Midnite Mine Superfund Site
100 Percent Design

Appendix A – General Design Information

June 2015

Prepared for:

Dawn Mining Company
PO Box 250
Ford, Washington 990413

and

Newmont USA Limited
6363 South Fiddler's Green Circle
Greenwood Village, Colorado 80111

Prepared By:

MWH Americas, Inc.
2890 E. Cottonwood Parkway, Suite 300
Salt Lake City, UT 84121

TABLE OF CONTENTS

A1.0 INTRODUCTION 1

A2.0 COMPLIANCE WITH PERFORMANCE STANDARDS 1

A3.0 GENERAL DESIGN DRAWINGS 1

A4.0 REMEDIAL ACTION CONSTRUCTION PROGRESSION 2

A4.1 PRINCIPAL EARLY WORKS REMEDIAL COMPONENTS 3

A4.1.1 Construction Support Zone and Surrounding Areas 3

A4.1.2 Site Access Road 3

A4.1.3 Decontamination Zone 3

A4.1.4 Drain Material Processing and Stockpiling Area (Area 5) 4

A4.2 PRINCIPAL PHASE 1 REMEDIAL COMPONENTS 4

A4.2.1 Hillside Waste Rock Pile Processing for Pit 4 Drain Rock 4

A4.2.2 Mine Waste Excavation and Backfilling Pit 4 4

A4.2.3 South Pond Construction 4

A4.2.4 Rhoads Property Haul Road Construction and Borrow Area Development 4

A4.2.5 Water Treatment Plant and Associated Ponds 5

A4.2.6 Water Treatment Plant Effluent Pipeline and Diffuser Construction 5

A4.2.7 Alluvial Groundwater Controls 6

A4.3 PRINCIPAL PHASE 2 REMEDIAL COMPONENTS 6

A4.3.1 Mine Waste Excavation and Backfilling Pit 3 6

A4.3.2 Hillside Waste Rock Processing for Pit 3 Drain Rock 6

A4.3.3 Regrading Area 5 6

A4.3.4 Backfilled Pit Area Remediation 6

A4.3.5 Existing WTP Building Demolition 6

A4.3.6 Mine Roads Remediation 7

A4.3.7 Western Drainage Waste Rock Remediation 7

A4.3.8 West Pond Construction 7

A4.3.9 Eastern and Western Drainage Sediment Remediation 7

A4.4 PRINCIPAL PHASE 3 REMEDIAL COMPONENTS 7

A4.4.1 Pollution Control Pond Removal 7

A4.4.2 South Pond Removal 7

A4.4.3 South Waste Rock Pile Remediation 8

A4.4.4 Central Drainage Sediment Remediation 8

A4.5 PRINCIPAL FINAL REMEDIATION COMPONENTS 8

A4.5.1 Permanent Influent Pipelines, Site Maintenance Roads, and Fencing 8

A4.5.2 West Pond Removal 8

A4.6 CONTINGENT ACTION – BLUE CREEK AND DELTA SEDIMENTS 8

A5.0 GREEN AND SUSTAINABLE REMEDIATION CONSIDERATIONS 9

A6.0 REFERENCES 9

LIST OF ACRONYMS

BODR	Basis of Design Report
BPA	Backfilled Pit Area
CD	Consent Decree
CP	chemical precipitation
CSZ	Construction Support Zone
GSR	Green and Sustainable Remediation
MA	Mined Area
NPDES	National Pollutant Discharge Elimination System
PCP	Pollution Control Pond
RA	Remedial Action
RAO	Remedial Action Objective
RD	Remedial Design
ROD	Record of Decision
Site	Midnite Mine Superfund Site
SOW	Statement of Work
Tribe	Spokane Tribe of Indians
WTP	Water Treatment Plant

A1.0 INTRODUCTION

This appendix to the Midnite Mine Superfund Site (Site) Basis of Design Report (BODR) summarizes the General Design Information. This includes a description of the General design drawings, reference to how the Remedial Design (RD) addresses the Performance Standards contained in the Consent Decree (CD) Statement of Work (SOW) (EPA, 2011), a summary of the phased Remedial Action (RA) construction progression, and Green and Sustainable Remediation (GSR) considerations.

A2.0 COMPLIANCE WITH PERFORMANCE STANDARDS

The CD SOW includes the Performance Standards that 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 in the BODR. That master table lists each Performance Standard and summarizes where or how each is addressed in the BODR.

A3.0 GENERAL DESIGN DRAWINGS

The General design drawings contain information related to site location, access, general location of existing and proposed facilities, site boundaries, survey control points, and standard symbols and abbreviations used in subsequent drawings. The General design drawings also depict the Principal Remedial Components as well as the Site topography and layout upon completion of the RA. All of the Midnite Mine engineering design drawings are contained in Volume II of this BODR. The drawings related to the General design information include:

Table A-1 – Summary of Section 1 General Drawings

Sheet Number	Description
1-1	COVER SHEET
1-2	INDEX OF DRAWINGS (1 OF 3)
1-3	INDEX OF DRAWINGS (2 OF 3)
1-4	INDEX OF DRAWINGS (3 OF 3)
1-5	MASTER LEGEND AND GENERAL NOTES
1-6	SITE LOCATION MAP
1-7	EXISTING CONDITIONS MIDNITE MINE SITE
1-8	EXISTING CONDITIONS NORTHEAST BLUE CREEK
1-9	EXISTING CONDITIONS SOUTHWEST BLUE CREEK
1-10	EXISTING CONDITIONS EAST ACCESS ROAD
1-11	EXISTING UTILITIES MIDNITE MINE SITE
1-12	EXISTING UTILITIES NORTHEAST BLUE CREEK
1-13	EXISTING UTILITIES SOUTHWEST BLUE CREEK
1-14	EXISTING UTILITIES EAST ACCESS ROAD
1-15	SUBSURFACE INVESTIGATION LOCATIONS - BOREHOLES
1-16	SUBSURFACE INVESTIGATION LOCATIONS - TEST PITS (1 OF 2)
1-17	SUBSURFACE INVESTIGATION LOCATIONS - TEST PIT (2 OF 2)
1-18	SEDIMENT AND SURFACE WATER SAMPLING LOCATIONS
1-19	SITE BOUNDARIES MAP
1-20	SURVEY CONTROL MAP
1-21	PRINCIPAL REMEDIAL COMPONENTS DESCRIPTIONS
1-22	PRINCIPAL REMEDIAL COMPONENTS EARLY WORKS
1-23	PRINCIPAL REMEDIAL COMPONENTS PHASE 1
1-24	PRINCIPAL REMEDIAL COMPONENTS PHASE 2 (1 OF 2)
1-25	PRINCIPAL REMEDIAL COMPONENTS PHASE 2 (2 OF 2)
1-26	PRINCIPAL REMEDIAL COMPONENTS PHASE 3
1-27	PRINCIPAL REMEDIAL COMPONENTS FINAL REMEDIATION
1-28	SITE TOPOGRAPHY - END OF PHASE 1
1-29	SITE TOPOGRAPHY - END OF PHASE 2
1-30	SITE TOPOGRAPHY - END OF PHASE 3
1-31	SITE TOPOGRAPHY - END OF REMEDIAL ACTION

Additional information is presented below regarding the RA phases and the Principal Remedial Action Components included on Drawings 1-21 through 1-27.

A4.0 REMEDIAL ACTION CONSTRUCTION PROGRESSION

The RA will comprise an Early Works phase, followed by three main phases of construction, and a final remediation phase as summarized below:

A4.1 PRINCIPAL EARLY WORKS REMEDIAL COMPONENTS

The Early Works phase includes preparation of the construction support zone (CSZ), remedial activities in the footprint and vicinity of the CSZ, construction of a Decontamination Zone, and construction of a new Site access road.

A4.1.1 Construction Support Zone and Surrounding Areas

The CSZ will be prepared for use during all phases of the RA construction. Activities will include:

- Relocation of three topsoil stockpiles (South, Northeast, and Northwest) and any contaminated material
- Cleanup and removal of the existing West Access Road
- Excavation and removal of mine-affected soil and sediment in Whitetail Creek (and verification of removal)
- Demolition of the existing mine buildings on the west side of the Site
- Site grading
- Building and infrastructure construction followed by placement of temporary support facilities

Additional details regarding the CSZ are included in Appendix B –Construction Support Facilities and Early Works.

A4.1.2 Site Access Road

A new road will be constructed to provide access from the West End Road to the CSZ on the west side of the Site. Additional details regarding the new access road are included in Appendix B – Construction Support Facilities and Early Works.

A4.1.3 Decontamination Zone

A Decontamination Zone and appurtenant facilities will be constructed in the southwest corner of the MA on the border of the CSZ. During RA construction, equipment and personnel will pass through the Decontamination Zone prior to entry into the CSZ and leaving the Site. Additional details regarding the Decontamination Zone are included in Appendix B – Construction Support Facilities and Early Works. The existing decontamination facilities located

near the existing Water Treatment Plant (WTP) will be used until the new Decontamination Zone is operational.

A4.1.4 Drain Material Processing and Stockpiling Area (Area 5)

An area south of Pit 4 (referred to as Area 5) will be graded to process and stockpile drain rock from the adjacent Hillside Waste Rock Pile. These details are included in Appendix D – Mine Waste Excavation and Containment.

A4.2 PRINCIPAL PHASE 1 REMEDIAL COMPONENTS

A4.2.1 Hillside Waste Rock Pile Processing for Pit 4 Drain Rock

A portion of the Hillside Waste Rock Pile will be processed for use as drain rock and liner bedding in Pit 4. The processed rock will be stockpiled in the prepared area, known as Area 5, just south of Pit 4. Details regarding processing the Hillside Waste Rock Pile and its use as drain rock are included in Appendix D – Mine Waste Excavation and Containment. Additional processing of the Hillside Waste Rock Pile will occur during Phase 2 as discussed below in Section A4.3.2 for use as drain rock in Pit 3.

A4.2.2 Mine Waste Excavation and Backfilling Pit 4

Pit 4 will be prepared (i.e., dewatered, sediments removed, and graded; highwall rock scaling), lined, backfilled, capped, covered, and revegetated during the Phase 1 RA construction activities. Sources of Pit 4 backfill include the sediments removed to prepare the pit bottom, Pit 4 Overburden Pile, reject material from the Hillside Waste Rock Pile, all ore/protore stockpiles, contaminated material from the West Access Road and CSZ, excavated materials from the Adit Pit and Pit 2 West, and portions of the South Waste Rock Pile. These activities are detailed in Appendix D – Mine Waste Excavation and Containment.

A4.2.3 South Pond Construction

A lined impoundment (named the South Pond) will be constructed in the South Waste Rock Pile to be used for water storage during Phase 2 construction (i.e., when Pit 3 is being backfilled and can no longer be used for water storage). The South Pond construction details are included in Appendix E – Water Management Ponds.

A4.2.4 Rhoads Property Haul Road Construction and Borrow Area Development

A temporary road will be built in the Rhoads Property to facilitate transportation of cover material from the Rhoads Property to the Site. Portions of the Rhoads Property will be developed to

supply cover material for the backfilled and capped pits. These details are included in Appendix C – Borrow Area.

Approval to use the Rhoads Property as a borrow source is contained in Spokane Tribal Resolution 2014-135, dated February 21, 2014. On May 29, 2015, as part of joint mediation efforts, the Tribe and the companies entered into a non-binding terms of agreement, which sets forth the framework for detailed definitive agreements that will provide for access to Tribal lands for all purposes related to implementing the Midnite Mine remedy, including access for excavating and transporting the Rhoads borrow material. The parties are proceeding to prepare the necessary agreements and leases to implement these terms. Permitting with the county and state for the borrow area is ongoing as discussed in Appendix M.

A4.2.5 Water Treatment Plant and Associated Ponds

The new WTP and associated equalization ponds will be constructed in the southwest area of the Site. Construction of temporary influent pipelines from the backfilled Pit 4 and the alluvial groundwater controls will occur during Phase 1. During the final remediation, the temporary piping will be replaced by permanent pipelines from the backfilled Pit 3 and Pit 4, the Backfilled Pit Area (BPA), and from the groundwater extraction trenches installed in the drainages located down gradient of the Site during Phase 3. The pipeline details are contained in Appendix J – Influent and Effluent Pipelines.

The schedule for completing the design and the construction of the new WTP and the effluent pipeline is dependent on finalizing the NPDES permit. It is assumed here that the permit will be finalized to enable the design and construction of the WTP and effluent pipeline to occur during Phase 1. If that is not possible, it will be constructed at a later date.

A4.2.6 Water Treatment Plant Effluent Pipeline and Diffuser Construction

The new effluent pipeline and diffuser will be constructed during Phase 1 provided that the NPDES permit for the new WTP is finalized in time to design and construct the WTP and effluent line during this phase. The effluent pipeline will be approximately 5.5 miles long and discharge to the Spokane River Arm of Lake Roosevelt. Soils upstream of the Blue Creek delta that are excavated to install the pipeline are suitable for use as backfill. Sediments in the Blue Creek delta are assumed to be mine affected, and will be consolidated along with the mine wastes in the pits. Construction activities at the two locations where the pipeline will cross Blue Creek will require temporary diversion of the creek. These diversions are expected to have

short durations (e.g., 1 to 2 days), and potential impacts to fish passage will be coordinated with the Tribe.

A4.2.7 Alluvial Groundwater Controls

Hydraulic barriers and extraction trenches will be installed in the three main drainages that lead away from the mined area to control migration of mine-affected alluvial groundwater. These details are included in Appendix G – Groundwater Controls.

A4.3 PRINCIPAL PHASE 2 REMEDIAL COMPONENTS

A4.3.1 Mine Waste Excavation and Backfilling Pit 3

Pit 3 will be prepared (i.e., dewatered, sediments removed, and graded; highwall rock scaling), lined, partially backfilled, and partially capped and covered during the Phase 2 RA construction activities. Sources of Pit 3 backfill include the sediments removed to prepare the pit bottom, western drainage waste rock, the East Waste Rock Pile, the remainder of the Hillside Waste Rock Pile, and contaminated soils and sediments from roads and drainages. These activities are detailed in Appendix D – Mine Waste Excavation and Containment.

A4.3.2 Hillside Waste Rock Processing for Pit 3 Drain Rock

The remaining Hillside Waste Rock material will be processed for use as drain rock and liner bedding in Pit 3. The processed rock will be stockpiled in the prepared area, known as Area 5, just south of Pit 4. Rejected material will be placed in Pit 3 as backfill.

A4.3.3 Regrading Area 5

The drain material processing and stockpiling area (Area 5) will be regraded and excess material placed in Pit 3 as backfill. These details are included in Appendix D – Mine Waste Excavation and Containment.

A4.3.4 Backfilled Pit Area Remediation

The BPA, including the Adit Pit and Pit 2 West, will be regraded, and portions of the BPA will be capped and covered/revegetated. These details are contained in Appendix D – Mine Waste Excavation and Containment.

A4.3.5 Existing WTP Building Demolition

The existing WTP buildings will be demolished and placed in Pit 3 as backfill. This assumes that the permitting, design and construction of the new WTP occurs during Phase 1. The

existing WTP will remain until the new WTP is operational. These details are contained in Appendix H – Demolition.

A4.3.6 Mine Roads Remediation

The contaminated materials in the Internal Mine Roads and the East Access Road will be removed and placed in Pit 3 as backfill. These details are contained in Appendix D – Mine Waste Excavation and Containment.

A4.3.7 Western Drainage Waste Rock Remediation

Any remaining contaminated material in the Western Drainage will be removed and placed in Pit 3 as backfill. These details are contained in Appendix D – Mine Waste Excavation and Containment.

A4.3.8 West Pond Construction

A lined impoundment (named the West Pond) will be constructed in the remediated Western Drainage to be used for water storage when the South Pond is taken off line (so that the remaining South Waste Rock Pile materials that underlie the South Pond can be removed). The West Pond construction details are included in Appendix E – Water Management Ponds.

A4.3.9 Eastern and Western Drainage Sediment Remediation

The contaminated sediments in the Eastern and Western Drainages will be removed and placed in Pit 3 as backfill. These details are contained in Appendix D – Mine Waste Excavation and Containment.

A4.4 PRINCIPAL PHASE 3 REMEDIAL COMPONENTS

A4.4.1 Pollution Control Pond Removal

The Pollution Control Pond (PCP) will be decommissioned and pond materials will be placed in Pit 3 as backfill. These details are included in Appendix D – Mine Waste Excavation and Containment.

A4.4.2 South Pond Removal

The South Pond will be decommissioned and pond materials will be placed in Pit 3 as backfill. These details are included in Appendix D – Mine Waste Excavation and Containment.

A4.4.3 South Waste Rock Pile Remediation

After the South Pond is taken off line, the remaining material in the South Waste Rock Pile will be removed and placed in Pit 3 as backfill. These details are included in Appendix D – Mine Waste Excavation and Containment.

A4.4.4 Central Drainage Sediment Remediation

The contaminated sediments in the Central Drainage will be removed and placed in Pit 3 as backfill. These details are contained in Appendix D – Mine Waste Excavation and Containment.

A4.5 PRINCIPAL FINAL REMEDIATION COMPONENTS

A4.5.1 Permanent Influent Pipelines, Site Maintenance Roads, and Fencing

Construct permanent influent pipelines from the backfilled Pit 3 and Pit 4, the BPA, and from the groundwater extraction trenches to the new WTP. Construct permanent site roads for long-term maintenance of the remediated areas. A permanent fence will be erected around the Waste Containment Area to limit access. It will be comprised of doweled jack-leg wooden fence in the steeper areas and a boulder barrier on the more gentle slopes (refer to drawing in Appendix D). The fence will have locking gates on all access routes.

A4.5.2 West Pond Removal

The West Pond will be decommissioned and pond materials will be placed in Pit 3 as backfill. These details are included in Appendix D – Mine Waste Excavation and Containment.

A4.6 CONTINGENT ACTION – BLUE CREEK AND DELTA SEDIMENTS

In accordance with the Record of Decision (ROD) (EPA, 2006), active remediation of the Blue Creek and Delta sediments may be required if the sediment cleanup standards are not achieved within a reasonable timeframe (approximately 10 years following waste containment). Blue Creek and Delta sediments were proposed to be evaluated in accordance with the Blue Creek and Delta Assessment Work Plan that was included in the Appendix Y of the 30% BODR (MWH, 2012). The sediment evaluation approach and timing is currently under discussion with EPA and the Tribe. If necessary, these sediments would be placed in additional cells constructed in the Contingency Storage Area, which would be constructed on top of the completed Phase 3 cover. These wastes would be completely encapsulated with a separate underliner and drainage system beneath the waste, and a composite cover system over the waste (see Appendix D – Mine Waste Excavation and Containment).

A5.0 GREEN AND SUSTAINABLE REMEDIATION CONSIDERATIONS

A general GSR overview for the Midnite Mine Superfund Site RD/RA is included in Section 4.0 of the BODR. Specific GSR concepts are included in design appendices B through J and AA.

A6.0 REFERENCES

MWH Americas, Inc. (MWH), 2012. Preliminary (30%) Basis of Design Report. Prepared for Dawn Mining Company and Newmont USA Limited. December 19.

U.S. Environmental Protection Agency (EPA), 2006. Midnite Mine Superfund Site Spokane Indian Reservation, Washington Record of Decision. Prepared by the Office of Environmental Cleanup, EPA Region 10. September.

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 B – Construction Support Facilities and Early Works

June 2015

Prepared for:

Dawn Mining Company
PO Box 250
Ford, Washington 990413

and

Newmont USA Limited
6363 South Fiddler's Green Circle
Greenwood Village, Colorado 80111

Prepared By:

MWH Americas, Inc.
2890 E. Cottonwood Parkway, Suite 300
Salt Lake City, UT 84121

TABLE OF CONTENTS

B1.0 INTRODUCTION 1

B2.0 PERFORMANCE STANDARDS 2

B3.0 ENGINEERING DESIGN DRAWINGS 5

B4.0 CONSTRUCTION SUPPORT FACILITIES 6

B4.1 PERMANENT FACILITIES/ACTIVITIES 7

B4.2 TEMPORARY FACILITIES/ACTIVITIES 8

B4.3 DECONTAMINATION ZONE 10

B4.3.1 Vehicle Decontamination Area 10

B4.3.2 Personnel Decontamination Area 12

B5.0 CONSTRUCTION SEQUENCING 12

B6.0 MATERIAL PROCESSING AND STOCKPILING AREA 14

B7.0 GREEN AND SUSTAINABLE REMEDIATION CONSIDERATIONS 15

B7.1 CONSTRUCTION MATERIAL CONSIDERATIONS 15

B7.2 CONSTRUCTION METHODS 16

B7.3 LOW IMPACT DEVELOPMENT/SUSTAINABILITY 16

B8.0 REFERENCES 17

TABLES

Table B-1 – Performance Standards Applicable to Construction Support Facilities 3

Table B-2 – Construction Support Zone Areas 9

FIGURE

Figure B-1 – Construction Support Zone Location Map

ATTACHMENTS

Attachment B-1 Decontamination Zone Collection Sump Sizing Analysis

Attachment B-2 Midnite Mine Remedial Action Pavement Design

LIST OF ACRONYMS

BMP	Best Management Practice
BODR	Basis of Design Report
CD	Consent Decree
CO_2	carbon dioxide
COC	constituents of concern
CSF	construction support facilities
CSZ	construction support zone
EMT	Emergency Medical Technician
EPA	U.S. Environmental Protection Agency
GSR	Green and Sustainable Remediation
HASP	Health and Safety Plan
HDPE	high-density polyethylene
LEED	Leadership in Energy and Environmental Design
MA	Mine Area or mined area
RA	Remedial Action
RAO	Remedial Action Objective
RAWP	Remedial Action Work Plan
RD	Remedial Design
Site	Midnite Mine Superfund Site
SOP	Standard Operating Procedure
SOW	Statement of Work
SWMP	Stormwater Management Plan
SWPPP	Storm Water Pollution Prevention Plan
Tribe	Spokane Tribe of Indians
WCA	Waste Containment Area
WSDOE	Washington Department of Ecology
WTP	Water Treatment Plant

B1.0 INTRODUCTION

This appendix to the *Midnite Mine Superfund Site Basis of Design Report* (BODR) presents the design information for the Early Works phase of the Remedial Action (RA) at the Midnite Mine Superfund Site (Site). Specifically, this appendix discusses the earthworks to prepare a Construction Support Zone (CSZ) where the Construction Support Facilities (CSF) will be located (Drawing 2-1); and the earthworks to prepare the new water treatment plant (WTP) location at the south end of the CSZ (Drawing 2-14). In addition, this appendix depicts design details of an area between Pit 3 and Pit 4 (see Drawing 2-23) that will be used for processing and stockpiling aggregate. This appendix also identifies the temporary facilities scheduled for removal or demolition at completion of the RA, and the permanent facilities that are to remain after RA for long-term management of the Site. Please note the design and schedule for the construction of the WTP and associated features have been put on hold pending the finalization of the NPDES permitting process. It is believed that sufficient area has been allotted at the south end of the CSZ for WTP and associated facilities. The WTP design details are presented in Appendix I of the 60% Basis of Design Report (MWH, 2013).

The Appendix B designs present the physical space and appropriate grading of the CSZ to accommodate the CSFs and to meet the performance standards specified in the Consent Decree (CD). The overall design of the CSZ is based upon the anticipated space requirements of the selected Contractor and information from previous investigations of subsurface conditions in the CSZ. The layout of the CSZ will be left to the selected Contractor's discretion in order to meet the space requirements for the project which are presented in the Technical Specifications (Appendix K) and Performance Standards.

The conceptual CSZ layout presented herein is intended only to demonstrate the adequacy of the CSZ for full-crew RA activities and is subject to change at the selected Contractor's discretion. The CSFs when completed will include: temporary construction roads, the permanent Site Access Road, Site security, emergency medical and administration buildings, a maintenance/electrical shop, the construction laydown areas, the construction water and fuel storage and load-out system, and the decontamination area (including separate vehicle and personnel decontamination areas, pump house, drainage controls, and facilities for showers, lockers, and laundry). It is anticipated that the selected Contractor will use temporary facilities for the vast majority of the CSFs (such as mobile trailers or prefabricated structures).

Appendix B:

- Demonstrates that the design will attain the applicable standards identified in the CD.
- Explains the strategy used to evaluate alternative locations and select the proposed location for the CSFs.
- Depicts the configuration and layout of the CSZ and the areas designated for specific purposes within.
- Discusses the sequence for site preparation and construction/mobilization of the support facilities and subsequent removal of temporary facilities.
- Presents Green and Sustainable Remediation (GSR) considerations.

B2.0 PERFORMANCE STANDARDS

The Performance Standards presented herein are defined in the *Consent Decree Statement of Work* (CD SOW; EPA, 2011), and were developed to 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 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 the CSFs and Early Works are outlined below.

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

Page 1 of 3

Performance Standard No. in CD SOW	Performance Standard	Comments
2.3.15 B.	Access to active Work Areas shall be restricted through the use of appropriate measures (e.g., fencing, barricades, etc.) as necessary to supplement the existing perimeter fence installed around the Mined Area. For purposes of this provision, active Work Areas shall mean those areas of the Work Area in which construction associated with the Work is occurring and such construction activities would represent a potential safety hazard to the general public or other site workers if access were not controlled. Active Work Areas shall also include those portions of the Work Area where, as a result of the ongoing construction activities, exposure to contaminants is temporarily greater than that which existed prior to the implementation of the construction activities.	Access restrictions to Active Work Areas will be defined in the Remedial Action Work Plan (RAWP). It is anticipated that access to Active Work Areas will be restricted to one controlled access location. However, should the need for alternative access be identified at a later date, proper access control and decontamination facilities and procedures will be implemented. During the Early Works, the permanent Site Access Road and decontamination area will be constructed and access to the work areas will be restricted by the existing perimeter fence. Upon completion of the permanent Site Access Road and decontamination area, construction access to the site will be restricted to the Permanent Site Access Road. Once inside the fence, the Site Access Road will pass through the support corridor, which includes construction support facilities and the WTP (and associated facilities). This corridor will be completely enclosed by a combination of proposed fencing and the existing perimeter fence. Site security will be regulated at the offices located at the construction management area. All visitors to the site will be required to check in at the construction management area. Once vehicles or personnel leave the support corridor and enter the Mine Site Proper by crossing the fence-line forming the northern boundary of the support corridor they will be required to pass through the decontamination area (and undergo appropriate decontamination procedures) before leaving the Mine Site.

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

Page 2 of 3

Performance Standard No. in CD SOW	Performance Standard	Comments
2.3.15 H.	To the extent practicable, construction activities shall be conducted in a manner that does not result in the re-contamination of areas already remediated or contamination of areas that were previously uncontaminated. Any such re-contaminated or newly contaminated areas shall be addressed by the Settling Defendants in a manner that is subject to the review and approval of EPA.	Removal of contaminated materials will be required prior to construction of the CSZ. Assembly of the individual facilities will occur during Phase 1 of RA construction activities and will be completed prior to sediment cleanup in the Western Drainage, thus avoiding recontamination of this support zone area (which has been remediated). Furthermore, the CSZ is designed to direct all personnel and vehicles through a decontamination zone to ensure that no vehicles or personnel transport contaminants from the Site. Potentially contaminated vehicles will travel through the decontamination zone via the Site Access Road. Clean vehicles transporting clean cover material will travel on a haul road that has been surfaced with clean material. This will prevent cross-contamination of the cover material and associated equipment.
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 and the Construction SWPPP that will be prepared prior to beginning this work will include the proposed BMPs to be used during the RA. The Construction SWPPP will include specific BMPs for sediment and stormwater control before and during construction. A Master SWMP will be prepared for after construction, as described in Appendix O.
2.3.19	Decontamination of equipment prior to the equipment leaving a controlled Work Area, shall be performed to control physical tracking of contaminants off site or through remediated areas. For purposes of this provision, a controlled Work Area shall mean an area where contaminated material has been disturbed by the construction activities. Adequate decontamination shall be determined by visual inspection. Equipment	The "Construction Support Facilities" design discussion is contained in this appendix and Volume II includes the Vehicle Decontamination Facilities design drawings. The decontamination area will be on the border between the Active Work Area (in the hot zone) and the CSZ. The equipment and procedures associated with

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

Page 3 of 3

Performance Standard No. in CD SOW	Performance Standard	Comments
	staining without the surface accumulation of material shall not require decontamination. Surface accumulations of materials on the tires, tracks, chassis, and truck body shall be removed either by brushing (or similar activity) or by washing with water.	decontamination during the RA will be presented in detail the RAWP.

B3.0 ENGINEERING DESIGN DRAWINGS

The engineering design drawings are contained in Volume II (Section 2) of the BODR. The drawings related to Construction Support Facilities include:

Sheet Number	Description
2-1	Early Works Plan
2-2	Southwest and Southeast Topsoil Stockpiles Removal Plan
2-3	Northeast and Northwest Topsoil Stockpiles Removal Plan
2-4	West Access Road and Whitetail Creek Materials Excavation Plan
2-5	Site Access Road Index
2-6	Site Access Road Plan and Profile Station 0+00 to 5+00
2-7	Site Access Road Plan and Profile Station 5+00 to 12+00
2-8	Site Access Road Plan and Profile Station 12+00 to 24+00
2-9	Site Access Road Plan and Profile Station 24+00 to 36+00
2-10	Site Access Road Plan and Profile Station 36+00 to 48+00
2-11	Site Access Road Plan and Profile Station 48+00 to 54+00
2-12	Site Access Road Plan and Profile Station 54+00 to End
2-13	Site Access Road Centerline Alignment and Typical Section Schedule
2-14	Construction Support Zone Layout
2-15	Vehicle Decontamination Area Grading Plan
2-16	Vehicle Decontamination Area Grading Points
2-17	Decontamination Zone Collection Sump Grading Plan
2-18	Collection Sump Drain Pipeline to Western Drainage Pump Station
2-19	Northern Support Facilities Grading Plan
2-20	Southern Support Facilities Grading Plan
2-21	Construction Support Zone Fencing Plan
2-22	Ore Stockpile 7 Relocation Plan
2-23	Material Processing and Stockpiling Area Preparation Plan
2-24	Early Works Typical Details and Sections (1 of 6)
2-25	Early Works Typical Details and Sections (2 of 6)
2-26	Early Works Typical Details and Sections (3 of 6)
2-27	Early Works Typical Details and Sections (4 of 6)
2-28	Early Works Typical Details and Sections (5 of 6)
2-29	Early Works Typical Details and Sections (6 of 6)

B4.0 CONSTRUCTION SUPPORT FACILITIES

The CSFs will be constructed within the CSZ during the early stages of the RA. The location selected for the CSFs is within the mined area (MA) boundary, but out of the way of the majority of the RA activities (including existing access road cleanup and drainage sediment cleanup). All facilities not necessary to support long-term management of the Site will be removed at the end

of the RA. As a result, this section distinguishes between the permanent facilities necessary for long-term Site management and the temporary facilities that will be used only during the RA and then either demolished or removed. Where practical, temporary facilities will be mobile trailers that can be transported to the Site, used during the RA, decontaminated (as necessary), and transported offsite at the end of the RA.

The selected location for the CSFs and the new WTP is in an area with existing mine buildings and stockpiled topsoil that may contain mined materials. As a result, this area must be scanned and remediated (as described in Appendix S) prior to construction of the CSFs. Access to this CSZ will be by the new Site Access Road (as shown in Drawing 2-1), which also will serve as the permanent site access at completion of the RA activities.

Figure B-1 presents the CSZ and each CSF within this area. Figure B-1 identifies each area with an ID number that corresponds to Table B-2, where a description, approximate size, location, and general comments for each area are presented.

Specific requirements for each area/facility are presented in the Technical Specifications (Appendix K). It will be the selected Contractor's responsibility to meet the requirements identified in the specifications and to facilitate performance of the Work. Additional decisions regarding the specifics of these facilities will be left to the selected Contractor's discretion

B4.1 PERMANENT FACILITIES/ACTIVITIES

The following permanent facilities will remain after completion of the RA.

- The Site Access Road to the WTP/support zone and into the MA.
- A security facility near the MA boundary to be identified at a later date.
- A vehicle/small equipment decontamination facility.

The Site Access Road will be surfaced with an asphalt pavement over a crushed aggregate base course to the entrance of the proposed WTP. The unpaved portion of the Site Access Road will be surfaced with a crushed aggregate surface course to minimize rutting and dust emissions. Design of this pavement is presented in Attachment B-2.

Other permanent facilities associated with the WTP will remain after completion of the RA, but are not discussed herein. This infrastructure includes the new WTP and its associated piping, treatment ponds, and appurtenant structures. Information regarding the WTP is presented in

Appendix I of the 60% Basis of Design Report (MWH, 2013). Information regarding the WTP influent and effluent pipelines is presented in Appendix J.

B4.2 TEMPORARY FACILITIES/ACTIVITIES

It is anticipated that the selected Contractor will use temporary facilities (such as mobile trailers or prefabricated structures) for the vast majority of the CSFs. These trailers and pre-fab structures will have foundations, and electrical and other utility connections provided in accordance with recommendation of the manufacturer of each type of temporary structure. At the end of the construction, all temporary facilities will be decontaminated and removed, if practical, or demolished and disposed of in the Pit 3 Waste Containment Area (WCA).

Table B-2 – Construction Support Zone Areas

Area ID #	Area Designation	Function/Use	Location	Approximate Size	Notes/Comments
1	Construction Management Area and Site Sign-In	Area for construction offices (for contractor foremen, site engineer, etc.) and parking. Will be used as the primary sign-in location for all Site visitors (does not include Site worker sign-in/out).	Central portion of the CSZ	80' x 125'	This area will include visitor parking.
2	Safety/Emergency Services Area	Area for medical/safety office, cover (e.g., carport) for on-site ambulance, and 80' x 80' pad for aerial evacuation during an emergency.	Central portion of the CSZ	90' x 140'	This area will house the ambulance/EMT staff and facilities for taking care of routine medical issues for construction staff and emergency evacuations. It should be noted that other areas on the Site (such as the existing WTP or other reasonably flat areas without trees) are suitable for use as an alternate medevac location if the medical station is inaccessible.
3	Contractor Lay-Down and Storage Area	Clean material laydown area immediately adjacent to the restricted work area within the remediation area to be used for construction materials storage (e.g., piping) prior to use.	Central and northern portion of the CSZ	2.3 Acres	Located in the clean CSZ to minimize delivery traffic into the restricted work area (which will require decon when leaving the Site). Grading, area layout, etc. left to Contractor discretion.
4	Fuel Farm Area	This area will be used for bulk fuel storage. Located within the CSZ to facilitate deliveries without decon of delivery trucks. The area is adjacent to the CSZ perimeter fence to facilitate filling of mobile fuel trucks located within the restricted work area. This eliminates the need for the on-Site fuel trucks to enter the CSZ.	Northern end of CSZ, adjacent to CSZ boundary	160' x 65'	Contractor will be responsible for implementing spill containment measures according to an approved spill containment and cleanup plan (submitted by the Contractor).
5	Crew Drop-Off/Pick up and Lunch Area	Area for: (1) Construction crew to be dropped off and picked up by shuttle vehicles, (2) Contractor trailers for crew lunches, safety meetings, etc., and (3) portable restrooms.	North-central end of the CSZ adjacent to the Decontamination Zone	0.5 Acres	Located adjacent to the Personnel Decontamination Area to promote efficient flow of construction crew members through the decontamination facilities and to/from the lunch trailers and Site pick-up/drop-off area at shift change.
6	Construction Personnel Decontamination Area	Area for decontamination trailers and laundry facilities. Flow of personnel to/from this area will be controlled by fencing and gates. Construction crew will sign in/sign out when moving through decontamination trailer at lunch breaks and shift changes.	In the Decontamination Zone, between the northern end of the CSZ and the restricted work area	135' x 55'	Decontamination facilities must include: clean (CSZ side) and dirty side (restricted work area) lockers for construction workers. Lockers must be available for each Site worker to be used for storage of personal items when arriving on-Site, and changing into and out of work coveralls and boots. The facilities also must include Scanning equipment, a sign in/sign out area, clearly defined restricted work area (potentially contaminated) and CSZ (clean) sides and decontamination showers (to be used as necessary). Laundry facilities will be available in this area for weekly cleaning of worker coveralls.
7	Vehicle and Equipment Decontamination Area	Area for scanning and decontamination of vehicles and equipment leaving the restricted work area. Will include a geomembrane-lined sump for collecting impacted water and separating sediment, concrete pavement for conveying water to the collection sump and facilitating housekeeping activities, and a small, heated building for housing decontamination equipment. The building will include an area where the driver can scan out and sign out.	In the Decontamination Zone, between the northern end of the CSZ and the restricted work area	0.5 Acres	Decontamination equipment for vehicles/equipment and operators will be provided here. Should a driver or other personnel in this area require additional decontamination they will walk over to the personnel decontamination area for further decontamination.
8	MA Vehicle Parking Area	Area is within the restricted work area and adjacent to the Personnel Decontamination Area to promote efficient flow of Site Contractor personnel from the drop off point inside the CSZ to on-site vehicles in the MA that will transport the workers to the work sites.	Northern end CSZ inside the restricted work area	160' x 80'	By parking the on-Site vehicles on the restricted work area side of the CSZ fencing, these vehicles will not require daily decontamination.
9	Contractor Maintenance/ Electrical Area	Area within the restricted work area for the Contractor to construct a shop for maintenance of vehicles, construction support equipment, etc.	Northern end of CSZ inside the restricted work area	60' x 90'	To be designed and constructed by the Contractor for equipment maintenance during the Site remediation.
10	On-Site Mobile Laboratory Area	Area within the restricted work area to be used for the On-Site Mobile Laboratory and associated storage and parking. Adjacent to the personnel decontamination area and pickup location. Located within the restricted work area to minimize traffic through the Decontamination Zone and promote quick transition of laboratory staff to and from the mobile laboratory. Details of the required area for the lab to be provided by laboratory testing consultant.	Northern end CSZ inside the restricted work area	40' x 40'	On-Site Lab will need to be mobilized to the Site prior to any cleanup activities and placed in an interim location (e.g., the existing WTP) until completion of Early Works soil clean-up. It is envisioned that the trucks used for this work will be parked adjacent to the facility and will not have to be decontaminated daily as the laboratory crew enters/exits the Site.

B4.3 DECONTAMINATION ZONE

The Decontamination Zone presented on Drawings 2-15 through 2-19 will contain (1) a vehicle decontamination area, and (2) a personnel decontamination area. These decontamination areas will be adjacent to one another, but separate to isolate personnel traffic from vehicular traffic and to minimize the potential for accidents. The decontamination areas are designed to promote flow of personnel and vehicles between the restricted work area, in which the RA construction will be occurring, and the clean CSZ in a safe and efficient manner. In addition, the decontamination areas collect, contain, and convey water used for decontamination activities to the water treatment system.

- The personnel decontamination area (see Drawing 2-19) is primarily intended for use by RA construction workers whose construction vehicles and equipment are left on-site at the MA Vehicle Parking Area where they can be accessed for use during the RA.
- The vehicle decontamination area (see Drawing 2-15) is intended for use only by vehicles that cannot be left in the restricted work area vehicle parking area (such as WTP operator vehicles).

Haul trucks using the haul road (presented in Appendix C and Section 3 of the Design Drawings) will be moving clean material on a road constructed with clean aggregate and, therefore, will not require regular use of the vehicle decontamination area. Should a haul truck need to undergo decontamination procedures, it must use the Site Access Road within the restricted work area before proceeding to the vehicle contamination area. Detailed discussions of these two primary decontamination areas are presented below.

B4.3.1 Vehicle Decontamination Area

The vehicle decontamination area will be located in the northwest corner of the fenced-in support corridor (see Drawings 2-14 and 2-15). The south-bound lane of the Site Access Road passes through the vehicle decontamination area to ensure that all vehicles leaving the Site will undergo screening and if necessary, decontamination procedures. The vehicle decontamination area will allow vehicles to move into and off site from the restricted work area in a safe and efficient manner.

The vehicle decontamination area will be paved with concrete and surface water will drain to a geomembrane-lined collection sump directly and via a shotcrete-lined ditch. The collection sump will collect impacted water from the vehicle decontamination procedures, and stormwater

runoff from a portion of the Site Access Road and other nearby areas within the CSZ. Impacted water collected in the sump will drain by gravity to the existing seep collection system in the Western Drainage via a dual-contained HDPE pipeline (see Sheet 2-18). The Western Drainage seep collection system will pump the collected water to the water treatment system. The collection sump has been designed to store the runoff from the 25-year recurrence interval short-duration storm (WSDOE, 2004). For sizing purposes, it has been conservatively assumed that no outflow from the pond occurs during this storm. The stormwater analysis associated with design of the collection sump is included as Attachment B-1.

Vehicles needing access to the restricted work area must first enter the Site from the south on the Site Access Road and pass through the existing site perimeter fence. Access to the Site will be controlled at an office located in the Construction Management Area (Drawing 2-20), where visitors and vendors must check in. After checking in and verifying the purpose of their visit and their need to access the restricted work area, visitors and vendors will be allowed to pass through the Vehicle Decontamination Area on the north-bound lane of the Site Access Road, and into the restricted work area where active remediation is ongoing. As a vehicle leaves the restricted work area, the south-bound lane of the Site Access Road will direct the vehicle attempting to exit to the decontamination area for screening and cleaning if necessary. Upon leaving the vehicle decontamination area, these vehicles must stop at the access control office (within the Construction Management Area) and sign out before leaving the Site.

Equipment necessary for screening the vehicle operators and passengers will be available in a heated structure at the vehicle decontamination area where the vehicle decontamination equipment also will be kept. Personnel screening equipment at the vehicle decontamination area is intended for use by a relatively small number of vehicle operators and passengers (e.g., field engineers) and will not be used by the vast majority of the construction personnel (who will use the facilities at the personnel decontamination area).

Suggested decontamination and verification procedures for personnel and vehicles are discussed in Radiation Protection Plan SOP-06 which is an attachment to the Midnite Mine HASP in Appendix L. The SOP has criteria for both vehicle and personnel decontamination which specifies action levels where decontamination is required prior to leaving the restricted work area. Specific decontamination procedures and layout of the decontamination facilities and area will be the responsibility of the selected Contractor.

B4.3.2 Personnel Decontamination Area

The personnel decontamination area is depicted on Drawing 2-19. Equipment and facilities will be present in the Personnel Decontamination Area to accommodate scanning of site construction workers, with decontamination facilities available for use if and when they are needed. The facilities in this area will include: scanning equipment, showers, lockers (for changing from civilian clothes into work clothes and vice versa), and laundry facilities.

Site construction workers entering the restricted work area, will be dropped off at the crew drop-off/pick-up area located immediately south of the personnel decontamination area (see Drawing 2-19). Restroom and other crew facilities will be located in the immediate area for convenience and efficiency. Personnel arriving on site will walk to the north of the drop-off/pick-up area and into the personnel decontamination area where they will access their “clean side” lockers to drop of any personal items then sign in. Once on the other side of the sign in area, personnel will access the “dirty side” lockers and change into their work coveralls. Site personnel then will exit the personnel decontamination area and walk east to the restricted area vehicle parking area where their equipment and vehicles are parked and proceed to work.

Personnel leaving the restricted work area will enter the personnel decontamination area from the MA vehicle parking area, where they will change out of potentially contaminated clothing (again, this likely will be work coveralls on the dirty side of the locker area). Workers then will undergo scanning. Workers who meet the scanning criteria will sign out and proceed to the drop-off/pick-up area. Workers failing to meet the scanning criteria will attempt to remove contamination from their undergarments. In the unlikely situation where the contamination cannot be removed from workers undergarments (i.e., denim pants, long underwear, etc.), they will take a shower, will be provided temporary undergarments, and pass to the clean side lockers where all workers will have stored a clean change of clothes.

Due to limited space for vehicle parking, any Site visitors will be encouraged to carpool and coordinate with the site access office prior to arrival. A limited number of parking spaces for visitors will be available at the Construction Management Area.

B5.0 CONSTRUCTION SEQUENCING

The selected location for the CSZ is in an area with existing mine buildings and stockpiled topsoil that may contain mined materials. As a result, preparation/cleanup of this CSZ (including the West Access/West Haul Road) is a necessary initial element of Phase 1

construction. Due to the schedule for preparation of this area, the material removed from this area will need to be temporarily stockpiled until it can be used as cover soil or placed in the WCA as waste.

The anticipated sequence for preparation, mobilization, and construction of the CSFs is as follows:

1) BMP installations for sediment and stormwater controls.
2) Demolition of the existing structures and foundations in this area (Drawing 2-1), with demolition debris stockpiled in an approved location within the MA (Drawing 2-1 and Appendix R - Staging / Temporary Stockpiling Plan). The demolition procedures are described in Appendix H.
3) Begin well abandonment activities (Appendix Z). Wells located in areas to be disturbed by the Early Works will be abandoned first.
4) Cleanup and removal of the West Access/West Haul Road (Drawing 2-4). Materials failing to meet the cleanup criteria will be stockpiled in an approved stockpiling location, such as that shown on Drawing 2-1 (also described in Appendix R).
5) Cleanup and removal of soil and sediments associated with Whitetail Creek and the other contaminated area identified on Drawing 2-4. Materials failing to meet the cleanup criteria will be stockpiled in an approved stockpiling location, such as that shown on Drawing 2-1 (also described in Appendix R).
6) Excavation of other contaminated mine waste and sediments within the proposed fenced area of the CSZ. These materials will be stockpiled in an approved location within the MA, such as that shown on Drawing 2-1 (also described in Appendix R). Procedures for identifying surface materials and sediments above the action levels for cleanup are discussed in Appendix S.
7) Excavation of stockpiled topsoil (Drawings 2-2 and 2-3) and placement in an approved stockpiling location (described in Appendix R). This material will be sampled to determine if it is clean (i.e., below the action level for surface material cleanup) or if it is above the action levels for constituents of concern (COCs).
8) Construction of the Site Access Road and Vehicle Decontamination Area (including a heated building for housing decontamination and scanning equipment, collection sump

and drain pipeline, and associated surface water controls). Site Access Road construction is illustrated on Drawings 2-5 through 2-13 and construction of the Vehicle Decontamination Area and associated collection sump and pipeline is presented on Drawings 2-15 through 2-18.

9) Grading of the CSZ once the overlying materials have been removed and it is verified as clean. Drawings 2-14 and 2-19 through 2-21 present the layout, grading plans, and fencing plan for the CSZ.

10) Construction and mobilization of the CSFs.

11) Preparation of the material processing and stockpiling area (Drawings 2-22 and 2-23).

Demolition or demobilization of the temporary CSFs unnecessary for long-term management of the Site will occur at the end of the RA. Demolition is discussed in detail in Appendix H.

B6.0 MATERIAL PROCESSING AND STOCKPILING AREA

A material processing and stockpiling area will be developed as part of the Early Works (see Drawings 2-22 and 2-23). This area is intended to provide the selected Contractor with the physical space necessary to perform the crushing and screening activities associated with production of drain rock from the Hillside Waste Rock Pile. Activities associated with preparation of the material processing and stockpiling area include:

- Relocation of Ore Stockpile #7 onto Ore and Protore Stockpile 6 (Drawing 2-22),
- Improvement of the existing safety berm at the northwest crest of the Pit 3 highwall (Drawings 2-23 and 2-29).
- Additional intermediate regrading of material processing and stockpiling area may be necessary to facilitate material processing and stockpiling. Large-scale regrading of the area prior to or during processing is not anticipated.

Details of material processing and stockpiling, including equipment type, location, and orientation are decisions that the selected Contractor will need to make. These decisions, which cannot be anticipated, will promote the safest and most efficient process for the selected Contractor. It is anticipated that material may go through a “grizzly” located on the Hillside Waste Rock Pile, the acceptable material may then be transported by conveyer belt (under a haulage overpass) to a processing plant for further processing. Due to safety concerns, the

processing plant equipment will not be permitted within 100-feet of the Pit 3 highwall and stockpiling activities will not take place within 15 feet of the safety berm.

B7.0 GREEN AND SUSTAINABLE REMEDIATION CONSIDERATIONS

Below are GSR considerations for Appendix B. GSR considerations were evaluated for: 1) Construction Materials and Equipment (characteristics and manufacturing considerations), 2) Construction Methods, and 3) Low Impact/Sustainability measures undertaken during construction.

B7.1 CONSTRUCTION MATERIAL CONSIDERATIONS

Site grading for the CSFs and the associated roads will be minimized to the extent possible to reduce the required construction equipment operating time, greenhouse gas emissions, and fill material.

Fly ash concrete, which provides improved performance and quality as well as a lower greenhouse gas footprint, has been specified for all concrete applications. Concrete suppliers in Spokane, Washington supply fly ash concrete of variable strengths using up to 20 percent fly ash in place of manufactured Portland cement. Since fly ash is considered a waste product from coal-fired power plants, the replacement of Portland cement with fly ash is considered to reduce the greenhouse gas footprint of concrete. The production of one ton of Portland cement produces approximately one ton of CO_2 as compared to zero CO_2 being produced using existing fly ash (http://www.us-concrete.com/ef_technology/index.asp). Therefore, for every ton of fly ash used, one ton of CO_2 emissions are prevented.

The use of LEED®-certified mobile trailers and prefabricated structures will be included as an option in the technical specifications and will be used if available and cost effective. The benefits of LEED-certified portable structure use include: the conservation of energy and water, reduction in greenhouse gas emissions and operating costs, and improvement of health and safety for occupants.

As requested by the Tribe, exterior color of any permanent structures will be selected to blend into their surroundings.

A number of components in the filter press package from the existing WTP will be salvaged and reused for the new WTP, including the filter press, membrane squeeze tank, pumps, and control

panels. Equipment currently in use at the existing decontamination facility will be evaluated for re-use at the proposed decontamination facilities.

B7.2 CONSTRUCTION METHODS

The construction equipment used for the CSFs will be appropriately sized to reduce fuel consumption and greenhouse gas emissions, and to minimize stormwater erosion during RA activities. To further reduce air emissions through all phases of construction, ultra-low sulfur diesel fuel will be used for all vehicles and construction equipment; vehicle and equipment no-idling policies and speed limits will be adhered to on the Site; and haul route lengths will be minimized (where feasible). Aggressive dust suppression also will be conducted in work areas and where necessary on the unpaved roads to decrease visible dust-related 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 during construction of the facilities in this area and following the RA.

B7.3 LOW IMPACT DEVELOPMENT/SUSTAINABILITY

Consolidation of construction support facilities in the southwestern corner of the MA focuses construction and longer-term support activities in one area, minimizing prolonged disruption of the MA and nearby wildlife habitat. A thoughtful approach was taken to optimize the route of the Site access roads to minimize disruption and vehicle mileage during the RA and over the long term. The route chosen already is a two-track road, so limited additional habitat degradation will occur when using this new access road alignment.

The access road constructed for the RA also will serve as the permanent access road after completion of RA activities. This road will be paved to eliminate dust during and post-construction. The East and West Access roads will be closed and remediated (except for necessary local traffic as approved by the Tribe and EPA), which consolidates activities in one area of the Site, thereby minimizing wildlife and Site ecological disruption.

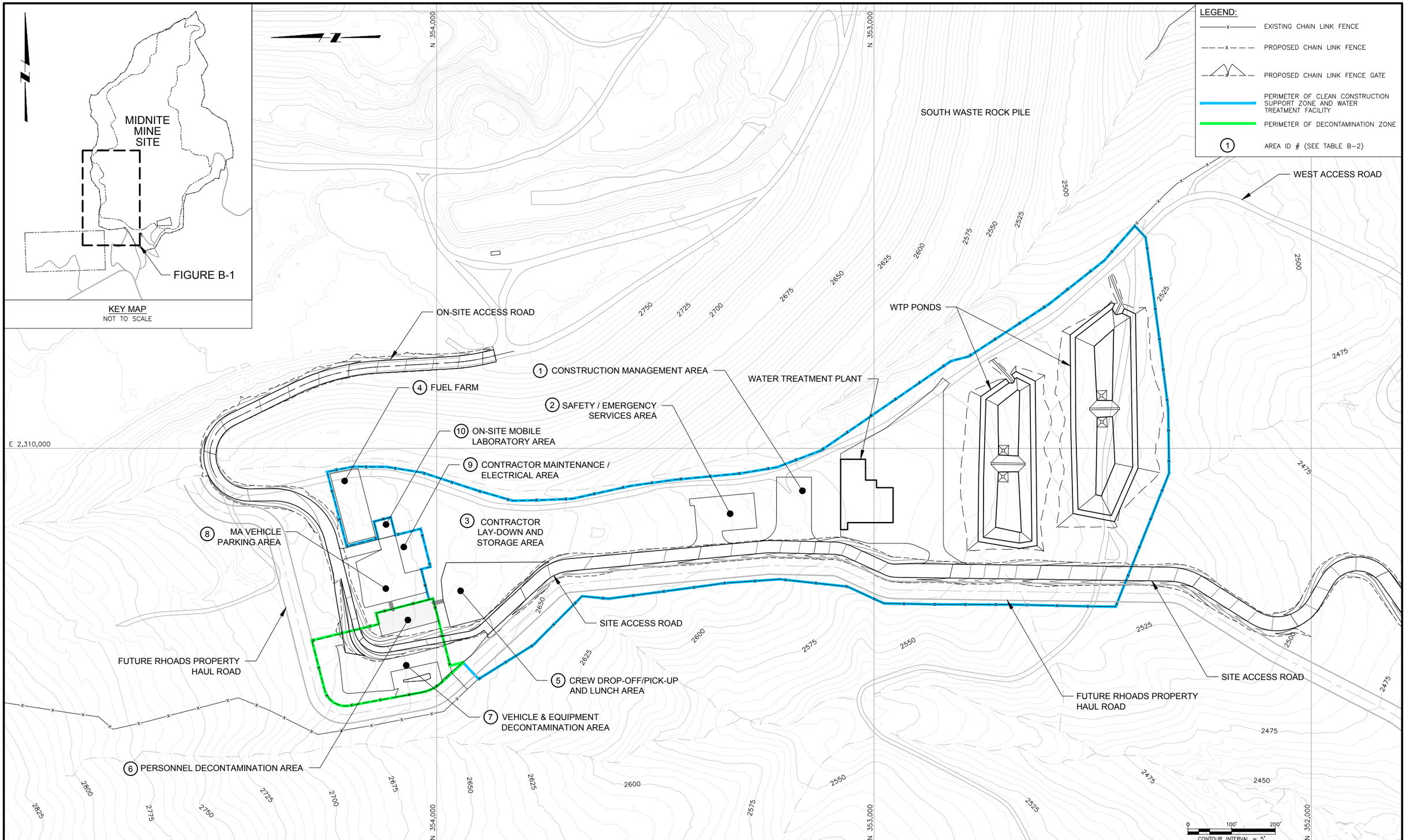
Maintaining a single point of entry/exit to the MA helps prevent re-contamination of areas already remediated or contamination of areas that were previously uncontaminated. This single point of entry/exit also minimizes the required support facilities and associated infrastructure that would be necessary if these facilities were positioned throughout the Site.

B8.0 REFERENCES

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

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.

Washington State Department of Ecology (WSDOE), 2004. Stormwater Management Manual for Eastern Washington. Publication Number 04-10-076. September.



NEWMONT

MWH

PROJECT LOCATION	WELLPINIT, WASHINGTON
PROJECT	MIDNITE MINE
TITLE	CONSTRUCTION SUPPORT ZONE LOCATION MAP
FIGURE B-1	REVISION 1
FILE NAME 1011322 CONS SUP ZONE	DATE JULY 2014

L:\Design-Drafting\Clients-I-P\NEWMONT\1011322 MIDNITE MINE\013-Sheet Set\FIGURES\2014-02-26 CSF TECH MEMO\REV_1\1011322 CONS SUP ZONE

Attachment B-1

Decontamination Zone Collection Sump Sizing Analysis

ATTACHMENT B-1

DECONTAMINATION ZONE COLLECTION SUMP SIZING ANALYSIS

Revisioning						
Rev.	**Date**	**Description**	**By**	**Checked**	**Date**	**Reviewed**
0	*7/8/14*	*90% Design*	*Jared Erickson*	*Alex Edstrom*	*7/10/2014*	

Location and Format

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

Z:\Projects\Clients\Dawn Mining Company\Midnite Mine\90 Percent Design\5 - Technical\Hydrology\Rational Method Calculations\Decontamination Zone Sump Volume Calculation.xlsx

The following calculations were generated using the following software:

Microsoft Office Professional Plus 2010 (Microsoft Excel)

Supplement

Supplement B-1.1 – Decontamination Zone Sump Volume Calculation Sheet
Supplement B-1.2 – Decontamination Zone Catchment Delineation Map

1.0 BACKGROUND

At the northern end of the Midnite Mine Construction Support Zone (CSZ) is the Decontamination Area that will be used for vehicles and personnel (See Drawing 2-13 through 2-16) during the RA construction. Impacted water from the area drained by the vehicle decontamination pad (including stormwater runoff and water used for vehicle decontamination) must be collected and treated prior to discharge. A lined sump has been designed to collect the impacted water. Water collected in this sump will gravity drain to the Western Drainage Seeps collection system, from where it will be pumped to the water treatment system. The calculations presented in this brief were performed to determine the appropriate capacity for the Decontamination Zone sump.

2.0 DESIGN CRITERIA

It is assumed that the volume of water generated by vehicle decontamination procedures will not be significant when compared to the volume of impacted stormwater runoff reporting to the decontamination area during a high-intensity storm. As such, the sump has been designed to store the runoff volume generated by the 25-year, 3-hour storm event.

3.0 METHODS

The runoff volume generated by the 25-year 3-hour storm event is calculated using the following expression:

$$V = C * \frac{P_{sds}}{12} * A$$

Where: V = Total runoff volume, cubic feet
C = Runoff loss coefficient, unit less
P_{sds} = Design Storm (25-year, 3-hour storm) precipitation depth, inches
A = Drainage contribution area, square feet

Assumptions are made to validate the runoff volume equation presented. Some of the assumptions made include;

a. Rate of runoff losses is constant through the duration of the storm
b. Rainfall intensity is constant throughout the duration of the storm
c. Contribution area is constant throughout the duration of the storm

<u>Runoff Loss Coefficient (C)</u>

The runoff loss coefficient (C) is used to approximate the runoff losses to infiltration. The runoff loss coefficient comes from Table 4.7.1 of the Stormwater Management Manual for Eastern Washington (SMMEW) (WDOE, 2004). The cover type corresponding to “Industrial Areas, Light” with “Rolling” type topography is used in this analysis.

The value presented in Table 4.7.1 of the SMMEW represents the value appropriate for use during the 10-year storm event. In the 25-year event (the design storm event) a lower percentage of runoff will infiltrate into the ground due to the higher rainfall intensity. To account for this, the SMMEW suggests that the loss coefficient value should be increased by 10 percent.

Design Storm Precipitation Depth (P_{sds})

The procedure to determine the design storm precipitation depth comes from the SMMEW (WDOE, 2004). The following expression from the SMMEW is used:

$$P_{sds} = 1.06 * C_{sds} * P_{2yr2hr}$$

Where: P_{sds} = 25-year, 3-hour storm precipitation depth, inches
C_{sds} = Conversion coefficient (1.82)
P_{2yr2hr} = 2-year, 2-hour precipitation depth (0.45 inches)

The 2-year, 2-hour precipitation depth (P_{2yr2hr}) is determined using Isopluvial maps prepared for Eastern Washington (WDOE, 2004). The conversion coefficient (C_{sds}) is used to convert the 2-year storm event to the 25-year event. The multiplier (1.06) is used to convert the 2-hour event to the 3-hour event.

Drainage Contribution Area (A)

The drainage contribution area is determined through delineation of the 90% design grading plan for the construction support zone (MWH, 2014) (See Supplement B-1.2).

4.0 RESULTS

The runoff loss coefficient, design storm precipitation depth, drainage contribution area, and calculated runoff volume for the Midnite Mine Decontamination Zone is presented in Table 1.

Table 1. Runoff Volume Variables and Calculated Runoff Volume

Runoff Loss Coefficient (C)	Design Storm Precipitation Depth (P_{sds})	Drainage Contribution Area (A)	Calculated Runoff Volume (V)
0.77	0.87 in	163,612 ft^2	9114 ft^3

Note:
In=Inches; ft^2=square feet; ft^3=cubic feet

The Decontamination Zone Sump, as designed, has 0.143 acre-feet (15,340 cubic feet) of available storage. This is sufficient to contain the storm runoff volume calculated from design precipitation event (25-year 3-hour storm event). Comparison with the Sump Elevation-Volume Curve (See Supplement B-1.1) shows a sump ponding depth of approximately six feet and a sump freeboard depth of approximately two feet.

5.0 REFERENCES

MWH Americas, Inc. (MWH), 2014. Midnite Mine Site Reclamation Design, 90% - End of Phase 1 Grading Plan.

Washington Department of Ecology (WDOE), 2004. Stormwater Management Manual for Eastern Washington. Washington State Department of Ecology. September.

Supplement B-1.1

Decontamination Zone Sump Volume Calculation Sheet

Decontamination Zone Sump Volume Calculation Sheet

Calculations By: JNE
Date: 7/8/2014
Checked By: Alex Edstrom
Date: 7/10/2014

Purpose

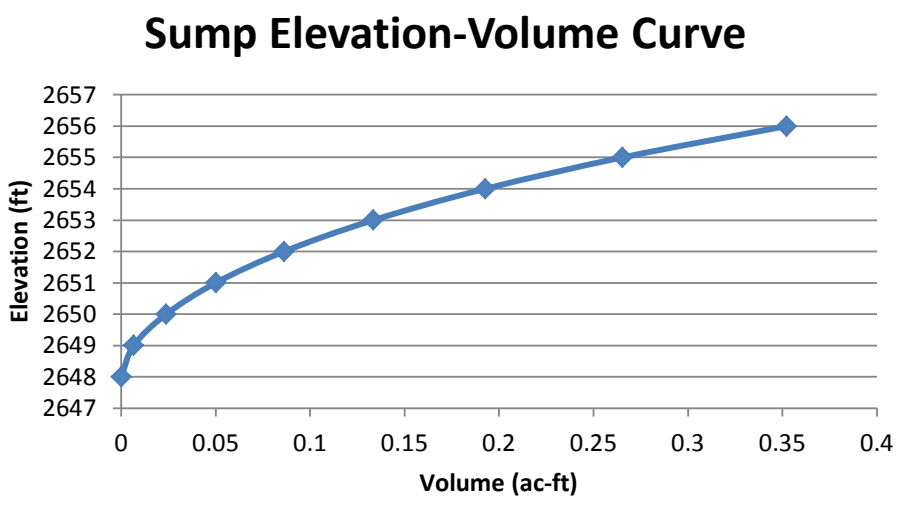
This calculation was performed to determine the required volume of the Lined Decontamination Zone Sump.

Calculation Results

The Required Sump Volume is 0.21 acre feet.
Approximate Detention Pond Water Surface Elevation is 2654.0 feet.
Avaliable Sump Freeboard Depth is 2.0 feet.
Sump Volume Excess of 0.145 acre feet.

Design Storm	Duration	Depth
25-Year "Short Duration Storm"	3 hour	0.87 Inches

Variable	Value	Reference
Loss Coefficient [C] - Industrial Area, Light	0.77	1
Area [A] ($ft^{2)}$	161987	2
Area [A] (acres)	3.76	2
Storm Volume (ft3)	9024	
Storm Volume (ac-ft)	0.207	



Current Sump Configuration Volume Calculation [Ref 2]			
Elevation (ft)	Area (ft2)	Volume (ft3)	Volume (ac-ft)
2648	21.4	0	0
2649	560	291	0.007
2650	936.3	1039	0.024
2651	1349.5	2182	0.050
2652	1803.4	3758	0.086
2653	2309.3	5815	0.133
2654	2857.4	8398	0.193
2655	3459.6	11556	0.265
2656	4104.9	15339	0.352

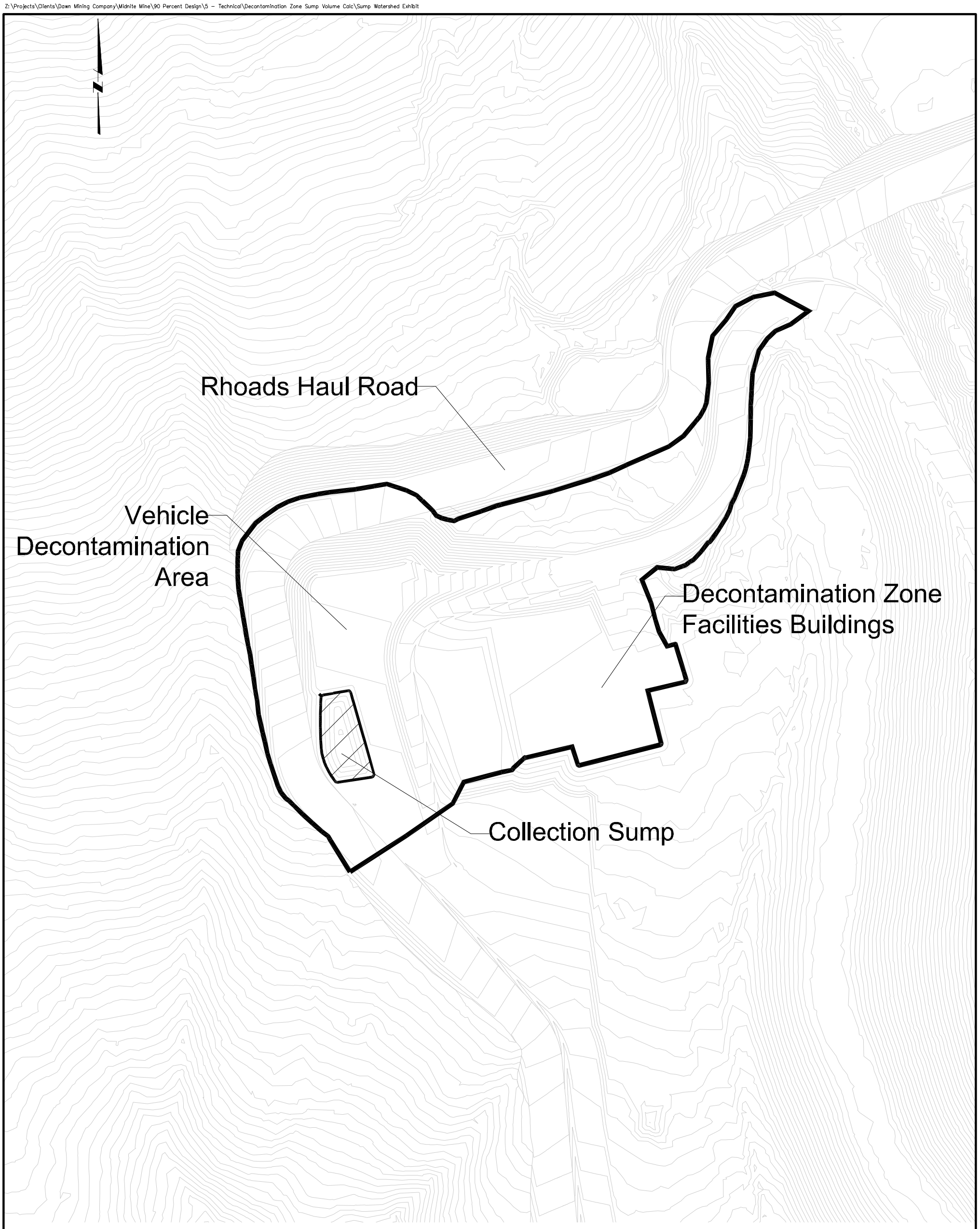
References

1 SMMEW 2004, Stormwater Management Manual for Eastern Washington
2 MWH, 2014. End of Mine Early Works 90% Grading Plan

Supplement B-1.2

Decontamination Zone Catchment Delineation Map

Z:\Projects\Clients\Dawn Mining Company\Midnite Mine\90 Percent Design\5 - Technical\Decontamination Zone Sump Volume Calc\Sump Watershed Exhibit



LEGEND:

CATCHMENT BOUNDARY

Decontamination Zone Contribution Delineation

Decontamination Zone Sump

DRAWING REFERENCE(S):

- EXISTING TOPOGRAPHY BASED UPON LIDAR MAPPING BY SPATIAL INTEL, 2010. WASHINGTON STATE PLANE–NORTH, NAD 83/NAVD 88.
- PREMINE TOPOGRAPHY AND PIT EXCAVATION TOPOGRAPHY BASED UPON INFORMATION PROVIDED BY U.S. BUREAU OF MINES (USBM), JULY, 1995. ORIGINAL COORDINATE SYSTEM USED IN USBM MAPPING (NAD27/NGVD29) HAS BEEN CONVERTED TO NAD83/NAVD88 BASED COORDINATES.

NEWMONT

PROJECT LOCATION	WELLPINIT, WASHINGTON
PROJECT	MIDNITE MINE
TITLE	DECONTAMINATION ZONE CATCHMENT DELINEATION MAP
FIGURE	B-1.2
REVISION	A
FILE NAME	Sump Watershed Exhibit
DATE	JUNE 2014

MWH

Attachment B-2

Midnite Mine Remedial Action Pavement Design

ATTACHMENT B-2

MIDNITE MINE REMEDIAL ACTION PAVEMENT DESIGN

Revisioning						
Rev.	**Date**	**Description**	**By**	**Checked**	**Date**	**Reviewed**
0	*14-Jul-14*	*90% Design*	*R. Schaut*	*J. Cumbers*	*15-Jul-14*	*Tom Kelley*

Location and Format

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

\\usslc1s01\IFO\Industrial Projects\MIDNITE MINE\Deliverables_Working Documents\Basis of Design Rpt\Appendix B - Support facilities\90% Submittal\Attachment B-2 Pavement Design

Supplements

Supplement B-2.1 – Laboratory Report
Supplement B-2.2 – Flexible Pavement Design Calculations, Site Access Road
Supplement B-2.3 – Rigid Pavement Calculations for Decontamination Pad

1.0 BACKGROUND

This calculation brief presents the methods, input parameters, and results of the analyses that were performed to calculate the thicknesses of paving and base course layers for paved surfaces at the Midnite Mine. Paved surfaces will include:

- the new Site Access Road from the intersection with the county-maintained West End Road to the new Water Treatment Plant (WTP),
- the vehicle decontamination area, and
- the yard area surrounding the WTP.

The new Site Access Road will be paved with asphaltic concrete (AC) to reduce fugitive dust during dry periods, and sediment in stormwater runoff during wet periods. The vehicle decontamination area will be paved with Portland cement concrete (PCC) to provide a durable surface for decontaminating vehicles prior to release from the site. The pavement for the yard area surrounding the WTP will consist of asphaltic concrete and thickness calculations for the yard area will be included as part of the WTP design.

These analyses were conducted using the Washington State Department of Transportation (WSDOT) *Pavement Policy* document (WSDOT, 2011) and the American Association of State Highway and Transportation Officials (AASHTO) *Guide for Design of Pavement Structures* (ASSHTO, 1993). This AASHTO document is used by the WSDOT and many other state and municipal agencies as the primary design procedure for pavement structures. In addition, the American Concrete Institute (ACI) *Guide for the Design and Construction of Concrete Parking Lots (ACI 330R-01)* (ACI, 2001) and the U.S. Army Technical Manual for *Concrete Floor Slabs Subjected to Heavy Loads (TM 5-809-12)* (U.S. Army, 1987) were used in the design of the concrete pavement for the decontamination area. In addition, recommendations for minimum pavement sections from Stevens County, WA were considered in this design.

2.0 SUBGRADE CONDITIONS

The proposed paved areas lie within, and immediately adjacent to, the proposed Rhoads Property borrow area that will be used to provide remediation cover soil at the Site. Therefore, the soils that are at the Rhoads Property are considered to be representative of the subgrade soils under the paved areas.

2.1 LABORATORY TESTING

The Rhoads Property soils have been extensively sampled and tested for engineering index properties, strength, and soil retention characteristics as part of two previous borrow investigations for soil cover material. These investigations were summarized in the *Borrow Source Design Investigation Report* (MGC, 2011a) and the *Rhoads Property Borrow Investigation, Phase II* (MGC, 2011b).

The predominant material overlying bedrock at the potential Rhoads Property borrow source consists of clayey sand (MGC, 2011a, 2011b). The upper layer of bedrock consists of quartz

monzonite which has been weathered to a residual clayey sand, with some slightly clayey or silty sand soils (residuum). It is assumed that both the overlying clayey sand and the underlying weathered bedrock residuum observed in the Rhoads Property are representative of the soils that will underlie the paved areas at the Site.

Additional laboratory testing was conducted in 2014 on the two anticipated subgrade soil types (clayey sand and weathered bedrock) in accordance with the *Work Plan – Soil Testing for Pavement Design* (MWH, 2014). One composite sample of clayey sand material (RP-C1) and one composite sample of weathered bedrock material (RP-C2) were submitted to Budinger & Associates of Spokane, Washington for engineering index property testing and R-value testing. The Budinger report is provided in Supplement B.2.1 to this calculation brief. The laboratory test results and soil classifications are summarized in Table 1. It should be noted that soils samples tested included only the minus 3-inch fraction of samples, which may have resulted in a slightly conservative estimate of subgrade behavior, including frost susceptibility.

2.1.1 Frost Susceptibility

The results of the engineering index property testing and the subsequent USCS classifications were evaluated to determine the susceptibility of the subgrade soils to frost heave. The results were compared with Figure G.6 of AASHTO (1993), which provides an estimation of frost susceptibility for various soil classifications. Based on this comparison, the two main subgrade soil types (sandy clay/clayey sand and weathered bedrock) are expected to have a frost susceptibility ranging from “low” to “high.” Due to this frost susceptibility, special design considerations are required, which are discussed further below.

3.0 ROADWAY TRAFFIC

The anticipated roadway traffic on the new Site Access Road was evaluated to provide input into the pavement thickness calculations. A 20-year design life was selected for the evaluation, and included a 10-year construction period, during which time the road will be used to transport construction equipment, materials, and personnel. The evaluation also considered the anticipated traffic related to ongoing water treatment plant operations, as well as traffic related to site maintenance and monitoring. A summary of anticipated traffic during the pavement design life is presented in Table 2.

Using the assumed traffic patterns (frequency, type, and weight) and the applicable load equivalency factors from Appendix D of AASHTO (1993), the 18,000 pound equivalent single-axle loads (ESALs) were estimated for each vehicle type. The ESAL values were summed to estimate the total ESALs for the roadway over the 20-year design life, as shown in Table 2. The resulting sum is approximately 40,000 ESALs. The ESAL parameter was used in the thickness design of the pavement sections as discussed below.

4.0 FLEXIBLE PAVEMENT DESIGN – SITE ACCESS ROAD

4.1 ROADWAY CATEGORY

Since the total ESAL value computed from the traffic study is less than 1,000,000, the Site Access Road is considered to be a low-volume roadway according to Table 5.3 of WSDOT (2011) and Chapter 4 of AASHTO (1993).

4.2 PAVEMENT ANALYSIS

The methods and assumptions used in the analysis of the flexible pavement for the Site Access Road are described in the following sections, and the design calculations are provided in Supplement B.2.2.

4.2.1 Design Method

The basic design method used is presented in Section 3.1 of AASHTO (1993) and involves identifying the required flexible pavement structural number (SN) to withstand the anticipated traffic loading. The SN is a function of the thickness, stiffness, and drainage performance of the various layers in the paving system, and the SN equation is shown in Section 1.2 of AASHTO (1993) and in Supplement B.2.2. The SN is used in the nomograph equation from Section 1.2 and Figure 3.1 of AASHTO (1993) to calculate the traffic loading that the paving system is expected to withstand over the design life. An iterative approach is used whereby the paving layers are adjusted until the required SN is determined which results in a calculated traffic loading that exceeds the anticipated traffic loading.

4.2.2 Input Parameters

The structural number (SN) equation and the nomograph equation discussed above are shown in the design calculations in Supplement B.2.2. Several input values are required for these equations. The input values are discussed below, along with any relevant assumptions.

- **Paving System Layer Thicknesses (D_i, D_{ii}).** The thickness of the asphalt surfacing (D_i) and the base course layer (D_{ii}) were adjusted as necessary until the required SN was calculated.
- **Structural Layer Coefficients (a_i, a_{ii}).** For hot-mix asphalt, a structural layer coefficient (a_i) of 0.40 was used based on Figure 2.5 of AASHTO (1993) and an elastic modulus (E) of 360,000 psi. For the base course material, a structural layer coefficient (a_{ii}) of 0.13 was used, based on Figure 2.6 of AASHTO (1993) and Table 5.2 of WSDOT (2011) and an assumed R-value of 80 for crushed stone base course (CSBC).
- **Drainage Coefficient (m_{ii}).** A drainage coefficient of 1.0 was used for the base course material, based on a drainage quality of "good" for crushed stone base course from Section 2.4.1 of AASHTO (1993), and conservatively assuming the moisture level approaches saturation greater than 25 percent of the time (from Table 2.4 of AASHTO, 1993).
- **Standard Normal Deviate (Z_R).** A Z_R value of -0.674 was selected from Table 4.1 of AASHTO (1993) based on a reliability factor (R) of 75 percent. A reliability factor of 75

percent is considered to be conservative for low-volume roadways, based on the discussion in Section 4.1.1 of AASHTO (1993).

- **Standard Deviation (S_o).** S_o value of 0.44 was used in the analyses, based on Section 4.3 of Part I of AASHTO (1993).
- **Design Serviceability Loss (ΔPSI).** The design serviceability loss (ΔPSI) is the difference between the initial serviceability (p_i) and the terminal serviceability (p_t). A ΔPSI value of 1.5 was use in the calculations, based on Table 5.2 of WSDOT (2011).
- **Resilient Modulus (M_R).** The R-value results from the laboratory testing were used to compute the resilient modulus (M_R) of the subgrade samples using the following equation from Section 1.5 of AASHTO (1993): M_R (psi) = 1000 + 555 x (R-Value). The computed M_R values are shown in Table 1 and were 10,435 and 13,210 psi for the composite sandy clay and weathered bedrock material, respectively. The value of 10,435 psi was conservatively selected for the pavement design. To account for variations in the subgrade resilient modulus due to seasonal changes in moisture conditions, an *effective resilient modulus* was computed using the methods in Section 4.1.1 of AASHTO (1993). Climatic Region VI (dry, hard freeze, spring thaw) was selected from Figure 4.1 of AASHTO (1993). Based on this climatic region, Table 4.1 in the AASHTO guide was used to estimate the season lengths for subgrade conditions. Using these season lengths, the procedures presented in Section 2.3.1 of the AASHTO guide were used to compute an effective resilient modulus of 4,480 psi, which was used in the calculations. These calculations are shown in Supplement B.2.2.

4.2.3 Frost Heave

As mentioned in Section 2.1.1 above, the two main subgrade soil types (sandy clay and weathered bedrock) are expected to have a frost susceptibility ranging from “low” to “high.” If the subgrade is classified as a frost susceptible soil, WSDOT (2011) requires that the total pavement section be at least one-half of the maximum expected depth of freezing. The depth of freezing was determined to be 30 inches, based on the Stevens County Building Code Ordinance (Stevens County, Washington, 1984). Therefore, a minimum total pavement thickness of 15 inches is required by the WSDOT guidance. This minimum recommended thickness for is relatively consistent with Stevens County guidance, which recommends 2 inches of AC pavement over 12 inches of CSBC for low traffic roadways and 3 inches of AC pavement over 12 inches of CSBC for higher traffic roadways.

4.2.4 Results of Flexible Pavement Analysis

Based on the iterative approach described in Section 4.2.1 above, and using the input parameters discussed in Section 4.2.2, it was calculated that a pavement section consisting of 4 inches of asphaltic concrete pavement overlying 11 inches of crushed stone base course (CSBC) will accommodate the anticipated traffic loading and meet the WSDOT minimum requirements for frost protection. This total thickness of pavement section is controlled by the minimum thickness of 15 inches needed to meet frost resistance requirements and corresponds to a structural number (SN) of 3.0, which can accommodate a calculated maximum traffic loading greater than 200,000 ESALs, which exceeds the anticipated traffic loading of approximately 40,000 ESALs.

5.0 CONCRETE PAVEMENT DESIGN – DECONTAMINATION AREA

5.1 PAVEMENT CATEGORY

The vehicle decontamination area will be used for the temporary parking of site vehicles during radiological scanning and decontamination (where needed) prior to leaving the site. The area will be paved with Portland cement concrete to provide a durable surface for decontamination activities and for ease of cleanup. Since traffic speeds across this paved area will be slow, and since vehicles will be parked temporarily, it will perform similar to a parking area rather than a roadway. Therefore, design guidelines for truck parking areas and heavy equipment on floor slabs on grade were used.

5.2 PAVEMENT ANALYSIS

The methods and assumptions used in the analysis of the Portland cement concrete pavement for the decontamination area are described in the following sections, and the design calculations are provided in Supplement B.2.3.

5.2.1 Design Method

Section 5.3.5 of WSDOT (2011) presents minimum thicknesses of Portland cement concrete (PCC) pavement and crushed stone base course (CSBC) for truck parking areas. For truck parking areas, WSDOT requires a minimum thickness of 8 inches (0.67 feet) of PCC overlying a minimum of 4.2 inches (0.35 feet) of CSBC. In addition, WSDOT (2011) requires that the total pavement section be at least one-half of the maximum expected depth of freezing if the subgrade is classified as a frost susceptible soil (see discussion in Section 4.2.3 above). Therefore, a pavement section consisting of 8 inches of PCC overlying 7 inches of CSBC (for a total pavement section of 15 inches) was selected as the initial recommended pavement section for analysis.

To evaluate the adequacy of the aforementioned pavement section, the method presented in the American Concrete Institute (ACI) *Guide for the Design and Construction of Concrete Parking Lots (ACI 330R-01)* (ACI, 2001) was used to evaluate the anticipated traffic loading in the area, specifically the heavy equipment on transport trailers, in addition to service vehicles for the heavy equipment. To account for equipment such as large haul trucks and loaders trafficking the slab, the methods described in the U.S. Army Technical Manual for *Concrete Floor Slabs on Grade Subjected to Heavy Equipment Loads (TM 5-809-12*) (U.S. Army, 1987) were used.

5.2.2 Subgrade Conditions

The subgrade material in the area of the decontamination pad is expected to consist predominantly of highly weathered bedrock (clayey sand) or relatively unweathered bedrock. The applicable modulus of subgrade reaction (k) for the subgrade was conservatively estimated to be 200 pci for the clayey sand/sandy clay using Table B.2 (ACI, 2001). A subgrade consisting primarily of unweathered rock will likely have a significantly higher k value. The *effective modulus of subgrade reaction* was estimated to be 250 pci, taking into account 7 inches of granular base material, based on Table 2.2 of ACI (2001). This effective k value was used in the subsequent analysis.

5.2.3 Loading

Using the truck traffic described above and the estimated number of trips over the slab, a maximum single axle load of 20 kips and a maximum tandem axle load of 60 kips was applied. This loading condition was selected to represent heavy equipment that is loaded onto trucks for highway transport, as well related service vehicles. The number of trips was based on the portion of truck traffic that is expected to travel through the decontamination facility. Figures A.1 through A.3 of ACI (2001) were then used to calculate slab fatigue for an assumed thickness of slab. Based on the subgrade conditions, and assuming a concrete compressive strength of 4,000 psi and flexural strength of 600 psi; a 6-inch thick concrete slab would reach only about 27 percent fatigue during this loading. This is significantly less than the 125 percent maximum allowable fatigue.

To account for loading of the pavement by heavy construction equipment, a 108-kip axle load from the heaviest piece of site equipment (CAT 992 Loader) was considered for 50 trips over the slab. The assumed concrete compressive strength was increased to 5,000 psi, and the nomograph on Figure 5-2 of U.S. Army (1987) was used to determine the required slab thickness. The nomograph includes axle loads up to 120 kips. Using the modulus of subgrade reaction described previously (250 pci), the nomograph was used to determine the recommended thickness for slabs under 108-kip axles for 10,000, 100,000, and 1,000,000 repetitions. The relationship between slab thickness and repetitions was used to estimate the required slab thickness for 100 axle load repetitions, or 50 vehicle trips over the slab. The required thickness for an unreinforced slab using this method is 8.2 inches.

5.2.4 Reinforcing Steel, Dowels and Concrete

Reinforcing steel will be added to the concrete slab to increase crack control and increase the required joint spacing in the slab. Using equation 2-2 (ACI, 2001), the required area of steel was calculated for joint spacing of 40 feet in both directions. For the 8-inch slab thickness and grade 60 reinforcing steel, the slab requires 0.0725 in^2 per foot of slab. Number four bars (0.2 in^2 nominal area) placed at a maximum of 2 feet on center in both directions will satisfy this requirement. Reinforcing steel should be broken at the slab joints.

Plain (smooth) dowels are recommended at joints due to the anticipated truck traffic. Based on the recommendations in Table 2.6 of ACI (2001), dowels should have a minimum diameter of 1 inch, should have a minimum length of 14 inches on each side of the joint, and should be placed at 12 inches on center. Dowels should be epoxy coated if deicing salts will be used on the slab.

The concrete used for the slab should be 5,000 psi (28-day compressive strength) and be air entrained (5 to 7 percent) to account for the freeze-thaw exposure. The recommended maximum nominal aggregate size is ¾-inch.

The addition of reinforcing steel at 0.1 in^2 per foot of slab allows for the reduction of the required overall slab thickness. Using Figure 5-4 of U.S. Army (1987), a reinforced slab with 0.1 in^2 per foot of slab would require a minimum thickness of 7.25 inches.

5.2.5 Results of Rigid Pavement Analysis

Based on the rigid pavement analysis using ACI (2001), a 6-inch concrete slab will accommodate the anticipated truck traffic loading. Using U.S. Army (1987) to account for individual pieces of heavy construction equipment, it was determined that a 7.25-inch reinforced concrete slab will accommodate the heavy loads. To account for frost considerations, the total minimum section should be 15 inches (WSDOT, 2011). A pavement section consisting of 8 inches of PCC overlying 7 inches of CSBC (for a total pavement section of 15 inches) is recommended as this pavement section will also meet the WSDOT minimum recommended pavement section for truck parking areas.

6.0 PAVEMENT DESIGN SUMMARY

The flexible (asphalt) and concrete pavement design information in Sections 4 and 5 are summarized in the table below.

Pavement Type	Asphalt	Concrete
Pavement use	Site access road	Decontamination pad
Design life	20 years	Construction period
Design frost depth	30 inches	30 inches
Pavement section thickness	15 inches	15 inches
Traffic loading for design	40,000 equivalent single-axle loads (ESALs)	100 repetitions with heavy construction equipment (104-kip single-axle load)
Pavement thickness	4 inches	8 inches
Base course thickness	11 inches	7 inches
Pavement strength	Asphaltic concrete, structural number (SN) 3	Portland cement concrete, 5,000 psi compressive strength
Pavement reinforcement	None	No 4 rebar, 2-foot centers
Pavement joints	None	Maximum 40-foot spacing

7.0 REFERENCES

American Association of State Highway and Transportation Officials (AASHTO), 1993. Guide for Design of Pavement Structures.

American Concrete Institute (ACI), 2001. Guide for Design and Construction of Concrete Parking Lots (ACI 330R-01).

Miller Geotechnical Consultants (MGC), 2011a. Borrow Source Design Investigation Report, Revision 2. Prepared on behalf of Newmont USA Limited and Dawn Mining Company for U.S. Environmental Protection Agency, Region 10. May 6.

Miller Geotechnical Consultants (MGC), 2011b. Technical Memorandum – Rhoads Property Borrow Investigation, Phase II, Revision 1. Prepared on behalf of Newmont USA Limited

and Dawn Mining Company for U.S. Environmental Protection Agency, Region 10. December 2.

MWH, Americas, Inc. (MWH), 2014. Work Plan – Soil Testing for Pavement Design, Revision 0. March 20.

Stevens County, Washington, 1984. Stevens County Building Code Ordinance.

U.S. Army, 1987. Technical Manual (TM) 5-809-12, Concrete Floor Slabs Subjected to Heavy Loads, Chapter 15. August.

Washington State Department of Transportation (WSDOT), 2011. WSDOT Pavement Policy. June.

TABLES

Table 1. Summary of 2014 Laboratory Test Results on Composite Subgrade Samples

Sample	Description	USCS Group Symbol	USCS Group Name	Gravel (%)	Sand (%)	Fines (%)	Atterberg Limits (%)			R-Value	Computed Resilient Modulus (M_R)[1] (psi)
							LL	PL	PI		
RP-C1	Sandy Clay (Composite)	CL / SC [2]	Sandy Lean Clay / Clayey Sand	2	48	50 [3]	24	19	5	17	10,435
RP-C2	Weathered Bedrock (Composite)	SC	Sandy Clay with Gravel	13	53	26	29	18	11	22	13,210

Notes: (1) Computed using the following equation: M_R (psi) = 1000 + 555 x R-Value, from p. I-14 of AASHTO (1993).

(2) Samples are considered to have low to high frost susceptibility, as a pavement subgrade soils, based on USCS classification and Figure G.6 (AASHTO, 1993)

(3) Hydrometer results from other Rhoads Borrow samples indicate up to 40% silt in the fine fraction.

Table 2 - Estimation of Equivalent Single-Axle Loads (ESALs), Midnite Mine West Access Road

Vehicle	Traffic Volume			Duration	Axle Load and Type[1]								Gross Wt.	Load Equivalency Factors[2]				ESALs
					Axle 1		Axle 2		Axle 3		Axle 4							
	(qty)	(days/week)	(weeks/yr)	(years)	Type	Load (kips)	Type	Load (kips)	Type	Load (kips)	Type	Load (kips)	(kips)	Axle 1	Axle 2	Axle 3	Axle 4	
Heavy Equipment Mob/Demob																		
Equipment Transport Deliveries	120	1	1	2	1	20	3	60	3	60	3	60	200	1.57	2.6	2.6	2.6	2,249
Crushing Equipment Deliveries	22	1	1	2	1	20	3	60	3	60	3	60	200	1.57	2.6	2.6	2.6	412
Primary Service Vehicles																		
Fuel Deliveries (8000-9000 gallons per)	1	4	50	10	1	20	2	34	2	34			88	1.57	1.08	1.08		7,460
Potable Water Deliveries (8000 gallons)	1	3	50	10	1	20	2	34	2	34			88	1.57	1.08	1.08		5,595
Portable Toilet Service	1	2	50	10	1	20	1	20					40	1.57	1.54			3,110
Non-Hazardous Trash	1	1	50	10	1	20	2	34					54	1.57	1.08			1,325
Hazardous Waste (waste oil filters)	2	0.25	50	10	1	20	2	34					54	1.57	1.08			663
Drinking Water	2	0.25	50	10	1	20	1	20					40	1.57	1.54			778
Lubricants	2	0.25	50	10	1	10	2	34					44	0.102	1.08			296
Tire Service	1	1	50	10	1	10	2	34					44	0.102	1.08			591
Outside Major Equipment Vendors	3	1	50	10	1	8	1	20					28	0.049	1.57			2,429
Daily Light Construction Vehicles																		
Personal Vehicles (pickups)	10	5	50	10	1	2	1	4					6	0.0004	0.004			110
Personnel Vans	3	5	50	10	1	6	1	10					16	0.017	0.102			893
Security Vehicles	2	5	50	10	1	2	1	4					6	0.0004	0.004			22
Additional On-Site Staff & Visitors	6	5	50	10	1	2	1	4					6	0.0004	0.004			66
Water Treatment Plant Operation																		
Dry Hydrated Lime (25 tons)	1	0.25	52	20	1	20	3	60					80	1.57	2.6			1,084
Liquid propane (2000 gallons)	1	0.5	52	20	1	12	2	22					34	0.198	0.198			206
Mobile IX Trailer	1	0.25	52	20	1	18	3	40					58	1.00	0.491			388
Sludge Trucks (30 CY)	1	1.25	52	20	1	20	2	34	2	34			88	1.57	1.08	1.08		4,849
HCl Acid Delivery (3000 gallons)	1	0.125	52	20	1	20	2	34					54	1.57	1.08			345
BaCl2 Solution/Polymer (1100 gallons)	1	0.375	52	20	1	10	2	16					26	0.102	0.065			65
Portable Toilet Service	2	1	52	20	1	20	1	20					40	1.57	1.57			6,531
Staff Vehicles (pickups)	4	5	52	20	1	2	1	4					6	0.0004	0.004			92
Other																		
Long-Term Maintenance & Monitoring	1	3	50	20	1	2	1	6					8	0.0004	0.017			52
																	Total =	39,608

Notes: (1) Axle Type: 1 = Single Axle, 2 = Tandem Axle, 3 = Triple Axle.

(2) Load equivalency factors taken from Tables D.4, D.5, and D.6 of AASHTO (1993), terminal serviceability (p_t) of 2.5, SN of 2.0.

Supplement B-2.1

Laboratory Report

Budinger
& Associates

Geotechnical Engineering
Environmental Engineering
Construction Materials Testing
Subsurface Exploration
Special Inspection

Proudly serving the Inland Northwest for over 30 years

Robert W. Schaut, PE
MWH Americas, Inc.
3665 JFK Parkway, Building 1, Suite 206
Fort Collins, CO 80525

June 26, 2014

Project Number L14251

PROJECT: Midnite Mine Materials Testing 2014
Wellpinit, WA

SUBJECT: Results of Laboratory Testing
Report # 1

At your request, we provided laboratory testing services for the subject project. Services were limited to the performance of specific laboratory tests, selected at your discretion.

For this period our involvement was limited to laboratory testing of two samples delivered to us on June 10, 2014. Laboratory tests were performed in general accordance with methods listed on the attached *Laboratory Summary*, *Particle Size Distribution Report*, and *R-Value* sheets.

If you have any questions, please call.

Respectfully Submitted,
BUDINGER & ASSOCIATES, INC.

Kyle L. Sanford
Mgr. Construction Services

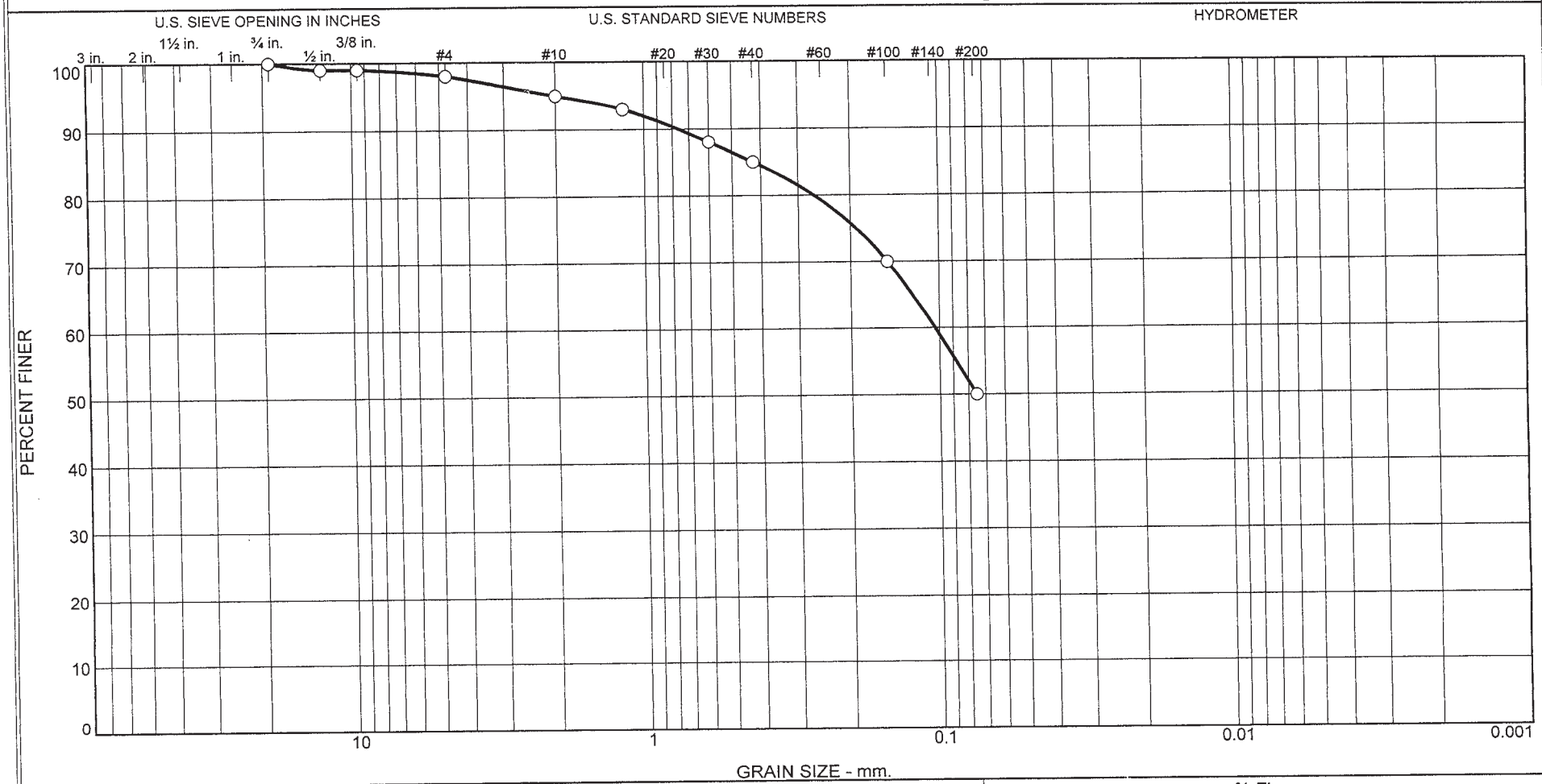
KLS/kh
Addressee – 2
Attachments:
- Soils – Laboratory Summary (1 page)
- Particle Size Distribution Report (2 pages)
- R-Value (2 pages)

1101 North Fancher Road
Spokane Valley, WA 99212
Tel: 509-535-8841
Fax:509-535-9589

SOILS
LABORATORY SUMMARY

LABORATORY NUMBER			14-0432	14-0433
SAMPLE NUMBER			1	2
SAMPLED BY			Client	Client
SAMPLE TYPE			Bulk	Bulk
DATE RECEIVED			6/10/14	6/10/14
SAMPLE LOCATION			RP-C1	RP-C2
		Units	Test Method	
MOISTURE CONTENT		%		9.3	7.9
ATTERBERG LIMITS			ASTM D-4318		
LIQUID LIMIT		%		24	29
PLASTIC LIMIT		%		19	18
PLASTICITY INDEX		%		5	11
R-VALUE			ASTM D-2844	17	22
SIEVE ANALYSIS			ASTM C-136		
	3"				100
S	1 1/2"	%			97
I	1"				93
E	3/4"	P		100	92
V	1/2"	A		99	89
E	3/8"	S		99	87
	#4	S		98	79
S	#10	I		95	63
I	#16	N		93	54
Z	#30	G		88	45
E	#40			85	41
	#100			70	31
	#200			50	26

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0	0	2	3	10	35	50	

Identification	Date Sampled	Date Received	Date Tested
Source of Sample: RP-C1 Sample Number: 1 (14-0432)		6/9/14	6/10/14

Client MWH Americas, Inc.

Project Midnite Mine Access Road Sub-Base Testing

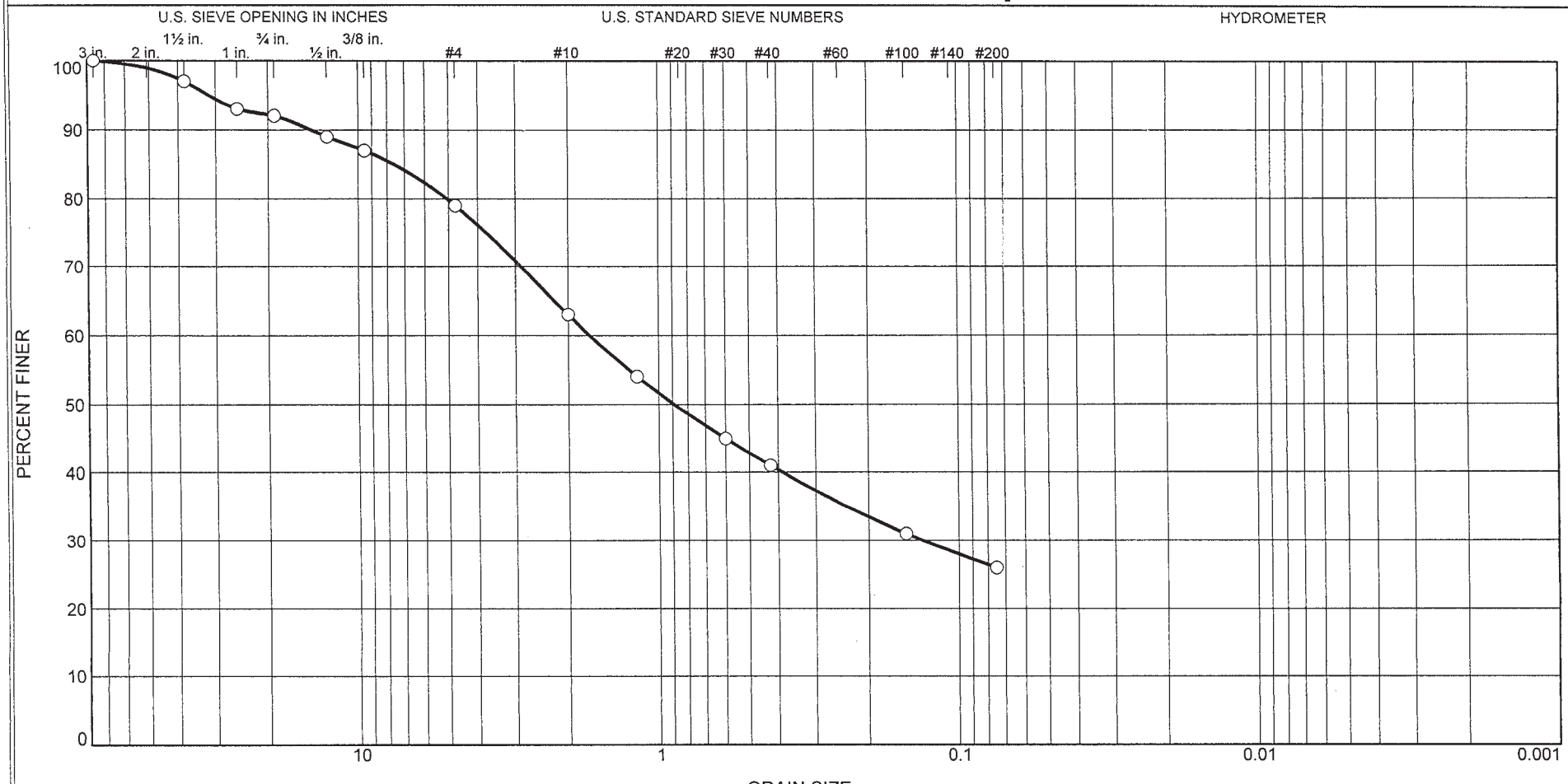
Project No. L14251 Date 6/24/14

BUDINGER & ASSOCIATES, INC.

○ Sampled by Client

Tested By: MB **Checked By:** TB

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0	8	13	16	22	15	26	

Identification	Date Sampled	Date Received	Date Tested
Source of Sample: RP-C2 Sample Number: 2 (14-0433)		6/9/14	6/10/14

Client MWH Americas, Inc.

Project Midnite Mine Access Road Sub-Base Testing

Project No. L14251 Date 6/24/14

BUDINGER & ASSOCIATES, INC.

○ Sampled by Client

Tested By: MB **Checked By:** TB

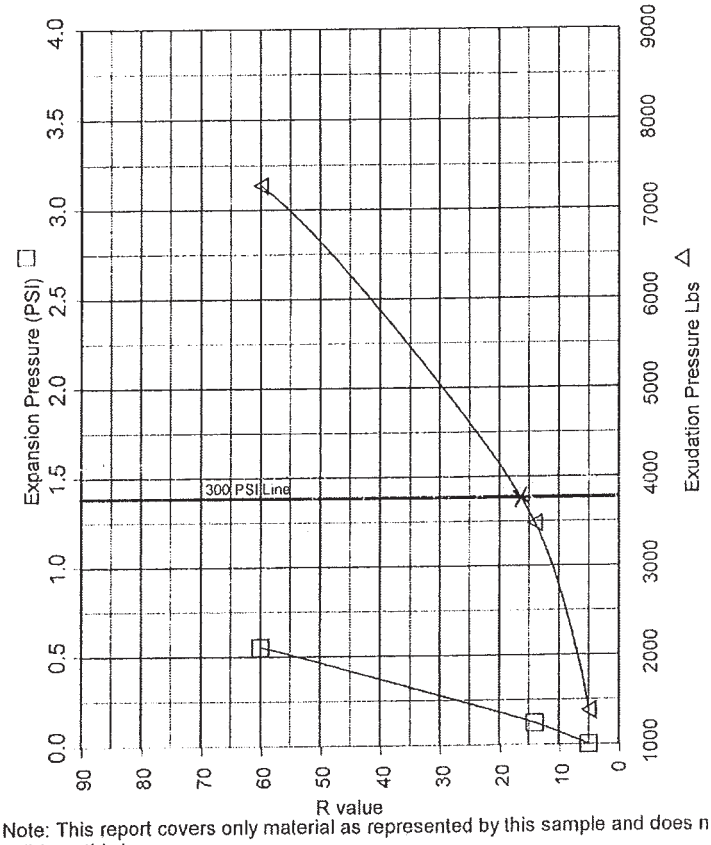
R-VALUE
ASTM D 2844

Project: 2014 Misc. Lab Testing
Client: Budinger and Associates
Sample ID: Sample #1
Location: L14251
Soil Description: Silt with Sand and Gravel

Lab Number: BO1400581A
Date Sampled: N/A
Sampled by: Client
Date Received: 6/16/14
Tested by: J Sanders

R VALUE DATA			
Percolation: None	Point 1	Point 2	Point 3
Exudation, PSI	110	277	579
Dry Density, PCF	117.5	124.1	129.7
Moisture Content, %	9.9	7.8	5.7
Exp. Pressure, PSI	0.00	0.12	0.55

SOIL CONSTANTS
R VALUE: 17



GRADATION: AASHTO T-11, T27		
SCREEN SIZE	AS RECEIVED % PASSING	AS TESTED % PASSING
4"		
3"		
2"		
1"		
3/4"	100	100
1/2"		
3/8"		
No. 4		
No. 8		
No. 16		
No. 30		
No. 50		
No. 100		
No. 200		

Note: This report covers only material as represented by this sample and does not necessarily cover all soil from this layer or source.

Reviewed by:

STRATA
A Professional Services Corporation
Integrity from the Ground Up

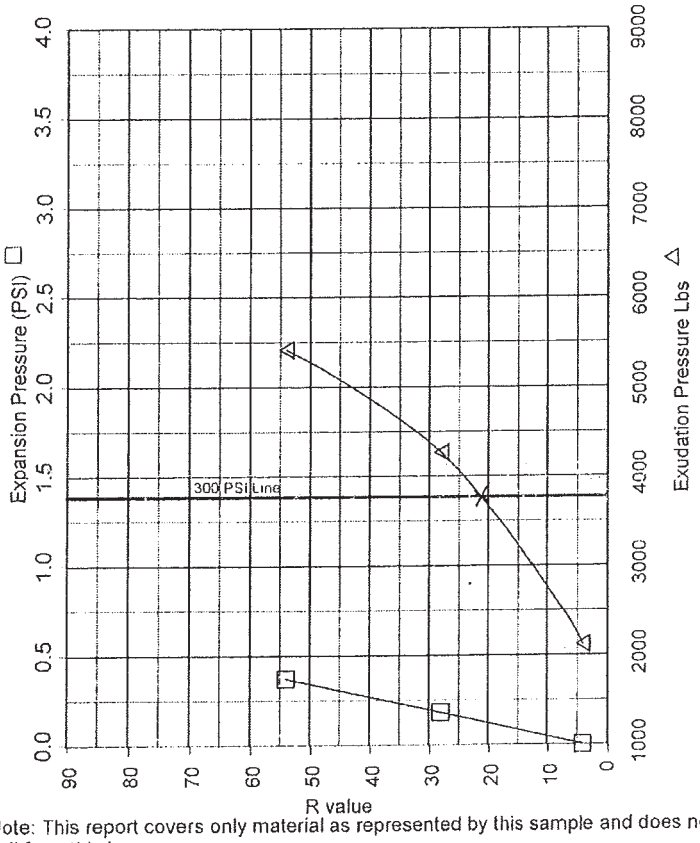
R-VALUE
ASTM D 2844

Project: 2014 Misc. Lab Testing
Client: Budinger and Associates
Sample ID: Sample #2
Location: L14251
Soil Description: Silt with Sand and Gravel

Lab Number: BO1400581B
Date Sampled: N/A
Sampled by: Client
Date Received: 6/16/14
Tested by: J Sanders

R VALUE DATA			
Percolation: None	Point 1	Point 2	Point 3
Exudation, PSI	169	339	431
Dry Density, PCF	124.0	130.7	130.2
Moisture Content, %	9.8	8.6	7.7
Exp. Pressure, PSI	0.00	0.18	0.37

SOIL CONSTANTS
R VALUE: 22



GRADATION: AASHTO T-11, T27		
SCREEN SIZE	AS RECEIVED % PASSING	AS TESTED % PASSING
4"		
3"		
2"		
1"		
3/4"	100	100
1/2"		
3/8"		
No. 4		
No. 8		
No. 16		
No. 30		
No. 50		
No. 100		
No. 200		

Note: This report covers only material as represented by this sample and does not necessarily cover all soil from this layer or source.

Reviewed by:

STRATA
A Professional Services Corporation
Integrity from the Ground Up

Supplement B-2.2

Flexible Pavement Design Calculations
Site Access Road

Supplement B.2.2 - Flexible Pavement Design Calculations, Site Access Road

Project Name: Midnite Mine **Project No:** 1011322
Facility: West Access Road
Site Location: near Wellpinit, WA

Computed by: JMC **Date:** 7/10/2014
Checked by: RWS **Date:** 7/14/2014

Calculate Required Pavement Section using AASHTO (1993):

Design ESAL (1)	Calculated ESAL (W_{18}) (2)	Z_R (3)	S_o (4)	ΔPSI (5)	M_R (psi) (6)	a_i (7)	a_{ii} (8)	SN (9)
39,608	45,768	-0.674	0.44	1.5	4,480	0.40	0.13	2.3

Notes/References:

(1) Design Equivalent Single Axle Loads (ESAL) , based on traffic estimates

See Table 2.

(2) Calculated ESAL (W_{18}) over the design period, calculated using the following equation from AASHTO (1993):

$$\text{Log}_{10}(W18) = Z_R*So + 9.36 * \text{LOG}_{10}(SN+1) - 0.2 + \text{LOG}_{10}(\Delta PSI/(4.2-1.5)) / 0.40 + 1094 /(SN+1)5.19 + 2.32 * \text{LOG}_{10} MR - 8.07$$

Based on values assumed here. Calculated (allowable) ESALs must be greater than design ESALs.
Nomograph equation, p. II-32 (AASHTO, 1993).

(3) Standard Normal Deviate (Z_R)

A Z_R value of -0.674 was used from Table 4-1 of AASHTO (1993), based on a reliability factor (R) of 75%.
(An R of 75% is considered to be conservative based on Section 4.1.1 of AASHTO, 1993).

(4) Standard Deviation (S_o)

An S_o value of 0.44 was used, based on Section 4.3 of Part I of AASHTO (1993) (the range for flexible pavements is 0.4 to 0.5).

(5) Design Serviceability Loss (ΔPSI) = Difference Between Initial Serviceability (p_i) and Terminal Serviceability (p_t)

A ΔPSI of 1.5 was used, based on Table 5.2 of WSDOT (2011).

(6) Effective Subgrade Resilient Modulus (M_R) (seasonally-adjusted)

Calculated based on measured laboratory R values, adjusted for seasonal conditions.

	Winter	Spring Thaw	Spring-Fall	Summer
Season (months)	3	1.5	3	4.5
Suggested M_R (psi)	20,000	2,000	6,000	10,435
Relative damage, u_f	0.01	2.59	0.20	0.06

Avg. u_f = 0.40 (weighted over 12 months)
Effective M_R = 4,480 PSI

The effective MR was calculated based on Section 4.1.1 of AASHTO (1993), using Climatic Region 6 from Figure 4-1.
Season lengths determined from Table 4.1 (II-71) of AASHTO (1993) for US Climatic Region 6.
Seasonal MR values from Table 4.2 (II-71) for good quality road bed; summer/dry value adjusted to laboratory result.
From Figure 2.3 (p. II-14) of AASHTO (1993) (uf = 1.18 * 10^8 * Mr^-2.32).
Seasonally-adjusted subgrade resilient modulus.

(7) Structural Layer Coefficient for Asphalt (a_i)

An a_i of 0.40 was used for hot mix asphalt based on Figure 2.5 of AASHTO (1993) and an elastic modulus (E) of 360,000 psi.

(8) Structural Layer Coefficient for Base Course (a_{ii})

An a_{ii} of 0.13 was used for base course based on Figure 2.6 of AASHTO (1993) and Table 5-2 of WSDOT (2011), assuming an R-value of 80.

(9) Structural Number (SN) = $D_i*a_i + D_{ii}*a_{ii}*m_{ii}$

See Chapter 4, Table 4.6, p II-80 of AASHTO (1993); for Climatic Region VI, good roadbed soil, low traffic, SN should range from 2-2.6.

Where:

m_{ii} =	Drainage Coefficient for Base Course		
D_i =	Thickness of Asphalt	**4.0**	in
D_{ii} =	Thickness of Aggregate Base (required)	5.4	in

An m_{ii} value of 1.0 was used assuming "good" drainage and moisture approaching saturation >25% of the time (Section 2.4.1 and Table 2.4 of AASHTO, 1993).
D_i and D_{ii} adjusted until required SN is determined. (Note: The min. recommended asphalt thickness is 1.0 inch for less than 50,000 ESALs from p. II-35 of AASHTO, 1993.)
D_i and D_{ii} adjusted until required SN is determined. (Note: The min. recommended base thickness is 4.0 inches for less than 50,000 ESALs from p. II-35, AASHTO, 1993.)

Adjust Pavement Section to Meet Minimum Requirements for Frost Protection from WSDOT (2011):

WSDOT (2011) requires that the total depth of the pavement section be at least one-half of the maximum expected depth of freezing when the subgrade is classified as a frost-susceptible soil. Depth of freezing determined from Stevens County Building Code Ordinance 02 (1984).

	Frost Depth	30	in
	Minimum Pavement Section	15	in
D_i =	Thickness of Asphalt	**4.0**	in
D_{ii} =	Thickness of Aggregate Base (adjusted)	**11.0**	in

SN = 3.0
Calculated ESAL (W18) = 214,098

Structural Number of 4 inches of ashalt over 11 inches of base.
Calculated ESAL for 4 inches of asphalt over 11 inches of base.

References:

American Association of State Highway Transportation Officials (AASHTO), 1993. Guide for Design of Pavement Structures.
Stevens County, Washington, 1984. Stevens County Building Code Ordinance.
Washington State Department of Transporation (WSDOT), 2011. WSDOT Pavement Policy. June.
U.S. ARMY, 1987. Technical Manual (TM) 5-809-12, Chapter 15, Concrete Floor Slabs Subjected to Heavy Loads. August.

Supplement B-2.3

Rigid Pavement Calculations for Decontamination Pad

Supplement B.2.3 - Rigid Pavement Calculations for Decontamination Pad

Project Name:	Midnite Mine	**Project No.**	1011322
Facility:	Vehicle Decontamination Area		
Site Location:	near Wellpinit, WA		
Computed by:	JMC	**Date:**	7/10/2014
Checked by:	RWS	**Date:**	7/15/2014

References:

American Concrete Institute (ACI), 2001. Guide for Design and Construction of Concrete Parking Lots (ACI 330R-01).
Stevens County, Washington, 1984. Stevens County Building Code Ordinance.
Washington State Department of Transporation (WSDOT), 2011. WSDOT Pavement Policy. June.
U.S. ARMY, 1987. Technical Manual (TM) 5-809-12, Chapter 15, Concrete Floor Slabs Subjected to Heavy Loads. August.

Notes:

Truck Parking Area Minimum Requirements from WSDOT (2011):

Portland Cement Concrete (PCC)	8	IN
Crushed Stone Base Course (CSBC)	4.2	IN
Total Section Thickness	12.2	IN
Min. Pavement Section Thickness for Frost Protection	15	IN
Therefore use:		
Portland Cement Concrete (PCC)	**8**	IN
Crushed Stone Base Course (CSBC)	**7**	IN
Total Section Thickness	**15**	IN

Minimum requirements from Section 5.3.5 of WSDOT (2011) (for truck parking at rest areas).

From Section 5.3.5 of WSDOT (2011), the total pavement section must be at least one-half of the maximum expected depth of freezing when the subgrade is classified as a frost-susceptible soil. Depth of freezing determined to be 30 inches from Stevens County, Washington Building Code Ordinance 02-1984.

Calculated Slab Thickness from ACI (2001):

Estimate Modulus of Subgrade Reaction (k):	Subgrade, k_{soil}	200	PCI	k value estimate based on Table B.2 of ACI (2001) for sandy clay/clayey sand, R=17.
	Effective Subgrade (k^*_{soil})	250	PCI	Effective k value accounting for 7 inches of granular base coarse below slab, from Table 2.2 of ACI (2001).
	Subgrade, k_{rock}	500	PCI	k value estimate for weathered rock (for reference only, not used in calculations).
Assumptions for Concrete:	Compressive Strength (f'_c)	4,000	PSI	Portland cement concrete air-entrained to between 5-7%, minimum w/c ratio of 0.5.
	Flexural Strength (M_R)	600	PSI	M_R estimated from Figure 2.1 of ACI (2001).
Determine Traffic Category from Table 2.3 of ACI (2001):	Traffic Category =	D		Category D selected is the most conservative in Table 2.3 of ACI (2001).

Estimate Traffic Loading for use on Figures A-1 and A-3 of ACI (2001):

Description	QTY	Days/ Week	Weeks/ Year	Years	Vehicle Trips Over Slab	Single Axle Repetitions	Double Axle Repetitions
Heavy Equipment Mob/Demob							
Equip. Transport Deliveries (on semis)	120	1	1	2	240	240	960
Crushing Equip. Deliveries (on semis)	22	1	1	2	44	44	176
Primary Service Vehicles							
Lubricants	2	0.25	50	10	250	250	500
Tire Service	1	1	50	10	500	500	1000
Outside Major Equipment Vendors	3	1	50	10	1500	3,000	
				Total =	2534	4034	2636

Assumes each piece of heavy equipment is decontaminated twice during construction period, and conservatively assumes one (1) 20-kip single axle and four (4) 60-kip double axles per transport vehicle.

Calculate Fatigue Consumption from Figures A.1, A.2 and A.3 of ACI (2001):

	Flexural Stress (psi)	Flexural Strength (psi)	Stress Ratio	Axle Repetitions	Allowable Repetitions	Fatigue Consumption
Single Axles (assume 6-inch concrete):	300	600	0.50	4034	400,000	1.0%
Tandem Axles (assume 6-inch concrete):	380	600	0.63	2636	10,000	26.4%
				Total Fatigue Consumption =		27.4%

Assume 20 kips per single axle.
Assume 60 kips per tandem axle.
Fatigue Consumption is <<<125%, therefore 6-inch thickness is OK per Section A.1 of ACI (2001).

Evaluate Heavy Equipment Drive on Slab per U.S. Army (1987):

Input Data for Figure 5-2 of U.S. Army (1987):	Increased Concrete Compressive Strength (f'_c) =	5000	PSI	
	Reps of Maximum Axle Load (108 kips for CAT 992) =	100	Axle Repetitions	Assumes one hundred (100) 110-kip axle loads pass over the slab.
	Effective Modulus of Subgrade Reaction (K) =	250	PCI	

Develop Correlation Between Vehicle Passes and Required Thickness from Fig. 5-2 of U.A. Army (1987):	Vehicle Passes =	10,000	100,000	1,000,000
	Thickness Required (in) =	10.7	11.9	13.2

Relationship: t (in) = 0.5429 * LN(repetitions) + 5.6833

Calculate Required Thickness for 100 Repetitions (50 vehicle trips): t = 8.2 IN

Required thickness (t) for unreinforced slab for 50 vehicle trips (100 repetitions of 110-kip axles).

Determine Reinforcing Steel Requirements per Section 2.8.1 of ACI (2001):

The slab thickness of 6 inches calculated above assumes no reinforcing steel. Steel is recommended for crack control and to increase joint spacing.

Distance Between Joints (L) =	40	FT
Coefficient of Subgrade Resistance (C_f) =	1.5	
Unit Weight of Concrete (w) =	145	PCF
Slab Thickness (h) =	8	IN
Alowable Tensile Stress (f_s) =	40,000	PSI
Area of Steel Required (A_s) = ($LC_fwh/24f_s$) =	0.0725	IN^2 per FT of slab
No. 4 Bar Nominal Cross-Sectional Area =	0.2	IN^2
Area of 1 No. 4 bar @ 2 FT on Center =	0.1	IN^2 per FT of slab
For a reinforced slab with	0.0725	IN^2 per FT of slab
Reduce required thickness to	7.25	IN
Use	8	IN

Typical value per Section 2.8.1 of ACI (2001).

For grade 60 steel per Section 2.8.1 of ACI (2001).

Equation 2-2 from ACI (2001).

Minimum thickness, Figure 5-4, U.S. ARMY (1987).

Midnite Mine Superfund Site
100 Percent Design

Appendix C – Borrow Area

June 2015

Prepared for:

Dawn Mining Company
PO Box 250
Ford, Washington 990413

and

Newmont USA Limited
6363 South Fiddler's Green Circle
Greenwood Village, Colorado 80111

Prepared By:

MWH Americas, Inc.
2890 E. Cottonwood Parkway, Suite 300
Salt Lake City, UT 84121

TABLE OF CONTENTS

C1.0 INTRODUCTION 1

C2.0 CANDIDATE SITES 2

C2.1 Rhoads Property Borrow Area 2

C2.2 Ford Borrow Area 3

C3.0 COMPLIANCE WITH PERFORMANCE STANDARDS 5

C4.0 ENGINEERING DRAWINGS 6

C5.0 GREEN AND SUSTAINABLE REMEDIATION CONSIDERATIONS 6

C5.1 Borrow Area Construction Material Considerations 6

C5.2 Borrow Area Construction Methods 7

C5.3 Borrow Area Low Impact Development/Sustainability 7

C6.0 REFERENCES 9

ATTACHMENTS

Attachment C-1 Rhoads Property Plan of Operations and Reclamation

Attachment C-2 Ford Borrow Area Plan of Operation and Reclamation

LIST OF ACRONYMS

BODR	Basis of Design Report
CD	Consent Decree
cy	cubic yard
DMC	Dawn Mining Company
EPA	U.S. Environmental Protection Agency
GSR	Green and Sustainable Remediation
HEP	Habitat Evaluation Procedures
HSWRP	Hillside Waste Rock Pile
MM	Midnite Mine
MT	metric tons
Newmont	Newmont USA Limited
POR	Plan of Operations and Reclamation
RA	Remedial Action
RAO	Remedial Action Objective
ROD	Record of Decision
Site	Midnite Mine Superfund Site
SOW	Scope of Work
Tribe	Spokane Tribe of Indians
WCA	Waste Containment Area
WDNR	Washington Department of Natural Resources

C1.0 INTRODUCTION

This appendix to the Midnite Mine Superfund Site Basis of Design Report (BODR) summarizes the Borrow Area design information. The planned remedial actions (RAs) at the Midnite Mine (MM) Superfund Site (Site) will require clean soil be transported to the Site for final cover and reclamation of the ground surfaces. These ground surfaces include the backfilled and covered pits, the excavated mine waste rock and protore stockpiles (mine materials) areas, and the drainages where sediments and other materials are removed. It was estimated in the Record of Decision (ROD) that approximately 700,000 cubic yards (cy) of clean soil from an approved borrow source will be used to provide an estimated three-foot-thick cover over the mine materials disposal area where mine materials will be consolidated (i.e., the waste containment areas), and to provide a one-foot-thick cover as needed in areas where bedrock is exposed during mine waste cleanup. These clean soils will be used for final grading/contouring and re-vegetation of the overall ground-surfaces. Additional details regarding how the cover will be constructed and graded are included in Appendix D – Mine Waste Excavation and Containment to this BODR.

The main body of this appendix was revised to reflect Spokane Tribal Council approval of use of the Rhoads Property Borrow Area and relegation of the Ford Borrow Area as a reserve borrow area for RA cover materials. Attachment C-1 contains the updated Rhoads Property Plan of Operations and Reclamation*, Revision 2* (Rhoads POR, MWH, 2014) that was sent to EPA and the Tribe as an interim submittal in April 2014. Attachment C-2 contains the Ford Borrow Area Plan of Operations and Reclamation (Ford POR), and was revised to be consistent with the reclamation costs in Attachment C-1, and includes long-term operation and maintenance costs. Please note that should the Rhoads Property Borrow Area use be revoked and the Ford Borrow Area become the primary borrow source for the capping at the MM, there would be a significant delay in implementation of the RA. The delay would be caused primarily by the permitting and revisions to the final design drawings that will be necessary for use of this alternate borrow area and its material. In addition, significant modifications to the Steven's County Ford-Wellpinit-Westend Road would be required to accommodate the increased truck traffic that would result from hauling soil cover material from off site.

In addition to clean soil cover, smaller quantities of miscellaneous drainage and erosion protection material materials will be required. These materials will be sourced either by processing on-site mine waste materials or from off-site commercial sources, in cases where

on-site materials do not exist for the intended purpose or these materials do not meet soil cleanup standards.

C2.0 CANDIDATE SITES

Two primary off-site borrow areas were evaluated as part of the Pre-Design Investigations. These borrow areas are the Rhoads Property Borrow area, which is adjacent to the Site, and the Ford Borrow area which is south of the Dawn Millsite. A complete discussion of the characterization of these areas is included in the *Borrow Source Design Investigation Report* (MGC, 2011).

C2.1 Rhoads Property Borrow Area

The Rhoads Property Borrow Area is an approximate 81-acre parcel located on fee land within the boundary of the Spokane Indian Reservation, immediately adjacent to and southwest of the Site. Results of the geotechnical investigations discussed in Section 3.0 of the BODR indicate that the Rhoads Property Borrow Area contains approximately 710,000 cy of clayey sand that will be suitable for soil cap and cover material, and will be suitable for a topsoil/growth medium. In addition to the soils being suitable for cover material, a key advantage to using the Rhoads Property as the borrow source is the proximity to the Site. This will allow for short haul distances and eliminates over-the-road haul-truck traffic through nearby communities. The Spokane Tribal Council conditionally authorized use of the Rhoads property during the RA in a resolution dated February 21, 2014. The *Rhoads POR* (MWH, 2014) was prepared and submitted to the Tribal Council describing how site materials would be excavated, transported, and the property will be reclaimed. Due to the fee land status of the Rhoads Property, permitting with Stevens County and the State of Washington Department of Natural Resources (WDNR) is required for this borrow area. Appendix M contains additional information regarding the required borrow area permitting.

Details of how the Rhoads Property would be used to supply borrow material during the RA is presented in the *Rhoads POR – Rev 2*, which is included in Attachment C-1. The *Rhoads POR* includes an Excavation Plan, Reclamation Plan, Long-Term Monitoring and Maintenance Plan, and a Stormwater Pollution Prevention Plan in addition to several other attachments (e.g., noxious weed plan) that were added since the initial version was submitted October 2012. The *Rhoads POR* also summarizes the results from previous investigations of the proposed borrow source and uses that information in various evaluations presented in the document.

C2.2 Ford Borrow Area

The Ford Borrow Area is an approximately 332-acre tract located near Ford, Washington and approximately 20 road miles east of the Site. The Ford Borrow Area is a reserve borrow area, in case there is an insufficient volume of suitable borrow material in the Rhoads Property Borrow Area or permitting of the Rhoads Property Borrow Area is unsuccessful. Results of the geotechnical investigations summarized in Section 3.0 of the BODR and in the attached *Ford POR* in Appendix C-2, indicate the Ford Borrow Area contains adequate quantities for cover material of two primary soil types: clean uniform sands and broadly graded sandy gravels, with varying amounts of cobbles.

Use of this borrow area as a source of borrow material will involve transportation of the material to the Site by way of over-the-road dump trucks and trailers for a one-way distance of approximately 20 miles. If the Ford Borrow Area is used, then trucks will travel through the communities of Ford and Wellpinit via the south borrow area roadway at the Dawn Millsite, State Highway 231, the Ford-Wellpinit/McCoy Lake Road, and the new Access Road constructed at the Site.

Despite the fact that the Ford Borrow Area contains adequate quantities of borrow material, the relatively low percentage of silt and clay in these materials make them less desirable as a cover material. Specifically, the low percent of silt and clay affects the soil's ability to retain moisture, which is a key constituent for reduction of meteoric water infiltration and radon emanation. If this source is used, a six-foot thick soil cover would be required in the areas where mine materials will be consolidated in the pits (as opposed to a three-foot thick layer if the Rhoads Property borrow material is used).

If the Ford Borrow Area is used for cover material, an upper plant growth layer would be required. The top 0.5 feet of the soil cover would consist of topsoil or amended soil to promote the establishment of vegetation. The recommended amendments are provided in the Revegetation Plan (located in BODR Appendix D, Attachment D-12). It is proposed that this plant growth material be obtained from the Lane Mountain processing facility in Valley Washington or a similar material source. This material is also characterized in the *Borrow Source Design Investigation Report* (MGC, 2011).

Details of how the Ford Borrow Area would be used to supply borrow material during the RA is presented in the *Ford POR,* which is included in Attachment C-2. The Ford POR also

summarizes the results from previous investigations of the proposed borrow area and uses that information in various evaluations presented in the document.

C2.3 Miscellaneous Material

Additional, relatively small quantities of drainage and erosion protection material materials will required for completions of RA construction. The SDs intend, to the extent practical, is to use on site materials sourced from the Hillside Waste Rock Pile (HSWRP) for the on-site drain and liner bedding materials.

A summary of estimated quantities for earthen materials that will be obtained from off-site commercial sources are summarized in Table C-1. These quantities and considerations associated with on-site processing of Hillside Waste Rock Pile (HSWRP) materials are discussed further in Appendix D. Drain materials that are to be placed outside of the Waste Containment Area (WCA) or above the WCA geomembrane cover are required to meet soil cleanup standards and will be sourced from off-site commercial sources. Likewise, erosion protection materials (e.g. rip rap and rip rap filter layers) are required to meet soil cleanup standards and will be sourced from off-site commercial sources.

Table C-1. Summary of Estimated Offsite Material Quantities

Material Description	Specification Section Reference	Estimated Quantity (Cubic Yards)
Crushed Aggregate Base Course	02200-2.2.F	2,148
Crushed Aggregate Surface Course	02200-2.2.G	9,913
Pea Gravel	02200-2.2.H	173
Clean Drain Gravel	02200-2.2.I	8,331
Filter Sand - Similar to 02205-2.3.B below, but must meet soil cleanup standards.	02200-2.2.K	715
Intermediate Filter Sand - Similar to 02205-2.3.C below, but must meet soil cleanup standards.	02200-2.2.L	1,370
Filter Sand - Similar to 02200-2.2.K, but is used in WCA, not required to meet soil cleanup standards.	02205-2.3.B	1,306
Intermediate Filter Sand - Similar to 02200-2.2.L, but is used in WCA, not required to meet soil cleanup standards.	02205-2.3.C	1,453
Alluvial Groundwater Control System - Drain Sand	02223-2.1.E	1,025
Type 0 (3-inch) Rip Rap	022273-2.1.B.1	16
Type I (6-inch) Rip Rap	022273-2.1.B.2	677
Type II (9-inch) Rip Rap	022273-2.1.B.3	4,003
Type III (12-inch) Rip Rap	022273-2.1.B.4	6,676
Type V (24-inch) Rip Rap	022273-2.1.B.6	2,873
Type I Rip Rap Filter	022273-2.3.A.1	2,311
Type II Rip Rap Filter	022273-2.3.A.2	3,404
Type III Rip Rap Filter	022273-2.3.A.3	599

C3.0 COMPLIANCE WITH PERFORMANCE STANDARDS

The Consent Decree (CD) Scope of Work (SOW) includes the Performance Standards that 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 Site remedy are summarized on Table 4-6 in the BODR. That master table lists each Performance Standard, summarizes where or how each is addressed in this BODR, and the current status.

Performance Standards specific to the cover construction are discussed in Appendix D – Mine Waste Excavation and Containment. The key Performance Standard related to the geologic cover materials (Performance Standard 2.4.2.4.2 H. ii.) requires that the cover thickness be sufficient to limit radon flux from the consolidated materials. As discussed above, the clayey sand in the Rhoads Property Borrow Area is better suited to meet this Performance Standard

because these materials require a thinner cover than the sandy materials from the Ford Borrow Area.

C4.0 ENGINEERING DRAWINGS

The engineering drawings for the two proposed borrow sources are contained in Volume II of the BODR. These drawings are listed below.

Sheet Number	Description
3-101	Rhoads Property Borrow Source Location Map
3-102	Rhoads Property Borrow Area Pre-Excavation Map
3-103	Rhoads Property Temporary Haul Road Key Map
3-104	Haul Road Plan and Profile Station 0+00 to 15+00
3-105	Temporary Haul Road Plan and Profile Station 15+00 to 30+00
3-106	Temporary Haul Road Plan and Profile Station 30+00 to 45+00
3-107	Temporary Haul Road Plan and Profile Station 45+00 to 60+00
3-108	Temporary Haul Road Plan and Profile Station 60+00 to END
3-109	Rhoads Property Final Reclamation Topography Map
3-110	Reclaimed Borrow Area Sections A and B
3-111	Reclaimed Borrow Area Section C
3-112	Borrow Area Typical Details and Sections
3-201	Ford Borrow Area Location Map
3-202	Ford Borrow Area Existing Conditions
3-203	Ford Borrow Area Layout
3-204	Ford Borrow Area Cross Sections
3-205	Ford Borrow Area Reclaimed Layout

These drawings are included in the *Rhoads POR* (Attachment C-1) and the *Ford POR* (Attachment C-2).

C5.0 GREEN AND SUSTAINABLE REMEDIATION CONSIDERATIONS

The green and sustainable remediation (GSR) considerations for obtaining borrow material during the RA are summarized below. The areas where GSR principles have been evaluated are: 1) Construction Materials (characteristics and manufacturing considerations), 2) Construction Methods, and 3) Low Impact/Sustainability measures that will be used during the excavation, transport, placement, and reclamation of the potential borrow areas during the RA.

C5.1 Borrow Area Construction Material Considerations

As stated above, the characteristics of the borrow material found at the Rhoads Property Borrow Area are more suitable for use as cover and for revegetation due to its clay content. In addition,

the soils from the Rhoads Property Borrow Area will allow for a thinner cover than the sandy soils from the Ford Borrow Area. A thinner cover (less material volume) directly equates to fewer equipment hours for excavation, transport, and placement of the cover system.

C5.2 Borrow Area Construction Methods

The construction equipment used for borrow source excavation and reclamation will be appropriately sized, depending on the topography of the area, to reduce fuel consumption and greenhouse gas emissions. Construction will be sequenced to minimize stormwater erosion during these activities. Dust suppression will be utilized at the Rhoads Property Borrow Area and on the haul roads from the borrow area to the Site to decrease dust emissions. Please refer to the dust control details in Attachments C-1 and C-2.

C5.3 Borrow Area Low Impact Development/Sustainability

The primary green and sustainable considerations for the use of the Rhoads Property over the Ford property as a cover borrow source are (1) its close proximity to the Site (approximately 150 feet southwest versus 20 miles), and (2) the smaller volume of Rhoads Property material needed for the RA cover. Because the Rhoads property is directly adjacent to the Site, it greatly reduces the truck haul distances required to transport the borrow material and eliminates haul-truck traffic through nearby communities during the three major periods of cover construction. The higher clay content in the Rhoads Property Borrow Area material results in a lower thickness and smaller volume of cover material (than Ford Borrow Area material) to meet radon emanation and infiltration control requirements. It is estimated that 2,000 metric tons (MT) of greenhouse gas emissions will be associated with the excavation, transportation, and placement of the Rhoads Property Borrow Area material, compared to approximately 10,000 MT if the Ford Borrow Area is used as the borrow source. This use of the Rhoads Property saves an estimated 836,000 gallons of diesel fuel and 8,000 MT of greenhouse gas emissions.

Along with significant greenhouse gas savings through the use of the Rhoads Property, there are other key green and sustainable considerations directly related to its location and the much reduced haul-truck traffic. These potential GSR benefits are:

- Low potential for traffic congestion, collisions or accidents, or road damage due to no over-the-road hauling of borrow materials.
- Reduced community impacts. If the Ford Borrow Area is used, haul truck traffic will cause noticeable increases in noise, road wear, and engine exhaust along the transport

route. Use of the Rhoads Property would essentially reduce vehicle traffic through Wellpinit to construction personnel, fuel transport, and non-borrow material transport. As a result, there would be limited effects on the character of the local communities due to construction-related traffic.

Additional green and sustainable practices that will be employed should the Rhoads Property be used include:

- To minimize impact to the riparian corridor along Whitetail Creek, which runs north to south along the east side of the Rhoads property, no excavation will be performed within a minimum 50-foot buffer area on either side of the stream, and proper grading of the surface as it approaches the 50-foot buffer zone will be performed to prevent sediment migration to the creek.
- The upper 1 foot of excavated soil will be stockpiled near the borrow area and re-used, after excavation of the borrow material is complete, to reclaim the borrow site.
- The commercial-value timber at the Rhoads Property Borrow Area will be bid to a Tribal timber contractor for clearing and harvest. Newmont/DMC representatives will coordinate with the Tribal Council to identify potential ways to distribute timber proceeds in a manner that is beneficial to the Tribe.
- The re-vegetation plan includes the hydroseeding of a native, Tribal-approved seed mix followed by the planting of native trees and shrubs to provide habitat and food for local wildlife populations. The actual seed mix and application rates were updated following the HEP vegetation survey in 2014. Seed mix and application rates are discussed in Revegetation Plan (Appendix D, Attachment D-12)
- The plant seedlings will be native to the borrow area. Arrangements will be made with a local nursery to promulgate the seed materials from the site and grow the seedlings from these seed sources.
- After revegetation efforts are complete, noxious weed surveys will be conducted routinely as described in an attachment to the *Rhoads POR* and in the body of the *Ford POR*. These efforts will help ensure native plant populations are retained and maintained on the reclaimed land surfaces.

C6.0 REFERENCES

Miller Geotechnical Consultants (MGC), 2011. Borrow Source Design Investigation Report, Revision 2, May 6.

MWH Americas Inc. (MWH), 2014. Rhoads Property Plan of Operations and Reclamation, Revision 2. April 29.

.

Attachment C-1

Rhoads Property Plan of Operations and Reclamation

Rhoads Property Plan of Operations and Reclamation

Revision 2

April 29, 2014

Prepared for:

Dawn Mining Company
PO Box 250
Ford, Washington 99013

and

Newmont USA Limited
6363 South Fiddler's Green Circle
Greenwood Village, Colorado 80111

Prepared By:

MWH Americas, Inc.
3665 JFK Parkway, Bldg 1, Suite 206
Fort Collins, Colorado 80525

TABLE OF CONTENTS

1.0 INTRODUCTION 1

1.1 PROJECT BACKGROUND 1
1.2 RHOADS PROPERTY PHYSICAL CHARACTERISTICS 2
1.2.1 Rhoads Property Description 2
1.2.2 Topography 2
1.2.3 Geology 2
1.2.4 Surface Water Hydrology 3
1.2.5 Groundwater Hydrology 4
1.2.6 Whitetail Creek Sediment Assessment 6
1.2.7 Climate 6
1.2.8 Vegetation 7
1.3 STAKEHOLDER COORDINATION AND COMMUNICATIONS 7
1.3.1 Project Stakeholders 7
1.3.2 Project Planning and Stakeholder Communications 8
1.4 CULTURAL CONSIDERATIONS 10
1.5 SCHEDULE 10

2.0 EXCAVATION PLAN 12

2.1 NEW ACCESS ROAD AND BORROW AREA HAUL ROAD 12
2.2 BORROW AREA HAUL ROAD 12
2.3 SITE ACCESS AND CONTROL 12
2.4 EXCAVATION EQUIPMENT 13
2.5 DUST CONTROL 13
2.6 SOIL STOCKPILE AREAS 14
2.7 SENSITIVE ENVIRONMENTS 15
2.8 EXCAVATION SEQUENCING 15
2.8.1 Preserve Vegetation/Mark Clearing Limits 16
2.8.2 Stormwater Management 16
2.8.3 Timber Harvest 18
2.8.4 Clearing 18
2.8.5 Salvaging Topsoil 18
2.8.6 Excavating Underlying Soil 18

3.0 RECLAMATION PLAN 20

3.1 PREPARING AND RE-CONTOURING THE EXCAVATED SURFACES 20
3.2 REPLACING THE SALVAGED TOPSOIL 20
3.3 REVEGETATION 21
3.3.1 Hydroseeding 21
3.3.2 Tree and Shrub Planting 22

4.0 LONG-TERM MONITORING AND MAINTENANCE PLAN 23

5.0 CONSTRUCTION-DERIVED WASTE HANDLING AND DISPOSAL 24

6.0 TRIBAL EMPLOYMENT RIGHTS ORDINANCE 25

7.0 FINANCIAL/OWNERSHIP RESPONSIBILITIES AND SURETY 26

8.0 REFERENCES 27

TABLES

Table 1. Rhoads Property– Radiological Test Results..... 3
Table 2. Rhoads Property Piezometer – Depth to Water Measurements..... 5
Table 3. Rhoads Property Revegetation Seed Mix.....22

FIGURES

Figure 1 Site Location
Figure 2 Rhoads Borrow Area Detailed Map
Figure 3 Rhoads Borrow Area Pre-Excavation Map
Figure 4 Rhoads Borrow Area Geology Map
Figure 5 NRCS Soil Survey Map for the Rhoads Property
Figure 6 Initial Work – Access Road Construction
Figure 7 Phase 1 – Excavation Sequence
Figure 8 Phase 2 – Excavation Sequence
Figure 9 Phase 3 – Excavation Sequence
Figure 10 Final Reclamation Topography Map
Figure 11 Midnite Mine Access Road Typical Section
Figure 12 Borrow Area Haul Road Typical Section
Figure 13 Whitetail Creek Haul Road Crossing
Figure 14 Procedures for Transplanting Bareroot or Container Plants

APPENDICES

Appendix A Rhoads Property Stratigraphic Logs and Piezometer Completion Diagrams
Appendix B Pre-Design Data Needs – Midnite Mine Standard Operating Procedures – Groundwater Well Installation and Development
Appendix C Habitat Evaluation Procedures - Standard Measurement Protocols and Techniques
Appendix D Midnite Mine Standard Operating Procedure 04 – General Survey Meter Operations and Contamination Surveys
Appendix E Noxious Weed Management Plan
Appendix F Lignosulfonate and Soil Sement® Brochures and Materials Safety Data Sheets (MSDS)
Appendix G Rhoads Borrow Area, pre-project vs. post-project surface water analyses
Appendix H Rhoads Property Stormwater Pollution Prevention Plan
Appendix I Spokane Tribe TERO Compliance Plan
Appendix J Rhoads Property Reclamation Cost Estimate
Appendix K EPA Form 7630 - FARR Initial/Annual Source Registration
Appendix L General Air Quality Permit for New or Modified True Minor Source Stone Quarrying , Crushing, and Screening Facilities in Indian Country

LIST OF ACRONYMS

AASHTO	American Association of State Highway and Transportation Officials
amsl	above mean sea level
bgs	below ground surface
BMP	Best Management Practice
CFR	Code of Federal Regulations
cpm	counts per minute
CSWGP	Construction Stormwater General Permit
CWA	Clean Water Act
DBH	diameter at breast height
DNR	Spokane Tribe Department of Natural Resources
EPA	U.S. Environmental Protection Agency
F	Fahrenheit
FARR	Federal Air Rules for Indian Reservations
HEP	Spokane Tribe Habitat Evaluation Procedures
IRMP	Tribal Integrated Resource Management Plan
lbs./acre	pounds per acre
MCLs	maximum contaminant levels
MM	Midnite Mine
Newmont	Newmont USA Limited
NRCS	Natural Resources Conservation Service
NWMP	Noxious Weed Management Plan
PLS	pure live seed
POR	Plan of Operations and Reclamation
RA	Remedial Action
RAWS	Remote Automatic Weather Station
RCRA	Resource Conservation and Recovery Act
RI	Remedial Investigation
ROD	Record of Decision
RST	Radiation Safety Technician
SOP	standard operating procedure
STHPO	Spokane Tribal Heritage Protection Officer
SWPPP	Stormwater Pollution Prevention Plan
TBC	Spokane Tribal Business Council
TDS	total dissolved solids
TERO	Spokane Tribe of Indians Tribal Employment Rights Ordinance

Tribe	Spokane Tribe of Indians
TSS	total suspended solids
WDOE	Washington Department of Ecology

1.0 INTRODUCTION

This plan presents details for obtaining soil borrow material from the Rhoads Property for use as soil cover during the remediation of the Midnite Mine Superfund Site (MM). This plan also includes the proposed reclamation activities that will be conducted to return the Rhoads Property to the identified post-operation land use(s). Rhoads Property reclamation will be conducted concurrently with excavation and removal of soil borrow material.

The proposed activities included in this plan include:

- Excavation and removal of cover soil materials (borrow materials) in stages from the Rhoads Property.
- Reclamation of the disturbed areas concurrent with the completion of the construction season excavation and removal of the borrow materials to restore the property's aesthetic qualities, wildlife habitat and traditional land uses (e.g., plant gathering for food and medicinal purposes, outdoor recreation).
- Management of the property's natural resources during the excavation and reclamation processes.

1.1 PROJECT BACKGROUND

The Rhoads Property and adjacent MM are located in Stevens County on the Spokane Indian Reservation in eastern Washington State, approximately 45 air miles northwest of Spokane (see Figures 1 and 2). MM is an inactive open-pit uranium mine and includes stockpiles of waste rock and protore (mining wastes) excavated during the active mining operations. The planned remedial actions at MM, as required by the Record of Decision (ROD; EPA, 2006), include consolidating the mining wastes in the open pits and capping the consolidated mining wastes with suitable soils. In addition, soils are needed to cover areas where mining wastes will be removed, and for final grading and revegetation of the ground-surfaces. The Rhoads Property was selected as a potential soil borrow source based on the available volume and quality of soils and its proximity to MM. The assessment and evaluation of the Rhoads Property as a borrow source for cover soils are summarized in the following documents:

- *Borrow Source Design Investigation Report – Revision 2* (MGC, 2011a)
- *Technical Memorandum Rhoads Property Borrow Investigation Phase II – Revision 1* (MGC, 2011b)
- *Midnite Mine Superfund Site Borrow Area Evaluation, Revision 1* (MWH, 2012)
- *Technical Memorandum - Rhoads Property Borrow Area Vegetation Survey* (WME, 2012)

Phase II borrow investigation volume estimates identified that 710,000 cubic yards of soil could be available at the Rhoads Property for use during the MM reclamation (MGC, 2011b). In addition, MM remedial design has identified approximately 100,000 cubic yards of soil could be available in existing MM topsoil stockpiles, and from required MM remedial excavations. Considering the two sources for materials supply, it is estimated that approximately 810,000 cubic yards of soil could be available for Remedial Action (RA) construction. Current remedial design estimates identify that up to 625,000 cubic yards of soil could be required to construct

the MM waste containment soil cover. In addition, it is estimated that as much as 200,000 cubic yards of soil could be required if the entire remaining mine disturbance areas require 1 foot of soil cover to aide in reestablishment of vegetation after soil cleanup activities are completed. Thus, it is estimated that up to 825,000 cubic yards of reclamation soil may be required to complete MM remedial construction.

1.2 RHOADS PROPERTY PHYSICAL CHARACTERISTICS

1.2.1 Rhoads Property Description

The Rhoads Property is an 81-acre land parcel situated on fee land within the boundary of the Spokane Indian Reservation, just southwest of MM (see Figure 2). The property is located in the North ½ of the Northeast ¼ of Section 14, Township 28 North, Range 37 East, Willamette Meridian. Additional details regarding the property's physical characteristics including topography, geology, surface water hydrology, climate, and vegetation are provided below.

1.2.2 Topography

The site generally slopes from north to south, dropping about 100 feet in elevation from approximately 2,500 feet above mean sea level (ft. amsl) on the north to 2,400 ft. amsl on the south. Slopes across the site range from less than 5 percent, to greater than 35 percent. East to west, the site straddles an undulating surface of northeast-southwest trending swales and intervening ridges. The existing (pre-excavation) topography is shown on Figure 3.

1.2.3 Geology

The Rhoads Property bedrock geologic setting is dominated by a granitic quartz monzonite that underlies unconsolidated alluvium, glacial deposits, and residuum (soil resulting from the in-place weathering of the monzonite) (See Figure 4). The Natural Resources Conservation Service (NRCS) soils map for this area is shown on Figure 5. The eastern half of the parcel is mapped as NRCS Unit 79 – Dragoon silt loam, a material characterized as residuum derived from granitic rock, mixed with volcanic ash and loess. Soil deposits in the northwestern portion (Unit 27 Bestom silt loam) are characterized as volcanic ash and loess over glacial till. The soils in the southwestern portion (Unit 57 – Clayton fine sandy loam) are described as mixed glacio-fluvial deposits in the NRCS soils survey reports.

Test pits excavated in the Rhoads Property are shown on Figure 3 as part of previous design investigations and indicate that the depth to bedrock ranges approximately 4 to 16 feet below ground surface (MGC, 2011a and 2011b). The Rhoads Property overburden (as observed in the test pits) generally consists of clayey sand soil derived from weathered granitic bedrock. The predominant material types can be grouped as follows:

- Topsoil
- Clayey sand – predominant soil material, ranges in thickness from 3-8 feet thick
- Weathered bedrock – The upper portion of bedrock is extremely weathered to disintegrated Quartz Monzonite residuum that gradually becomes less weathered with depth. The uppermost disintegrated and extremely weathered bedrock is potentially suitable for use as cover material. This upper portion of the bedrock can typically be excavated with a backhoe or dozer to produce fragments of weathered granite up to 6-inches in size in a silty to clayey sand matrix.

As described in Section 2.8, the borrow activities will include removing approximately 4 to 16 feet of the existing excavatable material for use as cover at MM. After the borrow materials have been excavated from a particular segment, the excavated surface will be re-contoured (see Section 3.0). A minimum of 1 foot of residual subsoil will be left in place at the bottom of the excavations prior to re-contouring. The excavated land surface will be ripped along contour with a track-mounted dozer to produce a loose subsoil substrate that will allow substrate weathering by moisture infiltration, subsoil moisture freeze/thaw during winter conditions, and plant root penetration. Salvaged topsoil will be placed on top of the residual subsoil as discussed below such that approximately 2 feet or more of growth medium substrate (residual subsoil and topsoil) remains in the reclaimed areas.

Borrow and reclamation activities will escalate the rate of subsoil weathering of the uppermost quartz monzonite due to the physical conditions discussed above. Radon levels will not change over the area as the borrow material is removed. Radon gas generation is a function of the radium concentrations in the soil and the moisture content of the soil. The radium concentrations of the soil material range from 1 to 3 pCi/g and the radium in the underlying weathered bedrock range from 1.6 to 2 pCi/g as shown on the following table taken from the *Borrow Source Design Investigation Report* (MGC, 2011a). The values for the overlying soil and the underlying weathered bedrock are the same and are typical of radium values in non-mineralized areas. Since the radium levels are not different at depth, the radon rates in the area are not expected to differ. Soil moisture can have an effect on the radon flux from an area if there are layers at depth that are higher than the upper layers. As the radium levels at depth are the same, and at levels indicative of average conditions in non-mineralized areas, the radon flux will not be different across the site after the borrow excavation and will be at levels that are similar to other non-mineralized areas.

Table 1. Rhoads Property– Radiological Test Results

Sample	Parameter			Material Description
	Lead 210 (pCi/g)	Radium 226 (pCi/g)	Uranium (mg/kg)	
RP-P3 / 2'-4'	1.6 +/- 1.1	2.1 +/- 0.2	6.4	Weathered Bedrock
RP-P5 / 4'-6'	1.2 +/- 1	1.1 +/- 0.1	2.0	Very clayey sand
RP-P6 / 2'–7'	3.5 +/- 1.1	3.0 +/- 0.2	6.4	Clayey sand with gravel
RP-P7 / 3'-9'	1.1 +/- 1	1.6 +/- 0.2	3.8	Clayey sand
RP-P11 / 1'–4'	0.1 +/- 1	1 +/- 0.1	2.3	Silty sand to sandy silt
RP-P11 / 6'-8'	0.7 +/- 1	1.1 +/- 0.1	3.0	Very clayey sand
RP-P13 / 4'–7'	0.7 +/- 1.1	1.6 +/- 0.2	3.8	Weathered Bedrock
RP-P14 / 5'-7'	0.9 +/- 1	1.7 +/- 0.2	4.7	Weathered Bedrock
RP-P16 / 3'–5'	0.3 +/- 1	1.1 +/- 0.1	2.1	Sandy clay

1.2.4 Surface Water Hydrology

The primary Rhoads Property surface water drainage is Whitetail Creek (referred to as the Far West Drainage in the EPA Remedial Investigation Report [EPA, 2005]). Whitetail Creek is an intermittent stream flowing in a north to south direction across the eastern portion of the property as shown on Figure 3. Several smaller ephemeral tributaries to Whitetail Creek traverse the property. The Whitetail Creek drainage flows in a southwesterly direction after leaving the Rhoads Property, roughly in a parallel direction to Blue Creek before it drains to Lake Roosevelt. In general, stream flow in the vicinity of the Rhoads Property is minimal or

absent during most of the year. The highest surface water flows occur in the spring during periods of increased rainfall and snowmelt. Whitetail Creek flows perennially along the Ford Wellpinit Highway but no surface flow makes it to the downstream highway culvert/crossing. Subsurface flows could feed springs along Blue Creek or the Spokane Arm of Lake Roosevelt.

1.2.5 Groundwater Hydrology

The groundwater system at the Rhoads Property is interpreted from the results of the Remedial Investigation (RI) performed at the adjacent MM (EPA, 2005), and from data collected during the two phases of investigation performed to evaluate the Rhoads Property as a borrow source (MGC, 2011a and MGC, 2011b).

In general, regional groundwater flows within two principal geologic material types: regolith and the shallow fractured bedrock. The regolith is an unconsolidated hydrogeologic unit consisting primarily of alluvium, but also includes colluvium, glacial deposits, and weathered bedrock. The bedrock hydrogeologic unit underlies the regolith and consists of the un-weathered granitic quartz monzonite. The upper un-weathered monzonite is fractured via exfoliation, resulting in horizontal fractures to depths approximately 50 feet below the un-weathered surface. The shallowest aquifer in the regolith is generally isolated from and perched on the un-weathered horizontally fractured monzonite. As a result, the two flow systems are expected to have different geochemistry, particularly in wells screened in shallow glacial deposits and deeper fractured monzonite.

Recharge to the shallowest aquifer in the regolith is from percolation of precipitation or from infiltration of intermittent or ephemeral surface water that flows in Whitetail Creek and the other unnamed drainages in and around the Rhoads Property. Recharge to the fractured monzonite is from leakage from the overlying regolith aquifer (in areas with downward gradients) and from infiltration where the bedrock is at or close to the ground surface. In areas surrounding MM where bedrock is exposed at the ground surface or underlies thin soils with natural vegetation, the amount of water entering the groundwater flow system is estimated to be 10 percent or less of precipitation (EPA, 2005). Generally, the percolating water migrates downward, accumulates and flows laterally in the more-permeable weathered bedrock that overlies the less-permeable un-weathered bedrock. Groundwater flow directions at the Rhoads Property are generally to the south; and are topographically driven with flow moving from areas of high topography toward stream valleys and drainages.

Newmont USA, Limited/Dawn Mining Company LLC (Newmont) installed five piezometers (RP-PZ1 through RP-PZ5) in the Rhoads Property during September 2011, located as shown on Figure 3, to determine if groundwater is present in the alluvium and weathered bedrock that is targeted for use as borrow material. The borehole stratigraphic logs and piezometer completion diagrams are included in Appendix A. Each piezometer was installed at the depth of hollow-stem auger refusal, which is inferred to be the contact between weathered and un-weathered bedrock. The completed piezometer depths range from approximately 14 feet below ground surface (bgs) to approximately 25 feet bgs. Quarterly water-level monitoring was performed between November 2011 and July 2013 as summarized on Table 1. Piezometers RP-PZ1, RP-PZ2, and RP-PZ3 (which all are installed at depths of 14 or 15 feet bgs) were dry at the time of each quarterly measurement. Depth-to-water in RP-PZ4 (completed at 17.7 feet bgs) ranged from dry (i.e., greater than 17.7 feet bgs) to approximately 7 feet bgs. Depth-to-water in RP-PZ5 (completed at 25 feet bgs) ranged from dry (i.e., greater than 25 feet bgs) to approximately 18 feet bgs. Both RP-PZ4 and RP-PZ5 were dry when water-level measurements were collected in the winter, and had the highest water levels in the spring. The

relatively high water level measured in RP-PZ4 (i.e., 7 feet bgs) indicates that groundwater may be locally perched in this area. The potential for locally perched groundwater is further supported by the drilling log for RP-PZ4, which indicates moist-to-wet soil conditions were encountered in the clayey sands at depths between 9 feet and approximately 14.5 feet, with dry-to-slightly moist conditions encountered in the underlying extremely weathered (decomposed) bedrock below 17 feet. This suggests that lower permeability soils limit the downward flow of water into the underlying decomposed bedrock in the vicinity of RP-PZ4.

Table 2. Rhoads Property Piezometer – Depth to Water Measurements
(feet below ground surface)*

Date	Piezometer ID				
	RP-PZ1	RP-PZ2	RP-PZ3	RP-PZ4	RP-PZ5
11/9/2011	Dry (>14)	Dry (>15)	Dry (>14)	Dry (>17.7)	21.4
1/17/2012	Dry (>14)	Dry (>15)	Dry (>14)	Dry (>17.7)	22.9
4/26/2012	Dry (>14)	Dry (>15)	Dry (>14)	7.9	22.6
7/9/2012	Dry (>14)	Dry (>15)	Dry (>14)	12.0	19.5
10/4/2012	Dry (>14)	Dry (>15)	Dry (>14)	Dry (>17.7)	24.0
1/9/2013	Dry (>14)	Dry (>15)	Dry (>14)	Dry (>17.7)	Dry (>25)
4/17/2013	Dry (>14)	Dry (>15)	Dry (>14)	6.6	18.3
7/19/2013	Dry (>14)	Dry (>15)	Dry (>14)	12.5	24.9

* Depth-to-water measurements were made from the top of the PVC piezometer casing; the depths-to-water included on the above table are corrected to subtract the length of stick-up casing from the original measurement.

Although it is not anticipated that the borrow and reclamation activities will impact the groundwater in the two flow systems underling the Rhoads Property, five monitoring well pairs will be installed as shown on Figure 3 to establish baseline conditions (water levels and general chemistry) prior to performing any borrow activities, and for long-term monitoring during and following the borrow and reclamation activities. The baseline wells are located in up- and down-gradient locations along the Whitetail Creek drainage and along other unnamed drainages east and west of Whitetail Creek. The wells will be located in topographic low areas within the drainages where groundwater is likely to converge and migrate onto and away from the site.

The baseline monitoring wells will be installed, developed, and sampled in accordance with the standard operating procedures (SOPs) included in the *Pre-Design Data Needs – Midnite Mine Standard Operating Procedures –Groundwater Well Installation and Development* (PDDN-SOP23; WME, 2013), which is included as Appendix B to this Plan of Operations and Reclamation (POR). Based on water level monitoring performed in the existing piezometers, it is anticipated that the shallow well in each pair will need to be screened immediately above or across the interface of the weathered and more-competent bedrock where the shallow water table is expected to be encountered (i.e., approximately 15 to 25 feet bgs). The well screens in the shallow wells will extend upward to approximately 5 feet bgs in order to monitor perched water that may be present at each location. The deep well in each pair will be screened in the underlying fractured monzonite with anticipated screened intervals between 30 and 50 feet bgs. If sufficient water is available in the monitoring wells, groundwater samples will be analyzed for the following parameters:

- Metals (aluminum, barium, beryllium, cadmium, cobalt, copper, iron, lead, manganese, nickel, silver, zinc, and uranium).
- Radionuclides (uranium -234, uranium 238, lead-210, and radium-226).

- Benzene, toluene, ethylbenzene, and xylene (BTEX).
- Polycyclic aromatic hydrocarbons (PAHs).
- Total Dissolved Solids (TDS)/Total Suspended Solids (TSS).
- Cations and Anions (calcium, magnesium, sodium, potassium, sulfate, chloride, carbonate, and bicarbonate).
- pH, specific conductivity, and temperature.

Water levels and groundwater samples will be collected semi-annually during the spring and fall seasons. The baseline monitoring data (collected prior to initiating any borrow activities) will be compared with subsequent monitoring data collected during and following the borrow and reclamation activities to evaluate impacts that the borrow/reclamation activities may have on water levels or water quality. Newmont will document the monitoring well installation and groundwater sampling activities in bi-annual progress reports that are distributed to the Tribe.

1.2.6 Whitetail Creek Sediment Assessment

Results of the MM Remedial Investigation (RI) indicated that radionuclide concentrations in Whitetail Creek sediments exceeded background levels (EPA, 2005). However, because the RI only included one composite sample in Whitetail Creek, Newmont have initiated a phased sediment sampling survey during 2013 to confirm the presence/absence of mine-related materials in the creek bed. Phase I and II radiologic and constituent concentration surveys were performed during the fall of 2013 and final investigation reports were provided to DNR (WME, 2014a and 2014b). These investigation results indicate that there are no impacted sediments in Whitetail Creek on the Rhoads Property.

It should be noted that the Borrow Plan for the Rhoads Property does not include excavation near or in Whitetail Creek as discussed below, and the preceding information regarding the EPA study was included for completeness.

1.2.7 Climate

The climate is characterized by warm, dry summers and moderately moist, cold winters. Between 1992 and 2013 the mean annual temperature at the nearby MM RAWS station was approximately 49 degrees F, with monthly average temperatures ranging from 28.2 degrees F in December to 71.9 degrees F in July.

Average annual precipitation at MM between 1992 and 2013 was about 16.5 inches, and monthly average precipitation ranges from about 0.3 inch in August to 2.1 inches in December. Of the total annual precipitation, 36 percent falls in April through September.

Monthly day and night wind speed and direction data indicate that the wind direction appears to be influenced by local topography, diurnal cycles and seasonal temperature changes. Daytime wind directions in the spring and summer months tend to be from the southwest while night winds tend to be from the west and northeast. This likely reflects the rising of warm air up the valley during the day (anabatic wind) and the sinking of cooler air in the evening (katabatic wind). In autumn and winter months, daytime winds tend to include a northeasterly component. Average wind speeds are typically below 13 mile per hour (mph). The MM RAWS station data indicate that the area is calm (< 1.2 mph) for more than 30 percent of the record.

1.2.8 Vegetation

Newmont representatives performed a vegetation survey in May 2012 at the Rhoads Property. The vegetation survey objectives were to:

1) Characterize existing vegetation conditions to support development of a borrow area revegetation plan.
2) Identify and delineate any wetlands that exist at the borrow area.

The May 2012 vegetation survey results identified that the Rhoads Property plant community, exclusive of the Whitetail Creek corridor, is fairly evenly distributed throughout the property and is dominated by a ponderosa pine (*Pinus ponderosa*) overstory, with arrowleaf balsamroot (*Balsamorhiza sagittata*), common snowberry (*Symphoricarpus albus*), bluebunch wheatgrass (*Pseudoroegneria spicata*), and pinegrass (*Calamagrostis rubescens*) dominating the understory. Minor species noted were strawberry (*Fragaria vesca*), geranium (*Geranium* sp.), silvery lupine (*Lupinus argenteus*), yarrow (*Achillea millefolium*), Idaho fescue (*Festuca idahoensis*) and Rose (Rosa sp.). The ponderosa pine is mixed with uneven aged seedlings and saplings. Small and large diameter sawtimber (9- to 15-inch diameter at breast height (DBH) and >15-inch DBH) exists across the area, while very few poletimber (5- to 9-inch DBH) exist. The average tree height of the sawtimber is 64 feet, with some large specimens reaching 75 feet tall. On average, the crown closure is approximately 41 percent (%), with an average of 30 mature sawtimber per acre. Additional vegetation information is available in the technical memorandum titled *Rhoads Property Borrow Area Vegetation Survey* (WME, 2012).

Newmont will conduct an additional vegetation survey in 2014 following the Spokane Tribe Habitat Evaluation Procedures (HEP) protocols, which are included in Appendix C. The HEP vegetation survey will further evaluate and establish species diversity and density (percent cover) for each vegetative strata, and will establish post-reclamation vegetation performance criteria. Newmont will modify the revegetation plan based on the results of the HEP survey and consultation with DNR staff.

1.3 STAKEHOLDER COORDINATION AND COMMUNICATIONS

This section identifies the project stakeholders, their roles, and how key issues will be communicated and resolved during the planning and execution of the proposed Rhoads Property borrow and reclamation activities.

1.3.1 Project Stakeholders

Spokane Tribe of Indians

The Spokane Tribe of Indians (Tribe) is the lead agency for the permitting, approval and regulatory oversight of the land associated with the Rhoads Property borrow site.

Tribal entities that are responsible for the Rhoads Property soil borrow operations and reclamation activities include:

- ***Spokane Tribal Business Council (TBC)*** – The TBC is elected by the general Tribal membership to create law and order code, manage resource-based business transactions, taxation, employ legal representation, government relations, and appoint committees. The TBC is charged with the duty of protecting the health, security, and

general welfare of the Tribe and all reservation residents. Mr. Rudy Peone is the TBC Chairman, and Mr. Rodney Abrahamson is the TBC Vice Chairman.

- ***Spokane Tribe Department of Natural Resources (DNR)*** – The Tribal DNR's mission is to preserve, protect, manage and enhance the long term sustainability of natural resources for present and future generations, through an interdisciplinary process by developing and implementing Best Management Practices (BMPs). Mr. B.J. Kieffer is the DNR Director.

  Programs within the DNR that have interest or expertise related to the proposed Rhoads Property borrow and reclamation activities include the:

  - ✓ Water and Fish Program
  - ✓ Wildlife Program
  - ✓ Air Quality Program
  - ✓ Forest Development
  - ✓ Fuels Management

Newmont USA, Limited/Dawn Mining Company

Newmont is responsible for implementing the Selected MM Remedy, which includes obtaining suitable borrow soil material to construct the cover system at the mine site. Newmont is responsible for procuring consultants and contractors to perform the borrow and reclamation work, which includes budgeting and securing the necessary funds. The Newmont Project Coordinator is Mr. Nick Cotts and the Alternate Project Coordinator is Mr. William Lyle. Mr. Lyle also is the Dawn Mining Company LLC General Manager.

Environmental Protection Agency

The EPA is the lead agency governing the remediation of MM. Courtesy copies of transmittals related to the Rhoads Property borrow and reclamation activities (including this POR) will be provided to the EPA. The EPA Remedial Project Manager is Ms. Ellen Hale.

1.3.2 Project Planning and Stakeholder Communications

It is Newmont's intent to plan and execute the proposed work such that the soil borrow activities have minimal impacts to the surrounding lands, and the reclamation activities restore the property to as close to pre-borrow conditions as possible. The planning process is iterative and considers the interests of various project stakeholders through direct communications and through ongoing review and revision of this planning document.

Topics to be addressed with this iterative planning process are described below:

- **Vegetation Survey**. Newmont will conduct an additional vegetation survey following Spokane Tribe Habitat Evaluation Procedures (HEP) protocols, which are included in Appendix C. The HEP survey is in response to ID Team concerns that the current vegetation survey is not comprehensive. The Company will conduct the survey following the prescribed protocol for the Rhoads Property in May 2014 and submit the results in a

summary report to Tribal DNR by August 31, 2014. The HEP survey results will be submitted to the DNR and incorporated into subsequent revisions to this POR.

- **Revegetation Seed Mix and Other Considerations**. A revegetation plan is presented in Section 3.0 below. Newmont representatives will meet with the DNR (and other interested parties identified by the DNR) to determine if modifications to this plan are warranted following completion of the 2014 HEP survey described above. The discussion also will include evaluating the survival rates for trees planted on other reclaimed Tribal lands, and the feasibility of using either seeds gathered from the reservation and/or seeds available from local nurseries. Revised seed mixes and tree/shrub seedling types, and seed/seedling sources for the revegetation efforts will be included in subsequent revisions to this POR based on these communications.
- **Noxious Weed Management**. A Noxious Weed Management Plan (NWMP) is included in this POR as Appendix E to address DNR concerns that noxious weeds will proliferate during the proposed borrow and reclamation activities. The NWMP includes noxious weed control methods (e.g., physical, biological, and chemical control) and preventive measures such as equipment cleaning requirements prior to entry onto the reservation and use of certified noxious-weed-free materials such as mulch, straw, seed, etc. Any noxious-weed chemical control methods will comply with Tribal Integrated Resource Management Plan (IRMP) requirements.
- **Clean Water Act Section 404 Permit and Section 401 Certification**. Company representatives have evaluated the necessity of Clean Water Act (CWA) certification and permitting based on the planned borrow activities associated with the Whitetail Creek drainage. The drainage crossing designs will likely require a Nation-Wide CWA 404 permit application and approval from the U.S. Army Corp of Engineers and supporting regulatory agencies. CWA Section 404 regulates the discharge of dredged and/or fill material in waters of the United States. CWA Section 401 requires that any applicant for a Section 404 permit also obtain a Water Quality Certification from the State or Tribe having “same as state” status with EPA. The purpose of the 401 certification is to confirm that any discharge will be in compliance with the Tribe’s applicable Water Quality Standards. The CWA 404 and 401 permit application/certification requirements will be made under separate cover and process with the appropriate regulatory agencies.
- **Timber Proceeds**. Borrow activities will be necessary at the Rhoads Property during three distinct phases of remediation at the adjoining MM. Timber will be removed during each of these three phases of remediation and their associated borrow events. Newmont has offered to donate proceeds from the timber harvests to a tribal youth group and will work with the tribal council to determine an appropriate youth group(s) for such donations.
- **Air Permits.** The selected Project Contractor will register with EPA under the Federal Air Rules for Reservations (FARR), and to obtain an EPA-issued Minor New Source Permit. FARR registration includes submittal of an Initial/Annual Source Registration (EPA Form 7630-4; see Attachment K). After initial registration, the Project Contractor will be required to re-register each year borrow activities are performed. The applicable Minor New Source Permit is titled General Air Quality Permit for New or Modified True Minor Source Stone Quarrying, Crushing, and Screening Facilities in Indian Country (included in Attachment L). The proposed borrow activities meet the requirements for the minor source permit including material volumes (i.e., <10,500,000 tons per year), fuel

types (low-sulfur diesel or biodiesel), combined fuel consumption (<310,000 gallons [note that the entire state of Washington is designated by EPA as an "ozone attainment area"]), and dust controls (see Section 2.5).

1.4 CULTURAL CONSIDERATIONS

The proposed borrow activities will comply with the Native American Graves Protection and Repatriation Act, 25 USC§3001 et seq. 43 CFR Part 10 with regards to inadvertent discovery of Native American remains and objects. All site activities will only be conducted following consultation and approval of the Spokane Tribal Heritage Protection Officer (STHPO). As may be required by the STHPO, an observer from the Tribe may be present during the soil borrow activities. Should cultural artifacts be encountered, Rhoads Property excavation operations shall immediately cease and the STHPO will be contacted to determine the appropriate action(s). No further Rhoads Property operations in this specific area will be performed until written authorization and approval is granted by the STHPO.

A Ground Disturbance Permit was submitted to the STHPO for the test pits excavated during the borrow area investigations discussed in Section 1.1. The Spokane Tribe's Preservation Office (Preservation Office) monitored the test pit work and no cultural resources were identified. In September 2013, a Ground Disturbance Permit was submitted to the STHPO to expand the disturbance area to include the entire Rhoads Property. In the spring/summer of 2014, the Preservation Office will conduct cultural resource surveys on the Rhoads Property and will consult with the STHPO as necessary to comply with the National Historic Preservation Act.

The Preservation Office will monitor borrow and reclamation activities as the STHPO determines necessary to ensure cultural resources are protected per STHPO's recommendations. Monitoring protocols will be developed to ensure that there is a clearly understood line of communication between the cultural monitor and construction staff to reinforce their authority to stop work in specific areas based on the discovery of cultural resources. If a cultural resource is discovered, work will stop immediately and the Preservation Office will determine the resources' significance. If determined significant, the Preservation Office will alert the STHPO. The STHPO may recommend data recovery and/or curation of the resources. No further Rhoads Property operations in this specific area will be performed until written authorization and approval is granted by the STHPO.

1.5 SCHEDULE

The soil borrow excavation will be conducted concurrently with the capping of the consolidated mining wastes at MM. Soil excavation will occur during the summer and early fall seasons (i.e., June through October) when conditions are relatively dry in this portion of Washington State and stormwater runoff and sediment transport are less likely. During years when capping of certain areas of MM are necessary, a portion (or segment) of the Rhoads Property will be excavated to obtain soil for this purpose. The Tribe will be notified whenever primary sediment control structures have been constructed (e.g., along the southern property boundary) to allow for inspection and approval before associated borrow activities commence.

Initial site work is shown on Figure 6 and will consist of construction of a new MM site access road. Under the tentative project schedule, construction of the new MM site access road will occur during 2015. Borrow excavation for cover soils will be performed in three phases as shown on Figure 7 through Figure 9. These phases coincide with the three phases of capping

of waste containment areas at MM. Under the current construction schedule, Phase 1 borrow excavation and soil cover placement will occur during 2018. Phase 2 borrow excavation and soil cover placement will occur during 2021. Phase 3 borrow excavation and soil cover placement is expected to occur during 2024. The shape and/or size of the borrow excavation phases depicted in the figures may vary depending on the quantity of soil required for cover at MM at a particular point in time. Concurrent reclamation will be employed during each excavation phase. Concurrent reclamation during each excavation phase entails reclaiming portions of the borrow area where excavation has been completed while active excavation is still occurring in other portions of the borrow area. Concurrent reclamation reduces the amount of disturbed area exposed to erosion at any given time, thus reducing the potential for sediment transport from disturbed areas. The use of concurrent reclamation also allows for the use of "live topsoiling," where topsoil stripped from new portions of the borrow area under development is hauled directly to areas being reclaimed. The use of live topsoiling reduces the need for stockpiling of topsoil during borrow area operations.

2.0 EXCAVATION PLAN

This section describes the specific activities required to obtain and transport soil from the Rhoads Property to MM.

2.1 NEW ACCESS ROAD AND BORROW AREA HAUL ROAD

As part of the MM RA, a new permanent access road is to be constructed from the West End/McCoy Lake Road to the southwest access point of MM, traversing the east side of the Rhoads Property as shown on Figure 6. This new road will provide access along a clean soil corridor in the southwest corner of the MM site to the necessary project infrastructure (water treatment plant, offices, shops, warehouse, site laydown area, etc.). The new access road will be designed and constructed in accordance with American Association of State Highway and Transportation Officials (AASHTO) standards for very low-volume local roads (AASHTO 2001, 2004). This will include designing the road for a maximum speed of 20 mph, with reduced operating speeds as low of 10 mph in steep or curved sections. The road will be designed for two-way traffic, to the extent possible; grades will be limited to 10 percent, with isolated sections that may be as steep as 12 percent. A typical cross-section of the new access road is shown on Figure 11.

Construction of the new access road will be completed primarily as a cut (excavated) road section across the Rhoads Property, with an asphalt-paved running surface. Topsoil and suitable cover soils excavated from within the access road footprint will be stockpiled in uncontaminated or decontaminated areas in the southwestern corner of the MM site for use in soil cover construction.

2.2 BORROW AREA HAUL ROAD

Prior to the commencement of the Phase 1 borrow excavation, a temporary haul road will be constructed on the Rhoads Property to allow soil to be transported from the borrow area to the MM as shown on Figure 7. The haul road will be constructed immediately prior to when soil is needed during the RA and this haul road will be removed systematically as the excavation and concurrent reclamation activities progress on the Rhoads Property as shown on Figure 8 though Figure 10. The access requirements to accomplish restoration activities will be evaluated by the Project Engineer in consultation with the Tribe prior to removing any section of the temporary haul road. The haul road will include a gravel running surface to reduce dust and sediment transport in surface water running off of the road surface. Typical haul road details are included on Figure 12 and Figure 13.

2.3 SITE ACCESS AND CONTROL

A four-strand smooth wire fence will be constructed along the perimeter to delineate the project boundary and to deter site access except at gates in the fence. All site access gates will be closed and locked during non-working hours. The Project Contractor will establish and follow check-in and check-out procedures at designated entrances to the Rhoads Property and MM. This fence will be removed following successful reclamation of the borrow site.

Haulage vehicles transporting soil between the Rhoads Property and MM will travel only on “clean” roads. Likewise, the borrow material from the Rhoads Property will be dumped and stockpiled in clean areas. As a result, it will not be necessary to decontaminate the haulage

vehicles between trips to the Rhoads Property. Newmont will perform weekly radiation surveys along the roadway surface to verify the clean status of the road. The roadway radiation surveys will be performed using the techniques and criteria used to survey the haulage equipment prior to first use as described below.

A Newmont representative will survey all haulage and excavation equipment for radionuclide contamination (alpha or beta as determined by the Newmont Radiation Safety Technician [RST]) before first entry to the Rhoads Property at the beginning of each construction phase. The alpha radiation count rate must be less than 20 counts per minute (cpm), and the beta radiation count rate must be less than 50 cpm above background. Vehicles/equipment not passing these criteria will be decontaminated at a designated area at MM until the above radiation-count criteria are met before entering the Rhoads Property and/or before travelling on any clean roads. All radiation surveys will be conducted in accordance with protocols provided in Midnite Mine Standard Operating Procedure 04 (MM-SOP04), General Survey Meter Operations and Contamination Surveys, Revision 0, February 15, 2009, which is included in Appendix D.

All vehicles and equipment will be pressure washed prior to entering the Rhoads Property at the beginning of each construction season to remove noxious weeds, seeds, or contaminants that may be present on the vehicles and equipment used for the borrow operation (as listed in Section 2.4). All decontamination will be performed at the designated MM decontamination facility. Additional details regarding noxious weed management are included in Appendix E.

In addition, all equipment will be inspected on a pre-shift basis to ensure that equipment is in a safe and operable condition. As part of these pre-shift inspections machinery fluid levels (oil, hydraulic fluid, anti-freeze, etc.) and fittings will be inspected and removed from service for repair. Equipment fueling, lubrication, and repair will be conducted at the MM maintenance area.

2.4 EXCAVATION EQUIPMENT

Excavation of the borrow material will be performed using typical industrial earthmoving equipment. The equipment will include the following types of equipment: dozers, scrapers, motor graders, front-end loaders, hydraulic excavators, rubber-tired backhoes, water trucks, and haul trucks.

2.5 DUST CONTROL

Dust control measures will be implemented to suppress fugitive dust. These measures will include:

- Enforcing a 20 mph speed limit on haul roads. Lower speed limits may be necessary to control dust depending on actual day-to-day site conditions. Site supervisory personnel will enforce speed limits. Should equipment operators be observed operating equipment at excessive speeds, appropriate corrective actions will be implemented.
- Applying water and/or biodegradable dust suppressants directly onto soils, work areas, and dirt roads. Water or dust suppressants will be applied in sufficient quantity to control dust, but not generate free liquids. Water which meets the Clean Water Act primary and secondary drinking water maximum contaminant levels (MCLs) will be used for dust suppression. Dust suppressant chemical treatments (e.g. lignosulfonate; see Appendix

F for product information) will be used only if necessary and then only after approval of the Tribe.

- The permanent site access road will be paved and the Rhoads Property haul road will be surfaced with imported durable aggregate running course in order to reduce dust generation in heavier traffic areas.
- In addition, site personnel will be trained and certified to use air opacity observation methods. Such real time observation and comparison methods can be used to determine if operations need to cease in 20 mph winds.

Dust-suppressant water will be applied directly onto the disturbed areas and work areas with the use of a water truck or other methods of conveyance. Soil-Sement® (polymer emulsion dust suppressant; see Appendix F for product information) and/or hydro-mulch/seed will be applied to inactive topsoil and cover soil stockpiles to control fugitive dust (refer to Section 3.3 for seed mix information). During active stockpile construction, water will be directly applied to the stockpiles by spraying with monitor equipped hoses and water truck water sprays. If water application is insufficient to control dust generation, wind-fencing will be installed to reduce the wind velocity in these areas and suppress dust generation.

Dust levels will be monitored qualitatively by site personnel certified to evaluate visible emissions in accordance with EPA Reference *Method 9 -Visual Determination of Opacity of Emissions from Stationary Sources* and *Method 22 – Visual Determination of Fugitive Emissions From Material Sources and Smoke Emissions From Flares*. A certified individual will be on site any time excavating and haulage activities are occurring to monitor for visible dust. The project goal is for no visible dust to be generated other than within a few feet of an excavator bucket/grader blade or vehicle tire, and for no visible dust to leave the site. The certified individual has the authority to direct site operations to rectify the dust-generating activity (e.g., reduce vehicle speeds, apply water or dust suppressant), and has the authority to stop work if dust generation cannot be controlled. The certified personnel will record field observations in accordance with EPA Reference Method 9, and these records will be included in quarterly progress reports that are distributed to the Tribe.

Additionally, Newmont will develop and implement a baseline and operations air monitoring program during the MM remediation to monitor the effectiveness of dust control. These air monitoring details will be developed in coordination with the Tribal DNR air quality representative. Site air monitoring will be addressed in a separate air monitoring plan that will be submitted for EPA/Tribal review in 2014. This air monitoring program is expected to begin in 2014.

2.6 SOIL STOCKPILE AREAS

As discussed in more detail below, the upper 1-foot of excavated topsoil will be salvaged and segregated so that it can be used as growth media during reclamation of the disturbed areas. Topsoil will be stockpiled along the property ridges or other relatively flat areas of the site away from drainage courses as shown on Figure 7 through Figure 9. Stockpile heights will be limited to 25 feet to minimize potential for erosion and sediment generation.

Excavated borrow material may be temporarily stockpiled within the work area in the open borrow-area segment prior to loading the soils to haul trucks for transportation to MM. However, it is expected the bulk of the excavated borrow material will be direct-loaded into haul trucks, thereby minimizing the need to stockpile the borrow material.

The soil stockpile areas will be visually inspected during and following construction for dust. Water will be applied to the stockpiles to control any visible dust during active construction/stockpiling activities. Since reclamation activities will be concurrent with the soil borrow activities, soil stockpiles are not expected to remain in place past the end of the construction season. However, should any stockpiles remain following a construction season, they will be stabilized by the application of a tackified hydro-mulch cover containing wood fiber and interim vegetative seed species. This hydro-mulch cover application will be installed so that a green wood-mulch blanket density is visibly present across the entire soil stockpile surface. Weekly inspections to verify a continuous hydro-mulch blanket is present will be conducted until snow cover is present or interim vegetation has emerged and established. Newmont will document these activities in monthly progress reports that are distributed to the Tribe.

2.7 SENSITIVE ENVIRONMENTS

Whitetail Creek runs north to south along the east side of the Rhoads Property, as depicted on Figure 3. No excavation will be performed within a minimum 50-foot buffer area on either side of the stream, and proper grading of the surface as it approaches the 50-foot no-disturbance zone will be performed to prevent sediment transfer to the creek. This buffer zone will be greater than 50 feet in many areas where steep slopes exist immediately above the stream in order to reduce the potential for sediment impacts. The buffer area will be delineated with DNR representatives and a four-strand smooth wire fence will be installed prior to commencing earthmoving activities. Once borrow area excavation and reclamation has been completed, the original drainage patterns throughout the Rhoads Property will be restored and surface water ultimately will infiltrate or recharge the creek in a fashion similar to pre-construction conditions. An analyses of pre-construction and post-construction surface water flow conditions is included as Appendix G and indicates that once initial revegetation with grasses and shrubs has been accomplished, there will be little change in peak stormwater runoff flows in areas downstream of the Rhoads Property. During construction, engineering controls will be implemented as described in the stormwater pollution prevention plan (SWPPP; included as Appendix H) to retain sediments in the disturbed areas.

Currently, an existing two-track road crosses Whitetail Creek as shown on Figure 3. The temporary haul road proposed for this work also will cross Whitetail Creek at this same location to minimize additional impacts to the creek. A cross section of the temporary haul road where it will cross Whitetail Creek is shown on Figure 11. A geogrid/fabric layer will be placed prior to fill placement to prevent fill intrusion into riparian soils. Free-draining coarse rock fill will be placed in the bottom layers of the creek crossing to allow base flow through the fill material. In addition, crossings of two other minor drainages located to the west of Whitetail Creek will also be made by the haul road. It is proposed that inlets to these three culvert crossings be constructed to function as sediment detention basins, with perforated vertical risers at the inlet and sized to store flows from the 2-year, 24-hour event as described in the SWPPP. The outlet structures for these three crossing will be sized to pass 100-year, 24-hour storm flows as described in the SWPPP. As detailed in SWPPP Attachment H2, two of the crossings will utilize 24-inch risers and culverts and the westernmost crossing will utilize an 18-inch risers and culvert.

2.8 EXCAVATION SEQUENCING

The sequence for borrow area development and excavation is shown on Figure 6 through Figure 10. Excavation of the borrow material generally will follow these steps:

1) Delineate borrow segment.

2) Install appropriate stormwater management structures.
3) Harvest and remove saleable timber within designated borrow segment.
4) Clear the borrow area segment, including non-harvest tree removal.
5) Salvage the upper 1-foot of the topsoil, and either stockpile these soils for reclamation of the borrow area segment upon completion of the excavation and regrading of the borrow area segment or haul the topsoil to previously completed segments for direct placement. In either case, 1-foot of topsoil shall be placed over all areas disturbed during the construction season in the same construction season.
6) Excavate the underlying soil and transport to MM for use as cap/cover material.
7) Shape and grade the remaining subsoil for reclamation.
8) Replace stockpiled topsoil over this contoured subsoil or direct haul from other segments as described above.
9) Revegetate the disturbed areas (Section 3.3).
10) Perform long-term monitoring of the reclaimed areas (Section 4.0).

These steps are discussed in more detail below.

2.8.1 Preserve Vegetation/Mark Clearing Limits

All clearing limits, sensitive areas and their buffers within the construction area will be clearly marked before beginning land-disturbing activities. A 25-foot buffer at the property boundary will not be excavated or otherwise disturbed. To the extent practicable, the duff layer, native top soil, and natural vegetation will be left in an undisturbed state in areas outside the marked disturbance zones.

2.8.2 Stormwater Management

Estimates of the pre- and post-project stormwater flows were calculated to evaluate potential long-term impacts that borrow area development will have on surface water flows in downstream areas. The results of the pre-project/post-project analyses identify there will be only minor changes in surface water flows due to the development of the Rhoads Property borrow area. In the long term, it can be expected that these peak flow differences will decrease even further as a mature forest develops in the reclaimed borrow area. The largest differences in the peak flows are expected to occur in the vicinity of the permanent access road where minor increases in localized peak flows may occur due to the impermeable asphalt-paved access road, and a slight increase in drainage area. Likewise, other areas in the vicinity of the permanent access road are expected to experience slightly decreased peak flows due to slightly smaller subbasins contributing to them after the construction of the Access Road. These effects will be minimized by the incorporation of regular ditch turnouts along the proposed access road as shown on Figure 10.

Best management practices will be coordinated and implemented during permanent access road construction and Rhoads Property soil borrow activities to prevent erosion and potential sediment transport from the disturbed areas to Whitetail Creek or to other surface water drainages on or adjacent to the property. Appendix H contains a construction stormwater pollution prevention plan (SWPPP) that has been prepared in accordance with the guidelines and procedures described in the Washington State Department of Ecology (WDOE) *How to*

Meet Ecology's Construction Stormwater General Permit Requirements: A Guide for Construction Sites (WDOE, 2010). The Federal Clean Water Act (CWA) requires a Construction Stormwater General Permit (CSWGP) for clearing, grading, and excavating activities that have the potential to discharge stormwater to surface and ground waters. The Washington Department of Ecology CSWGP is included in SWPPP Attachment H1. A CSWGP application will be completed and filed with the appropriate regulatory authority.

The attached SWPPP details specific procedures and physical structures that will be implemented to prevent discharges of turbid water to the surface water at and surrounding the property. The SWPPP was prepared to satisfy the requirements of the CSWGP, and describes the measures to prevent pollution of surface water by sediments mobilized during construction activities, and to minimize damage to construction areas caused by erosion. Inspections of stormwater and sediment control structures will be made on a regular basis, as well as following significant storm events as described in the SWPPP. If these inspections reveal damage to the stormwater/sediment control systems, repair and/or alterations will be made to the affected systems and the SWPPP modified as necessary to accommodate changes.

The primary mechanism for preventing construction-impacted stormwater from entering Whitetail Creek is by maintaining a minimum 50-foot natural (undisturbed) buffer zone on either side of the creek as described above in Section 2.7. Along most of Whitetail Creek through the Rhoads Property, a much wider buffer zone will be maintained to avoid steeper slope areas which may produce sediment (see Figure 10). This buffer zone will be delineated, fenced, and left undisturbed to prevent construction-related sediment transfer to the creek. Likewise, a 25-foot no-excavation buffer will be maintained inside the perimeter of the Rhoads Property to prevent construction-related sediment transfer off of the property.

During excavation, the active borrow excavation areas will be shaped to maintain a shallow earthen escarpment at the downhill edge of the excavation and retain runoff volumes associated with 2-year, 6-hour stormwater runoff within the excavation area. The downstream edge of the excavation area will be graded to slope uphill or will be bermed so that runoff that does not immediately infiltrate into the excavation bottom will pond, allowing sediments to settle out as the ponded water infiltrates or evaporates.

Sediment control structures will include sediment traps at the downstream end of each of the four drainages near the property boundaries. In addition, the three haul road crossing locations in the drainage will contain culvert pipes with inlet protection provided by designing the crossings as sediment detention structures. Both the sediment traps and sediment detention structures will remain in place until vegetation has been reestablished and approval for removal has been obtained from the Tribe. Additional erosion and sediment controls will include installation of gravel filter berms rock check dams, culvert outlets protection, and silt fencing. These features will be installed along the down gradient property boundary and down gradient of the stockpile areas or any other disturbed area where stormwater/sediments need to be controlled to prevent sediment migration off-property or to Whitetail Creek. All sediment control structures will be inspected on a daily basis during the construction season. Required maintenance will be performed immediately upon discovering that maintenance or repairs are necessary and determining the proper course of action. Additional details regarding stormwater and sediment controls are included in the SWPPP contained in Appendix H. The SWPPP will be reviewed and, if necessary, amended prior to each construction season and monthly during the construction season by the Project Engineer.

2.8.3 Timber Harvest

Newmont will bid commercial value timber to a Tribal timber contractor for clearing and harvest. Depending upon economic and market conditions, timber greater than 2 inches in diameter at breast height (DBH) could provide economic value for pulp, post/poles, and conventional sawtimber. The successful bidding contractor will be responsible for the removal of all timber in excess of 2 inches DBH. Newmont representatives will coordinate with the Tribal Council to identify potential ways to distribute timber proceeds in a manner that is beneficial to the Tribe. Refer to Section 1.3.2 which discusses the timber harvest and coordination with the Tribe.

2.8.4 Clearing

Clearing shall consist of removing all surface boulders, shrubs, brush, root balls, and non-harvest timber. The non-harvest timber and any other vegetation may be chipped or composted to add soil organic content to Rhoads Property cover material. Should there be excessive material that could inhibit plant growth if all of it is incorporated into the topsoil, the materials may be used at the MM or otherwise appropriately managed in accordance with Tribal rules or regulations.

During each year when the Rhoads Property will be used as a borrow source, clearing will be limited to the area scheduled to be excavated such that a sufficient amount of borrow material for that year's RA activities is available. No debris of any kind will be temporally staged or stockpiled in or adjacent to any stream or body of water, and no slash burnings will be conducted with the borrow activities.

2.8.5 Salvaging Topsoil

The upper 1-foot of topsoil will be excavated and placed in temporary stockpile locations. This salvaged topsoil will be staged and stockpiled such that it can be replaced during concurrent reclamation activities. The topsoil material will be excavated using either track-mounted dozer or wheeled scraper equipment. When dozer equipment is used, excavated topsoil will be loaded to articulating haul trucks by front-end loaders. When scrapper equipment is used, track-mounted dozer equipment may be required to assist the scrapper equipment with excavation of the topsoil. Collected topsoil will either be end-dumped or belly-dumped along the site ridge lines for temporary stockpiling.

If sections of temporary stockpiles are completed and not intended for that construction season's concurrent reclamation, the stockpiled topsoil will be stabilized by either a Soil-Sement® amendment (see Appendix F for product information) or will be hydro-mulched and seeded with a 1,500 lb. per acre mulch application. The hydro mulch will act to stabilize the stockpiled topsoils pending replacement, and the seed will enhance plant emergence after the topsoil is replaced. Seed mix information is included in Section 3.3.1.

2.8.6 Excavating Underlying Soil

After the topsoil is removed and stockpiled, the underlying soils will be excavated for use as cover material at MM. It is expected that the underlying soils will be excavated to depths approaching the weathered bedrock surface, which is approximately 4 to 16 feet deep across the site. Approximately 1 foot of residual soil will be left in place for reclamation. Excavation will progress from areas of higher elevation to areas of lower elevation. This downhill excavation progression will help manage stormwater and sediment as discussed above in Section 2.8.2.

The estimated direction of excavation within each segment of the borrow area is shown on Figure 7 through Figure 9.

3.0 RECLAMATION PLAN

This section describes the specific activities that will be implemented to restore the Rhoads Property after borrow material is excavated and removed from the site. The objectives of the reclamation activities are to restore the property's aesthetic qualities, wildlife habitat and traditional land uses. These traditional land uses include gathering plants for food and medicinal purposes and outdoor recreation. The reclamation activities also are intended to stabilize the disturbed areas so that wind and water erosion does not damage the reclaimed surfaces. Site reclamation practices will follow the sequence of activities identified below.

3.1 PREPARING AND RE-CONTOURING THE EXCAVATED SURFACES

After the borrow materials have been excavated from a particular segment, the excavated surfaces will be prepared and re-contoured. A minimum of 1 foot of residual subsoil will be left in place at the bottom of the excavations. The excavated land surface will be ripped along contour with a track-mounted dozer to produce a loose cover substrate that will allow substrate weathering, moisture infiltration and plant root penetration. The salvaged topsoil will be placed on top of the residual subsoil as discussed below such that approximately 2 feet of soil (residual subsoil and topsoil) remains in the reclaimed areas.

The excavated surfaces will be graded and shaped to blend with the surrounding terrain. This contouring will occur following borrow material excavation and transportation such that re-contoured areas are not re-disturbed by such activities. Re-contoured surfaces will be graded to slopes less than 3 foot horizontal to 1 foot vertical [3H:1V]. Areas with slopes steeper than 3H:1V will not be disturbed for borrow materials excavation.

To the extent practicable, the re-contoured slopes will contain combinations of concave, convex, and uniform slopes. Undulating slopes minimize sediment erosion and transport, and promote aesthetics. Long uniform slopes will be avoided because such slopes are susceptible to erosion. Likewise, cross slopes (along contour) will be curved and irregular as opposed to rectilinear.

3.2 REPLACING THE SALVAGED TOPSOIL

Salvaged topsoil will be placed on the re-contoured land surfaces to an average depth of 1 foot to act as a growth medium substrate for revegetation. The soil will be loaded from the stockpile locations by front-end loader and transported to the re-contoured land surface location by articulating haul truck. Topsoil placement activities will begin at the most up-gradient re-contoured land surface location. The soil will be end dumped in this location and pushed down the re-contoured slope with a track-mounted dozer.

During final topsoil grading, the dozer will be run up and down a slope establishing dozer track cleat depressions to begin forming the growth medium seed bed, and to assist with soil and debris compression and placement.

It is anticipated that the borrow-area operations in each segment will occur over relatively short periods (e.g., one to three months). As a result, topsoil will be stockpiled in each segment for short periods before being replaced. This essentially will result in "live topsoiling" in which the topsoil retains viable seeds and soil organisms and is replaced to the same ecological niche to aid in the revegetation process (WDNR, 1997). In addition, topsoil will be direct-hauled to the

extent possible from borrow area segments where active topsoil stripping is occurring to borrow area segments that have been recently excavated, regraded, and in need of topsoil covering.

3.3 REVEGETATION

The prepared, re-contoured and topsoiled excavated surfaces will be revegetated with the objectives of establishing a vegetative cover that, over time, will mature to replace that which existed prior to the borrow activities, and that can sustain itself naturally. Revegetating the disturbed areas also will prevent erosion of the replaced topsoil. Revegetation will comprise a combination of seeding with native grasses and forbs, and transplanting native tree and shrub species.

Once initial plant establishment occurs within the first two to three years, the plant community will undergo natural succession as biotic and abiotic processes occur in the revegetated area. During this time, plants will mature and species composition will change until a late successional community becomes established on site that will be similar to the surrounding undisturbed community. This process will take decades to occur. It is expected that ponderosa pine seedlings, for example, will grow approximately 12 inches in height per year after their initial establishment period. At this rate of growth, the trees that are established during revegetation would be expected to be 30 feet tall in 30 to 35 years.

3.3.1 Hydroseeding

The graded and dozer-tracked topsoil will be broadcast seeded using hydroseeding equipment. Hydroseeding simultaneously applies seed and fertilizer to the prepared seedbed. The hydroseeding process hydraulically applies the seed mixture identified in Table 2 and an inorganic fertilizer, which will be independently determined for each land segment by nutrient analysis. To transport the seed from the hydroseeding equipment to the prepared seedbed, 50 pounds per acre of cellulose wood fiber mulch will be included with the seed/fertilizer applications. The seed mix will be applied at a rate of 12 pounds pure live seed (PLS) per acre, which is approximately 150 percent greater than the drill-seed rate to account for variations associated with broadcast seeding versus drill seeding. Completion of the seedbed preparation process will include rock harrowing or other agricultural methods to scarify the hydroseeded surface. Standard rock harrowing procedures involves use of conventional agricultural drag implements which has the ability to scarify the soil surface, and to bed broadcast seed applications to an effective 2 to 3 inch depth leaving the soil surface in a roughened condition minimizing soil erosion conditions. Scarifying the surface will cover the hydroseed-applied seed with a shallow cover of soil and leave the reclaimed land surface in a rough, irregular condition which promotes seed and moisture microsite catchments and minimizes potential water erosion.

Completion of the revegetation process will include the application of a hydromulch blanket cover. This mulch cover will consist of 2,000 lbs./acre of the cellulose wood fiber mulch and a bio-degradable tackifer. The mulch blanket will retain moisture and moderate soil temperatures and the tackifier or binder is added to the hydromulch slurry to prevent it from eroding. The revegetation process will be conducted either late fall or early spring to minimize potential early seedling emergence and either winter or spring kill due to the lack of moisture. Preferably the hydroseeding/scarifying and hydromulching activities will be conducted concurrently with the season's first snowfall.

Table 3. Rhoads Property Revegetation Seed Mix

Scientific Name	Common Name	Percentage of Seed Mix
Pseudoroegneria spicata	Bluebunch Wheatgrass	45
Festuca idahoensis	Idaho Fescue	30
Poa-secunda	Sherman Big Bluegrass	15
Sanguisorba minor	Small Burnet	10

Note – The actual seed mix and application rates will be updated following the HEP vegetation survey that will occur in May 2014 (as discussed and confirmed with the DNR following completion of the HEP survey.)

3.3.2 Tree and Shrub Planting

Based on the May 2012 vegetation survey discussed in Section 1.2.8, the tree and shrub species that will be planted by hand using containerized (tubling) seedlings include ponderosa pine (*Pinus ponderosa*), common snowberry (*Symphoricarpus albus*), strawberry (*Fragaria vesca*), and Rose (*Rosa sp.*). It is anticipated that the ponderosa pine trees will be planted at an approximate density of 400 seedlings per acre and combinations of the above identified shrubs will be planted at an approximate density of 200 seedlings per acre. The shrub planting species and densities will depend on various site conditions such as aspect, elevation and water conditions. These tree and shrub planting criteria will be revised and updated if necessary following the completion of the HEP vegetation survey that will occur in May 2014.

The tubling planting techniques are shown on Figure 14. Tube seedlings will be inoculated into dormancy prior to removal from the nursery and will be planted at the end of the following fall season after initial native grass seeding of the land that is being reclaimed in Year 1. For example, if the land segment is re-seeded with native grasses during Year 1, the tree/shrub planting would occur in the fall season of Year 2.

The plant seedlings will be native to the mine site area; therefore, arrangements will be made with a local nursery to promulgate the seed materials (as possible) from the Site and grow the seedlings from these seed sources. All seedlings will be at least 18 months old prior to planting the seedlings at the site. Ponderosa pines are fairly adaptive in the local environment as evidenced by the regrowth of ponderosa pine within the confines of the Midnite Mine. Ponderosa pine seedlings acclimate well in gravelly soils and are frequently found in the native surroundings and flourishing in areas containing shallow to no soils such as rock outcroppings. The proposed two feet of cover soil over the re-contoured borrow area will be adequate to support the development of mature ponderosa pine trees because the cover soil will be placed over ripped highly weathered bedrock that will consist of fragments of weathered granite in a matrix of silty to clayey sand. This weathered material represents an ideal subsoil for deep root penetration and proliferation of both ponderosa pine and native shrubs.

Seedling protection tubes shall be used for all transplants to protect seedlings during the first three years from browse damage by mice, rabbits, beaver, deer, elk and other small or large herbivores. Seedling protectors would most likely be rigid polypropylene mesh tubes that cover the entire plant and allow room for growth for a minimum of three years (Schaap and DeYoe 1986). The tubes would be held in place with bamboo stakes and removed after three years so the tubes do not cause the plants to grow in a deformed shape. A three year protection period should be adequate to ensure high survivability.

4.0 LONG-TERM MONITORING AND MAINTENANCE PLAN

The revegetated areas will be inspected each summer season until the sites achieve 60 percent live vegetative cover density with three or more plant species, and 70 percent total cover density that includes live cover and litter using a point count method along a 100 foot transect. Three random transects per acre will be conducted within each disturbed land segment during the summer survey. Surveys will be conducted during each growing season and annual survey reports will be submitted to the DNR. The surveys also will include identifying bare ground areas, which are defined as areas greater than 250 ft^2 containing less than 20 percent live cover and areas containing signs of uncontrolled erosion (e.g., rills and gullies, accumulations of sediment or debris). Bare ground areas exhibiting less than 20 percent live vegetative cover that are identified after three successive seasons will be re-assessed for nutrients and other conditions that could cause vegetative failure. Pending the assessment results, the revegetation plan will be amended and the area reworked. Observed rills and gullies will be repaired as soon as practicable, and the area re-seeded and stabilized with either the hydromulch blanket or other erosion control measures such as excelsior matting, jute fabric, noxious-weed free straw or riprap. Areas which meet the defined success criteria after three successive survey seasons will be released from future surveys. The fencing and non-degradable stormwater-control structures will remain in place until the revegetation success criteria is met for three successive survey seasons and the Tribe is willing to release the reclamation surety discussed in Section 7.0.

In addition to the above surveys, noxious weed surveys will be conducted twice a field season along the disturbed land segments by a qualified biologist. Should noxious weeds (as defined by either Stevens County, State of Washington, or the Tribe) be discovered at the site, eradication procedures will be taken to eliminate the weed species as identified in the Noxious Weed Management Plan included in Appendix E.

5.0 CONSTRUCTION-DERIVED WASTE HANDLING AND DISPOSAL

All construction-derived waste materials will be disposed off the reservation in accordance with applicable transportation and disposal regulations. Construction-derived waste materials may consist of: (1) solid waste (e.g., extra materials used to build stormwater controls); (2) hazardous waste as regulated by the EPA under the Resource Conservation and Recovery Act (RCRA; e.g., excess pesticides/herbicides); and (3) items that contain hazardous components that might be regulated by some states (e.g., treated wood forms).

Solid waste will be disposed of at a municipal (Subtitle D) landfill or a construction and demolition waste landfill. Because the excavation activities are limited to work on previously undisturbed property, it is not anticipated that large quantities of hazardous or hazardous-component construction wastes will be generated. However, there may be construction-derived wastes that require special handling and disposal (e.g., excess pesticides/herbicides, treated wood forms). The following three-step process will be adhered to regarding construction-waste management:

1) Identify all hazardous wastes in accordance with RCRA procedures (e.g., *Test Methods for the Evaluation of Solid Waste, Physical/Chemical Methods*, SW-846). Alternately the Contractor performing the work may use knowledge of the waste to make this determination. For example, pesticide/herbicide containers and material safety data sheets will have handling and disposal information.

2) Waste disposal shall comply with the following:

   - A state or federally regulated hazardous waste management treatment, storage, or disposal facility.
   - A facility permitted, licensed, or registered by a state to manage municipal or industrial solid waste.
   - A facility that uses, reuses, or legitimately recycles the waste (or treats the waste prior to use, reuse, or recycling).
   - A “universal waste” handler or destination facility subject to the universal waste requirements of 40 CFR Part 273. (Waste pesticides/herbicides are classified as RCRA Universal Wastes.)

6.0 TRIBAL EMPLOYMENT RIGHTS ORDINANCE

All Rhoads Property soil borrow material excavation and reclamation work described in this POR will be conducted in accordance with the Spokane Tribe of Indians Tribal Employment Rights Ordinance (TERO). Project bidding and contractor selection will be conducted according to the Tribal provisions and regulations detailed in TERO. In the event a Tribal contractor's bid or qualifications do not meet the project requirements, the selected Contractor will be required to comply with all TERO hiring requirements. These requirements include submitting to the Spokane TERO Office a Compliance Plan documenting how the Contractor will meet their obligations and responsibilities under TERO before commencing work on the Spokane Indian Reservation. A copy of the Spokane TERO Office Compliance Plan is included as Appendix I.

7.0 FINANCIAL/OWNERSHIP RESPONSIBILITIES AND SURETY

Newmont intends to complete reclamation of disturbed areas within the borrow area on the Rhoads Property according to the Reclamation Plan (Section 3.0) specifications (including long-term maintenance of the property reclamation described in Section 4.0) within the year in which a specific disturbance occurs. Appendix J contains a reclamation cost estimate for a third-party Tribal contractor to perform the work described within the Reclamation Plan to reclaim the property if not completed by Newmont. The cost estimate for earthworks (recontouring, ripping, and topsoil covering) contains projected unit rates and costs to reclaim all the Rhoads Property borrow area disturbances. To ensure that the project is completed to Reclamation Plan specifications (including long-term maintenance of the property reclamation described in Section 4.0), Newmont will provide the Tribe a surety instrument in the form of either a Surety Bond, a Letter of Credit, or a Trust Account as determined by consensus of Newmont and the Tribe. The surety value will be determined in consideration of the estimated total reclamation costs described in Appendix J.

8.0 REFERENCES

American Association of State Highway and Transportation Officials (AASTHO), 2001. *Guidelines for Geometric Design of Very-Low Volume Local Roads (ADT<=400).* American Association of State Highway and Transportation Officials, Washington D.C.

American Association of State Highway and Transportation Officials (AASTHO), 2004. *A Policy on Geometric Design of Highways and Streets.* American Association of State Highway and Transportation Officials, Washington D.C.

Miller Geotechnical Consulting (MGC), 2011a. *Borrow Source Design Investigation Report – Revision 2*. Prepared on behalf of Newmont USA Limited and Dawn Mining Company for the U.S. EPA Region 10. May.

Miller Geotechnical Consulting (MGC), 2011b. *Technical Memorandum Rhoads Property Borrow Investigation Phase II – Revision 1*. Prepared on behalf of Newmont USA Limited and Dawn Mining Company for the U.S. EPA Region 10. December.

MWH Americas, Inc. (MWH), 2012. *Midnite Mine Superfund Site Borrow Area Evaluation, Revision 1*. Prepared for Dawn Mining Company, LLC and Newmont USA Limited. June 27.

Schaap, W. and D. DeYoe, 1986. Seedling Protectors for Preventing Deer Browsing. Forestry Research Lab, Oregon State University. Corvallis, OR.

U. S. Environmental Protection Agency (EPA), 2005. Midnite Mine Remedial Investigation Report. Prepared for U.S. Environmental Protection Agency by URS Corporation. September.

U. S. Environmental Protection Agency (EPA), 2006. *Midnite Mine Superfund Site Spokane Indian Reservation, Washington Record of Decision*. Prepared by the Office of Environmental Cleanup, EPA Region 10. September.

Washington State Department of Natural Resources (WDNR), 1997. *Best Management Practices for reclaiming Surface Mines in Washington and Oregon*. Open File Report 96-2, December.

Washington State Department of Ecology (WDOE), 2010. *How to Meet Ecology's Construction Stormwater General Permit Requirements: A Guide for Construction Sites*. Publication #99-37. March.

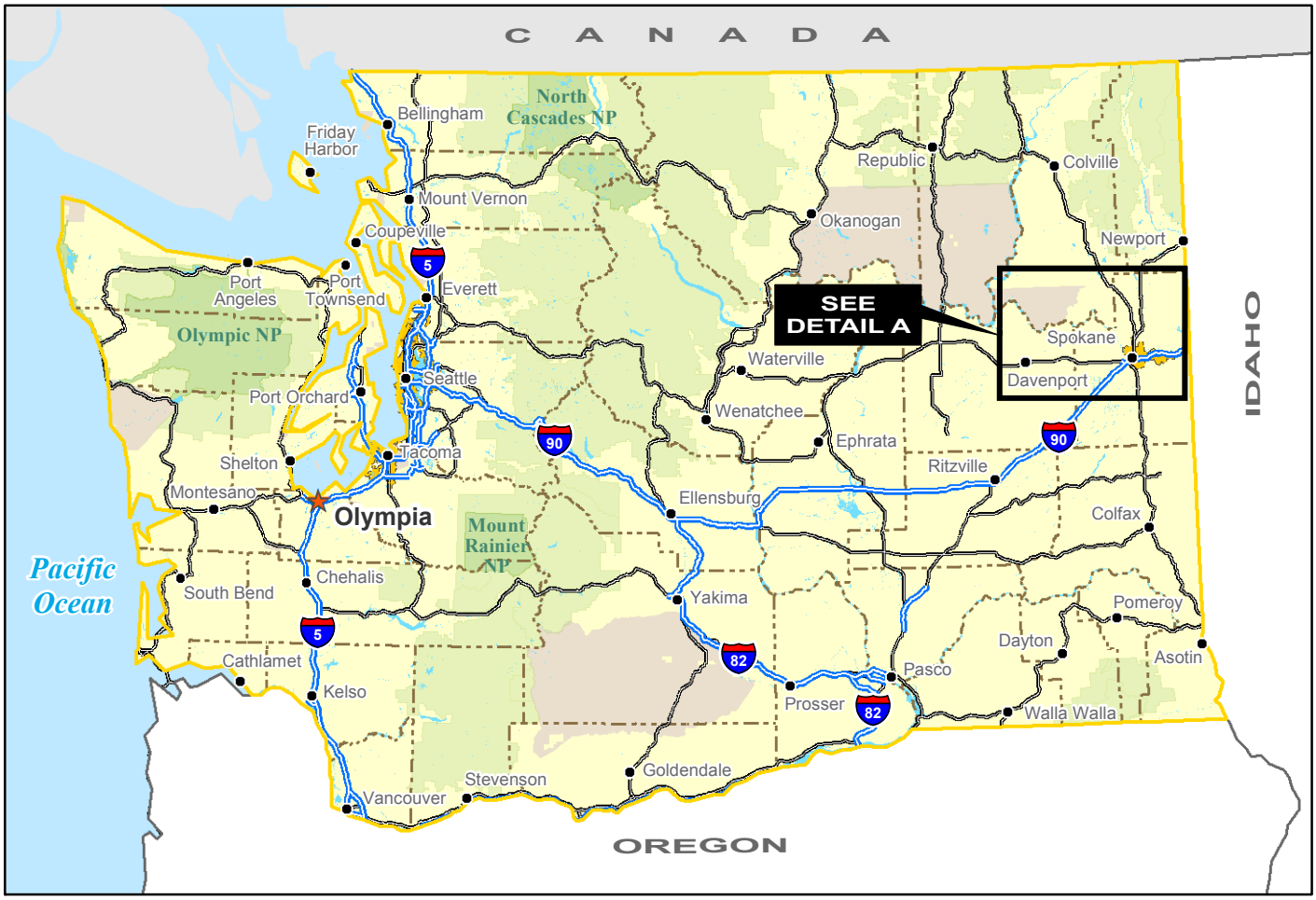
Worthington Miller Environmental, LLC (WME), 2012. *Technical Memorandum - Rhoads Property Borrow Area Vegetation Survey*. July 2.

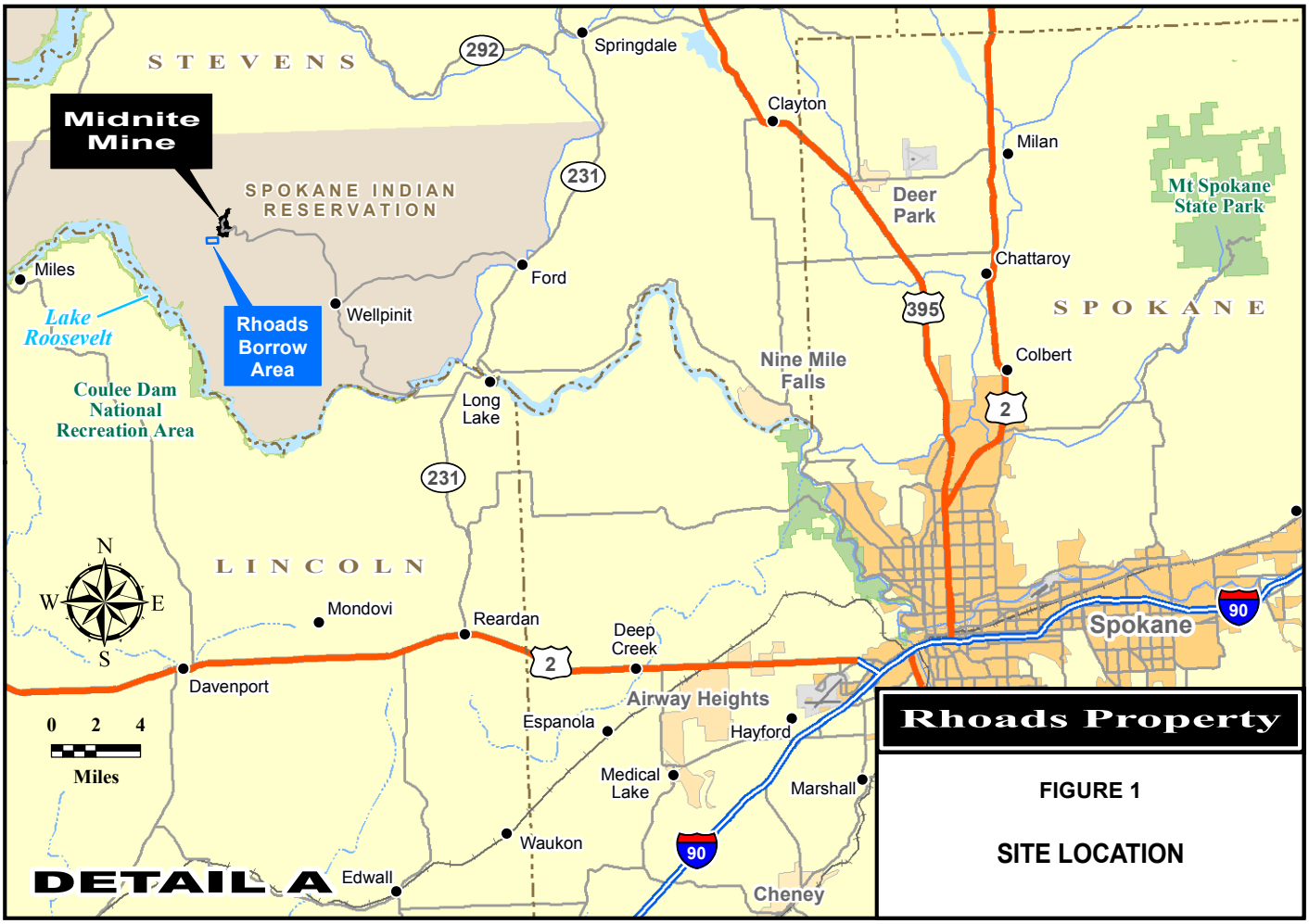
Worthington Miller Environmental, LLC (WME), 2013. Pre-Design Data Needs – Midnite Mine Standard Operating Procedures –Groundwater Well Installation and Development (PDDN-SOP23). May 21.

Worthington Miller Environmental, LLC (WME), 2014a. White Tail Creek Sediment Evaluation - Phase 1 Data Transmittal Report, Rev 1. February 20.

Worthington Miller Environmental, LLC (WME), 2014b. White Tail Creek Sediment Evaluation - Phase 2 Data Transmittal Report, Rev 0. February 20.

FIGURES





Rhoads Property

FIGURE 1

SITE LOCATION

Date: 11/11/2013

J:\Industrial Projects\MIDNITE MINE\RHOADS PROPERTY\EXCAVATION PLAN\FIGURES\Fig 1_Midnite Mine_Site Location_withReserv_8x11_ExcavPlan.mxd

J:\Industrial Projects\MIDNITE MINE\RHOADS PROPERTY\EXCAVATION PLAN\FIGURES\Fig 2_MidniteMine_Rhoads Borrow Area Detailed Map_ExcavPlan.mxd Date: 11/11/2013

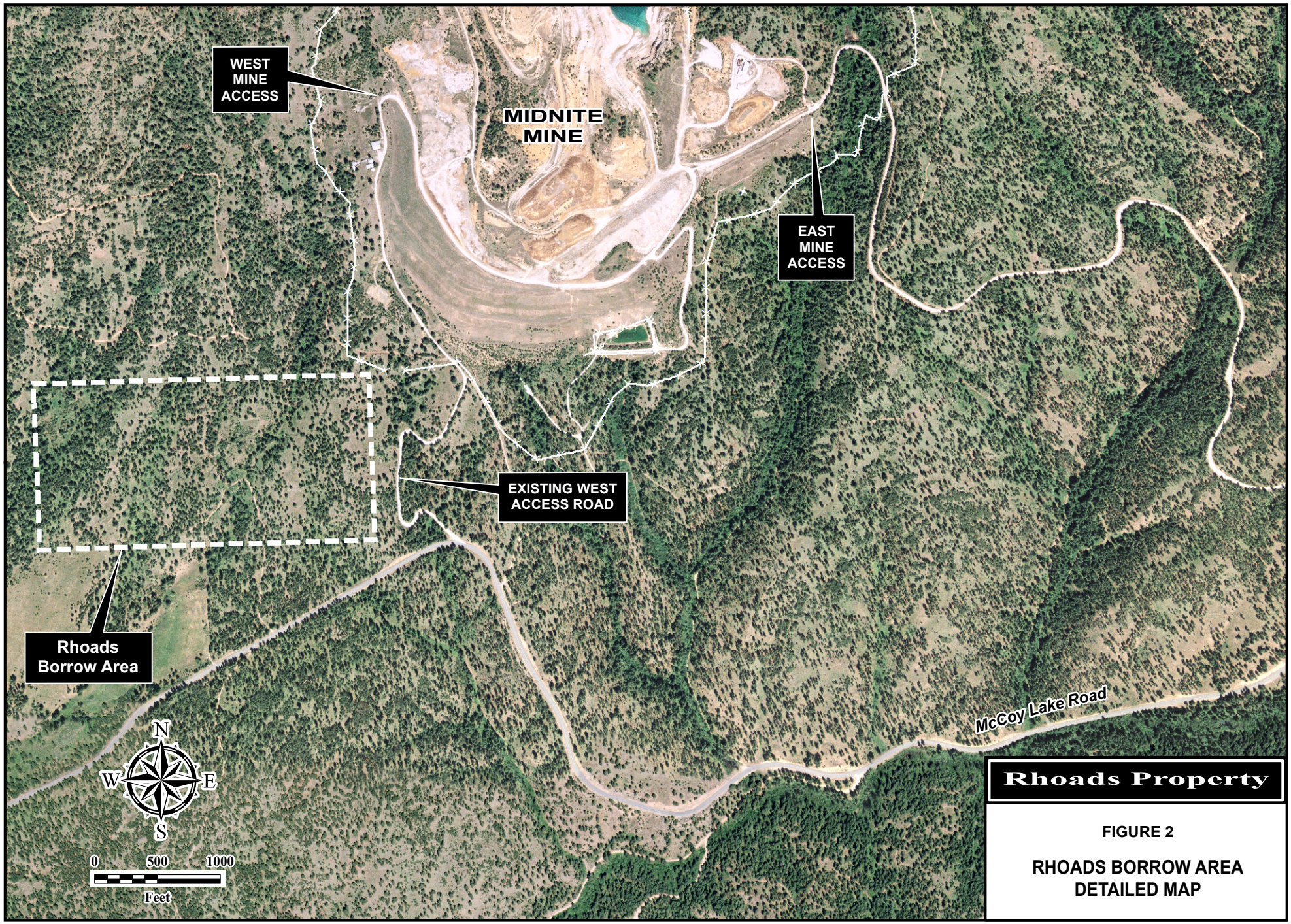


FIGURE 2

RHOADS BORROW AREA DETAILED MAP

RHOADS PROPERTY AND BORROW AREA BOUNDARY
N ½ □ NE ¼ □ SEC 14, T28N, R37E

MIDNITE MINE
ACCESS-CONTROL FENCE

WHITETAIL CREEK RIPARIAN AREA,
NO E□CAVATION WITHIN 50 FEET OF CREEK

E□ISTING SITE ROAD

WEST END RD

SPOKANE INDIAN RESERVATION

SPOKANE INDIAN RESERVATION

E 2,308,000
E 2,310,000
N 352,000

RP-P1
RP-P2
RP-P3
RP-P4
RP-P5
RP-P6
RP-P7
RP-P8
RP-P9
RP-P10
RP-P11
RP-P12
RP-P13
RP-P14
RP-P15
RP-P16
RP-P17
RP-P18
RP-P19
RP-P20
RP-P21
RP-P22
RP-P23
RP-P24
RP-P25
RP-P26
RP-PZ1
RP-PZ2
RP-PZ3
RP-PZ4
RP-PZ5
T1
T2
T3
T4
T5
T6
T7

2450
2400
2350

0 120' 240'

DRAWING REFERENCE(S):

- EXISTING TOPOGRAPHY BASED UPON LIDAR MAPPING BY SPATIAL INTEL, 2010. WASHINGTON STATE PLANE-NORTH, NAD 83/NAVD 88.
- TOPOGRAPHY WEST OF LIDAR TOPOGRAPHY DOWNLOADED FROM SEAMLESS.USGS.GOV

LEGEND:

5605	EXISTING GROUND SURFACE ELEVATION, FEET
	EXISTING ROAD
	EXISTING DRAINAGE
x	FENCE
	LIMITS OF EXCAVATION
RP-P1	TEST PIT LOCATION
RP-PZ1	PIEZOMETER LOCATION
	PROPOSED LOCATION OF MONITORING WELL PAIRS
	SLOPE 0-20%
	SLOPE 20-33%
	SLOPE 33% OR STEEPER

DESIGNED BY	T KELLEY	04-14
DRAWN BY	D MIRANDA	04-14
CHECKED BY	T KELLEY	04-14
APPROVED BY	C STRACHAN	04-14
PROJECT MANAGER	V DRAIN	04-14
CLIENT APPROVAL	B LYLE	
CLIENT REFERENCE NO.		

NEWMONT

PROJECT LOCATION: WELLPINIT, WASHINGTON

PROJECT: RHOADS BORROW

TITLE: RHOADS BORROW AREA PRE-E□CAVATION MAP

MWH

FIGURE: 3

REVISION: 1

FILE NAME: 1011322 POO 3

DATE: APR 2014

L:\Design-Drafting\Clients-I-P\NEWMONT\1011322 MIDNITE MINE\013-Sheet Set\FIGURES\2014-04-30 POO\1011322 POO 3

J:\Industrial Projects\MIDNITE MINE\RHOADS PROPERTY\EXCAVATION PLAN\FIGURES\Fig 4_MidniteMine_Rhoads Borrow Area Geology Map_Apr2014.mxd DATE: 11 Apr 2014

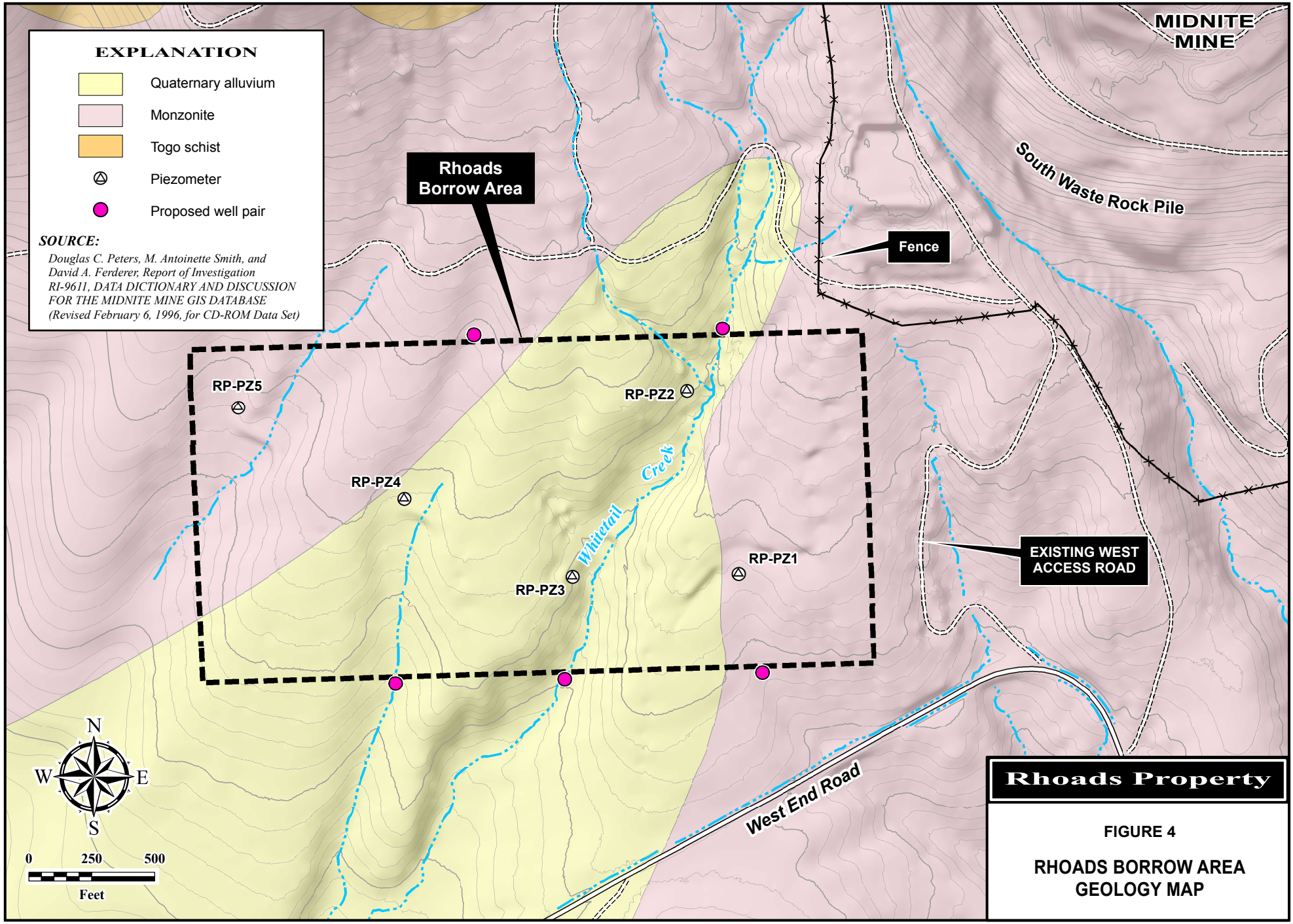


FIGURE 4

RHOADS BORROW AREA GEOLOGY MAP

J:\Industrial Projects\MIDNITE MINE\RHOADS PROPERTY\EXCAVATION PLAN\FIGURES\Fig 5_MidniteMine_NRCS Soil Survey Map for the Rhoads Property_Apr2014.mxd DATE: 8 Apr 2014

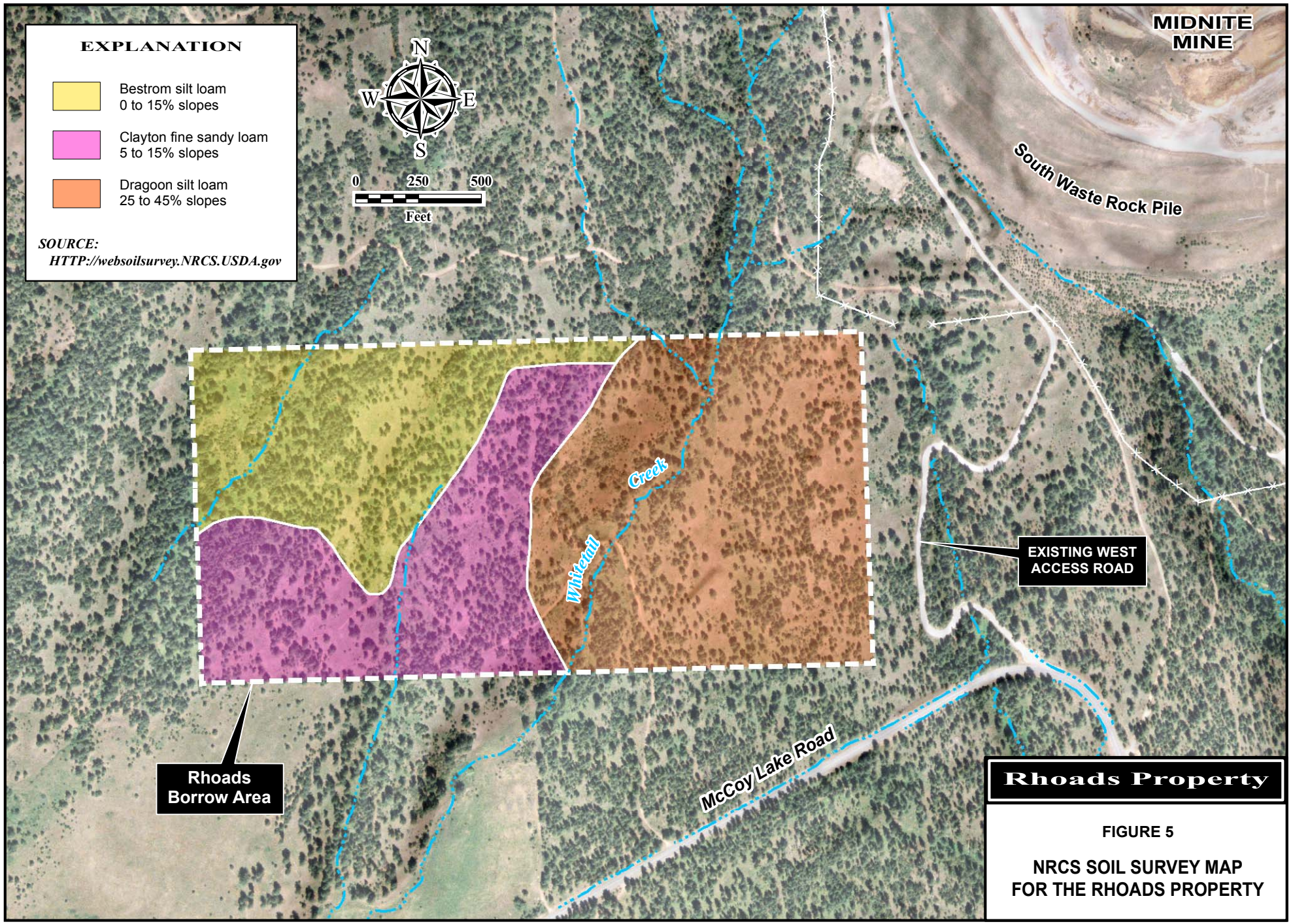


FIGURE 5

NRCS SOIL SURVEY MAP FOR THE RHOADS PROPERTY

RHOADS PROPERTY BOUNDARY

PROPOSED MIDNITE MINE SITE ACCESS

WHITETAIL CREEK RIPARIAN AREA,
NO E□CAVATION WITHIN 50□ OF CREEK

WHITETAIL CREEK

PROPOSED MIDNITE MINE SITE ACCESS ROAD

WEST-END RD

N 352,000

N 351,000

E 2,308,000

E 2,309,000

E 2,310,000

2525 2500 2475 2450 2425 2400 2375 2350 2325

0 120' 240'

DRAWING REFERENCE(S):

- EXISTING TOPOGRAPHY BASED UPON LIDAR MAPPING BY SPATIAL INTEL, 2010. WASHINGTON STATE PLANE–NORTH, NAD 83/NAVD 88.

LEGEND:

2475 EXISTING GROUND SURFACE ELEVATION, FEET

EXISTING DRAINAGE

FENCE

LIMITS OF EXCAVATION

DRAWING REFERENCE(S):

- EXISTING TOPOGRAPHY BASED UPON LIDAR MAPPING BY SPATIAL INTEL, 2010. WASHINGTON STATE PLANE–NORTH, NAD 83/NAVD 88.

DESIGNED BY	T KELLEY	04–14
DRAWN BY	D MIRANDA	04–14
CHECKED BY	T KELLEY	04–14
APPROVED BY	C STRACHAN	04–14
PROJECT MANAGER	V DRAIN	04–14
CLIENT APPROVAL	B LYLE	
CLIENT REFERENCE NO.		

NEWMONT

PROJECT LOCATION WELLPINIT, WASHINGTON

PROJECT RHOADS BORROW

TITLE INITIAL WORK - ACCESS ROAD CONSTRUCTION

MWH

FIGURE 6

REVISION 1

FILE NAME 1011322 POO 6

DATE APR 2014

L:\Design–Drafting\Clients–I–P\NEWMONT\101322 MIDNITE MINE\013–Sheet Set\FIGURES\2014–04–30 POO\101322 POO 6

RHOADS PROPERTY BOUNDARY

PROPOSED MIDNITE MINE SITE ACCESS

WHITETAIL CREEK RIPARIAN AREA,
NO E□CAVATION WITHIN 50□ OF CREEK

WHITETAIL CREEK HAUL ROAD CROSSING

PROPOSED BORROW
AREA HAUL ROAD

PROPOSED MIDNITE MINE
SITE ACCESS ROAD

WHITETAIL CREEK

WEST END RD

1-1

1-2

E 2,308,000

E 2,309,000

E 2,310,000

N 352,000

N 351,000

2500

2450

2400

2350

0 100' 200'

DRAWING REFERENCE(S):

- EXISTING TOPOGRAPHY BASED UPON LIDAR MAPPING BY SPATIAL INTEL, 2010. WASHINGTON STATE PLANE–NORTH, NAD 83/NAVD 88.

LEGEND:

- 2475 EXISTING GROUND SURFACE ELEVATION, FEET
- EXISTING DRAINAGE
- FENCE
- LIMITS OF EXCAVATION
- EXCAVATION SEGMENT
- DIRECTION OF TOPSOIL STRIPPING, STOCKPILING
- 1-1 EXCAVATION SUB–PHASE AND DIRECTION OF EXCAVATION
- TOPSOIL STOCKPILE AREAS

DESIGNED BY	T KELLEY	04–14
DRAWN BY	D MIRANDA	04–14
CHECKED BY	T KELLEY	04–14
APPROVED BY	C STRACHAN	04–14
PROJECT MANAGER	V DRAIN	04–14
CLIENT APPROVAL	B LYLE	
CLIENT REFERENCE NO.		

NEWMONT

PROJECT LOCATION: WELLPINIT, WASHINGTON

PROJECT: RHOADS BORROW

TITLE: PHASE 1 - E□CAVATION SEQUENCE

MWH

FIGURE: 7

REVISION: 1

FILE NAME: 1011322 POO 7

DATE: APR 2014

L:\Design-Drafting\Clients-I-P\NEWMONT\1011322 MIDNITE MINE\013-Sheet Set\FIGURES\2014-04-30 POO\101322 POO 7

RHOADS PROPERTY BOUNDARY

PROPOSED MIDNITE MINE SITE ACCESS

RECLAIMED PHASE 1 EXCAVATION AREA

2-1

2-2

2-3

2-4

WHITETAIL CREEK RIPARIAN AREA, NO EXCAVATION WITHIN 50' OF CREEK

PROPOSED BORROW AREA HAUL ROAD

WHITETAIL CREEK

PROPOSED MIDNITE MINE SITE ACCESS ROAD

WEST END RD

N 352,000

N 351,000

E 2,308,000

E 2,309,000

E 2,310,000

2500

2450

2400

2350

2380

2390

2410

2420

2430

2440

2460

2470

2480

2490

0 100' 200'

DRAWING REFERENCE(S):

- EXISTING TOPOGRAPHY BASED UPON LIDAR MAPPING BY SPATIAL INTEL, 2010. WASHINGTON STATE PLANE–NORTH, NAD 83/NAVD 88.

LEGEND:

- 2475 — EXISTING GROUND SURFACE ELEVATION, FEET
- EXISTING DRAINAGE
- FENCE
- DIRECTION OF TOPSOIL STRIPPING, STOCKPILING
- LIMITS OF EXCAVATION
- EXCAVATION SEGMENT
- 2450 — ESTIMATED FINAL RECLAMATION GROUND SURFACE ELEV, FEET
- NON–DISTURBANCE AREA DUE TO STEEP SLOPES, PROXIMITY TO WHITETAIL CREEK
- TOPSOIL STOCKPILE AREAS
- 2-1 — EXCAVATION SUB–PHASE AND DIRECTION OF EXCAVATION

DESIGNED BY	T KELLEY	04–14
DRAWN BY	D MIRANDA	04–14
CHECKED BY	T KELLEY	04–14
APPROVED BY	C STRACHAN	04–14
PROJECT MANAGER	V DRAIN	04–14
CLIENT APPROVAL	B LYLE	
CLIENT REFERENCE NO.		

NEWMONT

PROJECT LOCATION: WELLPINIT, WASHINGTON

PROJECT: RHOADS BORROW

TITLE: PHASE 2 - EXCAVATION SEQUENCE

MWH

FIGURE: 8

REVISION: 1

FILE NAME: 1011322 POO 8

DATE: APR 2014

L:\Design-Drafting\Clients-I-P\NEWMONT\1011322 MIDNITE MINE\013-Sheet Set\FIGURES\2014-04-30 POO\1011322 POO 8

RHOADS PROPERTY BOUNDARY

PROPOSED BORROW AREA HAUL ROAD

PROPOSED MIDNITE MINE SITE ACCESS

WHITETAIL CREEK RIPARIAN AREA, NO EXCAVATION WITHIN 50' OF CREEK

RECLAIMED PHASE 1 EXCAVATION AREA

RECLAIMED PHASE 2 EXCAVATION AREA

3-2

3-1

WHITETAIL CREEK

PROPOSED MIDNITE MINE SITE ACCESS ROAD

WEST END RD

N 352,000

N 351,000

E 2,308,000

E 2,309,000

E 2,310,000

0 100' 200'

DRAWING REFERENCE(S):

- EXISTING TOPOGRAPHY BASED UPON LIDAR MAPPING BY SPATIAL INTEL, 2010. WASHINGTON STATE PLANE–NORTH, NAD 83/NAVD 88.

LEGEND:

- 2475 EXISTING GROUND SURFACE ELEVATION, FEET
- EXISTING DRAINAGE
- FENCE
- DIRECTION OF TOPSOIL STRIPPING, STOCKPILING
- LIMITS OF EXCAVATION
- EXCAVATION SEGMENT
- 2450 ESTIMATED FINAL RECLAMATION GROUND SURFACE ELEV, FEET
- NON–DISTURBANCE AREA DUE TO STEEP SLOPES, PROXIMITY TO WHITETAIL CREEK
- TOPSOIL STOCKPILE AREAS
- 2-1 EXCAVATION SUB–PHASE AND DIRECTION OF EXCAVATION

DESIGNED BY	T KELLEY	04–14
DRAWN BY	D MIRANDA	04–14
CHECKED BY	T KELLEY	04–14
APPROVED BY	C STRACHAN	04–14
PROJECT MANAGER	V DRAIN	04–14
CLIENT APPROVAL	B LYLE	
CLIENT REFERENCE NO.		

NEWMONT

PROJECT LOCATION: WELLPINIT, WASHINGTON

PROJECT: RHOADS BORROW

TITLE: PHASE 3 - EXCAVATION SEQUENCE

MWH

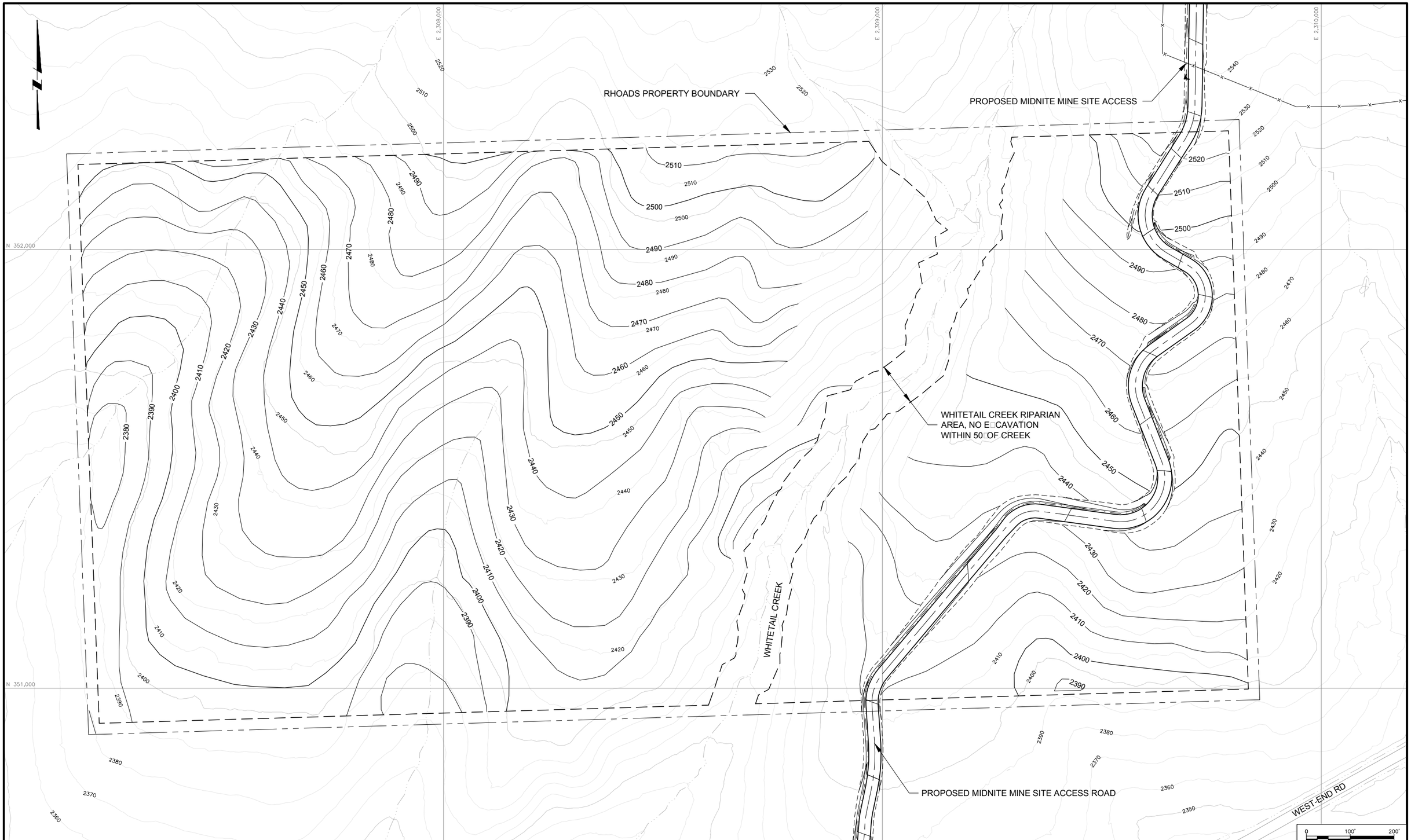
FIGURE: 9

REVISION: 1

FILE NAME: 1011322 POO 9

DATE: APR 2014

L:\Design–Drafting\Clients–L–P\NEWMONT\1011322 MIDNITE MINE\013–Sheet Set\FIGURES\2014–04–30 POO\1011322 POO 9



DRAWING REFERENCE(S):

- EXISTING TOPOGRAPHY BASED UPON LIDAR MAPPING BY SPATIAL INTEL, 2010. WASHINGTON STATE PLANE–NORTH, NAD 83/NAVD 88.

LEGEND:

2450	EXISTING GROUND SURFACE ELEVATION, FEET
2450	ESTIMATED FINAL RECLAMATION GROUND SURFACE ELEVATION, FEET
—x—	FENCE
— — —	LIMITS OF EXCAVATION
— · · —	EXISTING DRAINAGE

DESIGNED BY	T KELLEY	04–14
DRAWN BY	D MIRANDA	04–14
CHECKED BY	T KELLEY	04–14
APPROVED BY	C STRACHAN	04–14
PROJECT MANAGER	V DRAIN	04–14
CLIENT APPROVAL	B LYLE	
CLIENT REFERENCE NO.		

NEWMONT

PROJECT LOCATION: WELLPINIT, WASHINGTON

PROJECT: RHOADS BORROW

TITLE: FINAL RECLAMATION TOPOGRAPHY MAP

MWH

FIGURE: 10

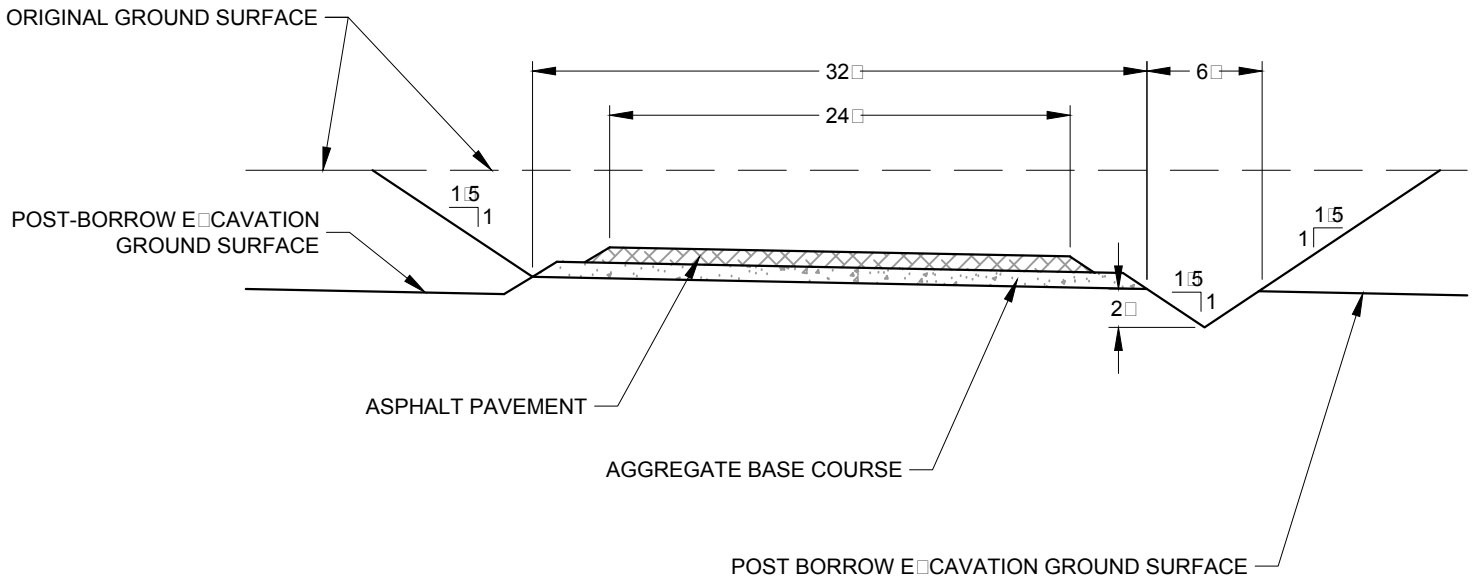
REVISION: 1

FILE NAME: 1011322 POO 10

DATE: APR 2014

L:\Design-Drafting\Clients-I-P\NEWMONT\1011322 MIDNITE MINE\013-Sheet Set\FIGURES\2014-04-30 POO\1011322 POO 10

L:\Design-Drafting\Clients-I-P\NEWMONT\1011322 MIDNITE MINE\013-Sheet Set\FIGURES\2014-04-30 POO\1011322 POO 11



0 10' 20'

NEWMONT

PROJECT
RHOADS BORROW

TITLE
MIDNITE MINE
ACCESS ROAD TYPICAL SECTION

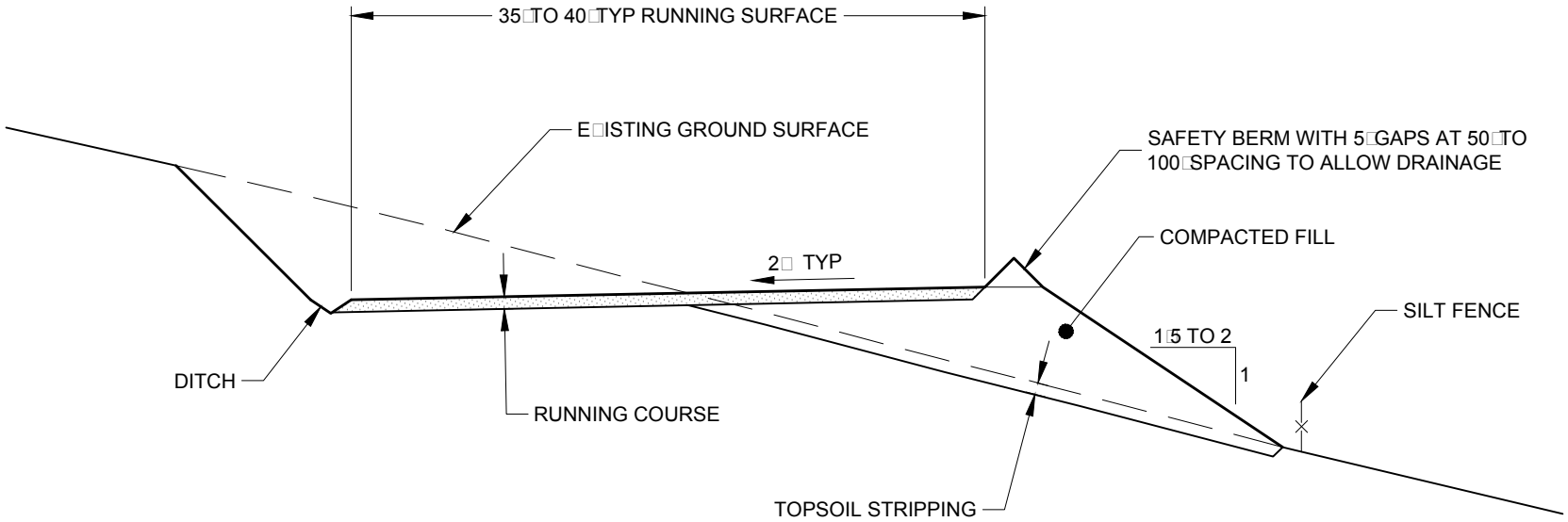
MWH

DATE APR 2014

FIGURE 11

FILE NAME 1011322 POO 11

L:\Design-Drafting\Clients-I-P\NEWMONT\1011322 MIDNITE MINE\013-Sheet Set\FIGURES\2014-04-30 POO\1011322 POO 12



0 10' 20'

NEWMONT

PROJECT
RHOADS BORROW

TITLE
BORROW AREA HAUL ROAD TYPICAL SECTION

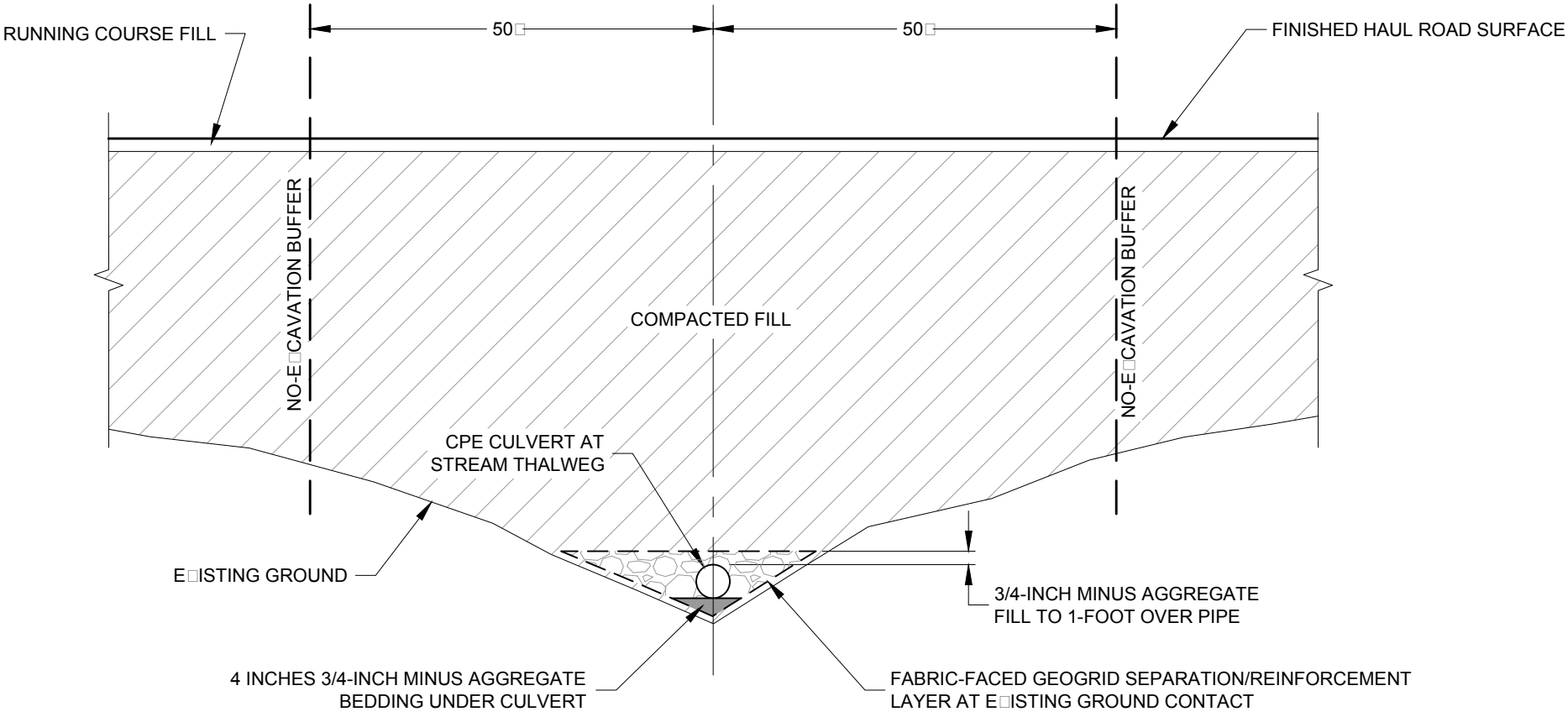
MWH

DATE APR 2014

FIGURE 12

FILE NAME 1011322 POO 12

L:\Design-Drafting\Clients-I-P\NEWMONT\1011322 MIDNITE MINE\013-Sheet Set\FIGURES\2014-04-30 PO0\1011322 PO013



NOTE:
RUNNING COURSE FILL, COMPACTED FILL, AGGREGATE PIPE ENVELOPE FILL, CPE CULVERT, AND GEOGRID SEPARATION LAYER TO BE REMOVED AFTER COMPLETION OF BORROW ACTIVITIES WEST OF WHITETAIL CREEK□

THIS DRAWING NOT TO SCALE□

NEWMONT

PROJECT
RHOADS BORROW

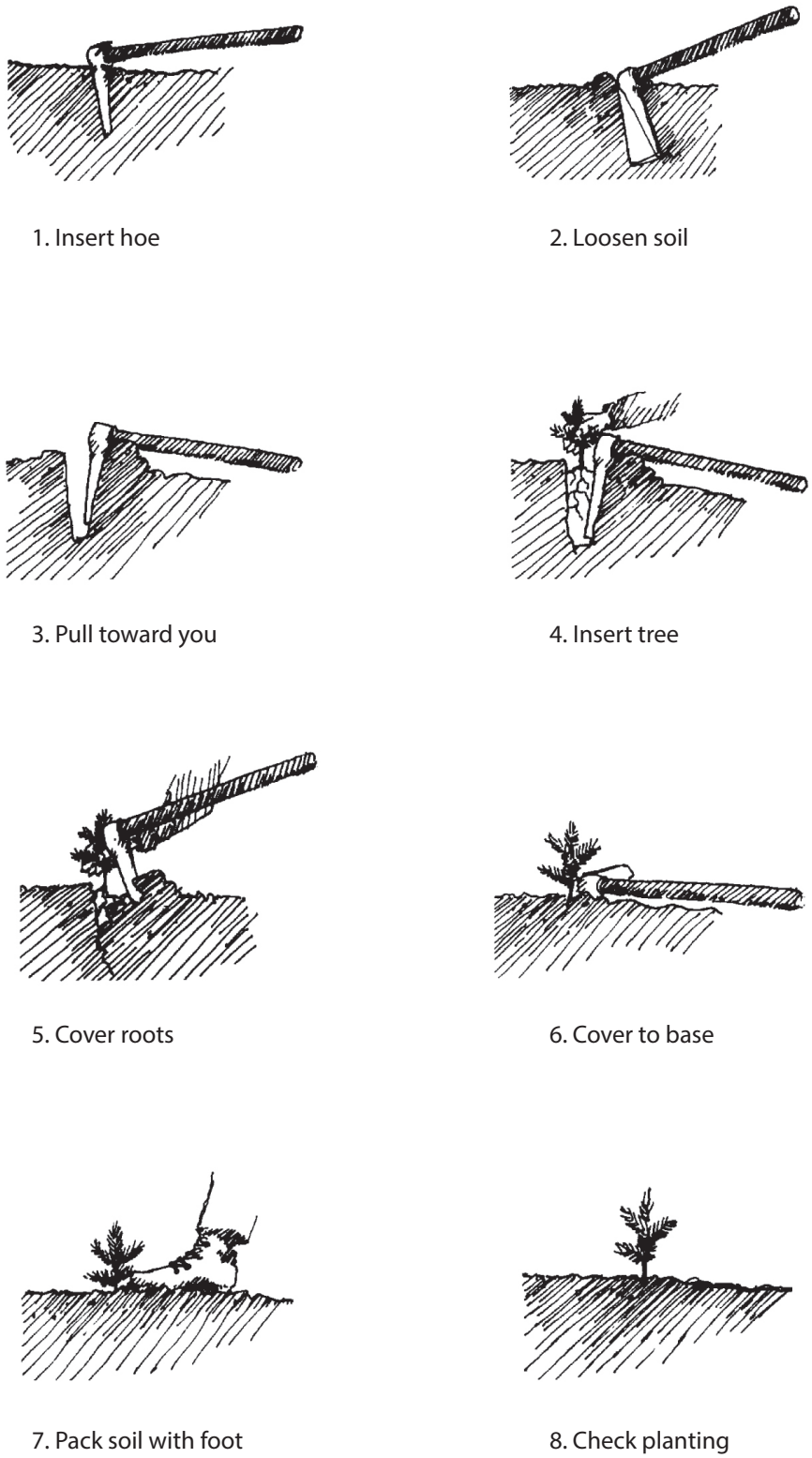
TITLE
WHITETAIL CREEK HAUL ROAD CROSSING

MWH

DATE APR 2014

FIGURE 13

FILE NAME 1011322 PO013



Rhoads Property

FIGURE 14

PROCEDURES FOR TRANSPLANTING BAREROOT OR CONTAINER PLANTS

MWH

SOURCE:
Best Management Practices for Reclaiming Surface Mines
Open File Report 96-2

Fig 14_Procedures for Transplanting_Apr2014.ai 8 Apr 2014

APPENDIX A

RHOADS PROPERTY STRATIGRAPHIC LOGS AND PIEZOMETER COMPLETION DIAGRAMS

BOREHOLE

BOREHOLE NUMBER: RP-P3-1 SHEET 1 OF 2

BORING LOCATION: Rhodes Property SURFACE ELEVATION:

DRILLING COMPANY: Ruen Drilling DRILLER: AJ Chubb DATE/TIME STARTED: 9/10/11 1036

EQUIPMENT: CME 850 DATE/TIME FINISHED: 9/10/11 1208

WATER DEPTH: DATE/TIME OF DEPTH: LOGGED BY: Bill Brasdon

ELEV. / DEPTH	SOIL PROFILE: SOIL DESCRIPTION	USCS CLASS	SAMPLES: NO.	TYPE	BLOW COUNT/6"	ELEV. / DEPTH	WELL DESCRIPTION	WELL CONSTRUCTION
	Silty clay (CL) Pale brn (10YR 6/3) dry, low to medium plasticity, soft, organics (roots)	CL	1	SS 2"	2 4 3 1.3/1.5	1		1036
						2		
	Clay w/trace silt, yellowish brn (10YR 5/4) medium plasticity, dry to slightly moist, soil is clumpy but breaks under finger pressure trace organics	CL	2	SS 2"	5 6 7 1.5/1.5	3 4		1042
	Grades to fine sand and clay (CL/SC), low plasticity, yellowish brn (10YR 5/4) dry to slightly moist where clumpy medium stiff to stiff.	CL/SC	3	SS 2"	7 8 11 1.5/1.5	5 6 7		1053

LEGEND

SPT STANDARD PENETRATION TEST
SH SHELBY TUBE
GB GRAB SAMPLE
CT CUTTINGS
PT PENETRATION SAMPLER (3 INCH)
SS SPLIT SPOON SAMPLER

WELL CONSTRUCTION DETAILS

CASING MATERIAL:
CASING DIAMETER:
FILTER TYPE:
BENTONITE TYPE:
GROUT TYPE:
SURFACE CASING WITH CAP: LOCK:
LENGTH OF STICKUP:

NO.	REVISIONS	REV. DATE	DESIGN BY	DRAWN BY	REVIEWED AND SIGNED BY

MWH

PROJECT No. PROJECT NUMBER
AutoCAD FILE NAME
SCALE: FIGURE No.

BOREHOLE

BOREHOLE NUMBER: BP-P2-1 SHEET 2 OF 2

BORING LOCATION: Rhodes Property SURFACE ELEVATION:

DRILLING COMPANY: Ruen Drilling DRILLER: A.J. Chubb DATE/TIME STARTED:

EQUIPMENT: DATE/TIME FINISHED:

WATER DEPTH: DATE/TIME OF DEPTH: LOGGED BY: Bill Brasden

ELEV. / DEPTH	SOIL PROFILE: SOIL DESCRIPTION	USCS CLASS	SAMPLES: NO.	TYPE	BLOW COUNT/6"	ELEV. / DEPTH	WELL DESCRIPTION	WELL CONSTRUCTION
	grades to clay (CL) w/ trace fine to medium sand, slightly moist to moist, Pale brn (10YR 6/3) stiff to very stiff, trace FeOx spots locally.	CL	4	SS 2"	7/14 21 1.5/1.5	8	outside of centerbit wet when pulled out for 9.5 Interval	1103
						9		
	As Above w/ trace FeOx and manganese spots locally. grades to light gray (5Y 7/2) @ 10.7'. (Top of bedrock?) ?	CL / Bad Rock	5	SS 2"	9 13 16 1.5/1.5	10		1114
						11		
	rock flour of decomposed Qtz monzonite light gray (5Y 5/2) w/ trace FeOx		6	SS 2"	50 for 1" 0.2/1.5	12	very hard and slow drilling w/ HSA	1153
					50 for 1/2"	13		
						14	TD 14' bgs w/HSA	1208

LEGEND

SPT STANDARD PENETRATION TEST
SH SHELBY TUBE
GB GRAB SAMPLE
CT CUTTINGS
PT PENETRATION SAMPLER (3 INCH)
SS SPLIT SPOON SAMPLER

WELL CONSTRUCTION DETAILS

CASING MATERIAL:
CASING DIAMETER:
FILTER TYPE:
BENTONITE TYPE:
GROUT TYPE:
SURFACE CASING WITH CAP: LOCK:
LENGTH OF STICKUP:

REV. NO.	REVISIONS	REV. DATE	DESIGN BY	DRAWN BY	REVIEWED AND SIGNED BY

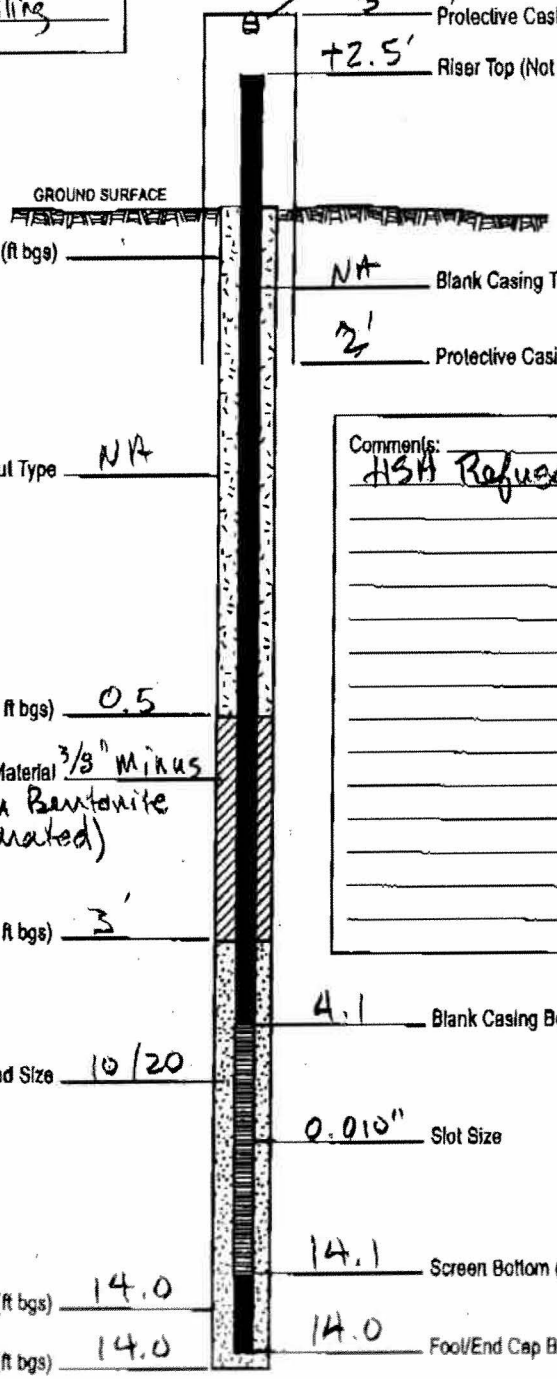
MWH

PROJECT NO./PROJECT NUMBER
DRAWING FILE/FILE NAME
SCALE: FIGURE No.

MONITORING WELL COMPLETION FORM

Project No: _____

Drilling Company: Ruen Drilling



Key Number NA

Protective Casing Top (ft ags) 3

Riser Top (Not applied to Flush Mount; ft ags) +2.5'

Concrete Bottom/Grout Top Depth (ft bgs) _____

Blank Casing Top Depth (Riser Bottom; ft bgs) NA

Protective Casing Depth (ft bgs) 2'

Grout Type NA

Grout Bottom Depth (Seal Top Depth; ft bgs) 0.5

Seal Material 3/8" Minus Granular Bentonite (Hyrated)

Top of Sand (seal bottom depth; ft bgs) 3'

Blank Casing Bottom (Screen Top; ft bgs) 4.1

Coarse Sand Size 10/20

Slot Size 0.010"

Screen Bottom (Foot Top; ft bgs) 14.1

Filter Pack Bottom (ft bgs) 14.0

Foot/End Cap Bottom (Well Total Depth; ft bgs) 14.0

Borehole Depth (ft bgs) 14.0

Comments: HSA Refusal @ 14' bgs

NOT TO SCALE

Loc ID/Well ID RP-P31

Geologist Bill Brasden

Date Construction Started 9/10/11

Date Construction Completed 9/10/11

LOC Type (i.e. Monitoring Well) Piezometer

Riser Material/Diameter _____

Blank Casing Material/Diameter Sch 40 PVC, 2"

Screen Material/Diameter Sch 40 PVC, 2"

Protective Casing Type 4" Square Metal

Borehole Diameter 7"

Above Ground Completion ☒ Flush Mount ☐

USCS Classification of Screened Interval CL & Weathered Bedrock

BOREHOLE

BOREHOLE NUMBER: RP-P32 SHEET 1 OF 3

BORING LOCATION: Rhodes Property

SURFACE ELEVATION:

DRILLING COMPANY: Buen Drilling DRILLER: AJ Chubb

DATE/TIME STARTED: 9/10/11 714

EQUIPMENT: CME 850

DATE/TIME FINISHED: 9/10/11 836

WATER DEPTH: DATE/TIME OF DEPTH:

LOGGED BY: Bill Bragdon

ELEV. / DEPTH	SOIL PROFILE: SOIL DESCRIPTION	USCS CLASS	SAMPLES: NO.	TYPE	BLOW COUNT/6"	ELEV. / DEPTH	WELL DESCRIPTION	WELL CONSTRUCTION
	silty clay (CL) w/ trace fine to medium gravel and organics (low to medium plasticity) soft, grayish brn (10YR 5/2) dry, with organic odor.	CL	1	SS 2"	3 2 3 1.5/1.5	1		
							Harder drilling @ 1.8'	714
	clayey fine to coarse sand (SC) with some silt & trace fine gravel, low to medium plasticity stiff, dry, grades to brn (7.5YR 4/3) @ 3.5, subangular fragments of Qtz monzonite.	SC	2	SS 2"	7 13 10 1.3/1.5	2 3 4		724
	clayey fine to coarse sand (SC) w/ trace silt and some fine and coarse gravel, strong brn (7.5YR 4/6) slightly moist stiff, subangular to angular sand & gravel of fine grained Qtz Monzonite		3	SS 2"	9 11 13 1.5/1.5	5 6 7		737

LEGEND

SPT STANDARD PENETRATION TEST
SH SHELBY TUBE
GB GRAB SAMPLE
CT CUTTINGS
PT PENETRATION SAMPLER (3 INCH)
SS SPLIT SPOON SAMPLER

WELL CONSTRUCTION DETAILS

CASING MATERIAL:
CASING DIAMETER:
FILTER TYPE:
BENTONITE TYPE:
GROUT TYPE:
SURFACE CASING WITH CAP: LOCK:
LENGTH OF STICKUP:

MWH

BOREHOLE NUMBER: BP-P32 **BOREHOLE** SHEET 2 OF 3

BORING LOCATION: Rhodes Property SURFACE ELEVATION:

DRILLING COMPANY: Ruen Drilling DRILLER: AJ Chubb DATE/TIME STARTED:

EQUIPMENT: DATE/TIME FINISHED:

WATER DEPTH: DATE/TIME OF DEPTH: LOGGED BY: Bill Brasden

ELEV. / DEPTH	SOIL PROFILE: SOIL DESCRIPTION	USCS CLASS	SAMPLES: NO.	TYPE	BLOW COUNT/6"	ELEV. / DEPTH	WELL DESCRIPTION	WELL CONSTRUCTION
			4	SS 2"	6 4 4 1.5/1.5	8	loose to very loose @ 7.5-8.0, perched water on bedrock?	
	Graded to Silty fine to medium sand (SP), strong brn (7.5Y 4/6) NP loose to medium dense slightly moist to moist. Decomposed qtz monzonite. Very hard drilling top of bedrock	SP				9		747
		Bad Rock	5	SS 2"	50 for 3 1/2" 0.3/1.5	10 11		805
	fine to coarse sand size angular fragments of qtz monzonite, light brownish gray (2.5Y 6/2, dry, non plastic fragments crumble w/ finger pressure					12		
	As Above		6	SS 2"	50 for 3" 0.3/0.3	13 14		

LEGEND

SPT STANDARD PENETRATION TEST
SH SHELBY TUBE
GB GRAB SAMPLE
CT CUTTINGS
PT PENETRATION SAMPLER (3 INCH)
SS SPLIT SPOON SAMPLER

WELL CONSTRUCTION DETAILS

CASING MATERIAL:
CASING DIAMETER:
FILTER TYPE:
BENTONITE TYPE:
GROUT TYPE:
SURFACE CASING WITH CAP: LOCK:
LENGTH OF STICKUP:

REV. NO.	REVISIONS	REV. DATE	DESIGN BY	DRAWN BY	REVIEWED AND SIGNED BY
1					

MWH

PROJECT No.: PROJECT NAME:
DRAWING FILE NAME:
SCALE: DRAWING No.:

BOREHOLE

BOREHOLE NUMBER: RP-PZ2 SHEET 3 OF 3

BORING LOCATION: Rhodes Property SURFACE ELEVATION:

DRILLING COMPANY: Buen Drilling DRILLER: AJ Chubb DATE/TIME STARTED:

EQUIPMENT: CME 850 DATE/TIME FINISHED:

WATER DEPTH: DATE/TIME OF DEPTH: LOGGED BY: Bill Bragdon

ELEV. / DEPTH	SOIL PROFILE: SOIL DESCRIPTION	SAMPLES: USCS CLASS	NO.	TYPE	BLOW COUNT/6"	ELEV. / DEPTH	WELL DESCRIPTION	WELL CONSTRUCTION
	Weathered Qtz Monzonite Gneiss fragments are hard (H3) Rock Flour of fine to medium sand, light gray (2.5Y 7/2) slightly moist		7	SS 2"	50 for 3½"	15	very hard and slow drilling - refusal TD 15' w/ HSA	836
						16		
						17		
						18		
						19		
						20		
						21		

LEGEND

SPT STANDARD PENETRATION TEST
SH SHELBY TUBE
GB GRAB SAMPLE
CT CUTTINGS
PT PENETRATION SAMPLER (3 INCH)
SS SPLIT SPOON SAMPLER

WELL CONSTRUCTION DETAILS

CASING MATERIAL:
CASING DIAMETER:
FILTER TYPE:
BENTONITE TYPE:
GROUT TYPE:
SURFACE CASING WITH CAP: LOCK:
LENGTH OF STICKUP:

REV. No.	REVISIONS	REV. DATE	DESIGN BY	DRAWN BY	REVIEWED AND SIGNED BY

MWH

PROJECT No. PROJECT NUMBER
AutoCAD FILE FILE NAME
SCALE: SCALE FIGURE No.

MONITORING WELL COMPLETION FORM

Project No: _____

Drilling Company: Ruen Drilling

Key Number NA

3' Protective Casing Top (ft ags)

+2.5 Riser Top (Not applied to Flush Mount; ft ags)

GROUND SURFACE

Concrete Bottom/Grout Top Depth (ft bgs) _____

NA Blank Casing Top Depth (Riser Bottom; ft bgs)

2' Protective Casing Depth (ft bgs)

Grout Type NA

Comments: HSA Refusal @ 15' bgs

Grout Bottom Depth (Seal Top Depth; ft bgs) 0.5'

Seal Material 3/8" Minus Granular Bentonite (Hydrated)

Top of Sand (seal bottom depth; ft bgs) 4.0

5.1 Blank Casing Bottom (Screen Top; ft bgs)

Coarse Sand Size 10/20

0.010" Slot Size

15.1 Screen Bottom (Foot Top; ft bgs)

Filter Pack Bottom (ft bgs) 15.0

15.0 Foot/End Cap Bottom (Well Total Depth; ft bgs)

Borehole Depth (ft bgs) 15.0

NOT TO SCALE

Loc ID/Well ID RP-PZ 2

Geologist Bill Bragdon

Date Construction Started 9/10/11

Date Construction Completed 9/10/11

LOC Type (i.e. Monitoring Well) Piezometer

Riser Material/Diameter _____

Blank Casing Material/Diameter Sch40 PVC 2"

Screen Material/Diameter Sch 40 PVC, 2"

Protective Casing Type 4" Square metal

Borehole Diameter 8"

Above Ground Completion ☒ Flush Mount ☐

USCS Classification of Screened Interval _____

BOREHOLE

BOREHOLE NUMBER: RP-P33 SHEET 1 OF 2

BORING LOCATION: Rhodes Property SURFACE ELEVATION:

DRILLING COMPANY: Ryan Drilling DRILLER: AJ Chubb DATE/TIME STARTED: 9/10/11 1338

EQUIPMENT: DATE/TIME FINISHED: 9/10/11 1456

WATER DEPTH: DATE/TIME OF DEPTH: LOGGED BY: Bill Bragdon

ELEV. / DEPTH	SOIL PROFILE: SOIL DESCRIPTION	USCS CLASS	SAMPLES: NO.	TYPE	BLOW COUNT/6"	ELEV. / DEPTH	WELL DESCRIPTION	WELL CONSTRUCTION
	Silty clay (CL) w/trace fine to medium sand, light brown (7.5YR 6/3) dry, soft, low to medium plasticity few organics and roots	CL	1	SS 2"	2 3 3 1.5/1.5	1		1338
	Silty fine to medium sand, very pale brn (10YR 7/3), non plastic, dry, medium dense Decomposed Qtz Monzonite.	SP	2	SS 2"	12 13 11 1.5/1.5	2 3 4		1345
	fine to medium sand (SP) w/trace silt, very pale brn (10YR 7/3) non plastic, dry, very dense. Decomposed Qtz monzonite.		3	SS 2"	44 50 for 3" 0.2/0.2	5 6 7		1354

LEGEND

SPT STANDARD PENETRATION TEST
SH SHELBY TUBE
GB GRAB SAMPLE
CT CUTTINGS
PT PENETRATION SAMPLER (3 INCH)
SS SPLIT SPOON SAMPLER

WELL CONSTRUCTION DETAILS

CASING MATERIAL:
CASING DIAMETER:
FILTER TYPE:
BENTONITE TYPE:
GROUT TYPE:
SURFACE CASING WITH CAP: LOCK:
LENGTH OF STICKUP:

REVISIONS	REV. DATE	DESIGN BY	DRAWN BY	REVIEWED AND SIGNED BY

MWH

PROJECT No.: PROJECT NUMBER
AutoCAD FILE FILE NAME
SCALE: SCALE FIGURE No.

BOREHOLE

BOREHOLE NUMBER: RP-B33 SHEET 2 OF 2

BORING LOCATION: Rhodes Property SURFACE ELEVATION:

DRILLING COMPANY: Ruen Drilling DRILLER: A.J. Chubb DATE/TIME STARTED:

EQUIPMENT: DATE/TIME FINISHED:

WATER DEPTH: DATE/TIME OF DEPTH: LOGGED BY: Bill Bragdon

ELEV. / DEPTH	SOIL PROFILE: SOIL DESCRIPTION	USCS CLASS	SAMPLES: NO.	TYPE	BLOW COUNT/6"	ELEV. / DEPTH	WELL DESCRIPTION	WELL CONSTRUCTION
	As Above, grading to slightly moist.	CS	4	SS 2"	40 50 for 4"	8		
						9	Slightly Harder drilling @ ≈9.3'	1412
	Decomposed Qtz Monzonite weathered to argillic, strong FeOX & manganese locally, dry to slightly moist, very pale brn w/ some dk yellowish brn (10YR 4/4), medium plasticity where argillic.	Bed rock	5	SS 2"	22 75 for 6" 1.0/1.0	10 11		1425
						12		
	As Above @10' bgs		6	SS 2"	50 for 4"	13	very hard and slow auguring 13-14'	1440
			7	SS 2"	50 for 0	14	Refusal TD 14' bgs	1456

LEGEND

SPT STANDARD PENETRATION TEST
SH SHELBY TUBE
GB GRAB SAMPLE
CT CUTTINGS
PT PENETRATION SAMPLER (3 INCH)
SS SPLIT SPOON SAMPLER

WELL CONSTRUCTION DETAILS

CASING MATERIAL:
CASING DIAMETER:
FILTER TYPE:
BENTONITE TYPE:
GROUT TYPE:
SURFACE CASING WITH CAP: LOCK:
LENGTH OF STICKUP:

REVISIONS	REV. DATE	DESIGN BY	DRAWN BY	REVIEWED AND SIGNED BY

MWH

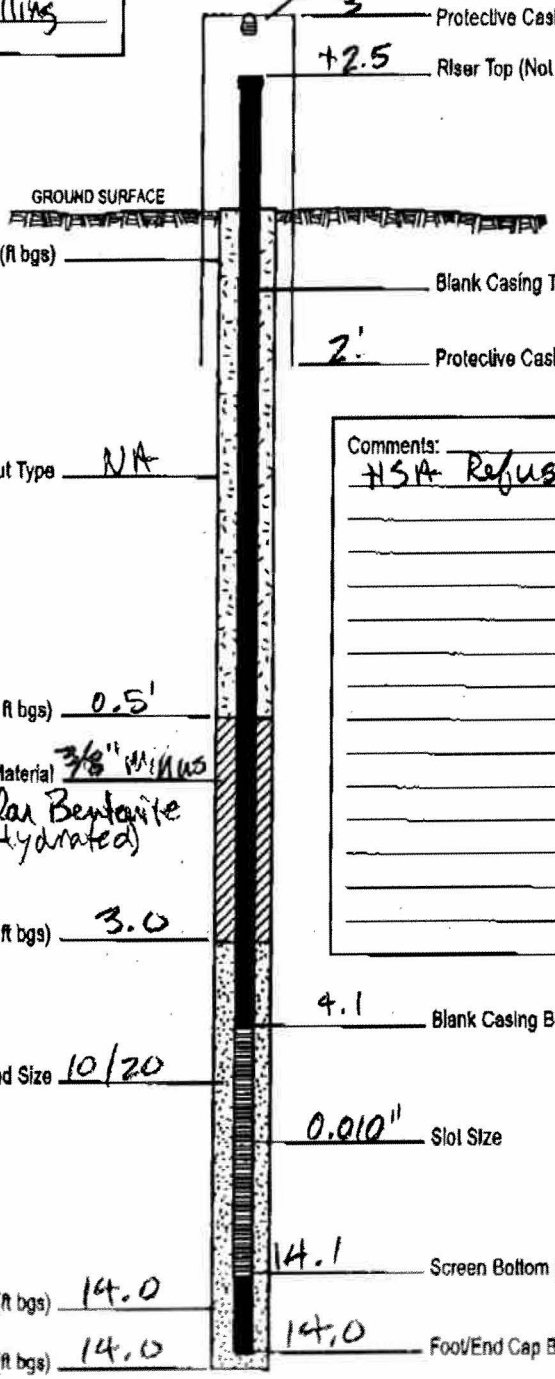
PROJECT No. PROJECT NUMBER
PLANSIZE FILE: FILE NAME
SCALE: FIGURE No.

MONITORING WELL COMPLETION FORM

Project No: _____

Drilling Company: Bucn Drilling

Key Number NA



Protective Casing Top (ft ags): 3

Riser Top (Not applied to Flush Mount; ft ags): +2.5

Concrete Bottom/Grout Top Depth (ft bgs): _____

Blank Casing Top Depth (Riser Bottom; ft bgs): _____

Protective Casing Depth (ft bgs): 2'

Grout Type: NA

Grout Bottom Depth (Seal Top Depth; ft bgs): 0.5'

Seal Material: 3/8" Minus Granular Bentonite (Hydrated)

Top of Sand (seal bottom depth; ft bgs): 3.0

Blank Casing Bottom (Screen Top; ft bgs): 4.1

Coarse Sand Size: 10/20

Slot Size: 0.010"

Screen Bottom (Foot Top; ft bgs): 14.1

Filter Pack Bottom (ft bgs): 14.0

Foot/End Cap Bottom (Well Total Depth; ft bgs): 14.0

Borehole Depth (ft bgs): 14.0

Comments: HSA Refusal @ 14' bgs

NOT TO SCALE

Loc ID/Well ID: RP-PZ3

Geologist: Bill Bragoon

Date Construction Started: 9/10/11

Date Construction Completed: 9/10/11

LOC Type (i.e. Monitoring Well): Piezometer

Riser Material/Diameter: /

Blank Casing Material/Diameter: Sch 40 PVC 2"

Screen Material/Diameter: Sch 40 PVC 2"

Protective Casing Type: 4" Square Metal

Borehole Diameter: 8"

Above Ground Completion ☒ Flush Mount ☐

USCS Classification of Screened Interval: _____

BOREHOLE

BOREHOLE NUMBER: RD-P34 SHEET 1 OF 3

BORING LOCATION: Rhodes Property SURFACE ELEVATION:

DRILLING COMPANY: Buen Drilling DRILLER: AJ Chubb DATE/TIME STARTED: 9/11/11 758

EQUIPMENT: CME-850 DATE/TIME FINISHED: 9/8/1 910

WATER DEPTH: DATE/TIME OF DEPTH: LOGGED BY: Bill Brasdon

ELEV. / DEPTH	SOIL PROFILE: SOIL DESCRIPTION	USCS CLASS	SAMPLES: NO.	TYPE	BLOW COUNT/6"	ELEV. / DEPTH	WELL DESCRIPTION	WELL CONSTRUCTION
	silty clay (CL) w/trace fine to medium sand, dry, low to medium plasticity, soft, few organics, Pale brn (10YR 6/3)	CL	1	SS 2"	3 2 3 1.4/1.5	1		0758
						2		
	silty clay (CL) with some fine gravel of Qtz Mon. grades to strong brn (7.5YR 5/6) low plasticity locally, subrounded to subangular, few FeOx spots, slightly moist, medium stiff	CL	2	SS 2"	6 6 7 1.5/1.5	3		
						4		803
	clayey fine to coarse sand (SC), brown (7.5YR 4/4), low to medium plasticity, slightly moist, medium stiff	SC	3	SS 2"	5 6 7 1.5/1.5	5		
	grades to clayey fines coarse gravel, low plasticity dark reddish gray (5YR 4/2) slightly moist, medium stiff	GC				6		810
						7		

LEGEND

SPT STANDARD PENETRATION TEST
SH SHELBY TUBE
GB GRAB SAMPLE
CT CUTTINGS
PT PENETRATION SAMPLER (3 INCH)
SS SPLIT SPOON SAMPLER

WELL CONSTRUCTION DETAILS

CASING MATERIAL:
CASING DIAMETER:
FILTER TYPE:
BENTONITE TYPE:
GROUT TYPE:
SURFACE CASING WITH CAP: LOCK:
LENGTH OF STICKUP:

REVISIONS	REV. DATE	DESIGN BY	DRAWN BY	REVIEWED AND SIGNED BY

MWH

PROJECT NO. PROJECT NAME
AutoCAD FILE NAME
SCALE FIGURE NO.

BOREHOLE

BOREHOLE NUMBER: RP-P3-4 SHEET 2 OF 3

BORING LOCATION: Rhodes Property SURFACE ELEVATION:

DRILLING COMPANY: Buen Drilling DRILLER: AJ Chubb DATE/TIME STARTED:

EQUIPMENT: CME 850 DATE/TIME FINISHED:

WATER DEPTH: DATE/TIME OF DEPTH: LOGGED BY: Bill Brasden

ELEV. / DEPTH	SOIL PROFILE: SOIL DESCRIPTION	SAMPLES: USCS CLASS	NO.	TYPE	BLOW COUNT/6"	ELEV. / DEPTH	WELL DESCRIPTION	WELL CONSTRUCTION
	fine to medium sandy clay (CL), medium plasticity slightly moist to moist, soft, brown (7.5YR 4/3)	CL	4	SS 2"	3 2 3 1.5/1.5	8 9		819
	grades to very soft clayey fine sand (SC), brn (10YR 5/3), moist to wet, very soft, medium plasticity.	SC	5	SS 2"	Hammer weight 1.8/1.8	10 11		
	CL as above @ 8.2'	CL				12		829
	SC as above @ 10.5' moist to wet @ 13' grades to brn (7.5YR 4/3), soft to medium stiff.	SC	6	SS 2"	1 3 5 1.5/1.5	13 14		837

LEGEND

SPT STANDARD PENETRATION TEST
SH SHELBY TUBE
GB GRAB SAMPLE
CT CUTTINGS
PT PENETRATION SAMPLER (3 INCH)
SS SPLIT SPOON SAMPLER

WELL CONSTRUCTION DETAILS

CASING MATERIAL:
CASING DIAMETER:
FILTER TYPE:
BENTONITE TYPE:
GROUT TYPE:
SURFACE CASING WITH CAP: LOCK:
LENGTH OF STICKUP:

REV. NO.	REVISIONS	REV. DATE	DESIGN BY	DRAWN BY	REVIEWED AND APPROVED BY

MWH

PROJECT NO.: PROJECT NUMBER
STANDARD FILE FILE NAME
SCALE: SCALE FIGURE NO.

BOREHOLE

BOREHOLE NUMBER: RIP-D34 SHEET 3 OF 3

BORING LOCATION: Rhodes Property SURFACE ELEVATION:

DRILLING COMPANY: Buem Drilling DRILLER: A J Chubb DATE/TIME STARTED:

EQUIPMENT: CME 850 DATE/TIME FINISHED:

WATER DEPTH: DATE/TIME OF DEPTH: LOGGED BY: Bill Bragdon

ELEV. / DEPTH	SOIL PROFILE: SOIL DESCRIPTION	USCS CLASS	SAMPLES: NO.	TYPE	BLOW COUNT/6"	ELEV. / DEPTH	WELL DESCRIPTION	WELL CONSTRUCTION
	Clayey fine to coarse sand (SC), pale brn (10YR 6/3) and brownish yellow (10YR 6/6), slightly moist, medium stiff to stiff, medium plasticity, locally strong manganese trace FeOx spots.	SC	7	SS 2"	6 8 12	15		
					1.5/16	16		846
		Pad rock				17	slower drilling ≈16.5-17.0	
	Bed Rock, Decomposed (wa) Qtz monzonite, breaks w/ finger pressure, generally yellowish brown (10YR 5/4) dry to slightly moist, feldspars to 1/2" trace to some FeOx and manganese locally. Some feldspars argillically altered.		8	SS 2"	11 16 23	18		
						19		858
							Slower Driller	
						20		
	Bedrock of Qtz monzonite as above w/ decrease in FeOx and manganese (ss8)		9	SS 2"	15 42 50 for 4"		TD w/ HSA	
						21	TD w/ SS	

LEGEND

SPT STANDARD PENETRATION TEST
SH SHELBY TUBE
GB GRAB SAMPLE
CT CUTTINGS
PT PENETRATION SAMPLER (3 INCH)
SS SPLIT SPOON SAMPLER

WELL CONSTRUCTION DETAILS

CASING MATERIAL:
CASING DIAMETER:
FILTER TYPE:
BENTONITE TYPE:
GROUT TYPE:
SURFACE CASING WITH CAP: LOCK:
LENGTH OF STICKUP:

REVISIONS	REV. DATE	DESIGN BY	DRAWN BY	REVIEWED AND APPROVED BY

MWH

PROJECT No.: PROJECT NUMBER
AUTOCAD FILE FILE NAME
SCALE: SCALE FIGURE No.

MONITORING WELL COMPLETION FORM

Project No: _____

Drilling Company: Ruen Drilling

Key Number NA

3' Protective Casing Top (ft ags)

+2.5 Riser Top (Not applied to Flush Mount; ft ags)

GROUND SURFACE

Concrete Bottom/Grout Top Depth (ft bgs)

Blank Casing Top Depth (Riser Bottom; ft bgs)

2' Protective Casing Depth (ft bgs)

Grout Type

Comments: HSA Refusal @ ≈21' bgs
3/8" Coated Pellets
21 to 17.8
10/20 Silica Sand 17.7 - 17.8

Grout Bottom Depth (Seal Top Depth; ft bgs) 1'

Seal Material 3/8" Minus Granular Bentonite Hydrated

Top of Sand (seal bottom depth; ft bgs) 6.5'

7.6' Blank Casing Bottom (Screen Top; ft bgs)

Coarse Sand Size 10/20

0.010" Slot Size

17.6 Screen Bottom (Foot Top; ft bgs)

Filter Pack Bottom (ft bgs) 17.7

17.7 Foot/End Cap Bottom (Well Total Depth; ft bgs)

Borehole Depth (ft bgs) 20'

NOT TO SCALE

Loc ID/Well ID RP-P34

Geologist Bill Bragdon

Date Construction Started 9/11/11

Date Construction Completed 9/11/11

LOC Type (i.e. Monitoring Well) Piezometer

Riser Material/Diameter /

Blank Casing Material/Diameter Sch 40 PVC 2"

Screen Material/Diameter Sch 40 PVC 2"

Protective Casing Type 4" Square Metal

Borehole Diameter 8"

Above Ground Completion ☒ Flush Mount ☐

USCS Classification of Screened Interval

BOREHOLE

BOREHOLE NUMBER: RP-B3 SHEET 1 OF 4

BORING LOCATION: Rhodes Property

SURFACE ELEVATION:

DRILLING COMPANY: Quen Drilling DRILLER: A. Schubb

DATE/TIME STARTED: 9/11/11 1209

EQUIPMENT:

DATE/TIME FINISHED:

WATER DEPTH: DATE/TIME OF DEPTH:

LOGGED BY: Bill Bragdon

ELEV. / DEPTH	SOIL PROFILE: SOIL DESCRIPTION	SAMPLES: USCS CLASS	NO.	TYPE	BLOW COUNT/6"	ELEV. / DEPTH	WELL DESCRIPTION	WELL CONSTRUCTION
	Silty clay w/ trace fine to medium sand (CL) low to medium plasticity, dry, soft, few organics Brown (7.5YR 4/3)	CL	1	SS 2"	3 2 2 1.4/1.5	1		1209
						2		
	grades to slightly moist, dk brn (7.5YR 3/2) very soft.	CL	2	SS 2"	1 1 1 1.4/1.5	3 4		1216
	fine sandy clay (CL) brown (10YR 4/3) slightly moist, medium plasticity soft to medium stiff.	CL	3	SS 2"	2 3 5 1.4/1.4	5 6 7		1221

LEGEND

SPT STANDARD PENETRATION TEST
SH SHELBY TUBE
GB GRAB SAMPLE
CT CUTTINGS
PT PENETRATION SAMPLER (3 INCH)
SS SPLIT SPOON SAMPLER

WELL CONSTRUCTION DETAILS

CASING MATERIAL:
CASING DIAMETER:
FILTER TYPE:
BENTONITE TYPE:
GROUT TYPE:
SURFACE CASING WITH CAP: LOCK:
LENGTH OF STICKUP:

REV. NO.	REVISIONS	REV. DATE	DESIGN BY	DRAWN BY	REVIEWED AND SIGNED BY

MWH

PROJECT NO.: PROJECT NUMBER
AutoCAD FILE: FILE NAME
SCALE: SCALE
FIGURE NO.

BOREHOLE NUMBER: RP-P35 **BOREHOLE** SHEET 2 OF 4

BORING LOCATION: Rhodes Property SURFACE ELEVATION:

DRILLING COMPANY: Rugen Drilling DRILLER: AJ Chavez DATE/TIME STARTED:

EQUIPMENT: CME 850 DATE/TIME FINISHED:

WATER DEPTH: DATE/TIME OF DEPTH: LOGGED BY: Bill Bragdon

ELEV. DEPTH	SOIL PROFILE: SOIL DESCRIPTION	USCS CLASS	SAMPLES: NO.	TYPE	BLOW COUNT/6"	ELEV. DEPTH	WELL DESCRIPTION	WELL CONSTRUCTION
	As Above w/ roots	CL	4	SS 2"	2 6 4 1.2/1.5	8 9		1229
	fine to medium sandy clay (CL), light olive brn (2.5Y 5/3), medium plasticity soft to medium stiff, trace FeOx, mica and manganese, minor vugs up to 0.1". slightly moist.	CL	5	SS 2"	3 4 8 1.5/1.5	10 11		1235
	Increase in sand to CL/SC As Above grading to light brownish gray (2.5Y 6/2) and yellowish brown (10YR 5/6) modeled appearance	CL/SC	6	SS 2"	5 6 8	12 13 14		1243

LEGEND

SPT STANDARD PENETRATION TEST
SH SHELBY TUBE
GB GRAB SAMPLE
CT CUTTINGS
PT PENETRATION SAMPLER (3 INCH)
SS SPLIT SPOON SAMPLER

WELL CONSTRUCTION DETAILS

CASING MATERIAL:
CASING DIAMETER:
FILTER TYPE:
BENTONITE TYPE:
GROUT TYPE:
SURFACE CASING WITH CAP: LOCK:
LENGTH OF STICKUP:

REVISIONS	REV. DATE	DESIGN BY	DRAWN BY	REVIEWED AND SIGNED BY

MWH

PROJECT NO. / PROJECT NUMBER
FILENAME / FILE NAME
SCALE: NONE FIGURE NO.

BOREHOLE

BOREHOLE NUMBER: RR-P35 SHEET 3 OF 4

BORING LOCATION: Rhodes Property SURFACE ELEVATION:

DRILLING COMPANY: Buen Drilling DRILLER: AJ Chubb DATE/TIME STARTED:

EQUIPMENT: CME 850 DATE/TIME FINISHED:

WATER DEPTH: DATE/TIME OF DEPTH: LOGGED BY: Bill Bragdon

ELEV. / DEPTH	SOIL PROFILE: SOIL DESCRIPTION	USCS CLASS	SAMPLES: NO.	TYPE	BLOW COUNT/6"	ELEV. / DEPTH	WELL DESCRIPTION	WELL CONSTRUCTION
	clayey fine sand (SC) w/ trace medium sand, medium plasticity, medium stiff to stiff, slightly moist, trace FeOx spots, Qtz Monzonite Gravel @ 15.5', generally light yellowish brn (10YR 6/4)	SC	7	SS 2"	5 9 12 1.5/1.5	15 16		1251
	Decomposed (w9) Qtz Monzonite to fine to medium sand, medium plasticity, slightly moist to moist, Generally yellowish brn (10YR 5/6) w/ trace FeOx and manganese. Argillic Alteration	BP	8	SS 2"	4 5 8 1.5/1.5	17 18 19		1301
	As Above w/ Qtz monzonite fine & coarse gravel		9	SS 2"	4 5 7 1.5	20 21		1311

LEGEND

SPT STANDARD PENETRATION TEST
SH SHELBY TUBE
GB GRAB SAMPLE
CT CUTTINGS
PT PENETRATION SAMPLER (3 INCH)
SS SPLIT SPOON SAMPLER

WELL CONSTRUCTION DETAILS

CASING MATERIAL:
CASING DIAMETER:
FILTER TYPE:
BENTONITE TYPE:
GROUT TYPE:
SURFACE CASING WITH CAP: LOCK:
LENGTH OF STICKUP:

REV.	REVISIONS	REV. DATE	DESIGN BY	DRAWN BY	REVIEWED AND CHECKED BY

MWH

PROJECT NO. / PROJECT NUMBER
AUTOCAD FILE / FILE NAME
SCALE: NONE FIGURE NO.

BOREHOLE

BOREHOLE NUMBER: BP-P3-5 SHEET 4 OF 4

BORING LOCATION: Rhodes Property SURFACE ELEVATION:

DRILLING COMPANY: Risen Drilling DRILLER: A Schubb DATE/TIME STARTED:

EQUIPMENT: DATE/TIME FINISHED:

WATER DEPTH: DATE/TIME OF DEPTH: LOGGED BY: Bill Bragden

ELEV. / DEPTH	SOIL PROFILE: SOIL DESCRIPTION	USCS CLASS	SAMPLES: NO.	TYPE	BLOW COUNT/6"	ELEV. / DEPTH	WELL DESCRIPTION	WELL CONSTRUCTION
	Strong FeOx & Mica locally, grades to light Olive brn (2.5Y 5/4) slightly moist.					22		
	Decomposed (wa) qtz monzonite, argillic is very sticky but no evidence of water. generally light Olive brn (2.5Y 5/4), medium plasticity.			SS	5 6 9	23		
				2"	9 1.5/1.5	24		1322
	As Above w/ strong FeOx, manganese and argillic feldspars to ½", some weathered, some fresh or slightly weathered. slightly moist.			SS	11 18	25		
				2"	29 1.5/1.5	26	TD w/ HSA TD w/ SS 26.5	1344

LEGEND

SPT STANDARD PENETRATION TEST
SH SHELBY TUBE
GB GRAB SAMPLE
CT CUTTINGS
PT PENETRATION SAMPLER (3 INCH)
SS SPLIT SPOON SAMPLER

WELL CONSTRUCTION DETAILS

CASING MATERIAL:
CASING DIAMETER:
FILTER TYPE:
BENTONITE TYPE:
GROUT TYPE:
SURFACE CASING WITH CAP: LOCK:
LENGTH OF STICKUP:

REVISIONS	REV. DATE	DESIGN BY	DRAWN BY	REVIEWED AND DONE BY

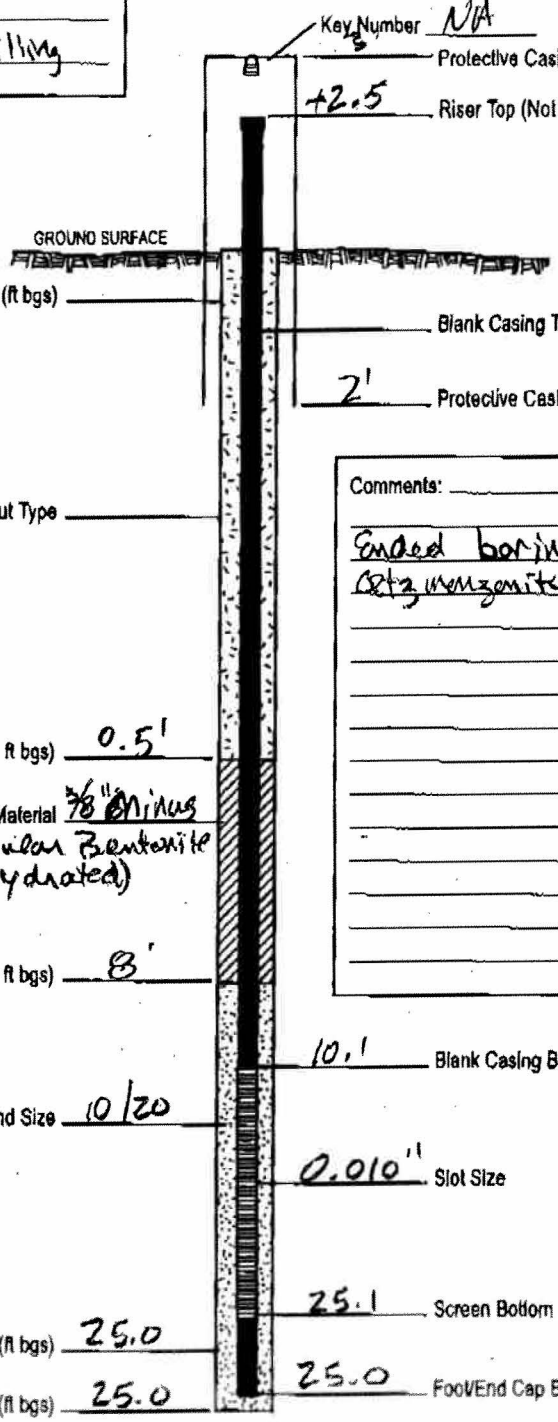
MWH

PROJECT NO. PROJECT NAME
FILE NAME
SCALE: SCALE FIGURE No.

MONITORING WELL COMPLETION FORM

Project No: _____

Drilling Company: Ruen Drilling



Key Number NA

Protective Casing Top (ft ags)

+2.5 Riser Top (Not applied to Flush Mount; ft ags)

Concrete Bottom/Grout Top Depth (ft bgs)

Blank Casing Top Depth (Riser Bottom; ft bgs)

2' Protective Casing Depth (ft bgs)

Grout Type

Grout Bottom Depth (Seal Top Depth; ft bgs) 0.5'

Seal Material 3/8" Minus Granular Bentonite (Hydrated)

Top of Sand (seal bottom depth; ft bgs) 8'

10.1 Blank Casing Bottom (Screen Top; ft bgs)

Coarse Sand Size 10/20

0.010" Slot Size

25.1 Screen Bottom (Foot Top; ft bgs)

Filter Pack Bottom (ft bgs) 25.0

25.0 Foot/End Cap Bottom (Well Total Depth; ft bgs)

Borehole Depth (ft bgs) 25.0

Comments: Ended boring in decomposed Qtz monzonite bedrock.

NOT TO SCALE

Loc ID/Well ID RP-P35

Geologist Bill Bragdon

Date Construction Started 9/11/11

Date Construction Completed 9/11/11

LOC Type (i.e. Monitoring Well) Piezometer

Riser Material/Diameter /

Blank Casing Material/Diameter sch40 PVC 2"

Screen Material/Diameter sch40 PVC / 2"

Protective Casing Type 4" square metal

Borehole Diameter 8"

Above Ground Completion ☒ Flush Mount ☐

USCS Classification of Screened Interval _____

APPENDIX B

PRE-DESIGN DATA NEEDS – MIDNITE MINE STANDARD OPERATING PROCEDURES – GROUNDWATER WELL INSTALLATION AND DEVELOPMENT

PREDESIGN DATA NEEDS - MIDNITE MINE STANDARD OPERATING PROCEDURES	PDDN-SOP23 REVISION: 0 PAGE: 1 OF 28 DATE: May 21, 2013
GROUNDWATER WELL INSTALLATION AND DEVELOPMENT	

Table of Contents

1. PURPOSE 3
2. RESPONSIBILITY 3
3. RELATED STANDARD OPERATING PROCEDURES 3
4. EQUIPMENT REQUIRED FOR GROUNDWATER WELL INSTALLATION 3
5. PROCEDURE 4
6. DOCUMENTATION 12
7. EQUIPMENT NECESSARY FOR MONITORING WELL DEVELOPMENT 13
8. WELL DEVELOPMENT PROCEDURES 13
9. FIELD METER CALIBRATION AND MEASUREMENT 15
10. DOCUMENTATION 20
11. ATTACHMENTS 21

1. PURPOSE

The purpose of this document is to define the Standard Operating Procedure (SOP) for installing and developing groundwater wells in unconsolidated geologic materials and bedrock at the Midnite Mine (Site) and in surrounding areas. This SOP explains the necessary equipment and procedures for well installation and development. The step-by-step procedures described herein are sufficiently detailed to allow field personnel to properly install and develop monitoring wells

The purpose of well development is to remove well drilling fluids, solids, or other particulates that may have been introduced or deposited on the borehole wall in a recently installed well during drilling and construction activities. This restores the hydraulic conductivity of the aquifer material surrounding the well to near pre-well installation conditions. Properly developed monitoring wells allow for the collection of ground water samples that are representative of the aquifer of concern.

2. RESPONSIBILITY

The individuals who will be involved and the tasks for which they are responsible are discussed in the QAPP.

3. RELATED STANDARD OPERATING PROCEDURES

This procedure is intended to be used with the following SOPs:

- PDDN-SOP3 Decontamination
- PDDN-SOP8 Groundwater Sampling
- PDDN-SOP24 Groundwater Well Pumping Test

4. EQUIPMENT REQUIRED FOR GROUNDWATER WELL INSTALLATION

Equipment that may be used for installing groundwater monitoring wells includes:

- Watch
- Well casing and well screen
- Bentonite pellets
- Filter sand
- Cement and powdered bentonite for grouting
- Stainless-steel and/or PVC centralizers
- Protective well casing with locking cap
- Steel guard posts
- High-pressure wash system
- Long-handled bristle brushes
- Wash/rinse tubs
- Liquinox™ detergent (or equivalent)
- Location map
- Drill rig capable of installing wells to the desired depth in the expected formation materials and conditions, with a cyclone to enable measurement of ground water flow rates and sample collection
- Cloth sample bags

- Weighted tape measure
- Water level probe
- Deionized or distilled water
- Disposable latex gloves
- Hand lens, magnification 10X
- Munsell soil color chart
- Knife
- Ten percent hydrochloric acid
- Chip trays
- Calibrated 5- and 1-gallon buckets
- Appropriate health and safety equipment
- Waterproof pens
- Field logbook
- Calculator
- Boring/well completion log sheets (an example is attached at the end of this SOP)
- Well construction log sheets (an example is attached at the end of this SOP).

5. PROCEDURE

5.1. Decontaminate Equipment

Decontamination procedures specified in PDN-SOP 3 shall be performed, including the following:

- Before each well is drilled, all lubricants, dirt, and contamination shall be removed from the drill pipe, thread caps, drill bits, tools, and table area of the drill rig by a high-pressure washer with a detergent solution, followed by a rinse with approved water. Equipment shall be decontaminated at the designated area located at the south end of Pit 3.

- The water truck or tank used to store approved decontamination water shall be cleaned and flushed out prior to the start of drilling activities. However, if the truck or tank is used only for storing approved water, it does not need to be decontaminated between wells, except for flushing of accumulated sediments as needed.

- Drill pipe, drill bits, and tools shall be stored off the ground.

- Injection and water pumps shall be cleaned, and only RV-type antifreeze shall be used.

- Any leaks from the drill rig shall be fixed or contained in such a way during drilling that they will not contaminate the borehole.

- Care shall be taken not to contaminate the drill rods or the borehole with diesel fluid, hydraulic fluid, WD-40, oil, dirty tools, and so forth.

- Drillers shall use clean gloves when handling downhole equipment. Different gloves shall be used for performing activities such as fueling, adding oil, and working on equipment.

- Pipe lubricants that are used should not introduce contaminants into the borehole. Lubricants that are environmentally acceptable include Green Stuff®, King Stuff®, vegetable oil, Crisco®, and some Teflon™-based lubricants. Lubricants that are not acceptable include petroleum-based and most metal-based lubricants. Worthington Miller Environmental (WMI) shall pre-approve lubricants that will be used, and the Material Safety Data Sheets (MSDS) for these lubricants shall be provided for approval.

- All well casing and screen shall be free of foreign material. Casing and screen shall be stored off the ground and protected with either plastic wrap or cardboard boxes. Casing and screen shall be kept in the original manufacturer's shipping containers until they are installed in the borehole. If the polyvinyl chloride (PVC) becomes contaminated, it shall be decontaminated according to PDDN-SOP3 before installation. Clean latex or rubber gloves shall be worn by the drillers when handling the well materials.

5.2. Drilling Procedures

All wells shall be drilled using air-rotary ~~temporary casing~~ drilling methods. Drilling shall be performed using Barber (dual-rotary), odex, or other temporary casing methods. Air will be the primary drilling fluid used. If other fluids are needed for borehole stability, cuttings removal, or restoring circulation, they will be used in the following sequence: (1) air/water mist, (2) foam, (3) polymer, and (4) bentonite mud. The discharge from the borehole will be directed to a cyclone so that ground water discharge rates can be measured.

The diameter of the boreholes shall be sufficient to provide a minimum 2-inch annulus between the well casing and the borehole. The borehole diameter is anticipated to be 14 inches at the surface to allow for 10~~2~~-inch steel surface casing. The borehole below the steel casing is anticipated to be 10 inches nominal.

5.3. Hydrogeology

The ground water data collection tasks during drilling shall include:

- Determination of the first occurrence of observable ground water
- Determination of whether ground water is present in alluvium or at the alluvium/bedrock contact
- Measurement of water production rates during drilling
- Observation of any significant increases or decreases of water production in the boreholes. Note if water production changes are related to changes in lithology, structure, or fracturing.
- Measurement of static water levels in the borehole at the start of each shift and after the final depth is reached.

5.3.1. General Notes

The borehole shall be airlifted to dryness (or until clean ground water is produced) at the end of a shift. This may require airlifting 15 to 30 minutes, letting the borehole sit undisturbed for 15 to 30 minutes, and then airlifting again.

5.3.2. First Occurrence of Water

The depth at which water is first encountered shall be noted. There is no minimum amount of water required to count as first water (i.e., any water encountered regardless of quantity qualifies as first water).

If drilling dry, the zones that produce moist/damp cuttings but no free water shall be noted. It shall be noted if damp/wet zones are encountered and if deeper zones are dry. In zones that produce moist/damp cuttings, stop drilling, let the borehole sit undisturbed for 10 to 15 minutes, and then airlift to determine if free water is present.

5.3.3. Alluvial Bedrock Contact

Stop drilling at the alluvial/bedrock contact and let the borehole sit undisturbed for 10 to 15 minutes and then airlift to determine if free water is present. Record in the field logbook whether or not water is present.

5.3.4. Water Production Measurement During Drilling

Measure water production during drilling as follows:

1. Airlift until water production stabilizes or diminishes to less than 0.5 gallons per minute (gpm), as specified in item 2 below. The procedure will be performed 1) every 10 feet of drill advancement, 2) after each drill rod is fully advanced, 3) after cleaning cuttings from the borehole, 4) after discontinuing drilling fluid injection, and 5) at the end of each shift.
2. Airlift, without injecting drilling fluid, a minimum of 5 minutes. Continue airlifting until water production stabilizes or is less than 0.5 gpm. Stabilization of water production usually takes between 5 and 15 minutes depending on borehole conditions (e.g., depth, degree of fracturing, drill fluid additives, and the amount of ground water).
3. After airlifting a minimum of 5 minutes, consider water production to be stable when two consecutive discharge measurements are nearly the same.
4. Measure discharge to the nearest 0.25 gpm using a calibrated 1- or 5-gallon bucket and a stopwatch.
5. Record the stable water production rate in the field logbook.
6. Ground water may not be present in sufficient quantities to sustain water production during airlifting. Note if a slug of water is observed after the new drilling rod is added or at the start of a shift.
7. Record other hydrogeologic information when possible. Note fracture zones, zones where flow increases/decreases, lost circulation zones, voids, and water blowing out of other boreholes.

5.3.5. Water Level Measurement

Measure water levels in boreholes at the start of every shift according to the following procedures:

1. Prepare the borehole and drill rig for water level measurement at the end of the previous shift by airlifting the borehole to remove injected drilling fluids and cuttings and by leaving the drill rods in the borehole so that the water

level can be measured at the start of the next shift without raising or lowering the drill rods.

2. At the start of every shift, measure the water level inside the drill rod with a water level probe as follows. Measure the water level before disturbing the borehole in any way (e.g., do not raise or lower the drill rods, or turn on the air).
   a. Test the water level probe before use by dipping it in water.
   b. Add weight to the water level probe as necessary.
   c. Note the depth of the exchange or any other obstacle in the drill rod and do not lower the water level probe beyond that depth.
   d. Determine depth to water from the ground surface. If the borehole is dry, record the maximum depth obtained during the measurement (e.g., dry to 200 feet below ground surface [bgs]) to the nearest foot.
   e. Note the reliability of the measurement. Some measurements may be questionable and shall be noted as such.
   f. Record the date, time, depth to water below ground level, and borehole depth in the field logbook.

5.4. Collection and Description of Samples

Borehole stratigraphy shall be logged by examination of the sample cuttings or split barrel samples. Monitoring wells shall be drilled using air-rotary drilling methods. Air will be the primary drilling fluid. The return fluid will consist of air, drill cuttings, and ground water, which will be routed through a cyclone to separate the air and allow measurement of ground water production. Representative samples of cuttings shall be collected by routing a portion of the cuttings/ground water discharge stream from the cyclone into a sample bag. The sample bag shall be replaced at 10-foot intervals. The sample bag shall be labeled with the borehole number, depth interval, date, and time of collection. A split of the sample shall be placed in a chip tray. The chip tray shall be labeled with the same information as the sample bag.

5.5. Monitoring Well Design and Completion

5.5.1. Well Design For Four-Inch or Five-Inch Casing and Screen

All groundwater monitoring wells shall be completed with new 5-inch schedule-80 PVC riser or 4-inch, schedule-40 PVC riser. Joints shall be flush threaded. The screen shall be factory slotted and approximately 20 feet in length. Screen lengths may be increased or decreased depending on hydrogeologic conditions. The screen slot size shall be 20 slot (0.020 inch). Bottom caps shall be flush-threaded and top caps shall be of the oversize slip cap type.

5.5.2. Well Design For Six-Inch Casing and Screen

All groundwater production wells will shall be completed with new 6-inch schedule-80 PVC riser. Joints shall be flush threaded. The screen shall be 6-inch schedule-80 PVC and shall be either wire-wrapped, high-flow factory slotted, or regular-flow factory slotted, depending on ground water flow rates encountered during drilling. The screen length is anticipated to be 20 feet, but it may be increased or decreased depending on hydrogeologic conditions. The screen slot size shall be 20 slot (0.020 inch) or 40 slot (0.040 inch) depending on

subsurface material sizes and ground water flow rates encountered during drilling. Bottom caps shall be flush-threaded and top caps shall be the oversize slip cap type.

5.5.3. Centralizers

Stainless steel or PVC centralizers shall be used at the top and bottom of the screen.

5.5.4. Filter Pack

The filter pack shall consist of 8 x 12 (40 slot screen) or 10 x 20 (20 slot screen) Colorado Silica Sand (or equivalent). The filter pack shall extend from the bottom of the screen to a point between 3 and 5 feet above the top of the screen. The filter pack shall be placed by pumping with water through a tremmie pipe.

5.5.5. Bentonite Seal

A bentonite seal that is a minimum of 5 feet thick shall be placed above the filter pack. The bentonite seal shall consist of coated pellets, pellets, chips, or slurry, depending on borehole conditions. Slurry seals shall be used only when pellets or chips cannot be placed in the annulus, and shall be mixed 20 to 30 percent solids by weight and be a minimum of 10 feet thick. Slurry seals shall be pumped through tremmie pipe and positively displaced upward.

5.5.6. Cement/Bentonite Grout

The annular space between the well casing and the borehole shall be grouted from the top of the bentonite seal to the surface. If the grout seal is placed on top of a bentonite slurry seal, the bentonite slurry seal shall be allowed to set before placement of the grout seal. If the grout seal is placed on top of a bentonite chip or pellet seal, the chip or pellet seal shall be allowed to hydrate a minimum of 1 hour before placement of the grout seal. The cement/bentonite grout mixture shall consist of 95 to 97 percent Type V or Type II-V Portland Cement and 3 to 5 percent bentonite powder by weight (equivalent to one 94-pound bag of cement and between 2.8 and 4.7 pounds of bentonite). Approximately 8.5 gallons of water shall be used for each cement/bentonite batch. The grout mixture shall be prepared by thoroughly mixing the bentonite powder with water first and then mixing in the cement.

Grout shall be placed in the well annulus with a tremmie pipe located within approximately 10 feet of the top of the bentonite seal. For wells less than 60 feet in depth, the grout shall be pumped through the tremmie pipe and positively displaced upward until undiluted grout flows from the annular space at ground surface. For wells deeper than 60 feet, the grout shall be pumped through the tremmie and positively displaced upward until approximately one-half the calculated volume has been pumped. The tremmie pipe shall then be pulled up to a depth approximately one-half the distance between the bentonite seal and the surface, and the remaining annular space shall be grouted by positively displacing the grout upward until undiluted grout flows from the annular space at ground surface.

No single lift of grout shall exceed 100 feet. If the depth of the annular space is greater than 100 feet, the annular space shall be grouted in two or more lifts, each lift being less than 100 feet. Each lift shall be allowed to set before the next lift is placed. Grout accelerants shall not be used.

5.5.7. Surface Completion

Steel protective casings with locking caps shall be installed at the surface around the monitoring wells. The steel casings shall be cemented in place and shall extend a minimum of 5 feet below ground surface and 3 feet above ground surface. The protective casings shall be a minimum of 4 inches larger in diameter than the PVC monitoring wells.

Grout shall be placed within the protective casing annulus from ground surface to one-half foot above ground surface. A weep hole shall be drilled in the protective casing at the top of the grout.

The monitoring well number shall be written on the top of the PVC monitoring well cap. A permanent mark shall be placed on the north side of the PVC monitoring well casing to indicate the water level measurement point.

5.5.8. Tremmie Pipe

Tremmie pipe used for the placement of the filter pack, bentonite slurry seals, and grout shall comprise flush-threaded steel or schedule-80 PVC. The tremmie pipe shall have a minimum inner diameter (ID) of 1.25 inches.

5.6. Monitoring Well Installation Procedure

The field geologist shall perform the following procedures when drilling and installing wells using casing advance systems:

1. All drilling equipment shall be decontaminated as specified in PDDN-SOP3 and Section 5.1 of this document. Record the decontamination procedure and personnel present in the field logbook.

2. Count and measure the lengths and sizes of all drilling rods, temporary drilling casing, and bits and record this information in the field logbook. This information may be useful in verifying borehole depths and diameters. Record the type of drill rig and the names of the drillers and helpers on the borehole log and in the field logbook.

3. Advance the borehole to total depth. During drilling, perform ground water airlift testing as specified in Sections 5.3.2, 5.5.3, and 5.5.4 and record the results on the borehole logs and/or in the field logbook. Perform overnight water level measurements as specified in Section 5.3.5. Collect cuttings samples over 10 foot intervals and log and label them as specified in Section 5.4.

4. After the borehole has been drilled to total depth, record the depth on the borehole log and in the field logbook. Trip out the drill string and measure the total depth of the open hole using a weighted fiberglass tape or by tagging with

the well casing when installing. Record the total open hole depth on the borehole log and in the field logbook.

5. Measure and record each joint of blank riser, screen, and the endcap to the nearest 0.1 foot.

6. Assemble the endcap, screen, and riser as it is lowered into the borehole and attach centralizers as specified in Section 5.3.1.3. Record the locations of the centralizers on the borehole log and/or in the field logbook.

7. For monitoring wells that do not use wire-wrapped screen, lower the screen and casing until the endcap rests on the bottom of the borehole and then raise the casing string until it is held in tension. For monitoring wells that use wire wrapped screen, lower the screen and casing until the endcap is approximately 1 foot off the bottom, based on measurements of the casing string and the open borehole depth.

8. Measure the stickup of the top of the casing above ground surface and calculate the screened interval. Adjust the screened interval by raising the casing assembly to desired interval, if necessary, and add bentonite pellets or sand to fill the bottom of the borehole to the bottom of the endcap. Record the total depth of the casing on the borehole log and in the field book.

9. Calculate and record the volume of the filter pack, bentonite seal, and grout required to fill the annular space based on the borehole size and casing size. The volume is calculated by subtracting the volume of the casing (based on the outer diameter) from the volume of the borehole using the equation:

   V=π(rb2 - rc2)h

   where: V =volume (in feet3)

   rb = radius of borehole (in feet)

   rc = radius of casing (in feet)

   h =height (in feet) between the top and bottom of thematerial (filter pack, bentonite, or grout).

10. As the temporary casing is pulled back, begin adding the filter pack into the annular space as described in Section 5.5.4. Repeated depth soundings to monitor the filter pack level shall be taken using either measured tremmie pipe or a weighted tape. The filter pack should be kept 1 to 2 feet up into the temporary casing so that the screen/riser is never exposed to the open borehole. The filter pack shall be extended to between 3 and 5 feet above the top of the screen. Allow sufficient time for the filter pack to settle through the water column before measuring and recording the final filter pack level.

11. Following filter pack placement, install a minimum 5-foot-thick bentonite pellet or chip seal or a minimum 10-foot-thick bentonite slurry seal. Pellets or chips shall be poured slowly to minimize bridging. Bentonite slurry seals shall be mixed to

between 20 and 30 percent solids and pumped through a tremmie pipe for placement. Repeated depth soundings to monitor the bentonite seal level shall be taken using either measured tremmie pipe or a weighted tape. Bentonite chip and pellet seals shall be allowed to hydrate a minimum of 1 hour before the placement of the grout seal. Bentonite slurry seals shall be allowed to set before placement of grout.

12. Grout the remaining annulus from the top of the bentonite seal to the surface using the grout mixture and procedures specified in Section 5.5.6. If the annular distance is greater than 100 feet, additional lifts of grout will be required. Each lift shall be allowed to harden before a new lift is placed. The grout shall be placed by tremmie pipe as specified in Section 5.5.8. All grout batches mixed and pumped shall be weighed using a mud scale; the weight of the grout should be between 13 and 15 pounds per gallon. All grout weights, gallons of water, and quantities of bags of cement and bags of bentonite powder used shall be recorded on the borehole logs and/or in the field book.

13. Before the last lift of grout sets, center the protective steel casing around the monitoring well casing and insert the steel casing approximately 5 feet into the grouted annulus. Insert a temporary spacer between the protective casing locking lid and the monitoring well cap to prevent the protective casing from settling. Label the monitoring well.

14. After the last grout lift has set for 24 hours, check it for settlement and add additional grout, if necessary.

5.7. Measurements

Measurements made during drilling of the borehole shall be performed to the nearest foot. Measurements made during well construction and of well construction materials shall be performed to the nearest 0.1 foot. Measurements shall consist of the following:

- Total depth of borehole at end of drilling below ground surface (bgs)
- Total depth of open borehole bgs, before the start of well construction
- Lengths of the endcap, screen sections, riser blank sections, and stickup of well above ground surface
- The depth bgs of the top of the filter pack, top of the bentonite seal, and the top of each grout lift.

Following well completion, the horizontal location of the monitoring well shall be determined by civil survey or with the use of a global positioning system (GPS) receiver. The elevation of the top of the protective casing, ground surface, top of PVC well, and water level measuring point (e.g., the top of the PVC well) shall be determined.

6. DOCUMENTATION

Observations and data acquired in the field during drilling and installation of wells shall be recorded to provide a permanent record. These observations shall be recorded with waterproof black ink in a bound, weatherproof field logbook with consecutively numbered pages. Corrections will consist of line-out deletions that are initialed and dated. If, during cold weather, the ink pen fails, a pencil may be used to record observations. The information in the field logbook shall include the following, as appropriate:

- Project name and number
- Names and titles of all field personnel
- Drilling company name and personnel
- Type of drill rig
- Date drilling started and finished
- Type of bit used and its size
- Boring number
- Drilling and well installation observations
- Daily progress
- Problems encountered and resolution
- Decontamination observations
- Weather conditions
- Grout, sand, and bentonite volume calculations prior to well installation
- The volume and composition of the grout, seals, and filter pack actually used during construction
- All measurements made to top of filter pack, seal, grout batches, and other depths
- Screen slot size (in inches), slot configuration, nominal casing size, schedule, composition, and manufacturer
- Coupling/joint design and composition
- Centralizer design and composition
- Protective casing composition and nominal ID
- Start and completion dates
- Surface completion information and date
- Depth to bedrock (if encountered)
- General ground water observations
- Ground water air lift flow measurements
- Overnight water levels
- Depth to first water
- Cuttings descriptions
- Bottom of the boring
- Casing sizes and depths
- Screen location(s)
- Coupling/joint locations
- Filter pack
- Bentonite seal(s)
- Cave-in locations
- Centralizers
- Height of riser without cap (above ground surface)
- Protective casing detail

- Surface elevation, if available
- Name and title of person(s) performing observation.

The field logbooks shall be used daily by the field personnel and shall be kept in the possession of field personnel or in a secure location during the project. A boring log (Attachment 23-5) shall be completed for each boring and shall be referenced in the field logbook. A well construction log shall be completed for monitoring wells, and the data shall also be recorded in the field logbook (Attachment 23-6). All documentation regarding well drilling and installation shall constitute a portion of the permanent project record.

7. EQUIPMENT NECESSARY FOR GROUNDWATER WELL DEVELOPMENT

The following items may be required to properly develop ground water monitoring wells:

- Well keys
- Electronic water level probe
- Calculator
- Field logbook
- Waterproof pen
- Stainless-steel submersible pump
- Gas-powered electric generator or other power source
- Polyvinyl chloride (PVC) or stainless-steel bailer (sized appropriately for well)
- Nylon rope, or wireline (deep wells) for bailing
- Surge block (sized appropriately for well)
- PVC or stainless-steel pipe for operating surge block (sized appropriately for well)
- Turbidimeter
- pH meter (with automatic temperature compensation)
- Conductivity meter (with automatic temperature compensation)
- Replacement batteries for instruments and water level probe
- Polyethylene or glass container (for field parameter measurements)
- Plastic squeeze bottle filled with deionized water
- 5-gallon bucket
- Drums or other large container for capturing development water
- Appropriate health and safety equipment
- Appropriate decontamination equipment
- Well completion information
- Well development forms.

8. WELL DEVELOPMENT PROCEDURES

The development of a newly installed monitoring well will proceed only after the cement/bentonite grout has been allowed to set for a minimum of 24 hours. Monitoring well development activities shall be completed prior to collecting ground water samples for analysis. Before development begins, the development equipment shall be decontaminated according to the procedures described in PDDN-SOP3. Equipment coming in contact with the well will also be decontaminated between wells.

Before development begins, the field personnel will verify that the pH meter, conductivity meter, turbidimeter, and water level probe are operating properly. The pH and conductivity meters require calibration every day prior to use. Calibration times and readings shall be recorded in the field logbook or the well development forms (Attachment 23-1). Specific instructions for meter calibration and measurement are given in Section 9.0 of this SOP.

Monitoring well development is accomplished using a surge block and/or a bailer and a submersible pump and/or airlift line to flush the screen, sand pack material, and borehole wall of drilling fluids and fine sediment resulting from well drilling and installation activities. This procedure also allows for the removal of fine sediment, which may have accumulated within the inner well casing.

Development consists of removing a minimum of three saturated borehole volumes of water during repeated surging and well evacuation episodes for wells that produce adequate quantities of water. For slow producing wells (i.e., wells that do not fully recover within 8 hours), the well(s) shall be purged dry a minimum of 3 times.

Well surging is the process of causing water to move through the screen and into and out of the sand pack and aquifer formation. This will be accomplished by gently surging the entire length of well screen either mechanically using a surge block or hydraulically using a bailer or pump. This allows for the proper packing of the filter pack material around the well screen.

Well evacuation is the process of removing water from throughout the entire water column by periodically lowering and raising the airlift line, bailer or pump intake. Development water evacuated from the groundwater wells will be collected in drums or holding tanks for disposal at Pit 3 or conveyed through a dedicated above ground pipe to Pit 3.

The saturated borehole volume calculation formula is presented in Attachement 23-4. The basic formula is volume equals pi times the radius squared times depth (saturated interval) ($V=\pi r2d$). To calculate the saturated borehole volume, the casing and borehole radii and the height of water in the casing and the filter pack must be known. The water level will be measured in the field prior to beginning development. Borehole and casing radii are obtained from the well completion data. Attachment 23-4 presents a sample saturated borehole volume calculation.

In wells that are completed in confined aquifers, and in wells that are completed in unconfined aquifers but are screened and filter packed below the water table, the height of water in the casing will exceed the height of water in the filter pack. In these cases, calculate the height of water in the filter pack based on the top of the filter pack interval, and not the top of the screen interval. To calculate the saturated borehole volume in these cases, substitute the appropriate height of water as shown on Attachment 23-4.

Note that wells have variable amounts of filter pack below the bottom of the screen. The volume of water below the bottom of the screen may be a significant portion of the total saturated borehole volume if there are only a few feet of measurable water in the screen and several feet of filter pack below the bottom of the screen. The saturated borehole volume calculation presented does not account for the volume of water in the borehole below the screen. For wells with only minimal amounts of water in the screen, evaluate

the amount of water within the borehole below the screen and consider it when purging the well.

During the well development activities, field measurements of temperature, pH, turbidity, and electrical conductivity are made, and the color, any presence of odors, and other comments regarding water quality are noted in the field logbook or on the well development forms. The date, time, and volume of water removed are also recorded at this time. Measurements of pH, electrical conductivity, turbidity, and temperature along with any observations will be recorded for each saturated borehole volume of water removed. A water sample will be collected to measure pH, electrical conductivity, turbidity, and temperature at the beginning of well development to compare the water quality as well development proceeds.

For wells that produce adequate quantities of water, monitoring well development activities will continue until measurements of the field parameters have stabilized, the water removed from the well is as clear of sediment as is practical, and a minimum of three saturated borehole volumes have been removed. For slow producing wells (i.e. wells that do not fully recover within 8 hours), the wells shall be purged dry a minimum of three times. Field parameters will be deemed stabilized when the electrical conductivity and turbidity values are within 10% and the pH values are within 0.2 units between subsequent saturated borehole volumes. If the well is pumped or bailed dry, it will be allowed to recover. Development will continue until a maximum of ten saturated borehole volumes have been removed.

9. FIELD METER CALIBRATION AND MEASUREMENT

9.1. pH Meter

The pH meter shall be calibrated each day before taking any readings of samples. Calibration and operation of the pH meter shall follow the manufacturer's specific instructions. In general, calibration is done by adjusting the meter with standard buffers that bracket the expected pH of the field water. Although procedures are generic, they were generally written for Hach Company Model EC10 and EC20 pH meters.

9.1.1. Required pH Measurement Equipment

Use the following apparatus and supplies for measuring pH in the field:

- Portable pH meter
- Spare pH electrode or electrolyte cartridge, as applicable
- pH electrode storage solution
- Extra batteries
- Beakers
- Buffer solutions of pH 4, 7, and 10
- Deionized or distilled water
- Wash bottle
- Kimwipes® or equivalent.

The pH meter shall automatically compensate for temperature and be capable of calibration with a two-point (using two buffers) slope adjustment method. The meter shall have a precision of at least ±0.05 pH units.

9.1.2. pH Meter Calibration Procedures

Before collecting samples, calibrate the pH meter in accordance with the manufacturer's instructions using calibration solutions. The field sampling technician shall record all pH measurement data, including calibration dates and times, readings, meter number, and temperatures, on a data sheet or in a field logbook.

The field sampling technician shall be familiar with the meter and shall follow the manufacturer's instructions for calibrating and using the meter. Calibrate the pH meter at least once per day, always at the start of each sampling day, and as needed during the day, especially when measuring waters with substantially different pH values. Check the pH calibration against a known standard three times daily, and recalibrate as necessary. Thoroughly document all calibrations, including the buffer readings and temperatures in the field logbook or data sheets. The field sampling technician shall do the following when calibrating the meter according to the manufacturer's procedures:

- Condition pH electrodes by soaking them for at least one hour in pH electrode storage solution. pH electrodes that have been properly stored in a pH electrode storage solution or with a cotton swab soaked in pH electrode storage solution in the protective cap do not need to be conditioned.
- One of the buffer solutions (pH of 4 or 10) selected for the slope adjustment should approximate the anticipated pH of the sample, and the other buffer should have a pH of 7. Ensure that the buffer solutions are at the same temperature and are as close as practical to the temperature of the water to be measured. Use aliquots of the buffer solutions once and then discard the aliquots.
- Before immersing the probe into the buffer or sample, rinse the probe with deionized or distilled water and blot it dry with clean Kimwipes® or equivalent. Protect the glass tip of the probe from abrasion and scratching.
- Calibrate the meter with two buffer solutions (two-point slope adjustment) at least once daily (or more often if specified by the manufacturer).
- If the calibrated slope of the pH meter deviates significantly from its theoretical value, test for a potentially defective electrode or contaminated buffer solution.
- Always use the same electrode for measurements that was used for calibration. Recalibrate the meter if the electrode is replaced.

9.1.3. pH Measurement

Determine the pH from a water sample as soon as possible after collecting. Determine the pH by the electrometric method using standard buffer solutions. The electrometric method is the preferred method because of its greater accuracy and ease of measurement. Either a glass electrode and a reference electrode, or a combination electrode, which combines the glass membrane electrode and the reference electrode, shall be used. The sampler shall measure pH as follows:

1. Thoroughly test and calibrate the pH meter, including the battery, before taking it to the field. The buffers used for calibration should bracket the anticipated pH values to be measured.

2. Recalibrate the meter each day in the field before use.
3. If the pH is measured in a container, rinse the sample container with deionized water and then rinse it three times with the sample water prior to measurement. Rinse the pH probe with deionized water and, if possible, blot the probe dry with clean Kimwipes® or equivalent. Be sure to protect the fragile glass bulb at the end of the probe from damage.
4. Immerse the electrode in the water, allow the pH reading to stabilize, and monitor the drift of the instrument. Do not immerse the electrode above the top of the pH probe. When the pH reading stabilizes (the meter will beep), record the temperature to the nearest 0.1□C and the pH reading to the nearest 0.01 unit.
5. Between measurements, store the electrode in Hach pH electrode storage solution or equivalent solution, if possible, or put a cotton swab soaked in electrode solution in the protective cap of the electrode.
6. Measure the pH of samples within a short period of time after sampling and on a separate aliquot of the sample.
7. If using a Hach One pH meter, dispense electrolyte if the reading becomes unstable or erratic or if stabilization takes too long. An unstable reading may also indicate an air bubble in the reference line. Depress the dispenser button repeatedly until the bubble is expelled (5 to 10 clicks should be sufficient). Note that it is not necessary to refresh the electrolyte gel at the reference outlet between readings unless the reading does not stabilize within a reasonable length of time.
8. Store the electrode on a short-term basis (between measurements/up to one week) in the Hach pH electrode storage solution or place a cotton swab that has been soaked in pH electrode storage solution in the pH probe protective cap. Do not store the electrode in deionized water, as this will shorten the electrode life.
9. Avoid prolonged exposure of the pH meter and probe to sunlight.

9.2. Conductivity Meter

Electrical conductivity, or specific conductance, is the ability of water to conduct an electric current and depends on the concentration of ions in solution. The relationship between electrical conductivity and the concentration of dissolved solids is approximately linear for most natural waters. Changes in this relationship indicate changes in the proportions of different salts and, therefore, changes in the sources of dissolved substances that enter the water body.

Electrical conductivity is usually measured in the field with a hand-held meter that is equipped with a specific conductance cell and temperature probe. The meter measures the ability of water to conduct electricity across a specified distance and cross-sectional area.

For measuring electrical conductivity in the field, the meter shall have an automatic temperature compensator and shall display electrical conductivity directly in units of microsiemens per centimeter (µS/cm), (for samples that have a conductivity less than 2,000 µS/cm) or of millisiemens per centimeter (mS/cm) (for samples with a conductivity equal to or exceeding 2.00 mS/cm), corrected to a temperature of 25 °C.

Electrical conductivity shall not be measured on a sample that was first used to measure pH. Potassium chloride that diffuses from the pH probe can alter the conductivity of the sample.

9.2.1. Required Electrical Conductivity Measurement Equipment

Use the following apparatus and supplies for measuring electrical conductivity in the field:

- Conductivity meter
- Extra batteries
- Calibration solutions which bracket the expected range of measurements
- Deionized or distilled water
- Wash bottle
- Kimwipes® or equivalent
- Beakers

9.2.2. Conductivity Meter Calibration

Before collecting samples, calibrate the conductivity meter using calibration solutions in accordance with the manufacturer's instructions. The sampler shall record all electrical conductivity measurement data, including calibration dates, readings, meter number, and temperatures on a data sheet or in a field logbook.

Reagent-grade potassium chloride (KCl) or other equivalent solutions are universally used as reference solutions to calibrate conductivity equipment. The reference solutions are also used to check the accuracy of the meter, usually on a daily basis or, as necessary, at more frequent intervals. The electrical conductivity of the reference solutions that are used to calibrate the meter should bracket the expected range of the electrical conductivity of the water samples. Commercially prepared calibration standards are available from laboratory suppliers at many standard concentrations.

The sampler shall calibrate the meter as follows:

1. Calibrate the meter according to the manufacturer's instructions.
2. Prepare or obtain standard reference solutions of a known value at a known temperature. Adjust the meter or the calibration solution to the correct temperature.
3. Adjust the meter to read the reference electrical conductivity. Rinse the probe with deionized water and blot the probe dry. Re-immerse the probe in the reference solution and read the measured value to validate the corrected electrical conductivity.

Check the calibration of the conductivity meter three times daily, and recalibrate as necessary.

9.2.3. Conductivity Measurement

Measure electrical conductivity immediately after a sample is collected. Record electrical conductivity readings to the nearest 1 µS/cm (for samples with a electrical conductivity less than 2000 µS/cm) or 0.01 mS/cm (for samples with a electrical conductivity greater than 2.00 mS/cm), corrected to 25°C.

The sampler shall measure electrical conductivity as follows:

1. Check the meter, including the battery, and calibrate the meter before taking it to the field. Reference solutions used for calibration should bracket the expected electrical conductivity values to be measured.
2. Recalibrate the meter in the field before use.
3. Rinse the probe with deionized water and blot the probe dry with clean Kimwipes or equivalent, without wiping the plating on the cell.
4. Insert the probe into the sample solution. Immerse the tip to or beyond the vent holes and agitate the probe vertically. Make sure that air bubbles are not trapped near the temperature sensor. Allow the reading to stabilize (the meter will beep) before recording measurements. Record the electrical conductivity and the temperature of the sample.
5. During normal use, rinse the probe thoroughly with deionized water between measurements to minimize the buildup of interfering substances on the probe element.
6. Avoid prolonged exposure of the probe to sunlight.

9.3. Turbidimeter Calibration and Measurement

One of the most sensitive and, therefore, the most representative field parameter measured during ground water sample collection is turbidity.

9.3.1. Turbidity Measurement Equipment

Use the following apparatus and supplies for measuring turbidity in the field:

- Portable turbidimeter
- Extra battery
- Calibration solutions which bracket the expected range of measurements
- Silicone oil
- Deionized or distilled water
- Wash bottle
- Liquinox™ solution
- Kimwipes®
- Beakers

9.3.2. Turbidimeter Calibration and Measurement

Calibrate the turbidimeter before mobilizing to the field. After arrival in the field, check the calibration by measuring standards of known turbidity as specified in the manufacturer's calibration and measurement procedures. The field sampling team shall record calibration checks, dates, and the meter number on a field data sheet or in the field logbook.

Note the following operational considerations:

- Avoid prolonged exposure of the turbidimeter to sunlight.
- Do not hold the instrument during measurements; instead, place the instrument on a flat, steady surface.

- Measure sample turbidity immediately after sample collection, before temperature changes and settling occur. Avoid sample dilution when possible. Particles suspended in the original sample may dissolve or otherwise change characteristics when the sample temperature changes or when the sample is diluted, resulting in a non-representative sample measurement.
- Handle measurement cells only by the top or by their caps to minimize dirt, scratches, and fingerprints in the light path.
- Always cap the sample cell to prevent spillage of sample into the instrument.
- Always close the sample compartment lid during measurement and storage.
- When applying silicone oil to the sample cells, use only a thin coat of oil. Do not use excessive amounts of oil.

The sampler shall measure turbidity as follows:

1. Thoroughly check the meter, including the battery, and then calibrate the meter in the office or laboratory before taking it to the field.
2. Measure the turbidity of the standard and compare it to its certified value.
3. Clean the sample cell.
4. Fill the sample cell with sample.
5. Clean and apply silicone oil to the outside of the sample cell.
6. Place the cell in the meter.
7. Select the range.
8. Signal average the sample (if necessary).
9. Read and record the turbidity to the nearest 0.01, 0.1, or 1.0 nephelometric turbidity unit (NTU), depending on the turbidity reading of the sample.
10. Empty and triple rinse the sample cell with deionized or distilled water.

10. DOCUMENTATION

Documentation of observations and data acquired in the field will provide information on well development and also provide a permanent record. These observations and data will be recorded with waterproof ink in a bound, weatherproof field logbook with consecutively numbered pages and/or on the well development forms and will include the following, as appropriate:

- Well designation
- Well location
- Date(s) and time of well development
- Static water level from top of well casing before and after development
- Volume of water in well prior to development
- Volume of water removed and time of removal
- Depth from top of well casing to bottom of well
- Screen length
- Depth from top of well casing to top of sediment inside well, if present, before and after development
- Calibration record of pH and conductivity meters
- Field measurements of pH, electrical conductivity, turbidity, and temperature taken during and after development
- Date, time and parameters of final field measurements

- Physical characteristics of removed water throughout development (color and odor)
- Type and size/capacity of pump and/or bailer
- Description of development technique
- Decontamination observations

11. ATTACHMENTS

Attachment 23-1	Calibration Sampling Data Sheet
Attachment 23-2	Groundwater Sampling Data Sheet
Attachment 23-3	Groundwater Well Development Sheet
Attachment 23-4	Groundwater Sampling Data Sheet
Attachment 23-5	Borehole Log
Attachment 23-5	Groundwater Well Completion Form

ATTACHMENT 23-1

CALIBRATION DATA SHEET

DATE: _____ **TIME:** _____

CALIBRATION PERFORMED BY: _____

pH Meter Number: _____

Buffer: _____ Measured Value: _____ Temp.: _____°C

Buffer: _____ Measured Value: _____ Temp.: _____°C

Buffer: _____ Measured Value: _____ Temp.: _____°C

Calibration check after calibration

Buffer: _____ Measured Value: _____ Temp.: _____°C

Calibration check at end of day **Time:** _____

Buffer: _____ Measured Value: _____ Temp.: _____°C

Conductivity Meter Number:_____

Standard: _____µS/cm Measured Value: _____µS/cm Temp.: _____°C

Calibration check after calibration

Standard: _____µS/cm Measured Value: _____µS/cm Temp.: _____°C

Standard: _____µS/cm Measured Value: _____µS/cm Temp.: _____°C

Calibration check at end of day **Time:** _____

Standard: _____µS/cm Measured Value: _____µS/cm Temp.: _____°C

Notes: _____

_____

Signature: _____

ATTACHMENT 23-2

GROUNDWATER SAMPLING DATA SHEET

IDENTIFICATION

Sample Location_____ _____Page___of_____

Date _____ Start Time _____ Stop time_____

Sample Control Number_____ Samplers _____

WEATHER CONDITIONS

Ambient Air Temperature: _____ °C☐ °F☐ Not Measured ☐ **Wind**: Heavy ☐ Moderate ☐ Light ☐

Precipitation: None ☐ Rain ☐ Snow ☐ Heavy ☐ Moderate ☐ Light ☐ Sunny ☐ Partly Cloudy ☐

INITIAL WELL MEASUREMENTS (Measurements in feet made from top of well casing)

Static Water Level_____ Total Depth_____ Well Casing ID_____ Casing Volume_____ 3X Casing Volume _____

Well purged with: _____

_____

_____

FIELD PARAMETER MEASUREMENTS DURING PURGING

Time	Volume (gallons)	pH	Cond. (µS/cm)	Temp. °C☐ °F☐	Turbidity Visual Est. ☐ Measured☐	Comments

Was a duplicate sample collected (02) ☐ Yes ☐ No Sample Control No._____

Was a rinsate sample collected (04) ☐ Yes ☐ No Sample Control No._____

FINAL SAMPLE PARAMETERS

Sample Date	Sample Time	Discharge cfs☐ gpm☐	pH	Cond. (µS/cm)	Temp. (°C)	Turbidity Visual Est. ☐ Measured☐

Notes:_____

_____

_____

_____

Sampler's Signature _____

ATTACHMENT 23-3

GROUNDWATER WELL DEVELOPMENT DATA SHEET

IDENTIFICATION

Sample Location _____ Date _____ Start Time _____ Stop Time _____ Page _____ of _____

Sample Control Number _____ Samplers _____

WEATHER CONDITIONS

Ambient Air Temperature: _____ °C ✌ °F ✌ Measured ✌ Estimated ✌ Wind: Heavy ✌ Moderate ✌ Light ✌

Weather: Sunny ☐ Partly Cloudy ✌ Cloudy ✌ Rain ✌ Snow ✌ Heavy ✌ Moderate ✌ Light ✌

INITIAL WELL MEASUREMENTS (Measurements in feet made from top of well casing)

Static Water Level _____ Total Depth _____ Top of Screen _____ Filter Pack Interval _____

Borehole Diameter (inches) _____ Well Casing ID _____ Well Casing OD _____ Feet of Water _____

Well Developed With _____

FINAL WELL MEASUREMENTS

Static Water Level _____ Total Volume Purged _____ Saturated Borehole Volume (gal) _____ Max Pumping Rate _____

INSTRUMENT CALIBRATION

pH Meter: Meter Number _____

Buffer ___ Measured Value _____ Temp. ____ °C

Buffer ___ Measured Value _____ Temp. ____ °C

Conductivity Meter: Meter Number _____

Standard ____ mS/cm Measured Value __ mS/cm Temp. ____ °C

Standard ____ mS/cm Measured Value __ mS/cm Temp. ____ °C

Turbidity Meter: _____ Standard _____ NTU Measured Value _____ NTU Standard _____ NTU Measured Value _____ NTU

FIELD PARAMETER MEASUREMENTS DURING DEVELOPMENT

Time	Volume (gallons)	pH	Cond. (mS.cm)	Temp. °C ✌ °F ✌	Turbidity Visual Est. ✌ Measured ✌	Comments

FINAL DEVELOPMENT PARAMETERS

Sample Date	Sample Time	Volume Purged (gal)	pH	Cond. (mS/cm)	Temp. (°C)	Turbidity Visual Est. ✌ Measured ✌

Notes: _____

_____

_____

_____

Sampler's Signature: _____

ATTACHMENT 23-4

SATURATED BOREHOLE VOLUME CALCULATION (with example)

Project: _____

Date: _____

Personnel: _____

Blank Form

Well: _____			Nominal Casing Diameter:	_____	inches
Total Depth:	_____	feet	Nominal Borehole Diameter:	_____	inches
Depth to Water:	_____	feet	Effective Porosity (P) of Filter Pack in Annulus: (Assume P=0.30 if no other data are available)	_____	
Height of Water in Casing (h_1):	_____	feet	Height of Water in Filter Pack (h_2):	_____	feet

a. Casing Radius (r_1) =	Casing Diameter	_____	inches ÷ 2÷ 12=	_____	feet = r_1
b. Borehole Radius (r_2) =	Borehole Diameter	_____	inches ÷ 2÷ 12=	_____	feet = r_2

c. Casing Volume (V_1) = $\Pi r_1^2 h_1$ =	3.142(	_____ ^{2})(		_____	)ft^3 = V_2
d. Annulus Volume (V_2) = $\Pi r_2^2 h_2$ =	3.142(	_____ ^{2})(		_____	)ft^3 = V_2
e. Saturated Annulus Volume(V_A) = P(V_2 - V_1) =	P(	_____	–	_____	)ft^3 = V_A
f. Saturated Borehole Volume(V_T) = *7.48(V_1 + V_A) =	7.48(	_____	+	_____	)gal = V_T

*Convert from ft^3 to gallons by multiplying by 7.48

Example

Well: MW-1			Nominal Casing Diameter:	2	inches
Total Depth:	35	feet	Nominal Borehole Diameter:	6.25	inches
Depth to Water:	20	feet	Effective Porosity (P) of Filter Pack in Annulus: (Assume P=0.30 if no other data are available)	0.45	
Height of Water in Casing (h_1):	15	feet	Height of Water in Filter Pack (h_2):	15	feet

a. Casing Radius (r_1) =	Casing Diameter	2	inches ÷ 2÷ 12=	0.083	feet = r_1
b. Borehole Radius (r_2) =	Borehole Diameter	6.25	inches ÷ 2÷ 12=	0.260	feet = r_2

c. Casing Volume (V_1) = $\Pi r_1^2 h_1$ =	3.142(	0.083 ^{2})(		15	) = 0.32 ft^3 = V_1
d. Annulus Volume (V_2) = $\Pi r_2^2 h_2$ =	3.142(	0.260 ^{2})(		15	) = 3.18 ft^3 = V_2
e. Saturated Annulus Volume(V_A) = P(V_2 - V_1) =	0.45(	3.18	–	0.32	) = 1.287 ft^3 = V_A
f. Saturated Borehole Volume(V_T) = *7.48(V_1 + V_A) =	7.48(	0.32	+	1.287	) = 12.02 gal = V_T

*Convert from ft^3 to gallons by multiplying by 7.48

ATTACHMENT 23-5

GROUNDWATER WELL BOREHOLE LOG

WORTHINGTON MILLER ENVIRONMENTAL, LLC.	BOREHOLE LOG PAGE: _____ DATE: _____	BOREHOLE NO.: _____

PROJECT INFORMATION

PROJECT: _____

PROJECT NO.: _____

CLIENT: _____

OWNER: _____

LOCATION: _____

_____

BOREHOLE LOCATION

FIELD INFORMATION

DATE & TIME ARRIVED: _____

BOREHOLE LOGGED BY: _____

VISITORS: _____

WEATHER: _____

DRILLING INFORMATION

DRILLING COMPANY: _____

START TIME: _____

BORING DEPTH: _____ BORING DIA.: _____

DRILLING METHOD: _____

SAMPLING METHOD: _____

TIME DRILLING COMPLETE: _____

BOREHOLE COMPLETION / ABANDONMENT INFORMATION

START TIME: _____ COMPLETE TIME: _____

INSTRUMENTATION: _____ BACKFILL: _____

ELEVATION - TOP OF BORING: _____ RELATIVE TO: _____

GROUNDWATER CONDITIONS

_____

FOLLOWING FIELD WORK

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

NOTES: _____

_____

_____

ATTACHEMENT 23-5

GROUNDWATER WELL BOREHOLL LOG CONTINUED

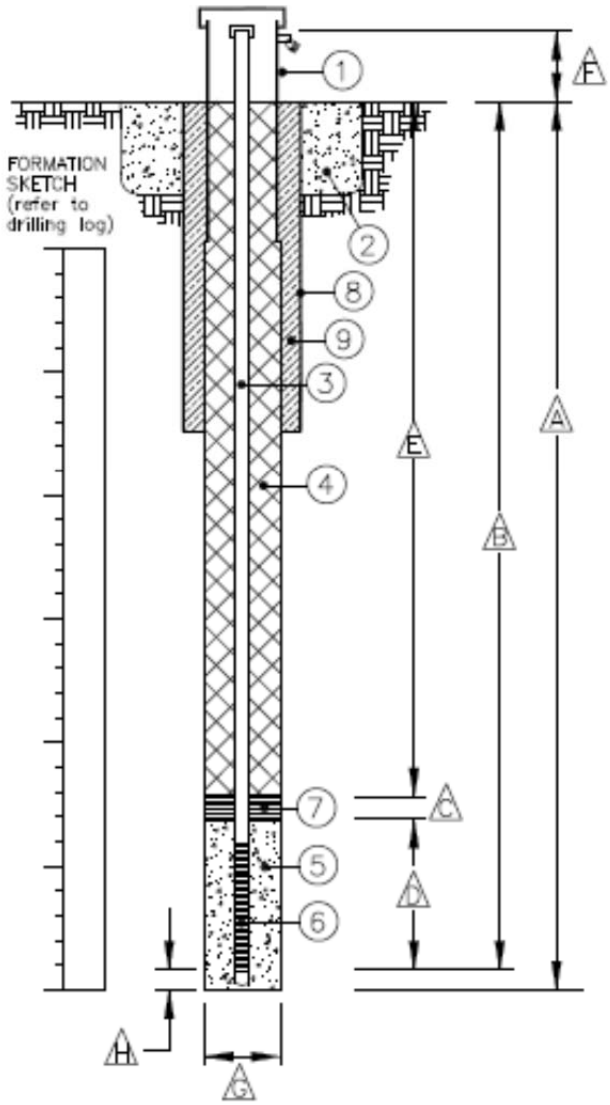
WORTHINGTON MILLER ENVIRONMENTAL, LLC.	BOREHOLE LOG PROJECT: _____ PAGE: _____ PROJECT NO.: _____ DATE: _____	BOREHOLE NO.: _____

DEPTH (FT)	CORE RECOV.	DRIVE SAMPLES			ADD'L SAMPLES	LITHOLOGY GRAPHIC	SOIL DESCRIPTION
		SAMPLE TYPE	BLOWS (PER 6")	RECOV.			
0							
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							
15							
16							
17							
18							
19							
20							

ATTACHMENT 23-6

GROUNDWATER WELL COMPLETION DIAGRAM

MONITORING WELL CONSTRUCTION INFORMATION SHEET



Job number _____
Well number _____
Date _____
Drilling company _____
Location _____
Date drilled _____
Date completed _____

Materials:

1. Protective casing? Yes No
   Height above ground _____ ft
2. Surface seal? Yes No
3. Solid pipe: Type ____ Length ____ Dia. ____
4. Seal type: _____
5. Filter pack: _____
6. Well screen: Type ____ Length ____ Dia. ____
   Slot size _____
7. Seal type: _____
8. Conductor casing: Type ____ Length ____
   Dia. ____
9. Cement seal: Interval _____ ft

Dimensions:

- A Total depth of boring _____ ft
- B Total depth of finished well _____ ft
- C Seal: Interval _____ ft
- D Filter pack: Interval _____ ft
- E Seal: Interval _____ ft
- F Height of stick-up _____ ft
- G Borehole diameter _____ ft
- H Length of endcap _____ ft

APPENDIX C

HABITAT EVALUATION PROCEDURES - STANDARD MEASUREMENT PROTOCOLS AND TECHNIQUES

HABITAT EVALUATION PROCEDURES

STANDARD MEASUREMENT PROTOCOLS AND TECHNIQUES (Draft)

Compiled By
Paul R Ashley – RHT Coordinator
November 2006

HEP Sampling Design and Measurement Protocols

Introduction

This document was developed to fulfill a request by the Upper Columbia United Tribes (UCUT) and Bonneville Power Administration (BPA) to develop a "stand alone" reference for Habitat Evaluation Procedures (HEP) transect protocols used by the Regional HEP Team (RHT). General and specific protocols are described. General protocols include a brief description of pre HEP survey pilot studies; transect establishment guidelines, and photo documentation parameters. In contrast, specific metrics detail actual habitat variable measurement techniques including diagrams where additional explanation is needed.

Specific metrics are identified with an alpha-numeric code. This allows project managers and others to identify specific measurement techniques in report tables without lengthy, redundant explanations. This report is intended to be a "living" document and will be modified as needed. The following standardized protocols and measurement techniques are used by the Regional HEP team to measure habitat variables described in HEP models.

General Protocols

Pilot Studies

Pilot studies are conducted in new habitat types and/or familiar habitat types that are comprised of unique structural conditions/key ecological correlates. Pilot study data is used to estimate the sample size needed for a confidence level ≥ 80% with a 10% tolerable error level (Avery 1994) and to determine the most appropriate sampling unit[9] for the habitat variable of interest i.e., a coefficient of variation analysis (BLM 1998). In addition, a power analysis is conducted on pilot study data (and periodically throughout data collection) to ensure that sample sizes are sufficient to identify a minimal detectable change of 20% in the variable of interest with a Type I error rate ≤0.10 and P = 0.9 (BLM 1998, Block et al. 2001). All field data is recorded on data loggers or data sheets and downloaded/transferred to data summary spreadsheets.

Transects

Transect cover sheets are used to document specific transect information including transect identification, cover type, HEP Team members, global positioning system (GPS) coordinates, and other pertinent information.
Transects are established at least 300 feet (100 meters), where possible, from ecotones, roads, and other anthropogenic influences. Transect starting points and azimuths (direction) are randomly selected for each cover type. Start points are selected based on superimposing a UTM grid over cover type maps and identifying specific X/Y coordinates with the aid of a random numbers table, or computer generated random number generator/point locater program.

[9] Includes micro-plot grid size and shape etc.

Transect start, turn, and end points are marked with 14-inch (36 centimeter) 0.25 inch (0.6 centimeter) diameter rebar stakes[10] painted fluorescent orange or red. GPS positions (UTM coordinates-NAD 27) are recorded at start, turn, and end points. If cover types change or transect length is greater than 300 feet, another transect azimuth is randomly selected, or the original azimuth is varied by 45 degrees (direction [left or right] is determined by the flip of a coin where more than one choice is possible). Compass azimuths (headings) are magnetic bearings i.e., not corrected for local declination. Transects are divided into 100 foot (30 meter) sample units for statistical purposes.

Photo Points

Photo points are established at the start point of each transect. Pictures are recorded from a height of three feet at the beginning of each transect while facing in the direction of the transect azimuth. A transect reference board (includes transect number, project name, date, GPS reference number) is placed at the 15 foot interval while a cover board is placed at the 30 foot mark on each transect. Occasionally, panoramic photographs are also needed e.g., dense vegetation, linear/narrow cover types. Habitat conditions are photographed with a Canon G1® 3.3 mega pixal digital camera (with and without magnification).

Specific Metrics

Metrics generally follow those described by Hays et al. (1981) and/or Avery (1994) unless otherwise noted. Some metrics have been modified due to extreme field conditions and/or to better meet Regional HEP Team needs.

Herbaceous Measurements

Percent Cover

1. Herbaceous percent cover measurements are recorded at 20 or 25-foot intervals on the right side of the transect tape (the right side is determined by standing at 0 feet and facing the line of travel/transect azimuth). RHT members walk on the left side of the transect line to reduce sample disturbance.
A square $0.1m^2$ micro-plot grid is used in grasslands to estimate percent cover of herbaceous vegetation while a rectangular $0.5m^2$ grid is generally used in shrublands (the $0.5m^2$ grid may also be used in grasslands if desired). The near right hand corner of the grid is placed at the sampling interval (rectangle grids are placed with the long axis perpendicular to the tape, and the lower right corner on the sampling interval). An example of micro-plot grid placement is shown in Figure 1. Approximately 20% of the micro plot is covered by vegetation in the example. Grid samples are considered independent samples for statistical purposes.
    1A: $0.1m^2$ micro-plot grid/20' interval
    1B: $0.1m^2$ micro-plot grid/25' interval
    1C: $0.5m^2$ micro-plot grid/20' interval

[10] Marking transect points with rebar stakes is at the discretion of the project proponent. Therefore, not all transects are marked in this manner.

1D: 0.5m^2 micro-plot grid/25' interval

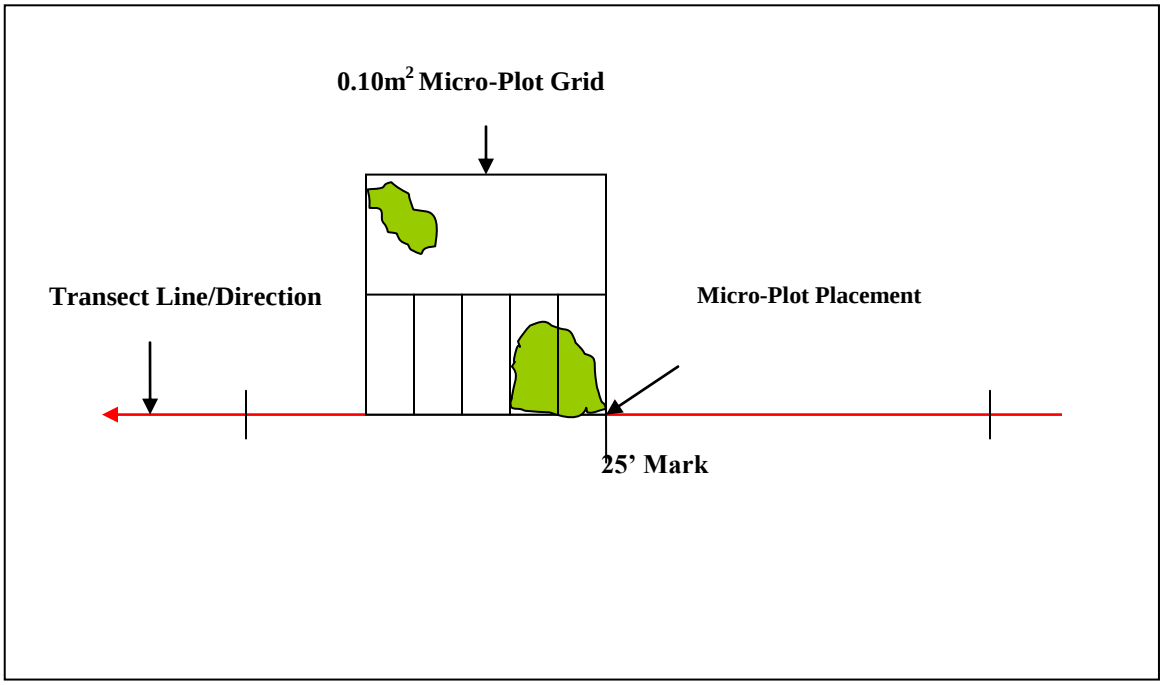


Figure 1. Micro-plot grid placement and percent cover example.

Height

2. Herbaceous height is measured with a measuring rod placed within the grid frame (scale = 10ths/ft.). Three evenly spaced measurements are recorded and averaged for each sample. Only leaf material is measured (leaves provide the greatest amount of cover). "Leaf material" may include residual cover and/or new growth predicated on HEP model variable requirements. Grass inflorescence is not included in height measurements.

2A. Four measurements, one from each corner of the micro plot grid, are recorded and averaged for each sample. Only leaf material is measured (leaves provide the greatest amount of cover). Grass inflorescence is not included in height measurements.

2B. A measuring rod is held vertical at the interval point: the highest vegetation to cross the measuring rod at that point is measured to the nearest tenth of a foot.

2B-1: 10' interval
2B-2: 20' interval
2B-3: 25' interval

Visual Obstruction Readings (VOR)

3. A Robel pole (Robel 1975) is used to document vertical and/or horizontal cover for herbaceous vegetation i.e., visual obstruction readings (VOR). Measurements are recorded at 20, 25, or 50-foot intervals. Intervals are determined by the length of each transect, i.e., a minimum of 12 measurements are required for each

transect, or cover type heterogeneity (structurally diverse cover types generally require larger sample sizes).

The Robel pole (Robel 1975) is placed on the transect line at the appropriate interval. Four observations are taken from a distance of four meters from the Robel pole and averaged to obtain a single visual obstruction reading or VOR. Observers sight over a one meter pole and record how much of the Robel pole is totally obscured from the ground up (Figure 2). Measurements are reported in 0.25 decimeter increments.

Two measurements are taken on the transect line on opposite sides of the Robel pole; two identical measurements are taken from the same point perpendicular to the transect line for a total of four "readings" (Figure 3). Sample size is determined to be adequate when the "running mean" varies ≤ 10% of the mean. VOR samples are considered independent for statistical purposes.

3A: 20' interval
3B: 25' interval
3C: 50' interval

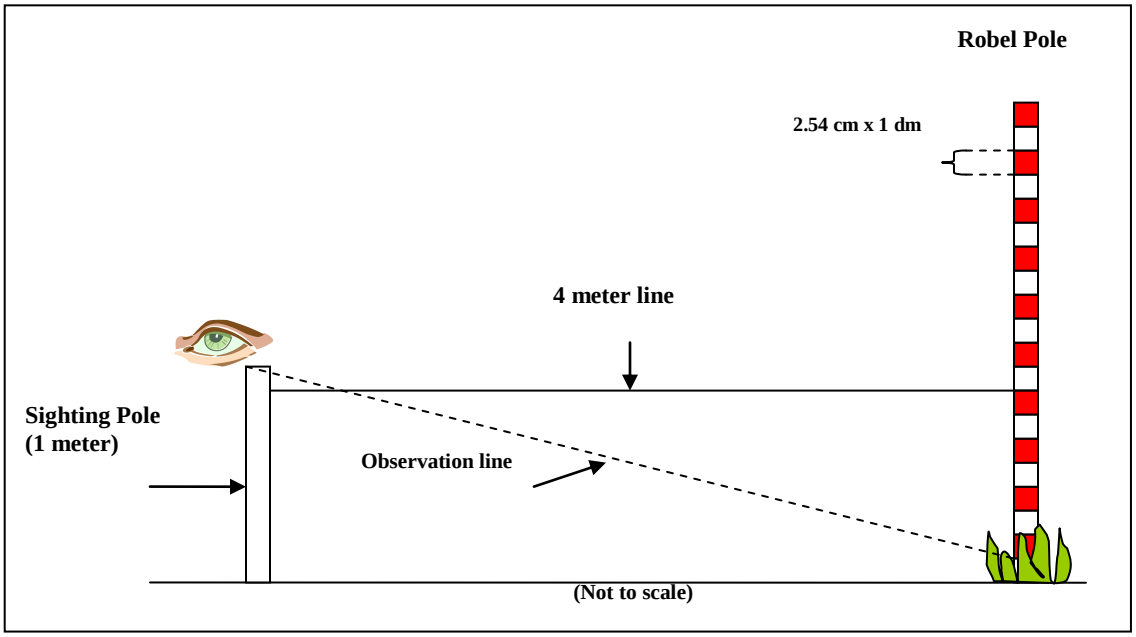


Figure 2. Visual obstruction reading diagram.

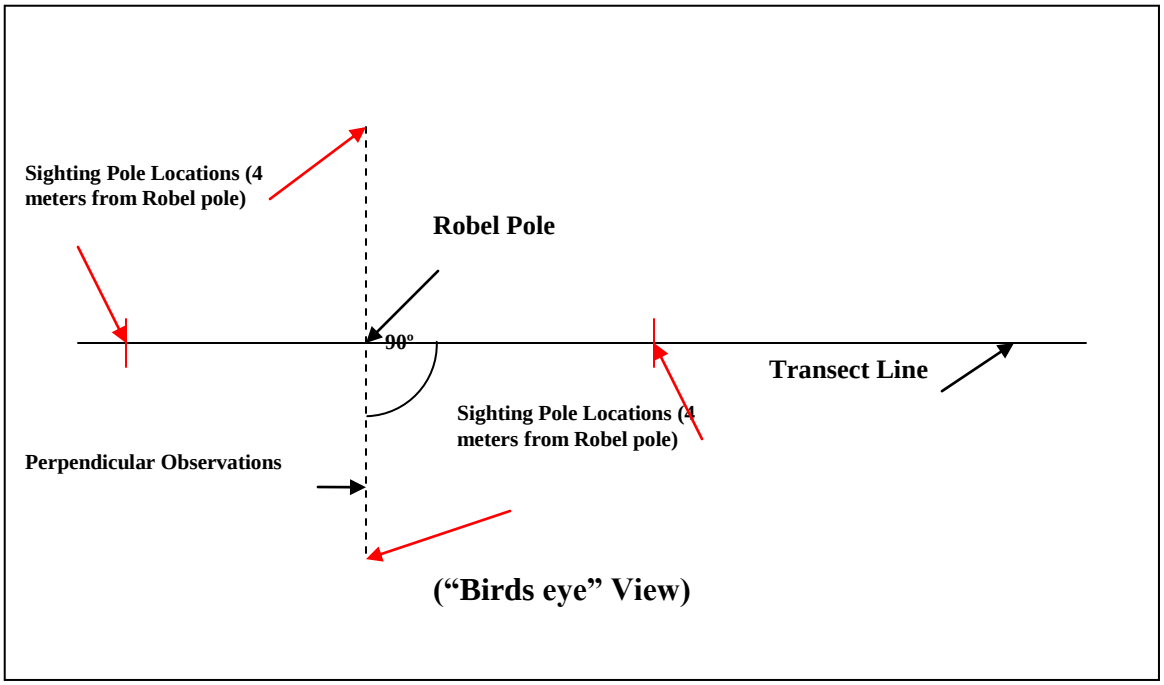


Figure 3. Robel pole "readings" layout diagram.

Shrub Measurements

Percent Cover

4. Line intercept or point intercept (USFWS 1981) is used to determine shrub cover. Line intercept is generally used when shrub cover is estimated at < 5% (the most accurate results are obtained using the line intercept method). In contrast, the point intercept method is used if shrub cover is estimated at > 5%.

4A: Line intercept is used to measure the amount of cover that intercepts the transect line as illustrated by the red lines shown in Figure 4. Measurements are in 10^{ths} of feet. Gaps in vegetation less than four tenths of a foot (5 inches) are ignored. The amount covered by shrubs is added to determine shrub intercept for each transect. For example, if 7.5 feet of a 100-foot long transect is covered by shrubs, percent cover is 7.5%.

Shrub cover is recorded by species. Where shrubs overlap, shrub intercept is recorded for the tallest shrub and noted for the lower shrub(s).

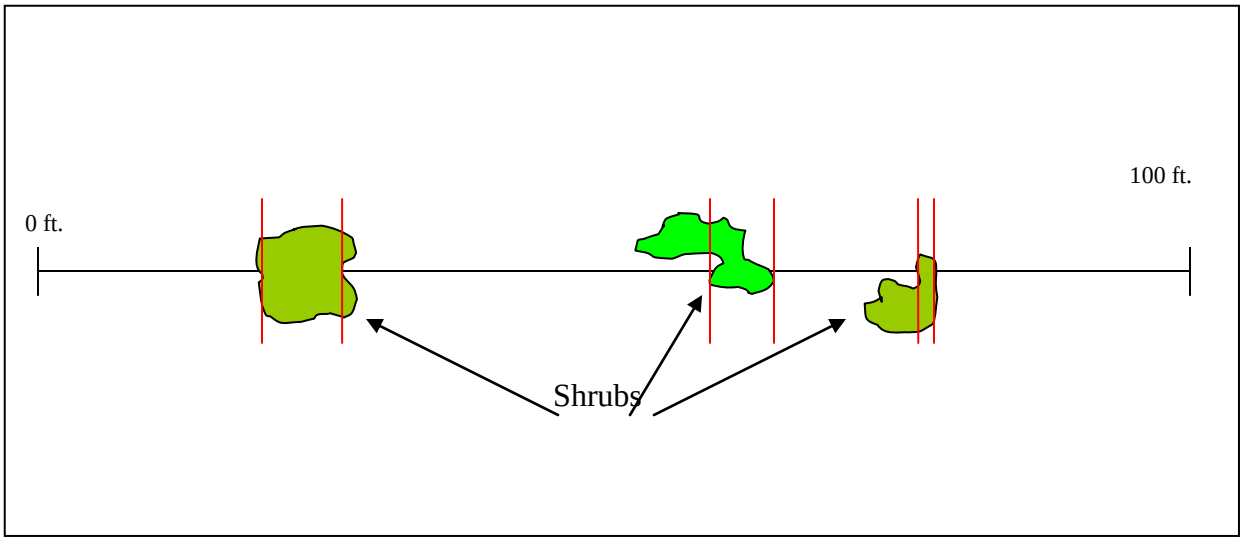


Figure 4. Line intercept method example.

4B: Point intercept is used when shrub canopy cover is estimated at ≥5%. Shrub cover is determined by recording the number of "hits" at specific intervals along a transect line. To be counted as a "hit", a portion of the shrub must cross the transect tape's interval number line e.g., 2', 4', 6'…. nth. If a portion of the shrub does not break the vertical plane at the interval number line, it is reported as a miss (Figure 5). Either a "hit" or "miss" is recorded on data loggers and/or paper data sheets for each designated interval.

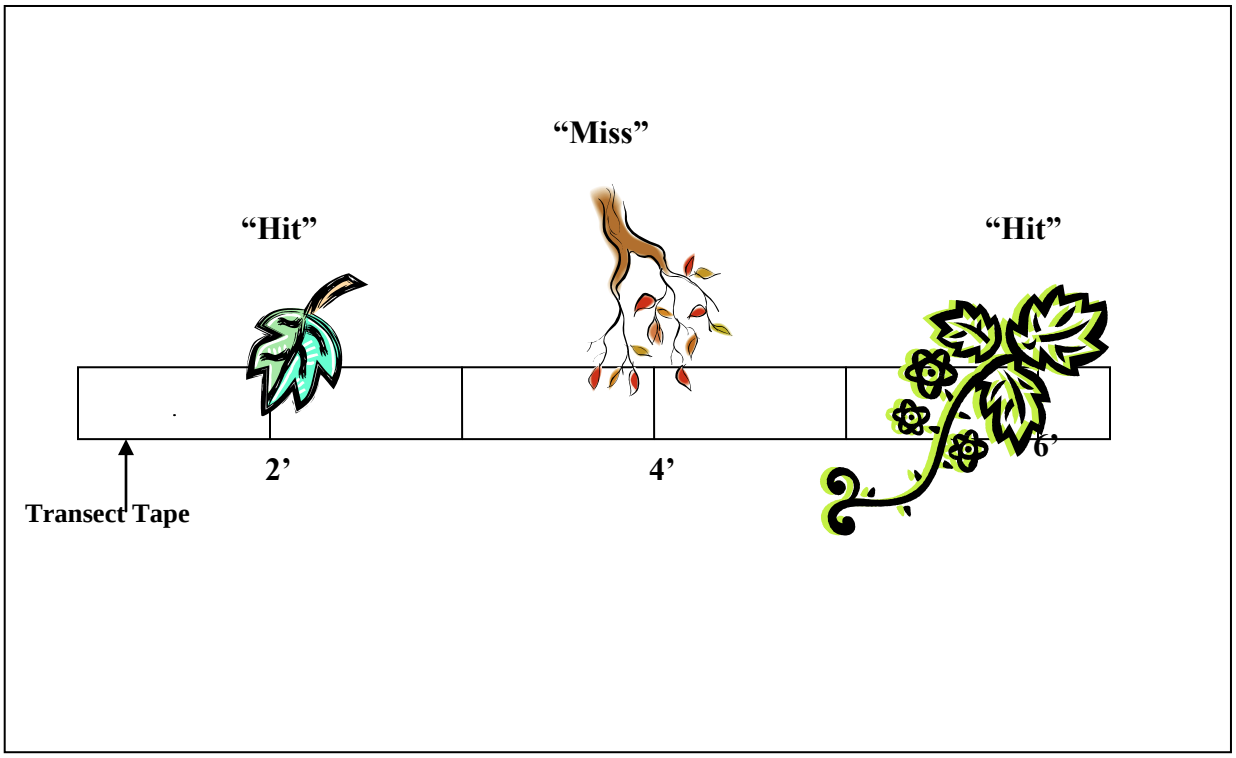


Figure 5. Point intercept method example showing "hits" and "misses" at two foot intervals.

From 5% to 20% cover, point data is collected at two-foot intervals (50 possible "hits" per 100 ft. sample unit). If shrub cover is estimated at >20%, shrub point data is collected at five foot intervals (20 possible "hits" per 100 ft. sample unit). On rare occasions, ten-foot intervals may be used when shrub cover exceeds 50% (10 possible "hits" per 100 ft. sample unit). The ten-foot interval is generally applied to shrub monocultures, or areas with few shrub species that exhibit relatively equal shrub distribution/density.
Shrub "hits" are recorded by species. Where shrubs overlap, shrub intercept is recorded for the tallest shrub and noted for the lower shrub(s).

4B-1: 2' interval
4B-2: 5' interval
4B-3: 10' interval

4C: Modified point method is used when shrub cover is impenetrable or otherwise inaccessible. A baseline transect is established along the shrub edge. A six-foot measuring rod is then inserted into the shrub cover at right angles to the baseline tape at appropriate intervals. Recorders estimate shrub "hits", species information, and height data where the end of the six-foot measuring rod intercepts the shrub cover (Figure 6). As with point intercept, intervals may very. Shrubs are identified by species.

4C-1: 2' interval
4C-2: 5' interval
4C-3: 10' interval

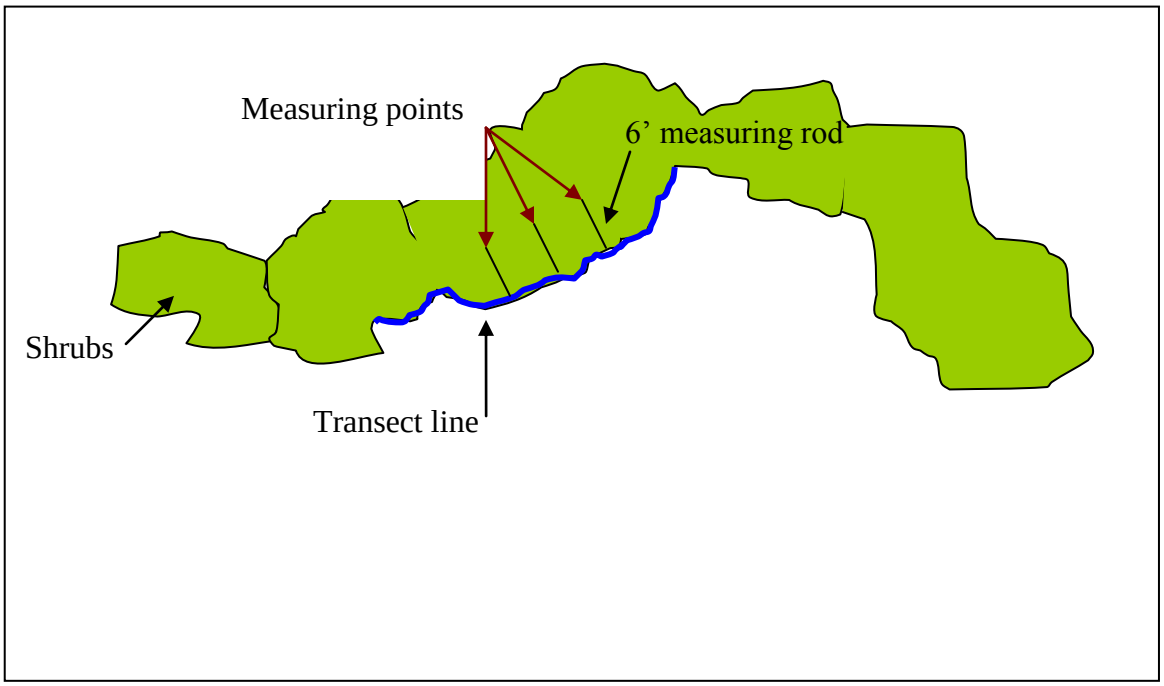


Figure 6. Modified point intercept layout example.

4D: Complex shrub intercept is used to determine percent shrub cover in multi strata shrub communities. This method is generally associated with point intercept methods whereas overlapping shrubs are identified for each stratum. Percent cover is determined for each of four possible strata as well as total percent shrub cover and overlapping percent cover.

The complex shrub intercept method is identified by adding the suffix "4D" after the appropriate line or point intercept method. For example, "4B-1-4D designates that complex shrub point intercept measurements were taken at two foot intervals. Similarly, 4C-2-4D designates that modified point intercept at five foot intervals was used to determine percent shrub cover for strata in a complex shrub community.

Shrub Height

5. Shrubs are defined as woody vegetation including trees <16 feet in height unless otherwise defined in HEP models. The Regional HEP Team assumes that trees <16 feet tall function ecologically more like shrubs than trees.

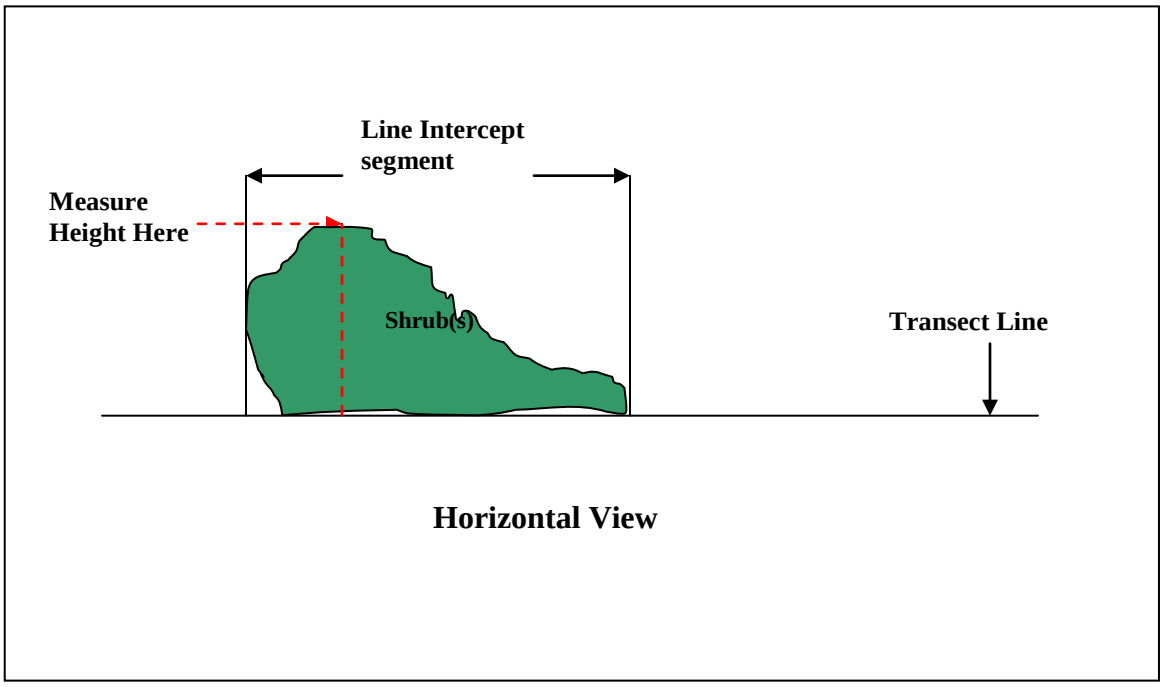


Figure 7. Line intercept shrub height measurement example.

Shrub height is measured in 10^{ths} of feet at the highest point for each uninterrupted line intercept segment as depicted in Figure 7, or the highest point that crosses each point intercept interval mark on the transect tape (Figure 8).
In structurally complex (overlapping) shrub communities, height is measured for each stratum (maximum of four) as illustrated in Figure 9. It is assumed that shrub height measurements correspond to the method used to determine percent shrub cover. For example, if percent shrub cover is determined using the line intercept

method (Figure 4), then it is assumed that shrub height will be obtained as illustrated in Figure 7.

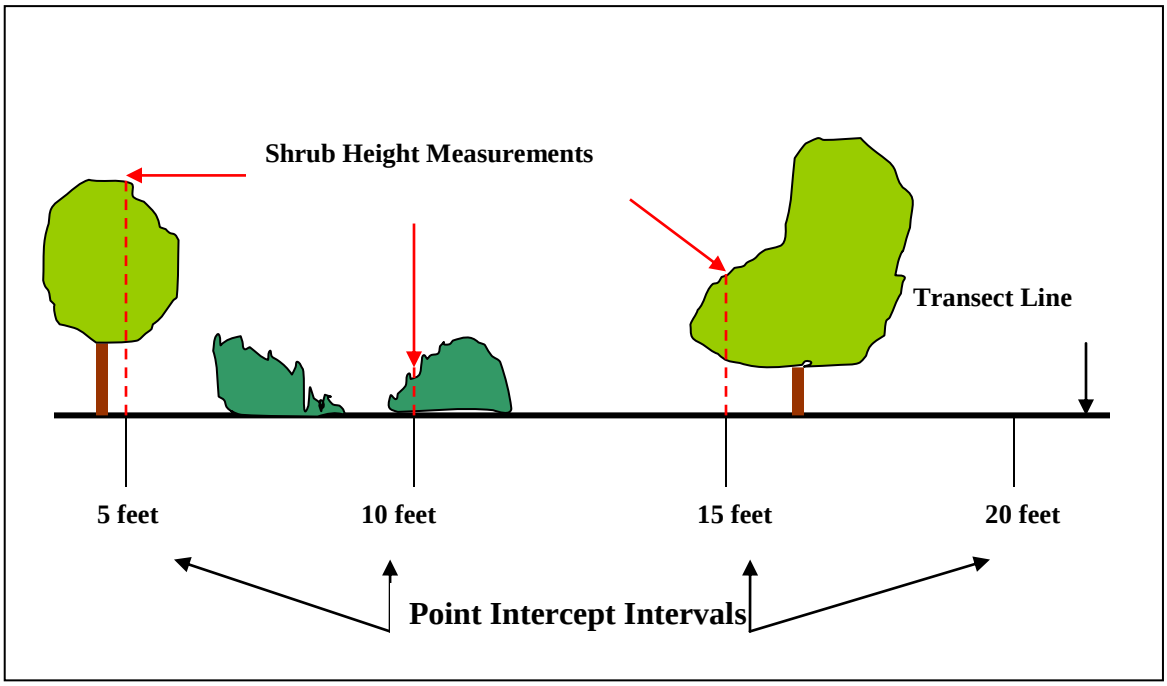


Figure 8. Point intercept shrub height example.

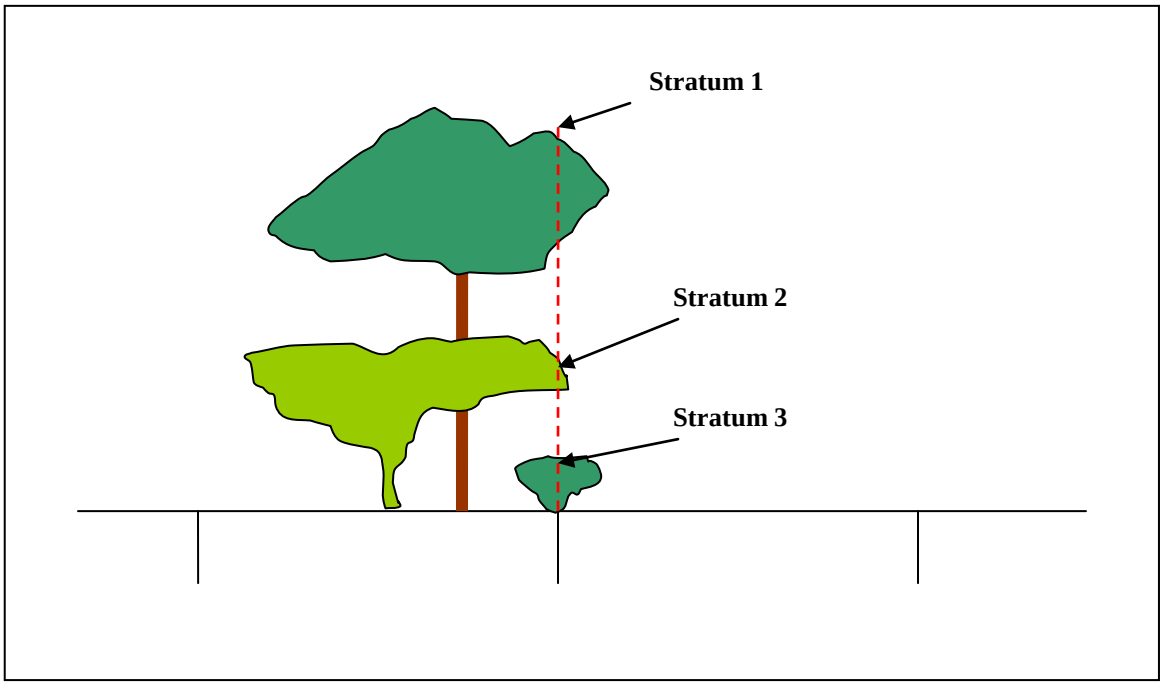


Figure 9. Complex shrub community shrub height measurement example.

Tree Measurements

Percent Canopy Cover

6. Tree canopy cover measurements are recorded at five or ten foot intervals with a densitometer (point intercept). Measurement intervals are determined by visually estimating tree canopy closure prior to initiating the survey. If estimated canopy closure is < 20% and estimated transect length ≤ 900 feet, measurements are recorded at five-foot intervals; if estimated canopy closure is > 20% and estimated transect length is ≥ 600 feet, ten-foot intervals are used. The size of the sample area strongly influences transect length. In small areas, data from several short (300 foot) transects may be "pooled" in order to determine percent tree canopy cover. As with shrubs, sampled trees are identified by species and the sampling unit is a 100 foot segment of the transect.

6A: 5' interval
6B: 10' interval

Height

7. Tree height is determined generally using a clinometer. In open areas, an electronic height measurement instrument may be used. Measurements are taken at the beginning and end of each transect and at 100 foot intervals. Additional samples may be taken if needed. HEP model variable requirements determine the extent of tree height measurements e.g., multi-canopy, overstory, etc.

Basal Area

8. Tree basal area data is collected at 100-foot intervals using a "factor 10" prism. Each 100-foot interval basal area observation (all tree "hits" at each 100-foot point) is considered an independent sample.

Snag DBH

9. Snag data is collected on belt transects. RHT members collect snag data in conjunction with tree canopy closure measurements using the same baseline transect. The diameter breast height (DBH) of all snags present within tenth-acre belt transects paralleling the baseline transect is measured. Either the actual DBH is recorded, or snag data is reported by class e.g., 5 snags <4" DBH, 2 snags >20" DBH etc.

Belt transects are 44 feet wide by 100 feet long i.e., 22 feet on each side of the baseline transect. Belt transect layout is depicted in Figure 10. As with shrubs and trees, the sampling unit is each 100-foot segment.

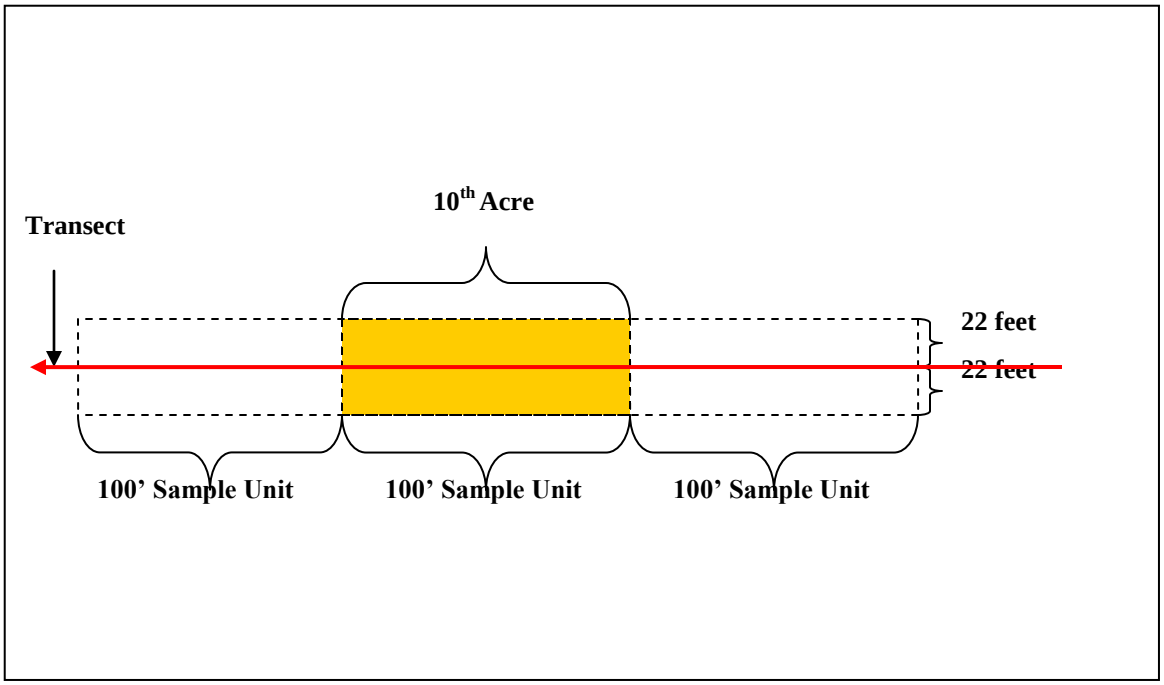


Figure 10. Belt transect layout diagram.

Sample Size Determination

The process for determining sample size (transect length) varies based on the variable measured. Shrub and tree cover and grid sample sizes are estimated as follows:

The amount of cover within each 100 foot sample unit is divided by sample unit length to obtain percent shrub/tree cover per sample unit (e.g. 10 feet of cover/100 feet = 10% shrub cover). The standard deviation for each transect is calculated for percent cover data from transect sample units. Sample size (transect length) is then determined through use of the following equation (Avery 1994):

$$n = \frac{t^2 s^2}{E^2}$$

Where: t = t value at the 95 percent (0.05) confidence interval for the appropriate degrees of freedom (df); s = standard deviation; and E = desired level of precision, or bounds (± 10 percent). Confidence intervals may vary from 80 percent (0.20) to 95 percent (0.05) depending on habitat variable heterogeneity and project management needs. The same method is used to determine sample size for micro plot samples based on total percent cover for herbaceous species.

References

Avery, T.E., H. E. Burkhart. 1994. Forest measurements. 4th edition. John Wiley and Sons. New York, NY.

BLM. 1998. Measuring and monitoring plant populations. BLM Technical Reference 1730-1. BLM National Business Center. Denver, CO. 477 p.

Block, W.M., W.L. Kendall, M.L. Morrison, and M. Dale Strickland. 2001. Wildlife study design. Springer Press. New York, NY. 210 p.

Hays, R. L., C. Summers, and W. Seitz. 1981. Estimating habitat variables. Western Energy and land Use Team. Fort Collins, CO: U.S. Fish and Wildlife Service.

Robel, R.J., J. N. Dayton, A.D. Hulbert. 1975. Relationship between visual obstruction measurements and weight of grassland vegetation. Journal of Range Management. 23: 295.

APPENDIX D

MIDNITE MINE STANDARD OPERATING PROCEDURE 04 – GENERAL SURVEY METER OPERATIONS AND CONTAMINATION SURVEYS

MIDNITE MINE STANDARD OPERATING PROCEDURES	**MM-SOP04** **REVISION: 0**
GENERAL SURVEY METER OPERATIONS AND CONTAMINATION SURVEYS	**PAGE: 1 OF 15** **DATE: February 15, 2009**

APPROVED BY: _____ DATE: _____
RADIATION SAFETY OFFICER

APPROVED BY: _____ DATE: _____
SITE MANAGER

Table of Contents

1. PURPOSE 3

2. RESPONSIBILITY 3

2.1. RADIATION SAFETY OFFICER (RSO) 3
2.2. RADIATION SAFETY TECHNICIAN 3
2.3. WORKER RESPONSIBILITIES 4

3. PRECAUTIONS 4

4. EQUIPMENT AND MATERIALS 4

4.1. SURVEY METERS, EQUIPMENT, SUPPLIES, AND DOCUMENTATION MATERIALS. 4

5. PROCEDURE 4

5.1. GENERAL 4
5.2. ROUTINE SURVEYS 5
5.3. RADIATION SURVEYS 6
5.4. CONTAMINATION SURVEYS 6
5.5. EQUIPMENT/VEHICLE SCREENING 8
5.6. FOLLOW-UP SURVEYS 9
5.7. CONTAMINATION MONITORING OF INDIVIDUALS 9
5.8. PORTABLE RADIATION SURVEY INSTRUMENT CALIBRATION 10

6. RECORDS 10

6.1. SURVEY RECORDS 10
6.2. INSTRUMENT CHECK RECORDS 12
6.3. QUALITY ASSURANCE 12

7. REFERENCES 12

8. ATTACHMENTS 12

1. PURPOSE

This procedure provides the requirements for performance of radiological surveys, including routine radiation and contamination surveys, survey techniques, personnel contamination monitoring, unconditional release limits, and instrument calibration requirements.

2. RESPONSIBILITY

2.1. Radiation Safety Officer (RSO)

2.1.1. Responsible for oversight, development, and implementation of this procedure.

2.1.2. Responsible for ensuring that radiological surveys provide representative samples of the work area to allow for the identification and evaluation of the potential radiological hazard.

2.1.3. Responsible for ensuring that only trained and qualified personnel perform surveys and authorize the unconditional release of material and equipment.

2.1.4. Responsible for communicating with applicable management when non-routine or special surveys will be necessary prior to and/or during radiological related work.

2.1.5. Responsible for authorizing survey methods and instrumentation to be used for unconditional release surveys of material and equipment.

2.2. Radiation Safety Technician

2.2.1. Responsible for informing the RSO when radiation, contamination, or airborne radioactivity levels have increased.

2.2.2. Responsible for conducting surveys in accordance with this procedure.

2.2.3. Responsible for ensuring that response checks have been performed prior to the use of selected instrumentation for radiological surveys.

2.2.4. Responsible for verifying operability of selected instrumentation (e.g., battery check, current calibration).

2.2.5. Responsible for preparing and submitting survey documentation to the RSO.

2.2.6. Responsible for performance of personnel surveys upon exiting Radiologically Controlled Areas.

2.2.7. Responsible for document control and record retention in accordance with the Midnite Mine Water Treatment Plant Quality Assurance Plan.

2.2.8. Responsible for ensuring that sufficient numbers of calibrated instruments are available.

2.3. Worker Responsibilities

2.3.1. Responsible for conducting personal contamination surveys in accordance with this procedure upon exiting the Water Treatment Plant Restricted Area.

2.3.2. Responsible for ensuring response checks have been performed prior to the use of selected instrumentation for radiological surveys.

3. PRECAUTIONS

N/A

4. EQUIPMENT AND MATERIALS

4.1. Survey meters, equipment, supplies, and documentation materials.

5. PROCEDURE

5.1. General

5.1.1. Radiation surveys shall be performed based upon the radionuclides and types of radiation which workers are anticipated to encounter.

5.1.2. General area surveys shall be used to assess the nominal radiation fields, to verify that radiological conditions have not changed, and to establish specific radiological controls for work to be performed.

5.1.3. Contact dose rates may be used to locate and identify the maximum radiation levels to which personnel could be exposed as well as localized sources of radiation which present unique radiological concerns.

5.1.4. Contamination surveys shall be performed to detect and quantify radioactive contaminants known or likely to be present, and to determine whether radioactive material is embedded (fixed) in a surface or is smearable (loose-surface).

5.1.5. Qualitative (large area) loose-surface contamination surveys should be performed to ensure that radioactive contamination has not been inadvertently spread.

5.1.6. Weekly, prior to use, all portable radiation detection instruments shall be checked with a source for consistency, and the results recorded on the Source Check Form (Attachment 4-3). The check shall be from at least one point using the same source as used for the reference reading. If readings vary 20% from the reference reading, the meter shall be removed from service, repaired, and re-calibrated as appropriate.

5.1.7. Daily, prior to use, each instrument shall be response checked by exposing the probe to radioactive material (i.e. an ore rock, lantern mantle, check source) to ensure the instrument is responding properly.

5.1.8. Prior to each use of an instrument, the following checks shall be completed:

- Physical Check (is it all there and in one piece)
- Battery check (in the 'bat OK' section)
- Background response check
- Calibration sticker check

5.1.9. The person documenting a survey shall notify the RSO and Supervisor whenever alpha contamination levels greater than 1,000 dpm/100cm² are found.

5.2. Routine Surveys

5.2.1. Surveys shall be conducted at a frequency commensurate with the hazards present and the personnel occupancies in a given area.

5.2.2. Weekly, monthly, quarterly, semi-annually, and annual routine surveys and inspections shall be performed with the frequency specified in Routine Inspection/Survey Frequency (Attachment 4-1).

5.2.3. Monthly surveys should be performed within the first full week of the month.

5.2.4. Quarterly surveys should be performed within the first three weeks of January, April, July, and October, as applicable.

5.2.5. Routine survey frequencies may be augmented under the direction of the RSO or RST when:

5.2.5.1. Unexpected contamination is found outside of the Water Treatment Plant Restricted Area (e.g., inside vehicles), .

5.2.5.2. Unexpected and/or significant increases in radiation levels, contamination levels or airborne radioactivity levels occur.

5.2.5.3. Maintenance activities or changes in work scope occur which may change radiological conditions (i.e., operations that may increase personnel dose rates, loose surface contamination, airborne radioactivity, etc.).

5.2.5.4. Changes to established survey frequencies shall require approval from the RSO and shall be documented.

5.3. Radiation Surveys

5.3.1. Measure general area gamma exposure rates at waist level and at 30 cm (11.82 inches) or more from a source or the surface of nearby objects.

5.3.2. Determine the source of radiation fields, when practical.

5.3.2.1. When necessary, ensure the survey instrument is not shielded by the body by rotating 180 degrees around the point being surveyed.

5.3.2.2. Measure exposure rates at the head, waist and feet level relative to the worker's position to radiation source(s).

5.3.2.3. Measure exposure rates overhead and underfoot where personnel may position themselves during work or inspections.

5.3.2.4. Observe for slight increases in instrument responses.

5.3.3. Perform contact gamma exposure rate measurements with the detector within ½" of the surface to be surveyed.

5.3.4. Measure the exposure rates at surfaces where radiation penetrates.

5.3.5. Evaluate the potential beta dose rate to the lens of the eye and skin, as appropriate.

5.3.6. Obtain an adequate number of measurements to provide a suitable representation of the dose rates over the entire area(s).

5.3.7. Appropriate radiation surveys shall be performed:

- In the work area(s) from which personnel have exited with unanticipated or unexpectedly high instrument responses.
- In areas where equipment configuration changed or dose rates may have changed.

5.3.8. Document the survey in accordance with Section 6.0

5.4. Contamination Surveys

In general, routine area contamination surveys will be performed by the RST. Routine personal contamination surveys (scans) may be performed by the worker if he/she is appropriately trained. All Water Treatment Plant and contractor workers will be instructed in personal contamination survey procedures during initial worker training or the annual refresher training. Individuals temporarily on site will receive training commensurate with their potential for exposure. That training will include instruction in personal contamination survey procedures. The RST will periodically observe workers surveying themselves out of the radiologically controlled area to be sure the surveys are being performed appropriately.

5.4.1. Standard contamination surveys shall evaluate fixed and smearable activity over a surface area of 100 cm^2. The loose-surface contamination shall be quantified by wiping (smearing) approximately 100 cm^2 (approximately 16 square inches) of the surface. Wipe surveys will be conducted by the RST or RSO.

5.4.2. Obtain a sufficient number of independent samples to accurately characterize typical loose-surface contamination levels.

5.4.2.1. Collect samples from sample points that will provide an accurate representation of the typical as well as maximum contamination in the area or on the surfaces surveyed. Specifically address:

- Areas of high traffic
- Handrails
- Under benches or tables
- Under the edges of components or piping.
- On horizontal surfaces protruding from walls (e.g., junction boxes, conduit, etc).
- Other accessible but isolated areas.

5.4.3. Survey surfaces that are easily accessible, directing specific attention to table tops, bench tops, and areas adjacent to contamination area boundaries and step-off-pads, etc.

5.4.4. Survey areas that may be potential sources of contamination. (i.e. floor drains, valves, contamination containment devices, etc.).

5.4.5. Smear samples shall be handled in a manner to prevent cross-contamination or loss of sample material.

5.4.6. Dry (e.g. air dry in still air) the smear sample prior to counting if it becomes wet during collection, since wet samples may result in instrument under-response due to sample self-absorption.

5.4.7. Ensure that hand-held probes do not become contaminated when counting samples. Check the detector background count rate if cross-contamination is suspected.

5.4.8. Smear samples can be analyzed with a contamination survey instrument in the field for gross alpha activity as follows:

5.4.8.1. For alpha activity, hold the detector within approximately 1/8 inch of the sample for at least 15 seconds, avoiding contact with the sample.

5.4.8.2. Calculate the sample activity in terms of dpm/100 cm^2 as follows:

$$DPM/100cm^2 = CPM / (\text{instrument efficiency} \times \text{area sampled in } 100\ cm^2)$$

5.4.8.3. Smears can also be analyzed using the laboratory scaler/detector apparatus in accordance with MM-SOP02, “Laboratory Scaler/Detector Operation”.

5.4.9. Perform large area contamination checks, as necessary, to monitor the radiological cleanliness of areas or to verify that surfaces are free from smearable contamination.

5.4.9.1. Sample the major portion of surfaces in rooms, hallways, other large areas or equipment by wiping a large (e.g., 1 to 100 ft^2) area using a soft, absorbent, cloth-like material as the collection material.

5.4.9.2. Survey smear media for radioactive contamination using alpha and/or beta- gamma instruments.

5.4.10. Evaluate surfaces for fixed activity to determine the presence of fixed radioactive materials as follows:

5.4.10.1. Hold the detector as near to the surface being evaluated as possible.

5.4.10.2. Move the probe over the surface being surveyed at a rate less than 1 detector width per second.

5.4.10.3. Note locations where either the visual or audible count rate increases and slow the probe movement to less than 1 detector width per second over areas which indicate increased count rates.

5.4.11. Document all contamination surveys in accordance with Section 6.0.

5.5. Equipment/Vehicle Screening

5.5.1. Equipment/vehicles leaving the Water Treatment Plant Restricted Area not for unconditional use shall be surveyed using a portable instrument

that utilizes a standard pancake G-M probe. If levels greater than 50 counts per minute above background are detected, the vehicle shall be decontaminated to levels below 50 counts per minute, or evaluated for loose surface contamination and fixed contamination (Section 5.4).Unconditional Release Surveys (Items Released for Public Use)

5.5.2. Unconditional release surveys shall consist of both direct and smearable monitoring (MM-SOP02) methods to assess the residual surface contamination of the equipment being monitored. Where the equipment meets the removable contamination release criteria based on a total contamination measurement, using a pancake probe or alpha survey meter, smears are not necessary.

5.5.3. If an item or material or equipment is determined to meet the unconditional release criteria, it shall be identified as meeting the release criteria or placed in a marked container or segregated in an area outside of the Water Treatment Plant Restricted Area. If a container/area is utilized inside the Water Treatment Plant Restricted Area, controls such as identifying the area with signs or labels must be in place to prevent the material from being re-contaminated, such as contaminated materials being placed in the container/area.

5.5.4. Surface contamination levels of material to be unconditionally released for unrestricted use shall have gross alpha activity of less than 5,000 dpm/100cm^2 (average), 15,000 dpm/100cm^2 (maximum), and 1,000 dpm/100cm^2 (removable), as listed in Table 2 of U.S. NRC Regulatory Guide 8.30.

5.5.5. Results of unconditional release survey(s) for surface contamination shall be documented in accordance with Section 6.0.

5.6. Follow-Up Surveys

5.6.1. Investigative surveys shall be performed, as applicable, immediately (as soon as practical) following the discovery or indication of abnormal radiological conditions.

5.7. Contamination Monitoring of Individuals

5.7.1. All individuals shall monitor for alpha activity upon leaving the Water Treatment Plant Restricted Area.

5.7.2. Requirements to monitor for contamination shall be identified on the applicable Radiation Work Permit (RWP).

5.7.3. Any indication of alpha activity above background or the alarm set level shall be considered as positive contamination and shall be addressed in accordance with MM-SOP06, “Decontamination Procedures”.

5.7.4. If washing does not remove the contamination, notify the RST.

5.8. Portable Radiation Survey Instrument Calibration

5.8.1. When the instrument is returned from calibration, complete the source check and record the results as reference readings (Attachment 4-3).

5.8.2. The instrument shall not be used if it is not operating properly or if the source response check differs from the reference reading by more than 20 percent. Instruments that fail the response or the battery check shall be tagged out of service.

5.8.3. Instrument calibrations shall be performed in accordance with manufacturer's recommendations at intervals not to exceed 12 months or at shorter intervals as recommended by the manufacturer. Calibrations shall be performed using radioactive sources traceable to NIST or equivalent, as practical.

5.8.4. Each instrument shall be calibrated at two points at about one-third and two-thirds of each linear full scale that is routinely used, or at one point near the mid-point of each decade on logarithmic scales that are routinely used.

5.8.5. Survey instruments shall be calibrated after repair, prior to use. For purposes of this section, a repair does not include battery, probe non-functioning accessory (e.g. handle), or cord replacement.

6. RECORDS

6.1. Survey Records

An example of a survey form is included as Attachment 4-2.

6.1.1. Surveys shall be documented in writing. The person performing the survey is responsible for the correct and accurate documentation of survey data.

6.1.2. Surveys should be documented as they are being performed whenever possible in a clear and legible manner using black or blue ink.

6.1.3. Indicate survey points or sample locations, as applicable, and record the associated measurements. Provide sufficient detail to adequately describe each specific area, room, or item surveyed.

6.1.4. Multiple page documents should be notated by numbering each page along with the total number of associated pages (i.e. page 1 of 3, etc.). Do not document survey information on the backside of a survey document.

6.1.5. If any space on a survey form is not applicable, it should be noted as N/A rather than being left blank.

6.1.6. Survey records shall include the type of survey performed (e.g., routine, weekly, RWP, etc.), name of person who performed the survey, date survey was performed, model number, serial number, and calibration due date for all instruments used to measure radiation levels or radioactive material concentrations, the specific location (area or room), component and equipment surveyed, the RWP number(s) if applicable, the results of survey measurements performed, and any remarks concerning radiological or non-radiological conditions (i.e. the presence of water, safety concerns, etc.) which may affect personnel exposure to radiation or radioactive material, as applicable.

6.1.7. The person performing the survey shall sign the survey record.

6.1.8. Provide a detailed description of radiation exposure rates so as to clearly identify the radiological conditions present and assist personnel to maintain doses ALARA.

6.1.8.1. Specifically identify general area exposure rates that are not at waist level. Indicate the distance from the floor or other surfaces.

6.1.9. Record loose-surface contamination sample locations and associated levels. Provide additional information, as necessary, to clarify the exact location of the sample points.

6.1.9.1. Identify sample locations.

6.1.9.2. Record the associated loose-surface contamination levels on the survey form, if possible.

6.1.9.3. Loose-surface contamination concentrations are recorded in terms of dpm/100cm² unless otherwise indicated.

6.1.9.4. Identify sample results for large area smears.

6.1.9.5. Provide descriptive information regarding surface conditions such as water, soil or debris on surfaces, as applicable.

6.1.10. Use arrows, as necessary, to indicate precise locations for survey measurements or other information.

6.1.11. Supervisors and workers shall be properly notified of any changes in radiological status.

6.1.12. The original documentation shall be forwarded to the RSO (or designee) for review on a daily basis.

6.2. Instrument Check Records

6.2.1. An example consistency check form is included as Attachment 4-3.

6.2.2. Response checks do not require any documentation.

6.3. Quality Assurance

6.3.1. All records of surveys shall be maintained in accordance with the Midnite Mine Water Treatment Plant Quality Assurance Program.

7. REFERENCES

7.1. U.S. NRC Regulatory Guide 8.30, “Health Physics Surveys in Uranium Mills”

7.2. Midnite Mine Water Treatment Plant Radiation Protection Procedures

7.3. Midnite Mine Water Treatment Plant Quality Assurance Plan and Procedures

8. ATTACHMENTS

8.1 Attachment 4-1 - Midnite Mine Water Treatment Plant Routine Inspection/Survey Frequency

8.2 Attachment 4-2 - Example Survey Form

8.3 Attachment 4-3 - Example Source Check Form

ATTACHMENT 4-1
MIDNITE MINE WATER TREATMENT PLANT ROUTINE INSPECTION/SURVEY FREQUENCY

DAILY INSPECTIONS/SURVEYS:

1. Radiation Instrument response checks on days when instruments are in use.

WEEKLY INSPECTIONS/SURVEYS:

1. Mine Water Treatment Plant Building lunchroom and plant area (Contamination with meter and smears).
2. Survey instrument consistency checks.

MONTHLY INSPECTONS/SURVEYS:

1. Mine Water Treatment Plant Building (Radiation).

ATTACHMENT 4-2
MIDNITE MINE WATER TREATMENT PLANT
SURVEY FORM

Description: Date:

Swipe results in circles, radiation readings in MR/HR, grab air samples in boxes. xxx = area of direct frisk, <50 cpm above background (_____cpm)
SWIPE RESULTS (DPM/100cm^2) alpha contamination.

No.	Cpm	dpm	No.	cpm	dpm	No.	Cpm	dpm
1			6			11		
2			7			12		
3			8			13		
4			9			14		
5			10			15		

Instrument	
Ser. no.	
Cal. due.	
Instrument	
Ser. no.	
Cal. due.	
Instrument	
Ser. no.	
Cal. due.	

Remarks: 100 cpm is assumed to equal 1,000 dpm ,
300 cpm is assumed to be 0.1 mr/hr.

Surveyed by_____ Reviewed by _____

ATTACHMENT 4-3
SOURCE CHECK FORM

Meter: _____ Serial Number: _____

Calibration Due: _____ Probe Type: _____

Source A: _____ ser. # _____ Initial Reading: _____ + 20%_____ - 20%_____

Source B: _____ ser. # _____ Initial Reading: _____ + 20%_____ - 20% _____

Date	Source A	Source B	Sat./Init.

Date	Source A	Source B	Sat./Init.

APPENDIX E

NOXIOUS WEED MANAGEMENT PLAN

Noxious Weed Management Plan for the Rhoads Property

April, 2014
Revision 1

Prepared on Behalf of:
Newmont USA, Limited and
Dawn Mining Company

Prepared By:
Worthington Miller Environmental, LLC
201 Linden Street Suite 301
Fort Collins, Colorado 80524

TABLE OF CONTENTS

1.0 INTRODUCTION 1

1.1 Goals and Objectives 1

1.2 Noxious Weeds List 1

2.0 NOXIOUS WEED INSPECTIONS 4

3.0 WEED MANAGEMENT 5

3.1 Prevention 5

3.2 Control 6

3.2.1 Control Methods 6

3.2.2 Identification and Recommended Controls by Species 7

3.2.3 Approach for Selection of Controls 7

3.2.4 County and Tribe Recommendations for Chemical and Biological Control Methods 8

4.0 PLAN REVISIONS AND REPORTING 10

5.0 REFERENCES 11

LIST OF TABLES

Table 1 Stevens County/Spokane Tribe Noxious Weed List

Table 2 Biocontrol List

LIST OF ATTACHMENTS

Attachment A Weed Inspection and Follow Up Forms

Attachment B Weed Identification and Recommended Controls

Attachment C Recommended Chemical Controls

Attachment D Biocontrol Information Sheets

1.0 INTRODUCTION

This Noxious Weed Management Plan (Plan) provides guidelines for managing noxious weeds during soil excavation and reclamation activities at the Rhoads Property, located on the Spokane Indian Reservation in Washington. This plan provides management practices for designated noxious weeds. Practices include preventive and proven control methods. The intent is to incorporate those practices that are effective, timely, and technically feasible.

This Plan is a component of the *Rhoads Property Plan of Operations and Reclamation* (POR), which presents details for obtaining cover soil materials from the Rhoads Property for use with the Midnite Mine Superfund Site (MM) remediation. The POR includes the proposed reclamation practices that will be conducted to return the Rhoads Property to the identified post-operation land use(s). The POR contains information regarding project stakeholders, planning considerations, and project schedule.

The noxious weed management practices presented in this Plan will be implemented and evaluated based on pre-construction investigations and subsequent annual inspections performed following phased soil excavation and concurrent site reclamation. Although this Plan presents several viable weed management practices, the control methods that are selected and implemented will be dependent on actual site conditions, weed locations with respect to site features and local soil conditions, and progress of previously implemented control methods. As a result, noxious weed management is a dynamic process that Newmont will implement in conjunction with stakeholder input.

1.1 Goals and Objectives

The following are the goals of this Plan:

- Develop and implement a comprehensive noxious weed management program using integrated management practices based upon site conditions and investigation.
- Prevent, contain, and control noxious weeds.
- Maintain healthy plant communities with native, desirable and beneficial vegetation.
- Prevent the introduction and/or the infestation of noxious weeds to neighboring lands.

1.2 Noxious Weeds List

The noxious weeds list included in this Plan (see Table 1) is a combination of noxious weeds identified by Stevens County and identified in the *Integrated Resource Management Plan (IRMP) for the Spokane Indian Reservation*. Stevens County is located closest to the Spokane reservation, and Table 1 lists their current noxious weeds, which include all Class A, Class B-designate and certain Class B/C noxious weeds from the 2013 Washington State Noxious Weeds List (WAC 16750) that are currently found growing or are known to have grown previously (reported sightings within the past 5 years in Steven's county), and the level of recommended control. Class A noxious weeds are those not native to the state, that are of limited distribution or are unrecorded in the state, and that pose a serious threat to the state. Eradication may be required and prevention/early detection are

high priority. Class B noxious weeds are those not native to the state, that are of limited distribution or are unrecorded in a region of the state, and that pose a serious threat to that region. Class B-designate means those Class B noxious weeds whose populations in a region or area are such that all seed production can be prevented within a calendar year, and Class C are any other noxious weeds. The complete list of noxious weeds can be found on the Stevens County Noxious Weed Control Board website:

http://www.co.stevens.wa.us/weedboard/noxious_weeds.htm.

The IRMP references the Spokane Indian Reservation Grazing Resource Inventory report, which estimated that 35% of the Reservation was infested with noxious weeds. Specific major noxious weed species noted in the IRMP are yellow starthistle, diffuse knapweed, spotted knapweed, Russian knapweed, and toadflax.

Table 1 gives a listing of the weeds from the Stevens County Designated Noxious Weed List, the State of Washington Class/List Type and the level of recommended control by the county. Also included are any species noted above in the IRMP that were not included in the Steven's county current list (i.e. Russian knapweed and toadflax).

The species listed for required control include Class A, Class B-Designate, and certain Class B/C select species. All are known to be aggressive invaders capable of spreading rapidly.

TABLE 1. STEVENS COUNTY/SPOKANE TRIBE NOXIOUS WEED LIST

Plant	Class List Type (WAC 16750)	Control Recommendation (Steven's County)
Buffalobur (*Solanum rostratum*)	Class A	May be required
Bighead knapweed (*Centaurea macrocephala*)	Class A	May be required
Clary sage (*Salvia sclarea*)	Class A	May be required
Flowering rush (*Butomus umbellatus*)	Class A	May be required
Meadow clary (*Salvia pratensis)*	Class A	May be required
Mediterranean sage (*Salvia aethiopis*)	Class A	May be required
Velvetleaf (*Abutilon theophrast*)	Class A	May be required
Annual bugloss (*Anchusa arvensis*)	Class B-designate	Required
Blueweed (viper's bugloss) (*Echium vulgare*)	Class B-designate	Required
Common bugloss (*Anchusa officinalis*)	Class B-designate	Required
Garden loosestrife (*Lysimachia valgaris*)	Class B-designate	Required
Kochia (*Kochia scoparia*)	Class B-designate	Required
Leafy Spurge (*Euphorbia esula*)	Class B-designate	Required
Musk Thistle (*Carduus nutans*)	Class B-designate	Required
Perennial Pepperweed (*Lepidium latifolium*)	Class B-designate	Required
Punturevine (*Tribulus terrestris*)	Class B-designate	Required
Purple Loosestrife (*lythrum salicaria*)	Class B-designate	Required
Saltcedar (*Tamarix ramosissima*)	Class B-designate	Required
Scotch broom (*Cytisus scoparius*)	Class B-designate	Required
Scotch thistle (*Onopordum acanthium*)	Class B-designate	Required
Tansy ragwort (*Senecio jacobaea*)	Class B-designate	Required
Wild chervil (*Anthriscus sylvestris*)	Class B-designate	Required
Yellow archangel (*Lamiastrum galeobdolon*)	Class B-designate	Required
Black Henbane (*Hyoscyamus niger*)	Class B select/C select	Required
Hoary alyssum (*Berteroa incana*)	Class B select/C select	Required
Longspine sandbur (*Cenchrus longispinus*)	Class B select/C select	Required
Butterfly bush (*Buddleja davidii*)	Class B select	Required if spreading off site
Myrtle spurge (*Euphorbia myrsinites*)	Class B select	Required if spreading off site
Plumeless Thistle (*Carduus acanthoides*)	Class B select/designate	Required
Rush skeletonweed (*Chondrilla juncea*)	Class B select/designate	Required
Yellow Starthistle (*Centaurea solstitialis*)*	Class B select/designate	Required
Diffuse knapweed (*Centaurea diffusa*)*	Class B select	A control strip of at least 40' wide must be maintained along property boundaries, including travel corridors
Spotted knapweed (*Centaurea maculosa*) *	Class B select	
Russian Knapweed (*Acroptilon repens*)*	Class B select	Not required
Dalmatian Toadflax (*Linaria dalmatica*)*	Class B select	Not required
Yellow Toadflax (*Linaria vulgaris*) *	Class C	Not required

*Weed species noted in IRMP; toadflax species was not specified

2.0 NOXIOUS WEED INSPECTIONS

A Newmont representative will perform pre-construction and annual weed inspections to locate weed populations, map their locations, estimate the density of the populations, and record the information for use in tracking progress of the management program. The primary goals of the inspections are to identify and record noxious weed species, density, and detailed location information. Identifying the species that are on site is vital in selecting the appropriate control methods and developing a strategy for control. All weed observations will be mapped in sufficient detail to re-locate for treatment and monitoring purposes. Mapping details will assist in identifying potential problems that may occur when control methods are implemented, such as damage to non-targeted species. Mapping also may eliminate certain control methods before implementation, by virtue of location. Finally, annual inspection of mapped areas will allow for evaluation of the effectiveness of the control methods.

The inspections will be performed prior to initiating any soil disturbing activities and annually after phased excavation activities and reclamation activities. Inspection forms are included in Attachment A (Form A). The initial and annual inspections will be conducted in late spring/early summer. The weed inspection forms will contain the following principle components:

- Date of inspection.
- Location and estimated density of any target weed species found on the premises.
- Additional weeds of concern found on site.
- Recommended control methods.

Each inspection (i.e. initial and annual) will identify noxious weed populations and locate these populations on a map using a set of symbols to identify species, size of the infestation, density of the population, type of surrounding vegetation, and type and degree of disturbance. The effectiveness of control methods will also be documented in each annual survey. Inspections will be conducted by a plant biologist that is familiar with the identification of noxious weeds in the area and will be completed using a grid mapping system within disturbed areas and a less intensive reconnaissance level survey within undisturbed areas.

The selected control methods will be based on the type, size, and location of the mapped noxious weeds. The treated area(s) will be monitored and re-inspected annually for new weed introductions and to evaluate the success of the control methods. Follow-up inspections will be documented using Inspection Follow-up forms (Attachment A, Form B).

3.0 WEED MANAGEMENT

Weed management is divided primarily into prevention and control. The prevention of noxious weed infestations will be a standard practice throughout soil disturbance and reclamation activities and weed control methods will be selected and implemented based on actual site conditions that include such things as species, size and density of the population, associated species, soil type, and proximity to water.

3.1 Prevention

Prevention is the highest priority weed management practice on non-infested lands; therefore protecting weed-free plant communities is the most economical and efficient land management practice. Disturbed land provides opportunity for noxious weeds to invade. The spread of noxious weeds is most likely to occur where soil has been disturbed by activities such as road and trail cuts, construction sites, the spread of gravel, road fill and topsoil contaminated with noxious weed seed, or overgrazing. Other known methods of weed introduction include contaminated hay, straw, and mulch, movement of contaminated vehicles and equipment across uncontaminated lands, wildlife fur, and human clothing.

Prevention is best accomplished by ensuring that new weed species seed or vegetative reproductive plant parts of weeds are not introduced into new areas, and by early detection of any new weed species before they begin to spread.

Methods to prevent introduction or establishment of noxious weeds in areas without infestations include:

- Identification of existing conditions, disturbances, and activities that could facilitate noxious weed invasion.
- Identification and eradication of small, new weed populations.
- Protection of weed free areas from initial introduction.
- Monitoring and control implementation to prevent recurrence.
- Timely revegetation and reclamation of disturbed sites
- The use of weed free seeds, mulch and straw.
- Prioritization of weed management along entry areas to the Rhoads Property.
- Limiting vehicle movement between weed areas and decontamination/rinsing of vehicles when feasible. (It will be a standard practice to pressure wash the exterior of any vehicles, ATV's, or mobile equipment prior to entering the Spokane Indian Reservation [refer to Section 2.3 of the POR]).

3.2 Control

3.2.1 Control Methods

Control methods include biological, cultural, mechanical, and chemical. The optimum method or methods for weed management will vary depending on a number of site-specific variables such as soil type and stability, grade, associated vegetation, existing and proposed land use, proximity to water, availability of irrigation water, weed type and stage of growth, and severity of the weed infestation. Specific control recommendations will be included on the inspection form(s) on a case by case basis. Control methods will be consistent with the IRMP.

Biological Control

Biological weed control involves using natural enemies for the control of specific weed species. Biological control is defined as "controlling pests by interfering with their ecological status, such as introduction of a natural enemy into the environment." This can sometimes be hard to establish, and can take 5 to 10 years for partial control because it involves moving an organism to a new environment. However, once established, biological controls can be less labor intensive and more continual than other methods of control. Biological control can be used as part of an integrated pest management program to destroy the invasive plant tissues and cause stress to those plants, thus reducing competition between weeds and desirable species.

Cultural Control

Cultural control is probably the most important control to utilize in preventing weed introduction and reducing spread once weeds are present. Cultural control employs common sense to prevent formation and spread of infestations. Some forms of this control include: using weed free seed and mulch when planting; cleaning tillage and cutting/harvesting equipment before moving from a weedy area to a non-weedy area; making sure topsoil is not harboring noxious weeds before stripping, stockpiling and reapplying; and education to be able to identify noxious weeds, becoming familiar with their life cycles, and determining how an weed population got started, why it still exists, and how to remove it with the least impact to the surrounding environment.

Mechanical Control

Mechanical control is the physical removal of weeds from the soil medium and includes tilling, mowing, pulling, cutting, or burning undesirable plant species. Tillage is most effective prior to seeding and establishment of desirable vegetation. The tillage method of weed control can be effective in eliminating noxious perennial weeds when repeated at short intervals (every 1-2 weeks) throughout the growing season. Tillage has the drawback of indiscriminately impacting all vegetation interspersed with weeds in established areas and can eliminate competitive, desirable vegetation leaving behind a prime seedbed for weeds to reinvade. Mowing can be an effective method for controlling the spread of an infestation and preventing the formation and dispersal of seeds. Mowing is most effective on weeds which spread solely or primarily by seed. In order to achieve this, it must be repeated at least twice during the growing season prior to, or shortly after bloom. Also, even the most intense mowing treatment will not kill hardy perennial weeds. Burning or cutting performs essentially the same function as mowing.

Chemical Control

Chemical control consists mostly of selective and non-selective herbicides. Considerations for chemical controls include; herbicide selection, timing of application, target weed, desirable plant species being grown or that will be planted, number of applications per year and number of years a particular species will need to be treated for desired control. Also important are the health and safety factors involved, and the need to consider undesirable impacts. The use of herbicides will be in compliance with all Tribal, Federal and State laws on proper use, storage, and disposal. The chemical application will be done by a licensed contractor in accordance with all applicable laws and regulations and all label instructions will be strictly followed. Applications of herbicides would not be permitted when the instructions on the herbicide label indicate conditions that are not optimal.

Application of herbicides will be suspended if the following conditions exist:

- Wind velocity exceeds 20 miles per hour;
- Snow or ice covers the foliage of noxious weeds; or
- Precipitation is occurring or imminent.

3.2.2 Identification and Recommended Controls by Species

Attachment B provides the identification and the recommended chemical, biological, cultural and mechanical management controls for the designated weed species, courtesy of the Stevens County Noxious Weed Control Board website.

3.2.3 Approach for Selection of Controls

Selection of control methods often requires an integrated management approach to achieve success. In some cases, only one control method may be warranted, while in other cases a combination of control methods may be needed. For instance, it may be necessary to use a total vegetation control herbicide on a small area followed by reseeding to the desired vegetation. Another example of integrated management is mowing or cultivating in spring or early summer followed by chemical treatment in the fall after regrowth has occurred. Infested areas may be inaccessible with large equipment and only mechanical or chemical control by hand may be possible. All alternatives will be considered before selecting one or more control methods.

Additional considerations will be made when selecting control treatments when specific situations arise regarding type, size, and location of weed infestations. Examples of this are perennial versus biennial, broadleaf versus grasses, noxious weeds interspersed with desirable vegetation, large monoculture patches, or small patches requiring spot treatment, infestations located near bodies of water, infestations located on topsoil piles, or on rough, steep, or nearly inaccessible terrain.

Treatment window schedules, based on the control methods chosen and the noxious weeds present, will be established for each treatment area. The best time to treat perennial noxious weeds is in the spring or fall during their active growth phase. Different species will have different

optimum treatment times even with the same type of control. Perennial weeds usually grow vegetatively in the spring, flower and seed in late spring and early summer, enter dormancy during the summer and actively grow again in the fall. The treatment windows selected will depend on the species present, geographic location, elevation, and control methods selected.

The final preparatory step is to determine the priority for areas to be treated. Prioritization ensures that the most important areas are dealt with at the most effective times. High priority areas to be considered are major traffic areas, road cuts and embankments. Ditches and pond embankments should be considered priority treatment areas to prevent offsite contamination by water transported seeds. Important areas of concern include areas that may transport weed seeds. These areas include ditches, streams, roadsides, trails, land equipment storage sites. Large monoculture patches are of concern wherever they occur and should always be a high priority. Also, small patches of weeds should always be treated to prevent expansion of weed populations.

Once the treatment plan is implemented, detailed records will be kept, and success or failure of treatment will be recorded so as to eliminate unsuccessful treatments. It may be necessary to experiment with different control methods to determine what works best for a specific treatment area.

3.2.4 County and Tribe Recommendations for Chemical and Biological Control Methods

The Stevens County Noxious Weed Board lists chemicals recommended for noxious weed control (included in Attachment C). The IRMP does not specify approved chemicals to be used for weed control, but that pesticide (including herbicide) use should be consistent with to FIFRA (Federal Insecticide, Fungicide and Rodenticide Act).

The recommended chemicals will only be used as approved by the Tribal Department of Natural Resources. The IRMP states that pesticides (including herbicides) are being phased out on the reservation. The IRMP states the following previsions from the Law and Order Code regarding pesticides:

- No aerial application unless specifically authorized by the Tribal Council
- Drift must be prevented
- Pesticide (herbicide, insecticide, fungicide and rodenticide) will not be permitted within any riparian corridor, any closer than 500 feet from the center of any riparian zone, nor within 500 feet of any wellhead protection area, without special clearance through the Tribal Water Resources Program. (Riparian corridors are defined as extending 100 feet beyond the outer boundaries of a riparian zone, and 1/2 mile from a river.)

The IRMP also requires that spraying of pesticides be avoided in traditional gathering areas in order to protect cultural resources.

With the desire to reduce of the use of pesticides, the IRMP mentions implementing the use of biological controls. The Stevens County weed management website lists many biocontrol agents

that are effective for some of the major noxious weed species. Table 2 lists these species and the corresponding biocontrol(s). Details of the insects used for as biocontrols are included in Attachment D.

TABLE 2. BIOCONTROL LIST

Weed Species	Biocontrol Agent
Dalmatian Toadflax	Mecinus janthinus
Diffuse knapweed, Spotted knapweed	Cyphocleonus achates, Larinus minutus, Metzneria paucipuntella, Sphenoptera jugoslavica
Leafy Spurge	Aphthona flava
Purple Loosestrife	Galerucella pusilla
Rush skeletonweed	Cystiphora schmidti, Eriophyes chondrillae, Puccinia chondrillina
Plumeless Thistle	Rhinocyllus conicus
Yellow Starthistle	Bangasternus orientalis, Eustenopus villosus

4.0 PLAN REVISIONS AND REPORTING

This Plan will be revised as appropriate, per compliance to any revisions made to the Spokane Tribe IRMP, Stevens County Weed Management Plans or State of Washington noxious weed species lists.

Information obtained from the weed inspections including control selection and implementation will be recorded on the weed inspection and follow-up forms (Attachment A). The completed inspection forms and mapping results of any identified weeds will be provided to the Tribe DNR within 60 days of the inspection.

5.0 REFERENCES

Integrated Resource Management Plan (IRMP) for the Spokane Indian Reservation, FINAL, May 2008.

Steven's County Noxious Weed Control Board website: http://www.co.stevens.wa.us/weedboard/noxious_weeds.htm

Attachment A
Weed Inspection and Follow-Up Forms

Rhoads Borrow Property

Weed Inspection Form A

Date: _____

Inspector: _____

Page: ___ of ___

Location: Coordinates:

Species:

Estimated Plant Density:

Description (approx. size of area infested, surrounding vegetation, soil type, topography, proximity to water, disturbances etc.):

Photos:

Comments / Control measures to be implemented:

Date controls implemented:

Rhoads Borrow Property

Weed Inspection / Follow-Up Form B

Date: _____

Inspector: _____

Page: ___ of ___

Location:	Coordinates:
Species Treated:	
Controls applied:	
Species present: yes no	
If present: Approx. density of plants or size of area infested:	
Photos:	
Comments / Follow-up measures to be implemented:	

Location:	Coordinates:
Species Treated:	
Controls applied:	
Species present: yes no	
If present: Approx. density of plants or size of area infested:	
Photos:	
Comments / Follow-up measures to be implemented:	

Attachment B
Weed Identification and Recommended Controls

Buffalobur

Solanum rostratum Dun. Nightshade family

Key identifying traits

- Deeply lobed watermelon type leaves
- Yellow, 5-lobed flowers through out summer
- Extremely spiny plant including stems, leaves and round seed pods
- Grows up to 2 feet tall with erect stem and ascending branches

Biology and ecology

- An annual with a tap root
- Native to U.S. but not to Washington State
- Common in some western wastelands and prairies
- Serves as a host for Colorado potato beetle
- Common on sandy soils but grows in most soils
- Occasionally found in gardens in our area probably introduced as a seed contaminant
- Not a highly competitive species and may not reproduce well in our climate

Control

Prevention – Learn to identify plants; know your property; beware of unusual or unintended plants in gardens and around bird feeders
Biological – none contemplated for this U.S. native; should have natural enemies already in native areas
Cultural – Good competitive vegetative cover helps
Mechanical – Cultivation, pulling and repeated cutting all work well; be careful to avoid puncture wounds from spines
Chemical – Several work well at label rates; care must be used if in a garden site to avoid off target plant damage

Where found – To date in Stevens County, found exclusively in garden settings or the odd plant under bird feeders with one or two individual plants being reported most years. Believed to be a contaminant seed in garden seed packets and birdseed mixtures.

Clary sage

Salvia sclarea L. Mint family

Key identifying traits

- Has characteristic square stem of mint family
- Flower color range from white-pink-blue-purple
- Flower petals divided into arching upper lip and a lower lip, also characteristic of the mint family
- Large showy bract under each cluster of flowers
- Erect plant with many branched flower spikes
- Plant covered with gland tipped hairs with an odor
- Leaves large and mostly basal with toothed margin

Biology and ecology

- A tap rooted biennial 20 inches to 6 feet tall
- Sometimes grown as an ornamental and a traditional producer of essential oils used in perfumery, distilling and tobacco flavoring
- First year growth as a fuzzy hairy basal rosette
- Quite competitive on dry sunny sites
- Can hybridize with Meadow clary if on same site

clary sage rosettes

Control

Prevention – Learn to identify plants; know your property; beware of fill dirt, hay and seed from outside your area

Biological – None- the closely related Mediterranean sage in Idaho is apparently reduced by a weevil

Cultural – Good vegetative cover helps but does not totally prevent spread from adjacent disturbed areas

Mechanical – Will not withstand regular tillage; pulling and digging are effective prior to seed production; cutting may be effective if repeated

Chemical – Several effective at label rates if a penetrating surfactant is used to get through the hairs to the leaf surface

Where found – Only one rangeland site of less than one acre in south central Stevens County has a pure wild Clary sage infestation but other sites of predominately Meadow clary shows indications of hybridization of the two.

Bighead knapweed

Centaurea macrocephala Puschk. Sunflower family

Key identifying traits

- Single, 1 to 3 inch wide, yellow flower heads on erect, unbranched, leafy stems 2 to 5 feet tall
- Broadly lance-shaped leaves have sharp pointed tips, shallowly toothed edges and rough surfaces
- Leaves change from simple stalks to winged stalks to no stalk as they become smaller up the stem
- Bracts surrounding the flower head are wider than long, mostly brown with lighter margins appearing in 8 to 12 layered rows
- Seeds are $\frac{1}{4}$ inch long with pale to brown plumes

Biology and ecology

- A perennial that reproduces by seed with up to 200 seeds per head
- Sold commercially as an ornamental under the names "Lemon fluff" or "Globe centaury"
- Found only as an escaped ornamental to date but competes vigorously in heavy grass stands in areas with loam soils and 20 inches of precipitation
- Remains green in August & palatable to livestock
- Generally only one or two stems 2 to 3 feet tall with 1 1/2 inch heads when found competing with grass but as an ornamental may be five feet tall with 3 inch heads on each of multiple stems

Control

Prevention – Learn to identify plants; know your property; beware of aggressive ornamentals
Biological – None known
Cultural – Competing vegetation helps limit spread
Mechanical – Repeated tillage, digging or cutting are all effective if properly timed to prevent seeds
Chemical – Several effective at label rates

Where found – Only occasionally reported as an intentionally planted ornamental in Stevens County but is in known as an aggressive escaped ornamental in northern Pend Oreille County and in Whitman and Okanogan Counties in Washington

Velvetleaf

***Abutilon theophrasti* Medic.** Mallow Family

Key identifying traits

- Large (3-8 inch wide) heart shaped leaves grow alternately on long slender stalks
- Entire plant is soft with short velvety hairs
- Yellow to yellow-orange 5-petal flowers; ½-1 inch wide, solitary generally in upper leaf axils
- 1-8 feet tall, rather linear in appearance with branching occurring in upper portion of plant
- Distinctive circular cluster of 12-15 seed pods produce purplish brown, kidney shaped seeds

Biology and ecology

- Tap rooted, summer annual reproducing by seed
- Does not tolerate frost
- 700-17,000 hard-coated seeds per plant remain viable when buried for more than 50 years
- Native to Asia where fiber is used to make rope, bags, nets and paper-introduced in North America in 1700's as a potential fiber crop
- Serious row crop (corn/soybeans) weed in the mid-West
- Found infrequently in gardens, along fencelines and roadsides throughout Washington
- Leaves are horizontal by day, changing to nearly vertical at night

Control

Prevention – Learn to identify plants; know your property; beware of contaminated vegetable seeds and feed screenings

Biological – Some active in mid-West

Cultural – Healthy established vegetation helps, but plants can produce seed under shade of a cover crop

Mechanical – Pulling, digging and cultivating prior to bloom will kill plants; burn plants with seed pods-even immature pods will ripen after cutting

Chemical – Several are reported to control the plant but no specific data available in Pacific Northwest

Where found – Known to occur only as single plants found in gardens in Stevens County

Created by Stevens County Noxious Weed Control Board, April 2000

Mediterranean sage

Salvia aethiopis L. Mint Family

Key identifying traits

- Wooly, upright, single-stalked plant; can reach 4' tall
- 4-12" long basal leaves have irregular margins and are on short stalks; upper leaves are opposite, smaller and clasp the stem
- Flowering stock is square in cross section and develops into a multi-branched inflorescence resembling a candelabra
- Many small white flowers are found in whorls at the tips of branches; 2 upper petals form a lip like a hooked beak, 3 lower petals form 3 lobes
- Leaves and stalks have a strong sage-like odor when crushed

Biology and ecology

- Biennial or short-lived perennial with a stout taproot; spreads only through seed
- Mature plants break off just above the basal leaves allowing the seeds to be dispersed through tumbling or dragging by animals or equipment
- Grows in dryer, disturbed sites such as roadsides, and abandoned fields and seems to prefer south-facing slopes with loose, gravelly soils
- Mediterranean sage is native to southern and southeastern Europe

Control

Prevention – Learn to identify plants; can be confused with common mullein in the rosette stage-must learn to distinguish; cleaning equipment is crucial

Biological – There are some established in states where infestations are large: not appropriate here

Mechanical – Digging at least 2-3" of taproot, mowing, or cultivation prior to seed set can all be effective

Chemical –Several herbicides- picloram, clopyralid or aminopyralid with 2,4-D & surfactant added should work well

Where found – ***Found only on one site in west-central Stevens Co as of 2011.***

Meadow clary

Salvia pratensis L. Mint family

Key identifying traits

- Has characteristic square stem of mint family
- Flowers blue to violet with small green bracts
- Flower petals divided into arching upper lip and a lower lip, also characteristic of the mint family
- One to two feet tall with few flowering spikes
- Leaves have bumpy surface and pointed tip
- Plant covered by small glandular hairs
- Plants range from strong odor to no odor

Biology and ecology

- A fibrous rooted perennial
- Sometimes grown as an ornamental
- Stressed or damaged plants can send up new plants from the remaining roots
- Quite competitive on dry sunny sites and able to live on deeper, less well drained sites as well
- Can hybridize with Clary sage if on same site

Control

Prevention – Learn to identify plants; know your property; beware of fill dirt or contaminated equip.
Biological – None; the closely related Mediterranean sage in Idaho is apparently reduced by a weevil
Cultural – Good vegetative cover helps but does not prevent infestation and spread
Mechanical – Not believed to withstand regular tillage; pulling cutting and digging are effective only if repeated with diligence to kill regrowth and new plants from roots
Chemical – Several effective at label rates if a penetrating surfactant is used to get through the hairs to the leaf surface and timing is geared to promote translocation to the roots

Where found –Less than a total of 10 acres near Waitts Lake, west of Addy and in the Kettle Falls area of Stevens County. May be hybridizing with the biennial Clary sage.

Created by Stevens County Noxious Weed Control Board, April 2000; Updated Jan 2004

Flowering rush

Butomus umbellatus Butomacea Family

Key identifying traits

- Freshwater aquatic plant resembling a large sedge
- Leaves are sword shaped, narrow and triangular in cross section
- Flowering stems are fleshy and spirally twisted
- Showy, pink flowers grow in umbels at ends of stems (but not all plants flower) June-August
- Grows as a shoreline emergent plant with upright, stiff foliage or as a wholly to partially submersed plant with flexible leaves
- Fleshy, rhizomatous roots with "bulbils"

Jenifer Parsons, DOE, holding plant. Top & root photos hers.

Biology and ecology

- Perennial plant reproducing by rhizomes, bulbils and, possibly, seeds
- Grows along muddy shores of lakes, streams, ditches, but can grow out into water as deep as 20' and be totally submersed
- It is the single member of it's family-it is not a true "rush"
- It is native to Eurasia

Control

Prevention – Learn to identify plants; looks like a large grass or sedge-must learn to distinguish

Biological – No known biological control in our area

Cultural – Does not seem to invade healthy shoreline communities as quickly as disturbed sites, but it can still invade

Mechanical – Digging and covering control trials are currently underway-it may be difficult to remove all root parts. Raking and cutting are not effective

Chemical –Plants that are mostly above water are more susceptible to foliar treatment with aquatic herbicides, but control has been inconsistent. Trials are underway in Montana, Idaho and WA.

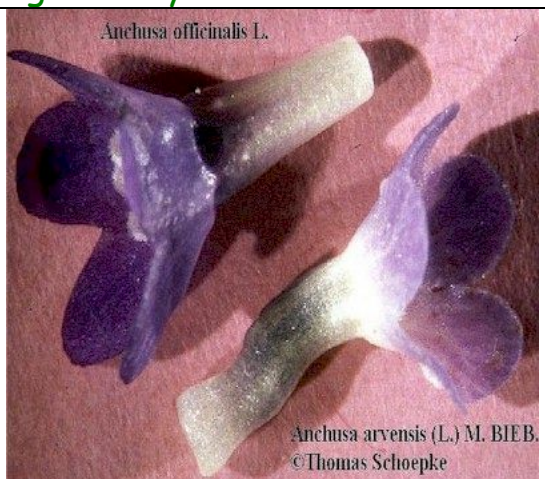
Flower Photo Leslie J. Mehrhoff, Univ. of Connecticut, Bugwood.org

Where found – Found along shore and well out into the waters of Lake Spokane in 2010. Also found in Whatcom, Benton, Yakima and Pend Oreille counties. Large infestation in Flathead Lake, MT and smaller populations elsewhere in the state and in Idaho.

Annual (small) bugloss

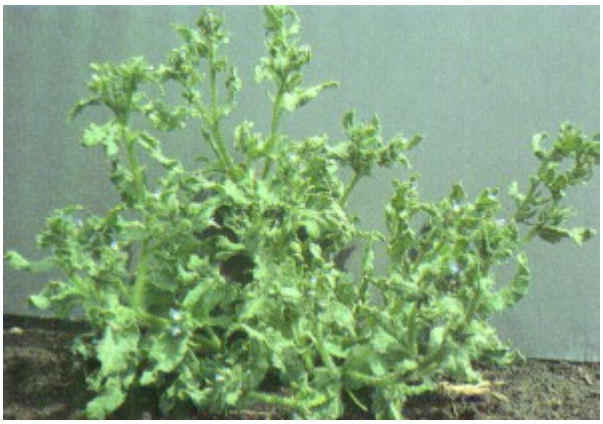
Anchusa arvensis L. Borage family

Key identifying traits



- Leafy, coiled flower stems typical of the Borage family
- Small five-lobed blue flowers with white centers
- Flower tubes white with a distinctive curve-unlike common bugloss which has a straight tube
- Bristly hairs arise from warty bumps covering plant
- Rough wrinkled lance-shaped alternate leaves
- Plant grows 6" to 24" tall with branching stems

Biology and ecology



- Annual plant-reproduces only by seed
- Member of the Borage family
- Germinates primarily in spring but some wait until fall
- Weed of waste ground and cultivated fields
- Especially in small grains both spring and fall
- Seeds viable in soil for several years

Control

Prevention – Learn to identify the plant; prevent establishment in fields by killing infestations along field borders and entrances; prevent spread from infested fields by cleaning swathers and combines

Biological – None available at this time

Cultural – Good competitive vegetation helps prevent establishment

Mechanical – Cultivation kills existing plants; pull or hoe plants in waste areas and burn them if they have produced seeds; seeds are long lived and can germinate over a period of months each year

Chemical – Some effective; best with adjuvant added to help penetrate through hairs; most effective when applied to young plants, prior to bud formation

Where found – Common in Williams valley and moving north in the Chewelah area of Stevens County. Primarily in farming areas-some sites believed to be from contaminated alfalfa seed. 2003- several roadside patches found in the north half of the county. Watch r.o.w. & fill areas.

Created by Stevens County Noxious Weed Control Board, March 2000; Updated January 2004

Blueweed *(Viper's bugloss)*

Echium vulgare Borage Family

Key identifying traits

- Blue flowers with pink stamens arranged on the upper side of short, scorpion-tail stems; as the stem straightens flowers open a few at a time, stalk to tip
- Stems and leaves are covered with stiff hairs which are swollen at the base
- Swellings have a reddish or blackish tint giving the stem a flecked appearance
- Single stalks or multiple branches 1-3 feet tall

digging mature blueweed

Biology and Ecology

- Biennial to short-lived, tap-rooted perennial
- Reproduces by seed and can regrow from crown
- Flowers June through early fall
- Seeds are produced in a four-part nutlet and are very hard and long-lived
- Thrives in sunny sites-does not tolerate shade
- Invades lawns, ornamental areas, roadsides and range land

blueweed rosette-bumpy

Control

Prevention- learn to identify plant; know your property; beware of fill dirt, hay and seed from outside your area

Biological- no known biological controls approved for Blueweed at this time

Cultural- competitive vegetation helps; keep lawns healthy (water/feed) to increase the vigor of turf and reduce open spaces for invasion

Mechanical- mowing can stop seed production in short term, but plants can re-grow and bloom shorter than the cutting blade; digging or pulling when soil conditions are moist is effective-control prior to bloom or, if after, bag or burn plants in a pile as appropriate (check local ordinances); seed bank will be present for years

Chemical- several herbicides are effective at label rates; best timing is in early spring when plants are in the rosette stage

blueweed flowers

Where found- common in the extreme southeastern portion of Stevens County, with only minor outbreaks elsewhere.

Common bugloss

Anchusa officinalis L. Borage family

Key identifying traits

- Flowers are blue to purple with white centers and straight rather than the curved tubes found in annual bugloss
- Flower stem initially coiled like a fiddleneck, but uncoils as flowers open
- Leaves are fleshy with a rough hairy surface; basal leaves to 8 inches long and oblong, stem leaves narrow and smaller
- Mature plants can have several flowering stalks
- Each flower can produce four seeds (nutlets)

Biology and ecology

- A perennial plant 1 to 2 feet tall with a tap root
- First year growth is a rosette; second year a single flower stalk, subsequently many stalks
- Flowers from May through July
- Spreads by seeds only
- Grows in dry areas including dry land alfalfa fields where it's succulent leaves cause mold in baled hay

Control

Prevention – Learn to identify plants; know your property; beware of fill dirt, hay and seed from outside your area

Biological – None known at this time

Cultural – Good competitive vegetation helps prevent infestation but doesn't stop it entirely

Mechanical – Cultivation, digging and pulling can all be effective if sufficient tap root is removed

Chemical – Several effective at label rates at or before bud stage with a surfactant added to penetrate the leaf hairs

Where found – Common in the Enterprise region of Stevens County and occasionally elsewhere in the southern 2/3 of the county. Large infestations in northern Spokane County; first reported in Washington state in Spokane County.

Created by Stevens County Noxious Weed Control Board, February 2001; Updated Jan 2006

Garden loosestrife

Lysimachia vulgaris L. Primrose Family

Key identifying traits

- Showy, yellow, primrose-like terminal flower clusters
- Five petals and reddish brown calyx margins
- Both the stems and leaves are softly hairy
- Lance shaped, opposite or whorled leaves
- Leaves are dotted with black or orange glands
- Erect plant growing 4 feet tall or more
- The fruit is a dry capsule

Biology and ecology

- Perennial; spreads by seeds and rhizomes
- Inhabits wetland and marshy sites
- In our county, flowering period has been observed to be between July and September
- Reported to be out-competing purple loosestrife (no relation) in western WA
- Blooms are an indication of well established plants since young plants don't appear to flower

Control

Prevention – Learn to identify plants; know your property; beware of ornamental starts and contaminated recreational equipment

Biological – None known and no research to date

Cultural – In combination with other methods, competitive vegetation & minimizing site disturbance helps

Mechanical – Small infestations can be dug, bagged and disposed of taking care not to disperse seeds; black plastic covers may be effective with small patches; limited by rhizomes and moist sites

Chemical - Broad leaf and non selective herbicides may be effective depending on site; special care, permit and license required for aquatic applications

Where found – The only recorded site in eastern WA is a limited infestation along the northern shoreline of Loon Lake in Stevens County.

Created by Stevens County Noxious Weed Control Board, February 2000; Updated Jan 2004

Kochia

Kochia scoparia L. Goosefoot family

Key identifying traits

- Many-branched erect plant 1 to 6 feet tall
- Leaves are ½-2 inches long, alternate, narrow, lance shaped with hairy margins & undersides
- Stems round, usually softly hairy & often red-tinged
- Inconspicuous flowers form dense spikes in leaf axils
- Flowers are usually surrounded by cluster of long hairs
- Short, upper flower spikes often nod

Biology and ecology

- Tap-rooted summer annual; reproduces by seed
- Seeds are generally only viable for 1 or 2 years
- Flowering and seed production from July through October; several flushes of seedlings per season
- Common in Western US in cultivated fields, gardens, roadsides, ditchbanks and waste areas
- Readily grazed by livestock although it sometimes contains high nitrate levels and can be toxic
- A serious economic problem in crops
- Drought resistant but does well under irrigation
- Old plants spread seeds while tumbling

kochia seedlings can form a solid mat

Control

Prevention – Learn to identify plants; know your property; control kochia along fencelines and roadways to reduce seed scatter by tumbling plants

Biological – No known biological controls

Cultural – Competitive vegetation helps avoid invasion and winter wheat withstands kochia better than spring wheat

Mechanical – Grazing and mowing will not stop seed production or kill the plant which will resprout from the stem; pull, hoe or cultivate to kill kochia; shallow tillage helps force seeds to sprout or decay

Chemical – Several effective at label rates, but kochia is often resistant to triazine & sulfonylurea herbicides; rotating herbicides with different modes of action helps prevent resistance development

Where found - Limited numbers of plants but widely scattered distribution in Stevens County; mainly along roadsides, railroad, parking lots, gravel pits and piles, other highly disturbed sites.

Leafy spurge

Euphorbia esula L. Spurge Family

Key identifying traits

- Showy pairs of yellow-green, heart shaped bracts (often mistaken for flowers)
- Entire plant contains a milky juice (sap)
- Roots are extensive with pink buds for new shoots or roots
- Leaves are alternate, narrow, 1 to 4 inches long
- Single stalks or multiple stems, up to 3 feet tall
- True flowers are yellow-green but inconspicuous
- Seeds are contained in a 3-celled capsule

Biology and ecology

- Perennial; reproduces by vigorous root stalks and seed; seed capsules explode when dry, projecting seeds up to 20 feet
- Sap can be an extreme irritant to man or beast
- Invades a wide variety of sites- dry hillsides, wet meadows, riparian areas, roadsides
- Once plants are well established (3 years) large nutrient reserves in the extensive root system make control difficult & expensive and eradication nearly impossible
- Forms dense stands grazed only by goats/sheep

Control

Prevention- Learn to identify the plant; know your property; beware of fill dirt, hay and seed from outside your area

Biological – Several used in combination with sheep and with herbicides to combat extensive infestations in the mountain west; trial colony only in Stevens Co

Cultural – Competitive vegetation helps but does not stop infestations

Mechanical – Persistent, almost zealous digging or cultivation is required to be at all successful

Chemical – A few are effective if applied using the correct rates, timing, mixtures, and adjuvants; most effective herbicides generally require a pesticide license. Many years required. Monitor for several years after last top growth is seen.

young plants

Where found - Small infestations found scattered around Stevens County; active ID and cost share control programs have limited the acres involved to less than 100

Created by Stevens County Noxious Weed Control Board, February 2000; Updated Jan 2004

Musk thistle

Carduus nutans Sunflower Family

Key identifying traits

- Large, 1 ½ -3 inch diameter bent over (nodding) flower heads
- Flowers are rose, violet or purple and one per stem
- Bracts surrounding flowers are broad and spine tipped
- Upper flower stems typically bare and lower stems are winged with spines
- Leaves are dark green, lobed and spiny with light green midrib
- Older plants multi-branched & grow to over 6 ft tall

Biology and ecology

- Biennial or sometimes a winter annual
- Invades pasture, range ,forest, road sides and fields
- Reproduction of musk thistle is entirely by seed
- Numerous small roots in the fall; large fleshy taproot in spring
- Only 2% of seeds have pappus and are wind borne
- Can form dense stands, discouraging animal presence and forage

Control

Prevention- Learn to identify the plant; know your property; beware of fill dirt, hay, manure and seed from outside your area

Biological – Biological controls well established in all parts of the county and dramatically reducing musk thistle stand density and vigor

Cultural – Competitive vegetation helps reduce open spaces for invasion

Mechanical – Mowing, cutting, digging, pulling or cultivation are all effective if done prior to flowering and repeated if necessary; seed bank will be present for years

Chemical – Several effective at label rates; best timing is when plants are in rosette stage or early bolt-spring and again in fall

Where found- Common in part of the Harvey Creek drainage with only minor outbreaks elsewhere in Stevens County. Population has decreased with effective biocontrol establishment

Created by Stevens County Noxious Weed Control Board, March 2000; Updated Jan 2004

Perennial Pepperweed

Lepidium Latifolium L. Mustard Family

Key identifying traits

- Small white flowers in dense clusters mainly at ends of stems
- Four flower petals, each 1/16 inch long
- Plant grows from 1 to over 3 feet tall
- Leaves are alternate, lance like, bright green to gray-green, sometimes toothed on margins
- Basal leaves have petioles (stalks) & are larger than upper leaves which are clasping
- Two small, rounded, flattened, slightly hairy reddish-brown seeds per fruit silicle (pod)

Biology and ecology

- A perennial spread by roots and seeds
- Prefers wet sites but can invade cropland- more often in pastures, ditches and roadsides
- Flowering occurs from early summer to fall
- Extensive root system and waxy layer on leaves and stems make it difficult to control
- A wide and fluctuating range of winter temperatures favors seed germination

Control

Prevention – Learn to identify plants; know your property; beware of fill dirt, hay and seed from outside your area- due to difficulty controlling this weed prevention and early control are important

Biological – None known at this time

Cultural – Competitive vegetation aids in control

Mechanical – Repeated hand pulling and digging are good for limited infestations-clean tillage equipment to avoid spreading roots

Chemical – Some broad leaf herbicides are effective at label rates, but must be used with care around moist sites

Where found – There are about ½ dozen known sites in Stevens County. Sites range from extremely dry gravel sites to very moist, grassy sites.

Created by Stevens County Noxious Weed Control Board, January 2001; Updated Jan 2004

Puncturevine

Tribulus terrestris L. Caltrop Family

Key identifying traits

- Usually grows prostrate, with trailing stems forming a mat from 1-10 feet in diameter
- Opposite, compound leaves are divided into 4-8 pairs of small, oval leaflets covered with fine hair
- Yellow, 5-petaled flowers are up to ½" wide and are formed at the leaf axils
- When mature and dry, the 5-part fruit breaks into hard, tack-like structures with sharp spines

Biology and ecology

- Native to southern Europe, this annual spreads only from seeds that can remain dormant 4-5 yrs
- Grows best on dry sandy soils, but tolerates most soil types. Intolerant of freezing temperatures
- Foliage is toxic to livestock, especially sheep, when consumed in quantity
- The hard, spiny burs damage wool, are objectionable in hay, can be injurious to livestock and will puncture bicycle tires and feet
- Other names: goathead, Texas sandbur, tackweed

Control

Prevention – Learn to identify plants; pay particular attention at roadside pullouts and along driveways; monitor tires, shoes, animals for burs

Biological – Two weevils, *Microlarinus lareynii* and *M. lypriformis*, have been introduced into the U.S. and have given reasonably good results

Cultural – Healthy, competitive vegetation can protect against this invader

Mechanical – Tillage is effective prior to seed production. Hand-pulling is preferred for small infestations. Mowing is ineffective due to the prostrate growth habit

Chemical – Many herbicides are reported to be effective

Where found – The only known plant in the county was found in 2004 at a pull-out off of Hwy 395, just east of the Columbia River bridge outside of Kettle Falls. Report any sightings please!

Created by Stevens County Noxious Weed Control Board, Dec 2004

Purple loosestrife

Lythrum salicaria L. Loosestrife Family

Key identifying traits

- Has long, showy, rose-purple flower spikes
- Flowers are small, numerous & have 5-7 petals
- Usually associated with moist or marshy areas
- Leaves simple, entire, and opposite or whorled
- Forms substantial root wads with many stems
- Has erect stems, often growing 6 to 10 feet tall
- Stems are stiff and four-sided
- Develops root rhizomes and abundant seeds
- Both a woody tap root and fibrous root system

Biology and ecology

- An attractive rhizomatous perennial; reproduces by seed, roots and vegetative growth
- Forms up to 2.5 million, pepper-size seeds per plant; seeds float on water and stick to animals
- Commonly displaces desirable wildlife habitat
- Only bees make good use of infested habitat
- Dense infestations can impede water flow
- Infestations often arise from ornamental use
- Sometimes confused with fireweed and spiraea

browning plants due to biocontrol damage

Control

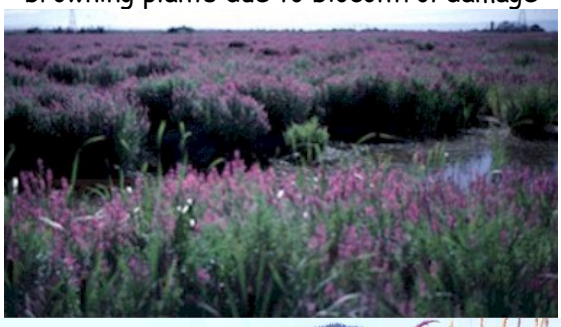
Prevention – Learn to identify plants; beware of ornamental varieties & contaminated boats/motors

Biological – Some very effective agents available and established in our county; substantial impact on plant vigor and reproduction (*Galerucella & Hylobius*)

Cultural – Competitive vegetation helps although plants can invade healthy native as well as managed introduced plant habitats

Mechanical – Small infestations can be dug, bagged and disposed of taking care not to disperse seeds

Chemical – Non-selective or broad leaf herbicides can be effectively used depending on site; if plants are in bloom, clip/bag flowers prior to spray; special care, permit and license required for aquatic applications



cutting flowering heads to bag prior to spray

Where found – Infestations at Waitts Lake, Loon Lake and Lake Spokane; a few other minor infestations have been located in pastures and along ditches elsewhere in Stevens County.

Created by Stevens County Noxious Weed Control Board, February 2000; Updated Jan 2004

Saltcedar

Tamarix ramosissima Ledeb. Tamarisk family

Key identifying traits

- Flowers are pale pink to white with 5 petals
- Many tiny flowers are in each finger-like cluster at branch tips
- Leaves look like cedar and are small and scale like on highly branched slender stems
- May have appearance of a shrub or a small tree
- Bark on saplings and stems is reddish-brown

a pretty specimen in a local yard

Biology and ecology

- Grows as deciduous or evergreen shrubs or small trees, 5 to 20 feet tall
- Both T. ramosissima and T. parviflora are used as ornamentals, but have escaped and naturalized along streams, canals, and reservoirs in the west
- Aggressive colonizer forming single species stands in riparian areas of arid landscapes
- Secretes salt inhibiting growth of other plants
- Extensive root system combined with a high evapotranspiration rate can cause lowered ground water levels and dry up springs and marshy areas

leaves are scales like on Cedar trees

Control

Prevention – Learn to identify plants; know your property; beware of fill dirt and seed from outside your area—Be careful with introduced ornamentals
Biological – Research is currently underway and field releases in the U.S. are pending. Not appropriate for the small amount of this plant found here
Cultural – Competitive vegetative cover helps but cannot prevent spread in susceptible sites
Mechanical – Repeated digging can be effective
Chemical – Several herbicides are effective at label rates but care must be used around moist areas

flowering stem

Where found – Ornamental plantings, usually single plants, of both T. ramosissima and T. parviflora have been noted here and there throughout Stevens County in residential areas. No confirmed escapes and naturalization known at this time, but wet sites within our more arid areas are potential locations for infestation

Scotch broom

Cytisus scoparius L. Pea Family

Key identifying traits

- A woody shrub up to 10 feet tall
- Classic legume flowers are showy, yellow and abundant
- Leaves mostly three parted with small, rounded leaflets
- Forms pods that are flattened, brown or black, with white hair on the margins
- Erect branches are angled and dark green
- Winter stems are bare of leaves, but usually remain bright green

Biology and ecology

- An aggressive, deciduous, perennial shrub
- Often started as an ornamental
- A problem in pastures, forests, wasteland and roadsides
- Common pest in western WA and OR very limited infestations east of the Cascades
- Dry mature pods are often heard "popping" as they split and eject seeds several feet
- Seeds remain viable in the soil for many years

Control

Prevention – Learn to identify plants; know your property; beware of contaminated logging equipment especially from west of the Cascades
Biological – A few identified in western Washington
Cultural – Good ground cover and seeding of disturbed areas helps but doesn't block infestations
Mechanical – Digging is very effective on smaller patches if sufficient root is removed and diligent follow up is used to pull or dig seedlings
Chemical – Several effective at label rates; must exercise care near trees to avoid damage; timing varies greatly with type of chemical

Where found –In northern Stevens County a few small infestations are known on forested sites following logging; one grave site ornamental planting also in a forested setting.

Created by Stevens County Noxious Weed Control Board, February 2000; Updated Jan 2006

Scotch thistle

Onopordum acanthium L. Sunflower Family

Key identifying traits

- Very large thistle growing up to 8 feet tall
- Stems have broad spiny wings
- Leaves are spiny and covered with fine dense hair
- Hairy leaf surface causes a grayish appearance
- Flower heads numerous, 1 to 2 inches in diameter
- Flowers violet to reddish; bracts taper to a spine
- Upper leaves alternate and coarsely lobed
- Basal leaves up to 2 feet long and 1 foot wide

Biology and ecology

- Tap-rooted biennial that reproduces by seed
- Invades roadsides, range and disturbed areas
- Thrives in sunny sites – but can tolerate shade
- Up to 50,000 seeds per plant; seeds viable 6-15 years
- Repeated branching may result in plants 5' wide
- Dense stands can create barriers that restrict livestock
- Drought tolerant but can flourish along open streams

Control

Prevention- Learn to identify the plant; know your property; beware of fill dirt, hay, manure and seed from outside your area

Biological – No known biological controls

Cultural – Competitive vegetation helps reduce open spaces for invasion

Mechanical – Mowing can stop seed production in short term, but plants can regrow; digging cutting and cultivation are effective; monitor for new growth season long; seed bank will remain for years

Chemical – Several effective at label rates; best timing is in early spring when plants are in rosette stage and again in fall when more rosettes germinate

a yard stick on a Scotch thistle rosette

Where found- Scattered small infestations, particularly in old barnyards as well as some sites covering several acres over pasture/range ground in the northern half of the county.

Created by Stevens County Noxious Weed Control Board, March 2000; Updated Jan 2006

Tansy ragwort

Senecio Jacobaea L *Sunflower family*

Key identifying traits

- Small (< 1inch), golden, daisy-like flowers are arranged in clusters at ends of stems
- Single or multi-branched; 1-6' tall
- Leaves 2-8" long, alternate, deeply lobed
- Irregular, deeply cut leaf segments give "ragged" appearance
- Observed at a distance (mainly during flowering), plant structure resembles St. Johnswort

Biology and ecology

- Biennial to short-lived, tap-rooted perennial
- Reproduces by seed; flowers July to September
- High alkaloid content makes all plant parts toxic to cattle, horses and, to some extent, sheep
- Invades log landings, roads and other openings in forested areas; widespread in western WA

Control

Prevention – Learn to identify plants; know your property; beware of equipment/vehicles recently used in western WA or OR and not thoroughly cleaned

Biological – Three established agents are working well in western WA, OR and CA; not practical for the small amounts of plants found in eastern WA

Cultural – Competitive vegetation helps reduce open spaces for invasion

Mechanical – Digging or pulling when soil conditions are moist is effective; needs to be before bloom or, if after, bag or burn plants in a pile as appropriate; seed bank will be present for years

Chemical - Several effective at label rates; best timing is spring during rosette stage although fall rosettes can be treated as well; new infestations are usually identified when in flower, requiring a combination of mechanical and chemical control over more than one year

Where found - A few small, isolated infestations are found in Stevens County in disturbed openings in forest settings and along backcountry roads.

Created by Stevens County Noxious Weed Control Board, February 2000; Updated Dec 2005

Wild chervil

Anthriscus sylvestris L. Parsley Family

Key identifying traits

- White flowers arranged in umbrella like cluster
- Fernlike compound leaves have a sheathing base
- Hollow, furrowed stems with lower stem hairy
- Nodes have a fringe of longer hairs
- Each $\frac{1}{8}$ to $\frac{1}{4}$ inch white flower produces two seeds
- Two seeds are joined and have antennae like tips
- Seeds are dark, $\frac{1}{4}$ inch long, narrow, smooth, shiny
- Plant grows 1 to 4 feet tall and has a tap root
- Foliage is not aromatic

Biology and ecology

- Biennial or short lived perennial reproduces by seed
- Upright rosette first year; flowers the following May through June or July
- Found in moist pastures, forested areas and roadsides

Control

Prevention – Learn to identify the plant; be careful of British wildflower seed mixes formulated to recreate the flora of hedgerows and meadows of the British Isles.

Biological – None available at this time

Cultural – Competitive vegetation helps but can invade well managed areas

Mechanical – Cultivation generally kills plants although some can regenerate from the crowns; mowing is ineffective; digging is effective if enough of the tap root is removed

Chemical – Not much solid information available at this writing. We are experimenting with various herbicides applied in the fall and spring; because it likes moist areas, options are somewhat limited.

Where found – Limited acreage primarily in the northeastern portion of Stevens County, but known to be in neighboring Spokane Co and British Columbia

Yellow archangel

Lamiastrum galeobdolon Mint Family

Key identifying traits

- Flowers are bright yellow and bell-shaped
- Stems are purplish, hairy, and square-shaped
- Leaves are opposite, serrated & ovate-shaped with a silver or white pattern on top; the undersides are a lighter green or sometimes purplish color
- It is viny, grows prostrate & may have an unpleasant odor

Photo by Richard Old, www.xidservices.com

Biology and ecology

- A perennial plant spreading by seeds & above ground runners (stolons)
- It tolerates a wide variety of growing conditions, is frost tolerant and can grow in lightly shaded to well shaded areas
- It is a popular choice for ground cover & is also used in hanging baskets and flower beds
- This plant is native to temperate regions of Asia
- Some infestations are believed to have started by improperly disposed yard & basket waste

Photo courtesy WA State Noxious Weed Board

Control

Prevention – Learn to identify plants; start monitoring early in the season; dispose of clippings and old hanging baskets or tubs properly

Biological – No known biological control in our area

Cultural – Do not plant this as a ground cover or in sites where it can easily spread and escape

Mechanical – Plants grow back heavily if cut and although easy to pull any remaining root fragments will grow new plants

Chemical – There are no specific chemical recommendations yet in the PNW Weed Management handbook but this plant should be susceptible to dicamba, glyphosate and mixtures with triclopyr

Photo courtesy WA State Noxious Weed Board

Where found – In WA there are escaped areas in King, Kitsap, and San Juan Counties and a site in the Mt. Baker Snoqualmie National Forest; no known escaped sites in Stevens County

Black henbane

Hyoscyamus niger L. Nightshade family

Key identifying traits

- Large, coarse, abundant foliage has a fowl odor
- Soft, stalkless leaves are toothed to shallowly lobed and have sticky hairs
- Funnel-shaped fused petals are yellow-green with purple veins and center
- 1 inch long pineapple-shaped seed capsules are in two overlapping rows on one side of the stem
- Each capsule has hundreds of tiny black seeds
- Hardened, almost woody seed stalks remain standing throughout winter and following spring

rosette

flowering plant

Biology and ecology

- Can be an annual or biennial 1 to 4 feet tall with a fleshy tap root
- Reproduces by seeds
- All parts are highly poisonous but the foliage is unpalatable and seldom grazed
- Has historic medicinal use at controlled doses and has also been used as an ornamental
- Grows on roadsides, waste areas and in pastures

flowers

Control

Prevention – Learn to identify plants; know your property; beware of fill dirt, hay and seed from outside your area

Biological – None known at this time

Cultural – Good vegetative cover substantially reduces chance of infestation

Mechanical – Will not tolerate cultivation; pulling and cutting can be very effective if properly timed to avoid seed set; bag and dispose of seed capsules if mature

Chemical - Several effective at label rates; generally easier to control when young, before the stalk(s) elongate; refer to the PNW Weed Management Handbook for specific chemical recommendations

seed heads & new growth

Where found – Found in several small infestations in the Colville area of Stevens County. Is found throughout the US and is a common weed in many suitable habitats.

Hoary Alyssum

Berteroa incana L. Mustard Family

Key identifying traits

- Flowers are white with 4 petals, deeply divided
- Usually only branched at the top of the plant
- Leaves are alternate, blades are simple
- Fruit is oblong, with two compartments containing 2-6 seeds
- Seeds grow close to stem, are round to oblong, narrowly winged, grayish-brown and rough

Biology and ecology

- Can be an annual, winter annual, biennial, or a short-lived perennial (!); usually 1-2½' tall
- Most abundant in disturbed sites but is also found in meadows and pastures
- Starting to be an invader in alfalfa crops
- Can be toxic to horses if it comprises 30% or more of their diet
- Spreads rapidly due to the high number of seeds per plant; spreads only by seed
- Likes direct sunlight but can also tolerate shade

Control

Prevention – Learn to identify plants; know your property; beware of fill dirt, hay and seed

Biological – No known biological control

Cultural – Good vegetative cover helps but does not prevent establishment or spread

Mechanical – Hand pulling or digging can be very effective for small infestations but should be done before there are seed pods. Mowing is not a good control option.

Chemical –PNW Weed Management Handbook does not have this weed listed for control recommendations, but other annual mustard recommendations may be useful. Telar and Escort are effective on most mustards. Spraying can be effective into early fall, as long as the plants are actively growing and have not dried out.

Hoary alyssum on street corner

Hoary alyssum in tree planting

Hoary alyssum on a mountain road

Where found – Largest infestations in the county are in Colville, Arden, Chewelah and Northport areas but Hoary alyssum is spreading rapidly.

Longspine sandbur

Cenchrus longispinus Grass Family

Key identifying traits

- Warm-season grass growing horizontally or upright to 3'
- 1-3" seed spikes have 10-30 pea size hard burs
- Burs are thickly set with stiff, sharp, spreading spines
- Leaf blades and leaf sheaths are flat in appearance; immature plants spread horizontally
- Frequently, old burs can be found clinging to a root of young plants which aids in distinguishing immature sandbur from other grasses

seedling with the bur attached to root-a good ID for young plants

Biology and ecology

- Summer annual that favors sandy or well-drained gravelly soils; thrives on sunny sites
- Invades lawns, roadsides, ornamental, disturbed areas
- Flowering and seed production July to September
- Mature burs cause injury to livestock mouths, noses and eyes and can reduce value of wool
- Commonly spread by animals, machinery and vehicles; burs cling to tires, clothing, soles and laces of shoes, knees, knuckles and pet hair

mature plant with ripe burs

Control

Prevention – Learn to identify the plant; know your property; beware of fill dirt, hay and seed from outside your area

Biological – None

Cultural – Competitive vegetation helps-keep lawns watered and fertilized to increase the vigor of turf and reduce open spaces

Mechanical – Mowing can stop seed production in short term, but plants can regrow and bloom shorter than the cutting blade; digging or pulling is effective; needs to be before bloom or, if after, bag or burn plants in a pile as appropriate; seed bank will be present for years

Chemical – Pre-emergence treatments are effective at label rates prior to germination but effectiveness can be lost due to leaching from rain or irrigation; post-emergence spot treatment with a non-selective glyphosate product is effective but care must be used to avoid loss of desirable plants. Broadleaf herbicides are not effective.

burs newly emerged

Where found – Limited infestations found in the sandy bench areas of Stevens County above Lake Roosevelt, particularly west of Kettle Falls.

Created by Stevens County Noxious Weed Control Board, April 2000; Updated Jan 2006

Butterfly bush

Buddleja davidii Loganiaceae Family

Key identifying traits

- Large, deciduous shrub, growing up to 10' tall
- Opposite, lance-shaped, 3-4" dark green leaves appear white or silvery underneath due to a covering of fine hairs
- Flowers are usually a shade of purple, but may be red, pink, blue, orange, yellow or white
- The fragrant, small, funnel-shaped flowers are borne in showy spikes at the ends of stems, looking and smelling very much like lilacs

"seedling" and backside of leaves

Biology and ecology

- Perennial shrub, reproducing mainly from seed, but will re-sprout from root stock when cut
- May produce up to 3 million seeds per plant
- This plant is a native to China and is a popular ornamental plant here
- Butterfly bush has escaped ornamental plantings and invaded roadsides, riparian areas & pastures

Control

Prevention – Learn to identify plants; do not allow ornamentals to escape; if you grow it in your yard, cut the spent flowers off and dispose to prevent spread of seed by birds, wind, water; choose alternate ornamental shrubs to plant

Biological – A weevil and a stem-boring beetle are currently being tested in New Zealand

Cultural – Healthy, competitive vegetation will help discourage domination, but will not stop it from getting started

Mechanical – Cutting will cause it to re-sprout; digging and pulling may cause more site disturbance, allowing more seeds to sprout

Chemical –Cut stump applications are effective as well as complete foliar coverage at the proper time

competing with invasive blackberries

Where found – No populations of escaped, untended bushes are known to be in Stevens County at this time but it could pop up almost anywhere

Myrtle spurge

Euphorbia myrsinites Spurge Family

Key identifying traits

- Fleshy, blue-green leaves form tight spirals around spreading, prostrate stems
- Bright yellow-green, showy bracts surround inconspicuous flowers in early spring
- Stems branch out from a central taproot, growing up to 18" long; plant height is only 4-6"
- White, milky sap (latex) is found when any part of the plant is broken

Biology and ecology

- A herbaceous perennial reproducing primarily and readily from seed; it has been noted that roots broken by cultivation can form new plants
- The latex is toxic and may cause severe dermatitis, burns and/or blisters in sensitive people
- This plant is a native to the Mediterranean region and was introduced to the US as an ornamental
- Prefers dry, well-drained soils in part to full sun; it is a popular rock garden ornamental
- Other names: donkey-tail and creeping spurge

Control

Prevention – Learn to identify plants; choose alternate plants for landscaping; do not allow ornamentals to escape

Biological – No known biological control

Cultural – Keeping desirable vegetation healthy and thick will help keep invaders out; don't let plants go to seed

Mechanical – Pulling/digging small patches can work; important to get the root; wear protective clothing

Chemical-Due to the waxy cuticle, must use an appropriate surfactant with the chosen herbicide; 2.4-D, dicamba and glyphosate should be effective

Where found – No "wild/escaped" sites are known to be in Stevens County at this time, but it has been seen in many ornamental landscapes.

Plumeless thistle

Carduus acanthoides L. Sunflower Family

Key identifying traits

- Abundant upper branching gives "top heavy" appearance to mature plants or old dead plants
- Spiny wings extend entire length of stems, right up to flower heads
- Flowers about 1 inch across and purple (generally)
- Bracts surrounding the flower are narrow, appearing as sharp spines
- Stem leaves are alternate and blend into stems
- Older rosettes have deeply lobed, wavy leaves with yellow spines along white leaf margins

Biology and ecology

- A winter annual or biennial with a tap root
- Reproduces by seed only
- Found in pastures, fields and roadsides
- Mature plants normally grow 3-6 feet tall but are known to grow as tall as 8 feet in our area
- Flowering occurs June to August
- Can dominate sites to exclusion of livestock
- Can hybridize with Musk thistle

Control

Prevention – Learn to identify plants; know your property; beware of fill dirt, hay and seed from outside your area

Biological – Some established and effective in the county reducing seed production and plant density

Cultural – Good vegetative cover tends to inhibit establishment but it can invade healthy sites

Mechanical – Regular cultivation, digging or cutting are effective because of seed only spread

Chemical –Several effective at label rates when applied at vegetative stage either in the first or second year of lifecycle (spring/fall)

Where found – Large infestations occur in valleys and along roads in the northern half of Stevens County with small outbreaks south of Highway 20.

Created by Stevens County Noxious Weed Control Board, February 2000; Updated Jan 2004

Rush skeletonweed

Chondrilla juncea L. Sunflower Family

Key identifying traits

- Early season rosette resembles dandelion leaves
- Inconspicuous stem leaves cause skeleton-like plant appearance and hence the common name
- Course hairs on lower 4 to 6 inches of stem
- Yellow, $\frac{3}{4}$ inch flowers are inconspicuous and widely scattered along length of stems
- Cut stems and leaves exude milky juice (sap)
- Flower petals number from 7-15 and are squared across the end with tiny lobes or teeth

Biology and ecology

- Perennial, multi-stemmed, 1 to 4 feet tall
- Reproduces by seed and by lateral root buds
- Parachute like seeds easily spread by wind
- Extensive deep roots make control difficult
- Inhabits well drained, light textured soils
- Found in roadsides, fields, range and pasture
- Soil disturbance aids establishment
- Flowers mid July through frost

Control

Prevention – Learn to identify plants; know your property; beware of fill dirt, hay and seed from outside your area

Biological – Gall midge, Gall mite and rust all well established in Stevens County and effective in limiting density and seed production

Cultural – Good vegetation inhibits establishment

Mechanical – Repeated effort required because of extensive roots and re-growth from roots and seeds

Chemical – Some are effective at label rates, particularly if applied to young growth and repeated on regrowth

Where found - Primarily in the southern 1/3 of Stevens County with the heaviest infestations along the HW 291 corridor from Spokane County to HW 231.

Created by Stevens County Noxious Weed Control Board, February 2000; Updated Jan 2006

Yellow starthistle

Centaurea solstitialis L. Sunflower Family

Key identifying traits

- Bright yellow flower head
- Sharp spines or thorns ¾"-1" long at base of flower heads
- Plant grows 2-3 feet tall, has grayish-green foliage and small "wings" on the stems
- Flower heads are borne singly on ends of branches
- Old plants or last year's skeletons have a cottony white tuft where flowers were
- Seedlings resemble a dandelion with deep lobed leaves

Biology and Ecology

- Annual – reproduces only by seed
- Invades rangelands, roadsides, and other disturbed areas
- Thrives in sunny sites – does not tolerate shade
- Toxic to horses in large amounts
- Flowers June through October
- Can have several flushes of plants per year

Control

Prevention - Learn to identify the plant; know your property; beware of fill dirt, hay and seed from outside your area; and confirm identification of any possible sightings

Biological – Over the years, several agents have been released in our county; no visible impact to date

Cultural – Competitive vegetation helps although plants can invade well managed areas

Mechanical – Killed by cultivation and tillage or by pulling; needs to be before bloom or, if after, bag or burn plants in a pile as appropriate; seed bank will be present for years

Chemical – Several effective at label rates when applied pre bud

Where found – Common in the Gold Hill area near Kettle Falls with smaller infestations found on open south and west slopes elsewhere in Stevens County.

Created by Stevens County Noxious Weed Control Board, February 2000; Updated Jan 2006

Diffuse & Spotted knapweed

Centaurea diffusa Lam. & Centaurea biebersteinii Lam. Sunflower Family

Key identifying traits

Diffuse & Spotted KW are hybridizing in our county; many plants have characteristics of both

- Many spreading branches with divided lower leaves; upper leaves are smaller and mostly undivided
- Diffuse kw flower bracts are tipped with definite slender spines
- Spotted kw flower bracts are dark tipped
- Bract margins divided like the teeth of a comb
- Leaves are grayish green, hairy and bitter
- Flowers are numerous; white to rose to purple

typical diffuse

typical spotted

Biology and ecology

- Annual, biennial(usually) or short lived perennials
- Tap rooted and growing 1 to 4 feet tall
- Infest roadsides, waste areas and rangelands
- Highly competitive and invasive on dry sites
- Flowering occurs from early July to September
- Old DK plants break off, tumble and scatter seed. SK flower heads open and disperse most seed within a 3 to 4 foot radius of the plant

Control

Prevention – Learn to identify plants; know your property; beware of fill dirt, hay and seed from outside your area

Biological – Several established and common in this area and having some effect on density and vigor when found working together on roots and seeds- especially *Larinus minutus*

Cultural – Competitive vegetation helps but can be displaced; fertilizer and irrigation generally favor grasses and burning reduces seed dispersal

Mechanical – Tillage, digging, pulling & cutting will reduce or eliminate plants if repeated frequently, thoroughly & prior to seed production

Chemical – Several effective at label rates with rosette and early bolt best stages for treatment

Where found – Widely distributed in Stevens County and surrounding areas

Russian knapweed

Acroptilon repens Sunflower Family

Key identifying traits

- Black to brown scaly roots produce stem buds
- Cone shaped heads with light pink to purple flowers
- Bracts surrounding each flower are paper like
- Forms dense colonies from root shoots
- Stems and leaves covered with fine hair, giving a blue or gray –green color
- Stems are erect, openly branched, 18" to 36"

Biology and ecology

- Tap-rooted perennial with limited seed production
- Spreads mainly by underground rootstocks
- Flowers June through September
- Invades cultivated fields, pastures and roadsides
- Roots penetrate to a depth of over 8 feet
- Ingestion of substantial amounts can be fatal to horses
- Grazed readily and without ill effects by other livestock

Control

Prevention- Learn to identify the plant; know your property; beware of fill dirt, hay and seed from outside your area

Biological – A gall forming nematode established in Washington may eventually assist control

Cultural – Competitive vegetation helps avoid initial infestation, but Russian knapweed can invade healthy plant communities

Mechanical – Mowing, pulling and cultivation are ineffective controls because of root spread

Chemical – Several effective at label rates, but timing is critical with bud stage and after a light frost being the two best times

Where found – Scattered sites along roadsides, pastures and cultivated fields in most regions of Stevens County.

Dalmatian toadflax

Linaria dalmatica Figwort family

Key identifying traits

- Waxy, blue green heart shaped leaves
- Dense alternate lower leaves clasp stem
- Yellow snapdragon type flowers have long spurs and an orange bearded throat
- Long slender flower/seed stalks develop throughout season with pea size 2-celled seed capsules
- Several stems from mature root crown

flowers and clasping leaves

Biology and ecology

- Perennial with extensive root system
- Spreads by both roots and seeds
- Grows to 3' tall, often in dense patches
- Flowers mid-summer until early fall
- Prefers dry sandy or gravely sites
- Aggressively invades roadsides and range

Control

Prevention – Learn to identify plants; know your property; beware of fill dirt, hay and seed from outside your area

Biological – A promising agent has been released county wide (2001-2002) with a few sites showing considerable damage. Potential for substantial impact to the toadflax population is strong

Cultural – Good ground cover helps avoid initial infestation; can invade healthy dry sites

Mechanical – Will not stand regular cultivation but occasional tillage or cutting and pulling are not sufficient due to extensive root system

Chemical – A few herbicides are effective if proper timing to promote translocation to the roots is combined with a good surfactant to penetrate the waxy leaves; refer to the PNW Weed Management Handbook for specific chemical recommendations

young plant

Where found – Widely distributed in Stevens County on well drained sites, particularly near some old cemeteries where it was introduced as an ornamental.

Yellow toadflax

Linaria vulgaris Mill. Figwort family

Key identifying traits

- Abundant yellow snapdragon type flowers
- Flowers 1" long with a bearded, orange throat
- Leaves are pale green, numerous, narrow, pointed at both ends and 2 $\frac{1}{2}$" long
- Fruit is round, $\frac{1}{4}$" in diameter and brown with 2 cells having many seeds
- Seeds are dark brown to black, 1/12" diameter, flattened with a papery wing

why it's sometimes called "butter & eggs"

Biology and ecology

- A perennial spreading from seeds and roots
- Tends to grow in patches as it spreads by roots
- Introduced and spread as an ornamental; also known as "butter and eggs"
- 1-2' tall; shorter than Dalmatian toadflax
- Extensive root system makes control difficult
- Aggressive invader of rangeland; able to displace desirable grasses
- Also found along roadsides, waste areas and fields

Yellow toadflax

Dalmatian toadflax

Control

Prevention – Learn to identify plants; know your property; beware of fill dirt, hay and seed from outside your area

Biological – Several agents have been found on yellow toadflax, but with no substantial impact yet

Cultural – Good vegetative cover helps but does not prevent establishment or spread

Mechanical – Usually will not stand regular cultivation – regular cutting and digging can weaken infestations but must be repeated to be effective

Chemical – Several effective but usually requires repeat treatment to kill extensive root systems; refer to the PNW Weed Management Handbook for specific chemical recommendations

another color variant

Where found – Found in scattered locations throughout Stevens County. Occasionally in fields but more often in waste areas and rangeland.

Attachment C
Recommended Chemical Controls

Chemical Recommendations for Noxious Weed Control

The following information is provided only as a general guide to weed control. Size of infestations, current or projected land use and site conditions will determine what herbicide or other control method will best suit your needs.

For individualized plans, please consult the Noxious Weed Control Board or WSU Cooperative Extension Agent in your area.

Always read and follow all label instructions on the products you select and use!

HERBICIDES

Most of the products listed below are . To purchase and apply restricted-use herbicides, a pesticide license is required. Contact the WA Dept. of Ag. or the WSU Cooperative Extension Office for information on how to obtain a license.

2,4-D: This product is sold under many names and formulations **(*Amine 4®, Hi-Dep®, Weedar 64®*** etc**).** 2,4-D is a selective, broadleaf herbicide, it will last 2-4 weeks in the soil after spraying, but nearly all of its effect is on the foliage.

Aminopyralid: On the market since **2006**. It is for use on broadleaf weeds, applied to foliage and moving down into the root system. This product can be sprayed up to the edge of water and can also be used on "seasonally dry" wetland. There are no grazing restrictions. The only brand name of this product is ***Milestone®.*** One drawback is that it is not very effective for the control of mustards or toadflax. This product has a very low use rate at a maximum rate of 7oz/acre.

Aminopyralid + 2,4-D: **New in 2008 Forefront R&P®** A mixture is for use in range and grass pastures, CRP lands, and permanent grass pastures. It controls a wide spectrum of broadleaf weeds and the 2,4-D aids in the burn down of plants.

Aminopyralid + Metsulfuron: **New in 2009 Chaparral®** This mixture is for use in range and pastures, CRP lands, and permanent grass pastures. The metsulfuron will help in the control of mustards and members of the borage family (tarweeds, etc.).

Dicamba: This is the active ingredient in ***Banvel®.*** It is also a selective, broadleaf herbicide and can last 2-4 months in the soil. Most of its activity is through the foliage but will provide some residual control of new seedlings. Usually provides quick burn down of plants.

Dicamba + 2,4-D: This is a combination often recommended to landowners with noxious weeds in a pasture or lawn setting. Some of the trade names include ***Weedmaster®, Range Star®, and Outlaw®.*** It controls a wide variety of broadleaf weeds.

Clopyralid: A broadleaf herbicide for use in pastures and non-crop areas. ***Transline®*** is recommended when weeds are growing among conifers.

Clopyralid + 2,4-D: A mix for pasture and rangeland, ***Curtail®*** is very good for use on thistles and other broadleaf weeds.

Clopyralid + Triclopyr: ***Redeem R&P®*** Another herbicide for pastures, rangeland, and non-crop areas.

Chlorsulfuron: A selective broadleaf herbicide for use in non-crop settings. ***Telar®*** is a trade name for this chemical. Now available in a smaller amount.

Metsulfuron: Another broadleaf herbicide used for weed and brush control in pastures, rangeland, and non-crop areas, the trade name is ***Escort®.***

Metsulfuron + 2,4-D, + Dicamba: Trade name is ***Cimarron Max®*** or **an** alternative is to buy the Dicamba + 2,4-D mix *(Weedmaster®, Outlaw®,* etc.) and add metsulfuron *(Escort®*). This is an excellent mix for a wide variety of weeds and brush. For use in pasture, rangeland, and CRP areas. In adverse conditions it can yellow or temporarily stunt grasses.

Picloram: ***Tordon®*** is the trade name for this herbicide and it is a long lasting herbicide for broadleaf plants. A license is required to purchase this product in any amount. It is a selective herbicide that will remain in the soil controlling broadleaf plants an average of 2-3 years depending on soil type. Picloram has both foliar and root activity.

Glyphosate: Most commonly known as ***Roundup®*****,** this active ingredient can be found in many herbicides. Glyphosate only works on foliage and has ***no*** soil activity. Particular caution should be used when applying glyphosate as it is non-selective (works on grasses and broadleaf plants); leaving bare ground for new weeds to get established unless reseeding is done.

*These are just a few of the many herbicides on the market today. The Pacific Northwest Weed Management Handbook has a much larger list of herbicides and their recommendations. The book can be purchased through the WSU Extension or accessed on line at http://weeds.ippc.orst.edu/pnw/weeds or find herbicides and label information at cdms.net

Backpack Calibrations
(per 1 gallon of water)

2,4-D	2 oz
Hi-Dep	2 oz
WeedMaster	1 oz
Roundup	2 oz
Curtail	3 oz
Redeem	1/2 oz
Tordon	2 oz

3-way mix per acre rate:

½ ounce Metsulfuron (Escort)

8 ounces Dicamba (Banvel)

1 quart 2,4-D

Surfactants

Surfactants are an important key to maximizing an herbicide's effectiveness.

Surfactants are formulated to improve the performance of herbicides in spray solutions. They do this by modifying one or more of the following:

1. Mixing (emulsifying and dispersing oil and water-soluble particles)
2. Coverage (spreading and wetting leaves)
3. Spray retention (sticking to the leaves)
4. Absorption (penetrating properties)

There are 5 classes of surfactants: nonionic, crop oil concentrates, nitrogen-surfactant blends, esterified seed oils, and organo-silicone surfactants.

Not all herbicides behave the same on or in the plant. Most labels will recommend the type of surfactant that is best for that particular herbicide. Also there must be consideration of plant characteristics of whatever plant you are spraying, such as waxy leaves, plant hairs, lack of leaves, and leaf arrangement.

Environmental conditions must also be a consideration. When there is high humidity and moisture, plants tend to have thin relatively permeable cuticles making it easier for the herbicide to penetrate the plants. When there is lower humidity the plant cuticles are thicker and harder to penetrate. During low humidity periods crop oil concentrates and esterified seed oils can pass through the cuticles better than nonionic surfactants.

If the label calls for 1 quart of surfactant per 100 gallons; the equation would be
32(converting quart to ounces) divided by 100.
Answer = .32 oz per gal.
So multiply .32 X number of gallons of water you are using.

If the label calls for a .5% solution;
Multiply the gallons of water you are using by .005 (converting .5% into a decimal)
Using 3 gallons as an example
3 × .005 = .015 gal
Then multiply by 128 to convert to ounces (128 oz in a gallon)
.015 × 128 = 1.9 oz for the 3 gallons

HERBICIDE MIXING ORDER

Unless the label states otherwise, add the herbicide to the water or fertilizer in the following order:

1. wettable powders or dispersible granules
2. flowable or aqueous liquids (solutions)
3. emulsifiable concentrates
4. crop oil concentrates

Spray tanks should be at least half filled with the carrier (water or fertilizer) before the herbicides are added. If the mixture foams excessively, separates, or becomes syrupy, do not apply. Tank mixes usually require constant agitation and should be applied promptly.

WEED	GROWTH CYCLE	EARLY SPRING When plants start actively growing	MID-SUMMER Bud to bloom	FALL Rosettes/ Perennials
Bull, Musk, Plumeless, and Scotch thistles	Biennial	2,4-D® Curtail® Redeem R&P® Tordon® Weedmaster® Milestone®	Same herbicides: Apply before plants flower	Same herbicides for fall rosette treatment
Canada thistle Dalmatian or yellow toadflax Russian knapweed	Perennial	Herbicide treatment at this time is not as effective	Curtail® Redeem R&P® Tordon® Weedmaster® Milestone® Telar®	Same herbicides: Apply after first frost
Fiddleneck tarweeds, Bugloss & other borage family	Annual, biennial & perennial	3-way mix* Telar® Redeem R&P® Escort + 2,4-D	Effective but should be done before plants flower	Same herbicides: Apply to perennials & rosettes
Hawkweeds	Perennial	Herbicide treatment at this time is not as effective	Banvel® Curtail® Redeem R&P® Milestone® Weedmaster®	Plants are hard to find but it may be effective
Knapweeds including yellow starthistle	Biennial & Perennial	2,4-D Milestone® Curtail® Redeem R&P® Tordon® Roundup®	Same herbicides: Apply before flowering	Same herbicides for fall rosette treatment
Kochia-	Annual- Usually starts germinating later than most annuals, but seeds keep germinating into the fall season. Should be treated as soon as it is growing.		Weedmaster® Vista® Roundup®-The smaller the plants the more effective herbicide will be. Big plants may develop resistance.	
Mustards	Annuals & Biennials	Escort or 3-way* Weedmaster® Telar®	Same herbicides: Apply before flowering	Same herb. for rosette treatment
Rush skeletonweed	Perennial	If spot spraying plants can be difficult to see early in the year	Tordon®+ 2,4-D Milestone® 3-way mix*	Same herbicides for fall rosette treatment
St Johnswort	Perennial	3-way mix* Weedmaster® Tordon®+ 2,4-D	3-way mix* Weedmaster® Tordon®+ 2,4-D	Not as effective in the fall

Reminder: 3-way mix is Metsulfuron, Dicamba, & 2,4-D aka Cimarron Max®

Attachment D
Biocontrol Information Sheets

Aphthona flava

Flea beetle

Weed(s) Attacked: Leafy Spurge

SCNWCB February 2006

GENEALOGY

Original sources for U.S. release was Italy and Hungary. First U.S. releases made in 1985. Now established in numerous states, especially Montana.

LIFE CYCLE

Eggs are deposited in June through early fall on the plant stem at or just under the soil surface. Larvae hatch and actively feed on roots from July through the winter, and into the following spring. Larvae are so small that a microscope is generally needed to see them. Depending on the climate of a particular site, adults may emerge from June through early fall. Adults are about 4mm long, and will jump when disturbed.

EFFECT

Both adult and larvae damage the plant. Adults feed on leaves and flowers. Larvae feed in and on roots hairs and young roots.

REDISTRIBUTION

This agent is not yet established in Stevens County.

COMMENTS

Aphthona flava was the first flea beetle to be released against Leafy Spurge in the United States. Around Bozeman Montana it's effect has been spectacular. There are numerous species of the Aphthona flea beetle. All have similarities in life cycle and habit, but some are better adapted for certain soil type, moisture regime, plant community, and exposure.

The most heavily infested Leafy Spurge areas in Stevens County are found on rugged, dry, hot, sandy sites in southern Stevens County. Efforts to establish this agent there started in 2001. Each year large numbers (a mix of species) have been released, but have thus far failed to establish in Stevens County. Efforts will continue.

Bangasternus orientalis

Yellow Starthistle Bud Weevil

Weed(s) Attacked: Yellow Starthistle

SCNWCB February 2006

GENEALOGY

Original source for U.S. release was northern Greece. First U.S. releases were made in 1985. Now established in California, Idaho, Oregon, and Washington. During 1990 at least 4,600 adult Bangasternus were released in Stevens County. How well the agent has established is not known.

LIFE CYCLE

Overwintered females lay as many as 470 eggs in late spring and early summer. Eggs are laid singly at the tips of unopened flower heads. Hatched larvae tunnel into the flower head and begin feeding on immature seeds and receptacle tissue. Larvae pupate into adults within a case constructed of chewed seeds. Adults about 6 mm long emerge from their individual seed head case in late summer and overwinter outside the plant.

EFFECT

Yellow Starthistle reproduces by seed alone. It is known that a single Bangasternus larva can destroy 60% of the seeds in a seed head.

REDISTRIBUTION

Shake adults off plant into a funnel assembly or pan in late spring and early summer. If possible, release 500 at new sites.

COMMENTS

This agent (along with Eustenopus villosus) has greatly reduced the Yellow Starthistle population at a site near Colfax WA over the past decade. In Stevens County Eustenopus villosus is more established and visible, and is more the focus of BioControl for Yellow Starthistle.

Cyphocleonus achates

Knapweed Root Weevil

Weed(s) Attacked: Diffuse and Spotted Knapweed

SCNWCB February 2006

GENEALOGY

Original sources for U.S. release was Austria, Greece, Hungary, and Romania. First U.S. releases made in 1988. Now established in Colorado, Montana, Oregon, and Washington. There are populations established in Stevens County.

LIFE CYCLE

In Stevens county, overwintered adults emerge from the knapweed roots mid to late July and into September. Mature adults are up to 20 mm long. They feed on younger leaves if available, leaves, and tissue from the stems. Females place a single egg in a chewed out hole on the root crown just below soil level. She may produce more than 100 eggs in her lifetime. Adults die before winter. When the eggs hatch the larvae begin tunneling into the knapweed roots. The larva overwinters in the root.

EFFECT

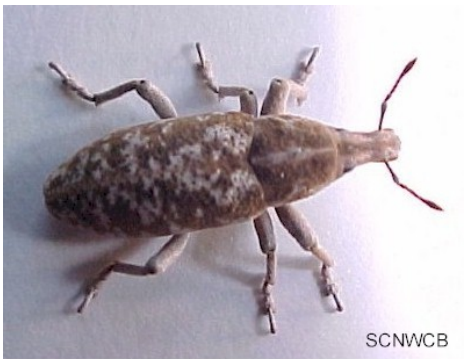
The larval root tunneling severely damages the weed. Adults eat above ground plant parts.

REDISTRIBUTION

This agent does not fly and spreads slowly if not manually redistributed. Not easy to spot in the field due to it's mottled color and habit of sitting perfectly still. When disturbed they often drop to the ground. Best chance to see and collect them is in the heat of the day. To collect, quickly bend the entire plant over into a collection net or pan. It is harder to hand pick them. They have a powerful grip but do not bite. For making a new release 50 adults is considered a workable number. A new colony stands the best chance of survival and establishment at new sites which are dominated by Diffuse Knapweed, spaced enough (1-2 feet) to allow the soil to become hot and dry. South facing slopes and/or large open fields of knapweed are best. A site free of disturbance (including development, traffic, herbicides, and regular grazing) increases the chances of establishment.

COMMENTS

The year 2000 marked the beginning of an effort to distribute this agent in Stevens County. Although Cyphocleonus achates is an excellent agent once established, it's inability to fly to new weed patches is a drawback. Therefore, the seed head weevil Larinus minutus (a strong flyer) has proven to be a more valuable natural enemy against Diffuse and Spotted Knapweed.



Cystiphora schmidti

Skeletonweed Gall Midge

Weed(s) Attacked: Rush Skeletonweed

SCNWCB February 2006

GENEALOGY

Original sources for U.S. release was Greece. First U.S. releases made in 1975. Established in the Pacific Northwest, including Idaho, Oregon, and Washington. Established in Stevens County.

LIFE CYCLE

There are as many as five generations per year. Eggs are injected into leaves and stems. . Larva hatch and begin to feed on the plant tissue around them. This causes the plant to form swollen purplish galls which encase the larva. Most larva pupate inside the gall. Some mature larva leave the gall, fall to the ground litter, and pupate. Both Larva and pupa stages overwinter, most inside the gall, some in the ground litter. The generation that winter catches finish their development into adults the following spring.

EFFECT

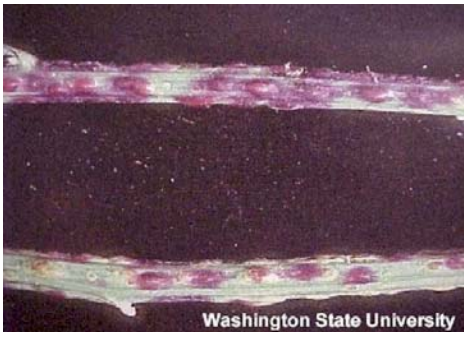
The larva is the destructive stage.

REDISTRIBUTION

Collect infected plants from July through September. Bind the galled plants together into "Teepees". Wedge these bundles into plants that are not infected. Some of the immature midges will complete their development within the collected galls, emerge, and attack the new plant. Cooler weather, evening releases, and high humidity helps the chances for establishment.

COMMENTS

The midge has become prey of native predators and parasitoids. The usefulness of this agent is therefore diminishing. It is still an important natural enemy of Rush Skeletonweed however.



Eriophyes chondrillae

Skeletonweed Gall Mite

Weed(s) Attacked: Rush Skeletonweed

SCNWCB February 2006

GENEALOGY

Original source for U.S. release was Italy. First U.S. releases made in 1977. Established in the Pacific Northwest, including Idaho, Oregon, and Washington. Established in Stevens County.

LIFE CYCLE

Eggs are microscopic (0.04mm). Adults usually cannot be seen with the naked eye. Each of the tiny females may deposit 60-100 eggs within the gall they share. After hatching hundreds of the minute worm like nymphs feed on the green gall material around them. The nymphs pass through several developmental stages to become adults. Whenever the gall dries out there is a mass exodus of all mobile stages.

In the Pacific Northwest the female mites form a dark brown overwintering stage called a deutogyne. The deutogynes move down the stem in fall to crevices in the plant at or below the soil surface where they become quiescent until spring.

When the weed starts to bolt in the spring the mites invade the shoot buds. Adults live up to 4 weeks. The mites feed and continue to reproduce on a roughly 10 day cycle until fall.

EFFECT

Mite feeding causes the buds to contort into galls which look like miniature cauliflower. Both nymphal and adult stages damage the plant. Mite feeding decreases plant vigor, helps reduce or eliminate seed production, hinders formation of rosettes, reduces shoot production, and sometimes results in the death of the plant.

REDISTRIBUTION

Collect infected plants from July to mid October. Bind the galled plants together into "Teepees". Wedge these bundles into plants that are not infected. Cooler weather, evening releases, and high humidity helps the chances for establishment.

COMMENTS

This mite disperses well within the weed patch, and is known to colonize any biotype of Rush Skeletonweed found in our area. It is considered the most effective agent released on Rush Skeletonweed to date in our area. The agent is well established in Stevens County.

Eustenopus villosus

Yellow Starthistle Hairy Weevil

Weed(s) Attacked: Yellow Starthistle

SCNWCB February 2006

GENEALOGY

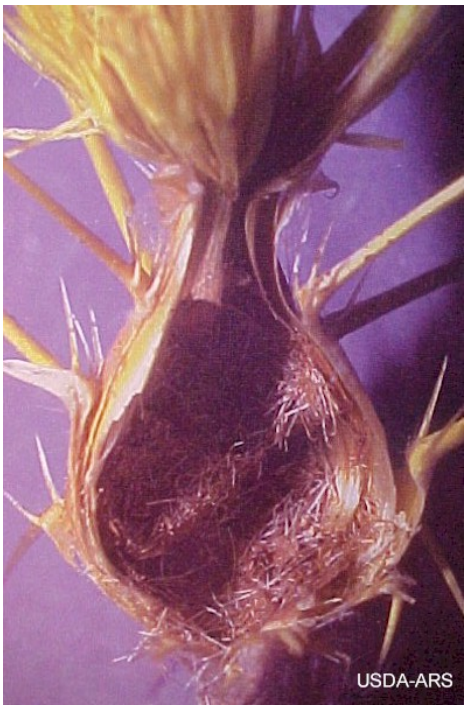
Original source for U.S. release was northern Greece. First U.S. releases were made in 1990. Now established in California, Idaho, Oregon, and Washington. First known release in Stevens County was made in 1996 on Gold Hill above Kettle Falls.

LIFE CYCLE

Adults which have overwintered outside the host plant began egg laying activity for the new year late in spring and early summer. These overwintered adults feed on and destroy many of the smaller developing flower heads. Females chew holes in the larger unopened flower heads and lay their eggs singly. They then cover the hole with chewed material. In about 3 days the eggs hatch and the larvae begin feeding on the developing seeds and receptacle tissue. After about two weeks the larvae fashion a pupal chamber from chewed seed head content. In another two weeks adults emerge and probably feed on late developing, small flower heads before overwintering begins.

EFFECT

Both the adult and larval stage are destructive. Feeding activity of the adults destroy a high percentage of the smaller unopened flower heads. Larvae feeding inside the larger flower heads often destroy 100% of the developing seeds.



REDISTRIBUTION

In Stevens County July is a good time to collect these agents. Easiest collection method is to shake the agents off into a collection pan. If possible release 250-500 at a new site.

COMMENTS

This agent has excellent potential. It has proven effective at sites in Washington and Idaho. In Stevens County the agent is well established on Gold Hill above Kettle Falls and is present at other sites as well. Starting in 2006 this agent will be the focus of July collections and redistribution.

Galerucella pusilla

Golden Loosestrife Beetle

Weed(s) Attacked: Purple Loosestrife

SCNWCB February 2006

GENEALOGY

Original source for U.S. release was northern Germany. First U.S. releases were made in 1992. Now established in Idaho, Maryland, Minnesota, Montana, New York, Oregon, Pennsylvania, Utah, Virginia, and Washington. This agent is well established at sites in Stevens county.

LIFE CYCLE

Overwintered adults emerge from the soil and soil litter, feed on buds and leaves, mate, and begin to lay eggs in May and June. A distinctive line of frass is often placed on top of the egg. When the eggs hatch larvae feed on leaves and other plant parts before moving down into the soil or litter to pupate into adults. These new adults emerge in July and August and continue feeding before hibernating for the winter. If the female emerges before mid-July she often lays eggs before going to ground for the winter. Presumably, some of these eggs hatch, and if the larvae find enough remaining food to develop, will also descend to the ground to pupate into adults and overwinter.

EFFECT

Both the adult and larvae are destructive to Purple Loosestrife. Plants that are attacked are severely defoliated. They turn brown and are easy to spot.

REDISTRIBUTION

A good time to collect these agents is from mid May to mid June. Collect these agents by shaking the plant inside a sweep net. This agent and it's close relative Galerucella calmariensis readily establish at new sites which are not flooded year-round. If possible release 250-500 at a new site.

COMMENTS

About 70-80% of the Galerucella releases in the U.S. are Galerucella pusilla. The remainder are Galerucella calmariensis. They are very similar. The photo of the eggs and larva are Galerucella calmariensis, but Galerucella pusilla eggs and larvae look the same. These agents are a success story almost everywhere they are found. Within a few years after being released at Purple Loosestrife sites in Stevens county that weed has been heavily impacted. Occasional releases are still being made in Stevens County, but the agent seems to be doing well on it's own.

Agriculture and Agri-Food Canada

Agriculture and Agri-Food Canada

Agriculture and Agri-Food Canada

NY Cooperative Fish & Wildlife Research Unit

Larinus minutus

Knapweed Flower/Seedhead Weevil

Weed(s) Attacked: Diffuse and Spotted Knapweed

SCNWCB February 2006

GENEALOGY

Original source for U.S. release was Greece. First U.S. releases were made in 1991. Now established in Montana, Oregon, and Washington. In Stevens County, starting in 2000, this has been the most heavily collected and redistributed agent of all time. It is now well established throughout the county, and needs little assistance.

LIFE CYCLE

Overwintered adults emerge from the ground litter in late May or June and begin feeding. Females lay clusters of eggs in open flowers. When the eggs hatch the larvae start feeding on flower parts and immature seeds. The larvae are aggressive and kill one another and other species within the seed head. The surviving larvae feed and go through numerous changes. Pupation into an adult takes place inside a cocoon made of chewed seed and flower parts and is attached to the flower receptacle. The new adults emerge from their cocoon in July and August. These adults feed before going into the ground litter to hibernate.

EFFECT

Both adult and larvae are destructive to Diffuse and Spotted Knapweed. Adults feed on young leaves in spring, and leaves and flowers later on. A larva often destroys all the seeds in it's seedhead.

REDISTRIBUTION

June and early July are the best times to collect this agent. The females have more egg laying ability at these times. A good collection method is to bend the entire plant over into a sweep net or container and shake the agents off. Place bugs in a paper sack with a little food (knapweed) and some water (a clean moistened sponge) for the trip to the new release site. Keep the bugs cool during their captivity. New release sites should closely resemble the environment from which the insects were collected. Generally this will be open, sunny knapweed patches, where plants are spaced enough for the ground between to be hot and dry. Release about 250-500 adults for each new site.

COMMENTS

The year 2000 marked the beginning of an effort to widely establish this agent throughout Stevens County. Over the years they have proven to be the best available BioAgent for Diffuse and Spotted Knapweed in our area. The insects are probably now established everywhere they are going to establish in Stevens County. Their impact is visible throughout numerous areas. They need little further assistance. As their populations increase over the coming years their impact should become significant throughout the county.

Larinus minutus adult

Larinus minutus adults

Larinus minutus on knapweed

Mecinus janthinus

Stem-boring Weevil

Weed(s) Attacked: Dalmatian Toadflax

SCNWCB February 2006

GENEALOGY

Original source for Canadian release was Yugoslavia and Italy. The agent is well established in British Columbia. Mecinus janthinus was approved for release in the U.S. in 1995. It migrated from southern British Columbia into northern Stevens County and was first documented in 2000. The first known U.S. collections and releases took place in Stevens County WA. Field Insectaries are being established throughout the county.

LIFE CYCLE

Starting in June females lay a single egg per chewed out cavity in the toadflax stems and seal the hole with a cap of chewed material. When the eggs hatch the larvae begins tunneling within the stem, increasing the size and length of the tunnel as they grow. After about a month the larvae stop tunneling and over several more weeks pupate into a new adult. These new adults remain inside the stem during the winter. Snow cover helps the dormant adults inside the stems survive the freezing temperatures of winter. Starting in May these new adults chew their way out of the stem, feed, and in June start laying eggs.

EFFECT

Adult feeding does substantial damage to the leaves. An attacked plant exhibits leaves with "buckshot" holes. The larval stem tunneling disrupts the food transport system between the roots and the leaves. At the initial collection sites in northern Stevens County the impact of this agent has been remarkable.

REDISTRIBUTION

This agent can be collected in late May and June. It is a focus of collections and redistribution in Stevens County. The population of this agent is on the increase in the county.

COMMENTS

At the initial collection sites in northern Stevens County this agent has proven highly destructive to Dalmatian Toadflax. At numerous new sites the population is increasing and damage is evident. A county wide grid of release sites has been selected and will receive the bulk of the insects collected over the coming years. It is expected that the populations of the insect will increase at these undisturbed "Field Insectaries" and move out into all areas of the county where Dalmatian Toadflax is found, which is almost everywhere.

Mecinus janthinus adult

Mecinus janthinus breeding

Mecinus janthinus damage

Metzneria paucipunctella

Knapweed Seed Head Moth

Weed(s) Attacked: Diffuse Knapweed, and Spotted Knapweed

SCNWCB February 2006

GENEALOGY

Original source for U.S. release was Switzerland. First U.S. releases were made in 1980. Now established in Idaho, Montana, Oregon, and Washington. In Stevens county 10,600 adults were released between 1986 and 1990. This agent is established in Stevens county, but is not very important.

LIFE CYCLE

Larvae which have overwintered inside the seed head pupate into adults in May. Adults are small moths about 7 mm long. They only fly at dusk and are rarely seen. Starting in June females lay between 60 and 100 eggs on the flower head. Eggs are reddish-brown, oval, less than 1mm long, and turn yellowish as they mature. Hatched larvae crawl into the opening flower head and begin to consume the contents. Larvae are aggressive and kill each another, and other larva in the seedhead. Generally, only one larva survives per seed head to start overwintering. Good snow cover increases the chances of larval survival for the winter.

EFFECT

In a single seedhead a young larva will consume a few seeds and reduce the viability of surviving seeds as it mines the seedhead receptacle. The older larva will web seeds together, preventing dispersal.

REDISTRIBUTION

Adult moths in the field are seldom seen or collected. The better method is to collect seed heads in early spring from sites where you have confirmed the presence of pupa and/or larva.

Metzneria paucipunctella pupa (left) and larva (right)

COMMENTS

Although Metzneria larvae kill one another, and other larval species in the seed head, it is thought the best possible impact occurs when Metzneria shares the knapweed patch with two gall fly species: Urophora affinis and Urophora quadrifasciata. Adult Urophora gall flies are everywhere in Stevens county. The distribution and density of Metzneria in the county is unclear. It is likely they are being supplanted by the much more important agent Larinus minutus. If other knapweed agents are absent, the impact of Metzneria and the two gall flies are minimal.

Puccinia chondrillina

Rush Skeletonweed Rust Fungus

Weed(s) Attacked: Rush Skeletonweed

SCNWCB February 2006

GENEALOGY

Original sources for U.S. release was Italy. First U.S. releases made in 1977. Established in the Pacific Northwest, including Idaho, Oregon, and Washington. Established in Stevens County.

LIFE CYCLE

The fungus forms infective spores within brownish pustules (uredia) on all above ground parts of the plant. These infective spores are released from the pustules from spring to fall to continue infection. Lesions (telia) at the base of flowering shoots are another source of rust spores. The overwintering stage is composed of dormant spores. In the spring the overwintered spores germinate on rosette leaves, which ultimately leads to the production of rust pustules (uredia) on all plant parts, and lesions (telia) at the base of the flowering shoots.

EFFECT

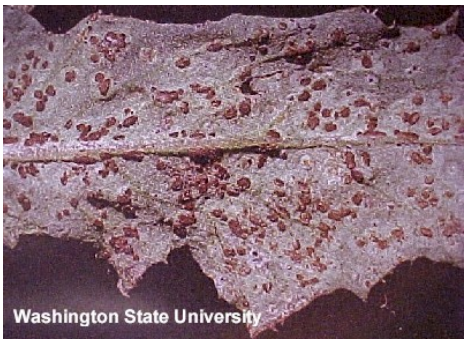
The pustules (uredia) and the lesions (telia) are destructive. Infected seedlings may be killed outright. Maturing plants have reduced vigor, reduced photosynthetic surfaces, reduced root vigor, and their ability to form viable seeds is hampered. Effects of the rust on Rush Skeletonweed is diminished at hot and dry sites.

REDISTRIBUTION

Infected rosettes can be collected and placed among uninfected plants during the spring and fall. During the summer collect rusted plants and bind them into "Teepees". Wedge these bundles into plants that are not infected. Cooler weather, evening releases, and high humidity helps the chances for establishment.

COMMENTS

This was the first plant pathogen released for the control of a noxious weed in North America.



Rhinocyllus conicus

Thistle Head Weevil

Weed(s) Attacked: Musk Thistle, Plumeless Thistle, Canada Thistle

SCNWCB February 2006

GENEALOGY

Original source for U.S. release was numerous sites in Europe. First U.S. releases made in 1969. Now well established in the Northwest, northern plains states, and Stevens county north of Hwy 20 (where most of our Plumeless, Musk, and Scotch Thistle are).

LIFE CYCLE

Starting in May overwintered adults mate, lay eggs, and then die. A single female may lay close to 200 eggs. Eggs are laid on the flower bud bracts and stem, and covered with chewed plant material. This covering turns tan and looks like warts. When the eggs hatch the larvae tunnel into the flower bud and feed in the receptacle and on developing seeds. Larvae in the seed head fashion individual hard protective pupal chambers from chewed plant material and feces, larvae in the stems do not. Development from egg to emerged adult takes anywhere from 40 to 60 days. Adults averaging about 6mm long, emerge from inside the seed head by chewing a hole in their pupa chamber, and then the receptacle face. These new adults look like they are covered in pollen, but this soon wears off and they are almost black to the eye. When they are not feeding, the new adults hide. These new adults do not lay eggs until the following spring. Adults overwinter in sheltered places.

EFFECT

Adults may slightly defoliate the Thistle. The larval stage is more destructive. This is an effective agent against Musk Thistle. It is much less effective against Plumeless and Canada Thistle, even though there may be many larva in a particular seed head.

REDISTRIBUTION

In Stevens County collect the egg laying adults in May and June. Shake the agents off the plant into a sweep net or deep sided plastic dish pan. A funnel assembly can also be used. Overwintered adults need to be released as soon as possible. Some new adults can be collected in the summer and fall if you can find them when they come out of hiding to feed. Release 250-500 per new site. This agent requires sites with less heat and some moisture. Hot dry places are not good.

COMMENTS

This agent is present at most thistle sites in Stevens county. Redistribution will be undertaken only where the need is clear. In Stevens County the agents impact on Plumeless Thistle is helpful, but is not providing control.

Sphenoptera jugoslavica

Bronze Knapweed Root-borer

Weed(s) Attacked: Diffuse Knapweed (preferred), and Spotted Knapweed

SCNWCB February 2006

GENEALOGY

Original source for U.S. release was Greece. First U.S. releases were made in 1980. Now established in California, Idaho, Montana, Oregon, and Washington. First documented release in Stevens County was in 1986.

LIFE CYCLE

The larvae overwinter in the root. The whitish larva are distinctive in that their head is noticeably wider than the rest of their body. Pupation into an adult occurs inside the root in late May and June. The peak adult emergence coincides with flowering, usually in July. Adults are somewhat flat, metallic bronze in color, and about 10 mm long. Females need 5 hot days (86 degrees Fahrenheit or more) before they lay eggs. The flat white eggs are placed between tightly packed rosette leaves in July and August. When the eggs hatch the larvae tunnel into the plant and down into the roots. Usually only one larva develops per root. The larval activity causes a rather large swollen gall on the root. Dry soil conditions favor larval survival.

EFFECT

Larva damage the plant by tunneling within the roots. Surviving plants are stunted and produce fewer flowers. Adults do a lesser degree of damage by feeding on leaves.

REDISTRIBUTION

Use a sweep net or deep sided plastic dish pan to collect adults in July-August an hour or so before dusk.

Comments

The population of this agent remains low in Stevens County. The reason may be predation of the larva. Outside of Stevens county there are sites where the collapse of knapweed population is attributed to this agent. Sites that are dry, and have some bare ground between plants spaced one to two feet apart are said to favor establishment. Though an excellent agent where established this agent appears to play a minor role in Stevens County.

APPENDIX F

LIGNOSULFONATE AND SOIL SEMENT® BROCHURES AND MATERIALS SAFETY DATA SHEETS (MSDS)

Lignosulfonate

Dust Control and Road Stabilization

Product Description

An alternative to road chlorides for dust control. **Lignosulfonates** are derived from lignin, a naturally occurring polymer found in wood that acts like glue holding the cellulose fibers of pulp together. During the pulping process, lignin is separated from the wood and undergoes an extensive process and eventually becomes an ammonium or sodium-based ligninsulfonate.

Lignosulfonates work by binding the road surface particles together. Water evaporates from the **lignosulfonate** as it dries, and the dust particles are trapped by the high-viscosity, naturally sticky material. In addition, over time some of the **lignosulfonates** become completely insoluble due to solar heating.

Uses or Application

- State, County and Township unpaved roads
- Federal/State Parks
- Mine haul roads
- Construction site haul roads
- Forest/timber haul roads
- Quarries/Mines
- Military roads
- Agricultural Roads
- Parking lot surfaces
- Tree/Flower/Shrub Nurseries
- Orchards
- Private and rural roads
- Industrial and federal project roads
- Construction staging areas
- Airfields and helicopter pads
- Feedlots

Generally **lignosulfonates** are associated with dust control and surface stabilization for roads. They are used as binders, dispersants, emulsifiers and sequestrates in a host of products such as gypsum board, animal feed pellets and micronutrient systems.

Typical Analysis

For a Ready-to-use formula

Chemical	Average Analysis
Water:	75%
Dry Solids:	25%
Lignin:	23.6%
pH:	4.5-6.0
Pounds per Gallon:	9.02 lbs
Color:	Light to Dark Brown

Features	Benefits
Fast acting product	• No need to close road • Results almost immediately apparent • Usable with almost all soil types
Non-hygroscopic	• Longer lasting results reduces reapplication costs • Reduces weather risks • Higher residual accumulation over time
Binder	• Safer roads and driving conditions • Longer lasting road stabilization • Fewer potholes/washboarding • Improves surface durability
Dust suppression	• Keeps fines on road • Cleaner air • Reduces dust to PM10 standard
Non-chloride product	• Better public relations • Environmentally safer • Safer for a variety of environmentally sensitive areas

Dust Control

Road Preparation

In preparation for applying ligninsulfonate as a dust suppressant, roads should first be re-crowned with a grader. Pre-wetting the road is recommended for best results. Lignin can also be applied without pre-wetting if water is not accessible, although results will vary depending on moisture content of the road base. Application rates for a topical application are 0.3 - 0.5 gallons per square yard.

Health, Toxicity & Environmental

Extensive studies have been conducted to evaluate the effects of **lignosulfonates** on the environment. Results show that they are not harmful to plants, animals or aquatic life when properly manufactured and applied. **Lignosulfonates** have been used as a treatment for dirt roads in Europe and the US since the 1920's.

The International Journal of Environmental Studies published a study in 1986 showing vegetation and growth of fir trees were not significantly affected at normal and above-normal application rates of **lignosulfonates**. Toxic levels of **lignosulfonates** in surface water have been established and confirm that concentrations must be relatively high before fish and other organisms are affected.

It is good practice to limit any dust control product application near water runoff into waterways.

Testimonials

EnviroTech has provided us with Tembec Lignin, which based on regular season use, has proven to perform better than other leading Lignins we have before used.

John Wood
Woody's Dust Control,
Rudd, IA

Lignosulfonate

GSA
Federal Supply Schedule
Contract No. GS-07F-0312J

Distributed By:

People Helping People Improve Their Environment

ENVIROTECH SERVICES, INC.

LIG2005

1140 38th Avenue, Suite 1 • Greeley CO 80634 • (t) 1/800-369-3878 • (f) 1/970-346-3959 • www.envirotechservices.com

©2005 EnviroTech Services Inc. No warranty expressed or implied, including but not limited to warranty of merchantability or fitness for a particular purpose, is made concerning this product.

MATERIAL SAFETY DATA SHEET

SECTION I: MATERIAL IDENTIFICATION

Chemical Name: **Ammonium Lignin Sulfonate (Lignosulfonate) RTU**

Distributor: *EnviroTech Services, Inc.*
Address: *910 54th Avenue, Suite 230*
Greeley, CO 80634
Telephone: *(970) 346-3900*
Fax: *(970) 346-3959*
Date Prepared: *April 9, 1999*
Date Updated: *January 1, 2010*

SECTION II: HAZARDOUS INGREDIENTS / IDENTITY INFORMATION

No Hazardous Ingredients

C.A.S. No.: *8061-53-8*

SECTION III: PHYSICAL/CHEMICAL CHARACTERISTICS

pH:	*3.5-5.5 As Received*
Boiling Point:	*212°F*
Vapor Density:	*Not Applicable*
Solubility in Water:	*100%*
Specific Gravity:	*1.10-1.170*
Melting Point:	*Not Applicable*
Appearance and Odor:	*Dark brown liquid with woody odor*

SECTION IV: FIRE AND EXPLOSION HAZARD DATA

Flammability:	*N/A Not Flammable or combustible*
Upper Explosion Limit:	*N/A*
Lower Explosion Limit:	*N/A*
Fire Fighting Procedures:	*Product not flammable. Use appropriate fire fighting procedures for surrounding fires and combustible materials.*

SECTION V: REACTIVITY DATA

Stability: *Stable under normal temperatures and pressures*
Incompatibilities: *Strong oxidizing agents, concentrated acids, Nitric acid.*
Hazardous Decomposition Products: *Thermal decomposition may release toxic oxides of carbon, sulfur and nitrogen. (CO_2, CO, NO_x).*
Hazardous Polymerization: *Will not occur.*

SECTION VI: HEALTH HAZARD DATA

Routes of Entry:

Eye Contact: *Avoid. Any foreign material in the eyes can cause irritation.*
Skin Contact: *Prolonged contact may cause light skin irritation in sensitive individuals.*
Inhalation: *N/A*
Ingestion: *None*
Toxicity: *LD50, Toxicological studies on lignosulfonates indicate that they are non toxic. In literature, LD50 for lignosulfonates has been reported to be 20,000 mg//kg body weight by ingestion. Materials with LD50 values of 5,000 mg/kg of body weight and greater are considered to be non toxic.*

Emergency and First Aid Procedures:

Eye Contact: *Flush eyes with luke warm flowing water, holding eyelids open intermittently, for at least 20 minutes. Contact physician if irritation persists.*
Skin Contact: *Wash with flowing water. Normal hygiene practices.*
Inhalation: *N/A*
Ingestion: *Not normally applicable unless copious quantities ingested. Drink large amounts of water. Do not induce vomiting. Do not give water to unconscious person. Contact a physician if irritation persists.*

SECTION VII: PRECAUTION FOR SAFE HANDLING AND USE

Spill and leak procedures: *Small spills flush with water. Large spills dyke and reclaim product or store for disposal as solid waste.*
Waste Disposal Method: *Dispose in accordance with federal, state, or local regulations.*
Personal Protective Equip: *Impervious or rubber gloves recommended for prolonged exposure. Safety glasses with side shields required to prevent eye contact. Work clothes changed daily. Follow normal hygiene procedures.*
Ventilation: *Not normally required.*
Respiratory Protection: *Not normally required.*

The information contained in this Material Safety Data Sheet is, to the best of our knowledge, accurate and reliable. No warranty of any kind is either expressed or implied.

This information should be provided to all individuals handling this product. Federal, state, and local regulations should be followed when handling this product.

Soil-Sement®

Dust Control,
Erosion Control,
Stabilization

MIDWEST

What is Soil-Sement®

Dust and Erosion Control Agent

Soil-Sement® is an environmentally safe, advanced powerful polymer emulsion that produces highly effective dust control, erosion control and soil stabilization. Soil-Sement® provides excellent bonding, cohesion, versatility, cost-effectiveness, environmental compliance and superior overall performance.

Soil-Sement®'s effectiveness results from the length and strength of its unique polymer molecule formulation and those polymer molecules' ability to bond with the surface materials. Its chemical structure is made of molecules attached in relatively straight-linked chains and then cross-linked among other chains or grids that may be 1,000,000 molecules long. It is a true giant compared to the much smaller molecular structure of oil, calcium, petroleum resin and asphalt emulsion products, which range from 100 to 10,000 molecules. As a result, Soil-Sement® can be as strong as steel or as resilient as rubber.

Soil-Sement® is the cumulation of 24 years of focused research and development, and unparalleled concentration on PM_{10}, $PM_{2.5}$, erosion control and stabilization solutions. It yields proprietary one-of-a-kind polymer chemistry manufactured to rigid quality standards utilized in combination with field experience in all industrial, commercial and municipal environments. The result is a performance and value combination that is unequaled by other chemical and polymer products. As a result Soil-Sement® has been the standard of comparison for all chemical types, including polymer products, since it's introduction in 1978. Especially today Soil-Sement® exemplifies the fact that **all polymers are not made equal**.

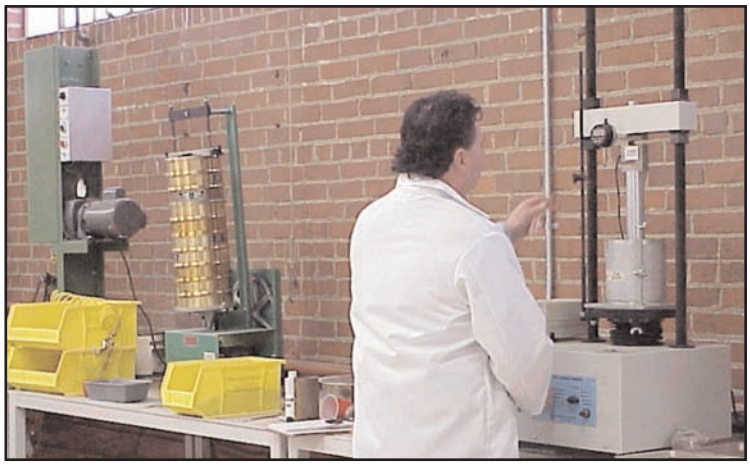
A Soil-Sement® treated surface will provide you with optimum performance 365 days a year!

ALL THE TIME EVERY TIME CERTIFIED

Outstanding Features and Benefits of Soil-Sement®:

- Nearly eliminates particulate matter (PM_{10} and $PM_{2.5}$).
- Does not contain any detectable polycyclic organic matter (POM) which includes polynuclear aromatic hydrocarbons (PAH).
- Is environmentally safe, non-toxic, non-corrosive, non-flammable and does not pollute groundwater.
- Has a cumulative effect and creates a stabilized surface which will resist shifting, breaking up or sink failures.
- Offers maximum weatherability to wind, rain, ultraviolet light and other weather conditions.
- Increases load-bearing strength of all types of soils and surfaces.
- Prevents water from seeping into and destabilizing the surface.
- Dries clear, providing an aesthetically pleasing appearance.
- Meets air, water, groundwater and stormwater compliance.

MIDWEST



Since 1975, Midwest Industrial Supply, Inc. has built a reputation of leadership through products and services that continually redefine dust control, erosion control and stabilization technology.

Our customers expect products that deliver real benefits, with performance far superior to other types of products being used today.

Our advantages include a full on-site laboratory with the latest state-of-the-art equipment.

We also have a group of dedicated, experienced professionals who are always ready to assist you with all of your dust control, erosion control and stabilization needs.

Pre-certified by the California Air Resources Board

CALCERT
INNOVATION ASSURED

Manufacturing Capabilities

We operate over 160,000 square feet of manufacturing and warehouse facilities in our Canton, Ohio location, with satellite operations located across the United States, Canada and Europe. We provide a complete research and development lab giving us total control over the formulation, manufacturing, quality and distribution of all of our products. Midwest's quality manufacturing process is designed to meet the criteria of ISO-9001.

Complete Customized Selling

We work with each customer to develop a customized dust or erosion control program that addresses your specific needs and requirements. Complete location surveys, soil evaluations, review of state and local air quality regulations, and other critical data are all combined as part of our detailed proposals and control plans. This determines the products, services, equipment, personnel, application schedules and budgets needed to do the job right.

Turn-key Applications

We offer complete turn-key application services. We serve our customers with a full-time fleet of properly equipped spray trucks and operators who are highly trained and professionally qualified. We provide field application services 24 hours a day, 7 days a week. Our central dispatch center maintains constant communications with the field operators for prompt routine service and immediate response to any emergency situation.

Recordkeeping and Reporting

We collect site, product, and application specific data in the field and create required daily reports which form the basis for the comprehensive, self-monitoring program needed for air quality compliance. Our administrative staff compiles required records of your dust and erosion control program and issues detailed quarterly and annual reports. These reports are prepared for presentation to state regulatory agencies for compliance with Title V certification provisions of the Clean Air Act and each state's air quality regulations.

"Soil-Sement® as a dust suppressant, in accordance with the manufacturer's instructions, will result in a significant reduction of PM_{10}..."

Now and In the Future...
Leader in Environmental Stewardship
Midwest Industrial Supply, Inc.

Midwest Industrial Supply, Inc. has over 28 years of experience of dust suppressant formulation, manufacturing and application experience. Our extensive research and development has resulted in products that are on the cutting edge of performance and environmental technology.

Midwest has always taken a leadership role in establishing regulatory requirements for chemical dust suppressants and stabilizers. We pride ourselves on the fact that our product line is engineered to reduce exposure to substances that cause cancer and other serious health effects...PM_{10}, $PM_{2.5}$, naturally-occurring asbestos-laden soil, radiation, PAHs, POMs, lead, ozone depletion and global warming. In other instances our products can be utilized to reduce the health hazards of heavy metals in mining and tailing operations, pesticide containment in soils and volatile organic compound (VOC) containment in soils.

Through the years Midwest Industrial Supply, Inc. has voluntarily sought **and** received third party verification of its stewardship...CalCert, California Air Resources Board (CARB), USEPA ETV, Canadian ETV and numerous testing and research projects — just a few of which are mentioned in the pages of this brochure.

MIDWEST...MAKING THE FUTURE SAFER AND HEALTHIER FOR EVERYONE!

Independent Tests & Certifications Confirm Soil-Sement®'s Superior Performance & Reliability!

Pre-certified by the California Air Resources Board

CALIFORNIA ENVIRONMENTAL TECHNOLOGY CERTIFICATION

CANADA VERIFIED VÉRIFIÉ

CALCERT
INNOVATION ASSURED

ERDC Engineer Research and Development Center

desert research institute

Arizona Department of Emergency & Military Affairs (ADEMA)

MRI Midwest Research Institute

SDSU San Diego State University

The world's leading advocates of new environmental technologies, and internationally recognized scientific and engineering evaluators of environmental performance have verified that Soil-Sement® is highly effective for controlling dust and the damaging effects of erosion and sediment pollution, while protecting the environmental ecosystem.

Soil-Sement® Dust and Erosion Control Agent

The staff of the internationally renowned California Air Resources Board (CARB) conducted an independent verification of the air quality benefits of Soil-Sement®. In particular, the staff of CARB determined that the use of Soil-Sement® as a dust suppressant, in accordance with the manufacturer's instructions, will result in a significant reduction of PM_{10} emissions from unpaved roads without contributing to existing levels of volatile organic compounds. Upon completing its evaluation, the staff of CARB notified all air pollution control districts in California that Soil-Sement®'s air quality claims had been verified. As a result of CARB's notification, air pollution control agencies have become familiar with Soil-Sement® and its proven air quality benefits.

CalCert and California Air Resources Board Certification

The California Environmental Technology Certification Program (CalCert), an internationally recognized independent, scientific and engineering evaluator of environmental performance, and the California Air Resources Board (CARB), one of the world's leading advocates of new environmental technologies, have certified Soil-Sement® performance. These certifications offer users and clients performance assurances when dependability is important and the cost of failure unacceptable.

Pre-certified by the California Air Resources Board

"When topically applied as a dust suppressant in accordance with manufacturer's instructions, including a total target concentration of 0.28 gallons of concentrate per square yard of treated surface applied in multiple passes in a single day, Soil-Sement® reduced PM_{10} emissions by approximately 84 percent after 339 days and 6,780 vehicles (predominantly light-duty) passes on an unpaved roadway consisting of a silty, sandy loam.

Soil-Sement® does not contain detectable levels of polynuclear organic matter which includes polynuclear aromatic hydrocarbons as defined by the Federal Clean Air Act section 112 (b); nor does Soil-Sement® contain detectable levels of fluorinated or brominated compounds that could be expected to contribute to ozone depletion or global warming."

California Environmental Technology Certification

Pursuant to the provisions of Section 39620 of the California Health and Safety Code

Midwest Industrial Supply, Inc.'s
Soil-Sement®

is hereby recognized as a

CERTIFIED TECHNOLOGY

with the following established level of performance

When topically applied as a dust suppressant in accordance with the manufacturer's instructions, including a target concentration of 0.28 gallons of concentrate per square yard of treated surface applied in multiple passes on a single day, Soil-Sement® reduced PM_{10} emissions by approximately 84 percent after 339 days and 6,780 vehicle (predominantly light-duty) passes on an unpaved road consisting of a silty, sandy loam.

Soil-Sement® does not contain detectable levels of polycyclic organic matter which includes polycyclic aromatic hydrocarbons as defined by the Federal Clean Air Act section 112 (b); nor does Soil-Sement® contain detectable levels of fluorinated or brominated compounds that could be expected to contribute to ozone depletion or global warming.

Certificate Number [02-02-059] became effective on April 11, 2002 for a period of three (3) years unless revoked in accordance with Section 91400 of Title 17 of the California Code of Regulations.

Winston H. Hickox
Agency Secretary
California Environmental Protection Agency

For complete Soil-Sement® certification information from CalCert, visit calepa.ca.gov/CalCert/CertifiedTech/Midwest.htm, or from the California ARB, visit www.arb.ca.gov/eqpr/mainlist.htm, or www.soilsement.com.

"Evaluation of the Air Quality Performance Claims for the Midwest Industrial Supply, Inc. Soil-Sement® Dust Suppressant," *California Air Resources Board*, Executive Order G-096-029-035.

Midwest Industrial Supply, Inc. Receives Canadian Verification Certificate.

The Honorable Christine S. Stewart, Canadian Minister of the Environment, awarded a verification certificate to Midwest Industrial Supply, Inc. under the Environmental Technology Verification (ETV) Program.

The ETV Program promotes the marketability of companies engaged in the environmental industry by providing assessment and validation of suppliers' technology performance. At the same time, it provides buyers with the assurance that the technology in question does indeed perform as claimed.

ETV

Environmental Technology Verification Program

..... enhancing the credibility of environmental technologies

CANADA VERIFIED VÉRIFIÉ

Soil-Sement®

Midwest Industrial Supply Inc.'s Soil-Sement®, when applied in accordance with the manufacturer's instructions, will:

1. on unpaved roadways in California's San Joaquin Valley
   a. achieve at least 95% suppressant efficiency on fugitive dust (PM_{10}) for three months after application and at least 80% after 11 months, and
   b. increase the R-value in the range of 30-40% when measured by ASTM Test Protocols D1883 and D2844, and calculated in accordance with the AASHTO Guide for Design of Pavement Structures, 1986; and
2. in acute toxicity tests, yield LC_{50}'s for rainbow trout (96-hr) and Daphnia magna (48-hr) of at least 7,000 ppm and 21,000ppm, respectively.

License Number: ETV 99005
Issued to: Midwest Industrial Supply Inc.

Verified* Performance March 25, 1999

John McMullen
President & CEO

Canada

* Refer to Technology Fact Sheet for additional information on the verification of this performance claim.

The Honorable Christine S. Stewart, Canadian Minister of the Environment presenting Canada Environmental Technology Verification certificate to Robert Vitale, President of Midwest Industrial Supply, Inc.

Why Environmental Technology Verification is Valuable for You and Why Midwest Supports ETV

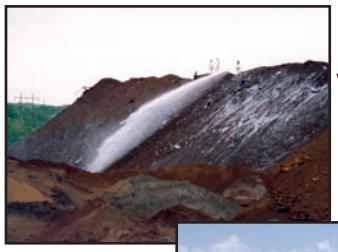
CALCERT
INNOVATION ASSURED

SOIL-SEMENT® TECHNOLOGY CERTIFICATION REQUIRES THAT:

- Significant reduction of PM_{10} emissions is verified.
- Environmental claims are verified.
- Complete evaluation and review of all test methods and protocols used to assure scientific, statistical accuracy of conclusions.
- Midwest is to continuously meet requirements for product certification to remain valid.
- Midwest can demonstrate having control over the manufacturing of the product to ensure we can consistently and reliably produce product that performs at least as well as the product used in the certification testing. Midwest's quality system is designed to meet the criteria of ISO-9001.
- Midwest quality management practices and standards are reviewed and certified.
- Midwest user manuals and application documents are reviewed and verified.
- Midwest's policy and procedure manual for personnel training of application is reviewed and verified.

Soil-Sement®'s Government Verifications are a Great Deal More than Meets the Eye!

THE MANY USES OF SOIL-SEMENT®



Residual Waste Landfills

Car Topping

Airports FOD

Pond Slopes

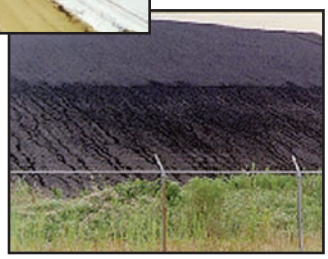
Intermodal

Hydroseeding

Naturally Occurring Asbestos

Unpaved Shoulders

Subgrade Stabilization



Coal Piles

Quarries

Public Works

Military Installations

Steel Mills

Slopes

Power Plants

Wineries

COMPLETE REPORTS AND TECHNICAL DATA AVAILABLE UPON REQUEST

For more information or to receive a complete list of other Midwest products, contact:

Midwest Industrial Supply, Inc.
1101 3rd Street Southeast
Canton, Ohio 44707

www.midwestind.com

MIDWEST

©2009 MIDWEST INDUSTRIAL SUPPLY, INC.

MIDWEST INDUSTRIAL SUPPLY, INC.
1101 3rd Street Southeast • Canton, Ohio 44707 • USA
Emergency Phone Number: 330-456-3121

SOIL-SEMENT®

MATERIAL SAFETY DATA SHEET

SECTION I -- IDENTIFICATION OF SUBSTANCE/PREPARATION AND COMPANY/UNDERTAKING

TRADE NAME: SOIL-SEMENT®
CHEMICAL NAME: POLYMER EMULSION
SYNONYMS: DUST RETARDANT
CHEMICAL FAMILY: N/A
MOLECULAR WEIGHT: N/A
FORMULA: AQUEOUS ACRYLIC VINYL ACETATE POLYMER EMULSION
CAS REGISTRY NO.: PRODUCT A BLEND - NO NUMBER ASSIGNED

SECTION II -- COMPOSITION/INFORMATION ON INGREDIENTS

NAME	CAS REG NO.	WT. %
Acrylic & Vinyl Acetate Polymer	Non-hazardous	5-50
Water	7732-18-5	95-50

SECTION III -- HAZARDS IDENTIFICATION

Acrylic & Polyvinyl Acetate Polymer	Non-hazardous
Water	Non-hazardous

SECTION IV -- FIRST AID MEASURES

EYES: Flush eyes with flowing water at least 15 minutes, get medical attention.
INHALATION: Move subject to fresh air.
SKIN: Flush with large amount of water or wash with soap and water.
INGESTION: Give water to drink. Call a physician.
NEVER GIVE FLUIDS OR INDUCE VOMITING.
IF PATIENT IS UNCONSCIOUS OR HAVING CONVULSIONS.

SECTION V -- FIRE FIGHTING MEASURES

FLASH POINT (TEST METHOD): Emulsion, >210^{0}F
AUTOIGNITION TEMPERATURE: N/A
EXTINGUISHING MEDIUM: N/A
SPECIAL FIREFIGHTING PROCEDURES: N/A
UNUSUAL FIRE AND EXPLOSION HAZARDS: Material can splatter above 2l2°F. Dried polymer film can burn but will not support combustion.

SECTION VI - ACCIDENTAL RELEASE MEASURES

SPILL AND LEAK PROCEDURES: Dike and control spill. Transfer liquid to containers for recovery or disposal. Keep spills out of sewers and open bodies of water.

SECTION VII -- HANDLING AND STORAGE

STORAGE: Keep in a cool, dry, ventilated storage area and in closed containers. Avoid freezing temperatures. Minimize contact with the air to prevent microorganism contamination and reduce the formation of skins on the surface.

HANDLING: Handle in a well-ventilated workspace.

SECTION VIII -- EXPOSURE CONTROL/PERSONAL PROTECTION

RESPIRATORY PROTECTION: None required if good ventilation is maintained.
VENTILATION: Mechanical exhaust at point of contaminant.
EYE PROTECTION: Chemical splash goggles recommended.
PROTECTIVE CLOTHING: Impervious gloves recommended.
OTHER: Under normal handling conditions, the risk of exposure to residual monomer is negligible.

SECTION IX -- PHYSICAL AND CHEMICAL PROPERTIES

BOILING/MELTING POINT @ 760 mm Hg: 212°F
VAPOR PRESSURE mm Hg @ 20°C: 17
SPECIFIC GRAVITY OR BULK DENSITY: 1.01 to 1.15
SOLUBILITY IN WATER: Dilutable
APPEARANCE: Milky White Liquid
ODOR: Characteristic Acrylic odor
pH: 4.0 to 9.5

SECTION X -- STABILITY AND REACTIVITY

STABILITY: Stable
CHEMICAL INCOMPATIBILITY: No hazardous reactions are expected to occur under normal industrial conditions.
HAZARDOUS DECOMPOSITION PRODUCTS: Thermal decomposition in the presence of air may yield carbon monoxide and/or carbon dioxide and water.
HAZARDOUS POLYMERIZATION: Does not occur
CONDITIONS TO AVOID: N/A
CORROSIVE TO METAL: No
OXIDIZER: No

SECTION XI -- TOX ICOLOGICAL INFORMATION

EFFECTS OF OVEREXPOSURE

INHALATION: Vapor from stored, undiluted product can cause headache and nausea.
SKIN: Stored, undiluted product is slightly irritating to skin.
EYES: Slightly irritating to eyes.
INGESTION: May be irritating to digestive tract.

	OSHA		ACGIH	
NAME	**TWA**	**STEL**	**TWA**	**STEL**
Acrylic & polyvinyl Acetate Polymer	None	None	None	None
Water	None	None	None	None

SECTION XII -- ECOLOGICAL INFORMATION

Animal toxicity studies on blended SOIL-SEMENT® have not been carried out because we believe the fish toxicity studies done on the blend demonstrate it is as non-toxic as the individual emulsions which go into the blend. TABLE #1 gives the results of our fish toxicity tests.

In summary, these data show that the LC_{50} of SOIL-SEMENT® on goldfish is somewhere above 12,500 ppm. This is extremely low toxicity, especially in view of the legal requirement that chemicals must be labeled "toxic to fish" only if their LC_{50} is less than 1.0 ppm.

TABLE I

FISH TOXICITY STUDIES			
EMULSION NUMBER	**TYPE OF FISH**	**HOURS**	**LC_{50} PPM**
C	Rainbow Trout	24	10,000
C	Rainbow Trout	96	8,950
C	Bluegill Sunfish	24	10,000
C	Bluegill Sunfish	96	5,640
C	Goldfish	24	4,200
H	Goldfish	24	7,500
G	Goldfish	24	10,000
D	Goldfish	24	13,400
F	Goldfish	24	13,400
SOIL-SEMENT®	Goldfish	24	12.500 - 25,000
SOIL-SEMENT®	Goldfish	48	12,500 - 25,000
SOIL-SEMENT®	Goldfish	72	12,500 - 20,000
B	Goldfish	24	24,000
E	Goldfish	24	24,000

The 48 hour LC_{50} for Daphnia Magna based on nominal test concentrations and mortality at the end of testing was calculated to be 3,482.8 parts per million (ppm).

SECTION XIII -- DISPOSAL CONSIDERATIONS

WASTE DISPOSAL METHOD:

Coagulate the emulsion by the stepwise addition of ferric chloride and lime or the addition of sand or other absorbent material. Remove the clear supernatant liquid and flush to a chemical sewer or landfill. Incinerate solids and the contaminated diking material according to local, state and federal regulations.

CONTAINER DISPOSAL:

Do not re-use containers. Do not weld on metal containers.

SECTION XIV -- TRANSPORTATION INFORMATION

D.O.T. PROPER SHIPPING NAME (49CFR172.101):	None
HAZARDOUS SUBSTANCE (40CFR116):	N/A
REPORTABLE QUANTITY (RQ):	N/A
D.O.T. HAZARD CLASSIFICATION (49CFR172.101):	Non-regulated
D.O.T. PLACARDS REQUIRED:	None
POISON CONSTITUENT (49CFR173.343):	N/A
BILL OF LADING DESCRIPTION:	Liquid plastic, NOS
C NO.:	N/A
UN/NA CODE:	N/A

SECTION XV-- REGULATORY INFORMATION

SOIL-SEMENT® is not a restricted article according to the Department of Transportation and International Air Transport Association regulations.

EPA SARA Title III hazard class:	None
OSHA HCS hazard class:	Non-OSHA hazardous (29CFR1910.1200)
EPA SARA Title III Section 313 (40CFR372)	
Toxic Chemicals present in quantities greater than the "de minimus" level are:	None

This product is not a "controlled product" under the Canadian Workplace Hazardous Material Information System (WHMIS)

SECTION XVI -- OTHER INFORMATION

ABBREVIATIONS AND SYMBOLS:

N.D. - Not Determined	N.A. - Not Applicable	N.T. - Not Tested
< - LESS THAN	> - MORE THAN	

APPENDIX G

RHOADS PROPERTY BORROW AREA, PRE-PROJECT VS. POST-PROJECT SURFACE WATER ANALYSES

Client:	*Newmont Mining Corporation*	**Sheet:** *1*	**of** *22*
Project:	*Rhoads Property*	**Date:**	*11-Nov-2013*
Description:	Rhoads Borrow Area: Pre-Project vs Post-Project Surface Water Analysis	**Job No:**	***1011322***

APPENDIX G - RHOADS BORROW AREA: PRE-PROJECT VS POST-PROJECT SURFACE WATER ANALYSES

Revisioning						
Rev.	**Date**	**Description**	**By**	**Checked**	**Date**	**Reviewed**
0	*6-Nov-2013*	*Rhoads POO Rev. 1*	*Leland Fuhrig*	*John Redmond*	*16-Oct-2013*	*Tom Kelley*

Location and Format

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

\\ussbs1s01\Projects\ Newmont Mining Corporation\Midnite Mine

The following calculations were generated using the following software:

Microsoft Office Professional Plus 2010 (Microsoft Excel)
AutoCAD 2011
Army Corps of Engineers (ACOE) HEC-HMS version 3.5

1.0 BACKGROUND

This document has been prepared to present calculations performed to estimate stormwater discharge from the drainages associated with the Rhoads Borrow Area. In accordance with the Stormwater Management Manual for Eastern Washington (WSDE, 2004), stormwater runoff from the Rhoads Borrow area was estimated for topography and vegetation conditions prior to borrow area development (Pre-Project condition) and conditions after borrow area reclamation (Post-Project condition).

For the Pre-Project condition, runoff was estimated based on good forest conditions, with litter and brush covering the soil over the entire drainage basin surfaces. For Post-Project conditions, runoff was estimated with the Rhoads Borrow area revegetated with a mixture of grass and low-growing shrubs with a ground cover of 30% to 70%. The Post-Project condition was also based on re-establishment of preexisting drainage pathways, and that the paved access road to the Midnite Mine site is the only surface feature that has substantially changed from the Pre-Project condition.

2.0 METHODOLOGY

The precipitation event that was used for the hydrologic analyses of the site was the 100-year, 24-hour storm. This storm event is a typical engineering design event for evaluating pre- and post-project development runoff to downstream areas, and is also the design storm in the Stormwater Management Manual for Eastern Washington (WSDE, 2004).

Based on the location of the site (Eastern Washington Region 3), an SCS Type 1A storm distribution was used as the design storm (Tetra Tech, 2011).

Storm precipitation depth-duration-frequency estimates for the project site recommended in the Midnite Mine Storm Water Design Investigation Report (Tetra Tech, 2011) were made using the National Oceanic and Atmospheric Administration (NOAA) National Weather Service Atlas 2 Volume 9. The estimated 100-year, 24-hour design storm event precipitation depth is 2.6 inches.

The Army Corps of Engineers (ACOE) HEC-HMS Version 3.5 software was used to perform hydrologic modeling for the Pre and Post-Project conditions. Hydrologic sub-basins were delineated based on topography with a 5-foot contour interval. Drainage basins for this study, the access road that will be constructed as part of the Remedial Action (RA) and remain in place post-project, and the Rhoads property boundary are shown on Figure 1. The drainage basins within this area were delineated using AutoCAD. Parameters including the basin areas, average slopes, and lengths were determined for entry in HEC-HMS. These basin properties are presented in Attachment 1. Routing diagrams from HEC-HMS modeling are presented in Attachment 2.

A curve number of 55 was used to represent undisturbed forested areas of the subbasins, based on recommendations presented in Tetra Tech (2011) for the Midnite Mine area. For the Post-Project condition, a curve number of 62 was assumed for reclaimed areas, representative of the condition where the area has been revegetated to the point where a mixture of grasses and low-growing brush results in 30% to 70% ground cover, but a forest has not yet been reestablished (MWH, 2012). A curve number of 98 was assigned to the surface of the paved access road to represent the impervious surface of that feature that will remain.

Another input to the HMS model to represent the basin response is Lag Time, as calculated using the following equation:

$$T_{lag} = \frac{L^{0.8}(S+1)^{0.7}}{1900(\%Slope)^{0.5}}$$, where:

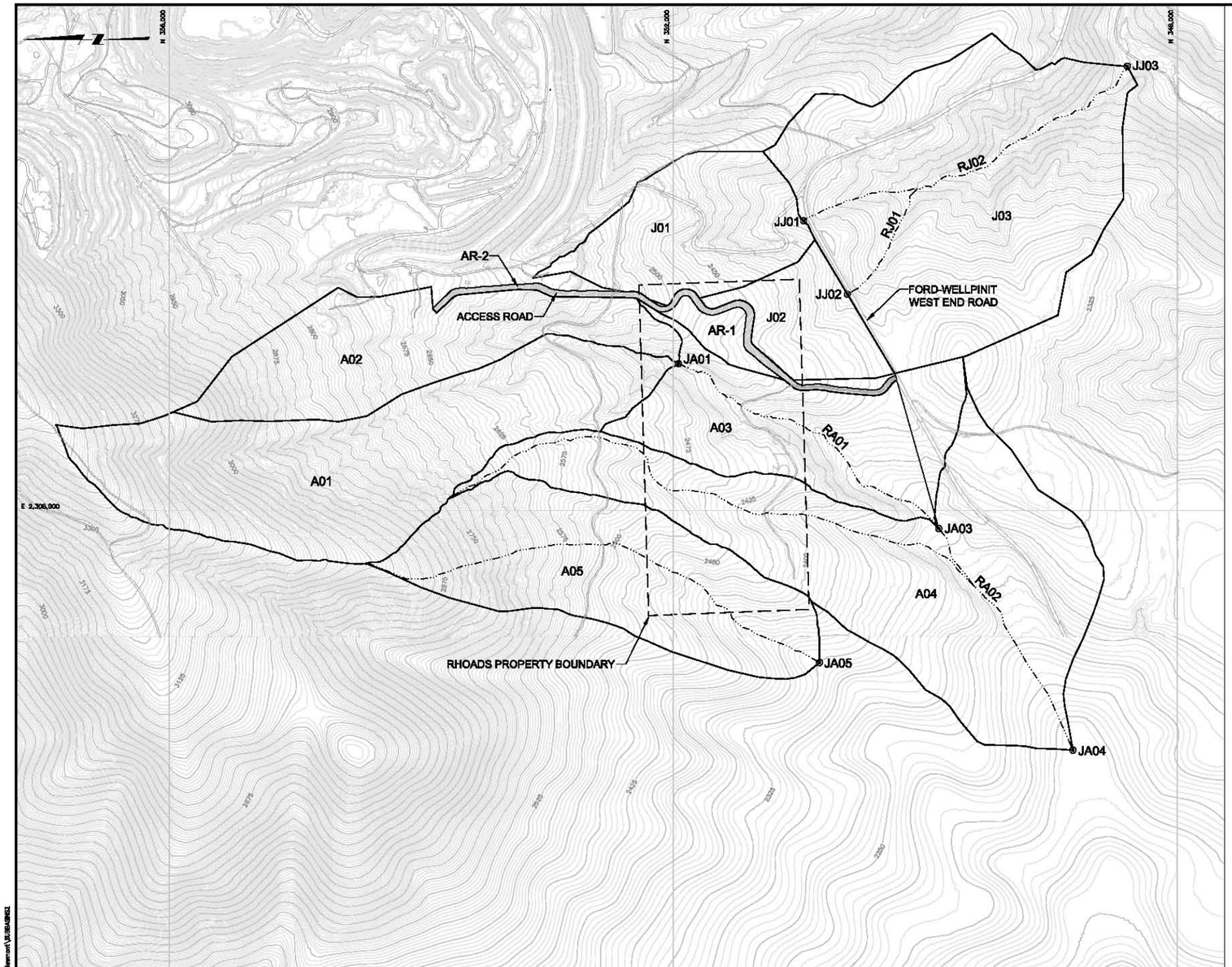
T_{lag} = lag time in hours,

L = length of the longest drainage path in meters,

S = (1000/CN) – 10,

CN = curve number, and

%Slope = the average watershed slope in percent.



LEGEND:

- 5605 EXISTING GROUND SURFACE ELEVATION, FEET
- SUBBASIN BOUNDARY
- RHOADS PROPERTY BOUNDARY
- ROUTED FLOW CHANNEL
- AR-1 SUBBASIN ID
- FLOW NODE
- JJ03 ROUTED FLOW PATH ID

0 400' 800'
CONTOUR INTERVAL = 5'

REV	DESCRIPTION	TECH	ENG	DATE
0	DRAFT	CF	LF	09-13

DISCLAIMER:
THIS DRAWING WAS DEVELOPED THROUGH THE APPLICATION OF PROFESSIONAL ENGINEERING SKILL AND PROPRIETARY METHODOLOGIES. PROCESSES AND KNOW HOW OF MWH AS AUTHOR ALL PURSUANT TO THE TERMS OF A CONTRACTUAL SCOPE OF WORK GOVERNING ITS PREPARATION. THIS DRAWING MAY NOT BE USED OR MODIFIED OTHER THAN IN STRICT ACCORDANCE WITH THE TERMS OF THE GOVERNING CONTRACT AND SCOPE OF WORK OR WITHOUT THE EXPRESS WRITTEN CONSENT AND COMMENT OF THE AUTHOR. ANY ALTERATION OR ADAPTATION OF THIS DRAWING SHALL BE CONSISTENT WITH THE AUTHOR'S CONTRACTUAL AND PROPRIETARY RIGHTS AND BE AT USER'S SOLE RISK AND WITHOUT ANY LIABILITY OR LEGAL RESPONSIBILITY OF MWH.

DRAWING REFERENCE(S):
- EXISTING TOPOGRAPHY BASED UPON LIDAR MAPPING BY SPATIAL INFO., 2010. WASHINGTON STATE PLANE-NORTH, NAD 83/NAVD 88.
- PREMINE TOPOGRAPHY AND PIT EXCAVATION TOPOGRAPHY BASED UPON INFORMATION PROVIDED BY U.S. BUREAU OF MINES (USBM), JULY 1983. ORIGINAL COORDINATE SYSTEM USED IN USBM MAPPING (SKIDDY/MINRAGS) HAS BEEN CONVERTED TO NAD83/NAVD88 BASED COORDINATES.

DESIGNED BY	L FUHRIG	09-13
DRAWN BY	C FOWLER	09-13
CHECKED BY	L FUHRIG	09-13
APPROVED BY	L FUHRIG	09-13
PROJECT MANAGER		

NEWMONT

PROJECT LOCATION: WELLPINIT, WASHINGTON
PROJECT: MIDNITE MINE
TITLE: SUBBASINS

MWH

SHEET 1 | REVISION 0
FILE NAME SUBBASINS2 | DATE SEPT 2013

K:\Design - Drafting\Clients_J-P\Newmont\SUBBASINS2

3.0 RESULTS

The above methods were used to generate inputs for HEC-HMS modeling to evaluate changes in basin runoff rates from Pre-Project to Post-Project conditions during the 100-year, 24-hour storm event. Output from the HEC-HMS modeling of peak runoff discharge rates for five junctions downstream of the Project Area are shown in Table 1. The location of these junctions with respect to the project area is shown on Figure 1.

Table 1. Comparison of Pre-Project and Post-Project Peak Discharge Rates

HEC-HMS Junction ID	Pre-Construction Peak Flow, CFS	Post-Construction Peak Flow, CFS	Percent Change From Pre-Construction
JA01	1.9	1.5	-21.1%
JA03	2.4	2.9	20.8%
JA04	3.6	4.0	11.1%
JA05	0.7	0.8	14.3%
JJ01	0.4	0.4	0.0%
JJ02	0.3	0.2	-33.3%

As can be seen in the table above, there will be only minor changes for most of the areas affected by the Access Road remaining downstream of the Rhoads borrow project area. In the long term, it can be expected that these peak flow differences will decrease even further as a mature forest develops in the reclaimed borrow area. The largest differences in the peak flows that have been calculated for this area are found at Junctions JA01, JA03 and JJ02. Junction JA03 is downstream from the Access Road, and the increase in the peak flow here is due to the higher curve number assigned to the paved access road than that of original native ground, and a slight increase in drainage area. Junctions JA01 and JJ02 have smaller subbasins contributing to them after the construction of the Access Road (Subbasins A02 and J02 are much smaller afterward) and the junctions therefore show a smaller peak flow as a result. The output graphs from HEC-HMS (Attachment 2) show these peaks graphically. Of note are the two separate peak flows that are seen in the Post-Project graphs for JA03 and JA04, with a small early peak showing the effect of the access road.

4.0 REFERENCES

MWH 2012. Midnite Mine Superfund Site Preliminary (30 Percent) Design Basis of Design Report, prepared for Dawn Mining Company and Newmont USA Ltd., December 19.

Tetra Tech, Inc. (Tetra Tech), 2011. Surface Water Design Investigation Report, prepared for Dawn Mining Company and Newmont USA Ltd., May 16.

Washington State Department of Ecology (WSDE), 2004. Stormwater Management Manual for Eastern Washington. http://www.ecy.wa.gov/programs/wq/stormwater/easternmanual/manual.html

Client: *Newmont Mining Corporation*
Project: *Rhoads Property*
Description: Rhoads Borrow Area: Pre-Project vs. Post-Project Surface Water Analysis

Sheet: *7* **of** *22*
Date:
Job No:

Attachment 1: HEC-HMS Inputs

Pre-Project

A01		
Longest Reach	2059	ft
Avg Slope	37.52	%
CN	55	
S	8.18	in
Tlag	0.18	hrs
	10.9	mins
Initial Abs	0	in
Area	0.144	mi2

A02		
Longest Reach	2481	ft
Avg Slope	27.83	%
CN	55	
S	8.18	in
Tlag	0.24	hrs
	14.7	mins
Initial Abs	0	in
Area	0.087	mi2

A03		
Longest Reach	3500	ft
Avg Slope	27.55	%
CN	55	
S	8.18	in
Tlag	0.32	hrs
	19.4	mins
Initial Abs	0	in
Area	0.085	mi2

A04		
Longest Reach	6289	ft
Avg Slope	9.366	%
CN	55.0	
S	8.18	in
Tlag	0.89	hrs
	53.28	mins
Initial Abs	0	in
Area	0.1805	mi2

A05		
Longest Reach	3995	ft
Avg Slope	17.150	%
CN	55.0	
S	8.18	in
Tlag	0.46	hrs
	27.39	mins
Initial Abs	0	in
Area	0.107	mi2

Post-Project

A01		
Longest Reach	2059	ft
Avg Slope	37.52	%
CN	55.1	
S	8.18	in
Tlag	0.18	hrs
	10.90	mins
Initial Abs	0	in
Area	0.144	mi2

A02		
Longest Reach	2481	ft
Avg Slope	27.83	%
CN	55.3	
S	8.18	in
Tlag	0.24	hrs
	14.7	mins
Initial Abs	0	in
Area	0.081	mi2

A03		
Longest Reach	3500	ft
Avg Slope	27.550	%
CN	58.2	
S	8.18	in
Tlag	0.32	hrs
	19.44	mins
Initial Abs	0	in
Area	0.082	mi2

A04		
Longest Reach	6289	ft
Avg Slope	9.366	%
CN	56.2	
S	7.79	in
Tlag	0.86	hrs
	51.69	mins
Initial Abs	0	in
Area	0.1805	mi2

A05		
Longest Reach	3995	ft
Avg Slope	17.15	%
CN	56.4	
S	7.73	in
Tlag	0.44	hrs
	26.44	mins
Initial Abs	0	in
Area	0.107	mi3

Client: *Newmont Mining Corporation*
Project: *Rhoads Property*
Description: Rhoads Borrow Area: Pre-Project vs. Post-Project Surface Water Analysis

Sheet: *8* **of** *22*
Date:
Job No:

Pre-Project

J01		
Longest Reach	2277	ft
Avg Slope	17.9	%
CN	55	
S	8.18	in
Tlag	0.28	hrs
	17.10	mins
Initial Abs	0	in
Area	0.058	mi2

J02		
Longest Reach	1619	ft
Avg Slope	12.09	%
CN	55	
S	8.18	in
Tlag	0.26	hrs
	15.84	mins
Initial Abs	0	in
Area	0.038	mi2

J03		
Longest Reach	3875	ft
Avg Slope	21.28	%
CN	55	
S	8.18	in
Tlag	0.40	hrs
	23.99	mins
Initial Abs	0	in
Area	0.18	mi2

N/A

N/A

Post-Project

J01		
Longest Reach	2277	ft
Avg Slope	17.900	%
CN	55.4	
S	8.18	in
Tlag	0.28	hrs
	17.10	mins
Initial Abs	0	in
Area	0.057	mi2

J02		
Longest Reach	1145	ft
Avg Slope	7.200	%
CN	57.6	
S	7.36	in
Tlag	0.24	hrs
	14.57	mins
Initial Abs	0	in
Area	0.0287	mi2

J03		
Longest Reach	3875	ft
Avg Slope	21.28	%
CN	55	
S	8.18	in
Tlag	0.40	hrs
	23.99	mins
Initial Abs	0	in
Area	0.18	mi2

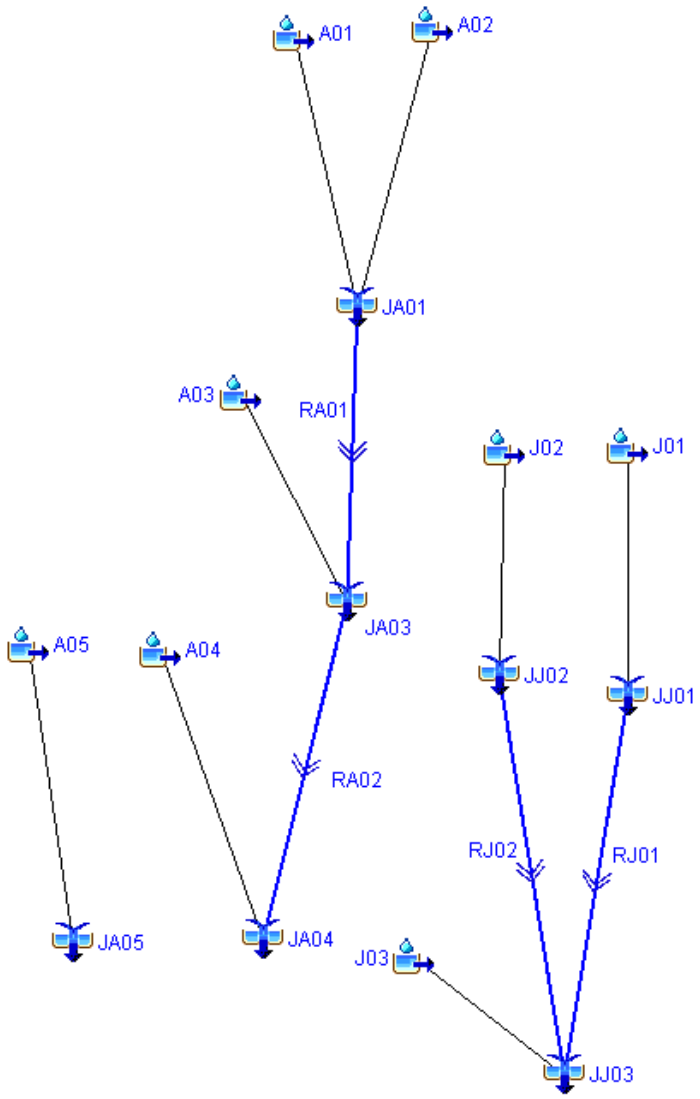
AR1		
Longest Reach	1194	ft
Avg Slope	7.4	%
CN	62.0	
S	6.13	in
Tlag	0.22	hrs
	13.29	mins
Initial Abs	0	in
Area	0.0083	mi2

AR2		
Longest Reach	4355	ft
Avg Slope	6.8	%
CN	98	
S	0.20408	in
Tlag	0.18734	hrs
	11.2407	mins
Initial Abs	0	in
Area	0.0079	mi2

Client:	*Newmont Mining Corporation*	**Sheet:** *9*	**of** *22*
Project:	*Rhoads Property*	**Date:**	*11-Nov-2013*
Description:	Rhoads Borrow Area: Pre-Project vs. Post-Project Surface Water Analysis	**Job No:**	***1011322***

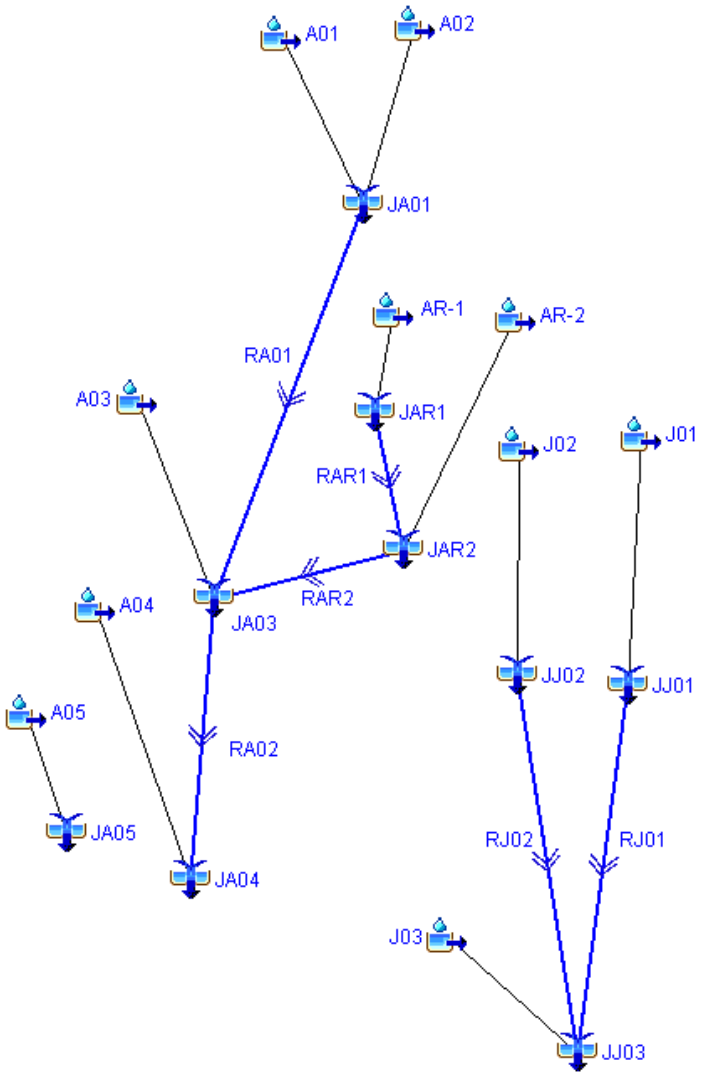
Attachment 2: HEC-HMS Outputs

Pre-construction Schematic:



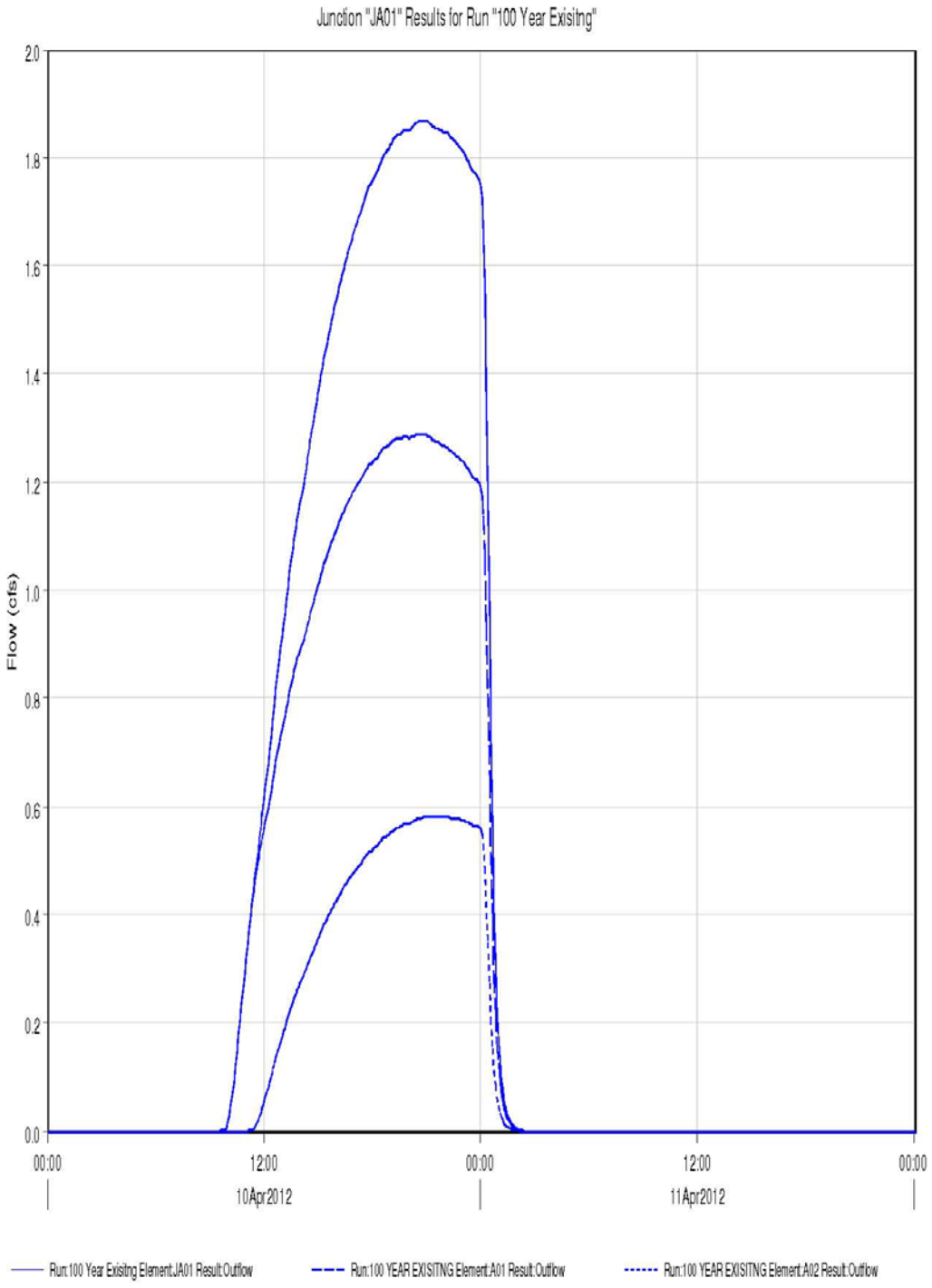
Client:	*Newmont Mining Corporation*	**Sheet:** *10* **of** *22*	
Project:	*Rhoads Property*	**Date:**	*11-Nov-2013*
Description:	Rhoads Borrow Area: Pre-Project vs. Post-Project Surface Water Analysis	**Job No:**	***1011322***

Post-construction Schematic:



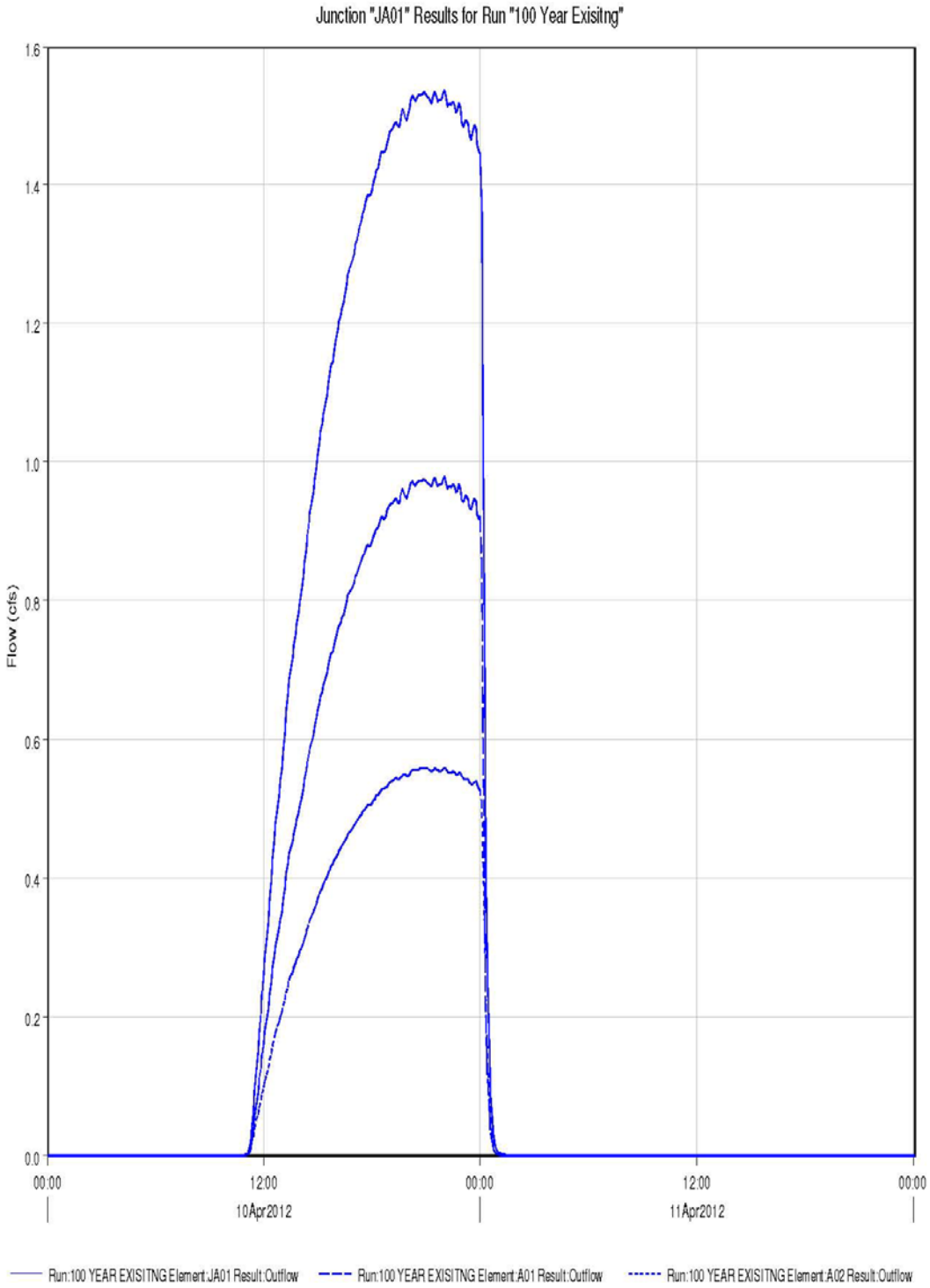
Output Graphs, pre-project followed by post-project for nodes JA-01, JA-03, JA-04, JA-05, JJ-01, JJ-02:

Client:	*Newmont Mining Corporation*	**Sheet:** *11*	**of** *22*
Project:	*Rhoads Property*	**Date:**	*11-Nov-2013*
Description:	Rhoads Borrow Area: Pre-Project vs. Post-Project Surface Water Analysis	**Job No:**	***1011322***

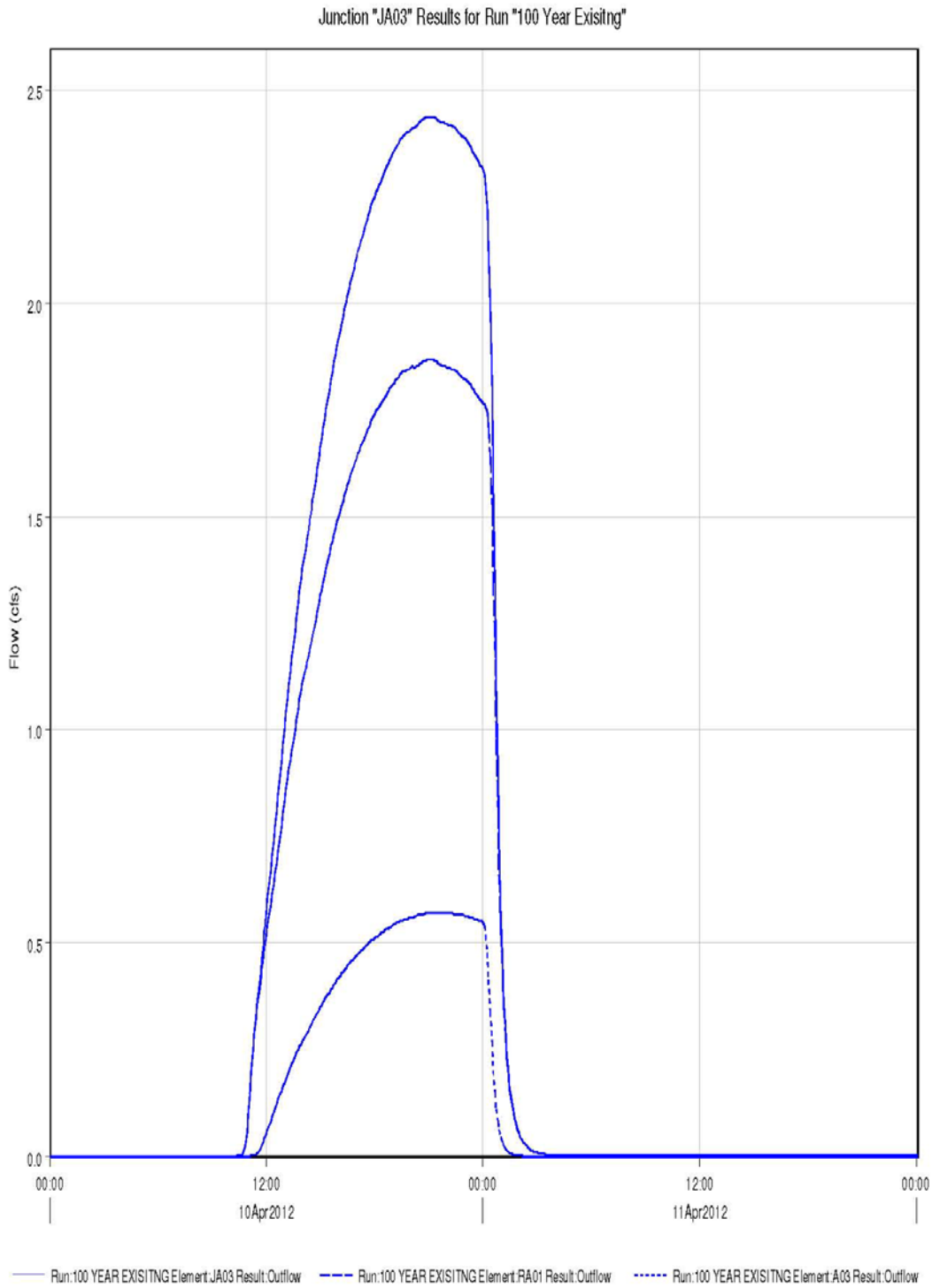


Client: *Newmont Mining Corporation*
Project: *Rhoads Property*
Description: Rhoads Borrow Area: Pre-Project vs. Post-Project Surface Water Analysis

Sheet: *12* **of** *22*
Date: *11-Nov-2013*
Job No: ***1011322***

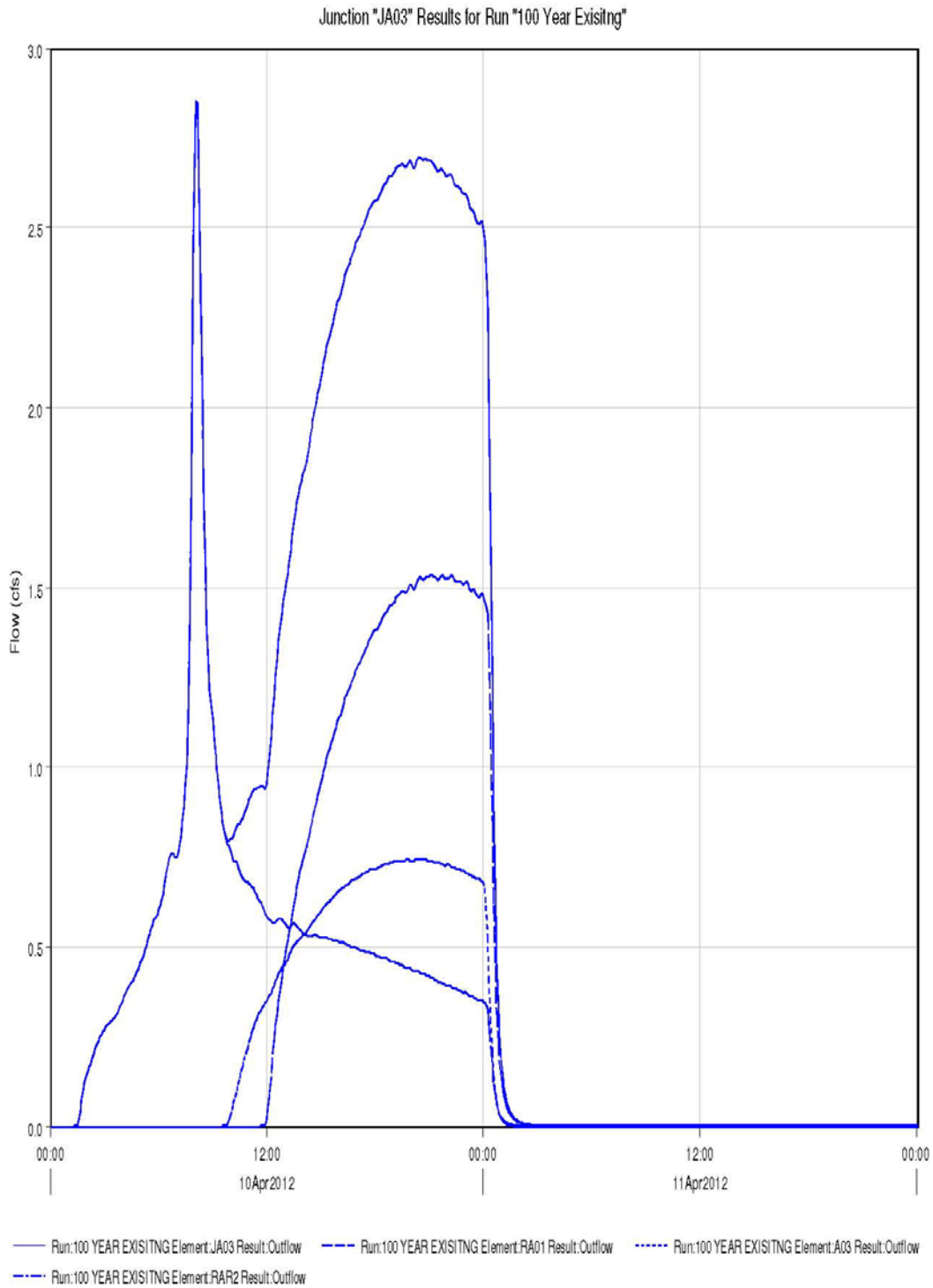


Client:	*Newmont Mining Corporation*	**Sheet:** *13* **of** *22*	
Project:	*Rhoads Property*	**Date:**	*11-Nov-2013*
Description:	Rhoads Borrow Area: Pre-Project vs. Post-Project Surface Water Analysis	**Job No:**	***1011322***



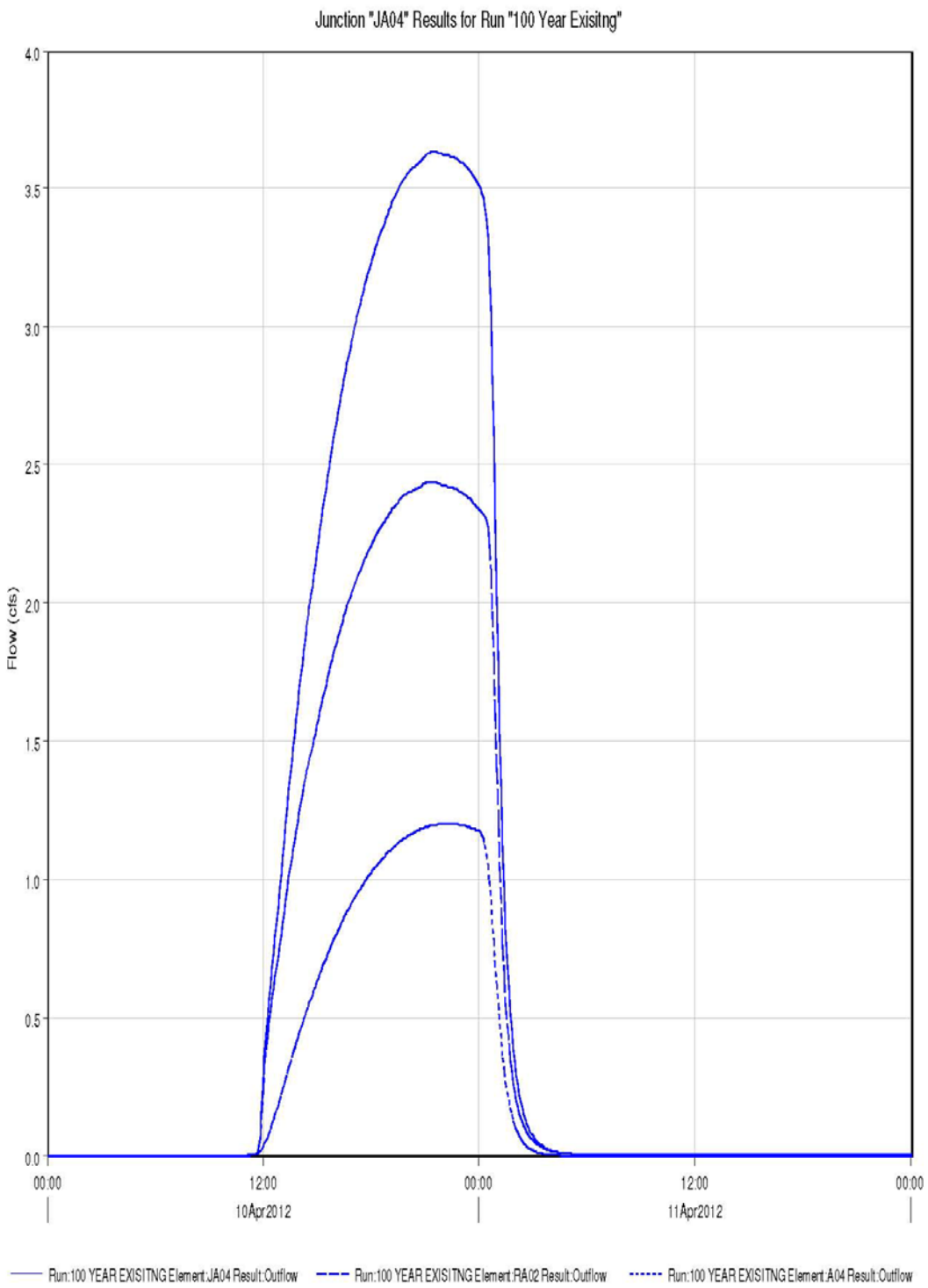
Client: *Newmont Mining Corporation*
Project: *Rhoads Property*
Description: Rhoads Borrow Area: Pre-Project vs. Post-Project Surface Water Analysis

Sheet: *14* **of** *22*
Date: *11-Nov-2013*
Job No: ***1011322***



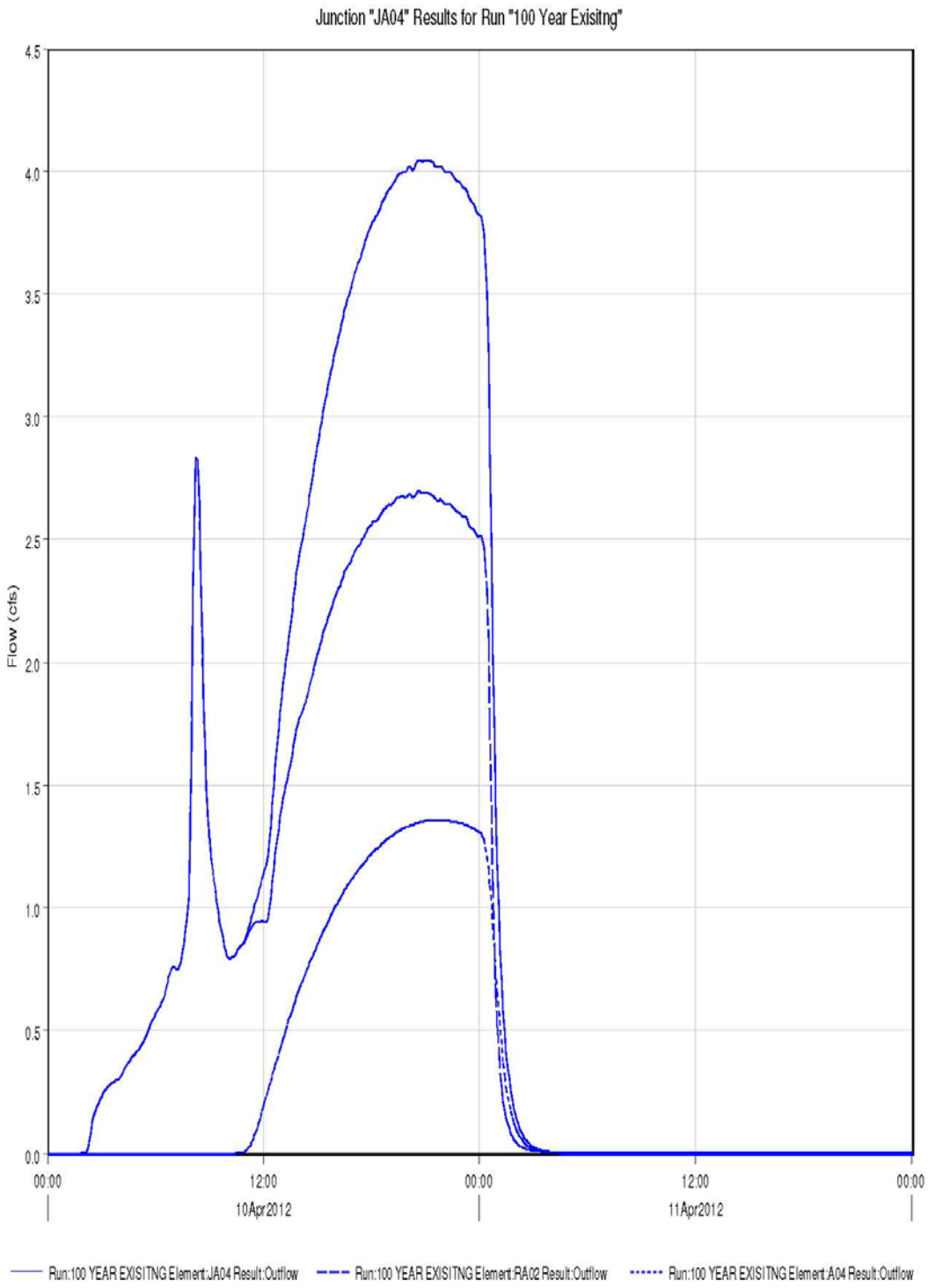
Client: *Newmont Mining Corporation*
Project: *Rhoads Property*
Description: Rhoads Borrow Area: Pre-Project vs. Post-Project Surface Water Analysis

Sheet: *15* **of** *22*
Date: *11-Nov-2013*
Job No: ***1011322***



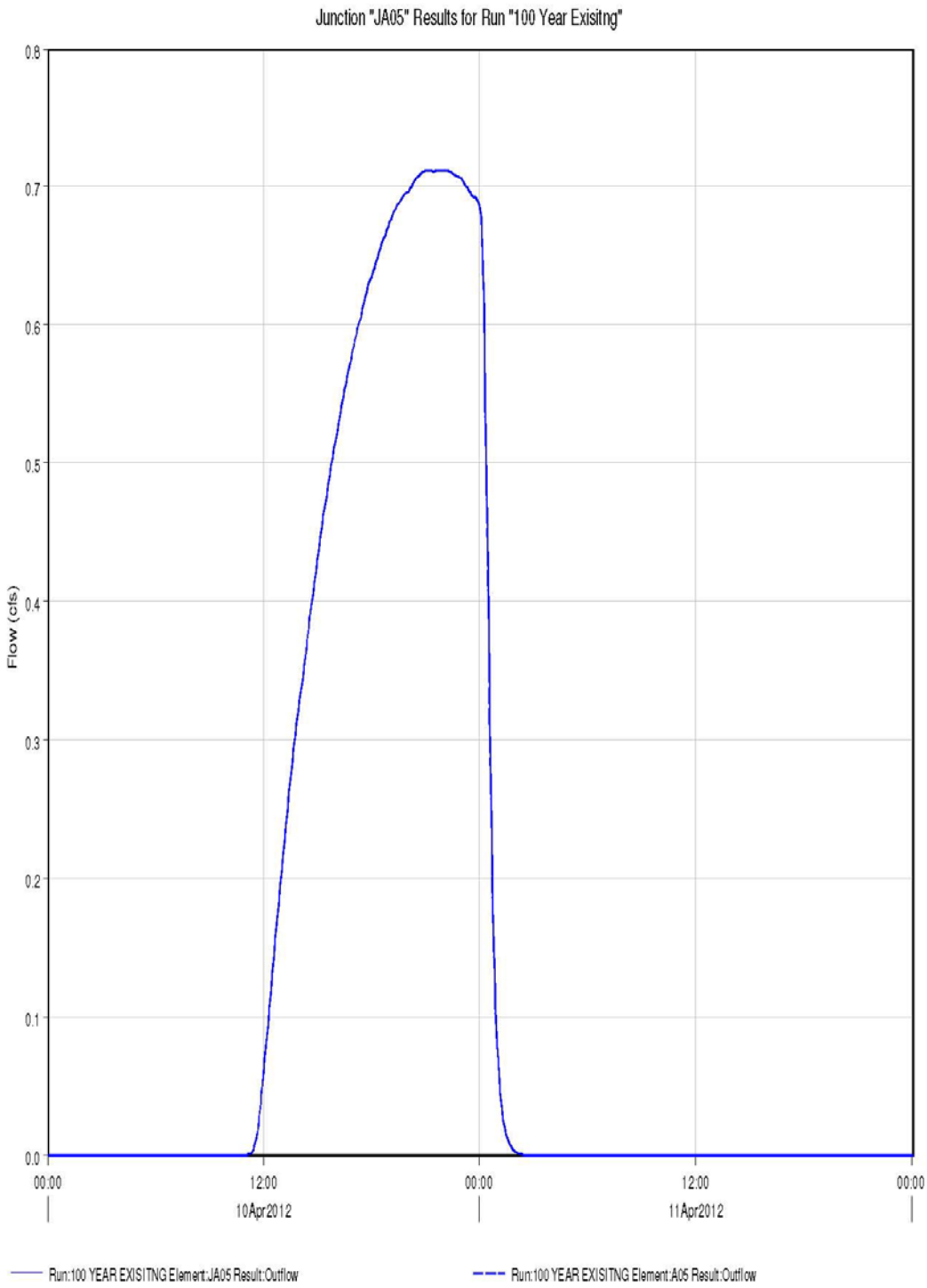
Client: *Newmont Mining Corporation*
Project: *Rhoads Property*
Description: Rhoads Borrow Area: Pre-Project vs. Post-Project Surface Water Analysis

Sheet: *16* **of** *22*
Date: *11-Nov-2013*
Job No: ***1011322***



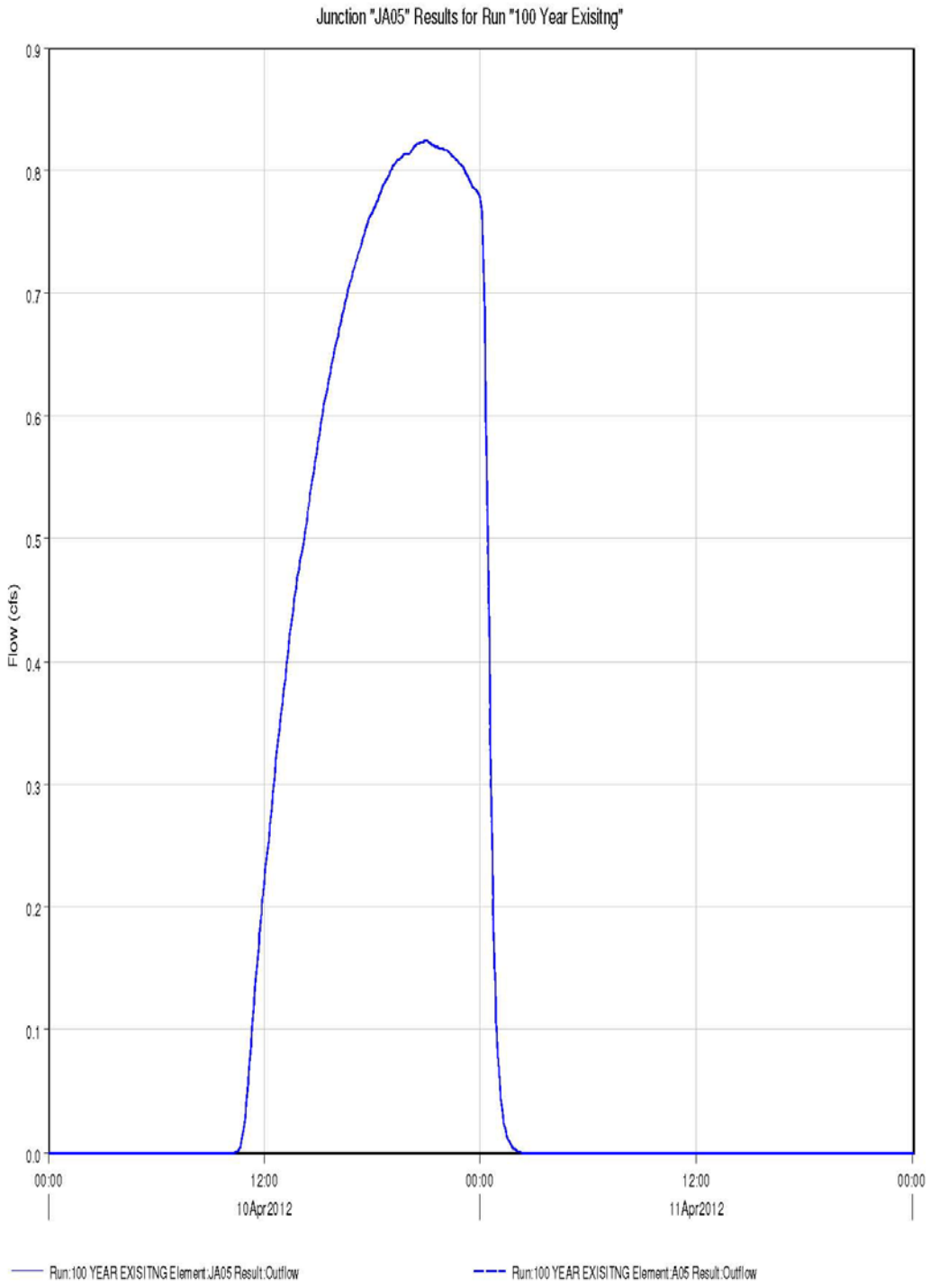
Client: *Newmont Mining Corporation*
Project: *Rhoads Property*
Description: Rhoads Borrow Area: Pre-Project vs. Post-Project Surface Water Analysis

Sheet: *17* **of** *22*
Date: *11-Nov-2013*
Job No: ***1011322***



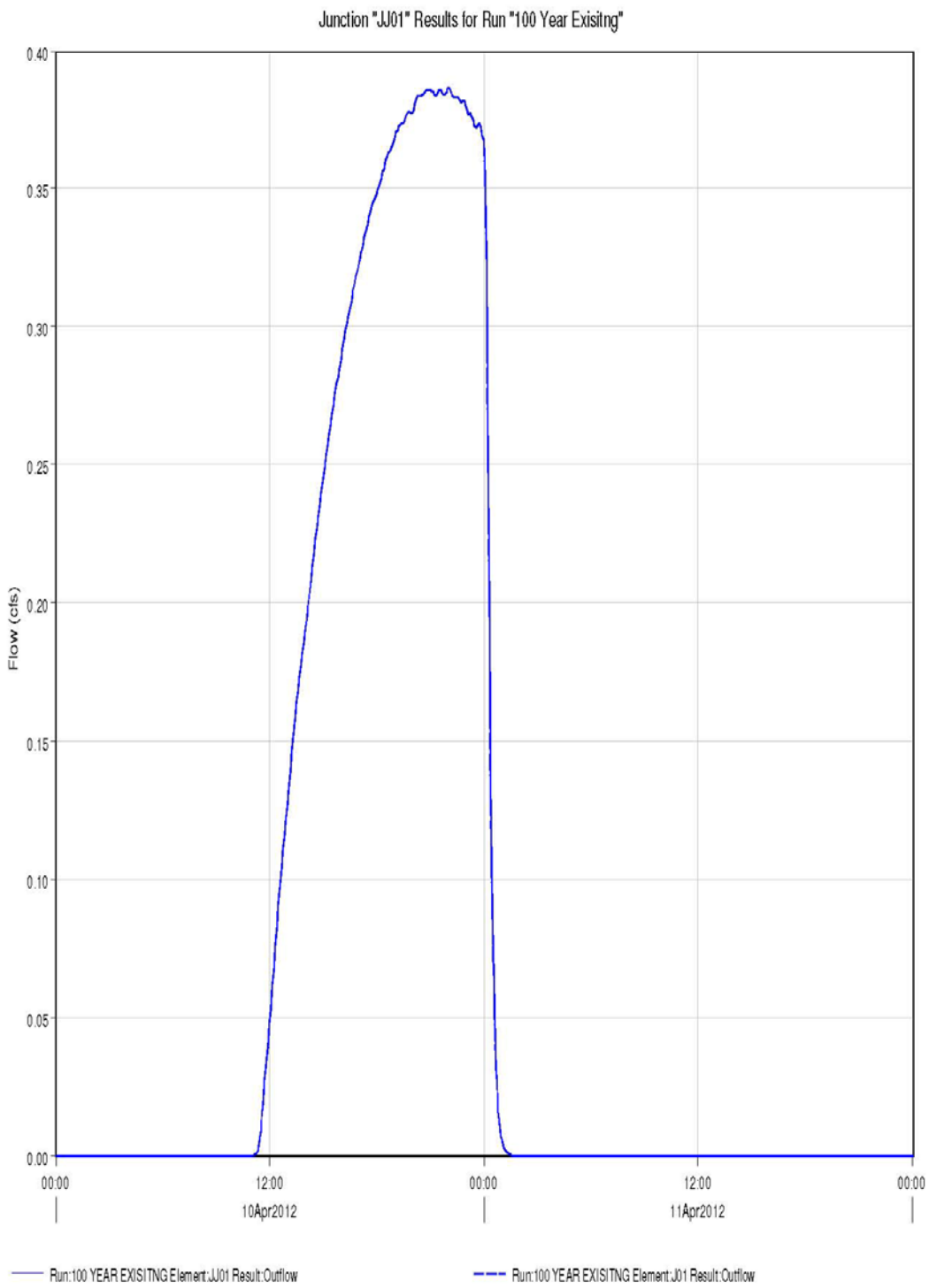
Client: *Newmont Mining Corporation*
Project: *Rhoads Property*
Description: Rhoads Borrow Area: Pre-Project vs. Post-Project Surface Water Analysis

Sheet: *18* **of** *22*
Date: *11-Nov-2013*
Job No: ***1011322***

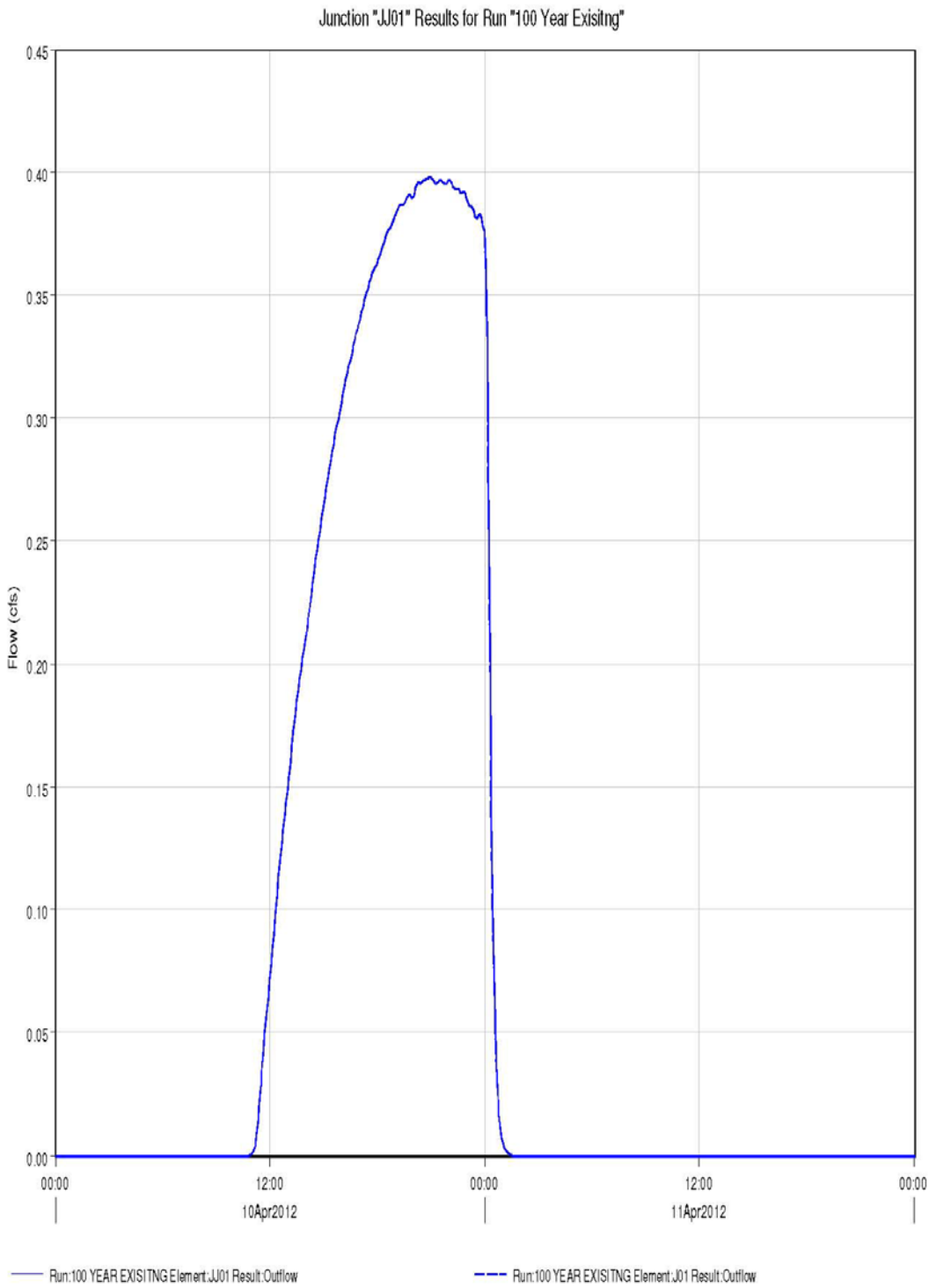


Client: *Newmont Mining Corporation*
Project: *Rhoads Property*
Description: Rhoads Borrow Area: Pre-Project vs. Post-Project Surface Water Analysis

Sheet: *19* **of** *22*
Date: *11-Nov-2013*
Job No: ***1011322***

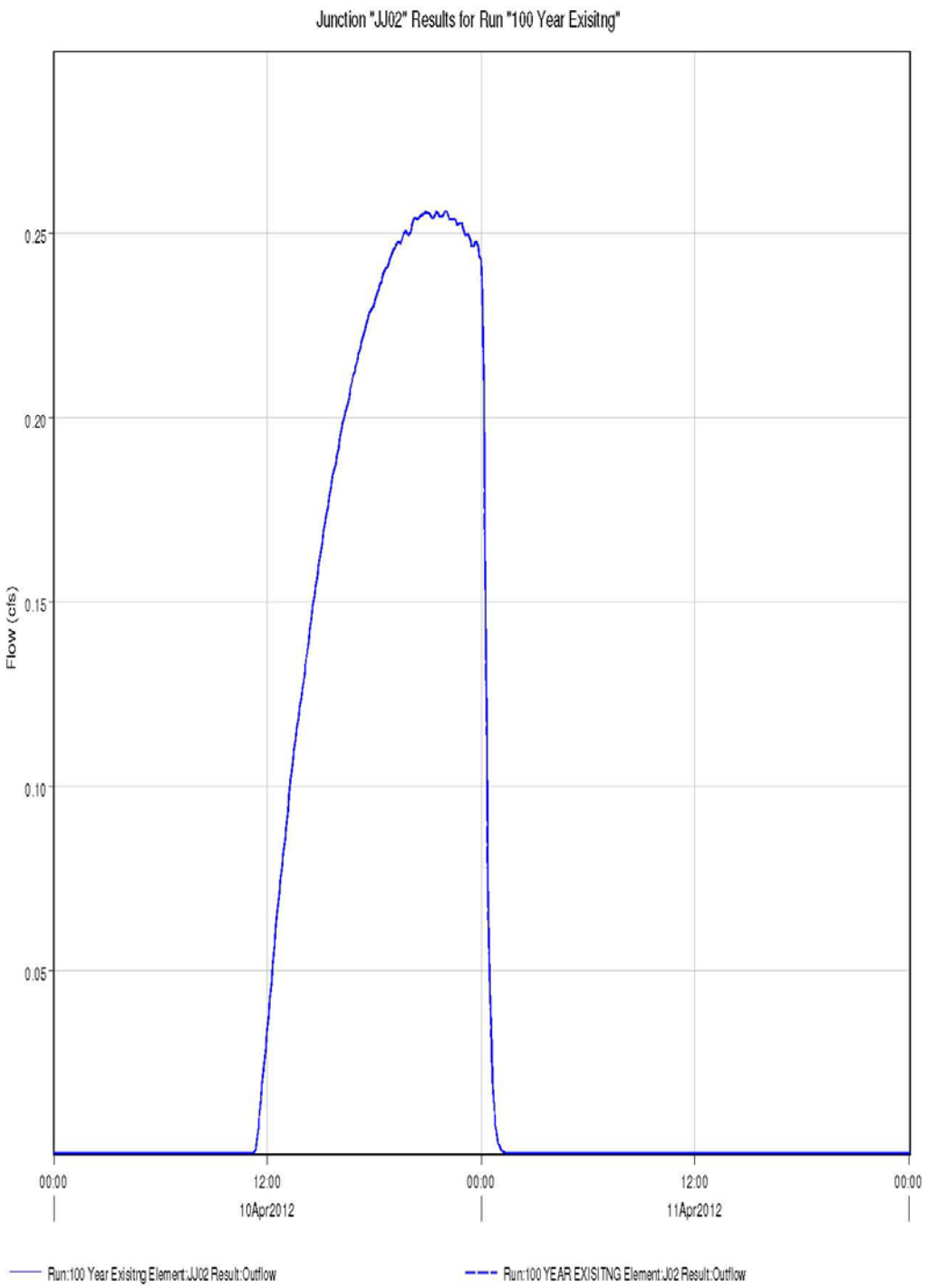


Client:	*Newmont Mining Corporation*	**Sheet:** *20* **of** *22*	
Project:	*Rhoads Property*	**Date:**	*11-Nov-2013*
Description:	Rhoads Borrow Area: Pre-Project vs. Post-Project Surface Water Analysis	**Job No:**	***1011322***



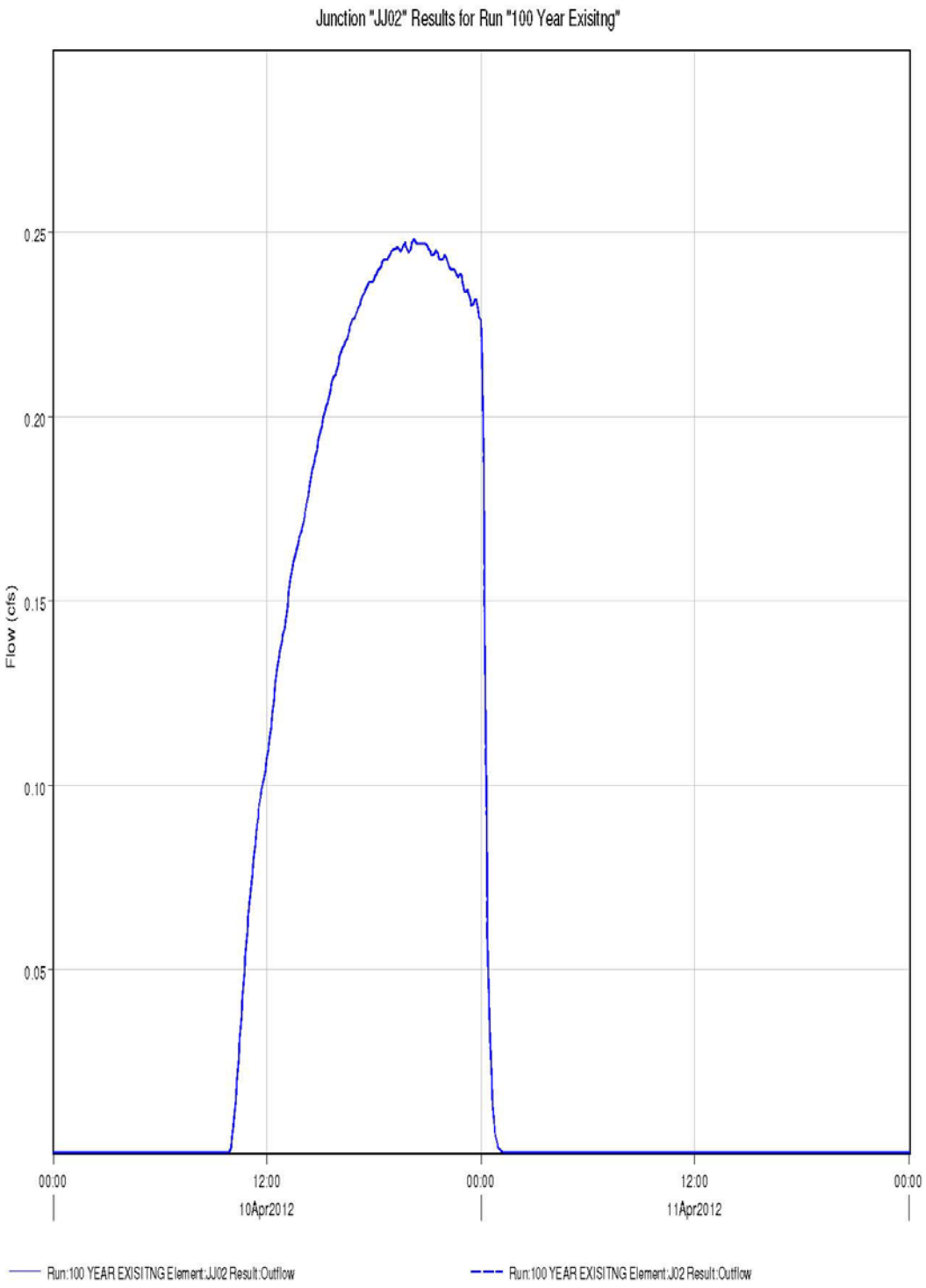
Client: *Newmont Mining Corporation*
Project: *Rhoads Property*
Description: Rhoads Borrow Area: Pre-Project vs. Post-Project Surface Water Analysis

Sheet: *21* **of** *22*
Date: *11-Nov-2013*
Job No: ***1011322***



Client: *Newmont Mining Corporation*
Project: *Rhoads Property*
Description: Rhoads Borrow Area: Pre-Project vs. Post-Project Surface Water Analysis

Sheet: *22* **of** *22*
Date: *11-Nov-2013*
Job No: ***1011322***



APPENDIX H

RHOADS PROPERTY STORMWATER POLLUTION PREVENTION PLAN

Rhoads Stormwater Pollution Prevention Plan

Revision 2

April 29, 2014

Prepared for:

Dawn Mining Company
PO Box 250
Ford, Washington 99013

and

Newmont USA Limited
6363 South Fiddler's Green Circle
Greenwood Village, Colorado 80111

Prepared By:

MWH Americas, Inc.
3665 JFK Parkway, Bldg 1, Suite 206
Fort Collins, Colorado 80525

TABLE OF CONTENTS

H1.0 INTRODUCTION 1

H1.1 PROJECT DESCRIPTION 1

H2.0 RHOADS PROPERTY DESCRIPTION 2

H3.0 SCHEDULE 3

H4.0 SENSITIVE AREAS 4

H5.0 ELEMENTS OF CONSTRUCTION STORMWATER POLLUTION PREVENTION 5

H5.1 ELEMENT #1: PRESERVE VEGETATION/MARK CLEARING LIMITS 5
H5.2 ELEMENT #2: ESTABLISH CONSTRUCTION ACCESS 5
H5.3 ELEMENT #3: CONTROL FLOW RATES 6
H5.3.1 Critical Habitat Buffer Zone 6
H5.3.2 Excavation Control 6
H5.3.3 Check Dams 7
H5.4 ELEMENT #4: INSTALL SEDIMENT CONTROLS 7
H5.5 ELEMENT #5: STABILIZE SOILS 7
H5.6 ELEMENT #6: PROTECT SLOPES 7
H5.7 ELEMENT #7: PROTECT DRAIN INLETS 8
H5.8 ELEMENT #8 STABILIZE CHANNELS AND OUTLETS 8
H5.9 ELEMENT #9: CONTROL POLLUTANTS 8
H5.10 ELEMENT #10: CONTROL DEWATERING 9
H5.11 ELEMENT #11: MAINTAIN BMPS 9
H5.12 ELEMENT #12: MANAGE THE PROJECT 9

H6.0 REFERENCES 10

FIGURES

Figure H1 Initial Work – Access Road Construction
Figure H2 Phase 1 Excavation and Reclamation Sequence
Figure H3 Phase 2 Excavation and Reclamation Sequence
Figure H4 Phase 3 Excavation and Reclamation Sequence
Figure H5 Final Reclaimed Surface Map
Figure H6 Sediment Control BMP Design Details (1 of 3)
Figure H7 Sediment Control BMP Design Details (2 of 3)
Figure H8 Sediment Control BMP Design Details (3 of 3)

ATTACHMENTS

Attachment H1 Construction Stormwater General Permit

Attachment H2 Surface Water Analyses for Construction Storm Water Pollution Prevention Plan

H1.0 INTRODUCTION

This Stormwater Pollution Prevention Plan (SWPPP) has been prepared in general accordance with the guidelines and procedures outlined in *How to Meet Ecology's Construction Stormwater General Permit Requirements: A Guide for Construction Sites*, by the Washington State Department of Ecology (WDOE, 2010). This SWPPP presents sediment and erosion control measures to be implemented during borrow activities as described in the *Rhoads Property Plan of Operations and Reclamation* (POR; MWH, 2014).

The Federal Clean Water Act (CWA) requires a Construction Stormwater General Permit (CSWGP) for clearing, grading, and excavating activities that have the potential to discharge stormwater to surface and ground waters. The Washington Department of Ecology CSWGP is included in Attachment H1. This SWPPP was prepared to satisfy the requirements of the CWA and CSWGP, and describes the measures to prevent pollution of surface water by sediments mobilized during construction activities, and to minimize damage to construction areas caused by erosion. A CSWGP application will be completed and filed with the appropriate regulatory authority.

The objectives of this SWPPP are to implement Best Management Practices (BMPs) to prevent or minimize erosion and sedimentation, and to identify, reduce, eliminate, or prevent stormwater contamination and water pollution from construction activity. This SWPPP will be reviewed and updated by the Project Engineer prior to each construction season and monthly during the construction season, or whenever there is a change in design, construction, operation, or maintenance at the construction site that has, or could have, a significant effect on the discharge of pollutants to surface waters or groundwater at or adjacent to the site. This SWPPP will be maintained on site during all borrow activities.

H1.1 PROJECT DESCRIPTION

Borrow soil (clayey sand) will be excavated from the Rhoads Property for use as cover soil during the remediation of the nearby Midnite Mine (MM) as explained in the POR. The location of the Rhoads Property and MM are shown on Figures 1 and 2 in the POR. The borrow activities will comprise the following:

- Delineating work areas
- Installing stormwater controls
- Harvesting timber
- Clearing
- Stripping and stockpiling topsoil
- Excavating and transporting borrow material
- Ripping excavated area to loosen and roughen subsoil surface
- Shaping excavated area to match surrounding terrain
- Replacing topsoil over subsoil
- Re-vegetating the disturbed areas

Specific project details can be found in the POR, which includes the Excavation Plan and Reclamation Plan.

H2.0 RHOADS PROPERTY DESCRIPTION

The Borrow Area is an undeveloped 81-acre parcel situated on fee land within the boundary of the Spokane Indian Reservation, just southwest of MM (see POR Figure 2). The property is located in the North ½ of the Northeast ¼ of Section 14, Township 28 North, Range 37 East. The areas immediately adjacent to the Rhoads Property are undeveloped woodlands and meadows with similar characteristics as discussed in the POR.

H3.0 SCHEDULE

The borrow activities will align with the scheduled capping of the consolidated mining wastes at MM, that are tentatively scheduled to occur in three phases; (1) upon completion of backfilling of Pit 4, (2) upon completion of regrading and initial backfilling of Pit 3, and (3) upon completion of final backfilling and grading of Pit 3. In order to minimize the potential for erosion and sediment transport from disturbed areas, construction activities in the borrow area will be limited to drier parts of the year (i.e., June through October). During years when borrow area activities occur, a portion (or segment) of the Rhoads Property will be used to obtain borrow material. Each disturbed area will be concurrently reclaimed at the end of the construction season to prevent erosion and to initiate stabilization of the disturbed areas. This process will repeat each construction season that borrow materials are required during the Remedial Action (RA). Long-term maintenance will occur to ensure the Rhoads Property reclamation efforts are successful. BMPs will be planned and implemented prior to any borrow activities.

H4.0 SENSITIVE AREAS

As described in the POR, no excavation will be performed within a 50-foot area on either side of Whitetail Creek. In addition, borrow excavation will not occur in areas where steep areas adjoining Whitetail Creek will result in poor access for installation of stormwater and sediment controls, and would have a higher likelihood of sediment transport to the creek as shown on Figures H3 through H5. Other ephemeral drainage pathways on the site typically do not contain surface water flow, but may flow during and immediately after storm events. These ephemeral drainage pathways in pathways not containing obvious drainage channel bed and bank features will be excavated down to the weathered bedrock surface. The topography of the excavated surface will be very similar to the pre-excavation topography. As a result, drainage, and potential sediment transport will be concentrated in these ephemeral drainage pathways. The areas where these drainages cross the southern boundary of the Rhoads Property are areas where stormwater and associated sediments are most likely to migrate off-site. These locations will be a focus of the stormwater/sediment controls and BMPs described later in this SWPPP and as shown on Figures H1 through H5.

H5.0 ELEMENTS OF CONSTRUCTION STORMWATER POLLUTION PREVENTION

This section presents a narrative of the 12 SWPPP elements as described in WDOE construction stormwater guidance. These elements cover the general strategies for preventing erosion and sedimentation. The BMPs to be used to control sediments during the Rhoads Property borrow activities are shown on Figures H6 through H8.

H5.1 ELEMENT #1: PRESERVE VEGETATION/MARK CLEARING LIMITS

All clearing limits, sensitive areas and their buffers within the construction area will be clearly marked before beginning land-disturbing activities. To the extent practicable, the duff layer, native top soil, and natural vegetation will be left in an undisturbed state in areas outside the marked disturbance zones.

During each construction season, the segments of the Rhoads Property that will be used to obtain borrow soil (as well as the stockpile areas and access routes) will be marked with stake and wire fence. These areas are shown on Figures H2 through H5. Only areas to be excavated during the particular construction season will be cleared of vegetation. The 50-foot non-disturbance buffer zone on either side of Whitetail Creek will be clearly marked and fenced with four-foot chain-link fence so that this area can be left undisturbed during the construction activities. Steeper slopes along Whitetail Creek will be similarly marked and not disturbed during borrow excavation. In addition, a 25-foot no-disturbance buffer will be maintained around the entire site perimeter, as shown on Figures H1 through H5.

H5.2 ELEMENT #2: ESTABLISH CONSTRUCTION ACCESS

As part of the overall RA at MM, a new permanent access road will be built extending from the West End Road to the west access point of MM and traversing the east side of the Rhoads Property as shown on Figure H1. This new road will provide access to the new water treatment plant and other RA facilities on the west side of MM. This road will be constructed during the earliest phase of project development and will include an asphalt-paved running surface to reduce dust and sediment runoff from the roadway.

A new temporary haul road also will be constructed to allow borrow soil transport from the Rhoads Property to MM as shown on Figure H2. The haul road will be the primary access for equipment involved in borrow area operations and will be constructed immediately prior to when borrow materials are needed during the RA. The haul road will be removed as part of the reclamation activities.

The temporary haul road will replace the existing two-track road that currently provides access to the site and will generally follow the existing road alignment to minimize additional disturbance. Vehicle and construction-equipment traffic from the mine site to the working segments of the borrow area will follow the borrow-area haul road. The borrow-area haul road will cross Whitetail Creek at the same point as the current vehicle crossing in order to reduce additional disturbance to Whitetail Creek. The borrow excavation will progress from west to east across the site, with the haul road being removed and reclaimed as it is no longer needed to access borrow area segments following reclamation.

Haulage vehicles transporting soil between the Rhoads Property and MM will only travel on "clean" roads that are outside of the contaminated mine area. Likewise, the borrow material from the Rhoads Property will be dumped and stockpiled in clean areas outside of the contaminated mine area pending use of the borrow material as soil cover. As a result, it will not be necessary to decontaminate the haulage vehicles between trips to the Rhoads Property. Newmont will perform weekly radiation surveys along the roadway surface to verify the clean status of the road. The roadway radiation surveys will be performed using the techniques and criteria used to survey the haulage equipment prior to first use as described below.

A Newmont representative will survey all haulage and excavation equipment for radionuclide contamination before first entry to the Rhoads Property at the beginning of each of the three scheduled borrow events. Haulage and excavation equipment must pass an appropriate radiation survey (alpha or beta as determined by the Newmont Radiation Safety Technician [RST]) before first entering the Rhoads Property at the beginning of each of the scheduled borrow events. The alpha radiation count rate must be less than 20 counts per minute (cpm), and the beta radiation count rate must be less than 50 cpm above background (note: the Rhoads Property background beta count rate will be determined prior to initiating the borrow activities). Vehicles/equipment not passing will be decontaminated at the designated MM area until the above radiation-count criteria are met before entering the Rhoads Property or before travelling on clean roads. All radiation surveys will be conducted in accordance with protocols provided in Midnite Mine Standard Operating Procedure 04 (MM-SOP04), General Survey Meter Operations and Contamination Surveys, Revision 0, February 15, 2009, which is included in Appendix D of the POR.

H5.3 ELEMENT #3: CONTROL FLOW RATES

The primary mechanism for controlling flow rates during the borrow activities will be to prevent stormwater in the disturbed areas from discharging directly into Whitetail Creek. This will be accomplished as follows:

H5.3.1 Critical Habitat Buffer Zone

A 50-foot buffer zone on either side of Whitetail Creek will be left undisturbed to prevent construction-related sediment transfer to the creek. In addition, steeper slopes along Whitetail Creek will be left undisturbed. These areas will be marked as described in SWPPP Element #1 above.

H5.3.2 Excavation Control

Borrow excavations will progress as shown on Figures H2 through H5. The downhill edge of the excavation will be silt fenced prior to any excavation, the area immediately up-gradient of the silt fence will be excavated below grade and/or bermed to control stormwater runoff from the disturbed area. During excavation, the active borrow excavation areas will be shaped to maintain a shallow earthen escarpment at the downhill edge of the excavation and retain runoff volumes associated with 2-year, 6-hour stormwater runoff within the excavation area. The downstream edge of the excavation area will be graded to slope uphill or bermed so that runoff that does not immediately infiltrate into the excavation bottom will pond, allowing sediments to settle out as the ponded water infiltrates or evaporates.

H5.3.3 Check Dams

Check dams will be constructed as needed in roadside ditches and the ephemeral drainage pathways at the Rhoads Property. The objective of the check dams are to prevent erosion and promote sedimentation by slowing flow velocities. These check dams will be installed in disturbed areas after completion of road construction activities and borrow excavation, regrading and topsoil replacement. The check dams will be inspected weekly and immediately after a significant storm event. The check dams will be repaired, if necessary, as soon as practicable after the inspection and accumulated sediments removed and placed in the borrow stockpiles.

H5.4 ELEMENT #4: INSTALL SEDIMENT CONTROLS

Sediment controls will be constructed at locations where stormwater from disturbed areas has the potential to flow into Whitetail Creek or off site. These locations include the downhill ends of active borrow area segments (silt fences), along the toe of borrow-area haul road fill slopes (silt fences), at drainage outlets from haul and access road ditches (drainage turnouts to level-spreaders and/or sediment traps at regular intervals), and around temporary topsoil stockpile areas (silt fences). Sediment traps will be installed in the ephemeral drainage pathways and in Whitetail Creek at the downhill (southerly) edge of the site, and silt fences will be installed along the downhill edge of the site in areas where concentrated runoff is not expected. The sediment control structures will be erected and functional prior to commencing of topsoil stripping for borrow excavations. The design of the sediment control structures is shown on Figures H6 through H8.

In addition, the haul road crossings of the two ephemeral drainages to the west of Whitetail Creek will be designed and constructed as sediment detention basins as indicated on Figure H2. These detention basins will have the capacity to store the runoff volume from the two-year, 6-hour storm, and bypass the 100-year, 24-hour storm without overtopping the road section as described in Attachment H2.

The sediment control structures will be inspected weekly and immediately after a storm event of equal to or greater than 1 inch of precipitation in 24 hours. They will be repaired, if necessary, as soon as practicable after the inspection and accumulated sediments removed and placed in the borrow stockpiles. The sediment control structures will be maintained until revegetation has been completed in upland areas and approval has been received from the Tribe for their removal.

H5.5 ELEMENT #5: STABILIZE SOILS

Upon completion of excavation of a borrow area segment, disturbed areas in that segment will be reclaimed in accordance with the POR in order to permanently stabilize the soils.

H5.6 ELEMENT #6: PROTECT SLOPES

Slopes will be protected in order to minimize erosion. This will include:

- Reducing continuous slope lengths by installation and maintenance of silt fencing along slope contours at approximately 100 foot spacings in disturbed areas until vegetation has been reestablished.

- Roughening the slope surface by track-walking completed slopes with tracked construction equipment in an upslope direction prior to revegetation work.
- Diverting upslope drainage and run-on waters with interceptors at top of slopes. When feasible, this water will be diverted around the disturbed areas to vegetated areas, or to Whitetail Creek or its unnamed tributaries before they exit the site.

H5.7 ELEMENT #7: PROTECT DRAIN INLETS

Culvert inlets installed along the access and haul roads will be protected to prevent coarse sediment from entering the drainage systems by designing the crossing to function as sediment detention basins as described in Section H5.4.

H5.8 ELEMENT #8 STABILIZE CHANNELS AND OUTLETS

Channels constructed along the haul road and access road will be designed, constructed, and stabilized to prevent erosion from the expected peak flow velocity of the 6-month, 3-hour storm. The channels will contain turnouts at regularly-spaced intervals as shown on Figures H1 through H5 in order to control flow volumes and velocities in any given channel segment. Channels will be stabilized with check dams, gravel filter berms. Channel outlets at drainage turnouts shall be routed to level spreaders or sediment traps and outlets shall be protected with armoring material (e.g., rip rap or erosion blankets) as shown on the figures.

H5.9 ELEMENT #9: CONTROL POLLUTANTS

Potential pollutants used for the work will be limited to those associated with motor vehicle and equipment operation, and chemicals that may be used to control noxious weeds. Vehicle and equipment fueling and maintenance will be performed at a designated area within the disturbed area of MM (i.e., these activities will not be performed on the Rhoads Property). Likewise, no fuels oils, lubricants, or chemicals will be stored on the Rhoads Property.

The BMPs that the Construction Contractor (CC) will use to control pollutants during borrow and site reclamation activities include:

- Employee Awareness Training: the CC will communicate to employees via daily tailgate meetings the protocols and procedures for proper handling and disposal of potential pollutants.
- Vehicle Maintenance: No vehicle maintenance will occur on the Rhoads Property.
- Hazardous Material Storage: No hazardous materials will be stored on the Rhoads Property. Material safety data sheets, a hazardous chemical inventory, and emergency contact information will be maintained at the CC's project trailer.
- Visual inspections: All equipment will be inspected on a weekly basis to ensure that oil or other petrochemicals are not leaking from the equipment. Leaking equipment will be removed from the area and repaired.
- Spill Kits and Spill Response: The CC will maintain spill kits appropriate for the materials being used during the borrow and reclamation activities. The CC will clean all spills immediately upon discovery, and properly dispose of the spent absorbent materials off-site. The Company Alternate Project Coordinator or the Project Coordinator will report any spill requiring reporting to the National Response Center at 1-800-424-8802 the EPA

Region 10 Remedial Project Manager, and the Director of the Spokane Tribe Department of Natural Resources.

Any wastes generated during the borrow and reclamation activities (including any excess pesticides or herbicides) will be handled and disposed of in accordance with applicable laws as described in Section 5.0 of the POR. Excess pesticides or herbicides will be disposed of in accordance with product label directions or information contained on material safety data sheets.

H5.10 ELEMENT #10: CONTROL DEWATERING

No dewatering is anticipated. If de-watering is required, discharge will be to an upland area where the flow will infiltrate and not run off.

H5.11 ELEMENT #11: MAINTAIN BMPS

The temporary erosion and sediment control BMPs will be maintained by the CC and repaired as needed to assure continued performance of their intended function. Maintenance and repair will be conducted in accordance with the BMP standards and specifications. Sediment control BMPs will be inspected by the Project Engineer (or designated person) every day during the construction seasons when there is a discharge from the site, and at least weekly when there is no discharge. If these inspections reveal damage to any BMPs, repair and/or alterations will be made to the affected systems and the SWPPP modified as necessary to accommodate any unforeseen conditions. The inspection frequency will be reduced to monthly for stabilized areas (i.e., reclaimed areas during inactive winter months). All temporary erosion and sediment BMPs will be removed within 30 days after the final site stabilization is achieved or after the temporary BMPs are no longer needed. Sediment control structures in ephemeral drainages and Whitetail Creek will remain in place until vegetation has been reestablished and approval for removal has been received from the Tribe. Trapped sediment will be removed or stabilized on site. Disturbed soil resulting from the removal of BMPs will be permanently stabilized.

H5.12 ELEMENT #12: MANAGE THE PROJECT

The Project Engineer will be responsible for confirming that the CC abides by this SWPPP, and will have stop-work authority. The Project Engineer will be a qualified professional in erosion and sediment control.

The Project Engineer will modify this SWPPP whenever inspection and/or monitoring indicates that the BMPs are inadequate, due to the actual discharge of or potential to discharge a pollutant. Likewise, this SWPPP will be modified whenever there is a change in the design, construction, operation, or maintenance of any BMP. This SWPPP shall be retained on-site or within reasonable access to the site.

H6.0 REFERENCES

MWH, 2014. *Rhoads Property Plan of Operation and Reclamation, Revision 2*. Prepared on behalf of Newmont USA Limited and Dawn Mining Company. April.

Washington State Department of Ecology (WDOE), 2010. *How to Meet Ecology's Construction Stormwater General Permit Requirements: A Guide for Construction Sites*. Publication #99-37. March.

RHOADS PROPERTY BOUNDARY

PROPOSED MIDNITE MINE SITE ACCESS

WHITETAIL CREEK RIPARIAN AREA,
NO EXCAVATION WITHIN 50' OF CREEK

WESTERN ACCESS ROAD

WHITETAIL CREEK

PROPOSED MIDNITE MINE SITE ACCESS ROAD

EXISTING SITE ROAD

WEST END RD

N 352,000

N 351,000

E 2,308,000

E 2,309,000

E 2,310,000

2525 2500 2475 2450 2425 2400 2375 2350 2325

0 120' 240'

LEGEND:

2475	EXISTING GROUND SURFACE ELEVATION, FEET
	EXISTING ROAD
	EXISTING DRAINAGE
	LIMITS OF EXCAVATION
—x—	FENCE
	LEAD-OFF DITCH

DRAWING REFERENCE(S):

- EXISTING TOPOGRAPHY BASED UPON LIDAR MAPPING BY SPATIAL INTEL, 2010. WASHINGTON STATE PLANE-NORTH, NAD 83/NAVD 88.

DESIGNED BY	T KELLEY	04-14
DRAWN BY	D MIRANDA	04-14
CHECKED BY	T KELLEY	04-14
APPROVED BY	C STRACHAN	04-14
PROJECT MANAGER	V DRAIN	04-14
CLIENT APPROVAL	B LYLE	
CLIENT REFERENCE NO.		

NEWMONT

PROJECT LOCATION: WELLPINIT, WASHINGTON

PROJECT: RHOADS BORROW

TITLE: INITIAL WORK - ACCESS ROAD CONSTRUCTION

MWH

FIGURE: H1

REVISION: 0

FILE NAME: 1011322 H1

DATE: APR 2014

L:\Design-Drafting\Clients-I-P\NEWMONT\1011322 MIDNITE MINE\013-Sheet Set\FIGURES\2014-04-30 SWPPP\1011322 H1

RHOADS PROPERTY BOUNDARY

PROPOSED MIDNITE MINE SITE ACCESS

DETENTION POND OUTLET

WHITETAIL CREEK RIPARIAN AREA, NO E□CAVATION WITHIN 50□ OF CREEK

WHITETAIL CREEK CULVERT CROSSING

DETENTION POND OUTLET

WHITETAIL CREEK HAUL ROAD CROSSING

SEDIMENT TRAP TO BE MAINTAINED UNTIL REVEGETATION HAS BEEN COMPLETED AND APPROVAL RECEIVED FROM TRIBE

PROPOSED BORROW AREA HAUL ROAD

WHITETAIL CREEK

PROPOSED MIDNITE MINE SITE ACCESS ROAD

SEDIMENT TRAP TO BE MAINTAINED UNTIL REVEGETATION HAS BEEN COMPLETED AND APPROVAL RECEIVED FROM TRIBE

SEDIMENT TRAP TO BE MAINTAINED UNTIL REVEGETATION HAS BEEN COMPLETED AND APPROVAL RECEIVED FROM TRIBE

SEDIMENT TRAP TO BE MAINTAINED UNTIL REVEGETATION HAS BEEN COMPLETED AND APPROVAL RECEIVED FROM TRIBE

WEST END RD

N 352,000

N 351,000

E 2,308,000

E 2,309,000

E 2,310,000

2500

2450

2400

2350

0 100' 200'

DRAWING REFERENCE(S):

- EXISTING TOPOGRAPHY BASED UPON LIDAR MAPPING BY SPATIAL INTEL, 2010. WASHINGTON STATE PLANE–NORTH, NAD 83/NAVD 88.

LEGEND:

- 2475 EXISTING GROUND SURFACE ELEVATION, FEET
- EXISTING DRAINAGE
- FENCE
- LIMITS OF EXCAVATION
- EXCAVATION SEGMENT
- LEAD–OFF DITCH
- TOPSOIL STOCKPILE AREAS
- CULVERT
- LEAD–OFF DITCH AND SEDIMENT TRAP

DESIGNED BY	T KELLEY	04–14
DRAWN BY	D MIRANDA	04–14
CHECKED BY	T KELLEY	04–14
APPROVED BY	C STRACHAN	04–14
PROJECT MANAGER	V DRAIN	04–14
CLIENT APPROVAL	B LYLE	
CLIENT REFERENCE NO.		

NEWMONT

PROJECT LOCATION: WELLPINIT, WASHINGTON

PROJECT: RHOADS BORROW

TITLE: PHASE 1 - E□CAVATION AND RECLAMATION SEQUENCE

MWH

FIGURE: H2

REVISION: 0

FILE NAME: 1011322 H2

DATE: APR 2014

L:\Design-Drafting\Clients-I-P\NEWMONT\1011322 MIDNITE MINE\013-Sheet Set\FIGURES\2014-04-30 SWPPP\1011322 H2

RHOADS PROPERTY BOUNDARY

PROPOSED MIDNITE MINE SITE ACCESS

RECLAIMED PHASE 1 E□CAVATION AREA

WHITETAIL CREEK RIPARIAN AREA, NO E□CAVATION WITHIN 50□ OF CREEK

DETENTION POND OUTLET

WHITETAIL CREEK HAUL ROAD CROSSING

WHITETAIL CREEK CULVERT CROSSING

SEDIMENT TRAP TO BE MAINTAINED UNTIL REVEGETATION HAS BEEN COMPLETED AND APPROVAL RECEIVED FROM TRIBE

PROPOSED BORROW AREA HAUL ROAD

WHITETAIL CREEK

PROPOSED MIDNITE MINE SITE ACCESS ROAD

SEDIMENT TRAP TO BE MAINTAINED UNTIL REVEGETATION HAS BEEN COMPLETED AND APPROVAL RECEIVED FROM TRIBE

SEDIMENT TRAP TO BE MAINTAINED UNTIL REVEGETATION HAS BEEN COMPLETED AND APPROVAL RECEIVED FROM TRIBE

SEDIMENT TRAP TO BE MAINTAINED UNTIL REVEGETATION HAS BEEN COMPLETED AND APPROVAL RECEIVED FROM TRIBE

WEST END RD

N 352,000

N 351,000

E 2,308,000

E 2,309,000

E 2,310,000

2500 2450 2400 2470 2460 2430 2420 2410 2390 2380 2350

0 100' 200'

DRAWING REFERENCE(S):

- EXISTING TOPOGRAPHY BASED UPON LIDAR MAPPING BY SPATIAL INTEL, 2010. WASHINGTON STATE PLANE–NORTH, NAD 83/NAVD 88.

LEGEND:

- 2475 — EXISTING GROUND SURFACE ELEVATION, FEET
- EXISTING DRAINAGE
- FENCE
- CULVERT
- LIMITS OF EXCAVATION
- EXCAVATION SEGMENT
- 2450 — ESTIMATED FINAL RECLAMATION GROUND SURFACE ELEV, FEET
- DIRECTION OF TOPSOIL STRIPPING, STOCKPILING
- NON–DISTURBANCE AREA DUE TO STEEP SLOPES, PROXIMITY TO WHITETAIL CREEK
- TOPSOIL STOCKPILE AREAS
- LEAD–OFF DITCH AND SEDIMENT TRAP
- LEAD–OFF DITCH

DESIGNED BY	T KELLEY	04–14
DRAWN BY	D MIRANDA	04–14
CHECKED BY	T KELLEY	04–14
APPROVED BY	C STRACHAN	04–14
PROJECT MANAGER	V DRAIN	04–14
CLIENT APPROVAL	B LYLE	
CLIENT REFERENCE NO.		

NEWMONT

PROJECT LOCATION: WELLPINIT, WASHINGTON

PROJECT: RHOADS BORROW

TITLE: PHASE 2 - E□CAVATION AND RECLAMATION SEQUENCE

MWH

FIGURE: H3

REVISION: 0

FILE NAME: 1011322 H3

DATE: APR 2014

L:\Design–Drafting\Clients–L–P\NEWMONT\1011322 MIDNITE MINE\013–Sheet Set\FIGURES\2014–04–30 SWPPP\1011322 H3

RHOADS PROPERTY BOUNDARY

PROPOSED BORROW AREA HAUL ROAD

PROPOSED MIDNITE MINE SITE ACCESS

WHITETAIL CREEK RIPARIAN AREA, NO EXCAVATION WITHIN 50' OF CREEK

RECLAIMED PHASE 1 EXCAVATION AREA

RECLAIMED PHASE 2 EXCAVATION AREA

SEDIMENT TRAP TO BE MAINTAINED UNTIL REVEGETATION HAS BEEN COMPLETED AND APPROVAL RECEIVED FROM TRIBE

WHITETAIL CREEK

PROPOSED MIDNITE MINE SITE ACCESS ROAD

SEDIMENT TRAP TO BE MAINTAINED UNTIL REVEGETATION HAS BEEN COMPLETED AND APPROVAL RECEIVED FROM TRIBE

SEDIMENT TRAP TO BE MAINTAINED UNTIL REVEGETATION HAS BEEN COMPLETED AND APPROVAL RECEIVED FROM TRIBE

SEDIMENT TRAP TO BE MAINTAINED UNTIL REVEGETATION HAS BEEN COMPLETED AND APPROVAL RECEIVED FROM TRIBE

WEST END RD

E 2,308,000 E 2,309,000 E 2,310,000

N 352,000 N 351,000

0 100' 200'

DRAWING REFERENCE(S):

- EXISTING TOPOGRAPHY BASED UPON LIDAR MAPPING BY SPATIAL INTEL, 2010. WASHINGTON STATE PLANE–NORTH, NAD 83/NAVD 88.

LEGEND:

- 2475 EXISTING GROUND SURFACE ELEVATION, FEET
- EXISTING DRAINAGE
- FENCE
- LIMITS OF EXCAVATION
- EXCAVATION SEGMENT
- 2450 ESTIMATED FINAL RECLAMATION GROUND SURFACE ELEV, FEET
- TOPSOIL STOCKPILE AREAS
- LEAD–OFF DITCH
- CULVERT

DESIGNED BY	T KELLEY	04–14
DRAWN BY	D MIRANDA	04–14
CHECKED BY	T KELLEY	04–14
APPROVED BY	C STRACHAN	04–14
PROJECT MANAGER	V DRAIN	04–14
CLIENT APPROVAL	B LYLE	
CLIENT REFERENCE NO.		

NEWMONT

PROJECT LOCATION: WELLPINIT, WASHINGTON

PROJECT: RHOADS BORROW

TITLE: PHASE 3 - EXCAVATION AND RECLAMATION SEQUENCE

MWH

FIGURE: H4

REVISION: 0

FILE NAME: 1011322 H4

DATE: APR 2014

L:\Design–Drafting\Clients–I–P\NEWMONT\1011322 MIDNITE MINE\013–Sheet Set\FIGURES\2014–04–30 SWPPP\1011322 H4

RHOADS PROPERTY BOUNDARY

PROPOSED MIDNITE MINE SITE ACCESS

WHITETAIL CREEK RIPARIAN AREA, NO EXCAVATION WITHIN 50' OF CREEK

SEDIMENT TRAP TO BE MAINTAINED UNTIL REVEGETATION HAS BEEN COMPLETED AND APPROVAL RECEIVED FROM TRIBE

WHITETAIL CREEK

PROPOSED MIDNITE MINE SITE ACCESS ROAD

SEDIMENT TRAP TO BE MAINTAINED UNTIL REVEGETATION HAS BEEN COMPLETED AND APPROVAL RECEIVED FROM TRIBE

SEDIMENT TRAP TO BE MAINTAINED UNTIL REVEGETATION HAS BEEN COMPLETED AND APPROVAL RECEIVED FROM TRIBE

SEDIMENT TRAP TO BE MAINTAINED UNTIL REVEGETATION HAS BEEN COMPLETED AND APPROVAL RECEIVED FROM TRIBE

WEST END RD

E 2,308,000 E 2,309,000 E 2,310,000

N 352,000 N 351,000

0 100' 200'

DRAWING REFERENCE(S):

- EXISTING TOPOGRAPHY BASED UPON LIDAR MAPPING BY SPATIAL INTEL, 2010. WASHINGTON STATE PLANE–NORTH, NAD 83/NAVD 88.

LEGEND:

2450	EXISTING GROUND SURFACE ELEVATION, FEET
2450	ESTIMATED FINAL RECLAMATION GROUND SURFACE ELEVATION, FEET
	EXISTING DRAINAGE
	FENCE
	LIMITS OF EXCAVATION
	LEAD–OFF DITCH

DESIGNED BY	T KELLEY	04–14
DRAWN BY	D MIRANDA	04–14
CHECKED BY	T KELLEY	04–14
APPROVED BY	C STRACHAN	04–14
PROJECT MANAGER	V DRAIN	04–14
CLIENT APPROVAL	B LYLE	
CLIENT REFERENCE NO.		

NEWMONT

PROJECT LOCATION: WELLPINIT, WASHINGTON

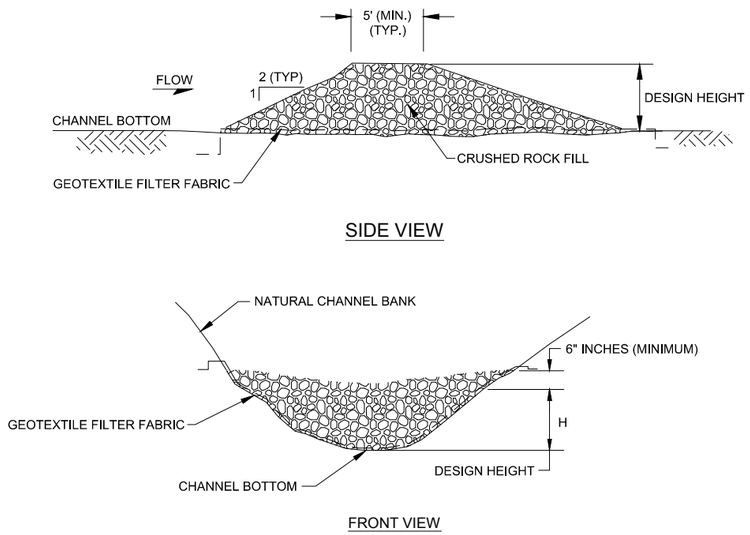
PROJECT: RHOADS BORROW

TITLE: FINAL RECLAIMED SURFACE MAP

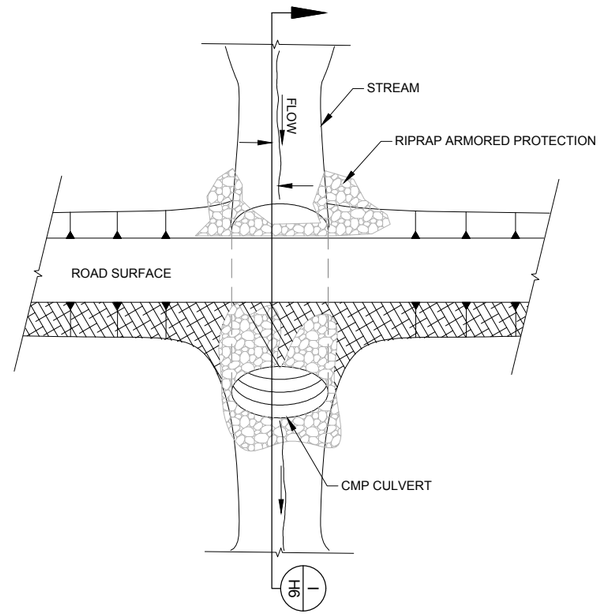
MWH

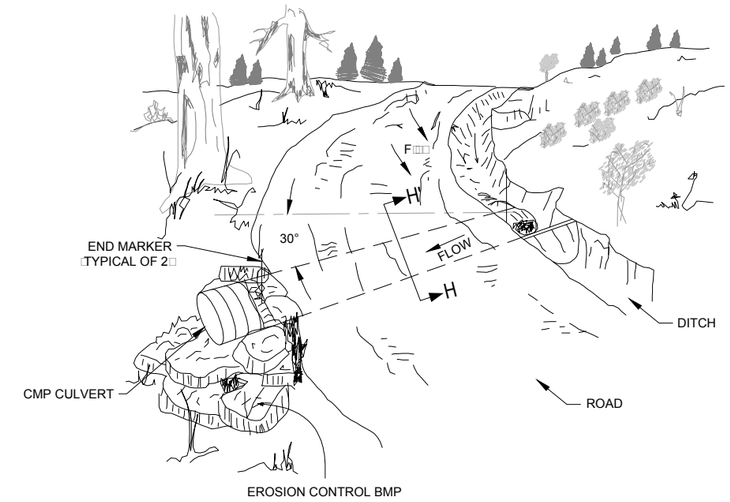
FIGURE	REVISION
H5	0
FILE NAME: 1011322 H5	DATE: APR 2014

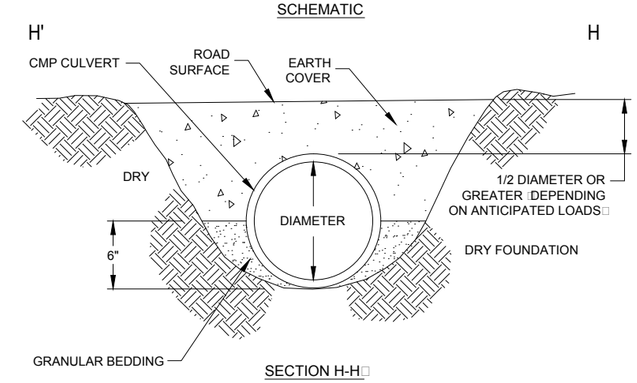
L:\Design–Drafting\Clients–I–P\NEWMONT\1011322 MIDNITE MINE\013–Sheet Set\FIGURES\2014–04–30 SWPPP\1011322 H5



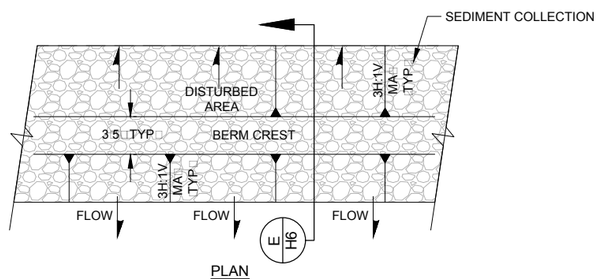
1 / H6 ROCK CHECK DAM
NOT TO SCALE

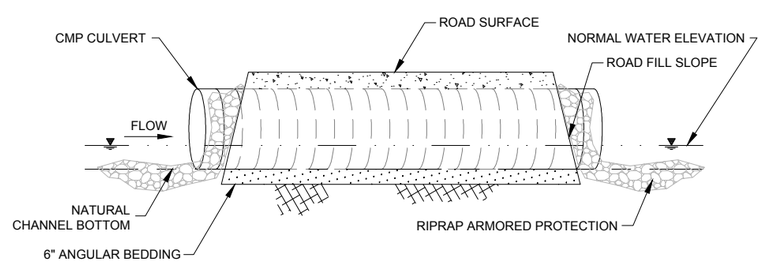




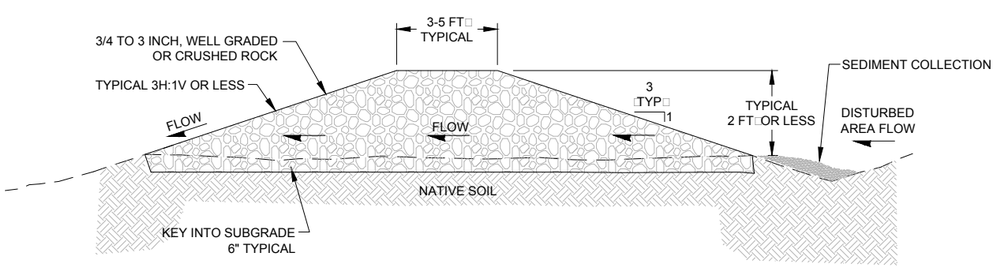


4 / H6 OUTLET PROTECTION
NOT TO SCALE

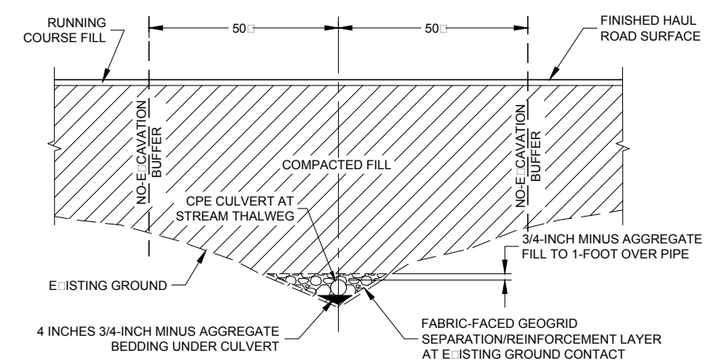




3 / H6 CULVERT UNDER ROAD
NOT TO SCALE



2 / H6 GRAVEL FILTER BERM
NOT TO SCALE



NOTE:
RUNNING COURSE FILL, COMPACTED FILL, AGGREGATE PIPE ENVELOPE FILL, CPE CULVERT, AND GEOGRID SEPARATION LAYER TO BE REMOVED AFTER COMPLETION OF BORROW ACTIVITIES WEST OF WHITETAIL CREEK.

5 / H6 WHITETAIL CREEK HAUL ROAD CROSSING
NOT TO SCALE

DESIGNED BY	T KELLEY	04-14
DRAWN BY	D MIRANDA	04-14
CHECKED BY	T KELLEY	04-14
APPROVED BY	C STRACHAN	04-14
PROJECT MANAGER	V DRAIN	04-14
CLIENT APPROVAL	B LYLE	
CLIENT REFERENCE NO.		

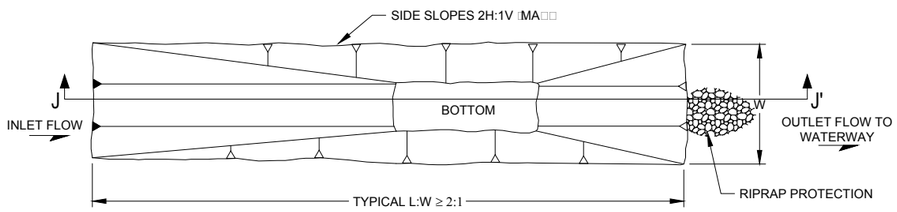
NEWMONT

PROJECT LOCATION: WELLPINIT, WASHINGTON
PROJECT: RHOADS BORROW
TITLE: SEDIMENT CONTROL BMP DESIGN DETAILS (1 OF 3)

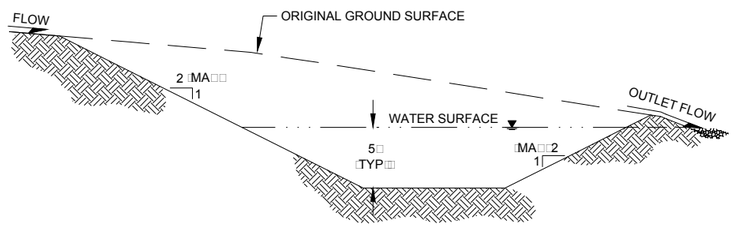
MWH

FIGURE: H6
REVISION: 0
FILE NAME: 1011322 H6
DATE: APR 2014

L:\Design-Drafting\Clients--P\NEWMONT\1011322 MIDNITE MINE\013-Sheet Set\FIGURES\2014-04-30 SWPPP\1011322 H6

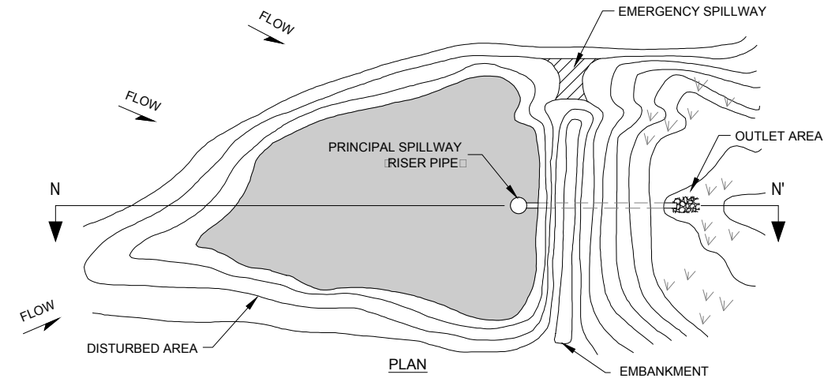


PLAN

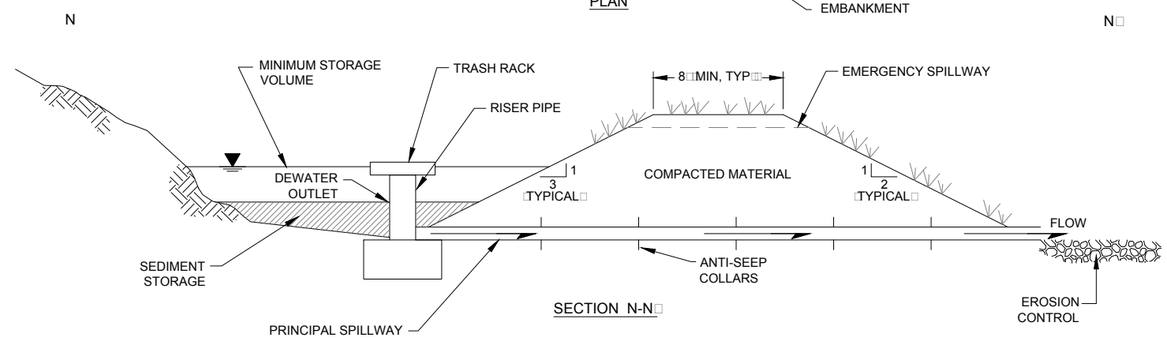


SECTION J-J□

6 / H7 SEDIMENT TRAP OR CATCH BASIN
NOT TO SCALE

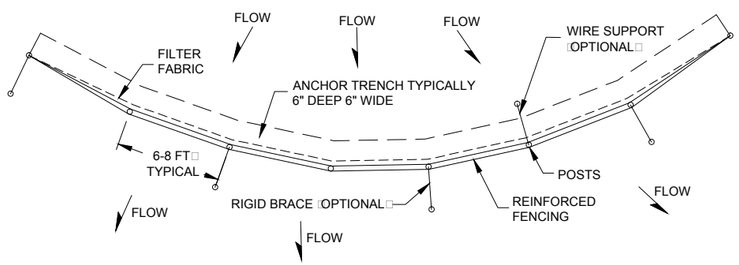


PLAN

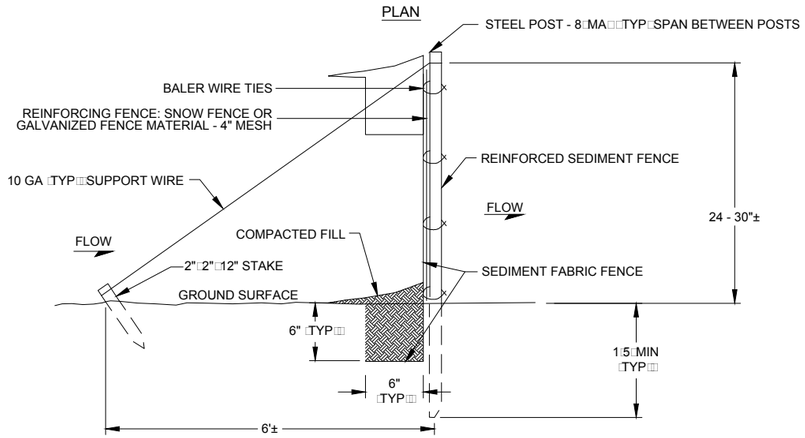


SECTION N-N□

8 / H7 SEDIMENT DETENTION POND
NOT TO SCALE

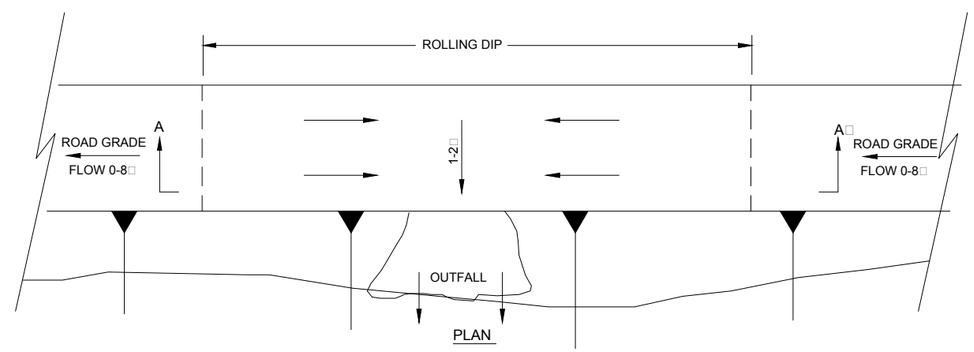


PLAN

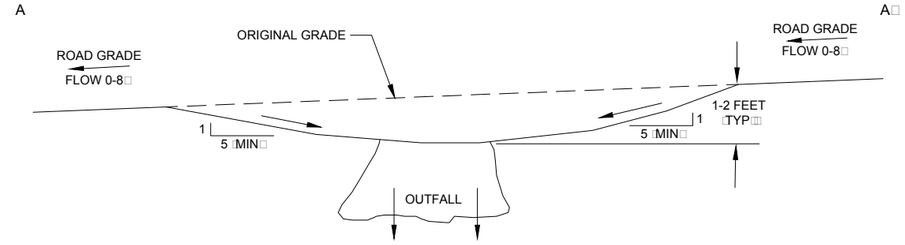


ELEVATION

7 / H7 TYPICAL SILT FENCE INSTALLATION □100 FT MA□ LENGTH□
NOT TO SCALE



PLAN



SECTION A-A□

9 / H7 ROLLING DIP
NOT TO SCALE

0 100' 200'

DESIGNED BY	T KELLEY	04–14
DRAWN BY	D MIRANDA	04–14
CHECKED BY	T KELLEY	04–14
APPROVED BY	C STRACHAN	04–14
PROJECT MANAGER	V DRAIN	04–14
CLIENT APPROVAL	B LYLE	
CLIENT REFERENCE NO.		

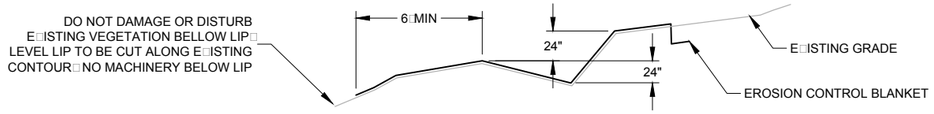
NEWMONT

PROJECT LOCATION: WELLPINIT, WASHINGTON
PROJECT: RHOADS BORROW
TITLE: SEDIMENT CONTROL BMP DESIGN DETAILS □2 OF 3□

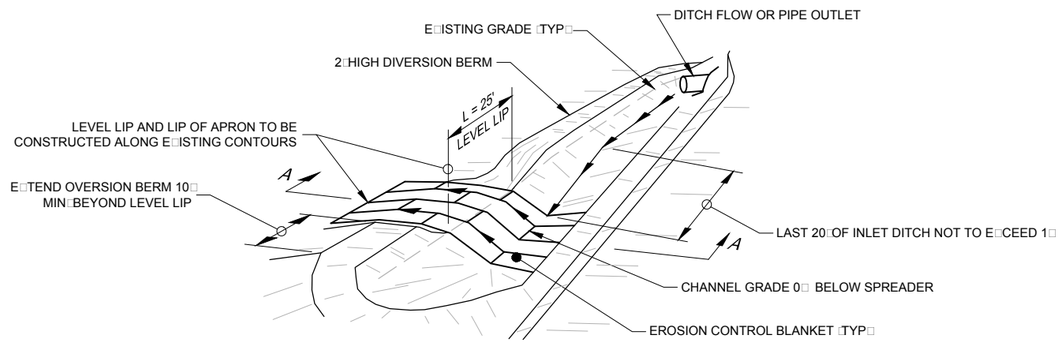
MWH

FIGURE: H7
REVISION: 0
FILE NAME: 1011322 H6
DATE: APR 2014

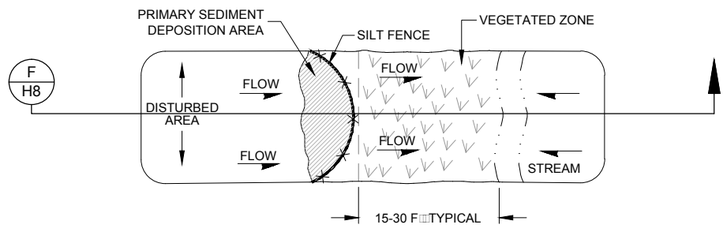
L:\Design-Drafting\Clients-L-P\NEWMONT\101322 MIDNITE MINE\013-Sheet Set\FIGURES\2014-04-30 SWPPP\1011322 H6



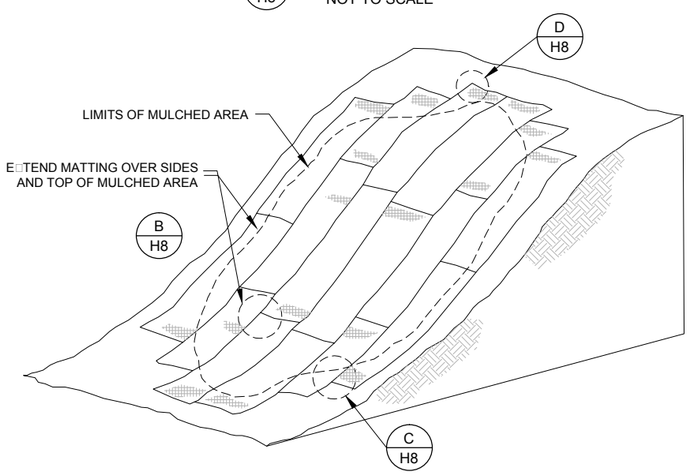
SECTION A-A



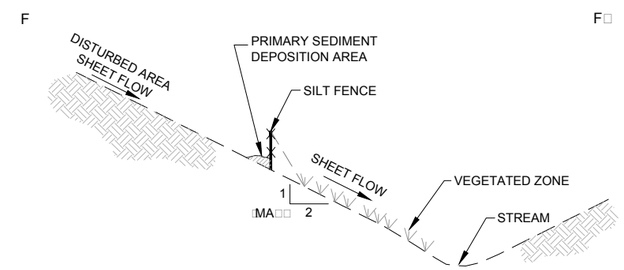
10 / H8 LEAD-OFF DITCH
NOT TO SCALE



PLAN VIEW

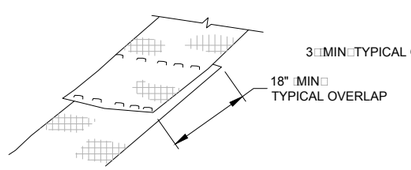


11 / H8 EROSION CONTROL BLANKET
NOT TO SCALE

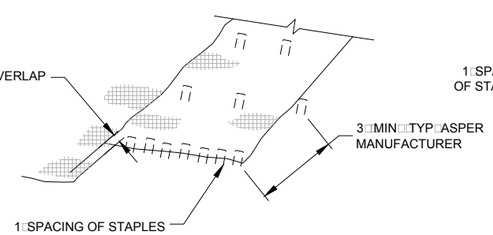


SECTION F

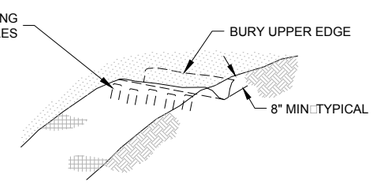
12 / H8 VEGETATED BUFFER ZONE
NOT TO SCALE



B / H8 EROSION CONTROL BLANKET
NOT TO SCALE



C / H8 EROSION CONTROL BLANKET
NOT TO SCALE



D / H8 EROSION CONTROL BLANKET
NOT TO SCALE

0 100' 200'

DESIGNED BY	T KELLEY	04–14
DRAWN BY	D MIRANDA	04–14
CHECKED BY	T KELLEY	04–14
APPROVED BY	C STRACHAN	04–14
PROJECT MANAGER	V DRAIN	04–14
CLIENT APPROVAL	B LYLE	
CLIENT REFERENCE NO.		

NEWMONT

PROJECT LOCATION: WELLPINIT, WASHINGTON

PROJECT: RHOADS BORROW

TITLE: SEDIMENT CONTROL BMP
DESIGN DETAILS □3 OF 3□

MWH

FIGURE: H8
REVISION: 0
FILE NAME: 1011322 H6
DATE: APR 2014

L:\Design-Drafting\Clients-I-P\NEWMONT\1011322 MIDNITE MINE\013-Sheet Set\FIGURES\2014-04-30 SWPPP\1011322 H6

ATTACHMENT H1

CONSTRUCTION STORMWATER GENERAL PERMIT

Issuance Date:	December 1, 2010
Effective Date:	January 1, 2011
Expiration Date:	December 31, 2015

CONSTRUCTION STORMWATER GENERAL PERMIT

National Pollutant Discharge Elimination System (NPDES) and State Waste Discharge General Permit for Stormwater Discharges Associated with Construction Activity

State of Washington
Department of Ecology
Olympia, Washington 98504

In compliance with the provisions of
Chapter 90.48 Revised Code of Washington
(State of Washington Water Pollution Control Act)
and
Title 33 United States Code, Section 1251 et seq.
The Federal Water Pollution Control Act (The Clean Water Act)

Until this permit expires, is modified or revoked, Permittees that have properly obtained coverage under this general permit are authorized to discharge in accordance with the special and general conditions that follow.

Kelly Susewind, P.E., P.G.
Water Quality Program Manager
Washington State Department of Ecology

TABLE OF CONTENTS

LIST OF TABLES 3

SPECIAL CONDITIONS 5

S1. PERMIT COVERAGE 5
S2. APPLICATION REQUIREMENTS 8
S3. COMPLIANCE WITH STANDARDS 11
S4. MONITORING REQUIREMENTS 12
S5. REPORTING AND RECORDKEEPING REQUIREMENTS 19
S6. PERMIT FEES 22
S7. SOLID AND LIQUID WASTE DISPOSAL 22
S8. DISCHARGES TO 303(D) OR TMDL WATER BODIES 22
S9. STORMWATER POLLUTION PREVENTION PLAN 26
S10. NOTICE OF TERMINATION 34

GENERAL CONDITIONS 36

G1. DISCHARGE VIOLATIONS 36
G2. SIGNATORY REQUIREMENTS 36
G3. RIGHT OF INSPECTION AND ENTRY 37
G4. GENERAL PERMIT MODIFICATION AND REVOCATION 37
G5. REVOCATION OF COVERAGE UNDER THE PERMIT 37
G6. REPORTING A CAUSE FOR MODIFICATION 38
G7. COMPLIANCE WITH OTHER LAWS AND STATUTES 38
G8. DUTY TO REAPPLY 38
G9. TRANSFER OF GENERAL PERMIT COVERAGE 39
G10. REMOVED SUBSTANCES 39
G11. DUTY TO PROVIDE INFORMATION 39
G12. OTHER REQUIREMENTS OF 40 CFR 39
G13. ADDITIONAL MONITORING 39
G14. PENALTIES FOR VIOLATING PERMIT CONDITIONS 40
G15. UPSET 40

G16. PROPERTY RIGHTS 40
G17. DUTY TO COMPLY 40
G18. TOXIC POLLUTANTS 41
G19. PENALTIES FOR TAMPERING 41
G20. REPORTING PLANNED CHANGES 41
G21. REPORTING OTHER INFORMATION 42
G22. REPORTING ANTICIPATED NON-COMPLIANCE 42
G23. REQUESTS TO BE EXCLUDED FROM COVERAGE UNDER THE PERMIT 42
G24. APPEALS 42
G25. SEVERABILITY 43
G26. BYPASS PROHIBITED 43
APPENDIX A – DEFINITIONS 46
APPENDIX B – ACRONYMS 54

LIST OF TABLES

Table 1. Summary of Permit Report Submittals 4
Table 2. Summary of Required On-site Documentation 4
Table 3. Summary of Primary Monitoring Requirements 12
Table 4. Monitoring and Reporting Requirements 16
Table 5. Turbidity, Fine Sediment & Phosphorus Sampling and Limits for 303(d)-Listed ... 24
Table 6. pH Sampling and Limits for 303(d)-Listed Waters 24

SUMMARY OF PERMIT REPORT SUBMITTALS

Refer to the Special and General Conditions within this permit for additional submittal requirements. Appendix A provides a list of definitions. Appendix B provides a list of acronyms.

Table 1. Summary of Permit Report Submittals

Permit Section	Submittal	Frequency	First Submittal Date
S5.A and S8	High Turbidity/Transparency Phone Reporting	As Necessary	Within 24 hours
S5.B	Discharge Monitoring Report	Monthly*	Within 15 days of applicable monitoring period
S5.F and S8	Noncompliance Notification	As necessary	Immediately
S5.F	Noncompliance Notification – Written Report	As necessary	Within 5 Days of non-compliance
G2.	Notice of Change in Authorization	As necessary	
G6.	Permit Application for Substantive Changes to the Discharge	As necessary	
G8.	Application for Permit Renewal	1/permit cycle	No later than 180 days before expiration
G9.	Notice of Permit Transfer	As necessary	
G20.	Notice of Planned Changes	As necessary	
G22.	Reporting Anticipated Non-compliance	As necessary	

SPECIAL NOTE: *Permittees must submit Discharge Monitoring Reports (DMRs) to the Washington State Department of Ecology monthly, regardless of site discharge, for the full duration of permit coverage. Refer to Section S5.B of this General Permit for more specific information regarding DMRs.

Table 2. Summary of Required On-site Documentation

Document Title	Permit Conditions
Permit Coverage Letter	See Conditions S2, S5
Construction Stormwater General Permit	See Conditions S2, S5
Site Log Book	See Conditions S4, S5
Stormwater Pollution Prevention Plan (SWPPP)	See Conditions S9, S5

SPECIAL CONDITIONS

S1. PERMIT COVERAGE

A. Permit Area

This Construction Stormwater General Permit (CSWGP) covers all areas of Washington State, except for federal and Tribal lands as specified in Special Condition S1.E.3.

B. Operators Required to Seek Coverage Under this General Permit:

1. Operators of the following construction activities are required to seek coverage under this CSWGP:

   a. Clearing, grading and/or excavation that results in the disturbance of one or more acres and discharges stormwater to surface waters of the State; and clearing, grading and/or excavation on sites smaller than one acre that are part of a larger common plan of development or sale, if the common plan of development or sale will ultimately disturb one acre or more and discharge stormwater to surface waters of the State.

      i. This includes forest practices (including, but not limited to, class IV conversions) that are part of a construction activity that will result in the disturbance of one or more acres, and discharge to surface waters of the State (that is, forest practices that prepare a site for construction activities); and

   b. Any size construction activity discharging stormwater to waters of the State that the Department of Ecology ("Ecology"):

      i. Determines to be a significant contributor of pollutants to waters of the State of Washington.

      ii. Reasonably expects to cause a violation of any water quality standard.

2. Operators of the following activities are not required to seek coverage under this CSWGP (unless specifically required under Special Condition S1.B.1.b. above):

   a. Construction activities that discharge all stormwater and non-stormwater to ground water, sanitary sewer, or combined sewer, and have no point source discharge to either surface water or a storm sewer system that drains to surface waters of the State.

   b. Construction activities covered under an Erosivity Waiver (Special Condition S2.C).

   c. Routine maintenance that is performed to maintain the original line and grade, hydraulic capacity, or original purpose of a facility.

C. Authorized Discharges:

1. Stormwater Associated with Construction Activity. Subject to compliance with the terms and conditions of this permit, Permittees are authorized to discharge stormwater associated with construction activity to surface waters of the State or to a storm sewer system that drains to surface waters of the State. (Note that "surface waters of the State" may exist on a construction site as well as off site; for example, a creek running through a site.)

2. Stormwater Associated with Construction Support Activity. This permit also authorizes stormwater discharge from support activities related to the permitted construction site (for example, an on-site portable rock crusher, off-site equipment staging yards, material storage areas, borrow areas, etc.) provided:

   a. The support activity relates directly to the permitted construction site that is required to have a NPDES permit; and

   b. The support activity is not a commercial operation serving multiple unrelated construction projects, and does not operate beyond the completion of the construction activity; and

   c. Appropriate controls and measures are identified in the Stormwater Pollution Prevention Plan (SWPPP) for the discharges from the support activity areas.

3. Non-Stormwater Discharges. The categories and sources of non-stormwater discharges identified below are authorized conditionally, provided the discharge is consistent with the terms and conditions of this permit:

   a. Discharges from fire-fighting activities.

   b. Fire hydrant system flushing.

   c. Potable water, including uncontaminated water line flushing.

   d. Pipeline hydrostatic test water.

   e. Uncontaminated air conditioning or compressor condensate.

   f. Uncontaminated ground water or spring water.

   g. Uncontaminated excavation dewatering water (in accordance with S9.D.10).

   h. Uncontaminated discharges from foundation or footing drains.

   i. Water used to control dust. Permittees must minimize the amount of dust control water used.

   j. Routine external building wash down that does not use detergents.

   k. Landscape irrigation water.

   The SWPPP must adequately address all authorized non-stormwater discharges, except for discharges from fire-fighting activities, and must comply with Special

Condition S3. At a minimum, discharges from potable water (including water line flushing), fire hydrant system flushing, and pipeline hydrostatic test water must undergo the following: dechlorination to a concentration of 0.1 parts per million (ppm) or less, and pH adjustment to within 6.5 – 8.5 standard units (su), if necessary.

D. Prohibited Discharges:

The following discharges to waters of the State, including ground water, are prohibited.

1. Concrete wastewater.
2. Wastewater from washout and clean-up of stucco, paint, form release oils, curing compounds and other construction materials.
3. Process wastewater as defined by 40 Code of Federal Regulations (CFR) 122.1 (see Appendix A of this permit).
4. Slurry materials and waste from shaft drilling.
5. Fuels, oils, or other pollutants used in vehicle and equipment operation and maintenance.
6. Soaps or solvents used in vehicle and equipment washing.
7. Wheel wash wastewater, unless discharged according to Special Condition S9.D.9.d.
8. Discharges from dewatering activities, including discharges from dewatering of trenches and excavations, unless managed according to Special Condition S9.D.10.

E. Limits on Coverage

Ecology may require any discharger to apply for and obtain coverage under an individual permit or another more specific general permit. Such alternative coverage will be required when Ecology determines that this CSWGP does not provide adequate assurance that water quality will be protected, or there is a reasonable potential for the project to cause or contribute to a violation of water quality standards.

The following stormwater discharges are not covered by this permit:

1. Post-construction stormwater discharges that originate from the site after completion of construction activities and the site has undergone final stabilization.
2. Non-point source silvicultural activities such as nursery operations, site preparation, reforestation and subsequent cultural treatment, thinning, prescribed burning, pest and fire control, harvesting operations, surface drainage, or road construction and maintenance, from which there is natural runoff as excluded in 40 CFR Subpart 122.
3. Stormwater from any federal project or project on federal land or land within an Indian Reservation except for the Puyallup Reservation. Within the Puyallup

Reservation, any project that discharges to surface water on land held in trust by the federal government may be covered by this permit.

4. Stormwater from any site covered under an existing NPDES individual permit in which stormwater management and/or treatment requirements are included for all stormwater discharges associated with construction activity.

5. Stormwater from a site where an applicable Total Maximum Daily Load (TMDL) requirement specifically precludes or prohibits discharges from construction activity.

S2. APPLICATION REQUIREMENTS

A. Permit Application Forms

1. Notice of Intent Form/Timeline

a. Operators of new or previously unpermitted construction activities must submit a complete and accurate permit application (Notice of Intent, or NOI) to Ecology.

b. The operator must submit the NOI at least 60 days before discharging stormwater from construction activities and must submit it on or before the date of the first public notice (see Special Condition S2.B below for details). The 30-day public comment period required by WAC 173-226-130(5) begins on the publication date of the second public notice. Unless Ecology responds to the complete application in writing, based on public comments, or any other relevant factors, coverage under the general permit will automatically commence on the thirty-first day following receipt by Ecology of a completed NOI, or the issuance date of this permit, whichever is later, unless Ecology specifies a later date in writing.

c. Applicants who propose to discharge to a storm or sewer system operated by Seattle, King County, Snohomish County, Tacoma, Pierce County, or Clark County must also submit a copy of the NOI to the appropriate jurisdiction.

d. If an applicant intends to use a Best Management Practice (BMP) selected on the basis of Special Condition S9.C.4 ("demonstrably equivalent" BMPs), the applicant must notify Ecology of its selection as part of the NOI. In the event the applicant selects BMPs after submission of the NOI, it must provide notice of the selection of an equivalent BMP to Ecology at least 60 days before intended use of the equivalent BMP.

e. Permittees must notify Ecology regarding any changes to the information provided on the NOI by submitting an updated NOI. Examples of such changes include, but are not limited to,

i. changes to the Permittee's mailing address,

ii. changes to the on-site contact person information, and

iii. changes to the area/acreage affected by construction activity.

2. Transfer of Coverage Form

The Permittee can transfer current coverage under this permit to one or more new operators, including operators of sites within a Common Plan of Development, provided the Permittee submits a Transfer of Coverage Form in accordance with General Condition G9. Transfers do not require public notice.

B. Public Notice

For new or previously unpermitted construction activities, the applicant must publish a public notice at least one time each week for two consecutive weeks, at least 7 days apart, in a newspaper with general circulation in the county where the construction is to take place. The notice must contain:

1. A statement that "The applicant is seeking coverage under the Washington State Department of Ecology's Construction Stormwater NPDES and State Waste Discharge General Permit."

2. The name, address and location of the construction site.

3. The name and address of the applicant.

4. The type of construction activity that will result in a discharge (for example, residential construction, commercial construction, etc.), and the number of acres to be disturbed.

5. The name of the receiving water(s) (that is, the surface water(s) to which the site will discharge), or, if the discharge is through a storm sewer system, the name of the operator of the system.

6. The statement: "Any persons desiring to present their views to the Washington State Department of Ecology regarding this application, or interested in Ecology's action on this application, may notify Ecology in writing no later than 30 days of the last date of publication of this notice. Ecology reviews public comments and considers whether discharges from this project would cause a measurable change in receiving water quality, and, if so, whether the project is necessary and in the overriding public interest according to Tier II antidegradation requirements under WAC 173-201A-320. Comments can be submitted to: Department of Ecology, P.O. Box 47696, Olympia, WA 98504-7696 Attn: Water Quality Program, Construction Stormwater."

C. Erosivity Waiver

Construction site operators may qualify for an erosivity waiver from the CSWGP if the following conditions are met:

1. The site will result in the disturbance of fewer than 5 acres and the site is not a portion of a common plan of development or sale that will disturb 5 acres or greater.

2. Calculation of Erosivity "R" Factor and Regional Timeframe:

   a. The project's rainfall erosivity factor ("R" Factor) must be less than 5 during the period of construction activity, as calculated using either the Texas A&M University online rainfall erosivity calculator at: http://ei.tamu.edu/ or EPA's calculator at http://cfpub.epa.gov/npdes/stormwater/lew/lewcalculator.cfm. The period of construction activity starts when the land is first disturbed and ends with final stabilization. In addition:

   b. The entire period of construction activity must fall within the following timeframes:

      i. For sites west of the Cascades Crest: June 15 – September 15.

      ii. For sites east of the Cascades Crest, excluding the Central Basin: June 15 – October 15.

      iii. For sites east of the Cascades Crest, within the Central Basin: no additional timeframe restrictions apply. The Central Basin is defined as the portions of Eastern Washington with mean annual precipitation of less than 12 inches. For a map of the Central Basin (Region 2), refer to http://www.ecy.wa.gov/pubs/ecy070202.pdf.

3. Construction site operators must submit a complete Erosivity Waiver certification form at least one week before disturbing the land. Certification must include statements that the operator will:

   a. Comply with applicable local stormwater requirements; and

   b. Implement appropriate erosion and sediment control BMPs to prevent violations of water quality standards.

4. This waiver is not available for facilities declared significant contributors of pollutants as defined in Special Condition S1.B.1.b.

5. This waiver does not apply to construction activities which include non-stormwater discharges listed in Special Condition S1.C.3.

6. If construction activity extends beyond the certified waiver period for any reason, the operator must either:

   a. Recalculate the rainfall erosivity "R" factor using the original start date and a new projected ending date and, if the "R" factor is still under 5 and the entire

project falls within the applicable regional timeframe in Special Condition S2.C.2.b, complete and submit an amended waiver certification form before the original waiver expires; or

b. Submit a complete permit application to Ecology in accordance with Special Condition S2.A and B before the end of the certified waiver period.

S3. COMPLIANCE WITH STANDARDS

A. Discharges must not cause or contribute to a violation of surface water quality standards (Chapter 173-201A WAC), ground water quality standards (Chapter 173-200 WAC), sediment management standards (Chapter 173-204 WAC), and human health-based criteria in the National Toxics Rule (40 CFR Part 131.36). Discharges not in compliance with these standards are not authorized.

B. Prior to the discharge of stormwater and non-stormwater to waters of the State, the Permittee must apply all known, available, and reasonable methods of prevention, control, and treatment (AKART). This includes the preparation and implementation of an adequate Stormwater Pollution Prevention Plan (SWPPP), with all appropriate BMPs installed and maintained in accordance with the SWPPP and the terms and conditions of this permit.

C. Ecology presumes that a Permittee complies with water quality standards unless discharge monitoring data or other site-specific information demonstrates that a discharge causes or contributes to a violation of water quality standards, when the Permittee complies with the following conditions. The Permittee must fully:

1. Comply with all permit conditions, including planning, sampling, monitoring, reporting, and recordkeeping conditions.

2. Implement stormwater BMPs contained in stormwater management manuals published or approved by Ecology, or BMPs that are demonstrably equivalent to BMPs contained in stormwater technical manuals published or approved by Ecology, including the proper selection, implementation, and maintenance of all applicable and appropriate BMPs for on-site pollution control. (For purposes of this section, the stormwater manuals listed in Appendix 10 of the Phase I Municipal Stormwater Permit are approved by Ecology.)

D. Where construction sites also discharge to ground water, the ground water discharges must also meet the terms and conditions of this CSWGP. Permittees who discharge to ground water through an injection well must also comply with any applicable requirements of the Underground Injection Control (UIC) regulations, Chapter 173-218 WAC.

S4. MONITORING REQUIREMENTS, BENCHMARKS AND REPORTING TRIGGERS

Table 3. Summary of Primary Monitoring Requirements

Size of Soil Disturbance[1]	Weekly Site Inspections	Weekly Sampling w/ Turbidity Meter	Weekly Sampling w/ Transparency Tube	Weekly pH Sampling[2]	Requires CESCL Certification?
Sites that disturb less than 1 acre, but are part of a larger Common Plan of Development	Required	Not Required	Not Required	Not Required	No
Sites that disturb 1 acre or more, but fewer than 5 acres	Required	Sampling Required – either method[3]		Required	Yes
Sites that disturb 5 acres or more	Required	Required	Not Required[4]	Required	Yes

A. Site Log Book

The Permittee must maintain a site log book that contains a record of the implementation of the SWPPP and other permit requirements, including the installation and maintenance of BMPs, site inspections, and stormwater monitoring.

B. Site Inspections

The Permittee's (operator's) site inspections must include all areas disturbed by construction activities, all BMPs, and all stormwater discharge points. (See Special Conditions S4.B.3 and B.4 below for detailed requirements of the Permittee's Certified Erosion and Sediment Control Lead [CESCL]).

[1] Soil disturbance is calculated by adding together all areas affected by construction activity. Construction activity means clearing, grading, excavation, and any other activity that disturbs the surface of the land, including ingress/egress from the site.

[2] If construction activity results in the disturbance of 1 acre or more, and involves significant concrete work (1,000 cubic yards of poured or recycled concrete over the life of a project) or the use of engineered soils (soil amendments including but not limited to Portland cement-treated base [CTB], cement kiln dust [CKD], or fly ash), and stormwater from the affected area drains to surface waters of the State or to a storm sewer stormwater collection system that drains to other surface waters of the State, the Permittee must conduct pH monitoring sampling in accordance with Special Condition S4.D.

[3] Sites with one or more acres, but fewer than 5 acres of soil disturbance, must conduct turbidity or transparency sampling in accordance with Special Condition S4.C.

[4] Sites equal to or greater than 5 acres of soil disturbance must conduct turbidity sampling using a turbidity meter in accordance with Special Condition S4.C.

Construction sites one acre or larger that discharge stormwater to surface waters of the State must have site inspections conducted by a certified CESCL. Sites less than one acre may have a person without CESCL certification conduct inspections; sampling is not required on sites that disturb less than an acre.

1. The Permittee must examine stormwater visually for the presence of suspended sediment, turbidity, discoloration, and oil sheen. The Permittee must evaluate the effectiveness of BMPs and determine if it is necessary to install, maintain, or repair BMPs to improve the quality of stormwater discharges.

   Based on the results of the inspection, the Permittee must correct the problems identified by:

   a. Reviewing the SWPPP for compliance with Special Condition S9 and making appropriate revisions within 7 days of the inspection.

   b. Immediately beginning the process of fully implementing and maintaining appropriate source control and/or treatment BMPs as soon as possible, addressing the problems no later than within 10 days of the inspection. If installation of necessary treatment BMPs is not feasible within 10 days, Ecology may approve additional time when an extension is requested by a Permittee within the initial 10-day response period.

   c. Documenting BMP implementation and maintenance in the site log book.

2. The Permittee must inspect all areas disturbed by construction activities, all BMPs, and all stormwater discharge points at least once every calendar week and within 24 hours of any discharge from the site. (For purposes of this condition, individual discharge events that last more than one day do not require daily inspections. For example, if a stormwater pond discharges continuously over the course of a week, only one inspection is required that week.) The Permittee may reduce the inspection frequency for temporarily stabilized, inactive sites to once every calendar month.

3. The Permittee must have staff knowledgeable in the principles and practices of erosion and sediment control. The CESCL (sites one acre or more) or inspector (sites less than one acre) must have the skills to assess the:

   a. Site conditions and construction activities that could impact the quality of stormwater, and

   b. Effectiveness of erosion and sediment control measures used to control the quality of stormwater discharges.

4. The SWPPP must identify the CESCL or inspector, who must be present on site or on-call at all times. The CESCL must obtain this certification through an approved erosion and sediment control training program that meets the minimum training standards established by Ecology (see BMP C160 in the manual referred to in Special Condition S9.C.1 and 2).

5. The Permittee must summarize the results of each inspection in an inspection report or checklist and enter the report/checklist into, or attach it to, the site log book. At a minimum, each inspection report or checklist must include:

    a. Inspection date and time.

    b. Weather information, the general conditions during inspection and the approximate amount of precipitation since the last inspection, and precipitation within the last 24 hours.

    c. A summary or list of all implemented BMPs, including observations of all erosion/sediment control structures or practices.

    d. A description of the locations:

        i. Of BMPs inspected.

        ii. Of BMPs that need maintenance and why.

        iii. Of BMPs that failed to operate as designed or intended, and

        iv. Where additional or different BMPs are needed, and why.

    e. A description of stormwater discharged from the site. The Permittee must note the presence of suspended sediment, turbidity, discoloration, and oil sheen, as applicable.

    f. Any water quality monitoring performed during inspection.

    g. General comments and notes, including a brief description of any BMP repairs, maintenance or installations made following the inspection.

    h. A summary report and a schedule of implementation of the remedial actions that the Permittee plans to take if the site inspection indicates that the site is out of compliance. The remedial actions taken must meet the requirements of the SWPPP and the permit.

    i. The name, title, and signature of the person conducting the site inspection, a phone number or other reliable method to reach this person, and the following statement: "I certify that this report is true, accurate, and complete to the best of my knowledge and belief."

C. <u>Turbidity/Transparency Sampling Requirements</u>

1. Sampling Methods

    a. If construction activity involves the disturbance of 5 acres or more, the Permittee must conduct turbidity sampling per Special Condition S4.C.

    b. If construction activity involves 1 acre or more but fewer than 5 acres of soil disturbance, the Permittee must conduct either transparency sampling **or** turbidity sampling per Special Condition S4.C.

2. Sampling Frequency

   a. The Permittee must sample all discharge locations at least once every calendar week when stormwater (or authorized non-stormwater) discharges from the site or enters any on-site surface waters of the state (for example, a creek running through a site).

   b. Samples must be representative of the flow and characteristics of the discharge.

   c. Sampling is not required when there is no discharge during a calendar week.

   d. Sampling is not required outside of normal working hours or during unsafe conditions.

   e. If the Permittee is unable to sample during a monitoring period, the Permittee must include a brief explanation in the monthly Discharge Monitoring Report (DMR).

   f. Sampling is not required before construction activity begins.

3. Sampling Locations

   a. Sampling is required at all points where stormwater associated with construction activity (or authorized non-stormwater) is discharged off site, including where it enters any on-site surface waters of the state (for example, a creek running through a site).

   b. The Permittee may discontinue sampling at discharge points that drain areas of the project that are fully stabilized to prevent erosion.

   c. The Permittee must identify all sampling point(s) on the SWPPP site map and clearly mark these points in the field with a flag, tape, stake or other visible marker.

   d. Sampling is not required for discharge that is sent directly to sanitary or combined sewer systems.

4. Sampling and Analysis Methods

   a. The Permittee performs turbidity analysis with a calibrated turbidity meter (turbidimeter) either on site or at an accredited lab. The Permittee must record the results in the site log book in nephelometric turbidity units (NTU).

   b. The Permittee performs transparency analysis on site with a 1¾-inch-diameter, 60-centimeter (cm)-long transparency tube. The Permittee will record the results in the site log book in centimeters (cm). Transparency tubes are available from: http://watermonitoringequip.com/pages/stream.html.

Table 4. Monitoring and Reporting Requirements

Parameter	Unit	Analytical Method	Sampling Frequency	Benchmark Value	Phone Reporting Trigger Value
Turbidity	NTU	SM2130 or EPA 180.1	Weekly, if discharging	25 NTU	250 NTU
Transparency	cm	Manufacturer instructions, or Ecology guidance	Weekly, if discharging	33 cm	6 cm

5. Turbidity/Transparency Benchmark Values and Reporting Triggers

The benchmark value for turbidity is 25 NTU or less. The benchmark value for transparency is 33 centimeters (cm). Note: Benchmark values do not apply to discharges to segments of water bodies on Washington State's 303(d) list (Category 5) for turbidity, fine sediment, or phosphorus; these discharges are subject to a numeric effluent limit for turbidity. Refer to Special Condition S8 for more information.

a. Turbidity 26 – 249 NTU, or Transparency 32 – 7 cm:

If the discharge turbidity is 26 to 249 NTU; or if discharge transparency is less than 33 cm, but equal to or greater than 6 cm, the Permittee must:

i. Review the SWPPP for compliance with Special Condition S9 and make appropriate revisions within 7 days of the date the discharge exceeded the benchmark.

ii. Immediately begin the process to fully implement and maintain appropriate source control and/or treatment BMPs as soon as possible, addressing the problems within 10 days of the date the discharge exceeded the benchmark. If installation of necessary treatment BMPs is not feasible within 10 days, Ecology may approve additional time when the Permittee requests an extension within the initial 10-day response period.

iii. Document BMP implementation and maintenance in the site log book.

b. Turbidity 250 NTU or greater, or Transparency 6 cm or less:

If a discharge point's turbidity is 250 NTU or greater, or if discharge transparency is less than or equal to 6 cm, the Permittee must complete the reporting and adaptive management process described below.

i. Telephone the applicable Ecology Region's Environmental Report Tracking System (ERTS) number within 24 hours, in accordance with Special Condition S5.F.

- Central Region (Okanogan, Chelan, Douglas, Kittitas, Yakima, Klickitat, Benton): (509) 575-2490

- Eastern Region (Adams, Asotin, Columbia, Ferry, Franklin, Garfield, Grant, Lincoln, Pend Oreille, Spokane, Stevens, Walla Walla, Whitman): (509) 329-3400
- Northwest Region (Kitsap, Snohomish, Island, King, San Juan, Skagit, Whatcom): (425) 649-7000
- Southwest Region (Grays Harbor, Lewis, Mason, Thurston, Pierce, Clark, Cowlitz, Skamania, Wahkiakum, Clallam, Jefferson, Pacific): (360) 407-6300

These numbers are also listed at the following web site: http://www.ecy.wa.gov/programs/wq/stormwater/construction/permit.html

ii. Review the SWPPP for compliance with Special Condition S9 and make appropriate revisions within 7 days of the date the discharge exceeded the benchmark.

iii. Immediately begin the process to fully implement and maintain appropriate source control and/or treatment BMPs as soon as possible, addressing the problems within 10 days of the date the discharge exceeded the benchmark. If installation of necessary treatment BMPs is not feasible within 10 days, Ecology may approve additional time when the Permittee requests an extension within the initial 10-day response period.

iv. Document BMP implementation and maintenance in the site log book.

v. Continue to sample discharges daily until:

a) Turbidity is 25 NTU (or lower); or

b) Transparency is 33 cm (or greater); or

c) The Permittee has demonstrated compliance with the water quality limit for turbidity:

1) No more than 5 NTU over background turbidity, if background is less than 50 NTU, or

2) No more than 10% over background turbidity, if background is 50 NTU or greater; or

d) The discharge stops or is eliminated.

D. pH Sampling Requirements -- Significant Concrete Work or Engineered Soils

If construction activity results in the disturbance of 1 acre or more, **and** involves significant concrete work (significant concrete work means greater than 1000 cubic yards poured concrete or recycled concrete used over the life of a project) or the use of engineered soils (soil amendments including but not limited to Portland cement-treated base [CTB], cement kiln dust [CKD], or fly ash), and stormwater from the affected area

drains to surface waters of the State or to a storm sewer system that drains to surface waters of the state, the Permittee must conduct pH monitoring as set forth below. Note: In addition, discharges to segments of water bodies on Washington State's 303(d) list (Category 5) for high pH are subject to a numeric effluent limit for pH; refer to Special Condition S8.

1. For sites with significant concrete work, the Permittee must begin the pH monitoring period when the concrete is first poured and exposed to precipitation, and continue weekly throughout and after the concrete pour and curing period, until stormwater pH is in the range of 6.5 to 8.5 (su).

2. For sites with engineered soils, the Permittee must begin the pH monitoring period when the soil amendments are first exposed to precipitation and must continue until the area of engineered soils is fully stabilized.

3. During the applicable pH monitoring period defined above, the Permittee must obtain a representative sample of stormwater and conduct pH analysis at least once per week.

4. The Permittee must monitor pH in the sediment trap/pond(s) or other locations that receive stormwater runoff from the area of significant concrete work or engineered soils before the stormwater discharges to surface waters.

5. The benchmark value for pH is 8.5 standard units. Anytime sampling indicates that pH is 8.5 or greater, the Permittee must either:

    a. Prevent the high pH water (8.5 or above) from entering storm sewer systems or surface waters; or

    b. If necessary, adjust or neutralize the high pH water until it is in the range of pH 6.5 to 8.5 (su) using an appropriate treatment BMP such as carbon dioxide (CO_2) sparging or dry ice. The Permittee must obtain written approval from Ecology before using any form of chemical treatment other than CO_2 sparging or dry ice.

6. The Permittee must perform pH analysis on site with a calibrated pH meter, pH test kit, or wide range pH indicator paper. The Permittee must record pH monitoring results in the site log book.

S5. REPORTING AND RECORDKEEPING REQUIREMENTS

A. High Turbidity Phone Reporting

Anytime sampling performed in accordance with Special Condition S4.C indicates turbidity has reached the 250 NTU phone reporting level, the Permittee must call Ecology's Regional office by phone within 24 hours of analysis. The web site is http://www.ecy.wa.gov/programs/wq/stormwater/construction/permit.html. Also see phone numbers in Special Condition S4.C.5.b.i.

B. Discharge Monitoring Reports

Permittees required to conduct water quality sampling in accordance with Special Conditions S4.C (Turbidity/Transparency), S4.D (pH), S8 (303[d]/TMDL sampling), and/or G13 (Additional Sampling) must submit the results to Ecology.

Permittees must submit monitoring data using Ecology's WebDMR program. To find out more information and to sign up for WebDMR go to: http://www.ecy.wa.gov/programs/wq/permits/paris/webdmr.html.

Permittees unable to submit electronically (for example, those who do not have an internet connection) must contact Ecology to request a waiver and obtain instructions on how to obtain a paper copy DMR at:

Mailing Address:
Department of Ecology
Water Quality Program
Attn: Stormwater Compliance Specialist
PO Box 47696
Olympia, WA 98504-7696

Permittees who obtain a waiver not to use WebDMR must use the forms provided to them by Ecology; submittals must be mailed to the address above. Permittees shall submit DMR forms to be received by Ecology within 15 days following the end of each month.

If there was no discharge during a given monitoring period, all Permittees must submit a DMR as required with “no discharge" entered in place of the monitoring results. For more information, contact Ecology staff using information provided at the following web site: http://www.ecy.wa.gov/programs/spills/response/assistancesoil%20map.pdf

C. Records Retention

The Permittee must retain records of all monitoring information (site log book, sampling results, inspection reports/checklists, etc.), Stormwater Pollution Prevention Plan, and any other documentation of compliance with permit requirements for the entire life of the construction project and for a minimum of three years following the termination of permit coverage. Such information must include all calibration and maintenance records, and records of all data used to complete the application for this

permit. This period of retention must be extended during the course of any unresolved litigation regarding the discharge of pollutants by the Permittee or when requested by Ecology.

D. Recording Results

For each measurement or sample taken, the Permittee must record the following information:

1. Date, place, method, and time of sampling or measurement.
2. The first and last name of the individual who performed the sampling or measurement.
3. The date(s) the analyses were performed.
4. The first and last name of the individual who performed the analyses.
5. The analytical techniques or methods used.
6. The results of all analyses.

E. Additional Monitoring by the Permittee

If the Permittee monitors any pollutant more frequently than required by this permit using test procedures specified by Special Condition S4 of this permit, the results of this monitoring must be included in the calculation and reporting of the data submitted in the Permittee's DMR.

F. Noncompliance Notification

In the event the Permittee is unable to comply with any part of the terms and conditions of this permit, and the resulting noncompliance may cause a threat to human health or the environment, the Permittee must:

1. Immediately notify Ecology of the failure to comply by calling the applicable Regional office ERTS phone number (find at http://www.ecy.wa.gov/programs/spills/response/assistancesoil%20map.pdf) or refer to Special Condition S4.C.5.b.i.
2. Immediately take action to prevent the discharge/pollution, or otherwise stop or correct the noncompliance, and, if applicable, repeat sampling and analysis of any noncompliance immediately and submit the results to Ecology within five (5) days of becoming aware of the violation.
3. Submit a detailed written report to Ecology within five (5) days, unless requested earlier by Ecology. The report must contain a description of the noncompliance, including exact dates and times, and if the noncompliance has not been corrected, the anticipated time it is expected to continue; and the steps taken or planned to reduce, eliminate, and prevent reoccurrence of the noncompliance.

The Permittee must report any unanticipated bypass and/or upset that exceeds any effluent limit in the permit in accordance with the 24-hour reporting requirement contained in 40 C.F.R. 122.41(l)(6)).

Compliance with these requirements does not relieve the Permittee from responsibility to maintain continuous compliance with the terms and conditions of this permit or the resulting liability for failure to comply. Refer to Section G14 of this permit for specific information regarding non-compliance.

G. Access to Plans and Records

1. The Permittee must retain the following permit documentation (plans and records) on site, or within reasonable access to the site, for use by the operator or for on-site review by Ecology or the local jurisdiction:

   a. General Permit.

   b. Permit Coverage Letter.

   c. Stormwater Pollution Prevention Plan (SWPPP).

   d. Site Log Book.

2. The Permittee must address written requests for plans and records listed above (Special Condition S5.G.1) as follows:

   a. The Permittee must provide a copy of plans and records to Ecology within 14 days of receipt of a written request from Ecology.

   b. The Permittee must provide a copy of plans and records to the public when requested in writing. Upon receiving a written request from the public for the Permittee's plans and records, the Permittee must either:

      i. Provide a copy of the plans and records to the requester within 14 days of a receipt of the written request; or

      ii. Notify the requester within 10 days of receipt of the written request of the location and times within normal business hours when the plans and records may be viewed; and provide access to the plans and records within 14 days of receipt of the written request; or

      Within 14 days of receipt of the written request, the Permittee may submit a copy of the plans and records to Ecology for viewing and/or copying by the requester at an Ecology office, or a mutually agreed location. If plans and records are viewed and/or copied at a location other than at an Ecology office, the Permittee will provide reasonable access to copying services for which a reasonable fee may be charged. The Permittee must notify the requester within 10 days of receipt of the request where the plans and records may be viewed and/or copied.

S6. PERMIT FEES

The Permittee must pay permit fees assessed by Ecology. Fees for stormwater discharges covered under this permit are established by Chapter 173-224 WAC. Ecology continues to assess permit fees until the permit is terminated in accordance with Special Condition S10 or revoked in accordance with General Condition G5.

S7. SOLID AND LIQUID WASTE DISPOSAL

The Permittee must handle and dispose of solid and liquid wastes generated by construction activity, such as demolition debris, construction materials, contaminated materials, and waste materials from maintenance activities, including liquids and solids from cleaning catch basins and other stormwater facilities, in accordance with:

A. Special Condition S3, Compliance with Standards.

B. WAC 173-216-110.

C. Other applicable regulations.

S8. DISCHARGES TO 303(D) OR TMDL WATER BODIES

A. <u>Sampling and Numeric Effluent Limits For Certain Discharges to 303(d)-listed Water Bodies</u>

1. Permittees who discharge to segments of water bodies listed as impaired by the State of Washington under Section 303(d) of the Clean Water Act for turbidity, fine sediment, high pH, or phosphorus, must conduct water quality sampling according to the requirements of this section, and Special Conditions S4.C.2.b-f and S4.C.3.b-d, and must comply with the applicable numeric effluent limitations in S8.C and S8.D.

2. All references and requirements associated with Section 303(d) of the Clean Water Act mean the most current listing by Ecology of impaired waters (Category 5) that exists on January 1, 2011, or the date when the operator's complete permit application is received by Ecology, whichever is later.

B. <u>Limits on Coverage for New Discharges to TMDL or 303(d)-listed Waters</u>

Operators of construction sites that discharge to a 303(d)-listed water body are not eligible for coverage under this permit *unless* the operator:

1. Prevents exposing stormwater to pollutants for which the water body is impaired, and retains documentation in the SWPPP that details procedures taken to prevent exposure on site; or

2. Documents that the pollutants for which the water body is impaired are not present at the site, and retains documentation of this finding within the SWPPP; or

3. Provides Ecology with data indicating the discharge is not expected to cause or contribute to an exceedance of a water quality standard, and retains such data on site with the SWPPP. The operator must provide data and other technical information to Ecology that sufficiently demonstrate:

    a. For discharges to waters without an EPA-approved or -established TMDL, that the discharge of the pollutant for which the water is impaired will meet in-stream water quality criteria at the point of discharge to the water body; or

    b. For discharges to waters with an EPA-approved or -established TMDL, that there is sufficient remaining wasteload allocation in the TMDL to allow construction stormwater discharge and that existing dischargers to the water body are subject to compliance schedules designed to bring the water body into attainment with water quality standards.

    Operators of construction sites are eligible for coverage under this permit if Ecology issues permit coverage based upon an affirmative determination that the discharge will not cause or contribute to the existing impairment.

C. Sampling and Numeric Effluent Limits for Discharges to Water Bodies on the 303(d) List for Turbidity, Fine Sediment, or Phosphorus

1. Permittees who discharge to segments of water bodies on the 303(d) list (Category 5) for turbidity, fine sediment, or phosphorus must conduct turbidity sampling in accordance with Special Condition S4.C.2 and comply with either of the numeric effluent limits noted in Table 5 below.

2. As an alternative to the 25 NTU effluent limit noted in Table 5 below (applied at the point where stormwater [or authorized non-stormwater] is discharged off-site), permittees may choose to comply with the surface water quality standard for turbidity. The standard is: no more than 5 NTU over background turbidity when the background turbidity is 50 NTU or less, or no more than a 10% increase in turbidity when the background turbidity is more than 50 NTU. In order to use the water quality standard requirement, the sampling must take place at the following locations:

    a. Background turbidity in the 303(d)-listed receiving water immediately upstream (upgradient) or outside the area of influence of the discharge.

    b. Turbidity at the point of discharge into the 303(d)-listed receiving water, inside the area of influence of the discharge.

3. Discharges that exceed the numeric effluent limit for turbidity constitute a violation of this permit.

4. Permittees whose discharges exceed the numeric effluent limit shall sample discharges daily until the violation is corrected and comply with the non-compliance notification requirements in Special Condition S5.F.

Table 5. Turbidity, Fine Sediment & Phosphorus Sampling and Limits for 303(d)-Listed Waters

Parameter identified in 303(d) listing	Parameter Sampled	Unit	Analytical Method	Sampling Frequency	Numeric Effluent Limit[1]
• Turbidity • Fine Sediment • Phosphorus	Turbidity	NTU	SM2130 or EPA180.1	Weekly, if discharging	25 NTU, at the point where stormwater is discharged from the site; OR In compliance with the surface water quality standard for turbidity (S8.C.1.a)

[1]Permittees subject to a numeric effluent limit for turbidity may, at their discretion, choose either numeric effluent limitation based on site-specific considerations including, but not limited to, safety, access and convenience.

D. Discharges to Water Bodies on the 303(d) List for High pH

1. Permittees who discharge to segments of water bodies on the 303(d) list (Category 5) for high pH must conduct pH sampling in accordance with the table below, and comply with the numeric effluent limit of pH 6.5 to 8.5 su (Table 6).

Table 6. pH Sampling and Limits for 303(d)-Listed Waters

Parameter identified in 303(d) listing	Parameter Sampled/Units	Analytical Method	Sampling Frequency	Numeric Effluent Limit
High pH	pH /Standard Units	pH meter	Weekly, if discharging	In the range of 6.5 – 8.5

2. At the Permittee's discretion, compliance with the limit shall be assessed at one of the following locations:

   a. Directly in the 303(d)-listed water body segment, inside the immediate area of influence of the discharge; or

   b. Alternatively, the permittee may measure pH at the point where the discharge leaves the construction site, rather than in the receiving water.

3. Discharges that exceed the numeric effluent limit for pH (outside the range of 6.5 – 8.5 su) constitute a violation of this permit.

4. Permittees whose discharges exceed the numeric effluent limit shall sample discharges daily until the violation is corrected and comply with the non-compliance notification requirements in Special Condition S5.F.

E. Sampling and Limits for Sites Discharging to Waters Covered by a TMDL or Another Pollution Control Plan

1. Discharges to a water body that is subject to a Total Maximum Daily Load (TMDL) for turbidity, fine sediment, high pH, or phosphorus must be consistent with the TMDL. Refer to http://www.ecy.wa.gov/programs/wq/tmdl/index.html for more information on TMDLs.

   a. Where an applicable TMDL sets specific waste load allocations or requirements for discharges covered by this permit, discharges must be consistent with any specific waste load allocations or requirements established by the applicable TMDL.

      i. The Permittee must sample discharges weekly or as otherwise specified by the TMDL to evaluate compliance with the specific waste load allocations or requirements.

      ii. Analytical methods used to meet the monitoring requirements must conform to the latest revision of the Guidelines Establishing Test Procedures for the Analysis of Pollutants contained in 40 CFR Part 136. Turbidity and pH methods need not be accredited or registered unless conducted at a laboratory which must otherwise be accredited or registered.

   b. Where an applicable TMDL has established a general waste load allocation for construction stormwater discharges, but has not identified specific requirements, compliance with Special Conditions S4 (Monitoring) and S9 (SWPPPs) will constitute compliance with the approved TMDL.

   c. Where an applicable TMDL has not specified a waste load allocation for construction stormwater discharges, but has not excluded these discharges, compliance with Special Conditions S4 (Monitoring) and S9 (SWPPPs) will constitute compliance with the approved TMDL.

   d. Where an applicable TMDL specifically precludes or prohibits discharges from construction activity, the operator is not eligible for coverage under this permit.

2. Applicable TMDL means a TMDL for turbidity, fine sediment, high pH, or phosphorus that is completed and approved by EPA before January 1, 2011, or before the date the operator's complete permit application is received by Ecology, whichever is later. TMDLs completed after the operator's complete permit application is received by Ecology become applicable to the Permittee only if they are imposed through an administrative order by Ecology, or through a modification of permit coverage.

S9. STORMWATER POLLUTION PREVENTION PLAN

The Permittee must prepare and properly implement an adequate Stormwater Pollution Prevention Plan (SWPPP) for construction activity in accordance with the requirements of this permit beginning with initial soil disturbance and until final stabilization.

A. The Permittee's SWPPP must meet the following objectives:

1. To implement best management practices (BMPs) to prevent erosion and sedimentation, and to identify, reduce, eliminate or prevent stormwater contamination and water pollution from construction activity.

2. To prevent violations of surface water quality, ground water quality, or sediment management standards.

3. To control peak volumetric flow rates and velocities of stormwater discharges.

B. General Requirements

1. The SWPPP must include a narrative and drawings. All BMPs must be clearly referenced in the narrative and marked on the drawings. The SWPPP narrative must include documentation to explain and justify the pollution prevention decisions made for the project. Documentation must include:

   a. Information about existing site conditions (topography, drainage, soils, vegetation, etc.).

   b. Potential erosion problem areas.

   c. The 12 elements of a SWPPP in Special Condition S9.D.1-12, including BMPs used to address each element.

   d. Construction phasing/sequence and general BMP implementation schedule.

   e. The actions to be taken if BMP performance goals are not achieved—for example, a contingency plan for additional treatment and/or storage of stormwater that would violate the water quality standards if discharged.

   f. Engineering calculations for ponds and any other designed structures.

2. The Permittee must modify the SWPPP if, during inspections or investigations conducted by the owner/operator, or the applicable local or state regulatory authority, it is determined that the SWPPP is, or would be, ineffective in eliminating or significantly minimizing pollutants in stormwater discharges from the site. The Permittee must then:

   a. Review the SWPPP for compliance with Special Condition S9 and make appropriate revisions within 7 days of the inspection or investigation.

   b. Immediately begin the process to fully implement and maintain appropriate source control and/or treatment BMPs as soon as possible, addressing the problems no later than 10 days from the inspection or investigation. If

installation of necessary treatment BMPs is not feasible within 10 days, Ecology may approve additional time when an extension is requested by a Permittee within the initial 10-day response period,

c. Document BMP implementation and maintenance in the site log book.

The Permittee must modify the SWPPP whenever there is a change in design, construction, operation, or maintenance at the construction site that has, or could have, a significant effect on the discharge of pollutants to waters of the State.

C. Stormwater Best Management Practices (BMPs)

BMPs must be consistent with:

1. Stormwater Management Manual for Western Washington (most recent edition), for sites west of the crest of the Cascade Mountains; or

2. Stormwater Management Manual for Eastern Washington (most recent edition), for sites east of the crest of the Cascade Mountains; or

3. Revisions to the manuals listed in Special Condition S9.C.1. & 2., or other stormwater management guidance documents or manuals which provide an equivalent level of pollution prevention, that are approved by Ecology and incorporated into this permit in accordance with the permit modification requirements of WAC 173-226-230; or

4. Documentation in the SWPPP that the BMPs selected provide an equivalent level of pollution prevention, compared to the applicable Stormwater Management Manuals, including:

   a. The technical basis for the selection of all stormwater BMPs (scientific, technical studies, and/or modeling) that support the performance claims for the BMPs being selected.

   b. An assessment of how the selected BMP will satisfy AKART requirements and the applicable federal technology-based treatment requirements under 40 CFR part 125.3.

D. SWPPP – Narrative Contents and Requirements

The Permittee must include each of the 12 elements below in Special Condition S9.D.1-12 in the narrative of the SWPPP and implement them unless site conditions render the element unnecessary and the exemption from that element is clearly justified in the SWPPP.

1. Preserve Vegetation/Mark Clearing Limits

   a. Before beginning land-disturbing activities, including clearing and grading, clearly mark all clearing limits, sensitive areas and their buffers, and trees that are to be preserved within the construction area.

b. Retain the duff layer, native top soil, and natural vegetation in an undisturbed state to the maximum degree practicable.

2. Establish Construction Access

a. Limit construction vehicle access and exit to one route, if possible.

b. Stabilize access points with a pad of quarry spalls, crushed rock, or other equivalent BMPs, to minimize tracking sediment onto roads.

c. Locate wheel wash or tire baths on site, if the stabilized construction entrance is not effective in preventing tracking sediment onto roads.

d. If sediment is tracked off site, clean the affected roadway thoroughly at the end of each day, or more frequently as necessary (for example, during wet weather). Remove sediment from roads by shoveling, sweeping, or pickup and transport of the sediment to a controlled sediment disposal area.

e. Conduct street washing only after sediment removal in accordance with Special Condition S9.D.2.d. Control street wash wastewater by pumping back on site or otherwise preventing it from discharging into systems tributary to waters of the State.

3. Control Flow Rates

a. Protect properties and waterways downstream of development sites from erosion and the associated discharge of turbid waters due to increases in the velocity and peak volumetric flow rate of stormwater runoff from the project site, as required by local plan approval authority.

b. Where necessary to comply with Special Condition S9.D.3.a, construct stormwater retention or detention facilities as one of the first steps in grading. Assure that detention facilities function properly before constructing site improvements (for example, impervious surfaces).

c. If permanent infiltration ponds are used for flow control during construction, protect these facilities from siltation during the construction phase.

4. Install Sediment Controls

The Permittee must design, install and maintain effective erosion controls and sediment controls to minimize the discharge of pollutants. At a minimum, the Permittee must design, install and maintain such controls to:

a. Construct sediment control BMPs (sediment ponds, traps, filters, etc.) as one of the first steps in grading. These BMPs must be functional before other land disturbing activities take place.

b. Minimize sediment discharges from the site. The design, installation and maintenance of erosion and sediment controls must address factors such as the amount, frequency, intensity and duration of precipitation, the nature of

resulting stormwater runoff, and soil characteristics, including the range of soil particle sizes expected to be present on the site.

c. Direct stormwater runoff from disturbed areas through a sediment pond or other appropriate sediment removal BMP, before the runoff leaves a construction site or before discharge to an infiltration facility. Runoff from fully stabilized areas may be discharged without a sediment removal BMP, but must meet the flow control performance standard of Special Condition S9.D.3.a.

d. Locate BMPs intended to trap sediment on site in a manner to avoid interference with the movement of juvenile salmonids attempting to enter off-channel areas or drainages.

e. Provide and maintain natural buffers around surface waters, direct stormwater to vegetated areas to increase sediment removal and maximize stormwater infiltration, unless infeasible.

f. Where feasible, design outlet structures that withdraw impounded stormwater from the surface to avoid discharging sediment that is still suspended lower in the water column.

5. Stabilize Soils

a. The Permittee must stabilize exposed and unworked soils by application of effective BMPs that prevent erosion. Applicable BMPs include, but are not limited to: temporary and permanent seeding, sodding, mulching, plastic covering, erosion control fabrics and matting, soil application of polyacrylamide (PAM), the early application of gravel base on areas to be paved, and dust control.

b. The Permittee must control stormwater volume and velocity within the site to minimize soil erosion.

c. The Permittee must control stormwater discharges, including both peak flow rates and total stormwater volume, to minimize erosion at outlets and to minimize downstream channel and stream bank erosion.

d. Depending on the geographic location of the project, the Permittee must not allow soils to remain exposed and unworked for more than the time periods set forth below to prevent erosion:

West of the Cascade Mountains Crest
During the dry season (May 1 - Sept. 30): 7 days
During the wet season (October 1 - April 30): 2 days

East of the Cascade Mountains Crest, except for Central Basin*
During the dry season (July 1 - September 30): 10 days
During the wet season (October 1 - June 30): 5 days

The Central Basin*, East of the Cascade Mountains Crest

During the dry Season (July 1 - September 30): 30 days
During the wet season (October 1 - June 30): 15 days

*Note: The Central Basin is defined as the portions of Eastern Washington with mean annual precipitation of less than 12 inches.

e. The Permittee must stabilize soils at the end of the shift before a holiday or weekend if needed based on the weather forecast.

f. The Permittee must stabilize soil stockpiles from erosion, protected with sediment trapping measures, and where possible, be located away from storm drain inlets, waterways, and drainage channels.

g. The Permittee must minimize the amount of soil exposed during construction activity.

h. The Permittee must minimize the disturbance of steep slopes.

i. The Permittee must minimize soil compaction and, unless infeasible, preserve topsoil.

6. Protect Slopes

a. The Permittee must design and construct cut-and-fill slopes in a manner to minimize erosion. Applicable practices include, but are not limited to, reducing continuous length of slope with terracing and diversions, reducing slope steepness, and roughening slope surfaces (for example, track walking).

b. The Permittee must divert off-site stormwater (run-on) or ground water away from slopes and disturbed areas with interceptor dikes, pipes, and/or swales. Off-site stormwater should be managed separately from stormwater generated on the site.

c. At the top of slopes, collect drainage in pipe slope drains or protected channels to prevent erosion.

i. West of the Cascade Mountains Crest: Temporary pipe slope drains must handle the peak 10-minute velocity of flow from a Type 1A, 10-year, 24-hour frequency storm for the developed condition. Alternatively, the 10-year, 1-hour flow rate predicted by an approved continuous runoff model, increased by a factor of 1.6, may be used. The hydrologic analysis must use the existing land cover condition for predicting flow rates from tributary areas outside the project limits. For tributary areas on the project site, the analysis must use the temporary or permanent project land cover condition, whichever will produce the highest flow rates. If using the Western Washington Hydrology Model (WWHM) to predict flows, bare soil areas should be modeled as "landscaped area."

ii. East of the Cascade Mountains Crest: Temporary pipe slope drains must handle the expected peak flow velocity from a 6-month, 3-hour storm for the developed condition, referred to as the short duration storm.

d. Place excavated material on the uphill side of trenches, consistent with safety and space considerations.

e. Place check dams at regular intervals within constructed channels that are cut down a slope.

7. Protect Drain Inlets

a. Protect all storm drain inlets made operable during construction so that stormwater runoff does not enter the conveyance system without first being filtered or treated to remove sediment.

b. Clean or remove and replace inlet protection devices when sediment has filled one-third of the available storage (unless a different standard is specified by the product manufacturer).

8. Stabilize Channels and Outlets

a. Design, construct and stabilize all on-site conveyance channels to prevent erosion from the following expected peak flows:

i. West of the Cascade Mountains Crest: Channels must handle the peak 10-minute velocity of flow from a Type 1A, 10-year, 24-hour frequency storm for the developed condition. Alternatively, the 10-year, 1-hour flow rate indicated by an approved continuous runoff model, increased by a factor of 1.6, may be used. The hydrologic analysis must use the existing land cover condition for predicting flow rates from tributary areas outside the project limits. For tributary areas on the project site, the analysis must use the temporary or permanent project land cover condition, whichever will produce the highest flow rates. If using the WWHM to predict flows, bare soil areas should be modeled as "landscaped area."

ii. East of the Cascade Mountains Crest: Channels must handle the expected peak flow velocity from a 6-month, 3-hour storm for the developed condition, referred to as the short duration storm.

b. Provide stabilization, including armoring material, adequate to prevent erosion of outlets, adjacent stream banks, slopes, and downstream reaches at the outlets of all conveyance systems.

9. Control Pollutants

Design, install, implement and maintain effective pollution prevention measures to minimize the discharge of pollutants. The Permittee must:

a. Handle and dispose of all pollutants, including waste materials and demolition debris that occur on site in a manner that does not cause contamination of stormwater.

b. Provide cover, containment, and protection from vandalism for all chemicals, liquid products, petroleum products, and other materials that have the potential to pose a threat to human health or the environment. On-site fueling tanks must include secondary containment. Secondary containment means placing tanks or containers within an impervious structure capable of containing 110% of the volume contained in the largest tank within the containment structure. Double-walled tanks do not require additional secondary containment.

c. Conduct maintenance, fueling, and repair of heavy equipment and vehicles using spill prevention and control measures. Clean contaminated surfaces immediately following any spill incident.

d. Discharge wheel wash or tire bath wastewater to a separate on-site treatment system that prevents discharge to surface water, such as closed-loop recirculation or upland land application, or to the sanitary sewer with local sewer district approval.

e. Apply fertilizers and pesticides in a manner and at application rates that will not result in loss of chemical to stormwater runoff. Follow manufacturers' label requirements for application rates and procedures.

f. Use BMPs to prevent contamination of stormwater runoff by pH-modifying sources. The sources for this contamination include, but are not limited to: bulk cement, cement kiln dust, fly ash, new concrete washing and curing waters, waste streams generated from concrete grinding and sawing, exposed aggregate processes, dewatering concrete vaults, concrete pumping and mixer washout waters. (Also refer to the definition for "concrete wastewater" in Appendix A--Definitions.)

g. Adjust the pH of stormwater if necessary to prevent violations of water quality standards.

h. Assure that washout of concrete trucks is performed offsite or in designated concrete washout areas only. Do not wash out concrete trucks onto the ground, or into storm drains, open ditches, streets, or streams. Do not dump excess concrete on site, except in designated concrete washout areas. Concrete spillage or concrete discharge to surface waters of the State is prohibited.

i. Obtain written approval from Ecology before using chemical treatment other than CO_2 or dry ice to adjust pH.

10. Control Dewatering

a. Permittees must discharge foundation, vault, and trench dewatering water, which have characteristics similar to stormwater runoff at the site, into a

controlled conveyance system before discharge to a sediment trap or sediment pond.

b. Permittees may discharge clean, non-turbid dewatering water, such as well-point ground water, to systems tributary to, or directly into surface waters of the State, as specified in Special Condition S9.D.8, provided the dewatering flow does not cause erosion or flooding of receiving waters. Do not route clean dewatering water through stormwater sediment ponds. Note that "surface waters of the State" may exist on a construction site as well as off site; for example, a creek running through a site.

c. Other treatment or disposal options may include:

   i. Infiltration.

   ii. Transport off site in a vehicle, such as a vacuum flush truck, for legal disposal in a manner that does not pollute state waters.

   iii. Ecology-approved on-site chemical treatment or other suitable treatment technologies.

   iv. Sanitary or combined sewer discharge with local sewer district approval, if there is no other option.

   v. Use of a sedimentation bag with discharge to a ditch or swale for small volumes of localized dewatering.

d. Permittees must handle highly turbid or contaminated dewatering water separately from stormwater.

11. Maintain BMPs

    a. Permittees must maintain and repair all temporary and permanent erosion and sediment control BMPs as needed to assure continued performance of their intended function in accordance with BMP specifications.

    b. Permittees must remove all temporary erosion and sediment control BMPs within 30 days after achieving final site stabilization or after the temporary BMPs are no longer needed.

12. Manage the Project

    a. Phase development projects to the maximum degree practicable and take into account seasonal work limitations.

    b. Inspection and monitoring -- Inspect, maintain and repair all BMPs as needed to assure continued performance of their intended function. Conduct site inspections and monitoring in accordance with Special Condition S4.

    c. Maintaining an updated construction SWPPP -- Maintain, update, and implement the SWPPP in accordance with Special Conditions S3, S4 and S9.

E. SWPPP – Map Contents and Requirements

The Permittee's SWPPP must also include a vicinity map or general location map (for example, a USGS quadrangle map, a portion of a county or city map, or other appropriate map) with enough detail to identify the location of the construction site and receiving waters within one mile of the site.

The SWPPP must also include a legible site map (or maps) showing the entire construction site. The following features must be identified, unless not applicable due to site conditions:

1. The direction of north, property lines, and existing structures and roads.
2. Cut and fill slopes indicating the top and bottom of slope catch lines.
3. Approximate slopes, contours, and direction of stormwater flow before and after major grading activities.
4. Areas of soil disturbance and areas that will not be disturbed.
5. Locations of structural and nonstructural controls (BMPs) identified in the SWPPP.
6. Locations of off-site material, stockpiles, waste storage, borrow areas, and vehicle/equipment storage areas.
7. Locations of all surface water bodies, including wetlands.
8. Locations where stormwater or non-stormwater discharges off-site and/or to a surface water body, including wetlands.
9. Location of water quality sampling station(s), if sampling is required by state or local permitting authority.
10. Areas where final stabilization has been accomplished and no further construction-phase permit requirements apply.

S10. NOTICE OF TERMINATION

A. The site is eligible for termination of coverage when it has met any of the following conditions:

1. The site has undergone final stabilization, the Permittee has removed all temporary BMPs (except biodegradable BMPs clearly manufactured with the intention for the material to be left in place and not interfere with maintenance or land use), and all stormwater discharges associated with construction activity have been eliminated; or
2. All portions of the site that have not undergone final stabilization per Special Condition S10.A.1 have been sold and/or transferred (per General Condition G9), and the Permittee no longer has operational control of the construction activity; or

3. For residential construction only, the Permittee has completed temporary stabilization and the homeowners have taken possession of the residences.

B. When the site is eligible for termination, the Permittee must submit a complete and accurate Notice of Termination (NOT) form, signed in accordance with General Condition G2, to:

Department of Ecology
Water Quality Program - Construction Stormwater
PO Box 47696
Olympia, Washington 98504-7696

The termination is effective on the date Ecology receives the NOT form, unless Ecology notifies the Permittee within 30 days that termination request is denied because the Permittee has not met the eligibility requirements in Special Condition S10.A.

Permittees transferring the property to a new property owner or operator/permittee are required to complete and submit the Notice of Transfer form to Ecology, but are not required to submit a Notice of Termination form for this type of transaction.

GENERAL CONDITIONS

G1. DISCHARGE VIOLATIONS

All discharges and activities authorized by this general permit must be consistent with the terms and conditions of this general permit. Any discharge of any pollutant more frequent than or at a level in excess of that identified and authorized by the general permit must constitute a violation of the terms and conditions of this permit.

G2. SIGNATORY REQUIREMENTS

A. All permit applications must bear a certification of correctness to be signed:

1. In the case of corporations, by a responsible corporate officer of at least the level of vice president of a corporation;
2. In the case of a partnership, by a general partner of a partnership;
3. In the case of sole proprietorship, by the proprietor; or
4. In the case of a municipal, state, or other public facility, by either a principal executive officer or ranking elected official.

B. All reports required by this permit and other information requested by Ecology must be signed by a person described above or by a duly authorized representative of that person. A person is a duly authorized representative only if:

1. The authorization is made in writing by a person described above and submitted to the Ecology.
2. The authorization specifies either an individual or a position having responsibility for the overall operation of the regulated facility, such as the position of plant manager, superintendent, position of equivalent responsibility, or an individual or position having overall responsibility for environmental matters.

C. Changes to authorization. If an authorization under paragraph G2.B.2 above is no longer accurate because a different individual or position has responsibility for the overall operation of the facility, a new authorization satisfying the requirements of paragraph G2.B.2 above must be submitted to Ecology prior to or together with any reports, information, or applications to be signed by an authorized representative.

D. Certification. Any person signing a document under this section must make the following certification:

"I certify under penalty of law, that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering

information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

G3. RIGHT OF INSPECTION AND ENTRY

The Permittee must allow an authorized representative of Ecology, upon the presentation of credentials and such other documents as may be required by law:

A. To enter upon the premises where a discharge is located or where any records are kept under the terms and conditions of this permit.

B. To have access to and copy – at reasonable times and at reasonable cost -- any records required to be kept under the terms and conditions of this permit.

C. To inspect -- at reasonable times – any facilities, equipment (including monitoring and control equipment), practices, methods, or operations regulated or required under this permit.

D. To sample or monitor – at reasonable times – any substances or parameters at any location for purposes of assuring permit compliance or as otherwise authorized by the Clean Water Act.

G4. GENERAL PERMIT MODIFICATION AND REVOCATION

This permit may be modified, revoked and reissued, or terminated in accordance with the provisions of Chapter 173-226 WAC. Grounds for modification, revocation and reissuance, or termination include, but are not limited to, the following:

A. When a change occurs in the technology or practices for control or abatement of pollutants applicable to the category of dischargers covered under this permit.

B. When effluent limitation guidelines or standards are promulgated pursuant to the CWA or Chapter 90.48 RCW, for the category of dischargers covered under this permit.

C. When a water quality management plan containing requirements applicable to the category of dischargers covered under this permit is approved, or

D. When information is obtained that indicates cumulative effects on the environment from dischargers covered under this permit are unacceptable.

G5. REVOCATION OF COVERAGE UNDER THE PERMIT

Pursuant to Chapter 43.21B RCW and Chapter 173-226 WAC, the Director may terminate coverage for any discharger under this permit for cause. Cases where coverage may be terminated include, but are not limited to, the following:

A. Violation of any term or condition of this permit.

B. Obtaining coverage under this permit by misrepresentation or failure to disclose fully all relevant facts.

C. A change in any condition that requires either a temporary or permanent reduction or elimination of the permitted discharge.

D. Failure or refusal of the Permittee to allow entry as required in RCW 90.48.090.

E. A determination that the permitted activity endangers human health or the environment, or contributes to water quality standards violations.

F. Nonpayment of permit fees or penalties assessed pursuant to RCW 90.48.465 and Chapter 173-224 WAC.

G. Failure of the Permittee to satisfy the public notice requirements of WAC 173-226-130(5), when applicable.

The Director may require any discharger under this permit to apply for and obtain coverage under an individual permit or another more specific general permit. Permittees who have their coverage revoked for cause according to WAC 173-226-240 may request temporary coverage under this permit during the time an individual permit is being developed, provided the request is made within ninety (90) days from the time of revocation and is submitted along with a complete individual permit application form.

G6. REPORTING A CAUSE FOR MODIFICATION

The Permittee must submit a new application, or a supplement to the previous application, whenever a material change to the construction activity or in the quantity or type of discharge is anticipated which is not specifically authorized by this permit. This application must be submitted at least sixty (60) days prior to any proposed changes. Filing a request for a permit modification, revocation and reissuance, or termination, or a notification of planned changes or anticipated noncompliance does not relieve the Permittee of the duty to comply with the existing permit until it is modified or reissued.

G7. COMPLIANCE WITH OTHER LAWS AND STATUTES

Nothing in this permit will be construed as excusing the Permittee from compliance with any applicable federal, state, or local statutes, ordinances, or regulations.

G8. DUTY TO REAPPLY

The Permittee must apply for permit renewal at least 180 days prior to the specified expiration date of this permit.

G9. TRANSFER OF GENERAL PERMIT COVERAGE

Coverage under this general permit is automatically transferred to a new discharger, including operators of lots/parcels within a common plan of development or sale, **if**:

A. A written agreement (Transfer of Coverage Form) between the current discharger (Permittee) and new discharger, signed by both parties and containing a specific date for transfer of permit responsibility, coverage, and liability is submitted to the Director; and

B. The Director does not notify the current discharger and new discharger of the Director's intent to revoke coverage under the general permit. If this notice is not given, the transfer is effective on the date specified in the written agreement.

When a current discharger (Permittee) transfers a portion of a permitted site, the current discharger must also submit an updated application form (NOI) to the Director indicating the remaining permitted acreage after the transfer.

G10. REMOVED SUBSTANCES

The Permittee must not re-suspend or reintroduce collected screenings, grit, solids, sludges, filter backwash, or other pollutants removed in the course of treatment or control of stormwater to the final effluent stream for discharge to state waters.

G11. DUTY TO PROVIDE INFORMATION

The Permittee must submit to Ecology, within a reasonable time, all information that Ecology may request to determine whether cause exists for modifying, revoking and reissuing, or terminating this permit or to determine compliance with this permit. The Permittee must also submit to Ecology, upon request, copies of records required to be kept by this permit [40 CFR 122.41(h)].

G12. OTHER REQUIREMENTS OF 40 CFR

All other requirements of 40 CFR 122.41 and 122.42 are incorporated in this permit by reference.

G13. ADDITIONAL MONITORING

Ecology may establish specific monitoring requirements in addition to those contained in this permit by administrative order or permit modification.

G14. PENALTIES FOR VIOLATING PERMIT CONDITIONS

Any person who is found guilty of willfully violating the terms and conditions of this permit shall be deemed guilty of a crime, and upon conviction thereof shall be punished by a fine of up to ten thousand dollars ($10,000) and costs of prosecution, or by imprisonment in the discretion of the court. Each day upon which a willful violation occurs may be deemed a separate and additional violation.

Any person who violates the terms and conditions of a waste discharge permit shall incur, in addition to any other penalty as provided by law, a civil penalty in the amount of up to ten thousand dollars ($10,000) for every such violation. Each and every such violation shall be a separate and distinct offense, and in case of a continuing violation, every day's continuance shall be deemed to be a separate and distinct violation.

G15. UPSET

Definition – "Upset" means an exceptional incident in which there is unintentional and temporary noncompliance with technology-based permit effluent limitations because of factors beyond the reasonable control of the Permittee. An upset does not include noncompliance to the extent caused by operational error, improperly designed treatment facilities, inadequate treatment facilities, lack of preventive maintenance, or careless or improper operation.

An upset constitutes an affirmative defense to an action brought for noncompliance with such technology-based permit effluent limitations if the requirements of the following paragraph are met.

A Permittee who wishes to establish the affirmative defense of upset must demonstrate, through properly signed, contemporaneous operating logs or other relevant evidence that: 1) an upset occurred and that the Permittee can identify the cause(s) of the upset; 2) the permitted facility was being properly operated at the time of the upset; 3) the Permittee submitted notice of the upset as required in Special Condition S5.F, and; 4) the Permittee complied with any remedial measures required under this permit.

In any enforcement proceeding, the Permittee seeking to establish the occurrence of an upset has the burden of proof.

G16. PROPERTY RIGHTS

This permit does not convey any property rights of any sort, or any exclusive privilege.

G17. DUTY TO COMPLY

The Permittee must comply with all conditions of this permit. Any permit noncompliance constitutes a violation of the Clean Water Act and is grounds for enforcement action; for permit termination, revocation and reissuance, or modification; or denial of a permit renewal application.

G18. TOXIC POLLUTANTS

The Permittee must comply with effluent standards or prohibitions established under Section 307(a) of the Clean Water Act for toxic pollutants within the time provided in the regulations that establish those standards or prohibitions, even if this permit has not yet been modified to incorporate the requirement.

G19. PENALTIES FOR TAMPERING

The Clean Water Act provides that any person who falsifies, tampers with, or knowingly renders inaccurate any monitoring device or method required to be maintained under this permit shall, upon conviction, be punished by a fine of not more than $10,000 per violation, or by imprisonment for not more than two years per violation, or by both. If a conviction of a person is for a violation committed after a first conviction of such person under this condition, punishment shall be a fine of not more than $20,000 per day of violation, or imprisonment of not more than four (4) years, or both.

G20. REPORTING PLANNED CHANGES

The Permittee must, as soon as possible, give notice to Ecology of planned physical alterations, modifications or additions to the permitted construction activity. The Permittee should be aware that, depending on the nature and size of the changes to the original permit, a new public notice and other permit process requirements may be required. Changes in activities that require reporting to Ecology include those that will result in:

A. The permitted facility being determined to be a new source pursuant to 40 CFR 122.29(b).

B. A significant change in the nature or an increase in quantity of pollutants discharged, including but not limited to: for sites 5 acres or larger, a 20% or greater increase in acreage disturbed by construction activity.

C. A change in or addition of surface water(s) receiving stormwater or non-stormwater from the construction activity.

D. A change in the construction plans and/or activity that affects the Permittee's monitoring requirements in Special Condition S4.

Following such notice, permit coverage may be modified, or revoked and reissued pursuant to 40 CFR 122.62(a) to specify and limit any pollutants not previously limited. Until such modification is effective, any new or increased discharge in excess of permit limits or not specifically authorized by this permit constitutes a violation.

G21. REPORTING OTHER INFORMATION

Where the Permittee becomes aware that it failed to submit any relevant facts in a permit application, or submitted incorrect information in a permit application or in any report to Ecology, it must promptly submit such facts or information.

G22. REPORTING ANTICIPATED NON-COMPLIANCE

The Permittee must give advance notice to Ecology by submission of a new application or supplement thereto at least forty-five (45) days prior to commencement of such discharges, of any facility expansions, production increases, or other planned changes, such as process modifications, in the permitted facility or activity which may result in noncompliance with permit limits or conditions. Any maintenance of facilities, which might necessitate unavoidable interruption of operation and degradation of effluent quality, must be scheduled during non-critical water quality periods and carried out in a manner approved by Ecology.

G23. REQUESTS TO BE EXCLUDED FROM COVERAGE UNDER THE PERMIT

Any discharger authorized by this permit may request to be excluded from coverage under the general permit by applying for an individual permit. The discharger must submit to the Director an application as described in WAC 173-220-040 or WAC 173-216-070, whichever is applicable, with reasons supporting the request. These reasons will fully document how an individual permit will apply to the applicant in a way that the general permit cannot. Ecology may make specific requests for information to support the request. The Director will either issue an individual permit or deny the request with a statement explaining the reason for the denial. When an individual permit is issued to a discharger otherwise subject to the construction stormwater general permit, the applicability of the construction stormwater general permit to that Permittee is automatically terminated on the effective date of the individual permit.

G24. APPEALS

A. The terms and conditions of this general permit, as they apply to the appropriate class of dischargers, are subject to appeal by any person within 30 days of issuance of this general permit, in accordance with Chapter 43.21B RCW, and Chapter 173-226 WAC.

B. The terms and conditions of this general permit, as they apply to an individual discharger, are appealable in accordance with Chapter 43.21B RCW within 30 days of the effective date of coverage of that discharger. Consideration of an appeal of general permit coverage of an individual discharger is limited to the general permit's applicability or nonapplicability to that individual discharger.

C. The appeal of general permit coverage of an individual discharger does not affect any other dischargers covered under this general permit. If the terms and conditions of this general permit are found to be inapplicable to any individual discharger(s), the matter

shall be remanded to Ecology for consideration of issuance of an individual permit or permits.

G25. SEVERABILITY

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

G26. BYPASS PROHIBITED

A. Bypass Procedures

Bypass, which is the intentional diversion of waste streams from any portion of a treatment facility, is prohibited for stormwater events below the design criteria for stormwater management. Ecology may take enforcement action against a Permittee for bypass unless one of the following circumstances (1, 2, 3 or 4) is applicable.

1. Bypass of stormwater is consistent with the design criteria and part of an approved management practice in the applicable stormwater management manual.

2. Bypass for essential maintenance without the potential to cause violation of permit limits or conditions.

   Bypass is authorized if it is for essential maintenance and does not have the potential to cause violations of limitations or other conditions of this permit, or adversely impact public health.

3. Bypass of stormwater is unavoidable, unanticipated, and results in noncompliance of this permit.

   This bypass is permitted only if:

   a. Bypass is unavoidable to prevent loss of life, personal injury, or severe property damage. “Severe property damage” means substantial physical damage to property, damage to the treatment facilities which would cause them to become inoperable, or substantial and permanent loss of natural resources which can reasonably be expected to occur in the absence of a bypass.

   b. There are no feasible alternatives to the bypass, such as the use of auxiliary treatment facilities, retention of untreated wastes, maintenance during normal periods of equipment downtime (but not if adequate backup equipment should have been installed in the exercise of reasonable engineering judgment to prevent a bypass which occurred during normal periods of equipment downtime or preventative maintenance), or transport of untreated wastes to another treatment facility.

c. Ecology is properly notified of the bypass as required in Special Condition S5.F of this permit.

4. A planned action that would cause bypass of stormwater and has the potential to result in noncompliance of this permit during a storm event.

   The Permittee must notify Ecology at least thirty (30) days before the planned date of bypass. The notice must contain:

   a. a description of the bypass and its cause

   b. an analysis of all known alternatives which would eliminate, reduce, or mitigate the need for bypassing.

   c. a cost-effectiveness analysis of alternatives including comparative resource damage assessment.

   d. the minimum and maximum duration of bypass under each alternative.

   e. a recommendation as to the preferred alternative for conducting the bypass.

   f. the projected date of bypass initiation.

   g. a statement of compliance with SEPA.

   h. a request for modification of water quality standards as provided for in WAC 173-201A-110, if an exceedance of any water quality standard is anticipated.

   i. steps taken or planned to reduce, eliminate, and prevent reoccurrence of the bypass.

5. For probable construction bypasses, the need to bypass is to be identified as early in the planning process as possible. The analysis required above must be considered during preparation of the Stormwater Pollution Prevention Plan (SWPPP) and must be included to the extent practical. In cases where the probable need to bypass is determined early, continued analysis is necessary up to and including the construction period in an effort to minimize or eliminate the bypass.

   Ecology will consider the following before issuing an administrative order for this type bypass:

   a. If the bypass is necessary to perform construction or maintenance-related activities essential to meet the requirements of this permit.

   b. If there are feasible alternatives to bypass, such as the use of auxiliary treatment facilities, retention of untreated wastes, stopping production, maintenance during normal periods of equipment down time, or transport of untreated wastes to another treatment facility.

   c. If the bypass is planned and scheduled to minimize adverse effects on the public and the environment.

After consideration of the above and the adverse effects of the proposed bypass and any other relevant factors, Ecology will approve, conditionally approve, or deny the request. The public must be notified and given an opportunity to comment on bypass incidents of significant duration, to the extent feasible. Approval of a request to bypass will be by administrative order issued by Ecology under RCW 90.48.120.

B. Duty to Mitigate

The Permittee is required to take all reasonable steps to minimize or prevent any discharge or sludge use or disposal in violation of this permit that has a reasonable likelihood of adversely affecting human health or the environment.

APPENDIX A – DEFINITIONS

AKART is an acronym for "all known, available, and reasonable methods of prevention, control, and treatment." AKART represents the most current methodology that can be reasonably required for preventing, controlling, or abating the pollutants and controlling pollution associated with a discharge.

Applicable TMDL means a TMDL for turbidity, fine sediment, high pH, or phosphorus, which was completed and approved by EPA before January 1, 2011, or before the date the operator's complete permit application is received by Ecology, whichever is later.

Applicant means an operator seeking coverage under this permit.

Best Management Practices (BMPs) means schedules of activities, prohibitions of practices, maintenance procedures, and other physical, structural and/or managerial practices to prevent or reduce the pollution of waters of the State. BMPs include treatment systems, operating procedures, and practices to control: stormwater associated with construction activity, spillage or leaks, sludge or waste disposal, or drainage from raw material storage.

Buffer means an area designated by a local jurisdiction that is contiguous to and intended to protect a sensitive area.

Bypass means the intentional diversion of waste streams from any portion of a treatment facility.

Calendar Day A period of 24 consecutive hours starting at 12:00 midnight and ending the following 12:00 midnight.

Calendar Week (same as Week) means a period of seven consecutive days starting at 12:01 a.m. (0:01 hours) on Sunday.

Certified Erosion and Sediment Control Lead (CESCL) means a person who has current certification through an approved erosion and sediment control training program that meets the minimum training standards established by Ecology (see BMP C160 in the SWMM).

Clean Water Act (CWA) means the Federal Water Pollution Control Act enacted by Public Law 92-500, as amended by Public Laws 95-217, 95-576, 96-483, and 97-117; USC 1251 et seq.

Combined Sewer means a sewer which has been designed to serve as a sanitary sewer and a storm sewer, and into which inflow is allowed by local ordinance.

Common Plan of Development or Sale means a site where multiple separate and distinct construction activities may be taking place at different times on different schedules and/or by different contractors, but still under a single plan. Examples include: 1) phased projects and projects with multiple filings or lots, even if the separate phases or filings/lots will be constructed under separate contract or by separate owners (e.g., a development where lots are sold to separate builders); 2) a development plan that may be phased over multiple years, but is still under a

consistent plan for long-term development; 3) projects in a contiguous area that may be unrelated but still under the same contract, such as construction of a building extension and a new parking lot at the same facility; and 4) linear projects such as roads, pipelines, or utilities. If the project is part of a common plan of development or sale, the disturbed area of the entire plan must be used in determining permit requirements.

Composite Sample means a mixture of grab samples collected at the same sampling point at different times, formed either by continuous sampling or by mixing discrete samples. May be "time-composite" (collected at constant time intervals) or "flow-proportional" (collected either as a constant sample volume at time intervals proportional to stream flow, or collected by increasing the volume of each aliquot as the flow increases while maintaining a constant time interval between the aliquots.

Concrete wastewater means any water used in the production, pouring and/or clean-up of concrete or concrete products, and any water used to cut, grind, wash, or otherwise modify concrete or concrete products. Examples include water used for or resulting from concrete truck/mixer/pumper/tool/chute rinsing or washing, concrete saw cutting and surfacing (sawing, coring, grinding, roughening, hydro-demolition, bridge and road surfacing). When stormwater comingles with concrete wastewater, the resulting water is considered concrete wastewater and must be managed to prevent discharge to waters of the state, including ground water.

Construction Activity means land disturbing operations including clearing, grading or excavation which disturbs the surface of the land. Such activities may include road construction, construction of residential houses, office buildings, or industrial buildings, and demolition activity.

Contaminant means any hazardous substance that does not occur naturally or occurs at greater than natural background levels. See definition of “hazardous substance” and WAC 173-340-200.

Demonstrably Equivalent means that the technical basis for the selection of all stormwater BMPs is documented within a SWPPP, including:

1. The method and reasons for choosing the stormwater BMPs selected.
2. The pollutant removal performance expected from the BMPs selected.
3. The technical basis supporting the performance claims for the BMPs selected, including any available data concerning field performance of the BMPs selected.
4. An assessment of how the selected BMPs will comply with state water quality standards.
5. An assessment of how the selected BMPs will satisfy both applicable federal technology-based treatment requirements and state requirements to use all known, available, and reasonable methods of prevention, control, and treatment (AKART).

Department means the Washington State Department of Ecology.

Detention means the temporary storage of stormwater to improve quality and/or to reduce the mass flow rate of discharge.

Dewatering means the act of pumping ground water or stormwater away from an active construction site.

Director means the Director of the Washington Department of Ecology or his/her authorized representative.

Discharger means an owner or operator of any facility or activity subject to regulation under Chapter 90.48 RCW or the Federal Clean Water Act.

Domestic Wastewater means water carrying human wastes, including kitchen, bath, and laundry wastes from residences, buildings, industrial establishments, or other places, together with such ground water infiltration or surface waters as may be present.

Ecology means the Washington State Department of Ecology.

Engineered Soils means the use of soil amendments including, but not limited, to Portland cement treated base (CTB), cement kiln dust (CKD), or fly ash to achieve certain desirable soil characteristics.

Equivalent BMPs means operational, source control, treatment, or innovative BMPs which result in equal or better quality of stormwater discharge to surface water or to ground water than BMPs selected from the SWMM.

Erosion means the wearing away of the land surface by running water, wind, ice, or other geological agents, including such processes as gravitational creep.

Erosion and Sediment Control BMPs means BMPs intended to prevent erosion and sedimentation, such as preserving natural vegetation, seeding, mulching and matting, plastic covering, filter fences, sediment traps, and ponds. Erosion and sediment control BMPs are synonymous with stabilization and structural BMPs.

Final Stabilization (same as fully stabilized or full stabilization) means the establishment of a permanent vegetative cover, or equivalent permanent stabilization measures (such as riprap, gabions or geotextiles) which prevents erosion.

Ground Water means water in a saturated zone or stratum beneath the land surface or a surface water body.

Hazardous Substance means any dangerous or extremely hazardous waste as defined in RCW 70.105.010 (5) and (6), or any dangerous or extremely dangerous waste as designated by rule under chapter 70.105 RCW; any hazardous sub-stance as defined in RCW 70.105.010(14) or any hazardous substance as defined by rule under chapter 70.105 RCW; any substance that, on the effective date of this section, is a hazardous substance under section 101(14) of the federal cleanup law, 42 U.S.C., Sec. 9601(14); petroleum or petroleum products; and any substance or category of substances, including solid waste decomposition products, determined by the director

by rule to present a threat to human health or the environment if released into the environment. The term hazardous substance does not include any of the following when contained in an underground storage tank from which there is not a release: crude oil or any fraction thereof or petroleum, if the tank is in compliance with all applicable federal, state, and local law.

Injection Well means a well that is used for the subsurface emplacement of fluids. (See Well.)

Jurisdiction means a political unit such as a city, town or county; incorporated for local self-government.

National Pollutant Discharge Elimination System (NPDES) means the national program for issuing, modifying, revoking and reissuing, terminating, monitoring, and enforcing permits, and imposing and enforcing pretreatment requirements, under sections 307, 402, 318, and 405 of the Federal Clean Water Act, for the discharge of pollutants to surface waters of the State from point sources. These permits are referred to as NPDES permits and, in Washington State, are administered by the Washington Department of Ecology.

Notice of Intent (NOI) means the application for, or a request for coverage under this general permit pursuant to WAC 173-226-200.

Notice of Termination (NOT) means a request for termination of coverage under this general permit as specified by Special Condition S10 of this permit.

Operator means any party associated with a construction project that meets either of the following two criteria:

- The party has operational control over construction plans and specifications, including the ability to make modifications to those plans and specifications; or
- The party has day-to-day operational control of those activities at a project that are necessary to ensure compliance with a SWPPP for the site or other permit conditions (e.g., they are authorized to direct workers at a site to carry out activities required by the SWPPP or comply with other permit conditions).

Permittee means individual or entity that receives notice of coverage under this general permit.

pH means a liquid's measure of acidity or alkalinity. A pH of 7 is defined as neutral. Large variations above or below this value are considered harmful to most aquatic life.

pH monitoring period means the time period in which the pH of stormwater runoff from a site must be tested a minimum of once every seven days to determine if stormwater pH is between 6.5 and 8.5.

Point source means any discernible, confined, and discrete conveyance, including but not limited to, any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, and container from which pollutants are or may be discharged to surface waters of the State. This term does not include return flows from irrigated agriculture. (See Fact Sheet for further explanation.)

Pollutant means dredged spoil, solid waste, incinerator residue, filter backwash, sewage, garbage, domestic sewage sludge (biosolids), munitions, chemical wastes, biological materials, radioactive materials, heat, wrecked or discarded equipment, rock, sand, cellar dirt, and industrial, municipal, and agricultural waste. This term does not include sewage from vessels within the meaning of section 312 of the CWA, nor does it include dredged or fill material discharged in accordance with a permit issued under section 404 of the CWA.

Pollution means contamination or other alteration of the physical, chemical, or biological properties of waters of the State; including change in temperature, taste, color, turbidity, or odor of the waters; or such discharge of any liquid, gaseous, solid, radioactive or other substance into any waters of the State as will or is likely to create a nuisance or render such waters harmful, detrimental or injurious to the public health, safety or welfare; or to domestic, commercial, industrial, agricultural, recreational, or other legitimate beneficial uses; or to livestock, wild animals, birds, fish or other aquatic life.

Process wastewater means any water which, during manufacturing or processing, comes into direct contact with or results from the production or use of any raw material, intermediate product, finished product, byproduct, or waste product (40 CFR 122.1).

Receiving water means the water body at the point of discharge. If the discharge is to a storm sewer system, either surface or subsurface, the receiving water is the water body to which the storm system discharges. Systems designed primarily for other purposes such as for ground water drainage, redirecting stream natural flows, or for conveyance of irrigation water/return flows that coincidentally convey stormwater are considered the receiving water.

Representative means a stormwater or wastewater sample which represents the flow and characteristics of the discharge. Representative samples may be a grab sample, a time-proportionate composite sample, or a flow proportionate sample. Ecology's Construction Stormwater Monitoring Manual provides guidance on representative sampling.

Sanitary sewer means a sewer which is designed to convey domestic wastewater.

Sediment means the fragmented material that originates from the weathering and erosion of rocks or unconsolidated deposits, and is transported by, suspended in, or deposited by water.

Sedimentation means the depositing or formation of sediment.

Sensitive area means a water body, wetland, stream, aquifer recharge area, or channel migration zone.

SEPA (State Environmental Policy Act) means the Washington State Law, RCW 43.21C.020, intended to prevent or eliminate damage to the environment.

Significant Amount means an amount of a pollutant in a discharge that is amenable to available and reasonable methods of prevention or treatment; or an amount of a pollutant that has a

reasonable potential to cause a violation of surface or ground water quality or sediment management standards.

Significant concrete work means greater than 1000 cubic yards poured concrete or recycled concrete over the life of a project.

Significant Contributor of Pollutants means a facility determined by Ecology to be a contributor of a significant amount(s) of a pollutant(s) to waters of the State of Washington.

Site means the land or water area where any "facility or activity" is physically located or conducted.

Source control BMPs means physical, structural or mechanical devices or facilities that are intended to prevent pollutants from entering stormwater. A few examples of source control BMPs are erosion control practices, maintenance of stormwater facilities, constructing roofs over storage and working areas, and directing wash water and similar discharges to the sanitary sewer or a dead end sump.

Stabilization means the application of appropriate BMPs to prevent the erosion of soils, such as, temporary and permanent seeding, vegetative covers, mulching and matting, plastic covering and sodding. See also the definition of Erosion and Sediment Control BMPs.

Storm drain means any drain which drains directly into a storm sewer system, usually found along roadways or in parking lots.

Storm sewer system means a means a conveyance, or system of conveyances (including roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, manmade channels, or storm drains designed or used for collecting or conveying stormwater. This does not include systems which are part of a combined sewer or Publicly Owned Treatment Works (POTW) as defined at 40 CFR 122.2.

Stormwater means that portion of precipitation that does not naturally percolate into the ground or evaporate, but flows via overland flow, interflow, pipes, and other features of a stormwater drainage system into a defined surface water body, or a constructed infiltration facility.

Stormwater Management Manual (SWMM) or Manual means the technical Manual published by Ecology for use by local governments that contain descriptions of and design criteria for BMPs to prevent, control, or treat pollutants in stormwater.

Stormwater Pollution Prevention Plan (SWPPP) means a documented plan to implement measures to identify, prevent, and control the contamination of point source discharges of stormwater.

Surface Waters of the State includes lakes, rivers, ponds, streams, inland waters, salt waters, and all other surface waters and water courses within the jurisdiction of the state of Washington.

Temporary Stabilization means the exposed ground surface has been covered with appropriate materials to provide temporary stabilization of the surface from water or wind erosion. Materials include, but are not limited to, mulch, riprap, erosion control mats or blankets and temporary cover crops. Seeding alone is not considered stabilization. Temporary stabilization is not a substitute for the more permanent "final stabilization."

Total Maximum Daily Load (TMDL) means a calculation of the maximum amount of a pollutant that a water body can receive and still meet state water quality standards. Percentages of the total maximum daily load are allocated to the various pollutant sources. A TMDL is the sum of the allowable loads of a single pollutant from all contributing point and nonpoint sources. The TMDL calculations must include a "margin of safety" to ensure that the water body can be protected in case there are unforeseen events or unknown sources of the pollutant. The calculation must also account for seasonable variation in water quality.

Treatment BMPs means BMPs that are intended to remove pollutants from stormwater. A few examples of treatment BMPs are detention ponds, oil/water separators, biofiltration, and constructed wetlands.

Transparency means a measurement of water clarity in centimeters (cm), using a 60 cm transparency tube. The transparency tube is used to estimate the relative clarity or transparency of water by noting the depth at which a black and white Secchi disc becomes visible when water is released from a value in the bottom of the tube. A transparency tube is sometimes referred to as a "turbidity tube."

Turbidity means the clarity of water expressed as nephelometric turbidity units (NTU) and measured with a calibrated turbidimeter.

Uncontaminated means free from any contaminant, as defined in MTCA cleanup regulations. See definition of "contaminant" and WAC 173-340-200.

Waste Load Allocation (WLA) means the portion of a receiving water's loading capacity that is allocated to one of its existing or future point sources of pollution. WLAs constitute a type of water quality based effluent limitation (40 CFR 130.2[h]).

Water quality means the chemical, physical, and biological characteristics of water, usually with respect to its suitability for a particular purpose.

Waters of the State includes those waters as defined as "waters of the United States" in 40 CFR Subpart 122.2 within the geographic boundaries of Washington State and "waters of the State" as defined in Chapter 90.48 RCW, which include lakes, rivers, ponds, streams, inland waters, underground waters, salt waters, and all other surface waters and water courses within the jurisdiction of the state of Washington.

Well means a bored, drilled or driven shaft, or dug hole whose depth is greater than the largest surface dimension. (See Injection well.)

Wheel wash wastewater means any water used in, or resulting from the operation of, a tire bath or wheel wash (BMP C106: Wheel Wash), or other structure or practice that uses water to physically remove mud and debris from vehicles leaving a construction site and prevent track-out onto roads. When stormwater comingles with wheel wash wastewater, the resulting water is considered wheel wash wastewater and must be managed according to Special Condition S9.D.9.

APPENDIX B – ACRONYMS

AKART	All Known, Available, and Reasonable Methods of Prevention, Control, and Treatment
BMP	Best Management Practice
CESCL	Certified Erosion and Sediment Control Lead
CFR	Code of Federal Regulations
CKD	Cement Kiln Dust
cm	Centimeters
CTB	Cement-Treated Base
CWA	Clean Water Act
DMR	Discharge Monitoring Report
EPA	Environmental Protection Agency
ESC	Erosion and Sediment Control
FR	Federal Register
NOI	Notice of Intent
NOT	Notice of Termination
NPDES	National Pollutant Discharge Elimination System
NTU	Nephelometric Turbidity Unit
RCW	Revised Code of Washington
SEPA	State Environmental Policy Act
SWMM	Stormwater Management Manual
SWPPP	Stormwater Pollution Prevention Plan
TMDL	Total Maximum Daily Load
UIC	Underground Injection Control
USC	United States Code
USEPA	United States Environmental Protection Agency
WAC	Washington Administrative Code
WQ	Water Quality
WWHM	Western Washington Hydrology Model

ATTACHMENT H2

SURFACE WATER ANALYSES FOR CONSTRUCTION STORM WATER POLLUTION PREVENTION PLAN

RHOADS BORROW AREA:

SURFACE WATER ANALYSES FOR CONSTRUCTION STORM WATER POLLUTION PREVENTION PLAN

Revisioning						
Rev.	**Date**	**Description**	**By**	**Checked**	**Date**	**Reviewed**
0	*7-Nov-2013*	*Rhoads POO Rev. 1*	*Leland Fuhrig*	*John Redmond*	*14-Oct-2013*	*Tom Kelley*
1	*25-Apr-2014*	*Deletion of Whitetail Crossing Detention Pond for Rev.2 POR SWPPP*	*Tom Kelley*			*Vance Drain*

Location and Format

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

||Usslcs01\IFO\Industrial Projects\Midnite Mine\Deliverables_Working Documents\Rhoads Excavation and Reclamation Plan\Rev2\Appendix H - SWPPP

The following calculations were generated using the following software:

Microsoft Office Professional Plus 2010 (Microsoft Excel)
SEDCAD 4
AutoCAD 2011
Army Corps of Engineers (ACOE) HEC-HMS version 3.5

1.0 BACKGROUND

This calculation brief has been prepared to support the Construction Storm Water Pollution Prevention Plan for the Rhoads Borrow Area, and presents the hydrologic analyses and BMP recommendations for that document. These analyses present peak stormwater flow (or discharge) estimates in site drainages under disturbed, bare ground conditions at the downstream (southern and southwestern) boundaries of the Rhoads property. In addition, it has been proposed that in areas where the temporary borrow area haul road crosses the two ephemeral drainage features lying to the west of Whitetail Creek, that these crossings be designed to act as detention basins for the upstream portions of the site. Calculations of the detention and outlet discharge capacities for the proposed detention basins are also included in the calculation estimate. The temporary haul road crossing of Whitetail Creek will be designed as a flow-through culvert with minimal stormwater detention upstream since sediment control along Whitetail Creek will include maintaining a vegetative buffer along both creek banks as described in the SWPPP.

2.0 METHODOLOGY

Analyses in this document have been done to design stormwater features to control storm water during development and operation of the Rhoads Property Borrow Area. The approach used in development of these features was based on the design criteria as set by the Washington State Department of Ecology (WDOE, 2004).

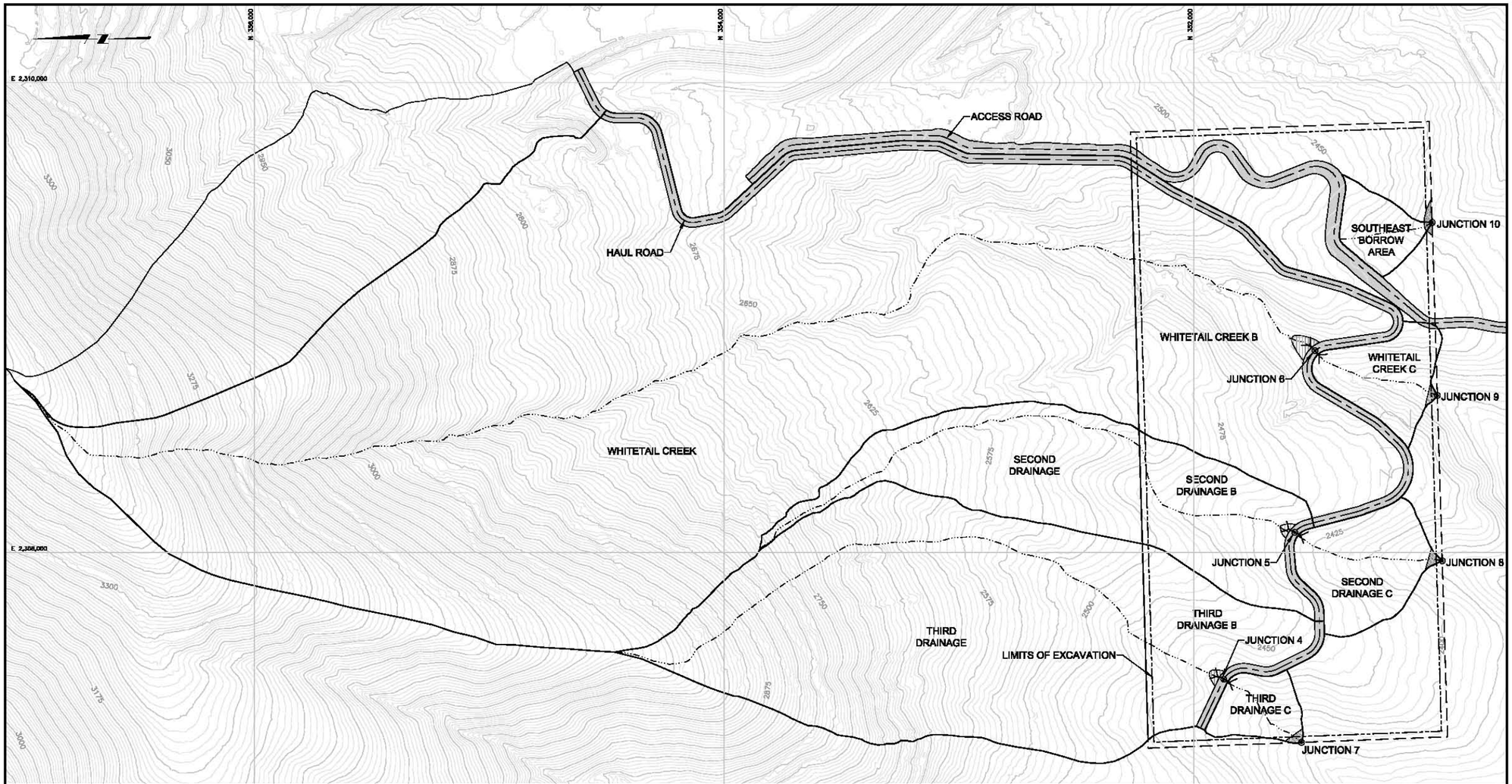
Major storm water features that are part of this evaluation include potential areas of ponding and associated outlet structures upstream of the haul road as it crosses the two ephemeral drainages to the West of Whitetail Creek and the flow-through culvert crossing of Whitetail Creek. These drainages are shown on Figure 1.

The Stormwater Management Manual for Eastern Washington (SMMEW; WDOE, 2004) was used as the basis for design of the structures that will pond and pass water underneath the temporary haul road. The SMMEW recommends the storage capacity of temporary construction detention basins be sized to store the estimated runoff volume from the 2-year runoff event.

The SMMEW also recommends that detention basin designs include a bypass for all BMPs unless the facility is able to convey the 25-year short-duration storm. It is also recommended that the release rate for the 25-year storm be equal to the pre-developed or existing 25-year peak flow.

The requirement for detention basin outlets is that they consist of a combination of principal and emergency spillways and that these outlets must pass the peak runoff expected from the contributing drainage area for a 100-year storm. In addition, the design criteria selected for the flow-through culvert crossing in the Whitetail drainage is that it safely pass the 25-year peak flow. Temporary diversion channels such as the haul road ditches will be designed to convey the 2-year, 6-hour storm event.

Based on the location of the site (Eastern Washington Region 3), an SCS Type 1A storm distribution was used as the design storm per recommendations in the Surface Water Design Investigation Report (Tetra Tech, 2011). The drainage areas associated with areas affected by the Rhoads property borrow area are shown in Figure 1.



LEGEND:

- 5605 — EXISTING GROUND SURFACE ELEVATION, FEET
- SUBBASIN BOUNDARY
- RHOADS PROPERTY BOUNDARY
- APPROXIMATE DRAINAGE PATH
- CULVERT
- LOCATIONS OF SEDIMENTATION PONDS AND PERFORATED RISER / CULVERT STRUCTURES
- LOCATIONS OF ROCK CHECK DAMS

0 200' 400'
CONTOUR INTERVAL = 5'

MARK	DESCRIPTION	TECH	ENG	DATE
0	DRAFT	CF	LF	10-13

DISCLAIMER:
THIS DRAWING WAS DEVELOPED THROUGH THE APPLICATION OF PROFESSIONAL ENGINEERING SKILL AND PROPRIETARY METHODOLOGIES, PROCESSES AND SOFTWARE OF MWH AS AUTHOR FOR PURPOSES PER THE TERMS OF A CONTRACT BETWEEN MWH AND NEWMONT PREPARATION. THIS DRAWING MAY NOT BE USED OR MODIFIED OTHER THAN IN STRICT ACCORDANCE WITH THE TERMS OF THE GOVERNING CONTRACT AND SCOPE OF WORK OR OTHERWISE WITHOUT THE ENGAGEMENT AND CONSENT OF THE AUTHOR. ANY ALTERATION OR ADAPTATION OF THIS DRAWING SHALL BE CONSISTENT WITH THE AUTHOR'S CONTRACTUAL AND PROPRIETARY RIGHTS AND BE AT USER'S SOLE RISK AND WITHOUT ANY LIABILITY OR LEGAL RESPONSIBILITY OF MWH.

DRAWING REFERENCE(S):
- EXISTING TOPOGRAPHY BASED UPON LIDAR MAPPING BY SPATIAL INTEL, 2010, WASHINGTON STATE PLANE-NORTH, NAD 83/NAVD 88.
- MINING TOPOGRAPHY AND PIT EXCAVATION TOPOGRAPHY BASED UPON INFORMATION PROVIDED BY U.S. BUREAU OF MINES (USBM), 1934 (PIT). ORIGINAL DATUM NOT PROVIDED BY USBM. MAPPING (NAD27/NAVD29) HAS BEEN CONVERTED TO NAD83/NAVD88 BASED COORDINATES.

DESIGNED BY	L FUHRIG 10-13
DRAWN BY	C FOWLER 10-13
CHECKED BY	L FUHRIG 10-13
APPROVED BY	L FUHRIG 10-13
PROJECT MANAGER	

NEWMONT

PROJECT LOCATION: WELLPINIT, WASHINGTON
PROJECT: MIDNITE MINE
TITLE: FIGURE 1

MWH

SHEET 1 | REVISION 0
FILE NAME SUBBASIN FIGURE1 | DATE SEPT 2013

I:\Drawings-Civil\Dwg\Objects 1=Achievement\SUBBASIN FIGURE1

Storm precipitation depth-duration-frequency estimates for the project site were determined using the National Oceanic and Atmospheric Administration (NOAA) National Weather Service Atlas 2 Volume 9. The design storm events for this project are presented in Table 1 below.

Table 1. Design Storm Event Summary

Storm Duration	Storm Depth	Storm Distribution
100 yr – 24 hr	2.6 inch	Type 1A
25 yr – 24 hr	1.7 inch	Type 1A
2 yr – 6 hr	0.8 inch	Type 1A

The Army Corps of Engineers (ACOE) HEC-HMS Version 3.5 software was used to perform runoff modeling for the mine site's reclaimed areas. The sub-basins were delineated based on site topography and grading plans developed for the 60% Design of the Remedial Action at the Midnite Mine site. Site contours developed at a 5-foot interval were used in these analyses. HEC-HMS was used to simulate the drainage into and through the Rhoads property for storm events recommended in the SMMEW.

Drainage basins and sub-basins associated with the Rhoads Property Borrow Area are shown on Figure 1. These drainage basins were delineated using AutoCAD and parameters including the basin areas, average slopes, and lengths were determined for entry in HEC-HMS.

The lengths of the longest drainage path and the average watershed slope for each sub-basin were measured using AutoCAD. A curve number of 55 was used for the sub-basins in undisturbed areas as recommended in the Storm Water Design Investigation (Tetra Tech, 2011), which is representative of forested areas in good condition, with litter and brush covering the soil. A curve number of 87 was used to represent all areas that will be disturbed within the Rhoads property, which is representative of conditions immediately after completion of borrow activities but before vegetation has been established. This representation of disturbed areas is conservative because it does not account for the proposed concurrent reclamation sequence, where only the specific area needed for RA construction will be disturbed in a given year, and that a number of years will elapse between subsequent disturbances, thus allowing for at least partial revegetation of previously disturbed area prior to the next disturbance.

Basin properties discussed above are presented in Table 2.

Table 2. Basin Hydrologic Properties

Basin ID	Sub-Basin Area (acres)	Sub-Basin Curve Number	Basin Average Slope (%)	Drainage Path Length (feet)
Whitetail Creek	139.4	55	26.7	2,612
Second Drainage	12.3	55	14.1	1,842
Third Drainage	40.4	55	21.1	2,612
Whitetail Creek 2B	24.5	87	12.0	1,038
Second Drainage B	8.3	87	8.6	837
Third Drainage B	7.8	87	10.9	719
Whitetail Creek C	3.7	87	22.6	570
Second Drainage C	5.3	87	14.8	630
Third Drainage C	2.2	87	14.8	438

Another input to the HEC-HMS model, representing the basin response to a storm event is Lag Time, where Lag time was calculated using the following equation:

$$T_{lag} = \frac{L^{0.8}(S+1)^{0.7}}{1900(\%Slope)^{0.5}}$$, where:

T_{lag} = lag time in hours,

L = length of the longest drainage path in meters,

S = (1000/CN) – 10,

CN = curve number, and

% Slope = the average watershed slope in percent.

3.0 RESULTS

Using the approach outlined in the methodology section above, the HEC-HMS runs produced results that depict the stormwater flows that can be expected at each of the points where the three primary drainages meet the haul road and where these drainages and a small drainage to the east meet with the southern edge of the Rhoads property. Complete HEC-HMS input parameters are shown in Attachment 1 while outputs and the HEC-HMS schematic are shown in Attachment 2. Table 3 summarizes peak stormwater discharge and runoff volumes from the 100-year, 24-hour storm event. The locations that correspond with Junctions 4-10 can be seen in Figure 1.

Table 3. Storm Event 100 Year – 24 Hour

Location	Peak Discharge (cfs)	Runoff Volume (acre-feet)
Junction-4	3.0	1.5
Junction-5	3.2	1.2
Junction-6	9.3	4.8
Junction-7	3.8	1.8
Junction-8	5.1	1.9
Junction-9	10.7	5.3
Junction-10	0.8	0.3

Table 4 presents peak discharge and runoff volume from the 25-year, 24-hour storm event.

Table 4. Storm Event 25 Year – 24 Hour

Location	Peak Discharge (cfs)	Runoff Volume (acre-feet)
Junction-4	1.1	0.4
Junction-5	1.2	0.5
Junction-6	3.5	1.4
Junction-7	1.4	0.6
Junction-8	1.9	0.8
Junction-9	4.0	1.6
Junction-10	0.3	0.1

Table 5 presents peak stormwater discharge and runoff volume from the 2-year, 6-hour storm event.

Table 5. Storm Event 2 Year – 6 Hour

Location	Peak Discharge (cfs)	Runoff Volume (acre-feet)
Junction-4	0.1	0.1
Junction-5	0.1	0.1
Junction-6	0.2	0.3
Junction-7	0.1	0.1
Junction-8	0.1	0.1
Junction-9	0.2	0.3
Junction-10	0.0	0.0

The SMMEW states that the storage capacity of a basin may be sized by obtaining the runoff volume from hydrologic calculations for the 2-year runoff event. Design results from SEDCAD 4 for the perforated risers at the two haul road ponds are included in Attachment 3. As shown by the results presented in Table 6 below, it is anticipated that the haul road basins will have the

capacity to contain the runoff from the 2-year, 6-hour storm event without overflowing the drop inlet at the top of the open riser pipe.

Table 6. Detention Capacity Evaluation -Storm Event 2 Year – 6 Hour

	Second Drainage	**Third Drainage**
Riser/Outlet Pipe Diameter (in.)	24	24
Riser Height (ft.)	3	4
Pond Bottom Elevation (ft.)	2437	2426
Lowest Perf. Elevation (ft.)	2438.0	2427.5
Top of Riser (Spillway) El. (ft.)	2440.0	2429.0
Road Elevation (ft.)	2441.7	2431.4
Outlet Discharge Capacity (cfs)	>3.0	>8.5
Storage Capacity @ Spillway (acre-ft.)	0.14	0.10
2-year, 6-hour Runoff Volume (acre-ft.)	0.1	0.1

In order to convey storm flows under the haul road at each of the three main drainages that are crossed, culvert capacities were evaluated for the drainages each haul road crossing. Design information on these culverts are included in Attachment 3. As described above, the design requirement for the culvert structures is to pass the 25-year, 24-hour event which they all do as shown in Table 7. Likewise, the two detention pond structures in the ephemeral basins to are expected to pass the peak flow associated with the 100-year, 24-hour storm without overtopping the roadway.

Table 7. Peak Stormwater Discharges in CFS for Design Storms and Perforated Riser Structures

Structure Location	**Peak Discharge 100-year, 24-hour Storm (cfs)**	**Peak Discharge 25-year, 24-hour Storm (cfs)**	**Maximum Stormwater Discharge Passable by Structure**
Whitetail Creek at Haul Road, 24-inch projecting CMP culvert	9.3	3.5	>20.0
Second Drainage at Haul Road, 24-inch CMP outlet structure	3.2	1.2	>3.0
Third Drainage at Haul Road, 24-inch CMP outlet structure	3.0	1.1	>8.5

In addition to the proposed detention basins that will be created at the two ephemeral drainage crossings, it is proposed that the active borrow excavation areas will be shaped to maintain a

shallow earthen escarpment at the downhill edge of the excavation and retain runoff volumes associated with 2-year, 6-hour stormwater runoff within the excavation area. The downstream edge of the excavation area will be graded to slope uphill or bermed so that runoff that does not immediately infiltrate into the excavation bottom will pond, allowing sediments to settle out as the ponded water infiltrates or evaporates.

4.0 REFERENCES

Tetra Tech, Inc. (Tetra Tech), 2011. Surface Water Design Investigation Report, prepared for Dawn Mining Company and Newmont USA Ltd., May 16.

Washington State Department of Ecology (WDOE), 2004. Stormwater Management Manual for Eastern Washington. http://www.ecy.wa.gov/programs/wq/stormwater/easternmanual/manual.html

Attachment 1: HEC-HMS Inputs

Subbasins North of Rhoads Property Boundary

Third Drainage		
Longest Reach	2612	ft
Avg Slope	21.13	%
CN	55.0	
S	8.18	in
Tlag	0.29	hrs
	17.56	mins
Initial Abs	0	in
Area	0.0631	mi2

Second Drainage		
Longest Reach	1842	ft
Avg Slope	14.08	%
CN	55.0	
S	8.18	in
Tlag	0.27	hrs
	16.27	mins
Initial Abs	0	in
Area	0.0192	mi2

Whitetail Creek		
Longest Reach	5272	ft
Avg Slope	26.66	%
CN	55.0	
S	8.18	in
Tlag	0.46	hrs
	27.42	mins
Initial Abs	0	in
Area	0.2178	mi2

Subbasins Between Rhoads Property Boundary and Haul Road

Third Drainage B		
Longest Reach	719	ft
Avg Slope	10.85	%
CN	87.0	
S	1.49	in
Tlag	0.06	hrs
	3.51	mins
Initial Abs	0	in
Area	0.0122	mi2

Second Drainage B		
Longest Reach	837	ft
Avg Slope	8.60	%
CN	87.0	
S	1.49	in
Tlag	0.07	hrs
	4.45	mins
Initial Abs	0	in
Area	0.013	mi2

Whitetail Creek B		
Longest Reach	1038	ft
Avg Slope	11.95	%
CN	87.0	
S	1.49	in
Tlag	0.07	hrs
	4.48	mins
Initial Abs	0	in
Area	0.0383	mi2

Subbasins South of Haul Road

Third Drainage C		
Longest Reach	438	ft
Avg Slope	14.81	%
CN	87.0	
S	1.49	in
Tlag	0.03	hrs
	2.02	mins
Initial Abs	0	in
Area	0.0034	mi2

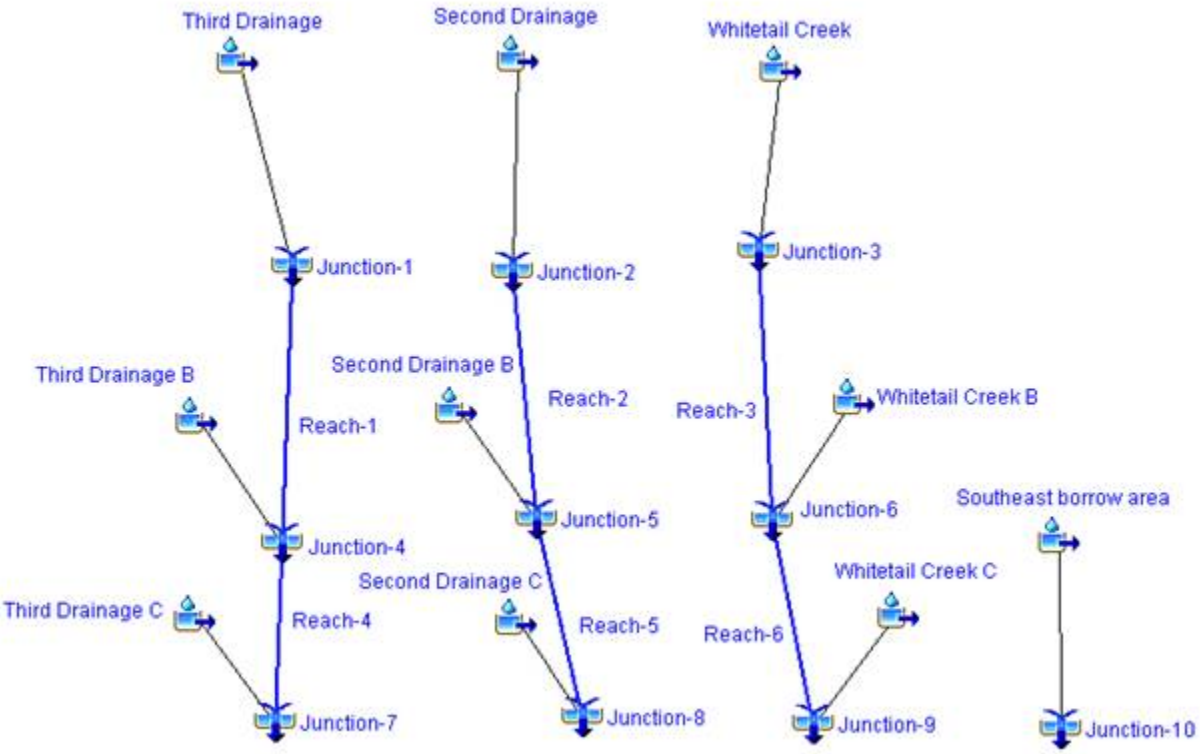
Second Drainage C		
Longest Reach	630	ft
Avg Slope	14.83	%
CN	87.0	
S	1.49	in
Tlag	0.04	hrs
	2.70	mins
Initial Abs	0	in
Area	0.0082	mi2

Whitetail Creek C		
Longest Reach	570	ft
Avg Slope	22.58	%
CN	87.0	
S	1.49	in
Tlag	0.03	hrs
	2.02	mins
Initial Abs	0	in
Area	0.0058	mi2

Southeast Borrow Area		
Longest Reach	509	ft
Avg Slope	11.2	%
CN	87.0	
S	1.49	in
Tlag	0.04	hrs
	2.62	mins
Initial Abs	0	in
Area	0.0033	mi2

Attachment 2: HEC-HMS Outputs

HEC-HMS Schematic:



HEC-HMS Output, 100-year, 24-hour:

Project: Haul_road Simulation Run: Basin 6 / 100-yr

Start of Run: 10Apr2012, 00:00 Basin Model: Basin 6
End of Run: 11Apr2012, 00:05 Meteorologic Model: 100-yr
Compute Time: 11Oct2013, 16:08:45 Control Specifications: Control 1

Show Elements: All Elements Volume Units: IN AC-FT Sorting: Alphabetic

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
Junction-1	0.0631	0.5	10Apr2012, 20:20	0.5
Junction-10	0.0033	0.8	10Apr2012, 07:55	0.3
Junction-2	0.0192	0.2	10Apr2012, 20:20	0.1
Junction-3	0.2178	1.9	10Apr2012, 21:00	1.6
Junction-4	0.0753	3.0	10Apr2012, 07:55	1.5
Junction-5	0.0322	3.2	10Apr2012, 08:00	1.2
Junction-6	0.2561	9.3	10Apr2012, 08:00	4.8
Junction-7	0.0787	3.8	10Apr2012, 07:55	1.8
Junction-8	0.0404	5.1	10Apr2012, 08:00	1.9
Junction-9	0.2619	10.7	10Apr2012, 08:00	5.3
Reach-1	0.0631	0.5	10Apr2012, 20:25	0.5
Reach-2	0.0192	0.2	10Apr2012, 20:25	0.1
Reach-3	0.2178	1.9	10Apr2012, 21:05	1.6
Reach-4	0.0753	3.0	10Apr2012, 08:00	1.5
Reach-5	0.0322	3.2	10Apr2012, 08:00	1.2
Reach-6	0.2561	9.3	10Apr2012, 08:00	4.8
Second Drainage	0.0192	0.2	10Apr2012, 20:20	0.1
Second Drainage B	0.0130	3.2	10Apr2012, 08:00	1.1
Second Drainage C	0.0082	2.0	10Apr2012, 07:55	0.7
Southeast borrow area	0.0033	0.8	10Apr2012, 07:55	0.3
Third Drainage	0.0631	0.5	10Apr2012, 20:20	0.5
Third Drainage B	0.0122	3.0	10Apr2012, 07:55	1.0
Third Drainage C	0.0034	0.8	10Apr2012, 07:55	0.3
Whitetail Creek	0.2178	1.9	10Apr2012, 21:00	1.6
Whitetail Creek B	0.0383	9.3	10Apr2012, 08:00	3.2
Whitetail Creek C	0.0058	1.4	10Apr2012, 07:55	0.5

HEC-HMS Output, 25-year, 24-hour:

Project: Haul_road Simulation Run: Basin 6 / 25-yr

Start of Run: 10Apr2012, 00:00 Basin Model: Basin 6
End of Run: 11Apr2012, 00:05 Meteorologic Model: 25-yr
Compute Time: 13Oct2013, 23:30:11 Control Specifications: Control 1

Show Elements: All Elements Volume Units: IN AC-FT Sorting: Alphabetic

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
Junction-1	0.0631	0.0	11Apr2012, 00:05	0.0
Junction-10	0.0033	0.3	10Apr2012, 08:00	0.1
Junction-2	0.0192	0.0	11Apr2012, 00:05	0.0
Junction-3	0.2178	0.1	11Apr2012, 00:05	0.0
Junction-4	0.0753	1.1	10Apr2012, 08:00	0.4
Junction-5	0.0322	1.2	10Apr2012, 08:00	0.5
Junction-6	0.2561	3.5	10Apr2012, 08:00	1.4
Junction-7	0.0787	1.4	10Apr2012, 08:00	0.6
Junction-8	0.0404	1.9	10Apr2012, 08:00	0.8
Junction-9	0.2619	4.0	10Apr2012, 08:00	1.6
Reach-1	0.0631	0.0	11Apr2012, 00:05	0.0
Reach-2	0.0192	0.0	11Apr2012, 00:05	0.0
Reach-3	0.2178	0.0	11Apr2012, 00:05	0.0
Reach-4	0.0753	1.1	10Apr2012, 08:00	0.4
Reach-5	0.0322	1.2	10Apr2012, 08:00	0.5
Reach-6	0.2561	3.5	10Apr2012, 08:00	1.4
Second Drainage	0.0192	0.0	11Apr2012, 00:05	0.0
Second Drainage B	0.0130	1.2	10Apr2012, 08:00	0.5
Second Drainage C	0.0082	0.8	10Apr2012, 08:00	0.3
Southeast borrow area	0.0033	0.3	10Apr2012, 08:00	0.1
Third Drainage	0.0631	0.0	11Apr2012, 00:05	0.0
Third Drainage B	0.0122	1.1	10Apr2012, 08:00	0.4
Third Drainage C	0.0034	0.3	10Apr2012, 08:00	0.1
Whitetail Creek	0.2178	0.1	11Apr2012, 00:05	0.0
Whitetail Creek B	0.0383	3.5	10Apr2012, 08:00	1.4
Whitetail Creek C	0.0058	0.5	10Apr2012, 08:00	0.2

HEC-HMS Output, 2-year, 6-hour:

Project: Haul_road Simulation Run: Basin 6 / 2-yr

Start of Run: 10Apr2012, 00:00 Basin Model: Basin 6
End of Run: 11Apr2012, 00:05 Meteorologic Model: 2-yr
Compute Time: 13Oct2013, 23:28:31 Control Specifications: Control 1

Show Elements: All Elements Volume Units: IN AC-FT Sorting: Alphabetic

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
Junction-1	0.0631	0.0	10Apr2012, 00:00	0.0
Junction-10	0.0033	0.0	10Apr2012, 18:25	0.0
Junction-2	0.0192	0.0	10Apr2012, 00:00	0.0
Junction-3	0.2178	0.0	10Apr2012, 00:00	0.0
Junction-4	0.0753	0.1	10Apr2012, 15:35	0.1
Junction-5	0.0322	0.1	10Apr2012, 15:35	0.1
Junction-6	0.2561	0.2	10Apr2012, 15:35	0.3
Junction-7	0.0787	0.1	10Apr2012, 16:35	0.1
Junction-8	0.0404	0.1	10Apr2012, 16:05	0.1
Junction-9	0.2619	0.2	10Apr2012, 15:40	0.3
Reach-1	0.0631	0.0	10Apr2012, 00:00	0.0
Reach-2	0.0192	0.0	10Apr2012, 00:00	0.0
Reach-3	0.2178	0.0	10Apr2012, 00:00	0.0
Reach-4	0.0753	0.1	10Apr2012, 16:35	0.1
Reach-5	0.0322	0.1	10Apr2012, 15:40	0.1
Reach-6	0.2561	0.2	10Apr2012, 15:40	0.3
Second Drainage	0.0192	0.0	10Apr2012, 00:00	0.0
Second Drainage B	0.0130	0.1	10Apr2012, 15:35	0.1
Second Drainage C	0.0082	0.0	10Apr2012, 18:25	0.1
Southeast borrow area	0.0033	0.0	10Apr2012, 18:25	0.0
Third Drainage	0.0631	0.0	10Apr2012, 00:00	0.0
Third Drainage B	0.0122	0.1	10Apr2012, 15:35	0.1
Third Drainage C	0.0034	0.0	10Apr2012, 18:25	0.0
Whitetail Creek	0.2178	0.0	10Apr2012, 00:00	0.0
Whitetail Creek B	0.0383	0.2	10Apr2012, 15:35	0.3
Whitetail Creek C	0.0058	0.0	10Apr2012, 18:25	0.0

Attachment 3: Results from Sedcad Simulations

SEDCAD 4 for Windows

Copyright 1998, 2010 Pamela J. Schwab

Structure Detail:

Structure #1 (Pond)

Second Drainage Pond at Haulroad

Pond Inputs:

Initial Pool Elev:	2,438.00 ft
Initial Pool:	0.02 ac-ft

Perforated Riser

Riser Diameter (in)	Riser Height (ft)	Barrel Diameter (in)	Barrel Length (ft)	Barrel Slope (%)	Manning's n	Spillway Elev (ft)	Number of Holes per Elev
24.00	3.00	24.00	80.00	8.20	0.0160	2,440.00	12

Pond Results:

Peak Elevation:	2,439.75 ft
Dewater Time:	0.84 days

Dewatering time is calculated from peak stage to lowest spillway

Elevation-Capacity-Discharge Table

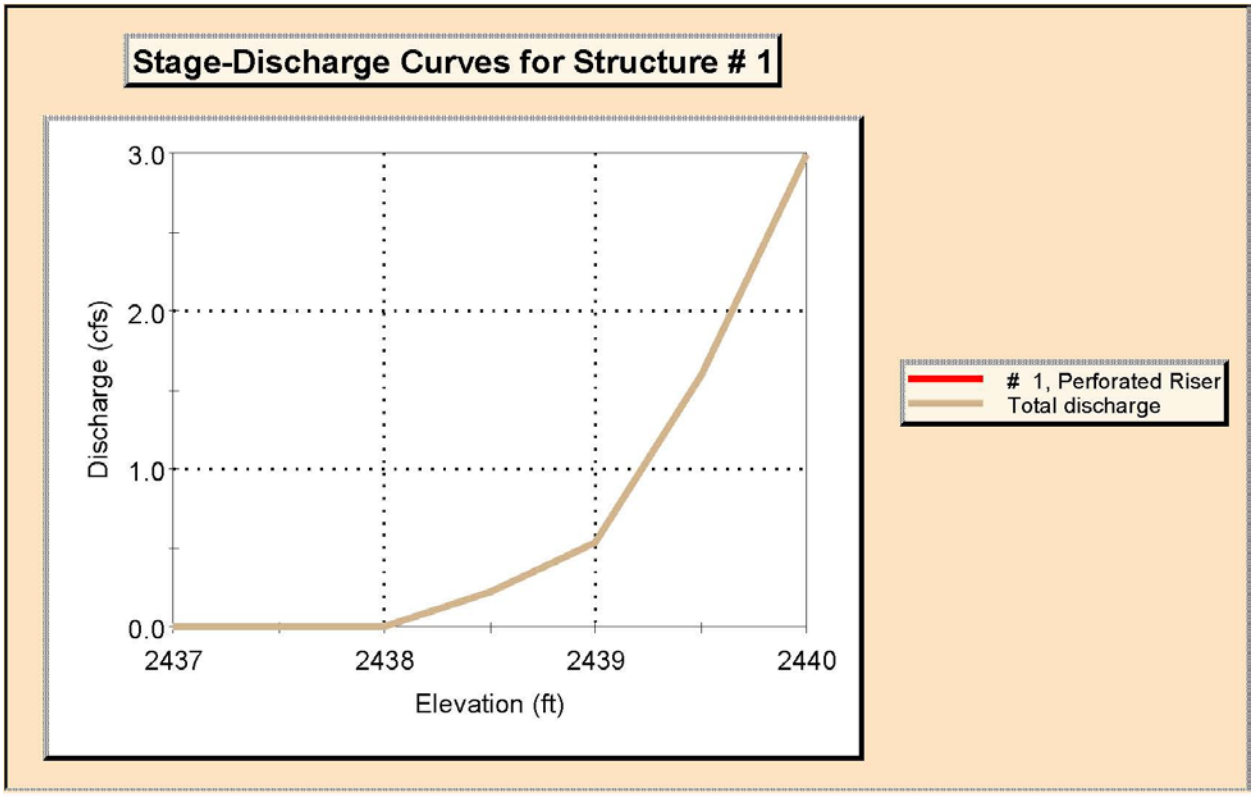
Elevation	Area (ac)	Capacity (ac-ft)	Discharge (cfs)	Dewater Time (hrs)	
2,437.00	0.007	0.000	0.000		
2,437.50	0.015	0.005	0.000		
2,438.00	0.027	0.016	0.000		Low hole SPW #1
2,438.50	0.041	0.033	0.223	3.45	
2,439.00	0.058	0.057	0.538	0.85	
2,439.50	0.080	0.092	1.592	15.30	
2,439.75	0.094	0.116	2.302	0.65	Peak Stage
2,440.00	0.106	0.138	2.984		Spillway #1

Detailed Discharge Table

SEDCAD 4 for Windows

Copyright 1998, 2010 Pamela J. Schwab

Elevation (ft)	Perf. Riser (cfs)	Combined Total Discharge (cfs)
2,437.00	0.000	0.000
2,437.50	0.000	0.000
2,438.00	1.00>0.000	0.000
2,438.50	1.00>0.223	0.223
2,439.00	2.00>0.538	0.538
2,439.50	2.00>1.592	1.592
2,440.00	2.984	2.984


Stage-Discharge Curves for Structure # 1
Discharge (cfs)
3.0
2.0
1.0
0.0
2437
2438
2439
2440
Elevation (ft)
1, Perforated Riser
Total discharge

SEDCAD 4 for Windows

Copyright 1998, 2010 Pamela J. Schwab

Structure Detail:

Structure #2 (Pond)

Third Drainage Pond at Haul Road

Pond Inputs:

Initial Pool Elev:	2,427.50 ft
Initial Pool:	0.02 ac-ft

Perforated Riser

Riser Diameter (in)	Riser Height (ft)	Barrel Diameter (in)	Barrel Length (ft)	Barrel Slope (%)	Manning's n	Spillway Elev (ft)	Number of Holes per Elev
18.00	4.00	18.00	80.00	10.00	0.0160	2,429.00	8

Pond Results:

Peak Elevation:	2,429.22 ft
Dewater Time:	1.01 days

Dewatering time is calculated from peak stage to lowest spillway

Elevation-Capacity-Discharge Table

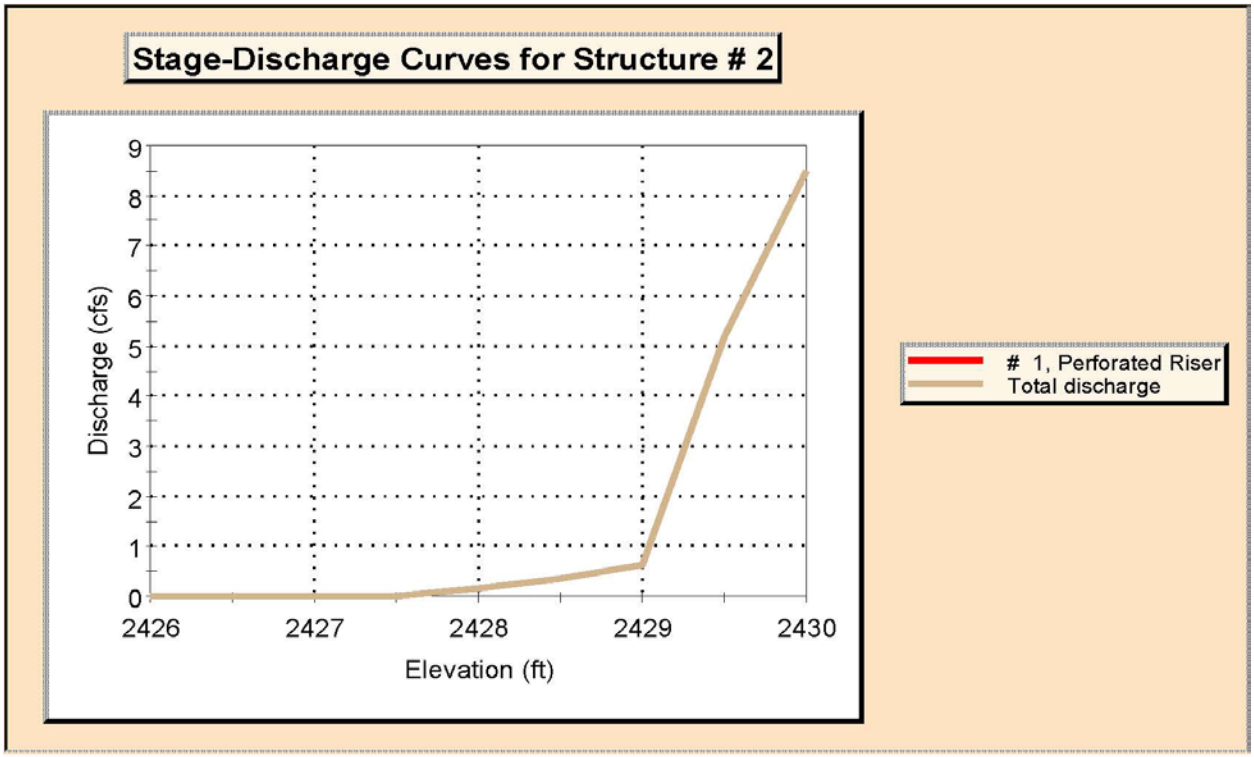
Elevation	Area (ac)	Capacity (ac-ft)	Discharge (cfs)	Dewater Time (hrs)	
2,426.00	0.000	0.000	0.000		
2,426.50	0.004	0.001	0.000		
2,427.00	0.015	0.005	0.000		
2,427.50	0.030	0.016	0.000		Low hole SPW #1
2,428.00	0.049	0.036	0.149	5.35	
2,428.50	0.069	0.065	0.359	1.50	
2,429.00	0.093	0.105	0.616	1.20	Spillway #1
2,429.22	0.106	0.129	2.657	16.10	Peak Stage
2,429.50	0.120	0.158	5.165		
2,430.00	0.150	0.225	8.509		

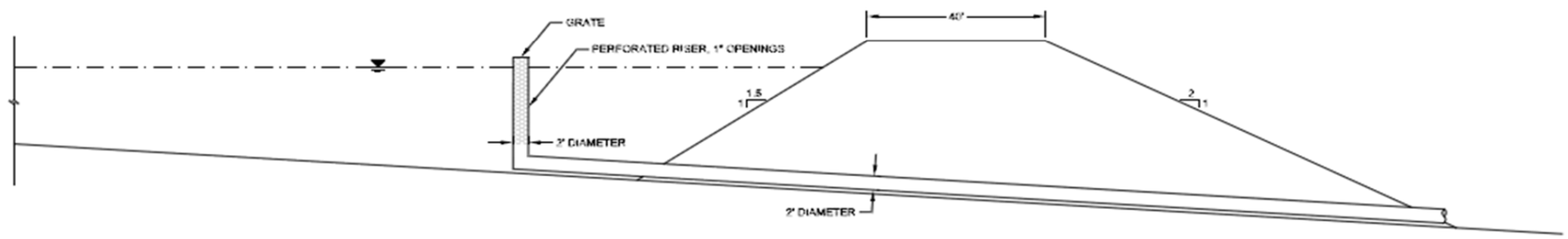
Detailed Discharge Table

SEDCAD 4 for Windows

Copyright 1998, 2010 Pamela J. Schwab

Elevation (ft)	Perf. Riser (cfs)	Combined Total Discharge (cfs)
2,426.00	0.000	0.000
2,426.50	0.000	0.000
2,427.00	0.000	0.000
2,427.50	1.00>0.000	0.000
2,428.00	1.00>0.149	0.149
2,428.50	1.00>0.359	0.359
2,429.00	0.616	0.616
2,429.50	5.165	5.165
2,430.00	8.509	8.509


Stage-Discharge Curves for Structure # 2
Discharge (cfs)
0
1
2
3
4
5
6
7
8
9
2426
2427
2428
2429
2430
Elevation (ft)
1, Perforated Riser
Total discharge



HAUL ROAD POND TYPICAL DETAIL
NOT TO SCALE

0	ISSUED FOR DRAFT	CF	LF	11-13	
REV	DESCRIPTION	TECH	ENG	DATE	

DISCLAIMER:
THIS DRAWING WAS DEVELOPED THROUGH THE APPLICATION OF PROFESSIONAL ENGINEERING SKILL AND PROPRIETARY METHODOLOGIES, PROCESSES AND BASIS DEEP BY MWH AS AUTHOR ALL PURSUANT TO THE TERMS OF A CONTRACTUAL SCOPE OF WORK DRAWING IS PROHIBITED. THIS DRAWING MAY NOT BE USED OR RELIANCE THEREON TAKEN IN DIRECT ACCORDANCE WITH THE TERMS OF THE GOVERNING CONTRACT AND SCOPE OF WORK OR OTHERWISE WITHOUT THE AUTHORITY AND CONSENT OF THE AUTHOR. ANY ALTERATION OR ADAPTATION OF THE DRAWING SHALL BE CONSISTENT WITH THE AUTHOR'S CONTRACTUAL AND PROPRIETARY RIGHTS AND BE AT USER'S SOLE RISK AND WITHOUT ANY LIABILITY OR LEGAL RESPONSIBILITY OF MWH.

DESIGNED BY	L FUHRIG	11-13
DRAWN BY	C FOWLER	11-13
CHECKED BY	J REDMOND	11-13
APPROVED BY	T KELLEY	11-13
PROJECT MANAGER	C STRACHAN	10-13

PROJECT LOCATION: WELLPINIT WASHINGTON
PROJECT: MIDNITE MINE
TITLE: HAUL ROAD POND TYPICAL DETAIL
SHEET: DETAIL 1
REVISION: 0
FILE NAME: LELAND Detail1
DATE: OCT 2013
MWH

APPENDIX I

SPOKANE TRIBE TERO COMPLIANCE PLAN

Project _____
Date _____
Contract Amount $_____

********** COMPLIANCE PLAN **********

SUGGESTED COMPLIANCE POLICIES RECOMMENDED FOR USE BY AN EMPLOYER

IN DEVELOPING AN ACCEPTABLE COMPLIANCE PLAN

_____
NAME OF COMPANY SIGNING THE COMPLIANCE PLAN

_____
CONTRACT AMOUNT $

ANY CONTRACTOR/SUBCONTRACTOR NOT SUBMITTING AN ACCEPTABLE COMPLIANCE PLAN MAY BE DENIED THE RIGHT TO COMMENCE OR CONTINUE BUSINESS WITHIN THE SPOKANE RESERVATION.

Employer Init._____ Date _____ TERO Init. _____ Date_____

COMPLIANCE PLAN RESPONSIBILITIES

Pursuant to section 5.0: Every employee of two or more employees and every contractor or subcontractor obtaining a contract or $10,000 or more shall submit an acceptable Compliance Plan on how they will meet their obligations and responsibilities under The Spokane Tribal Employment Rights Ordinance before commencing work on the Spokane Indian Reservation.

Section 4, Paragraph 4.1, Coverage and scope:

1. **Coverage: It is understood by all parties that the intent of the Spokane Tribal Employment Rights Ordinance is to secure a Local Indian Preference workforce. Therefore all job skill of craft positions, that require the use of manual labor or the use or hand tools, will be filled by qualified Local Indian Preference applicants. No Non-Indian Preference employee will be used on the project, except where cleared through the Tribal Employment Rights Director before start-up operations begin.**

    a. **Clearance shall be granted for Non-Indian Preference personnel if:**
        1. **There isn't any qualified Indian Preference applicant available at time of request.**
        2. **Key personnel and/or core crew employees will be used on the project as defined here within.**

    b. **Opportunities for supervisory personnel shall be filled with qualified Local Indian Preference applicants where practical.**

2. **Hiring: If qualified and available 100% of the work force shall be Local Indian Preference applicants for the duration of the project.(Attachment #1 and #7)**

3. **Payroll hours worked: At no time shall the Indian Preference work force hours fall below the percentage of Indian Preference workers on the payroll and/or a minimum of 50%.**

4. **Training programs: Training Programs will be initiated for craft or skill jobs if the Indian Preference workforce hours, for each craft or skill that fall below the 50% minimum.(Attachment# 12)**

    a. **Wages for Training Position shall not be less than 50% of Journeyman pay or minimum wage laws.**

    b. **Bureau of Apprenticeship Training Program requirements shall be Applicable were practical.**

4.2 Contractors and Subcontractors:

1. **All Indian Preference requirements contained in the Ordinance shall be binding on any and all contractors and subcontractors regardless of tier, and shall be deemed part or all contract or subcontract specifications let and/or signatory documents.**

2. **The employer agrees to accept the initial and primary responsibility for insuring all contractors and subcontractors comply with these requirements.**

3. **The employer agrees to the fact that the company, as well as any contractor(s) and subcontractor(s) shall be subject to penalties for any violation if the contractor(s) or subcontractor(s) fails to comply.**

Employer Init._____ Date_____ TERO Init._____ Date_____

Paragraph 4.3 Minimum Numerical Goals and Timetables for Indian Employment

1. **The employer agrees to hire a minimum percentage or number of Indian Preference employees according to the goals established for each craft, skill, job classification, etc., used by the employer and shall include Administrative, Supervisory and Professional categories. (Attachment #7)**

2. **These percentage(s) and man-hours shall be reviewed by the Commission annually and shall be revised as necessary to reflect the number of Indian Preference applicants available or changes in the employer hiring plans.**

3. **The employer agrees to submit a monthly report to the director indicating how he/she is meeting the Indian Preference Goals, all persons hired or discharged during the month, the positions involved, and any of the information required by the Commission and/or director.(Attachment #14)**

4.4 Training:

1. **Training Programs will be developed and initiated in all various Job Classifications used by the employer where a minimum of 50% Indian Employee Ratio are not used in each building trades craft or skill, but shall include administrative, supervisory and professional categories, where practical.**

2. **Minimum Local Indian Preference Trainees in each craft or skill shall be maintained through ratios established by the Federal Department of Labor, Bureau o f Apprenticeship standards where Federal Laws require Training Programs approved by the Federal Department of Labor for the duration of the project. (Attachment #13)**

3. **All apprentices wage rates shall not be less then laborers used on a project.**
4. **Local apprentice will be dispatched for the duration of the project prior to other journeymen personnel.**

4.5 Training Administrative Fees or Taxes:

1. **A Training Administrative Fee of .5% on the prime contracted dollar amount shall be paid to the trust account for training purposes.(Attachment #15) There isn't any administrative fees on subcontracted dollars. The Prime Contractor shall be billed within forty-five days from contract award.**

4.6 Job Qualifications and Personnel Requirements:

1. **Each Employer is prohibited from using Job Qualifications criteria or personnel requirements which bar Indian Preference from employment, unless such criteria or requirements are required and listed in the Directory or Occupation Titles under Bonafide Occupational Qualifications (BFOQ) and are required by business necessity.**

    a. **Each Employer will complete an Employment Request form (attachment #8) for all personnel used on the project. Only Bona Fide Occupational Qualifications (BFOQ) will be recognized by the TERO Director as qualifications for business necessity required by the employer.**
    b. **Employers who employ more than two employees may designate key personnel who are regular permanent employees in a supervisory or other key position(s). But only the first and thereafter every seventh employee will be employed as key personnel or core crew by an employer (attachment #1). All other positions shall be filled with qualified Indian Preference applicants. If qualified Indian Preference applicants cannot be obtained then Indian Preference Training Requirements may be initiated along with a clearance for Non-Indian Preference Personnel. (Attachment #13)**

Employer Init._____ Date_____ TERO Init._____ Date_____

c. **At no time shall core crew and/or key personnel displace Indian Preference Employee(s) and /or potential Indian Preference Employee(s) by performing work outside their normal classification.**

d. **The following are examples, but are not conclusive, Bonafide Occupational Qualifications.**

1. **Minimal Qualificational Standards; (as listed in the Directory or Occupational Titles)**
2. **Bonding requirements; (when handling cash)**
3. **Passing drug test; (when requiring by all personnel)**
4. **Criminal Records; (when for Law Enforcement or handling cash)**
5. **Physical Requirements; (for business Necessity)**
6. **Past Employment Discharges; (pertaining to any illegal or fraudulent Act in employment)**

e. **It is understood that the employer shall retain the right of determining whether an applicant and/or employee meet minimum qualifications and the Burden of Proof shall fall on the complainant if challenged by any party.**

4.7 <u>Tribal Hiring Hall</u>

1. **An employer may recruit and hire Local Indian Preference workers from whatever process he/she chooses, as long as he complies with the Ordinance and The Federal Equal Opportunity Act, in hiring practices, Local Indian Job Preference Regulations and any agreements pertaining to his/her operation.**

a. **Hiring Hall: All new hires, hourly and salaried, are required to check into the TERO Office within five working days. No Non -Indian Preference employee may commence work without first registering with TERO.**

b. **TERO Office: The TERO Office shall be given a reasonable time (up to 24 hours) period to furnish qualified referrals.**

c. **Local Indians: Shall mean any Indian Preference Applicant who has social and economic ties to the Spokane Tribe of Indians who maintains his primary place or residence on the Spokane Indian Reservation or Spokane Tribal Member living on or near the reservation.**

d. **Indian Preference Applicant: Shall mean any person recognized as one of the following in the stated order, except any order may be followed on Federal or State projects:**

1. **Enrolled member of the Spokane Tribe of Indians, next;**
2. **Child if an enrolled member of the Spokane Tribe of Indians, next;**
3. **Spouse of an enrolled member of the Spokane Tribe of Indians, next;**
4. **Enrolled member of a recognized Tribe of Indians.**

e. **Each employer and employee(s) will abide by the Tribal Hiring Hall Rules. (Attachment #6)**

4.8 <u>Counseling and Support Programs</u>

1. **Counseling: Where practical, the TERO counseling or support programs shall be required by each employer.**

2. **The employer will provide the opportunity for any employee to enter any such counseling or support programs prior to termination unless the employee was terminated for good cause as defined in section 4.9,(a).**

4.9 <u>Layoff and/or Terminations</u>

1. **Required Indian Preference ratios to core crew personnel (1 to 6) or percentages will be maintained throughout the length of projects.**

2. **No Indian Preference employee shall be terminated or receive a Layoff without good cause. Good cause termination shall be defied as, Failure to adequately perform the job, failure to follow orders, any illegal or fraudulent act pertaining to employment or any act which puts the employer or the employees in an unsafe position or positions.**

3. **All layoffs of Indian Preference Employees shall be in a reasonable and fare fashion.**

4. **Layoffs shall occur when there is not adequate work or when the employer has a cash flow shortage necessitating a reduction in the work force.**

5. **All layoffs shall be in same order of hiring in reference to core crew and the Local Indian Preference workforce.**

4.10 Promotion: Preferential consideration for promotional opportunities shall be given to Local Indian Preference Employees.

4.11 Summer Students: Preferential consideration for Local Indian Preference students shall be given by the employer for summer employment where practical.

4.12 Indian Preference Requirements in Awarding Prime Contracts and Subcontractors;

1. **Employers shall give preference in the award or contracts to tribally and "Locally Indian-Owned" businesses. For the purpose of identification a tribal registration number is required. The following information will be required from each owner claiming Local Indian Preference or other Indian-Owned business.**

- **a.** **Name of the recognized tribe**
- **b.** **Enrollment number of Indian-Owning and managing business**
- **c.** **Tribal Agency address and phone number**
- **d.** **Present Local Address**
- **e.** **Statements and/or Documentation on Local Indian Preference business who have social and economic ties to the Spokane Tribe of Indians.**
- **f.** **Type of business structure and percentage of Indian Ownership.**

2. **Any business or Indian Owned business may bid as Prime Contractor, supplier, or subcontractors, but may not submit bids for a subcontract or supplier if bidding on the prime contract.(Attachment#2)**

3. **The Tribal Employment Rights Office will provide a list of Tribally Owned and Local Indian Owned businesses which shall be supplied to employers for their use.(Attachment#4)**

4. **All contract or subcontract bid documents and advertisement shall contain a public notice on the establishment of the Spokane Tribal Employment Rights Ordinance and before bidding all parties shall contact the Tribal Employment Rights Office, P.O. box 100 Wellpinit, Wa., 99040, (509) 258-4581, to be advised of their responsibility in complying with Tribal Laws.**

5. **On contracts of $75,000 dollars or more each employer is required to submit an approved Local Indian Contracting Utilization Plan conforming to Local Indian Preference Contracting/Subcontracting rules and regulations, such Local Indian Contracting Utilization Plan must provide documentation is to:**

- **(I)** **How Local Indian Preference Bids were solicited; and**
- **(II)** **Who was awarded the contract; and**
- **(III)** **Why each contractor was awarded said contact.**

(Attachment #12)

Employer Init._____ Date_____ TERO Init._____ Date:_____

6. **No employer may commence work unless he/she has submitted the Commission approved Local Indian Contracting Utilization Plan.(Attachment #12)**

7. **When Awarding Prime Contracts and Subcontracts, employers shall comply with all requirements contained in paragraph (e) and (f) of section 4.12, of the Spokane Tribal Employment Rights Ordinance pertaining to the award of said contracts or subcontracts.**

4.13 Burden of Proof: In any hearing or matter before the Commission where the issue is employer compliance, the burden of proof shall be on the employer to show compliance of any subsection within Section 4.

5.0 Compliance Plans: All employers with two or more employees and all employers obtaining a contract of $10,000 or more shall abide by this Hiring and Employment Compliance Plan.

1. **Such plan shall strive to achieve a 100% Local Indian Employment goal in each job classification.**

2. **When key personnel and/or core crew are being used by an employer, all other job opportunities shall be filled by qualified Local Indian Preference applicants. If other applicants are cleared for employment because qualified Indian Preference applicants were not available. Then, the cleared employee shall accept the position offered under a "Limited Term Agreement" (Attachment #17) with the understanding of training a Local Indian Preference applicant to replace this individual, where practical.**

3. **Each employer shall submit a workforce report (attachment #1). This report shall meet workforce goals (attachment #7) with approval of the TERO director before start-up.**

4. **Training programs may be developed and initiate where a Local Indian Preference workforce goal cannot be met by the employer because qualified Local Indian Preference applicants were not available (attachment #13).**

5.3 Revision of Compliance Plans; Monthly Reports: This section will be used as a monitoring report to assure full compliance to the Compliance Plan and/or Ordinance.

1. **Reports: Employer reports shall be submitted on a daily, weekly, or monthly basis to theTERO Office. The report shall include the following, but shall not be limited to other information needed. Monthly Report Form.(attachment #14 Wages and Hour Reports))**

2. **By mutual consent of both the employ and the director, compliance plans may be revised or amended to address problem areas of concern.**

5.4 Final approval of Compliance Plans: All Compliance Plans shall obtain Final Approval from at least two members of the Commission within thirty days of start-up operations. Tentative approval may be obtained from the TERO Director for start-up purposes.

5.5 Non-Compliance or Violations: If the employer fails or refuses to comply with the compliance plan requirements here in or with the terms of its compliance plan as written, such non-compliance shall be deemed a violation of the ordinance and subject to sanctions provided for in section 7 of the ordinance.

5.6 Compliance by Unions:

1. **Each employer who is signatory to a Union must file a written Memorandum of Agreement (attachment #11) stating the Union will comply with the ordinance, rules, regulations, and orders or the Commission. No employer may commence work operations until said memorandum of agreement is signed by said Union (s) and employer.**

2. **Memorandum of Agreement: The Employer may develop there own memorandum of agreement with their signatory unions, but are required to include procedures for indenturing Local Indian Preference Applicants into the union and/or issuing temporary work permit. Also, the agreement must address a direct referral process, training program endenturement and a cooperative statement from the union on related TERO requirements.(Attachment#11)**

3. **Burden of Proof: In any hearing or matter before the Commission where the issue is employee compliance, the Burden of Proof shall be on the employer to show Compliance of any subsection within section 5.**

6.0 Complaints and Hearings

6.1 Notice: On all hearing request the director shall issue all proper written notices to all parties stating the nature of hearing and proper procedures to be used. This notice shall advise such parties of the violation, their required presence, to present testimony of witnesses or other evidence, and to be advised by council at their own expense.

6.2 Complaints Regarding Violations: Any Individual, Employer, or Organization that believes any covered employer or its agents has violated or is in violation of the Ordinance or any Rules, Regulations, or Orders issued to it may file a complaint, in writing to the Director.

1. **The Director shall investigate each and every complaint.**

2. **If upon investigation there is reason to believe a violation has occurred the Director shall proceed pursuant to section 7 (Enforcement and penalties for violations.)(attachment #8 Bond schedule)**

3. **Within 20 days after the receipt of the complaint the director shall provide the complaining party a written report and the status of the complaint.**

4. **Any individual employer, employee, or other party may challenge any action of the Commission of Director by filing a written complaint within five days from said action, requesting a hearing. The Commission shall set a date for a hearing no later than ten days from the date said complaint was filed.**

5. **Complaints filed under this section shall be filed with the Commission or its authorized agent within seven working days after the alleged unlawful violation(s) occurred or seven working days after the party learned of the alleged unlawful violation(s), but no complaint shall be accepted after 180 days from the date of alleged violation of occurrence.**

6. **All complaints shall include the date, place, and circumstances of the alleged unlawful violation(s) and served upon the person(s) against whom the charge(s) are made within ten days.**

7. **Service may be made by registered mail or hand delivery with receipt.**

Employer Init._____ Date_____ TERO Init._____ Date_____

6.3 Investigations: On its own initiative or pursuant to a complaint, the Commission or the Director shall make such public or private investigation as the director of the commission deems appropriate and necessary to determine whether any provision of the Ordinance or any rules, regulations, or orders have been violated.

6.4 Hearing: This section is self-explanatory and all hearings shall adhere to the rules of procedure.

6.5 Power to require Testimony and Production of Records: The Commission or the Director, or any designee may subpoena witnesses, take evidence and require the production of books, papers, contracts, agreements, or other documents, records or information with the director or the commission deems relevant in any investigation or matter that may be before the Commission.

6.6 Pre-hearing Procedures: This section is self-explanatory and all pre-hearing procedures shall be adhered to by all parties.

6.7 Conduct of the Hearing: All subtopics are self-explanatory and will be adhered to by all parties.

6.8 The Decision: The Decision shall be in writing and issued within thirty days after a hearing. All subtopics are self-explanatory and adhered to by the Commission.

6.9 The Record: This paragraph is self explanatory and will be preserved or stored for one year from date or decision, as required.

6.10 Finality of the Decision-Appeal:

1. The decision of the Commission shall be effective immediately and final when the time frame for filing a notice of appeal has expired, twenty days. The appeal shall be taken by an aggrieved party to the Spokane Tribal Court as provided in section 8.0.

2. The Commission Decision is final and shall be in writing and served by registered mail no later than thirty days after the close of the hearing. Should the party fail to comply immediately the Commission shall receive an injunction for relief from Tribal Court, pending the party(s) appeal or expiration of the time for appeal.

7.0 Enforcement and Penalties for Violations

7.1 The Director shall monitor and enforce the ordinance and any rules, regulations, and orders of the Commission as follows:

1. Informal Settlement: If the director has reason to believe a violation has occurred the director shall issue a written notice of violation to the alleged violator and they shall attempt to achieve informal settlement. If no settlement can reasonably be made, the employer shall be issued a formal citation and notice of non-compliance.

2. Formal Citation and Notice of Non-compliance: The Formal Citation shall set out the nature of the alleged violation and specific steps that must be initiated to come into compliance. The violator shall be provided no more than five days to comply or to submit a written request for a hearing before the Commission on the matter. This time may be shortened if irreparable harm will occur should the violation continue. (Attachment#18)

4. Bonding Monetary Schedules, (The employer shall comply with the Bonding Monetary Schedule.)(Attachment#8)

3. If a violator refuses to comply and has not submitted a written request for a hearing, within the five day time frame, pursuant to section 6.2(b) the director may seek to impose one or more penalties as outlined in 7.2 penalties. If no settlement can be obtained the Commission, after being fully advised on the matter , may issue an order imposing such penalties it deems necessary under section7.2 penalties.

7.2 Enforcement Any Employer, Contractor, Subcontractor, or Union who is found in violation or the Ordinance, Rules, regulations, or Orders of the Commission or Director shall be subject to penalties outlined in section 7.2 penalties.

7.3 Penalties: Self explanatory enforcement penalties and each day in which a violation exists shall constitute a separate violation with a maximum imposed penalty of $5,000 for each violation.

8.0 Appeals

8.1 Right to Appeal: Any party to a hearing shall have the right to appeal any decision of the Commission to Spokane Tribal Court by filing a notice of appeal within twenty days of the final decision of the Commission. Said notice must be in writing and filed in Spokane Tribal Court.

8.2 Scope of Review: The Tribal Court shall uphold the decision to the commission unless it is demonstrated that said decision is Arbitrary, Capricious, Unsupported by the weight of the evidence or in excess of Authority of the Commission.

8.3 Method of Appeal: Upon serving a written notice of appeal with the Tribal Court, with a copy to the TERO Director, as specified within the twenty day time frame, the notice of appeal shall; (a) set forth the order from which appeal is taken and (b) specify the grounds on which reversal or modification or order is sought; and (c) be signed by applicant.

8.4 Abatement of Order on Appeal: All orders of the Commission shall not be abated pending the outcome of the appeal in Tribal Court, except where the court shall by its mandate specifically direct the Commission as to further action in the matter, including making and entering a pay order or orders in connection therewith and the limitations or conditions to be contained therein

8.5 Bond of Appeal: The Director may petition and, for good cause shown, the court may order the party requesting a hearing to post a Bond sufficient to cover monetary damages to assure compliance with sanctions or remedial actions if the order is upheld in the court.

8.6 Security for Compliance: The Commission may petition Tribal Court pursuant to Tribal Court Rules and procedures to attach such property as necessary to ensure payment of any civil fines, fees, or damages owed in protecting the rights of the Commission and other affected parties.

9.1 Confiscation and Sale: Self-explanatory and binding on all parties.

10.1 Reporting and On-Site Inspections: Employers shall submit reports and other information requested by the director. The director and his/her representative shall have the right to make on-site inspections, investigations, and monitor any employer's compliance with the ordinance and rules, regulations and orders or the Commission. This may include the right to inspect and comply all relevant records of any employer, signatory union, or subcontractor with the right to speak with workers and conduct investigations on job sites. As a Government entity of The Spokane Tribe, this may include information gathered under the privacy act if pertinent to the investigation.

Employer Init._____ Date_____ TERO Init._____ Date_____

11.0 Commission Funds: All funds collected shall be under final control and disposition of the Spokane Tribal Council.

12.0 The Director shall assess an Employment Administrative fee to provide operational revenue for the Tribal Employment Rights Office.

12.1 Contracts: Every prime contractor obtaining a contract of %10,000 or more shall pay an Employment Administrative fee of 1.5% of the total contract amount of each contract. (Attachment#16 Admin, form)

12.2 Other Employers: Every employer, other than a contractor, with twenty or more employees shall pay an Employment administrative fee of 1.55% of the employers annual payroll. This fee shall be paid in quarterly installments and shall not be required of Educational, Health, or non profit employers.(Attachment#16)

12.3 Accounting: The Employment Administrative fees shall be paid to the Spokane Tribal Employment Rights Office within forty five days after contract award (section 12.1) or quarterly when using annual payroll method (section 12.2.)

13.0 Equal Employment Opportunities: No employer shall discriminate against any Indian Preference Employee or applicant for employment because of color, religion, sex, national origin, or age, and must assure Equal Opportunity for Address. Excluding, allowable Indian Preference Opportunities available through Tribal or Federal Laws.

14.0 Wage and Hour Standards

14.1 Equal Pay: Every employer shall be required to provide equal pay to Indian Preference Employees performing work similar or comparable to other employees.

14.2 Rate of Pay: The employer will comply to all applicable Federal, State, Local, or Tribal Laws concerning wages, hours and fringes.

14.3 Federal, State, and Local Agencies: The commission or the Director may use, Federal, State, local or Tribal agencies in resolving issues concerning wages, hours, and fringes applicable to said Agencies.

15.0 Health, welfare, and Pension Fund Benefits: Payroll deductions shall be permissible for health, Welfare, and Pension Fund Benefits, provided however, the following standards must be met:

- **a. The Deduction is not otherwise prohibited by law:**
- **b. It is either:**
  - **1. Voluntarily consented to be the employee in writing and in advance of the period in which the work is to be done and such consent is not a condition either for obtaining or for the continuation of employment, or**
  - **2. Provided for in a Bona Fide collective bargaining agreement between the contractor or subcontractor and representatives of its employees;**
- **c. No profit or other benefit is otherwise obtained, directly or indirectly, by the contractor or subcontractor or any affiliated person in the form or Commission dividend, or otherwise;**
- **d. The deductions shall serve the convenience and best interest of the employee.**

16.0 Safety, health and Environmental Protection: On all contracts of $75,000 or over each employer shall provide a written safety, health, and environmental plan on how they will be protected. (Attachment #10)

17.0 Retaliation or Reprisal: This section is self-explanatory and binding on all employers and will be monitored and enforced to the maximum extent when applicable.

Employer Init._____ Date_____ TERO Init._____ Date_____

18.0 All qualified subcontractors on the project are required to obtain a Specialty Contractor License to operate within the Spokane Indian Reservation. A fee of $25.00 will be charged for said license and must be renewed on a yearly basis, expiring on December 31st.

a. All subcontractor who are qualified shall obtain said license by requesting an application form from the Spokane Tribal Employment Rights Office and are subject to penalties outlined in section 7.0 if commencing work without said subcontractors license.

b. All piece work shall be considered subcontract work and shall meet the specialty contractors license required of the Spokane Tribal Employment Right s Office.

19.0 <u>Publication of Ordinance:</u> it shall be the responsibility of Tribal, Federal, State, Private, or Public entity to assure all Bid Advertisements and/or documents contain a statement saying the successful bidder will be obligated to comply with the ordinance and all rules, regulations, and orders of the Commission because it is Tribal Law.

20.0 <u>Effective Date:</u> The Ordinance shall be effective form the date approved by the Spokane Tribal Business Council.

21.0 <u>Rules and Regulations:</u> The Commission may from time to time adopt detailed rules, regulations, policies, and guidelines consistent with the implementation of the Ordinance.

22.0 <u>Severability:</u> If any provision of the ordinance or this compliance plan, or its application to any person or circumstances is held invalid, the remainder or the application or the provision to other person(s) or circumstances is not affected.

Attachment #1

MANPOWER REPORT FORM
****

NOTE: At no time shall the Local Indian Preference workforce hours fall below 50%. (But, if the TERO Office has qualified Local Indian Preference Employees, the employer will provide employment opportunities, for 100% of the workforce, excluding Core Crew.)

The following opportunities for employment will be filled by qualified Local Indian Preference applicants in order to meet a 100% Local Indian Preference hiring goal for the project and the same percentage of daily workforce hours will be Indian Preference employees hours worked, including Core Crew.

	DATE	CLASSIFICATION	NAME OF EMPLOYEE	I.P.	Code
1				Core Crew	
2				Local Indian	
3				Local Indian	
4				Local Indian	
5				Local Indian	
6				Local Indian	
7				Core Crew	
8				Local Indian	
9				Local Indian	

***Code:**

Spokane Tribal Member (1)
Child of Spokane Member (2)
Spouse of Spokane Member (3)
Other Indian (4)
Non-Indian (7)
TOTAL EMPLOYEES

Note: Qualified shall mean only Bona fide occupational standards recognized in the Dictionary if occupational Titles, U.S. Department of Labor.

*** No qualified Indian Preference Applicant Available**
**** Training Positions, as required by Apprenticeship Program Ratios (Apprentices shall be hired and retained by program seniority)**

Core Crew: Shall mean key personnel required by the employer who are regular, permanent employees and are in a supervisory or other key position, furthermore only the first (1) and thereafter every seventh (7) employee may be employed as key personnel and\or core crew by an employer. All layoffs shall be in same order of hiring in reference to core crew and the Local Indian Preference workforce.

TERO Init. _____ Date _____

MANPOWER REPORT FORM
****

NOTE: At no time shall the Local Indian Preference workforce hours fall below 50%. (But, if the TERO Office has qualified Local Indian Preference Employees, the employer will provide employment opportunities, for 100% of the workforce, excluding Core Crew.)

Qualified Local Indian Preference applicants will fill the following opportunities for employment in order to meet a 100% Local Indian Preference hiring goal for the project and the same percentage of daily workforce hours will be Indian Preference employees hours worked, including Core Crew.

	DATE	CLASSIFICATION	NAME OF EMPLOYEE	I.P.	Code
1				Core Crew	
2				Local Indian	
3				Local Indian	
4				Local Indian	
5				Local Indian	
6				Local Indian	
7				Core Crew	
8				Local Indian	
9				Local Indian	

***Code:**
Spokane Tribal Member (1)
Child of Spokane Member (2)
Spouse of Spokane Member (3)
Other Indian (4)
Non-Indian (7)
TOTAL EMPLOYEES

Note: Qualified shall mean only Bona fide occupational standards recognized in the Dictionary if occupational Titles, U.S. Department of Labor.

***** **No qualified Indian Preference Applicant Available**
****** **Training Positions, as required by Apprenticeship Program Ratios (Apprentices shall be hired and retained by program seniority)**

Core Crew: Shall mean key personnel required by the employer who are regular, permanent employees and are in a supervisory or other key position, furthermore only the first (1) and thereafter every seventh (7) employee may be employed as key personnel and\or core crew by an employer.

TERO Intit. _____ Date _____

Attachment#2

INDIAN PREFERENCE DOCUMENTATION

- **In order to receive consideration for Indian Preference proof of tribal enrollment is required.**
- **If you are an enrolled member of a federally recognized tribe you will be required to provide a copy of your tribal enrollment card.**
- **If you are a direct descendent of the Spokane Tribe, Certification of Indian Blood (CIB) will be require. (Child of an enrolled member of the Spokane Tribe)**
- **In order to receive consideration for being a spouse of a Spokane Tribal Member proof of marriage must be provided.**

* **ONLY LOCAL INDIAN PREFERENCE APPLICATIONS WILL BE CONSIDERED FOR EMPLOYMENT. (30 DAYS RESIDENCY REQUIRED)**

Verification of Indian Blood, Direct Descendency, or Spouse of a Spokane Tribal member must be submitted if applicable and will be used for hiring, promotion, training reduction in workforce purposes.
Workforce Notification: The above information shall officially inform all potential applicants for employment and/or present employees of the Indian preference requirements contained in the Spokane Tribal Employment Rights Ordinance. Furthermore, this information shall advise all potential applicant and/or employees that their career opportunities may be limited regarding promotions, reassignments, and transfers regardless of their qualifications.
This document, along with verification of Indian Preference documents will be placed in the Official Personnel file of each applicant and/or employee.
All information relating to Indian Preference is true and accurate to the best of my knowledge and if any information is found to be false shall grounds for immediate termination. (ALL DOCUMENT MUST BE SUBMITTED WITHIN 7 DAYS OR TERMINATION WILL OCCUR)

DATE:_____SIGNED:_____

ADDRESS:_____CITY:_____STATE:_____ZIP CODE:_____

Tribe: _____ Enrollment: #_____ Direct Descent: _____ Spouse: _____

INDIAN PREFERENCE APPLICANT

SECTION 2, Article 2.19
Shall mean any person recognized as one of the following in the state order, except any order my be followed on FEDERAL and STATE PROJECT:
(a) Enrolled member of the Spokane Tribe of Indians
(b) Child of an enrolled member of the Spokane Tribe of Indians
(c) Spouse of an enrolled member of the Spokane Tribe of Indians
(d) Enrolled member of a recognized Tribe of Indians

Attachment #3

SUBCONTRACT'S REQUEST TO TERO
****

Note: A minimum percentage of Subcontract funds shall be awarded to Local Indian Preference Subcontractors. (BUT IF THE TERO OFFICE HAS QUALIFIED INDIAN PREFERENCE SUBCONTRACTORS, 100% IS EXPECTED).

Subcontractor:
Company: ___________________________Type of Work: ____________________________
Total Bid: $___________________________Projected Cost: $___________________________

Company: ___________________________Type of Work:____________________________
Total Bid: $___________________________Projected Cost: $ ___________________________

Company: ___________________________Type of Work: ____________________________
Total Bid: $ Projected Cost: $___________________________

Company: ___________________________Type of Work: ____________________________
Total Bid: $___________________________Projected Cost: $___________________________

Total Subcontract Dollars: $_____________
Total Indian Preference Subcontract Dollars: $_____________
Total Indian Preference Subcontract Percent Dollars: $_____________

Note: All Indian Preference Bids will be considered acceptable if the "Qualified Contractor" is within reasonable prototype cost and\or estimate.

DEFINITION OF CONTRACTOR/SUB-CONTRACTOR:

- **Contractors/Sub-Contractors set their own hours, and can hire someone else to do the work. But they are often paid by the job and accept liability if it isn't finished on time or correctly. Therefore, a contractor assumes risk.**

- **Contractors/Sub-Contractors supply their own tools and equipment and otherwise have any investment in the resources required to do the job. They can't quit or be fired without some breach in the contract. They're free to advertise their services to the general public and often work for more than one company at a time.**

Employer Init. _______ Date _______ TERO Init._______ Date:_________

Attachment #4

NAMES OF LOCAL COMPANYS LOCATED ON THE RESERVATION WITH INDIAN PREFERENCE:

COMPANY NAME	**Action Security**	**(General Contractor)**
OWNER:	**Barbara LeBret**	**(Specialty Security Service)**
ADDRESS:	**P.O. BOX 510 Wellpinit, WA 99040**	
PHONE:	**(509) 228-7022 or (509) 258-7272**	

COMPANY NAME:	**Eagle River Development**	**(General Contractors)**
OWNER:	**Richard W. (Bill) Curtiss**	**(Environmental Mng./Consulting)**
ADDRESS:	**1015 North Yardley Street, Spokane WA 99202**	
PHONE:	**(509) 535-3064**	

COMPANY NAME:	**Hawkeye Building Supply (Supplier)**
OWNER:	**Barbara or Jack LeBret**
ADDRESS:	**P.O. Box 510 Wellpinit WA 99040**
PHONE:	**(509) 258-7022 or (509) 258-7272**

COMPANY NAME:	**Moyer Construction**	**(General 3 Contractor/Supplier)**
OWNER:	**Kay Moyer**	**(Management/Consulting)**
ADDRESS:	**P.O.BOX 263 Wellpinit WA 99040**	
PHONE:	**(509) 258-7711**	

COMPANY NAME:	**Spokane Tribal Wood Program (Supplier)**
OWNER:	**Chuck Stone**
ADDRESS:	**P.O.BOX 161 Wellpinit WA 99040**
PHONE:	**(509) 258-7764**

COMPANY NAME:	**Spokane Tribal Laboratories**
OWNER:	**Bruce Bradburn, Lab Manager**
ADDRESS:	**9608 E. Montgomery #13, Spokane WA 99206**
PHONE:	**(509) 928-1869**

COMPANY NAME:	**Sacred Ground Environmental, LLC**
OWNER:	**Marcus Martinez**
ADDRESS:	**P.O.BOX 248 Wellpinit WA 99040**
PHONE:	**(509)**

COMPANY NAME:	**Bright Star Gen. Const.**
OWNER:	**Vagen Gene Bright**
ADDRESS:	**6740 Hwy; 291 Nine Mile Falls WA 99O26**
PHONE:	**(509) 276-9737**

Attachment #5

REQUIREMENTS FOR
KEY PERSONNEL CLEARANCE REQUEST
TO
T.E.R.O.
****

Note: KEY PERSONNEL AND\OR CORE CREW CLEARANCE: Must be requested through the Tribal Employment Rights Office before being employed on the project.

a) Employers who employ more than two (2) employees may designate key personnel who are regular, permanent employees and are in a supervisory or other key position.

*** Note: At no time shall core crew and\or key personnel displace Indian Preference Employee(s) and |or potential Indian Preference Employee(s) by performing work outside their normal classification or craft.**

b) Key Personnel and\or Core Crew
1. **Supervisors**
2. **Leadman**
3. **Foreman**
4. **Employees needed for business necessity**

Note: CORE CREW SHALL MEAN: Key personnel required by the employer who are regular, permanent employees and are in a supervisory or other key position, furthermore only the first (1) and thereafter every seventh (7) employee may be employed as key personnel and\or core crew by an employer.

c) When an employer requires lay offs or reductions in force a minimum of <u>50%</u> Percent core crew to Indian Preference employees must be maintained.

d) 50% of the hours worked on a daily basis must be Indian Preference work hours.

Employer Init._____ Date _____ TERO Init. _____ Date:_____

Attachment #6

TRIBAL HIRING HALL RULES

****

1. **Within the Tribal Hiring Hall Referral System, applicants shall be dispatched, and\or hired in numerical order from the top of the list of qualified applicants. Except for employer request by name.**

2. **A request for an applicant by an employer for a local Indian preference applicant will be honored if the applicant is legally out of work or signed in on the out-of-work register.**

3. **Any applicant found to be working and is still on the out-of-work list will be removed from the list. (With the exception of training programs, and part-time work)**

4. **Any applicant out-of-work shall be permitted to register on all out-of-work lists maintained by the Tribal Hiring Hall.**

5. **It is the responsibility of any applicant to furnish the dispatch office with telephone numbers for contact purposes.**

6. **Any applicant called for work who cannot be contacted either because his\her phone has been disconnected or because he\she is out of town, or cannot be contacted except in the event of illness will after on (1) attempt, be removed from his\her place on the out-of-work register.**

7. **Any applicant who is called for any job who refuses said job for whatever reason, except in the event of illness and\or hardship will be removed from his\her position on the out-of-work register and placed to the bottom of the appropriate list, (The TERO Commission may request a Doctor's Certification of Illness).**

8. **On jobs of short duration or to finish existing jobs, the employee may be allowed ten (10) calendar days without losing his\her original place on the out-or-work register.**

9. **Any applicant who has been dispatched to the job at the classification he\she registers under and certifies to be qualified to do and who is discharged for cause, suspended for work assignments for six (6) months, will have their name moved from the top to the bottom of the out-of-work register.**

10. **All requests for applicant by name will be confirmed in writing by the contractor\employer, within 24 hours, they will be removed from the job immediately.**

Employer Init. _____ Date _____ TERO Init. _____ Date:_____

11. All applicants will sign the out-of-work once per month, or be removed from the out-of-work register.

12. All applicants who are drawing unemployment are required to sign in the out-of-work register every week. You are responsible to sign the out-of-work register in person every week for your unemployment benefits.

13. Short term or training jobs may be filled at the discretion of the TERO Director without using the correct order of the out of work register. (10 working days)

14. Any applicant who refuses or quits work and\or is terminated for good cause, as defined as; (Failure to adequately perform the job, failure to follow orders, any illegal or fraudulent act pertaining to employment, or any act which puts the employer or other employees in an unsafe position in the course of employment), will be subject to suspension of services from T.E.R.O. and will be determined on a case by case basis.

_____ _____

TERO Director **Date**

Employer Init. _____ Date _____ TERO Init. _____ Date_____

Attachment #7

INDIAN PREFERENCE WORKFORCE
GOALS AND TIMETABLES
****

HOURLY WORKFORCE

1.	Laborers	100%
2.	Carpenters	80 %
3.	Electricians	75 %
4.	Painters	80 %
5.	Plumbers	50 %
6.	Equipment Operator	75 %
7.	Maintenance	75 %
8.	Roofers	50 %
9.	Cement Mason	50 %
10.	Insulation	80 %
11.	Iron Workers	50 %
12.	Soft Floor Layers	50 %
13.	Sheet Metal	50 %
14.	Forestry	80 %
15.	Other _____	

SALARIEDWORKFORCE

1.	Supervision	50%
2.	Foreman	50%
3.	Office Personnel	100%
4.	Other_____	

NOTE: ALL APPRENTICES SHALL BE 100% INDIAN PREFERENCE AND EACH EMPLOYER SHALL MAINTAIN A MINIMUM OF 50% LOCAL INDIAN PREFERENCE WORKFORCE DAILY.

_____
Effective Date

_____
TERO Commission
Chairperson

_____
Lawrence E. Brown
TERO Director

Employer Init. _____ Date _____ TERO Init. _____ Date:_____

Attachment #8

SPOKANE TRIBAL EMPLOYMENT RIGHTS OFFICE
PENALTY SCHEDULE FOR VIOLATIONS

Pursuant to Section 7.0 Penalties for Violations
The maximum monetary penalty which may be imposed is $5,000.00 for each violation. Each day during which a violation exists shall constitute a separate violation.

VIOLATION SCHEDULE

(1)	FIRST VIOLATION:	Monetary Penalty (First Violation Suspended)
(2)	SECOND VIOLATION:	Maximum Monetary Penalty Per Day (Per Violation)
(3)	THIRD VIOLATION:	Maximum Penalty of $5,000.00 Per Day (Per Violation)

SECTION	PAR	VIOLATION	PENALTY
4	4.1	Coverage & Scope	$100.00
4	4.2	Contractor(s) & Subcontractors	$100.00
4	4.3	Goals & Timetables	$ 25.00
4	4.4	Training Programs	$100.00
4	4.5	Training Administrative Fee	$200.00
4	4.6	Job Qualification & Personnel Requirements	$ 50.00
4	4.7	Tribal Hiring Hall	$100.00
4	4.8	Counseling & Support Programs	$ 25.00
4	4.9	Layoffs	$100.00
4	4.10	Promotions	$ 25.00
4	4.11	Summer Students	$ 25.00
4	4.12	Preference in Contracting & Subcontracting	$500.00
4	4.13	Burden of Proof	N/A

Employer Init. _____ Date _____ TERO Init. _____ Date:_____

5	5.5	Compliance Plan Violation	$250.00
5	5.6(a)	Contents of Union Agreements	$ 50.00
5	5.6(b)	Memorandum of Agreement	$100.00
5	5.6(c)	N/A	N/A
5	5.6(d)	Burden of Proof	N/A
10	10.0	Reporting & On-Site Inspections	$100.00
12	12.1	Administrative Fee (Contracts)	$500.00
12	12.2	Administrative Fee (Other Employers)	$500.00
12	12.3	Accounting or Collection Process	$100.00
13	13.0	Equal Employment Opportunities	$100.00
14	14.1	Equal Pay	$100.00
14	14.2	Rate of Pay	$100.00
14	14.3	Highest Rate of Pay	$100.00
15	15.0	Health, Welfare & Pension Benefits	$100.00
16	16.0	Safety, Health & Environmental Plan	$500.00
17	17.0	Retaliation and\or Reprisal	$250.00
18	18.0	Subcontractor Operating License	$100.00

NOTE: The above schedule is to be interpreted as guidelines for initiating a monetary schedule, but The Tribal Employment Rights Commission retains the rights to determine and initiate monetary penalties on a case by case basis in the amount up to $5,000.00 per day, per violation as outlined in Section 7 of The Spokane Tribal Employment Rights Ordinance. Also, any monetary civil penalty initiated does not release an employer from back pay and damages to compensate any injured party.

_____ _____

Tribal Employment Rights Office Chairperson Date Approved

Employer Init._____ Date _____ TERO Init. _____ Date_____

MANPOWER REQUEST FORM

DATE:_____

EMPLOYER:_____ PROJECT:_____

ADDRESS:_____ CITY:_____

STATE:_____ ZIP CODE:_____ PHONE:_____

CONTACT PERSON:_____

I.

i, _____ request _____ Local Indian Preference
(Print) Name & Title Number

referral(s) from the Spokane Tribal Employment Rights Hiring Hall to fill the job classification of Journeyman_____ .

II.
Date needed:_____

Job Title:_____Rate of Pay:$_____

III.
Bona fide Occupation
Quaifications:_____
_____
_____
_____
_____

Employer Init. _____ Date _____ TERO Init. _____ Date:_____

************CLEARENCE CONFORMATION************

IV.
Presently the TERO Hiring Hall has made an applicant search, but cannot furnish a Local Indian Preference Applicant with substantial qualifications for the position of:

_____ _____
Classification **Length of Employment**

_____ _____
TERO Signature **Date**

************CLEARANCE PERMIT************
Core Crew [ ] **Non-Indian Employee [ ]**

DATE:_____

EMPLOYER:_____ **PROJECT:**_____

ADDRESS:_____ **CITY:**_____

STATE:_____ **ZIP CODE:**_____ **PHONE:**_____

CONTACT PERSON:_____

The following Non-Indian Preference employer has been cleared for employment purposes because the Tribal Employment Rights Hiring Hall cannot furnish a qualified applicant.

_____ _____ _____
Name **Classification** **Starting Date**

***NOTE:** **It shall be the employers responsible to provide a journeyman employment work record to the TERO Office in order to document Qualificational requirements.**
(Attachment #16, Page 2)

Permit valid for:_____ **Months**_____ **Days**_____**Hours**_____

_____
TERO Signature **Date**

Employer Init._____Date_____TERO_____Date_____

Attachment #10

SAFETY, HEALTH, AND ENVIRONMENTAL PROTECTION PLAN

****

1. **All employers shall comply with all local, federal, and state laws pertaining to safety, health, and environmental protection while working within the exterior boundaries of the Spokane Indian Reservation.**

2. **All employers shall be required to assure that maximum safety and health protection, along with environmental protection, are initiated when handling or working around hazardous material and\or waste products as follows:**

    1. **Methods for handling and disposal of,**
    2. **Air quality protection(s)**
    3. **Noise level protection(s)**
    4. **Visual Resources protection(s)**
    5. **Cultural Resources protection(s)**
    6. **Water Quality protection(s)**
    7. **Wildlife protection(s)**
    8. **Sanitary Waste Facilities.**
    9. **Shall meet the requirements included in the Occupation Safety, Health, Administration Act of both Federal and State Agencies.**
    10. **Shall meet the highest standards applicable on Tribal, Federal, and State Laws.**

3. **Arrangements shall be made with the appropriate agencies for refuge site(s) in providing employers a means of disposing of all waste products. A minimum cost for disposal shall be billed each employer through the Spokane Tribal Refuge Department, where appropriate.**

4. **(Failure to provide Safety and Health Protections), along with any improper disposal of a waste product(s), shall be considered a violation of Section 22.0, and immediate action may be initiated by the Commission and\or its agents under Section 7 of the Spokane Tribal Employment Rights Ordinance.**

NOTE: The Tribal Employment Rights Commission and\or its agent(s) reserves the rights to require minimum bonding for environmental protection.

Employer Init. _____ Date _____ TERO Init._____ Date:_____

Attachment #11

MEMORANDUM OF UNDERSTANDING
BETWEEN

Employer:

Union:

Project:

This Memorandum of Understanding relates only to work performed on the above mentioned project on the Spokane Indian Reservation, and further relates only to those individual Indian Preference employees hired and dispatched through the Tribal Employment Rights Office (TERO) hiring hall.

Hiring: The parties agree to modify the master labor agreement, for this project only, to allow the Tribal Employment Rights Office (TERO) to dispatch to signatory employers qualified workmen. The parties shall meet and establish hiring hall rules consistent with the Tribal Employment Rights Ordinance requirements and shall include first hire priority rights for all Local Indian Preference union members.

Union Membership and Service Fee Permit: The Tribal Employment Rights Office shall provide a dispatched individual a service fee check-off form, a copy of which shall be forwarded to the employer and the union, prior to being dispatched.

The employee must choose the option of joining the union, or working under a service fee permit and all rights and responsibilities normally associated with membership shall apply.

Prior to the Indian Preference Employee joining the union or if the Indian Preference Employee chooses the option of not joining the union, the service fee check off form signed by the employee shall authorize the employer to deduct a sum of cents per hour for each hour worked by the employee from the employee's wages, and said sum shall be payable by the employer to the union and\or designated trust by the 15th day of the month following the month in which the work was performed. Said hourly fees that are payable by the individual shall not exceed the normal monthly dues required by journeymen members. Therefore, journeymen service fee permit cost is _____ cents per hour worked, bur shall be adjusted for apprenticeship workers wages accordingly.

Training: The parties recognize the necessity for specialized training and agree to indenture Indian Preference hiring hall applicants, where practical for this project. All parties agree to meet and establish apprenticeship ratios consistent with the Bureau of Apprenticeship and Training of the Department of Labor.

Employer Init._____ Date_____ TERO Init. _____ Date_____

Supervisory and Key Personnel: The parties recognize the necessity of the employer to have hiring preference for supervisory and key personnel for the project. Therefore the parties agree to meet with representatives of the Tribal Employment Rights Office to determine the appropriate ratio of supervisory and\or key personnel consistent with Tribal Employment Rights Ordinance, for this project.

Grievance Procedure: The Grievance Procedure and Jurisdictional Disputes Procedure Found in the Master Labor Agreement shall apply to all matters relating to the Collective Bargaining Agreement. The parties agree to meet and establish Grievance Procedures relating to this Memorandum of Understanding, where necessary or practical.

_____	_____
Employer	**Union**
_____	_____
Business Manager	**Owner**
_____	_____
Date	**Date**

Employer Init. _____ Date _____ TERO Init. _____ Date:_____

Attachment #12

UTILIZATION PLAN

On all contracts of $75,000.00 or over, each employer shall provide an approved Indian Contracting Utilization Plan which shall assure maximum use of Local Indian Preference Entities and shall conform to the Indian Preference Contract\Subcontract Rules and Regulations contained in the Spokane Tribal Employment Rights Ordinance (Page 19).

In order to assure maximum use of Local Indian Entities and discourage any type of Bid Shopping, the following Indian subcontract Utilization procedures will be adhered to:

1) All prime bidders shall coordinate a subcontract bid opening a minimum of two (2) days before the prime contract bid opening with the Spokane Tribal Employment Rights Office.

2) The Spokane Tribal Employment Rights Office shall provide each prospective Prime Contractor a list of Local Indian Preference Businesses and each prospective bidder shall be notified by registered mail the place, time, and date bids will be accepted.

3) All bids shall be sealed bids and shall include not only potential Indian Preference Bidders but any other Bidders for each component and shall be opened in presence of a TERO agent and are not public information.

4) Upon bid opening, no bid shopping or other bids shall be accepted by the Prime Contractor.

5) All subcontract or contract bids shall be awarded in following priority (1) Local Indian Preference Bidders, second priority (2) other Indian Preference Bidders. All Indian Preference Bidders must meet the percentage(s) and conditions) required by the Spokane Tribal Employment Rights Ordinance, Rules, and regulations (Page 19).

NOTE: If the prime contractor fails to develop or initiate a Indian Preference Utilization Plan, he\she may be required to negotiate an acceptable subcontract with qualified Local Indian Preference subcontractor(s) within the percentages required by the Rules and Regulations of the Ordinance.

For documentation purposes the successful prime contractor must submit the following information to the Tribal Employment Rights Office, after contract award.

(I) How Indian Preference bids will be solicited
(ii) Who was awarded the contract(s)
(iii) Why each contractor was awarded the said contract.

Employer Init. _____ Date _____ TERO Init. _____ Date:_____

Attachment #13

TRAINING PROGRAM

PURPOSES

The following standards of training are established for the purpose of providing Local Indian Preference applicants a means of receiving "On the Job Training" in each craft or skill where the Local Indian Preference workforce falls below a 50% minimum employment percentage. These standards don not conform to Federal Labor Standards and shall not substitute for The Spokane Tribal Apprenticeship Program number 8000, which are applicable to Federal or State jobs.

WORK PROCESS

The Employer agrees to establish a work process in which the trainee will receive supervises work experience and training "On the Job Training" with the allocation of an approximate time to be spent in each major work process.

TRAINEE WAGES

A progressively increasing schedule of wages shall be paid to the trainee consistent with the skills required. The entry level wage shall but be less than minimum wage and/or 50% of journeyman pay, whichever is more.

A progressively increasing schedule of wages in percentages will be established and indicated in hour worked. Upon satisfactory evaluation of the employee, the trainee shall receive an increase in wages for each 500-hour satisfactory evaluation by the employer.

CREDIT FOR PREVIOUS EXPERIENCE

Trainees who have creditable experience in the skill or craft of related occupations, shall be granted advanced standing as trainees and shall receive comparable wages and credit for advancement.

SUPERVISION OF TRAINEES

The employer shall assure that the trainee(s) are under the supervision of competent and qualified journeymen on the job. Each employer may be required to provide documentation on supervisory or journeymen employees. Trainee(s) shall work the same hours as journeymen.

Employer Init. _____ Date_____ TERO Init. _____ Date:_____

OCCUPATIONAL TRAINING AGREEMENT

OCCUPATION

Skilled Occupational Objective:_____

TERM OF TRAINEE

The term of the trainee shall not be less than 4,000 hours of reasonably continuous employment.

TRAINEE WAGES AND WAGE PROGRESSION

Trainee(s) shall be paid based upon the following percentages of the wage rate for the craft or skill paid journeyman on the project.

1st	**500 hr**	**Period**	**55 %**	**5th**	**500 hr**	**Period**	**75 %**
2nd	**500 hr**	**Period**	**60 %**	**6th**	**500 hr**	**Period**	**80 %**
3rd	**500 hr**	**Period**	**65 %**	**7th**	**500 hr**	**Period**	**85 %**
4th	**500 hr**	**Period**	**70 %**	**8th**	**500 hr**	**Period**	**90 %**

RATIO OF TRAINEEES

For (1)one journeyman regularly employed, the employer may hire (1)one trainee, but at no time shall the Local Indian Workforce fall below 50% in this occupational craft or skill.

MAJOR WORK PROCESSES

The employer and TERO Director will establish the major work processes to be covered during each, 500-hour period. The trainee shall be given credit for past experience and receive comparable wages for such credit.

Employer Init. _____ Date_____ TERO Init. _____ Date:_____

Attachment #14

MONTHLY/QUARTERLY REPORT

_____

Employer

Monthly/Quarterly Date
Department

Total number of Employees on Payroll_____

Number of Indian preference Employees on Payroll

Name	Total of Opening	Date Hired	Date termin.	Title	Promot.	No. of apps.	*I.P Code	Wage rate	Social Security #

***Code: Spokane Tribal Member (1)**
Child of Spokane Member (2)
Spouse of Spokane Tribal Member (3)
Other Indian (4)
Non-Indian (7)

Note: Wage and hour reports required by Federal or State agencies will substitute for this form

ALL REPORTS MUST BE RETURNED TO THE PERSONNEL OFFICER BY THE 10TH OF THE NEXT MONTH.

Attachment #16

TRIBAL EMPLOYMENT RIGHTS OFFICE
TRAINING ADMINISTRATIVE FEE

Quarterly Report:(circle one) 1 2 3 4 **Invoice #_____**
Project:_____
Employer:_____
Address:_____
City:_____ State:_____
Zip Code:_____ Phone:_____

Spokane Tribal Employment Rights Ordinance States:

<u>SECTION 4.5 TRAINING ADMINISTRATIVE FEE:</u>
Every building trades employer that is a prime contractor on the Reservation of $10,000.00 or more shall pay a training fee of .5% of the total contract dollar amount. This revenue shall be used for Journeymen upgrade training and\or Apprenticeship training for any Journey Employee or Apprenticeship Trainee.

Contract Amount: _____
Training Fee 1/2 % _____
***Late penalty Fee:** _____
Total Fee Due _____
***(30 days late 10%) (60 days late 30%)**

Please make all checks payable to:

Spokane Tribe of Indians
TERO Office
Box 100
Wellpinit, Washington
99040

Total Fee Due:_____

Date Paid:_____

_____
Company Representative

Attachment #16

TRIBAL EMPLOYMENT RIGHTS OFFICE
EMPLOYMENT ADMINISTRATIVE FEE

Quarterly Report(s): (circle) 1 2 3 4 Invoice #_____
EMPLOYER:_____PROJECT:_____
ADDRESS:_____ CITY:_____
STATE:_____ ZIP CODE:_____ PHONE #:_____

Spokane Tribal Employment Rights Ordinance Requires:

SECTION 12.1 CONTRACTS
Every prime contractor obtaining a contract of $10,000.00 or more shall pay an Employment Administrative Fee equal to 1.5% of the total amount of each contract on the Reservation.

Contract amount: _____
Admin. Fee 1 2% or .015: _____
Late Penalty Fee (10% or 30%): _____
Total Fee(s) due _____

SECTION 12.2 OTHER EMPLOYERS
Every employer, other than a contractor, with 20 or more employees shall pay an Employment Administrative fee of 1.5% of the employers annual payroll. This Fee shall be paid in quarterly installments and shall not be required of Educational, Health, or Nonprofit employers.

Please complete total hours worked for all hourly employee(s) when calculating fees due when twenty or more employees are on payroll and not hired under a construction contract.

Months	Jan/March	April/June	July/Sept	Oct/Dec
Quarter				
Month(s)				
Day(s)				
Wages Paid				
Admin Fee 1% or .01 X ($)				

Due Date:_____

Spokane Tribe of Indians
TERO Office
P.O. Box 100
Wellpinit, WA 99040

Attachment #17

LIMITED TERM
EMPLOYMENT AGREEMENT

Upon receiving a request on _____ For a Local Indian Preference Applicant to be dispatched for the occupation of journeyman_____. Clearance is hereby granted under the following "Limited Term Employment Agreement," and conditions.

Presently The Spokane Tribal Hiring Hall has made an effort, but cannot furnish a journeyman Local Indian Employee with substantial qualifications.

Therefore a clearance shall be granted for a journeyman under this "Limited Term Employment Agreement," and shall be granted for a term of _____ Months. The approximate duration of the project shall be _____ years and _____months.

It is understood by all parties that this "Limited Term Agreement," is issued as a condition of employment for work performed in conduction with the Spokane Tribal Employment Rights Ordinance and is binding on all parties upon verification of the Journeyman Status of the cleared employee.

Employer:_____
Address:_____
State:_____ Phone:_____ Zip Code:_____

Applicant's Name:_____
Address:_____
State:_____ Phone:_____ Zip Code:_____

Company Representative Signature:_____Date:_____

Application Signature:_____Date:_____

TERO Director Signature:_____Date:_____

Approved [ ] **Disapproved [ ]**

JOURNEYMAN EMPLOYMENT RECORD

The following information is needed before this individual will be allowed to begin work:
(Must have four years experience)

Employer:_____
Address:_____
State:_____ **Phone:**_____ **Zip Code:**_____
Length of Employment:_____ **Month:**_____ **Year:**_____
To: Month_____ **Year:**_____

Employer:_____
Address:_____
State:_____ **Phone:**_____ **Zip Code:**_____
Length of Employment:_____ **Month:**_____ **Year:**_____
To: Month_____ **Year:**_____

Employer:_____
Address:_____
State:_____ **Phone:**_____ **Zip Code:**_____
Length of Employment:_____ **Month:**_____ **Year:**_____
To: Month_____ **Year:**_____

Employer:_____
Address:_____
State:_____ **Phone:**_____ **Zip Code:**_____
Length of Employment:_____ **Month:**_____ **Year:**_____
To: Month_____ **Year:**_____

I hereby certify that the above employment information is correct and accurate to the best of my knowledge. If any information should be proven to be falsified, I realize that it may be grounds for immediate dismissal.

Date:_____**Applicants Signature:**_____

Attachment #18

NOTICE OF NON-COMPLIANCE
Pursuant to Section 7.0 Enforcement and Penalties for Violations

Charge Number_____

Notice is hereby given to the Employer that reasonable cause exists for issuing a Notice of Non-Compliance by the Spokane Tribal Employment Rights Ordinance. Formal written charges will follow if an informal settlement cannot reasonably be made.

Employer: _____

Address:_____

State:_____Zip:_____Phone:_____

Violation(s): [ ]

Notice of Non-Compliance to:

Section(s) Paragraph(s)

1_____ _____

2_____ _____

3_____ _____

This Notice of Non-Compliance is issued as required by Section 7.1, paragraph (b) of the TERO Ordinance. This Notice is intended for notification purposes and in no way should be considered conclusive. The burden of proof for Compliance purposes shall be the responsibility of the employer as required by the TERO Ordinance.

Spokane Tribal Employment Rights Office
Box 100
Wellpinit, WA 99040
Phone (509) 258-4581

_____
Charging Party
Date:_____

[ ] All work shall be suspended at the end of this workday.

Compliance Program

Solutions	Injured Parties	Wages Owed	Time Frame

***The employer shall come into compliance within the specified time frame and/or* no more than five days*, or request in writing, a hearing before the Commission on the matter*.**

MONETARY PENALTY, Amount Due:_____

Monetary penalty arrangements shall be made for all violations as per the Monetary schedule, (Attachment #8). Contact the Spokane Tribe of Indians, located at the Sherwood Memorial building in Wellpinit Washington.

BE ADVISED: Any Employer who pays a monetary penalty shall not be released of any responsibility for payment of damages, wages, and/or compensation to injured parties, where due.

I, hereby accept this notice on Non-Compliance, with no admission of guilt either on my behalf or my employer behalf.

_____

Print Name Signature

Date:_____ Time:_____

The foregoing Compliance Plan is fully acceptable on behalf of:

_____

(Contractor/Owner)

and the Tribal Employment Rights Office

Dated this_____ Day of _____20___

Signed:_____

Lawrence E. Brown, Director
Tribal Employment Rights Office

Company Name:_____

Owner (s) Name:_____
(Please Print)

Owner (s) Name:_____
(Signature)

Project Name:_____

Address:_____

City, State, Zip Code:_____

Telephone Number:_____

Commission Chairperson:_____

Commission Member: _____

Date Approved: _____ Date Not Approved:_____

Employer Init. _____ Date _____ TERO Init. _____ Date_____

MEMORANDUM

Renewal Date January 7, 1999

TO: **Employers, Contractors, Sub-Contractors**

FROM: **Spokane Tribal Employment Rights Office (TER0)**

SUBJECT: **Acceptable Compliance Plan**

Each General Contractor shall sign and submit a Compliance Plan which is acceptable to the TERO officer. Attached is a suggested Compliance Plan.

The Contractor may negotiate with the TERO Director and submit a comparable Compliance Plan. But, again, each Contractor must submit an approved Compliance Plan.

Before bidding, it is understood by all parties that each employer must comply with all applicable Tribal Laws.

Employer Init. _____ Date _____ TERO Init. _____ Date_____

APPENDIX J

RHOADS PROPERTY RECLAMATION COST ESTIMATE

TABLE OF CONTENTS

J1.0 INTRODUCTION 1

J2.0 ELEMENTS OF ESTIMATED RECLAMATION COST 2

J2.1 GRADING/CONTOURING 2
J2.2 RIPPING OF WEATHERED BEDROCK SUB-BASE 2
J2.3 TOPSOIL PLACEMENT 3
J2.3.a Direct Push from Topsoil Stockpiles 3
J2.3.b Excavate Stockpiles, Load, Haul, and Spread 3
J2.3.b1 Excavate and Load Topsoil from Stockpiles 4
J2.3.b2 Haul and Dump Topsoil 4
J2.3.b3 Spread Topsoil 4
J2.4 REVEGETATION 4
J2.4.a Hydroseed Application 5
J2.4.b&c Hand Planting 5
J2.5 CONTRACTOR MOBILIZATION/DEMOBILIZATION 5
J2.6 MONITORING AND MAINTENANCE 5
J2.6a Monitoring 5
J2.6b Maintenance 6
J2.6c Monitoring Well Abandonment 6
J2.7 INDIRECT COSTS 7

J3.0 REFERENCES 9

TABLE

Table J1 Rhoads Property Borrow Area Reclamation Cost Estimate – BLM Format using RS Means (2014)

ATTACHMENT

Attachment J-1 RS Means Backup for the Rhoads Property Borrow Area Cost Estimate

J1.0 INTRODUCTION

This appendix summarizes the methods and assumptions used to estimate borrow area reclamation costs for the proposed Rhoads Property borrow area. Newmont intends to complete reclamation of disturbed areas within the borrow area on the Rhoads Property to Reclamation Plan specifications (Section 3.0 including long-term maintenance of the property reclamation described in Section 4.0) within the year in which the disturbance occurs. This appendix contains a reclamation cost estimate for a third-party Tribal contractor to perform the work described within the Reclamation Plan to reclaim the property if not completed by Newmont. The cost estimate for earthworks (recontouring, ripping, and topsoil covering) contains projected labor rates and equipment costs to reclaim all the Rhoads Property borrow area disturbances. To ensure that the project is completed to Reclamation Plan specifications (including long-term maintenance of the property reclamation described in Section 4.0), Newmont will provide the Tribe a surety instrument in the form of either a Surety Bond, a Letter of Credit, or a Trust Account as determined by consensus of Newmont and the Tribe.

The surety value is determined in consideration of the estimated total reclamation costs provided in Table J1. This estimate includes the other indirect costs associated with the BLM cost estimating format and includes a 15 percent contingency on the total non-burdened or bare cost and a 50 percent Tribal administration cost. As described above, this estimate is based on the development and reclamation plan for the Rhoads Property detailed in the revised *Rhoads Property Plan of Operations and Reclamation (Rhoads POR*, MWH 2014).

As described in the POR, any surface land disturbances will be reclaimed within the same year that the disturbance occurs. The total 74.2 acre disturbance area used in these calculations does not include the perimeter buffer, which was identified as a 25-foot-wide strip encircling the entire Rhoads Property disturbance area. In addition, the total area of disturbance used in these calculations does not include the 60-foot-wide non-disturbance area centered along Whitetail Creek. Areas of steeper slopes lying immediately adjacent to Whitetail Creek (shown on Figures 3 and 8 of the POR as areas that will not be disturbed by borrow operations) were included in the estimated area of disturbance because the precise limits of these non-disturbance areas have not been field verified at this time. Unless otherwise noted, unit costs used in preparing this estimate are based upon the 2014 RS-Means Heavy Construction published by Reed Construction Data (Means). These unit costs were adjusted using regional cost factors for the Spokane Area and include contractor overhead and profit within each individual unit cost.

J2.0 ELEMENTS OF ESTIMATED RECLAMATION COST

This cost estimate is based upon the borrow area reclamation elements described in the POR and includes estimates for the following major work tasks:

1. Grading/Contouring of the borrow area upon completion of borrow area activities in each segment
2. Ripping of the remaining subsoil and extremely weathered bedrock subbase
3. Topsoil Placement
4. Revegetation
5. Contractor Mobilization/Demobilization
6. Monitoring and Maintenance
7. Project Administration and Oversight

The cost estimate associated with the reclamation work is summarized in Table J1. When using the BLM cost estimating tool, bare costs are used to build the estimate and the indirect costs including profit are applied in Section H at the end of the estimate based on the cost buildup. Procedures used to estimate the cost of each of these work tasks are described in more detail in the following subsections. Backup information for reclamation costs provided herein is included in Attachment J-1.

J2.1 GRADING/CONTOURING

As described in the POR, a minimum of 1 foot of residual soil will be left in place at the bottom of the excavation upon completion of the borrow operations. The surface of this residual soil (subsoil) will be recontoured to match the surrounding terrain. The estimated cost for grading and contouring of the subsoils is based upon the maximum area of disturbance of 74.2 acres described in Section J1.0. A unit cost from Means of $0.20/square yard ($yd^2$), or $967.99 /acre, for finished grading on relatively steep slopes was used for this cost item. The burden and bare (or nonburdened) daily labor costs are $593.20 ($391.20) and $452.40 ($293.20) for an operator and a full-time laborer. The burdened and nonburdened daily equipment costs are $777.70 ($707.00) for a 30,000 pound (lbs) grader. Please refer to the copies of individual rate sheets used in this calculation from Means in Attachment J-1.

J2.2 RIPPING OF WEATHERED BEDROCK SUB-BASE

Prior to topsoil placement, the subsoil and extremely weathered bedrock left in place in the contoured excavation bottom will be ripped along contour. As with the grading and contouring estimate, the cost for ripping is based upon the maximum estimated area of disturbance (74.2 acres) as described in Section J1.0. In selecting the unit cost for ripping of the residual soil and extremely-weathered underlying bedrock, it was assumed that ripping productivity will be similar to what could be achieved in a soft shale, and a unit cost of $1.81/cubic yard ($yd^3$) was selected from Means for ripping of soft shale. Assuming a typical penetration depth of 0.5 feet into underlying extremely-weathered rock during ripping, this unit cost translates into a unit cost of $1,460.07/acre for ripping:

$$\$1.81/yd^3 \times 0.5 \text{ feet} \times 43{,}560\ ft^2/acre \times 1\ yd^3/27\ ft^3 = \$1{,}460.07/acre.$$

The burdened and nonburdened daily labor costs are $593.20 ($391.20) and $226.20 ($146.60) for an operator and a laborer (1/2 time). The burdened and nonburdened daily equipment costs are $2,088.2 ($1898.40) for a 300 Horsepower (H.P.) dozer and ripper. Please refer to the copies of individual rate sheets used in this calculation from Means in Attachment J-1.

J2.3 TOPSOIL PLACEMENT

Topsoil placement will primarily be performed by pushing topsoil from adjacent stockpiles using dozers. Topsoil placement in more remote and difficult access areas will require loading soil from stockpiles into off-road, articulated haul trucks, hauling to a dump point at the reclamation site, and spreading the topsoil in a 1-foot thick layer. The estimated cost for topsoil placement is based upon the maximum estimated area of disturbance of 74.2 acres described in Section J1.0. Approximately 119,709 yd^3 of topsoil will be needed to construct the required 1-foot-thick topsoil layer over this area:

$$1 \text{ foot} \times 74.2 \text{ acres} \times 43{,}560 \text{ ft}^2/\text{acres} \times 1 \text{ yd}^3/27 \text{ ft}^3 = 119{,}709 \text{ yd}^3$$

This cost estimate assumes that topsoil placement over 75 percent of the disturbed area will be achieved by directly pushing the topsoil from adjacent stockpile areas using dozers. The remaining topsoil will need to be placed by loading into articulated dump trucks, hauled to the placement area, dumped, and spread by a dozer.

Direct placement of topsoil from adjacent areas without stockpiling will be done to the extent practical. However, it is assumed for cost estimating purposes that all topsoil will be obtained from topsoil stockpiles. This is a conservative assumption and leads to higher estimated reclamation costs than actually will occur.

J2.3.a Direct Push from Topsoil Stockpiles

It is estimated that 75 percent of disturbed areas will be reclaimed by directly pushing soil from stockpiles located adjacent to the active borrow area segment. A unit cost from Means of $1.22/ yd^3 for backfilling by directly pushing sandy clay loam soil from a stockpile using a 300-H.P. (D8) was used in this cost item. The average push distance is 150 feet from the adjacent topsoil stockpiles. The burdened and nonburdened daily labor costs for direct pushing of topsoil are $593.20 ($391.20) and $226.20 ($146.60) for an operator and a laborer (1/2 time). The burdened and nonburdened daily equipment costs are $1,998.70 ($1817.00) for a 300 H.P. dozer only. Please refer to the copies of individual rate sheets used in this calculation from Means in Attachment J-1.

J2.3.b Excavate Stockpiles, Load, Haul, and Spread

It is estimated that the remaining 25 percent of disturbed areas in more remote locations from the topsoil stockpiles will be reclaimed by excavating and loading topsoil from the stockpiles into off-road articulated haul trucks, hauling and dumping the topsoil at the placement location, and spreading the topsoil using a dozer.

J2.3.b1 Excavate and Load Topsoil from Stockpiles

The unit cost of \$0.62/yd^3 for excavating and loading topsoil into articulated, off-road haul trucks was developed from the Means cost data assuming a wheel loader with a 3 yd^3 (Cat 930, etc.) or larger bucket would be used for this task. The 15 percent decrease in productivity that is recommended for loading into dump trucks is offset by the 15 percent increase in productivity that is recommended when excavating loose soils from stockpiles. The burdened and nonburdened daily labor costs for the excavation of topsoil are \$593.20 (\$391.20) and \$226.20 (\$146.60) for an operator and a laborer (1/2 time). The burdened daily equipment costs are \$575.08 for a 3.0 yd^3 front end (F.E.) loader. Please refer to the copies of individual rate sheets used in this calculation from Means in Attachment J-1.

J2.3.b2 Haul and Dump Topsoil

The unit cost for hauling topsoil to the placement location was developed assuming a 42- yd^3 articulated haul trucks would be used to transport the topsoil from the stockpile to the placement location in more remote areas. Unit costs were developed using a burdened unit rate of \$2.57/ yd^3, an estimated round trip cycle time of 20 minutes (which includes loading, roundtrip haul distance of 2,000 feet, dumping, standby, and loading-area spotting time), and an in-truck unit weight of 1.00 tons/ yd^3. A shrinkage factor between the material in-truck and the in-place topsoil layer was not applied since compaction of the topsoil is to be avoided to the extent possible.

Based upon these considerations, the unit cost for topsoil hauling to more remote locations was calculated as:

\$2.57/cy x (42cy/load) = \$107.94/load

The burdened and nonburdened daily labor costs for the haul and dump topsoil are \$458.40 (\$300.40) for a truck driver (full time). The burdened and nonburdened daily equipment costs are \$1,976.70 (\$1,797.00) for a 42 yd^3 (65 ton) off-road haul truck. Please refer to the copies of individual rate sheets used in this calculation from Means in Attachment J-1.

J2.3.b3 Spread Topsoil

It is estimated that topsoil spreading at the placement location will be accomplished using a 200-H.P. (e.g., Cat D7) dozer with an average push distances of 50 feet. A unit cost from Means of \$0.88/ yd^3 for backfilling by directly pushing sandy clay loam soil was used for this task. The burdened and nonburdened daily labor costs for the excavation of topsoil are \$593.20 (\$391.20) and \$226.20 (\$146.60) for an operator and a laborer (1/2 time). The burdened and nonburdened daily equipment costs are \$1,457.50 (\$1,325.00) for a 200 H.P. dozer. Please refer to the copies of individual rate sheets used in this calculation from Means in Attachment J-1.

J2.4 REVEGETATION

Revegetation elements are described in detail in the POR and include hydroseeding with grass species, followed by harrowing, and finally a hydromulch and tackifier application. Tree and shrub seedlings will be planted by hand two years after initial seeding in disturbed areas.

J2.4.a Hydroseed Application

Costs for hydroseed applications can vary greatly depending on the cost of specific seed mixes and application rates to be used. The unit cost selected for hydroseeding, harrowing, and hydromulch/tackifier application ($2,720/acre) was obtained from Means. The burdened and nonburdened daily labor costs for the hydroseed application are $452.40 ($293.20), $593.20 ($391.20), and $458.40 ($300.40) for a laborer, an equipment operator and a truck driver. The burdened and nonburdened daily equipment costs are $374.44 ($$340.40) and $403.04 ($366.40) for a 3,000 gallon hydromulcher and a 220 H.P. truck. Please refer to the copies of individual rate sheets used in this calculation from Means in Attachment J-1.

J2.4.b&c Hand Planting

As described in the POR, hand planting will consist of planting Ponderosa pine and selected shrub seedlings. Ponderosa seedlings will be hand planted at a rate of 400 seedlings per acre of disturbed land. Verbal cost quotations have been received from service personnel associated with Plants of the Wild and Northwest Trees and Reclamation Co. According to communications with Plants of the Wild, a cost of $1.25 per seedling would be required to mobilize/demobilize, collect, clean, and produce a 12” ponderosa pine seedling from a local seed source; and $4 per seedling would be required to plant a ponderosa pine seedling. Based upon this information, a total cost of $5.25 per seedling or $2,100 per acre was used for hand planting of tree seedlings.

Selected shrub seedlings will be hand planted at a rate of 200 seedlings per acre of disturbed land. Assuming the costs for procuring and planting shrub seedlings will be similar to those for tree seedlings, a cost of $1,050 per acre was assumed for hand planting of shrub seedlings.

J2.5 CONTRACTOR MOBILIZATION/DEMOBILIZATION

Contractor Mobilization/Demobilization costs depend largely on the distance of the selected contractor from the site, which is not known at the present time. A lump-sum contractor mobilization/demobilization cost of $10,000 ($9,100 nonburdened) has been estimated for each of the three construction Phases. It is anticipated that a Tribal Contractor and possibly a revegetation specialty subcontractor from the Spokane area would complete the reclamation work.

J2.6 MONITORING AND MAINTENANCE

It was estimated that monitoring would be performed on an annual basis and follow-up maintenance of any problem areas would be performed until specified revegetation criteria have been met. For the purposes of this cost estimate, it is estimated that monitoring and maintenance would be required for a five-year period following completion of project including the reclamation.

J2.6a Monitoring

Monitoring will consist of 1) performing annual reclamation surveys to evaluate whether revegetation targets are being met and 2) monitoring of groundwater through collection of groundwater samples at 10 monitoring wells installed up and downgradient of the Rhoads

Property Borrow Area. The annual monitoring will continue for 5 years following completion of the reclamation of the Site.

The site visits for reclamation surveys and groundwater monitoring will be conducted concurrently and a single report will be prepared annually that covers these monitoring activities. The reclamation and groundwater monitoring assumes a mid-level professional at $120/ hour. The reclamation monitoring will require one 10-hour day to walk the Site and evaluate/record the vegetation conditions. The groundwater monitoring will require 4 days for travel to and from the Site and collection and submittal of groundwater samples from the 10 monitoring wells.

The groundwater samples will be submitted for analyses including:

- BTEX and PAH
- Radionuclides (uranium -234, uranium 238, lead-210, and radium-226)
- Metals (aluminum, barium, beryllium, cadmium, cobalt, copper, lead, manganese, nickel, silver, zinc, and uranium)
- Total Dissolved Solids (TDS)/Total Suspended Solids (TSS)
- Cations and Anions (calcium, magnesium, sodium, potassium, sulfate, chloride, carbonate, and bicarbonate)
- pH, specific conductivity, and temperature (typically field measurements)

Sample analyses, based on bids from Anatek and Energy laboratories, will cost $888 per sample.

Four additional days have been allowed for preparation and review of the annual site monitoring report that includes the groundwater results as well as the reclamation survey observations and recommendations.

J2.6b Maintenance

For cost estimating purposes, it is assumed that maintenance will consist of reseeding portions of the Site, repair of BMPs, invasive species control, and repair of minor erosion features that occur while vegetation is being established. Using the BLM format for estimating maintenance cost, we assumed that 10 percent of the Site would require reseeding each year for 5 years. The yearly cost for this work uses 10 percent of initial hydroseeding costs for labor and equipment.

Also assumed was that 5 percent of the Site would require maintenance work e.g., filling in gullies caused by rainfall events yearly for 5 years. Yearly costs were developed assuming five percent of the total labor and equipment costs for the initial earthwork and recontouring would be necessary.

J2.6c Monitoring Well Abandonment

Following the 5-year maintenance and monitoring period, each of the 10 monitoring wells will be abandoned according to State of Washington and Tribe requirements. In general, all the surface completion protective casing and concrete will be removed then after filling the actual well casing with grout an attempt will be made to pull the casing from the borehole. If unsuccessful the casing will be cutoff 2 feet below ground surface and soil would be used to

backfill the remaining 2 feet of borehole to the ground surface. However, if the wells casing can be pulled, it along with the surface completion items will be properly disposed at a RCRA Subtitle C landfill. For cost estimating purposes, it was assumed that one professional and a drill rig with a driller and helper will be required for a total of 3 days to complete this work. Material costs are for truck rental, lodging and meals.

J2.7 INDIRECT COSTS

Indirect costs using the BLM cost estimating format includes:

- Engineering, Design, and Construction
- Contingency
- Insurance
- Bond
- Contractor profit
- Contract Administration
- BLM Indirect Costs

These indirect costs were applied as discussed below.

1. Engineering, Design and Construction – No additional costs were assumed for this item because the Rhoads BOR has a complete description and design details for the intended borrow sequence and reclamation process.

2. Contingency - The contingency was reduced to 15 percent from the Tribal request of 50 percent based on the accuracy of the design. In this case, the Rhoads Property Borrow Area design is at the 100 percent stage. The NCP, as detailed in *A Guide to Developing and Documenting Cost Estimates During the Feasibility Study (EPA, 2000),* allows for a progressive reduction in the contingency percentage as the design is refined through the 30%, 60%, 90%, and 100% stages. At the 100 percent stage the accuracy of the cost estimate should be between +15% and -10% of the actual final project cost.

   The BLM estimating tool applies contingency based on the total value of the project as follows: up to and including $500,000 use 10 percent; over $500,000 to $5 million use 8 percent; over $5 million to $50 million use 6 percent; and greater than $50 million, use 4 percent. If the BLM format had been strictly followed, then we would have applied an 8% contingency because the project is in the $1 million dollar range for the reclamation of the Rhoads Property Borrow Area.

3. Insurance - Insurance premiums are calculated at 1.5 percent of the total nonburdened labor costs.

4. Bond - Projects exceeding $100,000 require both a performance and a payment bond when using the BLM cost estimating format, which are necessary for projects with the Federal Government (Miller Act, 40 USC 270et seq.). Because the project exceeds the $100K threshold both a performance and a payment bond premium were applied at 1.5 percent of the total nonburdened O&M cost in Section G of Table J1 for a total of 3 percent.

5. Contractor Profit - For Federal construction contracts, the BLM recommends using 10 percent of estimated O&M cost for the contractor's profit. This was applied to the total non-burdened O&M costs in Section G of Table J1.

6. Contract Administration – The BLM calculates the contract administration cost as a percentage of the O&M cost as follows: up to and including $1 million use 10 percent; over $1 million to $25 million use 8 percent; and greater than $25 million use 6 percent. However, the Tribe has requested a 50 percent contract administrative costs and that has been applied to the total nonburdened O&M costs in Section G of Table J1.

7. BLM Indirect Cost - BLM's indirect cost rate is 21 percent of the contract administration costs. This item was applied to the contract administrative costs calculated in Item #6 above.

J3.0 REFERENCES

MWH, 2014. *Rhoads Property Plan of Operations and Reclamation, Revision 2*. Prepared on behalf of Newmont USA Limited and Dawn Mining Company. April.

EPA, 2000. A Guide to Developing and Documenting Cost Estimates During the Feasibility Study. EPA 540-R-00-002. July.

Redente Environmental Consultants (REC), 2012. Personal communication regarding typical revegetation costs. September 28.

Table J1. RHOADS BORROW AREA RECLAMATION COST ESTIMATE
BLM FORMAT - USING RS MEANS (2014)

	Non-Burdened Labor	Non-Burdened Equipment[2]	Non-Burdened Materials	Totals for Non-Burdened Costs
A. Earthwork/Recontouring				
Exploration				$ -
Exploration Roads & Drill Pads				$ -
Drill Hole Abandonment				$ -
Monitoring Well Abandonment (10 total)	$ 1,965.00	$ 4,500.00	$ 1,350.00	$ 7,815.00
Grading/Contouring	$ 26,960.42	$ 27,850.70		$ 54,811.12
Ripping of Weathered Bedrock Subbase	$ 20,038.15	$ 70,733.42		$ 90,771.57
Topsoil Placement - 119,709 CYs	$ -	$ -		$ -
1) Direct Push Topsoil (75% of topsoil)	$ 20,903.23	$ 70,623.21		$ 91,526.44
2) Excavate, Load, Haul, Dump, Spread (25% of topsoil)	$ -	$ -		$ -
a) Excavate and Load from Stockpile	$ 7,155.89	$ 6,956.30		$ 14,112.18
b) Hauling	$ 9,488.10	$ 56,758.07		$ 66,246.17
c) Spread Topsoil	$ 6,220.46	$ 15,325.61		$ 21,546.07
Yards, Etc.	$ -	$ -		$ -
Drainage & Sediment Control	$ -	$ -		$ -
Other**	$ -	$ -		$ -
Mobilization/Demobilization	$ -	$ 27,300.00		$ 27,300.00
Subtotal "A"	**$ 92,731.25**	**$ 280,047.30**	**$ 1,350.00**	**$ 374,128.56**
B. Revegetation/Stabilization	**Non-Burdened Labor**	**Non-Burdened Equipment[2]**	**Non-Burdened Materials**	**Totals for Non-Burdened Costs**
Exploration				$ -
Exploration Roads & Drill Pads				$ -
Roads				$ -
Drill Hole Abandonment				$ -
Pits				$ -
Quarries and Borrow Areas				$ -
a) Hydroseeding	$ 87,117.26	$ 62,524.85		$ 149,642.11
b) Hand Planting Trees	$ 24,292.61		$ 106,848.00	$ 131,140.61
c) Hand Planting Scrubs	$ 12,146.30		$ 53,424.00	$ 65,570.30
Landfills				$ -
Tailings				$ -
Foundations & Building Areas				$ -
Yards, Etc.				$ -
Drainage & Sediment Control				
Other**				
Subtotal "B"	**$ 123,556.16**	**$ 62,524.85**	**$ 160,272.00**	**$ 346,353.02**
C. Detoxification/Water Treatment/Disposal of Wastes**	**Non-Burdened Labor**	**Non-Burdened Equipment[2]**	**Non-Burdened Materials**	**Totals for Non-Burdened Costs**
Interim Fluid Management				
Closure Plan Development				
Process Ponds/Sludge				
Heaps				
Dumps (Waste & Landfill)				
Tailings				
Surplus Water Disposal				
Monitoring				
Other**				
Subtotal "C"				
D. Structure, Equipment and Facility Removal	**Non-Burdened Labor**	**Non-Burdened Equipment[2]**	**Non-Burdened Materials**	**Totals for Non-Burdened Costs**
Foundations & Building Areas				
Other Demolition				
Equipment Removal				
Fence Removal				
Fence Installation				
Pipe & Culvert Removal				
Powerline Removal				
Transformer Removal				
Rip-rap, rock lining, gabions				
Other Misc. Costs				
Other**				
Subtotal "D"				

E. Monitoring	Non-Burdened Labor	Non-Burdened Equipment(2)	Non-Burdened Materials	Totals for Non-Burdened Costs
Reclamation Monitoring	$ 3,930.00		$ 5,197.50	$ 9,127.50
Reclamation Reseeding (10% of initial hydroseeding/yr)	$ 43,558.63	$ 31,262.43		$ 74,821.05
Reclamation Maintenance (5% of initial earthwork/yr)	$ 23,182.81	$ 70,011.83		$ 93,194.64
Ground and Surface Water Monitoring	$ 25,152.00		$ 39,960.00	$ 65,112.00
Subtotal "E"	**$ 95,823.44**	**$ 101,274.25**	**$ 45,157.50**	**$ 242,255.19**
F. Construction Management & Support	**Non-Burdened Labor**	**Non-Burdened Equipment(2)**	**Non-Burdened Materials**	**Totals for Non-Burdened Costs**
Construction Management				
Road Maintenance				
Other**				
Subtotal "F"				
G. Operational & Maintenance Costs (Totals)				
Subtotal A through F	**$ 312,110.86**	**$ 443,846.41**	**$ 206,779.50**	**$ 962,736.77**
H. Indirect Costs				
1. Engineering Design and Construction (ED&C) Plan (7)				
2. Contingency (15%) (8)				$ 144,410.52
3. Insurance (1.5% of total labor costs) (9)				$ 4,681.66
4. Bond (1.5% performance and 1.5% for payment bond) (10)				$ 28,882.10
5. Contractor Profit (10%) (11)				$ 96,273.68
6. Contract Administration (50%) (12)				$ 481,368.39
7. BLM Indirect Cost (21%) (13)				$ 101,087.36
Subtotal Add-On Costs				**$ 856,703.71**
Grand Total				**$ 1,819,440.48**

1. Federal construction contracts require Davis-Bacon wage rates for contracts over $2,000. Wage rate estimates may include base pay, payroll loading, overhead and profit. To avoid double counting of any of the identified administrative costs the operator must itemize the components of their labor cost estimates or provide BLM with a signed statement, under penalty of USC I 001 , that identifies what specific administrative costs are included in the quoted hourly rate.

2. The reclamation cost estimate must include the estimated plugging cost of at least one drill hole for each active drill rig in the project area. Where the submitted Notice or approved Plan of Operations calls for drill holes to be plugged, but doesn't specifically require the drill holes be plugged before the drill rig has been moved from the drill pad, the reclamation cost estimate must include the plugging cost for those drill holes. For all drill holes and wells scheduled to be left open, the estimated plugging cost must be included in the reclamation cost estimate. Where the approved Plan of Operations proposes immediate mining through an area where the drilling is to occur, and the cost of the post-mining reclamation is included in the reclamation cost estimate, the cost estimate does not need to include the plugging costs for those drill holes.

3. Miscellaneous items should be itemized on accompanying worksheets.

4. Fluid management should be calculated only when mineral processing activities are involved. Fluid management represents the costs of maintaining proper fluid management to prevent overflow of solution ponds through premature cessation or abandonment of operations. Calculate a minimum six month direct cost estimate which includes power, supplies, equipment, labor and maintenance.

5. Handling of hazardous materials includes the cost of decontaminating, neutralizing, disposing, treating and/or isolating all hazardous materials used, produced, or stored on the site and/or isolating all hazardous materials used, produced, or stored on the site.

6. Any mitigation measures required in the Plan of Operations must be included in the reclamation cost estimate. Mitigation may include measures to avoid, minimize, rectify and reduce or eliminate the impact, or compensate for the impact.

7. Engineering, design and construction (ED&C) plans are often necessary to provide details on the reclamation needed to contract for the required work. To estimate the cost to develop an ED&C plan use 4. 8% of the O&M cost. Calculate the ED&C cost as a percentage of the O&M cost as follows: up to and including $1 million, use 8%; over $1 million to $25 million, use 6%; and over $25 million, use 4%. Inclusion of a line item for the development of an ED&C plan may not be necessary for small operations, such as notice-level exploration. With small, uncomplicated reclamation efforts contracting may be able to proceed without developing an ED&C plan. [ED&C is automatically eliminated if "Notice" is selected on the Property Information Sheet].

8. A contingency cost is included in the reclamation cost estimation to cover unforeseen cost elements. Calculate the contingency cost as a percentage of the O&M cost as follows: up to and including $500,000, use 10%; over $500,000 to $5 million, use 8%; over $5 million to $50 million, use 6%; and greater than $50 million, use 4%. As with the ED&C cost, inclusion of a contingency cost may not be necessary for small operations, such as notice-level exploration.

9. Insurance premiums are calculated at 1.5% of the total labor costs. Enter the premium amount if liability insurance is not included in the itemized unit costs.

10. Federal construction contracts exceeding $100,000 require both a performance and a payment bond (Miller Act, 40 USC 270et seq.). Each bond premium is figured at 1.5% of the O&M cost. Enter the sum of both premium costs on this line.

11. For Federal construction contracts, use I0% of estimated O&M cost for the contractor's profit.

12. To estimate the contract administration cost, use 6 to I0% of the operational and maintenance (O&M) cost. Calculate the contract administration cost as a percentage of the O&M cost as follows: up to and including $1 million, use I0%; over $1 million to $25 million, use 8%; and greater than $25 million use 6%.

13. BLM's indirect cost rate is 21 % of BLM's contract administration costs.

ATTACHMENT J-1

RS MEANS BACKUP FOR THE RHOADS PROPERTY BORROW AREA COST ESTIMATE

MWH

By MPG Date 04 MAR 2014 Client Sheet 1 of 1
Chkd. By Description RHOADS PROPERTY RECLAMATION COST EST. Job No.
Design Task J2.1 GRADING/CONTOURING

OBJECTIVE: ESTIMATE COST TO RECONTOUR RESIDUAL SOIL (SUBSOIL) LEFT IN BOTTOM OF EXCAVATION.

ASSUMPTIONS: AREA OF DISTURBANCE = 74.2 ACRES (MAX)
CREW (B-11L) – 1 OPERATOR; 1 LABORER; 1 GRADER
CITY COST INDEX (SPOKANE) = 93.2 TOTAL FOR SITE WORK
UNIT COST FOR FINISH GRADING = 0.21/SQUARE YARD
[RS MEANS 31 22 16.10 3300]

CALCULATION: COST ADJUSTMENT = $\frac{CCI}{100} = \frac{93.2}{100} = 0.932$

UNIT COST = 0.932 * \$0.21/SY = \$0.196 SAY \$0.20/SY

EXTENDED COST = [74.2 ACRES] * (\$0.20/SY * $\frac{1\,SY}{9\,SF}$ * $\frac{43560\,SF}{ACRE}$)

= [74.2 ACRES] * \$967.99

= \$71,824.86 △

= \$54,811.12 (NON-BURDENED) △

REFERENCE: RS MEANS - 2014 HEAVY CONSTRUCTION COST DATA

4 squares per inch

DIVISION		WASHINGTON																	
		RICHLAND			SEATTLE			SPOKANE			TACOMA			VANCOUVER			WENATCHEE		
		993			980 - 981,987			990 - 992			983 - 984			986			988		
		MAT.	INST.	TOTAL	MAT.	INST.	TOTAL	MAT.	INST.	TOTAL	MAT.	INST.	TOTAL	MAT.	INST.	TOTAL	MAT.	INST.	TOTAL
015433	CONTRACTOR EQUIPMENT		90.4	90.4		102.0	102.0		90.4	90.4		102.1	102.1		97.1	97.1		102.1	102.1
0241, 31 - 34	SITE & INFRASTRUCTURE, DEMOLITION	99.6	90.8	93.4	94.5	108.6	104.4	98.7	90.8	93.2	92.4	110.4	105.0	102.3	98.1	99.3	101.4	109.2	106.9
0310	Concrete Forming & Accessories	114.9	78.4	83.4	106.9	100.3	101.2	119.8	78.0	83.7	105.5	99.8	100.6	106.2	92.1	94.0	107.2	77.5	81.6
0320	Concrete Reinforcing	101.4	87.6	94.5	112.2	100.3	106.3	102.1	87.6	94.9	109.0	100.2	104.6	109.9	100.0	104.9	109.8	89.3	99.6
0330	Cast-in-Place Concrete	97.2	85.5	92.4	103.6	105.6	104.5	101.0	85.3	94.5	102.6	105.4	103.8	114.6	99.5	108.3	104.8	77.4	93.4
03	CONCRETE	110.3	82.6	96.6	102.0	101.7	101.8	112.6	82.3	97.6	100.5	101.3	100.9	110.5	95.9	103.3	108.4	79.8	94.3
04	MASONRY	99.3	83.2	89.3	109.2	99.9	103.4	99.9	83.8	89.9	106.7	99.9	102.5	107.3	96.7	100.7	109.1	91.5	98.2
05	METALS	88.5	84.1	87.1	104.5	93.4	101.1	90.8	83.7	88.6	106.0	91.6	101.6	103.4	92.1	99.9	103.5	86.1	98.1
06	WOOD, PLASTICS & COMPOSITES	103.4	75.7	87.8	102.2	99.3	100.6	112.1	75.7	91.6	101.3	99.3	100.2	93.1	91.9	92.5	102.9	75.9	87.6
07	THERMAL & MOISTURE PROTECTION	144.1	79.7	117.9	97.6	100.9	99.0	140.6	79.1	115.6	100.2	98.7	99.6	100.6	92.5	97.3	100.8	82.2	93.3
08	OPENINGS	109.2	71.2	100.2	105.2	99.8	103.9	109.7	71.7	100.7	102.7	99.8	102.0	98.5	94.4	97.5	102.2	71.5	94.9
0920	Plaster & Gypsum Board	130.6	74.8	92.6	106.9	99.2	101.7	121.5	74.8	89.7	111.5	99.2	103.1	109.4	91.9	97.5	114.0	75.1	87.5
0950, 0980	Ceilings & Acoustic Treatment	104.8	74.8	84.8	101.8	99.2	100.1	99.8	74.8	83.2	103.5	99.2	100.6	98.4	91.9	94.1	95.3	75.1	81.8
0960	Flooring	98.7	81.6	93.5	110.9	101.0	108.0	98.2	86.9	94.8	111.4	93.4	106.0	118.1	104.0	113.9	114.1	63.8	99.1
0970, 0990	Wall Finishes & Painting/Coating	106.4	66.2	82.2	104.2	90.1	95.7	106.6	72.4	86.0	104.8	90.1	96.0	107.2	68.4	83.9	104.8	66.2	81.6
09	FINISHES	116.6	76.7	94.4	108.1	98.9	102.9	114.3	78.5	94.3	108.2	97.4	102.2	105.6	91.9	98.0	108.5	72.9	88.7
COVERS	DIVS. 10 - 14, 25, 28, 41, 43, 44, 46	100.0	87.2	97.4	100.0	100.1	100.0	100.0	87.1	97.4	100.0	100.1	100.0	100.0	62.0	92.4	100.0	78.5	95.7
21, 22, 23	FIRE SUPPRESSION, PLUMBING & HVAC	100.3	109.7	104.1	100.0	117.1	106.8	100.2	85.9	94.5	100.1	100.8	100.4	100.2	88.6	95.5	95.2	87.9	92.3
26, 27, 3370	ELECTRICAL, COMMUNICATIONS & UTIL.	92.1	94.4	93.3	102.4	107.0	104.8	90.5	79.1	84.5	102.8	99.7	101.2	107.5	101.0	104.1	103.7	98.5	101.0
MF2010	WEIGHTED AVERAGE	102.2	89.6	96.7	102.5	104.8	103.5	102.5	82.7	93.8	102.3	100.0	101.3	103.1	93.2	98.8	102.0	87.1	95.5

DIVISION		WASHINGTON			WEST VIRGINIA														
		YAKIMA			BECKLEY			BLUEFIELD			BUCKHANNON			CHARLESTON			CLARKSBURG		
		989			258 - 259			247 - 248			262			250 - 253			263 - 264		
		MAT.	INST.	TOTAL	MAT.	INST.	TOTAL	MAT.	INST.	TOTAL	MAT.	INST.	TOTAL	MAT.	INST.	TOTAL	MAT.	INST.	TOTAL
015433	CONTRACTOR EQUIPMENT		102.1	102.1		100.8	100.8		100.8	100.8		100.8	100.8		100.8	100.8		100.8	100.8
0241, 31 - 34	SITE & INFRASTRUCTURE, DEMOLITION	94.7	109.8	105.3	97.9	89.2	91.8	99.6	89.2	92.3	105.8	89.2	94.1	99.0	90.0	92.7	106.3	89.2	94.3
0310	Concrete Forming & Accessories	106.0	95.3	96.8	86.3	92.0	91.2	88.3	91.9	91.4	87.7	92.2	91.6	99.6	93.4	94.2	85.3	92.1	91.1
0320	Concrete Reinforcing	109.5	88.8	99.2	92.3	89.4	90.9	94.2	84.9	89.6	94.8	85.0	89.9	100.6	89.5	95.1	94.8	84.4	89.6
0330	Cast-in-Place Concrete	109.6	84.4	99.2	102.0	102.1	102.0	101.9	102.1	102.0	101.6	100.3	101.0	100.6	102.7	101.4	111.3	98.4	105.9
03	CONCRETE	105.1	90.0	97.7	96.5	95.5	96.0	96.9	94.7	95.8	99.7	94.2	97.0	98.1	96.4	97.2	103.7	93.4	98.6
04	MASONRY	100.4	81.6	88.8	90.8	93.4	92.4	87.5	93.4	91.1	97.4	92.3	94.2	89.2	95.3	93.0	100.7	92.3	95.5
05	METALS	104.2	85.7	98.5	101.2	98.2	100.3	100.2	96.5	99.1	100.4	97.3	99.4	99.8	98.9	99.5	100.4	96.9	99.3
06	WOOD, PLASTICS & COMPOSITES	101.7	99.3	100.4	85.1	92.8	89.4	88.6	92.8	91.0	87.9	92.8	90.6	101.1	92.8	96.4	84.4	92.8	89.1
07	THERMAL & MOISTURE PROTECTION	100.3	81.6	92.7	107.1	89.4	99.9	104.4	89.4	98.4	104.7	90.0	98.7	103.6	90.2	98.2	104.6	88.9	98.3
08	OPENINGS	102.2	81.0	97.2	96.1	85.0	93.5	97.9	83.9	94.6	97.9	83.9	94.6	98.1	85.0	95.0	97.9	85.1	94.9
0920	Plaster & Gypsum Board	111.1	99.2	103.0	93.3	92.4	92.7	99.3	92.4	94.6	99.7	92.4	94.7	97.5	92.4	94.0	97.5	92.4	94.0
0950, 0980	Ceilings & Acoustic Treatment	97.3	99.2	98.6	93.4	92.4	92.7	92.4	92.4	92.4	94.2	92.4	93.0	102.2	92.4	95.7	94.2	92.4	93.0
0960	Flooring	112.4	59.1	96.4	100.5	114.1	104.6	99.8	114.1	104.1	99.5	114.1	103.9	104.4	114.1	107.3	98.6	114.1	103.2
0970, 0990	Wall Finishes & Painting/Coating	104.8	72.4	85.3	107.1	93.5	98.9	106.3	93.5	98.6	106.3	93.8	98.8	106.6	93.5	98.7	106.3	93.8	98.8
09	FINISHES	107.2	86.5	95.7	97.8	96.9	97.3	97.5	96.9	97.2	98.4	96.7	97.4	102.4	97.4	99.6	97.7	96.7	97.1
COVERS	DIVS. 10 - 14, 25, 28, 41, 43, 44, 46	100.0	97.3	99.5	100.0	56.6	91.3	100.0	56.6	91.3	100.0	96.7	99.3	100.0	97.7	99.5	100.0	96.7	99.3
21, 22, 23	FIRE SUPPRESSION, PLUMBING & HVAC	100.1	109.1	103.7	95.5	91.5	93.9	95.4	91.5	93.8	95.4	92.3	94.2	100.1	92.9	97.2	95.4	92.2	94.1
26, 27, 3370	ELECTRICAL, COMMUNICATIONS & UTIL.	105.9	94.4	99.9	91.2	91.9	91.6	94.4	91.9	93.1	95.8	96.8	96.3	96.3	91.9	94.0	95.8	96.8	96.3
MF2010	WEIGHTED AVERAGE	102.5	94.4	99.0	96.9	92.0	94.8	97.1	91.7	94.7	98.2	93.6	96.2	99.0	94.1	96.9	98.8	93.5	96.5

DIVISION		WEST VIRGINIA																	
		GASSAWAY			HUNTINGTON			LEWISBURG			MARTINSBURG			MORGANTOWN			PARKERSBURG		
		266			255 - 257			249			254			265			261		
		MAT.	INST.	TOTAL	MAT.	INST.	TOTAL	MAT.	INST.	TOTAL	MAT.	INST.	TOTAL	MAT.	INST.	TOTAL	MAT.	INST.	TOTAL
015433	CONTRACTOR EQUIPMENT		100.8	100.8		100.8	100.8		100.8	100.8		100.8	100.8		100.8	100.8		100.8	100.8
0241, 31 - 34	SITE & INFRASTRUCTURE, DEMOLITION	103.2	89.2	93.3	102.4	90.4	94.0	115.3	89.2	97.0	101.4	89.7	93.2	100.6	89.8	93.0	108.8	89.9	95.5
0310	Concrete Forming & Accessories	87.2	92.2	91.5	98.2	96.0	96.3	85.6	91.8	91.0	86.3	82.4	83.0	85.6	91.8	91.0	89.8	90.0	90.0
0320	Concrete Reinforcing	94.8	85.0	89.9	93.7	90.6	92.2	94.8	84.9	89.9	92.3	83.0	87.6	94.8	84.3	89.6	94.2	84.8	89.5
0330	Cast-in-Place Concrete	106.3	101.0	104.1	111.1	103.5	108.0	101.9	102.1	102.0	106.8	96.0	102.3	101.5	100.1	101.0	103.8	97.1	101.0
03	CONCRETE	100.2	94.4	97.3	101.8	98.0	99.9	105.8	94.6	100.3	99.9	88.0	94.1	96.6	93.8	95.3	101.6	92.1	96.9
04	MASONRY	101.5	92.3	95.8	89.8	99.9	96.0	90.3	93.4	92.2	91.7	85.6	87.9	117.9	92.3	102.0	78.3	90.7	86.0
05	METALS	100.3	97.2	99.4	103.6	99.5	102.3	100.3	96.5	99.1	101.6	94.9	99.5	100.4	96.7	99.3	101.0	96.8	99.7
06	WOOD, PLASTICS & COMPOSITES	87.0	92.8	90.2	97.2	95.4	96.2	84.7	92.8	89.3	85.1	81.3	82.9	84.7	92.8	89.3	88.0	88.8	88.4
07	THERMAL & MOISTURE PROTECTION	104.4	90.0	98.6	107.3	91.4	100.8	105.2	89.4	98.8	107.4	78.2	95.5	104.5	88.9	98.2	104.4	89.6	98.4
08	OPENINGS	96.1	83.9	93.2	95.4	86.6	93.4	97.9	83.9	94.6	98.1	73.9	92.4	99.1	85.1	95.8	96.9	81.8	93.3
0920	Plaster & Gypsum Board	99.0	92.4	94.5	102.1	95.1	97.4	97.5	92.4	94.0	93.9	80.5	84.8	97.5	92.4	94.0	100.1	88.3	92.0
0950, 0980	Ceilings & Acoustic Treatment	94.2	92.4	93.0	96.1	95.1	95.4	94.2	92.4	93.0	96.1	80.5	85.7	94.2	92.4	93.0	94.2	88.3	90.3
0960	Flooring	99.3	114.1	103.8	107.9	120.3	111.6	98.7	114.1	103.3	100.5	114.1	104.6	98.7	114.1	103.3	102.4	114.1	105.9
0970, 0990	Wall Finishes & Painting/Coating	106.3	93.5	98.6	107.1	93.5	98.9	106.3	77.0	88.7	107.1	42.2	68.1	106.3	93.8	98.8	106.3	93.5	98.6
09	FINISHES	97.9	96.6	97.2	101.7	100.5	101.0	98.8	95.1	96.7	98.7	82.3	89.6	97.3	96.7	96.9	99.3	94.8	96.8
COVERS	DIVS. 10 - 14, 25, 28, 41, 43, 44, 46	100.0	96.7	99.3	100.0	98.6	99.7	100.0	56.6	91.3	100.0	95.4	99.1	100.0	65.4	93.1	100.0	97.1	99.4
21, 22, 23	FIRE SUPPRESSION, PLUMBING & HVAC	95.4	91.4	93.8	100.4	89.3	95.9	95.4	91.5	93.8	95.5	86.7	91.9	95.4	92.2	94.1	100.2	88.1	95.4
26, 27, 3370	ELECTRICAL, COMMUNICATIONS & UTIL.	95.8	91.9	93.8	94.9	96.1	95.5	91.8	91.9	91.8	96.9	82.8	89.6	96.0	96.8	96.4	96.0	92.8	94.3
MF2010	WEIGHTED AVERAGE	98.2	92.8	95.8	99.8	95.2	97.8	98.4	91.4	95.4	98.3	86.1	93.0	98.8	92.6	96.1	98.9	91.4	95.6

Crew No.	Bare Costs		Incl. Subs O&P		Cost Per Labor-Hour	
Crew B-11J	Hr.	Daily	Hr.	Daily	Bare Costs	Incl. O&P
Equipment Oper. (med.)	$48.90	$391.20	$74.15	$593.20	$42.77	$65.35
Laborer	36.65	293.20	56.55	452.40		
Loader, 30,000 Lbs.		707.00		777.70		
Ripper, Beam & 1 Shank		81.40		89.54	49.27	54.20
8 L.H., Daily Totals		$1472.80		$1912.84	$92.05	$119.55
Crew B-11K	Hr.	Daily	Hr.	Daily	Bare Costs	Incl. O&P
Equipment Oper. (med.)	$48.90	$391.20	$74.15	$593.20	$42.77	$65.35
Laborer	36.65	293.20	56.55	452.40		
Trencher, Chain Type, 8' D		3376.00		3713.60	211.00	232.10
8 L.H., Daily Totals		$4060.40		$4759.20	$253.78	$297.45
Crew B-11L	Hr.	Daily	Hr.	Daily	Bare Costs	Incl. O&P
Equipment Oper. (med.)	$48.90	$391.20	$74.15	$593.20	$42.77	$65.35
Laborer	36.65	293.20	56.55	452.40		
Grader, 30,000 Lbs.		707.00		777.70	44.19	48.61
16 L.H., Daily Totals		$1391.40		$1823.30	$86.96	$113.96
Crew B-11M	Hr.	Daily	Hr.	Daily	Bare Costs	Incl. O&P
Equipment Oper. (med.)	$48.90	$391.20	$74.15	$593.20	$42.77	$65.35
Laborer	36.65	293.20	56.55	452.40		
Backhoe Loader, 80 H.P.		397.60		437.36	24.85	27.34
16 L.H., Daily Totals		$1082.00		$1482.96	$67.63	$92.69
Crew B-11N	Hr.	Daily	Hr.	Daily	Bare Costs	Incl. O&P
Labor Foreman (outside)	$38.65	$309.20	$59.65	$477.20	$40.19	$61.31
Equipment Operators (med.)	48.90	782.40	74.15	1186.40		
Truck Drivers (heavy)	37.55	1802.40	57.30	2750.40		
F.E. Loader, W.M., 5.5 C.Y.		1049.00		1153.90		
Dozer, 410 H.P.		2409.00		2649.90		
Dump Trucks, Off Hwy., 50 Ton		10722.00		11794.20	196.94	216.64
96 L.H., Daily Totals		$17074.00		$20012.00	$237.14	$277.94
Crew B-11Q	Hr.	Daily	Hr.	Daily	Bare Costs	Incl. O&P
Equipment Operator (med.)	$48.90	$391.20	$74.15	$593.20	$44.82	$68.28
Laborer	36.65	146.60	56.55	226.20		
Dozer, 140 H.P.		883.80		972.18	73.65	81.02
12 L.H., Daily Totals		$1421.60		$1791.58	$118.47	$149.30
Crew B-11R	Hr.	Daily	Hr.	Daily	Bare Costs	Incl. O&P
Equipment Operator (med.)	$48.90	$391.20	$74.15	$593.20	$44.82	$68.28
Laborer	36.65	146.60	56.55	226.20		
Dozer, 200 H.P.		1325.00		1457.50	110.42	121.46
12 L.H., Daily Totals		$1862.80		$2276.90	$155.23	$189.74
Crew B-11S	Hr.	Daily	Hr.	Daily	Bare Costs	Incl. O&P
Equipment Operator (med.)	$48.90	$391.20	$74.15	$593.20	$44.82	$68.28
Laborer	36.65	146.60	56.55	226.20		
Dozer, 300 H.P.		1817.00		1998.70		
Ripper, Beam & 1 Shank		81.40		89.54	158.20	174.02
8 L.H., Daily Totals		$2436.20		$2907.64	$203.02	$242.30
Crew B-11T	Hr.	Daily	Hr.	Daily	Bare Costs	Incl. O&P
Equipment Operator (med.)	$48.90	$391.20	$74.15	$593.20	$44.82	$68.28
Laborer	36.65	146.60	56.55	226.20		
Dozer, 410 H.P.		2409.00		2649.90		
Ripper, Beam & 2 Shanks		91.60		100.76	208.38	229.22
8 L.H., Daily Totals		$3038.40		$3570.06	$253.20	$297.51

Crew No.	Bare Costs		Incl. Subs O&P		Cost Per Labor-Hour	
Crew B-11U	Hr.	Daily	Hr.	Daily	Bare Costs	Incl. O&P
1 Equipment Operator (med.)	$48.90	$391.20	$74.15	$593.20	$44.82	$68.28
.5 Laborer	36.65	146.60	56.55	226.20		
1 Dozer, 520 H.P.		3116.00		3427.60	259.67	285.63
12 L.H., Daily Totals		$3653.80		$4247.00	$304.48	$353.92
Crew B-11V	Hr.	Daily	Hr.	Daily	Bare Costs	Incl. O&P
3 Laborers	$36.65	$879.60	$56.55	$1357.20	$36.65	$56.55
1 Roller, 2-Drum, W.B., 7.5 H.P.		182.80		201.08	7.62	8.38
24 L.H., Daily Totals		$1062.40		$1558.28	$44.27	$64.93
Crew B-11W	Hr.	Daily	Hr.	Daily	Bare Costs	Incl. O&P
1 Equipment Operator (med.)	$48.90	$391.20	$74.15	$593.20	$38.42	$58.64
1 Common Laborer	36.65	293.20	56.55	452.40		
10 Truck Drivers (heavy)	37.55	3004.00	57.30	4584.00		
1 Dozer, 200 H.P.		1325.00		1457.50		
1 Vibratory Roller, Towed, 23 Ton		412.00		453.20		
10 Dump Trucks, 8 C.Y., 220 H.P.		4172.00		4589.20	61.55	67.71
96 L.H., Daily Totals		$9597.40		$12129.50	$99.97	$126.35
Crew B-11Y	Hr.	Daily	Hr.	Daily	Bare Costs	Incl. O&P
1 Labor Foreman (outside)	$38.65	$309.20	$59.65	$477.20	$40.96	$62.76
5 Common Laborers	36.65	1466.00	56.55	2262.00		
3 Equipment Operators (med.)	48.90	1173.60	74.15	1779.60		
1 Dozer, 80 H.P.		481.00		529.10		
2 Roller, 2-Drum, W.B., 7.5 H.P.		365.60		402.16		
4 Vibrating Plate, Gas, 21"		184.00		202.40	14.31	15.75
72 L.H., Daily Totals		$3979.40		$5652.46	$55.27	$78.51
Crew B-12A	Hr.	Daily	Hr.	Daily	Bare Costs	Incl. O&P
1 Equip. Oper. (crane)	$50.25	$402.00	$76.20	$609.60	$43.45	$66.38
1 Laborer	36.65	293.20	56.55	452.40		
1 Hyd. Excavator, 1 C.Y.		814.80		896.28	50.92	56.02
16 L.H., Daily Totals		$1510.00		$1958.28	$94.38	$122.39
Crew B-12B	Hr.	Daily	Hr.	Daily	Bare Costs	Incl. O&P
1 Equip. Oper. (crane)	$50.25	$402.00	$76.20	$609.60	$43.45	$66.38
1 Laborer	36.65	293.20	56.55	452.40		
1 Hyd. Excavator, 1.5 C.Y.		1031.00		1134.10	64.44	70.88
16 L.H., Daily Totals		$1726.20		$2196.10	$107.89	$137.26
Crew B-12C	Hr.	Daily	Hr.	Daily	Bare Costs	Incl. O&P
1 Equip. Oper. (crane)	$50.25	$402.00	$76.20	$609.60	$43.45	$66.38
1 Laborer	36.65	293.20	56.55	452.40		
1 Hyd. Excavator, 2 C.Y.		1175.00		1292.50	73.44	80.78
16 L.H., Daily Totals		$1870.20		$2354.50	$116.89	$147.16
Crew B-12D	Hr.	Daily	Hr.	Daily	Bare Costs	Incl. O&P
1 Equip. Oper. (crane)	$50.25	$402.00	$76.20	$609.60	$43.45	$66.38
1 Laborer	36.65	293.20	56.55	452.40		
1 Hyd. Excavator, 3.5 C.Y.		2442.00		2686.20	152.63	167.89
16 L.H., Daily Totals		$3137.20		$3748.20	$196.07	$234.26
Crew B-12E	Hr.	Daily	Hr.	Daily	Bare Costs	Incl. O&P
1 Equip. Oper. (crane)	$50.25	$402.00	$76.20	$609.60	$43.45	$66.38
1 Laborer	36.65	293.20	56.55	452.40		
1 Hyd. Excavator, .5 C.Y.		448.00		492.80	28.00	30.80
16 L.H., Daily Totals		$1143.20		$1554.80	$71.45	$97.17

31 22 Grading

31 22 16 – Fine Grading

31 22 16.10 Finish Grading		Crew	Daily Output	Labor-Hours	Unit	Material	2014 Bare Costs Labor	Equipment	Total	Total Incl O&P
3000	Hand grade select gravel, including compaction, 4" deep	B-18	555	.043	S.Y.		1.61	.08	1.69	2.58
3100	6" deep		400	.060			2.24	.12	2.36	3.58
3120	8" deep		300	.080			2.99	.15	3.14	4.78
3300	Finishing grading slopes, gentle	B-11L	8900	.002			.08	.08	.16	.21
3310	Steep slopes		7100	.002			.10	.10	.20	.26
3312	Steep slopes, large quantities		64	.250	M.S.F.		10.70	11.05	21.75	28.50
3500	Finish grading lagoon bottoms		4	4			171	177	348	455
3600	Fine grade, top of lagoon banks for compaction		30	.533			23	23.50	46.50	61

31 23 Excavation and Fill

31 23 16 – Excavation

31 23 16.13 Excavating, Trench

0010	**EXCAVATING, TRENCH**									
0011	Or continuous footing									
0020	Common earth with no sheeting or dewatering included									
0050	1' to 4' deep, 3/8 C.Y. excavator	B-11C	150	.107	B.C.Y.		4.56	2.44	7	9.65
0060	1/2 C.Y. excavator	B-11M	200	.080			3.42	1.99	5.41	7.45
0062	3/4 C.Y. excavator	B-12F	270	.059			2.57	2.45	5.02	6.65
0090	4' to 6' deep, 1/2 C.Y. excavator	B-11M	200	.080			3.42	1.99	5.41	7.45
0100	5/8 C.Y. excavator	B-12Q	250	.064			2.78	2.38	5.16	6.85
0110	3/4 C.Y. excavator	B-12F	300	.053			2.32	2.21	4.53	5.95
0120	1 C.Y. hydraulic excavator	B-12A	400	.040			1.74	2.04	3.78	4.90
0130	1-1/2 C.Y. excavator	B-12B	540	.030			1.29	1.91	3.20	4.07
0300	1/2 C.Y. excavator, truck mounted	B-12J	200	.080			3.48	4.41	7.89	10.15
0500	6' to 10' deep, 3/4 C.Y. excavator	B-12F	225	.071			3.09	2.94	6.03	7.95
0510	1 C.Y. excavator	B-12A	400	.040			1.74	2.04	3.78	4.90
0600	1 C.Y. excavator, truck mounted	B-12K	400	.040			1.74	2.51	4.25	5.40
0610	1-1/2 C.Y. excavator	B-12B	600	.027			1.16	1.72	2.88	3.66
0620	2-1/2 C.Y. excavator	B-12S	1000	.016			.70	1.64	2.34	2.86
0900	10' to 14' deep, 3/4 C.Y. excavator	B-12F	200	.080			3.48	3.31	6.79	8.95
0910	1 C.Y. excavator	B-12A	360	.044			1.93	2.26	4.19	5.45
1000	1-1/2 C.Y. excavator	B-12B	540	.030			1.29	1.91	3.20	4.07
1020	2-1/2 C.Y. excavator	B-12S	900	.018			.77	1.82	2.59	3.18
1030	3 C.Y. excavator	B-12D	1400	.011			.50	1.74	2.24	2.68
1040	3-1/2 C.Y. excavator	"	1800	.009			.39	1.36	1.75	2.08
1300	14' to 20' deep, 1 C.Y. excavator	B-12A	320	.050			2.17	2.55	4.72	6.10
1310	1-1/2 C.Y. excavator	B-12B	480	.033			1.45	2.15	3.60	4.57
1320	2-1/2 C.Y. excavator	B-12S	765	.021			.91	2.14	3.05	3.74
1330	3 C.Y. excavator	B-12D	1000	.016			.70	2.44	3.14	3.75
1335	3-1/2 C.Y. excavator	"	1150	.014			.60	2.12	2.72	3.26
1340	20' to 24' deep, 1 C.Y. excavator	B-12A	288	.056			2.41	2.83	5.24	6.80
1342	1-1/2 C.Y. excavator	B-12B	432	.037			1.61	2.39	4	5.10
1344	2-1/2 C.Y. excavator	B-12S	685	.023			1.02	2.39	3.41	4.18
1346	3 C.Y. excavator	B-12D	900	.018			.77	2.71	3.48	4.17
1348	3-1/2 C.Y. excavator	"	1050	.015			.66	2.33	2.99	3.57
1352	4' to 6' deep, 1/2 C.Y. excavator w/trench box	B-13H	188	.085			3.70	5.15	8.85	11.30
1354	5/8 C.Y. excavator	"	235	.068			2.96	4.11	7.07	9.05
1356	3/4 C.Y. excavator	B-13G	282	.057			2.47	2.65	5.12	6.70
1358	1 C.Y. excavator	B-13D	376	.043			1.85	2.39	4.24	5.45
1360	1-1/2 C.Y. excavator	B-13E	508	.032			1.37	2.20	3.57	4.50
1362	6' to 10' deep, 3/4 C.Y. excavator w/trench box	B-13G	212	.075			3.28	3.52	6.80	8.85

MWH

By MPG Date 04 MAR 2014 Client Sheet of
Chkd. By Description RHOADS PROPERTY RECLAMATION COST EST Job No.
Design Task J2.2 RIPPING OF WEATHERED BEDROCK SUBBASE

OBJECTIVE: ESTIMATE COST TO RIP SUBSOIL AND EXTREMELY WEATHERED BEDROCK LEFT IN PLACE IN THE CONTOURED EXCAVATION BOTTOM.

ASSUMPTIONS: AREA OF DISTURBANCE = 74.2 ACRES (MAX)
CREW (B-11S) – 1 OPERATOR; 1 LABORER; 1 DOZER w/RIPPER (300hp)
CITY COST INDEX (SPOKANE) = 93.2 TOTAL FOR SITE WORK
UNIT COST FOR RIPPING SOFT SHALE = \$1.94/CY
[RS MEANS 31 23 16.32 2200]

CALCULATIONS: COST ADJUSTMENT = $\frac{CCI}{100} = \frac{93.2}{100} = 0.932$

UNIT COST = 0.932 * \$1.94/CY = \$1.81/CY

EXTENDED COST (FOR 0.5 FT OF PENETRATION)

$= \$1.81/CY * 0.5\,FT * \frac{43\,560\,SF}{ACRE} * \frac{1\,CY}{27\,FT^3}$

= \$1460.07/ACRE

= 74.2 * \$1460.07 = \$108,337.19 △

= \$90,771.57 (NON BURDENED) △

REFERENCE: RS MEANS – 2014 HEAVY CONSTRUCTION COST DATA

4 squares per inch

Crew No.	Bare Costs		Incl. Subs O&P		Cost Per Labor-Hour	
Crew B-11J	Hr.	Daily	Hr.	Daily	Bare Costs	Incl. O&P
Equipment Oper. (med.)	$48.90	$391.20	$74.15	$593.20	$42.77	$65.35
Laborer	36.65	293.20	56.55	452.40		
Loader, 30,000 Lbs.		707.00		777.70		
Ripper, Beam & 1 Shank		81.40		89.54	49.27	54.20
24 L.H., Daily Totals		$1472.80		$1912.84	$92.05	$119.55
Crew B-11K	Hr.	Daily	Hr.	Daily	Bare Costs	Incl. O&P
Equipment Oper. (med.)	$48.90	$391.20	$74.15	$593.20	$42.77	$65.35
Laborer	36.65	293.20	56.55	452.40		
Trencher, Chain Type, 8' D		3376.00		3713.60	211.00	232.10
24 L.H., Daily Totals		$4060.40		$4759.20	$253.78	$297.45
Crew B-11L	Hr.	Daily	Hr.	Daily	Bare Costs	Incl. O&P
Equipment Oper. (med.)	$48.90	$391.20	$74.15	$593.20	$42.77	$65.35
Laborer	36.65	293.20	56.55	452.40		
Loader, 30,000 Lbs.		707.00		777.70	44.19	48.61
32 L.H., Daily Totals		$1391.40		$1823.30	$86.96	$113.96
Crew B-11M	Hr.	Daily	Hr.	Daily	Bare Costs	Incl. O&P
Equipment Oper. (med.)	$48.90	$391.20	$74.15	$593.20	$42.77	$65.35
Laborer	36.65	293.20	56.55	452.40		
Backhoe Loader, 80 H.P.		397.60		437.36	24.85	27.34
16 L.H., Daily Totals		$1082.00		$1482.96	$67.63	$92.69
Crew B-11N	Hr.	Daily	Hr.	Daily	Bare Costs	Incl. O&P
Labor Foreman (outside)	$38.65	$309.20	$59.65	$477.20	$40.19	$61.31
Equipment Operators (med.)	48.90	782.40	74.15	1186.40		
Truck Drivers (heavy)	37.55	1802.40	57.30	2750.40		
F.E. Loader, W.M., 5.5 C.Y.		1049.00		1153.90		
Dozer, 410 H.P.		2409.00		2649.90		
Dump Trucks, Off Hwy., 50 Ton		10722.00		11794.20	196.94	216.64
176 L.H., Daily Totals		$17074.00		$20012.00	$237.14	$277.94
Crew B-11Q	Hr.	Daily	Hr.	Daily	Bare Costs	Incl. O&P
Equipment Operator (med.)	$48.90	$391.20	$74.15	$593.20	$44.82	$68.28
Laborer	36.65	146.60	56.55	226.20		
Dozer, 140 H.P.		883.80		972.18	73.65	81.02
12 L.H., Daily Totals		$1421.60		$1791.58	$118.47	$149.30
Crew B-11R	Hr.	Daily	Hr.	Daily	Bare Costs	Incl. O&P
Equipment Operator (med.)	$48.90	$391.20	$74.15	$593.20	$44.82	$68.28
Laborer	36.65	146.60	56.55	226.20		
Dozer, 200 H.P.		1325.00		1457.50	110.42	121.46
12 L.H., Daily Totals		$1862.80		$2276.90	$155.23	$189.74
Crew B-11S	Hr.	Daily	Hr.	Daily	Bare Costs	Incl. O&P
Equipment Operator (med.)	$48.90	$391.20	$74.15	$593.20	$44.82	$68.28
Laborer	36.65	146.60	56.55	226.20		
Dozer, 300 H.P.		1817.00		1998.70		
Ripper, Beam & 1 Shank		81.40		89.54	158.20	174.02
16 L.H., Daily Totals		$2436.20		$2907.64	$203.02	$242.30
Crew B-11T	Hr.	Daily	Hr.	Daily	Bare Costs	Incl. O&P
Equipment Operator (med.)	$48.90	$391.20	$74.15	$593.20	$44.82	$68.28
Laborer	36.65	146.60	56.55	226.20		
Dozer, 410 H.P.		2409.00		2649.90		
Ripper, Beam & 2 Shanks		91.60		100.76	208.38	229.22
16 L.H., Daily Totals		$3038.40		$3570.06	$253.20	$297.51

Crew No.	Bare Costs		Incl. Subs O&P		Cost Per Labor-Hour	
Crew B-11U	Hr.	Daily	Hr.	Daily	Bare Costs	Incl. O&P
1 Equipment Operator (med.)	$48.90	$391.20	$74.15	$593.20	$44.82	$68.28
.5 Laborer	36.65	146.60	56.55	226.20		
1 Dozer, 520 H.P.		3116.00		3427.60	259.67	285.63
12 L.H., Daily Totals		$3653.80		$4247.00	$304.48	$353.92
Crew B-11V	Hr.	Daily	Hr.	Daily	Bare Costs	Incl. O&P
3 Laborers	$36.65	$879.60	$56.55	$1357.20	$36.65	$56.55
1 Roller, 2-Drum, W.B., 7.5 H.P.		182.80		201.08	7.62	8.38
24 L.H., Daily Totals		$1062.40		$1558.28	$44.27	$64.93
Crew B-11W	Hr.	Daily	Hr.	Daily	Bare Costs	Incl. O&P
1 Equipment Operator (med.)	$48.90	$391.20	$74.15	$593.20	$38.42	$58.64
1 Common Laborer	36.65	293.20	56.55	452.40		
10 Truck Drivers (heavy)	37.55	3004.00	57.30	4584.00		
1 Dozer, 200 H.P.		1325.00		1457.50		
1 Vibratory Roller, Towed, 23 Ton		412.00		453.20		
10 Dump Trucks, 8 C.Y., 220 H.P.		4172.00		4589.20	61.55	67.71
96 L.H., Daily Totals		$9597.40		$12129.50	$99.97	$126.35
Crew B-11Y	Hr.	Daily	Hr.	Daily	Bare Costs	Incl. O&P
1 Labor Foreman (outside)	$38.65	$309.20	$59.65	$477.20	$40.96	$62.76
5 Common Laborers	36.65	1466.00	56.55	2262.00		
3 Equipment Operators (med.)	48.90	1173.60	74.15	1779.60		
1 Dozer, 80 H.P.		481.00		529.10		
2 Roller, 2-Drum, W.B., 7.5 H.P.		365.60		402.16		
4 Vibrating Plate, Gas, 21"		184.00		202.40	14.31	15.75
72 L.H., Daily Totals		$3979.40		$5652.46	$55.27	$78.51
Crew B-12A	Hr.	Daily	Hr.	Daily	Bare Costs	Incl. O&P
1 Equip. Oper. (crane)	$50.25	$402.00	$76.20	$609.60	$43.45	$66.38
1 Laborer	36.65	293.20	56.55	452.40		
1 Hyd. Excavator, 1 C.Y.		814.80		896.28	50.92	56.02
16 L.H., Daily Totals		$1510.00		$1958.28	$94.38	$122.39
Crew B-12B	Hr.	Daily	Hr.	Daily	Bare Costs	Incl. O&P
1 Equip. Oper. (crane)	$50.25	$402.00	$76.20	$609.60	$43.45	$66.38
1 Laborer	36.65	293.20	56.55	452.40		
1 Hyd. Excavator, 1.5 C.Y.		1031.00		1134.10	64.44	70.88
16 L.H., Daily Totals		$1726.20		$2196.10	$107.89	$137.26
Crew B-12C	Hr.	Daily	Hr.	Daily	Bare Costs	Incl. O&P
1 Equip. Oper. (crane)	$50.25	$402.00	$76.20	$609.60	$43.45	$66.38
1 Laborer	36.65	293.20	56.55	452.40		
1 Hyd. Excavator, 2 C.Y.		1175.00		1292.50	73.44	80.78
16 L.H., Daily Totals		$1870.20		$2354.50	$116.89	$147.16
Crew B-12D	Hr.	Daily	Hr.	Daily	Bare Costs	Incl. O&P
1 Equip. Oper. (crane)	$50.25	$402.00	$76.20	$609.60	$43.45	$66.38
1 Laborer	36.65	293.20	56.55	452.40		
1 Hyd. Excavator, 3.5 C.Y.		2442.00		2686.20	152.63	167.89
16 L.H., Daily Totals		$3137.20		$3748.20	$196.07	$234.26
Crew B-12E	Hr.	Daily	Hr.	Daily	Bare Costs	Incl. O&P
1 Equip. Oper. (crane)	$50.25	$402.00	$76.20	$609.60	$43.45	$66.38
1 Laborer	36.65	293.20	56.55	452.40		
1 Hyd. Excavator, .5 C.Y.		448.00		492.80	28.00	30.80
16 L.H., Daily Totals		$1143.20		$1554.80	$71.45	$97.17

31 23 16 – Excavation

	31 23 16.30 Drilling and Blasting Rock	Crew	Daily Output	Labor-Hours	Unit	Material	2014 Bare Costs Labor	Equipment	Total	Total Incl O&P
2900	Boulders, drilled, blasted	B-47	100	.240	B.C.Y.	3.15	9.80	16.20	29.15	36.50
3100	Jackhammer operators with foreman compressor, air tools	B-9	1	40	Day		1,475	234	1,709	2,525
3300	Track drill, compressor, operator and foreman	B-47	1	24	"		980	1,625	2,605	3,275
3500	Blasting caps				Ea.	6.25			6.25	6.85
3700	Explosives					.46			.46	.51
3900	Blasting mats, rent, for first day					144			144	158
4000	Per added day					48			48	53
4200	Preblast survey for 6 room house, individual lot, minimum	A-6	2.40	6.667			305	29.50	334.50	505
4300	Maximum	"	1.35	11.852			540	53	593	890
4500	City block within zone of influence, minimum	A-8	25200	.001	S.F.		.06		.06	.10
4600	Maximum	"	15100	.002	"		.10		.10	.17
5000	Excavate and load boulders, less than 0.5 C.Y.	B-10T	80	.150	B.C.Y.		6.70	6.55	13.25	17.45
5020	0.5 C.Y. to 1 C.Y.	B-10U	100	.120			5.40	10.50	15.90	19.75
5200	Excavate and load blasted rock, 3 C.Y. power shovel	B-12T	1530	.010			.45	1.04	1.49	1.84
5400	Haul boulders, 25 Ton off-highway dump, 1 mile round trip	B-34E	330	.024			.91	3.98	4.89	5.75
5420	2 mile round trip		275	.029			1.09	4.78	5.87	6.90
5440	3 mile round trip		225	.036			1.34	5.85	7.19	8.50
5460	4 mile round trip		200	.040			1.50	6.55	8.05	9.55
5600	Bury boulders on site, less than 0.5 C.Y., 300 H.P. dozer									
5620	150' haul	B-10M	310	.039	B.C.Y.		1.74	5.85	7.59	9.10
5640	300' haul		210	.057			2.56	8.65	11.21	13.40
5800	0.5 to 1 C.Y., 300 H.P. dozer, 150' haul		300	.040			1.79	6.05	7.84	9.40
5820	300' haul		200	.060			2.69	9.10	11.79	14.10

31 23 16.32 Ripping

0010	**RIPPING**									
0020	Ripping, trap rock, soft, 300 HP dozer, ideal conditions	B-11S	700	.017	B.C.Y.		.77	2.71	3.48	4.15
1500	Adverse conditions		660	.018			.81	2.88	3.69	4.40
1600	Medium hard, 300 HP dozer, ideal conditons		600	.020			.90	3.16	4.06	4.85
1700	Adverse conditions		540	.022			1	3.52	4.52	5.40
2000	Very hard, 410 HP dozer, ideal conditions	B-11T	350	.034			1.54	7.15	8.69	10.20
2100	Adverse conditions	"	310	.039			1.74	8.05	9.79	11.50
2200	Shale, soft, 300 HP dozer, ideal conditons	B-11S	1500	.008			.36	1.27	1.63	1.94
2300	Adverse conditions	"	1350	.009			.40	1.41	1.81	2.16
2310	Grader rear ripper, 180 H.P. ideal conditions	B-11J	740	.022			.92	1.07	1.99	2.58
2320	Adverse conditions	"	630	.025			1.09	1.25	2.34	3.04
2400	Medium hard, 300 HP dozer, ideal conditons	B-11S	1200	.010			.45	1.58	2.03	2.42
2500	Adverse conditions	"	1080	.011			.50	1.76	2.26	2.69
2510	Grader rear ripper, 180 H.P. ideal conditions	B-11J	625	.026			1.10	1.26	2.36	3.06
2520	Adverse conditions	"	530	.030			1.29	1.49	2.78	3.61
2600	Very hard, 410 HP dozer, ideal conditons	B-11T	800	.015			.67	3.13	3.80	4.46
2700	Adverse conditions	"	720	.017			.75	3.47	4.22	4.96
2800	Till, boulder clay/hardpan, soft, 300 H.P. dozer, ideal conditions	B-11S	7000	.002			.08	.27	.35	.42
2810	Adverse conditions	"	6300	.002			.09	.30	.39	.46
2815	Grader rear ripper, 180 H.P. ideal conditions	B-11J	1500	.011			.46	.53	.99	1.28
2816	Adverse conditions	"	1275	.013			.54	.62	1.16	1.50
2820	Medium hard, 300 H.P. dozer, ideal conditions	B-11S	6000	.002			.09	.32	.41	.49
2830	Adverse conditions	"	5400	.002			.10	.35	.45	.54
2835	Grader rear ripper, 180 H.P. ideal conditions	B-11J	740	.022			.92	1.07	1.99	2.58
2836	Adverse conditions	"	630	.025			1.09	1.25	2.34	3.04
2840	Very hard, 410 H.P. dozer, ideal conditions	B-11T	5000	.002			.11	.50	.61	.71
2850	Adverse conditions	"	4500	.003			.12	.56	.68	.79
3000	Dozing ripped material, 200 HP, 100' haul	B-10B	700	.017			.77	1.89	2.66	3.25

MWH.

By MPG Date 04 MAR 2014 Client Sheet 1 of 1
Chkd. By Description RHOADS PROPERTY RECLAMATION COST EST Job No.
Design Task J2.3a - DIRECT PUSH FROM TOPSOIL STOCKPILES

OBJECTIVE: ESTIMATE COST TO PLACE TOPSOIL FROM STOCKPILES ADJACENT TO EXCAVATION AREA.

ASSUMPTIONS: 75% OF DISTURBED AREA TO BE RECLAIMED BY THIS METHOD TO A DEPTH OF 1 FT
CREW (B-10M) - 1 OPERATOR, 1 LABORER, 1 DOZER (300 hp)
CITY COST INDEX (SPOKANE) = 93.2
UNIT COST = \$1.31/CY
[RS MEANS 31 23 23.14 5210]

CALCULATIONS: COST ADJUSTMENT = $\frac{93.2}{100}$ = 0.932

UNIT COST = 0.932 * \$1.31 = \$1.22/CY

AREA = (0.75) * [74.2 ACRES * 1 FT * $\frac{43560 \text{ SF}}{\text{ACRE}}$ * $\frac{1 \text{ CY}}{27 \text{ FT}^3}$

= 89,781.99 CY

EXTENDED COST = \$1.22/CY * 89,782 CY

= \$109,534.04

= \$91,526.44 (NON-BURDENED)

REFERENCE: RS MEANS - 2014 HEAVY CONSTRUCTION COST DATA

4 squares per inch

Crew No.	Bare Costs		Incl. Subs O&P		Cost Per Labor-Hour	
Crew B-10J	Hr.	Daily	Hr.	Daily	Bare Costs	Incl. O&P
1 Equip. Oper. (medium)	$48.90	$391.20	$74.15	$593.20	$44.82	$68.28
.5 Laborer	36.65	146.60	56.55	226.20		
1 Centrifugal Water Pump, 3"		78.80		86.68		
1 -20' Suction Hose, 3"		2.85		3.13		
2 -50' Discharge Hoses, 3"		3.00		3.30	7.05	7.76
12 L.H., Daily Totals		$622.45		$912.51	$51.87	$76.04
Crew B-10K	Hr.	Daily	Hr.	Daily	Bare Costs	Incl. O&P
1 Equip. Oper. (medium)	$48.90	$391.20	$74.15	$593.20	$44.82	$68.28
.5 Laborer	36.65	146.60	56.55	226.20		
1 Centr. Water Pump, 6"		340.80		374.88		
1 -20' Suction Hose, 6"		11.50		12.65		
2 -50' Discharge Hoses, 6"		12.20		13.42	30.38	33.41
12 L.H., Daily Totals		$902.30		$1220.35	$75.19	$101.70
Crew B-10L	Hr.	Daily	Hr.	Daily	Bare Costs	Incl. O&P
1 Equip. Oper. (medium)	$48.90	$391.20	$74.15	$593.20	$44.82	$68.28
.5 Laborer	36.65	146.60	56.55	226.20		
1 Dozer, 80 H.P.		481.00		529.10	40.08	44.09
12 L.H., Daily Totals		$1018.80		$1348.50	$84.90	$112.38
Crew B-10M	Hr.	Daily	Hr.	Daily	Bare Costs	Incl. O&P
1 Equip. Oper. (medium)	$48.90	$391.20	$74.15	$593.20	$44.82	$68.28
.5 Laborer	36.65	146.60	56.55	226.20		
1 Dozer, 300 H.P.		1817.00		1998.70	151.42	166.56
12 L.H., Daily Totals		$2354.80		$2818.10	$196.23	$234.84
Crew B-10N	Hr.	Daily	Hr.	Daily	Bare Costs	Incl. O&P
1 Equip. Oper. (medium)	$48.90	$391.20	$74.15	$593.20	$44.82	$68.28
.5 Laborer	36.65	146.60	56.55	226.20		
1 F.E. Loader, T.M., 1.5 C.Y		522.80		575.08	43.57	47.92
12 L.H., Daily Totals		$1060.60		$1394.48	$88.38	$116.21
Crew B-10O	Hr.	Daily	Hr.	Daily	Bare Costs	Incl. O&P
1 Equip. Oper. (medium)	$48.90	$391.20	$74.15	$593.20	$44.82	$68.28
.5 Laborer	36.65	146.60	56.55	226.20		
1 F.E. Loader, T.M., 2.25 C.Y.		959.80		1055.78	79.98	87.98
12 L.H., Daily Totals		$1497.60		$1875.18	$124.80	$156.26
Crew B-10P	Hr.	Daily	Hr.	Daily	Bare Costs	Incl. O&P
1 Equip. Oper. (medium)	$48.90	$391.20	$74.15	$593.20	$44.82	$68.28
.5 Laborer	36.65	146.60	56.55	226.20		
1 Crawler Loader, 3 C.Y.		1191.00		1310.10	99.25	109.18
12 L.H., Daily Totals		$1728.80		$2129.50	$144.07	$177.46
Crew B-10Q	Hr.	Daily	Hr.	Daily	Bare Costs	Incl. O&P
1 Equip. Oper. (medium)	$48.90	$391.20	$74.15	$593.20	$44.82	$68.28
.5 Laborer	36.65	146.60	56.55	226.20		
1 Crawler Loader, 4 C.Y.		1532.00		1685.20	127.67	140.43
12 L.H., Daily Totals		$2069.80		$2504.60	$172.48	$208.72
Crew B-10R	Hr.	Daily	Hr.	Daily	Bare Costs	Incl. O&P
1 Equip. Oper. (medium)	$48.90	$391.20	$74.15	$593.20	$44.82	$68.28
.5 Laborer	36.65	146.60	56.55	226.20		
1 F.E. Loader, W.M., 1 C.Y.		295.20		324.72	24.60	27.06
12 L.H., Daily Totals		$833.00		$1144.12	$69.42	$95.34

Crew No.	Bare Costs		Incl. Subs O&P		Cost Per Labor-Hour	
Crew B-10S	Hr.	Daily	Hr.	Daily	Bare Costs	Incl. O&P
1 Equip. Oper. (medium)	$48.90	$391.20	$74.15	$593.20	$44.82	$68.28
.5 Laborer	36.65	146.60	56.55	226.20		
1 F.E. Loader, W.M., 1.5 C.Y.		373.40		410.74	31.12	34.23
12 L.H., Daily Totals		$911.20		$1230.14	$75.93	$102.51
Crew B-10T	Hr.	Daily	Hr.	Daily	Bare Costs	Incl. O&P
1 Equip. Oper. (medium)	$48.90	$391.20	$74.15	$593.20	$44.82	$68.28
.5 Laborer	36.65	146.60	56.55	226.20		
1 F.E. Loader, W.M.,2.5 C.Y.		522.80		575.08	43.57	47.92
12 L.H., Daily Totals		$1060.60		$1394.48	$88.38	$116.21
Crew B-10U	Hr.	Daily	Hr.	Daily	Bare Costs	Incl. O&P
1 Equip. Oper. (medium)	$48.90	$391.20	$74.15	$593.20	$44.82	$68.28
.5 Laborer	36.65	146.60	56.55	226.20		
1 F.E. Loader, W.M., 5.5 C.Y.		1049.00		1153.90	87.42	96.16
12 L.H., Daily Totals		$1586.80		$1973.30	$132.23	$164.44
Crew B-10V	Hr.	Daily	Hr.	Daily	Bare Costs	Incl. O&P
1 Equip. Oper. (medium)	$48.90	$391.20	$74.15	$593.20	$44.82	$68.28
.5 Laborer	36.65	146.60	56.55	226.20		
1 Dozer, 700 H.P.		4485.00		4933.50	373.75	411.13
12 L.H., Daily Totals		$5022.80		$5752.90	$418.57	$479.41
Crew B-10W	Hr.	Daily	Hr.	Daily	Bare Costs	Incl. O&P
1 Equip. Oper. (medium)	$48.90	$391.20	$74.15	$593.20	$44.82	$68.28
.5 Laborer	36.65	146.60	56.55	226.20		
1 Dozer, 105 H.P.		591.80		650.98	49.32	54.25
12 L.H., Daily Totals		$1129.60		$1470.38	$94.13	$122.53
Crew B-10X	Hr.	Daily	Hr.	Daily	Bare Costs	Incl. O&P
1 Equip. Oper. (medium)	$48.90	$391.20	$74.15	$593.20	$44.82	$68.28
.5 Laborer	36.65	146.60	56.55	226.20		
1 Dozer, 410 H.P.		2409.00		2649.90	200.75	220.82
12 L.H., Daily Totals		$2946.80		$3469.30	$245.57	$289.11
Crew B-10Y	Hr.	Daily	Hr.	Daily	Bare Costs	Incl. O&P
1 Equip. Oper. (medium)	$48.90	$391.20	$74.15	$593.20	$44.82	$68.28
.5 Laborer	36.65	146.60	56.55	226.20		
1 Vibr. Roller, Towed, 12 Ton		559.20		615.12	46.60	51.26
12 L.H., Daily Totals		$1097.00		$1434.52	$91.42	$119.54
Crew B-11A	Hr.	Daily	Hr.	Daily	Bare Costs	Incl. O&P
1 Equipment Oper. (med.)	$48.90	$391.20	$74.15	$593.20	$42.77	$65.35
1 Laborer	36.65	293.20	56.55	452.40		
1 Dozer, 200 H.P.		1325.00		1457.50	82.81	91.09
16 L.H., Daily Totals		$2009.40		$2503.10	$125.59	$156.44
Crew B-11B	Hr.	Daily	Hr.	Daily	Bare Costs	Incl. O&P
1 Equipment Oper. (light)	$47.05	$376.40	$71.35	$570.80	$41.85	$63.95
1 Laborer	36.65	293.20	56.55	452.40		
1 Air Powered Tamper		26.20		28.82		
1 Air Compressor, 365 cfm		264.80		291.28		
2 -50' Air Hoses, 1.5"		11.60		12.76	18.91	20.80
16 L.H., Daily Totals		$972.20		$1356.06	$60.76	$84.75
Crew B-11C	Hr.	Daily	Hr.	Daily	Bare Costs	Incl. O&P
1 Equipment Oper. (med.)	$48.90	$391.20	$74.15	$593.20	$42.77	$65.35
1 Laborer	36.65	293.20	56.55	452.40		
1 Backhoe Loader, 48 H.P.		365.20		401.72	22.82	25.11
16 L.H., Daily Totals		$1049.60		$1447.32	$65.60	$90.46

31 23 23.14 Backfill, Structural		Crew	Daily Output	Labor-Hours	Unit	Material	2014 Bare Costs Labor	Equipment	Total	Total Incl O&P
3300	300' haul, sand & gravel	B-10W	465	.026	L.C.Y.		1.16	1.27	2.43	3.1[illegible]
3310	Sandy clay & loam		455	.026			1.18	1.30	2.48	3.23
3320	Common earth		415	.029			1.30	1.43	2.73	3.54
3340	Clay		370	.032			1.45	1.60	3.05	3.97
4000	200 H.P., 50' haul, sand & gravel	B-10B	2500	.005			.22	.53	.75	9[illegible]
4010	Sandy clay & loam		2435	.005			.22	.54	.76	9[illegible]
4020	Common earth		2200	.005			.24	.60	.84	1.03
4040	Clay		1950	.006			.28	.68	.96	1.17
4200	150' haul, sand & gravel		1225	.010			.44	1.08	1.52	1.86
4210	Sandy clay & loam		1200	.010			.45	1.10	1.55	1.89
4220	Common earth		1100	.011			.49	1.20	1.69	2.07
4240	Clay		975	.012			.55	1.36	1.91	2.34
4400	300' haul, sand & gravel		805	.015			.67	1.65	2.32	2.83
4410	Sandy clay & loam		790	.015			.68	1.68	2.36	2.89
4420	Common earth		735	.016			.73	1.80	2.53	3.10
4440	Clay		660	.018			.81	2.01	2.82	3.45
5000	300 H.P., 50' haul, sand & gravel	B-10M	3170	.004			.17	.57	.74	.89
5010	Sandy clay & loam		3110	.004			.17	.58	.75	.90
5020	Common earth		2900	.004			.19	.63	.82	.97
5040	Clay		2700	.004			.20	.67	.87	1.04
5200	150' haul, sand & gravel		2200	.005			.24	.83	1.07	1.28
5210	Sandy clay & loam		2150	.006			.25	.84	1.09	1.31
5220	Common earth		1950	.006			.28	.93	1.21	1.44
5240	Clay		1700	.007			.32	1.07	1.39	1.66
5400	300' haul, sand & gravel		1500	.008			.36	1.21	1.57	1.88
5410	Sandy clay & loam		1470	.008			.37	1.24	1.61	1.92
5420	Common earth		1350	.009			.40	1.35	1.75	2.09
5440	Clay		1225	.010			.44	1.48	1.92	2.30
6000	For compaction, see Section 31 23 23.23									
6010	For trench backfill, see Section 31 23 16.13 and 31 23 16.14									

31 23 23.15 Borrow, Loading And/Or Spreading										
0010	**BORROW, LOADING AND/OR SPREADING**									
4000	Common earth, shovel, 1 C.Y. bucket	B-12N	840	.019	B.C.Y.	16.65	.83	1.48	18.96	21
4010	1-1/2 C.Y. bucket	B-12O	1135	.014		16.65	.61	1.11	18.37	20.50
4020	3 C.Y. bucket	B-12T	1800	.009		16.65	.39	.89	17.93	19.85
4030	Front end loader, wheel mounted									
4050	3/4 C.Y. bucket	B-10R	550	.022	B.C.Y.	16.65	.98	.54	18.17	20.50
4060	1-1/2 C.Y. bucket	B-10S	970	.012		16.65	.55	.39	17.59	19.55
4070	3 C.Y. bucket	B-10T	1575	.008		16.65	.34	.33	17.32	19.20
4080	5 C.Y. bucket	B-10U	2600	.005		16.65	.21	.40	17.26	19.05
5000	Select granular fill, shovel, 1 C.Y. bucket	B-12N	925	.017		21	.75	1.34	23.09	25.50
5010	1-1/2 C.Y. bucket	B-12O	1250	.013		21	.56	1.01	22.57	25
5020	3 C.Y. bucket	B-12T	1980	.008		21	.35	.81	22.16	24.50
5030	Front end loader, wheel mounted									
5050	3/4 C.Y. bucket	B-10R	800	.015	B.C.Y.	21	.67	.37	22.04	24.50
5060	1-1/2 C.Y. bucket	B-10S	1065	.011		21	.51	.35	21.86	24
5070	3 C.Y. bucket	B-10T	1735	.007		21	.31	.30	21.61	24
5080	5 C.Y. bucket	B-10U	2850	.004		21	.19	.37	21.56	23.50
6000	Clay, till, or blasted rock, shovel, 1 C.Y. bucket	B-12N	715	.022		12.35	.97	1.74	15.06	16.95
6010	1-1/2 C.Y. bucket	B-12O	965	.017		12.35	.72	1.30	14.37	16.10
6020	3 C.Y. bucket	B-12T	1530	.010		12.35	.45	1.04	13.84	15.40
6030	Front end loader, wheel mounted									

MWH

By MPG Date 04 MAR 2014 Client Sheet 1 of 2
Chkd. By Description RHOADS PROPERTY RECLAMATION COST EST. Job No.
Design Task J2.3b - EXCAVATE STOCKPILES, LOAD, HAUL, AND SPREAD

OBJECTIVE: ESTIMATE COST TO PLACE TOPSOIL IN MORE REMOTE AREAS OF DISTURBED AREA BY LOAD, HAUL, AND SPREAD METHODS.

ASSUMPTIONS: 25% OF DISTURBED AREA TO BE RECLAIMED BY THIS METHOD TO A DEPTH OF 1 FT.
LOADING CREW (B-10T) - 1 OPERATOR; 1 LABORER; 1 FRONT END LOADER W/ 3 CY BUCKET.
HAUL CREW - PER SECTION J2.3b2 WRITE-UP
SPREADING CREW (B-10B) - 1 OPERATOR; 1 LABORER; 1 200 HP DOZER
CITY COST INDEX (SPOKANE) = 93.2
UNIT COST (LOADING) = \$0.67/CY
[RS MEANS 31 23 23.15 7070 - LABOR & EQUIP ONLY]
UNIT COST (SPREADING) = \$0.94/CY
[RS MEANS 31 23 23.14 4010]

CALCULATIONS: COST ADJUSTMENT = $\frac{93.2}{100}$ = 0.932

UNIT COST (LOADING) = 0.932 * \$0.67/CY = \$0.62/CY

AREA = (0.25) * [74.2 ACRES * 1 FT * $\frac{43560 \text{ SF}}{\text{ACRE}}$ * $\frac{1 \text{ CY}}{27 \text{ FT}^3}$]

= 29,927.33 CY

EXTENDED COST = \$0.62/CY * 29,927

= \$18,554.74 △
= \$14,112.18 (NON-BURDENED) △

UNIT COST (SPREADING) = 0.932 * \$0.94/CY = \$0.88/CY

4 squares per inch

MWH.

By MPG Date 04 MAR 2014 Client Sheet 2 of 2
Chkd. By Description RHOADS PROPERTY RECLAMATION COST EST Job No.
Design Task J 2.3b - EXCAVATE STOCKPILES, LOAD, HAUL, AND SPREAD

CALCULATIONS (CONTINUED):

EXTENDED COST = \$0.88/cy * 29,927 cy

= \$26,335.76

= \$21,546.07 (NON-BURDENED)

4 squares per inch

Crew No.	Bare Costs		Incl. Subs O&P		Cost Per Labor-Hour	
Crew B-10J	Hr.	Daily	Hr.	Daily	Bare Costs	Incl. O&P
1 Equip. Oper. (medium)	$48.90	$391.20	$74.15	$593.20	$44.82	$68.28
.5 Laborer	36.65	146.60	56.55	226.20		
1 Centrifugal Water Pump, 3"		78.80		86.68		
1 -20' Suction Hose, 3"		2.85		3.13		
2 -50' Discharge Hoses, 3"		3.00		3.30	7.05	7.76
12 L.H., Daily Totals		$622.45		$912.51	$51.87	$76.04
Crew B-10K	Hr.	Daily	Hr.	Daily	Bare Costs	Incl. O&P
1 Equip. Oper. (medium)	$48.90	$391.20	$74.15	$593.20	$44.82	$68.28
.5 Laborer	36.65	146.60	56.55	226.20		
1 Centr. Water Pump, 6"		340.80		374.88		
1 -20' Suction Hose, 6"		11.50		12.65		
2 -50' Discharge Hoses, 6"		12.20		13.42	30.38	33.41
12 L.H., Daily Totals		$902.30		$1220.35	$75.19	$101.70
Crew B-10L	Hr.	Daily	Hr.	Daily	Bare Costs	Incl. O&P
1 Equip. Oper. (medium)	$48.90	$391.20	$74.15	$593.20	$44.82	$68.28
.5 Laborer	36.65	146.60	56.55	226.20		
1 Dozer, 80 H.P.		481.00		529.10	40.08	44.09
12 L.H., Daily Totals		$1018.80		$1348.50	$84.90	$112.38
Crew B-10M	Hr.	Daily	Hr.	Daily	Bare Costs	Incl. O&P
1 Equip. Oper. (medium)	$48.90	$391.20	$74.15	$593.20	$44.82	$68.28
.5 Laborer	36.65	146.60	56.55	226.20		
1 Dozer, 300 H.P.		1817.00		1998.70	151.42	166.56
12 L.H., Daily Totals		$2354.80		$2818.10	$196.23	$234.84
Crew B-10N	Hr.	Daily	Hr.	Daily	Bare Costs	Incl. O&P
1 Equip. Oper. (medium)	$48.90	$391.20	$74.15	$593.20	$44.82	$68.28
.5 Laborer	36.65	146.60	56.55	226.20		
1 F.E. Loader, T.M., 1.5 C.Y		522.80		575.08	43.57	47.92
12 L.H., Daily Totals		$1060.60		$1394.48	$88.38	$116.21
Crew B-10O	Hr.	Daily	Hr.	Daily	Bare Costs	Incl. O&P
1 Equip. Oper. (medium)	$48.90	$391.20	$74.15	$593.20	$44.82	$68.28
.5 Laborer	36.65	146.60	56.55	226.20		
1 F.E. Loader, T.M., 2.25 C.Y.		959.80		1055.78	79.98	87.98
12 L.H., Daily Totals		$1497.60		$1875.18	$124.80	$156.26
Crew B-10P	Hr.	Daily	Hr.	Daily	Bare Costs	Incl. O&P
1 Equip. Oper. (medium)	$48.90	$391.20	$74.15	$593.20	$44.82	$68.28
.5 Laborer	36.65	146.60	56.55	226.20		
1 Crawler Loader, 3 C.Y.		1191.00		1310.10	99.25	109.18
12 L.H., Daily Totals		$1728.80		$2129.50	$144.07	$177.46
Crew B-10Q	Hr.	Daily	Hr.	Daily	Bare Costs	Incl. O&P
1 Equip. Oper. (medium)	$48.90	$391.20	$74.15	$593.20	$44.82	$68.28
.5 Laborer	36.65	146.60	56.55	226.20		
1 Crawler Loader, 4 C.Y.		1532.00		1685.20	127.67	140.43
12 L.H., Daily Totals		$2069.80		$2504.60	$172.48	$208.72
Crew B-10R	Hr.	Daily	Hr.	Daily	Bare Costs	Incl. O&P
1 Equip. Oper. (medium)	$48.90	$391.20	$74.15	$593.20	$44.82	$68.28
.5 Laborer	36.65	146.60	56.55	226.20		
1 F.E. Loader, W.M., 1 C.Y.		295.20		324.72	24.60	27.06
12 L.H., Daily Totals		$833.00		$1144.12	$69.42	$95.34

Crew No.	Bare Costs		Incl. Subs O&P		Cost Per Labor-Hour	
Crew B-10S	Hr.	Daily	Hr.	Daily	Bare Costs	Incl. O&P
1 Equip. Oper. (medium)	$48.90	$391.20	$74.15	$593.20	$44.82	$68.28
.5 Laborer	36.65	146.60	56.55	226.20		
1 F.E. Loader, W.M., 1.5 C.Y.		373.40		410.74	31.12	34.23
12 L.H., Daily Totals		$911.20		$1230.14	$75.93	$102.51
Crew B-10T	Hr.	Daily	Hr.	Daily	Bare Costs	Incl. O&P
1 Equip. Oper. (medium)	$48.90	$391.20	$74.15	$593.20	$44.82	$68.28
.5 Laborer	36.65	146.60	56.55	226.20		
1 F.E. Loader, W.M.,2.5 C.Y.		522.80		575.08	43.57	47.92
12 L.H., Daily Totals		$1060.60		$1394.48	$88.38	$116.21
Crew B-10U	Hr.	Daily	Hr.	Daily	Bare Costs	Incl. O&P
1 Equip. Oper. (medium)	$48.90	$391.20	$74.15	$593.20	$44.82	$68.28
.5 Laborer	36.65	146.60	56.55	226.20		
1 F.E. Loader, W.M., 5.5 C.Y.		1049.00		1153.90	87.42	96.16
12 L.H., Daily Totals		$1586.80		$1973.30	$132.23	$164.44
Crew B-10V	Hr.	Daily	Hr.	Daily	Bare Costs	Incl. O&P
1 Equip. Oper. (medium)	$48.90	$391.20	$74.15	$593.20	$44.82	$68.28
.5 Laborer	36.65	146.60	56.55	226.20		
1 Dozer, 700 H.P.		4485.00		4933.50	373.75	411.13
12 L.H., Daily Totals		$5022.80		$5752.90	$418.57	$479.41
Crew B-10W	Hr.	Daily	Hr.	Daily	Bare Costs	Incl. O&P
1 Equip. Oper. (medium)	$48.90	$391.20	$74.15	$593.20	$44.82	$68.28
.5 Laborer	36.65	146.60	56.55	226.20		
1 Dozer, 105 H.P.		591.80		650.98	49.32	54.25
12 L.H., Daily Totals		$1129.60		$1470.38	$94.13	$122.53
Crew B-10X	Hr.	Daily	Hr.	Daily	Bare Costs	Incl. O&P
1 Equip. Oper. (medium)	$48.90	$391.20	$74.15	$593.20	$44.82	$68.28
.5 Laborer	36.65	146.60	56.55	226.20		
1 Dozer, 410 H.P.		2409.00		2649.90	200.75	220.82
12 L.H., Daily Totals		$2946.80		$3469.30	$245.57	$289.11
Crew B-10Y	Hr.	Daily	Hr.	Daily	Bare Costs	Incl. O&P
1 Equip. Oper. (medium)	$48.90	$391.20	$74.15	$593.20	$44.82	$68.28
.5 Laborer	36.65	146.60	56.55	226.20		
1 Vibr. Roller, Towed, 12 Ton		559.20		615.12	46.60	51.26
12 L.H., Daily Totals		$1097.00		$1434.52	$91.42	$119.54
Crew B-11A	Hr.	Daily	Hr.	Daily	Bare Costs	Incl. O&P
1 Equipment Oper. (med.)	$48.90	$391.20	$74.15	$593.20	$42.77	$65.35
1 Laborer	36.65	293.20	56.55	452.40		
1 Dozer, 200 H.P.		1325.00		1457.50	82.81	91.09
16 L.H., Daily Totals		$2009.40		$2503.10	$125.59	$156.44
Crew B-11B	Hr.	Daily	Hr.	Daily	Bare Costs	Incl. O&P
1 Equipment Oper. (light)	$47.05	$376.40	$71.35	$570.80	$41.85	$63.95
1 Laborer	36.65	293.20	56.55	452.40		
1 Air Powered Tamper		26.20		28.82		
1 Air Compressor, 365 cfm		264.80		291.28		
2 -50' Air Hoses, 1.5"		11.60		12.76	18.91	20.80
16 L.H., Daily Totals		$972.20		$1356.06	$60.76	$84.75
Crew B-11C	Hr.	Daily	Hr.	Daily	Bare Costs	Incl. O&P
1 Equipment Oper. (med.)	$48.90	$391.20	$74.15	$593.20	$42.77	$65.35
1 Laborer	36.65	293.20	56.55	452.40		
1 Backhoe Loader, 48 H.P.		365.20		401.72	22.82	25.11
16 L.H., Daily Totals		$1049.60		$1447.32	$65.60	$90.46

Crew No.	Bare Costs		Incl. Subs O&P		Cost Per Labor-Hour	
Crew B-7C	**Hr.**	**Daily**	**Hr.**	**Daily**	**Bare Costs**	**Incl. O&P**
1 Labor Foreman (outside)	$38.65	$309.20	$59.65	$477.20	$38.81	$59.61
4 Laborers	36.65	1172.80	56.55	1809.60		
1 Equip. Oper. (medium)	48.90	391.20	74.15	593.20		
1 Truck Driver (heavy)	37.55	300.40	57.30	458.40		
1 Brush Chipper, 12", 130 H.P.		396.60		436.26		
1 Crawler Loader, 3 C.Y.		1191.00		1310.10		
2 Chain Saws, Gas, 36" Long		90.00		99.00		
1 Dump Truck, 12 C.Y., 400 H.P.		692.20		761.42	42.32	46.55
56 L.H., Daily Totals		$4543.40		$5945.18	$81.13	$106.16
Crew B-8	**Hr.**	**Daily**	**Hr.**	**Daily**	**Bare Costs**	**Incl. O&P**
1 Labor Foreman (outside)	$38.65	$309.20	$59.65	$477.20	$41.05	$62.71
2 Laborers	36.65	586.40	56.55	904.80		
2 Equip. Oper. (medium)	48.90	782.40	74.15	1186.40		
1 Equip. Oper. (oiler)	43.55	348.40	66.00	528.00		
2 Truck Drivers (heavy)	37.55	600.80	57.30	916.80		
1 Hyd. Crane, 25 Ton		745.80		820.38		
1 Crawler Loader, 3 C.Y.		1191.00		1310.10		
2 Dump Trucks, 12 C.Y., 400 H.P.		1384.40		1522.84	51.89	57.08
64 L.H., Daily Totals		$5948.40		$7666.52	$92.94	$119.79
Crew B-9	**Hr.**	**Daily**	**Hr.**	**Daily**	**Bare Costs**	**Incl. O&P**
1 Labor Foreman (outside)	$38.65	$309.20	$59.65	$477.20	$37.05	$57.17
4 Laborers	36.65	1172.80	56.55	1809.60		
1 Air Compressor, 250 cfm		202.40		222.64		
2 Breakers, Pavement, 60 lb.		19.60		21.56		
2 -50' Air Hoses, 1.5"		11.60		12.76	5.84	6.42
40 L.H., Daily Totals		$1715.60		$2543.76	$42.89	$63.59
Crew B-9A	**Hr.**	**Daily**	**Hr.**	**Daily**	**Bare Costs**	**Incl. O&P**
2 Laborers	$36.65	$586.40	$56.55	$904.80	$36.95	$56.80
1 Truck Driver (heavy)	37.55	300.40	57.30	458.40		
1 Water Tank Trailer, 5000 Gal.		141.60		155.76		
1 Truck Tractor, 220 H.P.		366.40		403.04		
2 -50' Discharge Hoses, 3"		3.00		3.30	21.29	23.42
24 L.H., Daily Totals		$1397.80		$1925.30	$58.24	$80.22
Crew B-9B	**Hr.**	**Daily**	**Hr.**	**Daily**	**Bare Costs**	**Incl. O&P**
2 Laborers	$36.65	$586.40	$56.55	$904.80	$36.95	$56.80
1 Truck Driver (heavy)	37.55	300.40	57.30	458.40		
2 -50' Discharge Hoses, 3"		3.00		3.30		
1 Water Tank Trailer, 5000 Gal.		141.60		155.76		
1 Truck Tractor, 220 H.P.		366.40		403.04		
1 Pressure Washer		69.40		76.34	24.18	26.60
24 L.H., Daily Totals		$1467.20		$2001.64	$61.13	$83.40
Crew B-9D	**Hr.**	**Daily**	**Hr.**	**Daily**	**Bare Costs**	**Incl. O&P**
1 Labor Foreman (outside)	$38.65	$309.20	$59.65	$477.20	$37.05	$57.17
4 Common Laborers	36.65	1172.80	56.55	1809.60		
1 Air Compressor, 250 cfm		202.40		222.64		
2 -50' Air Hoses, 1.5"		11.60		12.76		
2 Air Powered Tampers		52.40		57.64	6.66	7.33
40 L.H., Daily Totals		$1748.40		$2579.84	$43.71	$64.50
Crew B-10	**Hr.**	**Daily**	**Hr.**	**Daily**	**Bare Costs**	**Incl. O&P**
1 Equip. Oper. (medium)	$48.90	$391.20	$74.15	$593.20	$44.82	$68.28
.5 Laborer	36.65	146.60	56.55	226.20		
12 L.H., Daily Totals		$537.80		$819.40	$44.82	$68.28

Crew No.	Bare Costs		Incl. Subs O&P		Cost Per Labor-Hour	
Crew B-10A	**Hr.**	**Daily**	**Hr.**	**Daily**	**Bare Costs**	**Incl. O&P**
1 Equip. Oper. (medium)	$48.90	$391.20	$74.15	$593.20	$44.82	$68.28
.5 Laborer	36.65	146.60	56.55	226.20		
1 Roller, 2-Drum, W.B., 7.5 H.P.		182.80		201.08	15.23	16.76
12 L.H., Daily Totals		$720.60		$1020.48	$60.05	$85.04
Crew B-10B	**Hr.**	**Daily**	**Hr.**	**Daily**	**Bare Costs**	**Incl. O&P**
1 Equip. Oper. (medium)	$48.90	$391.20	$74.15	$593.20	$44.82	$68.28
.5 Laborer	36.65	146.60	56.55	226.20		
1 Dozer, 200 H.P.		1325.00		1457.50	110.42	121.46
12 L.H., Daily Totals		$1862.80		$2276.90	$155.23	$189.74
Crew B-10C	**Hr.**	**Daily**	**Hr.**	**Daily**	**Bare Costs**	**Incl. O&P**
1 Equip. Oper. (medium)	$48.90	$391.20	$74.15	$593.20	$44.82	$68.28
.5 Laborer	36.65	146.60	56.55	226.20		
1 Dozer, 200 H.P.		1325.00		1457.50		
1 Vibratory Roller, Towed, 23 Ton		412.00		453.20	144.75	159.22
12 L.H., Daily Totals		$2274.80		$2730.10	$189.57	$227.51
Crew B-10D	**Hr.**	**Daily**	**Hr.**	**Daily**	**Bare Costs**	**Incl. O&P**
1 Equip. Oper. (medium)	$48.90	$391.20	$74.15	$593.20	$44.82	$68.28
.5 Laborer	36.65	146.60	56.55	226.20		
1 Dozer, 200 H.P.		1325.00		1457.50		
1 Sheepsft. Roller, Towed		443.80		488.18	147.40	162.14
12 L.H., Daily Totals		$2306.60		$2765.08	$192.22	$230.42
Crew B-10E	**Hr.**	**Daily**	**Hr.**	**Daily**	**Bare Costs**	**Incl. O&P**
1 Equip. Oper. (medium)	$48.90	$391.20	$74.15	$593.20	$44.82	$68.28
.5 Laborer	36.65	146.60	56.55	226.20		
1 Tandem Roller, 5 Ton		159.00		174.90	13.25	14.57
12 L.H., Daily Totals		$696.80		$994.30	$58.07	$82.86
Crew B-10F	**Hr.**	**Daily**	**Hr.**	**Daily**	**Bare Costs**	**Incl. O&P**
1 Equip. Oper. (medium)	$48.90	$391.20	$74.15	$593.20	$44.82	$68.28
.5 Laborer	36.65	146.60	56.55	226.20		
1 Tandem Roller, 10 Ton		242.00		266.20	20.17	22.18
12 L.H., Daily Totals		$779.80		$1085.60	$64.98	$90.47
Crew B-10G	**Hr.**	**Daily**	**Hr.**	**Daily**	**Bare Costs**	**Incl. O&P**
1 Equip. Oper. (medium)	$48.90	$391.20	$74.15	$593.20	$44.82	$68.28
.5 Laborer	36.65	146.60	56.55	226.20		
1 Sheepsfoot Roller, 240 H.P.		1218.00		1339.80	101.50	111.65
12 L.H., Daily Totals		$1755.80		$2159.20	$146.32	$179.93
Crew B-10H	**Hr.**	**Daily**	**Hr.**	**Daily**	**Bare Costs**	**Incl. O&P**
1 Equip. Oper. (medium)	$48.90	$391.20	$74.15	$593.20	$44.82	$68.28
.5 Laborer	36.65	146.60	56.55	226.20		
1 Diaphragm Water Pump, 2"		72.00		79.20		
1 -20' Suction Hose, 2"		1.95		2.15		
2 -50' Discharge Hoses, 2"		1.80		1.98	6.31	6.94
12 L.H., Daily Totals		$613.55		$902.73	$51.13	$75.23
Crew B-10I	**Hr.**	**Daily**	**Hr.**	**Daily**	**Bare Costs**	**Incl. O&P**
1 Equip. Oper. (medium)	$48.90	$391.20	$74.15	$593.20	$44.82	$68.28
.5 Laborer	36.65	146.60	56.55	226.20		
1 Diaphragm Water Pump, 4"		115.80		127.38		
1 -20' Suction Hose, 4"		3.25		3.58		
2 -50' Discharge Hoses, 4"		4.70		5.17	10.31	11.34
12 L.H., Daily Totals		$661.55		$955.52	$55.13	$79.63

31 23 23.14 Backfill, Structural	Crew	Daily Output	Labor-Hours	Unit	Material	2014 Bare Costs Labor	Equipment	Total	Total Incl O&P
3300 300' haul, sand & gravel	B-10W	465	.026	L.C.Y.		1.16	1.27	2.43	3.16
3310 Sandy clay & loam		455	.026			1.18	1.30	2.48	3.23
3320 Common earth		415	.029			1.30	1.43	2.73	3.54
3340 Clay		370	.032			1.45	1.60	3.05	3.97
4000 200 H.P., 50' haul, sand & gravel	B-10B	2500	.005			.22	.53	.75	.91
* 4010 Sandy clay & loam		2435	.005			.22	.54	.76	.94
4020 Common earth		2200	.005			.24	.60	.84	1.03
4040 Clay		1950	.006			.28	.68	.96	1.17
4200 150' haul, sand & gravel		1225	.010			.44	1.08	1.52	1.86
4210 Sandy clay & loam		1200	.010			.45	1.10	1.55	1.89
4220 Common earth		1100	.011			.49	1.20	1.69	2.07
4240 Clay		975	.012			.55	1.36	1.91	2.34
4400 300' haul, sand & gravel		805	.015			.67	1.65	2.32	2.83
4410 Sandy clay & loam		790	.015			.68	1.68	2.36	2.89
4420 Common earth		735	.016			.73	1.80	2.53	3.10
4440 Clay		660	.018			.81	2.01	2.82	3.45
5000 300 H.P., 50' haul, sand & gravel	B-10M	3170	.004			.17	.57	.74	.89
5010 Sandy clay & loam		3110	.004			.17	.58	.75	.90
5020 Common earth		2900	.004			.19	.63	.82	.97
5040 Clay		2700	.004			.20	.67	.87	1.04
5200 150' haul, sand & gravel		2200	.005			.24	.83	1.07	1.28
5210 Sandy clay & loam		2150	.006			.25	.84	1.09	1.31
5220 Common earth		1950	.006			.28	.93	1.21	1.44
5240 Clay		1700	.007			.32	1.07	1.39	1.66
5400 300' haul, sand & gravel		1500	.008			.36	1.21	1.57	1.88
5410 Sandy clay & loam		1470	.008			.37	1.24	1.61	1.92
5420 Common earth		1350	.009			.40	1.35	1.75	2.09
5440 Clay		1225	.010			.44	1.48	1.92	2.30
6000 For compaction, see Section 31 23 23.23									
6010 For trench backfill, see Section 31 23 16.13 and 31 23 16.14									

31 23 23.15 Borrow, Loading And/Or Spreading									
0010 **BORROW, LOADING AND/OR SPREADING**									
4000 Common earth, shovel, 1 C.Y. bucket	B-12N	840	.019	B.C.Y.	16.65	.83	1.48	18.96	21
4010 1-1/2 C.Y. bucket	B-12O	1135	.014		16.65	.61	1.11	18.37	20.50
4020 3 C.Y. bucket	B-12T	1800	.009		16.65	.39	.89	17.93	19.85
4030 Front end loader, wheel mounted									
4050 3/4 C.Y. bucket	B-10R	550	.022	B.C.Y.	16.65	.98	.54	18.17	20.50
4060 1-1/2 C.Y. bucket	B-10S	970	.012		16.65	.55	.39	17.59	19.55
4070 3 C.Y. bucket	B-10T	1575	.008		16.65	.34	.33	17.32	19.20
4080 5 C.Y. bucket	B-10U	2600	.005		16.65	.21	.40	17.26	19.05
5000 Select granular fill, shovel, 1 C.Y. bucket	B-12N	925	.017		21	.75	1.34	23.09	25.50
5010 1-1/2 C.Y. bucket	B-12O	1250	.013		21	.56	1.01	22.57	25
5020 3 C.Y. bucket	B-12T	1980	.008		21	.35	.81	22.16	24.50
5030 Front end loader, wheel mounted									
5050 3/4 C.Y. bucket	B-10R	800	.015	B.C.Y.	21	.67	.37	22.04	24.50
5060 1-1/2 C.Y. bucket	B-10S	1065	.011		21	.51	.35	21.86	24
5070 3 C.Y. bucket	B-10T	1735	.007		21	.31	.30	21.61	24
5080 5 C.Y. bucket	B-10U	2850	.004		21	.19	.37	21.56	23.50
6000 Clay, till, or blasted rock, shovel, 1 C.Y. bucket	B-12N	715	.022		12.35	.97	1.74	15.06	16.95
6010 1-1/2 C.Y. bucket	B-12O	965	.017		12.35	.72	1.30	14.37	16.10
6020 3 C.Y. bucket	B-12T	1530	.010		12.35	.45	1.04	13.84	15.40
6030 Front end loader, wheel mounted									

23 23.15 Borrow, Loading And/Or Spreading	Crew	Daily Output	Labor-Hours	Unit	2014 Bare Costs Material	Labor	Equipment	Total	Total Incl O&P
35 3/4 C.Y. bucket	B-10R	465	.026	B.C.Y.	12.35	1.16	.63	14.14	16
40 1-1/2 C.Y. bucket	B-10S	825	.015		12.35	.65	.45	13.45	15.05
45 3 C.Y. bucket	B-10T	1340	.009		12.35	.40	.39	13.14	14.60
50 5 C.Y. bucket	B-10U	2200	.005		12.35	.24	.48	13.07	14.45
50 Front end loader, track mounted									
55 1-1/2 C.Y. bucket	B-10N	715	.017	B.C.Y.	12.35	.75	.73	13.83	15.50
70 3 C.Y. bucket	B-10P	1190	.010		12.35	.45	1	13.80	15.35
75 5 C.Y. bucket	B-10Q	1835	.007		12.35	.29	.84	13.48	14.90
00 Topsoil or loam from stockpile, shovel, 1 C.Y. bucket	B-12N	840	.019		24.50	.83	1.48	26.81	30
10 1-1/2 C.Y. bucket	B-12O	1135	.014		24.50	.61	1.11	26.22	29
20 3 C.Y. bucket	B-12T	1800	.009		24.50	.39	.89	25.78	28.50
30 Front end loader, wheel mounted									
50 3/4 C.Y. bucket	B-10R	550	.022	B.C.Y.	24.50	.98	.54	26.02	29
50 1-1/2 C.Y. bucket	B-10S	970	.012		24.50	.55	.39	25.44	28.50
70 3 C.Y. bucket	B-10T	1575	.008		24.50	.34	.33	25.17	28
80 5 C.Y. bucket	B-10U	2600	.005		24.50	.21	.40	25.11	28
00 For larger hauling units, deduct from above								30%	30%
00 Hauling only, excavated or borrow material, see Section 31 23 23.20									

23 23.16 Fill By Borrow and Utility Bedding									
0 **FILL BY BORROW AND UTILITY BEDDING**									
19 Utility bedding, for pipe & conduit, not incl. compaction									
50 Crushed or screened bank run gravel	B-6	150	.160	L.C.Y.	25	6.40	2.44	33.84	40
10 Crushed stone 3/4" to 1/2"		150	.160		28.50	6.40	2.44	37.34	43.50
10 Sand, dead or bank		150	.160		17.55	6.40	2.44	26.39	32
10 Compacting bedding in trench	A-1D	90	.089	E.C.Y.		3.26	.40	3.66	5.50
10 If material source exceeds 2 miles, add for extra mileage.									
0 See Section 31 23 23.20 for hauling mileage add.									

23 23.17 General Fill									
0 **GENERAL FILL**									
1 Spread dumped material, no compaction									
0 By dozer, no compaction	B-10B	1000	.012	L.C.Y.		.54	1.33	1.87	2.28
0 By hand	1 Clab	12	.667	"		24.50		24.50	37.50
0 Spread fill, from stockpile with 2-1/2 C.Y. F.E. loader									
0 130 H.P., 300' haul	B-10P	600	.020	L.C.Y.		.90	1.99	2.89	3.55
0 With dozer 300 H.P., 300' haul	B-10M	600	.020	"		.90	3.03	3.93	4.70
0 For compaction of embankment, see Section 31 23 23.23									
0 Gravel fill, compacted, under floor slabs, 4" deep	B-37	10000	.005	S.F.	.42	.19	.02	.63	.77
0 6" deep		8600	.006		.63	.22	.02	.87	1.05
0 9" deep		7200	.007		1.05	.26	.02	1.33	1.58
0 12" deep		6000	.008		1.48	.31	.03	1.82	2.13
0 Alternate pricing method, 4" deep		120	.400	E.C.Y.	31.50	15.50	1.32	48.32	60.50
0 6" deep		160	.300		31.50	11.60	.99	44.09	54
0 9" deep		200	.240		31.50	9.30	.79	41.59	50
0 12" deep		220	.218		31.50	8.45	.72	40.67	49
0 For fill under exterior paving, see Section 32 11 23.23									
0 For flowable fill, see Section 03 31 13.35									

23 23.19 Backfill, Airport Subgrade									
0 **BACKFILL, AIRPORT SUBGRADE**									
0 Backfill, dozer, sand & gravel, 12" depth ,300' haul, no compaction	B-10M	4500	.003	S.Y.		.12	.40	.52	.62
0 13" depth		4155	.003			.13	.44	.57	.68
0 14" depth		3860	.003			.14	.47	.61	.73
0 15" depth		3600	.003			.15	.50	.65	.78

MWH

By MPG Date 06 MAR 2014 Client Sheet 1 of 1
Chkd. By Description RHOADS PROPERTY RECLAMATION COST EST. Job No.
Design Task J2.3.b.2 HAUL AND DUMP TOPSOIL

OBJECTIVE: ESTIMATE COST TO HAUL TOPSOIL TO PLACEMENT AREAS.

ASSUMPTIONS: 1 CY OF TOPSOIL = 1 TON
VOLUME OF TOPSOIL TO HAUL = 29,927 CY
CREW (B-34H) - 1 TRUCK DRIVER; 1 OFF-ROAD DUMP TRUCK
CITY COST INDEX (SPOKANE) = 93.2
42 CY OFF ROAD HAUL VEHICLE
20 MIN WAIT/LOAD/UNLOAD
10 MPH TRAVEL SPEED
2000 FT CYCLE
UNIT COST = $2.76/CY
[RS MEANS 31 23 23.20 7060]

CALCULATION: COST ADJUSTMENT = $\frac{93.2}{100}$ = 0.932

UNIT COST = 0.932 * $2.76/CY = $2.57/CY

EXTENDED COST = 29,927 CY * $2.57/CY

= $76,912.39

= $66,246.17 (NON-BURDENED)

REFERENCE: RS MEANS - 2014 HEAVY CONSTRUCTION COST DATA

4 squares per inch

Crew No.	Bare Costs		Incl. Subs O&P		Cost Per Labor-Hour	
Crew B-34H	Hr.	Daily	Hr.	Daily	Bare Costs	Incl. O&P
1 Truck Driver (heavy)	$37.55	$300.40	$57.30	$458.40	$37.55	$57.30
1 Dump Truck, Off Hwy., 65 Ton		1797.00		1976.70	224.63	247.09
8 L.H., Daily Totals		$2097.40		$2435.10	$262.18	$304.39
Crew B-34I	Hr.	Daily	Hr.	Daily	Bare Costs	Incl. O&P
1 Truck Driver (heavy)	$37.55	$300.40	$57.30	$458.40	$37.55	$57.30
1 Dump Truck, 18 C.Y., 450 H.P.		867.60		954.36	108.45	119.30
8 L.H., Daily Totals		$1168.00		$1412.76	$146.00	$176.60
Crew B-34J	Hr.	Daily	Hr.	Daily	Bare Costs	Incl. O&P
1 Truck Driver (heavy)	$37.55	$300.40	$57.30	$458.40	$37.55	$57.30
1 Dump Truck, Off Hwy., 100 Ton		2898.00		3187.80	362.25	398.48
8 L.H., Daily Totals		$3198.40		$3646.20	$399.80	$455.77
Crew B-34K	Hr.	Daily	Hr.	Daily	Bare Costs	Incl. O&P
1 Truck Driver (heavy)	$37.55	$300.40	$57.30	$458.40	$37.55	$57.30
1 Truck Tractor, 6x4, 450 H.P.		742.40		816.64		
1 Lowbed Trailer, 75 Ton		219.80		241.78	120.28	132.30
8 L.H., Daily Totals		$1262.60		$1516.82	$157.82	$189.60
Crew B-34L	Hr.	Daily	Hr.	Daily	Bare Costs	Incl. O&P
1 Equip. Oper. (light)	$47.05	$376.40	$71.35	$570.80	$47.05	$71.35
1 Flatbed Truck, Gas, 1.5 Ton		270.20		297.22	33.77	37.15
8 L.H., Daily Totals		$646.60		$868.02	$80.83	$108.50
Crew B-34M	Hr.	Daily	Hr.	Daily	Bare Costs	Incl. O&P
1 Equip. Oper. (light)	$47.05	$376.40	$71.35	$570.80	$47.05	$71.35
1 Flatbed Truck, Gas, 3 Ton		333.00		366.30	41.63	45.79
8 L.H., Daily Totals		$709.40		$937.10	$88.67	$117.14
Crew B-34N	Hr.	Daily	Hr.	Daily	Bare Costs	Incl. O&P
1 Truck Driver (heavy)	$37.55	$300.40	$57.30	$458.40	$37.55	$57.30
1 Dump Truck, 8 C.Y., 220 H.P.		417.20		458.92		
1 Flatbed Trailer, 40 Ton		152.00		167.20	71.15	78.27
8 L.H., Daily Totals		$869.60		$1084.52	$108.70	$135.57
Crew B-34P	Hr.	Daily	Hr.	Daily	Bare Costs	Incl. O&P
1 Pipe Fitter	$58.50	$468.00	$88.35	$706.80	$47.97	$72.73
1 Truck Driver (light)	36.50	292.00	55.70	445.60		
1 Equip. Oper. (medium)	48.90	391.20	74.15	593.20		
1 Flatbed Truck, Gas, 3 Ton		333.00		366.30		
1 Backhoe Loader, 48 H.P.		365.20		401.72	29.09	32.00
24 L.H., Daily Totals		$1849.40		$2513.62	$77.06	$104.73
Crew B-34Q	Hr.	Daily	Hr.	Daily	Bare Costs	Incl. O&P
1 Pipe Fitter	$58.50	$468.00	$88.35	$706.80	$48.42	$73.42
1 Truck Driver (light)	36.50	292.00	55.70	445.60		
1 Equip. Oper. (crane)	50.25	402.00	76.20	609.60		
1 Flatbed Trailer, 25 Ton		113.60		124.96		
1 Dump Truck, 8 C.Y., 220 H.P.		417.20		458.92		
1 Hyd. Crane, 25 Ton		745.80		820.38	53.19	58.51
24 L.H., Daily Totals		$2438.60		$3166.26	$101.61	$131.93

Crew No.	Bare Costs		Incl. Subs O&P		Cost Per Labor-Hour	
Crew B-34R	Hr.	Daily	Hr.	Daily	Bare Costs	Incl. O&P
1 Pipe Fitter	$58.50	$468.00	$88.35	$706.80	$48.42	$73.42
1 Truck Driver (light)	36.50	292.00	55.70	445.60		
1 Equip. Oper. (crane)	50.25	402.00	76.20	609.60		
1 Flatbed Trailer, 25 Ton		113.60		124.96		
1 Dump Truck, 8 C.Y., 220 H.P.		417.20		458.92		
1 Hyd. Crane, 25 Ton		745.80		820.38		
1 Hyd. Excavator, 1 C.Y.		814.80		896.28	87.14	95.86
24 L.H., Daily Totals		$3253.40		$4062.54	$135.56	$169.27
Crew B-34S	Hr.	Daily	Hr.	Daily	Bare Costs	Incl. O&P
2 Pipe Fitters	$58.50	$936.00	$88.35	$1413.60	$51.20	$77.55
1 Truck Driver (heavy)	37.55	300.40	57.30	458.40		
1 Equip. Oper. (crane)	50.25	402.00	76.20	609.60		
1 Flatbed Trailer, 40 Ton		152.00		167.20		
1 Truck Tractor, 6x4, 380 H.P.		612.80		674.08		
1 Hyd. Crane, 80 Ton		1652.00		1817.20		
1 Hyd. Excavator, 2 C.Y.		1175.00		1292.50	112.24	123.47
32 L.H., Daily Totals		$5230.20		$6432.58	$163.44	$201.02
Crew B-34T	Hr.	Daily	Hr.	Daily	Bare Costs	Incl. O&P
2 Pipe Fitters	$58.50	$936.00	$88.35	$1413.60	$51.20	$77.55
1 Truck Driver (heavy)	37.55	300.40	57.30	458.40		
1 Equip. Oper. (crane)	50.25	402.00	76.20	609.60		
1 Flatbed Trailer, 40 Ton		152.00		167.20		
1 Truck Tractor, 6x4, 380 H.P.		612.80		674.08		
1 Hyd. Crane, 80 Ton		1652.00		1817.20	75.53	83.08
32 L.H., Daily Totals		$4055.20		$5140.08	$126.72	$160.63
Crew B-35	Hr.	Daily	Hr.	Daily	Bare Costs	Incl. O&P
1 Labor Foreman (outside)	$38.65	$309.20	$59.65	$477.20	$45.66	$69.76
1 Skilled Worker	47.30	378.40	73.25	586.00		
1 Welder (plumber)	57.55	460.40	86.90	695.20		
1 Laborer	36.65	293.20	56.55	452.40		
1 Equip. Oper. (crane)	50.25	402.00	76.20	609.60		
1 Equip. Oper. (oiler)	43.55	348.40	66.00	528.00		
1 Welder, Electric, 300 amp		55.30		60.83		
1 Hyd. Excavator, .75 C.Y.		662.00		728.20	14.94	16.44
48 L.H., Daily Totals		$2908.90		$4137.43	$60.60	$86.20
Crew B-35A	Hr.	Daily	Hr.	Daily	Bare Costs	Incl. O&P
1 Labor Foreman (outside)	$38.65	$309.20	$59.65	$477.20	$44.37	$67.87
2 Laborers	36.65	586.40	56.55	904.80		
1 Skilled Worker	47.30	378.40	73.25	586.00		
1 Welder (plumber)	57.55	460.40	86.90	695.20		
1 Equip. Oper. (crane)	50.25	402.00	76.20	609.60		
1 Equip. Oper. (oiler)	43.55	348.40	66.00	528.00		
1 Welder, Gas Engine, 300 amp		142.00		156.20		
1 Crawler Crane, 75 Ton		1492.00		1641.20	29.18	32.10
56 L.H., Daily Totals		$4118.80		$5598.20	$73.55	$99.97
Crew B-36	Hr.	Daily	Hr.	Daily	Bare Costs	Incl. O&P
1 Labor Foreman (outside)	$38.65	$309.20	$59.65	$477.20	$41.95	$64.21
2 Laborers	36.65	586.40	56.55	904.80		
2 Equip. Oper. (medium)	48.90	782.40	74.15	1186.40		
1 Dozer, 200 H.P.		1325.00		1457.50		
1 Aggregate Spreader		41.20		45.32		
1 Tandem Roller, 10 Ton		242.00		266.20	40.20	44.23
40 L.H., Daily Totals		$3286.20		$4337.42	$82.16	$108.44

31 23 23.20 Hauling		Crew	Daily Output	Labor-Hours	Unit	Material	2014 Bare Costs Labor	Equipment	Total	Total Incl O&P
6620	cycle 4000 ft	B-34G	476	.017	L.C.Y.		.63	3.76	4.39	5.10
6630	cycle 0.5 mile		510	.016			.59	3.50	4.09	4.76
6640	cycle 1 mile		442	.018			.68	4.04	4.72	5.50
6650	cycle 2 miles		340	.024			.88	5.25	6.13	7.15
6660	10 MPH, cycle 2000 ft		578	.014			.52	3.09	3.61	4.19
6670	cycle 3000 ft		578	.014			.52	3.09	3.61	4.19
6680	cycle 4000 ft		544	.015			.55	3.29	3.84	4.45
6690	cycle 0.5 mile		578	.014			.52	3.09	3.61	4.19
6700	cycle 1 mile		510	.016			.59	3.50	4.09	4.76
6710	cycle 2 miles		442	.018			.68	4.04	4.72	5.50
6720	cycle 4 miles		340	.024			.88	5.25	6.13	7.15
6730	15 MPH, cycle 2000 ft		612	.013			.49	2.92	3.41	3.96
6740	cycle 3000 ft		578	.014			.52	3.09	3.61	4.19
6750	cycle 4000 ft		578	.014			.52	3.09	3.61	4.19
6760	cycle 0.5 mile		612	.013			.49	2.92	3.41	3.96
6770	cycle 1 mile		544	.015			.55	3.29	3.84	4.45
6780	cycle 2 miles		476	.017			.63	3.76	4.39	5.10
6790	cycle 4 miles		374	.021			.80	4.78	5.58	6.50
6800	20 MPH, cycle 2 miles		510	.016			.59	3.50	4.09	4.76
6810	cycle 4 miles		442	.018			.68	4.04	4.72	5.50
6820	25 MPH, cycle 2 miles		544	.015			.55	3.29	3.84	4.45
6830	cycle 4 miles		476	.017			.63	3.76	4.39	5.10
7000	42 C.Y. off-road, 20 min. wait/Ld./Uld., 5 MPH, cycle 2000 ft	B-34H	798	.010			.38	2.25	2.63	3.05
7010	cycle 3000 ft		756	.011			.40	2.38	2.78	3.22
7020	cycle 4000 ft		672	.012			.45	2.67	3.12	3.62
7030	cycle 0.5 mile		756	.011			.40	2.38	2.78	3.22
7040	cycle 1 mile		630	.013			.48	2.85	3.33	3.87
7050	cycle 2 miles		462	.017			.65	3.89	4.54	5.25
7060	10 MPH, cycle 2000 ft		882	.009			.34	2.04	2.38	2.76
7070	cycle 3000 ft		840	.010			.36	2.14	2.50	2.90
7080	cycle 4000 ft		798	.010			.38	2.25	2.63	3.05
7090	cycle 0.5 mile		882	.009			.34	2.04	2.38	2.76
7100	cycle 1 mile		798	.010			.38	2.25	2.63	3.05
7110	cycle 2 miles		630	.013			.48	2.85	3.33	3.87
7120	cycle 4 miles		462	.017			.65	3.89	4.54	5.25
7130	15 MPH, cycle 2000 ft		924	.009			.33	1.95	2.28	2.64
7140	cycle 3000 ft		882	.009			.34	2.04	2.38	2.76
7150	cycle 4000 ft		882	.009			.34	2.04	2.38	2.76
7160	cycle 0.5 mile		882	.009			.34	2.04	2.38	2.76
7170	cycle 1 mile		840	.010			.36	2.14	2.50	2.90
7180	cycle 2 miles		714	.011			.42	2.52	2.94	3.41
7190	cycle 4 miles		546	.015			.55	3.29	3.84	4.46
7200	20 MPH, cycle 2 miles		756	.011			.40	2.38	2.78	3.22
7210	cycle 4 miles		630	.013			.48	2.85	3.33	3.87
7220	25 MPH, cycle 2 miles		798	.010			.38	2.25	2.63	3.05
7230	cycle 4 miles		672	.012			.45	2.67	3.12	3.62
7300	25 min. wait/Ld./Uld., 5 MPH, cycle 2000 ft		672	.012			.45	2.67	3.12	3.62
7310	cycle 3000 ft		630	.013			.48	2.85	3.33	3.87
7320	cycle 4000 ft		588	.014			.51	3.06	3.57	4.14
7330	cycle 0.5 mile		630	.013			.48	2.85	3.33	3.87
7340	cycle 1 mile		546	.015			.55	3.29	3.84	4.46
7350	cycle 2 miles		378	.021			.79	4.75	5.54	6.45
7360	10 MPH, cycle 2000 ft		714	.011			.42	2.52	2.94	3.41

MWH

By MPG Date 04 MAR 2014 Client Sheet of
Chkd. By Description RHOADS PROPERTY RECLAMATION COST EST. Job No.
Design Task J2.4.a HYDRASEED APPLICATION

OBJECTIVE: ESTIMATE COST FOR HYDROSEEDING OF DISTURBED AREA.

ASSUMPTIONS: AREA OF DISTURBANCE = 74.2 ACRES
HYDROSEEDING TO BE COMPLETED USING A UTILITY/MIX CREW (B-81) – 1 LABORER; 1 OPERATOR; 1 TRUCK DRIVER; 1 HYDROMULCHER; 1 TRUCK
UNIT COST = \$67/THOUSAND SF
[RS MEANS 32 92 19.14 5400]
CITY COST INDEX (SPOKANE) = 93.2

CALCULATIONS: COST ADJUSTMENT = $\frac{93.2}{100}$ = 0.932

UNIT COST = 0.932 * \$67/THOUSAND SF = \$62.44/THOU. SF

EXTENDED COST = \$62.44 * $\left[\frac{43560 \text{ SF}}{\text{ACRE}} * \frac{1 \text{ MSF}}{1000 \text{ SF}}\right]$

= \$2719.88/ACRE

= 74.2 ACRE * \$2720/ACRE

= \$201,824

= \$149,642.11 (NON-BURDENED)

REFERENCE: RS MEANS – 2014 HEAVY CONSTRUCTION COST DATA

4 squares per inch

Crew No.	Bare Costs Hr.	Bare Costs Daily	Incl. Subs O&P Hr.	Incl. Subs O&P Daily	Cost Per Labor-Hour Bare Costs	Cost Per Labor-Hour Incl. O&P
Crew B-79E						
2 Labor Foremen (outside)	$38.65	$618.40	$59.65	$954.40	$37.03	$57.09
7 Laborers	36.65	2052.40	56.55	3166.80		
1 Truck Driver (light)	36.50	292.00	55.70	445.60		
1 Paint Striper, T.M.; 120 Gal.		860.40		946.44		
1 Heating Kettle, 115 Gallon		63.00		69.30		
1 Flatbed Truck, Gas, 3 Ton		333.00		366.30		
5 Pickup Trucks, 3/4 Ton		785.00		863.50		
2 Air Compressors, 60 cfm		274.80		302.28		
2 -50' Air Hoses, 3/4"		6.50		7.15		
2 Breakers, Pavement, 60 lb.		19.60		21.56	29.28	32.21
80 L.H., Daily Totals		$5305.10		$7143.33	$66.31	$89.29
Crew B-80						
1 Labor Foreman (outside)	$38.65	$309.20	$59.65	$477.20	$39.71	$60.81
1 Laborer	36.65	293.20	56.55	452.40		
1 Truck Driver (light)	36.50	292.00	55.70	445.60		
1 Equip. Oper. (light)	47.05	376.40	71.35	570.80		
1 Flatbed Truck, Gas, 3 Ton		333.00		366.30		
1 Earth Auger, Truck-Mtd.		425.00		467.50	23.69	26.06
32 L.H., Daily Totals		$2028.80		$2779.80	$63.40	$86.87
Crew B-80A						
3 Laborers	$36.65	$879.60	$56.55	$1357.20	$36.65	$56.55
1 Flatbed Truck, Gas, 3 Ton		333.00		366.30	13.88	15.26
24 L.H., Daily Totals		$1212.60		$1723.50	$50.52	$71.81
Crew B-80B						
3 Laborers	$36.65	$879.60	$56.55	$1357.20	$39.25	$60.25
1 Equip. Oper. (light)	47.05	376.40	71.35	570.80		
1 Crane, Flatbed Mounted, 3 Ton		248.40		273.24	7.76	8.54
32 L.H., Daily Totals		$1504.40		$2201.24	$47.01	$68.79
Crew B-80C						
2 Laborers	$36.65	$586.40	$56.55	$904.80	$36.60	$56.27
1 Truck Driver (light)	36.50	292.00	55.70	445.60		
1 Flatbed Truck, Gas, 1.5 Ton		270.20		297.22		
1 Manual Fence Post Auger, Gas		8.00		8.80	11.59	12.75
24 L.H., Daily Totals		$1156.60		$1656.42	$48.19	$69.02
Crew B-81						
1 Laborer	$36.65	$293.20	$56.55	$452.40	$41.03	$62.67
1 Equip. Oper. (medium)	48.90	391.20	74.15	593.20		
1 Truck Driver (heavy)	37.55	300.40	57.30	458.40		
1 Hydromulcher, T.M., 3000 Gal.		340.40		374.44		
1 Truck Tractor, 220 H.P.		366.40		403.04	29.45	32.40
24 L.H., Daily Totals		$1691.60		$2281.48	$70.48	$95.06
Crew B-81A						
1 Laborer	$36.65	$293.20	$56.55	$452.40	$36.58	$56.13
1 Truck Driver (light)	36.50	292.00	55.70	445.60		
1 Hydromulcher, T.M., 600 Gal.		132.60		145.86		
1 Flatbed Truck, Gas, 3 Ton		333.00		366.30	29.10	32.01
16 L.H., Daily Totals		$1050.80		$1410.16	$65.67	$88.14
Crew B-82						
1 Laborer	$36.65	$293.20	$56.55	$452.40	$41.85	$63.95
1 Equip. Oper. (light)	47.05	376.40	71.35	570.80		
1 Horiz. Borer, 6 H.P.		83.00		91.30	5.19	5.71
16 L.H., Daily Totals		$752.60		$1114.50	$47.04	$69.66

Crew No.	Bare Costs Hr.	Bare Costs Daily	Incl. Subs O&P Hr.	Incl. Subs O&P Daily	Cost Per Labor-Hour Bare Costs	Cost Per Labor-Hour Incl. O&P
Crew B-82A						
1 Laborer	$36.65	$293.20	$56.55	$452.40	$41.85	$63.95
1 Equip. Oper. (light)	47.05	376.40	71.35	570.80		
1 Flatbed Truck, Gas, 3 Ton		333.00		366.30		
1 Flatbed Trailer, 25 Ton		113.60		124.96		
1 Horiz. Dir. Drill, 20k lb. Thrust		658.40		724.24	69.06	75.97
16 L.H., Daily Totals		$1774.60		$2238.70	$110.91	$139.92
Crew B-82B						
2 Laborers	$36.65	$586.40	$56.55	$904.80	$40.12	$61.48
1 Equip. Oper. (light)	47.05	376.40	71.35	570.80		
1 Flatbed Truck, Gas, 3 Ton		333.00		366.30		
1 Flatbed Trailer, 25 Ton		113.60		124.96		
1 Horiz. Dir. Drill, 30k lb. Thrust		936.20		1029.82	57.62	63.38
24 L.H., Daily Totals		$2345.60		$2996.68	$97.73	$124.86
Crew B-82C						
2 Laborers	$36.65	$586.40	$56.55	$904.80	$40.12	$61.48
1 Equip. Oper. (light)	47.05	376.40	71.35	570.80		
1 Flatbed Truck, Gas, 3 Ton		333.00		366.30		
1 Flatbed Trailer, 25 Ton		113.60		124.96		
1 Horiz. Dir. Drill, 50k lb. Thrust		1246.00		1370.60	70.53	77.58
24 L.H., Daily Totals		$2655.40		$3337.46	$110.64	$139.06
Crew B-82D						
1 Equip. Oper. (light)	$47.05	$376.40	$71.35	$570.80	$47.05	$71.35
1 Mud Trailer for HDD, 1500 Gal.		374.80		412.28	46.85	51.53
8 L.H., Daily Totals		$751.20		$983.08	$93.90	$122.89
Crew B-83						
1 Tugboat Captain	$48.90	$391.20	$74.15	$593.20	$42.77	$65.35
1 Tugboat Hand	36.65	293.20	56.55	452.40		
1 Tugboat, 250 H.P.		889.40		978.34	55.59	61.15
16 L.H., Daily Totals		$1573.80		$2023.94	$98.36	$126.50
Crew B-84						
1 Equip. Oper. (medium)	$48.90	$391.20	$74.15	$593.20	$48.90	$74.15
1 Rotary Mower/Tractor		364.20		400.62	45.52	50.08
8 L.H., Daily Totals		$755.40		$993.82	$94.42	$124.23
Crew B-85						
3 Laborers	$36.65	$879.60	$56.55	$1357.20	$39.28	$60.22
1 Equip. Oper. (medium)	48.90	391.20	74.15	593.20		
1 Truck Driver (heavy)	37.55	300.40	57.30	458.40		
1 Aerial Lift Truck, 80'		643.00		707.30		
1 Brush Chipper, 12", 130 H.P.		396.60		436.26		
1 Pruning Saw, Rotary		6.55		7.21	26.15	28.77
40 L.H., Daily Totals		$2617.35		$3559.57	$65.43	$88.99
Crew B-86						
1 Equip. Oper. (medium)	$48.90	$391.20	$74.15	$593.20	$48.90	$74.15
1 Stump Chipper, S.P.		162.10		178.31	20.26	22.29
8 L.H., Daily Totals		$553.30		$771.51	$69.16	$96.44
Crew B-86A						
1 Equip. Oper. (medium)	$48.90	$391.20	$74.15	$593.20	$48.90	$74.15
1 Grader, 30,000 Lbs.		707.00		777.70	88.38	97.21
8 L.H., Daily Totals		$1098.20		$1370.90	$137.28	$171.36

32 92 19.14 Seeding, Athletic Fields	Crew	Daily Output	Labor-Hours	Unit	2014 Bare Costs Material	Labor	Equipment	Total	Total Incl O&P
0010 **SEEDING, ATHLETIC FIELDS**									
0020 Seeding, athletic fields, athletic field mix, 8#/M.S.F. push spreader	1 Clab	8	1	M.S.F.	17.60	36.50		54.10	76
0100 Tractor spreader	B-66	52	.154		17.60	7.25	4.99	29.84	36
0200 Hydro or air seeding, with mulch and fertilizer	B-81	80	.300		19.35	12.30	8.85	40.50	50
0400 Birdsfoot trefoil, .45#/M.S.F., push spreader	1 Clab	8	1		12	36.50		48.50	69.50
0500 Tractor spreader	B-66	52	.154		12	7.25	4.99	24.24	29.50
0600 Hydro or air seeding, with mulch and fertilizer	B-81	80	.300		23	12.30	8.85	44.15	54
0800 Bluegrass, 4#/M.S.F., common, push spreader	1 Clab	8	1		14.30	36.50		50.80	72.50
0900 Tractor spreader	B-66	52	.154		14.30	7.25	4.99	26.54	32.50
1000 Hydro or air seeding, with mulch and fertilizer	B-81	80	.300		23.50	12.30	8.85	44.65	54.50
1100 Baron, push spreader	1 Clab	8	1		16.80	36.50		53.30	75
1200 Tractor spreader	B-66	52	.154		16.80	7.25	4.99	29.04	35
1300 Hydro or air seeding, with mulch and fertilizer	B-81	80	.300		23	12.30	8.85	44.15	54
1500 Clover, 0.67#/M.S.F., white, push spreader	1 Clab	8	1		2.13	36.50		38.63	59
1600 Tractor spreader	B-66	52	.154		2.13	7.25	4.99	14.37	18.85
1700 Hydro or air seeding, with mulch and fertilizer	B-81	80	.300		11.70	12.30	8.85	32.85	41.50
1800 Ladino, push spreader	1 Clab	8	1		2.21	36.50		38.71	59
1900 Tractor spreader	B-66	52	.154		2.21	7.25	4.99	14.45	18.95
2000 Hydro or air seeding, with mulch and fertilizer	B-81	80	.300		9.70	12.30	8.85	30.85	39
2200 Fescue 5.5#/M.S.F., tall, push spreader	1 Clab	8	1		10.80	36.50		47.30	68.50
2300 Tractor spreader	B-66	52	.154		10.80	7.25	4.99	23.04	28.50
2400 Hydro or air seeding, with mulch and fertilizer	B-81	80	.300		35.50	12.30	8.85	56.65	67.50
2500 Chewing, push spreader	1 Clab	8	1		6	36.50		42.50	63
2600 Tractor spreader	B-66	52	.154		6	7.25	4.99	18.24	23
2700 Hydro or air seeding, with mulch and fertilizer	B-81	80	.300		19.80	12.30	8.85	40.95	50.50
2900 Crown vetch, 4#/M.S.F., push spreader	1 Clab	8	1		80	36.50		116.50	145
3000 Tractor spreader	B-66	52	.154		80	7.25	4.99	92.24	105
3100 Hydro or air seeding, with mulch and fertilizer	B-81	80	.300		110	12.30	8.85	131.15	150
3300 Rye, 10#/M.S.F., annual, push spreader	1 Clab	8	1		8.80	36.50		45.30	66
3400 Tractor spreader	B-66	52	.154		8.80	7.25	4.99	21.04	26
3500 Hydro or air seeding, with mulch and fertilizer	B-81	80	.300		19.35	12.30	8.85	40.50	50
3600 Fine textured, push spreader	1 Clab	8	1		12	36.50		48.50	69.50
3700 Tractor spreader	B-66	52	.154		12	7.25	4.99	24.24	29.50
3800 Hydro or air seeding, with mulch and fertilizer	B-81	80	.300		26.50	12.30	8.85	47.65	57.50
4000 Shade mix, 6#/M.S.F., push spreader	1 Clab	8	1		9.30	36.50		45.80	67
4100 Tractor spreader	B-66	52	.154		9.30	7.25	4.99	21.54	27
4200 Hydro or air seeding, with mulch and fertilizer	B-81	80	.300		20.50	12.30	8.85	41.65	51
4400 Slope mix, 6#/M.S.F., push spreader	1 Clab	8	1		10.40	36.50		46.90	68
4500 Tractor spreader	B-66	52	.154		10.40	7.25	4.99	22.64	28
4600 Hydro or air seeding, with mulch and fertilizer	B-81	80	.300		26	12.30	8.85	47.15	57
4800 Turf mix, 4#/M.S.F., push spreader	1 Clab	8	1		10.90	36.50		47.40	68.50
4900 Tractor spreader	B-66	52	.154		10.90	7.25	4.99	23.14	28.50
5000 Hydro or air seeding, with mulch and fertilizer	B-81	80	.300		27.50	12.30	8.85	48.65	58.50
5200 Utility mix, 7#/M.S.F., push spreader	1 Clab	8	1		9.30	36.50		45.80	67
5300 Tractor spreader	B-66	52	.154		9.30	7.25	4.99	21.54	27
5400 Hydro or air seeding, with mulch and fertilizer	B-81	80	.300		35	12.30	8.85	56.15	67
5600 Wildflower, .10#/M.S.F., push spreader	1 Clab	8	1		1.80	36.50		38.30	58.50
5700 Tractor spreader	B-66	52	.154		1.80	7.25	4.99	14.04	18.50
5800 Hydro or air seeding, with mulch and fertilizer	B-81	80	.300		9.90	12.30	8.85	31.05	39.50
7000 Apply fertilizer, 800 lb./acre	B-66	4	2	Ton	1,000	94	65	1,159	1,325
7025 Fertilizer, mechanical spread	1 Clab	1.75	4.571	Acre	5.70	168		173.70	265
7100 Apply mulch, see Section 32 91 13.16									

APPENDIX K

EPA FORM 7630 - FARR INITIAL/ANNUAL SOURCE REGISTRATION

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION 10 FEDERAL AIR RULES FOR INDIAN RESERVATIONS

INITIAL / ANNUAL SOURCE REGISTRATION

Applicability: Air pollution sources regulated by 40 Code of Federal Regulations Part 49.138.

Please check box to show how you are using this form. ☐ **Initial Registration** ☐ **Annual Registration**

INSTRUCTIONS: Complete applicable parts of Sections A, B, C and D.

A. GENERAL INFORMATION

Identifying Information

Source (Facility) Name_____

Air Quality Operating Permit No. (if applicable)_____

Nature of the Business_____

Telephone (_____) _____-_____ Facsimile (_____)_____-_____

Source Physical Address: Street _____

City_____ County_____State _____ ZIP _____-_____

Indian Reservation Name_____

Compliance Contact _____Title_____

(Local Person responsible for source compliance with this rule)

Telephone (_____) _____-_____ Ext. _____ Facsimile (_____)_____-_____

Contact Person Mailing Address: Street (or PO Box #) _____

City_____ County_____ State _____ ZIP _____-_____

e.mail address _____

A. GENERAL INFORMATION Cont.

Owner's Name_____

Telephone (_____) _____-_____ Ext. _____ Facsimile (_____)_____-_____

Owner Mailing Address: Street (or PO Box #) _____

City_____ County_____ State _____ ZIP _____-_____

e.mail address _____

Contact _____Title_____

(Person authorized to receive requests for data and information)

Telephone (_____) _____-_____ Ext. _____ Facsimile (_____)_____-_____

Contact Person Mailing Address: Street (or PO Box #) _____

City_____ County_____ State _____ ZIP _____-_____

e.mail address _____

Operator's Name_____ (If different from Owner).

Telephone (_____) _____-_____ Ext. _____ Facsimile (_____)_____-_____

Operator's Mailing Address: Street (or PO Box #) _____

City_____ County_____ State _____ ZIP _____-_____

e.mail address _____

Contact _____Title_____

(Person authorized to receive requests for data and information)

Telephone (_____) _____-_____ Ext. _____ Facsimile (_____)_____-_____

Contact Person Mailing Address: Street (or PO Box #) _____

City_____ County_____ State _____ ZIP _____-_____

e.mail address _____

B. ATTACHMENTS

Include all of the following information as attachments to this form

- ☐ Process flow chart identifying all processing, combustion, handling, storage, and emission control equipment
- ☐ Narrative description of the production processes and air pollution control equipment
- ☐ List of all emission units and air pollution generating activities; include model and serial numbers for portable equipment
- ☐ Plot Plan
  - ✓ Location of all emission units and air pollution generating activities
  - ✓ Property lines for the air pollution source
  - ✓ Elevation above grade for each emission release point
  - ✓ Distance and direction to nearest residential or commercial property
- ☐ Type and quantity of fuels, including sulfur content of fuels, used on a daily, annual and maximum hourly basis
- ☐ Type and quantity of raw materials used or final product produced on a daily, annual and maximum hourly basis
- ☐ Typical operating schedule, including number of hours per day, number of days per week and number of weeks per year
- ☐ List of estimated efficiency of air pollution control equipment under present or anticipated operating conditions
- ☐ Estimates of the total actual emissions from the air pollution source for the following air pollutants: particulate matter, PM_{10}, $PM_{2.5}$, sulfur oxides (SO_x), nitrogen oxides (NO_x), carbon monoxide (CO), volatile organic compound (VOC), lead (Pb) and lead compounds, ammonia (NH_3), fluorides (gaseous and particulate), sulfuric acid mist (H_2SO_4), hydrogen sulfide (H_2S), total reduced sulfur (TRS) and reduced sulfur compounds, including all calculations for the estimates
- ☐ Other (provide details)

Confidential Treatment of Information

You may assert a business confidentiality claim covering any portion of the submitted information as provided in 40 C.F.R. part 2, subpart B. Please submit any information you claim as confidential business information separately, along with your claim of confidentiality. Note that emissions data and information necessary to determine emissions is not entitled to confidential treatment. Failure to assert a claim in the manner described in 40 C.F.R. part 2, subpart B allows the submitted information to be released to the public without further notice. Information subject to a business confidentiality claim may be disclosed by EPA only to the extent set forth in the above-cited regulations.

C. TABLE OF ANNUAL EMISSIONS

The following table should be completed by inserting estimates of the total actual emissions in tons/year for all pollutants contained in your worksheet stated above.

Pollutant	**Total Emissions**
PM	
PM_{10}	
$PM_{2.5}$	
SOx	
NOx	
CO	
VOC	
Pb	
NH_3	
Fluorides	
H_2SO_4	
H_2S	
TRS	
RSC	

Definition of acronyms

PM	Particulate Matter
PM_{10}	Particulate Matter less than 10 microns in size
$PM_{2.5}$	Particulate Matter less than 2.5 microns in size
SOx	Sulfur Oxides
NOx	Nitrogen Oxides
CO	Carbon Monoxide
VOC	Volatile Organic Compound
Pb	Lead and lead compounds
NH_3	Ammonia
Fluorides	Gaseous and particulates
H_2SO_4	Sulfuric Acid Mist
H_2S	Hydrogen Sulfide
TRS	Total Reduced Sulfur
RSC	Reduced Sulfur Compounds

D. OWNER OR OPERATOR CERTIFICATION OF TRUTH, ACCURACY AND COMPLETENESS

Certifying Official Information: Identify the certifying official and provide contact information.

Name: (Last)_____(First)_____(Middle)_____

Title_____ _____

Street or P.O. Box_____

City___ _____County_____State_____ZIP_____-_____

Telephone (____)_____-_____ Ext._____ Facsimile (____)_____-_____

e.mail address_____

Certification of Truth, Accuracy and Completeness: The Certifying Official must sign this statement after the form is completed.

I certify that, based on information and belief formed after reasonable inquiry, the statements and information contained in these documents are true, accurate and complete.

Name (signed)_____

Name (printed or typed)_____Date____/____/_____

Return completed forms and attachments to:

EPA Region 10 (OAWT-107)

FARR Registration Coordinator

Office of Air Waste and Toxics

1200 Sixth Avenue

Seattle, WA 98101

The public reporting and recordkeeping burden for this collection of information is estimated at 5.61 hours on average Send comments on the Agency's need for this information, the accuracy of the provided burden estimates, and any suggested methods for minimizing respondent burden, including through the use of automated collection techniques to the Director, Collection Strategies Division, US Environmental Protection Agency (2822T), 1200 Pennsylvania Ave., NW, Washington, D.C. 20460. Include the OMB control number 2060-0558 in any correspondence. Do not send the completed form to this address.

FARR REGISTRATION APPLICATION INSTRUCTIONS

GENERAL INFORMATION

Identifying Information

FACILITY

Enter the name and the correct street address or other physical location of the facility (e.g. Acme Road or Building 3, XYZ Industrial Park) together with telephone and facsimile numbers.

Provide a brief description of the nature of the business conducted by the facility.

Provide name of the Indian Reservation on which the facility is located.

Provide name and contact information for the facility contact person responsible for source compliance with this rule.

OWNER and OPERATOR

Enter the name of the owner and operator of the facility for which this application is being prepared. For individual owners, list the full name (last, middle initial, first). For multiple ownership where no legal business partnership exists, provide the name and mailing address, if different, of each individual owner using a backslash (\) to separate data for each owner. For corporations, include divisions or subsidiary name, if any. Enter the complete mailing address of the owner and operator.

Provide name and contact information for the contact person authorized to receive requests for data and information.

PROCEDURE FOR ESTIMATING EMISSIONS

The initial registration and annual registration must include an estimate of actual emissions taking into account equipment, operating conditions, and air pollution control measures. For an existing air pollution source that operated during the calendar year preceding the initial registration or annual registration submittal, the actual emissions are the actual rate of emissions for the preceding calendar year and must be calculated using the actual operating hours, production rates, in-place control equipment, and types of materials processed, stored, or combusted during the preceding calendar year. For a new air pollution source that is submitting its initial registration, the actual emissions are the estimated actual rate of emissions for the current calendar year. The emission estimates must be based upon actual test data or, in the absence of such data, upon procedures acceptable to the Regional Administrator. Any emission estimates submitted to the Regional Administrator must be verifiable using currently accepted engineering criteria. The following procedures are generally acceptable for estimating emissions from air pollution sources:

(i) Source-specific emission tests;
(ii) Mass balance calculations;
(iii) Published, verifiable emission factors that are applicable to the source;
(iv) Other engineering calculations; or
(v) Other procedures to estimate emissions specifically approved by the Regional Administrator.

APPENDIX L

GENERAL AIR QUALITY PERMIT FOR NEW OR MODIFIED TRUE MINOR SOURCE STONE QUARRYING , CRUSHING, AND SCREENING FACILITIES IN INDIAN COUNTRY

United States Environmental Protection Agency
General Permit for New or Modified Minor Sources of Air Pollution in Indian Country

http://www.epa.gov/air/tribal/tribalnsr.html

General Air Quality Permit for New or Modified True Minor Source Stone Quarrying , Crushing, and Screening Facilities in Indian Country

Information about this General Permit:

Applicability
Pursuant to the provisions of the Clean Air Act (CAA), Subchapter I, part D and 40 CFR part 49, subpart C, this permit authorizes the construction or modification and the operation of each stationary and portable stone quarrying, rock crushing, and screening plant for which a reviewing authority issues an Approval of the Request for Coverage (permitted source).

Eligibility
To be eligible for coverage under this general permit, the permitted source must qualify as a true minor source as defined in 40 CFR 49.152.

Request for Coverage
Requirements for submitting a Request for Coverage are contained in Section 7 of this general permit.

Incorporation of Documents
The information contained in each reviewing authority's Approval of the Request of Coverage is hereby incorporated into this general permit.

Termination
Section 6 of this general permit addresses a reviewing authority's ability to revise, revoke and reissue, or terminate this general permit. It also addresses the reviewing authority's ability to terminate an individual permitted source's Approval of the Request for Coverage under this general permit.

Definitions
The terms used herein shall have the meaning as defined in 40 CFR 49.152, unless otherwise defined in Attachment B of this permit. If a term is not defined, it shall be interpreted in accordance with normal business use.

Permit Terms and Conditions

The following applies to each permittee and permitted source with respect to only the affected emissions units and any associated air pollution control technologies in that permitted source's Approval of the Request for Coverage.

Section 1: General Provisions

1. *Construction and Operation*
   The permittee shall construct or modify and shall operate the affected emissions units and any associated air pollution control technologies in compliance with this permit and all other applicable federal air quality regulations; and in a manner consistent with representations made by the permittee in the Request for Coverage, to the extent the reviewing authority relies upon these representations in issuing the Approval of the Request for Coverage.

2. *Locations*
   This permit only authorizes the permittee to construct or modify and to operate the permitted source in the location(s) listed in the reviewing authority's Approval of the Request for Coverage for that permitted source.

3. *Liability*
   This permit does not release the permittee from any liability for compliance with other applicable federal and tribal environmental laws and regulations, including the CAA.

4. *Severability*
   The provisions of this permit are severable. If any portion of this permit is held invalid, the remaining terms and conditions of this permit shall remain valid and in force.

5. *Compliance*
   The permittee must comply with all provisions of this permit, including emission limitations that apply to the affected emissions units at the permitted source. Noncompliance with any permit provision is a violation of the permit and may constitute a violation of the CAA; is grounds for an enforcement action; and is grounds for the reviewing authority to revoke the Approval of the Request for Coverage and terminate the permitted source's coverage under this general permit.

6. *National Ambient Air Quality Standards (NAAQS)/Prevention of Significant Deterioration (PSD) Protection*
   The permitted source must not cause or contribute to a NAAQS violation or, in an attainment area, must not cause or contribute to a PSD increment violation.

7. *Unavailable Defense*
   It is not a defense for the permittee in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the provisions of this permit.

8. *Property Rights*
   The permit does not convey any property rights of any sort or any exclusive privilege.

9. *Information Requests*
   You, as the permittee, shall furnish to the reviewing authority, within a reasonable time, any information that the reviewing authority may request in writing to determine whether cause exists for revising, revoking and reissuing, or terminating the permit or to determine compliance with the permit. For any such information claimed to be confidential, the permittee must submit a claim of confidentiality in accordance with 40 CFR part 2 subpart B.

10. *Inspection and Entry*
    Upon presentation of proper credentials, the permittee must allow a representative of the reviewing authority to:
    a. Enter upon the premises where a permitted source is located or emissions-related activity is conducted or where records are required to be kept under the conditions of the permit;
    b. Have access to and copy, at reasonable times, any records that are required to be kept under the conditions of the permit;
    c. Inspect, during normal business hours or while the permitted source is in operation, any facilities, equipment (including monitoring and air pollution control equipment), practices or operations regulated or required under the permit;
    d. Sample or monitor, at reasonable times, substances or parameters for the purpose of assuring compliance with the permit or other applicable requirements and
    e. Record any inspection by use of written, electronic, magnetic and photographic media.

11. *Posting of Coverage*
    This general permit, and the most current Approval of the Request for Coverage for the permitted source, must be posted prominently at the facility, and each affected emissions unit and any associated air pollution control technology must be labeled with the identification number listed in the Approval of the Request for Coverage for that permitted source.

12. *Duty to Obtain Source-specific Permit*
    If the reviewing authority intends to terminate a permitted source's coverage under this general permit for cause as provided in Section 6 of this general permit, then the permittee shall apply for and obtain a source-specific as required by the reviewing authority.

13. *Credible Evidence*
    For the purpose of establishing whether the permittee violated or is in violation of any requirement of this permit, nothing shall preclude the use, including the exclusive use, of any credible evidence or information relevant to whether a permitted source would have been in compliance with applicable requirements if the permittee had performed the appropriate performance or compliance test or procedure.

14. *Setbacks*
    The permitted source shall not locate less than 150 feet from the nearest property boundary and not less than 1,000 feet from the nearest residence.

Section 2: Emission Limitations and Standards

15. The permittee shall maintain and operate each affected emissions unit, including any associated air pollution control equipment, in a manner consistent with good air pollution control practices for minimizing

emissions of New Source Review regulated pollutants and considering the manufacturer's recommended operating procedures at all times, including periods of startup, shutdown, maintenance and malfunction. The reviewing authority will determine whether the permittee is using acceptable operating and maintenance procedures based on information available to the reviewing authority which may include, but is not limited to, monitoring results, opacity observations, review of operating and maintenance procedures, and inspection of the permitted source.

16. Maximum raw material throughput shall not exceed 10,500,000 tons in any continuous rolling 12-month period.

17. Fuel combustion in stationary internal combustion engines shall be limited to diesel and biodiesel.

18. Diesel and biodiesel shall contain no more than 0.0015 percent sulfur by weight.

19. The combined fuel consumption in all engines and generators, excluding nonroad mobile engines, shall not exceed the following amounts in any continuous rolling 12-month period:
    a. 310,000 gallons if the permitted source is located in an ozone attainment area or a marginal or moderate ozone nonattainment area;
    b. 153,000 gallons if the permitted source is located in a serious ozone nonattainment area;
    c. 80,000 gallons if the permitted source is located in a severe ozone nonattainment area; or
    d. 30,000 gallons if the permitted source is located in an extreme ozone nonattainment area.

20. Emissions from all crushers, screens, drop points, and other possible release points shall be controlled by wet suppression.

21. Fugitive emissions from stone quarrying, rock crushing, and screening operations shall not exceed:
    a. 12 percent opacity for crushers; and
    b. 7 percent opacity, at other affected emissions units.

22. Truck dumping of nonmetallic minerals into any screening operation, feed hopper, or crusher is exempt from the emission limits in condition 21.

23. The permittee shall comply with the fugitive dust control plan in Attachment C.

24. Each affected compression ignition engine, excluding nonroad mobile engines, shall comply with the following limitations and standards:
    a. Each compression ignition engine that commenced construction on or after June 12, 2006 must be certified to the applicable Tier standards in 40 CFR 89.112 and 40 CFR 1039.101 through 1039.104, for all pollutants, for the same model year and maximum engine power.
    b. Each compression ignition engine that commenced construction before June 12, 2006 shall meet the following standards based on the engine's maximum rated power.

Maximum Engine Power Rating	Emission Standard
≤ 300 HP	(a) Change oil and filter every 1,000 hours of operation or annually, whichever comes first; (b) Inspect air cleaner every 1,000 hours of operation or annually, whichever comes first; (c) Inspect all hoses and belts every 500 hours of operation or annually, whichever comes first, and replace as necessary.
300 < HP ≤ 500	Limit CO to 49 ppm_{vd} @ 15% O_2 OR reduce CO emissions by 70 percent or more. Emissions shall be controlled through the use of an oxidation catalyst. Engines certified to Tier 3 standards in 40 CFR 89.112 are exempt from this limit.
HP > 500	Limit CO to 23 ppm_{vd} @ 15% O_2 OR reduce CO emissions by 70 percent or more. Emissions shall be controlled through the use of an oxidation catalyst. Engines rated at less than or equal to 560kW that are certified to Tier 3 standards in 40 CFR 89.112 are exempt from this limit. Engines rated at greater than 560kW that are certified to Tier 2 standards in 40 CFR 89.122 are exempt from this limit.

25. No affected compression ignition engine, excluding nonroad mobile engines, shall discharge into the atmosphere any gases that exhibit 20 percent opacity or greater averaged over any six-consecutive-minute period.

Section 3: Monitoring and Testing Requirements

26. *Wet Suppression Monitoring*
    At least once during each calendar month the permitted source operates, the permittee shall inspect to check that water is flowing to discharge spray nozzles in the wet suppression system. The owner or operator must initiate corrective action within 24 hours and complete corrective action as expediently as practical.

27. *Visible Emissions Survey*
    At least once during each calendar week in which the permitted source operates, the permittee shall perform a visible emissions survey of all affected emissions units subject to the opacity limit in Condition 24. The survey shall be performed during daylight hours by an individual trained in EPA Method 22 while the permitted source is in operation. If visible emissions are detected during the survey, the permittee shall either:
    a. Take corrective action so that within 24 hours no visible emissions are detected from any affected emissions units while they are in operation; or
    b. Demonstrate compliance with the opacity limit at all affected emissions units that discharged visible emissions during the survey using EPA Method 9 by an individual trained and certified in Method 9.

28. *Fugitive Emissions Survey*
    At least once during each calendar week in which the permitted source operates, the permittee shall survey the facility for visible fugitive emissions. If fugitive emissions are detected crossing the property line, the permittee shall take corrective actions according to the attached fugitive dust control plan.

29. *Initial Performance Test*
    Within 60 days after achieving the maximum production rate at which the permitted source will operate the affected emissions unit(s), but not later than 180 days after the first day of operation after the reviewing authority issues the Approval of the Request for Coverage, the permittee shall perform an initial performance test to verify compliance with the applicable opacity limitations in Condition 21. Performance tests shall be performed:
    a. According to a test plan approved by the reviewing authority;
    b. While the permitted source is operating under typical operating conditions;
    c. Using test Method 9 from 40 CFR part 60, appendix A with the following modifications:
        i. The observer shall stand at least 15 feet from the emissions source;
        ii. The observer shall, when possible, select a position that minimizes interference from other fugitive emissions sources; and
        iii. Water used for wet suppression shall not be confused with particulate matter emissions and is not to be considered a visible emission. When a water mist of this nature is present, the observation of emissions is to be made at a point in the plume where the mist is no longer visible; and
    d. The duration of each Method 9 test shall be at least 30 minutes.

    Compliance with each opacity limit shall be determined based on the average of at least five six-minute averages.

30. *Additional Performance Test(s)*
    Ongoing performance tests meeting the criteria of the initial performance tests in Condition 29 shall be performed whenever required by the reviewing authority but at least every five years.

31. *Performance Test for Engines*
    Within 60 days after achieving the maximum production rate at which the permitted source will operate, but not later than 180 days after the first day of operation after the reviewing authority issues of the Approval of the Request for Coverage the permittee shall perform a performance test to verify compliance with the CO and emission limits in Condition 24, as applicable, as follows:
    a. According to a test plan approved by the reviewing authority;
    b. While the SGRCS plant is operating under typical operating conditions;
    c. Using test methods from 40 CFR part 60, appendix A, or portable analyzers allowed by 40 CFR part 63, subpart ZZZZ, unless alternative methods are approved by the reviewing authority in writing in advance of the test;
    d. While the catalyst inlet temperature and pressure drop are being monitored and recorded;
    e. Upon completion of the performance test, the permittee shall establish the operating range for the catalyst inlet temperature based on a 4-hour average and the pressure drop across the catalyst; and
    f. The permittee shall conduct subsequent performance tests according to this paragraph whenever required by the reviewing authority.

32. *Continuous Parameter Monitoring at Engines*
For each engine greater than 500 hp subject to a CO emission limitation, the permittee shall install, operate, and maintain a continuous parameter monitoring system according to the methods in 40 CFR 63.6625(b) to continuously monitor catalyst inlet temperature. Catalyst temperature data shall be reduced to 4-hour rolling averages. The permittee shall maintain the 4-hour rolling average catalyst inlet temperature within the operating parameter established during the most recent performance test.

33. *Pressure Drop Monitoring at Engines*
For each engine greater than 500 hp subject to a CO emission limitation the permittee shall monitor the pressure drop across the catalyst on a monthly basis. The permittee shall ensure the pressure drop across the catalyst is within the operating parameter established during the most recent performance test.

Section 4: Recordkeeping Requirements

34. The permittee shall maintain all records required to be kept by this permit for at least five years from the date of origin, unless otherwise stated, either onsite or at a convenient location, such that they can be delivered to the reviewing authority within 24 hours of a request.

35. The permit application and all documentation supporting that application shall be maintained by the permittee for the duration of time the affected emissions unit(s) is covered under this permit.

36. The amounts of crushed rock, stone, sand, and gravel produced each month and continuous rolling 12-month period shall be recorded.

37. The types and quantities of fuel combusted engines and generators shall be recorded each month and continuous rolling 12-month period.

38. The dates and results of each wet suppression system monitoring performed pursuant to Condition 26, any corrective action taken as a result of each survey, and the result of any corrective action taken shall be recorded.

39. The dates and results of each visible emissions survey performed pursuant to Condition 27 shall be recorded. At a minimum, records shall include:
    a. The name of the person, company or entity conducting the survey;
    b. Whether visible emissions were detected from any affected emissions unit;
    c. Any corrective action taken;
    d. The result of any corrective action; and
    e. The results of any Method 9 tests performed.

40. The dates and results of each fugitive emissions survey performed pursuant to Condition 28, any corrective action taken as a result of each survey, and the result of any corrective action taken shall be recorded.

41. The results of each performance test conducted pursuant to Condition 29, 30, or 31 shall be recorded. At a minimum, the permittee shall maintain records of:
    a. The date of each test;
    b. Each test plan;

c. Any documentation required to approve an alternate test method;
d. Test conditions, including the amounts and types of products produced and the operating parameters of any control equipment;
e. The results of each test; and
f. The name of the company or entity conducting the analysis.

42. A log of all maintenance activities conducted on each engine, excluding nonroad mobile engines, shall be recorded.

43. The date, time, and duration of each deviation from the established catalyst operating parameters for each engine, corrective actions taken to return the equipment to normal operation and the results of any corrective action taken shall be recorded.

Section 5: Notification and Reporting Requirements

44. *Notification of construction or modification, and operations*
The permittee shall submit a written or electronic notice to the reviewing authority within 30 days from when the permittee begins actual construction, and when the permittee begins operations or resumes operation.

45. *Notification of Relocation*
When a permittee intends to relocate the permitted source to an alternate location contained in the Approval of the Request for Coverage, then the permittee must notify the reviewing authority electronically or in writing within 30 days before or after such relocation. The notification must identify the owner, the current location, and the new location of the permitted source.

46. *Notification of Change in Ownership*
If the permitted source changes ownership, then the permittee must submit a written or electronic notice to the reviewing authority within 90 days before or after the change in ownership is effective. In the report, the permittee must provide the reviewing authority a written agreement containing a specific date for transfer of ownership, and an effective date on which the new owner assumes partial and/ or full coverage and liability under this permit. The submittal must identify the previous owner, and update the name, street address, mailing address, contact information, and any other information about the permitted source if it would change as a result of the change of ownership. The permittee shall ensure that the permitted source remains in compliance with the general permit during any such transfer of ownership.

47. *Notification of Closure*
The permittee must submit a report of any permanent or indefinite closure to the reviewing authority in writing within 90 days after the cessation of all operations at the permitted source. The notification must identify the owner, the current location, and the last operating location of the permitted source. It is not necessary to submit a report of closure for regular, seasonal closures.

48. *Annual Reports*
The permittee shall submit an annual report on or before March 15 of each calendar year to the reviewing authority. The annual report shall cover the period from January 1 to December 31 of the previous calendar year and shall include:

a. An evaluation of the permitted source's compliance status with the requirements in Section 2 for each location in which the permitted source located during the calendar year;
b. Summaries of the required monitoring and recordkeeping in Sections 3 and 4; and
c. Summaries of deviation reports submitted pursuant to Condition 49.

49. *Deviation Reports*
The permittee shall promptly report to the reviewing authority any deviations from permit requirements including deviations attributable to upset conditions. Deviation reports shall include:
a. The identity of affected emissions unit where the deviation occurred.
b. The nature of the deviation;
c. The length of time of the deviation;
d. The probable cause of the deviation; and
e. Any corrective actions or preventive measures taken as a result of the deviation to minimize emissions from the deviation and to prevent future deviations.
f. For the purposes of this permit, *promptly* shall be defined to mean:
    i. Within 72 hours of discovery for deviations from any opacity or emission limit in Condition 21; or
    ii. Within 30 days after the end of the month in which the permittee discovered the deviation, for all other deviations.

50. *Performance Test Reports*
The permittee shall submit a test report to the reviewing authority within 45 days after the completion of any required performance test. At a minimum, the test report shall include:
a. A description of the affected emissions unit and sampling location(s);
b. The time and date of each test;
c. A summary of test results, reported in units consistent with the applicable standard;
d. A description of the test methods and quality assurance procedures used;
e. A summary of any deviations from the proposed test plan and justification for why the deviation(s) was necessary;
f. The amount of fuel burned, raw material consumed, and product produced during each test run;
g. Operating parameters of the affected emissions unit and control equipment during each test run;
h. Sample calculations of equations used to determine test results in the appropriate units; and
i. The name of the company or entity performing the analysis.

51. *Reporting and Notification Address*
The permittee shall send all required reports to the reviewing authority at the mailing address(es) specified in the Approval of the Request for Coverage.

52. *Signature Verifying Truth, Accuracy, and Completeness*
All reports required by this permit shall be signed by a responsible official as to the truth, accuracy, and completeness of the information. The report must state that, based on information and belief formed after reasonable inquiry, the statements and information are true, accurate, and complete. If the permittee discovers that any reports or notification submitted to the reviewing authority contain false, inaccurate, or incomplete information, the permittee shall notify the reviewing authority immediately and correct or amend the report as soon as practicable.

Section 6: Changes to this General Permit

53. *Revising, Reopening, Revoking and Reissuing, or Terminating for Cause*
    The permit may be revised, reopened, revoked and reissued, or terminated for cause. The filing of a request by you, the permittee, for a permit revision, revocation and re-issuance, or termination, or of a notification of planned changes or anticipated noncompliance does not stay any permit condition. This provision also applies to the documents incorporated by reference.

54. *Terminating Coverage under this Permit*
    The reviewing authority may terminate a previously issued Approval of the Request for Coverage, and thereby terminate that permittee's authorization to construct or modify, and that permitted source's authorization to operate under this general permit for cause as defined in Attachment B. The reviewing authority may provide the permittee with notice of the intent to terminate, and delay the effective date of the termination to allow the permittee to obtain a source specific permit as required by the reviewing authority.

55. *Change in ownership*
    If the permitted source changes ownership, the reviewing authority may change the Approval of the Request of Coverage to reflect the new ownership in accordance with the administrative amendment provisions in 40 CFR 49.159(f).

Section 7: Obtaining Coverage under this General Permit

To obtain coverage under this general permit, an applicant must submit a Request for Coverage to the appropriate reviewing authority for the area in which the permitted source is or will be located. Attachment D contains a list of reviewing authorities and their area of coverage. You must also submit a copy of the Request for Coverage to the Indian governing body for any area in which the permitted source will operate.

If the plant will locate in areas covered by more than one reviewing authority, the applicant need only submit a Request for Coverage to one reviewing authority for all intended locations of operation. The Request for Coverage must contain the information requested in the standard application form for this permit for each location. You must also submit a copy of the Request for Coverage to the Tribe for any area in which the permitted source will operate.

Attachment A: Abbreviations and Acronyms

CAA or the Act	Federal Clean Air Act
CFR	Code of Federal Regulations
CO	carbon monoxide
EPA	United States Environmental Protection Agency
gr/dscf	gram per dry standard cubic foot
NAAQS	National Ambient Air Quality Standards
NSR	New Source Review
PM	particulate matter
PM_{10}	particulate matter with an aerodynamic diameter less than 10 microns
$PM_{2.5}$	particulate matter with an aerodynamic diameter less than 2.5 microns
PSD	Prevention of Significant Deterioration

Attachment B: Definitions

For the purposes of this general permit:

Approval of the Request for Coverage means a reviewing authority's letter granting an applicant's request for construction or modification, and operation of a true minor source under the terms and conditions of this general permit.

Biodiesel means a combustion fuel made from fatty acids of methyl esters that complies with the specifications of ASTM 6751

Cause means with respect to the reviewing authority's ability to terminate a permitted source's coverage under a permit that:

1. The permittee is not in compliance with the provisions of this general permit;
2. The reviewing authority determines that the emissions resulting from the construction or modification of the permitted source significantly contribute to National ambient air quality standard (NAAQS) violations, which are not adequately addressed by the requirements in this general permit;
3. The reviewing authority has reasonable cause to believe that the permittee obtained Approval of the Request for Coverage by fraud or misrepresentation; or
4. The permittee failed to disclose a material fact required by the Request for Coverage or the regulations applicable to the permitted source of which the applicant had or should have had knowledge at the time the permittee submitted the Request for Coverage.

Construction means any physical change or change in the method of operation including fabrication, erection, installation, demolition, or modification of an affected emissions unit that would result in a change of emissions.

Permittee means the owner or operator of a permitted source.

Permitted source means each stationary and portable stone quarrying, rock crushing and screening facility for which a reviewing authority issues an Approval of the Request for Coverage.

Request for Coverage means a permit application that contains all the information required in the standard application form.

Standard cubic foot means a measure of the quantity of a gas equal to a cubic foot of volume at a temperature of 68 °F and a pressure of 29.92 in. Hg

Attachment C: Dust Control Plan

1. *Site Roadways and Plant Yard*
   a. The dust on the site roadways/plant yard shall be controlled by applications of water, calcium chloride or other acceptable fugitive dust control compound approved by the reviewing authority. Applications of dust suppressants shall be done as often as necessary to meet all applicable emission limits.
   b. All paved roadways/plant yards shall be swept as needed between applications.
   c. Any material spillage on roads shall be cleaned up immediately.

2. *Plant*
   a. The drop distance at each transfer point shall be reduced to the minimum the equipment can achieve.
   b. The transfer point from the re-circulating belt to the feed belt shall be equipped with an enclosed chute.

3. *Storage Piles*
   a. Stockpiling of all nonmetallic minerals shall be performed to minimize drop distance and control potential dust problems.
   b. Stockpiles shall be watered on an as needed basis in order to meet the opacity limits. Also, equipment to apply water or dust suppressant shall be available at the site, or on call for use at the site, within a given operating day.

4. *Truck Traffic*
   a. Vehicles shall be loaded to prevent their contents from dropping, leaking, blowing or otherwise escaping. This shall be accomplished by loading so that no part of the load shall come in contact within six (6) inches of the top of any side board, side panel or tail gate; otherwise, the truck shall be tarped.
   b. A speed limit sign of 15 miles-per-hour or lower shall be posted on site so that it is visible to truck traffic.

5. *Corrective Actions*
   If corrective action needs to be taken, the permittee shall consider and use one or more of the following options: adjust the watering and/or sweeping frequencies, reduce drop distances, increase cover, and/or take other actions to reduce fugitive dust emissions.

Attachment D – List of Reviewing Authorities and Areas of Coverage

EPA Region	Address	Area Covered	Phone Number
Region I	1 Congress Street Suite 1100 Boston, MA 02114–2023	Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, and Vermont	888- 372-7341 617-918-1111
Region II	290 Broadway 25th Floor New York, NY 10007–1866	New Jersey, New York, Puerto Rico, and Virgin Islands	877-251-4575
Region III	1650 Arch Street Philadelphia, PA 19103–2187	Delaware, District of Columbia, Maryland, Pennsylvania, Virginia, and West Virginia	800-438-2474 215-814-5000
Region IV	Sam Nunn Atlanta Federal Center 61 Forsyth Street SW 12th Floor Atlanta, GA 30303	Alabama, Florida, Georgia, Kentucky, Mississippi, North Carolina, South Carolina, and Tennessee	800-241-1754 404-562-9000
Region V	77 West Jackson Street Chicago, IL 60604	Illinois, Indiana, Michigan, Minnesota, Ohio, and Wisconsin	800-621-8431 312-353-2000
Region VI	1445 Ross Avenue Dallas, TX 75202	Arkansas, Louisiana, New Mexico, Oklahoma, and Texas	800-887-6063 214-665-2760
Region VII	11201 Renner Boulevard Lenexa, KS 66219	Iowa, Kansas, Missouri, and Nebraska	800-223-0425 913-551-7003
Region VIII	1595 Wynkoop Street Denver, CO 80202–1129	Colorado, Montana, North Dakota, South Dakota, Utah, and Wyoming	800-227-8917 303-312-6312
Region IX	75 Hawthorne Street San Francisco, CA 94105	American Samoa, Arizona, California, Guam, Hawaii, Nevada, and Northern Mariana Islands	866-EPA-9378 415-947-8000
Region X	1200 Sixth Avenue Seattle, WA 98101	Alaska, Idaho, Oregon, and Washington.	800-424-4372 206-553-1200

Attachment C-2

Ford Borrow Area Plan of Operations and Reclamation

Ford Borrow Area Plan of Operation and Reclamation

Revision 1

July 31, 2014

Prepared for:

Dawn Mining Company
PO Box 250
Ford, Washington 99013

and

Newmont USA Limited
6363 South Fiddler's Green Circle
Greenwood Village, Colorado 80111

Prepared By:

MWH Americas, Inc.
3665 JFK Parkway, Bldg 1, Suite 206
Fort Collins, Colorado 80525

TABLE OF CONTENTS

1.0 INTRODUCTION 1

2.0 SITE DESCRIPTION 2

2.1 LOCATION AND TOPOGRAPHY 2
2.2 PREVIOUS INVESTIGATIONS 2
2.3 GEOLOGY AND HYDROLOGY 2
2.4 CLIMATE AND VEGETATION 3
2.5 CULTURAL CONSIDERATIONS 3
2.6 PERMITTING 3

3.0 BORROW AREA LAYOUT 4

3.1 CONSTRAINTS ON BORROW AREA LIMITS 4
3.2 BORROW AREA DESCRIPTION 4
3.3 BORROW AREA ACCESS 4
3.4 TRANSPORTATION 5

4.0 BORROW AREA DEVELOPMENT AND OPERATION 6

4.1 BORROW AREA DEVELOPMENT 6
4.2 BORROW AREA OPERATION 6
4.3 DUST CONTROL 7
4.4 RECLAMATION SOIL SALVAGE 7
4.5 STORMWATER MANAGEMENT 8
4.6 CONSTRUCTION-DERIVED WASTE HANDLING AND DISPOSAL 8

5.0 BORROW AREA RECLAMATION 10

5.1 REGRADING AND SOIL PLACEMENT 10
5.2 RE-VEGETATION 10
5.3 LONG-TERM MONITORING AND MAINTENANCE PLAN 11

6.0 REFERENCES 12

APPENDICES

Appendix A Surface Water Analyses

Appendix B Reclamation Cost Estimate

LIST OF ACRONYMS

AASHTO	American Association of State Highway and Transportation Officials
BODR	Basis of Design Report
CFR	Code of Federal Regulations
cy	cubic yard
DMC	Dawn Mining Company LLC
EPA	U.S. Environmental Protection Agency
MM	Midnite Mine Superfund Site
Newmont	Newmont USA Limited
RA	Remedial Action
RCRA	Resource Conservation and Recovery Act
ROD	Record of Decision
SEPA	State Environmental Policy Act
SEQA	State Environmental Quality Act
WDOE	Washington Department of Ecology
WDOH	Washington Department of Health

1.0 INTRODUCTION

This plan presents details for obtaining soil from the Ford Borrow Area for use as a component of soil cover during the remediation of the Midnite Mine Superfund Site (MM). This plan also includes proposed reclamation activities that will be conducted to return the Ford Borrow Area to identified post-operation land use(s). Reclamation of the Ford Borrow Area will be conducted concurrently with the staged excavation of cover soils. It should be noted that the Spokane Tribal Council conditionally approved the Rhoads Borrow area and it is believed that the Rhoads Borrow will provide all the material necessary for the RA. The following discussion is included in this 90% design document as the Ford Borrow area should the Ford Borrow area be required as a replacement for the Rhoads Borrow Area. This borrow design has not been advanced beyond a 60% design component, and has not been submitted to any necessary permitting agencies.

The proposed activities included in this plan include:

- Excavation and removal of cover soils (borrow materials) in stages from the Ford Borrow Area.
- Reclamation of the disturbed areas concurrent with the completion of staged excavation from the borrow area.

The planned remedial actions at MM, as required by the Record of Decision (ROD; EPA, 2006), include consolidating the mining wastes in the open pits and covering the consolidated mining wastes with suitable soils. In addition, cover soils are needed to cover areas where mining wastes will be removed, and for final grading and re-vegetation of the ground surfaces. The Ford Borrow Area was evaluated as a potential borrow material source, based on the available volume and quality of soils. A complete discussion of the characterization of the borrow area is included in the Borrow Source Design Investigation Report (MGC, 2011)

It was estimated in the Record of Decision (ROD) that approximately 700,000 cubic yards (cy) of clean soil from an approved borrow source will be used to provide an estimated three-foot-thick cover over the mine materials disposal area (i.e., the waste containment areas) where mine materials will be consolidated, and to provide a one-foot-thick cover as needed in areas where bedrock is exposed during mine waste cleanup. These clean soils will be used for final grading/contouring and re-vegetation of the overall ground surfaces. Additional details regarding how the cover will be constructed and graded are included in Appendix D – Mine Waste Excavation and Containment of the 60% Basis of Design Report (BODR).

This total volume of cover material necessary for remediation, as estimated in the ROD, was based on material with a significant portion of fine-grained soil, such as the soils identified on the Rhoads Property, located adjacent to the MM. As described in Section 2, the soils identified in the Ford Borrow Area have a lower percentage of fine-grained soil, requiring a thicker cover for similar long-term performance. Therefore, an estimated borrow material volume of 1,500,000 million cubic yards is used for sizing of the Ford Borrow Area described in this plan.

2.0 SITE DESCRIPTION

2.1 LOCATION AND TOPOGRAPHY

The Ford Borrow Area is located in Stevens County on property owned by Dawn Mining Company LLC/Newmont USA Limited (DMC/Newmont) in eastern Washington, approximately 25 air miles northwest of Spokane. The Ford Borrow Area is located in the south ½ of Section 25, Township 28 North, Range 39 East W.M. The potential borrow area is situated in an area of rounded hills, ranging in elevation from approximately 1,800 to 1,880 feet. The borrow area site slopes from south to north, with natural slopes ranging from less than 5 percent to approximately 50 percent.

2.2 PREVIOUS INVESTIGATIONS

The area south of the Dawn Millsite (including the Ford Borrow Area site) has been investigated as a borrow material source for millsite reclamation cover soils on multiple occasions with drilling and test pit excavation. The assessment and evaluation of the Ford Borrow Area as a source for cover soils are summarized in the following documents:

- *Borrow Source Design Investigation Report – Revision 2* (MGC, 2011)
- *Borrow Material Evaluation* (MWH, 2008)
- *Updated Borrow Material Evaluation* (MFG, 2001)

Drawing 3-202 of the BODR summarizes previous geotechnical exploration in the potential Ford Borrow Area site. The drill hole and backhoe trench locations show the minimum depth of sand encountered at these locations.

2.3 GEOLOGY AND HYDROLOGY

As described in MFG (2001), the Dawn Millsite area is a fluvioglacial outwash terrace that drains to the north and west to Chamokane Creek, which is a tributary of the Spokane River. Near Chamokane Creek, the top surface of this terrace is comprised of sandy gravel. In areas away from the edge of this terrace, the gravels are mantled with varying thicknesses of medium-grained alluvial sands. The alluvial sands are the preferred component for MM RA cover material in the millsite area, and are the focus of borrow material investigation for the Ford Borrow Area.

Beneath the fluvioglacial sandy gravel are deposits of lacustrine silts and clays, as well as basalt bedrock. However, these materials are significantly lower in elevation than the anticipated depth of excavation for borrow materials.

The only perennial surface water flow is Chamokane Creek. Due to the relatively permeable soils in the area, there are limited expressions of surface water flow in drainages in the Ford Borrow Area region.

Groundwater flow and quality is monitored by DMC/Newmont at the millsite for compliance with conditions in the DMC Radioactive Materials License with the Washington Department of Health (WDOH). From data presented in MFG (2001) and other documents submitted to WDOH,

groundwater flow in the millsite area is generally from southeast to northwest toward Chamokane Creek. Depths to groundwater in the area north of the potential Ford Borrow Area are below elevation 1,700 feet (approximately 150 feet below ground surface). Drilling in the Ford Borrow Area (MGC, 2011) indicated dry holes at depth of approximately 40 to 50 feet. Groundwater is much deeper than the anticipated borrow excavation depths.

2.4 CLIMATE AND VEGETATION

The climate in the area is characterized by warm, dry summers and moderately moist, cold winters. The mean annual temperature is approximately 47 degrees F, with monthly average temperatures ranging from approximately 30 degrees F in January to 70 degrees F in August. Average annual precipitation at the millsite is approximately 20 inches, and average annual lake evaporation is approximately 36 inches (MFG, 2001).

The late-successional vegetative community in the millsite area is ponderosa pine woodland, with an open overstory of ponderosa pine trees and an understory of perennial grasses, forbs, and shrubs. The ponderosa pine is the dominant species in the site area (MFG, 2001).

2.5 CULTURAL CONSIDERATIONS

A cultural resources survey has been conducted for the millsite borrow area north of the potential Ford Borrow Area. A similar cultural resources survey will be conducted on the potential Ford Borrow Area site, if it is selected for use. Should cultural artifacts be encountered during excavation, excavation operations shall immediately cease and the appropriate agencies will be contacted to determine the appropriate action(s). No further borrow area operations will be performed until written authorization and approval is granted by the appropriate agencies.

2.6 PERMITTING

Borrow area permitting will be done through the appropriate State and County agencies. The permitting status of the Ford Borrow Area is discussed in Appendix M of the BODR. The Ford Borrow Area is on fee land in Stevens County, and has been zoned for resource extraction activities. As part of a Pre-Application Meeting, initial permitting information was submitted to Stevens County by DMC/Newmont in October 2013. This information included a Pre-Application Form, Site Analysis, Project Description, and draft SEPA checklist.

Additional required permits include a Conditional Administrative Use Permit with Stevens County, and a Surface Mining Reclamation Permit with Washington Department of Natural Resources. A Forest Practices Permit will have to be obtained with Washington Department of Natural Resources. In addition, State Environmental Quality Act (SEQA) permitting would be required with a lead state or county regulatory agency. All permitting planning efforts for the Ford Borrow Area were suspended when conditional approval of the Rhoads Borrow Area was received from the Spokane Tribal Council.

3.0 BORROW AREA LAYOUT

The location of the potential Ford Borrow Area is shown on Drawing 3-201 of the BODR. The potential borrow area location is entirely on DMC/Newmont property.

3.1 CONSTRAINTS ON BORROW AREA LIMITS

The potential Ford Borrow Area has been located within a trapezoidal-shaped area of DMC/Newmont property covering approximately 45 acres. Constraints on the layout are listed below.

- Within the DMC/Newmont property boundary.
- Maintaining a minimum distance of 30 feet from the two overhead power lines traversing the site area (on the east and west sides of the potential borrow area site).
- Maintaining a 250-foot wide visual buffer from State Highway 231.
- Keeping a 150-foot buffer from the southern limit of the Dawn Millsite borrow area.

3.2 BORROW AREA DESCRIPTION

The potential Ford Borrow Area layout is shown on Drawing 3-203 of the BODR. The completed borrow area covers approximately 37 acres, with the final grading at the end of excavation shown on Drawing 3-205 of the BODR. The bottom of the borrow area is planned with an excavated surface sloping from south to north at approximately 2 percent. Depths of excavation range from approximately 5 feet to 45 feet. Maximum internal excavated slopes will be 33 percent (3:1) to facilitate re-vegetation.

The north end of the borrow area will be excavated into natural ground at depths ranging from 10 to 25 feet. This depth of excavation will provide capacity for retention of stormwater runoff. The Stormwater Management Manual for Eastern Washington (WDOE, 2004) was used as the basis for evaluation and management of runoff from the borrow area, and recommends that the storage capacity of temporary construction retention basins be sized to store the estimated runoff volume from the 2-year storm event. Due to the anticipated depth of excavation at the downstream (north) end of the Ford Borrow Area, analyses in Appendix A show that runoff can be contained within the borrow area for storms including the 2-year event, as well as runoff from the 100-year, 24-hour event.

The borrow area is planned for development in three stages, concurrent with cover material requirements and scheduling for the MM RA. This is described in more detail in Section 4. If additional borrow material is necessary for the MM RA, the defined borrow area can be excavated deeper or the area to the west (west of the overhead power line and south of the millsite borrow area limits) are potential alternatives.

3.3 BORROW AREA ACCESS

Prior to borrow area development, a temporary haul road will be constructed from State Highway 231 to the Ford Borrow Area site. This temporary haul road is shown on Drawing 3-203 of the BODR. The haul road will include a gravel running surface to reduce dust and sediment transport in surface water running off of the road surface.

The haul road access from State Highway 231 is at the location of a current access road. This access from State Highway 231 is preferred over other locations of access from the highway, due to the existing access features and relatively long site distance. The haul road will be constructed immediately before borrow material is needed during the RA. The haul road will either be reclaimed at the end of borrow material operations or maintained by DMC/Newmont as an access road.

The haul road will be designed and constructed in accordance with American Association of State Highway and Transportation Officials (AASHTO) standards for very low-volume local roads (AASHTO 2001, 2004). This will include designing the road for a maximum speed of 20 mph, with reduced operating speeds as low of 10 mph in steep or curved sections. The haul road will be designed for two-way traffic; grades will be limited to 10 percent, with isolated sections that may be as steep as 12 percent.

Access to the Ford Borrow Area would be limited by a gate at the haul road access from State Highway 231. The site access gate will be closed and locked during non-working hours. If additional limitation on access is required by DMC/Newmont, a four-strand smooth wire fence will be constructed along the perimeter of the Ford Borrow Area to delineate the borrow area boundary and to deter site access except at the gate at the haul road. The fence will be removed following successful reclamation of the borrow area.

3.4 TRANSPORTATION

Transport of borrow material from the Ford Borrow Area to the MM will require over-highway haul trucks. The shortest route to the MM will be on State Highway 231 to Ford, then on the Wellpinit-Ford road through Wellpinit to the MM (a one-way haul distance of approximately 20 miles). From the anticipated schedule outlined in Section 4.2, cover material placement at the MM will take place in three periods. Transport of borrow material from the Ford Borrow Area to the MM would be scheduled to meet the cover placement requirements in these three periods. It is estimated that over-highway haul trucks would be dispatched every three minutes during these scheduled periods from either the Ford Borrow Area or the MM along this travel corridor.

Traffic control will be implemented at the access to Highway 231 and at the turnoff from the Wellpinit-Ford road to the mine access road. The details of the traffic control program will be developed in coordination and cooperation with Tribal, State and County transportation officials.

4.0 BORROW AREA DEVELOPMENT AND OPERATION

The staged layout of the potential Ford Borrow Area is shown on Drawing 3-203 of the BODR, with cross sections through the borrow area shown on Drawings 3-204 of the BODR.

4.1 BORROW AREA DEVELOPMENT

The Ford Borrow area would be developed as outlined below.

- Construction of the haul road to the borrow area site (described in Section 3.3).
- Timber removal and salvage from the borrow area limits.
- Clearing of the next phase of borrow area. Clearing would consist of removing all shrubs, brush, root balls, and non-harvestable timber; with cleared debris chipped or composted to add organic matter to the cover material or reclamation soils.
- Removal and stockpiling of reclamation soil (the upper 1.0 to 1.5 feet of the soil profile). This is described in Section 4.4.
- Excavation of borrow material from the next phase of area.

4.2 BORROW AREA OPERATION

The staged operation of the Ford Borrow Area is anticipated in three phases, as outlined below.

- Phase 1 comprises excavation of the middle section of the borrow area for Pit 4 cover placement. The anticipated Phase 1 volume is approximately 35 percent of the total volume, and would be excavated in approximately three years after RA startup. The current schedule indicates this excavation would occur in 2018.

- Phase 2 comprises the east section of the borrow area for Area 5 and limited Pit 3 area cover placement. The anticipated Phase 2 volume is approximately 25 percent of the total volume, and the current schedule indicates this excavation would occur in 2021.

- Phase 3 comprises the west section of the borrow area for Pit 3 cover placement. The anticipated Phase 2 volume is approximately 40 percent of the total volume, and the current schedule indicates this excavation would occur in 2024.

Borrow material excavation will be performed using typical industrial earthmoving equipment. The equipment may include the following: dozers, scrapers, motor graders, front-end loaders, hydraulic excavators, rubber-tired backhoes, water trucks, and over-highway haul trucks.

All vehicles and equipment will be pressure washed prior to entering the site at the beginning of each construction season to remove noxious weeds, seeds, or contaminants that may be present on the vehicles and equipment used for the borrow area operation.

In addition, all equipment will be inspected on a pre-shift basis to ensure that equipment is in a safe and operable condition. As part of these pre-shift inspections machinery fluid levels (oil, hydraulic fluid, anti-freeze, etc.) and fittings will be inspected and removed from service for repair. Equipment fueling, lubrication, and repair will be conducted at a designated maintenance area.

4.3 DUST CONTROL

Dust control measures will be implemented to suppress fugitive dust. These measures will include:

- Enforcing a 20 mph speed limit on the haul road. Lower speed limits may be necessary to control dust depending on actual day-to-day site conditions. Site supervisory personnel will enforce speed limits. Should equipment operators be observed operating equipment at excessive speeds, appropriate corrective actions will be implemented.
- Applying water and/or biodegradable dust suppressants directly onto soils, work areas, and haul roads. Water or dust suppressants will be applied in sufficient quantity to control dust, but not generate free liquids. Dust suppressant chemical treatments will be used only if necessary and then only after approval by appropriate regulatory agencies.
- In addition, site personnel will be trained and certified to use air opacity observation methods. Such real time observation and comparison methods can be used to determine if operations need to cease in windy conditions in excess of 20 mph.

Borrow material excavation will be conducted concurrently with the capping of the consolidated mining wastes at MM. Borrow material excavation will occur during the summer and early fall seasons (i.e., June through October) when conditions are relatively dry in this area of Washington State and stormwater runoff and sediment transport are less likely.

Dust-suppressant water will be applied directly onto the disturbed areas and work areas with the use of a water truck or other methods of conveyance. Soil-Sement® (polymer emulsion dust suppressant; see Attachment C-1 Appendix F for product information) and/or hydro-mulch/seed will be applied to inactive topsoil and cover soil stockpiles to control fugitive dust. During active stockpile construction, water will be directly applied to the stockpiles by spraying with monitor equipped hoses and water truck water sprays. If water application is insufficient to control dust generation, wind-fencing will be installed to reduce the wind velocity in these areas and suppress dust generation.

Dust levels will be monitored qualitatively by site personnel certified to evaluate visible emissions in accordance with EPA Reference *Method 9 -Visual Determination of Opacity of Emissions from Stationary Sources* and *Method 22 – Visual Determination of Fugitive Emissions From Material Sources and Smoke Emissions From Flares*. A certified individual will be on site any time excavating and haulage activities are occurring to monitor for visible dust. The project goal is for no visible dust to be generated other than within a few feet of an excavator bucket/grader blade or vehicle tire, and for no visible dust to leave the site. The certified individual has the authority to direct site operations to rectify the dust-generating activity (e.g., reduce vehicle speeds, apply water or dust suppressant), and has the authority to stop work if dust generation cannot be controlled.

4.4 RECLAMATION SOIL SALVAGE

As mentioned above, the upper 1.0 to 1.5-foot thickness of the excavated soil profile in the Ford Borrow Area will be salvaged and segregated so that it can be used as growth media during reclamation of the excavated surfaces of the borrow area and associated disturbed areas. This

reclamation soil will be stockpiled along the perimeter of the borrow area or other relatively flat areas of the site away from drainage courses. Stockpile heights will be limited to 20 feet to minimize potential for erosion and sediment generation.

Excavated borrow material may be temporarily stockpiled within the work area in the open borrow-area segment prior to loading the soils to haul trucks for transportation to MM. However, it is expected the bulk of the excavated borrow material will be direct-loaded into haul trucks, thereby minimizing the need to re-load and stockpile borrow material.

The soil stockpile areas will be visually inspected during and following construction for dust generation. Water will be applied to the stockpiles to control any visible dust during active construction/stockpiling activities. Since reclamation activities will be concurrent with the soil borrow activities, soil stockpiles are not expected to remain in place past the end of the specific construction season. However, should any stockpiles remain following a construction season, they will be stabilized by the application of a tackified hydro-mulch cover containing wood fiber and interim vegetative seed species. This hydro-mulch cover will be applied so that a green wood-mulch blanket density is visibly present across the entire soil stockpile surface. Weekly inspections to verify a continuous hydro-mulch blanket is present will be conducted until snow cover is present or interim vegetation has emerged and established.

4.5 STORMWATER MANAGEMENT

The potential Ford Borrow Area is located at the head of a south-to-north drainage, so that run-on into the borrow area is minimal. The borrow area layout and excavation plan results in a retention basin at the north (lower) end of the borrow area. The anticipated depth of excavation in this area provides sufficient capacity to contain the runoff within the borrow area from the 100-year storm (as outlined in Appendix A). This runoff containment capacity is sufficient for all three stages of borrow area operation, as well as after reclamation. Excavation of each phase of the borrow area will progress from north to south (from the low end of the borrow area to the high end of each phase) to maintain this storage capacity throughout borrow area operation.

Sediment control structures will be included along the haul road as necessary. As shown on Drawing 3-203 of the BODR, the haul road will cross one drainage at the east end of the east diversion channel, so that a culvert beneath the haul road is planned at this location. Between there and the borrow area, no other major drainages are crossed.

4.6 CONSTRUCTION-DERIVED WASTE HANDLING AND DISPOSAL

All construction-derived waste materials will be disposed off-site, in accordance with applicable transportation and disposal regulations.

Solid waste will be disposed of at a municipal (Subtitle D) landfill or a construction and demolition waste landfill. Because the excavation activities are limited to work on previously undisturbed property, it is not anticipated that large quantities of hazardous or hazardous-component construction wastes will be generated. However, there may be construction-derived wastes that require special handling and disposal (e.g., waste oil from equipment). The following process will be adhered to regarding construction-waste management:

1. Identify all hazardous wastes in accordance with RCRA procedures (e.g., *Test Methods for the Evaluation of Solid Waste, Physical/Chemical Methods*, SW-846). Alternately the Contractor performing the work may use knowledge of the waste to make this determination. For example, pesticide/herbicide containers and safety data sheets will have handling and disposal information.

2. Waste disposal shall comply with the following:

    - A state or federally regulated hazardous waste management treatment, storage, or disposal facility.
    - A facility permitted, licensed, or registered by a state to manage municipal or industrial solid waste.
    - A facility that uses, reuses, or legitimately recycles the waste (or treats the waste prior to use, reuse, or recycling).
    - A “universal waste” handler or destination facility subject to the universal waste requirements of 40 CFR Part 273. (Waste pesticides/herbicides are classified as RCRA Universal Wastes.)

5.0 BORROW AREA RECLAMATION

This section describes the specific activities that will be implemented to restore the area after borrow material is excavated and removed from the site. The objectives of the reclamation activities are to restore the property's aesthetic qualities and wildlife habitat, including minimizing wind and water erosion from reclaimed surfaces. Site reclamation practices will follow the sequence of activities identified below. The unit costs used in the estimate have been updated from the 60% BODR.

5.1 REGRADING AND SOIL PLACEMENT

After the borrow materials have been excavated from a particular phase, the excavated surfaces will be prepared and re-contoured. Maximum slopes will be 33 percent.

A minimum 1-foot thick layer of reclamation soil will be placed on re-contoured excavation surfaces. The reclamation soil will be placed in a manner that provides an appropriate root zone and seed bed for re-vegetation.

During final topsoil grading, the dozer will be run up and down slopes, establishing dozer track cleat depressions to begin forming the growth medium seed bed, and to assist with soil and debris compression and placement.

It is anticipated that the borrow-area operations in each segment will occur over relatively short periods (e.g., one to three months). As a result, reclamation soil will be stockpiled in each segment for short periods before being replaced. This essentially will result in "live topsoiling" in which the topsoil retains viable seeds and soil organisms and is replaced to the same ecological niche to aid in the re-vegetation process. In addition, reclamation soil will be direct-hauled to the extent possible from borrow area segments where active soil stripping is occurring to borrow area phases that have been recently excavated, and regraded, and are in need of reclamation soil covering.

5.2 RE-VEGETATION

The re-contoured and reclamation soil covered borrow area surfaces will be re-vegetated with the objectives of establishing a self-sustaining vegetative cover that, over time, will mature to replace that which existed prior to the borrow area operations. Re-vegetating the disturbed areas will also minimize erosion of the placed reclamation soil. Re-vegetation will comprise a combination of seeding (or hydroseeding) with native grasses, shrubs, and forbs.

Once initial plant establishment occurs within the first two to three years, the plant community will undergo natural succession as biotic and abiotic processes occur in the re-vegetated area. During this time, plants will mature and species composition will change until a late successional community becomes established on site that will be similar to the surrounding undisturbed community. This process will take decades to occur. It is expected that ponderosa pine seedlings, for example, will grow approximately 12 inches in height per year after their initial volunteer establishment period. At this rate of growth, the trees that are established during re-vegetation would be expected to be 30 feet tall in 30 to 35 years.

5.3 LONG-TERM MONITORING AND MAINTENANCE PLAN

The re-vegetated areas will be inspected each summer season until the sites achieve 60 percent live vegetative cover density with three or more plant species, and 70 percent total cover density that includes live cover and litter using a point count method along a 100 foot transect. Three random transects per acre will be conducted within each disturbed land segment during the summer survey. Surveys will be conducted during each growing season and annual survey reports will be submitted to the appropriate regulatory agency.

The surveys also will include identifying bare ground areas, which are defined as areas greater than 250 square feet containing less than 20 percent live cover and areas containing signs of uncontrolled erosion (e.g., rills and gullies, accumulations of sediment or debris). Bare ground areas exhibiting less than 20 percent live vegetative cover that are identified after three successive seasons will be re-assessed for nutrients and other conditions that could cause vegetative failure. Pending the assessment results, the re-vegetation plan will be amended and the area reworked. Observed rills and gullies will be repaired as soon as practicable, and the area re-seeded and stabilized with either the hydromulch blanket or other erosion control measures such as excelsior matting, jute fabric, noxious-weed free straw or riprap. Areas which meet the defined success criteria after three successive survey seasons will be released from future surveys. The fencing and non-degradable stormwater-control structures will remain in place until the re-vegetation success criteria are met for three successive survey seasons.

In addition to the above surveys, noxious weed surveys will be conducted twice a field season along the disturbed land segments by a qualified biologist. Should noxious weeds be discovered at the site (as defined by either Stevens County or State of Washington), eradication procedures will be taken to eliminate the weed species.

6.0 REFERENCES

American Association of State Highway and Transportation Officials (AASTHO), 2001. *Guidelines for Geometric Design of Very-Low Volume Local Roads (ADT<=400).* American Association of State Highway and Transportation Officials, Washington D.C.

American Association of State Highway and Transportation Officials (AASTHO), 2004. *A Policy on Geometric Design of Highways and Streets.* American Association of State Highway and Transportation Officials, Washington D.C.

Miller Geotechnical Consultants (MGC), 2011. *Borrow Source Design Investigation Report – Revision 2*. Prepared on behalf of Newmont USA Limited and Dawn Mining Company for the U.S. EPA Region 10. May.

MFG, Inc. (MFG), 2001. Appendix J – Updated Borrow Material Evaluation and Appendix K – Report on Vegetation, Root, and Soil Sampling Results in *Integrated Project Schedule for Closure of the Dawn Mining Company Millsite*. Prepared for Dawn Mining Company, November 30.

MWH Americas Inc. (MWH), 2008. Borrow Material Evaluation, Letter submitted to Washington Department of Health, Waste Management Section, September 26.

U. S. Environmental Protection Agency (EPA), 2006. *Midnite Mine Superfund Site Spokane Indian Reservation, Washington Record of Decision*. Prepared by the Office of Environmental Cleanup, EPA Region 10. September.

Washington Department of Ecology (WDOE), 2004. Stormwater Management Manual for Eastern Washington. http://www.ecy.wa.gov/programs/wq/stormwater/easternmanual/manual.html.

APPENDIX A

SURFACE WATER ANALYSES

FORD BORROW AREA: SURFACE WATER ANALYSES FOR CONSTRUCTION STORM WATER POLLUTION PREVENTION PLAN

Revisioning						
Rev.	**Date**	**Description**	**By**	**Checked**	**Date**	**Reviewed**
0	*22-Nov-2013*	*Ford Borrow*	*Leland Fuhrig*	*John Redmond*	*27-Nov-2013*	*Clint Strachan*
1	*5-Dec-2013*	*Ford Borrow*	*Leland Fuhrig*		*10-Dec-2013*	*Clint Strachan*

Location and Format

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

\\ussbs1s01\Projects\ Newmont Mining Corporation\Midnite Mine

The following calculations were generated using the following software:

Microsoft Office Professional Plus 2010 (Microsoft Excel)
AutoCAD 2011
Army Corps of Engineers (ACOE) HEC-HMS version 3.5

Attachment

Attachment 1 – HEC-HMS Inputs and Schematic
Attachment 2 – HEC-HMS Outputs

1.0 BACKGROUND

The Dawn Mining Company Ford Borrow Area near Ford, WA is a potential source of cover material for the Midnite Mine Remedial Design/Remedial Action (RD/RA) project. The cover material would be needed at three separate periods of the RD/RA activity, therefore the Ford Borrow Area development, operation, and reclamation is planned in three concurrent phases, as shown in Figures 1 through 3.

This calculation summary has been prepared to support the Construction Storm Water Pollution Prevention Plan for the proposed Ford Borrow Area, and presents the hydrologic analyses and best management practice (BMP) recommendations for that document. Estimates of runoff volume from selected storm events were compared with the storage capacity within the borrow area excavation at the northern, downstream end of the borrow area. These comparisons are provided for each of the three phases of material removal in the Ford Borrow Area.

2.0 ANALYSIS METHODS

The approach used in evaluation of runoff within the Ford Borrow Area was based on the design criteria as set by the Washington Department of Ecology Stormwater Management Manual for Eastern Washington (WDOE, 2004). This manual recommends that the storage capacity of a temporary construction retention basin be sized to store the estimated runoff volume from the 2-year storm event. This document provides an analysis of runoff from storms ranging from the 2-year to 100-year event.

The prominent storm water control feature of the Ford Borrow Area is the excavated area at the downstream (north) end of the borrow area. This excavated area ranges from 5 to 25 feet below the natural ground surface, and has a capacity for retention of runoff. At each of the three phases of borrow area operation, the retention capacity is proportionately increased, as seen in Figures 1 through 3.

Based on the location of the site (Eastern Washington Region 3), an SCS Type 1A storm distribution was used as the design storm per recommendations in the Surface Water Design Investigation Report (Tetra Tech, 2011). The drainage areas associated with areas affected by the proposed Ford Borrow Area are shown in Figures 1 through 3.

Storm precipitation depth-duration-frequency estimates for the project site were determined using the National Oceanic and Atmospheric Administration (NOAA) National Weather Service Atlas 2 Volume 9. The design storm events for this project are presented in Table 1 below.

Table 1 – Design Storm Event Summary

Storm Duration	Storm Depth	Storm Distribution
100 yr – 24 hr	2.6 inch	Type 1A
25 yr – 24 hr	1.7 inch	Type 1A
2 yr – 6 hr	0.8 inch	Type 1A

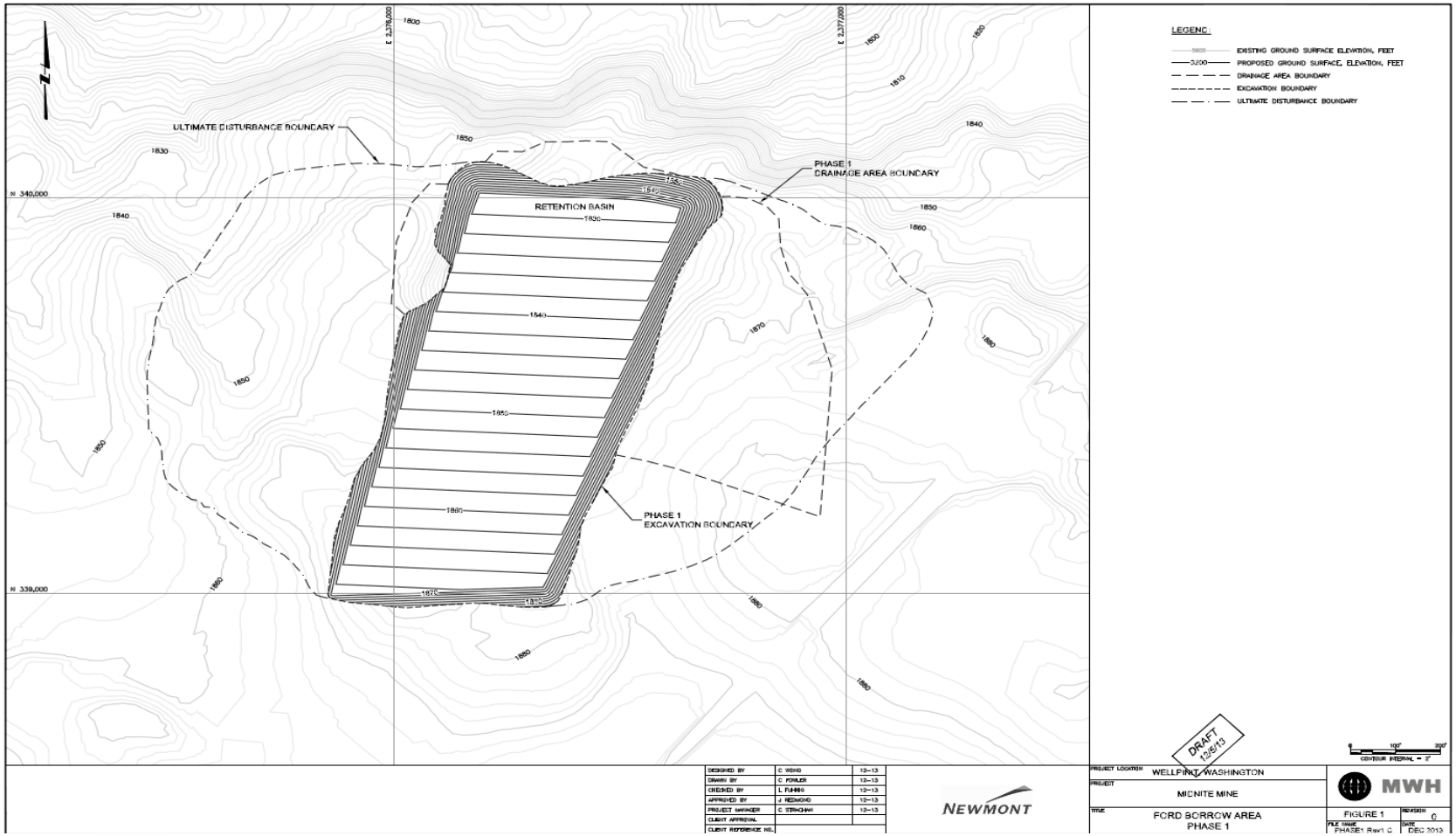


Figure 1 – Phase 1 layout of the proposed Ford Borrow Area

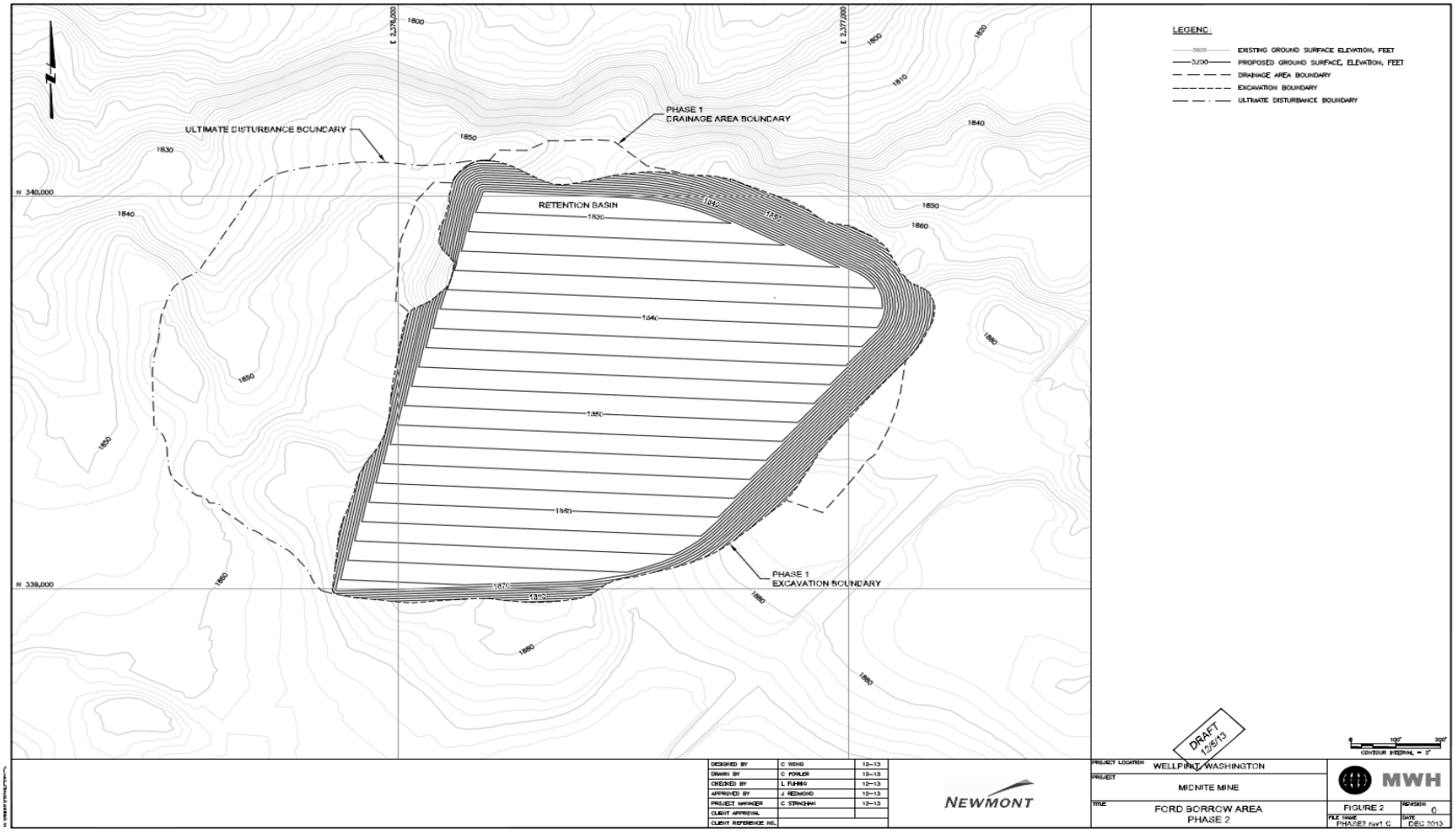


Figure 2 – Phase 2 layout of the proposed Ford Borrow Area

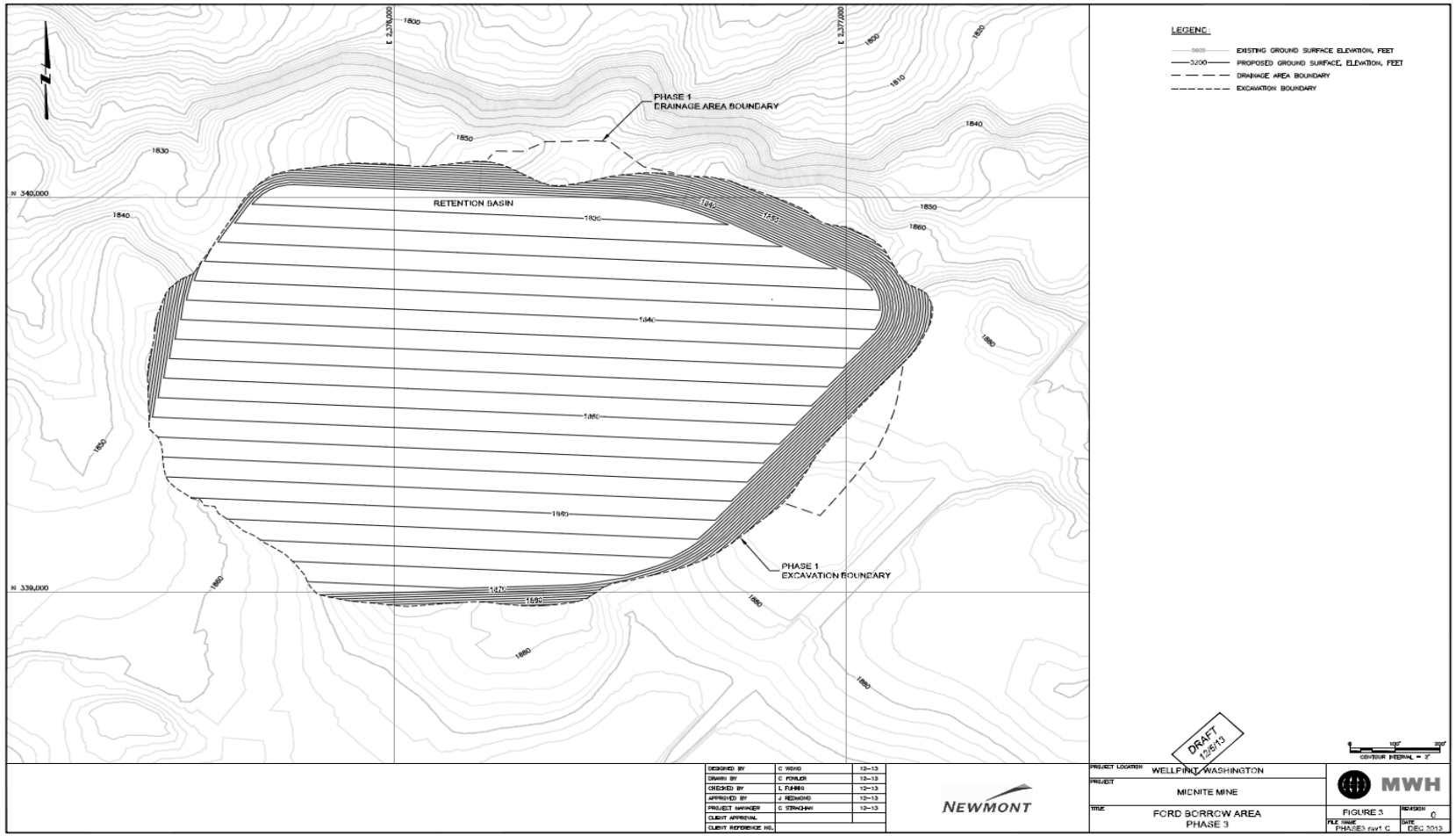


Figure 3 – Phase 3 layout of the proposed Ford Borrow Area

The Army Corps of Engineers (ACOE) HEC-HMS Version 3.5 software was used to perform runoff modeling for the Ford Borrow Area. The sub-basins were delineated based on site topography and grading plans developed for the phased layouts shown in Figures 1 through 3. Site contours developed at a 5-foot interval were used in these analyses. HEC-HMS was used to simulate the drainage into and through the borrow area for storm events recommended in the SMMEW.

As can be seen in the figures, the borrow area is at the head of the drainage basin, and runoff would be contained within the borrow area excavation boundary. The excavated surfaces were delineated using AutoCAD and parameters including the basin areas, average slopes, and lengths were determined for use as inputs to HEC-HMS. HEC-HMS inputs are included in Attachment 1.

The lengths of the longest drainage path and the average watershed slope for each sub-basin were measured using AutoCAD. A curve number of 56 was used for the sub-basins in undisturbed areas to represent marble loamy sand (0-25 percent slopes) as recommended in the Diversion Channel Design Report (Tetra Tech, 2013). A curve number of 87 was used to represent all areas that will be disturbed within the Ford Borrow Area, which is representative of conditions immediately after completion of borrow activities and before vegetation has been established. The curve number for the disturbed areas is conservative because is assumed over the entire area and does not account for the proposed concurrent reclamation. Reclamation of the areas will occur after each phase and a number of years will elapse between subsequent disturbances, thus allowing for at least partial re-vegetation (and a lower curve number with a reduction in runoff) of previously disturbed area prior to the next phase of borrow area operation.

Another input to the HEC-HMS model, representing the basin response to a storm event is Lag Time, where Lag time was calculated using the following equation:

$$T_{lag} = \frac{L^{0.8}(S+1)^{0.7}}{1900(\%Slope)^{0.5}}$$

Where:

T_{lag} = lag time in hours,
L = length of the longest drainage path in meters,
S = (1000/CN) – 10,
CN = curve number, and
% Slope = the average watershed slope in percent.

3.0 RESULTS

Using the approach outlined in the section above, the HEC-HMS runs produced results that depict the volume of water that can be expected to accumulate in the proposed borrow area during a 100-year, 24-hour storm.

Table 2 – Storm Totals, Ford Borrow Area: Storm Event 100-year - 24-hour

Construction Phase	Peak Runoff Rate, cfs	Volume, acre-feet
Phase 1	2.84	1.4
Phase 2	7.22	2.6
Phase 3	10.94	3.9

Table 3, below, shows the capacities of the borrow area excavation at the downstream end of the borrow area, by phase. The elevations and corresponding volumes shown in red text indicate the elevation in the borrow area excavation that is required to contain the runoff volume of the 100-year, 24-hour storm event, corresponding with the totals in Table 2 above. The bottom row of elevations and volumes for each phase represents the maximum elevation and containment volume within the borrow area excavation.

Table 3 – Stage-Storage Volumes for Ford Borrow Area, by Phase

Phase 1			Phase 2			Phase 3		
Elevation, feet	cubic feet	acre-feet	Elevation, feet	cubic feet	acre-feet	Elevation, feet	cubic feet	acre-feet
1830	0	0	1830	0	0	1830	0	0
1832	72,072	1.65	1832	85,646	1.97	1832	162,294	3.73
1834	197,916	4.54	1834	252,124	5.79	1834	462,974	10.63
1836	378,418	8.69	1836	514,281	11.81	1836	918,494	21.08
1838	614,635	14.11	1838	882,904	20.27			

As indicated by the runoff volumes in Table 2 and the excavated borrow area capacities in Table 3, the borrow area can contain all runoff from the 2-year event as well as runoff from the 100-year storm. As outlined in WDOE (2004), WDOE dam safety regulations are not applicable for this situation, since all impounded water from runoff in the borrow area will be contained within the excavated surface of the borrow area below natural ground levels.

4.0 REFERENCES

Tetra Tech, Inc. (Tetra Tech), 2011. Surface Water Design Investigation Report, prepared for Dawn Mining Company and Newmont USA Ltd., May 16.

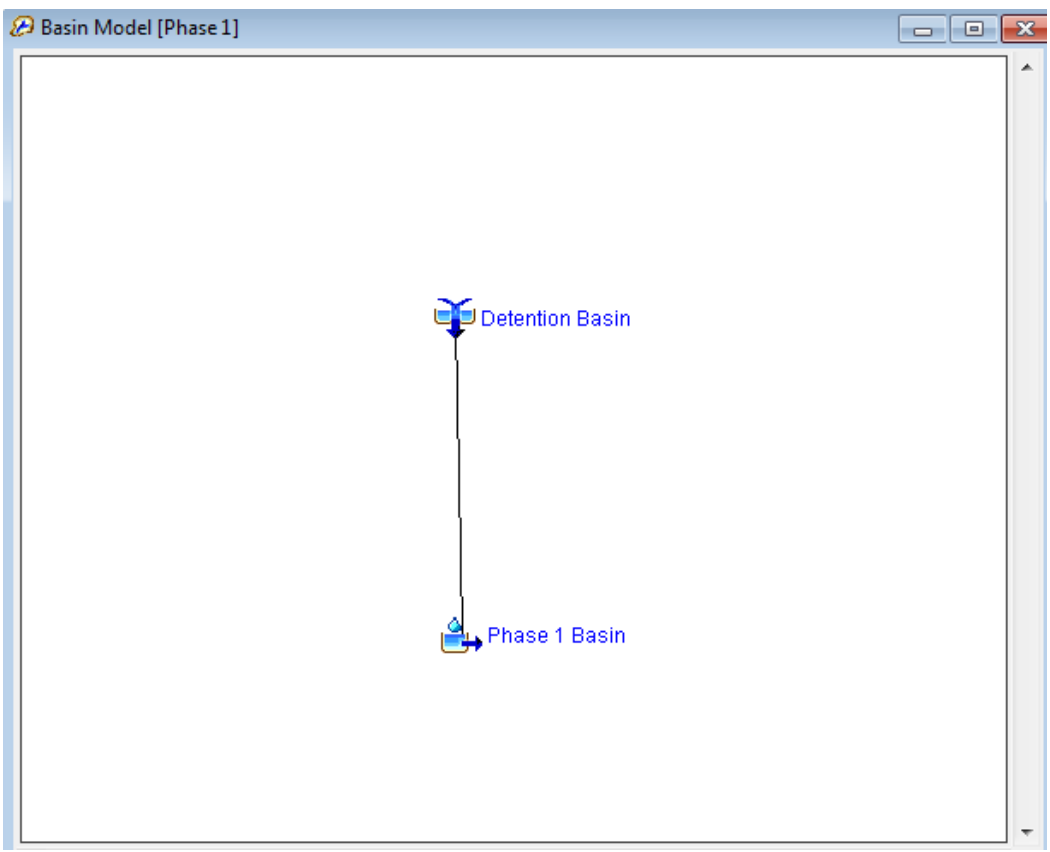
Tetra Tech, Inc. (Tetra Tech), 2013. Appendix D, Diversion Channel Design Report, prepared for Dawn Mining Company, February 21.

Washington Department of Ecology (WDOE), 2004. Stormwater Management Manual for Eastern Washington. http://www.ecy.wa.gov/programs/wq/stormwater/easternmanual/manual.html.

Attachment 1: HEC-HMS Inputs and Schematic

Phase 1			**Phase 2**			**Phase 3**		
Longest Reach	1019	ft	Longest Reach	1019	ft	Longest Reach	989	ft
Avg Slope	11.81	%	Avg Slope	12.42	%	Avg Slope	6.54	%
CN	76.85		CN	84.58		CN	85.81	
S	3.01	in	S	1.82	in	S	1.65	in
Tlag	0.10	hrs	Tlag	0.08	hrs	Tlag	0.10	hrs
	6.2	mins		4.7	mins		6.1	mins
Initial Abs	0	in	Initial Abs	0	in	Initial Abs	0	in
Area	0.032	mi^2	Area	0.040	mi^2	Area	0.056	mi^2

Typical Schematic:



Attachment 2: HEC-HMS Outputs

Phase 1 Output:

Global Summary Results for Run "Phase 1, 100-yr"

Project: Ford BA Simulation Run: Phase 1, 100-yr

Start of Run: 01Apr2000, 00:00 Basin Model: Phase 1
End of Run: 03Apr2000, 00:00 Meteorologic Model: 100-yr, 24-hr
Compute Time: 05Dec2013, 17:51:39 Control Specifications: Control 1

Show Elements: All Elements Volume Units: IN AC-FT Sorting: Hydrologic

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
Phase 1 Basin	0.032	2.838	01Apr2000, 08:00	1.4
Detention Basin	0.032	2.838	01Apr2000, 08:00	1.4

Phase 2 Output:

Global Summary Results for Run "Phase 2, 100-yr"

Project: Ford BA Simulation Run: Phase 2, 100-yr

Start of Run: 01Apr2000, 00:00 Basin Model: Phase 2
End of Run: 03Apr2000, 00:00 Meteorologic Model: 100-yr, 24-hr
Compute Time: 05Dec2013, 17:57:48 Control Specifications: Control 1

Show Elements: All Elements Volume Units: IN AC-FT Sorting: Hydrologic

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
Phase 2 Basin	0.04	7.223	01Apr2000, 08:00	2.6
Detention basin	0.04	7.223	01Apr2000, 08:00	2.6

Phase 3 Output:

Global Summary Results for Run "Phase 3, 100-yr"

Project: Ford BA Simulation Run: Phase 3, 100-yr

Start of Run: 01Apr2000, 00:00 Basin Model: Phase 3
End of Run: 03Apr2000, 00:00 Meteorologic Model: 100-yr, 24-hr
Compute Time: 05Dec2013, 17:55:19 Control Specifications: Control 1

Show Elements: All Elements Volume Units: IN AC-FT Sorting: Hydrologic

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
Phase 3 Basin	0.056	10.944	01Apr2000, 08:00	3.9
Detention Basin	0.056	10.944	01Apr2000, 08:00	3.9

APPENDIX B

RECLAMATION COST ESTIMATE

TABLE OF CONTENTS

B1.0 INTRODUCTION 1
B2.0 COST ELEMENTS 1
B2.1 Grading/Contouring 1
B2.2 Reclamation Soil Placement 1
B2.3 Re-vegetation 2
B2.4 Contractor Mobilization/Demobilization 2
B2.5 Monitoring and Maintenance 3
B2.6 Project Administration and Oversight 3

TABLES

Table B1 Reclamation Cost Estimate Summary

B1.0 INTRODUCTION

This appendix summarizes the methods and assumptions used to estimate borrow area reclamation costs for the proposed Ford Borrow Area. These estimates were made for a reclamation surety or bonding. A summary of estimated reclamation costs is presented in Table B1.

The borrow area reclamation cost estimate is based upon the complete development and reclamation of the borrow area, with surface land disturbances reclaimed concurrently within the same year that the disturbance occurs.

A 37-acre disturbance area was used in these calculations. Unless otherwise noted, unit costs used in preparing this estimate are based upon the 2014 on-line RS-Means Heavy Construction and RS-Means Site Work and Landscape Data Books published by Reed Construction Data (Means). These unit costs were adjusted using regional cost factors for the Spokane Area and include contractor overhead and profit within each individual unit cost.

B2.0 COST ELEMENTS

This cost estimate is based on the borrow area reclamation elements described in the Plan of Operation and Reclamation (POR). These elements are organized by major tasks below (which would apply to each phase of borrow area development).

1. Grading and contouring the borrow area surface
2. Reclamation soil placement
3. Re-vegetation
4. Reclamation contractor mobilization/demobilization
5. Monitoring and maintenance
6. Project administration and oversight

Procedures used to estimate the cost of each of these work tasks are described in more detail in the following subsections.

B2.1 Grading/Contouring

The excavated bottom surface and inside slopes will be graded and contoured to match the surrounding terrain. The estimated cost for grading and contouring of the subsoils is based upon the maximum area of disturbance of 37 acres. A unit cost from Means of $0.20/square yard ($yd^2$), or $967.99/acre, for finished grading on relatively steep slopes was used for this cost item.

B2.2 Reclamation Soil Placement

Although reclamation soil placement may be performed by pushing from adjacent stockpiles using dozers, reclamation soil placement will require loading from stockpiles into off-road, articulated haul trucks, hauling to a dump point in the borrow area, and spreading in a nominal 1-foot thick layer. The reclamation soil placement was estimated based on loading, truck-hauling, and spreading over the 37-acre area.

The unit cost of \$0.62/yd^3 for excavating and loading reclamation soil into articulated, off-road haul trucks was developed from the Means cost data assuming a wheel loader with a 3 yd^3 (Cat 930, etc.) or larger bucket would be used for this task. The 15 percent decrease in productivity that is recommended for loading into dump trucks is offset by the 15 percent increase in productivity that is recommended when excavating loose soils from stockpiles.

The unit cost for hauling reclamation soil to the placement location was developed assuming 40-ton articulated haul trucks would be used to transport the reclamation soil from the stockpile to the placement location in more remote areas. Unit costs were developed using a burdened hourly rate of \$180/hour, an estimated round trip cycle time of 8 minutes (which includes loading, one-way haul distances typically between 300 and 600 feet, dumping, return trip, standby, and loading-area spotting time), an in-truck unit weight of 1.33 tons/ yd^3, and an efficiency of 80 percent. A shrinkage factor between the material in-truck and the in-place reclamation soil layer was not applied, since compaction of the reclamation soil is to be avoided to the extent possible.

The unit cost for reclamation soil hauling was calculated as:

\$180/hr x (1 hr/0.8 hr) x (1 hr/60 min) x (8 min/load) = \$30.00/load

\$30.00/load x (1 load/ 40 tons) x (1.33 tons/yd^3) = \$1.00/yd^3

It is estimated that reclamation soil spreading at the placement location will be accomplished using a 200-HP (e.g. Cat D7) dozer with an average push distances of 50 feet. A unit cost from Means of \$0.88/yd^3 for backfilling by directly soil was used for this task.

The total unit cost is therefore \$2.50/yd^3 (\$0.62 excavate and load, \$1.00 haul, and \$0.88 spread).

B2.3 Re-vegetation

Re-vegetation elements described in the POR include hydroseeding with grass species, followed by harrowing, and finally a hydromulch and tackifier application.

Costs for hydroseed applications can vary greatly depending on the cost of specific seed mixes and application rates to be used. The unit cost selected for hydroseeding, harrowing, and hydromulch/tackifier application (\$2,720/acre) was obtained from Means and is similar to the average cost for similar projects and applications (\$2,120/acre) provided by a re-vegetation expert.

B2.4 Contractor Mobilization/Demobilization

Reclamation contractor mobilization/demobilization costs depend largely on the distance of the selected contractor from the site, which is not known at the present time. A lump-sum contractor mobilization/demobilization cost of \$10,000 has been estimated for each of the three construction phases. It is anticipated that a Tribal Contractor or a re-vegetation specialty subcontractor from the Spokane area would complete the reclamation work.

B2.5 Monitoring and Maintenance

It was estimated that monitoring would be performed on an annual basis and follow-up maintenance of any problem areas would be performed until specified re-vegetation criteria have been met. Monitoring and maintenance for a five-year period following completion of reclamation was estimated.

Monitoring will consist of performing annual vegetation surveys in order to evaluate whether revegetation targets are being met. In addition, annual monitoring will include an inspection to evaluate erosion and sediment transport conditions. It is estimated that annual vegetation monitoring and site inspections will cost $5,000/year and will continue for five years. In addition, it is estimated that analyses and reporting of each year's data will cost an additional $5,000, resulting in a total monitoring and reporting cost for revegetation progress of $10,000/year over the five-year period.

For cost estimating purposes, it is assumed that maintenance will consist of repair of BMPs, invasive species control, and repair of minor erosion features that occur while vegetation is being established. The cost of maintenance during this period is estimated to be 10 percent of the total cost for reclamation items 1 through 3 described above.

B2.6 Project Administration and Oversight

Project administration and oversight costs were estimated to be 15 percent of the total project cost (15 percent of the total cost of items 1 through 5).

Table B1. Reclamation Cost Estimate Summary

Cost Item	Quantity	Unit	Unit Cost	Subtotal
1. Grading/contouring	37	acres	$967.99	$35,816
2. Reclamation soil placement (load, haul, spread)	59,700	cubic yards	$2.50	$149,250
3. Re-vegetation (hydroseeding, harrow, hydromulch/tackifier)	37	acres	$2,720.00	$100,640
4. Contactor mobilization/demobilization (once per phase, 3 phases)	3	lump sum	$10,000	$30,000
5. Monitoring and maintenance	5	year duration		
a. Annual vegetation survey and inspection	5	years	$10,000	$50,000
b. Annual maintenance (10% of items 1 through 3)	1	(10%)	($285,706)	$28,571
6. Project Administration (15% of items 1 through 5)		(15%)	($394,277)	$59,142
TOTAL				**$453,419**