixon*	*D. Miklas*	*12/19/12*
1	*12/16/13*	*60% Design Submittal Pipeline Hydraulic Calculations*	*J. Dixon*	*W. An*	*12/11/13*
2	*07/31/14*	*90% Design Submittal Effluent Pipeline Hydraulic Calculations*	*J. Dixon*	*S. Romney*	*07/31/14*
3	*06/15/15*	*100% Design Submittal Influent and Effluent Pipeline Hydraulic Calculations*	*J. Dixon*	*D. Miklas*	*06/15/15*

Location and Format

Electronic copies of these calculations are located in the project files system at:

\\Usslc1s01\IFO\Industrial Projects\MIDNITE MINE\EFFLUENT PIPELINE

The calculations herein were generated using the following software:

AutoCAD Civil 3D 2011
Microsoft Office Excel 2010
SWMM 5.0

Supplements

Supplement J-1.1 – SWMM Model Status Report (Influent and Effluent)
Supplement J-1.2 – SWMM Link and Node IDs
Supplement J-1.3 – SWMM Hydraulic Profiles

1.0 INTRODUCTION

This attachment includes design details for the pipelines necessary to convey impacted waters to the Water Treatment Plant (Influent Pipelines) and the pipeline necessary to convey treated water from the Water Treatment Plant (WTP) to the discharge point proposed in Lake Roosevelt (Effluent Pipeline).

Currently additional water quality data is being collected in support of the NPDES permit application process. On May 20, 2014, a letter was sent to the EPA requesting a delay in the design of the WTP since the design of the WTP cannot be finalized until the discharge limits for the reissued NPDES permit are established. EPA approved that request. Delay of the design of the effluent pipeline from the new WTP to Lake Roosevelt was included in the request to EPA. The Effluent Pipeline design has not been advanced beyond the 60% design level.

It must be noted that, although effluent design has not been advanced, the sections of this attachment regarding the effluent design have not been removed. Headings have been added to the effluent portions of the design documents with the text “Not Updated” so the reviewer understands the situation and status of each section. Also, in Volume II: Part 2 of 2 - Design Drawings, Section 10 – Influent and Effluent Pipeline Designs, the effluent pipe drawings in the 100% submittal have watermarks indicating that the 60% effluent design has not been updated and a note has been added to the general notes section of Sheet 10-1 that “The effluent pipeline drawings and design have not been updated in this design submittal. The effluent pipeline drawings will be revised concurrently with the new WTP design once the NPDES permit is reissued and the discharge limits are established.”

2.0 BACKGROUND

The Midnite Mine Superfund Site (the Site) has mine waste rock containing uranium on the surface that will be backfilled into several existing open pits at the Site (Pits 3 and 4). These mine wastes will be moved back into the existing pits, then capped to prevent precipitation from contacting the waste rock. Once capped, groundwater entering the pits must be treated to remove metals before it is discharged off Site. The water will be collected and pumped for treatment via a series of influent pipes. Leak detection in the influent pipeline is described in Appendix J, Section J6.1.2.

Remediation of the Midnite Mine requires that contaminated water be treated before it is discharged into the Spokane River Arm of Lake Roosevelt. This water will be treated at a new WTP located at the former mine site and then must travel in a pipeline approximately 5.5 miles to Lake Roosevelt. The pipeline is designed to allow gravity flow to the Spokane River Channel at the bottom of the lake.

3.0 SYSTEM DESCRIPTION

In order to convey water around the project site for treatment at the WTP, several pipelines will be required. The piping will primarily consist of three major sections: the influent piping (before treatment), the effluent piping (after treatment), and the outfall diffuser. The diffuser utilizes a single port and requires very little in the way of hydraulic modeling. This attachment discusses each of these sections individually as they are somewhat independent of each other. As noted

above, the effluent pipeline and the diffuser design has been put on hold at the 60% design level until the NPDES permitting process is finalized.

3.1 INFLUENT PIPELINES

During remediation, influent piping will be temporary and frequently relocated to avoid areas where earthwork is being performed. As such, locations of influent piping during different phases are shown in this attachment, but only the final influent piping routes are modeled. Three primary locations will require dewatering: Pit 4, Pit 3, and the Backfilled Pit Areas. Each of these areas produce different flows during different periods and design flows for each are discussed below. All influent pipelines are shown in Section 10 of the drawings.

The influent pipeline drawings depict dual-walled pipelines for temporary piping during construction. However, the Field Engineer may permit single wall piping when crossing contaminated materials and in locations where potential leaks would not be detrimental to any remediated areas. All influent pipelines crossing remediated areas will use dual-wall pipe.

3.1.1 Initial Layout/Start of Phase 1

Initially, the existing pipelines will be used to convey water from Pit 4 and Pit 3 to the existing WTP. When construction begins, the mine–effected water in Pit 4 will be pumped directly to Pit 3 as shown in Figure 1 to dewater the pit. Also water will be pumped directly from the Backfilled Pit Areas (BPA) to Pit 3 as it is currently and from the existing seep collection system to the Pollution Control Pond (PCP) and into Pit 3. The water then will be pumped from Pit 3 to the existing WTP. The existing WTP will be operated until the new WTP is permitted and constructed near the end of Phase I of the RA. The layouts of the proposed pipeline configurations at the beginning of Phase 1 are shown in Figure 1, below.

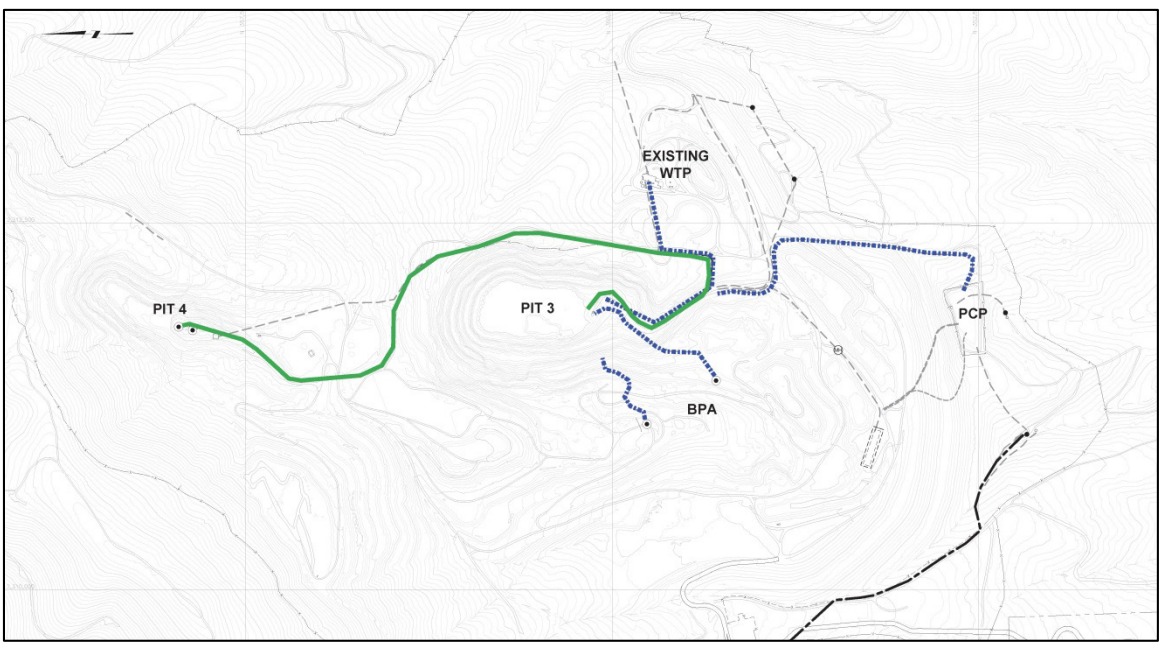

Figure 1. Start of Phase 1 Influent Pipelines

Pit 4 to Pit 3 (shown in green)
Currently water is pumped from Pit 4 directly to the existing WTP. However, as backfilling begins in the pit, water will be redirected to Pit 3 in order to avoid those areas affected by construction. Water will be pumped from the bottom of Pit 4, along the Pit 4 access road and then discharge into Pit 3 on the north side. Pit 4 initially is expected to produce up to 196-gpm, based on information in Appendix D.

As Pit 4 is backfilled, the head requirements for the pump will vary. The pump initially will be oversized to allow for this change in head. As the backfill rises and the dewatering well is extended, head on the pump should approach the design head.

Because the existing WTP is only run seasonally (during warmer months), the influent piping will not require protection against freezing and will not be buried during Phase 1.

Pit 3 to Existing Plant (shown in blue)
Influent piping between Pit 3 and the existing plant is already in place. The existing pump and pipeline are currently capable of moving 500 gpm, exceeding the capacity of the existing WTP .

Backfilled Pit Areas to Pit 3 (shown in blue)
Influent piping from the BPA is already in place and is currently being used to pump water from the BPA to Pit 3. These pipelines produce about 40 gpm and will not require modification for the first phase of construction.

3.1.2 Start of Phase 2

At the beginning of Phase 2, Pit 4 will be filled and capped and it is assumed that the new WTP will be completed. The new WTP will replace the existing plant and allow for water to be treated year-round. This will require that all influent piping be protected against freezing, provided by a minimum of 48-inches of cover. The South Pond also will be in place for storage of water prior to the treatment at the new WTP. The influent pipe alignments at the beginning of Phase 2 are shown in Figure 2 below.

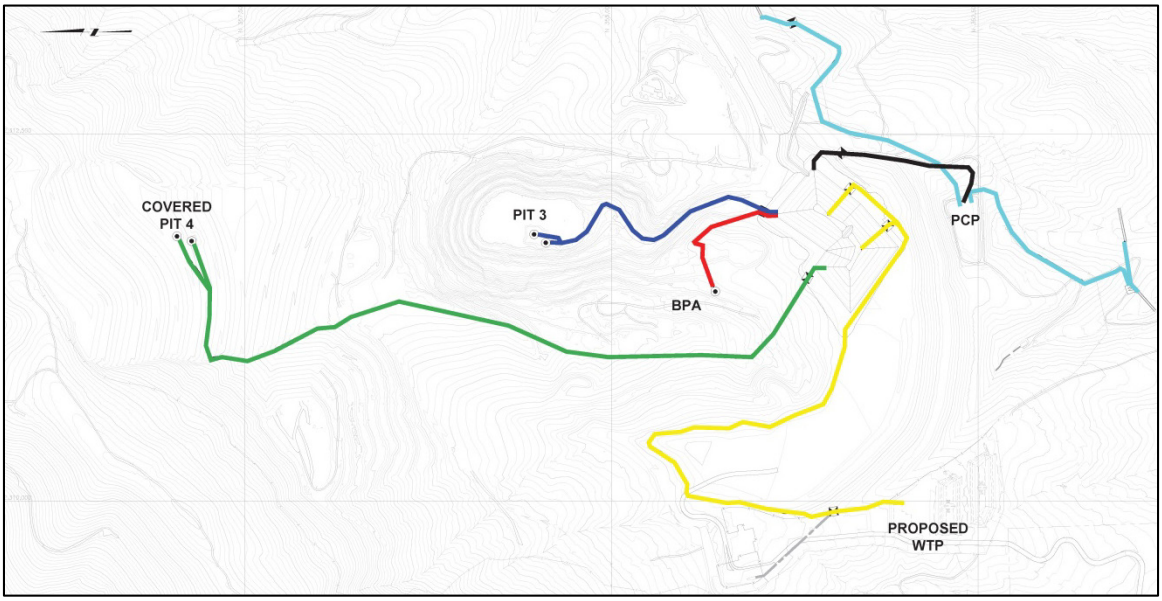

Figure 2. Start of Phase 2 Influent Pipelines

Pit 4 to South Pond (shown in green)
When Phase 2 begins, the piping from Pit 4 to Pit 3 will be abandoned and a new pipe will be operating that runs from Pit 4, along the west side of Pit 3, and discharges into the northwest corner of the new, temporary South Pond. If WTP makeup water needs require it, and the water quality from Pit 4 is acceptable, it is also possible that a portion of the water from Pit 4 will be piped directly to the WTP. Water will be stored in the South Pond until it is pumped for treatment at the new WTP.

Pit 3 to South Pond (shown in blue)
Once the new WTP is completed at the end of Phase 1, the existing WTP will be abandoned and water will be sent from Pit 3 down to the South Pond. Similar to the methods used in Pit 4, as Pit 3 is backfilled, the dewatering well(s) will have to be raised over time and the temporary pipeline route changed.

Backfilled Pit Areas to South Pond (shown in red)
After the first phase of construction, the pipelines from the BPA will have to be rerouted to transfer water to the South Pond instead of Pit 3. In conjunction with these changes, a wet well will be installed to collect and monitor flow from each of the wells. A single pipeline then will be installed from the wet well, to allow gravity flow down to the South Pond.

Extraction Trench Pipelines (shown in cyan)
At the end of Phase 1, new extraction trenches will be installed in the Western, Central, and Eastern Drainages. Water will flow from the Eastern Drainage via gravity down to the PCP. Water will be pumped from the Western and Central drainages into a wet well and then pumped again from the wet well up to the PCP.

South Pond to New WTP (shown in yellow)
The South Pond is located at a higher elevation than the new WTP location and will be capable of delivering water to the new WTP via gravity flow. A single pipeline will run west along the South Waste Rock Bench before changing direction to the south for delivery of the water to the new WTP.

3.1.3 Start of Phase 3

At the end of Phase 2, Pit 3 backfilling will continue but the West Pond will replace the South Pond. The South Pond which is constructed entirely within a waste rock dump will be decommissioned and removed during Phase 3 Treatment also will continue to operate year-round necessitating a minimum of 48-inches of cover over the influent piping. The influent pipeline alignments at the beginning of Phase 3 are shown in Figure 3 below.

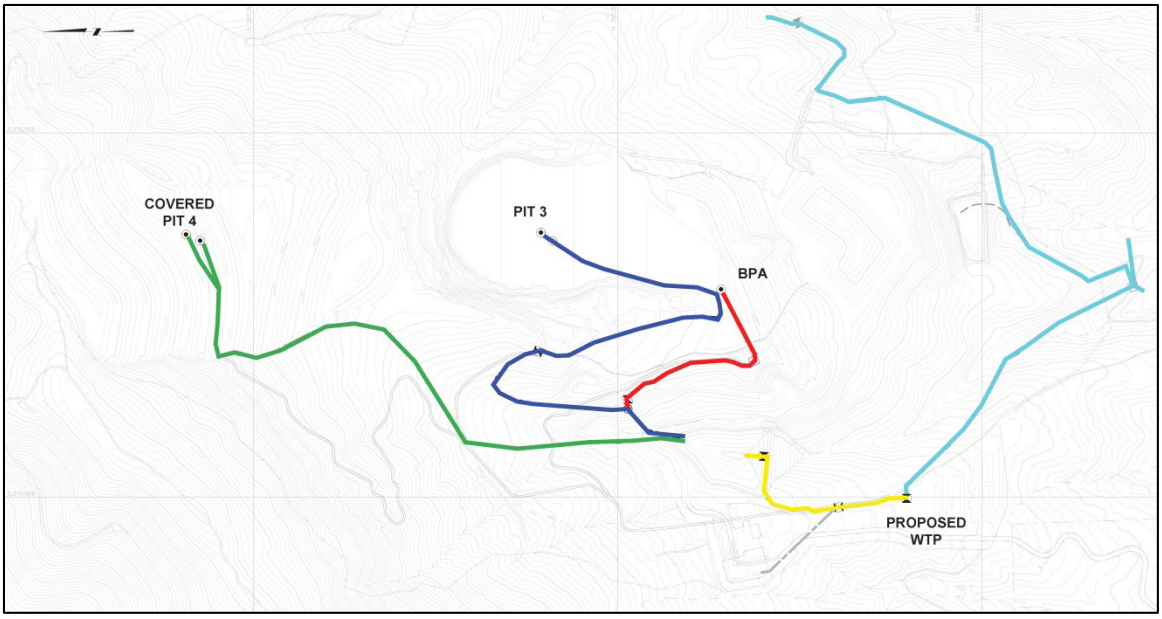

Figure 3. Start of Phase 3 Influent Pipelines

Pit 4 to West Pond (shown in green)
Prior to Phase 3 construction, the Pit 4 pipeline running around the western edge of Pit 3 will be relocated further to the west to flow into the West Pond. If WTP makeup water needs require it, and the water quality from Pit 4 is acceptable, it is also possible that a portion of the water from Pit 4 will be piped directly to the WTP.

Pit 3 to West Pond (shown in blue)
Near the end of Phase 2, the Pit 3 water will be redirected to the West Pond. The pipeline running to the South Pond then will be removed.

Backfilled Pit Areas to West Pond (shown in red)
As Phase 2 is completed, the BPA pipeline will be relocated so that water flows to the West Pond instead of the South Pond. This line will run from the wet well, as in Phase 2 construction. The water will flow down to the pond via gravity.

West Pond to New Plant (shown in yellow)
Similar to the South Pond, the West Pond will be located at a higher elevation than the new WTP. At the end of Phase 2, a pipeline will be installed from the West Pond to the WTP Equalization Pond for treatment.

Extraction Trench Pipelines (shown in cyan)
At the end of Phase 2, the extraction trench pipelines will no longer discharge into the PCP and will be relocated to connect to the main WTP influent pipelines. The Eastern Drainage will flow by gravity and the Central and Western Drainages will be pumped into a single wet well. Rather than pump the water to the West Pond, water from this wet well will be pumped to the main influent pipeline from the West Pond at the WTP bench.

3.1.4 End of Phase 3 (End of Construction Period)

At the end of Phase 3, Pit 3 backfilling will be completed but the West Pond will continue to operate. The Western Pond likely will remain in place as long as necessary post remediation to contain possible seasonal fluctuations in surface water and groundwater flows and until the hydrogeology and character of all water sources can be verified. It is estimated that the Western Pond could remain in place for 10 to 15 years following the completion of the construction period. Treatment also will continue to operate year-round requiring piping system freeze protection. The influent pipeline alignments at the end of Phase 3 are shown in Figure 4 below.

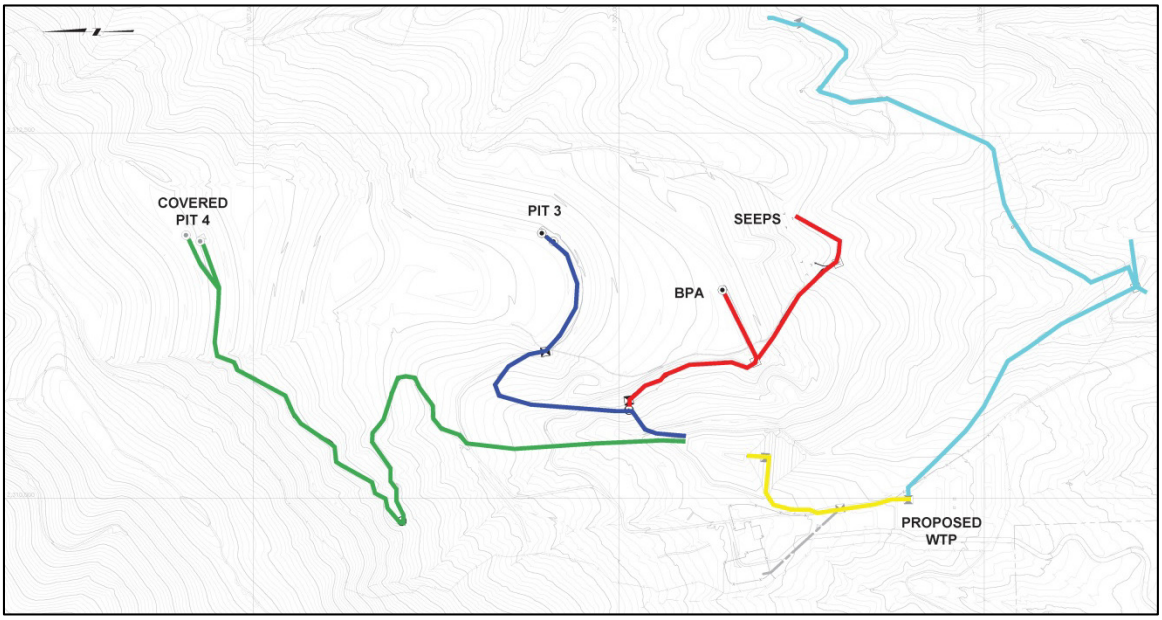

Figure 4. End of Phase 3 Influent Pipelines

Pit 4 to West Pond (shown in green)
After Phase 3, operation of the Pit 4 to West Pond pipeline will have been modified to follow the access road to the Pit 4 cover. If WTP makeup water needs require it, and the water quality from Pit 4 is acceptable, it is also possible that a portion of the water from Pit 4 will be piped directly to the WTP.

Pit 3 to West Pond (shown in blue)
Near the end of Phase 3, Pit 3 will be capped and the Pit 3 influent pipelines will have to be installed within the access roads on that cover. Once outside the cap, the pipeline will maintain the same alignment as described for the start of the phase.

Backfilled Pit Areas to West Pond (shown in red)
Near the end of Phase 3, Pit 3 will be capped and the BPA influent pipeline will have to be installed within the access roads on that cover. Once outside the cap, the pipeline will maintain the same alignment as described for the start of the phase.

A seepage collection system will also be installed within the cover of Pit 3. This pipeline will be connected to the BPA influent pipeline at a wet well.

West Pond to New Plant (shown in yellow)
After Phase 3, operation of the West Pond pipeline will continue as described at the start of the phase.

Extraction Trench Pipelines (shown in cyan)
After Phase 3, operation of the extraction trench pipelines will continue as described at the start of the phase.

3.1.5 Permanent Influent Pipelines

Once the influent discharges to the Western Pond are stable, the Western Pond will be decommissioned as described in Appendix E. The alluvial groundwater collection trenches will also be removed prior to the end of Remedial Action. The water from all the various pits and wells then will then be routed directly to the equalization pond at the WTP site. After remediation has ended at the Site, all influent pipelines will be dual-walled. The WTP will continue to operate year-round. The final alignments are shown in Figure 5 below.

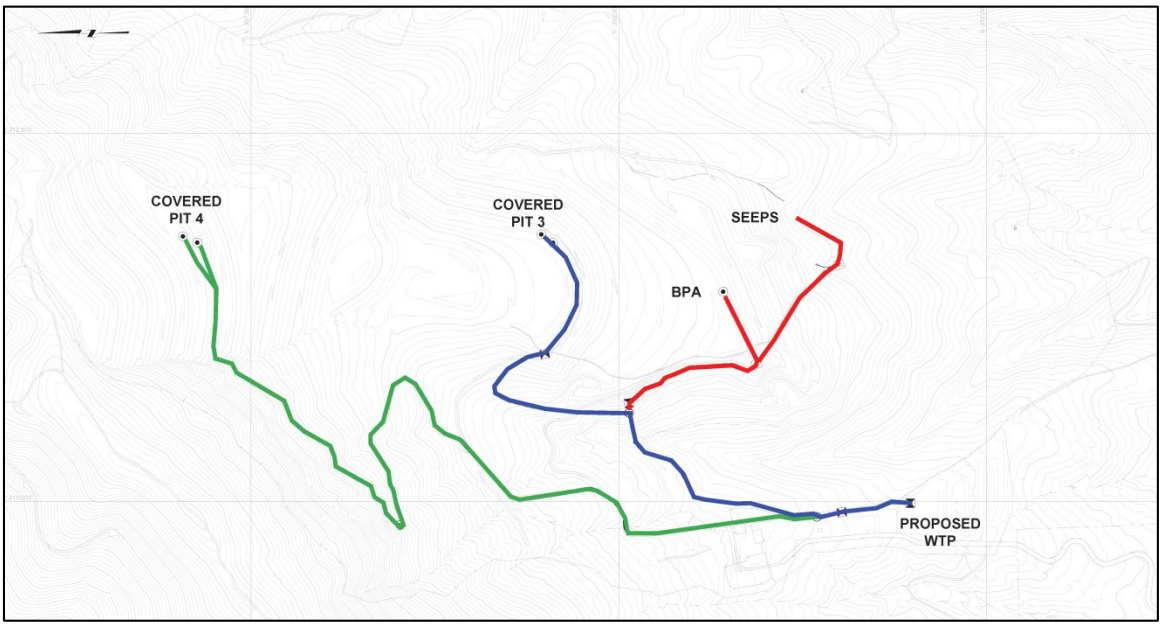

Figure 5. Permanent Influent Pipelines

Pit 4 to New Plant (shown in green)
The pipeline from Pit 4 to the West Pond will be modified at the end of construction to run along permanent access roads directly to the WTP. Water flow will be via gravity.

Pit 3 to Pit 4 Pipeline (shown in blue)
The pipeline from Pit 3 to the West Pond will be modified at the end of construction to connect to the Pit 4 pipeline which runs to the WTP. Water flow will be by gravity.

Backfilled Pit Areas to Pit 3 Pipeline (shown in red)
The pipeline from BPA will remain connected to the Pit 3 pipeline. The wet well from the BPA will also be relocated further west to fall outside the Pit 3 cover. The seepage collection system

will continue to connect to the BPA pipeline at the wet well. Water will flow by gravity from the wet well down to the WTP.

3.2 EFFLUENT PIPELINE – (NON-DESIGN UPDATES ONLY)

Two alternative pipeline alignments between the Site and Lake Roosevelt were reviewed as part of the 30 percent design submittal and one was selected for design (see Figure 6). While both alignments maintain a downward slope through most of the pipe, the selected alternative maintains more consistent grades. This helps to reduce sediment buildup, which could occur in the more shallow slopes. (Sediment might enter the pipe during construction and maintenance.) Although the selected alignment allows for the pipe to be placed within roadways along nearly the entire alignment so accessibility is improved. While both alignments are capable of conveying the water to Lake Roosevelt, the selected alternative does so with a smaller amount of disturbance and fewer hydraulic issues. It will also provide better access for installation and maintenance because it follows existing and future road alignments more so than the alternative.

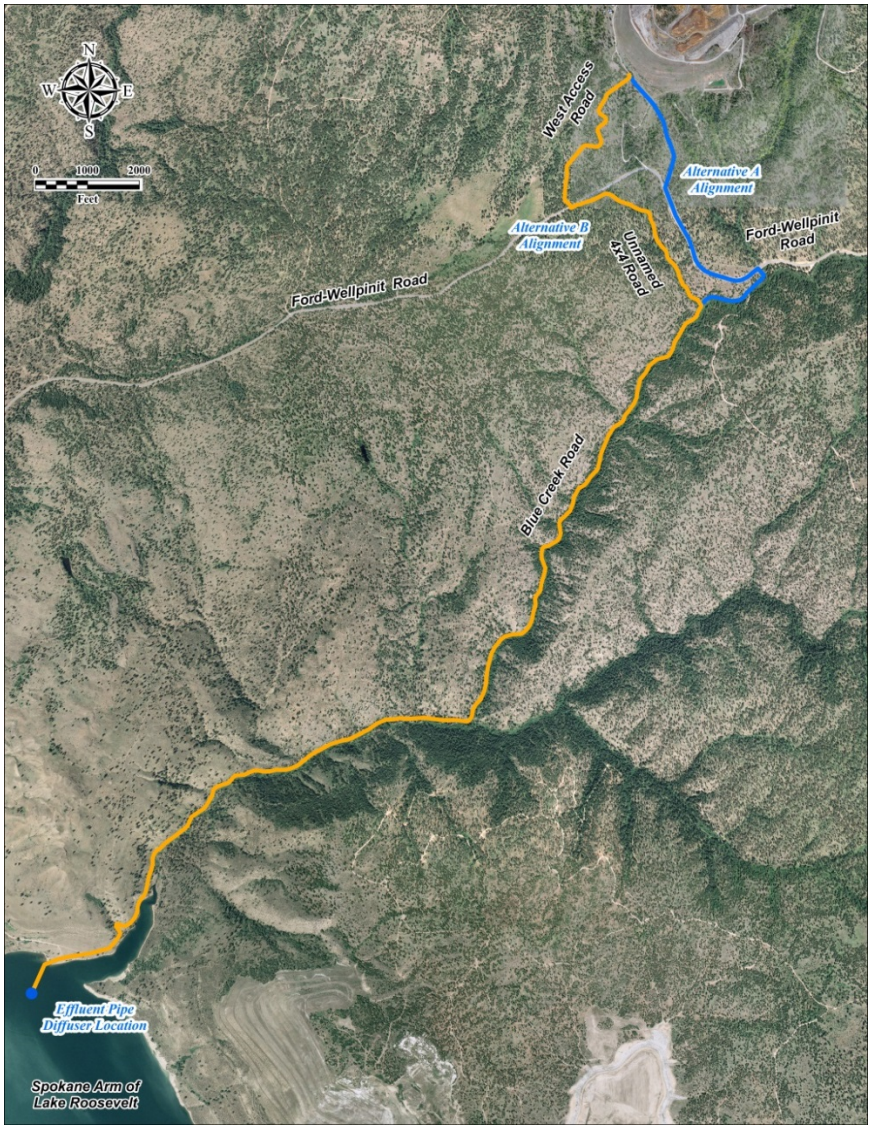

Figure 6. Effluent Pipeline Alternative Alignments (yellow was preferred)

The selected alignment utilizes the existing and future roadways and other easily accessible features and allows for a continuous downward slope in the pipeline. This will:

- Make pipeline construction easier
- Improve accessibility to the pipeline for maintenance
- Reduce the ecological impact of the pipeline to the surrounding area.

In addition, construction will be easier along the Blue Creek Road as rocky geologic features will be mostly avoided.

Figure 7 below shows the selected pipeline alignment. The blue line represents the pipeline from the future CP plant location down to the Spokane River Arm of Lake Roosevelt. At the discharge location, an outfall diffuser will release the treated water into the lake. The maximum flow from the WTP will be 500 gpm and will decrease over time down to 50 gpm or less. The system was modeled using 500 gpm and 50 gpm as the discharge variables.

The selected effluent pipeline route follows the western mine road until passing through the southwest gate. The pipeline then follows the proposed mine access road until reaching the Ford-Wellpinit Road. The pipe immediately passes underneath the road and travels roughly 100 feet eastward while remaining in the south shoulder. Once the pipeline reaches the Western Drainage, it travels down an unnamed 4x4 road until reaching the Blue Creek Road and then follows the road to Lake Roosevelt.

The upper 60 percent or so of the pipeline uses nominal 6-inch diameter pipe while the lower portion uses 8-inch pipe due to shallower slopes which are not capable of discharging water in the smaller diameter pipe as quickly. A total of 13 manholes will be spaced at a maximum of 2,500 feet apart with buried cleanouts spaced as needed (typically at 400 foot intervals). Manholes will act as traps to collect sediments being flushed down the pipe as well as points where effluent discharge can be observed visually. Manhole locations and details are showing in Section 10 of the drawings.

Figure 7. Final Effluent Pipeline Alignment

3.3 DIFFUSER – (NOT UPDATED)

The diffuser design was presented as part of the NPDES permit application, *Effluent Discharge Mixing Evaluation for the Midnite Mine Water Treatment Plant* (MWH, 2013), and consists of a single port, 6-inches in diameter, coming off at a 45 degree angle from an 8-inch diameter trunk line. The port will utilize a "duckbill" valve to prevent clogging from sediments entering the pipe. The effluent diffuser drawing detail is shown in Figure 8 below.

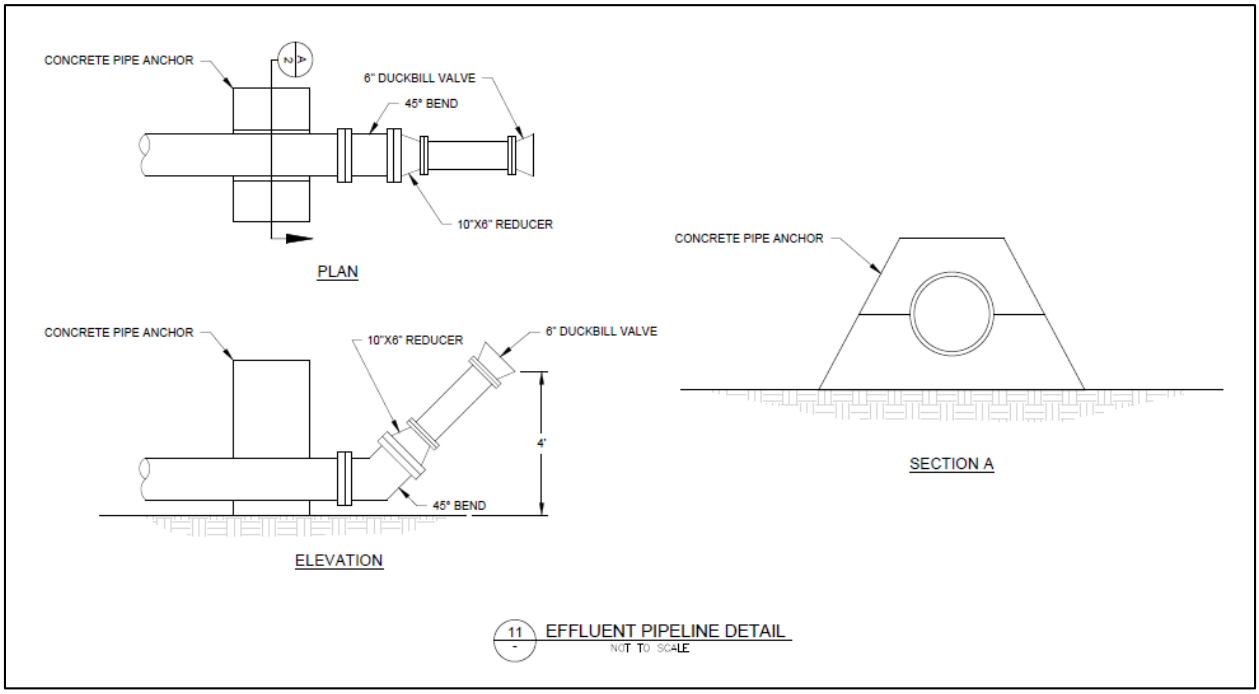

Figure 8. Effluent Diffuser Details

4.0 METHODOLOGY

4.1 PIPELINES

In order to accurately determine water levels in the pipelines and to calculate the pipe sizing, a model was run using the SWMM 5.0 software program (EPA, 2011). This program uses a series of user-input nodes and links to simulate the pipeline and to route flows through the system. These nodes and links require inputs such as lengths, diameters, depths, and coefficients in order to accurately model the system. While the nodes do not necessarily represent manholes or points of inflection, they can be adjusted to simulate these structures. The model provides calculations for heads and depths in the nodes, and flows, velocities, and slopes for the links.

The program utilizes a dynamic wave model to route flows through the pipeline and to the various end outfall points. The dynamic wave method was necessary due to the adverse slopes that occur regularly throughout the various pipelines. In the pressurized sections of pipe, the Darcy-Weisbach equation is used to calculate head losses due to friction through the pipe; whereas the Manning equation is used in non-pressurized sections.

The Manning equation is:

$$Q = \frac{1.486}{n} * \frac{A_{pipe}^{5/3}}{P^{2/3}} * S_o^{1/2}$$

Where:

Q is the flow travelling through the pipe (cubic feet per second [cfs])
n is the Manning's coefficient
A_{pipe} is the cross-sectional area of the pipe (square feet [sf])
P is the wetted perimeter of the pipe (ft)
S_o is the slope of the pipe (ft/ft)

The Darcy-Weisbach pressurized friction head loss equation is:

$$h_f = \frac{fLV^2}{2gd}$$

Where:

h_f is the head loss in the pipe due to friction (ft)
f is the coefficient of friction
V is the velocity in the pipe (fps)
g is the acceleration of gravity (ft/s^2)
d is the inner diameter of the pipe (ft)

Other pressurized head losses were calculated as:

$$h_L = K\frac{Q^2}{2gA^2}$$

Where:

h_L is the head loss (ft)
K is the loss coefficient
Q is the flow in the pipe (cfs)
g is the acceleration of gravity (ft/s^2)
A is the cross-sectional area of the pipe (sf)

4.2 OUTFALL DIFFUSER – (NOT UPDATED)

Because the diffuser uses a single port discharge, it follows the same methodology as the other pipelines outlined above and calculated in the Effluent Pipeline SWMM model.

5.0 ASSUMPTIONS

Pipe diameters on the influent pipelines were calculated in the SWMM model and vary for each pipeline.

Pipe diameters for the effluent pipeline are primarily nominal 6-inch from the inlet to approximately station 172+50 where the pipe then transitions to 8-inch diameter and continues at that diameter down to the discharge point in Spokane River Channel at the bottom of Lake Roosevelt. This sizing was selected to maintain gravity flows in the pipe and help prevent the need for additional containment or leak detection.

The Manning friction coefficient used was 0.012 for all sections of pipe. This number is based on the coefficient for slightly rougher than new plastic pipe (Sanks, 1998). An average head loss was assumed to be approximately one velocity head per thousand feet of pipe to calculate any small losses not accounted for otherwise, such as uneven pipe and wide bends. Entrance losses assumed 0.5 velocity heads and exit losses assumed 1.0 velocity head (Sanks, 1998).

A 5-foot minimum depth to the pipe invert in the model is assumed to avoid freezing. Where adverse slopes occurred in the gravity flow sections of pipe, depths were increased to maintain a steady slope as much as possible, but were not allowed to be more than 14-feet in depth. In the effluent pipeline, pipe depths were also increased in sections where existing ground slopes decreased in order to maintain steeper grades in the pipe and pipe diameters were increased to allow more water to flow through the pipe. By maintaining the steeper slopes and increasing flow capacity, gravity flows are maintained in the effluent pipeline.

Flow rates for each source were assumed as follows:

- During construction, flows from Pit 4 were assumed to be approximately 68 gpm for the overliner waste dewatering system and 128 gpm for the underliner drain system.

- Flows from Pit 3 were assumed to be 228 gpm for the overliner waste dewatering system and 366 gpm for the underliner drain system.

- Combined flows from the BPA extraction wells were assumed to be 40 gpm. The reasoning behind these flows is described in greater detail in Appendix D.

- The Western, Central, and Eastern Drainages are expected to provide 15 gpm each as described in Appendix G for a total of 45 gpm.

- The Pit 3 Seepage Collection System will be minimal and was assumed to provide 5 gpm from each toe for a total of 10 gpm.

However in all cases, there will be various ponds, at various times during the RA, upstream of the WTP that provide equalization of the mine affected water flows prior to treatment. The effluent pipeline will only be required to carry 500 gpm and it was assumed that it would enter the lake under the most conservative period when the reservoir is full (elevation 1290-ft).

SWMM also assumes that hydraulic jumps do not occur and that transitions are linear between nodes and exact locations of jumps are not calculated within the pipe sections. This does not allow the model to determine exact distances of pressurized sections in the pipe, but can at least determine which segments of pipe will be pressurized over some length.

Under normal operating conditions, surge is not considered a concern for the Midnite pipelines. On the permanent alignments, most pipeline segments will not be pressurized which eliminates the potential for surge. Valving has been avoided and allows for open flow which removes the possibility of dead-head on the pump. Vacuum breaks are also included to prevent siphoning. In addition, PE pipe is very tolerant of the effect of pressure surges (PPI, 2012).

6.0 NODE AND LINK IDS – (NOT UPDATED FOR EFFLUENT)

Because hundreds of nodes and links were used in the creation of the SWMM models, individual nodes and links cannot be visually discerned on a single map and it becomes impossible to determine where specific output and station values occur. Node and link IDs for each of the pipeline models were used to relate the plan views to the profiles and outputs and are included in Supplement J-1.2. Figure 9 and Figure 10 below show the links and nodes used to model the permanent (final) influent and effluent pipelines, respectively. For the influent piping, nodes are shown in dark blue and links are shown in light blue color. For the effluent pipeline, dark blue nodes indicate non-pressurized sections and red nodes indicate pressurized sections. It should be noted that the alluvial groundwater trenches are included in the influent model to determine final sizing even though they will be eliminated at the end of remedial action.

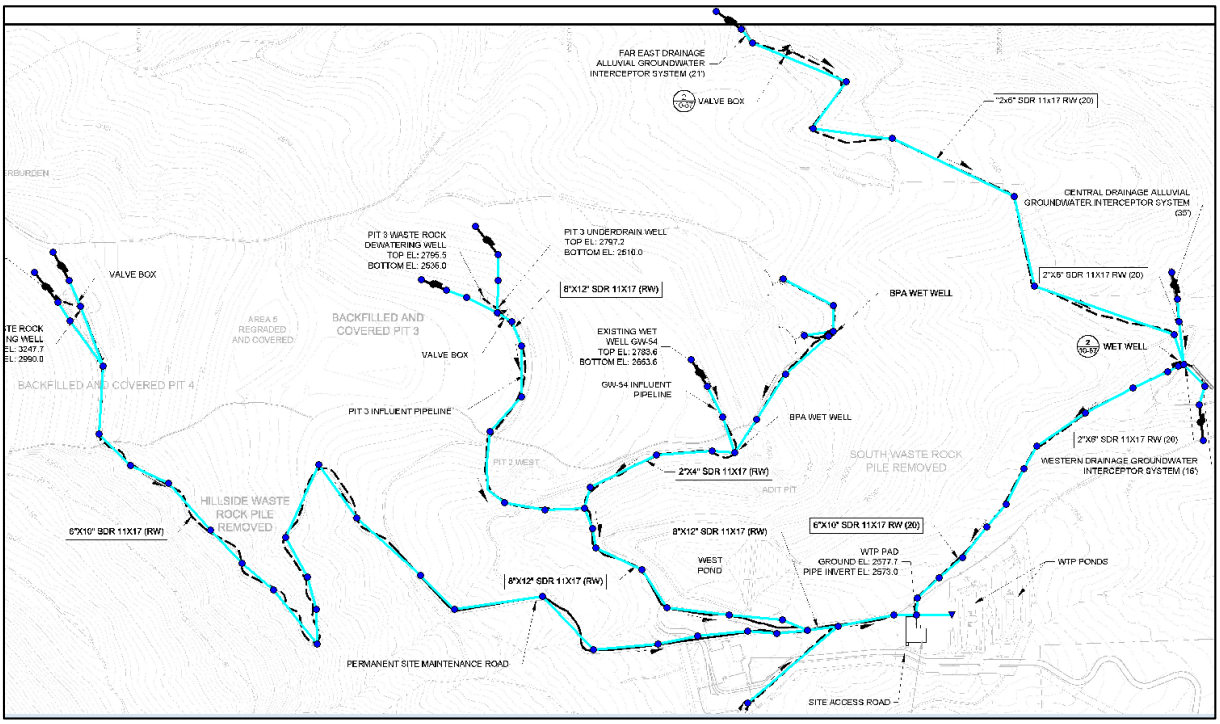

Figure 9. SWMM Model Nodes and Links for the End of Remedial Action (Permanent) Influent Pipelines

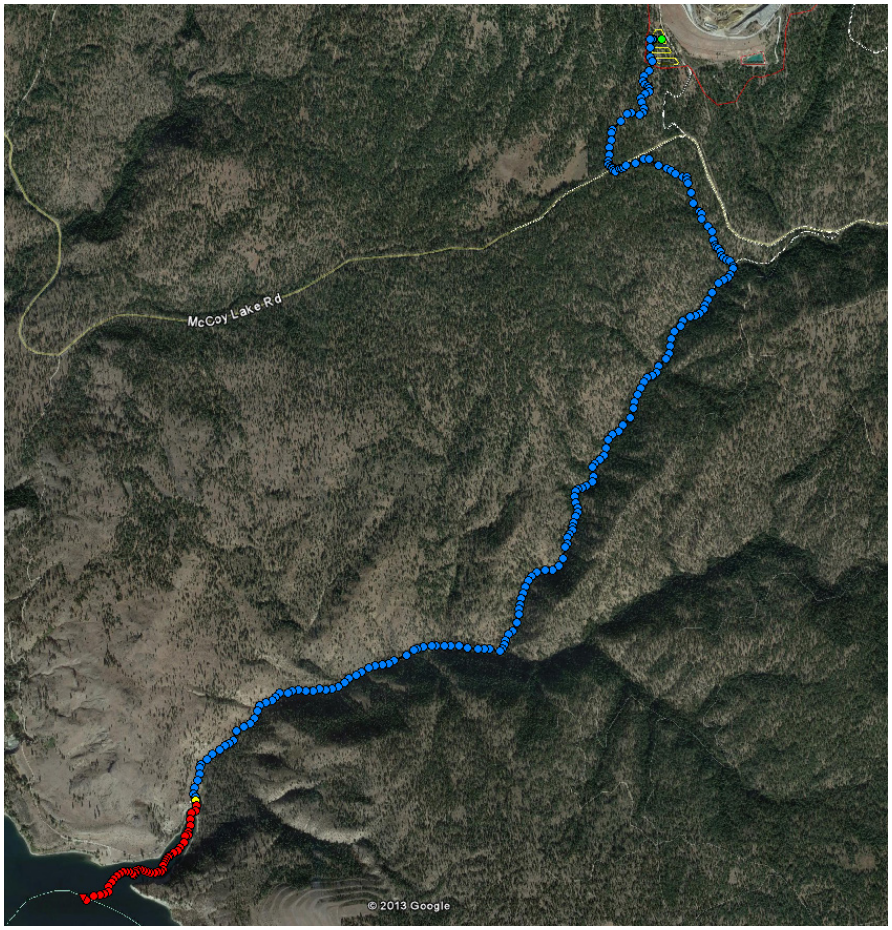

Figure 10. SWMM Model Nodes and Links for the End of Remedial Action (Permanent) Effluent Pipeline

7.0 HYDRAULIC MODEL RESULTS

Profiles for each of the various alignments and their resulting depths are discussed below.

7.1 INFLUENT PIPELINES

Pit 4 to the WTP

The influent pipeline from Pit 4 to the WTP is a pressurized pipeline and will be dual-walled. Maximum pressures occur at the lower dewatering well pump and reach a maximum pressure of roughly 300 ft (130 psi) at the pump but transitions to a gravity flow pipeline at ground surface.

While pressures at the dewatering pump are very high due to the large amount of elevation that must be overcome, the flow is 196-gpm and requires a nominal pipe diameter of 4-inches before combining with the other pipelines to transport the water to the Raw Mine Water Storage Pond at the WTP. At that point, the total flows increase to 840-gpm and the diameter will increase to 6-inches. Velocities are maintained below 10 fps prior to the junction and below 16 fps after, which is acceptable per the *Handbook of Polyethylene Pipe* (PPI, 2012).

Velocities through each section of pipe, pipe slopes, and other information are contained in the attached Status Report document (see Supplement J-1.1). Using the previously listed assumptions and running the alignment in the SWMM model, the calculated water depths and pressure results are shown in Figure 11 below. Views of smaller profile sections are included in Supplement J-1.3.

These profiles begin at the upper inlet and continue down to the outfall structure. Boxes indicate the location of nodes, black lines indicate the pipe, blue lines indicate the water level or pressure in the pipe, and the dashed black line indicates the existing ground level.

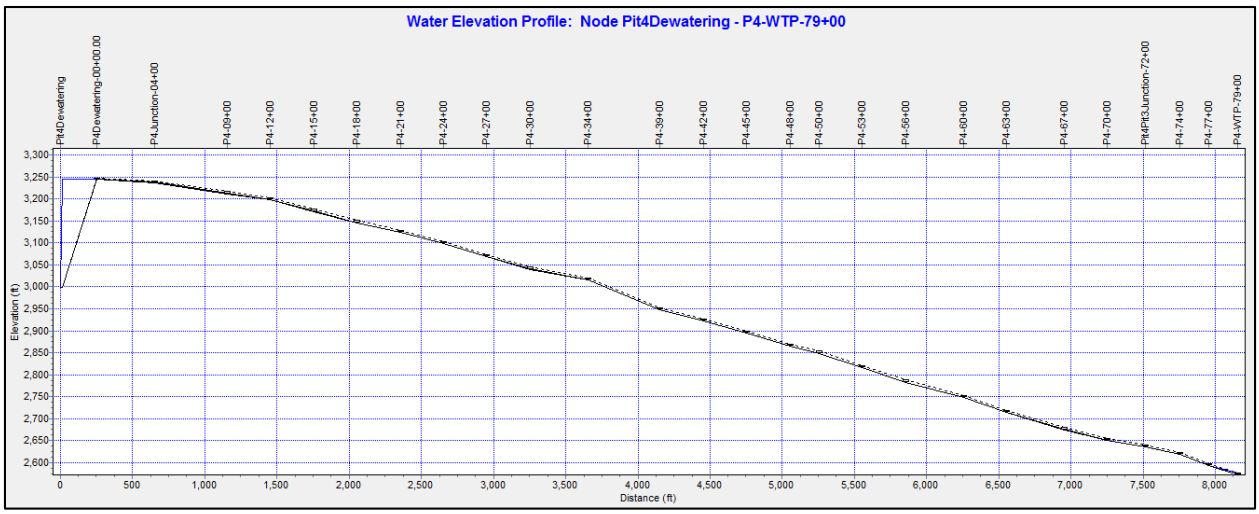

Figure 11. Influent Pipeline Profile from Pit 4 to WTP

Pit 3 to Pit 4 Pipeline

The influent pipeline from Pit 3 to the Pit 4 pipeline is a pressurized pipeline and will use dual-walled pipe. Maximum pressures occurred at the pump from the underliner well and reached a total pressure of over 500 ft (217 psi) at the pump. Once reaching the ground surface, the pipeline transitions to gravity flow.

While pressures were very high due to the large amount of elevation that must be overcome, the flows reach 594-gpm and require a nominal pipe diameter of 6-inches before combining with the other pipelines. At that point, the total flows increase to 840-gpm. Velocities are maintained below 10 fps which is acceptable per the *Handbook of Polyethylene Pipe* (PPI, 2012), as long as surging is prevented. This will be done through the use of air and vacuum break valves prior to large changes in grade.

Velocities through each section of pipe, pipe slopes, and other information are contained in the attached Status Report document (see Supplement J-1.1). Using the previously listed assumptions and running the alignment in the SWMM model, the calculated water depths and pressure results are shown in Figure 12 below. Views of smaller profile sections are included in Supplement J-1.3.

These profiles begin at the upper inlet and continue down to the junction with the Pit 4 pipeline. Boxes indicate the location of nodes, black lines indicate the pipe, blue lines indicate the water level or pressure in the pipe, and the dashed black line indicates the existing ground level.

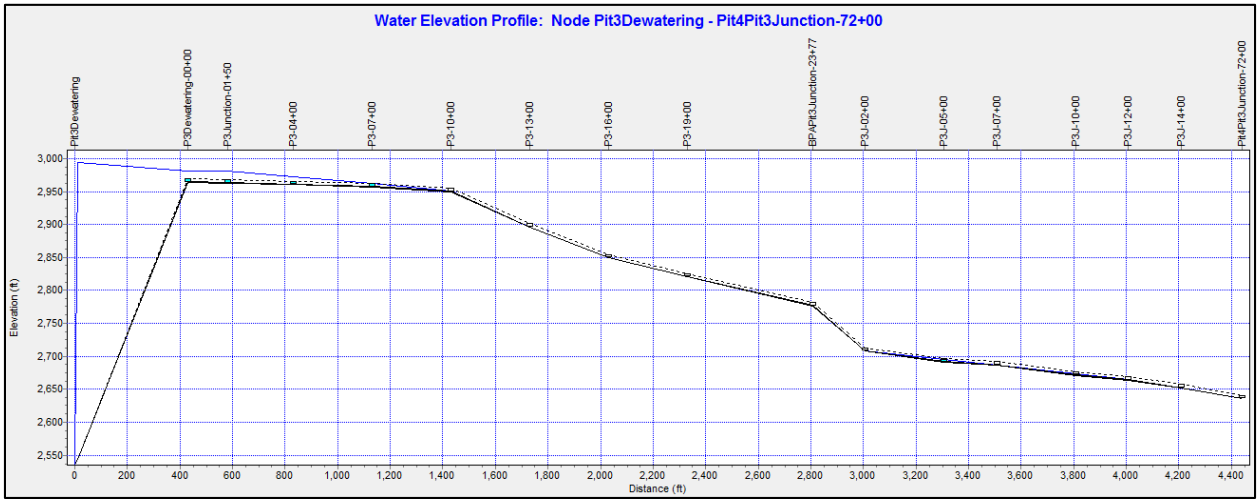

Figure 12. Influent Pipeline Profile from Pit 3 to Pit 4 Pipeline

Backfilled Pit Areas to the Pit 3 Pipeline

The influent pipeline from GW-54 to the Pit 3 pipeline is a pressurized pipeline and will use dual-walled pipe. Because the well is already in place, discharge lines will be maintained with new design after the well header. Assuming that the existing pumps are not oversized, it is assumed that maximum pressures after the well header will reach 15 ft (6 psi).

The combined flows reach 40-gpm and require a nominal pipe diameter of 2-inches prior to combining with the seepage collection pipe and then increase to 4-inches until the junction with the Pit 3 pipeline. Velocities are maintained below 5 fps which is acceptable per the *Handbook of Polyethylene Pipe* (PPI, 2012).

Velocities through each section of pipe, pipe slopes, and other information are contained in the attached Status Report document (see Supplement J-1.1). Using the previously listed assumptions and running the alignment in the SWMM model, the calculated water depths and pressure results are shown in Figure 13 below.

These profiles begin at the upper inlet and continue down to the junction with the Pit 3 pipeline. Boxes indicate the location of nodes, black lines indicate the pipe, blue lines indicate the water level or pressure in the pipe, and the dashed black line indicates the existing ground level.

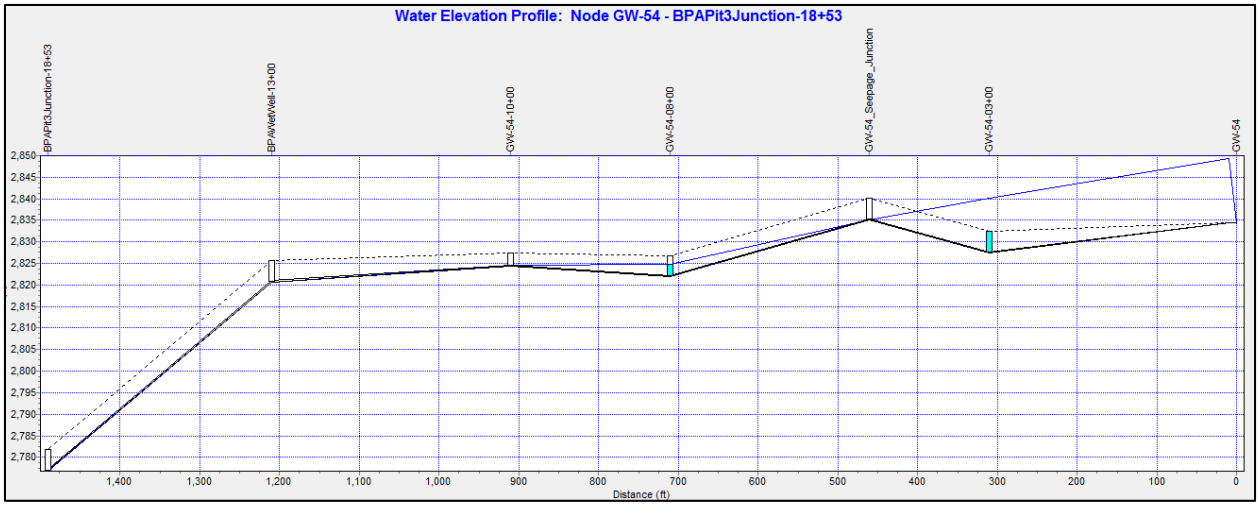

Figure 13. Influent Pipeline Profile from BPA to Pit 3 Pipeline

Extraction Trench Pipelines

The influent pipeline from the extraction trenches to the WTP is a pressurized pipeline and will use dual-walled pipe. Maximum pressures at the trench pumps reached total pressures of less than 50 ft (22 psi) at the pumps. Once reaching the ground surface, the pipelines transition to gravity flow to the wet well and are then pumped in a pressurized pipe up to the WTP. From the wet well, pressures are much higher and reach about 230 ft (100 psi).

The flows from each trench are assumed to be 15 gpm and will see atmospheric pressures. Once the trench flows are combined in the wet well, they will be pumped at 45 gpm up to the WTP. Velocities are maintained below 8 fps which is acceptable per the *Handbook of Polyethylene Pipe* (PPI, 2012).

Velocities through each section of pipe, pipe slopes, and other information are contained in the attached Status Report document (see Supplement J-1.1). Using the previously listed assumptions and running the alignment in the SWMM model, the calculated water depths and pressure results are shown in Figure 14 below.

These profiles begin at the upper inlets and continue down to the wet well and then up to the WTP pipeline. Boxes indicate the location of nodes, black lines indicate the pipe, blue lines indicate the water level or pressure in the pipe, and the dashed black line indicates the existing ground level.

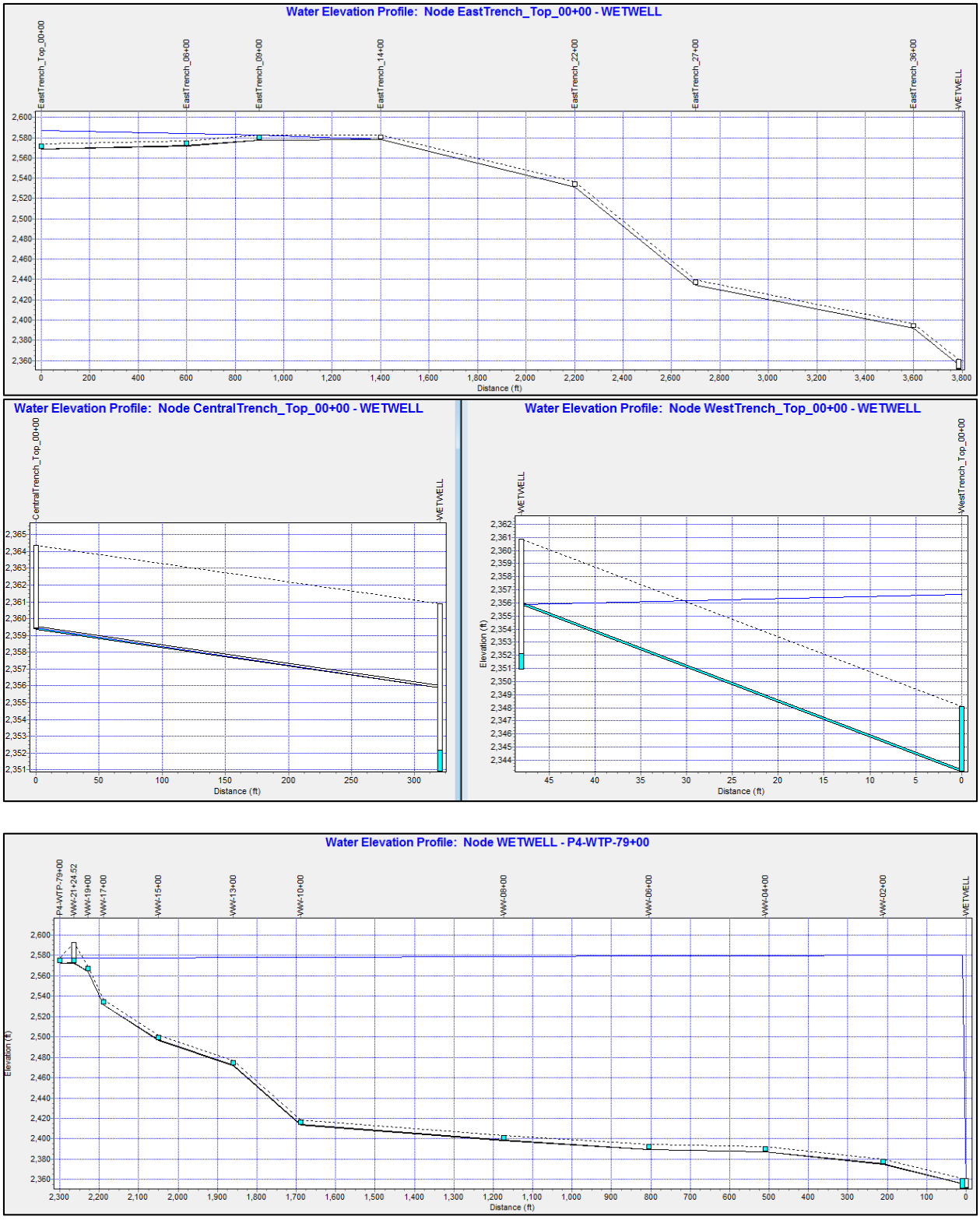

Figure 14. Extraction Trench Pipelines

Seepage Collection Pipeline

The influent pipeline from Pit 3 seepage collection system to the BPA wet well is a pressurized pipeline and will use dual-walled pipe. Water will flow via gravity from two toe drains into a single wet well where they will be pumped to the BPA wet well. Maximum pressures occur at the discharge line of the wet well around 210 ft (91 psi).

The combined flows reach 10-gpm and utilize a nominal pipe diameter of 2-inches. Velocities are maintained below 2 fps which is acceptable per the *Handbook of Polyethylene Pipe* (PPI, 2012).

Velocities through each section of pipe, pipe slopes, and other information are contained in the attached Status Report document (see Supplement J-1.1). Using the previously listed assumptions and running the alignment in the SWMM model, the calculated water depths and pressure results are shown in Figure 15 below.

These profiles begin at the upper inlet and continue down to the junction with the Pit 3 pipeline. Boxes indicate the location of nodes, black lines indicate the pipe, blue lines indicate the water level or pressure in the pipe, and the dashed black line indicates the existing ground level.

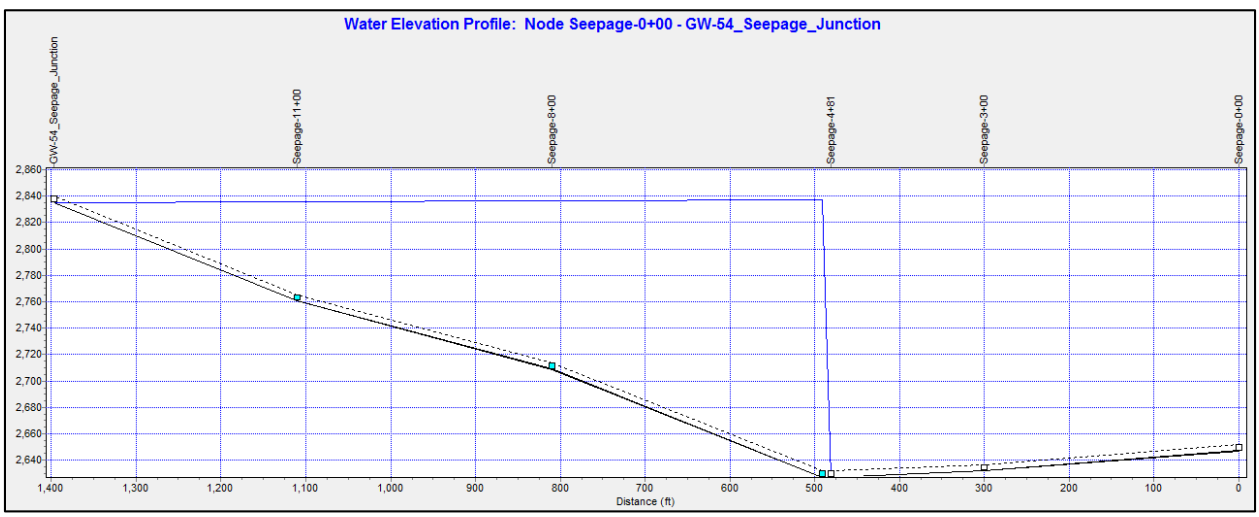

Figure 15. Seepage Collection Pipelines

7.2 EFFLUENT PIPELINE – (NOT UPDATED)

For the majority of the upper reaches, flows remained supercritical due to the steep slopes. In the lower approximately 40 percent of the alignment before entering the lake, the flows become subcritical. For the upper 60 percent, a nominal 6-inch diameter is primarily used in the modeling, while the lower subcritical sections primarily use a nominal 8-inch pipe. The pipe sizing is shown in greater detail in Section 10 of the design drawings.

Velocities through each section of pipe, pipe slopes, and other information are contained in the attached Status Report document (see Supplement J-1). Using the previously listed assumptions and running the alignment in the SWMM model, the calculated water depths and

pressure results are shown in Figure 16 below. Views of smaller profile sections are included in Supplement J-1.3.

These profiles begin at the upper inlet and continue down to the outfall structure. Boxes indicate the location of nodes, black lines indicate the pipe, blue lines indicate the water level or pressure in the pipe, and the dashed black line indicates the existing ground level. Of the 5.5 miles of pipe, roughly 5,400 feet requires installation deeper than 5 feet.

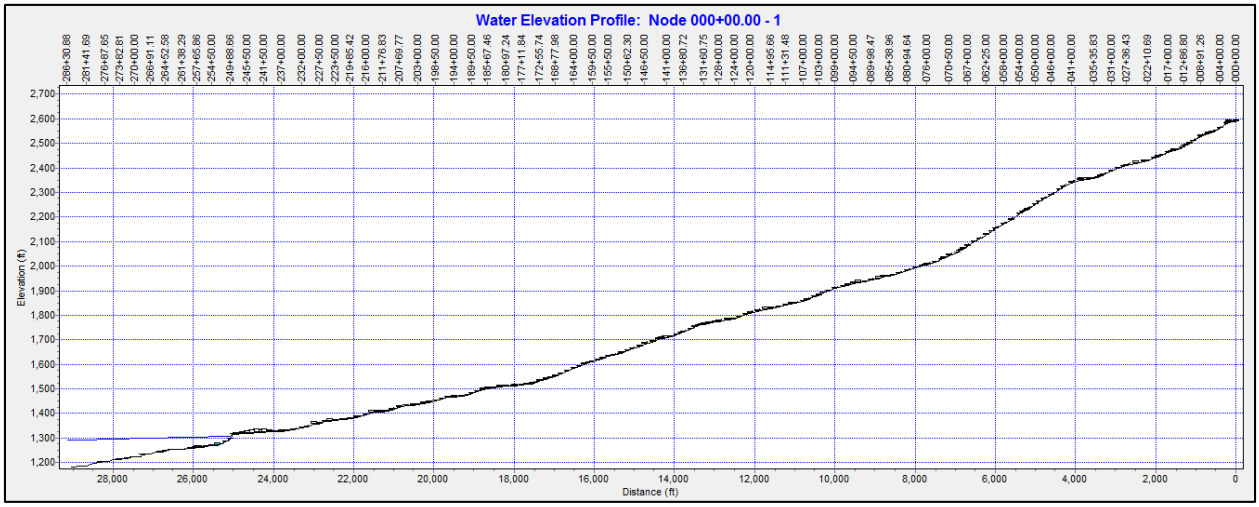

Figure 16. Effluent Pipeline Profile from Inlet to Diffuser

8.0 CONCLUSIONS

8.1 INFLUENT PIPELINES

Although the influent pipelines can be pressurized and don't require gravity flow, the selected pipe diameters allow for minimal pipeline pressures and are sufficient to handle flows throughout the life of the pipeline. Any potential leaks will be collected in the annular space between the inner and outer walls of the dual-walled pipes and, by minimizing the pressures, the potential for leaks to become serious, or to pressurize the annular space, will be reduced greatly. To prevent pressurization of the annular space any leaks will be allowed to drain back into the various pits and storage ponds.

The added benefit of pressurization is that it allows the pipes to maintain invert depths at 5 feet along nearly the entire alignment which will greatly reduce the higher costs of deep trenches that might otherwise be needed to maintain gravity flow in the influent pipelines.

The alignments were selected to maintain consistent grades, whether uphill or downhill. This will assist in reducing the number of vacuum break/air release valves that will be required to prevent siphoning and air entrapment in the pipelines. The locations of these valves are shown in Section 10 of the drawings. Constant/consistent grades also will allow for leaked flow trapped in the annular space of the dual-walled pipes to drain back in the pits and storage ponds for later treatment.

The influent pipe sizing and outputs is summarized in Table 1, below. Pipe sizing is shown in Section 10 of the 100% submittal design drawings.

Table 1. Final Influent Pipe Sizing and Outputs

Pipeline	Diameter (inches)	Design Flow Rate (gpm)	Max Velocity (fps)	Max Pressure at Grade (psi)
Pit 4 Underdrain to Junction	4	128	6.4	Atmospheric
Pit 4 Dewatering to Junction	4	68	4.64	Atmospheric
Pit 4 to Junction	4	196	11.62	Atmospheric
Pit 3 Underdrain to Junction	6	366	4.15	Atmospheric
Pit 3 Dewatering to Junction	6	228	2.59	Atmospheric
Pit 3 to Junction	6	594	22.23	Atmospheric
GW-54 to BPA Wetwell	2	40	4.98	6.5
Pit 3 Seepage to Seepage Wetwell	2	5	6.22	Atmospheric
Seepage Wetwell to BPA Wetwell	2	10	1.25	90.9
BPA Wetwell to Junction	4	50	4.64	1.3
Pit 3 Junction to Pit 4 Junction	6	644	16.66	Atmospheric
Pit 4 Junction to WTP	6	840	16.27	Atmospheric
East Trench to Wetwell	2	15	8.00	7.8
Central Trench to Wetwell	2	15	2.57	Atmospheric
West Trench to Wetwell	2	15	2.40	5.8
Trench Wetwell to WTP	4	45	1.15	108.2
Collection Sump to WTP	3	Not Determined	Not Determined	Not Determined

8.2 EFFLUENT PIPELINE – (NOT UPDATED)

The selected pipe diameters allow the pipeline to maintain gravity flows and will be sufficient to handle flows throughout the life of the pipeline. These diameters also helped to maintain pipe depths at 5 feet for over 80 percent of the alignments and reach a maximum depth of 14 feet for only about 100 feet in the entire effluent pipeline route.

There appear to be no pressurized sections and pressures were kept at atmospheric pressure. This greatly reduces the risk of a serious leak occurring in the pipeline and helps to prevent the need for leak detection. It should be noted that the pipeline appears to be pressurized where it enters the lake, however, this is actually just the lake level with a very minimal amount of pressure required to push the water out of the pipe. As the lake level drops, the head in the pipe will drop to that same level. In addition, the minimal pressure required to push water out of the pipe.

The alignment also maintains a consistent downward grade which helps to reduce sediment buildup, which could occur in the more shallow slopes (e.g., sediment might enter the pipe during construction). Any sediments that do collect will be contained at the manholes where they can be cleaned out.

8.3 DIFFUSER – (NOT UPDATED)

The diffuser design was taken from the NPDES permit application and modeled to verify functionality. Hydraulically, the outfall is capable of discharging the required 500 gpm into the

lake and the “duckbill” valve installed on the end will prevent clogging due to sediment that might enter the pipe during any shut-down period that might be experienced at the new WTP.

9.0 REFERENCES

Plastic Pipe Institute (PPI), 2012. Handbook of Polyethylene (PE) Pipe.

MWH Americas, Inc. (MWH), 2013. Effluent Discharge Mixing Evaluation for the Midnite Mine Water Treatment Plant. November.

Sanks, R.L., 1998. “Pumping Station Design”.

U.S. Environmental Protection Agency (EPA), 2011. Program Storm Water Management Model (SWMM) version 5.0.

Supplement J-1.1

SWMM Model Status Report

```
EPA STORM WATER MANAGEMENT MODEL - VERSION 5.0 (Build 5.0.022)
--------------------------------------------------------------


*********************************************************
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
*********************************************************

****************
Analysis Options
****************
Flow Units ............... GPM
Process Models:
  Rainfall/Runoff ........ NO
  Snowmelt ............... NO
  Groundwater ............ NO
  Flow Routing ........... YES
  Ponding Allowed ........ NO
  Water Quality .......... NO
Flow Routing Method ...... DYNWAVE
Starting Date ............ AUG-26-2013 00:00:00
Ending Date .............. AUG-27-2013 03:00:00
Antecedent Dry Days ...... 0.0
Report Time Step ......... 00:15:00
Routing Time Step ........ 1.00 sec


WARNING 08: elevation drop exceeds length for Conduit 4

WARNING 08: elevation drop exceeds length for Conduit 21

WARNING 08: elevation drop exceeds length for Conduit 23

WARNING 04: minimum elevation drop used for Conduit 63

WARNING 04: minimum elevation drop used for Conduit 145

*************
Element Count
*************
Number of rain gages ...... 0
Number of subcatchments ... 0
Number of nodes ........... 94
Number of links ........... 93
Number of pollutants ...... 0
Number of land uses ....... 0


************
Node Summary
************
                                        Invert      Max.    Ponded    External
Name                Type                 Elev.     Depth      Area    Inflow
--------------------------------------------------------------------------------
P4DewateringDischargeJUNCTION           2999.00      0.33       0.0
P4UnderdrainDischargeJUNCTION           2960.00      0.33       0.0
P3DewateringDischargeJUNCTION           2544.00      0.33       0.0
P3UnderdrainDischargeJUNCTION           2516.00      0.33       0.0
P4Junction-04+00    JUNCTION           3237.40      3.00       0.0
Pit4Dewatering      JUNCTION           2999.00      0.00       0.0    Yes
Pit4Underdrain      JUNCTION           2960.00      0.00       0.0    Yes
Pit3Dewatering      JUNCTION           2535.00      0.00       0.0    Yes
Pit3Underdrain      JUNCTION           2510.00      0.00       0.0    Yes
P3Junction-01+50    JUNCTION           2962.80      5.00       0.0
P4-WTP-79+00        JUNCTION           2572.00      5.00       0.0
Pit4Pit3Junction-72+00JUNCTION           2635.60      5.00       0.0
BPAPit3Junction-23+77JUNCTION           2776.80      5.00       0.0
BPAWetWell-13+00    JUNCTION           2818.00      5.00       0.0
```


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GW-54	JUNCTION	2834.35	0.00	0.0	Yes
GW-54-00+00.00	JUNCTION	2834.30	0.17	0.0	
GW-54-03+00	JUNCTION	2827.50	5.00	0.0	
P3Dewatering-00+00	JUNCTION	2964.40	5.00	0.0	
P3Underdrain-01+00	JUNCTION	2961.80	5.00	0.0	
P4Dewatering-00+00.00	JUNCTION	3244.50	3.00	0.0	
P4Underdrain-00+00	JUNCTION	3260.20	3.00	0.0	
P3-13+00	JUNCTION	2896.00	5.00	0.0	
P4-30+00	JUNCTION	3039.90	5.00	0.0	
P4-34+00	JUNCTION	3016.00	5.00	0.0	
P4-39+00	JUNCTION	2947.50	5.00	0.0	
P4-42+00	JUNCTION	2922.30	5.00	0.0	
P4-45+00	JUNCTION	2894.30	5.00	0.0	
P4-48+00	JUNCTION	2864.80	5.00	0.0	
P4-50+00	JUNCTION	2848.60	5.00	0.0	
P4-60+00	JUNCTION	2747.40	5.00	0.0	
P4-74+00	JUNCTION	2618.00	5.00	0.0	
P3J-12+00	JUNCTION	2664.00	5.00	0.0	
P3J-10+00	JUNCTION	2671.10	5.00	0.0	
P3J-07+00	JUNCTION	2686.70	5.00	0.0	
P3J-02+00	JUNCTION	2707.80	5.00	0.0	
GW-54_Seepage_Junction	JUNCTION	2830.50	5.00	0.0	
GW-54-08+00	JUNCTION	2821.80	5.00	0.0	
P3-16+00	JUNCTION	2849.40	5.00	0.0	
P3-10+00	JUNCTION	2950.00	5.00	0.0	
P3-04+00	JUNCTION	2960.20	5.00	0.0	
P4-27+00	JUNCTION	3068.50	5.00	0.0	
P4-09+00	JUNCTION	3211.90	5.00	0.0	
P4-21+00	JUNCTION	3123.70	5.00	0.0	
P4-24+00	JUNCTION	3098.00	5.00	0.0	
P4-53+00	JUNCTION	2816.00	5.00	0.0	
P4-56+00	JUNCTION	2782.90	5.00	0.0	
P4-63+00	JUNCTION	2713.80	5.00	0.0	
P4-70+00	JUNCTION	2650.80	5.00	0.0	
P4-67+00	JUNCTION	2674.80	5.00	0.0	
P4-77+00	JUNCTION	2592.40	5.00	0.0	
P3-07+00	JUNCTION	2957.00	5.00	0.0	
P3-19+00	JUNCTION	2820.80	5.00	0.0	
P3J-05+00	JUNCTION	2691.30	5.00	0.0	
P3J-14+00	JUNCTION	2652.00	5.00	0.0	
GW-54-10+00	JUNCTION	2824.30	3.00	0.0	
EastTrench_Pumped	JUNCTION	2548.13	21.00	0.0	
EastTrench_06+00	JUNCTION	2571.93	5.00	0.0	
EastTrench_22+00	JUNCTION	2531.24	5.00	0.0	
EastTrench_27+00	JUNCTION	2434.46	5.00	0.0	
EastTrench_36+00	JUNCTION	2391.61	5.00	0.0	
CentralTrench_Bottom	JUNCTION	2356.22	35.00	0.0	Yes
CentralTrench_Top_00+00	JUNCTION	2359.36	5.00	0.0	
WetWell_Pumped	JUNCTION	2350.87	10.00	0.0	Yes
WestTrench_Bottom	JUNCTION	2343.11	16.00	0.0	Yes
WW-02+00	JUNCTION	2375.07	5.00	0.0	
WW-06+00	JUNCTION	2389.25	5.00	0.0	
WW-13+00	JUNCTION	2471.99	5.00	0.0	
WW-19+00	JUNCTION	2563.87	5.00	0.0	
WW-21+24.52	JUNCTION	2572.36	20.00	0.0	
WETWELL	JUNCTION	2350.87	10.00	0.0	Yes
WestTrench_Top_00+00	JUNCTION	2343.11	5.00	0.0	
EastTrench_14+00	JUNCTION	2577.90	5.00	0.0	
EastTrench_Bottom	JUNCTION	2569.13	21.00	0.0	Yes
EastTrench_09+00	JUNCTION	2577.60	5.00	0.0	
WW-04+00	JUNCTION	2387.13	5.00	0.0	
WW-08+00	JUNCTION	2398.21	5.00	0.0	
WW-10+00	JUNCTION	2413.59	5.00	0.0	
WW-15+00	JUNCTION	2496.68	5.00	0.0	
WW-17+00	JUNCTION	2531.10	5.00	0.0	Yes
WestTrench_Pumped	JUNCTION	2343.11	16.00	0.0	
CentralTrench_Pumped	JUNCTION	2356.22	35.00	0.0	
EastTrench_Top_00+00	JUNCTION	2568.81	5.00	0.0	
Seepage-0+00	JUNCTION	2647.22	5.00	0.0	Yes
Seepage-3+00	JUNCTION	2631.93	5.00	0.0	
Seepage-4+81	JUNCTION	2627.09	5.00	0.0	

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Seepage2-0+00	JUNCTION	2661.05	5.00	0.0	Yes
Seepage-8+00	JUNCTION	2708.88	5.00	0.0	
Seepage-11+00	JUNCTION	2760.42	5.00	0.0	
SeepageWetWell	JUNCTION	2627.09	5.00	0.0	
CollectionSump	JUNCTION	2650.00	5.00	0.0	Yes
P4-18+00	JUNCTION	3145.60	5.00	0.0	
P4-15+00	JUNCTION	3171.50	5.00	0.0	
P4-12+00	JUNCTION	3197.70	5.00	0.0	
WTPOutfall	OUTFALL	2572.00	0.50	0.0	

****
Link Summary
****

Name	From Node	To Node	Type	Length	%Slope	Roughness
3	P4Underdrain-00+00	P4UnderdrainDischarge	CONDUIT	307.4	453.8743	0.0100
4	P4Dewatering-00+00.00	P4DewateringDischarge	CONDUIT	243.4	100.8628	0.0100
21	P3Dewatering-00+00	P3DewateringDischarge	CONDUIT	420.4	100.0000	0.0100
23	P3Underdrain-01+00	P3UnderdrainDischarge	CONDUIT	445.8	100.0000	0.0100
44	Pit4Pit3Junction-72+00	P4-74+00	CONDUIT	242.0	7.2920	0.0100
48	GW-54-00+00.00	GW-54-03+00	CONDUIT	300.0	2.2672	0.0100
49	GW-54_Seepage_Junction	GW-54-03+00	CONDUIT	150.0	2.0004	0.0100
55	P3Dewatering-00+00	P3Junction-01+50	CONDUIT	150.0	1.0667	0.0100
56	P3Junction-01+50	P3Underdrain-01+00	CONDUIT	50.0	2.0004	0.0100
57	P4Dewatering-00+00.00	P4Junction-04+00	CONDUIT	400.0	1.7753	0.0100
58	P4Underdrain-00+00	P4Junction-04+00	CONDUIT	400.0	5.7093	0.0100
59	BPAWetWell-13+00	BPAPit3Junction-23+77	CONDUIT	280.0	14.8762	0.0100
60	P3-13+00	P3-16+00	CONDUIT	300.0	15.7242	0.0100
61	BPAPit3Junction-23+77	P3J-02+00	CONDUIT	200.0	36.7568	0.0100
62	P4Junction-04+00	P4-09+00	CONDUIT	500.0	5.1066	0.0100
63	P4-WTP-79+00	WTPOutfall	CONDUIT	100.0	0.0010	0.0100
64	P3Junction-01+50	P3-04+00	CONDUIT	250.0	1.0401	0.0100
66	P4-27+00	P4-30+00	CONDUIT	300.0	9.5770	0.0100
67	P4-30+00	P4-34+00	CONDUIT	400.0	5.9857	0.0100
68	P4-34+00	P4-39+00	CONDUIT	500.0	13.8304	0.0100
69	P4-39+00	P4-42+00	CONDUIT	300.0	8.4298	0.0100
70	P4-42+00	P4-45+00	CONDUIT	300.0	9.3743	0.0100
71	P4-45+00	P4-48+00	CONDUIT	300.0	9.8812	0.0100
72	P4-48+00	P4-50+00	CONDUIT	200.0	8.1267	0.0100
73	P4-56+00	P4-60+00	CONDUIT	400.0	8.9102	0.0100
74	P4-60+00	P4-63+00	CONDUIT	300.0	11.2709	0.0100
75	P3J-05+00	P3J-07+00	CONDUIT	200.0	2.3006	0.0100
76	P3J-07+00	P3J-10+00	CONDUIT	300.0	5.2070	0.0100
77	P3J-10+00	P3J-12+00	CONDUIT	200.0	3.5522	0.0100
78	P3J-12+00	P3J-14+00	CONDUIT	200.0	6.0108	0.0100
80	P3-10+00	P3-13+00	CONDUIT	300.0	18.2989	0.0100
81	GW-54_Seepage_Junction	GW-54-08+00	CONDUIT	250.0	3.4821	0.0100
99	P3-19+00	BPAPit3Junction-23+77	CONDUIT	477.0	9.2638	0.0100
86	P4-77+00	P4-WTP-79+00	CONDUIT	200.0	10.2535	0.0100
87	P4-09+00	P4-12+00	CONDUIT	300.0	4.7386	0.0100
88	P4-24+00	P4-27+00	CONDUIT	300.0	9.8812	0.0100
89	P4-21+00	P4-24+00	CONDUIT	300.0	8.5983	0.0100
90	P4-50+00	P4-53+00	CONDUIT	300.0	10.9314	0.0100
92	P4-63+00	P4-67+00	CONDUIT	400.0	9.7967	0.0100
93	P4-67+00	P4-70+00	CONDUIT	300.0	8.0257	0.0100
94	P4-74+00	P4-77+00	CONDUIT	200.0	12.9062	0.0100
95	P4-53+00	P4-56+00	CONDUIT	300.0	11.1011	0.0100
96	P3-04+00	P3-07+00	CONDUIT	300.0	1.0667	0.0100
97	P3-07+00	P3-10+00	CONDUIT	300.0	2.3340	0.0100
98	P3-16+00	P3-19+00	CONDUIT	300.0	9.5770	0.0100
100	P3J-02+00	P3J-05+00	CONDUIT	300.0	5.5083	0.0100
101	P3J-14+00	Pit4Pit3Junction-72+00	CONDUIT	233.0	7.0561	0.0100
102	P4-70+00	Pit4Pit3Junction-72+00	CONDUIT	258.7	5.8852	0.0100
104	GW-54-10+00	BPAWetWell-13+00	CONDUIT	300.0	2.1005	0.0100
105	GW-54-10+00	GW-54-08+00	CONDUIT	200.0	1.2501	0.0100
118	WW-02+00	WetWell_Pumped	CONDUIT	200.0	9.6445	0.0100
122	WW-21+24.52	WW-19+00	CONDUIT	36.0	24.2678	0.0100
128	WETWELL	WestTrench_Top_00+00	CONDUIT	48.0	27.5755	0.0100
129	CentralTrench_Top_00+00	WETWELL	CONDUIT	320.0	1.0907	0.0100
130	EastTrench_09+00	EastTrench_06+00	CONDUIT	300.0	1.8903	0.0100

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131             EastTrench_14+00EastTrench_09+00CONDUIT          500.0    0.0600    0.0100
132             EastTrench_14+00EastTrench_22+00CONDUIT          800.0    5.8424    0.0100
133             EastTrench_22+00EastTrench_27+00CONDUIT          500.0   19.7291    0.0100
134             EastTrench_27+00EastTrench_36+00CONDUIT          900.0    4.7665    0.0100
135             EastTrench_36+00WETWELL         CONDUIT          185.0   19.6898    0.0100
136             WW-04+00        WW-02+00        CONDUIT          300.0    4.0233    0.0100
137             WW-06+00        WW-04+00        CONDUIT          294.3    0.7204    0.0100
138             WW-08+00        WW-06+00        CONDUIT          370.0    2.4223    0.0100
139             WW-10+00        WW-08+00        CONDUIT          514.0    2.9936    0.0100
140             WW-13+00        WW-10+00        CONDUIT          172.0   36.0979    0.0100
141             WW-15+00        WW-13+00        CONDUIT          190.0   13.1059    0.0100
142             WW-17+00        WW-15+00        CONDUIT          139.0   25.5586    0.0100
143             WW-19+00        WW-17+00        CONDUIT           39.0  154.9748    0.0100
144             CentralTrench_Top_00+00CentralTrench_PumpedCONDUIT           35.0    9.0078    0.0100
145             WestTrench_PumpedWestTrench_Top_00+00CONDUIT           16.0    0.0063    0.0100
146             EastTrench_Top_00+00EastTrench_PumpedCONDUIT           21.0  566.2545    0.0100
147             EastTrench_06+00EastTrench_Top_00+00CONDUIT          600.0    0.5200    0.0100
148             WW-21+24.52     P4-WTP-79+00    CONDUIT           36.0    1.0001    0.0100
158             Seepage-0+00    Seepage-3+00    CONDUIT          300.0    5.1033    0.0100
159             Seepage-3+00    Seepage-4+81    CONDUIT          181.0    2.6750    0.0100
160             Seepage-8+00    SeepageWetWell  CONDUIT          319.0   26.5262    0.0100
161             Seepage2-0+00   Seepage-4+81    CONDUIT          169.0   20.5131    0.0100
162             Seepage-11+00   Seepage-8+00    CONDUIT          300.0   17.4393    0.0100
163             GW-54_Seepage_JunctionSeepage-11+00   CONDUIT          287.0   25.1803    0.0100
164             CollectionSump  P4-74+00        CONDUIT          200.0   16.2088    0.0100
165             P4-12+00        P4-15+00        CONDUIT          300.0    8.7668    0.0100
166             P4-15+00        P4-18+00        CONDUIT          300.0    8.6657    0.0100
167             P4-18+00        P4-21+00        CONDUIT          300.0    7.3195    0.0100
1               Pit4Underdrain  P4UnderdrainDischargeIDEAL PUMP
2               Pit4Dewatering  P4DewateringDischargeIDEAL PUMP
20              Pit3Dewatering  P3DewateringDischargeIDEAL PUMP
22              Pit3Underdrain  P3UnderdrainDischargeIDEAL PUMP
37              GW-54           GW-54-00+00.00  IDEAL PUMP
39              WETWELL         WetWell_Pumped  IDEAL PUMP
41              EastTrench_BottomEastTrench_PumpedIDEAL PUMP
42              WestTrench_BottomWestTrench_PumpedIDEAL PUMP
43              CentralTrench_BottomCentralTrench_PumpedIDEAL PUMP
45              Seepage-4+81    SeepageWetWell  IDEAL PUMP


*********************
Cross Section Summary
*********************
                                      Full     Full     Hyd.     Max.   No. of     Full
Conduit          Shape               Depth     Area     Rad.    Width  Barrels     Flow
-------------------------------------------------------------------------------------
3                FORCE_MAIN           0.33     0.09     0.08     0.33     1     4033.63
4                FORCE_MAIN           0.33     0.09     0.08     0.33     1     1790.47
21               FORCE_MAIN           0.33     0.09     0.08     0.33     1     1782.18
23               FORCE_MAIN           0.33     0.09     0.08     0.33     1     1782.18
44               CIRCULAR             0.50     0.20     0.13     0.50     1      884.09
48               FORCE_MAIN           0.17     0.02     0.04     0.17     1       38.60
49               FORCE_MAIN           0.17     0.02     0.04     0.17     1       36.08
55               CIRCULAR             0.50     0.20     0.13     0.50     1      338.14
56               CIRCULAR             0.50     0.20     0.13     0.50     1      463.05
57               FORCE_MAIN           0.33     0.09     0.08     0.33     1      202.09
58               FORCE_MAIN           0.33     0.09     0.08     0.33     1      379.76
59               FORCE_MAIN           0.33     0.09     0.08     0.33     1      636.94
60               CIRCULAR             0.50     0.20     0.13     0.50     1     1298.24
61               CIRCULAR             0.50     0.20     0.13     0.50     1     1984.91
62               CIRCULAR             0.33     0.09     0.08     0.33     1      250.27
63               FORCE_MAIN           0.50     0.20     0.13     0.50     1       10.19
64               CIRCULAR             0.50     0.20     0.13     0.50     1      333.89
66               CIRCULAR             0.33     0.09     0.08     0.33     1      342.73
67               CIRCULAR             0.33     0.09     0.08     0.33     1      270.95
68               CIRCULAR             0.33     0.09     0.08     0.33     1      411.86
69               CIRCULAR             0.33     0.09     0.08     0.33     1      321.55
70               CIRCULAR             0.33     0.09     0.08     0.33     1      339.08
71               CIRCULAR             0.33     0.09     0.08     0.33     1      348.13
72               CIRCULAR             0.33     0.09     0.08     0.33     1      315.71
73               CIRCULAR             0.33     0.09     0.08     0.33     1      330.58
```


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74	CIRCULAR	0.33	0.09	0.08	0.33	1	371.81
75	CIRCULAR	0.50	0.20	0.13	0.50	1	496.58
76	CIRCULAR	0.50	0.20	0.13	0.50	1	747.08
77	CIRCULAR	0.50	0.20	0.13	0.50	1	617.05
78	CIRCULAR	0.50	0.20	0.13	0.50	1	802.67
80	CIRCULAR	0.50	0.20	0.13	0.50	1	1400.50
81	FORCE_MAIN	0.33	0.09	0.08	0.33	1	290.77
99	CIRCULAR	0.50	0.20	0.13	0.50	1	996.48
86	FORCE_MAIN	0.50	0.20	0.13	0.50	1	1492.87
87	CIRCULAR	0.33	0.09	0.08	0.33	1	241.08
88	CIRCULAR	0.33	0.09	0.08	0.33	1	348.13
89	CIRCULAR	0.33	0.09	0.08	0.33	1	324.74
90	CIRCULAR	0.33	0.09	0.08	0.33	1	366.16
92	CIRCULAR	0.33	0.09	0.08	0.33	1	346.64
93	CIRCULAR	0.33	0.09	0.08	0.33	1	313.75
94	CIRCULAR	0.50	0.20	0.13	0.50	1	1176.17
95	CIRCULAR	0.33	0.09	0.08	0.33	1	368.99
96	CIRCULAR	0.50	0.20	0.13	0.50	1	338.14
97	CIRCULAR	0.50	0.20	0.13	0.50	1	500.17
98	CIRCULAR	0.50	0.20	0.13	0.50	1	1013.18
100	CIRCULAR	0.50	0.20	0.13	0.50	1	768.39
101	CIRCULAR	0.50	0.20	0.13	0.50	1	869.67
102	CIRCULAR	0.33	0.09	0.08	0.33	1	268.67
104	FORCE_MAIN	0.33	0.09	0.08	0.33	1	221.31
105	FORCE_MAIN	0.33	0.09	0.08	0.33	1	167.22
118	FORCE_MAIN	0.33	0.09	0.08	0.33	1	504.04
122	FORCE_MAIN	0.33	0.09	0.08	0.33	1	829.60
128	FORCE_MAIN	0.17	0.02	0.04	0.17	1	148.78
129	FORCE_MAIN	0.17	0.02	0.04	0.17	1	26.00
130	CIRCULAR	0.17	0.02	0.04	0.17	1	24.17
131	CIRCULAR	0.17	0.02	0.04	0.17	1	4.31
132	CIRCULAR	0.17	0.02	0.04	0.17	1	42.50
133	CIRCULAR	0.17	0.02	0.04	0.17	1	78.09
134	CIRCULAR	0.17	0.02	0.04	0.17	1	38.39
135	CIRCULAR	0.17	0.02	0.04	0.17	1	78.02
136	FORCE_MAIN	0.33	0.09	0.08	0.33	1	314.36
137	FORCE_MAIN	0.33	0.09	0.08	0.33	1	124.18
138	FORCE_MAIN	0.33	0.09	0.08	0.33	1	239.02
139	FORCE_MAIN	0.33	0.09	0.08	0.33	1	267.97
140	FORCE_MAIN	0.33	0.09	0.08	0.33	1	1028.00
141	FORCE_MAIN	0.33	0.09	0.08	0.33	1	594.82
142	FORCE_MAIN	0.33	0.09	0.08	0.33	1	853.14
143	FORCE_MAIN	0.33	0.09	0.08	0.33	1	2257.83
144	FORCE_MAIN	0.17	0.02	0.04	0.17	1	81.31
145	FORCE_MAIN	0.17	0.02	0.04	0.17	1	1.60
146	FORCE_MAIN	0.17	0.02	0.04	0.17	1	760.82
147	CIRCULAR	0.17	0.02	0.04	0.17	1	12.68
148	FORCE_MAIN	0.33	0.09	0.08	0.33	1	148.24
158	FORCE_MAIN	0.17	0.02	0.04	0.17	1	59.83
159	FORCE_MAIN	0.17	0.02	0.04	0.17	1	42.21
160	FORCE_MAIN	0.17	0.02	0.04	0.17	1	145.69
161	FORCE_MAIN	0.17	0.02	0.04	0.17	1	126.81
162	FORCE_MAIN	0.17	0.02	0.04	0.17	1	116.17
163	FORCE_MAIN	0.17	0.02	0.04	0.17	1	141.65
164	CIRCULAR	0.50	0.20	0.13	0.50	1	1318.10
165	CIRCULAR	0.33	0.09	0.08	0.33	1	327.91
166	CIRCULAR	0.33	0.09	0.08	0.33	1	326.02
167	CIRCULAR	0.33	0.09	0.08	0.33	1	299.62

********** Flow Routing Continuity **********	Volume acre-feet ---	Volume 10^6 gal ---
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	0.000	0.000
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	4.425	1.442
External Outflow	4.405	1.435
Internal Outflow	0.000	0.000

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Storage Losses ...........          0.000          0.000
Initial Stored Volume ....          0.016          0.005
Final Stored Volume ......          0.035          0.012
Continuity Error (%) .....          0.013


***************************
Time-Step Critical Elements
***************************
None


********************************
Highest Flow Instability Indexes
********************************
All links are stable.


*************************
Routing Time Step Summary
*************************
Minimum Time Step           :     1.00 sec
Average Time Step           :     0.11 sec
Maximum Time Step           :     1.00 sec
Percent in Steady State     :     0.00
Average Iterations per Step :     0.22


******************
Node Depth Summary
******************

-----------------------------------------------------------------------
                                Average  Maximum  Maximum  Time of Max
                                  Depth    Depth      HGL   Occurrence
Node                  Type         Feet     Feet     Feet  days hr:min
-----------------------------------------------------------------------
P4DewateringDischarge JUNCTION    27.37   246.31  3245.31     1  00:00
P4UnderdrainDischarge JUNCTION    33.65   302.86  3262.86     1  00:00
P3DewateringDischarge JUNCTION    49.94   449.43  2993.43     1  00:32
P3UnderdrainDischarge JUNCTION    55.05   495.47  3011.47     1  00:36
P4Junction-04+00      JUNCTION     0.02     0.22  3237.62     1  00:47
Pit4Dewatering        JUNCTION     0.00     0.00  2999.00     0  00:00
Pit4Underdrain        JUNCTION     0.00     0.00  2960.00     0  00:00
Pit3Dewatering        JUNCTION     0.00     0.00  2535.00     0  00:00
Pit3Underdrain        JUNCTION     0.00     0.00  2510.00     0  00:00
P3Junction-01+50      JUNCTION     2.02    18.21  2981.01     1  02:01
P4-WTP-79+00          JUNCTION     0.57     5.09  2577.09     1  02:24
Pit4Pit3Junction-72+00 JUNCTION     0.05     0.41  2636.01     1  00:45
BPAPit3Junction-23+77 JUNCTION     0.02     0.20  2777.00     1  01:16
BPAWetWell-13+00      JUNCTION     0.01     0.07  2818.07     1  01:45
GW-54                 JUNCTION     0.00     0.00  2834.35     0  00:00
GW-54-00+00.00        JUNCTION     1.16    10.44  2844.74     1  00:58
GW-54-03+00           JUNCTION     0.90     8.05  2835.55     1  02:39
P3Dewatering-00+00    JUNCTION     1.93    17.33  2981.73     1  01:43
P3Underdrain-01+00    JUNCTION     2.20    19.83  2981.63     1  02:01
P4Dewatering-00+00.00 JUNCTION     0.02     0.14  3244.64     1  00:00
P4Underdrain-00+00    JUNCTION     0.02     0.14  3260.34     1  00:00
P3-13+00              JUNCTION     0.03     0.24  2896.24     1  00:00
P4-30+00              JUNCTION     0.02     0.22  3040.12     1  00:21
P4-34+00              JUNCTION     0.02     0.16  3016.16     1  02:32
P4-39+00              JUNCTION     0.02     0.19  2947.69     1  01:57
P4-42+00              JUNCTION     0.02     0.18  2922.48     1  02:47
P4-45+00              JUNCTION     0.02     0.18  2894.48     1  00:00
P4-48+00              JUNCTION     0.02     0.19  2864.99     1  02:55
P4-50+00              JUNCTION     0.02     0.17  2848.77     1  00:01
P4-60+00              JUNCTION     0.02     0.17  2747.57     1  01:09
P4-74+00              JUNCTION     0.04     0.32  2618.32     1  00:52
P3J-12+00             JUNCTION     0.04     0.34  2664.34     1  00:40
P3J-10+00             JUNCTION     0.20     1.84  2672.94     1  01:57
P3J-07+00             JUNCTION     0.04     0.36  2687.06     1  01:22
```


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```
P3J-02+00            JUNCTION     0.04     0.37  2708.17     1  00:26
GW-54_Seepage_Junction JUNCTION     0.01     0.10  2830.60     1  01:29
GW-54-08+00          JUNCTION     0.34     3.08  2824.88     1  01:50
P3-16+00             JUNCTION     0.03     0.28  2849.68     1  00:58
P3-10+00             JUNCTION     0.03     0.23  2950.23     1  02:14
P3-04+00             JUNCTION     1.40    12.58  2972.78     1  01:44
P4-27+00             JUNCTION     0.02     0.18  3068.68     1  00:17
P4-09+00             JUNCTION     0.03     0.24  3212.14     1  00:36
P4-21+00             JUNCTION     0.02     0.19  3123.89     1  00:04
P4-24+00             JUNCTION     0.02     0.18  3098.18     1  02:24
P4-53+00             JUNCTION     0.02     0.17  2816.17     1  00:36
P4-56+00             JUNCTION     0.02     0.19  2783.09     1  02:35
P4-63+00             JUNCTION     0.02     0.18  2713.98     1  01:54
P4-70+00             JUNCTION     0.02     0.21  2651.01     1  00:49
P4-67+00             JUNCTION     0.02     0.19  2674.99     1  00:22
P4-77+00             JUNCTION     0.03     0.28  2592.68     1  00:12
P3-07+00             JUNCTION     0.66     5.90  2962.90     1  01:26
P3-19+00             JUNCTION     0.03     0.30  2821.10     1  00:06
P3J-05+00            JUNCTION     0.47     4.23  2695.53     1  01:58
P3J-14+00            JUNCTION     0.04     0.32  2652.32     1  01:57
GW-54-10+00          JUNCTION     0.01     0.12  2824.42     1  01:34
EastTrench_Pumped    JUNCTION     4.60    41.38  2589.51     1  01:51
EastTrench_06+00     JUNCTION     1.45    13.08  2585.01     1  01:51
EastTrench_22+00     JUNCTION     0.01     0.05  2531.29     1  01:35
EastTrench_27+00     JUNCTION     0.01     0.08  2434.54     1  00:41
EastTrench_36+00     JUNCTION     0.01     0.05  2391.66     1  01:35
CentralTrench_Bottom JUNCTION     0.00     0.00  2356.22     0  00:00
CentralTrench_Top_00+00 JUNCTION     0.01     0.10  2359.46     1  02:02
WetWell_Pumped       JUNCTION    25.48   229.31  2580.18     1  02:47
WestTrench_Bottom    JUNCTION     0.00     0.00  2343.11     0  00:00
WW-02+00             JUNCTION    22.76   204.84  2579.91     1  01:15
WW-06+00             JUNCTION    21.10   189.86  2579.11     1  00:43
WW-13+00             JUNCTION    11.75   105.71  2577.70     1  01:44
WW-19+00             JUNCTION     1.48    13.33  2577.20     1  00:12
WW-21+24.52          JUNCTION     0.53     4.79  2577.15     1  01:31
WETWELL              JUNCTION     0.14     1.29  2352.16     1  00:00
WestTrench_Top_00+00 JUNCTION     1.50    13.52  2356.63     1  00:53
EastTrench_14+00     JUNCTION     0.01     0.07  2577.97     1  00:10
EastTrench_Bottom    JUNCTION     0.00     0.00  2569.13     0  00:00
EastTrench_09+00     JUNCTION     0.58     5.23  2582.83     1  01:36
WW-04+00             JUNCTION    21.38   192.38  2579.51     1  01:15
WW-08+00             JUNCTION    20.05   180.41  2578.62     1  02:43
WW-10+00             JUNCTION    18.26   164.34  2577.93     1  02:15
WW-15+00             JUNCTION     8.97    80.76  2577.44     1  00:55
WW-17+00             JUNCTION     5.13    46.15  2577.25     1  00:12
WestTrench_Pumped    JUNCTION     1.51    13.62  2356.73     1  00:53
CentralTrench_Pumped JUNCTION     0.38     3.42  2359.64     1  01:55
EastTrench_Top_00+00 JUNCTION     2.29    20.58  2589.39     1  01:38
Seepage-0+00         JUNCTION     0.00     0.03  2647.25     1  00:01
Seepage-3+00         JUNCTION     0.01     0.05  2631.98     1  00:00
Seepage-4+81         JUNCTION     0.00     0.02  2627.11     1  00:00
Seepage2-0+00        JUNCTION     0.00     0.02  2661.07     1  00:00
Seepage-8+00         JUNCTION    13.66   122.92  2831.80     1  00:58
Seepage-11+00        JUNCTION     7.85    70.68  2831.10     1  00:03
SeepageWetWell       JUNCTION    22.83   205.46  2832.55     1  01:29
CollectionSump       JUNCTION     0.00     0.02  2650.02     1  00:02
P4-18+00             JUNCTION     0.02     0.20  3145.80     1  02:16
P4-15+00             JUNCTION     0.02     0.19  3171.69     1  02:25
P4-12+00             JUNCTION     0.02     0.19  3197.89     1  02:26
WTPOutfall           OUTFALL      0.06     0.50  2572.50     1  00:00


*******************
Node Inflow Summary
*******************

-------------------------------------------------------------------------------------
                                 Maximum  Maximum                  Lateral       Total
                                 Lateral    Total  Time of Max      Inflow      Inflow
                                  Inflow   Inflow   Occurrence      Volume      Volume
Node                 Type            GPM      GPM  days hr:min    10^6 gal    10^6 gal
```


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--------------------------------------------------------------------------------
P4DewateringDischarge JUNCTION      0.00    68.00     1  00:00       0.000       0.110
P4UnderdrainDischarge JUNCTION      0.00   128.00     1  00:00       0.000       0.207
P3DewateringDischarge JUNCTION      0.00   228.00     1  00:00       0.000       0.369
P3UnderdrainDischarge JUNCTION      0.00   366.00     1  00:00       0.000       0.593
P4Junction-04+00      JUNCTION      0.00   196.00     1  00:00       0.000       0.317
Pit4Dewatering        JUNCTION     68.00    68.00     1  00:00       0.012       0.110
Pit4Underdrain        JUNCTION    128.00   128.00     1  00:00       0.023       0.207
Pit3Dewatering        JUNCTION    228.00   228.00     1  00:00       0.041       0.369
Pit3Underdrain        JUNCTION    366.00   366.00     1  00:00       0.066       0.593
P3Junction-01+50      JUNCTION      0.00   594.00     1  02:08       0.000       0.961
P4-WTP-79+00          JUNCTION      0.00   890.00     1  02:24       0.000       1.436
Pit4Pit3Junction-72+00 JUNCTION      0.00   840.00     1  00:00       0.000       1.356
BPAPit3Junction-23+77 JUNCTION      0.00   644.00     1  00:28       0.000       1.042
BPAWetWell-13+00      JUNCTION      0.00    50.00     1  00:00       0.000       0.081
GW-54                 JUNCTION     40.00    40.00     1  00:00       0.007       0.065
GW-54-00+00.00        JUNCTION      0.00    40.00     1  00:00       0.000       0.065
GW-54-03+00           JUNCTION      0.00    40.00     1  02:56       0.000       0.065
P3Dewatering-00+00    JUNCTION      0.00   228.00     1  01:15       0.000       0.369
P3Underdrain-01+00    JUNCTION      0.00   366.00     1  01:30       0.000       0.593
P4Dewatering-00+00.00 JUNCTION      0.00    68.00     1  00:00       0.000       0.110
P4Underdrain-00+00    JUNCTION      0.00   128.00     1  00:00       0.000       0.207
P3-13+00              JUNCTION      0.00   594.00     1  00:00       0.000       0.961
P4-30+00              JUNCTION      0.00   196.00     1  00:00       0.000       0.316
P4-34+00              JUNCTION      0.00   196.00     1  02:29       0.000       0.316
P4-39+00              JUNCTION      0.00   196.00     1  00:20       0.000       0.315
P4-42+00              JUNCTION      0.00   196.00     1  00:48       0.000       0.315
P4-45+00              JUNCTION      0.00   196.00     1  01:03       0.000       0.315
P4-48+00              JUNCTION      0.00   196.00     1  00:00       0.000       0.315
P4-50+00              JUNCTION      0.00   196.00     1  00:01       0.000       0.315
P4-60+00              JUNCTION      0.00   196.00     1  00:20       0.000       0.314
P4-74+00              JUNCTION      0.00   845.00     1  02:17       0.000       1.363
P3J-12+00             JUNCTION      0.00   644.00     1  02:38       0.000       1.042
P3J-10+00             JUNCTION      0.00   644.00     1  00:00       0.000       1.042
P3J-07+00             JUNCTION      0.00   644.00     1  01:45       0.000       1.042
P3J-02+00             JUNCTION      0.00   644.00     1  00:02       0.000       1.042
GW-54_Seepage_Junction JUNCTION      0.00    50.00     1  02:01       0.000       0.081
GW-54-08+00           JUNCTION      0.00    50.00     1  00:00       0.000       0.081
P3-16+00              JUNCTION      0.00   594.00     1  00:00       0.000       0.961
P3-10+00              JUNCTION      0.00   594.00     1  01:26       0.000       0.961
P3-04+00              JUNCTION      0.00   594.00     1  01:30       0.000       0.961
P4-27+00              JUNCTION      0.00   196.00     1  00:00       0.000       0.316
P4-09+00              JUNCTION      0.00   196.00     1  00:00       0.000       0.317
P4-21+00              JUNCTION      0.00   196.00     1  00:21       0.000       0.316
P4-24+00              JUNCTION      0.00   196.00     1  00:21       0.000       0.316
P4-53+00              JUNCTION      0.00   196.00     1  01:10       0.000       0.315
P4-56+00              JUNCTION      0.00   196.00     1  00:01       0.000       0.315
P4-63+00              JUNCTION      0.00   196.00     1  00:00       0.000       0.314
P4-70+00              JUNCTION      0.00   196.00     1  00:00       0.000       0.314
P4-67+00              JUNCTION      0.00   196.00     1  00:00       0.000       0.314
P4-77+00              JUNCTION      0.00   845.00     1  00:45       0.000       1.363
P3-07+00              JUNCTION      0.00   594.00     1  01:59       0.000       0.961
P3-19+00              JUNCTION      0.00   594.00     1  00:00       0.000       0.961
P3J-05+00             JUNCTION      0.00   644.00     1  00:06       0.000       1.042
P3J-14+00             JUNCTION      0.00   644.00     1  00:40       0.000       1.042
GW-54-10+00           JUNCTION      0.00    50.00     1  01:51       0.000       0.081
EastTrench_Pumped     JUNCTION      0.00    15.00     1  00:00       0.000       0.024
EastTrench_06+00      JUNCTION      0.00    15.00     1  01:36       0.000       0.024
EastTrench_22+00      JUNCTION      0.00    15.00     1  01:34       0.000       0.024
EastTrench_27+00      JUNCTION      0.00    15.00     1  00:00       0.000       0.024
EastTrench_36+00      JUNCTION      0.00    15.00     1  01:35       0.000       0.025
CentralTrench_Bottom JUNCTION     15.00    15.00     1  00:00       0.003       0.024
CentralTrench_Top_00+00 JUNCTION      0.00    15.00     1  02:10       0.000       0.024
WetWell_Pumped        JUNCTION      0.00    45.00     1  00:05       0.000       0.074
WestTrench_Bottom     JUNCTION     15.00    15.00     1  00:00       0.003       0.024
WW-02+00              JUNCTION      0.00    45.00     1  02:26       0.000       0.074
WW-06+00              JUNCTION      0.00    45.00     1  02:26       0.000       0.074
WW-13+00              JUNCTION      0.00    45.00     1  02:26       0.000       0.073
WW-19+00              JUNCTION      0.00    45.00     1  00:31       0.000       0.073
WW-21+24.52           JUNCTION      0.00    45.00     1  02:03       0.000       0.073
WETWELL               JUNCTION      0.00    45.00     1  00:05       0.000       0.073
```


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WestTrench_Top_00+00	JUNCTION	0.00	15.00	1	01:03	0.000	0.024
EastTrench_14+00	JUNCTION	0.00	15.00	1	02:03	0.000	0.024
EastTrench_Bottom	JUNCTION	15.00	15.00	1	00:00	0.003	0.024
EastTrench_09+00	JUNCTION	0.00	15.00	1	02:50	0.000	0.024
WW-04+00	JUNCTION	0.00	45.00	1	01:30	0.000	0.074
WW-08+00	JUNCTION	0.00	45.00	1	02:26	0.000	0.074
WW-10+00	JUNCTION	0.00	45.00	1	02:26	0.000	0.074
WW-15+00	JUNCTION	0.00	45.00	1	01:24	0.000	0.073
WW-17+00	JUNCTION	0.00	45.00	1	01:47	0.000	0.073
WestTrench_Pumped	JUNCTION	0.00	15.00	1	00:00	0.000	0.024
CentralTrench_Pumped	JUNCTION	0.00	15.00	1	00:00	0.000	0.024
EastTrench_Top_00+00	JUNCTION	0.00	15.00	1	01:46	0.000	0.024
Seepage-0+00	JUNCTION	5.00	5.00	1	00:00	0.001	0.008
Seepage-3+00	JUNCTION	0.00	5.00	1	00:00	0.000	0.008
Seepage-4+81	JUNCTION	0.00	10.00	1	00:50	0.000	0.016
Seepage2-0+00	JUNCTION	5.00	5.00	1	00:00	0.001	0.008
Seepage-8+00	JUNCTION	0.00	10.00	1	02:56	0.000	0.016
Seepage-11+00	JUNCTION	0.00	10.00	1	02:43	0.000	0.016
SeepageWetWell	JUNCTION	0.00	10.00	1	00:50	0.000	0.016
CollectionSump	JUNCTION	5.00	5.00	1	00:00	0.001	0.008
P4-18+00	JUNCTION	0.00	196.00	1	00:00	0.000	0.316
P4-15+00	JUNCTION	0.00	196.00	1	01:21	0.000	0.316
P4-12+00	JUNCTION	0.00	196.00	1	00:05	0.000	0.316
WTPOutfall	OUTFALL	0.00	890.00	1	02:24	0.000	1.435

****
Node Surcharge Summary
****

Surcharging occurs when water rises above the top of the highest conduit.

Node	Type	Hours Surcharged	Max. Height Above Crown Feet	Min. Depth Below Rim Feet
P4DewateringDischarge	JUNCTION	3.00	245.978	0.000
P4UnderdrainDischarge	JUNCTION	3.00	302.525	0.000
P3DewateringDischarge	JUNCTION	3.00	449.094	0.000
P3UnderdrainDischarge	JUNCTION	3.00	495.141	0.000
Pit4Dewatering	JUNCTION	3.00	0.000	0.000
Pit4Underdrain	JUNCTION	3.00	0.000	0.000
Pit3Dewatering	JUNCTION	3.00	0.000	0.000
Pit3Underdrain	JUNCTION	3.00	0.000	0.000
P3Junction-01+50	JUNCTION	3.00	17.707	0.000
P4-WTP-79+00	JUNCTION	3.00	4.585	0.000
GW-54	JUNCTION	3.00	0.000	0.000
GW-54-00+00.00	JUNCTION	3.00	10.269	0.000
GW-54-03+00	JUNCTION	3.00	7.888	0.000
P3Dewatering-00+00	JUNCTION	3.00	16.835	0.000
P3Underdrain-01+00	JUNCTION	3.00	19.332	0.000
P3J-10+00	JUNCTION	3.00	1.340	3.160
GW-54-08+00	JUNCTION	3.00	2.749	1.918
P3-04+00	JUNCTION	3.00	12.078	0.000
P3-07+00	JUNCTION	3.00	5.403	0.000
P3J-05+00	JUNCTION	3.00	3.731	0.769
EastTrench_Pumped	JUNCTION	3.00	41.216	0.000
EastTrench_06+00	JUNCTION	3.00	12.912	0.000
CentralTrench_Bottom	JUNCTION	3.00	0.000	35.000
WetWell_Pumped	JUNCTION	3.00	223.980	0.000
WestTrench_Bottom	JUNCTION	3.00	0.000	16.000
WW-02+00	JUNCTION	3.00	204.505	0.000
WW-06+00	JUNCTION	3.00	189.528	0.000
WW-13+00	JUNCTION	3.00	105.373	0.000
WW-19+00	JUNCTION	3.00	12.999	0.000
WW-21+24.52	JUNCTION	3.00	4.461	15.206
WestTrench_Top_00+00	JUNCTION	3.00	13.354	0.000
EastTrench_Bottom	JUNCTION	3.00	0.000	21.000
EastTrench_09+00	JUNCTION	3.00	5.059	0.000
WW-04+00	JUNCTION	3.00	192.043	0.000
WW-08+00	JUNCTION	3.00	180.072	0.000

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WW-10+00	JUNCTION	3.00	164.003	0.000
WW-15+00	JUNCTION	3.00	80.428	0.000
WW-17+00	JUNCTION	3.00	45.822	0.000
WestTrench_Pumped	JUNCTION	3.00	13.452	2.381
CentralTrench_Pumped	JUNCTION	3.00	3.250	31.583
EastTrench_Top_00+00	JUNCTION	3.00	20.414	0.000
Seepage-8+00	JUNCTION	3.00	122.757	0.000
Seepage-11+00	JUNCTION	3.00	70.513	0.000
SeepageWetWell	JUNCTION	3.00	205.296	0.000

****
Node Flooding Summary
****

No nodes were flooded.

****
Outfall Loading Summary
****

Outfall Node	Flow Freq. Pcnt.	Avg. Flow GPM	Max. Flow GPM	Total Volume 10^6 gal
WTPOutfall	11.11	890.00	890.00	1.435
System	11.11	890.00	890.00	1.435

****
Link Flow Summary
****

Link	Type	Maximum |Flow| GPM	Time of Max Occurrence days hr:min	Maximum |Veloc| ft/sec	Max/ Full Flow	Max/ Full Depth
3	CONDUIT	128.00	1 00:00	4.31	0.03	0.71
4	CONDUIT	68.00	1 00:00	2.29	0.04	0.71
21	CONDUIT	228.00	1 01:15	5.83	0.13	1.00
23	CONDUIT	366.00	1 01:30	9.36	0.21	1.00
44	CONDUIT	840.00	1 02:17	12.11	0.95	0.73
48	CONDUIT	40.00	1 02:56	4.07	1.04	1.00
49	CONDUIT	40.00	1 00:04	4.78	1.11	0.79
55	CONDUIT	228.00	1 01:01	2.59	0.67	1.00
56	CONDUIT	366.00	1 02:47	4.15	0.79	1.00
57	CONDUIT	68.00	1 00:00	3.13	0.34	0.54
58	CONDUIT	128.00	1 00:00	5.90	0.34	0.54
59	CONDUIT	50.00	1 00:00	3.50	0.08	0.39
60	CONDUIT	594.00	1 00:00	13.06	0.46	0.51
61	CONDUIT	644.00	1 00:02	12.63	0.32	0.56
62	CONDUIT	196.00	1 00:00	6.78	0.78	0.69
63	CONDUIT	890.00	1 02:24	10.10	87.34	1.00
64	CONDUIT	594.00	1 01:30	6.74	1.78	1.00
66	CONDUIT	196.00	1 00:00	7.91	0.57	0.61
67	CONDUIT	196.00	1 02:29	8.38	0.72	0.58
68	CONDUIT	196.00	1 00:20	9.38	0.48	0.53
69	CONDUIT	196.00	1 00:48	8.73	0.61	0.56
70	CONDUIT	196.00	1 01:03	9.04	0.58	0.54
71	CONDUIT	196.00	1 00:00	8.71	0.56	0.56
72	CONDUIT	196.00	1 00:01	8.85	0.62	0.55
73	CONDUIT	196.00	1 00:20	9.10	0.59	0.54
74	CONDUIT	196.00	1 00:00	9.38	0.53	0.53
75	CONDUIT	644.00	1 01:45	8.00	1.30	0.86
76	CONDUIT	644.00	1 00:00	8.00	0.86	0.86
77	CONDUIT	644.00	1 02:38	8.12	1.04	0.84
78	CONDUIT	644.00	1 00:40	10.36	0.80	0.66

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80	CONDUIT	594.00	1	00:00	14.81	0.42	0.46
81	CONDUIT	50.00	1	00:00	1.87	0.17	0.65
99	CONDUIT	594.00	1	02:25	13.62	0.60	0.50
86	CONDUIT	845.00	1	00:00	11.42	0.57	0.78
87	CONDUIT	196.00	1	00:05	7.43	0.81	0.64
88	CONDUIT	196.00	1	00:00	9.11	0.56	0.54
89	CONDUIT	196.00	1	00:21	8.86	0.60	0.55
90	CONDUIT	196.00	1	01:10	9.53	0.54	0.52
92	CONDUIT	196.00	1	00:00	8.79	0.57	0.56
93	CONDUIT	196.00	1	00:00	7.95	0.62	0.60
94	CONDUIT	845.00	1	00:45	15.15	0.72	0.61
95	CONDUIT	196.00	1	00:01	9.07	0.53	0.54
96	CONDUIT	594.00	1	01:59	6.74	1.76	1.00
97	CONDUIT	594.00	1	01:26	8.65	1.19	0.73
98	CONDUIT	594.00	1	00:00	11.32	0.59	0.58
100	CONDUIT	644.00	1	00:06	7.94	0.84	0.87
101	CONDUIT	644.00	1	00:00	9.32	0.74	0.73
102	CONDUIT	196.00	1	00:00	5.73	0.73	0.82
104	CONDUIT	50.00	1	00:00	5.43	0.23	0.29
105	CONDUIT	50.00	1	01:51	1.75	0.30	0.69
118	CONDUIT	45.00	1	02:26	1.15	0.09	1.00
122	CONDUIT	45.00	1	02:03	1.15	0.05	1.00
128	CONDUIT	15.00	1	01:19	2.40	0.10	0.61
129	CONDUIT	15.00	1	02:46	2.57	0.58	0.57
130	CONDUIT	15.00	1	02:50	1.53	0.62	1.00
131	CONDUIT	15.00	1	02:03	1.98	3.48	0.72
132	CONDUIT	15.00	1	01:34	4.58	0.35	0.37
133	CONDUIT	15.00	1	00:00	4.34	0.19	0.38
134	CONDUIT	15.00	1	01:35	4.31	0.39	0.38
135	CONDUIT	15.00	1	00:43	6.08	0.19	0.30
136	CONDUIT	45.00	1	01:30	1.15	0.14	1.00
137	CONDUIT	45.00	1	02:26	1.15	0.36	1.00
138	CONDUIT	45.00	1	02:26	1.15	0.19	1.00
139	CONDUIT	45.00	1	02:26	1.15	0.17	1.00
140	CONDUIT	45.00	1	02:26	1.15	0.04	1.00
141	CONDUIT	45.00	1	01:24	1.15	0.08	1.00
142	CONDUIT	45.00	1	01:47	1.15	0.05	1.00
143	CONDUIT	45.00	1	00:31	1.15	0.02	1.00
144	CONDUIT	15.00	1	02:10	1.78	0.18	0.80
145	CONDUIT	15.00	1	01:03	1.53	9.37	1.00
146	CONDUIT	15.00	1	01:46	1.53	0.02	1.00
147	CONDUIT	15.00	1	01:36	1.53	1.18	1.00
148	CONDUIT	45.00	1	02:24	1.15	0.30	1.00
158	CONDUIT	5.00	1	00:00	2.73	0.08	0.24
159	CONDUIT	5.00	1	00:02	3.57	0.12	0.20
160	CONDUIT	10.00	1	02:56	1.02	0.07	1.00
161	CONDUIT	5.00	1	00:00	6.22	0.04	0.14
162	CONDUIT	10.00	1	02:43	1.02	0.09	1.00
163	CONDUIT	10.00	1	02:01	1.20	0.07	0.79
164	CONDUIT	5.00	1	00:00	0.19	0.00	0.35
165	CONDUIT	196.00	1	01:21	8.74	0.60	0.56
166	CONDUIT	196.00	1	00:00	8.38	0.60	0.58
167	CONDUIT	196.00	1	00:21	8.31	0.65	0.58
1	PUMP	128.00	1	00:00			
2	PUMP	68.00	1	00:00			
20	PUMP	228.00	1	00:00			
22	PUMP	366.00	1	00:00			
37	PUMP	40.00	1	00:00			
39	PUMP	45.00	1	00:05			
41	PUMP	15.00	1	00:00			
42	PUMP	15.00	1	00:00			
43	PUMP	15.00	1	00:00			
45	PUMP	10.00	1	00:50			

****
Flow Classification Summary
****

	Adjusted	--- Fraction of Time in Flow Class ----				Avg.	Avg.

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Conduit	/Actual Length	Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Froude Number	Flow Change
3	1.00	0.00	0.00	0.00	0.00	0.11	0.00	0.00	0.18	0.0000
4	1.00	0.00	0.00	0.00	0.11	0.00	0.00	0.00	0.10	0.0000
21	1.00	0.00	0.00	0.00	0.11	0.00	0.00	0.00	0.00	0.0000
23	1.00	0.00	0.00	0.00	0.11	0.00	0.00	0.00	0.00	0.0000
44	1.00	0.00	0.00	0.00	0.00	0.11	0.00	0.00	0.40	0.0000
48	1.00	0.00	0.00	0.00	0.11	0.00	0.00	0.00	0.00	0.0000
49	1.00	0.00	0.00	0.00	0.00	0.11	0.00	0.00	0.25	0.0000
55	1.00	0.00	0.00	0.00	0.11	0.00	0.00	0.00	0.00	0.0000
56	1.00	0.00	0.00	0.00	0.11	0.00	0.00	0.00	0.00	0.0000
57	1.00	0.00	0.00	0.00	0.00	0.11	0.00	0.00	0.16	0.0000
58	1.00	0.00	0.00	0.00	0.00	0.11	0.00	0.00	0.30	0.0000
59	1.00	0.00	0.00	0.00	0.00	0.11	0.00	0.00	0.22	0.0000
60	1.00	0.00	0.00	0.00	0.00	0.11	0.00	0.00	0.57	0.0000
61	1.00	0.00	0.00	0.00	0.00	0.11	0.00	0.00	0.52	0.0000
62	1.00	0.00	0.00	0.00	0.00	0.11	0.00	0.00	0.29	0.0000
63	1.00	0.00	0.00	0.00	0.11	0.00	0.00	0.00	0.00	0.0000
64	1.00	0.00	0.00	0.00	0.11	0.00	0.00	0.00	0.00	0.0000
66	1.00	0.00	0.00	0.00	0.00	0.11	0.00	0.00	0.38	0.0000
67	1.00	0.00	0.00	0.00	0.00	0.11	0.00	0.00	0.41	0.0000
68	1.00	0.00	0.00	0.00	0.00	0.11	0.00	0.00	0.49	0.0000
69	1.00	0.00	0.00	0.00	0.00	0.11	0.00	0.00	0.44	0.0000
70	1.00	0.00	0.00	0.00	0.00	0.11	0.00	0.00	0.46	0.0000
71	1.00	0.00	0.00	0.00	0.00	0.11	0.00	0.00	0.44	0.0000
72	1.00	0.00	0.00	0.00	0.00	0.11	0.00	0.00	0.45	0.0000
73	1.00	0.00	0.00	0.00	0.00	0.11	0.00	0.00	0.47	0.0000
74	1.00	0.00	0.00	0.00	0.00	0.11	0.00	0.00	0.49	0.0000
75	1.00	0.00	0.00	0.00	0.00	0.11	0.00	0.00	0.22	0.0000
76	1.00	0.00	0.00	0.00	0.00	0.11	0.00	0.00	0.22	0.0000
77	1.00	0.00	0.00	0.00	0.00	0.11	0.00	0.00	0.23	0.0000
78	1.00	0.00	0.00	0.00	0.00	0.11	0.00	0.00	0.37	0.0000
80	1.00	0.00	0.00	0.00	0.00	0.11	0.00	0.00	0.68	0.0000
81	1.00	0.00	0.00	0.00	0.11	0.00	0.00	0.00	0.08	0.0000
99	1.00	0.00	0.00	0.00	0.00	0.11	0.00	0.00	0.61	0.0000
86	1.00	0.00	0.00	0.00	0.00	0.11	0.00	0.00	0.35	0.0000
87	1.00	0.00	0.00	0.00	0.00	0.11	0.00	0.00	0.34	0.0000
88	1.00	0.00	0.00	0.00	0.00	0.11	0.00	0.00	0.47	0.0000
89	1.00	0.00	0.00	0.00	0.00	0.11	0.00	0.00	0.45	0.0000
90	1.00	0.00	0.00	0.00	0.00	0.11	0.00	0.00	0.50	0.0000
92	1.00	0.00	0.00	0.00	0.00	0.11	0.00	0.00	0.44	0.0000
93	1.00	0.00	0.00	0.00	0.00	0.11	0.00	0.00	0.38	0.0000
94	1.00	0.00	0.00	0.00	0.00	0.11	0.00	0.00	0.59	0.0000
95	1.00	0.00	0.00	0.00	0.00	0.11	0.00	0.00	0.47	0.0000
96	1.00	0.00	0.00	0.00	0.11	0.00	0.00	0.00	0.00	0.0000
97	1.00	0.00	0.00	0.00	0.00	0.11	0.00	0.00	0.29	0.0000
98	1.00	0.00	0.00	0.00	0.00	0.11	0.00	0.00	0.46	0.0000
100	1.00	0.00	0.00	0.00	0.00	0.11	0.00	0.00	0.21	0.0000
101	1.00	0.00	0.00	0.00	0.00	0.11	0.00	0.00	0.31	0.0000
102	1.00	0.00	0.00	0.00	0.00	0.11	0.00	0.00	0.21	0.0000
104	1.00	0.00	0.00	0.00	0.00	0.11	0.00	0.00	0.41	0.0000
105	1.00	0.00	0.00	0.00	0.11	0.00	0.00	0.00	0.08	0.0000
118	1.00	0.00	0.00	0.00	0.11	0.00	0.00	0.00	0.00	0.0000
122	1.00	0.00	0.00	0.00	0.11	0.00	0.00	0.00	0.00	0.0000
128	1.00	0.00	0.00	0.00	0.00	0.00	0.11	0.00	0.16	0.0000
129	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.11	0.18	0.0000
130	1.00	0.00	0.00	0.00	0.11	0.00	0.00	0.00	0.00	0.0000
131	1.00	0.00	0.00	0.00	0.00	0.11	0.00	0.00	0.12	0.0000
132	1.00	0.00	0.00	0.00	0.00	0.11	0.00	0.00	0.42	0.0000
133	1.00	0.00	0.00	0.00	0.00	0.11	0.00	0.00	0.39	0.0000
134	1.00	0.00	0.00	0.00	0.00	0.11	0.00	0.00	0.39	0.0000
135	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.11	0.63	0.0000
136	1.00	0.00	0.00	0.00	0.11	0.00	0.00	0.00	0.00	0.0000
137	1.00	0.00	0.00	0.00	0.11	0.00	0.00	0.00	0.00	0.0000
138	1.00	0.00	0.00	0.00	0.11	0.00	0.00	0.00	0.00	0.0000
139	1.00	0.00	0.00	0.00	0.11	0.00	0.00	0.00	0.00	0.0000
140	1.00	0.00	0.00	0.00	0.11	0.00	0.00	0.00	0.00	0.0000
141	1.00	0.00	0.00	0.00	0.11	0.00	0.00	0.00	0.00	0.0000
142	1.00	0.00	0.00	0.00	0.11	0.00	0.00	0.00	0.00	0.0000
143	1.00	0.00	0.00	0.00	0.11	0.00	0.00	0.00	0.00	0.0000

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144	1.00	0.00	0.00	0.00	0.11	0.00	0.00	0.00	0.09	0.0000
145	1.00	0.00	0.00	0.00	0.11	0.00	0.00	0.00	0.00	0.0000
146	1.00	0.00	0.00	0.00	0.11	0.00	0.00	0.00	0.00	0.0000
147	1.00	0.00	0.00	0.00	0.11	0.00	0.00	0.00	0.00	0.0000
148	1.00	0.00	0.00	0.00	0.11	0.00	0.00	0.00	0.00	0.0000
158	1.00	0.00	0.00	0.00	0.00	0.11	0.00	0.00	0.32	0.0000
159	1.00	0.00	0.00	0.00	0.00	0.11	0.00	0.00	0.46	0.0000
160	1.00	0.00	0.00	0.00	0.11	0.00	0.00	0.00	0.00	0.0000
161	1.00	0.00	0.00	0.00	0.00	0.11	0.00	0.00	0.97	0.0000
162	1.00	0.00	0.00	0.00	0.11	0.00	0.00	0.00	0.00	0.0000
163	1.00	0.00	0.00	0.00	0.11	0.00	0.00	0.00	0.06	0.0000
164	1.00	0.00	0.00	0.00	0.11	0.00	0.00	0.00	0.01	0.0000
165	1.00	0.00	0.00	0.00	0.00	0.11	0.00	0.00	0.44	0.0000
166	1.00	0.00	0.00	0.00	0.00	0.11	0.00	0.00	0.41	0.0000
167	1.00	0.00	0.00	0.00	0.00	0.11	0.00	0.00	0.41	0.0000

****
Conduit Surcharge Summary
****

Conduit	Hours Full Both Ends	Hours Full Upstream	Hours Full Dnstream	Hours Above Full Normal Flow	Hours Capacity Limited
21	3.00	3.00	3.00	0.01	0.01
23	3.00	3.00	3.00	0.01	0.01
48	3.00	3.00	3.00	3.00	3.00
49	0.01	0.01	0.01	3.00	0.01
55	3.00	3.00	3.00	0.01	0.01
56	3.00	3.00	3.00	0.01	0.01
63	3.00	3.00	3.00	3.00	3.00
64	3.00	3.00	3.00	3.00	3.00
75	0.01	0.01	0.01	3.00	0.01
77	0.01	0.01	0.01	3.00	0.01
96	3.00	3.00	3.00	3.00	3.00
97	0.01	0.01	0.01	3.00	0.01
118	3.00	3.00	3.00	0.01	0.01
122	3.00	3.00	3.00	0.01	0.01
130	3.00	3.00	3.00	0.01	0.01
131	0.01	0.01	0.01	3.00	0.01
136	3.00	3.00	3.00	0.01	0.01
137	3.00	3.00	3.00	0.01	0.01
138	3.00	3.00	3.00	0.01	0.01
139	3.00	3.00	3.00	0.01	0.01
140	3.00	3.00	3.00	0.01	0.01
141	3.00	3.00	3.00	0.01	0.01
142	3.00	3.00	3.00	0.01	0.01
143	3.00	3.00	3.00	0.01	0.01
145	3.00	3.00	3.00	3.00	3.00
146	3.00	3.00	3.00	0.01	0.01
147	3.00	3.00	3.00	3.00	0.01
148	3.00	3.00	3.00	0.01	0.01
160	3.00	3.00	3.00	0.01	0.01
162	3.00	3.00	3.00	0.01	0.01

****
Pumping Summary
****

Pump	Percent Utilized	Number of Start-Ups	Min Flow GPM	Avg Flow GPM	Max Flow GPM	Total Volume 10^6 gal	Power Usage Kw-hr	% Time Off Pump Curve Low	% Time Off Pump Curve High
1	11.11	0	0.00	128.00	128.00	0.023	21.92	0.0	0.0
2	11.11	0	0.00	68.00	68.00	0.012	9.47	0.0	0.0
20	11.11	0	0.00	228.00	228.00	0.041	59.11	0.0	0.0
22	11.11	0	0.00	366.00	366.00	0.066	103.80	0.0	0.0

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37	11.11	0	0.00	40.00	40.00	0.007	0.23	0.0	0.0
39	11.11	0	0.00	45.00	45.00	0.008	5.80	0.0	0.0
41	11.11	0	0.00	15.00	15.00	0.003	0.17	0.0	0.0
42	11.11	0	0.00	15.00	15.00	0.003	0.12	0.0	0.0
43	11.11	0	0.00	15.00	15.00	0.003	0.03	0.0	0.0
45	11.11	0	0.00	10.00	10.00	0.002	1.16	0.0	0.0

```
Analysis begun on:  Tue Jun 09 10:05:32 2015
Analysis ended on:  Tue Jun 09 10:05:40 2015
Total elapsed time: 00:00:08
```


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```
EPA STORM WATER MANAGEMENT MODEL - VERSION 5.0 (Build 5.0.022)
--------------------------------------------------------------

*********************************************************
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
*********************************************************

****************
Analysis Options
****************
Flow Units ............... GPM
Process Models:
  Rainfall/Runoff ........ NO
  Snowmelt ............... NO
  Groundwater ............ NO
  Flow Routing ........... YES
  Ponding Allowed ........ NO
  Water Quality .......... NO
Flow Routing Method ...... DYNWAVE
Starting Date ............ JUL-09-2012 00:00:00
Ending Date .............. JUL-12-2012 03:00:00
Antecedent Dry Days ...... 0.0
Report Time Step ......... 00:05:00
Routing Time Step ........ 10.00 sec


**************************        Volume         Volume
Flow Routing Continuity        acre-feet       10^6 gal
**************************     ---------      ---------
Dry Weather Inflow .......         0.000          0.000
Wet Weather Inflow .......         0.000          0.000
Groundwater Inflow .......         0.000          0.000
RDII Inflow ..............         0.000          0.000
External Inflow ..........         6.905          2.250
External Outflow .........         6.750          2.200
Internal Outflow .........         0.000          0.000
Storage Losses ...........         0.000          0.000
Initial Stored Volume ....         0.000          0.000
Final Stored Volume ......         0.124          0.041
Continuity Error (%) .....         0.436


***************************
Time-Step Critical Elements
***************************
Link 034 (99.58%)


********************************
Highest Flow Instability Indexes
********************************
All links are stable.


*************************
Routing Time Step Summary
*************************
Minimum Time Step           :     0.59 sec
Average Time Step           :     0.01 sec
Maximum Time Step           :     0.59 sec
Percent in Steady State     :     0.00
Average Iterations per Step :     0.03


******************
Node Depth Summary
******************
```

Node	Type	Average Depth Feet	Maximum Depth Feet	Maximum HGL Feet	Time of Max Occurrence days	hr:min
001+15.24	JUNCTION	0.01	0.45	2573.58	3	02:48
002+50.00	JUNCTION	0.01	0.39	2571.57	3	02:01
003+00.00	JUNCTION	0.00	0.35	2570.65	3	02:52
003+50.00	JUNCTION	0.00	0.28	2569.28	3	02:06
004+00.00	JUNCTION	0.00	0.26	2564.69	3	02:59
006+00.00	JUNCTION	0.00	0.31	2542.08	3	02:38
007+00.00	JUNCTION	0.00	0.31	2535.41	3	02:04
008+91.26	JUNCTION	0.00	0.27	2522.15	3	02:11
010+71.09	JUNCTION	0.00	0.27	2504.65	3	02:06
011+50.00	JUNCTION	0.00	0.28	2496.53	3	02:30
012+32.07	JUNCTION	0.00	0.35	2489.10	3	02:01
012+86.80	JUNCTION	0.00	0.24	2486.14	3	02:08
013+50.00	JUNCTION	0.00	0.28	2477.16	3	02:36
014+46.69	JUNCTION	0.01	0.40	2469.15	3	02:17
015+50.00	JUNCTION	0.01	0.40	2465.70	3	02:44
016+25.00	JUNCTION	0.00	0.30	2462.80	3	02:58
017+00.00	JUNCTION	0.00	0.29	2457.41	3	02:23
018+29.01	JUNCTION	0.00	0.28	2447.16	3	02:10
019+50.00	JUNCTION	0.00	0.31	2436.56	3	02:57
020+37.02	JUNCTION	0.00	0.33	2430.96	3	02:23
022+10.69	JUNCTION	0.00	0.31	2421.56	3	02:08
022+86.10	JUNCTION	0.01	0.39	2416.89	3	02:49
025+00.00	JUNCTION	0.01	0.43	2409.49	3	02:18
027+36.43	JUNCTION	0.01	0.44	2402.69	3	02:34
028+12.61	JUNCTION	0.01	0.40	2400.48	3	02:40
029+50.00	JUNCTION	0.00	0.32	2395.45	3	02:49
031+00.00	JUNCTION	0.00	0.29	2386.04	3	02:35
033+00.00	JUNCTION	0.00	0.31	2369.52	3	02:30
033+83.68	JUNCTION	0.00	0.29	2364.04	3	02:13
034+50.00	JUNCTION	0.00	0.30	2359.05	3	02:50
035+35.83	JUNCTION	0.01	0.41	2355.41	3	02:58
035+79.51	JUNCTION	0.00	0.30	2354.65	3	02:14
035+86.58	JUNCTION	0.01	0.41	2354.41	3	02:21
036+18.02	JUNCTION	0.00	0.37	2353.89	3	02:07
036+32.13	JUNCTION	0.01	0.49	2353.65	3	02:43
037+55.63	JUNCTION	0.00	0.37	2352.30	3	02:06
038+04.62	JUNCTION	0.01	0.38	2351.27	3	02:26
038+56.45	JUNCTION	0.00	0.36	2350.23	3	02:10
039+00.00	JUNCTION	0.00	0.36	2348.43	3	02:42
041+00.00	JUNCTION	0.00	0.30	2339.10	3	02:09
043+15.87	JUNCTION	0.00	0.25	2322.23	3	02:42
044+00.00	JUNCTION	0.00	0.25	2311.80	3	02:16
046+00.00	JUNCTION	0.00	0.29	2287.79	3	02:33
048+00.00	JUNCTION	0.00	0.27	2272.01	3	02:28
049+00.00	JUNCTION	0.00	0.26	2261.96	3	02:26
050+00.00	JUNCTION	0.00	0.27	2250.26	3	02:06
052+00.00	JUNCTION	0.00	0.27	2229.64	3	02:11
052+50.00	JUNCTION	0.00	0.33	2224.93	3	02:17
053+29.97	JUNCTION	0.00	0.26	2219.86	3	02:55
054+00.00	JUNCTION	0.00	0.25	2211.78	3	02:48
056+00.00	JUNCTION	0.00	0.29	2187.70	3	02:44
058+00.00	JUNCTION	0.00	0.28	2170.82	3	02:33
060+00.00	JUNCTION	0.00	0.26	2151.60	3	02:15
061+00.00	JUNCTION	0.00	0.26	2140.63	3	02:08
062+25.00	JUNCTION	0.00	0.27	2126.91	3	02:02
064+00.00	JUNCTION	0.00	0.28	2110.53	3	02:19
065+25.16	JUNCTION	0.00	0.27	2099.23	3	02:27
067+00.00	JUNCTION	0.00	0.29	2081.71	3	02:17
068+18.92	JUNCTION	0.00	0.23	2070.83	3	02:26
068+50.46	JUNCTION	0.00	0.26	2065.83	3	02:17
068+90.01	JUNCTION	0.00	0.25	2061.47	3	02:00
069+50.00	JUNCTION	0.00	0.35	2053.94	3	02:07
070+50.00	JUNCTION	0.00	0.28	2043.49	3	02:52
071+50.00	JUNCTION	0.00	0.34	2034.45	3	02:15
072+00.00	JUNCTION	0.00	0.29	2031.83	3	02:02

072+50.00	JUNCTION	0.00	0.29	2027.69	3	02:03
073+89.10	JUNCTION	0.00	0.32	2016.31	3	02:03
074+00.00	JUNCTION	0.00	0.34	2015.67	3	02:51
076+00.00	JUNCTION	0.01	0.40	2006.21	3	02:26
076+51.61	JUNCTION	0.00	0.29	2004.20	3	02:22
077+18.30	JUNCTION	0.01	0.40	1999.12	3	02:15
078+89.84	JUNCTION	0.00	0.34	1992.93	3	02:07
080+94.64	JUNCTION	0.00	0.32	1982.26	3	02:08
083+00.00	JUNCTION	0.00	0.34	1970.10	3	02:08
084+50.00	JUNCTION	0.01	0.41	1962.78	3	02:23
085+38.96	JUNCTION	0.01	0.38	1959.85	3	02:07
086+00.00	JUNCTION	0.01	0.39	1957.66	3	02:44
087+00.00	JUNCTION	0.00	0.36	1954.05	3	02:01
088+10.00	JUNCTION	0.01	0.44	1949.52	3	02:28
089+98.47	JUNCTION	0.00	0.29	1943.24	3	02:04
091+50.00	JUNCTION	0.00	0.37	1935.91	3	02:25
093+19.34	JUNCTION	0.00	0.34	1932.20	3	02:33
094+50.00	JUNCTION	0.00	0.28	1928.23	3	02:32
095+79.46	JUNCTION	0.00	0.35	1921.73	3	02:50
097+00.00	JUNCTION	0.01	0.44	1916.27	3	02:06
099+00.00	JUNCTION	0.00	0.31	1909.77	3	02:39
100+75.38	JUNCTION	0.00	0.32	1898.36	3	02:45
102+03.79	JUNCTION	0.00	0.27	1890.18	3	02:02
103+00.00	JUNCTION	0.00	0.34	1880.73	3	02:55
104+13.29	JUNCTION	0.00	0.30	1874.63	3	02:55
105+92.76	JUNCTION	0.00	0.33	1862.13	3	02:35
107+00.00	JUNCTION	0.01	0.40	1856.26	3	02:19
109+00.00	JUNCTION	0.01	0.39	1849.63	3	02:04
109+96.42	JUNCTION	0.01	0.41	1846.35	3	02:02
111+31.48	JUNCTION	0.00	0.35	1841.72	3	02:48
112+94.08	JUNCTION	0.01	0.41	1834.54	3	02:10
114+95.66	JUNCTION	0.01	0.39	1828.12	3	02:21
116+50.00	JUNCTION	0.01	0.38	1822.59	3	02:56
118+15.61	JUNCTION	0.00	0.36	1816.46	3	02:21
120+00.00	JUNCTION	0.00	0.36	1808.85	3	02:04
121+33.86	JUNCTION	0.00	0.30	1802.59	3	02:04
122+81.24	JUNCTION	0.00	0.27	1791.93	3	02:03
124+00.00	JUNCTION	0.00	0.37	1784.98	3	02:18
125+43.38	JUNCTION	0.00	0.31	1781.78	3	02:33
126+00.00	JUNCTION	0.00	0.34	1779.71	3	02:48
128+00.00	JUNCTION	0.01	0.39	1774.52	3	02:25
129+00.00	JUNCTION	0.01	0.40	1772.78	3	02:37
130+50.00	JUNCTION	0.01	0.38	1767.64	3	02:03
131+60.75	JUNCTION	0.01	0.40	1763.50	3	02:26
132+42.82	JUNCTION	0.01	0.39	1760.80	3	02:25
133+00.00	JUNCTION	0.00	0.31	1758.59	3	02:06
134+05.39	JUNCTION	0.00	0.26	1751.38	3	02:37
134+93.24	JUNCTION	0.00	0.33	1741.98	3	02:20
136+80.72	JUNCTION	0.00	0.32	1731.92	3	02:13
137+53.72	JUNCTION	0.00	0.29	1727.33	3	02:32
138+50.00	JUNCTION	0.00	0.33	1720.05	3	02:11
139+84.10	JUNCTION	0.01	0.39	1712.99	3	02:54
141+00.00	JUNCTION	0.00	0.37	1708.79	3	02:15
141+50.00	JUNCTION	0.00	0.37	1706.79	3	02:18
142+26.60	JUNCTION	0.01	0.38	1703.75	3	02:55
143+11.42	JUNCTION	0.00	0.30	1700.24	3	02:24
144+50.00	JUNCTION	0.01	0.44	1690.54	3	02:06
146+50.00	JUNCTION	0.00	0.26	1683.63	3	02:15
147+60.86	JUNCTION	0.00	0.33	1671.83	3	02:37
149+50.00	JUNCTION	0.00	0.31	1661.58	3	02:43
150+62.30	JUNCTION	0.00	0.34	1654.56	3	02:29
152+25.00	JUNCTION	0.00	0.34	1646.29	3	02:29
154+10.11	JUNCTION	0.01	0.39	1637.50	3	02:08
155+50.00	JUNCTION	0.00	0.31	1632.03	3	02:05
156+87.10	JUNCTION	0.00	0.37	1623.59	3	02:41
158+08.07	JUNCTION	0.00	0.32	1618.45	3	02:59
159+50.00	JUNCTION	0.00	0.34	1610.01	3	02:02
160+50.00	JUNCTION	0.00	0.34	1605.01	3	02:25
161+50.00	JUNCTION	0.00	0.31	1599.87	3	02:38
162+81.61	JUNCTION	0.00	0.30	1590.85	3	02:58
164+00.00	JUNCTION	0.00	0.32	1582.28	3	02:30

165+70.08	JUNCTION	0.00	0.30	1571.81	3	02:09
167+28.99	JUNCTION	0.00	0.32	1560.30	3	02:09
168+77.98	JUNCTION	0.00	0.34	1551.45	3	02:14
170+00.00	JUNCTION	0.00	0.33	1545.23	3	02:13
170+95.00	JUNCTION	0.00	0.33	1540.11	3	02:02
172+09.84	JUNCTION	0.00	0.37	1534.22	3	02:53
172+55.74	JUNCTION	0.00	0.28	1532.11	3	02:21
174+60.00	JUNCTION	0.00	0.36	1521.17	3	02:14
176+00.00	JUNCTION	0.00	0.35	1518.05	3	02:13
177+11.84	JUNCTION	0.01	0.49	1515.35	3	02:44
179+00.00	JUNCTION	0.01	0.39	1513.36	3	02:17
180+97.24	JUNCTION	0.01	0.40	1510.02	3	02:24
182+70.80	JUNCTION	0.00	0.34	1506.95	3	02:36
184+10.84	JUNCTION	0.01	0.48	1503.07	3	02:51
185+67.46	JUNCTION	0.00	0.36	1501.27	3	02:43
186+75.00	JUNCTION	0.00	0.27	1498.30	3	02:36
188+24.66	JUNCTION	0.00	0.28	1488.12	3	02:59
189+50.00	JUNCTION	0.00	0.27	1480.89	3	02:32
190+53.43	JUNCTION	0.00	0.33	1474.35	3	02:19
192+13.56	JUNCTION	0.01	0.44	1469.47	3	02:06
194+00.00	JUNCTION	0.01	0.49	1467.20	3	02:31
195+68.22	JUNCTION	0.00	0.29	1465.13	3	02:09
197+00.00	JUNCTION	0.00	0.27	1458.46	3	02:10
198+50.00	JUNCTION	0.00	0.33	1449.60	3	02:12
200+22.48	JUNCTION	0.00	0.37	1444.25	3	02:48
201+50.00	JUNCTION	0.00	0.32	1441.32	3	02:24
203+00.00	JUNCTION	0.00	0.36	1436.09	3	02:08
204+25.08	JUNCTION	0.01	0.50	1433.51	3	02:43
206+00.00	JUNCTION	0.00	0.32	1431.56	3	02:29
207+69.77	JUNCTION	0.00	0.27	1425.35	3	02:22
209+38.58	JUNCTION	0.00	0.28	1414.53	3	02:48
210+50.00	JUNCTION	0.01	0.38	1408.78	3	02:22
211+76.83	JUNCTION	0.01	0.38	1406.37	3	02:01
213+12.04	JUNCTION	0.01	0.46	1403.96	3	02:00
214+50.00	JUNCTION	0.00	0.27	1401.96	3	02:34
216+00.00	JUNCTION	0.00	0.28	1392.83	3	02:01
217+50.00	JUNCTION	0.00	0.36	1385.12	3	02:40
218+35.17	JUNCTION	0.00	0.33	1383.00	3	02:20
219+85.42	JUNCTION	0.00	0.34	1378.22	3	02:29
221+00.00	JUNCTION	0.01	0.46	1375.22	3	02:25
221+86.88	JUNCTION	0.01	0.40	1374.21	3	02:48
223+50.00	JUNCTION	0.00	0.32	1371.29	3	02:40
225+00.00	JUNCTION	0.01	0.40	1366.31	3	02:21
226+26.32	JUNCTION	0.00	0.28	1363.76	3	02:41
227+50.00	JUNCTION	0.00	0.31	1357.44	3	02:32
229+00.00	JUNCTION	0.00	0.29	1351.32	3	02:10
230+50.00	JUNCTION	0.00	0.32	1344.34	3	02:43
232+00.00	JUNCTION	0.00	0.35	1339.50	3	02:45
234+06.14	JUNCTION	0.00	0.32	1333.88	3	02:30
235+50.00	JUNCTION	0.01	0.43	1329.25	3	02:16
237+00.00	JUNCTION	0.01	0.55	1327.45	3	02:20
238+50.00	JUNCTION	0.01	0.52	1326.32	3	02:38
240+00.00	JUNCTION	0.01	0.51	1325.10	3	02:21
241+50.00	JUNCTION	0.01	0.42	1323.72	3	02:38
242+50.00	JUNCTION	0.01	0.53	1322.40	3	02:00
243+29.25	JUNCTION	0.01	0.42	1321.70	3	02:14
244+47.58	JUNCTION	0.01	0.49	1320.12	3	02:30
245+50.00	JUNCTION	0.01	0.48	1319.17	3	02:08
246+78.73	JUNCTION	0.01	0.40	1317.76	3	02:08
248+50.00	JUNCTION	0.00	0.34	1314.60	3	02:16
249+00.00	JUNCTION	0.00	0.21	1312.77	3	02:09
249+88.66	JUNCTION	0.15	11.60	1307.25	3	02:19
251+00.00	JUNCTION	0.30	22.78	1306.42	3	02:19
252+28.63	JUNCTION	0.46	34.20	1305.91	3	02:19
253+10.73	JUNCTION	0.47	35.03	1305.58	3	02:28
254+50.00	JUNCTION	0.51	37.91	1305.03	3	02:28
255+79.58	JUNCTION	0.54	40.66	1304.51	3	02:28
256+21.72	JUNCTION	0.58	43.41	1304.34	3	02:28
257+27.54	JUNCTION	0.58	43.12	1303.75	3	02:33
257+65.86	JUNCTION	0.59	43.88	1303.60	3	02:28
258+25.85	JUNCTION	0.60	44.96	1303.36	3	02:33

259+40.73	JUNCTION	0.61	45.73	1302.90	3	02:33
261+38.29	JUNCTION	0.64	48.22	1302.11	3	02:19
263+00.00	JUNCTION	0.64	48.12	1301.47	3	02:09
264+12.68	JUNCTION	0.64	48.13	1301.02	3	02:19
264+52.58	JUNCTION	0.71	53.03	1300.41	3	02:19
264+80.35	JUNCTION	0.75	56.29	1300.30	3	02:19
265+45.39	JUNCTION	0.75	56.04	1299.93	3	02:09
266+47.14	JUNCTION	0.76	56.76	1299.52	3	02:31
266+91.11	JUNCTION	0.86	64.34	1298.94	3	02:31
266+94.21	JUNCTION	0.87	64.96	1298.93	3	02:31
267+47.77	JUNCTION	0.87	64.96	1298.71	3	02:31
268+50.00	JUNCTION	0.88	65.68	1298.30	3	02:17
268+87.00	JUNCTION	0.88	65.98	1298.15	3	02:17
269+18.09	JUNCTION	0.98	73.73	1298.03	3	02:18
270+00.00	JUNCTION	0.98	73.63	1297.43	3	02:09
270+44.61	JUNCTION	0.99	73.87	1297.25	3	02:09
271+93.60	JUNCTION	1.06	79.21	1296.66	3	02:17
272+34.30	JUNCTION	1.10	82.60	1296.49	3	02:21
272+86.27	JUNCTION	1.10	82.38	1296.29	3	02:09
273+48.36	JUNCTION	1.10	82.47	1296.04	3	02:31
273+82.81	JUNCTION	1.10	82.57	1295.90	3	02:18
274+06.70	JUNCTION	1.10	82.56	1295.81	3	02:18
274+79.84	JUNCTION	1.10	82.69	1295.51	3	02:18
275+40.21	JUNCTION	1.10	82.71	1295.27	3	02:09
276+01.53	JUNCTION	1.21	90.84	1294.79	3	02:09
276+87.65	JUNCTION	1.21	90.96	1294.45	3	02:09
278+00.00	JUNCTION	1.22	91.57	1294.00	3	02:17
279+47.70	JUNCTION	1.30	97.30	1293.41	3	02:17
280+25.36	JUNCTION	1.33	99.81	1293.10	3	02:17
281+41.69	JUNCTION	1.44	107.77	1292.64	3	02:49
281+59.21	JUNCTION	1.45	108.53	1292.57	3	02:55
282+12.22	JUNCTION	1.45	108.27	1292.35	3	02:49
283+00.00	JUNCTION	1.44	107.74	1292.00	3	02:55
284+38.45	JUNCTION	1.46	109.48	1291.24	3	02:55
286+30.88	JUNCTION	1.56	116.68	1290.68	3	02:09
OutfallDiffuser	OUTFALL	1.50	112.00	1290.00	3	02:00

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Node Inflow Summary
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Node	Type	Maximum Lateral Inflow GPM	Maximum Total Inflow GPM	Time of Max Occurrence days hr:min		Lateral Inflow Volume 10^6 gal	Total Inflow Volume 10^6 gal
001+15.24	JUNCTION	500.00	500.00	3	02:00	0.030	2.250
002+50.00	JUNCTION	0.00	500.00	3	02:48	0.000	2.250
003+00.00	JUNCTION	0.00	500.00	3	02:42	0.000	2.249
003+50.00	JUNCTION	0.00	500.00	3	02:00	0.000	2.249
004+00.00	JUNCTION	0.00	500.00	3	02:12	0.000	2.249
006+00.00	JUNCTION	0.00	500.00	3	02:00	0.000	2.249
007+00.00	JUNCTION	0.00	500.00	3	02:00	0.000	2.249
008+91.26	JUNCTION	0.00	500.00	3	02:18	0.000	2.249
010+71.09	JUNCTION	0.00	500.00	3	02:24	0.000	2.249
011+50.00	JUNCTION	0.00	500.00	3	02:05	0.000	2.249
012+32.07	JUNCTION	0.00	500.00	3	02:00	0.000	2.248
012+86.80	JUNCTION	0.00	500.00	3	02:01	0.000	2.248
013+50.00	JUNCTION	0.00	500.00	3	02:00	0.000	2.248
014+46.69	JUNCTION	0.00	500.00	3	02:00	0.000	2.248
015+50.00	JUNCTION	0.00	500.00	3	02:08	0.000	2.248
016+25.00	JUNCTION	0.00	500.00	3	02:44	0.000	2.248
017+00.00	JUNCTION	0.00	500.00	3	02:59	0.000	2.248
018+29.01	JUNCTION	0.00	500.00	3	02:59	0.000	2.248
019+50.00	JUNCTION	0.00	500.00	3	02:10	0.000	2.248
020+37.02	JUNCTION	0.00	500.00	3	02:00	0.000	2.247
022+10.69	JUNCTION	0.00	500.00	3	02:33	0.000	2.247
022+86.10	JUNCTION	0.00	500.00	3	02:00	0.000	2.247
025+00.00	JUNCTION	0.00	500.00	3	02:03	0.000	2.247

027+36.43	JUNCTION	0.00	500.00	3	02:00	0.000	2.246
028+12.61	JUNCTION	0.00	500.00	3	02:18	0.000	2.246
029+50.00	JUNCTION	0.00	500.00	3	02:40	0.000	2.246
031+00.00	JUNCTION	0.00	500.00	3	02:03	0.000	2.246
033+00.00	JUNCTION	0.00	500.00	3	02:00	0.000	2.246
033+83.68	JUNCTION	0.00	500.00	3	02:22	0.000	2.246
034+50.00	JUNCTION	0.00	500.00	3	02:00	0.000	2.245
035+35.83	JUNCTION	0.00	500.00	3	02:00	0.000	2.245
035+79.51	JUNCTION	0.00	500.00	3	02:59	0.000	2.245
035+86.58	JUNCTION	0.00	500.00	3	02:19	0.000	2.245
036+18.02	JUNCTION	0.00	500.00	3	02:00	0.000	2.245
036+32.13	JUNCTION	0.00	500.00	3	02:34	0.000	2.245
037+55.63	JUNCTION	0.00	500.00	3	02:59	0.000	2.245
038+04.62	JUNCTION	0.00	500.00	3	02:00	0.000	2.245
038+56.45	JUNCTION	0.00	500.00	3	02:26	0.000	2.245
039+00.00	JUNCTION	0.00	500.00	3	02:26	0.000	2.244
041+00.00	JUNCTION	0.00	500.00	3	02:42	0.000	2.244
043+15.87	JUNCTION	0.00	500.00	3	02:42	0.000	2.244
044+00.00	JUNCTION	0.00	500.00	3	02:26	0.000	2.244
046+00.00	JUNCTION	0.00	500.00	3	02:00	0.000	2.244
048+00.00	JUNCTION	0.00	500.00	3	02:33	0.000	2.244
049+00.00	JUNCTION	0.00	500.00	3	02:26	0.000	2.243
050+00.00	JUNCTION	0.00	500.00	3	02:00	0.000	2.243
052+00.00	JUNCTION	0.00	500.00	3	02:01	0.000	2.243
052+50.00	JUNCTION	0.00	500.00	3	02:00	0.000	2.243
053+29.97	JUNCTION	0.00	500.00	3	02:36	0.000	2.243
054+00.00	JUNCTION	0.00	500.00	3	02:38	0.000	2.243
056+00.00	JUNCTION	0.00	500.00	3	02:00	0.000	2.243
058+00.00	JUNCTION	0.00	500.00	3	02:33	0.000	2.243
060+00.00	JUNCTION	0.00	500.00	3	02:11	0.000	2.242
061+00.00	JUNCTION	0.00	500.00	3	02:06	0.000	2.242
062+25.00	JUNCTION	0.00	500.00	3	02:00	0.000	2.242
064+00.00	JUNCTION	0.00	500.00	3	02:00	0.000	2.242
065+25.16	JUNCTION	0.00	500.00	3	02:00	0.000	2.242
067+00.00	JUNCTION	0.00	500.00	3	02:00	0.000	2.242
068+18.92	JUNCTION	0.00	500.00	3	02:17	0.000	2.241
068+50.46	JUNCTION	0.00	500.00	3	02:00	0.000	2.241
068+90.01	JUNCTION	0.00	500.00	3	02:04	0.000	2.241
069+50.00	JUNCTION	0.00	500.00	3	02:00	0.000	2.241
070+50.00	JUNCTION	0.00	500.00	3	02:39	0.000	2.241
071+50.00	JUNCTION	0.00	500.00	3	02:00	0.000	2.241
072+00.00	JUNCTION	0.00	500.00	3	02:10	0.000	2.241
072+50.00	JUNCTION	0.00	500.00	3	02:56	0.000	2.241
073+89.10	JUNCTION	0.00	500.00	3	02:00	0.000	2.241
074+00.00	JUNCTION	0.00	500.00	3	02:00	0.000	2.241
076+00.00	JUNCTION	0.00	500.00	3	02:00	0.000	2.240
076+51.61	JUNCTION	0.00	500.00	3	02:41	0.000	2.240
077+18.30	JUNCTION	0.00	500.00	3	02:08	0.000	2.240
078+89.84	JUNCTION	0.00	500.00	3	02:06	0.000	2.240
080+94.64	JUNCTION	0.00	500.00	3	02:08	0.000	2.240
083+00.00	JUNCTION	0.00	500.00	3	02:00	0.000	2.239
084+50.00	JUNCTION	0.00	500.00	3	02:00	0.000	2.239
085+38.96	JUNCTION	0.00	500.00	3	02:08	0.000	2.239
086+00.00	JUNCTION	0.00	500.00	3	02:00	0.000	2.239
087+00.00	JUNCTION	0.00	500.00	3	02:08	0.000	2.239
088+10.00	JUNCTION	0.00	500.00	3	02:00	0.000	2.239
089+98.47	JUNCTION	0.00	500.00	3	02:25	0.000	2.238
091+50.00	JUNCTION	0.00	500.00	3	02:00	0.000	2.238
093+19.34	JUNCTION	0.00	500.00	3	02:41	0.000	2.238
094+50.00	JUNCTION	0.00	500.00	3	02:05	0.000	2.238
095+79.46	JUNCTION	0.00	500.00	3	02:00	0.000	2.237
097+00.00	JUNCTION	0.00	500.00	3	02:00	0.000	2.237
099+00.00	JUNCTION	0.00	500.00	3	02:12	0.000	2.237
100+75.38	JUNCTION	0.00	500.00	3	02:00	0.000	2.237
102+03.79	JUNCTION	0.00	500.00	3	02:09	0.000	2.237
103+00.00	JUNCTION	0.00	500.00	3	02:00	0.000	2.237
104+13.29	JUNCTION	0.00	500.00	3	02:05	0.000	2.236
105+92.76	JUNCTION	0.00	500.00	3	02:00	0.000	2.236
107+00.00	JUNCTION	0.00	500.00	3	02:00	0.000	2.236
109+00.00	JUNCTION	0.00	500.00	3	02:55	0.000	2.236
109+96.42	JUNCTION	0.00	500.00	3	02:08	0.000	2.236

111+31.48	JUNCTION	0.00	500.00	3	02:13	0.000	2.235
112+94.08	JUNCTION	0.00	500.00	3	02:00	0.000	2.235
114+95.66	JUNCTION	0.00	500.00	3	02:56	0.000	2.235
116+50.00	JUNCTION	0.00	500.00	3	02:12	0.000	2.235
118+15.61	JUNCTION	0.00	500.00	3	02:00	0.000	2.234
120+00.00	JUNCTION	0.00	500.00	3	02:04	0.000	2.234
121+33.86	JUNCTION	0.00	500.00	3	02:04	0.000	2.234
122+81.24	JUNCTION	0.00	500.00	3	02:00	0.000	2.234
124+00.00	JUNCTION	0.00	500.00	3	02:03	0.000	2.234
125+43.38	JUNCTION	0.00	500.00	3	02:10	0.000	2.233
126+00.00	JUNCTION	0.00	500.00	3	02:05	0.000	2.233
128+00.00	JUNCTION	0.00	500.00	3	02:00	0.000	2.233
129+00.00	JUNCTION	0.00	500.00	3	02:00	0.000	2.233
130+50.00	JUNCTION	0.00	500.00	3	02:05	0.000	2.233
131+60.75	JUNCTION	0.00	500.00	3	02:00	0.000	2.232
132+42.82	JUNCTION	0.00	500.00	3	02:31	0.000	2.232
133+00.00	JUNCTION	0.00	500.00	3	02:31	0.000	2.232
134+05.39	JUNCTION	0.00	500.00	3	02:25	0.000	2.232
134+93.24	JUNCTION	0.00	500.00	3	02:00	0.000	2.232
136+80.72	JUNCTION	0.00	500.00	3	02:57	0.000	2.232
137+53.72	JUNCTION	0.00	500.00	3	02:15	0.000	2.232
138+50.00	JUNCTION	0.00	500.00	3	02:00	0.000	2.231
139+84.10	JUNCTION	0.00	500.00	3	02:00	0.000	2.231
141+00.00	JUNCTION	0.00	500.00	3	02:15	0.000	2.231
141+50.00	JUNCTION	0.00	500.00	3	02:31	0.000	2.231
142+26.60	JUNCTION	0.00	500.00	3	02:00	0.000	2.231
143+11.42	JUNCTION	0.00	500.00	3	02:15	0.000	2.231
144+50.00	JUNCTION	0.00	500.00	3	02:00	0.000	2.231
146+50.00	JUNCTION	0.00	500.00	3	02:17	0.000	2.230
147+60.86	JUNCTION	0.00	500.00	3	02:00	0.000	2.230
149+50.00	JUNCTION	0.00	500.00	3	02:29	0.000	2.230
150+62.30	JUNCTION	0.00	500.00	3	02:00	0.000	2.230
152+25.00	JUNCTION	0.00	500.00	3	02:00	0.000	2.230
154+10.11	JUNCTION	0.00	500.00	3	02:00	0.000	2.229
155+50.00	JUNCTION	0.00	500.00	3	02:18	0.000	2.229
156+87.10	JUNCTION	0.00	500.00	3	02:00	0.000	2.229
158+08.07	JUNCTION	0.00	500.00	3	02:29	0.000	2.229
159+50.00	JUNCTION	0.00	500.00	3	02:00	0.000	2.229
160+50.00	JUNCTION	0.00	500.00	3	02:00	0.000	2.228
161+50.00	JUNCTION	0.00	500.00	3	02:22	0.000	2.228
162+81.61	JUNCTION	0.00	500.00	3	02:54	0.000	2.228
164+00.00	JUNCTION	0.00	500.00	3	02:00	0.000	2.228
165+70.08	JUNCTION	0.00	500.00	3	02:00	0.000	2.228
167+28.99	JUNCTION	0.00	500.00	3	02:00	0.000	2.228
168+77.98	JUNCTION	0.00	500.00	3	02:00	0.000	2.228
170+00.00	JUNCTION	0.00	500.00	3	02:14	0.000	2.227
170+95.00	JUNCTION	0.00	500.00	3	02:00	0.000	2.227
172+09.84	JUNCTION	0.00	500.00	3	02:00	0.000	2.227
172+55.74	JUNCTION	0.00	500.00	3	02:03	0.000	2.227
174+60.00	JUNCTION	0.00	500.00	3	02:00	0.000	2.227
176+00.00	JUNCTION	0.00	500.00	3	02:15	0.000	2.226
177+11.84	JUNCTION	0.00	500.00	3	02:00	0.000	2.226
179+00.00	JUNCTION	0.00	500.00	3	02:30	0.000	2.226
180+97.24	JUNCTION	0.00	500.00	3	02:00	0.000	2.226
182+70.80	JUNCTION	0.00	500.00	3	02:30	0.000	2.225
184+10.84	JUNCTION	0.00	500.00	3	02:00	0.000	2.225
185+67.46	JUNCTION	0.00	500.00	3	02:22	0.000	2.225
186+75.00	JUNCTION	0.00	500.00	3	02:08	0.000	2.224
188+24.66	JUNCTION	0.00	500.00	3	02:38	0.000	2.224
189+50.00	JUNCTION	0.00	500.00	3	02:06	0.000	2.224
190+53.43	JUNCTION	0.00	500.00	3	02:19	0.000	2.224
192+13.56	JUNCTION	0.00	500.00	3	02:00	0.000	2.224
194+00.00	JUNCTION	0.00	500.00	3	02:00	0.000	2.223
195+68.22	JUNCTION	0.00	500.00	3	02:06	0.000	2.223
197+00.00	JUNCTION	0.00	500.00	3	02:18	0.000	2.223
198+50.00	JUNCTION	0.00	500.00	3	02:00	0.000	2.223
200+22.48	JUNCTION	0.00	500.00	3	02:00	0.000	2.222
201+50.00	JUNCTION	0.00	500.00	3	02:21	0.000	2.222
203+00.00	JUNCTION	0.00	500.00	3	02:00	0.000	2.222
204+25.08	JUNCTION	0.00	500.00	3	02:00	0.000	2.222
206+00.00	JUNCTION	0.00	500.00	3	02:06	0.000	2.221

207+69.77	JUNCTION	0.00	500.00	3	02:22	0.000	2.221
209+38.58	JUNCTION	0.00	500.00	3	02:13	0.000	2.221
210+50.00	JUNCTION	0.00	500.00	3	02:00	0.000	2.221
211+76.83	JUNCTION	0.00	500.00	3	02:00	0.000	2.221
213+12.04	JUNCTION	0.00	500.00	3	02:00	0.000	2.220
214+50.00	JUNCTION	0.00	500.00	3	02:14	0.000	2.220
216+00.00	JUNCTION	0.00	500.00	3	02:00	0.000	2.220
217+50.00	JUNCTION	0.00	500.00	3	02:00	0.000	2.220
218+35.17	JUNCTION	0.00	500.00	3	02:06	0.000	2.219
219+85.42	JUNCTION	0.00	500.00	3	02:00	0.000	2.219
221+00.00	JUNCTION	0.00	500.00	3	02:00	0.000	2.219
221+86.88	JUNCTION	0.00	500.00	3	02:25	0.000	2.219
223+50.00	JUNCTION	0.00	500.00	3	02:00	0.000	2.219
225+00.00	JUNCTION	0.00	500.00	3	02:00	0.000	2.218
226+26.32	JUNCTION	0.00	500.00	3	02:39	0.000	2.218
227+50.00	JUNCTION	0.00	500.00	3	02:01	0.000	2.218
229+00.00	JUNCTION	0.00	500.00	3	02:59	0.000	2.218
230+50.00	JUNCTION	0.00	500.00	3	02:01	0.000	2.218
232+00.00	JUNCTION	0.00	500.00	3	02:00	0.000	2.217
234+06.14	JUNCTION	0.00	500.00	3	02:37	0.000	2.217
235+50.00	JUNCTION	0.00	500.00	3	02:00	0.000	2.217
237+00.00	JUNCTION	0.00	500.00	3	02:00	0.000	2.217
238+50.00	JUNCTION	0.00	500.00	3	02:38	0.000	2.216
240+00.00	JUNCTION	0.00	500.00	3	02:38	0.000	2.216
241+50.00	JUNCTION	0.00	500.00	3	02:38	0.000	2.215
242+50.00	JUNCTION	0.00	500.00	3	02:00	0.000	2.215
243+29.25	JUNCTION	0.00	500.00	3	02:54	0.000	2.215
244+47.58	JUNCTION	0.00	500.00	3	02:15	0.000	2.215
245+50.00	JUNCTION	0.00	500.00	3	02:08	0.000	2.214
246+78.73	JUNCTION	0.00	500.00	3	02:08	0.000	2.214
248+50.00	JUNCTION	0.00	500.00	3	02:18	0.000	2.214
249+00.00	JUNCTION	0.00	500.00	3	02:56	0.000	2.214
249+88.66	JUNCTION	0.00	500.00	3	02:39	0.000	2.214
251+00.00	JUNCTION	0.00	500.00	3	02:39	0.000	2.213
252+28.63	JUNCTION	0.00	500.00	3	02:03	0.000	2.213
253+10.73	JUNCTION	0.00	500.00	3	02:03	0.000	2.213
254+50.00	JUNCTION	0.00	500.00	3	02:56	0.000	2.212
255+79.58	JUNCTION	0.00	500.00	3	02:03	0.000	2.212
256+21.72	JUNCTION	0.00	500.00	3	02:03	0.000	2.212
257+27.54	JUNCTION	0.00	500.00	3	02:19	0.000	2.211
257+65.86	JUNCTION	0.00	500.00	3	02:50	0.000	2.211
258+25.85	JUNCTION	0.00	500.00	3	02:42	0.000	2.211
259+40.73	JUNCTION	0.00	500.00	3	02:42	0.000	2.210
261+38.29	JUNCTION	0.00	500.00	3	02:42	0.000	2.210
263+00.00	JUNCTION	0.00	500.00	3	02:42	0.000	2.210
264+12.68	JUNCTION	0.00	500.00	3	02:42	0.000	2.209
264+52.58	JUNCTION	0.00	500.00	3	02:18	0.000	2.209
264+80.35	JUNCTION	0.00	500.00	3	02:02	0.000	2.208
265+45.39	JUNCTION	0.00	500.00	3	02:27	0.000	2.208
266+47.14	JUNCTION	0.00	500.00	3	02:27	0.000	2.208
266+91.11	JUNCTION	0.00	500.00	3	02:27	0.000	2.208
266+94.21	JUNCTION	0.00	500.00	3	02:18	0.000	2.207
267+47.77	JUNCTION	0.00	500.00	3	02:17	0.000	2.207
268+50.00	JUNCTION	0.00	500.00	3	02:17	0.000	2.207
268+87.00	JUNCTION	0.00	500.00	3	02:17	0.000	2.207
269+18.09	JUNCTION	0.00	500.00	3	02:55	0.000	2.206
270+00.00	JUNCTION	0.00	500.00	3	02:17	0.000	2.206
270+44.61	JUNCTION	0.00	500.00	3	02:55	0.000	2.206
271+93.60	JUNCTION	0.00	500.00	3	02:09	0.000	2.205
272+34.30	JUNCTION	0.00	500.00	3	02:09	0.000	2.205
272+86.27	JUNCTION	0.00	500.00	3	02:09	0.000	2.205
273+48.36	JUNCTION	0.00	500.00	3	02:09	0.000	2.205
273+82.81	JUNCTION	0.00	500.00	3	02:09	0.000	2.204
274+06.70	JUNCTION	0.00	500.00	3	02:09	0.000	2.204
274+79.84	JUNCTION	0.00	500.00	3	02:09	0.000	2.204
275+40.21	JUNCTION	0.00	500.00	3	02:09	0.000	2.204
276+01.53	JUNCTION	0.00	500.00	3	02:09	0.000	2.204
276+87.65	JUNCTION	0.00	500.00	3	02:09	0.000	2.203
278+00.00	JUNCTION	0.00	500.00	3	02:09	0.000	2.203
279+47.70	JUNCTION	0.00	500.00	3	02:09	0.000	2.203
280+25.36	JUNCTION	0.00	500.00	3	02:09	0.000	2.202

281+41.69	JUNCTION	0.00	500.00	3	02:09	0.000	2.202
281+59.21	JUNCTION	0.00	500.00	3	02:31	0.000	2.202
282+12.22	JUNCTION	0.00	500.00	3	02:09	0.000	2.201
283+00.00	JUNCTION	0.00	500.00	3	02:09	0.000	2.201
284+38.45	JUNCTION	0.00	500.00	3	02:09	0.000	2.201
286+30.88	JUNCTION	0.00	500.00	3	02:09	0.000	2.200
OutfallDiffuser	OUTFALL	0.00	500.00	3	02:21	0.000	2.200

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Node Surcharge Summary
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Surcharging occurs when water rises above the top of the highest conduit.

Node	Type	Hours Surcharged	Max. Height Above Crown Feet	Min. Depth Below Rim Feet
249+88.66	JUNCTION	1.00	10.940	0.000
251+00.00	JUNCTION	1.00	22.119	0.000
252+28.63	JUNCTION	1.00	33.536	0.000
253+10.73	JUNCTION	1.00	34.369	0.000
254+50.00	JUNCTION	1.00	37.244	0.000
255+79.58	JUNCTION	1.00	39.997	0.000
256+21.72	JUNCTION	1.00	42.749	0.000
257+27.54	JUNCTION	1.00	42.459	0.000
257+65.86	JUNCTION	1.00	43.216	0.000
258+25.85	JUNCTION	1.00	44.297	0.000
259+40.73	JUNCTION	1.00	45.069	0.000
261+38.29	JUNCTION	1.00	47.561	0.000
263+00.00	JUNCTION	1.00	47.456	0.000
264+12.68	JUNCTION	1.00	47.467	0.000
264+52.58	JUNCTION	1.00	52.368	0.000
264+80.35	JUNCTION	1.00	55.628	0.000
265+45.39	JUNCTION	1.00	55.378	0.000
266+47.14	JUNCTION	1.00	56.102	0.000
266+91.11	JUNCTION	1.00	63.681	0.000
266+94.21	JUNCTION	1.00	64.298	0.000
267+47.77	JUNCTION	1.00	64.293	0.000
268+50.00	JUNCTION	1.00	65.015	0.000
268+87.00	JUNCTION	1.00	65.317	0.000
269+18.09	JUNCTION	1.00	73.063	0.000
270+00.00	JUNCTION	1.00	72.965	0.000
270+44.61	JUNCTION	1.00	73.207	0.000
271+93.60	JUNCTION	1.00	78.543	0.000
272+34.30	JUNCTION	1.00	81.941	0.000
272+86.27	JUNCTION	1.00	81.714	0.000
273+48.36	JUNCTION	1.00	81.806	0.000
273+82.81	JUNCTION	1.00	81.909	0.000
274+06.70	JUNCTION	1.00	81.894	0.000
274+79.84	JUNCTION	1.00	82.032	0.000
275+40.21	JUNCTION	1.00	82.051	0.000
276+01.53	JUNCTION	1.00	90.176	0.000
276+87.65	JUNCTION	1.00	90.293	0.000
278+00.00	JUNCTION	1.00	90.905	0.000
279+47.70	JUNCTION	1.00	96.636	0.000
280+25.36	JUNCTION	1.00	99.146	0.000
281+41.69	JUNCTION	1.00	107.102	0.000
281+59.21	JUNCTION	1.00	107.862	0.000
282+12.22	JUNCTION	1.00	107.611	0.000
283+00.00	JUNCTION	1.00	107.081	0.000
284+38.45	JUNCTION	1.00	108.813	0.000
286+30.88	JUNCTION	1.00	116.021	0.000

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Node Flooding Summary
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No nodes were flooded.

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Outfall Loading Summary
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Outfall Node	Flow Freq. Pcnt.	Avg. Flow GPM	Max. Flow GPM	Total Volume 10^6 gal
OutfallDiffuser	1.33	500.00	500.00	2.200
System	1.33	500.00	500.00	2.200

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Link Flow Summary
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Link	Type	Maximum |Flow| GPM	Time of Max Occurrence days	hr:min	Maximum |Veloc| ft/sec	Max/ Full Flow	Max/ Full Depth
001	CONDUIT	500.00	3	02:48	4.83	0.71	0.63
002	CONDUIT	500.00	3	02:42	5.57	0.64	0.56
003	CONDUIT	500.00	3	02:00	6.81	0.53	0.48
004	CONDUIT	500.00	3	02:12	10.13	0.57	0.53
005	CONDUIT	500.00	3	02:00	9.58	0.51	0.55
006	CONDUIT	500.00	3	02:00	8.63	0.67	0.60
007	CONDUIT	500.00	3	02:18	9.22	0.66	0.57
008	CONDUIT	500.00	3	02:24	10.14	0.56	0.53
009	CONDUIT	500.00	3	02:05	10.05	0.54	0.53
010	CONDUIT	500.00	3	02:00	8.41	0.57	0.62
012	CONDUIT	500.00	3	02:01	9.00	0.76	0.58
013	CONDUIT	500.00	3	02:00	10.47	0.46	0.52
014	CONDUIT	500.00	3	02:00	7.68	0.60	0.67
015	CONDUIT	500.00	3	02:08	6.54	0.95	0.78
016	CONDUIT	500.00	3	02:44	7.50	0.90	0.68
017	CONDUIT	500.00	3	02:59	9.05	0.65	0.58
018	CONDUIT	500.00	3	02:59	9.44	0.62	0.56
019	CONDUIT	500.00	3	02:10	9.10	0.59	0.58
020	CONDUIT	500.00	3	02:00	8.22	0.68	0.63
021	CONDUIT	500.00	3	02:33	8.18	0.75	0.63
022	CONDUIT	500.00	3	02:00	7.43	0.69	0.69
023	CONDUIT	500.00	3	02:03	6.33	0.93	0.80
024	CONDUIT	500.00	3	02:00	6.00	1.02	0.85
025	CONDUIT	500.00	3	02:18	6.19	1.03	0.82
026	CONDUIT	500.00	3	02:40	7.22	0.92	0.71
027	CONDUIT	500.00	3	02:03	8.82	0.69	0.59
028	CONDUIT	500.00	3	02:00	8.96	0.60	0.59
029	CONDUIT	500.00	3	02:22	8.81	0.68	0.59
030	CONDUIT	500.00	3	02:00	9.07	0.63	0.58
031	CONDUIT	500.00	3	02:00	5.90	0.41	0.54
032	CONDUIT	500.00	3	02:59	5.87	0.71	0.54
034	CONDUIT	500.00	3	02:19	5.94	0.39	0.53
035	CONDUIT	500.00	3	02:00	5.28	0.70	0.59
036	CONDUIT	500.00	3	02:34	4.72	0.54	0.65
037	CONDUIT	500.00	3	02:59	4.74	0.87	0.64
038	CONDUIT	500.00	3	02:00	5.58	0.59	0.56
039	CONDUIT	500.00	3	02:26	5.62	0.62	0.56
040	CONDUIT	500.00	3	02:26	7.20	0.85	0.71
041	CONDUIT	500.00	3	02:42	7.96	0.81	0.65
042	CONDUIT	500.00	3	02:42	9.84	0.62	0.54
043	CONDUIT	500.00	3	02:26	10.97	0.49	0.50
044	CONDUIT	500.00	3	02:00	9.93	0.50	0.54
045	CONDUIT	500.00	3	02:33	9.55	0.62	0.56
046	CONDUIT	500.00	3	02:26	10.40	0.55	0.52
047	CONDUIT	500.00	3	02:00	10.54	0.51	0.51
048	CONDUIT	500.00	3	02:01	10.14	0.54	0.53

049	CONDUIT	500.00	3	02:00	8.94	0.56	0.59
050	CONDUIT	500.00	3	02:36	9.19	0.69	0.57
051	CONDUIT	500.00	3	02:38	10.79	0.51	0.50
052	CONDUIT	500.00	3	02:00	10.12	0.50	0.53
053	CONDUIT	500.00	3	02:33	9.65	0.60	0.55
054	CONDUIT	500.00	3	02:11	10.19	0.56	0.53
055	CONDUIT	500.00	3	02:06	10.52	0.52	0.51
056	CONDUIT	500.00	3	02:00	10.22	0.52	0.53
057	CONDUIT	500.00	3	02:00	9.79	0.57	0.54
058	CONDUIT	500.00	3	02:00	9.92	0.58	0.54
059	CONDUIT	500.00	3	02:00	9.76	0.55	0.55
060	CONDUIT	500.00	3	02:17	10.58	0.58	0.51
061	CONDUIT	500.00	3	02:00	11.21	0.43	0.49
062	CONDUIT	500.00	3	02:04	10.76	0.52	0.51
063	CONDUIT	500.00	3	02:00	8.94	0.49	0.59
064	CONDUIT	500.00	3	02:39	8.49	0.76	0.61
065	CONDUIT	500.00	3	02:00	8.54	0.58	0.61
066	CONDUIT	500.00	3	02:10	8.41	0.77	0.62
067	CONDUIT	500.00	3	02:56	9.44	0.60	0.56
068	CONDUIT	500.00	3	02:00	8.86	0.61	0.59
069	CONDUIT	500.00	3	02:00	7.97	0.71	0.65
070	CONDUIT	500.00	3	02:00	7.01	0.80	0.73
071	CONDUIT	500.00	3	02:41	7.59	0.91	0.68
072	CONDUIT	500.00	3	02:08	7.58	0.62	0.68
073	CONDUIT	500.00	3	02:06	7.07	0.92	0.72
074	CONDUIT	500.00	3	02:08	8.03	0.76	0.64
075	CONDUIT	500.00	3	02:00	7.99	0.71	0.65
076	CONDUIT	500.00	3	02:00	6.96	0.78	0.73
077	CONDUIT	500.00	3	02:08	6.57	0.96	0.77
078	CONDUIT	500.00	3	02:00	6.70	0.92	0.76
079	CONDUIT	500.00	3	02:08	6.91	0.92	0.74
080	CONDUIT	500.00	3	02:00	6.46	0.85	0.79
081	CONDUIT	500.00	3	02:25	7.13	0.96	0.72
082	CONDUIT	500.00	3	02:00	6.53	0.39	0.50
083	CONDUIT	500.00	3	02:41	5.92	0.59	0.54
084	CONDUIT	500.00	3	02:05	6.96	0.50	0.47
085	CONDUIT	500.00	3	02:00	6.85	0.38	0.48
086	CONDUIT	500.00	3	02:00	6.58	0.81	0.77
087	CONDUIT	500.00	3	02:12	6.93	0.97	0.73
088	CONDUIT	500.00	3	02:00	8.40	0.68	0.62
089	CONDUIT	500.00	3	02:09	9.06	0.69	0.58
090	CONDUIT	500.00	3	02:00	8.79	0.55	0.60
091	CONDUIT	500.00	3	02:05	8.28	0.75	0.63
092	CONDUIT	500.00	3	02:00	8.45	0.66	0.62
093	CONDUIT	500.00	3	02:00	7.16	0.74	0.71
094	CONDUIT	500.00	3	02:55	6.54	0.96	0.78
095	CONDUIT	500.00	3	02:08	6.49	0.94	0.78
096	CONDUIT	500.00	3	02:13	6.84	0.94	0.74
097	CONDUIT	500.00	3	02:00	6.77	0.82	0.75
098	CONDUIT	500.00	3	02:56	6.49	0.98	0.78
099	CONDUIT	500.00	3	02:12	6.74	0.92	0.75
100	CONDUIT	500.00	3	02:00	6.93	0.90	0.73
101	CONDUIT	500.00	3	02:04	7.20	0.86	0.71
102	CONDUIT	500.00	3	02:04	7.93	0.81	0.65
103	CONDUIT	500.00	3	02:00	9.34	0.65	0.57
104	CONDUIT	500.00	3	02:03	6.66	0.35	0.49
105	CONDUIT	500.00	3	02:10	6.19	0.58	0.52
106	CONDUIT	500.00	3	02:05	6.54	0.45	0.49
107	CONDUIT	500.00	3	02:00	5.67	0.53	0.55
108	CONDUIT	500.00	3	02:00	5.21	0.65	0.59
109	CONDUIT	500.00	3	02:05	6.69	0.94	0.76
110	CONDUIT	500.00	3	02:00	6.65	0.90	0.76
111	CONDUIT	500.00	3	02:31	6.53	0.96	0.78
112	CONDUIT	500.00	3	02:31	7.39	0.90	0.69
113	CONDUIT	500.00	3	02:25	9.33	0.67	0.57
114	CONDUIT	500.00	3	02:00	8.98	0.53	0.58
115	CONDUIT	500.00	3	02:57	8.10	0.75	0.64
116	CONDUIT	500.00	3	02:15	8.72	0.69	0.60
117	CONDUIT	500.00	3	02:00	8.50	0.63	0.61
118	CONDUIT	500.00	3	02:00	7.25	0.75	0.70
119	CONDUIT	500.00	3	02:15	6.87	0.92	0.74

120	CONDUIT	500.00	3	02:31	7.06	0.87	0.72
121	CONDUIT	500.00	3	02:00	6.92	0.87	0.73
123	CONDUIT	500.00	3	02:15	7.68	0.86	0.67
124	CONDUIT	500.00	3	02:00	7.00	0.65	0.73
125	CONDUIT	500.00	3	02:17	7.38	0.95	0.69
126	CONDUIT	500.00	3	02:00	8.97	0.53	0.59
127	CONDUIT	500.00	3	02:29	8.18	0.75	0.63
128	CONDUIT	500.00	3	02:00	8.13	0.69	0.64
129	CONDUIT	500.00	3	02:00	7.71	0.77	0.67
130	CONDUIT	500.00	3	02:00	7.10	0.80	0.72
131	CONDUIT	500.00	3	02:18	7.43	0.89	0.69
132	CONDUIT	500.00	3	02:00	7.64	0.70	0.67
133	CONDUIT	500.00	3	02:29	7.59	0.85	0.68
134	CONDUIT	500.00	3	02:00	8.03	0.71	0.64
135	CONDUIT	500.00	3	02:00	7.70	0.78	0.67
136	CONDUIT	500.00	3	02:22	8.15	0.77	0.63
137	CONDUIT	500.00	3	02:54	8.86	0.66	0.59
138	CONDUIT	500.00	3	02:00	8.62	0.64	0.60
139	CONDUIT	500.00	3	02:00	8.62	0.70	0.60
140	CONDUIT	500.00	3	02:00	8.64	0.64	0.60
141	CONDUIT	500.00	3	02:00	8.03	0.71	0.64
142	CONDUIT	500.00	3	02:14	7.88	0.77	0.65
143	CONDUIT	500.00	3	02:00	7.92	0.75	0.65
144	CONDUIT	500.00	3	02:00	7.42	0.76	0.69
145	CONDUIT	500.00	3	02:03	8.13	0.83	0.64
146	CONDUIT	500.00	3	02:00	6.69	0.37	0.49
147	CONDUIT	500.00	3	02:15	5.89	0.58	0.54
148	CONDUIT	500.00	3	02:00	4.87	0.54	0.63
149	CONDUIT	500.00	3	02:30	4.57	0.86	0.66
150	CONDUIT	500.00	3	02:00	5.14	0.66	0.60
151	CONDUIT	500.00	3	02:30	5.64	0.66	0.56
152	CONDUIT	500.00	3	02:00	5.02	0.51	0.61
153	CONDUIT	500.00	3	02:22	4.87	0.83	0.63
154	CONDUIT	500.00	3	02:08	6.95	0.53	0.47
155	CONDUIT	500.00	3	02:38	8.31	0.33	0.41
156	CONDUIT	500.00	3	02:06	8.36	0.36	0.41
301	CONDUIT	500.00	3	02:19	7.43	0.34	0.45
302	CONDUIT	500.00	3	02:00	5.40	0.49	0.58
303	CONDUIT	500.00	3	02:00	4.34	0.77	0.70
304	CONDUIT	500.00	3	02:06	5.33	0.82	0.58
305	CONDUIT	500.00	3	02:18	8.03	0.38	0.42
306	CONDUIT	500.00	3	02:00	7.35	0.35	0.45
307	CONDUIT	500.00	3	02:00	6.07	0.49	0.52
308	CONDUIT	500.00	3	02:21	6.19	0.57	0.52
309	CONDUIT	500.00	3	02:00	6.24	0.46	0.51
310	CONDUIT	500.00	3	02:00	4.69	0.59	0.65
311	CONDUIT	500.00	3	02:06	4.97	0.86	0.62
312	CONDUIT	500.00	3	02:22	7.50	0.45	0.44
313	CONDUIT	500.00	3	02:13	8.25	0.34	0.41
314	CONDUIT	500.00	3	02:00	6.46	0.38	0.50
315	CONDUIT	500.00	3	02:00	5.40	0.63	0.58
316	CONDUIT	500.00	3	02:00	4.82	0.64	0.63
317	CONDUIT	500.00	3	02:14	5.74	0.75	0.55
318	CONDUIT	500.00	3	02:00	8.16	0.35	0.42
319	CONDUIT	500.00	3	02:00	6.77	0.38	0.48
320	CONDUIT	500.00	3	02:06	6.24	0.55	0.51
321	CONDUIT	500.00	3	02:00	6.42	0.48	0.50
322	CONDUIT	500.00	3	02:00	5.10	0.52	0.61
323	CONDUIT	500.00	3	02:25	4.66	0.83	0.65
324	CONDUIT	500.00	3	02:00	5.77	0.65	0.55
325	CONDUIT	500.00	3	02:00	5.85	0.47	0.54
326	CONDUIT	500.00	3	02:39	6.24	0.62	0.51
327	CONDUIT	500.00	3	02:01	7.52	0.38	0.44
328	CONDUIT	500.00	3	02:59	7.39	0.43	0.45
329	CONDUIT	500.00	3	02:01	7.11	0.40	0.46
330	CONDUIT	500.00	3	02:00	6.39	0.48	0.50
331	CONDUIT	500.00	3	02:37	6.40	0.52	0.50
332	CONDUIT	500.00	3	02:00	5.48	0.48	0.57
333	CONDUIT	500.00	3	02:00	4.05	0.76	0.74
334	CONDUIT	500.00	3	02:38	3.72	1.01	0.81
335	CONDUIT	500.00	3	02:38	3.85	0.96	0.78

336	CONDUIT	500.00	3	02:38	4.30	0.93	0.70
337	CONDUIT	500.00	3	02:00	4.23	0.72	0.71
338	CONDUIT	500.00	3	02:54	4.21	1.00	0.72
339	CONDUIT	500.00	3	02:15	4.39	0.73	0.69
340	CONDUIT	500.00	3	02:08	4.12	0.90	0.73
341	CONDUIT	500.00	3	02:08	4.63	0.85	0.66
342	CONDUIT	500.00	3	02:18	5.68	0.64	0.55
343	CONDUIT	500.00	3	02:56	8.27	0.47	0.41
344	CONDUIT	500.00	3	02:39	4.63	0.20	0.66
345	CONDUIT	500.00	3	02:39	3.23	0.26	1.00
346	CONDUIT	500.00	3	02:03	3.23	0.17	1.00
347	CONDUIT	500.00	3	02:03	3.23	0.47	1.00
348	CONDUIT	500.00	3	02:56	3.23	0.35	1.00
349	CONDUIT	500.00	3	02:03	3.23	0.34	1.00
350	CONDUIT	500.00	3	02:03	3.23	0.20	1.00
351	CONDUIT	500.00	3	02:19	3.23	1.34	1.00
352	CONDUIT	500.00	3	02:50	3.23	0.36	1.00
353	CONDUIT	500.00	3	02:42	3.23	0.37	1.00
354	CONDUIT	500.00	3	02:42	3.23	0.55	1.00
355	CONDUIT	500.00	3	02:42	3.23	0.43	1.00
356	CONDUIT	500.00	3	02:42	3.23	1.02	1.00
357	CONDUIT	500.00	3	02:42	3.23	0.92	1.00
358	CONDUIT	500.00	3	02:18	3.23	0.28	1.00
359	CONDUIT	500.00	3	02:02	3.23	0.15	1.00
360	CONDUIT	500.00	3	02:27	3.23	1.71	1.00
361	CONDUIT	500.00	3	02:27	3.23	0.54	1.00
362	CONDUIT	500.00	3	02:27	3.23	0.22	1.00
363	CONDUIT	500.00	3	02:18	3.23	0.11	1.00
364	CONDUIT	500.00	3	02:17	3.23	0.94	1.00
365	CONDUIT	500.00	3	02:17	3.23	0.54	1.00
366	CONDUIT	500.00	3	02:17	3.23	0.51	1.00
367	CONDUIT	500.00	3	02:55	3.23	0.10	1.00
368	CONDUIT	500.00	3	02:17	3.23	1.03	1.00
369	CONDUIT	500.00	3	02:55	3.23	0.59	1.00
370	CONDUIT	500.00	3	02:09	3.23	0.27	1.00
371	CONDUIT	500.00	3	02:09	3.23	0.18	1.00
372	CONDUIT	500.00	3	02:09	3.23	3.29	1.00
373	CONDUIT	500.00	3	02:09	3.23	0.78	1.00
374	CONDUIT	500.00	3	02:09	3.23	0.69	1.00
375	CONDUIT	500.00	3	02:09	3.23	1.02	1.00
376	CONDUIT	500.00	3	02:09	3.23	0.76	1.00
377	CONDUIT	500.00	3	02:09	3.23	0.89	1.00
378	CONDUIT	500.00	3	02:09	3.23	0.20	1.00
379	CONDUIT	500.00	3	02:09	3.23	0.80	1.00
380	CONDUIT	500.00	3	02:09	3.23	0.58	1.00
381	CONDUIT	500.00	3	02:09	3.23	0.26	1.00
382	CONDUIT	500.00	3	02:09	3.23	0.28	1.00
383	CONDUIT	500.00	3	02:09	3.23	0.19	1.00
384	CONDUIT	500.00	3	02:31	3.23	0.24	1.00
385	CONDUIT	500.00	3	02:09	3.23	2.29	1.00
386	CONDUIT	500.00	3	02:09	3.23	1.33	1.00
387	CONDUIT	500.00	3	02:09	3.23	0.49	1.00
388	CONDUIT	500.00	3	02:09	3.23	0.22	1.00
423	CONDUIT	500.00	3	02:21	5.67	0.10	1.00

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Flow Classification Summary
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Conduit	Adjusted /Actual Length	--- Fraction of Time in Flow Class ---- Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Avg. Froude Number	Avg. Flow Change
001	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.02	0.0000
002	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.02	0.0000
003	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.03	0.0000
004	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.05	0.0000
005	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.05	0.0000
006	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.04	0.0000

007	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.04	0.0000
008	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.05	0.0000
009	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.05	0.0000
010	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.04	0.0000
012	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.04	0.0000
013	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.05	0.0000
014	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.03	0.0000
015	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.02	0.0000
016	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.03	0.0000
017	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.04	0.0000
018	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.05	0.0000
019	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.04	0.0000
020	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.04	0.0000
021	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.04	0.0000
022	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.03	0.0000
023	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.02	0.0000
024	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.02	0.0000
025	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.02	0.0000
026	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.03	0.0000
027	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.04	0.0000
028	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.04	0.0000
029	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.04	0.0000
030	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.04	0.0000
031	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.03	0.0000
032	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.03	0.0000
034	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.03	0.0000
035	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.02	0.0000
036	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.02	0.0000
037	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.02	0.0000
038	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.02	0.0000
039	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.02	0.0000
040	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.03	0.0000
041	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.03	0.0000
042	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.05	0.0000
043	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.06	0.0000
044	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.05	0.0000
045	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.05	0.0000
046	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.05	0.0000
047	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.05	0.0000
048	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.05	0.0000
049	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.04	0.0000
050	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.04	0.0000
051	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.06	0.0000
052	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.05	0.0000
053	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.05	0.0000
054	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.05	0.0000
055	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.05	0.0000
056	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.05	0.0000
057	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.05	0.0000
058	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.05	0.0000
059	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.05	0.0000
060	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.05	0.0000
061	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.06	0.0000
062	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.06	0.0000
063	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.04	0.0000
064	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.04	0.0000
065	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.04	0.0000
066	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.04	0.0000
067	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.05	0.0000
068	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.04	0.0000
069	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.03	0.0000
070	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.03	0.0000
071	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.03	0.0000
072	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.03	0.0000
073	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.03	0.0000
074	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.04	0.0000
075	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.04	0.0000
076	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.03	0.0000
077	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.02	0.0000
078	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.03	0.0000
079	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.03	0.0000

080	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.02	0.0000
081	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.03	0.0000
082	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.03	0.0000
083	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.03	0.0000
084	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.03	0.0000
085	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.03	0.0000
086	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.02	0.0000
087	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.03	0.0000
088	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.04	0.0000
089	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.04	0.0000
090	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.04	0.0000
091	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.04	0.0000
092	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.04	0.0000
093	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.03	0.0000
094	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.02	0.0000
095	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.02	0.0000
096	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.03	0.0000
097	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.03	0.0000
098	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.02	0.0000
099	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.03	0.0000
100	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.03	0.0000
101	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.03	0.0000
102	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.03	0.0000
103	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.05	0.0000
104	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.03	0.0000
105	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.03	0.0000
106	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.03	0.0000
107	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.02	0.0000
108	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.02	0.0000
109	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.03	0.0000
110	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.03	0.0000
111	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.02	0.0000
112	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.03	0.0000
113	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.05	0.0000
114	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.04	0.0000
115	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.04	0.0000
116	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.04	0.0000
117	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.04	0.0000
118	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.03	0.0000
119	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.03	0.0000
120	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.03	0.0000
121	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.03	0.0000
123	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.03	0.0000
124	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.03	0.0000
125	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.03	0.0000
126	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.04	0.0000
127	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.04	0.0000
128	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.04	0.0000
129	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.03	0.0000
130	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.03	0.0000
131	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.03	0.0000
132	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.03	0.0000
133	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.03	0.0000
134	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.04	0.0000
135	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.03	0.0000
136	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.04	0.0000
137	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.04	0.0000
138	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.04	0.0000
139	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.04	0.0000
140	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.04	0.0000
141	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.04	0.0000
142	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.03	0.0000
143	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.03	0.0000
144	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.03	0.0000
145	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.04	0.0000
146	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.03	0.0000
147	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.03	0.0000
148	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.02	0.0000
149	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.02	0.0000
150	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.02	0.0000
151	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.02	0.0000

152	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.02	0.0000
153	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.02	0.0000
154	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.03	0.0000
155	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.04	0.0000
156	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.04	0.0000
301	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.04	0.0000
302	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.02	0.0000
303	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.02	0.0000
304	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.02	0.0000
305	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.04	0.0000
306	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.04	0.0000
307	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.03	0.0000
308	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.03	0.0000
309	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.03	0.0000
310	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.02	0.0000
311	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.02	0.0000
312	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.04	0.0000
313	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.04	0.0000
314	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.03	0.0000
315	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.02	0.0000
316	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.02	0.0000
317	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.02	0.0000
318	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.04	0.0000
319	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.03	0.0000
320	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.03	0.0000
321	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.03	0.0000
322	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.02	0.0000
323	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.02	0.0000
324	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.03	0.0000
325	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.03	0.0000
326	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.03	0.0000
327	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.04	0.0000
328	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.04	0.0000
329	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.03	0.0000
330	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.03	0.0000
331	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.03	0.0000
332	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.02	0.0000
333	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.01	0.0000
334	1.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.01	0.0000
335	1.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.01	0.0000
336	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.02	0.0000
337	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.02	0.0000
338	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.01	0.0000
339	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.02	0.0000
340	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.01	0.0000
341	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.02	0.0000
342	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.02	0.0000
343	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.04	0.0000
344	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.02	0.0000
345	1.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.0000
346	1.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.0000
347	1.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.0000
348	1.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.0000
349	1.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.0000
350	1.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.0000
351	1.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.0000
352	1.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.0000
353	1.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.0000
354	1.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.0000
355	1.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.0000
356	1.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.0000
357	1.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.0000
358	1.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.0000
359	1.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.0000
360	1.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.0000
361	1.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.0000
362	1.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.0000
363	1.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.0000
364	1.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.0000
365	1.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.0000
366	1.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.0000

367	1.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.0000
368	1.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.0000
369	1.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.0000
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387	1.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.0000
388	1.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.0000
423	1.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.0000

****
Conduit Surcharge Summary
****

Conduit	Hours Full Both Ends	Hours Full Upstream	Hours Full Dnstream	Hours Above Full Normal Flow	Hours Capacity Limited
024	0.01	0.01	0.01	1.00	0.01
025	0.01	0.01	0.01	1.00	0.01
334	0.01	0.01	0.01	1.00	0.01
338	0.01	0.01	0.01	1.00	0.01
345	1.00	1.00	1.00	0.01	0.01
346	1.00	1.00	1.00	0.01	0.01
347	1.00	1.00	1.00	0.01	0.01
348	1.00	1.00	1.00	0.01	0.01
349	1.00	1.00	1.00	0.01	0.01
350	1.00	1.00	1.00	0.01	0.01
351	1.00	1.00	1.00	1.00	1.00
352	1.00	1.00	1.00	0.01	0.01
353	1.00	1.00	1.00	0.01	0.01
354	1.00	1.00	1.00	0.01	0.01
355	1.00	1.00	1.00	0.01	0.01
356	1.00	1.00	1.00	1.00	1.00
357	1.00	1.00	1.00	0.01	0.01
358	1.00	1.00	1.00	0.01	0.01
359	1.00	1.00	1.00	0.01	0.01
360	1.00	1.00	1.00	1.00	1.00
361	1.00	1.00	1.00	0.01	0.01
362	1.00	1.00	1.00	0.01	0.01
363	1.00	1.00	1.00	0.01	0.01
364	1.00	1.00	1.00	0.01	1.00
365	1.00	1.00	1.00	0.01	0.01
366	1.00	1.00	1.00	0.01	0.01
367	1.00	1.00	1.00	0.01	0.01
368	1.00	1.00	1.00	1.00	1.00
369	1.00	1.00	1.00	0.01	0.01
370	1.00	1.00	1.00	0.01	0.01
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376	1.00	1.00	1.00	0.01	0.01
377	1.00	1.00	1.00	0.01	0.01

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379	1.00	1.00	1.00	0.01	0.01
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381	1.00	1.00	1.00	0.01	0.01
382	1.00	1.00	1.00	0.01	0.01
383	1.00	1.00	1.00	0.01	0.01
384	1.00	1.00	1.00	0.01	0.01
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387	1.00	1.00	1.00	0.01	0.01
388	1.00	1.00	1.00	0.01	0.01
423	1.00	1.00	1.00	0.01	0.01

```
Analysis begun on:  Mon Dec 09 15:53:57 2013
Analysis ended on:  Mon Dec 09 15:55:40 2013
Total elapsed time: 00:01:43
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Supplement J-1.2

SWMM Node and Link IDs

Node IDs

Node IDs for the effluent pipe are found in the 60% design submittal and have not been repeated in these figures.

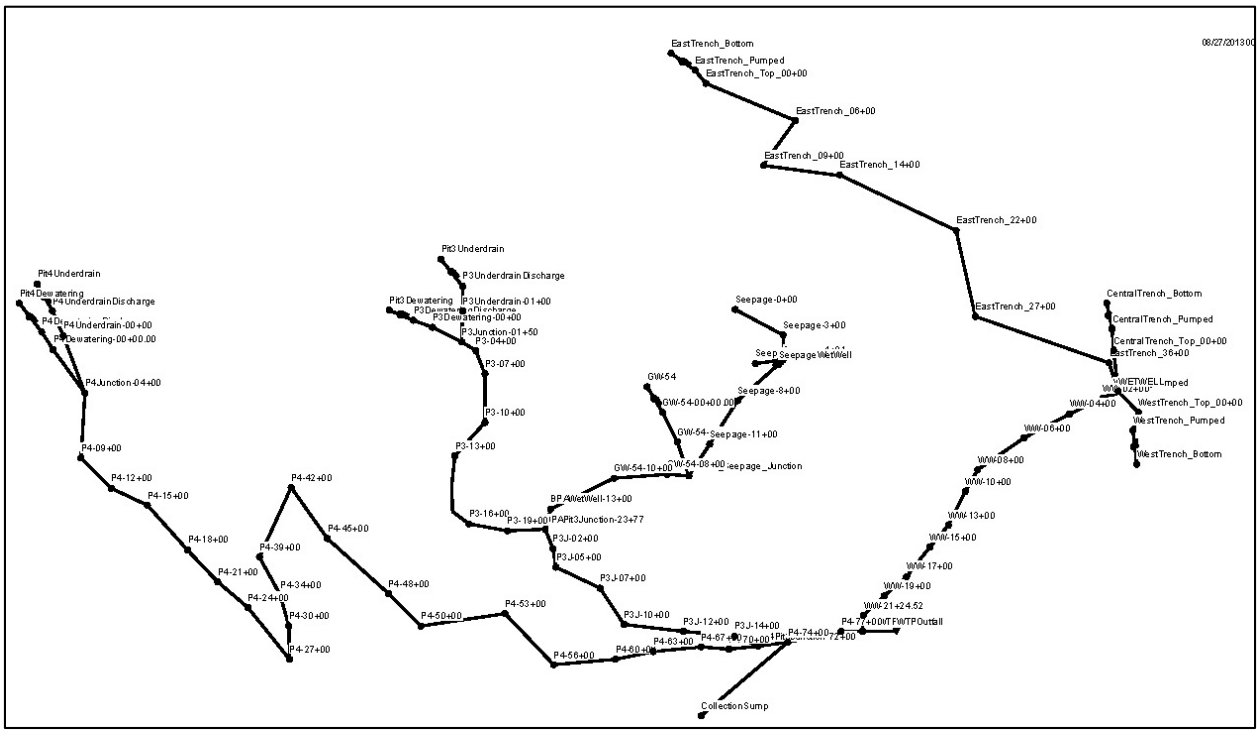


Figure 1. Influent Pipeline Node IDs

Link IDs

Link IDs for the effluent pipe are found in the 60% design submittal and have not been repeated in these figures.

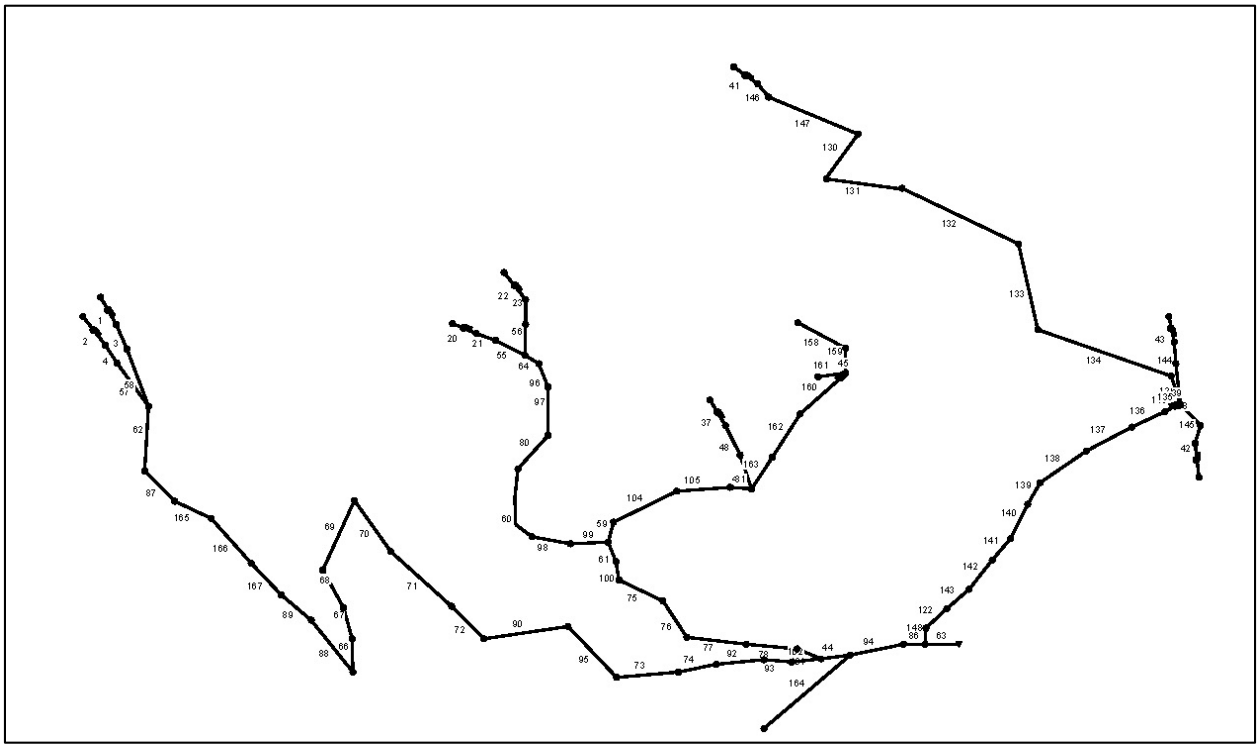


Figure 2. Influent Pipeline Link IDs

Supplement J-1.3

SWMM Hydraulic Profiles

Influent Pipeline Alignment Hydraulic Profiles

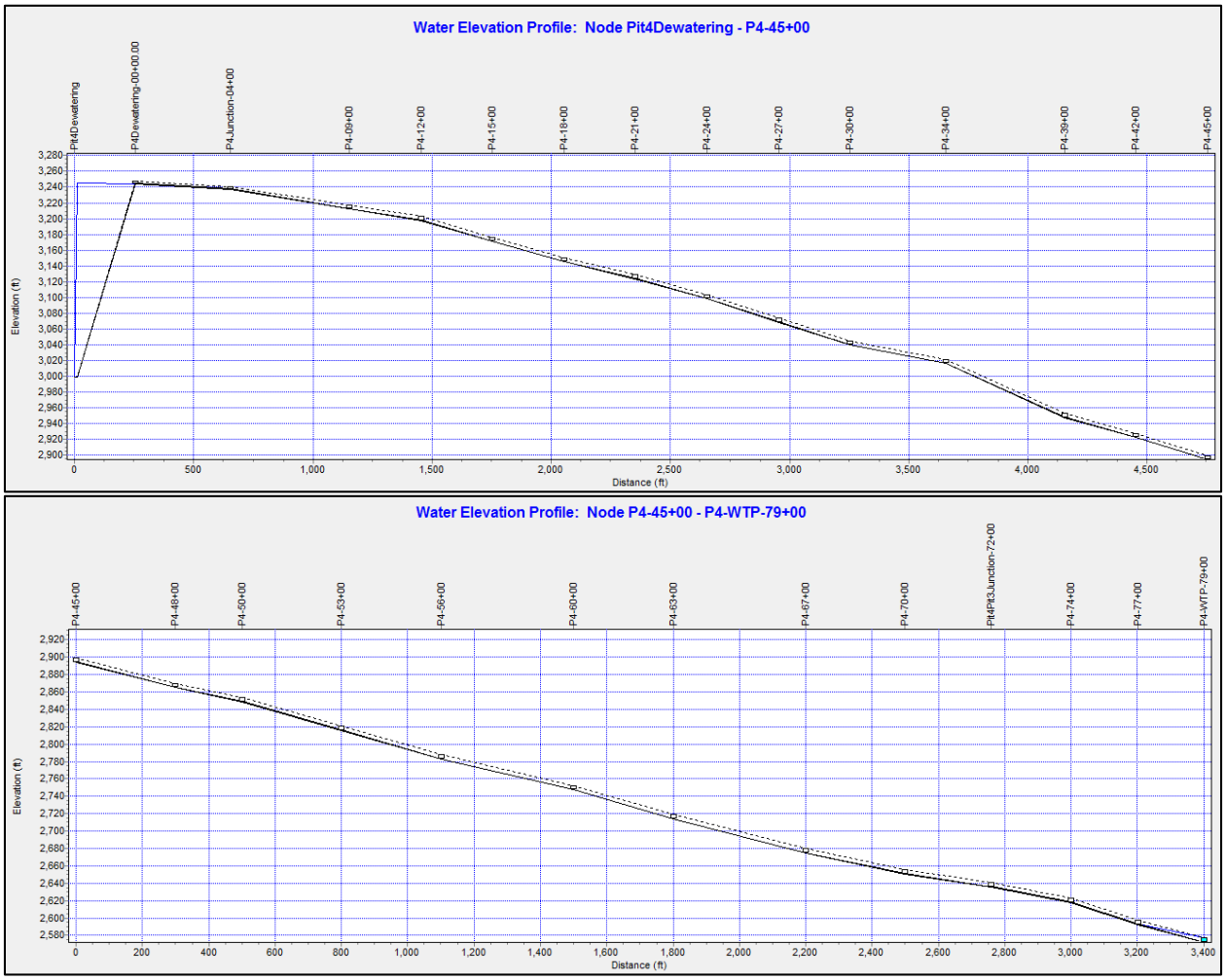
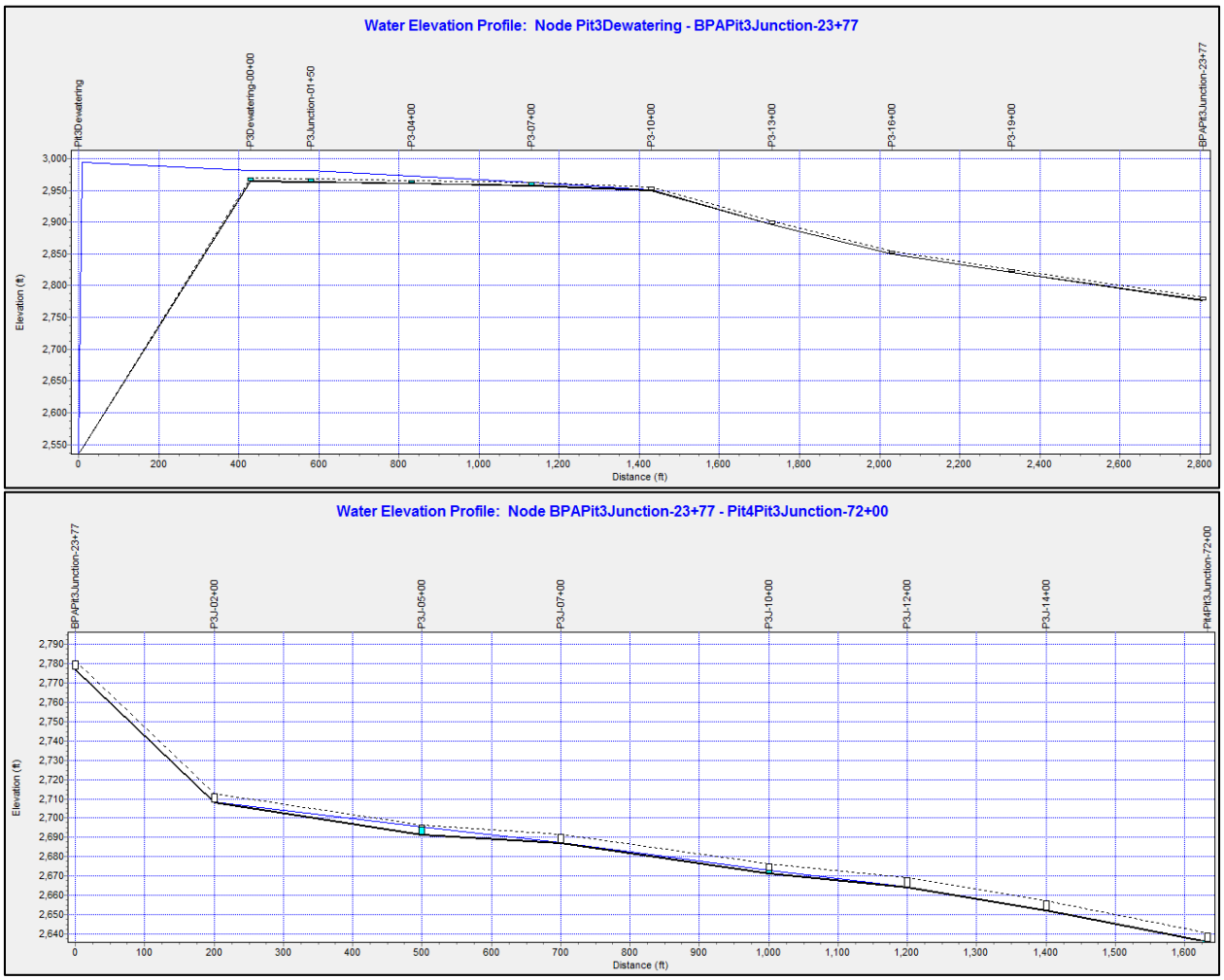


Figure 1. Pit 4 profiles



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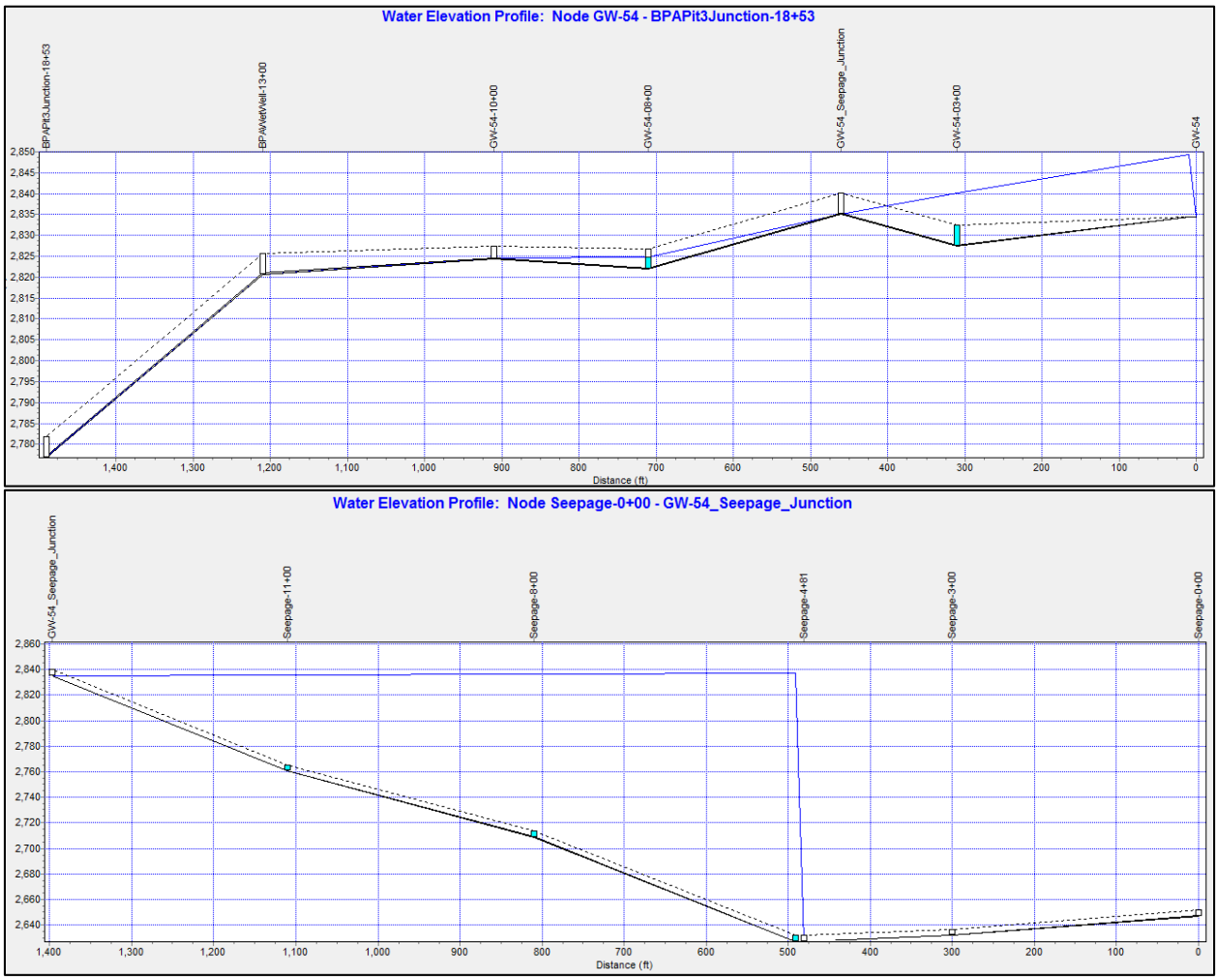


Figure 3. Seepage Collection and BPA profiles

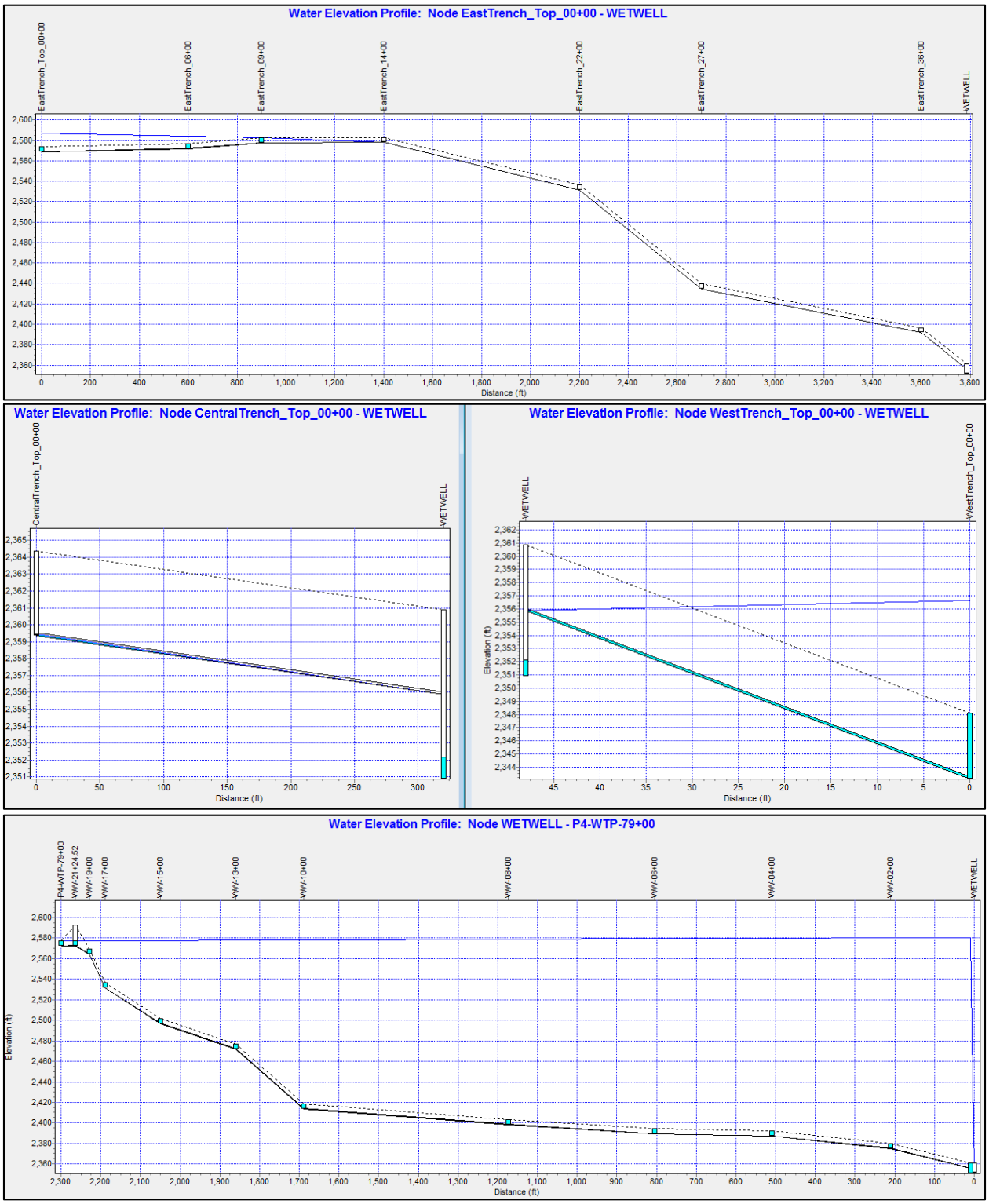
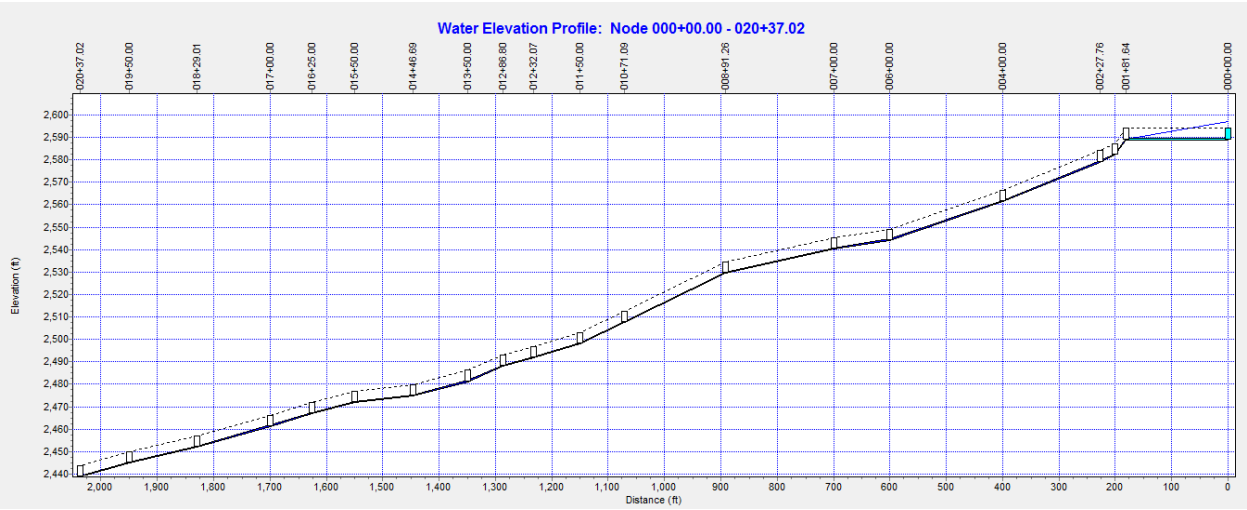
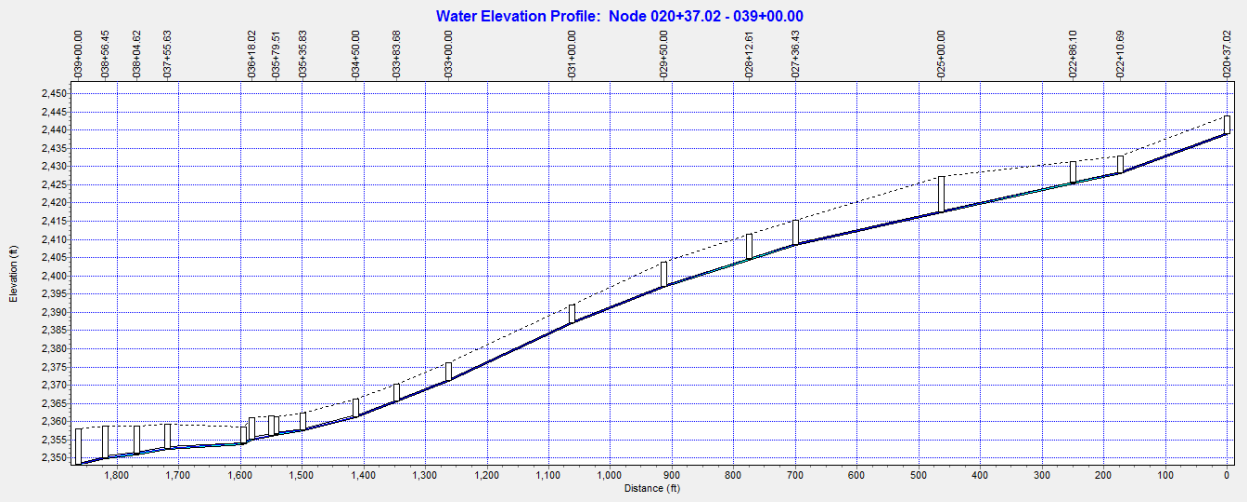
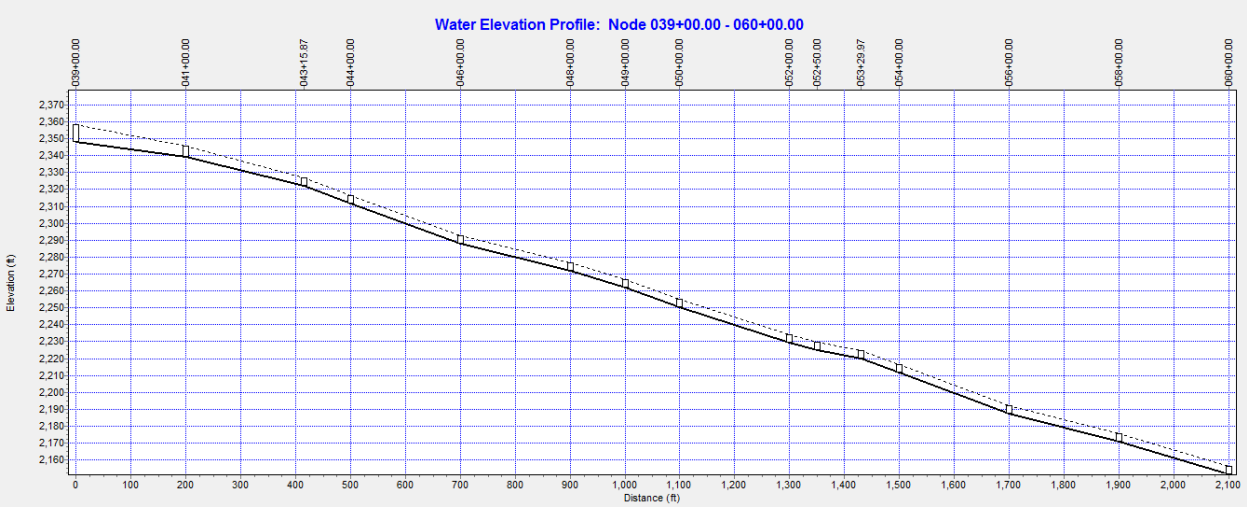


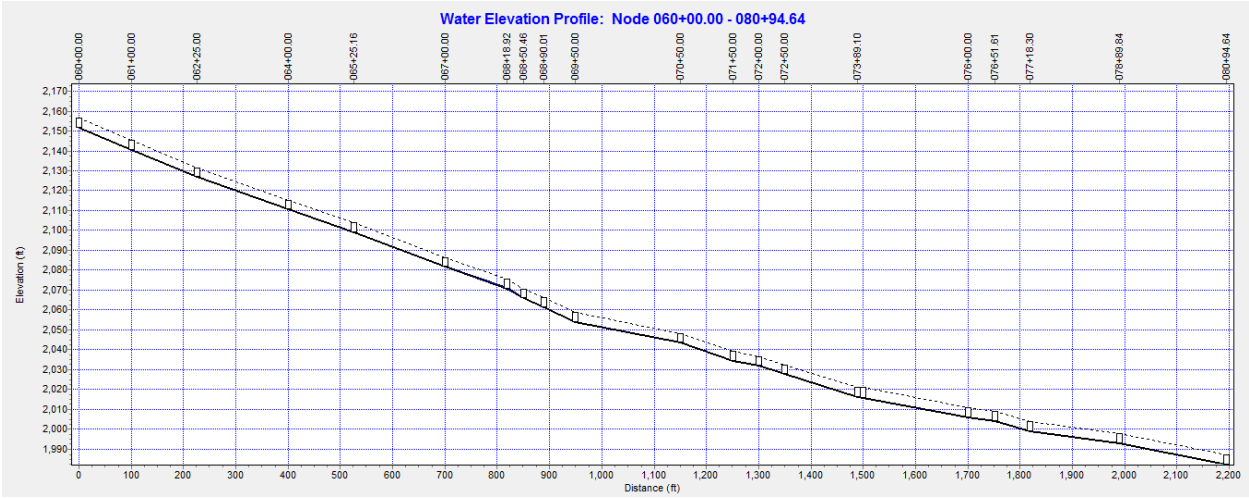
Figure 4. Extraction Trench Profiles

Effluent Pipeline Alignment Hydraulic Profiles – (NOT UPDATED)





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068+18.92
068+50.46
068+90.01
069+50.00
070+50.00
071+50.00
072+00.00
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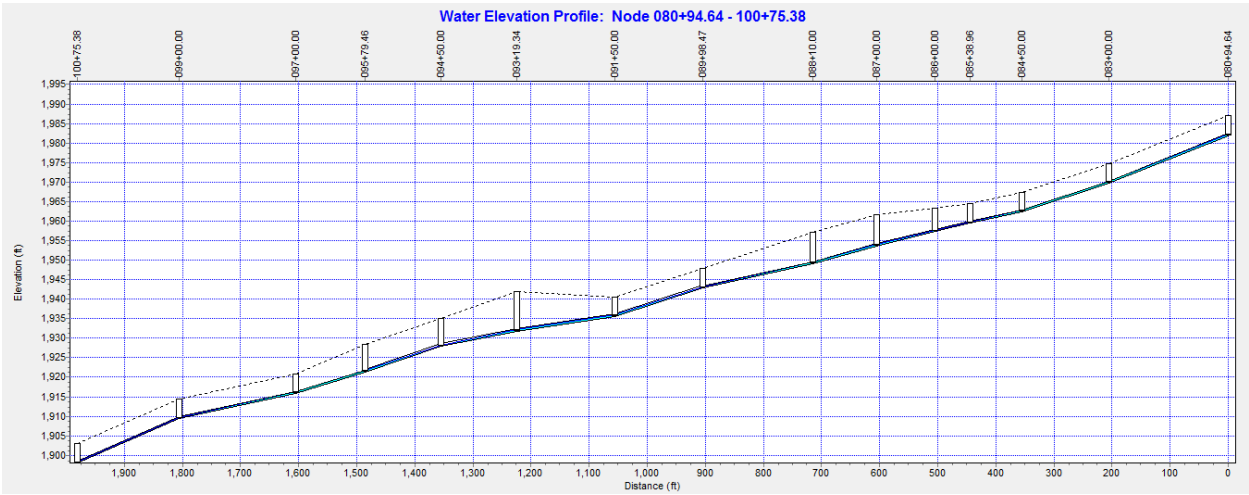
080+94.64
Elevation (ft)
Distance (ft)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095+79.46
094+50.00
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089+98.47
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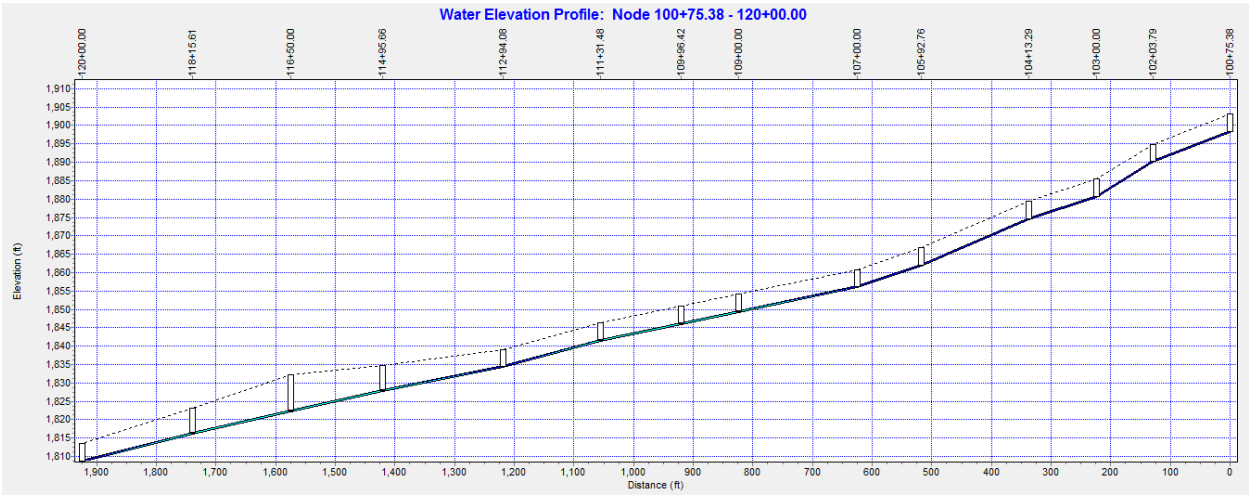
080+94.64
Elevation (ft)
Distance (ft)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112+94.08
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109+96.42
109+00.00
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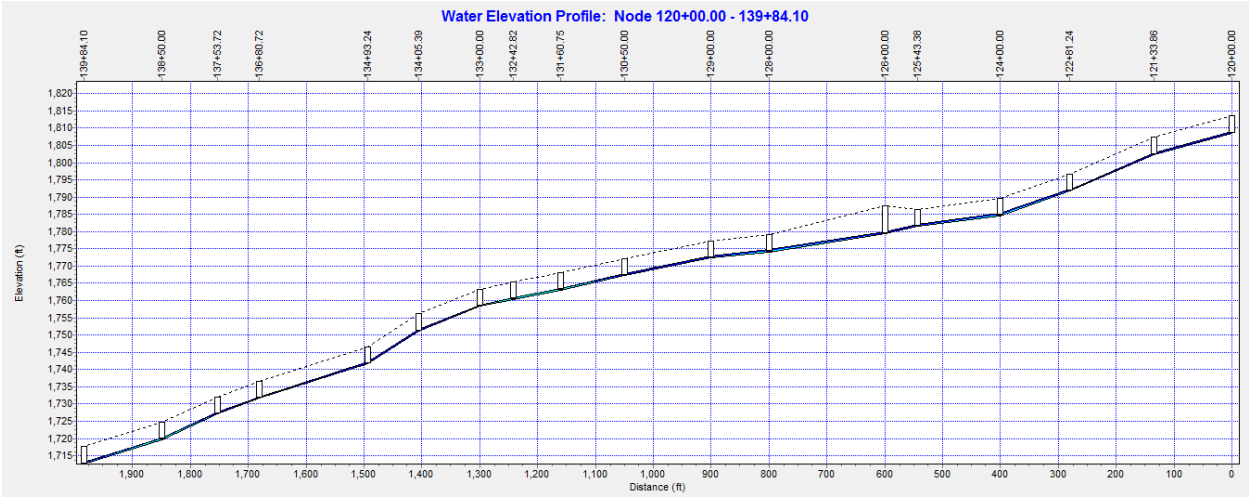
100+75.38
Elevation (ft)
Distance (ft)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132+42.82
131+60.75
130+50.00
129+00.00
128+00.00
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122+81.24
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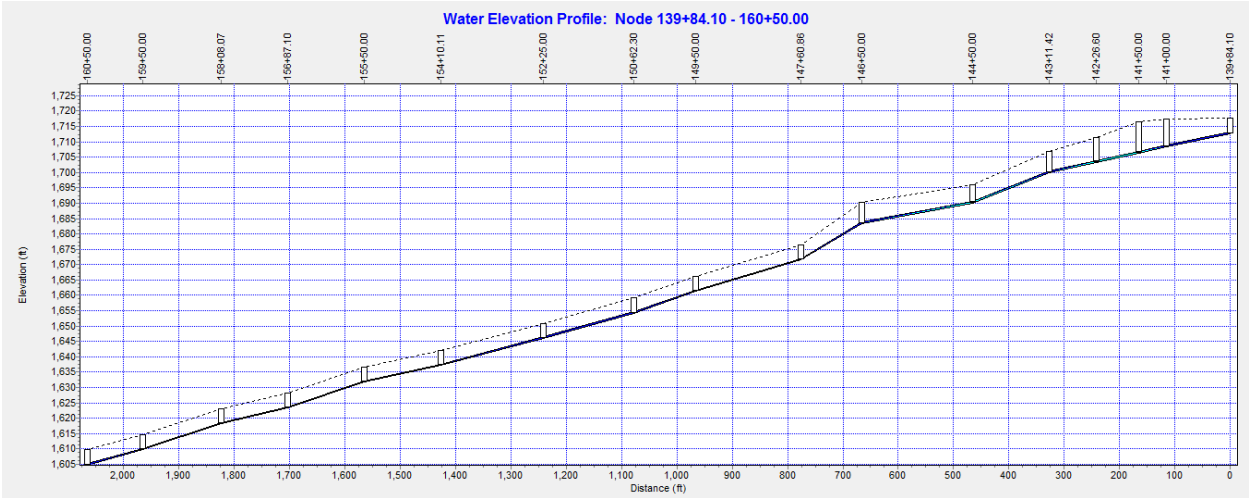
120+00.00
Elevation (ft)
Distance (ft)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152+25.00
150+62.30
149+50.00
147+60.86
146+50.00
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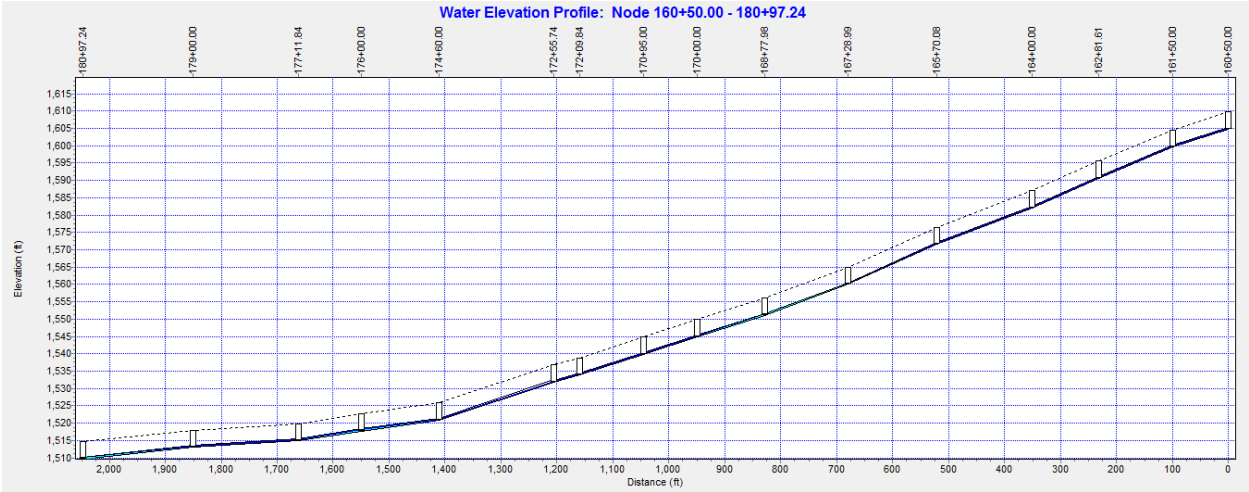
139+84.10
Elevation (ft)
Distance (ft)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170+00.00
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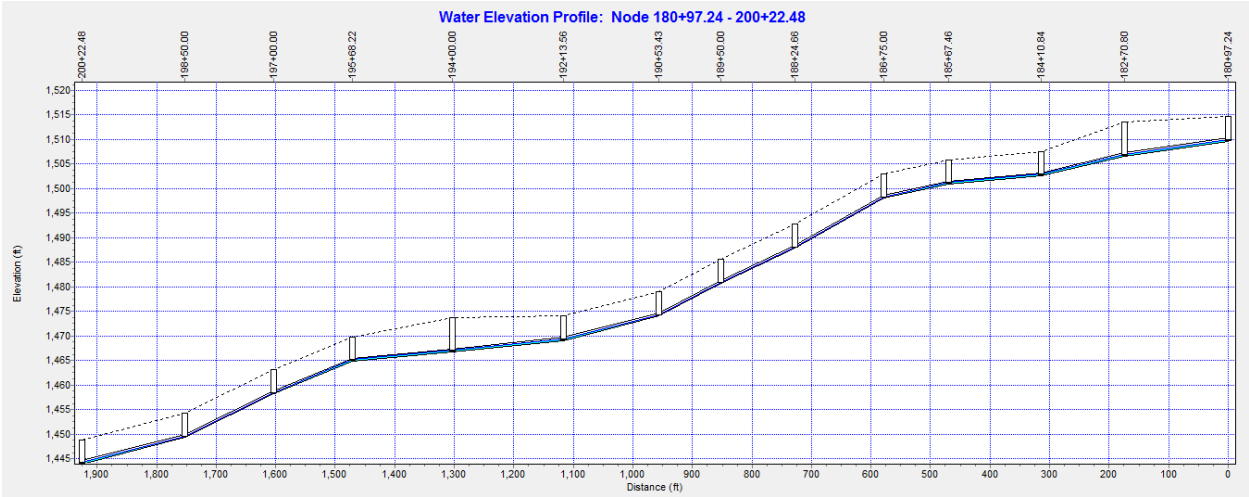
Elevation (ft)
Distance (ft)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194+00.00
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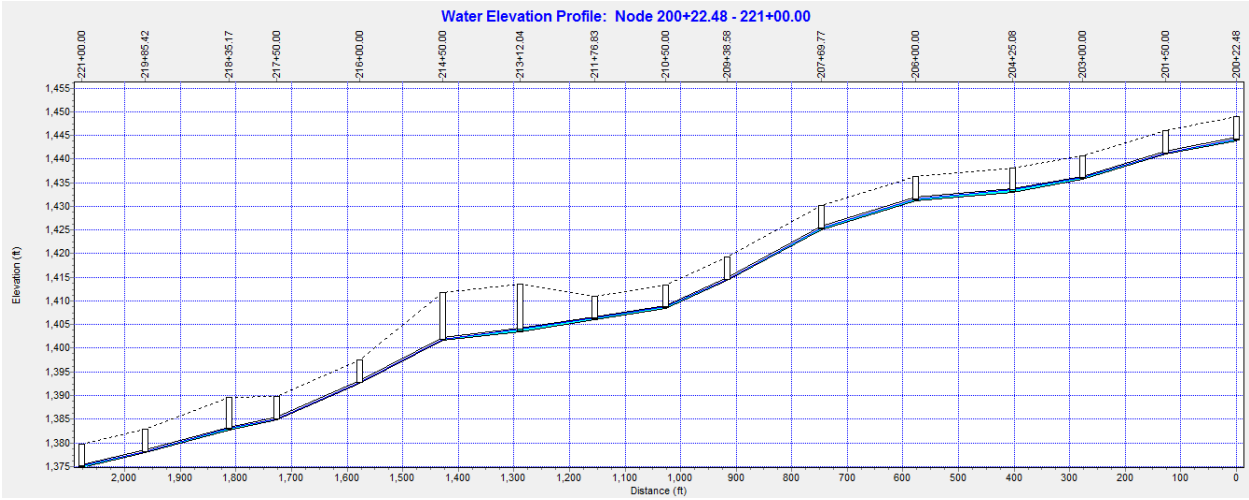
180+97.24
Elevation (ft)
Distance (ft)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217+50.00
216+00.00
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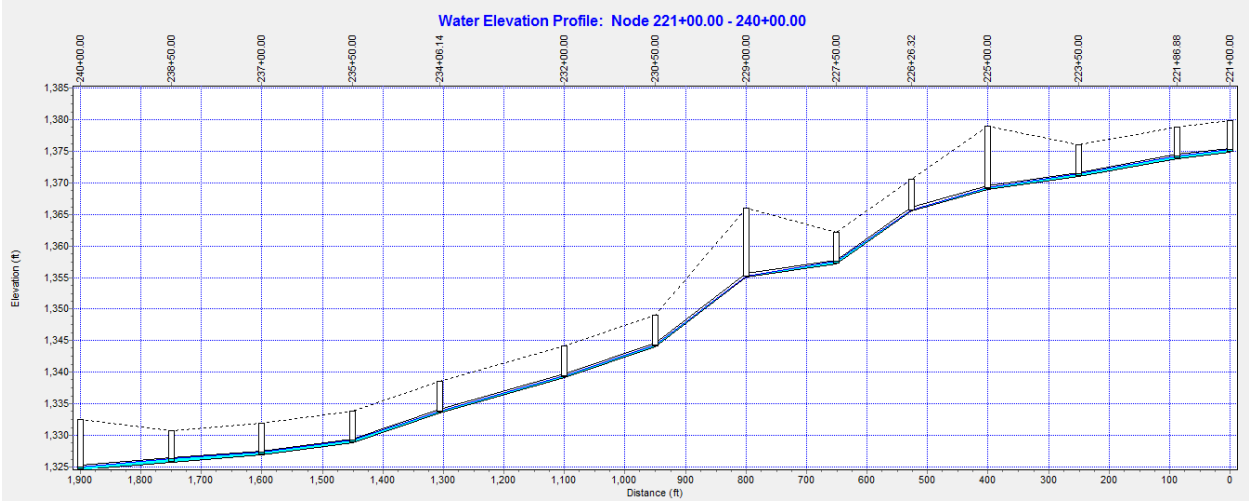
213+12.04
211+76.83
210+50.00
209+38.58
207+69.77
206+00.00
204+25.08
203+00.00
201+50.00
200+22.48
Elevation (ft)
Distance (ft)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240+00.00
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235+50.00
234+06.14
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230+50.00
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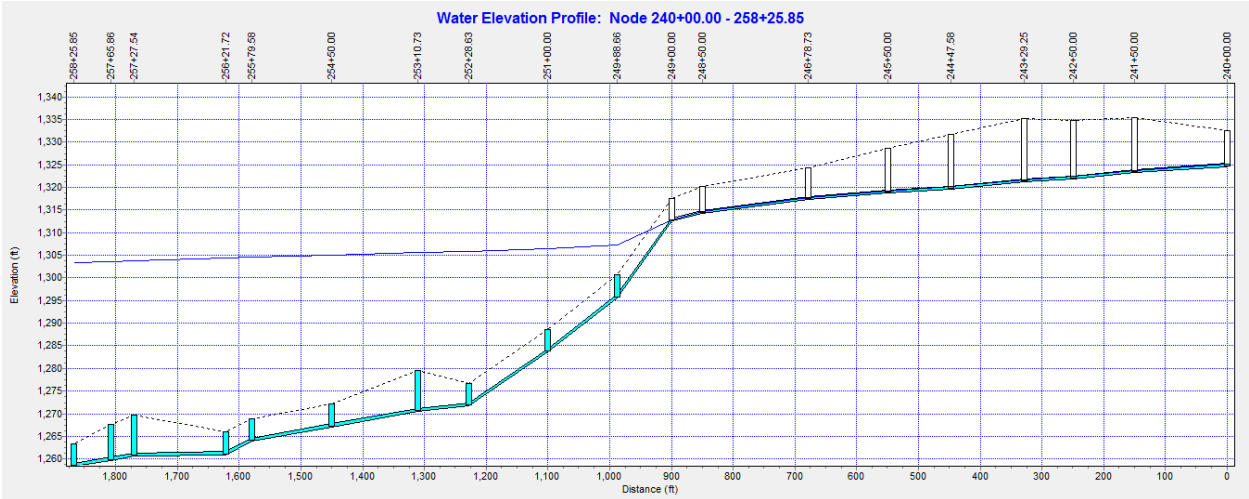
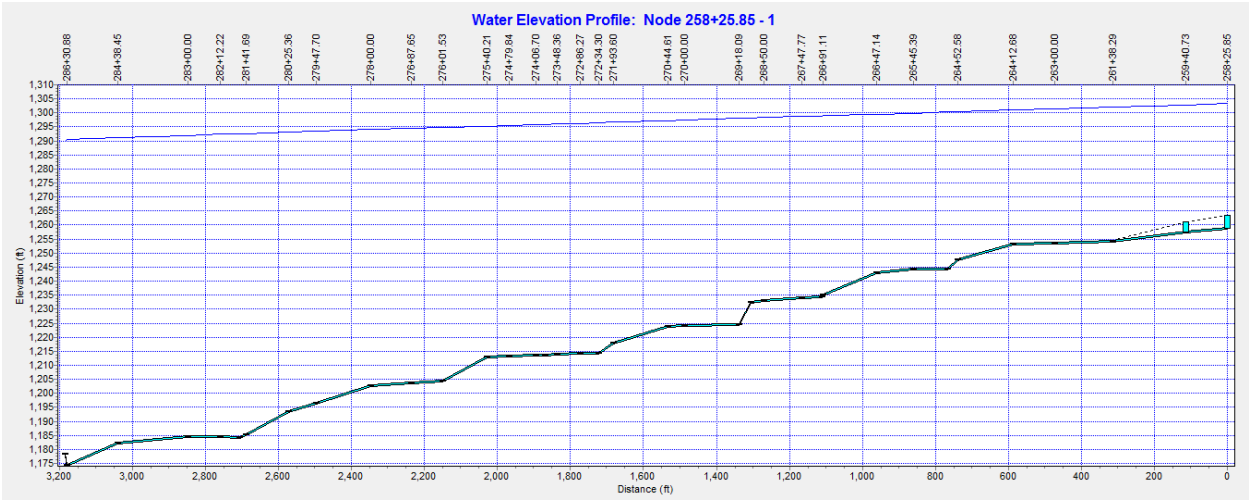
221+00.00
Elevation (ft)
Distance (ft)





Profiles showing water levels in the pipeline. Profiles begin at the inlet and end at the outfall.

Attachment J-2

Summary of 2013 Blue Creek Geotechnical Investigation Report

SUMMARY OF 2013 BLUE CREEK GEOTECHNICAL INVESTIGATION

Revision 0

December 2013

Prepared by:

MWH®

2890 East Cottonwood Parkway, Suite 300
Salt Lake City, Utah 84121

Prepared for:

Dawn Mining Company, LLC and Newmont USA Limited

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Appendix B Land Survey Report
Appendix C Test Pit Logs
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Appendix E Blue Creek Road Gamma Survey
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Table 1 Blue Creek Pipeline – Test Pit Summary
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Figure 1 Effluent Pipeline Alignment Overall Layout
Figure 2 Mine Area – Effluent Pipeline Geotechnical Evaluation Layout
Figure 3 Blue Creek East – Effluent Pipeline Geotechnical Evaluation Layout
Figure 4 Blue Creek West – Effluent Pipeline Geotechnical Evaluation Layout

LIST OF ACRONYMS

ASTM	American Standard Testing Method
bgs	below ground surface
CL	clayey sand
LL	liquid limit
MWH	Montgomery Watson Harza
PI	plasticity index
PL	plastic limit
QAPP	Quality Assurance Project Plan
ROD	Record of Decision
SC	sandy clay
Site	Midnite Mine Site
SOPs	Standard Operating Procedures
SP-SM	poorly graded sands with silt
USCS	Unified Soils Classification System
USEPA	U.S. Environmental Protection Agency
Work Plan	Blue Creek Pipeline Geotechnical Evaluation Work Plan – Revision 2
WTP	water treatment plant

1.0 INTRODUCTION

This report documents a test pit investigation program as part of the Blue Creek Pipeline Geotechnical Evaluation for the Midnite Mine Site (Site) in Stevens County, Washington. This evaluation was conducted in response to the U.S. Environmental Protection Agency (USEPA) Record of Decision (ROD) for the Midnite Mine Superfund Site (USEPA, 2006). The investigation was conducted in accordance with the *Blue Creek Pipeline Geotechnical Evaluation Work Plan – Revision 2* (MWH, 2012).

As indicated in the ROD, a component of the final selected remedy includes a pipeline to convey water for off-site discharge from the water treatment plant (WTP) to the Spokane River Arm of Lake Roosevelt. Results from this investigation will be utilized during the remedial design efforts.

The purpose of this investigation was to determine the characteristics of subsurface materials along the proposed pipeline alignment as shown in Figure 1. This report is intended to aid designers in evaluating the site and subsurface conditions for the design of the pipeline and associated construction activities.

2.0 INVESTIGATION OBJECTIVES

The objective of this test pit investigation program, as outlined in the *Blue Creek Pipeline Geotechnical Evaluation Work Plan – Revision 2* (Work Plan) is to determine the characteristics of the soil and bedrock within the range of anticipated excavation depths along the proposed pipeline alignment. Geotechnical data obtained from this test pit investigation are as follows:

1. Soil and bedrock depths along the pipeline corridor,
2. Depth to groundwater,
3. Excavation characteristics of the materials encountered,
4. Compressibility and support characteristics of the pipe foundation materials, and
5. Suitability of excavated materials for pipe backfill.

Gamma surveying was also performed to determine if contaminated sediments exist along the pipeline corridor at the ground surface and at depth.

3.0 INVESTIGATION ACTIVITIES

The completion of the test pits and collection and analysis of soil samples was performed in accordance with the procedures described in the approved Work Plan (MWH 2012) and the approved Quality Assurance Project Plan [(QAPP) Tetra Tech, 2010], including the relevant Standard Operating Procedures (SOPs) attached to the Work Plan.

3.1 TEST PIT EXCAVATIONS

The test pit investigation was completed between September 10 and 12, 2013. Twenty-five test pits were excavated on approximately 1,000 foot centers as shown on Figures 2 through 4. The

completed test pits are summarized in Table 1. In accordance with the approved Work Plan and as required by the Spokane Tribe of Indians, an observer from the Tribe was present during the test pit excavations. Following completion of the test pit investigation, the Archaeology and Preservation Department of the Spokane Tribe of Indians issued a report of their activities. A copy of this report is included as Appendix A of this report. Field coordinates for the completed test pits were determined by a State of Washington licensed land surveyor. A copy of the land survey report is included in Appendix B of this report. As indicated in Table 1, the depths of the individual test pits varied and ranged from 4.5 to 12 feet.

3.2 LOCATION ACCESS

As shown on Figures 2 through 4, the test pits were located either near existing trails or along Blue Creek Road (BIA Highway 55). Clearing of vegetation was not required to access the investigation locations. The test pits were excavated at the locations staked previously in the field with one exception. Test pit TP-16 was relocated approximately 15 feet from its staked location to avoid a large tree. Test pit TP-25 was not staked prior to investigation activities, and was located in the field using measurements from the southwest corner of the Mine site perimeter fencing based on the location presented on Figure 2 of the Work Plan.

3.3 EQUIPMENT AND PROCEDURES

The test pits were excavated using a rubber-tired backhoe (Deere 410D) provided by Moyer Construction of Wellpinit, Washington. In general, test pits were excavated approximately 8 to 12 feet below ground surface (bgs) or to backhoe refusal.

The test pits were logged by a geotechnical engineer, and a detailed test pit log was prepared for each location. The test pit logs are provided in Appendix C of this report. Geological logging was conducted in general accordance with the Unified Soils Classification System (USCS), American Standard Testing Method (ASTM) Standard D 2488-93, Standard Practice for Description and Identification of Soils (Visual Method); and ASTM Standard D 5434-93, Standard Guide for Field Logging of Subsurface Explorations of Soil and Rock.

In addition, a field reconnaissance gamma survey was conducted at each test pit location using a Ludlum Model 19 Micro R Meter. Gamma readings were recorded at the ground surface and at each depth interval as included on the test pit logs. The gamma survey was completed in accordance with SOP for "Direct Gamma Field Survey for Field Reconnaissance" (PDDN-SOP 21) included in the approved Work Plan.

Of particular interest during the logging of the test pits were the depths of bedrock and groundwater, as well as the difficulty of excavating the earthen materials because these can have an effect on the construction of the pipeline.

After logging, photographs of the spoils pile or representative grain sizes were taken. Photographs of the test pits are presented in Appendix D.

The test pits were abandoned by backfilling using the excavated soils. In general, the excavated soils were placed in the test pits in the general order in which they were excavated. The soils were placed in approximately 18-inch lifts and compacted using the backhoe bucket. Following backfilling, a

stake (with test pit number) was placed at the mid-point of the test pit to allow easy identification during surveying of test pit locations by a State of Washington licensed land surveyor.

3.4 BLUE CREEK ROAD GAMMA SURVEYS

Two gamma exposure rate surveys were performed by Tetra Tech on August 21 and October 15, 2013. These surveys were conducted in accordance with the Work Plan and SOP PDDN-SOP21. The first survey consisted of a continuously logged gamma radiation survey beginning at the intersection of West-End Road and Blue Creek Road and continued west for approximately 1,500 feet. The second survey consisted of static measurements taken every 100 feet along Blue Creek Road. A copy of the Blue Creek Gamma Survey report is included in Appendix E of this report.

4.0 SAMPLING AND ANALYSIS

In accordance with the approved Work Plan, geotechnical soil samples were collected from selected test pit locations to evaluate index properties. A total of eight samples were collected along the length of the pipeline alignment. The following analyses were performed by Budinger & Associates, Inc. of Spokane, Washington:

- ASTM D 698 – Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (Standard Proctor).
- ASTM D 4318 – Standard Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils Atterberg Limits (fine grained soils only).
- ASTM D 422 – Standard Standard Test Method for particle-Size Analysis of Soils

Results of the geotechnical analyses are presented in Appendix F and summarized on Table 2.

5.0 SUMMARY OF RESULTS AND STRATIGRAPHIC SEQUENCE

This section presents a summary of the Site geotechnical conditions along the proposed pipeline alignment. The Site geologic and geotechnical data were evaluated in terms of the observed and interpreted conditions and associated technical considerations and/or constraints that could impact design layouts and construction methodology.

Professional geologic and geotechnical engineering judgements about the subsurface conditions and material engineering properties are presented in this document. The subsurface data, results, and interpretations presented were derived from analysis of the test pit and testing data obtained during the investigative activities; the geologic conditions, materials, and structures observed at the ground surface. The following sections present the results of the test pit investigation.

5.1 EXISTING FACILITIES

During the execution of the field investigation, the area immediately surrounding the individual test pit locations was visually scanned for the presence of utilities. The pipeline alignment does not cross existing aboveground electrical utilities. Underground utilities were not encountered in any of the test pit locations.

5.2 GEOLOGY

The bedrock geologic setting of the Midnite Mine and surrounding area is dominated by a granitic quartz monzonite that intruded into a metamorphosed sedimentary (meta-sedimentary) rock, known as the Togo Formation. Much of the overlying meta-sedimentary rock has been eroded away, leaving a "roof pendant" of Togo Formation rock, which is primarily phyllite schist and calc-silicate rocks, including marble, quartzite, and hornfels.

Surficial soil deposits overlie the bedrock at the Site, with thicknesses ranging from 0 to over 20 feet. Generally, soil deposits at the Site are thinnest along ridge crests, and thickest along valley bottoms. The soils were laid down by stream and glacial activity and through weathering of bedrock. Deposits from a series of floods from glacial Lake Missoula left sand and gravel deposits in some areas. The hillsides adjacent to Blue Creek downstream of the Oyachen Creek tributary are composed largely of these sand and gravel deposits. Unconsolidated materials in the site area include surficial deposits such as alluvium, colluvium, and glacial deposits. Weathered bedrock and fractured, more competent bedrock underlie these unconsolidated deposits.

5.2.1 Topsoil

A thin veneer of topsoil was present at most test pit locations. The topsoil consisted of silty and clayey sands. These materials were dry to moist and contained roots and other organic material. Where this material was absent, it was at test pit locations along Blue Creek Road where the material was likely removed during road construction.

5.2.2 Alluvium

Alluvium was present in the test pits completed along Blue Creek Road to the West-End Road (TP-1 through TP-21) to depths up to 12.5 feet. The alluvium typically consisted of poorly graded sands with various amounts of gravel, silt and clay (SP, SP-SM, SM, or SC). Cobbles and boulders of various sizes were also noted in the test pit logs when encountered. This large aggregate was round to subangular and ranged in size from 4 to 18-inches. The alluvium is generally described as loose to dense, and dry to moist. Groundwater was encountered at a limited number of locations (TP-2, TP-5, TP-15, TP-17, and TP-21) at depths ranging from 9 to 12.5 feet below bgs. In general, this material may be used for support of conveyance piping after processing to remove aggregate larger than 3-inches to avoid damage to pipeline materials.

5.2.3 Colluvium

Colluvium was present in the test pits completed in the area north of the West-End Road up to the Site perimeter fencing (TP-22 through TP-25). The colluvium ranged in depth from 4 to 10 feet bgs. The colluvium typically consisted of clayey sand to sandy clay (SC or CL), dry to moist, and in a dense to very dense condition. Larger aggregate was present (<10 percent) at some locations and consisted of fragments of weathered quartz monzonite.

5.2.4 Bedrock

It is likely that bedrock was encountered at one location (TP-2) along the Blue Creek Road. Although samples of the material at this location were not recovered, a continuous surface approximately 12 feet in length was present at the bottom of the test pit at this location.

Weathered bedrock was encountered at depths of 4 to 4.5 feet bgs at two test pit locations (TP-24 and TP-25) near the Site perimeter fence. The weathered bedrock encountered was identified as quartz monzonite and the upper 6 inches of this material was easily rippable with the light excavation equipment used during this investigation program.

5.3 GEOTECHNICAL LABORATORY RESULTS

Results of the laboratory geotechnical testing conducted in 2013 are summarized in Table 2 and included in Appendix F. Results are generally consistent with the soil properties observed and logged in the field by the MWH geotechnical engineer.

Six samples collected in the alluvium consisted of poorly graded sands with silt (SP-SM) and clayey sand (SC). The gradation varies by location with a range of gravels, sands, and fines. The percentage of gravel ranged from 3 to 13 percent and the percentage of sand ranged from 57 to 89 percent. The percentage of fines (silt and clay typically represented as the percent passing the #200 sieve) ranged from 8 to 38 percent with an average of 18%. It is likely that the samples are not entirely representative of the alluvium since large gravels and cobbles are not included in the sample. The liquid limit (LL) of the alluvium samples ranged from 26 to 34 with an average LL of 30.8. The plastic limit (PL) of the alluvium samples ranged from 18 to 23 with an average PL of 20.8. The plasticity index (PI) of the samples ranged from 3 to 16 with an average PI of 10.

The other 2 samples were collected in the colluvium and consist of clayey/silty sand (SC-SM). The gradation varies by location with a range of gravels, sands, and fines. The percentage of gravel ranged from 2 to 4 percent and the percentage of sand ranged from 50 to 74 percent. The percentage of fines in the samples ranged from 22% to 48% with an average fines content of 35%. The LL of the samples ranged from 27 to 30 with an average LL of 28.5. The PL of the samples ranged from 21 to 23 with an average PL of 22. The PI of the samples ranged from 6 to 7 with an average PI of 6.5.

5.4 GAMMA SURVEY RESULTS

Results of the two gamma surveys conducted on Blue Creek Road are included in Appendix E. As presented in Appendix E, a total of 970 gamma measurements were collected during the continuous scan survey of Blue Creek Road. The gamma exposure rates ranged from 23.9 to 37 micro roentgens per hour (μR/hr). In addition, a total of 16 static measurements were collected at discrete locations at 100-foot intervals at differing detector heights (ground surface and 1-meter height) along Blue Creek Road. The gamma exposure rates for the static surface measurements ranged from 25.3 to 32.7 μR/hr. For the static 1-meter measurements, the gamma exposure rates ranged from 24.2 to 30.4 μR/hr. The results of the surveys indicate that the gamma exposure rates are within the background levels previously measured during the White Tail Creek investigation (Tetra Tech, 2013).

Results of the field reconnaissance gamma survey collected from the test pit spoils are presented on the test pit logs included in Appendix C. The gamma exposure rates ranged from 10 to 36 μR/hr. Based on a direct comparison of these results with the gamma exposure rates from the Blue Creek Road surveys, the test pit results fall within similar ranges and can be also be considered representative of the background levels measured during the White Tail Creek investigation.

6.0 CONCLUSIONS AND RECOMMENDATIONS

The following summarizes the results of the investigation activities:

- For engineering and construction purposes, the deposits of alluvium and colluvium can be considered to have similar properties. The colluvium has slightly higher fines content than the alluvium. The colluvium was difficult to excavate and would be suitable for pipeline support. The alluvium was easy to excavate and would be suitable for reuse as construction material after processing.
- Weathered bedrock was encountered at shallow depths ranging from 4 to 4.5 feet bgs at locations near the north end of the pipeline alignment. The bedrock is typically weathered and friable and was rippable to a depth of 6-inches with conventional excavation equipment.
- Boulders were encountered along the pipeline alignment. These may affect excavation, depending on pipeline depths and boulder locations and depths.

The following are recommendations for excavation and construction of the pipeline based on the results of this investigation:

- The undisturbed native soils are suitable for support of the proposed pipeline with little settlement if construction disturbance is minimized. It will be important to provide adequate compaction of native or backfill materials in the pipe zone particularly along the sides and below the pipe haunches to reduce deflections of the pipe with loading from the soil placed above the pipe.
- Some processing of excavated soil (depending on location) will be required to remove large aggregate (>3-inch) that could damage piping material due to the development of large point loads during backfilling.
- Boulders within the alluvium or shallow bedrock that cannot be excavated will need to be removed with a hydraulic hammer attached to the excavator arm if the boulder is large enough to span the planned width of the trench.
- Field observation and evaluation of subsurface conditions by a field engineer or geologist may be required during pipeline excavation to evaluate when weathered bedrock has been reached and if the anticipated excavation depths match the conditions encountered in the field.

7.0 REFERENCES

MWH, 2012. Blue Creek Pipeline Geotechnical Evaluation Work Plan – Revision 2. September 2012.

Tetra Tech, 2013. Technical Memorandum: Blue Creek Road Gamma Survey. November 2013.

USEPA, 2006. Record of Decision, Midnite Mine Superfund Site, Spokane Indian Reservation, Washington. September 2006.

TABLES

TABLE 1
BLUE CREEK PIPELINE – TEST PIT SUMMARY

Test Pit Designation	Date	Northing*	Easting*	Elevation*	Depth (feet)	Depth to Groundwater (feet)	Depth to Bedrock (feet)
BC-TP1	9/10/13	337588.8	2300989.7	1331.7	8	NE	NE
BC-TP2	9/10/13	338305.9	2301644.5	1337.7	11.5	**10.0**	**11.5**
BC-TP3	9/10/13	339087.8	2302247.6	1374.5	11	NE	NE
BC-TP4	9/10/13	339376.8	2303172.2	1412.9	10.5	NE	NE
BC-TP5	9/10/13	339716.3	2304081.4	1438.7	12.5	**12.5**	NE
BC-TP6	9/10/13	340116.4	2305018.5	1473.0	11.5	NE	NE
BC-TP7	9/10/13	340388.0	2305985.0	1510.9	10	NE	NE
BC-TP8	9/10/13	340347.6	2306992.0	1532.8	10	NE	NE
BC-TP9	9/10/13	341172.3	2307418.0	1593.3	10.5	NE	NE
BC-TP10	9/10/13	341994.6	2307901.2	1649.1	11	NE	NE
BC-TP11	9/11/13	342743.9	2308389.2	1709.9	10	NE	NE
BC-TP12	9/11/13	343695.3	2308545.3	1766.0	11	NE	NE
BC-TP13	9/11/13	344449.2	2309069.6	1801.5	9	NE	NE
BC-TP14	9/11/13	345281.7	2309587.5	1843.4	8	NE	NE
BC-TP15	9/11/13	346152.3	2310073.5	1897.1	10	**9.0**	NE
BC-TP16	9/11/13	347058.6	2310508.9	1941.6	8.5	NE	NE
BC-TP17	9/11/13	347772.3	2311144.9	1985.8	9	**9.0**	NE
BC-TP18	9/12/13	348410.0	2311526.4	2028.6	10	NE	NE
BC-TP19	9/12/13	349195.0	2310969.5	2123.5	8.5	NE	NE
BC-TP20	9/11/13	350086.2	2310583.3	2228.0	4.5	NE	NE
BC-TP21	9/12/13	350463.0	2309696.7	2326.1	10	**9.5**	NE
BC-TP22	9/12/13	350443.1	2308944.5	2373.6	10	NE	NE
BC-TP23	9/12/13	351376.2	2309284.8	2431.8	4.5	NE	NE
BC-TP24	9/12/13	351925.1	2309721.7	2496.5	4.5	NE	**4**
BC-TP25	9/12/13	352319.2	2309684.9	2534.9	5	NE	**4.5**

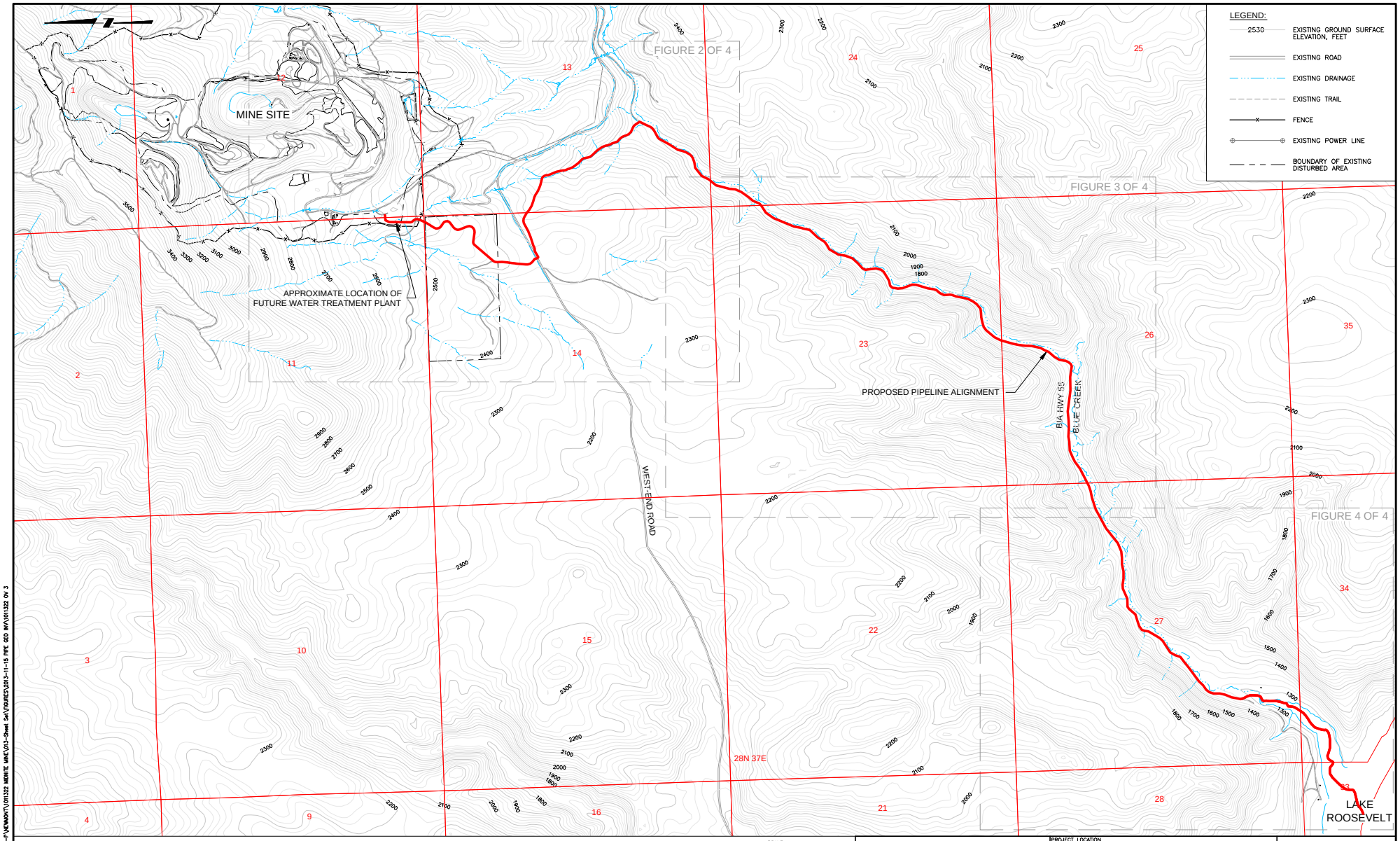
*Washington State Plane – North (NAD 83). Elevation – NAVD 88
NE – Not Encountered

TABLE 2
BLUE CREEK PIPELINE - GEOTECHNICAL TESTING SUMMARY

Test Pit Designation	Sample Depth (feet)	Field Description	Soil Fraction (<3-inches)			Atterberg Limit			Standard Proctor		USCS Designation
			Gravel %	Sand %	-#200 %	LL (%)	PL (%)	PI (%)	Max Dry Density (pcf)	Optimum Moisture (%)	
BC-TP1	3-8	Clayey Sand (SC); fine to medium grained, dark yellowish brown (10YR 4/4); moist; interbedded clay layers 2-6 inches thick - sandy clay; moist; plastic; grayish brown (10YR 5/2); moderately dense.	6	82	12	NP	NP	NP	124.6	11.2	SP-SM
BC-TP3	3-6	Sand (SP); fine to medium grained; yellowish brown (10YR 5/4); moist; loose - easy digging.	3	89	8	NP	NP	NP	107.6	5.7	SP-SM
BC-TP7	8-10	Sand (SP); fine to coarse grained; moist; yellowish brown (10YR 5/4); moderately dense-easy digging; sidewalls free standing.	3	89	8	26	23	3	108.9	9.9	SP-SM
BC-TP11	3-4	Sand (SP); coarse grained; rounded; brown (7.5YR 5/4); moist; moderately dense.	12	66	22	34	18	16	124.2	10.2	SC
BC-TP20	2-4	Clayey Sand (SC) to Sandy Clay (CL) w/some gravel (<5%); fine grained; dry to moist; plastic when wetted; light yellowish brown (10YR 6/4).	5	57	38	31	21	10	117.2	13.1	SC
BC-TP21	3-10	Clayey Sand (SC); fine to coarse grained; rounded; moist; dark yellowish brown (10YR 4/4); loose.	6	69	25	32	21	11	121	12.9	SC
BC-TP22	2-10	Clayey Sand (SC); fine grained; moist; very dense; light yellowish brown (2.5Y 6/4).	2	50	48	27	21	6	114.3	14.1	SC-SM
BC-TP24	2-4	Clayey Sand (SC); fine to medium grained; dry; brown (7.5YR 5/3); some boulders and cobbles (<10%); large aggregate is rounded to subangular; granitic in origin; moderately dense.	4	74	22	30	23	7	121.2	11.3	SC-SM

LL: Liquid Limit
pcf: pounds per cubic foot
PI: Plasticity Index
PL: Plastic Limit
USCS: Unified Soil Classification System

FIGURES



DRAWING REFERENCES:

- EXISTING PLANIMETRICS BASED UPON LIDAR MAPPING BY SPATIAL INTEL, 2010. WASHINGTON STATE PLANE–NORTH, NAD 83/NAVD 88.
- EXISTING TOPOGRAPHY CONTOURS DOWNLOADED FROM "SEAMLESS.USGS.GOV", DOWNLOADED JUNE 12, 2012. WASHINGTON STATE PLANE–NORTH, NAD 83/NAVD 88.

SCALE
800' 0 800' 1600'
CONTOUR INTERVAL = 20 FEET

NEWMONT

PROJECT LOCATION	WELLPINIT, WASHINGTON
PROJECT	MIDNITE MINE
TITLE	EFFLUENT PIPELINE ALIGNMENT OVERALL LAYOUT

MWH

FIGURE 1	REVISION 3
FILE NAME 1011322 OV 3	DATE NOV 2013

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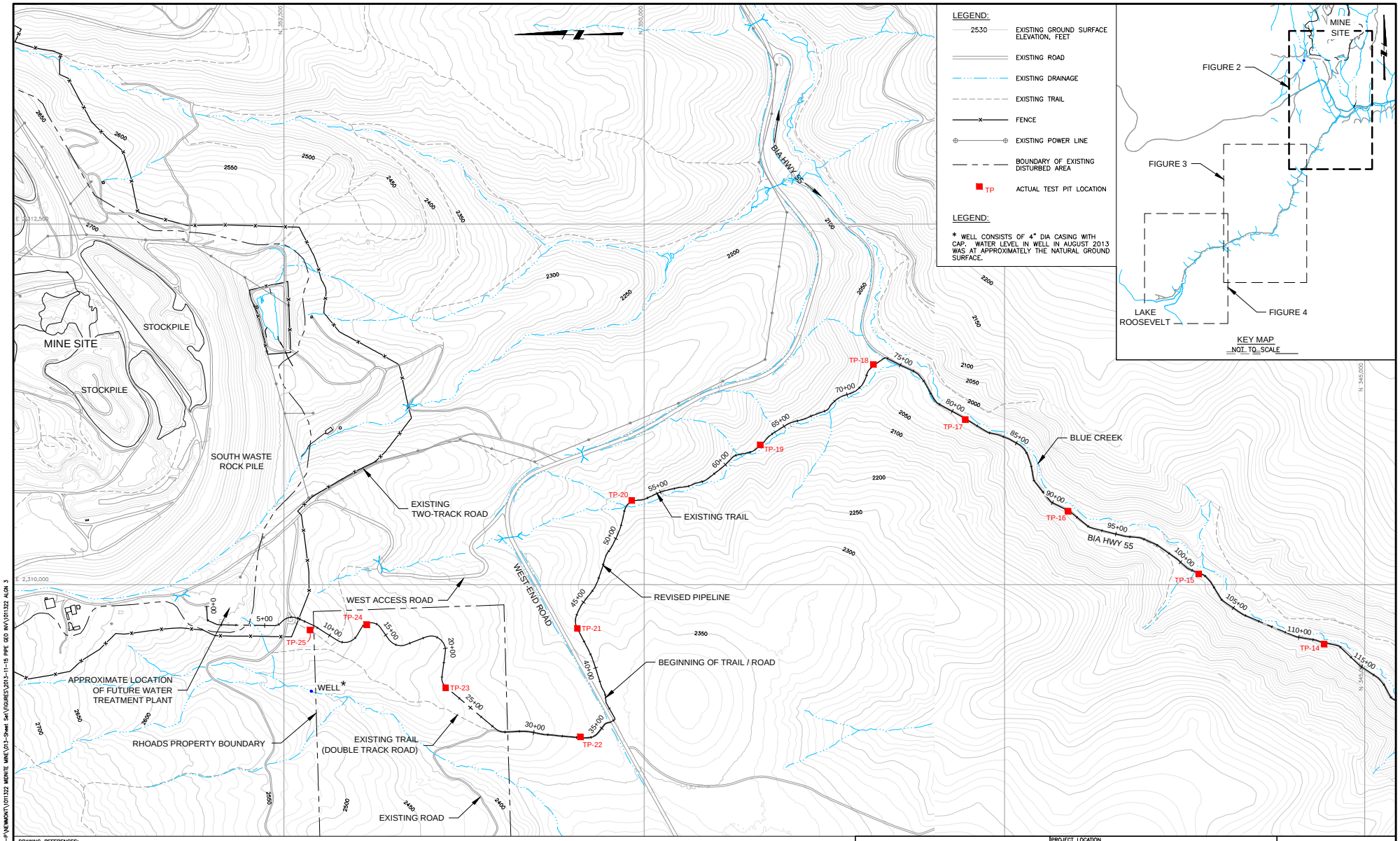

DRAWING REFERENCES:

- EXISTING TOPOGRAPHY ALONG THE PIPELINE CORRIDOR BASED UPON LIDAR MAPPING BY SPATIAL INTEL, 2010. WASHINGTON STATE PLANE-NORTH, NAD 83/NAVD 88.
- OTHER EXISTING SITE TOPOGRAPHY CONTOURS DOWNLOADED FROM "SEAMLESS.USGS.GOV", JUNE 12, 2012. WASHINGTON STATE-PLANE, NAD 83/NAVD 88.
- LAKE ROOSEVELT CONTOURS FROM BATHYMETRIC SURVEY BY RESCAN CONDUCTED FEBRUARY 22-25, 2011.

SCALE
300' 0 300' 600'
CONTOUR INTERVAL = 10 FEET

NEWMONT

PROJECT LOCATION	WELLPINIT, WASHINGTON
PROJECT	MIDNITE MINE
TITLE	MINE AREA - EFFLUENT PIPELINE GEOTECHNICAL EVALUATION LAYOUT
FIGURE 2	REVISION 3
FILE NAME 1011322 ALGN 3	DATE NOV 2013

MWH

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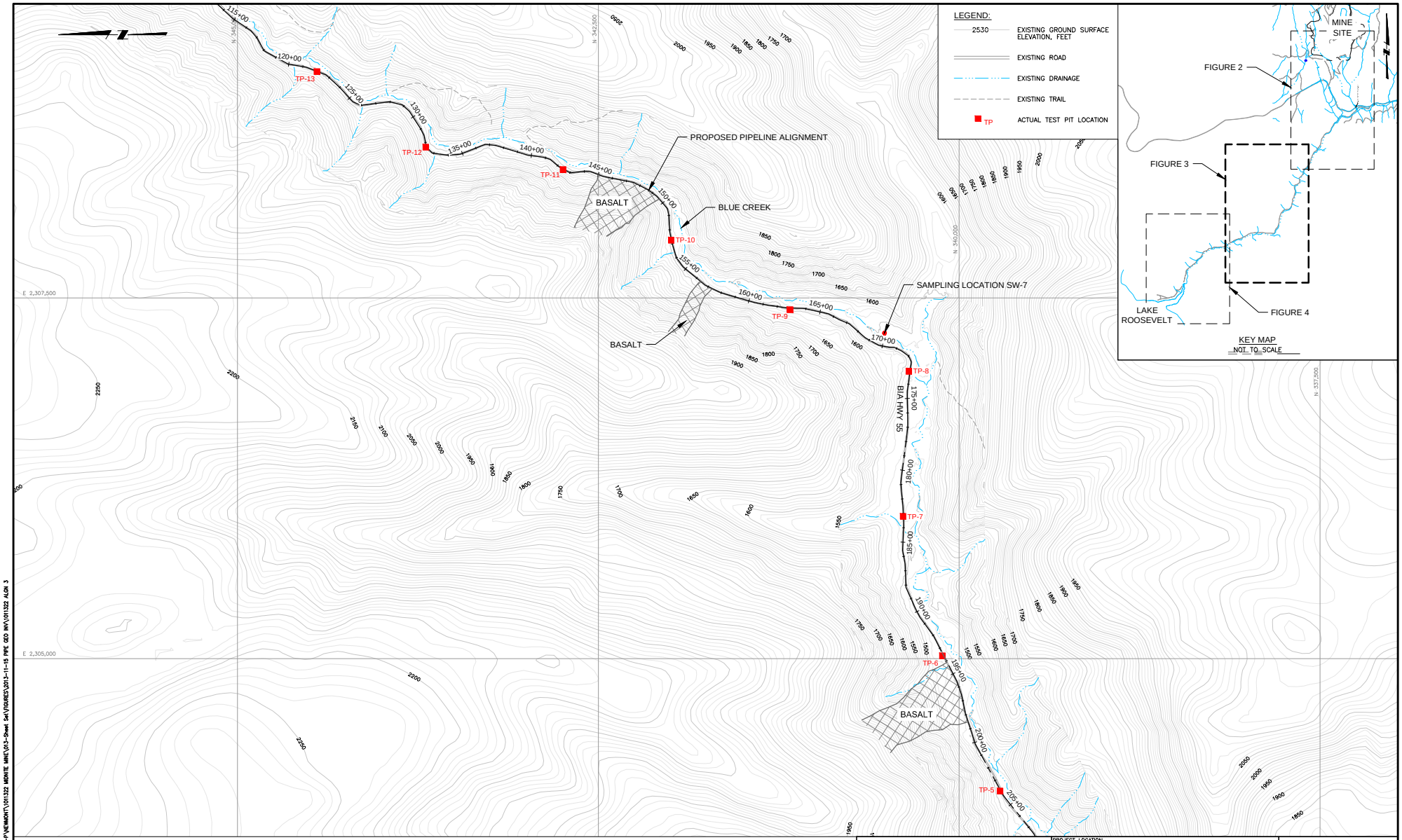

DRAWING REFERENCES:

- EXISTING TOPOGRAPHY ALONG THE PIPELINE CORRIDOR BASED UPON LIDAR MAPPING BY SPATIAL INTEL, 2010. WASHINGTON STATE PLANE-NORTH, NAD 83/NAVD 88.
- OTHER EXISTING SITE TOPOGRAPHY CONTOURS DOWNLOADED FROM "SEAMLESS.USGS.GOV", JUNE 12, 2012. WASHINGTON STATE-PLANE, NAD 83/NAVD 88.
- LAKE ROOSEVELT CONTOURS FROM BATHYMETRIC SURVEY BY RESCAN CONDUCTED FEBRUARY 22-25, 2011.

NOTE:

BASALT OUTCROP LOCATIONS ARE APPROXIMATE, BASED ON VISUAL OBSERVATIONS FROM BIA HWY 55.

SCALE
300' 0 300' 600'
CONTOUR INTERVAL = 10 FEET

NEWMONT

PROJECT LOCATION	WELLPINIT, WASHINGTON
PROJECT	MIDNITE MINE
TITLE	BLUE CREEK EAST - EFFLUENT PIPELINE GEOTECHNICAL EVALUATION LAYOUT
FIGURE 3	REVISION 3
FILE NAME 1011322 ALGN 3	DATE NOV 2013

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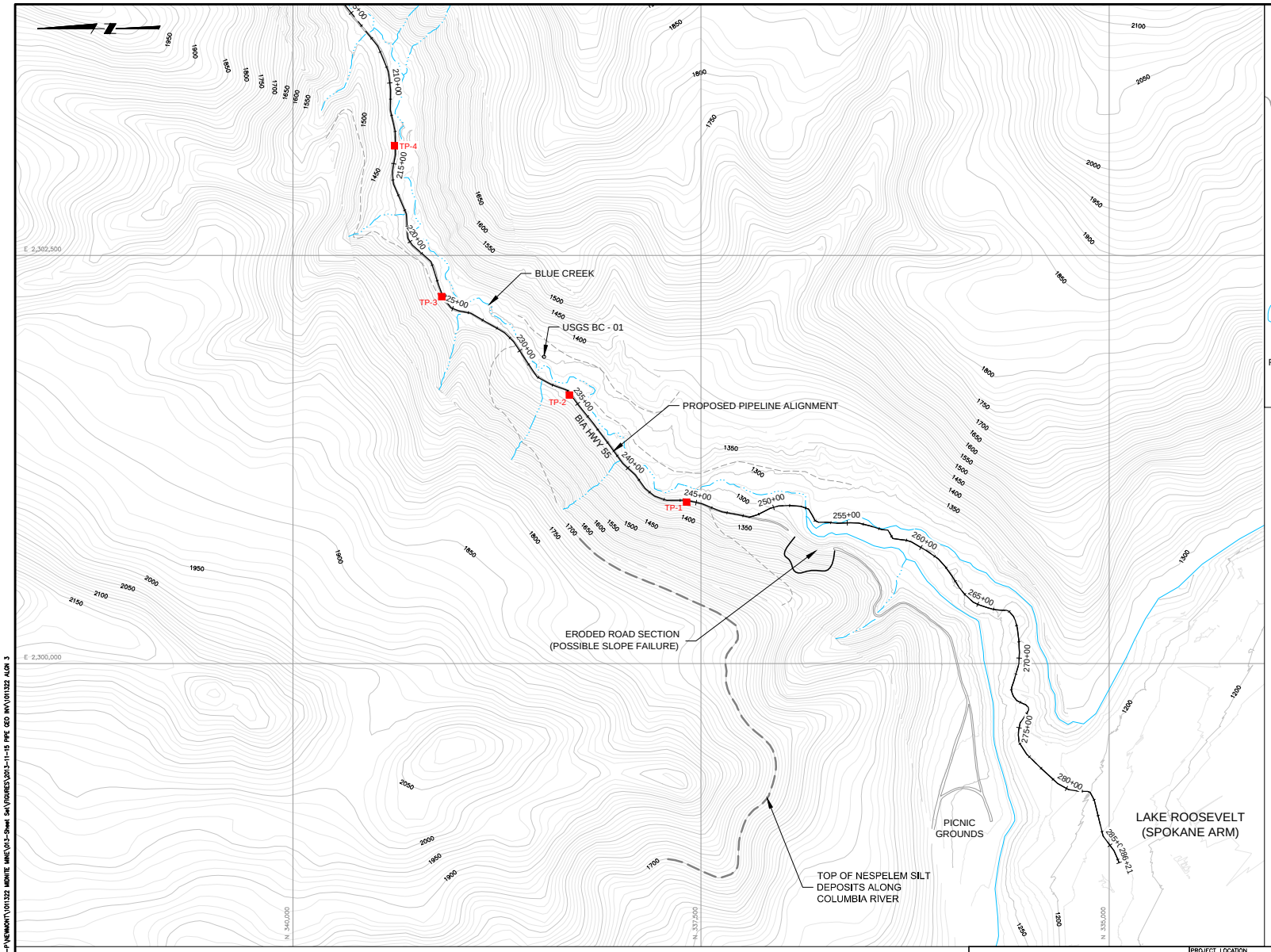

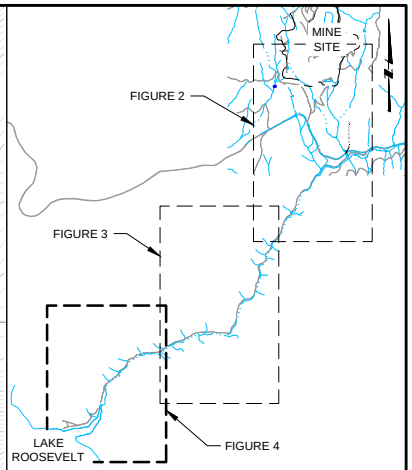

KEY MAP
NOT TO SCALE

LEGEND:

2530	EXISTING GROUND SURFACE ELEVATION, FEET
	EXISTING ROAD
	EXISTING DRAINAGE
	EXISTING TRAIL
TP	ACTUAL TEST PIT LOCATION

DRAWING REFERENCES:

- EXISTING TOPOGRAPHY ALONG THE PIPELINE CORRIDOR BASED UPON LIDAR MAPPING BY SPATIAL INTEL, 2010. WASHINGTON STATE PLANE-NORTH, NAD 83/NAVD 88.
- OTHER EXISTING SITE TOPOGRAPHY CONTOURS DOWNLOADED FROM "SEAMLESS.USGS.GOV", JUNE 12, 2012. WASHINGTON STATE-PLANE, NAD 83/NAVD 88.
- LAKE ROOSEVELT CONTOURS FROM BATHYMETRIC SURVEY BY RESCAN CONDUCTED FEBRUARY 22-25, 2011.

SCALE
300' 0 300' 600'
CONTOUR INTERVAL = 10 FEET

NEWMONT

PROJECT LOCATION	WELLPINIT, WASHINGTON
PROJECT	MIDNITE MINE
TITLE	BLUE CREEK WEST - EFFLUENT PIPELINE GEOTECHNICAL EVALUATION LAYOUT
FIGURE 4	REVISION 3
FILE NAME 1011322 ALGN 3	DATE NOV 2013

MWH

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APPENDIX A

CULTURAL RESOURCES MONITORING REPORT

CULTURAL RESOURCES MONITORING OF BACKHOE TEST PITS ALONG BLUE CREEK, WELLPINIT, WASHINGTON

Prepared for:

Worthington Miller Environmental, LLC

Prepared By:

Jackie Corley, B.A.
Tribal Archaeologist

Reviewed By:

James Harrison, M.A.
Principal Investigator

Spokane Tribe of Indians
Archaeology and Preservation Department
6187 Agency Square Road
P.O. Box 100
Wellpinit, Washington 99040
(509) 258-4060

7 October, 2013

DATE: October 7, 2013

PROJECT TITLE: Blue Creek Backhoe Test Pits

PROJECT SPONSOR: Worthington Miller Environmental, LLC

REPORT TITLE: Cultural Resources Monitoring of the Blue Creek Backhoe Test Pits Wellpinit, Washington

LOCATION: Blue Creek Drainage, Spokane Reservation

USGS 7.5' QUAD: Turtle Lake Quadrangle

LAND OWNERSHIP: Spokane Tribe of Indians

NUMBER OF PREVIOUSY RECORDED SITES: 0

NUMBER OF NEWLY RECORDED SITES: 0

BACKGROUND: Worthington Miller Environmental, LLC conducted backhoe test pits along the road adjacent to Blue Creek (BIA highway 55), September 10-12, 2013. Due to ground disturbances in the area, and recommendations from the Spokane THPO, STI was contacted to provide a monitor during the project. The goal of this report is to fulfill the cultural resources regulatory requirements and recommendations of the Spokane Tribe of Indians' Tribal Preservation Officer Randy Abrahamson (STI THPO). This project is one small component of the section 106 compliance for the Midnight Mine reclamation project.

PROJECT SUMMARY: While Worthington Miller Environmental, LLC trenched test pits along Blue Creek Road, to test for geologic stability for a proposed waste water transference pipeline. A monitor was present for ground breaking disturbances. The Blue Creek Backhoe Test Pits Project occurred September 10-12, 2013. Test pits were trenched along the road running adjacent to Blue Creek, up to Midnight Mine. The area was previously surveyed, and shovel probes excavated (Corley 2013).

METHODS: Monitor Jackie Corley from the Spokane Tribe of Indians Archaeology and Preservation Department was present during the Blue Creek Test Pit Project. The monitor was present while a backhoe trenched all 25 soil sample test pits. Trenches were usually about three meters long and five meters deep, if bedrock was not reached. Soil from the bottom of eight test pits was collected in two five gallon buckets, for further testing.

RESULTS AND CONCLUSIONS: Cultural resources were not observed during the Blue Creek Backhoe Test Pits project, and completion of this job occurred on September 12, 2013. Further monitoring is recommended if additional ground disturbing activities are to take place.

APPENDIX B

LAND SURVEY REPORT

WALTER O. DALE
PRESIDENT

BENTHIN & ASSOCIATES

PROFESSIONAL LAND SURVEYING AND PLANNING
1004 NORTH ATLANTIC STREET • SPOKANE, WA. 99201-2209
(509) 325-4529 • (FAX) 325-4520 • SURVEY@GPS-SURVEYOR.COM

SCOTT A. DALE
SECRETARY

MIDNITE MINE TEST PIT REPORT FOR BLUE CREEK PIPELINE

COORDINATE SYSTEM IS NAD 83 (CORS 96) GROUND COORDINATES WITH NAVD 88 ELEVATIONS

TEST PIT	NORTHING	EASTING	ELEVATION	DESCRIPTION
TP-1	337588.8	300989.7	1331.7	PER WOOD STAKE
TP-2	338305.9	301644.5	1337.7	PER WOOD STAKE
TP-3	339087.8	302247.6	1374.5	PER WOOD STAKE
TP-4	339376.8	303172.2	1412.9	PER WOOD STAKE
TP-5	339716.3	304081.4	1438.7	PER WOOD STAKE
TP-6	340116.4	305018.5	1473.0	PER WOOD STAKE
TP-7	340388.0	305985.0	1510.9	PER WOOD STAKE
TP-8	340347.6	306992.0	1532.8	PER WOOD STAKE
TP-9	341172.3	307418.0	1593.3	PER WOOD STAKE
TP-10	341994.6	307901.2	1649.1	PER WOOD STAKE
TP-11	342743.9	308389.2	1709.9	PER WOOD STAKE
TP-12	343695.3	308545.3	1766.0	*MAPPING GRADE ONLY*
TP-13	344449.2	309069.6	1801.5	PER WOOD STAKE
TP-14	345281.7	309587.5	1843.4	PER WOOD STAKE
TP-15	346152.3	310073.5	1897.1	PER WOOD STAKE
TP-16	347058.6	310508.9	1941.6	PER WOOD STAKE
TP-17	347772.3	311144.9	1985.8	PER WOOD STAKE
TP-18	348410.0	311526.4	2028.6	PER WOOD STAKE
TP-19	349195.0	310969.5	2123.5	PER WOOD STAKE
TP-20	350086.2	310583.3	2228.0	PER WOOD STAKE
TP-21	350463.0	309696.7	2326.1	PER WOOD STAKE
TP-22	350443.1	308944.5	2373.6	PER WOOD STAKE
TP-23	351376.2	309284.8	2431.8	PER WOOD STAKE
TP-24	351925.1	309721.7	2496.5	PER WOOD STAKE
TP-25	352319.2	309684.9	2534.9	PER WOOD STAKE

NOTE: Coordinates on Test Pits are only certified to the nearest 1'
Elevations on Test Pits are only certified to the neartest 1'
Test Pits located with mapping grade are only certified Horiz. to the nearest 5.0'
Test Pits located with mapping grade are only certified Vert. to the nearest 10.0'
These coordinates are surface values with a 2,000,000 factor removed from Eastings to differentiate from actual NAD 83 (CORS 96) Grid Coordinates.

WALTER O. DALE
STATE OF WASHINGTON
29270
REGISTERED
PROFESSIONAL LAND SURVEYOR

10-17-13

APPENDIX C

TEST PIT LOGS

TEST PIT LOG

PAGE: 1

DATE: 9/10/13

TEST PIT NO.: TP-1

PROJECT INFORMATION

PROJECT: MIDWITE MINE - BLUE CREEK PIPELINE

PROJECT NO.: 1011322

CLIENT: DAWN MINING CO.

OWNER:

GPS COORDINATES AND GPS ERROR: UTM (83/88)
11T 0414780; 5305134

TEST PIT LOCATION

SEE FIGURE 4 OF WP
STA 250+00

FIELD INFORMATION

DATE & TIME ARRIVED: 9/10/13

TEST PIT LOGGED BY: GRONSETH

VISITORS: COLLEY

WEATHER: CLEAR, COOL (50's), CALM

EXCAVATION INFORMATION

EXCAVATION COMPANY: MOYER CONSTRUCTION

START TIME: 09:06

TEST PIT DEPTH: 8 FT

TEST PIT DIA.: 3 FT

EXCAVATION METHOD: BACKHOE - DEERE 410D

SAMPLING METHOD: BUCKET

TIME EXCAVATION COMPLETE: 09:30

TEST PIT COMPLETION / ABANDONMENT INFORMATION

START TIME: 09:35

COMPLETE TIME: 10:00 EST

INSTRUMENTATION: —

BACKFILL: SPOILS

GROUNDWATER CONDITIONS

DRY - GW NOT ENCOUNTERED TO TERMINATION DEPTH

FOLLOWING FIELD WORK

TIME OF CLEAN-UP COMPLETE: —

TIME LEFT SITE: —

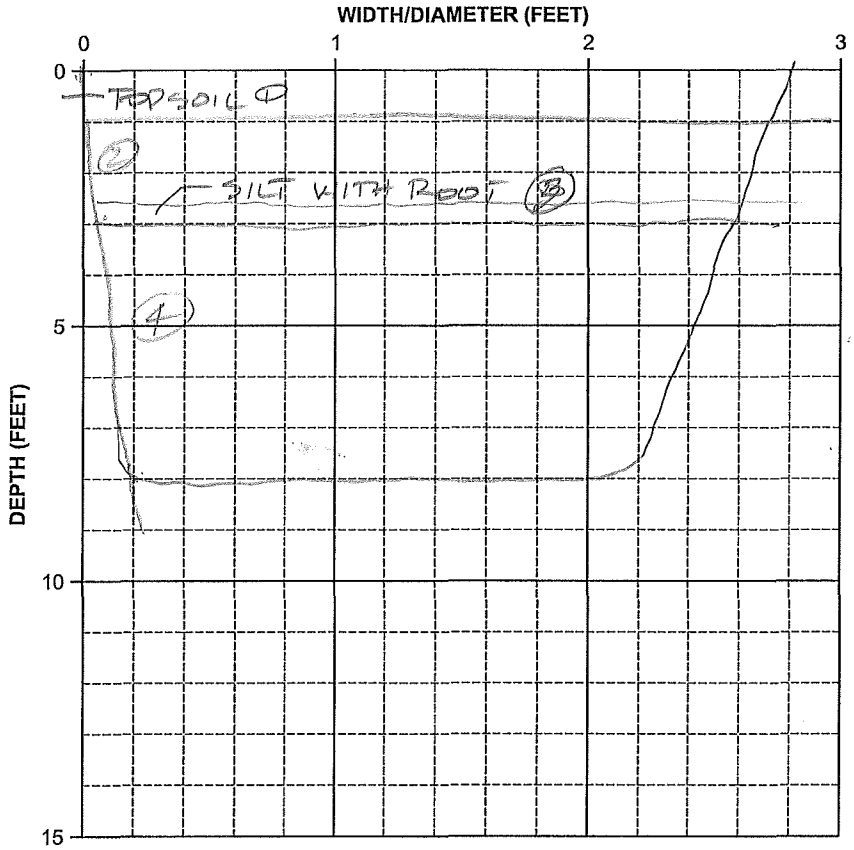
NOTES:

TEST PIT LOG

PROJECT: MIDNITE MINE – BLUE CREEK PIPELINE PAGE: 2

PROJECT NO.: 1011322 DATE: 9/10/13

TEST PIT NO.: TP-1



DEPTH	SAMPLE I.D.	SAMPLE TYPE
3-8	①	BULK

SOIL TYPE	SOIL DEPTH	SOIL DESCRIPTION AND EXCAVATION NOTES
①	0-0.8	TOPSOIL ROOTS, LARGE COBBLES UP TO 2' FT SILTY SAND, FINE GRAINED (10YR 5/3) MOIST; LOOSE
②	0.8-2.5	SAND, COARSE GRAINED, PALE YELLOW (2.5Y 7/3) COARSE GRAINED, ROUNDED TO SUBANGULAR, LOOSE – EASY DIGGING
③	2.5-3.0	SILT VERY FINE GRAINED, PALE YELLOW (2.5Y 7/3) HARD
4	3.-8	CLAYEY SAND (SC) FINE TO MEDIUM GRAINED, DARK YELLOWISH BROWN (10YR 4/4) MOIST. INTERBEDDED CLAY LAYERS 2-6 INCHES THICK. SANDY CLAY, MOIST; PLASTIC, GRAYISH BROWN (10YR 5/2). MOD DENSE

NOTES:

TEST PIT LOG

GAMMA RDG = 20 MR/HR

PAGE: 1

DATE: 9/10/13

TEST PIT NO.: TP 2

PROJECT INFORMATION

PROJECT: MIDWEST MINE - BLUE CREEK PIPELINE

PROJECT NO.: 1011322

CLIENT: DAWN MINING CO.

OWNER:

GPS COORDINATES AND GPS ERROR: UTM (83/83)
11T 0414989, 5305340

TEST PIT LOCATION

STA. 240+00
AS INDICATED ON FIG 4
OF WORKPLAN

FIELD INFORMATION

DATE & TIME ARRIVED: 10:05 - 10:45

TEST PIT LOGGED BY: GRONSETH

VISITORS: J. CORLEY

WEATHER: CLEAR, CALM, COOL (60's)

EXCAVATION INFORMATION

EXCAVATION COMPANY: MOYER CONSTRUCTION

START TIME: 10:05

TEST PIT DEPTH: 11.5 FT

TEST PIT DIA.: 3 FT

EXCAVATION METHOD: BACKHOE DEERE 410D

SAMPLING METHOD: —

TIME EXCAVATION COMPLETE: 10:45

TEST PIT COMPLETION / ABANDONMENT INFORMATION

START TIME: 10:50

COMPLETE TIME: 11:20 EST

INSTRUMENTATION:

BACKFILL: SPOILS

GROUNDWATER CONDITIONS

WATER ENTERING EXCAVATION AT 10 FT BGS

FOLLOWING FIELD WORK

TIME OF CLEAN-UP COMPLETE: —

TIME LEFT SITE: —

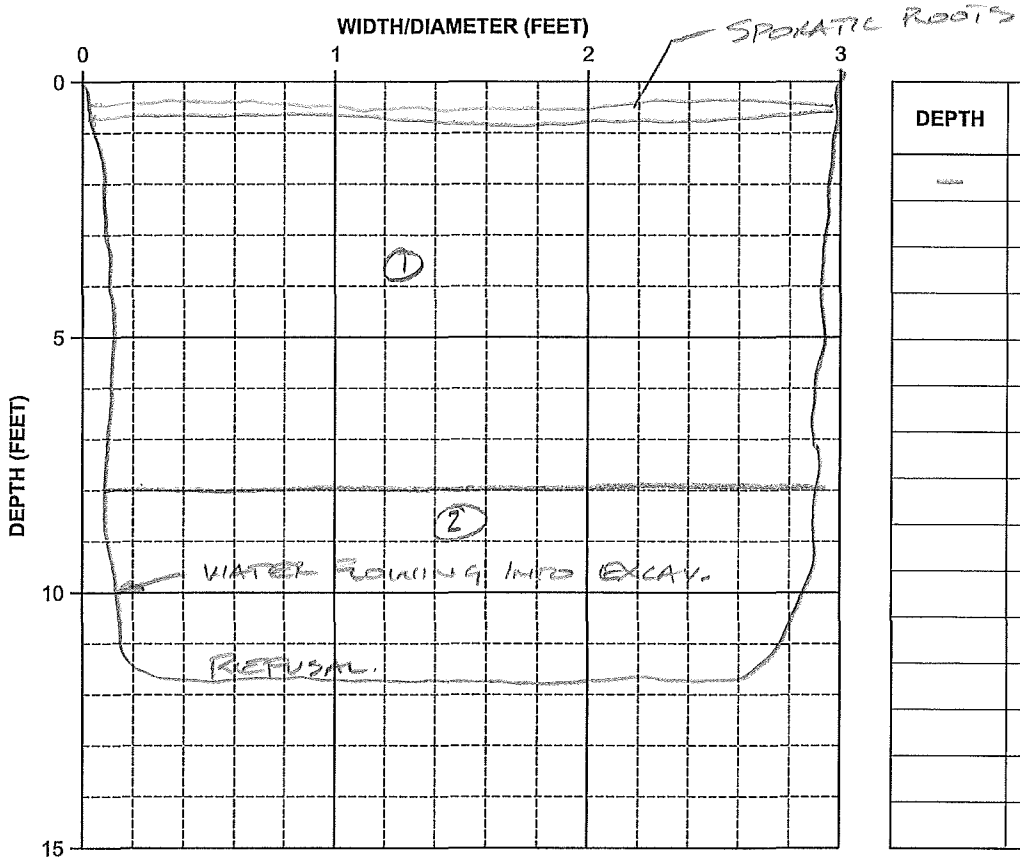
NOTES:

TEST PIT LOG

TEST PIT NO.: TP-2

PROJECT: MIDNITE MINE - BLUE GREEK PIPELINE **PAGE:** 2

PROJECT NO.: 1011322 **DATE:** 9/10/13



DEPTH	SAMPLE I.D.	SAMPLE TYPE
—	—	—

SURFACE GAMMA RDG = 20 μR/HR

SOIL TYPE	SOIL DEPTH	SOIL DESCRIPTION AND EXCAVATION NOTES
1	0-3	SILTY SAND (SM); FINE GRAINED, DARK YELLOWISH BRN (10YR 3/4); LOOSE-EASY DIGGING; MOIST GAMMA READING = 20 μR/HR, NON-PLASTIC. 2" ROOTS AT 3.0 FT
	3-8 FT	AS ABOVE
2	8 FT -10	CLAYEY SAND (SC), FINE GRAINED, LIGHT OLIVE BRN (2.5Y 5/3) LOOSE - EASY DIGGING. GAMMA READING = 20 μR/HR MOIST BUT BECOMING WETTER
	10 FT	AS ABOVE, WET w/ 3" COBBLES, ROUNDED TO SUBANGULAR, BLACK. WATER FREE FLOWING INTO EXCAVAT. 10 FT

NOTES: 11.5 FT REFUSAL ON APPARENT BEDROCK. NO BEDROCK MATERIAL RECOVERED

TEST PIT LOG

PAGE: 1

DATE: 9/10/13

TEST PIT NO.: TP-3

PROJECT INFORMATION

PROJECT: MIDNITE MINE - BLUE CREEK PIPELINE

PROJECT NO.: 1511322

CLIENT: DAWN MINING CO.

OWNER:

GPS COORDINATES AND GPS ERROR: UTM (83/82)
11T 0415184; 5305553

TEST PIT LOCATION

STA 230+00
AS INDICATED ON
FIG 4 OF WORKPLAN

FIELD INFORMATION

DATE & TIME ARRIVED: 10:54

TEST PIT LOGGED BY: GROHSETH

VISITORS: J. CORLEY

WEATHER: CLEAR, CALM, WARM (70's)

EXCAVATION INFORMATION

EXCAVATION COMPANY: MOYER CONSTRUCTION

START TIME: 10:59

TEST PIT DEPTH: 11 FT

TEST PIT DIA.: 4 FT

EXCAVATION METHOD: BACKHOE - DEERE 410 D

SAMPLING METHOD: BUCKET

TIME EXCAVATION COMPLETE: 11:33

TEST PIT COMPLETION / ABANDONMENT INFORMATION

START TIME: 11:40

COMPLETE TIME: 12:00 EST

INSTRUMENTATION:

BACKFILL: SPOILS

GROUNDWATER CONDITIONS

GROUNDWATER NOT ENCOUNTERED

FOLLOWING FIELD WORK

TIME OF CLEAN-UP COMPLETE: —

TIME LEFT SITE: —

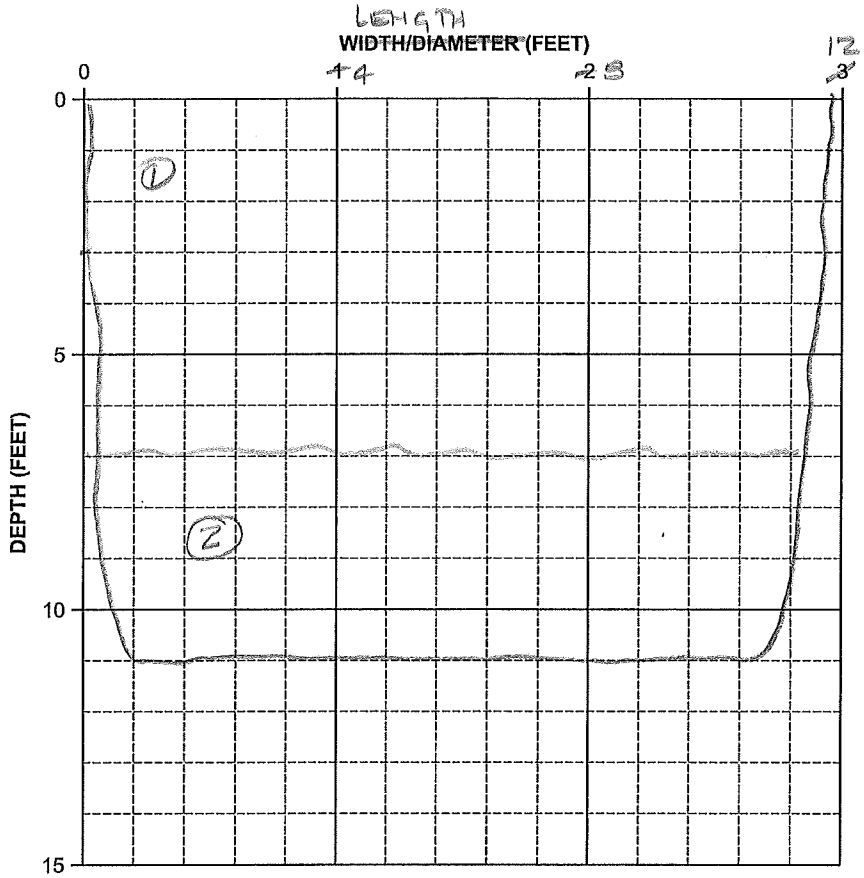
NOTES:

TEST PIT LOG

PROJECT: MIDNITE MINE- BLUE CREEK PIPELINE PAGE: 2

PROJECT NO.: 1011322 DATE: 9/10/13

TEST PIT NO.: TP-3



DEPTH	SAMPLE I.D.	SAMPLE TYPE
3-6'	TP-2	BULK

SURFACE GAMMA RDG: 21 μR/HR

SOIL TYPE	SOIL DEPTH	SOIL DESCRIPTION AND EXCAVATION NOTES
0 1	0-3 FT	SAND (SP); FINE TO MEDIUM GRAINED, YELLOWISH BRN (10YR 5/4) DRY, LOOSE - EASY DIGGING; ROOTS UP TO 1" DOWN TO 1FT. GAMMA RDG = 20 μR/HR
	3-7 FT	AS ABOVE BECOMING MOIST. GAMMA RDG = 20 μR/HR
2	7-9 FT	SAND W/ SOME COBBLES (<10%) (SP): FINE TO MEDIUM GRAINED, YELLOWISH BRN (10YR 5/4); MOIST; LOOSE - EASY DIGGING, COBBLES ROUNDED SIZED TO 6"; COBBLES APPEAR TO BE QTZ MONZONITE
	9-11 FT	AS ABOVE - TP TERMINATE DUE TO SIDE WALL FAILURE

NOTES:

TEST PIT LOG

PAGE: 1

DATE: 9/10/13

TEST PIT NO.: TP-4

PROJECT INFORMATION

PROJECT: MIDWITE MINE - BLUE CREEK PIPELINE

PROJECT NO.: 1011322

CLIENT: DAWN MINING CO

OWNER:

GPS COORDINATES AND GPS ERROR: UTM (83/83)
11T 0415469; 5305635

TEST PIT LOCATION

STA 220+00
AS INDICATED ON FIG 4
OF WORK PLAN

FIELD INFORMATION

DATE & TIME ARRIVED: 11:38

TEST PIT LOGGED BY: GROMBETH

VISITORS: J. CORLEY

WEATHER: CLEAR, CALM, WARM (80's)

EXCAVATION INFORMATION

EXCAVATION COMPANY: MOYER CONSTRUCTION

START TIME: 11:40

TEST PIT DEPTH: 10.5 FT

TEST PIT DIA.: 2-FT

EXCAVATION METHOD: BACKHOE DEERE 410 D

SAMPLING METHOD: BUCKET

TIME EXCAVATION COMPLETE: 12:09

TEST PIT COMPLETION / ABANDONMENT INFORMATION

START TIME: 12:15

COMPLETE TIME: 12:45 EST.

INSTRUMENTATION:

BACKFILL: SPOILS

GROUNDWATER CONDITIONS

GROUNDWATER NOT ENCOUNTERED

FOLLOWING FIELD WORK

TIME OF CLEAN-UP COMPLETE: —

TIME LEFT SITE: —

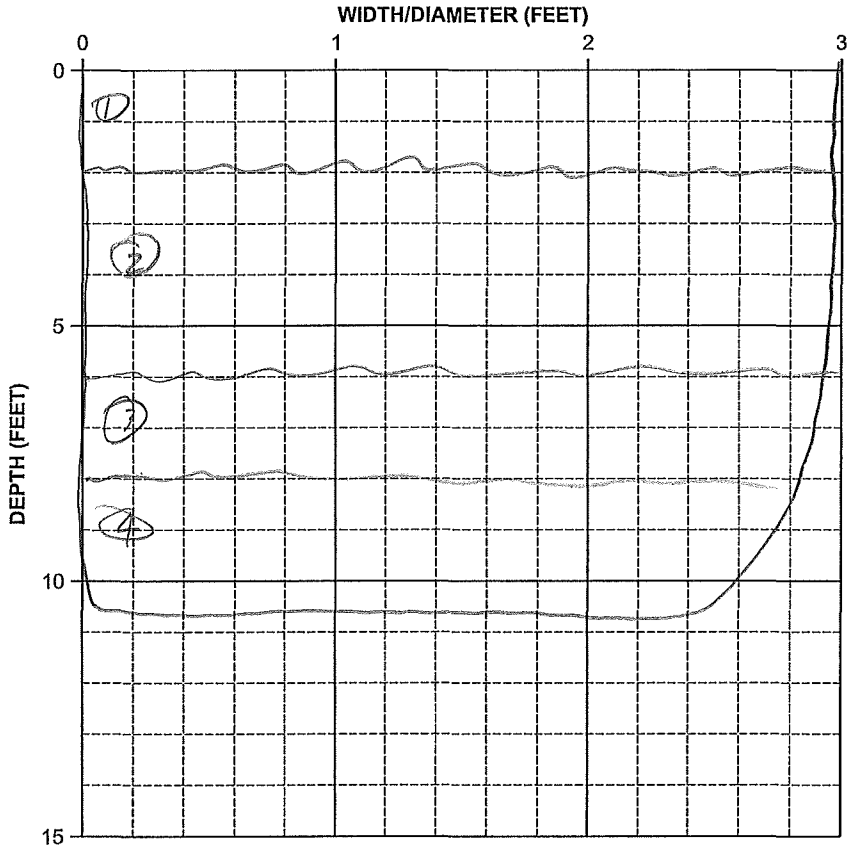
NOTES:

TEST PIT LOG

PROJECT: MIDWHITE MINE - BLUE CREEK PIPELINE PAGE: 2

PROJECT NO.: 1011322 DATE: 9/10/13

TEST PIT NO.: TP-4



DEPTH	SAMPLE I.D.	SAMPLE TYPE
—	—	—

SURFACE GAMMA RDG = 21 μR/HR

SOIL TYPE	SOIL DEPTH	SOIL DESCRIPTION AND EXCAVATION NOTES
1	0-2	SAND (SP), FINE TO MEDIUM GRAINED; BRN (10YR 5/3) DRY TO MOIST; LOOSE - EASY DIGGING; ROOTS IN UPPER 6-INCHES. GAMMA RDG = 17 μR/HR
2	2-6	AS ABOVE - SOME ROUNDED COBBLES TO 8-INCHES
	6-~~10.5~~ 8	SILTY SAND (SP-SM), FINE TO MEDIUM GRAINED, BRN (10YR 5/3) MOIST. SOME CLAYEY SAND (SC) FINE TO MEDIUM GRAINED BRN (10YR 5/3) MOIST; MOD. DENSE. RDG = 19 μR/HR
	8-10.5	SAND (SP), FINE TO MEDIUM GRAINED; BRN (10YR 5/3); DENSE; MOIST. REFUSAL AT 10.5 FEET

GAMMA RDG = 21 μR/HR

NOTES:

TEST PIT LOG

PAGE: 1

DATE: 9/10/13

TEST PIT NO.: TP-5

PROJECT INFORMATION

PROJECT: MIDWITE MINE - BLUE CREEK PIPELINE

PROJECT NO.: 1011322

CLIENT: DAVIS MINING CO.

OWNER:

GPS COORDINATES AND GPS ERROR: UTM

NO SIGNAL

TEST PIT LOCATION

STA 210+00

AS INDICATED ON FIG 3 OF THE WORKPLAN.

FIELD INFORMATION

DATE & TIME ARRIVED: 9/10/13 12:15

TEST PIT LOGGED BY: GROMSETH

VISITORS: J. COLLEY

WEATHER: CLEAR, CALM, WARM 80's

EXCAVATION INFORMATION

EXCAVATION COMPANY: MEYER CONSTRUCTION

START TIME: 12:15

TEST PIT DEPTH: 12.5 FT

TEST PIT DIA.: 2 FT

EXCAVATION METHOD: BACKHOE DEERE 410D

SAMPLING METHOD: BUCKET

TIME EXCAVATION COMPLETE: 13:05

TEST PIT COMPLETION / ABANDONMENT INFORMATION

START TIME: 13:30

COMPLETE TIME: 14:00 EST

INSTRUMENTATION: —

BACKFILL: SPOILS

GROUNDWATER CONDITIONS

GROUNDWATER ENCOUNTERED AT 12.5 FT

FOLLOWING FIELD WORK

TIME OF CLEAN-UP COMPLETE: —

TIME LEFT SITE: —

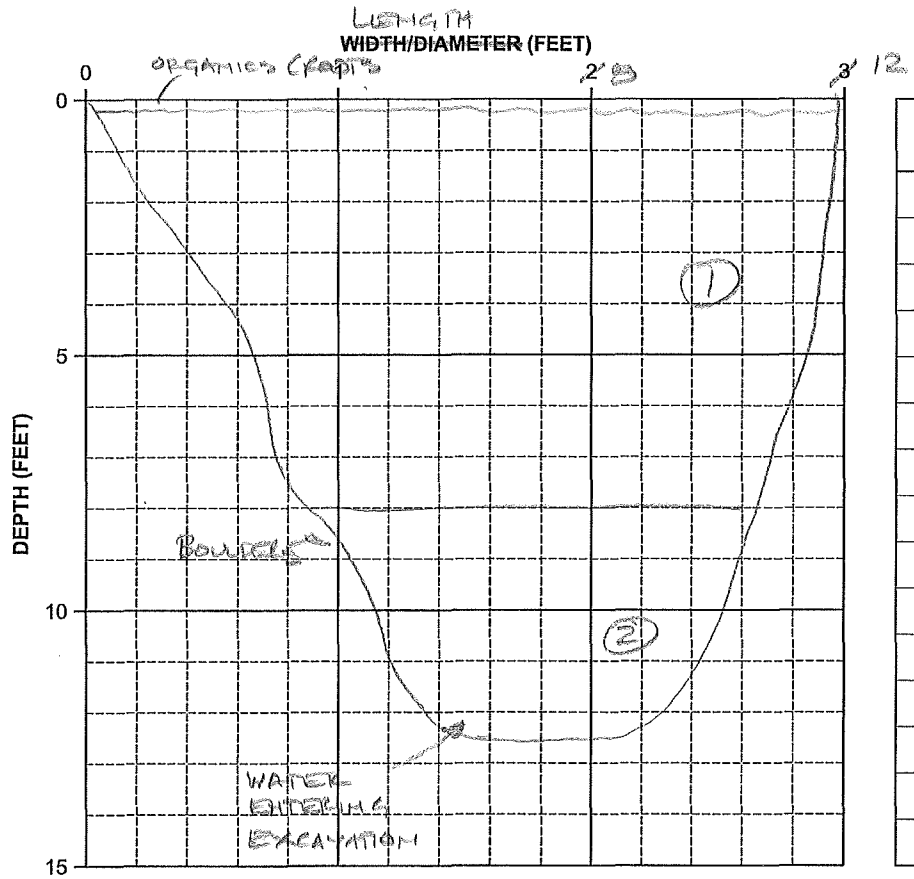
NOTES:

TEST PIT LOG

PROJECT: MIDWITE MINE - BLUE CREEK PIPELINE PAGE: 2

PROJECT NO.: 1011322 DATE: 9/10/13

TEST PIT NO.: TP-5



DEPTH	SAMPLE I.D.	SAMPLE TYPE
—	—	—

SURFACE GAMMA RDG = 22 μR/HR

SOIL TYPE	SOIL DEPTH	SOIL DESCRIPTION AND EXCAVATION NOTES
1	0 - 2	SILTY SAND (SM) w/ COBBLES (<15%); FINE GRAINED; MOD. DENSE; BRN (10YR 5/3); MOIST; COBBLES TO 10-INCHES BASALT ORIGIN. GAMMA RDG = 24 μR/HR. THIN LAYER OF ORGANICS IN UPPER 3-INCHES
	2-8	SILTY SAND (SM) w/ BOULDERS (<15%); MOIST; FINE GRAINED; MOD DENSE; LIGHT OLIVE BRN (2.5Y 5/4); BOULDERS TO 18-INCHES, ANGULAR; BASALT ORIGIN. GAMMA RDG = 26 μR/HR
2	8 - 12.5	CLAYEY SAND (SC) w/ GRAVEL (<10%); MEDIUM GRAINED; REDDISH GRAY (5YR 5/2) MOIST, BECOMING WET AT 10 FT. DIFFICULT DIGGING - DENSE; REFUSAL AT 12.5 FT. REFUSAL APPEARS TO BE ON BOULDERS

NOTES: ~~SMALL AMOUNT OF STANDING WATER IN BOTTOM OF HOLE~~

TEST PIT LOG

PAGE: 1

DATE: 9/10/13

TEST PIT NO.: TP-6

PROJECT INFORMATION

PROJECT: MIDNITE MINE - BLUE CREEK PIPELINE

PROJECT NO.: 1611822

CLIENT: DAWN MINING CO

OWNER:

GPS COORDINATES AND GPS ERROR: UTM (83/99) 11T 0416025, 5305852

TEST PIT LOCATION

STA 200+00

AS INDICATED ON FIG 3 OF WORK PLAN.

FIELD INFORMATION

DATE & TIME ARRIVED: 13:35

TEST PIT LOGGED BY: GLOMSETH

VISITORS: J. CORLEY

WEATHER: CLEAR, CALM, WARM (80's)

EXCAVATION INFORMATION

EXCAVATION COMPANY: MOYER CONSTRUCTION

START TIME: 13:45

TEST PIT DEPTH: 11.5 - FT

TEST PIT DIA.: 3-FT

EXCAVATION METHOD: BACKHOE - DEERE 410D

SAMPLING METHOD: BUCKET

TIME EXCAVATION COMPLETE: 14:15

TEST PIT COMPLETION / ABANDONMENT INFORMATION

START TIME: 14:20

COMPLETE TIME: 14:40 EST.

INSTRUMENTATION:

BACKFILL: SPOILS

GROUNDWATER CONDITIONS

GW NOT ENCOUNTERED

FOLLOWING FIELD WORK

TIME OF CLEAN-UP COMPLETE: —

TIME LEFT SITE: —

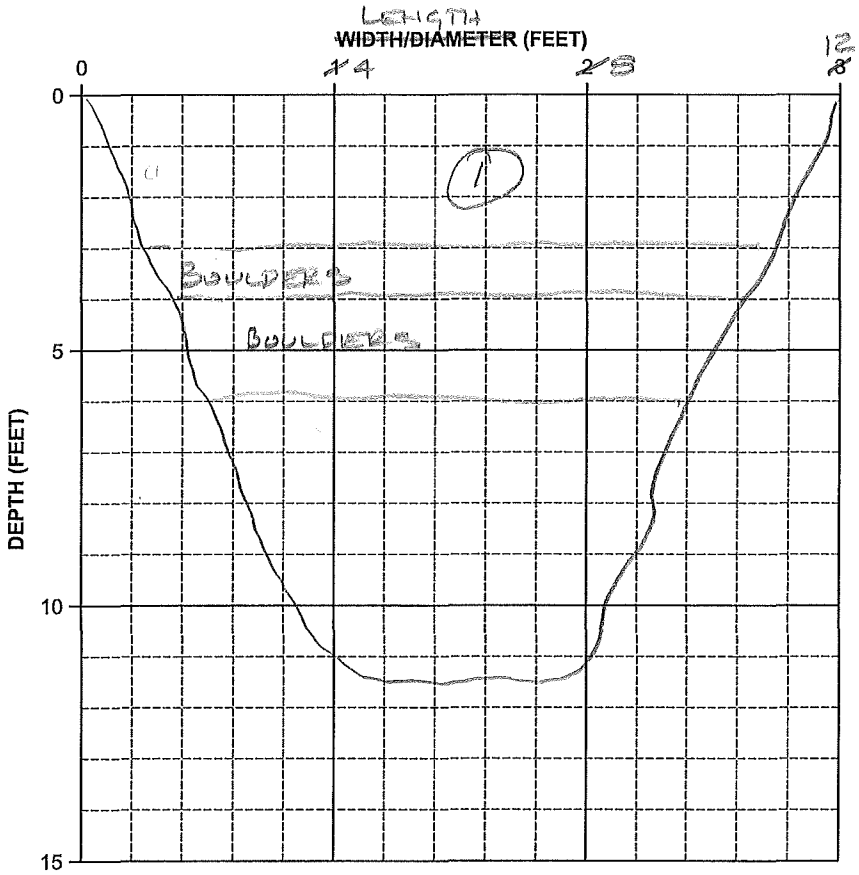
NOTES:

TEST PIT LOG

PROJECT: MINWHITE MINE - BLUE CREEK PIPELINE PAGE: 2

PROJECT NO.: 1011322 DATE: 9/10/13

TEST PIT NO.: TP-6



DEPTH	SAMPLE I.D.	SAMPLE TYPE
—	—	—

SURFACE GAMMA RDG = 24 μR/HR

SOIL TYPE	SOIL DEPTH	SOIL DESCRIPTION AND EXCAVATION NOTES
		SOME ROOTS (0.25-1") IN UPPER FOOT
1	0-3 FT	SILTY SAND (SM); FINE GRAINED, DRY, DK YELLOWISH BRN (10YR 4/4) SOME GRAVEL (<15%) & COBBLES TO 4"; COBBLES ARE ROUNDED. EASY (LOOSE) DIGGING; GAMMA RDG = 22 μR/HR
	3-4	AS ABOVE W/BOULDERS & COBBLES. DIFFICULT DIGGING-MOD. DENSE; COBBLES OF BASALT ORIGIN. ANGULAR SIZE TO 12"-16" MOIST
	4-6	AS ABOVE... VERY DIFFICULT TO EXCAVATE DUE TO LARGE COBBLES/BOULDERS
	6-11.5	SILTY SAND (SM); FINE TO MEDIUM GRAINED, DK YELLOWISH BRN (10YR 4/4) W/ COBBLES (<15%); SUB ANGULAR TO ANGULAR; MOIST; MOD. DENSE

NOTES: CULVERT LOCATED @ 25' NORTH

TEST PIT LOG

PAGE: 1

DATE: 9/10/13

TEST PIT NO.: TP-7

PROJECT INFORMATION

PROJECT: MIDWHITE MINE - BLUE CREEK PIPELINE

PROJECT NO.: 1011322

CLIENT: DAWN MINING CO

OWNER:

GPS COORDINATES AND GPS ERROR: UTM BASIS

11T 0416344; 5305879

TEST PIT LOCATION

STA 170+00
AS INDICATED ON
FIG 3 OF WORKPLAN

FIELD INFORMATION

DATE & TIME ARRIVED: 14:26

TEST PIT LOGGED BY: GRONSETH

VISITORS: J. CORLEY

WEATHER: CLEAR, CALM, WARM (80's)

EXCAVATION INFORMATION

EXCAVATION COMPANY: MOYER CONSTRUCTION

START TIME: 14:30

TEST PIT DEPTH: 10 FT

TEST PIT DIA.: 2 FT

EXCAVATION METHOD: BACKHOE DEERE 410D

SAMPLING METHOD: BUCKET

TIME EXCAVATION COMPLETE: 14:58

TEST PIT COMPLETION / ABANDONMENT INFORMATION

START TIME: 15:00

COMPLETE TIME: 15:20 EST.

INSTRUMENTATION: —

BACKFILL: SPOILS

GROUNDWATER CONDITIONS

GROUNDWATER NOT ENCOUNTERED.

FOLLOWING FIELD WORK

TIME OF CLEAN-UP COMPLETE: —

TIME LEFT SITE: —

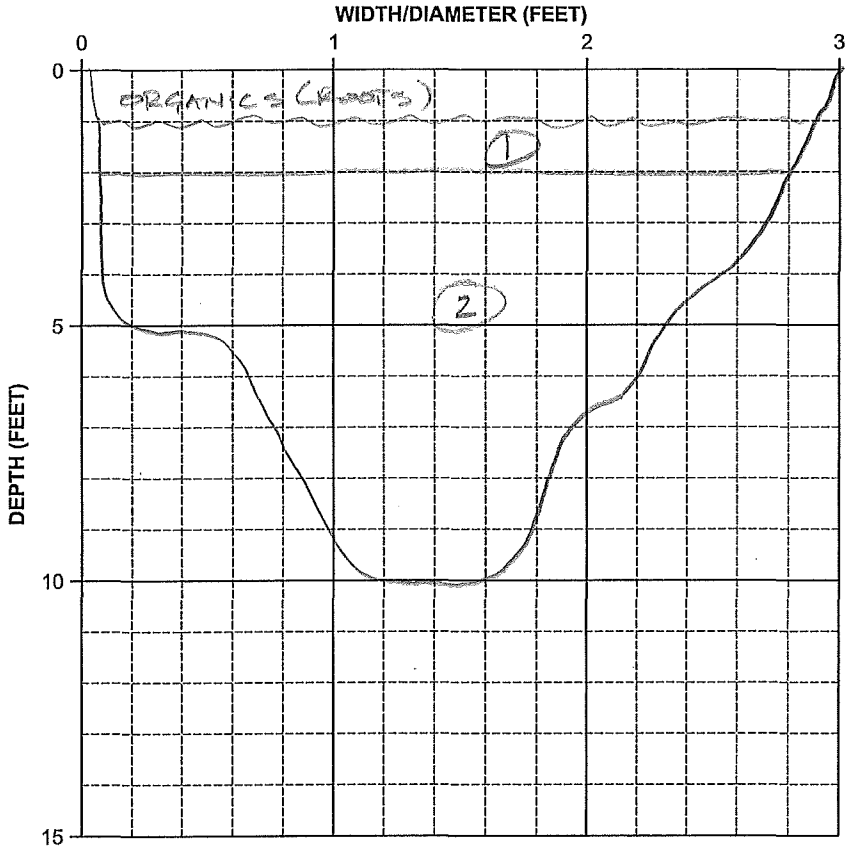
NOTES:

TEST PIT LOG

PROJECT: MIDNITE MINE - BLUE CREEK PIPELINE PAGE: 2

PROJECT NO.: 1011322 DATE: 9/10/13

TEST PIT NO.: TP-7



DEPTH	SAMPLE I.D.	SAMPLE TYPE
8-10	TP-7	BULK

SOIL TYPE	SOIL DEPTH	SOIL DESCRIPTION AND EXCAVATION NOTES
1	0-2	SILTY SAND (SP-SM) W/GRAVEL; FINE GRAINED, DRY, YELLOWISH BRN (10YR 5/4); GRAVEL ROUND TO SUBANGULAR. ORGANICS (ROOTS) IN UPPER FOOT. ROOTS TO 0.5 INCH; MOD. DENSE
	2-4	SAND (SP); FINE TO COARSE GRAINED, MOIST; YELLOWISH BRN (10YR 5/4). (MOD. DENSE) EASY EXCAVATION. SIDEWALLS FREE STANDING
	4-10	AS ABOVE. BOTTOM OF TP. SAMPLED 8-10

NOTES: GW NOT ENCOUNTERED. EXCAVATION GOT EASIER W/DEPTH

TEST PIT LOG

PAGE: 1

DATE: 9/10/13

TEST PIT NO.: TP-8

PROJECT INFORMATION

PROJECT: MIDWITE MINE - BLUE CREEK PIPELINE

PROJECT NO.: 1011322

CLIENT: DAKIN MINING CO.

OWNER:

GPS COORDINATES AND GPS ERROR: UTM BASIS

11T 0416696; 5305872

TEST PIT LOCATION

STA 180+00
AS INDICATED ON
FIG 3 OF WORKPLAN.

FIELD INFORMATION

DATE & TIME ARRIVED: 15:00

TEST PIT LOGGED BY: GRONSETH

VISITORS: J. CORLEY

WEATHER: CLEAR, CALM, WARM (80's)

EXCAVATION INFORMATION

EXCAVATION COMPANY: MOYER CONSTRUCTION

START TIME: 15:04

TEST PIT DEPTH: 10 FT

TEST PIT DIA.: 2 FT

EXCAVATION METHOD: BACKHOE DEERE 410D

SAMPLING METHOD: BUCKET

TIME EXCAVATION COMPLETE: 15:30

TEST PIT COMPLETION / ABANDONMENT INFORMATION

START TIME: 15:35

COMPLETE TIME: 16:00 EST

INSTRUMENTATION: –

BACKFILL: SPOILS

GROUNDWATER CONDITIONS

GROUNDWATER NOT ENCOUNTERED

FOLLOWING FIELD WORK

TIME OF CLEAN-UP COMPLETE: –

TIME LEFT SITE: –

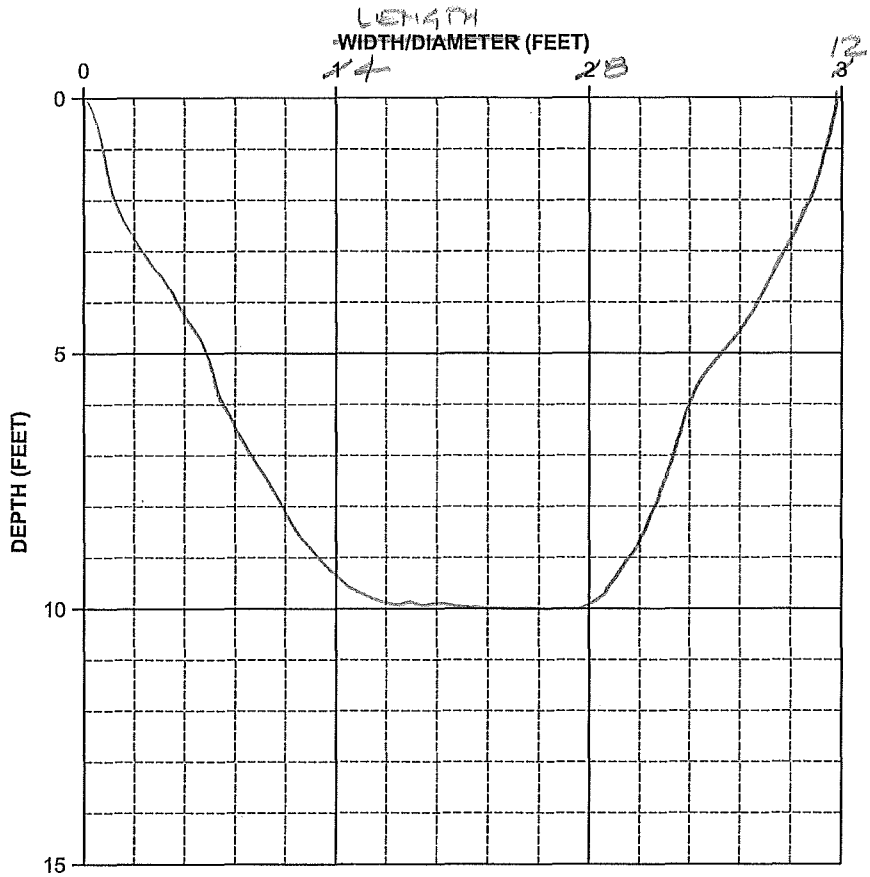
NOTES:

TEST PIT LOG

PROJECT: MIDNITE MINE - BLUE CREEK PIPELINE PAGE: 2

PROJECT NO.: 1011322 DATE: 9/10/13

TEST PIT NO.: TP-8



DEPTH	SAMPLE I.D.	SAMPLE TYPE
—	—	—

SURFACE GAMMA RDG = 20 µR/HR

SOIL TYPE	SOIL DEPTH	SOIL DESCRIPTION AND EXCAVATION NOTES
①	0-2	SILTY SAND (SM); FINE TO MEDIUM GRAINED; MOIST; BROWN (10YR 4/3); SOME GRAVEL (≤5%) TO 1-INCH. GRAVEL IS ROUNDED BASALT IN ORIGIN. GAMMA RDG = 18 µR/HR
	2-4	AS ABOVE W/ COBBLES (≤15%). COBBLES TO 10-INCH ROUNDED TO SUBANGULAR; MOD. DENSE
	4-6	SAND W/SILT (SM) W/ COBBLES. FINE TO MEDIUM GRAINED, MOIST; COBBLES TO 12-INCH ROUNDED; MOD. DENSE
	6-7	CLAYEY SAND (SC) FINE TO COARSE GRAINED, WET; OLIVE BROWN (2.5Y 4/4); MOD. DENSE
	7-10	CLAYEY SAND (SC) AS ABOVE MOIST

NOTES: GROUNDWATER NOT ENCOUNTERED

TEST PIT LOG

PAGE: 1

DATE: 9/10/13

TEST PIT NO.: TP-9

PROJECT INFORMATION

PROJECT: MIDNITE MINE - BLUE CREEK PIPELINE

PROJECT NO.: 101322

CLIENT: DAWN MINING CO.

OWNER:

GPS COORDINATES AND GPS ERROR: UTM (83/88)
11T 0416784; 5306117

TEST PIT LOCATION

STA 170+00
AS INDICATED ON FIG 3
OF WORKPLAN.

FIELD INFORMATION

DATE & TIME ARRIVED: 15:30

TEST PIT LOGGED BY: GRONSETH

VISITORS: J. COKLEY

WEATHER: CLEAR, CALM, WARM (80's)

EXCAVATION INFORMATION

EXCAVATION COMPANY: MOYER CONSTRUCTION

START TIME: 15:40

TEST PIT DEPTH: 10.5 FT

TEST PIT DIA.: 1.5 FT

EXCAVATION METHOD: BACKHOE - DEERE 410D

SAMPLING METHOD: BUCKET

TIME EXCAVATION COMPLETE: 16:10

TEST PIT COMPLETION / ABANDONMENT INFORMATION

START TIME: 16:15

COMPLETE TIME: 16:45 EST.

INSTRUMENTATION: —

BACKFILL: SPOILS

GROUNDWATER CONDITIONS

GROUNDWATER NOT ENCOUNTERED

FOLLOWING FIELD WORK

TIME OF CLEAN-UP COMPLETE: —

TIME LEFT SITE: —

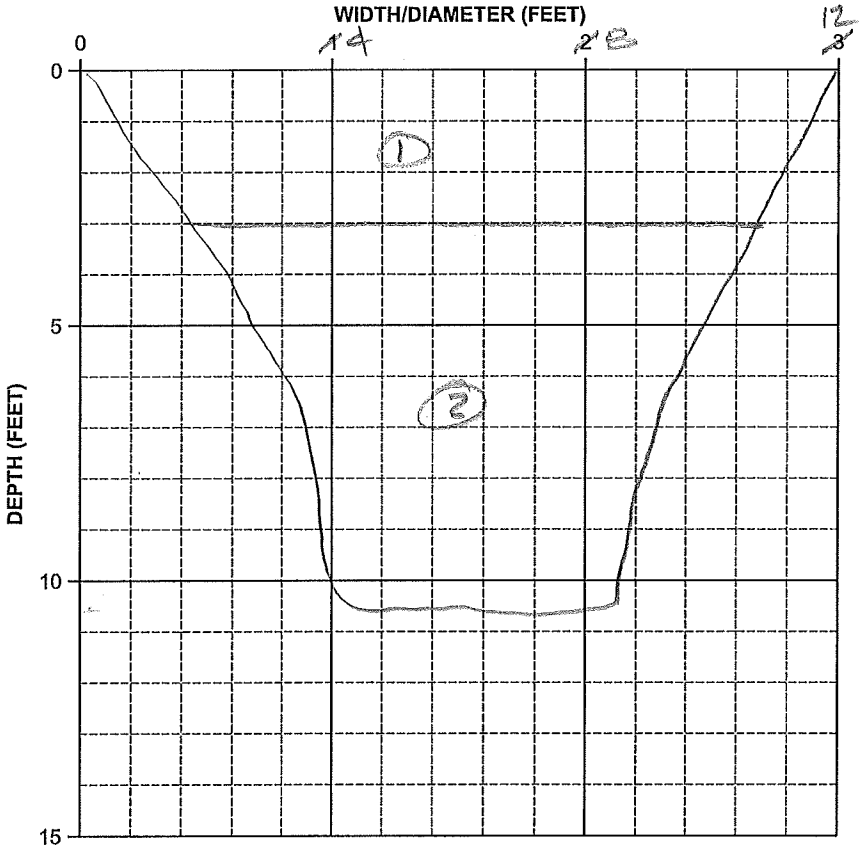
NOTES:

TEST PIT LOG

PROJECT: MIDNITE MINE - BLUE CREEK PIPELINE PAGE: 2

PROJECT NO.: 1011322 DATE: 9/10/13

TEST PIT NO.: TP-7



DEPTH	SAMPLE I.D.	SAMPLE TYPE
—	—	—

SURFACE GAMMA RDG = 26 μR/HR

SOIL TYPE	SOIL DEPTH	SOIL DESCRIPTION AND EXCAVATION NOTES
1	0-3	SILTY SAND W/GRAVEL (SM), FINE TO MEDIUM GRAINED; MOIST LIGHT YELLOWISH BRN (10YR 6/4). GRAVEL SUBANGULAR TO ANGULAR. LOOSE - EASY DIGGING. RDG = 26 μR/HR
	3-6	SAND W/SILT + GRAVEL (SP-SM), MEDIUM TO COARSE GRAINED, MOIST; LIGHT YELLOWISH BRN (10YR 6/4); GRAVEL SUBANGULAR TO ANGULAR. APPEARS TO BE QTZ MONZONITE IN ORIGIN. EASY TO EXCAVATE - LOOSE. RDG = 28 μR/HR
	6-8	SAND W/SILT (SP-SM), MEDIUM TO COARSE GRAINED, MOIST; LIGHT YELLOWISH BRN (10YR 6/4). SOME COBBLE AT 8 FT AS ABOVE. EASY TO EXCAVATE - LOOSE
	8-10.5	AS ABOVE. TERMINATED TP DUE TO PROBLEMS W/BACKHOE RDG = 24 μR/HR

NOTES: GROUNDWATER NOT ENCOUNTERED.

TEST PIT LOG

PAGE: 1

DATE: 9/10/13

TEST PIT NO.: TP-10

PROJECT INFORMATION

PROJECT: MIDNITE MINE - BLUE CREEK PIPELINE

PROJECT NO.: 1011322

CLIENT: DAWN MINING CO.

OWNER:

GPS COORDINATES AND GPS ERROR: UTM (83/88)
11T 0416951; 5306359

TEST PIT LOCATION

STA 160+00
AS INDICATED ON
FIG 3 OF WORKPLAN

FIELD INFORMATION

DATE & TIME ARRIVED: 16:12

TEST PIT LOGGED BY: GRONSETH

VISITORS: J. CORLEY

WEATHER: CLEAR, CALM, WARM (80's)

EXCAVATION INFORMATION

EXCAVATION COMPANY: MOYER CONSTRUCTION

START TIME: 16:15

TEST PIT DEPTH: 11-FT

TEST PIT DIA.: 2FT

EXCAVATION METHOD: BACKHOE DEERE 410D

SAMPLING METHOD: BUCKET

TIME EXCAVATION COMPLETE: 16:50

TEST PIT COMPLETION / ABANDONMENT INFORMATION

START TIME: 16:55

COMPLETE TIME: 17:15 EST.

INSTRUMENTATION: —

BACKFILL: SPOILS

GROUNDWATER CONDITIONS

GROUNDWATER NOT ENCOUNTERED

FOLLOWING FIELD WORK

TIME OF CLEAN-UP COMPLETE: —

TIME LEFT SITE: —

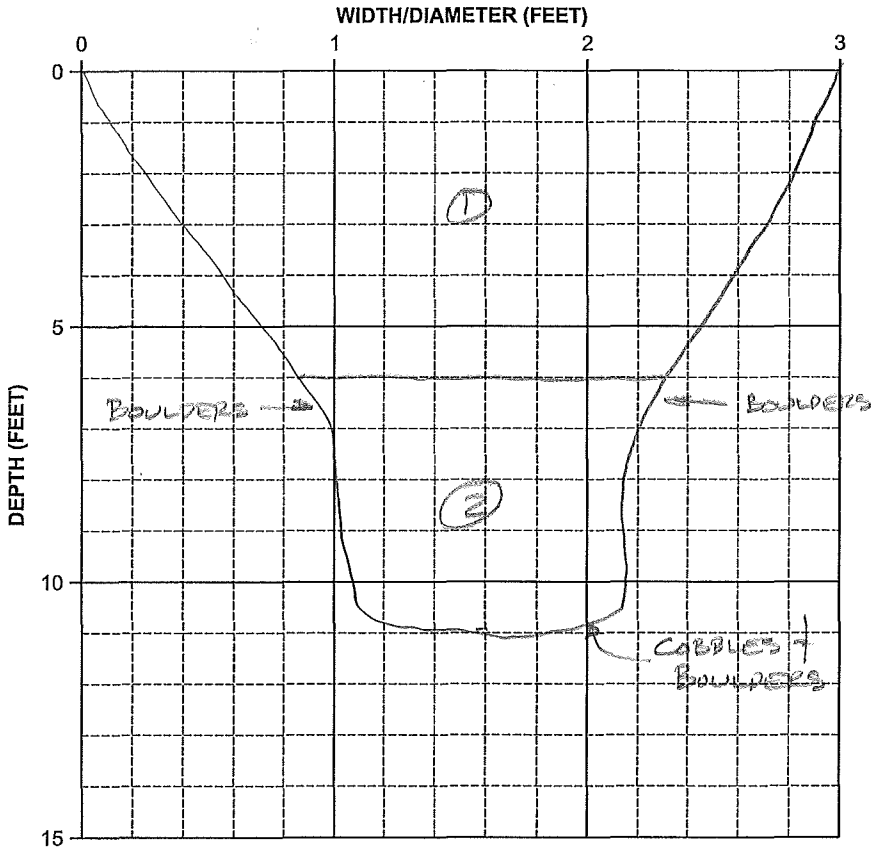
NOTES:

TEST PIT LOG

PROJECT: MIRPHITE MINE - BLUE CREEK PIPELINE PAGE: 2

PROJECT NO.: 1011322 DATE: 9/10/13

TEST PIT NO.: TP-10



DEPTH	SAMPLE I.D.	SAMPLE TYPE
—	—	—

SOIL TYPE	SOIL DEPTH	SOIL DESCRIPTION AND EXCAVATION NOTES
1	0-2	SILTY SAND (SM) W/ (<15%) COBBLES; FINE TO MEDIUM GRAINED MOIST, BROWN (7.5YR 5/2). COBBLES ARE ROUND TO SUBANGULAR. COBBLES APPEAR TO BE BASALT ORIGIN. HARD TO EXCAVATE - DENSE.
	2-4	SILTY SAND (SM) W/ (<10%) BOULDERS; FINE TO MEDIUM GRAINED MOIST; BROWN (7.5YR 5/2). BOULDERS TO 18-INCHES. BOULDERS ARE ROUNDED TO SUBANGULAR, BASALT IN ORIGIN
	4-6	SILTY SAND (SM) W/ (<10%) COBBLES; FINE TO MEDIUM GRAINED; MOD. DENSE; MOIST; BROWN (7.5YR 5/2). COBBLES ARE ROUND TO SUB-ANGULAR

NOTES:

6-8	CLAYEY SAND (SC) W/ (<15%) COBBLES; FINE TO MEDIUM GRAINED, MOIST BROWN (7.5YR 4/3). EASY TO EXCAVATE - LOOSE
8-11	AS ABOVE

TEST PIT LOG

PAGE: 1

DATE: 9/11/13

TEST PIT NO.: TP-11

PROJECT INFORMATION

PROJECT: MIDNITE MINE - BLUE CREEK PIPELINE

PROJECT NO.: 1011322

CLIENT: DAWN MINING CO.

OWNER:

GPS COORDINATES AND GPS ERROR: UTM (83/88) 11T 0417088; 5306599

TEST PIT LOCATION

STA 150+00 AS INDICATED ON FIG 3 OF WORKPLAN.

FIELD INFORMATION

DATE & TIME ARRIVED: 09:41

TEST PIT LOGGED BY: GRONSETH

VISITORS: NONE

WEATHER: CLEAR, CALM, COOL (60's)

EXCAVATION INFORMATION

EXCAVATION COMPANY: MOYER CONSTRUCTION

START TIME: 09:45

TEST PIT DEPTH: 10 FT

TEST PIT DIA.: 1.5 FT

EXCAVATION METHOD: BACKHOE DEERE 410D

SAMPLING METHOD: BULK

TIME EXCAVATION COMPLETE: 10:15

TEST PIT COMPLETION / ABANDONMENT INFORMATION

START TIME: 10:20

COMPLETE TIME: 10:50 EST.

INSTRUMENTATION: —

BACKFILL: SPOILS

GROUNDWATER CONDITIONS

GROUNDWATER NOT ENCOUNTERED

FOLLOWING FIELD WORK

TIME OF CLEAN-UP COMPLETE: —

TIME LEFT SITE: —

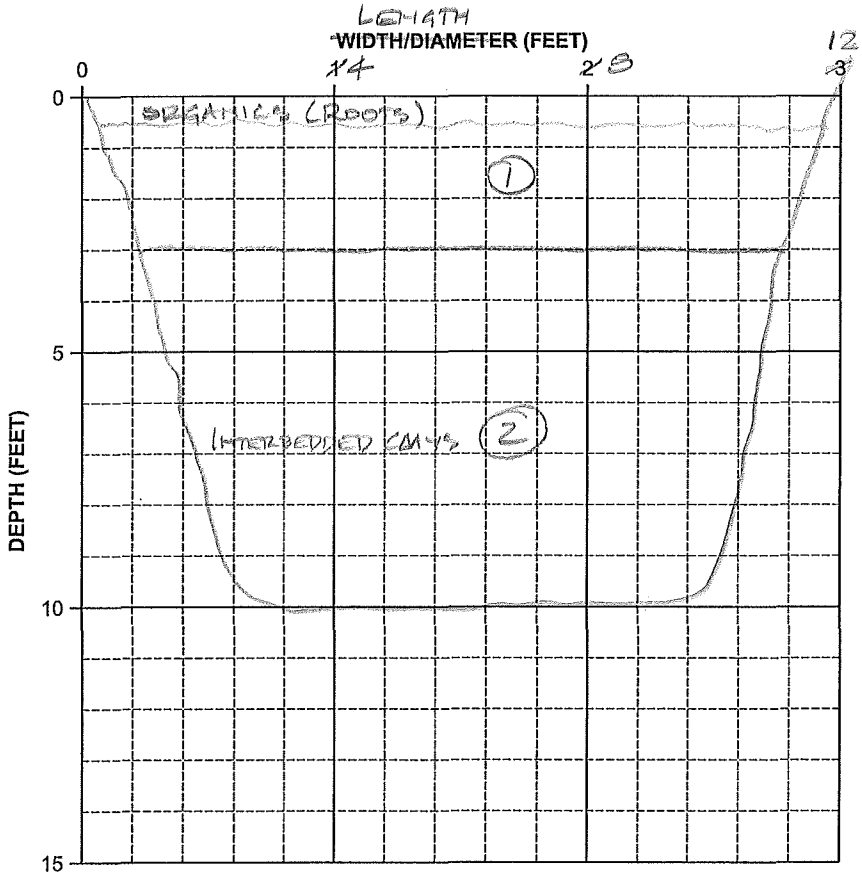
NOTES:

TEST PIT LOG

PROJECT: MIDWITE MINE - BLUE CREEK PIPELINE PAGE: 2

PROJECT NO.: 1011322 DATE: 9/11/13

TEST PIT NO.: TP-11



DEPTH	SAMPLE I.D.	SAMPLE TYPE
3-4	TP-11	BULK

SURFACE GAMMA RDG = 32 μR/HR

SOIL TYPE	SOIL DEPTH	SOIL DESCRIPTION AND EXCAVATION NOTES
1	0-3	SAND W/SILT (SP-SM); MEDIUM TO COARSE GRAINED, BROWN (7.5YR 5/4); MOIST; ROOTS IN UPPER 6". EASY TO EXCAVATE GAMMA RDG = 32 μR/HR
	3-6	SAND (SP); COARSE GRAINED, BROWN (7.5YR 5/4); MOIST ROUNDED; GAMMA RDG = 30 μR/HR. SOME COBBLES AT 6-FT COBBLES TO 4-INCH; ROUND; MOD DENSE
	6-8	AS ABOVE, SOME INTERBEDDED CLAY IN BUCKET
	8-10	SAND (SP); COARSE GRAINED, BROWN (7.5 YR/5/4); MOIST; MOD DENSE ROUNDED. GAMMA RDG = 28 μR/HR

NOTES: GROUND WATER NOT ENCOUNTERED; EXCAVATION WAS FREE STANDING

TEST PIT LOG

PAGE: 1

DATE: 9/11/13

TEST PIT NO.: TP-12

PROJECT INFORMATION

PROJECT: MIDWITE MINE - BLUE CREEK PIPELINE

PROJECT NO.: 1011322

CLIENT: DAWN MINING CO.

OWNER:

GPS COORDINATES AND GPS ERROR: UTM (83/88) 11T 0419179; 5306826

TEST PIT LOCATION

STA 140+00
AS INDICATED ON FIG 3
OF WORKPLAN

FIELD INFORMATION

DATE & TIME ARRIVED: 9/11/13 10:20

TEST PIT LOGGED BY: GRONSETT

VISITORS: NONE

WEATHER: CLEAR, CALM, COOL (60's)

EXCAVATION INFORMATION

EXCAVATION COMPANY: MOYER CONSTRUCTION

START TIME: 10:20

TEST PIT DEPTH: 11 FT

TEST PIT DIA.: 2-FT

EXCAVATION METHOD: BACKHOE - DEERE 410 D

SAMPLING METHOD: BUCKET

TIME EXCAVATION COMPLETE: 10:50

TEST PIT COMPLETION / ABANDONMENT INFORMATION

START TIME: 10:55

COMPLETE TIME: 11:20 EST

INSTRUMENTATION:

BACKFILL: SPOILS

GROUNDWATER CONDITIONS

GROUNDWATER NOT ENCOUNTERED

FOLLOWING FIELD WORK

TIME OF CLEAN-UP COMPLETE: —

TIME LEFT SITE: —

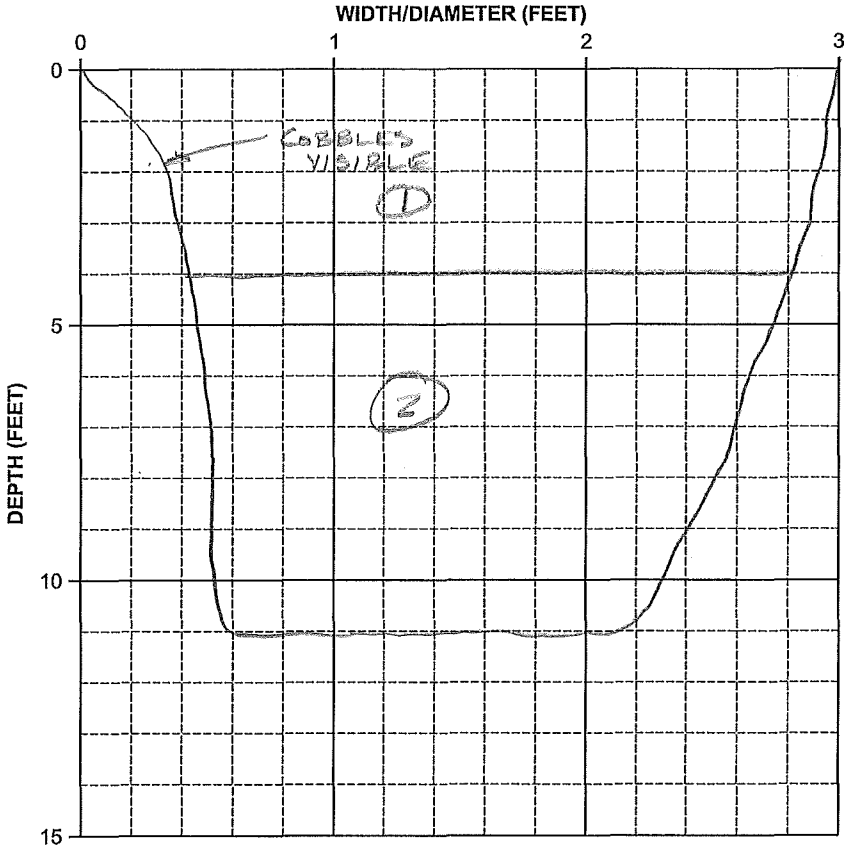
NOTES:

TEST PIT LOG

PROJECT: MIDWITE MINE - BLUE CREEK PIPELINE PAGE: 2

PROJECT NO.: 1091322 DATE: 9/11/13

TEST PIT NO.: TP-12



DEPTH	SAMPLE I.D.	SAMPLE TYPE
—	—	—

SURFACE GAMMA RDG = 36 μR/HR

SOIL TYPE	SOIL DEPTH	SOIL DESCRIPTION AND EXCAVATION NOTES
1	0-2'	CLAYEY SAND (SC) W/GRAVEL; FINE TO MEDIUM GRAINED; MOIST; LOOSE; LIGHT YELLOWISH BROWN (10YR 6/4). GRAVEL ROUNDED TO SUBANGULAR. A FEW COBBLES IN MATRIX TO 6-INCHES. GAMMA = 30 μR/HR
	2-4	CLAYEY SAND (SC); FINE TO MEDIUM GRAINED; MOIST; LIGHT YELLOWISH BRN (10YR 6/4); MOD. DENSE
2	4-6	SILTY SAND (SM); FINE GRAINED; MOIST; LIGHT OLIVE BRN (2.5YR 5/4); MOD. DENSE; GAMMA RDG = 28 μR/HR
	6-8	AS ABOVE
	8-11	AS ABOVE GAMMA RDG = 32 μR/HR

NOTES: BASALT BOULDERS VISIBLE UPSLOPE

EXCAVATION IS FREE STANDING

TEST PIT LOG

PAGE: 1

DATE: 9/11/13

TEST PIT NO.: TP-13

PROJECT INFORMATION

PROJECT: MIDHITE MINE - BLUE CREEK PIPELINE

PROJECT NO.: 1011322

CLIENT: DAWN MINING CO.

OWNER:

GPS COORDINATES AND GPS ERROR:

NO SIGNAL

TEST PIT LOCATION

STA 130+00

AS INDICATED ON

FIG 3 OF WORKPLAN

FIELD INFORMATION

DATE & TIME ARRIVED: 9/11/13 10:55

TEST PIT LOGGED BY: GROMSETH

VISITORS: NONE

WEATHER: CLEAR, CALM, WARM (UPPER 70's)

EXCAVATION INFORMATION

EXCAVATION COMPANY: MOYER CONSTRUCTION

START TIME: 11:00

TEST PIT DEPTH: 9 FT

TEST PIT DIA.: 4 FT

EXCAVATION METHOD: BACKHOE DEERE 410D

SAMPLING METHOD: NONE

TIME EXCAVATION COMPLETE: 11:35

TEST PIT COMPLETION / ABANDONMENT INFORMATION

START TIME: 11:40

COMPLETE TIME: 12:00 EST

INSTRUMENTATION:

BACKFILL: SPOILS

GROUNDWATER CONDITIONS

GROUNDWATER WAS NOT ENCOUNTERED

FOLLOWING FIELD WORK

TIME OF CLEAN-UP COMPLETE: —

TIME LEFT SITE: —

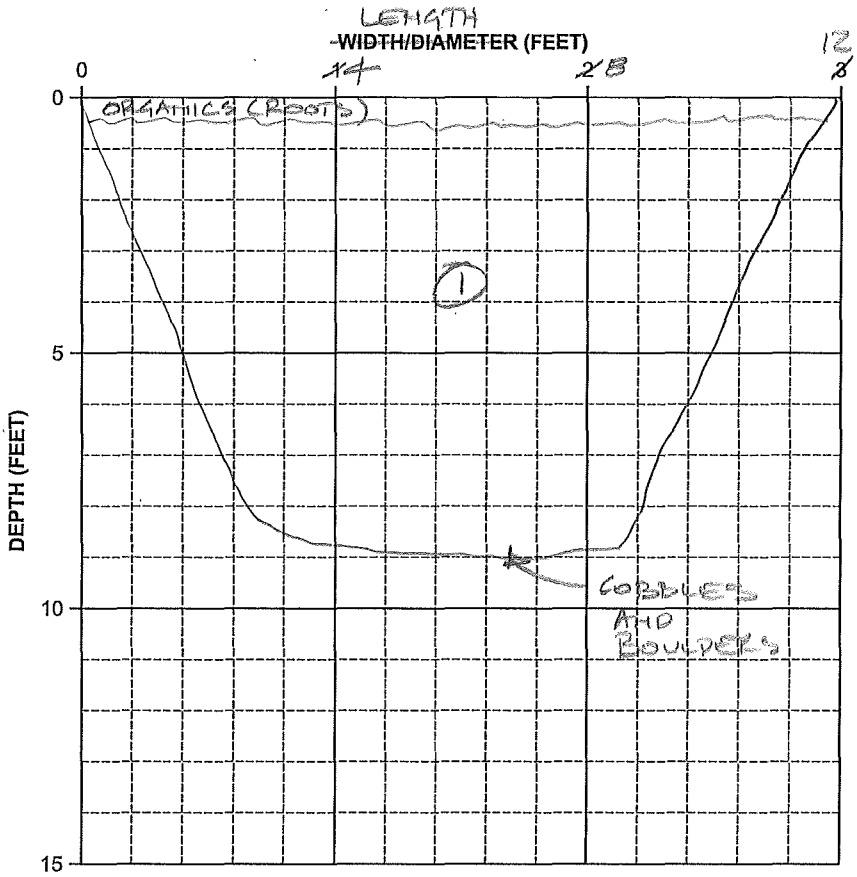
NOTES:

TEST PIT LOG

PROJECT: MIDWITE MINE – BLUE CREEK PIPELINE PAGE: 2

PROJECT NO.: 1011322 DATE: 9/11/13

TEST PIT NO.: TP-13



DEPTH	SAMPLE I.D.	SAMPLE TYPE
—	—	—

SURFACE GAMMA RDG = 35 μR/HR

SOIL TYPE	SOIL DEPTH	SOIL DESCRIPTION AND EXCAVATION NOTES
1	0-3	SAND (SP); COARSE GRAINED; DRY TO MOIST; YELLOWISH BRN (10YR 5/4); ROUND TO SUBANGULAR, SOME COBBLES TO 10-1 INCHES; ROUND TO SUBANGULAR. BASALT ORIGIN. GAMMA RDG = 32 μR/HR. SOME ORGANICS (ROOTS) IN UPPER 6 INCHES
	3-5	AS ABOVE W/ BOULDERS TO 18 INCHES; BOULDERS ROUND TO SUBANGULAR. DIGGING DIFFICULT, DENSE
	5-7	AS ABOVE; GAMMA RDG = 35 μR/HR
	7-9	AS ABOVE – REFUSAL @ 9 FT GAMMA RDG = 28 μR/HR

NOTES: EXCAVATION IS NOT FREE STANDING

TEST PIT LOG

PAGE: 1

DATE: 9/11/13

TEST PIT NO.: TP-14

PROJECT INFORMATION

PROJECT: MIDWITE MINE - BLUE CREEK PIPELINE

PROJECT NO.: 1011322

CLIENT: DAWN MINING CO.

OWNER:

GPS COORDINATES AND GPS ERROR: UTM (83/80)
11T 0417516, 5309327

TEST PIT LOCATION

STA 120+00
As INDICATED ON
Fig 2 OF WORKPLAN

FIELD INFORMATION

DATE & TIME ARRIVED: 9/11/13 11:40

TEST PIT LOGGED BY: GRONSETH

VISITORS: NONE

WEATHER: CLEAR, CALM, WARM (80's)

EXCAVATION INFORMATION

EXCAVATION COMPANY: MOYER CONSTRUCTION

START TIME: 11:45

TEST PIT DEPTH: 8 FT TEST PIT DIA.: 1.5 FT

EXCAVATION METHOD: BACKHOE DEERE 410D

SAMPLING METHOD: BUCKET

TIME EXCAVATION COMPLETE: 12:00

TEST PIT COMPLETION / ABANDONMENT INFORMATION

START TIME: 12:00 COMPLETE TIME: 12:30 EST.

INSTRUMENTATION: BACKFILL: NATIVE SOILS

GROUNDWATER CONDITIONS

GROUNDWATER NOT ENCOUNTERED

FOLLOWING FIELD WORK

TIME OF CLEAN-UP COMPLETE: — TIME LEFT SITE: —

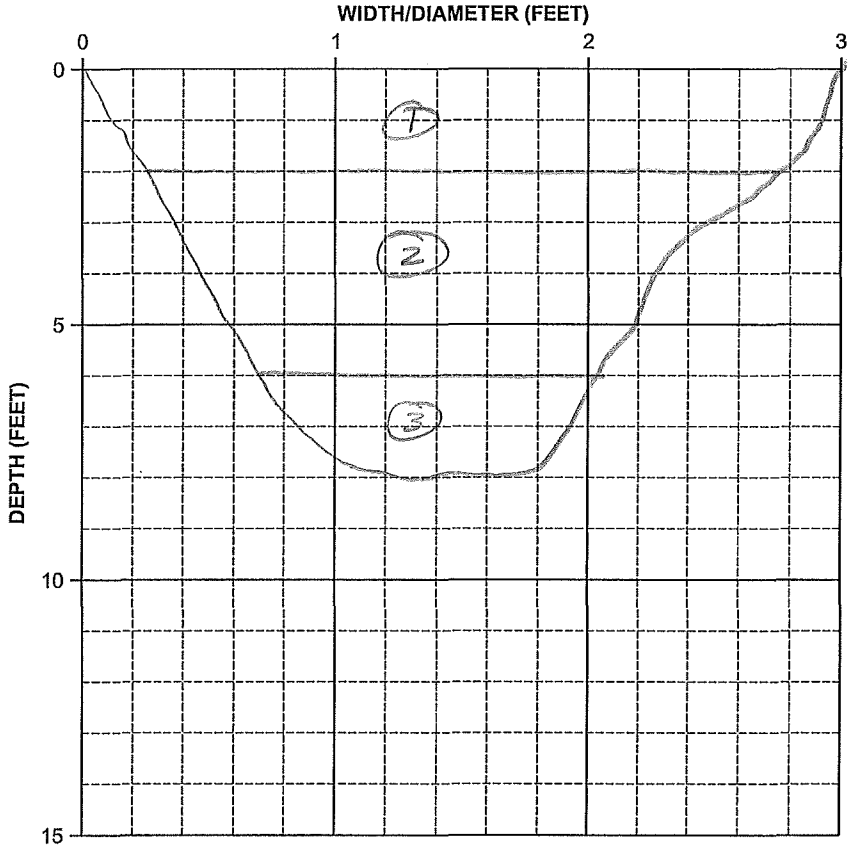
NOTES:

TEST PIT LOG

PROJECT: MIDNITE MINE - BLUE CREEK PIPELINE PAGE: 2

PROJECT NO.: 1011322 DATE: 9/11/13

TEST PIT NO.: TP-14



DEPTH	SAMPLE I.D.	SAMPLE TYPE
—	—	—

SURFACE GAMMA RDG = 33 µR/HR

SOIL TYPE	SOIL DEPTH	SOIL DESCRIPTION AND EXCAVATION NOTES
1	0-2	CLAYEY SAND w/ COBBLES (<10%); FINE TO COARSE GRAINED; MED. DENSE; MOIST; BROWN (10YR 5/3); COBBLES TO 10-INCHES, ROUND TO SUBANGULAR. GAMMA RDG = 33 µR/HR
1		
2	2-4	SAND (SP); COARSE GRAINED; MOIST; BROWN (10YR 5/3) (<15%) COBBLES TO 10-INCHES, ROUND TO SUB ANGULAR; MED. DENSE. RDG = 30 µR/HR
	4-6	AS ABOVE
3	6-8	SILTY SAND (SM); FINE GRAINED; MOIST; GRAYISH BROWN (2.5YR 5/3) GAMMA RDG = 30 µR/HR. SOME IRON STAINING; MED. DENSE
		REFUSAL @ 8 FT

NOTES: GROUNDWATER NOT ENCOUNTERED

TEST PIT LOG

PAGE: 1

DATE: 9/11/13

TEST PIT NO.: TP-15

PROJECT INFORMATION

PROJECT: MIDNITE MINE - BLUE CREEK PIPELINE

PROJECT NO.: 1011222

CLIENT: DAWN MINING CO.

OWNER:

GPS COORDINATES AND GPS ERROR: UTM (83/88)

11T 0413669; 5307593

TEST PIT LOCATION

STA 110+00

AS INDICATED ON PG 2 OF WORKPLAN.

FIELD INFORMATION

DATE & TIME ARRIVED: 9/11/13; 12:10

TEST PIT LOGGED BY: GROMYETH

VISITORS: JACKIE CORLEY ARRIVED

WEATHER: CLEAR, CALM, WARM (80's)

EXCAVATION INFORMATION

EXCAVATION COMPANY: MOYER CONSTRUCTION

START TIME: 12:15

TEST PIT DEPTH: 10 FT

TEST PIT DIA.: 1.5 FT

EXCAVATION METHOD: BACKHOE DEERE 410D

SAMPLING METHOD: HOME

TIME EXCAVATION COMPLETE: 12:45

TEST PIT COMPLETION / ABANDONMENT INFORMATION

START TIME: 12:50

COMPLETE TIME: 13:15 EST

INSTRUMENTATION:

BACKFILL: NATIVE SPOILS

GROUNDWATER CONDITIONS

GROUNDWATER ENTERING EXCAVATION @ 9 FT

FOLLOWING FIELD WORK

TIME OF CLEAN-UP COMPLETE: —

TIME LEFT SITE: —

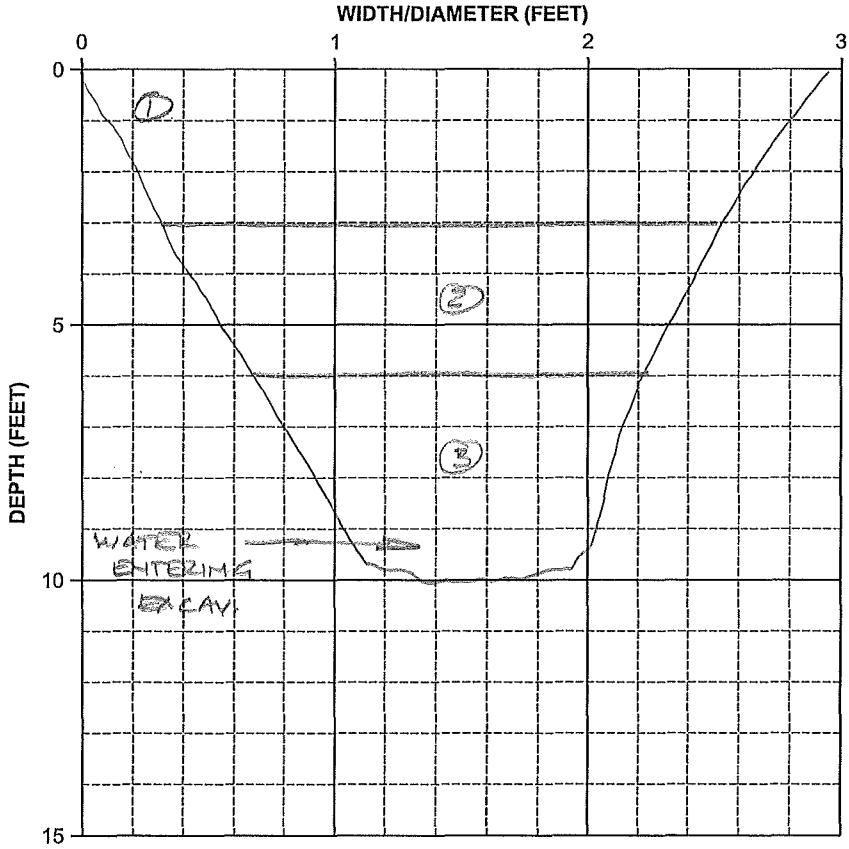
NOTES:

TEST PIT LOG

PROJECT: MIDWHITE MINE - BLUE CREEK PIPELINE PAGE: 2

PROJECT NO.: 1011322 DATE: 9/11/13

TEST PIT NO.: TP-15



DEPTH	SAMPLE I.D.	SAMPLE TYPE
—	—	—

SURFACE GAMMA RDG = 25 μR/HR

SOIL TYPE	SOIL DEPTH	SOIL DESCRIPTION AND EXCAVATION NOTES
1	0-3	FILL; CLAYEY SAND W/COBBLES; FINE GRAINED; MOIST; DENSE YELLOWISH BRN (10YR 5/4); COBBLES TO 8-INCHES SUBANGULAR; GAMMA RDG = 28 μR/HR, ROOTS IN UPPER 6-INCHES.
2	3-6	CLAYEY SAND (SC); FINE TO MEDIUM GRAINED; MOIST; MOD. DENSE, YELLOWISH BRN (10YR 5/4); NO COBBLES
3	6-8	SILTY SAND (SM); FINE GRAINED; MOIST; BROWN (10YR 4/3); MOD. DENSE GAMMA RDG = 26 μR/HR
	8-10	AS ABOVE; WATER ENTERING EXCAV. @ 9 FT

NOTES: AREA APPEARS REWORKED FOR ROAD CONSTRUCTION.

TEST PIT LOG

PAGE: 1

DATE: 9/11/13

TEST PIT NO.: TP-16

PROJECT INFORMATION

PROJECT: MIDNITE MINE - BLUE CREEK PIPELINE

PROJECT NO.: 1011322

CLIENT: DAWN MINING CO

OWNER:

GPS COORDINATES AND GPS ERROR: UTM (83/88)
11T 0417818, 5307861

TEST PIT LOCATION

STA 100+00
CENTER OF TRENCH
MOVED TO M 99+85
TO AVOID LARGE
TREE

FIELD INFORMATION

DATE & TIME ARRIVED: 9/11/13 ; 13:15

TEST PIT LOGGED BY: GROMSETH

VISITORS: J. CORLEY

WEATHER: CLEAR, CALM, WARM (80's)

EXCAVATION INFORMATION

EXCAVATION COMPANY: MOYER CONSTRUCTION

START TIME: 13:15

TEST PIT DEPTH: 8.5 TEST PIT DIA.: 2-FT

EXCAVATION METHOD: BACKHOE DEERE 410 D

SAMPLING METHOD: BUCKET

TIME EXCAVATION COMPLETE: 13:50

TEST PIT COMPLETION / ABANDONMENT INFORMATION

START TIME: 13:55 COMPLETE TIME: 14:30 EST.

INSTRUMENTATION: — BACKFILL: NATIVE SPOILS.

GROUNDWATER CONDITIONS

GROUNDWATER NOT ENCOUNTERED

FOLLOWING FIELD WORK

TIME OF CLEAN-UP COMPLETE: — TIME LEFT SITE: —

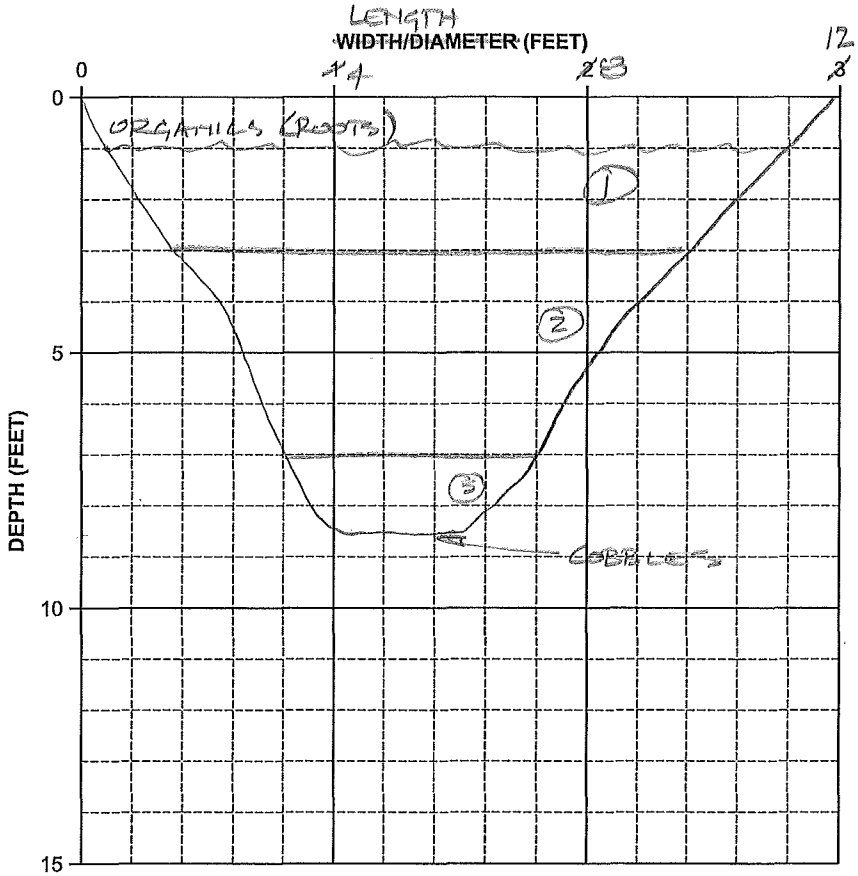
NOTES:

TEST PIT LOG

PROJECT: MIDWITE MINE - BLUE CREEK PIPELINE PAGE: 2

PROJECT NO.: 191322 DATE: 9/11/13

TEST PIT NO.: TP-16



DEPTH	SAMPLE I.D.	SAMPLE TYPE
—	—	—

SURFACE GAMMA RDG = 28 μR/HR

SOIL TYPE	SOIL DEPTH	SOIL DESCRIPTION AND EXCAVATION NOTES
1	0 - 3	SILTY SAND (SM); FINE GRAINED, DRY TO MOIST; PALE YELLOW (2.5Y 7/3). ORGANIC LAYER IN UPPER 1-FT, ROOTS TO 0.5 INCH; DENSE GAMMA RDG = 28 μR/HR.
2	3 - 6	SILTY SAND (SM); FINE GRAINED; MOIST; PALE BROWN (10YR 6/3); SOME GRAVEL (<5%); MOD. DENSE
	6 - 7	SILTY SAND (SM) FINE TO MEDIUM GRAINED; MOIST; PALE BROWN (10YR 6/3); MOD. DENSE
3	7 - 8.5	AS ABOVE W/COBBLES TO 12-INCHES. VERY DIFFICULT DIGGING; DENSE COBBLES APPEAR TO BE BASALT. REFUSAL AT 8.5FT

GAMMA RDG = 30 μR/HR

NOTES:

TEST PIT LOG

PAGE: 1

DATE: 9/11/13

TEST PIT NO.: TP-17

PROJECT INFORMATION

PROJECT: MIDNITE MINE - BLUE CREEK PIPELINE

PROJECT NO.: 1011322

CLIENT: DAWN MINING CO.

OWNER:

GPS COORDINATES AND GPS ERROR: UTM (83/88)
11T 0418023; 5303054

TEST PIT LOCATION

STA 90+00
AS INDICATED ON
FIG 2 OF WORKPLAN

FIELD INFORMATION

DATE & TIME ARRIVED: 9/11/13 ; 13:55

TEST PIT LOGGED BY: GROMSETH

VISITORS: J. CORLEY

WEATHER: CLEAR, CALM, WARM (80's)

EXCAVATION INFORMATION

EXCAVATION COMPANY: MOYER CONSTRUCTION

START TIME: 13:55

TEST PIT DEPTH: 9 FT

TEST PIT DIA.: 3 FT

EXCAVATION METHOD: BACKHOE - DEERE 410 D

SAMPLING METHOD: NONE

TIME EXCAVATION COMPLETE: 14:30

TEST PIT COMPLETION / ABANDONMENT INFORMATION

START TIME: 14:35

COMPLETE TIME: 15:00 EST

INSTRUMENTATION:

BACKFILL: NATIVE SPOILS

GROUNDWATER CONDITIONS

GROUNDWATER ENTERING EXCAVATION AT 9 FT BGS

FOLLOWING FIELD WORK

TIME OF CLEAN-UP COMPLETE: —

TIME LEFT SITE: —

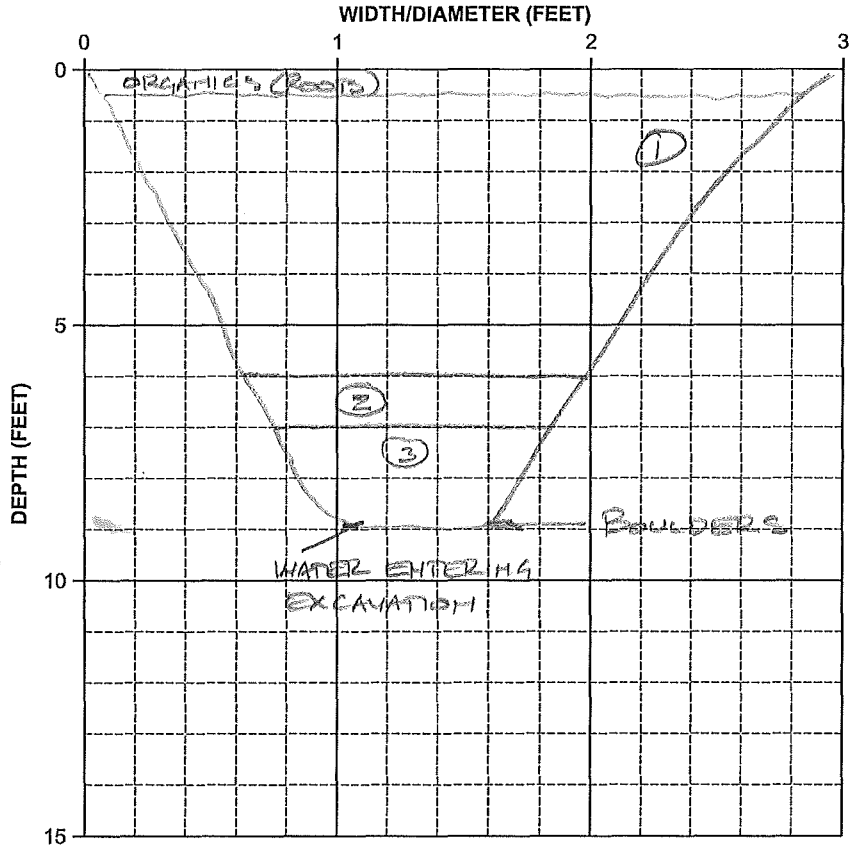
NOTES:

TEST PIT LOG

PROJECT: MIDNITE MINE - BLUE CREEK PIPELINE PAGE: 2

PROJECT NO.: 1011322 DATE: 9/11/12

TEST PIT NO.: TP-17



DEPTH	SAMPLE I.D.	SAMPLE TYPE
—	—	—

SURFACE GAMMA RDG = 30 μR/HR

SOIL TYPE	SOIL DEPTH	SOIL DESCRIPTION AND EXCAVATION NOTES
1	0 – 3	SAND w/ SOME CLAY (SP), MEDIUM TO COARSE GRAINED; DRY TO MOIST W/DEPTH; DARK YELLOWISH BROWN (10YR 4/4); GRAINS ARE ROUNDED. ORGANIC LAYER IN TOP 6-INCHES; GAMMA = 28 μR/HR
	3 – 6	AS ABOVE
2	6 – 7	CLAYEY SAND (SC); FINE GRAINED; MOIST; GRAYISH BROWN (2.5Y 5/2), STIFF IRON STAINING; GAMMA RDG = 29 μR/HR
3	7 – 9	SAND (SP), COARSE GRAINED; MOIST TO WET; DARK YELLOWISH BROWN (10YR 4/4); GRAINS ARE ROUNDER. SOME COBBLES (<5%) TO 6 INCHES; DENSE
	9	AS ABOVE; MORE BOULDER SIZE MATERIAL; ROUND TO SUBANGULAR; MOD DENSE

REFUSAL @ 9 FT
GAMMA RDG = 26

NOTES: BASALT OUTCROP UPSLOPE OF THIS LOCATION.

EXCAVATION NOT FREE STANDING

TEST PIT LOG

PAGE: 1

DATE: 9/11/13

TEST PIT NO.: TP-20

PROJECT INFORMATION

PROJECT: MIDNITE MINE - BLUE CREEK PIPELINE

PROJECT NO.: 1011322

CLIENT: PAVIN MINING CO.

OWNER:

GPS COORDINATES AND GPS ERROR: UTM (83/88)
11T 0417863, 5308800

TEST PIT LOCATION

STA 50+00 AS INDICATED ON FIG 2. OF WORKPLAN

FIELD INFORMATION

DATE & TIME ARRIVED: 9/11/13; 14:42

TEST PIT LOGGED BY: GROMSETH

VISITORS: J. GORLEY

WEATHER: CLEAR, LIGHT BREEZE, WARM (80's)

EXCAVATION INFORMATION

EXCAVATION COMPANY: MOYER CONSTRUCTION

START TIME: 15:41

TEST PIT DEPTH: 4.5 FT

TEST PIT DIA.: 1.5 FT

EXCAVATION METHOD: BACKHOE DEERE 410D

SAMPLING METHOD: BUCKET

TIME EXCAVATION COMPLETE: 16:15

TEST PIT COMPLETION / ABANDONMENT INFORMATION

START TIME: 16:15

COMPLETE TIME: 16:25

INSTRUMENTATION:

BACKFILL: TRENCH SPOILS

GROUNDWATER CONDITIONS

GROUNDWATER NOT ENCOUNTERED

FOLLOWING FIELD WORK

TIME OF CLEAN-UP COMPLETE: —

TIME LEFT SITE: —

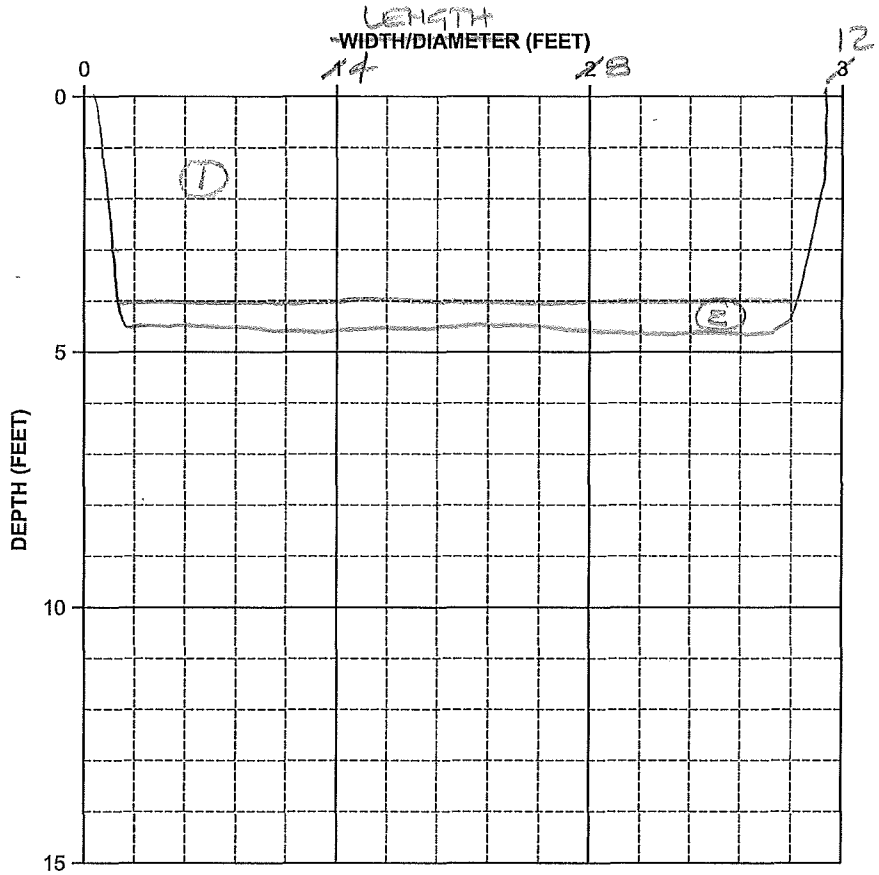
NOTES: EXCAVATION FREE STANDING
NO PHOTO - OUT OF BATTERY

TEST PIT LOG

PROJECT: MIDNITE MINE - BLUE CREEK PIPELINE PAGE: 2

PROJECT NO.: 1011322 DATE: 9/11/13

TEST PIT NO.: TP-20



DEPTH	SAMPLE I.D.	SAMPLE TYPE
2-4	TP-20	BULK

SURFACE GAMMA = 28 μR/HR

SOIL TYPE	SOIL DEPTH	SOIL DESCRIPTION AND EXCAVATION NOTES
①	0-4	CLAYEY SAND (SC) w/ SOME GRAVEL (<5%) TO SANDY CLAY (CL); FINE GRAINED; DRY TO MOIST; PLASTIC WHEN WET; LIGHT YELLOWISH BROWN (10YR 6/4) GAMMA RDG = 26 μR/HR. THIN LAYER OF ORGANICS UPPER 6
	4-4.5	AS ABOVE VERY DENSE - DIFFICULT TO EXCAVATE. COLOR CHANGE TO DARK YELLOWISH BROWN (10YR 4/6). BACKHOE COULD NO LONGER EXCAVATE - REFUSAL GAMMA RDG = 25 μR/HR

NOTES: EXCAVATION IS FREE STANDING
SAMPLE FROM 2-4

TEST PIT LOG

PAGE: 1

DATE: 9/12/13

TEST PIT NO.: TP-19

PROJECT INFORMATION

PROJECT: MIDNITE MINE-BLUE CREEK PIPELINE

PROJECT NO.: 1011322

CLIENT: DAWN MINING CO.

OWNER:

GPS COORDINATES AND GPS ERROR: UTM (83/88)
11T 0417990; 5308507

TEST PIT LOCATION

STA 60+00
AS INDICATED ON FIGURE 2.

FIELD INFORMATION

DATE & TIME ARRIVED: 9/12/13 ; 06:50

TEST PIT LOGGED BY: GRONSETH

VISITORS: J. CORLETT

WEATHER: CLEAR, CALM, COOL (50's)

EXCAVATION INFORMATION

EXCAVATION COMPANY: MOYER CONSTRUCTION

START TIME: 06:55

TEST PIT DEPTH: 8.5 FT

TEST PIT DIA.: 1.5 FT

EXCAVATION METHOD: BACKHOE DEERE 410D

SAMPLING METHOD: NONE

TIME EXCAVATION COMPLETE: 07:30

TEST PIT COMPLETION / ABANDONMENT INFORMATION

START TIME: 07:35

COMPLETE TIME: 08:10 EST.

INSTRUMENTATION: —

BACKFILL: NATIVE SPOILS

GROUNDWATER CONDITIONS

GROUNDWATER NOT ENCOUNTERED

FOLLOWING FIELD WORK

TIME OF CLEAN-UP COMPLETE: —

TIME LEFT SITE: —

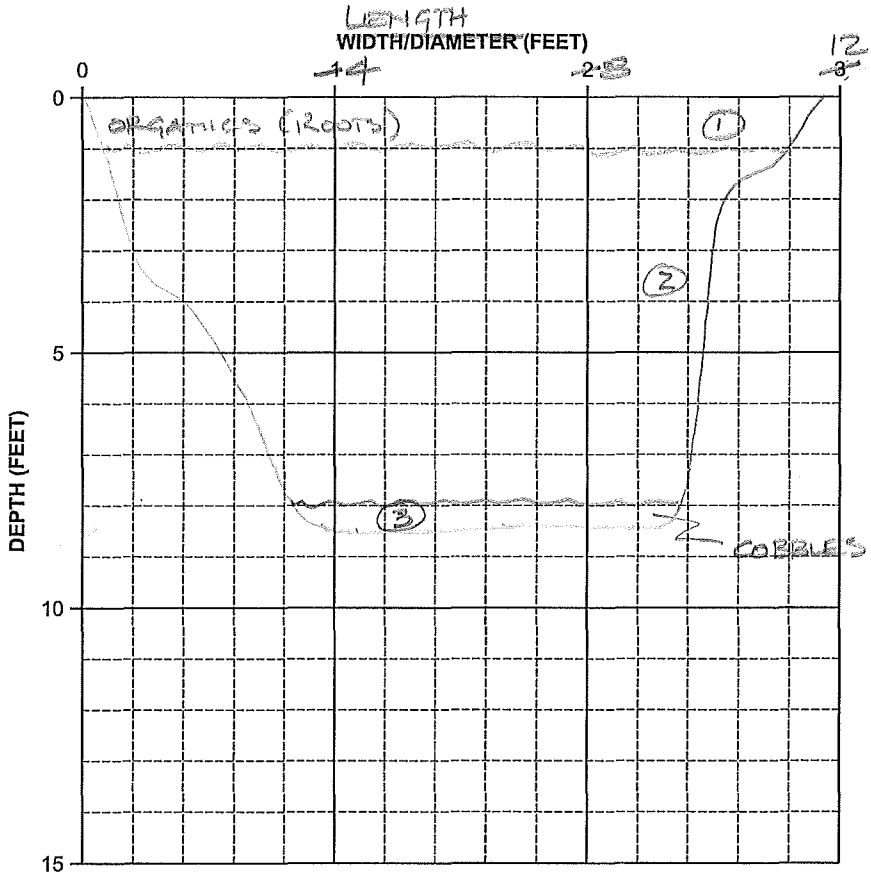
NOTES:

TEST PIT LOG

PROJECT: MIDNITE MINE - BLUE CREEK PIPELINE PAGE: 2

PROJECT NO.: 1011322 DATE: 9/12/13

TEST PIT NO.: TP-19



DEPTH	SAMPLE I.D.	SAMPLE TYPE
—	—	—

SURFACE GAMMA = 30μR/HR

SOIL TYPE	SOIL DEPTH	SOIL DESCRIPTION AND EXCAVATION NOTES
1	0-1	CLAYEY SAND (SC); FINE GRAINED; DRY; DARK OLIVE BROWN (2.5Y 3/3); ORGANIC (ROOTS); SOFT
2	1-3	CLAYEY SAND (SC); MEDIUM TO COARSE GRAINED; MOIST; YELLOWISH BROWN (10YR 5/8); PLASTIC; GAMMA BKG = 30μR/HR; SOFT
	3-5	CLAYEY SAND (SC); MEDIUM GRAINED; MOIST; DARK YELLOWISH BROWN (10YR 4/4); PLASTIC; SOFT
	5-8	CLAYEY SAND (SC); MEDIUM GRAINED; MOIST; LIGHT OLIVE GRAY (5Y 6/2); PLASTIC; GAMMA BKG = 30μR/HR; SOFT
3	8-8.5	CLAY SAND (SC) W/ SOME COBBLES (25%); MEDIUM GRAINED, MOIST; DARK YELLOWISH BROWN (10YR 4/2); PLASTIC; VERY SOFT

NOTES: EXCAVATION IS FREE STANDING.

TEST PIT LOG

PAGE: 1

DATE: 9/12/13

TEST PIT NO.: TP-18

PROJECT INFORMATION

PROJECT: MIDNITE MINE - BLUE CREEK PIPELINE

PROJECT NO.: 1011322

CLIENT: DAWN MINING CO.

OWNER:

GPS COORDINATES AND GPS ERROR: UTM (83/88)

11T 0418153; 5308256

TEST PIT LOCATION

STA 70+00 AS INDICATED ON FIGURE 2.

FIELD INFORMATION

DATE & TIME ARRIVED: 9/12/13; 07:35

TEST PIT LOGGED BY: GROMSETH

VISITORS: J. CORLETT

WEATHER: CLEAR, CALM, COOL (50's)

EXCAVATION INFORMATION

EXCAVATION COMPANY: MOSER CONSTRUCTION

START TIME: 07:40

TEST PIT DEPTH: 10 FT

TEST PIT DIA.: 1.5 FT

EXCAVATION METHOD: BACKHOE DEERE 410D

SAMPLING METHOD: BUCKET

TIME EXCAVATION COMPLETE: 08:15

TEST PIT COMPLETION / ABANDONMENT INFORMATION

START TIME: 8:15

COMPLETE TIME: 0845 EST

INSTRUMENTATION: —

BACKFILL: SPOILS

GROUNDWATER CONDITIONS

GROUNDWATER NOT ENCOUNTERED

FOLLOWING FIELD WORK

TIME OF CLEAN-UP COMPLETE: —

TIME LEFT SITE: —

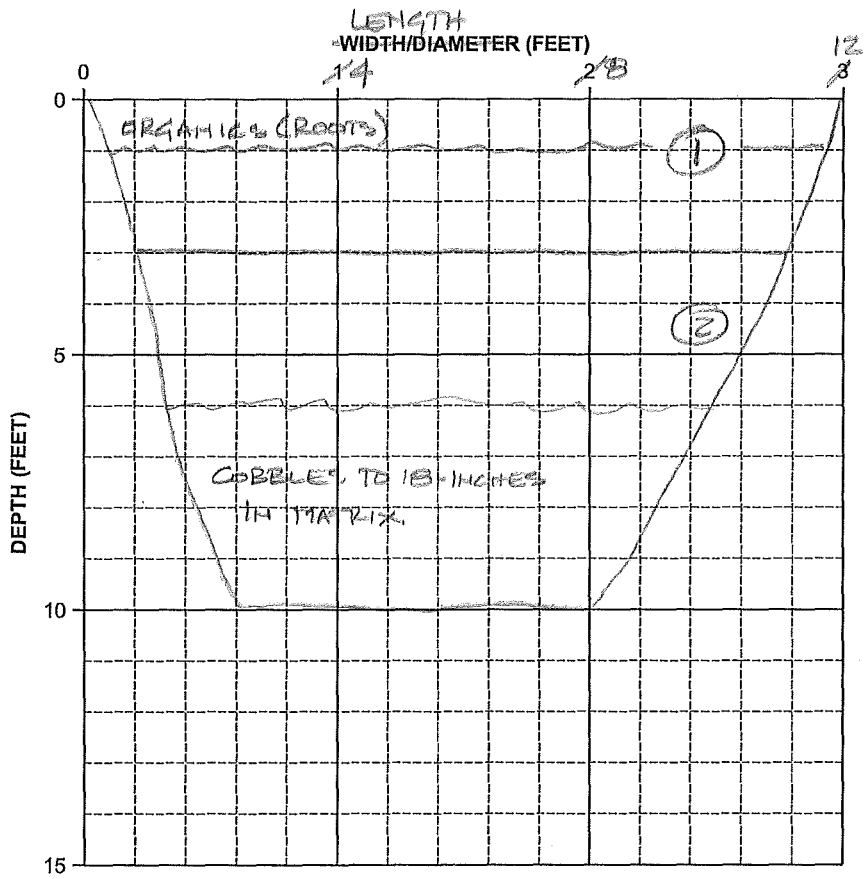
NOTES:

TEST PIT LOG

PROJECT: MIDNITE MINE - BLUE CREEK PIPELINE PAGE: 2

PROJECT NO.: 1011322 DATE: 9/12/13

TEST PIT NO.: TP-18



DEPTH	SAMPLE I.D.	SAMPLE TYPE
—	—	—

SURFACE GAMMA = 28 μR/HR

PHOTO 30

SOIL TYPE	SOIL DEPTH	SOIL DESCRIPTION AND EXCAVATION NOTES
1	0-3	CLAYEY SAND W/ SOME GRAVEL (<5%); FINE TO MEDIUM GRAINED, DRY; PALE BROWN (10YR 6/3); GRAVEL ROUND TO SUBANGULAR SOFT; GAMMA RDG = 28 μR/HR; ORGANICS (ROOTS) IN UPPER 1-FT
1	3-6	CLAYEY SAND (SC); FINE TO MEDIUM GRAINED; MOIST; DARK YELLOWISH BROWN (10YR 4/4); SOFT; GAMMA RDG = 28 μR/HR
2	6-9	CLAYEY SAND (SC) W/ COBBLES (<10%); FINE TO COARSE GRAINED, MOIST; DARK YELLOWISH BROWN (10 YR 4/4); COBBLES ROUND TO SUBANGULAR COBBLES TO 8-INCHES (QTZ MONZONITE)
	9-10	AS ABOVE TERMINATED TP. GAMMA RDG = 28 μR/HR

NOTES: EXCAVATION IS FREE STANDING

TEST PIT LOG

PAGE: 1

DATE: 9/12/13

TEST PIT NO.: TP-21

PROJECT INFORMATION

PROJECT: MIDNITE MINE - BLUE CREEK PIPELINE

PROJECT NO.: 1011322

CLIENT: DAWN MINING

OWNER:

GPS COORDINATES AND GPS ERROR: UTM (83/88)
11T 0417618; 5308909

TEST PIT LOCATION

STA 40+00

STAKE IS MARKED 50+00
BUT LOCATION IS CONSISTENT
WITH FIG. 2 IN WORK PLAN.

FIELD INFORMATION

DATE & TIME ARRIVED: 9/12/13; 08:50

TEST PIT LOGGED BY: GRONSETH

VISITORS: J. CORLEY

WEATHER: CLEAR, CALM, COOL (60's)

EXCAVATION INFORMATION

EXCAVATION COMPANY: MOYER CONSTRUCTION

START TIME: 09:02

TEST PIT DEPTH: 10 FT

TEST PIT DIA.: 2-FT

EXCAVATION METHOD: BACKHOE DEERE 410D

SAMPLING METHOD: BUCKET

TIME EXCAVATION COMPLETE: 9:50

TEST PIT COMPLETION / ABANDONMENT INFORMATION

START TIME: 09:55

COMPLETE TIME: 10:05 EST

INSTRUMENTATION: —

BACKFILL: SPOILS

GROUNDWATER CONDITIONS

GROUNDWATER ENTERING EXCAVATION AT 9.5 FT BGS

FOLLOWING FIELD WORK

TIME OF CLEAN-UP COMPLETE: —

TIME LEFT SITE: —

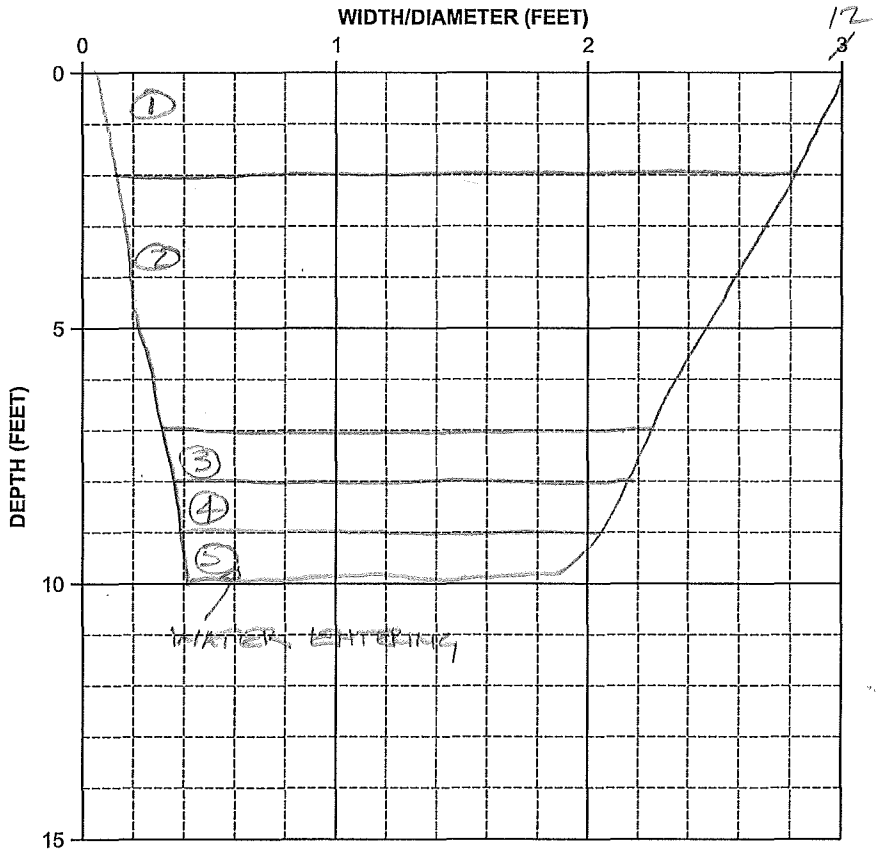
NOTES:

TEST PIT LOG

PROJECT: MIDNITE MINE - BLUE CREEK PIPELINE PAGE: 2

PROJECT NO.: 1011322 DATE: 9/12/13

TEST PIT NO.: TP-21



DEPTH	SAMPLE I.D.	SAMPLE TYPE
3-10	TP-21	BULK

SURFACE GAMMA RDG = 25 µR/HR

SOIL TYPE	SOIL DEPTH	SOIL DESCRIPTION AND EXCAVATION NOTES
1	0-2	CLAYEY SAND (SC); FINE TO MEDIUM GRAINED; DRY; LIGHT BROWN (9.5YR 6/4); LOOSE; GAMMA RDG = 25 µR/HR, ORGANIC LAYER (ROOTS/PINE NEEDLES UPPER 1-FOOT.
2	2-7	SANDY CLAY (SC); FINE GRAINED; STIFF; MOIST; PLASTIC; DARK YELLOWISH BROWN (10YR 4/4); GAMMA RDG = 25 µR/HR
3	7-8.5	CLAYEY SAND (SC); FINE TO COARSE GRAINED, ROUNDED; MOIST; DARK YELLOWISH BROWN (10YR 4/4); LOOSE; GAMMA RDG = 25
4	8.5-9	LEAN CLAY (CL); FINE GRAINED; SOFT; MOIST, GRAY (5Y 6/1); PLASTIC
5	9-10	CLAY SAND (SC); FINE TO MEDIUM GRAINED, WET; DARK YELLOWISH BROWN (10YR 4/4); WATER FLOWING INTO EXCAVATION AT 9.5 FT RDG = 25 µR/HR

NOTES: EXCAVATION IS FREE STANDING

TEST PIT LOG

PAGE: 1

DATE: 9/12/13

TEST PIT NO.: TP-25

PROJECT INFORMATION

PROJECT: MIDWITE MINE - BLUE CREEK PIPELINE

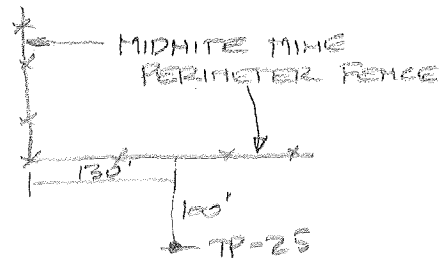
PROJECT NO.: 1011322

CLIENT: DAWN MINING, CO.

OWNER:

GPS COORDINATES AND GPS ERROR: UTM (83/88)
11 T 0417646; 5309476

TEST PIT LOCATION



FIELD INFORMATION

DATE & TIME ARRIVED: 9/12/13; 11:00

TEST PIT LOGGED BY: GROMETH

VISITORS: J. CORLEY

WEATHER: CLEAR, BREEZY, WARM (80's)

EXCAVATION INFORMATION

EXCAVATION COMPANY: MOYER CONSTRUCTION

START TIME: 11:00

TEST PIT DEPTH: 5 FT

TEST PIT DIA.: 1.5 FT

EXCAVATION METHOD: BACK HOE DEERE 410 D

SAMPLING METHOD: BUCKET

TIME EXCAVATION COMPLETE: 11:32

TEST PIT COMPLETION / ABANDONMENT INFORMATION

START TIME: 12:15

COMPLETE TIME: 12:30

INSTRUMENTATION: —

BACKFILL: NATIVE SPOILS

GROUNDWATER CONDITIONS

GROUNDWATER NOT ENCOUNTERED.

FOLLOWING FIELD WORK

TIME OF CLEAN-UP COMPLETE: —

TIME LEFT SITE: —

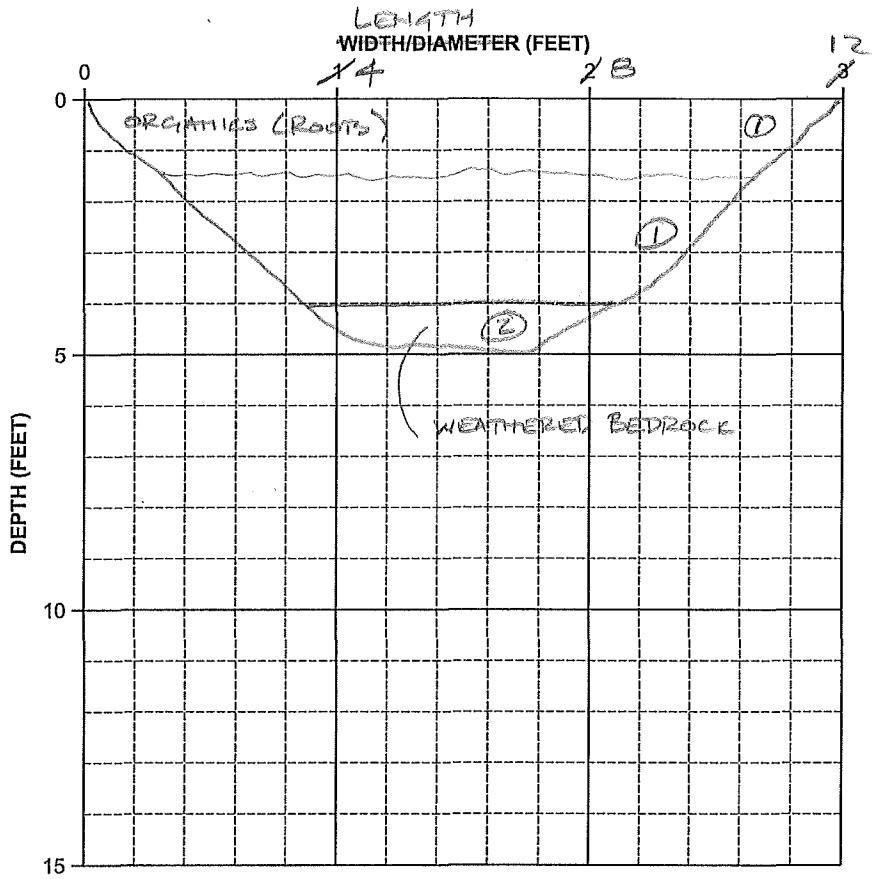
NOTES:

TEST PIT LOG

PROJECT: MIDNITE MINE - BLUE CREEK PIPELINE PAGE: 2

PROJECT NO.: 101 1322 DATE: 9/12/13

TEST PIT NO.: TP-25



DEPTH	SAMPLE I.D.	SAMPLE TYPE
–	–	–

SURFACE RDG = 17 μR/HR

SOIL TYPE	SOIL DEPTH	SOIL DESCRIPTION AND EXCAVATION NOTES
①	0 - 2.5	CLAYEY SAND (SC); FINE GRAINED; DRY (HARD TO EXCAVATE PAST 1.5 FT) BROWN (10YR 5/3). 2 LARGE PIECES OF COBBLE TO 8-INCHES; SUBANGULAR; ORGANIC LAYER (ROOTS) UPPER 1.5 FT. GAMMA RDG = 17 μR/HR.
	2.5 - 4.5	AS ABOVE
②	4.5 - 5.0	WEATHERED QTZ MONZONITE, LIGHT GRAY (5YR 7/1) BEDROCK IS RIPPABLE FOR 6-INCHES. PIECES TO 6-INCHES FRIABLE - BREAKS EASILY W/FINGER PRESSURE. GAMMA RDG = 10 μR/HR

NOTES: EXCAVATION IS FREE STANDING

TEST PIT LOG

PAGE: 1

DATE: 9/12/13

TEST PIT NO.: TP-24

PROJECT INFORMATION

PROJECT: MIDAITE MINE - BLUE CREEK PIPELINE

PROJECT NO.: 1011322

CLIENT: DAWN MINING CO.

OWNER:

GPS COORDINATES AND GPS ERROR: UTM (83/00)
11T 0417650; 5309353

TEST PIT LOCATION

STA 10+00
As SHOWN ON FIG 2 OF WORK PLAN

FIELD INFORMATION

DATE & TIME ARRIVED: 9/12/13 ; 12:15

TEST PIT LOGGED BY: GLOMSETH

VISITORS: J. CORLEY

WEATHER: CLEAR, CALM, WARM (80's)

EXCAVATION INFORMATION

EXCAVATION COMPANY: MOVER CONSTRUCTION

START TIME: 12:17

TEST PIT DEPTH: 4.5 FT

TEST PIT DIA.: 1.5 FT

EXCAVATION METHOD: BACKHOE DEERE 410D

SAMPLING METHOD: BUCKET

TIME EXCAVATION COMPLETE: 12:47

TEST PIT COMPLETION / ABANDONMENT INFORMATION

START TIME: 12:50

COMPLETE TIME: 13:00 EST.

INSTRUMENTATION: —

BACKFILL: NATIVE SPOILS

GROUNDWATER CONDITIONS

GROUNDWATER NOT ENCOUNTERED.

FOLLOWING FIELD WORK

TIME OF CLEAN-UP COMPLETE: —

TIME LEFT SITE: —

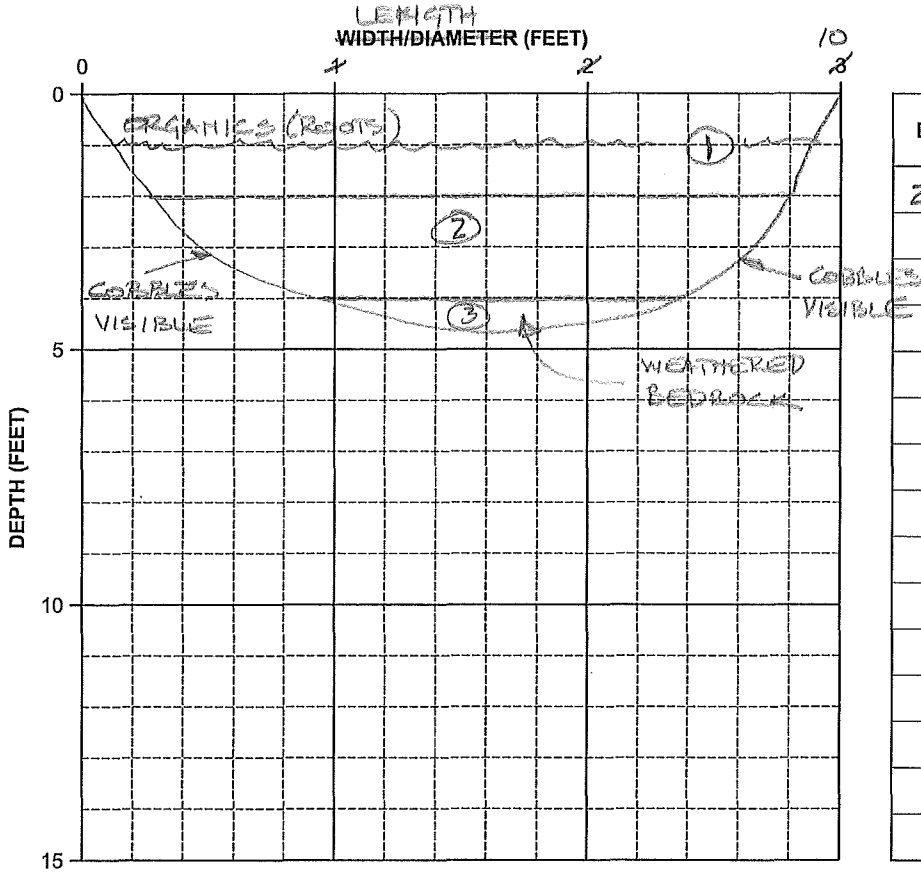
NOTES:

TEST PIT LOG

TEST PIT NO.: TP-24

PROJECT: MIDNITE MINE - BLUE CREEK PIPELINE **PAGE:** 2

PROJECT NO.: 1011322 **DATE:** 9/12/13



DEPTH	SAMPLE I.D.	SAMPLE TYPE
2-4	TP-24	BULK

SURFACE GAMMA RDG = 22 μR/HR

SOIL TYPE	SOIL DEPTH	SOIL DESCRIPTION AND EXCAVATION NOTES
1	0-2	CLAYEY SAND (SC); FINE TO MEDIUM GRAINED; LOOSE; DRY; BROWN (7.5 YR 5/3); ORGANICS (ROOTS) IN UPPER 1-FT; RDG = 22 μR/HR.
1 2	2-4	CLAYEY SAND (SC); FINE TO MEDIUM GRAINED; DRY; BROWN (7.5 YR 5/3); SOME BOULDERS & COBBLES (<10%) IN MATRIX; LARGE AGGREGATE IS ROUNDED TO SUBANGULAR; GRANITIC IN ORIGIN. MOD. DENSE
3	4-4.5	WEATHERED QTZ MONZONITE; LIGHT GRAY (5 YR 7/1); ROCK IS RIPPABLE FOR 6-INCHES - RIPPABLE PIECES ARE 6-INCHES LONG; FRIABLE - BREAKS EASILY W/FINGER PRESSURE. RDG = 20 μR/HR.

NOTES: EXCAVATION IS FREE STANDING

TEST PIT LOG

PAGE: 1

DATE: 9/12/13

TEST PIT NO.: TP-23

PROJECT INFORMATION

PROJECT: MIDHITE MINE - BLUE CREEK PIPELINE

PROJECT NO.: 1011322

CLIENT: DAWN MINING CO.

OWNER:

GPS COORDINATES AND GPS ERROR: UTM (83/80)

11T 0413500; 5309195

TEST PIT LOCATION

STA 20+00

on Alg 2

TP-23 is LOCATED NORTH 62 FT FROM A MONITORING WELL (CP OR OP-1)

FIELD INFORMATION

DATE & TIME ARRIVED: 9/12/13; 13:00

TEST PIT LOGGED BY: GROMSETH

VISITORS:

WEATHER: CLEAR, CALM, WARM (80s)

EXCAVATION INFORMATION

EXCAVATION COMPANY: MOYER CONSTRUCTION

START TIME: 13:06

TEST PIT DEPTH: 4.5 FT

TEST PIT DIA.: 1.5 FT

EXCAVATION METHOD: BACKHOE - DEERE 410 D

SAMPLING METHOD: NONE

TIME EXCAVATION COMPLETE: 13:43

TEST PIT COMPLETION / ABANDONMENT INFORMATION

START TIME: 13:45

COMPLETE TIME: 14:00 EST

INSTRUMENTATION: —

BACKFILL: NATIVE SPOILS

GROUNDWATER CONDITIONS

GROUNDWATER NOT ENCOUNTERED

FOLLOWING FIELD WORK

TIME OF CLEAN-UP COMPLETE: —

TIME LEFT SITE: —

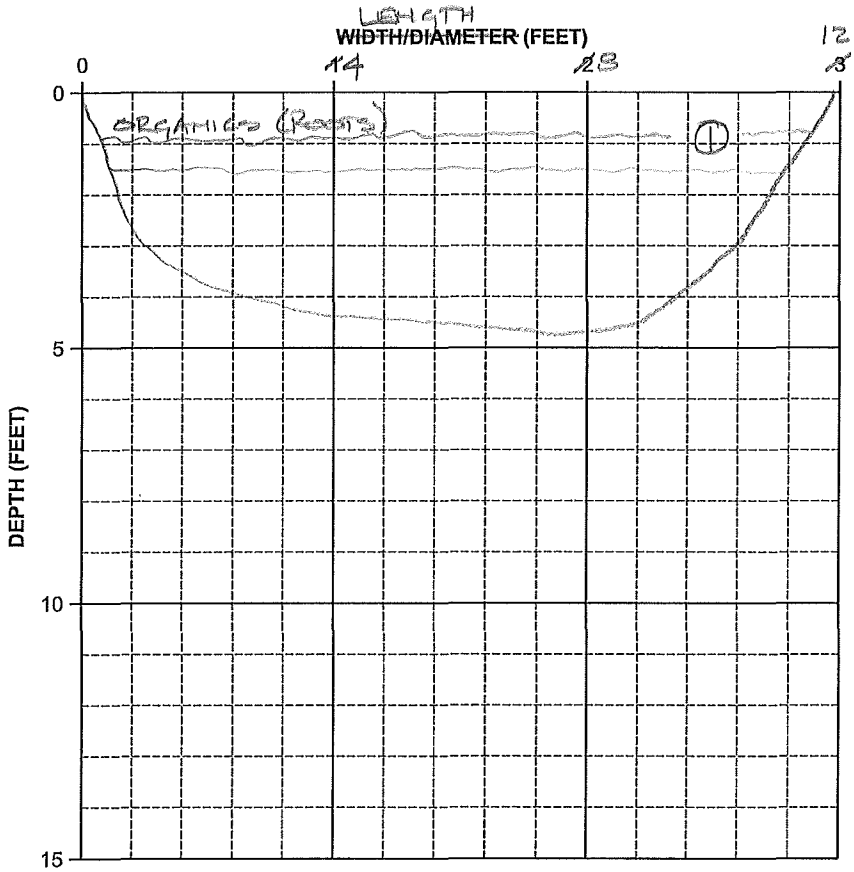
NOTES:

TEST PIT LOG

TEST PIT NO.: TP-23

PROJECT: MIDWITE MINE - BLUE CREEK PIPELINE **PAGE:** 2

PROJECT NO.: 1011322 **DATE:** 9/12/13



DEPTH	SAMPLE I.D.	SAMPLE TYPE
—	—	—

SURFACE GAMMA RDG = 16 μR/HR

SOIL TYPE	SOIL DEPTH	SOIL DESCRIPTION AND EXCAVATION NOTES
1	0 - 2.5	SANDY CLAY (CL); FINE GRAINED; DRY (DIFFICULT TO EXCAVATE); STIFF PLASTIC WHEN WETTED; LIGHT YELLOWISH BROWN (10YR 6/4); ORGANICS (ROOTS) IN UPPER 1.0 FT. RDG = 15 μR/HR.
1	2.5 - 4.0	SANDY CLAY (CL); FINE GRAINED; SLIGHTLY MOIST; VERY STIFF (EXCAVATION ADVANCED 1.5 FT IN 10 MINUTES); MODERATELY PLASTIC; LIGHT YELLOWISH BROWN (10YR 6/4). RDG = 16 μR/HR.
2	4.0 - 4.5	SANDY CLAY (CL); FINE GRAINED; SLIGHTLY MOIST; VERY STIFF (EXCAVATION ADVANCED 0.5 FT IN 10 MINUTES); MODERATELY PLASTIC; LIGHT YELLOWISH BROWN (10YR 6/4). RDG = 16 μR/HR

NOTES: EXCAVATION IS FREE STANDING

TEST PIT LOG

PAGE: 1

DATE: 9/12/13

TEST PIT NO.: TP-22

PROJECT INFORMATION

PROJECT: MIDMAITE MINE - BLUE CREEK PIPELINE

PROJECT NO.: 1011322

CLIENT: DAWN MINING CO.

OWNER:

GPS COORDINATES AND GPS ERROR: UTM (83/83) 11T 0417438, 5308906

TEST PIT LOCATION

STA 30+00 ON FIG. 2
STAKE MARKED 40+00

FIELD INFORMATION

DATE & TIME ARRIVED: 9/12/13, 14:01

TEST PIT LOGGED BY: GRONSETH

VISITORS: J. CORLEY

WEATHER: CLEAR, CALM, WARM (80's)

EXCAVATION INFORMATION

EXCAVATION COMPANY: MOYER CONSTRUCTION

START TIME: 14:00

TEST PIT DEPTH: 10 FT

TEST PIT DIA.: 1.5 FT

EXCAVATION METHOD: BACKHOE - DEERE 410 D

SAMPLING METHOD: BULK

TIME EXCAVATION COMPLETE: 14:55

TEST PIT COMPLETION / ABANDONMENT INFORMATION

START TIME: 15:00

COMPLETE TIME: 15:20 EST.

INSTRUMENTATION: —

BACKFILL: NATIVE SPOILS

GROUNDWATER CONDITIONS

GROUNDWATER NOT ENCOUNTERED

FOLLOWING FIELD WORK

TIME OF CLEAN-UP COMPLETE: —

TIME LEFT SITE: —

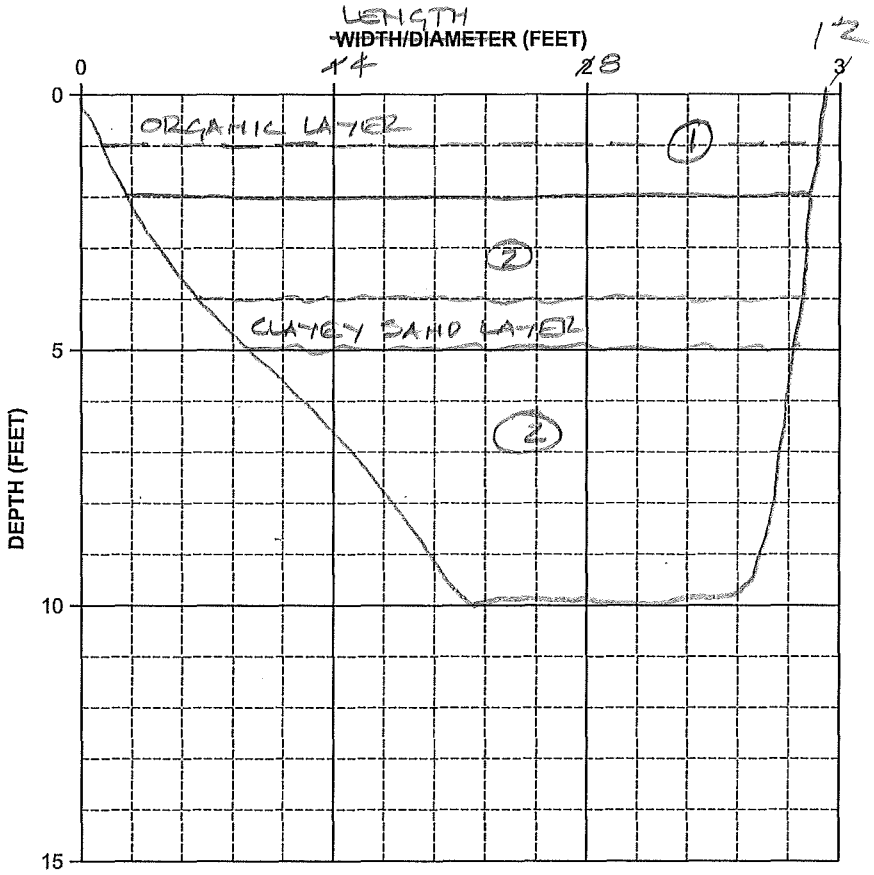
NOTES:

TEST PIT LOG

PROJECT: MIDNITE MINE - BLUE CREEK PIPELINE PAGE: 2

PROJECT NO.: 1011322 DATE: 9/12/13

TEST PIT NO.: TP-22



DEPTH	SAMPLE I.D.	SAMPLE TYPE
2-10	TP-22	BULK

SURFACE GAMMA RDG = 15 μR/HR

SOIL TYPE	SOIL DEPTH	SOIL DESCRIPTION AND EXCAVATION NOTES
1	0-2	SANDY CLAY (CL); VERY DENSE; DRY; LIGHT YELLOWISH BROWN (2.5Y 6/3); EXCAVATED MATERIAL IS HARD & BLOCKY, FIRED CLAY CONSISTENCY. GAMMA RDG = 17 μR/HR. ORGANICS UPPER 1 FT
~~1~~ 2	2-4	AS ABOVE.
2	4-5	CLAYEY SAND (SC); VERY DENSE; MOIST, LIGHT YELLOWISH BROWN (2.5Y 6/3); FINE GRAINED. RDG = 20 μR/HR.
	5-8	SANDY CLAY (CL); VERY DENSE, MOIST; LIGHT YELLOWISH BROWN (2.5Y 6/4); PLASTIC WHEN WETTED. RDG = 16 μR/HR
	8-10	AS ABOVE. RDG = 18 μR/HR

NOTES: EXCAVATION FREE STANDING

APPENDIX D

TEST PIT PHOTO LOG

Photo D-1 Test Pit TP-2 Spoils

Photo D-2 Test Pit TP-3 Spoils

Photo D-3 Test Pit TP-4 Spoils

Photo D-4 Test Pit TP-5 Spoils

Photo D-5 Test Pit TP-6 Spoils

Photo D-6 Test Pit TP-7 Representative Grain Sizes

Photo D-7 Test Pit TP-8 Spoils

Photo D-8 Test Pit TP-10 Spoils

Photo D-9 Test Pit TP-11 Spoils

Photo D-10 Test Pit TP-12 Spoils

Photo D-11 Test Pit TP-13 Spoils

Photo D-12 Test Pit TP-14 Spoils

Photo D-13 Test Pit TP-15 Spoils

Photo D-14 Test Pit TP-16 Spoils

Photo D-15 Test Pit TP-17 Spoils

Photo D-16 Test Pit TP-18 Spoils

Photo D-17 Test Pit TP-19 Spoils

Photo D-18 Test Pit TP-21 Spoils

Photo D-19 Test Pit TP-22 Spoils

Photo D-20 Test Pit TP-23 Spoils

Photo D-21 Test Pit TP-24 Spoils

Photo D-22 Test Pit TP-25 Spoils

APPENDIX E

BLUE CREEK ROAD GAMMA SURVEY

TETRA TECH

Technical Memorandum

To:	Rebecca Bilodeau	From:	Aaron Orechwa; Daniel Workman
Company:	Worthington Miller Environmental	Date:	November 1, 2013
Address:	201 Linden Street, Suite 301 Fort Collins, Colorado 80524-4431	Project No.:	114-182335X
Re:	Blue Creek Road Gamma Survey		

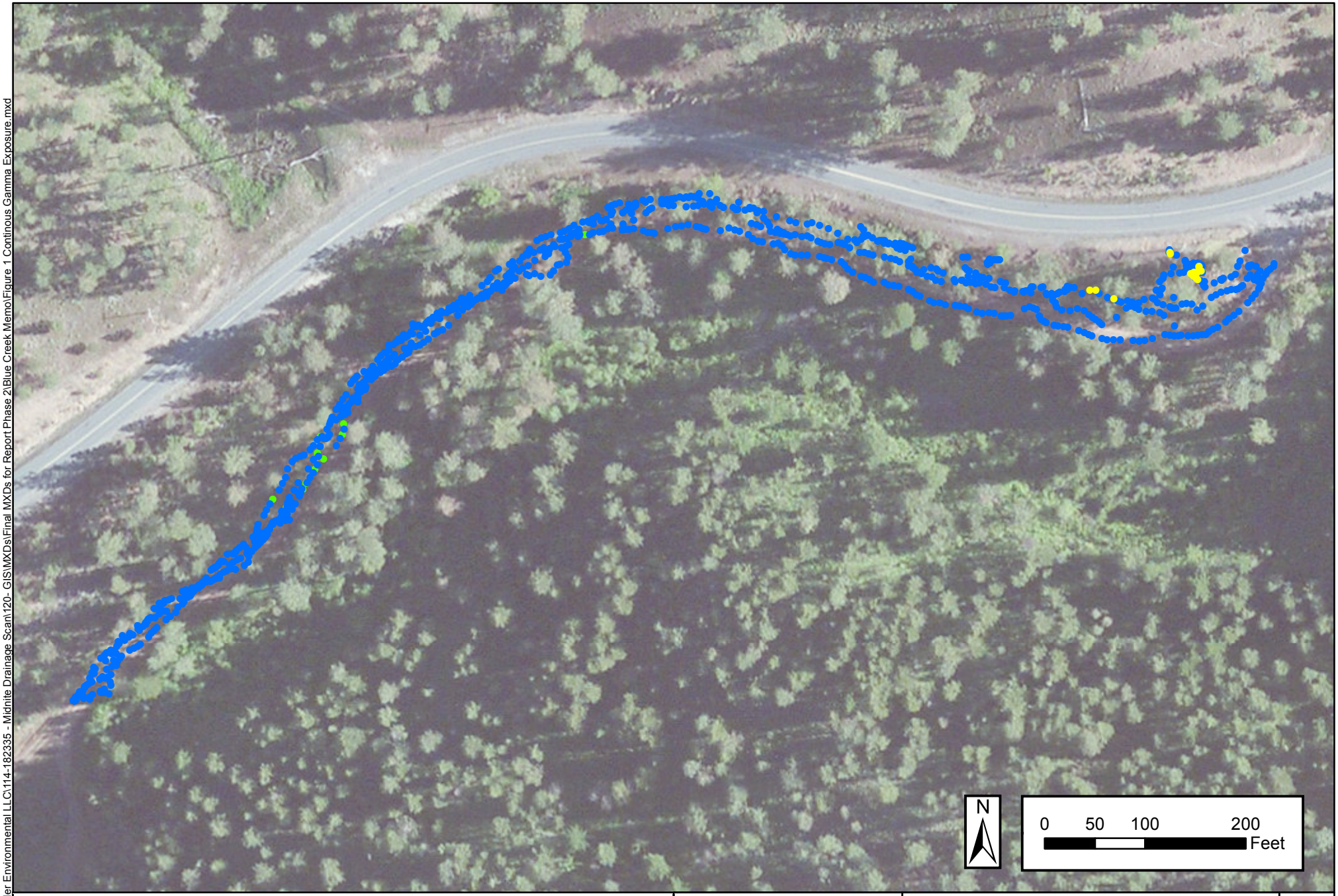
BLUE CREEK ROAD GAMMA SURVEY

This technical memorandum provides the results of the gamma exposure rate surveys that were performed along a portion of the Blue Creek Road near Wellpinit, Washington and Midnite Mine. This survey was performed in accordance with "Blue Creek Pipeline Geotechnical Evaluation Work Plan" (MWH, 2013) and corresponding standard operating procedure (SOP) for "Direct Gamma Field Survey for Field Reconnaissance" (PDDN-SOP 21, WME, 2012).

Field engineers performed two surveys on Blue Creek Road. The first survey was performed on August 21, 2013 and consisted of a continuously logged gamma radiation survey. A gamma exposure rate survey with 100 percent percent scan coverage (less than 2-meter scan width interval) was performed beginning at the intersection of Wellpinit Road and Blue Creek Road and continuing west for approximately 1,500 feet. Field engineers measured gamma exposure rates using proprietary data logging software and Ludlum 2350/44-10 instruments positioned 1 meter above the ground surface. The methods, procedures, and quality assurance/quality control (QA/QC) protocol followed for this survey are described in detail in the technical memorandum "Midnite Mine White Tail Creek Gamma Radiation Survey" (Tetra Tech, 2013). The second survey was performed on October 15, 2013 and consisted of static measurements taken every 100 feet along the Blue Creek Road, utilizing the same instrumentation used to conduct the continuously logged gamma survey. A total of 16 locations were measured. Measurements were recorded at two different heights for each location: a surface measurement at 5 centimeters above ground surface, and a measurement from 1 meter above ground surface. Measurements were taken in the center of the road. For each height, five measurements were recorded; the arithmetic mean was calculated and used for the analysis. Attachment A includes the field log book with the static measurement data.

Table 1 provides the results of the static measurements for both detector heights. Figure 1 displays the results of the continuously logged gamma exposure rate measurements; Figure 2 presents a map showing the static measurements for both detector heights. Table 2 provides comparison of the summary statistics between the continuous and static gamma measurements.

Tetra Tech
3801 Automation Way, Suite 100, Fort Collins, CO 80525
Tel 970.223.9600 Fax 970.223.7171 www. tetratech.com



Gamma Exposure Rate (µR/hr)

- < 25
- 25 - 35
- 35 - 45
- 45 - 55
- > 55

Issued by:

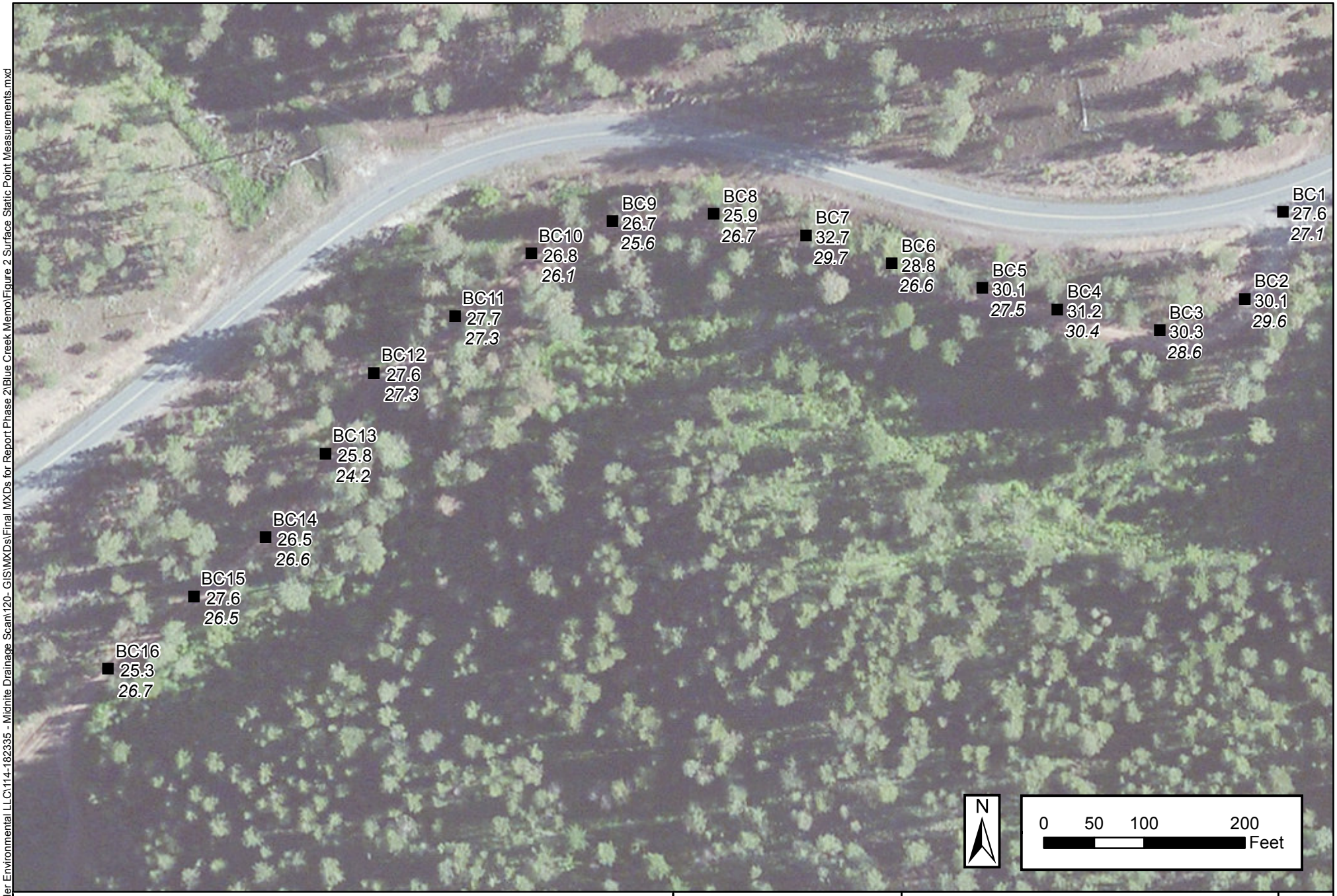
TETRA TECH
3801 Automation Way, Suite 100
Fort Collins, Colorado 80525
(970) 223-9600 (970) 223-7171 fax

Blue Creek Road
Continously Logged 1 meter
Gamma Exposure Rate Map

1
Revision

Project:	Midnite Mine White Tail Creek	Project no.: 114-182335	Figure 1
Location:	Wellpinit, WA	October, 2013	

V:\T-Z\Worthington Miller Environmental LLC\114-182335 - Midnite Drainage Scan\120- GIS\MXDs\Final MXDs for Report Phase 2\Blue Creek Memo\Figure 1 Continous Gamma Exposure.mxd



BC4 -- Location ID
■ 31.2 -- Surface Static Gamma Exposure Rate (µR/hr)
30.4 -- 1 meter Static Gamma Exposure Rate (µR/hr)

Issued by:

TETRA TECH
3801 Automation Way, Suite 100
Fort Collins, Colorado 80525
(970) 223-9600 (970) 223-7171 fax

Blue Creek Road
Static Gamma Exposure Rate Map

1
Revision

Project:	Midnite Mine Blue Creek Road	Project no.: 114-182335	Figure 2
Location:	Wellpinit, WA	October, 2013	

V:\T-Z\Worthington Miller Environmental LLC\114-182335 - Midnite Drainage Scan\120- GIS\MXDs\Final MXDs for Report Phase 2\Blue Creek Memo\Figure 2 Surface Static Point Measurements.mxd

Table 1. Surface and 1-meter Static Gamma Exposure Rate Measurements

ID	Surface (µR/hr)	1-meter (µR/hr)
BC1	27.6	27.1
BC2	30.1	29.6
BC3	30.3	28.6
BC4	31.2	30.4
BC5	30.1	27.5
BC6	28.8	26.6
BC7	32.7	29.7
BC8	25.9	26.7
BC9	26.7	25.6
BC10	26.8	26.1
BC11	27.7	27.3
BC12	27.6	27.3
BC13	25.8	24.2
BC14	26.5	26.6
BC15	27.6	26.5
BC16	25.3	26.7
AVERAGE	**28.2**	**27.3**

Table 2. Summary Statistics of Continuous and Static Gamma Exposure Rate Surveys

Statistic	Continuous 1 m Scan Gamma Exposure Rate (µR/hr)	Static 1 m Gamma Exposure Rate (µR/hr)	Static Surface Gamma Exposure Rate (µR/hr)
# of Measurements	970	16	16
Minimum	23.9	24.2	25.3
Maximum	37.0	30.4	32.7
Mean	29.4	27.3	28.2
Standard Deviation	2.23	1.61	2.15
Median	29.1	26.9	27.6
Percentile 90th	32.3	29.6	30.8
Percentile 95th	33.8	29.9	31.6
Percentile 99th	35.5	30.3	32.5

A total of 970 measurements were collected during the continuous scan survey of Blue Creek Road. Figure 1 provides the gamma exposure rate map for Blue Creek Road resulting from the continuous scan survey at a detector height of 1 meter above ground surface. The gamma exposure rates ranged between 23.9 and 37.0 micro roentgens per hour (µR/hr). The mean and median gamma exposure rates for the continuous survey were 29.4 and 29.1 µR/hr, respectively. A total of 16 static measurements were collected at discrete locations on a 100-foot interval at differing detector heights. For the static surface measurements the gamma exposure rates ranged between 25.3 and 32.7 µR/hr, with a mean and standard deviation of 28.2 and 27.56 µR/hr, respectively. For the static 1-meter measurements, the gamma exposure rates ranged between 24.2 and 30.4 µR/hr, with a mean and standard deviation of 27.3 and 26.9 µR/hr, respectively. Figure 3 provides an individual value plot comparing the gamma exposure rate measurements between the continuous and static gamma surveys. The gamma measurements were collected within the Blue Creek road area that is within the quartz Monzonite geologic formation. The gamma exposure rates collected at Blue Creek road are within the background levels measured during the White Tail Creek investigation (Tetra Tech, 2013).

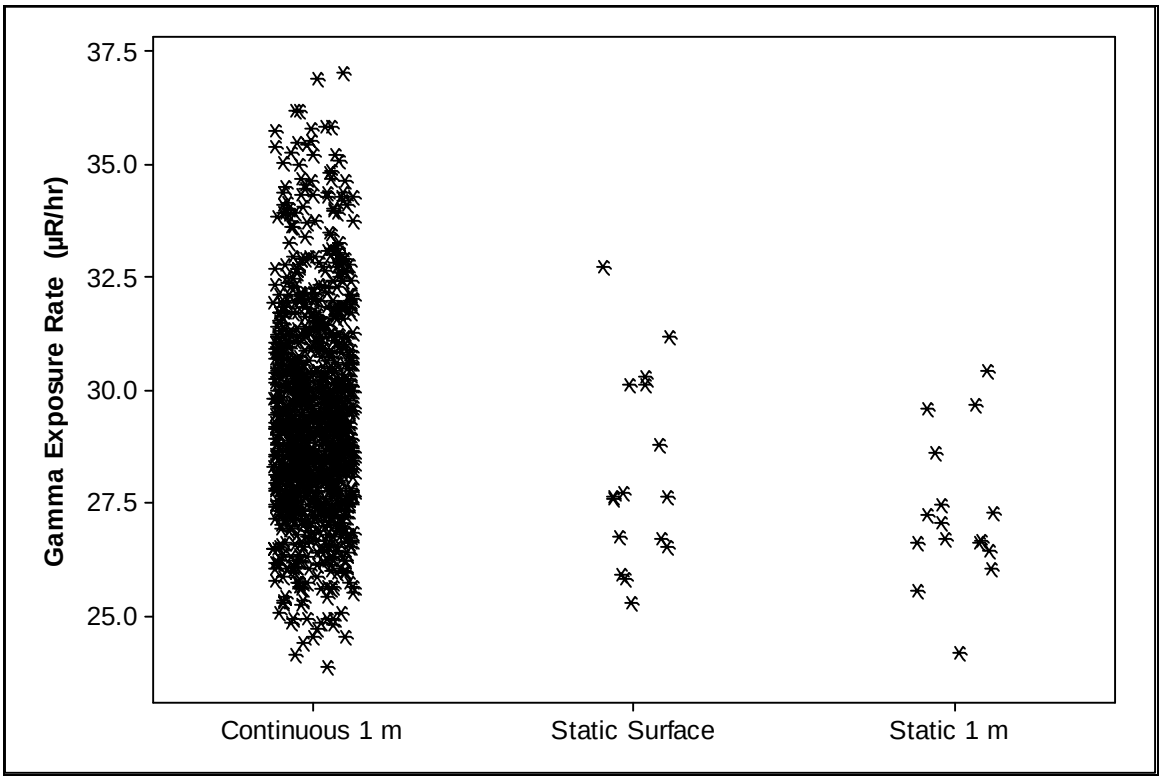


Figure 3. Individual Value Plot of Continuous and Static Gamma Exposure Rate Measurements

REFERENCES

Tetra Tech. 2013. Technical Memorandum: Midnite Mine White Tail Creek Gamma Radiation Survey. August 30.

[WME] Worthington Miller Environmental, LLC. 2012. Predesign Data Needs – Midnite Mine Standard Operating Procedures: Direct Gamma Field Survey for Field Reconnaissance.

MWH. 2013. Blue Creek Pipeline Geotechnical Evaluation Work Plan Revision 2. September 12, 2013.

ATTACHMENT A
FIELD LOG BOOK
STATIC MEASUREMENT DATA

10/15/13

ID	Time	γ_s	γ_m
WTC26	1615	30.1, 31.4, 30.7 32.9, 29.8	27.3, 28.4, 26.7 24.7, 25.4

L1 → 28.5, 25.9, 25.4, 28.3, 27.3
L2 → 27.1, 26.9, 24.6, 27.0, 25.9
R1 → 23.6, 24.9, 25.7, 23.5, 23.4
R2 → 24.6, 26.3, 22.5, 22.1, 22.7

L2 3' L1 4' C 4' R1 4' R2

ID	Time	γ_s	γ_m
WTC27	1623	27.8, 28.4, 26.8 27.2, 28.2	23.7, 22.4, 25.4 24.2, 24.0

L1 → 23.1, 24.5, 24.4, 22.7, 24.3
L2 → 21.7, 22.7, 24.0, 22.0, 23.1
R1 → 24.2, 24.0, 24.3, 24.3, 23.1
R2 → 24.3, 22.6, 21.2, 22.4, 23.5

L2 7' L1 6' C 6' R1 7' R2

End of entries for page ↓

Gm
10/15/13

10/15/13

LEFT WHITE TAIL CREEK @ 1645
ARRIVED AT BLUE CREEK ROAD 1700
INITIATED BLUE CREEK SURFACE SURVEY

ID		Surface Gamma (μR/hr)	1m γ (μR/hr)
BC1	1702	28.2, 28.1, 28.0, 27.4 26.4	28.8, 26.8 27.3, 25.6 26.9
BC2	1703	29.5, 30.3, 31.7, 30.0 29.1	29.4 29.1 28.8 30.5 29.7
BC3	1705	30.1, 30.5, 30.5 28.7, 31.8,	28.7, 29.6 30.1, ~~27.1, 27.3~~
BC4	1706	31.5, 32.3, 31.1 29.1 31.9	~~31.8~~, 29.9 ~~30.9~~ 31.2 ~~28.3~~
BC5	1708	30.3, 30.7, 30.4 30.1, 29.2	27.2, 27.0 26.9, 29.0 27.3
BC6	1710	28.2, 27.9, 29.9 29.0, 29.0	26.3, 26.7 26.7, 26.1 27.3
BC7	1712	32.5, 34.5, 31.5 32.0, 33.2	30.6, 31.6 30.1, 27.6 28.4

10/15/13

ID		γ_s	γ_{1m}
BC 8	1713	27.4, 24.7 26.2, 26.5 24.8	27.1, 27.7 26.0, 26.2 26.5
BC 9	1715	26.5, 26.6 25.3, 27.2 28.0	26.3, 26.6 24.8, 25.8 24.3
BC10	1720	27.3, 27.1 26.8, 25.1 27.1	26.8, 25.7 26.6, 26.0 25.2
BC11	1722	29.6, 26.7 26.8, 27.2 28.3	28.6, 26.3 28.0, 26.0 27.4
BC 12	1725	26.0, 28.1 27.2, 27.8 29.0	24.9, 27.2 27.4, 27.8 29.1
BC 13	1726	27.1, 28.2 24.0, 24.8 25.0	23.7, 24.9 24.3, 23.4 24.6
BC 14	1727	26.5, 26.0 27.1 27.3 25.8	26.2, 24.7 25.7, 26.5 26.9

END

10/15/13

ID	γ_s	γ_{1m}
BC 15 1728	27.2, 28.1 29.2, 26.5 26.9	26.3, 27.0 27.2, 25.5 26.3
1729 BC 16	24.7, 26.1 24.0, 24.7 26.9	27.9, 26.8, 27.5 25.5, 25.6

COMPLETED BLUE CREEK SURVEY AT 1730.

LEFT SITE @ 1730

ARRIVED HOTEL @ 1830

PERFORMED QC @ 1830

~~ID~~	~~Time~~	~~γ_s~~	~~γ_{1m}~~
~~WTC28~~	~~0845~~		

EM
10/16/13

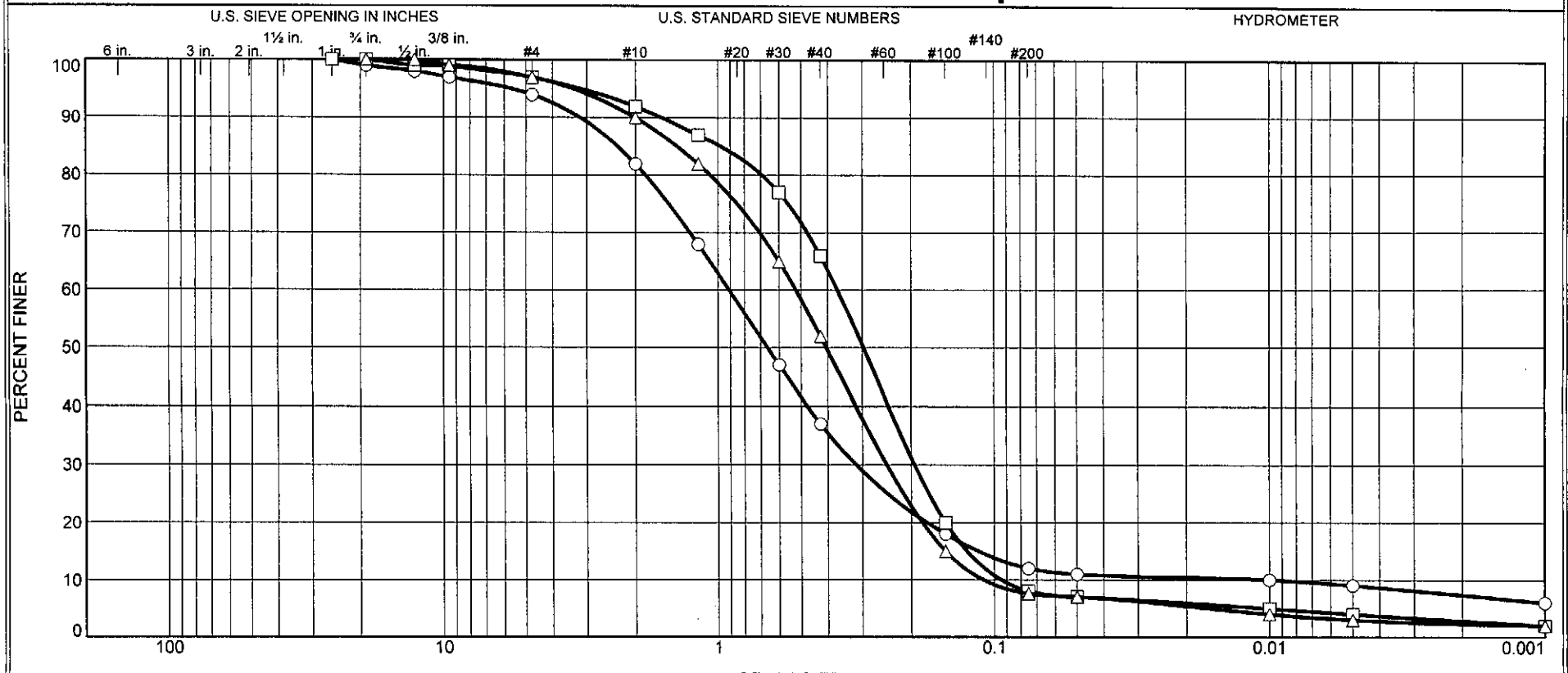
APPENDIX F

GEOTECHNICAL LABORATORY TEST RESULTS

PROCTOR/CLASSIFICATION LABORATORY SUMMARY

LABORATORY NUMBER				13-1053	13-1054	13-1055	13-1056	13-1057	13-1058	13-1059	13-1060
SAMPLE NUMBER				1	2	3	4	5	6	7	8
SAMPLED BY				Client	Client	Client	Client	Client	Client	Client	Client
SAMPLE TYPE				Bulk	Bulk	Bulk	Bulk	Bulk	Bulk	Bulk	Bulk
DATE RECEIVED				9/13/13	9/13/13	9/13/13	9/13/13	9/13/13	9/13/13	9/13/13	9/13/13
SAMPLE SOURCE				TP-1 @ 3'-8'	TP-3 @3'-6'	TP-7 @8'-10'	TP-11 @3'-4'	TP-20 @2'-4'	TP-21 @3'-10'	TP-22 @2'-10'	TP-24 @2'-4'
		Units	Test Method								
PROCTOR			ASTM D-698								
Maximum Density		pcf		124.6	107.6	108.9	124.2	117.2	121.0	114.3	121.2
Optimum Moisture		%		11.2	5.7	9.9	10.2	13.1	12.9	14.1	11.3
Sample Moisture		%		5.3	3.0	2.7	10.5	8.9	13.3	7.9	4.1
ATTERBERG LIMITS			ASTM D-4318								
Liquid Limit		%				26	34	31	32	27	30
Plastic Limit		%				23	18	21	21	21	23
Plasticity Index		%		NP	NP	3	16	10	11	6	7
SIEVE ANALYSIS			ASTM D-422								
	3"										
	1 1/2"				100						
S	1"	%		100	100-		100	100			
I	3/4"			99	100-	100	98	99	100	100	
E	1/2"	P		98	99	100-	97	99	99	100-	100
V	3/8"	A		97	99	99	95	98	98	99	100-
E	#4	S		94	97	97	88	95	94	98	96
	#10	S		82	92	90	74	82	81	93	83
S	#16	I		68	87	82	65	73	71	87	70
I	#30	N		47	77	65	54	64	58	78	54
Z	#40	G		37	66	52	48	60	52	73	47
E	#100			18	20	15	30	49	36	58	31
	#200			12	8.0	7.6	22	38	25	48	22
	.05mm			11	7	7	20	35	22	39	19
	.01mm			10	5	4	8	21	14	15	12
	0.005mm			9	4	3	6	16	9	11	9
	.001mm			6	2	2	4	9	6	5	6

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0	1	5	12	45	25	3	9
□	0	0	3	5	26	58	4	4
△	0	0	3	7	38	44	5	3

	Source	Sample #	Depth/Elev.	Date Sampled	USCS	Material Description	NM %	LL	PL
○	on site	1(13-1053)	3'-8'		SP-SM	poorly graded sand with silt	5.3	0	0
□	on site	2 (13-1054)	3'-6'		SP-SM	poorly graded sand with silt	3.0	0	0
△	on site	3 (13-1055)	8'-10'		SP-SM	poorly graded sand with silt	2.7	26	23

Client MWH

Project Blue Creek Drainage Materials

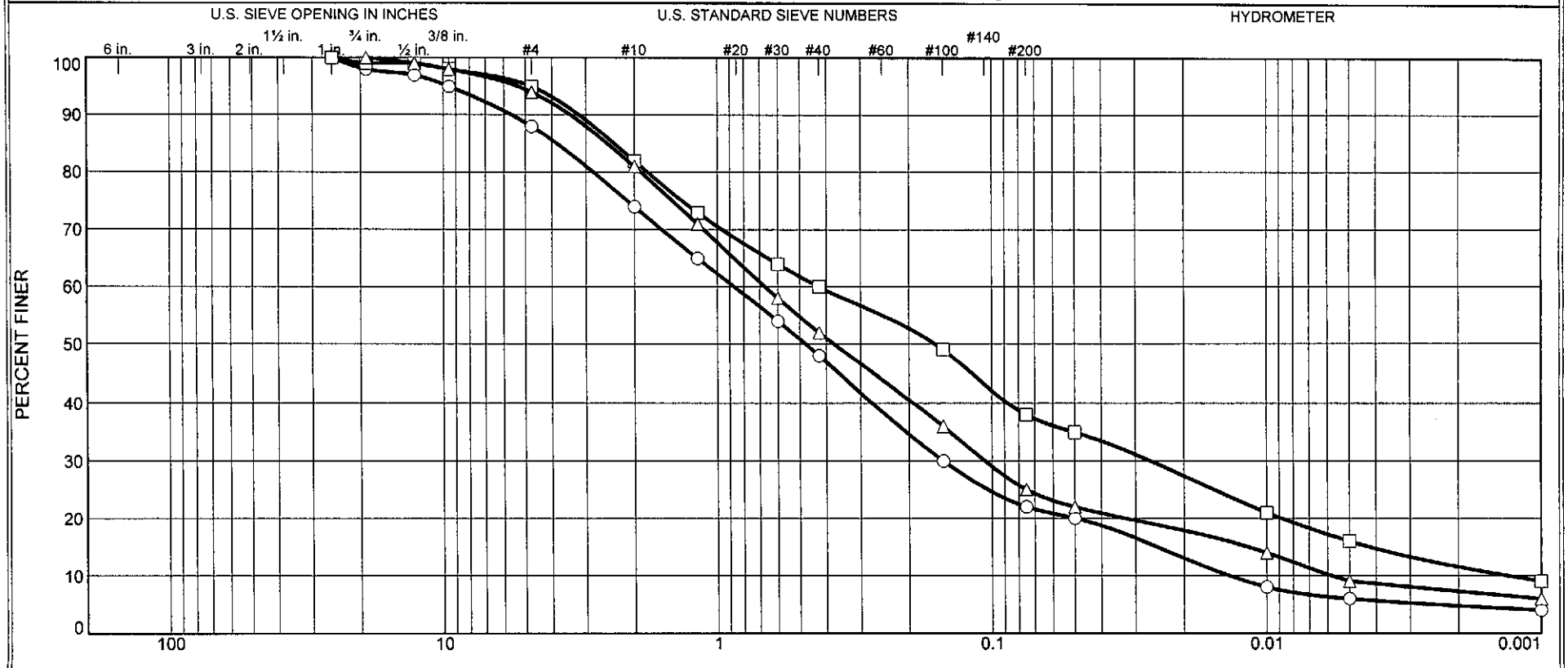
Project No. L13459 Date 9/27/13

BUDINGER & ASSOCIATES, INC.

○ Sampled by Client from TP-1
□ Sampled by Client from TP-3
△ Sampled by Client from TP-7

Tested By: ○ AA □ KC △ AA **Checked By:** TB

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0	2	10	14	26	26	16	6
□	0	1	4	13	22	22	22	16
△	0	0	6	13	29	27	16	9

	Source	Sample #	Depth/Elev.	Date Sampled	USCS	Material Description	NM %	LL	PL
○	on site	4 (13-1056)	3'-4'		SC	clayey sand	10.5	34	18
□	on site	5 (13-1057)	2'-4'		SC	clayey sand	8.9	31	21
△	on site	6 (13-1058)	3'-10'		SC	clayey sand	13.3	32	21

Client MWH

Project Blue Creek Drainage Materials

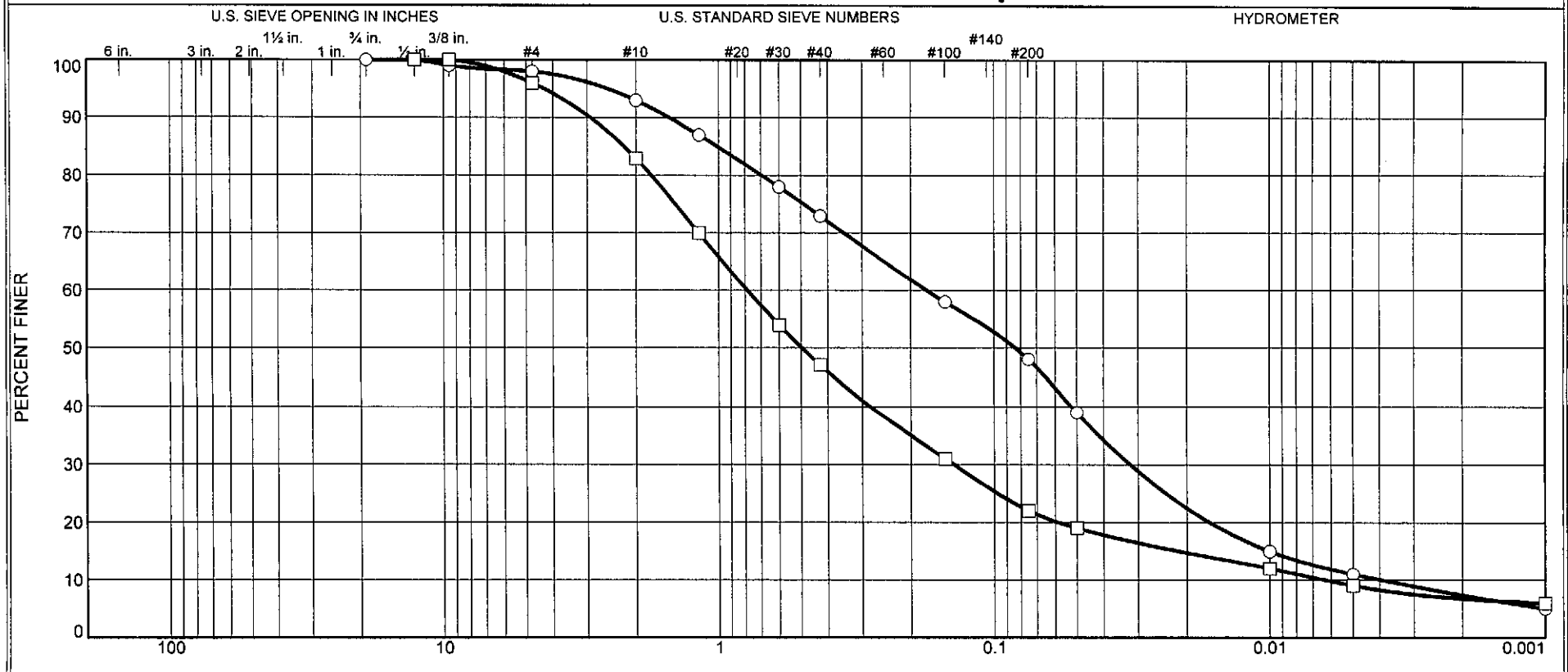
Project No. L13459 Date 9/27/13

BUDINGER & ASSOCIATES, INC.

○ Sampled by Client from TP-11
□ Sampled by Client
△ Sampled by Client

Tested By: KC **Checked By:** TB

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0	0	2	5	20	25	37	11
□	0	0	4	13	36	25	13	9

	Source	Sample #	Depth/Elev.	Date Sampled	USCS	Material Description	NM %	LL	PL
○	on site	7 (13-1059)	2'-10'		SC-SM	silty clayey sand	7.9	27	21
□	on site	8 (13-1060)	2'-4'		SC-SM	silty clayey sand	4.1	30	23

Client MWH

Project Blue Creek Drainage Materials

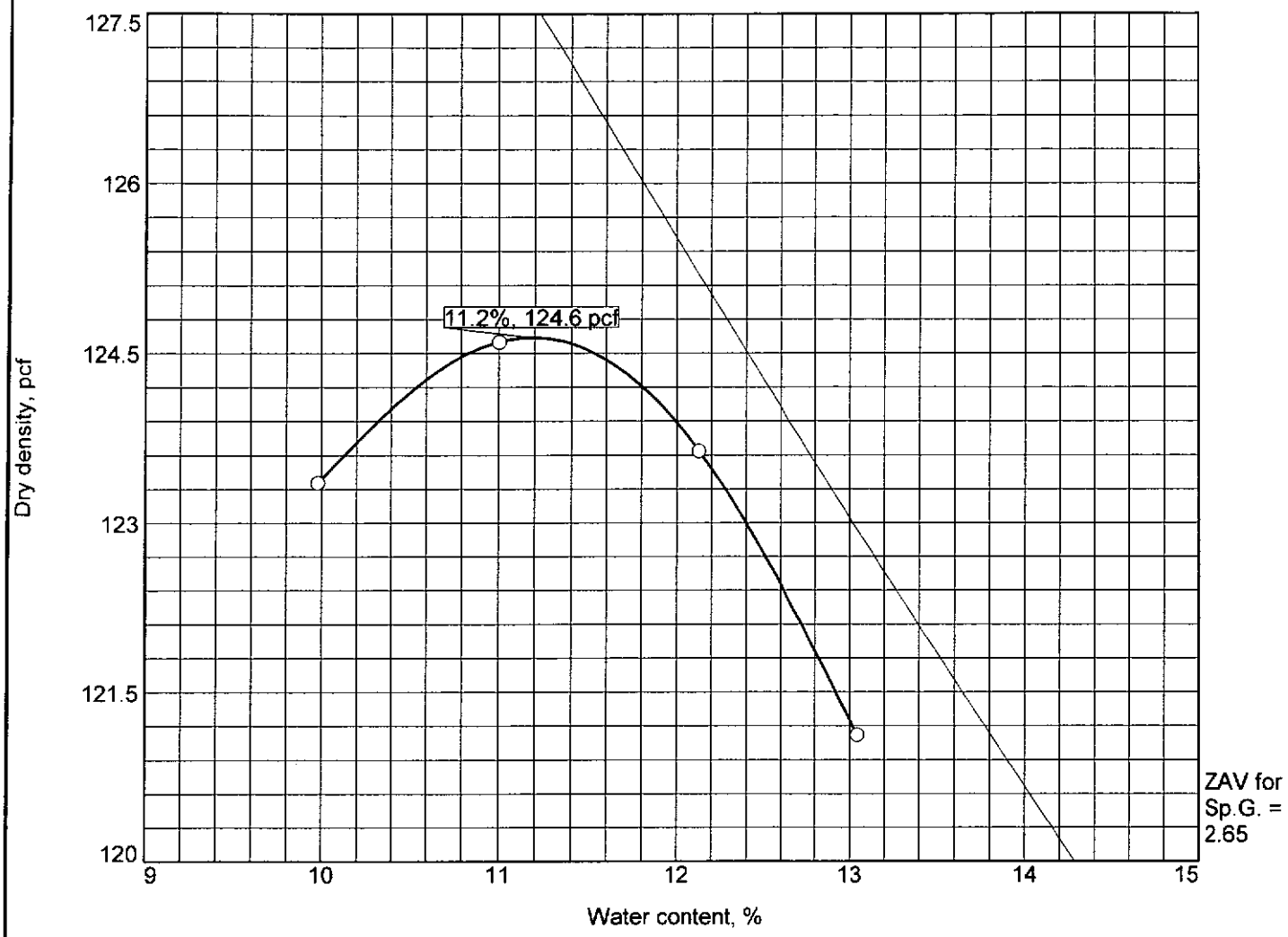
Project No. L13459 Date 9/27/13

BUDINGER & ASSOCIATES, INC.

○ Sampled by Client
□ Sampled by Client

Tested By: AA **Checked By:** TB

Moisture-Density Relationship



Test specification: ASTM D 698-07 Method C Standard

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > 3/4 in.	% < No.200
	USCS	AASHTO						
3'-8'	SP-SM	A-1-b	5.3		0		1	12

TEST RESULTS	MATERIAL DESCRIPTION
Maximum dry density = 124.6 pcf Optimum moisture = 11.2 %	poorly graded sand with silt

Project No. L13459 **Client:** MWH
Project: Blue Creek Drainage Materials

○ **Source of Sample:** on site **Sample Number:** 1(13-1053)

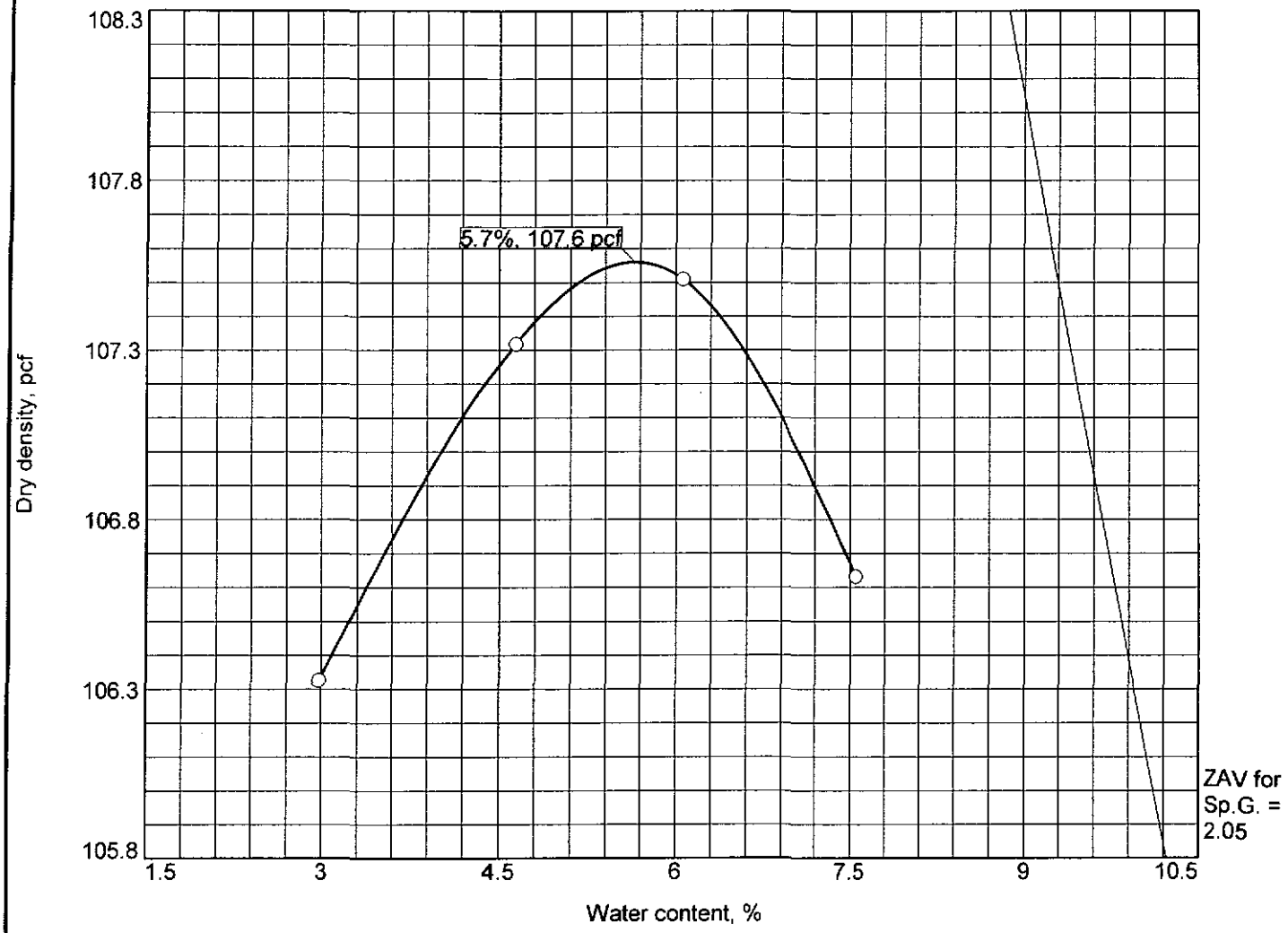
Remarks:
Sampled by Client

BUDINGER & ASSOCIATES, INC.

Date 9/27/13

Tested By: TS **Checked By:** TB

Moisture-Density Relationship



Test specification: ASTM D 698-91 Procedure A Standard

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > #4	% < No.200
	USCS	AASHTO						
3'-6'	SP-SM	A-3	3.0		0		3	8.0

TEST RESULTS	MATERIAL DESCRIPTION
Maximum dry density = 107.6 pcf Optimum moisture = 5.7 %	poorly graded sand with silt

Project No. L13459 **Client:** MWH
Project: Blue Creek Drainage Materials

○ **Source of Sample:** on site **Sample Number:** 2 (13-1054)

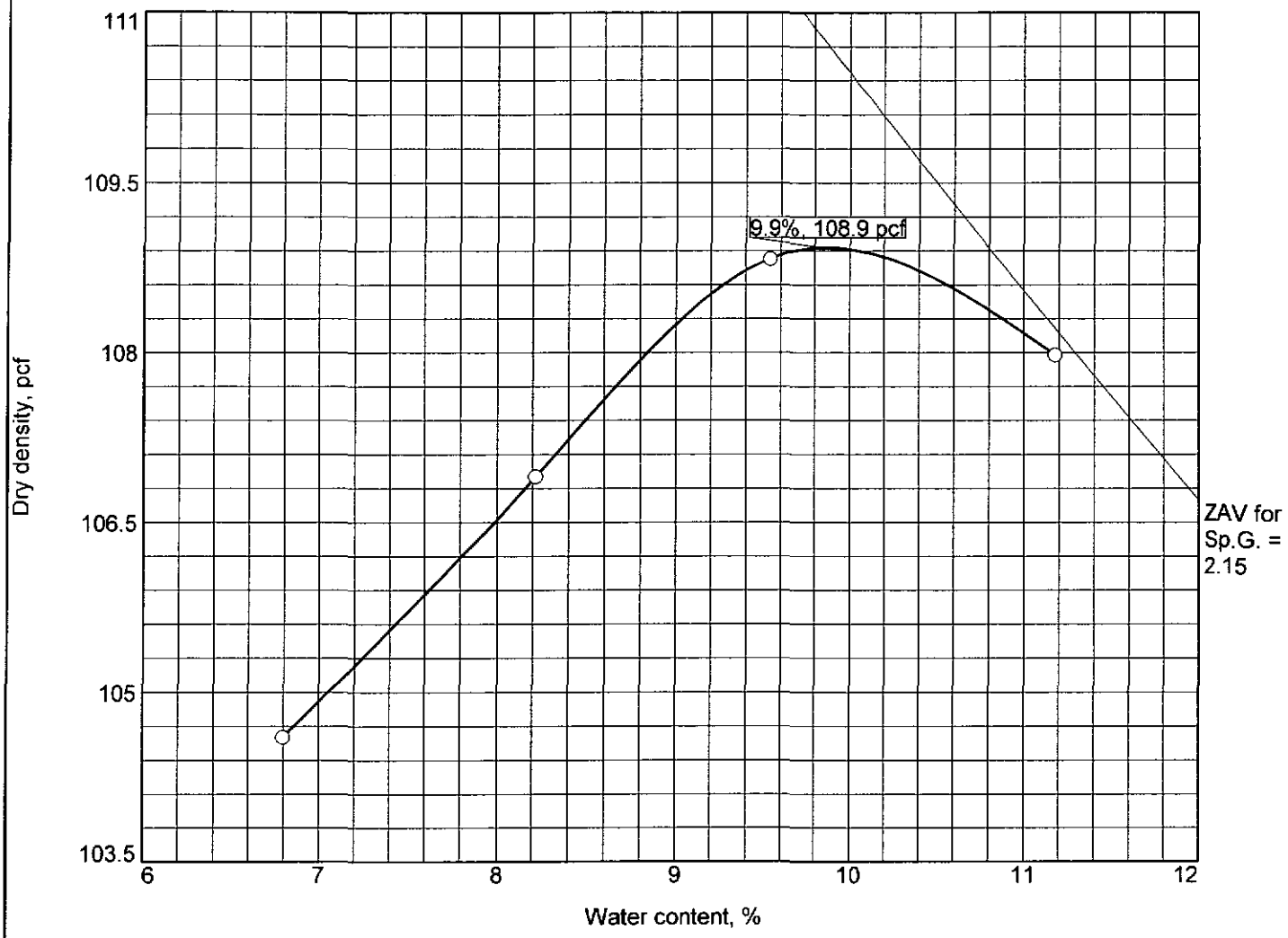
Remarks:
Sampled by Client

BUDINGER & ASSOCIATES, INC.

Date 9/27/13

Tested By: AA **Checked By:** TB

Moisture-Density Relationship



Test specification: ASTM D 698-91 Procedure A Standard

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > #4	% < No.200
	USCS	AASHTO						
8'-10'	SP-SM	A-2-4(0)	2.7		26		3	7.6

TEST RESULTS	MATERIAL DESCRIPTION
Maximum dry density = 108.9 pcf Optimum moisture = 9.9 %	poorly graded sand with silt

Project No. L13459 **Client:** MWH
Project: Blue Creek Drainage Materials

○ **Source of Sample:** on site **Sample Number:** 3 (13-1055)

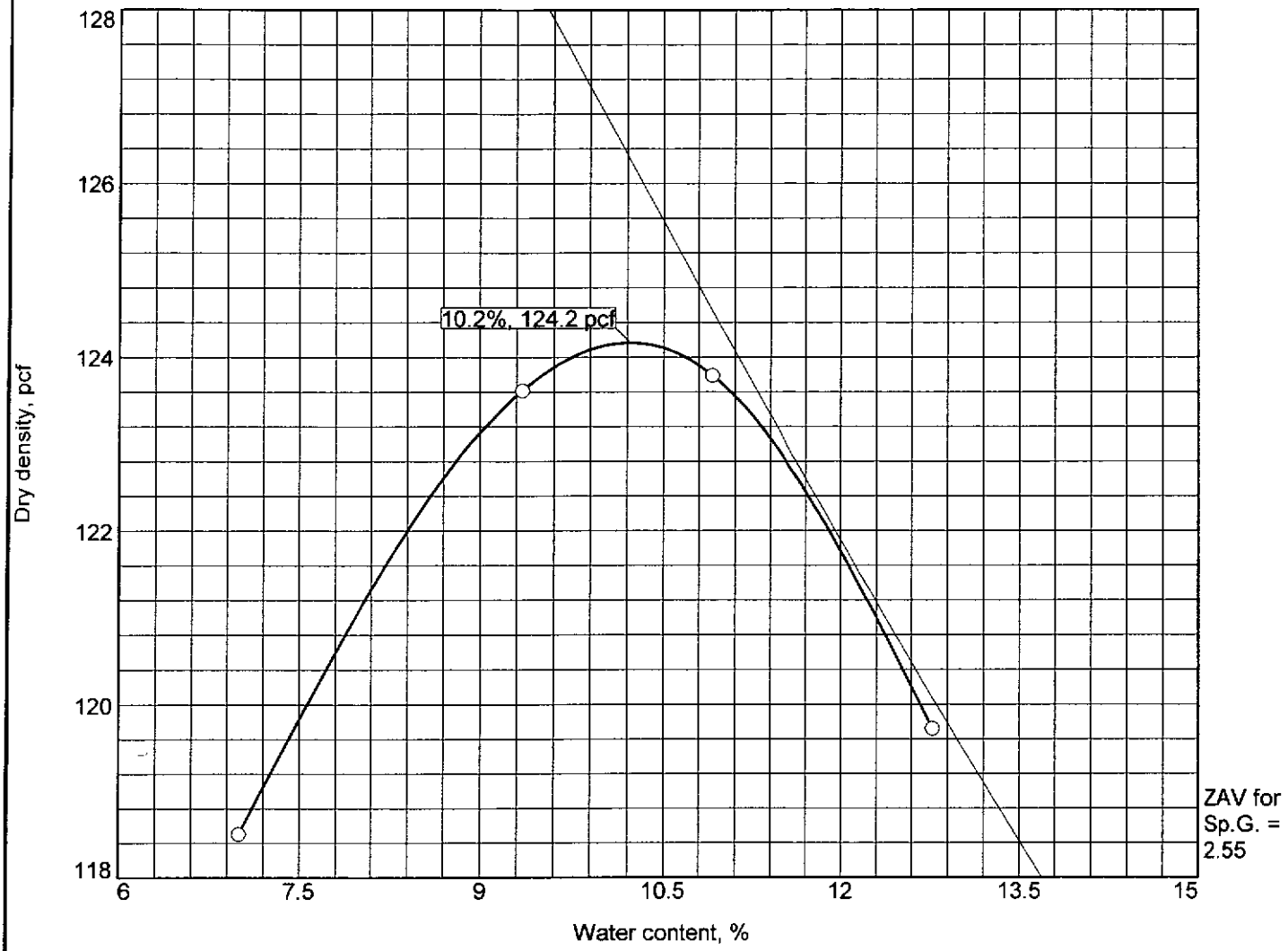
Remarks:
Sampled by Client

BUDINGER & ASSOCIATES, INC.

Date 9/27/13

Tested By: TS **Checked By:** TB

Moisture-Density Relationship



Test specification: ASTM D 698-91 Procedure C Standard

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > 3/4 in.	% < No.200
	USCS	AASHTO						
3'-4'	SC	A-2-6(0)	10.5		34		2	22

TEST RESULTS	MATERIAL DESCRIPTION
Maximum dry density = 124.2 pcf Optimum moisture = 10.2 %	clayey sand

Project No. L13459 **Client:** MWH
Project: Blue Creek Drainage Materials

○ **Source of Sample:** on site **Sample Number:** 4 (13-1056)

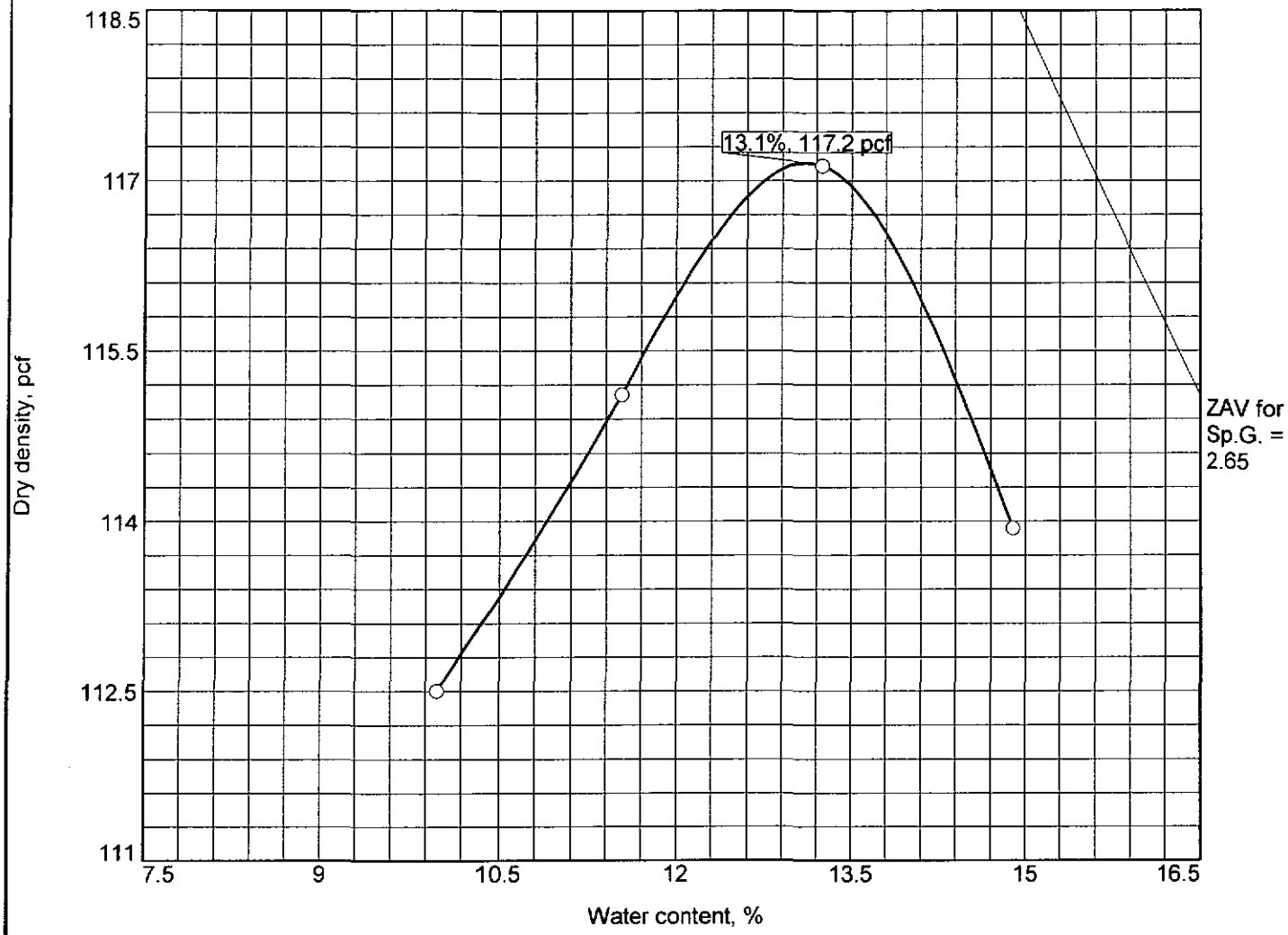
Remarks:
Sampled by Client

BUDINGER & ASSOCIATES, INC.

Date 9/27/13

Tested By: AA **Checked By:** TB

Moisture-Density Relationship



Test specification: ASTM D 698-07 Method B Standard

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > 3/8 in.	% < No.200
	USCS	AASHTO						
2'-4'	SC	A-4(0)	8.9		31		2	38

TEST RESULTS	MATERIAL DESCRIPTION
Maximum dry density = 117.2 pcf Optimum moisture = 13.1 %	clayey sand

Project No. L13459 **Client:** MWH
Project: Blue Creek Drainage Materials

○ **Source of Sample:** on site **Sample Number:** 5 (13-1057)

Remarks:
Sampled by Client from TP-20 @ 2'-4'

BUDINGER & ASSOCIATES, INC.

Date 9/27/13

Tested By: TS **Checked By:** TB

Moisture-Density Relationship

Test specification: ASTM D 698-91 Procedure A Standard

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > #4	% < No.200
	USCS	AASHTO						
3'-10'	SC	A-2-6(0)	13.3		32		6	25

TEST RESULTS	MATERIAL DESCRIPTION
Maximum dry density = 121.0 pcf Optimum moisture = 12.9 %	clayey sand

Project No. L13459 **Client:** MWH
Project: Blue Creek Drainage Materials

○ **Source of Sample:** on site **Sample Number:** 6 (13-1058)

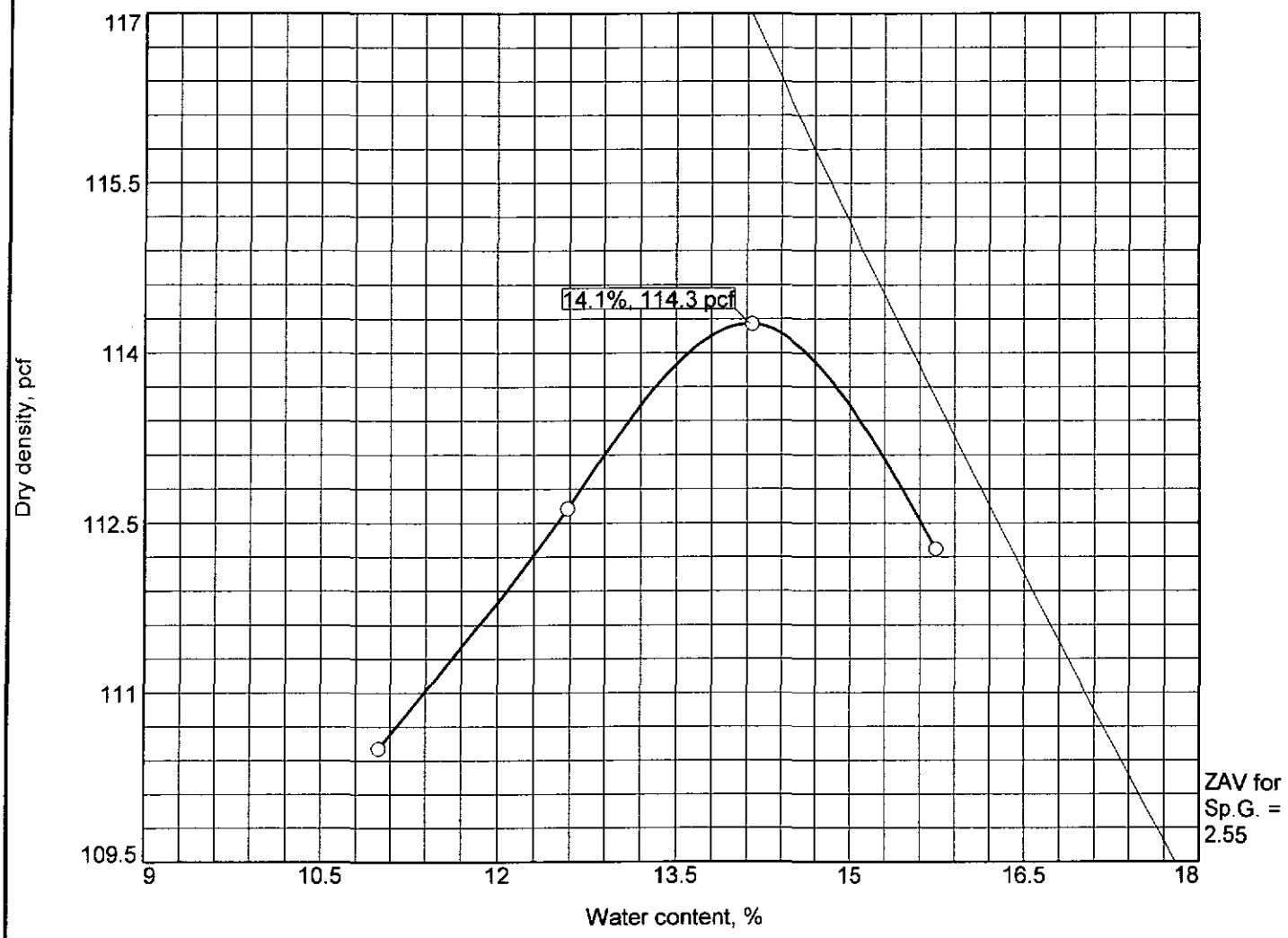
Remarks:
Sampled by Client

BUDINGER & ASSOCIATES, INC.

Date 9/27/13

Tested By: AA **Checked By:** TB

Moisture-Density Relationship



Test specification: ASTM D 698-91 Procedure A Standard

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > #4	% < No.200
	USCS	AASHTO						
2'-10'	SC-SM	A-4(0)	7.9		27		2	48

TEST RESULTS	MATERIAL DESCRIPTION
Maximum dry density = 114.3 pcf Optimum moisture = 14.1 %	silty clayey sand

Project No. L13459 **Client:** MWH
Project: Blue Creek Drainage Materials

○ **Source of Sample:** on site **Sample Number:** 7 (13-1059)

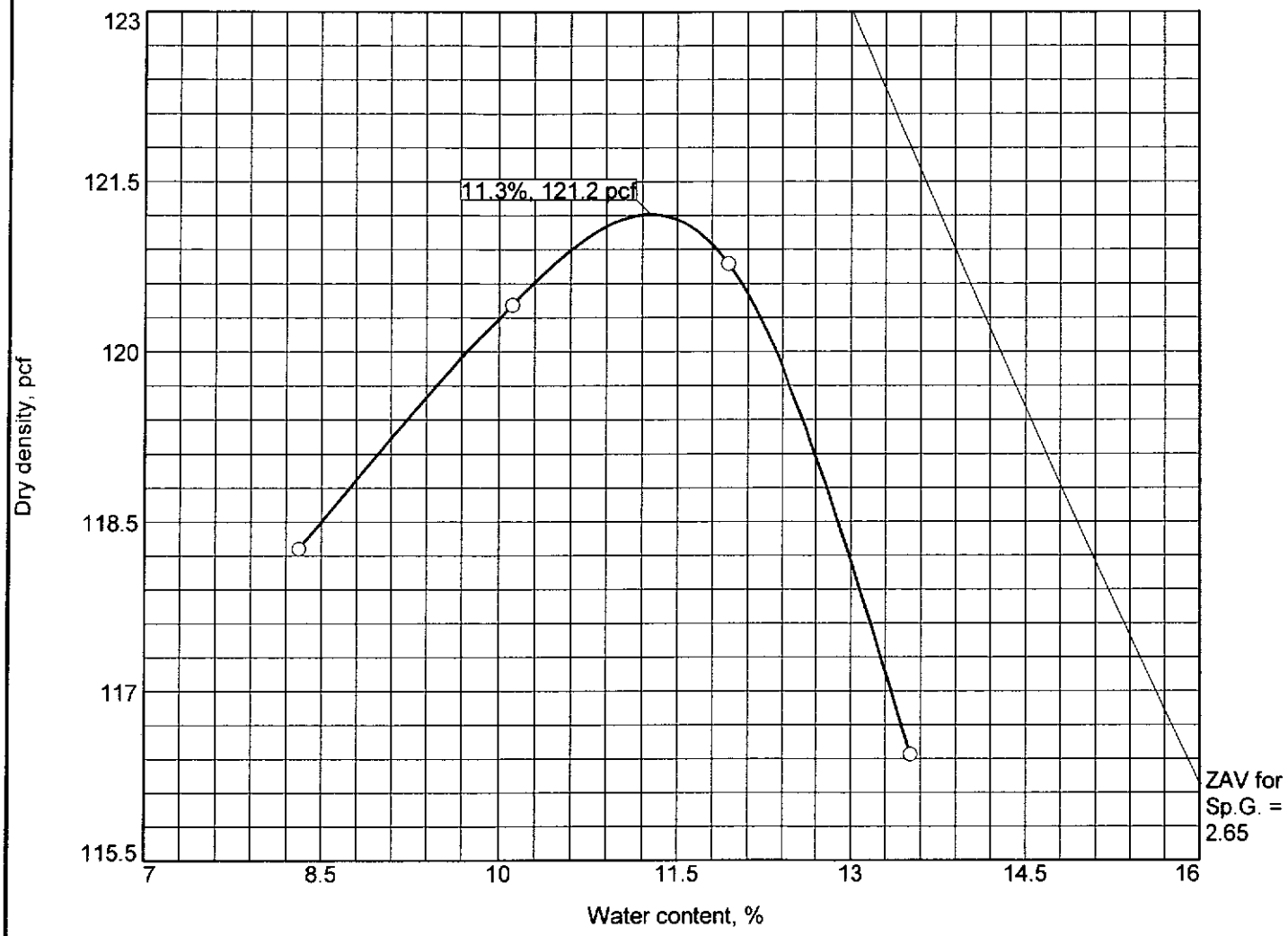
Remarks:
Sampled by Client

BUDINGER & ASSOCIATES, INC.

Date 9/27/13

Tested By: AA **Checked By:** TB

Moisture-Density Relationship



Test specification: ASTM D 698-07 Method B Standard

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > 3/8 in.	% < No.200
	USCS	AASHTO						
2'-4'	SC-SM	A-2-4(0)	4.1		30		0	22

TEST RESULTS	MATERIAL DESCRIPTION
Maximum dry density = 121.2 pcf Optimum moisture = 11.3 %	silty clayey sand

Project No. L13459 **Client:** MWH
Project: Blue Creek Drainage Materials

○ **Source of Sample:** on site **Sample Number:** 8 (13-1060)

Remarks:
Sampled by Client from TP-24 @ 2'-4'

BUDINGER & ASSOCIATES, INC.

Date 9/27/13

Tested By: TS **Checked By:** TB

Attachment J-3

Geohazard Evaluation Proposed Water Treatment Discharge Pipeline Alignment

GEOHAZARD EVALUATION
PROPOSED WATER TREATMENT DISCHARGE PIPELINE ALIGNMENT
MIDNITE MINE

Prepared for:

Worthington Miller Environmental, LLC
201 Linden St. Suite 301
Fort Collins, CO 80524

Prepared by:

Plumley & Associates, Inc.
Fort Collins, Colorado 80525

November, 2012

1 INTRODUCTION

Long term water management at the Midnite Mine will include construction of a Water Treatment Plant (WTP) at the Midnite Mine site. Treated water from the new WTP would be discharged via pipeline into the Spokane Arm of Franklin D. Roosevelt Lake. The proposed pipeline alignment evaluated at the time of this investigation was approximately 5 miles long and follows the existing Blue Creek road located along the north side of Blue Creek to Franklin D. Roosevelt Lake (Figure 1).

The purpose of the geohazard evaluation was to identify the existing geologic conditions and potential geologic hazards for preliminary design of the proposed pipeline alignment between the WTP and the Spokane Arm of Franklin D. Roosevelt Lake. The focus of this investigation was to identify potential geologic hazards and geotechnical constraints (such as active landslides, and potentially unstable slopes) for the proposed pipeline alignment, and also to provide preliminary recommendations to minimize the risk of these hazards and constraints to the pipeline.

The scope of work for this investigation was described in the work plan WTP Facility Siting Work Plan (MGC, 2010) and included researching published information, interpreting aerial photographs, and performing geologic reconnaissance mapping of the conditions along the pipeline route. This report summarizes the results of the geohazard evaluation.

2 GEOHAZARD INVESTIGATION PROCEDURES

The tasks performed during this investigation are described below.

Available published and unpublished geologic and geotechnical reports and maps were researched and reviewed to develop an understanding of the geologic conditions and geotechnical issues that occur in the area. Available aerial photographs covering the WTP site and area traversed by the proposed pipeline were researched and interpreted to assist in identifying landslides and potentially unstable areas prior to field mapping. A list of the geologic publications relevant to the WTF and pipeline alignment is provided in the reference section of the technical report.

Reconnaissance level engineering geologic mapping was performed along the pipeline corridor to identify significant geologic hazards and geotechnical constraints for pipeline developments, including: active landslide areas, potentially unstable slopes, and area susceptible to accelerated erosion. The various forms of landslides were delineated during mapping based on type of movement and materials involved in accordance with Varnes (1978). In addition, the geomorphology was used to infer the relative age and activity of the landslide deposits. Geologic hazards and adverse geotechnical conditions were delineated on the updated topographic base maps developed as specified in the Surveys and Field Investigation Work Plan (Tetra Tech 2010a). An index map illustrating the location and boundaries of the geologic mapping conducted during this investigation is provided on Figure 2. The results of the reconnaissance geologic mapping are presented on Figures 3, 4, 5 and 6.

It is important to note that the geologic mapping was restricted to the lower portion of Blue Creek where areas of concern (such as active landslide and unstable slopes) were identified that could pose a risk or geotechnical constraint to construction and operation of the proposed pipeline. Geologic hazards were not identified during the field reconnaissance conducted at the WTF site and the upper portion of the Blue Creek area along the proposed pipeline alignment. For that reason, the WTF site and upper portion of Blue Creek is not included within the boundaries of the geologic maps presented on Figures 3, 4, 5, and 6.

Photographs of key geologic features identified during this investigation are provided in Appendix A.

Subsurface investigations were not included within the scope of work for this geologic reconnaissance. In places, this report discusses the presumed shallow subsurface conditions inferred by surface observations and past

experience. This discussion is provided for preliminary planning purposes only. The actual subsurface conditions may vary from those inferred from surficial observations. For that reason, the actual subsurface conditions will need to be confirmed by subsurface geotechnical investigations prior to final design.

3 GEOLOGIC SETTING

The Midnite Mine site is situated on the south facing slope in the southern portion of the Huckleberry Mountains approximately ½ mile southwest of Spokane Mountain. The Togo Formation is the oldest rock unit exposed in the open pits. The Togo Formation consists of a Precambrian sequence of metasedimentary rocks that presumably correlate with the lower Wallace Formation of the Belt Supergroup exposed in the Coeur d'Alene mining district (Miller and Clark, 1975). Folded metasedimentary rocks of the Togo Formation were later sheared, faulted, and metamorphosed during intrusion of granitic rocks (i.e. quartz monzonite) during the Cretaceous. The Togo Formation rocks occur as a roof pendent (i.e. a large mass of rock forming the roof of a major igneous intrusion). The texture of the granitic rocks (i.e. quartz monzonite) is highly variable and ranges from pegmatitic (very coarse-grained) to aplitic (fine-grained) (Nash, 1977). Bedrock exposed in the vicinity of the proposed WTP and pipeline alignment consists of porphyritic quartz monzonite and fine-grained quartz monzonite as described by Becraft and Weis (1961).

Thick deposits of glaciolacustrine and glaciofluvial deposits cover bedrock along the lower portion of Blue Creek and slopes along the Spokane River valley. During the Pleistocene, continental glaciers formed one or more times in the intermountain plateau of British Columbia and ice lobes advanced south following north-south oriented valleys into eastern Washington, Idaho and western Montana (Waitt, 1983). In late Pleistocene, several of these ice lobes blocked the flow of major rivers and formed huge glacial lakes. One of these ancient lakes, referred to as glacial Lake Columbia was formed when an ice lobe blocked the flow of the Columbia River at Grand Coulee, impounding water in the Columbia River valley, and possibly the Spokane River valley. The Pleistocene lake beds typically consist of repeated sequences of varved layers of lacustrine silt and clay interrupted by graded beds of gravel, sand and silt. The fine-grained varved layers were deposited by glaciolacustrine sedimentation processes. The graded gravel, sand and silt beds are inferred to have been deposited as bedload material carried by floods entering glacial Lake Columbia from the east. The sedimentary structures and rhythmic sequence of deposition provide evidence to suggest that these graded beds were invasively deposited into the varved beds by repeated catastrophic floods from glacial Lake Missoula (Waitt, 1983, Atwater 1963). After the glaciers retreated, erosion has removed much of the glacial sediments from the Columbia River and Spokane River valleys and cut broad terraces at several elevations that were modified or covered by later alluvial fan, alluvial channel, and landslide deposits.

The Pleistocene glaciolacustrine deposits are highly susceptible to landslide development. Jones and others (1961) examined more than 300 landslides along the upper 200 miles of the Columbia River Valley, including the Pleistocene deposits bordering Franklin D. Roosevelt Lake. Their report summarizes the numerous slope failures in Pleistocene sediments that primarily involve terrace landforms underlain by sand, silt, clay and gravel. Landsliding of surficial deposits apparently began as the glaciers retreated and stream erosion incised the valleys. The frequency of landsliding increased after construction of Grand Coulee Dam. According to Jones and others (1961), many slopes underlain by the Pleistocene sediments were destabilized due to saturation by reservoir water; or drawdowns associated with the periodic water level fluctuations. As summarized by Jones and others (1961):

> "Many landslides occurred along Franklin D. Roosevelt Lake in terrace scarps that became unstable when the reservoir filled. Slides occurred in all sediment types. One cause of landslide occurrence has been the fluctuation of the surface of Franklin D. Roosevelt Lake, necessitated by power demands at Grand Coulee Dam. Consequently, the surface of the lake has been lowered different amounts during the winter and spring of each year, the maximum being 85 feet in 1955. "

Along the Spokane River Arm, the report identified 17 recent landslides that included: slump-earthflow landslides, slip-off landslides, multiple-alcove landslides, and off bedrock landslides (failure of surficial deposits on a sloping bedrock surface).

4 GEOLOGIC MAP UNITS

This section provides a brief description of the major geologic units mapped during the field reconnaissance.

Quartz Monzonite (Kqf). Quartz monzonite occurs in the slope on the north side of Blue Creek above the alluvial terrace deposits adjacent to Blue Creek as shown on Figure 6. Exposures of the rock mass occur in a few areas; most of the bedrock areas are covered by a thin veneer of colluvium or talus material (that was not mapped as a separate unit) derived from the weathering and erosion of the quartz monzonite.

Pleistocene Sediments (Qg). The slopes bounding the lower portion of Blue Creek Valley are covered by Pleistocene sediments. Where exposed, these sediments were observed to consist of poorly consolidated (or unconsolidated) bedded sands and silts. However, as described above, this unit is known to also contain sequences of varved silts and clays and gravels. These poorly consolidated materials are highly susceptible to sloughing and accelerated erosion, and localized landslide.

Alluvial Terrace Deposits (Qt). Alluvial terraces occur along the Blue Creek as shown on Figures 4, 5 and 6. These terrace deposits are unconsolidated mixtures of sand, silt, and gravel that represent older alluvial deposits that have been partially eroded or removed by later down cutting (or incising) of Blue Creek. These materials should be relatively easy to excavate and may provide a source of bedding material for pipeline construction, if needed.

Alluvial Fan Deposits (Qf). Active alluvial fans occur at the mouth of unnamed tributary channels to Blue Creek as shown on Figures 5 and 6. These active fans are subject to periodic deposition of debris flows with source areas originating in the Pleistocene sediments. Debris flows could result in deposition (or partial burial) over the road and pipeline alignment (but are unlikely to damage a buried pipeline).

Possible Older Landslide Area (Qlso). A suspected older landslide area is identified on Figure 4. The suspected landslide area is characterized by a broad area of sloughing and accelerated erosion that transport silt and sand material to the toe of slope. The sloughing of the slope and accumulation at the toe of slope has not displaced the existing road; however the road appears to serve as a catchment bench at the toe of slope. The geomorphology of the slope does not suggest that this possible landslide feature is deep-seated or extends below the roadbed. Future sloughing and erosion of this area would likely result in deposition (or partial burial) over the road and pipeline alignment (but would not likely damage a buried pipeline).

Landslide Area (Qls). An active landslide is located near the mouth of Blue Creek (where Blue Creek enters the Spokane Arm of Franklin D. Roosevelt Lake) is identified in Figure 3. (Photo 1A and 1B, Appendix A). The landslide area occurs in the slope adjacent to a section of the reservoir that is inundated most of the year. However, at the time of the field reconnaissance (April, 26th, 2012), the water levels in the reservoir were low such that this portion of the reservoir (located below the mapped landslide area) was not inundated. The landslide area occurs in poorly consolidated and uncemented sand and silt beds. Retrogressive sloughing (i.e. shallow failures) of these materials has removed a section of the dirt access road that follows the north side of Blue Creek. The zone of sloughing appears to be expanding upslope, and laterally, and deepening overtime. This area is highly susceptible to continued shallow sloughing of granular beds that could undermine a pipeline constructed through this area. Landslide activity in this area is likely controlled by a combination of factors that include: (1) the presence of weak, uncemented sediments in an oversteepened slope; (2) road cut through the middle to lower portion of the slide area that locally undermined the slope; (3) periodic saturation of the toe of the slope (and drawdown) associated with the reservoir water levels; (4) wave erosion along the toe of the slope; and (5) stream erosion from Blue Creek that flows along the toe of the slope when the reservoir water levels are not sufficient to inundate this area.

Alluvium (Qal). Alluvium consists of silt, sand and gravel deposited as alluvial stream and overbank deposits associated with the current Blue Creek Stream corridor.

5 GEOHAZARDS DISCUSSION

Five areas of concern relative to identified geohazards along the proposed pipeline alignment are identified on the engineering geologic maps provided on Figures 3, 4, 5 and 6. Area 1 is the active landslide area located near the mouth of Blue Creek along the margin of the Spokane Arm of Roosevelt Lake (Photo 1, Appendix A). This landslide area is characterized by repeated retrogressive shallow failures that have essentially removed the section of the Blue Creek Access road that traversed through the slide area. Sloughing of the sand and silt beds is evident both above and below the existing road grade. However, the remnants of the road through the slide area appears to persist at the approximate original road grade (except for minor displacement in the south portion of the slide area) suggesting that the movement observed in the slide area reflects surficial soughing and not deeper seated or rotation type movement.

This active landslide area best fits the description of a "Slip-off Slope Landslides" as defined by Jones and others (1961):

> "Slip off slope landslides combine in varying proportions the processes of sliding, fall, and flow. They are landslides in which the mass of material shows little backward rotation but slides or rolls forward. Landslides of this type do not cut deeply into terraces. They occur most frequently in materials of medium- and coarse-grain size on slopes that lose support at the toe due to undermining by stream erosion, wave action, saturation, excavation, or similar causes. Unlike most of the slump earthflows, these landslides seldom reach their maximum development in one failure but continue to enlarge by raveling and caving for a long period."

In the case of the mapped active slide area, the unstable slope has been subjected to undermining associated with wave erosion, and seasonal stream erosion along the toe of the slope; and by excavation along the roadway. The toe of the slope is also subjected to periodic saturation and drawdown resulting from the fluctuating reservoir water levels. Additional geotechnical investigation including subsurface investigation is recommended to evaluate the feasibility of stabilizing the slope through the landslide area sufficient to allow for construction, operation and maintenance of the pipeline through this area.

The feasibility of relocating the pipeline to avoid the landslide area has not been evaluated. One conceptual alternative pipeline alignment identified during this field reconnaissance is shown on Figure 3. This alternative pipeline route would move the pipeline off the slope and onto the floor of the reservoir in this area in order to avoid the unstable slope. This option would entail crossing Blue Creek and following the old Blue Creek Channel to deeper waters in the reservoir. Blue Creek in this area is typically inundated most of the year by the reservoir. The feasibility of constructing the pipeline along the reservoir floor (to avoid the slide area) would need to evaluate the risk posed from erosion and scour and lateral stream migration along the section of Blue Creek that is sub aerially exposed during low reservoir water conditions; and potential risk associated with shifting sediments deposited in the reservoir in the Blue Creek delta below the water level. Geotechnical analysis that includes appropriate subsurface investigation and geomorphic analysis would be necessary to evaluate the feasibility of constructing the pipeline on the floor of the reservoir to avoid the active landslide area.

The other areas of concern denoted on the geologic maps (Areas 2, 3 and 4 and 5) are areas where erosion (and sloughing) of the stream bank are encroaching near or onto the margin of the roadway where the Pipeline would be constructed (Photos 2 and 3, Appendix A). The design of the pipeline should include sufficient erosion protection measures in these areas to minimize the risk to the pipeline from anticipated stream bank erosion.

No obvious hard bedrock areas that would likely require blasting for excavation during installation of the pipeline were observed along the proposed pipeline route. However, the excavation conditions should be further evaluated by excavating backhoe test pits at representative locations along the pipeline route to confirm the excavatibility of the bedrock using conventional trenching equipment.

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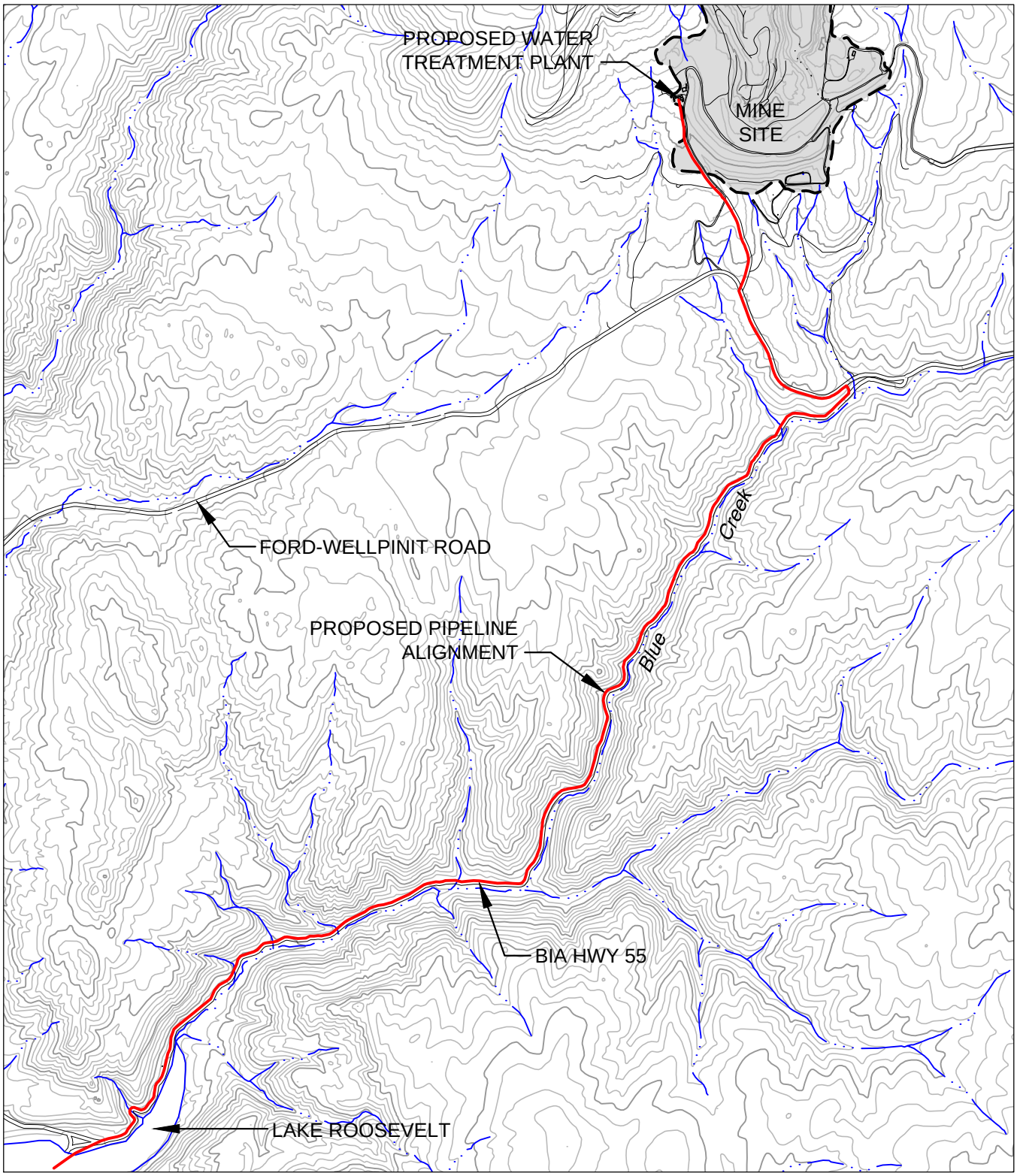
Attachments:

Figures

Appendix A: Photographs

Figures



NORTH

SCALE IN FEET

0 2500

MIDNITE MINE

FIGURE 1
PROPOSED PIPELINE ROUTE
BLUE CREEK AREA

PROJECT: 181850	WORTHINGTON MILLER ENVIRONMENTAL, LLC.
DATE: JULY 2012	
FILE: BLUE CREEK PIPE	

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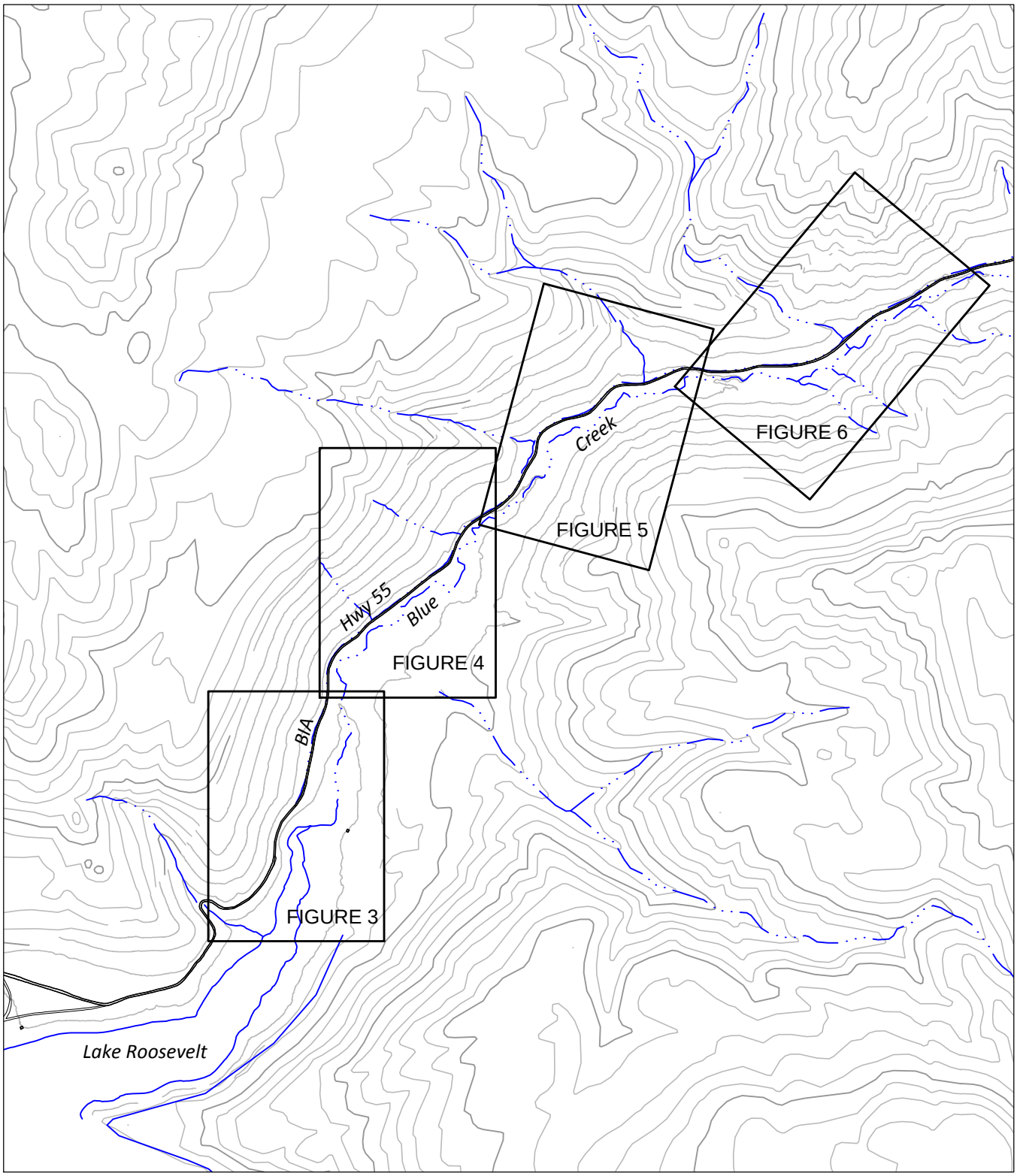

NORTH

SCALE IN FEET

0 800

MIDNITE MINE

FIGURE 2
GEOLOGIC INDEX MAP
BLUE CREEK AREA

PROJECT:	181850	WORTHINGTON MILLER ENVIRONMENTAL, LLC.
DATE:	JULY 2012	
FILE:	BLUE CREEK INDEX	

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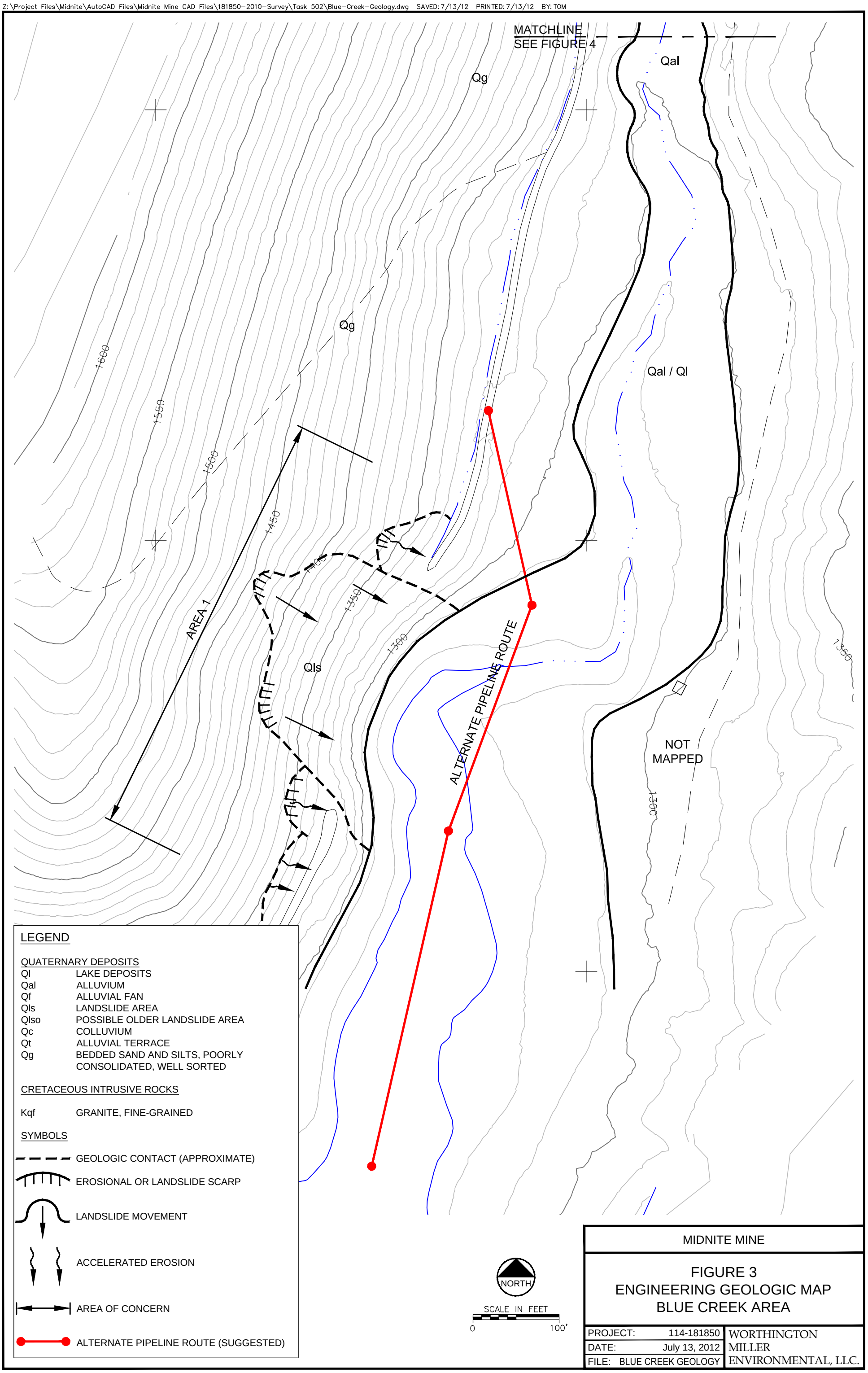

MIDNITE MINE

FIGURE 3
ENGINEERING GEOLOGIC MAP
BLUE CREEK AREA

PROJECT: 114-181850	WORTHINGTON MILLER ENVIRONMENTAL, LLC.
DATE: July 13, 2012	
FILE: BLUE CREEK GEOLOGY	

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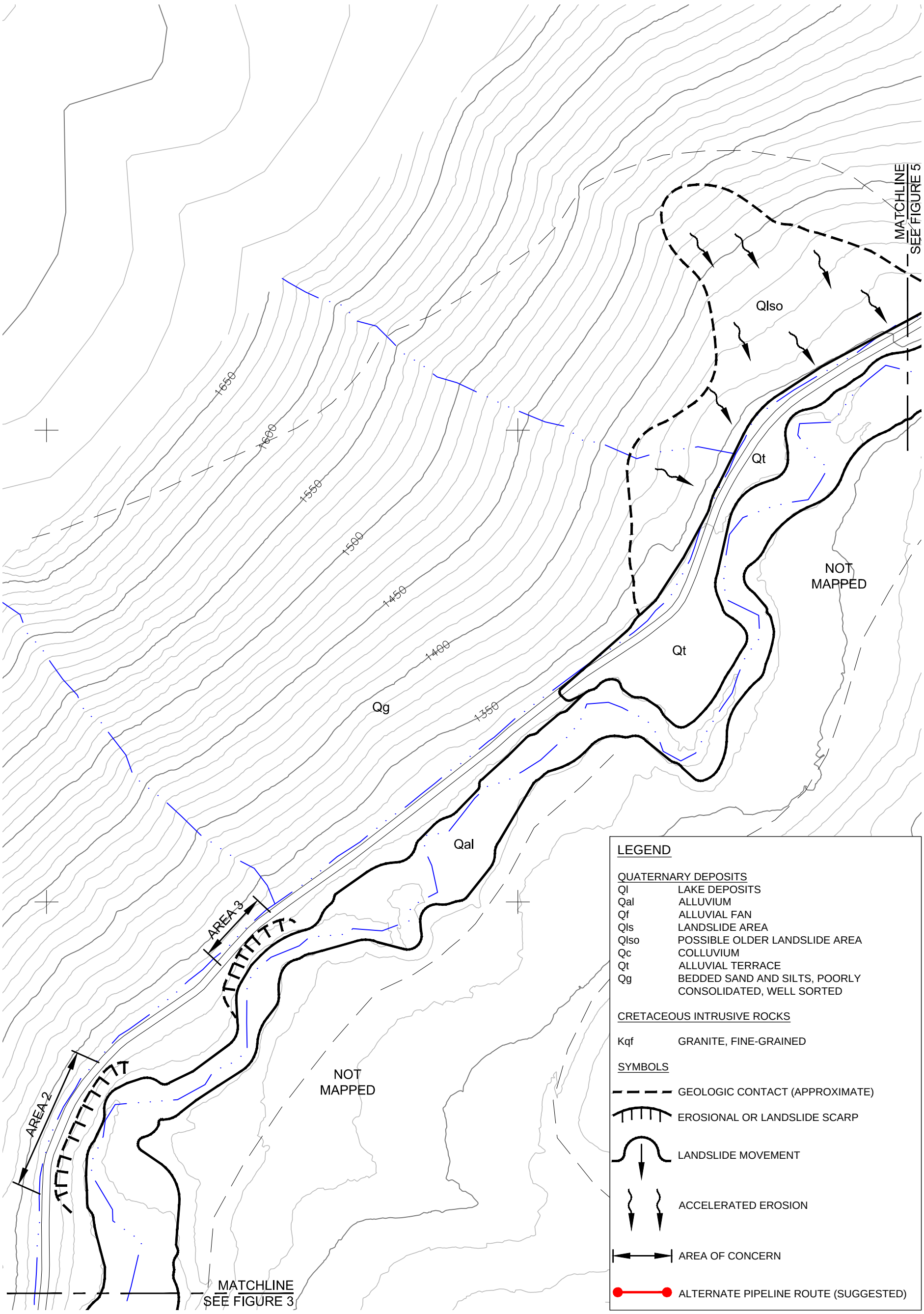

MIDNITE MINE

FIGURE 4
ENGINEERING GEOLOGIC MAP
BLUE CREEK AREA

PROJECT: 114-181850	WORTHINGTON MILLER ENVIRONMENTAL, LLC.
DATE: July 13, 2012	
FILE: BLUE CREEK GEOLOGY	

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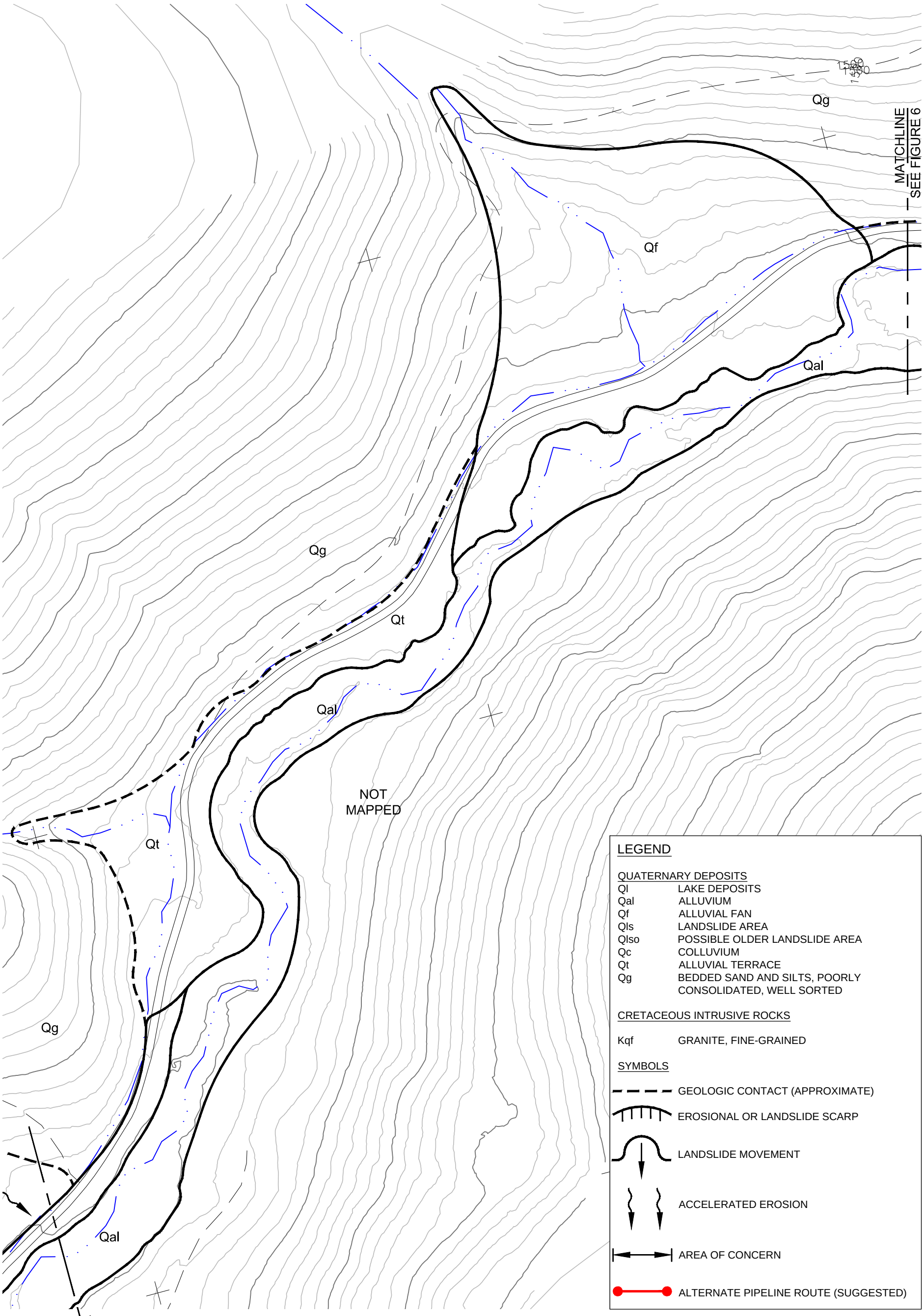

MIDNITE MINE

FIGURE 5
ENGINEERING GEOLOGIC MAP
BLUE CREEK AREA

PROJECT: 114-181850	WORTHINGTON MILLER ENVIRONMENTAL, LLC.
DATE: July 13, 2012	
FILE: BLUE CREEK GEOLOGY	

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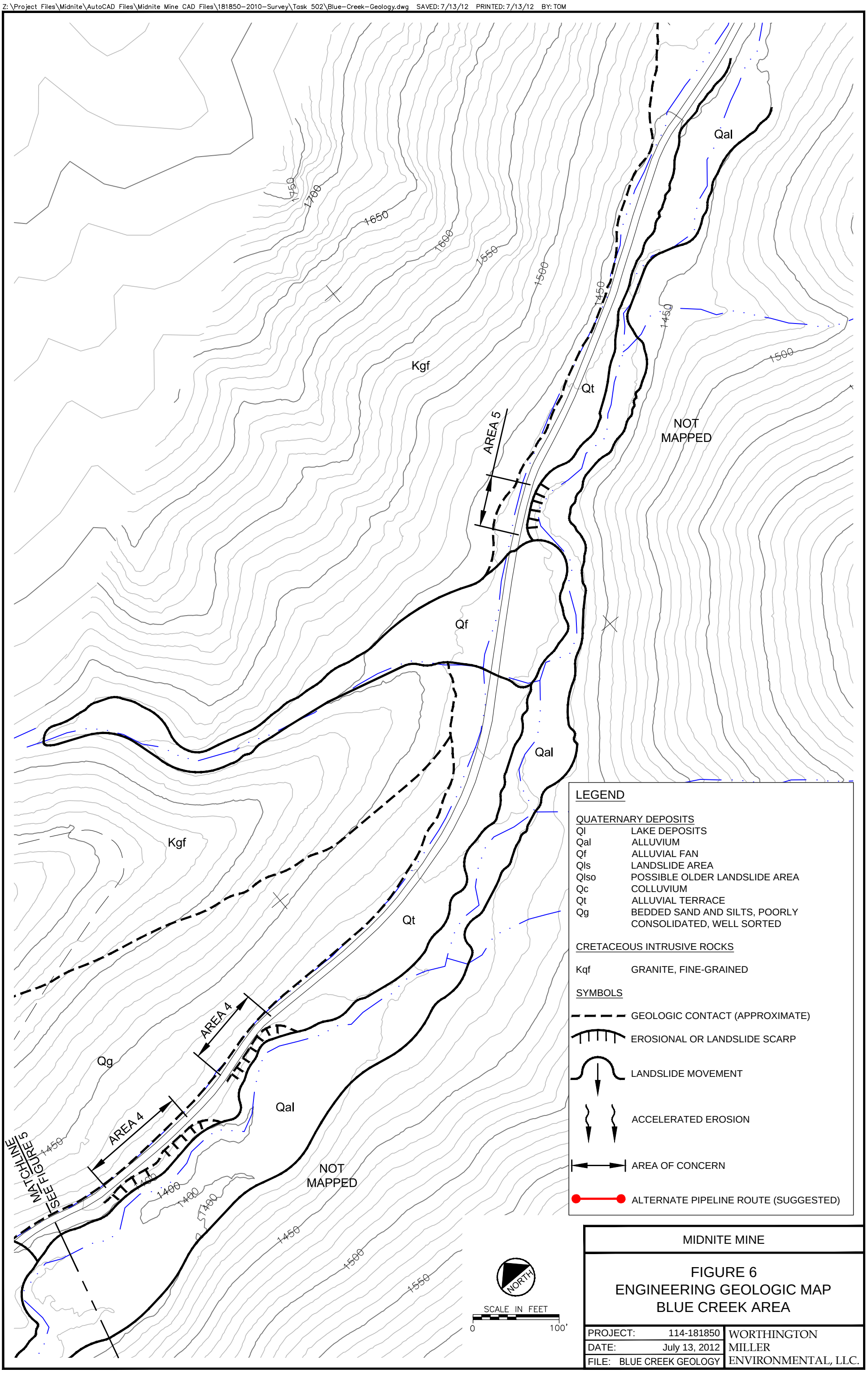

MIDNITE MINE

FIGURE 6
ENGINEERING GEOLOGIC MAP
BLUE CREEK AREA

PROJECT: 114-181850	WORTHINGTON MILLER ENVIRONMENTAL, LLC.
DATE: July 13, 2012	
FILE: BLUE CREEK GEOLOGY	

Appendix A

Photographs

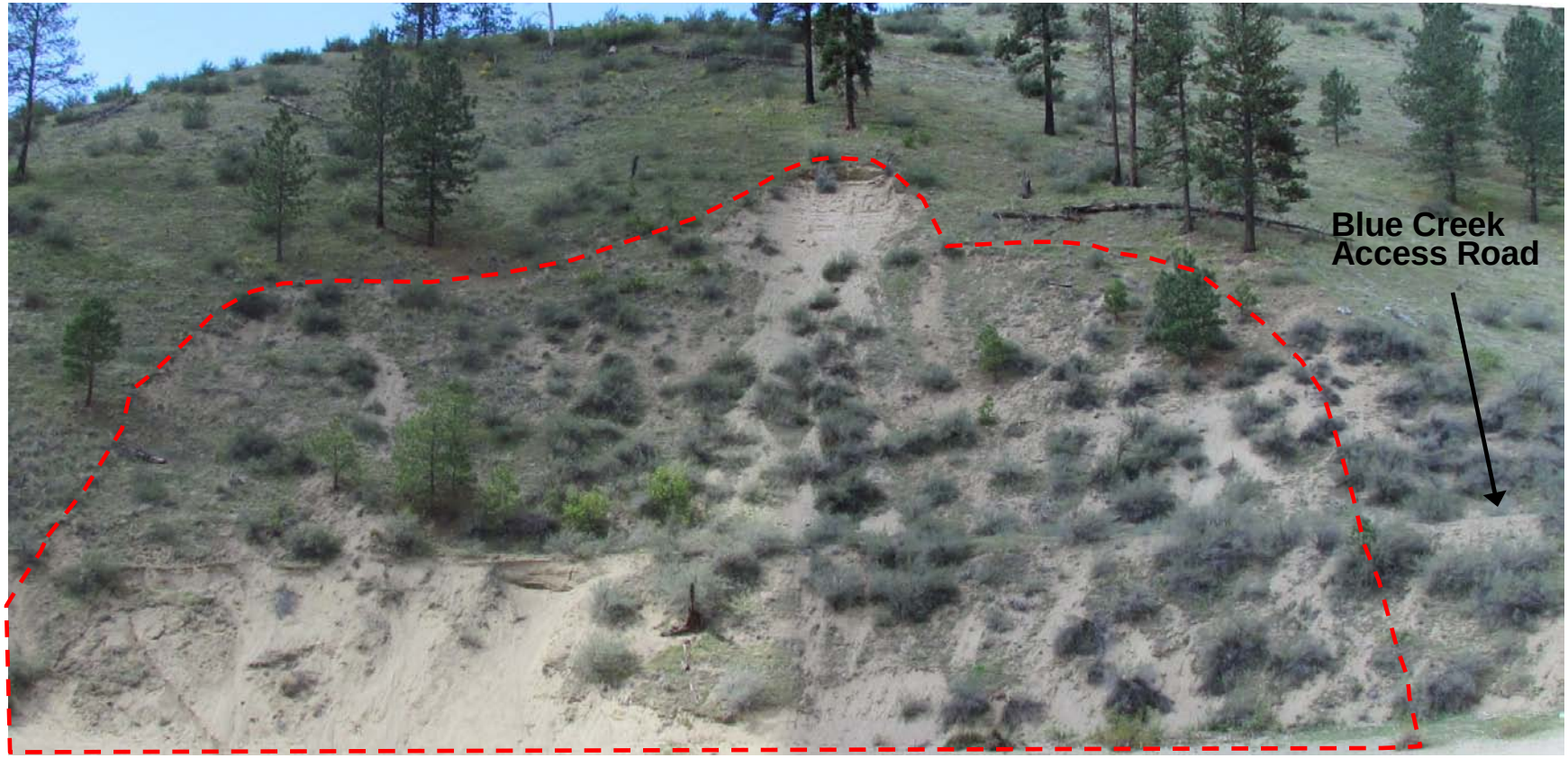

Photo 1A. Area 1 - View west of landslide area in poorly consolidated sand and silt beds located near the confluence of Blue Creek and the Spokane River Arm of Roosevelt Lake. Soughing in the landslide area has removed a section of the dirt access road (BIA HWY 55 that follows Blue Creek) that formerly traversed the slide area (4/27/12).

Photo 1B- Area 1 - View west of landslide area shown in Photo 1A. Note Blue Creek stream channel located near the toe of slope during low water conditions. .

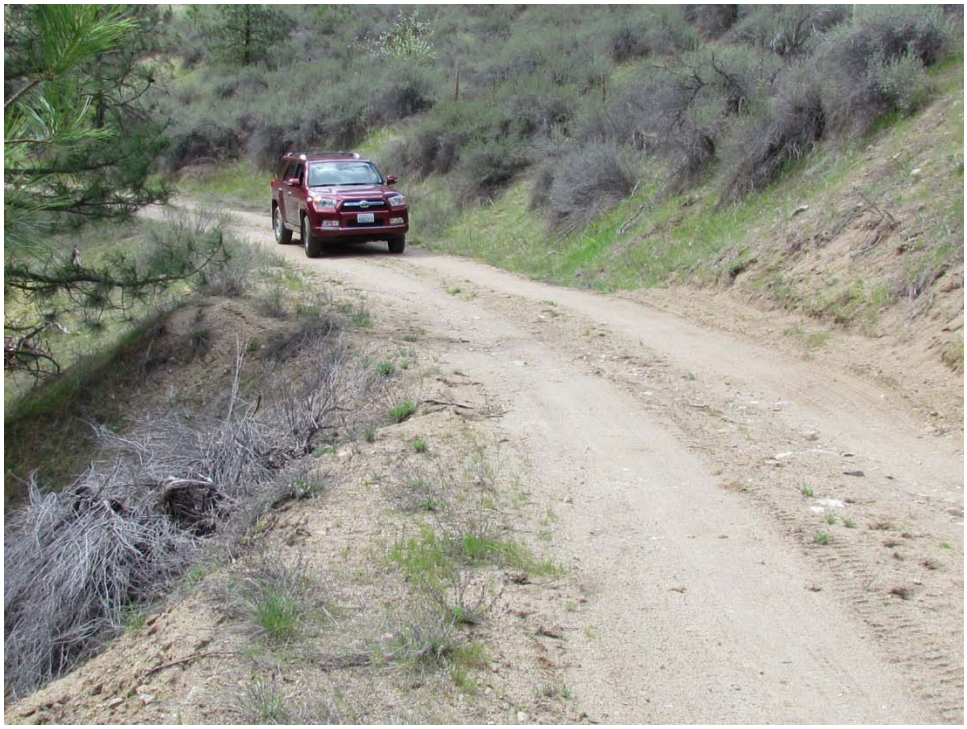

Photo 2. Site 2 - View west of area where erosion and sloughing encroached into the margin of the roadway (4/27/12).

Photo 3. Site 3 – View west of area where erosion of creek bank is encroaching on roadway (4/27/12)

Photo 4. View towards the south in the direction of one possible alignment alternative (shown on Figure 1) to avoid the Area 1 landslide.

Attachment J-4

Letter Requesting Delay in Schedule

WORTHINGTON MILLER ENVIRONMENTAL, LLC
201 Linden, Suite 301
Fort Collins, Colorado 80524
970.672.8770

May 20, 2014

Ellen Hale
USEPA Region 10
1200 Sixth Ave, ECL 15
Seattle, Washington

Re: Midnite Mine, U.S. EPA Docket No. CERCLA-10-2009-0026: Remedial Design – Water Treatment Plant

Dear Ms. Hale:

On December 17, 2013 we submitted the Midnite Mine 60% Remedial Design which included the Water Treatment Plant (WTP) design and associated water collection and conveyance systems. You provided 60% design comments, including comments on the WTP and associated water collection and conveyance systems, on May 2, 2014.

We have also provided information required by EPA to apply for a modification to the existing NPDES discharge permit. The modified permit would change the location of the discharge to a point in Lake Roosevelt and change the allowable discharge limits. We are currently collecting additional data to support the permit modification. It is anticipated that the additional data collection will not be completed until May 2015. We also understand that there are issues regarding constituent limits that EPA and the Spokane Tribe of Indians will have to resolve before the permit can be finalized. It is not known when these issues will be resolved.

Since the design of the WTP cannot be finalized until the required discharge limits are known, it is not reasonable to advance the WTP design beyond the 60% design level. In addition, the pipeline design should be suspended as there are questions about temperature requirements for the discharge that could be impacted by the water collection and conveyance systems.

We therefore propose that the WTP design and associated water collection and conveyance systems be placed on hold until the discharge limits are finalized. The water collection and conveyance system include the discharge line from the new WTP to Lake Roosevelt and the diffuser in the lake. The water conveyance and storage facilities that will be necessary during construction such as the temporary storage ponds on the South Waste Rock Pile and in the Western Drainage along with systems necessary to collect and convey water to and from these ponds and the wells within the Pits will proceed as originally scheduled and will be completed at the 90% level, along with the rest of the Remedial Design by July 31, 2014.

We would propose that once the NPDES permit amendment is complete that you review the 60% design comments on the WTP and associated systems to ensure that the comments remain valid. Once the updated comments have been received, the WTP and associated water collection and conveyance systems 90% design would be completed and submitted within 90 days of receipt of the updated comments. The final (100%) design of the WTP and associated water collection and conveyance systems would then be submitted 60 days after comments are received on the 90% design of these elements.

Please let me know if you concur with this change in schedule and if you have any questions or concerns

Sincerely,

WORTHINGTON MILLER ENVIRONMENTAL

Louis Miller
Supervising Contractor

cc: Randy Connelly, Spokane Tribe of Indians
Kira Sykes, CH2M Hill (electronic copy only)
Bill Lyle, Newmont Mining Company
Fred Kirschner (electronic copy only)