MWH

BUILDING A BETTER WORLD

May 31, 2011

Mr. Dave Tomten
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RE: Transmittal of the *Remedial Investigation/Feasibility Study Work Plan for P4's Ballard, Henry, and Enoch Valley Mines – Rev 2, Final*

Dear Dave:

This final document was prepared to fulfill two of the major milestones presented in Sections 9.6.1 RI/FS Work Plan and 9.6.2 Sampling and Analysis Plan ("SAP") of the 2009 Administrative Settlement Agreement and Order on Consent (2009 AOC /CO) and Task 1 of the Scope of Work (SOW). The information presented in this extensive *RI/FS Work Plan* follows the *Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA* (USEPA, 1988) and the requirements in the 2009 AOC/CO.

Enclosed with this letter are the materials necessary to update your previous draft hard copies of the *Remedial Investigation/Feasibility Study Work Plan for P4's Ballard, Henry, and Enoch Valley Mines – Revision 0 Draft (RI/FS Work Plan*), which will result in a final version of this work plan entitled *RI/FS Work Plan – Revision 2 Final*. The revised text, figures, tables, drawings, and appendices attached to this letter are listed below:

- ✓ New cover letter
- ✓ VOLUME I (Part 1 of 3) – TEXT / FIGURES
  - New volume cover and spine
  - Executive Summary, Table of Contents and all text (sections 1-8, remove Section 9)
  - Figures: 1-1, 3-3 thru 3-27, 3-31 thru 3-38, 3-43, 3-58, 3-59, and 7-1
- ✓ VOLUME I (Part 2 of 3) - TABLES
  - New Volume cover and spine
  - Tables: 2-14 thru 2-16, 3-2, 3-5, 3-8 thru 3-10, 3-12, 3-17 thru 3-19, 3-21, 3-24, 3-25, 3-27, 3-33, 3-34, 3-37, 3-40, 3-41, 3-43, 3-50, 3-54, 3-55, and 4-11 thru 4-13
- ✓ VOLUME I (Part 3 of 3) – DRAWINGS
  - New volume cover and spine
  - Drawings: 2-5, 2-6, 2-8, 3-9 thru 3-12, 3-15 thru 3-19, 3-31 thru 3-34, 3-36, 3-38, 3-43 thru 3-45, 3-51, 3-53, and 3-60 (new)
- ✓ VOLUME II – APPENDICES
  - New, larger binder, cover, and spine
  - Appendices A: Cover sheet, Table A-1, and Direct Push results drawings (pages 2 of 8 thru 8 of 8)

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- Appendix A-2: Cover sheet, Tables 2-2 thru 2-4; 3-3; 3-10 thru 3-12; 3-37 thru 3-60; 3-73 thru 3-93, and Figures 3-1 thru 3-3
- Appendix A-4: Text only
- Appendix A-5: Cover sheet, Table A5-6
- Appendix C: Text, Tables C3-1 thru C3-3, C4-1, C4-2, C4-6 thru C4-9, and C4-11, Figures C3-1, C4-2, and C4-3
- Appendix D: Cover sheet, Appendix D1 (cover sheet), Appendix D2 (cover sheet and text), Appendix D3 (cover sheet), Appendix D5 (cover sheet replaces former D5 cover), Appendix D6 (new cover sheet, formerly Appendix D5)
- Appendix F (new)

Should you have any questions on the information presented in this letter or the hard-copy inserts provided for assembly of the *RI/FS Work Plan – Rev 2 Final,* please contact Barry Koch at (208) 547-1439 or me at (801) 617-3250.

Best Regards,

Vance Drain
MWH Project Manager

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BALLARD, HENRY, AND ENOCH VALLEY MINES

REMEDIAL INVESTIGATION AND FEASIBILITY STUDY

WORK PLAN

Final
Revision 2

MAY 2011

Prepared by:

MWH AMERICAS, INC.

Prepared for:

P4 PRODUCTION, LLC

NOTICE

This work plan has been prepared in accordance with the terms set out in the contract between P4 Production LLC (P4) and MWH Americas, Inc (MWH). The information, evaluations, and opinions contained herein were based on data and results that are in part prepared by or obtained from other parties not under the direct control of MWH. In preparing this report, MWH made use of, and relied upon, data, drawings, analyses, reports, memos, letters, e-mails, and other information provided by others. MWH did not perform independent investigations or analyses to determine the validity or suitability of such items and information except as specifically indicated herein. Therefore, neither MWH nor P4 or any person acting on any of their behalf, make any warranty, express or implied, or assume any liability with respect to the use of any information, method, product, process, or statement contained in this report.

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EXECUTIVE SUMMARY

ES.1 INTRODUCTION

This Executive Summary briefly describes (1) the site background focusing on the phosphate mining activities that have occurred through time in southeastern (SE) Idaho, (2) the history of the investigations at the historic P4 Production, LLC (P4) Ballard, Henry, and Enoch Valley phosphate mines sites (the Sites), and (3) the current status of the Remedial Investigation and Feasibility Study (RI/FS) being conducted under Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) at these Sites. These investigations have focused primarily on selenium contamination at the Sites.

Also summarized are the objectives of the RI/FS process in fulfilling the requirements of the Administrative Settlement Agreement and Order on Consent/Consent Order for Remedial Investigation/Feasibility Study (2009 CO/AOC) with the US Environmental Protection Agency (USEPA) Region 10, other federal and state agencies including the US Bureau of Reclamation (BLM), the US Forest Service (USFS), US Department of Interior, Idaho Department of Environmental Quality (IDEQ) and the Shoshone-Bannock tribes, collectively known as the Agencies and Tribes (A/Ts). Finally, the principal findings from data gap analyses, which serve as the basis for the proposed RI, are summarized, as are the proposed RI activities. The RI and FS are interactive components of the regulatory process and often are conducted concurrently so that the data collected in the RI will support the development of alternatives for Site cleanup (remediation) in the FS. This RI/FS Work Plan (Work Plan) is one of the initial steps in the CERCLA process and includes many components, several of which are not discussed in this Executive Summary. Please refer to the table of contents to better understand the full scope of this document.

ES.2 SITE BACKGROUND AND HISTORY OF INVESTIGATIONS

The Sites were developed for their phosphate ore between 1951 and 2003 and are located approximately 13 to 19 miles north-northeast of the City of Soda Springs in SE Idaho. From 1952 until 1997, mining was conducted by the Monsanto Company (Monsanto). In

September 1997, Monsanto spun off its traditional chemical business to form Solutia. Monsanto and Solutia formed a joint venture, P4 Production, LLC (P4), which owned and operated the phosphate mines. P4 was assigned the phosphate mining leases and mineral rights. In May 2001, the joint venture was dissolved and P4 became a wholly-owned subsidiary of Monsanto. P4 is a current and former lease holder of State and Federal surface and mineral rights, and privately holds portions of the Sites.

The Ballard Mine is the oldest of the three mines being addressed in the RI/FS and was mined from 1952 to 1969. The Henry Mine was active between 1969 and 1989, and the Enoch Valley Mine was active between 1989 and 2003. Following the completion of mining at the Enoch Valley Mine in 2003, mining operations moved to the South Rasmussen Mine, which is still actively mined by P4 and is not a part of this RI/FS.

Investigations to assess potential impacts of phosphate mining (primarily selenium contamination) on human health and the environment have been ongoing in SE Idaho since 1996, after several horses were diagnosed with selenosis and subsequently euthanized. These investigations were conducted on a regional (or area-wide) basis, involving numerous phosphate mines in SE Idaho until approximately 2004, when the investigations began focusing on specific mines. An area-wide human health and ecological risk assessment was performed by the IDEQ in 2002 using the data collected throughout the region. The findings of that risk assessment can be found at - http://giscenter.isu.edu/research/techpg/sisp/reports.asp

Investigations at P4's historic Sites were performed between 2002 and 2009 as part of an expedited CERCLA Engineering Evaluation and Cost Analysis (EE/CA) approach that is consistent with the National Oil and Hazardous Substances Pollution Contingency Plan. In 2009, the A/Ts determined that the RI/FS process (also under CERCLA) was more appropriate for assessment of risk to the environment and human health and the subsequent identification of cleanup solutions, if they were necessary. In transitioning this work from the abbreviated EE/CA to the more rigorous RI/FS process in 2009, P4 has continued several long-term field sampling/monitoring programs, including surface water and ground

water sampling. Additional investigations of other media that may be necessary will be handled by preparing medium-specific sampling and analysis plans.

ES.3 RI/FS OBJECTIVES

The objectives of the RI/FS at the Sites, as described in the 2009 CO/AOC, are: (1) to determine the nature and extent of contamination and any threat to public health, welfare, or the environment caused by the release, or threatened release, of hazardous substances, pollutants, or contaminants at or from the Sites, by conducting an RI; and (2) to determine and evaluate alternatives for remedial action, if any, to prevent, mitigate or otherwise respond to, or remedy, any release, or threatened release, of hazardous substances, pollutants, or contaminants at or from the Sites, by conducting an FS.

ES.4 PRINCIPAL FINDINGS FROM THE DATA GAP ANALYSIS

As part of the RI/FS scoping process, historical data were evaluated in this Work Plan to identify data gaps and the additional data collection activities that must be completed under the RI for the FS process to begin. This evaluation primarily used data collected under the 2003 CO/AOC. Data collected prior to the 2003 CO/AOC were, and will be, used as necessary to supplement this newer data during human health and ecological risk assessments (HHERA) that will be conducted following the RI (refer to Appendix C for the HHERA Work Plan). RI reports will be prepared for each mine site as will mine-specific RAs. The principal findings presented in this Work Plan from the evaluation of existing data include:

Soils - Extensive soil sampling has been conducted on and near the Sites, and no data gaps have been identified for upland soils at the three Sites for non-radiogenic elements. However, risks from radionuclides have been identified by the A/Ts as a potential concern during preparation of this RI/FS Work Plan. Total uranium data has been collected from Site soils; however, the risk assessment will need to consider other radiogenic components found in the Site soils (e.g., radon, gamma, etc.). Therefore, supplemental data will be collected on site to assist in reducing the uncertainty in the risk assessment for the

radionuclides. In addition, the host rocks for the phosphate mining are known to contain naturally elevated uranium in addition to some metals; and undisturbed background areas have not been characterized for use in the risk assessment. Further background sampling is planned. Because of potential sediment transport to riparian soil areas along stream corridors, a limited data gap has been identified in sediments and riparian soils due to inadequate coverage of constituents of potential concern (COPCs) compared to soil in source areas at all three mines (see sediment below). A limited number of soil (and groundwater) samples will be collected in the shop area of the Ballard Site (the Ballard Shop Area) to investigate potential historical releases related to shop activities (e.g., the handling of fuels, oils, and solvents, etc., in a maintenance setting).

Vegetation – Extensive vegetation sampling has been conducted on and near the Sites, and no data gaps have been identified for upland and riparian vegetation at the three Sites.

Surface Water – Extensive surface water data exists for the Sites, and no data gaps have been identified for surface water. However, ongoing surface water monitoring will be continued to provide a baseline for determining the effectiveness associated with possible future remedial actions.

Sediment – The spatial coverage of sediment data is good; however, a limited data gap has been identified in sediments and riparian soils due to inadequate coverage of COPCs in sediments when compared to source area soils at all Sites. Some COPCs in source-area soil exceed screening criteria and these COPCs have not been characterized in sediment. At Ballard Mine, there is evidence of some mass transport and the nature and extent need to be further characterized in sediments because of chemicals in soil that are elevated (e.g., arsenic). Mass transport is not as great of concern at the Henry and Enoch Valley mines because of adequate soil covers in the likely source areas and sediment retention features; however, verification sampling of sediment needs to be conducted in areas of aquatic habitat for the COPCs not previously selected for analysis.

Groundwater – *Alluvial Flow System*: The alluvial system has limited data gaps to be addressed at the Ballard and Henry mines . Approximately 13 direct push boreholes will be needed to

address these data gaps. Areas that need to be addressed include (1) an area on the leading edge of a selenium plume downgradient of the southwestern corner of the Ballard Mine near the Blackfoot River; (2) the leading edge of a plume originating from the northwest corner of the Ballard Mine; and (3) an area northeast of the southern portion of the Henry Mine where some groundwater with slightly elevated selenium concentrations was identified. A limited groundwater investigation of the alluvial groundwater system around the Ballard Shop Area will be conducted to investigate potential release of organic compounds to the environment from the activities at the shop. No alluvial system data gaps were identified at the Enoch Valley Mine.

Dinwoody Formation Groundwater System: A data gap has been identified in the northwest portion of the Enoch Valley Mine where COPC-affected groundwater has been identified above screening levels. Downgradient, the Dinwoody Formation dips below a basalt unit that is monitored and is not affected by COPCs. However, the Dinwoody Formation below the basalt has not been evaluated for the presence of COPCs. No data gaps in the Dinwoody Formation at the Ballard or Henry mines were identified.

Wells Formation Flow System: Data gaps have not been identified in the Wells Formation flow system at any of the Sites.

Secondary Media – Secondary media have been collected since 1996 to evaluate the effects of selenium on human health and the environment. These Sites have a large inventory of secondary media data, much more than typical RI/FS sites, likely because of the suspected effects of selenium on livestock. Secondary media collected to date include: aquatic (stream habitat information, fish, and benthic macroinvertebrates data) and terrestrial (elk tissue, bird egg and cattle tissue data, and small mammal and terrestrial invertebrate data) information. Much of this secondary media has been collected and analyzed under the EE/CA process, including all of the aquatic information listed above. The human health and ecological risk assessments to be conducted generally will rely on the primary media discussed above for use in risk calculations. Secondary media data will be used as additional lines of evidence to support the risk assessment, if needed. A data gap for secondary media could occur if risk assessment analyses using primary media indicate the need for secondary media data in order

to reduce the risk uncertainty and these data do not exist. At this time, no additional secondary media samples have been identified.

ES.5 RI TASKS

This Work Plan outlines the tasks necessary to address the data gaps mentioned above and move to the RI reporting phase, which includes conducting a risk assessment and completing the FS. To close the data gaps identified above and obtain the necessary additional data to complete the RI, the following activities are planned:

- Installation of direct push boreholes and monitoring wells in strategic locations so that groundwater samples can be collected
- Continued groundwater sample collection and analysis
- Continued surface water collection and analysis
- Sampling of sediment and riparian soils
- Sampling of soil and groundwater in the Ballard Shop Area for organic compounds potentially associated with historical shop maintenance activities
- Sampling of Site areas for radionuclides, including uranium decay daughter products (i.e., radon and gamma radiation at a minimum)
- Sampling of soils in an additional background area(s) to evaluate the concentration of radionuclides and other COPCs in a natural or pre-mined setting that are representative of the entire mine footprint prior to mining

As discussed above, these RI tasks will lead to the following documents for each of the P4 mine sites: an RI report that will discuss the findings of these and previous investigations and human and ecological RAs that will identify Site risks. The final task identified in the Work Plan is the preparation of an FS that will evaluate site-specific cleanup options based on the risk assessment and propose cleanup alternatives for each of the Sites. Limited additional data will be collected and technical memoranda will be prepared during, and immediately following, the RI and risk assessment phases to support the FS. These identified activities include evaluation of background concentrations of COPCs in various media, the natural attenuation potential of various Site COPCs, and focused cover material property investigations based on risk assessment findings.

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ACRONYMS AND ABBREVIATIONS

amsl	above mean sea level
ARARs	Applicable or Relevant and Appropriate Requirements
ARD	Acid Rock Drainage
A/Ts	Agencies and Tribes
AVS	acid volatile sulfide
bgs	below ground surface
BLM	Bureau of Land Management (Department of Interior)
BLSH	black shale (sample prefix)
BRA	Baseline Risk Assessment
BRSH	brown shale (sample prefix)
CCC	Criterion Continuous Concentration
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CHSH	cherty shale (sample prefix)
cm	centimeter
CO/AOC	Consent Order/Administrative Order on Consent
COC	Contaminant of Concern
COPC	Contaminant of Potential Concern
COPEC	Chemical of Potential Ecological Concern
CWS	center waste shale
DAR	Data Approval Request
DELB	Decision Error Lower Bound
DO	dissolved oxygen
DQO	Data Quality Objective
DQUR	Data Quality and Usability Report
DSR	Data Summary Report
dw	dry weight
EDD	Electronic Data Deliverable
e.g.	*exempli gratia* (Latin, for example)
EE/CA	Engineering Evaluation and Cost Analysis
EIS	Environmental Impact Statement
ERA	Ecological Risk Assessment
FS	Feasibility Study
FSP	Field Sampling Plan
ft	feet
gpm	gallons per minute
GRA(s)	General Response Action(s)
HASP	Health and Safety Plan
HHRA	Human Health Risk Assessment
i.e.	*id est* (Latin, that is to say; in other words)

IDEQ	Idaho Department of Environmental Quality
IDFG	Idaho Department of Fish and Game
IDL	Idaho Department of Lands
IDWR	Idaho Department of Water Resources
IMA	Idaho Mining Association
MCL	Maximum Contaminant Level, Federal Drinking Water Standard
MCY	million cubic yards
MDL	Method Detection Limit
mg/kg	milligrams per kilograms
mg/L	milligram per liter
MMP	Monsanto Mine Pit
MWD	Monsanto Waste Dump
MMW	Monsanto Monitoring Well
MST	Monsanto Stream Location
MNA	Monitored Natural Attenuation
MWH	MWH, Inc. (formerly Montgomery Watson Harza, Inc.)
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NOAA	National Oceanic and Atmospheric Administration
NRC	National Research Council
OSC	On-Scene Coordinator
P4	P4 Production L.L.C.
PCBs	polychlorinated biphenyls
PRAO	Preliminary Remedial Action Objective
PVC	polyvinylchloride (plastic)
QA	Quality Assurance
QAPP	Quality Assurance Program Plan
QC	Quality Control
RAO	Remedial Action Objective
RBS	Rapid Bioassessment Score
RI	Remedial Investigation
RI/FS	Remedial Investigation and Feasibility Study
RMP	Risk Management Plan
RPM	Remedial Project Manager (USEPA)
SAP	Sampling and Analysis Plan
SE	Southeast (SE Idaho)
sec	second
SEGW	Surface Expression of Groundwater
SEM	Simultaneously Extracted Metal
SI	Site Investigation (component of the EE/CA)
SOW	Statement of Work (from the RI/FS AOC unless specified otherwise)
SPLP	Synthetic Precipitation Leaching Procedure

Sites	Ballard, Henry and Enoch Valley Mines as defined in the 2009 RI/FS AOC
sq. ft.	square feet
SWD	Spatial Wire Diagram
SWPPP	Stormwater Pollution Prevention Plan
TDR	Time Domain Reflectometry
TDS	Total Dissolved Solids
TEL	Threshold Effect Level
TOCO	top soil cover (sample prefix)
TOST	top soil stockpile (sample prefix)
Tribes	Shoshone-Bannock Tribes
USEPA	United States Environmental Protection Agency
USFS	United States Department of Agriculture, Forest Service
USFWS	Fish and Wildlife Service
USGS	United States Geological Survey

1.0 INTRODUCTION

This Remedial Investigation/Feasibility Study Work Plan (RI/FS Work Plan) was prepared by MWH Americas, Inc. (MWH) on behalf of P4 Production, LLC (P4), in accordance with the requirements of the Administrative Settlement Agreement and Order on Consent/Consent Order for Remedial Investigation/Feasibility Study (2009 CO/AOC; USEPA, 2009). The 2009 CO/AOC is a voluntary agreement between P4 and the United States Environmental Protection Agency (USEPA), the Idaho Department of Environmental Quality (IDEQ), the United States Department of Agriculture, United States Forest Service (USFS), the United State Department of the Interior, United State Bureau of Land Management (BLM), the Shoshone-Bannock tribes (Tribes), collectively referred to as the Agencies and Tribes or A/Ts. This RI/FS Work Plan supports the comprehensive mine-specific RI/FS that will be conducted at P4's three historic phosphate mines: Ballard, Henry and Enoch Valley mines (collectively, the "Sites"). The Sites were developed for their phosphate ore between 1951 and 2003 and are located approximately 13 to 19 miles north-northeast of the City of Soda Springs in southeastern (SE) Idaho, as shown on Figure 1-1.

This RI/FS Work Plan is the required planning document that presents the background, methods, and procedures for conducting the RI/FS, as described in Task 1.c. Scoping Deliverables of the Statement of Work (SOW), which is attached to the 2009 CO/AOC as Appendix 1 (USEPA, 2009).

The 2009 CO/AOC provides for the performance by P4 of an RI and FS for each of the Sites. The objectives of the RI/FS, as described in the SOW, are (1) to determine the nature and extent of contamination and any threat to public health, welfare, or the environment caused by the release, or threatened release, of hazardous substances, pollutants, or contaminants at or from the Sites, by conducting a remedial investigation; and (2) to determine and evaluate alternatives for remedial action, if any, to prevent, mitigate, or otherwise respond to, or remedy, any release, or threatened release, of hazardous substances, pollutants, or contaminants at or from the Sites, by conducting a feasibility study. The RI

and FS are interactive and may be conducted concurrently so that the data collected in the RI will support the development of remedial alternatives in the FS.

1.1 Background

Investigations to assess potential impacts of phosphate mining on human health and the environment have been ongoing in SE Idaho since 1996. Specifically, overburden and waste rock, which are byproducts of extracting phosphate ore from the earth, have the potential to release levels of selenium to the environment that exceed ambient background. The effects of selenium in the environment were first investigated in SE Idaho in 1996 after several horses were diagnosed with selenosis and subsequently euthanized. The horses had grazed in a pasture irrigated with selenium-contaminated water emanating from a historic phosphate mine site.

These investigations were conducted on a regional basis until approximately 2004 and involved numerous phosphate mines in SE Idaho. . However, in 2004, the investigations began to focus on specific mines. Investigations at P4's historic Ballard, Henry and Enoch Valley mines were performed between 2004 and 2009 as part of an Engineering Evaluation and Cost Analysis (EE/CA) consistent with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). In 2009, P4 and the A/Ts determined that the RI/FS process under CERCLA was more appropriate for assessment of risk to the environment and human health, and the subsequent identification of remedies, if needed.

During this period, the vast majority of the investigation was conducted under direction of the Idaho Mining Association's (IMA's) Selenium Committee. Regulatory agencies provided input and some oversight through the Interagency/Phosphate Industry Selenium Working Group. In 2001, the regional investigation was transformed into an area-wide investigation performed by several phosphate mining companies belonging to IMA under the direction of IDEQ and other regulatory agencies pursuant to a CERCLA CO/AOC (2001 CO/AOC; IDEQ, 2001). Effective October 24, 2003, the USEPA, IDEQ, USFS, and P4, the latter as Respondent, voluntarily entered into a new CO/AOC (2003 CO/AOC; USEPA, 2003).

The 2003 CO/AOC provided for the performance by P4 of Site Investigations (SIs) and EE/CA programs that were consistent with CERCLA and the NCP for the Ballard, Henry and Enoch Valley mines. On November 30, 2009, the 2003 CO/AOC was superseded by the 2009 CO/AOC for an RI/FS under CERCLA.

1.2 Purpose and Scope

In accordance with the 2009 CO/AOC, the purpose of this RI/FS Work Plan is to present the methods and assumptions to be used in the RI/FS, including any background information or data used to scope the RI/FS. The scoping process identifies data gaps and focuses the RI/FS so that the correct types and amounts of data are collected to support site characterization, risk assessment, and remedy selection. A significant amount of relevant characterization data for several media has been collected since 1997 to address the specific pathways and contaminants of potential concern (COPCs), which are the subject of the RI/FS; therefore, the presentation of background and scoping data comprises a substantial portion of this RI/FS Work Plan. In addition, this RI/FS Work Plan describes the different tasks or project components of the RI/FS, presents a plan for completing these tasks, and provides the rationale for the plan.

Due to the extensive historical and recent data for the Sites, this RI/FS Work Plan focuses on any additional work necessary to address data gaps identified through the scoping process. Where possible, either the existing media-specific Sampling and Analysis Plans (SAPs) developed under the site investigation (SI)/EECA AOC will be modified to accommodate any new field work or new SAPs will be developed.

The RI/FS will include the following tasks:

- Community relations
- Field investigation
- Sample analysis and validation
- Data evaluation

- Risk assessment
- Treatability studies and pilot testing
- Remedial investigation reporting
- Remedial alternative development and screening
- Detailed analysis of alternatives
- Feasibility study reporting

The specific plan for completing these tasks, including schedule and project management considerations, is presented herein.

1.3 Project Management

Project management for the 2009 CO/AOC includes all of the activities and interactions among P4, the USEPA, and supporting A/T personnel, as defined below, that are necessary to complete the RI/FS process for the Sites.

1.3.1 Project Coordination

USEPA has been designated as the "Lead Agency" for the P4 Sites as explained in the 2009 CO/AOC. The IDEQ, the US Fish and Wildlife Service (USFWS), and the Tribes have accepted Support Agency status for all three Sites. The USFS has declined Support Agency status for Henry and Ballard mine sites, but has retained Support Agency status for the Enoch Valley Mine Site. The BLM has declined Support Agency status for the Ballard Mine Site and Enoch Valley Mine sites, but has retained Support Agency status for the Henry Mine Site. USEPA, as the Lead Agency for the Sites, will coordinate with the Support Agencies and P4.

The USEPA's Remedial Project Manager (RPM) for the Sites is:

Dave Tomten
U.S. Environmental Protection Agency
1435 N. Orchard St.
Boise, Idaho 83706
Phone: (208) 378-5763
Fax: (208) 378-5744
Email: tomten.dave@epa.gov

P4 has designated, as the Project Coordinator for the Sites:

Barry Koch
Special Projects Lead - Mining
Monsanto Company
P.O. Box 816
Soda Springs, Idaho 83276
Phone: (208) 547-1439
Fax: (208) 547-1139
Email: barry.s.koch@monsanto.com

The RPM and the P4 Project Coordinator will be responsible for overseeing the activities required and conducted at the Sites under the 2009 AOC/CO. USEPA and P4 may change their RPM and Project Coordinator, and shall notify each other in writing at least five (5) days prior to any such change.

1.3.2 Roles and Responsibilities

The RI/FS project team organization is shown on Figure 1-1. USEPA, as the Lead Agency, will perform the routine project management, oversight, and implementation. USEPA's RPM has vested authority and also is the On-Scene Coordinator (OSC) through the NCP. In addition, USEPA's RPM shall have the authority consistent with the NCP, to halt any work required by the 2009 CO/AOC and to take any necessary response action when he determines that conditions at any of the Sites may present an immediate endangerment to public health or welfare or the environment.

1.3.3 Reporting Procedures/Coordination

The documents required to be prepared, submitted for approval, approved, and implemented by P4 under the 2009 CO/AOC are known as deliverables. All deliverables

will be submitted initially by P4 in draft form in accordance with the schedule provided in the 2009 CO/AOC SOW, or as otherwise established by the RPM.

These deliverables are subject to review, comment, and written approval or disapproval by the A/Ts. The RPM shall consolidate comments received from the USEPA and the Support Agencies and provide a single set of comments to P4. P4 will provide written responses to the A/Ts' comments and submit a revised document to the RPM in accordance with the schedule in the 2009 CO/AOC SOW. All documents submitted under the 2009 CO/AOC will incorporate the A/Ts' comments and correct all deficiencies identified by the RPM, unless such comments are revised or withdrawn in writing. All work performed under the 2009 CO/AOC will be in accordance with the various approved deliverables, unless otherwise authorized in writing by the RPM. For the purposes of the 2009 CO/AOC, the necessary deliverables are:

- Draft and Final RI/FS Work Plan and SAPs
- Data Validation Summaries and Data Summary Reports
- Draft and Final RI Report
- Draft and Final Baseline Risk Assessment Report
- Draft and Final FS Report

Unless the RPM authorizes a smaller number in writing, P4 shall provide to the RPM three electronic copies and three paper copies of each draft and final deliverable, including one unbound copy, and shall provide one electronic copy and one paper copy to each Support Agency. These copies will be sent to the contacts listed below.

All reports, maps, and supporting information will be provided in readily reproducible form. Electronic copies will be in a form that can be electronically modified and that are formatted in a manner consistent with specifications provided by the RPM. Paper copies of deliverables will be sent by regular or overnight mail or facsimile.

1. For USEPA: to the RPM designated above three copies including one unbound copy.

2. For IDEQ:

   Michael Rowe

   Idaho Department of Environmental Quality
   444 Hospital Way, #300
   Pocatello, Idaho 83201
   Phone: (208) 236-6160
   Fax: (208) 236-6168
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3. For the Forest Service (Enoch Valley only):

   (A.) Mary Kauffman

   USDA, U.S. Forest Service
   Caribou/Targhee National Forest
   1405 Hollipark Dr.
   Falls, Idaho 83401
   Phone: (208) 557-5779
   Fax: (208) 557-5826
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   (B.) Caribou National Forest
   Soda Springs District Office
   Attn: Enoch Valley Site Record
   410 E. Hooper St.
   Soda Springs, ID 83204

   (C.) James Alexander

   USDA Office of the General Counsel
   1220 SW Third Avenue, Suite 1734
   Portland, OR 97204
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   Fax: (503) 326-3807
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4. For the BLM:

   Jeff Jones

   Minerals Branch Chief
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5. For USFWS:

   Sandi Fisher

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6. For the Tribes:

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   Fax: (208) 478-3909
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   (B.) Susan Hanson

   11458 Philbin Road
   Pocatello, Idaho 83202
   Email: susanh@ida.net

   (C.) Eldine Stevens (electronic copies only)

   Bureau of Indian Affairs
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   Muskogee Oklahoma 74402
   Phone: 918 781-4712
   Email: Eldine.Stevens@bia.gov

1.3.4 Data Management Plan

The Data Management Plan includes the provisions for storing and transmitting the data generated during site activities. MWH currently maintains a Microsoft Access™ database for P4 at its Walnut Creek, California, office. All laboratory data are input into the database directly from laboratory electronic data deliverables (EDDs) after data validation and data report quality control have been completed. All hard copies of laboratory data reports generated during the RI/FS will be stored in the access database. Field data (e.g., pH measurements) will be input into the database after office QC checks are completed. The validated data, along with QA/QC information and data validation summaries, will be submitted to the USEPA in electronic format within 120 calendar days of the date of collection of the last sample from each sampling event.

The project database is designed to incorporate, at minimum, sample collection information (e.g., sample identification, location, date and time of sample collected, matrix) and laboratory analytical fields specified in the project EDD requirements indicated in the *Quality Assurance Program Plan (QAPP) Addendum* (MWH, 2009f). The USEPA flags, reason codes, and final qualified data will be uploaded from EDDs provided by the data validators as discussed in the *QAPP/QAPP Addendum* (MWH, 2004d and 2009f). The EDDs will contain detailed laboratory sample data, including associations with QC batch sample results in GeoTracker Electronic Deliverable Format. Specifications for the GeoTracker Deliverable Format are provided in the *QAPP Addendum* (MWH, 2009f).

1.4 RI/FS Work Plan Organization

This RI/FS Work Plan generally follows the suggested outline in *Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA, Interim Final* (USEPA, 1988). However, due to the transition from a largely-completed EE/CA SI to an RI/FS, a large amount of data was available to scope the RI/FS, which allowed for the expansion of several sections of this RI/FS Work Plan, such as Section 2.0 Site Background and Physical Setting and Section 3.0 Initial Evaluation. This RI/FS Work Plan consists of eight sections and four appendices, as described below:

Section 1.0 Introduction - Describes the Site background, including regulatory framework, purpose/ objectives of the RI/FS Work Plan, project management activities that will be followed during the RI/FS, and organization of this document.

Section 2.0 Site Background and Physical Setting - Provides descriptions of the mine facilities and operations, summarizes previous environmental investigations with potential relevance to the Sites, and describes the physical characteristics of the Sites and surrounding area, including: regional hydrology and geology, drainage and surface water hydrology; site geology, site hydrogeology, climate, demography and land use, and ecology.

Section 3.0 Initial Evaluation - Summarizes the findings of historical field investigations and presents the nature and extent by media for each of these programs as a whole and, where appropriate, for individual mine sites. The fate and transport of chemical constituents detected during the historical investigations and Conceptual Site Models (CSMs) for the Sites are considered for the purpose of the risk assessments as discussed in this section.

Section 4.0 Work Plan Rationale - Enumerates (1) preliminary applicable, relevant, and appropriate regulations (ARARs) and (2) preliminary remedial action objectives (RAOs) for the Sites. In addition, this section assesses the data quality objects (DQOs) for the remaining data gaps at the Sites.

Section 5.0 Remedial Investigation/Feasibility Study Tasks - Lists and describes the key tasks to be performed in the RI/FS, as outlined in *Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA, Interim Final* (USEPA, 1988).

Section 6.0 Key Assumptions - Sets forth the key assumptions used to develop the Work Plan and RI/FS approach.

Section 7.0 Schedule - Relates the schedule for the RI/FS based on the 2009 CO/AOC.

Section 8.0 References - Lists the reference documents cited in this RI/FS Work Plan.

Appendix A Existing Characterization Data and Reports

Appendix B Final Data Quality and Usability Report and Data Approval Request (DQUR/DAR)

Appendix C Human Health and Ecological Risk Assessment (HHERA) Work Plan

Appendix D Media-specific SAPs and Addendum and the Quality Assurance Project Plan (QAPP) and QAPP Addendum that will constitute the overall SAP for the RI/FS.

Appendix E Health and Safety Plan (HASP). The HASP is produced under a separate cover to facilitate distribution to the project team.

Appendix F Comments and Comment Responses. This is the record of agency comments and P4's comment responses.

Tables, figures, and the large number of drawings are contained in separate volumes for easier reference.

This RI/FS Work Plan addresses the Sites collectively. In the future, per the 2009 CO/AOC, major project deliverables, such as the RI and FS reports will address each mine separately.

2.0 SITE BACKGROUND AND PHYSICAL SETTING

This section of the RI/FS Work Plan presents the background (history) and physical characteristics (setting) for the Sites and investigations that have been conducted at the mines. This information provides a basis for the characterization discussions and conceptual site models for the Sites as presented in Section 3.0 and assists in identifying additional investigations that may be necessary to fill the remaining data gaps as presented in Section 4.0. The history of each mine site is summarized in Section 2.1, the Sites' physical characteristics are described in Section 2.2, and a summary of previous investigations is presented in Section 2.3.

2.1 Site History – Ballard, Henry, and Enoch Valley Mines

This section describes the histories of the three mines that are being evaluated under the RI/FS process. These histories include three distinct components: (1) operational histories; (2) mining, waste rock disposal, and reclamation practices; and (3) current land status. A general description of these historical components is provided below for the entire RI/FS project area. Specific information related to these historical components then follows for each mine in Section 2.1.1 Ballard Mine, Section 2.1.2 Henry Mine, and Section 2.1.3 Enoch Valley Mine. The regulatory history related to environmental conditions at the Sites is presented in Section 1.0, and a chronological list of environmental and related studies is provided at the end of Section 2.0.

Operational History. The three mines to be investigated during the RI/FS were actively mined from 1952 until 2003. From 1952 until 1997, mining was conducted by the Monsanto Company (Monsanto). In September 1997, Monsanto spun off its traditional chemical business to form Solutia. Monsanto and Solutia formed a joint venture, P4 Production, LLC (P4), which owned and operated the phosphate mines. P4 was assigned the phosphate mining leases and mineral rights. In May 2001, the joint venture was dissolved and P4 became a wholly-owned subsidiary of Monsanto. P4 is a current and former lease holder of State and Federal surface and mineral rights, and, currently owns portions of the Sites.

The Ballard Mine is the oldest of the three mines being addressed in the RI/FS. It was mined from 1952 to 1969. The Henry Mine was active between 1969 and 1989, and the Enoch Valley Mine was active between 1989 and 2003. Following the completion of mining at the Enoch Valley Mine in 2003, P4 moved its mining operations to the South Rasmussen Mine, which is still active and is not a part of this RI/FS.

Mining and Waste Rock Disposal Practices. The phosphate mining practice at the three mine sites generally involved removal of overburden soils and weathered rock to access the phosphate ore. As the phosphate ore was excavated by scrapers or trucks and shovels, the adjacent rock was also excavated, allowing the mine pit walls to be sloped to a stable configuration during mining. In addition, there was non-economic rock within the excavated ore sequence (i.e., waste shales). This overburden and waste rock was placed adjacent to the mine pits, or as backfill into mine pits, as mining was completed. Overburden and waste rock within the mined rock sequence consists of several types of shales, including brown, black, and cherty shales, as well as limestone and chert. This geology is discussed further in Section 2.2.4.

Reclamation Summary. Over time, reclamation practices at the P4 mines have become more sophisticated and effective in reducing infiltration and oxidation in the mine waste rock dumps. In general, reclamation success at the Sites has improved over time and adequate vegetative cover has developed with few exceptions. Reclamation was limited at the Ballard Mine and largely consisted of some test plots and planting of some grasses and alfalfa. Regrading and cover placement was not a significant part of the Ballard Mine closure as per mining practices during the 50s and 60s era. The Henry Mine exhibits a significant change in reclamation practice with some of the most dense vegetation coverage observed at the Sites. The changes to reclamation practices between Henry and Ballard were largely due to knowledge gained and observations made at the Ballard Mine. The typical seed mixes at the Henry Mine utilized a relatively limited selection of aggressive, introduced grasses and forbs planted in center waste rock cover materials. With time, the Site has attained additional diversity and native vegetation is returning. The Enoch Valley Mine represents another evolution and improvement in reclamation practices. Reclamation practices were

similar to those employed at the Henry Mine until 1993. After 1993, these practices evolved to consist of the exclusive use of topsoil cover combined with an increased diversity of native grasses and forbs in the seed mix, while no longer using waste shale as a covering material. The result of this improvement is a slightly lower vegetative cover density compared to the Henry Mine site, but a greater number of native species. This diversity of native species creates a greater likelihood that the pre-mining plant communities will re-establish sooner through natural processes.

A summary of the current land status at each of the three mines is presented below, including (1) the general overview of the mine land area, (2) areas and volumes of the waste rock dumps and mine pits, (3) surficial cover material and vegetation, and (4) ancillary facilities.

2.1.1 Ballard Mine

The following sections provide a detailed description of the operational history of the Ballard Mine. Much of this information is derived from Lee (2001) and from discussions with current P4 employees.

2.1.1.1 Operational History

The Ballard Mine is the oldest of the three phosphate mines being addressed in the RI/FS. It was mined from 1952 to 1969. The Ballard Mine is located in T7S, R42-43E and was originally leased to the J. R. Simplot Company (Simplot) in December 1948 under mineral lease BL 055875. Simplot never developed the lease; and on May 23, 1951, Simplot assigned the lease to Monsanto, which started exploration and stripping in June 1951. Mining started in 1952 on the southern portion of lease BL-055875 and expanded to the north.

A second Ballard Mine lease, I-05723, was issued to Monsanto in July 1955 to include additional phosphate ore deposits to the west. In 1955, mining operations were initiated within lease I-05723 and were referred to as Ballard Mine Pit #1 or the West Ballard Pit (location number MMP035; Drawing 2-1). Ballard Mine Pit #1 contained the largest ore reserves and was operated for a longer period than any other pit in the mine. The Ballard

Mine eventually consisted of several side-hill and open-pit excavations. During the 1961-1962 mining season, a 470-foot-long conveyor belt was installed from the footwall to the tipple level in Ballard Mine Pit #1 to improve hauling efficiency (Lee, 2001). The loading facilities included tipples, screens, conveyors, weigh bins, and automatic samplers. During 1964 and 1965, Monsanto utilized a 45-inch horizontal auger to recover a limited quantity of ore that remained under the highwall in stripped-out pit areas. Trucks hauled ore from the mine to the elemental phosphorus plant at Soda Springs using public roads until the current private haul road was completed in July 1958.

Mining continued at various locations on the two leases from 1952 until Monsanto ceased mining activities in 1969. During the 17 years of mining, 10.4 million dry net tons of phosphate rock were mined and hauled to Monsanto's elemental phosphorus plant at Soda Springs (Lee, 2001). Approximately 20 million cubic yards (MCY) of waste rock were stripped; of that amount, two MCY were used to backfill the pits, with the remaining 18 MCY hauled to the waste rock dumps (Lee, 2001). The mining operations at the Ballard Mine predated the Idaho Surface Mining Act of 1971, as well as several federal mining-related regulations. Monsanto relinquished both of the Ballard Mine mineral leases to the BLM in April 1984, and BLM accepted relinquishment in July 1984.

2.1.1.2 Mining, Waste Rock Disposal, and Reclamation Practices

The Ballard Mine was primarily mined by using scrapers, and there was no planned segregation of the material in the waste rock dumps or cover placement. Waste rock generally was placed in the area adjacent to the pit where it was mined. Because of the mining sequence, black, unoxidized middle shales from the bottom of the mine pits commonly ended up on the outer waste rock dump surfaces.

Reclamation had started on the earlier pits even before mining operations were completed. As early as 1958, the Ballard Mine waste rock dumps were used for experimental plantings for reclamation. Additional experimental plantings were done in the 1960s and early 1970s by the USFS Experimental Station at Logan, Utah, which planted a total of 78 different species of trees, shrubs, grasses and forb seeds, seedlings, and cuttings on the waste rock

dumps (Lee, 2001). In the early 1980s, a study was conducted by Monsanto on cost-effective reclamation activities that might be performed at the Ballard Mine. Some small projects that were launched as part of the study included highwall reduction, spreading of soil, and breaking up of hard floors with subsequent plantings.

Several varieties of grasses and alfalfa that were planted on mine waste rock areas are doing well, but there are some angle-of-repose slopes and mine pit areas where vegetation is mostly absent. Many of the plant species that were planted as test plots throughout the mine area have become established, and there is also a great deal of voluntary vegetation. In general, the tops of some of the waste rock dumps have not been graded to promote stormwater drainage, and the mine pits have not been backfilled to a significant volume and graded.

2.1.1.3 Current Mine Land Status

The Ballard Mine currently contains external waste rock dumps, open pits, an abandoned haul road, and the Ballard Shop Area. P4 owns approximately 865 acres of surface rights and has a surface easement from the State of Idaho on an additional 360 acres. At present, the Ballard Mine has six distinct open mine pits and six distinct waste rock dumps. The disturbance area for the Ballard Mine generally is compact and has approximately equal dimensions in the north-south and east-west directions (approximately 1.4 by 1.4 miles). The Ballard Mine includes approximately 534 acres of waste rock dumps, mine pits and service areas (Table 2-1). Due to the age of the mine, vegetation has developed over most of the mine area with the exception of some mine pit areas and a few steep waste rock dump slopes. The configuration of the mine pits and waste rock dump areas at the Ballard Mine are shown on Drawing 2-1.

Overburden Piles and Mine Pits. The volumes provided in Table 2-1 were developed in 2008 and are reported in the 2007 and 2008 Data Summary Report (DSR; MWH, 2009b). These volumes are an estimation of the mine area configuration based on available surface topographies from before and after mining. The exceptions are areas of partial pit backfill in MMP035 and MMP036. Because ultimate pit topography is unavailable, it is not possible to accurately calculate the volume of backfill in the mine pits. However, in the case of the

Ballard Mine, the amount of backfill is relatively minor; therefore, no attempt was made to estimate the volume. Historical records indicate that approximately 18 MCY of mine waste rock were hauled to the external waste rock dumps, and 2 MCY were placed back in the mine pits (Lee, 2001). The reported external volume correlates well with the volume calculations based on current topography and pre-mine topography presented in Table 2-1.

Surface Cover and Vegetation. Based on the 2009 investigations, surficial material on waste rock dumps at the Ballard Mine consists mainly of an approximate 2:1 mixture of weathered brown shale and black shale. There are occasional areas, comprised of two to five percent of a waste rock dump, which are covered in dominantly black shale. Areas of black shale occur most often at waste rock dumps MWD080 and MWD081. Black cherty shale covers up to five percent of the area of some dumps and occurs most often at dumps MWD082 and MWD093. Limestone and sandstone typically are found only as cover near the base of Wells Formation highwalls. Dolomite or limestone boulders are present primarily near the edges of highwalls and pits. Many areas with brown shale or mixtures of brown shale and black shale cover have weathered to resemble an incipient topsoil; however, placed topsoil cover was not observed in 2009.

The depth of weathering in the rock cover where soil characteristics are developing is typically one to two feet thick on the tops of dumps and on gentle slopes. These flatter areas are covered mostly with a mixture of weathered brown and black shale. Soil-like material on steeper slopes is typically less than or equal to six inches thick, consisting of black shale or cherty shale. Slopes at angle-of-repose are predominately unweathered black shale and cherty shale. Roads are primarily cherty shale and limestone.

The vegetative cover is relatively dense in some areas consisting mainly of grass and forbs species and with other areas possessing a higher percentage of woody species. The following species are the most common:

- *Pascopyrum smithii:* western wheatgrass
- *Dactylis glomerata*: orchardgrass

- *Bromus tectorum*: cheatgrass
- *Bromus inermis*: smooth brome
- *Medicago sativa*: alfalfa
- *Achillea millefolium*: western yarrow
- *Geranium viscosissimum*: sticky geranium
- *Lappula occidentalis*: flatspine stickseed
- Amelanchier alnifolia: serviceberry
- *Artemisia tridentata*: big sagebrush
- *Populus tremuloides*: quaking Aspen
- *Purshia tridentata:* antelope bitterbrush

Additional information on the soil and vegetation surveys conducted in 2009 can be found in the technical memorandum located in Appendix A2.

Ancillary Facilities. At this time, the only ancillary facilities remaining at the Ballard Mine are remnants of a partially paved haul road, various unimproved soft surface two-track roads, and the Ballard Shop Area consisting of a large garage/shop building, an unused office building, various small storage sheds and buildings, and a stockpile of slag from the P4 Soda Springs plant.

The haul road is shown on Drawing 2-1. This haul road path is from the current P4 haul road along the south side of the Ballard Mine to the mine pit on the east side. The road is paved and/or improved dirt in various conditions throughout its length.

The unimproved roads are located throughout the mine area providing access to the monitoring wells, springs, old vegetation test plots, and other Site features. These roads are developed directly on whatever surface material is present are not considered separate features.

The Ballard Shop Area is comprised of the remnants of the mining administrative facility, maintenance facilities, and ore loading operation. The maintenance facility was operated as a shop for heavy trucks and mining equipment from approximately 1952 to 1989 for both the Ballard and Henry mines. Since the Henry Mine closure, the shop area has been used intermittently for storage. The former garage/shop building is still present. This building has a concrete pad and foundation and currently is used by P4 to store vehicles, construction and maintenance materials, and miscellaneous items. Adjacent to the garage building is an unused office building. Around the remainder of the shop area are several small sheds (both open and closed) that are used to store drill core, agricultural equipment, and miscellaneous items. Four rail boxcars sit approximately 750 feet north of the main shop area. These boxcars are used for storing ore samples. Slag also is stockpiled in the shop area. This stockpiled slag is used for road repairs and is present as road base in the shop area.

2.1.2 Henry Mine

The following sections provide a detailed description of the operational history of the Henry Mine. Again, much of this information is derived from Lee (2001), which is augmented through discussions with current P4 employees.

2.1.2.1 Operational History

The Henry Mine, which was operated by Monsanto from 1969 to 1989, is located in T6S, R42-43E., with the northern end approximately one mile to the southeast of the small village of Henry, Idaho. Monsanto leased and operated the Henry Mine from the issuance of the mine permit (Lease # I-011451) in 1960 and mine permit (Lease #I-013814) in 1965, until the leases were relinquished to the BLM in December 1993. The mining plan called for five mine panels or pits along five miles of phosphate outcrop. Initial mining was conducted at Pits I and II (MMP042 and MMP043). Mining operations in the South Henry Continuation (Pit III, MMP044) started in the fall of 1976 and were completed in 1980. Mining operation started at the Center Henry Continuation (Pit IV, part of MMP042) immediately thereafter and was completed in the fall of 1985. Mining operations in the North Henry Continuation (Pit V, part of MMP041) started at the beginning of 1986 and were completed in mid-

October, 1989 (Lee, 2001). The BLM accepted the lease relinquishment on December 7, 1993, following reclamation.

Approximately five miles of phosphate outcrop were eventually developed and mined with the entire output of the mine going to Monsanto's elemental phosphorus plant at Soda Springs (Lee, 2001). Monsanto contracted with Dravo-Soda Springs (renamed Degerstrom Ventures in 2001) for mining and ore hauling. Shipping the ore from the mine to the elemental phosphorus plant at Soda Springs was by truck with two or three belly-dump trailers.

2.1.2.2 Mining, Waste Rock Disposal, and Reclamation Practices

The initial mining operation at the Henry Mine utilized scrapers for both mining and striping waste rock and overburden. In 1986, the operation was converted to haul truck and shovel (Lee, 2001). Mining at the Henry Mine generally started near the center, and then progressed outward to the southeast and northwest along the outcrop of the Phosphoria Formation.

The Henry Mine was transitional between historical practices and more modern reclamation practices. Initially, the waste rock disposal practice was similar to that used at the Ballard Mine, with external waste rock dumps adjacent to the mine pits. However, as a result of some of the early reclamation research performed at the Ballard Mine, together with the influence of the Idaho Mine Reclamation Act of 1971, reclamation became a standard part of the mining practice at the Henry Mine. By 1978, backfilling mine pits also became a common practice. As a result, most of the mine pits have been backfilled and graded to promote stormwater drainage away from the pit backfill. Portions of the mine highwalls remain exposed in a number of the pit areas. However, these exposures are Wells Formation limestone, which are not selenium-rich rocks and, therefore, will not leach selenium when exposed to surface conditions. Only mine pits on the northern and southern ends of the mine were not backfilled.

All of the mine waste rock areas were successfully revegetated with excellent coverage. The mine waste rock areas were graded, but there are some relatively small mine areas with poor

drainage. General practices at the Henry Mine included the use of oxidized brown shale as a cover over various waste rock materials as outlined in the mine approval stipulations. This rock has lower permeability and higher water retention capacity than much of the waste rock and resulted in increased plant growth and density.

2.1.2.3 Current Mine Land Status

The Henry Mine contains reclaimed pit backfills, external waste rock dumps, two un-backfilled mine pits, and an abandoned haul road. The mine disturbance is located along a linear northwest trending geologic outcrop of the Phosphoria Formation oriented in a northwest-southeast direction. The mine lease area is approximately five miles long and one-half-mile wide and includes 689 acres owned by P4, 40 acres owned by the BLM, and 1,080 acres owned by the Idaho Department of Lands (IDL). Approximately 1,000 acres of this mine lease area were disturbed during mining operations and consist of waste rock dumps and mine pit areas (Table 2-2). Approximately 680 of the 1000 acres which was originally disturbed have been successfully reclaimed. The remaining un-reclaimed areas include mine pits, highwalls, and portions of the haul road. Not all of the mine pits were backfilled to original grade; therefore, mine highwalls are visible along the length of much of the mine. The general condition of the Henry Mine is that of a reclaimed mine and portions have been used for livestock grazing for more than 15 years. The configuration of the mine pits and waste rock dump areas at the Henry Mine is shown on Drawing 2-2.

Overburden Piles and Mine Pits. For the Henry Mine area, the waste rock dump volume estimates presented in Table 2-2 were based on the pre-mine topography and a new topographic survey completed for P4 in 2008. The waste rock dump boundaries for the Henry Mine include the backfilled mine pit areas, which are generally shown to have a net cut (excavated) volume because the pits were not backfilled to original grade. Therefore, the fill volumes for the waste rock dumps are estimated for the areas external to the mine pit areas only and do not include the waste rock areas within pit boundaries. Cut volumes in Table 2-2 include both un-backfilled mine pit volumes as well as the volume of the unfilled portion up to original grade above any pit backfill. The areas presented correspond to the volumes estimated (e.g., only external areas or estimated pit areas).

Rough estimates for the pit backfill volumes were calculated for the Henry Mine. P4 records indicate that 99.6 MCY of waste rock was moved at the Henry Mine. The estimated volume in the external waste rock dumps is 32.3 MCY (Table 2-2). Therefore, 67.3 MCY are estimated to be contained in the Henry Mine pits as backfill.

Surface Cover and Vegetation. Surficial cover material on waste rock dumps at the Henry Mine consists primarily of weathered brown shale as documented during the 2009 soil and vegetation surveys. Up to two percent limestone mixed with the weathered brown shale comprises a small percentage (less than five percent) of the total area of the dumps. Limestone and sandstone cover is found primarily near the base of highwalls, along with scattered dolomite boulders. Roads are made primarily of limestone where not paved. Black shale cover is rare and comprises less than one percent of the total area of any dump. The weathered brown shale cover closely resembles and functions as topsoil over the majority of the dumps.

Based on a 2009 soil survey, weathered brown shale cover thicknesses average two to three feet on flat areas of the Henry Mine waste rock dumps. The slopes are typically gentle with cover less than or equal to one foot thick. Steeper slopes are benched with cover less than or equal to six inches thick on the sloped portions and greater than one foot thick on the flat areas. Uncovered areas at angle-of-repose are not present on the waste rock dumps, and only occur at the remaining Wells Formation highwalls and road cuts through the Dinwoody Formation.

Vegetative cover is good to excellent, with areas consisting mainly of grass and forbs species and other areas with a higher concentration of woody species. The following species are the most common:

- *Bromus inermis*: smooth brome
- Bromus marginatus: mountain brome
- *Dactylis glomerata*: orchardgrass
- *Pascopyrum smithii:* western wheatgrass

- *Medicago* sativa: alfalfa
- *Artemesia ludoviciana*: white sage
- *Collomia linearis*: slenderleaf collomia
- *Artemesia tridentata*: big sagebrush

Additional information on the soil and vegetation surveys conducted in 2009 can be found in the Technical Memorandum located in Appendix A2.

Ancillary Facilities. Prior to closure, the Henry Mine area included offices, shops, and an ore loading area (tipple). At closure, the buildings and structures were removed. With the exception of a three-mile long former haul road, which is mostly paved, and minor two-track dirt roads, no significant ancillary facilities remain at the Henry Mine.

2.1.3 Enoch Valley Mine

The following sections provide a detailed description of the operational history of the Enoch Valley Mine. Again, much of this information is derived from Lee (2001), which is augmented through discussions with current P4 employees.

2.1.3.1 Operational History

The Enoch Valley Mine, operated by P4, is located in T6S, R43E, approximately 19 miles northeast of Soda Springs, Idaho. The mine lease area is approximately three and a half miles long by half a mile wide and consists of three federal phosphate leases and two State of Idaho leases. The Enoch Valley Mine began operation in 1989 and continued until 2003. Monsanto Company began preparing its Enoch Valley Mine leases for mining in late 1987. The mining plan called for mining to progress from the north and south ends of the property towards the center. Monsanto contracted with Dravo-Soda Springs (renamed as Degerstrom Ventures in 2001) for mining and ore hauling, and mining began at the north end of the property in 1989. Shipment of ore from the mine to the Monsanto elemental phosphorus plant, over 19.5 miles of haul road, began in 1990. Shipment of ore from the south lease began in August 1990. In the spring of 2000, the active north and south mine

pits were finally joined near the middle of the lease. P4's records indicate that approximately 51.5 MCY of waste rock was moved at the Enoch Valley Mine. The mineral leases at the Enoch Valley Mine have not been relinquished back to the federal agencies.

2.1.3.2 Mining, Waste Rock Disposal, and Reclamation Practices

Mining of the Enoch Valley deposit was conducted using primarily hydraulic shovels and haul trucks with pit backfilling and some selective handling of overburden and waste rock. The Enoch Valley Mine was mined from both ends working toward the center. This resulted in external waste rock dumps being placed on the northern and southern portions of the mine area during the early stages of mining. As mining progressed toward the center, the mine pits became the primary locations for waste rock placement. A portion of the topsoil and limestone were segregated for later use in reclamation. In most cases, these materials were hauled directly from the mining area to the areas being reclaimed.

The reclamation at the Enoch Valley Mine utilized modern practices with pit backfilling, slope grading and planned revegetation. Most reclaimed areas at the Enoch Valley Mine received either direct haul or stockpiled topsoil, with the exception of pit and external waste rock dump areas reclaimed prior to 1993, which are located at the extreme south and north ends of the mine area. The north waste rock dump (MWD091) is located west of the north pit and contains mostly cherty shale and topsoil cover with some black shale. The second waste rock dump, or south waste rock dump (MWD092), includes the reclaimed south end of the pit and land adjacent to the pit on the west. This dump is mostly topsoil cover with some black shale, brown shale, and topsoil stockpiles. A portion of the cover for these waste rock dumps also includes a nominal four-foot-thick layer of limestone beneath the soil cover. This construction is found in the backfilled pit areas between the current open pit areas and extends 1,550 feet to the northwest and 2,750 feet to the south.

2.1.3.3 Current Mine Land Status

The Enoch Valley Mine has been largely reclaimed. The maintenance and administrative offices and the active ore loading facilities for the South Rasmussen Mine are located near

the center of the Enoch Valley Mine site. With the exception of this area, the current condition of the mine is very similar to the Henry Mine. The mine is oriented in a northwest-southeast direction and is slightly more than three miles long and approximately a half mile wide. It includes 55 acres owned by P4, 838 acres administered by the IDL, and 582 acres of USFS land. The current configuration of the mine pits and waste rock dump areas at the Enoch Valley Mine are shown on Drawing 2-3. The area of waste rock dumps and remaining mine pit exposures is approximately 498 acres (Table 2-3).

Overburden Piles and Mine Pits. For the Enoch Valley Mine area, the volumes estimated in Table 2-3 were based on the pre-mine topography and the December 2007 topography in the geographic information system database maintained by P4. The waste rock dump boundaries for the Enoch Valley Mine waste rock dump MWD091 include the mine pit backfill areas, which would show as a cut volume because the pits were not backfilled to original grade. Therefore, the fill volume for waste rock dump MWD091 is estimated for the external dump area only. Waste rock dump MWD092 is defined as an external dump. Two cut volumes for mine pit MMP045 were estimated, one for the largely un-backfilled area and one for backfilled areas that include the cut volume between the backfill surface and the original grade.

P4 records indicated that approximately 51.5 MCY of waste rock was moved at the Enoch Valley Mine. The calculations presented in Table 2-3 indicate that an estimated 22.2 MCY is contained in the external waste rock dumps; therefore, the mine pit contains an estimated 29.3 MCY of waste rock as backfill.

Surface Cover and Vegetation. Surficial cover material on waste rock dumps at the Enoch Valley Mine consists primarily of reclaimed soil with some weathered brown shale. After several years of use as cover, weathered brown shale in the field appears similar to topsoil and is difficult to distinguish. However, observations during the 2009 soil and vegetation reconnaissance (Appendix A2) and reclamation records indicate that only the extreme northern and southern ends of the Enoch Valley Mine did not receive a topsoil cover (verbal communication, Mike Vice, P4 Reclamation Manager, 2009). A nominal four feet of limestone was placed between the waste rock (generally center waste shale) and the topsoil

cover in locations approximately 1,550 feet northwest and 2,750 feet south of the current un-backfilled open pit. In addition, limestone is occasionally found mixed up to five percent with the weathered topsoil in areas near highwalls. Roads are made primarily of limestone.

Surficial cover/growth media averages two to three feet thick in flat areas on the Enoch Valley Mine dumps. Slopes are typically gentle, with cover less than or equal to two feet thick. Steeper slopes are benched with the sloped portions covered at less than or equal to two feet thick and flat areas covered at greater than or equal to two feet. Uncovered areas, at angle-of-repose, are not present on the waste rock dumps and minimal exposure of Wells Formation highwalls remains.

Vegetative cover is good to excellent, with areas consisting mainly of grass and forbs species and other areas with a higher concentration of woody species. The following species are the most common:

- *Bromus inermis*: smooth brome
- *Bromus marginatus*: mountain brome
- *Dactylis glomerata*: orchardgrass
- *Pascopyrum smithii:* western wheatgrass
- *Achillea millefolium*: western yarrow
- *Geranium viscosissimum*: sticky geranium
- *Linum lewisii*: Lewis flax
- *Wyethis amplexicaulis*: mule's ears
- *Amelanchier alnifolia*: serviceberry
- *Artemesia tridentata*: big sagebrush
- *Populus tremuloides*: quaking Aspen

Additional information on the soil and vegetation surveys conducted in 2009 can found in the technical memorandum located in Appendix A2.

Ancillary Facilities. At this time, active facilities remain at the Enoch Valley Mine to support current mining at P4's South Rasmussen Mine. The primary activity at the Enoch Valley Mine occurs at the ore loading facility. Ore is transported from the South Rasmussen Mine to the Enoch Valley Mine by haul truck, where it is deposited in ore stockpiles that cover up to nine acres. Special triple-trailer ore trucks/trains are loaded with approximately 210 tons of phosphate ore per truck. After the trucks are loaded, they depart the Enoch Valley Mine on a paved private haul road that runs down to the phosphorous plant near the town of Soda Springs.

Other facilities that are present at the Enoch Valley Mine, supporting the South Rasmussen Mine, include the following:

- Mine office building (approx. 7,500 square feet [sq. ft].)
- Garage storage shed (approx. 1,400 sq. ft.)
- Vehicle maintenance shop and wash bays (approx. 28,500 sq. ft.)
- Fuel containment area (approx. 4,500 sq. ft.)
- Fuel tanks and vehicle fluid tanks (e.g., motor oil) (10 ranging from 4,300 to 30,000 gallons)
- Tire shop (approx. 3,400 sq. ft.)
- Prill storage tower (ammonium nitrate)
- Two blasting supply magazines
- Electrical substation
- Two propane tanks (18,000 and 1,000 gallon)
- Laydown/storage yard
- Stormwater ponds that in part receive stormwater from the active area, including MSP022, MSP023, and MSP031 (these ponds may receive COPCs from the active areas)

The active facilities at the Enoch Valley Mine are located at the approximate center of the mine site (Drawing 2-3). The northern and southern areas of the mine are largely inactive without notable ancillary facilities.

2.2 Site Physical Characteristics

This section describes the regional physical characteristics and, as necessary, presents specific physical characteristics at individual Sites and/or areas of interest in the immediate vicinity of the mines. Summaries of the Site are (1) physiography, (2) climate and meteorological information, (3) hydrology, (4) geology, (5) hydrogeology, (6) soils, (7) ecology, (8) land and water use, (9) demographics, and (10) cultural and natural resources.

2.2.1 Physiography

The Sites straddle the boundary between the Basin and Range and Rocky Mountain Physiographic Provinces. The transition between the two provinces occurs at the western edge of the Aspen Range, with the western region (Basin and Range) consisting of wide, deeply filled, flat basins separated by block-faulted mountains, and the eastern region (Rocky Mountain) consisting of subparallel folded mountain ranges separated by thinly-filled valleys (Mabey and Oriel, 1970; Fenneman, 1917).

Ballard Mine. Topography of the Ballard Mine is dominated by a medium gradient, north-northwest/south-southeast trending ridgeline at elevations ranging from approximately 6,300 to 7,000 feet above mean sea level (amsl). A number of intermittent streams originate from, or flow past, the Ballard Mine. The Ballard Mine is located within three major drainages: Long Valley Creek, Wooley Valley Creek, and the Blackfoot River. Long Valley Creek leads generally northward to the Little Blackfoot River, which empties into the northeast corner of the Blackfoot Reservoir. Wooley Valley Creek discharges into the Blackfoot River southeast of the Ballard Mine, which drains into the Blackfoot Reservoir. The Blackfoot River is located south of the Ballard Mine.

Henry Mine. Topography of the Henry Mine is dominated by a northwest-southeast trending ridgeline at elevations ranging from approximately 6,300 to 7,000 feet amsl above

mean sea level. Mine pits are found along the eastern side of this high gradient ridgeline and are located along a five-mile stretch of this particular Phosphoria outcrop. The majority of the waste rock dumps are located northeast of the mine pits, except for the canyon fill waste rock dump (MWD087) which is southwest of MMP042 and MMP043. Near the north end of the lease, between MMP041 and MMP043, the Little Blackfoot River cuts across the property, flowing to the west into the Blackfoot Reservoir.

Enoch Valley Mine. Topography of the Enoch Valley Mine consists of a long, low ridgeline running northwest to southeast. Elevations range from about 6,600 feet to over 7,000 feet amsl. The topography includes grassy meadows, steep drainages, and exposed rock outcrops along the ridges. Small springs in the area have been used to create larger wetland areas, and the out-of-pit waste rock areas have been contoured to create and maintain these wetland ecosystems. There are fifteen ponds and other depressions that have been enhanced to mimic natural wetlands. Several small streams drain the mine and adjacent area.

2.2.2 Climatic and Meteorological Information

The climate of SE Idaho is semi-arid with hot summers and cold winters. The climate is strongly influenced by topography, which in turn influences wind patterns, temperature, and precipitation. North trending mountain ranges in the region create a natural barrier for water-saturated Pacific air masses. The rain shadow effect causes the Snake River Plain region to be semi-arid with a middle latitude steppe climate. Precipitation during the colder months is generally in the form of snow, while precipitation during the summer is primarily associated with localized, orographic thunderstorms.

Tables 2-4 and 2-5 present data from the Enoch Valley Mine climate station, and Blackfoot Bridge climate data taken from the *Draft Environmental Impact Statement Blackfoot Bridge* (Blackfoot Bridge Environmental Impact Statement; EIS; BLM, 2009). The Enoch Valley Mine climate station is located at the Enoch Valley Mine office on the eastern edge of the P4 Sites, at an elevation of 6,720 feet amsl. This station location is shown on Drawing 2-3. Estimated climate data used for the proposed Blackfoot Bridge Mine lease was derived from

data taken at 13 area climate stations, as detailed in BLM (2009). The Blackfoot Bridge area is located just southwest of the Ballard Mine across the Blackfoot River.

July and August are typically the driest months of the year and May is usually the wettest. Annual precipitation at the Sites ranges from 17 to 19 inches per year. July and August are the warmest months of the year, while December and January are the coldest. Average temperatures range from minimums of -13.7 degrees Fahrenheit (ºF) in December to maximums of 89.1ºF in July.

2.2.3 Hydrology

The vicinity of the P4 Sites is surficially drained by two main drainages, the Little Blackfoot River to the north and the Blackfoot River to the south, both of which drain directly into the Blackfoot Reservoir. Blackfoot Reservoir is used to irrigate agricultural land in the area. Formed by the confluence of Diamond Creek and Lanes Creek, the Blackfoot River begins nearly 13 miles east of the point where the river discharges into the Blackfoot Reservoir. The headwaters of the Little Blackfoot River are nearly four miles to the northeast of the point where it discharges into the Blackfoot Reservoir. Water released from the Blackfoot Reservoir continues in the Blackfoot River until its confluence with the Snake River, approximately 37 miles to the northwest. The hydrology in the vicinity of the P4 mines is shown on Drawing 2-4.

Stream baseflow originates from springs in the mountain and valley areas. There are several small to medium springs in the Sites which are typically located in the alluvial valleys or at the break in slope on the ridges. These springs are discharge points for groundwater systems consisting of isolated alluvial aquifers and sedimentary formations. Many headwater streams at higher elevations only flow during snowmelt runoff while others are fed by larger perennial springs. Various waste rock dump seeps and springs contribute some flow to a number of perennial and intermittent streams found throughout the Sites. The hydrology at each P4 mine (or Site) is discussed below. In many cases, the smaller, sometimes ephemeral streams were not identified on United States Geological Survey (USGS) maps; for the purpose of characterization, they have been given informal designations.

Ballard Mine. The Ballard Mine is drained on the east by the Wooley Valley Creek system and on the west by an unnamed drainage system. Wooley Valley Creek will reach the Blackfoot River during the snowmelt and peak runoff periods in the spring but becomes dry in the summer and does not contribute any flow to the Blackfoot River for the rest of the year. Table 2-6 shows the discharges and seasonal differences among the main drainages at the Ballard Mine.

Henry Mine. The southern portion of the Henry Mine is drained to the northeast by Lone Pine Creek, to the southwest by the Long Valley Creek system, and the northern portion of the mine is drained by the Little Blackfoot River as shown on Drawing 2-4. Lone Pine Creek flows most of the year (only drying up during late summer) and feeds directly into the Little Blackfoot River east of the Mine. A tributary to Long Valley Creek drains a small southern portion of the mine. This tributary becomes intermittently dry during the summer. Eventually, water in the tributary flows to Long Valley Creek and then to the Little Blackfoot River, west of mine. The Little Blackfoot River flows east to west, from Enoch Valley to Long Valley, and cuts directly through the north and central portions of the Henry Mine. From the mine it flows directly into the Blackfoot Reservoir. Table 2-7 shows the discharges and seasonal differences in the main Henry Mine drainages.

Enoch Valley Mine. The Enoch Valley Mine is drained to the south by the Rasmussen Creek system, which then feeds into Angus Creek just south of the mine as shown on Drawing 2-4. The Rasmussen Creek headwaters originate on the western slopes of the Enoch Valley Mine. Water flow in Rasmussen Creek is intermittent throughout the year; the upper reaches dry out in the summer, and the creek maintains perennial flow only near the confluence with Angus Creek. Angus Creek is a perennial stream and flows directly into the Blackfoot River. The northern area of the Enoch Valley Mine is drained by an annual snowmelt channel that originates above the mine and flows west into Enoch Valley. The channel dries long before reaching Lone Pine Creek. Table 2-8 shows the discharges and seasonal differences in the main Enoch Valley Mine drainages.

Blackfoot River. Formed by the confluence of Diamond Creek and Lanes Creek, the Blackfoot River begins nearly 1.5 miles upstream of the Angus Creek confluence. Reaches

upstream of the Angus Creek confluence are considered background and are void of any surface water discharge from the P4 Sites. However, downstream and upstream of the Angus Creek confluence there are other drainages to the Blackfoot River that come from other mine sites. These streams include State Land Creek, Trail Creek, Slug Creek, Dry Valley Creek, East Mill Creek, and Spring Creek. Table 2-9 shows the discharges and seasonal variations in the Blackfoot River discharge.

Mine Area Ponds. Eighteen ponds that regularly have standing water have been monitored at the three Sites. These ponds are listed in Table 2-10 and are shown on Drawing 2-4. A majority of these ponds are seasonal and become dry by late summer. They vary in size from less than 0.1 acres (MSP059) to approximately 5.8 acres (MSP014) and have varying riparian vegetation densities. Some have healthy riparian habitats well-suited for wildlife whereas others are found in barren depressions with no significant riparian vegetation.

Potential overflow locations are listed in Table 2-10 for ponds that may overtop during a runoff or extreme storm event. These are anticipated directions of flow in case overtopping occurs, but these flow patterns have not been observed. Many of the ponds listed were, or are, part of a stormwater control system with secondary ponds present should they overtop. Several of the ponds have formed in mine pits or similar restricted basins, and there is no reasonable expectation that they will overtop. These locations are noted as closed basins. The Enoch Valley Mine currently has active operations and an active Stormwater Pollution Prevention Plan (SWPPP). Typically, water at the Enoch Valley Mine is managed on site to the extent possible. Excess water may be used for road dust control. However, there are five identified outfalls associated with the pond system (refer to Table 2-10).

2.2.4 Geology

The Sites are located within the Basin and Range Physiographic Province of western North America. The geology of the Basin and Range Province is characterized by linear, north-trending, fault-bounded ranges and basins formed by extensional tectonism. This extensional tectonism overprints an earlier period of compressional tectonics that included major overthrusting associated with the Bannock Thrust Zone in southeast Idaho, which

resulted in synclinal-anticlinal folds and some faulting during the Upper Cretaceous and Paleocene periods. The extensional Basin and Range block faulting has occurred since the Oligocene period with differential subsidence and uplift occurring mostly with normal faulting, resulting in the current major valleys and ridges. The principal stratigraphic units in the area of the Sites range in age from Mississippian to Quaternary and are described in Table 2-11.

Ranges in SE Idaho are generally composed of deformed Paleozoic and Mesozoic sedimentary rocks, including thick marine clastic units, cherts, and limestones. The valleys are largely filled in with Quaternary alluvium and colluvium that overlie Pleistocene basalt flows in some places. Thick rhyolite flows of the Snake River Plain region and rhyolite domes south of the Blackfoot Reservoir comprise most of the remaining volcanic sequences in the region. Massive accumulations of marine sediment occurred during the Paleozoic era over a large area of eastern Idaho, southwestern Montana, and northern Utah. During Permian times the Phosphoria Formation was deposited, creating the western phosphate field which includes the SE Idaho phosphate resource area. The Phosphoria Formation has four members: the Meade Peak Phosphatic Shale, Rex Chert, Cherty Shale, and Retort Phosphatic Shale. The Meade Peak Member, which ranges in thickness from about 55 to 200 feet, is the source of most of the extracted phosphate ore. This is the oldest member of the Phosphoria Formation and is typically overlain by either the Rex Chert or the Cherty Shale. The Retort Member is discontinuous and is found in the northern and eastern parts of the region but not in the vicinity of the Sites (USGS and USFS, 1977).

The most important mineral commodity in the area is the phosphate rock of the Meade Peak Phosphatic Shale Member of the Phosphoria Formation as stated above. This rock is composed of carbonate fluorapatite minerals that occur as nodules, pisolites, oolites, pellets, and fossil fragments, along with organic matter and quartz, muscovite, and calcite as accessory minerals, and very small amounts of such metals as vanadium, uranium, chromium, nickel, and rare earths. Minor phases, such as pyrite and sphalerite, also have been identified in the deposit (Piper, 2001).

Another significant sedimentary unit in the area is the Triassic Dinwoody Formation, which is made up of upper and lower units consisting of limestone, siltstone, and shale layers. The lower Dinwoody Formation is directly above the Phosphoria units in the stratigraphic section. The upper and lower units are often separated by a distinct layer of Woodside Shale. The Meade Peak Member of the Phosphoria Formation is underlain by the upper unit of the Wells Formation, which consists of sandstone interbedded with limestone and dolomite. In some locations, the Grandeur Limestone of the Park City Formation is present above the Wells Formation and is usually considered part of the Wells Formation for mapping purposes.

Regional geologic mapping of the program area was conducted in 1927 by the USGS (Mansfield, 1927). Subsequent mapping programs in the area were conducted by Hovland (1981), Oberlindacher (1990), and Oberlindacher, et al., unpublished. Mine features within the program are included on the regional geologic map presented as Drawing 2-5[1]. Field observations and boring logs, at the local scale, have been used in updating the mine-specific conceptual hydrogeologic models, cross-section drawings, and in determining locations of proposed wells. Discrepancies between Drawing 2-5 and other drawings and field observations may exist. The Ballard Mine area is more structurally complex than the Henry and Enoch Valley mines, which developed along linear northeast trend exposures of the Phosphoria Formation (Drawing 2-5). This complexity is shown on the detailed geologic map of the Ballard Mine area (Drawing 2-6). The steeply dipping character of the geology in the mine areas and the faulted nature of the Ballard Mine area are illustrated in the general cross sections provided in Drawing 2-7. The geology of the Ballard Mine was derived largely from Hovland (1981) meshed together with the regional maps presented by primarily Mansfield (1927) and Oberlindacher, et al. (1982).

[1] Drawing 2-5 is a compilation of Oberlindacher, et al. (1982); Hovland (1981); Mansfield (1927); Oberlindacher (1990); Oberlindacher, et al. (unpublished), and other P4 sources. The map presents the general geology and key features relevant to the RI/FS. Drawing 2-5 and Drawing 2-6, which is specific to the Ballard Mine area, do not attempt a complete compilation of all of the detail presented in the cited sources. Oberlindacher, et al., (unpublished) provides considerably more geologic detail for a portion of the area containing the Sites. If it becomes available electronically during the RI, it may be used to further update the geologic drawings.

2.2.5 Hydrogeology

The groundwater system in the region can be divided into (1) local shallow groundwater systems within basin-fill alluvium, (2) shallow to deep intermediate systems within sedimentary bedrock units, and (3) regional groundwater flow systems within deeper sedimentary bedrock units. Local systems generally are recharged and discharge within a single adjacent ridge and valley area. An example of an intermediate flow system is one that is recharged on one side of a ridge and then discharges to an adjacent valley on the opposite side of the ridge, whereas regional systems may transmit groundwater over large distances through multiple interconnecting valleys. The principal hydrostratigraphic units in the area of the Sites range in age from Mississippian to Quaternary in age and are described in Table 2-11 along with the type of flow system they commonly support.

The alluvium and colluvium in the valleys are up to approximately 150 feet thick and are recharged by direct precipitation and shallow flow from the topographic ridges. The alluvial groundwater systems interact directly with the local surface water systems along the valleys with gaining and losing streams at different locations. Where the bedrock sedimentary units contact alluvium, groundwater will similarly move between the bedrock and alluvium, depending on the hydraulic characteristics of the units and the hydraulic gradients at different locations. The alluvial groundwater is mostly unconfined and the water table surface and groundwater flow generally mirrors surface topography and surface water flow directions Because of alternating clayey and sandy bedding in the alluvium, deeper zones may be semi-confined or confined. It has been found during drilling at the Sites that the transitional contact between the alluvium and weathered bedrock often will have higher hydraulic conductivity than the alluvium and act as a semi-confined or confined unit associated with the alluvial system. Fractured basalt beds have been located within the alluvial basins. These beds may have relatively high hydraulic conductivity and are in direct hydraulic communication with the alluvial system. The basalts may alter the hydrogeologic conditions of the alluvial system, but currently they are considered part of the alluvial system.

In the bedrock units, the Thaynes, Dinwoody, Phosphoria, and Wells formations are the principal sedimentary formations in the area of the Sites through which significant

groundwater flow may occur. Previous hydrogeologic research conducted in the area generally indicates the following regarding potential bedrock groundwater systems in the area:

- The Thaynes and Dinwoody formations typically support intermediate groundwater flow systems (Ralston et al., 1977; Ralston et al., 1980).
- The Phosphoria Formation does not support any major groundwater flow systems; however, the Rex Chert Member may transmit groundwater where locally fractured (Ralston et al., 1977; Ralston et al., 1980). The main ore-bearing unit of the Phosphoria Formation, the Meade Peak Phosphatic Shale, is relatively impermeable due to low vertical hydraulic conductivity (Ralston et al., 1980).
- The Wells Formation supports a regional groundwater system (Ralston et al., 1977; Ralston et al., 1980). The Wells Formation has the highest hydraulic conductivity compared to the other bedrock units in the region (BLM, 1999).

In general, the flow systems in the Thaynes and Dinwoody formations are separated from the deeper Wells Formation by the low hydraulic conductivity of the Phosphoria Formation (in particular the Meade Peak Member). This causes the upper flow systems in the Thaynes and/or Dinwoody formations to be typically local or intermediate in extent, while the lower flow system in the Wells Formation may commonly be regional.

It should be noted that the above descriptions are generalities. For example, the Wells Formation could support local or intermediate systems, and the Dinwoody or Thaynes formations could support local flow systems. However, the converse cases are generally not known (e.g., alluvium is unlikely to support a regional or intermediate flow system).

Recharge to the bedrock units generally occurs along outcrops, particularly along topographically high ridges and flows downward, typically along the dip of the geologic beds. Eroded, steeply dipping beds are more likely to be significant zones of recharge when compared to flat laying beds because of the differences between permeability parallel and perpendicular to the bedding.

Groundwater flow through bedrock units is controlled by several factors, including the hydraulic properties of the units (i.e., with bedding and cross bedding hydraulic

conductivities) and hydraulic gradients, the areal extent, thickness and orientation of the geologic units, as well as structural controls such as folding, fracturing, and faulting. Fracturing of bedrock units (especially chert, mudstone, and limestone) has the potential to create secondary permeability and increase the hydraulic conductivity in an otherwise low-conductivity unit. Faulting in the bedrock units (i.e., where movement or displacement has occurred) can create flow barriers where gouge has formed as the result of rock grinding together. Some faults may have associated fracturing or dilatant zones that enhance permeability. Generally, the larger the fault displacement or more compressional a fault (e.g., thrust faults versus normal faults), the more likely it will be to have significant gouge and be a flow barrier. Factors such as rock type, depth, hydrostatic pressure, and other geologic conditions also can influence the hydrogeologic character of a fault or fault zone.

Any flow systems encountered in the Phosphoria Formation will not be regional in extent but could be intermediate or local in sporadic cases. It is most likely that where encountered in the Phosphoria Formation, groundwater occurs in isolated, structurally controlled systems confined to specific beds or units. Regardless, flow through the Phosphoria Formation perpendicular to bedding is expected to be very limited due to the presence of low permeability shales and mudstones. The potential risk and associated potential groundwater contamination in this type of system is much less than in the more laterally extensive flow systems associated with the other bedrock units. As such, the current conceptual models and hydrogeologic investigations are not focused on flow within the Phosphoria Formation. Previous studies in the Idaho phosphate area have indicated that spring discharge to surface water from the Phosphoria Formation is an infrequent occurrence (Winter, 1980; Ralston et al., 1980). Approximately 2% of spring discharge and total stream gain was found to be supplied by the Phosphoria Formation regionally (Winter, 1980).

2.2.6 Soils

Factors that influence the development of soil across the area are bedrock, surface geology, slope and slope aspect, and climate. Loess (windblown silt particles) from the Snake River Plain greatly affected the pedogenesis on the leeward (east) side of the Aspen Range to the south side of the Ballard Mine, and it is assumed this process has had a similar effect at the

Henry and Enoch Valley mines. The steeply dipping geologic strata have contributed to large-scale soil and rock movement, and thereby influenced the continuity of soils on the flanks of the mountain ranges. As stated in the Blackfoot Bridge EIS (BLM, 2009), a more recent factor influencing soil development is vegetation, which controls the quantity and decomposition of plant detritus and affects the weathering of parent materials.

Soils in the vicinity of the Sites are typically brown clayey, gravely and cobbly loams (USDA, 1990). Coarse fragments in the subsoils range from pebbles to cobbles and vary in percent by volume. The soils are moderately deep and well drained. Surficial cover material on waste rock dumps at the Sites often consists of weathered brown shale as documented during the 2009 soil and vegetation surveys. After several years of use as cover, weathered brown shale in the field appears similar to, and is difficult to distinguish from, topsoil.

2.2.7 Ecology

This section briefly discusses the biological resources in the Southeast Idaho Phosphate Resource Area extracted from TetraTech (2002). The *1998 Regional Investigation Report* (MW, 1999) presents a detailed discussion of the regional ecology.

2.2.7.1 Ecological Characteristics

The vegetation in the Southeast Idaho Phosphate Resource Area is transitional between the Great Basin vegetation to the south and the Rocky Mountain vegetation to the north (MW, 1999). The six vegetation types within the Southeast Idaho Phosphate Resource Area are a result of elevation, moisture, temperature, soil type, slope, and aspect. A list of plant species found in the Southeast Idaho Phosphate Resource Area is presented in Table A.1 of Appendix A of MW (1999). Based on previous investigations, the Southeast Idaho Phosphate Resource Area contains or supports about 75 species of mammals, 272 species of birds, 16 species of reptiles, 16 species of fish, and 7 species of amphibians (USGS and USFWS, 1977; USFWS 1985, 1997; and Idaho Conservation Center Data Base (ICCDB) 1999, all as cited in MW, 1999).

2.2.7.2 Threatened and Endangered Species

The only threatened and endangered species occurring in Caribou County is the Canada lynx (Lynx canadensis), listed as threatened (USFWS, 2008). The gray wolf (Canis lupus) is an experimental/non-essential population and is not listed as endangered.

2.2.8 Land and Water Use

Farming and ranching are the dominant land uses in the vicinity of the P4 mines, although recreational uses are present on the public lands. Drawing 2-8 provides land ownership information surrounding the Sites. The primary public recreational use is hunting. Mining is the principal use of the area with active mining being conducted by P4, as well as Agrium, in the vicinity of these historic mining sites.

Potential water resource uses in the P4 mine areas include industrial use, power generation, irrigation, stock watering, recreational use, wildlife use, and cold-water biota use. Groundwater use in the vicinity of the Sites is dependent on several variables, including population and land use, availability and quality of surface water, and availability and quality of groundwater. In the more remote regions, groundwater use generally is limited to livestock watering. Farming consists of dry land crops that often are not irrigated. In the valleys surrounding the mined areas, groundwater is primarily used for livestock watering, limited domestic use, and mine site water supply. Mine site uses include domestic use at the Degerstrom/Enoch Valley Mine Office and Shop building, dust abatement, and washing equipment.

2.2.9 Demographics

The area surrounding the P4 Sites is sparsely populated. The largest nearby population center is Soda Springs, Idaho, which is located 12 miles to the south-southwest of the Ballard Mine Site. The unincorporated community of Henry is located several miles to the northwest of the Henry Mine. Outside of these areas, the population largely resides on scattered ranches and farms.

Soda Springs is the largest community in Caribou County and accounts for nearly half of the county population. The 2000 Census (U.S. Census, 2000) counted 3,381 residents, with a majority being between 20 and 64 years old. Table 2-12 illustrates the age, sex, and racial distributions in Soda Springs.

Phosphate mining, manufacturing, agriculture, and related industries comprise the main economic base of Soda Springs. Thus, the economy largely depends on available natural resources. Of the 2,422 residents above the age of 16, 1,429 are in the labor force; 128 of these are in the forestry, agriculture, fishing and hunting, or mining industries, with 294 in manufacturing. In 2000, 6.3 percent of the labor force was unemployed. Table 2-13 summarizes the employment distribution by the various economic sectors in Soda Springs.

2.2.10 Cultural and Natural Resource Features

Cultural resources are often equated with archaeology, but also include cultural landscapes, historical records, social institutions, expressive cultures, and old buildings. SE Idaho is located within the Snake River and Salmon River culture area of the northern Great Basin (Butler, 1986). The Sites are located in the Central Rocky Mountains at the edge of this culture area. As stated in the Blackfoot Bridge EIS (BLM, 2009), the chert and porcellanite facies of the Phosphoria Formation in SE Idaho are not important archeological resources due to the low number of fossils and impurities found in the formation. The rocks were not of adequate quality to be attractive to early area inhabitants for stone tool manufacture. Additional details of the cultural resources, including the prehistoric context of SE Idaho, are documented in the Blackfoot Bridge EIS (BLM, 2009).

In a historic context, the first recorded Euroamericans to arrive in SE Idaho were fur trappers and explorers in the early 1800s. By the 1840s, immigrants to the west coast were following the trails identified by these early trappers and explorers; consequently, the Hudspeth cutoff of the Oregon and California trails passed directly through Soda Springs. Mormon pioneers began to settle the area in the 1860s followed by an influx of gold miners into the 1890s. Soda Springs became a major supply center for miners in the area from 1870 to 1920.

The encroachments of these Euroamerican settlements led to displacement of the native peoples in the area: the Shoshone and Bannock tribes. The Fort Hall reservation, north of Pocatello, was established in 1863. The Bridger Treaty between the United States and the Shoshone and Bannock tribes was established in 1868 and was intended to preserve the rights of the Tribes to hunt, fish, gather, and practice other traditional land uses on unoccupied federal lands. This included the gathering of traditional use plant species and vegetation. The Federal government has an obligation to consult with the Shoshone and Bannock tribes on issues that could have a bearing on their traditional use of the land in the area of the Sites.

2.3 Summary of Previous Investigations

This section provides a chronological listing and summary of the studies and data collection activities associated with programs implemented in the phosphate mine area of SE Idaho that are relevant to the P4 Mine Area RI/FS. Much of the data collected at the P4 mines and vicinity are associated with potential impacts from mining, with emphasis on selenium in the environment.

All of the data listed in this section are relevant to the RI/FS at the Ballard, Henry and Enoch Valley mines; however, in some cases, only a small subset of the data is spatially relevant (i.e., within the potential area of impact associated with the Sites). In addition, certain data may be useful for some uses and not others. For example, surface water data from the early IMA studies are not as relevant as more recent data and were based on samples collected from sampling locations that were more widely spaced than the sampling locations for more recent data. However, the older data are useful in characterization and evaluating temporal trends. The intent of this section is to present only the potentially relevant studies and data. Determinations of data relevance for specific uses and discussions of data quality are provided in Section 3.9 and the *Data Quality and Usability Report* (MWH, 2010a).

2.3.1 Chronological Listing of Relevant Environmental Studies and Data

Various studies have been conducted and data collected at the P4 Sites to assess the nature and extent of primarily selenium impacts from phosphate mining. Early during the study period, regional and area-wide data needs were identified at meetings of the Interagency/Phosphate Industry Selenium Working Group (Working Group) and IDEQ's Selenium Area-Wide Advisory Committee (Advisory Committee). IMA's Selenium Committee then developed a plan and provided a draft to both the Working Group and Advisory Committee for review. The IMA revised and finalized the plan based on Working Group and Advisory Committee comments before implementing the approved version. In certain cases, the IMA used academics from the University of Idaho to plan and implement biotic sampling events. In two instances, the Idaho Department of Fish and Game (IDFG) planned and/or performed the required sampling.

For the first three years, which included two and a half field years, the IMA regional investigation was undertaken voluntarily with the A/Ts being afforded the opportunity to review and comment on all plans and reports. IDEQ took charge in 2001, with the IMA participating companies, including P4, signing an area-wide consent order (2001 CO/AOC). From that point forward, the A/Ts had direct oversight and approval of the area-wide investigation efforts. P4 implemented a voluntary soil and vegetation study for the Enoch Valley Mine in 2000. In 2003, P4 entered into a mine-specific AOC/CO (2003 CO/AOC) for the Ballard, Henry, and Enoch Valley mines to conduct an EE/CA (USEPA, 2003). An interim surface water and sediment investigation was carried out for the three mines in 2002 and 2003, with the agreement that the results would be regarded as part of the mine-specific effort addressed by the 2003 CO/AOC that was being negotiated at the time. All investigation work undertaken in 2002 and since then has been, and continues to be, performed under the direct oversight and approval of the A/Ts.

In addition to the programs directly related to selenium impacts associated with phosphate mining in SE Idaho, a number of other relevant studies have been conducted by governmental and academic entities, such as the USGS or the University of Idaho. Data

associated with mine permitting studies (e.g., environmental impact studies) and studies conducted at other phosphate mines in the region may also be relevant, particularly studies that addressed geochemical or fate and transport issues. These studies are generally referenced in this document, but they are not discussed extensively in this section.

Most of the pre-2003 AOC data and study summaries are presented in various reports given to either the IMA or P4/Monsanto and are available in the public record. The EE/CA SI reports have not been prepared, and therefore, not all SI data have been formally reported and approved by the A/Ts. However, all of the post-2003 AOC data have been validated by procedures prescribed by the A/Ts. The specific investigation activities reports and data submittals that may be relevant to the RI/FS by year are as follows:

1998

- February - Fall 1997 Interim Surface Water Survey Report (MW, 1998a)

1999

- December - 1998 Regional Investigation Report (MW, 1999)

2000

- October - 1999 Interim Investigation Data Report (MW, 2000)

2001

- March - Enoch Valley Mine Waste Rock Dump Characterization (MW, 2001a)
- April - 1999-2000 Regional Investigation Data Report for Surface Water, Sediment and Aquatic Biota Sampling Activities, September 1999 (MW, 2001b)
- July - 1999-2000 Regional Investigation Data Report for Surface Water, Sediment and Aquatic Biota Sampling Activities, May-June 2000 (MW, 2001c)

2002

- March - Spring 2001 Area-Wide Investigation Data Summary (MWH, 2002a)
- March - Analysis of Selenium Levels in Bird Eggs and Assessment of the Effects of Selenium on Avian Reproduction in Southeast Idaho (Ratti, et al., 2002)
- July - High-Resolution Seasonal Surface Water Sampling Decision Memorandum (MWH, 2002b)
- November - High-Resolution Seasonal Surface Water Sampling Decision Memorandum Supplement (MWH, 2002c)

- December - Summer 2001 Area-Wide Investigation Data Summary (MWH, 2002d)
- December - Final Area Wide Human Health and Ecological Risk Assessment, Selenium Project, Southeast Idaho Phosphate Mining Resource Area (TetraTech, 2002)

2003

- March - An Evaluation of the Effects of Selenium on Elk, Mule Deer, and Moose in SE Idaho (Kuck, 2003)

2004

- February – Area Wide Risk Management Plan: Removal Action Goals and Objectives, and Action Levels for Addressing Releases and Impacts from Historic Phosphate Mining Operations in Southeast Idaho (IDEQ, 2004a)
- June - P4 Production SI Seasonal Vegetation Investigation Memorandum (MWH, 2004a)
- July - Chromium Speciation Sampling in Sediment, Riparian Soil, and Waste Rock Dump Soil Memorandum (MWH, 2004b)
- July - Field Investigation Update July 2004 Mass Wasting Sampling Effort (MWH, 2004c)

2005

- April - Interim Surface Water and Sediment Investigation Data Submittal (2002-2003 Data) (MWH, 2005a)
- June - Chromium Speciation Study in Pond Sediment, Stream Sediment, Stream Riparian Soil, and Waste Rock Dump Soil Memorandum (MWH, 2005b)

2006

- March - June 2005 Groundwater Data Submittal Memorandum (MWH, 2006a)
- October - Data Gap Assessment for the Draft Interim Phase I SIs Evaluation Summary (MWH, 2006b)
- November - October 2005 Groundwater Data Validation Report Memorandum (MWH, 2006c)

2007

- February - Monitoring Well Installation Technical Memorandum for Final 2005 Phase II Supplemental SI Groundwater Work Plan (MWH, 2007a)
- April - May 2006 Data Validation Report Memorandum (MWH, 2007b)
- April - Waste Rock Dump Vegetation Sampling History Memorandum (MWH, 2007c)

- August - As-Built Details and Results of Data Collected for the January to June 2007 period at the Enoch Valley Backfill Monitoring Site (O'Kane, 2007)
- October - Medium-Specific Data Summaries (MWH, 2007d)
- November - Interim Phase I SIs Evaluation Summary (MWH, 2007g)

2008

- February - Pre-2004 Documents and Data Review and Summary (MWH, 2008a)
- February - Draft - Geochemical Characterization of Phosphate Mining Overburden (TetraTech, 2008)
- August - Memorandum - Summary of a Spreadsheet Water Balance for the Monsanto Enoch Valley Backfill Cover System (O'Kane, 2008a)
- October - Performance Monitoring of Backfilled Panels And External Overburden Waste Dumps (O'Kane, 2008b)
- December - Interim Report for Hydrogeologic Investigation Revision 3 – 2007 Hydrogeologic Data Collection Activities & Updated Conceptual Models (MWH, 2008b)

2009

- May - Draft - Performance Monitoring of Backfilled Panels And External Overburden Waste Dumps (O'Kane, 2009a)
- June - Installation Report for the Horseshoe Overburden Area (O'Kane, 2009b)
- August - 2007 and 2008 Data Summary Report (MWH, 2009b)
- direct push sampling data summary reported in Appendix A
- surface water sampling data summary reported in Appendix D
- groundwater monitoring and sampling data summary reported in Appendix D

2010

- January – Final, Data Quality Assessment – Pre-2004 Data 1999-2000 Elk Tissue Samples Technical Memorandum. (MWH, 2010b)
- May – Data Quality and Usability Report (DQUR) and Data Approval Request (DAR) – Final, Revision 2 (MWH, 2010a)

This list of reports is not all inclusive and does not contain reports from government or academic entities that may have relevant data. In addition, only those reports containing or relating to data are shown. Planning documents (e.g., work plans) are not included in the list.

Tables 2-14 and 2-15 outline the number of samples for various media collected prior to and after the 2003 CO/AOC and as part of the EE/CA SI. Table 2-16, summarizes the analytical parameters that have been analyzed for each of the media. Maps presenting the spatial distribution of the data, primarily selenium, are presented in Section 3.0 along with the results.

2.3.2 Summary of Data Sources

This section presents a brief synopsis of the studies and data collection efforts that are most relevant to the P4 Mine Area RI/FS. The data, including sampling locations, are detailed in Section 3.0. The data quality with respect to the potential data uses is discussed in the *DQUR* (MWH, 2010a).

2.3.2.1 Geographic/Topographic Characterization Data

Physical characterization has been conducted throughout the EE/CA SI. As part of the SI, digital topographies for the Ballard and Henry mines were obtained in 2005 and 2008, respectively, and a topographical survey for the Enoch Valley Mine was performed in 2007. In addition to data depicting the current topographic terrain in the mine areas, digital data of the pre-mine topography was obtained for all three mines from the USGS. Use of the two topographic surfaces provided the basis for extensive computerized cut and fill analysis, which supported a quantitative and graphical assessment of changes in the topography related to mining. This analysis was especially useful in the mapping of mine waste rock dump and pit boundaries, which was supplemented with recent orthophotography from the National Agriculture Imagery Program and by field reconnaissance. Quantitative estimates of mine waste rock deposit volumes also were possible using the cut and fill analysis described in Section 2.1.Other sources of data relating to the physical characterization of the Sites are P4 records. For the Ballard Mine, these records are more limited because of the age of the mine. For the Henry Mine, the mine records and maps are largely in paper form. For the Enoch Valley Mine, both electronic and paper records are available, including a digital model of the mine pit.

Most of the remaining information collected for the characterization of the physical condition of the mine areas was obtained by direct physical observation during the numerous field activities. Mapping and geo-reconnaissance activities conducted in 2004 and 2008 specifically evaluated the physical condition of the mine waste rock areas (MWH, 2009e).

2.3.2.2 Overburden and Cover Characterization Data

P4 has supported material property and hydrologic studies of cover material and overburden dump material either directly or through a group of IMA member companies. These studies are relevant to the RI/FS site characterization because they provide information on the migration of water through the cover system into the underlying dump material, which affects the rate of solute transport from the vadose zone toward the water table.

The most relevant study uses instrumentation of the pit backfill at the Enoch Valley Mine to monitor the water balance associated with the cover that was placed on the overburden (O'Kane, 2007, 2008a, 2008b, and 2009a). This work and the resulting reports have not been reviewed by the A/Ts nor published in peer-reviewed publications. Therefore, if these data are used explicitly in any of the RIs or FSs for the Sites, they will need to be submitted to the A/Ts in their entirety for review and approval.

The Enoch Valley cover consists of topsoil over limestone overlying center waste shale. At the mid-slope transect, the topsoil is approximately 25 inches thick while the limestone is approximately 30 inches thick. The instrumented cover system has been operational since August 2006 and includes:

- One primary (mid-slope) monitoring station
- Two secondary (one downslope and one upslope) monitoring stations
- One v-notch weir at the base of the cover to collect and measure runoff

The primary monitoring station consists of:

- One weather station that measures rainfall, air temperature, relative humidity, wind speed and direction, and net radiation. Rainfall data are recorded continuously (as it occurs) while all the other data are recorded hourly and/or daily.

- Sixteen nested time domain reflectometry (TDR) probes used to measure in-situ volumetric water content. The TDR probes are co-located with sixteen heat dissipation/thermal conductivity sensors used to measured in-situ suction and temperature. Sensors begin at a depth of four inches and were placed at four-inch intervals up to a depth of 73 inches. Data from the TDR probes are recorded every six hours.

- Three separate polyvinyl chloride (PVC) access tubes installed parallel-to-contour to manually measure in-situ volumetric water content with a portable soil moisture monitoring probe. Data are collected at selected intervals every four inches up to a maximum depth of 24.8 inches.

- Three nested vacuum lysimeters used to manually collect samples of pore water at depths of 6, 24, and 48 inches.

The two secondary (one downslope and one upslope) monitoring stations consist of:

- Twelve nested TDR probes at each station used to measure in-situ volumetric water content. Sensors begin at depths of 2 to 4 inches and were placed at six-inch intervals up to 72 inches depth. Data are recorded every six hours.

- Three separate PVC access tubes installed parallel-to-contour at each station to manually measure in-situ volumetric water content with a portable soil moisture monitoring probe. Data are collected at selected intervals every four inches up to a maximum depth of 24.8 inches.

Snow surveys have been conducted intermittently to determine the maximum amount of snow accumulated just prior to melt. Instrumentation, excluding manual measurements and field surveys, consists of automated data acquisition systems.

Data from the monitoring has been reported in O'Kane (2008a, 2008b and 2009a) and is summarized in Section 3.1. Similar monitoring systems have been installed on covered waste rock dumps at nearby phosphate mines owned by J. R. Simplot and Agrium, and data from these studies may be useful in assessing soil covers during the FS.

Similarly, systems have been installed at the nearby Horseshoe Overburden Facility at P4's South Rasmussen Mine (O'Kane, 2009b). While much of the data that is being collected there is unique to the Horseshoe Overburden Facility cover system, which is dissimilar to covers at the Sites, a portion of the monitoring system has been established on uncovered center waste shale (CWS). Data collected from this location will be relevant as a baseline for comparison of cover systems to a non-covered condition, such as those found at some areas of the Ballard Mine. The South Rasmussen Mine is adjacent to the Enoch Valley Mine, and as such, their climate and geological conditions are similar. Equipment has been collecting data in the uncovered CWS area at the Horseshoe Overburden Facility has been operational since March 2008. The equipment in this area is:

- One nearby net radiometer and rainfall tipping bucket gauge
- Six nested TDR probes used to measure in-situ volumetric water content

The TDR probes are co-located with six heat dissipation/thermal conductivity sensors used to measured in-situ suction and temperature. Sensors are located at depths of 2, 6, 12, 24, 48, and 72 inches.

Cover material studies have also been conducted as part of the Blackfoot Bridge EIS (BLM, 2009). While these studies have not collected direct infiltration data, a considerable amount of modeling and evaluation of various cover systems using local geologic materials has been performed. The material properties data collected during the cover material studies is also relevant for the modeling and cover evaluations that will be conducted for the FS. The potential cover material information for the Blackfoot Bridge Mine is most applicable to the Ballard Mine due to their close proximity. Specific data available from geotechnical and hydrologic testing of alluvium materials is listed below:

- Moisture retention curves
- Saturated hydraulic conductivity
- Standard Proctor compaction
- Atterberg limits

- Particle size distribution (percent coarse, percent sand, and percent silt and clay)
- Specific gravity

2.3.2.3 Geochemical Characterization Data

Rock of the Meade Peak Member of the Phosphoria Formation and overlying and underlying rocks have been characterized in numerous studies, many of which have been conducted by the USGS (e.g., Herring, et al., 1999 and 2001; and Grauch, et al., 2001). The Herring, et al. (1999 and 2001) studies are most directly relevant to the source characterization for the Sites. In these studies, the USGS mapped and sampled three measured sections in the Enoch Valley Mine pit. One of these sections was an unweathered drill core while the other two sections were from the more weathered mine pit rocks. The samples were analyzed for 64 major and trace elements and other parameters (e.g., organic carbon). This list of analytes included selenium and other relevant chemicals. Results for standard reference materials were also reported. The detailed stratigraphy and semi-quantitative X-ray fluorescence (XRF) elemental analyses of the unweathered section (core) are presented in Grauch, et al. (2001), including 745 analyses for selenium along the Meade Peak section. The leachate chemistry of these rocks was also evaluated (Herring, 2004b).

The USGS studies focused primarily on in-situ rock; however, studies of the geochemistry of the displaced rock in overburden dumps have also been conducted. At the Enoch Valley Mine, a 350-foot borehole was advanced through an overburden dump and sampled for geochemical parameters (TetraTech, 2008). The following parameters were collected: moisture content (field and lab), total and leachable selenium, total and leachable organic carbon, acid-base accounting parameters, and sulfur species (total, organic, sulfide, and sulfate). In addition, in-situ measurement of oxygen, carbon dioxide, relative humidity, and temperature were made.

A baseline geochemical study was conducted for the proposed Blackfoot Bridge Mine, located two miles southwest of the Ballard Mine (Whetstone, 2009). The mineralogy, whole rock element composition (28 elements), total organic carbon content, synthetic precipitation leaching procedure (SPLP) testing, and saturated and unsaturated column

leaching test results were reported for ore and overburden materials associated with the proposed mine. These data are similar in extent to other mine permitting studies in SE Idaho. However, the Blackfoot Bridge Mine data are particularly relevant to the P4 RI/FS due to its proximity to the Ballard Mine. This is because of similar geology, as well as, the fact that the baseline geochemical study for the Blackfoot Bridge Mine was completed recently (Whetstone, 2009). Improvements in the design and optimization of this recent study were based on a review of the procedures and results from previous permitting studies.

An EIS was completed for the North Rasmussen Ridge Mine which is less than a mile east of the Enoch Valley Mine (BLM, 2003). During the RI/FS, geochemical data from this EIS may be used. EIS data from other phosphate mines also may be reviewed, but the Blackfoot Bridge and North Rasmussen Ridge Mine EIS data are the most relevant to the Sites due to their proximity to the site and because these are recent studies.

2.3.2.4 Hydrogeologic Studies

Specific evaluation of hydrogeologic conditions in the area of the Ballard, Henry and Enoch Valley mines for the EE/CA began in 2004. In 2004, work was conducted to identify existing geologic/hydrogeologic data related to the mine areas, including available mine maps, cross sections and exploration logs, and the locations and logs for domestic, agricultural, industrial, and monitoring wells within a three-mile radius of the mines. Drilling logs were obtained from the Idaho Department of Water Resources (IDWR) for the wells that were found, when available. These logs were presented in MWH (2007a). The wells that were identified are listed below:

- Four monitoring wells designated MMW001 and MMW002 at the Ballard Mine, and MMW003 and MMW004 at the Henry Mine
- Five production (industrial) wells designated MPW006, MPW019, and MPW020 at the Henry Mine, and MPW022 and MPW023 at the Enoch Valley Mine
- Seven agricultural wells designated MAW001 through MAW007
- Six domestic wells designated MDW001 through MDW006

Most of the agricultural and domestic wells cannot be directly associated with a specific mine.

The existing wells were sampled beginning in the spring of 2004 along with other expressions of groundwater, including dump seeps (8), springs (6), headwater stream locations (20), and ponds (18) that may be connected to the groundwater systems. For many of the seeps, springs, and stream stations, analytical data are available dating back to 1998. The data from 1998 through 2005 were presented in MWH (2007a). Subsequent sampling results from 2007 and 2008 are presented in MWH (2008b) and MWH (2009d). Data from 2009 are presented in the RI/FS in Section 3.0.

Monitoring well installation specifically in support of the EE/CA hydrogeologic characterization began in 2007. Monitoring wells were installed at all three mines targeting the three significant groundwater systems: the local alluvial system, the intermediate Dinwoody and Thaynes formations system, and the regional Wells Formation system. Two wells have been installed in Phosphoria Formation rock at spatially relevant locations; however, the permeable Phosphoria Formation beds are not considered to be laterally extensive groundwater systems. Table 2-17 summarizes the current monitoring well network, and the monitoring well locations are shown on Drawing 2-9. Appendix A5 provides comprehensive well construction tables and associated well logs. In 2010, one well (MMW036) was installed in a basalt unit in the alluvial system. Descriptions of the drilling procedure, lithologies drilled, and monitoring well construction is provided in MWH (2008b), MWH (2009d) and Appendix A3 for the drilling that occurred in 2009.

During the hydrogeologic investigation conducted in 2007, it became apparent that the local alluvial system contained greater levels of possible COPCs than the other systems (MWH, 2007f). Because the local alluvial system is shallow and in unconsolidated geologic materials, the preferred method of investigation was changed to direct push groundwater sampling technology (MWH, 2007f and P4 Production, 2009). During the 2008 investigations, 127 soil borings were advanced with 90 grab groundwater samples collected, and 13 monitoring wells were installed in the borings. To further characterize areas where plume boundaries had not been defined, 33 soil borings and 23 grab groundwater samples were completed in

2009 along with four new wells completed in the borings. The locations of the direct push boring and monitoring wells are provided on Drawing 2-10.

Other than the direct push boring sampling, water quality sampling has been conducted on a semi-annual to annual basis for all of the groundwater monitoring locations, except the domestic and agricultural well locations. The domestic and agricultural locations were sampled in 2004 and 2008 (MWH 2007a and MWH, 2009b). In addition, aquifer testing (single well slug testing) was completed on 20 monitoring wells in 2008 and nine monitoring wells in 2009 (MWH, 2009b and Appendix A4). Currently, water level monitoring with data loggers is being conducted at 26 of the 31 monitoring wells. Of the wells listed in Table 2-17, only the monitoring wells installed in 2009 (MMW032, MMW033, MMW034, MMW035, and MMW036) do not have data loggers. The results of the recent aquifer testing and water level monitoring are presented in MWH (2009b) and Appendix A4.

Studies of regional and mine-specific hydrogeology have been used to develop the hydrogeologic conceptual model for the P4 mine sites (MWH, 2008b). These studies include: Mohammad (1976), Ralston, et al. (1977), Winter (1980), Ralston, et al. (1980), Mayo (1982), Brooks (1982), and Ralston, et al. (1983). The regional studies and direct consultation from Dr. Dale Ralston have been important in defining the principal groundwater systems in the P4 mine areas. The studies by Mohammad (1976) and Ralston, et al. (1980), in particular, provided the basis for the conceptual models for groundwater flow presented in this Work Plan and that were utilized during the scoping process for EE/CA SI data collection. Ralston, et al. (1980) also presented data specific to the hydrogeologic conditions at the northern portion of the Henry Mine. The Blackfoot Bridge EIS baseline hydrogeologic characterization (BLM, 2009) presents analogous data for development of the Ballard Mine conceptual hydrogeological model based on proximity and similar geologic setting and conditions.

2.3.2.5 Pre-2003 AOC Environmental Data Collection and Reporting

Following is a list of the pre-2003 AOC studies with potential relevant data for the RI/FS program, organized by media. These data may be compared to more recent data from more

extensive data collection programs (e.g., for evaluation of temporal trends), or in support of human health and/or ecological risk assessments. Evaluation of these data for appropriate uses is summarized in Section 3.8 and presented in the *DQUR* (MWH, 2010a). At a minimum, the data are being recognized here as available should specific data uses be identified during the RI/FS. Special consideration has been given to the data collected from elk, bird eggs, and cattle as presented in the *DQUR* (MWH, 2010a) as these data will be utilized in the risk assessment. The specific locations of the samples are discussed in Section 3.0 along with the analytical results.

Upland Soils

- Five (5) upland soil samples were collected in July 1998 from the Ballard Mine waste rock dumps. Results were reported in the *Southeast Idaho Phosphate Resource Area Selenium Project 1998 Regional Investigation Report* (MW, 1999).

- One hundred thirty-three (133) upland soil samples were collected at the Enoch Valley Mine in July 2000. Results were reported in the *Enoch Valley Mine Waste Rock Dump Characterization* report (MW, 2001a).

- Eight (8) upland soil samples were collected in May 2001 at P4 waste rock dumps. These data were reported in the *Spring 2001 Area-Wide Investigation Data Summary* (MWH, 2002a).

- Ten (10) upland soil samples were collected in the fall of 2001 at P4 waste rock dumps. These data were reported in the *Summer 2001 Area-Wide Investigation Data Summary* (MWH, 2002e).

Riparian Soils

- Five (5) riparian soil samples were taken in August 2001 from P4 surface water stations. These data were reported in the *Summer 2001 Area-Wide Investigation Data Summary* (MWH, 2002e).

Upland Vegetation

- Ten (10) upland vegetation samples were collected in July 1998 from P4 waste rock dumps. These data were reported in the *Southeast Idaho Phosphate Resource Area Selenium Project 1998 Regional Investigation Report* (MW, 1999).

- Eighty-three (83) upland vegetation samples were collected at the Enoch Valley Mine in July 2000. These data were reported in the *Enoch Valley Mine Waste Rock Dump Characterization* (MW, 2001a).

- Six (6) upland vegetation samples were collected in the fall of 2001 at P4 waste rock dumps. These data were reported in the *Summer 2001 Area-Wide Investigation Data Summary* (MWH, 2002e).

Riparian Vegetation

- Twenty-two (22) riparian vegetation samples were collected in September 1999 at P4 surface water locations. These data were reported in the *1999-2000 Regional Investigation Data Report for Surface Water, Sediment and Aquatic Biota Sampling Activities, September 1999* (MW, 2001b).

- Five (5) riparian vegetation samples were collected in September 2001 at P4 surface water locations. These data were reported in the *Summer 2001 Area-Wide Investigation Data Summary* (MWH, 2002e).

Surface Water

- Six (6) surface water samples were collected at P4 surface water sampling locations in September 1997. These results were presented in the *Fall 1997 Interim Surface Water Survey Report* (MW, 1998a).

- Eighteen (18) surface water samples were collected from P4 surface water sampling locations in May 1998. These data were reported in the *1998 Regional Investigation Report* (MW, 1999).

- Eighteen (18) surface water samples were collected from P4 surface water sampling locations in September 1998. These data were reported in the *1998 Regional Investigation Report* (MW, 1999).

- Nine (9) surface water samples were collected in May 1999 along the Blackfoot River. These data were presented in the *1999 Interim Investigation Data Report* (MW, 2000).

- Thirty-five (35) surface water samples were collected in September 1999 at P4 surface water sampling stations. These data were presented in the *1999-2000 Regional Investigation Data Report for Surface Water, Sediment and Aquatic Biota Sampling Activities, September 1999* (MW, 2001b).

- Ten (10) surface water samples were collected from a Blackfoot River station on a monthly basis from May 1999 to April 2000, in addition to the May and September events described above. The May-August 1999 sampling data were presented in the *1999 Interim Investigation Data Report* (MW, 2000), while September 1999-April 2000 data were presented in the *1999-2000 Regional Investigation Data Report for Surface Water, Sediment and Aquatic Biota Sampling Activities, September 1999* (MW, 2001b).

- Thirty-six (36) surface water samples were collected at P4 surface water sampling locations in May 2000. The data were presented in the *1999-2000 Regional Investigation Data Report for Surface Water, Sediment and Aquatic Biota Sampling Activities, May-June 2000* (MW, 2001d).

- Fifty-four (54) surface water samples were collected at P4 surface water sampling locations in May 2001. These data were reported in the *Spring 2001 Area-Wide Investigation Data Summary* (MWH, 2002a).

- Fifty-four (54) surface water samples were collected at P4 surface water sampling locations in May 2002. These data were reported in the *Interim Surface Water and Sediment Investigation Data Submittal (2002-2003 Data)* (MWH, 2005a).

- Twenty-three (23) surface water samples were collected at P4 surface water sampling locations in September 2002. These data were reported in the *Interim Surface Water and Sediment Investigation Data Submittal (2002-2003 Data)* (MWH, 2005a).

- Forty-six (46) surface water samples were collected during a high-resolution seasonal sampling event from 2002 to 2003. Samples were collected every other month from mid-July 2002 through mid-March 2003, and monthly during the runoff period from April 2003 through July 2003. Between four and seven samples were collected in each month during this period; some stations became dry and/or frozen during this time, which is why the monthly sample numbers were not consistent. Data from this effort was reported in the *Interim Surface Water and Sediment Investigation Data Submittal (2002-2003 Data)* (MWH, 2005a).

Please note that surface expressions of groundwater (SEGW) samples are not accounted for in this section and are presented separately below.

<u>Sediment</u>

- Eighteen (18) sediment samples were collected at P4 surface water sampling locations in September 1998. These data were reported in the *1998 Regional Investigation Report* (MW, 1999).

- Thirty-three (33) sediment samples were collected at P4 surface water locations in September 1999. These data were reported in the *1999-2000 Regional*

Investigation Data Report for Surface Water, Sediment and Aquatic Biota Sampling Activities, September 1999 (MW, 2001b).

- One (1) sediment sample was collected from the Blackfoot Reservoir in May 2000. This data was reported in the *1999-2000 Regional Investigation Data Report for Surface Water, Sediment and Aquatic Biota Sampling Activities, May-June 2000* (MW, 2001c).

- Eighty-four (84) sediment samples were collected at P4 surface water locations in May 2002. These data were then reported in the *Interim Surface Water and Sediment Investigation Data Submittal (2002-2003 Data)* (MWH, 2005a).

- Forty-seven (47) sediment samples were collected at P4 surface water locations in September 2002. These data were reported in the *Interim Surface Water and Sediment Investigation Data Submittal (2002-2003 Data)* (MWH, 2005a).

Surface Expressions of Groundwater

Surface expressions of groundwater (SEGW) include stream headwaters, springs, dump seeps, and ponds.

- Eleven (11) SEGW samples were taken at P4 sampling locations in September 1997. These data were reported in the *Fall 1997 Interim Surface Water Survey Report* (MW, 1998a).

- Three (3) SEGW samples were collected from P4 sampling locations in 1998 (two in May and one in September). These data were reported in the *1998 Regional Investigation Report* (MW, 1999).

- Two (2) SEGW samples were taken at Ballard Mine in May 2000. These data were presented in the 1999-2000 Regional Investigation Data Report for Surface Water, Sediment and Aquatic Biota Sampling Activities, May – June 2000 (MW, 2001c).

- Nineteen (19) SEGW samples were then taken at P4 sampling locations in May 2001. These data were reported in the *Spring 2001 Area-Wide Investigation Data Summary* (MWH, 2002a).

- Thirty-two (32) SEGW samples were taken at P4 sampling locations in May 2002. These data were reported in the *Interim Surface Water and Sediment Investigation Data Submittal (2002-2003 Data)* (MWH, 2005a).

- Twenty-five (25) SEGW samples were taken at P4 sampling locations in September 2002. These data were reported in the *Interim Surface Water and Sediment Investigation Data Submittal (2002-2003 Data)* (MWH, 2005a).

- Forty-eight (48) SEGW samples were taken during a high-resolution seasonal sampling event from 2002 to 2003. Samples were taken every other month from mid-July 2002 through mid-March 2003 and monthly during the runoff period from April 2003 through July 2003. Between two and ten samples were taken each month during this period; some stations became dry and/or frozen during this time, which is why the monthly sample numbers were not consistent. Data from this effort was reported in the *Interim Surface Water and Sediment Investigation Data Submittal (2002-2003 Data)* (MWH, 2005a).

Groundwater

P4 mine area groundwater systems were sampled twice prior to 2004. In 1998, one sample was taken in May and the other in September, both at Enoch Valley Mine. These data were reported in the *1998 Regional Investigation Report* (MW, 1999).

Aquatic Biota - Benthic Macroinvertebrates

- Twenty-one (21) benthic macroinvertebrate samples were collected at P4 surface water stations in September 1999. These data were reported in the *1999-2000 Regional Investigation Data Report for Surface Water, Sediment and Aquatic Biota Sampling Activities, September 1999* (MW, 2001b).

- Twenty-three (23) benthic macroinvertebrate samples were collected at P4 surface water stations in May 2000. These data were reported in the *1999-2000 Regional Investigation Data Report for Surface Water, Sediment and Aquatic Biota Sampling Activities, May – June 2000* (MW, 2001c).

Aquatic Biota - Macrophytes

- Twenty (20) macrophyte samples were collected at P4 surface water stations in September 1999. These data were reported in the *1999-2000 Regional Investigation Data Report for Surface Water, Sediment and Aquatic Biota Sampling Activities, September 1999* (MW, 2001b).

- Nineteen (19) macrophyte samples were collected in May 2000. These data were reported in the 1999-2000 Regional Investigation Data Report for Surface Water, Sediment and Aquatic Biota Sampling Activities, May – June 2000 (MW, 2001c).

Aquatic Biota - Periphyton

- Seven (7) periphyton samples were collected at P4 surface water stations in September 1999. These data were reported in the *1999-2000 Regional Investigation Data Report for Surface Water, Sediment and Aquatic Biota Sampling Activities, September 1999* (MW, 2001b).

- Eight (8) periphyton samples were collected in May 2000. These data were reported in the 1999-2000 Regional Investigation Data Report for Surface Water, Sediment and Aquatic Biota Sampling Activities, May – June 2000 (MW, 2001c).

Aquatic Biota - Plankton

- Ten (10) plankton samples were collected at Blackfoot Reservoir stations in September 1999. These data were reported in the *1999-2000 Regional Investigation Data Report for Surface Water, Sediment and Aquatic Biota Sampling Activities, September 1999* (MW, 2001b).

- Ten (10) plankton samples were collected in May 2000. These data were reported in the 1999-2000 Regional Investigation Data Report for Surface Water, Sediment and Aquatic Biota Sampling Activities, May-June 2000 (MW, 2001c).

Aquatic Biota - Fish

Salmonids and forage fishes were sampled in September and in May 1999 and again in 2000 as detailed below.

- In 1999, salmonids were collected at 15 P4 sampling locations (two of these were regional background locations) and forage fish were collected at 11 P4 sampling locations (two of these were regional background locations). These data were reported in the *1999-2000 Regional Investigation Data Report for Surface Water, Sediment and Aquatic Biota Sampling Activities, September 1999* (MW, 2001b).

- In 2000, salmonids were collected at nine P4 sampling locations and forage fish were collected at 17 P4 stations. These data were reported in the *1999-2000 Regional Investigation Data Report for Surface Water, Sediment and Aquatic Biota Sampling Activities, May-June 2000* (MW, 2001c).

Terrestrial Biota - Cattle

- Twenty (20) cattle were studied in 1999 at the Henry Mine. The investigation took place on cattle grazing areas at reclaimed overburden dumps at the Henry Mine and in a background area. Materials sampled during the grazing portion of the study included soil and vegetation in the pasture areas, and blood and blood serum. This initial onsite investigation was followed by a study of the cattle after they were removed from the grazing area and moved to a feed lot. Samples included blood, muscle and organ tissue. The sampling protocol and resulting tissue data for the feed lot portion of the study are both presented in the *1999 Interim Investigation Data Report* (MW, 2000). The data associated with this study are summarized in this Work Plan and are presented in the *DQUR* including blood and plasma from both the grazing and feedlot portions of the study and associated soil and vegetation data.

Terrestrial Biota - Elk

- One hundred sixty (160) elk were sampled during the hunting season of 1999 throughout the Southeast Idaho phosphate resource area. These data are presented in the *1999 Interim Investigation Data Report* (MW, 2000).

- Fifty-four (54) elk were sampled during the hunting season of 2000. These data are summarized in this RI/FS Work Plan and the details are included in the *DQUR* (MWH, 2010a).

Terrestrial Biota - Small Mammals

- Fifteen (15) small mammal samples were collected in September 2001 at P4 waste rock dumps and on the banks of surface water sampling locations. These data were reported in the *Summer 2001 Area-Wide Investigation Data Summary* (MWH, 2002e). Species collected include: western harvest mouse, deer mouse, least chipmunk, and Uinta ground squirrel.

Terrestrial Biota - Invertebrates

- Eighteen (18) terrestrial invertebrate samples were collected in September 2001 at P4 waste rock dumps and on the banks of surface water sampling locations. These data were reported in the *Summer 2001 Area-Wide Investigation Data Summary* (MWH, 2002e).

Terrestrial Biota - Bird Eggs

- Two hundred fifteen (215) bird egg samples were collected throughout the Southeast Idaho phosphate resource area in May 1999. These data are presented in the *1999 Interim Investigation Data Report* (MW, 2000).

- Three hundred thirty-four (334) bird egg samples were collected throughout the Southeast Idaho phosphate resource area in May 2000. These data are summarized in this RI/FS Work Plan and the details are included in the *DQUR* (MWH, 2010a).

- Three hundred sixty-nine (369) bird egg samples were collected throughout the Southeast Idaho phosphate resource area in May 2001. These data are summarized in this RI/FS Work Plan and the details are included in the *DQUR* (MWH, 2010a).

2.3.2.6 Post-2003 AOC Environmental Data Collection and Reporting

Studies conducted and data collected for the EE/CA program established by the 2003 AOC will be used in the RI/FS. These are listed below by media type. It is envisioned that all of

these data will be available for the RI/FS. The data uses and data quality are discussed in Section 3.8.

Upland Soils

- One hundred thirty (130) samples were collected as part of the waste rock dump mass wasting investigation (26 from the Ballard Mine, 52 from the Henry Mine, and 52 from the Enoch Valley Mine). These data were reported in the *Interim Phase I SIs Evaluation Summary* (MWH, 2007g).

- Eight (8) samples were collected as part of the agronomic soils study (all from the Ballard Mine). These data were reported in the *Interim Phase I SIs Evaluation Summary* (MWH, 2007g).

- Two hundred twenty-six (226) upland soil samples were taken at P4 sampling locations from June-July 2009. These data will be reported in a future data summary report.

Riparian Soils

- One hundred thirteen (113) riparian soil samples were collected at P4 sampling locations in September 2004. These data were reported in the *Interim Phase I SIs Evaluation Summary* (MWH, 2007g).

Upland Vegetation

- One hundred thirty (130) upland vegetation samples were collected at P4 waste rock dump locations in July 2004 based on inclusion of upland soil as part of the mass wasting investigation. These data were reported in the *Interim Phase I SIs Evaluation Summary* (MWH, 2007g).

- Eighteen (18) upland vegetation samples were collected during the seasonal vegetation study. One composite sample was taken from one selected waste rock dump at each of the Ballard, Henry, and Enoch Valley mines. Each of the three waste rock dump locations were then sampled each month May to October of 2004. These data were reported in the *Interim Phase I SIs Evaluation Summary* (MWH, 2007g).

- Four hundred twenty-eight (428) upland vegetation samples were collected at P4 sampling locations from June-July 2009. These data will be reported in a future data summary report.

- Fifty-two (52) upland vegetation samples were collected at P4 sampling locations in August 2009. These data will be reported in a future data summary report.

Riparian Vegetation

- One hundred thirteen (113) riparian vegetation samples were collected at P4 sampling locations in September 2004 in concurrence with riparian soil collection. These data were reported in the *Interim Phase I SIs Evaluation Summary* (MWH, 2007g).

- Eighteen (18) riparian vegetation samples were collected during the seasonal vegetation study. One composite sample was collected at each of three sampling locations along the Blackfoot River. These three Blackfoot River locations were then sampled each month from May to October 2004. These data were reported in the *Interim Phase I SIs Evaluation Summary* (MWH, 2007g).

Surface Water

- Fifty-five (55) surface water samples were collected at P4 sampling locations in May 2004. These data were reported in the *Interim Phase I SIs Evaluation Summary* (MWH, 2007g).

- Forty (40) surface water samples were collected at P4 sampling locations in May 2006. These data were reported in the *May 2006 Data Validation Report Memorandum* (MWH, 2007b).

- Thirty-eight (38) surface water samples were collected at P4 sampling locations in May 2007. These data were reported in the *2007 and 2008 Data Summary Report* (MWH, 2009b).

- Twenty-eight (28) surface water samples were collected at P4 sampling locations in September 2007. These data were reported in the *2007 and 2008 Data Summary Report* (MWH, 2009b).

- Thirty-eight (38) surface water samples were collected at P4 sampling locations in May 2008. These data were reported in the *2007 and 2008 Data Summary Report* (MWH, 2009b).

- Twenty-nine (29) surface water samples were collected at P4 sampling locations in September 2008. These data were reported in the *2007 and 2008 Data Summary Report* (MWH, 2009b).

- Twenty-two (22) surface water samples were collected at P4 sampling locations in May 2009. These data will be reported in a future data summary report.

- Four (4) surface water samples were collected at P4 sampling locations in September 2009. These data will be reported in a future data summary report.

Sediment

- Ninety-eight (98) sediment samples were collected at P4 sampling locations in May 2004. These data were reported in the *Interim Phase I SIs Evaluation Summary* (MWH, 2007g).

Surface Expressions of Groundwater

- Sixty-one (61) SEGW samples were collected at P4 sampling locations in May 2004. These data were reported in the *Interim Phase I SIs Evaluation Summary* (MWH, 2007g).
- Fifty-one (51) SEGW samples were collected at P4 sampling locations in May 2006. These data were reported in the *Interim Report for Hydrogeologic Investigation* (MWH, 2008b).
- Thirty-six (36) SEGW samples were collected at P4 sampling locations in May 2007. These data were reported in the *2007 and 2008 Data Summary Report* (MWH, 2009b).
- Twenty (20) SEGW samples were collected at P4 sampling locations in September 2007. These data were reported in the *2007 and 2008 Data Summary Report* (MWH, 2009b).
- Forty-one (41) SEGW samples were collected at P4 sampling locations in May 2008. These data were reported in the *2007 and 2008 Data Summary Report* (MWH, 2009b).
- Twenty-one (21) SEGW samples were collected at P4 sampling locations in September 2008. These data were reported in the *2007 and 2008 Data Summary Report* (MWH, 2009b).
- Twelve (12) SEGW samples were collected at P4 sampling locations in May 2009. These data will be reported in a future data summary report.
- Seven (7) SEGW samples were collected at P4 sampling locations in September 2009. These data will be reported in a future data summary report.

Alluvial System Groundwater

The shallow alluvial aquifer systems were sampled for dissolved selenium at discrete locations around the Ballard, Henry, and Enoch Valley mines in 2008 and 2009.

- Ninety (90) shallow groundwater samples were collected in 2008 under the *Direct Push Groundwater Sampling Work Plan* (MWH, 2007f). These data were reported in the *2007 and 2008 Data Summary Report* (MWH, 2009b).

- Twenty-three (23) shallow groundwater samples were collected in 2009 under the *2009 Direct Push Groundwater Continuation Sampling and Analysis Plan* (P4, 2009). These data will be reported in a future data summary report.

- In addition to the direct push samples taken in 2009, 16 pre-packed wells (12 installed in 2008 and four installed in 2009) were sampled for an extended list of inorganic analytes.

Bedrock Groundwater (including conventional alluvial wells)

The groundwater samples described in this section were collected from monitoring wells, agricultural wells, domestic wells, and production wells, which are located on and in the vicinity of the P4 mine facilities.

- Thirty-three (33) wells were sampled in 2004 (May, September and October, combined). These data were reported in the *Monitoring Well Installation Technical Memorandum for Final 2005 Phase II Supplemental SI Groundwater Work Plan* (MWH, 2007a).

- Eleven (11) wells were sampled in 2005 (June and October). These data were reported in the Monitoring Well Installation Technical Memorandum for Final 2005 Phase II Supplemental SI Groundwater Work Plan (MWH, 2007a).

- Six (6) wells were sampled in 2006. These data were reported in *Interim Report for Hydrogeologic Investigation* (MWH, 2008b).

- Twenty (20) wells were sampled in September 2007. These data were reported in the *2007 and 2008 Data Summary Report* (MWH, 2009b).

- Thirty-two (32) wells were sampled in May 2008. These data were reported in the *2007 and 2008 Data Summary Report* (MWH, 2009b).

- Thirty (30) wells were sampled in September 2008. These data were reported in the *2007 and 2008 Data Summary Report* (MWH, 2009b).

- Twenty-four (24) wells were sampled in May 2009. These data will be reported in a future data summary report.

- Nine (9) wells were sampled in September 2009. These data will be reported in a future data summary report.

Aquatic Biota – Benthic Macroinvertebrates

- Sixty-six (66) benthic macroinvertebrate samples were collected at P4 sampling locations in June 2004. These data were reported in the *Interim Phase I SIs Evaluation Summary* (MWH, 2007g).

Aquatic Biota – Fish

Salmonids and forage fishes were sampled in May 2004, as described below:

- Salmonids were collected at five P4 sampling locations; both the fillet and the whole body were analyzed. These data were reported in the *Interim Phase I SIs Evaluation Summary* (MWH, 2007g).
- Forage fish were collected at 31 P4 sampling locations; forage fish were analyzed as whole body. These data were reported in the *Interim Phase I SIs Evaluation Summary* (MWH, 2007g).

Terrestrial Biota

No terrestrial biota data have been collected during the post-2003 EE/CA project.

Habitat Assessment

In 2004, P4 conducted aquatic and terrestrial (riparian) habitat assessments. The aquatic habitat assessment was conducted at all stream stations for the purpose of developing a predictive model to differentiate stream habitat that supports fish from stream habitat that does not support fish. Statistical methods were used to develop possible models.

P4 conducted a riparian (terrestrial) assessment of ponds and non-fish-bearing streams. The habitat assessments were conducted in two parts – one assessment for ponds and one assessment for non-fish-bearing stream stations (including seeps and springs). The assessments were performed by a qualified ornithologist experienced in performing ecological habitat assessments. As no protocol could be found to fit the needs of this investigation (all protocols available are tailored to assess the habitats of threatened or endangered species), the ornithologist developed a detailed protocol. The assessment of each station consisted of detailed observations, including use, or potential use, of the habitat as well as the presence or absence of a particular assemblage of species, where each

assemblage more or less represents a guild of species exploiting the habitat of interest in a similar manner. These assessments are summarized in Section 3.0.

Functional Use Survey

On June 14 and 15, 2004, representatives from IDEQ, supported by the USEPA, Forest Service, BLM, USFWS, and accompanied by P4 and their consultant, conducted functional use inspections of the non-regulated surface water features at P4's Ballard, Henry and Enoch Valley mines (IDEQ, 2004b). The purpose of the inspections was to assign the appropriate risk management action levels to non-regulated surface water features (i.e., site ponds) based on a reasonable assessment of the existing and potential future uses of the features. In accordance with IDEQ's Area Wide Risk Management Plan (IDEQ, 2004a), three selenium action level tiers were established for non-regulated surface waters:

- Tier 1 is the most restrictive selenium action level at 0.005 milligram per liter (mg/L) based on USFWS/Department of Interior guidance for the protection of nesting and breeding waterfowl, and other sensitive riparian species. Tier 1 was assigned to surface water features that appeared to provide adequate open water, emergent vegetation, protective cover, and food sources to support a local resident migratory bird population during typical nesting/breeding seasons.
- The Tier 2 selenium action level was set at 0.05 mg/L based on veterinary guidance for the protection of domestic livestock. This action level was assigned to surface water features within grazing allotments, those exhibiting evidence of livestock use, or ponds with a reasonable potential for future use as drinking water for livestock.
- The final selenium action level, Tier 3, was set at 0.201 mg/L based on IDEQ's risk management action level calculations for use as an occasional drinking water source by transitory terrestrial wildlife as opposed to the more restrictive uses assigned under Tier 2.

This assessment evaluated the function, habitat, and uses of the ponds on the P4 Sites. It was noted that, with few exceptions, the functional use survey corresponded closely to P4's habitat assessment.

3.0 INITIAL EVALUATION

Numerous investigations and evaluations have been performed at the Sites, as summarized in Section 2.3. This section provides a synthesis of the historic data gathered for each mine in order to assist in identifying any remaining data gaps and to begin building the basis for making risk management decisions and remedial action planning, if any. Based on this section, a data gap analysis for each mine site is presented in Section 4.0 that will serve as the basis for future RI/FS investigations. Below is a summary of the historic information that is available for the Sites and is organized as follows:

1. Contaminant Sources (Section 3.1) - This section presents an overview of the potential source(s) of COPCs at the Sites and includes discussions on the general geochemistry of the various source materials at the mine.

2. Nature and Extent of Contamination (Organized by Site and by Media in Sections 3.2, 3.3, 3.4, and 3.5) - These sections support, summarize, and expand on the nature and extent of information presented in previous documents for the following primary media: (1) soil, (2) vegetation, (3) surface water, (4) sediment, (5) groundwater; and secondary media: (6) aquatic biota, and (7) terrestrial biota. The secondary media are intended to be used as additional lines of evidence in the human health and/or ecological risk assessments as further discussed in Section 3.8 that will be performed in the RI/FS. Tables of detections above selected relevant screening criteria (e.g., maximum contaminant levels [MCLs] for groundwater COPCs) for primary media are included in this section for each medium. These results are evaluated to aid in the discussion of the nature and extent of COPCs in each medium and at each Site. Section 3.5 discusses contamination found in area surface waters downstream of the Sites. These sections are intended to be relatively "stand-alone" to facilitate future RI/FS documents that will treat the three mines as individual Sites with separate site-specific studies and reports.

3. Fate and Transport (General and Site-Specific in Sections 3.6 and 3.7). Initially, general chemical and physical transport mechanisms and processes are presented in Section 3.6 to provide a foundation for detailed discussions that occur later in Section 3.7. Section 3.7 presents specific fate and transport processes that are occurring at the Sites and have been verified by the investigations to date.

4. Initial Risk Characterization Conceptual Site Models (Human and Ecological in Section 3.8). The basis for methods and protocols that will be used in the RI/FS to evaluate human health and ecological risks are presented in this section. The conceptual site models for both human health and ecological risk evaluations are

discussed along with specifics regarding current and future receptors, complete and incomplete exposure pathways, and other pertinent information for both the human health and ecological risk assessments.

5. Quality Assessment of Existing Data (Section 3.9) - This section identifies the types and quality of the existing data for the Sites by summarizing information presented in the *Data Quality and Usability Report (DQUR)/Data Approval Request (DAR)* (MWH, 2010a) provided in Appendix B. The *DQUR/DAR* provides extensive detail regarding the existing data types and their usability in this RI/FS.

3.1 Contaminant Sources

Sources of COPCs at the Sites are the geologic materials that have been excavated during the process of mining, specifically rocks of the Phosphoria Formation, which contain the phosphate ore and its associated inorganic constituents. Because of the scale of the mining operations and the volume of source material placed throughout the Sites, the inorganic contaminants are the greatest concern. The objective of this section is to discuss the source materials in their natural state and an excavated/disturbed condition to provide a basis for the nature and extent of inorganic COPCs at each mine and waters downstream of this mining area as discussed in Sections 3.2 through 3.5.

3.1.1 Phosphoria Formation

The primary known/recognized source material of contaminants associated with phosphate mining in SE Idaho is the Meade Peak Member of the Phosphoria Formation (see Table 2-11 for a stratigraphic column). In particular, the waste shale between ore horizons contributes much of the COPC loading. This is in part because the middle or center waste shale (CWS), as it is known, represents a significant portion of the overburden that is stockpiled when the ore is removed; and this shale is enriched with COPCs, most notably selenium. Thinner waste shale beds above and below the ore horizons also contribute. Figure 3-1 depicts the relevant portion of stratigraphic section associated with mining activities in SE Idaho. A presentation of the geology and origin of the Middle Permian Phosphoria Formation is given in Hein, et al. (2004) with a synopsis of the stratigraphy in Section 2.2.4.

The general lithogeochemistry of the Meade Peak Member is summarized in Herring and Grauch (2004) in which 11 major elements and 21 trace elements are evaluated and discussed. These researchers note that concentrations of cadmium, chromium, selenium, silver, uranium, and zinc are "exceptionally" enriched in the Meade Peak Member compared to the world-wide shale average. It is specifically noted that the range of selenium mean values for the individual ore and waste shale units (upper, center, and lower waste shale, and upper and lower ore) is 39 – 68 parts per million (ppm; approximately equivalent to milligrams per kilograms dry weight; mg/kg dw), compared to a shale average of approximately 0.8 ppm (Herring and Grauch, 2004). The selenium concentrations are relatively evenly distributed in the Meade Peak section, although the lowest mean concentration is in the lower waste shale. For the other exceptionally enriched elements noted, the range of mean values compared to shale averages of Herring and Grauch (2004)[2] are as follows:

- Cadmium - the range of means is 22 to 112 ppm increasing downward in the Meade Peak section, and compared to a shale average of 0.3 ppm.
- Chromium - the range of means is 525 to 1470 ppm with the highest concentration in the center waste shale, and compared to a shale average of 100 ppm.
- Silver - the range of means is 4 to 14 ppm relatively uniformly distributed, and compared to a shale average of 0.1 ppm.
- Uranium – the range of means is 26 to 108 ppm being approximately three times as concentrated in the ore beds, and compared to a shale average of 3 ppm.
- Zinc – the range of means is 763 to 3,349 ppm increasing downward in the Meade Peak section similar to cadmium, and compared to a shale average of 150 ppm.

The averages for other elements in the Meade Peak Member that are not "exceptionally enriched," but have potential environmental significance are:

Antimony – 6 (1.5)	Arsenic – 25 (15)
Barium – 175 (600)	Cobalt – 6 (10)

[2] Herring and Grauch (2004) considered both the world-shale composite averages and the North American shale composite averages when selecting an average value for comparison.

Copper – 93 (58)	Mercury – 0.41 (0.4)
Manganese – 248 (600)	Molybdenum – 35 (5)
Nickel – 288 (60)	Lead – 15 (25)
Thallium – 3 (1.4)	Vanadium – 590 (200)

(in ppm with the black shale average used for comparison in parentheses)

Of the elements identified as exceptionally enriched, a section of the Meade Peak Member measured and sampled at the Enoch Valley Mine indicates that selenium and silver concentrations are relatively uniform throughout the ore and shale beds. Whereas, cadmium, uranium, and zinc tend to be more concentrated in the ore beds with the highest concentrations tending to be in the lower ore. Chromium appears slightly more concentrated in the center waste shale (Herring, et al., 2001).

Other useful lithogeochemcial data on the Meade Peak Member rocks at the Enoch Valley Mine are available in Grauch, et al. (2001) and Herring, et al. (1999). The Grauch, et al. (2001) document provides a detailed 194-foot-long stratigraphic section through the Meade Peak Formation at the Enoch Valley Mine. This section is supplemented with approximately four semi-quantitative X-Ray Fluorescence (XRF) analyses per foot along the section. Analyses for 13 elements, including selenium, molybdenum, nickel, and zinc, were obtained. Because the analyses were semi-quantitative, the results are less useful for absolute concentrations but provide a detailed indication of trends within the section and beds with relatively more elevated concentrations. The Herring, et al. (1999) document compared weathered and unweathered Meade Peak Member rocks at the Enoch Valley Mine. These documents are not discussed further here, but may be useful during the RI.

The stratigraphic relationship of the ore and center waste shale is shown on Figure 3-1. Typically, the mining activities are extended to the depth where the Grandeur Tongue Dolomite or the Wells Formation is encountered. Therefore, significant quantities of dolomite or limestone only are excavated when it is required for mine pit stability. However, this quantity can be significant. Much of the waste rock is the CWS, along with thinner shale beds that overlie and underlie the phosphate ore horizon (i.e., the hanging and footwall

muds, respectively). As the mine pit is expanded, the Rex Chert and Cherty Shale members, and possibly Dinwoody Formation rocks become proportionally more significant in the waste rock. For some mine pits, these rocks that overlie the Meade Peak Member can represent the largest proportion of the waste rock.

The upper Phosphoria Formation Rex Chert and Cherty Shale lithogeochemistry is presented in Hein, et al. (2004), and the document includes a presentation of the geochemistry of these units at the Enoch Valley Mine. The mean concentrations observed in the Rex Chert and Cherty Shale at Enoch Valley are 18.3 ppm for selenium, 297 ppm for chromium, and 282 ppm for zinc. Cadmium, silver, and uranium data are not reported. It is noted that the higher selenium concentrations are from rocks transitional to the Meade Peak; without the transitional rocks included in the means, the average selenium concentration is less than 1 ppm. It is also stated that other elements of environmental interest occur at concentrations near or below the shale average.

Whole rock lithogeochemical data have also been collected in association with the Blackfoot Bridge EIS. The elemental concentrations were determined for 28 elements for geologic materials within the Blackfoot Bridge project area including alluvium, rhyolite tuff, Rex Chert, Grandeur Tongue/Wells Formation and the various ore and waste rock horizons in the Meade Peak Member of the Phosphoria Formation (Whetstone, 2009). The ranges presented for the Meade Peak and Rex Chert members are consistent with Herring and Grauch (2004) and Hein, et al. (2004). The Blackfoot Bridge data are discussed further in the following section.

The leachable elements in the Meade Peak Member were evaluated in Herring (2004) for rocks collected from measured sections at the Enoch Valley Mine (two sections and one core) and two other mines: the Rasmussen Ridge Mine, adjacent to Enoch Valley Mine; and the Dry Valley Mine, southeast of the Henry Mine (one section each). It was observed that selenium, cadmium, and zinc are most leachable from unweathered rocks. The study indicated that oxidation after excavation from a mine is not needed for the initial release of selenium and other trace elements.

3.1.2 Waste Rock

As described in Section 2, studies have been conducted that provide data on the character and behavior of waste rock at and/or near the Sites. A recent study has been conducted at the Enoch Valley Mine where the waste rock was drilled and various geochemical, hydrological, and physical measurements were collected throughout the waste rock profile (Tetra Tech, 2008). A second useful study was a baseline geochemistry study conducted for the EIS required as part of the permitting process for P4's proposed Blackfoot Bridge Mine. The proposed P4 Blackfoot Bridge Mine is located approximately 2 to 3 miles southwest of the Ballard Mine. The results of this study were reported in Whetstone (2009) and BLM (2009). Detailed information is available in these studies that may be useful for addressing specific lines of investigation in the RI. Some of the key findings related to waste rock from these studies are summarized below. In addition to these studies, pertinent information may be obtained during the RI from the EIS for the North Rasmussen Mine that is approximately one-half mile east of the Enoch Valley Mine.

<u>Enoch Valley Waste Rock Study</u>

The chemical composition of the rock units that compose the waste rock at the Sites is a good initial characterization of the potential source composition for the Sites. However, specific analyses of the waste rock as it occurs in the waste rock dumps are potentially more useful. The waste at the Enoch Valley Mine has been studied in some detail to evaluate attenuation, removal, and movement of selenium in phosphate waste rock (Tetra Tech, 2008). In the spring of 2006, the mine pit backfill MWD091 was drilled and sampled to a depth of 343 feet to collect chemical and physical data on the waste rock. The mine pit bottom was encountered at 341 feet below grade. Samples were collected and analyzed for total and leachable organic carbon, total and leachable selenium, acid generating and neutralizing potential, net neutralizing potential, sulfur species, moisture content, grain size and soil moisture retention. Notable geochemical conclusions from 13, two-foot-long composites collected between 5 and 343 feet below ground surface (bgs) are:

- The waste rock in the mine pit backfill is net neutralizing on average with no samples characterized as acid generating.

- Total organic carbon ranged from not detected at 0.1% to 8.8%, and leachable organic carbon ranged from not detected (<1 mg/L) to 3 mg/L.
- Total selenium concentrations ranged from 0.79 to 139 mg/kg with leachable selenium ranging from not detected (<0.0001 mg/L) to 0.119 mg/L.
- Sulfur concentrations ranged from not detected (<0.01%) to 2.08%.

In addition, oxygen (O_2), carbon dioxide (CO_2), and relative humidity were monitored between 36.5 and 312.5 feet (bgs) at 10 locations in June and August of 2006. The oxygen content in the waste rock at 36.5 feet bgs ranged from 2.2% in June to 9.2% in August and quickly decreased with depth. At 80.8 feet bgs oxygen content ranged from 0.5% in June to 0.7% in August. Carbon dioxide exhibited a reverse relationship, being lowest at 36.5 feet bgs ranging from 6.3 to 6.6% and generally was above 8% at or below 80.8 feet bgs to 312.5 feet bgs. The relative humidity ranged from 33 to 67%. The depleted oxygen and elevated carbon dioxide with increasing depth suggests that microbial decomposition of organic matter is occurring in the pit backfill along with limited air circulation. It should be noted that the carbon dioxide concentrations also may be affected by the presence of carbonate minerals in the rock. However, the depleted oxygen content with elevated carbon dioxide and the net neutralizing character of the waste rock suggest that processes associated with sulfide oxidation are probably not significant below more than a few feet from the surface. The data indicate that leachable selenium is readily available.

Blackfoot Bridge Baseline Studies

It is reasonable to assume that the geology of the Phosphoria Formation and associated units are similar between the proposed Blackfoot Bridge Mine and the Ballard Mine Site because of their close proximity and because data from rock representative of waste rock at the Blackfoot Fridge Mine are generally representative of the Sites. As part of the baseline study, composite samples were collected from bore holes and test pits; and various tests were conducted to evaluate possible chemical impacts from exposing these rocks to the surficial environment.

An extensive data set was developed for the elemental content of the waste and ore units at Blackfoot Bridge Mine as part of the EIS baseline geochemical study. Analyses were

conducted for 28 elements, including cadmium, selenium and other elements of environmental concern, for 10 units. Some of the individual units tested were alluvium, rhyolite tuff, Rex Chert (including Cherty Shale), upper waste shale, upper ore, CWS, lower ore, lower ore partings, lower waste shale, and Grandeur Tongue/Wells Formation. The individual elements were assessed among the individual units.

Of the trace elements detected, it was noted that antimony, arsenic, cadmium, chromium, copper, lead, mercury, silver, strontium, and uranium were most concentrated in the ore beds. Nickel, selenium, and zinc were most concentrated in the waste shale. Molybdenum was concentrated in the ore and waste shale. It was also noted that arsenic, cadmium, copper, molybdenum, nickel, phosphorous, selenium, strontium, sulfur, uranium, and zinc concentrations were above world-wide shale averages (Whetstone, 2009; BLM, 2009). Chromium was not noted as being above the world-wide average given in the report, but it appears that it should also have been included in the list. Whetstone (2009) provides an extensive discussion of the elemental abundances by rock type; however, considering only the waste rock units and those elements noted as "elevated" compared to shale averages by the USGS (Herring and Grauch, 2004), the following summaries apply:

- Selenium - highest concentrations occurred in the CWS with an average concentration of 47 mg/kg
- Cadmium - highest concentrations occurred in the lower waste shale with an average concentration of 78 mg/kg (CWS was 19 mg/kg)
- Chromium - highest concentration occurred in the CWS with an average concentration of 469 mg/kg
- Silver - approximately 5 mg/kg in most of the waste rock units
- Uranium - averaged approximately 24 mg/kg in the waste shale, being much more enriched in the ore units (93 mg/kg in the lower ore
- Zinc - highest concentration occurred in the lower waste shale with an average of 2,154 mg/kg (CWS was 1,002 mg/kg)

A significant part of the Blackfoot Bridge Mine baseline study, especially as it relates to this RI Work Plan, was the leaching studies. It was observed, based on results from the synthetic precipitation leaching procedure (SPLP; EPA Method 1312), that selenium could leach from

the waste rock units in concentrations that would exceed the State of Idaho freshwater criteria of 0.005 mg/L. Specifically, the CWS produced leachate concentrations up to 0.1 mg/L selenium. These results are significant in that this procedure is commonly used to simulate the leaching that occurs when precipitation first contacts the rock, and it represents readily soluble and transportable selenium.

Column leaching studies conducted for the Blackfoot Bridge Mine EIS by Whetstone Associates, Inc. (Whetstone, 2009) have provided data about the behavior of the waste rock in the environment. These studies concluded that total dissolved solids (TDS), sulfate, cadmium, copper, iron, manganese, nickel, selenium, and zinc may be released from waste rock units at concentrations of potential environmental concern. Actual observations from the Sites in surface water and groundwater, discussed in Sections 3.2 through 3.4, suggest that this conclusion may not be directly correlative to field conditions at the Sites. For example, several of the metals are elevated in the column effluent but are rarely observed to be elevated above the Blackfoot Bridge Mine EIS screening levels (Whetstone, 2009) in actual aqueous environmental samples originating from the Sites (i.e., copper, iron, manganese, nickel, and zinc).

For the Blackfoot Bridge Mine EIS, fourteen leaching columns were constructed which evaluated various waste rock and ore stockpile compositions. Six of the leaching columns were characteristic of waste rock in unsaturated conditions, and three were characteristic of waste rock in saturated conditions. Two columns represented unsaturated ore stockpiles from different stages of the mining plan, and three were quality control columns (a blank and two duplicates). The size and surface area of the materials in the leaching columns were evaluated, and this test material was found to be coarser than what would be encountered during mining operations, but acceptable for this testing.

The unsaturated columns were leached through eleven, 19-day cycles. Each cycle required 14 days of solution application, two days of drain down, and three days of aeration. The saturated columns were similarly cycled through eleven, 19-day cycles consisting of 14-day solution application and a five-day rest (BLM, 2009).

The results of the column studies indicated markedly different behavior for saturated versus unsaturated waste rock conditions. Initial flushing was observed in both the unsaturated and saturated columns as was expected based on the SPLP and soluble selenium testing previously discussed. The first one to three cycles exhibited higher concentrations of TDS, sulfate, and metals. With the exception of iron and manganese, which may be more mobile in lower oxygen environments, metals were less mobile in the saturated conditions and more mobile in the unsaturated conditions. This was particularly true for selenium, which was relatively immobile in the saturated conditions (BLM, 2009). Specific observations from the columns included:

- The pH in the column effluents remained near-neutral ranging from approximately 6.7 to 8.5 with the lower pH results occurring during the first three cycles.
- Selenium exceeded the State of Idaho surface water quality standard of 0.005 mg/L in all unsaturated column effluents for all cycles; however, for the saturated columns, selenium was exceeded only in the first cycle samples.
- Cadmium exceeded the relevant State of Idaho cold water biota criteria of 0.0006 mg/L (Criterion Continuous Concentration [CCC]; 100 mg/L hardness assumed) in the majority of column leachate samples, including all first cycle samples.
- Nickel (0.29 mg/L maximum) and zinc (0.45 mg/L maximum) exceeded surface water criteria in some initial leaching cycles, but not in subsequent cycles (i.e., State of Idaho cold water biotic standards of 0.052 mg/L and 0.12 mg/L, respectively; CCC; assuming 100 mg/L hardness).
- Iron exceeded the State of Idaho groundwater secondary standard of 0.3 mg/L in a relatively few initial effluent samples, most commonly in the saturated columns.
- Manganese exceeded the State of Idaho secondary groundwater standard of 0.05 mg/L in all initial cycle effluent samples, but concentrations above the standard persisted in the saturated columns.
- TDS started out above 500 mg/L in all the columns, but decreased to less than 500 mg/L after the third cycle in all the columns.
- Sulfate exhibited a similar trend, being greater than 200 mg/L (up to approximately 1,500 mg/L) in the first cycle, but at 200 mg/L or less by the third cycle. The lower rate of sulfate release in later cycles from the saturated columns suggests an inhibition of sulfide oxidation.

While the specific analyte concentrations determined during the Blackfoot Bridge studies do not have direct relevance to the Sites, these data help support the overall site conceptual model and the understanding of contaminant mobility and transport in geologic materials similar to the Sites. For example, the differences in analyte mobility observed in saturated (oxygen limited) and unsaturated (oxygenated) Blackfoot Bridge columns may help clarify the conceptual model and explain why elevated COPC concentrations are detected or are not detected depending on the hydrogeologic setting. It is not expected that the quantitative data from the Blackfoot Bridge studies will be used except for comparisons and to support similar situations noted at the Sites.

Physical and Hydrologic Data

In addition to the geochemical data collected from waste rock studies, some site-specific non-chemical data have been collected at Enoch Valley that may be of use during the RI. Additional data were collected during the Tetra Tech (2008) Waste Rock Study, including grain size data, moisture content, and soil moisture characteristic curve results.

Grain size data were collected from two samples at Enoch Valley at depths of 2 – 5 feet and 167 – 169 feet bgs. The upper sample was CWS and top soil and the lower sample was CWS only. The results were as follows:

Depth:	2 – 5 ft	167 – 169 ft
Gravel %:	30.2	17.5
Sand %:	27.4	27.3
Silt & Clay %:	42.4	37.6 silt/17.6 clay

The shallow sample was described as gravelly clay with sand, and the deeper sample was described as sandy silt with gravel and clay. As reported in Tetra Tech (2008), 17 samples were analyzed in the laboratory for moisture content. The samples were collected from 2- to 6-foot-long intervals between 5 and 343 feet bgs. The results ranged from 6.0 to 24.4 % moisture, and there was not a pattern or trend to the data with depth. These data indicated

that the waste rock is not saturated and that water flow, if it is occurring, is most likely through preferential vertical flow paths.

Soil moisture characteristics were collected from two samples with the following results:

Depth:	175 – 177 ft	237 – 241 ft
Soil Type:	limestone sand	CWS
Field Capacity:	20.2 % water	22.0 % water
Wilting Point:	10.1 % water	10.9 % water
Avail. Water Cap.	0.1328	0.1339
Bulk Density	1.32 g/cm^3	1.21 g/cm^3

O'Kane Consultants, Inc., was retained by IMA to design, install, and manage field performance monitoring systems for the cover systems installed at the reclaimed backfilled panels and external overburden dumps at the Enoch Valley Mine as discussed in Section 2.3.2.2. The overall objective of these ongoing field monitoring programs is to develop an understanding for the processes and characteristics influencing general moisture transport/storage within waste rock disposal facilities and specifically in MMD091 at the Enoch Valley Mine, which is a backfilled mine pit. This monitoring also will lead to a better understanding of the surface water balance of various cover system designs. Sites at Simplot and Agrium mines also have been similarly instrumented so that a range of cover systems can be evaluated. A summary of key data and trends in the preliminary performance of the cover systems for the 2008 monitoring period as reported in O'Kane (2009a) is provided below:

1. The total precipitation (rainfall plus snow water equivalent) received at the Enoch Valley Mine in 2008 was 388 mm (15.3 in). Consistent with data observed in 2007, the total precipitation measured at the monitoring site in 2008 was below historic normals; however, distribution of rainfall over the months was different, which influenced site water balances.

2. The in-situ temperature measured at the monitoring site in 2008 showed that the cover materials did not record below freezing temperatures, consistent with 2007

measurements. The soil profiles were completely thawed over the spring melt period allowing melt water to infiltrate the profile.

3. The moisture content and thermal conductivity sensors at each site illustrate that water content increased gradually over the entire cover profile as a result of spring melt. The spring melt, in conjunction with large rainfall received in May, provided moisture storage to buffer the effect of a lack of rainfall in July. The instrumentation at the monitoring sites showed that during periods of high evapotranspirative demand when rainfall was low, moisture was obtained from deep in the soil profiles. The large rainfall received in November replenished the moisture storage for the 2009 season.

4. A water balance was completed for the monitoring site to provide an estimate of net percolation. For the Enoch Valley Site, 8 mm of precipitation percolated into the waste rock, or approximately 2 percent of total precipitation. Percolation for 2007 was estimated to be higher at approximately 10 percent of total precipitation (O'Kane, 2008a).

Similar data was collected in 2007 and reported by O'Kane (2008b). In addition, a Guelph Permeameter was used to obtain measurements of hydraulic conductivity (i.e., permeability) in the unsaturated zone within the study area on MWD091. This hydraulic conductivity in the unsaturated zone is referred to as the "field-saturated" hydraulic conductivity (K_{fs}). The geometric mean permeability of the cover material in the study location on MWD091 was reported as 2.7×10^{-4} cm/sec (O'Kane, 2008b).

Continued cover performance monitoring will provide valuable data related to cover system designs that will be used during the evaluation of alternatives in the FS. Data from all three sites monitored by O'Kane may be useful in establishing hydrologic characteristics of various cover configurations that occur at the three P4 Sites. Recently, sites have been instrumented at P4's Rasmussen Ridge Mine (O'Kane, 2009b). Data from this mine, in particular a location with uncovered CWS, will be useful in establishing hydrologic characteristics. The uncovered CWS configuration may be analogous to areas at the Ballard Mine. The detailed data presented in the O'Kane reports may be used in the development and calibration of cover performance models.

3.1.3 Mine Pits

Specific data have not been collected from the Phosphoria Formation exposed in mine pits to address how readily pit walls release selenium and other COPCs. However, given the in-situ condition of the rock in the pit walls, the lithogeochemical characterization discussed in Section 3.1.1 is accurate for the fundamental composition of the rock. The rate and mass of COPC release has not been characterized, but fundamentally it will be lower than waste rock facilities. This is because there is much less rock surface area available for leaching in a pit wall compared to a waste rock dump. Any leaching of soluble selenium would occur in the mine pits using similar geochemical processes to the column leach tests, and selenium would theoretically decline through leaching over time. However, erosion of the pit walls could expose less weathered rock, thereby reviving the selenium release processes.

3.1.4 Other Sources

With the exception of slag stored at the Ballard Mine shop area, no other significant primary sources are noted at the Sites. The slag was characterized indirectly as part of the soil and vegetation study conducted in 2009. This study is discussed in Section 3.2.1.1 and in Appendix A2. This potential source is relatively minor. Secondary sources are present such as ponds. These are discussed as being associated with the various mines and media in the following sections.

3.2 Ballard Mine – Nature and Extent of Contamination by Media

The following subsections present the nature and extent of contamination detected in the various media that have been sampled at the Ballard Mine. In each of the subsections, historical data for primary and secondary media are summarized in tables and the discussions are aided through the use of figures and drawings. For each primary medium, preliminary screening levels (values) presented in Table 3-1 are a combination of the most conservative of promulgated standards used in human and ecological risk assessment, as well as study-specific background values. These screening levels then are used to evaluate the concentration of each constituent in each medium. The screening levels presented in Table 3-1 and medium-specific summary tables discussed below are consistent with the human

health and ecological screening criteria that will be used during the Site risk assessments as described in Appendix C of this RI/FS Work Plan.

Conservative levels of both human health and ecological standards are used in the screening of these medium-specific data. For example, the cadmium standard for human health in surface water is the EPA Regional Screening standard of 0.018 mg/L, but in Table 3-1 and in Table 3-5 (i.e., the surface water screening table presented for Ballard Mine) the ecological standard of 0.0006 mg/L (State of Idaho Surface Water for Aquatic Life Chronic Criteria) is used for surface water screening because it is more conservative.

Note that these screening levels and preliminary background values are used to facilitate the discussion of nature and extent and are not to be considered final remediation goals or background values. The preliminary background values cited in the discussion in Section 3.2 below were reported in the Interim Phase I SIs Evaluation Summary (MWH, 2007g) or were based on the 2009 soil and vegetation investigation further discussed in Sections 3.2.1.2 and 3.2.2.3. Media-specific background values need to be further evaluated during the RI/FS process as discussed in Section 4.0.

The term "analytes of interest" often is discussed in individual sections by medium (e.g., soil, groundwater, etc.) where these analytes are compared to the screening levels and background values. Specific analytes of interest were selected because:

(1) They are typically elevated in the source materials (i.e., waste rock).

(2) They are discussed in historical studies where a specific subset of analytes was selected for analysis and spatial wire diagrams were developed for certain analytes (e.g., aluminum, cadmium, iron, nickel, selenium, vanadium, and zinc) to evaluate spatial and temporal concentration trends.

(3) They frequently exceed relevant screening standards presented in Table 3-1 and are in this Work Plan's summary tables.

(4) They often are primary human health or ecological risk drivers.

In future RI and risk assessment reports, the use of this term most likely will be replaced by other similar terms such as COPCs, constituents of potential ecological concern (COPECs), and COCs.

3.2.1 Soils

Characterization of surface soils at the Ballard Mine has been performed for upland and riparian soils during several investigations since 2004. These investigations include: (1) the mass wasting investigation in the summer of 2004, (2) the supplemental waste rock dump and facility soil characterization in the summer of 2009, and (3) the riparian habitat assessment in the summer of 2004. Each of these investigations is summarized below. To facilitate the discussion, soil concentrations were compared to preliminary screening levels based on the USEPA Regional Screening Levels for Residential Soil as shown on Table 3-1 or to background concentrations. Exceedances of the preliminary screening values for soil are presented in Table 3-2. In addition, soil sample locations for pre-2004, area-wide investigations and selenium concentrations are presented on Drawing 3-1. Locations and selenium results for pre-2004 soil and vegetation investigations, specifically for the Ballard Mine, are shown on Drawing 3-2.

3.2.1.1 Waste Dump Soil Characterization – Mass Wasting Investigation

A reconnaissance of waste rock dumps at the Ballard Mine was performed in June 2004 to identify and map existing and potential mass wasting areas along dump boundaries. Six impacted areas were indentified and one such area was selected at random for sampling on MWD082. Two downward sloping, 150-foot transects, 12.5 feet apart, were set up at this area perpendicular to the dump boundary. Transects began on-dump and crossed the dump boundary and continued off-dump onto native land. Thirteen co-located soil and vegetation samples were taken along each transect and were analyzed for selenium only. These data were originally reported in the *Draft - Interim Phase I SIs Evaluation Summary* (MWH, 2007g).

Transect locations and selenium sampling results are presented herein on Drawing 3-3 for soil and Drawing 3-4 for vegetation.

This task is discussed in conjunction with the waste rock dump vegetation characterization discussion under Section 3.2.2 below because the data were evaluated together. The discussion for both of these activities is only presented in this section.

Presented on Figure 3-2 is a line plot of the co-located soil and vegetation results along the transects. The upland soil and vegetation selenium preliminary background concentrations are also plotted on the graph.

Figure 3-2 suggests that off-dump transport is occurring at these particular transects which run from mine waste rock dump MWD082 to native ground. Off-dump transport is evident by the fact that the off-dump concentrations do not immediately drop below background levels for soil and vegetation, as expected. This can be explained by the steep on-dump slope aspect (90% slope), making off-dump transport likely. Most soil samples were found above the preliminary soil background concentration, estimated at the time of the study, of 8.1 mg/kg dw except for those at the very end (furthest off-dump) of each transect. Vegetation selenium concentrations ranged from 1.7 to 68 mg/kg dw and soil selenium concentrations ranged from 4.8 to 71 mg/kg dw. These data, including background, will be re-evaluated during the RI given the additional soil and vegetation data collected since 2004.

3.2.1.2 Waste Dump Soil Characterization – Supplemental Waste Rock Dump and Facility Soil Characterization

In June 2009, a soil survey and surface soil sampling was conducted at the Ballard Mine waste rock dumps, partially backfilled pits, historic haul road and facilities, and a mine-specific background area located adjacent to the mine area. The primary objective was to characterize the nature and extent of the analytes of interest within the study boundaries. The survey and sampling results are reported in *Supplemental Soil and Vegetation Characterization Data Summary Technical Memorandum* included in Appendix A2 of this Work Plan. A brief summary of the characterization activities are provided in this section.

The soil survey was conducted prior to the sampling event. In each potential source area and background location, the observed cover material was classified into the following major types: topsoil stockpile, topsoil cover, brown shale, cherty shale, black shale, and other (i.e., limestone, dolomite, etc.). The relative abundance of each material was estimated and is further discussed in Appendix A2.

Soil sampling was conducted following the soil survey at the ten Ballard Mine potential source areas (six waste rock dumps, two partially backfilled mine pits, one historic ore haul road, and one historic facility) and background location. Drawing 3-5 shows the locations (typically a randomly selected 50-foot by 50-foot quadrat) and also reports the total selenium result for each sample. A total of 105 composite surface soil samples were collected from the Ballard Mine areas per Supplemental Mine Waste Rock Dump and Facility Soil and Vegetation Characterization Sampling and Analysis Plan (MWH, 2009e). The soil samples were analyzed for antimony, arsenic, boron, cadmium, total chromium, hexavalent chromium, cobalt, copper, manganese, mercury, molybdenum, nickel, selenium, silver, thallium, uranium, vanadium, and zinc.

Table 3-2 presents the analyte concentration for samples that exceeded the preliminary screening levels (USEPA Regional Screening Levels for Residential Soil). Based upon this table, the following analytes were identified as those that have at least one soil sample exceeding its preliminary screening level:

- Arsenic
- Cadmium
- Cobalt
- Manganese
- Vanadium

Uranium did not exceed criteria based on chemical risks. However, concentrations of uranium in the Site soils were found to be high enough that the A/Ts requested evaluation of radiogenic risks associated with uranium and its daughter products in the risk assessment.

At the Ballard Mine, maximum selenium values ranged from 24.9 to 209 mg/kg dw and did not exceed the screening level of 390 mg/kg dw at any of the potential source areas. The selenium values are elevated compared to the background samples collected. Preliminary site-specific background concentrations ranged from 0.250 to 0.485 mg/kg dw.

Concentrations of arsenic, cadmium, cobalt, manganese, and vanadium did exceed the screening level at one or more potential source areas; as shown in Table 3-3, most of the occurrences were fairly isolated with the exception of arsenic.

Arsenic concentrations in all soil samples collected from the potential source areas exceeded the screening level of 0.39 mg/kg dw. Concentrations of arsenic ranged from 3.51 to 45.5 mg/kg dw across all source areas. Although arsenic concentrations in the study's background location ranged from 2.55 to 3.66 mg/kg dw, which suggests arsenic is naturally elevated above the screening level, all waste rock dump soil samples except for one sample on MWD083, exceeded the maximum background arsenic concentration of 3.66 mg/kg dw. As a result, because background arsenic concentrations and the concentrations of arsenic on the waste dumps exceed the screening level for soil of 0.39 mg/kg, further evaluation of these data will be needed in the RI report that will be prepared for the Ballard Mine as discussed in Section 4.0. In addition, a data gap has been identified associated with background data and supplemental arsenic data likely will be collected in a background area.

The background soil samples, which were part of the 2009 soil and vegetation study, were collected in areas representative of where external waste rock dumps have been placed. Not represented were the areas of mine pit and mine pit backfills found in a natural (unmined) setting. This is a significant distinction because the geology and geochemistry is known to vary significantly across these areas, and the average background COPC concentrations in soils may deviate from what is represented in the June 2009 study.

3.2.1.3 Riparian Soil Characterization – Habitat Assessment of Ponds, Wetlands, and Non-Fish-Bearing Streams

In May 2004, riparian habitat assessments, including evaluation of soil, vegetation, and species assemblages, were conducted on the riparian areas of ponds, wetland, and non-fish-bearing streams at Ballard Mine. The sampling locations and selenium results are presented on Drawing 3-6. As the ponds, wetlands, and non-fish-bearing streams within the study area are not inhabited by fish, their ecological function is largely riparian oriented. Thus, it is riparian exposure pathways that are of primary concern in such systems.

The riparian habitat assessments were conducted in two parts: one for ponds and one for non-fish-bearing stream stations (including seeps and springs). The assessments were performed by a qualified ornithologist and fisheries biologist. As no regulatory or standard protocol could be found to fit the needs of this investigation (all protocols available were tailored to assessing habitats of threatened or endangered species), the ornithologist developed a detailed protocol. In tandem with the riparian habitat assessments, stream habitat assessments were performed at the same stream reaches. These stream habitat assessments or rapid bioassessment surveys conducted on the P4 streams used protocols established by USEPA (Barbour, et. al., 1999) to characterize the quality of the physical habitat and are discussed in Section 3.2.5.1. Details of the procedures of both assessments, as well as the original presentation of the data, can be found in the *Draft - Interim Phase I SIs Evaluation Summary* (MWH, 2007g).

The riparian assessment of each station began with a detailed observation of the area and then habitat use was recorded. Habitat use was described as the presence or absence of a particular assemblage of species, where each assemblage more or less represents a guild of species exploiting the habitat of interest in a similar manner. A statistical analysis was performed on each data matrix to classify the stations. After the statistical analysis, each station was grouped into a cluster, which for discussion purposes here, we will refer to clusters as habitat quality rankings. For ponds, rankings 1 and 2 were regarded as ponds with high quality riparian habitat, while rankings 3 and 4 were ponds with low quality riparian habitat.

After the statistical analysis on the non-fish-bearing streams, it was determined that stations can be grouped into four distinct categories:

- Ranking #1—high quality aquatic and terrestrial habitat
- Ranking #2—high quality aquatic, but low quality terrestrial habitat
- Ranking #3—low quality aquatic, but high quality terrestrial habitat
- Ranking #4—low quality aquatic and terrestrial habitat

Riparian soil and vegetation samples were collected at twenty-six stations for laboratory analysis in September 2004. Soil samples were analyzed for cadmium, chromium, copper, molybdenum, nickel, selenium, vanadium, and zinc. Vegetation samples were analyzed for cadmium, copper, molybdenum, selenium, and zinc. These data were presented in the *Draft - Interim Phase I SIs Evaluation Summary* (MWH, 2007g).

The resulting data matrices for ponds and non-fish-bearing streams at the Ballard Mine are presented together in Table 3-4. This table presents observed or potential species use, soil, and vegetation selenium concentrations, and habitat quality rankings.

As shown in Table 3-4, the majority of the riparian habitats were of high quality. Of the 18 stations assessed for riparian habitats, twelve stations were in the highest quality ranking category and only one was in the lowest. Soil selenium concentrations ranged from 0.25 to 570 mg/kg dw, and vegetation selenium concentrations ranged from 0.25 to 27 mg/kg dw.

Given the nature of these non-fish-bearing stream systems, interpreting low scores as indicative of poor quality habitat may be too harsh. Low scores are more likely indicative of a limited amount of habitat type present. Small streams simply do not generate much riparian habitat. In fact, most of the ponded areas have higher scores, which may be a function of a pond having a larger area because it is a two-dimensional, rather than largely one-dimensional, feature in the environment. Thus, the assessment of non-fish-bearing riparian habitats does not point to any such habitats being of poor quality due to the Site.

3.2.2 Vegetation

Vegetation characterization at the Ballard Mine has been performed for upland vegetation during four primary investigations since 2004. These investigations include: (1) the mass wasting investigation in the summer of 2004, (2) the seasonal vegetation assessment in summer and fall 2004, (3) the supplemental waste rock dump and facility characterization in the summer and fall of 2009, and (4) the riparian habitat assessment in the summer of 2004. The mass wasting and riparian habitat investigations included soil and vegetation samples; since these data are evaluated together, the discussion for vegetation is included in Section 3.2.1 above. The other two investigations are summarized below.

To facilitate the discussion, vegetation concentrations were compared to preliminary screening levels referenced from mineral tolerance of animals (National Research Council [NRC], 2005) as shown on Table 3-1 or to background concentration determined for the various investigations. Exceedances of the preliminary screening values for vegetation are presented in Table 3-5. Vegetation sample locations for pre-2004 area-wide investigations and selenium concentrations in soil are presented on Drawing 3-1. Locations and selenium results for pre-2004 vegetation investigations, specifically the Ballard Mine, are shown on Drawing 3-2.

3.2.2.1 Waste Dump Vegetation Characterization – Mass Wasting Investigation

Refer to 3.2.1 for a discussion of the vegetation results during the mass wasting investigation at the Ballard Mine.

3.2.2.2 Waste Dump Vegetation Characterization – Seasonal Vegetation Investigation

Monthly composite vegetation data were collected at one quadrat on MWD081 at Ballard Mine from May to October 2004. The purpose of this investigation was to determine if there are any seasonal differences of selenium concentrations in upland vegetation growing on waste rock dumps. Samples were analyzed for selenium only from a combination of old and new growth in the quadrat. These data were originally presented and discussed in the

Draft - Interim Phase I SIs Evaluation Summary (MWH, 2007g). Quadrat location and sampling results are presented on Drawing 3-4. The results of the seasonal vegetation investigation (grasses and alfalfa) are provided in Table 3-6.

As shown in Table 3-6, the quadrat sampled at MWD081 shows no monthly selenium concentration trend. All samples were found to contain selenium concentration at less than the detection limit of 0.5 mg/kg dw.

3.2.2.3 Waste Dump Vegetation Characterization – Supplemental Waste Rock Dump and Facility Vegetation Characterization

In June 2009, a vegetation survey and sampling was conducted at the Ballard Mine waste rock dumps, partially backfilled pits, historic haul road and facilities, and a mine-specific background area located within the mine footprint. The primary objective was to characterize the nature and extent of the analytes of interest within the study boundaries. The survey and sampling results are reported in *Supplemental Soil and Vegetation Characterization Data Summary Technical Memorandum* included in Appendix A2 of this Work Plan. A brief summary of the characterization activities are provided in this section.

The vegetation survey was conducted prior to the sampling event. The relative abundance of the overall vegetative cover for each source and background area, as well as the relative abundance of each species encountered of all life forms (i.e., grasses, forbs and shrubs) was estimated. Vegetation was identified as to species, if possible, and if not, to the lowest taxonomic level. At this time, data were not collected to determine the biomass of specific vegetation species. The species of grasses, forbs, and shrubs identified at the Sites and the relative abundance of each plant species by mine are detailed in the *Technical Memorandum* included in Appendix A2 of this Work Plan.

Vegetation sampling was conducted following the vegetation survey at ten Ballard Mine potential source areas (six waste rock dumps, two partially backfilled mine pits, one historic ore haul road, and one historic facility) and one background location. Drawing 3-7 shows the locations (typically a randomly selected 50-foot by 50-foot quadrat) and presents the total

selenium result for each sample. A total of 189 vegetation samples were collected from the Ballard Mine area. The majority of the vegetation samples were composites of grasses and forbs collected from five random one-foot by one-foot grid points within each quadrat. Samples of vegetation separated by life form (grasses, forbs, and shrubs) and plants classified as culturally significant were also collected at some locations. The vegetation sampling addressed potential seasonal variations in concentration of COPCs detected in vegetation samples collected throughout the Sites, particularly in forbs. A subset of stations sampled in the spring event was re-sampled for forbs in the fall for this purpose. The samples were analyzed for antimony, arsenic, boron, cadmium, total chromium, cobalt, copper, manganese, mercury, molybdenum, nickel, selenium, silver, thallium, uranium, vanadium, and zinc. A brief discussion of the sample results for the composited grasses and forbs samples is provided below with additional details present in Appendix A2 of this Work Plan.

Table 3-5 presents the analyte concentration for each sample compared to preliminary screening levels (from mineral tolerance of animals (NRC, 2005). Analytes that exceeded the preliminary screening level were:

- Cadmium
- Selenium
- Molybdenum

Table 3-5 shows the exceedances of the screening levels for cadmium, selenium, and molybdenum in all samples collected in 2004 and 2009. Two samples exceeded the cadmium screening level of 10 mg/kg dw. One forbs sample collected from the MMP036 in the spring of 2009 had a cadmium concentration of 21.5 mg/kg dw. In addition, one vegetation sample collected from pond MSP062 in 2004 had a cadmium concentration of 11.1 mg/kg dw. At the Ballard Mine, concentrations of selenium and molybdenum exceeded the screening level of 5 mg/kg dw in greater than half of the waste rock dump samples. This was also true in all other potential source areas except the historic haul road. Concentrations of selenium ranged from 0.30 to 1,010 mg/kg dw from all areas. The highest selenium concentrations were reported on the waste rock dumps, but the backfilled pit samples also reported elevated selenium concentrations (0.37 to 122 mg/kg dw).

Molybdenum concentrations ranged from 1.49 to 425 mg/kg dw. The highest concentrations were reported at the historic facility and the waste rock dumps. Molybdenum in the background area ranged from 1.74 to 99.6 mg/kg dw, and also exceeded the 5 mg/kg dw screening level. Given the similarity of the background concentrations to the other measured concentrations, the issue of an elevated background will need to be evaluated during the RI/FS.

A primary objective of the 2009 supplemental sampling activities was to evaluate the concentrations of constituents in composite grass and forb (vegetation) samples as further described in Appendix A-2. Table 3-7 provides a summary of the concentrations ranges and screening level exceedances in these grass and forb composite vegetation samples. As shown in this table, only selenium and molybdenum were found to be elevated above screening levels in the 2009 grass/forb composite samples and as discussed above regarding the evaluation of all 2004 and 2009 samples, the highest concentrations were typically detected on the waste rock dumps. It should be noted that only grass and forb composite samples (GF samples) are included in this summary table (Table 3-7). Forb only samples (FB samples) collected for seasonality evaluations are not included in this summary table, but can be found in Table 3-5.

The 2009 vegetation sampling also addressed potential seasonal variation of analyte concentrations in forbs. Tables and figures within Appendix A2 provide the statistical summaries for spring and fall analyte concentrations for all of the forb samples and the data are also provided on Table 3-5. In general, the selenium concentrations at background locations appear to decrease in the fall, and a majority of the dump locations show an increase in selenium concentrations. Molybdenum concentrations show no general pattern at the background locations, but similarly to selenium, also showed an increasing concentration trend at dump locations in the fall.

3.2.2.4 Riparian Vegetation Characterization

Refer to Section 3.2.1 for discussion of the riparian vegetation results and riparian habitat assessments at the Ballard Mine.

3.2.3 Surface Water and Sediment

This section presents the nature and extent of analytes detected in surface water bodies and sediment at Ballard Mine. To facilitate the discussion, surface water and sediment concentrations were compared to preliminary screening levels as discussed for each of these media below and as shown in Table 3-1 or to background concentrations determined for the various investigations. Exceedances of the preliminary screening levels for surface water are presented in Table 3-8. Surface water sample locations for area-wide investigations are presented on Drawing 3-8. These area-wide locations and pre-2004 and EE/CA (2004-2009) selenium concentrations are presented on Drawings 3-9 and 3-10.

3.2.3.1 Surface Water

Extensive surface water monitoring has occurred in the Ballard Mine area since 1997 with 41 stations being used to evaluate potential impacts to surface water by activities at the Site. Surface waters collected from these stations have been sampled for several metals, cations, anions, general water quality parameters, field parameters, and flow measurements over the period of record. The results for these monitoring events are presented in the various documents listed in Section 2.3. In addition to the reporting and evaluation of water quality data, loading analyses have been performed as described in the *Interim Phase I SIs Evaluation Summary* (MWH, 2007g). This section discusses only the analytes of interest which were selected based on the area-wide studies where they were detected at elevated levels in surface waters. In addition, only the results from those surface water samples collected during May and September sampling events since surface water monitoring began in 1997 are discussed (i.e., during runoff and baseflow conditions)..

Metals (inclusive of metalloid and non-metal cationic trace elements) that are evaluated in surface waters include aluminum, cadmium, iron, nickel, selenium, vanadium, and zinc. The discussion is supported by spatial wire diagrams (SWDs) from 2004, 2007, and 2008 sampling events, which graphically display contaminant concentrations of flowing systems on the Site (Figures 3-3 to 3-27), and selenium-time plots (Figures 3-28 and 3-29) of selected mine-specific sampling locations that were chosen because of their proximity and relevance

to the Ballard Mine. The 2004 surface water spatial diagrams present sediment sampling results from the concurrent sediment sampling event; these are discussed later in this section. Drawings 3-11 and 3-12 present the site stream networks with surface water sampling locations and historical selenium concentrations.

Analyte concentrations in surface water are compared herein to selected preliminary screening levels for evaluation purposes. They are as follows:

- Cadmium, nickel, selenium, and zinc – These metals were evaluated under the IDAPA 58.01.02 criterion continuous concentration (CCC) aquatic life standards (IDAPA, 2006). Hardness-dependent criteria were calculated for cadmium, nickel, and zinc.
- Vanadium – This metal was evaluated under the remediation action level recommended by the Area Wide Risk Management Plan (RMP; IDEQ, 2004a).
- Iron – This metal was evaluated under the Lowest Chronic Value observed in freshwater daphnids (Oak Ridge National Laboratory, 1996).
- Aluminum – This metal was evaluated under the USEPA national recommended freshwater standards for chronic criteria (CCC; USEPA, 2009b).

Spatial Wire Diagrams Overview

The SWDs present a visual representation of the analyte concentrations in surface water for all three mines. The SWDs simplify and present the stream network of flowing systems from each mine downstream to the Blackfoot Reservoir. Refer to Drawing 3-11 for a map of the stream/station network. Results from each sampling station were compared to various thresholds for the analyte of interest. Each threshold (or range) is presented visually by a different (stream) line, or symbol, thickness, and color. For display purposes, each station's result is compared to the threshold ranges and applied to the line medially (i.e., the line thickness and color for each station is depicted halfway upstream, and halfway downstream of a sampling station to the next sampling station or stream confluence, whichever is closer). Please note that concentration representations for State Land Creek, Trail Creek, Slug Creek, Dry Valley Creek, East Mill Creek, Spring Creek, Lanes Creek, and No Name Creek come from historical IMA data that is not presented herein. These data will be reported in the Ballard Mine RI report.

Sampling stations are identified by either circles or rectangles on the SWD. Light green circles identify background stations (upstream of all mining activities) and dark green circles identify mine-specific background stations (stations that are upstream of all P4 Sites but that could be influenced by other non-P4 mining activities). Grey rectangles identify stations that are downstream of P4 mining activities, and white rectangles identify stations that were not sampled. Referring to the surface water SWDs, a light blue dashed line indicates a stream channel that was dry during the sampling event.

The SWDs are for visual display only and are not to scale; north is generally at the top of the page on these diagrams. The Sites are drained by two main streams, the Blackfoot River and the Little Blackfoot River, both of which flow generally west into the Blackfoot Reservoir. Both the Blackfoot River and Little Blackfoot River potentially drain the Enoch Valley Mine and Ballard Mine areas, while the Henry Mine area is only drained by the Little Blackfoot River.

Surface Water Quality

Surface water in the Ballard Mine area is a calcium-bicarbonate type water with pH levels ranging from 6.5 to 9.1. Semi-annual monitoring of surface water at the Ballard Mine indicates that total selenium concentrations are generally above background levels and often exceed the IDEQ CCC aquatic life standard. Several small tributaries that originate in the mine area exhibit this tendency. Many streams around the Ballard Mine are fed either by perennial springs or runoff derived streams (intermittent) that go dry at the height of summer when runoff ends. The SWDs, presented as Figures 3-3 to 3-27, depict the spatial distribution of analyte concentrations around the mine. Diagrams from both spring and fall events are included to illustrate the seasonal differences and to show which streams become dry during the year. As shown in the SWDs, those streams emanating from the east and west of the Ballard Mine are intermittent and thus do not contribute contaminant loading to the Blackfoot River perennially. Analytical results for those parameters that exceed screening criteria for Ballard Mine area surface water stations are summarized in Table 3-8.

As shown on the SWDs, selenium periodically exceeds screening criteria in surface water bodies around Ballard Mine as does a few other analytes. Cadmium concentrations are typically elevated above preliminary background surface water concentrations of 0.00026 mg/L during runoff in the tributaries originating in the mine area, and have been observed exceeding the variable hardness-dependent screening level at MST067. Nickel and zinc concentrations in surface water have been observed to be elevated above preliminary background surface water concentrations around the mine of 0.0047 mg/L and 0.015 mg/L, respectively, but have not exceeded their respective screening level. Vanadium concentrations exceeding preliminary background surface water concentrations of 0.0065 mg/L were observed only in 2008 on the west side of Ballard Mine at MST067, MST068, and MST069.

Figures 3-28 and 3-29 present total selenium concentrations in surface waters collected and discharge volumes observed at MST069 and MST066 during spring and fall since 1997. MST069 was chosen because it is a near-source, perennial stream and historically has some of the highest analyte concentrations in its surface waters. MST066 was chosen because it emanates directly from Ballard Mine and is the final surface water monitoring station on the tributary network before it reaches the Blackfoot River. These upstream (near source) and downstream locations are used to spatially evaluate concentrations as well as to evaluate any correlation between surface water and sediment as discussed below.

Surface Water Results in an Upstream (Near-Source) Location – The time plot presented for MST069 does not suggest any seasonality, but an increase in selenium concentrations detected in surface water at this location is evident over time. There does not appear to be any relationship between discharge and concentration at this location. Surface water selenium concentrations at MST069 have been found above the screening level of 0.005 mg/L each time it has been sampled in the spring or the fall (12 times total). Concentrations of selenium in surface waters collected from MST069 range from 0.034 to 1.31 mg/L.

In addition to selenium for MST069, historical spring and fall concentration of other analytes of interest detected in surface water samples are summarized below (see Table 3-8):

- Aluminum has been sampled four times at MST069. Concentrations have been observed above the screening level of 0.087 mg/L in only one of the four events. Concentrations range from non-detect to 0.28 mg/L.

- Cadmium at MST069 has been found elevated above the hardness-dependent screening level one of the 12 times it has been sampled. This exceedance was observed in the fall of 2009. Concentrations range from non-detect at 0.0001 to 0.00155 mg/L.

- Iron has been sampled at MST069 six times and has never been observed above the screening level of 0.158 mg/L. Concentrations range from non-detect at 0.02 to 0.05 mg/L.

- Nickel has been sampled at MST069 10 times and has never been observed above the hardness-dependent screening level. Concentrations range from 0.0094 to 0.039 mg/L.

- Vanadium concentrations have been found above the screening level of 0.02 mg/L at MST069 only once of the 12 times it has been sampled. Concentrations range from non-detect at 0.0250 to 0.03 mg/L.

- Zinc has been sampled at MST069 10 times and has never been observed above the hardness-dependent screening level. Concentrations range from non-detect at 0.015 to 0.054 mg/L.

Surface Water Results in a Downstream Location – The tributary containing MST066 surface water (stream) sampling location is an intermittent stream so its seasonality cannot be determined. However, selenium concentrations at MST066 may be increasing over time. The data presented in Figure 3-29 also suggests that the concentration of selenium in surface water is positively correlated with discharge. Selenium concentrations at MST066 have been found above the screening level of 0.005 mg/L five out of the seven times it has been sampled in the spring. Concentrations in the fall range from non-detect to 0.052 mg/L.

In addition to selenium for MST066, historical spring and fall concentration of other analytes of interest detected in surface water samples are summarized below (see Table 3-8):

- Aluminum has been sampled three times at MST066. Concentrations have been observed above the screening level of 0.087 mg/L in one of the three events. Concentrations range from non-detect at 0.03 to 1.59 mg/L.

- Cadmium at MST066 has not been elevated above the hardness-dependent criteria during any of the seven sampling events. Concentrations range from non-detect at 0.0001 to 0.0001 mg/L.

- Iron has been sampled at MST066 two times and has never been observed above the screening level of 0.158 mg/L. Concentrations range from non-detect at 0.02 to 0.029 mg/L.

- Nickel has been sampled at MST066 six times and has never been observed above the hardness-dependent CCC. Concentrations range from 0.0008 to 0.0052 mg/L.

- Vanadium concentrations have never been found above the screening level of 0.02 mg/L at MST066 out of the seven times it has been sampled. Concentrations range from non-detect at 0.0002 to 0.014 mg/L.

- Zinc has been sampled at MST066 six times and has never been observed above the hardness-dependent screening level. Concentrations range from non-detect 0.002 to 0.012 mg/L.

Spring, Seep, and Stream Headwater Recession Analysis

In 2006, water discharge was measured at eight springs, seeps, and stream headwaters every three weeks from May to September as part of a stream recession analysis at Ballard Mine. The study was undertaken in an attempt to model the release of water from natural storages, typically assumed to be groundwater discharge, into these channels once surface runoff has ceased. Discharges at eight stations listed in Table 3-9 were measured and evaluated. Locations are depicted on Drawing 3-11.

A discharge plot for each of the stations monitored at Ballard Mine is included as Figure 3-30. Also included is a table of calculated recession constants, *k,* for each station, Table 3-9. Recession constant, or *depletion factor,* is commonly used as an indicator of the extent of baseflow in streams (Nathan and McMahon, 1990).

$$k = \left(\frac{Q}{Q_0}\right)^{1/t}$$

Recession constants were calculated from the above equation where Q_0 is initial flow and Q is flow at some fixed time interval t previously (e.g., 20 days before). The recession constant was calculated for each time-step as representative of each of the recession curves evident in

the hydrograph (Langbein, 1938). Average *k* values for the entire hydrograph are presented in Table 3-9. Also shown are the final *k* values during the last time-step. Presumably the final recession constant will be during the lowest flow period and will be most representative of baseflow conditions.

The typical ranges of recession constants for stream flow components, chiefly runoff (0.2-0.8), interflow (0.7-0.94) and groundwater flow (0.93-0.995), do overlap (Nathan and McMahon, 1990). However, high recession constants (e.g., > 0.9) tend to indicate dominance of baseflow in stream flow. Further analysis and modeling may be conducted, as necessary, during the RI.

As suggested by the recession constants in Table 3-9, most of the stations monitored at Ballard Mine are supplied by groundwater sources (i.e., *k* > 0.93). Two stations in particular appear to be supplied by interflow: MSG004 and MST095, which both have final *k* values of 0.88. This conclusion is reinforced by the discharge plots for these stations. As shown on Figure 3-30, both of these stations become dry and their sources exhausted, suggesting that a consistent source of flow (groundwater) is not being supplied. Other stations become dry as well but have final *k* values above 0.93 (MDS030, MST067, and MST096), which suggests that *k* value ranges indeed overlap.

3.2.3.2 Sediment

This section presents the nature and extent of analytes in the sediments of surface water bodies at Ballard Mine. Extensive sediment sampling took place in the Ballard Mine area from 1998 to 2004 with 27 stations being used to evaluate potential impacts to sediments in the area by the Site mining activities. Sediment sampling stations were at streams, waste rock dump seeps, springs, and ponds. Stations were sampled for several metals, cations, anions, pH, and organic carbon during the period of record and the results for these monitoring events are presented in the various documents listed in Section 2.3. Exceedances of the preliminary screening levels for sediment are presented in Table 3-10. Analyte concentrations for the following metals in sediments based on the area wide studies have been evaluated here: cadmium, chromium, nickel, selenium, vanadium, and zinc. These six

constituents were the only analytes run in the laboratory during the 2004 sediment investigation. To aid in the discussion, SWDs from the 2004 sediment sampling event are presented, as well as selenium time plots for sediment sampling locations that were chosen because of their proximity and relevance to the specific mine (see Surface Water portion of this section for selection rationale). The 2004 SWDs, Figures 3-3 to 3-7, graphically illustrate analyte concentrations in the sediments of flowing systems on the site. These locations and results are also shown on Drawing 3-13. The time plots depicted in Figures 3-31 and 3-32 show surface water selenium concentrations at the presented location in an attempt to correlate surface water and sediment results.

Analyte concentrations in sediment are compared herein to selected preliminary screening levels presented in Table 3-1 and listed below:

- Selenium – Compared to the freshwater sediment screening level (SSL) from Van Derveer and Canton (1997).
- Cadmium, chromium, nickel, and zinc –the threshold effect level (TEL) and assessment and remediation of contaminated sites TEL for freshwater sediment in National Oceanic and Atmospheric Administration (NOAA) screening quick reference tables (Buchman, 2008).
- Vanadium – compared to the marine sediment apparent effects threshold from Buchman (2008).

As shown on the SWDs, selenium concentrations in sediments exceed the screening level of 4 mg/kg at locations on both sides of the Ballard Site, specifically on the west side at MST069 and MST067 and on the east side MST092, MST094, MST095, MST096, and MSG006. The main stem of Wooley Valley Creek exceeds the screening level in sediments collected right below the confluence with the tributary containing MST089, and exceeds preliminary background concentrations at the two other monitoring locations MST272 and MST273. The streams around Ballard Mine that exceed the screening level for selenium in sediments are positively correlated with those that exceed the corresponding surface water selenium standard.

Concentrations of the other analytes are shown exceeding sediment screening level at various stations at the Ballard Site as illustrated on their respective SWDs. Cadmium levels detected in sediments exceed its screening level of 0.583 mg/kg at every station around the Ballard Site. It should be noted that the screening level for cadmium of 0.583 mg/kg is well below the previously estimated background of 10 mg/kg (from upstream locations). MST067, MST069, and MST095 also exceed the upstream cadmium background of 10 mg/kg.

Nickel concentrations in sediment samples collected around the Ballard Site exceed its screening level of 18mg/kg at every station except MST066, MST090, MST096, and MSG006. The nickel screening level of 18 mg/kg is well below the calculated preliminary background concentration for nickel of 69 mg/kg.

Vanadium concentrations in sediment samples collected around the Ballard Site exceed its screening level of 57 mg/kg at MST067, MST092, MST095, and MST27; these stations also exceed the preliminary background of 59 mg/kg. For vanadium, its screening level of 57 mg/kg is very similar to its preliminary background concentration of 59 mg/kg.

Zinc levels in sediment samples collected around the Ballard Site exceed its preliminary background level of 130 mg/kg at MST067, MST069, MST089, MST092, MST095, and MST272. The zinc screening level of 98 mg/kg also was exceeded in sediment samples collected at MST094 and MST273. As with the other sediment metals screening levels, the zinc screening level of 98 mg/kg is more conservative than the upstream background concentration of 130 mg/kg. Analyte (i.e., metals) concentrations in sediments discussed above do not appear to be positively correlated with surface water concentrations at the Ballard Site. This suggests that deposition of other analytes has some temporal variability.

Figures 3-31 and 3-32 present sediment selenium concentrations and the coinciding surface water selenium concentrations at MST069 and MST066 during each sediment sampling event since 1998. These upstream (near-source) and downstream locations are used to spatially evaluate concentrations as well as to evaluate any correlation between surface water and sediment as discussed below.

Sediment Results in an Upstream (Near-Source) Location – The plot for MST069 shows that sediment selenium concentrations were consistently exceeding the screening level in 2002 and 2004. The surface water concentrations suggest a correlation between surface water and sediment selenium concentrations. Selenium concentrations in sediment samples collected at MST069 have been found above the screening level of 4.0 mg/kg all three times sediments have been collected at this location. Selenium concentrations in sediments at MST069 range from 420 to 690 mg/kg.

In addition to selenium in sediments collected at MST069, historical concentrations of other analytes of interest dating back to 1998 are summarized below (see Table 3-10):

- Cadmium has been sampled three times at MST069. Concentrations have been observed above the screening level of 0.583 during all three events. Concentrations ranged from 11.1 to 21 mg/kg.
- Chromium has been sampled at MST069 three times and concentrations have never been observed above the screening level of 36.286 mg/kg. Concentrations ranged from 24 to 31 mg/kg.
- Nickel has been sampled at MST069 three times and has been observed above the screening level of 18 mg/kg during all three events. Concentrations ranged from 83.8 to 120 mg/kg.
- Vanadium concentrations have not been found above the screening level of 57 mg/kg at MST069 during any of the three times it has been sampled. Concentrations ranged from 20 to 26.6 mg/kg.
- Zinc has been sampled at MST069 three times and was observed above the screening level of 98 mg/kg during all three events. Concentrations ranged from 311 to 400 mg/kg.

Sediment Results in a Downstream Location – The time plot for MST066 shows that sediment selenium concentrations were below the screening level in 2002 and 2004. The surface water concentrations suggest that there is no correlation between surface water and sediment selenium concentrations at this location. Selenium concentrations at MST066 were found below the screening level of 4.0 mg/kg the two times it has been sampled at 2.4 and 3.2 mg/kg during 2002 and 2004.

In addition to selenium in sediments collected at MST066, historical concentrations of other analytes of interest detected in sediments dating back to 1998 are summarized below (see Table 3-10):

- Cadmium has been sampled twice at MST066. Concentrations were observed above the screening level of 0.583 mg/kg during both events. Concentrations for both events were 2.3 mg/kg. Even though concentrations exceeded screening level, both were below the preliminary background concentration of 10 mg/kg.
- Chromium has been sampled at MST066 twice and concentrations have never been observed above the screening level of 36.286 mg/kg. Concentrations were 23.6 and 25 mg/kg.
- Nickel has been sampled at MST066 twice and has never been observed above the screening level of 18 mg/kg. Concentrations were 15.2 and 18 mg/kg.
- Vanadium concentrations have not been found above the screening level of 57 mg/kg at MST066 during either of the two times it has been sampled. Concentrations were 44.1 and 45 mg/kg.
- Zinc has been sampled at MST066 twice and was not observed above the screening level of 98 mg/kg during either event. Concentrations were 75 and 98 mg/kg.

3.2.4 Groundwater

Of the three Sites, the Ballard Mine has the most complex geologic and hydrogeologic conditions. The Ballard Mine geologic setting is complex with folded stratigraphy displaced by several normal faults.

The Ballard Mine is unique in that it straddles three watersheds. Surface water and shallow alluvial groundwater flow from the east side of the mine and reports to a tributary of the Wooley Valley hydrologic system. On the west side, water travels to either the upper reach of Long Valley Creek or a tributary of the Blackfoot River on the southwestern corner of the mine area. Surface water samples collected from ponds and shallow seeps immediately downgradient of the mine waste areas contain selenium concentrations at levels that suggest impacts to underlying groundwater are possible (e.g., dump seep MDS030 has a total selenium concentration ranging from 0.45 mg/L to 0.893 mg/L from 2004 to 2009).

Potential groundwater impacts at the Ballard Mine have been investigated through the use of monitoring wells, direct push boreholes, and direct push pre-pack wells (or borehole wells). The majority of these wells were installed in 2007, 2008, and 2009. Groundwater samples have been collected from these monitoring wells during spring and fall sampling events and analyzed for metals and general water quality parameters. Area-wide well locations are shown on Drawing 3-14. Monitoring well and direct push (pre-pack) well locations for the Ballard Mine are shown on Drawing 3-15. The direct push locations are described in more detail in Appendix A-1, including completion depths and selenium concentration in Table A1. Drawing 3-15 also presents historical maximum and minimum selenium concentrations as well as trend graphs of selenium concentrations. The direct push boreholes are shown on Drawings 3-16 to 3-19. Groundwater was collected from these direct push boreholes and analyzed for selenium on only one occasion. The selenium concentrations in groundwater based on these single groundwater grab samples are depicted on separate drawings and will supplement the monitoring wells data to delineate the Ballard Mine groundwater plumes as discussed below and in the RI report that will be prepared for the Ballard Mine investigations.

Monitoring locations at the Ballard Mine are also presented in Table 3-11, which includes the location of the well, the well name (or station number), the type of monitoring well and the corresponding screened interval. In addition, the table indicates the specific hydrostratigraphic groundwater unit as discussed in Section 2.2.5 that each well is screened in and is intended to monitor. The three distinct hydrostratigraphic units found at the Ballard Mine are presented in the discussion below.

The groundwater investigations at the Ballard Mine site have focused on individual aquifers present beneath this area. Three distinct hydrostratigraphic flow systems have been identified and sampled during the monitoring well installation and groundwater sampling program:

- Shallow alluvial system (generally the local groundwater system)
- Dinwoody and Thaynes formation bedrock system (generally part of the intermediate groundwater system)

- Wells Formation bedrock system (generally part of the regional groundwater system)

The objective of this groundwater sampling has been to evaluate the nature and extent of elevated selenium and other constituent levels in these individual systems as well as in the overall hydrogeologic system.

Constituent concentrations in groundwater are compared to selected screening levels for evaluation purposes. The groundwater results are compared to the following screening criteria:

- Antimony, barium, beryllium, cadmium, chromium, copper, fluoride, lead, mercury, nitrate, nitrite, selenium, and thallium compared to the IDAPA 58.01.11 primary groundwater quality standards
- Aluminum, chloride, iron, manganese, pH, silver, sulfate, TDS, and zinc compared to the IDAPA 58.01.11 secondary groundwater quality standards
- Arsenic – compared to the USEPA primary MCL
- Boron, cobalt, nickel, and vanadium – compared to the UDEPA Regional Screening Levels (RSLs).

Note that the discussions below are focused on selenium because it is the primary risk driver. Exceedances of other constituents are summarized in Section 3.2.4.2 and presented in Table 3-12.

Sections 3.7 and 3.8 provide discussion of the source, transport pathways, and receptors for the Sites. However, the most relevant groundwater sources, pathways, and receptors are briefly described here. It should be noted that groundwater, regardless of the potential for reaching a receptor, will be evaluated in the risk assessment.

Potential receptors for groundwater impacted by elevated COPCs that originated at the Ballard Mine are largely human or agricultural receptors through the use of groundwater extracted from contaminant-affected aquifers. However, aquatic life, wildlife, and livestock could be affected through the discharge of the groundwater to surface water as springs or

baseflow to the ephemeral stream channels. The alluvial system is of most concern for this pathway because the groundwater discharge points are often relatively close to the primary sources of COPC to groundwater, which in this case are primarily the waste rock dumps. Various contaminant attenuation mechanisms become important along more distal flow paths.

3.2.4.1 Hydrostratigraphic System Monitoring for Selenium

Springs on the east side of the Ballard Mine are potential discharge points for COPC-affected groundwater that, in part, originates from the waste rock dumps. Such springs are only present as dump seeps on the west side of the Site. The intermittent streams on the west side and the Blackfoot River could receive baseflow discharge from the alluvial system. No domestic wells are known to be close enough to the Site to be pathways to potential human receptors. Domestic use of the shallow alluvial groundwater is unlikely because of the shallow depth and low yield from the shallow alluvial aquifer. Nonetheless, it is hypothetically possible, and the domestic use of alluvial groundwater will be evaluated in the risk assessment. A shallow agricultural well (MAW008) is located near the Site on the west side.

Shallow Alluvial Monitoring

The shallow unconfined alluvial unit contains alluvium, colluviums, and uppermost weathered (decomposing) bedrock, because these units have similar hydrogeologic properties and form a single shallow hydrostratigraphic unit. The alluvial system is generally considered to be a local system where groundwater recharges and discharges in the same local basin (e.g., recharge on the valley slope then discharges to the stream system in the valley).

As illustrated on Drawings 3-16 to 3-19, selenium groundwater plumes have been delineated on both sides of the mine. In the discussion below, the east-side plumes are discussed first followed by those found on the west side of the Ballard Mine Site.

East Ballard Mine Area Groundwater Plumes. On the east side of the mine, contaminated groundwater is associated with two waste rock dumps and has resulted in three distinct plumes - one originating from MWD084 (i.e., the northern plume below) and two originating at MWD082 (i.e., the southern plumes). These waste rock dumps and range of selenium concentrations are illustrated on Drawings 3-15, 3-16, and 3-17. Elevated selenium concentrations associated with these two mine dumps were identified using a combination of direct push boreholes, direct push monitoring wells, and monitoring wells.

MWD084 Northern Groundwater Plume. The downgradient edge of the northern selenium groundwater plume originating from MWD084 is bounded by direct push boreholes and direct push wells, MBW131 (<0.0005 mg/L), BH132 (0.0060 mg/L), BH133 (<0.0005 mg/L), BH050 (<0.001 mg/L), BH051 (0.004 mg/L), and BH133 (<0.0005 mg/L), all of which are dissolved selenium values. These concentrations are all below the screening level (Idaho groundwater standard of 0.05 mg/L) and below the decision error lower bound (DELB) value of 0.017 mg/L derived in P4 (2009). The maximum selenium concentration detected in groundwater within the northern plume was measured at 1.25 mg/L in groundwater collected from BH053 adjacent to the edge of the mine dump. An alluvial monitoring well, MMW032, was installed in 2009 south of MWD084 and the groundwater sample collected from this well had a selenium concentration of 0.00267 mg/L during one sampling event in the fall of 2009. This well was installed in the deeper portion of the alluvium to evaluate vertical extent of selenium impacted groundwater near BH053 where the maximum concentration was measured in this area. Further east in the valley, direct push monitoring well, BH133, reported a selenium concentration in groundwater of <0.0005 mg/L in the spring of 2009.

MWD082 Southern Groundwater Plumes. The southern groundwater plumes on the eastern side of the Ballard Mine has been delineated using data from direct push boreholes, as well as monitoring wells and direct push wells. The selenium groundwater plumes originating from MWD082 are bounded on their downgradient ends by boreholes BH128 (<0.0005 mg/L), MBW130 (0.0022 mg/L), BH127 (0.0046 mg/L), and BH129 (<0.0005 mg/L). The

dissolved selenium concentrations are all below the groundwater screening level of 0.05 mg/L and the DELB value of 0.017 mg/L.

There are three monitoring wells that have been installed to monitor the southern groundwater plumes. The total selenium concentrations measured in groundwater collected from MMW018 (installed in 2007) has been very consistent and has only ranged from 0.027 to 0.029 mg/L. This well can be compared to the adjacent BH031 with 0.113 mg/L dissolved selenium for an evaluation of vertical extent of the plume (refer to Drawing 3-17). The highest selenium concentration measured in groundwater contained in the southern plume was reported at 0.63 mg/kg in groundwater collected from MBW032. This direct push monitoring well location is adjacent to the waste dump MWD082. Monitoring wells MMW029 and MMW033 are bedrock wells but have been used to evaluate the vertical extent of the groundwater plume in this area. The selenium concentrations measured in groundwater collected from these wells will be discussed further in association with the intermediate flow systems. Springs in this area (MSG004, MSG005, MSG006, and MSG007) have total selenium concentrations in surface waters collected from these locations ranging from 0.002 to 0.28 mg/L. The two springs (MST095 and MSG006) in the same general flow path as MMW018 and MBW032 have total selenium concentrations between 0.018 and 0.446 mg/L reported in spring discharge collected at these locations.

Direct push monitoring well MBW130 was installed in 2009 in the valley east of the dump and bounds the downgradient edge of the groundwater plume. A dissolved selenium concentration of 0.00223 mg/L was reported in groundwater collected from this well.

West Ballard Mine Area Groundwater Plumes. On the west side of the Ballard Mine, the selenium plumes in the shallow groundwater have been delineated using a combination of groundwater samples collected from wells, direct push boreholes, and direct push (pre-packed) wells. The west side selenium plumes appear to originate from waste rock dumps MWD080 and MWD081. Refer to Drawings 3-18 and 3-19 for the locations of these groundwater plumes and the borehole and monitoring well locations where groundwater samples were collected and analyzed to delineate these plumes.

MWD080 Groundwater Plume. The groundwater plume originating from waste rock dump MWD080 appears relatively broad, but has not migrated very far downgradient in the shallow alluvial groundwater system. The topography indicates that the majority of MWD080 is contained in the Little Blackfoot River watershed. The hydraulic gradient in this area is likely relatively flat which may explain the limited extent of the plume. The apparent downgradient edge of this plume is bounded by selenium concentrations detected in groundwater of 0.030 mg/L in BH149, <0.001 mg/L in BH071, 0.018 mg/L in BH070, 0.0047 mg/L in BH148, and 0.012 mg/L in BH069. These concentrations are below the groundwater screening level of 0.05 mg/L selenium, but exceed the DELB value of 0.017 mg/L at two locations. Four direct push boreholes installed in 2009 to define the southwest side of this groundwater plume were dry. MMW017, installed in 2007, has reported decreasing selenium concentrations in groundwater since monitoring began ranging from 0.13 mg/L in September 2007 to 0.0937 mg/L in June 2009 as shown on Drawing 3-15 and tabulated in Table 3-12. In the spring of 2009, groundwater collected from two direct push wells (MBW026 and MBW027) installed near MMW017 measured total selenium concentrations of 0.221 mg/L and 0.21 mg/L, respectively. These direct push wells, coupled with MMW017, suggest that there is a decreasing concentration in this groundwater plume with depth similar to that observed on the east side of the Ballard Mine.

MWD081 Groundwater Plume. A hill composed primarily of bedrock with a veneer of alluvium at its base is present adjacent to and downslope from waste rock dumps MWD081 and MWD080. The two plumes originating from MWD081 and the southern part of MWD080 are migrating beneath the surface in the alluvial groundwater system on either side of this bedrock hill. These two plumes turn south toward the Blackfoot River and merge prior to reaching the river (see Drawing 3-19).

Total selenium concentrations in groundwater collected from two monitoring wells installed for the Blackfoot Bridge EIS, MW-15A and MW-16A, in 2009 were 1.67 and 0.0180 mg/L, respectively. Direct push well, MBW028, reported a total selenium concentration of 0.894 mg/L in the spring of 2009. The other three direct push wells within the plume (MBW006, MBW009, and MBW011) reported total selenium concentrations in groundwater collected

from these monitoring wells in 2009of 0.300, 0.0117, and 0.569 mg/L, respectively. Overall, these merged selenium plumes are bounded by BH142 with a selenium concentration in groundwater of 0.033 mg/L, BH139 (0.0018 mg/L), BH119 (0.029 mg/L), BH118 (<0.001 mg/L), BH136 (0.012 mg/L), MBW135 (<0.0008 mg/L), and BH134 (<0.0005 mg/L). These monitoring locations are all below the groundwater screening value of 0.05 mg/L selenium, with two locations exceeding the DELB groundwater value of 0.017 mg/L. In addition, borehole BH125 appears to be located in the most downgradient location and had a dissolved selenium concentration in groundwater of 0.067 mg/L. Boreholes installed in the alluvium to the west of the plume were dry (i.e., BH137 – BH141 and BH143). These boreholes encountered refusal between 11 and 20 feet bgs before water was located. It appears likely that a basalt layer is located in these areas.

Springs MST069 and MST067, as shown on Drawing 3-12, also have yielded sufficient water for sampling. Surface water samples collected from these springs had total selenium concentrations ranging from 0.022 to 1.65 mg/L. Similar to several springs on the east side of the mine, the elevation of the spring discharge is higher than the water levels measured in the wells.

The configuration of the plume appears to reflect the direction of surface water flow toward the Blackfoot River. The plume is not as well bounded on the western edge due to refusal in a number of attempted direct push locations. However, surface water flow in this area is eastward toward the Ballard Mine. This, in combination with the lower selenium concentrations in the direct push borings that were completed, suggests that the plume migration is largely to the south toward the Blackfoot River and not westward.

Dinwoody and Thaynes Formation Bedrock Groundwater Monitoring

The Dinwoody Formation is exposed primarily in southern and eastern portions of the mine site. The exposures south of the mine form a highland area, are likely a source of groundwater recharge, and are not expected to receive groundwater flow from the Ballard Mine area. East of the mine, the Dinwoody Formation occurs at a lower elevation in the adjacent valley; and alluvial groundwater in this area has been found to contain elevated concentrations of selenium which could contaminate a portion of this unit.

There are four wells installed to monitor the Dinwoody Formation on the east side of the mine. One monitoring well, MMW018, was installed in 2007. Although this monitoring well was installed in the uppermost portion of the formation, it likely is transitional to the overlying alluvial unit; as a result, it was discussed above in the shallow alluvial unit. The selenium concentration in groundwater collected from MMW018 ranged from 0.027 mg/L to 0.029 mg/L between 2007 and 2009. The goal of a second monitoring well, MMW029, installed in 2008 was to address flow within the Dinwoody Formation that may be isolated from the overlying alluvium. This was done at a location just off the edge of mine waste dump MWD082. Selenium concentrations in groundwater collected from this monitoring well were 0.806 mg/L and 0.865 mg/L measured in the fall 2008 and fall 2009, respectively. In the spring of 2009, a groundwater sample collected from MMW029 had a total selenium concentration of 0.685 mg/L.

Monitoring well MMW032 also is screened at the bottom of the alluvium and across a thin section of the Dinwoody Formation. Groundwater collected from this monitoring well had a total selenium concentration of 0.00267 in the fall of 2009. A third well (MMW033) nested with MMW029, was installed in 2009 to further delineate the vertical extent of the plume in this area. Groundwater collected and analyzed from MMW033 had a total selenium concentration of 0.00577 mg/L in the fall of 2009. Wells MMW029 and MMW033 are screened from 45 to 60 feet bgs and 128 to 148 feet bgs, respectively. As indicated by the total selenium concentrations detected in groundwater collected from these monitoring wells, the impacted groundwater measured at the top of the Dinwoody Formation at

MMW029 does not appear to have a large impact on the deeper Dinwoody Formation in this area.

The Dinwoody Formation is not known to be present on the west side of the Ballard Mine, and there are no wells installed in the Dinwoody Formation on the west side of Ballard mine.

Wells Formation Bedrock Groundwater Monitoring

Three of the five wells, as listed in Table 3-11, installed in the Wells Formation at the Ballard Mine, contain groundwater with selenium concentrations above the groundwater screening level of 0.050 mg/L total selenium. These wells include monitoring wells MMW006, MMW020, and MMW021.

MMW006 is installed on the south edge of the West Ballard Mine Pit (MMP035, refer to Drawing 3-15). In the spring and fall of 2008 and spring of 2009, the total selenium concentrations detected in groundwater collected from MMW006 were 0.069, 0.0715, and 0.0699 mg/L, respectively. These concentrations are below the highest concentration of 0.08 mg/L for total selenium in groundwater detected in MMW006 in the fall of 2007.

Monitoring well MMW020 (the replacement well for MMW001) is located in the mine interior adjacent to the West Ballard Pit. Groundwater samples collected from this monitoring well were below the 0.050 mg/L total selenium standard during the fall 2007 and spring and fall 2008 groundwater sampling events and ranged from 0.00881 to 0.017 mg/L. In the spring of 2009, groundwater collected from this well had a total selenium concentration of 0.221 mg/L and with a similar total selenium concentration of 0.193 mg/L in fall 2009 as shown on Drawing 3-15.

Groundwater collected from monitoring well MMW021 located on the west side of Mine Pit 035 (MMP035) approached the groundwater total selenium standard of 0.050 mg/L, with concentrations of 0.047 and 0.0495 mg/L between 2007 and 2009.

Groundwater samples collected from monitoring wells installed in the Wells Formation along the perimeter areas to the Ballard Mine, MMW030 and MMW031, have total selenium concentrations below the screening level of 0.050 mg/L. Monitoring well MMW031, installed near the toe of waste rock dump MWD080 at the Ballard Mine was drilled through alluvium into the Wells Formation. Direct push boreholes in similar locations along MWD080, but installed in the shallow alluvial aquifer, had groundwater samples with total selenium concentrations ranging from 0.37 mg/L in BH018 to 1.32 mg/L in BH019. Groundwater samples collected from monitoring well MMW031, installed in the Wells Formation, had total selenium concentrations of 0.000874 mg/L during the fall 2008 groundwater sampling event and 0.000683 mg/L in the spring 2009 sampling event.

MMW030 was intended to address both the potential alluvium to Wells Formation groundwater flow pathway, as well as the potential structural pathway along the southern edge of the mine. MMW030 was installed through an area of alluvial groundwater with elevated selenium concentrations up to 1.65 mg/L in MST069 (which is a seep/spring that represents the shallow groundwater). The monitoring well encountered a fault in the bottom of the drill hole between the Wells Formation and Phosphoria Formation. Selenium was not detected in groundwater collected from MMW030 during the fall 2008 sampling event, but a groundwater sample collected in the spring of 2009 had at a total selenium concentration of 0.00116 mg/L.

3.2.4.2 Hydrostratigraphic System Monitoring for Other Constituents

The monitoring wells, direct push wells, and direct push boreholes at Ballard Mine have been sampled during seven semi-annual (May/June and September) sampling events between May 2004 and September 2009. Not all of the wells included in this discussion were sampled during every event because it depends on when each monitoring well was installed as to when the semi-annual sampling began. Groundwater collected from these wells was analyzed for total and dissolved metals and general chemistry parameters, as discussed above. The results of the analyses are shown in Table 3-12, which includes only those analytes that were detected above their respective regulatory screening values for

groundwater (referenced above). The analytes that were detected in groundwater above their applicable screen values are:

- Aluminum, total
- Antimony, total
- Arsenic, total
- Cadmium, total and dissolved
- Iron, total and dissolved
- Manganese, total and dissolved
- TDS
- Sulfate

Aluminum, iron, and manganese exceedances appear to be the result of elevated background concentrations in the shallow groundwater, as well as groundwater contained within the Dinwoody and Wells formations. These metals detected in groundwater do not appear to be an indicator of mine impacts and there does not appear to be a correlation between these metals and selenium. Furthermore, when both total and dissolved concentrations have been reported, often the elevated concentrations are not present in the dissolved fraction. This is especially notable for aluminum, which is a major mineral- forming element in clays. Clays are responsible for much of the turbidity observed in the monitoring wells. This may be also true to a lesser extent with iron. Manganese is more often elevated in the dissolved groundwater fraction, but it is commonly elevated in groundwater collected from wells that appear not to be impacted by the Sites. Again, this indicates that this metal is naturally elevated in the groundwater collected and analyzed from groundwater underlying the Sites.

Total aluminum detected in groundwater exceeded its groundwater screening value of 0.2 mg/L in nine wells (MAW008, MBW026, MBW027, MMW017, MMW020, MMW030, MMW032, MMW033, and MW15A) with values above the groundwater screening level and ranging from 0.21 to 14.4 mg/L. These groundwater exceedances often occurred during a single sampling event. For example, a groundwater sample collected from MMW020, which

is screened in the Wells Formation, had a total aluminum exceedance during the fall 2007 (10/16/07) sampling event of 0.24 mg/L, whereas aluminum concentrations detected in groundwater collected and analyzed from this monitoring well during later sampling events ranged from not detected at less than 0.03 to 0.115 mg/L.

Total iron detected in groundwater exceeded its groundwater screening value of 0.3 mg/L in eight wells (MAW008, MBW026, MBW027, MMW020, MMW030, MMW032, MMW033, and MW16A) with values above the groundwater screening value and ranging from 0.353 to 17.5 mg/L. These are generally the same wells that contained exceedances of the aluminum screening value (with a couple of exceptions). The distribution of total iron values detected in groundwater is skewed as a result of two values being higher than 1.16 mg/L. All other exceedances of the 0.3 mg/L screening level are below 1.16 mg/L. Total iron was detected at 5.75 in agricultural well MAW008 in September 2008, and at 17.5 mg/L in MBW026 on May 2009 (these wells were only sampled once each). The results from these two wells appear statistically to be extreme outliers. Dissolved iron in groundwater exceeded the 0.3 mg/L screening value in only one well MW16A at 0.573 mg/L in a groundwater sample collected from this monitoring well in June 2009.

Total manganese detected in groundwater exceeded its screening value of 0.05 mg/L in 13 wells (MAW008, MBW009, MBW011, MBW026, MBW028, MBW048, MMW017, MMW018, MMW020, MMW021, MMW030, MMW033, and MW16A) with values above the screening value and ranging from 0.065 to 1.81 mg/L. Dissolved manganese exceeded the 0.05 mg/L groundwater standard in five of these wells. Similar to the aluminum and iron discussed above, the manganese exceedances occur in all wells, from all hydrostratigraphic units, and do not appear to be correlated with elevated selenium concentrations in groundwater or other indications of impacts from the Sites (e.g., sulfate).

Total antimony detected in groundwater did not exceed its screening value of 0.006 mg/L in any wells, but was included in the list above because the reporting limit for antimony exceeded the screening value once in one well (MMW017) during the in September 2007 groundwater sampling event. It is probable that antimony is not a concern at the Site.

Total arsenic detected in groundwater exceeded its screening value of 0.01 mg/L during one sampling event in one well and had a reporting limit above its screening value during one sampling event in one well (MW15A) in June 2009. It was detected at 0.0267 mg/L in MMW030 in May 2009. Groundwater samples were not collected from MMW030 and analyzed for arsenic during any subsequent groundwater events based on sampling plans that were approved by the A/Ts.

Total and dissolved cadmium were detected in groundwater and exceed their screening value of 0.005 mg/L in one well (MMW020) with values ranging from 0.0081 to 0.0108 mg/L total cadmium and from 0.0078 to 0.00951 mg/L dissolved cadmium This occurred during three consecutive sampling events (October 2007, May 2008, and September 2008). Groundwater samples were not collected from this monitoring well for cadmium analysis during 2009. Well MMW020 is located in the western portion of the Ballard Mine and is screened in the Wells Formation. As discussed above, groundwater collected and analyzed from this well has shown an increasing trend for total selenium.

Total dissolved solids (TDS) in groundwater exceeded its screening value of 500 mg/L in 12 monitoring wells (MBW006, MBW009, MBW011, MBW026, MBW027, MBW028, MBW032, MMW017, MMW020, MMW029, MW15A, and MW16A) with values ranging from 506 to 1,860 mg/L. Most of these TDS exceedances in groundwater directly correlate with selenium exceedances in groundwater. For example, groundwater samples collected from MMW029 (screened in the Dinwoody Formation) consistently have elevated total selenium concentrations (0.685 to 0.865 mg/L). The TDS concentrations in this well range from 1,700 to 1,330 mg/L over the same three sampling events. Groundwater collected from MMW020, which is screened in the Wells Formation, has groundwater TDS concentrations ranging from 490 to 624 mg/L during four sampling events, while the total selenium concentrations in groundwater collected from this well ranged from 0.01 to 0.221 mg/L.

Sulfate exceeded its groundwater screening value of 250 mg/L in 8 wells (MBW006, MBW009, MBW028, MBW032, MMW017, MMW029, MW15A, and MW16A) with concentrations reported in groundwater collected from these wells above the screening value

and ranging from 334 to 867 mg/L. Most of these groundwater sulfate exceedances occurred in the wells with total selenium and TDS exceedances. Monitoring well MMW029 is screened in the Dinwoody Formation and has consistently had groundwater with elevated total selenium and TDS concentrations as discussed above. The groundwater sulfate values in well MMW0029 range from 547 to 582 mg/L during the same three sampling events. The highest sulfate concentrations are reported in the alluvial system. For example, groundwater collected and analyzed from MBW032, which is screened in the shallow alluvial system, had a sulfate concentration of 867 mg/L in spring 2009 with a corresponding total selenium concentration of 0.605 mg/L.

3.2.5 Aquatic Biota

A variety of aquatic biological-chemical data were collected during the pre and post-2004 investigation periods at the Sites. These historic aquatic data include (1) stream habitat assessments, (2) fish data, and (3) benthic macroinvertebrate data. The are- wide aquatic data are presented on Drawings 3-20 and 3-21 for the pre-2004 and EE/CA (2004-2009) time periods. The aquatic data specifically collected in and around the Ballard Mine are summarized below.

3.2.5.1 Stream Habitat Assessment

A stream habitat assessment was conducted in May 2004 on all streams influenced by the Sites with the objective of developing a predictive model that would differentiate stream habitat that supports fish from stream habitat that does not support fish. These results are reported in *Draft - Interim Phase I SIs Evaluation Summary* (MWH, 2007g) and summarized below. Possible models were evaluated based on three input variables: (1) selenium concentration in surface water ($\ln[Se]_{sw}$), (2) selenium concentration in sediment ($\ln[Se]_{sed}$); and (3) the rapid bioassessment score (RBS).

Rapid bioassessment surveys conducted on the P4 streams used protocols established by USEPA (Barbour, et. al., 1999) to characterize the quality of the physical habitat. The stream habitat assessment used the following ten categories:

- Frequency of riffles (or bends)
- Channel flow status
- Embeddedness
- Velocity and depth regime
- Sediment deposition
- Epifaunal substrate and available cover
- Vegetative protection
- Channel alteration
- Riparian vegetative zone width
- Bank stability

The RBS for each station was established by assigning each of the ten categories a score of 0 to 20 points based upon field inspection. The scores from the ten categories then were summed to calculate the RBS for each station. The maximum RBS is 200 points, with a high score indicating an overall high quality of physical habitat.

In addition to the RBS score, the presence or absence of fish at a station was also a consideration. The locations of the stream stations evaluated are shown on Drawing 3-21, along with the selenium tissue concentrations presented later in this section. The presence of fish was determined at each station by electroshocking. If fish were found, that is an unambiguous indication of the presence of fish. Unfortunately, not finding fish is not an unambiguous indication of their absence. Thus, for those stations where no fish were found, but are bounded upstream and downstream by nearby stations on the same stream where fish were found, fish were assumed to be present. Of the 66 stations included in the assessment of the three Sites, seven were assumed to include fish using this logic. These stations are MST044, MST045, MST046, MST047, MST049, MST130, MST133, and MST236.

Various models were developed and evaluated using the data collected above as inputs to determine the model with the best predictive reliability regarding fish presence or absence.

With the input variables ($\ln[Se]_{sw}$, $\ln[Se]_{sed}$, and RBS) models were developed using each variable separately, any two in combination, or all three. The most reliable model used surface water selenium concentrations and RBS to predict whether or not the stream could support fish. RBS was found to be the most influential of the variables tested.

As detailed in the *Draft - Interim Phase I SIs Evaluation Summary* (MWH, 2007g), it is possible to accurately predict whether a given stream reach does or does not support fish by assessing the reach using USEPA's rapid bioassessment protocol and by collecting and analyzing a sample of stream water for selenium within the reach. This ability to differentiate habitats could prove useful during the RI/FS process in prioritizing or tailoring remedies for specific locations.

Table 3-13 presents the RBS and fish presence at Ballard Mine area stream stations. To help understand the relationship between RBS and fish presence, also shown are surface water and sediment selenium concentrations from the corresponding sampling events.

Based on the 12 stations that were evaluated at Ballard Mine, the rapid bioassessment scores ranged between 29 and 50 and no fish were found in any of the stations. Even the regional background station, MST093, reported an RBS of 35 and did not report fish.

3.2.5.2 Fish

Attempts were made in 2004 to collect fish from surface water stations at Ballard Mine to evaluate impacts of Site contaminants on fish in area streams; however, attempts to locate fish were unsuccessful. This is likely the result of several factors, including poor fish habitat at these stations due to physical factors such as intermittent streams (see the RBS scores found on the SWD, Figures 3-33 to 3-37) as well mining-related factors. Results of this investigation are included in the *Draft - Interim Phase I SIs Evaluation Summary* (MWH, 2007g).

3.2.5.3 Benthic Macroinvertebrates

This section presents the nature and extent of metals in benthic macroinvertebrates at Ballard Mine. Samples were collected from ten stream locations (i.e., surface stations) during

the 2004 sampling event to evaluate potential Site contaminant impacts on benthic macroinvertebrates in the area streams. The benthic macroinvertebrates samples were analyzed for selenium, and the results of this monitoring event are presented in the *Draft - Interim Phase I SIs Evaluation Summary (MWH, 2007g)*. To aid in the discussion, the selenium SWD from the 2004 benthic macroinvertebrate sampling event and historical selenium result tables are presented in Figure 3-38 and Table 3-14 at the end of Section 3.0. The wire diagram, Figure 3-38, graphically illustrates analyte concentrations in benthic macroinvertebrates found in streams on the site. Many of the benthic samples collected during 2004 had high method detection limits (MDLs) as a result of low sample volumes (i.e., low numbers of macroinvertebrates), which are probably due to insufficient habitat as indicated by the stream habitat assessment and as a result of sample dilution in the laboratory. As discussed earlier (with regard to fish), these are intermittent streams that during most years are completely dry by late summer so the numbers of macroinvertebrates would be expected to be low. The samples with high MDLs were censored at one-half the MDLs and are denoted with solid red circles on the SWD. Thus, while these samples appear to be elevated, they are in fact non-detected concentrations and the elevated method detection limits constrain the utility of the data. Refer to Drawing 3-12, which depicts the locations of where these samples were collected and their concentrations.

Table 3-14 presents the selenium concentrations found in benthic macroinvertebrates in streams in the vicinity of the Ballard Mine. Of the ten results, seven of the results are flagged non-detected with MDLs ranging from 8.3 to 1300 mg/kg dw. Of the ten samples, only three of them had detected results; the others were false positives driven by the high MDLs described above. Detected selenium concentrations in these three samples ranged from 17 to 313 mg/kg dw.

3.2.6 Terrestrial Biota

A variety of biological-chemical data are available from the pre-2004 period as located on Drawing 3-22. This includes the elk tissue, bird egg, and cattle biotic tissue data. These data may be uniquely useful in the human and ecological risk assessments and are, therefore,

considered separately in the discussion below. In addition, data also are available for other media including various small mammals and terrestrial invertebrates.

The results for the elk tissue and bird egg data are not unique to a particular mine. However, these area-wide terrestrial data are presented here for the Ballard Mine; the terrestrial biota discussions for Henry and Enoch Valley mines reference these subsections. In addition, the cattle data were collected at Henry Mine and are summarized in Section 3.3.6.3. More detailed information on the elk tissue, bird egg, and cattle tissue data is found in the *DQUR/DAR* (MWH, 2010a).

3.2.6.1 Elk Tissue Studies

Elk samples were collected during the Idaho elk hunting seasons of 1999 and 2000. The elk study was a cooperative effort between the Selenium Committee and the Idaho Department of Fish and Game (IDFG) with P4 being one of six member companies of the Selenium Committee. IDFG collected elk skeletal muscle and liver tissues from hunters who harvested elk in game management units 66A and 76. The collection stations were erected near the P4 plant on Highway 34, north of Soda Springs, and on Lower Georgetown Canyon Road near Georgetown, which overlap the central and eastern portions of the Resource Area. Elk kill locations were provided by the hunters. One-hundred-sixty elk were sampled in 1999 and 54 elk were sampled in 2000.

Skeletal muscle and liver tissue samples were collected from elk at the check stations and analyzed for cadmium and selenium in 1999 and in 2000; the elk tissue samples were analyzed for cadmium, copper, iron, lead, manganese, molybdenum, selenium, and zinc. Locations and selenium analytical results can be found on Drawing 3-22.

Due to the extensive foraging range and migration patterns of elk, even those elk that were killed near a specific mine may not be attributed solely to that mine; as a result, the elk study results are presented only in this section of this RI/FS work plan and referenced as appropriate for the Henry and Enoch Valley discussions.

The 1999 results and discussion can be found in the *1999 Interim Investigation Data Report* (MW, 2000). The 2000 results were not presented in any formal document. As shown in Drawing 3-22, in 1999, liver selenium concentrations ranged from 0.65 to 39 mg/kg dw, and ranged from 0.60 to 41 mg/kg dw in 2000. Muscle selenium concentrations ranged from 0.22 to 3.7 mg/kg dw in 1999 and from 0.19 to 2.8 mg/kg dw in 2000.

No applicable regulatory screening levels or standards have been identified at this time for comparison to the elk biotic data. These data will be applied and used in the human health and ecological risk process as discussed in the risk assessment methodology (Appendix C) as discussed in the *DQUR/DAR* (MWH, 2010a) located in Appendix B.

3.2.6.2 Bird Eggs

Bird egg samples were collected in the spring from 1999-2001 for a regional reproductive success study. The bird egg study was a cooperative effort between the Selenium Committee and the University of Idaho Department of Fish and Wildlife Resources (IDFWR) with P4 being one of six member companies of the Selenium Committee. Three phases of investigation were implemented during the three-year effort, which focused on the Blackfoot Reservoir, the Upper Blackfoot River watershed, Alexander Reservoir, and Grays Lake Wildlife Refuge (i.e., the central district).

1. Phase I compared selenium in bird eggs of selected species between mining and background sites.

2. Phase II compared reproduction success of bird species between mining and background sites.

3. Phase III was a comparison of selenium levels in bird eggs and the relationship to individual reproductive success. An additional component of Phase III was to collect co-located water samples for selenium analysis.

Samples were collected from 215 bird eggs in 1999, 334 in 2000, and 369 in 2001. Species from which bird eggs were collected were American coot, American kestrel, American robin, barn swallow, Brewer's blackbird, brown-headed cowbird, common snipe, Canada goose, cinnamon teal, cliff swallow, eared grebe, European starling, Franklin's gull, house wren,

killdeer, long-billed curlew, mallard, marsh wren, mountain bluebird, northern flicker, red-winged blackbird, ring-billed gull, sandhill crane, song sparrow, tree sparrow, western grebe, white-faced ibis, willet, yellow-headed blackbird, and yellow warbler.

These samples were analyzed for cadmium and selenium in 1999 and 2000, and selenium only in 2001. Egg selenium data and collection locations from 1999, 2000, and 2001 can be found on Drawings 3-23 to 3-25, respectively. Refer to the *1999 Interim Investigation Data Report* (MW, 2000) for further discussion and presentation of the results from the 1999 bird egg study. The 2000 and 2001 results have not been formally reported.

As shown on Drawings 3-23 to 3-25, bird egg selenium concentrations from the various species ranged from 0.61 to 21.3 mg/kg dw in 1999, 0.28 to 26 mg/kg dw in 2000, and 1.3 to 32 mg/kg dw in 2001.

No applicable regulatory screening levels or standards have been identified at this time for comparison to the bird egg data. These data will be applied and used in the human health and ecological risk process as discussed in the risk assessment methodology (Appendix C) as discussed in the *DQUR/DAR* (MWH, 2010a) provided in Appendix B.

Due to the extensive foraging range and migration patterns of some birds on the site, even those eggs that were found near a specific mine may not be attributed solely to that; as a result, the bird egg study results are presented only in this section of this RI/FS work plan and referenced as appropriate for the Henry and Enoch Valley discussions.

3.2.6.3 Cattle

Refer to Section 3.3.6 for discussion of the cattle biotic data based on data from grazing studies at the Henry Mine.

3.2.6.4 Small Mammals

This section presents the nature and extent of analytes in small mammals at Ballard Mine. In 2001, small mammals were sampled (deer mice) at upland and riparian locations to evaluate

potential impacts by mine waste rock dumps, and possible surface water and sediment contamination, on small mammals. Deer mice samples were collected at three quadrats on waste rock dump MWD081 at Ballard Mine in September 2001. Samples were analyzed for several metals: aluminum, antimony, arsenic, barium, beryllium, cadmium, chromium, copper, lead, manganese, mercury, molybdenum, nickel, selenium, silver, thallium, vanadium, uranium, and zinc.

Selenium results are presented in Table 3-15 and are shown on Drawing 3-26. Complete analytical results of this investigation are included in the *Summer 2001 Area-Wide Investigation Data Summary* (MWH, 2002e). As shown in Table 3-15, small mammal samples were collected from three quadrats on MWD081 in September 2001. Deer mice were collected at all three locations and concentrations ranged from 6.5 to 11 mg/kg dw.

No applicable regulatory screening level levels or standards have been identified at this time for comparison to the small mammal's data. At this time, the use of these data is limited as indicated in the *DQUR/DAR* (MWH, 2010a). However, the data's existence is noted and should risk assessment indicate the potential need to evaluate small mammals, the data may be used in scoping a study.

3.2.6.5 Terrestrial Invertebrates

This section presents the nature and extent of analytes in terrestrial invertebrates at Ballard Mine. In 2001, samples were collected of insects and worms at upland and riparian locations to evaluate potential impacts by mine waste rock dumps, and possible surface water and sediment contamination, on terrestrial invertebrates. Insects, which included lady bugs, popping bugs, spiders, flying ants, gnats, and other flying insects, were collected at three quadrats on waste rock dump MWD081 at Ballard Mine in September 2001.

The insect samples were analyzed for several metals: aluminum, antimony, arsenic, barium, beryllium, cadmium, chromium, copper, lead, manganese, mercury, molybdenum, nickel, selenium, silver, thallium, vanadium, uranium, and zinc. Selenium results are presented in Table 3-16 and are shown on Drawing 3-26. Complete analytical results of this investigation

are included in the *Summer 2001 Area-Wide Investigation Data Summary* (MWH, 2002e). As shown in Table 3-16, terrestrial invertebrate samples were collected from three quadrats on MWD081 in September 2001. Only insects were found and concentrations ranged from 29 to 30 mg/kg dw.

No applicable regulatory screening level or standards have been identified at this time for comparison to the terrestrial invertebrate data. At this time, the use of these data is limited as indicated in the *DQUR/DAR* (MWH, 2010a). However, the data's existence is noted and should risk assessment indicate the potential need to evaluate terrestrial invertebrates, the data may be used in scoping a study.

3.2.7 Ballard Mine Summary

This section provides a summary of the historic data gathered for the Ballard Mine as discussed in the subsection above in order to help identify any remaining data gaps. Based on this section, a data gaps analysis for each mine site is presented in Section 4.0 that will serve as the basis for future RI/FS investigations. A summary of the sample locations, analyte lists, and investigation results for all the media investigated at the Ballard Mine are presented in Table 3-17. The key findings or conclusions for each media at the Site are summarized below.

3.2.7.1 Soils

Surface soils characterization at the Ballard Mine has been performed for upland and riparian soils during several investigations since 2004. These investigations are:

- Mass wasting investigation (summer 2004) – 26 samples
- Supplemental waste rock dump and facility soil characterization (summer 2009) – 105 samples
- Riparian habitat assessment (summer 2004) – 26 samples

The key findings, including analytes that were elevated above screening levels and/or investigation-specific preliminary background values are:

- The 2004 and 2009 soil investigations reported isolated areas of elevated concentrations of cadmium, cobalt, nickel, manganese, and vanadium in soil when compared to the screening levels and background.
- The 2004 and 2009 soil investigations reported elevated arsenic levels in soil when compared to its screening level and preliminary background primarily on mine waste dumps, mine pit areas and the haul road.
- The 2004 and 2009 soil investigations reported selenium levels in soil below its screening level, but elevated above the preliminary background area primarily on mine waste dumps, mine pit areas and the haul road.
- Total uranium concentrations do not exceed screening levels based on chemical risks; however, radiogenic risks may be present and based on the A/Ts request will be evaluated in the risk assessment. Data on uranium daughter products have not been collected, but will be important in reducing uncertainty in the risk assessment specifically for uranium and uranium daughter products.
- Where off-dump soil transport has occurred (mass wasting), detected concentrations of various metals in soils and vegetation do not immediately drop below the relevant screening levels or preliminary background levels. Off-dump transport typically is not evident where the dump boundary is located uphill and transport has not occurred.
- Arsenic concentrations in soil are elevated above the residential soil screening levels in the 2009 background area. Evaluation of existing soil and vegetation background needs to be conducted during the RI/FS process.

Based on evaluation of data at the Ballard Mine, the nature and extent of surface soil impacts at the Ballard Mine has been defined adequately with the exception of the radionuclides in on-site soils. Further assessment of the soil background needs to be conducted for radionuclides and possibly other COPCs so that the entire area disturbed by the mining operation is evaluated appropriately (i.e., appropriate inputs) in the risk assessment and the feasibility study (FS). As a result, limited further field characterization of soil is necessary at this time both on site and in a background location. As further data evaluation is performed during the RI/FS, the need for additional characterization will be reassessed and, if necessary, performed.

3.2.7.2 Vegetation

Vegetation characterization at the Ballard Mine has been performed for upland vegetation during four primary investigations since 2004. These investigations are:

- Mass wasting investigation (summer 2004) – 26 samples
- Seasonal vegetation assessment (summer and fall 2004) – 6 samples
- Supplemental waste rock dump and facility characterization (summer and fall of 2009) – 189 samples
- Riparian habitat assessment (summer of 2004) – 26 samples

The key findings from these investigations at the Ballard Mine Site are:

- The 2004 vegetation investigation reported isolated areas of elevated cadmium in vegetation when compared to its screening level.
- The 2004 and 2009 vegetation investigation report elevated molybdenum and selenium in vegetation when compared to their screening levels throughout the mine waste dumps, mine pit areas, and haul road.
- Where off-dump soil transport has occurred (mass wasting), detected concentrations of various metals in soils and vegetation do not immediately drop below the relevant screening levels or preliminary background levels. Off-dump transport typically is not evident where the dump boundary is located uphill and transport has not occurred.
- Molybdenum is elevated in soil above its screening level in the 2009 background area. Evaluation of existing soil and vegetation background levels for molybdenum needs to be conducted during the RI/FS process.

Based on evaluation of data at the Ballard Mine, the nature and extent of vegetation impacts at the Ballard Mine has been defined adequately so that, if necessary, risk assessments and the FS can be conducted. As a result, no further field characterization is necessary at this time. As further data evaluation is performed during the RI/FS, the need for additional characterization will be reassessed and if necessary performed.

3.2.7.3 Surface Water and Sediment

Surface water monitoring has occurred primarily in the spring and fall at the Ballard Mine area since 1997 with up to 41 stations being used to evaluate potential impacts by the Site to surface water in the area. The key findings from the surface water and sediment sampling conducted at the Ballard Mine are:

Many streams around the Ballard Mine are fed either by intermittent springs or runoff-derived streams (intermittent) that go dry at the height of summer when runoff ends.

- Historic surface water data has isolated exceedances of surface water screening levels for aluminum, barium, boron, cadmium, copper, iron, manganese, silver, thallium, and vanadium, primarily in seeps, springs and ponds, but also in a few downstream surface water monitoring stations.
- Dump seep, spring, and pond surface water contains a greater number of constituents elevated above their respective screening levels compared to streams.
- Monitoring indicates that total selenium concentrations in surface waters are generally above preliminary background levels and often exceed the IDEQ CCC aquatic life standard in seeps, springs and ponds as well as in a few downstream locations.
- Concentrations of all constituents are typically higher during spring sampling events when compared to the corresponding fall sampling events.

Sediment sampling has occurred at the Ballard Mine area from 1998 to 2004 with 27 stations being used to evaluate potential impacts to area sediments by activities on the Site. Sediment sampling stations are at strategic locations on streams, waste rock dump seeps, springs, and ponds. The key findings derived from sediment samples collected at these locations are as follows:

- Historic sediment data has isolated exceedances of screening levels for vanadium in seeps, springs, ponds, and downstream stream locations.
- Historic sediment data has frequent exceedances of screening levels for cadmium, chromium, nickel, and selenium in seeps, springs, ponds, and downstream stream locations.

- The stream sampling locations around Ballard Mine that exceed the screening level for selenium in sediments are positively (or directly) correlated with those that exceed the surface water standard.
- A comparison among the data sets for sediments, soils, and surface water reveals that the historic sediment samples were analyzed for specific, but limited, analytes. For example, arsenic was not reported in sediment samples, but it is detected, and in some cases occurred at levels above relevant screening levels in nearby soil samples.

The nature and extent of surface water impacts at the Ballard Mine has been defined adequately so that, if necessary, risk assessments and the FS can be conducted. As a result, no further field characterization of surface water is necessary at this time. As further data evaluation is performed during the RI/FS, the need for additional characterization will be reassessed and, if necessary, performed. Ongoing surface water monitoring is necessary to establish a baseline to judge the effectiveness of potential future remedies.

Based on the summary information above, the spatial characterization of sediment impacts at the Ballard Mine has been defined adequately so that, if necessary, risk assessments and the FS can be conducted. A data gap relating to COPC coverage in sediments has been identified and is further discussed in Section 4.0. Additional investigations of surface water, sediment, and riparian soils were conducted in fall 2010 to address these data gaps. These results will be reported in the RI report that will be prepared for each Site.

3.2.7.4 Groundwater

Groundwater monitoring occurred primarily between 2007 and 2009 at the Ballard Mine with 25 wells (including monitoring wells, production wells, agricultural wells, and domestic water wells) and several direct push boreholes used to evaluate potential impacts to underlying groundwater. The key groundwater investigation findings for the Ballard Mine are as follows:

- Isolated monitoring wells reported concentrations of arsenic and cadmium in groundwater above their screening levels.
- Aluminum, iron, and manganese frequently exceeded their groundwater screening levels in monitoring wells and other wells; however, these exceedances

were most often reported for the total fraction compared to the dissolved fraction and elevated concentrations of these metals often occurred in wells outside of site-impacted areas. As a result, it appears that aluminum, iron, and manganese are naturally elevated in groundwater in this area.

- Selenium, sulfate, and TDS exceed their groundwater screening levels in several monitoring wells, primarily alluvial groundwater wells. These analytes likely are indicators of site-related impacts.

- On the east side of the mine, impacted alluvial groundwater is associated with two waste rock dumps and has resulted in three distinct plumes. On the west side of the mine, impacted alluvial groundwater is associated with two waste rock dumps and has resulted in two distinct plumes. Total selenium concentrations on both sides of the mine exceed the groundwater screening value of 0.050 mg/L in the alluvial groundwater. The extent of elevated selenium in shallow groundwater and the associated alluvial plumes has largely been characterized. However, some areas need limited additional characterization.

- Groundwater collected from monitoring wells screened near the top of the Dinwoody Formation on the east side of the mine exceed the total selenium screening level; whereas, monitoring wells screened deeper in the Dinwoody Formation report a lesser impact. The Dinwoody Formation is not known to be present on the west side of the Ballard Mine, and there are no monitoring wells installed in the Dinwoody Formation on the west side of Ballard mine.

- Three of the five monitoring wells installed in the Wells Formation at Ballard Mine have total selenium concentrations in groundwater above the screening level for selenium. The three monitoring wells with elevated concentrations are located in the interior of the mine. Monitoring wells on the perimeter of the mine have selenium concentrations in groundwater below its screening level of 0.050 mg/L.

Based on the groundwater data, the nature and extent for groundwater at the Ballard Mine has been defined except for limited areas as discussed in Section 4.0 Data Gaps.

3.2.7.5 Aquatic Biota

A variety of aquatic biological-chemical data was collected during the pre- and post-2004 investigation periods at the Site. These historic aquatic data are (1) stream habitat assessments, (2) fish data, and (3) benthic macroinvertebrate data. The key findings for aquatic biota are as follows:

- Based on the 12 stations that were evaluated during the stream habitat assessment at Ballard Mine, the rapid bioassessment scores (RBS) ranged between 29 and 50 out of 200 and no fish were found in any of the stations. Even the regional background station, MST093, reported an RBS of 35 and did not report fish. The low RBS scores indicated that the stations evaluated were poor aquatic habitat.

- Ten samples of macroinvertebrates were collected from the Ballard Mine area streams for analyses. Seven of the ten samples had high MDLs as a result of low sample volumes (i.e., low numbers of macroinvertebrates), which are probably due to insufficient habitat as indicated by the stream habitat assessment. As discussed earlier with regard to fish, these are intermittent streams that during most years are completely dry by late summer. There also is a potential that impacts from COPCs in the streams could have affected the macroinvertebrate numbers. Selenium concentrations were reported as elevated in the three macroinvertebrate samples with valid results.

Nature and extent information for aquatic tissue data at the Ballard Mine is adequate for their intended purpose as additional lines of evidence in the human health and/or ecological risk assessment. The potential need for additional sampling of this medium will be evaluated pending results of the risk assessment for the P4 mines.

3.2.7.6 Terrestrial Biota

A variety of biological-chemical data are available from the pre-2004 period. This includes the elk tissue, bird egg, and cattle biotic tissue data. No applicable regulatory screening levels or standards have been identified at this time for comparison to the elk tissue, bird egg, and cattle biotic data. These data will be used during the RI/FS as described in the *DQUR/DAR* (MWH, 2010a). Data also are available for two other media - small mammals and terrestrial invertebrates. At this time, the use of the small mammals and terrestrial data is limited as indicated in the *DQUR/DAR* (MWH, 2010a). However, the data's existence is noted and should risk assessment indicate the potential need to evaluate small mammals or terrestrial invertebrates, the data may be used in scoping a study. A summary for terrestrial biota is as follows:

- Area wide skeletal muscle and liver tissue samples were collected from elk at check stations and analyzed for cadmium and selenium in 1999 and in 2000. A total of 160 elk were collected in 1999 and analyzed for selenium only. A total of

54 elk were collected in 2000 and analyzed for selenium in addition to other parameters.

- Area-wide bird egg data were collected in 1999, 2000, and 2001. Bird eggs were analyzed for cadmium and selenium in 1999 and 2000 with a total of 215 and 334 bird eggs sampled in these two years, respectively. In 2001, 369 bird eggs were sampled and analyzed for selenium only.
- A cattle-grazing study was performed at the Henry Mine and is discussed in Section 3.3.7.
- In 2001, small mammals (deer mice) were sampled at three locations at Ballard Mine and analyzed for selenium.
- Insects, which included lady bugs, popping bugs, spiders, flying ants, gnats, and other flying insects, were collected at three locations in 2001 and analyzed for selenium.

3.3 Henry Mine – Nature and Extent of Contamination by Media

The following subsections present the nature and extent of contamination detected in the various media that have been sampled at the Henry Mine. In each of the subsections, historical data for primary and secondary media are summarized in tables and the discussions are aided through the use of figures and drawings. For each primary medium, preliminary screening levels (values) presented in Table 3-1 are a combination of the most conservative of promulgated standards used in human and ecological risk assessment, as well as study-specific background values. These screening levels then are used to evaluate the concentration of each constituent in each medium. The screening levels presented in Table 3-1 and medium-specific summary tables discussed below are consistent with the human health and ecological screening criteria that will be used during the Site risk assessments as described in Appendix C of this RI/FS Work Plan.

Note that these screening levels and preliminary background values are used to facilitate the discussion of nature and extent and are not to be considered final remediation goals or background values. The preliminary background values cited in the discussion in Section 3.3 were reported in the *Interim Phase I SIs Evaluation Summary (MWH, 2007g)* or were based on the 2009 soil and vegetation investigation further discussed in Sections 3.3.1.2 and 3.3.2.3.

Media-specific background values need to be further evaluated during the RI/FS process as discussed in Section 4.0.

The term "analytes of interest" often is discussed in individual sections by medium (e.g., soil, groundwater) where these analytes are compared to the screening levels and background values. Specific analytes of interest were selected because they are:

(1) Typically elevated in the source materials (i.e., waste rock.)

(2) Discussed in historical studies where a specific subset of analytes was selected for analysis and spatial wire diagrams were developed for certain analytes (e.g., aluminum, cadmium, iron, nickel, selenium, vanadium, and zinc) to evaluate spatial and temporal concentration trends

(3) Frequently exceeding relevant screening standards presented in Table 3-1 and are in this Work Plan's summary tables

(4) Often primary human health or ecological risk drivers

In future RI and risk assessment reports, the use of this term will likely be replaced by other similar terms such as COPCs, COPECs, and COCs.

3.3.1 Soils

Surface soils characterization at the Henry Mine has been performed for upland and riparian soils during several investigations since 2004. These investigations include (1) the mass wasting investigation in the summer of 2004, (2) the supplemental waste rock dump and facility soil characterization in the summer of 2009, and (3) the riparian habitat assessment in the summer of 2004. Each of these investigations is summarized below. As described in Section 3.2.1, soil concentrations were compared to preliminary screening levels shown on Table 3-1 or to background concentrations. Exceedances of the preliminary screening values for soil samples collected in the Henry Mine area are presented in Table 3-18. Soil sample locations for pre-2004 area-wide investigations and selenium concentrations are presented on Drawing 3-1. Sampling locations and selenium results for pre-2004 soil and vegetation investigations, specifically the Henry Mine, are shown on Drawing 3-27.

3.3.1.1 Waste Dump Soil Characterization – Mass Wasting Investigation

A reconnaissance of waste rock dumps at Henry Mine was performed in June 2004 to identify and map existing and potential mass wasting areas along dump boundaries. Five potentially impacted areas were identified and one such area was randomly selected for sampling on MWD086. One control area was chosen for comparison on mine waste rock dump MWD085. The control site was selected due to the off-dump portion of the potential transect which was located uphill of the actual mine dump, thus allowing little or no potential for off-dump transport of sediment on to this area. Two downward sloping 150-foot transects, 12.5 feet apart, were set up at these areas perpendicular to the dump boundary. Transects began on-dump and crossed the dump boundary and continued off-dump onto native land. Thirteen co-located soil and vegetation samples were collected along each transect and were analyzed for selenium only. These data were originally reported in the *Draft - Interim Phase I SIs Evaluation Summary* (MWH, 2007g). Transect locations and sampling results for this investigation at the Henry Mine are presented on Drawings 3-28 and 3-29. This task is discussed in conjunction with the waste rock dump vegetation characterization discussion under Section 3.3.2 because the data were evaluated together. The discussion for both of these activities is only presented in this section.

Presented on Figures 3-39 and 3-40 are line-plots of the co-located soil and vegetation results along these transects. The soil and vegetation selenium preliminary background concentrations are plotted on the graphs as well.

Figure 3-39 suggests that off-dump transport is not occurring at the control transects on MWD085. As expected for a control site, the soil and vegetation selenium results on the dump are elevated above background and immediately drop below background levels at the border of the waste rock dump. The off-dump portion of these transects were located on undisturbed land and were uphill of the waste rock dump, so there was little chance of transport to occur. Only one vegetation sample had a detected concentration of selenium above the preliminary background concentration, estimated at the time of the study of 1.0 mg/kg dw, along the length of each control transect (refer to Figure 3-39). In both instances, these elevations were on-dump. The on-dump soil samples on both transects

were elevated above the preliminary background whereas the samples off-dump were found below the preliminary background. Concentrations of selenium detected in vegetation ranged from not detected concentrations at 0.25 (or ½ of the method detection limit of 0.50) to 1.9 mg/kg dw, and soil concentrations ranged from not detected concentrations at 0.25 to 53 mg/kg dw.

Figure 3-40 suggests that off-dump transport is not occurring at transects on MWD086 where mass wasting was a potential (i.e., off dump is located downhill). Similar to the control site discussed above, most of the soil results on the dump are elevated above background and drop below background levels before the border of the waste rock dump, indicating that no off-dump transport has occurred. All of the on-dump and off-dump vegetation concentrations are below background, indicating that no off-dump transport has occurred. Selenium detected in vegetation samples ranged from not detected concentrations at 0.25 (or ½ of the method detection limit of 0.50) to 0.90 mg/kg dw, and soil concentrations ranged from not detected concentrations at 0.25 to 14 mg/kg dw. These data, including background, will be re-evaluated during the RI because of the additional soil and vegetation data collected since 2004.

3.3.1.2 Waste Dump Soil Characterization – Supplemental Waste Rock Dump and Facility Soil Characterization

In June 2009, a soil survey and surface soil sampling was conducted at the Henry Mine waste rock dumps, partially backfilled pits, historic haul road and facilities, and a mine-specific background area located adjacent to the mine area. The primary objective was to characterize the nature and extent of the analytes of interest within the study boundaries. The survey and sampling results are reported in *Supplemental Soil and Vegetation Characterization Data Summary Technical Memorandum* included in Appendix A2 of this Work Plan. A brief summary of the characterization activities are provided in this section.

The soil survey was conducted prior to the sampling event for the Ballard Mine as discussed in Section 3.2.1.2. Soil sampling was performed following the soil survey at the six Henry Mine potential source areas (five waste rock dumps and one historic ore haul road) and the

background location. Drawing 3-30 shows the locations (typically a randomly selected 50-foot by 50-foot quadrat) and reports the total selenium result for each sample. A total of 70 composite surface soil samples were collected from the Henry Mine areas.

Table 3-18 presents the analyte concentrations that exceeded the preliminary soil screening levels (USEPA Regional Screening Levels for Residential Soil) for the soil samples collected during this 2009 study. Based upon the results presented in Table 3-18, the following analytes were identified as those that have at least one soil sample exceeding its preliminary screening level:

- Arsenic
- Cadmium
- Manganese
- Vanadium

Uranium did not exceed the EPA screening criteria based on chemical risks. However, concentrations of uranium in the Site soil were found to be high enough that the A/Ts requested evaluation of radiogenic risks associated with uranium and its daughter products in the risk assessment.

Table 3-19 summarizes the concentration ranges and number of soil samples exceeding the screening value for selenium and any other analytes with one or more sample exceedance. At the Henry Mine, maximum selenium values in soil ranged from 57.1 to 318 mg/kg dw and did not exceed the soil screening level of 390 mg/kg dw at any of the potential source areas. Selenium concentrations were elevated compared to the background area, where soil selenium concentrations ranged from 0.477 to 1.26 mg/kg dw.

Concentrations of arsenic, cadmium, manganese, and vanadium in soil did exceed the screening level at one or more potential source areas; however, as shown in Table 3-19, most of the occurrences were fairly isolated (with the exception of arsenic). Although two samples from waste rock dumps exceeded the manganese screening value of 1,800 mg/kg dw, none of the soil samples exceeded the maximum background concentration of 3,990

mg/kg dw. Cadmium was 114 mg/kg dw in one historic haul road sample, which exceeded the screening level of 70 mg/kg dw. This sample was a QC sample collected in triplicate and the two other samples had cadmium concentrations of 54.0 and 10.4 mg/kg dw, which were below the screening level.

Arsenic concentrations in all soil samples collected from the potential source areas at the Henry Mine exceeded the screening level of 0.39 mg/kg dw. Concentrations of arsenic ranged from 4.38 to 45.5 mg/kg dw across all source areas. Although, arsenic concentrations in the site-specific preliminary background location ranged from 6.60 to 9.01 mg/kg dw, which also suggests arsenic is naturally elevated above the residential screening level, all but two samples from the historic haul road MHR002 exceeded the maximum Henry Mine area background concentration of 9.01 mg/kg dw. A data gap has been identified associated with background data, and supplemental arsenic data likely will be collected in a background area.

The background soil samples that were collected as part of the June 2009 soil and vegetation study were collected in areas representative of where external waste rock dumps have been placed. Not represented were the areas of mine pit and mine pit backfills found in a natural (unmined) setting. This is a significant distinction because the geology and geochemistry is known to vary significantly across these areas, and the average background COPC concentrations in soils may similarly deviate from what is represented in the June 2009 study.

3.3.1.3 Riparian Soil Characterization – Habitat Assessment of Ponds, Wetlands, and Non-Fish-Bearing Streams

In May 2004, riparian habitat assessments, including evaluation of soil, vegetation, and species assemblages, were conducted on the riparian areas associated with ponds, wetlands, and non-fish-bearing streams at the Henry Mine. The design and execution of this study are the same as those presented in Section 3.2.1.3 for the Ballard Site. In tandem with the riparian habitat assessments, stream habitat assessments were performed at the same stream reaches. These stream habitat assessments or rapid bioassessment surveys conducted on the P4 streams used protocols established by USEPA (Barbour, et. al., 1999) to characterize the

quality of the physical habitat and are discussed in Section 3.3.5.1. Data from both assessments were originally presented in the *Draft - Interim Phase I SIs Evaluation Summary* (MWH, 2007g).

Riparian soil and vegetation samples were collected for laboratory analysis in September 2004. Thirty-five stations were sampled. The resulting data matrices for ponds and non-fish-bearing streams at the Henry Mine are presented together in Table 3-20. These tables show observed or potential species use, soil and vegetation selenium concentrations, and habitat quality rankings.

As shown in Table 3-20, the majority of the riparian habitats were of low quality. Of 21 stations assessed, only nine were in the top two quality ranking categories. Soil selenium concentrations ranged from 0.25 to 45 mg/kg dw and vegetation selenium concentrations ranged from 0.25 to 65 mg/kg dw.

Given the nature of these non-fish-bearing stream systems, interpreting low scores as indicative of poor quality habitat may be too harsh. Low scores more likely are indicative of a limited amount of habitat type present. Small streams do not generate significant riparian habitat. In fact, most of the ponded areas have higher scores, which may be a function of a pond having a larger area because it is a two-dimensional, rather than one-dimensional, feature in the environment. Thus, the assessment of non-fish-bearing riparian habitats does not point to any such habitats being of poor quality due to the Site.

3.3.2 Vegetation

Vegetation characterization at the Henry Mine has been performed for upland vegetation during four primary investigations since 2004. These investigations are (1) the mass wasting investigation in the summer of 2004, (2) the seasonal vegetation assessment in summer and fall 2004, (3) the supplemental waste rock dump and facility characterization in the summer and fall of 2009, and (4) the riparian habitat assessment in the summer of 2004. The mass wasting and riparian habitat investigations included soil and vegetation samples and as these

data are evaluated together; the discussion for vegetation is presented in Section 3.2.1. The other two investigations are summarized below.

Vegetation concentrations were compared to preliminary screening levels referenced from mineral tolerance of animals (NRC, 2005) as shown in Table 3-1 or to preliminary background concentration determined for the various investigations. Exceedances of the preliminary screening values for vegetation are presented in Table 3-21. Vegetation sample locations for pre-2004 area-wide investigations and selenium concentrations in soil are presented on Drawing 3-1. Locations and selenium results for pre-2004 vegetation investigations for the Henry Mine are shown on Drawing 3-27. This extensive data set is presented on Drawing 3-27 but it has largely been superseded by data collected in 2009. Although the existence of this earlier data is recognized and may be of use during preparation of the RI report and/or in the risk assessments that will be necessary for the Henry Mine as described in the *DQUR/DAR* (MWH, 2010a), its future use likely will be limited. As a result, the pre-2004 data are not discussed further here.

3.3.2.1 Waste Dump Vegetation Characterization – Mass Wasting Investigation

Refer to Section 3.3.1 for discussion of the vegetation results during the mass wasting investigation at the Henry Mine.

3.3.2.2 Waste Dump Vegetation Characterization – Seasonal Vegetation Investigation

Monthly composite vegetation data were collected at one quadrat on MWD086 at the Henry Mine from May to October 2004. The purpose of this investigation was to determine if there are any seasonal differences of selenium concentrations in upland vegetation growing on waste rock dumps. Samples were analyzed for selenium only from a combination of old and new growth in the quadrat. These data were originally presented and discussed in the *Draft - Interim Phase I SIs Evaluation Summary (MWH, 2007g)*. Quadrat location and sampling results are presented on Drawing 3-29. The results of the seasonal vegetation investigation (grasses and alfalfa) are provided in Table 3-22.

As shown in Table 3-22, the quadrat sampled at MWD086 shows some monthly selenium concentration variability with a possible decreasing trend late in the summer to early fall. Concentrations ranged from 7.5 mg/kg dw in July to 0.80 mg/kg dw in October.

3.3.2.3 Waste Dump Vegetation Characterization – Supplemental Waste Rock Dump and Facility Vegetation Characterization

In June 2009, a vegetation survey and sampling was conducted at the Henry Mine waste rock dumps, its historic haul road, and a mine-specific background area located within the mine footprint. The primary objective was to characterize the nature and extent of the analytes of interest within the study boundaries. The survey and sampling results are reported in *Supplemental Soil and Vegetation Characterization Data Summary Technical Memorandum* which is in Appendix A2 of this Work Plan. A brief summary of the characterization activities are provided in this section. The investigation methods used for the Henry Mine are the same as those presented in Section 3.2.2.3 for Ballard Mine.

Vegetation sampling was conducted following the vegetation survey at the six Henry Mine potential source areas (five waste rock dumps and one historic ore haul road) and one background location. Drawing 3-31 shows the locations (typically a randomly selected 50-foot by 50-foot quadrat) and reports the total selenium result for each sample. A total of 170 vegetation samples were collected from the Henry Mine area. The vegetation sampling addressed potential seasonal variations in concentration of analytes detected in vegetation samples collected throughout the Sites, particularly in forbs. A subset of stations sampled in the spring event was re-sampled for forbs in the fall. A brief discussion of the sample results for the composited grasses and forbs is provided below with additional details present in Appendix A2 of this Work Plan.

Table 3-21 presents the analyte concentration for each vegetation sample compared to preliminary vegetation screening levels (from mineral tolerance of animals (NRC, 2005) for these analytes. Analytes that exceeded the preliminary screening level were:

- Selenium
- Molybdenum

Table 3-21 shows exceedances of the screening level for selenium and molybdenum in all 2004 and 2009 samples. Molybdenum in the background area ranged from non-detect at a detection limit of 1.43 to 2.87 mg/kg dw. The concentrations in the source areas reached a maximum molybdenum concentration of 125 mg/kg dw in a grass sample. Selenium concentration exceedances were much fewer. Selenium concentration ranged from 0.45 to 146 mg/kg dw from all source areas. The highest selenium concentrations were reported on the waste rock dumps, but the historic haul road samples also reported elevated selenium concentrations (1.27 to 8.26 mg/kg dw).

A primary objective of the 2009 supplemental sampling activities was to evaluate the concentrations of constituents in composite grass and forb samples as further described in Appendix A2. Table 3-23 provides a summary of the concentration ranges and screening level exceedances in these composites. As shown in this table, selenium and molybdenum were found to be elevated above screening levels in the 2009 grass/forb composite samples; and, as discussed above regarding the evaluation of all 2004 and 2009 samples, the highest concentrations were typically detected on the waste rock dumps. At the Henry Mine, concentrations of molybdenum exceeded the screening level of 5 mg/kg dw in greater than half of the waste rock dump samples and exactly half of the haul road samples.

As discussed above, 2009 vegetation sampling addressed potential seasonal variation of analyte concentrations in forb samples (a composite of new and old growth). Tables and figures within Appendix A2 provide the statistical summaries for spring and fall analyte concentrations for all of the forb samples, and the data are also provided on Table 3-21. Selenium concentrations at the Henry Mine increased in the fall at two of the three background locations and increased at the majority of dump locations. Molybdenum concentrations showed little seasonal change at the background locations but, opposite to selenium, a majority of dump locations showed a decrease in molybdenum concentrations in the fall.

3.3.2.4 Riparian Vegetation Characterization

Refer to Section 3.3.1 for discussion of the riparian vegetation results and riparian habitat assessments at the Henry Mine.

3.3.3 Surface Water and Sediment

This section presents the nature and extent of analytes detected in surface water bodies and sediments collected and analyzed from the Henry Mine Site. To facilitate the discussion, surface water and sediment concentrations were compared to preliminary screening levels as discussed for each of these media below and as shown on Table 3-1 or to background concentrations determined for the various investigations. Exceedances of the preliminary screening values for surface water are presented in Table 3-24. Surface water sample locations for area-wide investigations are presented on Drawing 3-8. These area-wide locations and pre-2004 and EE/CA (2004-2009) selenium concentrations are presented on Drawings 3-9 and 3-10.

3.3.3.1 Surface Water

Extensive surface water monitoring has occurred in the Henry Mine area since 1997 with 31 stations being used to evaluate potential impacts by the Site to surface water in the area. These stations have been sampled for several metals, cations, anions, general water quality parameters, field parameters, and flow measurements over the period of record. The results for these monitoring events are presented in the various documents listed in Section 2.3. In addition to the reporting and evaluation of water quality data, loading analyses have been performed as described in the *Interim Phase I SIs Evaluation Summary (MWH, 2007g)*. However, this section only presents the analytes of interest that are mentioned below, and only those samples collected during May and September (runoff and baseflow) sampling events since monitoring began in 1997. Metal (inclusive of metalloid and non-metal cationic trace elements) concentrations that are evaluated were based on the area-wide studies and include aluminum, cadmium, iron, nickel, selenium, vanadium, and zinc. The discussion is supported by spatial wire diagrams (SWDs), from 2004, 2007, and 2008 sampling events, which graphically display contaminant concentrations of flowing systems on the Site (Figures

3-3 to 3-27), and selenium time plots (Figures 3-41 and 3-42) of selected mine-specific sampling locations that were chosen because of their proximity and relevance to the Henry Mine. The 2004 surface water spatial diagrams also present sediment sampling results from the concurrent sediment sampling events; these will be discussed later in this section. Drawings 3-32 and 3-33 present a map of the Site stream networks with surface water/sediment sampling locations and historical selenium concentrations.

Analyte concentrations in surface water are compared to selected screening levels for evaluation purposes as discussed in Section 3.2.3.1 of this Work Plan and shown on Table 3-1.

Surface Water Quality

Surface water in the Henry Mine area is a calcium-bicarbonate type water with pH levels ranging from 6.2 to 10.8. Semi-annual monitoring indicates that selenium concentrations are generally below background levels; the exception being Lone Pine Creek and its tributaries, which generally exceed the IDEQ CCC aquatic life standard, but only during the spring runoff period. The SWDs (see Section 3.2.3 for a discussion of SWD interpretation) presented in Figures 3-3 to 3-27 depict the spatial distribution of analyte concentrations in streams emanating from the Henry Mine. Diagrams from both spring and fall events are included to illustrate the seasonal differences in concentrations. Analytical results for all Henry Mine area surface water stations are summarized in Table 3-24.

As shown on the SWDs, selenium detected in surface waters periodically exceeds the screening criteria in surface water bodies around the Henry Mine as do a few other analytes. Cadmium concentrations have been observed above the variable hardness-dependent screening level at one location at the Henry Mine. This was at a newly discovered runoff channel in spring 2008, unofficially called *Tributary to Henry Creek* (MST280). Nickel concentrations frequently have been observed above background along the lower stretches of the Little Blackfoot River (MRV016 and MST234), Long Valley Creek (MST050), the Henry Mine limestone drain (MDS022), and the tributary to Henry Creek (MST280). A sudden increase in vanadium concentrations detected in surface water was seen in 2008.

Concentrations of vanadium were found above the surface water screening level in the Little Blackfoot River (MST234, MST044, and MST045) in both spring and fall 2008 and at the tributary to Henry Creek (MST280) in spring 2008. Vanadium concentrations detected in surface water were above the screening level at the Meadow Creek background station (MST235) in spring 2008. Zinc concentrations in surface water have never been observed above the variable hardness-dependent screening level at the Henry Mine and have only been observed above preliminary background of 0.015 mg/L infrequently and at sporadic locations.

Figures 3-41 and 3-42 present total selenium concentrations and discharges observed at the Little Blackfoot River (MST044) and the West Fork of Lone Pine Creek (MST057) during spring and fall since 1997. MST044 was chosen because it is a central monitoring location in the Henry Mine area and the Little Blackfoot River perennially discharges into the Blackfoot Reservoir. MST057 was chosen because analyte concentrations often have been observed elevated above the total selenium screening level, and it is a perennial stream emanating directly from the Henry Mine. These upstream (near-source) and downstream locations are used to spatially evaluate concentrations as well as to evaluate any correlation between surface water and sediment.

Surface Water Results in a Downstream Location – Selenium concentrations at MST044 in the Little Blackfoot River show no noticeable seasonality or temporal trend. In fall 2007, an anomalous spike in total selenium concentration was detected but has not been detected in subsequent sampling events. There is no apparent relationship between discharge and total selenium concentration at this location. Total selenium concentrations at MST044 have been found above the selenium screening level of 0.005 mg/L on only one occasion out of the eleven times it has been sampled in the spring or the fall. Total selenium concentrations detected in surface water at this locations range from not detected (<0.001) to 0.046 mg/L (refer to Table3-24).

In addition to total selenium detected in surface water collected at MST044, historical spring and fall surface water data dating back to 1997 (see Table 3-24) for other analytes of interest are summarized below:

- Aluminum has been sampled three times at MST044. Concentrations have been observed above the screening level of 0.087 mg/L in only one of the three events. Concentrations range from non-detect at 0.03 to 0.11 mg/L.

- At MST044, cadmium has been found elevated above the hardness-dependent screening level two of the ten times it has been sampled. Both of these exceedances occurred in 1998 when samples were not filtered and the total fraction was analyzed. Concentrations range from non-detect at 0.001 to 0.0034 mg/L.

- Iron has been sampled at MST044 five times and has never been observed above the screening level of 0.158 mg/L. Concentrations range from non-detect at 0.015 to 0.1 mg/L.

- Nickel has been sampled at MST044 eight times and has never been observed above the hardness-dependent screening level. Concentrations range from non-detect at 0.0016 to 0.005 mg/L.

- Vanadium concentrations have been found above the screening level of 0.02 mg/L at MST044 three out of the 10 times it has been sampled. Concentrations range from non-detect at 0.0026 to 0.089 mg/L.

- Zinc has been sampled at MST044 eight times and has never been observed above the hardness-dependent screening level. Concentrations range from non-detect at 0.0011to 0.02 mg/L.

Surface Water Results in an Upstream (Near-Source) Location – Total selenium concentrations at MST057 on the West Fork of Lone Pine Creek appear to be increasing over time. There is an apparent seasonality here with concentrations being greater in the spring. There is also a strong positive correlation suggested between concentration and discharge. Selenium concentrations at MST057 have been found above the screening level of 0.005 mg/L five out of the 10 times it has been sampled in the spring or the fall. Concentrations range from non-detect (at 0.001 mg/L) to 0.0276 mg/L.

In addition to total selenium detected in surface water collected at MST057, historical spring and fall surface water data dating back to 2002 (see Table 3-24) for other analytes of interest are summarized below:

- Aluminum has been sampled three times at MST057. Concentrations have been observed above the screening level of 0.087 mg/L during all three events. Concentrations range from 0.14 to 0.84 mg/L.

- At MST057, cadmium has not been found elevated above the hardness-dependent screening level during any of the 10 events it has been sampled. Concentrations range from non-detect at 0.0001 to 0.0001 mg/L.
- Iron has been sampled at MST057 three times and has never been observed above the screening level of 0.158 mg/L. Concentrations range from non-detect at 0.0250 to 0.052 mg/L.
- Nickel has been sampled at MST057 nine times and has never been observed above the hardness-dependent screening level. Concentrations range from non-detect at 0.0004 to 0.014 mg/L.
- Vanadium concentrations have never been found above the screening level of 0.02 mg/L at MST057 during any of the 10 events it has been sampled. Concentrations range from non-detect at 0.0002 to 0.0025 mg/L.
- Zinc has been sampled at MST057 nine times and has never been observed above the hardness-dependent screening level. Concentrations range from non-detect at 0.002 to 0.0375 mg/L.

Spring, Seep, and Stream Headwater Recession Analysis

In 2006, surface water discharges were measured at three springs, seeps, and stream headwaters every three weeks from May to September as part of a stream recession analysis at the Henry Mine. The study was undertaken in an attempt to model the release of water from natural storage areas, typically assumed to be groundwater discharge, into these channels once surface runoff has ceased. Surface water discharges at the three Henry Mine stations listed in Table 3-9 were measured and evaluated.

Figure 3-43 is a discharge plot for each of the three stations monitored at the Henry Mine. Table 3-9 presents the calculated recession constants, *k,* for each station with average and final recession constants. Further details on the study and analysis are found in the discussion for Ballard Mine in Section 3.2.

As suggested by the recession constants in Table 3-9, one of the three stations appears to have water supplied by an interflow source and the other two stations by groundwater. MDS016 has a final recession constant of 0.932, but becomes dry after only two measuring events. MDS022 and MSG002 both have final recession constants above 0.98 and maintain constant discharge.

3.3.3.2 Sediment

This section presents the nature and extent of analytes detected in the sediments generally collected beneath surface water bodies at the Henry Mine. Extensive sediment sampling took place in the Henry Mine area from 1998 to 2004 with 29 stations being used to evaluate potential sediment impacts caused by mining activities at the Site. Sampling stations were located on streams, waste rock dump seeps, a spring, a reservoir delta, and ponds. Stations were sampled for several metals, cations, anions, pH, and organic carbon during that period of time. The results for these monitoring events are presented in the various documents listed in Section 2.3. Exceedances of the preliminary screening values for sediment are presented in Table 3-25 and pre-2004 and EE/CA locations, and results are shown on Drawings 3-32 and 3-33. Based on the area-wide studies, analyte concentrations evaluated are cadmium, chromium, nickel, selenium, vanadium, and zinc. These were the only six analytes that were run in the laboratory during the 2004 sediment investigation. SWDs from the 2004 sediment sampling event are presented in addition to selenium time plots for locations that were chosen because of their proximity and relevance to the specific mine (see Section 3.2.3 for selection rationale). The 2004 SWDs, Figures 3-3 to 3-7, graphically illustrate analyte concentrations in the sediments of flowing systems on the Site. The time plots, Figures 3-44 and 3-45, show surface water and sediment selenium concentrations at stream locations MST044 and MST057 and attempt to correlate surface water and sediment concentrations at these locations over time. Analyte concentrations in sediment are compared to selected screening levels and/or background for evaluation purposes as described in Section 3.2.3.2 and listed in Table 3-1.

As shown in the SWDs, selenium concentrations exceed the screening level for sediment at only one Henry Mine monitoring location; the West Fork of the Lone Pine Creek (MST057). There are monitoring locations where sediments contain sporadic selenium concentrations above preliminary background: Long Valley Creek (MST050), Lone Pine Creek (MST054 and MST058), Henry Mine limestone drain (MDS022), and a tributary to the West Fork of Lone Pine Creek (MST276). Selenium concentrations in sediment appear to positively correlate with surface water concentrations.

There are various other analyte concentrations in sediments that are elevated above the previously estimated preliminary background levels for streams emanating from the Henry Mine as illustrated on their respective SWDs. The sediment samples collected from Long Valley Creek at one location (MST050) contained concentrations of nickel above its screening level and zinc above its preliminary background level. The sediment samples collected in the spring-fed tributary above Long Valley Creek are elevated above the nickel screening level and the zinc preliminary background level at MST277. At Lone Pine Creek, one sediment sample collected at MST058 had a nickel concentration elevated above its screening level. The sediments collected from the Henry limestone drain (MDS022) and Strip Mine Creek (MST063) are both elevated above the nickel screening level. Cadmium concentrations in sediments collected at every Henry Mine location exceeded the cadmium screening level. However, as with many of the metals in sediment, the screening criterion used for cadmium in sediment is much lower than the preliminary background level for cadmium. Other analyte concentrations in sediments do not appear as positively correlated with surface water concentrations at the Henry Mine.

Figures 3-44 and 3-45 present sediment selenium concentrations and the coinciding surface water total selenium concentrations at the Little Blackfoot River (MST044) and the West Fork of Lone Pine Creek (MST057) locations during each surface water/sediment sampling event since 1998. These upstream (near-source) and downstream locations are used to spatially evaluate concentrations as well as to evaluate any correlation between surface water and sediment as discussed below.

Sediment Results in a Downstream Location –The plot for MST044 at Little Blackfoot River shows that sediment selenium concentrations have been below the screening level of 4.0 mg/kg all three times it has been sampled since 1998. Selenium concentrations in sediments range from 1.1 to 1.9 mg/kg. The surface water concentrations appear to have a direct relationship to sediment selenium concentrations at this location as both the surface water and sediment concentrations are below their respective screening levels.

In addition to selenium detected in sediment collected at MST044, historical sediment concentration data dating back to 1998 (see Table 3-25) for other analytes of interest are summarized below:

- Cadmium has been sampled three times at MST044. Concentrations were observed above the screening level of 0.583 mg/kg during all three events. Concentrations ranged from 1.39 to 6.7 mg/kg. Even though concentrations exceeded the screening level, all were below the preliminary background concentration of 10 mg/kg.
- Chromium has been sampled at MST044 twice and concentrations have never been observed above the screening level of 36.286 mg/kg. Concentrations were 35 and 36 mg/kg.
- Nickel has been sampled at MST044 three times and has been observed above the screening level of 18 mg/kg one of the three events. Concentrations ranged from 11.3 to 43 mg/kg. Even though there was one screening level exceedance, it was below the preliminary background concentration of 69 mg/kg.
- Vanadium concentrations have been found above the screening level of 57 mg/kg at MST044 during only once of the three times it has been sampled. This exceedance was reported in 1998. Concentrations ranged from 29.3 to 77 mg/kg.
- Zinc has been sampled at MST044 three times and was observed above the screening level of 98 mg/kg once during the three events. However this exceedance has not been repeated since 1998. Concentrations ranged from 68 to 100 mg/kg. Even though there was one screening level exceedance, it was below the preliminary background concentration of 130 mg/kg.

Sediment Results in an Upstream (Near-Source) Location – The time plot for MST057 at West Fork of Lone Pine Creek shows that sediment selenium concentrations have been seen above the screening level of 4.0 mg/kg on two occasions. Selenium concentrations detected in sediment ranged from 1.5 to 4.4 mg/kg. The surface water concentrations suggest that there is little correlation between surface water and sediment selenium concentrations at this location.

In addition to selenium detected in sediments collected at MST057, historical sediment concentration data dating back to 2002 (see Table 3-25) for other analytes of interest are summarized below:

- Cadmium has been sampled three times at MST057. Concentrations were observed above the screening level of 0.583 mg/kg during all three events. Concentrations ranged from 4.1 to 4.38 mg/kg. Even though concentrations exceeded the screening level, all were below the preliminary background concentration of 10 mg/kg.

- Chromium has been sampled at MST057 three times and concentrations have never been observed above the screening level of 36.286 mg/kg. Concentrations ranged from 24.4 to 27 mg/kg.

- Nickel has been sampled at MST057 three times and has never been observed above the screening level of 18 mg/kg. Concentrations ranged from 15 to 17 mg/kg.

- Vanadium concentrations have been found below the screening level of 57 mg/kg at MST057 during each of the three times it has been sampled. Concentrations ranged from 25 to 27.5 mg/kg.

- Zinc has been sampled at MST057 three times and was observed above the screening level of 98 mg/kg two of the three events. Concentrations ranged from 93 to 110 mg/kg. Even though concentrations exceeded screening level, all were below the preliminary background concentration of 130 mg/kg.

3.3.4 Groundwater

The mine plan for the Henry Mine was relatively simple compared to the Ballard Mine because mining was developed along the northeastern limb of the Wooley Valley anticline, and the stratigraphic section is not repeated within the mine area. The areas immediately to the southwest of the mine pits are a ridge formed by Wells Formation, while areas to the northeast of the mine pits are lowlands generally underlain by alluvium, as well as remnants of the Phosphoria Formation, and stratigraphically higher units, like the Dinwoody Formation along ridges. The mine pits and related mine dumps are elongated along a northwest-southeast trend parallel to the strike of the Phosphoria Formation, with the pits developed along the hillsides to the southwest. As a result of the topographic setting and the placement of the mine pits, surface water runoff and shallow groundwater flow from the pits and waste dumps will tend to be downhill to the northeast until intercepting the lowlands and then flowing along the valley bottoms, generally to the east and southeast.

Potential groundwater impacts at the Henry Mine have been investigated through the use of monitoring wells, direct push boreholes, and direct push pre-pack wells (or borehole wells.

The majority of these wells were installed in 2007, 2008, and 2009. These monitoring wells have been sampled during spring and fall sampling events for metals and general water quality parameters. Monitoring well and direct push (pre-pack) well locations for the Henry Mine are shown on Drawing 3-34. The direct push boreholes are described in more detail in Appendix A-1, with depth and total selenium concentrations provided in Table A1. Drawing 3-34 also presents historical maximum and minimum selenium concentrations as well as trend graphs of selenium concentrations. The direct push boreholes are shown on Drawing 3-35 and Drawing 3-36. Groundwater was collected from these direct push boreholes for selenium analysis only once. The selenium concentrations in groundwater based on these single grab samples are depicted on separate drawings and supplements the monitoring wells data to delineate the Henry Mine groundwater plumes.

Monitoring locations at the Henry Mine are presented in Table 3-26, which lists the location of the well, the well name (or station number), the type of monitoring well, and the corresponding screened interval. In addition, the table indicates the specific hydrostratigraphic groundwater system as discussed in Section 2.2.5 that each well is screened in and is intended to monitor. The three distinct hydrostratigraphic systems found at Henry Mine are presented in the discussion in Section 3.3.4.1.

Sections 3.7 and 3.8 provide discussion of the source, transport pathways, and receptors for the Sites. The most relevant groundwater sources, pathways, and receptors are briefly described here. It should be noted that groundwater, regardless of the potential for reaching a receptor, will be evaluated in the risk assessment.

Potential receptors for groundwater impacted by elevated COPCs that originated at the Henry Mine are largely human or agricultural receptors through the use of groundwater extracted from contaminant-affected aquifers. Aquatic life, wildlife, and livestock could also be affected through the discharge of the groundwater to surface water as springs or baseflow to the ephemeral stream channels. The alluvial system is of most concern for this pathway because the groundwater discharge points are often relatively close to the primary sources of COPC to groundwater, which in this case, are primarily the waste rock dumps. Various contaminant attenuation mechanisms become important along more distal flow paths.

The few springs near the Henry Site are potential discharge points for COPC-affected groundwater that mostly originates from the waste rock dumps. The few intermittent streams largely east the Site and the Little Blackfoot River could receive baseflow discharge from the alluvial system. No known domestic or agricultural wells are close enough to the Site to be pathways to potential receptors.

3.3.4.1 Hydrostratigraphic System Monitoring

Three distinct hydrostratigraphic groundwater systems have been identified and sampled at the Henry Mine:

- Shallow alluvial system(generally the local groundwater system)
- Dinwoody and Thaynes formations bedrock system (generally part of the intermediate groundwater system)
- Wells Formation bedrock system (generally part of the regional groundwater system)
- The objective of this sampling has been to evaluate the nature and extent of elevated selenium and other constituent levels in these individual units as well as the overall hydrogeologic system. Constituent concentrations in groundwater are compared to selected screening levels for evaluation purposes. The hierarchy of screening levels is described in Section 3.2.4. Note that the discussion below is focused on selenium because it is the primary risk driver as suggested by the number of groundwater quality standard exceedances (excluding those standards that are based on Secondary MCLs). Other exceedances are summarized in Section 3.3.4.2 and presented in Table 3- 27.

<u>Shallow Alluvial Monitoring</u>

The local alluvial groundwater system was evaluated in two general areas at the Henry Mine. These areas are primarily located in alluvial areas near the north and central Henry mine pits (near the Little Blackfoot River), and near the south pit in headwater areas of Lone Pine and Long Valley creeks. Generally, data in these areas was not conducive to isochemical contouring because of limited numbers of sample results above selenium detection limits. This in part is due to the fact that extensive alluvial deposits are not present in the Henry Mine area (e.g., compared to the Ballard Mine area). Water collected from ponds and seeps directly associated with the mine waste areas contains selenium concentrations at levels that

suggest impacts to groundwater are possible (e.g., dump seep MDS034 has total selenium concentrations ranging from 0.0505 mg/L to 0.14 mg/L from 2008 to 2009).

North Henry Mine Area. Groundwater sample data collected from monitoring well MMW004, located northeast of the backfilled portion of pit MMP041, have consistently low detections of total selenium ranging from not detected (<0.001) to 0.00273 mg/L, which are below the groundwater screening level of 0.05 mg/L. This well is installed in basalt, but is likely representative of the shallow alluvial groundwater system. Direct push sampling north of the river was not successful in acquiring groundwater samples due to the lack of alluvial deposits.

Samples from one shallow monitoring well located near the river between MMP041 and MWD088 have also contained low levels of total selenium. Groundwater samples collected from MMW019 had concentrations ranging from not detected (< 0.001) to 0.00541 mg/L during the 2007 to 2009 monitoring period. As depicted on Drawing 3-34, MMW019 shows slight seasonal fluctuations. This well is actually screened in the Phosphoria Formation, and currently it is not clear whether groundwater collected from this location is representative of the shallow groundwater flow system.

MWD088 Area. An alluvial groundwater system was identified south of the Little Blackfoot River and along the edge of waste rock dump through the use of direct push borehole MWD088. Dissolved selenium concentrations in groundwater samples collected from these boreholes ranged from not detected (<0.001) to 0.13 mg/L in BH058, BH059, and BH063. Selenium concentrations detected in groundwater samples collected from two direct push boreholes on the northern edge of MWD088 near the Little Blackfoot River were not detected (<0.001) and 0.041 mg/L. A step-out direct push borehole and direct push monitoring well were installed in 2009, BH153 and MBW152, and groundwater samples from these locations contained dissolved selenium concentrations of 0.0055 mg/L and 0.0047 mg/L, respectively (see Drawing 3-35). These concentrations were below the screening value and DELB value. Two other direct push boreholes further east in the valley produced groundwater samples that were either not detected for selenium (i.e., <0.001) or dry. Selenium concentrations in groundwater samples collected further south along the edge

of MWD086 were elevated with respect to the selenium screening level. Borehole BH063 produced a groundwater sample with a selenium concentration of 0.13 mg/L. It appears that there are some locally elevated concentrations of total and dissolved selenium in the shallow groundwater near MWD088 and MWD086, but laterally extensive groundwater plumes emanating from these mine waste rock dumps appear not to be present. Attempts to investigate the alluvium along the edge of MWD088 and downgradient from BH063 were not successful because of the presence of shallow bedrock. However, groundwater from boreholes sampled in the area of the downhill toe of the waste rock dump had concentrations generally less than 0.05 mg/L near the waste rock and at or less than 0.0055 mg/L nearer to the Little Blackfoot River. Therefore, it appears that some groundwater with elevated selenium is present locally beneath or along the edges of the waste rock dumps, but this has not migrated significantly beyond the waste rock dump margin.

South Henry Mine Area. The direct push program and monitoring well sampling in the area between waste rock dumps MWD086 and MWD090 on the south end of the Henry Mine has not indicated any selenium impacts above screening levels to the alluvial groundwater system beyond the waste rock areas.

MWD086 Area. Within the waste rock area, groundwater samples collected from monitoring well MMW010 have exhibited variable total selenium levels ranging from not detected at <0.001 mg/L to 0.10 mg/L between 2007 and 2009 (Drawing 3-34). Groundwater samples collected from this well has exceeded the selenium screening level of 0.05 mg/L twice, both during spring sampling events in 2008 and 2009. However, the selenium concentrations reported in groundwater samples collected from this well during the fall sampling events are well below the selenium screening level. This trend can be seen on Drawing 3-34. Clearly, the spring runoff event has an influence on selenium concentrations detected in groundwater collected at this location. The groundwater samples collected from direct push boring BH074, southeast of MMW010 and also within the waste rock area, had a dissolved selenium concentration of 0.031 mg/L (Drawing 3-36) in 2008. Other borings further down the probable flow path were dry or had dissolved selenium concentrations

detected in groundwater samples below the DELB value of 0.017 mg/L (e.g., BH073, 0.003 mg/L and BH076, <0.001 mg/L).

MWD090 Area. Groundwater samples collected from the shallow alluvial system to the east of MWD090 also contained selenium; however, the concentrations were below the total selenium screening level of 0.05 mg/L. MMW014 near the edge of the waste dump contained selenium concentrations in groundwater ranging from not detected at <0.001 to 0.00227 mg/L between 2007 and 2009. Further to the east, groundwater samples from direct push boreholes BH157 and BH158 contained dissolved selenium concentrations of 0.018 and 0.032 mg/L. The extent of selenium in groundwater to the east of this waste rock dump has not been defined based on the use of the DELB value of 0.017 mg/L (P4, 2009); the groundwater concentrations are below the selenium screening level of 0.05 mg/L. Nonetheless, the extent of selenium migration in this area should be understood relative to the potential surface water receptors in the area, including the headwaters of Lone Pine Creek and the nearby pond.

Dinwoody and Thaynes Formations Bedrock Monitoring

All of the mine pits are west of and hydrostratigraphically separated from the Dinwoody and Thaynes formations due to the presence of the upper Phosphoria Formation, and none are in direct contact with the Dinwoody or Thaynes formations. Some portions of the waste rock dumps are in direct contact with (overlie) the Dinwoody Formation. In most areas, the dumps are physically separated from the Dinwoody Formation due to intervening alluvial material. However, small portions of waste dumps MWD085, MWD086/MWD087, and MWD088 are in direct contact with the Dinwoody Formation without significant intervening alluvial (colluvial) material. Monitoring well MMW022 was installed in 2007 in the Dinwoody Formation, adjacent to the northeastern lobe of MWD086, where it is in direct contact with the Dinwoody Formation (Drawings 3-34). This location was considered a "worst case" condition for evaluating the potential waste rock – Dinwoody Formation flow path at the Henry Mine.

Groundwater samples from monitoring well MMW022 have been collected and analyzed four times since the well was installed in the fall of 2007. Total selenium concentrations in groundwater have ranged between 0.0173 and 0.0206 mg/L, indicating some possible impact to the Dinwoody Formation. These concentrations are still below the selenium screening level in groundwater of 0.05 mg/L.

A second intermediate groundwater monitoring well (MMW028) was installed at the Henry Mine to address potential groundwater flow in the Dinwoody Formation along strike toward the Little Blackfoot River. This monitoring well was installed between waste rock dump MWD088 and the Little Blackfoot River (Drawing 3-34). The total selenium concentrations reported for groundwater samples collected from MMW028 during the fall 2008 and spring 2009 sampling events were relatively low at 0.00264 mg/L and 0.00551 mg/L, respectively.

Wells Formation Bedrock Monitoring

The Wells Formation outcrops are to the southwest of the Henry Mine, adjacent to the highwall of all of the Henry Mine pits. Two monitoring wells were installed in the Wells Formation to monitor for potential impacts from the Henry Mine. One (MMW011) is located north of the northwest end of MWD088 (central Henry), and the other (MMW023) was installed through the base of open pit MMP041 into the Wells Formation (Drawing 3-34). Water level data for these wells appear to support a northwestward flow direction. This likely groundwater flow direction is based on the fact that MMW011 and MMW023 are installed in generally the same stratigraphic interval of the steeply dipping Wells Formation, which contains sand beds of relatively high hydraulic conductivity. The most probable flow direction is either to the northwest or southeast along the strike of the bedding, and the gradient between MMW011 and MMW023 suggests that the flow is to the northwest.

Groundwater samples have been collected from monitoring wells MMW011 and MMW023 since 2007. Groundwater samples collected from monitoring well MMW011 have had total selenium concentrations ranging from not detected at <0.001 mg/L to 0.00206 mg/L. This indicates that possible impacts to the Wells Formation from the central Henry Mine area appear to be insignificant at this location. Two of the four groundwater sampling events at

this location were non-detections for selenium. The groundwater sample collected from MMW011 in the spring of 2009 had the highest concentration detected at 0.00206 mg/L. Monitoring well MMW023, located within and down dip of the north Henry pit MMP041 has had total selenium concentrations in groundwater ranging from 0.003 mg/L to 0.017 mg/L. Groundwater concentrations approaching or above the total selenium screening level of 0.05 mg/L have not been observed in the Wells Formation at the Henry Mine.

3.3.4.2 Hydrostratigraphic System Monitoring for Other Constituents

The monitoring wells, direct push wells, and direct push boreholes at the Henry Mine were sampled during ten semi-annual (May/June and September/October) groundwater sampling events between May 2004 and September 2009. Not all of the monitoring locations included in this discussion were sampled during every event due to varying installation times. MMW004 was installed in 2004 and groundwater samples have been collected 10 times from it during the 2004 to 2009 time period. This well has the longest history of monitoring at the Site. Groundwater samples collected from the monitoring wells have been analyzed for total and dissolved metals, and general chemistry parameters, as discussed above in Section 3.3.4.1. The results of the groundwater analyses are summarized in Table 3-27, which includes only those analytes that were detected above their respective regulatory screening values (referenced in Section 3.3.4.1). The constituents that exceeded applicable screening values in groundwater are:

- Aluminum, total
- Cadmium, total and dissolved
- Iron, total and dissolved
- Manganese, total and dissolved
- Zinc, total
- pH
- TDS
- Sulfate

Similar to the Ballard Mine, aluminum, iron, and manganese exceedances in groundwater samples collected from monitoring wells at the Henry Mine appear to be the result of elevated background concentrations in the shallow groundwater, as well as groundwater contained in the Dinwoody and Wells formations. Elevated concentrations of these metals in groundwater appear not to be an indicator of mine-related groundwater impacts. There is not a good association between elevated levels of aluminum, iron, and manganese and elevated selenium levels.

Total aluminum exceeded its groundwater screening value of 0.2 mg/L in three wells (MAW006, MMW011, and MMW022) with values in groundwater collected from these monitoring wells ranging from 0.223 to 4.65 mg/L. These groundwater exceedances often were reported during a single groundwater sampling event in each well, except for MMW022, in which aluminum has been detected in groundwater above its screening value in two out of three sampling events. The dissolved aluminum concentration detected in groundwater collected and analyzed from these three wells range from not detected to 0.05 mg/L. The difference between the total and dissolved values suggests that the aluminum is associated with clay minerals suspended in the water.

Total iron detected in groundwater exceeded its groundwater screening value of 0.3 mg/L in ten wells (MAW004, MAW006, MAW007, MMW004, MMW010, MMW011, MMW014, MMW023, MPW022, and MPW023) with reported concentrations ranging from 0.32 to 8.06 mg/L. The highest total iron exceedances in groundwater were generally reported in agricultural or production wells and could be associated with steel casing corrosion. However, MMW023, screened in the Wells Formation, reported total iron concentrations in groundwater ranging from 0.61 to 4.97 mg/L. Typically, groundwater samples collected from the wells that have total iron exceedances do not have elevated dissolved iron concentrations in the same samples. Dissolved iron concentrations in groundwater exceeded 0.3 mg/L in five wells (MAW004, MAW007, MMW004, MMW023, and MPW022) and ranged from 0.417 to 4.37 mg/L. MMW004 reported a dissolved iron concentration in groundwater of 0.417 mg/L in June 2005 but was not analyzed for total iron during the same sampling event.

Total manganese exceeded its groundwater screening value of 0.05 mg/L in ten wells (MAW004, MAW006, MAW007, MDW003, MMW010, MMW011, MMW014, MMW022, MMW023, and MPW023) with values above the screening value from 0.0741 to 3.39 mg/L. Dissolved manganese in groundwater exceeded 0.05 mg/L in nine of these wells. In MPW022, dissolved manganese in groundwater collected from this well was above the groundwater screening value of 0.05 mg/L during two sampling events (October 2005 and May 2006). However, groundwater sampled from this monitoring well had non-detected total manganese during the October 2005 event. This comparison cannot be made for the May 2006 groundwater sampling event because the sample was not analyzed for total manganese in May 2006. Similar to the aluminum and iron exceedances in groundwater discussed above, the manganese exceedances in groundwater occurs in all wells from all hydrostratigraphic systems and does not appear to be correlated with selenium concentrations.

Total and dissolved cadmium in groundwater both slightly exceed the groundwater screening value of 0.005 mg/L in one well (MMW010) during the October 2008 sampling event. During that October event, total cadmium concentration was 0.00529 mg/L and dissolved cadmium concentration was 0.00544 mg/L in the groundwater collected and analyzed from this monitoring well. Two previous sampling events did not report an exceedance for cadmium and total cadmium in groundwater (the concentrations were 0.0001 and 0.0021 mg/L). Monitoring well MMW010 has not been sampled for cadmium since the fall of 2008.

Production well MPW022 reported one sampling event where the pH in groundwater collected from this well exceeded the upper end of the secondary standard. This well reported a groundwater pH of 8.7 in May 2008 compared to the standard range of 6.5 to 8.5. Groundwater collected during four other sampling events reported pH concentrations ranging from 7.7 to 8.5.

Zinc has been reported above the groundwater screening level in October 2005 at MMW004 and MPW022. These zinc concentrations are several orders of magnitude greater than other wells and appear to be incorrect. These data will be further evaluated.

TDS exceeded its groundwater screening value of 500 mg/L in eight wells (MAW004, MDW005, MMW004, MMW010, MMW014, MMW019, MMW022, and MMW023) which had concentrations ranging from 514 to 1,770 mg/L. The highest TDS concentrations were reported in groundwater samples collected from MMW010, which also had elevated selenium concentrations. The groundwater TDS exceedances in this well ranged from 940 to 1,770 mg/L with four of five sampling events reporting an exceedance of the groundwater screening value. Groundwater samples collected at three other wells, MMW014, MMW022, MMW023, reported elevated concentrations of TDS, but low concentrations of total selenium (below the groundwater screening value). These three wells are screened in the shallow alluvium (MMW014), Dinwoody Formation (MMW022), and Wells Formation (MMW023). The agricultural well, MAW004, and domestic water well, MDW005, reported TDS concentrations in groundwater of 680 and 550 mg/L, respectively.

Sulfate exceeded its groundwater screening value of 250 mg/L in two wells (MMW010 and MMW022) with values ranging from 260 to 740 mg/L. MMW010 screened in the alluvium, consistently exhibits elevated total selenium and TDS concentrations in groundwater collected from this well as discussed above. The sulfate values in groundwater collected from MMW010 ranged from 367 to 740 mg/L during four of its five sampling events. Monitoring well MMW022 had a single exceedance of sulfate in groundwater during the spring of 2008 when its associated total selenium concentration was 0.017 mg/L.

3.3.5 Aquatic Biota

A variety of aquatic biological-chemical data were collected during the pre- and post-2004 investigation periods (see Drawings 3-20 and 3-21) at the Sites that will be evaluated, as necessary, during the upcoming RI/FS. These historic aquatic data include (1) stream habitat assessments, (2) fish data, and (3) benthic macroinvertebrate data. The aquatic data specifically collected in and around the Henry Mine are summarized below.

3.3.5.1 Stream Habitat Assessment

As described in Section 3.2.5.1 for the Ballard Mine, a stream habitat assessment was conducted in May 2004 on streams influenced by the P4 Sites with the objective of developing a predictive model that would differentiate stream habitat that supports fish from stream habitat that does not support fish. These results are reported in *Draft - Interim Phase I SIs Evaluation Summary* (MWH, 2007g) and summarized below.

Table 3-28 presents the RBS (maximum of 200 points) and fish presence at the Henry Mine area stream stations. To help understand the relationship between RBS and fish presence, also shown are surface water and sediment selenium concentrations from the corresponding sampling events. Of the 20 stations that were assessed, 10 of the stations either observed or presumed fish presence as shown in the Table 3-28. The rapid bioassessment scores from stations that reported fish ranged from 52 to 151. The rapid bioassessment scores from stations that presumed fish ranged from 31 to 139 and stations that did not observe fish ranged from 7 to 56. Four of 20 stations were either regional or mine-specific background locations and two mine-specific background locations, MST048 and MST276, reported scores of 151 and 56, respectively. The two regional background stations reported a score of 139 for MST049 and a score of 103 for MST254.

3.3.5.2 Fish

Fish samples were collected from five surface stream locations (i.e., surface water stations) in 2004 to evaluate impacts of Site contaminants on fish in area streams. Samples were analyzed for several analytes: cadmium, nickel, selenium, vanadium, and zinc. Results of this investigation are included in the *Draft - Interim Phase I SIs Evaluation Summary* (MWH, 2007g). SWDs from the 2004 fish sampling event and historical selenium results tables are presented in Figures 3-33 to 3-37 and Table 3-29 at the end of Section 3.0. The SWDs, Figures 3-33 to 3-37, graphically illustrate analyte concentrations in forage fish and salmonids found in streams on the Site. The RBS (see Section 3.2.5) is also provided for each station on the fish SWDs.

As shown in the SWDs, few forage fish, and no salmonids, were obtained from the sampling stations emanating from the Henry Mine. However, as the RBS indicates, this is most likely due to the poor fish habitat at these stations.

Table 3-29 presents the selenium concentrations found in forage fish in streams emanating from the Henry Mine. Forage fish were collected at six stations near the Henry Mine in 2004 (MWH, 2007g) and were analyzed for total selenium. The concentrations of selenium ranged from 2.4 to 6.1 mg/kg dw. The data reported for the other analytes of interest from these six stations are summarized below:

- Cadmium concentrations ranged from 0.1 to 0.18 mg/kg dw
- Nickel concentrations from 2.6 to 24 mg/kg dw
- Vanadium concentrations ranged from 0.41 to 0.95 mg/kg dw
- Zinc concentrations ranged from 160 to 230 mg/kg dw

3.3.5.3 Benthic Macroinvertebrates

This section presents the nature and extent of analytes in benthic macroinvertebrates at the Henry Mine. Benthic macroinvertebrate samples were collected from 23 stream locations (i.e., surface water stations) during the 2004 sampling event to evaluate potential Site contaminant impacts on benthic macroinvertebrates in the area streams. The benthic macroinvertebrates samples were analyzed for selenium and the results of this monitoring event are presented in the *Draft - Interim Phase I SIs Evaluation Summary* (MWH, 2007g). The selenium SWD from the 2004 benthic macroinvertebrate sampling event (see Figure 3-38) and historical selenium results are presented in Table 3-30 at the end of Section 3.0. Many of the benthic samples collected during 2004 had high MDLs as a result of low sample volumes (i.e., low numbers of macroinvertebrates), which are probably due to insufficient habitat as indicated by the stream habitat assessment and as a result of sample dilution in the laboratory. As discussed earlier (with regard to fish), these are intermittent streams that during most years are completely dry by late summer so the numbers of macroinvertebrates would be expected to be low. The samples with high MDLs were censored at one-half the MDLs and are denoted with solid red circles on the SWD. Thus, while these samples appear

to be elevated, they are in fact non-detected concentrations and the elevated method detection limits constrain the utility of the data. Refer to Drawing 3-21, which depicts the locations of where these samples were collected and their concentrations.

Table 3-30 presents selenium concentrations found in benthic macroinvertebrates in streams in the vicinity of the Henry Mine. Of the 23 results, 20 of the results are flagged as non-detect with MDLs ranging from 1.3 to 130 mg/kg dw. Station MST057 reported a selenium concentration of 6.2 mg/kg dw, and MST049 at 3.8 mg/kg dw. Station MST276 reported a selenium concentration of 2.9 mg/kg dw.

3.3.6 Terrestrial Biota

A variety of biological-chemical data are available from pre-2004 as shown on Drawing 3-22. This includes the elk tissue, bird egg, and cattle biotic data. These data may be uniquely useful in the human and ecological risk assessments and are, therefore, considered separately in the discussion below. Data also are available for other media, including various small mammals and terrestrial invertebrates. The results for the elk tissue and bird egg data are not unique to a particular mine. These area-wide terrestrial data are presented once, in Section 3.2.6. The cattle biotic data were collected at the Henry Mine and are summarized below. Detailed information on the elk tissue, bird egg, and cattle tissue data are found in the *DQUR/DAR* (MWH, 2010a).

3.3.6.1 Elk

Refer to Section 3.2.6 for discussion of elk biotic data at the Sites.

3.3.6.2 Bird Eggs

Refer to Section 3.2.6 for discussion of the bird egg biotic data at the Sites.

3.3.6.3 Cattle

In 1997, the IMA formed a Selenium Committee to identify the sources and extent of selenium and other trace element impacts associated with phosphate mining. In order to

provide quantitative selenium data that could be used to refine the human health risk assessment, the Selenium Committee expanded an existing cattle grazing study that was being conducted on reclaimed overburden dumps at the Henry Mine by Monsanto, IDL, and the University of Idaho. During the last three years of the grazing study, beginning in 1997, the scope was expanded to include characterization of selenium levels in dump surface soil and vegetation, and in the last two years (1999-2000) included steer blood and serum sampling. During the summer of 1999, blood and serum samples were obtained just before the steers were exposed to the reclaimed pasture, at three-week intervals while on the pasture, and immediately upon removal from the Henry Mine pasture. Soil and vegetation within the pastures were also sampled for selenium. The grazing study was conducted during a 9-week period in the summer and employed a common grazing rotation for montane pastures in and near the Caribou National Forest. Three separate, fenced pastures were grazed by three groups of yearling steers.

Because of the magnitude of uncertainties associated with the beef ingestion component of the Selenium Committee's preliminary human health risk assessment (MW, 1999), the Selenium Committee purchased 20 steers to conduct a selenium depuration study. Fifteen of the steers were animals used in the grazing study, with five randomly selected from each of the three reclaimed, seleniferous pastures. Another five steers were randomly selected from a native, undisturbed, non-seleniferous pasture. The depuration investigation was conducted under conditions that simulated the normal handling of steers as they are prepared for market. The steers were pastured for one-month on lowland (low-seleniferous) pasture after removal from the Henry Mine pastures followed by four months in a feedlot consuming a diet containing selenium in a concentration of 0.3 mg/kg (wet, but air-dried; the maximum concentration of selenium allowed under feedlot regulations).

The primary objectives of the Selenium Committee's beef depuration study were:

- To determine whether selenium levels in beef tissues from steers exposed, under relatively worst-case conditions, to pasture affected by phosphate mining are elevated and, if so, to what degree

- To characterize levels of selenium in skeletal muscle and other soft tissues (liver, heart, and kidney) to reduce uncertainties estimated in the preliminary human health risk assessment
- To estimate the rate of depuration (removal) of selenium from beef tissue to reduce uncertainties quantified in the preliminary human health risk assessment

A secondary objective was to use information obtained to evaluate the potential for health effects to the steers themselves and, by extrapolation, to other grazing cattle and wildlife.

Further discussion, the sampling protocol and the resulting data of the depuration study portion of the investigation are both presented in the *1999 Interim Investigation Data Report* (MW, 2000). Cattle tissue concentrations and grazing locations can be found on Drawing 3-22.

No applicable regulatory screening levels have been identified at this time for comparison to the cattle data. These data will be applied and used for the human health and ecological risk process as part of the risk assessment appendix (Appendix C) to this Work Plan as delineated by the *DQUR/DAR* (MWH, 2010a) provided in Appendix B. Soil, vegetation, blood, and blood serum data have also been obtained from the University of Idaho laboratory as discussed and presented in the *DQUR/DAR* (MWH, 2010a). These data will be available for the RI and risk assessment as needed and/or appropriate.

3.3.6.4 Small Mammals

This section presents the nature and extent of analytes in small mammals at the Henry Mine. In 2001, small mammals were sampled (least chipmunk and deer mice) at upland and riparian locations to evaluate potential impacts by mine waste rock dumps, and possible surface water and sediment contamination, on small mammals. Least chipmunk and deer mice samples were collected at three quadrats on waste rock dump MWD086 at the Henry Mine and at one stream station riparian area (MST049) in September 2001. Selenium results are listed in Table 3-31 and are shown on Drawing 3-37. Complete analytical results of this investigation are included in the *Summer 2001 Area-Wide Investigation Data Summary* (MWH, 2002e).

As shown in Table 3-31, small mammal samples were collected from three quadrats on MWD086 and from the riparian area at MST049 in September 2001. Deer mice were collected at the three locations on MWD086 and one deer mouse and two least chipmunks were collected at MST049. Concentrations ranged from 0.26 to 0.55 mg/kg dw at MST049 and 2.0 to 2.6 mg/kg dw on MWD086.

No applicable regulatory screening levels have been identified at this time for comparison to the small mammal data. The use of these data are limited as indicated in the *DQUR/DAR* (MWH, 2010a). However, the data's existence is noted; and if the risk assessment indicates the potential need to evaluate small mammals, the data may be used in scoping a study.

3.3.6.5 Terrestrial Invertebrates

This section presents the nature and extent of analytes in terrestrial invertebrates at the Henry Mine. In 2001, insect and worm samples were collected at upland and riparian locations to evaluate potential impacts by mine waste rock dumps, and possible surface water and sediment contamination, on terrestrial invertebrates. Insects collected at the Henry Mine included lady bugs, popping bugs, spiders, flying ants, gnats, and other flying insects. Insect samples were collected at three quadrats on waste rock dump MWD086 and insect and worm samples were collected at one stream station riparian area (MST049) in September 2001. Selenium results are presented in Table 3-32 and are shown on Drawing 3-37. Complete analytical results of this investigation are included in the *Summer 2001 Area-Wide Investigation Data Summary* (MWH, 2002e).

As shown in Table 3-32, terrestrial invertebrate samples were collected from three quadrats on MWD086 and from the riparian area at MST049 in September 2001. Insects were collected at the three locations on MWD086 and concentrations of selenium ranged from 7.9 to 12 mg/kg dw. Insects and worms were sampled at MST049 with concentrations of selenium 0.67 mg/kg dw and 21 mg/kg dw, respectively.

No applicable regulatory levels have been identified at this time for screening of this terrestrial invertebrate data. The use of these data is limited as indicated in the *DQUR/DAR*

(MWH, 2010a). However, the data's existence is noted; and if the risk assessment indicates the potential need to evaluate terrestrial invertebrates, the data may be used to scope a study.

3.3.7 Henry Mine Summary

This section provides a summary of the historic data gathered for the Henry Mine as discussed in the subsection above in order to help identify any remaining data gaps. Based on this section, a data gaps analysis for each Site is presented in Section 4.0 that will serve as the basis for future RI/FS investigations. A summary of the sample locations, analyte lists, and investigation results for all the media investigated at the Henry Mine are presented in Table 3-33. The key findings or conclusions for each media at the Site are further summarized below.

3.3.7.1 Soils

Surface soils characterization at the Henry Mine has been performed for upland and riparian soils during several investigations since 2004. These investigations included:

- Mass wasting investigation (summer 2004) – 52 samples
- Supplemental waste rock dump and facility soil characterization (summer 2009) – 70 samples
- Riparian habitat assessment (summer 2004) – 35 samples

The key findings from these soil investigations, including analytes that were elevated in soil above relevant screening levels and/or investigation-specific preliminary background values are:

- The 2004 and 2009 soil investigations reported isolated areas of elevated cadmium, manganese, and vanadium in soil when compared to screening levels and background on the mine waste dumps and the haul road.
- The 2004 and 2009 soil investigations reported elevated arsenic in soil when compared to the screening level and background primarily on mine waste dumps and the haul road.

- The 2004 and 2009 soil investigations reported selenium elevated in soil above the background area, but below screening levels, primarily on mine waste dumps and the haul road.
- Total uranium concentrations do not exceed screening levels based on chemical risks; however, radiogenic risks may be present and based on the A/Ts request will be evaluated in the risk assessment. Data on uranium daughter products have not been collected, but will be important in reducing uncertainty in the risk assessment specifically for uranium and uranium daughter products.
- Where off-dump soil transport has occurred (mass wasting), concentrations of contaminants in soil do not immediately drop below screening or preliminary background levels for soil and vegetation. Off-dump transport typically is not evident where the dump boundary is located uphill and transport has not occurred.
- Arsenic and manganese are elevated in soil above the residential screening levels in the 2009 background area. Evaluation of existing soil and vegetation background needs to be conducted during the RI/FS process.

Based on evaluation of data at the Henry Mine, the nature and extent of surface soil impacts at the Henry Mine has been defined adequately with the exception of the radionuclides in on-site soils. Further assessment of the soil background needs to be conducted for radionuclides and possibly other COPCs so that the entire area disturbed by the mining operation is evaluated appropriately (i.e., appropriate inputs) in the risk assessment and the FS. As a result, limited further field characterization of soil is necessary at this time both on site and in a background location. As further data evaluation is performed during the RI/FS, the need for additional characterization will be reassessed and, if necessary, performed.

3.3.7.2 Vegetation

Vegetation characterization at the Henry Mine has been performed for upland vegetation during four primary investigations since 2004. These investigations are:

- Mass wasting investigation (summer 2004) – 52 samples
- Seasonal vegetation assessment (summer and fall 2004) – 6 samples
- Supplemental waste rock dump and facility characterization (summer and fall of 2009) – 170 samples

- Riparian habitat assessment (summer of 2004) – 35 samples

The key findings from the vegetation sampling, which include a list of analytes that were elevated above screening levels and/or investigation-specific preliminary background values, are:

- The 2004 and 2009 vegetation investigations report elevated molybdenum and selenium in vegetation above screening levels throughout the mine waste dumps, mine pit areas, and to a lesser degree on the haul road.
- Where off-dump soil transport has occurred (mass wasting), concentrations of contaminants in soil and vegetation do not immediately drop below screening levels or preliminary background levels for soil and vegetation. Off-dump transport typically is not evident where the dump boundary is located uphill and transport has not occurred.

Based on evaluation of data at the Henry Mine, the nature and extent of vegetation impacts at the Henry Mine has been defined adequately so that, if necessary, risk assessments and the FS can be conducted. As a result, no further field characterization is necessary at this time. As further data evaluation is performed during the RI/FS, the need for additional characterization will be reassessed and, if necessary, performed.

3.3.7.3 Surface Water and Sediment

Surface water monitoring has occurred primarily in the spring and fall at the Henry Mine area since 1997 with 31 stations used to evaluate potential impacts to surface water/sediment in the area from the activities at the Site. The key findings from the surface water and sediment sampling conducted at the Ballard Mine are:

- Semi-annual surface water monitoring indicates that selenium and other analyte concentrations in downstream locations are generally below surface water screening levels and preliminary background levels; the exception is Lone Pine Creek and its tributaries, which generally exceeded the selenium surface water screening level (IDEQ CCC aquatic life standard), but only during spring runoff.
- Historic surface water collected from streams, seeps, springs and ponds reported isolated exceedances of applicable surface water screening levels for aluminum, barium, boron, cadmium, iron, manganese, nickel, thallium, vanadium, and zinc (primarily in seeps, springs and ponds).

- Dump seeps, springs, and ponds exhibited a greater number of analytes in surface water that are elevated above the applicable screening levels compared to downstream stream locations.
- Surface water monitoring in seeps, springs, and ponds indicates that total selenium concentrations in water collected from these locations are generally above preliminary background levels and often exceed the selenium screening level (i.e., the IDEQ CCC aquatic life standard).
- Concentrations in surface water are typically higher for all constituents during spring sampling events when compared to fall sampling events.

Sediment sampling has occurred at the Henry Mine area from 1998 to 2004 through the sampling of 29 stations to evaluate potential impacts to sediments in the area from activities on the Site. Sediment sampling stations were located on streams, waste rock dump seeps, springs, and ponds. The key findings of the sediment sampling, including a list of analytes that were elevated above screening levels and/or preliminary background values, are:

- Historic sediment samples collected from seeps, springs, ponds and downstream stream locations frequently exceed the sediment screening levels for cadmium, chromium, nickel, selenium and vanadium.
- Sediment samples collected from stream locations commonly are elevated in cadmium, and to a much lesser extent nickel, selenium, and zinc.
- Selenium concentrations in sediments appear to be positively correlated with surface water selenium concentrations.
- A comparison among the data sets for sediments, soils, and surface water reveals that the historic sediment samples were analyzed for specific, but limited, analytes. For example, arsenic was not reported in sediment samples, but it is detected, and in some cases occurred at levels above relevant screening levels, in nearby soil samples.

The nature and extent of surface water impacts at the Henry Mine has been defined adequately so that, if necessary, risk assessments and the FS can be conducted. As a result, no further field characterization of surface water is necessary at this time. As further data evaluation is performed during the RI/FS, the need for additional characterization will be reassessed and, if necessary, performed. Ongoing surface water monitoring is necessary to establish a baseline to judge the effectiveness of potential future remedies.

Based on the summary information presented above, the spatial characterization of sediment impacts at the Henry Mine has been defined adequately so that, if necessary, risk assessments and the FS can be conducted. A data gap relating to COPC coverage in sediments has been identified and is further discussed in Section 4.0. Additional investigations of surface water, sediment, and riparian soils were conducted in fall 2010 to address these data gaps. The results will be reported in the RI report that will be prepared for each Site.

3.3.7.4 Groundwater

Groundwater monitoring has occurred primarily between 2007 and 2009 at the Henry Mine with 16 wells (including monitoring wells, production wells, agricultural wells, and domestic water wells) and several direct push boreholes being used to evaluate potential Site impacts to groundwater. The key findings from the groundwater sampling, which includes a list of analytes detected in groundwater that are elevated above their groundwater screening levels, are:

- Groundwater samples from isolated monitoring wells contained concentrations of cadmium above the screening levels.
- Aluminum, iron and manganese frequently exceed their groundwater screening levels in monitoring wells (and other well types listed above); however, exceedances often occurred in wells outside of Site-impacted areas. As a result, as discussed in Section 3.3.4.2, it appears that aluminum, iron and manganese are naturally elevated in the region.
- Selenium, sulfate and TDS exceed their groundwater screening levels in several monitoring wells, primarily alluvial groundwater wells. These analytes appear to be indicators of Site-related impacts.
- The local alluvial groundwater system was evaluated in two general areas at the Henry Mine. These areas primarily are located in shallow alluvial sediments: (1) near the north and central Henry mine pits near the Little Blackfoot River; and (2) near the south pit in the headwater areas of Lone Pine and Long Valley Creeks. Selenium in groundwater exceeds its screening level in the alluvial systems. However, groundwater selenium exceedances are limited to areas adjacent to waste rock. An area in the southern portion of the mine needs limited further characterization as described in Section 4.0, because groundwater exceeds the DELB value defined as part of the direct push investigation. However, the locations did not exceed the groundwater screening value for total selenium.

- Total selenium has been detected in groundwater collected from monitoring wells installed in the Dinwoody and Wells formations, but does not exceed its screening level.

Based on the groundwater data, the nature and extent for groundwater at the Henry Mine has been defined except for limited alluvial areas as discussed in Section 4.0 Data Gaps.

3.3.7.5 Aquatic Biota

A variety of aquatic biological-chemical data were collected during the pre- and post-2004 investigation periods at the Henry Mine. These historic aquatic data are (1) stream habitat assessments. (2) fish data, and (3) benthic macroinvertebrate data. The key findings for aquatic biota are as follows:

- Based on the 20 stations that were evaluated during the stream habitat assessment at the Henry Mine, the rapid bioassessment scores (RBS) ranged between 31 and 151 out of 200. The two mine-specific background locations, MST048 and MST276, reported scores of 151 and 56, respectively. The regional background stations reported a score of 139 for MST049 and a score of 103 for MST254.

- Forage fish were collected from six stations. No salmonid fish were collected. The only elevated concentration for any of the analytes was observed at MST043 on the Little Blackfoot River where forage fish were elevated in selenium.

- A total of 23 macroinvertebrate samples were collected and analyzed. Many of the benthic samples collected during 2004 (20 of 23) had high MDLs ranging from 1.3 to 130 mg/kg dw as a result of low sample volumes (i.e., low numbers of macroinvertebrates), which are probably due to insufficient habitat as indicated by the stream habitat assessment and as a result of sample dilution in the laboratory. Station MST057 reported a selenium concentration of 6.2 mg/kg dw and MST049 at 3.8 mg/kg dw. Station MST276 reported a selenium concentration of 2.9 mg/kg dw.

Nature and extent information for aquatic tissue data at the Henry Mine is adequate for their intended purpose as additional lines of evidence in the human health and/or ecological risk assessment. The potential need for additional sampling of this media will be evaluated pending results of the risk assessment for the P4 mines.

3.3.7.6 Terrestrial Biota

A variety of biological-chemical data are available from the pre-2004 period. This includes the elk tissue, bird egg, and cattle biotic tissue data. No applicable regulatory screening levels or standards have been identified at this time for comparison to the elk tissue, bird egg, and cattle biotic data. These data will be used during the RI/FS as described in the *DQUR/DAR* (MWH, 2010a). Data also are available for two other media: small mammals and terrestrial invertebrates. At this time, the use of the small mammals and terrestrial data are limited as indicated in the *DQUR/DAR* (MWH, 2010a). The data's existence is noted and if risk assessment indicates the potential need to evaluate small mammals, the data may be used in scoping a study. A summary of the terrestrial biota is as follows:

- Area wide skeletal muscle and liver tissue samples were collected from elk at check stations and analyzed for cadmium and selenium in 1999 and in 2000. A total of 160 elk were collected in 1999 and analyzed for selenium only. A total of 54 elk were collected in 2000 and analyzed for selenium in addition to other parameters.

- Area wide bird egg data were collected in 1999, 2000, and 2001. Bird eggs were analyzed for cadmium and selenium in 1999 and 2000 with a total of 215 and 334 bird eggs sampled in these two years, respectively. In 2001, 369 bird eggs were sampled and analyzed for selenium only.

- A multi-year, cattle-grazing study was performed at Henry Mine. Blood and serum samples were obtained from steers while on before, during, and after pasture. As well under conditions that simulated the normal handling of steers as they are prepared for market. Tissue samples were obtained as well as related soil and vegetations samples.

- In 2001, small mammals were collected from three areas from one waste dump and from the riparian area. Deer mice were collected at the three locations on the waste dump and one deer mouse and two least chipmunks were collected at from the riparian stations.

- Insects, which included lady bugs, popping bugs, spiders, flying ants, gnats, and other flying insects, were collected at three areas on waste rock dump and from one riparian station in 2001. Insects were collected at the three locations on the waste dump. Insects and worms were sampled at the riparian station.

Nature and extent information for terrestrial tissue data at the Henry Mine is adequate for their intended purpose as additional lines of evidence in the human health and/or ecological

risk assessment. The potential need for additional sampling of this media will be evaluated pending results of the risk assessment for the P4 mines.

3.4 Enoch Valley Mine – Nature and Extent of Contamination by Media

The following subsections present the nature and extent of contamination detected in the various media that have been sampled at the Enoch Valley Mine. In each of the subsections, historical data for primary and secondary media are summarized in tables and the discussions are aided through the use of figures and drawings. For each primary medium, preliminary screening levels (values) presented in Table 3-1 are a combination of the most conservative of promulgated standards used in human and ecological risk assessment, as well as study-specific background values. These screening levels are used to evaluate the concentration of each constituent in each medium. The screening levels presented in Table 3-1 and medium-specific summary tables discussed below are consistent with the human health and ecological screening criteria that will be used during the Site risk assessments as described in Appendix C of this RI/FS Work Plan.

Note that these screening levels and preliminary background values are used to facilitate the discussion of nature and extent and are not to be considered final remediation goals or background values. The preliminary background values cited in the discussion in Section 3.4 were reported in the Interim Phase I SIs Evaluation Summary (MWH, 2007g) or were based on the 2009 soil and vegetation investigation further discussed in Sections 3.4.1.2 and 3.4.2.3. Media-specific background values need to be further evaluated during the RI/FS process as discussed in Section 4.0.

The term "analytes of interest" often is discussed in individual sections by medium (e.g., soil, groundwater) where these analytes are compared to the screening levels and background values. Specific analytes of interest were selected because:

(1) Typically elevated in the source materials (i.e., waste rock)

(2) Discussed in historical studies where a specific subset of analytes was selected for analysis and spatial wire diagrams were developed for certain analytes (e.g., aluminum, cadmium, iron, nickel, selenium, vanadium, and zinc) to evaluate spatial and temporal concentration trends

(3) Frequently exceeding relevant screening standards presented in Table 3-1 and are in this Work Plan's summary tables

(4) Often primary human health or ecological risk drivers

In future RI and risk assessment reports, the use of this term will most likely be replaced by other similar terms such as COPCs, COPECs, and COCs.

3.4.1 Soils

Surface soils characterization at the Enoch Valley Mine has been performed for upland and riparian soils during several investigations since 2004. These investigations include (1) the mass wasting investigation in the summer of 2004, (2) the supplemental waste rock dump and facility soil characterization in the summer of 2009 and (3) the riparian habitat assessment in the summer of 2004. Each of these investigations is summarized below. As described in Section 3.2.1, soil concentrations were compared to preliminary screening levels shown in Table 3-1 or to preliminary background concentration. Exceedances of the preliminary screening values for soil samples collected in the Enoch Valley Mine area are presented in Table 3-34. Soil sample locations for pre-2004 area-wide investigations and selenium concentrations in soil are presented on Drawing 3-1. Sampling locations and selenium results for pre-2004 soil and vegetation investigations for Enoch Valley Mine are shown on Drawing 3-38. The relatively extensive data set presented on Drawing 3-38 has largely been superseded by the data collected in 2009. The existence of these data is recognized and may be of use during the RI. However, as described in the *DQUR/DAR* (MWH, 2010a) their use during the RI/FS likely will be limited, and they are not discussed further here.

3.4.1.1 Waste Dump Soil Characterization – Mass Wasting Investigation

A reconnaissance of waste rock dumps at Enoch Valley Mine was performed in June 2004 to identify and map existing and potential mass wasting areas along dump boundaries. Four impacted areas were identified and one of the areas (i.e., MWD091) was randomly selected for sampling related to the mass wasting investigation. One control area on mine waste rock dump MWD091 was chosen for comparison. The control site was selected due to the off-dump portion of the potential transect sloping uphill, thus allowing little or no potential for off-dump transport. Two downward sloping 150-foot transects, 12.5 feet apart, were set up at these areas perpendicular to the dump boundary. Transects began on-dump and crossed the dump boundary and continued off-dump onto native land. Thirteen co-located soil and vegetation samples were collected along each transect and were analyzed for selenium only. These data were originally reported in the *Draft - Interim Phase I SIs Evaluation Summary* (MWH, 2007g). Transect locations and sampling results for this investigation at the Enoch Valley Mine are presented on Drawings 3-39 and 3-40.

This task is discussed in conjunction with the waste rock dump vegetation characterization in Section 3.4.2 below because the data were evaluated together. The discussion for both of these activities is only presented in this section.

Figures 3-46 and 3-47 contain line-plots of the co-located soil and vegetation results along the transects. The soil and vegetation selenium preliminary background concentrations are plotted on the graphs.

Figure 3-46 suggests that off-dump transport is not occurring at the control transects on MWD091. As expected for a control site, the soil and vegetation results on the dump are elevated above the preliminary background concentrations, estimated at the time of the study, and drop below background levels near the border of the waste rock dump. The off-dump portion of these transects were located on undisturbed land uphill of the actual mine dump so there was little chance of transport to occur. Most of the soil results (depicted on Figure 3-46) are elevated above preliminary background on the waste rock dump and drop below preliminary background levels before the border of the waste rock dump, indicating

that no off-dump (uphill) transport has occurred, as one would expect. The vegetation concentrations begin above background at the beginning of the on-dump end of the transect and decrease to below background before the border, indicating that no off-dump transport has occurred. The vegetation samples collected had selenium concentrations ranging from not detected at 0.25 (or ½ of the method detection limit of 0.50 mg/kg dw) to 16 mg/kg dw, and soil selenium concentrations ranging from not detected concentrations at 0.25 to 140 mg/kg dw.

Figure 3-47 suggests that off-dump transport also is not occurring at transects on MWD091 where mass wasting and downslope transport of soil containing selenium could occur. All of the vegetation concentrations are below preliminary background. Soil concentrations appear steady all along the transects with one preliminary background exceedance of 9.7 mg/kg dw at the beginning of the on-dump end of the transect. Vegetation samples were all not detected concentrations at 0.25 mg/kg dw (or ½ of the detection limit of 0.50 mg/kg dw) and soil concentrations ranged from not detected at 0.25 to 9.7 mg/kg dw.

These data, including background, will be re-evaluated during the RI because additional soil and vegetation data has been collected since 2004.

3.4.1.2 Waste Dump Soil Characterization – Supplemental Waste Rock Dump and Facility Soil Characterization

In June 2009, a soil survey and surface soil sampling was conducted at the Enoch Valley Mine waste rock dumps, partially backfilled pits, historic haul road and facilities, and a mine-specific background area located adjacent to the mine area. The primary objective was to characterize the nature and extent of the analytes of interest within the study boundaries. The survey and sampling results are reported in *Supplemental Soil and Vegetation Characterization Data Summary Technical Memorandum* included in Appendix A2 of this Work Plan. A brief summary of the characterization activities are provided in this section.

The soil survey was conducted prior to the sampling event as discussed for the Ballard Mine in Section 3.2.1.2. Soil sampling was conducted following the soil survey at the five Enoch

Valley Mine potential source areas (three waste rock dumps and two active facilities, the tipple area and a haul road) and background location. Drawing 3-41 shows the locations (typically a randomly selected 50-foot by 50-foot quadrat) and gives the total selenium result for each sample. A total of 51 composite surface soil samples were collected from the Enoch Valley Mine areas.

Table 3-34 presents the analyte concentration for samples that exceeded the preliminary screening levels (USEPA Regional Screening Levels for Residential Soil). Based upon this table, the following analytes from the 2009 sampling were identified as those that have at least one soil sample exceeding its preliminary screening level:

- Arsenic
- Cadmium
- Vanadium

Uranium did not exceed the EPA screening criteria based on chemical risks. However, concentrations of uranium in the Site soils were found to be high enough that the A/Ts requested evaluation of radiogenic risks associated with uranium and its daughter products in the risk assessment.

Table 3-35 summarizes the concentration ranges and number of soil samples exceeding the screening value for selenium and any analytes with one or more sample exceedance of their individual screening levels. At the Enoch Valley Mine, maximum selenium values detected in soil ranged from 39.7 mg/kg dw on active facilities to 113 mg/kg dw on the mine dumps and did not exceed the screening level of 390 mg/kg dw at any of the potential source areas. These soil selenium concentrations are elevated when compared to background, with background concentrations ranging from 0.54 to 8.63 mg/kg dw.

Concentrations of arsenic, cadmium, and vanadium in soil samples collected at the Enoch Valley Mine did exceed the screening level at one or more potential source areas; however, as shown in Table 3-35, with the exception of arsenic, the occurrences were isolated.

Arsenic concentrations in all soil samples collected from the potential source areas at the Enoch Valley Mine exceeded the screening level of 0.39 mg/kg dw. Concentrations of arsenic in soil samples ranged from 5.2 to 20.8 mg/kg dw across all source areas. Arsenic concentrations in soil samples collected at the preliminary background location ranged from 3.77 to 7.65 mg/kg dw, which suggests arsenic is naturally elevated above the screening level. Twenty of 30 soil samples collected from the waste rock dumps and six of ten soil samples collected from the active facilities exceeded the maximum Enoch Valley Mine area arsenic background concentration of 7.65 mg/kg dw. A data gap has been identified associated with background data, and supplemental arsenic data likely will be collected in a background area.

The background soil samples that were collected as part of the June 2009 soil and vegetation study were collected in areas representative of where external waste rock dumps have been placed. Not represented were the areas of mine pit and mine pit backfills found in a natural (unmined) setting. This is a significant distinction because the geology and geochemistry is known to vary significantly across these areas, and the average background COPC concentrations in soils may similarly deviate from what is represented in the June 2009 study.

3.4.1.3 Riparian Soil Characterization – Habitat Assessment of Ponds, Wetlands, and Non-Fish-Bearing Streams

In May 2004, riparian habitat assessments, including evaluation of soil, vegetation, and species assemblages, were conducted on the riparian areas associated with ponds, wetlands, and non-fish-bearing streams at the Enoch Valley Mine. The design and execution of this study are the same as those presented in Section 3.2.1.3 for the Ballard Mine. In tandem with the riparian habitat assessments, stream habitat assessments were performed at the same stream reaches. These stream habitat assessments or rapid bioassessment surveys conducted on the P4 streams used protocols established by USEPA (Barbour, et. al., 1999) to characterize the quality of the physical habitat and are discussed in Section 3.4.5.1. Data from both assessments were originally presented in the *Draft - Interim Phase I SIs Evaluation Summary* (MWH, 2007g).

Riparian soil and vegetation samples were collected for laboratory analysis in September 2004. Thirty-one stations were sampled as shown on Drawing 3-6. Vegetation was collected in 1999 at three stations on Angus Creek and was analyzed for selenium and cadmium. These data are presented in the *1999 Interim Investigation Data Report, Southeast Idaho Phosphate Resource Area Selenium Project* (MW, 2000).

The resulting data matrices for ponds and non-fish-bearing streams at the Enoch Valley Mine are presented together in Table 3-36. These tables list observed or potential species use, soil and vegetation selenium concentrations, and habitat quality rankings.

As shown in Table 3-36, the majority of the riparian habitats were of high quality. Of the 16 stations assessed, ten stations were in the highest quality ranking category and only three were in the lowest. Soil selenium concentrations ranged from 0.25 to 70 mg/kg dw and vegetation selenium concentrations ranged from 0.25 to 17 mg/kg dw.

Given the nature of these non-fish-bearing stream systems, interpreting low scores as indicative of poor quality habitat may be incorrect. Low scores more likely are indicative of a limited amount of habitat type present. Small streams simply do not generate much riparian habitat. In fact, most of the ponded streams have higher scores, which may be a function of a pond having a larger area because it is a two-dimensional, rather than one-dimensional, feature in the environment. Thus, the assessment of non-fish-bearing riparian habitats does not point to any such habitats being of poor quality due to the Site-related activities.

3.4.2 Vegetation

Vegetation characterization at the Enoch Valley has been performed for upland vegetation during four primary investigations since 2004. These investigations are (1) the mass wasting investigation in the summer of 2004, (2) the seasonal vegetation assessment in summer and fall of 2004, (3) the supplemental waste rock dump and facility characterization in the summer and fall of 2009, and (4) the riparian habitat assessment in the summer of 2004. The mass wasting and riparian habitat investigations included soil and vegetation samples;

since these data are evaluated together, the discussion for vegetation is included in Section 3.4.1. The other two investigations are summarized below.

Analytes detected in vegetation were compared to preliminary screening levels referenced from mineral tolerance of animals (NRC, 2005) as shown in Table 3-1 or to preliminary background concentration determined for the various investigations. Exceedances of the preliminary screening values for vegetation are presented in Table 3-37. Vegetation sample locations for pre-2004 area-wide investigations and selenium concentrations in soil are presented on Drawing 3-1. Sample locations and selenium results for pre-2004 vegetation investigations at the Enoch Valley Mine are shown on Drawing 3-38. The relatively extensive data set presented on Drawing 3-38 has been largely superseded by the data collected in 2009. The existence of these data is recognized and the data may be of some use during the RI and as described in the *DQUR/DAR* (MWH, 2010a); their use during the RI/FS likely will be limited, and they are not discussed further here.

3.4.2.1 Waste Dump Vegetation Characterization – Mass Wasting Investigation

Refer to 3.4.1 for discussion of the vegetation results during the mass wasting investigation at the Enoch Valley Mine.

3.4.2.2 Waste Dump Vegetation Characterization – Seasonal Vegetation Investigation

Monthly composite vegetation data were collected at one quadrat on MWD091 at the Enoch Valley Mine from May to October 2004. The purpose of this investigation was to determine if there are any seasonal differences of selenium concentrations in upland vegetation growing on waste rock dumps. Samples were analyzed for selenium only from a combination of old and new growth in the quadrat. These data were originally presented and discussed in the *Draft - Interim Phase I SIs Evaluation Summary* (MWH, 2007g). Quadrat location and sampling results are presented on Drawing 3-40. A summary of the 2004 seasonal vegetation selenium concentrations for grasses and forbs (alfalfa) is provided in Table 3-38.

As shown in Table 3-38, the vegetation sampled in the quadrat located on MWD091 shows some monthly selenium concentration variability with a decreasing trend throughout the summer into early fall. Concentrations of selenium in vegetation ranged from 25 mg/kg dw in May to 0.80 mg/kg dw in September.

3.4.2.3 Waste Dump Vegetation Characterization – Supplemental Waste Rock Dump and Facility Vegetation Characterization

In June 2009, a vegetation survey was conducted on the Enoch Valley Mine waste rock dumps, its active facilities, and a mine-specific background area located within the mine footprint. The primary objective was to characterize the nature and extent of the analytes of interest within the study boundaries. The survey and sampling results are reported in *Supplemental Soil and Vegetation Characterization Data Summary Technical Memorandum* included in Appendix A2 of this Work Plan. A brief summary of the characterization activities are provided in this section. The sampling process and analyses are described in Section 3.2.2.3.

Vegetation sampling was conducted following the vegetation survey at the five Enoch Valley Mine potential source areas (three waste rock dumps and two active facilities, the tipple area and a haul road) and background location. Drawing 3-42 shows the locations (typically a randomly selected 50-foot by 50-foot quadrat) and gives the total selenium result for each sample. A total of 121 vegetation samples were collected from the Enoch Valley Mine area. The vegetation sampling addressed potential seasonal variations in concentration of COPCs detected in vegetation samples collected throughout the Sites, particularly in forbs (new and old growth composited). A subset of stations sampled in the spring event was re-sampled for forbs in the fall for this purpose. A brief discussion of the sample results for the composited grasses and forbs is provided below with additional details presented in Appendix A2 of this Work Plan.

Table 3-37 presents the analyte concentration for each composited vegetation sample compared to preliminary screening levels (from mineral tolerance of animals (NRC, 2005)). Analytes that exceeded the preliminary screening level are:

- Boron
- Selenium
- Molybdenum

Table 3-37 summarizes the vegetation samples exceeding the screening level for boron, selenium, and molybdenum. A boron concentration in one vegetation background sample (364 mg/kg) exceeded the screening level of 150 mg/kg. Molybdenum concentrations in these vegetation samples ranged from not detected (detection limit of 1.45) to 47.3 mg/kg dw. The highest concentrations of molybdenum were detected in vegetation samples collected on waste rock dumps. Molybdenum in the background area ranged from not detected (detection limit of 1.45) to 10.4 mg/kg dw and also exceeded the 5 mg/kg dw screening criteria. Given the similarity of the background concentrations to the other measured concentrations, the issue of an elevated background will need to be evaluated during the RI and FS reporting phases of this project.

Selenium concentration in all 2004 and 2009 samples ranged from not detected (detection limit of 0.5 mg/kg dw) to 105 mg/kg dw from all source areas. The highest selenium concentrations in vegetation were reported on the waste rock dumps, but vegetation collected and analyzed at the active facilities also had elevated selenium concentrations.

A primary objective of the 2009 supplemental sampling activities was to evaluate the concentrations of constituents in composite grass and forb samples as further described in Appendix A2. Table 3-39 provides a summary of the concentration ranges and screening level exceedances in these composite samples. As shown in this table, selenium and molybdenum were found to be elevated above screening levels in the 2009 grass/forb composite samples; and, as discussed above regarding the evaluation of all 2004 and 2009 samples, the highest concentrations were typically detected on the waste rock dumps. At the Enoch Valley Mine, concentrations of molybdenum in the grass/forb samples collected during 2009 exceeded the screening level of 5 mg/kg dw in exactly half of the waste rock dump vegetation samples and only two of seven active facility samples. Selenium concentrations in the vegetation exceeded the screening level of 5 mg/kg dw in 11 of 30

grass/forbs waste rock dump vegetation samples and only two of seven active facility vegetation samples that were collected and analyzed.

As discussed above, 2009 vegetation sampling addressed potential seasonal variation of analyte concentrations in forbs. Tables and figures within Appendix A2 provide the statistical summaries for spring and fall analyte concentrations for all of the forb samples; the data is listed in Table 3-37. Both selenium and molybdenum concentrations in the forbs appear to be increasing in the fall at background locations. Molybdenum concentrations are decreasing and selenium concentrations are increasing in the fall at a majority of the dump locations.

3.4.2.4 Riparian Vegetation Characterization

Refer to 3.4.1 for discussion of the riparian vegetation results and riparian habitat assessments at the Enoch Valley Mine.

3.4.3 Surface Water and Sediment

This section presents the nature and extent of analytes detected in surface water bodies and sediment at the Enoch Valley Mine. Surface water and sediment concentrations were compared to preliminary screening levels as discussed for each of these media below and as shown in Table 3-1 or to background concentrations determined for the various investigations. Exceedances of the preliminary screening values for surface water analytes are presented in Table 3-40. Surface water sample locations for area-wide investigations are presented on Drawing 3-8. These area-wide locations and pre-2004 and EE/CA (2004-2009) selenium concentrations are presented on Drawings 3-9 and 3-10.

3.4.3.1 Surface Water

Extensive surface water monitoring has occurred in the Enoch Valley Mine area since 1997 with 31 stations being sampled and analyzed to evaluate potential impacts to surface water from the mine activities. These stations have been sampled for several metals, cations, anions, general water quality parameters, field parameters, and flow measurements over the

period of record; the results for these monitoring events are presented in the various documents listed in Section 2.3. In addition to the reporting and evaluation of water quality data, loading analyses have been performed as described in the *Interim Phase I SIs Evaluation Summary* (MWH, 2007g). However, this section only discusses the analytes of interest that are mentioned below and only those surface water samples collected during May and September (runoff and baseflow) sampling events since monitoring began in 1997. Metals (inclusive of metalloid and non-metal cationic trace elements) concentrations in surface waters that are evaluated were based on the area-wide studies and include aluminum, cadmium, iron, nickel, selenium, vanadium, and zinc. The discussion is also supported by SWDs from 2004, 2007, and 2008 sampling events, which graphically display contaminant concentrations of flowing systems on the Site (Figures 3-3 to 3-27, and selenium time plots (Figures 3-48 and 3-49) of selected mine-specific sampling locations that were chosen because of their proximity and relevance to the Enoch Valley Mine. The 2004 surface water spatial diagrams present sediment sampling results from the concurrent sediment sampling event; these will be discussed later in this section. Drawings 3-43 and 3-44 present a map of the site stream networks with surface water sampling locations and historical selenium concentrations.

Note that not all of the historical Enoch Valley Mine surface water data are presented in this section; refer to Section 2.3 for a complete summary of historical investigations. This section only discusses the analytes of interest that are mentioned in the previous paragraph and only those samples collected during May and September (runoff and baseflow) sampling events since monitoring began in 1997.

Analyte concentrations in surface water are compared to selected screening levels for evaluation purposes as discussed in Section 3.2.3.1 and shown in Table 3.1

Surface Water Quality

Surface water in the Enoch Valley Mine area is a calcium-bicarbonate type water with pH levels ranging from 6.5 to 8.8. Semi-annual monitoring indicates that selenium concentrations generally are above background levels and sometimes exceed the IDEQ CCC aquatic life standard. However, exceedances are seasonal and generally occur during spring runoff. Many streams around the Enoch Valley Mine are runoff-derived streams (intermittent) and go dry in the height of summer when runoff ends. The Rasmussen Creek system and other tributary streams exhibit these tendencies.

The SWDs, presented as Figures 3-3 to 3-27, depict the spatial distribution of analyte concentrations around the mine (see Section 3.2.3 for a discussion of SWDs). Diagrams from both spring and fall surface water sampling events are included to illustrate the seasonal differences and indicate which streams become dry during some portion of the year. Analytical results for the Enoch Valley Mine area surface water stations are summarized in Table 3-40.

As shown on the SWDs, surface water dissolved selenium concentrations periodically exceed the surface water selenium screening criteria of 0.005 mg/L in surface water bodies around the Enoch Valley Mine as do a few other analytes. Cadmium concentrations are generally below preliminary background level of 0.00026 mg/L, but were observed to be above the variable hardness-dependent screening level in the spring of 2008 at the headwaters of the East Fork of Rasmussen Creek (MST269). Nickel concentrations detected in surface water are observed only above its preliminary background level of 0.0047 mg/L at MST144 and at MST143 (the East Fork of Rasmussen Creek) and have been found above the variable hardness-dependent screening level at the headwaters of the East Fork of Rasmussen Creek (MST269). Vanadium is not usually detected in surface water above its preliminary background concentrations of 0.0065 mg/L and has only been detected at the headwaters of the East Fork of Rasmussen Creek (MST269), in spring of 2008. Zinc has only been detected in surface water above its preliminary background level of 0.015 mg/L at MST144 in the spring of 2008, and above the variable hardness-dependent screening level at the headwaters of the East Fork of Rasmussen Creek (MST269), in spring of 2008.

Figures 3-48 and 3-49 present temporal plots of total selenium concentrations and discharges observed at two surface water sampling locations on Rasmussen Creek, MST136 and MST133, during the spring and fall seasons since 1997. MST136 was chosen because of its location at the headwaters of Rasmussen Creek, and it is a station with historically elevated analyte concentrations that emanate from the Enoch Valley Mine area. MST133 was chosen because it is the farthest downstream monitoring station on Rasmussen Creek whose elevated analyte concentrations can solely be attributed to the Enoch Valley Mine. These upstream (near-source) and downstream locations are used to spatially evaluate concentrations as well as to evaluate any correlation between surface water and sediment as discussed below.

Surface Water Results in an Upstream (Near-Source) Location - The headwaters of Rasmussen Creek (MST136) become dry every summer, so no seasonality can be determined. Based on the data collected, there does not appear to be any temporal trend and there is no apparent relationship between discharge and selenium concentration at this location. Total selenium concentrations in surface water samples collected at MST136 have been found above the screening level of 0.005 mg/L each of the six times it has been sampled in the spring or the fall. Selenium concentrations at MST 136 range from 0.007 to 0.021 mg/L.

In addition to selenium for MST136, historical spring and fall surface water data for other analytes dating back to 2002 are summarized below (see Table 3-40).

- Aluminum was analyzed in surface water collected from MST136 one time. The total aluminum concentration, 0.28 mg/L, was above its screening level of 0.087 mg/L.
- Cadmium has not been detected above the hardness-dependent screening level of 0.000870 mg/L any of the six times samples have been analyzed. Cadmium concentrations in surface water collected from MST 136 range from 0.0001 to 0.0003 mg/L.
- Iron was analyzed in surface water collected from MST136 three times and has never been observed above its screening level of 0.158 mg/L. All three samples were non-detected concentrations with the detection limit ranging from 0.02 to 0.025 mg/L.

- Nickel was analyzed in surface water collected from MST136 five times and has never been observed above its hardness-dependent screening level of 0.0966 mg/L. Nickel concentrations range from 0.002 to 0.0031 mg/L.

- Vanadium concentrations have never been found above the screening level of 0.02 mg/L at MST136 during any of the six times it has been sampled. Concentrations range from non-detect at 0.0024 to 0.0025 mg/L.

- Zinc was analyzed in surface water collected from MST136 five times and has never been observed above the hardness-dependent screening level of 0.220 mg/L. Concentrations range from non-detect at 0.002 to 0.035 mg/L.

Surface Water Results in a Downstream Location - Selenium concentrations in surface water samples collected on the lower stretch of Rasmussen Creek (MST133) have fluctuated over time. This section of the stream also becomes dry in the summer so no seasonality can be determined based on the available data. There does not appear to be any relationship between concentration and discharge. Total selenium concentrations at MST133 have been found above the screening level of 0.005 mg/L in two out of the nine times it has been sampled in the spring or the fall. Concentrations range from not detected (at <0.001) to 0.0075 mg/L.

In addition to selenium in surface water collected at MST133, historical spring and fall surface water data dating back to 1997 for other analytes of interest are summarized below (see Table 3-40).

- Aluminum has been sampled twice at MST133. Surface water concentrations were observed above the screening level of 0.087 mg/L during both events and range from 0.5 to 1.12 mg/L.

- At MST133, cadmium has not been found elevated above the hardness-dependent screening level during any of the eight times it has been sampled and analyzed in surface water collected from this location. All samples were non-detected concentrations with detect limits range from 0.0001 to 0.000125 mg/L.

- Iron has been sampled at MST133 four times and has been observed above the screening level of 0.158 mg/L two of the four times. Concentrations range from 0.034 to 0.22 mg/L.

- Nickel has been sampled at MST133 five times and has never been observed above the hardness-dependent screening level. Nickel concentrations in surface water samples range from not detected at 0.0026 to 0.0021 mg/L.

- Vanadium concentrations have not been found above the screening level of 0.02 mg/L at MST133 during any of the six events it has been sampled. Concentrations range from non-detect at 0.0002 to 0.0025 mg/L.

- Zinc has been sampled at MST133 five times and has never been observed above the hardness-dependent screening level. Zinc concentrations in surface water samples range from not detected at 0.002 to 0.007 mg/L.

Spring, Seep, and Stream Headwater Recession Analysis

In 2006, surface water discharges were measured at two springs, seeps, and stream headwaters every three weeks from May to September as part of a stream recession analysis at the Enoch Valley Mine. The study was undertaken in an attempt to model the release of water from natural storages, typically assumed to be groundwater discharge, into these channels once surface runoff ceased. Surface water discharge at two stations were measured and evaluated and are listed in Table 3-9.

A discharge plot for each of the stations monitored at the Enoch Valley Mine is depicted on Figure 3-50. Included is a table of calculated recession constants, *k*, for each station, Table 3-9. Average and final recession constants are included in this table. Further details on the study and analysis are found in the discussion for the Ballard Mine in Section 3.2.

As suggested by the recession constants in Table 3-9, both of the stations appear to be supplied flow by a groundwater source. Both MDS026 and MSG001 exhibit final recession constants above 0.99 and maintain constant discharge.

3.4.3.2 Sediment

This section presents the nature and extent of analytes detected in the sediments collected beneath surface water bodies at the Enoch Valley Mine. Extensive sediment sampling took place in the Enoch Valley Mine area from 1998 to 2004; 26 stations were sampled to evaluate potential impacts by the Site to sediments in the area. Sampling stations were at streams, waste rock dump seeps, a spring, and ponds. Sediment samples were analyzed for various metals, cations, anions, pH, and organic carbon during the period of record; and the results for these monitoring events are presented in the various tables and figures listed in

Section 2.3. Exceedances of the preliminary screening values for sediment are presented in Table 3-41. Locations and results for pre-2004 and EE/CA sediment data are shown on Drawings 3-43 and 3-44. Analyte concentrations evaluated here are based on the area-wide studies and contain cadmium, chromium, nickel, selenium, vanadium, and zinc. These were the only six analytes that were run in the laboratory during the 2004 sediment investigation. SWDs from the 2004 sediment sampling event are presented as well as selenium time plots for locations that were chosen because of their proximity and relevance to the specific mine (see Section 3.2.3 for selection rationale). The 2004 SWDs, Figures 3-3 to 3-7, graphically illustrate analyte concentrations in the sediments of flowing systems on the Site. Figures 3-51 and 3-52 show surface water selenium concentrations at the indicated location and are included in order to make correlations between surface water and sediment. Analyte concentrations in sediment are compared to selected screening levels for evaluation purposes as described in Section 3.2.3.2 and shown in Table 3-1.

Sediment Quality

As shown in the SWDs, selenium concentrations in sediment exceed the screening level at only one monitoring location at the Enoch Valley Mine (MST144). There also are two monitoring locations that are elevated above the selected background concentration on Rasmussen Creek (MST133 and MST135). These exceedances appear to coincide with surface water exceedances at the same locations.

Cadmium and nickel exceed their respective sediment screening level at every sample station at the Enoch Valley Mine. Screening levels for these metals in sediment are well below the preliminary background levels that were previously calculated for the Site. At MST130, an Enoch Valley Mine background sediment station, the sediment sample from this location also exceeds the sediment screening level for both cadmium and nickel. Vanadium concentrations in sediment were detected above the preliminary background concentration on Angus Creek (MST126), but mine-specific background concentrations of vanadium detected in sediments upstream on Angus Creek (MST130) also were above the preliminary background concentration. Zinc exceeds its sediment screening level of 98 mg/Kg on Rasmussen Creek (MST133, MST134, MST135, and MST136) and Angus Creek (MST127

and MST132). Sediments collected and analyzed from mine-specific background stations at the Enoch Valley Mine (MST129, MST130, and MST274) were observed above the zinc screening level. Sediments collected from MST130 and MST274 also exceeded their preliminary background level.

Figures 3-51 and 3-52 present sediment selenium concentrations and the coinciding surface water selenium concentrations at the Rasmussen Creek headwaters (MST136) and on a lower stretch of Rasmussen Creek (MST133) during each sediment sampling event since 1998. These upstream (near-source) and downstream locations are used to spatially evaluate concentrations as well as to evaluate any correlation between surface water and sediment as discussed below.

Sediment Results in an Upstream (Near-Source) Location - The time plot for MST136, which is located in a Rasmussen Creek headwaters area, shows that sediment selenium concentrations have been below the screening level both times it has been sampled (see Figure 3-51). The surface water concentrations suggest that there is little correlation between surface water concentrations (which are higher than the standard) and sediment selenium concentrations at this location. Selenium concentrations in sediment collected at MST136 were found below the screening level of 4.0 mg/kg both times it has been sampled at 0.7 and 1.7 mg/kg.

In addition to selenium concentrations detected in sediments collected at MST136, historical concentration of other analytes of interest in sediment data dating back to 2002 (see Table 3-41) are summarized below.

- Cadmium has been analyzed in sediment collected from MST136 on two occasions. Concentrations were detected above the cadmium screening level of 0.583 mg/kg during both events at 3.15 and 4.6 mg/kg. Even though concentrations exceeded the screening level, both were below the upstream background sediment cadmium concentration of 10 mg/kg.
- Chromium has been analyzed in sediment collected from MST136 twice and concentrations were observed above the screening level of 36.286 mg/kg on one of the two occasions. Concentrations were 25.8 and 38 mg/kg.
- Nickel has been analyzed in sediment collected from MST136 twice and was observed above the screening level of 18 mg/kg on both occasions at 23.7 and

33 mg/kg. Even though these nickel concentrations in sediment exceed the screening level, both were below the upstream background concentration of 69 mg/kg.

- Vanadium concentrations were found below the screening level of 57 mg/kg at MST136 both times it has been sampled. Concentrations were 40.4 and 53 mg/kg.

- Zinc has been analyzed in sediment collected from MST136 twice and was observed above the screening level of 98 mg/kg during both events at 101 and 160 mg/kg. Even though concentrations exceeded screening level, only one was above the preliminary background concentration of 130 mg/kg.

Sediment Results in a Downstream Location - The time plot for MST133, located downstream on Rasmussen Creek, indicates that sediment selenium concentrations have been below the screening level all three times it has been sampled (see Figure 3-52). The surface water concentrations suggest that there is little correlation between surface water and sediment selenium concentrations at this location. Selenium concentrations detected in sediment collected at MST133 were found below the screening level of 4.0 all three times it has been sampled. Concentrations ranged from a non-detect at a detection limit of 1.4 mg/kg to 2.2 mg/kg. Compared to its upstream location, MST136, selenium concentrations in MST133 were similar to slightly higher.

In addition to selenium concentrations detected in sediment samples collected at MST133, historical concentration of other analytes of interest in sediment samples collected at this location dating back to 1999 (see Table 3-41) are summarized below.

- Cadmium has been analyzed in sediment collected from MST133 three times and was detected above the screening level of 0.583 mg/kg during all three events. Concentrations ranged from 2.1 to 5.9 mg/kg. Even though concentrations exceeded the screening level, all were below the preliminary background concentration of 10 mg/kg.

- Chromium has been analyzed in sediment collected from MST133 twice and was detected below the screening level of 36.286 mg/kg on both occasions. The concentration for both events was 30 mg/kg.

- Nickel has been analyzed in sediment collected from MST133 twice and was observed above the screening level of 18 mg/kg on both occasions at 31.1 and 32 mg/kg. Even though concentrations exceeded the screening level, both were below the preliminary background concentration of 69 mg/kg.

- Vanadium concentrations were found below the screening level of 57 mg/kg at MST133 both times it has been sampled. Concentrations were 39 and 45.5 mg/kg.
- Zinc has been analyzed in sediment collected from MST133 twice and was observed above the screening level of 98 mg/kg during both events at130 and 150 mg/kg. Even though concentrations exceeded the screening level, only one was above the preliminary background concentration of 130 mg/kg.

3.4.4 Groundwater

The Enoch Valley Mine, like the Henry Mine, is developed along an anticline limb and is relatively linear running along a northwest trending exposure of the Phosphoria Formation. Ponds and seeps directly associated with the mine waste areas contain selenium concentrations at levels that suggest impacts to groundwater are possible (e.g., dump seep MDS026 has a total selenium concentration ranging from 0.006 mg/L to 0.43 mg/L from 2004 to 2009). However, groundwater wells and more distal springs indicate that impacts to groundwater do not extend much beyond the near-surface in the vicinity of the mine and waste rock facilities as indicated by Wells Formation monitoring well MMW009 and deeper alluvial system wells MMW007 and MMW008, which were all found to have total selenium concentrations of less than or equal to 0.005 mg/L between 2007 and 2009. Impacts to the groundwater system occur in localized areas near the waste rock dumps as discussed below.

Potential groundwater impacts at the Enoch Valley Mine have been investigated through the use of monitoring wells, direct push boreholes, and direct push pre-pack wells or borehole wells. The majority of these wells were installed in 2007, 2008, and 2009. These monitoring wells have been sampled during spring and fall sampling events for metals and general water quality parameters. Monitoring well and direct push (pre-pack) well locations for the Enoch Valley Mine are shown on Drawing 3-45. The direct push boreholes are described in more detail in Appendix A-1, with depth and total selenium concentrations provided in Table A1. Drawing 3-45 presents historical maximum and minimum selenium concentrations as well as trend graphs of selenium concentrations. The direct push boreholes are shown on Drawing 4-46. Groundwater was collected from these direct push boreholes for selenium analysis only once. The dissolved selenium concentrations in groundwater based on these single

grab samples are depicted on separate drawings and supplements the monitoring well data in delineating the Enoch Valley Mine groundwater plumes.

Monitoring locations at the Enoch Valley Mine are presented in Table 3-42, which gives the location of the well, the well name (or station number), the type of monitoring well, and the corresponding screened interval. The table indicates the specific hydrostratigraphic groundwater unit as discussed in Section 2.2.5 that each well is screened in and is intended to monitor. The three distinct hydrostratigraphic units found at the Enoch Valley Mine are presented in the discussion in the following section (3.4.4.1).

Sections 3.7 and 3.8 provide discussion of the source, transport pathways, and receptors for the Sites. The most relevant groundwater sources, pathways, and receptors are briefly described here. It should be noted that groundwater, regardless of the potential for reaching a receptor, will be evaluated in the risk assessment.

Potential receptors for groundwater impacted by elevated COPCs that originated at the Enoch Valley Mine are largely human or agricultural receptors through the use of groundwater extracted from contaminant-affected aquifers. Aquatic life, wildlife, and livestock could also be affected through the discharge of the groundwater to surface water as springs or baseflow to the ephemeral stream channels. The alluvial system is of most concern for this pathway because the groundwater discharge points are often relatively close to the primary sources of COPC to groundwater, which, in this case, are primarily the waste rock dumps. Various contaminant attenuation mechanisms become important along more distal flow paths.

The few springs near the Enoch Valley Site are potential discharge points for COPC-affected groundwater that, largely, originates from the waste rock dumps. The few intermittent streams southwest and south of the Site could receive baseflow discharge from the alluvial system. No known domestic livestock are close enough to the Site to be pathways to potential receptors. Agricultural wells MAW002 and MAW005 could potentially draw site-affected groundwater; however, these locations are relatively distal from the Site.

3.4.4.1 Hydrostratigraphic System Monitoring

The groundwater investigations are discussed below in terms of its location within the hydrostratigraphic system found at the Enoch Valley Mine. Three distinct hydrostratigraphic flow systems have been sampled including:

- Shallow alluvial system(generally the local groundwater system)
- Dinwoody and Thaynes formations bedrock system (generally part of the intermediate groundwater system)
- Wells Formation bedrock system (generally part of the regional groundwater system)

The objective of this groundwater sampling has been to evaluate the nature and extent of elevated selenium and other constituent levels in these individual units and the overall hydrogeologic system. Constituent concentrations in groundwater are compared to selected screening levels as discussed in Section 3.2.4. Note that the discussions below are focused on selenium because it is the primary risk driver. Exceedances of other constituents are summarized in Section 3.4.4.2 and are presented in Table 3-43.

Shallow Alluvial Monitoring

The local alluvial groundwater system is present adjacent to the Enoch Valley Mine in two general areas - west of the northern portion of the mine (northern end of MWD091, and in the southern mine area around the south and west side of MWD092. Elevated selenium concentrations in shallow groundwater have only been identified locally in the Enoch Valley Mine area.

North Enoch Valley Mine Area. In the northern area of the Enoch Valley Mine, the relevant alluvial groundwater system lies to the west of the northern portion of MWD091.

MWD091 Area. Monitoring well MMW012 was installed into the alluvium near the top of the underlying bedrock. The well has been dry since installation, and seven of ten direct push locations in the alluvial system were dry in 2008. However, groundwater is

encountered in the area. MMW036, installed in 2009, reported a total selenium concentration of 0.00593 mg/L. This well is installed in a basalt unit that appears to represent the shallow groundwater system downgradient from the mine area. MBW112 and MBW107 contained total selenium concentrations that are below the screening level of 0.05 mg/L.

Between the north and south areas of the Enoch Valley Mine, BH106 is located near pond MSP022 and reported a selenium concentration of 0.012 mg/L in 2008. Pond MSP022, near BH106, had a measured total selenium concentration of 0.009 mg/L in the spring of 2008, and was dry in the fall of 2008 (the last two times this pond has been measured). The next locations downgradient of both of these locations contained dissolved selenium at or below the detection limit of 0.001 mg/L.

South Enoch Valley Mine Area. The alluvial system in the southern area of the mine was evaluated through the drilling of monitoring wells MMW007, MMW008, and MMW013 in 2007 as well as boreholes and pre-pack wells in 2008 and 2009. In this southern portion of the Enoch Valley Mine, groundwater was encountered in a much higher percentage of the boreholes when compared to the northern end; and dissolved selenium concentrations are generally low (Drawing 3-46).

Southwest of MWD092. On the southwest side of MWD092, some higher concentrations of selenium have been detected. Alluvial monitoring points in this area that exhibit elevated selenium are BH083 (0.05 mg/L), BH154 (0.010 mg/L), BH156 (0.19 mg/L), and MBW085 (0.00131 mg/L). The concentrations reported for MMW013 installed at the alluvia-Dinwoody Formation contact have ranged from 0.001 to 0.124 mg/L (MMW013 and is discussed in context of the Dinwoody Formation below). Boreholes upstream of the area contained selenium below the detection limit of 0.001 mg/L (i.e., BH080 – BH082).

Southeast of MWD092. The shallow groundwater underlying the area on the southeast side of MWD092 is notably less impacted by selenium when compared to the southwest side. Selenium was not detected in groundwater collected from 15 of the 16 direct push boreholes that were drilled and sampled in this area. The only detection was 0.002 mg/L of dissolved

selenium in BH105 groundwater. Monitoring wells MMW007 and MMW008 were installed in the weathered Dinwoody Formation, which is likely part of the alluvial groundwater system. The maximum total selenium concentration measured in groundwater samples collected from these wells was 0.0050 mg/L in 2008, and the total selenium concentrations have ranged from 0.00119 to 0.005 mg/L in MMW007 and <0.001 to 0.00138 mg/L in MMW008. Groundwater collected from pre-pack well MBW087 had a total selenium concentration of 0.000798 mg/L in 2009, and pre-pack well MBW099 had a dissolved selenium concentration of <0.0005 mg/L in 2009 (total analyses were not conducted because of high turbidity in this pre-pack direct push well).

Dinwoody and Thaynes Formations Bedrock Monitoring

Five monitoring wells have been installed in the Enoch Valley Mine area to address the intermediate Dinwoody Formation groundwater system. The wells are MMW013, MMW024, and MMW034 on the southwest side of mine waste dump MWD092, well MMW025 on the southeast end of the mine, and wells MMW027 and MMW035 on the northwest end (Drawing 3-45). The sixth well above, MMW013, was installed to address the alluvial system but is included in this discussion because it is installed in the uppermost weathered Dinwoody Formation and is apparently influenced by the Dinwoody flow system as discussed in Section 3.7.4.4.

Consistent with groundwater collected from the other monitoring wells on the southeast end of the mine (e.g., MMW007 and MMW008) and the direct push results, MMW025 contained relatively low total selenium concentrations of 0.000879 mg/L and 0.00168 mg/L (fall 2008 and spring 2009). While dump seep MDS026 has had selenium concentrations exceeding 0.10 mg/L, groundwater in this area does not appear to be impacted.

Monitoring well MMW013 is located near BH083 and is installed in the uppermost weathered Dinwoody Formation (and may be associated with the alluvial system). This well has shown an increasing trend in dissolved selenium concentrations since 2007 (total selenium concentrations ranging from 0.001 to 0.124 mg/L as shown on Drawing 3-45).

Monitoring well MMW024 was installed into the Dinwoody Formation adjacent to MWD092 to test the conceptual flow pathway down geologic dip in beds that may outcrop beneath the waste rock dump. Some limited impact to groundwater is indicated in the Dinwoody Formation at this location, with total selenium measured in groundwater at 0.0137 mg/L during the fall 2008 sampling event and 0.0243 mg/L during the spring 2009 sampling event. Monitoring well MMW034 was installed in 2009 to evaluate the vertical extent of groundwater contamination and in the fall of 2009 had a selenium concentration in groundwater of 0.0762 mg/L. MMW034 is paired with MMW013.

Monitoring well MMW025 was installed on the southern end of MWD092 to test the Dinwoody Formation flow path to the south and southeast. The total selenium concentrations reported for MMW025 in the fall of 2009 was 0.000879mg/L.

Monitoring well MMW027 was installed in the northwestern portion of the Enoch Valley Mine area to characterize the potential Dinwoody Formation flow path. This monitoring well was installed below a large area of waste rock that sets in a relatively steep swale. Conceptually, the MMW027 location is set in a worst-case location. The investigation of the alluvium in this area generally indicates that the alluvial system does not contain water. This suggests that the uppermost groundwater system is largely in the Dinwoody Formation. In the fall of 2008, the total selenium concentration in groundwater collected from MMW027 was 0.314 mg/L and in spring 2009 was 0.329 mg/L. This flow path was further characterized in 2009 with the installation of MMW035. The selenium concentration reported for this well in the fall of 2009 was 0.772 mg/L (averaged triplicate). MMW035 was nested with MMW027 to evaluate the vertical extent of selenium in groundwater. MMW036 was intended to evaluate the lateral extent of selenium and other COPCs in the Dinwoody Formation groundwater, but was installed in the basalt system that yielded significant water when encountered. The single reported groundwater sample collected in the fall of 2009 from this well has only a very low level of total selenium, detected at 0.00593 mg/L.

Wells Formation Bedrock Monitoring

Two monitoring wells have been installed in the Wells Formation in the Enoch Valley Mine area - MMW009 in the northern portion of the mine and MMW026 in the southern portion of the mine. MMW009 was installed to specifically evaluate the Wells Formation flow path from a backfilled mine pit. The concentration of total selenium measured in MMW009 ranged from less than 0.0005 to 0.00104 mg/L (at the detection limit) between 2007 and 2009.

One additional monitoring well (MMW026) was installed into the regional Wells Formation groundwater system in the southern end of the Enoch Valley Mine area. The total selenium concentration in the groundwater sample collected from MMW026 in the fall of 2008 was 0.00130 mg/L, compared to 0.00104 mg/L detected in MMW009 during the same period. In the spring of 2009, groundwater collected from MMW026 had a selenium concentration of 0.00107 mg/L.

A couple of non-P4 wells have been drilled in the area southeast of the Enoch Valley Mine. The Agrium production well MPW006 appears to have been installed and screened in the Wells Formation. The driller's log (included in MWH, 2007a) indicated that a portion of the well is also screened above the Wells Formation. The second perforated section of the well is possibly in the Phosphoria Formation, but the log is not sufficiently detailed to confirm this. Regardless, MPW006 was sampled in the spring and fall of 2004 with measured dissolved selenium concentration less than the detection limit of 0.001 mg/L in both events (MWH, 2007a).

Agricultural well MAW005 likely is installed in the Wells Formation to the southeast of the mine along the strike of the Wells Formation. Based on the well log, the borehole likely encountered 70 feet of limestone at the bottom of the boring. However, the well was perforated only in the upper 30 feet of the limestone and the remaining 50 feet of perforation appears to have been in the alluvium (MWH, 2007a). Well MAW005 was also sampled in the spring of 2004 and winter of 2008. The total selenium concentration

measured in MAW005 was less than the detection limit of 0.001 mg/L during both sampling events.

3.4.4.2 Hydrostratigraphic System Monitoring for Other Constituents

The monitoring wells, direct push wells, and direct push boreholes at the Enoch Valley Mine were sampled during eight semi-annual (May/June and September/October) sampling events between May 2004 and September 2009; not all of the wells included in this discussion were sampled during every event depending on when the well was installed. The wells were analyzed for total and dissolved metals, and general chemistry parameters. The results of the analyses are shown in Table 3-43, which includes only those analytes that were detected above their respective regulatory screening values. The constituents that exceeded applicable screening values are:

- Aluminum, total
- Iron, total and dissolved
- Lead, total
- Manganese, total and dissolved
- Zinc, total
- TDS
- Sulfate

As discussed for both the Ballard and Henry mines, aluminum, iron, and manganese groundwater exceedances at the Enoch Valley monitoring locations appear to be the result of elevated background concentrations in the shallow groundwater, as well as Dinwoody and Wells formations. Elevated levels of these metals in groundwater does not appear to be an indicator of mine impacts, as there is no apparent association between elevated levels of aluminum, iron, and manganese in groundwater and elevated selenium concentrations.

Total aluminum exceeded its screening value of 0.2 mg/L in seven wells (MBW087, MMW007, MMW008, MMW009, MMW024, MMW025, and MMW036) with values ranging

from 0.254 to 8.75 mg/L. These exceedances were often reported during multiple sampling events for five of the wells. MMW008, screened in the top of the Dinwoody Formation/bottom of the alluvium, reported the highest total aluminum concentrations in groundwater ranging from 2.56 to 8.75 mg/L during three consecutive sampling events (fall 2007, spring 2008, and fall 2008). The highest concentration in this well was reported in the fall of 2008 and was much higher than two previous events. This well was not sampled for aluminum in 2009. Dissolved aluminum concentrations in filtered groundwater samples collected from this monitoring well were far less than total concentrations ranging from not detected at 0.03 mg/L to 0.04 mg/L in MMW008. In all the other wells (MMW007, MMW009, MMW024, and MMW025) with elevated total aluminum reported during multiple sampling events, dissolved aluminum concentrations typically were below the detection limits. This suggests that the aluminum detected in unfiltered groundwater samples collected from these wells and analyzed for total aluminum is from clay particles entrained in the water column during groundwater sampling. This sediment entrainment is confirmed because when the groundwater samples are filtered and analyzed, the dissolved aluminum concentrations are below the detection limit.

Total iron in groundwater exceeded its screening value of 0.3 mg/L in seven wells (MAW002, MBW087, MMW007, MMW008, MMW009, MMW025, and MPW019) with values above the screening value from 0.338 to 6.96 mg/L. These were generally the same wells that contained exceedances of the aluminum screening value, with a couple of exceptions. The total iron exceedances were often reported during multiple sampling events for four of the wells. MMW008, screened in the top of the Dinwoody Formation/bottom of the alluvium, reported the highest total iron concentrations ranging from 2.15 to 6.96 mg/L during three consecutive sampling events (fall 2007, spring 2008, and fall 2008). This well was not sampled for iron in 2009. Dissolved iron concentrations were far less than total concentrations and ranged from non-detect to 0.0354 mg/L in MMW008. In all the other wells with elevated total aluminum during multiple sampling events (MMW007, MMW009, MPW019), dissolved iron concentrations were typically below the detection limits except for in MMW009 and MAW002. The total and dissolved iron concentrations in MMW009 ranged from 0.05 to 2.27 mg/L and 0.04 to 1.02 mg/L, respectively, and the dissolved

concentration for MAW002 was 0.54 mg/L during one sampling event. Similar to aluminum, it appears that the iron is associated with turbidity in the monitoring wells.

Total manganese in groundwater exceeded its screening value of 0.05 mg/L in eight wells (MAW002, MBW087, MMW007, MMW008, MMW009, MMW013, MMW025, and MPW019) with values above the screening value from 0.0524 to 0.61 mg/L. Multiple exceedances were reported for MMW007, MMW008 and MMW009; and, similar to aluminum and iron, MMW008 reported some of the higher total manganese concentrations. Unlike aluminum and iron, dissolved concentrations of manganese were elevated in several of these same eight wells and ranged from 0.0715 to 0.582 mg/L.

Total lead in groundwater slightly exceeded the standard of 0.015 mg/L in one well during one sampling event. MMW009, screened in the Wells Formation, reported a total lead concentration of 0.0174 mg/L during spring 2008. Concentrations of lead during two other events were 0.0001 and 0.00218 mg/L. The concentration of dissolved lead in the spring of 2009(0.00218 mg/L) was much lower than the total concentration.

Zinc in groundwater exceeded the screening level in May 2004 and December 2008 at MAW005. The total zinc concentrations are orders of magnitude greater than other wells at the Enoch Mine and appear to be the result of a laboratory error. These results will be further investigated.

TDS in groundwater exceeded its screening value of 500 mg/L in six wells (MAW005, MMW013, MMW024, MMW027, MMW034, and MMW035) with values ranging from 501 to 2,010 mg/L. Four of these wells report total selenium exceedances in groundwater, as discussed above. The highest TDS concentration was reported in MMW027 (2,010 mg/L) in spring 2009. The only other time this well was sampled, the TDS concentration was 698 mg/L. Groundwater collected from MMW035, which had the highest selenium concentration (0.775 mg/L), also had a TDS concentration of 1,140 mg/L during the same event. Monitoring well MMW013 had detected TDS and selenium above their groundwater screening values during four of five sampling events. These wells show a good association between elevated selenium concentrations and elevated TDS concentrations in groundwater.

Sulfate exceeded its groundwater screening value of 250 mg/L in three wells (MAW005, MMW013, and MMW035) with results ranging from 258 to 447 mg/L. As discussed above, both MMW013 and MMW035 reported exceedances of the selenium groundwater screening value. MMW013 reported a sulfate exceedance in groundwater during each of the five times it was sampled with concentrations ranging from 219 to 332 mg/L. Monitoring well MMW035, which was installed in 2009, reported a sulfate concentration in groundwater of 447 mg/L.

3.4.5 Aquatic Biota

A variety of aquatic biological-chemical data were collected during the pre- and post-2004 investigation periods (see Drawings 3-20 and 3-21) at the Sites that will be evaluated, as necessary, during the upcoming RI/FS. These historic aquatic data are (1) stream habitat assessments, (2) fish data, and (3) benthic macroinvertebrate data. The aquatic data specifically collected in and around the Enoch Valley Mine are summarized below and were evaluated to determine whether collection of additional aquatic biota is necessary during the upcoming RI/FS for the Enoch Valley Mine.

3.4.5.1 Stream Habitat Assessment

As described in Section 3.2.5.1 for the Ballard Mine, a stream habitat assessment for the Enoch Valley Mine was conducted in May 2004 on streams influenced by the P4 Sites with the objective of developing a predictive model that would differentiate stream habitat that supports fish from stream habitat that does not support fish. These results are reported in *Draft - Interim Phase I SIs Evaluation Summary* (MWH, 2007g) and summarized below.

Table 3-44 presents the RBS (maximum 200 points) and fish presence at the Enoch Valley Mine area stream stations. To help understand the relationship between RBS and fish presence, also shown are surface water and sediment selenium concentrations from the corresponding sampling events. Of the 15 stations that were assessed, eight of the stations either observed or presumed fish presence as shown in the Table 3-44. The RBS from stations that reported fish ranged from 52 to 139. The RBS from the two stations that

presumed fish were 48 and 87, and stations that did not observe fish ranged from 3 to 49. Four of 15 stations were from mine-specific background locations and reported rapid bioassessment scores ranging from 35 at MST274 to 133 at MST128.

3.4.5.2 Fish

This section presents the nature and extent of analytes in forage fish and salmonids at the Enoch Valley Mine. Fish were sampled at two stream locations (i.e., surface water stations) in 1999 and 2000, and six stations in 2004, to evaluate mine contaminant impacts on fish in area streams. Fish tissue samples were analyzed in 2004 for cadmium, nickel, selenium, vanadium, and zinc. In 1999 and 2000, samples were only analyzed for cadmium and selenium. Results of this investigation are included in the *Draft - Interim Phase I SIs Evaluation Summary* (MWH, 2007g). SWDs from the 2004 fish sampling event and historical selenium results tables are presented on Figures 3-33 to 3-37 and in Tables 3-45 and 3-46 at the end of Section 3.0.

As shown in the SWDs, fish were found only on the lower reaches of Rasmussen Creek and along Angus Creek. As the RBS indicates, this is due to the poor fish habitat at stations near the Site. Only forage fish were collected on Rasmussen Creek, and both forage fish and salmonids were collected on Angus Creek.

Tables 3-45 and 3-46 present historical selenium concentrations found in salmonids and forage fish in streams emanating from the Enoch Valley Mine. As shown in Table 3-45, salmonids were sampled at the Enoch Valley Mine area stations in 2004. Salmonid selenium concentrations at the Enoch Valley Mine ranged from 1.2 to 6.7 mg/kg dw.

As shown in Table 3-46, forage fish were sampled at the Enoch Valley Mine stations in 1999, 2000, and 2004. Ten samples were collected at six stations; selenium concentrations in forage fish tissue samples ranged from 3.4 to 15 mg/kg dw. Historical concentration data from all events for the other analytes of interest in forage fish tissues are summarized below:

- Cadmium has been analyzed ten times at six different stations at the Enoch Valley Mine throughout 1999, 2000, and 2004. Concentrations ranged from 0.11 to 2.8 mg/kg dw.
- Nickel was analyzed at six stations at the Enoch Valley Mine and only in 2004. Concentrations ranged from 0.21 to 5.9 mg/kg dw.
- Vanadium was analyzed at six stations at the Enoch Valley Mine and only in 2004. Concentrations ranged from 0.5 to 1.7 mg/kg dw.
- Zinc was analyzed at six stations at the Enoch Valley Mine and only in 2004. Concentrations ranged from 79 to 230 mg/kg dw.

3.4.5.3 Benthic Macroinvertebrates

This section presents the nature and extent of analytes in benthic macroinvertebrates at the Enoch Valley Mine. Samples were collected from 13 stream stations during the 2004 sampling event and from three of the 13 stations in 1999 and 2000 to evaluate potential Site contaminant impacts on benthic macroinvertebrates in the area streams. The benthic macroinvertebrates samples were analyzed for cadmium and selenium in 1999 and 2000 and only selenium in 2004. Results from these monitoring events are presented in the various documents listed in Section 2.3. The selenium SWD from the 2004 benthic macroinvertebrate sampling event (see Figure 3-38) and historical selenium results tables are presented in Table 3-47 at the end of Section 3.0.

Many of the benthic samples collected during 2004 had high MDLs as a result of low sample volumes (i.e., low numbers of macroinvertebrates), which are probably due to insufficient habitat as indicated by the stream habitat assessment and as a result of sample dilution in the laboratory. The samples with high MDLs were censored at one-half the MDLs and are denoted with solid red circles on the SWD. Thus, while these samples appear to be elevated, they are in fact non-detected concentrations and the elevated method detection limits constrain the utility of the data. Refer to Drawings 3-20 and 3-21, which depict the locations of where these samples were collected and their concentrations in and around the Enoch Valley Mine.

Table 3-47 presents selenium concentrations found in benthic macroinvertebrates in streams around the Enoch Valley Mine. As shown in this table, benthic macroinvertebrates were collected at three Enoch Valley Mine stations in 1999 and 2000, and at all 13 stations in 2004. As discussed above, during the 2004 event, six of the 13 stations had high MDLs. Of the seven locations that reported detectable selenium concentrations in 2004, concentrations ranged from 3.4 to 18 mg/kg dw.

3.4.6 Terrestrial Biota

A variety of biological-chemical data are available from the pre-2004 period as shown on Drawing 3-22. This includes the elk tissue, bird egg, and cattle biotic data. These data may be uniquely useful in the human and ecological risk assessments and are, therefore, considered separately in the discussion below. Data also are available for other media, including various small mammals and terrestrial invertebrates. The results for the elk tissue and bird egg data are not unique to a particular mine. These area-wide terrestrial data are presented once in Section 3.2.6. The cattle data were collected at the Henry Mine and are summarized in Section 3.3.6. Detailed information on the elk tissue, bird egg, and cattle tissue data are found in the *DQUR/DAR* (MWH, 2010a).

3.4.6.1 Elk

Refer to Section 3.2.6 for discussion of the elk biotic data at the Sites.

3.4.6.2 Bird Eggs

Refer to Section 3.2.6 for discussion of the bird egg biotic data at the Sites.

3.4.6.3 Cattle

Refer to Section 3.3.6 for discussion of the cattle biotic data at the Sites.

3.4.6.4 Small Mammals

This section presents the nature and extent of analytes in small mammals at the Enoch Valley Mine. In 2001, small mammals were collected (least chipmunk and deer mice) at upland and riparian locations to evaluate potential impacts by mine waste rock dumps and possible surface water and sediment contamination on small mammals. Deer mice samples were collected at one stream station riparian area (MST130) near the Enoch Valley mine in September 2001. Selenium results from these small mammals are presented in Table 3-48 and are shown on Drawing 3-47. Complete analytical results of this investigation are included in the *Summer 2001 Area-Wide Investigation Data Summary* (MWH, 2002e).

As shown in Table 3-48, deer mice samples were collected from the riparian zone at the mine-specific background station MST130 in September 200,1 and selenium concentrations ranged from 0.54 to 0.76 mg/kg dw. This station is located in Wooley Valley and was the closest station to the Enoch Valley Mine.

No applicable regulatory screening levels have been identified at this time for comparison to the small mammal data. At this time, the use of these data is limited as indicated in the *DQUR/DAR* (MWH, 2010a). The data's existence is noted and if the risk assessment indicates the potential need to evaluate small mammals, the data may be used in scoping a study.

3.4.6.5 Terrestrial Invertebrates

This section presents the nature and extent of analytes in terrestrial invertebrates at the Enoch Valley Mine. In 2001, samples were collected of insects and worms at upland and riparian locations to evaluate potential impacts by mine waste rock dumps, and possible surface water and sediment contamination, on terrestrial invertebrates. Insects collected at the Enoch Valley Mine included lady bugs, popping bugs, spiders, flying ants, gnats, and other flying insects. Insect and worm samples were collected at one stream station riparian area (MST130) near the Enoch Valley Mine in September 2001. Selenium results are presented in Table 3-49 at the end of Section 3.0 and are shown on Drawing 3-47.

Complete analytical results of this investigation as well as the evaluation are included in the *Summer 2001 Area-Wide Investigation Data Summary* (MWH, 2002e).

As shown in Table 3-49, terrestrial invertebrate samples were collected from the riparian area at the mine-specific background station MST130 in September 2001. Insects and worms were sampled with selenium concentrations of 3.2 mg/kg dw and 55 mg/kg dw, respectively. This station is located in Wooley Valley and was the closest station to the Enoch Valley Mine.

No applicable regulatory screening levels have been identified at this time for comparison to the terrestrial invertebrate data. At this time, the use of these data is limited as indicated in the *DQUR/DAR* (MWH, 2010a). The data's existence is noted; if the risk assessment indicates the potential need to evaluate terrestrial invertebrates, the data may be used in scoping a study.

3.4.7 Enoch Valley Mine Summary

This section provides a summary of the historic data gathered for the Enoch Valley Mine as discussed in the subsections above in order to help identify any remaining data gaps. A data gaps analysis for each mine site is presented in Section 4.0 that will serve as the basis for future RI/FS investigations. A summary of the sample locations, analyte lists, and investigation results for all the media investigated at the Enoch Valley Mine is presented in Table 3-50. The key findings or conclusions for each media at the Site are summarized below.

3.4.7.1 Soils

Surface soils characterization at the Enoch Valley Mine has been performed for upland and riparian soils during several investigations since 2004. These investigations included:

- Mass wasting investigation (summer 2004) – 52 samples
- Supplemental waste rock dump and facility soil characterization (summer 2009) – 51 samples

- Riparian habitat assessment (summer 2004) – 31 samples

The key findings for these soil investigations, including analytes that were elevated above screening levels and/or investigation-specific preliminary background values, are:

- The 2004 and 2009 investigations had soil concentrations with isolated exceedances of cadmium, manganese, nickel, and vanadium when compared to appropriate screening levels.
- The 2004 and 2009 investigations had soil concentrations with elevated arsenic levels when compared to its screening level and background primarily on mine waste dumps, mine pit areas and the haul road.
- The 2004 and 2009 investigations had soil selenium concentrations that were elevated above the background selenium level, but below USEPA regional screening levels for residential soil (EPA, 2009), primarily on mine waste dumps, mine pit areas and the haul road.
- Total uranium concentrations do not exceed screening levels based on chemical risks; however, radiogenic risks may be present and based on the A/Ts request will be evaluated in the risk assessment. Data on uranium daughter products have not been collected, but will be important in reducing uncertainty in the risk assessment specifically for uranium and uranium daughter products.
- Off-dump soil transport has not occurred (mass wasting), as selenium concentrations drop below screening levels or preliminary background levels for soil and vegetation prior to or at the dump boundary. In addition, off-dump transport, typically is not evident where the dump boundary is located uphill and transport via mass wasting has not occurred.
- Arsenic and manganese are elevated in soil above the residential screening levels in the 2009 background area. Evaluation of existing soil and vegetation background levels need to be conducted during the RI/FS process.

Based on evaluation of data at the Enoch Valley Mine, the nature and extent of surface soil impacts at the Site has been defined adequately with the exception of the radionuclides in on-site soils. Further assessment of the soil background needs to be conducted for radionuclides and possibly other COPCs so that the entire area disturbed by the mining operation is evaluated appropriately in the risk assessment and the FS. Limited field characterization of soil is necessary at this time both on site and in a background location. As further data evaluation is performed during the RI/FS, the need for additional characterization will be reassessed and, if necessary, performed.

3.4.7.2 Vegetation

Vegetation characterization at the Enoch Valley Mine has been performed for upland vegetation during four primary investigations since 2004. These investigations are:

- Mass wasting investigation (summer 2004) – 52 samples
- Seasonal vegetation assessment (summer and fall 2004) – 6 samples
- Supplemental waste rock dump and facility characterization (summer and fall of 2009) – 121 samples
- Riparian habitat assessment (summer of 2004) – 31 samples

The key findings from the vegetation studies, including a list of analytes that were elevated above screening levels and/or investigation-specific preliminary background values, are:

- One exceedance of the boron screening standard in a in a background vegetation occurred in a sample collected in 2009. Boron concentrations are generally higher in background areas when compared to waste rock dump sample locations/areas.
- The 2004 and 2009 vegetation investigation report elevated molybdenum and selenium throughout the mine waste dumps and mine pit areas.
- Off-dump soil transport has not occurred (mass wasting), as selenium concentrations drop below screening levels or preliminary background levels for soil and vegetation prior to or at the dump boundary. In addition, off-dump transport, typically is not evident where the dump boundary is located uphill and transport via mass wasting has not occurred.
- Molybdenum and selenium are elevated in vegetation above the screening level in the 2009 background area. Evaluation of existing soil and vegetation background levels need to be conducted during the RI/FS process.

Based on evaluation of data at the Enoch Valley Mine, the nature and extent of vegetation impacts at the Site has been defined adequately so that, if necessary, risk assessments and the FS can be conducted. No further field characterization is necessary at this time. As further data evaluation is performed during the RI/FS, the need for additional characterization will be reassessed and, if necessary, performed.

3.4.7.3 Surface Water and Sediment

Surface water monitoring has occurred primarily in the spring and fall at the Enoch Valley Mine area since 1997 where 31 stations are being sampled to evaluate potential Site impacts to surface waters in the area. The key findings from the surface water investigation, including a list of analytes that were elevated above surface water screening levels and/or preliminary background values, are:

- Semi-annual surface water sample analyses indicate that selenium periodically exceeds screening levels in surface water bodies around Enoch Valley Mine as do a few other analytes.
- Historic surface water samples have isolated exceedances of surface water screening levels for aluminum, barium, boron, cadmium, iron, manganese, nickel, thallium, vanadium, and zinc.
- Dump seeps, springs, and ponds typically reported a greater number of these analytes above screening levels.
- Surface water monitoring indicates that total selenium concentrations in surface waters are generally above preliminary background levels and often exceed the screening level (IDEQ CCC aquatic life standard) in seeps, springs and ponds and occasionally exceed the screening level in a few downstream locations.
- Concentrations of all analytes that exceed their respective standards typically are higher during spring sampling event when compared to fall sampling events.

Sediment sampling has occurred at the Enoch Valley Mine area from 1998 to 2004 where 26 stations are being sampled to evaluate potential Site impacts to sediments in the area. Sediment sampling stations were at streams, waste rock dump seeps, springs, and ponds. The key findings from the sediment investigations, including a list of analytes that were elevated above screening levels and/or preliminary background values, are:

- Historic sediment sample analyses frequently have exceedances of sediment screening levels for cadmium, chromium, nickel, selenium and vanadium in seeps, springs, ponds and downstream stream locations.
- Elevated sediment concentrations for cadmium, chromium, nickel, selenium, vanadium, and zinc primarily correspond to sediment samples collected from dump seeps and pond areas.

- Sediment samples collected from stream locations were frequently elevated in cadmium, chromium, nickel, and to a much lesser extent selenium. These sediment exceedances appear to coincide with surface water exceedances at the same locations.

- A comparison among the data sets for sediments, soils, and surface water reveals that the historic sediment samples were analyzed for specific, but limited, analytes. For example, arsenic was not reported in sediment samples, but it is detected, and in some cases occurred at levels above relevant screening levels, in nearby soil samples.

The nature and extent of surface water impacts at the Enoch Valley Mine has been defined adequately so that, if necessary, risk assessments and the FS can be conducted. No further field characterization of surface water is necessary at this time. As further data evaluation is performed during the RI/FS, the need for additional characterization will be reassessed and, if necessary, performed. Ongoing surface water monitoring is necessary to collect baseline effectiveness monitoring of potential future remedies.

Based on the summary information presented above, the spatial characterization of sediment impacts at the Enoch Valley Mine has been defined adequately so that, if necessary, risk assessments and the FS can be conducted. A data gap relating to COPC coverage in sediments has been identified and is further discussed in Section 4.0. Additional investigations of surface water, sediment, and riparian soils were conducted in the fall of 2010 to address these data gaps. These results will be reported in the RI report that will be prepared for each Site.

3.4.7.4 Groundwater

Groundwater monitoring was conducted between 2007 and 2009 at the Enoch Valley Mine. During that time, groundwater samples were collected from 24 wells (monitoring wells, production wells, agricultural wells, and domestic water wells) and several direct push boreholes. These samples were used to evaluate potential groundwater impacts related to activities conducted at the Enoch Valley Site. The key findings for the groundwater investigation, including a list of analytes that were elevated above groundwater screening levels, are:

- One well, MMW009, reported a concentration of total lead in groundwater above the screening level from one sampling event. However, dissolved lead from this event and total and dissolved lead concentrations detected in groundwater samples collected during subsequent sampling events were all below the lead screening criteria.

- Aluminum, iron and manganese frequently exceeded their screening levels in groundwater collected from monitoring wells and other wells. However, these exceedances most often were reported for the total fraction compared to the dissolved fraction and elevated concentrations often occurred in wells outside of Site-impacted areas. As a result, it is appears that elevated levels of aluminum, iron, and manganese in groundwater are naturally elevated in the region.

- Selenium, as well as, sulfate and TDS exceeded their groundwater screening levels in samples collected from several monitoring wells, primarily alluvial groundwater wells. Selenium, sulfate, TDS appear to be indicator parameters of Site-related groundwater impacts.

- The shallow alluvial groundwater system is present adjacent to the Enoch Valley Mine in two general areas: (1) west of the northern portion of the mine (northern end of MWD091); and (2) in the southern mine area around the south and west side of MWD092. Elevated selenium concentrations in shallow groundwater have only been identified in small localized areas in the Enoch Valley Site.

- Selenium in groundwater has exceeded its screening level in wells constructed in the Dinwoody Formation.

- Selenium has been detected in, but has not exceeded its screening level, in groundwater collected from the Wells Formation.

Based on the groundwater data, the nature and extent for groundwater at the Enoch Valley Mine has been defined except for limited areas as discussed in Section 4.0 Data Gaps.

3.4.7.5 Aquatic Biota

A variety of aquatic biological-chemical data were collected during the pre- and post-2004 investigation periods at the Enoch Valley Mine. These historic aquatic data are (1) stream habitat assessments, (2) fish data, and (3) benthic macroinvertebrate data. The key findings for aquatic biota are as follows:

- Based on the 15 stations that were evaluated during the stream habitat assessment at the Enoch Valley Mine, the rapid bioassessment scores (RBS)

ranged between 3 and 139 out of 200. The four mine-specific background locations, reported rapid bioassessment scores ranging from 35 to 133.

- Salmonid and forage fish were collected from six stations. A total of ten forage fish samples were collected and all reported elevated selenium. A total of four salmonid samples were collected and all contained selenium.
- Thirteen stations were sampled for benthic macroinvertebrate data. A majority of the samples had elevated method detection levels due to limited sample mass a result of low sample volumes probably due to insufficient habitat as indicated by the stream habitat assessment.

Nature and extent information for aquatic tissue data at the Enoch Valley Mine is adequate for their intended purpose as additional lines of evidence in the human health and/or ecological risk assessment. The potential need for additional sampling of this media will be evaluated pending results of the risk assessment for the P4 mines.

3.4.7.6 Terrestrial Biota

A variety of biological-chemical data are available from the pre-2004 period. This includes the elk tissue, bird egg, and cattle biotic tissue data. These data will be used during the RI/FS as described in the *DQUR/DAR* (MWH, 2010a). Data also are available for two other media: small mammals and terrestrial invertebrates. At this time, the use of the small mammals and terrestrial data are limited as indicated in the *DQUR/DAR* (MWH, 2010a). The data's existence is noted; and if the risk assessment indicates the potential need to evaluate small mammals, the data may be used in scoping a study. The key findings for terrestrial biota are as follows:

- Area wide skeletal muscle and liver tissue samples were collected from elk at check stations and analyzed for cadmium and selenium in 1999 and in 2000. A total of 160 elk were collected in 1999 and analyzed for selenium only. A total of 54 elk were collected in 2000 and analyzed for selenium in addition to other parameters.
- Area wide bird egg data were collected in 1999, 2000, and 2001. Bird eggs were analyzed for cadmium and selenium in 1999 and 2000 with a total of 215 and 334 bird eggs sampled in these two years, respectively. In 2001, 369 bird eggs for sampled and analyzed for selenium only.

- A multi-year cattle grazing study was performed at Henry Mine as discussed in Section 3.3.7.
- In 2001, small mammals were collected from one riparian stream location. Deer mice (3 Samples) were collected at one riparian location.
- Insects, which included lady bugs, popping bugs, spiders, flying ants, gnats, and other flying insects, as well as worms were collected at one riparian location in 2001.

Nature and extent information for terrestrial tissue data at the Enoch Valley Mine is adequate for their intended purpose as additional lines of evidence in the human health and/or ecological risk assessment. The potential need for additional sampling of this medium will be evaluated pending results of the risk assessment for the P4 mines.

3.5 Other Downstream Areas – Characterization of Contamination by Medium

The following subsections present the characterization of contamination in various media for other downstream areas, primarily along the Blackfoot River. Not all media are included because samples have not been collected for all media in these downstream areas. In each of the subsections below, historical data for primary and secondary media are summarized in tables, figures, and drawings. For each primary medium, preliminary screening levels presented in Table 3-1 are a combination of the most conservative of promulgated standards used in human and ecological risk assessment, as well as study-specific background values. These screening levels are used to evaluate the concentration of each constituent in each medium. The screening levels presented in Table 3-1 and medium-specific summary tables discussed below are consistent with the human health and ecological screening criteria that will be used during the Site risk assessments as described in Appendix C of this RI/FS Work Plan.

These screening levels and preliminary background values are used to facilitate the discussion of nature and extent and are not to be considered final remediation goals or background values. The preliminary background values cited in the discussion in Section 3.5 below were reported in the *Interim Phase I SIs Evaluation Summary* (MWH, 2007g). Media-

specific background values need to be further evaluated during the RI/FS process as discussed in Section 4.0.

The term "analytes of interest" often is discussed in individual sections by medium (e.g., soil, groundwater,) where these analytes are compared to the screening levels and background values. Specific analytes of interest were selected because they are:

(1) Typically elevated in the source materials (i.e., waste rock)

(2) Discussed in historical studies where a specific subset of analytes was selected for analysis and spatial wire diagrams were developed for certain analytes (e.g., aluminum, cadmium, iron, nickel, selenium, vanadium, and zinc) to evaluate spatial and temporal concentration trends

(3) Frequently exceeding relevant screening standards presented in Table 3-1 and are in this Work Plan's summary tables

(4) Often primary human health or ecological risk drivers

In future RI and risk assessment reports, the use of this term will most likely be replaced by other similar terms such as COPCs, COPECs, and COCs.

It should also be noted that the downstream areas may be impacted by releases from other mines and facilities not associated with P4 or the Sites. However, these data are presented as they may be useful in the RI for assessing effects on downstream areas from the Sites and in risk assessment evaluations of cumulative risk.

3.5.1 Soils

Surface soil characterization along the Blackfoot River was performed in 2004 and included a riparian soil investigation only. Riparian soil samples were collected in September 2004 at 16 locations along the Blackfoot River as shown on Drawing 3-6. Soil samples were analyzed for cadmium, chromium, copper, molybdenum, nickel, selenium, vanadium, and zinc. These data were originally presented in the *Draft - Interim Phase I SIs Evaluation Summary* (MWH, 2007g). Table 3-51 presents the riparian soil selenium results.

As shown in Table 3-51, selenium detected in riparian soil collected along the Blackfoot River ranges from 0.50 to 1.9 mg/kg dw with five of the 16 samples having concentrations less than the detection limit of 0.50 mg/kg dw.

3.5.2 Vegetation

Vegetation characterization along the Blackfoot River for riparian vegetation was performed in 1999 and 2004. These investigations were (1) the riparian vegetation samples in 1999 and 2004, and (2) seasonal vegetation investigation also in 2004. These vegetation investigations are summarized below. Vegetation concentrations were compared to preliminary screening levels referenced from mineral tolerance of animals (NRC, 2005) as shown on Table 3-1 or to preliminary background concentration determined for the various investigations. Vegetation sample locations for EE/CA area-wide riparian investigations and selenium concentrations in soil and vegetation are presented on Drawing 3-6.

3.5.2.1 Seasonal Vegetation Investigation

Monthly composite vegetation data were collected at three riparian locations along the Blackfoot River from May to October 2004. The purpose of this investigation was to determine if there are any seasonal differences of selenium concentrations in riparian vegetation (grasses) growing in riparian areas along the river. Samples were analyzed for selenium only. These data were originally presented and discussed in the *Draft - Interim Phase I SIs Evaluation Summary* (MWH, 2007g). Riparian locations and sampling results are presented on Drawing 3-6.

The results of the seasonal vegetation investigation are provided in Table 3-52. The riparian locations sampled along the Blackfoot River show no monthly selenium concentration trend. All samples at all locations were found to be below the detection limit.

3.5.2.2 Riparian Vegetation Characterization

Riparian vegetation samples were collected in September of 1999 and 2004 at locations along the Blackfoot River. Eight stations were sampled in 1999 and 16 were sampled in 2004.

Samples were analyzed for cadmium and selenium in 1999 and for cadmium, copper, molybdenum, selenium, and zinc in 2004. The 1999 data were originally presented in the *1999 Interim Investigation Data Report, Southeast Idaho Phosphate Resource Area Selenium Project* (MW, 2000), and the 2004 data in the *Draft - Interim Phase I SIs Evaluation Summary* (MWH, 2007g). Table 3-53 presents the riparian vegetation selenium results.

Selenium concentrations in riparian vegetation along the Blackfoot River ranged from 0.076 to 1.9 mg/kg dw in 1999. In 2004, all samples collected were non-detected concentrations at a detection limit of 0.50 mg/kg dw.

3.5.3 Surface Water and Sediment

This section presents the nature and extent of analytes in the water and sediment along the Blackfoot River.

3.5.3.1 Surface Water

The Blackfoot River is designated for cold water aquatic life, salmonid spawning, primary recreation, and domestic water supply (IDEQ 2009b). It is also designated as Special Resource Water from the confluence of Lanes and Diamond creeks to the Blackfoot Reservoir and is recognized as needing protection to preserve outstanding or unique characteristics in order to maintain current beneficial uses. The Lanes Creek and Diamond Creek confluence is about 13 miles upstream (east) of the Ballard Mine Site. Angus Creek, which originates near the Enoch Valley Site, enters the Blackfoot River approximately a mile downstream of the Lanes and Diamond creek confluence. The main stem of Blackfoot River from the confluence of Lanes and Diamond creeks to the Blackfoot Reservoir is a 303(d) listed segment for selenium, sediment, dissolved oxygen, and elevated temperature (IDEQ 2005 and 2008). The main stem of the Blackfoot River from the confluence of Slug Creek to the Blackfoot Reservoir also is listed for selenium (IDEQ 2008). Slug Creek is a tributary to the Blackfoot River about 6 miles upstream of the Ballard Mine Site.

Extensive surface water sampling has occurred in the Blackfoot River since 1997 with surface water and sediment samples collected at 16 stations for evaluation of potential mine-

related impacts to the surface water (and sediment) medium. These stations have been sampled for several metals, cations, anions, general water quality parameters, field parameters, and flow measurements over the period of record; the results for these monitoring events are presented in the various documents listed in Section 2.3. In addition to the reporting and evaluation of water quality data, loading analyses have been performed as described in the *Interim Phase I SIs Evaluation Summary* (MWH, 2007g). This section discusses the analytes of interest that are mentioned below and is limited to those surface water samples collected during the May and September sampling events since monitoring began in 1997. Metals (inclusive of metalloid and non-metal cationic trace elements) concentrations detected in surface waters were based on the area-wide studies for aluminum, cadmium, iron, nickel, selenium, vanadium, and zinc. The discussion also is supported by SWDs from 2004, 2007, and 2008 sampling events, which graphically display contaminant concentrations at various sampling locations on water network found in the area (Figures 3-3 to 3-27) and selenium-time plot figures for MST019 on the Blackfoot River (Figures 3-53 and 3-54). The 2004 surface water spatial diagrams present sediment sampling results from the concurrent sediment sampling event; these will be discussed later in this section. Drawings 3-9 and 3-10 depict maps of the area stream networks with surface water sampling locations and historical surface water selenium concentrations. Drawing 3-9 also includes sediment sample results from the pre-2004 area wide sampling event.

Analyte concentrations in surface water are compared to selected screening levels for evaluation purposes as discussed in Section 3.2.3.1 and listed in Table 3-1.

Water Quality

Surface water in the Blackfoot River, below the Angus Creek confluence, is a calcium-bicarbonate type water with low to moderate TDS (156 to 330 mg/L) and weak to moderately alkaline pH (7.0 to 9.0). Semi-annual monitoring indicates a distinct seasonality in selenium concentrations in the Blackfoot River. Baseline concentrations are generally below background levels but will increase and occasionally exceed the IDEQ CCC aquatic life standard for a short time each year when river discharge is at its peak during spring runoff. The SWDs (see Section 3.2.3 for a discussion of SWD interpretation), presented in

Figures 3-3 to 3-27, depict the spatial distribution of analyte concentrations in the Blackfoot River. Diagrams from both spring and fall events are included to illustrate the seasonal differences in surface water concentrations. The analytical results for surface water samples collected from the Blackfoot River stations are summarized in Table 3-54 for the 2004 to 2008 time period.

As shown on the SWDs, selenium appears to be the only elevated analyte observed on the Blackfoot River within the P4 monitoring network. Zinc was found elevated above preliminary background at one location in the fall of 2008, but only selenium has been found elevated above screening level. It should be noted that although this station is directly below the confluence, which is the final surficial input from the Sites, there are a number of non-P4 inputs of contaminants upstream of this location. Thus, it would be erroneous to attribute contaminant concentrations at this location, and others along the Blackfoot River, solely to the Sites. In fact, the SWDs illustrate this influence of upstream contamination sources. As depicted on Figure 3-8, surface waters collected from locations MST027 and MST028 (both upstream of P4-exclusive influences) in the spring of 2007 are shown to be elevated above the selenium screening level of 0.005 mg/L. Both stations are directly downstream of East Mill Creek and Spring Creek confluences; and as shown, both streams have been historically elevated with selenium. MST027 is located directly below the Angus Creek confluence, which is a stream with potential for P4 influence; but as depicted on the figure, Angus Creek selenium concentrations are below preliminary background for its entire length. Figure 3-3 depicts surface water selenium concentrations on streams throughout the Sites in the spring of 2004 and lends support to this scenario.

Figure 3-53 presents total selenium concentrations verses discharges observed at one sampling location (MST019) on the Blackfoot River during spring and fall since 1997. This station was chosen because it is directly below the Ballard Mine and directly downstream of the stream channel leading from the Site, the final surficial input into the river from the Mine.

As mentioned above, and illustrated in Figure 3-53, elevated selenium concentrations detected in surface water samples collected from MST019, which is located in the Blackfoot

River, are distinctly seasonal (i.e., higher in the spring than in the fall). There also appears to be some positive correlation between total selenium concentration and discharge. Furthermore, there does not appear to be temporal trends for selenium concentrations at this location. Selenium concentrations at MST019 have been found above the screening level of 0.005 mg/L four out of the 16 times it has been sampled in the spring or the fall. Concentrations range from non-detect at 0.0007 to 0.0092 mg/L.

In addition to selenium detected in surface water samples collected at MST019, historical spring and fall data dating back to 1997 (see Table 3-54) for other analytes of interest are summarized below:

- Aluminum has been sampled three times at MST019. Aluminum concentrations were detected in surface water above the screening level of 0.087 mg/L during all three events. Concentrations range from 0.1 to 0.35 mg/L.
- Cadmium has been found in surface water above the hardness-dependent screening level of 0.0006 mg/L three of the 16 times MST019 has been sampled. However these exceedances occurred in 1998 and 1999 when samples were not filtered and the total fraction was analyzed. Concentrations of cadmium detected in surface water range from not detected (at 0.0001) to 0.031 mg/L.
- Iron has been detected in surface water samples collected at MST019 eight times and has been observed above the screening level of 0.158 mg/L in two of the eight sampling events. Concentrations range from not detected at 0.02 to 0.26 mg/L.
- Nickel has been detected in surface water samples collected at MST019 twelve (12) times and has never been observed above the hardness-dependent screening level of 0.052 mg/L. Concentrations range from not detected at 0.001 to 0.014 mg/L.
- Vanadium has not been detected in surface water samples collected at MST019 above the screening level of 0.02 mg/L at MST019 during any of the 11 events in which it has been analyzed. Concentrations range from not detected at 0.0002 to 0.0025 mg/L.
- Zinc has not been detected in surface water samples collected at MST019 above the screening level of 0.12 mg/L during the twelve (12) sampling events in which it has been analyzed. Concentrations range from not detected at 0.001 to 0.0375 mg/L.

3.5.3.2 Sediment

This section presents the characterization of analytes in the sediments of the Blackfoot River. Extensive sediment sampling took place in the Blackfoot River from 1998 to 2004 when 16 stations were used to evaluate potential impacts to sediments in the river from Site-related activities as shown on Drawing 3-13. These stations were sampled for several metals, cations, anions, pH, and organic carbon during the period of record; the results for these monitoring events are presented in the various documents listed in Section 2.3. Analyte concentrations evaluated here are based on the area-wide studies and include cadmium, chromium, nickel, selenium, vanadium, and zinc. These were the only six analytes that were run in the laboratory during the 2004 sediment investigation. SWDs from the 2004 sediment sampling event are presented as well as selenium time plots for MST019 (see Section 3.2.3 for selection rationale). The wire diagrams, Figures 3-3 to 3-7, graphically illustrate analyte concentrations in the sediments of flowing systems near the Sites. The time plot, Figure 3-54, shows surface water selenium concentrations at the presented location and is included in order to make correlations between surface water and sediment. Analyte concentrations in sediment are compared to selected screening levels for evaluation purposes as described in Section 3.2.3.2 and shown in Table 3-1.

As shown in the SWD, 2004 sediment concentrations below the Wooley Valley Creek confluence on the Blackfoot River show no exceedances above the screening level for selenium. Concentrations exceed the selected background concentrations at two locations on the Blackfoot River - one downstream of the Angus Creek confluence (MST026) and one mine-specific background monitoring location (MST229 - suggesting that selenium in sediments may not be the result of contributions from Sites. Based upon the SWD, there does not appear to be any correlation between sediment selenium concentration and surface water selenium concentration on the Blackfoot River.

Of the other analytes detected in sediments, only cadmium was observed at concentrations exceeding screening level or preliminary background on the Blackfoot River. Cadmium detected in sediments exceeds the screening level of 0.583 mg/kg at every monitoring location below Angus Creek. Though these stations exceed the cadmium sediment

screening level, they do not exceed the preliminary background concentration of 10 mg/kg. One mine-specific background monitoring location (MST229) was found to exceed the cadmium sediment screening level. Other analyte concentrations in sediment do not appear correlated to surface water concentrations at the Enoch Valley Mine. This suggests that deposition of other analytes has some temporal variability.

Figure 3-54 presents sediment selenium concentrations and the coinciding surface water selenium concentrations at MST019 on the Blackfoot River during each sediment/surface water sampling event since 1998.

The time plot for MST019 on the Blackfoot River shows that sediment selenium concentrations have been below the screening level of 4.0 mg/kg during each of the five sampling events. There does not appear to be evidence to suggest any temporal trend. The surface water concentrations suggest that there is little correlation between surface water and sediment selenium concentrations at this location. Selenium concentrations in sediments collected at MST019 consistently were found below its screening level and ranged from 0.275 to 1.1 mg/kg.

In addition to selenium, historical concentration of other analytes of interest analyzed in sediments collected at MST019 dating back to 1998 (see Table 3-55) are summarized below:

- Cadmium has been detected above the screening level of 0.583 mg/kg during all five sampling events at MST019. Concentrations range from 0.99 to 2.9 mg/kg. Even though concentrations exceeded the screening level, they were below the preliminary background concentration of 10 mg/kg.
- Chromium has been analyzed in sediment samples collected at MST019 during three sampling events and all concentrations are below the screening level of 36.286 mg/kg and range from 19 to 22 mg/kg.
- Nickel has been analyzed in sediment samples collected at MST019 during four sampling events and was detected above the screening level of 18 mg/kg on one of the four occasions. Concentrations ranged from 7.5 to 23 mg/kg. Even though one concentration exceeded the screening level, it was below the preliminary background concentration of 69 mg/kg.

- Vanadium has been analyzed in sediment samples collected at MST019 during four sampling events and was detected below the screening level of 57 mg/kg at MST019 during each event. Concentrations ranged from 14 to 29 mg/kg.
- Zinc has been run in sediment samples collected at MST019 during four events and was detected below the screening level of 98 mg/kg during each event. Concentrations ranged from 27 to 38 mg/kg.

3.5.4 Aquatic Biota

A variety of aquatic biological-chemical data were collected during the pre- and post-2004 investigation periods at the Sites that will be evaluated, as necessary, during the upcoming RI/FS. These historic aquatic data are (1) stream habitat assessments, (2) fish tissue data, and (3) benthic macroinvertebrate data. The aquatic data specifically collected in and along the Blackfoot River are summarized below, and these data have been evaluated to determine if collection of additional aquatic biota data is needed during the upcoming RI/FS.

3.5.4.1 Stream Habitat Assessment

As described in Section 3.2.5.1 for the Ballard Mine, a stream habitat assessment was conducted in May 2004 on streams influenced by the area mines with the objective of developing a predictive model that would differentiate stream habitat that supports fish from stream habitat that does not support fish. These results are reported in *Draft - Interim Phase I SIs Evaluation Summary* (MWH, 2007g) and summarized below.

Table 3-56 presents the RBS (maximum of 200 points) and fish presence at stations on the Blackfoot River. To help understand the relationship between RBS and fish presence, also shown are surface water and sediment selenium concentrations from the corresponding sampling events. Of the 15 stations that were assessed in the Blackfoot River, all of the stations observed fish as shown in Table 3-56. The RBS from these stations ranged from 69 to 145. Three of the stations were from mine-specific background locations and reported scores ranging from 94 to 107.

3.5.4.2 Fish

This section presents the nature and extent of analytes in forage fish and salmonids in the Blackfoot River. Fish samples were collected from six stations in 1999, seven stations in 2000, and 16 stations in 2004, in order to evaluate mine contaminant impacts on fish in the river. Forge fish and salmonid samples were analyzed for cadmium, nickel, selenium, vanadium, and zinc in 2004. In 1999 and 2000, fish tissue samples were analyzed only for cadmium and selenium. Results from these monitoring events are presented in the various documents listed in Section 2.3. SWDs from the 2004 fish sampling event (see Figures 3-33 to 3-37) and historical selenium results tables are presented at the end of Section 3.0.

As shown in the SWDs, fish were found all along the Blackfoot River. Forage fish were collected at all stations and salmonids were found at MST023 and MST027. Although many of the Blackfoot River stations where the fish were found to have elevated metal levels in their tissue are downstream of P4 influences, it would be erroneous to attribute contaminants solely to those inputs. As illustrated on the SWDs, there are upstream, non-P4 influences that are elevated and contributing contaminants to the Blackfoot River. For example, mine specific background stations MST229 and MST029 are shown elevated and both are in close proximity to the confluences of East Mill and Spring creeks and both have historically elevated systems that are not P4 influenced.

Tables 3-57 and 3-58 present historical selenium concentrations found in salmonids and forage fish in streams emanating from the Enoch Valley Mine. As shown in Table 3-57, salmonids were sampled at Blackfoot River stations in 1999, 2000, and 2004. Sixteen samples were taken at eight stations. Salmonid selenium concentrations in the Blackfoot River ranged from 0.87 to 9.7 mg/kg dw.

As shown in Table 3-58, forage fish were sampled at Blackfoot River stations in 1999, 2000, and 2004. Twenty-nine samples were collected at 16 stations, and forage fish selenium concentrations in the Blackfoot River ranged from 1.8 to 15 mg/kg dw. In addition to selenium, historical concentration data from all events for the other analytes of interest are summarized below:

- Cadmium was analyzed in fish tissues 29 times at 16 different stations on the Blackfoot River throughout 1999, 2000, and 2004. Concentrations ranged from 0.83 to 0.97 mg/kg dw.
- Nickel was analyzed in fish collected at 16 stations on the Blackfoot River and only in 2004. Concentrations ranged from 0.63 to 4.3 mg/kg dw.
- Vanadium was analyzed in fish collected at 16 stations on the Blackfoot River and only in 2004. Concentrations ranged from 0.46 to 2.1 mg/kg dw.
- Zinc was analyzed in fish collected at 16 stations on the Blackfoot River and only in 2004. Concentrations ranged from 93 to 260 mg/kg dw.

3.5.4.3 Benthic Macroinvertebrates

This section presents the characterization of analytes in benthic macroinvertebrates in the Blackfoot River. Macroinvertebrate samples were collected from 16 stream locations (i.e., surface water stations) during the 1999, 2000, and 2004 sampling events to evaluate area mines contaminant impact on benthic macroinvertebrates in the river. The benthic macroinvertebrate samples were analyzed for cadmium and selenium in 1999 and 2000, and selenium only in 2004. Results from these monitoring events are presented in the various documents listed in Section 2.3. The selenium SWD from the 2004 benthic macroinvertebrate sampling event (see Figure 3-38) and historical selenium results tables are presented in Table 3-59. Many of the benthic samples collected during 2004 had high MDLs because of the inability to collect enough biomass in the field. The samples were analyzed but were diluted in the lab to obtain sufficient sample volume. As a result, these samples were reported as non-detected concentrations although with high MDLs. These samples with high MDLs were censored at one-half the MDLs and are denoted with solid red circles on the SWD. Thus, while these samples appear to be elevated, they are in fact non-detected concentrations.

As shown on the SWD, benthic macroinvertebrates were found at all stations on the Blackfoot River. Although many of the Blackfoot River stations where benthic macroinvertebrates were found elevated are downstream of P4 influences, it would be erroneous to attribute contaminants solely to those inputs. As illustrated on the SWDs, there are upstream, non-P4 influences that are elevated and contributing contaminants to the

Blackfoot River. For example, MST027 and mine-specific background station MST229 are shown elevated and are both directly downstream of the confluences of East Mill and Spring creeks, both historically elevated systems that are not P4 influenced.

Table 3-59 presents historical selenium concentrations found in benthic macroinvertebrates at sampling stations along the Blackfoot River. As shown in this table, benthic macroinvertebrates were collected at seven of the 16 Blackfoot River stations in 1999 and 2000, and all 16 stations in 2004. A combined total of 30 benthic samples have been collected during the three sampling events. Detected selenium concentrations in these benthic samples range from 1.0 to 27 mg/kg dw.

3.5.5 Terrestrial Biota

A variety of biological-chemical data are available from the pre-2004 period (see Drawings 3-0 and 3-21). This biological data includes the elk tissue, bird egg, and cattle biotic data. These data may be uniquely useful in the human health and ecological risk assessments and, therefore, are considered separately in the discussion below. Data also are available for other media such as various small mammals and terrestrial invertebrates. The results for the elk tissue and bird egg data are not unique to a particular mine. These area-wide data are presented once, in Section 3.2.6. The cattle data were collected at the Henry Mine and are in Section 3.3.6. Detailed information on the elk tissue, bird egg, and cattle tissue data are found in the *DQUR/DAR* (MWH, 2010a).

3.5.5.1 Elk

Refer to Section 3.2.6 for discussion of the elk biotic data at the Sites.

3.5.5.2 Bird Eggs

Refer to Section 3.2.6 for discussion of the bird egg biotic data at the Sites.

3.5.5.3 Cattle

Refer to Section 3.3.6 for discussion of the cattle biotic data at the Sites.

3.5.5.4 Small Mammals

This section presents the characterization of analytes in small mammals in riparian areas along the Blackfoot River. In 2001, small mammals were sampled (least chipmunk and deer mice) at riparian locations along the river to evaluate potential impacts of detected surface water and sediment contamination on small mammals. Small mammal samples (harvest mouse, deer mouse, and least chipmunk) were collected at one stream station riparian area (MST026) in September 2001. Selenium results are presented in Table 3-60.

As shown in Table 3-60, a deer mouse, a western harvest mouse, and a least chipmunk were collected and analyzed with reported selenium concentrations ranging from 0.35 to 1.7 mg/kg dw. Complete analytical results of this investigation are included in the *Summer 2001 Area-Wide Investigation Data Summary* (MWH, 2002e).

No applicable regulatory screening levels have been identified at this time for comparison to this small mammal data. At this time, the uses of these data are limited as indicated in the *DQUR/DAR* (MWH, 2010a). The data's existence is noted; if the risk assessment indicates a potential need to evaluate small mammals, the data may be used in scoping a study.

3.5.5.5 Terrestrial Invertebrates

This section presents the characterization of analytes detected in terrestrial invertebrates in riparian areas along the Blackfoot River. In 2001, samples of insects and worms were collected at riparian locations to evaluate potential mine-related impacts to terrestrial invertebrates by surface water and sediment contamination. Insect and worm samples were collected at one stream station riparian area (MST026) in September 2001. These invertebrates were analyzed for aluminum, antimony, arsenic, barium, beryllium, cadmium, chromium, copper, lead, manganese, mercury, molybdenum, nickel, selenium, silver, thallium, vanadium, uranium, and zinc. Selenium results are presented in Table 3-61. Complete analytical results of this investigation are included in the *Summer 2001 Area-Wide Investigation Data Summary* (MWH, 2002e).

As shown in Table 3-61, terrestrial invertebrate samples of insects and worms were analyzed and had selenium concentrations of 3.3 mg/kg dw and 38 mg/kg dw, respectively.

No applicable regulatory screening levels have been identified at this time for comparison to the terrestrial invertebrate data. At this time, the uses of these data are limited as indicated in the *DQUR/DAR* (MWH, 2010a). The data's existence is noted; if the risk assessment indicates a potential need to evaluate terrestrial invertebrates, the data may be used in scoping a study.

3.6 Contaminant Fate and Transport

This section describes the possible fate and transport processes for constituents that have been detected at the P4 Sites. Section 3.6.1 presents an overview while Section 3.6.2 discusses the chemical processes that influence fate and transport of COPCs in the environment. The following subsection (Section 3.6.3.) discusses constituent fate and mobility in the environment specifically as it relates to the inorganic constituents found at the P4 mine sites. The objective of Section 3.6 is to provide the basis for the fate and transport discussions that are included in Section 3.7 and as part of the human health and ecological conceptual site models presented in Section 3.8. When combined, the information presented in Sections 3.6, 3.7, and 3.8 will support the design of any necessary field sampling activities that would be required during the RI/FS.

3.6.1 Contaminant Fate and Transport Overview

The general classes of chemical compounds discussed in this section only include inorganics because, based on site knowledge, other classes of compounds, such as organics, are not COPCs associated with the P4 mine sites.

Constituent fate and transport is controlled by a complex set of processes, including constituent source characteristics (e.g., waste types, and duration and method of placement in the environment), site physical characteristics (e.g., site geomorphology, structural geology, and hydrogeology), and the physical and chemical properties of individual constituents. This fate and transport discussion is intended to be qualitative and descriptive,

rather than quantitative, and is based on the current understanding of general fate and transport processes potentially occurring at the P4 mine sites. The fate and transport discussions are presented in the following two sections:

- Transport Processes - provides a brief general summary and discussion of the physical and chemical transport processes that move constituents through the environment and specific physical/chemical properties of inorganic elements that determine their fate and mobility in the environment. This section also discusses the chemical and biological factors that lead to the degradation and transformation of constituents (where applicable).

- Inorganic Constituent Characteristics, Fate, and Mobility - provides a qualitative evaluation of the fate and mode of constituent transport in terms of the chemical and physical properties for inorganic elements. In this section, inorganic elements are grouped for discussion purposes when they behave similarly in the environment.

3.6.2 Transport Processes

The fate and transport of organic and inorganic constituents in the environment is a complex process and is influenced by the following physical and chemical transport processes. Note that the relative influence or the dominance of any of these individual transport mechanisms depends on the chemical and physical properties of the site (site conditions), the constituents present at the site, and the interaction of the constituents with both the site media and each other. The transport and attenuation processes include:

- **Advection** – The physical process by which solutes are transported by the bulk motion of the flowing groundwater.

- **Diffusion** – Random motion of compound molecules or ions in solution or in the vapor phase that results in their moving from areas of high concentration to areas of lower concentration. For solute transport in groundwater, this process is slower than advection but results in movement of compounds in directions other than the groundwater flow.

- **Dispersion** – A spreading phenomenon that causes dilution of the solute (groundwater) due to mechanical mixing during fluid advection and molecular diffusion.

- **Adsorption/Desorption** – Physical and electrochemical attractions that cause compounds to adsorb to and desorb from soil, resulting in compound

movement that is slower than the average speed of groundwater or infiltrating water.

- **Solubility** – The concentration of a compound that can be dissolved in water or another liquid.
- **Transformation** – The conversion of constituents into other compounds due to microbial activity, environmental conditions, or chemical processes (such as hydrolysis or oxidation/reduction). Transformation results in a reduction of the mass of the constituent in the environment. The transformation products can be more or less toxic and their mass may increase as the mass of the original constituent decreases.
- **Volatilization** – The transfer of constituents from liquids into the gas phase in unsaturated environments or into the atmosphere.

The behavior of inorganic constituents affected by these processes can be estimated using environmental fate parameters such as Henry's Law constants and adsorption coefficients, which relate the physical and chemical properties of the individual constituent to the environment. Compound-specific fate and transport parameters are complex for inorganic constituents due to the solubility of the individual constituents, which is determined by the pH, reduction-oxidation (redox) potential, the speciation of the chemical, and the temperature of the environment.

The following paragraphs focus on the chemical and physical properties that specifically influence the fate and transport of inorganic constituents in the environment. These chemical/physical processes are interrelated, which often complicates the fate and transport of inorganic constituents in groundwater. Because of the specificity of chemical and physical properties affecting the fate and transport of inorganic constituents in the environment, they are addressed on an individual basis below:

- **Solubility/Precipitation.** The maximum amount of an inorganic constituent that will dissolve in groundwater can be estimated using the thermodynamic solubility constants of the different inorganic compounds that can be formed. If the aqueous solubility limit of a mineral phase is exceeded, the solid phase should precipitate until the system reaches equilibrium. For instance, if a leachate high in sulfate recharges an aquifer containing groundwater in equilibrium with gypsum (calcium sulfate), the solubility of gypsum would be exceeded and gypsum would precipitate until the system reached chemical equilibrium. In natural systems, many factors complicate the application of chemical equilibrium

principles. Dissolution kinetic of a mineral may be slower than the rate of groundwater flow, and consequently that mineral species may never reach saturation in the groundwater. Many types of minerals contain the same constituent ions, and the contribution of an ion from one mineral will decrease the solubility of another mineral containing the same ion (Stumm and Morgan, 1981). The redox conditions and/or pH of soil pore solution or groundwater also affects the solubility of minerals.

- **Adsorption/Desorption**. Adsorption/desorption of ions to or from soil particles plays an important role in the fate and transport of inorganics. Surface adsorption and desorption depends on the surface charge, the properties and charge of the ion, and the pH of the water. Like adsorption of organics, the adsorption of a specific inorganic species to a solid surface can be described by a partitioning coefficient, Kd. However, much of the data on partitioning of inorganics between the aqueous and solid phases either is based on laboratory experiments in very simple systems or is derived empirically from field observations at a specific site. Hence, this information has limited value in quantifying adsorption and desorption reactions; but this information is useful in qualitatively evaluating the behavior of inorganics and in predicting their relative behavior in soil and groundwater. In general, positively charged metal ions, such as iron, manganese, barium, zinc, and some anions, tend to adsorb to solid phases; and transport of these species will be retarded relative to the groundwater flow velocity.

- **Complexation.** Complexes are dissolved species formed from the combination of two or more simple dissolved species, each of which can exist in an aqueous solution (Drever, 1982). Complexes typically are formed between cations and anions, and between cations and neutral to negatively charged organic species. The negatively charged or neutral species usually is called the ligand. Simple cation and anion complexes are referred to as ion pairs; complexes that are more structurally complicated are referred to as coordination compounds. Ion pairs typically are less stable than coordination compounds. Organic acids and compounds that have more than one ligand (called multi dentate) form relatively stable complexes. The stability of the complex is described by its stability constant, which is analogous to the equilibrium constant defined for dissolution/precipitation reactions. Formation of complexes can increase the solubility of a compound by removing free ions from solution. Complexes can stabilize a dissolved species in solution, and hence can be an important factor in the transport of inorganics, particularly for the transition metals iron, manganese, and chromium.

- **Reduction-Oxidation.** Reduction-oxidation (redox) reactions involve changes in the oxidation states of elements. Redox conditions in soil and groundwater are determined primarily by bacterially mediated decomposition of organic matter (or occasionally sulfides or ferrous silicates) and the rate at which oxygen is introduced to the system (Drever, 1982). For soils, water content also affects redox potential. In general, as the soil water content increases, the redox

potential decreases. Other factors that control the redox potential in soil or groundwater are the presence of redox buffers, such as iron and manganese oxides and hydroxides, and the fact that reactions that lower redox potential are slow.

3.6.3 Inorganic Constituent Characteristics, Fate, and Mobility

Inorganic constituents that originate from the Sites are derived from phosphate ore and associated rocks. These rocks contain trace amounts of cadmium, chromium, nickel, selenium, vanadium, uranium and other elements, which are COPCs found in the media at the Site, including soil, surface water, sediments, groundwater, and biota. The COPCs that have been detected in these environmental media (at each mine site) above selected regulatory screening levels are presented in Sections 3.2, 3.3, and 3.4. These COPCs are all inorganic, existed in the environment prior to mining activities, and are persistent in the environment, unlike many organic compounds which degrade over time. As discussed below, the chemical form (species) may change depending on site conditions resulting in more or less mobile forms of the inorganic elements. In some instances, attenuation can occur similar to degradable organics, but this attenuation is the result of the inorganic constituent transitioning from a mobile phase to an immobile phase. When rocks containing COPCs are removed from their natural setting, these phase transitions can result in the release of the COPCs at concentration of environmental concern.

The following text presents a general description of fate and transport of the inorganic constituents in the environment, which includes inorganic constituents that have been detected at the Site. Unless otherwise noted, these discussions are taken from Kabata-Pendias and Pendias (1992). A more extensive discussion of selenium follows this generic discussion of inorganic transport because it is recognized that selenium is the primary risk driver at the Site.

Cadmium, Nickel, Silver, and Zinc. Cadmium, nickel, silver, and zinc are present in soil as cations. The mobility of these metals is related to their solubility in water, which in turn is related to the pH and redox conditions. These metals become more soluble (mobile) with lower pH. At the neutral to alkaline soil conditions that are present at the Sites, all of these

metals have low mobility. Silver in particular is highly insoluble in the soil environment (McLean and Bledsoe, 1992). Cadmium can be converted to $CdOH^+$, which is not readily sorbed and thus shows a greater tendency to migrate. These metals could be more mobile in areas of the Sites where low pH acid rock drainage (ARD) develops. However, at the Sites, waste rock in the waste dumps is net neutral and acidic waters have not been observed.

Arsenic. Arsenic typically is present as anions and can be more mobile than the cations discussed above. Arsenic can be present in a variety of oxidation states. Under most environmental conditions, arsenic is present as either as +5 (arsenate) or +3 (arsenite). Both pH and the redox are important in assessing the form and mobility of arsenic. Arsenate predominates in more oxidized conditions and arsenic mobility is relatively low. However, as the pH increases or redox decreases, arsenite will predominate and mobility will increase.

Chromium. Chromium can exist in the environment as a cation in the trivalent state (e.g., Cr^{3+} in common complexes such as chromium chloride ($CrCl_3$) or chromium hydroxide ($Cr(OH)_3$) or as part of anionic complexes in the hexavalent state (e.g., CrO_4^{2-}). In the trivalent state (Cr(III)), chromium behaves similarly to the other cations discussed, being mobile only under acidic conditions. In contrast, hexavalent chromium (Cr(VI)) is highly mobile. Cr(VI) is unstable and can be converted to Cr(III) in the presence of organic matter. However, in deeper soils where little organic matter is present, Cr(VI) is persistent.

Molybdenum. Molybdenum is a cationic metal (Mo^{4+} and Mo^{6+} predominating); however, it exists primarily as anionic molybdate (MoO_4^{2-}) in the environment. Because of this behavior, molybdenum typically has the characteristic of increasing solubility with increasing pH. Molybdenum is often associated with organic matter and may be enriched in organic-rich rocks such as black shale. Molybdenum is strongly adsorbed by iron hydroxides and organic matter.

Uranium. Natural uranium is found in the environment in three forms called isotopes: uranium-234, uranium-235, and uranium-238. Ninety-nine percent of natural uranium occurring in rock is uranium-238. Uranium-235 accounts for just 0.72 percent of natural uranium, but it is more radioactive than uranium-238. Uranium-234 is the least abundant

uranium isotope in rock. Naturally Occurring Radioactive Material (NORM) is defined as materials which may contain any of the primordial radionuclides or radioactive elements as they occur in nature, such as radium, uranium, thorium, potassium, and their radioactive decay products that are undisturbed as a result of human activities (USEPA, 2006b).

Natural uranium is not a stable element. As uranium decays, it releases radiation and forms decay products. Uranium-238 decay products include uranium-234, radium-226, and radon-222. During the decay process, uranium releases alpha particles and low levels of gamma rays. Alpha particles can travel only short distances and do not penetrate human skin; however, gamma radiation can penetrate the body.

The half-life for uranium-238 is about 4.5 billion years, uranium-235 is 710 million years and uranium-234 is 250,000 years. Because of the slow rate of decay, the total amount of natural uranium in the earth stays almost the same, but radionuclides can move from place to place through natural processes or by human activities.

Uranium is known to be associated primarily with phosphatic deposits because hexavalent uranium complexes well with dissolved phosphate. Phosphate rock contains phosphorite, a form of the mineral apatite, which is known to accommodate uranium. Uranium is present in the phosphate ores of SE Idaho and can be concentrated during the refinement process prior to processing. USGS researchers have analyzed Phosphoria Formation ore for uranium. This analysis has shown uranium concentrations ranging from 26 to 108 ppm with the highest concentrations occurring in the ore beds (Herring and Grauch, 2004).

Sulfate. Sulfate is a highly mobile constituent. The complexes it forms with the most common condition in soil are typically highly soluble, if not miscible, and they can generally be expected to conservatively infiltrate with water. It is not expected to significantly sorb or volatilize. Sulfate is readily taken up by plants, but can also be converted to sulfide under reducing conditions, which may be biologically mediated. Based on the behavior of sulfate in the environment, it is expected that sulfate is released from the waste rock at the Sites, that it is mobile, and should correlate with concentrations of other COPCs being released.

Selenium. The fate and transport of selenium depends on the site-specific geochemical conditions similar to the other inorganics discussed above. In general, selenium exists as selenate (SeO_4^{2-}) in oxic alkaline conditions. Selenates are highly mobile; however, selenite (SeO_3^{2-}) becomes stable under less oxidizing conditions. Selenite is a less mobile form of selenium. Under strongly reducing conditions, elemental selenium will form followed by selenides (H_2Se or HSe^-). Elemental selenium and selenides have very low mobility. Because selenium is the primary COPC at the P4 mines, the information presented below greatly expands on the mechanisms governing the fate and transport of selenium.

The initial mineralogical form of the selenium, and any other element, plays a large role in the potential release to the environment. In relatively insoluble forms, the selenium may not be released into the environment as a contaminant, even if present in elevated concentrations in the source rock, or it may be released so slowly that it results in no measurable change in the environment. Some forms are readily released and others require secondary reactions for the selenium to be released. Selenium has chemical properties similar to sulfur and readily substitutes for sulfur in the lattices of sulfide minerals (Neal, 1990). Mineralogical studies by the USGS document the occurrence of seleniferous sphalerite, pyrite, and organic compounds as well as native selenium in rocks of the Meade Peak Member of the Phosphoria Formation. Selenium is associated with organic matter (kerogen) in carbon-rich rocks and with pyrite in rocks that have lower concentrations of organic carbon (Desborough et al., 1999). Selenium correlates most strongly with both organic carbon and total sulfur in the Meade Peak rocks (Herring and Grauch, 2004). Selenium that is bound in sulfides and organic carbon may be released as the result of oxidation reactions similar to the processes that form acid-rock drainage in metal and coal mine waste rock dumps.

It appears that the majority of the selenium in the Meade Peak Member waste rock is contained in sulfides and organic material that need to be oxidized to mobilize the selenium contained within the rock matrix. However, geochemical studies of the Phosphoria Formation also indicate that a portion of the total selenium content occurs outside of these identified mineralogical reservoirs (Maxim, 2002); these studies suggest that there is a source

of readily soluble selenium in relatively unweathered Meade Peak Member rocks that can be released by short-term leaching (24 hour) even under anoxic conditions (Herring, 2004). Recently, saturated and unsaturated column testing for the Blackfoot Bridge EIS verified that there is an initial release of soluble selenium (Whetstone, 2009; BLM, 2009). However, this testing indicated that the initial selenium release was much less under saturated conditions and that beyond the first leaching cycle, unsaturated and oxidizing conditions were required for long-term selenium release.

The occurrences of elevated selenium concentrations in first rinses during column testing suggest that selenium may also be present as surficial complexes adsorbed onto clay, carbonate minerals, and oxides of iron, aluminum, and manganese in the unweathered (unoxidized) rock. Such selenium may be released at a higher than background rate when the permeability of the rock mass is increased due to disturbances like mining. Oxyhydroxides along with organic matter constitute a secondary source of selenium in unweathered or minimally weathered Meade Peak rocks, with sulfide as the primary reservoir (Perkins and Foster, 2004). It is possible that this more readily soluble selenium is the result of in-situ weathering of primary minerals and organic matter prior to mining.

It is possible that the readily soluble forms of selenium (adsorbed selenite or selenate ions) are the most significant contributor to elevated aqueous selenium concentrations associated with the phosphate mining waste, and that the less soluble forms contribute less selenium in the near term following waste rock deposition. This in part may be due to sufficient neutralizing capacity in the waste rock, which inhibits the formation of the widespread acidic and biological conditions that enhance sulfide oxidation reactions and the subsequent release of selenium from sulfide minerals. However, where oxidation can readily occur due to air movement through the waste rock, the less soluble forms of selenium may represent a more significant long-term source.

Accelerated release of selenium (and other COPCs) due to ARD formation is not a significant concern associated with the waste rock at the Sites. The conditions surrounding sulfide oxidation and the development of ARD are complex, but they are also very well studied (e.g., Alpers and Blowes, 1994). There are a number of ways a circum-neutral

environment can slow sulfide oxidation. Most importantly, ARD generation is a process that occurs much more rapidly in the presence of catalyzing bacteria (e.g., *Thiobacillus ferrooxidans*), which only thrive in the low-pH environments. Another notable factor is that ferric iron (Fe^{3+}) also will oxidize sulfides, even in the absence of oxygen. In alkaline conditions, the ferric iron will readily precipitate and form a secondary mineral, such as ferric hydroxide. Under acidic conditions the ferric ion will remain in solution and is available to oxidize additional pyrite or other sulfide minerals thereby further advancing ARD formation. Of note is that the secondary iron minerals that precipitate in the neutral environment may coat sulfide grains limiting oxygen and water availability for further oxidation (Nicholson, et al., 1990). Therefore, while the oxidation process may be transforming selenium and other COPCs to mobile forms, there are other concurrent processes that moderate the oxidation process and release of selenium into the environment.

The selenium must be transported from the source to the surrounding environment once released from the mineral form. This requires both specific hydrochemical and hydrological processes. Reduced forms of selenium such as selenide (Se^{2-}) and native selenium (Se^{0}) are relatively insoluble in water, have low environmental mobility, and have potential for bio-availability (Seed et al., 2000; Neal, 1990).). However, exposure to atmospheric oxygen can oxidize selenide (Se^{2-}) from sulfides and organic matter and oxidize native selenium (Se^{0}) into more mobile forms such as selenite (SeO_3^{2-}) and selenate (SeO_4^{2-}).

Once mobile and in transport, the potential exists for attenuation of selenium through biologically mediated reduction of selenate to less mobile selenite and subsequent adsorption within the waste rock and/or groundwater flow systems. Further reduction may result in precipitation as native selenium or as a selenide. If mobile selenium forms are present, or if the top of a mine dump is oxygenated, selenium may be released and move in a mobile form. However, if the interior of the mine dump or mine pit back fill is oxygen deficient, it is possible for selenium to be reduced through biological processes, become less mobile, and be retained in the dump environment through adsorption or precipitation. For this to be effective, a carbon source needs to be available for the bacterial growth and development of anoxic conditions. Such anoxic conditions are indicated by some dump seepages (Herring,

2004). In contrast, if a waste rock dump is well aerated, reduction of selenium is less likely and selenium transport through the dump is more likely. Factors that affect the air flow into a dump can include dump composition (i.e., material grain size), physical configuration (e.g., compaction, location of fine and coarse material), level of saturation, and placement and type of closure cover.

The sorption and oxidation/reduction processes that affect the transport of selenium have been studied. Selenium occurs as three principal species under oxidizing conditions and typical groundwater pH: selenite (SeO_3^{2-}), biselenite ($HSeO_3^-$) and selenate (SeO_4^{2-}) (Neal, 1990; Hem, 1989). Geochemical controls that reduce or limit the solubility of selenium in water include adsorption of selenium into mineral surfaces with iron, manganese, and aluminum hydroxides and oxyhydroxides (Hayes et al. 1987; Balistrieri and Chao, 1990; and Rajan, 1979). Clay and carbonate minerals may also provide effective sorption surfaces for selenium (Bar-Yosef and Meek, 1987; Cowan et al., 1990). In general, selenate is much less strongly adsorbed to mineral surfaces than is selenite. Redox potential and pH both affect selenium solubility and sorption reactions with reducing conditions and lower pH favoring sorption (Neal, 1990; McLean and Bledsoe, 1992). The pH of groundwater and surface water at the Sites tends to be circum-neutral.

Redox reaction rates involving selenium are quite rapid (Pickering et al., 1995) with the aqueous species selenite (SeO_3^{2-}) and selenate (SeO_4^{2-}) being readily reduced to insoluble Se^0 (Hem, 1989). Likewise, native selenium (Se^0) and selenide (Se^{2-}) are easily oxidized to forms that are more mobile in the environment (Pickering et al., 1995). Microbial activity is an important process that affects the redox cycling of selenium in the environment. Selenate in solution is reduced to elemental selenium and precipitated by a number of anaerobic bacteria that are present in a wide range of sediment types (Stolz et al, 2002). Sulfate reducing bacteria are able to reduce selenium oxyanions to elemental selenium by abiotic, but biologically mediated, pathways (Hockin and Gadd, 2003). The remobilization of selenium through microbially mediated oxidation also occurs. However, the rates of oxidation are generally three to four orders of magnitude less than the reductive part of the cycle (Stolz et

al., 2002). The microbial mediation of selenium to volatile methylated selenium species may be a factor in the persistence of selenium in soil and water (Neal, 1990).

If the selenium is released from the dump environment into the groundwater environment, many of the same attenuation processes will continue to affect the selenium mobility. As long as an anoxic environment is present and some soluble organic matter is present, natural selenium attenuation may occur.

In summary, two reservoirs of selenium result in most, if not all, of the selenium contamination seen at the Sites. The first of these is a reservoir or readily soluble selenium that may be mobilized by contact with water moving through or across the rock. The second reservoir is minerals or organic matter that needs to be oxidized for release of bound selenium. Flushing of soluble selenium can occur throughout the waste rock dump immediately after deposition. This may represent a limited long-term source of selenium because this reservoir is relatively small compared to the total selenium content. However, oxidation of selenium containing minerals can begin once the rock is excavated. After the excavated rock is placed in a dump, the sulfide oxidation processes are likely to occur on the outer shell of the dump but can progress inward with time. This may gradually mobilize selenium and act as a longer-term source; however, sulfide oxidation processes may be relatively inhibited in the waste rock deposits.

Once mobilized, other processes may work to immobilize selenium. Pit backfills in particular are favorable for developing anoxic conditions because of more limited exterior dump surface area (a top surface only) compared to exterior waste rock dumps with a larger total external area (i.e., tops and sides). In these conditions, anaerobic bacteria many reduce the selenium to the less soluble selenite species, which may then sorb to a variety of mineral surfaces. Conversion to more reduced selenium species may result in direct precipitation as native selenium. Organic matter is important for bacterial growth and the reduction process. The Phosphoria Formation, with its high organic content, may provide a carbon source and support the reduction process. A key consideration for this attenuation process is whether anoxic conditions develop in the waste rock dump. This is not assured because of processes such as thermal convection through the dump and the level of water saturation. The

presence or absence of anaerobic bacteria may be one explanation for the variation of selenium concentration in some dump seepage.

3.7 Transport Pathways

This section describes the specific physical transport pathways by which Site constituents may move into and through the environment. The four media discussed here are soil, vegetation, surface water, and groundwater. The discussion of soil and vegetation is limited because transport in these media is local if at all. However, transport in surface water and groundwater is primarily through advection in the pathways of importance, and off-site transport in these media has been documented. Therefore, the discussion of transport in these water pathways is more extensive. The discussion of groundwater transport presents a general discussion of contaminant release and migration followed by mine-specific discussions of individual potential transport pathways that were identified and investigated in the EE/CA since 2004 (e.g., MWH, 2007a; MWH, 2009d).

This transport pathways discussion is a synthesis of the physical properties and site characterization data presented in Sections 3.1 through 3.4 for each of the four primary media of interest. The transport pathways discussed in this section are incorporated into the comprehensive site conceptual models that address the overall contaminant release and migration to potential receptors, which are discussed in Section 3.8. The subsections below only discuss the release mechanisms and physical routes of migration whereby contaminants may move away from the source areas.

3.7.1 Soil Transport

Soil COPCs may be physically transported through erosion and mass wasting, and chemically released through reactions occurring when water contacts these soils. The suspended and dissolved solids transported by surface runoff are generally transported only a short distance from the waste dumps as supported by the soils data discussed in Sections 3.2 to 3.4. As runoff water flows over and off unreclaimed waste dumps and pit walls, the larger solids can be deposited on the surface and the dissolved COPCs may be transported

to the surface water and groundwater system, depending on the occurrence of attenuation. Across the Sites, the erosion or mass wasting transport pathway results in sediment accumulations that may act as secondary sources. These secondary sources are not considered to be significant for receptors because of their limited areal extent.

3.7.2 Transport in Vegetation

Plant uptake of COPCs from soils is not a pathway for physical transport of COPCs away from the Sites. However, this process is a potential exposure pathway to receptors as further discussed in the overall site conceptual models in Section 3.8. Soils may receive COPCs transported via surface water, seeps, or shallow groundwater flow and then act as a secondary source, primarily via plant uptake from soil. Certain plant species have the ability to accumulate selenium at concentrations higher than observed in the soil/overburden (hyperaccumulators). As described in Sections 3.2 to 3.4, outside of the waste dumps, plant uptake of selenium remains low because the soil selenium concentrations are low.

3.7.3 Surface Water Transport

Transport of selenium and other COPCs from potential source areas to stream systems can happen via two different mechanisms:

- Groundwater discharge to the ground surface or stream - groundwater discharge via dump seeps, springs, and shallow groundwater
- Runoff - overland runoff due to precipitation or snowmelt

An example of these flow paths is illustrated on Figure 3-55. The most general conceptual pathway for selenium and other COPC release from phosphate mining waste is transport through the waste rock dump via precipitation or snow melt infiltration. Infiltration can be followed either by discharge to the surface as a seep or infiltration and percolation to the groundwater system. Infiltration into the groundwater would then be followed by discharge through a spring or the shallow groundwater directly into a surface water channel or pond. Alternately, certain conditions may also allow for overland flow over exposed source rock to enter surface water channels directly.

3.7.3.1 Groundwater Discharge to Surface Water

Seeps. One route of transport of selenium and other COPCs into surface water is the infiltration of precipitation and discharge via waste rock dump seeps as shown on Figure 3-55. Conditions may allow for rainfall or snowmelt to infiltrate and enter the dump. The infiltrate may then percolate and follow preferential flow pathways and exit the dump as seepage. Seeps of this nature are generally found on poorly reclaimed dumps where poor vegetative cover facilitates infiltration. Dump seeps on the site are typically found at the toes of dumps and can be either ephemeral or perennial but are usually the former. They also generally occur at topographic lows in the natural, pre-dump surface such as pre-existing drainages. Dump seep discharge points are typically only briefly channelized, and the seepage usually infiltrates right back into the off-dump groundwater system. However, for a brief moment each year, many seeps will eventually make contact with streams during spring runoff. An example of a perennial dump seep that maintains nearly year-round contact with a surface water channel is MDS022 at the Henry Mine (Drawing 3-33). The Henry Mine South Pit Overburden Dump Limestone Drain flows directly into Strip Mine Creek which converges with Lone Pine Creek.

Seeps also occur under slightly different conditions, where waste rock dumps have been built directly on pre-existing springs or existing drainage channels. As discussed in Section 3.7.1.4, the bottom of dumps may have higher permeability because when the rock is dumped the larger fragments tend to settle along the bottom of the slope and any compaction from equipment tends to occur on the upper surfaces. Thus, when a dump is placed over a spring or pre-existing stream channel, water is able to flow and transport COPCs through the waste rock to a discharge point, typically at the toe, with relative ease. An existing tributary channel that runs beneath a mine dump at the Ballard Mine is an example of this type of system. Sampling location MST069 on the tributary has been found to repeatedly have elevated levels of selenium and is one of the most impacted streams at the Sites.

Springs. Infiltration may bypass the dump seep pathways and percolate directly into the shallow groundwater systems and then discharge as springs farther down the groundwater

system, as shown on Figure 3-55. There are numerous springs at the Sites, and most of them are alluvial groundwater expressions that surface near the toes of waste dumps. While most springs at the Sites deliver perennial discharge to the surface, few provide enough water to sustain overland flow to surface water channels throughout the year. Most springs become channelized just down slope from the discharge point, but the channel will typically end further down slope and the overland flow will become diffuse. Some springs will infiltrate back into the ground without reaching an established channel, but some will make eventual contact with streams. This contact is often facilitated and accelerated by seasonal snowmelt and heavy rains.

Shallow Groundwater. Infiltration that does not reach the surface by seeps or springs may eventually reach a stream channel by alluvial groundwater discharge (baseflow). As mentioned above, alluvial groundwater is often discharged at the surface via various springs throughout the Sites. The shallow groundwater is also capable of discharging directly into drainages in alluvial valleys at lower elevations, as shown on Figure 3-55. The alluvial groundwater systems at each of the Sites are described in detail in Sections 3.7.4.2 through 3.7.4.4, but the relationships to surface water are summarized here.

On the east side of the Ballard Mine, hydrogeological relationships between spring and well data suggest that the North Fork and the main stem of Wooley Valley Creek could be potentially impacted by alluvial groundwater discharge. On the west side, the surface water that could be impacted is Long Valley Creek to the north and a short tributary to the Blackfoot River to the south.

At the Henry Mine, the seepage and shallow groundwater flow from the southern end of the central Henry Mine area could recharge and potentially impact groundwater within the alluvial system that flows to the southwest toward Long Valley Creek. Data also suggest a likely discharge area for shallow groundwater within the alluvium into Lone Pine Creek.

At the Enoch Valley Mine, alluvial flow from the center and southern portions of the mine will report to the East Fork and the main stem of Rasmussen Creek. The most direct

impacts are likely to the East Fork of Rasmussen Creek where the channel runs along and underneath the southern mine waste area.

It should be noted that many of the streams references above may be intermittent and not receive groundwater baseflow from affected groundwater sources during much of the year. It has been observed that elevated selenium concentrations are largely associated with snow melt during the spring runoff period and not the baseflow portion of the seasons.

In general, much of the groundwater discharge to surface waters at the Sites is seasonal (related to snow melt), whether it is from seeps, springs, or as baseflow. It appears that a primary source of COPCs is runoff-related interflow or shallow groundwater flow. Therefore, effects of the transport/transfer of COPCs in groundwater to surface water are most pronounced in the spring and early summer. However, perennial discharges also occur. These perennial discharges are typically associated with deeper groundwater flow paths. Both shallow and deeper groundwater sources may transport/transfer COPCs to receiving surface water bodies.

3.7.3.2 Runoff Transport to Surface Water

The other component of the surface water selenium transport conceptual model is overland flow from runoff. Overland flow can occur over waste rock dumps during heavy rains or during the spring snowmelt resulting in direct surface runoff into surface water channels. There are generally two ways that this type of runoff can occur. Runoff can occur in well reclaimed areas of waste rock, or surface runoff can be initiated by stormwater pond or backfilled mine pit overflow.

Waste rock dump runoff is less likely to have a significant role in selenium transport because, if runoff does occur from a dump, it will likely be over adequately reclaimed areas with lower soluble selenium and other COPC concentrations (in contrast to percolation through waste rock). Reclaimed areas usually are graded and well vegetated to facilitate runoff and discourage infiltration; thus, the runoff will not be in contact with source rock. Conversely,

precipitation and snow melt is less likely to runoff on poorly reclaimed areas and more likely to infiltrate into the waste rock.

Transport of selenium and other COPCs from surface runoff typically is going to occur from ponds or un-backfilled mine pit overflow. A list of the 18 ponds on the Sites and the potential overflow locations are listed in Table 2-10. These are potential directions of flow in case overtopping occurs, and these flow patterns have never been observed. In some cases, however, channels have been observed suggesting that such overflow does occasionally occur. In addition, many of the ponds listed were, or are, part of a stormwater control system with secondary ponds present should they overtop.

The poorly reclaimed un-backfilled mine pits at the Ballard Mine are capable of providing some runoff with elevated selenium and COPC concentrations to the surface water system. Notably, runoff channels have been observed issuing from mine pits MMP039 and MMP040. Runoff from MMP040 can leave the site. Runoff from MMP039 is captured in a pond behind a shallow berm on MWD084 where it either evaporates or infiltrates the waste rock. The berm may overtop during a significant runoff event. Some runoff is also possible from MMP036.

3.7.4 Groundwater Transport

This section presents a discussion of the potential pathways for groundwater transport of selenium and other COPCs. Included in the discussion is the presentation of generic transport pathways for each source type. This is followed by discussion of specific groundwater transport pathways for each mine area. In this discussion, three types of flow systems relevant to the P4/Monsanto mines are considered:

- Shallow alluvial groundwater flow systems
- Flow systems in the Dinwoody and Thaynes formations
- Flow systems in the Wells Formation

All three of the systems, but mostly the bedrock system, may be modified by structurally controlled flow systems.

As discussed in Section 2.2.5, these systems can be generally related to the three types of flow systems identified for the Southwest Idaho Phosphate Region: (1) local, (2) intermediate, and (3) regional. These flow systems roughly correspond to the first three hydrogeologic systems identified for the P4/Monsanto mines, with the structural systems most commonly being local and intermediate. However, exceptions can occur.

With local systems, the recharge areas are located adjacent to the discharge area (e.g., recharge on a hillside and the discharge to a stream in the adjacent valley floor). For this study, the uppermost weathered bedrock is included in the alluvial system because the hydrogeologic properties of the weathered bedrock are similar to the alluvium; and groundwater in the weathered bedrock appears to be in direct communication with the groundwater in the alluvium. Basalt and other bedrock units may also act as local systems in some cases. The water table in this system may occur either in the alluvium or underlying weathered bedrock depending upon the season and hydrogeologic properties of the units. Groundwater flow in colluvial deposits is also considered part of this system. Colluvial deposits are typically mixed deposits of soil and rock that results from the mass wasting of slopes. Since the shallow groundwater system often directly underlies the waste rock deposits, the alluvial system is most likely to be impacted by seepage from the waste rock dumps, and may provide the most direct link to potential receptors, whether it be through spring flow, discharge to nearby creeks, or potential plant uptake. Local bedrock flow paths may occur in the mine areas such as the interior of the Ballard Mine, where the Dinwoody Formation may represent a flow path between the Center and West Mine Pits.

The Dinwoody and Thaynes formations typically host either local or intermediate ground-water flow systems. The intermediate systems have the recharge area in one basin and the discharge area in the adjacent basin. There may be local systems that overlie intermediate groundwater flow systems. While the Dinwoody and Thaynes formations commonly support local and intermediate flow systems, it is possible that more regional flow systems

could be supported by these formations (recharge in one basin with discharge in basins that are not adjacent).

The Wells Formation is generally considered to host intermediate and/or regional ground-water flow systems. The recharge areas for a regional flow system may be separated from the discharge areas by several topographic highs and be overlain by both local and intermediate groundwater flow systems. It is possible, however, that the Wells Formation also supports local flow systems.

Structural flow systems resulting from faulting or local and regional fracturing may act as local, intermediate, and regional flow systems, depending on how extensive the features are. Faults may act as flow barriers or conduits and, in some cases, may act as both. For example, thrust faults typically have a low permeability gouge zone; however, there may be significant fracturing adjacent to the actual fault that increases permeability along the thrust fault. Normal faults may have sufficient gouge to act as a flow barrier, or may be relatively open and act as a flow conduit and not be a barrier to flow. When conceptualizing the bedrock flow systems, the presence of structural features needs to considered. Generally, the greater the fault displacement, the more likely fault gouge is present and that the fault acts as a flow barrier. In addition, compressional faults like thrust faults are more likely to be flow barriers compared to extensional faults like normal faults. However, other geologic factors may have an effect on the hydrogeologic character of a fault or fault system.

3.7.4.1 Generic Transport Models

There are three primary settings where selenium-bearing shales or other rocks could be exposed to the environment and have the potential to leach selenium and other constituents (COPCs) to groundwater.

- Locations where the CWS and other COPC-bearing rock have been placed in an external (outside the mine pit) waste dump (Figure 3-55).
- Locations where the CWS and other COPC-bearing rock have been used to backfill a mine pit (Figure 3-56).

- Locations where the CWS and other COPC-bearing rock are exposed in an open mine pit wall (Figure 3-57).

The general conceptual models for each of these conditions are discussed below. There are some common components to the models that should be considered. This includes the observation that the P4 phosphate mines have been developed on mountainsides where the Phosphoria Formation is exposed at the surface. Typically, because of mining practices, the external waste rock is placed on the downhill side. This creates a condition where runoff and near-surface groundwater flow is directed in one direction – downhill away from the mine. However, there are some exceptions:

- Within the Ballard Mine area there are locations where waste dumps are uphill of a mine pit due to repetition of the geologic section and the presence of multiple pits.
- At the Enoch Valley Mine, the topography becomes relatively flat on the southern end of the mine.
- Deeper flow could be independent of topography.

Geochemistry necessarily plays a role in the conceptualization of the groundwater flow systems. Groundwater flow and a single source alone are not the prerequisite for groundwater contamination. The chemical processes must be present that allow the contaminant to dissolve and enter the groundwater system. Conversely, changes in the chemical environment of the groundwater system downgradient of a primary source may attenuate COPC in a groundwater system. The geochemical discussion presented above in Section 3.6.3 needs to be considered when discussing groundwater transport pathways.

Waste Rock Dumps. The largest sources of COPCs within the Sites are the waste rock dumps. The general transport model for an external waste rock dump is presented in Figure 3-55. In a 1976 study on the impacts of phosphate mining on groundwater systems, it was found that local flow systems associated with waste rock dumps are the primary pathway impacting groundwater quality (Mohammad, 1976). The general transport model for a waste rock dump consists of the following steps:

1. Precipitation on the waste rock dump

2. Evapotranspiration

3. Stormwater or snow melt runoff

4. Infiltration into the waste rock

5. Discharge as a dump seep

6. Percolation or flow into the alluvial or bedrock groundwater systems

Each transport model component or group of related components is discussed further in the *2007 Interim Hydrogeologic Report* (MWH, 2008b) and summarized below:

- Precipitation on the waste rock dump (Item 1 on Figure 3-55 and Figure 3-56) - The average annual precipitation in the vicinity of the P4 mines is approximately 17 to 19 inches (Section 2.2.2), with approximately 50 percent coming as snowfall in the winter months (Somsen Ranch SNOTEL Station). A portion of the winter precipitation is lost to sublimation, but most of the remainder is stored as snow and becomes available for recharge and/or runoff during a relatively short spring snowmelt period. Site-specific data are available for the Enoch Valley Mine as reported in Section 3.1.2 and O'Kane (2009a). In 2008, 15.3 inches of rain fell at the Enoch Valley soil monitoring location, which was slightly below average.

- Evapotranspiration (Item 2) - During the summer and much of the fall, evaporation and plant transpiration is effective in reducing infiltration to the waste rock and potential runoff. Even without plants, evaporation of soil moisture may occur from capillary action (wicking of the water upward). However, if only evaporative losses are considered, the total amount of water removed from the system would obviously be less. In the spring, the plants are just emerging and the plant surface area is less, reducing the effectiveness of transpiration and, to some extent, evaporation. In general, plant density and root depth will affect water infiltration into waste rock; and more water will infiltrate where plant coverage is low or not present.

- Storm water or snow melt runoff (Item 3) - Runoff is important to consider when estimating infiltration through the waste rock. Runoff can typically range from 0 to as much as 70 percent of precipitation. Hydraulic properties of the soil, antecedent moisture conditions, vegetation, rainfall intensity, and slope are all factors in the runoff component. Runoff typically has a short contact time with the waste rock, and as such, will typically have lower concentrations of dissolved solutes (including selenium) as compared to water that infiltrates through the material and has a longer residence time. The surface material is also more likely to be leached of available contaminants. However, depending upon

the amount of erosion that occurs with the runoff event, total concentrations may be elevated due to suspended solids. Impacted runoff typically will be evaluated through surface water sampling, with impacts more likely to be seen during periods of high runoff (e.g., spring snowmelt). Interflow may be another component of runoff. Interflow is the shallow groundwater flow in the surficial soil layers that may occur along a waste rock dump face. This flow may pick up higher concentrations of COPCs. The occurrence of high COPC concentrations associated with spring runoff may suggest that this is an important component of the hydrologic system.

- Infiltration into the waste rock (Item 4) - After the precipitation or snowmelt infiltrates the soil and percolates beyond the root zone; it is no longer susceptible to evapotranspiration or runoff and will either percolate through the waste rock or be trapped in storage. The study being conducted at Enoch Valley indicated infiltration into the waste rock ranged from 2 to 10 percent in 2007 and 2009 as presented in Section 3.1.2. This Site is on a well-vegetated dump slope.

- During infiltration and percolation, the geochemical and biological processes are important. Flushing of soluble selenium from the rock surfaces is the primary early source of selenium impact. A secondary source of selenium can be from the oxidation of selenium-bearing sulfide minerals and organic matter, but the significance of this source can be quite variable. Attenuation processes may act to retain some of the selenium within the waste rock environment. These geochemical processes were discussed in Section 3.6.3.

- Discharge as a dump seep (Item 5) - After water has passed through the waste rock, it will either manifest as toe seepage or infiltrate to the subsurface beneath or downhill of the dump. Toe seepage usually occurs at the toe of the mine dump at the interface of the native ground surface and the base of the waste rock dump. This discharge often is expressed at depressions of the native topography such as stream channels. Lateral seepage is a function of the hydraulic conductivity of the waste rock, layering in the waste rock, and underlying geology, in particular, the contrast between the layers or waste rock and underlying geologic materials, and the topography of the contact. For example, if a highly permeable waste rock dump sits on steep topography with a low permeability underlying unit, toe seepage will likely occur. If there is not a significant permeability contrast between the waste rock and underlying material, or if the underlying material is more permeable and the waste rock dumps are on a gentle slope, downward percolation may be favored.

- As noted previously, the P4 waste rock dumps tend to be on hillsides with underlying pre-existing drainage channels. Alluvial material at the Sites was found to be dominated by silt and clay, suggesting lower permeability compared to the waste rock. Typically, loose waste rock, particularly at the bottom of dumps, tends to have relatively high permeability. The hydraulic conductivity values given by Mohammad (1976) for phosphate waste rock in SE Idaho range between 6.5×10^{-2} and 2.7×10^{0} cm/sec. The fine sand to clay alluvium/colluvium

could range from 10^{-3} to 10^{-6} cm/sec (for silts) (Freeze and Cherry, 1979), which is consistent with the hydraulic testing data presented in Appendix A4. Given an order of magnitude or more difference in hydraulic conductivity between the units, a saturated zone along the bottom of the waste rock dump would be favored; and this would result in lateral flow toward the toe of the waste rock dump.

- Percolation to the alluvial or bedrock groundwater systems (Item 6) - Some portion of the water draining downward as unsaturated and/or saturated vertical flow will infiltrate the underlying geology and become groundwater. The geologic materials that underlie the waste rock are typically colluvium, and in some cases alluvium or weathered bedrock. Generally, the weathered bedrock surface will be more permeable than the underlying unweathered bedrock, and near surface horizontal flow would be favored, similar to the colluvium and alluvium. Typically, flow in these units closely follows the overlying topography.

Water movement must occur to transport the selenium and other COPCs away from the primary sources. Water movement from the waste rock dump material into the groundwater environment is an important factor in describing the behavior of constituents in this area. Water movement within the source waste rock is also important in affecting the rate and volume of selenium released to the surface water and groundwater systems. It has been commonly recognized that preferential flow through the waste rock is an important process to consider when evaluating contaminant transport (e.g., Li, 2000, Molson et al., 2005). This may have a couple of effects. The first is that selenium-impacted seepage may appear sooner after a waste dump is constructed via preferential pathways compared to the entire dump reaching field capacity before seepage occurs. This prediction is consistent with observations from the phosphate mine areas. Secondly, the ultimate volume of selenium loading may be dominated by water-rock contact along the preferential flow channels. Significant portions of the dump may never exceed field capacity and become saturated enough that gravity drainage occurs. This concept is consistent with observations of relatively low moisture content from drilling conducted in the waste rock dumps at the Enoch Valley Mine (Tetra Tech, 2008). Therefore, only a fraction of the total mass of soluble selenium in the waste rock may be available for transport. This may be especially notable at the smaller scale for the selenium mass that is contained within the matrix of rock fragments (i.e., the preferential flow path is around the rock fragment not through it).

Backfilled Mine Pit. Figure 3-56 presents a conceptual model for a generic backfilled mine pit. The components of precipitation, evapotranspiration, runoff, infiltration, and percolation are generally the same as for the external waste rock dump discussed above. The primary difference is the discharge location, but the geochemical conditions may also be different with anoxic conditions being favored in the waste material backfilled into the mine pits.

Water that infiltrates the waste rock backfill will tend to percolate to the base of the backfill. There is the possibility that some water will infiltrate into the walls of the backfilled mine pit, but the majority should flow toward the pit bottom. The backfill in the pit bottom may be saturated either as a perched pore water zone or because the bottom of the pit is in contact with the local water table. If infiltration into the waste rock exceeds infiltration into the bedrock units, water will accumulate in the bottom of the backfilled pit.

Because of the geology and mining practices, the bottom of the mine pit will be near or at the contact of the Meade Peak Member of the Phosphoria Formation with the top of the Wells Formation or possibly the Grandeur Tongue. The footwall unit is the Wells Formation with the remainder of the Phosphoria Formation and the Dinwoody Formation exposed in the opposite wall (the hanging wall). The Dinwoody Formation may or may not be exposed high up on the pit wall. The Meade Peak Member is generally recognized as a low permeability unit; therefore, much of the leakage from the bottom of the mine pit may be into the uppermost Wells Formation. This pathway was specifically investigated through the installation of MMW009 at the northern end of the Enoch Valley Mine (see Section 3.4.4).

The backfilled mine pit is more ideal for creating anoxic conditions and promoting selenium attenuation when compared to waste rock dumps that have more surface exposure to the atmosphere. Unlike mine waste rock dumps, the opportunities for convective air flow through the waste rock in backfilled pits are greatly reduced because of the pit walls (i.e., only the top surface is exposed to the atmosphere). For a similar reason, the level of saturation is also higher, which also limits air ingress and encourages anaerobic bacteria growth. This greater tendency for anoxia will limit any potential sulfide oxidation and

secondary selenium release. With the introduction of anoxic water to the bedrock, attenuation may be more efficient in the groundwater regime.

Open Mine Pit. Figure 3-57 presents the general conceptual model of an open pit. While the opportunity for attenuation of selenium is less in this scenario because of oxidizing conditions, the amount of selenium that can be mobilized is greatly reduced because of limited exposure of selenium-bearing shale. Water contact with the Meade Peak Member is limited to the pit walls and possibly some loose material in the pit bottom. This is in contrast to the much greater surface area exposed to leaching in a waste rock dump or pit backfill. The amount of surface area for selenium release is many orders of magnitude less in a mine pit than in a waste rock dump. The amount of water available for infiltration to the Wells Formation also is limited by the low permeability of the Meade Peak Member in the base of the pit and evaporation. In rare cases, the water that runs into a pit may pond directly against the footwall Wells Formation and recharge into the Wells Formation. Overall, the opportunity for impacting groundwater appears much less in an open mine pit than other scenarios (e.g., waste rock dump).). However, if secondary water sources from springs or seeps enter the pit that is partially backfilled, then the transport of COPCs to the groundwater system would be more likely

3.7.4.2 Ballard Mine Groundwater Transport Pathways

Of the three mine areas, the Ballard Mine is the most complex. Both the Henry and Enoch Valley Mines are developed along limbs of large-scale folds; therefore, each mine tends to have a single, linear mine pit configuration. The Ballard Mine geologic setting is more complex with folded stratigraphy displaced by several normal faults (Drawing 2-6). Mining has occurred from a number of smaller pits. In effect, the central portion of the Ballard Mine is uplifted in a horst block with the stratigraphy stepping down to the east and west. This has resulted in the ore bed sequence being repeated four times within the mine area, with a central outcrop of the Wells Formation (see Drawings 2-6 and 2-7). This faulting also has isolated the ore bed sequence found in the Ballard Mine from other outcrops of the Phosphoria Formation in the area. The east side of the mine area is bounded by the Slug Valley Fault, with the mine area on the downthrown side. This results in exposures of the

Wells Formation to the east. The west side of the mine area is bounded by a large area of Quaternary sediments and basalt. Another range-bounding normal fault is postulated in this area by Mansfield (1927) with the stratigraphic sequence stepped and down-dropped to the west. However, there is no visible expression of this fault in the Ballard Mine area. The strike-slip Blackfoot Fault with possibly a couple of thousand feet of lateral displacement is located just to the south of the Ballard Mine.

The Ballard Mine is also unique for the P4 mine sites in that it straddles three watersheds. Surface water and shallow alluvial groundwater flow, and presumably shallow groundwater flow, from the east side of the mine flow to a tributary of the Wooley Valley hydrologic system. On the west side, water reports to either the upper reach of Long Valley Creek on the northwest corner of the mine area or a tributary of the Blackfoot River on the southwestern corner of the mine area.

In addition, the Ballard Mine is the oldest of the three mines having been mined between 1951 and 1969, and has been subjected to a lesser degree of reclamation. This lack of reclamation in some areas of the mine may be having an effect on the amount of selenium being released to the environment. A more detailed description of the Ballard Mine and history is provided in Section 2.1.

Shallow Alluvial Systems

For this RI/FS Work Plan and the Ballard Mine, the shallow alluvial system contains alluvium, colluviums, and uppermost weathered (decomposing) bedrock because these units have similar hydrogeologic properties and form a single hydrogeologic system. However, the stratigraphy in the unit may be relatively complex with layers of differing hydraulic conductivities. This may result in the occurrence of semi-confined conditions when higher yield sediment layers are encountered. This same layering of sediment will help inhibit the vertical migration of potential contaminants.

Alluvial Systems on East Side of Mine

The alluvial groundwater system on the east side of the Ballard Mine consists of a thin layer of older alluvium and colluvium (unit Qw) overlying the Triassic Dinwoody Formation (e.g., Section S, Drawing 3-48). Recent alluvial deposits (Qal) lie in the center of the adjacent valley along a tributary to Wooley Valley. It is postulated that in this area groundwater flow in the alluvial system from the Ballard Mine mirrors topography with water movement generally eastward toward the center of the valley then southward down valley. A portion of the groundwater in this flow system discharges from several springs. The presence of these springs may be due to local changes in the hydraulic transmissivity within the alluvium forcing the groundwater to the surface. As discussed below an upward hydraulic gradient is also suggested in the Dinwoody Formation in this area that may be contributing to the presence of the springs.

Sources of potential contaminants to the alluvial system on the east side of the Ballard Mine include external waste rock dumps MWD082 and MWD084 (Drawing 2-6). The generic model for an external waste dump, presented in Figure 3-55, is a good representation of the source and transport pathways. Sections S and T (Drawings 3-48 and 3-49, respectively) provide specific conceptual illustrations of the flow system associated with the MWD082 and MWD084 waste dumps. The most probable receptor along this pathway would be through interaction and mixing with surface water, then through surface water exposure. It appears unlikely that the alluvium will yield sufficient water to provide a direct groundwater resource based on the drilling to date.

The nature and extent discussion presented in Section 3.2.4 indicates that the 2008 and 2009 direct push investigations and companion well installation delineated alluvial selenium plumes on both sides of the mine. Elevated selenium concentrations were identified by several direct push boreholes associated with mine dump MWD084 and two separate selenium plumes are evident from mine dump MWD082 (Drawing 3-17). The occurrence and configuration of these plumes is consistent with the transport model and follow the general topographic gradient in the area.

The conceptual transport model suggests that flow to the underlying bedrock units is possible on the east side of the Ballard Mine. However, deeper wells installed into the lower alluvium and Dinwoody Formation exhibit much lower selenium and other COPC concentrations. For example, alluvial well MBW032 and upper Dinwoody Formation well MMW029 have had selenium concentrations ranging from 0.605 to 0.865 mg/L (Table 3-12). However, MMW033 which was installed adjacent to these wells, but deeper in the Dinwoody Formation, contained a selenium concentration of 0.00577 in September 2009. MMW032 was installed at the alluvial-Dinwoody contact and similarly had a relatively low selenium concentration of 0.00267 mg/L while the shallow groundwater, as indicated by the direct push investigation, exhibits concentrations up to 1.25 mg/L in this area (Drawing 3-17).

The reason for the apparent containment of selenium to the shallow alluvium appears to be an upward hydraulic gradient in the Dinwoody Formation. This is indicated by a co-located pair of monitoring wells (MMW029 and MMW033). Monitoring well MMW029, the shallower of the nested Dinwoody Formation monitoring wells, had a water elevation of 6,474.26 feet amsl in September 2009, whereas the deeper monitoring well MMW033 had a water elevation of 6478.71 feet. Therefore, the head in the deeper well was approximately 4.5 feet higher indicating an upward hydraulic gradient. This upward gradient is likely expressed by the presence of several springs in this area (e.g., MSG005 and MSG006).

Alluvial Systems on West Side of Mine

The alluvial groundwater system on the west side of the Ballard Mine is comprised of the colluvium and older alluvium (Qw) shown on Drawing 2-6, and younger alluvium (Qal) along Long Valley Creek and Blackfoot River. The relationship of the alluvium to the pits and mine waste dumps of the Ballard Mine is illustrated on Sections H, R and U (Drawings 3-50, 3-51, and 3-52, respectively). The configuration and flow system are very similar to the generic conceptual model described for an external waste dump in Figure 3-55. Mohammad (1976) indicated this system to be an example of a local flow system.

Along the majority of the western flank of the Ballard Mine, the geologic and hydrogeologic configuration is similar and is well represented by Section R (Drawing 3-51). The alluvium, which near the mine may be colluvium, underlies the waste rock west of the West Ballard Mine Pit (MMP035) and appears to thicken westward toward the valley axis. Wells Formation underlies the alluvium and colluvium near the mine pit but how far westward it continues in the subsurface is uncertain. Basalt may exist beneath a thin alluvial unit to the west and is also noted at the surface (Drawing 2-6).

Based on the 2008 and 2009 direct push borehole programs, associated installation of alluvial monitoring wells, and monitoring of springs and seeps, alluvial plumes with elevated selenium and other COPCs have been observed on the western side of the Ballard Mine (Section 3.2.4 and Drawing 3-19). The alluvial groundwater plumes on the western side of the Ballard Mine appear to largely originate from waste rock dumps MWD080 and MWD081. The plume originating from MWD080 appears relatively broad, but does not seem to have migrated very far downgradient in the alluvial system. This could be due to the relatively flat hydraulic gradients in this area, as the area lies approximately on the drainage divide between the Little Blackfoot and Blackfoot rivers to the north and south, respectively. The topography indicates that the majority of MWD080 is in the Little Blackfoot River watershed.

A hill is adjacent to MWD081; and the plumes originating from MWD081 and the southern part of MWD080 are migrating in the alluvial groundwater system on either side of the hill. These two plumes turn southward to the Blackfoot River and merge (Drawing 3-19). It appears that the southern plume may enter the Blackfoot River, but this has not been confirmed.

Similar to the east side of the Ballard Mine, an upward gradient in the bedrock may be present. Two wells installed in the Wells Formation on the west side of the mine in areas within the selenium plumes have low or no detected concentrations of selenium (MMW030 and MMW031) with selenium concentrations ranging from <0.0005 to 0.00116 mg/L; Table 3-12). MMW030 is installed near alluvial well MW-16A and these two wells, while they are not co-located, have very similar water elevations (6,330.16 and 6,330.56 feet amsl in

September 2009; respectively). This, at least, suggests a very weak downward gradient but presents the possibility of an upward gradient within the bedrock unit in co-located wells. Regardless, the Wells Formation wells do not have elevated concentrations of COPCs, whereas the overlaying alluvium does. This suggests that there is not a significant downward gradient.

Dinwoody and Thaynes System

The Dinwoody Formation is mapped to the east and south of the Ballard Mine area, as well as in the interior area between the various mine pits (Drawing 2-6). To the south, the Dinwoody Formation outcrops in the Fox Hills as a small peak several hundred feet higher than the mine area, south of the Blackfoot Fault. The Thaynes Formation is not mapped in the vicinity of the mine.

Dinwoody Formation on East Side of Mine

The Dinwoody Formation on the east side of the Ballard Mine area is generally not in direct contact with the mine waste rock dumps or the mine pits. Outcrops occur as elevated areas that were not mined or used for waste rock disposal (see Drawing 2-6). The Dinwoody Formation underlies the alluvial and colluvial deposits throughout the area as illustrated on Section S (Drawings 3-48). There are at least two intervening flow systems between the Dinwoody Formation and the mine wastes that may intercept selenium impacted water, and that could limit the occurrence of COPC-affected water in the Dinwoody Formation. The first of these is the seepage flow system that occurs at the base of the waste rock. The second is the alluvial flow system, including the more permeable upper "weathered" bedrock surface. Within the Dinwoody Formation, the deeper flow system is controlled by the bedding orientation and any secondary permeability developed from fracturing.

Groundwater flow in the Dinwoody Formation in this area is expected to be from recharge near the mine to the east, down stratigraphic dip and downgradient. The flow system, however, is relatively short because as the Dinwoody Formation is offset by the Slug Valley Fault just east of the mine as shown on Section S. The Slug Valley Fault is a major

northwest trending normal (extensional fault) that has been traced or inferred across the area of the P4 mines (see Drawing 2-6). The effect of the fault on the Dinwoody flow system is uncertain. If it acts as a flow barrier, it may result in a local flow system discharging to the alluvial system. If the fault is permeable, flow may be across the fault and contribute to an intermediate or regional flow system in the Wells Formation. Alternatively, the fault may direct flow southeastward toward Wooley Valley. Springs discharging from the Slug Valley Fault have not been mapped near the mine. For this fault-controlled flow system to be a concern, there would need to be an indication of COPC-impacted water in the Dinwoody Formation flow system near the fault, which there is not.

Four monitoring wells have been installed into the Dinwoody Formation on the east side of the Ballard Mine (MMW018, MMW029, MMW032 and MMW033). Of these, MMW018 and MMW032 are in the highly weathered upper Dinwoody Formation, but also screen alluvium, and are generally considered alluvial wells. MMW029 is installed in relatively shallow Dinwoody rocks, and MMW033 is installed in deeper Dinwoody Formation. As discussed above in association with the alluvium and in Section 3.2.4, MMW029, MMW032 and MMW033 were installed to assess the vertical extent of contamination with MMW029 and MMW033 installed as a nested pair for evaluating vertical concentration and hydraulic gradients. Based on the results obtained, it appears that there is an upward hydraulic gradient in the Dinwoody Formation and that contamination is limited to the upper alluvial system (see alluvial discussion above and Section 3.2.4). (The selenium concentrations measured in MMW032 and MMW033 in September 2009 were 0.00267 and 0.00577 mg/L, respectively.) From the upward gradient it can be inferred that the Slug Valley Fault is not a highly permeable feature on average. If it were highly permeable and transmitting water from the Dinwoody Formation, an upward gradient would be less likely. Essentially, it appears that the Slug Valley Fault is acting as a dam to groundwater flow in the Dinwoody Formation.

Dinwoody Formation Located in Mine Interior

Four cross sections illustrate the configuration of the Dinwoody Formation flow system in the interior of the mine area. Sections H and R (Drawings 3-50 and 3-51) are sections

oriented approximately perpendicular to the strike of the bedding. Section C on Drawing 2-7 is similar to Section H, but with a larger scale. Section Q on Drawing 3-53 is oriented approximately parallel to strike down the axis of the small syncline between the west and center mine pits.

Mohammad (1976) commented on this system that is in the interior of the mine area and suggested that it was one of the more significant flow systems at the Ballard Mine. He noted that the recharge area was in the middle pit and the discharge area was on the east wall of the west pit. There are at least four springs discharging near the top of the east wall of the west pit (MDS030-033). Mohammad (1976) suggested that much of the flow system was contained in the fractured Rex Chert; however, given the position of these discharges, it appears more likely that flow occurs within the Dinwoody Formation or the overlying waste rock dump. Regardless, the key flow vector appears to be east to west discharging to the west pit. Section Q (Drawing 3-53) suggests that there may be a minor component of flow toward the south. If this was a complete flow path, impacts to the alluvial and/or bedrock system to the south and southwest of the mine would be expected. Alluvial impacts have been identified, but these appear to be associated with waste rock dump MWD081 and not a source further upgradient because alluvial water was not present suggesting a very limited groundwater recharge area (see Drawing 3-19). The bedrock well (MMW030) installed in an apparently downgradient position does not contain elevated concentrations of selenium (Table 3-12). It, therefore, appears that the seeps discharging to the West Ballard Mine Pit (MMP035) are the termination of this transport pathway.

Observations of the spring flow that discharges to the mine pit suggest that much of the flow evaporates along the pit wall or at the bottom of the pits. It is likely that selenium in this water may persist as a soluble salt, which is remobilized during precipitation events. Therefore, if the Wells Formation or other groundwater pathway is exposed in the bottom of the mine pit, it could result in an impact to the groundwater flow system from a secondary source. These same conditions may exist in other Ballard pits but are less obvious. This could in part account for the impacts in monitoring wells MMW006,

MMW020, and MMW021 as discussed below and needs to be considered when evaluating remedial options.

Regional Wells Formation System

The Wells Formation in the vicinity of the Ballard Mine has been identified as part of the regional flow system, with the ridge extending northward from the mine site identified as a recharge area for the regional system (Mohammad, 1976). Large surface exposures of Wells Formation, which represent likely recharge areas, are located to the east and north of the Ballard Mine area (Drawing 2-6). These areas may represent locations of significant water influx into the regional flow system and by hydrogeologic principles will have higher hydraulic potential. However, the bedding orientation of the Wells Formation north of the mine is less favorable for recharging the groundwater system (i.e., it is sub-horizontal). Based on the supposition that recharge is occurring in areas of Wells Formation outcrop, the regional groundwater flow through the Ballard Mine area would likely be to the westward with a possible southward component. The common faulting and folding is likely to have a pronounced effect on the flow beneath the mine area. The general structural grain (bedding, fault and fold strike) in the mine area is northwest-southeast. The Blackfoot Fault along the southern edge of the mine area and the north end of the Fox Hills may limit flow to the south and focus flow in the northwestward direction. In addition, effects of the faulting in the mine area may also compartmentalize the flow system in the mine area. This compartmentalization likely restricts flow in the Wells Formation, although it is possible that there may be some local faulting that enhances flow in specific locations and directions. This is further described in a memorandum from Dr. Dale Ralston attached in MWH (2008b).

The position of the Ballard Mine and the associated Fox Hills is approximately located midway between the South and Henry West Lobe flow systems of Mayo (1982). It is unclear as to where water recharging to the regional flow system near the Ballard Mine will discharge. Specific discharge locations from the regional system have not been identified in the mine area (Mohammad, 1976). The nearest known discharge areas for the regional flow system are the springs near Henry or the Woodall Springs on the north end of the Aspen

Range. It has been reported that discharge from the Wells Formation occurs to the Blackfoot River and in wetland areas near the proposed Blackfoot Bridge Mine (BLM, 2009).

Hydrogeologic studies and modeling conducted for the proposed Blackfoot Bridge Mine in the Aspen Range, 2.5 to 3 miles to the southwest of the Ballard Mine, suggest a northward flow component in the regional aquifer and that Woodall Springs is actually a high point in the regional system in the area (BLM, 2009). The Woodall Springs, then, are not a probable discharge area for the regional flow system in the Ballard Mine area. The identified northwest flow gradient suggests that the Henry Springs (elev. 6,150 feet amsl) may be the discharge location for groundwater recharging to the Wells Formation in the Ballard Mine area. Water levels in the Wells Formation in the mine area range between approximately 6,235 and 6,330 feet amsl.

There are indications that flow to the southwest may be occurring. The water level in a new agricultural well MAW009 constructed and installed by P4 north of the mine was approximately 6,242.6 feet amsl on April 27, 2010 (Drawing 2-6). This suggests that the large exposure of the Wells Formation north of the mine may indeed be acting as a recharge area for the Wells Formation and further suggests general groundwater flow to the southwest. Complicating the hydrogeologic picture, it is noted that water elevations within the Wells Formation at the proposed Blackfoot Bridge Mine to the south of the Ballard Mine are generally in the 6,150 to 6,200 feet amsl range (BLM, 2009). From this information, it could be proposed that there is flow to the southwest from the Ballard Mine in the Wells Formation. However, the presence and effect on groundwater flow of the Blackfoot Fault also needs to be considered. It could be that the Blackfoot Fault is hydraulically isolating the Wells Formation at the Ballard Mine from the system to the south. Regardless, monitoring well MMW030 is in this potential southwestward flow path.

Flow to the northwest from the Ballard Mine remains a possibility. The Henry Springs are located off the northwestern end of the Wooley Range which contains the Henry Mine. The springs are located in an area of travertine deposition that currently forms a peninsula in the Blackfoot Reservoir (Drawing 2-5 – springs are located just off the upper left corner of the map). The springs are located at the approximate intersection of the Henry Thrust Fault and

the Slug Valley Fault, a normal fault. These structural features may have an influence on the location of the springs. The Ballard Mine area is located approximately 5.5 miles to the southeast of the springs along the structural strike and the inferred trace of the Slug Valley Fault. Two wells are located within this flow path (MMW031 and the new agricultural well MAW009). Neither of these wells indicates any elevated concentrations of COPC (see Section 3.2). It should be noted that MAW009 was installed in 2009 not directly as part of the CERCLA programs. P4 has collected data from the well that indicated a total selenium concentration of 0.00086 mg/L and sulfate at 5.3 mg/L on February 11, 2010 (these data have not been validated and is considered screening level). Similarly, MMW030 is located on the southwest side of the Ballard Mine and has not indicated any impact from COPCs.

It is noted that water discharging from the regional springs does travel a relatively long distance. The age of the water discharging from these springs is on the order of 10,000 to 20,000 years old (Mayo, 1982). This suggests that potential impacts to the springs from the mine waste at the Ballard Mine are a remote possibility, at least in the near term. The potential for impacts to other groundwater receptors will be dependent upon a number of other factors, including travel time and distance from the source.

Further complicating the hydrogeologic picture in the Wells Formation at the Ballard Mine, it is noted that the observed gradients in the Wells Formation within the Ballard Mine are counter to the southwest or northwest flow directions appearing to be directed back eastward toward the mine (Appendix A4 and Section U, Drawing 3-52). The picture that emerges is that structural features and bedding within the Wells Formation combine to create a complicated compartmentalized flow system. In these types of systems, groundwater elevations and flow gradients may be substantially different in adjacent blocks of Wells Formation that are separated by a fault. It appears that, to some extent, this occurs at both the Ballard Mine and the proposed Blackfoot Bridge Mine.

Because of the complexity of the Wells Formation flow systems at the local mine scale, the focus needs to be on the larger regional scale. It is postulated that regional flow is either to northwest toward the Henry Springs or potentially to the southwest toward the Blackfoot

River. Monitoring Wells MMW030 and MMW031 have been installed to address flow in either direction and so far have not indicated any elevated COPC concentrations.

Wells Formation in Mine Interior Areas

There are surface exposures of the Wells Formation in the interior of the mine area. These exposures likely represent sources of direct groundwater recharge to the Wells Formation regional flow system. The position of these exposures in the core of the horst block in the Ballard Mine area result in the exposure at higher elevations; because of mining practices, they are less likely to be in contact with mine wastes. The relative position of the Wells Formation surface exposures with respect to the mine wastes are shown on Sections C (Drawing 2-7), Q (Drawing 3-53), and T (Drawing 3-49), and on the geologic map (Drawing 2-6).

The highland to the north of the Ballard Mine, which extends into the center of the mine, is thought to be a recharge area for the regional flow system (Mohammad, 1976). Given the large exposure of Wells Formation and the elevated topography north of the mine, there is potentially a component of flow from the north to the south and west. It appears less likely that there would be flow from the higher interior areas of the mine northward. Other factors to consider in this potential transport pathway are the general lack of possible sources located directly on outcrops of Wells Formation in the higher interior areas and the compartmentalization of the rock units.

Wells Formation in West Pit Area

The potentiometric data for monitoring wells MMW006, MMW020, and MMW021 help illustrate the flow field in the Wells Formation in the west pit area. These well locations are shown on Drawing 2-6, and in cross sections H and I (Drawings 3-50 and 3-54). What is suggested by these data is that flow is westward. The north-northwestward hydraulic gradient between MMW006 and MMW021 is almost flat (water levels of 6,220.15 and 6,223.78 feet amsl, respectively; September 2009 data, see Appendix A4). The hydraulic gradient between MMW020 (6,251.76 feet amsl) and MMW021 (6,223.78 feet amsl) is

approximately 0.047 southwestward (28 feet of head difference over approximately 600 horizontal). Given the presence of exposures of the Wells Formation to the east and northeast, a westward to southwestward groundwater flow path away from the recharge area is reasonable. However, it needs to be noted that MMW020 and MMW021 are located in different hydrostratigraphic positions within the Wells Formation and the hydraulic head difference between the two wells represents a potential, but may not represent the actual, predominate flow component. Instead, it is likely that flow is in the direction of the strike of the bedding to the northwest. This concept is further developed by Dr. Ralston in the memorandum attached in Appendix F of MWH (2008b).

Further complicating the flow model is the potentiometric surface data from Wells Formation monitoring wells MMW030 and MMW031 installed on the southwest and northwest boundary of the mine. The September 2009 water levels from these wells were 6,330.16 and 6,251.05 feet amsl, respectively (Appendix A4). These data suggest flow eastward into the mine area from the Wells Formation. In reality, faulting has probably developed separate hydraulically isolated compartments (as discussed above).

The three wells (MMW006, MMW020 and MMW021) located around the West Ballard Mine Pit (MMP035) contain elevated selenium levels. The source of selenium may be originating from within the West Ballard Pit. The dump seeps/springs that discharge into the mine pit have elevated selenium (i.e., MDS030 – MDS033). Even if this water evaporated in the mine pit, it will be available as soluble selenium that can be remobilized and eventually infiltrate into the pit bottom. The West Ballard Mine Pit does not contain standing water. A second possible source is the partial pit backfill in the north end of the mine pit. The hydrograph for MMW020 does indicate a local recharge source with an early spring response to snow melt (Appendix A4).

An alternative explanation for the impacts observed around the West Ballard Mine Pit may be faults directing water to the West Ballard Pit area from other upgradient sources. For example, water accumulating in the Central Ballard Mine Pit (MMP036) may infiltrate along one of the mapped faults to the Wells Formation and then may flow to the west toward the West Ballard Mine Pit (MMP035). Mohammad (1976) suggested that this was occurring, but

that the infiltrating water was entering the Rex Chert and discharging in the west pit. An alternative potential source is a fault inferred beneath waste rock dump MWD093. A fault in this position may intercept some impacted flow in the Dinwoody or alluvial systems and allow it to migrate vertically to the Wells Formation. The dump seep discharge and in-pit waste rock both seem to be more probable sources.

Wells Formation West of the Mine Area

The Wells Formation extends some distance west of the Ballard Mine area in the subsurface beneath the alluvial deposits. Mansfield (1927) postulated a range-bounding normal fault beneath the alluvium west of the site that juxtaposed Phosphoria and Dinwoody formations against the Wells Formation. The existence or position of this fault has apparently not been confirmed.

One potential pathway to the regional Wells Formation flow system is migration of impacted water from the alluvium in contact with waste rock into the Wells Formation. This was investigated through the installation of monitoring wells MMW030 and MMW031. As presented in Section 3.2.4, it does not appear that this groundwater has been impacted by COPCs. This observation also supports the postulated compartmentalization of flow systems in the highly faulted Ballard Mine area.

3.7.4.3 Henry Mine Groundwater Transport Pathways

The Henry Mine is largely reclaimed; including grading, contouring, and revegetation of the waste dumps (see Section 2.1.2). The mine plan was relatively simple at the Henry Mine when compared to the Ballard Mine, because mining was developed along the northeastern limb of the Wooley Valley anticline and the stratigraphic section is not repeated within the mine area. The strike of the bedding through the mine area is consistently northwest-southeast with dips to the northeast from approximately 50 to 70 degrees. The area immediately to the southwest of the mine pits is a ridge formed by Wells Formation, while the areas to the northeast of the mine pits are lowlands underlain by alluvium as well as remnants of the Phosphoria Formation. Stratigraphically higher units, like the Dinwoody

Formation, are found along ridges farther to the northeast. Consequently, the mine pits and related mine dumps are elongate along a northwest-southeast trend parallel to the strike of the Phosphoria Formation, with the pits developed along the hillsides to the southwest (Drawings 2-2 and 2-5). As a result of the topographic setting and the placement of the mine pits, surface water runoff and shallow groundwater flow from the pits and waste dumps will tend to be downhill to the northeast until intercepting the lowlands and then will flow along the valley bottoms, generally to the east and southeast.

Shallow Alluvial System

The portions of the Henry Mine discussed in the following text relate to the surface water and alluvial groundwater flow patterns. The local alluvial groundwater system was evaluated in two general areas at the Henry Mine. These areas are primarily located in alluvial areas near the north and central Henry mine pits (MMP041 and MMP043, respectively) near the Little Blackfoot River and near the south pit in headwater areas of Lone Pine and Long Valley Creeks.

Northern Henry Alluvial System

In the vicinity of the northern portion of the Henry Mine, there are basically three shallow alluvial systems: two systems exist approximately 2,500 feet to the southwest and to the northeast of the mine and the third system is located to the east of the North Henry mine pit (MMP041), along either side of the Little Blackfoot River. Due to topographic highs and intervening bedrock, only the alluvial system immediately to the east of the Henry mine pits is located physically or hydrostratigraphically close enough to the mine area to be a complete transport pathway from COPCs sources.

The investigations summarized in Section 3.3.4 determined that an alluvial system north of the Little Blackfoot River along the backfilled portion of MMP041 and waste rock dump MWD085 is not significant. Attempts to investigate the flow path resulted in dry holes or refusal due to bedrock.

While not considered shallow alluvium, the other component of the shallow groundwater system near North Henry is the Quaternary Basalt located in the vicinity of the south end of MWD085 (Drawing 2-5). The basalt is generally found at the surface, except where locally overlain by younger alluvium or colluvium, and typically follows the topographic lows because the basalt flooded pre-existing drainages. The basalt is generally 50 to over 200 feet at its thickest along the axis of the topographic gap (Brooks, 1982). The southeast portion of waste dump MWD085 overlies the basalt. Therefore, seepage or infiltration from MWD085 may recharge and could cause impacts to groundwater within the basalt. Monitoring well MMW004 monitors groundwater within the basalt at the southeast end of mine dump MWD085 and has had concentrations of selenium less than 0.005 mg/L.

Because of the shallow basalt, the alluvial flow path south of the Little Blackfoot River has been difficult to investigate due to shallow bedrock. Some alluvial groundwater samples have been obtained at key locations. As presented in Section 3.3.4, low levels of selenium have been detected (<0.006 mg/L) in the alluvial system between the river and MWD088. The only measured selenium concentration near the State of Idaho groundwater standard on the downstream edge was collected from a direct push borehole near the toe of MWD088 (BH059; 0.041 mg/L Se). Further upstream between ponds MSP015 and MSP016 and along the northeastern edge of the waste rock, a direct push borehole water sample was obtained with 0.13 mg/L selenium (BH063).

The data from the northern Henry Mine area indicate that the alluvial system is of limited extent but may be impacted near waste rock dump MWD088. These slightly elevated concentrations may have been isolated occurrences related to brief spring runoff flow from the waste rock that occurred in 2008 (e.g., MDS034 and MST280; 0.14 and 0.29 mg/L Se, respectively). No flow was observed at these discharge locations after the spring 2008 event. The extent of alluvial impacts in the northern Henry Mine area appear to be limited near the waste rock dumps and impacts have not been located in areas not immediately adjacent to a dump.

South Henry Alluvial System

Similar to northern Henry Mine area, there are three shallow alluvial systems in the vicinity of the southern portion of the center Henry Mine area, as can be seen on Section B (Drawing 2-7): two approximately 3,000 to 3,500 feet southwest and northeast of the mine, and a third adjacent to the northeastern edge of the mine. The first two of these systems are topographically and hydrostratigraphically separate from the mine and are unlikely to be impacted (see Section B). One possible exception to this is the two lobes of waste material in waste dump MWD087 that extend to the southwest across the ridge underlain by the Wells Formation. These lobes of waste dump MWD087 are located within two small drainages that drain southwest into the alluvial system located approximately 3,000 feet southwest of the center portion of the Henry Mine (Drawing 2-5). Through this potential pathway, seepage or runoff from waste dump MWD087 could impact this southwestern alluvial system. The northern of these lobes contains only a small amount of waste rock. For the more substantial "valley fill" dump lobe to the south, a direct push sample was collected in 2008 near the toe of the dump. This direct push location (BH072) was dry and no sample was collected. Of the other two direct push locations south of MWD087, one was reported as dry (BH078) and one reported a selenium concentration of less than the detection limit (BH079) (see Drawing 3-36).

The third alluvial system is composed of Quaternary alluvium and colluvium that fills a narrow, elongate valley that trends parallel to the mined bedrock units and is adjacent to or beneath the mine waste rock (Qw on Drawing 2-5). There is a topographic divide along this valley, such that surface water runoff within this valley will flow northwest (to the Little Blackfoot River discussed above) or southeast toward the headwater tributaries to Lone Pine and Long Valley creeks. Waste dump MWD086 is located primarily within or adjacent to the alluvial valley southeast of the divide. Runoff, seepage, or infiltration primarily from waste dump MWD086 may recharge and potentially impact this shallow alluvium in the headwater area north of the P4 haul road. Where the drainage is adjacent to the P4 haul road, the shallow alluvial valley splits into two tributaries: one flows to the southwest toward Long Valley Creek and the other drains to the southeast and then northeast into the upper reaches of Lone Pine Creek, as shown on Drawing 2-2.

Runoff or shallow groundwater flow from waste dump MWD088 or mine pit MMP042, flows into the alluvial valley and then to the southeast toward the P4 haul road. A cross section along the axis of this valley and in the direction of shallow alluvial groundwater flow (Section O) is shown on Drawing 3-55. Monitoring well MMW010 was installed in the shallow alluvium within the footprint of waste dump MWD087. This well has been sampled since the fall of 2007 and has ranged from <0.001 to 0.1 mg/L selenium with the higher concentrations in the spring compared to the fall. In addition, pond MSP014 is also present in this area, and in the spring of 2006 had an average selenium concentration of 0.0737 mg/L. It is possible that this pond receives some direct surface water runoff from the waste rock dump as well as waste rock seepage. Alluvium downstream of the waste rock area has either been dry or reported relatively lower selenium concentrations (e.g., BH079, <0.001 mg/L, BH073, 0.003 mg/L, BH076, <0.001 mg/L, see Section 3.3.4)

There is one shallow alluvial groundwater system that could be impacted by the south Henry Mine area located primarily to the northeast of the southern end of the mine. It is partially overlain by waste dump MWD090 (see Drawing 2-5). Seepage from waste dump MWD090 would directly recharge the alluvial system and then flow as shallow groundwater to the northeast into the upper reaches of Lone Pine Creek. A series of springs (headwater stream stations) are present in the upper reaches of Lone Pine Creek (MST058, MST064, and MST276) that likely represents a discharge area for shallow groundwater within the alluvium beneath waste dump MWD090. The shallow water level in MMW014 (2.9 feet bgs) suggests that the well is in the same flow system as the springs. The selenium concentration in these springs and MMW014 suggest that the shallow alluvial system in this area is not significantly impacted by COPCs (see Section 3.3.4). Dissolved selenium results were reported for two borings installed in 2009 downgradient of the southernmost lobe of MWD090: BH158 (0.0318 mg/L), and BH157 (0.018 mg/L) (see Drawing 3-36). These data suggest that there are some impacts to the shallow alluvial groundwater in this area but are below the State of Idaho groundwater quality standards. It is possible that impacts in this area could be related to a non-P4 mine located to the south of the Henry Mine.

Dinwoody and Thaynes System

The Dinwoody and Thaynes formations are mapped along the northeast edge of the Henry Mine, but are not present within the interior or southwest of the mine (see Drawing2-5). The Dinwoody Formation outcrops along a ridge northeast of the mine. The Thaynes Formation is mapped along a second ridge farther to the northeast with an intervening alluvial valley along the trend of the Henry Thrust Fault.

The mine pits are west of and hydrostratigraphically separated from the Dinwoody and Thaynes formations by the upper Phosphoria Formation. In order for seepage from the mine pits to flow to and recharge the Dinwoody Formation (closer to the mine than the Thaynes Formation), it would have to flow across bedding through the Phosphoria Formation and into the Dinwoody Formation. The Phosphoria Formation has a low hydraulic conductivity perpendicular to bedding and is generally an aquitard; therefore, seepage from the mine pits is unlikely to impact the Dinwoody or Thaynes formations.

On the other hand, some portions of the waste rock dumps are in direct contact with (overlie) the Dinwoody Formation (see Drawing2-5). In most areas, the dumps are physically separated from the Dinwoody Formation due to intervening alluvial material (see Sections B, Drawing 2-7). However, small portions of waste dumps MWD085, MWD086/MWD087, and MWD088 are in direct contact with the Dinwoody Formation without significant intervening alluvial (or colluvial) material. A portion of waste rock dump MWD086 was reclaimed such that the surface was not graded to provide positive drainage allowing rainwater or snowmelt to pool on the dump surface, infiltrate directly into the waste dump, and potentially impact the Dinwoody Formation. Therefore, monitoring well MMW022 was installed in the Dinwoody Formation, adjacent to the northeastern lobe of MWD086, where it is in direct contact with the Dinwoody Formation (Drawings 2-5 and 2-7). This location was chosen because it appears as though it has the most direct or shortest potential waste rock transport pathway to the Dinwoody Formation at the Henry Mine.

Well MMW022 was sampled in the fall of 2007, in the spring and fall of 2008, and in the spring of 2009. For these sampling events, total selenium ranged from 0.0173 to 0.0206

mg/L, indicating some impact to groundwater in the Dinwoody Formation but less than the State of Idaho groundwater standard of 0.050 mg/L. Due to the presence of the Henry Thrust Fault, as well as portions of the middle of the Dinwoody Formation section with low permeability, it is unlikely that groundwater within the Dinwoody Formation will flow to the northeast into the Thaynes Formation (Drawing 2-5). It is possible that groundwater within the Dinwoody Formation flows along bedding and discharges within that stratigraphic interval in a lateral or down-dip direction. The water level within MMW022 is approximately at 6,420 feet amsl whereas the ground surface elevation in the alluvial area to the northeast is approximately 6,340 feet amsl. A spring and seep survey was conducted in the drainage to the northeast of MMW022 leading toward Lone Pine Creek to evaluate whether groundwater discharge is occurring in the drainage to the northeast of MMW022. No springs were located.

An additional potential flow path exists. The groundwater flow in the Dinwoody Formation may also have a component of flow to the northwest along the strike of the bedding and folding. A shallow Dinwoody Formation well near the Little Blackfoot River was installed in 2008 (MMW028) to assess this potential transport pathway. Monitoring well MMW028 was installed between waste rock dump MWD088 and the Little Blackfoot River (Drawings 2-5 and 3-56; Section V). The selenium concentration detected in MMW028 was relatively low at 0.00264 and 0.00551mg/L during the fall of 2008 and spring of 2009 sampling events. This suggests that while there may be some connection along strike in the Dinwoody Formation to potential sources, this pathway is not currently transporting selenium and other COPCs at any significant levels (see Section 3.3.4). These concentrations could represent a background level for selenium at this location.

Wells Formation System

The Wells Formation outcrops to the southwest of the Henry Mine, adjacent to the highwall of all of the Henry mine pits. The ridge to the southwest of the Henry Mine, which is underlain by Wells Formation (Drawing 2-5,) is an area of recharge to the Wells Formation (Brooks, 1982). A major discharge area for the Wells Formation in the form of Henry Springs occurs near the town of Henry to the northwest (Mayo, 1982). This appears to

indicate that regional groundwater flow within the Wells Formation is to the northwest in the direction of bedding strike.

The Henry Springs are located at the intersection of the normal Slug Valley Fault and the Henry Thrust Fault (Ralston, et al., 1983). This suggests that these faults are affecting and focusing groundwater transport and discharge in the area. Further, a major strike-slip fault with as much as 4,000 feet of lateral displacement is located just south of the South Henry mine pit (Drawing 2-5). This fault, the Rasmussen Fault, is most likely a flow barrier that limits groundwater movement to the south. Therefore, the hydrogeological transport model suggests that groundwater that originates in the Henry Mine area flows northwest along Wells Formation bedding strike toward the Henry Springs. It appears that the Henry Mine is contained within a structural block bounded by the Henry Thrust Fault on the east and north, the Slug Valley Fault on the west and the Rasmussen Fault on the south (Drawing 2-5). The combination of these features and the orientation of the Wells Formation bedding focus the regional groundwater flow and discharge to the Henry Springs.

The two monitoring wells in the Wells Formation at the Henry Mine, MMW011 and MMW023, are installed to the northwest and southeast of the Little Blackfoot River, with MMW023 within the North Henry Mine open pit. Both monitoring wells were screened across the top of the Wells Formation (MWH, 2008b). The water elevations from September 2009 in MMW011 was 6,180.90 feet amsl compared to 6,159.95 feet amsl in MMW023 indicating a gradient to the northwest in the strike direction of the Wells Formation bedding (see Appendix A4). The Henry Springs discharge is at approximately 6,150 feet amsl. The hydrographic relationship between MMW011 and MMW023 is similar although MMW011 shows a more direct response to spring runoff, possibly suggesting some recharge from the Little Blackfoot River. The response in MMW023 is more muted (Appendix A4). The potentiometric groundwater elevations for MMW011, MMW023, and the elevation of the discharge at Henry Springs are all consistent with a northwesterly groundwater flow.

Monitoring wells MMW011 and MMW023 were last sampled in the spring of 2009 (the wells were sampled in 2010 but these data have not been validated in time for inclusion in this

Work Plan). Monitoring well MMW011, located approximately 400 feet northwest of waste dump MWD088 along the strike of bedding, had 0.00206 mg/L total selenium detected (Table 3-27). Monitoring well MMW023, located directly beneath and down-dip of the North Henry pit MMP041 contained 0.017 mg/L of total selenium. In the previous three sampling events, total selenium was measured at 0.003 to 0.004 mg/L in MMW023. All the results are well below the State of Idaho standard for groundwater of 0.05 mg/L selenium.

Currently, there are two groundwater monitoring wells installed within the Wells Formation at the Henry Mine because it is difficult to find suitable well locations within the formation due to the steep dip. The transport model indicates flow to the northwest and toward the springs present at the Henry Mine assuming the preferred flow direction is along bedding as opposed to across bedding. It appears that the transport model is correct and that these wells are ideally located on the downgradient side of the mine along the strike of the Wells Formation. Monitoring of these wells has indicated relatively low concentrations of selenium. Concentrations of iron and manganese, which are more mobile in a reducing environment, are relatively elevated when compared to standards (see Section 3.3.4). This may suggest that selenium in the source areas (backfilled mine pits) is relatively immobile due to reducing conditions in the mine waste, or that selenium is being attenuated along a flow path that is reducing. A slight increase in selenium concentration in MMW023 in the spring of 2009 may have resulted from significant spring runoff as indicated in a number of monitoring well hydrographs (Appendix A4). A larger runoff/recharge event may cause more selenium to mobilize from the waste rock exposed in the un-backfilled portion of the mine pit. A similar occurrence was noted in monitoring well MMW020 at the un-backfilled West Ballard Mine Pit.

Structural Flow System

On the northern end of the Henry Mine, between MMP041 and MMP043, there is a gap in the ridge and an apparent deflection in the geologic units. The Little Blackfoot River flows through this gap. In addition, basalt flooded through the gap in the geologic past (see Drawing2-5). There are no significant faults mapped at this location, as suggested by both the gap and apparent deflection in the geologic units. The potential presence of a structural

feature such as a fault acting as a flow barrier or conduit was discussed in MWH (2008b) and MWH (2009b). This was further evaluated by tracking the hydrologic responses of MMW011 and MMW023 installed in the Wells Formation on either side of the possible structure. The results of this analysis are inconclusive. Both wells responded to the spring recharge event on almost the same day but to differing degrees (see hydrographs in Appendix A4).

The deflection in the geologic units could be a fault with relatively minor displacement or a fold. Any efforts to locate the structural feature beneath the basalt would be completely blind. Because the proposed structure apparently pre-dates the basalt and is located beneath it, impacted water from waste dumps or mine pits cannot directly infiltrate into the feature. Therefore, any impacted groundwater would have to move laterally to the structure or through the basalt. Three wells are present in this area to address this potential flow path – MMW011 in the Wells Formation, MMW019 in the shallow bedrock horizon, and MMW004 in the basalt (Drawing 2-5). Total selenium above the standard of 0.05 mg/L has not been detected in these wells (Section 3.3.4). In 2009, the maximum selenium concentration was 0.0054 mg/L in MMW019. It appears unlikely that the structure provides a completed pathway; and due to the difficulty in investigating the feature, further investigation is not recommended.

The Rasmussen Fault, located south of the southern portion of the Henry Mine, laterally displaces the bedrock units and offsets the surface expression of the Wells Formation. This is a strike-slip fault that likely is a barrier to groundwater flow and is a contributor to the hypothesis of northwest flow of groundwater within the Wells Formation. It is unlikely that significant flow occurs along or across this fault to the southeast.

Other mine faults have been mapped in the Henry Mine area cutting through the stratigraphic units approximately perpendicular to strike. These frequent faults show relatively minor displacement, are narrow fractures, and are likely only present locally. Such small faults and fractures contribute to the bulk hydrogeologic character of the bedrock unit and should be characterized as a component of the overall hydrostratigraphic unit.

3.7.4.4 Enoch Valley Mine Groundwater Transport Pathways

The Enoch Valley Mine, like the Henry Mine, is developed along an anticline limb and is relatively linear running along a northwest trending exposure of the Phosphoria Formation. The current transport models for the Enoch Valley hydrogeology are described below and are illustrated on the geology map (Drawing 2-5), Section A, which illustrates the broader geologic section (Drawing 2-7), and Sections D, J, K, and L, which provide more detailed information (Drawings 3-57 through 3-59). Ponds and seeps directly associated with the mine waste areas contain selenium concentrations at levels that suggest impacts to groundwater are possible (e.g., dump seep MDS026 has contained selenium from between 0.006 to 0.43 mg/L between 2004 and 2009).

Shallow Alluvial System

Similar to the Henry Mine, opportunities for off-site impacts to the alluvial groundwater flow system are relatively few. This is because of the linear configuration of the mine where much of the mine sits in a small valley that parallels the geologic formations limiting alluvial transport to the axis of the valley. There is a hydrologic divide near the center of the mine. The northern portion of the mine drains toward Lone Pine Creek and the Little Blackfoot River, whereas the center and southern portions drain toward Rasmussen Creek and East Fork of Rasmussen Creek and then to Angus Creek (Drawing 2-5).

Conceptually, impacts to the Enoch Valley alluvial systems may be less than at the Ballard Mine. In general, the waste rock areas of the Enoch Valley Mine are reclaimed adequately and have established grasses and favorable slope grading. These factors will reduce infiltration into the waste rock and mobilization of COPCs.

Alluvial flow in the northern portion of the mine is primarily contained in three ephemeral drainages. The largest of the drainages is located above spring station MST061 and now contains monitoring well MMW012 (Drawing 2-5). The other minor drainages are located to the north. Section L (Drawing 3-59) is oriented approximately down the larger of the drainages through MMW012 and toward agricultural well MAW003. The conceptual

transport model for this area includes waste rock seepage potentially infiltrating into the alluvial system and flowing westward toward Lone Pine Creek as illustrated in Section L.

The possible northern alluvial flow system was tested through the installation of MMW012 in 2007. It was found that the alluvium down to the Dinwoody Formation contact was dry, and no water has been observed since the installation of MMW012. Similarly, the direct push investigation conducted in the area in 2008 indicated the alluvium was dry.

Deeper borings were installed to evaluate the bedrock hydrogeology. Most of these wells encountered a basalt layer immediately beneath or within the alluvium. The basalt is relatively thin near the mine at MMW027 and MMW035 (e.g., 5 to 10 feet thick) but thickens significantly to the west; MMW036 was installed in a high permeability basalt unit (1.4×10^{-2} cm/sec; Appendix A4). At MMW036, approximately 70 feet of basalt was drilled and the bottom of the unit was not penetrated. It appears that higher permeability weathered Dinwoody Formation and basalt are acting as the upper-most water bearing unit in this area and may represent a local system similar to the alluvium . The Dinwoody Formation is discussed below. The monitoring well installed in the basalt is in a likely downgradient position from the mine (MMW036). The selenium concentration measured in this well was 0.00593 mg/L in the fall 2009 sampling event.

Alluvial groundwater flow from the central and southern portions of the mine will report to Rasmussen Creek and the East Fork of Rasmussen Creek. The most direct impacts are likely to the East Fork of Rasmussen Creek where the channel runs along and underneath the southern mine waste area (MWD092) (Drawing 2-5). Mine waste overlies some smaller tributary channels feeding Rasmussen Creek, most notably at MDS025. Sections D, J, and K illustrate the alluvial flow system in the southern area (Drawings 3-57 and 3-58).

The alluvium in the southern area of the mine was evaluated through the drilling of monitoring wells MMW007, MMW008, and MMW013 in 2007 and then subsequently during the direct push sampling program in 2008 and 2009. The alluvium in this area adjacent to the mine was observed to yield small amounts, if any at all, of groundwater during drilling. All three wells in the southern area were advanced into the shallow Dinwoody Formation

where more significant (> 1 gallon per minute) groundwater flow was encountered. This shallow bedrock system is considered a continuation of the alluvial system and primarily represents flow along the upper decomposing bedrock contact. The direct push sampling technology was also successful in obtaining groundwater samples from the lower yielding, shallow alluvium; so between the wells and direct push boreholes, there has been a vertical characterization of the alluvial system.

The positions of MMW007 and MMW008 are schematically shown on Section D in cross section (Drawing 5-57) and in plan view on Drawing 2-5. The total selenium concentrations measured in these two wells have never been above 0.005 mg/L from fall 2007 to spring 2009 (see Section 3.4.4). Similarly, all of the direct push samples in this area have had measured selenium concentrations that were near or below the detection limit (Drawing 3-46). However, the dump seep (MDS026) located on the south end of the MWD092 waste rock dump, contained selenium at concentrations up to 0.43 mg/L (May 2004). It is suggested by these results that there is an upward hydraulic gradient. This upward gradient results in water, which has contacted the waste rock and is discharging at MDS026, not entering the shallow alluvial system. There is anecdotal information that the southern end of MWD092 may have been placed on a spring. In 2006, the flow from MDS026 was observed to range between approximately 5.1 (May) to 2.4 gpm (September) and has the characteristic of groundwater discharge opposed to a direct runoff response (see Section 3.4.4).

Monitoring well MMW013 is projected onto Section K (Drawing 3-58). The total selenium concentration measured in MMW013 steadily increased from <0.001 mg/L (fall 2007) to 0.124 mg/L (fall 2009) (Table 3-43). The direct push sampling investigation completed in the spring of 2008 and 2009 also indicated some selenium in the alluvial system, but not an extensive plume similar to that observed at the Ballard Mine (Drawing 3-48). Based on the increasing trend in MMW013, the impact in this area may be expanding. Direct push borehole monitoring well MBW085 is located in a downgradient position and most recently had 0.00131 mg/L selenium. Continued monitoring in this area will determine if an enlarging plume is present in the alluvial system originating from where waste rock was placed above the drainage in tributary channels. An alternative transport pathway may be

upward from the Dinwoody Formation, which has been shown to be affected by COPCs as discussed below. This may be supported by the fact that MMW013 has higher selenium concentrations than were observed in any of the shallower direct push sample locations.

Dinwoody and Thaynes System

The Dinwoody Formation outcrops along the southwestern side of the Enoch Valley Mine. This outcrop area represents a recharge area for a local or intermediate groundwater flow system in the Dinwoody Formation. However, the discharge location for this flow system has not been identified. A flow system with discharge along the Henry Thrust Fault is conceptually reasonable (see Section B, Drawing 2-7); however, the trace of the thrust fault has not been observed to be a locus of spring discharge. In addition, the Dinwoody Formation is not exposed at the surface along the Henry Thrust Fault. The overlaying Thaynes Formation represents the surface exposure along most of the west of Enoch Valley. Discharge to the northwest and southeast also is a possibility. In these areas, the discharge could be to the Lone Pine Creek or Angus Creek alluvial systems. However, springs have not been identified in the area during the investigations that are associated with this alluvial system. As discussed below, discharge directly to the alluvial/basalt groundwater systems also may be occurring.

The Thaynes Formation can be a component of local or intermediate flow systems. At the Enoch Valley Mine, the Thaynes Formation is not in direct contact with any sources (see Section K, Drawing 3-58, for an example). The only potential for impacting a flow system in the Thaynes Formation is therefore indirect, such as impacted alluvium that overlies the unit. At this time, such secondary sources have not been observed, and data suggest that there is not a complete flow path between mine-related sources and the groundwater system in the Thaynes Formation.

For the majority of the northern portion of the mine area, there is not a source to the Dinwoody Formation. The waste rock is confined to the mine pit backfill and exposure to the Dinwoody Formation is limited (see Drawing 2-5). There are, however, external waste dumps on the northernmost end of the mine located on Dinwoody Formation and

colluvium overlaying Dinwoody Formation (Section L; Drawings 3-59). This includes a location where the waste rock was placed in a pre-mine drainage, and this area has been the focus of investigation in the northern Enoch Mine area.

Three wells were intended to investigate groundwater within the Dinwoody Formation in the northern Enoch Valley Mine area: monitoring wells MMW027, MMW035, and MMW036. As discussed above, MMW036 was actually installed in a thick basalt unit when the Dinwoody Formation was not encountered as expected beneath the alluvium. Monitoring wells MMW027 and MMW035 are close enough to be considered a co-located pair of wells and are intended to evaluate vertical hydraulic and concentration gradients within the Dinwoody Formation. The selenium concentration in groundwater collected from both monitoring wells is elevated to a similar level between 0.314 and 0.772 mg/L and increased with depth as the higher concentration was detected in MMW035, the deeper well. The fall 2009 water elevation in MMW027 was 6,408.85 feet amsl, whereas the water elevation in the deeper MMW035 was 6,412.23 feet amsl, indicating an upward gradient (Appendix A4). The concentration gradient does not appear to match the hydraulic gradient. These data suggest that the source is not local but farther up the slope as illustrated on Section L (Drawing 3-59).

At the MMW027/035 location, the shallow well MMW027 screens Dinwoody Formation beds that subcrop farther down on the hill beneath the waste rock compared to MMW035 that screens beds that subcrop farther up the hill (Drawing 3-59). Therefore, the deeper beds are recharged from a higher elevation and can have higher hydraulic head than the shallower beds. This configuration often creates an upward hydraulic gradient as is observed between monitoring wells MMW027 and MMW035 (see Appendix A4). The other component of this system is the basalt encountered beneath the alluvium. This highly permeable unit ($K = 1.4\times10^{-2}$ cm/sec) appears to act as a drain; and, as a result, the alluvial system is largely dry in this area (Appendix A4).

The basalt may receive flow from the Dinwoody Formation flow system due to the proposed upward hydraulic gradient. If there is an upward hydraulic gradient to the basalt as

there is within the Dinwoody Formation, flow through bedding fractures would recharge the basalt from below (Drawing 2-7). If there is an upward hydraulic gradient to the basalt, then the existing monitoring well in the basalt could see Site COPC-affected water from the Dinwoody Formation as well as from the alluvial unit. It is unknown if this upward gradient between the Dinwoody Formation and basalt exists

Any other flow systems within the Dinwoody are likely to be deep toward the center of the Georgetown Syncline (Drawing 2-5). These flow paths are long and would be subject to much dilution and attenuation before being within reach of any potential receptors. Possible impacts to the basalt are more of a concern because this unit appears to yield high quantities of groundwater in the shallow subsurface. Driller logs for wells installed west of the mine near Lone Pine Creek (i.e., MAW002 and MDW002, Drawing 2-5) are inconclusive as to the geology encountered, although it appears that once "hard rock" or "black cinder" was encountered in these borings then groundwater at its highest yield was noted..

The other area of possible impacts to the Dinwoody Formation is in the southern portion of the mine. In this area, the recharge area for the Dinwoody Formation is overlain by the MWD092 waste rock dump. The relationship of the Dinwoody Formation and the waste dump in this area is shown on Sections D, J, and K (Drawings 3-57 and 3-58). Monitoring wells MMW007, MMW008, and MMW025, (on the southeast end) and MMW013, MMW024, and MMW034 (on the southwest side) have all been installed in the Dinwoody Formation. Monitoring wells MMW007, MMW008, and MMW013 are installed near the alluvial-Dinwoody Formation contact and appear to be most closely associated with the alluvial system. They provide data on the hydrogeologic conditions at the top of the Dinwoody Formation groundwater flow system.

Similar to the alluvial system on the southern end of MWD092, groundwater within the Dinwoody Formation does not appear to be impacted by COPCs, as indicated by water quality data from MMW025, which had a maximum selenium concentration of 0.00168 mg/L (May 2009; Table 3-43). The water level information suggests that there is a weak downward gradient in the Dinwoody Formation in this portion of the mine (Appendix A4). The water levels in MMW007, MMW008, and MMW025 are within 1 foot and the wells are

not co-located so this conclusion may not be correct. What is certain is that the vertical gradient in either direction is weak. In addition, the apparent lack of contaminant transport into the groundwater system of this area suggests a lack of any significant downward gradient.

Groundwater within the Dinwoody Formation along the southwestern edge of MWD092 near MMW024 and MMW034 has been observed to be impacted by COPCs. The potential pathway in the Dinwoody Formation is illustrated on Section K (Drawing 3-58). Based on the September 2009 water elevations in MMW024 (6,643.37 feet amsl) and MMW034 (6,629.91 feet amsl), there is a component of groundwater flow to the southwest (Appendix A4). These monitoring wells may be installed in separate hydrostratigraphic units within the Dinwoody Formation so these data should be used with caution. Nonetheless, this transport pathway appears to be complete and is impacted by COPCs.

The topographic and geologic configuration of the area near MWD092 suggests that groundwater flow within the Dinwoody Formation is likely to the southeast approximately along the axis of the Georgetown Syncline. The topography southwest, west, and northwest of the MWD092 is elevated with respect to the area with elevated COPCs (Drawing 2-3). Waste rock dump MWD092 sets on steeply dipping Dinwoody Formation beds on the northwestern limb of the syncline (Drawings 2-5, 2-7 (Section A) and 3-58 (Section K)). The areas to the northwest and southwest of MWD092 contain southwest dipping beds of the Thaynes Formation, which is underlain by the Dinwoody Formation. Further to the southwest is the Henry Thrust Fault which has placed Dinwoody Formation on top of Thaynes Formation. Based on this configuration, it is likely that the Dinwoody/Thaynes flow system is recharged from direct precipitation and snowmelt at elevations higher than the area with affected groundwater observed at MMW013, MMW024, and MMW034. This suggests higher potentiometric surfaces in these areas and flow to the southeast toward topographically lower areas near the center of the syncline.

The potential for flow in the southeast direction along bedding strike is further supported by:

- The potentiometric surface elevation difference between wells MMW024 (6,643.37 feet amsl) and MMW034 (6,629.91 feet amsl) southwest of MWD092, and MMW025 (6,581.53 feet amsl) southeast of MWD092. This difference is greater than 40 feet. This indicates the potential for flow along strike to the southeast (see Appendix A4 for presentation of water levels).

- A possible upward hydraulic gradient is suggested on the southeast end of MWD092. The vertical gradient between Dinwoody and Dinwoody/Alluvial monitoring wells on the southeast of MWD092 is relatively flat (MMW007, MMW008, and MMW025). However, the presences of dump seep MDS026, which appears to be a groundwater feed spring (Section 3.4.4) and the lack of elevated COPCs in either the alluvium or Dinwoody Formation suggest generally upward groundwater flow in the area (Appendix A4).

- The most likely source for COPC-affected groundwater in MMW013, MMW024, and MMW034 is pond MSP020 and the surrounding area (alluvial recharge in the side drainage), which is northwest of the monitoring wells (selenium concentrations in pond water collected from MSP020 typically have ranged from 0.02 to 0.09 mg/L)).

These observations are consistent with the conceptual model of recharge to the Dinwoody/Thaynes flow system from the highlands to the northwest and southwest. What is suggested is that water percolating into the Dinwoody Formation from MSP020 or MWD092 would move down dip into the groundwater flow system, then laterally along strike to discharge to the alluvial system and possibly Rasmussen Creek near the southern end of the mine. MDS026 may represent such a discharge location. Furthermore, it appears that elevated COPC concentrations in the alluvium are an indication of impacted Dinwoody Formation. Monitoring well MMW013 installed near the alluvium-Dinwoody Formation contact has higher COPC concentrations than the shallow alluvium.

The alternatives are movement down dip along the steeply dipping beds into the Georgetown Syncline or flow along strike to the northwest. The latter of these options appears very unlikely because of the exposures; the Dinwoody Formation would be a recharge area at a higher elevation along strike. If movement is down dip, the leading edge of COPC-affected groundwater quickly would become not practicably reachable by either monitoring well or groundwater extraction well. The flow path would be toward the Henry Thrust Fault, then likely to the northwest. Dilution along such a long flow path would result

in not being able to observe such an impact in the hundreds of years in the future when it might arrive at a shallow groundwater location of discharge point.

Regional Wells Formation System

The Wells Formation outcrops primarily east of the Enoch Valley Mine on the opposite side of the Enoch Valley Fault (Drawing 2-5). The Enoch Valley Fault displaces Wells Formation against Wells Formation in the mine area, as shown on Section A (Drawing 2-7). The exposure of Wells Formation east of the mine represents the core of the Snowdrift Anticline and likely represents a significant recharge area for the regional groundwater flow system. The elevation of this area is just above 7,000 feet amsl over the majority of the area. Down-geologic-dip to the southwest, the Wells Formation rapidly plunges to the core of the adjacent Georgetown Syncline at as much as 3,000 feet below the ground surface (see the left side of Section A and right side of Section B, Drawing 2-7). In the majority of the mine area, the Wells Formation strikes northwesterly and dips steeply at approximately 60 degrees. However, there is a flexure in the northern portion of the mine; and the strike swings approximately 20 degrees farther west and flattens to approximately 45 degrees (Drawing 2-5).

The conceptual transport model for flow in the Wells Formation in the Enoch Valley Mine area is for groundwater flow from the recharge area east of the mine, generally to the west beneath the Enoch Valley Mine towards the Henry Thrust Fault. This assumes that the normal Enoch Valley Fault does not function as a flow barrier. There likely is a northwest or southeast component to the flow due to the structural grain of the region. Thrust faults commonly act as a flow barrier, in which case, the fault would deflect flow. However, if the thrust fault is not a flow barrier, then it will not affect the Wells Formation recharge to the west of the Henry Mine and there would be northwest or southeast flow along the axis of the syncline.

Regional flow from the Enoch Valley Mine area, along the Henry Thrust Fault, toward the springs found at the Henry Mine (elev. 6,130 feet amsl) is a possible flow path (Drawing 2-5). It is also possible that flow is to the north of Henry to Wells Formation springs

associated with the Enoch Valley Fault. The Sinkhole Spring of Mayo (1982) is one possible discharge location (located approximately 18 miles to the northwest of the mine at approx. 6,200 feet amsl; see Drawing 3-60). Dating of water issuing from these springs indicates that the water is on the order of 20,000 years old (Mayo, 1982). Potential discharge locations to the southeast of the Enoch Valley Mine have not been identified.

The Wells Formation is largely only in contact with mine wastes in the footwall of the backfilled mine pits at the Enoch Valley Mine. Mine waste rock dumps generally do not overlie the Wells Formation exposures east of the mine (see Sections K and L, Drawings 3-58 and 3-59). The most likely source of potential selenium impacts to the Wells Formation is, therefore, infiltration through a backfilled mine pit as discussed in Section 3.7.4.1.

Flow to the northwest and southeast along the strike of the Wells Formation represents a more likely exposure scenario for potential groundwater receptors. In these directions, the Wells Formation may be reached with a water supply well of reasonable depth. Down dip to the southwest, the Wells Formation deepens rapidly; and the only potential receptor would be a deep municipal-type water well, which is not likely in this area given the distance to a large municipal area and many other shallower locations where the regional flow system may be reached.

A goal for the 2007 field program was to specifically test the Wells Formation flow path from a backfilled mine pit. This was done with the installation of MMW009. The position of MMW009 downgradient of a backfilled mine pit is illustrated on Section L (Drawing 3-59). The relatively high head in MMW009 (at approximately 6,520 feet amsl) supports the hypothesis of a substantial recharge area to the east for the regional Wells Formation groundwater flow system and that the Enoch Valley Fault along its full length is not a flow barrier. The maximum detected concentration of total selenium measured in MMW009 was 0.00104 mg/L (fall 2008). Similar to MMW023 at the Henry Mine, iron and manganese, which are more mobile in a reducing environment, appear elevated in MMW009 (see Section 3.4.4). This suggests that selenium may be immobile in the pit backfill or attenuated in the reduced aquifer.

In 2008, MMW026 was installed on the southeast end of the Enoch Valley Mine to test the potential flow path to the southeast along the strike of the Wells Formation. The water quality in the well did not exceed any relevant standards (maximum selenium concentration of 0.0013 mg/L; see Section 3.4.4). The fall 2009 water elevation in MMW026 (6,315.5 feet amsl) was lower than MMW009 (6,454.66 feet amsl) suggesting flow to the southeast. However, it is possible that there is a groundwater divide between the two wells and flow is both northwest and southeast. Either way, MMW009 and MMW026 are well positioned to monitor groundwater flow in the Wells Formation.

Groundwater flow down the geologic dip is not considered further. As mention above, the depth to the Wells Formation quickly becomes extreme for water well installation. Any flow path to a potential receptor (spring or possible well) becomes miles long and attenuation and dilution would very likely act to reduce any loading from Enoch Valley to less than measurable levels. In addition, the Henry Fault likely acts as a flow barrier in the down dip direction, further increasing the likelihood that the dominate flow direction is to the northwest, southeast, or both. One factor that may limit flow to the southeast is the strike-slip Rasmussen Fault that runs just south of the Enoch Valley Mine.

Structural Flow Systems

As noted in the previous section, there is a flexure in the northern half of the mine, north of which the strike of the beds trends more westward with a shallower dip. It has not been determined how much of this change in strike and dip is due to simple folding or how much faulting is involved. To the extent that faulting is present, a large offset does not occur as indicated by the mine configuration and the regional geologic mapping (Drawing 2-5). As there is not a significant displacement of units across the structure, it is not likely to provide a flow pathway more extensive than otherwise exists.

3.8 Initial Risk Characterization Conceptual Site Models

The risk assessment process begins with the development of a conceptual site model (CSM). The CSM is a descriptive and graphical presentation of the physical, chemical, and biological

relationships between sources of chemical contaminants and potentially exposed populations of receptors. As such, the CSM integrates available site-specific information regarding contaminant sources, fate and transport pathways, land uses, current and future potentially exposed populations, and complete and incomplete exposure pathways. Human health and ecological CSMs for the Sites are described in Sections 3.8.1 and 3.8.2, respectively, and are further described in the HHERA Work Plan in Appendix C.

3.8.1 Human Health Conceptual Site Model

A graphical representation of the human health CSM for the Sites is presented in Figure 3-58. As described in Section 2.1, the primary sources of potential contaminants (i.e., primarily inorganic trace elements) associated with the Sites include reclaimed mine waste rock dumps and mine pits. A more detailed description of the mobilization and transport of potential contaminants from native materials and waste rock is provided in Sections 3.6 and 3.7. In general, physical (wind, precipitation, and ambient temperature changes) and chemical weathering processes at the Sites release potential contaminants from waste rock in the mine dumps and other more minor sources. The dissolution of soluble minerals, the oxidation of the surface, and, in some cases, the interior of the waste rock dumps and mine pits are the primary chemical processes affecting the release of chemicals from these areas. After the waste rock is broken down by physical and chemical processes, trace elements may be leached into waste rock and soil pore water. Surface and subsurface soils (e.g., waste rock) may be considered secondary sources of contamination (Figure 3-58). Secondary release mechanisms include wind erosion of exposed rock and surface soils, surface water runoff, and infiltration of surface water into soils followed by percolation of pore water into groundwater. Tertiary sources of contamination include the following abiotic exposure media: ambient air, surface and subsurface soils, sediment, surface water, and groundwater (Figure 3-58).

Because the primary sources of potential contaminants (i.e., mine pits and waste rock dumps) are present at each of the three P4 mines, similar fate and transport processes apply at all three Sites. In addition, at each mine similar human receptors and exposure pathways are potentially present. As a result, the following CSM discussion is generalized to all three

of the Sites. During the preparation of the RI/FS report, the potential need to refine the human health CSM on a mine-specific basis will be evaluated; and Site-specific CSMs will be developed, if necessary.

Key elements of the human health CSM for the Sites, including land uses in and around the Sites, current and future human receptors relevant to the Sites, and potentially complete and incomplete exposure pathways between human receptors and contaminated media are discussed in the following subsections.

3.8.1.1 Land Uses

The Sites are located in the SE Idaho Phosphate Resource Area and consist of former phosphate mines and ancillary facilities. The Sites are an amalgamation of ownership types: lands privately held by P4, and lands leased or formerly leased from the BLM, State of Idaho, and USFS for the purpose of mining. The adjoining or neighboring lands are privately-held ranches and public lands, including BLM, State of Idaho, and USFS lands.

Currently, the Sites are primarily reclaimed mine land used for limited livestock grazing and some uses that support nearby active mining. Neighboring lands may be used for other purposes such as recreational uses and ranching, including grazing of livestock. While unlikely under P4's current operation, future changes could result in P4 current and former leases of public lands reverting to the government for unrestricted use and their private lands could be redeveloped for residential use.

3.8.1.2 Current and Future Receptors

At, and in the vicinity of, the Sites, the most common land uses are phosphate mining and livestock grazing. Consequently, current and future human receptors in these areas include mine site workers and seasonal ranchers. The current and future seasonal rancher is present for a few months of the year while grazing cattle at, or in the vicinity of, the Sites. Mine site workers are protected by Mining Safety and Health Administration (MSHA) regulations and other health and safety rules. As a result, current and future mine site workers will be

evaluated, but only semi-quantitatively, using risk estimates for other receptors and comparisons between exposure assumptions for workers and other receptors

State, USFS, BLM, and private lands are present in the vicinity of the Sites and are potentially used by recreational receptors. Current and future recreational receptors include fisherman, hunters, campers, and hikers. These receptors potentially come into contact with contaminated abiotic media (e.g., soil, surface water, or sediment) and may consume tissues of harvested biota (e.g., fish or large game animals, including deer and elk). Additionally, according to the Bridger Treaty between the U.S. Government and the Shoshone and Bannock tribes, current and future Native American receptors have rights to hunt, fish, gather plants, and practice other traditional activities on unoccupied federal lands.

Under a hypothetical future use scenario, there are several possibilities including:

- Private lands within P4's mine sites (their holdings) could be developed for residential use.
- Public lands within P4's mine sites could be reopened for unrestricted public use.
- Seasonal ranchers also could convert their private ranches into rural residential land use if it was developed and zoned accordingly.

While future residential land use is unlikely for the majority of the Sites and vicinity, this conservative receptor usage will be evaluated for purposes of determining impacts to potential future receptors under unrestricted land use which will help in the development of land use management plans.

Consistent with the current and future use discussed above, the current and future human receptors for the evaluation of human health risks at the Sites are:

- Current/Future Recreational Hunter
- Current/Future Recreational Fisherman
- Current/Future Recreational Camper/Hiker
- Current/Future Native Americans

- Current/Future Seasonal Rancher
- Current/Future Worker (evaluated semi-quantitatively)
- Hypothetical Future Resident

3.8.1.3 Complete and Incomplete Exposure Pathways

The human receptors identified in Section 3.8.1.2 are potentially exposed to Site contaminants during various activities. Recreational hunters and Native Americans may use lands for harvesting wild game such as deer and elk. Recreational fisherman, Native Americans, and hypothetical future residents may use the Sites for fishing. Native American receptors also may use the Sites while foraging for culturally significant plants, which are used for tea or general consumption. Hikers and campers may use the Sites for hiking and camping on short recreational trips. Longer-term activities include potential future residents and seasonal ranchers who live at, or in the vicinity of, the Sites. These receptors may use groundwater as in-house potable water or for irrigating fruits and vegetables that are subsequently consumed. Additionally, groundwater may be used by seasonal ranchers for watering livestock.

Complete and incomplete exposure pathways for the above receptors are graphically illustrated in Figure 3-58 and described on a medium-specific basis below.

<u>Soil</u>

Contaminants may be released to soil through weathering/leaching and dispersion of airborne particulates at overburden disposal areas (ODAs). Human receptors with a potential for exposure to soils at the Sites include seasonal ranchers, recreational hunters, recreational fisherman, recreational hikers/campers, Native Americans, workers, and hypothetical future residents.

These receptors potentially are exposed to contaminants in soil through direct contact pathways such as incidental ingestion and dermal absorption of soil or inhalation of fugitive dust particles (e.g., generated from physical disturbance of the soil from vehicle usage).

Indirect exposure pathways include consumption of plants grown in contaminated soils and consumption of livestock or game animals foraging on or around the Sites. Both Native Americans and recreational hunters have a complete exposure pathway through the consumption of game animals that may potentially bioaccumulate contaminants from soils at the Sites. This pathway is potentially complete but insignificant for hypothetical future residents. Native Americans also may collect and consume culturally significant plants that grow on or around the Sites. Hypothetical future residents may consume fruits and vegetables grown in contaminated soils. The seasonal rancher has potential exposure to soil contaminants through consumption of beef which is harvested from cattle grazing on or around the Sites. This pathway is potentially complete but insignificant for hypothetical future residents.

As noted in Section 3.8.1.2 above, it is possible that some terrestrial biota consumption pathways could be applicable to receptors not specifically mentioned above. For example, a recreational fisherman or a recreational camper/hiker could also hunt. Such alternative exposure pathways will be evaluated qualitatively in the Uncertainty Analysis section of the HHERA.

Sediments

Contaminants may be released to sediments through weathering/leaching processes from mine dump materials, infiltration/percolation, and surface water runoff to on-site ponds and on-site/off-site drainages. Direct exposure to contaminants in sediment is potentially complete but insignificant for the recreational fisherman, recreational camper/hiker, Native American, and hypothetical future resident.

While direct human exposure to sediments at the Sites is not likely to occur to any appreciable degree, indirect exposure pathways are potentially significant through the consumption of organisms that uptake contaminants from sediments. Recreational fisherman, Native Americans, and residential receptors may consume fish harvested from impacted ponds or drainages. Additionally, Native Americans may consume culturally significant plants (e.g., cattails) harvested from impacted ponds or drainages.

As noted in Section 3.8.1.2, above, it is possible that some aquatic biota consumption pathways could be applicable to receptors not specifically mentioned above. For example, a recreational hunter or a recreational camper/hiker could also fish. Such alternative exposure pathways will be evaluated qualitatively in the Uncertainty Analysis section of the HHERA.

Surface Water

Contaminants may be released to surface water through weathering/leaching of mine dump materials, infiltration/percolation, and surface water runoff to on-site ponds and on-site/off-site drainages. Human exposure to surface water at or in the vicinity of the Sites is considered potentially complete for recreational hunters, recreational fishermen, recreational hikers/campers, Native Americans, hypothetical future residents, and seasonal ranchers.

Complete surface water exposure pathways are both direct and indirect exposures to contaminants in surface water. Potentially complete direct exposure pathways include incidental ingestion and dermal contact with surface water. Direct exposure pathways for surface water are potentially complete for recreational fishermen, Native Americans, and hypothetical future residents. It is unlikely that recreational swimming is a significant exposure pathway due to low surface water temperatures, remoteness of the Sites, and the limited size of surface water bodies in the vicinity of the Sites. Seasonal ranchers may have limited direct contact with surface water, but such exposures are unlikely to be significant. Inhalation of contaminants from surface water is considered to be an incomplete exposure pathway because trace metals are not volatile.

Indirect exposure pathways for surface water include the consumption of fish harvested from on-site ponds or on-site/off-site drainages. The fish consumption pathway is potentially complete for Native Americans, recreational fisherman, and hypothetical future residents, who may harvest fish from surface water bodies at or in the vicinity of the Sites. Contaminant uptake from surface water to wild game, including elk and moose, represents a potentially complete exposure pathway for Native Americans and recreational hunters. This exposure pathway is potentially complete but insignificant for hypothetical future residents. Consumption of culturally significant aquatic plants is also a potentially complete exposure

pathway for Native Americans. Surface water may be used for watering cattle and other livestock, which are subsequently consumed by seasonal ranchers. This exposure pathway is potentially complete but insignificant for hypothetical future residents.

As noted in Section 3.3.1.2 above, it is possible that some aquatic biota consumption pathways could be applicable to receptors not specifically mentioned above. For example, a recreational hunter or a recreational camper/hiker could also fish. Such alternative exposure pathways will be evaluated qualitatively in the Uncertainty Analysis section of the HHERA.

Groundwater

Contaminants may be released to groundwater through weathering/leaching of overburden material and infiltration/percolation of trace minerals through the vadose zone to subsurface water. Potentially complete human exposure pathways for groundwater at the Sites are limited to the seasonal rancher and the hypothetical future resident.

Complete groundwater exposure pathways are both direct and indirect exposures to contaminants in groundwater. Potentially complete direct exposure pathways result from the use of groundwater at, or in the vicinity of, the Sites as a potable water supply. Direct exposure pathways for seasonal ranchers and hypothetical future residents include ingestion of potable water and dermal contact with potable water while bathing or showering.

Indirect exposure pathways are potentially complete for the seasonal rancher and hypothetical future resident. The use of groundwater for watering livestock may result in contaminant uptake by livestock, including beef cattle that are subsequently consumed by seasonal ranchers. Groundwater that is used to irrigate homegrown fruits and vegetables may result in contaminant uptake by plants that are harvested and consumed by hypothetical future residents.

Complete Exposure Pathways Summary

In summary, potentially complete and significant exposure pathways for human receptors are as follows:

- Recreational hunters potentially have complete and significant exposure pathways associated with direct soil contact (i.e., incidental soil ingestion, dermal contact with soil, and inhalation of fugitive dust) and from consumption of wild game that uptake contaminants from surface water and soil.

- Recreational fishermen potentially have complete and significant exposure pathways associated with direct soil contact (i.e., incidental soil ingestion, dermal contact with soil, and inhalation of fugitive dust), direct contact with surface water (i.e., incidental ingestion and dermal contact with surface water), and consumption of fish that uptake contaminants from surface water and sediments.

- Recreational campers/hikers potentially have complete and significant exposure pathways related to direct contact with contaminated soils.

- Native Americans potentially have complete and significant exposure pathways related to direct contact with soil; direct contact with surface water; and consumption of biota such as fish, wild game, and culturally significant plants.

- Seasonal ranchers potentially have complete and significant exposure pathways related to direct contact with soil, direct contact with groundwater used as a potable water supply (i.e., inhalation, ingestion, and dermal contact with groundwater,) and consumption of beef cattle that uptake contaminants from groundwater and soil while grazing at the Sites.

- Hypothetical future residents potentially have complete and significant exposure pathways related to direct contact with soil, direct contact with groundwater used as a potable water supply, consumption of fish, and consumption of homegrown fruits and vegetables that uptake contaminants from groundwater and soil.

- Exposure pathways and potential risks to future workers will be evaluated semi-quantitatively using risk estimates for other similar receptors and comparisons between exposure assumptions for future workers and other receptors

It should be noted that year-round exposure to contaminated media, including soil and surface water at, and in the vicinity of, the Sites does not occur due to seasonal limitations (i.e., snowpack and ice for approximately six months of the year). As a result, direct exposure pathways between human receptors and these media are limited. Additionally, indirect exposure pathways associated with the harvesting and consumption of fish and wild game are limited by licenses and seasonal availability, along with State regulations regarding harvest quantities. These limitations will be addressed in the human health exposure assessment to be used in the evaluation of risks to public health, as described further in Appendix C.

3.8.2 Ecological Conceptual Site Model

In the risk assessment process under CERCLA (USEPA 1997), an ecological CSM is the product derived from the first phase of the assessment process known as Problem Formulation. Problem Formulation is a formal process for generating and evaluating preliminary hypotheses about the potential for adverse ecological effects to have occurred. The primary components of Problem Formulation are:

- Identification of the ecosystem at risk
- Identification of stressor characteristics
- Identification of known effects
- Selection of assessment endpoints
- Construction of a CSM

The complete Problem Formulation is contained in Appendix C (HHERA Work Plan). This section presents the CSM, along with the proposed assessment endpoints and selected receptors to evaluate these assessment endpoints.

The CSM for the Sites identifies the primary contaminant sources, release mechanisms, transport mechanisms, secondary contaminant sources, potential pathways, and exposure routes for the selected receptors. The migration of potential contaminants from primary sources to secondary sources occurs through various transport processes that were described in detail in Sections 3.7 and 3.8. The ecological portion of the conceptual model identifies where contaminant interactions with biota can occur, describes the uptake of site contaminants into the biological system, and diagrams key receptor contaminant exposure pathways. Receptors are exposed to metals through direct contact with contaminated media and through food web transfer. Figure 3-59 shows the sources, transport pathways, the ecological receptors, and the potentially contaminated media to which receptors are most likely exposed. Figure 3-60 shows the food web relationships for selected receptors at the Sites and illustrates energy and contaminant transfer in the ecosystem which constitutes complete exposure pathways.

3.8.2.1 Endpoint and Receptor Selection

Endpoints define the focus of the ecological risk assessment, and this section identifies both assessment and measurement endpoints. Assessment endpoints are explicit statements about what aspects of the ecological system (conditions or processes) are valued and intended for protection. Each assessment endpoint is evaluated for risk, which may not be directly quantifiable. Generally, assessment endpoints are populations or communities of ecological receptors (USEPA 1997a). Measurement endpoints are the various means by which the assessment endpoints are evaluated. Measurement endpoints are quantifiable indicators of the state of the valued conditions or processes through laboratory or field experimentation that are related to the characteristic chosen as the assessment endpoint.

The assessment and measurement endpoints for this ERA are shown in Table 3-62. Assessment endpoints include the survival and reproductive success of fish, birds, and mammals. Baseline risk evaluations for plants, aquatic invertebrates, terrestrial invertebrates, reptiles, and amphibians were not selected for detailed risk evaluations, consistent with prior risk evaluations in the region (Tetra Tech, 2002) and IDEQ's intent to focus resources, minimize future site-specific risk assessment needs, and make decisions about mine-specific risk management options using a process that is consistent with their regional perspective (IDEQ, 2004a).

Measurement endpoints for upper trophic level wildlife were evaluated based on risk to specific target receptors since it is neither possible, nor practical, to evaluate the risk posed to every potentially exposed species. Selection of indicator receptors focuses the ecological risk assessment on those ecological features or resources that have substantial aesthetic, social, or economic value or are important in the biological function or biodiversity of the system. Additionally, receptors provide a clear, logical connection between regulatory policy goals and anticipated ecotoxicological investigations. The selected indicator receptors are representative species from the feeding guilds identified for habitats in the Resource Area. A feeding guild represents a group of species which exploit the same ecosystem resources in the same way and, therefore, could be expected to have the same exposure to environmental contaminants.

The proposed feeding guilds for the Resource Area are described below and are supported by species occurrence and trophic level information detailed in Appendix C. Table 3-62 summarizes the feeding guilds and the proposed ecological receptor endpoint and indicator receptors:

A systematic approach was used to identify representative wildlife species (receptors) on which to base the ecological risk assessment for the site. The criteria used to select the representative species were as follows:

- *Species occurrence.* Species known to occur in the area (e.g., deer mouse) had priority for the evaluation over species that are transient or do not occur in the area (e.g., lynx) because they are likely to have much greater exposure to stressors from the site (discussed in Appendix C,).

- *Exposure frequency.* Receptors that are likely to have the highest exposures were selected over receptors with lower potential exposure. Exposure frequency was evaluated based on the organism's home range. Species with large home ranges (e.g., elk) will have lower exposure frequency to chemicals at a site than non-migratory animals with small home ranges (e.g., meadow vole) (discussed in detail for selected receptors in Appendix C).

- *Foraging habits/Feeding guilds.* Foraging habits were evaluated to determine the pathways by which wildlife would become exposed. Both terrestrial and aquatic based foraging habits were evaluated. Species that forage on prey in the sediment will be exposed to contaminants through the incidental ingestion of sediments at higher rates than species that forage in the water column. Wildlife that forages on invertebrates that live in the sediment is also likely to be exposed to higher concentrations of chemicals because their prey has greater exposure to the sediment. The same analogy can be applied to soil based exposure pathways. Additionally, position in the food chain level (i.e., trophic level status) is an indicator or the likelihood of exposure to bioaccumulative chemicals, where wildlife in upper trophic levels is more highly exposed. For example, we expect a seed eating migratory bird such as the American goldfinch to be less exposed to site contaminants than a cutthroat trout that is in greater contact with potentially contaminated media and has a higher trophic position in the food web (see Appendix C, Tables C4-8 through C4-10).

- *Ingestion rates.* Intake rates of sediment and food were evaluated because they help determine the potential level of exposure. Within similar feeding guilds, smaller species within a feeding guild will tend to have greater exposure to contaminants because they have higher rates of food consumption relative to their body weight per day (discussed in detail for selected receptors in Appendix C).

Selection of receptors was based on the factors described above, prior precedence of receptor selection for the region (MW, 1998b, Tetra Tech, 2002), and species occurrence described in Appendix C. Wildlife species (receptors) that were selected to represent of each assessment endpoint are presented in Table 3-62.

3.8.2.2 Stressor Bioavailability and Exposure Routes

For toxicity to occur in an ecological receptor there must be clear indications of the quantity of chemical exposure and the degree to which the chemical exposure may include a bioavailable fraction that can cause toxicity directly or indirectly through food web transfer. This section describes factors that affect the bioavailability of metals in terrestrial and aquatic environments based on routes of exposure to ecological receptors. Drexler, et al. (2003) provides a recent and detailed review of factors affecting metals bioavailability in terrestrial and aquatic systems.

An overriding condition of metals exposure is that metals are naturally occurring and some are essential nutrients, such that plants and animals have evolved intricate strategies to balance nutrient levels and thus modulate exposures to metals (Drexler, et al., 2003). These strategies may include inhibited uptake, detoxification, storage, increased elimination, and acclimation (Drexler, et al. 2003). The ecological risk assessment will not quantitatively examine the relative contribution of each of these strategies. However, measures of tissue concentrations, for example whole fish, provide our best quantitative measure of site-specific exposure concentrations.

<u>Surface Water</u>

Freely dissolved levels of inorganic ions are the best indicator of aquatic toxicity to phytoplankton, zooplankton, other invertebrates, and fish as evidenced by the development of national ambient water quality criteria (NAWQC) for metals (USEPA, 2009b). Water hardness (concentrations of the cations calcium, magnesium, and manganese) can also affect the degree of bioavailability of metals and specifically has been incorporated into the application of water quality criteria for cadmium, chromium III, lead, nickel, silver, and zinc.

With the 2009 NAWQC update, USEPA now requires that the biotic ligand model be used to determine the bioavailability and toxicity for copper.

The biotic ligand model is based on the hypothesis that toxicity is not simply related to total aqueous metal concentration, but that both metal-ligand complexation (organic and inorganic) and metal interaction with competing cations at the site of action of toxicity need to be considered. For fish, the biotic ligand appears to correspond to sites on the surface membrane of the gill responsible for regulating sodium ion uptake. Mortality occurs when the concentration of metal that is bound to the biotic ligand exceeds a threshold concentration. Dissolved organic carbon (DOC) matter is known to be an important ligand for most metals in most natural waters and is an input variable in the biotic ligand model (USEPA, 2007a). Biotic ligand models for other metals (aluminum, cadmium, lead, nickel, silver, and zinc) are in the development stage but have not been through review and acceptance by the USEPA [3].

Water pH is another factor that influences the degree of metal complexation, bioavailability, and toxicity. Metal ions become more available as pH decreases; as pH decreases, there is a corresponding increase in H+ ions that compete with metal ions for complexation with DOC.

With regard to compensatory mechanisms in animals, rainbow trout have been shown to actively control body and tissue concentrations of copper and zinc (essential nutrients) such that concentrations in the fish do not correlate well with exposure concentrations, while concentrations of cadmium (non-essential nutrients) correlate with exposure concentrations (Drexler et al., 2003). Mechanisms to control metal concentrations in trout have been shown to include uptake inhibition, detoxification and storage using metallothionein, and increased elimination (Drexler et al., 2003).

Water ingestion also is a contaminant exposure route for wildlife as described in Appendix C.

[3] See Hydroqual's web site at: http://www.hydroqual.com/wr_blm.html as referenced on USEPAs water quality web site (http://www.epa.gov/waterscience/criteria/copper/2007/index.htm)

Soil

Plants as sessile or stationary organisms have developed several means of managing toxic levels of metals: 1) excluding them at the root zone from biological uptake, 2) sequestering the metal in a non-toxic form once accumulated (Grill et al., 1985), and 3) adapting. As evidence for adaptation, metal tolerant plants were historically used by those in the mining industry to determine where mineral concentrations were (Baker et al., 1988). Plants may exhibit a wide range of sensitivity to metals, and bulk soil concentrations have been found to be poor predictors of the bioavailable fraction of metals to plants (Lasat, 2000).

The same issues of a broad range of sensitivities in species and a poor correlation between toxicity and bulk soil concentrations exist for terrestrial invertebrates as well. Terrestrial invertebrates are exposed to contaminants in soil by direct contact and through ingestion. Allen (2002) has proposed the development of terrestrial biotic ligand models to determine the bioavailable fraction of metals available to plants, invertebrates, and microbes and thus the potential for toxicity, but terrestrial biotic ligand models have yet to be evaluated by the USEPA. Bioavailable forms of metals for uptake are free metal ions and soluble metal complexes. Metal forms that are not bioavailable are adsorbed to inorganic soil; bound to soil organic matter; precipitated as oxides, hydroxides and carbonates; and embedded in the structure of silicate minerals. Factors known to affect metals bioavailability include cation exchange capacity, organic carbon levels, pH, and amorphous Al/Fe (Barnett and Hawkins, 2008).

Soil ingestion by birds and mammals may occur incidentally during foraging and may occur indirectly through prey consumption where the prey species (e.g., earthworms) have consumed soil which still resides in their gut. Soil ingestion as a contaminant exposure route for wildlife is described in Appendix C.

Sediment

Benthic invertebrates, or invertebrates that live in the sediments found in area streams and ponds, are exposed to contaminants in sediment by direct contact and through ingestion.

Sediment pore water has been identified as a major route of exposure of infaunal and epibenthic organisms to sediment contaminants (Adams et al., 2001). Factors that influence the bioavailable concentration of metals in pore water include those identified for surface waters and described above. The bioavailability of several metals [copper (Cu), cadmium (Cd), nickel (Ni), lead (Pb), and zinc (Zn)] is dependent on the amount of sulfide in the sediment (McGrath et al., 2002). Under anoxic sediment conditions, sulfide is produced by sulfate reducing bacteria. Sulfide can bind with free metal ions to produce insoluble complexes that cause the metal to not be bioavailable. Acid volatile sulfide (AVS) is a very good measure of the portion of the solid phase sulfide that reacts with free metal. Predictions of metal bioavailability can be made based on measured concentrations of AVS and simultaneously extracted metal (SEM). SEM analyses are performed on the same extract used to determine AVS and measure how much of a reactive form of metal is present. If AVS concentrations are present in excess of SEM concentrations, then it is likely that little reactive metal is available. If, however, AVS concentrations are lower than the sum total SEM concentrations, the there may be excess and bioavailable metals.

Sediment ingestion by fish, birds, and mammals may occur incidentally during foraging and may occur indirectly through prey consumption where the prey species (e.g., chironomids) have consumed sediment which still resides in their gut. Sediment ingestion as a contaminant exposure route for wildlife is described in Appendix C.

Food

Transfer of contaminants to higher-level predators in the food chain is a primary means by which animals are exposed to contaminants and has been an integral part of risk assessment modeling practices as developed by the USEPA (USEPA, 1993; Drexler et al., 2003). Despite the occurrence of trophic transfer as an important and primary exposure route for animals, there are very few instances where metals have been found to biomagnify (i.e., increase in concentration with increasing trophic level) (Drexler et al. 2003). Assimilation efficiency of metals from the gut of the predator is dependent on the form of the metal that is found in the prey. For example, it has been shown for aquatic herbivores that consume algae that it is only the metals that are inside the algal cell that are assimilated; the metals

bound to the exterior of the algal cell wall are eliminated through feces (Drexler et al., 2003). Selenium, a particular metal of concern in the region, can be both rapidly accumulated and rapidly excreted (approximately 70 to 80 percent) such that tissue body burdens may change within days and adverse effects from toxicity may be reversed if the adverse effects did not include developmental deformities (USDOI, 1998).

3.9 Quality Assessment of Existing Data

In advance of this RI/FS Work Plan, P4 submitted *DQUR/DAR* (MWH, 2010a), which identified and evaluated the existing data (as presented and discussed in Sections 2.0 and 3.0 of this Work Plan). The *DQUR/DAR* specified the need and use for the relevant data in development of this RI/FS Work Plan. They are:

- Scoping and site characterization to determine the nature and extent of COPC and contaminants of potential ecological concern (COPEC) impacts in relevant media
- Risk assessment
- Evaluation of possible technologies/assembly of remedial alternatives (that is, the FS)

Section 2.0 of the *DQUR/DAR* provided details regarding the type of data needed in order to perform each of these component tasks of an RI/FS, and Section 3.0 of the *DQUR/DAR* provided detailed descriptions of the existing data that are relevant and appropriate for use in each task.

As discussed in Section 3.0 of the *DQUR/DAR,* three primary groups of existing data are considered to be important and relevant to the RI/FS for the Sites. Specifically, these data groups are:

1. **2004-2009 EE/CA Data Set.** Data collected as part of the 2004-2009 EE/CA and as specified in the 2003 CO/AOC. These data have been analyzed and validated according to current standards and are of known quality and are acceptable for all data uses.

2. **Pre-2004 Data Set.** Data collected in sampling events conducted between 1997 and 2003. Pre-2004 data exist that are (1) unique and should be used to supplement future risk assessment activities at the Sites or (2) standard and not uniquely useful but may supplement other data. These data were collected as part of regional studies in association with the IMA and regulatory agencies prior to the 2004-2009 EE/CA investigations.

3. **Other Relevant Data.** This is information and data that generally have been peer reviewed or approved by regulatory agencies; however, some unpublished sources may need to be considered because of their unique character.

Section 5 of the *DQUR/DAR* provided an evaluation of the quality of these existing data. Each of the three primary groupings of data was considered relevant to the RI/FS and was assessed based on (1) data need and use, (2) DQOs, (3) known data quality, (4) data uncertainties, and (5) further actions to address quality or limitations, as appropriate. Table 3-63 summarizes the data sets discussed, projected data uses in the RI/FS, and overall quality assessment.

As summarized in Section 6.0 of the *DQUR/DAR,* P4 considers these existing data to be usable for the specified RI/FS tasks for the following reasons:

- The pre-2004 data listed in Table 3-63 have been collected using appropriate planning, sampling methods, trained sampling teams, analytical methods, and known laboratories with appropriate credentials. These the data will be useful for RI/FS scoping, site characterization, and FS evaluation of alternatives.

- Data collected by P4 specifically as part of the EE/CA (2004 to 2009) for the Sites, which have been validated to current standards, will be appropriate for risk assessment in addition to any other use that is of value during the RI/FS, i.e., determination of the nature and extent of contaminants in various media at the Sites. It is anticipated that pre-2004 elk tissue, bird egg, and cattle study data will be acceptable to support the risk assessment after validation.

- Other relevant data that are published and, potentially, some unpublished data may be appropriate for use in the RI/FS. To provide a more robust RI/FS, these data will be used with professional judgment employed as to the quality of the data. It is unlikely that any decisions will be made solely based on these outside data; instead, they will be used to supplement mine-specific data. This practice is common in scientific work and CERCLA studies. These data, where used, will be referenced appropriately so that reviewers can assess the appropriateness and quality of the data.

All future RI/FS analytical data, much like the 2004-2009 EE/CA data, will be collected under an A/T-approved sampling and analysis plan (SAP). As a result, any analytical data collected during the RI/FS will be suitable for use in the three RI/FS data need/use areas of: (1) scoping/site characterization, (2) risk assessment, and (3) evaluation of remedial technologies and alternatives during the FS.

4.0 WORK PLAN RATIONALE

This section provides the supporting information and rationale that is necessary to identify the specific work activities that will be necessary during the RI/FS. This information, coupled with the information and data presented in Sections 2.0 and 3.0, is used to determine whether existing data are available and adequate to conduct the risk assessments and feasibility studies for the P4 Sites. Where data gaps are identified, additional investigations are proposed to fill these gaps in the Site knowledge.

The list of preliminary Applicable or Relevant and Appropriate Requirements (ARARs) presented in Section 4.1 is used primarily to assist in determining whether sufficient data are available to address compliance with regulations that will be used to determine if site cleanup has been achieved. By presenting the preliminary ARARs, any significant gaps in the data related to regulatory compliance can be identified. Preliminary Remedial Action Objectives (PRAOs) presented in Section 4.2 are medium-specific (or operable unit-specific) goals that help focus the investigations at the Site by identifying several site-specific objectives for protecting human health and the environment. Similar to ARARs, PRAOs are used to focus the RI on collecting the data necessary to evaluate potential remedies. In Section 4.3, data quality objectives (DQOs) are presented and are used to help scope the Work Plan. In the case of the Sites, these are primarily used to evaluate the appropriateness and usability of existing data. In summary, the ARARs, PRAOs, DQOs, and information and data presented in Sections 2.0 and 3.0 are used to identify the data gaps at each mine as presented in Section 4.4.

4.1 Preliminary ARARs

The site cleanup process under CERCLA (Section 121[d]) requires that remedial actions comply with ARARs as well as other pertinent information to be considered. ARARs are promulgated state and federal laws and regulations consisting of cleanup standards, criteria, and other environmental protection or siting requirements. This section summarizes preliminary ARARs that are potentially applicable, as well as those that may be appropriate

and relevant and those "to be considered." No attempt has been made to determine which of the preliminary ARARs would be potentially applicable and which would be potentially relevant and appropriate. However, the tables designate those standards that are potentially to be considered. These ARARs were developed in consultation with the A/Ts through submittal of a technical memorandum (MWH, 2010c) and subsequent responses and discussions.

Where a state law or regulation has a federal counterpart, the state requirement will be ARAR only if it is more stringent than the federal requirement. It should be noted that Idaho State Law does not allow Idaho standards to be more stringent than Federal Law. Therefore, it is unlikely that a State standard will be the more stringent. Therefore, no attempt has been made to verify whether the State laws and regulations identified in the following tables are more stringent than their federal counterparts.

Identification of potential ARARs at this stage of the RI/FS is intended to help assess where data gaps exist during the planning process and to help in early identification of remedial needs and technology. ARAR identification is an iterative process during the RI/FS and is continually refined as a better understanding is gained of Site conditions, contaminants, and remedial action alternatives. Thus, the potential ARARs presented here are preliminary and are to be refined during the RI/FS process.

There are three types of ARARs: chemical-, location-, and action-specific. The Federal and Site chemical-specific ARARs preliminarily identified for the Sites are presented in Tables 4-1 and 4-2, respectively. The chemical-specific ARARs generally define concentration limits for environmental media.

The location- and action-specific ARARs are presented in Tables 4-3 and 4-4 for Federal and State sources, respectively. These are considered together because some of the potential ARARs may be both location- and action-specific. The location-specific ARARs define requirements for remedial activities in environmentally sensitive areas, such as wetlands and floodplains, and define siting and permit requirements for new treatment and disposal facilities. More than chemical-specific ARARs, location-specific ARARs are dependent on

the specific areas to be remediated and the remedial alternatives available, which are currently not defined. However, some general assumptions can be made. For example, the Sites are located in non-tribal areas; therefore, location-specific ARARs based on tribal requirements would not apply. As remedial approaches are better developed during the FS, technology or activity-based requirements (i.e., action-specific ARARs) will be better defined.

4.2 Preliminary Remedial Action Objectives and Alternatives

Remedial action objectives (RAOs) are medium-specific or operable unit-specific goals for protecting human health and the environment (USEPA, 1988). Full detailed RAOs and numeric Remedial Action Goals (RAGS) will be developed in the FS based on the site characterization data, ARARs, risk assessment, and other relevant information. However, sufficient information is available on the Sites to present PRAOs. The PRAOs can be useful when evaluating data gaps and developing the rationale for the Work Plan. The general PRAOs, as identified by the A/Ts, for the Sites' various impacted media are as follows:

<u>Mine Waste Rock and Contaminated Soils</u>

Human Heath

- Prevent or reduce exposure to waste rock and contaminated soils to achieve acceptable risk levels.
- Prevent or reduce release and migration of contaminants from source materials to groundwater and surface water such that beneficial uses are restored or maintained (source control).

Environment

- Prevent or reduce exposure to waste rock and contaminated soils, to achieve acceptable risk levels.
- Prevent or reduce erosion and migration of contaminated source materials to adjacent areas and media to maintain integrity of remedy and acceptable risk levels (i.e., source control).

- Prevent or reduce release and migration of contaminants from source materials to groundwater and surface water such that beneficial uses are restored or maintained (i.e., source control).

<u>In-Stream Sediments and Riparian Overbank Deposits</u>

Human Health

- Prevent or reduce exposure to contaminated sediments and overbank deposits to achieve acceptable risk levels.

Environment

- Prevent or reduce exposure of aquatic biota and terrestrial receptors to contaminated sediments and overbank deposits to achieve acceptable risk levels.

<u>Surface Water in Streams and Ponds</u>

Human Health

- Prevent or reduce exposure to contaminated surface water to achieve acceptable risk levels.
- Return surface water to its expected beneficial uses (reduce contaminant levels to comply with surface water quality ARARs).

Environment

- Prevent or reduce exposure of aquatic and terrestrial receptors to contaminated surface water to achieve acceptable risk levels.
- Return surface water to its expected beneficial uses (reduce contaminant levels to comply with surface water quality ARARs).

Groundwater

Human Health

- Prevent or reduce exposure to contaminated groundwater to achieve acceptable risk levels.
- Prevent further migration of the contaminant plume (source control).
- Return groundwater to its expected beneficial uses wherever practicable (reduce contaminant levels to comply with groundwater quality ARARs).

Environment

- Prevent or reduce discharge of contaminated groundwater to surface waters at concentrations that exceed relevant standards (source control).

Vegetation

Human Health

- Prevent or reduce exposure to contaminated vegetation to achieve acceptable risk levels.

Environment

- Prevent or reduce exposure to contaminated vegetation to achieve acceptable risk levels.

Air is not considered a medium of concern, consistent with the IDEQ area-wide human health risk assessment, where particulate inhalation was eliminated as an exposure pathway during the Tier I evaluation (Section 6.7.2.1, IDEQ, 2002). However, this will be addressed in risk assessment for completeness.

In compliance with the 2009 CO/AOC SOW, the RI/FS Work Plan is to contain a preliminary identification of remedial alternatives so that any data needs and treatability testing associated with these potential alternatives may be determined.

For the P4 Sites, the remedial alternatives need to account for the very large scale of the Sites (e.g., the Henry Mine Site is five miles long). Some alternatives like excavation and removal to an off-site disposal facility or some capping scenarios probably are not practical at this scale; and, based on the initial screening in the FS, that alternative likely will be removed from further consideration in the CERCLA corrective action process. In-place containment by growth media covers and source controls, including controlling run-on and run-off from waste-rock piles, are more likely. Alternatives such as range management also need to be considered; in fact, this option could prove to be the best remedy for the Sites to address some exposure scenarios.

In some cases, there may be opportunities for conducting water treatment in specific smaller areas of contamination to help limit off-site impacts. Given these considerations, the potential remedial technologies and alternatives for addressing the large-scale remedial actions that may be needed to achieve the RAOs (PRAOs) are:

<u>Source Controls – Treatment options to control air and water contact with source materials</u>

- Regrading waste rock to encourage runoff and reduce infiltration
- Run-on controls
- Vegetated cover placement (e.g., at the Ballard Mine)
- Cover enhancement (e.g., addition of material or vegetation)
- Waste rock placement in mine pit in combination with cover placement
- Removal of waste rock placed over spring discharge areas
- Removal and relocation of small quantities of contaminated materials (e.g., mass wasting areas or sediments)

<u>Source Remediation – Ex- and in-situ chemical treatment options to improve dump seepage and groundwater infiltration quality within the sources</u>

- Limiting oxygen infiltration to waste rock (e.g., organic matter addition to cover) or in-pit placement

- In-situ chemical fixation (e.g., chemical reduction with injected agents)

Water Treatment Remedies – Ex- and in-situ treatment options for contaminated surface water and groundwater discharges

- Groundwater interceptor systems (in combination with treatment technologies)
- Ex-situ biological treatment (e.g., to provide chemical reduction)
- Ex-situ passive chemical treatment (e.g., zero valent iron)
- Ex-situ conventional treatment for extracted groundwater or contained surface water (e.g., ion exchange system)
- In-situ chemical or biological reduction in groundwater systems
- Monitored natural attenuation

Livestock and Wildlife Exposure Reduction – Remedies to reduce livestock and wildlife exposure to COPCs

- Institutional controls to preclude or limit grazing including fencing or specific grazing schedule
- Improved range management practices (livestock)
- Selective vegetation eradication
- Removal (replacement) of surface water bodies with elevated COPCs
- Waste rock cover enhancement
- Selective removal and relocation of small quantities of contaminated materials (e.g., hot spots on ODAs or sediments)
- Remedial actions to improve water quality (see above)

Human Exposure Reduction – Remedies to reduce human exposure to COPCs

- Covers and/or cover enhancement
- Institutional controls to preclude or limit residential development

- Institutional controls to prohibit or limit domestic well drilling in areas of contaminated groundwater
- Institutional controls to prevent human exposure to source areas

The evaluation and final definition of the viable remedial technologies and possible remedial alternatives will occur during the FS process. This evaluation will include the "No Action Alternative" which serves as a basis for comparison during the process. The potential remedial alternatives presented above have been considered when evaluating data gaps presented in Section 4.4.

4.3 Refined Data Quality Objectives

The DQOs process discussed in this section was used to guide the RI/FS data gaps analysis presented in Section 4.4. They identify the objectives and data quality parameters that need to be obtained to support the decision making process related to the RI/FS program. Because there is a large amount of existing data, the DQOs tend to focus on identifying whether the existing data are adequate for the RI/FS (e.g., in coverage, quantity, and quality). The data assessment and evaluation performed during the P4 Sites' RI/FS will follow the USEPA's seven step DQO process. A brief description of each step from the USEPA guidance (USEPA, 2006a) is discussed below.

1. **State the problem**. Concisely define the problem to be studied. Review prior studies and existing information to gain a sufficient understanding to define the problem. Identify the planning team members, including the decision-makers. For each data gap category, the problem statement is presented. Planning team members and decision-makers are the same for each data collection activity.

2. **Identify the goals of the study**. Identify what questions the study will attempt to resolve and what actions may result from each decision. Consider alternative actions, and develop a decision or estimation statements.

3. **Identify information inputs**. Identify the information that needs to be obtained and the measurements that need to be taken to resolve the decision statement.

4. **Define the boundaries of the study**. Specify the time periods and spatial boundaries to which decisions will apply. Determine when and where data should be collected. Define the target population of interest.

5. **Develop the analytic approach**. Define the parameters of interest, specify the action level, and integrate the previous DQO outputs into a single statement that describes the logical basis for choosing among alternative actions. Define an "if... then..." statement. For estimation problems, specify the estimator.

6. **Specify performance or acceptance criteria**. Define the decision-makers' tolerable decision error rates based on a consideration of the consequences of making an incorrect decision. For estimation problems, specify acceptable limits on estimation uncertainty.

7. **Develop the plan for obtaining the data**. Evaluate information from the previous steps and generate alternative data collection designs. Choose the most resource-effective design that meets DQOs.

The DQOs for each of the primary media (groundwater, surface water, sediment, soil, and vegetation) as well as the DQOs for secondary media (aquatic and terrestrial biota) are presented in Tables 4-5 to 4-10. These DQOs describe the types, coverage, and quality of data needed to support the RI, risk assessments, and the FS. The DQOs at this level are relatively general. However, as specific data collection plans are presented, they may be refined further. The assessment of data quality has been addressed in detail in the DQUR (Appendix B), and there is an interrelation between the DQUR and DQOs presented here.

4.4 Assessment of Remaining Data Gaps

The data gaps for the Sites have been developed considering the primary information and data presented in Sections 2.0 and 3.0, as well as the possible ARARs, RAOs, and DQOs presented in this section. The data gaps for nature, extent, and risk assessment have been grouped by mine and by primary and secondary media. Potential data gaps associated with FS-related items are also presented.

4.4.1 Primary Media

Primary media are those media that represent the COPC sources identified at the Sites for human and ecological receptor exposures. They will be used as the principal component in the initial stages of the risk assessment. The Sites' primary media are:

- Soil

- Vegetation
- Surface water
- Sediment
- Groundwater

Vegetation is more typically a receptor and would be considered a secondary media based on the scheme presented here. However, it is recognized that vegetation at the SE Idaho phosphate mines is one of the primary risk drivers to livestock and wildlife receptors via the consumption pathway. Therefore, there has been extensive vegetation sampling with vegetation being treated as a primary media herein.

In the case of the P4 Sites, there is an additional source material that can be considered. This material is the mined rock, primarily from the Phosphoria Formation, which ultimately is the source of the COPCs. As described in Section 3.1, there is considerable chemical data available relating to the rock mined from the SE Idaho phosphate mines and at the Sites. However, it is the other primary media that represent the points of exposure to potential receptors and must be evaluated in the RI, i.e., the soil that has formed from or been placed on the rock or the surface water and/or groundwater that have come into contact with the rock. It is these other primary media that are the focus of the data gap analysis.

Should a situation arise where data on the source rock is needed, these data are available. Therefore, at this time, data gaps have not been identified associated with the Phosphoria Formation or other rock exposed during phosphate mining at the Sites; and the source rock is not discussed further in this section.

Possible data gaps for the primary media are discussed below and are organized by Site. Tables 4-11, 4-12, and 4-13 present a summary of the data gap analysis for each of the primary media at each Site.

4.4.1.1 Ballard Mine Data Gaps

Only a few data gaps have been identified at the Ballard Mine that will have to be addressed by further sampling during the RI/FS program. Each of the primary media is discussed, and a summary is presented in Table 4-11.

Soil. The nature and extent of inorganic COPCs present in Site soils has been described in Section 3.2.1 and in Appendix A2. Based on extensive sampling conducted in 2009, there is comprehensive data for soils on waste rock dumps, partially backfilled mine pits, a former haul road, and the Ballard Shop Area. In addition, a site-specific background area has been sampled. Sufficient data are available to define the nature and extent and sufficient data are presented to conduct a risk assessment for the non-radiogenic COPCs. These data are of known and acceptable quality for the intended uses (see Appendix B). However, data gaps have been identified.

The first data gap is related to radiogenic COPCs. During the preparation of this RI/FS Work Plan, radiogenic risks have been identified by the A/Ts as a concern. Assessment of these risks involves modeling and has multiple levels of uncertainty. To reduce this uncertainty, additional site-specific soil data will be collected for radiogenic uranium daughter products. Associated with the need to assess the on-site radiogenic risk in soil is the data gap related to an appropriate background data set. Specifically, background data need to be collected which is representative of the entire geologic sequence that is ultimately disturbed by the mining. This is important because the mined units of the Phosphoria Formation are known to be elevated in uranium, and this is not represented in the current background data set. This also may be true of other COPCs.

Based on site knowledge, organic contaminants generally are not a concern at the Sites with the possible exception of the shop areas at the Ballard and Enoch Valley sites. The Enoch Valley Shop Area is currently active, supporting P4's current mining operations, and is not being addressed in this RI/FS. However, the Ballard Shop Area is mostly an inactive facility (only used for storage) and is included in the scope of the RI/FS.

The Ballard Shop Area included truck and mine machinery maintenance operations that had fuels, oils, and potentially solvents associated with the operation. Soils and groundwater in the shop area have not been investigated for associated volatile and semi-volatile organic compounds (VOCs and SVOCs). Electrical transformers are present on the site and, as a result, polychlorinated biphenyls (PCBs) are a potential concern. A visual survey, historical record search, and employee interviews will be conducted to determine and evaluate potential release locations. A sampling and analysis plan (SAP) will be prepared based on this initial work which will provide details of the proposed sampling effort (i.e., sampling rationale, locations, and analyses to be run on soil and groundwater samples). The Ballard Shop Area SAP will be attached to this RI/FS Work Plan as Appendix D2 when completed and approved by the A/Ts.

Riparian soil samples have been collected near the Ballard Site. These data generally are adequate. However, a sediment data gap relating to COPC coverage was identified as discussed below for sediment. During high flow, sediment can be deposited into riparian areas; this creates a condition where the sediment data gap translates to a riparian soil data gap. Some limited riparian soil sampling is proposed to address the COPCs identified for the soil sampling but not contained in existing data. It is planned that for each location where a sediment sample is collected a corresponding riparian soil sample be collected as detailed in the SAP presented in Appendix D1.

A data need was also identified to help facilitate the FS should RI and risk assessment results indicate the need for remedies, including new or improved soil cover. Physical/hydraulic soil properties are needed, primarily those that relate to water movement off and through the waste rock. These data will be useful during the FS alternatives analysis so that the difference between options for covering the waste rock dumps can be evaluated for their potential effectiveness. At the Ballard Mine waste rock dumps specifically, there are large areas that support vegetation where the waste rock has broken down sufficiently to be characterized as the initial stage of soil development. In the technology and alternative analysis of various soil covers in the FS, evaluations will need to be conducted to determine the effectiveness of new or additional soil placement on top of the existing vegetated waste rock. The additional level reduction in water infiltration will need to be estimated to provide

justification for any additional soil cover costs (i.e., a cost/benefit analysis). Previous attempts to quantify this have shown that the level of uncertainty associated with the current cover properties leads to a large variability in the infiltration estimates. In order to conduct that analysis, an estimate of the current physical/hydrogeologic soil conditions will be needed and that estimate will be best made with site-specific data. This data collection and study will be conducted in specific areas where placing or improving soil cover is indicated in the RI and risk assessment as a potential remedial action to be considered in the FS. A SAP will be prepared for this activity and submitted to the A/Ts for approval at the appropriate time.

Vegetation. The nature and extent for vegetation has been described in Section 3.2.2 and in Appendix A2. Based on extensive sampling conducted in 2009, there are comprehensive data for vegetation on waste rock dumps, partially backfill mine pits, a former haul road, and the Ballard Shop Area. In addition, a site-specific background area has been sampled. Data are available for composite grasses and forbs samples, as well as life-form specific samples (i.e., grasses, forbs and shrubs, and culturally significant plants. As a result of this work, sufficient data are available to define the nature and extent of COPCs in vegetation and to conduct a risk assessment and FS. These data are of known and acceptable quality for the intended uses (see Appendix B). No data gaps have been identified for vegetation at the Ballard Mine Site.

Surface Water. Although surface water and surface water runoff is very limited at the Sites, extensive surface water sampling has been conducted in a limited number of surface water drainages in and around the Ballard Mine Site as described in Section 3.2.3.1. This surface water sampling is ongoing and will provide the baseline data necessary to evaluate the effectiveness of any remedial actions that might be implemented at the Site. Based on the review of available surface water data, it is sufficient in coverage and quality for defining the nature and extent of contamination in surface water, conducting the risk assessment, and preparing an FS for the Ballard Mine.

Sediment. The sediment data for the Ballard Mine is presented and discussed in Section 3.2.3.2. The sediment spatial coverage in areas of the Ballard Mine is considered adequate.

However, antimony, arsenic, mercury and silver concentration are present in Site soils; data for these analytes in sediment are not available. While these analytes are unlikely to be risk drivers at the Sites, the A/Ts have expressed the need to be consistent between the soil and sediment pathways. At the Ballard Mine, there is evidence of erosion and downstream transportation from the unreclaimed waste rock areas as indicated by visual observations as well as elevated selenium concentrations in sediment samples collected downstream of these areas. Therefore, the lack of antimony, arsenic, mercury, and silver data for sediments located downstream of the Ballard Mine, but upstream of the Blackfoot River, is considered a potential data gap based on consistency with the soil COPC list. This potential data gap will be addressed by additional sampling as detailed in the SAP in Appendix D1.

Sediment data for ponds at the Ballard Mine exists. None of the ponds at Ballard have been identified as possessing viable aquatic habitat (IDEQ, 2004b). As a result, the pond sediment data is considered sufficient at the Ballard Mine Site; additional data collection will not be required. The existing data and analytes are sufficient for determining the level of impacts to the ponds given their aquatic classifications.

Groundwater. The groundwater in and near the Ballard Mine has been investigated through monitoring well installation and well and spring/seep sampling as described in Section 3.2.4. As discussed in Sections 2.0 and 3.0, three groundwater flow systems have been evaluated – the Alluvial, Dinwoody Formation, and regional Wells Formation flow systems. Potential data gaps at the Ballard Mine have been identified for the alluvial and Wells Formation flow systems. The potential data gaps related to each groundwater flow system are discussed below.

Alluvial Flow System. The alluvial flow system at the Ballard Mine has been characterized with a combination of permanent monitoring wells and one-time direct push samples. Using the data from these programs, alluvial plumes have been defined emanating from waste rock dump areas. The occurrence of these plumes is consistent with observed concentrations in dump seeps and springs. Sufficient data generally are available to define the extent of the plumes in lateral and downgradient areas with two exceptions on the west side of the Ballard Mine.

The first area requiring further characterization is waste rock dump MWD081. As described in Section 3.2.4, an area of elevated selenium and other COPCs is migrating toward the south. The extent of the plume has been defined except at the downgradient-most end adjacent to the Blackfoot River channel (e.g., borings BH125 and 136 on Drawing 3-19). During the 2009 investigation in the spring, the channel area was too wet to access with the direct-push equipment. Therefore, a data gap remains at this location. Approximately, three groundwater samples are proposed for this location to define the extent of COPC transport adjacent to the Blackfoot River flow system. These data will be collected in the late summer or early fall to (1) facilitate access and (2) to sample during low flow conditions. If access still proves to be limited, these samples may be collected via hand-auger holes.

The groundwater samples collected near the river during low-flow conditions are more likely to represent groundwater flow toward the river, whereas during high-flow, river water may be moving from the river into the shallow alluvial groundwater system. It is possible that river water, which has infiltrated the alluvium during high flow, will persist in the alluvium for some time during the low flow period until it is displaced by groundwater. This condition will need to be considered when evaluating the data.

The second shallow alluvial groundwater data gap is on the downgradient end of the area with elevated COPCs emanating from MWD080 (e.g., borings BH024 and 149, Drawing 3-19). This groundwater flow system appears to flow northward toward the Little Blackfoot River. The plume appears to be relatively stagnant, but samples have not been collected in the downgradient area. The area is too wet for access in the spring. Sampling from approximately five additional direct-push borings later in the year will facilitate collection of the necessary samples as detailed in the SAP Addendum in Appendix D3.

Dinwoody Flow System. As discussed in Section 3.7.4.2, the Dinwoody Formation flow system is located to the south and east of the Ballard Mine (Drawing 2-6). The area to the south is a highland and is not likely to be impacted by flow from the mine area. The area to the east, however, likely is located in a downgradient position. The investigation of the Dinwoody Formation east of the mine indicates that affected groundwater does not extend to depth. Where impacted, it is only the shallow, weathered portion of the Dinwoody Formation that

may contain elevated COPC concentrations; this system is considered part of the alluvial flow system discussed above. Monitoring wells drilled to depth in the Dinwoody Formation indicate an upward hydraulic gradient that helps explain the lack of contamination at depth. The lateral extent of the elevated COPC concentrations has been characterized by two wells in the shallow Dinwoody Formation (MMW018 and MMW029) as shown on Drawing 3-48. Based on these data, data gaps in the Dinwoody Formation at the Ballard Mine are not indicated and additional monitoring wells are not needed.

Wells Formation Flow System. The Wells Formation is present along the western and northern portions of the Ballard Mine as presented in Section 3.7.4.2. The area north of the mine is a highland (Drawing 2-6) and has not been investigated because it is most likely to be an area of unimpacted groundwater recharge. In addition, depth to the regional groundwater system from the ridge top is excessive. An agricultural well installed by P4 on the flank of the highland to the north of the mine has low levels of COPCs (Section 3.2.4).

The Wells Formation is present beneath the alluvium west of the mine. The Wells Formation west of the mine has been investigated, and COPC concentrations at levels suggestive of impacts from the mine have not been reported. Furthermore, the local hydraulic gradient in this area appears to be generally toward the mine.

Groundwater with elevated COPCs has been identified within the Wells Formation on the perimeter of the West Ballard Mine Pit (MMP035). The source of the affected groundwater is readily identified as dumps seeps and direct infiltration from in-pit waste rock. The data collected to date suggest that the extent of contamination is confined to the mine area near the mine pit. This is consistent with the compartmentalized geology that apparently is the result of extensive faulting in the mine area. In addition, mixing, dispersion, and chemical/biochemical attenuation processes likely are helping to confine the extent of contamination to near the mine pit. Due to the complex geology, further characterization is problematic. For these reasons, this area is not identified as a data gap that can be acted upon. The hydrogeology of this area is considered in more detail in Section 3.7.4.

4.4.1.2 Henry Mine Data Gaps

As described below, only a few data gaps have been identified at the Henry Mine that will need to be addressed by further sampling during the RI/FS program. Each of the primary media are discussed and a summary is presented in Table 4-12.

Soil. The nature and extent of COPCs present in Site soils has been described in Section 3.3.1 and in Appendix A2. Based on extensive sampling conducted in 2009, there is comprehensive data for soils on waste rock dumps, backfill mine pits, and a former haul road. In addition, a site-specific background area has been sampled.. Sufficient data are available to define the nature and extent of COPCs in soil, and sufficient data for non-radiogenic COPCs of known quality exist, to conduct the risk assessment and FS for this mine. However, data gaps have been identified.

The first data gap is related to radiogenic COPCs. During the preparation of this RI/FS Work Plan, radiogenic risks have been identified by the A/Ts as a concern. Assessment of these risks involves modeling and has multiple levels of uncertainty. To reduce this uncertainty, additional site-specific soil data will be collected for radiogenic uranium daughter products. Associated with the need to assess the on-site radiogenic risk in soil is the data gap related to an appropriate background data set. Specifically, background data that is representative of the entire geologic sequence disturbed by the mining needs to be collected. This is important because the mined units of the Phosphoria Formation are known to be elevated in uranium, and this fact is not represented in the current background data set. This also may be true of other COPCs.

Riparian soil samples have been collected near the Site and generally are adequate. However, a sediment data gap was identified relating to COPC coverage. During high flow, sediment can be deposited into riparian areas. This creates a condition where the sediment data gap translates into a riparian soil data gap. Some limited sampling needs to be conducted to address the COPC identified for the soil sampling as detailed in the SAP in Appendix D1.

The other data gap identified is associated with the physical properties of the soil on the waste rock dumps. Similar to the Ballard Mine, soil property data from the Henry Mine will be useful during the FS alternatives analysis where the existing condition will be compared to possible cover improvements (i.e., comparing cost to benefit). However, unlike the Ballard Mine, growth media cover (largely weathered brown Meade Peak Member shale) was placed over the majority of the waste rock dumps. An estimate of the current performance of the cover will be especially important if only small incremental performance increases can be obtained with substantial cover modifications. In order to conduct the analysis, an estimate of the current physical/hydrogeologic soil conditions will be necessary and that estimate will be made best with site-specific data as detailed in the SAP in Appendix D2.

Vegetation. The nature and extent for vegetation has been described in Section 3.3.2 and in Appendix A2. Based on extensive sampling conducted in 2009, there is comprehensive data for vegetation on waste rock dumps, backfill mine pits, and a former haul road. In addition, a site-specific background area has been sampled. Data are available for composite grasses and forbs samples, as well as life-form samples (i.e., grasses, forbs and shrubs), and culturally significant plants. Sufficient data of known quality are available to define the nature and extent of COPCs in vegetation and to conduct a risk assessment and FS. No data gaps have been identified for vegetation at the Henry Mine Site.

Surface Water. Extensive surface water sampling has been conducted in and around the Henry Mine Site as described in Section 3.3.3.1. Data are sufficient for defining nature and extent of COPCs in surface water and to conduct the risk assessment and FS. In addition, ongoing monitoring will continue to provide a baseline for future effective monitoring associated with possible remedial actions.

Sediment. The sediment data for the Henry Mine are discussed in Section 3.3.3.2. The sediment spatial coverage in areas of the Henry Mine is considered adequate. However, if elevated antimony, arsenic, mercury, or silver concentrations in Site soils were eroded into the headwater stream system or Site ponds, then there could be exceedances of sediment screening criteria. Data for these metals in sediment are not within the existing data set for Henry Mine.

It should be noted that the Henry Mine was reclaimed during its active mining period and sediment controls were installed and are mostly in place. An evaluation of the existing stream sediment data for the Henry Mine indicates no significant transport of elevated COPCs away from the Site. There is a lack of quality aquatic habitat along the stream channels near the mine as discussed for the stream habitat assessment in Section 3.3.5.1 (with the exception of the Little Blackfoot River). For these reasons, only limited sampling of additional analytes mentioned above is proposed on Lone Pine Creek where quality aquatic habitat is first encountered prior to the confluence with the Little Blackfoot River.

Sediment data for ponds at the Henry Mine exists. However, two of the ponds at the Site, MSP014 and MSP016, have been identified as possessing aquatic habitat (IDEQ, 2004b). Therefore, the lack of antimony, arsenic, mercury, and silver data in sediments from these ponds are a data gap. This data gap will be addressed by additional sediment sampling as detailed in the SAP in Appendix D1.

Groundwater. The groundwater in and near the Henry Mine has been investigated through monitoring well installation and well and spring/seep sampling as described in Section 3.3.4. As described in Sections 2.0 and 3.0, three groundwater flow systems have been evaluated at the Henry Mine – the alluvial, Dinwoody Formation, and Wells Formation flow systems. Data gaps at the Henry Mine have been identified for the alluvial flow system only. The data gap analyses related to each groundwater flow system are discussed below.

Alluvial Flow System. As described in Section 3.3.4, the alluvial system near the Henry Mine is relatively limited because the mine is located between two bedrock ridges along most of the length of the mine (Drawing 2-5). In 2009, an area northeast of waste rock dump MWD090 was investigated with two direct-push boreholes (BH157 and 158). As described in Section 3.3.4, the selenium concentrations were above the DELB level which indicates the need for additional characterization of the nature and extent in this area (Drawing 3-36). In this area, there is the potential for impacts from another off-site mine which is not owned by P4. As a result, the follow-up characterization has to have broad enough coverage to determine whether COPC impacted water in this area originates from the Site or from the off-site mine. It is anticipated that up to five additional direct push boreholes will be used to further

evaluate the nature and extent of affected groundwater in this area as discussed in the SAP Addendum included in Appendix D3.

Dinwoody Flow System. Groundwater samples collected from monitoring wells installed in the Dinwoody Formation along key conceptual flow paths have not indicated COPC concentrations exceeding groundwater standards. This statement is qualified here and elsewhere in that iron, manganese, and aluminum may exceed criteria but these exceedances appear to be a regional background issue as opposed to indicating effects from the Sites. Nonetheless, the data summarized in Section 3.7.4 indicate that the nature and extent of groundwater impacts in the Dinwoody Formation system flow paths have been sufficiently characterized and a data gap does not exist for this groundwater system at the Henry Mine Site.

Wells Formation Flow System. As discussed in Section 3.7.4, the conceptual flow path for groundwater in the Wells Formation at the Henry Mine is to the northwest along the strike of the formation to the Henry Springs. Two wells have been installed on the downgradient portion of the flow path in the Henry Mine area (MMW011 and MMW023). Groundwater samples collected from these wells report no COPCs exceeding relevant groundwater standards (i.e., excluding iron, manganese, and aluminum). Since these wells are located in the appropriate locations for monitoring the Wells Formation flow system at the Henry Mine, there is no data gap. On a broader basis, with the exception of the monitoring wells around the West Ballard Mine pit, impacts from mine sites have not been seen in the Wells Formation at any of the Sites (see Section 3.7.4). It appears that there is not a data gap associated with the Wells Formation flow system at the Henry Mine based on:

- Flow to the northwest is supported by:
  - The occurrence of the nearby Henry Springs to the northwest of the mine, which is a known discharge location for the regional flow system
  - The apparent northwest flow gradient between MMW011, MMW023, and the Henry Springs
  - The geologic strike of the Wells Formation

  - The probable hydrogeologic flow barrier formed by the Rasmussen Fault just south of the Henry Mine

- The monitoring wells that are located at the mine are in an ideal position for monitoring the effects of the mine and mine wastes on the Wells Formation, and they do not show groundwater exceedances of relevant criteria.

- Data from other locations suggest that the impacts to the Wells Formation flow system are relatively rare.

- Percolation and mobilization of selenium and other COPCs through backfilled mine pits to the Wells Formation do not appear to be a complete flow path, possibly because of oxygen deficient environments in the pit backfills.

- Where impacts occur, there is direct recharge from dump seepage into an open pit (i.e., at the Ballard Mine).

It appears that where mine pits have been backfilled there is not ideal geochemical conditions for mobilizing high concentrations of selenium and other COPCs, which then could impact the Wells Formation. (In the case of the Ballard Mine, impacted waste rock dump seepage discharges directly to the mine pit where it infiltrates. In addition, the West Ballard Mine pit is partly backfilled with an unreclaimed (uncovered or graded) waste rock dump.)

The A/Ts have stated that a third well at the Henry Mine would be desirable to provide better spatial coverage and possibly better define the flow system. This appears unnecessary based on results to date. The location suggested by the A/Ts is along the P4 haul road between the MMP042 and MMP044 mine pits. This is the most reasonable location for reaching the Wells Formation outside of the monitoring wells that already exist. However, the monitoring well would be downgradient only of the MMP044 mine pit and associated backfill. The estimated depth of this well would be 280 to 350 feet deep based on a ground elevation of approximately 6,475 to 6,525 feet amsl and an estimated groundwater level of 6,195 feet amsl. Due to the steep dip of the Wells Formation, if there is a slight deviation in the dip of the formation, or deviation of the borehole, the depth to the Wells Formation could be greater than the targeted depth. Given the discussion above and in previous sections, this monitoring appears to be unneeded. In addition, the well would be installed in-line with MMW011 and MMW023 and could not be used to help resolve any other flow

vector than along geologic strike. Currently, there are three points being used to establish this flow vector (MMW011, MMW023, and Henry Springs).

Flow vectors along the geologic strike of the Wells Formation are considered most relevant to evaluating risk at the Henry Mine. Flow is expected to be toward the known discharge source for the regional system (the Henry Springs), which is largely on the strike of the formation (i.e., not in a down dip direction). The Wells Formation dips at approximately 60 degrees and up to 70 degrees to the northeast at the Henry Mine. At that dip, the depth to the unit increases at a rate of almost 2-to-1 as you move horizontally away from the outcrop in a perpendicular direction; thus, at 1,000 feet off the outcrop, depth to the unit would be approximately 2,000 feet. Any flow vector not along strike, but down dip, would result in any potential impacts being at depths that are beyond the reach of any well installation that would be reasonable or expected for this area. Therefore, the risk of exposure is very low to non-existent. Flow to a location where exposure is more likely would have to occur along a long flow path where dilution, attenuation, and travel time would result in inconsequential potential exposure. Travel times from recharge areas to discharge locations (springs) have generally been demonstrated as being greater than 10,000 years based on water age dating (Ralston, et al., 1983). For these reasons and the difficultly involved in investigating the flow system in down dip vectors, if flow off-strike in the Wells Formation is a data gap, it may not be practical to address it. This is discussed further in Section 4.4.5.

4.4.1.3 Enoch Valley Mine Data Gaps

Only a few data gaps have been identified at the Enoch Valley Mine that will need to be addressed by further sampling during the RI/FS program. Each of the primary media is discussed and a summary is presented in Table 4-13.

Soil. The nature and extent of COPCs present in Site soils is described in Section 3.4.1 and in Appendix A2. Based on extensive sampling conducted in 2009, there are comprehensive data for soils on waste rock dumps, backfill mine pits, active haul road, and other active facilities. In addition, a site-specific background area was established and samples have been collected. Sufficient data for non-radiogenic COPCs are available to define the nature and

extent of COPCs in soil, and sufficient data of known quality exist to conduct a risk assessment and FS for this mine. However, data gaps have been identified.

The first data gap is related to radiogenic COPCs. During the preparation of this RI/FS Work Plan, radiogenic risks have been identified by the A/Ts as a concern. Assessment of these risks involves modeling and has multiple levels of uncertainty. To reduce this uncertainty, additional site-specific soil data will be collected for radiogenic uranium daughter products. To assess the on-site radiogenic risk, background data representative of the entire geologic sequence needs to be collected. This is important because the mined units of the Phosphoria Formation are known to be elevated in uranium, and this is not represented in the current background data set. This also may be true of other COPCs.

Riparian soil samples have been collected near the Site. This data is generally adequate; however, a sediment data gap was identified. This data gap relates to the COPC coverage as discussed above for the previous mines. During high flow conditions (e.g., spring runoff), sediments can be deposited into riparian areas; this creates a condition where the sediment data gap translates to a riparian soil data gap. Some limited sampling needs to be conducted to address the COPCs identified for the sediment sampling as detailed in the SAP in Appendix D1.

The other data gap identified is associated with the physical/hydrogeologic properties of the soil on the waste rock dumps. Similar to the Ballard and Henry mines, soil properties data from the Enoch Valley Mine will be useful during the FS alternatives analysis. Unlike the Ballard Mine, growth media cover was placed over the majority of the waste rock dumps. An estimate of the current performance of the cover will be especially important if only small incremental performance increases can be obtained with substantial cover modifications. In order to conduct the analysis, an estimate of the current physical and hydrogeological soil conditions will be necessary; that estimate will be made with site-specific data as detailed in the SAP in Appendix D2.

Vegetation. The nature and extent for vegetation has been described in Section 3.4.2 and in Appendix A2. Based on extensive sampling conducted in 2009, there is comprehensive data

for vegetation on waste rock dumps, backfill mine pits, active haul roads, and other active facilities. In addition, a site-specific background area has been sampled. Data are available for composite grasses and forbs samples, as well as life-form specific samples, and culturally significant plants. Sufficient data of known quality are available to define the nature and extent of COPCs in vegetation and to conduct a risk assessment. No data gaps have been identified for vegetation at the Enoch Valley Mine Site.

Surface Water. Extensive surface water sampling has been conducted in and around the Enoch Valley Mine Site as described in Section 3.4.3.1. Data are sufficient for defining nature and extent of COPCs in surface water and to conduct the risk assessment and FS. Continuous flow monitoring may be needed at some locations for remedial design, but this is not currently considered a data gap for the RI/FS. Monitoring will continue to provide a baseline for future effectiveness associated with possible remedial actions.

Sediment. The sediment data for the Enoch Valley Mine are presented and discussed in Section 3.4.3.2. The sediment spatial coverage in areas of the Enoch Valley Mine is considered adequate. However, if elevated antimony, arsenic, mercury, and silver concentrations in the soils were eroded into the stream system, then there could be exceedances of sediment screening criteria. Data for these metals in sediment are not within the existing data set for Enoch Valley Mine.

The Enoch Valley Mine was reclaimed during the active mining period and sediment controls were installed and are still in place. An evaluation of the existing stream sediment data for the Enoch Valley Mine indicates no significant transport of elevated COPCs away from the mine. In addition, there is a lack of quality aquatic habitat along the stream channels near the mine as discussed for the stream habitat assessment in Section 3.4.5.1. For these reasons, limited confirmatory sampling in stream areas for the additional analytes mentioned above is only proposed on Rasmussen Creek where quality aquatic habitat is first encountered prior to the confluence with Angus Creek.

Sediment data for ponds at the Enoch Valley Mine exists. However, four of the ponds at the Site (MSP017, MSP018, MSP021 and MSP031) have been identified as possessing

aquatic habitat (IDEQ, 2004b). Therefore, the lack of antimony, arsenic, mercury, and silver data in sediments from these ponds is a data gap. This data gap will be addressed by additional sediment sampling as detailed in the SAP in Appendix D1.

Groundwater. The groundwater in and near the Enoch Valley Mine has been investigated through monitoring well installation, and well sampling, and spring/seep sampling (see Section 3.3.4). As described in Sections 2.0 and 3.0, three groundwater flow systems have been evaluated at the Enoch Valley Mine – alluvial, Dinwoody Formation, and regional Wells Formation. Data gaps at the Enoch Valley Mine have been identified for the Dinwoody Formation flow system only. Data gap analyses related to each groundwater flow system are discussed below.

Alluvial Flow System. The alluvial system at the Enoch Valley Mine is limited primarily to the north and south ends of the mine as described in Section 3.7.4.4. The characterization is complete in these areas. On the north end of the mine, the alluvium is relatively dry because the uppermost water table is within the bedrock. Where alluvial groundwater has been encountered, it is likely perched water infiltrating vertically from spring snowmelt.

On the south end of the mine, the opposite condition exists with slight downward or upward vertical gradients, which may change seasonally. A relatively large number of alluvial groundwater monitoring points have been advanced off of the southeast end of the mine, and elevated COPC concentrations have not been observed. The one exception is dump seep MDS026, which has the characteristic of a groundwater discharge point (as opposed to just seasonal snowmelt seepage) (see Section 3.7.4.4). This discharge point has elevated selenium and other COPCs, but it is in direct contact with the mine waste rock dump. It appears there is an upwelling of groundwater in this area, and this upwelling has kept the shallow groundwater from being impacted except for the dump seep.

Elevated COPC concentrations have been observed in the Rasmussen Creek drainage along the southern (southwestern) edge of the mine in the vicinity of monitoring well MMW013. Sufficient groundwater monitoring points have been completed in this area to define the nature and extent of contamination in the alluvium. For example, MBW085 installed down

drainage from the area of known impact has indicated selenium concentration less than 0.002 mg/L in the alluvial helping to define the downgradient edge of the plume. As a result, additional direct-push boreholes are not recommended during the RI for the Enoch Valley Mine.

Dinwoody Flow System. Elevated concentrations of COPCs have been identified in groundwater collected from two monitoring well locations in the Dinwoody Formation at the Enoch Valley Mine. The first is on the northern (northwest) end of the mine at monitoring wells MMW027 and MMW035. The second location is southwest of waste rock dump MWD092 at monitoring well locations MMW013, MMW024 and MMW034 (Drawing 2-9). The Dinwoody Formation also has been investigated to the southeast of MWD092, but was found not to be affected by COPCs. As discussed in Section 3.7.4.4, this appears to be due to the presence of an upward hydrogeologic gradient confining COPCs to dump seepage.

At the northwest location (MMW027 and MMW035), the Dinwoody Formation is dipping to the southwest subcropping beneath the waste rock dump on the downhill side of a backfilled mine pit (MWD091 and MMP045). As a result, the Dinwoody Formation appears to be recharged by water percolating through the waste rock, which then moves down dip toward Long Valley and Lone Pine Creek. Monitoring wells MMW027 and MMW035 installed within the Dinwoody Formation in the downgradient direction have elevated concentrations of selenium. As described in Section 3.7.4.4, these monitoring wells suggest an upward hydraulic gradient within the Dinwoody Formation. Within Long Valley, basalt overlays and may receive groundwater flow from the Dinwoody Formation.

If there is an upward hydraulic gradient into the basalt as there is within the Dinwoody Formation, groundwater movement through bedding fractures would recharge the basalt from below as discussed in Section 3.7.4.4 (Drawing 2-7). If that is the case, then the existing monitoring well (MMW036) in the basalt would see COPC-affected water from the Dinwoody Formation as well as from the alluvial unit. It is unknown if this upward gradient between the Dinwoody Formation and basalt exists. A monitoring well in the Dinwoody Formation paired with basalt monitoring well MMW036 would fill this data gap as well as

provide direct water quality information in what is a downgradient location from waste rock dump MWD091.

The second location where the Dinwoody Formation contains elevated concentrations of COPCs is in the southern portion of the Enoch Valley Mine; located southwest of MWD092, in the area of MMW013 and MMW034 (Drawing 2-9). The setting of the Dinwoody Formation and mine waste dumps is similar to the northwestern portion of the Enoch Valley Mine discussed above. However, the geology and topography to the west and down dip is very different. As discussed in Section 3.7.4.4, the topographic and geologic configuration of the area near MWD092 suggests that groundwater flow within the Dinwoody Formation is likely to the southeast along the strike of bedding. The areas southwest, west, and northwest of MWD092 are topographically higher than the area where these monitoring wells are located (Drawing 2-3). Based on this configuration and the geology, it is likely that the Dinwoody/Thaynes flow system is recharged from direct precipitation and snowmelt at elevations higher than the mine-affected groundwater observed at MMW013, MMW024, and MMW034. This configuration would suggest higher potentiometric surfaces in these areas and flow to the southeast toward topographically lower areas along the strike of the Dinwoody Formation.

What is suggested is that water percolating into the Dinwoody Formation from pond MSP020 or MWD092 moves down dip into the groundwater flow system, then laterally along strike to discharge to the alluvial system and possibly Rasmussen Creek near the southern end of the Site. MDS026 may represent such a discharge location. It appears that elevated COPC concentrations in the alluvium are an indication of impacted Dinwoody Formation (i.e., MMW013).

The alternatives are movement down dip along the steeply dipping beds into the Georgetown Syncline or flow along strike to the northwest. The latter of these options appears very unlikely because the Dinwoody Formation is exposed at a higher elevation along strike to the northwest; therefore, the area is a likely groundwater recharge source with higher groundwater elevations when compared to the MMW013 area. If movement is down dip, it would not be practical to reach the leading edge of COPC-affected groundwater by

either a monitoring well or a groundwater extraction well. The flow path would be to the Henry Thrust Fault and then likely to the northwest. Dilution and attenuation along such a long flow path would result in not being able to observe such an impact in the hundreds of years in the future when it might arrive at a shallow groundwater location discharge point.

Because of the reasons presented above, it appears that monitoring wells in the alluvium (i.e., MBW085 and MBW087) are well positioned to observe down-drainage upwelling COPC-affected groundwater from the Dinwoody Formation, and MMW025 is well position to observe potentially COPC-affected groundwater moving laterally along strike of the Dinwoody Formation. Therefore, a data gap is not identified along the southwestern edge of MWD092. Continued monitoring of MMW013, MMW024, and MMW034 will provide data on any changes in COPC impacts to the Dinwoody and Dinwoody/alluvial flow systems.

Wells Formation Flow System. Similar to the Henry Mine, the Wells Formation has been characterized by collecting and analyzing groundwater from strategically placed monitoring wells installed in the Wells Formation. Monitoring well MMW009 was installed in the Wells Formation on the north end of the mine adjacent to a backfilled mine pit. Monitoring well MMW026 was installed along the Wells Formation strike just to the southeastern end of the waste rock dump and mine pit (Drawings 2-5 and 2-9). Therefore, groundwater flow along strike in either the northwest or southeast directions has been characterized; and P4 has monitoring wells ideally positioned to observe possible impacts from the Site. To date, groundwater at these monitoring wells appears unaffected by the Site.

Because, the Wells Formation dips steeply to the southwest at the Enoch Valley Mine, it is impracticable to install a monitoring well in the center portion of the mine area in a down dip direction. This operation could involve drilling through as much as 200 to 300 feet of waste rock (see Drawing 3-58 for example) and an additional 150 to 200 feet of overlying Phosphoria or Wells formations before encountering the Wells Formation containing groundwater. If offset to avoid the waste rock, the total well depth likely would have to be greater than 1,000 feet in order to reach the Wells Formation. In addition, it is possible that the major groundwater flow component from the Wells Formation is either to the northwest

or southeast along the strike where discharge areas are more likely. Groundwater discharge in the down dip direction is geologically improbable unless discharge is along the Henry Fault (Drawing 2-5), and regional groundwater discharge along the fault has not been observed. This might be expected because often a lower thrust fault contact is associated with intense compression and gouge development creating more of a flow barrier than a conduit. This is similar to the potential flow in the Dinwoody Formation in this direction discussed above, and any flow arriving from the Site along the Henry Fault in hundreds of years would be extremely diluted and chemically attenuated. Similar to the Henry Mine, because of the depth to the Wells Formation in a down dip direction (i.e., away from the mine), potential exposure scenarios for receptors are very limited to non-existent.

It appears that monitoring wells installed in the Wells Formation at the Enoch Valley Mine Site are ideally located to monitor possible groundwater impacts to the Wells Formation and that the nature and extent of contamination in the Wells Formation has been defined at the Enoch Valley Mine to the extent necessary. Because of the steep dip of the Wells Formation at the Enoch Valley Mine, an additional monitoring well in the central portion of the mine would be relatively deep. The monitoring well likely would have to be 1,000 feet deep or more unless located on and drilled through a significant thickness of waste rock. Even if a monitoring well were advanced in the interior of the mine, the monitoring wells on the perimeter still provide more important information relative to possible impacts to the groundwater resource. For these reasons and the difficultly involved in investigating the flow system in down dip vectors, if flow off-strike in the Wells Formation is a data gap, it may not be practical to address it. This is discussed further in Section 4.4.5.

4.4.2 Secondary Media

Secondary media include data from receptors that will be considered supporting information during the risk assessment. For example, if risk to a receptor is indicated based on a primary media, then available secondary media will be evaluated to confirm or refute the assessment. The uses of these data are further established in the risk assessment methodology presented in Appendix C. At this time, data gaps are not identified associated with secondary media (i.e., biotic media). The risk assessment could indicate media where additional sampling may

be needed to reduce uncertainty. The secondary media that are available and their relevance to the project data needs are summarized in Tables 4-12 through 4-14.

4.4.3 Background Characterization

Except for Site soils, sufficient data for the various media have been collected to characterize background. Previous EE/CA studies included statistically derived background numbers that have been presented, but they have not been agreed to by the A/Ts. The background evaluation will be an important consideration in both the risk assessment and FS. Therefore, a background evaluation will be conducted during the RI. The study will include identification of appropriate background locations, samples/sampling event(s), and statistical methods to be used in the background study.

The data gap associated with Site soils was specifically identified with radiogenic COPCs, including total uranium. The complete geologic sequence that is undisturbed by mining is not represented in the current background data set. This will be important to the assessment of risks because a portion of the sequence is known to have naturally elevated concentrations of some COPCs. To accurately characterize background, data should be collected from the units disturbed by mining, as well as those locations where waste is placed. This data gap may also be relevant to other non-radiogenic COPCs.

4.4.4 Feasibility Support and Treatability Studies

The need for data to support the FS falls into two broad categories. The first is the appropriate data necessary to determine the nature and extent of contamination in the Site's primary media. In addition, specific data are necessary which represent the physical characteristics or conditions at the Site that may affect the technical implementability of the wide range of remedial technologies. These factors, the nature and extent of contamination and the Site's physical conditions, tend to limit the technologies and process options that ultimately are available to remediate any contaminated Site's media.

The second broad category of data needed for the FS includes the technical information from the available literature that allows the evaluation and selection of the most viable

technologies and process options from those that exist using the criteria of implementability, effectiveness, and cost given the range and magnitude of Site contaminants.

In some situations, site-specific treatability studies can be conducted to assist in the technology evaluation. These studies are used to evaluate on-site technology performance and to help determine whether the technology is a viable candidate for site remediation. Typically, treatability studies are only conducted on the most promising of technologies because they are costly and there may be sufficient technical literature that can be used in the FS to evaluate and select the appropriate technologies for site remediation. Bench-scale studies can be used to evaluate some technologies (e.g., a water treatment process) and have an advantage in that they are much less costly than treatability studies. However, bench scale studies can only be performed for a relatively small range of technologies, primarily those related to water treatment.

During the upcoming FS, containment options or cover systems for limiting selenium leaching from source rock (i.e., waste rock piles) will need to be evaluated including various cover designs and their implementability, effectiveness, and cost. A great deal of information is available for cover designs both within the SE Idaho phosphate area, but also within the mining industry and in the available technical literature. . In many cases, the necessary data are available from a variety of technical sources so that covers can be designed to control water and air infiltration. What is not certain for the P4 Sites is the relative effectiveness of the covers that are in place. This is important because various covers exist throughout the Sites, and it needs to be determined whether these covers need to be or can be improved based on a cost/benefit analysis. These covers primarily include 1-3 feet of native soil overlying waste rock which serves to limit infiltration of precipitation and support vegetative growth.

To conduct these evaluations in the FS, data on the physical and hydraulic properties of the cover material should be obtained either from P4's current mining operation located nearby or by conducting site-specific field measurements and testing of site soils for various hydraulic properties, including saturated and unsaturated hydraulic conductivity and grain size. This information would provide an opportunity to develop more reliable and site-

specific estimates of water infiltration into and through the Site waste rock. Based on well-established modeling techniques, an estimate of infiltration could be developed that accounts for site-specific soil storage properties, possible vegetative cover mixes, site-specific precipitation, etc. However, such information will only be needed where risk assessment indicates that a remedy is required. As such, any data collection efforts will be focused in areas requiring remediation as indicated by the risk assessment and/or possibly ARARs.

Water treatment technologies and their performance, with the limitations presented by the Site conditions, will need to be evaluated in the FS. Certain ex-situ treatment technologies are being evaluated at the phosphate mines in SE Idaho to understand what technologies are technically implementable and effective. The most promising of these technologies should be tested on mine-specific water at the P4 Sites so that implementability, effectiveness, and costs can be evaluated. In-situ treatment technologies may be an option for treatment of groundwater or for treatment of water within the source materials. During the RI, an evaluation of the technical literature will be conducted and, if necessary, promising technologies can be tested on site. There will be a focus on systems that can be operated in remote locations with difficult access and/or without electrical power.

Similar to in-situ treatment, monitored-natural attenuation (MNA) is an option to be considered during the FS. During the RI, MNA will be researched and any data gaps to evaluate this option will be filled during the RI. The needed parameters for water chemistry are available in current data sets and include (at a minimum): pH, dissolved oxygen (DO), and oxidation-reduction potential measurements in surface water and groundwater. Speciation information (e.g., selenate and selenite) also may be helpful in determining if natural attenuation of selenium is occurring within the hydrologic systems at the Sites. What needs to be determined following additional research is whether additional data on the aquifer solids are needed. P4 has archived solids from the aquifer systems so that testing can be implemented if necessary.

In summary, data should be collected to support the FS in the following areas:

- Soil cover properties should be obtained for the existing waste rock facilities covers, possibly including uncovered areas at the Ballard Mine, should risk assessment or ARARs indicate the need for remediation in specific areas.

- Ex-situ water treatment data relevant to selenium at SE Idaho phosphate mines should be reviewed and treatability (pilot-scale) or bench-scale studies performed using site-specific waters on the most promising technologies. (One such test is planned to be implemented at the Ballard Mine; MWH (2010d)).

- Data on in-situ treatment of selenium impacted waters should be evaluated and much like the ex-situ water treatment technologies mentioned above should be tested either at a bench scale or in an on-site treatability study, if appropriate.

- The available technical literature and site-specific data regarding MNA will be reviewed in the FS to determine if the site-specific data support an MNA alternative in the FS (e.g., USEPA, 2007a and b).

Plans to address the FS data gaps are not included in this RI/FS Work Plan but will be developed at a later date once the RI and risk assessment reports for the individual Sites are submitted to the A/Ts and there is sufficient agreement as to how to focus these studies.

4.4.5 Summary of Data Gaps

Based on the detailed information presented in Sections 4.4.1 through 4.4.4 and summarized in Tables 4-11, 4-12, and 4-13, the following data gaps have been identified:

<u>Soils</u>

- Data gaps associated with non-radiogenic COPCs have not been identified for upland soils at the three sites. However, additional background data for these COPCs have been identified as a need that will require future data collection activities in a representative background area (i.e., an unmined area containing a similar geologic section).

- Radiogenic risk has been identified as a concern; and to reduce the uncertainty associated with the assessment of risks, additional data are needed on the Sites, including the radioactive daughter products of uranium (e.g., radon and gamma). As discussed below, additional background data to support this assessment also are needed.

- Because of potential sediment transport into riparian soil areas along stream corridors, a limited data gap has been identified in sediments and riparian soils due to inadequate COPCs coverage compared to soil in source areas at all three mines (see sediment below).

- A data gap has been identified associated with soils around the Ballard Mine Shop Area for potential organic contaminants. As a result, soil and groundwater samples will be collected in the Ballard Mine Shop Area and analyzed for VOC and SVOC compounds. Soil samples will be evaluated for PCB because of electrical transformers in the area. Details of this sampling effort will be provided in the Ballard Shop SAP, which will be included in Appendix D2 following the A/Ts' approval.

Vegetation

- No data gaps have been identified for upland and riparian vegetation at the three sites.

Surface Water

- No data gaps have been identified for surface water at the three sites. However, ongoing surface water monitoring will provide a baseline for determining the effectiveness associated with any future remedial actions.

Sediment

- The spatial coverage of sediment data is good; however, some COPCs in source-areas soil exceed screening criteria and have not been characterized in sediment. At the Ballard Mine, there is evidence of some mass transport; and nature and extent need to be further characterized for soil COPCs. Mass transport is not as great of a concern at the Henry and Enoch Valley mines because of adequate caps/soil cover in the likely source areas; however, verification sampling of sediment needs to be conducted in areas of aquatic habitat for the COPCs not previously selected for analysis.

Groundwater

- *Alluvial Flow System*: The alluvial system has limited data gaps to be addressed at the Ballard and Henry mine sites. Approximately 13 direct push holes will be needed to address these data gaps in the following areas: (1) the leading edge of a plume downgradient of MWD081 at the Ballard Mine near the Blackfoot River, (2) the leading edge of a plume northwest of MWD080 at the Ballard Mine, and (3) northeast of MWD090 at the Henry Mine. No alluvial system data gaps were identified at the Enoch Valley Mine. The current belief is that groundwater samples will be collected from wells located downgradient of the Ballard Shop Area and analyzed for VOCs and SVOCs to assess whether historic releases of organic compounds occurred from this facility (see Soils above). Specific details

of this sampling effort will be provided in the Ballard Shop SAP, which will be included in Appendix D2 following A/Ts' approval.

- *Dinwoody Formation Flow System*: A data gap has been identified in the northwest portion of the Enoch Valley Mine where COPC-affected groundwater has been identified above screening levels. Downgradient, the Dinwoody Formation dips below a basalt unit that is monitored and is not affected by COPCs. The hydrogeologic conditions and COPC concentrations are not known in the Dinwoody Formation beneath the basalt unit but may be addressed by installing a monitoring well nested with the existing MMW036. Understanding the vertical hydraulic gradient between the Dinwoody Formation and the basalt will be important for providing further resolution to the conceptual model for groundwater flow in this area. No data gaps in the Dinwoody Formation at the Ballard or Henry mines were identified.

- *Wells Formation Flow System*: A data gap related to the Wells Formation is not apparent at this time, but could exist. If future data provides a more definitive indication of a data gap, the need to address the data gap will be evaluated. The need to address any such data gap would have to be considered along with site knowledge, the cost of drilling, and the associated human and ecological risks. These factors may suggest that it is unnecessary or impractical to attempt resolving this data gap.

Secondary Media

- The risk assessment will primarily use data from the primary media (soil, sediment, surface water, groundwater, and vegetation) as described in Appendix C. The available secondary media data will be used as additional lines of evidence to support the risk assessment, if needed. A data gap in the secondary media could occur if analyses using primary media indicate the need for secondary media data to reduce uncertainty. At this time, no additional secondary media samples have been identified.

Background Characterization

- Analytical data is available and background concentrations need to be calculated for the various primary media using locations and statistical methods agreed to by the A/Ts and P4 (included in Tables 4-11 through 4-13 in relevant media).

- In addition, background areas need to be sampled that represent the pre-mine footprint before excavation commenced in the pit areas. Both radiogenic and non-radiogenic COPCs will be included in the additional background characterization.

Data Supporting Feasibility Study

- A data gap has been identified associated with the physical/hydraulic properties of on-site cover soils (included in Tables 4-11 through 4-13 with soil). These data can be used to help evaluate cover systems during the FS. (Data will be collected using field and laboratory tests and long-term in-situ monitoring.)

- Treatability or bench-scale studies might be necessary to test both ex-situ and in-situ options for treating surface water and groundwater with elevated COPCs (included in Tables 4-11 through 4-13 with groundwater).

- An assessment needs to be conducted to determine whether sufficient information is available regionally and at the Site level to support an MNA alternative (included in Tables 4-11 through 4-13 with groundwater). Additional analyses of the Site aquifer matrix material may be needed.

- FS data gaps will be addressed after the RIs and RAs for the Sites focus the data gaps to specific issues and areas.

5.0 REMEDIAL INVESTIGATION/FEASIBILITY STUDY TASKS

In this section, the tasks to be performed during the upcoming RI/FS are presented. This section discusses:

- Site characterization tasks that are necessary during the RI to thoroughly evaluate the nature and extent of site contaminants and potential risks to human health and the environment (e.g., project planning and field investigations)
- Methods and procedures that will be used to evaluate the RI data following analyses of samples collected from various site media (e.g., data validation, data evaluations, plans for assessing site risks)
- Tasks that will be conducted following the RI characterization activities to summarize the site conditions and possible remedies (if necessary) for the Site (RI reporting, FS planning and reporting, and post-RI/FS support

The major RI activities are presented below with a discussion of how each task will be conducted during the upcoming RI/FS at the Sites.

5.1 Project Planning

Project planning includes the tasks necessary to evaluate data collected prior to the RI, scope the necessary field activities (i.e., data gap analysis), and plan for the field activities. The *Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA, Interim Final* (USEPA, 1988) lists the following tasks:

- Prepare an RI/FS Work Plan memorandum.
- Conduct an RI/FS kickoff meeting (i.e., RI/FS brainstorming meeting) with project stakeholders to evaluate possible data gaps and other RI data needs. An initial data gaps/scoping meeting was conducted on March 3, 2010.
- Conduct a Site visit/meeting to determine site constraints, investigation limitations.
- Obtain easements/ permits/ site access agreements (as necessary).
- Collect, summarize, and evaluate existing site data as presented in Sections 2.0 and 3.0 of this Work Plan.

- Develop an initial CSM that will be refined following RI activities as presented in Section 3.0 of this Work Plan.
- Identify data needs and DQOs as included in Section 4.0 of this Work Plan.
- Identify preliminary RAOs or objectives for site cleanup and possible alternatives for site remediation as included in Section 4.0 of this Work Plan.
- Identify possible treatability studies that may be necessary for various site media as discussed in Section 4.0 of this Work Plan.
- Identify possible ARARs as included in Section 4.0 of this Work Plan.
- Prepare plans, including Field Sampling Plan (FSP) and QAPP (SAP), project health and safety plan (HASP), and other work plan addenda that might be necessary following submittal and approval of the initial RI/FS WP to complete the RI investigation discussed later in this section.
- Procure subcontractors who might be necessary for the project. The subcontractors necessary for the RI would include drillers, laboratories, as well as materials for any treatability studies.
- Manage the field investigation, including quality control procedures (e.g., audits of field methods and procedures).

Because the P4 Sites have been extensively investigated prior to the initiation of the RI/FS process, many of the tasks listed above have been completed or are already in place for the Sites. P4 and MWH will use this list as guidance to determine whether the project planning portion of the RI/FS process is being followed. Several of these tasks are presented in earlier sections of this Work Plan (e.g., collection, summary, and evaluation of existing site data, development of RAOs, identification of possible ARARs, etc.).

An initial data gaps meeting was conducted on March 3, 2010, to kick off the project planning activities for this RI/FS. In this meeting, P4 summarized the historic data discussing the COPCs found in each of the primary media at each of the mine sites. P4 then presented preliminary thoughts on additional investigations that likely will be necessary during the RI to complete the contaminant evaluations for the three Sites. Follow-up meetings might be conducted to come to agreement on the scope of the additional RI tasks (i.e., the data gaps) prior to P4's preparation of an FSP for any additional investigative work.

5.2 Community Relations

The development and implementation of community involvement activities are the responsibility of USEPA Region 10. Although implementation of the Community Involvement Plan (CIP) is the responsibility of USEPA, upon USEPA's request, other stakeholders can assist by providing information regarding the Sites' history, participating in public meetings, and preparing fact sheets for distribution to the general public.

An Agency CIP was developed to support the 2003 AOC/CO. Currently, the USEPA is updating the existing CIP to support the RI/FS activities (USEPA, 2010). This updated CIP will be followed by all stakeholders during the implementation of the RI/FS.

On a quarterly or semiannual basis during the RI, P4 will provide updates to the USEPA community relations leader that will be included in newsletters and other forms of communications at select locations in SE Idaho. Public libraries often are used as focal points for the distribution of newsletters, plans, and reports that are prepared for the Sites. Details of the interactions among stakeholders and information distribution sites will be provided in the updated CIP.

5.3 Field Investigations

Field investigations include those activities necessary to prepare for and to execute the field program presented in the approved RI/FS Work Plan. The FSP discusses the various field activities/tasks that will be necessary to complete the sampling and analyses of various site media. The RI data will be used to evaluate (1) site physical and biological characteristics, (2) contaminant source characteristics, (3) nature and extent of contamination, (4) contaminant fate and transport, (5) site risks, and (6) treatment technologies and alternatives during the FS.

This RI is unique in that it is continuing the CERCLA process by building on information and data gathered during the EE/CA that was conducted at the Monsanto Sites in the 2004 to 2009 time frame. As a result, the upcoming RI will use a combination of A/T-approved existing and amended media-specific SAPs and memoranda to fill the data gaps as identified

in Section 4.0 of this Work Plan. For example, a groundwater sampling memorandum was submitted for regulatory review and approval for the 2010 RI groundwater sampling (see Appendix D for this memorandum). This is an ongoing program that was modified for the RI by subtle changes in the analytical program to refine the analyte list and number of locations sampled. In addition, new media-specific SAPs (e.g., Sediment/Riparian Soil SAP included in Appendix D) have been prepared where it was necessary as discussed below.

Therefore, the FSP presented in Appendix D is a combination of existing, amended, and new media-specific SAPs that will be used as a guide for sampling of the various media during the RI. The QAPP, also provided in Appendix D, provides guidance so that the quality assurance program will be followed in the field and in the laboratory so that high-level data quality is maintained during the RI. Together, the media-specific SAPs and QAPP in Appendix D, along with the HASP in Appendix E, will be used to collect additional data in a proper, effective, and safe manner during the RI field program.

Subtle changes in the ongoing field programs during the RI will allow P4 to complete the investigative portion of the CERCLA process and move into technology and alternative evaluations for various contaminated media (and areas) identified within the Sites. P4 will continue these ongoing programs with updates, as necessary, for future sampling rounds and/or to address new Site challenges. Below is a list of field programs that will be necessary to address the data gaps that were identified in Section 4.0:

- ***Surface Water Monitoring*** - Ongoing surface water monitoring at the Sites will provide a continuous record of water quality and will become the basis for remedy performance monitoring (this has not been identified as a specific data gap for the RI/FS but will be needed for assessment of the effectiveness of any remedial measured implemented designed to improve surface water quality). An existing SAP is in place for this sampling and will continue to be used through 2010 (MWH, 2009a).

- ***Sediment/Riparian Soil Sampling*** – Sediments and riparian soils have been sampled at the Sites, but this investigation would be conducted with an expanded list of analytes and would be used for nature and extent as well as ecological risk evaluations. Sediment and riparian soil sampling is proposed in streams and ponds at all three Sites. An SAP has been developed for this task and is attached to this Work Plan in Appendix D1.

- ***Direct Push Borehole Installation*** – Direct-push boreholes are proposed to address alluvial groundwater data gaps at the Ballard and Henry mine (seven locations at the Ballard Mine and five locations at the Henry Mine) This task will be documented by amending the existing *2009 Direct Push Groundwater Continuation Sampling and Analysis Plan* (P4 Production, 2009) through a 2010 Direct-Push and Monitoring Well Installation SAP Addendum (Appendix D3).

- ***Monitoring Well Installation*** – Installation of one monitoring well at the Enoch Valley Mine Site to evaluated nature and extent of COPCs in the Dinwoody Formation. This task will be documented by amending the existing *2009 Monitoring Well Installation Technical Memorandum* (MWH, 2009d) and associated documents through a 2010 Direct-Push and Monitoring Well Installation SAP Addendum (Appendix D4).

- ***Groundwater Monitoring*** – Ongoing groundwater sampling associated with existing and new groundwater monitoring wells and surface expressions of groundwater at all three Sites to complete the nature and extent characterization. This activity will be addressed through a 2010 Groundwater Monitoring Memorandum provided in Appendix D4, which is a SAP addendum similar to the 2009 Groundwater SAP; MWH, 2009c.

- ***Ballard Shop Area Investigation*** – Historic releases of fuels, oils, solvents and/or PCBs may have occurred in the Ballard Mine Shop area. To assess this data gap, soil and groundwater samples will be collected and analyzed, as described in the Ballard Mine Shop SAP. This SAP will be prepared for A/Ts' approval and after approved will be provided for insertion into Appendix D2.

- ***Supplemental Site Soil and Background Characterization –*** Site soils will be further characterized for uranium daughter products, including radon and gamma radiation, to facilitate a thorough evaluation of radiogenic risks. This investigation will consist of a supplemental study of key areas on the Sites as described in an SAP that will be prepared for this effort. In addition to the Site soils, soil background data will be collected from an undisturbed (natural) background area that is representative of the mine footprint prior to mining. The focus of the background characterization is on radiogenic COPCs in soil; gamma radiation and radon investigations also will be conducted. It is anticipated that the soil samples collected in the background areas for total uranium and daughter product analyses also might be analyzed for the soil COPC list. Specifics of these characterization activities, including background area selection, sample locations, sampling, and analysis procedures, will be appended to this Work Plan as an SAP in Appendix D5.

- ***Waste Dump Cover Sampling*** - Sampling of soil cover material on waste rock dumps for physical and hydraulic properties at all three Sites to help determine the optimal cover material(s) (i.e., thickness, permeability, grain size) given the constraints posed by the Site's location/physical conditions and range of COPCs in the source areas. This task will be addressed in an SAP after the RIs and RAs

for the Sites define specific areas where new or modified covers may be utilized as part of a remedy.

- ***Materials Sampling for Potential MNA Remedy*** – Evaluation and determination of the need for analysis of geologic materials for parameter necessary to support a MNA remedy. The need for data to support the potential MNA remedy and potential applicability of such a remedy will be presented in a technical memorandum during the RI as discussed in Section 5.5.2.

P4 will follow the approved RI/FS Work Plan to complete the RI. Following validation of the RI data, an RI report will be prepared for each mine site and revised based on regulatory comments. After the final RI report is approved, the FS process will begin.

5.4 Sample Analysis, Data Validation, and Data Management

The project QAPP for this RI/FS project is presented in Appendix D. The QAPP includes the sample analysis and data validation methods and procedures that will be followed during the RI/FS process at the P4 Sites. P4 will follow the latest USEPA guidance for conducting sample analysis and data validation that is detailed in the latest USEPA guidance entitled "*Guidance for Quality Assurance Project Plans"* (USEPA QA/G-5; USEPA, 2002).

The project SAP (FSP, in combination with the QAPP) in Appendix D details the methods and procedures that will be used to complete the following tasks:

- Sample management (in the field and in the laboratory)
- Various analyses (including any field screening and laboratory analyses)
- Data validation

5.4.1 Data Validation

P4 will use a third party to validate the data sets. P4's subcontractor for those services to date has been Laboratory Data Consultants (LDC) of Sacramento, California. Data will be validated by this third party using the general protocol and process described in the *USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review* (NFG; USEPA, 2004b).

5.4.2 Data Management

Information gathered during Site characterization will be documented in well-maintained field log books, field forms, and laboratory reports according to the appropriate standard operating procedures (SOPs) and relevant plans (e.g., the FSP). Field log books and field forms will be used to document observations, measurements, and other notable events during the field activities. Laboratory reports will document sample custody and analytical results. In addition, quality assurance/ quality control (QA/QC) results, including adherence to prescribed protocols, nonconformity events, corrective measures, and/or data deficiencies, will be reported in the narrative section of the laboratory reports.

The quality and validity of field and laboratory data compiled during the RI will be documented by maintaining and evaluating field reports, sample shipment records, and validating analytical results. The quality and validity of previously collected data have been re-evaluated through review of the sample collection, handling, analysis, and quality control procedures performed by other investigators or data users as documented in the *DQUR Report* (MWH, 2010a).

All validated data, and the electronic data deliverable (EDD,) will be made available to the USEPA in electronic format (i.e., computer disc or equivalent). The validated data, along with QA/QC information and data validation summaries, will be submitted to the USEPA in electronic format within 120 days of the date of collection of the last sample. In addition, this information will be provided in the RI reports that are prepared for the project.

5.5 Data Evaluation and RI Reporting

Following collection, analysis, and validation of the RI data, P4 will evaluate the data to be included in the RI report or in the Data Summary Report (DSR) should the RI take more than two years to complete. Data evaluation includes the efforts related to the evaluation of data after it has been verified that the data are of acceptable accuracy and precision. Data evaluation begins on the day that the first set of validated data is received by P4 and ends

during the preparation of the RI reports for each Site. Typical data evaluation activities include:

- Initial data evaluation
- Data reduction and tabulation
- Environmental fate and transport modeling and/or evaluation (if necessary)
- Quality control measures

5.5.1 Data Summary Reports

Should DSRs be necessary, the data collected during that round of yearly sampling will be evaluated and summarized in tables through comparisons to established (e.g., MCLs for groundwater) and/or developed benchmarks (background metals concentrations in site soils developed by collection and evaluation of background soils samples). In addition, figures will be prepared to spatially depict the locations and concentrations of contaminants in each affected media for each mine site. The DSRs will identify data gaps and additional (and/or modified) sampling and analysis that will be necessary for the following field season.

5.5.2 Technical Memoranda

During the course of the RI/FS several technical memoranda will be prepared and submitted to the A/Ts for review and approval. The conclusions of these memoranda and resulting data will be incorporated into the RI and FS reports, as appropriate.

The first of the technical memoranda will be the Background Assessment Technical Memorandum. This memorandum will present the locations and statistical methods used to determine background for each of the media being characterized during the RI. This technical memorandum will be produced because it may be an important component of analyses presented in the RI report. Agreement between the A/Ts and P4 on the background concentrations for COPC concentrations prior to the RI report will help facilitate completion of the RI. Appropriate guidance will be considered. For example, IDEQ's *Statistical Guidance for Determining Background Ground Water Quality and Degradation* will

be utilized, if appropriate (IDEQ, 2009a). The most recent version of the EPA's ProUCL (i.e., Version 4) will be used for all the background assessment statistical calculations. The web link to this program is http://www.epa.gov/esd/tsc/software.htm.

A technical memorandum will be produced assessing the potential applicability of Monitored Natural Attenuation (MNA) to the P4 Sites. This memorandum will assess whether MNA is a remedy that can be considered at the P4 Sites, and if appropriate, if the relevant data are available to support MNA. Much of the data that may be needed is available or could be readily developed. However, presentation of the potential MNA will allow for the A/Ts and P4 to agree upon the appropriate potential application of MNA and the type of data needed to support the application. Guidance will be considered (e.g., USEPA, 2007a & b); but because of some uniqueness of the Sites, there may need to be cooperative interaction between the A/Ts and P4 to determine the appropriate approach and supporting information. The technical memorandum will support this dialog.

During the FS, the 2009 CO/AOC indicates that three interim deliverables are necessary which comprise the body of the FS Report. These deliverables are:

1. Development and Screening of Remedial Alternatives
2. Detailed Analysis of Remedial Alternatives
3. Comparative Analysis of Remedial Alternatives

Section 5.8 below presents specifics of the FS process that will be captured in these technical memoranda and/or the FS Report which will be prepared for each Site. P4 will prepare the first interim deliverable listed above for the first Site where an FS report is initiated; however deliverables 2 and 3 will not be prepared prior to preparation of the draft FS report for the initial Site unless the deliverables are specifically requested by the A/Ts.

Following preparation of this initial interim deliverable and the preparation of the FS for the first Site, if the alternatives for the various media largely remain the same, then no additional interim deliverables will be necessary and the subsequent second and third FS reports will be prepared and submitted without this initial deliverable. However, if there are substantial

changes in the types of remedial technologies or alternatives that are anticipated for the subsequent Sites, then the initial deliverable will be prepared.

Additional technical memoranda may be submitted to address specific issues that are identified during the RI, the risk assessment, and the FS. The contents of these memoranda will be agreed to by the A/Ts and P4 in advance of each submission.

5.5.3 RI Report

Following the final round of data collection, an RI report will be prepared for each of the Sites directed by the 2009 CO/AOC. Data evaluations in these RI reports will include summaries of the data for each media by comparing these data to existing, accepted benchmarks for some media (e.g., MCLs for GW) and a combination of existing benchmarks and sites-specific background levels developed for the Site. Complete data sets will be available electronically as an appendix to these RI reports.

5.6 Assessment of Risks and Reporting

This task includes activities related to the assessment of risks to human health and the environment from potential exposures to Site-derived contaminants. The baseline risk assessment (BRA) will include both a Human Health Risk Assessment (HHRA) and an Ecological Risk Assessment (ERA) to assess the potential human health and ecological risks posed by Site-derived contaminants in the absence of any remedial action. P4 will conduct the HHRA and ERA consistent with this approved RI/FS Work Plan and relevant USEPA guidance using contaminant exposure point concentrations developed from data collected at, and in the vicinity of, the Sites. In Appendix C, the risk assessment work plan is provided and includes the methodologies that will be used in preparing the HHRAs and ERAs for the Sites.

The HHRA shall be consistent with USEPA human health risk assessment guidance (USEPA, 1989, 1991, 1992, 2004a, and 2005). The HHRA will include the following components:

- Identification of COPCs that are considered to be most important to the evaluation of potential human health risks
- Exposure assessment to identify the potential exposure scenarios and pathways by which human exposures to Site COPCs could occur and to estimate the magnitude, frequency, and duration of potentially complete exposures to Site COPCs
- Toxicity assessment to summarize the relevant toxicity information for selected COPCs and the relationship between magnitude of exposure and adverse human health effects
- Risk characterization to integrate the toxicity and exposure assessments into quantitative and qualitative evaluations of the potential risks to human health from exposure to chemicals in environmental media.

The ERA will be conducted using USEPA's eight-step, three-phase screening and baseline assessment process (USEPA, 1992 and 1997a &b). The ERA will evaluate the likelihood of adverse ecological effects occurring as a result of exposure to chemicals of potential ecological concern (COPECs). The three phases of the assessment process common to both screening and baseline assessments are:

- ***Problem Formulation*** – This is the phase in which the COPECs and the ecological setting and receptors are identified and where interactions are described in a CSM.
- ***Analysis Phase*** – This phase describes the quantitative data and statistical methods used to determine COPEC exposure for various ecological receptors and selected thresholds of each COPEC used to quantify adverse ecological effects.
- ***Risk Characterization*** – This phase integrates the exposure and effects data described in the analyses phase to determine the likelihood of adverse ecological effects occurring. An analysis of the uncertainty associated with risk estimates is a principal component of the risk characterization process.

A BRA report will be prepared and submitted to the A/Ts that documents the HHRA and ERA conducted for each mine site for review and approval. The draft BRA report will summarize the methods and assumptions used in, and results of, the mine-specific HHRAs and ERAs. Following review by the A/Ts, P4 will prepare and submit responses to the A/Ts' comments followed by a revised final BRA report that addresses those comments.

Typically, the BRA is included as an appendix to the RI report, which is what P4 proposes for this RI report submittal.

5.7 Treatability Studies and Pilot Testing

If candidate treatment technologies have not been sufficiently demonstrated, or cannot be adequately evaluated for this Site on the basis of available information, treatability testing will be conducted. Treatability testing will be performed, as deemed necessary, by P4 and the A/Ts to assist in the FS process during the selection of appropriate technologies and in the detailed analysis of alternatives. Depending on the field work necessary, a separate SAP and HASP for the treatability studies may be necessary. In addition, if applicable, the testing results will be used in the detailed design of the selected remedial technology.

The following activities would be necessary in support of any treatability studies or pilot testing:

- Preparation of a memorandum discussing the candidate technology
- Selection of a test facility and/or location
- Preparation of a treatability or pilot testing work plan (SAP) for A/Ts review and approval
- Procurement of necessary equipment for the testing and necessary vendors and analytical services (conducted concurrently with preparation of the SAP)
- Collection, submittal, and analysis of appropriate samples and data validation
- Evaluation of the results and report preparation

The deliverables listed above are subject to A/Ts review and approval. Depending on the sequence of activities, the treatability study report may be a part of the RI or FS report or a separate deliverable. The report will evaluate the technology's effectiveness, implementability, cost, and actual results as compared with predicted results. The report also will evaluate full- scale application of the technology.

5.8 Feasibility Study Planning and Reporting

Following A/Ts approval of the RI reports for each Site, P4 will evaluate (1) the RI data, (2) data obtained during treatability studies, and (3) any other information contained in previous documents prepared for the Sites. Findings derived from these data will be used to develop remedial alternatives for controlling risks to human health and the environment at each of the Sites. During preparation of the FS, candidate treatment technologies will be evaluated and remedial alternatives will be assembled that are appropriate for site conditions, following the standard FS alternative development process as shown on Figure 5-1. The FS process will use the findings of the HHRA, including contaminants of concern (COCs), exposure routes, and potential receptors, and will apply ARARs to develop appropriate RAOs and general response actions (GRAs) as presented in Section 4.0 and described below. The *Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA, Interim Final* (USEPA, 1988) will be followed during the FS process.

The RAOs, discussed in Section 4.0, were developed:

- To protect human health and the environment
- For site-specific exposure routes and receptors
- According to specific risk-based remediation goals (e.g., MCLs) for individual COCs
- To meet the site ARARs

GRAs are designed to meet the RAOs and may include treatment, containment, excavation, extraction, disposal, institutional controls, or a combination of these responses. In the FS, remedial technologies will be evaluated for each GRA and COCs (i.e., inorganic compounds) at the Sites.

5.8.1 Remedial Alternatives Development and Screening

This task includes efforts to select the alternatives that will undergo full or detailed analysis. The task begins when the RI report is approved by the A/Ts and there is sufficient data to develop GRAs and begin the initial evaluations of potential technologies for remediation of

the Sites. Below, we discuss the FS process from identification, screening, and selection of technologies to assembly and screening of remedial alternatives.

Technology Identification and Initial Screening. The technology evaluation begins with a review of the GRAs that will satisfy the RAOs. The FS will identify and screen the full list of available technologies applicable to each GRA. Because the field work and other studies have been proceeding for years at P4's Sites and other phosphate mines in SE Idaho, identification of the most promising technologies for contaminated media at the Sites (i.e., soil/sediment and water) should be fairly straightforward. The GRAs developed for the sites are engineering or administrative solutions for protection of human health and the environment from the site-related COCs. As discussed in the *Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA, Interim Final* (USEPA, 1988), GRAs may include treatment, containment, excavation, disposal, institutional actions, or a combination of these. Like RAOs, GRAs are medium-specific.

In the initial technology screening, the universe of potentially applicable remedial technology types and their associated process options areas reduced by evaluating the options with respect to their on-site technical implementability. The goal is to reduce the number of process options per remedial technology to one. This is accomplished by using the information available from the RI and other studies on contaminant types, contaminant concentrations, and on-site characteristics to quickly screen out technologies and process options that cannot be effectively implemented at the Site. Figure 5-2 provides a generic illustration of the FS process and indicates how technologies and individual process options are screened for each medium and then assembled into alternatives.

Final Technology Screening - Effectiveness, Implementability, and Relative Cost. Following the initial technology screening based on technical implementability, technology process options considered to be implementable will be evaluated in greater detail before selecting one process to represent each technology type. One representative process is selected for each technology type to simplify the subsequent development and evaluation of alternatives without limiting flexibility during the remedial design. Possible process options

will be evaluated with respect to effectiveness, implementability, and relative cost. This evaluation focuses on effectiveness with less emphasis on relative cost and implementability.

As described in the *Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA, Interim Final* (USEPA, 1988), the effectiveness evaluation is the most important technology evaluation criterion. Effectiveness is used to eliminate undesirable technologies and determine the most viable technologies for the site contamination in each medium and for specific conditions. This evaluation focuses on (1) the potential effectiveness of the process options in handling the estimated areas or volumes of media to meet the remediation goals identified in the RAO, (2) the potential impacts to human health and the environment during the construction and implementation phase of the remediation process, and (3) how proven and reliable the process is with respect to the contaminants and conditions at the site.

Implementability is evaluated with respect to both the technical and administrative feasibility of the process option. Cost plays a limited role in the evaluation and is based on engineering judgment as high, medium, or low relative to the other process options. Refer to Figure 5-2 for a generalized diagram of how technologies will be evaluated and alternatives will be assembled and screened.

These criteria will be used to select viable technologies that will be retained for assembly into alternatives for the Sites.

Assembly and Screening of Remedial Alternatives. In assembling alternatives, GRAs and the process options chosen to represent the various technology types for each medium will be combined to form alternatives for the Site as a whole. For the FS, this process will entail assembling the alternatives based on the FS evaluation described above and as described in the *Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA, Interim Final* (USEPA, 1988).

The assembled alternatives will be evaluated against the short- and long-term aspects of three broad criteria: effectiveness, implementability, and cost. In this step, the alternatives

will be further reduced in number so that remaining alternatives can undergo a more extensive detailed analysis.

- ***Effectiveness*** – A key aspect of the screening evaluation is the effectiveness of each alternative in protecting human health and the environment. In addition, to be judged effective an alternative must (1) be effective in the short term (referring to the construction and implementation period) and long term (referring to long-term permanence of the alternative) and (2) reduce the toxicity, mobility, or volume of the contaminated media by the use of treatment that decreases the threats or risks associated with the contamination.

- ***Implementability*** – Implementability, as a screening criterion, is the measure of both the technical and administrative feasibility of constructing, operating, and maintaining a remedial alternative given the particular process options and specific site conditions.

- ***Cost*** – Cost estimates during the screening stage typically are based on a variety of cost estimating data, including vendor information, conventional cost estimating guides, or previous project totals. Both operating and maintenance (O&M) and capital costs will be considered and the costs will be reduced to a single figure for each alternative (i.e., an overall total project remediation cost). Because the alternatives at this stage of the process will need refinement, these costs are not as accurate as they need to be for purposes of the detailed analysis (for which the costs estimates should be within the range of +50% to -30%). As discussed in the *Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA, Interim Final* (USEPA, 1988), "Absolute accuracy of the cost estimates during the screening is not essential."

- ***Post-Screening Tasks***. The screening process will yield a reduced number of remedial alternatives that will be evaluated further in the detailed analysis of alternatives discussed below. Often a meeting is held at this stage with the regulatory agencies so that all parties understand the direction of the FS.

For the FS reports prepared for the Sites, a stakeholder meeting will be necessary; this may be accomplished either with a conference call or a face-to-face meeting. If supplemental data are necessary to complete the detailed analysis of alternatives, those data gaps will be discussed and filled during this phase of the FS process. These data needs might include treatability studies and/or limited investigations depending on, for example, site-specific process options and technical requirements.

5.8.2 Detailed Analysis of Remedial Alternatives – Using the Threshold, Balancing, and Modifying Criteria

A reduced number of viable alternatives will be taken through the detailed analysis. The purpose of the detailed analysis of alternatives is to provide decision makers with adequate information to permit selection of an appropriate site remedy. The detailed analysis is the last phase of the FS process in which alternatives are evaluated with respect to the nine evaluation criteria that the USEPA has developed to address the CERCLA requirements and preferences (*CERCLA Overview* - http://www.epa.gov/superfund/policy/cercla.htm, USEPA 1988 and 1990). The nine criteria consist of the following.

CRITERIA	DISCUSSION
1. Overall protection of human health and the environment	These are "Threshold Criteria" that each alternative *must* satisfy to be eligible for selection based on statutory requirements. [a]
2. Compliance with ARARs	
3. Long-term effectiveness and permanence	These are the technical criteria called "Balancing Criteria" upon which the detailed analysis primarily is based.
4. Reduction of toxicity, mobility, or volume	
5. Short-term effectiveness	
6. Implementability	
7. Cost	
8. State acceptance	These "Modifying Criteria" are related to the acceptance of the remedial alternative by the public and regulatory agencies. These criteria are assessed formally after the public comment period at which time public and agency comments are factored into the selection of the preferred alternative.
9. Community acceptance	

[a] USEPA can waive aspects of threshold criteria if there are logical reasons for the exception (e.g., an ARAR might be waived because of a unique site condition).

In the detailed analysis, the remaining alternatives are analyzed individually against each of the nine criteria (this constitutes the "individual analysis") discussed above and then compared against one another (the "comparative analysis") to determine their respective strengths and weaknesses and identify the key trade-offs that must be balanced for the Site. Identification of the "preferred" alternative will be the final step and outcome of the FS process.

5.9 Post RI/FS Project Support

The activities occurring after the release of the FS to the public should be reported under this task. The following are typical activities associated with Post RI/FS project support:

- Preparing the pre-design report
- Preparing the conceptual design
- Attending public meetings and support community involvement activities as needed
- Reviewing and providing QC of the work effort

The first two bullets contain tasks/documents that P4 will prepare and submit, as appropriate, for the selected Site remedies following review and acceptance of the FS. All parties will attend public meetings where information regarding the RI/FS is presented to update the public on the project progress. The writing and revision of the responsiveness summary and ROD will fall to the USEPA. It will be the responsibility of all stakeholders, including P4, to provide post-RI/FS quality control support in the form of review and comment on the major documents provided in the bulleted list above.

6.0 KEY ASSUMPTIONS

The key assumptions associated with the development of this Work Plan for the P4 RI/FS are as follows:

- At the Sites, initial CERCLA investigations were conducted under the more abbreviated EE/CA process under the 2003 CO/AOC. As a result of the 2009 CO/AOC, these EE/CA investigations were transitioned to the more intensive CERCLA RI/FS process. Field investigations have previously been conducted or are ongoing. Therefore, to document the ongoing programs, existing or amended SAPs (e.g., groundwater characterization) are being utilized and can be found in Appendix D of this RI/FS Work Plan. New media-specific SAPs (e.g., sediment and riparian soil investigation) have been prepared and are attached to this Work Plan to supplement the existing field program and the completed RI/FS field work. The A/Ts have been notified of P4's intent to utilize this approach to fulfill the SAP requirement of the RI/FS Work Plan. Comment has not been received; it is, therefore, assumed that this transitional process is approved by the A/Ts and complies with CERCLA requirements. Unanticipated additional media-specific SAPs may be needed in the future in which case they would be added to the SAPs in Appendix D.

- The Community Involvement Plan (CIP) has been prepared by the USEPA for the P4 Sites. This CIP will be utilized and is included in this RI/FS Work Plan by reference (USEPA, 2010).

- As specified in the 2009 CO/AOC SOW (USEPA, 2009a), this RI/FS Work Plan has been prepared for all three Sites under the RI/FS umbrella. However, future deliverables and work products will be prepared for the each of the individual Sites as listed below.

  - Ballard Mine Site
  - Enoch Valley Mine Site
  - Henry Mine Site

- Consistent with the 2009 CO/AOC, these site-specific deliverables will include the RI report, the BRA (includes the HHRA and ERA), and the FS.

- The conclusions reached in the *DQUR* and resulting conditions regarding data quality and usability are the basis for utilizing the pre-RI data in the evaluations that will be performed during the BRA and FS for the Sites.

7.0 SCHEDULE

Figure 7-1 presents the anticipated RI/FS schedule of events based upon the November 30, 2009, signature date for the 2009 CO/AOC SOW. A summary of the work products and timeframes taken from the 2009 CO/AOC SOW are included in the schedule as well as summarized below.

7.1 RI/FS SOW Schedule for Primary Deliverables (all days are calendar days)

The primary deliverables for the RI/FS at the P4 Sites are discussed below. These include this RI/FS Work Plan, data validation summaries, data summary reports, the remedial investigation reports, baseline risk assessment reports, and feasibility study reports. As discussed earlier, after this Work Plan is submitted for all three Sites, future deliverables will be prepared for each Site (e.g., an RI report will be prepared for each of the P4 mines). Again, Figure 7-1 presents the anticipated RI/FS schedule. For clarification, note that in the schedule, calendar days as presented in the 2009 CO/AOC SOW and as listed below under each deliverable have been converted to working days (e.g., 7 calendar days equates to 5 working days).

7.1.1 RI/FS Work Plan and Sampling and Analysis Plans

- Within 45 days of the Effective Date of the Settlement Agreement, Respondent submits a draft report evaluating quality and usability of existing data and Data Approval Request seeking approval of potentially relevant data collected prior to or under the 2003 CO/AOC.
- Within 21 days of receipt, Agencies will provide comments on draft report and Data Approval Request.
- Within 14 days, Respondent meets with Agencies after receipt of comments (or as soon thereafter as is practicable if necessary to accommodate Agencies' schedules).
- Within 21 days of receipt of comments on draft report, Respondent submits a final report evaluating quality and usability of existing data and data approval request.

- Within 21 days after receipt of final report, Agencies will provide written confirmation as to approval or rejection of data, findings, and recommendations in the Data Approval Request (deadline included for planning purposes only).

- Within 60 days of receipt of Agencies' formal response to the Data Approval Request, Respondent submits a draft Data Gap Analysis and Draft RI/FS Work Plan.

- Within 45 days of receipt, Agencies will provide comments on the draft Data Gap Analysis and Draft RI/FS Work Plan (deadline included for planning purposes only).

- Within 21 days of receipt, Respondent meets with Agencies to discuss comments on the draft Data Gap Analysis and Draft RI/FS Work Plan (or as soon thereafter as is practicable if necessary to accommodate Agencies' schedules).

- Within 30 days of the meeting with the Agencies, Respondent submits a final Data Gap Analysis and final RI/FS Work Plan.

- Scoping meetings will be held at Respondent's request during development of planning deliverables.

7.1.2 Data Validation Summaries

- Data validation summaries are due within 90 days from the date of collection of the last sample from each sampling event.

7.1.3 Data Summary Reports

- Draft data summary reports are due within 120 days after completion of each season's field work or within 90 days of the receipt of final laboratory data, whichever is earlier.

- Thirty days are allowed for Agencies to submit comments (for planning purposes).

- Twenty-one days are allowed for Respondents to submit responses to Agencies' comments.

- Within 21 days after responses are submitted to the Agencies, a meeting/conference call will be held among all parties to discuss outstanding issues identified in responses to comments.

- Within 30 days of the above meeting/conference call, submit Final DSRs.

7.1.4 Remedial Investigation Report(s)

- Submit draft remedial investigation (RI) report for Ballard Mine Site within 120 days after receipt of validated laboratory data from the final field season.
- Submit draft RI report for Henry Mine Site within 30 days following approval of Ballard Mine Site RI report.
- Submit draft RI report for Enoch Valley Mine Site within 30 days following approval of Henry Mine Site RI report.
- Forty-five days are allowed for Agencies to submit comments (for planning purposes).
- Twenty-one days are allowed for Respondents to submit response to Agencies' comments.
- Within 21 days after responses are submitted to the Agencies, a meeting/conference call will be held to discuss outstanding issues identified in responses to comments.
- Within 30 days of above meeting/conference, submit mine-specific Final RI.

7.1.5 Baseline Risk Assessment Report(s)

- Submit mine-specific draft BRA within 60 days after submittal of draft RI.
- Forty-five days are allowed for Agencies to submit comments (for planning purposes).
- Twenty-one days are allowed for Respondents to submit responses to Agencies' comments.
- Within 21 days after responses are submitted to the Agencies, a meeting/Conference call will be held to discuss responses.
- Within 30 days of above meeting/conference, submit mine-specific Final BRA.

7.1.6 Feasibility Study Report(s)

- Submit draft FS within 120 days after submittal of mine-specific final BRA report.
- Forty-five days are allowed for Agencies to submit comments (for planning purposes).

- Twenty-one days are allowed for Respondents to submit responses to Agencies' comments.
- Within 21 days after responses are submitted to the Agencies, a meeting/conference call will be held to discuss outstanding issued identified in responses to comments.
- Within 30 days of the above meeting/conference, submit mine-specific final FS report.

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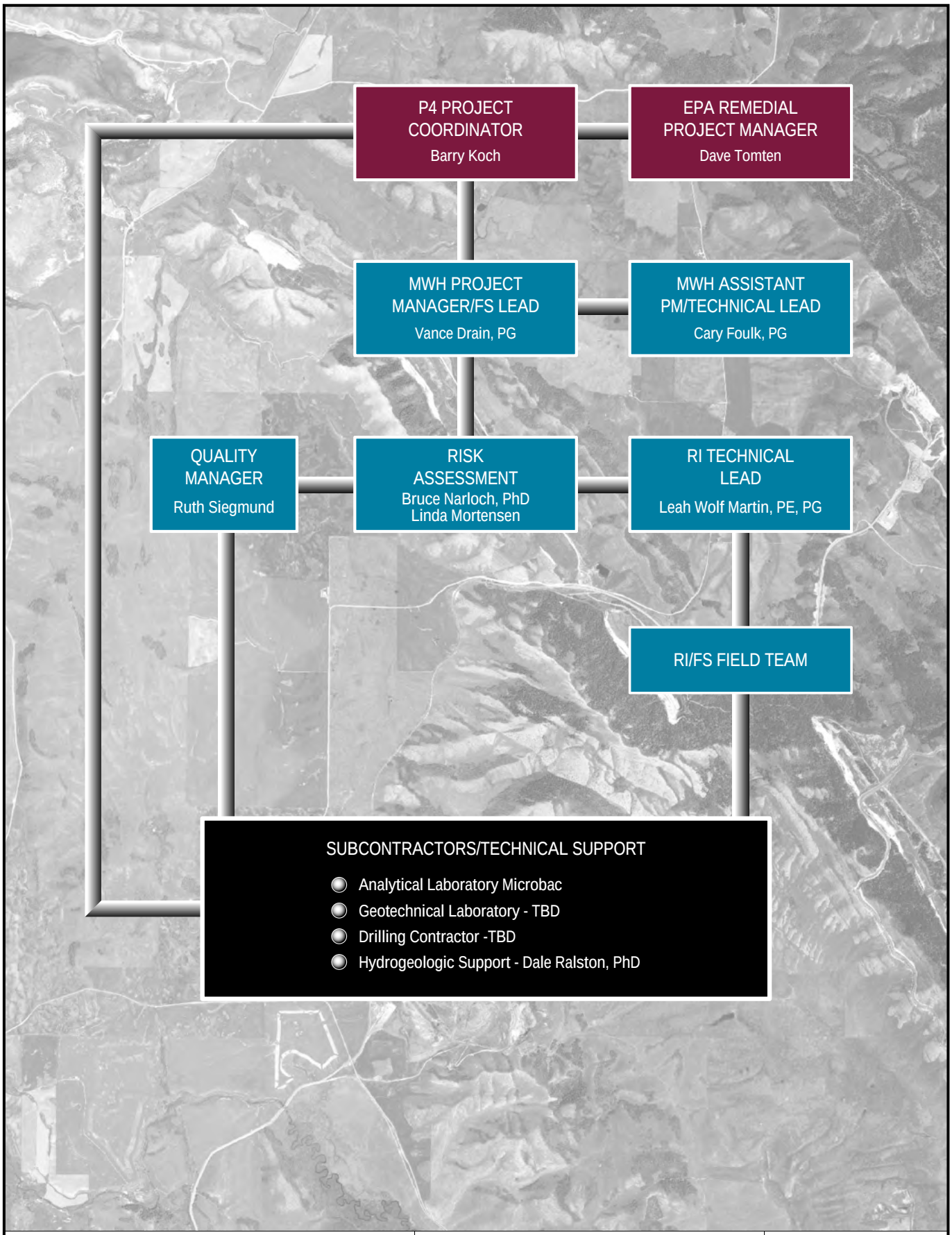
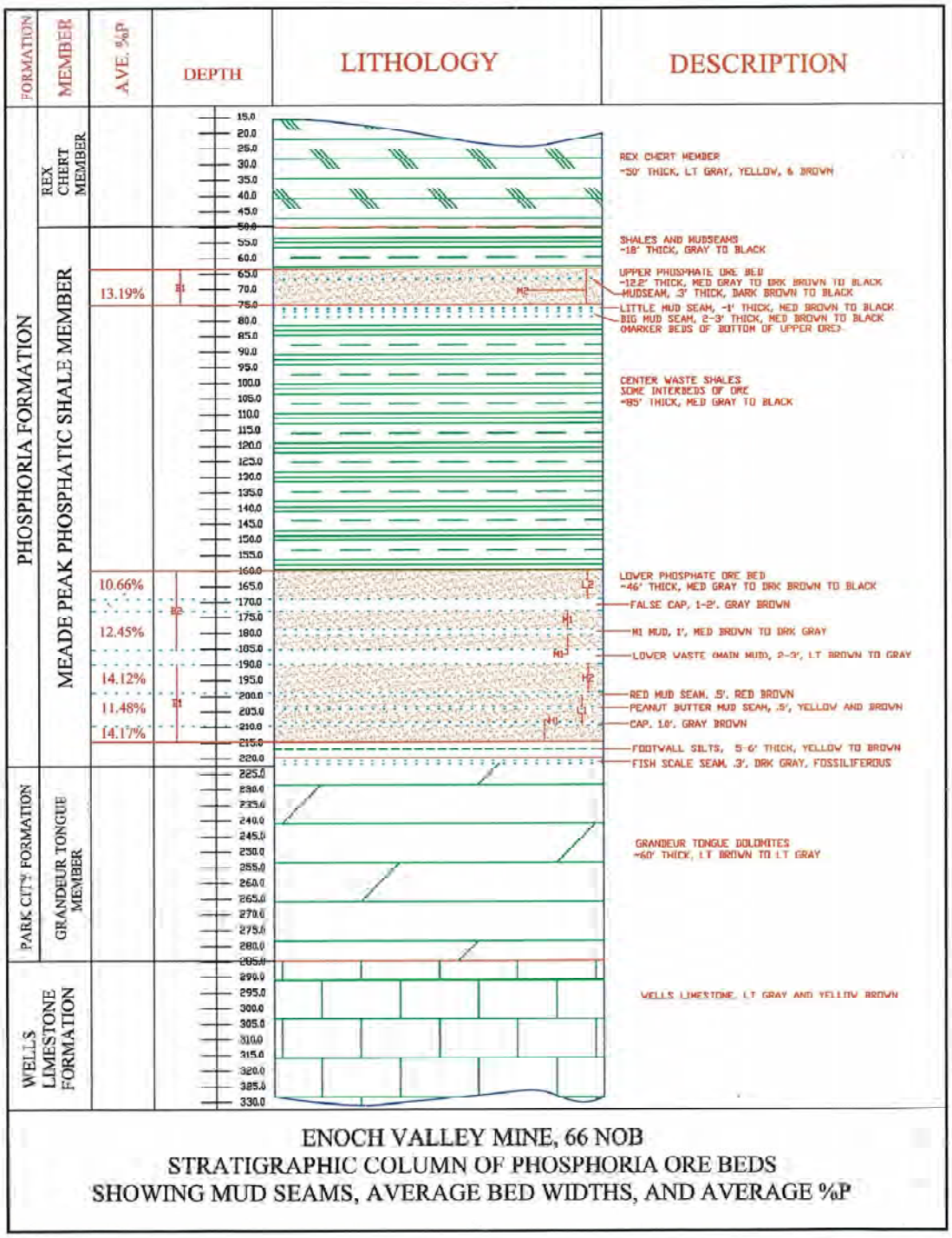


P4 Production, LLC

PROJECT LOCATION	BALLARD, HENRY AND ENOCH VALLEY MINES
PROJECT	P4 RI/FS WORK PLAN
TITLE	RI/FS ORGANIZATION CHART
SHEET	FIGURE 1-1
REVISION	
FILE NAME	Fig 8-01 RI/FS Organization Chart _510.ai

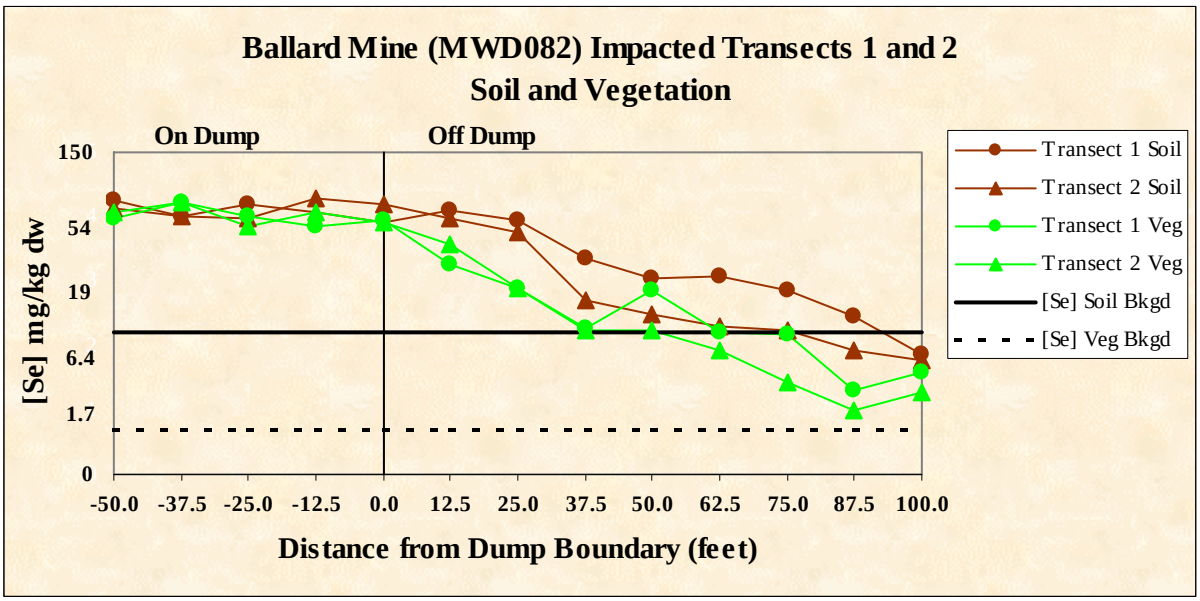
MWH

FIGURE 3-1
Stratigraphic column of phosphate ore horizons at the Enoch Valley Mine



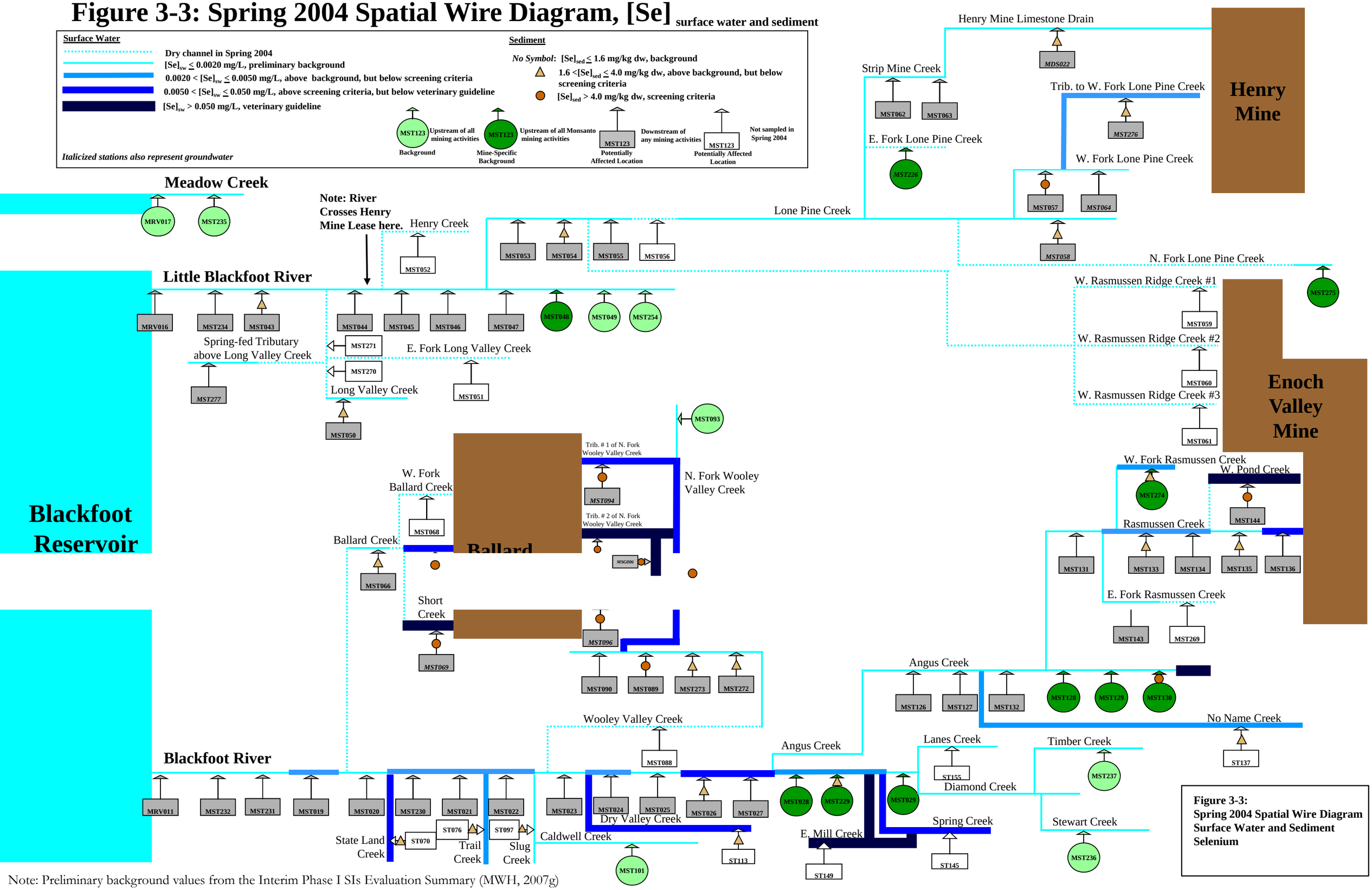
ENOCH VALLEY MINE, 66 NOB
STRATIGRAPHIC COLUMN OF PHOSPHORIA ORE BEDS
SHOWING MUD SEAMS, AVERAGE BED WIDTHS, AND AVERAGE %P

FIGURE 3-2



Notes: Preliminary soil background = 8.1 mg/kg dw, preliminary vegetation background = 1.0 mg/kg dw.
Non-detected concentrations are presented as one-half the MDL.

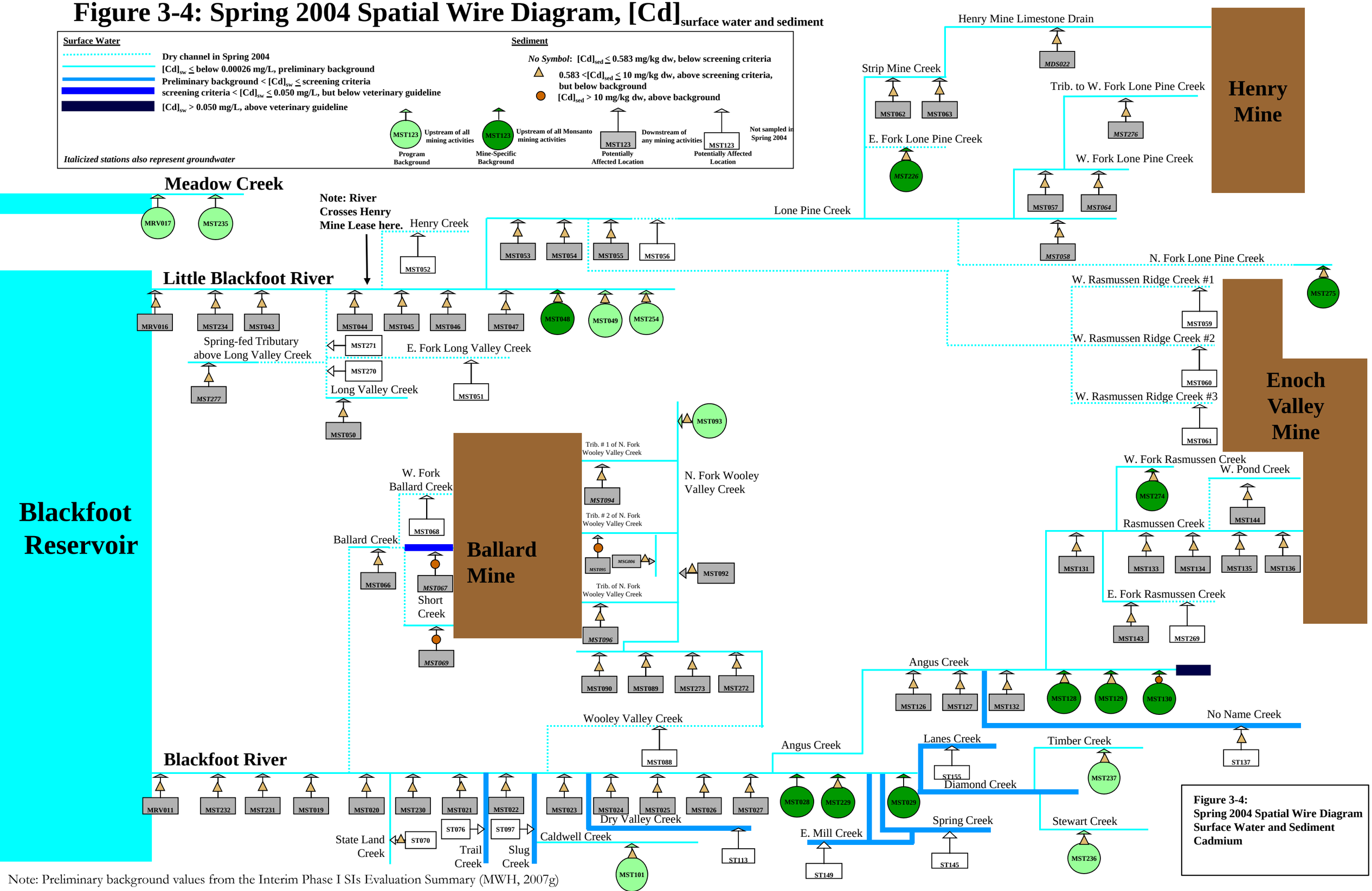
Figure 3-3: Spring 2004 Spatial Wire Diagram, [Se] surface water and sediment



Note: Preliminary background values from the Interim Phase I SIs Evaluation Summary (MWH, 2007g)

Figure 3-3:
Spring 2004 Spatial Wire Diagram
Surface Water and Sediment
Selenium

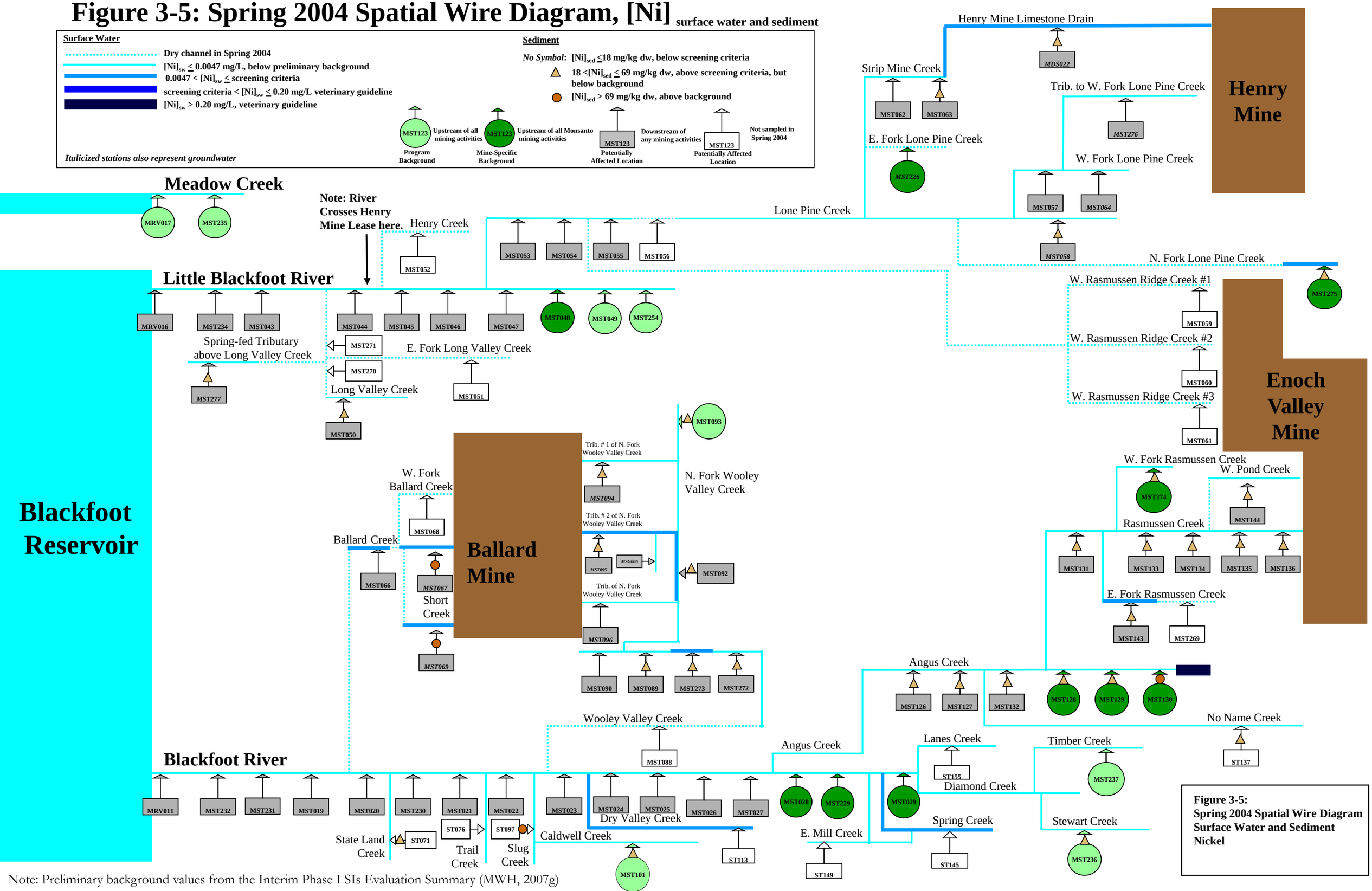
Figure 3-4: Spring 2004 Spatial Wire Diagram, $[Cd]_{surface\ water\ and\ sediment}$



Note: Preliminary background values from the Interim Phase I SIs Evaluation Summary (MWH, 2007g)

Figure 3-4:
Spring 2004 Spatial Wire Diagram
Surface Water and Sediment
Cadmium

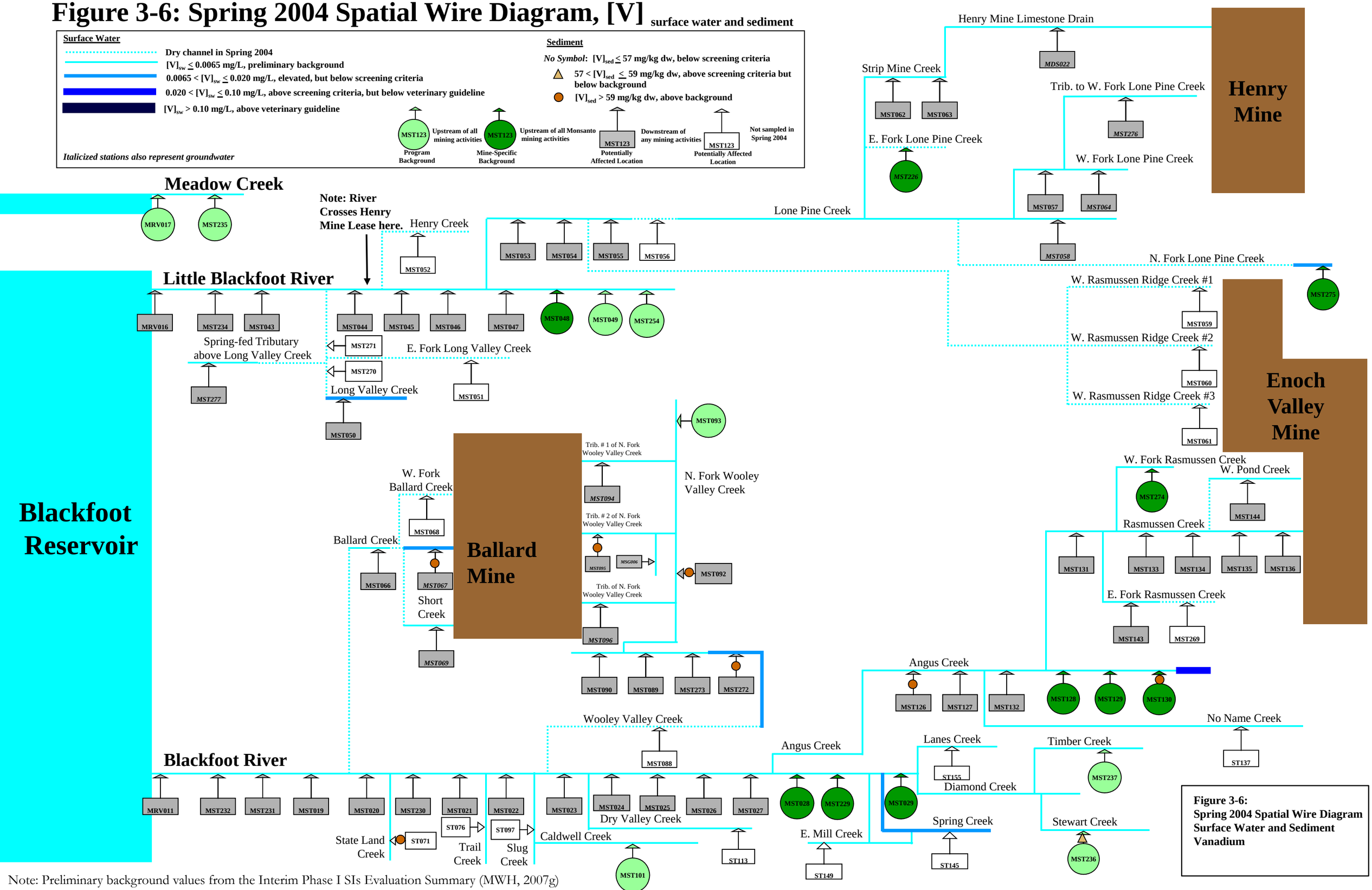
Figure 3-5: Spring 2004 Spatial Wire Diagram, [Ni] surface water and sediment



Note: Preliminary background values from the Interim Phase I SIs Evaluation Summary (MWH, 2007g)

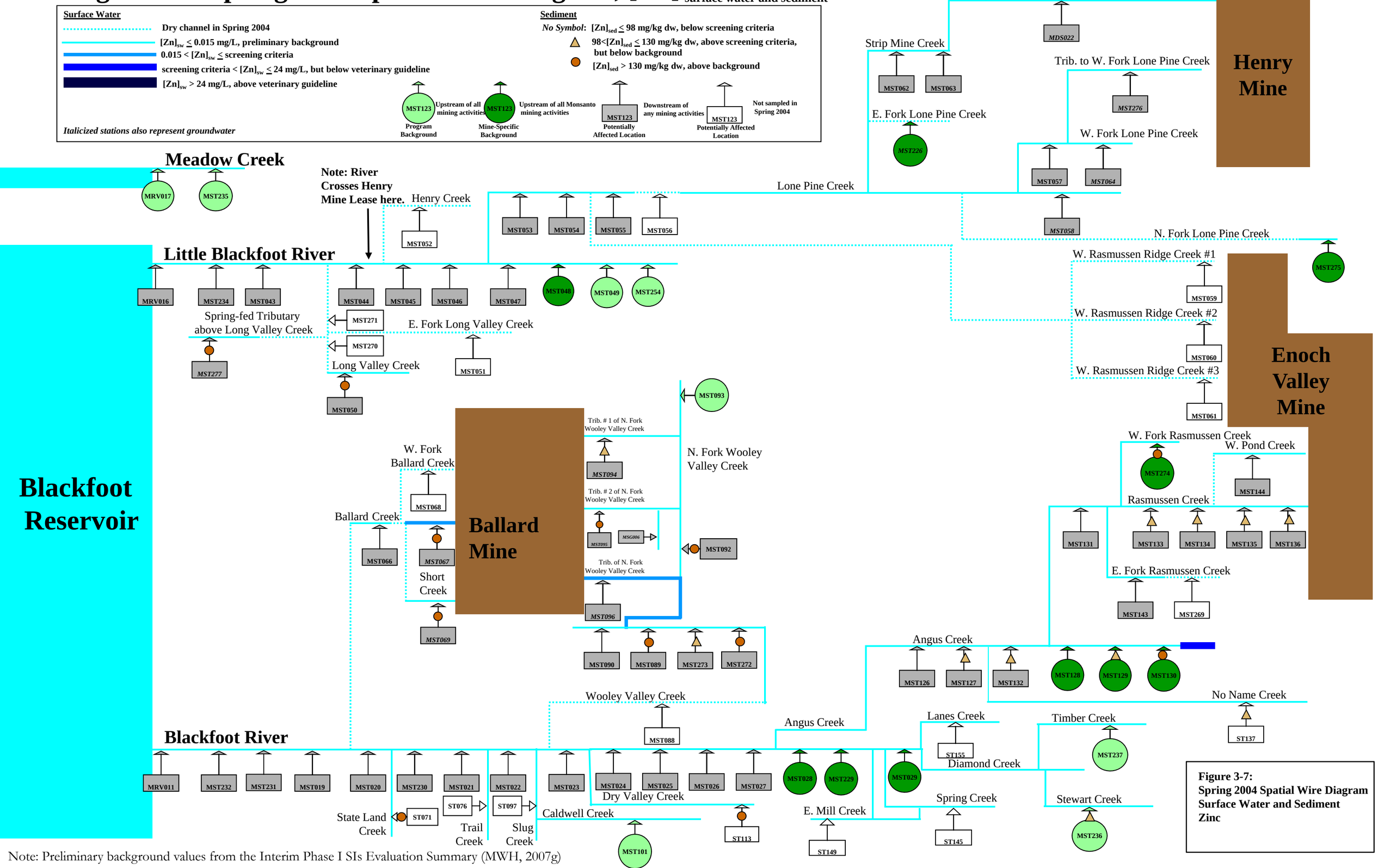
Figure 3-5:
Spring 2004 Spatial Wire Diagram
Surface Water and Sediment
Nickel

Figure 3-6: Spring 2004 Spatial Wire Diagram, [V] surface water and sediment



Note: Preliminary background values from the Interim Phase I SIs Evaluation Summary (MWH, 2007g)

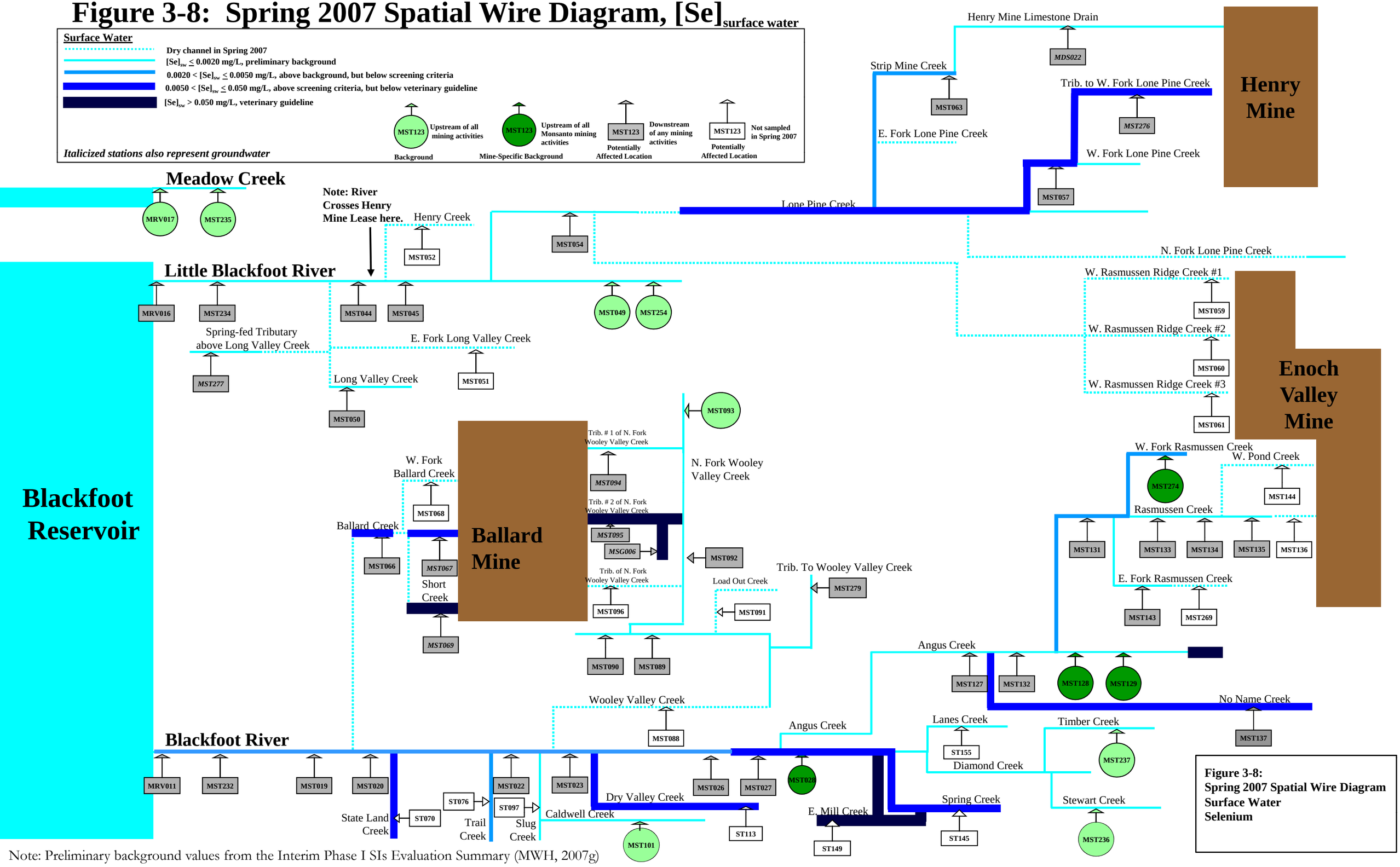
Figure 3-7: Spring 2004 Spatial Wire Diagram, [Zn] surface water and sediment



Note: Preliminary background values from the Interim Phase I SIs Evaluation Summary (MWH, 2007g)

Figure 3-7:
Spring 2004 Spatial Wire Diagram
Surface Water and Sediment
Zinc

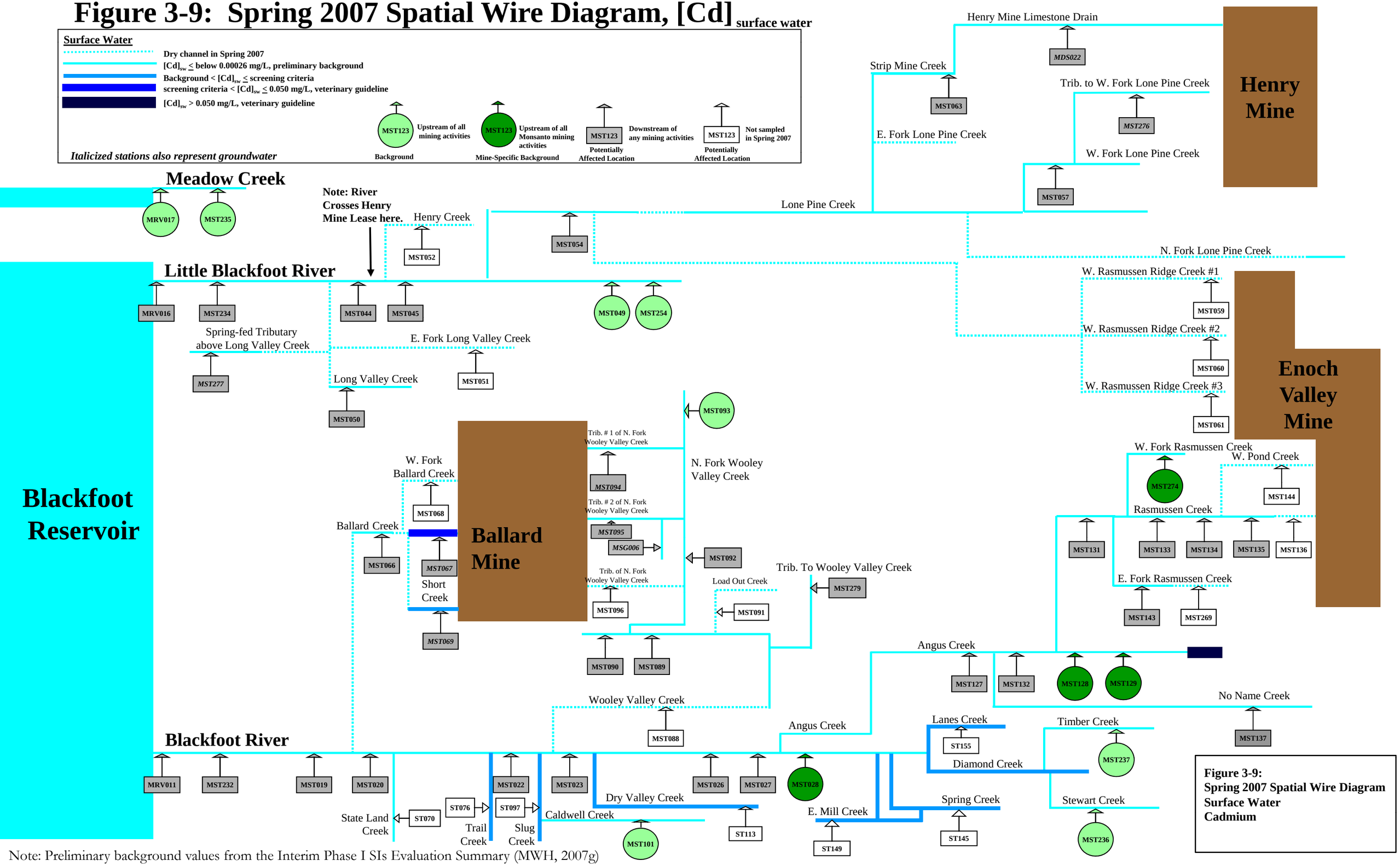
Figure 3-8: Spring 2007 Spatial Wire Diagram, $[Se]_{surface\ water}$



Note: Preliminary background values from the Interim Phase I SIs Evaluation Summary (MWH, 2007g)

Figure 3-8:
Spring 2007 Spatial Wire Diagram
Surface Water
Selenium

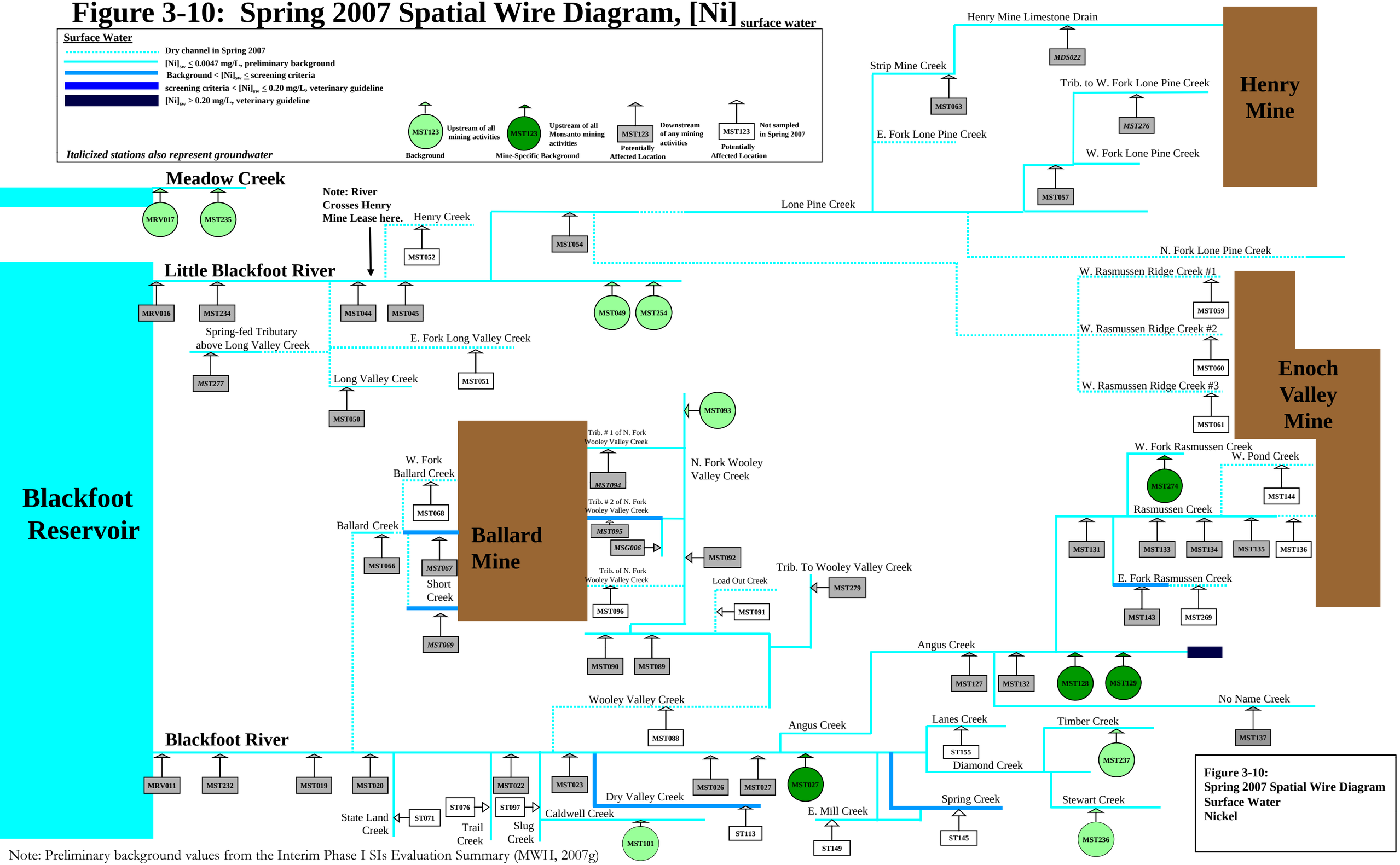
Figure 3-9: Spring 2007 Spatial Wire Diagram, $[Cd]_{surface\ water}$



Note: Preliminary background values from the Interim Phase I SIs Evaluation Summary (MWH, 2007g)

Figure 3-9:
Spring 2007 Spatial Wire Diagram
Surface Water
Cadmium

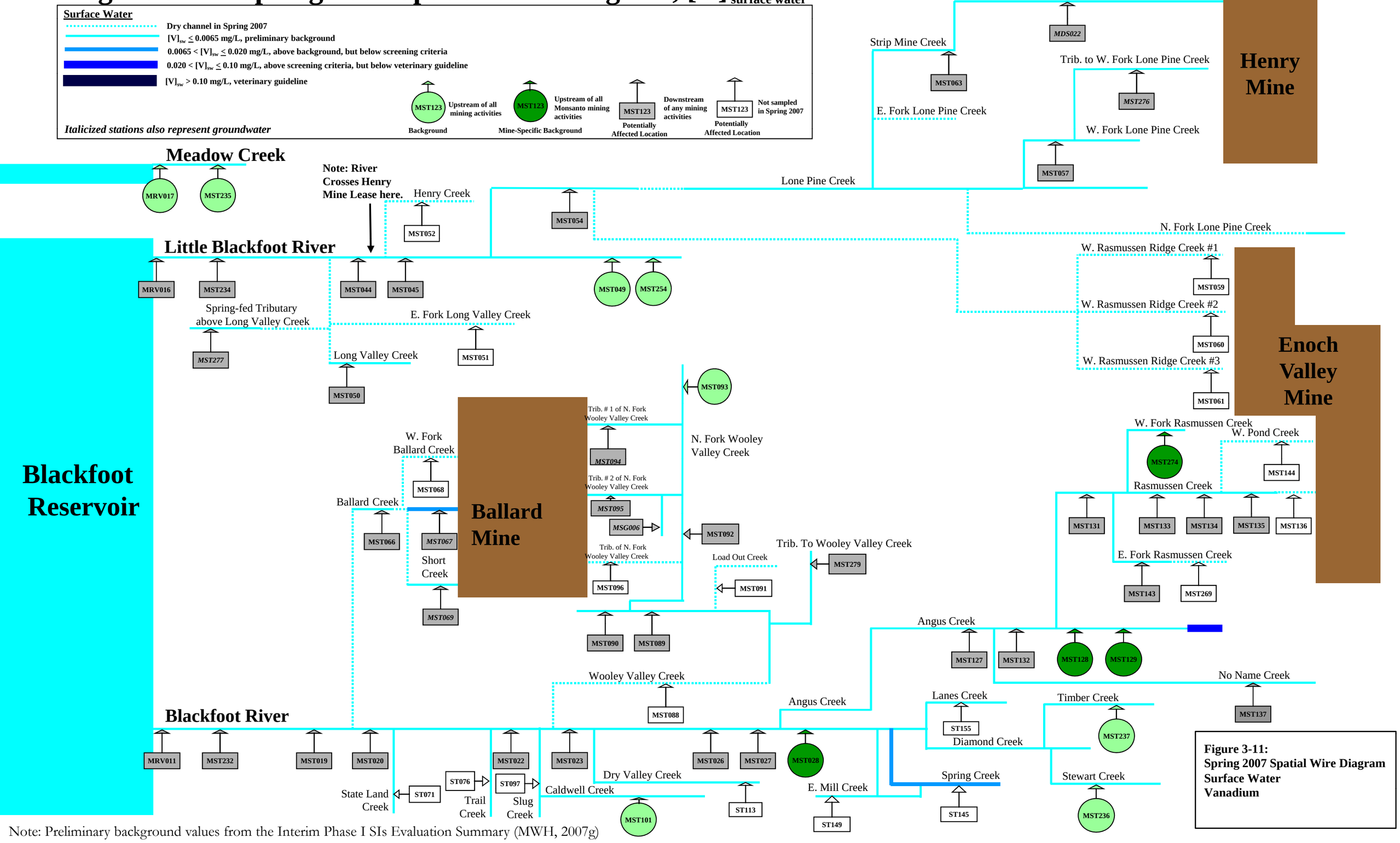
Figure 3-10: Spring 2007 Spatial Wire Diagram, [Ni] surface water



Note: Preliminary background values from the Interim Phase I SIs Evaluation Summary (MWH, 2007g)

Figure 3-10:
Spring 2007 Spatial Wire Diagram
Surface Water
Nickel

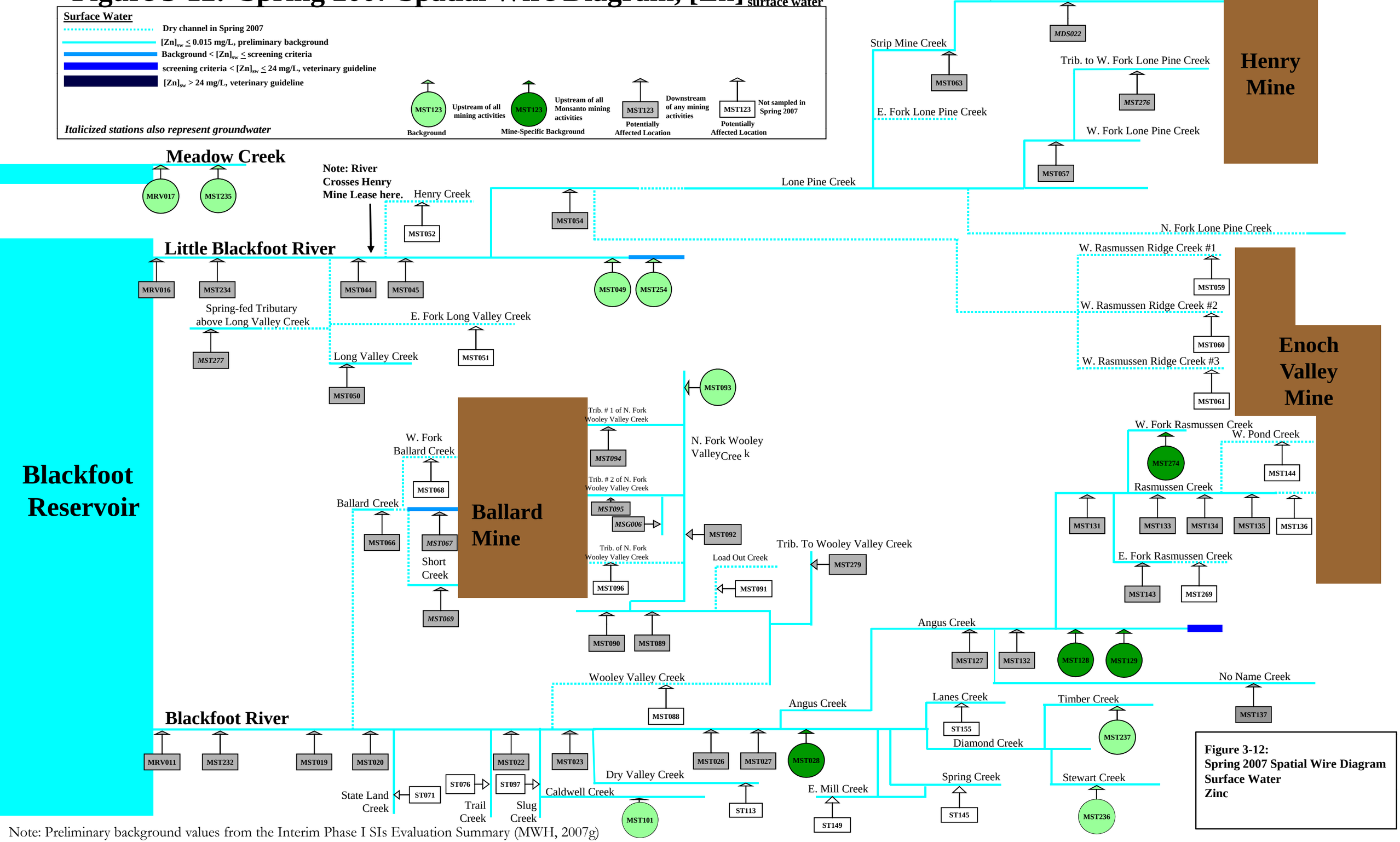
Figure 3-11: Spring 2007 Spatial Wire Diagram, $[V]_{surface\ water}$



Note: Preliminary background values from the Interim Phase I SIs Evaluation Summary (MWH, 2007g)

Figure 3-11:
Spring 2007 Spatial Wire Diagram
Surface Water
Vanadium

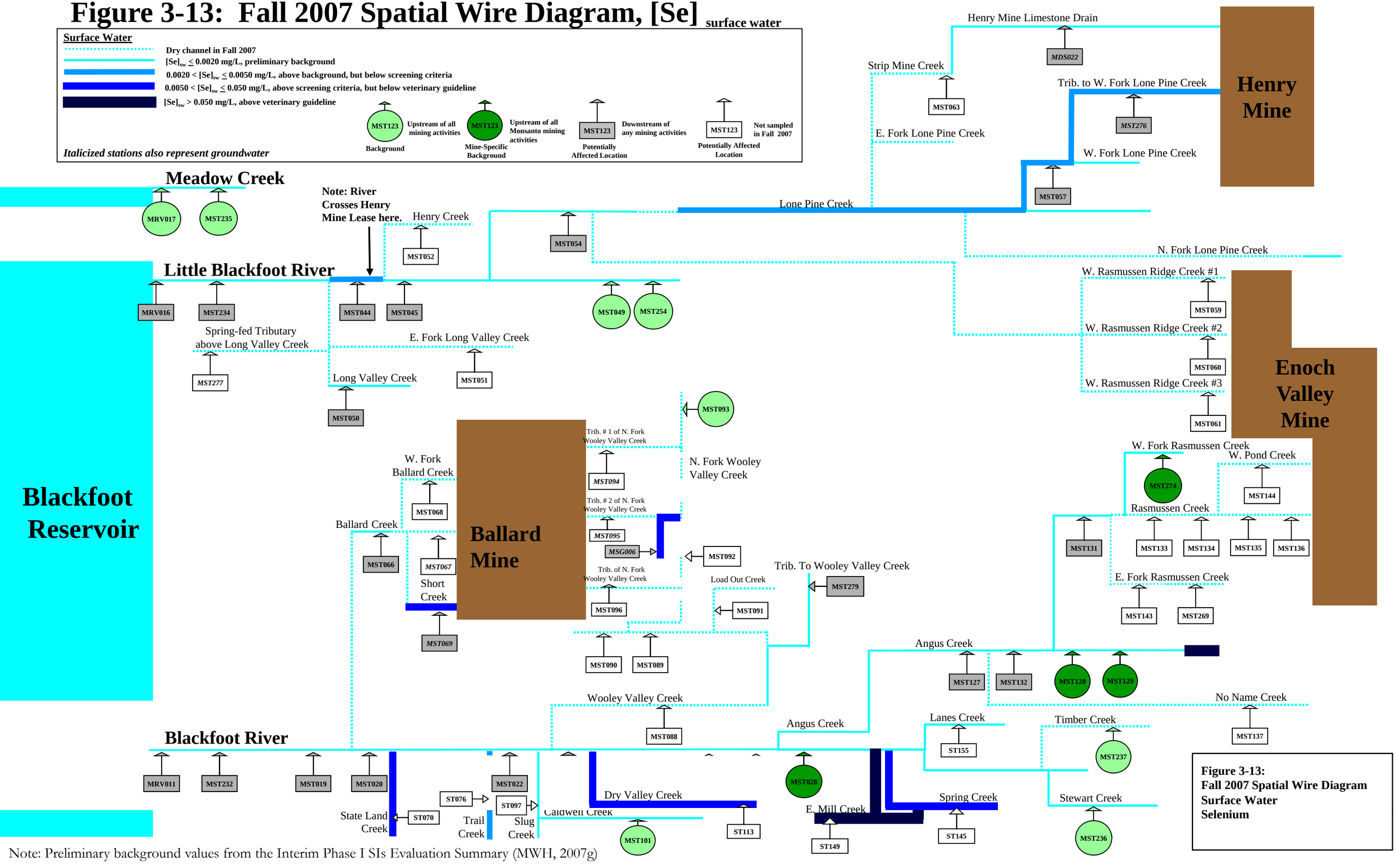
Figure 3-12: Spring 2007 Spatial Wire Diagram, [Zn] surface water



Note: Preliminary background values from the Interim Phase I SIs Evaluation Summary (MWH, 2007g)

Figure 3-12:
Spring 2007 Spatial Wire Diagram
Surface Water
Zinc

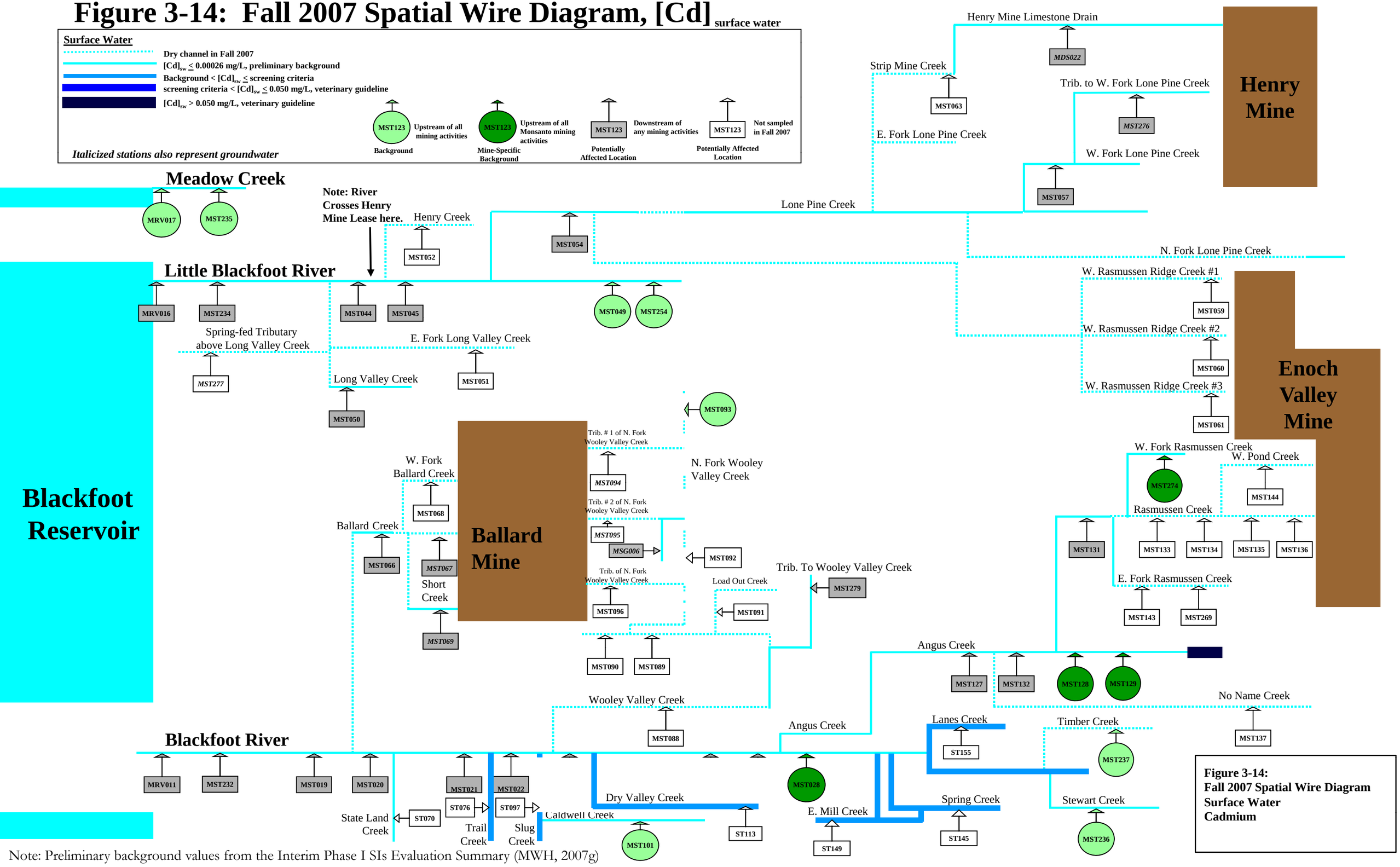
Figure 3-13: Fall 2007 Spatial Wire Diagram, [Se] surface water



Note: Preliminary background values from the Interim Phase I SIs Evaluation Summary (MWH, 2007g)

Figure 3-13:
Fall 2007 Spatial Wire Diagram
Surface Water
Selenium

Figure 3-14: Fall 2007 Spatial Wire Diagram, $[Cd]_{surface\ water}$



Note: Preliminary background values from the Interim Phase I SIs Evaluation Summary (MWH, 2007g)

Figure 3-14:
Fall 2007 Spatial Wire Diagram
Surface Water
Cadmium

Figure 3-15: Fall 2007 Spatial Wire Diagram, [Ni] surface water

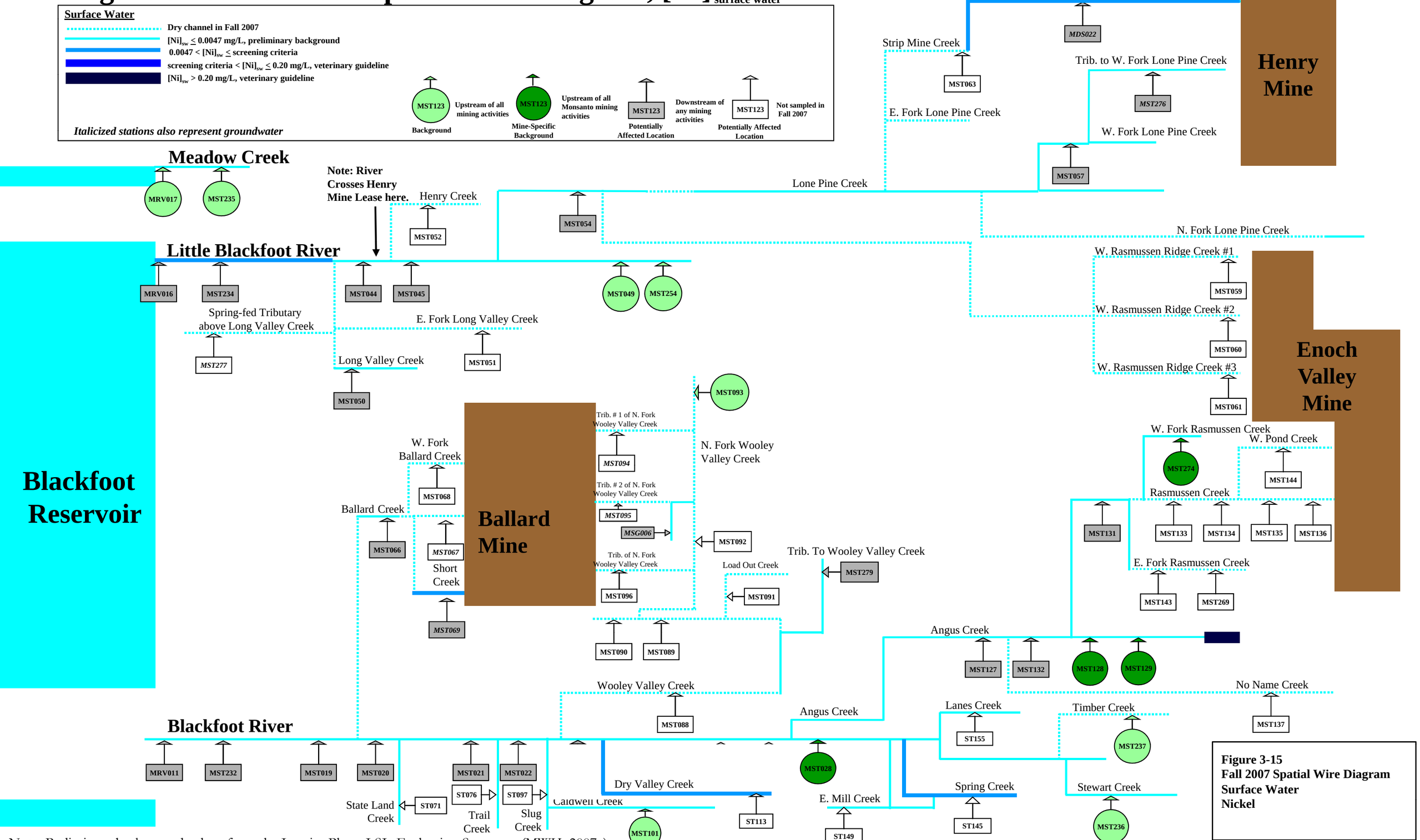


Figure 3-15
Fall 2007 Spatial Wire Diagram
Surface Water
Nickel

Note: Preliminary background values from the Interim Phase I SIs Evaluation Summary (MWH, 2007g)

Figure 3-16: Fall 2007 Spatial Wire Diagram, $[V]_{surface\ water}$

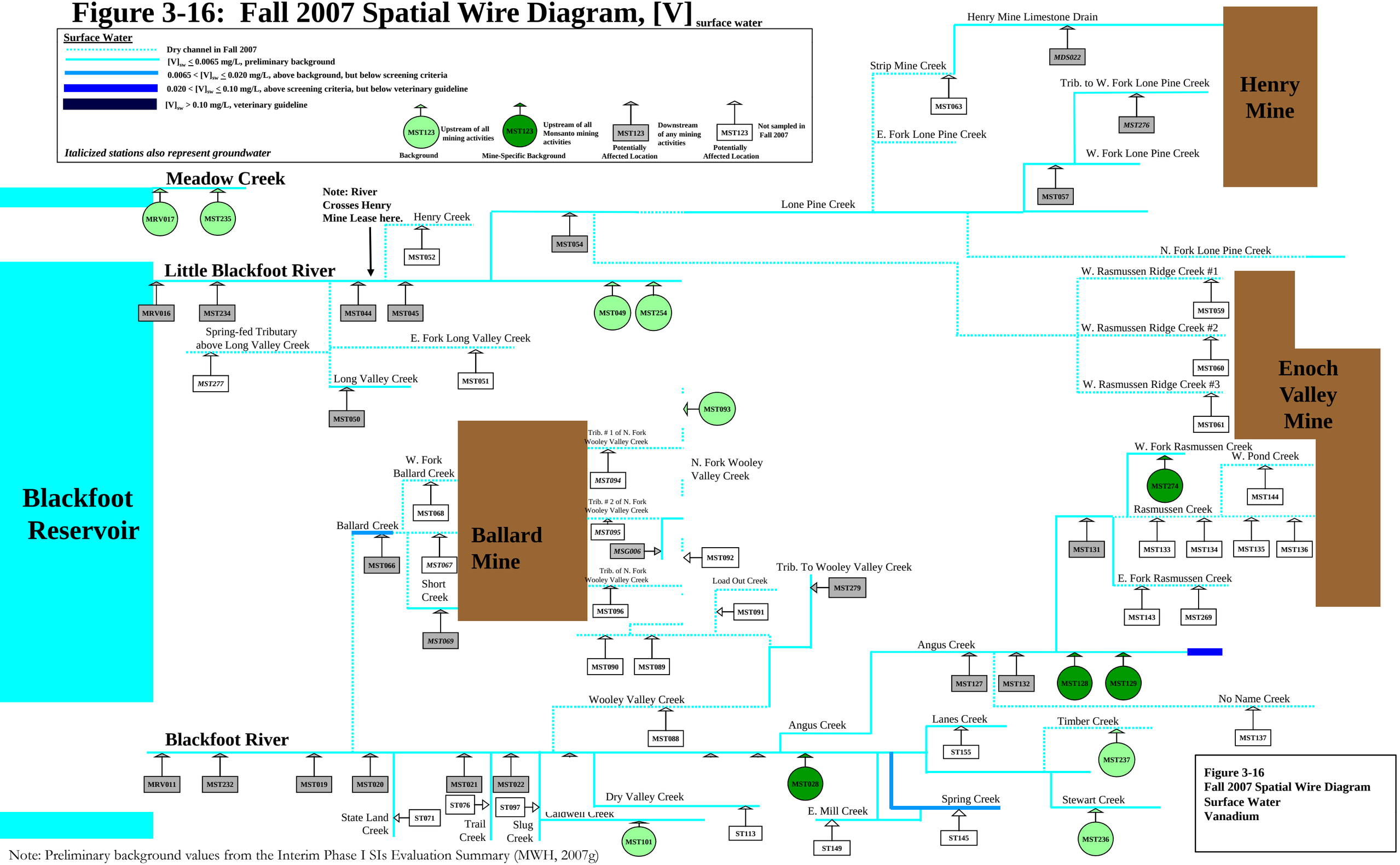
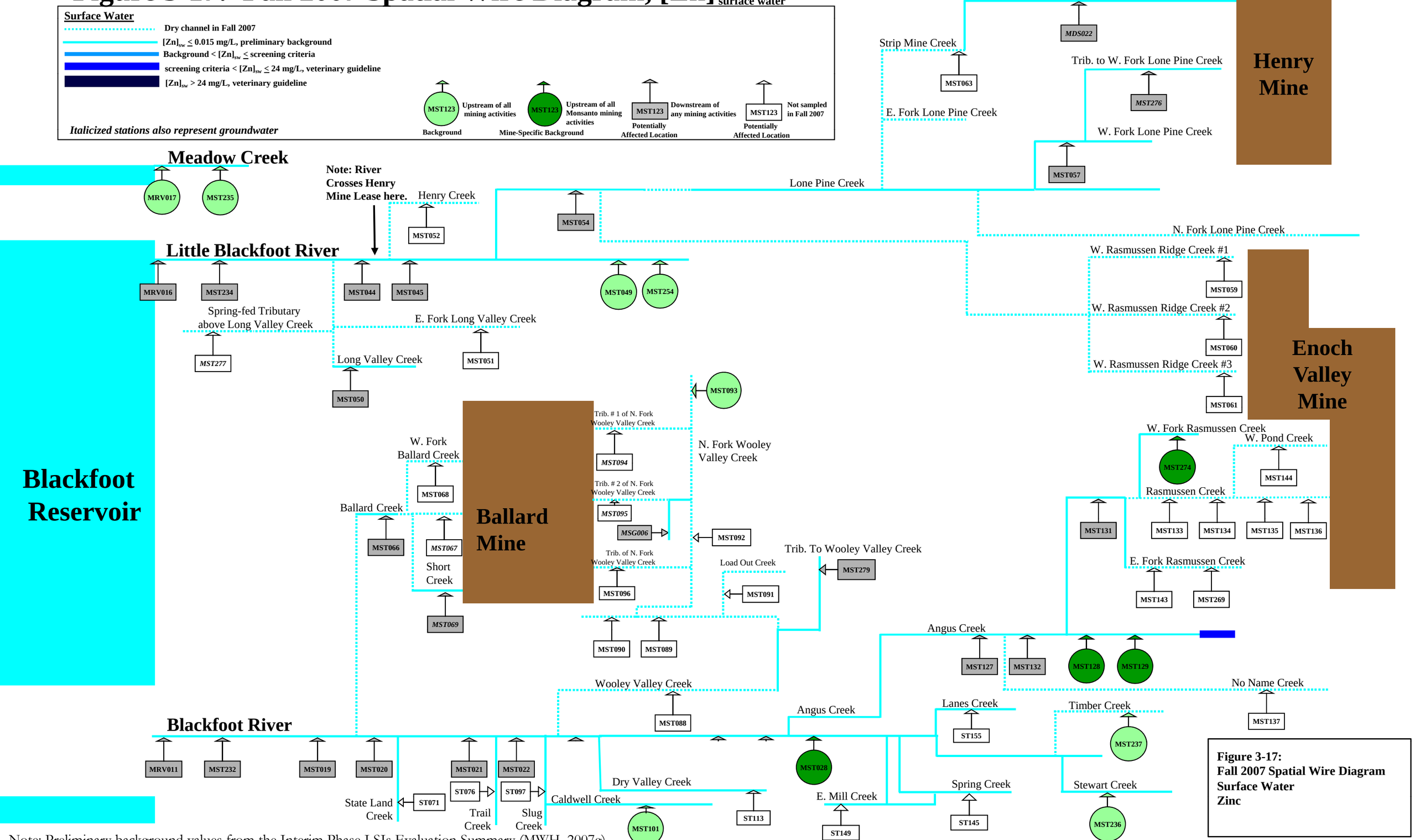


Figure 3-16
Fall 2007 Spatial Wire Diagram
Surface Water
Vanadium

Note: Preliminary background values from the Interim Phase I SIs Evaluation Summary (MWH, 2007g)

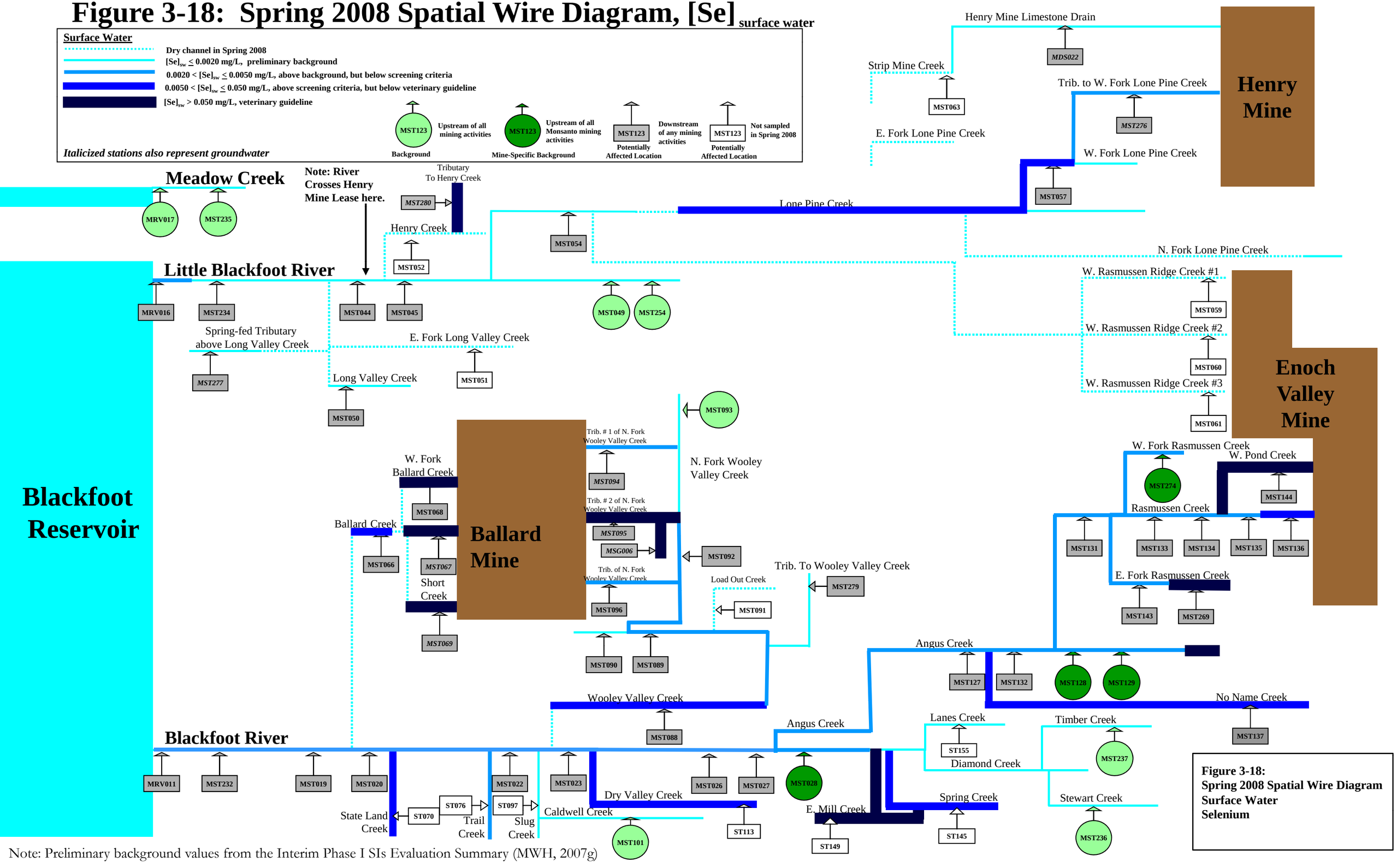
Figure 3-17: Fall 2007 Spatial Wire Diagram, [Zn] surface water



Note: Preliminary background values from the Interim Phase I SIs Evaluation Summary (MWH, 2007g)

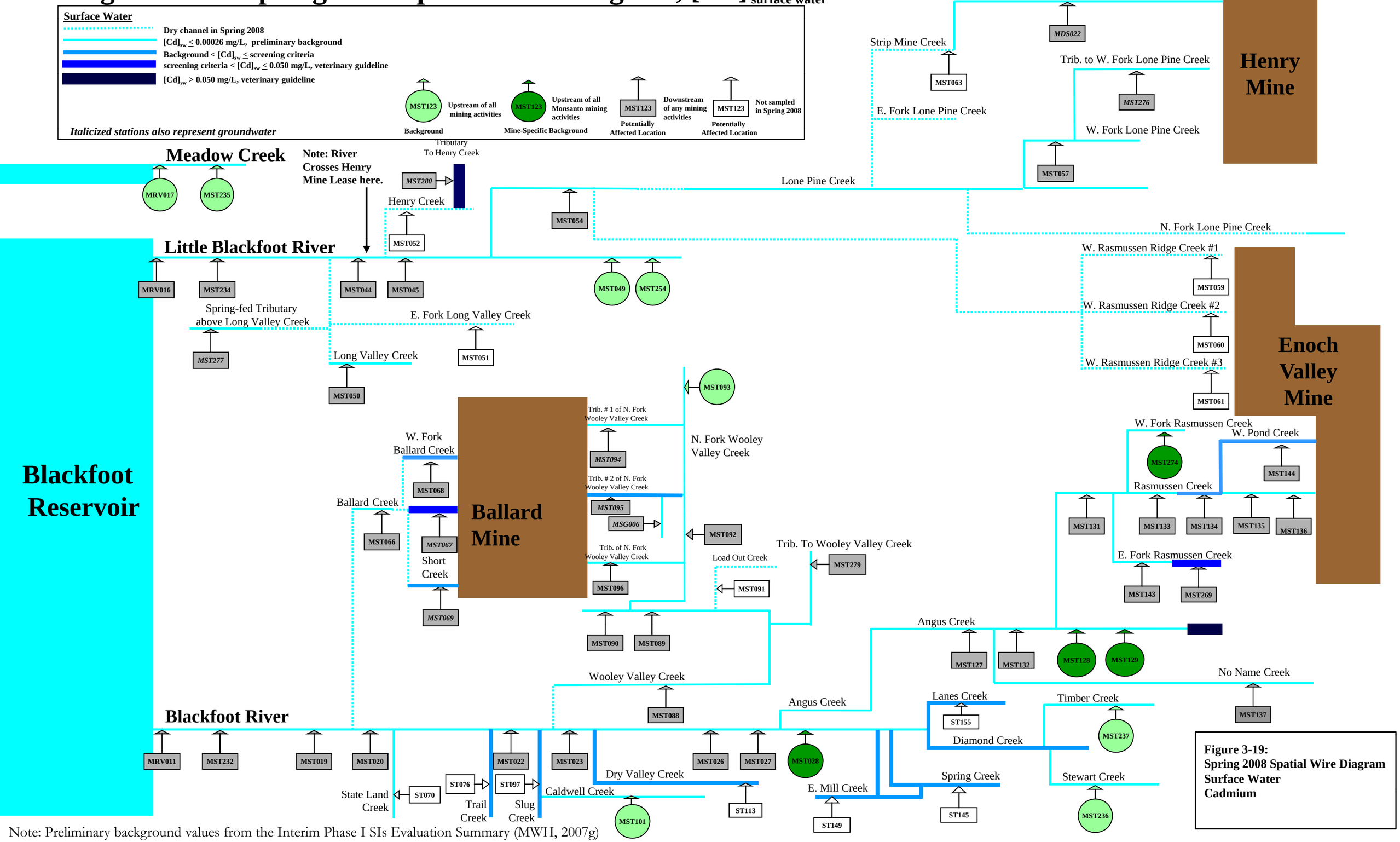
Figure 3-17:
Fall 2007 Spatial Wire Diagram
Surface Water
Zinc

Figure 3-18: Spring 2008 Spatial Wire Diagram, $[Se]_{surface\ water}$



Note: Preliminary background values from the Interim Phase I SIs Evaluation Summary (MWH, 2007g)

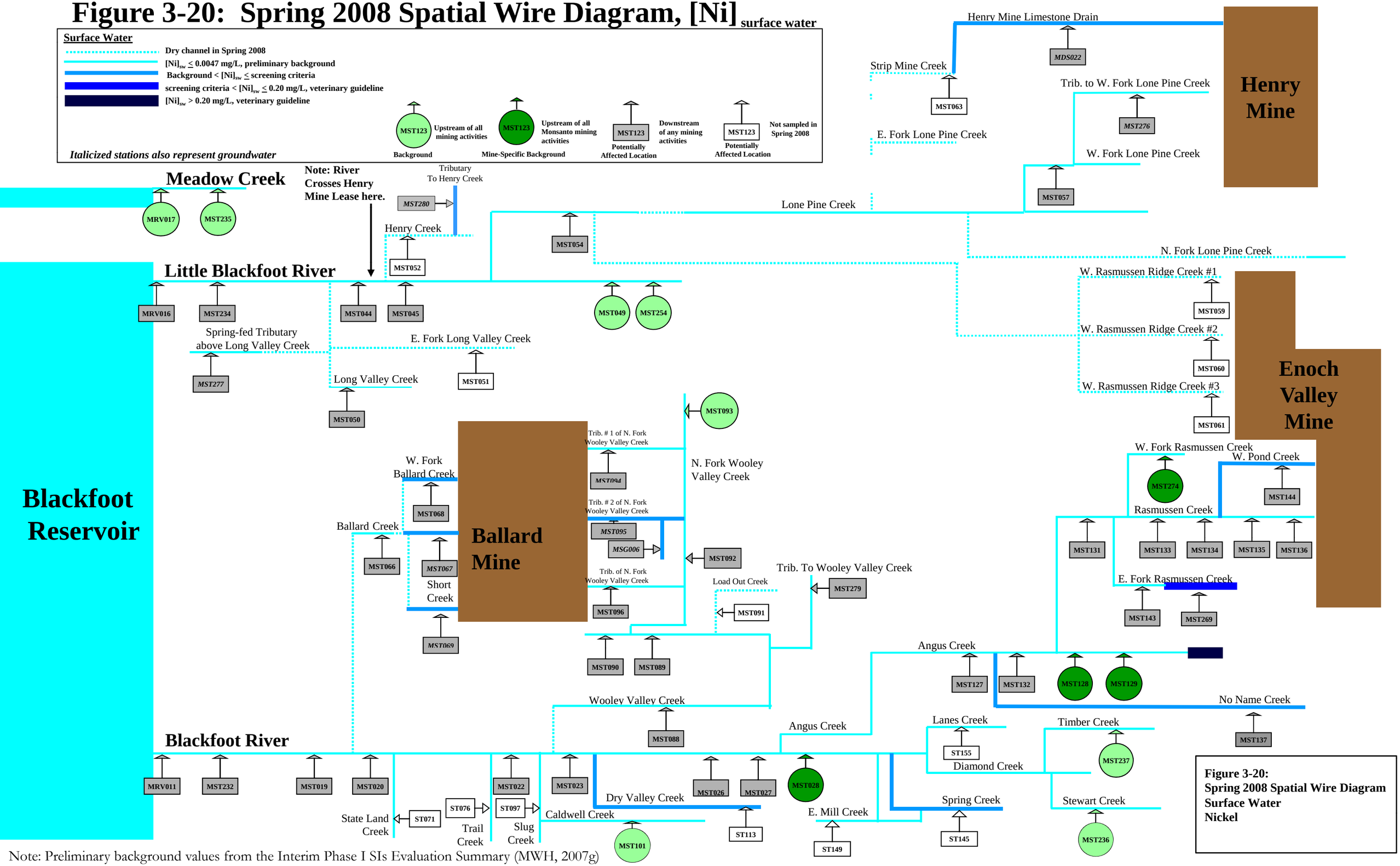
Figure 3-19: Spring 2008 Spatial Wire Diagram, [Cd] surface water



Note: Preliminary background values from the Interim Phase I SIs Evaluation Summary (MWH, 2007g)

Figure 3-19:
Spring 2008 Spatial Wire Diagram
Surface Water
Cadmium

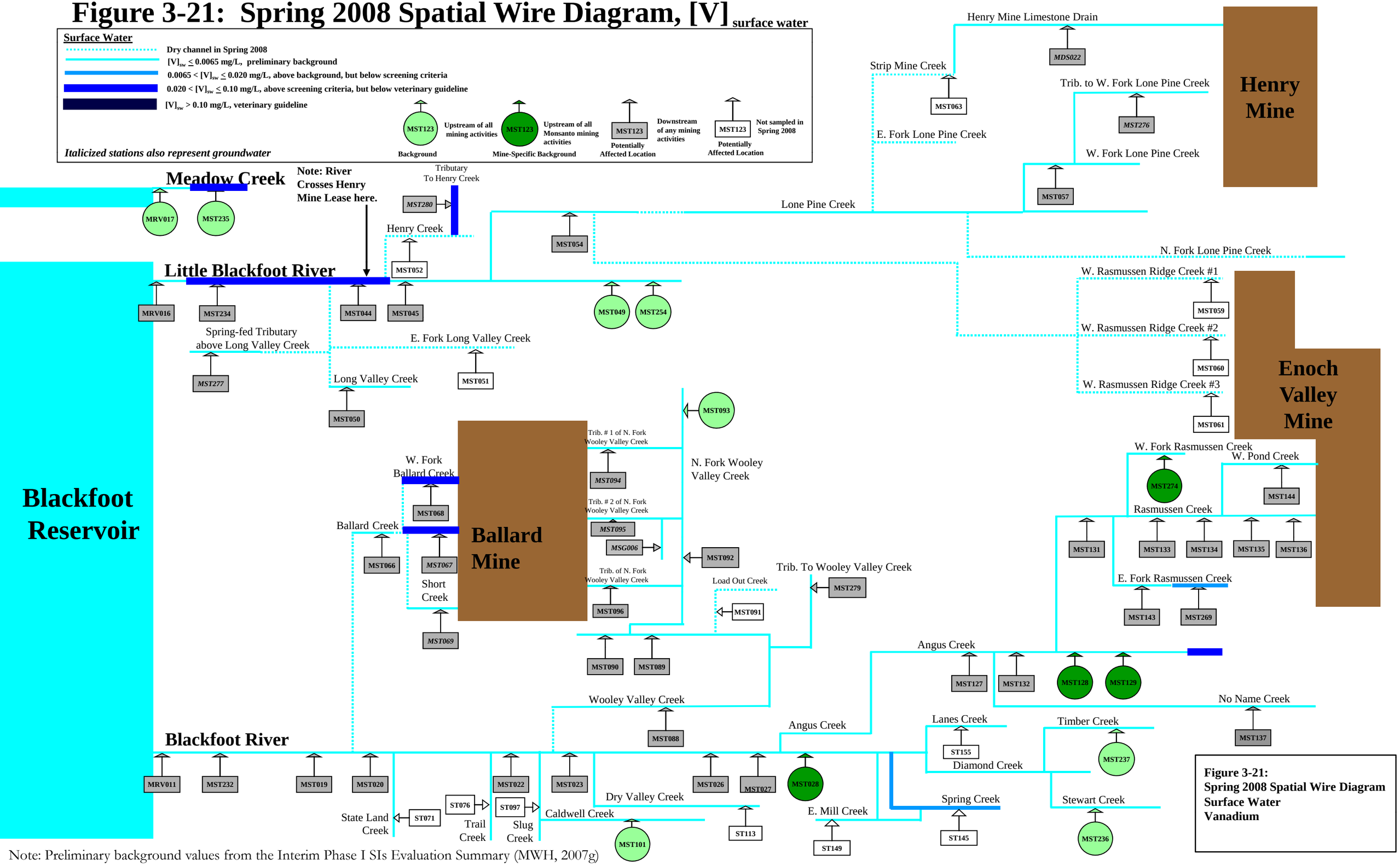
Figure 3-20: Spring 2008 Spatial Wire Diagram, [Ni] surface water



Note: Preliminary background values from the Interim Phase I SIs Evaluation Summary (MWH, 2007g)

Figure 3-20:
Spring 2008 Spatial Wire Diagram
Surface Water
Nickel

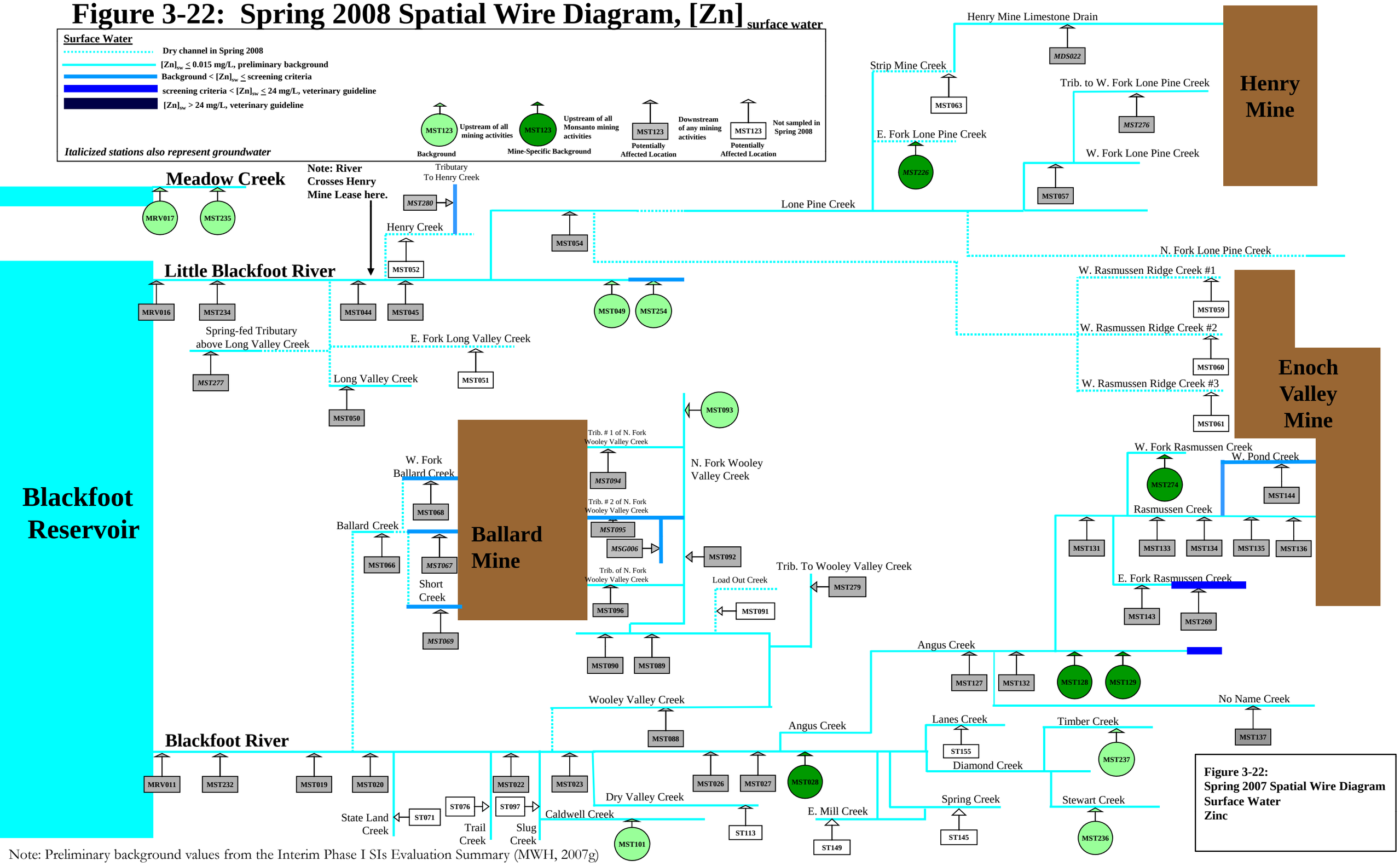
Figure 3-21: Spring 2008 Spatial Wire Diagram, [V] surface water



Note: Preliminary background values from the Interim Phase I SIs Evaluation Summary (MWH, 2007g)

Figure 3-21:
Spring 2008 Spatial Wire Diagram
Surface Water
Vanadium

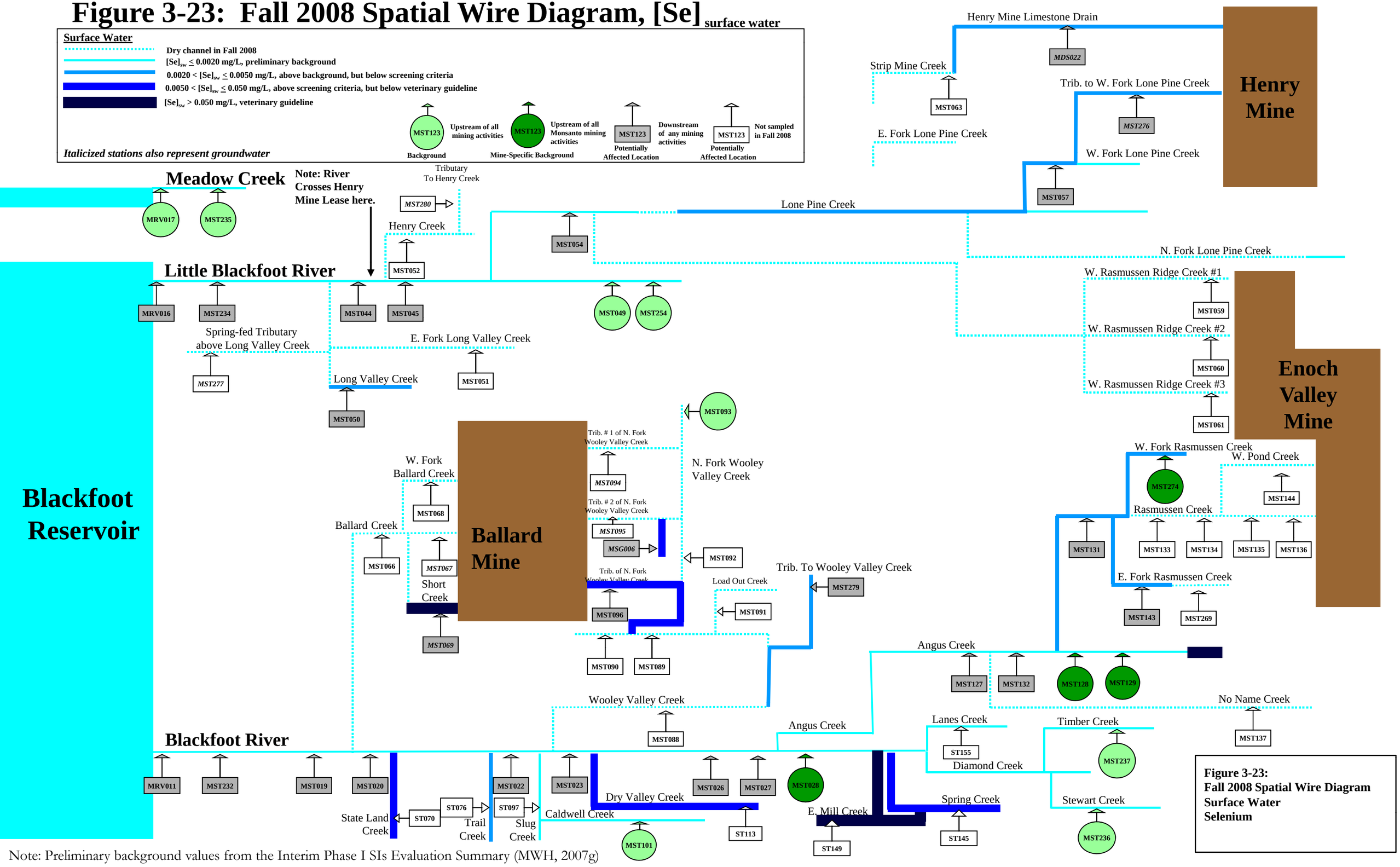
Figure 3-22: Spring 2008 Spatial Wire Diagram, $[Zn]_{surface\ water}$



Note: Preliminary background values from the Interim Phase I SIs Evaluation Summary (MWH, 2007g)

Figure 3-22:
Spring 2007 Spatial Wire Diagram
Surface Water
Zinc

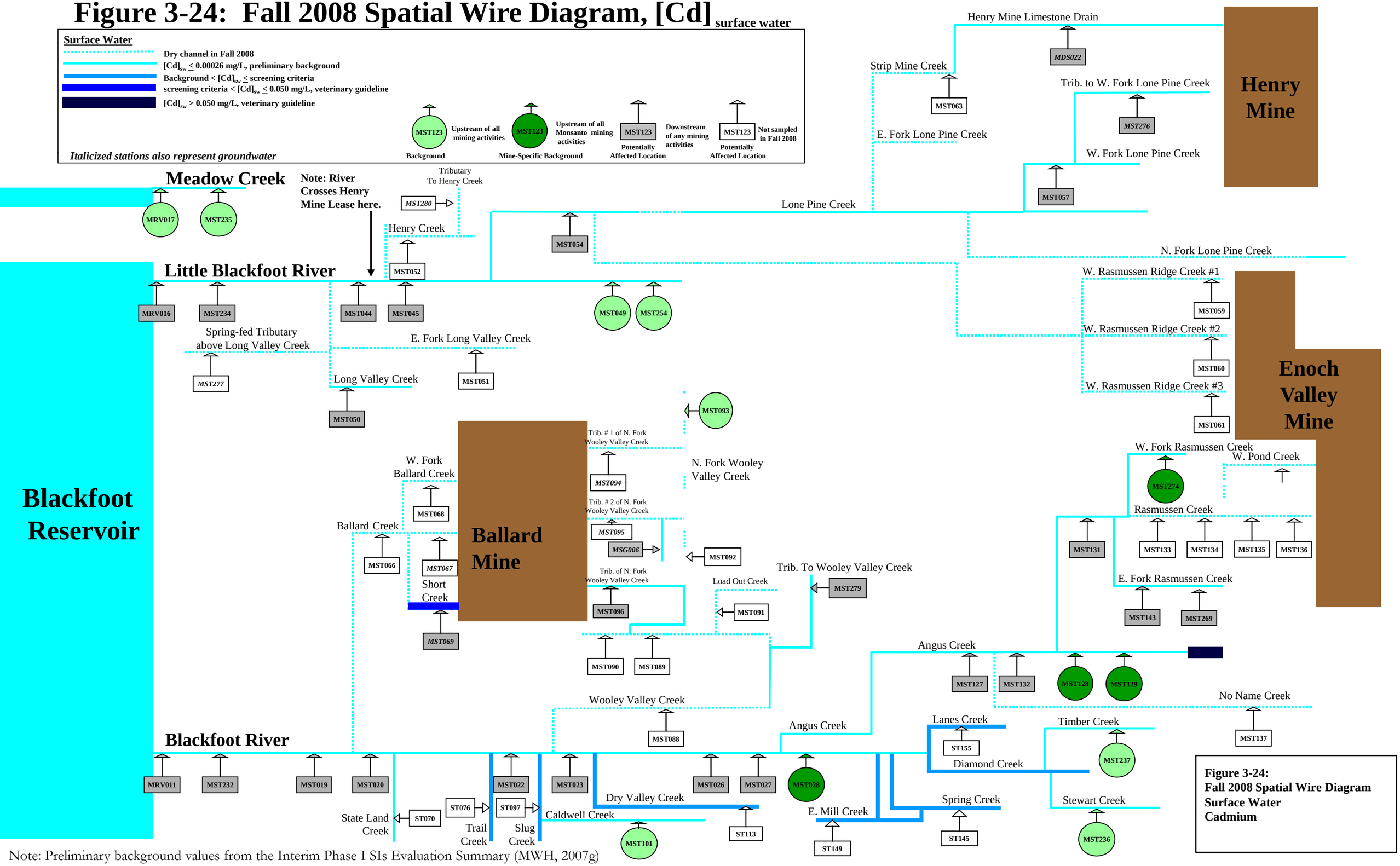
Figure 3-23: Fall 2008 Spatial Wire Diagram, $[Se]_{surface\ water}$



Note: Preliminary background values from the Interim Phase I SIs Evaluation Summary (MWH, 2007g)

Figure 3-23:
Fall 2008 Spatial Wire Diagram
Surface Water
Selenium

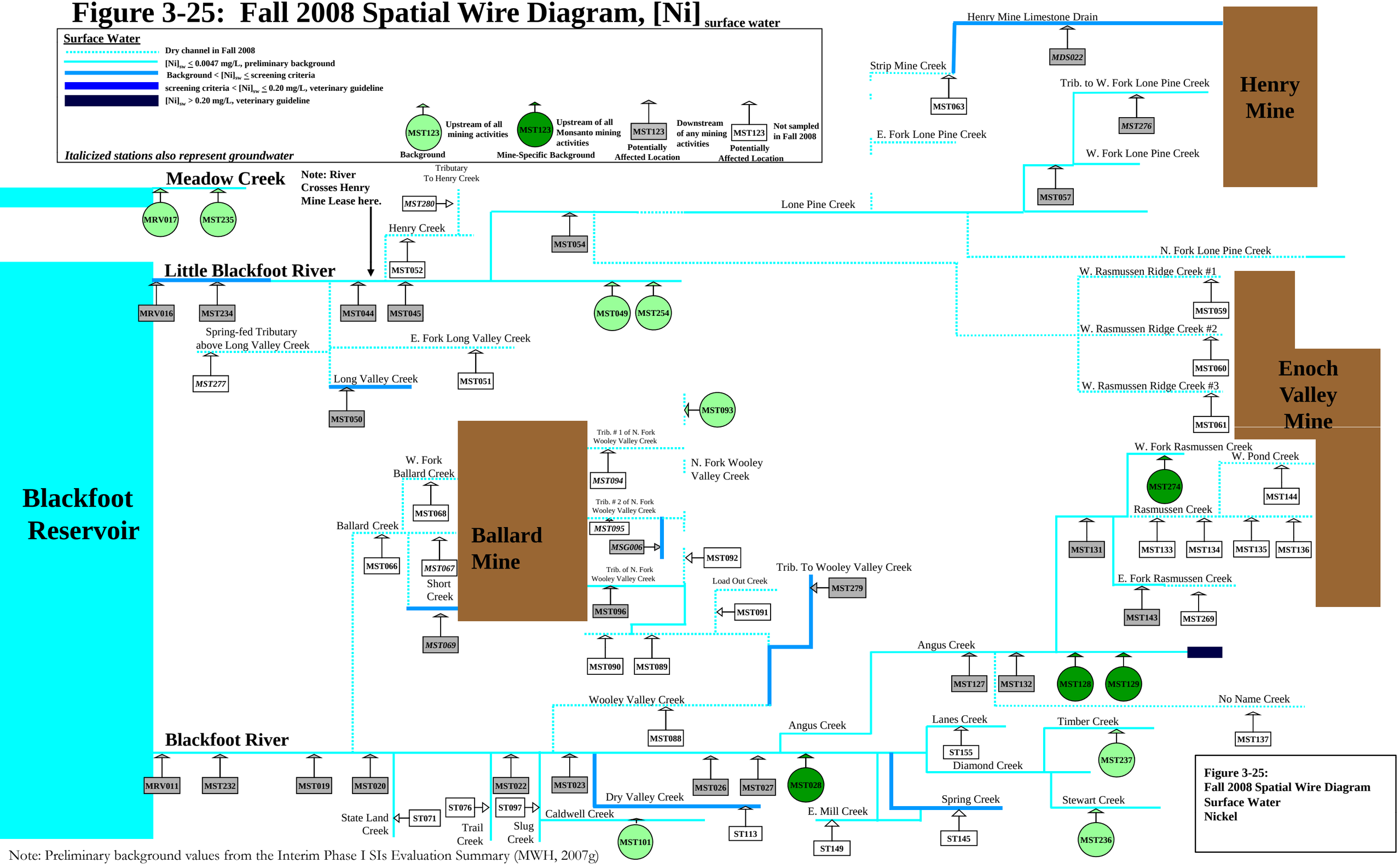
Figure 3-24: Fall 2008 Spatial Wire Diagram, [Cd] surface water



Note: Preliminary background values from the Interim Phase I SIs Evaluation Summary (MWH, 2007g)

Figure 3-24:
Fall 2008 Spatial Wire Diagram
Surface Water
Cadmium

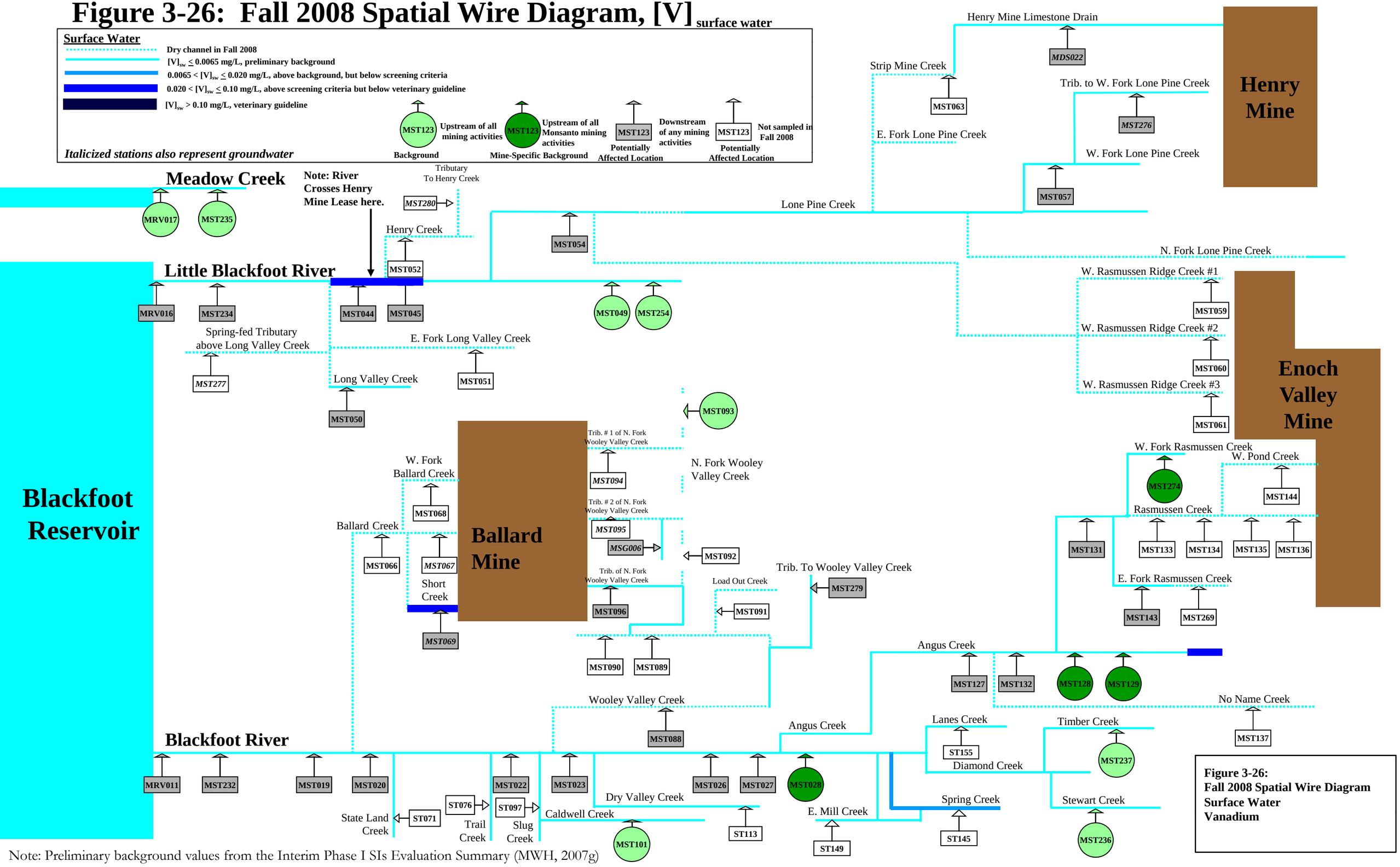
Figure 3-25: Fall 2008 Spatial Wire Diagram, $[Ni]_{surface\ water}$



Note: Preliminary background values from the Interim Phase I SIs Evaluation Summary (MWH, 2007g)

Figure 3-25:
Fall 2008 Spatial Wire Diagram
Surface Water
Nickel

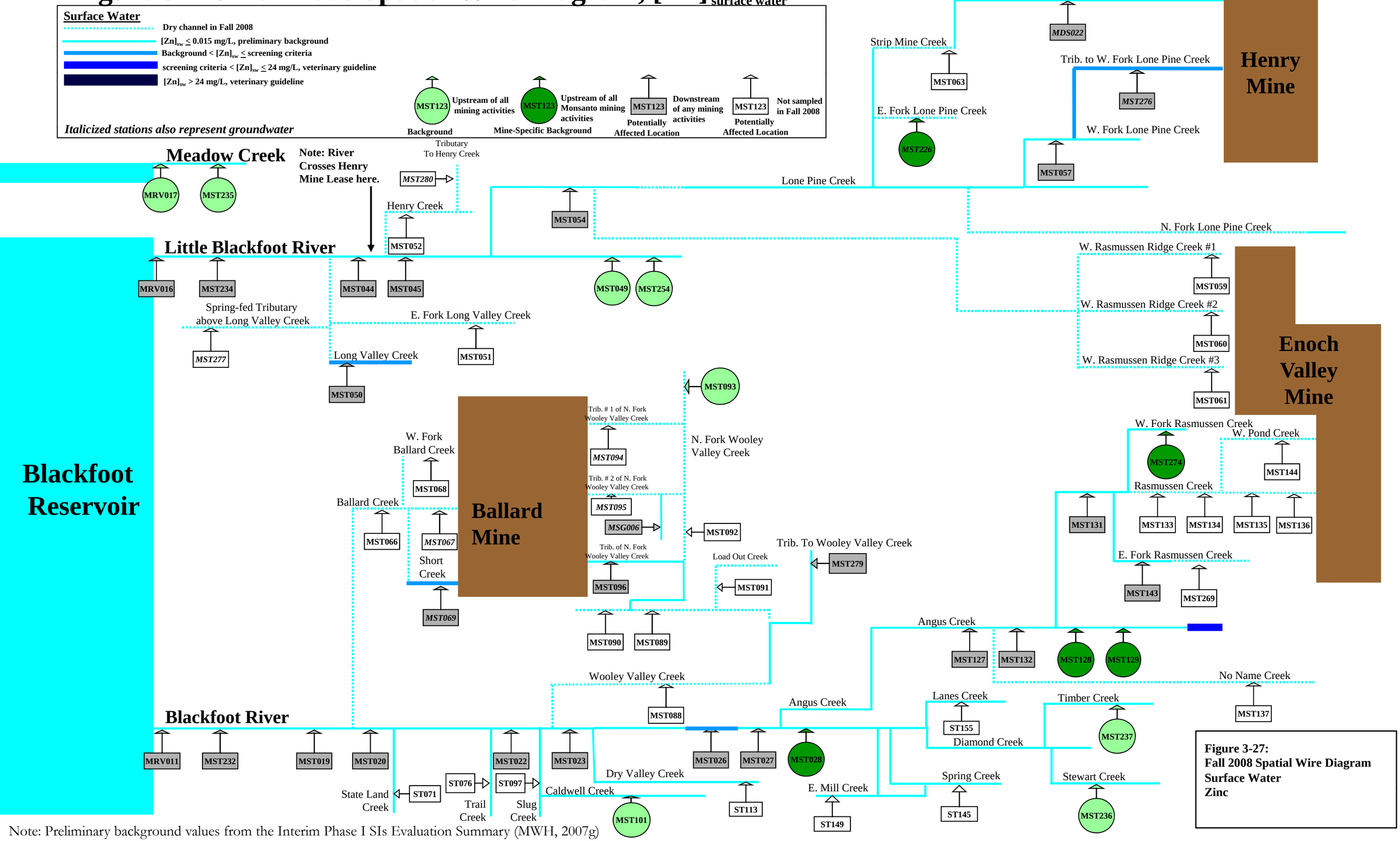
Figure 3-26: Fall 2008 Spatial Wire Diagram, $[V]_{surface\ water}$



Note: Preliminary background values from the Interim Phase I SIs Evaluation Summary (MWH, 2007g)

Figure 3-26:
Fall 2008 Spatial Wire Diagram
Surface Water
Vanadium

Figure 3-27: Fall 2008 Spatial Wire Diagram, $[Zn]_{surface\ water}$



Note: Preliminary background values from the Interim Phase I SIs Evaluation Summary (MWH, 2007g)

Figure 3-27:
Fall 2008 Spatial Wire Diagram
Surface Water
Zinc

FIGURE 3-28
Ballard Mine Selenium Timeplot - MST069

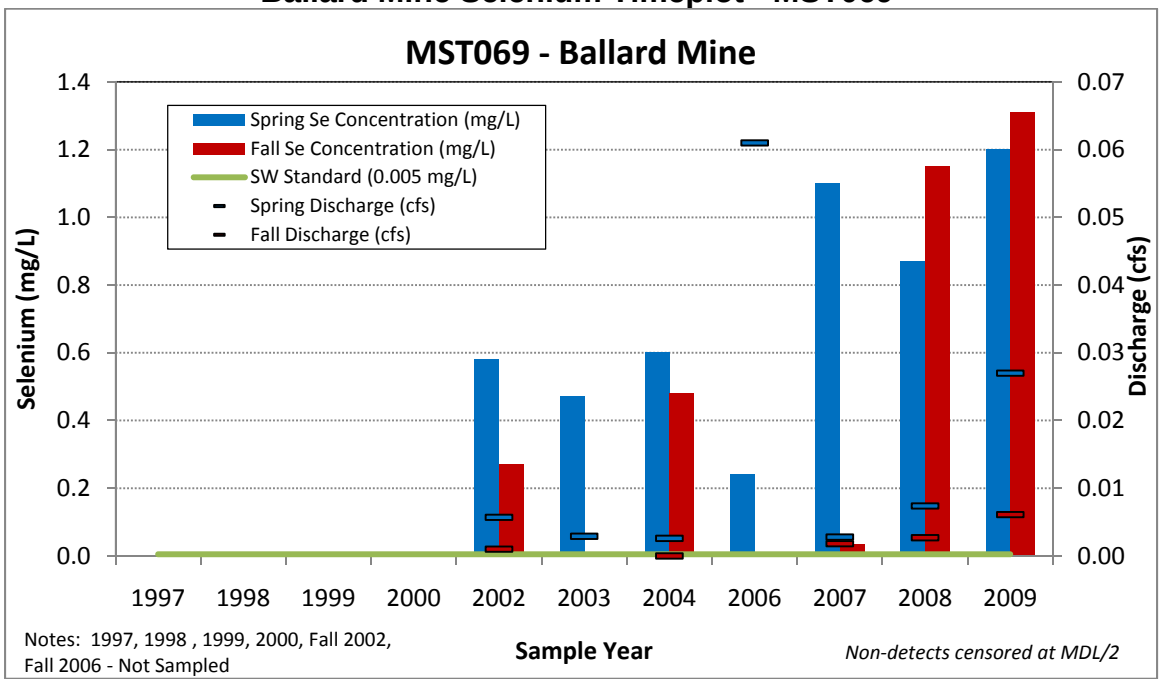


FIGURE 3-29
Ballard Mine Selenium Timeplot - MST066

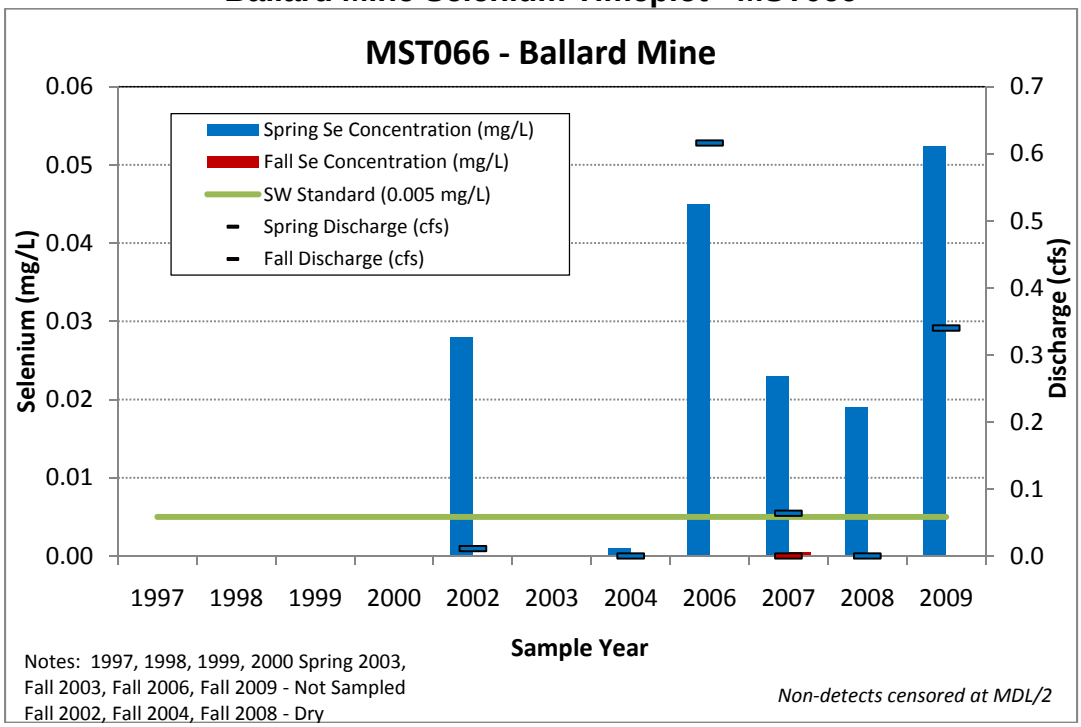


FIGURE 3-30
Ballard Mine Spring, Seep, and Headwater Discharge Recession Plot, Summer 2006

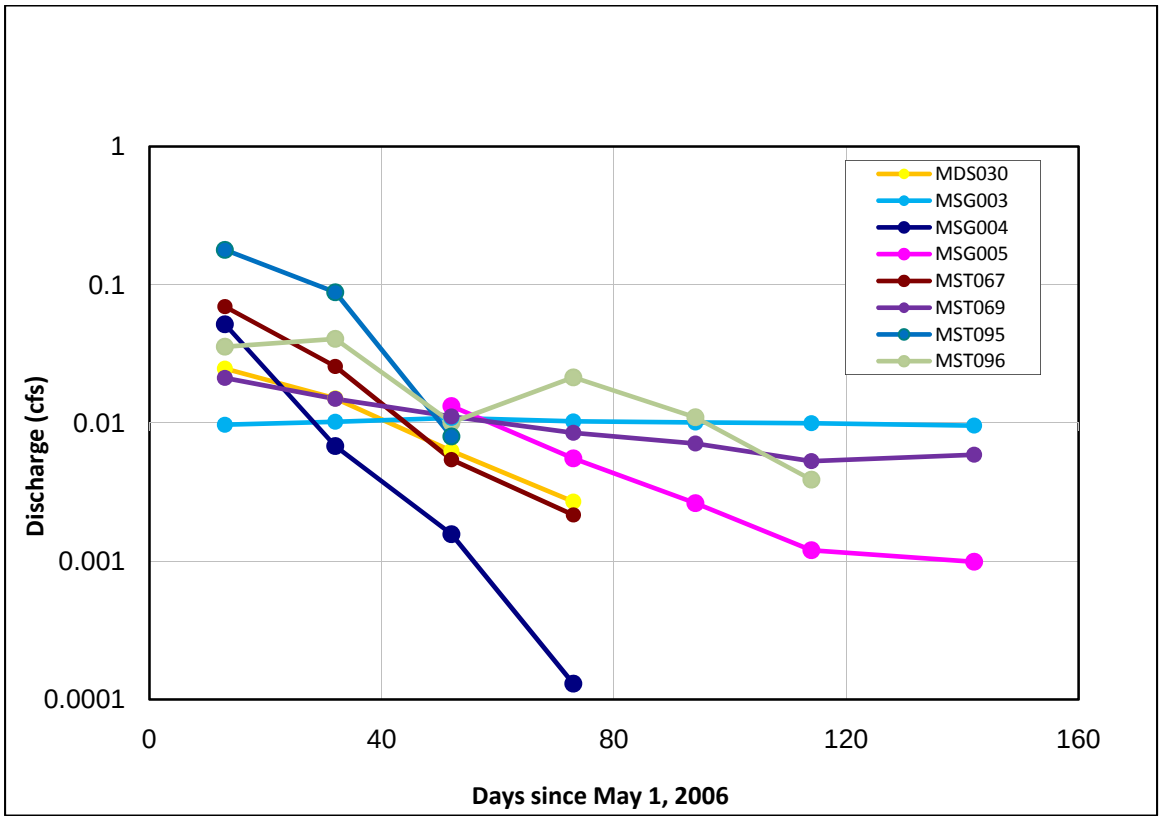


FIGURE 3-31
Ballard Mine Selenium Timeplot - MST069

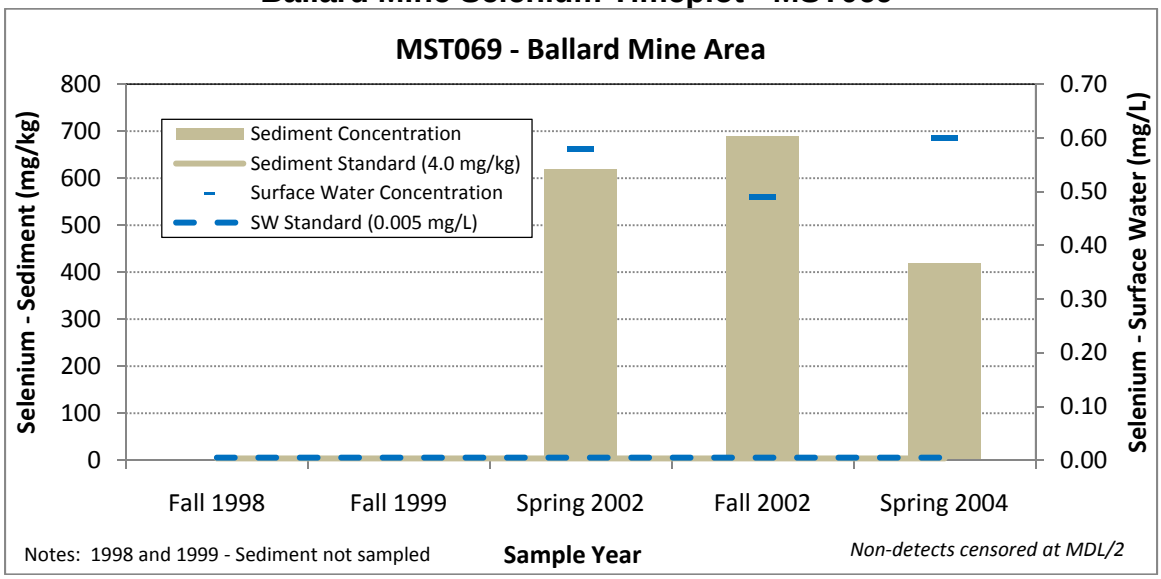


FIGURE 3-32
Ballard Mine Selenium Timeplot - MST066

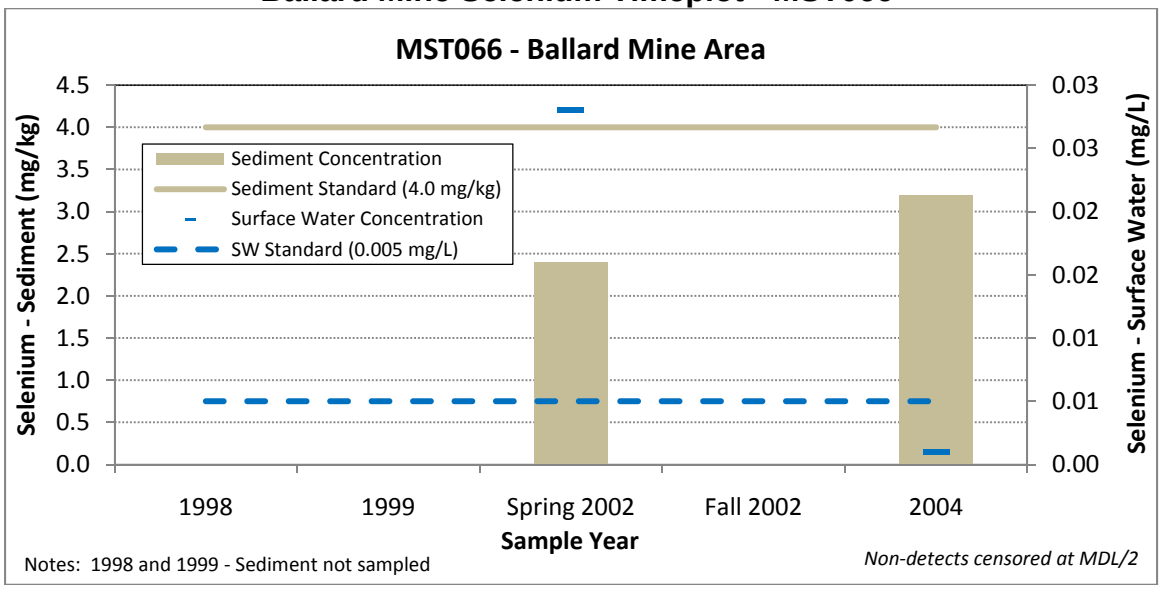


Figure 3-33: Spring 2004 Spatial Wire Diagram, $[Se]_{forage\ fish\ and\ salmonids}$

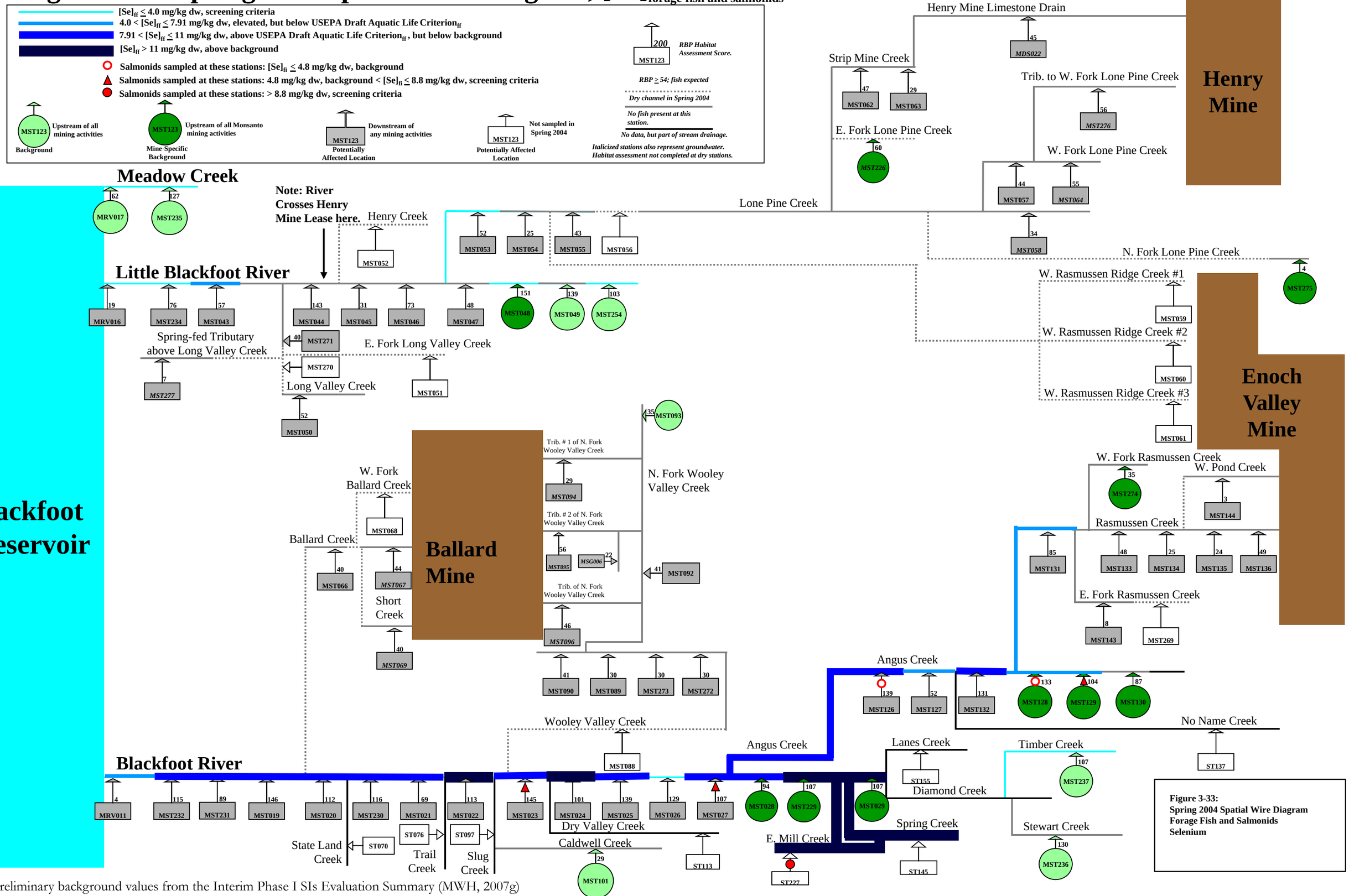


Figure 3-33:
Spring 2004 Spatial Wire Diagram
Forage Fish and Salmonids
Selenium

Note: Preliminary background values from the Interim Phase I SIs Evaluation Summary (MWH, 2007g)

Figure 3-34: Spring 2004 Spatial Wire Diagram, $[Cd]_{forage\ fish}$

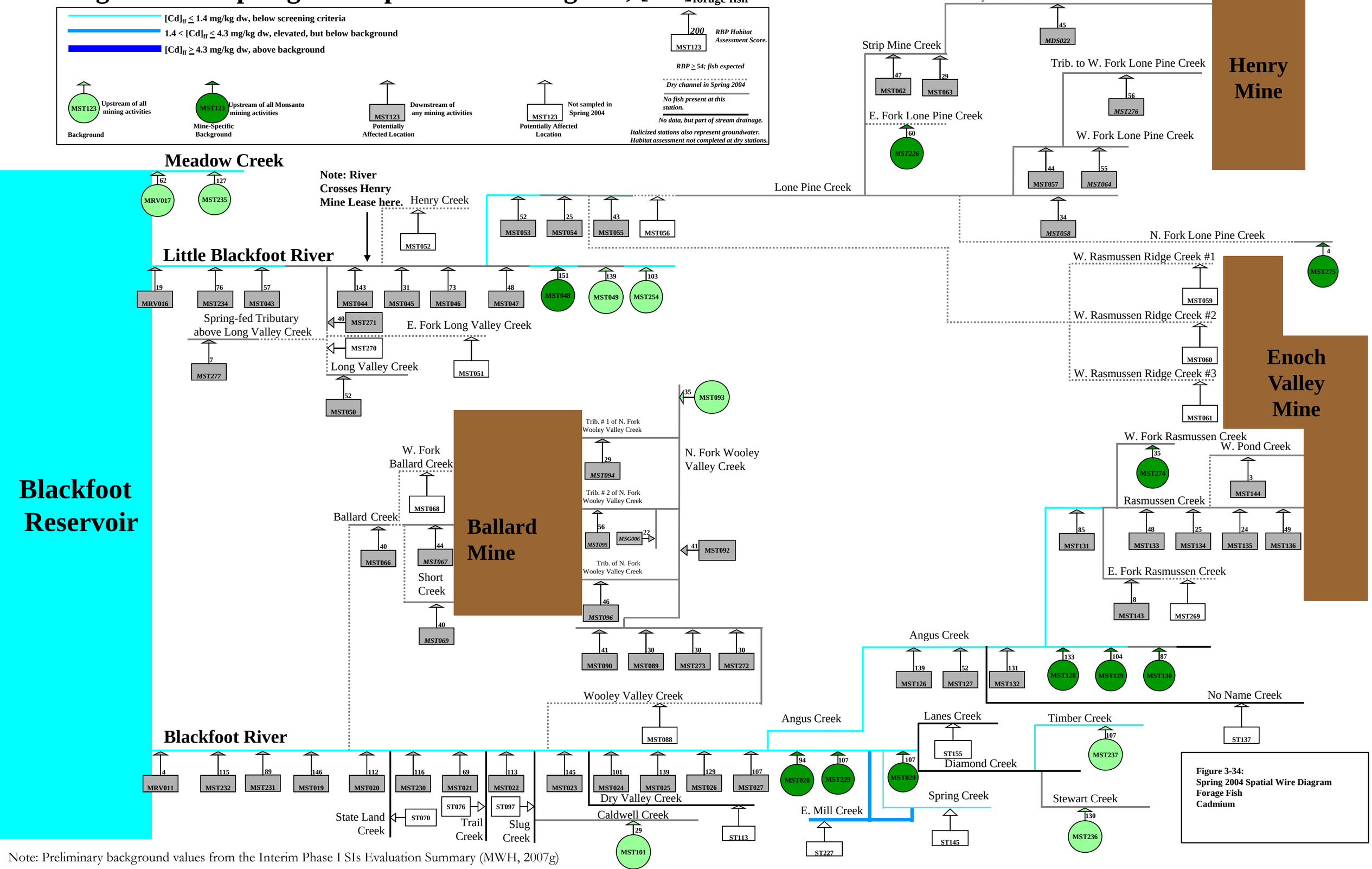
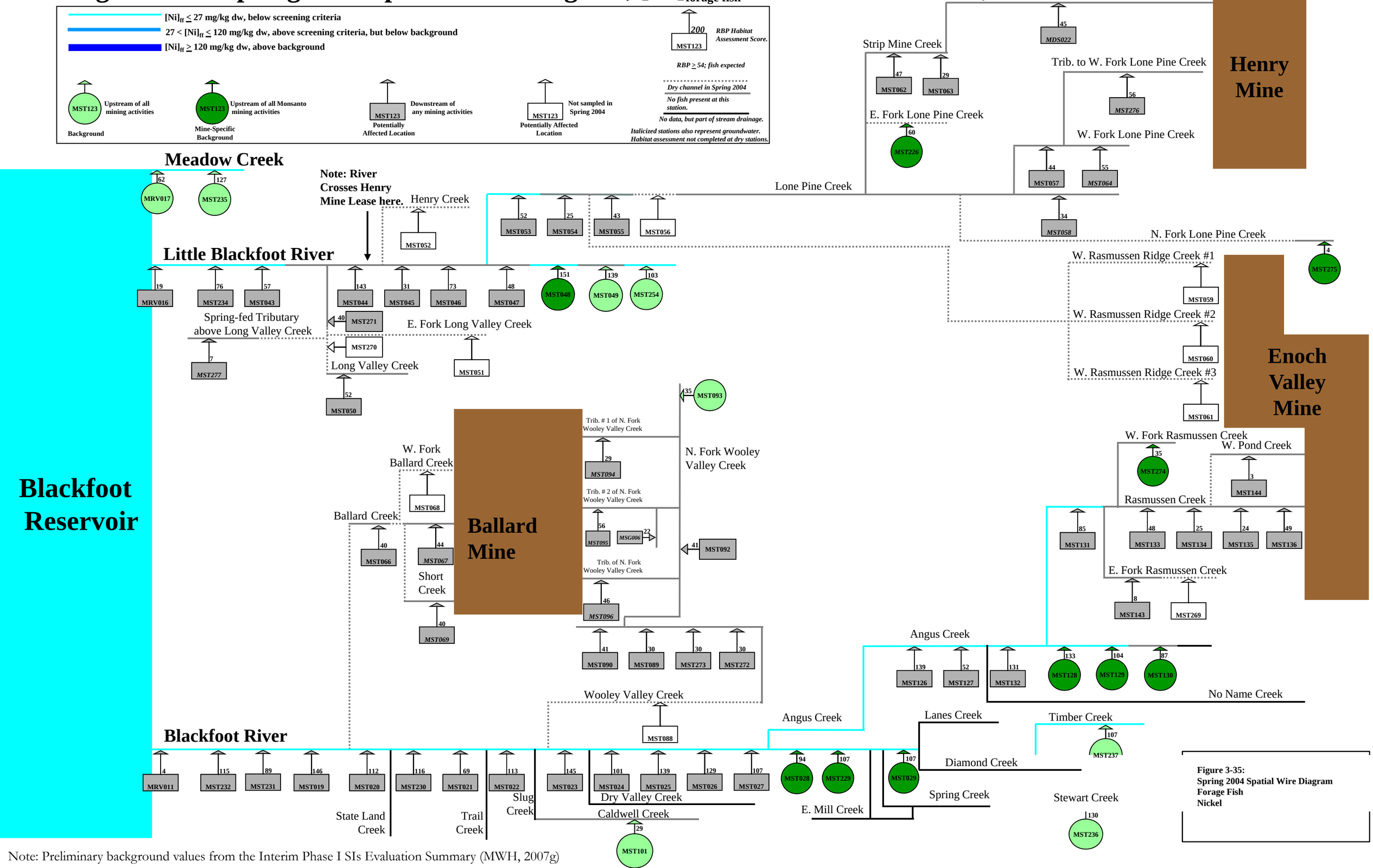


Figure 3-34:
Spring 2004 Spatial Wire Diagram
Forage Fish
Cadmium

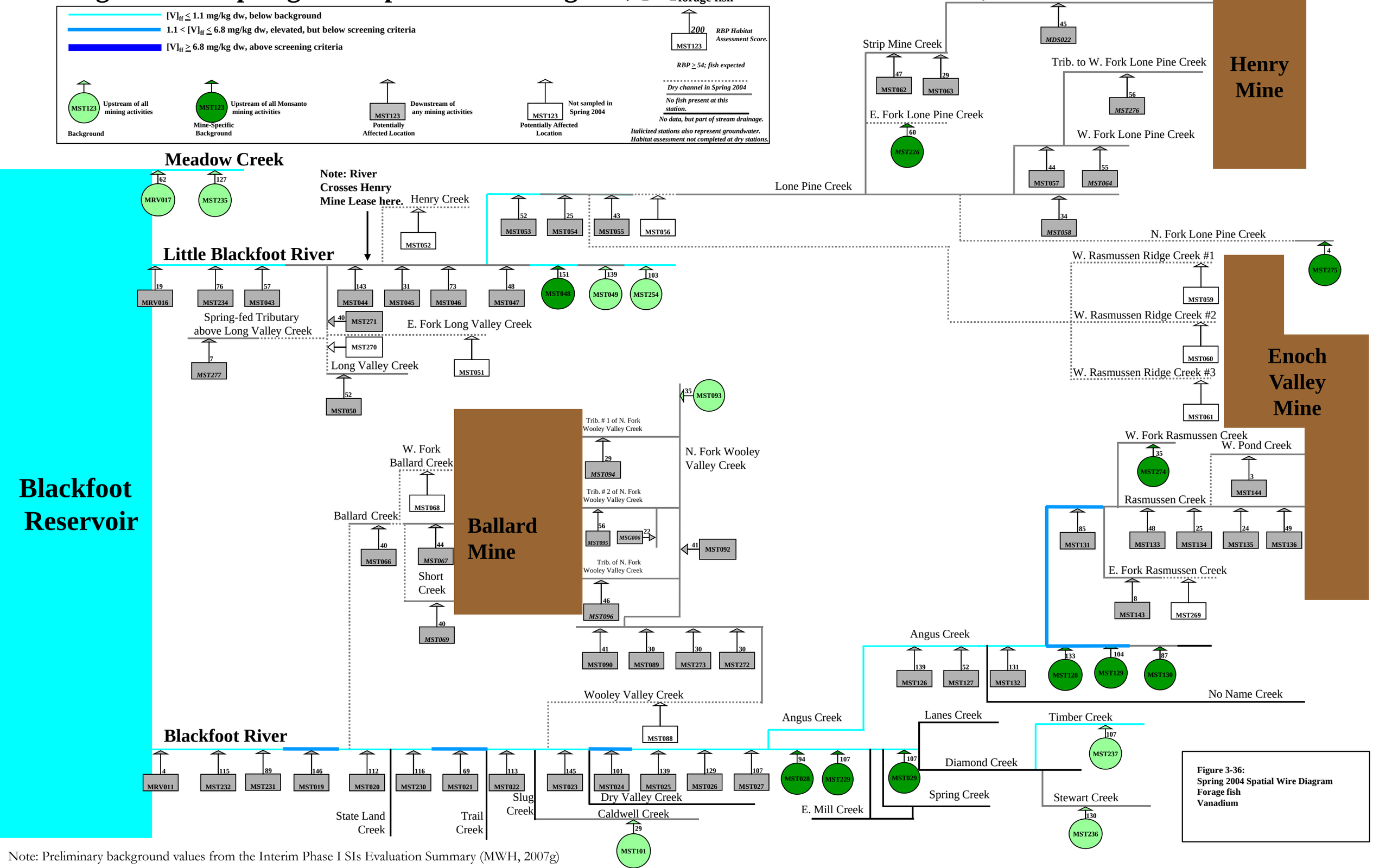
Note: Preliminary background values from the Interim Phase I SIs Evaluation Summary (MWH, 2007g)

Figure 3-35: Spring 2004 Spatial Wire Diagram, $[Ni]_{forage\ fish}$



Note: Preliminary background values from the Interim Phase I SIs Evaluation Summary (MWH, 2007g)

Figure 3-36: Spring 2004 Spatial Wire Diagram, $[V]_{forage\ fish}$



Note: Preliminary background values from the Interim Phase I SIs Evaluation Summary (MWH, 2007g)

Figure 3-37: Spring 2004 Spatial Wire Diagram, $[Zn]_{forage\ fish}$

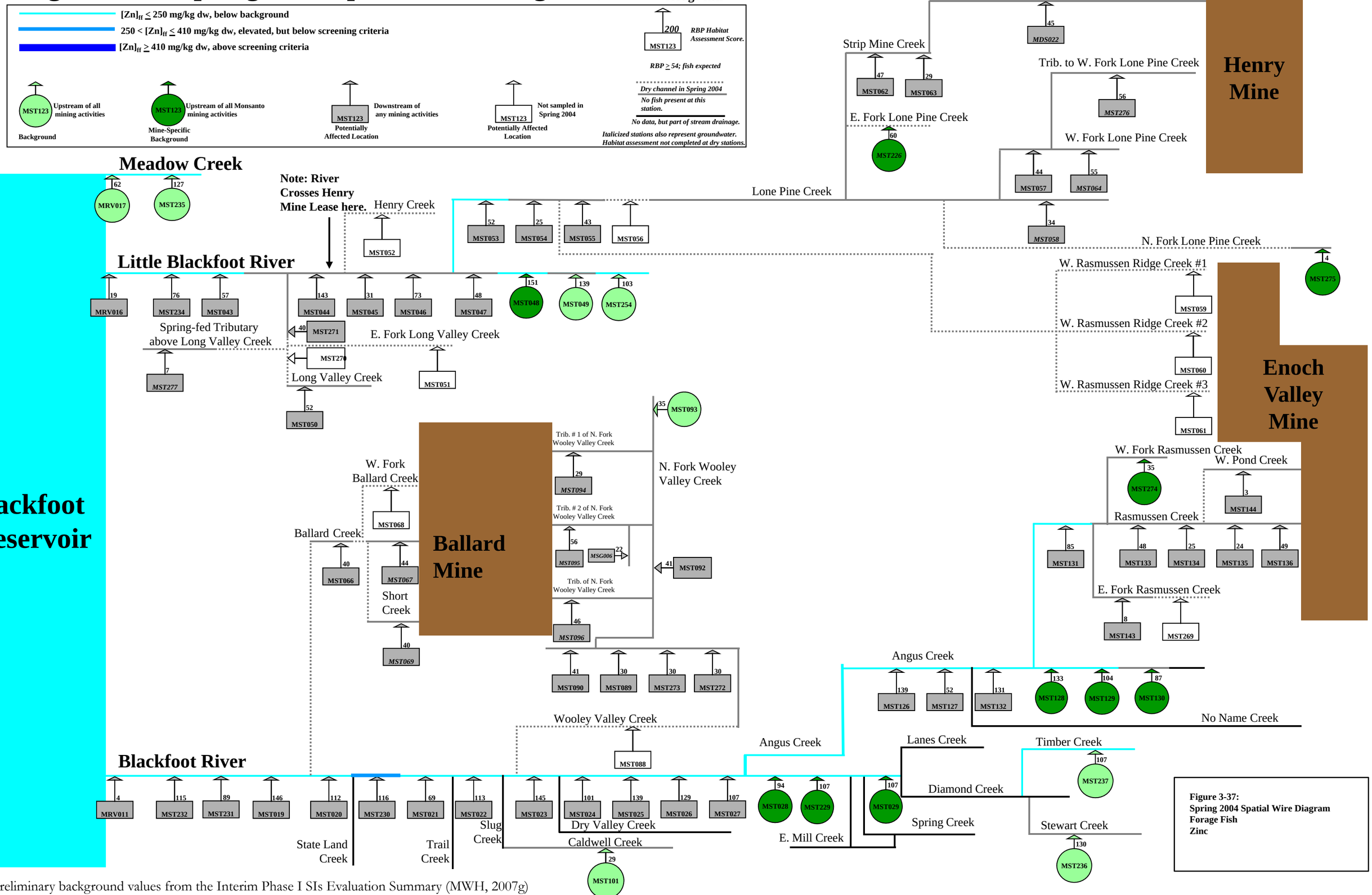
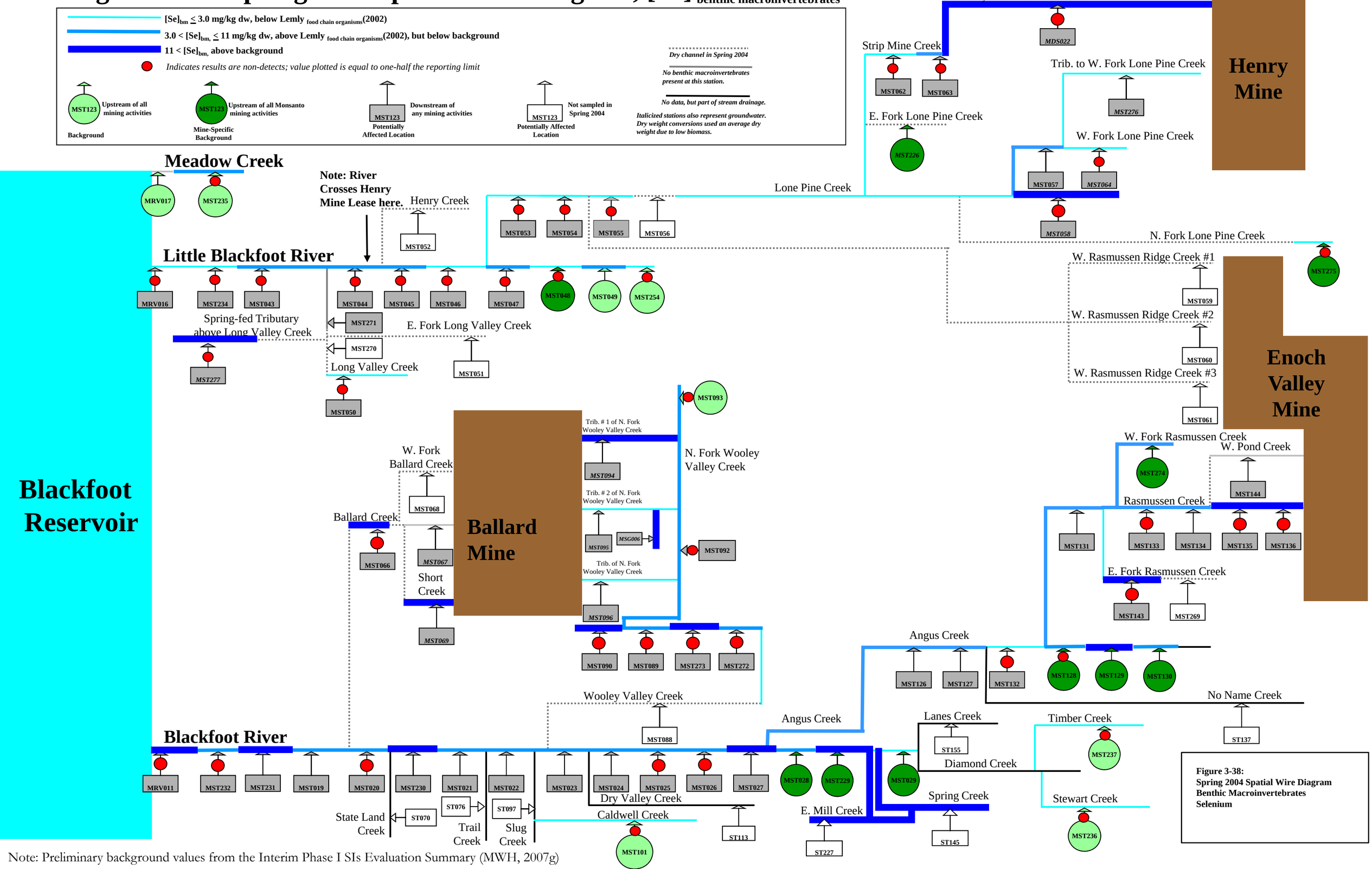


Figure 3-37:
Spring 2004 Spatial Wire Diagram
Forage Fish
Zinc

Note: Preliminary background values from the Interim Phase I SIs Evaluation Summary (MWH, 2007g)

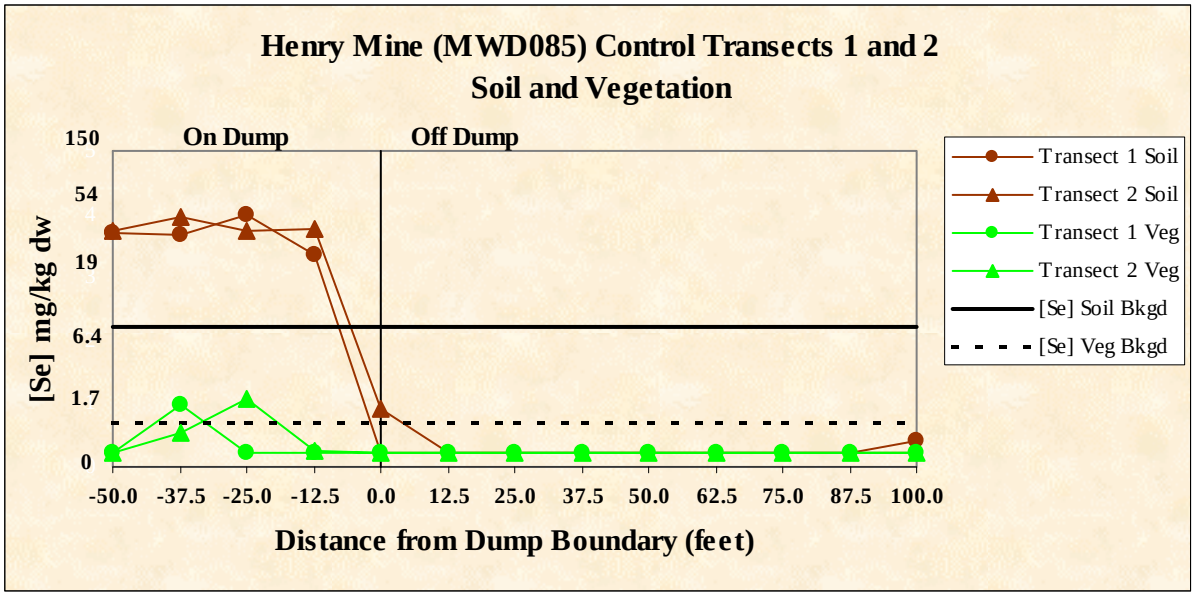
Figure 3-38: Spring 2004 Spatial Wire Diagram, [Se] benthic macroinvertebrates



Note: Preliminary background values from the Interim Phase I SIs Evaluation Summary (MWH, 2007g)

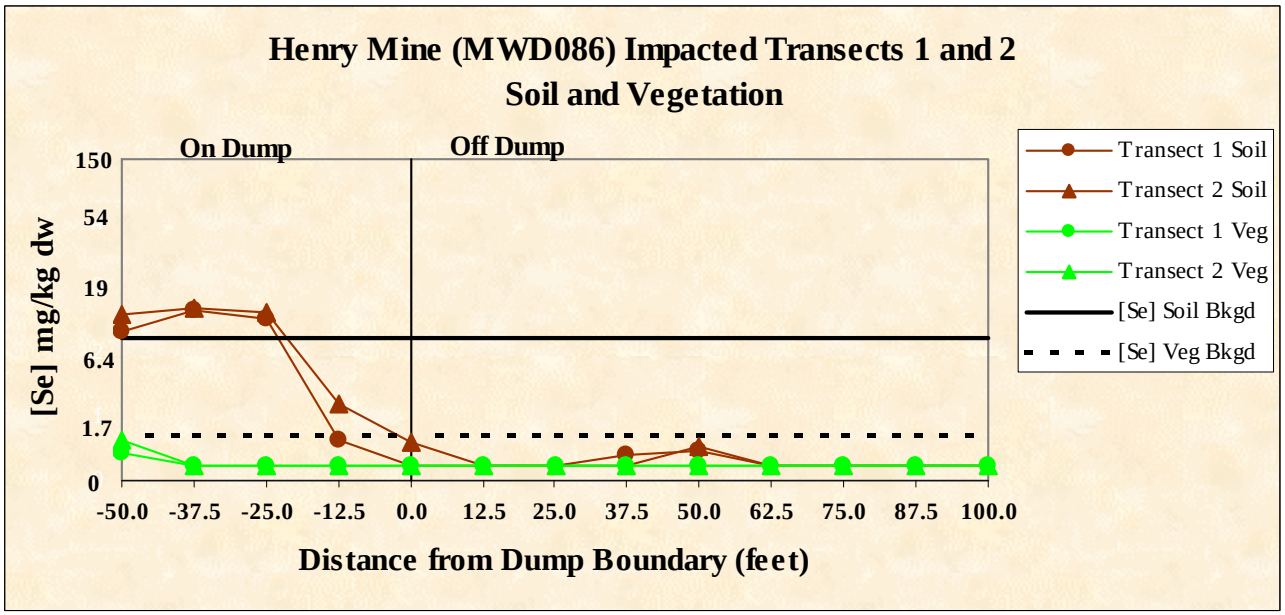
Figure 3-38:
Spring 2004 Spatial Wire Diagram
Benthic Macroinvertebrates
Selenium

FIGURE 3-39



Notes: Preliminary soil background = 8.1 mg/kg dw, preliminary vegetation background = 1.0 mg/kg dw.
Non-detected concentrations are presented as one-half the MDL.

FIGURE 3-40



Notes: Preliminary soil background = 8.1 mg/kg dw, preliminary vegetation background = 1.0 mg/kg dw.
Non-detected concentrations are presented as one-half the MDL.

FIGURE 3-41
Henry Mine Selenium Timeplot - MST044, Little Blackfoot River

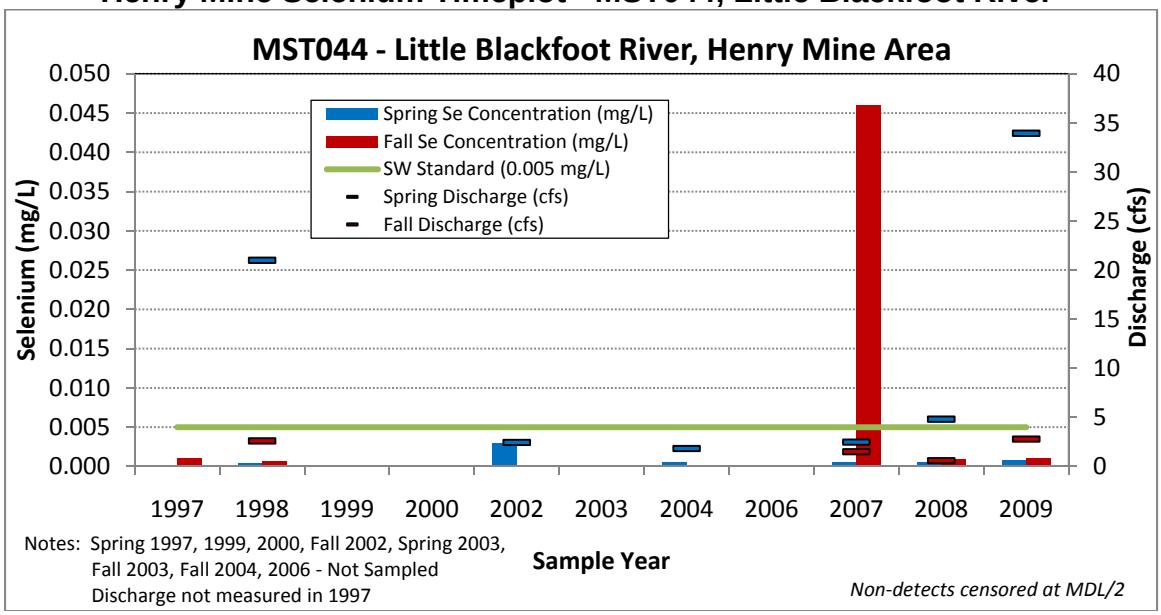


FIGURE 3-42
Henry Mine Selenium Timeplot - MST057, West Fork Lone Pine Creek

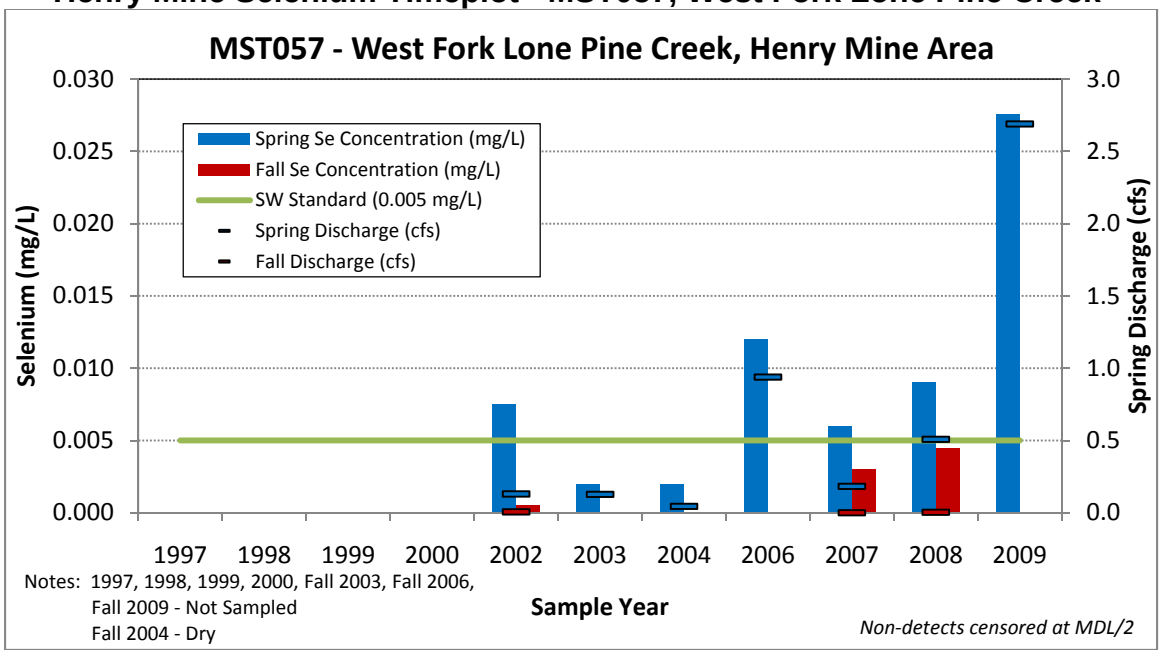


FIGURE 3-43
Henry Mine Spring, Seep, and Headwater Discharge Recession Plot, Summer 2006

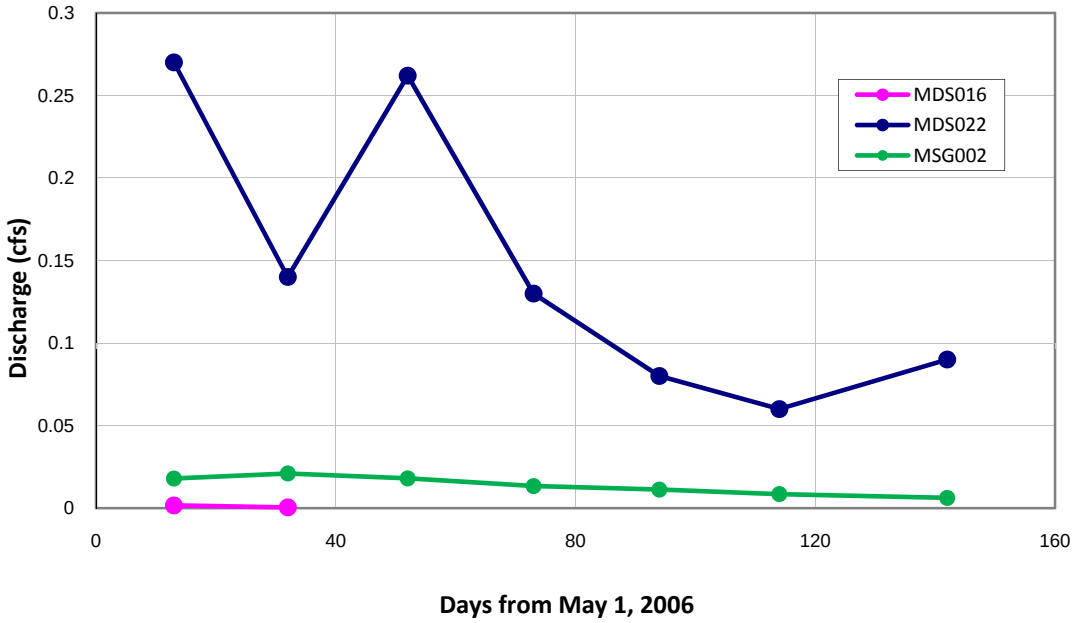


FIGURE 3-44
Henry Mine Selenium Timeplot - MST044, Little Blackfoot River

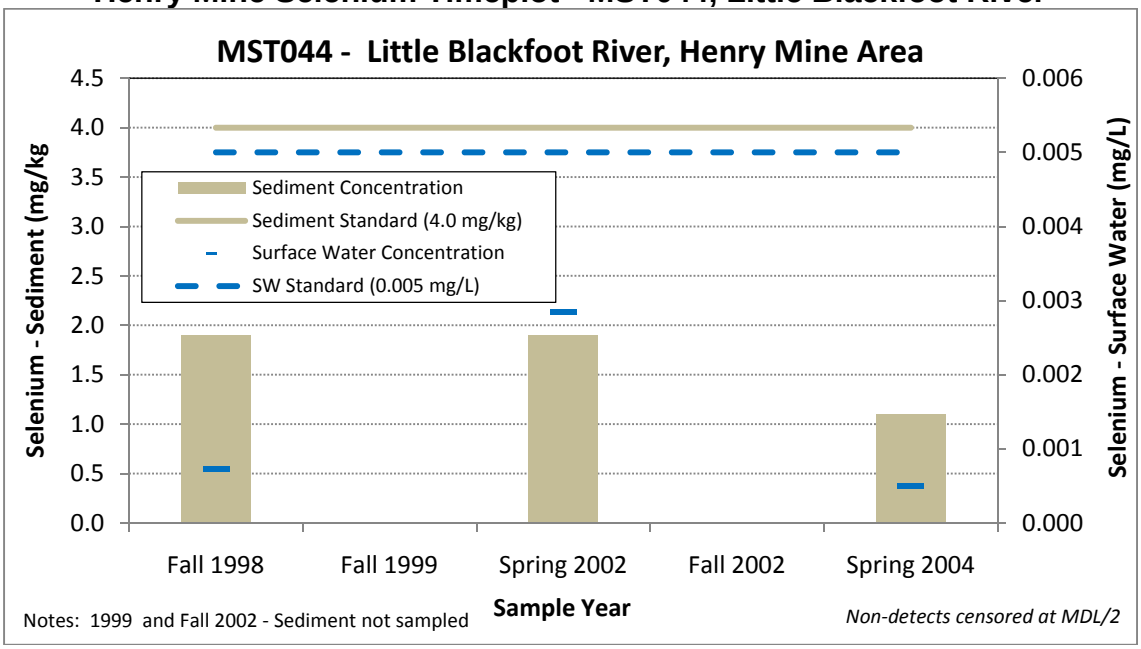


FIGURE 3-45
Henry Mine Selenium Timeplot - MST057, West Fork Lone Pine Creek

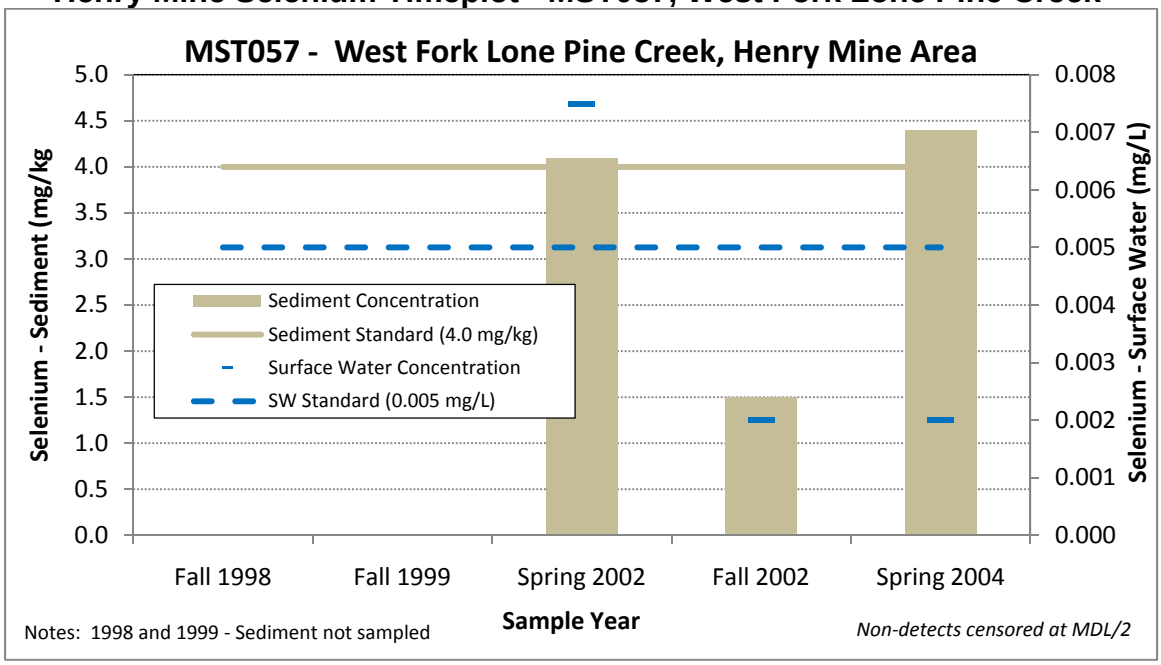
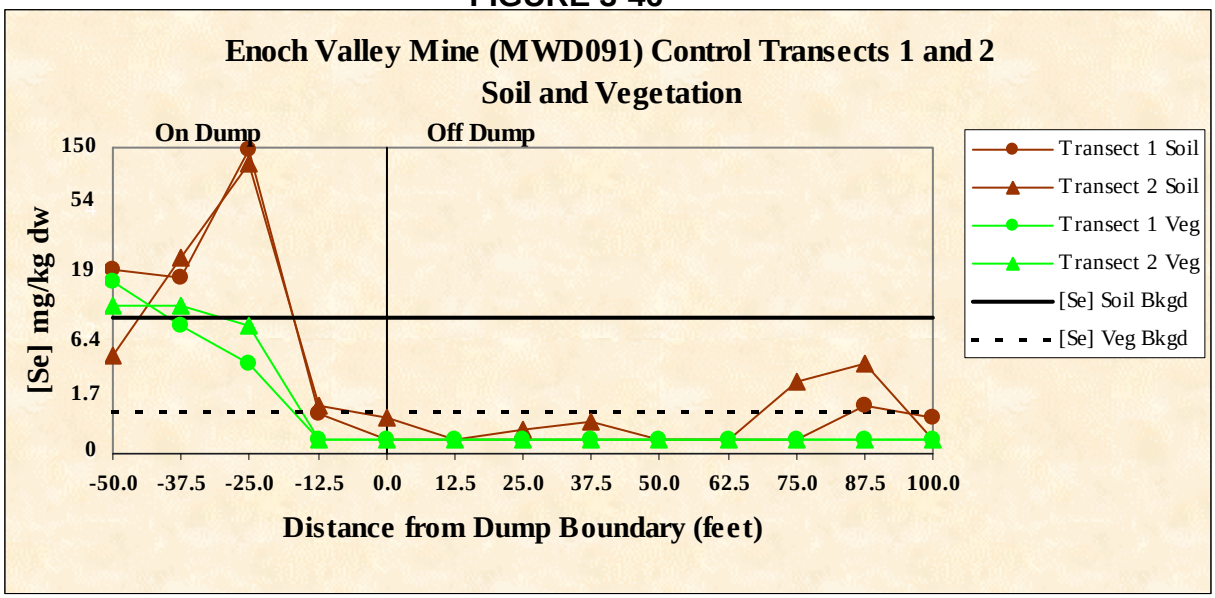
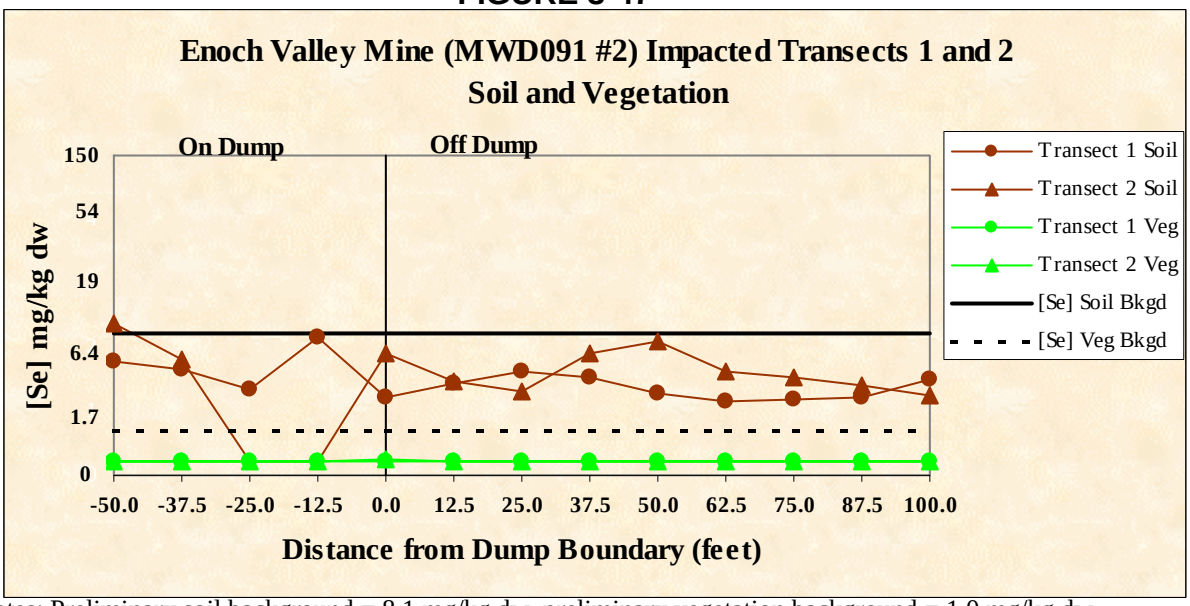


FIGURE 3-46



Notes: Preliminary soil background = 8.1 mg/kg dw, preliminary vegetation background = 1.0 mg/kg dw.
Non-detected concentrations are presented as one-half the MDL.

FIGURE 3-47



Notes: Preliminary soil background = 8.1 mg/kg dw, preliminary vegetation background = 1.0 mg/kg dw.
Non-detected concentrations are presented as one-half the MDL.

FIGURE 3-48
Enoch Valley Mine Selenium Timeplot - MST136, Rasmussen Creek Headwaters

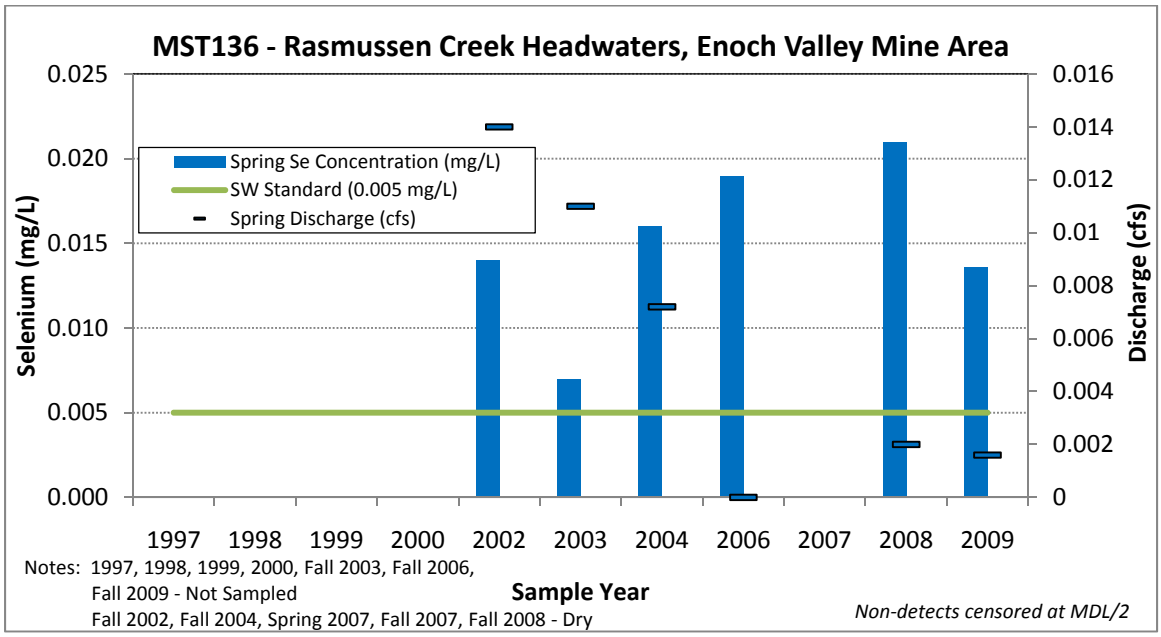


FIGURE 3-49
Enoch Valley Mine Selenium Timeplot - MST133, Rasmussen Creek

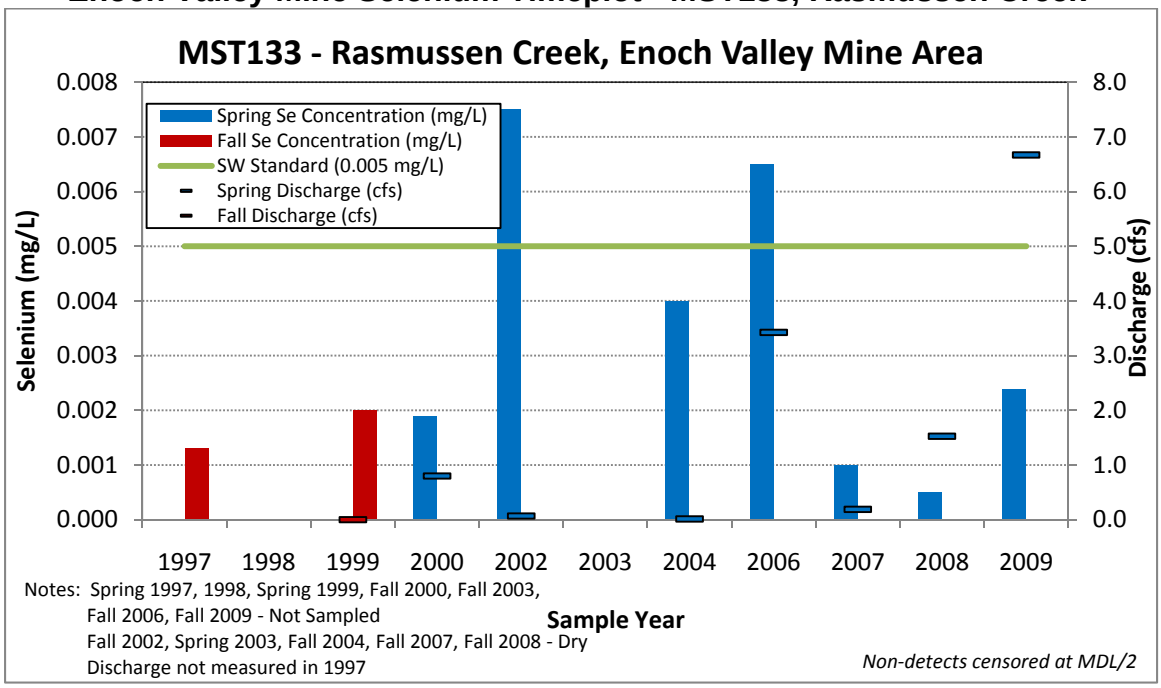


FIGURE 3-50
Enoch Valley Mine Spring, Seep, and Headwater Discharge Recession Plot, Summer 2006

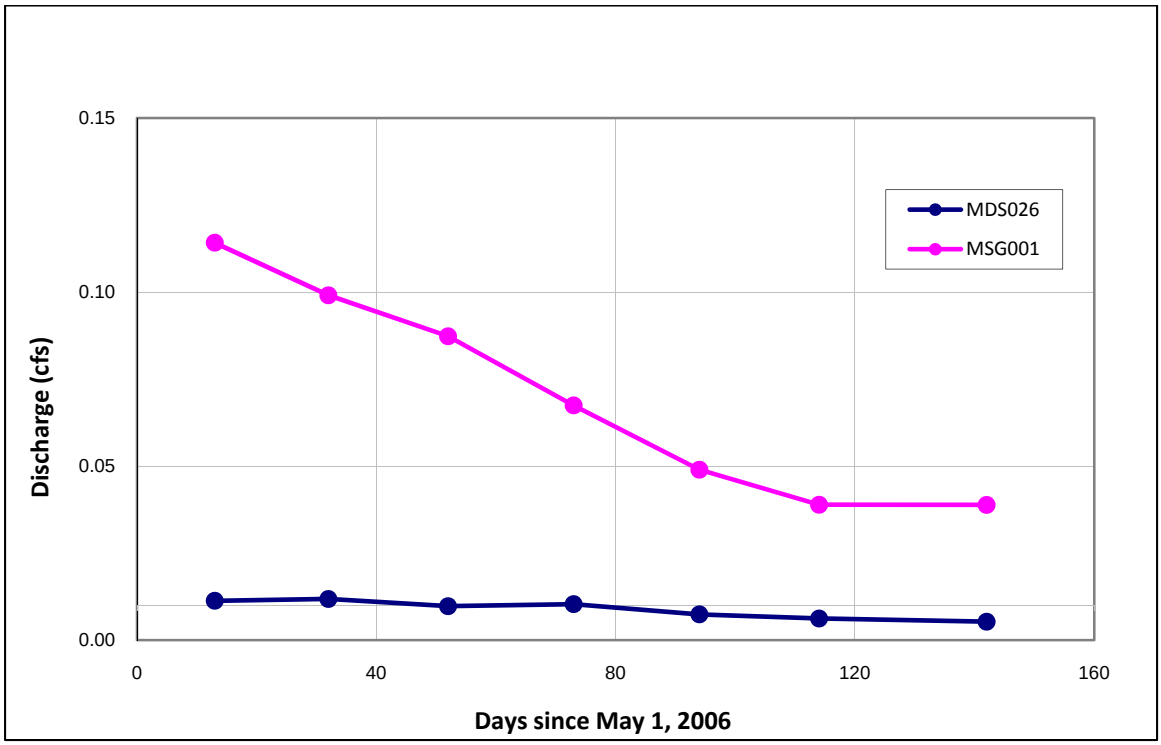


FIGURE 3-51
Enoch Valley Mine Selenium Timeplot - MST136, Rasmussen Creek Headwaters

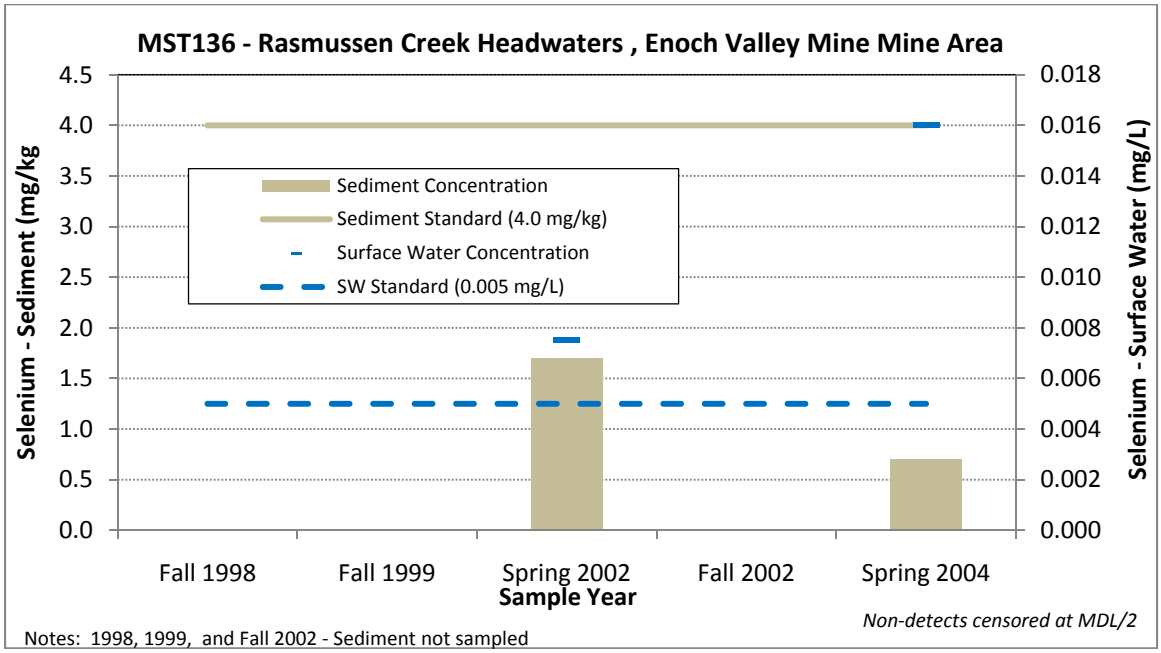


FIGURE 3-52
Enoch Valley Mine Selenium Timeplot - MST133, Rasmussen Creek

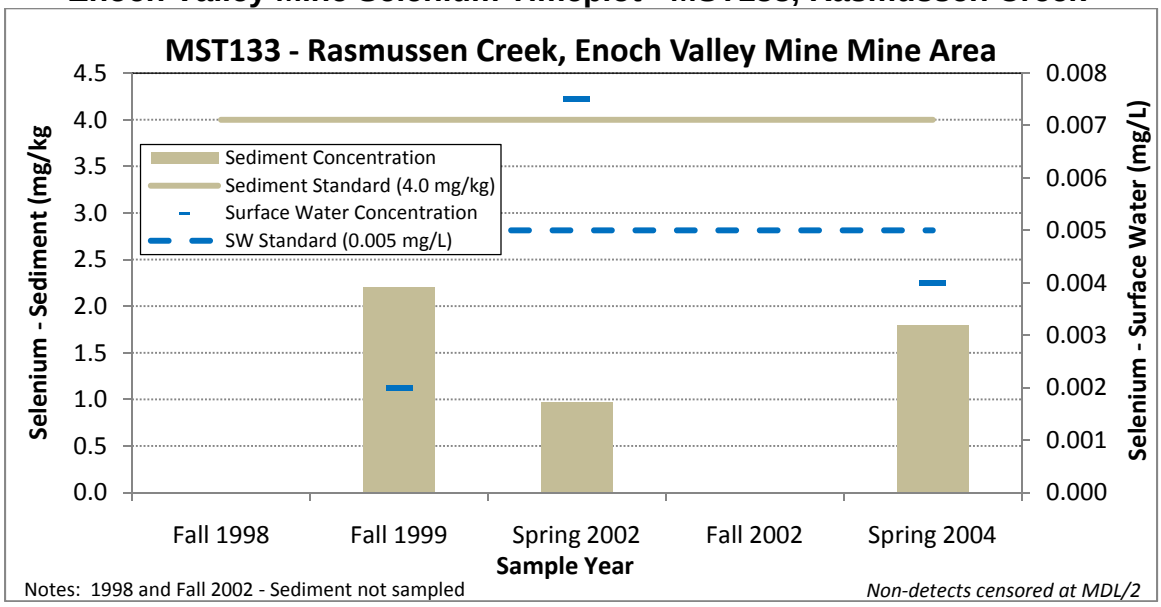


FIGURE 3-53
Blackfoot River Selenium Timeplot – MST019

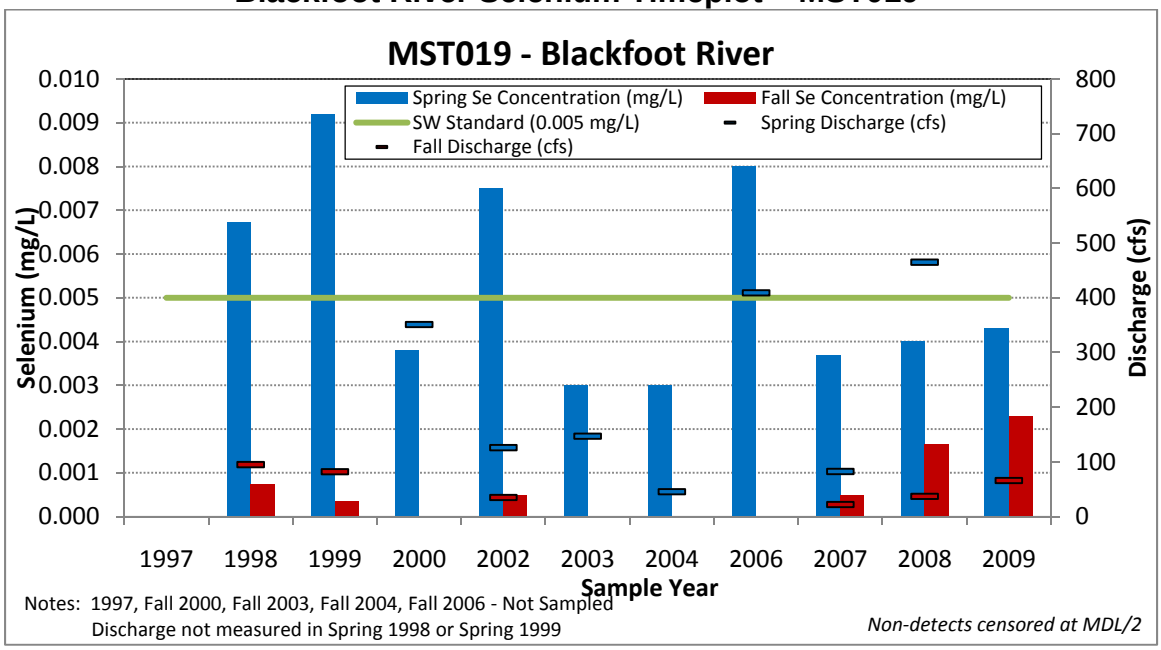
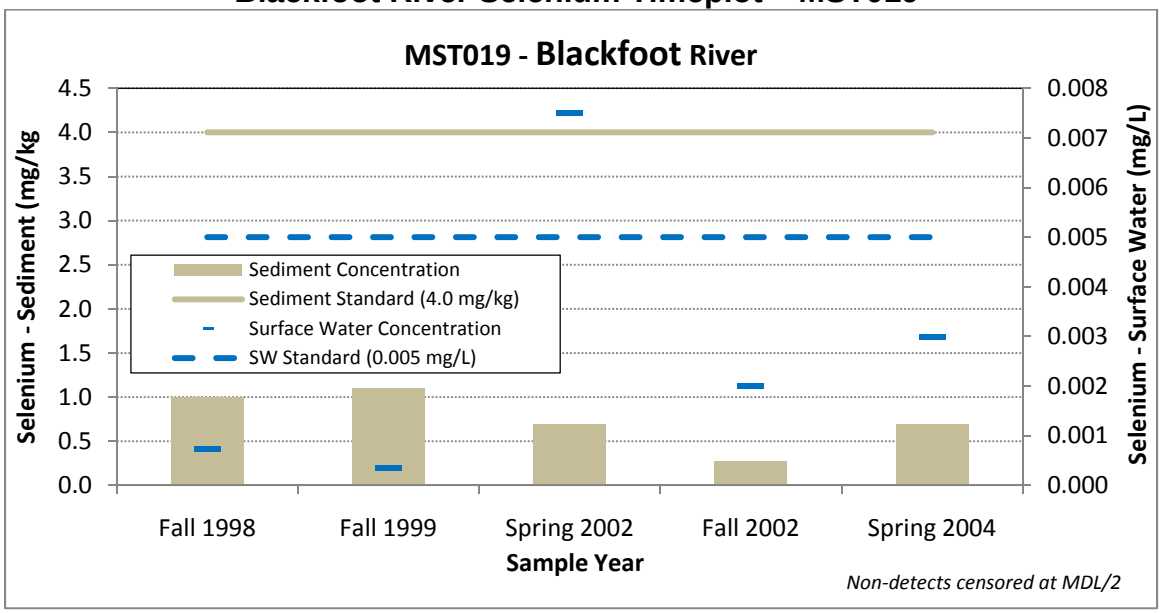
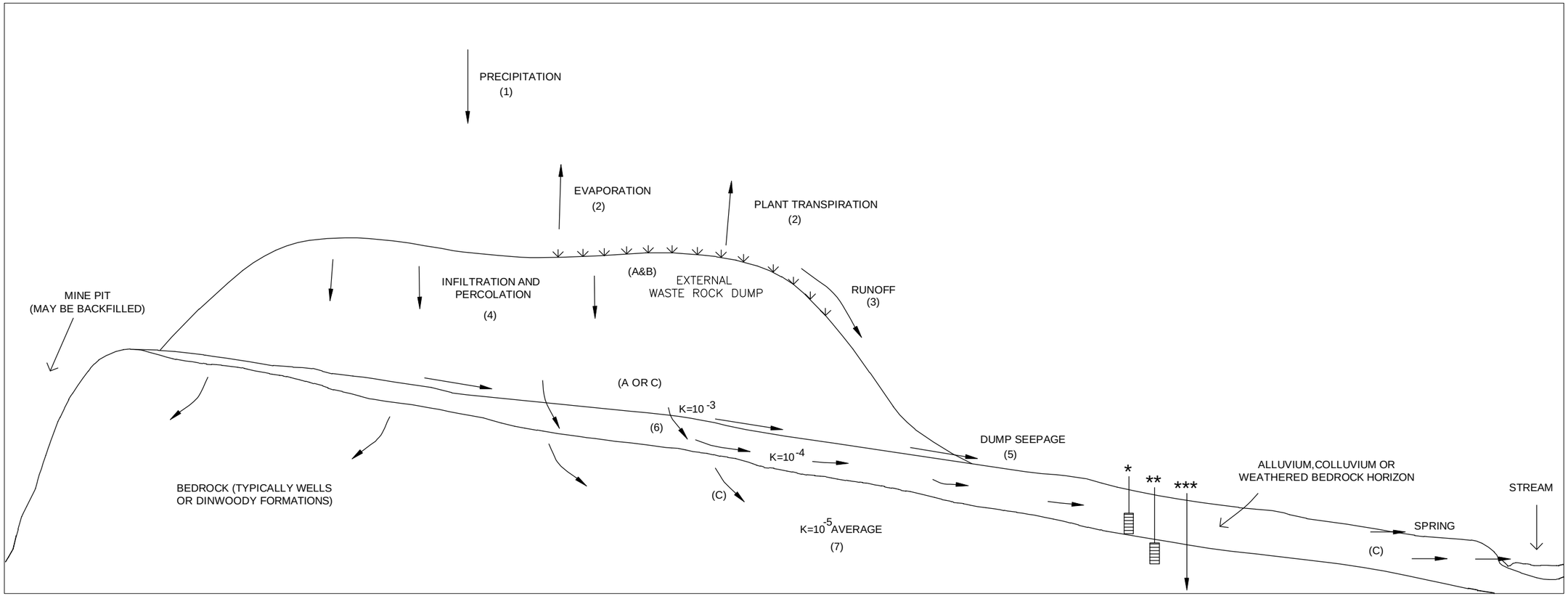


FIGURE 3-54
Blackfoot River Selenium Timeplot – MST019





NOT TO SCALE

HYDROLOGICAL PROCESSES (WITH EXAMPLE FLUXES)

1. PRECIPITATION = 2.4 GPM/ACRE BASED ON 23.64 INCHES/YEAR AVERAGE
2. EVAPOTRANSPIRATION = ESTIMATED TO BE 1.2 TO 1.7 GPM/ACRE OR 50 TO 70% OF TOTAL PRECIPITATION (COMBINED EVAPORTRANSPIRATION)
3. RUNOFF = ESTIMATED TO BE 0.24 TO 0.48 GPM/ACRE OR 10 TO 20% OF TOTAL PRECIPITATION (BASED ON SLOPES FROM 2–33%)
4. INFILTRATION = ESTIMATED TO BE 0.36 TO 0.72 GPM/ACRE OR 15 OR 30% OF TOTAL PRECIPITATION
5. SEEPAGE = ESTIMATED TO BE 0.32 TO 0.65 GPM/ACRE BASED ON ASSUMED 10X HIGHER K COMPARED TO UNDERLYING UNIT
6. INFILTRATION TO ALLUVIUM = 0.04 TO 0.07 GPM/ACRE
7. INFILTRATION TO BEDROCK = 0.004 TO 0.007GPM/ACRE
(RATES ESTIMATED BASED ON MODELING AND ASSUMPTIONS)

GEOCHEMICAL/BIOLOGICAL PROCESSES

A. LEACHING OF SOLUBLE SELENIUM
B. OXIDATION OF SULFIDES
C. BIOLOGICAL REDUCTION OF SELENIUM AND ADSORPTION AND PRECIPITATION

WASTE ROCK DUMP LOCATIONS

BALLARD – MWD080,MWD081,MWD083,MWD084,MWD082
HENRY – MWD087,MWD090,MWD086,MWD088,MWD085
ENOCH VALLEY – MWD092,MWD091

WELL LOCATIONS

* ALLUVIAL – MMW010,MMW014,MMW012,MMW017,MW–15A,MW–16A
** WEATHERED DINWOODY– MMW007,MMW008,MMW013,MMW018
*** DEEP DINWOODY – MMW022

ISSUED DRAFT FOR AGENCY REVIEW 7/6/10

ISSUE REV	DESCRIPTION	TECH	ENG	DATE
0	ISSUED DRAFT FOR AGENCY REVIEW	CHF	LWM	07/06/10

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CHECKED BY	E MARKS	07/06/10
APPROVED BY	C FOULK	07/06/10
PROJECT MANAGER	V DRAIN	07/06/10
CLIENT APPROVAL	B KOCH	07/06/10
CLIENT REFERENCE NO.		

P4 Production, LLC

PROJECT LOCATION: BALLARD, HENRY AND ENOCH VALLEY MINES
PROJECT: RI/FS WORK PLAN
TITLE: CONCEPTUAL MODEL
GENERIC EXTERNAL WASTE ROCK DUMP

MWH

FIGURE 3-55
REVISION 0
FILE NAME 1005813D236

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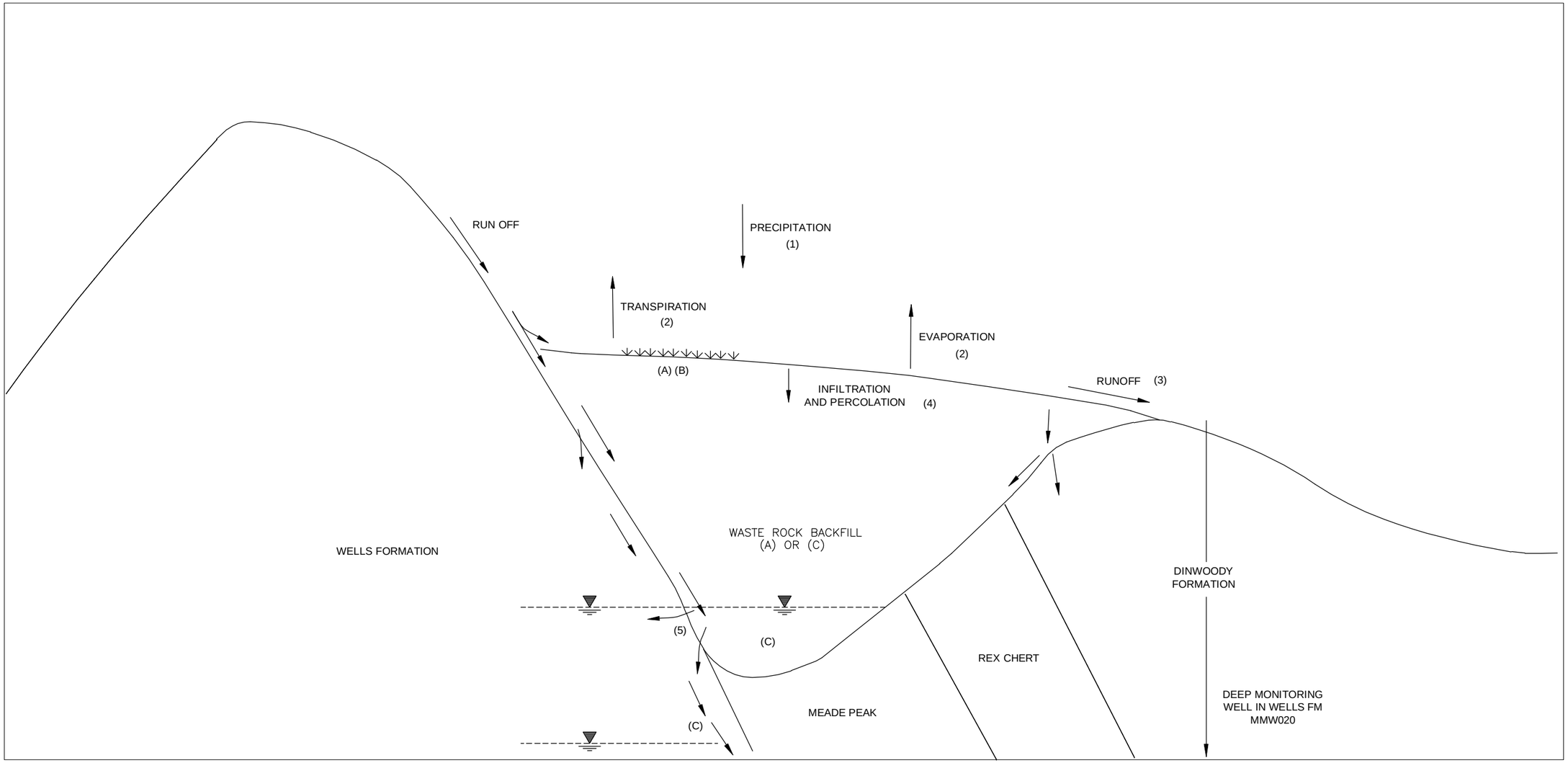

NOT TO SCALE

HYDROLOGICAL PROCESSES

1. PRECIPITATION = 2.4 GPM/ACRE BASED ON 23.64 INCHES/YEAR AVERAGE
2. EVAPOTRANSPIRATION = ESTIMATED TO BE 1.2 TO 1.7 GPM/ACRE OR 50 TO 70% OF TOTAL PRECIPITATION (COMBINED EVAPORTRANSPIRATION)
3. RUNOFF = ESTIMATED TO BE 0.24 TO 0.48 GPM/ACRE OR 10 TO 20% OF TOTAL PRECIPITATION(BASED ON SLOPES FROM 2–33%)
4. INFILTRATION = ESTIMATED TO BE 0.36 TO 0.72 GPM/ACRE OR 15 OR 30% OF TOTAL PRECIPITATION
5. INFILTRATION TO BEDROCK = 0.004 TO 0.007GPM/ACRE (GROUNDWATER IN PIT MAY BE PERCHED)

(RATES ESTIMATED BASED ON MODELING AND ASSUMPTIONS)

GEOCHEMICAL/BIOLOGICAL PROCESSES

A. LEACHING OF SOLUBLE SELENIUM
B. OXIDATION OF SULFIDES
C. BIOLOGICAL REDUCTION OF SELENIUM AND ADSORPTION AND/OR PRECIPITATION

ISSUED DRAFT FOR AGENCY REVIEW 7/6/10

ISSUE REV	DESCRIPTION	TECH	ENG	DATE
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PROJECT MANAGER	V DRAIN	07/06/10
CLIENT APPROVAL	B KOCH	07/06/10
CLIENT REFERENCE NO.		

P4 Production, LLC

PROJECT LOCATION: BALLARD, HENRY AND ENOCH VALLEY MINES
PROJECT: RI/FS WORK PLAN
TITLE: CONCEPTUAL MODEL GENERIC BACKFILLED MINE PIT

MWH

FIGURE: 3-56
REVISION: 0
FILE NAME: 1005813D238

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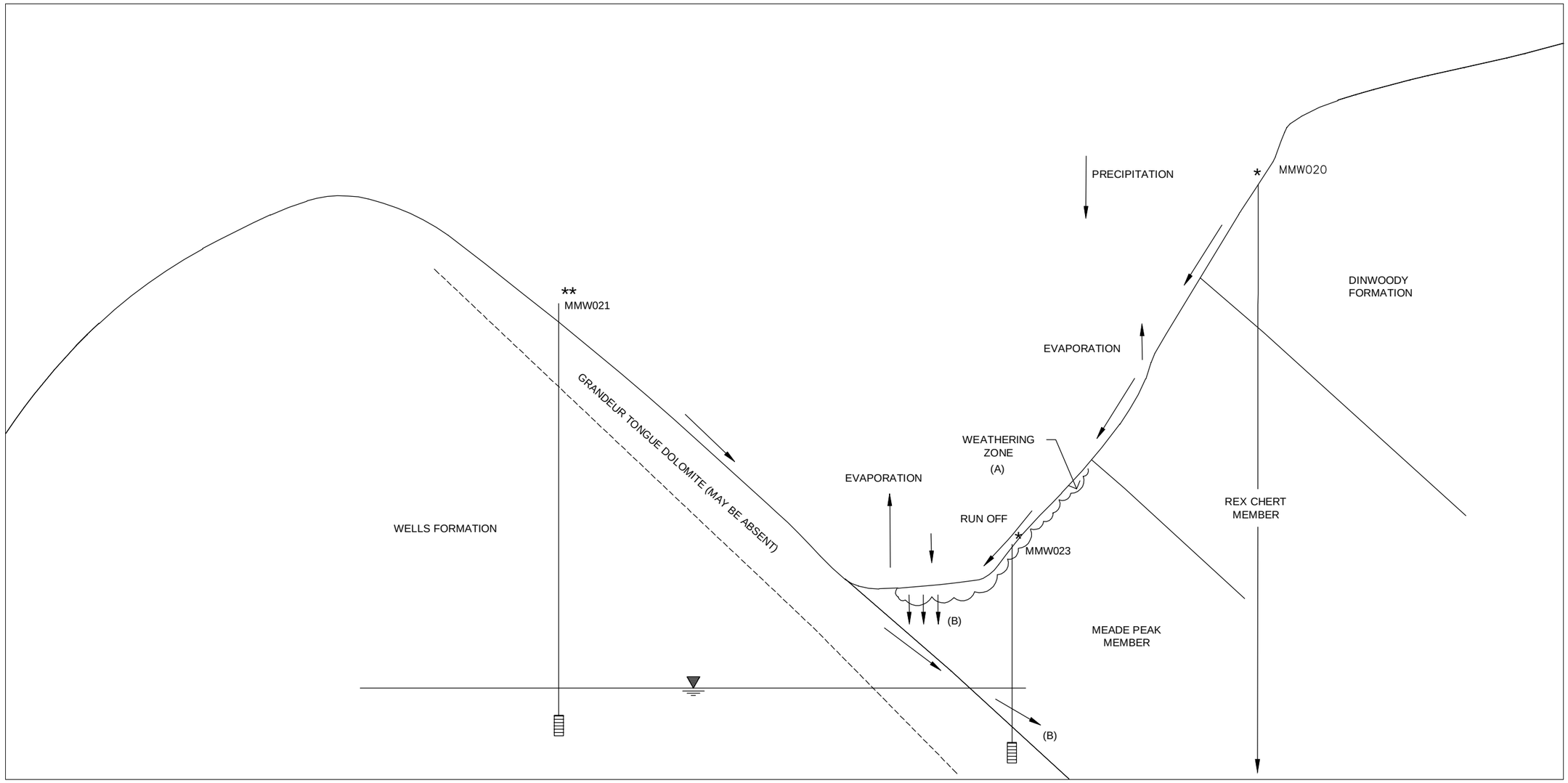

NOT TO SCALE

GEOCHEMICAL/BIOLOGICAL PROCESSES

A. LEACHING OF SOLUBLE SELENIUM AND OXIDATION OF SULFIDES
B. BIOLOGICAL REDUCTION OF SELENIUM AND ADSORPTION AND PRECIPITATION

WELL LOCATIONS

* UPPER WELLS FM.– MMW023,MMW020
** DEEPER WELLS FM. – MMW021

ISSUED DRAFT FOR AGENCY REVIEW 7/6/10

ISSUE REV	DESCRIPTION	TECH	ENG	DATE
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APPROVED BY	C FOULK	07/06/10
PROJECT MANAGER	V DRAIN	07/06/10
CLIENT APPROVAL	B KOCH	07/06/10
CLIENT REFERENCE NO.		

P4 Production, LLC

PROJECT LOCATION: BALLARD, HENRY AND ENOCH VALLEY MINES
PROJECT: RI/FS WORK PLAN
TITLE: CONCEPTUAL MODEL GENERIC OPEN MINE PIT

MWH

FIGURE 3-57
REVISION 0
FILE NAME 1005813D237

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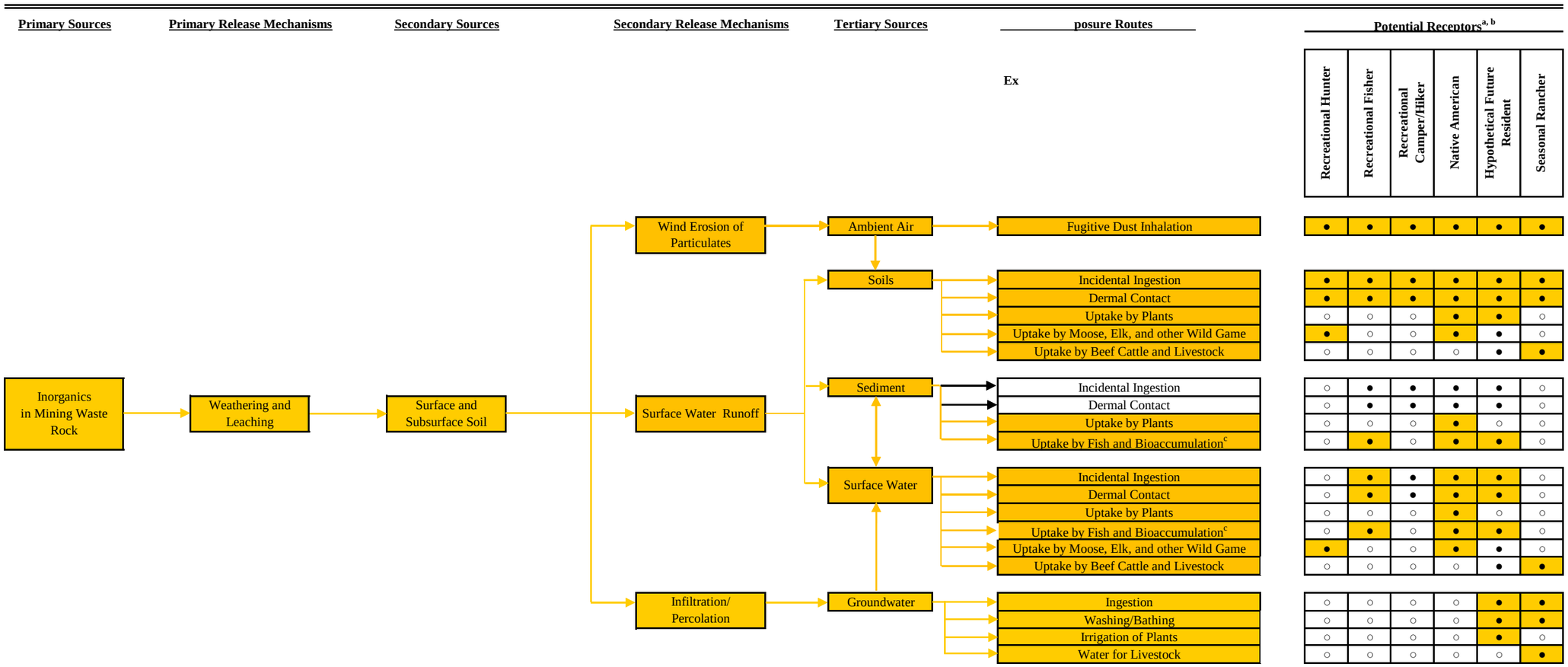
FIGURE 3-58
HUMAN HEALTH CONCEPTUAL SITE MODEL
P4 SITE RI/FS



Potentially Complete Exposure Pathway
Potentially Complete but Insignificant Pathway
Incomplete Pathway
Complete Exposure Pathway
Potentially Complete but Insignificant Pathway
Incomplete Exposure Pathway

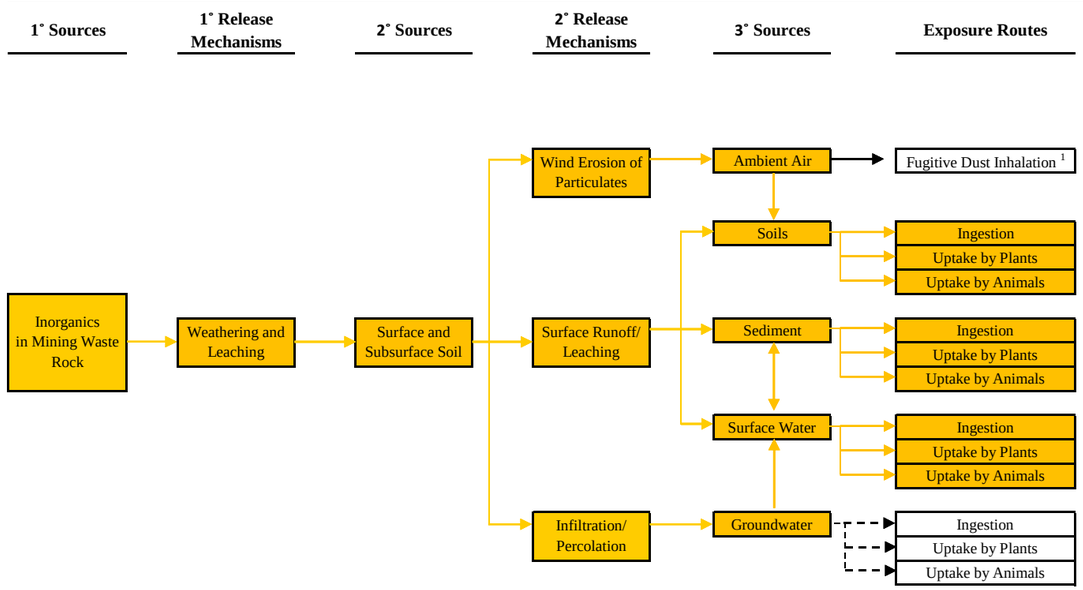
Notes:

[a] All potential receptors are both current and future receptors except for future hypothetical residential receptor.

[b] It is also possible that some biota consumption pathways could be applicable to multiple receptors. For example, a recreational hunter could also fish; a recreational fisherman could also hunt; a recreational camper/hiker could hunt and/or fish. Such alternative exposure pathways will be evaluated qualitatively in the Uncertainty Analysis section of the HHERA.

[c] Bio accumulation in aquatic receptors represents uptake to the appropriate trophic level for ingestion and for fi shing.

FIGURE 3-59
ECOLOGICAL CONCEPTUAL SITE MODEL
P4 SITES RI/FS



Potential Ecological Receptors

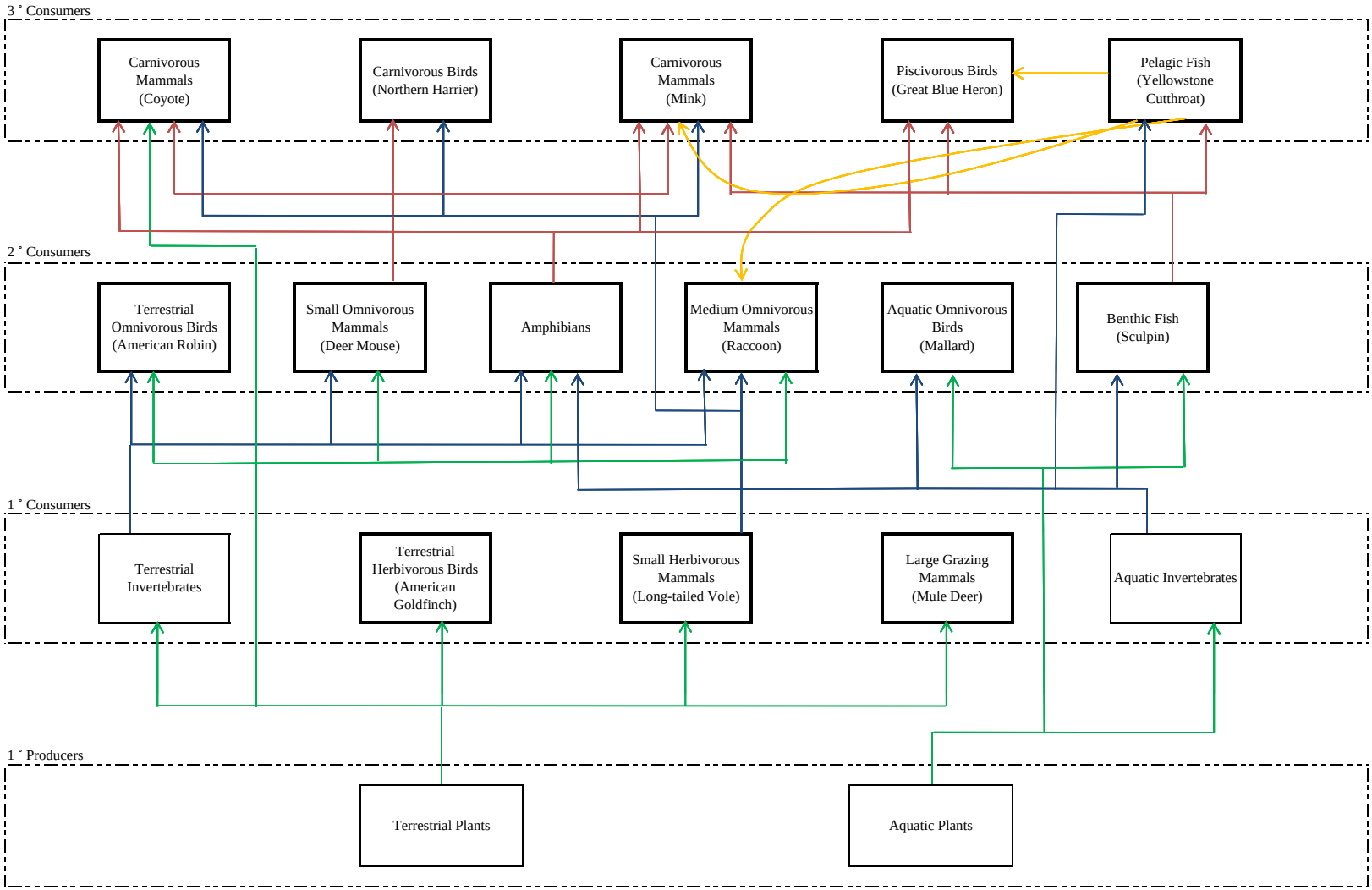
Exposure Route	Aquatic Invertebrates	Benthic and Pelagic Fish [2]	Terrestrial and Aquatic Plants [3]	Terrestrial Invertebrates [4]	Reptiles [5]	Amphibians [6]	Terrestrial Herbivore [7]	Avian Herbivore [8]	Terrestrial Omnivore [9]	Avian Omnivore [10]	Terrestrial Predator [11]	Avian Predator [12]
Fugitive Dust Inhalation [1]	○	○	○	○	●	●	●	●	●	●	●	●
Soils – Ingestion	○	○	○	●	●	●	●	●	●	●	●	●
Soils – Uptake by Plants	○	○	●	●	●	●	●	●	●	●	○	○
Soils – Uptake by Animals	○	○	○	○	●	●	○	○	●	●	●	●
Sediment – Ingestion	●	●	○	○	●	●	●	●	●	●	●	●
Sediment – Uptake by Plants	●	●	●	○	●	●	○	●	●	●	●	○
Sediment – Uptake by Animals	●	●	○	○	●	●	○	○	●	●	●	●
Surface Water – Ingestion	●	●	○	●	●	●	●	●	●	●	●	●
Surface Water – Uptake by Plants	●	●	●	○	●	●	○	●	●	●	○	○
Surface Water – Uptake by Animals	●	●	○	○	●	●	○	○	●	●	●	●
Groundwater – Ingestion	○	○	○	○	○	○	○	○	○	○	○	○
Groundwater – Uptake by Plants	●	●	●	○	●	●	●	●	●	●	○	○
Groundwater – Uptake by Animals	○	●	○	○	●	●	○	○	●	●	●	●

Notes:

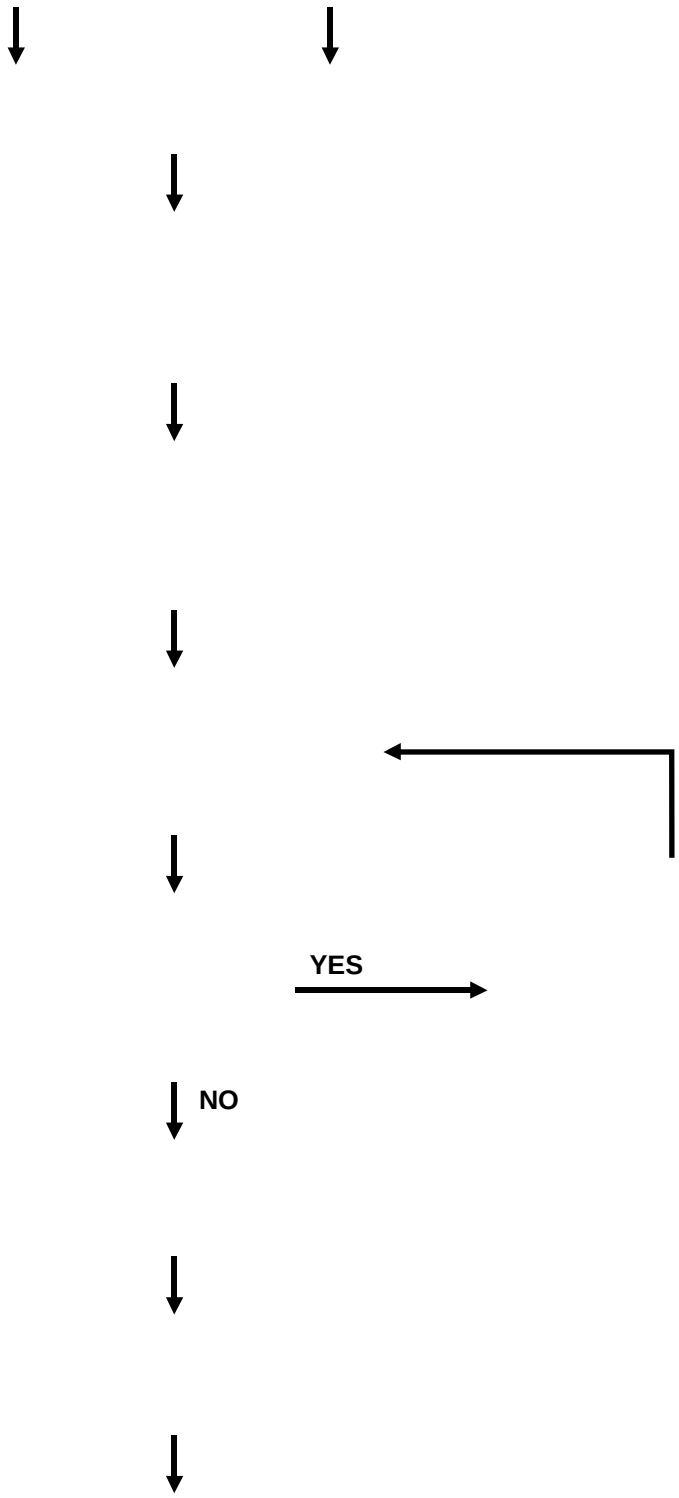
- Potentially Complete Exposure Pathway
- Potentially Complete but Insignificant Pathway
- Incomplete Pathway
- ● Complete Exposure Pathway
- ● Potentially Complete but Insignificant Pathway
- ○ Incomplete Exposure Pathway

[1] The direct exposure pathways of dermal contact and inhalation of contaminants are not evaluated for ecological receptors due to lack of relevant toxicological information. Ingestion represents the highest exposure scenario for direct contact pathways.
[2] The selected indicator receptor for the assessment endpoint of benthic fish is the sculpin; the selected indicator receptor for pelagic fish is the cutthroat trout.
[3] Not a direct assessment endpoint, will be evaluated qualitatively.
[4] Not a direct assessment endpoint, will be evaluated qualitatively.
[5] Not a direct assessment endpoint, will be evaluated qualitatively.
[6] Amphibians are a direct assessment endpoint.
[7] The selected indicator receptors for the assessment endpoint of terrestrial herbivore are the long-tailed vole, elk, and beef cattle.
[8] The selected indicator receptor for the assessment endpoint of avian herbivore is the American goldfinch.
[9] The selected indicator receptors for the assessment endpoint of terrestrial omnivore are the deer mouse and raccoon.
[10] The selected indicator receptors for the assessment endpoint of avian omnivore are the American robin and mallard duck.
[11] The selected indicator receptors for the assessment endpoint of terrestrial predator are the mink and coyote.
[12] The selected indicator receptors for the assessment endpoint of avian predator are the great blue heron and the northern harrier.

FIGURE 3-60
FOOD WEB MODEL
P4 SITES RI/FS



Note
Receptors in bolded boxes were selected as indicator receptors for quantitative evaluation in the ecological risk assessment.
Green line - consumption pathways of 1 ˚ Producers
Blue line - consumption pathways of 1 ˚ Consumers
Red line - consumption pathways of 2 ˚ Consumers
Orange line - consumption pathways of 3 ˚ Consumers



WORKING DRAFT
INFORMA

P4 Production, LLC

PROJECT LOCATION
BALLARD, HENRY AND ENOCH VALLEY MINES

PROJECT
P4 RI/FS WORK PLAN

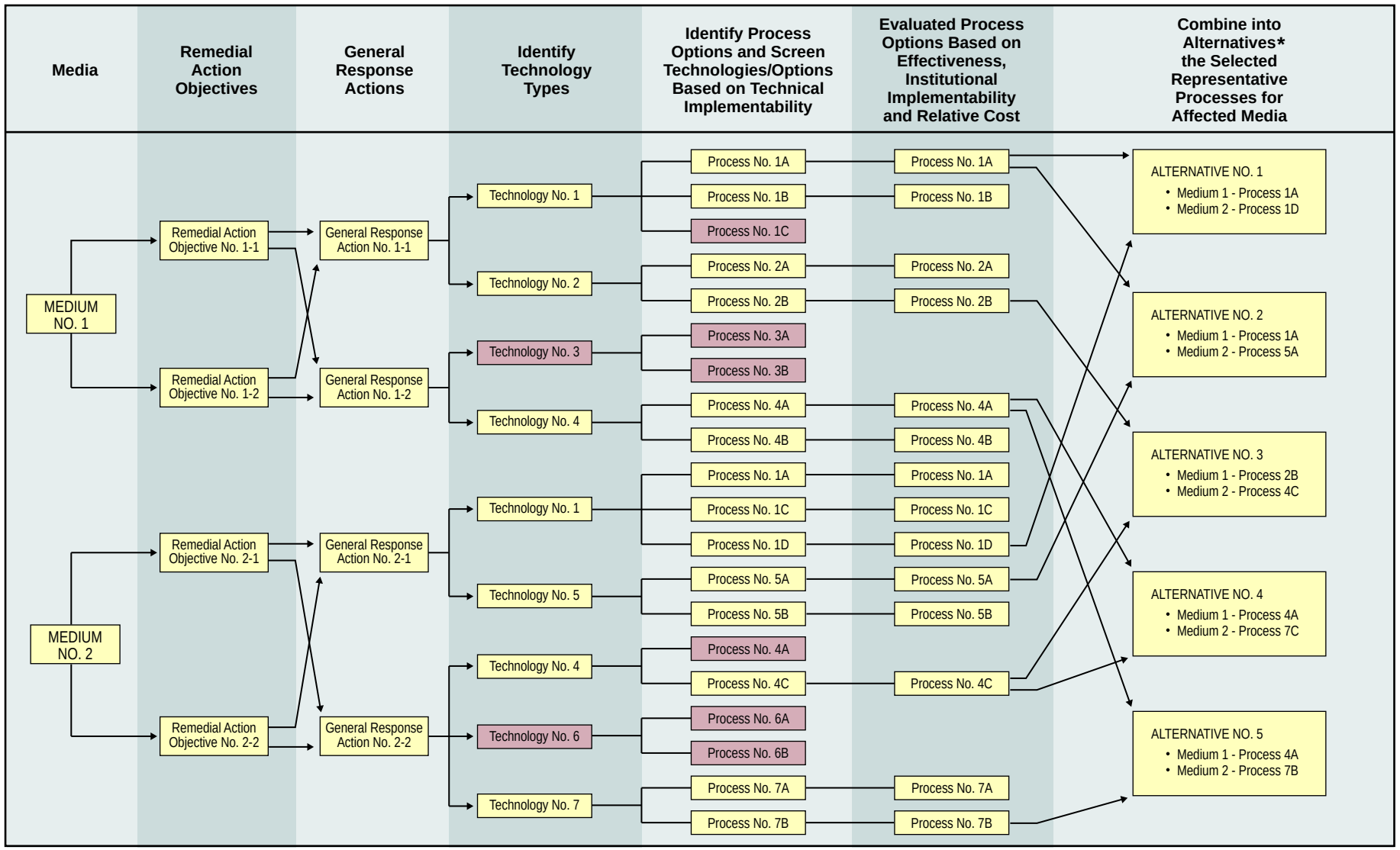
TITLE
ALTERNATIVE DEVELOPMENT

MWH

SHEET
FIGURE 5-1

REVISION

FILE NAME
Fig 5-01 Alternative Development_510.ai



Source: EPA/540/G-89/004, OSWER Directive 9355 3-01, October 1988 Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA

* *The combination of medium-technology options into site-wide alternatives may be conducted later in the FS if media interactions are insignificant*

Process options that are screened out

Process options selected to represent technology type

WORKING DRAFT INFORMATIONAL ONLY

P4 Production, LLC

PROJECT LOCATION: BALLARD, HENRY AND ENOCH VALLEY MINES

PROJECT: P4 RI/FS WORK PLAN

TITLE: GENERIC ALTERNATIVE DEVELOPMENT PROCESS

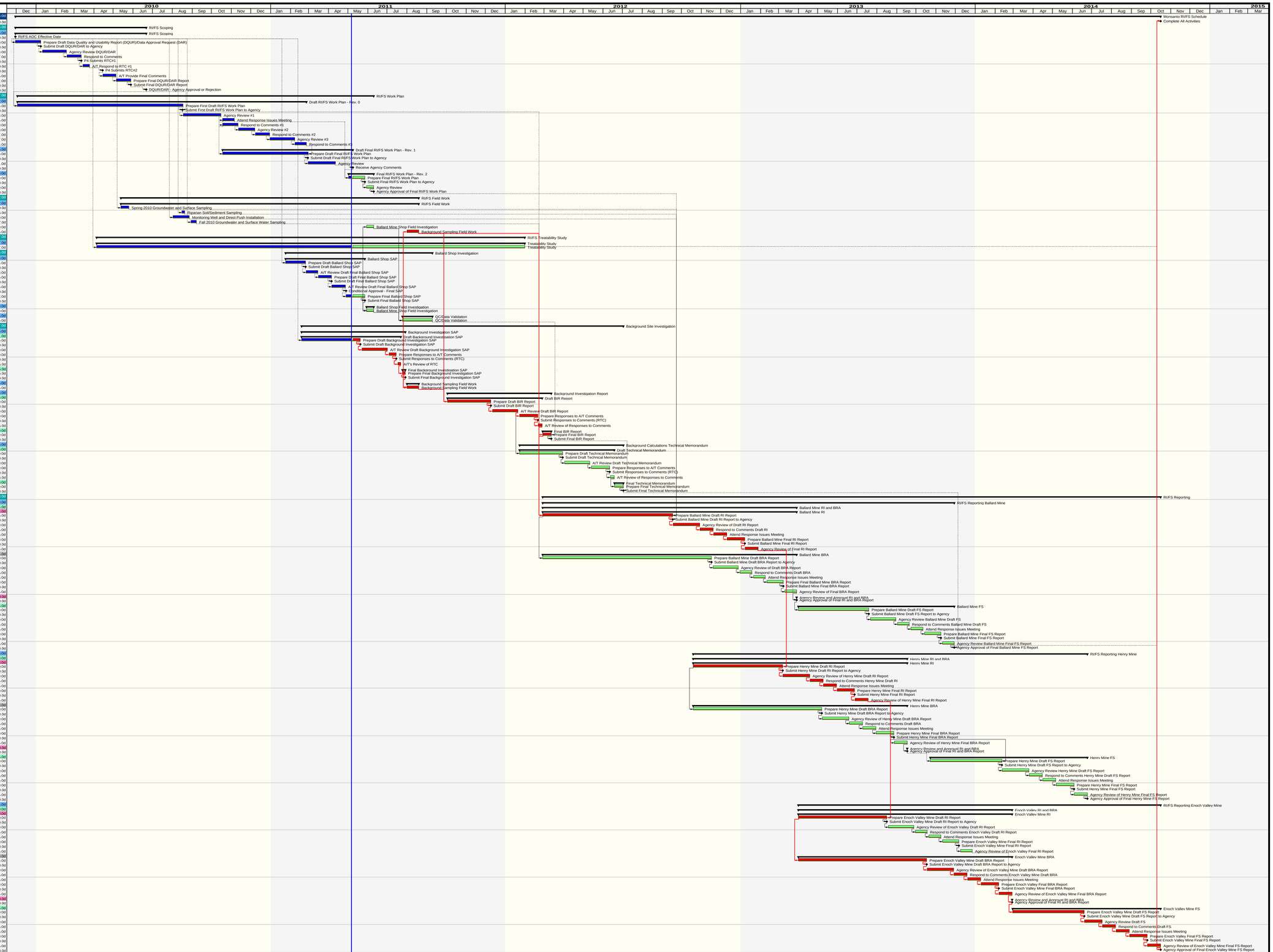
MWH

SHEET: FIGURE 5-2

REVISION:

FILE NAME: Fig 5-02_Generic Alternative Development Process_510.ai

Activity ID	Activity Name	Start	Finish	Original Duration
Monsanto RI/FS Schedule		30-Nov-09 A	16-Oct-14	1274.04
A00000	Complete All Activities		16-Oct-14	0.00
RI/FS Scoping		30-Nov-09 A	21-Jun-10 A	146.00
RI/FS Scoping		30-Nov-09 A	21-Jun-10 A	146.00
A01110	RI/FS AOC Effective Date	30-Nov-09 A		0.00
A01120	Prepare Draft Data Quality and Usability Report (DQUR)/Data Approval Reques...	30-Nov-09 A	08-Jan-10 A	30.00
A01130	Submit Draft DQUR/DAR to Agency		08-Jan-10 A	0.00
A01140	Agency Review DQUR/DAR	11-Jan-10 A	17-Feb-10 A	28.00
A01150	Respond to Comments	18-Feb-10 A	12-Mar-10 A	17.00
A01160	P4 Submits RTC#1		12-Mar-10 A	0.00
A01170	A/T Respond to RTC #1	15-Mar-10 A	25-Mar-10 A	9.00
A01180	P4 Submits RTC#2		14-Apr-10 A	0.00
A01190	A/T Provide Final Comments	15-Apr-10 A	05-May-10 A	15.00
A01200	Prepare Final DQUR/DAR Report	06-May-10 A	28-May-10 A	17.00
A01210	Submit Final DQUR/DAR Report		28-May-10 A	0.00
A01220	DQUR/DAR - Agency Approval or Rejection		21-Jun-10 A	0.00
RI/FS Work Plan		03-Dec-09 A	10-Jun-11	397.00
Draft RI/FS Work Plan - Rev. 0		03-Dec-09 A	25-Feb-11 A	322.00
A02110	Prepare First Draft RI/FS Work Plan	03-Dec-09 A	17-Aug-10 A	184.00
A02120	Submit First Draft RI/FS Work Plan to Agency		17-Aug-10 A	0.00
A02130	Agency Review #1	18-Aug-10 A	15-Oct-10 A	43.00
A02140	Attend Response Issues Meeting	18-Oct-10 A	05-Nov-10 A	15.00
A02150	Respond to Comments #1	18-Oct-10 A	11-Nov-10 A	19.00
A02160	Agency Review #2	12-Nov-10 A	07-Dec-10 A	18.00
A02170	Respond to Comments #2	08-Dec-10 A	30-Dec-10 A	17.00
A02180	Agency Review #3	31-Dec-10 A	07-Feb-11 A	27.00
A02190	Respond to Comments #3	08-Feb-11 A	25-Feb-11 A	14.00
Draft Final RI/FS Work Plan - Rev. 1		18-Oct-10 A	09-May-11	145.00
A02200	Prepare Draft Final RI/FS Work Plan	18-Oct-10 A	28-Feb-11 A	96.00
A02210	Submit Draft Final RI/FS Work Plan to Agency		28-Feb-11 A	0.00
A02220	Agency Review	28-Feb-11 A	12-Apr-11 A	31.00
A02230	Receive Agency Comments		09-May-11	0.00
Final RI/FS Work Plan - Rev. 2		02-May-11 A	10-Jun-11	30.00
A02240	Prepare Final RI/FS Work Plan	02-May-11 A	27-May-11	20.00
A02250	Submit Final RI/FS Work Plan to Agency		27-May-11	0.00
A02260	Agency Review	30-May-11	10-Jun-11	10.00
A02270	Agency Approval of Final RI/FS Work Plan		10-Jun-11	0.00
RI/FS Field Work		13-May-10 A	19-Aug-11	332.00
RI/FS Field Work		13-May-10 A	19-Aug-11	332.00
A03110	Spring 2010 Groundwater and Surface Sampling	13-May-10 A	25-May-10 A	9.00
A03120	Riparian Soil/Sediment Sampling	16-Aug-10 A	20-Aug-10 A	5.00
A03130	Monitoring Well and Direct Push Installation	02-Aug-10 A	27-Aug-10 A	20.00
A03140	Fall 2010 Groundwater and Surface Water Sampling	30-Aug-10 A	07-Sep-10 A	7.00
A03150	Ballard Mine Shop Field Investigation	30-May-11	10-Jun-11	10.00
A03160	Background Sampling Field Work	01-Aug-11	19-Aug-11	15.00
RI/FS Treatability Study		05-Apr-10 A	31-Jan-12	477.00
Treatability Study		05-Apr-10 A	31-Jan-12	477.00
A04110	Treatability Study	05-Apr-10 A	31-Jan-12	477.00
Ballard Shop Investigation		24-Jan-11 A	09-Sep-11	165.00
Ballard Shop SAP		24-Jan-11 A	27-May-11	90.00
A05110	Prepare Draft Ballard Shop SAP	24-Jan-11 A	24-Feb-11 A	24.00
A05120	Submit Draft Ballard Shop SAP		24-Feb-11 A	0.00
A05130	A/T Review Draft Final Ballard Shop SAP	25-Feb-11 A	15-Mar-11 A	13.00
A05140	Prepare Draft Final Ballard Shop SAP	16-Mar-11 A	05-Apr-11 A	15.00
A05150	Submit Draft Final Ballard Shop SAP		05-Apr-11 A	0.00
A05160	A/T Review Draft Final Ballard Shop SAP	06-Apr-11 A	27-Apr-11 A	16.00
A05170	Conditional Approval - Final SAP		28-Apr-11 A	0.00
A05180	Prepare Final Ballard Shop SAP	28-Apr-11 A	27-May-11	22.00
A05190	Submit Final Ballard Shop SAP		27-May-11	0.00
Ballard Shop Field Investigation		30-May-11	10-Jun-11	10.00
A05200	Ballard Mine Shop Field Investigation	30-May-11	10-Jun-11	10.00
QC/Data Validation		25-Jul-11	09-Sep-11	35.00
A05210	QC/Data Validation	25-Jul-11	09-Sep-11	35.00
Background Site Investigation		18-Feb-11 A	02-Jul-12	357.00
Background Investigation SAP		18-Feb-11 A	29-Jul-11	116.00
Draft Background Investigation SAP		18-Feb-11 A	22-Jul-11	111.00
A06110	Prepare Draft Background Investigation SAP	18-Feb-11 A	20-May-11	66.00
A06120	Submit Draft Background Investigation SAP		20-May-11	0.00
A06130	A/T Review Draft Background Investigation SAP	23-May-11	01-Jul-11	30.00
A06140	Prepare Responses to A/T Comments	04-Jul-11	15-Jul-11	10.00
A06150	Submit Responses to Comments (RTC)		15-Jul-11	0.00
A06160	A/T's Review of RTC	18-Jul-11	22-Jul-11	5.00
Final Background Investigation SAP		25-Jul-11	29-Jul-11	5.00
A06170	Prepare Final Background Investigation SAP	25-Jul-11	29-Jul-11	5.00
A06180	Submit Final Background Investigation SAP		29-Jul-11	0.00
Background Sampling Field Work		01-Aug-11	19-Aug-11	15.00
A06190	Background Sampling Field Work	01-Aug-11	19-Aug-11	15.00
Background Investigation Report		03-Oct-11	12-Mar-12	116.00
Draft BIR Report		03-Oct-11	27-Feb-12	106.00
A06200	Prepare Draft BIR Report	03-Oct-11	09-Dec-11	50.00
A06210	Submit Draft BIR Report		09-Dec-11	0.00
A06220	A/T Review Draft BIR Report	12-Dec-11	20-Jan-12	30.00
A06230	Prepare Responses to A/T Comments	23-Jan-12	20-Feb-12	20.00
A06240	Submit Responses to Comments (RTC)		20-Feb-12	0.00
A06250	A/T Review of Responses to Comments	21-Feb-12	27-Feb-12	5.00
Final BIR Report		28-Feb-12	12-Mar-12	10.00
A06260	Prepare Final BIR Report	28-Feb-12	12-Mar-12	10.00
A06270	Submit Final BIR Report		12-Mar-12	0.00
Background Calculations Technical Memorandum		23-Jan-12	02-Jul-12	116.00
Draft Technical Memorandum		23-Jan-12	18-Jun-12	106.00
A06280	Prepare Draft Technical Memorandum	23-Jan-12	30-Mar-12	50.00
A06290	Submit Draft Technical Memorandum		30-Mar-12	0.00
A06300	A/T Review Draft Technical Memorandum	02-Apr-12	11-May-12	30.00
A06330	Prepare Responses to A/T Comments	14-May-12	11-Jun-12	20.00
A06340	Submit Responses to Comments (RTC)		11-Jun-12	0.00
A06350	A/T Review of Responses to Comments	12-Jun-12	18-Jun-12	5.00
Final Technical Memorandum		19-Jun-12	02-Jul-12	10.00
A06310	Prepare Final Technical Memorandum	19-Jun-12	02-Jul-12	10.00
A06320	Submit Final Technical Memorandum		02-Jul-12	0.00
RI/FS Reporting		28-Feb-12	16-Oct-14	688.04
RI/FS Reporting Ballard Mine		28-Feb-12	29-Nov-13	459.00
Ballard Mine RI and BRA		28-Feb-12	29-Mar-13	284.00
Ballard Mine RI		28-Feb-12	29-Mar-13	284.00
A07110	Prepare Ballard Mine Draft RI Report	28-Feb-12	17-Sep-12	145.00
A07120	Submit Ballard Mine Draft RI Report to Agency		17-Sep-12	0.00
A07130	Agency Review of Draft RI Report	18-Sep-12	29-Oct-12	30.00
A07140	Respond to Comments Draft RI	30-Oct-12	19-Nov-12	15.00
A07150	Attend Response Issues Meeting	20-Nov-12	10-Dec-12	15.00
A07160	Prepare Ballard Mine Final RI Report	11-Dec-12	07-Jan-13	20.00
A07170	Submit Ballard Mine Final RI Report		07-Jan-13	0.00
A07180	Agency Review of Final RI Report	08-Jan-13	28-Jan-13	15.00
Ballard Mine BRA		28-Feb-12	29-Mar-13	284.00
A07190	Prepare Ballard Mine Draft BRA Report	28-Feb-12	16-Nov-12	189.00
A07200	Submit Ballard Mine Draft BRA Report to Agency		16-Nov-12	0.00
A07210	Agency Review of Draft BRA Report	19-Nov-12	28-Dec-12	30.00
A07220	Respond to Comments Draft BRA	31-Dec-12	18-Jan-13	15.00
A07230	Attend Response Issues Meeting	21-Jan-13	08-Feb-13	15.00
A07240	Prepare Final Ballard Mine BRA Report	11-Feb-13	08-Mar-13	20.00
A07250	Submit Ballard Mine Final BRA Report		08-Mar-13	0.00
A07260	Agency Review of Final BRA Report	11-Mar-13	29-Mar-13	15.00
Agency Review and Approval RI and BRA		29-Mar-13	29-Mar-13	0.00
A07270	Agency Approval of Final RI and BRA Report		29-Mar-13	0.00
Ballard Mine FS		01-Apr-13	29-Nov-13	175.00
A07280	Prepare Ballard Mine Draft FS Report	01-Apr-13	19-Jul-13	80.00
A07290	Submit Ballard Mine Draft FS Report to Agency		19-Jul-13	0.00
A07300	Agency Review Ballard Mine Draft FS	22-Jul-13	30-Aug-13	30.00
A07310	Respond to Comments Ballard Mine Draft FS	02-Sep-13	20-Sep-13	15.00
A07320	Attend Response Issues Meeting	23-Sep-13	11-Oct-13	15.00
A07330	Prepare Ballard Mine Final FS Report	14-Oct-13	08-Nov-13	20.00
A07340	Submit Ballard Mine Final FS Report		08-Nov-13	0.00
A07350	Agency Review Ballard Mine Final FS Report	11-Nov-13	29-Nov-13	15.00
A07360	Agency Approval of Final Ballard Mine FS Report		29-Nov-13	0.00
RI/FS Reporting Henry Mine		19-Oct-12	24-Jun-14	438.00
Henry Mine RI and BRA		19-Oct-12	17-Sep-13	238.00
Henry Mine RI		19-Oct-12	17-Sep-13	238.00
A07370	Prepare Henry Mine Draft RI Report	19-Oct-12	07-Mar-13	100.00
A07380	Submit Henry Mine Draft RI Report to Agency		07-Mar-13	0.00
A07390	Agency Review of Henry Mine Draft RI Report	08-Mar-13	18-Apr-13	30.00
A07400	Respond to Comments Henry Mine Draft RI	19-Apr-13	09-May-13	15.00
A07410	Attend Response Issues Meeting	10-May-13	30-May-13	15.00
A07420	Prepare Henry Mine Final RI Report	31-May-13	27-Jun-13	20.00
A07430	Submit Henry Mine Final RI Report		27-Jun-13	0.00
A07440	Agency Review of Henry Mine Final RI Report	28-Jun-13	18-Jul-13	15.00
Henry Mine BRA		19-Oct-12	17-Sep-13	238.00
A07450	Prepare Henry Mine Draft BRA Report	19-Oct-12	07-May-13	143.00
A07460	Submit Henry Mine Draft BRA Report to Agency		07-May-13	0.00
A07470	Agency Review of Henry Mine Draft BRA Report	08-May-13	18-Jun-13	30.00
A07480	Respond to Comments Draft BRA	19-Jun-13	09-Jul-13	15.00
A07490	Attend Response Issues Meeting	10-Jul-13	30-Jul-13	15.00
A07500	Prepare Henry Mine Final BRA Report	31-Jul-13	27-Aug-13	20.00
A07510	Submit Henry Mine Final BRA Report		27-Aug-13	0.00
A07520	Agency Review of Henry Mine Final BRA Report	28-Aug-13	17-Sep-13	15.00
Agency Review and Approval RI and BRA		17-Sep-13	17-Sep-13	0.00
A07530	Agency Approval of Final RI and BRA Report		17-Sep-13	0.00
Henry Mine FS		23-Oct-13	24-Jun-14	175.00
A07540	Prepare Henry Mine Draft FS Report	23-Oct-13	11-Feb-14	80.00
A07550	Submit Henry Mine Draft FS Report to Agency		11-Feb-14	0.00
A07560	Agency Review Henry Mine Draft FS Report	12-Feb-14	25-Mar-14	30.00
A07570	Respond to Comments Henry Mine Draft FS Report	26-Mar-14	15-Apr-14	15.00
A07580	Attend Response Issues Meeting	16-Apr-14	06-May-14	15.00
A07590	Prepare Henry Mine Final FS Report	07-May-14	03-Jun-14	20.00
A07600	Submit Henry Mine Final FS Report		03-Jun-14	0.00
A07610	Agency Review of Henry Mine Final FS Report	04-Jun-14	24-Jun-14	15.00
A07620	Agency Approval of Final Henry Mine FS Report		24-Jun-14	0.00
RI/FS Reporting Enoch Valley Mine		01-Apr-13	16-Oct-14	404.00
Enoch Valley RI and BRA		01-Apr-13	27-Feb-14	239.00
Enoch Valley Mine RI		01-Apr-13	27-Feb-14	239.00
A07630	Prepare Enoch Valley Mine Draft RI Report	01-Apr-13	18-Aug-13	100.00
A07640	Submit Enoch Valley Mine Draft RI Report to Agency		16-Aug-13	0.00
A07650	Agency Review of Enoch Valley Draft RI Report	19-Aug-13	27-Sep-13	30.00
A07660	Respond to Comments Enoch Valley Draft RI Report	30-Sep-13	18-Oct-13	15.00
A07670	Attend Response Issues Meeting	21-Oct-13	08-Nov-13	15.00
A07680	Prepare Enoch Valley Mine Final RI Report	11-Nov-13	06-Dec-13	20.00
A07690	Submit Enoch Valley Mine Final RI Report		06-Dec-13	0.00
A07700	Agency Review of Enoch Valley Final RI Report	09-Dec-13	27-Dec-13	15.00
Enoch Valley Mine BRA		01-Apr-13	27-Feb-14	239.00
A07710	Prepare Enoch Valley Mine Draft BRA Report	01-Apr-13	17-Oct-13	144.00
A07720	Submit Enoch Valley Mine Draft BRA Report to Agency		17-Oct-13	0.00
A07730	Agency Review of Enoch Valley Mine Draft BRA Report	18-Oct-13	28-Nov-13	30.00
A07740	Respond to Comments Enoch Valley Mine Draft BRA	29-Nov-13	19-Dec-13	15.00
A07750	Attend Response Issues Meeting	20-Dec-13	09-Jan-14	15.00
A07760	Prepare Enoch Valley Final BRA Report	10-Jan-14	06-Feb-14	20.00
A07770	Submit Enoch Valley Mine Final BRA Report		06-Feb-14	0.00
A07780	Agency Review of Enoch Valley Mine Final BRA Report	07-Feb-14	27-Feb-14	15.00
Agency Review and Approval RI and BRA		27-Feb-14	27-Feb-14	0.00
A07790	Agency Approval of Final RI and BRA Report		27-Feb-14	0.00
Enoch Valley Mine FS		28-Feb-14	16-Oct-14	165.00
A07800	Prepare Enoch Valley Mine Draft FS Report	28-Feb-14	19-Jun-14	80.00
A07810	Submit Enoch Valley Mine Draft FS Report to Agency		19-Jun-14	0.00
A07820	Agency Review Draft FS	20-Jun-14	17-Jul-14	20.00
A07830	Respond to Comments Draft FS	18-Jul-14	07-Aug-14	15.00
A07840	Attend Response Issues Meeting	08-Aug-14	28-Aug-14	15.00
A07850	Prepare Enoch Valley Final FS Report	29-Aug-14	25-Sep-14	20.00
A07860	Submit Enoch Valley Mine Final FS Report		25-Sep-14	0.00
A07870	Agency Review of Enoch Valley Mine Final FS Report	26-Sep-14	16-Oct-14	15.00
A07880	Agency Approval of Final Enoch Valley Mine FS Report		16-Oct-14	0.00



Start Date: 30-Nov-09
Finish Date: 16-Oct-14
Data Date: 7-May-11

Actual Level of Effort
Primary Baseline
Actual Work
Remaining Work
Critical Remaining Work
Milestone
Summary

P4 Production, LLC

PROJECT LOCATION: BALLARD, HENRY AND ENOCH VALLEY MINES
PROJECT: P4 RI/FS WORK PLAN
TITLE: RI/FS SCHEDULE

MWH

SHEET: FIGURE 7-1
REVISION: 11May2011
FILE NAME: Fig 7-01 Monsanto RI_FS Schedule_May2011_24x36MOD.ai

TABLES

SECTION 2

TABLE 2-1
BALLARD MINE WASTE ROCK DUMP AND MINE PIT AREAS AND VOLUMES

Waste Rock Dump/ Mine Pit	Net Fill (cu. yd.)	Net Cut (cu. yd.)	2D Area[1] (sq. ft.)	3D Area[2] (sq. ft.)
MWD080	4,990,000	---	3,520,000	3,670,000
MWD081	3,920,000	---	2,060,000	2,180,000
MWD082	3,040,000	---	3,170,000	3,330,000
MWD083	608,000	---	727,000	760,000
MWD084	1,140,000	---	1,270,000	1,320,000
MWD093	5,060,000	---	2,860,000	3,030,000
MMP035	---	13,200,000	4,030,000	4,730,000
MMP036	---	5,850,000	2,680,000	2,970,000
MMP037	---	2,660,000	1,020,000	1,150,000
MMP038	---	21,800	56,200	60,200
MMP039	---	844,000	1,030,000	1,100,000
MMP040	---	1,230,000	905,000	982,000
TOTAL	**18,800,000**	**23,800,000**	**23,300,000**	**25,300,000**
Acres:			**534**	**581**

Notes:
Calculated areas and volumes have been rounded to three significant figures.
(1) - 2D area is the area in a horizontal map view.
(2) - 3D area is the surface area that accounts for topography.
--- = not applicable

TABLE 2-2
HENRY MINE WASTE ROCK DUMP AND MINE PIT AREAS AND VOLUMES

Waste Rock Dump/ Mine Pit	Net Fill[1] (cu. yd.)	Net Cut[2] (cu. yd.)	2D Area[3] (sq. ft.)	3D Area[4] (sq. ft.)
MWD085	2,500,000	---	2,850,000	2,890,000
MWD086	11,200,000	---	12,100,000	12,400,000
MWD087	6,570,000	---	3,760,000	3,870,000
MWD088	3,650,000	---	3,190,000	3,260,000
MWD090	8,390,000	---	4,340,000	4,480,000
MMP041[5]	---	6,500,000	4,230,000	4,900,000
MMP042	---	837,000	1,640,000	1,700,000
MMP043	---	11,500,000	6,140,000	6,610,000
MMP044[5]	---	13,600,000	3,960,000	4,640,000
TOTAL	**32,300,000**	**32,400,000**	**42,200,000**	**44,800,000**
Acres:			**969**	**1,030**

Notes:
Calculated areas and volumes have been rounded to three significant figures.
(1) - Fill volumes and areas are for the external waste rock dumps; the portion of the dump within mine pit boundaries is not included.
(2) - Net cut volume is from below original grade and does not include backfilled volume of the mine pits.
(3) - 2D area is the area in a horizontal map view.
(4) - 3D area is the surface area that accounts of the topography.
(5) - Pits MMP041and MMP044 contain un-backfilled volume.
--- = not applicable

TABLE 2-3
ENOCH VALLEY MINE WASTE ROCK DUMP AND MINE PIT AREAS AND VOLUMES

Waste Rock Dump/ Mine Pit	Net Fill(1) (cu. yd.)	Net Cut (cu. yd.)	2D Area(2) (sq. ft.)	3D Area(3) (sq. ft.)
MWD091	8,130,000	---	8,910,000(4)	10,500,000(4)
MWD092	14,100,000	---	10,600,000	10,800,000
MMP045(5)	---	8,500,000	2,200,000	2,600,000
MMP045(6)	---	3,380,000	--	--
TOTAL	**22,200,000**	**11,900,000**	**21,700,000**	**23,900,000**
Acres:			**498**	**549**

Notes:
Calculated areas and volumes have been rounded to three significant figures.
(1) - Fill volume is for the external waste rock dumps; the portion of the dumps within mine pit boundaries is not included.
(2) - 2D area is the area in a horizontal map view.
(3) - 3D area is the surface area that accounts of the topography.
(4) - Includes external waste rock dumps and backfill areas.
(5) - Un-backfilled portion of mine pit
(1) (6) - Net cut volume above backfill, below original grade, and does not include backfilled volume.
--- = not applicable

TABLE 2-4 ENOCH VALLEY WEATHER STATION CLIMATE DATA[a]													
	Jan	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Annual**
Avg. Monthly Precipitation (in.)	2.34	1.99	1.51	1.58	2.26	1.70	0.51	1.04	1.30	1.65	1.36	1.75	19.0
Avg. Monthly Min. Temperature (ºF)	-12.9	-11.4	-7.30	6.97	20.4	26.7	34.3	32.5	22.7	11.8	1.98	-13.7	9.34
Avg. Monthly Temperature (ºF)	16.0	19.2	26.3	34.9	46.0	54.4	64.8	60.2	49.3	38.1	28.5	19.8	38.1
Avg. Monthly Max. Temperature (ºF)	41.8	44.5	52.4	64.8	74.0	81.4	89.1	86.9	81.3	68.4	55.3	43.9	65.3

Notes:
a - Data is derived from the Enoch Valley Mine weather station climate readings compiled from 1997-2000 and 2005-2008.

TABLE 2-5 ESTIMATED AVERAGE PRECIPITATION AND TEMPERATURE AT BLACKFOOT BRIDGE[a]													
	Jan	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Annual**
Avg. Monthly Precipitation (in.)	1.24	1.25	1.40	1.51	2.38	1.63	1.17	1.35	1.43	1.40	1.22	1.19	17.2
Avg. Monthly Min. Temperature (ºF)	14.3	17.5	24.5	33.1	40.5	46.6	50.8	49.9	43.3	33.3	23.3	16.3	32.8
Avg. Monthly Temperature (ºF)	16.4	17.6	26.3	33.0	41.0	49.1	59.6	55.3	45.1	35.4	25.2	22.7	35.5
Avg. Monthly Max. Temperature (ºF)	25.2	29.5	38.7	49.8	60.8	71.3	79.8	79.3	69.3	53.8	38.5	28.1	52.0

Notes:
a - Data is derived from climate readings taken at 13 area weather stations, as described in BLM (2009)

TABLE 2-6 BALLARD MINE SURFACE WATER DISCHARGES				
P4 Monitoring Location**	**Annual Runoff Discharge* (cfs)**		**Annual Baseflow Discharge* (cfs)**	
	2007	**2008**	**2007**	**2008**
Ballard Creek				
MST066	0.064	0	0	dry
MST067	0	0.034	dry	dry
Wooley Valley Creek				
MST088	dry	2.6	dry	dry
MST089	0.026	0.26	dry	dry
MST090	0.054	0.071	dry	dry

Notes:
cfs = cubic feet per second
dry = no water present
0 = water present but there was no observed flow or flow was so small as not to be measurable with standard equipment.
* - Runoff measurement are typically in May and baseflow measurements typically in September.
** - Monitoring locations shown on Drawing 2-4

TABLE 2-7 HENRY MINE SURFACE WATER DISCHARGES				
P4 Monitoring Location**	**Annual Runoff Discharge* (cfs)**		**Annual Baseflow Discharge* (cfs)**	
	2007	**2008**	**2007**	**2008**
Little Blackfoot River				
MST044	2.5	4.8	1.5	0.59
MST045	2.2	6.5	1.5	0.80
MST234	10	12	7.0	7.6
Lone Pine Creek				
MST054	0.37	0.95	0.13	0.26
Long Valley Creek				
MST050	0	0.0013	0	0
MST277	0	0	dry	dry

Notes:
cfs = cubic feet per second
dry = no water present
0 = water present but there was no observed flow or flow was so small as not to be measurable with standard equipment.
* - Runoff measurement are typically in May and baseflow measurements typically in September.
** - Monitoring locations shown on Drawing 2-4

TABLE 2-8 ENOCH VALLEY MINE SURFACE WATER DISCHARGES				
P4 Monitoring Location**	Annual Runoff Discharge* (cfs)		Annual Baseflow Discharge* (cfs)	
	2007	2008	2007	2008
Angus Creek				
MST127	4.7	9.1	0.11	0.37
MST128	3.7	7.8	0.34	0.33
MST129	2.2	5.1	0.99	0
MST132	4.1	8.6	0.39	0.20
Rasmussen Creek				
MST131	0.87	1.8	0.044	0.29
MST133	0.19	1.5	dry	dry
MST134	0	3.2	dry	dry
MST135	0	0.59	dry	dry
MST136	dry	0.0020	dry	dry

Notes:
cfs = cubic feet per second
dry = no water present
0 = water present but there was no observed flow or flow was so small as not to be measurable with standard equipment.
* - Runoff measurement are typically in May and baseflow measurements typically in September.
** - Monitoring locations shown on Drawing 2-4

TABLE 2-9 BLACKFOOT RIVER DISCHARGES				
P4 Monitoring Location**	Annual Runoff Discharge* (cfs)		Annual Baseflow Discharge* (cfs)	
	2007	2008	2007	2008
MST019	82	465	22	37
MST020	100	-	23	31
MST022	88	-	25	42
MST023	180	-	29	37
MST026	84	603	28	47
MST027	136	315	27	50
MST028	120	261	25	31
MST232	106	-	31	41

Notes:
(-) Flow measurement not collected because river was not safe to enter.
* - Runoff measurement are typically in May and baseflow measurements typically in September.
** - Monitoring locations shown on Drawing 2-4

TABLE 2-10 MINE AREA PONDS						
Pond	**Mine**	**Site ID**	**Approx. Area (acres)**	**Perennial**	**Potential Overflow Location**	**Use/Features**
Dredge Pond	Ballard	MSP010	<0.10	No	Closed basin.	Adjacent to paved haul road, supports some willows.
Upper Elk Pond	Ballard	MSP011	0.17	No	Tributary to Blackfoot River	Supports many willows, below waste rock.
Lower Elk Pond	Ballard	MSP012	0.14	No	Tributary to Blackfoot River	Supports many willows, below waste rock.
NE Pond	Ballard	MSP013	<0.10	No	Tributary to Wooley Valley Creek	In grassy area below waste rock, shallow, quick to dry.
Henry Pond	Henry	MSP014	5.80	Yes	Tributary to Lone Pine Creek	No riparian vegetation.
Smith Pond	Henry	MSP015	1.28	No	Tributary to Little Blackfoot River	Adjacent to Henry haul road, supports some willows, used by livestock.
Center Pond	Henry	MSP016	0.71	Yes	Tributary to Little Blackfoot River	Large, below waste rock, supports few willows.
South Pond	Enoch Valley	MSP017	2.69	Yes	South Pond extension then tributary to Angus Creek (Outfall 5[1])	Large, supports riparian grasses and many willows.
Keyhole Pond	Enoch Valley	MSP018	<0.10	Yes	South Pond (MSP017)	Small, below reclaimed waste rock, supports riparian grasses and willows.
Bat Cave Pond	Enoch Valley	MSP019	0.29	Yes	South Pond (MSP017)	On reclaimed pit backfill and lined with bentonite, supports some riparian grasses.
West Pond	Enoch Valley	MSP020	3.99	No	Smaller secondary ponds then Rasmussen Creek (Outfall 4[1])	Large, borders native land and reclaimed waste rock, supports some willows.

TABLE 2-10 (continued) MINE AREA PONDS						
Pond	**Mine**	**Site ID**	**Approx. Area (acres)**	**Perennial**	**Potential Overflow Location**	**Use/Features**
Stock Pond	Enoch Valley	MSP021	1.62	Yes	Bat Cave Pond (MSP019)	Used for road dust control water, on reclaimed waste rock, supports some willows.
Tipple Pond(2)	Enoch Valley	MSP022	0.36	Yes	Tipple pond series(3) then possibly to Rasmussen Creek headwater (Outfall 3(1))	Used for road dust control water, small, no riparian vegetation.
Office Pond(4)	Enoch Valley	MSP023	0.64	No	Rasmussen Creek headwater(5) (Outfall 3(1))	Facilities stock pond, small, some riparian vegetation.
Shop Pond	Enoch Valley	MSP031	0.30	No	Pumped to Tipple Pond, possibly Rasmussen Creek headwater (Outfall 2(1))	Supports some willows, many riparian grasses, has supported nesting Sandhill Cranes.
South Pit Pond	Henry	MSP055	0.12	No	Closed basin	Open pit pond, small, no riparian vegetation.
Pit #4 Stock Pond	Ballard	MSP059	<0.10	No	Closed basin	Small un-backfilled pit pond, supports many willows.
Pit #6 Pond	Ballard	MSP062	0.21	No	Closed basin	Small, in partially backfilled pit, supports many willows.

Notes:

(1) Enoch Valley SWPPP outfall.

(2) Uppermost of a four pond stormwater system. The other ponds generally do not contain water except during runoff or large storm events.

(3) The Tipple Pond listed here is the first in a series of four stormwater ponds. The other three ponds in the series are smaller and typically go dry. Tipple pond is currently managed by flow to the other ponds in series, excess water is pumping back to first pond (MSP022), to Enoch Valley mine pit, or used for dust control.

(4) The Office Pond was formerly identified as the Haul Road Pond; however, the designation MSP023 has not changed.

(5) Water flow that historically went to the Office Pond (MSP023) was diverted to the Tipple Pond (MSP022) and as a result, MSP023 rarely contains water.

TABLE 2-11
GENERALIZED STRATIGRAPHY OF THE PROJECT AREA [1]

	AGE	FORMATION	MEMBERS	GENERAL DESCRIPTION	HYDROGEOLOGIC CHARACTERISTICS [2]
CENOZOIC	Quaternary	ALLUVIUM (Qal and Qw)	--	Alluvium or colluvium.	Supports local groundwater flow system.
CENOZOIC	Quaternary/ Tertiary	BASALT (Qb)	--	Basalt flows, basalt ash.	Can support intermediate groundwater flow system where fractured, but generally supports local systems.
MESOZOIC	Triassic	THAYNES (Ŧt)	Several Members	Mostly limestone with sandstone layers. Some siltstone and shale members.	Supports intermediate groundwater flow system.
MESOZOIC	Triassic	DINWOODY FM (Ŧd)	Upper Unit	Gray, fossiliferous limestone interbedded with olive-brown calcareous siltstone.	Supports intermediate groundwater flow system.
MESOZOIC	Triassic	DINWOODY FM (Ŧd)	Woodside Shale	Reddish-brown siltstone and shale. Discontinuous in program area.	Does not support groundwater flow system.
MESOZOIC	Triassic	DINWOODY FM (Ŧd)	Lower Unit	Olive-brown calcareous siltstone and shale with thin-bedded limestone.	Supports intermediate groundwater flow system.
PALEOZOIC	Permian	PHOSPHORIA FM (Pp)	Retort Phosphatic Shale	Phosphatic shale. Discontinuous in area of Sites.	Does not support groundwater flow system. Low hydraulic conductivity layer.
PALEOZOIC	Permian	PHOSPHORIA FM (Pp)	Cherty Shale	Thin-bedded dark-brown to black cherty mudstone, siliceous shale and argillaceous chert.	Does not support groundwater flow system. Low hydraulic conductivity layer.
PALEOZOIC	Permian	PHOSPHORIA FM (Pp)	Rex Chert	Thick-bedded black to white chert with some mudstone and some limestone lenses.	May support isolated groundwater flow where highly fractured in areas.
PALEOZOIC	Permian	PHOSPHORIA FM (Pp)	Meade Peak Phosphatic Shale (Ppm)	Dark-brown to black mudstone, limestone and phosphorite. Meade Peak member is typically mined.	Does not support groundwater flow system. Low hydraulic conductivity layer.
PALEOZOIC	Permian/ Pennsylvanian	PARK CITY FM [3]	Grandeur Limestone	Light gray dolomite and cherty dolomite with some sandstone. Discontinuous in area of Sites. Mapped with Wells Fm.	May support a flow system, but is not present throughout the Sites. It appears to be present at Ballard, but not Henry or Enoch Valley.
PALEOZOIC	Permian/ Pennsylvanian	WELLS FM (ℙw)	Upper Unit (ℙwu)	Light gray to reddish-brown sandstone, some interbedded limestone and dolomite.	Supports groundwater flow systems, which may be regional.
PALEOZOIC	Permian/ Pennsylvanian	WELLS FM (ℙw)	Lower Unit (ℙl)	Medium bedded gray cherty limestone, some interbedded sandstone.	Supports groundwater flow systems, which may be regional.
PALEOZOIC	Mississippian	BRAZER OR MONROE CANYON FM (Mb)	Brazer Limestone	Light gray limestone with interbedded sandstone, occasionally with grey and green shale. Not exposed or intersected by drilling in the area of the sites.	--

Notes:
1. Stratigraphy based on Ralston, et al., 1980 and Ralston, et al., 1983.
2. Notes on hydrologic characteristics are based on several sources of information. Information not available for all units.
3. Often mapped as part of the Wells Formation.

TABLE 2-12 AGE, SEX, AND RACIAL DISTRIBUTION IN 2000										
Age (years)	**> 5**	**5-9**	**10-14**	**15-19**	**20-24**	**25-34**	**35-44**	**45-54**	**55-64**	**65+**
	252	256	316	316	225	368	511	409	270	458
Gender	**Female**	**Male**								
	1,732	1,649								
Race or Ethnicity	**White**	**Black or African American**	**Native American or Native Alaskan**	**Asian**	**Native Hawaiian or Other Pacific Islander**	**Other**	**Two or More Races**	**Hispanic or Latino[a]**		
	3,267	1	3	5	7	40	58	98		
Total Population	3,381									

Notes:
[a] Hispanic or Latino persons may be of any race and are considered an ethnic group rather than a racial group.
Source: U. S. Census, 2000

TABLE 2-13 EMPLOYMENT DISTRIBUTION BY ECONOMIC SECTOR IN 2000															
Total Labor Force	**Agriculture, Forestry, Fishing and Hunting, or Mining**	**Construction**	**Manufacturing**	**Wholesale Trade**	**Retail Trade**	**Transportation and Warehousing, and Utilities**	**Information**	**Finance, Insurance, Real Estate, Rental and Leasing**	**Professional, Scientific, Management, Administrative, and Waste Management Services**	**Educational, Health, and Social Services**	**Arts, Entertainment, Recreation, Accommodation and Food Services**	**Other Services**	**Public Administration**	**Unemployed**	**Population 16 Years and Older**
1,429	128	204	294	20	132	37	4	26	45	241	109	59	40	90	2,422

Source: U.S. Census, 2000

TABLE 2-14
PRE-2003 AOC SAMPLING SUMMARY

	Surface Water	Groundwater	Surface-Expressed Groundwater	Sediment	Salmonids	Forage Fish	Benthic Macroinvertebrates	Macrophytes	Periphyton	Plankton	Riparian Soil	Riparian Vegetation	Upland Soil	Upland Vegetation	Cattle	Bird Eggs	Elk	Small Mammals	Terrestrial Invertebrates
September 1997	6	-	11	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
May 1998	18	1	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
July 1998	-	-	-	-	-	-	-	-	-	-	-	-	5	10	-	-	-	-	-
September 1998	18	1	1	18	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1999	-	-	-	-	-	-	-	-	-	-	-	-	-	-	20	-	160	-	-
May 1999	9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	215	-	-	-
June 1999	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
July 1999	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
August 1999	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
September 1999	35	-	-	33	15	11	21	20	7	10	-	22	-	-	-	-	-	-	-
October 1999	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
November 1999	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
December 1999	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	54	-	-
January 2000	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
February 2000	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
March 2000	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
April 2000	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
May 2000	36	-	2	1	9	17	23	19	8	10	-	-	-	-	-	334	-	-	-
July 2000	-	-	-	-	-	-	-	-	-	-	-	-	133	83	-	-	-	-	-
May 2001	54	-	19	-	-	-	-	-	-	-	-	-	8	-	-	369	-	-	-
August 2001	-	-	-	-	-	-	-	-	-	-	5	-	-	-	-	-	-	-	-
August-September 2001	-	-	-	-	-	-	-	-	-	-	-	-	10	6	-	-	-	-	-
September 2001	-	-	-	-	-	-	-	-	-	-	-	5	-	-	-	-	-	15	18
May 2002	54	-	32	84	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
July 2002	6	-	7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
September 2002	23	-	25	47	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
November 2002	4	-	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
January 2003	5	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
March 2003	5	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
April 2003	7	-	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
May 2003	7	-	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
June 2003	6	-	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
July 2003	6	-	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Notes: The total numbers of stations sampled per sampling event are provided.

TABLE 2-15
POST-2003 AOC SAMPLING SUMMARY

	Surface Water	Groundwater	Surface-Expressed Groundwater	Direct Push Shallow Ground Water	Direct Push Shallow Ground Water (MBWs)	Sediment	Salmonids	Forage Fish	Benthic Macroinvertebrates	Macrophytes	Periphyton	Plankton	Riparian Soil	Riparian Vegetation	Upland Soil	Upland Vegetation	Cattle	Bird Eggs	Elk	Small Mammals	Terrestrial Invertebrates
May 2004	55	19	44	-	-	99	5	31	-	-	-	-	-	3	-	3	-	-	-	-	-
June 2004	-	-	-	-	-	-	-	-	66	-	-	-	-	3	-	3	-	-	-	-	-
July 2004	-	-	-	-	-	-	-	-	-	-	-	-	-	3	138	133	-	-	-	-	-
August 2004	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-	3	-	-	-	-	-
September 2004	-	5	17	-	-	-	-	-	-	-	-	-	113	113	-	3	-	-	-	-	-
October 2004	-	9	-	-	-	-	-	-	-	-	-	-	-	3	-	3	-	-	-	-	-
June 2005	-	7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
October 2005	-	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
May 2006	40	6	51	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
May 2007	38	-	36	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
September 2007	28	20	20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
May 2008	38	32	41	90	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
September 2008	29	30	21	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
May 2009	22	24	12	23	16	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
June-July 2009	-	-	-	-	-	-	-	-	-	-	-	-	-	-	226	428	-	-	-	-	-
August 2009	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	52	-	-	-	-	-
September 2009	4	9	7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Notes: The total numbers of stations sampled per sampling event are provided.

TABLE 2-16
SUMMARY OF ANALYTICAL PARAMETERS BY MEDIUM

	Surface Water		Groundwater		Surface-Expressed Groundwater		Direct Push Shallow Groundwater		Direct Push Shallow Groundwater (MBWs)		Sediment	Salmonids	Forage Fish	Benthic Macroinvertebrates	Macrophytes	Periphyton	Plankton	Riparian Soil	Riparian Vegetation	Upland Soil	Upland Vegetation	Cattle	Bird Eggs	Elk	Small Mammals	Terrestrial Invertebrates
	T	D	T	D	T	D	T	D	T	D																
Aluminum	L	L	L	M	L	L	N	N	A	N	N	N	N	N	N	N	N	M	L	L	L	N	N	N	A	A
Antimony	N	L	L	L	L	L	N	N	N	N	N	N	N	N	N	N	N	M	L	L	L	N	N	N	A	A
Arsenic	N	L	L	L	L	L	N	N	N	N	N	N	N	N	N	N	N	M	L	L	L	N	N	N	A	A
Barium	N	L	L	L	L	L	N	N	N	N	N	N	N	N	N	N	N	M	L	L	L	N	N	N	A	A
Beryllium	N	L	L	L	L	L	N	N	N	N	N	N	N	N	N	N	N	M	L	L	L	N	N	N	A	A
Boron	N	N	L	L	L	L	N	N	N	N	N	N	N	N	N	N	N	N	L	L	L	N	N	N	A	A
Cadmium	L	M	M	M	L	M	N	N	A	N	A	A	A	M	A	A	A	A	L	M	M	A	A	A	A	A
Calcium	L	M	M	M	L	M	N	N	N	A	M	N	N	N	N	N	N	N	N	M	N	A	N	N	N	N
Chloride	N	M	N	A	N	M	N	N	N	A	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Chromium	L	L	M	M	L	L	N	N	A	N	M	N	N	N	N	N	N	A	L	M	L	N	N	N	A	A
Cobalt	N	L	L	L	L	L	N	N	N	N	L	N	N	N	N	N	N	N	N	N	L	N	N	N	N	N
Copper	N	L	L	L	L	L	N	N	N	N	L	N	N	N	N	N	N	A	L	M	L	A	N	M	A	A
Fluoride	N	N	L	N	L	L	N	N	N	N	N	N	N	N	N	N	N	N	N	L	N	N	N	N	N	N
Gross Alpha	N	N	L	N	L	N	N	N	A	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Gross Beta	N	N	L	N	L	N	N	N	A	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Iron	N	L	M	M	L	L	N	N	A	A	M	N	N	N	N	N	N	N	L	M	L	A	N	M	N	N
Lead	N	L	L	L	L	L	N	N	N	N	N	N	N	N	N	N	N	M	L	L	L	A	N	M	A	A
Magnesium	L	M	L	M	L	M	N	N	N	A	M	N	N	N	N	N	N	N	N	L	N	A	N	N	N	N
Manganese	L	L	M	M	L	L	N	N	A	N	L	N	N	N	N	N	N	M	N	A	L	A	N	M	A	A

TABLE 2-16
SUMMARY OF ANALYTICAL PARAMETERS BY MEDIUM

	Surface Water		Groundwater		Surface-Expressed Groundwater		Direct Push Shallow Groundwater		Direct Push Shallow Groundwater (MBWs)		Sediment	Salmonids	Forage Fish	Benthic Macroinvertebrates	Macrophytes	Periphyton	Plankton	Riparian Soil	Riparian Vegetation	Upland Soil	Upland Vegetation	Cattle	Bird Eggs	Elk	Small Mammals	Terrestrial Invertebrates
	T	D	T	D	T	D	T	D	T	D																
Mercury	N	L	L	L	L	L	N	N	N	N	N	N	N	N	N	N	N	M	L	L	L	N	N	N	A	A
Molybdenum	N	L	L	L	L	L	N	N	N	N	N	N	N	N	N	N	N	M	L	M	L	A	N	M	A	A
Nickel	L	M	M	M	L	M	N	N	A	N	M	L	L	N	N	N	N	N	N	A	L	N	N	N	A	A
NO_2/NO_3 as N	N	N	M	N	L	N	N	N	A	N	N	N	N	N	N	N	N	N	N	L	N	N	N	N	N	N
N Kjeldahl	L	N	L	N	L	N	N	N	N	N	N	N	N	N	N	N	N	N	N	L	N	N	N	N	N	N
Phosphorus	N	N	L	N	L	N	N	N	N	N	N	N	N	N	N	N	N	N	N	L	N	A	N	N	N	N
Phosphorus (ortho)	N	N	N	N	N	L	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Potassium	L	M	L	M	L	M	N	N	N	A	M	N	N	N	N	N	N	N	N	M	N	N	N	N	N	N
Selenium	A	N	M	M	A	L	N	A	A	N	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
Selenium (extractable)	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	L	N	N	N	N	N	N
Selenium (selenite)	N	N	N	L	N	L	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Selenium (selenate)	N	N	N	L	N	L	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Silver	N	L	L	L	L	L	N	N	N	N	N	N	N	N	N	N	N	M	L	L	L	N	N	N	A	A
Sodium	L	M	L	M	L	M	N	N	N	A	M	N	N	N	N	N	N	M	N	M	N	N	N	N	N	N
Sulfate	N	M	N	A	L	N	N	N	N	A	M	N	N	N	N	N	N	N	N	L	L	N	N	N	N	N
TDS	L	N	M	N	L	N	N	N	A	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Thallium	N	L	L	L	L	L	N	N	N	N	N	N	N	N	N	N	N	M	L	M	L	N	N	N	A	A
TOC	N	N	L	N	L	N	N	N	N	N	A	N	N	N	N	N	N	N	N	L	N	N	N	N	N	N
Total Alk.	M	N	N	A	M	N	N	N	A	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N

TABLE 2-16
SUMMARY OF ANALYTICAL PARAMETERS BY MEDIUM

	Surface Water		Groundwater		Surface-Expressed Groundwater		Direct Push Shallow Groundwater		Direct Push Shallow Groundwater (MBWs)		Sediment	Salmonids	Forage Fish	Benthic Macroinvertebrates	Macrophytes	Periphyton	Plankton	Riparian Soil	Riparian Vegetation	Upland Soil	Upland Vegetation	Cattle	Bird Eggs	Elk	Small Mammals	Terrestrial Invertebrates
	T	D	T	D	T	D	T	D	T	D																
TSS	L	N	M	N	L	N	N	N	A	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Uranium	N	L	L	L	L	L	N	N	N	N	N	N	N	N	N	N	N	N	N	L	L	N	N	N	A	A
Vanadium	L	M	M	M	L	M	N	N	A	N	M	L	L	N	N	N	N	N	L	A	L	N	N	N	A	A
Zinc	L	M	M	M	L	M	N	N	A	N	M	L	L	N	N	N	N	N	L	A	M	A	N	M	A	A

Notes:
T - Total Fraction
D - Dissolved Fraction
A - Constituent was analyzed for in all events the medium was sampled
M - Constituent was analyzed for in most events the medium was sampled (≥ one-half)
L - Constituent was analyzed for in limited events the medium was sampled (< one-half)
N - Never sampled for in this medium

TABLE 2-17 SUMMARY OF EE/CA MONITORING WELLS				
Monitoring Well	**Mine**	**Year Installed**	**System Monitored**	**Notes**
MMW006	Ballard	2007(1)	Wells Fm.	
MMW007	Enoch Valley	2007	Alluvial/Dinwoody	Well in uppermost Dinwoody Fm. and alluvium but is considered to be alluvial system.
MMW008	Enoch Valley	2007	Alluvial/Dinwoody	Well in uppermost Dinwoody Fm. and alluvium but is considered to be alluvial system.
MMW009	Enoch Valley	2007	Wells Fm.	
MMW010	Henry	2007	Alluvial	
MMW011	Henry	2007	Wells Fm.	
MMW012	Enoch Valley	2007	Alluvial	
MMW013	Enoch Valley	2007	Dinwoody Fm.	
MMW014	Henry	2007	Alluvial	
MW-15A	Ballard	2006	Alluvial	Installed for Blackfoot Bridge EIS
MW-16A	Ballard	2006	Alluvial	Installed for Blackfoot Bridge EIS
MMW017	Ballard	2007	Alluvial	
MMW018	Ballard	2007	Alluvial/Dinwoody	Well in uppermost Dinwoody Fm. and alluvium but is considered to be alluvial system.
MMW019	Henry	2007	(Phosphoria Fm.)	
MMW020	Ballard	2007	Wells Fm.	Installed as replacement for MMW001
MMW021	Ballard	2007	Wells Fm.	Installed as replacement for MMW002
MMW022	Henry	2007	Dinwoody Fm.	
MMW023	Henry	2007	Wells Fm.	
MMW024	Enoch Valley	2008(2)	Dinwoody Fm.	
MMW025	Enoch Valley	2008	Dinwoody Fm.	
MMW026	Enoch Valley	2008	Wells Fm.	
MMW027	Enoch Valley	2008	Dinwoody Fm.	
MMW028	Henry	2008	Dinwoody Fm.	
MMW029	Ballard	2008	Dinwoody Fm.	
MMW030	Ballard	2008	Wells Fm.	
MMW031	Ballard	2008	Wells Fm.	
MMW032	Ballard	2009(3)	Alluvial/Dinwoody	
MMW033	Ballard	2009	(Phosphoria Fm.)	
MMW034	Enoch Valley	2009	Dinwoody Fm.	
MMW035	Enoch Valley	2009	Dinwoody Fm.	
MMW036	Enoch Valley	2009	Basalt	Dinwoody Fm. was not encountered at location, only permeable basalt.

Notes:
(1) - Well construction summary for 2007 reported in MWH (2008b).
(2) - Well construction summary for 2008 reported in MWH (2009d).
(3) - Well construction summary for 2009 contained in Appendix A.

TABLES

SECTION 3

TABLE 3-1
SCREENING LEVEL SUMMARY BY MEDIA

Analyte	Soil Screening Value[a] (mg/kg)	Vegetation Screening Value[b] (mg/kg)	Surface Water Screening Value (mg/l)	Sediment Screening Value (mg/kg)	Groundwater Screening Value (mg/l)
Aluminum	77,000	1,000	0.087[c]	25.5[d]	0.2[e]
Antimony	31	--	0.030[f]	3[g]	0.006[e]
Arsenic	0.39	30	0.150[h]	5.9[i]	0.01[j]
Barium	15,000	--	0.003[f]	--	2[e]
Beryllium	160	--	0.0006[f]	--	0.004[e]
Boron	16,000	150	0.0016[f]	--	7.3[k]
Cadmium	70	10	0.0006[h,l]	0.583[d]	0.005[e]
Chloride	--	--	--	--	250[e]
Chromium	120,000	100	0.011[h,l,m]	36.286[d]	0.1[e]
Cobalt	23	25	0.003[f]	50[o]	0.011[k]
Copper	3,100	40	0.011[h,l]	35.7[i]	1.3[e]
Fluoride	--	--	--	--	4[e]
Iron	55,000	500	0.158[p]	2[o]	0.3[e]
Lead	400	100	0.0025[h,l]	35[i]	0.015[e]
Manganese	1,800	2,000	0.12[n]	460[o]	0.05[e]
Mercury	5.6	--	0.00077[f]	0.174[i]	0.002[e]
Molybdenum	390	5	0.034[f]	--	0.18[k]
Nickel	1,500	100	0.052[h,l]	18[i]	0.73[k]
Nitrate	130,000	--	--	--	10[e]
Nitrite	7,800	--	--	--	1[e]
Selenium	390	5	0.005[h,m]	4[q]	0.05[e]
Silver	390	--	0.00036[f]	0.5[o]	0.1[e]
Sulfate	--	--	--	--	250[e]
TDS	--	--	--	--	500[e]
Thallium	5	--	0.00003[f]	--	0.002[e]
Uranium	230	--	0.142[n]	--	0.03[j]
Vanadium	390	50	0.02[n]	57[r]	0.26[k]
Zinc	23,000	500	0.12[h,l]	98[d]	5[e]
pH	--	--	--	--	6.5-8.5[e]

Notes:

[a] USEPA Regional Screening Levels for Soil, Residential, Source: ORNL December 2009 http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/index.htm

[b] Mineral tolerance of animals, second revised edition, 2005 National Research Council, published by the National Academics Press, WA DC, 496 pages

[c] National Recommended Water Quality Criteria (USEPA, 2009); Freshwater Standards for Chronic Criteria (CCC)

[d] The ARCS TEL for freshwater sediment in NOAA SQuiRT (Buchman, 2008)

[e] State of Idaho Ground Water Quality Rule (IDAPA 58.01.11). Note that secondary MCLs are listed for pH, aluminum, chloride, iron, manganese, pH, silver, sulfate, TDS and zinc

[f] Chronic freshwater screening value in NOAA SQuiRT (Buchman, 2008)

[g] Buchman, M. 1999. NOAA HAZMAT Report 99-1.

[h] State of Idaho Surface Water Quality for Aquatic Life (IDAPA 58.01.02); Chronic Criteria (CCC)

[i] TEL for freshwater sediment in NOAA SQuiRT (Buchman, 2008)

[j] USEPA primary and secondary Maximum Contaminant Level (MCL), National Primary Drinking Water Regulations, EPA.

[k] USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Site

[l] Aquatic life criteria for these metals are expressed as function of total hardness.

[m] Criterion is expressed as total recoverable (unfiltered concentration).

[n] Tier II Secondary Chronic Value. Source: ORNL, 1996.

[o] Guidelines for the protection and management of aquatic sediment quality in Ontario Aug 1993.

[p] Lowest Chronic Value (LCV) observed for fresh water daphnids. Source: ORNL, 1996.

[q] Screening value from Van Derveer and Canton (1997)

[r] Freshwater sediment screening value not available; screening value presented based on the marine sediment AET (Buchman, 2008)

TABLE 3-2

BALLARD MINE - SUMMARY OF SOIL EXCEEDANCES
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				Analyte (mg/Kg, dry weight)						
Sample Identification	Collection Date	Sample Medium	Sample Type	Arsenic	Cadmium	Cobalt	Manganese	Nickel	Selenium	Vanadium
			Screening Value:	0.39	70	23	1800	1500	390	390
MBB001 (Ballard Background)										
0906-MBB001-01-SS	7/10/2009	Soil	Primary	2.96	1.40	5.27	437	13.0	0.304	14.8
0906-MBB001-02-SS	7/10/2009	Soil	Primary	3.27	1.58	5.51	455	13.2	0.361	15.4
0906-MBB001-03-SS	7/10/2009	Soil	Primary	3.38	1.48	5.32	405	17.1	0.379	17.5
0906-MBB001-04-SS	7/10/2009	Soil	Primary	2.99	1.79	4.83	424	14.2	0.414	16.0
0906-MBB001-05-SS	7/9/2009	Soil	Primary	2.55	1.63	4.11	419	13.5 J-	0.250 J-	10.7 J+
0906-MBB001-06-SS	7/10/2009	Soil	Primary	3.48	2.26	3.86	442	14.9	0.418	16.3 J+
0906-MBB001-07-SS-1	7/10/2009	Soil	Triplicate	3.48	2.13	3.39	327	12.4	0.366	15.4 J+
0906-MBB001-07-SS-2	7/10/2009	Soil	Triplicate	3.42	2.61	3.44	327	13.0	0.417	17.2
0906-MBB001-07-SS-3	7/10/2009	Soil	Triplicate	3.02	2.15	3.29	356	12.2	0.281	12.9 J+
0906-MBB001-07-SS-avg	7/10/2009	Soil	Averaged	3.31	2.3	3.37	337	12.5	0.355	15.2 J+
0906-MBB001-08-SS	7/9/2009	Soil	Primary	2.69	1.42	4.53	352	13.3 J-	0.391 J-	13.8 J+
0906-MBB001-09-SS	7/9/2009	Soil	Primary	2.64	2.85	4.47	462	13.9 J-	0.376 J-	12.9 J+
0906-MBB001-10-SS	7/10/2009	Soil	Primary	3.66	3.39	3.89	360	20.2	0.485	17.9 J+
MBS001 (Ballard Mine Shop)										
0906-MBS001-01-SS	7/9/2009	Soil	Primary	8.88	46.9	2.78	169	103 J-	23.1 J-	376 J+
0906-MBS001-02-SS	7/9/2009	Soil	Primary	13.9	81	4.02	249	109 J-	17.7 J-	662 J+
0906-MBS001-03-SS	7/9/2009	Soil	Primary	12.3	56.3	4.83	216	143 J-	32.9 J-	289 J+
0906-MBS001-04-SS	7/9/2009	Soil	Primary	14.4	83.2	3.39	130	161 J-	35.4 J-	790 J+
0906-MBS001-05-SS	7/9/2009	Soil	Primary	12.2	71.4	3.24	123	142 J-	35.4 J-	535 J+
MDS030 (Dump Seep)										
SSMDS030-0-C(5)	9/11/2004	Soil	Primary	NS	7 J	NS	NS	53 J	10.2	92.7
MDS031 (Dump Seep)										
SSMDS031-0-C(5)	9/11/2004	Soil	Primary	NS	3.2 J	NS	NS	55.1 J	3.5	68.7
MDS032 (Dump Seep)										
SSMDS032-0-C(5)	9/11/2004	Soil	Primary	NS	7 J	NS	NS	68 J	162	66
MDS033 (Dump Seep)										
SSMDS033-0-C(5)	9/11/2004	Soil	Primary	NS	52.6 J	NS	NS	772 J	24	121
MHR001 (Historic Haul Road)										
0906-MHR001-01-SS	7/9/2009	Soil	Primary	6.71	2.57	11.7	1090	42.8 J-	1.72 J-	28.8 J+
0906-MHR001-02-SS	7/8/2009	Soil	Primary	4.73 J+	1.44	8.95	1780	22.5	0.572	18.8
0906-MHR001-03-SS	7/8/2009	Soil	Primary	4.41 J+	2.10	8.44	318 J	138	3.88	12.1
0906-MHR001-04-SS	7/9/2009	Soil	Primary	5.19	4.87	11.0	3620	37.2 J-	1.34 J-	34.0 J+
0906-MHR001-05-SS	7/8/2009	Soil	Primary	4.55 J+	18.4	8.57	1740	48.7	2.92	106
0906-MHR001-06-SS	7/8/2009	Soil	Primary	12.4 J	36.8 J+	5.22	234 J	148	18.9 J	266
0906-MHR001-07-SS-1	7/8/2009	Soil	Triplicate	18.4 J	42.6 J+	7.16	252 J	198	25.9 J	292
0906-MHR001-07-SS-2	7/8/2009	Soil	Triplicate	17.9 J	43.0 J+	5.77	361 J	201	26.7 J	273
0906-MHR001-07-SS-3	7/8/2009	Soil	Triplicate	16.2 J	45.2 J+	6.04	385 J	193	22.0 J	234
0906-MHR001-07-SS-avg	7/8/2009	Soil	Averaged	17.5 J	43.6 J+	6.32	333 J	197	24.9 J	266
0906-MHR001-08-SS	7/8/2009	Soil	Primary	5.66 J	10.8 J+	5.81	412 J	87.5	3.96 J	51.2
0906-MHR001-09-SS	7/8/2009	Soil	Primary	4.73 J	8.69 J+	5.23	501 J	69.3	3.07 J	35.8
0906-MHR001-10-SS	7/8/2009	Soil	Primary	9.45 J	24.3 J+	4.76	335 J	113	12.7 J	108
MMP035 (Mine Pit)										
0906-MMP035-01-SS	7/8/2009	Soil	Primary	24.0 J+	36.2	4.10	154	212	28.0	248
0906-MMP035-03-SS	7/8/2009	Soil	Primary	28.7 J+	9.78	6.04	186	334	39.4	116
0906-MMP035-04-SS	7/9/2009	Soil	Primary	36.7	32.8	7.49	289	349 J-	65.5 J-	269 J+
0906-MMP035-05-SS	7/9/2009	Soil	Primary	22.3	50.4	6.55	256	273 J-	66.3 J-	342 J+
0906-MMP035-06-SS	7/9/2009	Soil	Primary	13.7	105	2.54	98.8	186 J-	22.0 J-	690 J+
0906-MMP035-07-SS-1	7/9/2009	Soil	Triplicate	30.7	25.8	6.90	212	323 J-	152 J-	189 J+
0906-MMP035-07-SS-2	7/9/2009	Soil	Triplicate	31.1	24.4	6.13	244	309 J-	109 J-	218 J+
0906-MMP035-07-SS-3	7/9/2009	Soil	Triplicate	27.4	26.2	7.06	290	276 J-	130 J-	222 J+
0906-MMP035-07-SS-avg	7/9/2009	Soil	Averaged	29.7	25.5	6.7	249	303 J-	130 J-	210 J+
0906-MMP035-08-SS	7/9/2009	Soil	Primary	15.5	8.17	7.00	324	204 J-	26.7 J-	65.6 J+
0906-MMP035-09-SS	7/9/2009	Soil	Primary	11.3	9.41	7.73	287	139 J-	22.3 J-	60.7 J+
0906-MMP035-10-SS	7/8/2009	Soil	Primary	23.9 J+	30.6	7.87	258	301	60.5	203
0906-MMP035-AL01-SS	7/9/2009	Soil	Primary	27.7	52.5	5.89	218	265 J-	73.4 J-	593 J+
MMP036 (Mine Pit)										
0906-MMP036-02-SS	6/23/2009	Soil	Primary	10.6	34.0 J+	4.08	255	116	5.84	321
0906-MMP036-03-SS	6/22/2009	Soil	Primary	22.5	109	4.25	118	240	18.7 J	433
0906-MMP036-04-SS	6/22/2009	Soil	Primary	37.3	140	6.85	403	282	31.7 J	598
0906-MMP036-05-SS	6/22/2009	Soil	Primary	27.5	167	4.03	128	249	28.0 J	534

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BALLARD MINE - SUMMARY OF SOIL EXCEEDANCES
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				Analyte (mg/Kg, dry weight)						
Sample Identification	**Collection Date**	**Sample Medium**	**Sample Type**	**Arsenic**	**Cadmium**	**Cobalt**	**Manganese**	**Nickel**	**Selenium**	**Vanadium**
			Screening Value:	**0.39**	**70**	**23**	**1800**	**1500**	**390**	**390**
0906-MMP036-06-SS	6/22/2009	Soil	Primary	**22.7**	**51.1**	**7.65**	**216**	**196**	**17.1 J**	**263**
0906-MMP036-07-SS-1	6/22/2009	Soil	Triplicate	**21.7**	**82.9**	**6.37**	**392**	**174**	**13.3 J**	**160**
0906-MMP036-07-SS-2	6/22/2009	Soil	Triplicate	**19.3**	**22.9**	**5.06**	**162**	**139**	**21.0 J**	**127**
0906-MMP036-07-SS-3	6/22/2009	Soil	Triplicate	**16.2**	**30.7**	**9.54**	**227**	**176**	**10.6 J**	**161**
0906-MMP036-07-SS-avg	6/22/2009	Soil	Averaged	**19.1**	**45.5**	**6.99**	**260**	**163**	**15 J**	**149**
0906-MMP036-08-SS	6/22/2009	Soil	Primary	**22.2**	**61.1**	**5.16**	**180**	**176**	**28.7 J**	**282**
0906-MMP036-09-SS	6/22/2009	Soil	Primary	**17.1**	**45.0**	**5.74**	**232**	**148**	**18.4 J**	**270**
0906-MMP036-10-SS	6/22/2009	Soil	Primary	**10.9**	**8.00**	**8.19**	**176**	**124**	**14.9 J**	**57.9**
0906-MMP036-AL01-SS	6/23/2009	Soil	Primary	**27**	**77.1 J+**	**5.24**	**205**	**315**	**39.5**	**508**
SSMMP036-1-C(5)	7/17/2004	Soil	Primary	NS	**15.9**	NS	**2.6**	**4.8**	<0.01	**1.8**
MRV011 (Reservoir Delta)										
SSMRV011-0-C(5)	9/11/2004	Soil	Primary	NS	**1.08**	NS	NS	**11.3 J**	**0.5 J**	**21.4 J**
MSG003 (Spring)										
SSMSG003-0-C(5)	9/8/2004	Soil	Primary	NS	**9.54**	NS	NS	**74.5**	**52 J-**	**87**
MSG004 (Spring)										
RDMSG004-0-C(5)	9/15/2004	Road Soil	Primary	NS	**4.19**	NS	NS	**52.4 J**	**3.8**	**53.4**
SSMSG004-0-C(11)	9/9/2004	Soil	Primary	NS	**10.5**	NS	NS	**71.3**	**6.3 J-**	**85**
MSG005 (Spring)										
RDMSG005-0-C(5)	9/15/2004	Road Soil	Primary	NS	NS	NS	NS	NS	**3.5**	NS
SSMSG005-1-C(5)QA1	9/10/2004	Soil	Triplicate	NS	**1.23 J**	NS	NS	**15 J**	**16**	**30**
SSMSG005-1-C(5)QA2	9/10/2004	Soil	Triplicate	NS	**1.36 J**	NS	NS	**14.7 J**	**17.1**	**30**
SSMSG005-1-C(5)QA3	9/10/2004	Soil	Triplicate	NS	**1.35 J**	NS	NS	**13.9 J**	**17.2**	**30.4**
SSMSG005-1-C(5)QA4	9/10/2004	Soil	Triplicate	NS	NS	NS	NS	NS	NS	NS
SSMSG005-1-C(5)QA-avg	9/10/2004	Soil	Averaged	NS	**1.31 J**	NS	NS	**14.5 J**	**16.8**	**30.1**
MSG006 (Spring)										
RDMSG006-0-C(5)	9/15/2004	Road Soil	Primary	NS	**2.62**	NS	NS	**43.4 J**	**5**	**51.7**
SSMSG006-0-C(5)	9/10/2004	Soil	Primary	NS	**1.43 J**	NS	NS	**11.2 J**	**570**	**24.4**
MSP010 (Pond)										
SSMSP010-0-C(5)	9/11/2004	Soil	Primary	NS	**22.5**	NS	NS	**1620 J**	**53**	**207**
MSP011 (Pond)										
SSMSP011-0-C(5)	9/8/2004	Soil	Primary	NS	**110**	NS	NS	**193**	**48 J-**	**571**
MSP012 (Pond)										
SSMSP012-0-C(7)	9/8/2004	Soil	Primary	NS	**131**	NS	NS	**162**	**38 J-**	**773**
MSP013 (Pond)										
SSMSP013-0-C(5)	9/9/2004	Soil	Primary	NS	**30.4**	NS	NS	**140**	**24 J-**	**232**
MSP059 (Pond)										
SSMSP059-0-C(7)	9/8/2004	Soil	Primary	NS	**27.7**	NS	NS	**231**	**39 J-**	**298**
MSP062 (Pond)										
SSMSP062-0-C(5)	9/10/2004	Soil	Primary	NS	**126 J**	NS	NS	**255 J**	**20.5**	**646**
MST019 (Stream)										
SSMST019-0-C(5)	9/11/2004	Soil	Primary	NS	**3.74**	NS	NS	**14.8 J-**	**1.5 J**	**40.7 J-**
MST020 (Stream)										
SSMST020-1-C(5)QA1	9/14/2004	Soil	Triplicate	NS	**1.15**	NS	NS	**16.4 J**	**1.8 J**	**31.7**
SSMST020-1-C(5)QA2	9/14/2004	Soil	Triplicate	NS	**1.11**	NS	NS	**15.4 J**	**1.6 J**	**29.9**
SSMST020-1-C(5)QA3	9/14/2004	Soil	Triplicate	NS	**1.12**	NS	NS	**15.8 J**	**1.7 J**	**30**
SSMST020-1-C(5)QA-avg	9/14/2004	Soil	Averaged	NS	**1.13**	NS	NS	**15.9 J**	**1.7 J**	**30.5**
MST021 (Stream)										
SSMST021-0-C(5)	9/10/2004	Soil	Primary	NS	**1.58**	NS	NS	**22.3 J**	**1.2 J**	**33.1 J**
MST022 (Stream)										
SSMST022-1-C(6)QA1	9/10/2004	Soil	Triplicate	NS	**2 J**	NS	NS	**11.7 J**	**1 J**	**26.2 J**
SSMST022-1-C(6)QA2	9/10/2004	Soil	Triplicate	NS	**1.82 J**	NS	NS	**12.8 J**	**0.9 J**	**26.3 J**
SSMST022-1-C(6)QA3	9/10/2004	Soil	Triplicate	NS	**1.73 J**	NS	NS	**13.7 J**	**0.9 J**	**26.1 J**
SSMST022-1-C(6)QA-avg	9/10/2004	Soil	Averaged	NS	**1.85 J**	NS	NS	**12.7 J**	**0.933 J**	**26.2 J**
MST066 (Stream)										
SSMST066-0-C(5)	9/8/2004	Soil	Primary	NS	**2.85**	NS	NS	**20.1**	**9.8 J-**	**62.2**
MST067 (Stream)										
SSMST067-0-C(5)	9/8/2004	Soil	Primary	NS	**23.5**	NS	NS	**104**	**39 J-**	**207**
MST068 (Stream)										
SSMST068-0-C(5)	9/10/2004	Soil	Primary	NS	**34.8 J**	NS	NS	**109 J**	**25.4**	**351**

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BALLARD MINE - SUMMARY OF SOIL EXCEEDANCES
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				Analyte (mg/Kg, dry weight)						
Sample Identification	**Collection Date**	**Sample Medium**	**Sample Type**	**Arsenic**	**Cadmium**	**Cobalt**	**Manganese**	**Nickel**	**Selenium**	**Vanadium**
			Screening Value:	**0.39**	**70**	**23**	**1800**	**1500**	**390**	**390**
MST069 (Stream)										
SSMST069-0-C(5)	9/8/2004	Soil	Primary	NS	**4.21**	NS	NS	**23**	**2.8 J-**	**44.8**
MST088 (Stream)										
SSMST088-0-C(7)	9/9/2004	Soil	Primary	NS	**2.57**	NS	NS	**20.7**	<0.5 UJ	**42.9**
MST089 (Stream)										
SSMST089-0-C(6)	9/9/2004	Soil	Primary	NS	**4.74**	NS	NS	**24**	**6.6 J-**	**46.4**
MST090 (Stream)										
SSMST090-0-C(5)	9/9/2004	Soil	Primary	NS	**1.66**	NS	NS	**10.7**	<0.5 UJ	**23.2**
MST092 (Stream)										
SSMST092-1-C(5)QA1	9/9/2004	Soil	Triplicate	NS	**6.14**	NS	NS	**35.9**	**19.4 J-**	**75.7**
SSMST092-1-C(5)QA2	9/9/2004	Soil	Triplicate	NS	**5.95**	NS	NS	**34.7**	**18.4 J-**	**72.8**
SSMST092-1-C(5)QA3	9/9/2004	Soil	Triplicate	NS	**5.95**	NS	NS	**36**	**18.6 J-**	**74.3**
SSMST092-1-C(5)QA4	9/9/2004	Soil	Triplicate	NS	NS	NS	NS	NS	NS	NS
SSMST092-1-C(5)QA-avg	9/9/2004	Soil	Averaged	NS	**6.01**	NS	NS	**35.5**	**18.8 J-**	**74.3**
MST094 (Stream)										
SSMST094-0-C(5)	9/9/2004	Soil	Primary	NS	**1.43**	NS	NS	**23.9**	**0.7 J-**	**44.3**
MST095 (Stream)										
SSMST095-0-C(6)	9/9/2004	Soil	Primary	NS	**15.5**	NS	NS	**70.2**	**15 J-**	**208**
MST096 (Stream)										
SSMST096-0-C(5)	9/10/2004	Soil	Primary	NS	**0.44 J**	NS	NS	**16.7 J**	**1.3 J**	**31.1**
MST230 (Stream)										
SSMST230-0-C(5)	9/14/2004	Soil	Primary	NS	**0.91**	NS	NS	**12.8 J**	**1.9 J**	**22.1**
MST231 (Stream)										
SSMST231-0-C(8)	9/10/2004	Soil	Primary	NS	**1.13**	NS	NS	**12.5 J**	<0.5	**21.7 J**
MST232 (Stream)										
SSMST232-1-C(5)QA1	9/10/2004	Soil	Triplicate	NS	**1.93**	NS	NS	**15.1 J**	<0.5	**30.4 J**
SSMST232-1-C(5)QA2	9/10/2004	Soil	Triplicate	NS	**2.08**	NS	NS	**16.8 J**	<0.5	**33.1 J**
SSMST232-1-C(5)QA3	9/10/2004	Soil	Triplicate	NS	**1.98**	NS	NS	**14.5 J**	<0.5	**30.1 J**
SSMST232-1-C(5)QA-avg	9/10/2004	Soil	Averaged	NS	**2**	NS	NS	**15.5 J**	<0.5	**31.2 J**
MST272 (Stream)										
SSMST272-0-C(5)	9/9/2004	Soil	Primary	NS	**5.57**	NS	NS	**33.6**	**2.5 J-**	**92.8**
MST273 (Stream)										
SSMST273-0-C(5)	9/9/2004	Soil	Primary	NS	**3.62**	NS	NS	**21.2**	**6.9 J-**	**43.1**
MWD080 (Waste Rock Dump)										
0906-MWD080-01-SS	7/8/2009	Soil	Primary	**23.3 J+**	**25.7**	**7.86**	**1470**	**228**	**33.8**	**130**
0906-MWD080-02-SS	6/23/2009	Soil	Primary	**35.8 J**	**13.8**	**7.76**	**224 J**	**312**	**136 J**	**121**
0906-MWD080-03-SS	6/23/2009	Soil	Primary	**31.9 J**	**31.7**	**9.75**	**146 J**	**263**	**209 J**	**277**
0906-MWD080-04-SS	7/8/2009	Soil	Primary	**13.6 J+**	**14.4**	**8.24**	**906 J**	**155**	**13.2**	**89.1**
0906-MWD080-05-SS	6/23/2009	Soil	Primary	**44.4 J**	**17.8**	**7.36**	**297 J**	**359**	**106 J**	**164**
0906-MWD080-06-SS	6/23/2009	Soil	Primary	**45.5 J**	**11.8**	**6.82**	**215 J**	**369**	**198 J**	**143**
0906-MWD080-07-SS-1	6/23/2009	Soil	Triplicate	**27.6**	**36.1 J+**	**7.51**	**245 J**	**243**	**115**	**173**
0906-MWD080-07-SS-2	6/23/2009	Soil	Triplicate	**22.2**	**26.6 J+**	**7.09**	**296 J**	**210**	**70.2**	**145**
0906-MWD080-07-SS-3	6/23/2009	Soil	Triplicate	**25.2**	**28.0 J+**	**7.12**	**314 J**	**231**	**70.6**	**155**
0906-MWD080-07-SS-avg	6/23/2009	Soil	Averaged	**25**	**30.2 J+**	**7.24**	**285 J**	**228**	**85.3**	**158**
0906-MWD080-08-SS	7/8/2009	Soil	Primary	**24.5 J+**	**38.7**	**5.84**	**318 J**	**189**	**80.1**	**188**
0906-MWD080-09-SS	7/8/2009	Soil	Primary	**15.8 J+**	**27.2**	**5.54**	**267 J**	**144**	**56.1**	**151**
0906-MWD080-10-SS	7/8/2009	Soil	Primary	**3.84 J+**	**11.3**	**2.66**	**94.4 J**	**36.4**	**9.55**	**64.8**
SSMWD080-1-C(5)	7/17/2004	Soil	Primary	NS	**24**	NS	**3.5**	**35.6**	**1.91**	**6.5**
SSMWD080-2-C(5)	7/17/2004	Soil	Primary	NS	**33.9**	NS	**0.7**	**12.2**	**0.35**	**13.9**
SSMWD080-3-C(5)	7/17/2004	Soil	Primary	NS	**7.9**	NS	**1.2**	**6.5**	**0.26**	**4**
SSMWD080-4-C(5)	7/17/2004	Soil	Primary	NS	**14**	NS	**1.8**	**20.9**	**0.68**	**5.1**
MWD081 (Waste Rock Dump)										
0906-MWD081-01-SS	6/17/2009	Soil	Primary	**21.6**	**63.6**	**7.98**	**362**	**240**	**25.3**	**505**
0906-MWD081-02-SS	6/17/2009	Soil	Primary	**15.8**	**52.5**	**7.12**	**1040**	**157**	**22.5**	**504**
0906-MWD081-03-SS	6/17/2009	Soil	Primary	**37.1**	**26.3**	**25.6**	**225**	**319**	**99.5**	**170**
0906-MWD081-04-SS	6/17/2009	Soil	Primary	**30.1**	**23.4**	**7.18**	**299**	**297**	**71.2**	**162**
0906-MWD081-05-SS	6/18/2009	Soil	Primary	**32.1**	**25.2 J+**	**5.37 J-**	**162**	**292**	**69.7 J**	**143**
0906-MWD081-06-SS	6/18/2009	Soil	Primary	**35.1**	**11.9 J+**	**7.78 J-**	**117**	**325**	**141 J**	**103**
0906-MWD081-08-SS	6/18/2009	Soil	Primary	**36.5**	**34.8 J+**	**6.00 J-**	**192**	**303**	**84.8 J**	**255**
0906-MWD081-09-SS	6/18/2009	Soil	Primary	**23.3**	**99.5 J+**	**4.21 J-**	**187**	**247**	**40.2 J**	**808**

TABLE 3-2

BALLARD MINE - SUMMARY OF SOIL EXCEEDANCES
(Page 4 of 6)

				Analyte (mg/Kg, dry weight)						
Sample Identification	Collection Date	Sample Medium	Sample Type	Arsenic	Cadmium	Cobalt	Manganese	Nickel	Selenium	Vanadium
			Screening Value:	0.39	70	23	1800	1500	390	390
0906-MWD081-10-SS	6/18/2009	Soil	Primary	21	63.4 J+	4.61 J-	228	215	36.2 J	563
0906-MWD081-AL03-SS-1	6/23/2009	Soil	Triplicate	19.7	72.3 J+	4.57	112	177	35.7	632
0906-MWD081-AL03-SS-2	6/23/2009	Soil	Triplicate	24.6	84.6 J+	5.78	113	167	41.2	555
0906-MWD081-AL03-SS-3	6/23/2009	Soil	Triplicate	21.3	71.4 J+	4.17	122	188	37.6	691
0906-MWD081-AL03-SS-avg	6/23/2009	Soil	Averaged	21.9	76.1 J+	4.84	116	177	38.2	626
MWD082 (Waste Rock Dump)										
0906-MWD082-01-SS	7/8/2009	Soil	Primary	25.3 J	24.1 J+	11.7	366 J	270	25.9 J	169
0906-MWD082-02-SS	7/8/2009	Soil	Primary	34.7 J	14.6 J+	8.04	405 J	387	31.0 J	132
0906-MWD082-03-SS	6/23/2009	Soil	Primary	35.7	45.6 J+	13.8	741 J	402	35.3	342
0906-MWD082-04-SS	6/23/2009	Soil	Primary	8.08	4.92 J+	6.77	222 J	121	3.51	43.8
0906-MWD082-05-SS	6/23/2009	Soil	Primary	16.8	17.2 J+	8.02	254 J	180	17.0	79.0
0906-MWD082-06-SS	6/22/2009	Soil	Primary	21	27.8	6.86	588	253	40.5 J	92.3
0906-MWD082-07-SS-1	7/8/2009	Soil	Triplicate	8.36 J	7.54 J+	6.69	286 J	119	6.94 J	44.2
0906-MWD082-07-SS-2	7/8/2009	Soil	Triplicate	8.42 J	3.86 J+	8.07	273 J	129	5.48 J	29.4
0906-MWD082-07-SS-3	7/8/2009	Soil	Triplicate	8.49 J	3.59 J+	7.06	270 J	117	4.99 J	28.1
0906-MWD082-07-SS-avg	7/8/2009	Soil	Averaged	8.42 J	5 J+	7.27	276 J	122	5.8 J	33.9
0906-MWD082-08-SS	6/23/2009	Soil	Primary	32.7	29.5 J+	8.23	150 J	453	156	129
0906-MWD082-09-SS	6/22/2009	Soil	Primary	25.5	25.1	6.95	282	179	39.1 J	138
0906-MWD082-10-SS	6/22/2009	Soil	Primary	7.68	5.46	11.5	1320	154	4.04 J	33.5 J+
SSMWD082-10-C(5)	7/18/2004	Soil	Primary	NS	NS	NS	NS	NS	20.9 J-	NS
SSMWD082-11-C(5)	7/18/2004	Soil	Primary	NS	NS	NS	NS	NS	16.2 J-	NS
SSMWD082-12-C(5)	7/18/2004	Soil	Primary	NS	NS	NS	NS	NS	10.8 J-	NS
SSMWD082-13-C(5)	7/18/2004	Soil	Primary	NS	NS	NS	NS	NS	5.4 J-	NS
SSMWD082-14-C(5)QA1	7/19/2004	Soil	Triplicate	NS	NS	NS	NS	NS	63	NS
SSMWD082-14-C(5)QA2	7/19/2004	Soil	Triplicate	NS	NS	NS	NS	NS	62	NS
SSMWD082-14-C(5)QA3	7/19/2004	Soil	Triplicate	NS	NS	NS	NS	NS	60	NS
SSMWD082-14-C(5)QA-avg	7/19/2004	Soil	Averaged	NS	NS	NS	NS	NS	61.7	NS
SSMWD082-15-C(5)	7/19/2004	Soil	Primary	NS	NS	NS	NS	NS	54	NS
SSMWD082-16-C(5)	7/19/2004	Soil	Primary	NS	NS	NS	NS	NS	53	NS
SSMWD082-17-C(6)	7/19/2004	Soil	Primary	NS	NS	NS	NS	NS	71	NS
SSMWD082-18-C(5)	7/19/2004	Soil	Primary	NS	NS	NS	NS	NS	65	NS
SSMWD082-19-C(11)	7/19/2004	Soil	Primary	NS	NS	NS	NS	NS	53	NS
SSMWD082-1-C(5)	7/16/2004	Soil	Primary	NS	10.8	NS	3.3	18.8	0.86	1.6
SSMWD082-1-C(6)	7/18/2004	Soil	Primary	NS	NS	NS	NS	NS	70 J-	NS
SSMWD082-20-C(5)	7/19/2004	Soil	Primary	NS	NS	NS	NS	NS	42	NS
SSMWD082-21-C(9)	7/19/2004	Soil	Primary	NS	NS	NS	NS	NS	14.1	NS
SSMWD082-22-C(5)	7/19/2004	Soil	Primary	NS	NS	NS	NS	NS	11	NS
SSMWD082-23-C(7)	7/19/2004	Soil	Primary	NS	NS	NS	NS	NS	8.9	NS
SSMWD082-24-C(6)	7/19/2004	Soil	Primary	NS	NS	NS	NS	NS	8.5	NS
SSMWD082-25-C(5)	7/19/2004	Soil	Primary	NS	NS	NS	NS	NS	5.9	NS
SSMWD082-26-C(5)	7/19/2004	Soil	Primary	NS	NS	NS	NS	NS	4.8	NS
SSMWD082-2-C(1)	7/18/2004	Soil	Primary	NS	NS	NS	NS	NS	54 J-	NS
SSMWD082-2-C(5)	7/16/2004	Soil	Primary	NS	27.1	NS	0.9	12.5	0.52	10.8
SSMWD082-3-C(5)	7/16/2004	Soil	Primary	NS	22.7	NS	2.3	8.3	0.5	4.8
SSMWD082-3-C(5)QA1	7/6/2004	Soil	Primary	NS	24.3	NS	2.8	8	0.41	4.9
SSMWD082-3-C(9)	7/18/2004	Soil	Primary	NS	NS	NS	NS	NS	65 J-	NS
SSMWD082-4-C(6)	7/18/2004	Soil	Primary	NS	NS	NS	NS	NS	58 J-	NS
SSMWD082-5-C(5)	7/18/2004	Soil	Primary	NS	NS	NS	NS	NS	49 J-	NS
SSMWD082-6-C(7)	7/18/2004	Soil	Primary	NS	NS	NS	NS	NS	59 J-	NS
SSMWD082-7-C(12)	7/18/2004	Soil	Primary	NS	NS	NS	NS	NS	51 J-	NS
SSMWD082-8-C(7)	7/18/2004	Soil	Primary	NS	NS	NS	NS	NS	28 J-	NS
SSMWD082-9-C(7)	7/18/2004	Soil	Primary	NS	NS	NS	NS	NS	19.8 J-	NS
MWD083 (Waste Rock Dump)										
0906-MWD083-01-SS	6/21/2009	Soil	Primary	10.7	3.74	15.9	5180	106	2.94 J	28.8
0906-MWD083-02-SS	6/21/2009	Soil	Primary	16.1	14.5	7.72	351	165	9.92 J	71.3
0906-MWD083-03-SS	6/21/2009	Soil	Primary	11.5	6.22	8.75	1280	115	6.34 J	44.4
0906-MWD083-04-SS	6/21/2009	Soil	Primary	13.3	21.3	6.99	467	142	9.87 J	103
0906-MWD083-05-SS	6/21/2009	Soil	Primary	12.1	11.4	7.32	445	148	9.63 J	70.6
0906-MWD083-06-SS	6/18/2009	Soil	Primary	6.26	6.80 J+	6.75 J-	575	51.2	5.29 J	40.1
0906-MWD083-07-SS-1	6/18/2009	Soil	Triplicate	10.7	7.59 J+	4.05 J-	95.2	116	10.6 J	45.1
0906-MWD083-07-SS-2	6/18/2009	Soil	Triplicate	10.8	12.9 J+	7.07 J-	212	117	13.9 J	73.2
0906-MWD083-07-SS-3	6/18/2009	Soil	Triplicate	9.71	7.28 J+	6.60 J-	192	102	9.71 J	58.9

TABLE 3-2

BALLARD MINE - SUMMARY OF SOIL EXCEEDANCES
(Page 5 of 6)

				Analyte (mg/Kg, dry weight)						
Sample Identification	Collection Date	Sample Medium	Sample Type	Arsenic	Cadmium	Cobalt	Manganese	Nickel	Selenium	Vanadium
			Screening Value:	0.39	70	23	1800	1500	390	390
0906-MWD083-07-SS-avg	6/18/2009	Soil	Averaged	10.4	9.26 J+	5.91 J-	166	112	11.4 J	59.1
0906-MWD083-08-SS	6/23/2009	Soil	Primary	3.51	1.94 J+	6.44	534	17.7	0.874	16.9
0906-MWD083-09-SS	6/18/2009	Soil	Primary	15.4	26.2 J+	5.81 J-	274	132	23.7 J	165
0906-MWD083-AL01-SS	6/23/2009	Soil	Primary	9.28	12.5 J+	7.16	322	77.0	12.2	70.0
MWD084 (Waste Rock Dump)										
0906-MWD084-01-SS	6/20/2009	Soil	Primary	21.7	30.9	6.25	379	205	17.3 J	249
0906-MWD084-02-SS	6/20/2009	Soil	Primary	7.8	12.7	4.17	214	89.9	2.67	83.0
0906-MWD084-03-SS	6/20/2009	Soil	Primary	20.6	30.7	10.0	294	198	35.5	134
0906-MWD084-04-SS	6/20/2009	Soil	Primary	25.3	46.3	6.15	259	290	44.9 J	305
0906-MWD084-07-SS-1	6/20/2009	Soil	Triplicate	6.56	4.77	10.2	2430	48.7	3.38	34.1
0906-MWD084-07-SS-2	6/20/2009	Soil	Triplicate	7.58	7.09	13.6	2640	68.2	4.58 J	56.4
0906-MWD084-07-SS-3	6/20/2009	Soil	Triplicate	8.32	6.76	9.80	1870	72.0	5.35	39.2
0906-MWD084-07-SS-avg	6/20/2009	Soil	Averaged	7.49	6.21	11.2	2310	63	4.44 J	43.2
0906-MWD084-09-SS	6/20/2009	Soil	Primary	25.5	32.8	7.95	517	266	101	173
0906-MWD084-10-SS	6/20/2009	Soil	Primary	38.5	18.3	7.77	353	635	162 J	251
0906-MWD084-AL02-SS	6/20/2009	Soil	Primary	15.9	22.0	6.99	399	168	24.9 J	128
0906-MWD084-AL04-SS	6/23/2009	Soil	Primary	29.7	77.8 J+	5.81	248	246	51.2	478
0906-MWD084-AL05-SS	7/10/2009	Soil	Primary	10.1	19.9	4.31	219	130	16.3	90.0 J+
SSMWD084-1-C(5)	7/16/2004	Soil	Primary	NS	37.6	NS	2.4	21.4	0.12	3.2
MWD093 (Waste Rock Dump)										
0906-MWD093-01-SS	6/21/2009	Soil	Primary	31.5	28.8	6.16	251	314	49.5 J	194
0906-MWD093-02-SS	6/21/2009	Soil	Primary	26.1	18.7	8.58	262	247	174 J	109
0906-MWD093-03-SS	6/21/2009	Soil	Primary	30.4	43.2	7.41	274	284	88.4 J	251
0906-MWD093-04-SS	6/21/2009	Soil	Primary	32.7	37.1	6.97	194	350	49.8 J	250
0906-MWD093-05-SS	6/21/2009	Soil	Primary	30.9 J	22.2	8.15	229	355	42.3 J	171 J+
0906-MWD093-06-SS	6/21/2009	Soil	Primary	16.4 J	21.2	10.0	206	185	13.3 J	110 J+
0906-MWD093-07-SS-1	6/21/2009	Soil	Triplicate	10.7 J	6.89	7.76	463	132	7.17 J	48.5 J+
0906-MWD093-07-SS-2	6/21/2009	Soil	Triplicate	11.3 J	14.9	7.34	188	152	6.87 J	75.2 J+
0906-MWD093-07-SS-3	6/21/2009	Soil	Triplicate	21.9 J	10.2	6.06	220	218	18.2 J	96.9 J+
0906-MWD093-07-SS-avg	6/21/2009	Soil	Averaged	14.6 J	10.7	7.05	290	167	10.7 J	73.5 J+
0906-MWD093-08-SS	6/21/2009	Soil	Primary	29.6 J	49.7	6.35	250	308	35.6 J	237 J+
0906-MWD093-10-SS	6/21/2009	Soil	Primary	8.73 J	7.52	7.26	321	134	9.46 J	55.2 J+
0906-MWD093-AL01-SS	6/23/2009	Soil	Primary	22.4	58.4 J+	5.65	269 J	191	35.9	473

TABLE 3-2

BALLARD MINE - SUMMARY OF SOIL EXCEEDANCES
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Notes:

Result is greater than screening value

NS - not sampled

FLAG DEFINITION:

U	The analyte was analyzed for, but was not detected above the level of the reported sample quantitation limit.
J	The result is an estimated quantity. The associated numerical value is the approximated concentration of the analyte in the sample.
J+	The result is an estimated quantity, but the result may be biased high.
J-	The result is an estimated quantity, but the result may be biased low.
J+/B	Result is estimated and biased high; associated field blank contained target analyte.
R	The result is unusable. The sample result is rejected due to serious deficiencies in meeting quality control criteria. The analyte may or may not be present in the sample.
UJ	The analyte was analyzed for, but was not detected. The reported quantitation limit is approximate and may be inaccurate or imprecise.

SOURCE FOR SCREENING VALUES (SEE ALSO TABLE 3

Soil	USEPA Regional Screening Levels for Soil, Residential (source: ORNL, December 2009).

TRIPLICATE RESULT

"Primary" indicates locations where only one sample was collected from a given location. "Triplicate" indicates locations where a total of three samples were collected from a given location for the purpose of quality assurance.

The average value for triplicate samples is calculated as follows: (a) the mean of three detected values, (b) the mean of two detected values if result of one triplicate is not detected, (c) the detected value if results of two triplicates are not detected, or (d) less than the highest method detection limit if all triplicate results are not detected.

TABLE 3-3
BALLARD MINE
2009 SOIL SAMPLING CONCENTRATION RANGES AND SCREENING LEVEL EXCEEDANCES (mg/kg dw)[1]

Analyte	SL	Background (n=10)	Waste Rock Dumps (n=60)	[n] > SL	Partially Backfilled Pits (n=20)	[n] > SL	Historic Ore Haul Road (n=10)	[n] > SL	Historic Facility (n=5)	[n] > SL
Selenium	390	0.25 - 0.49	0.87 - 209	0	5.84 - 130	0	0.57 - 24.9	0	17.7 - 35.4	0
Arsenic	0.39	2.55-3.66	3.51-45.5	60	10.6-37.3	20	4.41-17.5	10	8.88-14.4	5
Cadmium	70	1.40-3.39	1.94-99.5	3	8.00-167	5	1.44-43.6	0	46.9-83.2	3
Cobalt	23	3.37-5.51	2.66-25.6	1	2.54-7.87	0	4.76-11.7	0	2.78-4.83	0
Manganese	1800	337-462	94.4-5180	2	98.8-403	0	234-3620	1	123-249	0
Vanadium	390	10.7-17.9	16.9-808	7	57.9-598	6	12.1-266	0	289-790	3

Notes:
n = total number of samples
[n] = sample concentration
SL = screening level
1 - Triplicate samples are treated as a single sample as described in Appendix A.
Shaded results indicate those which ranges contain exceedances.

TABLE 3-4
BALLARD MINE
RIPARIAN HABITAT ASSESSMENT DATA MATRIX

Station	Category	Amphibians	Swimming birds	Marsh-nesting birds	Cavity-nesting birds	Birds that forage at water's edge	Aerial-foraging birds	Open cup-nesting birds	Small mammals	Water dependent medium-sized mammals	Upland medium-sized mammals	Game mammals	Livestock	Sept 2004 Soil Selenium Concentration (mg/kg dw)	Sept 2004 Vegetation Selenium Concentration (mg/kg dw)	Habitat Quality Ranking
MSG006	spring	0	0	1	0	0	1	1	1	0	1	1	1	570	17	1
MSP010	pond	1	1	0	1	0	0	1	0	0	0	1	1	53	27	3
MSP011	pond	1	0	0	1	1	0	1	0	0	1	1	1	48	8.5	3
MSP012	pond	1	0	0	1	0	0	1	1	0	1	1	1	38	10	3
MSP059	pond	1	1	0	0	1	0	1	0	0	1	1	1	39	16	3
MSP062	pond	1	0	0	1	1	0	1	1	0	1	1	1	21	3.2	3
MST066	stream	0	0	0	0	0	1	1	0	0	1	0	1	9.8	0.25	1
MST067	stream	0	0	0	0	0	1	1	1	0	1	0	1	39	0.60	1
MST069	stream	0	0	0	0	0	1	1	1	0	1	0	1	2.8	3.1	1
MST089	stream	0	0	0	0	0	1	0	1	0	1	0	1	6.6	0.25	1
MST090	stream	0	0	0	0	0	1	1	1	0	1	1	1	0.25	0.25	1
MST092	stream	0	0	0	0	0	1	1	1	0	1	1	1	19	0.25	1
MST093	stream	0	0	0	0	0	1	1	1	0	1	1	1	0.50	0.25	1
MST094	stream	0	0	0	0	0	1	1	1	0	1	1	1	0.70	0.25	1
MST095	stream	0	0	0	0	0	1	1	1	0	1	1	1	15	13	1
MST096	ponded stream	1	1	1	0	0	0	1	1	0	1	1	1	1.3	2.4	4
MST272	stream	0	0	1	0	0	1	1	1	0	1	1	1	2.5	0.25	1
MST273	stream	0	0	0	0	0	1	0	1	0	1	0	1	6.9	0.25	1

Notes:
Non-detected concentrations are presented as one-half the minimum detection limit. The minimum detection limit for both media was 0.5 mg/kg dw.
Habitat Quality Ranking
1—high quality aquatic and terrestrial habitat
2—high quality aquatic, but low quality terrestrial habitat
3—low quality aquatic, but high quality terrestrial habitat
4—low quality aquatic and terrestrial habitat

TABLE 3-5

BALLARD MINE - SUMMARY OF VEGETATION EXCEEDANCES
(Page 1 of 10)

				Analyte (mg/Kg, dry weight)		
Sample Identification	**Collection Date**	**Vegetation Type**	**Sample Type**	**Cadmium**	**Molybdenum**	**Selenium**
			Screening Value:	**10**	**5**	**5**
BALLARD (Not Determined)						
0908-BALLARD-CS-ARLU	8/25/2009	ARLU	Primary	**1.22 J**	<1.47	**1.17**
0908-BALLARD-CS-JUSC-LEAF	8/25/2009	JUSC-LEAF	Primary	**0.252 J**	**4.29**	<0.499
0908-BALLARD-CS-JUSC-STEM	8/25/2009	JUSC-STEM	Primary	**0.425 J**	**1.74 J**	**0.483 J**
MBB001 (Ballard Background)						
0906-MBB001-01-FB	7/10/2009	FB	Primary	**0.478**	**2.43 J**	**0.730**
0906-MBB001-01-GS	7/10/2009	GS	Primary	**0.110 J**	**3.30**	**0.285**
0906-MBB001-01-SL-AMAL	7/10/2009	SL-AMAL	Primary	**0.239 J**	**2.17 J**	**0.532**
0906-MBB001-01-SL-POTR	7/10/2009	SL-POTR	Primary	**0.898 J**	<1.49	**0.463**
0906-MBB001-01-SL-SYAL	7/10/2009	SL-SYAL	Primary	**0.0361 J**	**2.71 J**	**0.291**
0906-MBB001-01-SM-AMAL	7/10/2009	SM-AMAL	Primary	**0.366 J**	<1.49	<0.0990
0906-MBB001-01-SM-POTR	7/10/2009	SM-POTR	Primary	**1.34 J**	<1.49	<0.0949
0906-MBB001-01-SM-SYAL	7/10/2009	SM-SYAL	Primary	**0.0874 J**	<1.49	**0.134 J**
0906-MBB001-02-GF	7/10/2009	GF	Primary	**0.218 J**	**2.93 J**	**0.270**
0906-MBB001-02-SL-AMAL	7/10/2009	SL-AMAL	Primary	**0.400 J**	**1.80 J**	**0.613**
0906-MBB001-02-SL-POTR	7/10/2009	SL-POTR	Primary	**1.20**	<1.49	**0.126 J**
0906-MBB001-02-SM-AMAL	7/10/2009	SM-AMAL	Primary	**0.613**	<1.54	<0.100
0906-MBB001-02-SM-POTR	7/10/2009	SM-POTR	Primary	**1.30**	<1.49	**0.129 J**
0906-MBB001-03-GF	7/10/2009	GF	Primary	**0.370**	**3.01**	**0.390**
0906-MBB001-03-SL-SYAL	7/10/2009	SL-SYAL	Primary	**0.0531 J**	<1.50	**0.103 J**
0906-MBB001-03-SM-SYAL	7/10/2009	SM-SYAL	Primary	**0.139**	<1.50	<0.0992
0906-MBB001-04-GF	7/10/2009	GF	Primary	**0.130**	**1.74 J**	**0.685**
0906-MBB001-04-SL-AMAL	7/10/2009	SL-AMAL	Primary	**0.289**	<1.50	<0.100
0906-MBB001-04-SL-POTR	7/10/2009	SL-POTR	Primary	**1.16**	<1.48	<0.0956
0906-MBB001-04-SL-SYAL	7/10/2009	SL-SYAL	Primary	**0.0983**	**1.71 J**	**0.835**
0906-MBB001-04-SM-AMAL	7/10/2009	SM-AMAL	Primary	**0.362**	<1.50	<0.0996
0906-MBB001-04-SM-POTR	7/10/2009	SM-POTR	Primary	**1.95**	<1.50	**0.283**
0906-MBB001-04-SM-SYAL	7/10/2009	SM-SYAL	Primary	**0.197**	<1.49	**3.18**
0906-MBB001-05-FB	7/9/2009	FB	Primary	**0.138**	**20.6**	**4.41**
0906-MBB001-05-GS	7/9/2009	GS	Primary	**0.173**	**206**	**0.347**
0906-MBB001-06-GF	7/10/2009	GF	Primary	**0.535 J**	**99.6**	**0.200**
0906-MBB001-06-SL-PRVI	7/10/2009	SL-PRVI	Primary	**0.0273 J**	**10.4**	**0.579**
0906-MBB001-06-SM-PRVI	7/10/2009	SM-PRVI	Primary	**0.0915 J**	**24.4**	**0.179 J**
0906-MBB001-07-GF-1	7/10/2009	GF	Triplicate	**0.242 J**	**1.91 J**	**1.70**
0906-MBB001-07-GF-2	7/10/2009	GF	Triplicate	**0.374**	**1.75 J**	**0.205**
0906-MBB001-07-GF-3	7/10/2009	GF	Triplicate	**0.413 J**	**147**	**0.229**
0906-MBB001-07-GF-avg	7/10/2009	GF	Averaged	**0.343 J**	**50.2 J**	**0.711**
0906-MBB001-07-SL-1-SYAL	7/10/2009	SL-SYAL	Triplicate	**0.0602 J**	<1.50	**0.498**
0906-MBB001-07-SL-2-SYAL	7/10/2009	SL-SYAL	Triplicate	**0.0646 J**	**2.17 J**	<0.0980
0906-MBB001-07-SL-3-SYAL	7/10/2009	SL-SYAL	Triplicate	**0.0676 J**	<1.49	**1.37**
0906-MBB001-07-SL-avg-SYAL	7/10/2009	SL-SYAL	Averaged	**0.0641 J**	**2.17 J**	**0.934**
0906-MBB001-07-SM-1-SYAL	7/10/2009	SM-SYAL	Triplicate	**0.264 J**	<1.49	**0.161 J**
0906-MBB001-07-SM-2-SYAL	7/10/2009	SM-SYAL	Triplicate	**0.207**	<1.49	**0.430**
0906-MBB001-07-SM-3-SYAL	7/10/2009	SM-SYAL	Triplicate	**0.161 J**	<1.49	<0.0977
0906-MBB001-07-SM-avg-SYAL	7/10/2009	SM-SYAL	Averaged	**0.211 J**	<1.49	**0.296 J**
0906-MBB001-08-FB	7/9/2009	FB	Primary	**0.466**	**4.60**	**1.63**
0906-MBB001-08-GS	7/9/2009	GS	Primary	**0.219**	**4.61**	**0.318**

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BALLARD MINE - SUMMARY OF VEGETATION EXCEEDANCES
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				Analyte (mg/Kg, dry weight)		
Sample Identification	**Collection Date**	**Vegetation Type**	**Sample Type**	**Cadmium**	**Molybdenum**	**Selenium**
			Screening Value:	**10**	**5**	**5**
0906-MBB001-09-GF	7/9/2009	GF	Primary	**0.313**	**5.63**	**1.77**
0906-MBB001-09-SL-AMAL	7/9/2009	SL-AMAL	Primary	**0.345**	**2.45 J**	**1.16**
0906-MBB001-09-SM-AMAL	7/9/2009	SM-AMAL	Primary	**0.357**	<1.48	**0.272**
0906-MBB001-10-FB	7/10/2009	FB	Primary	**0.131**	**2.34 J-**	**0.243 J**
0906-MBB001-10-GS	7/10/2009	GS	Primary	**0.380**	**240 J-**	**0.308 J**
0906-MBB001-10-SL-POTR	7/10/2009	SL-POTR	Primary	**0.394**	<1.50 UJ	**0.166 J**
0906-MBB001-10-SM-POTR	7/10/2009	SM-POTR	Primary	**0.332**	<1.48 UJ	**0.598 J**
0908-MBB001-01-FB	8/25/2009	FB	Primary	**0.337**	**5.08**	**0.549 J+**
0908-MBB001-05-FB	8/25/2009	FB	Primary	**0.375**	**2.66 J**	**0.671**
0908-MBB001-08-FB	8/25/2009	FB	Primary	**0.261**	**4.79**	**0.423**
0908-MBB001-10-FB	8/25/2009	FB	Primary	**0.180**	**2.52 J**	**0.661**
MBS001 (Ballard Mine Shop)						
0906-MBS001-01-GF	7/9/2009	GF	Primary	**2.94**	**10.5**	**12**
0906-MBS001-02-GF	7/9/2009	GF	Primary	**1.40**	**1.96 J**	**4.35**
0906-MBS001-03-GF	7/9/2009	GF	Primary	**1.05**	**425**	**6.47**
0906-MBS001-04-GF	7/9/2009	GF	Primary	**0.147**	**3.15**	**23.2**
0906-MBS001-05-GF	7/9/2009	GF	Primary	**1.72**	**9.73**	**27.5**
MDS030 (Dump Seep)						
VEMDS030-0-C(5)	9/11/2004	Vegetation	Primary	**0.18 JT**	**0.33 J+T**	**2 JT**
MDS031 (Dump Seep)						
VEMDS031-0-C(5)	9/11/2004	Vegetation	Primary	**0.76 T**	**1.43 T**	**11.5 T**
MDS032 (Dump Seep)						
VEMDS032-0-C(5)	9/11/2004	Vegetation	Primary	**0.2 JT**	<0.1 UT	**11 T**
MDS033 (Dump Seep)						
VEMDS033-0-C(5)	9/11/2004	Vegetation	Primary	**0.52 J+T**	**1.3 J+T**	**6.7 T**
MHR001 (Historic Haul Road)						
0906-MHR001-01-GF	7/9/2009	GF	Primary	**0.170**	**8.11**	**0.379**
0906-MHR001-02-GF	7/8/2009	GF	Primary	**0.226**	**9.56**	**1.39**
0906-MHR001-03-GF	7/8/2009	GF	Primary	**1.25**	**2.57 J**	**7.94**
0906-MHR001-04-FB	7/9/2009	FB	Primary	**0.494**	<1.50	**1.18**
0906-MHR001-04-GS	7/9/2009	GS	Primary	**0.0825 J**	<1.49	**0.493**
0906-MHR001-05-GF	7/8/2009	GF	Primary	**0.206**	<1.48	**0.386 J**
0906-MHR001-05-SL-SYAL	7/8/2009	SL-SYAL	Primary	**0.0643 J**	<1.49	**0.365 J**
0906-MHR001-05-SM-SYAL	7/8/2009	SM-SYAL	Primary	**0.397**	<1.47	**1.76 J**
0906-MHR001-06-GF	7/8/2009	GF	Primary	**1.14**	**6.17**	**1.06 J**
0906-MHR001-07-GF-1	7/8/2009	GF	Triplicate	**1.05**	**9.27**	**62.4 J**
0906-MHR001-07-GF-2	7/8/2009	GF	Triplicate	**0.727**	**6.58**	**75.8 J**
0906-MHR001-07-GF-3	7/8/2009	GF	Triplicate	**0.714**	**6.38**	**69.5 J**
0906-MHR001-07-GF-avg	7/8/2009	GF	Averaged	**0.83**	**7.41**	**69.2 J**
0906-MHR001-08-GF	7/8/2009	GF	Primary	**0.732**	**2.86 J**	**0.785 J**
0906-MHR001-09-GF	7/8/2009	GF	Primary	**0.280**	<1.49	**0.609 J**
0906-MHR001-10-GF	7/8/2009	GF	Primary	**0.339**	**4.28**	**4.72 J**
0908-MHR001-04-FB	8/25/2009	FB	Primary	**0.103**	<1.48	**0.923**
MMP035 (Mine Pit)						
0906-MMP035-01-GF	7/8/2009	GF	Primary	**0.769**	**11.7**	**8.92 J**
0906-MMP035-01-SF-AMAL	7/8/2009	SL-AMAL	Primary	**0.312**	**3.55**	**13.8 J**
0906-MMP035-01-SL-AMAL	7/8/2009	SL-AMAL	Primary	**0.516**	**4.66**	**29.7 J**
0906-MMP035-01-SL-CAAR	7/8/2009	SL-CAAR	Primary	**1.39**	**2.19 J**	**8.03 J**

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BALLARD MINE - SUMMARY OF VEGETATION EXCEEDANCES
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				Analyte (mg/Kg, dry weight)		
Sample Identification	**Collection Date**	**Vegetation Type**	**Sample Type**	**Cadmium**	**Molybdenum**	**Selenium**
			Screening Value:	**10**	**5**	**5**
0906-MMP035-01-SL-PUTR	7/8/2009	SL-PUTR	Primary	**0.395**	**16.7**	**18.7 J**
0906-MMP035-01-SM-AMAL	7/8/2009	SM-AMAL	Primary	**0.571**	<1.48	**10.6 J**
0906-MMP035-01-SM-CAAR	7/8/2009	SM-CAAR	Primary	**1.04**	**10.2**	**2.33 J**
0906-MMP035-01-SM-PUTR	7/8/2009	SM-PUTR	Primary	**0.802**	**4.03**	**6.55 J**
0906-MMP035-03-GF	7/8/2009	GF	Primary	**0.413**	**28.8**	**12.6 J**
0906-MMP035-03-SF-CAAR	7/8/2009	SF-CAAR	Primary	**0.321**	**4.78**	**3.45**
0906-MMP035-03-SL-CAAR	7/8/2009	SL-CAAR	Primary	**0.780**	**3.43**	**12.0 J**
0906-MMP035-03-SM-CAAR	7/8/2009	SM-CAAR	Primary	**1.06**	**14.9**	**5.79 J**
0906-MMP035-04-GF	7/9/2009	GF	Primary	**0.898**	**11.2**	**27.6 J**
0906-MMP035-05-GF	7/9/2009	GF	Primary	**2.20**	**10.6 J-**	**30.4 J**
0906-MMP035-06-FB	7/9/2009	FB	Primary	**2.10**	**13.3 J-**	**19.9 J**
0906-MMP035-06-GS	7/9/2009	GS	Primary	**4.43**	**9.96 J-**	**4.21 J**
0906-MMP035-07-GF-1	7/9/2009	GF	Triplicate	**0.618**	**5.16 J-**	**124 J**
0906-MMP035-07-GF-2	7/9/2009	GF	Triplicate	**0.579**	**6.15 J-**	**111 J**
0906-MMP035-07-GF-3	7/9/2009	GF	Triplicate	**0.638**	**6.62 J-**	**130 J**
0906-MMP035-07-GF-avg	7/9/2009	GF	Averaged	**0.612**	**5.98 J-**	**122 J**
0906-MMP035-08-GF	7/9/2009	GF	Primary	**0.274**	**8.47 J-**	**76.7 J**
0906-MMP035-09-GF	7/9/2009	GF	Primary	**0.317**	**3.48 J-**	**53.5 J**
0906-MMP035-10-GF	7/8/2009	GF	Primary	**0.717**	**11.4**	**20.0 J**
0906-MMP035-AL01-GF	7/9/2009	GF	Primary	**0.707**	**8.14 J-**	**77.6 J**
0908-MMP035-06-FB	8/25/2009	FB	Primary	**4.05 J**	**76**	**54**
MMP036 (Mine Pit)						
0906-MMP036-02-GF	6/23/2009	GF	Primary	**2.56**	**9.47**	**15.9 J**
0906-MMP036-03-GF	6/22/2009	GF	Primary	**2.86**	**2.70 J**	**0.368**
0906-MMP036-04-FB	6/22/2009	FB	Primary	**21.5**	**2.60 J**	**141**
0906-MMP036-04-GS	6/22/2009	GS	Primary	**2.01**	**3.23**	**23.5**
0906-MMP036-05-GF	6/22/2009	GF	Primary	**4.52**	**6.12**	**1.05**
0906-MMP036-06-GF	6/22/2009	GF	Primary	**1.10**	**4.18**	**20.4**
0906-MMP036-07-GF-1	6/22/2009	GF	Triplicate	**1.45**	**5.08**	**0.778**
0906-MMP036-07-GF-2	6/22/2009	GF	Triplicate	**2.15**	**9.18**	**0.444**
0906-MMP036-07-GF-3	6/22/2009	GF	Triplicate	**2.16**	**11.7**	**0.538**
0906-MMP036-07-GF-avg	6/22/2009	GF	Averaged	**1.92**	**8.65**	**0.587**
0906-MMP036-08-GF	6/22/2009	GF	Primary	**2.00**	<1.49	**0.913**
0906-MMP036-09-GF	6/22/2009	GF	Primary	**2.25**	**7.19**	**1.89**
0906-MMP036-10-GF	6/22/2009	GF	Primary	**1.10**	**5.39**	**7.08**
0906-MMP036-AL01-GF	6/23/2009	GF	Primary	**1.72**	**5.15**	**10.7 J**
0908-MMP036-04-FB	8/25/2009	FB	Primary	**6.54 J**	**1.96 J**	**1010**
0908-MMP036-CS-PRVI-FRUIT	8/25/2009	PRVI-FRUIT	Primary	**0.0257 J**	<1.49	**0.722 J**
0908-MMP036-CS-PRVI-LEAF	8/25/2009	PRVI-LEAF	Primary	<0.0249	<1.49	**1.80**
0908-MMP036-CS-PRVI-STEM	8/25/2009	PRVI-STEM	Primary	**0.0352 J**	<1.50	**1.97**
MRV011 (Reservoir Delta)						
VEMRV011-0-C(5)	9/11/2004	Vegetation	Primary	**0.08 JT**	**0.47 J+T**	<0.5 UT
MSG003 (Spring)						
VEMSG003-0-C(5)	9/8/2004	Vegetation	Primary	**0.87 T**	**0.94 T**	**9.3 T**
MSG004 (Spring)						
VEMSG004-0-C(11)	9/9/2004	Vegetation	Primary	**0.23 JT**	**3.89 T**	**1.3 JT**
MSG005 (Spring)						
VEMSG005-1-C(5)QA1	9/10/2004	Vegetation	Triplicate	**0.27 J+T**	**0.74 J+T**	**1 JT**

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BALLARD MINE - SUMMARY OF VEGETATION EXCEEDANCES
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				Analyte (mg/Kg, dry weight)		
Sample Identification	**Collection Date**	**Vegetation Type**	**Sample Type**	**Cadmium**	**Molybdenum**	**Selenium**
			Screening Value:	**10**	**5**	**5**
VEMSG005-1-C(5)QA2	9/10/2004	Vegetation	Triplicate	**0.26 J+T**	**0.75 J+T**	**0.9 JT**
VEMSG005-1-C(5)QA3	9/10/2004	Vegetation	Triplicate	**0.26 J+T**	**0.83 J+T**	**0.9 JT**
VEMSG005-1-C(5)QA4	9/10/2004	Vegetation	Triplicate	NS	NS	NS
VEMSG005-1-C(5)QA-avg	9/10/2004	Vegetation	Averaged	**0.263 J+T**	**0.773 J+T**	**0.933 JT**
MSG006 (Spring)						
VEMSG006-0-C(5)	9/10/2004	Vegetation	Primary	**0.19 JT**	**0.87 T**	**17.2 T**
MSP010 (Pond)						
VEMSP010-0-C(5)	9/11/2004	Vegetation	Primary	**2.75 T**	**4.83 T**	**26.8 T**
MSP011 (Pond)						
VEMSP011-0-C(5)	9/8/2004	Vegetation	Primary	**2.02 T**	**3.07 T**	**8.5 T**
MSP012 (Pond)						
VEMSP012-0-C(7)	9/8/2004	Vegetation	Primary	**4.39 T**	**6.14 T**	**10 T**
MSP013 (Pond)						
VEMSP013-0-C(5)	9/9/2004	Vegetation	Primary	**0.92 T**	**3.53 T**	**23 T**
MSP059 (Pond)						
VEMSP059-0-C(7)	9/8/2004	Vegetation	Primary	**2.77 T**	**45.9 T**	**16 T**
MSP062 (Pond)						
VEMSP062-0-C(5)	9/10/2004	Vegetation	Primary	**11.1 T**	**12.1 T**	**3.2 T**
MST019 (Stream)						
VEMST019-0-C(5)	9/11/2004	Vegetation	Primary	**0.63 T**	**0.88 T**	<0.5 UT
MST020 (Stream)						
VEMST020-1-C(5)QA1	9/14/2004	Vegetation	Triplicate	**0.09 JT**	**0.53 T**	<0.5 UT
VEMST020-1-C(5)QA2	9/14/2004	Vegetation	Triplicate	**0.09 JT**	**0.51 T**	<0.5 UT
VEMST020-1-C(5)QA3	9/14/2004	Vegetation	Triplicate	**0.1 JT**	**0.53 T**	<0.5 UT
VEMST020-1-C(5)QA-avg	9/14/2004	Vegetation	Averaged	**0.0933 JT**	**0.523 T**	<0.5 UT
MST021 (Stream)						
052404VEMST021-1-C7	5/24/2004	Vegetation	Primary	NS	NS	<0.5 UT
061604VEMST021-1-C(5	6/16/2004	Vegetation	Primary	NS	NS	<0.5 UJT
071504VEMST021-1-C(5)	7/15/2004	Vegetation	Primary	NS	NS	<0.5 UT
081604VEMST021-1-C(5)	8/16/2004	Vegetation	Primary	NS	NS	<0.5 UJT
VEMST021-0-C(5)	9/10/2004	Vegetation	Primary	<0.05 UT	**0.57 J+T**	<0.5 UT
VEMST021-1-C(5)QA1	10/18/2004	Vegetation	Triplicate	NS	NS	<0.5 UJT
VEMST021-1-C(5)QA2	10/18/2004	Vegetation	Triplicate	NS	NS	<0.5 UJT
VEMST021-1-C(5)QA3	10/18/2004	Vegetation	Triplicate	NS	NS	<0.5 UJT
VEMST021-1-C(5)QA-avg	10/18/2004	Vegetation	Averaged	NS	NS	<0.5 UJT
MST022 (Stream)						
VEMST022-1-C(6)QA1	9/10/2004	Vegetation	Triplicate	**0.25 J+T**	**0.64 JT**	<0.5 UT
VEMST022-1-C(6)QA2	9/10/2004	Vegetation	Triplicate	**0.21 J+T**	**0.78 JT**	<0.5 UT
VEMST022-1-C(6)QA3	9/10/2004	Vegetation	Triplicate	**0.41 J+T**	**0.9 JT**	<0.5 UT
VEMST022-1-C(6)QA4	9/10/2004	Vegetation	Triplicate	NS	NS	NS
VEMST022-1-C(6)QA-avg	9/10/2004	Vegetation	Averaged	**0.29 J+T**	**0.773 JT**	<0.5 UT
MST066 (Stream)						
VEMST066-0-C(5)	9/8/2004	Vegetation	Primary	**0.37 T**	**1.32 T**	<0.5 UT
MST067 (Stream)						
VEMST067-0-C(5)	9/8/2004	Vegetation	Primary	**0.26 JT**	**0.47 T**	**0.6 JT**
MST068 (Stream)						
VEMST068-0-C(5)	9/10/2004	Vegetation	Primary	**0.09 JT**	**2.33 T**	**40 T**

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BALLARD MINE - SUMMARY OF VEGETATION EXCEEDANCES
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				Analyte (mg/Kg, dry weight)		
Sample Identification	**Collection Date**	**Vegetation Type**	**Sample Type**	**Cadmium**	**Molybdenum**	**Selenium**
			Screening Value:	**10**	**5**	**5**
MST069 (Stream)						
VEMST069-0-C(5)	9/8/2004	Vegetation	Primary	**0.34 T**	**0.54 T**	**3.1 T**
MST088 (Stream)						
VEMST088-0-C(7)	9/9/2004	Vegetation	Primary	**0.56 T**	**1.41 T**	<0.5 UT
MST089 (Stream)						
VEMST089-0-C(6)	9/9/2004	Vegetation	Primary	**0.36 T**	**1.24 T**	<0.5 UT
MST090 (Stream)						
VEMST090-0-C(5)	9/9/2004	Vegetation	Primary	**0.24 JT**	**1.15 T**	<0.5 UT
MST092 (Stream)						
VEMST092-1-C(5)QA1	9/9/2004	Vegetation	Triplicate	**0.54 T**	**2.16 T**	<0.5 UT
VEMST092-1-C(5)QA2	9/9/2004	Vegetation	Triplicate	**0.53 T**	**2.11 T**	<0.5 UT
VEMST092-1-C(5)QA3	9/9/2004	Vegetation	Triplicate	**0.51 T**	**2.65 T**	<0.5 UT
VEMST092-1-C(5)QA-avg	9/9/2004	Vegetation	Averaged	**0.527 T**	**2.31 T**	<0.5 UT
MST094 (Stream)						
VEMST094-0-C(5)	9/9/2004	Vegetation	Primary	**0.12 JT**	**1.2 T**	<0.5 UT
MST095 (Stream)						
VEMST095-0-C(6)	9/9/2004	Vegetation	Primary	**1.17 T**	**2.25 T**	**12.5 T**
MST096 (Stream)						
VEMST096-0-C(5)	9/10/2004	Vegetation	Primary	**0.22 JT**	**0.6 T**	**2.4 JT**
MST230 (Stream)						
VEMST230-0-C(5)	9/14/2004	Vegetation	Primary	**0.06 JT**	**0.46 T**	<0.5 UT
MST231 (Stream)						
052404VEMST231-1-C6	5/24/2004	Vegetation	Primary	NS	NS	<0.5 UT
061604VEMST231-1-C(6	6/16/2004	Vegetation	Primary	NS	NS	<0.5 UJT
VEMST231-0-C(5)	10/18/2004	Vegetation	Primary	NS	NS	<0.5 UJT
VEMST231-0-C(8)	9/10/2004	Vegetation	Primary	<0.05 UT	**1.25 T**	<0.5 UT
VEMST231-1-C(6)	7/15/2004	Vegetation	Primary	NS	NS	<0.5 UT
VEMST231-1-C(7)	8/16/2004	Vegetation	Primary	NS	NS	<0.5 UJT
MST232 (Stream)						
VEMST232-1-C(5)QA1	9/10/2004	Vegetation	Triplicate	**0.07 JT**	**1.94 T**	<0.5 UT
VEMST232-1-C(5)QA2	9/10/2004	Vegetation	Triplicate	<0.05 UT	**2.18 T**	<0.5 UT
VEMST232-1-C(5)QA3	9/10/2004	Vegetation	Triplicate	<0.05 UT	**2.08 T**	<0.5 UT
VEMST232-1-C(5)QA4	9/10/2004	Vegetation	Triplicate	NS	NS	NS
VEMST232-1-C(5)QA-avg	9/10/2004	Vegetation	Averaged	**0.07 JT**	**2.07 T**	<0.5 UT
MST272 (Stream)						
VEMST272-0-C(5)	9/9/2004	Vegetation	Primary	**0.38 T**	**2.44 T**	<0.5 UT
MST273 (Stream)						
VEMST273-0-C(5)	9/9/2004	Vegetation	Primary	**0.18 JT**	**0.78 T**	<0.5 UT
MWD080 (Waste Rock Dump)						
0906-MWD080-01-GF	7/8/2009	GF	Primary	**0.477**	**4.61**	**86.1 J**
0906-MWD080-01-SL-PUTR	7/8/2009	SL-PUTR	Primary	**0.135**	<1.49	**124 J**
0906-MWD080-01-SL-SYAL	7/8/2009	SL-SYAL	Primary	**0.114**	**2.15 J**	**189 J**
0906-MWD080-01-SM-PUTR	7/8/2009	SM-PUTR	Primary	**0.296**	<1.50	**22.6 J**
0906-MWD080-01-SM-SYAL	7/8/2009	SM-SYAL	Primary	**0.355**	<1.48	**17.7 J**
0906-MWD080-02-GF	6/23/2009	GF	Primary	**1.05**	**14.6**	**53**
0906-MWD080-03-FB	6/23/2009	FB	Primary	**0.841**	**1.76 J**	**84.1**
0906-MWD080-03-GS	6/23/2009	GS	Primary	**1.16**	**6.8**	**69.1**

TABLE 3-5

BALLARD MINE - SUMMARY OF VEGETATION EXCEEDANCES
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				Analyte (mg/Kg, dry weight)		
Sample Identification	**Collection Date**	**Vegetation Type**	**Sample Type**	**Cadmium**	**Molybdenum**	**Selenium**
			Screening Value:	**10**	**5**	**5**
0906-MWD080-03-SL-PUTR	6/23/2009	SL-PUTR	Primary	**0.260**	**8.82**	**42.7**
0906-MWD080-03-SM-PUTR	6/23/2009	SM-PUTR	Primary	**0.465**	<1.45	**12.5**
0906-MWD080-04-GF	7/8/2009	GF	Primary	**0.244**	**5.73**	**3.90 J**
0906-MWD080-05-GF	6/23/2009	GF	Primary	**0.591**	**13.1**	**77.2**
0906-MWD080-06-FB	6/23/2009	FB	Primary	**0.591**	**10.4**	**234 J**
0906-MWD080-06-GS	6/23/2009	GS	Primary	**0.420**	**10.7**	**121**
0906-MWD080-07-GF-1	6/23/2009	GF	Triplicate	**1.66**	**4.89**	**47.2**
0906-MWD080-07-GF-2	6/23/2009	GF	Triplicate	**1.28**	**3.70**	**28.1**
0906-MWD080-07-GF-3	6/23/2009	GF	Triplicate	**1.81**	**6.06**	**28.7 J**
0906-MWD080-07-GF-avg	6/23/2009	GF	Averaged	**1.58**	**4.88**	**34.7 J**
0906-MWD080-08-GF	7/8/2009	GF	Primary	**0.549**	**8.9**	**24.2 J**
0906-MWD080-09-GF	7/8/2009	GF	Primary	**0.753**	**4.76**	**13.3 J**
0906-MWD080-10-GF	7/8/2009	GF	Primary	**0.630**	**6.22**	**27.0 J**
0908-MWD080-03-FB	8/25/2009	FB	Primary	**0.770 J**	**66.5**	**123**
0908-MWD080-06-FB	8/25/2009	FB	Primary	**1.34 J**	**26.3**	**229**
MWD081 (Waste Rock Dump)						
061604VEMWD081-1-C(5	6/16/2004	Vegetation	Primary	NS	NS	<0.5 UJT
071404VEMWD081-1-C(5)	7/14/2004	Vegetation	Primary	NS	NS	<0.5 UT
081604VEMWD081-1-C(5)	8/16/2004	Vegetation	Primary	NS	NS	<0.5 UJT
0906-MWD081-01-GF	6/17/2009	GF	Primary	**2.80**	**12.7**	**10.2 J**
0906-MWD081-02-GF	6/17/2009	GF	Primary	**2.99**	**8.7**	**8.20 J**
0906-MWD081-03-GF	6/17/2009	GF	Primary	**1.23**	**2.63 J**	**11.2 J**
0906-MWD081-04-FB	6/17/2009	FB	Primary	**0.265**	<1.87	**12.7 J**
0906-MWD081-04-GS	6/17/2009	GS	Primary	**0.721**	**11.4**	**8.57 J**
0906-MWD081-05-GF	6/18/2009	GF	Primary	**1.54**	**13.6**	**14.3 J+**
0906-MWD081-06-GF	6/18/2009	GF	Primary	**1.89**	**8.49**	**18.6 J+**
0906-MWD081-08-GF	6/18/2009	GF	Primary	**0.965**	**7.99**	**27.0 J+**
0906-MWD081-09-GF	6/18/2009	GF	Primary	**4.47**	**10**	**38.6 J+**
0906-MWD081-09-SL-PUTR	6/18/2009	SL-PUTR	Primary	**0.785**	<1.47	**34.5 J+**
0906-MWD081-09-SM-PUTR	6/18/2009	SM-PUTR	Primary	**1.17**	<1.48	**8.97 J+**
0906-MWD081-10-GF	6/18/2009	GF	Primary	**2.51**	**9.1**	**27.6**
0906-MWD081-AL03-GF-1	6/23/2009	GF	Triplicate	**4.68**	**21.5**	**9.75 J**
0906-MWD081-AL03-GF-2	6/23/2009	GF	Triplicate	**4.97**	**17.9**	**21.3 J**
0906-MWD081-AL03-GF-3	6/23/2009	GF	Triplicate	**3.96**	**18.8**	**12.6 J**
0906-MWD081-AL03-GF-avg	6/23/2009	GF	Averaged	**4.54**	**19.4**	**14.6 J**
0908-MWD081-04-FB	8/25/2009	FB	Primary	**0.526 J**	**5.98**	**1.67**
091504VEMWD081-0-C(5)	9/15/2004	Vegetation	Primary	**0.95 J+T**	**3.34 T**	<0.5 UT
101804VEMWD081-0-C(5)	10/18/2004	Vegetation	Primary	NS	NS	<0.5 UJT
VEMWD081-1-C7-QA1	5/24/2004	Vegetation	Triplicate	NS	NS	<0.5 UT
VEMWD081-1-C7-QA2	5/24/2004	Vegetation	Triplicate	NS	NS	<0.5 UT
VEMWD081-1-C7-QA3	5/24/2004	Vegetation	Triplicate	NS	NS	<0.5 UT
VEMWD081-1-C7-QA-avg	5/24/2004	Vegetation	Averaged	NS	NS	<0.5 UT
MWD082 (Waste Rock Dump)						
0906-MWD082-01-GS	7/8/2009	GS	Primary	**0.905**	**22.9**	**2.42 J**
0906-MWD082-02-GF	7/8/2009	GF	Primary	**0.362**	**29.5**	**52.3 J**
0906-MWD082-03-GF	6/23/2009	GF	Primary	**2.50**	**11.3**	**366 J**
0906-MWD082-04-GF	6/23/2009	GF	Primary	**0.217**	**9.86**	**0.304 J**
0906-MWD082-05-GF	6/23/2009	GF	Primary	**1.49**	**19**	**0.499 J**

TABLE 3-5

BALLARD MINE - SUMMARY OF VEGETATION EXCEEDANCES
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				Analyte (mg/Kg, dry weight)		
Sample Identification	**Collection Date**	**Vegetation Type**	**Sample Type**	**Cadmium**	**Molybdenum**	**Selenium**
			Screening Value:	**10**	**5**	**5**
0906-MWD082-06-GF	6/22/2009	GF	Primary	**0.702**	**3.50**	**3.06 J**
0906-MWD082-07-GF-1	7/8/2009	GF	Triplicate	**0.247**	**13.8**	**0.506 J**
0906-MWD082-07-GF-2	7/8/2009	GF	Triplicate	**0.252**	**7.21**	**0.379 J**
0906-MWD082-07-GF-3	7/8/2009	GF	Triplicate	**0.212**	**13.7**	**0.260 J**
0906-MWD082-07-GF-avg	7/8/2009	GF	Averaged	**0.237**	**11.6**	**0.382 J**
0906-MWD082-08-GF	6/23/2009	GF	Primary	**0.498**	**10.9**	**63.0 J**
0906-MWD082-09-GF	6/22/2009	GF	Primary	**0.684**	<26.8	**22.7 J**
0906-MWD082-10-GF	6/22/2009	GF	Primary	**0.405**	**7.5**	**5.53 J**
0906-MWD082-10-SL-POTR	6/22/2009	SL-POTR	Primary	**2.99**	<1.46	**1.79 J**
0906-MWD082-10-SM-POTR	6/22/2009	SM-POTR	Primary	**3.83**	<1.47	**0.484 J**
0908-MWD082-01-FB	8/25/2009	FB	Primary	**3.09**	**18.9**	**5.37**
VEMWD082-10-C(5)	7/18/2004	Vegetation	Primary	NS	NS	**8 T**
VEMWD082-11-C(5)	7/18/2004	Vegetation	Primary	NS	NS	**7.7 T**
VEMWD082-12-C(5)	7/18/2004	Vegetation	Primary	NS	NS	**2.7 JT**
VEMWD082-13-C(5)	7/18/2004	Vegetation	Primary	NS	NS	**3.8 T**
VEMWD082-14-C(5)QA1	7/19/2004	Vegetation	Triplicate	NS	NS	**59 T**
VEMWD082-14-C(5)QA2	7/19/2004	Vegetation	Triplicate	NS	NS	**58 T**
VEMWD082-14-C(5)QA3	7/19/2004	Vegetation	Triplicate	NS	NS	**58 T**
VEMWD082-14-C(5)QA-avg	7/19/2004	Vegetation	Averaged	NS	NS	**58.3 T**
VEMWD082-15-C(5)	7/19/2004	Vegetation	Primary	NS	NS	**68 J-T**
VEMWD082-16-C(5)	7/19/2004	Vegetation	Primary	NS	NS	**46 J-T**
VEMWD082-17-C(6)	7/19/2004	Vegetation	Primary	NS	NS	**57 J-T**
VEMWD082-18-C(5)	7/19/2004	Vegetation	Primary	NS	NS	**49 J-T**
VEMWD082-19-C(11)	7/19/2004	Vegetation	Primary	NS	NS	**35 J-T**
VEMWD082-1-C(6)	7/18/2004	Vegetation	Primary	NS	NS	**53 T**
VEMWD082-20-C(5)	7/19/2004	Vegetation	Primary	NS	NS	**17.2 J-T**
VEMWD082-21-C(9)	7/19/2004	Vegetation	Primary	NS	NS	**8.3 J-T**
VEMWD082-22-C(5)	7/19/2004	Vegetation	Primary	NS	NS	**8.4 J-T**
VEMWD082-23-C(7)	7/19/2004	Vegetation	Primary	NS	NS	**5.9 J-T**
VEMWD082-24-C(6)	7/19/2004	Vegetation	Primary	NS	NS	**3.2 J-T**
VEMWD082-25-C(5)	7/19/2004	Vegetation	Primary	NS	NS	**1.7 J-T**
VEMWD082-26-C(5)	7/19/2004	Vegetation	Primary	NS	NS	**2.6 J-T**
VEMWD082-2-C(10)	7/18/2004	Vegetation	Primary	NS	NS	**67 T**
VEMWD082-3-C(9)	7/18/2004	Vegetation	Primary	NS	NS	**54 T**
VEMWD082-4-C(6)	7/18/2004	Vegetation	Primary	NS	NS	**46 T**
VEMWD082-5-C(5)	7/18/2004	Vegetation	Primary	NS	NS	**50 T**
VEMWD082-6-C(7)	7/18/2004	Vegetation	Primary	NS	NS	**25.2 T**
VEMWD082-7-C(12)	7/18/2004	Vegetation	Primary	NS	NS	**17.2 T**
VEMWD082-8-C(7)	7/18/2004	Vegetation	Primary	NS	NS	**8.7 T**
VEMWD082-9-C(7)	7/18/2004	Vegetation	Primary	NS	NS	**16.6 T**
MWD083 (Waste Rock Dump)						
0906-MWD083-01-FB	6/21/2009	FB	Primary	**1.28**	**2.54 J**	**2.34**
0906-MWD083-01-GS	6/21/2009	GS	Primary	**0.230**	**4.38**	**0.320**
0906-MWD083-02-GF	6/21/2009	GF	Primary	**1.28**	**13.9**	**0.388**
0906-MWD083-03-GF	6/21/2009	GF	Primary	**0.792**	**4.64**	**0.917**
0906-MWD083-04-GF	6/21/2009	GF	Primary	**0.715**	**3.72**	**0.310**
0906-MWD083-05-GF	6/21/2009	GF	Primary	**1.09**	**7.01**	**1.36**
0906-MWD083-06-GF	6/18/2009	GF	Primary	**0.452**	**3.92**	**6.51 J+**

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BALLARD MINE - SUMMARY OF VEGETATION EXCEEDANCES
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				Analyte (mg/Kg, dry weight)		
Sample Identification	**Collection Date**	**Vegetation Type**	**Sample Type**	**Cadmium**	**Molybdenum**	**Selenium**
			Screening Value:	**10**	**5**	**5**
0906-MWD083-07-GF-1	6/18/2009	GF	Triplicate	**0.733**	**5.02**	**1.64**
0906-MWD083-07-GF-2	6/18/2009	GF	Triplicate	**0.523**	**1.76 J**	**4.53**
0906-MWD083-07-GF-3	6/18/2009	GF	Triplicate	**0.674**	**2.44 J**	**1.77**
0906-MWD083-07-GF-avg	6/18/2009	GF	Averaged	**0.643**	**3.07 J**	**2.65**
0906-MWD083-08-GF	6/23/2009	GF	Primary	**1.28**	**4.46**	**0.851 J**
0906-MWD083-09-GF	6/18/2009	GF	Primary	**0.661**	**3.62**	**54.4**
0906-MWD083-AL01-GF	6/23/2009	GF	Primary	**0.626**	**2.04 J**	**12.1 J**
0908-MWD083-01-FB	8/25/2009	FB	Primary	**0.861 J**	**1.85 J**	**4.97**
0908-MWD083-CS-POTR-LEAF	8/25/2009	POTR-LEAF	Primary	**1.86**	<1.48	**2.21**
0908-MWD083-CS-POTR-STEM	8/25/2009	POTR-STEM	Primary	**2.80**	<1.50	**2.54**
MWD084 (Waste Rock Dump)						
0906-MWD084-01-GF	6/20/2009	GF	Primary	**1.60**	**41.9**	**6.60 J**
0906-MWD084-02-GF	6/20/2009	GF	Primary	**1.53**	**45.8**	**3.83 J**
0906-MWD084-03-GF	6/20/2009	GF	Primary	**1.38**	**101**	**73.6**
0906-MWD084-04-GF	6/20/2009	GF	Primary	**1.71**	**30**	**108 J**
0906-MWD084-07-GF-1	6/20/2009	GF	Triplicate	**0.263**	**4.40**	**2.15 J**
0906-MWD084-07-GF-2	6/20/2009	GF	Triplicate	**0.148**	**2.10 J**	**0.700 J**
0906-MWD084-07-GF-3	6/20/2009	GF	Triplicate	**0.173**	**3.78**	**3.32 J**
0906-MWD084-07-GF-avg	6/20/2009	GF	Averaged	**0.195**	**3.43 J**	**2.06 J**
0906-MWD084-07-SL-2-ARTR	6/20/2009	SL-ARTR	Triplicate	**0.388**	<1.48	**0.491**
0906-MWD084-07-SL-3-SYAL	6/20/2009	SL-SYAL	Triplicate	**0.0498 J**	**1.70 J**	**0.796 J**
0906-MWD084-07-SL-avg-ARTR	6/20/2009	SL-ARTR	Averaged	**0.388**	<1.48	**0.491**
0906-MWD084-07-SL-avg-SYAL	6/20/2009	SL-SYAL	Averaged	**0.0498 J**	**1.7 J**	**0.796 J**
0906-MWD084-07-SM-2-ARTR	6/20/2009	SM-ARTR	Triplicate	**0.609**	**1.82 J**	**0.757 J**
0906-MWD084-07-SM-3-SYAL	6/20/2009	SM-SYAL	Triplicate	**0.349**	<1.41	**0.602 J**
0906-MWD084-07-SM-avg-ARTR	6/20/2009	SM-ARTR	Averaged	**0.609**	**1.82 J**	**0.757 J**
0906-MWD084-07-SM-avg-SYAL	6/20/2009	SM-SYAL	Averaged	**0.349**	<1.41	**0.602 J**
0906-MWD084-09-GF	6/20/2009	GF	Primary	**1.28**	**10.3**	**146 J**
0906-MWD084-10-GF	6/20/2009	GF	Primary	**1.43**	**7**	**72.0 J**
0906-MWD084-AL02-GF	6/20/2009	GF	Primary	**1.95**	**14.6**	**36.1 J**
0906-MWD084-AL04-GF	6/23/2009	GF	Primary	**3.32**	**4.48**	**58.9 J**
0906-MWD084-AL05-FB	7/10/2009	FB	Primary	**1.96**	**17.4 J-**	**135 J**
0906-MWD084-AL05-GS	7/10/2009	GS	Primary	**0.777**	**15.4 J-**	**38.5 J**
0908-MWD084-AL05-FB	8/25/2009	FB	Primary	**0.961**	**23.3**	**239**
MWD093 (Waste Rock Dump)						
0906-MWD093-01-GF	6/21/2009	GF	Primary	**0.852**	**4.71**	**2.84**
0906-MWD093-02-GS	6/21/2009	GS	Primary	**0.415**	**6.02**	**34.6**
0906-MWD093-03-GF	6/21/2009	GF	Primary	**1.13**	**7.38**	**116**
0906-MWD093-04-GF	6/21/2009	GF	Primary	**1.20**	**4.78**	**9.41**
0906-MWD093-05-GF	6/21/2009	GF	Primary	**0.931**	**18**	**6.91**
0906-MWD093-06-GF	6/21/2009	GF	Primary	**1.52**	**12**	**1.19**
0906-MWD093-07-GF-1	6/21/2009	GF	Triplicate	**0.616**	**3.76**	**0.949**
0906-MWD093-07-GF-2	6/21/2009	GF	Triplicate	**1.27**	**5.97**	**0.471**
0906-MWD093-07-GF-3	6/21/2009	GF	Triplicate	**0.625**	**3.95**	**2.57**
0906-MWD093-07-GF-avg	6/21/2009	GF	Averaged	**0.837**	**4.56**	**1.33**
0906-MWD093-08-GF	6/21/2009	GF	Primary	**3.05**	**11.1**	**27.2**
0906-MWD093-10-GF	6/21/2009	GF	Primary	**0.506**	**8.15**	**5.43**
0906-MWD093-AL01-GF	6/23/2009	GF	Primary	**3.30**	**6.56**	**13.3 J**

TABLE 3-5

BALLARD MINE - SUMMARY OF VEGETATION EXCEEDANCES
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				Analyte (mg/Kg, dry weight)		
Sample Identification	**Collection Date**	**Vegetation Type**	**Sample Type**	**Cadmium**	**Molybdenum**	**Selenium**
			Screening Value:	**10**	**5**	**5**
0908-MWD093-02-FB	8/25/2009	FB	Primary	**1.25 J**	**18.4**	**81.1**
0908-MWD093-CS-ARTR-LEAF	8/25/2009	ARTR-LEAF	Primary	**1.07**	<1.48	**2.16**
0908-MWD093-CS-ARTR-STEM	8/25/2009	ARTR-STEM	Primary	**1.78**	<1.49	**1.57**

TABLE 3-5

BALLARD MINE - SUMMARY OF VEGETATION EXCEEDANCES
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Notes:

Allium - onion (scientific name undetermined)
AMAL - serviceberry (*Amelanchier alnifolia*)
AR - active ore haul road
ARLU - white sagebrush (*Artemisia ludoviciana*)
ARTR - big sagebrush (*Artemisia tridentata*)
BB - Ballard Mine background
BE - Enoch Valley Mine background
BH - Henry Mine background
BS - Ballard Mine shop
CAAR - Siberian peashrub (*Caragana arborescens*)
CHNA - yellow Rabbitbrush (*Chrysothamnus viscidiflorus*)*
CS - Culturally Significant plants
FB - forb
GF - grasses and forbs
GS - grass
HR - historic ore haul road
JUSC - Rocky Mountain juniper (*Juniperus scopulorum*)
POTR - quaking aspen (*Populus tremuloides*)
PRVI - chokecherry (*Prunus virginiana*)
PUTR - antelope bitterbrush (*Purshia tridentata*)
ROWI - Wood's rose (*Rosa woodsii*)
SF - shrub fruit
SL - shrub leaves
SM - shrub stems
SYAL - mountain strawberry (*Symphoricarpos oreophilus*)
TA - Enoch Valley Minte tipple area
VE - vegetation sample
WD - waste rock dump
Wild St - wild strawberry

* The current symbol for yellow Rabbitbrush is "CHVI8."

Result is greater than screening value
Method detection limit for non-detected value is greater than the screening value

FLAG DEFINITION:

U	The analyte was analyzed for, but was not detected above the level of the reported sample quantitation limit.
J	The result is an estimated quantity. The associated numerical value is the approximated concentration of the analyte in the sample.
J+	The result is an estimated quantity, but the result may be biased high.
J-	The result is an estimated quantity, but the result may be biased low.
J+/B	Result is estimated and biased high; associated field blank contained target analyte.
R	The result is unusable. The sample result is rejected due to serious deficiencies in meeting quality control criteria. The analyte may or may not be present in the sample.
UJ	The analyte was analyzed for, but was not detected. The reported quantitation limit is approximate and may be inaccurate or imprecise.
K	Serial dilutions not performed for samples analyzed by this method (EPA 200.7; 200.8).
T	Laboratory SOP does not address biotic matrices; biotic-specific LCS/SRM not analyzed.

SOURCE FOR SCREENING VALUES (SEE ALSO TABLE 3

Vegetation	Mineral tolerance of animals, second revised edition, 2005 National Research Council, published by the national academics press, WA DC, pp. 13-14.

TRIPLICATE RESULT

"Primary" indicates locations where only one sample was collected from a given location. "Triplicate" indicates locations where a total of three samples were collected from a given location for the purpose of quality assurance.

The average value for triplicate samples is calculated as follows: (a) the mean of three detected values, (b) the mean of two detected values if result of one triplicate is not detected, (c) the detected value if results of two triplicates are not detected, or (d) less than the highest method detection limit if all triplicate results are not detected.

TABLE 3-6
BALLARD MINE
2004 SEASONAL VEGETATION SELENIUM CONCENTRATIONS (mg/kg dw)

Station Name	Station ID	May	Jun	Jul	Aug	Sep	Oct
Ballard Mine Pit #1 Overburden Dump #2	MWD081	ND	ND	ND	ND	ND	ND

Notes:
ND = concentration was less than the detection limit of 0.5 mg/kg dw.

TABLE 3-7
BALLARD MINE
2009 GRASS/FORB SAMPLING CONCENTRATION RANGES AND SCREENING LEVEL EXCEEDANCES (mg/kg dw)[1]

Analyte	SL	Background Range (n=6)	Waste Rock Dumps (n=53)	[n] > SL	Partially Backfilled Pits (n=18)	[n] > SL	Historic Ore Haul Road (n=9)	[n] > SL	Historic Facility (n=5)	[n] > SL
Selenium	5	0.20-1.77	0.30-366	37	0.37-122	13	0.38-69.2	2	4.35-27.5	4
Molybdenum	5	1.74-99.6	2.04-101	35	1.49U-28.8	14	2.57-9.56	4	1.96-425	3

Notes:
n - total number of samples
[n] - sample concentration
SL - screening level
1 - Triplicate samples are treated as a single sample as described in Appendix A.
Shaded results indicate those which ranges contain exceedances.

TABLE 3-8

BALLARD MINE - SUMMARY OF SURFACE WATER EXCEEDANCES

(Page 1 of 56)

Location:	MDS030		MDS030		MDS030		MDS030		MDS030		MDS030		MDS030		MDS030		MDS030	
Location Type:	Dump Seep		Dump Seep		Dump Seep		Dump Seep		Dump Seep		Dump Seep		Dump Seep		Dump Seep		Dump Seep	
Sample ID:	051104SWMDS030-0-F		051104SWMDS030-0-U		SWMDS030-0-F		SWMDS030-0-U		050206GWMDS030-0-F		050206GWMDS030-0-U		051007SWMDS030-0-F		051007SWMDS030-0-U		091407GWMDS030-0-F	
Collection Date:	5/11/2004		5/11/2004		9/11/2004		9/11/2004		5/2/2006		5/2/2006		5/10/2007		5/10/2007		9/14/2007	
Sample Type:	Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater	
	Primary		Primary		Primary		Primary		Primary		Primary		Primary		Primary		Primary	
	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL
Total Metals (mg/L)																		
Aluminum	NS		NS		NS		NS		NS		NS		NS		**0.07 JK**	0.087	NS	
Barium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Beryllium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Boron	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium	NS		NS		NS		NS		NS		<0.0001 UK		NS		NS		NS	
Chromium	NS		NS		NS		NS		NS		**0.0021 K**		NS		NS		NS	
Cobalt	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Copper, total	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Iron	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Lead	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Molybdenum	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Nickel	NS		NS		NS		NS		NS		<0.0006 UK		NS		NS		NS	
Selenium	NS		**0.52**	0.005	NS		**0.57**	0.005	NS		**0.45**	0.005	NS		**0.73**	0.005	NS	
Silver	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Thallium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Vanadium	NS		NS		NS		NS		NS		**0.001 JK**	0.02	NS		NS		NS	
Zinc	NS		NS		NS		NS		NS		<0.002 UK		NS		NS		NS	
Dissolved Metals (mg/L)																		
Aluminum, dissolved	NS		NS		NS		NS		<0.03 UK	0.087	NS		NS		NS		<0.03 UK	0.087
Barium, dissolved	NS		NS		NS		NS		**0.044 K**	0.003	NS		NS		NS		**0.055 K**	0.003
Beryllium, dissolved	NS		NS		NS		NS		<0.002 UK	0.0006	NS		NS		NS		<0.002 UK	0.0006
Boron, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		**0.03 JK**	0.0016
Cadmium, dissolved	<0.0001 UK	0.00127	NS		<0.0001 UK	0.00127	NS		<0.0001 UK	0.00127	NS		<0.0001 UK	0.00127	NS		<0.0001 UK	0.00127
Chromium, dissolved	**0.0015 K**	0.231	NS		<0.0001	0.231	NS		**0.0021 K**	0.231	NS		**0.0018 K**	0.231	NS		<0.0001 UK	0.231
Cobalt, dissolved	NS		NS		NS		NS		<0.01 UK	0.003	NS		NS		NS		<0.01 UK	0.003
Copper, dissolved	NS		NS		NS		NS		<0.01 UK	0.0371	NS		NS		NS		<0.01 UK	0.0371
Iron, dissolved	NS		NS		NS		NS		<0.02 UK	0.158	NS		NS		NS		<0.02 UK	0.158
Lead, dissolved	NS		NS		NS		NS		<0.0001 UK	0.0109	NS		NS		NS		<0.0001 UK	0.0109
Molybdenum, dissolved	NS		NS		NS		NS		<0.01 UK	0.034	NS		NS		NS		<0.01 UK	0.034
Nickel, dissolved	**0.0031 K**	0.168	NS		**0.005 K**	0.168	NS		<0.0006 UK	0.168	NS		**0.0014 JK**	0.168	NS		**0.0035 K**	0.168
Selenium, dissolved	**0.42**	0.005	NS		**0.59**	0.005	NS		**0.44 J-**	0.005	NS		NS		NS		**0.9**	0.005
Silver, dissolved	NS		NS		NS		NS		<0.01 UK	0.00036	NS		NS		NS		<0.01 UJK	0.00036
Thallium, dissolved	NS		NS		NS		NS		<0.0001 UK	0.00003	NS		NS		NS		<0.0002 UK	0.00003
Vanadium, dissolved	**0.0009 JK**	0.02	NS		**0.00054 K**	0.02	NS		**0.0005 JK**	0.02	NS		**0.001 JK**	0.02	NS		**0.0012 K**	0.02
Zinc, dissolved	**0.003 JK**	0.382	NS		<0.002 UK	0.382	NS		**0.003 JK**	0.382	NS		**0.002 JK**	0.382	NS		<0.002 UK	0.382

TABLE 3-8

BALLARD MINE - SUMMARY OF SURFACE WATER EXCEEDANCES

Location:	MDS030		MDS030		MDS030		MDS030		MDS030		MDS030		MDS030		MDS030		MDS030	
Location Type:	Dump Seep		Dump Seep		Dump Seep		Dump Seep		Dump Seep		Dump Seep		Dump Seep		Dump Seep		Dump Seep	
Sample ID:	091407GWMDS030-0-U		050708GWMDS030-0-F		050708GWMDS030-0-U		091608GWMDS030-0-F		091608GWMDS030-0-U		0905GWMDS030-F		0905GWMDS030-U		0909GWMDS030-F		0909GWMDS030-U	
Collection Date:	9/14/2007		5/7/2008		5/7/2008		9/16/2008		9/16/2008		5/30/2009		5/30/2009		9/22/2009		9/22/2009	
Sample Type:	Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater	
	Primary		Primary		Primary		Primary		Primary		Primary		Primary		Primary		Primary	
	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL
Total Metals (mg/L)																		
Aluminum	**1.8 J+K**	0.087	NS		**0.28 J+K**	0.087	NS		**1.97**	0.087	NS		NS		NS		NS	
Barium	**0.064 K**	0.003	NS		**0.049 K**	0.003	NS		NS		NS		NS		NS		NS	
Beryllium	<0.002 UK	0.0006	NS		<0.002 UK	0.0006	NS		NS		NS		NS		NS		NS	
Boron	**0.03 JK**	0.0016	NS		<0.03 UK	0.0016	NS		NS		NS		NS		NS		NS	
Cadmium	<0.0002 UK	0.00127	NS		<0.0001 UK	0.00127	NS		<0.000625		NS		<0.000125		NS		**0.000155 J**	
Chromium	**0.0059 K**	0.231	NS		**0.001 K**	0.231	NS		**0.00642 J**		NS		NS		NS		NS	
Cobalt	<0.01 UK	0.003	NS		<0.01 UK	0.003	NS		NS		NS		NS		NS		NS	
Copper, total	<0.01 UK	0.0371	NS		<0.01 UK	0.0371	NS		NS		NS		NS		NS		NS	
Iron	**1.63 K**	0.158	NS		**0.2 J+K**	0.158	NS		**1.53**	0.158	NS		NS		NS		NS	
Lead	**0.0009 J+K**	0.0109	NS		**0.0002 JK**	0.0109	NS		NS		NS		NS		NS		NS	
Molybdenum	<0.01 UK	0.034	NS		<0.01 UK	0.034	NS		NS		NS		NS		NS		NS	
Nickel	**0.0051 K**	0.168	NS		**0.0024 JK**	0.168	NS		**0.00715 J**		NS		NS		NS		NS	
Selenium	**0.92**	0.005	NS		**0.45**	0.005	NS		**0.893**	0.005	NS		**0.866**	0.005	NS		**0.814**	0.005
Silver	<0.01 UK	0.00036	NS		<0.01 UK	0.00036	NS		NS		NS		NS		NS		NS	
Thallium	<0.0001 UK	0.00003	NS		<0.0002 UK	0.00003	NS		NS		NS		NS		NS		NS	
Vanadium	**0.0041 K**	0.02	NS		**0.0012 J+K**	0.02	NS		<0.00500	0.02	NS		<0.00500	0.02	NS		**0.0176**	0.02
Zinc	**0.01 K {J+}**	0.382	NS		**0.002 JK**	0.382	NS		<0.0250		NS		NS		NS		NS	
Dissolved Metals (mg/L)																		
Aluminum, dissolved	NS		**0.05 JK**	0.087	NS		<0.0500	0.087	NS		NS		NS		NS		NS	
Barium, dissolved	NS		**0.043 K**	0.003	NS		NS		NS		NS		NS		NS		NS	
Beryllium, dissolved	NS		<0.002 UK	0.0006	NS		NS		NS		NS		NS		NS		NS	
Boron, dissolved	NS		**0.03 JK**	0.0016	NS		NS		NS		NS		NS		NS		NS	
Cadmium, dissolved	NS		<0.0001 UK	0.00127	NS		<0.000625	0.00127	NS		<0.000125	0.00127	NS		**0.000166 J**	0.00127	NS	
Chromium, dissolved	NS		<0.0001 UK	0.231	NS		<0.00250	0.231	NS		NS		NS		NS		NS	
Cobalt, dissolved	NS		<0.01 UK	0.003	NS		NS		NS		NS		NS		NS		NS	
Copper, dissolved	NS		<0.01 UK	0.0371	NS		NS		NS		NS		NS		NS		NS	
Iron, dissolved	NS		<0.02 UK	0.158	NS		<0.0250	0.158	NS		NS		NS		NS		NS	
Lead, dissolved	NS		<0.0001 UK	0.0109	NS		NS		NS		NS		NS		NS		NS	
Molybdenum, dissolved	NS		<0.01 UK	0.034	NS		NS		NS		NS		NS		NS		NS	
Nickel, dissolved	NS		**0.0031 K**	0.168	NS		<0.00500	0.168	NS		NS		NS		NS		NS	
Selenium, dissolved	NS		**0.49**	0.005	NS		**0.86**	0.005	NS		NS		NS		NS		NS	
Silver, dissolved	NS		<0.01 UJK	0.00036	NS		NS		NS		NS		NS		NS		NS	
Thallium, dissolved	NS		<0.0001 UK	0.00003	NS		NS		NS		NS		NS		NS		NS	
Vanadium, dissolved	NS		**0.0009 JK**	0.02	NS		<0.00500	0.02	NS		NS		NS		NS		NS	
Zinc, dissolved	NS		<0.002 UK	0.382	NS		<0.0250	0.382	NS		NS		NS		NS		NS	

TABLE 3-8

BALLARD MINE - SUMMARY OF SURFACE WATER EXCEEDANCES

Location:	MDS031		MDS031		MDS031		MDS031		MDS031		MDS031		MDS031		MDS031		MDS031	
Location Type:	Dump Seep		Dump Seep		Dump Seep		Dump Seep		Dump Seep		Dump Seep		Dump Seep		Dump Seep		Dump Seep	
Sample ID:	051104SWMDS031-0-F		051104SWMDS031-0-U		SWMDS031-0-F		SWMDS031-0-U		050206GWMDS031-0-F		050206GWMDS031-0-U		051007SWMDS031-0-F		051007SWMDS031-0-U		050708GWMDS031-0-F	
Collection Date:	5/11/2004		5/11/2004		9/11/2004		9/11/2004		5/2/2006		5/2/2006		5/10/2007		5/10/2007		5/7/2008	
Sample Type:	Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater	
	Primary		Primary		Primary		Primary		Primary		Primary		Primary		Primary		Primary	
	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL
Total Metals (mg/L)																		
Aluminum	NS		NS		NS		NS		NS		NS		NS		**1.01 J+K**	0.087	NS	
Barium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Beryllium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Boron	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium	NS		NS		NS		NS		NS		**0.0003 JK**		NS		NS		NS	
Chromium	NS		NS		NS		NS		NS		**0.0023 K**		NS		NS		NS	
Cobalt	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Copper, total	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Iron	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Lead	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Molybdenum	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Nickel	NS		NS		NS		NS		NS		**0.0037 K**		NS		NS		NS	
Selenium	NS		**0.38**	0.005	NS		**0.38**	0.005	NS		**0.57**	0.005	NS		**0.77**	0.005	NS	
Silver	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Thallium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Vanadium	NS		NS		NS		NS		NS		**0.0013 K**	0.02	NS		NS		NS	
Zinc	NS		NS		NS		NS		NS		**0.009 JK**		NS		NS		NS	
Dissolved Metals (mg/L)																		
Aluminum, dissolved	NS		NS		NS		NS		<0.03 UK	0.087	NS		NS		NS		**0.04 J+K**	0.087
Barium, dissolved	NS		NS		NS		NS		**0.059 K**	0.003	NS		NS		NS		**0.044 K**	0.003
Beryllium, dissolved	NS		NS		NS		NS		<0.002 UK	0.0006	NS		NS		NS		<0.002 UK	0.0006
Boron, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		**0.03 JK**	0.0016
Cadmium, dissolved	<0.0001 UK	0.00127	NS		<0.0001 UK	0.00127	NS		**0.0002 JK**	0.00127	NS		<0.0001 UK	0.00127	NS		<0.0001 UK	0.00127
Chromium, dissolved	**0.0011 K**	0.231	NS		<0.0001	0.231	NS		**0.0022 K**	0.231	NS		**0.0015 K**	0.230	NS		<0.0004 UK	0.231
Cobalt, dissolved	NS		NS		NS		NS		<0.01 UK	0.003	NS		NS		NS		<0.01 UK	0.003
Copper, dissolved	NS		NS		NS		NS		<0.01 UK	0.0371	NS		NS		NS		<0.01 UK	0.0371
Iron, dissolved	NS		NS		NS		NS		<0.02 UK	0.158	NS		NS		NS		<0.02 UK	0.158
Lead, dissolved	NS		NS		NS		NS		<0.0001 UK	0.0109	NS		NS		NS		<0.0001 UK	0.0109
Molybdenum, dissolved	NS		NS		NS		NS		<0.01 UK	0.034	NS		NS		NS		<0.01 UK	0.034
Nickel, dissolved	**0.0011 K**	0.168	NS		**0.0057 K**	0.168	NS		**0.0036 K**	0.168	NS		**0.0022 JK**	0.168	NS		**0.0048 K**	0.168
Selenium, dissolved	**0.45**	0.005	NS		**0.43**	0.005	NS		**0.48 J-**	0.005	NS		NS		NS		**0.43**	0.005
Silver, dissolved	NS		NS		NS		NS		<0.01 UK	0.00036	NS		NS		NS		<0.01 UJK	0.00036
Thallium, dissolved	NS		NS		NS		NS		<0.0001 UK	0.00003	NS		NS		NS		<0.0001 UK	0.00003
Vanadium, dissolved	**0.00099 K**	0.02	NS		**0.00075 K**	0.02	NS		**0.0007 JK**	0.02	NS		**0.0011 K**	0.02	NS		**0.0012 K**	0.02
Zinc, dissolved	<0.002 UK	0.382	NS		**0.002 JK**	0.382	NS		**0.008 JK**	0.382	NS		**0.002 JK**	0.382	NS		<0.002 UK	0.382

TABLE 3-8

BALLARD MINE - SUMMARY OF SURFACE WATER EXCEEDANCES

Location:	MDS031		MDS031		MDS031		MDS032		MDS032		MDS032		MDS032		MDS032		MDS032	
Location Type:	Dump Seep		Dump Seep		Dump Seep		Dump Seep		Dump Seep		Dump Seep		Dump Seep		Dump Seep		Dump Seep	
Sample ID:	050708GWMDS031-0-U		091608GWMDS031-0-F		091608GWMDS031-0-U		051104SWMDS032-0-F		051104SWMDS032-0-U		SWMDS032-0-F		SWMDS032-0-U		050206GWMDS032-0-F		050206GWMDS032-0-U	
Collection Date:	5/7/2008		9/16/2008		9/16/2008		5/11/2004		5/11/2004		9/11/2004		9/11/2004		5/2/2006		5/2/2006	
Sample Type:	Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater	
	Primary		Primary		Primary		Primary		Primary		Primary		Primary		Primary		Primary	
	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL
Total Metals (mg/L)																		
Aluminum	**0.24 K**	0.087	NS		**0.521**	0.087	NS		NS		NS		NS		NS		NS	
Barium	**0.043 K**	0.003	NS		NS		NS		NS		NS		NS		NS		NS	
Beryllium	<0.002 UK	0.0006	NS		NS		NS		NS		NS		NS		NS		NS	
Boron	**0.04 JK**	0.0016	NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium	**0.0002 JK**	0.00127	NS		<0.000625		NS		NS		NS		NS		NS		**0.0002 JK**	
Chromium	**0.003 K**	0.231	NS		<0.00515		NS		NS		NS		NS		NS		**0.0006 K**	
Cobalt	<0.01 UK	0.003	NS		NS		NS		NS		NS		NS		NS		NS	
Copper, total	<0.01 UK	0.0371	NS		NS		NS		NS		NS		NS		NS		NS	
Iron	**0.31 K**	0.158	NS		**0.48**	0.158	NS		NS		NS		NS		NS		NS	
Lead	**0.0001 JK**	0.0109	NS		NS		NS		NS		NS		NS		NS		NS	
Molybdenum	<0.01 UK	0.034	NS		NS		NS		NS		NS		NS		NS		NS	
Nickel	**0.0088 K**	0.168	NS		**0.00933 J**		NS		NS		NS		NS		NS		**0.0052 K**	
Selenium	**0.42**	0.005	NS		**0.728**	0.005	NS		**0.5**	0.005	NS		**0.29**	0.005	NS		**1.46**	0.005
Silver	<0.01 UK	0.00036	NS		NS		NS		NS		NS		NS		NS		NS	
Thallium	**0.0001 JK**	0.00003	NS		NS		NS		NS		NS		NS		NS		NS	
Vanadium	**0.0018 K**	0.02	NS		<0.00500	0.02	NS		NS		NS		NS		NS		**0.0009 JK**	0.02
Zinc	**0.012 J+K**	0.382	NS		<0.0250		NS		NS		NS		NS		NS		**0.012 K**	
Dissolved Metals (mg/L)																		
Aluminum, dissolved	NS		<0.0500	0.087	NS		NS		NS		NS		NS		<0.03 UK	0.087	NS	
Barium, dissolved	NS		NS		NS		NS		NS		NS		NS		**0.056 K**	0.003	NS	
Beryllium, dissolved	NS		NS		NS		NS		NS		NS		NS		<0.002 UK	0.0006	NS	
Boron, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium, dissolved	NS		<0.000625	0.00127	NS		<0.0001 UK	0.00127	NS		**0.0001 JK**	0.00127	NS		**0.0002 JK**	0.00127	NS	
Chromium, dissolved	NS		<0.00250	0.231	NS		<0.0005 UK	0.231	NS		<0.0001	0.231	NS		**0.0004 JK**	0.231	NS	
Cobalt, dissolved	NS		NS		NS		NS		NS		NS		NS		<0.01 UK	0.003	NS	
Copper, dissolved	NS		NS		NS		NS		NS		NS		NS		<0.01 UK	0.0371	NS	
Iron, dissolved	NS		<0.0250	0.158	NS		NS		NS		NS		NS		<0.02 UK	0.158	NS	
Lead, dissolved	NS		NS		NS		NS		NS		NS		NS		<0.0001 UK	0.0109	NS	
Molybdenum, dissolved	NS		NS		NS		NS		NS		NS		NS		<0.01 UK	0.034	NS	
Nickel, dissolved	NS		**0.00514 J**	0.168	NS		**0.0067 K**	0.168	NS		**0.0108 K**	0.168	NS		**0.0051 K**	0.168	NS	
Selenium, dissolved	NS		**0.718**	0.005	NS		**0.45**	0.005	NS		**0.29**	0.005	NS		**1.25**	0.005	NS	
Silver, dissolved	NS		NS		NS		NS		NS		NS		NS		<0.01 UK	0.00036	NS	
Thallium, dissolved	NS		NS		NS		NS		NS		NS		NS		<0.0001 UK	0.00003	NS	
Vanadium, dissolved	NS		<0.00500	0.02	NS		**0.0011 K**	0.02	NS		**0.00081 K**	0.02	NS		**0.0004 JK**	0.02	NS	
Zinc, dissolved	NS		<0.0250	0.382	NS		**0.004 JK**	0.382	NS		**0.006 JK**	0.382	NS		**0.01 K**	0.382	NS	

TABLE 3-8

BALLARD MINE - SUMMARY OF SURFACE WATER EXCEEDANCES

Location:	MDS032		MDS032		MDS032		MDS032		MDS032		MDS032		MDS033		MDS033		MDS033	
Location Type:	Dump Seep		Dump Seep		Dump Seep		Dump Seep		Dump Seep		Dump Seep		Dump Seep		Dump Seep		Dump Seep	
Sample ID:	051007SWMDS032-0-F		051007SWMDS032-0-U		091307GWMDS032-0-F		091307GWMDS032-0-U		050708GWMDS032-0-F		050708GWMDS032-0-U		051104SWMDS033-0-F		051104SWMDS033-0-U		050206GWMDS033-0-F	
Collection Date:	5/10/2007		5/10/2007		9/13/2007		9/13/2007		5/7/2008		5/7/2008		5/11/2004		5/11/2004		5/2/2006	
Sample Type:	Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater	
	Primary		Primary		Primary		Primary		Primary		Primary		Primary		Primary		Primary	
	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL
Total Metals (mg/L)																		
Aluminum	NS		**0.24 K**	0.087	NS		**2.69 K**	0.087	NS		**1.41 J+K**	0.087	NS		NS		NS	
Barium	NS		NS		NS		**0.077 K**	0.003	NS		**0.067 K**	0.003	NS		NS		NS	
Beryllium	NS		NS		NS		<0.002 UK	0.0006	NS		<0.002 UK	0.0006	NS		NS		NS	
Boron	NS		NS		NS		**0.05 JK**	0.0016	NS		**0.07 K**	0.0016	NS		NS		NS	
Cadmium	NS		NS		NS		**0.001 K**	0.00127	NS		**0.0014 K**	0.00127	NS		NS		NS	
Chromium	NS		NS		NS		**0.0087 K**	0.231	NS		**0.0055 K**	0.231	NS		NS		NS	
Cobalt	NS		NS		NS		<0.01 UK	0.003	NS		<0.01 UK	0.003	NS		NS		NS	
Copper, total	NS		NS		NS		<0.01 UK	0.0371	NS		**0.01 JK**	0.0371	NS		NS		NS	
Iron	NS		NS		NS		**2.29 K**	0.158	NS		**1.4 J+K**	0.158	NS		NS		NS	
Lead	NS		NS		NS		**0.0014 K**	0.0109	NS		**0.0012 K**	0.0109	NS		NS		NS	
Molybdenum	NS		NS		NS		<0.01 UK	0.034	NS		<0.01 UK	0.034	NS		NS		NS	
Nickel	NS		NS		NS		**0.0148 K**	0.168	NS		**0.0178 K**	0.168	NS		NS		NS	
Selenium	NS		**0.9**	0.005	NS		**0.69**	0.005	NS		**0.75**	0.005	NS		**1.48**	0.005	NS	
Silver	NS		NS		NS		<0.01 UK	0.00036	NS		<0.01 UK	0.00036	NS		NS		NS	
Thallium	NS		NS		NS		<0.0001 UK	0.00003	NS		<0.0001 UK	0.00003	NS		NS		NS	
Vanadium	NS		NS		NS		**0.0068 K**	0.02	NS		**0.0063 K**	0.02	NS		NS		NS	
Zinc	NS		NS		NS		**0.038 K**	0.382	NS		**0.045 K**	0.382	NS		NS		NS	
Dissolved Metals (mg/L)																		
Aluminum, dissolved	NS		NS		<0.03 UK	0.087	NS		**0.07 J+K**	0.087	NS		NS		NS		<0.03 UK	0.087
Barium, dissolved	NS		NS		**0.057 K**	0.003	NS		**0.051 K**	0.003	NS		NS		NS		**0.095 K**	0.003
Beryllium, dissolved	NS		NS		<0.002 UK	0.0006	NS		<0.002 UK	0.0006	NS		NS		NS		<0.002 UK	0.0006
Boron, dissolved	NS		NS		**0.05 JK**	0.0016	NS		**0.05 K**	0.0016	NS		NS		NS		NS	
Cadmium, dissolved	<0.0001 UK	0.00127	NS		<0.0001 UK	0.00127	NS		<0.0001 UK	0.00127	NS		**0.0002 JK**	0.00127	NS		**0.0003 JK**	0.00127
Chromium, dissolved	**0.0009 K**	0.231	NS		**0.0002 JK**	0.231	NS		<0.0001 UK	0.231	NS		**0.0007 K**	0.231	NS		**0.0018 K**	0.231
Cobalt, dissolved	NS		NS		<0.01 UK	0.003	NS		<0.01 UK	0.003	NS		NS		NS		<0.01 UK	0.003
Copper, dissolved	NS		NS		<0.01 UK	0.0371	NS		<0.01 UK	0.0371	NS		NS		NS		<0.01 UK	0.0371
Iron, dissolved	NS		NS		<0.02 UK	0.158	NS		<0.02 UK	0.158	NS		NS		NS		<0.02 UK	0.158
Lead, dissolved	NS		NS		<0.0001 UK	0.0109	NS		<0.0001 UK	0.0109	NS		NS		NS		<0.0001 UK	0.0109
Molybdenum, dissolved	NS		NS		<0.01 UK	0.034	NS		**0.01 JK**	0.034	NS		NS		NS		<0.01 UK	0.034
Nickel, dissolved	**0.0058 K**	0.168	NS		**0.0062 K**	0.168	NS		**0.0086 K**	0.168	NS		**0.011 K**	0.168	NS		**0.0066 K**	0.168
Selenium, dissolved	NS		NS		**0.57**	0.005	NS		**0.56**	0.005	NS		**1.4**	0.005	NS		**1.14**	0.005
Silver, dissolved	NS		NS		<0.01 UK	0.00036	NS		**0.01 J-K**	0.00036	NS		NS		NS		<0.01 UK	0.00036
Thallium, dissolved	NS		NS		<0.0001 UK	0.00003	NS		<0.0001 UK	0.00003	NS		NS		NS		<0.0001 UK	0.00003
Vanadium, dissolved	**0.0021 K**	0.02	NS		**0.0023 K**	0.02	NS		**0.0017 K**	0.02	NS		**0.00163 K**	0.02	NS		**0.0009 JK**	0.02
Zinc, dissolved	**0.005 JK**	0.382	NS		**0.003 JK**	0.382	NS		**0.003 JK**	0.382	NS		**0.007 JK**	0.382	NS		**0.011 K**	0.382

TABLE 3-8

BALLARD MINE - SUMMARY OF SURFACE WATER EXCEEDANCES

Location:	MDS033		MDS033		MDS033		MDS033		MDS033		MDS033		MDS033		MRV011		MRV011	
Location Type:	Dump Seep		Dump Seep		Dump Seep		Dump Seep		Dump Seep		Dump Seep		Dump Seep		Reservoir Delta		Reservoir Delta	
Sample ID:	050206GWMDS033-0-U		051407SWMDS033-0-F		051407SWMDS033-0-U		091307GWMDS033-0-F		091307GWMDS033-0-U		050708GWMDS033-0-F		050708GWMDS033-0-U		052104SWMRV011-0-F		052104SWMRV011-0-U	
Collection Date:	5/2/2006		5/14/2007		5/14/2007		9/13/2007		9/13/2007		5/7/2008		5/7/2008		5/21/2004		5/21/2004	
Sample Type:	Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Surface Water		Surface Water	
	Primary		Primary		Primary		Primary		Primary		Primary		Primary		Primary		Primary	
	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL
Total Metals (mg/L)																		
Aluminum	NS		NS		**1.61 K**	0.087	NS		**2.02 K**	0.087	NS		**0.89 J+K**	0.087	NS		NS	
Barium	NS		NS		NS		NS		**0.072 K**	0.003	NS		**0.029 JK**	0.003	NS		NS	
Beryllium	NS		NS		NS		NS		<0.002 UK	0.0006	NS		<0.004 UK	0.0006	NS		NS	
Boron	NS		NS		NS		NS		**0.05 JK**	0.0016	NS		<0.05 UK	0.0016	NS		NS	
Cadmium	**0.0008 K**		NS		NS		NS		**0.0007 K**	0.00127	NS		**0.001 K**	0.00126	NS		NS	
Chromium	**0.0131 K**		NS		NS		NS		**0.0165 K**	0.231	NS		**0.0074 K**	0.228	NS		NS	
Cobalt	NS		NS		NS		NS		<0.01 UK	0.003	NS		<0.02 UK	0.003	NS		NS	
Copper, total	NS		NS		NS		NS		<0.01 UK	0.0371	NS		<0.02 UK	0.0367	NS		NS	
Iron	NS		NS		NS		NS		**1.93 K**	0.158	NS		**0.79 J+K**	0.158	NS		NS	
Lead	NS		NS		NS		NS		**0.0008 J+K**	0.0109	NS		**0.0007 K**	0.0108	NS		NS	
Molybdenum	NS		NS		NS		NS		<0.01 UK	0.034	NS		<0.02 UK	0.034	NS		NS	
Nickel	**0.0175 K**		NS		NS		NS		**0.0212 K**	0.168	NS		**0.0184 K**	0.166	NS		NS	
Selenium	**1.67**	0.005	NS		**0.052**	0.005	NS		**2.2**	0.005	NS		**0.66**	0.005	NS		**0.002 J**	0.005
Silver	NS		NS		NS		NS		<0.01 UK	0.00036	NS		<0.02 UK	0.00036	NS		NS	
Thallium	NS		NS		NS		NS		<0.0001 UK	0.00003	NS		<0.0005 UK	0.00003	NS		NS	
Vanadium	**0.0083 K**	0.02	NS		NS		NS		**0.0071 K**	0.02	NS		**0.0062 K**	0.02	NS		NS	
Zinc	**0.049 K**		NS		NS		NS		**0.044 K**	0.382	NS		**0.041 K**	0.378	NS		NS	
Dissolved Metals (mg/L)																		
Aluminum, dissolved	NS		NS		NS		<0.03 UK	0.087	NS		**0.06 JK**	0.087	NS		NS		NS	
Barium, dissolved	NS		NS		NS		**0.065 K**	0.003	NS		**0.024 K**	0.003	NS		NS		NS	
Beryllium, dissolved	NS		NS		NS		<0.002 UK	0.0006	NS		<0.002 UK	0.0006	NS		NS		NS	
Boron, dissolved	NS		NS		NS		**0.05 JK**	0.0016	NS		**0.03 JK**	0.0016	NS		NS		NS	
Cadmium, dissolved	NS		**0.0002 JK**	0.00127	NS		<0.0001 UK	0.00127	NS		<0.0001 UK	0.00127	NS		<0.0001 UK	0.000917	NS	
Chromium, dissolved	NS		**0.0001 JK**	0.231	NS		**0.0001 JK**	0.231	NS		<0.0002 UK	0.231	NS		NS		NS	
Cobalt, dissolved	NS		NS		NS		<0.01 UK	0.003	NS		<0.01 UK	0.003	NS		NS		NS	
Copper, dissolved	NS		NS		NS		<0.01 UK	0.0371	NS		<0.01 UK	0.0371	NS		NS		NS	
Iron, dissolved	NS		NS		NS		<0.02 UK	0.158	NS		<0.02 UK	0.158	NS		NS		NS	
Lead, dissolved	NS		NS		NS		<0.0001 UK	0.0109	NS		<0.0001 UK	0.0109	NS		NS		NS	
Molybdenum, dissolved	NS		NS		NS		<0.01 UK	0.034	NS		<0.01 UK	0.034	NS		NS		NS	
Nickel, dissolved	NS		**0.008 JK**	0.168	NS		**0.0114 K**	0.168	NS		**0.0057 K**	0.168	NS		**0.0004 JK**	0.104	NS	
Selenium, dissolved	NS		NS		NS		**1.56**	0.005	NS		**0.38**	0.005	NS		NS		NS	
Silver, dissolved	NS		NS		NS		<0.01 UK	0.00036	NS		<0.01 UJK	0.00036	NS		NS		NS	
Thallium, dissolved	NS		NS		NS		<0.0001 UK	0.00003	NS		<0.0001 UK	0.00003	NS		NS		NS	
Vanadium, dissolved	NS		**0.0013 JK**	0.02	NS		**0.0019 K**	0.02	NS		**0.0017 K**	0.02	NS		**0.00104 K**	0.02	NS	
Zinc, dissolved	NS		**0.008 JK**	0.382	NS		**0.004 JK**	0.382	NS		**0.003 JK**	0.382	NS		<0.002 UK	0.237	NS	

TABLE 3-8

BALLARD MINE - SUMMARY OF SURFACE WATER EXCEEDANCES

Location:	MRV011		MRV011		MRV011		MRV011		MRV011		MRV011		MRV011		MRV011		MRV011	
Location Type:	Reservoir Delta		Reservoir Delta		Reservoir Delta		Reservoir Delta		Reservoir Delta		Reservoir Delta		Reservoir Delta		Reservoir Delta		Reservoir Delta	
Sample ID:	050706SWMRV011-0-F		050706SWMRV011-0-U		051407SWMRV011-0-F		051407SWMRV011-0-U		090807SWMRV011-0-F		090807SWMRV011-0-U		051308SWMRV011-0-F		051308SWMRV011-0-U		091908SWMRV011-0-F	
Collection Date:	5/7/2006		5/7/2006		5/14/2007		5/14/2007		9/8/2007		9/8/2007		5/13/2008		5/13/2008		9/19/2008	
Sample Type:	Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water	
	Primary		Primary		Primary		Primary		Primary		Primary		Primary		Primary		Primary	
	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL
Total Metals (mg/L)																		
Aluminum	NS		NS		NS		<0.06 UK	0.087	NS		**0.05 JK {J+}**	0.087	NS		**1.26 J+K**	0.087	NS	
Barium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Beryllium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Boron	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Chromium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Cobalt	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Copper, total	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Iron	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Lead	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Molybdenum	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Nickel	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Selenium	NS		**0.006**	0.005	NS		**0.004 J**	0.005	NS		<0.001	0.005	NS		**0.004 J**	0.005	NS	
Silver	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Thallium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Vanadium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Zinc	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Dissolved Metals (mg/L)																		
Aluminum, dissolved	**0.04 JK {J+}**	0.087	NS		NS		NS		NS		NS		NS		NS		<0.0500	0.087
Barium, dissolved	**0.067 K**	0.003	NS		NS		NS		NS		NS		NS		NS		NS	
Beryllium, dissolved	<0.002 UK	0.0006	NS		NS		NS		NS		NS		NS		NS		NS	
Boron, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium, dissolved	<0.0001 UK	0.000798	NS		<0.0001	0.000929	NS		<0.0001 UK	0.000929	NS		**0.0001 JK**	0.000706	NS		<0.000125	0.00127
Chromium, dissolved	**0.0002 JK**	0.119	NS		<0.0001	0.148	NS		<0.0001 UK	0.148	NS		<0.0001 UK	0.100	NS		**0.00218 J+**	0.231
Cobalt, dissolved	<0.01 UK	0.003	NS		NS		NS		NS		NS		NS		NS		NS	
Copper, dissolved	<0.01 UK	0.0187	NS		NS		NS		NS		NS		NS		NS		NS	
Iron, dissolved	<0.02 UK	0.158	NS		NS		NS		NS		NS		NS		NS		<0.0250	0.158
Lead, dissolved	<0.0001 UK	0.00471	NS		NS		NS		NS		NS		NS		NS		NS	
Molybdenum, dissolved	<0.01 UK	0.034	NS		NS		NS		NS		NS		NS		NS		NS	
Nickel, dissolved	**0.0011 JK**	0.0851	NS		**0.0011 JK**	0.106	NS		**0.0014 JK**	0.106	NS		**0.003 K**	0.0712	NS		**0.00260 J**	0.168
Selenium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Silver, dissolved	<0.01 UK	0.00036	NS		NS		NS		NS		NS		NS		NS		NS	
Thallium, dissolved	<0.0001 UK	0.00003	NS		NS		NS		NS		NS		NS		NS		NS	
Vanadium, dissolved	**0.0004 JK**	0.02	NS		**0.0007 JK**	0.02	NS		**0.0011 J+K**	0.02	NS		**0.0015 K**	0.02	NS		<0.00500	0.02
Zinc, dissolved	**0.002 JK**	0.193	NS		<0.002 UJK	0.242	NS		<0.002 UK	0.242	NS		**0.012 K**	0.162	NS		<0.00500	0.382

TABLE 3-8

BALLARD MINE - SUMMARY OF SURFACE WATER EXCEEDANCES

Location:	MRV011		MSG003		MSG003		MSG003		MSG003		MSG003		MSG003		MSG003		MSG003	
Location Type:	Reservoir Delta		Spring		Spring		Spring		Spring		Spring		Spring		Spring		Spring	
Sample ID:	091908SWMRV011-0-U		051104SWMSG003-0-F		051104SWMSG003-0-U		SWMSG003-0-F		SWMSG003-0-U		050206GWMSG003-0-F		050206GWMSG003-0-U		051007SWMSG003-1-F		051007SWMSG003-1-U	
Collection Date:	9/19/2008		5/11/2004		5/11/2004		9/8/2004		9/8/2004		5/2/2006		5/2/2006		5/10/2007		5/10/2007	
Sample Type:	Surface Water		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater	
	Primary		Primary		Primary		Primary		Primary		Primary		Primary		Triplicate		Triplicate	
	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL
Total Metals (mg/L)																		
Aluminum	NS		NS		NS		NS		NS		NS		NS		NS		<0.03 UK	0.087
Barium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Beryllium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Boron	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium	NS		NS		NS		NS		NS		NS		<0.0001 UK		NS		NS	
Chromium	NS		NS		NS		NS		NS		NS		**0.001 K {J+}**		NS		NS	
Cobalt	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Copper, total	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Iron	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Lead	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Molybdenum	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Nickel	NS		NS		NS		NS		NS		NS		<0.0006 UK		NS		NS	
Selenium	**0.00176 J**	0.005	NS		**0.47**	0.005	NS		**0.44**	0.005	NS		**0.48**	0.005	NS		**0.57**	0.005
Silver	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Thallium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Vanadium	NS		NS		NS		NS		NS		NS		**0.0011 K**	0.02	NS		NS	
Zinc	NS		NS		NS		NS		NS		NS		<0.002 UK		NS		NS	
Dissolved Metals (mg/L)																		
Aluminum, dissolved	NS		NS		NS		NS		NS		<0.03 UK	0.087	NS		NS		NS	
Barium, dissolved	NS		NS		NS		NS		NS		**0.043 K**	0.003	NS		NS		NS	
Beryllium, dissolved	NS		NS		NS		NS		NS		<0.002 UK	0.0006	NS		NS		NS	
Boron, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium, dissolved	NS		<0.0001 UK	0.00127	NS		<0.0001 UK	0.00127	NS		<0.0001 UK	0.00127	NS		<0.0001 UK	0.00127	NS	
Chromium, dissolved	NS		**0.0009 K**	0.231	NS		**0.0005 JK**	0.231	NS		**0.001 K**	0.231	NS		**0.0017 K**	0.231	NS	
Cobalt, dissolved	NS		NS		NS		NS		NS		<0.01 UK	0.003	NS		NS		NS	
Copper, dissolved	NS		NS		NS		NS		NS		<0.01 UK	0.0371	NS		NS		NS	
Iron, dissolved	NS		NS		NS		NS		NS		<0.02 UK	0.158	NS		NS		NS	
Lead, dissolved	NS		NS		NS		NS		NS		<0.0001 UK	0.0109	NS		NS		NS	
Molybdenum, dissolved	NS		NS		NS		NS		NS		<0.01 UK	0.034	NS		NS		NS	
Nickel, dissolved	NS		**0.0025 K**	0.168	NS		**0.0066 K**	0.168	NS		<0.0006 UK	0.168	NS		**0.0012 JK**	0.168	NS	
Selenium, dissolved	NS		**0.39**	0.005	NS		**0.46**	0.005	NS		**0.46 J-**	0.005	NS		NS		NS	
Silver, dissolved	NS		NS		NS		NS		NS		<0.01 UK	0.00036	NS		NS		NS	
Thallium, dissolved	NS		NS		NS		NS		NS		<0.0001 UK	0.00003	NS		NS		NS	
Vanadium, dissolved	NS		**0.00106 K**	0.02	NS		**0.00087 K**	0.02	NS		**0.0007 JK**	0.02	NS		**0.0011 K**	0.02	NS	
Zinc, dissolved	NS		<0.002 UK	0.382	NS		<0.002 UK	0.382	NS		<0.002 UK	0.382	NS		<0.002 UK	0.382	NS	

TABLE 3-8

BALLARD MINE - SUMMARY OF SURFACE WATER EXCEEDANCES

Location:	MSG003		MSG003		MSG003		MSG003		MSG003		MSG003		MSG003		MSG003		MSG003	
Location Type:	Spring		Spring		Spring		Spring		Spring		Spring		Spring		Spring		Spring	
Sample ID:	051007SWMSG003-2-F		051007SWMSG003-2-U		051007SWMSG003-3-F		051007SWMSG003-3-U		051007SWMSG003-avg-F		051007SWMSG003-avg-		091207GWMSG003-1-F		091207GWMSG003-1-U		091207GWMSG003-2-F	
Collection Date:	5/10/2007		5/10/2007		5/10/2007		5/10/2007		5/10/2007		5/10/2007		9/12/2007		9/12/2007		9/12/2007	
Sample Type:	Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater	
	Triplicate		Triplicate		Triplicate		Triplicate		Averaged		Averaged		Triplicate		Triplicate		Triplicate	
	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL
Total Metals (mg/L)																		
Aluminum	NS		<0.03 UK	0.087	NS		<0.03 UK	0.087	NS		<0.03 UK	0.087	NS		<0.03 UK	0.087	NS	
Barium	NS		NS		NS		NS		NS		NS		NS		**0.043 K**	0.003	NS	
Beryllium	NS		NS		NS		NS		NS		NS		NS		<0.002 UK	0.0006	NS	
Boron	NS		NS		NS		NS		NS		NS		NS		**0.02 JK**	0.0016	NS	
Cadmium	NS		NS		NS		NS		NS		NS		NS		<0.0001 UK	0.00127	NS	
Chromium	NS		NS		NS		NS		NS		NS		NS		**0.001 K**	0.231	NS	
Cobalt	NS		NS		NS		NS		NS		NS		NS		<0.01 UK	0.003	NS	
Copper, total	NS		NS		NS		NS		NS		NS		NS		<0.01 UK	0.0371	NS	
Iron	NS		NS		NS		NS		NS		NS		NS		<0.02 UK	0.158	NS	
Lead	NS		NS		NS		NS		NS		NS		NS		<0.0001 UK	0.0109	NS	
Molybdenum	NS		NS		NS		NS		NS		NS		NS		<0.01 UK	0.034	NS	
Nickel	NS		NS		NS		NS		NS		NS		NS		**0.0015 JK**	0.168	NS	
Selenium	NS		**0.58**	0.005	NS		**0.56**	0.005	NS		**0.57**	0.005	NS		**0.48**	0.005	NS	
Silver	NS		NS		NS		NS		NS		NS		NS		<0.01 UK	0.00036	NS	
Thallium	NS		NS		NS		NS		NS		NS		NS		<0.0001 UK	0.00003	NS	
Vanadium	NS		NS		NS		NS		NS		NS		NS		**0.001 K**	0.02	NS	
Zinc	NS		NS		NS		NS		NS		NS		NS		**0.002 JK**	0.382	NS	
Dissolved Metals (mg/L)																		
Aluminum, dissolved	NS		NS		NS		NS		NS		NS		**0.04 JK**	0.087	NS		**0.04 JK**	0.087
Barium, dissolved	NS		NS		NS		NS		NS		NS		**0.046 K**	0.003	NS		**0.044 K**	0.003
Beryllium, dissolved	NS		NS		NS		NS		NS		NS		<0.002 UK	0.0006	NS		<0.002 UK	0.0006
Boron, dissolved	NS		NS		NS		NS		NS		NS		**0.03 JK**	0.0016	NS		**0.03 JK**	0.0016
Cadmium, dissolved	<0.0001 UK	0.00127	NS		<0.0001 UK	0.00127	NS		<0.0001 UK	0.00127	NS		<0.0001 UK	0.00127	NS		<0.0001 UK	0.00127
Chromium, dissolved	**0.0014 K**	0.231	NS		**0.0014 K**	0.231	NS		**0.0015 K**	0.231	NS		**0.0004 JK**	0.231	NS		<0.0001 UK	0.231
Cobalt, dissolved	NS		NS		NS		NS		NS		NS		<0.01 UK	0.003	NS		<0.01 UK	0.003
Copper, dissolved	NS		NS		NS		NS		NS		NS		<0.01 UK	0.0371	NS		<0.01 UK	0.0371
Iron, dissolved	NS		NS		NS		NS		NS		NS		<0.02 UK	0.158	NS		<0.02 UK	0.158
Lead, dissolved	NS		NS		NS		NS		NS		NS		<0.0001 UK	0.0109	NS		<0.0001 UK	0.0109
Molybdenum, dissolved	NS		NS		NS		NS		NS		NS		<0.01 UK	0.034	NS		<0.01 UK	0.034
Nickel, dissolved	**0.0012 JK**	0.168	NS		**0.0011 JK**	0.168	NS		**0.00117 JK**	0.168	NS		**0.002 JK**	0.168	NS		**0.0021 JK**	0.168
Selenium, dissolved	NS		NS		NS		NS		NS		NS		**0.57**	0.005	NS		**0.56**	0.005
Silver, dissolved	NS		NS		NS		NS		NS		NS		<0.01 UK	0.00036	NS		<0.01 UK	0.00036
Thallium, dissolved	NS		NS		NS		NS		NS		NS		<0.0001 UK	0.00003	NS		**0.0001 JK**	0.00003
Vanadium, dissolved	**0.0011 K**	0.02	NS		**0.0011 K**	0.02	NS		**0.0011 K**	0.02	NS		**0.0011 K**	0.02	NS		**0.0011 K**	0.02
Zinc, dissolved	**0.002 JK**	0.382	NS		<0.002 UK	0.382	NS		**0.002 JK**	0.382	NS		<0.002 UK	0.382	NS		<0.002 UK	0.382

TABLE 3-8

BALLARD MINE - SUMMARY OF SURFACE WATER EXCEEDANCES

Location:	MSG003		MSG003		MSG003		MSG003		MSG003		MSG003		MSG003		MSG003		MSG003	
Location Type:	Spring		Spring		Spring		Spring		Spring		Spring		Spring		Spring		Spring	
Sample ID:	091207GWMSG003-2-U		091207GWMSG003-3-F		091207GWMSG003-3-U		091207GWMSG003-avg-		091207GWMSG003-avg-		050708GWMSG003-0-F		050708GWMSG003-0-U		091608GWMSG003-0-F		091608GWMSG003-0-U	
Collection Date:	9/12/2007		9/12/2007		9/12/2007		9/12/2007		9/12/2007		5/7/2008		5/7/2008		9/16/2008		9/16/2008	
Sample Type:	Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater	
	Triplicate		Triplicate		Triplicate		Averaged		Averaged		Primary		Primary		Primary		Primary	
	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL
Total Metals (mg/L)																		
Aluminum	<0.03 UK	0.087	NS		<0.03 UK	0.087	NS		<0.03 UK	0.087	NS		<0.03 UK	0.087	NS		<0.0500	0.087
Barium	**0.043 K**	0.003	NS		**0.042 K**	0.003	NS		**0.0427 K**	0.003	NS		**0.04 K**	0.003	NS		NS	
Beryllium	<0.002 UK	0.0006	NS		<0.002 UK	0.0006	NS		<0.002 UK	0.0006	NS		<0.002 UK	0.0006	NS		NS	
Boron	**0.02 JK**	0.0016	NS		**0.02 JK**	0.0016	NS		**0.02 JK**	0.0016	NS		**0.03 JK**	0.0016	NS		NS	
Cadmium	<0.0001 UK	0.00127	NS		<0.0001 UK	0.00127	NS		<0.0001 UK	0.00127	NS		<0.0001 UK	0.00127	NS		<0.000625	
Chromium	**0.0013 K**	0.230	NS		**0.0013 K**	0.230	NS		**0.0012 K**	0.231	NS		<0.0001 UK	0.231	NS		<0.00250	
Cobalt	<0.01 UK	0.003	NS		<0.01 UK	0.003	NS		<0.01 UK	0.003	NS		<0.01 UK	0.003	NS		NS	
Copper, total	<0.01 UK	0.0371	NS		<0.01 UK	0.0370	NS		<0.01 UK	0.0371	NS		<0.01 UK	0.0371	NS		NS	
Iron	<0.02 UK	0.158	NS		<0.02 UK	0.158	NS		<0.02 UK	0.158	NS		<0.02 UK	0.158	NS		<0.0250	0.158
Lead	<0.0001 UK	0.0109	NS		<0.0001 UK	0.0109	NS		<0.0001 UK	0.0109	NS		<0.0001 UK	0.0109	NS		NS	
Molybdenum	<0.01 UK	0.034	NS		<0.01 UK	0.034	NS		<0.01 UK	0.034	NS		<0.01 UK	0.034	NS		NS	
Nickel	**0.002 JK**	0.168	NS		**0.0017 JK**	0.168	NS		**0.00173 JK**	0.168	NS		**0.0048 K**	0.168	NS		<0.00500	
Selenium	**0.54**	0.005	NS		**0.57**	0.005	NS		**0.53**	0.005	NS		**0.37**	0.005	NS		**0.64**	0.005
Silver	<0.01 UK	0.00036	NS		<0.01 UK	0.00036	NS		<0.01 UK	0.00036	NS		<0.01 UK	0.00036	NS		NS	
Thallium	<0.0001 UK	0.00003	NS		<0.0001 UK	0.00003	NS		<0.0001 UK	0.00003	NS		**0.0002 JK**	0.00003	NS		NS	
Vanadium	**0.001 K**	0.02	NS		**0.001 JK**	0.02	NS		**0.001 JK**	0.02	NS		**0.0009 JK**	0.02	NS		<0.00500	0.02
Zinc	<0.002 UK	0.382	NS		<0.002 UK	0.382	NS		**0.002 JK**	0.382	NS		<0.002 UK	0.382	NS		<0.0250	
Dissolved Metals (mg/L)																		
Aluminum, dissolved	NS		**0.05 JK**	0.087	NS		**0.0433 JK**	0.087	NS		**0.06 J+K**	0.087	NS		<0.0500	0.087	NS	
Barium, dissolved	NS		**0.041 K**	0.003	NS		**0.0437 K**	0.003	NS		**0.041 K**	0.003	NS		NS		NS	
Beryllium, dissolved	NS		<0.002 UK	0.0006	NS		<0.002 UK	0.0006	NS		<0.002 UK	0.0006	NS		NS		NS	
Boron, dissolved	NS		**0.02 JK**	0.0016	NS		**0.0267 JK**	0.0016	NS		**0.02 JK**	0.0016	NS		NS		NS	
Cadmium, dissolved	NS		<0.0001 UK	0.00127	NS		<0.0001 UK	0.00127	NS		<0.0001 UK	0.00127	NS		<0.000625	0.00127	NS	
Chromium, dissolved	NS		<0.0001 UK	0.231	NS		**0.0004 JK**	0.231	NS		<0.0001 UK	0.231	NS		<0.00287	0.231	NS	
Cobalt, dissolved	NS		<0.01 UK	0.003	NS		<0.01 UK	0.003	NS		<0.01 UK	0.003	NS		NS		NS	
Copper, dissolved	NS		<0.01 UK	0.0371	NS		<0.01 UK	0.0371	NS		<0.01 UK	0.0371	NS		NS		NS	
Iron, dissolved	NS		<0.02 UK	0.158	NS		<0.02 UK	0.158	NS		<0.02 UK	0.158	NS		<0.0250	0.158	NS	
Lead, dissolved	NS		<0.0001 UK	0.0109	NS		<0.0001 UK	0.0109	NS		<0.0001 UK	0.0109	NS		NS		NS	
Molybdenum, dissolved	NS		<0.01 UK	0.034	NS		<0.01 UK	0.034	NS		<0.01 UK	0.034	NS		NS		NS	
Nickel, dissolved	NS		**0.0022 JK**	0.168	NS		**0.0021 JK**	0.168	NS		**0.0032 K**	0.168	NS		<0.00500	0.168	NS	
Selenium, dissolved	NS		**0.56**	0.005	NS		**0.563**	0.005	NS		**0.37**	0.005	NS		**0.653**	0.005	NS	
Silver, dissolved	NS		<0.01 UK	0.00036	NS		<0.01 UK	0.00036	NS		<0.01 UJK	0.00036	NS		NS		NS	
Thallium, dissolved	NS		**0.0001 JK**	0.00003	NS		**0.0001 JK**	0.00003	NS		<0.0001 UK	0.00003	NS		NS		NS	
Vanadium, dissolved	NS		**0.0011 K**	0.02	NS		**0.0011 K**	0.02	NS		**0.0012 K**	0.02	NS		<0.00500	0.02	NS	
Zinc, dissolved	NS		<0.002 UK	0.382	NS		<0.002 UK	0.382	NS		<0.002 UK	0.382	NS		<0.0250	0.382	NS	

TABLE 3-8

BALLARD MINE - SUMMARY OF SURFACE WATER EXCEEDANCES

Location:	MSG004		MSG004		MSG004		MSG004		MSG004		MSG004		MSG004		MSG004		MSG004	
Location Type:	Spring		Spring		Spring		Spring		Spring		Spring		Spring		Spring		Spring	
Sample ID:	051204SWMSG004-0-F		051204SWMSG004-0-U		SWMSG004-0-F		SWMSG004-0-U		050906GWMSG004-1-F		050906GWMSG004-1-U		050906GWMSG004-2-F		050906GWMSG004-2-U		050906GWMSG004-3-F	
Collection Date:	5/12/2004		5/12/2004		9/9/2004		9/9/2004		5/9/2006		5/9/2006		5/9/2006		5/9/2006		5/9/2006	
Sample Type:	Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater	
	Primary		Primary		Primary		Primary		Triplicate		Triplicate		Triplicate		Triplicate		Triplicate	
	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL
Total Metals (mg/L)																		
Aluminum	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Barium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Beryllium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Boron	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium	NS		NS		NS		NS		NS		**0.0001 JK**		NS		<0.0001 UK		NS	
Chromium	NS		NS		NS		NS		NS		**0.0013 K**		NS		**0.0013 K**		NS	
Cobalt	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Copper, total	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Iron	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Lead	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Molybdenum	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Nickel	NS		NS		NS		NS		NS		**0.001 JK**		NS		**0.001 JK**		NS	
Selenium	NS		**0.016**	0.005	NS		**0.031**	0.005	NS		**0.044**	0.005	NS		**0.048**	0.005	NS	
Silver	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Thallium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Vanadium	NS		NS		NS		NS		NS		**0.0012 K**	0.02	NS		**0.0012 K**	0.02	NS	
Zinc	NS		NS		NS		NS		NS		**0.004 JK**		NS		**0.003 JK**		NS	
Dissolved Metals (mg/L)																		
Aluminum, dissolved	NS		NS		NS		NS		<0.03 UK	0.087	NS		<0.03 UK	0.087	NS		<0.03 UK	0.087
Barium, dissolved	NS		NS		NS		NS		**0.024 K**	0.003	NS		**0.027 K**	0.003	NS		**0.028 K**	0.003
Beryllium, dissolved	NS		NS		NS		NS		<0.002 UK	0.0006	NS		<0.002 UK	0.0006	NS		<0.002 UK	0.0006
Boron, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium, dissolved	<0.0001 UK	0.00100	NS		<0.0001 UK	0.00108	NS		<0.0001 UK	0.000978	NS		<0.0001 UK	0.00100	NS		<0.0001 UK	0.00101
Chromium, dissolved	**0.0006 K**	0.165	NS		<0.0003	0.183	NS		**0.0013 K**	0.160	NS		**0.0013 K**	0.165	NS		**0.0012 K**	0.167
Cobalt, dissolved	NS		NS		NS		NS		<0.01 UK	0.003	NS		<0.01 UK	0.003	NS		<0.01 UK	0.003
Copper, dissolved	NS		NS		NS		NS		<0.01 UK	0.0253	NS		<0.01 UK	0.0262	NS		<0.01 UK	0.0265
Iron, dissolved	NS		NS		NS		NS		<0.02 UK	0.158	NS		<0.02 UK	0.158	NS		<0.02 UK	0.158
Lead, dissolved	NS		NS		NS		NS		<0.0001 UK	0.00686	NS		<0.0001 UK	0.00717	NS		<0.0001 UK	0.00728
Molybdenum, dissolved	NS		NS		NS		NS		<0.01 UK	0.034	NS		<0.01 UK	0.034	NS		<0.01 UK	0.034
Nickel, dissolved	**0.0023 K**	0.119	NS		**0.0089 K**	0.132	NS		**0.0008 JK**	0.115	NS		**0.0008 JK**	0.119	NS		**0.0008 JK**	0.121
Selenium, dissolved	**0.009**	0.005	NS		**0.018**	0.005	NS		**0.044**	0.005	NS		**0.044**	0.005	NS		**0.043**	0.005
Silver, dissolved	NS		NS		NS		NS		<0.01 UJK	0.00036	NS		<0.01 UK	0.00036	NS		<0.01 UK	0.00036
Thallium, dissolved	NS		NS		NS		NS		<0.0001 UK	0.00003	NS		<0.0001 UK	0.00003	NS		<0.0001 UK	0.00003
Vanadium, dissolved	**0.00157 K**	0.02	NS		**0.00516 K**	0.02	NS		**0.001 K**	0.02	NS		**0.001 K**	0.02	NS		**0.001 K**	0.02
Zinc, dissolved	**0.003 JK**	0.270	NS		<0.002 UK	0.301	NS		**0.003 JK**	0.261	NS		**0.01 K**	0.271	NS		**0.003 JK**	0.274

TABLE 3-8

BALLARD MINE - SUMMARY OF SURFACE WATER EXCEEDANCES

Location:	MSG004		MSG004		MSG004		MSG004		MSG004		MSG004		MSG004		MSG004		MSG004	
Location Type:	Spring		Spring		Spring		Spring		Spring		Spring		Spring		Spring		Spring	
Sample ID:	050906GWMSG004-3-U		050906GWMSG004-avg-		050906GWMSG004-avg-		050907SWMSG004-0-F		050907SWMSG004-0-U		051508GWMSG004-0-F		051508GWMSG004-0-U		091708GWMSG004-0-F		091708GWMSG004-0-U	
Collection Date:	5/9/2006		5/9/2006		5/9/2006		5/9/2007		5/9/2007		5/15/2008		5/15/2008		9/17/2008		9/17/2008	
Sample Type:	Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater	
	Triplicate		Averaged		Averaged		Primary		Primary		Primary		Primary		Primary		Primary	
	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL
Total Metals (mg/L)																		
Aluminum	NS		NS		NS		NS		**4.21 K**	0.087	NS		**1.32 J+K**	0.087	NS		**0.496**	0.087
Barium	NS		NS		NS		NS		NS		NS		**0.052 K**	0.003	NS		NS	
Beryllium	NS		NS		NS		NS		NS		NS		<0.002 UK	0.0006	NS		NS	
Boron	NS		NS		NS		NS		NS		NS		**0.02 JK**	0.0016	NS		NS	
Cadmium	<0.0001 UK		NS		**0.0001 JK**		NS		NS		NS		<0.0001 UK	0.000920	NS		**0.000465 J**	
Chromium	**0.0012 K**		NS		**0.00127 K**		NS		NS		NS		**0.0041 K**	0.146	NS		**0.0208**	
Cobalt	NS		NS		NS		NS		NS		NS		<0.01 UK	0.003	NS		NS	
Copper, total	NS		NS		NS		NS		NS		NS		<0.01 UK	0.0230	NS		NS	
Iron	NS		NS		NS		NS		NS		NS		**0.97 J+K**	0.158	NS		**1.36**	0.158
Lead	NS		NS		NS		NS		NS		NS		**0.0011 K**	0.00612	NS		NS	
Molybdenum	NS		NS		NS		NS		NS		NS		<0.01 UK	0.034	NS		NS	
Nickel	**0.001 JK**		NS		**0.001 JK**		NS		NS		NS		**0.0023 JK**	0.105	NS		**0.0166**	
Selenium	**0.05**	0.005	NS		**0.0473**	0.005	NS		**0.015**	0.005	NS		**0.005 J-**	0.005	NS		**0.0135**	0.005
Silver	NS		NS		NS		NS		NS		NS		<0.01 UK	0.00036	NS		NS	
Thallium	NS		NS		NS		NS		NS		NS		<0.0001 UK	0.00003	NS		NS	
Vanadium	**0.0012 K**	0.02	NS		**0.0012 K**	0.02	NS		NS		NS		**0.0027 K**	0.02	NS		<0.00500	0.02
Zinc	**0.004 JK**		NS		**0.00367 JK**		NS		NS		NS		**0.009 JK**	0.238	NS		**0.0562 J**	
Dissolved Metals (mg/L)																		
Aluminum, dissolved	NS		<0.03 UK	0.087	NS		NS		NS		<0.03 UK	0.087	NS		<0.0500	0.087	NS	
Barium, dissolved	NS		**0.0263 K**	0.003	NS		NS		NS		**0.041 K**	0.003	NS		NS		NS	
Beryllium, dissolved	NS		<0.002 UK	0.0006	NS		NS		NS		<0.002 UK	0.0006	NS		NS		NS	
Boron, dissolved	NS		NS		NS		NS		NS		<0.01 UK	0.0016	NS		NS		NS	
Cadmium, dissolved	NS		<0.0001 UK	0.000998	NS		<0.0001 UK	0.000994	NS		<0.0001 UK	0.000931	NS		<0.000125	0.00113	NS	
Chromium, dissolved	NS		**0.00127 K**	0.164	NS		<0.0001 UK	0.163	NS		<0.0001 UK	0.149	NS		**0.00123 J**	0.195	NS	
Cobalt, dissolved	NS		<0.01 UK	0.003	NS		NS		NS		<0.01 UK	0.003	NS		NS		NS	
Copper, dissolved	NS		<0.01 UK	0.0260	NS		NS		NS		<0.01 UK	0.0235	NS		NS		NS	
Iron, dissolved	NS		<0.02 UK	0.158	NS		NS		NS		<0.02 UK	0.158	NS		**0.0305 J**	0.158	NS	
Lead, dissolved	NS		<0.0001 UK	0.00711	NS		NS		NS		<0.0001 UK	0.00626	NS		NS		NS	
Molybdenum, dissolved	NS		<0.01 UK	0.034	NS		NS		NS		<0.01 UK	0.034	NS		NS		NS	
Nickel, dissolved	NS		**0.0008 JK**	0.118	NS		**0.0042 K**	0.117	NS		**0.0019 JK**	0.107	NS		**0.00482**	0.141	NS	
Selenium, dissolved	NS		**0.0437**	0.005	NS		NS		NS		**0.006**	0.005	NS		**0.011**	0.005	NS	
Silver, dissolved	NS		<0.01 UJK	0.00036	NS		NS		NS		<0.01 UK	0.00036	NS		NS		NS	
Thallium, dissolved	NS		<0.0001 UK	0.00003	NS		NS		NS		<0.0001 UK	0.00003	NS		NS		NS	
Vanadium, dissolved	NS		**0.001 K**	0.02	NS		<0.0002 UK	0.02	NS		<0.0002 UK	0.02	NS		<0.0250	0.02	NS	
Zinc, dissolved	NS		**0.00533 JK**	0.269	NS		**0.002 JK**	0.267	NS		**0.008 JK**	0.243	NS		**0.00525 J**	0.322	NS	

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BALLARD MINE - SUMMARY OF SURFACE WATER EXCEEDANCES

Location:	**MSG004**		**MSG004**		**MSG005**		**MSG005**		**MSG005**		**MSG005**		**MSG005**		**MSG005**		**MSG005**	
Location Type:	**Spring**		**Spring**		**Spring**		**Spring**		**Spring**		**Spring**		**Spring**		**Spring**		**Spring**	
Sample ID:	**0905GWMSG004-F**		**0905GWMSG004-U**		**051204SWMSG005-0-F**		**051204SWMSG005-0-U**		**SWMSG005-1-F**		**SWMSG005-1-U**		**SWMSG005-2-F**		**SWMSG005-2-U**		**SWMSG005-3-F**	
Collection Date:	**5/30/2009**		**5/30/2009**		**5/12/2004**		**5/12/2004**		**9/9/2004**		**9/9/2004**		**9/9/2004**		**9/9/2004**		**9/9/2004**	
Sample Type:	**Groundwater**		**Groundwater**		**Groundwater**		**Groundwater**		**Groundwater**		**Groundwater**		**Groundwater**		**Groundwater**		**Groundwater**	
	Primary		**Primary**		**Primary**		**Primary**		**Triplicate**		**Triplicate**		**Triplicate**		**Triplicate**		**Triplicate**	
	Result	**SL**	**Result**	**SL**	**Result**	**SL**	**Result**	**SL**	**Result**	**SL**	**Result**	**SL**	**Result**	**SL**	**Result**	**SL**	**Result**	**SL**
Total Metals (mg/L)																		
Aluminum	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Barium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Beryllium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Boron	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium	NS		**0.000602**		NS		NS		NS		NS		NS		NS		NS	
Chromium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Cobalt	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Copper, total	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Iron	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Lead	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Molybdenum	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Nickel	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Selenium	NS		**0.022**	0.005	NS		**0.007**	0.005	NS		**0.004 J**	0.005	NS		**0.004 J**	0.005	NS	
Silver	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Thallium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Vanadium	NS		<0.00500	0.02	NS		NS		NS		NS		NS		NS		NS	
Zinc	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Dissolved Metals (mg/L)																		
Aluminum, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Barium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Beryllium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Boron, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium, dissolved	<0.000125	0.00102	NS		<0.0001 UK	0.00108	NS		<0.0001 UK	0.00108	NS		<0.0001 UK	0.00108	NS		<0.0001 UK	0.00108
Chromium, dissolved	NS		NS		**0.0005 JK**	0.183	NS		**0.0005 JK**	0.183	NS		**0.0005 JK**	0.184	NS		**0.0006 JK**	0.183
Cobalt, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Copper, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Iron, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Lead, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Molybdenum, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Nickel, dissolved	NS		NS		<0.0002 UK	0.133	NS		**0.0039 K**	0.132	NS		**0.004 K**	0.133	NS		**0.0039 K**	0.132
Selenium, dissolved	NS		NS		**0.007**	0.005	NS		**0.004 J**	0.005	NS		**0.004 J**	0.005	NS		**0.004 J**	0.005
Silver, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Thallium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Vanadium, dissolved	NS		NS		<0.00024	0.02	NS		**0.00006 JK**	0.02	NS		**0.00018 JK**	0.02	NS		**0.00015 JK**	0.02
Zinc, dissolved	NS		NS		**0.003 JK**	0.302	NS		<0.002 UK	0.301	NS		<0.002 UK	0.302	NS		<0.002 UK	0.301

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BALLARD MINE - SUMMARY OF SURFACE WATER EXCEEDANCES

Location:	**MSG005**		**MSG005**		**MSG005**		**MSG005**		**MSG005**		**MSG005**		**MSG005**		**MSG005**		**MSG005**	
Location Type:	**Spring**		**Spring**		**Spring**		**Spring**		**Spring**		**Spring**		**Spring**		**Spring**		**Spring**	
Sample ID:	**SWMSG005-3-U**		**SWMSG005-avg-F**		**SWMSG005-avg-U**		**050306GWMSG005-1-F**		**050306GWMSG005-1-U**		**050306GWMSG005-2-F**		**050306GWMSG005-2-U**		**050306GWMSG005-3-F**		**050306GWMSG005-3-U**	
Collection Date:	**9/9/2004**		**9/9/2004**		**9/9/2004**		**5/3/2006**		**5/3/2006**		**5/3/2006**		**5/3/2006**		**5/3/2006**		**5/3/2006**	
Sample Type:	**Groundwater**		**Groundwater**		**Groundwater**		**Groundwater**		**Groundwater**		**Groundwater**		**Groundwater**		**Groundwater**		**Groundwater**	
	Triplicate		**Averaged**		**Averaged**		**Triplicate**		**Triplicate**		**Triplicate**		**Triplicate**		**Triplicate**		**Triplicate**	
	Result	**SL**	**Result**	**SL**	**Result**	**SL**	**Result**	**SL**	**Result**	**SL**	**Result**	**SL**	**Result**	**SL**	**Result**	**SL**	**Result**	**SL**
Total Metals (mg/L)																		
Aluminum	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Barium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Beryllium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Boron	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium	NS		NS		NS		NS		<0.0001 UK		NS		<0.0001 UK		NS		<0.0001 UK	
Chromium	NS		NS		NS		NS		**0.0007 K**		NS		**0.0006 K**		NS		**0.0006 K**	
Cobalt	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Copper, total	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Iron	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Lead	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Molybdenum	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Nickel	NS		NS		NS		NS		<0.0006 UK		NS		<0.0006 UK		NS		<0.0006 UK	
Selenium	**0.004 J**	0.005	NS		**0.004 J**	0.005	NS		**0.01**	0.005	NS		**0.01**	0.005	NS		**0.01**	0.005
Silver	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Thallium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Vanadium	NS		NS		NS		NS		**0.0004 JK**	0.02	NS		**0.0003 JK**	0.02	NS		**0.0004 JK**	0.02
Zinc	NS		NS		NS		NS		**0.003 JK**		NS		**0.002 JK**		NS		**0.002 JK**	
Dissolved Metals (mg/L)																		
Aluminum, dissolved	NS		NS		NS		<0.03 UK	0.087	NS		<0.03 UK	0.087	NS		<0.03 UK	0.087	NS	
Barium, dissolved	NS		NS		NS		**0.031 K**	0.003	NS		**0.032 K**	0.003	NS		**0.031 K**	0.003	NS	
Beryllium, dissolved	NS		NS		NS		<0.002 UK	0.0006	NS		<0.002 UK	0.0006	NS		<0.002 UK	0.0006	NS	
Boron, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium, dissolved	NS		<0.0001 UK	0.00108	NS		<0.0001 UK	0.00102	NS		<0.0001 UK	0.00102	NS		<0.0001 UK	0.00102	NS	
Chromium, dissolved	NS		**0.000533 JK**	0.183	NS		**0.0005 JK**	0.170	NS		**0.0005 K**	0.170	NS		**0.0005 JK**	0.170	NS	
Cobalt, dissolved	NS		NS		NS		<0.01 UK	0.003	NS		<0.01 UK	0.003	NS		<0.01 UK	0.003	NS	
Copper, dissolved	NS		NS		NS		<0.01 UK	0.0269	NS		<0.01 UK	0.0270	NS		<0.01 UK	0.0269	NS	
Iron, dissolved	NS		NS		NS		<0.02 UK	0.158	NS		<0.02 UK	0.158	NS		<0.02 UK	0.158	NS	
Lead, dissolved	NS		NS		NS		<0.0001 UK	0.00742	NS		<0.0001 UK	0.00745	NS		**0.0001 JK**	0.00742	NS	
Molybdenum, dissolved	NS		NS		NS		<0.01 UK	0.034	NS		<0.01 UK	0.034	NS		<0.01 UK	0.034	NS	
Nickel, dissolved	NS		**0.00393 K**	0.132	NS		<0.0006 UK	0.122	NS		<0.0006 UK	0.123	NS		<0.0006 UK	0.122	NS	
Selenium, dissolved	NS		**0.004 J**	0.005	NS		**0.012**	0.005	NS		**0.012**	0.005	NS		**0.007 J-**	0.005	NS	
Silver, dissolved	NS		NS		NS		<0.01 UK	0.00036	NS		<0.01 UK	0.00036	NS		<0.01 UK	0.00036	NS	
Thallium, dissolved	NS		NS		NS		<0.0001 UK	0.00003	NS		<0.0001 UK	0.00003	NS		<0.0001 UK	0.00003	NS	
Vanadium, dissolved	NS		**0.00013 JK**	0.02	NS		<0.0002 UK	0.02	NS		<0.0002 UK	0.02	NS		<0.0002 UK	0.02	NS	
Zinc, dissolved	NS		<0.002 UK	0.301	NS		<0.002 UK	0.278	NS		<0.002 UK	0.279	NS		<0.002 UK	0.278	NS	

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BALLARD MINE - SUMMARY OF SURFACE WATER EXCEEDANCES

Location:	MSG005		MSG005		MSG005		MSG005		MSG005		MSG005		MSG005		MSG005		MSG005	
Location Type:	Spring		Spring		Spring		Spring		Spring		Spring		Spring		Spring		Spring	
Sample ID:	050306GWMSG005-avg-		050306GWMSG005-avg-		050907SWMSG005-0-F		050907SWMSG005-0-U		091107GWMSG005-0-F		091107GWMSG005-0-U		051508GWMSG005-0-F		051508GWMSG005-0-U		091708GWMSG005-1-F	
Collection Date:	5/3/2006		5/3/2006		5/9/2007		5/9/2007		9/11/2007		9/11/2007		5/15/2008		5/15/2008		9/17/2008	
Sample Type:	Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater	
	Averaged		Averaged		Primary		Primary		Primary		Primary		Primary		Primary		Triplicate	
	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL
Total Metals (mg/L)																		
Aluminum	NS		NS		NS		<0.03 UK	0.087	NS		<0.03 UK	0.087	NS		**0.06 JK**	0.087	NS	
Barium	NS		NS		NS		NS		NS		**0.05 K**	0.003	NS		**0.032 K**	0.003	NS	
Beryllium	NS		NS		NS		NS		NS		<0.002 UK	0.0006	NS		<0.002 UK	0.0006	NS	
Boron	NS		NS		NS		NS		NS		**0.02 JK**	0.0016	NS		**0.02 JK**	0.0016	NS	
Cadmium	NS		<0.0001 UK		NS		NS		NS		<0.0001 UK	0.00102	NS		<0.0001 UK	0.00106	NS	
Chromium	NS		**0.000633 K**		NS		NS		NS		<0.0005 UK	0.169	NS		<0.0003 UK	0.178	NS	
Cobalt	NS		NS		NS		NS		NS		<0.01 UK	0.003	NS		<0.01 UK	0.003	NS	
Copper, total	NS		NS		NS		NS		NS		<0.01 UK	0.0267	NS		<0.01 UK	0.0283	NS	
Iron	NS		NS		NS		NS		NS		**0.19 K**	0.158	NS		**0.11 K**	0.158	NS	
Lead	NS		NS		NS		NS		NS		<0.0001 UK	0.00736	NS		<0.0001 UK	0.00787	NS	
Molybdenum	NS		NS		NS		NS		NS		<0.01 UK	0.034	NS		<0.01 UK	0.034	NS	
Nickel	NS		<0.0006 UK		NS		NS		NS		**0.001 JK**	0.122	NS		**0.0007 JK**	0.128	NS	
Selenium	NS		**0.01**	0.005	NS		**0.007**	0.005	NS		**0.002 J**	0.005	NS		**0.015**	0.005	NS	
Silver	NS		NS		NS		NS		NS		<0.01 UK	0.00036	NS		<0.01 UK	0.00036	NS	
Thallium	NS		NS		NS		NS		NS		<0.0002 UK	0.00003	NS		<0.0001 UK	0.00003	NS	
Vanadium	NS		**0.000367 JK**	0.02	NS		NS		NS		**0.0004 JK**	0.02	NS		**0.0002 JK**	0.02	NS	
Zinc	NS		**0.00233 JK**		NS		NS		NS		**0.017 K {J+}**	0.276	NS		**0.002 JK**	0.292	NS	
Dissolved Metals (mg/L)																		
Aluminum, dissolved	<0.03 UK	0.087	NS		NS		NS		<0.03 UK	0.087	NS		<0.03 UK	0.087	NS		<0.0500	0.087
Barium, dissolved	**0.0313 K**	0.003	NS		NS		NS		**0.052 K**	0.003	NS		**0.032 K**	0.003	NS		NS	
Beryllium, dissolved	<0.002 UK	0.0006	NS		NS		NS		<0.002 UK	0.0006	NS		<0.002 UK	0.0006	NS		NS	
Boron, dissolved	NS		NS		NS		NS		**0.02 JK**	0.0016	NS		<0.01 UK	0.0016	NS		NS	
Cadmium, dissolved	<0.0001 UK	0.00102	NS		<0.0001 UK	0.00107	NS		<0.0001 UK	0.00107	NS		<0.0001 UK	0.00103	NS		<0.000125	0.00105
Chromium, dissolved	**0.0005 JK**	0.170	NS		<0.0001 UK	0.180	NS		**0.0001 JK**	0.182	NS		<0.0001 UK	0.171	NS		<0.00193	0.176
Cobalt, dissolved	<0.01 UK	0.003	NS		NS		NS		<0.01 UK	0.003	NS		<0.01 UK	0.003	NS		NS	
Copper, dissolved	<0.01 UK	0.0269	NS		NS		NS		<0.01 UK	0.0290	NS		<0.01 UK	0.0272	NS		NS	
Iron, dissolved	<0.02 UK	0.158	NS		NS		NS		**0.03 JK**	0.158	NS		<0.02 UK	0.158	NS		<0.0250	0.158
Lead, dissolved	**0.0001 JK**	0.00742	NS		NS		NS		<0.0001 UK	0.00813	NS		<0.0001 UK	0.00751	NS		NS	
Molybdenum, dissolved	<0.01 UK	0.034	NS		NS		NS		<0.01 UK	0.034	NS		<0.01 UK	0.034	NS		NS	
Nickel, dissolved	<0.0006 UK	0.122	NS		**0.004 K**	0.130	NS		**0.0012 JK**	0.132	NS		**0.0024 JK**	0.124	NS		**0.00309 J**	0.127
Selenium, dissolved	**0.0103 J-**	0.005	NS		NS		NS		**0.002 J**	0.005	NS		**0.014**	0.005	NS		**0.00475**	0.005
Silver, dissolved	<0.01 UK	0.00036	NS		NS		NS		<0.01 UK	0.00036	NS		<0.01 UJK	0.00036	NS		NS	
Thallium, dissolved	<0.0001 UK	0.00003	NS		NS		NS		<0.0001 UK	0.00003	NS		<0.0001 UK	0.00003	NS		NS	
Vanadium, dissolved	<0.0002 UK	0.02	NS		<0.0002 UK	0.02	NS		**0.0005 JK**	0.02	NS		<0.0002 UK	0.02	NS		<0.0250	0.02
Zinc, dissolved	<0.002 UK	0.278	NS		<0.002 UK	0.296	NS		**0.009 JK**	0.300	NS		**0.004 JK**	0.281	NS		**0.00647 J**	0.289

TABLE 3-8

BALLARD MINE - SUMMARY OF SURFACE WATER EXCEEDANCES

Location:	MSG005		MSG005		MSG005		MSG005		MSG005		MSG005		MSG005		MSG005		MSG005	
Location Type:	Spring		Spring		Spring		Spring		Spring		Spring		Spring		Spring		Spring	
Sample ID:	091708GWMSG005-1-U		091708GWMSG005-2-F		091708GWMSG005-2-U		091708GWMSG005-3-F		091708GWMSG005-3-U		091708GWMSG005-avg-		091708GWMSG005-avg-		0905GWMSG005-1-F		0905GWMSG005-1-U	
Collection Date:	9/17/2008		9/17/2008		9/17/2008		9/17/2008		9/17/2008		9/17/2008		9/17/2008		5/30/2009		5/30/2009	
Sample Type:	Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater	
	Triplicate		Triplicate		Triplicate		Triplicate		Triplicate		Averaged		Averaged		Triplicate		Triplicate	
	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL
Total Metals (mg/L)																		
Aluminum	<0.0500	0.087	NS		<0.0500	0.087	NS		<0.0500	0.087	NS		<0.0500	0.087	NS		NS	
Barium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Beryllium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Boron	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium	<0.000125		NS		<0.000125		NS		<0.000125		NS		<0.000125		NS		<0.000125	
Chromium	<0.00171		NS		**0.00118 J**		NS		**0.00194 J**		NS		**0.00156 J**		NS		NS	
Cobalt	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Copper, total	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Iron	**0.0376 J**	0.158	NS		**0.0351 J**	0.158	NS		**0.0368 J**	0.158	NS		**0.0365 J**	0.158	NS		NS	
Lead	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Molybdenum	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Nickel	**0.00203 J**		NS		**0.00242 J**		NS		**0.00242 J**		NS		**0.00229 J**		NS		NS	
Selenium	**0.00460**	0.005	NS		**0.00499**	0.005	NS		**0.00467**	0.005	NS		**0.00475**	0.005	NS		**0.00668**	0.005
Silver	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Thallium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Vanadium	<0.0250	0.02	NS		<0.0250	0.02	NS		<0.00500	0.02	NS		<0.0250	0.02	NS		<0.00500	0.02
Zinc	**0.00962 J**		NS		**0.00858 J**		NS		**0.00877 J**		NS		**0.00899 J**		NS		NS	
Dissolved Metals (mg/L)																		
Aluminum, dissolved	NS		<0.0500	0.087	NS		<0.0500	0.087	NS		<0.0500	0.087	NS		NS		NS	
Barium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Beryllium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Boron, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium, dissolved	NS		<0.000125	0.00102	NS		<0.000125	0.00104	NS		<0.000125	0.00104	NS		<0.000125	0.00102	NS	
Chromium, dissolved	NS		**0.000994 J**	0.169	NS		**0.00121 J**	0.174	NS		**0.0011 J**	0.173	NS		NS		NS	
Cobalt, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Copper, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Iron, dissolved	NS		<0.0250	0.158	NS		<0.0250	0.158	NS		<0.0250	0.158	NS		NS		NS	
Lead, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Molybdenum, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Nickel, dissolved	NS		**0.00232 J**	0.122	NS		**0.00222 J**	0.126	NS		**0.00254 J**	0.125	NS		NS		NS	
Selenium, dissolved	NS		**0.00433**	0.005	NS		**0.00476**	0.005	NS		**0.00461**	0.005	NS		NS		NS	
Silver, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Thallium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Vanadium, dissolved	NS		<0.00500	0.02	NS		<0.0250	0.02	NS		<0.0250	0.02	NS		NS		NS	
Zinc, dissolved	NS		**0.00629 J**	0.278	NS		**0.00640 J**	0.286	NS		**0.00639 J**	0.284	NS		NS		NS	

TABLE 3-8

BALLARD MINE - SUMMARY OF SURFACE WATER EXCEEDANCES

Location:	MSG005		MSG005		MSG005		MSG005		MSG005		MSG005		MSG006		MSG006		MSG006	
Location Type:	Spring		Spring		Spring		Spring		Spring		Spring		Spring		Spring		Spring	
Sample ID:	0905GWMSG005-2-F		0905GWMSG005-2-U		0905GWMSG005-3-F		0905GWMSG005-3-U		0905GWMSG005-avg-F		0905GWMSG005-avg-U		051404SWMSG006-0-F		051404SWMSG006-0-U		SWMSG006-0-F	
Collection Date:	5/30/2009		5/30/2009		5/30/2009		5/30/2009		5/30/2009		5/30/2009		5/14/2004		5/14/2004		9/10/2004	
Sample Type:	Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater	
	Triplicate		Triplicate		Triplicate		Triplicate		Triplicate		Triplicate		Primary		Primary		Primary	
	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL
Total Metals (mg/L)																		
Aluminum	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Barium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Beryllium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Boron	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium	NS		<0.000125		NS		<0.000125		NS		<0.000125		NS		NS		NS	
Chromium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Cobalt	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Copper, total	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Iron	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Lead	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Molybdenum	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Nickel	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Selenium	NS		**0.00655**	0.005	NS		**0.00655**	0.005	NS		**0.00659**	0.005	NS		**0.22**	0.005	NS	
Silver	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Thallium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Vanadium	NS		<0.00500	0.02	NS		<0.00500	0.02	NS		<0.00500	0.02	NS		NS		NS	
Zinc	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Dissolved Metals (mg/L)																		
Aluminum, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Barium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Beryllium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Boron, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium, dissolved	<0.000125	0.00103	NS		<0.000125	0.00103	NS		<0.000125	0.00103	NS		<0.0001 UK	0.00127	NS		<0.0001 UK	0.00127
Chromium, dissolved	NS		NS		NS		NS		NS		NS		**0.0008 K**	0.231	NS		<0.0001	0.231
Cobalt, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Copper, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Iron, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Lead, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Molybdenum, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Nickel, dissolved	NS		NS		NS		NS		NS		NS		<0.0002 UK	0.168	NS		**0.0072 K**	0.168
Selenium, dissolved	NS		NS		NS		NS		NS		NS		**0.213**	0.005	NS		**0.26**	0.005
Silver, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Thallium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Vanadium, dissolved	NS		NS		NS		NS		NS		NS		**0.00073 K**	0.02	NS		**0.00106 K**	0.02
Zinc, dissolved	NS		NS		NS		NS		NS		NS		<0.002 UK	0.382	NS		**0.003 JK**	0.382

TABLE 3-8

BALLARD MINE - SUMMARY OF SURFACE WATER EXCEEDANCES

Location:	MSG006		MSG006		MSG006		MSG006		MSG006		MSG006		MSG006		MSG006		MSG006	
Location Type:	Spring		Spring		Spring		Spring		Spring		Spring		Spring		Spring		Spring	
Sample ID:	SWMSG006-0-U		050306GWMSG006-0-F		050306GWMSG006-0-U		050907SWMSG006-0-F		050907SWMSG006-0-U		091207GWMSG006-0-F		091207GWMSG006-0-U		051508GWMSG006-0-F		051508GWMSG006-0-U	
Collection Date:	9/10/2004		5/3/2006		5/3/2006		5/9/2007		5/9/2007		9/12/2007		9/12/2007		5/15/2008		5/15/2008	
Sample Type:	Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater	
	Primary		Primary		Primary		Primary		Primary		Primary		Primary		Primary		Primary	
	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL
Total Metals (mg/L)																		
Aluminum	NS		NS		NS		NS		**0.17 JK**	0.087	NS		**0.24 K**	0.087	NS		**0.27 K**	0.087
Barium	NS		NS		NS		NS		NS		NS		**0.063 K**	0.003	NS		**0.052 K**	0.003
Beryllium	NS		NS		NS		NS		NS		NS		<0.002 UK	0.0006	NS		<0.002 UK	0.0006
Boron	NS		NS		NS		NS		NS		NS		<0.01 UK	0.0016	NS		**0.03 JK**	0.0016
Cadmium	NS		NS		**0.0002 JK**		NS		NS		NS		<0.0001 UK	0.00127	NS		**0.0003 JK**	0.00127
Chromium	NS		NS		**0.0005 K**		NS		NS		NS		<0.0005 UK	0.231	NS		<0.0004 UK	0.231
Cobalt	NS		NS		NS		NS		NS		NS		<0.01 UK	0.003	NS		<0.01 UK	0.003
Copper, total	NS		NS		NS		NS		NS		NS		<0.01 UK	0.0371	NS		**0.03 JK**	0.0371
Iron	NS		NS		NS		NS		NS		NS		**0.5 K**	0.158	NS		**0.3 K**	0.158
Lead	NS		NS		NS		NS		NS		NS		<0.0001 UK	0.0109	NS		<0.0001 UK	0.0109
Molybdenum	NS		NS		NS		NS		NS		NS		<0.01 UK	0.034	NS		<0.01 UK	0.034
Nickel	NS		NS		**0.0197 K**		NS		NS		NS		**0.0045 K**	0.168	NS		**0.0124 K**	0.168
Selenium	**0.28**	0.005	NS		**0.181**	0.005	NS		**0.26**	0.005	NS		**0.018**	0.005	NS		**0.098**	0.005
Silver	NS		NS		NS		NS		NS		NS		<0.01 UK	0.00036	NS		<0.01 UK	0.00036
Thallium	NS		NS		NS		NS		NS		NS		<0.0001 UK	0.00003	NS		<0.0001 UK	0.00003
Vanadium	NS		NS		**0.0041 K**	0.02	NS		NS		NS		**0.0022 K**	0.02	NS		**0.0031 K**	0.02
Zinc	NS		NS		**0.018 K**		NS		NS		NS		**0.004 JK**	0.382	NS		**0.03 K**	0.382
Dissolved Metals (mg/L)																		
Aluminum, dissolved	NS		**0.04 JK {J+}**	0.087	NS		NS		NS		**0.18 JK**	0.087	NS		<0.03 UK	0.087	NS	
Barium, dissolved	NS		**0.048 K**	0.003	NS		NS		NS		**0.063 K**	0.003	NS		**0.048 K**	0.003	NS	
Beryllium, dissolved	NS		<0.002 UK	0.0006	NS		NS		NS		<0.002 UK	0.0006	NS		<0.002 UK	0.0006	NS	
Boron, dissolved	NS		NS		NS		NS		NS		**0.01 JK**	0.0016	NS		**0.03 JK**	0.0016	NS	
Cadmium, dissolved	NS		**0.0001 JK**	0.00127	NS		<0.0001 UK	0.00127	NS		<0.0001 UK	0.00127	NS		**0.0001 JK**	0.00127	NS	
Chromium, dissolved	NS		**0.0004 JK**	0.231	NS		<0.0001 UK	0.231	NS		<0.0001 UK	0.231	NS		<0.0001 UK	0.231	NS	
Cobalt, dissolved	NS		<0.01 UK	0.003	NS		NS		NS		<0.01 UK	0.003	NS		<0.01 UK	0.003	NS	
Copper, dissolved	NS		<0.01 UK	0.0371	NS		NS		NS		**0.38 K**	0.0371	NS		<0.01 UK	0.0371	NS	
Iron, dissolved	NS		<0.02 UK	0.158	NS		NS		NS		**0.1 K**	0.158	NS		<0.02 UK	0.158	NS	
Lead, dissolved	NS		<0.0001 UK	0.0109	NS		NS		NS		<0.0001 UK	0.0109	NS		<0.0001 UK	0.0109	NS	
Molybdenum, dissolved	NS		<0.01 UK	0.034	NS		NS		NS		<0.01 UK	0.034	NS		**0.01 JK**	0.034	NS	
Nickel, dissolved	NS		**0.0185 K**	0.168	NS		**0.013 K**	0.168	NS		**0.0037 K**	0.168	NS		**0.0134 K**	0.168	NS	
Selenium, dissolved	NS		**0.138 J-**	0.005	NS		NS		NS		**0.017**	0.005	NS		**0.098**	0.005	NS	
Silver, dissolved	NS		<0.01 UK	0.00036	NS		NS		NS		<0.01 UK	0.00036	NS		<0.01 UJK	0.00036	NS	
Thallium, dissolved	NS		<0.0001 UK	0.00003	NS		NS		NS		<0.0001 UK	0.00003	NS		<0.0001 UK	0.00003	NS	
Vanadium, dissolved	NS		**0.0016 K**	0.02	NS		<0.0002 UK	0.02	NS		**0.0016 K**	0.02	NS		**0.0012 J+K**	0.02	NS	
Zinc, dissolved	NS		**0.018 K**	0.382	NS		<0.002 UK	0.382	NS		<0.002 UK	0.382	NS		**0.032 K**	0.382	NS	

TABLE 3-8

BALLARD MINE - SUMMARY OF SURFACE WATER EXCEEDANCES

Location:	MSG006		MSG006		MSG006		MSG006		MSG007		MSG007		MSG007		MSG007		MSG007	
Location Type:	Spring		Spring		Spring		Spring		Spring		Spring		Spring		Spring		Spring	
Sample ID:	091808GWMSG006-0-F		091808GWMSG006-0-U		0905GWMSG006-F		0905GWMSG006-U		051006GWMSG007-0-F		051006GWMSG007-0-U		051407SWMSG007-0-F		051407SWMSG007-0-U		091407GWMSG007-0-F	
Collection Date:	9/19/2008		9/19/2008		5/30/2009		5/30/2009		5/10/2006		5/10/2006		5/14/2007		5/14/2007		9/14/2007	
Sample Type:	Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater	
	Primary		Primary		Primary		Primary		Primary		Primary		Primary		Primary		Primary	
	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL
Total Metals (mg/L)																		
Aluminum	NS		**0.87**	0.087	NS		NS		NS		NS		NS		**0.49 K**	0.087	NS	
Barium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Beryllium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Boron	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium	NS		**0.000285 J**		NS		<0.000125		NS		**0.0001 JK**		NS		NS		NS	
Chromium	NS		**0.00505 J+**		NS		NS		NS		**0.0017 K**		NS		NS		NS	
Cobalt	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Copper, total	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Iron	NS		**0.839**	0.158	NS		NS		NS		NS		NS		NS		NS	
Lead	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Molybdenum	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Nickel	NS		**0.00900**		NS		NS		NS		**0.0022 JK**		NS		NS		NS	
Selenium	NS		**0.0234**	0.005	NS		**0.0669**	0.005	NS		**0.008**	0.005	NS		**0.003 J**	0.005	NS	
Silver	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Thallium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Vanadium	NS		<0.00500	0.02	NS		<0.00500	0.02	NS		**0.0031 K**	0.02	NS		NS		NS	
Zinc	NS		**0.0144 J**		NS		NS		NS		**0.008 JK**		NS		NS		NS	
Dissolved Metals (mg/L)																		
Aluminum, dissolved	<0.0500	0.087	NS		NS		NS		**0.07 JK**	0.087	NS		NS		NS		<0.03 UK	0.087
Barium, dissolved	NS		NS		NS		NS		**0.023 K**	0.003	NS		NS		NS		**0.06 K**	0.003
Beryllium, dissolved	NS		NS		NS		NS		<0.002 UK	0.0006	NS		NS		NS		<0.002 UK	0.0006
Boron, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		**0.02 JK**	0.0016
Cadmium, dissolved	<0.000125	0.00127	NS		<0.000125	0.00127	NS		<0.0001 UK	0.000884	NS		<0.0001	0.000958	NS		<0.0001 UK	0.00103
Chromium, dissolved	**0.00221 J+**	0.231	NS		NS		NS		**0.0003 JK**	0.138	NS		<0.0001	0.155	NS		<0.0001 UK	0.172
Cobalt, dissolved	NS		NS		NS		NS		<0.01 UK	0.003	NS		NS		NS		<0.01 UK	0.003
Copper, dissolved	NS		NS		NS		NS		<0.01 UK	0.0217	NS		NS		NS		<0.01 UK	0.0273
Iron, dissolved	**0.0297 J**	0.158	NS		NS		NS		**0.04 JK**	0.158	NS		NS		NS		**0.39 K**	0.158
Lead, dissolved	NS		NS		NS		NS		<0.0001 UK	0.00570	NS		NS		NS		<0.0001 UK	0.00754
Molybdenum, dissolved	NS		NS		NS		NS		<0.01 UK	0.034	NS		NS		NS		<0.01 UK	0.034
Nickel, dissolved	**0.00731**	0.168	NS		NS		NS		**0.0007 JK**	0.0990	NS		**0.0006 JK**	0.111	NS		**0.002 JK**	0.124
Selenium, dissolved	**0.0232**	0.005	NS		NS		NS		**0.005 J**	0.005	NS		NS		NS		**0.001 J**	0.005
Silver, dissolved	NS		NS		NS		NS		<0.01 UK	0.00036	NS		NS		NS		<0.01 UJK	0.00036
Thallium, dissolved	NS		NS		NS		NS		<0.0001 UK	0.00003	NS		NS		NS		<0.0002 UK	0.00003
Vanadium, dissolved	<0.00500	0.02	NS		NS		NS		**0.0005 JK**	0.02	NS		<0.0002	0.02	NS		**0.0007 JK**	0.02
Zinc, dissolved	<0.00500	0.382	NS		NS		NS		**0.004 JK**	0.225	NS		<0.002 UJK	0.253	NS		**0.002 JK**	0.282

TABLE 3-8

BALLARD MINE - SUMMARY OF SURFACE WATER EXCEEDANCES

Location:	MSG007		MSG007		MSG007		MSG007		MSG007		MSG007		MSG007		MSG008		MSG008	
Location Type:	Spring		Spring		Spring		Spring		Spring		Spring		Spring		Spring		Spring	
Sample ID:	091407GWMSG007-0-U		051508GWMSG007-0-F		051508GWMSG007-0-U		091808GWMSG007-0-F		091808GWMSG007-0-U		0905GWMSG007-F		0905GWMSG007-U		052208GWMSG008-0-F		052208GWMSG008-0-U	
Collection Date:	9/14/2007		5/15/2008		5/15/2008		9/18/2008		9/18/2008		5/30/2009		5/30/2009		5/22/2008		5/22/2008	
Sample Type:	Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater	
	Primary		Primary		Primary		Primary		Primary		Primary		Primary		Primary		Primary	
	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL
Total Metals (mg/L)																		
Aluminum	**3.36 J+K**	0.087	NS		**0.65 J+K**	0.087	NS		**4.38**	0.087	NS		NS		NS		**0.25 K**	0.087
Barium	**0.088 K**	0.003	NS		**0.029 K**	0.003	NS		NS		NS		NS		NS		**0.065 K**	0.003
Beryllium	<0.002 UK	0.0006	NS		<0.002 UK	0.0006	NS		NS		NS		NS		NS		<0.002 UK	0.0006
Boron	**0.02 JK**	0.0016	NS		**0.02 JK**	0.0016	NS		NS		NS		NS		NS		**0.03 JK**	0.0016
Cadmium	<0.0002 UK	0.00105	NS		<0.0001 UK	0.000920	NS		**0.000288 J**		NS		**0.000245 J**		NS		<0.0002 UK	0.00127
Chromium	**0.003 K**	0.177	NS		**0.001 K**	0.146	NS		**0.00742**		NS		NS		NS		**0.265 K**	0.231
Cobalt	<0.01 UK	0.003	NS		<0.01 UK	0.003	NS		NS		NS		NS		NS		<0.01 UK	0.003
Copper, total	<0.01 UK	0.0281	NS		<0.01 UK	0.0230	NS		NS		NS		NS		NS		**0.01 JK**	0.0371
Iron	**4.22 K**	0.158	NS		**0.67 J+K**	0.158	NS		**3.94**	0.158	NS		NS		NS		<0.03 UK	0.158
Lead	**0.002 K**	0.00782	NS		**0.0004 JK**	0.00612	NS		NS		NS		NS		NS		**0.001 K**	0.0109
Molybdenum	<0.01 UK	0.034	NS		<0.01 UK	0.034	NS		NS		NS		NS		NS		<0.01 UK	0.034
Nickel	**0.0035 K**	0.128	NS		**0.0012 JK**	0.105	NS		**0.00593**		NS		NS		NS		**0.181 K**	0.168
Selenium	**0.003 J**	0.005	NS		**0.02 J-**	0.005	NS		**0.0131**	0.005	NS		**0.0396**	0.005	NS		**0.34**	0.005
Silver	<0.01 UK	0.00036	NS		<0.01 UK	0.00036	NS		NS		NS		NS		NS		<0.01 UK	0.00036
Thallium	<0.0001 UK	0.00003	NS		<0.0001 UK	0.00003	NS		NS		NS		NS		NS		<0.0002 UK	0.00003
Vanadium	**0.0057 K**	0.02	NS		**0.0016 K**	0.02	NS		**0.00967 J**	0.02	NS		<0.00500	0.02	NS		<0.0007 UK	0.02
Zinc	**0.012 K {J+}**	0.290	NS		**0.004 JK**	0.238	NS		**0.0291 J**		NS		NS		NS		<0.004 UK	0.382
Dissolved Metals (mg/L)																		
Aluminum, dissolved	NS		<0.03 UK	0.087	NS		<0.0500	0.087	NS		NS		NS		**0.23 K**	0.087	NS	
Barium, dissolved	NS		**0.022 K**	0.003	NS		NS		NS		NS		NS		**0.061 K**	0.003	NS	
Beryllium, dissolved	NS		<0.002 UK	0.0006	NS		NS		NS		NS		NS		<0.002 UK	0.0006	NS	
Boron, dissolved	NS		<0.01 UK	0.0016	NS		NS		NS		NS		NS		**0.02 JK**	0.0016	NS	
Cadmium, dissolved	NS		<0.0001 UK	0.000920	NS		<0.000125	0.000938	NS		<0.000125	0.000898	NS		**0.0002 JK**	0.00127	NS	
Chromium, dissolved	NS		<0.0001 UK	0.146	NS		<0.00194	0.150	NS		NS		NS		<0.0001 UK	0.231	NS	
Cobalt, dissolved	NS		<0.01 UK	0.003	NS		NS		NS		NS		NS		<0.01 UK	0.003	NS	
Copper, dissolved	NS		<0.01 UK	0.0230	NS		NS		NS		NS		NS		**0.02 JK**	0.0371	NS	
Iron, dissolved	NS		**0.05 K**	0.158	NS		**0.0405 J**	0.158	NS		NS		NS		**0.09 K**	0.158	NS	
Lead, dissolved	NS		<0.0001 UK	0.00612	NS		NS		NS		NS		NS		<0.0001 UK	0.0109	NS	
Molybdenum, dissolved	NS		<0.01 UK	0.034	NS		NS		NS		NS		NS		<0.01 UK	0.034	NS	
Nickel, dissolved	NS		**0.0017 JK**	0.105	NS		**0.00303 J**	0.108	NS		NS		NS		**0.0059 K**	0.168	NS	
Selenium, dissolved	NS		**0.02**	0.005	NS		**0.00522**	0.005	NS		NS		NS		**0.35**	0.005	NS	
Silver, dissolved	NS		<0.01 UK	0.00036	NS		NS		NS		NS		NS		<0.01 UK	0.00036	NS	
Thallium, dissolved	NS		<0.0001 UK	0.00003	NS		NS		NS		NS		NS		<0.0001 UK	0.00003	NS	
Vanadium, dissolved	NS		<0.0002 UK	0.02	NS		<0.00500	0.02	NS		NS		NS		**0.0022 K**	0.02	NS	
Zinc, dissolved	NS		<0.002 UK	0.238	NS		<0.00500	0.245	NS		NS		NS		**0.003 JK**	0.382	NS	

TABLE 3-8

BALLARD MINE - SUMMARY OF SURFACE WATER EXCEEDANCES

Location:	MSP010		MSP010		MSP010		MSP010		MSP010		MSP011		MSP011		MSP011		MSP011	
Location Type:	Pond		Pond		Pond		Pond		Pond		Pond		Pond		Pond		Pond	
Sample ID:	051504SWMSP010-0-F		051504SWMSP010-0-U		050406SWMSP010-0-F		050406SWMSP010-0-U		050406SWMSP010-0-U		051204SWMSP011-1-F		051204SWMSP011-1-U		051204SWMSP011-2-F		051204SWMSP011-2-U	
Collection Date:	5/15/2004		5/15/2004		5/4/2006		5/4/2006		5/6/2006		5/12/2004		5/12/2004		5/12/2004		5/12/2004	
Sample Type:	Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater	
	Primary		Primary		Primary		Primary		Primary		Triplicate		Triplicate		Triplicate		Triplicate	
	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL
Total Metals (mg/L)																		
Aluminum	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Barium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Beryllium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Boron	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Chromium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Cobalt	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Copper, total	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Iron	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Lead	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Molybdenum	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Nickel	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Selenium	NS		**0.63**	0.005	NS		NS		**1.07**	0.005	NS		**0.047**	0.005	NS		**0.049**	0.005
Silver	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Thallium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Vanadium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Zinc	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Dissolved Metals (mg/L)																		
Aluminum, dissolved	NS		NS		**0.03 JK {J+}**	0.087	NS		NS		NS		NS		NS		NS	
Barium, dissolved	NS		NS		**0.023 K**	0.003	NS		NS		NS		NS		NS		NS	
Beryllium, dissolved	NS		NS		<0.002 UK	0.0006	NS		NS		NS		NS		NS		NS	
Boron, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium, dissolved	**0.0008 K**	0.00127	NS		**0.0018 K**	0.00127	NS		NS		**0.001 K**	0.000590	NS		**0.0011 K**	0.000595	NS	
Chromium, dissolved	NS		NS		**0.009 K**	0.231	NS		NS		NS		NS		NS		NS	
Cobalt, dissolved	NS		NS		<0.01 UK	0.003	NS		NS		NS		NS		NS		NS	
Copper, dissolved	NS		NS		<0.01 UK	0.0371	NS		NS		NS		NS		NS		NS	
Iron, dissolved	NS		NS		<0.02 UK	0.158	NS		NS		NS		NS		NS		NS	
Lead, dissolved	NS		NS		<0.0001 UK	0.0109	NS		NS		NS		NS		NS		NS	
Molybdenum, dissolved	NS		NS		**0.02 JK**	0.034	NS		NS		NS		NS		NS		NS	
Nickel, dissolved	**0.0252 K**	0.168	NS		**0.0239 K**	0.168	NS		NS		**0.0099 K**	0.0547	NS		**0.0099 K**	0.0555	NS	
Selenium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Silver, dissolved	NS		NS		<0.01 UJK	0.00036	NS		NS		NS		NS		NS		NS	
Thallium, dissolved	NS		NS		<0.0001 UK	0.00003	NS		NS		NS		NS		NS		NS	
Vanadium, dissolved	**0.0155 K**	0.02	NS		**0.0125 K**	0.02	NS		NS		**0.0124 K**	0.02	NS		**0.0126 K**	0.02	NS	
Zinc, dissolved	**0.009 JK**	0.382	NS		**0.038 K**	0.382	NS		NS		**0.01 JK**	0.124	NS		**0.011 K**	0.126	NS	

TABLE 3-8

BALLARD MINE - SUMMARY OF SURFACE WATER EXCEEDANCES

Location:	MSP011		MSP011		MSP011		MSP011		MSP011		MSP011		MSP011		MSP011		MSP011	
Location Type:	Pond		Pond		Pond		Pond		Pond		Pond		Pond		Pond		Pond	
Sample ID:	051204SWMSP011-3-F		051204SWMSP011-3-U		051204SWMSP011-avg-F		051204SWMSP011-avg-U		050406SWMSP011-0-F		050406SWMSP011-0-U		050406SWMSP011-0-U		051007SWMSP011-0-F		051007SWMSP011-0-U	
Collection Date:	5/12/2004		5/12/2004		5/12/2004		5/12/2004		5/4/2006		5/4/2006		5/6/2006		5/10/2007		5/10/2007	
Sample Type:	Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater	
	Triplicate		Triplicate		Averaged		Averaged		Primary		Primary		Primary		Primary		Primary	
	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL
Total Metals (mg/L)																		
Aluminum	NS		NS		NS		NS		NS		NS		NS		NS		<0.03 UK	0.087
Barium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Beryllium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Boron	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Chromium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Cobalt	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Copper, total	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Iron	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Lead	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Molybdenum	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Nickel	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Selenium	NS		**0.049**	0.005	NS		**0.0483**	0.005	NS		NS		**0.043**	0.005	NS		**0.043**	0.005
Silver	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Thallium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Vanadium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Zinc	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Dissolved Metals (mg/L)																		
Aluminum, dissolved	NS		NS		NS		NS		<0.03 UK	0.087	NS		NS		NS		NS	
Barium, dissolved	NS		NS		NS		NS		**0.024 K**	0.003	NS		NS		NS		NS	
Beryllium, dissolved	NS		NS		NS		NS		<0.002 UK	0.0006	NS		NS		NS		NS	
Boron, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium, dissolved	**0.001 JK**	0.000591	NS		**0.00103 JK**	0.000593	NS		**0.0001 JK**	0.000810	NS		NS		**0.0005 K**	0.000618	NS	
Chromium, dissolved	NS		NS		NS		NS		**0.0003 JK**	0.122	NS		NS		**0.0007 K**	0.0831	NS	
Cobalt, dissolved	NS		NS		NS		NS		<0.01 UK	0.003	NS		NS		NS		NS	
Copper, dissolved	NS		NS		NS		NS		<0.01 UK	0.0191	NS		NS		NS		NS	
Iron, dissolved	NS		NS		NS		NS		<0.02 UK	0.158	NS		NS		NS		NS	
Lead, dissolved	NS		NS		NS		NS		<0.0001 UK	0.00485	NS		NS		NS		NS	
Molybdenum, dissolved	NS		NS		NS		NS		<0.01 UK	0.034	NS		NS		NS		NS	
Nickel, dissolved	**0.0099 K**	0.0549	NS		**0.0099 K**	0.0551	NS		**0.001 JK**	0.0871	NS		NS		**0.0104 K**	0.0585	NS	
Selenium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Silver, dissolved	NS		NS		NS		NS		<0.01 UJK	0.00036	NS		NS		NS		NS	
Thallium, dissolved	NS		NS		NS		NS		<0.0001 UK	0.00003	NS		NS		NS		NS	
Vanadium, dissolved	**0.0127 K**	0.02	NS		**0.0126 K**	0.02	NS		**0.0008 JK**	0.02	NS		NS		**0.0102 K**	0.02	NS	
Zinc, dissolved	**0.011 JK**	0.125	NS		**0.0107 JK**	0.125	NS		**0.003 JK**	0.198	NS		NS		**0.008 JK**	0.133	NS	

TABLE 3-8

BALLARD MINE - SUMMARY OF SURFACE WATER EXCEEDANCES

Location:	MSP011		MSP011		MSP011		MSP011		MSP011		MSP011		MSP011		MSP011		MSP012	
Location Type:	Pond		Pond		Pond		Pond		Pond		Pond		Pond		Pond		Pond	
Sample ID:	050808GWMSP011-1-F		050808GWMSP011-1-U		050808GWMSP011-2-F		050808GWMSP011-2-U		050808GWMSP011-3-F		050808GWMSP011-3-U		050808GWMSP011-avg-F		050808GWMSP011-avg-		051204SWMSP012-0-F	
Collection Date:	5/8/2008		5/8/2008		5/8/2008		5/8/2008		5/8/2008		5/8/2008		5/8/2008		5/8/2008		5/12/2004	
Sample Type:	Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater	
	Triplicate		Triplicate		Triplicate		Triplicate		Triplicate		Triplicate		Averaged		Averaged		Primary	
	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL
Total Metals (mg/L)																		
Aluminum	NS		**0.11 JK**	0.087	NS		**0.14 JK**	0.087	NS		**0.1 JK**	0.087	NS		**0.117 JK**	0.087	NS	
Barium	NS		**0.008 JK**	0.003	NS		**0.008 JK**	0.003	NS		**0.008 JK**	0.003	NS		**0.008 JK**	0.003	NS	
Beryllium	NS		<0.002 UK	0.0006	NS		<0.002 UK	0.0006	NS		<0.002 UK	0.0006	NS		<0.002 UK	0.0006	NS	
Boron	NS		**0.03 JK**	0.0016	NS		**0.02 JK**	0.0016	NS		**0.03 JK**	0.0016	NS		**0.0267 JK**	0.0016	NS	
Cadmium	NS		**0.0016 K**	0.000479	NS		**0.0015 K**	0.000475	NS		**0.0016 K**	0.000479	NS		**0.00157 K**	0.000477	NS	
Chromium	NS		**0.0021 K**	0.0579	NS		**0.0022 K**	0.0573	NS		**0.0022 K**	0.0579	NS		**0.00217 K**	0.0577	NS	
Cobalt	NS		<0.01 UK	0.003	NS		<0.01 UK	0.003	NS		<0.01 UK	0.003	NS		<0.01 UK	0.003	NS	
Copper, total	NS		<0.01 UK	0.00878	NS		<0.01 UK	0.00867	NS		<0.01 UK	0.00878	NS		<0.01 UK	0.00875	NS	
Iron	NS		**0.12 K**	0.158	NS		**0.14 K**	0.158	NS		**0.13 K**	0.158	NS		**0.13 K**	0.158	NS	
Lead	NS		<0.0001 UK	0.00181	NS		<0.0001 UK	0.00178	NS		**0.0002 JK**	0.00181	NS		**0.0002 JK**	0.00180	NS	
Molybdenum	NS		<0.01 UK	0.034	NS		<0.01 UK	0.034	NS		<0.01 UK	0.034	NS		<0.01 UK	0.034	NS	
Nickel	NS		**0.0078 K**	0.0403	NS		**0.0075 K**	0.0399	NS		**0.0077 K**	0.0403	NS		**0.00767 K**	0.0402	NS	
Selenium	NS		**0.069**	0.005	NS		**0.071**	0.005	NS		**0.07**	0.005	NS		**0.07**	0.005	NS	
Silver	NS		<0.01 UK	0.00036	NS		<0.01 UK	0.00036	NS		<0.01 UK	0.00036	NS		<0.01 UK	0.00036	NS	
Thallium	NS		**0.0002 JK**	0.00003	NS		<0.0002 UK	0.00003	NS		<0.0002 UK	0.00003	NS		**0.0002 JK**	0.00003	NS	
Vanadium	NS		**0.015 K**	0.02	NS		**0.0146 K**	0.02	NS		**0.0146 K**	0.02	NS		**0.0147 K**	0.02	NS	
Zinc	NS		**0.027 K**	0.0915	NS		**0.026 K**	0.0905	NS		**0.027 K**	0.0915	NS		**0.0267 K**	0.0912	NS	
Dissolved Metals (mg/L)																		
Aluminum, dissolved	<0.03 UK	0.087	NS		<0.03 UK	0.087	NS		<0.03 UK	0.087	NS		<0.03 UK	0.087	NS		NS	
Barium, dissolved	<0.008 UK	0.003	NS		<0.009 UK	0.003	NS		<0.006 UK	0.003	NS		<0.003 UK	0.003	NS		NS	
Beryllium, dissolved	<0.002 UK	0.0006	NS		<0.002 UK	0.0006	NS		<0.002 UK	0.0006	NS		<0.002 UK	0.0006	NS		NS	
Boron, dissolved	**0.01 JK**	0.0016	NS		**0.02 JK**	0.0016	NS		**0.02 JK**	0.0016	NS		**0.0167 JK**	0.0016	NS		NS	
Cadmium, dissolved	**0.0005 K**	0.000497	NS		**0.0005 K**	0.000493	NS		**0.0005 K**	0.000490	NS		**0.0005 K**	0.000493	NS		**0.0015 K**	0.000615
Chromium, dissolved	<0.0002 UK	0.0611	NS		<0.0002 UK	0.0605	NS		<0.0003 UK	0.0598	NS		<0.0001 UK	0.0605	NS		NS	
Cobalt, dissolved	<0.01 UK	0.003	NS		<0.01 UK	0.003	NS		<0.01 UK	0.003	NS		<0.01 UK	0.003	NS		NS	
Copper, dissolved	**0.02 JK**	0.00928	NS		<0.01 UK	0.00918	NS		<0.01 UK	0.00908	NS		**0.02 JK**	0.00918	NS		NS	
Iron, dissolved	<0.02 UK	0.158	NS		<0.02 UK	0.158	NS		<0.02 UK	0.158	NS		<0.02 UK	0.158	NS		NS	
Lead, dissolved	<0.0001 UK	0.00195	NS		<0.0001 UK	0.00192	NS		<0.0001 UK	0.00189	NS		<0.0001 UK	0.00192	NS		NS	
Molybdenum, dissolved	<0.01 UK	0.034	NS		<0.01 UK	0.034	NS		<0.01 UK	0.034	NS		<0.01 UK	0.034	NS		NS	
Nickel, dissolved	**0.0073 K**	0.0426	NS		**0.0068 K**	0.0421	NS		**0.0069 K**	0.0417	NS		**0.007 K**	0.0421	NS		**0.0081 K**	0.0582
Selenium, dissolved	**0.068 J-**	0.005	NS		**0.068 J-**	0.005	NS		**0.067 J-**	0.005	NS		**0.0677 J-**	0.005	NS		NS	
Silver, dissolved	<0.01 UJK	0.00036	NS		<0.01 UJK	0.00036	NS		<0.01 UJK	0.00036	NS		<0.01 UJK	0.00036	NS		NS	
Thallium, dissolved	**0.0001 JK**	0.00003	NS		**0.0001 JK**	0.00003	NS		**0.0001 JK**	0.00003	NS		**0.0001 JK**	0.00003	NS		NS	
Vanadium, dissolved	**0.0144 K**	0.02	NS		**0.0144 K**	0.02	NS		**0.0144 K**	0.02	NS		**0.0144 K**	0.02	NS		**0.027 K**	0.02
Zinc, dissolved	**0.012 K**	0.0968	NS		**0.006 JK**	0.0957	NS		**0.01 K {J+}**	0.0947	NS		**0.00933 JK**	0.0957	NS		**0.01 JK**	0.132

TABLE 3-8

BALLARD MINE - SUMMARY OF SURFACE WATER EXCEEDANCES

Location:	MSP012		MSP012		MSP012		MSP012		MSP012		MSP012		MSP012		MSP012		MSP013	
Location Type:	Pond		Pond		Pond		Pond		Pond		Pond		Pond		Pond		Pond	
Sample ID:	051204SWMSP012-0-U		050406SWMSP012-0-F		050406SWMSP012-0-U		050406SWMSP012-0-U		050907SWMSP012-0-F		050907SWMSP012-0-U		050808GWMSP012-0-F		050808GWMSP012-0-U		050406SWMSP013-0-F	
Collection Date:	5/12/2004		5/4/2006		5/4/2006		5/6/2006		5/9/2007		5/9/2007		5/8/2008		5/8/2008		5/4/2006	
Sample Type:	Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater	
	Primary		Primary		Primary		Primary		Primary		Primary		Primary		Primary		Primary	
	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL
Total Metals (mg/L)																		
Aluminum	NS		NS		NS		NS		NS		<0.03 UK	0.087	NS		**0.13 JK**	0.087	NS	
Barium	NS		NS		NS		NS		NS		NS		NS		**0.006 JK**	0.003	NS	
Beryllium	NS		NS		NS		NS		NS		NS		NS		<0.002 UK	0.0006	NS	
Boron	NS		NS		NS		NS		NS		NS		NS		**0.02 JK**	0.0016	NS	
Cadmium	NS		NS		NS		NS		NS		NS		NS		**0.0019 K**	0.000511	NS	
Chromium	NS		NS		NS		NS		NS		NS		NS		**0.0091 K**	0.0636	NS	
Cobalt	NS		NS		NS		NS		NS		NS		NS		<0.01 UK	0.003	NS	
Copper, total	NS		NS		NS		NS		NS		NS		NS		<0.01 UK	0.00968	NS	
Iron	NS		NS		NS		NS		NS		NS		NS		**0.17 K**	0.158	NS	
Lead	NS		NS		NS		NS		NS		NS		NS		**0.0001 JK**	0.00205	NS	
Molybdenum	NS		NS		NS		NS		NS		NS		NS		<0.01 UK	0.034	NS	
Nickel	NS		NS		NS		NS		NS		NS		NS		**0.0094 K**	0.0444	NS	
Selenium	**0.115**	0.005	NS		NS		**0.073 J-**	0.005	NS		**0.145**	0.005	NS		**0.12**	0.005	NS	
Silver	NS		NS		NS		NS		NS		NS		NS		<0.01 UK	0.00036	NS	
Thallium	NS		NS		NS		NS		NS		NS		NS		<0.0001 UK	0.00003	NS	
Vanadium	NS		NS		NS		NS		NS		NS		NS		**0.0296 K**	0.02	NS	
Zinc	NS		NS		NS		NS		NS		NS		NS		**0.028 K**	0.101	NS	
Dissolved Metals (mg/L)																		
Aluminum, dissolved	NS		<0.03 UK	0.087	NS		NS		NS		NS		<0.03 UK	0.087	NS		**0.05 JK {J+}**	0.087
Barium, dissolved	NS		**0.006 JK**	0.003	NS		NS		NS		NS		<0.005 UK	0.003	NS		**0.01 JK**	0.003
Beryllium, dissolved	NS		<0.002 UK	0.0006	NS		NS		NS		NS		<0.002 UK	0.0006	NS		<0.002 UK	0.0006
Boron, dissolved	NS		NS		NS		NS		NS		NS		**0.01 JK**	0.0016	NS		NS	
Cadmium, dissolved	NS		**0.0008 K**	0.000522	NS		NS		**0.0008 K**	0.000701	NS		**0.0004 JK**	0.000529	NS		**0.0015 K**	0.000556
Chromium, dissolved	NS		**0.0025 K**	0.0655	NS		NS		**0.0012 J+K**	0.0993	NS		**0.0014 K**	0.0667	NS		**0.0026 K**	0.0717
Cobalt, dissolved	NS		<0.01 UK	0.003	NS		NS		NS		NS		<0.01 UK	0.003	NS		<0.01 UK	0.003
Copper, dissolved	NS		<0.01 UK	0.00998	NS		NS		NS		NS		<0.01 UK	0.0102	NS		<0.01 UK	0.0110
Iron, dissolved	NS		<0.02 UK	0.158	NS		NS		NS		NS		<0.02 UK	0.158	NS		<0.02 UK	0.158
Lead, dissolved	NS		<0.0001 UK	0.00213	NS		NS		NS		NS		<0.0001 UK	0.00219	NS		<0.0001 UK	0.00241
Molybdenum, dissolved	NS		<0.01 UK	0.034	NS		NS		NS		NS		<0.01 UK	0.034	NS		**0.01 JK**	0.034
Nickel, dissolved	NS		**0.0048 K**	0.0458	NS		NS		**0.0105 K**	0.0704	NS		**0.0071 K**	0.0467	NS		**0.0155 K**	0.0502
Selenium, dissolved	NS		NS		NS		NS		NS		NS		**0.118 J-**	0.005	NS		NS	
Silver, dissolved	NS		<0.01 UJK	0.00036	NS		NS		NS		NS		<0.01 UJK	0.00036	NS		<0.01 UJK	0.00036
Thallium, dissolved	NS		**0.0001 JK**	0.00003	NS		NS		NS		NS		**0.0001 JK**	0.00003	NS		<0.0001 UK	0.00003
Vanadium, dissolved	NS		**0.0227 K**	0.02	NS		NS		**0.0273 K**	0.02	NS		**0.0256 K**	0.02	NS		**0.0135 K**	0.02
Zinc, dissolved	NS		**0.007 JK**	0.104	NS		NS		**0.007 JK**	0.160	NS		<0.002 UK	0.106	NS		**0.038 K**	0.114

TABLE 3-8

BALLARD MINE - SUMMARY OF SURFACE WATER EXCEEDANCES

Location:	MSP013		MSP013		MSP013		MSP059		MSP059		MSP059		MSP059		MSP059		MSP059	
Location Type:	Pond		Pond		Pond		Pond		Pond		Pond		Pond		Pond		Pond	
Sample ID:	050406SWMSP013-0-U		051608GWMSP013-0-F		051608GWMSP013-0-U		051204SWMSP059-0-F		051204SWMSP059-0-U		050406SWMSP059-0-F		050406SWMSP059-0-U		050406SWMSP059-0-U		051007SWMSP059-0-F	
Collection Date:	5/4/2006		5/16/2008		5/16/2008		5/12/2004		5/12/2004		5/4/2006		5/4/2006		5/6/2006		5/10/2007	
Sample Type:	Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater	
	Primary		Primary		Primary		Primary		Primary		Primary		Primary		Primary		Primary	
	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL
Total Metals (mg/L)																		
Aluminum	NS		NS		**1.26 J+K**	0.087	NS		NS		NS		NS		NS		NS	
Barium	NS		NS		**0.01 JK**	0.003	NS		NS		NS		NS		NS		NS	
Beryllium	NS		NS		<0.002 UK	0.0006	NS		NS		NS		NS		NS		NS	
Boron	NS		NS		**0.02 JK**	0.0016	NS		NS		NS		NS		NS		NS	
Cadmium	NS		NS		**0.0032 K**	0.000533	NS		NS		NS		NS		NS		NS	
Chromium	NS		NS		**0.0257 K**	0.0674	NS		NS		NS		NS		NS		NS	
Cobalt	NS		NS		<0.01 UK	0.003	NS		NS		NS		NS		NS		NS	
Copper, total	NS		NS		<0.01 UK	0.0103	NS		NS		NS		NS		NS		NS	
Iron	NS		NS		**1.38 K**	0.158	NS		NS		NS		NS		NS		NS	
Lead	NS		NS		**0.0006 J+K**	0.00222	NS		NS		NS		NS		NS		NS	
Molybdenum	NS		NS		**0.01 JK**	0.034	NS		NS		NS		NS		NS		NS	
Nickel	NS		NS		**0.0247 K**	0.0471	NS		NS		NS		NS		NS		NS	
Selenium	**0.2**	0.005	NS		**0.16**	0.005	NS		**0.029**	0.005	NS		NS		**0.024 J-**	0.005	NS	
Silver	NS		NS		<0.01 UK	0.00036	NS		NS		NS		NS		NS		NS	
Thallium	NS		NS		**0.0006 K**	0.00003	NS		NS		NS		NS		NS		NS	
Vanadium	NS		NS		**0.0452 K**	0.02	NS		NS		NS		NS		NS		NS	
Zinc	NS		NS		**0.099 K**	0.107	NS		NS		NS		NS		NS		NS	
Dissolved Metals (mg/L)																		
Aluminum, dissolved	NS		**0.09 JK**	0.087	NS		NS		NS		**0.35 K**	0.087	NS		NS		NS	
Barium, dissolved	NS		<0.003 UK	0.003	NS		NS		NS		**0.018 K**	0.003	NS		NS		NS	
Beryllium, dissolved	NS		<0.002 UK	0.0006	NS		NS		NS		<0.002 UK	0.0006	NS		NS		NS	
Boron, dissolved	NS		<0.01 UK	0.0016	NS		NS		NS		NS		NS		NS		NS	
Cadmium, dissolved	NS		**0.0011 K**	0.000320	NS		**0.0004 JK**	0.000508	NS		**0.0009 K**	0.000482	NS		NS		**0.0013 K**	0.000467
Chromium, dissolved	NS		**0.0041 K**	0.0328	NS		NS		NS		**0.003 K**	0.0586	NS		NS		**0.0088 K**	0.0560
Cobalt, dissolved	NS		<0.02 UK	0.003	NS		NS		NS		<0.01 UK	0.003	NS		NS		NS	
Copper, dissolved	NS		<0.01 UK	0.00485	NS		NS		NS		<0.01 UK	0.00888	NS		NS		NS	
Iron, dissolved	NS		<0.02 UK	0.158	NS		NS		NS		**0.14 K**	0.158	NS		NS		NS	
Lead, dissolved	NS		<0.0001 UK	0.000840	NS		NS		NS		<0.0001 UK	0.00184	NS		NS		NS	
Molybdenum, dissolved	NS		<0.01 UK	0.034	NS		NS		NS		<0.01 UK	0.034	NS		NS		NS	
Nickel, dissolved	NS		**0.0127 K**	0.0224	NS		**0.0072 K**	0.0440	NS		**0.012 K**	0.0408	NS		NS		**0.0171 K**	0.0389
Selenium, dissolved	NS		**0.16**	0.005	NS		NS		NS		NS		NS		NS		NS	
Silver, dissolved	NS		<0.01 UJK	0.00036	NS		NS		NS		<0.01 UJK	0.00036	NS		NS		NS	
Thallium, dissolved	NS		**0.0001 JK**	0.00003	NS		NS		NS		<0.0001 UK	0.00003	NS		NS		NS	
Vanadium, dissolved	NS		**0.0169 K**	0.02	NS		**0.0116 K**	0.02	NS		**0.0067 K**	0.02	NS		NS		**0.0106 K**	0.02
Zinc, dissolved	NS		**0.02 K**	0.0509	NS		**0.007 JK**	0.0999	NS		**0.022 K**	0.0926	NS		NS		**0.045 K**	0.0884

TABLE 3-8

BALLARD MINE - SUMMARY OF SURFACE WATER EXCEEDANCES

Location:	MSP059		MSP059		MSP059		MSP062		MSP062		MSP062		MSP062		MSP062		MSP062	
Location Type:	Pond		Pond		Pond		Pond		Pond		Pond		Pond		Pond		Pond	
Sample ID:	051007SWMSP059-0-U		051608GWMSP059-0-F		051608GWMSP059-0-U		051204SWMSP062-0-F		051204SWMSP062-0-U		050406SWMSP062-0-F		050406SWMSP062-0-U		050406SWMSP062-0-U		050808GWMSP062-0-F	
Collection Date:	5/10/2007		5/16/2008		5/16/2008		5/12/2004		5/12/2004		5/4/2006		5/4/2006		5/6/2006		5/8/2008	
Sample Type:	Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater	
	Primary		Primary		Primary		Primary		Primary		Primary		Primary		Primary		Primary	
	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL
Total Metals (mg/L)																		
Aluminum	**8.47 J+K**	0.087	NS		**5.73 K**	0.087	NS		NS		NS		NS		NS		NS	
Barium	NS		NS		**0.033 K**	0.003	NS		NS		NS		NS		NS		NS	
Beryllium	NS		NS		<0.002 UK	0.0006	NS		NS		NS		NS		NS		NS	
Boron	NS		NS		**0.03 JK**	0.0016	NS		NS		NS		NS		NS		NS	
Cadmium	NS		NS		**0.0034 K**	0.000463	NS		NS		NS		NS		NS		NS	
Chromium	NS		NS		**0.0574 K**	0.0553	NS		NS		NS		NS		NS		NS	
Cobalt	NS		NS		<0.01 UK	0.003	NS		NS		NS		NS		NS		NS	
Copper, total	NS		NS		**0.01 JK**	0.00837	NS		NS		NS		NS		NS		NS	
Iron	NS		NS		**5.42 K**	0.158	NS		NS		NS		NS		NS		NS	
Lead	NS		NS		**0.0019 K**	0.00170	NS		NS		NS		NS		NS		NS	
Molybdenum	NS		NS		<0.01 UK	0.034	NS		NS		NS		NS		NS		NS	
Nickel	NS		NS		**0.0413 K**	0.0385	NS		NS		NS		NS		NS		NS	
Selenium	**0.027**	0.005	NS		**0.018 J-**	0.005	NS		**0.002 J**	0.005	NS		NS		**0.001 J-**	0.005	NS	
Silver	NS		NS		<0.01 UK	0.00036	NS		NS		NS		NS		NS		NS	
Thallium	NS		NS		<0.0004 UK	0.00003	NS		NS		NS		NS		NS		NS	
Vanadium	NS		NS		**0.0392 K**	0.02	NS		NS		NS		NS		NS		NS	
Zinc	NS		NS		**0.189 K**	0.0873	NS		NS		NS		NS		NS		NS	
Dissolved Metals (mg/L)																		
Aluminum, dissolved	NS		**0.34 K**	0.087	NS		NS		NS		<0.03 UK	0.087	NS		NS		**0.11 J+K**	0.087
Barium, dissolved	NS		**0.014 JK**	0.003	NS		NS		NS		**0.009 JK**	0.003	NS		NS		<0.004 UK	0.003
Beryllium, dissolved	NS		<0.002 UK	0.0006	NS		NS		NS		<0.002 UK	0.0006	NS		NS		<0.002 UK	0.0006
Boron, dissolved	NS		**0.03 JK**	0.0016	NS		NS		NS		NS		NS		NS		**0.03 JK**	0.0016
Cadmium, dissolved	NS		**0.0008 K**	0.000407	NS		**0.0021 JK**	0.000788	NS		**0.0016 K**	0.000745	NS		NS		**0.0017 K**	0.000381
Chromium, dissolved	NS		**0.0089 K**	0.0461	NS		NS		NS		**0.0006 K**	0.108	NS		NS		**0.0031 K**	0.0420
Cobalt, dissolved	NS		<0.01 UK	0.003	NS		NS		NS		<0.01 UK	0.003	NS		NS		<0.01 UK	0.003
Copper, dissolved	NS		<0.01 UK	0.00692	NS		NS		NS		<0.01 UK	0.0169	NS		NS		<0.01 UK	0.00628
Iron, dissolved	NS		**0.17 K**	0.158	NS		NS		NS		<0.02 UK	0.158	NS		NS		**0.06 K**	0.158
Lead, dissolved	NS		<0.0001 UK	0.00133	NS		NS		NS		<0.0001 UK	0.00415	NS		NS		<0.0001 UK	0.00117
Molybdenum, dissolved	NS		<0.01 UK	0.034	NS		NS		NS		**0.01 JK**	0.034	NS		NS		<0.01 UK	0.034
Nickel, dissolved	NS		**0.0086 K**	0.0318	NS		**0.015 K**	0.0836	NS		**0.0088 K**	0.0770	NS		NS		**0.0049 K**	0.0289
Selenium, dissolved	NS		**0.014 J-**	0.005	NS		NS		NS		NS		NS		NS		<0.001	0.005
Silver, dissolved	NS		<0.01 UK	0.00036	NS		NS		NS		<0.01 UJK	0.00036	NS		NS		<0.01 UJK	0.00036
Thallium, dissolved	NS		<0.0001 UK	0.00003	NS		NS		NS		**0.0002 JK**	0.00003	NS		NS		**0.0001 JK**	0.00003
Vanadium, dissolved	NS		**0.008 K**	0.02	NS		**0.0062 K**	0.02	NS		**0.0036 K**	0.02	NS		NS		**0.0028 K**	0.02
Zinc, dissolved	NS		**0.021 K**	0.0723	NS		**0.02 JK**	0.190	NS		**0.018 K**	0.175	NS		NS		**0.011 K {J+}**	0.0657

TABLE 3-8

BALLARD MINE - SUMMARY OF SURFACE WATER EXCEEDANCES

Location:	MSP062		MST019		MST019		MST019		MST019		MST019		MST019		MST019		MST019	
Location Type:	Pond		Stream		Stream		Stream		Stream		Stream		Stream		Stream		Stream	
Sample ID:	050808GWMSP062-0-U		052004SWMST019-0-F		052004SWMST019-0-U		051206SWMST019-0-F		051206SWMST019-0-U		051507SWMST019-1-F		051507SWMST019-1-U		051507SWMST019-2-F		051507SWMST019-2-U	
Collection Date:	5/8/2008		5/20/2004		5/20/2004		5/12/2006		5/12/2006		5/15/2007		5/15/2007		5/15/2007		5/15/2007	
Sample Type:	Groundwater		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water	
	Primary		Primary		Primary		Primary		Primary		Triplicate		Triplicate		Triplicate		Triplicate	
	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL
Total Metals (mg/L)																		
Aluminum	**0.38 K**	0.087	NS		NS		NS		NS		NS		**0.35 K**	0.087	NS		**0.34 K**	0.087
Barium	**0.005 JK**	0.003	NS		NS		NS		NS		NS		NS		NS		NS	
Beryllium	<0.002 UK	0.0006	NS		NS		NS		NS		NS		NS		NS		NS	
Boron	**0.03 JK**	0.0016	NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium	**0.0032 K**	0.000377	NS		NS		NS		NS		NS		NS		NS		NS	
Chromium	**0.0088 K**	0.0413	NS		NS		NS		NS		NS		NS		NS		NS	
Cobalt	<0.01 UK	0.003	NS		NS		NS		NS		NS		NS		NS		NS	
Copper, total	<0.01 UK	0.00617	NS		NS		NS		NS		NS		NS		NS		NS	
Iron	**0.44 K**	0.158	NS		NS		NS		NS		NS		NS		NS		NS	
Lead	**0.0004 JK**	0.00115	NS		NS		NS		NS		NS		NS		NS		NS	
Molybdenum	<0.01 UK	0.034	NS		NS		NS		NS		NS		NS		NS		NS	
Nickel	**0.007 K**	0.0284	NS		NS		NS		NS		NS		NS		NS		NS	
Selenium	<0.001	0.005	NS		**0.003 J**	0.005	NS		**0.008**	0.005	NS		**0.004 J**	0.005	NS		**0.004 J**	0.005
Silver	<0.01 UK	0.00036	NS		NS		NS		NS		NS		NS		NS		NS	
Thallium	**0.0007 K**	0.00003	NS		NS		NS		NS		NS		NS		NS		NS	
Vanadium	**0.0074 K**	0.02	NS		NS		NS		NS		NS		NS		NS		NS	
Zinc	**0.042 K**	0.0646	NS		NS		NS		NS		NS		NS		NS		NS	
Dissolved Metals (mg/L)																		
Aluminum, dissolved	NS		NS		NS		**0.05 JK {J+}**	0.087	NS		NS		NS		NS		NS	
Barium, dissolved	NS		NS		NS		**0.067 K**	0.003	NS		NS		NS		NS		NS	
Beryllium, dissolved	NS		NS		NS		<0.002 UK	0.0006	NS		NS		NS		NS		NS	
Boron, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium, dissolved	NS		<0.0002 UK	0.000858	NS		<0.0001 UK	0.000793	NS		<0.0001 UK	0.000877	NS		<0.0001 UK	0.000877	NS	
Chromium, dissolved	NS		NS		NS		<0.0002 UK	0.118	NS		**0.0006 K**	0.137	NS		**0.0007 K**	0.137	NS	
Cobalt, dissolved	NS		NS		NS		<0.01 UK	0.003	NS		NS		NS		NS		NS	
Copper, dissolved	NS		NS		NS		<0.01 UK	0.0185	NS		NS		NS		NS		NS	
Iron, dissolved	NS		NS		NS		<0.02 UK	0.158	NS		NS		NS		NS		NS	
Lead, dissolved	NS		NS		NS		**0.0001 JK**	0.00466	NS		NS		NS		NS		NS	
Molybdenum, dissolved	NS		NS		NS		<0.01 UK	0.034	NS		NS		NS		NS		NS	
Nickel, dissolved	NS		**0.0005 JK**	0.0946	NS		**0.0011 JK**	0.0843	NS		**0.001 JK**	0.0978	NS		**0.001 JK**	0.0978	NS	
Selenium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Silver, dissolved	NS		NS		NS		<0.01 UJK	0.00036	NS		NS		NS		NS		NS	
Thallium, dissolved	NS		NS		NS		<0.0001 UK	0.00003	NS		NS		NS		NS		NS	
Vanadium, dissolved	NS		**0.0009 K**	0.02	NS		<0.0002 UK	0.02	NS		**0.0013 K**	0.02	NS		**0.0013 K**	0.02	NS	
Zinc, dissolved	NS		<0.004 UK	0.215	NS		<0.002 UK	0.192	NS		<0.002 UK	0.222	NS		<0.002 UK	0.222	NS	

TABLE 3-8

BALLARD MINE - SUMMARY OF SURFACE WATER EXCEEDANCES

Location:	MST019		MST019		MST019		MST019		MST019		MST019		MST019		MST019		MST019	
Location Type:	Stream		Stream		Stream		Stream		Stream		Stream		Stream		Stream		Stream	
Sample ID:	051507SWMST019-3-F		051507SWMST019-3-U		051507SWMST019-avg-F		051507SWMST019-avg-U		090907SWMST019-0-F		090907SWMST019-0-U		051308SWMST019-0-F		051308SWMST019-0-U		091508SWMST019-0-F	
Collection Date:	5/15/2007		5/15/2007		5/15/2007		5/15/2007		9/9/2007		9/9/2007		5/13/2008		5/13/2008		9/15/2008	
Sample Type:	Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water	
	Triplicate		Triplicate		Averaged		Averaged		Primary		Primary		Primary		Primary		Primary	
	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL
Total Metals (mg/L)																		
Aluminum	NS		**0.37 K**	0.087	NS		**0.353 K**	0.087	NS		**0.26 K**	0.087	NS		**0.1 JK**	0.087	NS	
Barium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Beryllium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Boron	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Chromium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Cobalt	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Copper, total	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Iron	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Lead	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Molybdenum	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Nickel	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Selenium	NS		**0.003 J**	0.005	NS		**0.00367 J**	0.005	NS		<0.001	0.005	NS		**0.004 J**	0.005	NS	
Silver	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Thallium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Vanadium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Zinc	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Dissolved Metals (mg/L)																		
Aluminum, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		<0.0500	0.087
Barium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Beryllium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Boron, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium, dissolved	<0.0001 UK	0.000865	NS		<0.0001 UK	0.000872	NS		<0.0001 UK	0.000734	NS		<0.0001 UK	0.000695	NS		<0.000125	0.000742
Chromium, dissolved	**0.0006 K**	0.134	NS		**0.000633 K**	0.136	NS		<0.0001 UK	0.106	NS		<0.0001 UK	0.0982	NS		**0.000528 J**	0.108
Cobalt, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Copper, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Iron, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		<0.0250	0.158
Lead, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Molybdenum, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Nickel, dissolved	**0.001 JK**	0.0958	NS		**0.001 JK**	0.0970	NS		**0.001 JK**	0.0753	NS		**0.0017 JK**	0.0696	NS		**0.00150 J**	0.0766
Selenium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Silver, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Thallium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Vanadium, dissolved	**0.0013 K**	0.02	NS		**0.0013 K**	0.02	NS		**0.0012 J+K**	0.02	NS		**0.0012 K**	0.02	NS		<0.00500	0.02
Zinc, dissolved	<0.002 UK	0.218	NS		<0.002 UK	0.221	NS		<0.002 UK	0.171	NS		**0.007 JK**	0.158	NS		**0.00544 J**	0.174

TABLE 3-8

BALLARD MINE - SUMMARY OF SURFACE WATER EXCEEDANCES

Location:	MST019		MST019		MST019		MST019		MST019		MST020		MST020		MST020		MST020	
Location Type:	Stream		Stream		Stream		Stream		Stream		Stream		Stream		Stream		Stream	
Sample ID:	091508SWMST019-0-U		0905SWMST019-F		0905SWMST019-U		0909SWMST019-F		0909SWMST019-U		052004SWMST020-0-F		052004SWMST020-0-U		051206SWMST020-0-F		051206SWMST020-0-U	
Collection Date:	9/15/2008		5/4/2009		5/4/2009		9/21/2009		9/21/2009		5/20/2004		5/20/2004		5/12/2006		5/12/2006	
Sample Type:	Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water	
	Primary		Primary		Primary		Primary		Primary		Primary		Primary		Primary		Primary	
	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL
Total Metals (mg/L)																		
Aluminum	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Barium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Beryllium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Boron	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Chromium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Cobalt	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Copper, total	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Iron	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Lead	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Molybdenum	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Nickel	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Selenium	**0.00166**	0.005	NS		**0.00431 J**	0.005	NS		**0.00231**	0.005	NS		**0.002 J**	0.005	NS		**0.007**	0.005
Silver	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Thallium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Vanadium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Zinc	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Dissolved Metals (mg/L)																		
Aluminum, dissolved	NS		NS		NS		NS		NS		NS		NS		**0.03 JK {J+}**	0.087	NS	
Barium, dissolved	NS		NS		NS		NS		NS		NS		NS		**0.068 K**	0.003	NS	
Beryllium, dissolved	NS		NS		NS		NS		NS		NS		NS		<0.002 UK	0.0006	NS	
Boron, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium, dissolved	NS		**0.000134 J**	0.000645	NS		<0.000125	0.000780	NS		<0.0001	0.000821	NS		<0.0001 UK	0.000787	NS	
Chromium, dissolved	NS		NS		NS		NS		NS		NS		NS		<0.0002 UK	0.117	NS	
Cobalt, dissolved	NS		NS		NS		NS		NS		NS		NS		<0.01 UK	0.003	NS	
Copper, dissolved	NS		NS		NS		NS		NS		NS		NS		<0.01 UK	0.0183	NS	
Iron, dissolved	NS		**0.259**	0.158	NS		<0.0250	0.158	NS		NS		NS		<0.02 UK	0.158	NS	
Lead, dissolved	NS		NS		NS		NS		NS		NS		NS		**0.0001 JK**	0.00460	NS	
Molybdenum, dissolved	NS		NS		NS		NS		NS		NS		NS		<0.01 UK	0.034	NS	
Nickel, dissolved	NS		NS		NS		NS		NS		**0.0014 JK**	0.0888	NS		**0.0012 JK**	0.0835	NS	
Selenium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Silver, dissolved	NS		NS		NS		NS		NS		NS		NS		<0.01 UJK	0.00036	NS	
Thallium, dissolved	NS		NS		NS		NS		NS		NS		NS		<0.0001 UK	0.00003	NS	
Vanadium, dissolved	NS		<0.00500	0.02	NS		<0.00500	0.02	NS		**0.00092 JK**	0.02	NS		<0.0002 UK	0.02	NS	
Zinc, dissolved	NS		NS		NS		NS		NS		<0.002 UJK	0.202	NS		**0.002 JK**	0.190	NS	

TABLE 3-8

BALLARD MINE - SUMMARY OF SURFACE WATER EXCEEDANCES

Location:	MST020		MST020		MST020		MST020		MST020		MST020		MST020		MST020		MST020	
Location Type:	Stream		Stream		Stream		Stream		Stream		Stream		Stream		Stream		Stream	
Sample ID:	051407SWMST020-0-F		051407SWMST020-0-U		091407SWMST020-0-F		091407SWMST020-0-U		051408SWMST020-0-F		051408SWMST020-0-U		091508SWMST020-0-F		091508SWMST020-0-U		0905SWMST020-F	
Collection Date:	5/14/2007		5/14/2007		9/14/2007		9/14/2007		5/14/2008		5/14/2008		9/15/2008		9/15/2008		5/4/2009	
Sample Type:	Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water	
	Primary		Primary		Primary		Primary		Primary		Primary		Primary		Primary		Primary	
	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL
Total Metals (mg/L)																		
Aluminum	NS		**0.31 K**	0.087	NS		**0.14 JK**	0.087	NS		**1.2 J+K**	0.087	NS		NS		NS	
Barium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Beryllium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Boron	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Chromium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Cobalt	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Copper, total	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Iron	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Lead	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Molybdenum	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Nickel	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Selenium	NS		**0.004 J**	0.005	NS		<0.001	0.005	NS		**0.005 J**	0.005	NS		**0.00154 J+**	0.005	NS	
Silver	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Thallium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Vanadium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Zinc	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Dissolved Metals (mg/L)																		
Aluminum, dissolved	NS		NS		NS		NS		NS		NS		<0.0500	0.087	NS		NS	
Barium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Beryllium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Boron, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium, dissolved	**0.0002 JK**	0.000870	NS		<0.0001 UK	0.000753	NS		<0.0001 UK	0.000734	NS		<0.000125	0.000742	NS		<0.000125	0.000666
Chromium, dissolved	<0.0001	0.135	NS		<0.0001 UK	0.110	NS		<0.0001 UK	0.106	NS		<0.000500	0.108	NS		NS	
Cobalt, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Copper, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Iron, dissolved	NS		NS		NS		NS		NS		NS		<0.0250	0.158	NS		**0.0574 J+/B**	0.158
Lead, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Molybdenum, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Nickel, dissolved	**0.001 JK**	0.0966	NS		**0.0009 JK**	0.0782	NS		**0.0028 JK**	0.0753	NS		**0.00159 J**	0.0766	NS		NS	
Selenium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Silver, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Thallium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Vanadium, dissolved	**0.0012 JK**	0.02	NS		<0.0008 UK	0.02	NS		**0.0013 K**	0.02	NS		<0.00500	0.02	NS		<0.00500	0.02
Zinc, dissolved	**0.003 JK**	0.220	NS		<0.002 UK	0.178	NS		**0.005 JK**	0.171	NS		**0.00622 J**	0.174	NS		NS	

TABLE 3-8

BALLARD MINE - SUMMARY OF SURFACE WATER EXCEEDANCES

Location:	**MST020**		**MST020**		**MST020**		**MST021**		**MST021**		**MST021**		**MST021**		**MST021**		**MST021**	
Location Type:	**Stream**		**Stream**		**Stream**		**Stream**		**Stream**		**Stream**		**Stream**		**Stream**		**Stream**	
Sample ID:	**0905SWMST020-U**		**0909SWMST020-F**		**0909SWMST020-U**		**052004SWMST021-1-F**		**052004SWMST021-1-U**		**052004SWMST021-2-F**		**052004SWMST021-2-U**		**052004SWMST021-3-F**		**052004SWMST021-3-U**	
Collection Date:	**5/4/2009**		**9/21/2009**		**9/21/2009**		**5/20/2004**		**5/20/2004**		**5/20/2004**		**5/20/2004**		**5/20/2004**		**5/20/2004**	
Sample Type:	**Surface Water**		**Surface Water**		**Surface Water**		**Surface Water**		**Surface Water**		**Surface Water**		**Surface Water**		**Surface Water**		**Surface Water**	
	Primary		**Primary**		**Primary**		**Triplicate**		**Triplicate**		**Triplicate**		**Triplicate**		**Triplicate**		**Triplicate**	
	Result	**SL**	**Result**	**SL**	**Result**	**SL**	**Result**	**SL**	**Result**	**SL**	**Result**	**SL**	**Result**	**SL**	**Result**	**SL**	**Result**	**SL**
Total Metals (mg/L)																		
Aluminum	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Barium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Beryllium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Boron	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Chromium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Cobalt	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Copper, total	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Iron	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Lead	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Molybdenum	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Nickel	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Selenium	**0.00421 J**	0.005	NS		**0.00203**	0.005	NS		**0.002 J**	0.005	NS		**0.003 J**	0.005	NS		**0.002 J**	0.005
Silver	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Thallium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Vanadium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Zinc	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Dissolved Metals (mg/L)																		
Aluminum, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Barium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Beryllium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Boron, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium, dissolved	NS		<0.000125	0.000805	NS		<0.0001	0.000826	NS		<0.0002 UK	0.000844	NS		<0.0001	0.000826	NS	
Chromium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Cobalt, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Copper, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Iron, dissolved	NS		<0.0250	0.158	NS		NS		NS		NS		NS		NS		NS	
Lead, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Molybdenum, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Nickel, dissolved	NS		NS		NS		**0.0013 JK**	0.0895	NS		**0.0013 JK**	0.0925	NS		**0.0014 JK**	0.0896	NS	
Selenium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Silver, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Thallium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Vanadium, dissolved	NS		<0.00500	0.02	NS		**0.00092 JK**	0.02	NS		**0.001 K**	0.02	NS		**0.00093 JK**	0.02	NS	
Zinc, dissolved	NS		NS		NS		<0.002 UJK	0.204	NS		<0.004 UK	0.210	NS		<0.002 UJK	0.204	NS	

TABLE 3-8

BALLARD MINE - SUMMARY OF SURFACE WATER EXCEEDANCES

Location:	MST021		MST021		MST021		MST021		MST022		MST022		MST022		MST022		MST022	
Location Type:	Stream		Stream		Stream		Stream		Stream		Stream		Stream		Stream		Stream	
Sample ID:	052004SWMST021-avg-F		052004SWMST021-avg-U		051206SWMST021-0-F		051206SWMST021-0-U		051904SWMST022-0-F		051904SWMST022-0-U		051206SWMST022-0-F		051206SWMST022-0-U		051407SWMST022-0-F	
Collection Date:	5/20/2004		5/20/2004		5/12/2006		5/12/2006		5/19/2004		5/19/2004		5/12/2006		5/12/2006		5/14/2007	
Sample Type:	Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water	
	Averaged		Averaged		Primary		Primary		Primary		Primary		Primary		Primary		Primary	
	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL
Total Metals (mg/L)																		
Aluminum	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Barium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Beryllium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Boron	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Chromium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Cobalt	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Copper, total	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Iron	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Lead	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Molybdenum	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Nickel	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Selenium	NS		**0.00233 J**	0.005	NS		**0.007**	0.005	NS		**0.003 J**	0.005	NS		**0.007**	0.005	NS	
Silver	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Thallium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Vanadium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Zinc	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Dissolved Metals (mg/L)																		
Aluminum, dissolved	NS		NS		**0.05 JK {J+}**	0.087	NS		NS		NS		<0.03 UK	0.087	NS		NS	
Barium, dissolved	NS		NS		**0.069 K**	0.003	NS		NS		NS		**0.068 K**	0.003	NS		NS	
Beryllium, dissolved	NS		NS		<0.002 UK	0.0006	NS		NS		NS		<0.002 UK	0.0006	NS		NS	
Boron, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium, dissolved	<0.0002	0.000832	NS		<0.0001 UK	0.000793	NS		<0.0001	0.000832	NS		<0.0001 UK	0.000780	NS		<0.0001	0.000880
Chromium, dissolved	NS		NS		<0.0003 UK	0.118	NS		NS		NS		<0.0001 UK	0.116	NS		<0.0001	0.137
Cobalt, dissolved	NS		NS		<0.01 UK	0.003	NS		NS		NS		<0.01 UK	0.003	NS		NS	
Copper, dissolved	NS		NS		<0.01 UK	0.0185	NS		NS		NS		<0.01 UK	0.0180	NS		NS	
Iron, dissolved	NS		NS		<0.02 UK	0.158	NS		NS		NS		<0.02 UK	0.158	NS		NS	
Lead, dissolved	NS		NS		**0.0002 JK**	0.00466	NS		NS		NS		**0.0002 JK**	0.00452	NS		NS	
Molybdenum, dissolved	NS		NS		<0.01 UK	0.034	NS		NS		NS		<0.01 UK	0.034	NS		NS	
Nickel, dissolved	**0.00133 JK**	0.0905	NS		**0.0012 JK**	0.0843	NS		**0.0013 JK**	0.0905	NS		**0.0011 JK**	0.0823	NS		**0.0009 JK**	0.0982
Selenium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Silver, dissolved	NS		NS		<0.01 UJK	0.00036	NS		NS		NS		<0.01 UJK	0.00036	NS		NS	
Thallium, dissolved	NS		NS		<0.0001 UK	0.00003	NS		NS		NS		<0.0001 UK	0.00003	NS		NS	
Vanadium, dissolved	**0.00095 JK**	0.02	NS		<0.0002 UK	0.02	NS		**0.00087 JK**	0.02	NS		<0.0002 UK	0.02	NS		**0.0007 JK**	0.02
Zinc, dissolved	<0.004 UJK	0.206	NS		<0.002 UK	0.192	NS		<0.002 UJK	0.206	NS		**0.002 JK**	0.187	NS		**0.004 JK**	0.223

TABLE 3-8

BALLARD MINE - SUMMARY OF SURFACE WATER EXCEEDANCES

Location:	**MST022**		**MST022**		**MST022**		**MST022**		**MST022**		**MST022**		**MST022**		**MST022**		**MST022**	
Location Type:	**Stream**		**Stream**		**Stream**		**Stream**		**Stream**		**Stream**		**Stream**		**Stream**		**Stream**	
Sample ID:	**051407SWMST022-0-U**		**090907SWMST022-0-F**		**090907SWMST022-0-U**		**051408SWMST022-1-F**		**051408SWMST022-1-U**		**051408SWMST022-2-F**		**051408SWMST022-2-U**		**051408SWMST022-3-F**		**051408SWMST022-3-U**	
Collection Date:	**5/14/2007**		**9/9/2007**		**9/9/2007**		**5/14/2008**		**5/14/2008**		**5/14/2008**		**5/14/2008**		**5/14/2008**		**5/14/2008**	
Sample Type:	**Surface Water**		**Surface Water**		**Surface Water**		**Surface Water**		**Surface Water**		**Surface Water**		**Surface Water**		**Surface Water**		**Surface Water**	
	Primary		**Primary**		**Primary**		**Triplicate**		**Triplicate**		**Triplicate**		**Triplicate**		**Triplicate**		**Triplicate**	
	Result	**SL**	**Result**	**SL**	**Result**	**SL**	**Result**	**SL**	**Result**	**SL**	**Result**	**SL**	**Result**	**SL**	**Result**	**SL**	**Result**	**SL**
Total Metals (mg/L)																		
Aluminum	**0.31 K**	0.087	NS		**0.1 JK**	0.087	NS		**1.62 K**	0.087	NS		**1.57 K**	0.087	NS		**1.74 K**	0.087
Barium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Beryllium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Boron	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Chromium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Cobalt	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Copper, total	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Iron	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Lead	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Molybdenum	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Nickel	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Selenium	**0.004 J**	0.005	NS		<0.001	0.005	NS		**0.004 J**	0.005	NS		**0.004 J**	0.005	NS		**0.004 J**	0.005
Silver	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Thallium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Vanadium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Zinc	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Dissolved Metals (mg/L)																		
Aluminum, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Barium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Beryllium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Boron, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium, dissolved	NS		<0.0001 UK	0.000745	NS		<0.0001 UK	0.000701	NS		<0.0001 UK	0.000698	NS		<0.0001 UK	0.000695	NS	
Chromium, dissolved	NS		<0.0001 UK	0.108	NS		<0.0001 UK	0.0993	NS		<0.0001 UK	0.0988	NS		<0.0001 UK	0.0982	NS	
Cobalt, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Copper, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Iron, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Lead, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Molybdenum, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Nickel, dissolved	NS		**0.0009 JK**	0.0770	NS		**0.0022 JK**	0.0704	NS		**0.0021 JK**	0.0700	NS		**0.003 JK**	0.0696	NS	
Selenium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Silver, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Thallium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Vanadium, dissolved	NS		<0.0009 UK	0.02	NS		**0.0015 K**	0.02	NS		**0.0013 K**	0.02	NS		**0.0014 K**	0.02	NS	
Zinc, dissolved	NS		<0.002 UK	0.175	NS		**0.004 JK**	0.160	NS		**0.005 JK**	0.159	NS		**0.005 JK**	0.158	NS	

TABLE 3-8

BALLARD MINE - SUMMARY OF SURFACE WATER EXCEEDANCES

Location:	MST022		MST022		MST022		MST022		MST066		MST066		MST066		MST066		MST066	
Location Type:	Stream		Stream		Stream		Stream		Stream		Stream		Stream		Stream		Stream	
Sample ID:	051408SWMST022-avg-F		051408SWMST022-avg-U		091608SWMST022-0-F		091608SWMST022-0-U		051804SWMST066-0-F		051804SWMST066-0-U		051006GWMST066-0-F		051006GWMST066-0-U		051407SWMST066-0-F	
Collection Date:	5/14/2008		5/14/2008		9/16/2008		9/16/2008		5/18/2004		5/18/2004		5/10/2006		5/10/2006		5/14/2007	
Sample Type:	Surface Water		Surface Water		Surface Water		Surface		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water	
	Averaged		Averaged		Primary		Primary		Primary		Primary		Primary		Primary		Primary	
	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL
Total Metals (mg/L)																		
Aluminum	NS		**1.64 K**	0.087	NS		NS		NS		NS		NS		NS		NS	
Barium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Beryllium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Boron	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium	NS		NS		NS		NS		NS		NS		NS		<0.0001 UK		NS	
Chromium	NS		NS		NS		NS		NS		NS		NS		<0.0005 UK		NS	
Cobalt	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Copper, total	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Iron	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Lead	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Molybdenum	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Nickel	NS		NS		NS		NS		NS		NS		NS		**0.0009 JK**		NS	
Selenium	NS		**0.004 J**	0.005	NS		**0.00146**	0.005	NS		**0.001 J**	0.005	NS		**0.045**	0.005	NS	
Silver	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Thallium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Vanadium	NS		NS		NS		NS		NS		NS		NS		**0.0059 K**	0.02	NS	
Zinc	NS		NS		NS		NS		NS		NS		NS		**0.004 JK**		NS	
Dissolved Metals (mg/L)																		
Aluminum, dissolved	NS		NS		<0.0500	0.087	NS		NS		NS		<0.03 UK	0.087	NS		NS	
Barium, dissolved	NS		NS		NS		NS		NS		NS		**0.047 K**	0.003	NS		NS	
Beryllium, dissolved	NS		NS		NS		NS		NS		NS		<0.002 UK	0.0006	NS		NS	
Boron, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium, dissolved	<0.0001 UK	0.000698	NS		<0.000125	0.000772	NS		<0.0002 UK	0.000848	NS		<0.0001 UK	0.000915	NS		<0.0001	0.000870
Chromium, dissolved	<0.0001 UK	0.0988	NS		<0.000500	0.114	NS		<0.0004 UK	0.130	NS		**0.0004 JK**	0.145	NS		<0.0001	0.135
Cobalt, dissolved	NS		NS		NS		NS		NS		NS		<0.01 UK	0.003	NS		NS	
Copper, dissolved	NS		NS		NS		NS		NS		NS		<0.01 UK	0.0229	NS		NS	
Iron, dissolved	NS		NS		<0.0250	0.158	NS		NS		NS		<0.02 UK	0.158	NS		NS	
Lead, dissolved	NS		NS		NS		NS		NS		NS		<0.0001 UK	0.00607	NS		NS	
Molybdenum, dissolved	NS		NS		NS		NS		NS		NS		<0.01 UK	0.034	NS		NS	
Nickel, dissolved	**0.00243 JK**	0.0700	NS		**0.00157 J**	0.0811	NS		**0.0048 K**	0.0930	NS		**0.0008 JK**	0.104	NS		**0.0008 JK**	0.0966
Selenium, dissolved	NS		NS		NS		NS		**0.002 J**	0.005	NS		**0.048**	0.005	NS		NS	
Silver, dissolved	NS		NS		NS		NS		NS		NS		<0.01 UK	0.00036	NS		NS	
Thallium, dissolved	NS		NS		NS		NS		NS		NS		<0.0001 UK	0.00003	NS		NS	
Vanadium, dissolved	**0.0014 K**	0.02	NS		<0.00500	0.02	NS		**0.0044 K**	0.02	NS		**0.0059 K**	0.02	NS		**0.0063 JK**	0.02
Zinc, dissolved	**0.00467 JK**	0.159	NS		<0.00500	0.184	NS		**0.012 JK**	0.211	NS		**0.004 JK**	0.237	NS		**0.006 JK**	0.220

TABLE 3-8

BALLARD MINE - SUMMARY OF SURFACE WATER EXCEEDANCES

Location:	MST066		MST066		MST066		MST066		MST066		MST066		MST066		MST067		MST067	
Location Type:	Stream		Stream		Stream		Stream		Stream		Stream		Stream		Stream		Stream	
Sample ID:	051407SWMST066-0-U		091407SWMST066-0-F		091407SWMST066-0-U		050908SWMST066-0-F		050908SWMST066-0-U		0905SWMST066-F		0905SWMST066-U		051104SWMST067-0-F		051104SWMST067-0-U	
Collection Date:	5/14/2007		9/14/2007		9/14/2007		5/9/2008		5/9/2008		5/4/2009		5/4/2009		5/11/2004		5/11/2004	
Sample Type:	Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Groundwater		Groundwater	
	Primary		Primary		Primary		Primary		Primary		Primary		Primary		Primary		Primary	
	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL
Total Metals (mg/L)																		
Aluminum	<0.15 UK	0.087	NS		**1.59 K**	0.087	NS		<0.07 UK	0.087	NS		NS		NS		NS	
Barium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Beryllium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Boron	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Chromium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Cobalt	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Copper, total	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Iron	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Lead	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Molybdenum	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Nickel	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Selenium	**0.023**	0.005	NS		<0.001	0.005	NS		**0.019**	0.005	NS		**0.0524 J**	0.005	NS		**0.029**	0.005
Silver	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Thallium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Vanadium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Zinc	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Dissolved Metals (mg/L)																		
Aluminum, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Barium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Beryllium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Boron, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium, dissolved	NS		<0.0001 UK	0.00110	NS		<0.0001 UK	0.000855	NS		<0.000125	0.000818	NS		**0.0013 K**	0.00127	NS	
Chromium, dissolved	NS		<0.0001 UK	0.188	NS		<0.0001 UK	0.132	NS		NS		NS		**0.0006 K**	0.231	NS	
Cobalt, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Copper, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Iron, dissolved	NS		NS		NS		NS		NS		**0.0287 J+/B**	0.158	NS		NS		NS	
Lead, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Molybdenum, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Nickel, dissolved	NS		**0.0052 K**	0.136	NS		**0.0022 JK**	0.0943	NS		NS		NS		**0.0125 K**	0.168	NS	
Selenium, dissolved	NS		NS		NS		NS		NS		NS		NS		**0.01**	0.005	NS	
Silver, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Thallium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Vanadium, dissolved	NS		**0.0108 K**	0.02	NS		<0.0002 UK	0.02	NS		<0.00500	0.02	NS		**0.00841 K**	0.02	NS	
Zinc, dissolved	NS		<0.002 UK	0.309	NS		<0.002 UK	0.214	NS		NS		NS		**0.027 K**	0.382	NS	

TABLE 3-8

BALLARD MINE - SUMMARY OF SURFACE WATER EXCEEDANCES

Location:	MST067		MST067		MST067		MST067		MST067		MST067		MST067		MST067		MST068	
Location Type:	Stream		Stream		Stream		Stream		Stream		Stream		Stream		Stream		Stream	
Sample ID:	050206GWMST067-0-F		050206GWMST067-0-U		050907SWMST067-0-F		050907SWMST067-0-U		050708GWMST067-0-F		050708GWMST067-0-U		0905SWMST067-F		0905SWMST067-U		051006GWMST068-0-F	
Collection Date:	5/2/2006		5/2/2006		5/9/2007		5/9/2007		5/7/2008		5/7/2008		5/4/2009		5/4/2009		5/10/2006	
Sample Type:	Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Surface Water		Surface Water		Groundwater	
	Primary		Primary		Primary		Primary		Primary		Primary		Primary		Primary		Primary	
	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL
Total Metals (mg/L)																		
Aluminum	NS		NS		NS		**0.36 K**	0.087	NS		<0.3 UJK	0.087	NS		NS		NS	
Barium	NS		NS		NS		NS		NS		**0.05 JK**	0.003	NS		NS		NS	
Beryllium	NS		NS		NS		NS		NS		<0.01 UK	0.0006	NS		NS		NS	
Boron	NS		NS		NS		NS		NS		<0.08 UK	0.0016	NS		NS		NS	
Cadmium	NS		**0.0046 K**		NS		NS		NS		**0.0018 K**	0.00127	NS		NS		NS	
Chromium	NS		**0.0008 K**		NS		NS		NS		**0.0001 JK**	0.231	NS		NS		NS	
Cobalt	NS		NS		NS		NS		NS		<0.05 UK	0.003	NS		NS		NS	
Copper, total	NS		NS		NS		NS		NS		<0.05 UK	0.0371	NS		NS		NS	
Iron	NS		NS		NS		NS		NS		<0.1 UK	0.158	NS		NS		NS	
Lead	NS		NS		NS		NS		NS		<0.0001 UK	0.0109	NS		NS		NS	
Molybdenum	NS		NS		NS		NS		NS		<0.05 UK	0.034	NS		NS		NS	
Nickel	NS		**0.0167 K**		NS		NS		NS		**0.0105 K**	0.168	NS		NS		NS	
Selenium	NS		**0.56**	0.005	NS		**0.022**	0.005	NS		**0.41**	0.005	NS		**0.867 J**	0.005	NS	
Silver	NS		NS		NS		NS		NS		<0.05 UK	0.00036	NS		NS		NS	
Thallium	NS		NS		NS		NS		NS		<0.0002 UK	0.00003	NS		NS		NS	
Vanadium	NS		**0.0246 K**	0.02	NS		NS		NS		**0.0257 K**	0.02	NS		NS		NS	
Zinc	NS		**0.105 K**		NS		NS		NS		**0.036 K**	0.382	NS		NS		NS	
Dissolved Metals (mg/L)																		
Aluminum, dissolved	<0.03 UK	0.087	NS		NS		NS		**0.07 JK**	0.087	NS		NS		NS		<0.03 UK	0.087
Barium, dissolved	**0.071 K**	0.003	NS		NS		NS		**0.048 K**	0.003	NS		NS		NS		**0.056 K**	0.003
Beryllium, dissolved	<0.002 UK	0.0006	NS		NS		NS		<0.002 UK	0.0006	NS		NS		NS		<0.002 UK	0.0006
Boron, dissolved	NS		NS		NS		NS		**0.04 JK**	0.0016	NS		NS		NS		NS	
Cadmium, dissolved	**0.0044 K**	0.00127	NS		**0.0014 K**	0.00127	NS		**0.0016 K**	0.00127	NS		**0.00231**	0.00127	NS		**0.0018 K**	0.00127
Chromium, dissolved	**0.0009 K**	0.231	NS		<0.0001 UK	0.231	NS		<0.0001 UK	0.231	NS		NS		NS		**0.0012 K**	0.231
Cobalt, dissolved	<0.01 UK	0.003	NS		NS		NS		<0.01 UK	0.003	NS		NS		NS		<0.01 UK	0.003
Copper, dissolved	<0.01 UK	0.0371	NS		NS		NS		<0.01 UK	0.0371	NS		NS		NS		<0.01 UK	0.0371
Iron, dissolved	<0.02 UK	0.158	NS		NS		NS		<0.02 UK	0.158	NS		<0.0250	0.158	NS		<0.02 UK	0.158
Lead, dissolved	**0.0003 JK**	0.0109	NS		NS		NS		<0.0001 UK	0.0109	NS		NS		NS		<0.0003 UK	0.0109
Molybdenum, dissolved	**0.02 JK**	0.034	NS		NS		NS		**0.03 JK**	0.034	NS		NS		NS		**0.16 K**	0.034
Nickel, dissolved	**0.0171 K**	0.168	NS		**0.008 K**	0.168	NS		**0.0128 K**	0.168	NS		NS		NS		**0.0243 K**	0.168
Selenium, dissolved	**0.47 J-**	0.005	NS		NS		NS		**0.44**	0.005	NS		NS		NS		**0.7**	0.005
Silver, dissolved	<0.01 UK	0.00036	NS		NS		NS		<0.01 UJK	0.00036	NS		NS		NS		<0.01 UK	0.00036
Thallium, dissolved	**0.0001 JK**	0.00003	NS		NS		NS		<0.0001 UK	0.00003	NS		NS		NS		**0.0002 JK**	0.00003
Vanadium, dissolved	**0.0238 K**	0.02	NS		**0.0113 K**	0.02	NS		**0.0263 K**	0.02	NS		**0.0233**	0.02	NS		**0.0229 K**	0.02
Zinc, dissolved	**0.116 K**	0.382	NS		**0.029 K**	0.382	NS		**0.035 K**	0.382	NS		NS		NS		**0.044 K**	0.382

TABLE 3-8

BALLARD MINE - SUMMARY OF SURFACE WATER EXCEEDANCES

Location:	MST068		MST068		MST068		MST069		MST069		MST069		MST069		MST069		MST069	
Location Type:	Stream		Stream		Stream		Stream		Stream		Stream		Stream		Stream		Stream	
Sample ID:	051006GWMST068-0-U		050708GWMST068-0-F		050708GWMST068-0-U		051004SWMST069-0-F		051004SWMST069-0-U		SWMST069-0-F		SWMST069-0-U		050806GWMST069-1-F		050806GWMST069-1-U	
Collection Date:	5/10/2006		5/7/2008		5/7/2008		5/10/2004		5/10/2004		9/8/2004		9/8/2004		5/8/2006		5/8/2006	
Sample Type:	Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater	
	Primary		Primary		Primary		Primary		Primary		Primary		Primary		Triplicate		Triplicate	
	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL
Total Metals (mg/L)																		
Aluminum	NS		NS		<0.07 UJK	0.087	NS		NS		NS		NS		NS		NS	
Barium	NS		NS		**0.037 K**	0.003	NS		NS		NS		NS		NS		NS	
Beryllium	NS		NS		<0.002 UK	0.0006	NS		NS		NS		NS		NS		NS	
Boron	NS		NS		**0.05 J+K**	0.0016	NS		NS		NS		NS		NS		NS	
Cadmium	**0.0027 K**		NS		**0.0015 K**	0.00117	NS		NS		NS		NS		NS		**0.0002 JK**	
Chromium	**0.0012 K**		NS		**0.0014 K**	0.205	NS		NS		NS		NS		NS		**0.0008 K**	
Cobalt	NS		NS		<0.01 UK	0.003	NS		NS		NS		NS		NS		NS	
Copper, total	NS		NS		<0.01 UK	0.0329	NS		NS		NS		NS		NS		NS	
Iron	NS		NS		<0.02 UK	0.158	NS		NS		NS		NS		NS		NS	
Lead	NS		NS		**0.0002 JK**	0.00945	NS		NS		NS		NS		NS		NS	
Molybdenum	NS		NS		**0.15 K**	0.034	NS		NS		NS		NS		NS		NS	
Nickel	**0.0228 K**		NS		**0.0135 K**	0.149	NS		NS		NS		NS		NS		**0.0095 K**	
Selenium	**0.78**	0.005	NS		**0.48**	0.005	NS		**0.6**	0.005	NS		**0.48**	0.005	NS		**0.001 J**	0.005
Silver	NS		NS		<0.01 UK	0.00036	NS		NS		NS		NS		NS		NS	
Thallium	NS		NS		**0.0006 J+K**	0.00003	NS		NS		NS		NS		NS		NS	
Vanadium	**0.0214 K**	0.02	NS		**0.0404 K**	0.02	NS		NS		NS		NS		NS		**0.0012 K**	0.02
Zinc	**0.045 K**		NS		**0.034 K**	0.339	NS		NS		NS		NS		NS		**0.016 K**	
Dissolved Metals (mg/L)																		
Aluminum, dissolved	NS		**0.04 JK**	0.087	NS		NS		NS		NS		NS		<0.03 UK	0.087	NS	
Barium, dissolved	NS		**0.037 K**	0.003	NS		NS		NS		NS		NS		**0.072 K**	0.003	NS	
Beryllium, dissolved	NS		<0.002 UK	0.0006	NS		NS		NS		NS		NS		<0.002 UK	0.0006	NS	
Boron, dissolved	NS		**0.04 JK**	0.0016	NS		NS		NS		NS		NS		NS		NS	
Cadmium, dissolved	NS		**0.0012 K**	0.00120	NS		**0.0001 JK**	0.00127	NS		<0.0001 UK	0.00127	NS		**0.0002 JK**	0.00127	NS	
Chromium, dissolved	NS		<0.0004 UK	0.214	NS		**0.0007 K**	0.231	NS		<0.0002	0.231	NS		**0.0006 K**	0.231	NS	
Cobalt, dissolved	NS		<0.01 UK	0.003	NS		NS		NS		NS		NS		<0.01 UK	0.003	NS	
Copper, dissolved	NS		<0.01 UK	0.0344	NS		NS		NS		NS		NS		<0.01 UK	0.0371	NS	
Iron, dissolved	NS		<0.02 UK	0.158	NS		NS		NS		NS		NS		<0.02 UK	0.158	NS	
Lead, dissolved	NS		<0.0001 UK	0.00999	NS		NS		NS		NS		NS		<0.0001 UK	0.0109	NS	
Molybdenum, dissolved	NS		**0.15 K**	0.034	NS		NS		NS		NS		NS		<0.01 UK	0.034	NS	
Nickel, dissolved	NS		**0.0146 K**	0.156	NS		**0.0251 K**	0.168	NS		**0.037 K**	0.168	NS		**0.0098 K**	0.168	NS	
Selenium, dissolved	NS		**0.49**	0.005	NS		**0.64**	0.005	NS		**0.49**	0.005	NS		**0.41**	0.005	NS	
Silver, dissolved	NS		<0.01 UJK	0.00036	NS		NS		NS		NS		NS		<0.01 UK	0.00036	NS	
Thallium, dissolved	NS		<0.0001 UK	0.00003	NS		NS		NS		NS		NS		<0.0001 UK	0.00003	NS	
Vanadium, dissolved	NS		**0.043 K**	0.02	NS		**0.00114 K**	0.02	NS		**0.00111 K**	0.02	NS		**0.0023 K**	0.02	NS	
Zinc, dissolved	NS		**0.029 K**	0.355	NS		**0.009 JK**	0.382	NS		**0.011 K**	0.382	NS		**0.019 K**	0.382	NS	

TABLE 3-8

BALLARD MINE - SUMMARY OF SURFACE WATER EXCEEDANCES

Location:	MST069		MST069		MST069		MST069		MST069		MST069		MST069		MST069		MST069	
Location Type:	Stream		Stream		Stream		Stream		Stream		Stream		Stream		Stream		Stream	
Sample ID:	050806GWMST069-2-F		050806GWMST069-2-U		050806GWMST069-3-F		050806GWMST069-3-U		050806GWMST069-avg-F		050806GWMST069-avg-U		050907SWMST069-0-F		050907SWMST069-0-U		091307GWMST069-0-F	
Collection Date:	5/8/2006		5/8/2006		5/8/2006		5/8/2006		5/8/2006		5/8/2006		5/9/2007		5/9/2007		9/13/2007	
Sample Type:	Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater	
	Triplicate		Triplicate		Triplicate		Triplicate		Averaged		Averaged		Primary		Primary		Primary	
	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL
Total Metals (mg/L)																		
Aluminum	NS		NS		NS		NS		NS		NS		NS		**0.28 K**	0.087	NS	
Barium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Beryllium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Boron	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium	NS		**0.0003 JK**		NS		**0.0002 JK**		NS		**0.000233 JK**		NS		NS		NS	
Chromium	NS		**0.0006 K**		NS		**0.0005 K**		NS		**0.000633 K**		NS		NS		NS	
Cobalt	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Copper, total	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Iron	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Lead	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Molybdenum	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Nickel	NS		**0.0089 K**		NS		**0.0088 K**		NS		**0.00907 K**		NS		NS		NS	
Selenium	NS		**0.35**	0.005	NS		**0.36**	0.005	NS		**0.237 J**	0.005	NS		**1.05**	0.005	NS	
Silver	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Thallium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Vanadium	NS		**0.001 JK**	0.02	NS		**0.0009 JK**	0.02	NS		**0.00103 JK**	0.02	NS		NS		NS	
Zinc	NS		**0.015 K**		NS		**0.015 K**		NS		**0.0153 K**		NS		NS		NS	
Dissolved Metals (mg/L)																		
Aluminum, dissolved	<0.03 UK	0.087	NS		<0.03 UK	0.087	NS		<0.03 UK	0.087	NS		NS		NS		<0.06 UK	0.087
Barium, dissolved	**0.074 K**	0.003	NS		**0.074 K**	0.003	NS		**0.0733 K**	0.003	NS		NS		NS		**0.047 K**	0.003
Beryllium, dissolved	<0.002 UK	0.0006	NS		<0.002 UK	0.0006	NS		<0.002 UK	0.0006	NS		NS		NS		<0.004 UK	0.0006
Boron, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		**0.04 JK**	0.0016
Cadmium, dissolved	**0.0002 JK**	0.00127	NS		**0.0002 JK**	0.00127	NS		**0.0002 JK**	0.00127	NS		**0.0004 JK**	0.00127	NS		<0.0002 UK	0.00127
Chromium, dissolved	**0.0006 K**	0.231	NS		**0.0005 K**	0.231	NS		**0.000567 K**	0.231	NS		**0.0008 J+K**	0.231	NS		<0.0002 UK	0.231
Cobalt, dissolved	<0.01 UK	0.003	NS		<0.01 UK	0.003	NS		<0.01 UK	0.003	NS		NS		NS		<0.02 UK	0.003
Copper, dissolved	<0.01 UK	0.0371	NS		<0.01 UK	0.0371	NS		<0.01 UK	0.0371	NS		NS		NS		<0.02 UK	0.0371
Iron, dissolved	<0.02 UK	0.158	NS		<0.02 UK	0.158	NS		<0.02 UK	0.158	NS		NS		NS		<0.04 UK	0.158
Lead, dissolved	<0.0001 UK	0.0109	NS		<0.0001 UK	0.0109	NS		<0.0001 UK	0.0109	NS		NS		NS		<0.0002 UK	0.0109
Molybdenum, dissolved	<0.01 UK	0.034	NS		<0.01 UK	0.034	NS		<0.01 UK	0.034	NS		NS		NS		<0.02 UK	0.034
Nickel, dissolved	**0.0093 K**	0.168	NS		**0.0092 K**	0.168	NS		**0.00943 K**	0.168	NS		**0.0238 K**	0.168	NS		**0.029 K**	0.168
Selenium, dissolved	**0.41**	0.005	NS		**0.38**	0.005	NS		**0.38**	0.005	NS		NS		NS		**0.75**	0.005
Silver, dissolved	<0.01 UK	0.00036	NS		<0.01 UK	0.00036	NS		<0.01 UK	0.00036	NS		NS		NS		<0.02 UK	0.00036
Thallium, dissolved	<0.0001 UK	0.00003	NS		<0.0001 UK	0.00003	NS		<0.0001 UK	0.00003	NS		NS		NS		<0.0003 UK	0.00003
Vanadium, dissolved	**0.0022 K**	0.02	NS		**0.0022 K**	0.02	NS		**0.00223 K**	0.02	NS		**0.0014 K**	0.02	NS		**0.002 JK**	0.02
Zinc, dissolved	**0.016 K**	0.382	NS		**0.015 K**	0.382	NS		**0.0167 K**	0.382	NS		**0.015 K**	0.382	NS		**0.015 JK**	0.382

TABLE 3-8

BALLARD MINE - SUMMARY OF SURFACE WATER EXCEEDANCES

Location:	MST069		MST069		MST069		MST069		MST069		MST069		MST069		MST069		MST069	
Location Type:	Stream		Stream		Stream		Stream		Stream		Stream		Stream		Stream		Stream	
Sample ID:	091307GWMST069-0-U		050708GWMST069-0-F		050708GWMST069-0-U		091608GWMST069-0-F		091608GWMST069-0-U		0905SWMST069-F		0905SWMST069-U		0905GWMST069-F		0905GWMST069-U	
Collection Date:	9/13/2007		5/7/2008		5/7/2008		9/16/2008		9/16/2008		5/4/2009		5/4/2009		5/31/2009		5/31/2009	
Sample Type:	Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Surface Water		Surface Water		Groundwater		Groundwater	
	Primary		Primary		Primary		Primary		Primary		Primary		Primary		Primary		Primary	
	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL
Total Metals (mg/L)																		
Aluminum	<0.17 UK	0.087	NS		<0.15 UJK	0.087	NS		<0.0500	0.087	NS		NS		NS		NS	
Barium	**0.054 K**	0.003	NS		**0.041 K**	0.003	NS		NS		NS		NS		NS		NS	
Beryllium	<0.002 UK	0.0006	NS		<0.002 UK	0.0006	NS		NS		NS		NS		NS		NS	
Boron	**0.29 K**	0.0016	NS		<0.04 UK	0.0016	NS		NS		NS		NS		NS		NS	
Cadmium	**0.0004 JK**	0.00127	NS		**0.001 K**	0.00127	NS		<0.00125		NS		NS		NS		**0.00153**	
Chromium	**0.0006 K**	0.231	NS		**0.0003 JK**	0.231	NS		<0.00500		NS		NS		NS		NS	
Cobalt	<0.01 UK	0.003	NS		<0.01 UK	0.003	NS		NS		NS		NS		NS		NS	
Copper, total	<0.01 UK	0.0371	NS		<0.01 UK	0.0371	NS		NS		NS		NS		NS		NS	
Iron	**0.1 J+K**	0.158	NS		**0.04 J+K**	0.158	NS		**0.0359 J**	0.158	NS		NS		NS		NS	
Lead	**0.0002 JK**	0.0109	NS		<0.0001 UK	0.0109	NS		NS		NS		NS		NS		NS	
Molybdenum	<0.01 UK	0.034	NS		**0.01 JK**	0.034	NS		NS		NS		NS		NS		NS	
Nickel	**0.0286 K**	0.168	NS		**0.0244 K**	0.168	NS		**0.0382 J**		NS		NS		NS		NS	
Selenium	**0.034**	0.005	NS		**0.87**	0.005	NS		**1.15**	0.005	NS		**1.20 J**	0.005	NS		**1.65**	0.005
Silver	<0.01 UK	0.00036	NS		<0.01 UK	0.00036	NS		NS		NS		NS		NS		NS	
Thallium	**0.0002 JK**	0.00003	NS		<0.0002 UK	0.00003	NS		NS		NS		NS		NS		NS	
Vanadium	**0.0019 K**	0.02	NS		<0.0008 UK	0.02	NS		<0.0250	0.02	NS		NS		NS		<0.00500	0.02
Zinc	**0.02 K**	0.382	NS		**0.032 K**	0.382	NS		**0.0595 J**		NS		NS		NS		NS	
Dissolved Metals (mg/L)																		
Aluminum, dissolved	NS		**0.04 J+K**	0.087	NS		<0.0500	0.087	NS		NS		NS		NS		NS	
Barium, dissolved	NS		**0.039 K**	0.003	NS		NS		NS		NS		NS		NS		NS	
Beryllium, dissolved	NS		<0.002 UK	0.0006	NS		NS		NS		NS		NS		NS		NS	
Boron, dissolved	NS		**0.04 JK**	0.0016	NS		NS		NS		NS		NS		NS		NS	
Cadmium, dissolved	NS		**0.0005 K**	0.00127	NS		<0.00125	0.00127	NS		**0.000777**	0.00127	NS		**0.000859**	0.00127	NS	
Chromium, dissolved	NS		<0.0001 UK	0.231	NS		<0.00500	0.231	NS		NS		NS		NS		NS	
Cobalt, dissolved	NS		<0.01 UK	0.003	NS		NS		NS		NS		NS		NS		NS	
Copper, dissolved	NS		<0.01 UK	0.0371	NS		NS		NS		NS		NS		NS		NS	
Iron, dissolved	NS		<0.02 UK	0.158	NS		<0.0250	0.158	NS		<0.0250	0.158	NS		NS		NS	
Lead, dissolved	NS		<0.0001 UK	0.0109	NS		NS		NS		NS		NS		NS		NS	
Molybdenum, dissolved	NS		**0.01 JK**	0.034	NS		NS		NS		NS		NS		NS		NS	
Nickel, dissolved	NS		**0.029 K**	0.168	NS		**0.0386 J**	0.168	NS		NS		NS		NS		NS	
Selenium, dissolved	NS		**0.92**	0.005	NS		**1.19**	0.005	NS		NS		NS		NS		NS	
Silver, dissolved	NS		<0.01 UJK	0.00036	NS		NS		NS		NS		NS		NS		NS	
Thallium, dissolved	NS		<0.0001 UK	0.00003	NS		NS		NS		NS		NS		NS		NS	
Vanadium, dissolved	NS		**0.0011 K**	0.02	NS		<0.0250	0.02	NS		<0.00500	0.02	NS		NS		NS	
Zinc, dissolved	NS		**0.03 K**	0.382	NS		**0.0543 J**	0.382	NS		NS		NS		NS		NS	

TABLE 3-8

BALLARD MINE - SUMMARY OF SURFACE WATER EXCEEDANCES

Location:	MST069		MST069		MST069		MST069		MST088		MST088		MST088		MST088		MST088	
Location Type:	Stream		Stream		Stream		Stream		Stream		Stream		Stream		Stream		Stream	
Sample ID:	0909SWMST069-F		0909SWMST069-U		0909GWMST069-F		0909GWMST069-U		050906SWMST088-1-F		050906SWMST088-1-U		050906SWMST088-2-F		050906SWMST088-2-U		050906SWMST088-3-F	
Collection Date:	9/21/2009		9/21/2009		9/22/2009		9/22/2009		5/9/2006		5/9/2006		5/9/2006		5/9/2006		5/9/2006	
Sample Type:	Surface Water		Surface Water		Groundwater		Groundwater		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water	
	Primary		Primary		Primary		Primary		Triplicate		Triplicate		Triplicate		Triplicate		Triplicate	
	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL
Total Metals (mg/L)																		
Aluminum	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Barium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Beryllium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Boron	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium	NS		NS		NS		**0.00175**		NS		NS		NS		NS		NS	
Chromium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Cobalt	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Copper, total	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Iron	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Lead	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Molybdenum	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Nickel	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Selenium	NS		**1.31**	0.005	NS		**1.4**	0.005	NS		<0.001	0.005	NS		**0.012**	0.005	NS	
Silver	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Thallium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Vanadium	NS		NS		NS		**0.0397**	0.02	NS		NS		NS		NS		NS	
Zinc	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Dissolved Metals (mg/L)																		
Aluminum, dissolved	NS		NS		NS		NS		<0.03 UK	0.087	NS		<0.03 UK	0.087	NS		<0.03 UK	0.087
Barium, dissolved	NS		NS		NS		NS		**0.023 K**	0.003	NS		**0.025 K**	0.003	NS		**0.024 K**	0.003
Beryllium, dissolved	NS		NS		NS		NS		<0.002 UK	0.0006	NS		<0.002 UK	0.0006	NS		<0.002 UK	0.0006
Boron, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium, dissolved	**0.00155 J**	0.00127	NS		**0.0014**	0.00127	NS		<0.0001 UK	0.000766	NS		<0.0001 UK	0.000774	NS		<0.0001 UK	0.000782
Chromium, dissolved	NS		NS		NS		NS		**0.0003 JK**	0.113	NS		**0.0003 JK**	0.114	NS		**0.0002 JK**	0.116
Cobalt, dissolved	NS		NS		NS		NS		<0.01 UK	0.003	NS		<0.01 UK	0.003	NS		<0.01 UK	0.003
Copper, dissolved	NS		NS		NS		NS		<0.01 UK	0.0176	NS		<0.01 UK	0.0179	NS		<0.01 UK	0.0181
Iron, dissolved	<0.0250	0.158	NS		NS		NS		**0.06 K**	0.158	NS		**0.06 K**	0.158	NS		**0.06 K**	0.158
Lead, dissolved	NS		NS		NS		NS		<0.0001 UK	0.00438	NS		<0.0001 UK	0.00446	NS		<0.0001 UK	0.00455
Molybdenum, dissolved	NS		NS		NS		NS		<0.01 UK	0.034	NS		<0.01 UK	0.034	NS		<0.01 UK	0.034
Nickel, dissolved	NS		NS		NS		NS		**0.0015 JK**	0.0803	NS		**0.0015 JK**	0.0815	NS		**0.0018 JK**	0.0827
Selenium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Silver, dissolved	NS		NS		NS		NS		<0.01 UK	0.00036	NS		<0.01 UK	0.00036	NS		<0.01 UK	0.00036
Thallium, dissolved	NS		NS		NS		NS		<0.0001 UK	0.00003	NS		<0.0001 UK	0.00003	NS		<0.0001 UK	0.00003
Vanadium, dissolved	**0.0301**	0.02	NS		NS		NS		**0.0014 K**	0.02	NS		**0.0014 K**	0.02	NS		**0.0014 K**	0.02
Zinc, dissolved	NS		NS		NS		NS		**0.003 JK**	0.182	NS		**0.004 JK**	0.185	NS		**0.005 JK**	0.188

TABLE 3-8

BALLARD MINE - SUMMARY OF SURFACE WATER EXCEEDANCES

Location:	MST088		MST088		MST088		MST088		MST088		MST089		MST089		MST089		MST089	
Location Type:	Stream		Stream		Stream		Stream		Stream		Stream		Stream		Stream		Stream	
Sample ID:	050906SWMST088-3-U		050906SWMST088-avg-F		050906SWMST088-avg-U		050908SWMST088-0-F		050908SWMST088-0-U		051404SWMST089-0-F		051404SWMST089-0-U		050906GWMST089-0-F		050906GWMST089-0-U	
Collection Date:	5/9/2006		5/9/2006		5/9/2006		5/9/2008		5/9/2008		5/14/2004		5/14/2004		5/9/2006		5/9/2006	
Sample Type:	Surface Water		Surface Water		Surface Water		Surface Water		Surface		Surface Water		Surface Water		Surface Water		Surface Water	
	Triplicate		Averaged		Averaged		Primary		Primary		Primary		Primary		Primary		Primary	
	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL
Total Metals (mg/L)																		
Aluminum	NS		NS		NS		NS		**0.18 JK**	0.087	NS		NS		NS		NS	
Barium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Beryllium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Boron	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium	NS		NS		NS		NS		NS		NS		NS		NS		<0.0001 UK	
Chromium	NS		NS		NS		NS		NS		NS		NS		NS		**0.0004 JK**	
Cobalt	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Copper, total	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Iron	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Lead	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Molybdenum	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Nickel	NS		NS		NS		NS		NS		NS		NS		NS		**0.0015 JK**	
Selenium	**0.011**	0.005	NS		**0.0115**	0.005	NS		**0.007**	0.005	NS		**0.001 J**	0.005	NS		**0.025**	0.005
Silver	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Thallium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Vanadium	NS		NS		NS		NS		NS		NS		NS		NS		**0.0017 K**	0.02
Zinc	NS		NS		NS		NS		NS		NS		NS		NS		**0.002 JK**	
Dissolved Metals (mg/L)																		
Aluminum, dissolved	NS		<0.03 UK	0.087	NS		NS		NS		NS		NS		**0.11 JK**	0.087	NS	
Barium, dissolved	NS		**0.024 K**	0.003	NS		NS		NS		NS		NS		**0.032 K**	0.003	NS	
Beryllium, dissolved	NS		<0.002 UK	0.0006	NS		NS		NS		NS		NS		<0.002 UK	0.0006	NS	
Boron, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium, dissolved	NS		<0.0001 UK	0.000774	NS		**0.0001 JK**	0.000570	NS		<0.0002 UK	0.000779	NS		<0.0001 UK	0.000838	NS	
Chromium, dissolved	NS		**0.000267 JK**	0.114	NS		<0.0001 UK	0.0741	NS		**0.0004 JK**	0.115	NS		**0.0003 JK**	0.128	NS	
Cobalt, dissolved	NS		<0.01 UK	0.003	NS		NS		NS		NS		NS		<0.01 UK	0.003	NS	
Copper, dissolved	NS		<0.01 UK	0.0179	NS		NS		NS		NS		NS		<0.01 UK	0.0201	NS	
Iron, dissolved	NS		**0.06 K**	0.158	NS		NS		NS		NS		NS		**0.04 JK**	0.158	NS	
Lead, dissolved	NS		<0.0001 UK	0.00446	NS		NS		NS		NS		NS		<0.0001 UK	0.00516	NS	
Molybdenum, dissolved	NS		<0.01 UK	0.034	NS		NS		NS		NS		NS		<0.01 UK	0.034	NS	
Nickel, dissolved	NS		**0.0016 JK**	0.0815	NS		**0.0022 JK**	0.0520	NS		**0.0038 K**	0.0822	NS		**0.0016 JK**	0.0915	NS	
Selenium, dissolved	NS		NS		NS		NS		NS		<0.001	0.005	NS		**0.027**	0.005	NS	
Silver, dissolved	NS		<0.01 UK	0.00036	NS		NS		NS		NS		NS		<0.01 UK	0.00036	NS	
Thallium, dissolved	NS		<0.0001 UK	0.00003	NS		NS		NS		NS		NS		<0.0001 UK	0.00003	NS	
Vanadium, dissolved	NS		**0.0014 K**	0.02	NS		**0.0023 K**	0.02	NS		**0.0017 K**	0.02	NS		**0.0019 K**	0.02	NS	
Zinc, dissolved	NS		**0.004 JK**	0.185	NS		**0.007 JK**	0.118	NS		<0.004 UK	0.187	NS		**0.003 JK**	0.208	NS	

TABLE 3-8

BALLARD MINE - SUMMARY OF SURFACE WATER EXCEEDANCES

Location:	MST089		MST089		MST089		MST089		MST089		MST089		MST090		MST090		MST090	
Location Type:	Stream		Stream		Stream		Stream		Stream		Stream		Stream		Stream		Stream	
Sample ID:	050807SWMST089-0-F		050807SWMST089-0-U		051508SWMST089-0-F		051508SWMST089-0-U		0905SWMST089-F		0905SWMST089-U		051404SWMST090-0-F		051404SWMST090-0-U		050807SWMST090-0-F	
Collection Date:	5/8/2007		5/8/2007		5/15/2008		5/15/2008		5/6/2009		5/6/2009		5/14/2004		5/14/2004		5/8/2007	
Sample Type:	Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water	
	Primary		Primary		Primary		Primary		Primary		Primary		Primary		Primary		Primary	
	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL
Total Metals (mg/L)																		
Aluminum	NS		<0.03 UK	0.087	NS		**0.07 J+K**	0.087	NS		NS		NS		NS		NS	
Barium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Beryllium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Boron	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Chromium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Cobalt	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Copper, total	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Iron	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Lead	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Molybdenum	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Nickel	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Selenium	NS		<0.001	0.005	NS		**0.004 J**	0.005	NS		**0.0361 J**	0.005	NS		**0.001 J**	0.005	NS	
Silver	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Thallium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Vanadium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Zinc	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Dissolved Metals (mg/L)																		
Aluminum, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Barium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Beryllium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Boron, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium, dissolved	<0.0001 UK	0.000785	NS		<0.0001 UK	0.000660	NS		<0.000125	0.000648	NS		<0.0005 UK	0.000874	NS		<0.0001 UK	0.000850
Chromium, dissolved	<0.0003 UK	0.117	NS		<0.0001 UK	0.0913	NS		NS		NS		NS		NS		<0.0002 UK	0.131
Cobalt, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Copper, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Iron, dissolved	NS		NS		NS		NS		**0.0388 J**	0.158	NS		NS		NS		NS	
Lead, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Molybdenum, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Nickel, dissolved	**0.0022 JK**	0.0831	NS		**0.0025 JK**	0.0645	NS		NS		NS		**0.001 JK**	0.0973	NS		**0.0011 JK**	0.0935
Selenium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Silver, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Thallium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Vanadium, dissolved	**0.002 K**	0.02	NS		**0.0028 K**	0.02	NS		<0.00500	0.02	NS		**0.0029 K**	0.02	NS		**0.0007 JK**	0.02
Zinc, dissolved	<0.002 UK	0.189	NS		**0.005 JK**	0.147	NS		NS		NS		<0.01 UK	0.221	NS		<0.002 UK	0.213

TABLE 3-8

BALLARD MINE - SUMMARY OF SURFACE WATER EXCEEDANCES

Location:	MST090		MST090		MST090		MST090		MST090		MST092		MST092		MST092		MST092	
Location Type:	Stream		Stream		Stream		Stream		Stream		Stream		Stream		Stream		Stream	
Sample ID:	050807SWMST090-0-U		051508SWMST090-0-F		051508SWMST090-0-U		0905SWMST090-F		0905SWMST090-U		051404SWMST092-0-F		051404SWMST092-0-U		050906SWMST092-0-F		050906SWMST092-0-U	
Collection Date:	5/8/2007		5/15/2008		5/15/2008		5/6/2009		5/6/2009		5/14/2004		5/14/2004		5/9/2006		5/9/2006	
Sample Type:	Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water	
	Primary		Primary		Primary		Primary		Primary		Primary		Primary		Primary		Primary	
	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL
Total Metals (mg/L)																		
Aluminum	<0.03 UK	0.087	NS		**0.08 JK**	0.087	NS		NS		NS		NS		NS		NS	
Barium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Beryllium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Boron	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Chromium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Cobalt	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Copper, total	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Iron	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Lead	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Molybdenum	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Nickel	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Selenium	<0.001	0.005	NS		<0.001	0.005	NS		<0.000500	0.005	NS		**0.006**	0.005	NS		**0.044**	0.005
Silver	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Thallium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Vanadium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Zinc	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Dissolved Metals (mg/L)																		
Aluminum, dissolved	NS		NS		NS		NS		NS		NS		NS		**0.03 JK {J+}**	0.087	NS	
Barium, dissolved	NS		NS		NS		NS		NS		NS		NS		**0.033 K**	0.003	NS	
Beryllium, dissolved	NS		NS		NS		NS		NS		NS		NS		<0.002 UK	0.0006	NS	
Boron, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium, dissolved	NS		<0.0001 UK	0.000780	NS		<0.000125	0.000627	NS		<0.0005 UK	0.000615	NS		<0.0001 UK	0.000927	NS	
Chromium, dissolved	NS		<0.0001 UK	0.116	NS		NS		NS		NS		NS		**0.0004 JK**	0.148	NS	
Cobalt, dissolved	NS		NS		NS		NS		NS		NS		NS		<0.01 UK	0.003	NS	
Copper, dissolved	NS		NS		NS		NS		NS		NS		NS		<0.01 UK	0.0233	NS	
Iron, dissolved	NS		NS		NS		**0.0366 J**	0.158	NS		NS		NS		**0.04 JK**	0.158	NS	
Lead, dissolved	NS		NS		NS		NS		NS		NS		NS		<0.0001 UK	0.00621	NS	
Molybdenum, dissolved	NS		NS		NS		NS		NS		NS		NS		<0.01 UK	0.034	NS	
Nickel, dissolved	NS		**0.0027 JK**	0.0823	NS		NS		NS		**0.009 K**	0.0581	NS		**0.0034 K**	0.106	NS	
Selenium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Silver, dissolved	NS		NS		NS		NS		NS		NS		NS		<0.01 UK	0.00036	NS	
Thallium, dissolved	NS		NS		NS		NS		NS		NS		NS		<0.0001 UK	0.00003	NS	
Vanadium, dissolved	NS		**0.0009 JK**	0.02	NS		<0.00500	0.02	NS		**0.0022 K**	0.02	NS		**0.0022 K**	0.02	NS	
Zinc, dissolved	NS		**0.004 JK**	0.187	NS		NS		NS		<0.01 UK	0.132	NS		**0.004 JK**	0.241	NS	

TABLE 3-8

BALLARD MINE - SUMMARY OF SURFACE WATER EXCEEDANCES

Location:	MST092		MST092		MST092		MST092		MST092		MST092		MST094		MST094		MST094	
Location Type:	Stream		Stream		Stream		Stream		Stream		Stream		Stream		Stream		Stream	
Sample ID:	050807SWMST092-0-F		050807SWMST092-0-U		051508SWMST092-0-F		051508SWMST092-0-U		0905SWMST092-F		0905SWMST092-U		051304SWMST094-0-F		051304SWMST094-0-U		050906GWMST094-0-F	
Collection Date:	5/8/2007		5/8/2007		5/15/2008		5/15/2008		5/6/2009		5/6/2009		5/13/2004		5/13/2004		5/9/2006	
Sample Type:	Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Groundwater		Groundwater		Groundwater	
	Primary		Primary		Primary		Primary		Primary		Primary		Primary		Primary		Primary	
	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL
Total Metals (mg/L)																		
Aluminum	NS		<0.03 UK	0.087	NS		**0.04 JK**	0.087	NS		NS		NS		NS		NS	
Barium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Beryllium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Boron	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Chromium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Cobalt	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Copper, total	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Iron	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Lead	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Molybdenum	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Nickel	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Selenium	NS		<0.001	0.005	NS		**0.007**	0.005	NS		**0.0721 J**	0.005	NS		**0.023**	0.005	NS	
Silver	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Thallium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Vanadium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Zinc	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Dissolved Metals (mg/L)																		
Aluminum, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		<0.03 UK	0.087
Barium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		**0.014 K**	0.003
Beryllium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		<0.002 UK	0.0006
Boron, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium, dissolved	<0.0001 UK	0.000880	NS		<0.0002 UK	0.000887	NS		<0.000125	0.000740	NS		NS		NS		<0.0001 UK	0.000651
Chromium, dissolved	<0.0002 UK	0.137	NS		<0.0001 UK	0.139	NS		NS		NS		NS		NS		**0.0002 JK**	0.0896
Cobalt, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		<0.01 UK	0.003
Copper, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		<0.01 UK	0.0138
Iron, dissolved	NS		NS		NS		NS		**0.0387 J**	0.158	NS		NS		NS		<0.02 UK	0.158
Lead, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		<0.0001 UK	0.00323
Molybdenum, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		<0.01 UK	0.034
Nickel, dissolved	**0.0014 JK**	0.0982	NS		**0.0033 K**	0.0994	NS		NS		NS		**0.0005 J-K**	0.0974	NS		<0.0006 UK	0.0632
Selenium, dissolved	NS		NS		NS		NS		NS		NS		**0.021 J-**	0.005	NS		**0.001 J**	0.005
Silver, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		<0.01 UK	0.00036
Thallium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		<0.0001 UK	0.00003
Vanadium, dissolved	**0.0007 JK**	0.02	NS		**0.0021 K**	0.02	NS		<0.00500	0.02	NS		**0.0017 J-K**	0.02	NS		**0.0008 JK**	0.02
Zinc, dissolved	**0.002 JK**	0.223	NS		**0.007 JK**	0.226	NS		NS		NS		NS		NS		<0.002 UK	0.144

TABLE 3-8

BALLARD MINE - SUMMARY OF SURFACE WATER EXCEEDANCES

Location:	MST094		MST094		MST094		MST094		MST094		MST094		MST094		MST095		MST095	
Location Type:	Stream		Stream		Stream		Stream		Stream		Stream		Stream		Stream		Stream	
Sample ID:	050906GWMST094-0-U		050907SWMST094-0-F		050907SWMST094-0-U		051508GWMST094-0-F		051508GWMST094-0-U		0905SWMST094-F		0905SWMST094-U		051404SWMST095-0-F		051404SWMST095-0-U	
Collection Date:	5/9/2006		5/9/2007		5/9/2007		5/15/2008		5/15/2008		5/7/2009		5/7/2009		5/14/2004		5/14/2004	
Sample Type:	Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Surface Water		Surface Water		Groundwater		Groundwater	
	Primary		Primary		Primary		Primary		Primary		Primary		Primary		Primary		Primary	
	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL
Total Metals (mg/L)																		
Aluminum	NS		NS		<0.03 UK	0.087	NS		**0.14 JK**	0.087	NS		NS		NS		NS	
Barium	NS		NS		NS		NS		**0.018 JK**	0.003	NS		NS		NS		NS	
Beryllium	NS		NS		NS		NS		<0.002 UK	0.0006	NS		NS		NS		NS	
Boron	NS		NS		NS		NS		**0.01 JK**	0.0016	NS		NS		NS		NS	
Cadmium	<0.0001 UK		NS		NS		NS		<0.0001 UK	0.000726	NS		NS		NS		NS	
Chromium	**0.0005 JK**		NS		NS		NS		<0.0001 UK	0.104	NS		NS		NS		NS	
Cobalt	NS		NS		NS		NS		<0.01 UK	0.003	NS		NS		NS		NS	
Copper, total	NS		NS		NS		NS		<0.01 UK	0.0162	NS		NS		NS		NS	
Iron	NS		NS		NS		NS		**0.14 K**	0.158	NS		NS		NS		NS	
Lead	NS		NS		NS		NS		<0.0001 UK	0.00396	NS		NS		NS		NS	
Molybdenum	NS		NS		NS		NS		<0.01 UK	0.034	NS		NS		NS		NS	
Nickel	<0.0006 UK		NS		NS		NS		**0.0017 JK**	0.0741	NS		NS		NS		NS	
Selenium	**0.002 J**	0.005	NS		<0.001	0.005	NS		**0.002 J**	0.005	NS		**0.00305**	0.005	NS		**0.059**	0.005
Silver	NS		NS		NS		NS		<0.01 UK	0.00036	NS		NS		NS		NS	
Thallium	NS		NS		NS		NS		<0.0002 UK	0.00003	NS		NS		NS		NS	
Vanadium	**0.0007 JK**	0.02	NS		NS		NS		**0.0013 K**	0.02	NS		NS		NS		NS	
Zinc	<0.002 UK		NS		NS		NS		**0.026 K**	0.168	NS		NS		NS		NS	
Dissolved Metals (mg/L)																		
Aluminum, dissolved	NS		NS		NS		<0.03 UK	0.087	NS		NS		NS		NS		NS	
Barium, dissolved	NS		NS		NS		**0.014 JK**	0.003	NS		NS		NS		NS		NS	
Beryllium, dissolved	NS		NS		NS		<0.002 UK	0.0006	NS		NS		NS		NS		NS	
Boron, dissolved	NS		NS		NS		**0.02 JK**	0.0016	NS		NS		NS		NS		NS	
Cadmium, dissolved	NS		<0.0001 UK	0.000858	NS		<0.0001 UK	0.000734	NS		<0.000125	0.000621	NS		**0.0002 J-K**	0.00127	NS	
Chromium, dissolved	NS		<0.0001 UK	0.132	NS		<0.0001 UK	0.106	NS		NS		NS		NS		NS	
Cobalt, dissolved	NS		NS		NS		<0.01 UK	0.003	NS		NS		NS		NS		NS	
Copper, dissolved	NS		NS		NS		<0.01 UK	0.0165	NS		NS		NS		NS		NS	
Iron, dissolved	NS		NS		NS		<0.02 UK	0.158	NS		<0.0250	0.158	NS		NS		NS	
Lead, dissolved	NS		NS		NS		<0.0001 UK	0.00404	NS		NS		NS		NS		NS	
Molybdenum, dissolved	NS		NS		NS		<0.01 UK	0.034	NS		NS		NS		NS		NS	
Nickel, dissolved	NS		**0.0036 K**	0.0947	NS		**0.0018 JK**	0.0753	NS		NS		NS		**0.0068 J-K**	0.168	NS	
Selenium, dissolved	NS		NS		NS		**0.002 J**	0.005	NS		NS		NS		NS		NS	
Silver, dissolved	NS		NS		NS		<0.01 UJK	0.00036	NS		NS		NS		NS		NS	
Thallium, dissolved	NS		NS		NS		<0.0001 UK	0.00003	NS		NS		NS		NS		NS	
Vanadium, dissolved	NS		<0.0002 UK	0.02	NS		<0.0007 UK	0.02	NS		<0.00500	0.02	NS		**0.0023 J-K**	0.02	NS	
Zinc, dissolved	NS		<0.002 UK	0.215	NS		**0.002 JK**	0.171	NS		NS		NS		**0.013 J-K**	0.382	NS	

TABLE 3-8

BALLARD MINE - SUMMARY OF SURFACE WATER EXCEEDANCES

Location:	MST095		MST095		MST095		MST095		MST095		MST095		MST095		MST095		MST096	
Location Type:	Stream		Stream		Stream		Stream		Stream		Stream		Stream		Stream		Stream	
Sample ID:	050306GWMST095-0-F		050306GWMST095-0-U		050907SWMST095-0-F		050907SWMST095-0-U		051508GWMST095-0-F		051508GWMST095-0-U		0905SWMST095-F		0905SWMST095-U		051404SWMST096-0-F	
Collection Date:	5/3/2006		5/3/2006		5/9/2007		5/9/2007		5/15/2008		5/15/2008		5/7/2009		5/7/2009		5/14/2004	
Sample Type:	Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Surface Water		Surface Water		Groundwater	
	Primary		Primary		Primary		Primary		Primary		Primary		Primary		Primary		Primary	
	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL
Total Metals (mg/L)																		
Aluminum	NS		NS		NS		<0.03 UK	0.087	NS		**0.61 J+K**	0.087	NS		NS		NS	
Barium	NS		NS		NS		NS		NS		**0.072 K**	0.003	NS		NS		NS	
Beryllium	NS		NS		NS		NS		NS		<0.002 UK	0.0006	NS		NS		NS	
Boron	NS		NS		NS		NS		NS		**0.03 JK**	0.0016	NS		NS		NS	
Cadmium	NS		**0.0006 K**		NS		NS		NS		**0.0005 JK**	0.00127	NS		NS		NS	
Chromium	NS		**0.0009 K**		NS		NS		NS		<0.0003 UK	0.231	NS		NS		NS	
Cobalt	NS		NS		NS		NS		NS		<0.01 UK	0.003	NS		NS		NS	
Copper, total	NS		NS		NS		NS		NS		**0.01 JK**	0.0371	NS		NS		NS	
Iron	NS		NS		NS		NS		NS		**0.46 J+K**	0.158	NS		NS		NS	
Lead	NS		NS		NS		NS		NS		<0.0001 UK	0.0109	NS		NS		NS	
Molybdenum	NS		NS		NS		NS		NS		<0.01 UK	0.034	NS		NS		NS	
Nickel	NS		**0.0695 K**		NS		NS		NS		**0.017 K**	0.168	NS		NS		NS	
Selenium	NS		**0.39**	0.005	NS		**0.073**	0.005	NS		**0.23 J-**	0.005	NS		**0.446**	0.005	NS	
Silver	NS		NS		NS		NS		NS		<0.01 UK	0.00036	NS		NS		NS	
Thallium	NS		NS		NS		NS		NS		<0.0001 UK	0.00003	NS		NS		NS	
Vanadium	NS		**0.0036 K**	0.02	NS		NS		NS		**0.0061 K**	0.02	NS		NS		NS	
Zinc	NS		**0.105 K**		NS		NS		NS		**0.026 K**	0.382	NS		NS		NS	
Dissolved Metals (mg/L)																		
Aluminum, dissolved	<0.03 UK	0.087	NS		NS		NS		<0.03 UK	0.087	NS		NS		NS		NS	
Barium, dissolved	**0.047 K**	0.003	NS		NS		NS		**0.061 K**	0.003	NS		NS		NS		NS	
Beryllium, dissolved	<0.002 UK	0.0006	NS		NS		NS		<0.002 UK	0.0006	NS		NS		NS		NS	
Boron, dissolved	NS		NS		NS		NS		**0.02 JK**	0.0016	NS		NS		NS		NS	
Cadmium, dissolved	**0.0005 K**	0.00127	NS		**0.0002 JK**	0.00113	NS		**0.0004 JK**	0.00127	NS		**0.000248 J**	0.00127	NS		<0.0001 UK	0.00109
Chromium, dissolved	**0.003 K**	0.231	NS		<0.0001 UK	0.197	NS		<0.0001 UK	0.231	NS		NS		NS		**0.0002 JK**	0.186
Cobalt, dissolved	<0.01 UK	0.003	NS		NS		NS		<0.01 UK	0.003	NS		NS		NS		NS	
Copper, dissolved	<0.01 UK	0.0371	NS		NS		NS		<0.01 UK	0.0371	NS		NS		NS		NS	
Iron, dissolved	<0.02 UK	0.158	NS		NS		NS		<0.02 UK	0.158	NS		<0.0250	0.158	NS		NS	
Lead, dissolved	<0.0001 UK	0.0109	NS		NS		NS		<0.0001 UK	0.0109	NS		NS		NS		NS	
Molybdenum, dissolved	**0.01 JK**	0.034	NS		NS		NS		<0.01 UK	0.034	NS		NS		NS		NS	
Nickel, dissolved	**0.0665 K**	0.168	NS		**0.0108 K**	0.142	NS		**0.0167 K**	0.168	NS		NS		NS		**0.0005 JK**	0.134
Selenium, dissolved	**0.38**	0.005	NS		NS		NS		**0.25**	0.005	NS		NS		NS		**0.016**	0.005
Silver, dissolved	<0.01 UK	0.00036	NS		NS		NS		<0.01 UK	0.00036	NS		NS		NS		NS	
Thallium, dissolved	<0.0001 UK	0.00003	NS		NS		NS		<0.0001 UK	0.00003	NS		NS		NS		NS	
Vanadium, dissolved	**0.0013 K**	0.02	NS		**0.0058 K**	0.02	NS		**0.0058 K**	0.02	NS		<0.00500	0.02	NS		**0.00072 K**	0.02
Zinc, dissolved	**0.101 K**	0.382	NS		**0.013 K**	0.324	NS		**0.023 K**	0.382	NS		NS		NS		**0.017 K**	0.306

TABLE 3-8

BALLARD MINE - SUMMARY OF SURFACE WATER EXCEEDANCES

Location:	MST096		MST096		MST096		MST096		MST096		MST096		MST096		MST096		MST096	
Location Type:	Stream		Stream		Stream		Stream		Stream		Stream		Stream		Stream		Stream	
Sample ID:	051404SWMST096-0-U		SWMST096-0-F		SWMST096-0-U		050306GW		050306GWMST096-0-U		051808GWMST096-0-F		051808GWMST096-0-U		091708GWMST096-0-F		091708GWMST096-0-U	
Collection Date:	5/14/2004		9/10/2004		9/10/2004		5/3/2006		5/3/2006		5/18/2008		5/18/2008		9/17/2008		9/17/2008	
Sample Type:	Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater	
	Primary		Primary		Primary		Primary		Primary		Primary		Primary		Primary		Primary	
	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL
Total Metals (mg/L)																		
Aluminum	NS		NS		NS		NS		NS		NS		**0.16 J+K**	0.087	NS		**1.9**	0.087
Barium	NS		NS		NS		NS		NS		NS		**0.035 K**	0.003	NS		NS	
Beryllium	NS		NS		NS		NS		NS		NS		<0.002 UK	0.0006	NS		NS	
Boron	NS		NS		NS		NS		NS		NS		**0.02 JK**	0.0016	NS		NS	
Cadmium	NS		NS		NS		NS		<0.0001 UK		NS		<0.0001 UK	0.00105	NS		<0.000125	
Chromium	NS		NS		NS		NS		**0.0007 K**		NS		<0.0002 UK	0.177	NS		**0.00322**	
Cobalt	NS		NS		NS		NS		NS		NS		<0.01 UK	0.003	NS		NS	
Copper, total	NS		NS		NS		NS		NS		NS		<0.01 UK	0.0281	NS		NS	
Iron	NS		NS		NS		NS		NS		NS		**0.08 J+K**	0.158	NS		**1.45**	0.158
Lead	NS		NS		NS		NS		NS		NS		<0.0001 UK	0.00782	NS		NS	
Molybdenum	NS		NS		NS		NS		NS		NS		<0.01 UK	0.034	NS		NS	
Nickel	NS		NS		NS		NS		<0.0006 UK		NS		**0.0013 JK**	0.128	NS		**0.00327 J**	
Selenium	**0.02**	0.005	NS		**0.027**	0.005	NS		**0.052**	0.005	NS		**0.031**	0.005	NS		**0.0302**	0.005
Silver	NS		NS		NS		NS		NS		NS		<0.01 UK	0.00036	NS		NS	
Thallium	NS		NS		NS		NS		NS		NS		<0.0001 UK	0.00003	NS		NS	
Vanadium	NS		NS		NS		NS		**0.0008 JK**	0.02	NS		**0.0013 K**	0.02	NS		<0.00500	0.02
Zinc	NS		NS		NS		NS		**0.004 JK**		NS		**0.003 JK**	0.290	NS		**0.0108 J**	
Dissolved Metals (mg/L)																		
Aluminum, dissolved	NS		NS		NS		<0.03 UK	0.087	NS		<0.03 UK	0.087	NS		<0.0500	0.087	NS	
Barium, dissolved	NS		NS		NS		**0.033 K**	0.003	NS		**0.035 K**	0.003	NS		NS		NS	
Beryllium, dissolved	NS		NS		NS		<0.002 UK	0.0006	NS		<0.002 UK	0.0006	NS		NS		NS	
Boron, dissolved	NS		NS		NS		NS		NS		<0.01 UK	0.0016	NS		NS		NS	
Cadmium, dissolved	NS		<0.0001 UK	0.00113	NS		<0.0001 UK	0.00113	NS		**0.0001 JK**	0.00104	NS		<0.000125	0.00104	NS	
Chromium, dissolved	NS		<0.0001	0.196	NS		**0.0004 JK**	0.196	NS		<0.0001 UK	0.174	NS		**0.000773 J**	0.174	NS	
Cobalt, dissolved	NS		NS		NS		<0.01 UK	0.003	NS		<0.01 UK	0.003	NS		NS		NS	
Copper, dissolved	NS		NS		NS		<0.01 UK	0.0313	NS		<0.01 UK	0.0276	NS		NS		NS	
Iron, dissolved	NS		NS		NS		<0.02 UK	0.158	NS		**0.05 JK**	0.158	NS		<0.0250	0.158	NS	
Lead, dissolved	NS		NS		NS		<0.0001 UK	0.00892	NS		<0.0001 UK	0.00765	NS		NS		NS	
Molybdenum, dissolved	NS		NS		NS		<0.01 UK	0.034	NS		<0.01 UK	0.034	NS		NS		NS	
Nickel, dissolved	NS		**0.0036 K**	0.142	NS		<0.0006 UK	0.142	NS		**0.0024 JK**	0.125	NS		**0.00429**	0.125	NS	
Selenium, dissolved	NS		**0.027**	0.005	NS		**0.041 J-**	0.005	NS		**0.032**	0.005	NS		**0.0298**	0.005	NS	
Silver, dissolved	NS		NS		NS		<0.01 UK	0.00036	NS		<0.01 UK	0.00036	NS		NS		NS	
Thallium, dissolved	NS		NS		NS		<0.0001 UK	0.00003	NS		<0.0001 UK	0.00003	NS		NS		NS	
Vanadium, dissolved	NS		**0.00013 JK**	0.02	NS		<0.0002 UK	0.02	NS		**0.0014 K**	0.02	NS		<0.00500	0.02	NS	
Zinc, dissolved	NS		<0.002 UK	0.324	NS		**0.003 JK**	0.323	NS		**0.009 JK**	0.285	NS		<0.00500 UJ	0.285	NS	

TABLE 3-8

BALLARD MINE - SUMMARY OF SURFACE WATER EXCEEDANCES

Location:	MST096		MST096		MST230		MST230		MST230		MST230		MST230		MST230		MST230	
Location Type:	Stream		Stream		Stream		Stream		Stream		Stream		Stream		Stream		Stream	
Sample ID:	0905GWMST096-F		0905GWMST096-U		052004SWMST230-1-F		052004SWMST230-1-U		052004SWMST230-2-F		052004SWMST230-2-U		052004SWMST230-3-F		052004SWMST230-3-U		052004SWMST230-avg-F	
Collection Date:	5/31/2009		5/31/2009		5/20/2004		5/20/2004		5/20/2004		5/20/2004		5/20/2004		5/20/2004		5/20/2004	
Sample Type:	Groundwater		Groundwater		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water	
	Primary		Primary		Triplicate		Triplicate		Triplicate		Triplicate		Triplicate		Triplicate		Averaged	
	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL
Total Metals (mg/L)																		
Aluminum	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Barium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Beryllium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Boron	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium	NS		<0.000125		NS		NS		NS		NS		NS		NS		NS	
Chromium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Cobalt	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Copper, total	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Iron	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Lead	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Molybdenum	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Nickel	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Selenium	NS		**0.0638**	0.005	NS		**0.003 J**	0.005	NS		**0.003 J**	0.005	NS		**0.002 J**	0.005	NS	
Silver	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Thallium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Vanadium	NS		<0.00500	0.02	NS		NS		NS		NS		NS		NS		NS	
Zinc	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Dissolved Metals (mg/L)																		
Aluminum, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Barium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Beryllium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Boron, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium, dissolved	<0.000125	0.00112	NS		<0.0001 UK	0.000832	NS		<0.0001 UK	0.000830	NS		<0.0001	0.000828	NS		<0.0001	0.000830
Chromium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Cobalt, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Copper, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Iron, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Lead, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Molybdenum, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Nickel, dissolved	NS		NS		**0.0004 JK**	0.0905	NS		**0.0003 JK**	0.0903	NS		**0.0013 JK**	0.0898	NS		**0.000667 JK**	0.0903
Selenium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Silver, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Thallium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Vanadium, dissolved	NS		NS		**0.00101 K**	0.02	NS		**0.001 K**	0.02	NS		**0.00091 JK**	0.02	NS		**0.000973 JK**	0.02
Zinc, dissolved	NS		NS		<0.002 UK	0.206	NS		<0.002 UK	0.205	NS		<0.002 UJK	0.204	NS		<0.002 UJK	0.205

TABLE 3-8

BALLARD MINE - SUMMARY OF SURFACE WATER EXCEEDANCES

Location:	**MST230**		**MST231**		**MST231**		**MST231**		**MST231**		**MST231**		**MST231**		**MST231**		**MST231**	
Location Type:	**Stream**		**Stream**		**Stream**		**Stream**		**Stream**		**Stream**		**Stream**		**Stream**		**Stream**	
Sample ID:	**052004SWMST230-avg-U**		**052104SWMST231-1-F**		**052104SWMST231-1-U**		**052104SWMST231-2-F**		**052104SWMST231-2-U**		**052104SWMST231-3-F**		**052104SWMST231-3-U**		**052104SWMST231-avg-F**		**052104SWMST231-avg-U**	
Collection Date:	**5/20/2004**		**5/21/2004**		**5/21/2004**		**5/21/2004**		**5/21/2004**		**5/21/2004**		**5/21/2004**		**5/21/2004**		**5/21/2004**	
Sample Type:	**Surface Water**		**Surface Water**		**Surface Water**		**Surface Water**		**Surface Water**		**Surface Water**		**Surface Water**		**Surface Water**		**Surface Water**	
	Averaged		**Triplicate**		**Triplicate**		**Triplicate**		**Triplicate**		**Triplicate**		**Triplicate**		**Averaged**		**Averaged**	
	Result	**SL**	**Result**	**SL**	**Result**	**SL**	**Result**	**SL**	**Result**	**SL**	**Result**	**SL**	**Result**	**SL**	**Result**	**SL**	**Result**	**SL**
Total Metals (mg/L)																		
Aluminum	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Barium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Beryllium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Boron	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Chromium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Cobalt	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Copper, total	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Iron	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Lead	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Molybdenum	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Nickel	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Selenium	**0.00267 J**	0.005	NS		**0.002 J**	0.005	NS		**0.002 J**	0.005	NS		**0.002 J**	0.005	NS		**0.002 J**	0.005
Silver	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Thallium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Vanadium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Zinc	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Dissolved Metals (mg/L)																		
Aluminum, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Barium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Beryllium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Boron, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium, dissolved	NS		<0.0002 UK	0.000924	NS		<0.0002 UK	0.000926	NS		<0.0002 UK	0.000912	NS		<0.0002 UK	0.000920	NS	
Chromium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Cobalt, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Copper, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Iron, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Lead, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Molybdenum, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Nickel, dissolved	NS		**0.0007 JK**	0.106	NS		**0.0007 JK**	0.106	NS		**0.0005 JK**	0.104	NS		**0.000633 JK**	0.105	NS	
Selenium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Silver, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Thallium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Vanadium, dissolved	NS		**0.001 K**	0.02	NS		**0.001 K**	0.02	NS		**0.001 K**	0.02	NS		**0.001 K**	0.02	NS	
Zinc, dissolved	NS		<0.004 UK	0.240	NS		<0.004 UK	0.241	NS		<0.004 UK	0.236	NS		<0.004 UK	0.239	NS	

TABLE 3-8

BALLARD MINE - SUMMARY OF SURFACE WATER EXCEEDANCES

Location:	MST231		MST231		MST232		MST232		MST232		MST232		MST232		MST232		MST232	
Location Type:	Stream		Stream		Stream		Stream		Stream		Stream		Stream		Stream		Stream	
Sample ID:	050706SWMST231-0-F		050706SWMST231-0-U		052104SWMST232-0-F		052104SWMST232-0-U		050706SWMST232-1-F		050706SWMST232-1-U		050706SWMST232-2-F		050706SWMST232-2-U		050706SWMST232-3-F	
Collection Date:	5/7/2006		5/7/2006		5/21/2004		5/21/2004		5/7/2006		5/7/2006		5/7/2006		5/7/2006		5/7/2006	
Sample Type:	Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water	
	Primary		Primary		Primary		Primary		Triplicate		Triplicate		Triplicate		Triplicate		Triplicate	
	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL
Total Metals (mg/L)																		
Aluminum	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Barium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Beryllium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Boron	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Chromium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Cobalt	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Copper, total	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Iron	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Lead	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Molybdenum	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Nickel	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Selenium	NS		**0.008**	0.005	NS		**0.002 J**	0.005	NS		**0.007**	0.005	NS		**0.007**	0.005	NS	
Silver	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Thallium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Vanadium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Zinc	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Dissolved Metals (mg/L)																		
Aluminum, dissolved	<0.03 UK	0.087	NS		NS		NS		<0.03 UK	0.087	NS		<0.03 UK	0.087	NS		<0.03 UK	0.087
Barium, dissolved	**0.063 K**	0.003	NS		NS		NS		**0.064 K**	0.003	NS		**0.063 K**	0.003	NS		**0.063 K**	0.003
Beryllium, dissolved	<0.002 UK	0.0006	NS		NS		NS		<0.002 UK	0.0006	NS		<0.002 UK	0.0006	NS		<0.002 UK	0.0006
Boron, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium, dissolved	<0.0001 UK	0.000808	NS		<0.0001 UK	0.000926	NS		<0.0001 UK	0.000800	NS		<0.0001 UK	0.000798	NS		<0.0001 UK	0.000800
Chromium, dissolved	**0.0001 JK**	0.122	NS		NS		NS		**0.0001 JK**	0.120	NS		**0.0001 JK**	0.119	NS		**0.0001 JK**	0.120
Cobalt, dissolved	<0.01 UK	0.003	NS		NS		NS		<0.01 UK	0.003	NS		<0.01 UK	0.003	NS		<0.01 UK	0.003
Copper, dissolved	<0.01 UK	0.0190	NS		NS		NS		<0.01 UK	0.0188	NS		<0.01 UK	0.0187	NS		<0.01 UK	0.0188
Iron, dissolved	<0.02 UK	0.158	NS		NS		NS		<0.02 UK	0.158	NS		<0.02 UK	0.158	NS		<0.02 UK	0.158
Lead, dissolved	<0.0004 UK	0.00483	NS		NS		NS		<0.0004 UK	0.00474	NS		**0.0006 K**	0.00471	NS		<0.0005 UK	0.00474
Molybdenum, dissolved	<0.01 UK	0.034	NS		NS		NS		<0.01 UK	0.034	NS		<0.01 UK	0.034	NS		<0.01 UK	0.034
Nickel, dissolved	**0.0019 JK**	0.0867	NS		**0.0008 JK**	0.106	NS		**0.0012 JK**	0.0855	NS		**0.0012 JK**	0.0851	NS		**0.0012 JK**	0.0855
Selenium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Silver, dissolved	<0.01 UJK	0.00036	NS		NS		NS		<0.01 UJK	0.00036	NS		<0.01 UJK	0.00036	NS		<0.01 UJK	0.00036
Thallium, dissolved	<0.0001 UK	0.00003	NS		NS		NS		<0.0001 UK	0.00003	NS		<0.0001 UK	0.00003	NS		<0.0001 UK	0.00003
Vanadium, dissolved	<0.0002 UK	0.02	NS		**0.00106 K**	0.02	NS		<0.0002 UK	0.02	NS		<0.0002 UK	0.02	NS		<0.0002 UK	0.02
Zinc, dissolved	**0.005 JK**	0.197	NS		<0.002 UK	0.241	NS		<0.002 UK	0.194	NS		<0.002 UK	0.193	NS		**0.002 JK**	0.194

TABLE 3-8

BALLARD MINE - SUMMARY OF SURFACE WATER EXCEEDANCES

Location:	MST232		MST232		MST232		MST232		MST232		MST232		MST232		MST232		MST232	
Location Type:	Stream		Stream		Stream		Stream		Stream		Stream		Stream		Stream		Stream	
Sample ID:	050706SWMST232-3-U		050706SWMST232-avg-F		050706SWMST232-avg-U		051407SWMST232-1-F		051407SWMST232-1-U		051407SWMST232-2-F		051407SWMST232-2-U		051407SWMST232-3-F		051407SWMST232-3-U	
Collection Date:	5/7/2006		5/7/2006		5/7/2006		5/14/2007		5/14/2007		5/14/2007		5/14/2007		5/14/2007		5/14/2007	
Sample Type:	Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water	
	Triplicate		Averaged		Averaged		Triplicate		Triplicate		Triplicate		Triplicate		Triplicate		Triplicate	
	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL
Total Metals (mg/L)																		
Aluminum	NS		NS		NS		NS		**0.25 K**	0.087	NS		**0.24 K**	0.087	NS		**0.26 K**	0.087
Barium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Beryllium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Boron	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Chromium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Cobalt	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Copper, total	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Iron	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Lead	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Molybdenum	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Nickel	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Selenium	**0.008**	0.005	NS		**0.00733**	0.005	NS		**0.003 J**	0.005	NS		**0.003 J**	0.005	NS		**0.004 J**	0.005
Silver	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Thallium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Vanadium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Zinc	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Dissolved Metals (mg/L)																		
Aluminum, dissolved	NS		<0.03 UK	0.087	NS		NS		NS		NS		NS		NS		NS	
Barium, dissolved	NS		**0.0633 K**	0.003	NS		NS		NS		NS		NS		NS		NS	
Beryllium, dissolved	NS		<0.002 UK	0.0006	NS		NS		NS		NS		NS		NS		NS	
Boron, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium, dissolved	NS		<0.0001 UK	0.000800	NS		<0.0001	0.000910	NS		<0.0001	0.000920	NS		<0.0001	0.000917	NS	
Chromium, dissolved	NS		**0.0001 JK**	0.120	NS		<0.0001	0.144	NS		<0.0001	0.146	NS		<0.0001	0.146	NS	
Cobalt, dissolved	NS		<0.01 UK	0.003	NS		NS		NS		NS		NS		NS		NS	
Copper, dissolved	NS		<0.01 UK	0.0188	NS		NS		NS		NS		NS		NS		NS	
Iron, dissolved	NS		<0.02 UK	0.158	NS		NS		NS		NS		NS		NS		NS	
Lead, dissolved	NS		**0.0006 K**	0.00474	NS		NS		NS		NS		NS		NS		NS	
Molybdenum, dissolved	NS		<0.01 UK	0.034	NS		NS		NS		NS		NS		NS		NS	
Nickel, dissolved	NS		**0.0012 JK**	0.0855	NS		**0.001 JK**	0.103	NS		**0.001 JK**	0.105	NS		**0.0009 JK**	0.104	NS	
Selenium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Silver, dissolved	NS		<0.01 UJK	0.00036	NS		NS		NS		NS		NS		NS		NS	
Thallium, dissolved	NS		<0.0001 UK	0.00003	NS		NS		NS		NS		NS		NS		NS	
Vanadium, dissolved	NS		<0.0002 UK	0.02	NS		**0.001 JK**	0.02	NS		**0.0009 JK**	0.02	NS		**0.0009 JK**	0.02	NS	
Zinc, dissolved	NS		**0.002 JK**	0.194	NS		<0.002 UJK	0.235	NS		<0.002 UJK	0.238	NS		<0.002 UJK	0.238	NS	

TABLE 3-8

BALLARD MINE - SUMMARY OF SURFACE WATER EXCEEDANCES

Location:	MST232		MST232		MST232		MST232		MST232		MST232		MST232		MST232		MST232	
Location Type:	Stream		Stream		Stream		Stream		Stream		Stream		Stream		Stream		Stream	
Sample ID:	051407SWMST232-avg-F		051407SWMST232-avg-U		090807SWMST232-0-F		090807SWMST232-0-U		051308SWMST232-1-F		051308SWMST232-1-U		051308SWMST232-2-F		051308SWMST232-2-U		051308SWMST232-3-F	
Collection Date:	5/14/2007		5/14/2007		9/8/2007		9/8/2007		5/13/2008		5/13/2008		5/13/2008		5/13/2008		5/13/2008	
Sample Type:	Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water	
	Averaged		Averaged		Primary		Primary		Triplicate		Triplicate		Triplicate		Triplicate		Triplicate	
	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL
Total Metals (mg/L)																		
Aluminum	NS		**0.25 K**	0.087	NS		**0.12 JK**	0.087	NS		**1.5 K**	0.087	NS		**1.62 J+K**	0.087	NS	
Barium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Beryllium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Boron	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Chromium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Cobalt	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Copper, total	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Iron	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Lead	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Molybdenum	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Nickel	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Selenium	NS		**0.00333 J**	0.005	NS		<0.001	0.005	NS		**0.004 J**	0.005	NS		**0.004 J**	0.005	NS	
Silver	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Thallium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Vanadium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Zinc	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Dissolved Metals (mg/L)																		
Aluminum, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Barium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Beryllium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Boron, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium, dissolved	<0.0001	0.000915	NS		<0.0001 UK	0.000943	NS		<0.0001	0.000706	NS		**0.0001 JK**	0.000706	NS		<0.0001 UK	0.000729
Chromium, dissolved	<0.0001	0.145	NS		<0.0001 UK	0.151	NS		<0.0001 UK	0.100	NS		<0.0001 UK	0.100	NS		<0.0001 UK	0.105
Cobalt, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Copper, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Iron, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Lead, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Molybdenum, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Nickel, dissolved	**0.000967 JK**	0.104	NS		**0.0018 JK**	0.109	NS		**0.0028 JK**	0.0712	NS		**0.003 JK**	0.0712	NS		**0.0018 JK**	0.0745
Selenium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Silver, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Thallium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Vanadium, dissolved	**0.000933 JK**	0.02	NS		<0.0008 UK	0.02	NS		**0.0017 K**	0.02	NS		**0.0012 K**	0.02	NS		**0.0014 J+K**	0.02
Zinc, dissolved	<0.002 UJK	0.237	NS		**0.009 JK**	0.247	NS		**0.011 JK**	0.162	NS		**0.013 K**	0.162	NS		**0.002 JK**	0.169

TABLE 3-8

BALLARD MINE - SUMMARY OF SURFACE WATER EXCEEDANCES

Location:	MST232		MST232		MST232		MST232		MST232		MST272		MST272		MST272		MST272	
Location Type:	Stream		Stream		Stream		Stream		Stream		Stream		Stream		Stream		Stream	
Sample ID:	051308SWMST232-3-U		051308SWMST232-avg-F		051308SWMST232-avg-U		091508SWMST232-0-F		091508SWMST232-0-U		051404SWMST272-0-F		051404SWMST272-0-U		050906SWMST272-0-F		050906SWMST272-0-U	
Collection Date:	5/13/2008		5/13/2008		5/13/2008		9/15/2008		9/15/2008		5/14/2004		5/14/2004		5/9/2006		5/9/2006	
Sample Type:	Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water	
	Triplicate		Averaged		Averaged		Primary		Primary		Primary		Primary		Primary		Primary	
	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL
Total Metals (mg/L)																		
Aluminum	**1.24 K**	0.087	NS		**1.45 J+K**	0.087	NS		NS		NS		NS		NS		NS	
Barium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Beryllium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Boron	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Chromium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Cobalt	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Copper, total	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Iron	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Lead	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Molybdenum	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Nickel	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Selenium	**0.004 J**	0.005	NS		**0.004 J**	0.005	NS		**0.00127 J+**	0.005	NS		<0.001	0.005	NS		**0.01**	0.005
Silver	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Thallium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Vanadium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Zinc	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Dissolved Metals (mg/L)																		
Aluminum, dissolved	NS		NS		NS		<0.0500	0.087	NS		NS		NS		**0.07 JK**	0.087	NS	
Barium, dissolved	NS		NS		NS		NS		NS		NS		NS		**0.028 K**	0.003	NS	
Beryllium, dissolved	NS		NS		NS		NS		NS		NS		NS		<0.002 UK	0.0006	NS	
Boron, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium, dissolved	NS		**0.0001 JK**	0.000715	NS		<0.000125	0.000880	NS		NS		NS		<0.0001 UK	0.000785	NS	
Chromium, dissolved	NS		<0.0001 UK	0.102	NS		**0.000636 J**	0.137	NS		NS		NS		**0.0003 JK**	0.117	NS	
Cobalt, dissolved	NS		NS		NS		NS		NS		NS		NS		<0.01 UK	0.003	NS	
Copper, dissolved	NS		NS		NS		NS		NS		NS		NS		<0.01 UK	0.0182	NS	
Iron, dissolved	NS		NS		NS		<0.0250	0.158	NS		NS		NS		**0.07 K**	0.158	NS	
Lead, dissolved	NS		NS		NS		NS		NS		NS		NS		<0.0001 UK	0.00457	NS	
Molybdenum, dissolved	NS		NS		NS		NS		NS		NS		NS		<0.01 UK	0.034	NS	
Nickel, dissolved	NS		**0.00253 JK**	0.0725	NS		**0.00185 J**	0.0982	NS		**0.0012 J-K**	0.116	NS		**0.0014 JK**	0.0831	NS	
Selenium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Silver, dissolved	NS		NS		NS		NS		NS		NS		NS		<0.01 UK	0.00036	NS	
Thallium, dissolved	NS		NS		NS		NS		NS		NS		NS		<0.0001 UK	0.00003	NS	
Vanadium, dissolved	NS		**0.00143 J+K**	0.02	NS		<0.00500	0.02	NS		**0.0111 J-K**	0.02	NS		**0.0014 K**	0.02	NS	
Zinc, dissolved	NS		**0.00867 JK**	0.165	NS		**0.00663 J**	0.223	NS		NS		NS		**0.003 JK**	0.189	NS	

TABLE 3-8

BALLARD MINE - SUMMARY OF SURFACE WATER EXCEEDANCES

Location:	MST273		MST273		MST273		MST273		MST278		MST278		MST279		MST279		MST279	
Location Type:	Stream		Stream		Stream		Stream		Stream		Stream		Stream		Stream		Stream	
Sample ID:	051404SWMST273-0-F		051404SWMST273-0-U		050906SWMST273-0-F		050906SWMST273-0-U		051006SWMST278-0-F		051006SWMST278-0-U		050807SWMST279-0-F		050807SWMST279-0-U		091507GWMST279-0-F	
Collection Date:	5/14/2004		5/14/2004		5/9/2006		5/9/2006		5/10/2006		5/10/2006		5/8/2007		5/8/2007		9/15/2007	
Sample Type:	Surface Water		Surface Water		Surface Water		Surface Water		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater	
	Primary		Primary		Primary		Primary		Primary		Primary		Primary		Primary		Primary	
	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL
Total Metals (mg/L)																		
Aluminum	NS		NS		NS		NS		NS		NS		NS		**0.26 K**	0.087	NS	
Barium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Beryllium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Boron	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Chromium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Cobalt	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Copper, total	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Iron	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Lead	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Molybdenum	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Nickel	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Selenium	NS		<0.001	0.005	NS		**0.016**	0.005	NS		**0.122**	0.005	NS		**0.001 J**	0.005	NS	
Silver	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Thallium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Vanadium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Zinc	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Dissolved Metals (mg/L)																		
Aluminum, dissolved	NS		NS		<0.03 UK	0.087	NS		<0.03 UK	0.087	NS		NS		NS		<0.03 UK	0.087
Barium, dissolved	NS		NS		**0.026 K**	0.003	NS		**0.03 K**	0.003	NS		NS		NS		**0.051 K**	0.003
Beryllium, dissolved	NS		NS		<0.002 UK	0.0006	NS		<0.002 UK	0.0006	NS		NS		NS		<0.002 UK	0.0006
Boron, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		**0.02 JK**	0.0016
Cadmium, dissolved	NS		NS		<0.0001 UK	0.000787	NS		**0.0007 K**	0.000994	NS		<0.0001 UK	0.000880	NS		<0.0001 UK	0.000974
Chromium, dissolved	NS		NS		**0.0003 JK**	0.117	NS		**0.0008 K**	0.163	NS		<0.0004 UK	0.137	NS		<0.0001 UK	0.159
Cobalt, dissolved	NS		NS		<0.01 UK	0.003	NS		<0.01 UK	0.003	NS		NS		NS		<0.01 UK	0.003
Copper, dissolved	NS		NS		<0.01 UK	0.0183	NS		<0.01 UK	0.0259	NS		NS		NS		<0.01 UK	0.0251
Iron, dissolved	NS		NS		**0.05 JK**	0.158	NS		<0.02 UK	0.158	NS		NS		NS		**0.06 K**	0.158
Lead, dissolved	NS		NS		<0.0001 UK	0.00460	NS		<0.0001 UK	0.00705	NS		NS		NS		<0.0001 UK	0.00680
Molybdenum, dissolved	NS		NS		<0.01 UK	0.034	NS		**0.02 JK**	0.034	NS		NS		NS		<0.01 UK	0.034
Nickel, dissolved	**0.004 J-K**	0.133	NS		**0.0016 JK**	0.0835	NS		**0.0066 K**	0.117	NS		**0.0014 JK**	0.0982	NS		**0.0029 JK**	0.114
Selenium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		<0.001	0.005
Silver, dissolved	NS		NS		<0.01 UK	0.00036	NS		<0.01 UK	0.00036	NS		NS		NS		<0.01 UJK	0.00036
Thallium, dissolved	NS		NS		<0.0001 UK	0.00003	NS		<0.0001 UK	0.00003	NS		NS		NS		<0.0001 UK	0.00003
Vanadium, dissolved	**0.0046 J-K**	0.02	NS		**0.0016 K**	0.02	NS		**0.0073 K**	0.02	NS		**0.0009 JK**	0.02	NS		**0.0012 K**	0.02
Zinc, dissolved	NS		NS		**0.003 JK**	0.190	NS		**0.017 K**	0.267	NS		<0.002 UK	0.223	NS		<0.002 UK	0.259

TABLE 3-8

BALLARD MINE - SUMMARY OF SURFACE WATER EXCEEDANCES

Location:	MST279		MST279		MST279		MST279		MST279	
Location Type:	Stream		Stream		Stream		Stream		Stream	
Sample ID:	091507GWMST279-0-U		050908GWMST279-0-F		050908GWMST279-0-U		091908GWMST279-0-F		091908GWMST279-0-U	
Collection Date:	9/15/2007		5/9/2008		5/9/2008		9/18/2008		9/18/2008	
Sample Type:	Groundwater		Groundwater		Groundwater		Groundwater		Groundwater	
	Primary		Primary		Primary		Primary		Primary	
	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL
Total Metals (mg/L)										
Aluminum	**1.73 J+K**	0.087	NS		**0.07 JK**	0.087	NS		**5.65**	0.087
Barium	**0.065 K**	0.003	NS		**0.025 K**	0.003	NS		NS	
Beryllium	<0.002 UK	0.0006	NS		<0.002 UK	0.0006	NS		NS	
Boron	**0.03 JK**	0.0016	NS		**0.03 JK**	0.0016	NS		NS	
Cadmium	<0.0001 UK	0.000977	NS		<0.0001 UK	0.000761	NS		**0.000478 J**	
Chromium	**0.0048 K**	0.159	NS		<0.0001 UK	0.112	NS		**0.0108**	
Cobalt	<0.01 UK	0.003	NS		<0.01 UK	0.003	NS		NS	
Copper, total	<0.01 UK	0.0252	NS		<0.01 UK	0.0174	NS		NS	
Iron	**1.69 K**	0.158	NS		**0.1 K**	0.158	NS		**5.17**	0.158
Lead	**0.001 J+K**	0.00683	NS		<0.0001 UK	0.00432	NS		NS	
Molybdenum	<0.01 UK	0.034	NS		<0.01 UK	0.034	NS		NS	
Nickel	**0.0041 K**	0.114	NS		<0.0012 UK	0.0794	NS		**0.0142**	
Selenium	<0.001	0.005	NS		<0.001	0.005	NS		**0.00248**	0.005
Silver	<0.01 UK	0.00036	NS		<0.01 UK	0.00036	NS		NS	
Thallium	<0.0003 UK	0.00003	NS		<0.0001 UK	0.00003	NS		NS	
Vanadium	**0.0028 K**	0.02	NS		**0.0012 J+K**	0.02	NS		**0.0136**	0.02
Zinc	**0.011 K {J+}**	0.260	NS		<0.002 UK	0.181	NS		**0.0432**	
Dissolved Metals (mg/L)										
Aluminum, dissolved	NS		<0.03 UK	0.087	NS		<0.0500	0.087	NS	
Barium, dissolved	NS		**0.026 K**	0.003	NS		NS		NS	
Beryllium, dissolved	NS		<0.002 UK	0.0006	NS		NS		NS	
Boron, dissolved	NS		**0.02 JK**	0.0016	NS		NS		NS	
Cadmium, dissolved	NS		<0.0001 UK	0.000777	NS		<0.000125	0.000908	NS	
Chromium, dissolved	NS		<0.0001 UK	0.115	NS		**0.00241**	0.143	NS	
Cobalt, dissolved	NS		<0.01 UK	0.003	NS		NS		NS	
Copper, dissolved	NS		<0.01 UK	0.0180	NS		NS		NS	
Iron, dissolved	NS		<0.02 UK	0.158	NS		**0.0315 J**	0.158	NS	
Lead, dissolved	NS		<0.0001 UK	0.00449	NS		NS		NS	
Molybdenum, dissolved	NS		<0.01 UK	0.034	NS		NS		NS	
Nickel, dissolved	NS		**0.0018 JK**	0.0819	NS		**0.00476**	0.103	NS	
Selenium, dissolved	NS		<0.001	0.005	NS		**0.00161**	0.005	NS	
Silver, dissolved	NS		<0.01 UJK	0.00036	NS		NS		NS	
Thallium, dissolved	NS		<0.0001 UK	0.00003	NS		NS		NS	
Vanadium, dissolved	NS		**0.0014 K**	0.02	NS		<0.00500	0.02	NS	
Zinc, dissolved	NS		<0.002 UK	0.186	NS		**0.00539 J**	0.234	NS	

TABLE 3-8

BALLARD MINE - SUMMARY OF SURFACE WATER EXCEEDANCES
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Notes:
NS - not sampled
SL - screening level
F - filtered
U - unfiltered
Avg - average

Result is greater than screening value
Method detection limit for non-detected value is greater than the screening value

FLAG DEFINITION:

U	The analyte was analyzed for, but was not detected above the level of the reported sample quantitation limit.
J	The result is an estimated quantity. The associated numerical value is the approximated concentration of the analyte in the sample.
J+	The result is an estimated quantity, but the result may be biased high.
J-	The result is an estimated quantity, but the result may be biased low.
J+/B	Result is estimated and biased high; associated field blank contained target analyte.
R	The result is unusable. The sample result is rejected due to serious deficiencies in meeting quality control criteria. The analyte may or may not be present in the sample.
UJ	The analyte was analyzed for, but was not detected. The reported quantitation limit is approximate and may be inaccurate or imprecise.
K	Serial dilutions not performed for samples analyzed by this method (EPA 200.7; 200.8).

SOURCES FOR SCREENING VALUES (SEE ALSO TABLE 3

Surface Water	Unless identified otherwise below, screening levels are the chronic freshwater screening value in NOAA SQuiRT (Buchman, 2008).
	Screening levels for aluminum is the Freshwater Standards for Chronic Criteria (CCC) from the National Recommended Water Quality Criteria (USEPA, 2009).
	Screening values for arsenic, cadmium, chromium, copper, lead, nickel, selenium, and zinc are the CCCs from the State of Idaho Surface Water Quality for Aquatic Life (IDAPA 58.01.02); those for cadmium, chromium, copper, lead, nickel, and zinc are expressed as a function of total hardness. Screening levels for cadmium and selenium are expressed as total recoverable (unfiltered concentration).
	The screening level for iron is the Lowest Chronic Value (LCV) observed for fresh water daphnids (source: ORNL, 1996).
	The screening levels for manganese, uranium, and vanadium are the Tier II Secondary Chronic Values (source: ORNL, 1996).

TRIPLICATE RESULT

"Primary" indicates locations where only one sample was collected from a given location. "Triplicate" indicates locations where a total of three samples were collected from a given location for the purpose of quality assurance.
The average value for triplicate samples is calculated as follows: (a) the mean of three detected values, (b) the mean of two detected values if result of one triplicate is not detected, (c) the detected value if results of two triplicates are not detected, or (d) less than the highest method detection limit if all triplicate results are not detected.

TABLE 3-9 SPRING, SEEP, AND STREAM HEADWATER RECESSION CONSTANT (*K*) VALUES		
	Average	**Final**
Ballard Mine		
MDS030	0.964	0.960
MSG003	1.000	0.998
MSG004	0.905	0.888
MSG005	0.970	0.993
MST067	0.944	0.957
MST069	0.989	1.000
MST095	0.925	0.887
MST096	0.979	0.949
Henry Mine		
MDS016	0.932	0.932
MDS022	0.990	1.014
MSG002	0.992	0.989
Enoch Valley Mine		
MDS026	0.994	0.994
MSG001	0.991	0.999

Notes:
Average – the average recession constant of each time-step on the hydrograph.
Final – the recession constant for the final time-step in the hydrograph.

TABLE 3-10

BALLARD MINE - SUMMARY OF SEDIMENT EXCEEDANCES
(Page 1 of 3)

					Analyte (mg/Kg, dry weight)					
Location	Location Type	Sample Identification	Collection Date	Sample Type	Cadmium	Chromium	Nickel	Selenium	Vanadium	Zinc
				Screening Level:	0.583	36.286	18	4	57	98
MDS030	Dump Seep	051104SEMDS030-0	5/11/2004	Primary	3.27	37.9	25.3	250 J-	39.1	89 J
MDS031	Dump Seep	051104SEMDS031-0	5/11/2004	Primary	8.32	110	96.8	83 J-	57	348 J
MDS032	Dump Seep	051104SEMDS032-0	5/11/2004	Primary	8.29	75.1	78.1	1300 J-	44.7	263 J
MDS033	Dump Seep	051104SEMDS033-0	5/11/2004	Primary	6.28	125	98.5	470 J-	62.2	295 J
MRV011	Reservoir Delta	052104SEMRV011-0	5/21/2004	Primary	1.18	20.6	11.6 J	1 J	20.9	46
MSG003	Spring	051104SEMSG003-0	5/11/2004	Primary	11.2	136	72.9	180 J-	97.1	328 J
MSG004	Spring	051204SEMSG004-0	5/12/2004	Primary	9.1	486	312 J	29.4 J-	55.7 J	340 J
MSG005	Spring	051204SEMSG005-0	5/12/2004	Primary	1.48	29.3 J	26.2 J	8.8 J-	32.8 J	92 J
MSG006	Spring	051504SEMSG006-0	5/14/2004	Primary	1.27	36.8	17.2	290	33.6	73
MSP010	Pond	051504SEMSP010-0	5/15/2004	Primary	25.6	593	249	114	202	940
MSP011	Pond	051204SEMSP011-1-Q1	5/12/2004	Triplicate	67	613	102 J	36 J-	474	710
MSP011	Pond	051204SEMSP011-1-Q2	5/12/2004	Triplicate	66	610	100 J	30 J-	456	710
MSP011	Pond	051204SEMSP011-1-Q3	5/12/2004	Triplicate	67.5	630	105 J	35 J-	485	730
MSP011	Pond	051204SEMSP011-1-Q-avg	5/12/2004	Averaged	66.8	618	102 J	33.7 J-	472	717
MSP012	Pond	051204SEMSP012-0	5/12/2004	Primary	138	734	192 J	63 J-	535	1520
MSP059	Pond	051204SEMSP059-0	5/12/2004	Primary	43.4	672	341 J	49 J-	657	1750
MSP062	Pond	051204SEMSP062-0	5/12/2004	Primary	118	740	375 J	58 J-	920	2360
MST019	Stream	052004SEMST019-0	5/20/2004	Primary	1.24	20	7.7	0.7 J	17.1 J	31 J
MST020	Stream	052004SEMST020-0	5/20/2004	Primary	1.48	30.7	13.3 J	<0.5	30.1 J	45 J
MST021	Stream	052004SEMST021-1-QA1	5/20/2004	Triplicate	1.54	26.5	7.3	0.5 J	20 J	30 J
MST021	Stream	052004SEMST021-1-QA2	5/20/2004	Triplicate	1.23	32.1	8.7	<0.5	20.9 J	29 J
MST021	Stream	052004SEMST021-1-QA3	5/20/2004	Triplicate	1.61	29.3	8.3	<0.5	18.3 J	30 J
MST021	Stream	052004SEMST021-1-QA-avg	5/20/2004	Averaged	1.46	29.3	8.1	0.5 J	19.7 J	29.7 J
MST022	Stream	051904SEMST022-0	5/19/2004	Primary	1.38	25.4	7.3	0.5 J	18.7 J	26 J
MST066	Stream	051804SEMST066-0	5/18/2004	Primary	2.34	23.6	15.2	3.2 J	44.1	75
MST067	Stream	051104SEMST067-0	5/11/2004	Primary	34.2	196	161	82 J-	268	886 J
MST069	Stream	051004SEMST069-0	5/10/2004	Primary	11.1	31 J	83.8 J	420 J-	26.6 J	311 J
MST089	Stream	051404SEMST089-0	5/14/2004	Primary	5.45	41.5	27.8	14.7	47.6	171
MST090	Stream	051404SEMST090-0	5/14/2004	Primary	0.93 J-	22.4	10 J	0.6 J	26.8	58 J
MST092	Stream	051404SEMST092-0	5/14/2004	Primary	9.29 J-	98.7	50.2 J	57	94.2	315 J

TABLE 3-10

BALLARD MINE - SUMMARY OF SEDIMENT EXCEEDANCES
(Page 2 of 3)

					Analyte (mg/Kg, dry weight)					
Location	Location Type	Sample Identification	Collection Date	Sample Type	Cadmium	Chromium	Nickel	Selenium	Vanadium	Zinc
				Screening Level:	0.583	36.286	18	4	57	98
MST094	Stream	051304SEMST094-0	5/13/2004	Primary	**1.28 J-**	**39.8**	**24.1 J**	**8.2**	**42.6**	**103 J**
MST095	Stream	051404SEMST095-0	5/14/2004	Primary	**10.5 J-**	**94.7**	**57.5 J**	**22**	**85.9**	**252 J**
MST096	Stream	051404SEMST096-0	5/14/2004	Primary	**0.55 J-**	**29**	**13.7 J**	**16.8**	**25**	**80 J**
MST230	Stream	052004SEMST230-1-QA1	5/20/2004	Triplicate	**3.65**	**40.8 J**	**9**	**0.7 J**	**35.1**	**40**
MST230	Stream	052004SEMST230-1-QA2	5/20/2004	Triplicate	**2.57**	**35.9 J**	**9.1**	**0.8 J**	**23.8**	**34**
MST230	Stream	052004SEMST230-1-QA3	5/20/2004	Triplicate	**2.52**	**33.1 J**	**9.5**	**1 J**	**23.4**	**33**
MST230	Stream	052004SEMST230-1-QA-avg	5/20/2004	Averaged	**2.91**	**36.6 J**	**9.2**	**0.833 J**	**27.4**	**35.7**
MST231	Stream	052104SEMST231-QA1	5/21/2004	Triplicate	**0.67**	**9.68**	**6.5 J**	<0.5	**9.51**	**24**
MST231	Stream	052104SEMST231-QA2	5/21/2004	Triplicate	**0.7**	**10.1**	**6.9 J**	<0.5	**9.87**	**24**
MST231	Stream	052104SEMST231-QA3	5/21/2004	Triplicate	**0.7**	**9.97**	**6.7 J**	<0.5	**9.68**	**23**
MST231	Stream	052104SEMST231-QA-avg	5/21/2004	Averaged	**0.69**	**9.92**	**6.7 J**	<0.5	**9.69**	**23.7**
MST232	Stream	052104SEMST232-0	5/21/2004	Primary	**1.09**	**16**	**10.2 J**	**1.2 J**	**16.3**	**40**
MST272	Stream	051404SEMST272-0	5/14/2004	Primary	**4.1**	**42.1**	**27.7**	**2 J**	**65.1**	**149**
MST273	Stream	051404SEMST273-0	5/14/2004	Primary	**2.79**	**30.8**	**18.9**	**1.7 J**	**36.7**	**104**

TABLE 3-10

BALLARD MINE - SUMMARY OF SEDIMENT EXCEEDANCES
(Page 3 of 3)

Notes:

Result is greater than screening value

Flag Definition:

U	The analyte was analyzed for, but was not detected above the level of the reported sample quantitation limit.
J	The result is an estimated quantity. The associated numerical value is the approximated concentration of the analyte in the sample.
J+	The result is an estimated quantity, but the result may be biased high.
J-	The result is an estimated quantity, but the result may be biased low.
J+/B	Result is estimated and biased high; associated field blank contained target analyte.
R	The result is unusable. The sample result is rejected due to serious deficiencies in meeting quality control criteria. The analyte may or may not be present in the sample.
UJ	The analyte was analyzed for, but was not detected. The reported quantitation limit is approximate and may be inaccurate or imprecise.

Sources for Screening Values (see also Table 3-1):

Sediment

Screening levels for aluminum, cadmium, chromium, and zinc are the ARCS threshold effects levels (TELs) for freshwater sediment in NOAA SQuiRT (Buchman, 2008).
Screening level for antimony is from Buchman, M. 1999. NOAA HAZMAT Report 99-1.
Screening levels for arsenic, copper, lead, mercury, and nickel are the TEL for freshwater sediment in NOAA SQuiRT (Buchman, 2008).

Screening levels for cobalt, iron, manganese, and silver are from Guidelines for the Protection and Management of Aquatic Sediment Quality in Ontario, August 1993.
Screening level for selenium is from Van Derveer and Canton (1997).
Screening level for vanadium is from the marine sediment AET (Buchman, 2008).

Triplicate Results:

"Primary" indicates locations where only one sample was collected from a given location. "Triplicate" indicates locations where a total of three samples were collected from a given location for the purpose of quality assurance.
The average value for triplicate samples is calculated as follows: (a) the mean of three detected values, (b) the mean of two detected values if result of one triplicate is not detected, (c) the detected value if results of two triplicates are not detected, or (d) less than the highest method detection limit if all triplicate results are not detected.

TABLE 3-11 BALLARD MINE GROUNDWATER MONITORING LOCATIONS						
Mine	Station Description	Location		Station Number	Station Type	Groundwater System Monitored and Screened Interval (ft bgs)
		Latitude	Longitude			
Ballard	Torgeson Well	42 49 29.52	111 29 45.56	MAW008	AW	ND
	Short Creek	42 49 04.15	111 29 25.80	MBW006	BW	Alluvial 14-9
	Blackfoot River Road @ Monsanto Haul Road	42 49 12.96	111 29 48.71	MBW009	BW	Alluvial 11-6
	Ballard Creek	42 49 23.46	111 29 38.93	MBW011	BW	Alluvial 15-10
	Ballard, Western Shallow	42 50 01.91	111 29 54.83	MBW026	BW	Alluvial 11-6
	Ballard, Western Deeper	42 50 02.23	111 29 54.34	MBW027	BW	Alluvial 16-11
	Torgeson	42 49 34.44	111 29 42.93	MBW028	BW	Alluvial 21-16
	Holmgren	42 49 33.92	111 28 11.14	MBW032	BW	Alluvial 15-10
	Wooley Valley Creek	42 50 03.76	111 27 56.21	MBW048	BW	Alluvial 9-4
	Wooley Valley Creek	42 49 40	111 27 10	MBW130	BW	Alluvial 25-20
	Wooley Valley Creek	42 50 24	111 28 33	MBW131	BW	Alluvial 8-3
	West Ballard Mine area downgradient of MWD081	42 48 40	111 29 43	MBW135	BW	Alluvial 20-15
	Godfrey House Well	42 49 26.39	111 33 14.40	MDW004	DW	ND
	South of West Ballard Pit; south of waste rock dumps	42 49 20.0	111 29 03.0	MMW006	MW	Wells Formation 330-310
	Northwest of Ballard Mine into Long Valley Creek alluvial flow field	42 49 59.6	111 29 47.4	MMW017	MW	Alluvial 56-36
	East of Ballard Mine in Wooley Valley alluvial flow field	42 49 39.4	111 28 04.5	MMW018	MW	Alluvial 33-18
	East side of West Ballard Pit (MMP035); replacement of MMW001	42 49 36.4	111 29 03.3	MMW020	MW	Wells Formation 408-388
	West side of West Ballard Pit (MMP035); replacement of MMW002	42 49 35.6	111 29 23.9	MMW021	MW	Wells Formation 250-230
	East Ballard mine area in the vicinity of MMW018	42 49 37.78	111 28 08.74	MMW029	MW	Dinwoody Formation 60-45
	Along the southwestern portion of Ballard Mine in the vicinity of MMW016A	42 49 10.72	111 29 17.03	MMW030	MW	Wells Formation 155-135
	Along the western perimeter of Ballard Mine in the vicinity and north of MMW017	42 50 11.87	111 29 43.05	MMW031	MW	Wells Formation 200-180
	Adjacent to MWD084	42 50 09.3	111 28 21.8	MMW032	MW	Alluvial 65-55
	Deeper well nested with MMW029	42 49 35.3	111 2811.9	MMW033	MW	Dinwoody Formation 148 – 128
	West Ballard Mine near MST068	42 49 35.99	111 29 36.55	MW-15A	MW	Alluvial 40-30
	Southwest Ballard Mine near MST069	42 49 08.83	111 29 16.53	MW-16A	MW	Alluvial 30-20

Notes:
Location (GPS) coordinates use the NAD27 datum and are presented in ddd mm ss.ss format (degrees minutes seconds).
ND - Not determined

TABLE 3-11 BALLARD MINE GROUNDWATER MONITORING LOCATIONS						
Mine	Station Description	Location		Station Number	Station Type	Groundwater System Monitored and Screened Interval (ft bgs)
		Latitude	Longitude			
AW - Agricultural Well BW - Borehole Monitoring Well DW - Domestic Well MW - Monitoring Well PW - Production Well						

TABLE 3-12

BALLARD MINE - SUMMARY OF GROUNDWATER EXCEEDANCES
(Page 1 of 10)

		Well Name:	MAW008	MBW006	MBW009	MBW011	MBW026	MBW027	MBW028
		Collection Date:	09/26/08	05/10/09	05/10/09	05/10/09	05/11/09	05/11/09	05/11/09
		Well Type:	AW	BW	BW	BW	BW	BW	BW
		Result Type:	Primary	Primary	Primary	Primary	Primary	Primary	Primary
Analyte	**Units**	**Screening Value**							
Total Metals									
Aluminum	mg/L	0.2	**1.09**	<0.0500	**0.0793 J**	<0.0500	**14.4**	**0.283**	**0.114**
Antimony	mg/L	0.006	NS	NS	NS	NS	NS	NS	NS
Arsenic	mg/L	0.01	NS	NS	NS	NS	NS	NS	NS
Cadmium	mg/L	0.005	**0.000334 J**	<0.000125	**0.00106**	**0.000170 J**	**0.000893**	**0.000331 J**	**0.000490 J**
Iron	mg/L	0.3	**5.73**	**0.0297 J**	**0.0927 J**	**0.0954 J**	**17.5**	**0.402**	**0.167**
Manganese	mg/L	0.05	**0.244**	**0.0158**	**0.495**	**0.096**	**0.0691**	**0.00508**	**0.176**
Selenium	mg/L	0.05	**0.0709**	**0.3**	**0.0117**	**0.569**	**0.221**	**0.21**	**0.894**
Dissolved Metals									
Aluminum, dissolved	mg/L	0.2	<0.0500	NS	NS	NS	NS	NS	NS
Antimony, dissolved	mg/L	0.006	NS	NS	NS	NS	NS	NS	NS
Arsenic, dissolved	mg/L	0.01	NS	NS	NS	NS	NS	NS	NS
Cadmium, dissolved	mg/L	0.005	<0.000125	NS	NS	NS	NS	NS	NS
Iron, dissolved	mg/L	0.3	**0.0330 J**	<0.0250	**0.0305 J**	**0.0434 J**	**0.249**	<0.0250	<0.0250
Manganese, dissolved	mg/L	0.05	**0.0921**	NS	NS	NS	NS	NS	NS
Selenium, dissolved	mg/L	0.05	**0.0729**	NS	NS	NS	NS	NS	NS
General Chemistry									
Residue, Filterable (TDS)	mg/L	500	**472**	**808**	**800**	**506**	**554**	**508**	**1090**
Sulfate	mg/L	250	**62.0**	**375**	**334**	**163**	**157**	**182**	**474**

TABLE 3-12

BALLARD MINE - SUMMARY OF GROUNDWATER EXCEEDANCES
(Page 2 of 10)

Well Name:			**MBW032**	**MBW048**	**MBW130**	**MBW131**	**MBW135**	**MDW004**	**MDW004**
Collection Date:			**05/12/09**	**05/12/09**	**05/15/09**	**05/15/09**	**05/15/09**	**05/22/04**	**05/19/08**
Well Type:			**BW**	**BW**	**BW**	**BW**	**BW**	**DW**	**DW**
Result Type:			**Primary**	**Primary**	**Primary**	**Primary**	**Primary**	**Primary**	**Primary**
Analyte	**Units**	**Screening Value**							
Total Metals									
Aluminum	mg/L	0.2	<0.0500	**0.181**	NS	NS	NS	NS	<0.03 UK
Antimony	mg/L	0.006	NS	NS	NS	NS	NS	NS	
Arsenic	mg/L	0.01	NS	NS	NS	NS	NS	NS	NS
Cadmium	mg/L	0.005	**0.000923**	<0.000125	NS	NS	NS	<0.0002 UK	<0.0001 UK
Iron	mg/L	0.3	**0.0786 J**	**0.278**	NS	NS	NS	NS	**0.05 JK**
Manganese	mg/L	0.05	**0.00883**	**0.278**	NS	NS	NS	NS	**0.002 JK**
Selenium	mg/L	0.05	**0.605**	<0.000500	NS	NS	NS	<0.001	**0.002 J**
Dissolved Metals									
Aluminum, dissolved	mg/L	0.2	NS	NS	NS	NS	NS	NS	<0.03 UK
Antimony, dissolved	mg/L	0.006	NS	NS	NS	NS	NS	NS	NS
Arsenic, dissolved	mg/L	0.01	NS	NS	NS	NS	NS	NS	NS
Cadmium, dissolved	mg/L	0.005	NS	NS	NS	NS	NS	<0.0002 UK	<0.0001 UK
Iron, dissolved	mg/L	0.3	<0.0250	**0.159**	NS	NS	NS	NS	<0.02 UK
Manganese, dissolved	mg/L	0.05	NS	NS	NS	NS	NS	NS	**0.003 JK**
Selenium, dissolved	mg/L	0.05	NS	NS	**0.00223**	<0.000500	<0.000759	<0.001	<0.001
General Chemistry									
Residue, Filterable (TDS)	mg/L	500	**1860**	**116**	NS	NS	NS	NS	**330 J-**
Sulfate	mg/L	250	**867**	**6.68**	NS	NS	NS	**15.1**	**14.7**

TABLE 3-12

BALLARD MINE - SUMMARY OF GROUNDWATER EXCEEDANCES
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Well Name:			MMW001	MMW001	MMW001	MMW001	MMW001	MMW001	MMW001
Collection Date:			05/21/04	10/07/04	10/07/04	06/23/05	11/01/05	05/18/06	10/16/07
Well Type:			MW	MW	MW	MW	MW	MW	MW
Result Type:			Primary	Primary	Averaged Triplicate	Primary	Primary	Primary	Primary
Analyte	**Units**	**Screening Value**							
Total Metals									
Aluminum	mg/L	0.2	NS	NS	NS	NS	NS	NS	**0.75 K****
Antimony	mg/L	0.006	NS	NS	NS	NS	NS	NS	<0.0004 UK
Arsenic	mg/L	0.01	NS	NS	NS	NS	NS	NS	0.006 K
Cadmium	mg/L	0.005	NS	NS	NS	NS	**<0.05 UK**	**0.0215 K**	0.0025 K
Iron	mg/L	0.3	NS	NS	NS	NS	**<0.2 UK**	NS	**0.64 K**
Manganese	mg/L	0.05	NS	NS	NS	NS	**0.3 JK**	NS	**0.189 K**
Selenium	mg/L	0.05	NS	NS	NS	NS	**0.069**	**0.131**	0.028
Dissolved Metals									
Aluminum, dissolved	mg/L	0.2	NS	NS	NS	<0.03 UK	<0.03 UK	<0.03 UK	<0.03 UK
Antimony, dissolved	mg/L	0.006	NS	NS	NS	NS	NS	<0.0004 UK	<0.0004 UK
Arsenic, dissolved	mg/L	0.01	NS	NS	NS	NS	NS	0.0008 JK	0.0039 K
Cadmium, dissolved	mg/L	0.005	0.0033 K	**0.00593 K**	**0.0058 K**	**0.0061 K**	0.0029 K	0.005 K	0.0013 K
Iron, dissolved	mg/L	0.3	NS	NS	NS	<0.01 UK	<0.02 UK	<0.02 UK	0.02 JK
Manganese, dissolved	mg/L	0.05	NS	NS	NS	0.0312 K	**0.0585 K**	0.0071 K	**0.143 K**
Selenium, dissolved	mg/L	0.05	0.046	0.017**	**0.017**	**0.067**	**0.072**	**0.125**	0.023
General Chemistry									
Residue, Filterable (TDS)	mg/L	500	NS	NS	NS	NS	NS	**550**	500 J-
Sulfate	mg/L	250	99.6	99.3	98	122	98.1	149	117 J-

TABLE 3-12

BALLARD MINE - SUMMARY OF GROUNDWATER EXCEEDANCES
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		Well Name:	MMW006	MMW006	MMW006	MMW006	MMW017	MMW017	MMW017
		Collection Date:	10/17/07	05/20/08	09/24/08	06/03/09	09/19/07	05/13/08	09/23/08
		Well Type:	MW	MW	MW	MW	MW	MW	MW
		Result Type:	Averaged Triplicate	Primary	Averaged Triplicate	Primary	Primary	Primary	Primary
Analyte	**Units**	**Screening Value**							
Total Metals									
Aluminum	mg/L	0.2	<0.03 UK	**0.08 J+K**	<0.05	NS	**0.21 J+K**	<0.04 UJK	<0.0500
Antimony	mg/L	0.006	<0.0004 UK	NS	NS	NS	<0.008 UK	<0.0004 UK	NS
Arsenic	mg/L	0.01	**0.0032 K**	NS	NS	NS	**0.0035 K**	**0.0023 J+K**	NS
Cadmium	mg/L	0.005	<0.0001 UK	<0.0001 UK	<0.000125	NS	**0.0005 K**	**0.0018 K**	**0.000558**
Iron	mg/L	0.3	<0.02 UK	**0.04 J+K**	<0.025	NS	**0.23 J+K**	**0.02 JK**	<0.0250
Manganese	mg/L	0.05	**0.00107 JK**	**0.0021 JK**	**0.000824 J**	NS	**0.48 K**	**0.0395 K**	**0.0130**
Selenium	mg/L	0.05	**0.08**	**0.069**	**0.0715 J**	**0.0699**	**0.13**	**0.103**	**0.101**
Dissolved Metals									
Aluminum, dissolved	mg/L	0.2	<0.03 UK	<0.03 UK	<0.05	NS	<0.03 UK	<0.03 UK	<0.0500
Antimony, dissolved	mg/L	0.006	<0.0004 UK	NS	NS	NS	<0.0004 UK	<0.0004 UK	NS
Arsenic, dissolved	mg/L	0.01	**0.00367 K**	NS	NS	NS	**0.0036 K**	**0.0048 J+K**	NS
Cadmium, dissolved	mg/L	0.005	<0.0001 UK	<0.0001 UK	<0.000125	NS	**0.0005 JK**	**0.0006 K**	**0.000566**
Iron, dissolved	mg/L	0.3	<0.02 UK	<0.02 UK	<0.025	NS	<0.02 UK	<0.02 UK	<0.0250
Manganese, dissolved	mg/L	0.05	**0.00117 JK**	<0.0005 UK	**0.00257 J**	NS	**0.533 K**	**0.0174 K**	**0.00843**
Selenium, dissolved	mg/L	0.05	**0.0767**	**0.059**	**0.0694 J**	NS	**0.13**	**0.103**	**0.0994**
General Chemistry									
Residue, Filterable (TDS)	mg/L	500	**280 J-**	**290 J-**	**303**	**402**	**1000 J-**	**1000 J-**	**1060**
Sulfate	mg/L	250	**60.6**	**59.1**	**58**	**58.1**	**461**	**452**	**446**

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BALLARD MINE - SUMMARY OF GROUNDWATER EXCEEDANCES
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Well Name:			**MMW017**	**MMW018**	**MMW018**	**MMW018**	**MMW018**	**MMW020**	**MMW020**
Collection Date:			**06/03/09**	**09/17/07**	**05/19/08**	**09/23/08**	**06/02/09**	**10/16/07**	**05/20/08**
Well Type:			**MW**	**MW**	**MW**	**MW**	**MW**	**MW**	**MW**
Result Type:			**Primary**	**Averaged Triplicate**	**Averaged Triplicate**	**Primary**	**Primary**	**Primary**	**Primary**
Analyte	**Units**	**Screening Value**							
Total Metals									
Aluminum	mg/L	0.2	NS	<0.03 UK	<0.03 UK	<0.0500	NS	**0.24 K**	<0.03 UK
Antimony	mg/L	0.006	NS	<0.0004 UK	<0.0004 UK	NS	NS	**0.0013 JK**	NS
Arsenic	mg/L	0.01	NS	**0.0008 JK**	**0.00137**	NS	NS	**0.0012 K**	NS
Cadmium	mg/L	0.005	NS	<0.0001 UK	<0.0001 UK	<0.000125	NS	**0.0081 K**	**0.0092 K**
Iron	mg/L	0.3	NS	**0.0533 JK**	**0.0367 JK**	<0.0250	NS	**0.37 K**	**0.13 K**
Manganese	mg/L	0.05	NS	**0.0157 K**	**0.0653 K**	**0.0208**	NS	**0.081 K**	**0.0143 K**
Selenium	mg/L	0.05	**0.0937**	**0.029**	**0.027**	**0.0274**	**0.0276**	**0.017**	**0.01**
Dissolved Metals									
Aluminum, dissolved	mg/L	0.2	NS	<0.04 UK	<0.03 UK	<0.0500	NS	<0.03 UK	<0.03 UK
Antimony, dissolved	mg/L	0.006	NS	<0.0004 UK	<0.0004 UK	NS	NS	**0.0007 JK**	NS
Arsenic, dissolved	mg/L	0.01	NS	**0.000567 JK**	<0.0005 UK	NS	NS	**0.0013 K**	NS
Cadmium, dissolved	mg/L	0.005	NS	<0.0001 UK	<0.0001 UK	<0.000125	NS	**0.0078 K**	**0.0098 K**
Iron, dissolved	mg/L	0.3	NS	<0.0267 UK	<0.02 UK	<0.0250	NS	**0.05 JK**	**0.04 JK**
Manganese, dissolved	mg/L	0.05	NS	**0.000933 JK**	**0.0395 K**	**0.0147**	NS	**0.0851 K**	**0.0149 K**
Selenium, dissolved	mg/L	0.05	NS	**0.0277**	**0.0257**	**0.0270**	NS	**0.016**	**0.009**
General Chemistry									
Residue, Filterable (TDS)	mg/L	500	**1060**	**250 J-**	**280 J-**	**292**	**268**	**500 J-**	**490 J-**
Sulfate	mg/L	250	**447**	**48.4**	**60**	**50.2**	**42.9**	**127**	**131**

TABLE 3-12

BALLARD MINE - SUMMARY OF GROUNDWATER EXCEEDANCES
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Well Name:			MMW020	MMW020	MMW020	MMW021	MMW021	MMW021	MMW021
Collection Date:			09/23/08	06/05/09	09/23/09	10/16/07	05/19/08	09/22/08	06/02/09
Well Type:			MW	MW	MW	MW	MW	MW	MW
Result Type:			Primary	Primary	Primary	Primary	Primary	Primary	Primary
Analyte	**Units**	**Screening Value**							
Total Metals									
Aluminum	mg/L	0.2	**0.115**	NS	NS	<0.03 UK	<0.03 UK	<0.0500	NS
Antimony	mg/L	0.006	NS	NS	NS	**0.0006 JK**	NS	NS	NS
Arsenic	mg/L	0.01	NS	NS	NS	**0.0015 K**	NS	NS	NS
Cadmium	mg/L	0.005	**0.0108**	NS	NS	<0.0001 UK	<0.0001 UK	<0.000125	NS
Iron	mg/L	0.3	**1.12**	NS	NS	**0.05 JK**	**0.05 J+K**	<0.0250	NS
Manganese	mg/L	0.05	**0.0232**	NS	NS	**0.17 K**	**0.0061 K**	**0.00126 J**	NS
Selenium	mg/L	0.05	**0.00881**	**0.221**	**0.193**	**0.047**	**0.049**	**0.0495**	**0.0488**
Dissolved Metals									
Aluminum, dissolved	mg/L	0.2	<0.0500	NS	NS	<0.03 UK	<0.03 UK	<0.0500	NS
Antimony, dissolved	mg/L	0.006	NS	NS	NS	**0.0006 JK**	NS	NS	NS
Arsenic, dissolved	mg/L	0.01	NS	NS	NS	**0.0022 K**	NS	NS	NS
Cadmium, dissolved	mg/L	0.005	**0.00951**	NS	NS	<0.0001 UK	<0.0001 UK	<0.000125	NS
Iron, dissolved	mg/L	0.3	**0.0294 J**	NS	NS	<0.02 UK	<0.02 UK	<0.0250	NS
Manganese, dissolved	mg/L	0.05	**0.0191**	NS	NS	**0.167 K**	<0.0005 UK	<0.000500	NS
Selenium, dissolved	mg/L	0.05	**0.00497**	NS	NS	**0.042**	**0.048**	**0.0491**	NS
General Chemistry									
Residue, Filterable (TDS)	mg/L	500	**524**	**624**	**496**	**380 J-**	**380 J-**	**424**	**408**
Sulfate	mg/L	250	**113**	**183**	**197**	**48.5**	**44.6**	**45.2**	**46.1**

TABLE 3-12

BALLARD MINE - SUMMARY OF GROUNDWATER EXCEEDANCES
(Page 7 of 10)

Well Name:			**MMW029**	**MMW029**	**MMW029**	**MMW030**	**MMW030**	**MMW031**	**MMW031**
Collection Date:			**09/22/08**	**05/14/09**	**09/21/09**	**09/21/08**	**05/19/09**	**09/20/08**	**05/13/09**
Well Type:			**MW**	**MW**	**MW**	**MW**	**MW**	**MW**	**MW**
Result Type:			**Primary**	**Primary**	**Primary**	**Primary**	**Primary**	**Primary**	**Primary**
Analyte	**Units**	**Screening Value**							
Total Metals									
Aluminum	mg/L	0.2	<0.0500	<0.0500	<0.0500	<0.0500	**0.426**	<0.0500	<0.0500
Antimony	mg/L	0.006	NS	<0.000250	<0.00100	NS	**0.00269**	NS	<0.000250
Arsenic	mg/L	0.01	NS	<0.00500	<0.00125	NS	**0.0267**	NS	**0.000456 J**
Cadmium	mg/L	0.005	<0.000125	<0.000125	<0.000125	<0.000125	<0.000125	<0.000125	<0.000125
Iron	mg/L	0.3	<0.0250	<0.0250	**0.0396 J+/B**	<0.0250	**0.353**	<0.0250	<0.0250
Manganese	mg/L	0.05	**0.0445**	**0.00223**	**0.00594**	**0.0846**	**0.0923**	**0.00149 J**	<0.000500
Selenium	mg/L	0.05	**0.806**	**0.685**	**0.865**	<0.000500	**0.00116**	**0.000874 J**	**0.000683 J**
Dissolved Metals									
Aluminum, dissolved	mg/L	0.2	<0.0500	NS	NS	**0.106**	NS	<0.0500	NS
Antimony, dissolved	mg/L	0.006	NS	NS	NS	NS	NS	NS	NS
Arsenic, dissolved	mg/L	0.01	NS	NS	NS	NS	NS	NS	NS
Cadmium, dissolved	mg/L	0.005	<0.000125	NS	NS	<0.000125	NS	<0.000125	NS
Iron, dissolved	mg/L	0.3	<0.0250	<0.0250	<0.0250	**0.0833 J**	<0.0250	**0.0255 J**	<0.0250
Manganese, dissolved	mg/L	0.05	**0.0431**	NS	NS	**0.101**	NS	**0.00236**	NS
Selenium, dissolved	mg/L	0.05	**0.764**	NS	NS	**0.000572 J**	NS	**0.00124 J**	NS
General Chemistry									
Residue, Filterable (TDS)	mg/L	500	**1330**	**1170**	**1200**	**234**	**282**	**156**	**156**
Sulfate	mg/L	250	**547**	**556**	**582**	**15.0**	**16.4**	**3.21**	**6.10**

TABLE 3-12

BALLARD MINE - SUMMARY OF GROUNDWATER EXCEEDANCES
(Page 8 of 10)

Well Name:			**MMW032**	**MMW033**	**MW15A**	**MW15A**	**MW15A**	**MW15A**	**MW15A**
Collection Date:			**09/25/09**	**09/25/09**	**11/15/06**	**04/20/07**	**08/10/07**	**05/12/08**	**10/18/08**
Well Type:			**MW**	**MW**	**MW**	**MW**	**MW**	**MW**	**MW**
Result Type:			**Primary**	**Primary**	**Primary**	**Primary**	**Primary**	**Primary**	**Primary**
Analyte	**Units**	**Screening Value**							
Total Metals									
Aluminum	mg/L	0.2	**0.718**	**1.74**	**0.15**	**8.17 J**	**0.86**	**159**	**0.11 J**
Antimony	mg/L	0.006	NS	NS	<0.003	<0.003	<0.003	NS	NS
Arsenic	mg/L	0.01	NS	NS	**0.023**	**0.018**	<0.003	**0.041**	**0.014**
Cadmium	mg/L	0.005	**0.000433 J**	<0.000125	<0.0001	**0.0007**	<0.0001	**0.017**	0.0003
Iron	mg/L	0.3	**0.396**	**1.16**	**0.16**	**7.46**	**0.91**	**199**	**0.13 J**
Manganese	mg/L	0.05	**0.0491**	**0.344**	**2.050**	**0.13**	**0.012**	**4.60**	<0.005 J
Selenium	mg/L	0.05	**0.00267**	**0.00577**	**0.520**	**0.81**	**1.99**	**1.07**	**1.40**
Dissolved Metals									
Aluminum, dissolved	mg/L	0.2	NS	NS	<0.05	<0.05	**0.08**	**0.47**	<0.05
Antimony, dissolved	mg/L	0.006	NS	NS	<0.003	<0.003	<0.003	NS	NS
Arsenic, dissolved	mg/L	0.01	NS	NS	0.022	0.012	0.041	**0.011**	**0.009**
Cadmium, dissolved	mg/L	0.005	NS	NS	<0.0001	**0.0002**	**0.0003**	**0.0003**	**0.0003**
Iron, dissolved	mg/L	0.3	**0.0301 J**	<0.0250	**0.05**	<0.05	**0.07**	**0.35**	<0.05
Manganese, dissolved	mg/L	0.05	NS	NS	**1.98**	**0.017**	**0.008**	**0.010**	<0.005
Selenium, dissolved	mg/L	0.05	NS	NS	**0.59**	**0.8**	**1.94**	**1.15**	**1.48**
General Chemistry									
Residue, Filterable (TDS)	mg/L	500	**248**	**266**	**1270**	**612**	**1180**	**1350**	**1370**
Sulfate	mg/L	250	**9.96**	**30.9**	**673**	**295**	**535**	**644**	**790 J**

TABLE 3-12

BALLARD MINE - SUMMARY OF GROUNDWATER EXCEEDANCES
(Page 9 of 10)

		Well Name:	MW15A	MW16A	MW16A	MW16A	MW16A	MW16A	MW16A
		Collection Date:	06/05/09	11/15/06	04/18/07	08/10/07	05/12/08	10/18/08	06/04/09
		Well Type:	MW	MW	MW	MW	MW	MW	MW
		Result Type:	Primary	Primary	Primary	Primary	Primary	Primary	Primary
Analyte	**Units**	**Screening Value**							
Total Metals									
Aluminum	mg/L	0.2	**0.262**	**4.19**	<0.05	**0.84**	<0.05	<0.05 J	<0.0500
Antimony	mg/L	0.006	<0.000527	<0.003	<0.003	<0.003	NS	NS	<0.000250
Arsenic	mg/L	0.01	<0.0125	**0.004**	<0.003	<0.003	<0.003	<0.003	**0.00112**
Cadmium	mg/L	0.005	**0.000285 J**	**0.0002**	<0.0001	<0.0001	<0.0001	<0.0001	<0.000125
Iron	mg/L	0.3	**0.268**	**4.24**	**0.29 J**	**1.47**	**0.42**	**0.67 J**	**0.562**
Manganese	mg/L	0.05	**0.0336**	**0.080**	**1.71 J**	**1.86**	**1.48**	**1.4 J**	**1.81**
Selenium	mg/L	0.05	**1.67**	**0.054**	**0.11**	**0.049**	**0.070**	**0.016**	**0.0180**
Dissolved Metals									
Aluminum, dissolved	mg/L	0.2	NS	<0.05	<0.05	<0.05	<0.05	<0.05	NS
Antimony, dissolved	mg/L	0.006	NS	<0.003	<0.003	<0.003	NS	NS	NS
Arsenic, dissolved	mg/L	0.01	NS	0.003	<0.003	<0.003	<0.003	<0.003	NS
Cadmium, dissolved	mg/L	0.005	NS	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	NS
Iron, dissolved	mg/L	0.3	<0.0250	<0.05	**0.29**	**0.44**	**0.40**	**0.67**	**0.573**
Manganese, dissolved	mg/L	0.05	NS	**0.006**	**1.7**	**1.61**	**1.46**	**1.5**	NS
Selenium, dissolved	mg/L	0.05	NS	**0.056**	**0.11**	**0.05**	**0.074**	**0.021**	NS
General Chemistry									
Residue, Filterable (TDS)	mg/L	500	**1580**	**238**	**1480 H**	**1450**	**1560**	**1570**	**1700**
Sulfate	mg/L	250	**650**	**27**	**905**	**769**	**819**	**870 J**	**748**

TABLE 3-12

BALLARD MINE - SUMMARY OF GROUNDWATER EXCEEDANCES
(Page 10 of 10)

Notes:
AW - agricultural well
BW - direct-push alluvial aquifer well
DW - domestic well
MW - monitoring well
NS- not sampled
PW - production well

Result is greater than screening value
Method detection limit for non-detected value is greater than the screening value

FLAG DEFINITION:

U	The analyte was analyzed for, but was not detected above the level of the reported sample quantitation limit.
J	The result is an estimated quantity. The associated numerical value is the approximated concentration of the analyte in the sample.
J+	The result is an estimated quantity, but the result may be biased high.
J-	The result is an estimated quantity, but the result may be biased low.
J+/B	Result is estimated and biased high; associated field blank contained target analyte.
R	The result is unusable. The sample result is rejected due to serious deficiencies in meeting quality control criteria. The analyte may or may not be present in the sample.
UJ	The analyte was analyzed for, but was not detected. The reported quantitation limit is approximate and may be inaccurate or imprecise.
K	Serial dilutions not performed for samples analyzed by this method (EPA 200.7; 200.8).
H	Qualified data, received past holding time.

SOURCES FOR SCREENING VALUES (SEE ALSO TABLE 3

Groundwater	Unless identified otherwise below, screening levels are from State of Idaho Ground Water Quality Rule (IDAPA 58.01.11). Screening levels for pH, aluminum, chloride, iron, manganese, pH, silver, sulfate, TDS, and zinc are Secondary Maximum Contaminant Levels (MCLs). Screening values for arsenic and uranium are USEPA primary and secondary MCLs, National Primary Drinking Water Regulations, EPA. Screening values for boron, cobalt, molybdenum, nickel, and vanadium are USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites.

SOURCES FOR DA

Data from 2006, 2007, and 2008 for MW-15A and MW-16A were collected by Whetstone Associates as part of baseline studies for the Blackfoot Bridge EIS (BLM,2009). MWH started sampling and reporting data from these wells in 2009 as part of the 2009 AOC/CO. All other data were collected per the 2009 AOC/CO or the 2004 AOC/CO.

TRIPLICATE RESULT

"Primary" indicates locations where only one sample was collected from a given location. "Triplicate" indicates locations where a total of three samples were collected from a given location for the purpose of quality assurance.
The average value for triplicate samples is calculated as follows: (a) the mean of three detected values, (b) the mean of two detected values if result of one triplicate is not detected, (c) the detected value if results of two triplicates are not detected, or (d) less than the highest method detection limit if all triplicate results are not detected.

TABLE 3-13 BALLARD MINE STREAM HABITAT ASSESSMENT DATA MATRIX				
Station	**May 2004 [Se]sw, mg/L**	**May 2004 [Se]sed, mg/kg dw**	**RBS (Habitat Score)**	**Fish Presence**
MST066	0.0010	3.2	40	No
MST067	0.029	82	44	No
MST069	0.60	420	40	No
MST089	0.0010	15	30	No
MST090	0.0010	0.60	41	No
MST092	0.0060	57	41	No
MST093**	0.00050	0.25	35	No
MST094	0.023	8.2	29	No
MST095	0.059	22	50	No
MST096	0.02	17	46	No
MST272	0.00050	2.0	30	No
MST273	0.00050	1.7	30	No

Notes:
Non-detected concentrations have been censored at one-half the MDL. The MDL for surface water was 0.0010 mg/L and for sediment was 0.50 mg/kg dw.
** - Regional background station
[Se]sw, mg/L – concentration of selenium in surface reported in mg/L
[Se]sed, mg/kg dw – concentration of selenium in sediment, reported in mg/kg on a dw basis

TABLE 3-14
BALLARD MINE
HISTORICAL BENTHIC MACROINVERTEBRATE SELENIUM CONCENTRATIONS (mg/kg dw)

Ballard Mine Station	Station ID	June 2004	Flag
Ballard Mine Southeast Spring	MSG006	86	J
Tributary, above Blackfoot River	MST066	170	UJ
Tributary, below Ballard Mine	MST069	313	J
Wooley Valley Creek, below North Fork Wooley Valley Creek	MST089	21	UJ
Wooley Valley Creek, above North Fork Wooley Valley Creek	MST090	1300	UJ
North Fork Wooley Valley Creek, above Wooley Valley Creek	MST092	8.3	UJ
North Fork Wooley Valley Creek, above Ballard Mine	MST093**	8.3	UJ
Spring-fed tributary #1 of North Fork Wooley Valley Creek, below Ballard Mine	MST094	17	J
Wooley Valley Creek, above Loadout Creek at road	MST272	9.5	UJ
Wooley Valley Creek, above ponding and below MST089	MST273	170	UJ

Notes:
** - Regional background station
Flags:
U – Non-detect (Non-detected concentrations were censored and value presented is equal to the MDL)
J – Estimated result

TABLE 3-15 BALLARD MINE HISTORICAL SMALL MAMMAL SELENIUM CONCENTRATIONS (mg/kg dw)					
Ballard Mine Station	**Station ID**	**Species**		**Sept 2001**	**Flag**
		Common Name	**Scientific Name**		
Ballard Mine Pit #1 Overburden Dump #2	MWD081-Quadrat1	deer mouse	P. maniculatus	6.5	J
	MWD081-Quadrat2	deer mouse	P. maniculatus	11.0	J
	MWD081-Quadrat3	deer mouse	P. maniculatus	9.0	J
Notes: J – Estimated result					

TABLE 3-16 BALLARD MINE HISTORICAL TERRESTRIAL INVERTEBRATE SELENIUM CONCENTRATIONS (mg/kg dw)			
Ballard Mine Station	**Station ID - Sample Type**	**Sept 2001**	**Flag**
Ballard Mine Pit #1 Overburden Dump #2	MWD081-Quadrat1 - Insects	30	
	MWD081-Quadrat2 - Insects	29	
	MWD081-Quadrat3 - Insects	30	

TABLE 3-17 BALLARD MINE SUMMARY OF INVESTIGATION FINDINGS BY MEDIUM						
Medium	**Dates Sampled**	**Approximate Number of Sampling Locations**	**Analytes Sampled**	**Location of Samples Collected**	**Investigation Results Summary**	**Summary Assessment**
Soils	2004	1) 26 locations on 2 transects	Se	See Drawing 3-3	See Section 3.2.1.1 Se ranged from 4.8 to 71 mg/kg dw.	The nature and extent of surface soil impacts at the Ballard Mine has been defined adequately so that if necessary, risk assessments and the feasibility study (FS) can be conducted for the non-radiogenic COPCs. However for radiogenic risks, to reduce the uncertainty in the inherently conservative risk calculations, site-specific uranium isotopes data for soil and radon and gamma measurements will be collected both on site and in a background area(s). In addition, soil samples will be collected throughout the Ballard Shop area to evaluate if there were leaks/spill of organic compounds during the operation of the facility. A data gap also has been identified for sediment (see below) and this carries forward to riparian soils. Therefore some additional limited sampling of riparian soil is needed. Finally, further evaluation of existing background data is needed to statisticall quantify background concentrations..
	2009	2) 105 composite samples	Sb, As, B, Cd, Cr, Co, Cu, Mn, Hg, Mo, Ni, Se, Ag, Tl, U, V, Zn	See Drawing 3-5	See Section 3.2.1.2 - Isolated exceedances of Cd, Co, Mn and V above screening levels (SLs). - As exceedances above SL. - As background above SL. - As ranged from 3.51 to 45.5 mg/kg dw - Elevated Se above background. - Se ranged from 24.9 to 209 mg/kg dw.	
	2004	3) 26 riparian soil samples	Cd, Cr, Cu, Mo, Ni, Se, V, Zn	See Drawing 3-6	See Section 3.2.1.3 - Isolated exceedances of Cd, Ni, and V above SLs. - 1 Se exceedance above SL. - Se ranged from 0.25 to 570 mg/kg dw.	

TABLE 3-17 BALLARD MINE SUMMARY OF INVESTIGATION FINDINGS BY MEDIUM						
Medium	**Dates Sampled**	**Approximate Number of Sampling Locations**	**Analytes Sampled**	**Location of Samples Collected**	**Investigation Results Summary**	**Summary Assessment**
Vegetation	2004	1) 26 locations on 2 transects	Se	See Drawing 3-4	See Section 3.2.2.1 Se ranged from1.7 to 68 mg/kg dw.	The nature and extent of vegetation impacts at the Ballard Mine has been defined adequately so that risk assessments and the FS can be conducted. As a result, no further field characterization is necessary. However, further evaluation of existing background data is needed.
	2004	2) Composite samples monthly (i.e. for 6 months)	Se	See Drawing 3-6	See Section 3.2.2.2 Monthly vegetation samples were below the detection limit.	
	2009	3) 189 samples	Sb, As, B, Cd, Cr, Co, Cu, Mn, Hg, Mo, Ni, Se, Ag, Tl, U, V, Zn	See Drawing 3-7	See Section 3.2.2.3 - Mo and Se exceedances of SLs. - Mo background also exceeded SLs. - Mo ranged from 1.49 to 425 mg/kg. - Se ranged from 0.30 to 366 mg/kg dw. - 1 Cd exceedance of SL of 21.5 mg/kg dw	
	2004	4) 26 riparian samples	Cd, Cu, Mo, Se, Zn	See Drawing 3-6	See Section 3.2.2.4 - Isolated Cd and Mo exceedances of SLs. - Se exceedances of SLs.	

TABLE 3-17 BALLARD MINE SUMMARY OF INVESTIGATION FINDINGS BY MEDIUM						
Medium	**Dates Sampled**	**Approximate Number of Sampling Locations**	**Analytes Sampled**	**Location of Samples Collected**	**Investigation Results Summary**	**Summary Assessment**
					- Se ranged from 0.25 to 27 mg/kg dw.	
Surface Water	Fall and Spring 1997 - 2009	41 sampling stations	Metals Cations Anions General Water Quality Parameters Field Parameters	See Drawings 3-8 to 3-12	See Section 3.2.3.1 Al, Ba, B, Cd, Cu, Fe, Mn, Ag, Tl, Se, and V exceeded SLs.	The nature and extent of surface water impacts at the Ballard Mine has been defined adequately so that if necessary, risk assessments and the FS can be conducted. As a result, no further field characterization is required. However, ongoing monitoring is necessary to collect baseline effectiveness monitoring of potential future remedies. Further evaluation of existing background data is needed.
Sediment	5 events: Fall 1998, Fall 1999, Spring 2002, Fall 2002, and Spring 2004	27 sampling stations	Metals Cations Anions pH TOC	See Drawings 3-9, 3-11, and 3-13	See Section 3.2.3.2 Cd, Ni, Se, V, and Zn exceeded SLs.	The spatial characterization of sediment impacts at the Ballard Mine has been defined adequately so that if necessary, risk assessments and the FS can be conducted. However, a data gap relating to COPC coverage in sediments has been identified and will be addressed by the Fall 2010 sampling event as described in Appendix D1. In addition further evaluation of existing background data is needed.

TABLE 3-17 BALLARD MINE SUMMARY OF INVESTIGATION FINDINGS BY MEDIUM						
Medium	**Dates Sampled**	**Approximate Number of Sampling Locations**	**Analytes Sampled**	**Location of Samples Collected**	**Investigation Results Summary**	**Summary Assessment**
Groundwater	Fall and Spring 2004 - 2009	25 wells	Metals Cations Anions General Water Quality Parameters General Field Parameters	See Drawings 3-15 to 3-19	See Section 3.2.4 - Isolated exceedances of As and Sb of SLs - Elevated concentrations of Al, Fe, Mn - Se, SO_4, and TDS exceedances above SLs - Se ranged from non-detect to 1.67 mg/L. - Se exceeds screening level in shallow, intermediate, and deep groundwater.	The nature and extent for groundwater at the Ballard Mine has been defined except for limited areas as discussed in Section 4.0, Data Gaps.
Aquatic Biota						
Stream Habitat Assessment	2004	13 stations	NA	See Drawing 3-21	See Section 3.2.5.1 RBS scores from 29 to 52 out of 200	The nature and extent for stream habitat data at the Ballard Mine has been defined adequately so that if necessary, risk assessments and the FS can be conducted. As a result, no further characterization is needed.

TABLE 3-17 BALLARD MINE SUMMARY OF INVESTIGATION FINDINGS BY MEDIUM						
Medium	**Dates Sampled**	**Approximate Number of Sampling Locations**	**Analytes Sampled**	**Location of Samples Collected**	**Investigation Results Summary**	**Summary Assessment**
Fish	2004	NA	NA	See Drawings 3-20 and 3-21	See Section 3.2.5.2 No fish were found and the stream habitat assessment indicated poor fish habitat.	Nature and extent information for fish data at the Ballard Mine are adequate for their intended purpose as additional lines of evidence in the human health and/or ecological risk assessment. The potential need for additional sampling of this media will be evaluated pending results of the risk assessment for the P4 mines.
Benthic Macroinvertebrates	2004	10 stations	Se	See Drawing 3-21	See Section 3.2.5.3 Se ranged from 17 to 313 mg/kg dw. All selenium results exceeded the screening level. In addition the MDL was usually above the SL.	Nature and extent information for benthic macroinvertebrate data at the Ballard Mine are adequate for their intended purpose as additional lines of evidence in the human health and/or ecological risk assessment. The potential need for additional sampling of this media will be evaluated pending results of the risk assessment for the P4 mines.

TABLE 3-17 BALLARD MINE SUMMARY OF INVESTIGATION FINDINGS BY MEDIUM						
Medium	**Dates Sampled**	**Approximate Number of Sampling Locations**	**Analytes Sampled**	**Location of Samples Collected**	**Investigation Results Summary**	**Summary Assessment**
Terrestrial Biota						
Elk	1999 2000	160 elk 54 elk	Ca and Se Cd, Cu, Fe, Pb, Mn, Mo, Se, and Zn	See Drawings 3-22 and 3-26	See Section 3.2.6.1 Se ranged from 0.65 to 39 mg/kg dw in elk livers Se ranged from 0.60 to 41 mg/kg dw in elk livers	Nature and extent information for elk data at the Ballard Mine are adequate for their intended purpose as additional lines of evidence in the human health and/or ecological risk assessment. The potential need for additional sampling of this media will be evaluated pending results of the risk assessment for the P4 mines.
Bird Eggs	1999 2000 2001	215 eggs 334 eggs 369 eggs	Cd and Se Cd and Se Se	See Drawings 3-23 to 3-26	See Section 3.2.6.2 Se ranged from 0.61 to 21.3 mg/kg dw Se ranged from 0.29 to 25 mg/kg dw Se ranged from 1.3 to 31.9 mg/kg dw	Nature and extent information for bird egg data at the Ballard Mine are adequate for their intended purpose as additional lines of evidence in the human health and/or ecological risk assessment. The potential need for additional sampling of this media will be evaluated pending results of the risk assessment for the P4 mines.
Cattle	See Section 3.3.6.3 Henry Mine	See Section 3.3.6.3 Henry Mine	See Section 3.3.6.3 Henry Mine	See Section 3.3.6.3 Henry Mine	See Section 3.3.6.3 Henry Mine	See Section 3.3.6.3 Henry Mine

TABLE 3-17 BALLARD MINE SUMMARY OF INVESTIGATION FINDINGS BY MEDIUM						
Medium	**Dates Sampled**	**Approximate Number of Sampling Locations**	**Analytes Sampled**	**Location of Samples Collected**	**Investigation Results Summary**	**Summary Assessment**
Small Mammals	2001	3 quadrat samples	Al, Sb, As, Ba, Be, Cd, Cr, Cu, Pb , Mn, Hg, Mo Ni, Se, Ag, Th, V, U, and Zn	See Drawings 3-22 and 3-26	See Section 3.2.6.4 Se ranged from 6.5 to 11 mg/kg dw	Nature and extent information for small mammals data at the Ballard Mine are adequate for their intended purpose as additional lines of evidence in the human health and/or ecological risk assessment. The potential need for additional sampling of this media will be evaluated pending results of the risk assessment for the P4 mines.
Terrestrial Invertebrates	2001	3 quadrat samples	Al, Sb, As, Ba, Be, Cd, Cr, Cu, Pb , Mn, Hg, Mo Ni, Se, Ag, Th, V, U, and Zn	See Drawings 3-22 and 3-26	See Section 3.2.6.5 Se ranged from 29 to 30 mg/kg dw	Nature and extent information for terrestrial invertebrates data at the Ballard Mine are adequate for their intended purpose as additional lines of evidence in the human health and/or ecological risk assessment. The potential need for additional sampling of this media will be evaluated pending results of the risk assessment for the P4 mines.

TABLE 3-18

HENRY MINE - SUMMARY OF SOIL EXCEEDANCES
(Page 1 of 5)

				Analyte (mg/Kg, dry weight)				
Sample Identification	**Date**	**Medium**	**Type**	**Arsenic**	**Cadmium**	**Manganese**	**Selenium**	**Vanadium**
			Screening Value:	**0.39**	**70**	**1800**	**390**	**390**
MBH002 (Henry Background)								
0906-MBH002-01-SS	6/18/2009	Soil	Primary	**8.1**	**0.881**	**2120**	**0.643 J**	**26.2**
0906-MBH002-02-SS	6/18/2009	Soil	Primary	**8.25**	**1.15**	**2840**	**1.26**	**26.6**
0906-MBH002-03-SS	6/18/2009	Soil	Primary	**7.47**	**1.10**	**2540**	**1.02**	**26.5**
0906-MBH002-04-SS	6/18/2009	Soil	Primary	**9.01**	**0.790**	**2190**	**0.874 J**	**27.1**
0906-MBH002-05-SS	6/18/2009	Soil	Primary	**8**	**0.997 J+**	**1890**	**0.736 J**	**22.9**
0906-MBH002-06-SS	6/17/2009	Soil	Primary	**7.15**	**0.572**	**2730**	**0.626**	**25.0**
0906-MBH002-07-SS-1	6/16/2009	Soil	Triplicate	**9.47 J+**	**0.818 J+**	**2600 J**	**0.745 J+**	**27.1**
0906-MBH002-07-SS-2	6/16/2009	Soil	Triplicate	**8.37 J+**	**0.983 J+**	**2600 J**	**0.666 J+**	**28.1**
0906-MBH002-07-SS-3	6/16/2009	Soil	Triplicate	**7.95 J+**	**1.08 J+**	**2700 J**	**0.741 J+**	**23.7**
0906-MBH002-07-SS-avg	6/16/2009	Soil	Averaged	**8.6 J+**	**0.96 J+**	**2630 J**	**0.717 J+**	**26.3**
0906-MBH002-08-SS	6/18/2009	Soil	Primary	**8.58**	**0.746 J+**	**1500**	**0.477 J**	**22.4**
0906-MBH002-09-SS	6/16/2009	Soil	Primary	**6.60 J+**	**0.858 J+**	**3990 J**	**0.863 J+**	**22.2**
0906-MBH002-10-SS	6/18/2009	Soil	Primary	**7.24**	**0.792 J+**	**2920**	**0.677 J**	**23.0**
MDS016 (Dump Seep)								
SSMDS016-0-C(5)	9/11/2004	Soil	Primary	NS	**16.1 J**	NS	**7.8**	**150**
MDS022 (Dump Seep)								
SSMDS022-0-C(5)	9/10/2004	Soil	Primary	NS	**3.04 J**	NS	**6.9**	**47.7**
MHR002 (Historic Haul Road)								
0906-MHR002-01-SS	6/18/2009	Soil	Primary	**14.4**	**19.4 J+**	**410**	**21.1 J**	**110**
0906-MHR002-02-SS	6/18/2009	Soil	Primary	**13.2**	**20.6 J+**	**447**	**19.0 J**	**145**
0906-MHR002-03-SS	6/19/2009	Soil	Primary	**8.9**	**29.3**	**939**	**8.05 J**	**160 J+**
0906-MHR002-04-SS	6/19/2009	Soil	Primary	**16.1**	**32.9**	**148**	**12.7 J**	**234 J+**
0906-MHR002-05-SS	6/18/2009	Soil	Primary	**7.26**	**37.4**	**204**	**9.27**	**149**
0906-MHR002-06-SS	6/18/2009	Soil	Primary	**10.5**	**31.3**	**230**	**7.45**	**117**
0906-MHR002-07-SS-1	6/18/2009	Soil	Triplicate	**19.2**	**114**	**140**	**16.6**	**1370**
0906-MHR002-07-SS-2	6/18/2009	Soil	Triplicate	**15.4**	**54.0**	**808**	**10.5**	**240**
0906-MHR002-07-SS-3	6/18/2009	Soil	Triplicate	**7.3**	**10.4**	**481**	**2.94**	**58.6**
0906-MHR002-07-SS-avg	6/18/2009	Soil	Averaged	**14**	**59.5**	**476**	**10**	**556**
0906-MHR002-08-SS	6/18/2009	Soil	Primary	**33.4**	**32.4**	**197**	**57.1**	**199**
0906-MHR002-09-SS	6/18/2009	Soil	Primary	**45.5**	**39.4**	**228**	**47.6**	**110**
0906-MHR002-10-SS	6/18/2009	Soil	Primary	**26.1**	**34.1**	**186**	**21.6**	**77.1**
MRV016 (Reservoir Delta)								
SSMRV016-0-C(5)	9/11/2004	Soil	Primary	NS	**1.06**	NS	**1.6 J**	**13.7 J-**
MSG002 (Spring)								
SSMSG002-0-C(5)	9/13/2004	Soil	Primary	NS	**0.92 J+**	NS	<0.5	**42.7 J**
MSP014 (Pond)								
SSMSP014-0-C(5)	9/13/2004	Soil	Primary	NS	**5.78**	NS	**11.5**	**65**
MSP015 (Pond)								
SSMSP015-0-C(6)	9/13/2004	Soil	Primary	NS	**5.67**	NS	**24**	**66.1**
MSP016 (Pond)								
SSMSP016-0-C(5)	9/13/2004	Soil	Primary	NS	**20.5**	NS	**45**	**215**
MSP055 (Pond)								
SSMSP055-0-C(10)	9/13/2004	Soil	Primary	NS	**67.3**	NS	**28**	**773**
MST043 (Stream)								
SSMST043-0-C(5)	9/11/2004	Soil	Primary	NS	**0.83**	NS	**1.1 J**	**26.8 J**
MST044 (Stream)								
SSMST044-0-C(6)	9/14/2004	Soil	Primary	NS	**2.84**	NS	**5.3 J-**	**38.3**
MST045 (Stream)								
SSMST045-0-C(5)	9/14/2004	Soil	Primary	NS	**0.92**	NS	**1.5 J-**	**23.8**
MST046 (Stream)								
SSMST046-0-C(5)	9/13/2004	Soil	Primary	NS	**1.17**	NS	**1.1 J-**	**25.2**
MST047 (Stream)								

TABLE 3-18

HENRY MINE - SUMMARY OF SOIL EXCEEDANCES
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				Analyte (mg/Kg, dry weight)				
Sample Identification	**Date**	**Medium**	**Type**	**Arsenic**	**Cadmium**	**Manganese**	**Selenium**	**Vanadium**
			Screening Value:	**0.39**	**70**	**1800**	**390**	**390**
SSMST047-0-C(6)	9/13/2004	Soil	Primary	NS	**1.3**	NS	**1.1 J-**	**28.5**
MST050 (Stream)								
SSMST050-0-C(5)	9/10/2004	Soil	Primary	NS	**1.26**	NS	<0.5	**32 J**
MST051 (Stream)								
SSMST051-1-C(5)QA1	9/14/2004	Soil	Triplicate	NS	**3.71**	NS	**1.8 J-**	**51.6**
SSMST051-1-C(5)QA2	9/14/2004	Soil	Triplicate	NS	**4.16**	NS	**1.8 J-**	**56.4**
SSMST051-1-C(5)QA3	9/14/2004	Soil	Triplicate	NS	**3.58**	NS	**1.9 J-**	**49.7**
SSMST051-1-C(5)QA-avg	9/14/2004	Soil	Averaged	NS	**3.82**	NS	**1.83 J-**	**52.6**
MST052 (Stream)								
SSMST052-0-C(5)	9/14/2004	Soil	Primary	NS	**6.58**	NS	**3.4 J-**	**80.1**
MST053 (Stream)								
SSMST053-1-C(5)QA1	9/13/2004	Soil	Triplicate	NS	**1.18**	NS	**1 J-**	**29.3**
SSMST053-1-C(5)QA2	9/13/2004	Soil	Triplicate	NS	**1.16**	NS	**0.9 J-**	**27.3**
SSMST053-1-C(5)QA3	9/13/2004	Soil	Triplicate	NS	**1.19**	NS	**0.9 J-**	**27.7**
SSMST053-1-C(5)QA4	9/13/2004	Soil	Triplicate	NS	NS	NS	NS	NS
SSMST053-1-C(5)QA-avg	9/13/2004	Soil	Averaged	NS	**1.18**	NS	**0.933 J-**	**28.1**
MST054 (Stream)								
SSMST054-0-C(5)	9/13/2004	Soil	Primary	NS	**1.72**	NS	**1.4 J-**	**27.4**
MST055 (Stream)								
SSMST055-0-C(5)	9/12/2004	Soil	Primary	NS	**1.53**	NS	<0.5	**26.3 J-**
MST056 (Stream)								
SSMST056-0-C(5)	9/13/2004	Soil	Primary	NS	**1.71**	NS	**1 J-**	**31.6**
MST057 (Stream)								
SSMST057-0-C(5)	9/13/2004	Soil	Primary	NS	**5.72 J+**	NS	**3.1**	**30.4 J**
MST058 (Stream)								
SSMST058-0-C(5)	9/13/2004	Soil	Primary	NS	**2.46 J+**	NS	**1.3 J**	**36.1 J**
MST062 (Stream)								
SSMST062-0-C(5)	9/12/2004	Soil	Primary	NS	**1.15**	NS	<0.5	**20.1 J-**
MST063 (Stream)								
SSMST063-0-C(5)	9/14/2004	Soil	Primary	NS	**4.63**	NS	**4.3 J-**	**55.2**
MST064 (Stream)								
SSMST064-0-C(5)	9/13/2004	Soil	Primary	NS	**6.62 J+**	NS	**1.7 J**	**57 J**
MST234 (Stream)								
SSMST234-0-C(5)	9/11/2004	Soil	Primary	NS	**0.95**	NS	<0.5	**17.7 J**
MST270 (Stream)								
SSMST270-0-C(5)	9/10/2004	Soil	Primary	NS	**3.2**	NS	**1.6 J**	**50.6 J**
MST271 (Stream)								
SSMST271-0-C(5)	9/14/2004	Soil	Primary	NS	**1.75 J+**	NS	<0.5	**42.8 J**
MST276 (Stream)								
SSMST276-0-C(5)	9/13/2004	Soil	Primary	NS	**7.74 J+**	NS	**1.5 J**	**48.4 J**
MST277 (Stream)								
SSMST277-0-C(5)	9/14/2004	Soil	Primary	NS	**3.4 J+**	NS	**0.7 J**	**57.3 J**
MWD085 (Waste Rock Dump)								
0906-MWD085-01-SS	6/17/2009	Soil	Primary	**36.7**	**27.9**	**228**	**56.6 J**	**218 J+**
0906-MWD085-02-SS	6/17/2009	Soil	Primary	**29.4**	**43.7**	**193**	**29.6 J**	**300 J+**
0906-MWD085-03-SS	6/16/2009	Soil	Primary	**36.5**	**45.5 J+**	**490**	**39.3 J+**	**151**
0906-MWD085-04-SS	6/16/2009	Soil	Primary	**22.1**	**35.5 J+**	**396**	**31.5 J+**	**148**
0906-MWD085-05-SS	6/16/2009	Soil	Primary	**32.3**	**46.6 J+**	**296**	**43.9 J+**	**163**
0906-MWD085-06-SS	6/23/2009	Soil	Primary	**25.6**	**42.2 J+**	**320 J**	**28.7**	**160**
0906-MWD085-07-SS-1	6/17/2009	Soil	Triplicate	**3.84**	**3.85**	**613**	**1.48 J**	**23.6 J+**
0906-MWD085-07-SS-2	6/17/2009	Soil	Triplicate	**3.93**	**3.90**	**683**	**1.14 J**	**24.5 J+**
0906-MWD085-07-SS-3	6/17/2009	Soil	Triplicate	**6.91**	**19.7**	**655**	**8.55 J**	**104 J+**

TABLE 3-18

HENRY MINE - SUMMARY OF SOIL EXCEEDANCES
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				Analyte (mg/Kg, dry weight)				
Sample Identification	**Date**	**Medium**	**Type**	**Arsenic**	**Cadmium**	**Manganese**	**Selenium**	**Vanadium**
			Screening Value:	**0.39**	**70**	**1800**	**390**	**390**
0906-MWD085-07-SS-avg	6/17/2009	Soil	Averaged	**4.89**	**9.15**	**650**	**3.72 J**	**50.7 J+**
0906-MWD085-08-SS	6/17/2009	Soil	Primary	**4.38**	**3.74**	**941**	**1.20 J**	**24.9 J+**
0906-MWD085-09-SS	6/17/2009	Soil	Primary	**40.7**	**25.9**	**175**	**91.8**	**251**
0906-MWD085-10-SS	6/17/2009	Soil	Primary	**28.5**	**32.8**	**363**	**70.3**	**263**
SSMWD085-14-C(5)	7/22/2004	Soil	Primary	NS	NS	NS	**41**	NS
SSMWD085-15-C(5)	7/22/2004	Soil	Primary	NS	NS	NS	**52**	NS
SSMWD085-16-C(5)	7/22/2004	Soil	Primary	NS	NS	NS	**41**	NS
SSMWD085-17-C(5)	7/22/2004	Soil	Primary	NS	NS	NS	**42**	NS
SSMWD085-18-C(5)	7/22/2004	Soil	Primary	NS	NS	NS	**1.5 J**	NS
SSMWD085-19-C(5)	7/22/2004	Soil	Primary	NS	NS	NS	<0.5	NS
SSMWD085-20-C(5)	7/22/2004	Soil	Primary	NS	NS	NS	<0.5	NS
SSMWD085-21-C(6)	7/22/2004	Soil	Primary	NS	NS	NS	<0.5	NS
SSMWD085-22-C(5)	7/22/2004	Soil	Primary	NS	NS	NS	<0.5	NS
SSMWD085-23-C(5)	7/22/2004	Soil	Primary	NS	NS	NS	<0.5	NS
SSMWD085-24-C(5)	7/22/2004	Soil	Primary	NS	NS	NS	<0.5	NS
SSMWD085-25-C(6)	7/22/2004	Soil	Primary	NS	NS	NS	<0.5	NS
MWD086 (Waste Rock Dump)								
0906-MWD086-01-SS	6/16/2009	Soil	Primary	**33.4**	**37.5 J+**	**287**	**46.4 J+**	**97.6**
0906-MWD086-02-SS	6/15/2009	Soil	Primary	**4**	**2.85**	**684**	**0.687 J**	**27.3 J+**
0906-MWD086-03-SS	6/15/2009	Soil	Primary	**29**	**48.9**	**264**	**47.9**	**386 J+**
0906-MWD086-04-SS	6/15/2009	Soil	Primary	**29**	**45.6**	**315**	**59.6**	**265 J+**
0906-MWD086-05-SS	6/15/2009	Soil	Primary	**18.8**	**18.7**	**222**	**10.5**	**123 J+**
0906-MWD086-06-SS	6/15/2009	Soil	Primary	**13**	**3.79**	**402**	**9.44**	**39.7 J+**
0906-MWD086-07-SS-1	6/17/2009	Soil	Triplicate	**12.3**	**7.58**	**428**	**11.3**	**75.4**
0906-MWD086-07-SS-2	6/17/2009	Soil	Triplicate	**13.8**	**5.34**	**398**	**9.43**	**57.9**
0906-MWD086-07-SS-3	6/17/2009	Soil	Triplicate	**12.3**	**5.52**	**396**	**9.77**	**57.8**
0906-MWD086-07-SS-avg	6/17/2009	Soil	Averaged	**12.8**	**6.15**	**407**	**10.2**	**63.7**
0906-MWD086-08-SS	6/15/2009	Soil	Primary	**4.5**	**2.13**	**1230**	**2.86**	**22.3 J+**
0906-MWD086-09-SS	6/16/2009	Soil	Primary	**6.05**	**2.24 J+**	**2040**	**4.51 J+**	**28.7**
0906-MWD086-10-SS	6/16/2009	Soil	Primary	**24.6**	**28.5 J+**	**510**	**28.5 J+**	**141**
SMWD086-18-C(5)	7/22/2004	Soil	Primary	NS	NS	NS	**0.8 J-**	NS
SSMWD086-10-C(6)	7/22/2004	Soil	Primary	NS	NS	NS	<0.5	NS
SSMWD086-11-C(5)	7/22/2004	Soil	Primary	NS	NS	NS	<0.5	NS
SSMWD086-12-C(6)	7/22/2004	Soil	Primary	NS	NS	NS	<0.5	NS
SSMWD086-13-C(8)	7/22/2004	Soil	Primary	NS	NS	NS	<0.5	NS
SSMWD086-14-C(16)	7/22/2004	Soil	Primary	NS	NS	NS	**12.4 J-**	NS
SSMWD086-15-C(9)	7/22/2004	Soil	Primary	NS	NS	NS	**13.6 J-**	NS
SSMWD086-16-C(5)	7/22/2004	Soil	Primary	NS	NS	NS	**12.6 J-**	NS
SSMWD086-17-C(5)	7/22/2004	Soil	Primary	NS	NS	NS	**2.3 J-**	NS
SSMWD086-19-C(5)	7/22/2004	Soil	Primary	NS	NS	NS	<0.5 UJ	NS
SSMWD086-1-C(16)QA1	7/22/2004	Soil	Triplicate	NS	NS	NS	**8.9 J-**	NS
SSMWD086-1-C(16)QA2	7/22/2004	Soil	Triplicate	NS	NS	NS	**9.8 J-**	NS
SSMWD086-1-C(16)QA3	7/22/2004	Soil	Triplicate	NS	NS	NS	**9 J-**	NS
SSMWD086-1-C(16)QA-avg	7/22/2004	Soil	Averaged	NS	NS	NS	**9.23 J-**	NS
SSMWD086-20-C(5)	7/22/2004	Soil	Primary	NS	NS	NS	<0.5 UJ	NS
SSMWD086-21-C(5)	7/22/2004	Soil	Primary	NS	NS	NS	<0.5 UJ	NS
SSMWD086-22-C(5)	7/22/2004	Soil	Primary	NS	NS	NS	**0.7 J-**	NS
SSMWD086-23-C(5)	7/22/2004	Soil	Primary	NS	NS	NS	<0.5	NS
SSMWD086-24-C(5)	7/22/2004	Soil	Primary	NS	NS	NS	<0.5	NS
SSMWD086-25-C(5)	7/22/2004	Soil	Primary	NS	NS	NS	<0.5	NS
SSMWD086-26-C(5)	7/22/2004	Soil	Primary	NS	NS	NS	<0.5	NS
SSMWD086-2-C5(5)	7/22/2004	Soil	Primary	NS	NS	NS	**13.3 J-**	NS
SSMWD086-3-C(5)	7/22/2004	Soil	Primary	NS	NS	NS	**11.2 J-**	NS
SSMWD086-4-C(5)	7/22/2004	Soil	Primary	NS	NS	NS	**0.9 J-**	NS
SSMWD086-5-C(5)	7/22/2004	Soil	Primary	NS	NS	NS	<0.5 UJ	NS

TABLE 3-18

HENRY MINE - SUMMARY OF SOIL EXCEEDANCES
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				Analyte (mg/Kg, dry weight)				
Sample Identification	**Date**	**Medium**	**Type**	**Arsenic**	**Cadmium**	**Manganese**	**Selenium**	**Vanadium**
			Screening Value:	**0.39**	**70**	**1800**	**390**	**390**
SSMWD086-6-C(5)	7/22/2004	Soil	Primary	NS	NS	NS	<0.5 UJ	NS
SSMWD086-7-C(5)	7/22/2004	Soil	Primary	NS	NS	NS	<0.5 UJ	NS
SSMWD086-8-C(7)	7/22/2004	Soil	Primary	NS	NS	NS	**0.5 J-**	NS
SSMWD086-9-C(6)	7/22/2004	Soil	Primary	NS	NS	NS	**0.6 J-**	NS
MWD087 (Waste Rock Dump)								
0906-MWD087-01-SS	6/15/2009	Soil	Primary	**25.8**	**25.5**	**497**	**19.7**	**168 J+**
0906-MWD087-02-SS	6/15/2009	Soil	Primary	**27**	**30.9**	**179**	**96.2**	**182 J+**
0906-MWD087-03-SS	6/15/2009	Soil	Primary	**16**	**47.5**	**68.8**	**12.0**	**230 J+**
0906-MWD087-04-SS	6/15/2009	Soil	Primary	**32.1**	**35.5**	**408**	**31.4**	**273 J+**
0906-MWD087-05-SS	6/16/2009	Soil	Primary	**21.8**	**27.0 J+**	**136**	**32.5 J+**	**167**
0906-MWD087-06-SS	6/16/2009	Soil	Primary	**28.6**	**41.5 J+**	**292**	**24.8 J+**	**258**
0906-MWD087-07-SS-1	6/16/2009	Soil	Triplicate	**29.6**	**39.1 J+**	**313**	**37.2 J+**	**284**
0906-MWD087-07-SS-2	6/16/2009	Soil	Triplicate	**30.8**	**41.3 J+**	**376**	**36.1 J+**	**214**
0906-MWD087-07-SS-3	6/16/2009	Soil	Triplicate	**30.4**	**36.8 J+**	**350**	**30.6 J+**	**212**
0906-MWD087-07-SS-avg	6/16/2009	Soil	Averaged	**30.3**	**39.1 J+**	**346**	**34.6 J+**	**237**
0906-MWD087-08-SS	6/16/2009	Soil	Primary	**21.9**	**24.8 J+**	**289**	**25.0 J+**	**197**
0906-MWD087-09-SS	6/16/2009	Soil	Primary	**30.1**	**35.8 J+**	**280**	**49.1 J+**	**194**
0906-MWD087-10-SS	6/16/2009	Soil	Primary	**22.9**	**28.0 J+**	**165**	**29.6 J+**	**165**
MWD088 (Waste Rock Dump)								
0906-MWD088-01-SS-1	6/15/2009	Soil	Triplicate	**27.7**	**23.7**	**198**	**39.1**	**155 J+**
0906-MWD088-01-SS-2	6/15/2009	Soil	Triplicate	**25.2**	**25.7**	**203**	**26.6**	**154 J+**
0906-MWD088-01-SS-3	6/15/2009	Soil	Triplicate	**25.6**	**24.1**	**213**	**32.7**	**136 J+**
0906-MWD088-01-SS-avg	6/15/2009	Soil	Averaged	**26.2**	**24.5**	**205**	**32.8**	**148 J+**
0906-MWD088-02-SS	6/23/2009	Soil	Primary	**14.7**	**39.3 J+**	**296 J**	**21.8**	**158**
0906-MWD088-03-SS	6/15/2009	Soil	Primary	**25.1**	**22.3**	**710**	**10.1**	**149 J+**
0906-MWD088-04-SS	6/16/2009	Soil	Primary	**33.0 J+**	**29.2 J+**	**202 J**	**35.3 J+**	**205**
0906-MWD088-06-SS	6/15/2009	Soil	Primary	**7.92**	**6.33**	**1650**	**2.62**	**38.7 J+**
0906-MWD088-07-SS	6/16/2009	Soil	Primary	**30.0 J+**	**58.2 J+**	**267 J**	**55.4 J+**	**584**
0906-MWD088-08-SS	6/16/2009	Soil	Primary	**44.5 J+**	**28.5 J+**	**165 J**	**53.1 J+**	**332**
0906-MWD088-09-SS	6/23/2009	Soil	Primary	**17.9**	**22.7 J+**	**334 J**	**16.1**	**147**
0906-MWD088-10-SS	6/16/2009	Soil	Primary	**22.3 J+**	**25.1 J+**	**249 J**	**13.7 J+**	**180**
0906-MWD088-AL01-SS	6/19/2009	Soil	Primary	**34**	**33.1**	**189**	**31.8 J**	**256 J+**
MWD090 (Waste Rock Dump)								
0906-MWD090-01-SS	6/16/2009	Soil	Primary	**8.85**	**12.6 J+**	**893**	**8.45 J+**	**81.8**
0906-MWD090-02-SS	6/17/2009	Soil	Primary	**7.89**	**19.1**	**1870**	**8.64**	**117**
0906-MWD090-03-SS	6/16/2009	Soil	Primary	**13.8**	**35.7 J+**	**413**	**34.4 J+**	**143**
0906-MWD090-04-SS	6/17/2009	Soil	Primary	**34.9**	**45.5**	**266**	**318**	**412**
0906-MWD090-05-SS	6/16/2009	Soil	Primary	**21**	**36.2 J+**	**123**	**36.8 J+**	**255**
0906-MWD090-06-SS	6/16/2009	Soil	Primary	**30.4**	**36.0 J+**	**269**	**41.2 J+**	**227**
0906-MWD090-07-SS1	6/16/2009	Soil	Triplicate	**24.1**	**28.8 J+**	**318**	**29.2 J+**	**144**
0906-MWD090-07-SS2	6/16/2009	Soil	Triplicate	**21.5**	**27.0 J+**	**283**	**28.5 J+**	**184**
0906-MWD090-07-SS3	6/16/2009	Soil	Triplicate	**25.6 J+**	**30.9 J+**	**292 J**	**35.2 J+**	**213**
0906-MWD090-07-SS-avg	6/16/2009	Soil	Averaged	**23.7 J+**	**28.9 J+**	**298 J**	**31 J+**	**180**
0906-MWD090-08-SS	6/16/2009	Soil	Primary	**29.3 J+**	**21.6 J+**	**182 J**	**146 J+**	**205**
0906-MWD090-09-SS	6/16/2009	Soil	Primary	**23.7 J+**	**33.2 J+**	**646 J**	**62.4 J+**	**322**
0906-MWD090-10-SS	6/16/2009	Soil	Primary	**25.8 J+**	**38.3 J+**	**225 J**	**95.6 J+**	**271**

TABLE 3-18

HENRY MINE - SUMMARY OF SOIL EXCEEDANCES
(Page 5 of 5)

Notes:

Result is greater than screening value

NS - not sampled

FLAG DEFINITION:

U	The analyte was analyzed for, but was not detected above the level of the reported sample quantitation limit.
J	The result is an estimated quantity. The associated numerical value is the approximated concentration of the analyte in the sample.
J+	The result is an estimated quantity, but the result may be biased high.
J-	The result is an estimated quantity, but the result may be biased low.
J+/B	Result is estimated and biased high; associated field blank contained target analyte.
R	The result is unusable. The sample result is rejected due to serious deficiencies in meeting quality control criteria. The analyte may or may not be present in the sample.
UJ	The analyte was analyzed for, but was not detected. The reported quantitation limit is approximate and may be inaccurate or imprecise.
K	Serial dilutions not performed for samples analyzed by this method (EPA 200.7; 200.8).
T	Laboratory SOP does not address biotic matrices; biotic-specific LCS/SRM not analyzed.

SOURCE FOR SCREENING VALUES (SEE ALSO TABLE 3

Soil	USEPA Regional Screening Levels for Soil, Residential (source: ORNL, December 2009).

TRIPLICATE RESULT

"Primary" indicates locations where only one sample was collected from a given location. "Triplicate" indicates locations where a total of three samples were collected from a given location for the purpose of quality assurance.

The average value for triplicate samples is calculated as follows: (a) the mean of three detected values, (b) the mean of two detected values if result of one triplicate is not detected, (c) the detected value if results of two triplicates are not detected, or (d) less than the highest method detection limit if all triplicate results are not detected.

TABLE 3-19
HENRY MINE
2009 SOIL SAMPLING CONCENTRATION RANGES AND SCREENING LEVEL EXCEEDANCES (mg/kg dw)[1]

Analyte	SL	Background (n=10)	Waste Rock Dumps (n=50)	[n] > SL	Historic Ore Haul Road (n=10)	[n] > SL
Selenium	390	0.48 - 1.26	0.69-318	0	7.45-57.1	0
Arsenic	0.39	6.60 - 9.01	4.38-44.50	50	7.26-45.5	10
Cadmium	70	0.572 - 1.15	2.13-48.9	0	10.4-114	1
Manganese	1800	1500 - 3990	68.8-2040	2	148-939	0
Vanadium	390	22.2 - 27.1	22.3-584	2	77.1-556	1

Notes:
n - total number of samples
[n] - sample concentration
SL - screening level
1 - Triplicate samples are treated as a single sample as described in Appendix A.
Shaded results indicate those which ranges contain exceedances of screening level.

TABLE 3-20
HENRY MINE
RIPARIAN HABITAT ASSESSMENT DATA MATRIX

Station	Category	Amphibians	Swimming birds	Marsh-nesting birds	Cavity-nesting birds	Birds that forage at water's edge	Aerial-foraging birds	Open cup-nesting birds	Small mammals	Water dependent medium-sized mammals	Upland medium-sized mammals	Game mammals	Livestock	Sept 2004 Soil Selenium Concentration (mg/kg dw)	Sept 2004 Vegetation Selenium Concentration (mg/kg dw)	Habitat Quality Ranking
MDS022	ponded seep	1	1	1	0	0	1	1	1	0	1	1	1	6.9	0.25	4
MSP014	pond	1	1	1	1	1	1	1	1	0	1	1	1	12	3.3	1
MSP015	pond	1	1	0	1	1	0	1	0	0	1	1	1	24	25	3
MSP016	pond	1	1	0	1	0	0	1	1	0	1	1	1	45	6.5	3
MSP055	pond	0	0	0	0	1	0	0	0	0	0	0	0	28	65	4
MST044	stream	0	0	0	1	0	1	1	1	0	1	1	1	5.3	7.9	4
MST045	ponded stream	1	1	0	1	1	1	0	1	0	1	1	1	1.5	0.25	3
MST046	stream	1	1	0	0	0	1	1	0	0	1	0	1	1.1	0.25	2
MST047	stream	1	1	0	0	0	1	1	0	0	1	0	1	1.1	0.25	2
MST049	ponded stream	1	1	0	1	0	0	1	1	0	1	1	1	0.25	0.25	3
MST050	ponded stream	1	1	0	1	1	1	0	1	0	1	1	1	0.25	0.25	3
MST054	stream	1	0	0	0	0	1	0	0	0	0	0	1	1.4	0.25	2
MST055	stream	1	0	0	0	0	1	1	0	0	0	0	1	0.25	0.25	2
MST057	ponded stream	1	0	0	1	0	1	1	1	0	1	1	1	3.1	0.25	4
MST058	stream	0	0	0	0	0	1	1	1	0	1	1	1	1.3	0.25	1
MST062	stream	0	0	0	0	0	1	0	0	0	0	0	1	0.25	0.25	2
MST063	stream	0	0	0	0	0	1	1	1	0	1	1	1	4.3	0.25	1
MST064	stream	1	0	1	0	0	1	1	1	0	1	1	1	1.7	0.25	4
MST275	ponded stream	1	1	0	1	1	1	1	0	0	1	1	1	0.25	0.25	3
MST276	stream	1	0	1	0	0	1	1	1	0	1	1	1	1.5	0.25	4
MST277	stream	1	0	0	0	0	1	1	0	0	0	1	1	0.70	0.25	2

Notes:
Non-detected concentrations are presented as one-half the MDL. The MDL for both media was 0.5 mg/kg dw.
Habitat Quality Ranking
1—high quality aquatic and terrestrial habitat
2—high quality aquatic, but low quality terrestrial habitat
3—low quality aquatic, but high quality terrestrial habitat
4—low quality aquatic and terrestrial habitat

TABLE 3-21

HENRY MINE - SUMMARY OF VEGETATION EXCEEDANCES
(Page 1 of 8)

				Analyte (mg/Kg, dry weight)	
Sample Identification	**Collection Date**	**Vegetation Type**	**Sample Type**	**Molybdenum**	**Selenium**
			Screening Value:	**5**	**5**
MBH002 (Henry Background)					
0906-MBH002-01-GF	6/18/2009	GF	Primary	<1.49	**0.383 J+**
0906-MBH002-01-SL-ARTR	6/18/2009	SL-ARTR	Primary	<1.43	**0.722**
0906-MBH002-01-SM-ARTR	6/18/2009	SM-ARTR	Primary	<1.39	**0.581**
0906-MBH002-02-GF	6/18/2009	GF	Primary	**2.63 J**	**0.456 J+**
0906-MBH002-02-SL-ARTR	6/18/2009	SL-ARTR	Primary	<1.48	**0.318 J+**
0906-MBH002-02-SM-ARTR	6/18/2009	SM-ARTR	Primary	<1.46	<0.123 UJ
0906-MBH002-03-GF	6/18/2009	GF	Primary	**1.84 J**	**0.941**
0906-MBH002-03-SL-AMAL	6/18/2009	SL-AMAL	Primary	<1.46	**0.575**
0906-MBH002-03-SL-ARTR	6/18/2009	SL-ARTR	Primary	<1.46	**0.594**
0906-MBH002-03-SM-AMAL	6/18/2009	SM-AMAL	Primary	<1.49	**0.324 J+**
0906-MBH002-03-SM-ARTR	6/18/2009	SM-ARTR	Primary	<1.44	**0.239 J+**
0906-MBH002-04-GF	6/18/2009	GF	Primary	**1.77 J**	**1.12**
0906-MBH002-05-FB	6/18/2009	FB	Primary	<1.48	**0.518**
0906-MBH002-05-GS	6/18/2009	GS	Primary	**1.89 J**	**0.265 J+**
0906-MBH002-05-SL-ARTR	6/18/2009	SL-ARTR	Primary	<1.49	**0.340**
0906-MBH002-05-SL-PUTR	6/18/2009	SL-PUTR	Primary	<1.49	**0.169 J+/B**
0906-MBH002-05-SL-SYAL	6/18/2009	SL-SYAL	Primary	<1.49	**0.216 J+/B**
0906-MBH002-05-SM-ARTR	6/18/2009	SM-ARTR	Primary	<2.90	**0.145 J+/B**
0906-MBH002-05-SM-PUTR	6/18/2009	SM-PUTR	Primary	<1.49	**0.153 J+/B**
0906-MBH002-05-SM-SYAL	6/18/2009	SM-SYAL	Primary	<1.48	**0.110 J+/B**
0906-MBH002-06-GF	6/17/2009	GF	Primary	**2.01 J**	**0.296 J+/B**
0906-MBH002-06-SL-SYAL	6/17/2009	SL-SYAL	Primary	**1.54 J**	**0.209 J+/B**
0906-MBH002-06-SM-SYAL	6/17/2009	SM-SYAL	Primary	<1.49	**0.108 J+/B**
0906-MBH002-07-GF-1	6/16/2009	GF	Triplicate	<1.44	**0.373**
0906-MBH002-07-GF-2	6/16/2009	GF	Triplicate	**2.25 J**	**0.318**
0906-MBH002-07-GF-3	6/16/2009	GF	Triplicate	<1.46	**0.287**
0906-MBH002-07-GF-avg	6/16/2009	GF	Averaged	**2.25 J**	**0.326**
0906-MBH002-07-SL-1-ARTR	6/16/2009	SL-ARTR	Triplicate	<1.45	**0.689**
0906-MBH002-07-SL-1-PUTR	6/16/2009	SL-PUTR	Primary	<1.49	**0.237**
0906-MBH002-07-SL-2-ARTR	6/16/2009	SL-ARTR	Triplicate	<1.49	**0.467**
0906-MBH002-07-SL-2-SYAL	6/16/2009	SL-SYAL	Triplicate	<1.48	**0.199**
0906-MBH002-07-SL-3-SYAL	6/16/2009	SL-SYAL	Triplicate	**2.32 J**	**0.551**
0906-MBH002-07-SL-avg-ARTR	6/16/2009	SL-ARTR	Averaged	<1.49	**0.578**
0906-MBH002-07-SL-avg-SYAL	6/16/2009	SL-SYAL	Averaged	**2.32 J**	**0.375**
0906-MBH002-07-SM-1-ARTR	6/16/2009	SM-ARTR	Triplicate	**2.23 J**	**0.234**
0906-MBH002-07-SM-1-PUTR	6/16/2009	SM-PUTR	Primary	<1.47	**0.109 J**
0906-MBH002-07-SM-2-ARTR	6/16/2009	SM-ARTR	Triplicate	<1.47	**0.200**
0906-MBH002-07-SM-2-SYAL	6/16/2009	SM-SYAL	Triplicate	<2.93	<0.0871
0906-MBH002-07-SM-3-SYAL	6/16/2009	SM-SYAL	Triplicate	<1.49	**0.160 J**
0906-MBH002-07-SM-avg-ARTR	6/16/2009	SM-ARTR	Averaged	**2.23 J**	**0.217**
0906-MBH002-07-SM-avg-SYAL	6/16/2009	SM-SYAL	Averaged	<2.93	**0.16 J**
0906-MBH002-08-FB	6/18/2009	FB	Primary	<1.49	**0.291 J+**
0906-MBH002-08-GS	6/18/2009	GS	Primary	**2.54 J**	**0.362 J+**
0906-MBH002-08-SL-ARTR	6/18/2009	SL-ARTR	Primary	<2.91	**0.557**
0906-MBH002-08-SL-CHNA	6/18/2009	SL-CHVI8	Primary	<2.57	**0.812**
0906-MBH002-08-SL-SYAL	6/18/2009	SL-SYAL	Primary	<2.38	**0.319 J+**
0906-MBH002-08-SM-ARTR	6/18/2009	SM-ARTR	Primary	<4.66	**0.257 J+**

TABLE 3-21

HENRY MINE - SUMMARY OF VEGETATION EXCEEDANCES
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				Analyte (mg/Kg, dry weight)	
Sample Identification	**Collection Date**	**Vegetation Type**	**Sample Type**	**Molybdenum**	**Selenium**
			Screening Value:	**5**	**5**
0906-MBH002-08-SM-CHNA	6/18/2009	SM-CHVI8	Primary	<3.00	**1.20**
0906-MBH002-08-SM-SYAL	6/18/2009	SM-SYAL	Primary	<2.52	<0.0996
0906-MBH002-09-GF	6/16/2009	GF	Primary	**1.48 J**	**0.241**
0906-MBH002-09-SL-PUTR	6/16/2009	SL-PUTR	Primary	<1.48	**0.167 J**
0906-MBH002-09-SM-PUTR	6/16/2009	SM-PUTR	Primary	<1.50	**0.211**
0906-MBH002-10-FB	6/18/2009	FB	Primary	<1.50	**0.492**
0906-MBH002-10-GS	6/18/2009	GS	Primary	**2.87 J**	**0.393**
0906-MBH002-10-SL-AMAL	6/18/2009	SL-AMAL	Primary	<1.49	**0.197 J+/B**
0906-MBH002-10-SL-ARTR	6/18/2009	SL-ARTR	Primary	<1.49	**0.760**
0906-MBH002-10-SL-CHNA	6/18/2009	SL-CHVI8	Primary	<2.75	**0.637**
0906-MBH002-10-SL-PUTR	6/18/2009	SL-PUTR	Primary	<2.89	**0.415**
0906-MBH002-10-SL-SYAL	6/18/2009	SL-SYAL	Primary	**2.19 J**	**0.301**
0906-MBH002-10-SM-AMAL	6/18/2009	SM-AMAL	Primary	<2.88	**0.242 J+/B**
0906-MBH002-10-SM-ARTR	6/18/2009	SM-ARTR	Primary	<3.51	**0.232 J+/B**
0906-MBH002-10-SM-CHNA	6/18/2009	SM-CHVI8	Primary	<2.78	**0.647**
0906-MBH002-10-SM-PUTR	6/18/2009	SM-PUTR	Primary	<2.90	**0.226 J+/B**
0906-MBH002-10-SM-SYAL	6/18/2009	SM-SYAL	Primary	<4.97	**0.199 J+/B**
0908-MBH002-05-FB	8/25/2009	FB	Primary	<1.47	**1.63**
0908-MBH002-08-FB	8/25/2009	FB	Primary	<1.47	**0.832**
0908-MBH002-10-FB	8/25/2009	FB	Primary	**1.91 J**	**0.392**
0908-MBH002-CS-JUSC-LEAF	8/25/2009	JUSC-LEAF	Primary	<1.49	**0.181 J**
0908-MBH002-CS-JUSC-STEM	8/25/2009	JUSC-STEM	Primary	<1.48	**0.192 J**
MDS016 (Dump Seep)					
VEMDS016-0-C(5)	9/11/2004	Vegetation	Primary	**2.18 J+T**	**0.7 JT**
MDS022 (Dump Seep)					
VEMDS022-0-C(5)	9/10/2004	Vegetation	Primary	**3.98 T**	<0.5 UT
MHR002 (Historic Haul Road)					
0906-MHR002-01-GF	6/18/2009	GF	Primary	**8.72**	**3.07**
0906-MHR002-02-GF	6/18/2009	GF	Primary	**4.44**	**1.27**
0906-MHR002-03-GF	6/19/2009	GF	Primary	**5.17**	**8.26**
0906-MHR002-04-FB	6/19/2009	FB	Primary	**3.06**	**2.58**
0906-MHR002-04-GS	6/19/2009	GS	Primary	**2.23 J**	**1.30**
0906-MHR002-05-GF	6/18/2009	GF	Primary	**1.96 J**	**2.78**
0906-MHR002-06-GF	6/18/2009	GF	Primary	<1.46	**3.03**
0906-MHR002-07-GF-1	6/18/2009	GF	Triplicate	<1.45	**1.31**
0906-MHR002-07-GF-2	6/18/2009	GF	Triplicate	**2.49 J**	**1.60**
0906-MHR002-07-GF-3	6/18/2009	GF	Triplicate	**4.38**	**2.49**
0906-MHR002-07-GF-avg	6/18/2009	GF	Averaged	**3.44 J**	**1.8**
0906-MHR002-08-GF	6/18/2009	GF	Primary	**11.3**	**4.03 J**
0906-MHR002-09-GF	6/18/2009	GF	Primary	**11.3**	**4.13**
0906-MHR002-10-FB	6/18/2009	FB	Primary	**13.1**	**49.0 J+**
0906-MHR002-10-GS	6/18/2009	GS	Primary	**18.8**	**3.78 J+**
0908-MHR002-04-FB	8/25/2009	FB	Primary	**1.56 J**	**1.28**
0908-MHR002-10-FB	8/25/2009	FB	Primary	**2.91 J**	**4.10**
MRV016 (Reservoir Delta)					
VEMRV016-0-C(5)	9/11/2004	Vegetation	Primary	**0.31 T**	<0.5 UT
MSG002 (Spring)					
VEMSG002-0-C(5)	9/13/2004	Vegetation	Primary	**1.9 T**	<0.5 UT

TABLE 3-21

HENRY MINE - SUMMARY OF VEGETATION EXCEEDANCES
(Page 3 of 8)

				Analyte (mg/Kg, dry weight)	
Sample Identification	**Collection Date**	**Vegetation Type**	**Sample Type**	**Molybdenum**	**Selenium**
			Screening Value:	**5**	**5**
MSP014 (Pond)					
VEMSP014-0-C(5)	9/13/2004	Vegetation	Primary	**2.26 T**	**3.3 T**
MSP015 (Pond)					
VEMSP015-0-C(6)	9/13/2004	Vegetation	Primary	**0.4 T**	**25 T**
MSP016 (Pond)					
VEMSP016-0-C(5)	9/13/2004	Vegetation	Primary	**0.65 T**	**6.5 T**
MSP055 (Pond)					
VEMSP055-0-C(10)	9/13/2004	Vegetation	Primary	**5.49 T**	**65 T**
MST043 (Stream)					
VEMST043-0-C(5)	9/11/2004	Vegetation	Primary	**1.56 T**	<0.5 UT
MST044 (Stream)					
VEMST044-0-C(6)	9/14/2004	Vegetation	Primary	**4.51 T**	**7.9 T**
MST045 (Stream)					
VEMST045-0-C(5)	9/14/2004	Vegetation	Primary	**0.63 T**	<0.5 UT
MST046 (Stream)					
VEMST046-0-C(5)	9/13/2004	Vegetation	Primary	**1.83 T**	<0.5 UT
MST047 (Stream)					
VEMST047-0-C(6)	9/13/2004	Vegetation	Primary	**1.5 T**	<0.5 UT
MST050 (Stream)					
VEMST050-0-C(5)	9/10/2004	Vegetation	Primary	**2.45 T**	<0.5 UT
MST051 (Stream)					
VEMST051-1-C(5)QA1	9/14/2004	Vegetation	Triplicate	**3.57 T**	<0.5 UT
VEMST051-1-C(5)QA2	9/14/2004	Vegetation	Triplicate	**3.44 T**	<0.5 UT
VEMST051-1-C(5)QA3	9/14/2004	Vegetation	Triplicate	**3.54 T**	<0.5 UT
VEMST051-1-C(5)QA-avg	9/14/2004	Vegetation	Averaged	**3.52 T**	<0.5 UT
MST052 (Stream)					
VEMST052-0-C(5)	9/14/2004	Vegetation	Primary	**19.3 T**	<0.5 UT
MST053 (Stream)					
VEMST053-1-C(5)QA1	9/13/2004	Vegetation	Triplicate	**1.2 T**	<0.5 UT
VEMST053-1-C(5)QA2	9/13/2004	Vegetation	Triplicate	**1.27 T**	<0.5 UT
VEMST053-1-C(5)QA3	9/13/2004	Vegetation	Triplicate	**1.22 T**	<0.5 UT
VEMST053-1-C(5)QA-avg	9/13/2004	Vegetation	Averaged	**1.23 T**	<0.5 UT
MST054 (Stream)					
VEMST054-0-C(5)	9/13/2004	Vegetation	Primary	**0.88 T**	<0.5 UT
MST055 (Stream)					
VEMST055-0-C(5)	9/12/2004	Vegetation	Primary	**0.48 T**	<0.5 UT
MST056 (Stream)					
VEMST056-0-C(5)	9/13/2004	Vegetation	Primary	**1.1 T**	<0.5 UT
MST057 (Stream)					
VEMST057-0-C(5)	9/13/2004	Vegetation	Primary	**0.72 T**	**0.5 JT**
MST058 (Stream)					
VEMST058-0-C(5)	9/13/2004	Vegetation	Primary	**1.64 T**	<0.5 UT
MST062 (Stream)					
VEMST062-0-C(5)	9/12/2004	Vegetation	Primary	**1.19 T**	<0.5 UT
MST063 (Stream)					
VEMST063-0-C(5)	9/14/2004	Vegetation	Primary	**1.24 T**	<0.5 UT
MST064 (Stream)					

TABLE 3-21

HENRY MINE - SUMMARY OF VEGETATION EXCEEDANCES
(Page 4 of 8)

				Analyte (mg/Kg, dry weight)	
Sample Identification	**Collection Date**	**Vegetation Type**	**Sample Type**	**Molybdenum**	**Selenium**
			Screening Value:	**5**	**5**
VEMST064-0-C(5)	9/13/2004	Vegetation	Primary	**1.38 T**	<0.5 UT
MST234 (Stream)					
VEMST234-1-C(5)	9/11/2004	Vegetation	Primary	**3.33 T**	<0.5 UT
MST270 (Stream)					
VEMST270-0-C(5)	9/10/2004	Vegetation	Primary	**1.41 T**	<0.5 UT
MST271 (Stream)					
VEMST271-0-C(5)	9/14/2004	Vegetation	Primary	**0.71 T**	<0.5 UT
MST276 (Stream)					
VEMST276-0-C(5)	9/13/2004	Vegetation	Primary	**1.17 T**	<0.5 UT
MST277 (Stream)					
VEMST277-0-C(5)	9/14/2004	Vegetation	Primary	**1.32 T**	<0.5 UT
MWD085 (Waste Rock Dump)					
0906-MWD085-01-GF	6/17/2009	GF	Primary	**28**	**1.24**
0906-MWD085-02-FB	6/17/2009	FB	Primary	**7.53**	**2.31**
0906-MWD085-02-GS	6/17/2009	GS	Primary	**15.7**	**0.717**
0906-MWD085-03-FB	6/16/2009	FB	Primary	**15.9**	**6.29**
0906-MWD085-03-GS	6/16/2009	GS	Primary	**20.7**	**1.21**
0906-MWD085-04-GF	6/16/2009	GF	Primary	**12.9**	**1.56**
0906-MWD085-05-GF	6/16/2009	GF	Primary	**9.67**	**2.49**
0906-MWD085-06-GF	6/23/2009	GF	Primary	**8.89**	**1.49 J**
0906-MWD085-07-GF-1	6/17/2009	GF	Triplicate	**7.21**	**3.20 J**
0906-MWD085-07-GF-2	6/17/2009	GF	Triplicate	**4.86**	**4.06**
0906-MWD085-07-GF-3	6/17/2009	GF	Triplicate	**4.57**	**5.86**
0906-MWD085-07-GF-avg	6/17/2009	GF	Averaged	**5.55**	**4.37 J**
0906-MWD085-08-GF	6/17/2009	GF	Primary	**8.15**	**6.66**
0906-MWD085-09-GF	6/17/2009	GF	Primary	**58.4**	**3.60 J**
0906-MWD085-10-GF	6/17/2009	GF	Primary	**7.3**	**19.2 J**
0908-MWD085-02-FB	8/25/2009	FB	Primary	**5.4**	**2.48**
0908-MWD085-03-FB	8/25/2009	FB	Primary	**10.9**	**9.81**
VEMWD085-10-C(6)	7/21/2004	Vegetation	Primary	NS	<0.5 UT
VEMWD085-11-C(5)	7/21/2004	Vegetation	Primary	NS	<0.5 UT
VEMWD085-12-C(6)	7/21/2004	Vegetation	Primary	NS	<0.5 UT
VEMWD085-13-C(6)	7/21/2004	Vegetation	Primary	NS	<0.5 UT
VEMWD085-14-C(5)	7/22/2004	Vegetation	Primary	NS	<0.5 UT
VEMWD085-15-C(5)	7/22/2004	Vegetation	Primary	NS	**0.7 JT**
VEMWD085-16-C(5)	7/22/2004	Vegetation	Primary	NS	**1.9 JT**
VEMWD085-17-C(5)	7/22/2004	Vegetation	Primary	NS	<0.6 UT
VEMWD085-18-C(5)	7/22/2004	Vegetation	Primary	NS	<0.5 UT
VEMWD085-19-C(5)	7/22/2004	Vegetation	Primary	NS	<0.5 UT
VEMWD085-1-C(5)	7/21/2004	Vegetation	Primary	NS	<0.5 UT
VEMWD085-20-C(5)	7/22/2004	Vegetation	Primary	NS	<0.5 UT
VEMWD085-21-C(6)	7/22/2004	Vegetation	Primary	NS	<0.5 UT
VEMWD085-22-C(5)	7/22/2004	Vegetation	Primary	NS	<0.5 UT
VEMWD085-23-C(5)	7/22/2004	Vegetation	Primary	NS	<0.5 UT
VEMWD085-24-C(5)	7/22/2004	Vegetation	Primary	NS	<0.5 UT
VEMWD085-25-C(6)	7/22/2004	Vegetation	Primary	NS	<0.5 UT
VEMWD085-26-C(7)QA1	7/21/2004	Vegetation	Triplicate	NS	<0.5 UT
VEMWD085-26-C(7)QA2	7/21/2004	Vegetation	Triplicate	NS	<0.5 UT

TABLE 3-21

HENRY MINE - SUMMARY OF VEGETATION EXCEEDANCES
(Page 5 of 8)

				Analyte (mg/Kg, dry weight)	
Sample Identification	**Collection Date**	**Vegetation Type**	**Sample Type**	**Molybdenum**	**Selenium**
			Screening Value:	**5**	**5**
VEMWD085-26-C(7)QA3	7/21/2004	Vegetation	Triplicate	NS	<0.5 UT
VEMWD085-26-C(7)QA-avg	7/21/2004	Vegetation	Averaged	NS	<0.5 UT
VEMWD085-2-C(5)	7/21/2004	Vegetation	Primary	NS	**1.7 JT**
VEMWD085-3-C(5)	7/21/2004	Vegetation	Primary	NS	<0.5 UT
VEMWD085-4-C(5)	7/21/2004	Vegetation	Primary	NS	<0.5 UT
VEMWD085-5-C(5)	7/21/2004	Vegetation	Primary	NS	<0.5 UT
VEMWD085-6-C(5)	7/21/2004	Vegetation	Primary	NS	<0.5 UT
VEMWD085-7-C(6)	7/21/2004	Vegetation	Primary	NS	<0.5 UT
VEMWD085-8-C(5)	7/21/2004	Vegetation	Primary	NS	<0.5 UT
VEMWD085-9-C(5)	7/21/2004	Vegetation	Primary	NS	<0.5 UT
MWD086 (Waste Rock Dump)					
052404VEMWD086-1-C6	5/24/2004	Vegetation	Primary	NS	**3.5 T**
061604VEMWD086-1-C(5	6/16/2004	Vegetation	Primary	NS	**6.6 J-T**
0906-MWD086-01-GF	6/16/2009	GF	Primary	**7.32**	**5.98**
0906-MWD086-02-GF	6/15/2009	GF	Primary	**4.74**	**1.14**
0906-MWD086-03-GF	6/15/2009	GF	Primary	**8.68**	**8.6**
0906-MWD086-04-GF	6/15/2009	GF	Primary	**12.2**	**7.48**
0906-MWD086-05-GF	6/15/2009	GF	Primary	**5.36**	**0.765**
0906-MWD086-06-GF	6/15/2009	GF	Primary	**4.96**	**3.51**
0906-MWD086-07-FB-1	6/17/2009	FB	Primary	**9.59**	**2.17 J**
0906-MWD086-07-GS-1	6/17/2009	GS	Triplicate	**8.64**	**1.80 J**
0906-MWD086-07-GS-2	6/17/2009	GS	Triplicate	**9.91**	**1.09 J**
0906-MWD086-07-GS-3	6/17/2009	GS	Triplicate	**11.9**	**1.13 J**
0906-MWD086-07-GS-avg	6/17/2009	GS	Averaged	**10.2**	**1.34 J**
0906-MWD086-08-GF	6/15/2009	GF	Primary	**13.3**	**46**
0906-MWD086-09-GF	6/16/2009	GF	Primary	**7.85**	**35.3**
0906-MWD086-10-GF	6/16/2009	GF	Primary	**4.85**	**2.42**
0908-MWD086-07-FB-1	8/25/2009	FB	Triplicate	**6.65**	**1.88**
0908-MWD086-07-FB-2	8/25/2009	FB	Triplicate	**5.34**	**3.45**
0908-MWD086-07-FB-3	8/25/2009	FB	Triplicate	**20.1**	**9.11**
0908-MWD086-07-FB-avg	8/25/2009	FB	Averaged	**10.7**	**4.82**
0908-MWD086-CS-ARTR-LEAF	8/25/2009	ARTR-LEAF	Primary	**2.78 J**	**0.643 J**
0908-MWD086-CS-ARTR-STEM	8/25/2009	ARTR-STEM	Primary	<1.50	**0.504 J**
0908-MWD086-CS-POTR-LEAF	8/25/2009	POTR-LEAF	Primary	<1.49	**5.26**
0908-MWD086-CS-POTR-STEM	8/25/2009	POTR-STEM	Primary	<1.49	**1.23**
091504VEMWD086-0-C(5)	9/15/2004	Vegetation	Primary	**13 T**	**1 JT**
101804VEMWD086-0-C(5)	10/18/2004	Vegetation	Primary	NS	**0.8 J-T**
VEMWD086-10-C(6)	7/22/2004	Vegetation	Primary	NS	<0.5 UT
VEMWD086-11-C(5)	7/22/2004	Vegetation	Primary	NS	<0.5 UT
VEMWD086-12-C(6)	7/22/2004	Vegetation	Primary	NS	<0.5 UT
VEMWD086-13-C(8)	7/22/2004	Vegetation	Primary	NS	<0.5 UT
VEMWD086-14-C(16)	7/22/2004	Vegetation	Primary	NS	**0.9 JT**
VEMWD086-15-C(9)	7/22/2004	Vegetation	Primary	NS	<0.5 UT
VEMWD086-16-C(5)	7/22/2004	Vegetation	Primary	NS	<0.5 UT
VEMWD086-17-C(5)	7/22/2004	Vegetation	Primary	NS	<0.5 UT
VEMWD086-18-C(5)	7/22/2004	Vegetation	Primary	NS	<0.5 UT
VEMWD086-19-C(5)	7/22/2004	Vegetation	Primary	NS	<0.5 UT
VEMWD086-1-C(16)QA1	7/22/2004	Vegetation	Triplicate	NS	**0.6 JT**
VEMWD086-1-C(16)QA2	7/22/2004	Vegetation	Triplicate	NS	<0.5 UT

TABLE 3-21

HENRY MINE - SUMMARY OF VEGETATION EXCEEDANCES
(Page 6 of 8)

				Analyte (mg/Kg, dry weight)	
Sample Identification	**Collection Date**	**Vegetation Type**	**Sample Type**	**Molybdenum**	**Selenium**
			Screening Value:	**5**	**5**
VEMWD086-1-C(16)QA3	7/22/2004	Vegetation	Triplicate	NS	**0.6 JT**
VEMWD086-1-C(16)QA4	7/22/2004	Vegetation	Triplicate	NS	NS
VEMWD086-1-C(16)QA-avg	7/22/2004	Vegetation	Averaged	NS	**0.6 JT**
VEMWD086-1-C(5)	7/14/2004	Vegetation	Primary	NS	**7.5 T**
VEMWD086-1-C(5)QA1	8/16/2004	Vegetation	Triplicate	NS	**5.5 J-T**
VEMWD086-1-C(5)QA2	8/16/2004	Vegetation	Triplicate	NS	**5.4 J-T**
VEMWD086-1-C(5)QA3	8/16/2004	Vegetation	Triplicate	NS	**5.4 J-T**
VEMWD086-1-C(5)QA-avg	8/16/2004	Vegetation	Averaged	NS	**5.43 J-T**
VEMWD086-20-C(5)	7/22/2004	Vegetation	Primary	NS	<0.5 UT
VEMWD086-21-C(5)	7/22/2004	Vegetation	Primary	NS	<0.5 UT
VEMWD086-22-C(5)	7/22/2004	Vegetation	Primary	NS	<0.5 UT
VEMWD086-23-C(5)	7/22/2004	Vegetation	Primary	NS	<0.5 UT
VEMWD086-24-C(5)	7/22/2004	Vegetation	Primary	NS	<0.5 UT
VEMWD086-25-C(5)	7/22/2004	Vegetation	Primary	NS	<0.5 UT
VEMWD086-26-C(5)	7/22/2004	Vegetation	Primary	NS	<0.5 UT
VEMWD086-2-C(5)	7/22/2004	Vegetation	Primary	NS	<0.5 UT
VEMWD086-3-C(5)	7/22/2004	Vegetation	Primary	NS	<0.5 UT
VEMWD086-4-C(5)	7/22/2004	Vegetation	Primary	NS	<0.5 UT
VEMWD086-5-C(5)	7/22/2004	Vegetation	Primary	NS	<0.5 UT
VEMWD086-6-C(5)	7/22/2004	Vegetation	Primary	NS	<0.5 UT
VEMWD086-7-C(5)	7/22/2004	Vegetation	Primary	NS	<0.5 UT
VEMWD086-8-C(7)	7/22/2004	Vegetation	Primary	NS	<0.5 UT
VEMWD086-9-C(6)	7/22/2004	Vegetation	Primary	NS	<0.5 UT
MWD087 (Waste Rock Dump)					
0906-MWD087-01-GF	6/15/2009	GF	Primary	**19.2**	**1.56**
0906-MWD087-02-GF	6/15/2009	GF	Primary	**10.2**	**146**
0906-MWD087-03-GF	6/15/2009	GF	Primary	**48.5**	**0.921**
0906-MWD087-04-GF	6/15/2009	GF	Primary	**46.3**	**1.08**
0906-MWD087-05-GF	6/16/2009	GF	Primary	**22.2**	**1.26**
0906-MWD087-06-FB	6/16/2009	FB	Primary	**110**	**0.856**
0906-MWD087-06-GS	6/16/2009	GS	Primary	**125**	**0.587**
0906-MWD087-07-GF-1	6/16/2009	GF	Triplicate	**93.8**	**0.782**
0906-MWD087-07-GF-2	6/16/2009	GF	Triplicate	**64.9**	**1.11**
0906-MWD087-07-GF-3	6/16/2009	GF	Triplicate	**64.1**	**0.725**
0906-MWD087-07-GF-avg	6/16/2009	GF	Averaged	**74.3**	**0.872**
0906-MWD087-08-GF	6/16/2009	GF	Primary	**49.9**	**0.752**
0906-MWD087-09-GF	6/16/2009	GF	Primary	**63**	**0.451**
0906-MWD087-10-GF	6/16/2009	GF	Primary	**74.6**	**0.628**
0908-MWD087-06-FB	8/25/2009	FB	Primary	**3.78**	**7.56**
0908-MWD087-CS-ARLU	8/25/2009	ARLU	Primary	<1.50	**1.78**
MWD088 (Waste Rock Dump)					
0906-MWD088-01-GF-1	6/15/2009	GF	Triplicate	**7.64**	**1.85**
0906-MWD088-01-GF-2	6/15/2009	GF	Triplicate	**10.3**	**0.544**
0906-MWD088-01-GF-3	6/15/2009	GF	Triplicate	**13**	**0.692**
0906-MWD088-01-GF-avg	6/15/2009	GF	Averaged	**10.3**	**1.03**
0906-MWD088-02-FB	6/23/2009	FB	Primary	**7.24**	**20.2 J**
0906-MWD088-02-GS	6/23/2009	GS	Primary	**5.57**	**2.25 J**
0906-MWD088-03-GF	6/15/2009	GF	Primary	**12.9**	**0.606**

TABLE 3-21

HENRY MINE - SUMMARY OF VEGETATION EXCEEDANCES
(Page 7 of 8)

				Analyte (mg/Kg, dry weight)	
Sample Identification	**Collection Date**	**Vegetation Type**	**Sample Type**	**Molybdenum**	**Selenium**
			Screening Value:	**5**	**5**
0906-MWD088-04-GF	6/16/2009	GF	Primary	**8.66**	**2.36**
0906-MWD088-06-GF	6/15/2009	GF	Primary	**6.62**	**0.648**
0906-MWD088-07-GF	6/16/2009	GF	Primary	**6.33**	**1.44**
0906-MWD088-08-GF	6/16/2009	GF	Primary	**14.9**	**0.865**
0906-MWD088-09-FB	6/23/2009	FB	Primary	**5.05**	**3.36 J**
0906-MWD088-09-GS	6/23/2009	GS	Primary	**1.53 J**	**2.22**
0906-MWD088-10-GF	6/16/2009	GF	Primary	**5.42**	**0.472**
0906-MWD088-AL01-GF	6/19/2009	GF	Primary	**11.6**	**4.52**
0908-MWD088-02-FB	8/25/2009	FB	Primary	**6.87**	**5.61**
0908-MWD088-09-FB	8/25/2009	FB	Primary	**1.71 J**	**3.29**
MWD090 (Waste Rock Dump)					
0906-MWD090-01-GF	6/16/2009	GF	Primary	**7.36**	**4.80**
0906-MWD090-02-FB	6/17/2009	FB	Primary	**2.95 J**	**2.77 J**
0906-MWD090-02-GS	6/17/2009	GS	Primary	**2.33 J**	**1.15 J**
0906-MWD090-03-GF	6/16/2009	GF	Primary	**10.7**	**65.3**
0906-MWD090-04-FB	6/17/2009	FB	Primary	**22.1**	**67.6 J**
0906-MWD090-04-GS	6/17/2009	GS	Primary	**4.85**	**139 J**
0906-MWD090-05-GF	6/16/2009	GF	Primary	**22.7**	**2.02**
0906-MWD090-06-GF	6/16/2009	GF	Primary	**24.9**	**10.3**
0906-MWD090-07-GF1	6/16/2009	GF	Triplicate	**24.5**	**1.62**
0906-MWD090-07-GF2	6/16/2009	GF	Triplicate	**16.9**	**3.61**
0906-MWD090-07-GF3	6/16/2009	GF	Triplicate	**24.2**	**1.91**
0906-MWD090-07-GF-avg	6/16/2009	GF	Averaged	**21.9**	**2.38**
0906-MWD090-08-GF	6/16/2009	GF	Primary	**7.82**	**134**
0906-MWD090-09-GF	6/16/2009	GF	Primary	**7.61**	**20.4**
0906-MWD090-10-GF	6/16/2009	GF	Primary	**6.25**	**66**
0908-MWD090-02-FB	8/25/2009	FB	Primary	**4.47**	**2.62**
0908-MWD090-04-FB	8/25/2009	FB	Primary	**23.8**	**69.1**

TABLE 3-21

HENRY MINE - SUMMARY OF VEGETATION EXCEEDANCES
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Notes:

Allium - onion (scientific name undetermined)
AMAL - serviceberry (*Amelanchier alnifolia*)
AR - active ore haul road
ARLU - white sagebrush (*Artemisia ludoviciana*)
ARTR - big sagebrush (*Artemisia tridentata*)
BB - Ballard Mine background
BE - Enoch Valley Mine background
BH - Henry Mine background
BS - Ballard Mine shop
CAAR - Siberian peashrub (*Caragana arborescens*)
CHNA - yellow Rabbitbrush (*Chrysothamnus viscidiflorus*)*
CS - Culturally Significant plants
FB - forb
GF - grasses and forbs
GS - grass
HR - historic ore haul road
JUSC - Rocky Mountain juniper (*Juniperus scopulorum*)
POTR - quaking aspen (*Populus tremuloides*)
PRVI - chokecherry (*Prunus virginiana*)
PUTR - antelope bitterbrush (*Purshia tridentata*)
ROWI - Wood's rose (*Rosa woodsii*)
SF - shrub fruit
SL - shrub leaves
SM - shrub stems
SYAL - mountain strawberry (*Symphoricarpos oreophilus*)
TA - Enoch Valley Minte tipple area
VE - vegetation sample
WD - waste rock dump
Wild St - wild strawberry

* The current symbol for yellow Rabbitbrush is "CHVI8."

Result is greater than screening value
Method detection limit for non-detected value is greater than the screening value

FLAG DEFINITION:

U	The analyte was analyzed for, but was not detected above the level of the reported sample quantitation limit.
J	The result is an estimated quantity. The associated numerical value is the approximated concentration of the analyte in the sample.
J+	The result is an estimated quantity, but the result may be biased high.
J-	The result is an estimated quantity, but the result may be biased low.
J+/B	Result is estimated and biased high; associated field blank contained target analyte.
R	The result is unusable. The sample result is rejected due to serious deficiencies in meeting quality control criteria. The analyte may or may not be present in the sample.
UJ	The analyte was analyzed for, but was not detected. The reported quantitation limit is approximate and may be inaccurate or imprecise.
K	Serial dilutions not performed for samples analyzed by this method (EPA 200.7; 200.8).
T	Laboratory SOP does not address biotic matrices; biotic-specific LCS/SRM not analyzed.

SOURCE FOR SCREENING VALUES (SEE ALSO TABLE 3

Vegetation	Mineral tolerance of animals, second revised edition, 2005 National Research Council, published by the national academics press, WA DC, pp. 13-14.

TRIPLICATE RESULT

"Primary" indicates locations where only one sample was collected from a given location. "Triplicate" indicates locations where a total of three samples were collected from a given location for the purpose of quality assurance. The average value for triplicate samples is calculated as follows: (a) the mean of three detected values, (b) the mean of two detected values if result of one triplicate is not detected, (c) the detected value if results of two triplicates are not detected, or (d) less than the highest method detection limit if all triplicate results are not detected.

TABLE 3-22
HENRY MINE
2004 SEASONAL VEGETATION SELENIUM CONCENTRATIONS (mg/kg dw)

Station Name	Station ID	May	Jun	Jul	Aug	Sep	Oct
Henry Mine Center Waste Dump	MWD086	3.5	6.6	7.5	5.4	1.0	0.80

Notes:
Non-detected concentrations are presented as one-half the MDL. The MDL limit was 0.5 mg/kg dw.

TABLE 3-23
HENRY MINE
2009 GRASS/FORB SAMPLING CONCENTRATION RANGES AND SCREENING LEVEL EXCEEDANCES (mg/kg dw)[1]

Analyte	SL	Background (n=7)	Waste Rock Dumps (n=42)	[n] > SL	Historic Ore Haul Road (n=8)	[n] > SL
Selenium	5	0.24-1.12	0.45-146	13	1.27-8.26	1
Molybdenum	5	1.48-2.63	4.74-74.6	39	1.46U-11.3	4

Notes:
n - total number of samples
[n] - sample concentration
SL - screening level
1 - Triplicate samples are treated as a single sample as described in Appendix A.
Shaded results indicate those which ranges contain exceedances of the screening level.

TABLE 3-24

HENRY MINE - SUMMARY OF SURFACE WATER EXCEEDANCES
(Page 1 of 33)

Location:	MDS016		MDS016		MDS016		MDS016		MDS016		MDS016		MDS022		MDS022		MDS022	
Location Type:	Dump Seep		Dump Seep		Dump Seep		Dump Seep		Dump Seep		Dump Seep		Dump Seep		Dump Seep		Dump Seep	
Sample ID:	052204SWMDS016-0-F		052204SWMDS016-0-U		050806GWMDS016-0-F		050806GWMDS016-0-U		050807SWMDS016-0-F		050807SWMDS016-0-U		051804SWMDS022-0-F		051804SWMDS022-0-U		SWMDS022-0-F	
Collection Date:	5/22/2004		5/22/2004		5/8/2006		5/8/2006		5/8/2007		5/8/2007		5/18/2004		5/18/2004		9/10/2004	
Sample Type:	Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater	
	Primary		Primary		Primary		Primary		Primary		Primary		Primary		Primary		Primary	
	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL
Total Metals (mg/L)																		
Aluminum	NS		NS		NS		NS		NS		<0.03 UK	0.087	NS		NS		NS	
Barium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Beryllium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Boron	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium	NS		NS		NS		**0.0008 K**		NS		NS		NS		NS		NS	
Cobalt	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Iron	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Nickel	NS		NS		NS		**0.0069 K**		NS		NS		NS		NS		NS	
Selenium	NS		<0.001	0.005	NS		**0.018**	0.005	NS		<0.001	0.005	NS		<0.001	0.005	NS	
Silver	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Thallium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Vanadium	NS		NS		NS		**0.0011 K**	0.02	NS		NS		NS		NS		NS	
Zinc	NS		NS		NS		**0.014 K**		NS		NS		NS		NS		NS	
Dissolved Metals (mg/L)																		
Aluminum, dissolved	NS		NS		**0.03 JK**	0.087	NS		NS		NS		NS		NS		NS	
Barium, dissolved	NS		NS		**0.034 K**	0.003	NS		NS		NS		NS		NS		NS	
Beryllium, dissolved	NS		NS		<0.002 UK	0.0006	NS		NS		NS		NS		NS		NS	
Boron, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium, dissolved	<0.0002 UK	0.00127	NS		**0.0008 K**	0.00127	NS		**0.0002 JK**	0.00127	NS		<0.0001 UK	0.00127	NS		<0.0001 UK	0.00127
Cobalt, dissolved	NS		NS		<0.01 UK	0.003	NS		NS		NS		NS		NS		NS	
Iron, dissolved	NS		NS		<0.02 UK	0.158	NS		NS		NS		NS		NS		NS	
Molybdenum, dissolved	NS		NS		<0.01 UK	0.034	NS		NS		NS		NS		NS		NS	
Nickel, dissolved	**0.0129 K**	0.168	NS		**0.0069 K**	0.168	NS		**0.0176 K**	0.168	NS		**0.0057 K**	0.168	NS		**0.0085 K**	0.168
Selenium, dissolved	<0.001	0.005	NS		**0.02**	0.005	NS		NS		NS		NS		NS		<0.001	0.005
Silver, dissolved	NS		NS		<0.01 UK	0.00036	NS		NS		NS		NS		NS		NS	
Thallium, dissolved	NS		NS		<0.0001 UK	0.00003	NS		NS		NS		NS		NS		NS	
Vanadium, dissolved	<0.0004 UK	0.02	NS		**0.0022 K**	0.02	NS		<0.0002 UK	0.02	NS		<0.00013	0.02	NS		<0.00005	0.02
Zinc, dissolved	**0.008 JK**	0.382	NS		**0.016 K**	0.382	NS		**0.008 JK**	0.382	NS		<0.002 UK	0.382	NS		**0.002 JK**	0.382

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HENRY MINE - SUMMARY OF SURFACE WATER EXCEEDANCES
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Location:	MDS022		MDS022		MDS022		MDS022		MDS022		MDS022		MDS022		MDS022		MDS022	
Location Type:	Dump Seep		Dump Seep		Dump Seep		Dump Seep		Dump Seep		Dump Seep		Dump Seep		Dump Seep		Dump Seep	
Sample ID:	SWMDS022-0-U		050806GWMDS022-0-F		050806GWMDS022-0-U		050307SWMDS022-0-F		050307SWMDS022-0-U		091307GWMDS022-0-F		091307GWMDS022-0-U		051408GWMDS022-0-F		051408GWMDS022-0-U	
Collection Date:	9/10/2004		5/8/2006		5/8/2006		5/3/2007		5/3/2007		9/13/2007		9/13/2007		5/14/2008		5/14/2008	
Sample Type:	Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater	
	Primary		Primary		Primary		Primary		Primary		Primary		Primary		Primary		Primary	
	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL
Total Metals (mg/L)																		
Aluminum	NS		NS		NS		NS		<0.06 UJK	0.087	NS		**1.12 K**	0.087	NS		<0.11 UJK	0.087
Barium	NS		NS		NS		NS		NS		NS		**0.078 K**	0.003	NS		**0.041 K**	0.003
Beryllium	NS		NS		NS		NS		NS		NS		<0.002 UK	0.0006	NS		<0.002 UK	0.0006
Boron	NS		NS		NS		NS		NS		NS		**0.02 JK**	0.0016	NS		**0.02 JK**	0.0016
Cadmium	NS		NS		<0.0001 UK		NS		NS		NS		**0.0005 JK**	0.00127	NS		<0.0001 UK	0.00127
Cobalt	NS		NS		NS		NS		NS		NS		<0.01 UK	0.003	NS		<0.01 UK	0.003
Iron	NS		NS		NS		NS		NS		NS		**1.37 K**	0.158	NS		**1.47 K**	0.158
Nickel	NS		NS		**0.0035 K**		NS		NS		NS		**0.011 K**	0.168	NS		**0.0107 K**	0.168
Selenium	<0.001	0.005	NS		**0.005**	0.005	NS		<0.001	0.005	NS		<0.001	0.005	NS		<0.001	0.005
Silver	NS		NS		NS		NS		NS		NS		<0.01 UK	0.00036	NS		<0.01 UK	0.00036
Thallium	NS		NS		NS		NS		NS		NS		<0.0001 UK	0.00003	NS		<0.0002 UK	0.00003
Vanadium	NS		NS		<0.0002 UK	0.02	NS		NS		NS		**0.0039 K**	0.02	NS		**0.0004 JK**	0.02
Zinc	NS		NS		<0.002 UK		NS		NS		NS		**0.025 K**	0.382	NS		<0.003 UK	0.382
Dissolved Metals (mg/L)																		
Aluminum, dissolved	NS		<0.03 UK	0.087	NS		NS		NS		<0.03 UK	0.087	NS		<0.03 UK	0.087	NS	
Barium, dissolved	NS		**0.024 K**	0.003	NS		NS		NS		**0.071 K**	0.003	NS		**0.036 K**	0.003	NS	
Beryllium, dissolved	NS		<0.002 UK	0.0006	NS		NS		NS		<0.002 UK	0.0006	NS		<0.002 UK	0.0006	NS	
Boron, dissolved	NS		NS		NS		NS		NS		**0.02 JK**	0.0016	NS		**0.01 JK**	0.0016	NS	
Cadmium, dissolved	NS		<0.0001 UK	0.00127	NS		<0.0001 UK	0.00127	NS		<0.0001 UK	0.00127	NS		<0.0001 UK	0.00127	NS	
Cobalt, dissolved	NS		<0.01 UK	0.003	NS		NS		NS		<0.01 UK	0.003	NS		<0.01 UK	0.003	NS	
Iron, dissolved	NS		<0.02 UK	0.158	NS		NS		NS		<0.02 UK	0.158	NS		<0.02 UK	0.158	NS	
Molybdenum, dissolved	NS		<0.01 UK	0.034	NS		NS		NS		<0.01 UK	0.034	NS		<0.01 UK	0.034	NS	
Nickel, dissolved	NS		**0.0035 K**	0.168	NS		**0.0072 K**	0.168	NS		**0.0084 K**	0.168	NS		**0.0079 K**	0.168	NS	
Selenium, dissolved	NS		**0.004 J**	0.005	NS		NS		NS		<0.001	0.005	NS		<0.001	0.005	NS	
Silver, dissolved	NS		<0.01 UK	0.00036	NS		NS		NS		<0.01 UK	0.00036	NS		<0.01 UJK	0.00036	NS	
Thallium, dissolved	NS		<0.0001 UK	0.00003	NS		NS		NS		<0.0001 UK	0.00003	NS		<0.0001 UK	0.00003	NS	
Vanadium, dissolved	NS		**0.0004 JK**	0.02	NS		<0.0004 UK	0.02	NS		**0.002 K**	0.02	NS		<0.0003 UK	0.02	NS	
Zinc, dissolved	NS		**0.003 JK**	0.382	NS		**0.002 JK**	0.382	NS		<0.002 UK	0.382	NS		<0.002 UK	0.382	NS	

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HENRY MINE - SUMMARY OF SURFACE WATER EXCEEDANCES
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Location:	MDS022		MDS022		MDS034		MDS034		MDS034		MDS034		MRV016		MRV016		MRV016	
Location Type:	Dump Seep		Dump Seep		Dump Seep		Dump Seep		Dump Seep		Dump Seep		Reservoir Delta		Reservoir Delta		Reservoir Delta	
Sample ID:	091808GWMDS022-0-F		091808GWMDS022-0-U		052208GWMDS034-0-F		052208GWMDS034-0-U		0905GWMDS034-F		0905GWMDS034-U		052004SWMRV016-0-F		052004SWMRV016-0-U		051007SWMRV016-0-F	
Collection Date:	9/19/2008		9/19/2008		5/22/2008		5/22/2008		5/31/2009		5/31/2009		5/20/2004		5/20/2004		5/10/2007	
Sample Type:	Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Surface Water		Surface Water		Surface Water	
	Primary		Primary		Primary		Primary		Primary		Primary		Primary		Primary		Primary	
	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL
Total Metals (mg/L)																		
Aluminum	NS		**1.09**	0.087	NS		**0.15 JK**	0.087	NS		NS		NS		NS		NS	
Barium	NS		NS		NS		**0.058 K**	0.003	NS		NS		NS		NS		NS	
Beryllium	NS		NS		NS		<0.002 UK	0.0006	NS		NS		NS		NS		NS	
Boron	NS		NS		NS		**0.02 JK**	0.0016	NS		NS		NS		NS		NS	
Cadmium	NS		**0.000304 J**		NS		**0.0009 K**	0.00127	NS		**0.000184 J**		NS		NS		NS	
Cobalt	NS		NS		NS		<0.01 UK	0.003	NS		NS		NS		NS		NS	
Iron	NS		**1.4**	0.158	NS		**0.8 K**	0.158	NS		NS		NS		NS		NS	
Nickel	NS		**0.0120**		NS		**0.0134 K**	0.168	NS		NS		NS		NS		NS	
Selenium	NS		**0.00347**	0.005	NS		**0.14**	0.005	NS		**0.0505**	0.005	NS		<0.001	0.005	NS	
Silver	NS		NS		NS		<0.01 UK	0.00036	NS		NS		NS		NS		NS	
Thallium	NS		NS		NS		<0.0004 UK	0.00003	NS		NS		NS		NS		NS	
Vanadium	NS		<0.00500	0.02	NS		**0.01 K**	0.02	NS		<0.00500	0.02	NS		NS		NS	
Zinc	NS		**0.0240 J**		NS		**0.018 K**	0.382	NS		NS		NS		NS		NS	
Dissolved Metals (mg/L)																		
Aluminum, dissolved	<0.0500	0.087	NS		<0.03 UK	0.087	NS		NS		NS		NS		NS		NS	
Barium, dissolved	NS		NS		**0.058 K**	0.003	NS		NS		NS		NS		NS		NS	
Beryllium, dissolved	NS		NS		<0.002 UK	0.0006	NS		NS		NS		NS		NS		NS	
Boron, dissolved	NS		NS		**0.01 JK**	0.0016	NS		NS		NS		NS		NS		NS	
Cadmium, dissolved	<0.000125	0.00127	NS		**0.0005 JK**	0.00127	NS		**0.000129 J**	0.00127	NS		<0.0001 UK	0.00127	NS		<0.0001	0.00127
Cobalt, dissolved	NS		NS		<0.01 UK	0.003	NS		NS		NS		NS		NS		NS	
Iron, dissolved	<0.0250	0.158	NS		**0.16 K**	0.158	NS		NS		NS		NS		NS		NS	
Molybdenum, dissolved	NS		NS		**0.03 JK**	0.034	NS		NS		NS		NS		NS		NS	
Nickel, dissolved	**0.00927**	0.168	NS		**0.0116 K**	0.168	NS		NS		NS		**0.0009 JK**	0.168	NS		**0.0034 JK**	0.168
Selenium, dissolved	**0.00357**	0.005	NS		**0.14**	0.005	NS		NS		NS		NS		NS		NS	
Silver, dissolved	NS		NS		<0.01 UK	0.00036	NS		NS		NS		NS		NS		NS	
Thallium, dissolved	NS		NS		<0.0001 UK	0.00003	NS		NS		NS		NS		NS		NS	
Vanadium, dissolved	<0.00500	0.02	NS		**0.0088 K**	0.02	NS		NS		NS		**0.00094 K**	0.02	NS		<0.0008	0.02
Zinc, dissolved	**0.00547 J**	0.382	NS		**0.019 K**	0.382	NS		NS		NS		**0.004 JK**	0.382	NS		**0.009 JK**	0.382

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HENRY MINE - SUMMARY OF SURFACE WATER EXCEEDANCES
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Location:	MRV016		MRV016		MRV016		MRV016		MRV016		MRV016		MRV016		MSG002		MSG002	
Location Type:	Reservoir Delta		Reservoir Delta		Reservoir Delta		Reservoir Delta		Reservoir Delta		Reservoir Delta		Reservoir Delta		Spring		Spring	
Sample ID:	051007SWMRV016-0-U		090807SWMRV016-0-F		090807SWMRV016-0-U		051008SWMRV016-0-F		051008SWMRV016-0-U		091908SWMRV016-0-F		091908SWMRV016-0-U		050806GWMSG002-0-F		050806GWMSG002-0-U	
Collection Date:	5/10/2007		9/8/2007		9/8/2007		5/10/2008		5/10/2008		9/19/2008		9/19/2008		5/8/2006		5/8/2006	
Sample Type:	Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Groundwater		Groundwater	
	Primary		Primary		Primary		Primary		Primary		Primary		Primary		Primary		Primary	
	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL
Total Metals (mg/L)																		
Aluminum	<0.03 UK	0.087	NS		<0.03 UK	0.087	NS		<0.03 UK	0.087	NS		NS		NS		NS	
Barium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Beryllium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Boron	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium	NS		NS		NS		NS		NS		NS		NS		NS		<0.0001 UK	
Cobalt	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Iron	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Nickel	NS		NS		NS		NS		NS		NS		NS		NS		**0.0022 JK**	
Selenium	<0.001	0.005	NS		<0.001	0.005	NS		**0.002 J**	0.005	NS		**0.00192**	0.005	NS		**0.001 J**	0.005
Silver	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Thallium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Vanadium	NS		NS		NS		NS		NS		NS		NS		NS		**0.0005 JK**	0.02
Zinc	NS		NS		NS		NS		NS		NS		NS		NS		**0.005 JK**	
Dissolved Metals (mg/L)																		
Aluminum, dissolved	NS		NS		NS		NS		NS		<0.0500	0.087	NS		<0.03 UK	0.087	NS	
Barium, dissolved	NS		NS		NS		NS		NS		NS		NS		**0.054 K**	0.003	NS	
Beryllium, dissolved	NS		NS		NS		NS		NS		NS		NS		<0.002 UK	0.0006	NS	
Boron, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium, dissolved	NS		<0.0001 UK	0.00127	NS		<0.0001 UK	0.00127	NS		<0.000125	0.00127	NS		<0.0001 UK	0.00101	NS	
Cobalt, dissolved	NS		NS		NS		NS		NS		NS		NS		<0.01 UK	0.003	NS	
Iron, dissolved	NS		NS		NS		NS		NS		<0.0250	0.158	NS		<0.02 UK	0.158	NS	
Molybdenum, dissolved	NS		NS		NS		NS		NS		NS		NS		<0.01 UK	0.034	NS	
Nickel, dissolved	NS		**0.003 K**	0.168	NS		**0.004 K**	0.168	NS		**0.00484**	0.168	NS		**0.0019 JK**	0.120	NS	
Selenium, dissolved	NS		NS		NS		NS		NS		NS		NS		<0.001	0.005	NS	
Silver, dissolved	NS		NS		NS		NS		NS		NS		NS		<0.01 UK	0.00036	NS	
Thallium, dissolved	NS		NS		NS		NS		NS		NS		NS		<0.0001 UK	0.00003	NS	
Vanadium, dissolved	NS		**0.0013 J+K**	0.02	NS		**0.0015 K**	0.02	NS		<0.00500	0.02	NS		**0.0013 K**	0.02	NS	
Zinc, dissolved	NS		**0.007 JK**	0.382	NS		**0.005 JK**	0.382	NS		**0.0133 J**	0.382	NS		**0.003 JK**	0.272	NS	

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HENRY MINE - SUMMARY OF SURFACE WATER EXCEEDANCES
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Location:	MSG002		MSG002		MSG002		MSG002		MSP014		MSP014		MSP014		MSP014		MSP014	
Location Type:	Spring		Spring		Spring		Spring		Pond		Pond		Pond		Pond		Pond	
Sample ID:	050307SWMSG002-0-F		050307SWMSG002-0-U		091808GWMSG002-0-F		091808GWMSG002-0-U		051504SWMSP014-0-F		051504SWMSP014-0-U		050406SWMSP014-1-F		050406SWMSP014-1-U		050406SWMSP014-2-F	
Collection Date:	5/3/2007		5/3/2007		9/18/2008		9/18/2008		5/15/2004		5/15/2004		5/4/2006		5/4/2006		5/4/2006	
Sample Type:	Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater	
	Primary		Primary		Primary		Primary		Primary		Primary		Triplicate		Triplicate		Triplicate	
	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL
Total Metals (mg/L)																		
Aluminum	NS		<0.03 UK	0.087	NS		**0.939**	0.087	NS		NS		NS		NS		NS	
Barium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Beryllium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Boron	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium	NS		NS		NS		<0.000125		NS		NS		NS		NS		NS	
Cobalt	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Iron	NS		NS		NS		**0.758**	0.158	NS		NS		NS		NS		NS	
Nickel	NS		NS		NS		**0.00319 J**		NS		NS		NS		NS		NS	
Selenium	NS		**0.012**	0.005	NS		**0.0161 J**	0.005	NS		**0.035**	0.005	NS		**0.077**	0.005	NS	
Silver	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Thallium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Vanadium	NS		NS		NS		<0.00500	0.02	NS		NS		NS		NS		NS	
Zinc	NS		NS		NS		**0.00658 J**		NS		NS		NS		NS		NS	
Dissolved Metals (mg/L)																		
Aluminum, dissolved	NS		NS		<0.0500	0.087	NS		NS		NS		**0.04 JK**	0.087	NS		<0.03 UK	0.087
Barium, dissolved	NS		NS		NS		NS		NS		NS		**0.028 K**	0.003	NS		**0.028 K**	0.003
Beryllium, dissolved	NS		NS		NS		NS		NS		NS		<0.002 UK	0.0006	NS		<0.002 UK	0.0006
Boron, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium, dissolved	<0.0001 UK	0.000808	NS		<0.000125	0.000818	NS		**0.0002 JK**	0.00127	NS		**0.0001 JK**	0.00127	NS		**0.0002 JK**	0.00127
Cobalt, dissolved	NS		NS		NS		NS		NS		NS		<0.01 UK	0.003	NS		<0.01 UK	0.003
Iron, dissolved	NS		NS		<0.0250	0.158	NS		NS		NS		<0.02 UK	0.158	NS		<0.02 UK	0.158
Molybdenum, dissolved	NS		NS		NS		NS		NS		NS		<0.01 UK	0.034	NS		<0.01 UK	0.034
Nickel, dissolved	**0.0021 JK**	0.0867	NS		**0.00291 J**	0.0883	NS		**0.0108 K**	0.168	NS		**0.0069 K**	0.168	NS		**0.0065 K**	0.168
Selenium, dissolved	NS		NS		**0.0159 J**	0.005	NS		NS		NS		NS		NS		NS	
Silver, dissolved	NS		NS		NS		NS		NS		NS		<0.01 UJK	0.00036	NS		<0.01 UJK	0.00036
Thallium, dissolved	NS		NS		NS		NS		NS		NS		<0.0001 UK	0.00003	NS		<0.0001 UK	0.00003
Vanadium, dissolved	<0.0007 UK	0.02	NS		<0.00500	0.02	NS		**0.00277 K**	0.02	NS		**0.0022 J+K**	0.02	NS		**0.0021 J+K**	0.02
Zinc, dissolved	**0.038 K**	0.197	NS		<0.00500	0.201	NS		**0.004 JK**	0.382	NS		**0.017 K**	0.382	NS		**0.009 JK**	0.382

TABLE 3-24

HENRY MINE - SUMMARY OF SURFACE WATER EXCEEDANCES
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Location:	MSP014		MSP014		MSP014		MSP014		MSP014		MSP014		MSP014		MSP015		MSP015	
Location Type:	Pond		Pond		Pond		Pond		Pond		Pond		Pond		Pond		Pond	
Sample ID:	050406SWMSP014-2-U		050406SWMSP014-3-F		050406SWMSP014-3-U		050406SWMSP014-avg-		050406SWMSP014-avg-		091808GWMSP014-0-F		091808GWMSP014-0-U		051804SWMSP015-0-F		051804SWMSP015-0-U	
Collection Date:	5/4/2006		5/4/2006		5/4/2006		5/4/2006		5/4/2006		9/18/2008		9/18/2008		5/18/2004		5/18/2004	
Sample Type:	Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater	
	Triplicate		Triplicate		Triplicate		Averaged		Averaged		Primary		Primary		Primary		Primary	
	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL
Total Metals (mg/L)																		
Aluminum	NS		NS		NS		NS		NS		NS		<0.0500	0.087	NS		NS	
Barium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Beryllium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Boron	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium	NS		NS		NS		NS		NS		NS		<0.000125		NS		NS	
Cobalt	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Iron	NS		NS		NS		NS		NS		NS		<0.0250	0.158	NS		NS	
Nickel	NS		NS		NS		NS		NS		NS		**0.00725**		NS		NS	
Selenium	**0.075**	0.005	NS		**0.069**	0.005	NS		**0.0737**	0.005	NS		**0.00738**	0.005	NS		**0.153**	0.005
Silver	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Thallium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Vanadium	NS		NS		NS		NS		NS		NS		<0.00500	0.02	NS		NS	
Zinc	NS		NS		NS		NS		NS		NS		<0.00500		NS		NS	
Dissolved Metals (mg/L)																		
Aluminum, dissolved	NS		<0.03 UK	0.087	NS		**0.04 JK**	0.087	NS		**0.905**	0.087	NS		NS		NS	
Barium, dissolved	NS		**0.029 K**	0.003	NS		**0.0283 K**	0.003	NS		NS		NS		NS		NS	
Beryllium, dissolved	NS		<0.002 UK	0.0006	NS		<0.002 UK	0.0006	NS		NS		NS		NS		NS	
Boron, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium, dissolved	NS		**0.0002 JK**	0.00127	NS		**0.000167**	0.00127	NS		<0.000125	0.00127	NS		<0.0001 UK	0.00127	NS	
Cobalt, dissolved	NS		<0.01 UK	0.003	NS		<0.01 UK	0.003	NS		NS		NS		NS		NS	
Iron, dissolved	NS		<0.02 UK	0.158	NS		<0.02 UK	0.158	NS		**0.877**	0.158	NS		NS		NS	
Molybdenum, dissolved	NS		<0.01 UK	0.034	NS		<0.01 UK	0.034	NS		NS		NS		NS		NS	
Nickel, dissolved	NS		**0.007 K**	0.168	NS		**0.0068 K**	0.168	NS		**0.00771**	0.168	NS		**0.0035 K**	0.168	NS	
Selenium, dissolved	NS		NS		NS		NS		NS		**0.00813**	0.005	NS		NS		NS	
Silver, dissolved	NS		<0.01 UJK	0.00036	NS		<0.01 UJK	0.00036	NS		NS		NS		NS		NS	
Thallium, dissolved	NS		<0.0001 UK	0.00003	NS		<0.0001 UK	0.00003	NS		NS		NS		NS		NS	
Vanadium, dissolved	NS		**0.0023 K**	0.02	NS		**0.0022 J+K**	0.02	NS		<0.00500	0.02	NS		**0.00255 K**	0.02	NS	
Zinc, dissolved	NS		**0.009 JK**	0.382	NS		**0.0117 JK**	0.382	NS		<0.00500	0.382	NS		**0.002 JK**	0.382	NS	

TABLE 3-24

HENRY MINE - SUMMARY OF SURFACE WATER EXCEEDANCES

Location:	MSP015		MSP015		MSP016		MSP016		MSP016		MSP016		MSP016		MSP016		MSP016	
Location Type:	Pond		Pond		Pond		Pond		Pond		Pond		Pond		Pond		Pond	
Sample ID:	050406SWMSP015-0-F		050406SWMSP015-0-U		051704SWMSP016-1-F		051704SWMSP016-1-U		051704SWMSP016-2-F		051704SWMSP016-2-U		051704SWMSP016-3-F		051704SWMSP016-3-U		051704SWMSP016-avg-	
Collection Date:	5/4/2006		5/4/2006		5/17/2004		5/17/2004		5/17/2004		5/17/2004		5/17/2004		5/17/2004		5/17/2004	
Sample Type:	Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater	
	Primary		Primary		Triplicate		Triplicate		Triplicate		Triplicate		Triplicate		Triplicate		Averaged	
	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL
Total Metals (mg/L)																		
Aluminum	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Barium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Beryllium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Boron	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Cobalt	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Iron	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Nickel	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Selenium	NS		**0.38**	0.005	NS		**0.124**	0.005	NS		**0.123 J-**	0.005	NS		**0.125**	0.005	NS	
Silver	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Thallium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Vanadium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Zinc	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Dissolved Metals (mg/L)																		
Aluminum, dissolved	<0.03 UK	0.087	NS		NS		NS		NS		NS		NS		NS		NS	
Barium, dissolved	**0.034 K**	0.003	NS		NS		NS		NS		NS		NS		NS		NS	
Beryllium, dissolved	<0.002 UK	0.0006	NS		NS		NS		NS		NS		NS		NS		NS	
Boron, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium, dissolved	**0.0007 K**	0.00127	NS		<0.0001 UK	0.00120	NS		NS		NS		<0.0001 UK	0.00120	NS		<0.0001 UK	0.00121
Cobalt, dissolved	<0.01 UK	0.003	NS		NS		NS		NS		NS		NS		NS		NS	
Iron, dissolved	<0.02 UK	0.158	NS		NS		NS		NS		NS		NS		NS		NS	
Molybdenum, dissolved	<0.01 UK	0.034	NS		NS		NS		NS		NS		NS		NS		NS	
Nickel, dissolved	**0.0138 K**	0.168	NS		**0.0038 K**	0.156	NS		**0.0037 J-K**	0.158	NS		**0.0037 K**	0.155	NS		**0.00373 J-K**	0.156
Selenium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Silver, dissolved	<0.01 UJK	0.00036	NS		NS		NS		NS		NS		NS		NS		NS	
Thallium, dissolved	<0.0001 UK	0.00003	NS		NS		NS		NS		NS		NS		NS		NS	
Vanadium, dissolved	**0.0029 K**	0.02	NS		**0.00453 K**	0.02	NS		**0.00441 J-K**	0.02	NS		**0.00464 K**	0.02	NS		**0.00453 J-K**	0.02
Zinc, dissolved	**0.04 K**	0.382	NS		<0.002 UK	0.354	NS		NS		NS		<0.002 UK	0.354	NS		<0.002 UK	0.356

TABLE 3-24

HENRY MINE - SUMMARY OF SURFACE WATER EXCEEDANCES
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Location:	MSP016		MSP016		MSP016		MSP055		MSP055		MSP055		MSP055		MSP055		MSP055	
Location Type:	Pond		Pond		Pond		Pond		Pond		Pond		Pond		Pond		Pond	
Sample ID:	051704SWMSP016-avg-		050406SWMSP016-0-F		050406SWMSP016-0-U		051504SWMSP055-0-F		051504SWMSP055-0-U		050906SWMSP055-0-F		050906SWMSP055-0-U		051007SWMSP055-0-F		051007SWMSP055-0-U	
Collection Date:	5/17/2004		5/4/2006		5/4/2006		5/15/2004		5/15/2004		5/9/2006		5/9/2006		5/10/2007		5/10/2007	
Sample Type:	Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater	
	Averaged		Primary		Primary		Primary		Primary		Primary		Primary		Primary		Primary	
	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL
Total Metals (mg/L)																		
Aluminum	NS		NS		NS		NS		NS		NS		NS		NS		<0.03 UK	0.087
Barium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Beryllium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Boron	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Cobalt	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Iron	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Nickel	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Selenium	**0.124 J-**	0.005	NS		**0.41**	0.005	NS		**0.97**	0.005	NS		**0.34**	0.005	NS		**0.36**	0.005
Silver	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Thallium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Vanadium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Zinc	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Dissolved Metals (mg/L)																		
Aluminum, dissolved	NS		<0.03 UK	0.087	NS		NS		NS		<0.03 UK	0.087	NS		NS		NS	
Barium, dissolved	NS		**0.038 K**	0.003	NS		NS		NS		**0.006 JK**	0.003	NS		NS		NS	
Beryllium, dissolved	NS		<0.002 UK	0.0006	NS		NS		NS		<0.002 UK	0.0006	NS		NS		NS	
Boron, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium, dissolved	NS		<0.0001 UK	0.00127	NS		**0.0303 K**	0.00127	NS		**0.0203 K**	0.00115	NS		**0.0352 JK**	0.00127	NS	
Cobalt, dissolved	NS		<0.01 UK	0.003	NS		NS		NS		<0.01 UK	0.003	NS		NS		NS	
Iron, dissolved	NS		<0.02 UK	0.158	NS		NS		NS		<0.02 UK	0.158	NS		NS		NS	
Molybdenum, dissolved	NS		<0.01 UK	0.034	NS		NS		NS		**0.04 JK**	0.034	NS		NS		NS	
Nickel, dissolved	NS		**0.0116 K**	0.168	NS		**0.565 K**	0.168	NS		**0.434 K**	0.146	NS		**1.26 K**	0.168	NS	
Selenium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Silver, dissolved	NS		<0.01 UJK	0.00036	NS		NS		NS		<0.01 UK	0.00036	NS		NS		NS	
Thallium, dissolved	NS		<0.0001 UK	0.00003	NS		NS		NS		**0.0002 JK**	0.00003	NS		NS		NS	
Vanadium, dissolved	NS		**0.0031 K**	0.02	NS		**0.0376 K**	0.02	NS		**0.0689 K**	0.02	NS		**0.0281 JK**	0.02	NS	
Zinc, dissolved	NS		**0.014 K**	0.382	NS		**1.9 K**	0.382	NS		<0.01 UK	0.332	NS		**4.73 K**	0.382	NS	

TABLE 3-24

HENRY MINE - SUMMARY OF SURFACE WATER EXCEEDANCES
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Location:	MSP055		MSP055		MST043		MST043		MST043		MST043		MST043		MST043		MST043	
Location Type:	Pond		Pond		Stream		Stream		Stream		Stream		Stream		Stream		Stream	
Sample ID:	051508GWMSP055-0-F		051508GWMSP055-0-U		052104SWMST043-1-F		052104SWMST043-1-U		052104SWMST043-2-F		052104SWMST043-2-U		052104SWMST043-3-F		052104SWMST043-3-U		052104SWMST043-avg-	
Collection Date:	5/15/2008		5/15/2008		5/21/2004		5/21/2004		5/21/2004		5/21/2004		5/21/2004		5/21/2004		5/21/2004	
Sample Type:	Groundwater		Groundwater		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water	
	Primary		Primary		Triplicate		Triplicate		Triplicate		Triplicate		Triplicate		Triplicate		Averaged	
	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL
Total Metals (mg/L)																		
Aluminum	NS		**0.11 JK**	0.087	NS		NS		NS		NS		NS		NS		NS	
Barium	NS		**0.007 JK**	0.003	NS		NS		NS		NS		NS		NS		NS	
Beryllium	NS		<0.002 UK	0.0006	NS		NS		NS		NS		NS		NS		NS	
Boron	NS		<0.01 UK	0.0016	NS		NS		NS		NS		NS		NS		NS	
Cadmium	NS		**0.0194 K**	0.00115	NS		NS		NS		NS		NS		NS		NS	
Cobalt	NS		<0.01 UK	0.003	NS		NS		NS		NS		NS		NS		NS	
Iron	NS		**0.06 K**	0.158	NS		NS		NS		NS		NS		NS		NS	
Nickel	NS		**0.397 K**	0.145	NS		NS		NS		NS		NS		NS		NS	
Selenium	NS		**0.53**	0.005	NS		<0.001	0.005	NS		<0.001	0.005	NS		<0.001	0.005	NS	
Silver	NS		<0.01 UK	0.00036	NS		NS		NS		NS		NS		NS		NS	
Thallium	NS		<0.0005 UK	0.00003	NS		NS		NS		NS		NS		NS		NS	
Vanadium	NS		**0.0508 K**	0.02	NS		NS		NS		NS		NS		NS		NS	
Zinc	NS		**1.71 K**	0.329	NS		NS		NS		NS		NS		NS		NS	
Dissolved Metals (mg/L)																		
Aluminum, dissolved	<0.03 UK	0.087	NS		NS		NS		NS		NS		NS		NS		NS	
Barium, dissolved	**0.008 JK**	0.003	NS		NS		NS		NS		NS		NS		NS		NS	
Beryllium, dissolved	<0.002 UK	0.0006	NS		NS		NS		NS		NS		NS		NS		NS	
Boron, dissolved	<0.01 UK	0.0016	NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium, dissolved	**0.0176 K**	0.00112	NS		<0.0002 UK	0.00127	NS		<0.0001	0.00127	NS		<0.0001	0.00127	NS		<0.0002	0.00127
Cobalt, dissolved	<0.01 UK	0.003	NS		NS		NS		NS		NS		NS		NS		NS	
Iron, dissolved	<0.02 UK	0.158	NS		NS		NS		NS		NS		NS		NS		NS	
Molybdenum, dissolved	**0.03 JK**	0.034	NS		NS		NS		NS		NS		NS		NS		NS	
Nickel, dissolved	**0.344 K**	0.139	NS		**0.0015 JK**	0.168	NS		**0.0041 JK**	0.168	NS		**0.0038 JK**	0.168	NS		**0.00313 JK**	0.168
Selenium, dissolved	**0.53**	0.005	NS		NS		NS		NS		NS		NS		NS		NS	
Silver, dissolved	<0.01 UJK	0.00036	NS		NS		NS		NS		NS		NS		NS		NS	
Thallium, dissolved	**0.0002 JK**	0.00003	NS		NS		NS		NS		NS		NS		NS		NS	
Vanadium, dissolved	**0.0367 K**	0.02	NS		**0.0011 K**	0.02	NS		**0.00117 JK**	0.02	NS		**0.00115 JK**	0.02	NS		**0.00114 JK**	0.02
Zinc, dissolved	**1.79 K**	0.317	NS		**0.004 JK**	0.382	NS		**0.004 JK**	0.382	NS		**0.004 JK**	0.382	NS		**0.004 JK**	0.382

TABLE 3-24

HENRY MINE - SUMMARY OF SURFACE WATER EXCEEDANCES
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Location:	MST043		MST044		MST044		MST044		MST044		MST044		MST044		MST044		MST044	
Location Type:	Stream		Stream		Stream		Stream		Stream		Stream		Stream		Stream		Stream	
Sample ID:	052104SWMST043-avg-		051904SWMST044-0-F		051904SWMST044-0-U		050907SWMST044-1-F		050907SWMST044-1-U		050907SWMST044-2-F		050907SWMST044-2-U		050907SWMST044-3-F		050907SWMST044-3-U	
Collection Date:	5/21/2004		5/19/2004		5/19/2004		5/9/2007		5/9/2007		5/9/2007		5/9/2007		5/9/2007		5/9/2007	
Sample Type:	Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water	
	Averaged		Primary		Primary		Triplicate		Triplicate		Triplicate		Triplicate		Triplicate		Triplicate	
	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL
Total Metals (mg/L)																		
Aluminum	NS		NS		NS		NS		**0.11 JK**	0.087	NS		**0.11 JK**	0.087	NS		**0.11 JK**	0.087
Barium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Beryllium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Boron	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Cobalt	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Iron	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Nickel	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Selenium	<0.001	0.005	NS		<0.001	0.005	NS		<0.001	0.005	NS		<0.001	0.005	NS		<0.001	0.005
Silver	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Thallium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Vanadium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Zinc	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Dissolved Metals (mg/L)																		
Aluminum, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Barium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Beryllium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Boron, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium, dissolved	NS		<0.0001 UK	0.00104	NS		<0.0001 UK	0.00104	NS		<0.0001 UK	0.00104	NS		<0.0001 UK	0.00105	NS	
Cobalt, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Iron, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Molybdenum, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Nickel, dissolved	NS		**0.0008 JK**	0.126	NS		**0.0007 JK**	0.126	NS		**0.0008 JK**	0.126	NS		**0.0012 JK**	0.128	NS	
Selenium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Silver, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Thallium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Vanadium, dissolved	NS		**0.0013 K**	0.02	NS		**0.0015 K**	0.02	NS		**0.0015 K**	0.02	NS		**0.0015 K**	0.02	NS	
Zinc, dissolved	NS		<0.002 UK	0.287	NS		<0.002 UK	0.287	NS		<0.002 UK	0.287	NS		**0.003 JK**	0.291	NS	

TABLE 3-24

HENRY MINE - SUMMARY OF SURFACE WATER EXCEEDANCES
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Location:	MST044		MSG004		MST044		MST044		MST044		MST044		MST044		MST044		MST044	
Location Type:	Stream		Stream		Stream		Stream		Stream		Stream		Stream		Stream		Stream	
Sample ID:	050907SWMST044-avg-		050907SWMST044-avg-		090907SWMST044-0-F		090907SWMST044-0-U		051208SWMST044-0-F		051208SWMST044-0-U		091708SWMST044-1-F		091708SWMST044-1-U		091708SWMST044-2-F	
Collection Date:	5/9/2007		5/9/2007		9/9/2007		9/9/2007		5/10/2008		5/10/2008		9/17/2008		9/17/2008		9/17/2008	
Sample Type:	Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water	
	Averaged		Averaged		Primary		Primary		Primary		Primary		Triplicate		Triplicate		Triplicate	
	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL
Total Metals (mg/L)																		
Aluminum	NS		**0.11 JK**	0.087	NS		**0.08 JK**	0.087	NS		<0.08 UK	0.087	NS		NS		NS	
Barium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Beryllium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Boron	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Cobalt	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Iron	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Nickel	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Selenium	NS		<0.001	0.005	NS		**0.046**	0.005	NS		<0.001	0.005	NS		<0.000958	0.005	NS	
Silver	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Thallium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Vanadium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Zinc	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Dissolved Metals (mg/L)																		
Aluminum, dissolved	NS		NS		NS		NS		NS		NS		<0.0500	0.087	NS		<0.0500	0.087
Barium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Beryllium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Boron, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium, dissolved	<0.0001 UK	0.00105	NS		<0.0001 UK	0.00110	NS		<0.0001 UK	0.000978	NS		<0.000125	0.00108	NS		<0.000125	0.00109
Cobalt, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Iron, dissolved	NS		NS		NS		NS		NS		NS		<0.0250	0.158	NS		<0.0250	0.158
Molybdenum, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Nickel, dissolved	**0.0009 JK**	0.127	NS		**0.0013 JK**	0.136	NS		**0.002 JK**	0.115	NS		**0.00202 J**	0.134	NS		**0.00262 J**	0.134
Selenium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Silver, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Thallium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Vanadium, dissolved	**0.0015 K**	0.02	NS		**0.002 K**	0.02	NS		**0.0885 K**	0.02	NS		<0.0250	0.02	NS		<0.0250	0.02
Zinc, dissolved	**0.003 JK**	0.289	NS		**0.005 JK**	0.310	NS		**0.002 JK**	0.261	NS		<0.00500	0.304	NS		<0.00500	0.305

TABLE 3-24

HENRY MINE - SUMMARY OF SURFACE WATER EXCEEDANCES
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Location:	MST044		MST044		MST044		MST044		MST044		MST044		MST044		MST044		MST044	
Location Type:	Stream		Stream		Stream		Stream		Stream		Stream		Stream		Stream		Stream	
Sample ID:	091708SWMST044-2-U		091708SWMST044-3-F		091708SWMST044-3-U		091708SWMST044-avg-		091708SWMST044-avg-		0905SWMST044-F		0905SWMST044-U		0909SWMST044-F		0909SWMST044-U	
Collection Date:	9/17/2008		9/17/2008		9/17/2008		9/17/2008		9/17/2008		5/5/2009		5/5/2009		9/21/2009		9/21/2009	
Sample Type:	Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water	
	Triplicate		Triplicate		Triplicate		Averaged		Averaged		Primary		Primary		Primary		Primary	
	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL
Total Metals (mg/L)																		
Aluminum	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Barium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Beryllium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Boron	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Cobalt	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Iron	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Nickel	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Selenium	**0.00123 J+**	0.005	NS		**0.00126**	0.005	NS		**0.00125 J+**	0.005	NS		**0.000801**	0.005	NS		**0.00105**	0.005
Silver	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Thallium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Vanadium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Zinc	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Dissolved Metals (mg/L)																		
Aluminum, dissolved	NS		<0.0500	0.087	NS		<0.0500	0.087	NS		NS		NS		NS		NS	
Barium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Beryllium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Boron, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium, dissolved	NS		<0.000125	0.00109	NS		<0.000125	0.00109	NS		<0.000125	0.000772	NS		<0.000125	0.00104	NS	
Cobalt, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Iron, dissolved	NS		<0.0250	0.158	NS		<0.0250	0.158	NS		<0.0250	0.158	NS		<0.0250	0.158	NS	
Molybdenum, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Nickel, dissolved	NS		**0.00251 J**	0.134	NS		**0.00238 J**	0.134	NS		NS		NS		NS		NS	
Selenium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Silver, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Thallium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Vanadium, dissolved	NS		<0.0250	0.02	NS		<0.0250	0.02	NS		<0.00500	0.02	NS		**0.00828 J**	0.02	NS	
Zinc, dissolved	NS		**0.0100 J**	0.306	NS		**0.01 J**	0.305	NS		NS		NS		NS		NS	

TABLE 3-24

HENRY MINE - SUMMARY OF SURFACE WATER EXCEEDANCES
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Location:	MST045		MST045		MST045		MST045		MST045		MST045		MST045		MST045		MST045	
Location Type:	Stream		Stream		Stream		Stream		Stream		Stream		Stream		Stream		Stream	
Sample ID:	051904SWMST045-0-F		051904SWMST045-0-U		050907SWMST045-0-F		050907SWMST045-0-U		090907SWMST045-0-F		090907SWMST045-0-U		051308SWMST045-0-F		051308SWMST045-0-U		091708SWMST045-0-F	
Collection Date:	5/19/2004		5/19/2004		5/9/2007		5/9/2007		9/9/2007		9/9/2007		5/14/2008		5/14/2008		9/17/2008	
Sample Type:	Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water	
	Primary		Primary		Primary		Primary		Primary		Primary		Primary		Primary		Primary	
	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL
Total Metals (mg/L)																		
Aluminum	NS		NS		NS		**0.14 JK**	0.087	NS		**0.03 JK**	0.087	NS		**0.06 J+K**	0.087	NS	
Barium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Beryllium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Boron	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Cobalt	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Iron	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Nickel	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Selenium	NS		<0.001	0.005	NS		<0.001	0.005	NS		<0.001	0.005	NS		<0.001	0.005	NS	
Silver	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Thallium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Vanadium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Zinc	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Dissolved Metals (mg/L)																		
Aluminum, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		<0.0500	0.087
Barium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Beryllium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Boron, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium, dissolved	<0.0001 UK	0.000987	NS		<0.0001 UK	0.00105	NS		<0.0001 UK	0.00112	NS		<0.0001 UK	0.000956	NS		<0.000125	0.00110
Cobalt, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Iron, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		<0.0250	0.158
Molybdenum, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Nickel, dissolved	**0.0005 JK**	0.116	NS		**0.0009 JK**	0.127	NS		**0.0013 JK**	0.139	NS		**0.0025 JK**	0.111	NS		**0.00303 J**	0.136
Selenium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Silver, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Thallium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Vanadium, dissolved	**0.00261 K**	0.02	NS		**0.0021 K**	0.02	NS		**0.0022 K**	0.02	NS		**0.0018 K**	0.02	NS		<0.0250	0.02
Zinc, dissolved	**0.011 K**	0.265	NS		<0.002 UK	0.288	NS		**0.004 JK**	0.317	NS		**0.01 K {J+}**	0.252	NS		**0.0141 J**	0.309

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HENRY MINE - SUMMARY OF SURFACE WATER EXCEEDANCES
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Location:	MST045		MST045		MST045		MST045		MST045		MST045		MST045		MST045		MST045	
Location Type:	Stream		Stream		Stream		Stream		Stream		Stream		Stream		Stream		Stream	
Sample ID:	091708SWMST045-0-U		0905SWMST045-1-F		0905SWMST045-1-U		0905SWMST045-2-F		0905SWMST045-2-U		0905SWMST045-3-F		0905SWMST045-3-U		0905SWMST045-avg-F		0905SWMST045-avg-U	
Collection Date:	9/17/2008		5/5/2009		5/5/2009		5/5/2009		5/5/2009		5/5/2009		5/5/2009		5/5/2009		5/5/2009	
Sample Type:	Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water	
	Primary		Triplicate		Triplicate		Triplicate		Triplicate		Triplicate		Triplicate		Averaged		Averaged	
	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL
Total Metals (mg/L)																		
Aluminum	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Barium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Beryllium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Boron	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Cobalt	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Iron	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Nickel	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Selenium	**0.00115**	0.005	NS		**0.00107 J**	0.005	NS		**0.000965 J**	0.005	NS		**0.000883**	0.005	NS		**0.000973 J**	0.005
Silver	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Thallium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Vanadium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Zinc	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Dissolved Metals (mg/L)																		
Aluminum, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Barium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Beryllium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Boron, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium, dissolved	NS		<0.000125	0.000780	NS		<0.000125	0.000764	NS		<0.000125	0.000793	NS		<0.000125	0.000780	NS	
Cobalt, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Iron, dissolved	NS		**0.0304 J**	0.158	NS		**0.0300 J**	0.158	NS		**0.0272 J**	0.158	NS		**0.0292 J**	0.158	NS	
Molybdenum, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Nickel, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Selenium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Silver, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Thallium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Vanadium, dissolved	NS		<0.00500	0.02	NS		<0.00500	0.02	NS		<0.00500	0.02	NS		<0.00500	0.02	NS	
Zinc, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	

TABLE 3-24

HENRY MINE - SUMMARY OF SURFACE WATER EXCEEDANCES
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Location:	MST045		MST045		MST045		MST045		MST045		MST045		MST045		MST045		MST046	
Location Type:	Stream		Stream		Stream		Stream		Stream		Stream		Stream		Stream		Stream	
Sample ID:	0909SWMST045-1-F		0909SWMST045-1-U		0909SWMST045-2-F		0909SWMST045-2-U		0909SWMST045-3-F		0909SWMST045-3-U		0909SWMST045-avg-F		0909SWMST045-avg-U		052104SWMST046-0-F	
Collection Date:	9/21/2009		9/21/2009		9/21/2009		5/9/2007		9/21/2009		9/21/2009		9/21/2009		9/21/2009		5/21/2004	
Sample Type:	Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water	
	Triplicate		Triplicate		Triplicate		Triplicate		Triplicate		Triplicate		Averaged		Averaged		Primary	
	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL
Total Metals (mg/L)																		
Aluminum	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Barium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Beryllium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Boron	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Cobalt	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Iron	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Nickel	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Selenium	NS		**0.00103**	0.005	NS		**0.00172**	0.005	NS		**0.00107**	0.005	NS		**0.00127**	0.005	NS	
Silver	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Thallium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Vanadium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Zinc	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Dissolved Metals (mg/L)																		
Aluminum, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Barium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Beryllium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Boron, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium, dissolved	<0.000125	0.00105	NS		<0.000125	0.00102	NS		<0.000125	0.00102	NS		<0.000125	0.00103	NS		<0.0005 UK	0.000819
Cobalt, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Iron, dissolved	<0.0250	0.158	NS		<0.0250	0.158	NS		<0.0250	0.158	NS		<0.0250	0.158	NS		NS	
Molybdenum, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Nickel, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		<0.001 UK	0.0884
Selenium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Silver, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Thallium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Vanadium, dissolved	**0.00682 J**	0.02	NS		**0.00764 J**	0.02	NS		**0.00616 J**	0.02	NS		**0.00687 J**	0.02	NS		<0.0007 UK	0.02
Zinc, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		<0.01 UK	0.201

TABLE 3-24

HENRY MINE - SUMMARY OF SURFACE WATER EXCEEDANCES
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Location:	MST046		MST047		MST047		MST050		MST050		MST050		MST050		MST050		MST050	
Location Type:	Stream		Stream		Stream		Stream		Stream		Stream		Stream		Stream		Stream	
Sample ID:	052104SWMST046-0-U		052104SWMST047-0-F		052104SWMST047-0-U		051404SWMST050-0-F		051404SWMST050-0-U		050406SWMST050-0-F		050406SWMST050-0-U		051407SWMST050-0-F		051407SWMST050-0-U	
Collection Date:	5/21/2004		5/21/2004		5/21/2004		5/14/2004		5/14/2004		5/4/2006		5/4/2006		5/14/2007		5/14/2007	
Sample Type:	Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water	
	Primary		Primary		Primary		Primary		Primary		Primary		Primary		Primary		Primary	
	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL
Total Metals (mg/L)																		
Aluminum	NS		NS		NS		NS		NS		NS		NS		NS		**0.44 K**	0.087
Barium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Beryllium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Boron	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Cobalt	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Iron	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Nickel	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Selenium	<0.001	0.005	NS		<0.001	0.005	NS		<0.001	0.005	NS		<0.001	0.005	NS		<0.001	0.005
Silver	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Thallium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Vanadium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Zinc	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Dissolved Metals (mg/L)																		
Aluminum, dissolved	NS		NS		NS		NS		NS		<0.03 UK	0.087	NS		NS		NS	
Barium, dissolved	NS		NS		NS		NS		NS		**0.029 K**	0.003	NS		NS		NS	
Beryllium, dissolved	NS		NS		NS		NS		NS		<0.002 UK	0.0006	NS		NS		NS	
Boron, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium, dissolved	NS		<0.0001 UK	0.00127	NS		<0.0001 UK	0.000576	NS		<0.0001 UK	0.000599	NS		<0.0001	0.000686	NS	
Cobalt, dissolved	NS		NS		NS		NS		NS		<0.01 UK	0.003	NS		NS		NS	
Iron, dissolved	NS		NS		NS		NS		NS		<0.02 UK	0.158	NS		NS		NS	
Molybdenum, dissolved	NS		NS		NS		NS		NS		<0.01 UK	0.034	NS		NS		NS	
Nickel, dissolved	NS		**0.0014 K**	0.168	NS		**0.0019 K**	0.0528	NS		**0.0013 JK**	0.0559	NS		**0.0016 JK**	0.0683	NS	
Selenium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Silver, dissolved	NS		NS		NS		NS		NS		<0.01 UJK	0.00036	NS		NS		NS	
Thallium, dissolved	NS		NS		NS		NS		NS		<0.0001 UK	0.00003	NS		NS		NS	
Vanadium, dissolved	NS		**0.00468 K**	0.02	NS		**0.0169 K**	0.02	NS		**0.0016 K**	0.02	NS		**0.0017 JK**	0.02	NS	
Zinc, dissolved	NS		**0.003 JK**	0.382	NS		<0.002 UK	0.120	NS		**0.003 JK**	0.127	NS		**0.002 JK**	0.155	NS	

TABLE 3-24

HENRY MINE - SUMMARY OF SURFACE WATER EXCEEDANCES
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Location:	MST050		MST050		MST050		MST050		MST050		MST050		MST050		MST050		MST051	
Location Type:	Stream		Stream		Stream		Stream		Stream		Stream		Stream		Stream		Stream	
Sample ID:	090807SWMST050-0-F		090807SWMST050-0-U		050908SWMST050-0-F		050908SWMST050-0-U		091708SWMST050-0-F		091708SWMST050-0-U		0905SWMST050-F		0905SWMST050-U		0905SWMST051-F	
Collection Date:	9/8/2007		9/8/2007		5/9/2008		5/9/2008		9/17/2008		9/17/2008		5/4/2009		5/4/2009		5/5/2009	
Sample Type:	Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water	
	Primary		Primary		Primary		Primary		Primary		Primary		Primary		Primary		Primary	
	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL
Total Metals (mg/L)																		
Aluminum	NS		**1.53 K**	0.087	NS		<0.1 UK	0.087	NS		NS		NS		NS		NS	
Barium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Beryllium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Boron	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Cobalt	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Iron	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Nickel	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Selenium	NS		<0.001	0.005	NS		<0.001	0.005	NS		**0.00253**	0.005	NS		**0.00249 J**	0.005	NS	
Silver	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Thallium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Vanadium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Zinc	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Dissolved Metals (mg/L)																		
Aluminum, dissolved	NS		NS		NS		NS		<0.0500	0.087	NS		NS		NS		NS	
Barium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Beryllium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Boron, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium, dissolved	<0.0001 UK	0.000963	NS		<0.0001 UK	0.000887	NS		<0.000125	0.000816	NS		<0.000125	0.000499	NS		<0.000125	0.000493
Cobalt, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Iron, dissolved	NS		NS		NS		NS		**0.0406 J**	0.158	NS		**0.0659 J+/B**	0.158	NS		**0.0281 J**	0.158
Molybdenum, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Nickel, dissolved	**0.0092 K**	0.112	NS		**0.0042 K**	0.0994	NS		**0.0101**	0.0879	NS		NS		NS		NS	
Selenium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Silver, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Thallium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Vanadium, dissolved	**0.0061 K**	0.02	NS		<0.0002 UK	0.02	NS		<0.00500	0.02	NS		<0.00500	0.02	NS		<0.00500	0.02
Zinc, dissolved	<0.002 UK	0.255	NS		**0.004 JK**	0.226	NS		**0.0183 J**	0.200	NS		NS		NS		NS	

TABLE 3-24

HENRY MINE - SUMMARY OF SURFACE WATER EXCEEDANCES
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Location:	MST051		MST052		MST052		MST053		MST053		MST054		MST054		MST054		MST054	
Location Type:	Stream		Stream		Stream		Stream		Stream		Stream		Stream		Stream		Stream	
Sample ID:	0905SWMS		050906SWMST052-0-F		050906SWMST052-0-U		052104SWMST053-0-F		052104SWMST053-0-U		052204SWMST054-0-F		052204SWMST054-0-U		051407SWMST054-0-F		051407SWMST054-0-U	
Collection Date:	5/5/2009		5/9/2006		5/9/2006		5/21/2004		5/21/2004		5/22/2004		5/22/2004		5/14/2007		5/14/2007	
Sample Type:	Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water	
	Primary		Primary		Primary		Primary		Primary		Primary		Primary		Primary		Primary	
	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL
Total Metals (mg/L)																		
Aluminum	NS		NS		NS		NS		NS		NS		NS		NS		**0.35 K**	0.087
Barium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Beryllium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Boron	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Cobalt	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Iron	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Nickel	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Selenium	**0.000705**	0.005	NS		**0.001 J**	0.005	NS		<0.001	0.005	NS		<0.001	0.005	NS		<0.001	0.005
Silver	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Thallium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Vanadium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Zinc	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Dissolved Metals (mg/L)																		
Aluminum, dissolved	NS		<0.03 UK	0.087	NS		NS		NS		NS		NS		NS		NS	
Barium, dissolved	NS		**0.04 K**	0.003	NS		NS		NS		NS		NS		NS		NS	
Beryllium, dissolved	NS		<0.002 UK	0.0006	NS		NS		NS		NS		NS		NS		NS	
Boron, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium, dissolved	NS		**0.0002 JK**	0.000648	NS		<0.0001 UK	0.000814	NS		<0.0001 UK	0.000870	NS		<0.0001	0.000896	NS	
Cobalt, dissolved	NS		<0.01 UK	0.003	NS		NS		NS		NS		NS		NS		NS	
Iron, dissolved	NS		<0.02 UK	0.158	NS		NS		NS		NS		NS		NS		NS	
Molybdenum, dissolved	NS		<0.01 UK	0.034	NS		NS		NS		NS		NS		NS		NS	
Nickel, dissolved	NS		**0.0027 JK**	0.0628	NS		**0.0009 JK**	0.0877	NS		**0.0007 JK**	0.0966	NS		**0.0011 JK**	0.101	NS	
Selenium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Silver, dissolved	NS		<0.01 UK	0.00036	NS		NS		NS		NS		NS		NS		NS	
Thallium, dissolved	NS		<0.0001 UK	0.00003	NS		NS		NS		NS		NS		NS		NS	
Vanadium, dissolved	NS		**0.0027 K**	0.02	NS		**0.00075 K**	0.02	NS		**0.00122 K**	0.02	NS		**0.0011 JK**	0.02	NS	
Zinc, dissolved	NS		**0.008 JK**	0.143	NS		<0.002 UK	0.199	NS		<0.002 UK	0.220	NS		<0.002 UJK	0.230	NS	

TABLE 3-24

HENRY MINE - SUMMARY OF SURFACE WATER EXCEEDANCES
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Location:	MST054		MST054		MST054		MST054		MST054		MST054		MST055		MST055		MST056	
Location Type:	Stream		Stream		Stream		Stream		Stream		Stream		Stream		Stream		Stream	
Sample ID:	090907SWMST054-0-F		090907SWMST054-0-U		051508SWMST054-0-F		051508SWMST054-0-U		091908SWMST054-0-F		091908SWMST054-0-U		051904SWMST055-0-F		051904SWMST055-0-U		050506SWMST056-0-F	
Collection Date:	9/9/2007		9/9/2007		5/15/2008		5/15/2008		9/19/2008		9/19/2008		5/19/2004		5/19/2004		5/5/2006	
Sample Type:	Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water	
	Primary		Primary		Primary		Primary		Primary		Primary		Primary		Primary		Primary	
	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL
Total Metals (mg/L)																		
Aluminum	NS		**3.48 K**	0.087	NS		**0.21 K**	0.087	NS		NS		NS		NS		NS	
Barium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Beryllium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Boron	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Cobalt	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Iron	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Nickel	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Selenium	NS		<0.001	0.005	NS		<0.001	0.005	NS		**0.00129**	0.005	NS		**0.002 J**	0.005	NS	
Silver	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Thallium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Vanadium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Zinc	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Dissolved Metals (mg/L)																		
Aluminum, dissolved	NS		NS		NS		NS		**0.844**	0.087	NS		NS		NS		<0.03 UK	0.087
Barium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		**0.052 K**	0.003
Beryllium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		<0.002 UK	0.0006
Boron, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium, dissolved	<0.0001 UK	0.000863	NS		<0.0001 UK	0.000884	NS		<0.000125	0.000868	NS		<0.0001 UK	0.000836	NS		<0.0001 UK	0.000808
Cobalt, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		<0.01 UK	0.003
Iron, dissolved	NS		NS		NS		NS		**0.827**	0.158	NS		NS		NS		<0.02 UK	0.158
Molybdenum, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		<0.01 UK	0.034
Nickel, dissolved	**0.0015 JK**	0.0955	NS		**0.0022 JK**	0.0990	NS		**0.00339 J**	0.0962	NS		**0.0003 JK**	0.0911	NS		**0.0015 JK**	0.0867
Selenium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Silver, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		<0.01 UJK	0.00036
Thallium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		<0.0001 UK	0.00003
Vanadium, dissolved	**0.0025 K**	0.02	NS		**0.0011 J+K**	0.02	NS		**0.00525 J**	0.02	NS		**0.00082 K**	0.02	NS		<0.0002 UK	0.02
Zinc, dissolved	<0.002 UK	0.217	NS		**0.003 JK**	0.225	NS		**0.00597 J**	0.219	NS		<0.002 UK	0.207	NS		**0.004 JK**	0.197

TABLE 3-24

HENRY MINE - SUMMARY OF SURFACE WATER EXCEEDANCES
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Location:	MST056		MST057		MST057		MST057		MST057		MST057		MST057		MST057		MST057	
Location Type:	Stream		Stream		Stream		Stream		Stream		Stream		Stream		Stream		Stream	
Sample ID:	050506SWMST056-0-U		051804SWMST057-0-F		051804SWMST057-0-U		050806SWMST057-0-F		050806SWMST057-0-U		051007SWMST057-0-F		051007SWMST057-0-U		090907SWMST057-0-F		090907SWMST057-0-U	
Collection Date:	5/5/2006		5/18/2004		5/18/2004		5/8/2006		5/8/2006		5/10/2007		5/10/2007		9/9/2007		9/9/2007	
Sample Type:	Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water	
	Primary		Primary		Primary		Primary		Primary		Primary		Primary		Primary		Primary	
	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL
Total Metals (mg/L)																		
Aluminum	NS		NS		NS		NS		NS		NS		**0.37 K**	0.087	NS		**0.84 K**	0.087
Barium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Beryllium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Boron	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Cobalt	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Iron	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Nickel	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Selenium	**0.002 J**	0.005	NS		**0.002 J**	0.005	NS		**0.012**	0.005	NS		**0.006**	0.005	NS		**0.003 J**	0.005
Silver	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Thallium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Vanadium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Zinc	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Dissolved Metals (mg/L)																		
Aluminum, dissolved	NS		NS		NS		**0.04 JK**	0.087	NS		NS		NS		NS		NS	
Barium, dissolved	NS		NS		NS		**0.042 K**	0.003	NS		NS		NS		NS		NS	
Beryllium, dissolved	NS		NS		NS		<0.002 UK	0.0006	NS		NS		NS		NS		NS	
Boron, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium, dissolved	NS		<0.0002 UK	0.000918	NS		<0.0001 UK	0.000826	NS		<0.0001	0.000965	NS		<0.0001 UK	0.00102	NS	
Cobalt, dissolved	NS		NS		NS		<0.01 UK	0.003	NS		NS		NS		NS		NS	
Iron, dissolved	NS		NS		NS		**0.02 JK**	0.158	NS		NS		NS		NS		NS	
Molybdenum, dissolved	NS		NS		NS		<0.01 UK	0.034	NS		NS		NS		NS		NS	
Nickel, dissolved	NS		<0.0014 UK	0.105	NS		**0.0009 JK**	0.0895	NS		**0.0014 JK**	0.113	NS		**0.0014 JK**	0.123	NS	
Selenium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Silver, dissolved	NS		NS		NS		<0.01 UK	0.00036	NS		NS		NS		NS		NS	
Thallium, dissolved	NS		NS		NS		<0.0001 UK	0.00003	NS		NS		NS		NS		NS	
Vanadium, dissolved	NS		**0.0011 K**	0.02	NS		**0.0015 K**	0.02	NS		<0.0009	0.02	NS		**0.0012 J+K**	0.02	NS	
Zinc, dissolved	NS		<0.004 UK	0.238	NS		<0.002 UK	0.204	NS		<0.002 UJK	0.256	NS		**0.002 JK**	0.279	NS	

TABLE 3-24

HENRY MINE - SUMMARY OF SURFACE WATER EXCEEDANCES
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Location:	MST057		MST057		MST057		MST057		MST057		MST057		MST058		MST058		MST058	
Location Type:	Stream		Stream		Stream		Stream		Stream		Stream		Stream		Stream		Stream	
Sample ID:	051508SWMST057-0-F		051508SWMST057-0-U		091808SWMST057-0-F		091808SWMST057-0-U		0905SWMST057-F		0905SWMST057-U		051804SWMST058-0-F		051804SWMST058-0-U		SWMST058-0-F	
Collection Date:	5/15/2008		5/15/2008		9/18/2008		9/18/2008		5/5/2009		5/5/2009		5/18/2004		5/18/2004		9/13/2004	
Sample Type:	Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Groundwater		Groundwater		Groundwater	
	Primary		Primary		Primary		Primary		Primary		Primary		Primary		Primary		Primary	
	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL
Total Metals (mg/L)																		
Aluminum	NS		**0.14 JK**	0.087	NS		NS		NS		NS		NS		NS		NS	
Barium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Beryllium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Boron	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Cobalt	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Iron	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Nickel	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Selenium	NS		**0.009**	0.005	NS		**0.00445 J**	0.005	NS		**0.0276**	0.005	NS		<0.001	0.005	NS	
Silver	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Thallium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Vanadium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Zinc	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Dissolved Metals (mg/L)																		
Aluminum, dissolved	NS		NS		<0.0500	0.087	NS		NS		NS		NS		NS		NS	
Barium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Beryllium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Boron, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium, dissolved	<0.0001 UK	0.000836	NS		<0.000125	0.000970	NS		<0.000125	0.000756	NS		<0.0001 UK	0.000955	NS		<0.0001 UK	0.00111
Cobalt, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Iron, dissolved	NS		NS		<0.0250	0.158	NS		**0.0519 J**	0.158	NS		NS		NS		NS	
Molybdenum, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Nickel, dissolved	**0.0025 JK**	0.0911	NS		**0.00413**	0.113	NS		NS		NS		<0.0008 UK	0.111	NS		**0.0032 K**	0.138
Selenium, dissolved	NS		NS		NS		NS		NS		NS		<0.001	0.005	NS		<0.001	0.005
Silver, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Thallium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Vanadium, dissolved	<0.0004 UK	0.02	NS		<0.00500	0.02	NS		<0.00500	0.02	NS		**0.00072 K**	0.02	NS		**0.00132 K**	0.02
Zinc, dissolved	<0.002 UK	0.207	NS		<0.00500	0.258	NS		NS		NS		**0.008 JK**	0.252	NS		**0.003 JK**	0.315

TABLE 3-24

HENRY MINE - SUMMARY OF SURFACE WATER EXCEEDANCES
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Location:	MST058		MST058		MST058		MST062		MST062		MST063		MST063		MST063		MST063	
Location Type:	Stream		Stream		Stream		Stream		Stream		Stream		Stream		Stream		Stream	
Sample ID:	SWMST058-0-U		050806GWMST058-0-F		050806GWMST058-0-U		051804SWMST062-0-F		051804SWMST062-0-U		051804SWMST063-0-F		051804SWMST063-0-U		050406SWMST063-1-U		050406SWMST063-2-U	
Collection Date:	9/13/2004		5/8/2006		5/8/2006		5/18/2004		5/18/2004		5/18/2004		5/18/2004		5/5/2006		5/5/2006	
Sample Type:	Groundwater		Groundwater		Groundwater		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water	
	Primary		Primary		Primary		Primary		Primary		Primary		Primary		Triplicate		Triplicate	
	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL
Total Metals (mg/L)																		
Aluminum	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Barium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Beryllium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Boron	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium	NS		NS		<0.0001 UK		NS		NS		NS		NS		NS		NS	
Cobalt	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Iron	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Nickel	NS		NS		**0.001 JK**		NS		NS		NS		NS		NS		NS	
Selenium	<0.001	0.005	NS		**0.009**	0.005	NS		<0.001	0.005	NS		**0.002 J**	0.005	**0.006**	0.005	**0.006**	0.005
Silver	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Thallium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Vanadium	NS		NS		**0.0007 JK**	0.02	NS		NS		NS		NS		NS		NS	
Zinc	NS		NS		**0.002 JK**		NS		NS		NS		NS		NS		NS	
Dissolved Metals (mg/L)																		
Aluminum, dissolved	NS		<0.03 UK	0.087	NS		NS		NS		NS		NS		NS		NS	
Barium, dissolved	NS		**0.034 K**	0.003	NS		NS		NS		NS		NS		NS		NS	
Beryllium, dissolved	NS		<0.002 UK	0.0006	NS		NS		NS		NS		NS		NS		NS	
Boron, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium, dissolved	NS		<0.0001 UK	0.000734	NS		<0.0001 UK	0.000875	NS		<0.0001 UK	0.00116	NS		NS		NS	
Cobalt, dissolved	NS		<0.01 UK	0.003	NS		NS		NS		NS		NS		NS		NS	
Iron, dissolved	NS		**0.02 JK**	0.158	NS		NS		NS		NS		NS		NS		NS	
Molybdenum, dissolved	NS		<0.01 UK	0.034	NS		NS		NS		NS		NS		NS		NS	
Nickel, dissolved	NS		**0.001 JK**	0.0753	NS		<0.0004 UK	0.0974	NS		**0.0019 K**	0.147	NS		NS		NS	
Selenium, dissolved	NS		**0.013**	0.005	NS		NS		NS		NS		NS		NS		NS	
Silver, dissolved	NS		<0.01 UK	0.00036	NS		NS		NS		NS		NS		NS		NS	
Thallium, dissolved	NS		<0.0001 UK	0.00003	NS		NS		NS		NS		NS		NS		NS	
Vanadium, dissolved	NS		**0.0011 K**	0.02	NS		**0.00116 K**	0.02	NS		**0.001 K**	0.02	NS		NS		NS	
Zinc, dissolved	NS		**0.003 JK**	0.171	NS		<0.002 UK	0.221	NS		<0.002 UK	0.334	NS		NS		NS	

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HENRY MINE - SUMMARY OF SURFACE WATER EXCEEDANCES
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Location:	MST063		MST063		MST063		MST063		MST063		MST063		MST063		MST063		MST063	
Location Type:	Stream		Stream		Stream		Stream		Stream		Stream		Stream		Stream		Stream	
Sample ID:	050406SWMST063-3-U		050406SWMST063-avg-		050506SWMST063-1-F		050506SWMST063-1-U		050506SWMST063-2-F		050506SWMST063-2-U		050506SWMST063-3-F		050506SWMST063-3-U		050506SWMST063-avg-	
Collection Date:	5/5/2006		5/5/2006		5/5/2006		5/5/2006		5/5/2006		5/5/2006		5/5/2006		5/5/2006		5/5/2006	
Sample Type:	Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water	
	Triplicate		Averaged		Triplicate		Triplicate		Triplicate		Triplicate		Triplicate		Triplicate		Averaged	
	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL
Total Metals (mg/L)																		
Aluminum	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Barium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Beryllium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Boron	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Cobalt	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Iron	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Nickel	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Selenium	**0.007**	0.005	**0.00633**	0.005	NS		**0.006**	0.005	NS		**0.006**	0.005	NS		**0.006**	0.005	NS	
Silver	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Thallium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Vanadium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Zinc	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Dissolved Metals (mg/L)																		
Aluminum, dissolved	NS		NS		<0.03 UK	0.087	NS		<0.03 UK	0.087	NS		<0.03 UK	0.087	NS		<0.03 UK	0.087
Barium, dissolved	NS		NS		**0.038 K**	0.003	NS		**0.037 K**	0.003	NS		**0.037 K**	0.003	NS		**0.0373 K**	0.003
Beryllium, dissolved	NS		NS		<0.002 UK	0.0006	NS		<0.002 UK	0.0006	NS		<0.002 UK	0.0006	NS		<0.002 UK	0.0006
Boron, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium, dissolved	NS		NS		<0.0001 UK	0.000846	NS		<0.0001 UK	0.000848	NS		<0.0001 UK	0.000843	NS		<0.0001 UK	0.000846
Cobalt, dissolved	NS		NS		<0.01 UK	0.003	NS		<0.01 UK	0.003	NS		<0.01 UK	0.003	NS		<0.01 UK	0.003
Iron, dissolved	NS		NS		<0.02 UK	0.158	NS		<0.02 UK	0.158	NS		<0.02 UK	0.158	NS		<0.02 UK	0.158
Molybdenum, dissolved	NS		NS		<0.01 UK	0.034	NS		<0.01 UK	0.034	NS		<0.01 UK	0.034	NS		<0.01 UK	0.034
Nickel, dissolved	NS		NS		**0.0007 JK**	0.0927	NS		**0.0006 JK**	0.0931	NS		**0.0006 JK**	0.0923	NS		**0.000633**	0.0927
Selenium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Silver, dissolved	NS		NS		<0.01 UJK	0.00036	NS		<0.01 UJK	0.00036	NS		<0.01 UJK	0.00036	NS		<0.01 UJK	0.00036
Thallium, dissolved	NS		NS		<0.0001 UK	0.00003	NS		<0.0001 UK	0.00003	NS		<0.0001 UK	0.00003	NS		<0.0001 UK	0.00003
Vanadium, dissolved	NS		NS		<0.0002 UK	0.02	NS		<0.0002 UK	0.02	NS		<0.0002 UK	0.02	NS		<0.0002 UK	0.02
Zinc, dissolved	NS		NS		**0.018 K**	0.211	NS		**0.002 JK**	0.212	NS		<0.002 UK	0.210	NS		**0.01 JK**	0.211

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HENRY MINE - SUMMARY OF SURFACE WATER EXCEEDANCES
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Location:	MST063		MST063		MST063		MST063		MST063		MST064		MST064		MST064		MST064	
Location Type:	Stream		Stream		Stream		Stream		Stream		Stream		Stream		Stream		Stream	
Sample ID:	050506SWMST063-avg-		050307SWMST063-0-F		050307SWMST063-0-U		0905SWMST063-F		0905SWMST063-U		051804SWMST064-0-F		051804SWMST064-0-U		SWMST064-1-F		SWMST064-1-U	
Collection Date:	5/5/2006		5/3/2007		5/3/2007		5/5/2009		5/5/2009		5/18/2004		5/18/2004		9/13/2004		9/13/2004	
Sample Type:	Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Groundwater		Groundwater		Groundwater		Groundwater	
	Averaged		Primary		Primary		Primary		Primary		Primary		Primary		Triplicate		Triplicate	
	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL
Total Metals (mg/L)																		
Aluminum	NS		NS		<0.1 UJK	0.087	NS		NS		NS		NS		NS		NS	
Barium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Beryllium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Boron	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Cobalt	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Iron	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Nickel	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Selenium	**0.006**	0.005	NS		**0.005 J**	0.005	NS		**0.00580 J**	0.005	NS		**0.002 J**	0.005	NS		**0.002 J {J+}**	0.005
Silver	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Thallium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Vanadium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Zinc	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Dissolved Metals (mg/L)																		
Aluminum, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Barium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Beryllium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Boron, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium, dissolved	NS		<0.0001 UK	0.00109	NS		<0.000125	0.000943	NS		<0.0001 UK	0.000996	NS		<0.0001 UK	0.000985	NS	
Cobalt, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Iron, dissolved	NS		NS		NS		<0.0250	0.158	NS		NS		NS		NS		NS	
Molybdenum, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Nickel, dissolved	NS		**0.0031 K**	0.135	NS		NS		NS		<0.0004 UK	0.118	NS		**0.0015 K**	0.116	NS	
Selenium, dissolved	NS		NS		NS		NS		NS		**0.003 J**	0.005	NS		**0.001 J**	0.005	NS	
Silver, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Thallium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Vanadium, dissolved	NS		**0.0011 J+K**	0.02	NS		<0.00500	0.02	NS		**0.00065 K**	0.02	NS		**0.00064 K**	0.02	NS	
Zinc, dissolved	NS		**0.002 JK**	0.307	NS		NS		NS		<0.002 UK	0.268	NS		<0.002 UK	0.264	NS	

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HENRY MINE - SUMMARY OF SURFACE WATER EXCEEDANCES
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Location:	MST064		MST064		MST064		MST064		MST064		MST064		MST064		MST064		MST234	
Location Type:	Stream		Stream		Stream		Stream		Stream		Stream		Stream		Stream		Stream	
Sample ID:	SWMST064-2-F		SWMST064-2-U		SWMST064-3-F		SWMST064-3-U		SWMST064-avg-F		SWMST064-avg-U		050806GWMST064-0-F		050806GWMST064-0-U		052004SWMST234-1-F	
Collection Date:	9/13/2004		9/13/2004		9/13/2004		9/13/2004		9/13/2004		9/13/2004		5/8/2006		5/8/2006		5/20/2004	
Sample Type:	Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Surface Water	
	Triplicate		Triplicate		Triplicate		Triplicate		Averaged		Averaged		Primary		Primary		Triplicate	
	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL
Total Metals (mg/L)																		
Aluminum	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Barium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Beryllium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Boron	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium	NS		NS		NS		NS		NS		NS		NS		**0.0001 JK**		NS	
Cobalt	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Iron	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Nickel	NS		NS		NS		NS		NS		NS		NS		**0.0013 JK**		NS	
Selenium	NS		**0.002 J {J+}**	0.005	NS		**0.002 J {J+}**	0.005	NS		**0.002 J**	0.005	NS		**0.021**	0.005	NS	
Silver	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Thallium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Vanadium	NS		NS		NS		NS		NS		NS		NS		**0.0023 K**	0.02	NS	
Zinc	NS		NS		NS		NS		NS		NS		NS		**0.004 JK**		NS	
Dissolved Metals (mg/L)																		
Aluminum, dissolved	NS		NS		NS		NS		NS		NS		<0.03 UK	0.087	NS		NS	
Barium, dissolved	NS		NS		NS		NS		NS		NS		**0.081 K**	0.003	NS		NS	
Beryllium, dissolved	NS		NS		NS		NS		NS		NS		<0.002 UK	0.0006	NS		NS	
Boron, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium, dissolved	<0.0001 UK	0.000983	NS		<0.0001 UK	0.000986	NS		<0.0001 UK	0.000984	NS		<0.0001 UK	0.00126	NS		<0.0001 UK	0.00127
Cobalt, dissolved	NS		NS		NS		NS		NS		NS		<0.01 UK	0.003	NS		NS	
Iron, dissolved	NS		NS		NS		NS		NS		NS		<0.02 UK	0.158	NS		NS	
Molybdenum, dissolved	NS		NS		NS		NS		NS		NS		<0.01 UK	0.034	NS		NS	
Nickel, dissolved	**0.0016 K**	0.116	NS		**0.0016 K**	0.116	NS		**0.00157 K**	0.116	NS		**0.0012 JK**	0.166	NS		**0.0021 K**	0.168
Selenium, dissolved	**0.002 J**	0.005	NS		**0.001 J**	0.005	NS		**0.00133 J**	0.005	NS		**0.02**	0.005	NS		NS	
Silver, dissolved	NS		NS		NS		NS		NS		NS		<0.01 UK	0.00036	NS		NS	
Thallium, dissolved	NS		NS		NS		NS		NS		NS		<0.0001 UK	0.00003	NS		NS	
Vanadium, dissolved	**0.00069 K**	0.02	NS		**0.00063 K**	0.02	NS		**0.000653 K**	0.02	NS		**0.0034 K**	0.02	NS		**0.00094 K**	0.02
Zinc, dissolved	**0.006 JK**	0.263	NS		<0.002 UK	0.264	NS		**0.006 JK**	0.263	NS		**0.002 JK**	0.378	NS		**0.005 JK**	0.382

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HENRY MINE - SUMMARY OF SURFACE WATER EXCEEDANCES
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Location:	MST234		MST234		MST234		MST234		MST234		MST234		MST234		MST234		MST234	
Location Type:	Stream		Stream		Stream		Stream		Stream		Stream		Stream		Stream		Stream	
Sample ID:	052004SWMST234-1-U		052004SWMST234-2-F		052004SWMST234-2-U		052004SWMST234-3-F		052004SWMST234-3-U		052004SWMST234-avg-		052004SWMST234-avg-		050706SWMST234-1-F		050706SWMST234-1-U	
Collection Date:	5/20/2004		5/20/2004		5/20/2004		5/20/2004		5/20/2004		5/20/2004		5/20/2004		5/7/2006		5/7/2006	
Sample Type:	Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water	
	Triplicate		Triplicate		Triplicate		Triplicate		Triplicate		Averaged		Averaged		Triplicate		Triplicate	
	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL
Total Metals (mg/L)																		
Aluminum	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Barium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Beryllium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Boron	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Cobalt	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Iron	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Nickel	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Selenium	<0.001	0.005	NS		<0.001	0.005	NS		<0.001	0.005	NS		<0.001	0.005	NS		<0.001	0.005
Silver	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Thallium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Vanadium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Zinc	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Dissolved Metals (mg/L)																		
Aluminum, dissolved	NS		NS		NS		NS		NS		NS		NS		<0.03 UK	0.087	NS	
Barium, dissolved	NS		NS		NS		NS		NS		NS		NS		**0.055 K**	0.003	NS	
Beryllium, dissolved	NS		NS		NS		NS		NS		NS		NS		<0.002 UK	0.0006	NS	
Boron, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium, dissolved	NS		<0.0001 UK	0.00127	NS		<0.0002 UK	0.00127	NS		<0.0002 UK	0.00127	NS		<0.0001 UK	0.00119	NS	
Cobalt, dissolved	NS		NS		NS		NS		NS		NS		NS		<0.01 UK	0.003	NS	
Iron, dissolved	NS		NS		NS		NS		NS		NS		NS		<0.02 UK	0.158	NS	
Molybdenum, dissolved	NS		NS		NS		NS		NS		NS		NS		<0.01 UK	0.034	NS	
Nickel, dissolved	NS		**0.0019 K**	0.168	NS		**0.0016 JK**	0.168	NS		**0.00187 JK**	0.168	NS		**0.0012 JK**	0.152	NS	
Selenium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Silver, dissolved	NS		NS		NS		NS		NS		NS		NS		<0.01 UK	0.00036	NS	
Thallium, dissolved	NS		NS		NS		NS		NS		NS		NS		<0.0001 UK	0.00003	NS	
Vanadium, dissolved	NS		**0.0009 K**	0.02	NS		**0.0008 K**	0.02	NS		**0.00088 K**	0.02	NS		**0.0007 JK**	0.02	NS	
Zinc, dissolved	NS		**0.005 JK**	0.382	NS		<0.004 UK	0.382	NS		**0.005 JK**	0.382	NS		**0.005 JK**	0.346	NS	

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HENRY MINE - SUMMARY OF SURFACE WATER EXCEEDANCES
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Location:	MST234		MST234		MST234		MST234		MST234		MST234		MST234		MST234		MST234	
Location Type:	Stream		Stream		Stream		Stream		Stream		Stream		Stream		Stream		Stream	
Sample ID:	050706SWMST234-2-F		050706SWMST234-2-U		050706SWMST234-3-F		050706SWMST234-3-U		050706SWMST234-avg-		050706SWMST234-avg-		051007SWMST234-0-F		051007SWMST234-0-U		090907SWMST234-1-F	
Collection Date:	5/7/2006		5/7/2006		5/7/2006		5/7/2006		5/7/2006		5/7/2006		5/10/2007		5/10/2007		9/9/2007	
Sample Type:	Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water	
	Triplicate		Triplicate		Triplicate		Triplicate		Averaged		Averaged		Primary		Primary		Triplicate	
	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL
Total Metals (mg/L)																		
Aluminum	NS		NS		NS		NS		NS		NS		NS		**0.05 JK**	0.087	NS	
Barium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Beryllium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Boron	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Cobalt	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Iron	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Nickel	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Selenium	NS		<0.001	0.005	NS		<0.001	0.005	NS		<0.001	0.005	NS		<0.001	0.005	NS	
Silver	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Thallium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Vanadium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Zinc	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Dissolved Metals (mg/L)																		
Aluminum, dissolved	<0.03 UK	0.087	NS		**0.14 JK**	0.087	NS		**0.14 JK**	0.087	NS		NS		NS		NS	
Barium, dissolved	**0.054 K**	0.003	NS		**0.055 K**	0.003	NS		**0.0547 K**	0.003	NS		NS		NS		NS	
Beryllium, dissolved	<0.002 UK	0.0006	NS		<0.002 UK	0.0006	NS		<0.002 UK	0.0006	NS		NS		NS		NS	
Boron, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium, dissolved	<0.0001 UK	0.00119	NS		<0.0001 UK	0.00120	NS		<0.0001 UK	0.00119	NS		<0.0001	0.00127	NS		<0.0001 UK	0.00127
Cobalt, dissolved	<0.01 UK	0.003	NS		<0.01 UK	0.003	NS		<0.01 UK	0.003	NS		NS		NS		NS	
Iron, dissolved	<0.02 UK	0.158	NS		<0.02 UK	0.158	NS		<0.02 UK	0.158	NS		NS		NS		NS	
Molybdenum, dissolved	<0.01 UK	0.034	NS		<0.01 UK	0.034	NS		<0.01 UK	0.034	NS		NS		NS		NS	
Nickel, dissolved	**0.0011 JK**	0.153	NS		**0.0013 JK**	0.155	NS		**0.0012 JK**	0.153	NS		**0.0026 JK**	0.168	NS		**0.0035 K**	0.168
Selenium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Silver, dissolved	<0.01 UK	0.00036	NS		<0.01 UK	0.00036	NS		<0.01 UK	0.00036	NS		NS		NS		NS	
Thallium, dissolved	<0.0001 UK	0.00003	NS		<0.0001 UK	0.00003	NS		<0.0001 UK	0.00003	NS		NS		NS		NS	
Vanadium, dissolved	**0.0007 JK**	0.02	NS		**0.0007 JK**	0.02	NS		**0.0007 JK**	0.02	NS		<0.0008	0.02	NS		**0.0012 J+K**	0.02
Zinc, dissolved	**0.004 JK**	0.347	NS		**0.004 JK**	0.352	NS		**0.00433 JK**	0.349	NS		**0.005 JK**	0.382	NS		**0.007 JK**	0.382

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HENRY MINE - SUMMARY OF SURFACE WATER EXCEEDANCES
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Location:	MST234		MST234		MST234		MST234		MST234		MST234		MST234		MST234		MST234	
Location Type:	Stream		Stream		Stream		Stream		Stream		Stream		Stream		Stream		Stream	
Sample ID:	090907SWMST234-1-U		090907SWMST234-2-F		090907SWMST234-2-U		090907SWMST234-3-F		090907SWMST234-3-U		090907SWMST234-avg-		090907SWMST234-avg-		051008SWMST234-0-F		051008SWMST234-0-U	
Collection Date:	9/9/2007		9/9/2007		9/9/2007		9/9/2007		9/9/2007		9/9/2007		9/9/2007		5/10/2008		5/10/2008	
Sample Type:	Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water	
	Triplicate		Triplicate		Triplicate		Triplicate		Triplicate		Averaged		Averaged		Primary		Primary	
	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL
Total Metals (mg/L)																		
Aluminum	<0.03 UK	0.087	NS		<0.03 UK	0.087	NS		**0.03 JK**	0.087	NS		**0.03 JK**	0.087	NS		<0.11 UK	0.087
Barium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Beryllium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Boron	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Cobalt	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Iron	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Nickel	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Selenium	<0.001	0.005	NS		<0.001	0.005	NS		<0.001	0.005	NS		<0.001	0.005	NS		<0.001	0.005
Silver	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Thallium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Vanadium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Zinc	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Dissolved Metals (mg/L)																		
Aluminum, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Barium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Beryllium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Boron, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium, dissolved	NS		<0.0001 UK	0.00127	NS		<0.0001 UK	0.00127	NS		<0.0001 UK	0.00127	NS		<0.0001 UK	0.00126	NS	
Cobalt, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Iron, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Molybdenum, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Nickel, dissolved	NS		**0.0034 K**	0.168	NS		**0.0037 K**	0.168	NS		**0.00353 K**	0.168	NS		**0.0036 K**	0.167	NS	
Selenium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Silver, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Thallium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Vanadium, dissolved	NS		**0.0011 J+K**	0.02	NS		**0.0012 J+K**	0.02	NS		**0.00117**	0.02	NS		**0.0672 K**	0.02	NS	
Zinc, dissolved	NS		**0.008 JK**	0.382	NS		**0.006 JK**	0.382	NS		**0.007 JK**	0.382	NS		**0.005 JK**	0.381	NS	

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HENRY MINE - SUMMARY OF SURFACE WATER EXCEEDANCES
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Location:	MST234		MST234		MST270		MST270		MST271		MST271		MST276		MST276		MST276	
Location Type:	Stream		Stream		Stream		Stream		Stream		Stream		Stream		Stream		Stream	
Sample ID:	091908SWMST234-0-F		091908SWMST234-0-U		050606SWMST270-0-F		050606SWMST270-0-U		050906SWMST271-0-F		050906SWMST271-0-U		051804SWMST276-0-F		051804SWMST276-0-U		SWMST276-0-F	
Collection Date:	9/19/2008		9/19/2008		5/6/2006		5/6/2006		5/9/2006		5/9/2006		5/18/2004		5/18/2004		9/13/2004	
Sample Type:	Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Groundwater		Groundwater		Groundwater	
	Primary		Primary		Primary		Primary		Primary		Primary		Primary		Primary		Primary	
	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL
Total Metals (mg/L)																		
Aluminum	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Barium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Beryllium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Boron	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Cobalt	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Iron	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Nickel	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Selenium	NS		**0.00164 J+**	0.005	NS		<0.001	0.005	NS		<0.001	0.005	NS		**0.003 J**	0.005	NS	
Silver	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Thallium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Vanadium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Zinc	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Dissolved Metals (mg/L)																		
Aluminum, dissolved	<0.0500	0.087	NS		**0.12 JK**	0.087	NS		<0.03 UK	0.087	NS		NS		NS		NS	
Barium, dissolved	NS		NS		**0.028 K**	0.003	NS		**0.042 K**	0.003	NS		NS		NS		NS	
Beryllium, dissolved	NS		NS		<0.002 UK	0.0006	NS		<0.002 UK	0.0006	NS		NS		NS		NS	
Boron, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium, dissolved	<0.000125	0.00127	NS		<0.0001 UK	0.000642	NS		<0.0001 UK	0.000805	NS		<0.0001 UK	0.000935	NS		<0.0001 UK	0.000976
Cobalt, dissolved	NS		NS		<0.01 UK	0.003	NS		<0.01 UK	0.003	NS		NS		NS		NS	
Iron, dissolved	<0.0250	0.158	NS		<0.02 UK	0.158	NS		**0.03 JK**	0.158	NS		NS		NS		NS	
Molybdenum, dissolved	NS		NS		<0.01 UK	0.034	NS		<0.01 UK	0.034	NS		NS		NS		NS	
Nickel, dissolved	**0.00634**	0.168	NS		**0.0022 JK**	0.0620	NS		**0.0022 JK**	0.0863	NS		**0.0013 J+K**	0.107	NS		**0.002 K**	0.114
Selenium, dissolved	NS		NS		NS		NS		NS		NS		**0.003 J**	0.005	NS		**0.002 J**	0.005
Silver, dissolved	NS		NS		<0.01 UK	0.00036	NS		<0.01 UK	0.00036	NS		NS		NS		NS	
Thallium, dissolved	NS		NS		<0.0001 UK	0.00003	NS		<0.0001 UK	0.00003	NS		NS		NS		NS	
Vanadium, dissolved	<0.00500	0.02	NS		**0.0032 K**	0.02	NS		**0.002 K**	0.02	NS		**0.00108 K**	0.02	NS		**0.00086 K**	0.02
Zinc, dissolved	**0.00769 J**	0.382	NS		**0.003 JK**	0.141	NS		**0.005 JK**	0.196	NS		<0.002 UK	0.244	NS		<0.002 UK	0.260

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HENRY MINE - SUMMARY OF SURFACE WATER EXCEEDANCES
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Location:	MST276		MST276		MST276		MST276		MST276		MST276		MST276		MST276		MST276	
Location Type:	Stream		Stream		Stream		Stream		Stream		Stream		Stream		Stream		Stream	
Sample ID:	SWMST276-0-U		050806GWMST276-0-F		050806GWMST276-0-U		051007SWMST276-0-F		051007SWMST276-0-U		091107GWMST276-0-F		091107GWMST276-0-U		051508GWMST276-0-F		051508GWMST276-0-U	
Collection Date:	9/13/2004		5/8/2006		5/8/2006		5/10/2007		5/10/2007		9/11/2007		9/11/2007		5/15/2008		5/15/2008	
Sample Type:	Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater	
	Primary		Primary		Primary		Primary		Primary		Primary		Primary		Primary		Primary	
	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL
Total Metals (mg/L)																		
Aluminum	NS		NS		NS		NS		<0.03 UK	0.087	NS		<0.03 UK	0.087	NS		**0.07 J+K**	0.087
Barium	NS		NS		NS		NS		NS		NS		**0.066 K**	0.003	NS		**0.061 K**	0.003
Beryllium	NS		NS		NS		NS		NS		NS		<0.002 UK	0.0006	NS		<0.002 UK	0.0006
Boron	NS		NS		NS		NS		NS		NS		**0.02 JK**	0.0016	NS		**0.02 JK**	0.0016
Cadmium	NS		NS		<0.0001 UK		NS		NS		NS		<0.0001 UK	0.000992	NS		<0.0001 UK	0.000958
Cobalt	NS		NS		NS		NS		NS		NS		<0.01 UK	0.003	NS		<0.01 UK	0.003
Iron	NS		NS		NS		NS		NS		NS		**0.03 JK**	0.158	NS		**0.03 J+K**	0.158
Nickel	NS		NS		<0.0006 UK		NS		NS		NS		**0.0009 JK**	0.117	NS		**0.0009 JK**	0.111
Selenium	**0.013**	0.005	NS		**0.005 J**	0.005	NS		**0.006**	0.005	NS		**0.003 J**	0.005	NS		**0.005 J-**	0.005
Silver	NS		NS		NS		NS		NS		NS		<0.01 UK	0.00036	NS		<0.01 UK	0.00036
Thallium	NS		NS		NS		NS		NS		NS		**0.0006 J+K**	0.00003	NS		<0.0001 UK	0.00003
Vanadium	NS		NS		**0.0002 JK**	0.02	NS		NS		NS		**0.0006 JK**	0.02	NS		**0.0009 JK**	0.02
Zinc	NS		NS		<0.002 UK		NS		NS		NS		<0.002 UK	0.266	NS		<0.002 UK	0.253
Dissolved Metals (mg/L)																		
Aluminum, dissolved	NS		<0.03 UK	0.087	NS		NS		NS		<0.03 UK	0.087	NS		<0.03 UK	0.087	NS	
Barium, dissolved	NS		**0.063 K**	0.003	NS		NS		NS		**0.066 K**	0.003	NS		**0.063 K**	0.003	NS	
Beryllium, dissolved	NS		<0.002 UK	0.0006	NS		NS		NS		<0.002 UK	0.0006	NS		<0.002 UK	0.0006	NS	
Boron, dissolved	NS		NS		NS		NS		NS		**0.02 JK**	0.0016	NS		<0.01 UK	0.0016	NS	
Cadmium, dissolved	NS		<0.0001 UK	0.00101	NS		<0.0001	0.00106	NS		<0.0001 UK	0.00105	NS		<0.0001 UK	0.000989	NS	
Cobalt, dissolved	NS		<0.01 UK	0.003	NS		NS		NS		<0.01 UK	0.003	NS		<0.01 UK	0.003	NS	
Iron, dissolved	NS		<0.02 UK	0.158	NS		NS		NS		<0.02 UK	0.158	NS		<0.02 UK	0.158	NS	
Molybdenum, dissolved	NS		<0.01 UK	0.034	NS		NS		NS		<0.01 UK	0.034	NS		<0.01 UK	0.034	NS	
Nickel, dissolved	NS		<0.0006 UK	0.121	NS		**0.0008 JK**	0.130	NS		**0.0011 JK**	0.127	NS		**0.0021 JK**	0.117	NS	
Selenium, dissolved	NS		**0.003 J**	0.005	NS		NS		NS		**0.003 J**	0.005	NS		**0.006**	0.005	NS	
Silver, dissolved	NS		<0.01 UK	0.00036	NS		NS		NS		<0.01 UK	0.00036	NS		<0.01 UK	0.00036	NS	
Thallium, dissolved	NS		<0.0001 UK	0.00003	NS		NS		NS		<0.0001 UK	0.00003	NS		<0.0001 UK	0.00003	NS	
Vanadium, dissolved	NS		**0.0009 JK**	0.02	NS		<0.0004	0.02	NS		**0.0007 JK**	0.02	NS		<0.0002 UK	0.02	NS	
Zinc, dissolved	NS		**0.002 JK**	0.275	NS		<0.002 UJK	0.295	NS		<0.002 UK	0.288	NS		<0.002 UK	0.265	NS	

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HENRY MINE - SUMMARY OF SURFACE WATER EXCEEDANCES
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Location:	MST276		MST276		MST277		MST277		MST277		MST277		MST277		MST277		MST277	
Location Type:	Stream		Stream		Stream		Stream		Stream		Stream		Stream		Stream		Stream	
Sample ID:	100608GWMST276-0-F		100608GWMST276-0-U		052204SWMST277-1-F		052204SWMST277-1-U		052204SWMST277-2-F		052204SWMST277-2-U		052204SWMST277-3-F		052204SWMST277-3-U		052204SWMST277-avg-	
Collection Date:	10/6/2008		10/6/2008		5/22/2004		5/20/2004		5/22/2004		5/22/2004		5/22/2004		5/22/2004		5/22/2004	
Sample Type:	Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater	
	Primary		Primary		Triplicate		Triplicate		Triplicate		Triplicate		Triplicate		Triplicate		Averaged	
	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL
Total Metals (mg/L)																		
Aluminum	NS		**0.0933 J**	0.087	NS		NS		NS		NS		NS		NS		NS	
Barium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Beryllium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Boron	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium	NS		<0.000125		NS		NS		NS		NS		NS		NS		NS	
Cobalt	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Iron	NS		**0.0752 J**	0.158	NS		NS		NS		NS		NS		NS		NS	
Nickel	NS		**0.00332 J**		NS		NS		NS		NS		NS		NS		NS	
Selenium	NS		**0.00354**	0.005	NS		<0.001	0.005	NS		<0.001	0.005	NS		<0.001	0.005	NS	
Silver	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Thallium	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Vanadium	NS		<0.00500	0.02	NS		NS		NS		NS		NS		NS		NS	
Zinc	NS		**0.00784 J**		NS		NS		NS		NS		NS		NS		NS	
Dissolved Metals (mg/L)																		
Aluminum, dissolved	<0.0500	0.087	NS		NS		NS		NS		NS		NS		NS		NS	
Barium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Beryllium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Boron, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium, dissolved	<0.000125	0.000987	NS		<0.0005 UK	0.00101	NS		<0.0005 UK	0.00101	NS		<0.0005 UK	0.00101	NS		<0.0005 UK	0.00101
Cobalt, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Iron, dissolved	<0.0250	0.158	NS		NS		NS		NS		NS		NS		NS		NS	
Molybdenum, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Nickel, dissolved	**0.00341 J**	0.116	NS		**0.001 JK**	0.120	NS		**0.002 JK**	0.120	NS		**0.001 JK**	0.120	NS		**0.00133 JK**	0.120
Selenium, dissolved	**0.00383**	0.005	NS		<0.001	0.005	NS		<0.001	0.005	NS		<0.001	0.005	NS		<0.001	0.005
Silver, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Thallium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS		NS	
Vanadium, dissolved	<0.00500	0.02	NS		<0.0004 UK	0.02	NS		<0.0004 UK	0.02	NS		<0.0003 UK	0.02	NS		<0.0003 UK	0.02
Zinc, dissolved	**0.110**	0.265	NS		<0.01 UK	0.274	NS		<0.01 UK	0.273	NS		<0.01 UK	0.273	NS		<0.01 UK	0.273

TABLE 3-24

HENRY MINE - SUMMARY OF SURFACE WATER EXCEEDANCES

Location:	MST277		MST277		MST277		MST277		MST277		MST277		MST277		MST280		MST280	
Location Type:	Stream		Stream		Stream		Stream		Stream		Stream		Stream		Stream		Stream	
Sample ID:	052204SWMST277-avg-		051006GWMST277-0-F		051006GWMST277-0-U		051407SWMST277-0-F		051407SWMST277-0-U		051508GWMST277-0-F		051508GWMST277-0-U		052208SWMST280-0-F		052208SWMST280-0-U	
Collection Date:	5/22/2004		5/10/2006		5/10/2006		5/14/2007		5/14/2007		5/15/2008		5/15/2008		5/22/2008		5/22/2008	
Sample Type:	Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater	
	Averaged		Primary		Primary		Primary		Primary		Primary		Primary		Primary		Primary	
	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL
Total Metals (mg/L)																		
Aluminum	NS		NS		NS		NS		<0.03 UK	0.087	NS		<0.05 UJK	0.087	NS		<0.06 UJK	0.087
Barium	NS		NS		NS		NS		NS		NS		**0.049 K**	0.003	NS		NS	
Beryllium	NS		NS		NS		NS		NS		NS		<0.002 UK	0.0006	NS		NS	
Boron	NS		NS		NS		NS		NS		NS		**0.02 J+K**	0.0016	NS		NS	
Cadmium	NS		NS		<0.0001 UK		NS		NS		NS		<0.0001 UK	0.000793	NS		NS	
Cobalt	NS		NS		NS		NS		NS		NS		<0.01 UK	0.003	NS		NS	
Iron	NS		NS		NS		NS		NS		NS		**0.26 K**	0.158	NS		NS	
Nickel	NS		NS		**0.0008 JK**		NS		NS		NS		**0.0015 JK**	0.0843	NS		NS	
Selenium	<0.001	0.005	NS		<0.001	0.005	NS		<0.001	0.005	NS		<0.001	0.005	NS		**0.29**	0.005
Silver	NS		NS		NS		NS		NS		NS		<0.01 UK	0.00036	NS		NS	
Thallium	NS		NS		NS		NS		NS		NS		<0.0001 UK	0.00003	NS		NS	
Vanadium	NS		NS		**0.0039 K**	0.02	NS		NS		NS		**0.0006 JK**	0.02	NS		NS	
Zinc	NS		NS		**0.003 JK**		NS		NS		NS		**0.005 JK**	0.192	NS		NS	
Dissolved Metals (mg/L)																		
Aluminum, dissolved	NS		<0.03 UK	0.087	NS		NS		NS		<0.03 UK	0.087	NS		NS		NS	
Barium, dissolved	NS		**0.08 K**	0.003	NS		NS		NS		**0.047 K**	0.003	NS		NS		NS	
Beryllium, dissolved	NS		<0.002 UK	0.0006	NS		NS		NS		<0.002 UK	0.0006	NS		NS		NS	
Boron, dissolved	NS		NS		NS		NS		NS		<0.01 UK	0.0016	NS		NS		NS	
Cadmium, dissolved	NS		<0.0001 UK	0.000841	NS		<0.0001	0.000998	NS		**0.0001 JK**	0.000764	NS		**0.0078 K**	0.00127	NS	
Cobalt, dissolved	NS		<0.01 UK	0.003	NS		NS		NS		<0.01 UK	0.003	NS		NS		NS	
Iron, dissolved	NS		<0.02 UK	0.158	NS		NS		NS		**0.14 K**	0.158	NS		NS		NS	
Molybdenum, dissolved	NS		<0.01 UK	0.034	NS		NS		NS		<0.01 UK	0.034	NS		NS		NS	
Nickel, dissolved	NS		**0.0007 JK**	0.0919	NS		**0.0016 JK**	0.118	NS		**0.0033 K**	0.0798	NS		**0.0646 K**	0.168	NS	
Selenium, dissolved	NS		<0.001	0.005	NS		NS		NS		<0.001	0.005	NS		NS		NS	
Silver, dissolved	NS		<0.01 UK	0.00036	NS		NS		NS		<0.01 UK	0.00036	NS		NS		NS	
Thallium, dissolved	NS		<0.0001 UK	0.00003	NS		NS		NS		<0.0001 UK	0.00003	NS		NS		NS	
Vanadium, dissolved	NS		**0.0037 K**	0.02	NS		<0.0002	0.02	NS		<0.0008 UK	0.02	NS		**0.0402 K**	0.02	NS	
Zinc, dissolved	NS		**0.005 JK**	0.209	NS		**0.004 JK**	0.269	NS		**0.011 K**	0.182	NS		**0.142 K**	0.382	NS	

TABLE 3-24

HENRY MINE - SUMMARY OF SURFACE WATER EXCEEDANCES
(Page 33 of 33)

Notes:
NS - not sampled
SL - screening level
F - filtered
U - unfiltered
Avg - average

Result is greater than screening value
Method detection limit for non-detected value is greater than the screening value

FLAG DEFINITION:

U	The analyte was analyzed for, but was not detected above the level of the reported sample quantitation limit.
J	The result is an estimated quantity. The associated numerical value is the approximated concentration of the analyte in the sample.
J+	The result is an estimated quantity, but the result may be biased high.
J-	The result is an estimated quantity, but the result may be biased low.
J+/B	Result is estimated and biased high; associated field blank contained target analyte.
R	The result is unusable. The sample result is rejected due to serious deficiencies in meeting quality control criteria. The analyte may or may not be present in the sample.
UJ	The analyte was analyzed for, but was not detected. The reported quantitation limit is approximate and may be inaccurate or imprecise.
K	Serial dilutions not performed for samples analyzed by this method (EPA 200.7; 200.8).

SOURCES FOR SCREENING VALUES (SEE ALSO TABLE 3

Surface Water	Unless identified otherwise below, screening levels are the chronic freshwater screening value in NOAA SQuiRT (Buchman, 2008).
	Screening levels for aluminum is the Freshwater Standards for Chronic Criteria (CCC) from the National Recommended Water Quality Criteria (USEPA, 2009).
	Screening values for arsenic, cadmium, chromium, copper, lead, nickel, selenium, and zinc are the CCCs from the State of Idaho Surface Water Quality for Aquatic Life (IDAPA 58.01.02); those for cadmium, chromium, copper, lead, nickel, and zinc are expressed as a function of total hardness. Screening levels for cadmium and selenium are expressed as total recoverable (unfiltered concentration).
	The screening level for iron is the Lowest Chronic Value (LCV) observed for fresh water daphnids (source: ORNL, 1996).
	The screening levels for manganese, uranium, and vanadium are the Tier II Secondary Chronic Values (source: ORNL, 1996).

TRIPLICATE RESULT

"Primary" indicates locations where only one sample was collected from a given location. "Triplicate" indicates locations where a total of three samples were collected from a given location for the purpose of quality assurance.
The average value for triplicate samples is calculated as follows: (a) the mean of three detected values, (b) the mean of two detected values if result of one triplicate is not detected, (c) the detected value if results of two triplicates are not detected, or (d) less than the highest method detection limit if all triplicate results are not detected.

TABLE 3-25

HENRY MINE - SUMMARY OF SEDIMENT EXCEEDANCES
(Page 1 of 3)

					Analyte (mg/Kg, dry weight)					
Location	Location Type	Sample Identification	Collection Date	Sample Type	Cadmium	Chromium	Nickel	Selenium	Vanadium	Zinc
				Screening Level:	0.583	36.286	18	4	57	98
MDS016	Dump Seep	052204SEMDS016-0	5/22/2004	Primary	12.7	137	123 J	9.7	103 J	371 J
MDS022	Dump Seep	051804SEMDS022-0	5/18/2004	Primary	1.82	10.7	34.2	1.9 J	12.7	76
MRV016	Reservoir Delta	052004SEMRV016-0	5/20/2004	Primary	0.74	13.9	6.4	0.8 J	8.87 J	74 J
MSP014	Pond	051504SEMSP014-0	5/15/2004	Primary	21	222	104	18.9	181	621
MSP015	Pond	051804SEMSP015-0	5/18/2004	Primary	10.5	53	85.6	22 J	66	602
MSP016	Pond	051704SEMSP016-1-QA1	5/17/2004	Triplicate	38	334	105	53 J	492	977
MSP016	Pond	051704SEMSP016-1-QA2	5/17/2004	Triplicate	44.3	349	105	55 J	514	1010
MSP016	Pond	051704SEMSP016-1-QA3	5/17/2004	Triplicate	42.1	344	99.2	54 J	514	939
MSP016	Pond	051704SEMSP016-1-QA-avg	5/17/2004	Averaged	41.5	342	103	54 J	507	975
MSP055	Pond	051504SEMSP055-0	5/15/2004	Primary	104	1030	1110	148	940	7940
MST043	Stream	052104SEMST043-QA1	5/21/2004	Triplicate	1.09	25.5	13.8 J	1.5 J	22.5	89
MST043	Stream	052104SEMST043-QA2	5/21/2004	Triplicate	0.74	23.6	14.8 J	1.4 J	21.9	86
MST043	Stream	052104SEMST043-QA3	5/21/2004	Triplicate	0.88	25.1	14.5 J	2.1 J	22.3	89
MST043	Stream	052104SEMST043-QA-avg	5/21/2004	Averaged	0.903	24.7	14.4 J	1.67 J	22.2	88
MST044	Stream	051904SEMST044-0	5/19/2004	Primary	1.39	36	11.3	1.1 J	29.3 J	68 J
MST045	Stream	051904SEMST045-0	5/19/2004	Primary	0.66	24.8	12.1	1.1 J	20.9 J	49 J
MST046	Stream	052104SEMST046-0	5/21/2004	Primary	1.41	26.4	14.7 J	0.5 J	26.8	67
MST047	Stream	052104SEMST047-0	5/21/2004	Primary	0.9	28	16.2 J	<0.5	34.3	82
MST050	Stream	051404SEMST050-0	5/14/2004	Primary	3.89	37.7	26.2	2.1 J	42.6	135
MST053	Stream	052104SEMST053-0	5/21/2004	Primary	1.42	28.5	15.2 J	<0.5	29.7	63
MST054	Stream	052204SEMST054-0	5/22/2004	Primary	0.82	21	12.7 J	2 J	13.7	97
MST055	Stream	051904SEMST055-0	5/19/2004	Primary	2.16	35.4	14.4 J	1 J	40.6 J	67 J
MST057	Stream	051804SEMST057-0	5/18/2004	Primary	4.48	24.4	15	4.4 J	27.5	93
MST058	Stream	051804SEMST058-0	5/18/2004	Primary	2.1	14.2	19.7	2 J	24.9	82
MST062	Stream	051804SEMST062-0	5/18/2004	Primary	1.05	15.7	8.6	<0.6 UJ	13.3	43
MST063	Stream	051804SEMST063-0	5/18/2004	Primary	1.73	24.1	20.3	<0.6 UJ	30.9	73
MST064	Stream	051804SEMST064-0	5/18/2004	Primary	5.65	50	12.9	0.8 J	52	83
MST234	Stream	052004SEMST234-1-QA1	5/20/2004	Triplicate	0.81	20.7	16.2 J	1.7 J	13.4	98

TABLE 3-25

HENRY MINE - SUMMARY OF SEDIMENT EXCEEDANCES
(Page 2 of 3)

					Analyte (mg/Kg, dry weight)					
Location	Location Type	Sample Identification	Collection Date	Sample Type	Cadmium	Chromium	Nickel	Selenium	Vanadium	Zinc
				Screening Level:	0.583	36.286	18	4	57	98
MST234	Stream	052004SEMST234-1-QA2	5/20/2004	Triplicate	**0.74**	**23.5**	**12.8 J**	**1.9 J**	**12.7**	**102**
MST234	Stream	052004SEMST234-1-QA3	5/20/2004	Triplicate	**1.28**	**26.5**	**15.1 J**	**0.8 J**	**24.6**	**78**
MST234	Stream	052004SEMST234-1-QA-avg	5/20/2004	Averaged	**0.943**	**23.6**	**14.7 J**	**1.47 J**	**16.9**	**92.7**
MST276	Stream	051804SEMST276-0	5/18/2004	Primary	**4.27**	**86**	**12.5**	**2 J**	**56.5**	**42**
MST277	Stream	052204SEMST277-1-QA1	5/22/2004	Triplicate	**3.67**	**33.8 J**	**23.1**	**0.8 J**	**43.3**	**150**
MST277	Stream	052204SEMST277-1-QA2	5/22/2004	Triplicate	**3.84**	**35.8 J**	**23.3**	**0.7 J**	**47.2**	**152**
MST277	Stream	052204SEMST277-1-QA3	5/22/2004	Triplicate	**3.72**	**34.7 J**	**22.8**	**0.9 J**	**45.1**	**151**
MST277	Stream	052204SEMST277-1-QA-avg	5/22/2004	Averaged	**3.74**	**34.8 J**	**23.1**	**0.8 J**	**45.2**	**151**

TABLE 3-25

HENRY MINE - SUMMARY OF SEDIMENT EXCEEDANCES
(Page 3 of 3)

Notes:

Result is greater than screening value

FLAG DEFINITION:

U	The analyte was analyzed for, but was not detected above the level of the reported sample quantitation limit.
J	The result is an estimated quantity. The associated numerical value is the approximated concentration of the analyte in the sample.
J+	The result is an estimated quantity, but the result may be biased high.
J-	The result is an estimated quantity, but the result may be biased low.
J+/B	Result is estimated and biased high; associated field blank contained target analyte.
R	The result is unusable. The sample result is rejected due to serious deficiencies in meeting quality control criteria. The analyte may or may not be present in the sample.
UJ	The analyte was analyzed for, but was not detected. The reported quantitation limit is approximate and may be inaccurate or imprecise.

SOURCES FOR SCREENING VALUES (SEE ALSO TABLE 3

Sediment

Screening levels for aluminum, cadmium, chromium, and zinc are the ARCS threshold effects levels (TELs) for freshwater sediment in NOAA SQuiRT (Buchman, 2008).
Screening level for antimony is from Buchman, M. 1999. NOAA HAZMAT Report 99-1.
Screening levels for arsenic, copper, lead, mercury, and nickel are the TEL for freshwater sediment in NOAA SQuiRT (Buchman, 2008).

Screening levels for cobalt, iron, manganese, and silver are from Guidelines for the Protection and Management of Aquatic Sediment Quality in Ontario, August 1993.
Screening level for selenium is from Van Derveer and Canton (1997).
Screening level for vanadium is from the marine sediment AET (Buchman, 2008).

TRIPLICATE RESULT

"Primary" indicates locations where only one sample was collected from a given location. "Triplicate" indicates locations where a total of three samples were collected from a given location for the purpose of quality assurance.
The average value for triplicate samples is calculated as follows: (a) the mean of three detected values, (b) the mean of two detected values if result of one triplicate is not detected, (c) the detected value if results of two triplicates are not detected, or (d) less than the highest method detection limit if all triplicate results are not detected.

TABLE 3-26 HENRY MINE GROUNDWATER MONITORING LOCATIONS						
Mine	Station Description	Location		Station Number	Station Type	Groundwater System Monitored and Screened Interval (ft bgs)
		Latitude	Longitude			
Henry	Dredge Field Well	52 51 57.01	111 29 22.21	MAW004	AW	ND
	Godfrey Field Well West	42 51 59.54	111 30 49.85	MAW006	AW	Basalt 109-89
	Godfrey Field Well North	42 52 29.99	111 29 49.20	MAW007	AW	Alluvial 119-59
	Near the Little Blackfoot River	42 54 14	111 29 23	MBW152	BW	Alluvial 15-10
	North of Henry Mine north pit	42 54 07.7	111 29 46.5	MMW004	MW	Alluvial/ Dinwoody Formation No screen
	Taylor House Well	42 52 29.99	111 26 45.99	MDW003	DW	ND
	Cedar Bay RV Park Well	42 54 32.40	111 31 51.59	MDW005	DW	Alluvial / Travertine 45-40
	Southeast of Center Henry Pit; near MPW023	42 52 22.3	111 27 51.3	MMW010	MW	Alluvial 32-12
	Northwest of Center Henry Pit; south of Little Blackfoot River	42 53 48.3	111 29 30.0	MMW011	MW	Wells Formation 115-95
	Southeast of Henry Mine center pit in Lone Pine Creek alluvial flow field	42 51 59.3	111 27 05.2	MMW014	MW	Alluvial 22-7
	North of Henry Mine center pit	42 53 50.2	111 29 25.4	MMW019	MW	Alluvial 14-4
	Northeast lobe of Henry Mine waste rock dump MWD086	42 53 09.2	111 28 18.3	MMW022	MW	Dinwoody Formation 326-306
	Henry Mine North Pit	42 54 20.50	111 30 27.50	MMW023	MW	Wells Formation 357-352
	Near the Little Blackfoot River northwest of MMW019	42 53 50.24	111 28 60.00	MMW028	MW	Dinwoody Formation 96-76
	South Henry Pit Dewatering Well	42 52 03.5	111 27 28.4	MPW022	PW	ND No Screen
	Center Henry Pit Dewatering Well	42 52 17.7	111 27 47.2	MPW023	PW	ND No Screen

Notes:
Location (GPS) coordinates use the NAD27 datum and are presented in ddd mm ss.ss format (degrees minutes seconds).
ND - Not determined
AW - Agricultural Well
BW - Borehole Monitoring Well
DW - Domestic Well
MW - Monitoring Well
PW - Production Well

TABLE 3-27

HENRY MINE - SUMMARY OF GROUNDWATER EXCEEDANCES
(Page 1 of 10)

Well Name:			MAW004	MAW004	MAW006	MAW006	MAW007	MAW007	MBW152
Collection Date:			05/21/04	06/12/08	09/15/04	06/12/08	10/06/04	06/11/08	05/16/09
Well Type:			AW	AW	AW	AW	AW	AW	BW
Result Type:			Primary	Primary	Primary	Primary	Primary	Primary	Primary
Analyte	**Units**	**Screening Value**							
Dissolved Metals									
Aluminum, dissolved	mg/L	0.2	NS	**0.12 JK**	NS	**0.05 JK**	NS	<0.03 UK	NS
Cadmium, dissolved	mg/L	0.005	<0.0002 UK	<0.0001 UK	<0.0001	<0.0001 UK	NS	<0.0001 UK	NS
Iron, dissolved	mg/L	0.3	NS	**3.41 K**	NS	<0.02 UK	NS	**0.84 K**	NS
Manganese, dissolved	mg/L	0.05	NS	**0.17 K**	NS	**0.0059 K**	NS	**0.354 J+K**	NS
Selenium, dissolved	mg/L	0.05	<0.001	<0.001	<0.001 UJ	<0.001	NS	<0.001	**0.00536 J**
Zinc, dissolved	mg/L	5	**0.008 JK**	**0.006 JK**	**0.022 K**	**0.031 K**	**0.053 J-K**	**0.045 K**	NS
Total Metals									
Aluminum	mg/L	0.2	NS	**0.04 JK**	NS	**4.65 K**	NS	<0.13 UK	NS
Cadmium	mg/L	0.005	<0.0002 UK	<0.0001 UK	<0.0002 UK	**0.0002 JK**	<0.0001	<0.0001 UK	NS
Iron	mg/L	0.3	NS	**3.47 K**	NS	**4.09 K**	NS	**1.27 K**	NS
Manganese	mg/L	0.05	NS	**0.16 K**	NS	**0.193 K**	NS	**0.357 K**	NS
Selenium	mg/L	0.05	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	NS
Zinc	mg/L	5	**0.037 K**	**0.005 JK**	**0.036 K**	**0.04 K**	**0.087 JK**	**0.073 K**	NS
General Chemistry									
pH		6.5-8.5	NS	**7.7 J**	NS	**8.2 J**	NS	**8.2 J**	NS
Residue, Filterable (TDS)	mg/L	500	NS	**680 J-**	NS	**200 J-**	NS	**300 J-**	NS
Sulfate	mg/L	250	**7.7**	**9.3 J-**	**10.4**	**10.7**	**23.8**	**19.3**	NS

TABLE 3-27

HENRY MINE - SUMMARY OF GROUNDWATER EXCEEDANCES
(Page 2 of 10)

Well Name:			**MDW003**	**MDW003**	**MDW005**	**MDW005**	**MMW004**	**MMW004**	**MMW004**
Collection Date:			**05/19/04**	**05/21/08**	**05/22/04**	**05/21/08**	**05/22/04**	**10/05/04**	**06/24/05**
Well Type:			**DW**	**DW**	**DW**	**DW**	**MW**	**MW**	**MW**
Result Type:			**Primary**	**Primary**	**Primary**	**Primary**	**Averaged Triplicate**	**Primary**	**Averaged Triplicate**
Analyte	**Units**	**Screening Value**							
Dissolved Metals									
Aluminum, dissolved	mg/L	0.2	NS	<0.03 UK	NS	<0.03 UK	NS	NS	<0.03 UK
Cadmium, dissolved	mg/L	0.005	<0.0002 UK	<0.0001 UK	<0.0002 UK	<0.0001 UK	<0.0002 UK	<0.0001 UK	<0.0001 UK
Iron, dissolved	mg/L	0.3	NS	**0.05 K**	NS	**0.06 K**	NS	NS	**0.417 K**
Manganese, dissolved	mg/L	0.05	NS	**0.862 K**	NS	**0.0049 K**	NS	NS	**0.0133 K**
Selenium, dissolved	mg/L	0.05	**0.001 J**	**0.002 J**	<0.001	**0.001 J**	<0.001	<0.001	**0.00133 J**
Zinc, dissolved	mg/L	5	<0.004 UK	**0.002 JK**	**0.056 K**	**0.084 K**	<0.004 UK	**0.051 K {J+}**	**0.0723 K**
Total Metals									
Aluminum	mg/L	0.2	NS	**0.12 JK**	NS	**0.13 JK**	NS	NS	NS
Cadmium	mg/L	0.005	<0.0002 UK	<0.0001 UK	<0.0002 UK	<0.0001 UK	NS	NS	NS
Iron	mg/L	0.3	NS	**0.19 K**	NS	**0.05 J+K**	NS	NS	NS
Manganese	mg/L	0.05	NS	**0.915 K**	NS	**0.0026 JK**	NS	NS	NS
Selenium	mg/L	0.05	**0.002 J**	**0.002 J**	<0.001	**0.002 J**	NS	NS	NS
Zinc	mg/L	5	**0.005 JK**	<0.002 UK	**0.052 K**	**0.08 K**	NS	NS	NS
General Chemistry									
pH		6.5-8.5	NS	**8 J**	NS	**7.9 J**	NS	NS	**7.73**
Residue, Filterable (TDS)	mg/L	500	NS	**220 J-**	NS	**550 J-**	NS	NS	NS
Sulfate	mg/L	250	**6.4**	**61.6**	**43.7**	**44.7**	**132**	**137**	**123**

TABLE 3-27

HENRY MINE - SUMMARY OF GROUNDWATER EXCEEDANCES
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		Well Name:	MMW004	MMW004	MMW004	MMW004	MMW004	MMW004	MMW010
		Collection Date:	10/30/05	05/14/06	09/15/07	05/20/08	09/22/08	06/01/09	10/17/07
		Well Type:	MW	MW	MW	MW	MW	MW	MW
		Result Type:	Averaged Triplicate	Averaged Triplicate	Primary	Primary	Primary	Primary	Primary
Analyte	Units	Screening Value							
Dissolved Metals									
Aluminum, dissolved	mg/L	0.2	**0.0333 JK**	<0.03 UK	<0.03 UK	<0.03 UK	<0.0500	NS	**0.03 JK**
Cadmium, dissolved	mg/L	0.005	<0.0001 UK	<0.0001 UK	<0.0001 UK	<0.0001 UK	<0.000125	NS	**0.0001 JK**
Iron, dissolved	mg/L	0.3	<0.02 UK	**0.0333 JK**	<0.02 UK	**0.02 JK**	**0.0374 J**	NS	**0.05 JK**
Manganese, dissolved	mg/L	0.05	**0.0028 J+K**	**0.00243 JK**	**0.0019 JK**	**0.0031 K**	**0.00708**	NS	**3.57 K**
Selenium, dissolved	mg/L	0.05	**0.00133 J**	**0.001 J**	**0.002 J**	**0.002 J**	**0.00244**	NS	<0.001
Zinc, dissolved	mg/L	5	**0.0393 K**	**0.0413 K**	**0.009 JK**	**0.003 JK**	**0.0162 J**	NS	**0.017 K**
Total Metals									
Aluminum	mg/L	0.2	NS	NS	<0.03 UK	<0.03 UK	<0.0500	NS	<0.06 UK
Cadmium	mg/L	0.005	<0.0833 UK	<0.0001 UK	<0.0001 UK	<0.0001 UK	<0.000125	NS	**0.0001 JK**
Iron	mg/L	0.3	**0.633 K**	NS	**0.69 K**	**0.43 K**	**1.07**	NS	**0.36 K**
Manganese	mg/L	0.05	<0.433 UK	NS	**0.0097 K**	**0.0082 K**	**0.0174**	NS	**3.39 K**
Selenium	mg/L	0.05	<0.001	**0.00133 J**	**0.002 J**	**0.002 J**	**0.00254**	**0.00273**	<0.001
Zinc	mg/L	5	**477 K**	**0.138 K**	**0.006 JK**	<0.002 UK	**0.0156 J**	NS	**0.015 K {J+}**
General Chemistry									
pH		6.5-8.5	**7.7**	**7.73**	**7.9 J**	**7.9 J**	NS	NS	**7.4 J**
Residue, Filterable (TDS)	mg/L	500	NS	**483**	**460 J-**	**460 J-**	**514**	**548**	**280 J-**
Sulfate	mg/L	250	**128**	**116**	**129**	**125**	**116**	**112**	**36.7**

TABLE 3-27

HENRY MINE - SUMMARY OF GROUNDWATER EXCEEDANCES
(Page 4 of 10)

Well Name:			MMW010	MMW010	MMW010	MMW010	MMW011	MMW011	MMW011
Collection Date:			05/15/08	10/06/08	06/04/09	09/23/09	10/19/07	05/21/08	09/21/08
Well Type:			MW	MW	MW	MW	MW	MW	MW
Result Type:			Primary	Primary	Primary	Primary	Primary	Primary	Primary
Analyte	**Units**	**Screening Value**							
Dissolved Metals									
Aluminum, dissolved	mg/L	0.2	**0.05 J+K**	<0.0500	NS	NS	<0.03 UK	<0.03 UK	<0.0500
Cadmium, dissolved	mg/L	0.005	**0.0021 K**	**0.00544**	NS	NS	**0.0006 K**	**0.0007 K**	**0.000466 J**
Iron, dissolved	mg/L	0.3	<0.02 UK	**0.0357 J**	NS	NS	<0.02 UK	<0.02 UK	**0.0263 J**
Manganese, dissolved	mg/L	0.05	**0.872 K**	**1.12**	NS	NS	**0.0328 K**	**0.0081 K**	**0.000995 J**
Selenium, dissolved	mg/L	0.05	**0.1**	**0.0188**	NS	NS	<0.001	<0.001	**0.00129 J**
Zinc, dissolved	mg/L	5	**0.196 K**	**0.173**	NS	NS	**0.027 K**	**0.027 K**	**0.0287 {J+}**
Total Metals									
Aluminum	mg/L	0.2	**0.12 JK**	<0.0500	NS	NS	**0.24 J+K**	**0.19 JK**	<0.0500
Cadmium	mg/L	0.005	**0.0021 K**	**0.00529**	NS	NS	**0.0007 K**	**0.001 K**	**0.000439 J**
Iron	mg/L	0.3	**0.32 K**	**0.106**	NS	NS	**0.42 K**	**0.34 K**	<0.0250
Manganese	mg/L	0.05	**0.869 K**	**1.11**	NS	NS	**0.0343 K**	**0.0741 K**	**0.00201**
Selenium	mg/L	0.05	**0.1**	**0.0182**	**0.0764**	**0.0191**	<0.001	<0.001	**0.000876 J**
Zinc	mg/L	5	**0.204 K**	**0.175**	NS	NS	**0.061 K**	**0.057 K**	**0.0294**
General Chemistry									
pH		6.5-8.5	**7.6 J**	NS	NS	NS	**8 J**	**8.2 J**	NS
Residue, Filterable (TDS)	mg/L	500	**940 J-**	**1260**	**1770**	**1420**	**420 J-**	**420 J-**	**426**
Sulfate	mg/L	250	**367 J-**	**534**	**688**	**740**	**98.4**	**96.1**	**89.0**

TABLE 3-27

HENRY MINE - SUMMARY OF GROUNDWATER EXCEEDANCES
(Page 5 of 10)

		Well Name:	MMW011	MMW014	MMW014	MMW014	MMW014	MMW019	MMW019
		Collection Date:	06/02/09	09/17/07	05/13/08	09/21/08	06/03/09	09/17/07	05/14/08
		Well Type:	MW	MW	MW	MW	MW	MW	MW
		Result Type:	Primary	Primary	Primary	Primary	Primary	Primary	Primary
Analyte	**Units**	**Screening Value**							
Dissolved Metals									
Aluminum, dissolved	mg/L	0.2	NS	<0.12 UK	<0.03 UK	<0.0500	NS	<0.09 UK	<0.03 UK
Cadmium, dissolved	mg/L	0.005	NS	<0.0001 UK	**0.0001 JK**	<0.000125	NS	<0.0001 UK	<0.0001 UK
Iron, dissolved	mg/L	0.3	NS	**0.15 K**	**0.04 JK**	**0.0426 J**	NS	<0.04 UK	<0.02 UK
Manganese, dissolved	mg/L	0.05	NS	**0.995 K**	**0.252 K**	**0.367**	NS	**0.0083 K**	<0.0005 UK
Selenium, dissolved	mg/L	0.05	NS	<0.001	<0.001	**0.00227**	NS	<0.001	**0.005 J**
Zinc, dissolved	mg/L	5	NS	**0.006 JK**	**0.005 J+K**	<0.00500	NS	**0.002 JK**	**0.002 JK**
Total Metals									
Aluminum	mg/L	0.2	NS	<0.12 UK	<0.07 UJK	<0.0500	NS	<0.03 UK	<0.03 UK
Cadmium	mg/L	0.005	NS	**0.0001 JK**	**0.0001 JK**	<0.000125	NS	<0.0001 UK	<0.0002 UK
Iron	mg/L	0.3	NS	**0.29 K**	**0.7 K**	**0.526**	NS	<0.02 UK	**0.03 J+K**
Manganese	mg/L	0.05	NS	**0.947 K**	**0.254 K**	**0.391**	NS	**0.0107 K**	**0.001 J-K**
Selenium	mg/L	0.05	**0.00206**	<0.001	<0.001	**0.00203**	**0.00173**	<0.001	**0.004 J-**
Zinc	mg/L	5	NS	**0.005 JK**	<0.004 UK	**0.00637 J**	NS	<0.002 UK	**0.004 JK**
General Chemistry									
pH		6.5-8.5	NS	**7.5 J**	**7.9 J**	NS	NS	**7.8 J**	**8.1 J**
Residue, Filterable (TDS)	mg/L	500	**450**	**580 J-**	**450 J-**	**578**	**350**	**520 J-**	**350 J-**
Sulfate	mg/L	250	**96.8**	**35.8**	**61.9**	**36.9**	**28.6**	**159**	**93.5**

TABLE 3-27

HENRY MINE - SUMMARY OF GROUNDWATER EXCEEDANCES
(Page 6 of 10)

		Well Name:	MMW019	MMW019	MMW022	MMW022	MMW022	MMW022	MMW023
		Collection Date:	09/22/08	06/02/09	09/19/07	05/19/08	09/22/08	39966	39374
		Well Type:	MW	MW	MW	MW	MW	MW	MW
		Result Type:	Primary	Primary	Averaged Triplicate	Averaged Triplicate	Primary	Primary	Primary
Analyte	**Units**	**Screening Value**							
Dissolved Metals									
Aluminum, dissolved	mg/L	0.2	<0.0500	NS	<0.03 UK	<0.03 UK	<0.0500	NS	**0.04 JK**
Cadmium, dissolved	mg/L	0.005	<0.000125	NS	<0.0001 UK	<0.0001 UK	<0.000125	NS	**0.0002 JK**
Iron, dissolved	mg/L	0.3	<0.0250	NS	<0.02 UK	<0.02 UK	<0.0250	NS	**0.5 K**
Manganese, dissolved	mg/L	0.05	**0.00954**	NS	**0.0773 K**	**0.0018 JK**	**0.00118 J**	NS	**0.952 K**
Selenium, dissolved	mg/L	0.05	**0.000665 J**	NS	**0.0163**	**0.018**	**0.0170**	NS	<0.001
Zinc, dissolved	mg/L	5	<0.00500	NS	<0.002 UK	**0.00333 JK**	<0.00500	NS	**0.328 K**
Total Metals									
Aluminum	mg/L	0.2	<0.0500	NS	**0.223 J+K**	<0.03 UK	**0.322**	NS	<0.03 UK
Cadmium	mg/L	0.005	<0.000125	NS	<0.0001 UK	<0.0001 UK	<0.000125	NS	**0.0007 K**
Iron	mg/L	0.3	<0.0250	NS	**0.163 J+K**	<0.02 UK	**0.291**	NS	**0.61 K**
Manganese	mg/L	0.05	**0.000547 J**	NS	**0.101 K**	**0.00717 K**	**0.0243**	NS	**0.936 K**
Selenium	mg/L	0.05	**0.000563 J**	**0.00541**	**0.0173**	**0.017**	**0.0175**	**0.0206**	**0.003 J**
Zinc	mg/L	5	<0.00500	NS	**0.002 JK**	**0.00233 JK**	<0.00500	NS	**0.344 K**
General Chemistry									
pH		6.5-8.5	NS	NS	**8 J**	**8 J**	NS	NS	**7.8 J**
Residue, Filterable (TDS)	mg/L	500	**554**	**308**	**600 J-**	**653 J-**	**618**	**706**	**710 J-**
Sulfate	mg/L	250	**159**	**55.9**	**235**	**260**	**239**	**246**	**211**

TABLE 3-27

HENRY MINE - SUMMARY OF GROUNDWATER EXCEEDANCES
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Well Name:			**MMW023**	**MMW023**	**MMW023**	**MMW028**	**MMW028**	**MPW022**	**MPW022**
Collection Date:			**39586**	**39713**	**39965**	**39713**	**39947**	**38127**	**38266**
Well Type:			**MW**	**MW**	**MW**	**MW**	**MW**	**PW**	**PW**
Result Type:			**Primary**	**Primary**	**Primary**	**Primary**	**Primary**	**Primary**	**Primary**
Analyte	**Units**	**Screening Value**							
Dissolved Metals									
Aluminum, dissolved	mg/L	0.2	**0.05 JK**	<0.0500	NS	<0.0500	NS	NS	NS
Cadmium, dissolved	mg/L	0.005	<0.0001 UK	<0.000125	NS	<0.000125	NS	<0.0002 UK	NS
Iron, dissolved	mg/L	0.3	**4.37 K**	**3.71**	NS	<0.0250	<0.0250	NS	NS
Manganese, dissolved	mg/L	0.05	**0.717 K**	**0.724**	NS	**0.000871 J**	NS	NS	NS
Selenium, dissolved	mg/L	0.05	<0.001	**0.000639 J**	NS	**0.00253**	NS	**0.003 J**	NS
Zinc, dissolved	mg/L	5	**0.007 JK**	**0.0174 J**	NS	<0.00500	NS	<0.004 UK	**0.101 J-K**
Total Metals									
Aluminum	mg/L	0.2	<0.03 UK	<0.0500	NS	<0.0500	<0.0500	NS	NS
Cadmium	mg/L	0.005	**0.0015 K**	**0.000765**	NS	<0.000125	<0.000125	NS	NS
Iron	mg/L	0.3	**4.97 K**	**4.13**	NS	<0.0250	<0.0250	NS	NS
Manganese	mg/L	0.05	**0.698 K**	**0.656**	NS	**0.000704 J**	**0.000563 J**	NS	NS
Selenium	mg/L	0.05	**0.004 J**	**0.00389**	**0.0170**	**0.00264**	**0.00551**	NS	NS
Zinc	mg/L	5	**0.104 K**	**0.764**	NS	<0.00500	**1.56**	NS	NS
General Chemistry									
pH		6.5-8.5	**7.7 J**	NS	NS	NS	NS	NS	NS
Residue, Filterable (TDS)	mg/L	500	**700 J-**	**768**	**818**	**484**	**402**	NS	NS
Sulfate	mg/L	250	**222**	**214**	**227**	**68.0**	**70.7**	**2.9 J**	**3.1**

TABLE 3-27

HENRY MINE - SUMMARY OF GROUNDWATER EXCEEDANCES
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		Well Name:	MPW022	MPW022	MPW022	MPW022	MPW022	MPW022	MPW023
		Collection Date:	38527	38656	38851	39344	39583	39715	38265
		Well Type:	PW	PW	PW	PW	PW	PW	PW
		Result Type:	Primary	Primary	Primary	Primary	Primary	Primary	Primary
Analyte	**Units**	**Screening Value**							
Dissolved Metals									
Aluminum, dissolved	mg/L	0.2	<0.03 UK	<0.03 UK	<0.03 UK	<0.03 UK	<0.03 UK	<0.0500	NS
Cadmium, dissolved	mg/L	0.005	<0.0001 UK	<0.0001 UK	<0.0001 UK	<0.0001 UK	<0.0001 UK	<0.000125	<0.0001 UK
Iron, dissolved	mg/L	0.3	**0.13 K**	**4.3 K**	**2.39 K**	**0.04 JK**	**0.1 K**	**0.0368 J**	NS
Manganese, dissolved	mg/L	0.05	**0.0156 K**	**0.233 K**	**0.0926 K**	**0.0279 K**	**0.0273 K**	**0.0379**	NS
Selenium, dissolved	mg/L	0.05	<0.001	<0.001	<0.001	<0.001	<0.001	<0.000500	<0.001
Zinc, dissolved	mg/L	5	**0.043 K {J+}**	**0.127 K {J+}**	**0.006 JK**	<0.002 UK	<0.002 UK	**0.0140 J**	**0.741 K {J+}**
Total Metals									
Aluminum	mg/L	0.2	NS	NS	NS	**0.04 J+K**	<0.03 UK	<0.0500	NS
Cadmium	mg/L	0.005	NS	<0.1 UK	<0.0001 UK	<0.0001 UK	<0.0001 UK	<0.000125	NS
Iron	mg/L	0.3	NS	**8.06 K**	NS	**1.36 K**	**0.55 K**	**0.497**	NS
Manganese	mg/L	0.05	NS	<0.5 UK	NS	**0.0412 K**	**0.0276 K**	**0.0345**	NS
Selenium	mg/L	0.05	NS	<0.001	<0.001	<0.001	<0.001	<0.000500	NS
Zinc	mg/L	5	NS	**547 K**	**0.155 K**	**0.015 K {J+}**	**0.003 JK**	**0.00924 J**	NS
General Chemistry									
pH		6.5-8.5	**8.3**	**7.7**	**7.9**	**8.5 J**	**8.7 J**	NS	NS
Residue, Filterable (TDS)	mg/L	500	NS	NS	**120**	**60 J-**	**70 J-**	**30.0 {J+}**	NS
Sulfate	mg/L	250	**2.8 J**	<0.5	<0.5	<0.5	<1.7 UJ	<0.500	**70**

TABLE 3-27

HENRY MINE - SUMMARY OF GROUNDWATER EXCEEDANCES
(Page 9 of 10)

Well Name:			**MPW023**	**MPW023**	**MPW023**	**MPW023**
Collection Date:			**38525**	**39369**	**39586**	**39714**
Well Type:			**PW**	**PW**	**PW**	**PW**
Result Type:			**Primary**	**Primary**	**Primary**	**Primary**
Analyte	**Units**	**Screening Value**				
Dissolved Metals						
Aluminum, dissolved	mg/L	0.2	<0.03 UK	<0.03 UK	<0.03 UK	<0.0500
Cadmium, dissolved	mg/L	0.005	<0.0001 UK	<0.0001 UK	<0.0001 UK	<0.000125
Iron, dissolved	mg/L	0.3	**0.2 K**	**0.24 K**	**0.2 K**	**0.230**
Manganese, dissolved	mg/L	0.05	**0.186 K**	**0.211 K**	**0.2 K**	**0.212**
Selenium, dissolved	mg/L	0.05	<0.001	<0.001	<0.001	**0.000718 J**
Zinc, dissolved	mg/L	5	**0.59 K {J+}**	**0.72 K**	**0.648 K**	**0.734**
Total Metals						
Aluminum	mg/L	0.2	NS	<0.03 UK	<0.03 UK	<0.0500
Cadmium	mg/L	0.005	NS	<0.0001 UK	<0.0001 UK	<0.000125
Iron	mg/L	0.3	NS	**0.28 K**	**0.26 K**	**0.303**
Manganese	mg/L	0.05	NS	**0.2 K**	**0.197 K**	**0.204**
Selenium	mg/L	0.05	NS	<0.001	<0.001	**0.000653 J**
Zinc	mg/L	5	NS	**0.859 K**	**0.658 K**	**0.857**
General Chemistry						
pH		6.5-8.5	**8.2**	**8.1 J**	**8.1 J**	NS
Residue, Filterable (TDS)	mg/L	500	NS	**310 J-**	**310 J-**	**304**
Sulfate	mg/L	250	**63.1**	**68.2**	**64.7**	**58.5**

TABLE 3-27

HENRY MINE - SUMMARY OF GROUNDWATER EXCEEDANCES
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Notes:
AW - agricultural well
BW - direct-push alluvial aquifer well
DW - domestic well
MW - monitoring well
NS- not sampled
PW - production well

Result is greater than screening value
Method detection limit for non-detected value is greater than the screening value

FLAG DEFINITION:

U	The analyte was analyzed for, but was not detected above the level of the reported sample quantitation limit.
J	The result is an estimated quantity. The associated numerical value is the approximated concentration of the analyte in the sample.
J+	The result is an estimated quantity, but the result may be biased high.
J-	The result is an estimated quantity, but the result may be biased low.
J+/B	Result is estimated and biased high; associated field blank contained target analyte.
R	The result is unusable. The sample result is rejected due to serious deficiencies in meeting quality control criteria. The analyte may or may not be present in the sample.
UJ	The analyte was analyzed for, but was not detected. The reported quantitation limit is approximate and may be inaccurate or imprecise.
K	Serial dilutions not performed for samples analyzed by this method (EPA 200.7; 200.8).

SOURCES FOR SCREENING VALUES (SEE ALSO TABLE 3

Groundwater Unless identified otherwise below, screening levels are from State of Idaho Ground Water Quality Rule (IDAPA 58.01.11).
Screening levels for pH, aluminum, chloride, iron, manganese, pH, silver, sulfate, TDS, and zinc are Secondary Maximum Contaminant Levels (MCLs).
Screening values for arsenic and uranium are USEPA primary and secondary MCLs, National Primary Drinking Water Regulations, EPA.
Screening values for boron, cobalt, molybdenum, nickel, and vanadium are USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites.

TRIPLICATE RESULT

"Primary" indicates locations where only one sample was collected from a given location. "Triplicate" indicates locations where a total of three samples were collected from a given location for the purpose of quality assurance.
The average value for triplicate samples is calculated as follows: (a) the mean of three detected values, (b) the mean of two detected values if result of one triplicate is not detected, (c) the detected value if results of two triplicates are not detected, or (d) less than the highest method detection limit if all triplicate results are not detected.

TABLE 3-28
HENRY MINE
STREAM HABITAT ASSESSMENT DATA MATRIX

Station	May 2004 [Se]sw, mg/L	May 2004 [Se]sed, mg/kg dw	RBS (Habitat Score)	Fish Presence
MST043	0.00050	1.7	57	X
MST044	0.00050	1.1	143	X[a]
MST045	0.00050	1.1	31	X[a]
MST046	0.00050	0.50	73	X[a]
MST047	0.00050	0.25	48	X[a]
MST048*	0.00050	0.90	151	X
MST049**	0.00050	0.25	139	X[a]
MST050	0.00050	2.1	52	No
MST053	0.00050	0.25	52	X
MST054	0.00050	2.0	25	No
MST055	0.0020	1.0	43	No
MST057	0.0020	4.4	44	No
MST058	0.00050	2.0	34	No
MST062	0.00050	0.30	47	No
MST063	0.0020	0.30	29	No
MST064	0.0020	0.80	55	No
MST234	0.00050	1.5	76	X
MST254**	0.00050	0.25	103	X
MST276*	0.0030	2.0	56	No
MST277	0.00050	0.80	7	No

Notes:
Non-detected concentrations have been censored at one-half the MDL. MDL for surface water was 0.0010 mg/L and for sediment was 0.50 mg/kg dw.
* - Mine-specific background station
** - Regional background station
a - no fish observed, but presumed to be present based on hydraulic connection to adjacent stations with fish present
[Se]sw, mg/L – concentration of selenium in surface reported in mg/L
[Se]sed, mg/kg dw – concentration of selenium in sediment, reported in mg/kg on a dw basis

TABLE 3-29 HENRY MINE HISTORICAL FORAGE FISH SELENIUM CONCENTRATIONS (mg/kg dw)			
Henry Mine Station	**Station ID**	**May 2004**	**Flag**
Reservoir Delta at Little Blackfoot River	MRV016	2.8	
Little Blackfoot River, below Long Valley Creek	MST043	6.1	
Little Blackfoot River, below Reese Creek	MST048*	3.7	
Lone Pine Creek, above Little Blackfoot River	MST053	3.5	
Little Blackfoot River, above Blackfoot Reservoir	MST234	3.9	
Little Blackfoot River, upstream of Henry cutoff road	MST254**	2.4	U

Notes:
* - Mine-specific background station
** - Regional background station
U - Non-detect (Non-detected concentrations were censored and value presented is equal to the MDL)

TABLE 3-30
HENRY MINE
HISTORICAL BENTHIC MACROINVERTEBRATE SELENIUM CONCENTRATIONS
(mg/kg dw)

Henry Mine Station	Station ID	June 2004	Flag
Henry Mine South Pit Overburden Dump Limestone Drain	MDS022	130	UJ
Reservoir Delta at Little Blackfoot River	MRV016	2.9	UJ
Little Blackfoot River, below Long Valley Creek	MST043	3.2	UJ
Little Blackfoot River, immediately below Henry Mine,	MST044	8.3	UJ
Little Blackfoot River, above Henry Creek	MST045	6.3	UJ
Little Blackfoot River, below Lone Pine Creek	MST046	5.5	UJ
Little Blackfoot River, above Lone Pine Creek	MST047	13	UJ
Little Blackfoot River, below Reese Creek	MST048*	2.6	UJ
Little Blackfoot River, above Reese Creek	MST049**	3.8	J
Long Valley Creek, below Ballard Mine, (ponded area)	MST050	5.0	UJ
Lone Pine Creek, above Little Blackfoot River	MST053	4.2	UJ
Lone Pine Creek, above Spring-Fed Creek	MST054	3.1	UJ
Lone Pine Creek, below Strip Mine Creek	MST055	4.5	UJ
Lone Pine Creek, above Lone Pine Creek	MST057	6.2	J
Lone Pine Creek, above West Fork Lone Pine Creek	MST058	42	UJ
Strip Mine Creek, above Lone Pine Creek	MST062	1.7	UJ
Strip Mine Creek, below Henry Mine	MST063	15	UJ
West Fork Lone Pine Creek, above tributary	MST064	3.5	UJ
Little Blackfoot River, above Blackfoot Reservoir	MST234	1.8	UJ
Little Blackfoot River, upstream of Henry cutoff road	MST254**	1.3	UJ
North Fork Lone Pine Creek, Northeast and above East Fork Lone Pine Creek	MST275	4.2	UJ
Tributary to West Fork Lone Pine Creek, above West Fork Lone Pine Creek	MST276	2.9	J
Spring-fed tributary, above Lone Pine Creek	MST277	29	UJ

Notes:
* - Mine-specific background station
** - Regional background station
Flags:
U – Non-detect (Non-detected concentrations were censored and value presented is equal to the MDL)
J – Estimated result

TABLE 3-31 HENRY MINE HISTORICAL SMALL MAMMAL SELENIUM CONCENTRATIONS (mg/kg dw)					
Henry Mine Station	Station ID	Species		Sept 2001	Flag
		Common Name	Scientific Name		
Little Blackfoot River, above Reese Creek	MST049	least chipmunk	T. minimus	0.26	J
	MST049	least chipmunk	T. minimus	0.55	J
	MST049	deer mouse	P. maniculatus	0.45	J
Henry Mine Pit #1 Overburden Dump	MWD086-Quadrat1	deer mouse	P. maniculatus	2.2	J
	MWD086-Quadrat2	deer mouse	P. maniculatus	2.6	J
	MWD086-Quadrat3	deer mouse	P. maniculatus	2.0	J
Notes: J – Estimated result					

TABLE 3-32 HENRY MINE HISTORICAL TERRESTRIAL INVERTEBRATE SELENIUM CONCENTRATIONS (mg/kg dw)			
Henry Mine Station	Station ID - Sample Type	Sept 2001	Flag
Little Blackfoot River, above Reese Creek	MST049 - Insects	0.67	
	MST049 - Worms	21	
Henry Mine Pit #1 Overburden Dump	MWD086-Quadrat1 - Insects	7.9	
	MWD086-Quadrat2 - Insects	12	
	MWD086-Quadrat3 - Insects	10	

TABLE 3-33 HENRY MINE SUMMARY OF INVESTIGATION FINDINGS BY MEDIUM						
Medium	**Dates Sampled**	**Approximate Number of Sampling Locations**	**Analytes Sampled**	**Location of Samples Collected**	**Investigation Results Summary**	**Summary Assessment**
Soils	2004	1) 52 locations on 4 transects	Se	See Drawing 3-28	See Section 3.3.1.1 Se ranged from 0.25 to 53 mg/kg dw.	The nature and extent of surface soil impacts at the Henry Mine has been defined adequately so that if necessary, risk assessments and the feasibility study (FS) can be conducted for the non-radiogenic COPCs. However for radiogenic risks, to reduce the uncertainty in the inherently conservative risk calculations, site-specific uranium isotopes data for soil and radon and gamma measurements will be collected both on site and in a background area(s). Also, a data gap has been identified for sediment (see below) and this carries forward to riparian soils. Therefore, some additional limited sampling of riparian soil is needed. Further evaluation of current background data also is needed to statistically quantify background concentrations.
	2009	2) 70 composite samples	Sb, As, B, Cd, Cr, Co, Cu, Mn, Hg, Mo, Ni, Se, Ag, Tl, U, V, Zn	See Drawing 3-30	See Section 3.3.1.2 - Isolated exceedances of Cd, Mn and V above screening levels (SLs). - As and Mn background exceeded SLs. - As and Se exceedances above SLs. - As ranged from 4.38 to 45.5 mg/kg dw - Se ranged from 57.1 to 318 mg/kg dw.	
	2004	3) 35 riparian soil samples	Cd, Cr, Cu, Mo, Ni, Se, V, Zn	See Drawing 3-6	See Section 3.3.1.3 Isolated exceedances of Cd, Ni, and V. Se exceedances. Se ranged from 0.25 to 45 mg/kg dw.	

TABLE 3-33 HENRY MINE SUMMARY OF INVESTIGATION FINDINGS BY MEDIUM						
Medium	**Dates Sampled**	**Approximate Number of Sampling Locations**	**Analytes Sampled**	**Location of Samples Collected**	**Investigation Results Summary**	**Summary Assessment**
Vegetation	2004	1) 52 locations on 4 transects	Se	See Drawing 3-29	See Section 3.3.2.1 Se ranged from 0.25 to 1.9 mg/kg dw.	The nature and extent of vegetation impacts at the Henry Mine has been defined adequately so that risk assessments and the FS can be conducted. As a result, no further field characterization is necessary. However, further evaluation of existing background data is needed.
	2004	2) Composite samples monthly (i.e. for 6 months)	Se	See Drawing 3-6	See Section 3.3.2.2 Monthly vegetation Se samples ranged from 0.80 to 7.5 mg/kg dw.	
	2009	3) 170 samples	Sb, As, B, Cd, Cr, Co, Cu, Mn, Hg, Mo, Ni, Se, Ag, Tl, U, V, Zn	See Drawing 3-31	See Section 3.3.2.3 - Mo and Se exceedances above SLs. - Mo ranged from 1.46 to 74.6 mg/kg. - Se ranged from 0.45 to 146 mg/kg dw.	
	2004	4) 35 riparian samples	Cd, Cu, Mo, Se, Zn	See Drawing 3-6	See Section 3.3.2.4 Se exceedances Se ranged from 0.25 to 65 mg/kg dw.	

TABLE 3-33 HENRY MINE SUMMARY OF INVESTIGATION FINDINGS BY MEDIUM						
Medium	**Dates Sampled**	**Approximate Number of Sampling Locations**	**Analytes Sampled**	**Location of Samples Collected**	**Investigation Results Summary**	**Summary Assessment**
Surface Water	Fall and Spring 1997 - 2009	31 sampling stations	Metals Cations Anions General Water Quality Parameters Field Parameters	See Drawings 3-8 to 3-10 and 3-32 to 3-33	See Section 3.3.3.1 Al, Ba, B, Cd, Fe, Mn, Ni, Tl, Se, V, and Zn exceeded SLs.	The nature and extent of surface water impacts at the Henry Mine has been defined adequately so that if necessary, risk assessments and the FS can be conducted. As a result, no further field characterization is required. However, ongoing monitoring is necessary to collect baseline effectiveness monitoring of potential future remedies. Further evaluation of existing background data is needed.
Sediment	5 events: Fall 1998, Fall 1999, Spring 2002, Fall 2002, and Spring 2004	28 sampling stations	Metals Cations Anions pH TOC	See Drawings 3-9, 3-13, and 3-32	See Section 3.3.3.2 Cd, Cr, Ni, Se, and V exceeded SLs.	The spatial characterization of sediment impacts at the Henry Mine has been defined adequately so that if necessary, risk assessments and the FS can be conducted. However, a data gap relating to COPC coverage in sediments has been identified and will be addressed by the Fall 2010 sampling event as described in Appendix D1. In addition further evaluation of existing background data is needed.

TABLE 3-33 HENRY MINE SUMMARY OF INVESTIGATION FINDINGS BY MEDIUM						
Medium	**Dates Sampled**	**Approximate Number of Sampling Locations**	**Analytes Sampled**	**Location of Samples Collected**	**Investigation Results Summary**	**Summary Assessment**
Groundwater	Fall and Spring 2004 - 2009	16 wells	Metals Cations Anions General Water Quality Parameters General Field Parameters	See Drawings 3-35 and 3-36	See Section 3.3.4 - Isolated exceedances of Cd and Zn above SLs. - Elevated concentrations of Al, Fe, Mn above SLs - Se, SO_4, and TDS exceedances above SLs. - Se ranged from non-detect to 0.1 mg/L. Se exceeds standard in shallow groundwater.	The nature and extent for groundwater at the Henry Mine has been defined except for limited areas as discussed in Section 4.0.
Aquatic Biota						
Stream Habitat Assessment	2004	20 stations	NA	See Drawing 3-21	See Section 3.3.5.1 RBS scores from 31 to 151 out of 200	The nature and extent for stream habitat data at the Henry Mine has been defined adequately so that if necessary, risk assessments and the FS can be conducted. As a result, no further characterization is needed.

TABLE 3-33 HENRY MINE SUMMARY OF INVESTIGATION FINDINGS BY MEDIUM						
Medium	**Dates Sampled**	**Approximate Number of Sampling Locations**	**Analytes Sampled**	**Location of Samples Collected**	**Investigation Results Summary**	**Summary Assessment**
Fish	2004	6 stations	Cd, Ni, Se, V, Zn	See Drawings 3-20 and 3-21	See Section 3.3.5.2 Forage fish Se ranged from 2.4 to 6.1 mg/kg dw. No salmonids were collected.	Nature and extent information for fish data at the Henry Mine are adequate for their intended purpose as additional lines of evidence in the human health and/or ecological risk assessment. The potential need for additional sampling of this media will be evaluated pending results of the risk assessment for the P4 mines.
Benthic Macroinvertebrates	2004	23 stations	Se	See Drawing 3-21	See Section 3.3.5.3 Detected Se ranged from 2.9 to 6.2 mg/kg dw. Two of the three detected selenium results exceeded the SL In addition the MDL was usually above the SL.	Nature and extent information for benthic macroinvertebrate data at the Henry Mine are adequate for their intended purpose as additional lines of evidence in the human health and/or ecological risk assessment. The potential need for additional sampling of this media will be evaluated pending results of the risk assessment for the P4 mines.

TABLE 3-33 HENRY MINE SUMMARY OF INVESTIGATION FINDINGS BY MEDIUM						
Medium	**Dates Sampled**	**Approximate Number of Sampling Locations**	**Analytes Sampled**	**Location of Samples Collected**	**Investigation Results Summary**	**Summary Assessment**
Terrestrial Biota						
Elk	1999 2000	160 elk 54 elk	Ca and Se Cd, Cu, Fe, Pb, Mn, Mo, Se, and Zn	See Drawings 3-22 and 3-37	See Section 3.3.6.1 Se ranged from 0.65 to 39 mg/kg dw in elk livers Se ranged from 0.60 to 41 mg/kg dw in elk livers	Nature and extent information for elk data at the Henry Mine are adequate for their intended purpose as additional lines of evidence in the human health and/or ecological risk assessment. The potential need for additional sampling of this media will be evaluated pending results of the risk assessment for the P4 mines.
Bird Eggs	1999 2000 2001	215 eggs 334 eggs 369 eggs	Cd and Se Cd and Se Se	See Drawings 3-23 to 3-25 and 3-37	See Section 3.3.6.2 Se ranged from 0.61 to 21.3 mg/kg dw Se ranged from 0.29 to 25 mg/kg dw Se ranged from 1.3 to 31.9 mg/kg dw	Nature and extent information for bird egg data at the Henry Mine are adequate for their intended purpose as additional lines of evidence in the human health and/or ecological risk assessment. The potential need for additional sampling of this media will be evaluated pending results of the risk assessment for the P4 mines.

TABLE 3-33 HENRY MINE SUMMARY OF INVESTIGATION FINDINGS BY MEDIUM						
Medium	**Dates Sampled**	**Approximate Number of Sampling Locations**	**Analytes Sampled**	**Location of Samples Collected**	**Investigation Results Summary**	**Summary Assessment**
Cattle	1999	20 Steers – skeletal muscle, kidney, liver, heart,	Cd, Cu, Fe, Mn, Mo, Pb, Se, Zn	See Drawing 3-37	Tissue Se ranged from 0.097 mg/kg dw in skeletal muscle to 2.2 mg/kg dw in kidney.	Nature and extent information for cattle data at the Henry Mine are adequate for their intended purpose as additional lines of evidence in the human health and/or ecological risk assessment. The potential need for additional sampling of this media will be evaluated pending results of the risk assessment for the P4 mines.
Small Mammals	2001	3 quadrat samples, 1 riparian station	Al, Sb, As, Ba, Be, Cd, Cr, Cu, Pb , Mn, Hg, Mo Ni, Se, Ag, Th, V, U, and Zn	See Drawings 3-22 and 3-37	See Section 3.3.6.4 Se ranged from 0.26 to 2.6 mg/kg dw .	Nature and extent information for small mammals data at the Henry Mine are adequate for their intended purpose as additional lines of evidence in the human health and/or ecological risk assessment. The potential need for additional sampling of this media will be evaluated pending results of the risk assessment for the P4 mines.

TABLE 3-33 HENRY MINE SUMMARY OF INVESTIGATION FINDINGS BY MEDIUM						
Medium	**Dates Sampled**	**Approximate Number of Sampling Locations**	**Analytes Sampled**	**Location of Samples Collected**	**Investigation Results Summary**	**Summary Assessment**
Terrestrial Invertebrates	2001	3 quadrat samples, 1 riparian station	Al, Sb, As, Ba, Be, Cd, Cr, Cu, Pb , Mn, Hg, Mo Ni, Se, Ag, Th, V, U, and Zn	See Drawings 3-22 and 3-37	See Section 3.3.6.5 Se ranged from 0.67 to 21 mg/kg dw	Nature and extent information for terrestrial invertebrates data at the Henry Mine are adequate for their intended purpose as additional lines of evidence in the human health and/or ecological risk assessment. The potential need for additional sampling of this media will be evaluated pending results of the risk assessment for the P4 mines.

TABLE 3-34

ENOCH VALLEY MINE - SUMMARY OF SOIL EXCEEDANCES
(Page 1 of 5)

				Analyte (mg/Kg, dry weight)					
Sample Identification	**Collection Date**	**Sample Medium**	**Sample Type**	**Arsenic**	**Cadmium**	**Manganese**	**Nickel**	**Selenium**	**Vanadium**
			Screening Value:	**0.39**	**70**	**1800**	**1500**	**390**	**390**
MAR001 (Active Haul Road)									
0906-MAR001-01-SS	6/20/2009	Soil	Primary	**7.84**	**36.9**	**191**	**127**	**13.4**	**219**
0906-MAR001-02-SS	6/20/2009	Soil	Primary	**8.13**	**26.1**	**218**	**147**	**9.73**	**111**
0906-MAR001-03-SS	6/20/2009	Soil	Primary	**8.05**	**29.0**	**226**	**149**	**10.4**	**149**
0906-MAR001-04-SS	6/20/2009	Soil	Primary	**7.91**	**17.0**	**222**	**135**	**10.6**	**75.8**
0906-MAR001-05-SS	6/20/2009	Soil	Primary	**7.53**	**17.7**	**217**	**117**	**9.75**	**71.1**
MBE001 (Enoch Valley Background)									
0906-MBE001-01-SS	6/22/2009	Soil	Primary	**4.98**	**0.538**	**3460**	**27.7**	**0.640 J**	**20.2**
0906-MBE001-03-SS	6/21/2009	Soil	Primary	**6.05 J**	**1.67**	**2660**	**27.3**	**0.917 J**	**24.9 J+**
0906-MBE001-04-SS	6/21/2009	Soil	Primary	**5.37 J**	**2.52**	**2440 J**	**19.6**	**0.696 J**	**24.0 J+**
0906-MBE001-05-SS	6/21/2009	Soil	Primary	**5.62 J**	**1.11**	**2040 J**	**22.5**	**0.816 J**	**22.1 J+**
0906-MBE001-06-SS	6/21/2009	Soil	Primary	**3.77 J**	**1.14**	**1350 J**	**21.7**	**0.935 J**	**18.5 J+**
0906-MBE001-07-SS-1	6/21/2009	Soil	Triplicate	**7.47**	**9.39**	**877**	**60.4**	**6.65 J**	**53.7**
0906-MBE001-07-SS-2	6/21/2009	Soil	Triplicate	**6.99**	**7.99**	**1110**	**59.0**	**5.38 J**	**48.8**
0906-MBE001-07-SS-3	6/21/2009	Soil	Triplicate	**8.5**	**11.6**	**974**	**70.2**	**8.63 J**	**54.1**
0906-MBE001-07-SS-avg	6/21/2009	Soil	Averaged	**7.65**	**9.66**	**987**	**63.2**	**6.89 J**	**52.2**
0906-MBE001-08-SS	6/21/2009	Soil	Primary	**6.49 J**	**6.50**	**1150**	**27.2**	**1.66 J**	**31.2 J+**
0906-MBE001-09-SS	6/21/2009	Soil	Primary	**5.72**	**5.07**	**2170**	**32.2**	**0.834 J**	**29.8**
0906-MBE001-10-SS	6/21/2009	Soil	Primary	**4.54 J**	**2.04**	**1580**	**21.0**	**0.537 J**	**24.4 J+**
0906-MBE001-AH2-SS	6/22/2009	Soil	Primary	**7.05**	**8.90**	**564**	**28.4**	**2.00 J**	**36.8 J+**
MDS025 (Dump Seep)									
SSMDS025-0-C(5)	9/12/2004	Soil	Primary	NS	**35 J**	NS	**1750 J**	**50**	**232 J**
MDS026 (Dump Seep)									
SSMDS026-0-C(5)	9/12/2004	Soil	Primary	NS	**15.9 J**	NS	**52 J**	**6.5**	**123**
MSG001 (Spring)									
SSMSG001-0-C(5)	9/11/2004	Soil	Primary	NS	**0.65 J**	NS	**18.8 J**	**0.7 J**	**37.4**
MSP017 (Pond)									
SSMSP017-0-C(5)	9/12/2004	Soil	Primary	NS	**21.2 J**	NS	**84 J**	**50**	**136 J**
MSP018 (Pond)									
SSMSP018-0-C(7)	9/11/2004	Soil	Primary	NS	**102 J**	NS	**779 J**	**70**	**216 J**
MSP019 (Pond)									
SSMSP019-0-C(6)	9/11/2004	Soil	Primary	NS	**41 J**	NS	**91 J**	**9.8**	**268 J**
MSP020 (Pond)									
SSMSP020-0-C(5)	9/11/2004	Soil	Primary	NS	**23.5 J**	NS	**119 J**	**17.9**	**129 J**
MSP021 (Pond)									
SSMSP021-0-C(5)	9/11/2004	Soil	Primary	NS	**46 J**	NS	**120 J**	**42**	**291 J**
MSP022 (Pond)									
SSMSP022-0-C(6)	9/11/2004	Soil	Primary	NS	**7.1 J**	NS	**35 J**	**6.7**	**97.5 J**
MSP023 (Pond)									
SSMSP023-0-C(5)	9/11/2004	Soil	Primary	NS	**30 J**	NS	**124 J**	**25.4**	**435 J**
MSP031 (Pond)									
SSMSP031-0-C(5)	9/11/2004	Soil	Primary	NS	**12.8 J**	NS	**120 J**	**24.3**	**184 J**
MST023 (Stream)									
SSMST023-0-C(8)	9/14/2004	Soil	Primary	NS	**0.77**	NS	**10.5 J**	**1.1 J**	**17**
MST024 (Stream)									
SSMST024-0-C(11)	9/14/2004	Soil	Primary	NS	**0.72**	NS	**9 J**	**0.9 J**	**16.5**
MST025 (Stream)									
SSMST025-1-C(7)QA1	9/14/2004	Soil	Triplicate	NS	**1.1**	NS	**10.3 J**	**1 J**	**18.5**
SSMST025-1-C(7)QA2	9/14/2004	Soil	Triplicate	NS	**0.99**	NS	**10.6 J**	**0.9 J**	**19.1**
SSMST025-1-C(7)QA3	9/14/2004	Soil	Triplicate	NS	**0.96**	NS	**10.9 J**	**0.9 J**	**19.6**
SSMST025-1-C(7)QA-avg	9/14/2004	Soil	Averaged	NS	**1.02**	NS	**10.6 J**	**0.933 J**	**19.1**
MST026 (Stream)									
SSMST026-0-C(5)	9/10/2004	Soil	Primary	NS	**2.4 J**	NS	**14.7 J**	**0.8 J**	**27.1 J**
MST027 (Stream)									
SSMST027-0-C(5)	9/9/2004	Soil	Primary	NS	**0.87**	NS	**11.5**	<0.5	**20.5**

TABLE 3-34

ENOCH VALLEY MINE - SUMMARY OF SOIL EXCEEDANCES
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				Analyte (mg/Kg, dry weight)					
Sample Identification	**Collection Date**	**Sample Medium**	**Sample Type**	**Arsenic**	**Cadmium**	**Manganese**	**Nickel**	**Selenium**	**Vanadium**
			Screening Value:	**0.39**	**70**	**1800**	**1500**	**390**	**390**
MST059 (Stream)									
SSMST059-1-C(5)QA1	9/14/2004	Soil	Triplicate	NS	**2.86 J+**	NS	**23.8 J**	<0.5	**43.9 J**
SSMST059-1-C(5)QA2	9/14/2004	Soil	Triplicate	NS	**3.15 J+**	NS	**22.8 J**	<0.5	**40.6 J**
SSMST059-1-C(5)QA3	9/14/2004	Soil	Triplicate	NS	**3.01 J+**	NS	**18.2 J**	<0.5	**32.2 J**
SSMST059-1-C(5)QA-avg	9/14/2004	Soil	Averaged	NS	**3.01 J+**	NS	**21.6 J**	<0.5	**38.9 J**
MST060 (Stream)									
SSMST060-0-C(5)	9/14/2004	Soil	Primary	NS	**5.87 J+**	NS	**19.6 J**	**0.7 J**	**35.1 J**
MST061 (Stream)									
SSMST061-1-C(5)QA1	9/14/2004	Soil	Triplicate	NS	**12.7 J+**	NS	**47.9 J**	**2.3 J**	**60.2 J**
SSMST061-1-C(5)QA2	9/14/2004	Soil	Triplicate	NS	**13.4 J+**	NS	**47.7 J**	**2.1 J**	**60 J**
SSMST061-1-C(5)QA3	9/14/2004	Soil	Triplicate	NS	**12.6 J+**	NS	**47.9 J**	**2.3 J**	**62.3 J**
SSMST061-1-C(5)QA-avg	9/14/2004	Soil	Averaged	NS	**12.9 J+**	NS	**47.8 J**	**2.23 J**	**60.8 J**
MST126 (Stream)									
SSMST126-0-C(5)	9/9/2004	Soil	Primary	NS	**2.43**	NS	**23.4**	<0.5	**39**
MST127 (Stream)									
SSMST127-0-C(5)	9/9/2004	Soil	Primary	NS	**2.66**	NS	**20.8**	<0.5	**35.6**
MST131 (Stream)									
SSMST131-0-C(5)	9/9/2004	Soil	Primary	NS	**1.99**	NS	**21.4**	<0.5	**35.7**
MST132 (Stream)									
SSMST132-1-C(6)QA1	9/9/2004	Soil	Triplicate	NS	**3.25**	NS	**24.9**	<0.5	**39.2**
SSMST132-1-C(6)QA2	9/9/2004	Soil	Triplicate	NS	**3.44**	NS	**24.2**	<0.5	**39.2**
SSMST132-1-C(6)QA3	9/9/2004	Soil	Triplicate	NS	**3.29**	NS	**23.9**	<0.5	**40.3**
SSMST132-1-C(6)QA4	9/9/2004	Soil	Triplicate	NS	NS	NS	NS	NS	NS
SSMST132-1-C(6)QA-avg	9/9/2004	Soil	Averaged	NS	**3.33**	NS	**24.3**	<0.5	**39.6**
MST133 (Stream)									
SSMST133-0-C(5)	9/8/2004	Soil	Primary	NS	**2.05**	NS	**27.4**	**0.8 J**	**38.8**
MST134 (Stream)									
SSMST134-0-C(5)	9/8/2004	Soil	Primary	NS	**2.81**	NS	**24.6**	**3.7**	**40.7**
MST135 (Stream)									
SSMST135-0-C(5)	9/8/2004	Soil	Primary	NS	**2.7**	NS	**22.2**	**2.5 J**	**44.5**
MST136 (Stream)									
SSMST136-0-C(7)	9/11/2004	Soil	Primary	NS	**2.6 J**	NS	**29.7 J**	**1.3 J**	**29.5 J**
MST143 (Stream)									
SSMST143-0-C(6)	9/8/2004	Soil	Primary	NS	**3.4**	NS	**22.9**	<0.5	**47.8**
MST144 (Stream)									
SSMST144-0-C(5)	9/12/2004	Soil	Primary	NS	**8.7 J**	NS	**41 J**	**6.1**	**75.6 J**
MST269 (Stream)									
SSMST269-0-C(5)	9/12/2004	Soil	Primary	NS	**26.3 J**	NS	**205 J**	**14.3**	**235**
MTA001 (Tipple Area)									
0906-MTA001-01-SS	6/19/2009	Soil	Primary	**7.78**	**29.7**	**716**	**65.6**	**13.2 J**	**174 J+**
0906-MTA001-02-SS	6/19/2009	Soil	Primary	**5.69**	**0.967**	**1640**	**21.4**	**0.821 J**	**21.1 J+**
0906-MTA001-03-SS	6/19/2009	Soil	Primary	**7.59**	**25.7**	**758**	**82.7**	**10.5 J**	**152 J+**
0906-MTA001-04-SS	6/19/2009	Soil	Primary	**13.2**	**72.2**	**284**	**163**	**39.7 J**	**575 J+**
0906-MTA001-05-SS	6/19/2009	Soil	Primary	**5.2**	**0.497**	**506**	**22.8**	**0.733 J**	**22.5 J+**
MWD091 (Waste Rock Dump)									
SSMWD091-10-C(6)	7/19/2004	Soil	Primary	NS	NS	NS	NS	<0.5	NS
SSMWD091-11-C(5)	7/19/2004	Soil	Primary	NS	NS	NS	NS	<0.5	NS
SSMWD091-12-C(5)	7/20/2004	Soil	Primary	NS	NS	NS	NS	**1.2 J-**	NS
SSMWD091-13-C(5)	7/20/2004	Soil	Primary	NS	NS	NS	NS	**0.8 J-**	NS
SSMWD091-14-C(5)QA1	7/20/2004	Soil	Triplicate	NS	NS	NS	NS	**4.1 J-**	NS
SSMWD091-14-C(5)QA2	7/20/2004	Soil	Triplicate	NS	NS	NS	NS	**3.7 J-**	NS
SSMWD091-14-C(5)QA3	7/20/2004	Soil	Triplicate	NS	NS	NS	NS	**4.3 J-**	NS
SSMWD091-14-C(5)QA-avg	7/20/2004	Soil	Averaged	NS	NS	NS	NS	**4.03 J-**	NS
SSMWD091-15-C(6)	7/20/2004	Soil	Primary	NS	NS	NS	NS	**23.3 J-**	NS
SSMWD091-16-C(10)	7/20/2004	Soil	Primary	NS	NS	NS	NS	**112 J-**	NS

TABLE 3-34

ENOCH VALLEY MINE - SUMMARY OF SOIL EXCEEDANCES
(Page 3 of 5)

				Analyte (mg/Kg, dry weight)					
Sample Identification	**Collection Date**	**Sample Medium**	**Sample Type**	**Arsenic**	**Cadmium**	**Manganese**	**Nickel**	**Selenium**	**Vanadium**
			Screening Value:	**0.39**	**70**	**1800**	**1500**	**390**	**390**
SSMWD091-17-C(5)	7/20/2004	Soil	Primary	NS	NS	NS	NS	**1.2 J-**	NS
SSMWD091-18-C(6)	7/20/2004	Soil	Primary	NS	NS	NS	NS	**0.8 J-**	NS
SSMWD091-19-C(5)	7/20/2004	Soil	Primary	NS	NS	NS	NS	<0.5 UJ	NS
SSMWD091-1-C(6)	7/20/2004	Soil	Primary	NS	NS	NS	NS	**19.2**	NS
SSMWD091-20-C(5)	7/20/2004	Soil	Primary	NS	NS	NS	NS	**0.5 J-**	NS
SSMWD091-21-C(5)	7/20/2004	Soil	Primary	NS	NS	NS	NS	**0.7 J**	NS
SSMWD091-22-C(8)	7/20/2004	Soil	Primary	NS	NS	NS	NS	<0.5 UJ	NS
SSMWD091-23-C(5)	7/20/2004	Soil	Primary	NS	NS	NS	NS	<0.5 UJ	NS
SSMWD091-24-C(5)	7/20/2004	Soil	Primary	NS	NS	NS	NS	**2.2 J-**	NS
SSMWD091-25-C(5)	7/20/2004	Soil	Primary	NS	NS	NS	NS	**3.3 J-**	NS
SSMWD091-26-C(7)	7/20/2004	Soil	Primary	NS	NS	NS	NS	<0.5 UJ	NS
SSMWD091-27-C(5)	7/20/2004	Soil	Primary	NS	NS	NS	NS	**4.9 J-**	NS
SSMWD091-28-C(5)	7/20/2004	Soil	Primary	NS	NS	NS	NS	**4.2 J-**	NS
SSMWD091-29-C(5)	7/20/2004	Soil	Primary	NS	NS	NS	NS	**2.8 J-**	NS
SSMWD091-2-C(5)	7/20/2004	Soil	Primary	NS	NS	NS	NS	**17**	NS
SSMWD091-30-C(5)	7/20/2004	Soil	Primary	NS	NS	NS	NS	**7.7 J-**	NS
SSMWD091-31-C(5)	7/20/2004	Soil	Primary	NS	NS	NS	NS	**2.4 J-**	NS
SSMWD091-32-C(9)	7/20/2004	Soil	Primary	NS	NS	NS	NS	**3.2**	NS
SSMWD091-33-C(5)	7/20/2004	Soil	Primary	NS	NS	NS	NS	**4.1**	NS
SSMWD091-34-C(5)	7/20/2004	Soil	Primary	NS	NS	NS	NS	**3.6**	NS
SSMWD091-35-C(5)	7/20/2004	Soil	Primary	NS	NS	NS	NS	**2.6 J**	NS
SSMWD091-36-C(5)	7/20/2004	Soil	Primary	NS	NS	NS	NS	**2.2 J**	NS
SSMWD091-37-C(5)	7/20/2004	Soil	Primary	NS	NS	NS	NS	**2.3 J**	NS
SSMWD091-38-C(10)	7/20/2004	Soil	Primary	NS	NS	NS	NS	**2.4 J**	NS
SSMWD091-39-C(7)	7/20/2004	Soil	Primary	NS	NS	NS	NS	**3.5**	NS
SSMWD091-3-C(5)	7/20/2004	Soil	Primary	NS	NS	NS	NS	**141**	NS
SSMWD091-4-C(5)	7/20/2004	Soil	Primary	NS	NS	NS	NS	**0.9 J**	NS
SSMWD091-5-C(5)	7/20/2004	Soil	Primary	NS	NS	NS	NS	<0.5	NS
SSMWD091-6-C(6)	7/20/2004	Soil	Primary	NS	NS	NS	NS	<0.5	NS
SSMWD091-7-C(5)	7/19/2004	Soil	Primary	NS	NS	NS	NS	<0.5	NS
SSMWD091-8-C(5)	7/19/2004	Soil	Primary	NS	NS	NS	NS	<0.5	NS
SSMWD091-9-C(7)	7/19/2004	Soil	Primary	NS	NS	NS	NS	<0.5	NS
MWD091N (Waste Rock Dump)									
0906-MWD091N-01-SS	6/22/2009	Soil	Primary	**5.52**	**5.82**	**492**	**34.2**	**6.03 J**	**37.0 J+**
0906-MWD091N-02-SS	6/22/2009	Soil	Primary	**5.81**	**9.64**	**490**	**54.4**	**5.21 J**	**55.5**
0906-MWD091N-03-SS	6/20/2009	Soil	Primary	**24.2**	**16.0**	**260**	**117**	**13.2**	**75.9**
0906-MWD091N-04-SS	6/22/2009	Soil	Primary	**8.73**	**15.0**	**368**	**118**	**16.7 J**	**69.4**
0906-MWD091N-05-SS	6/20/2009	Soil	Primary	**6.17**	**6.50**	**449**	**60.5**	**2.01**	**35.5**
0906-MWD091N-06-SS	6/20/2009	Soil	Primary	**15.2**	**46.5**	**414**	**176**	**18.6**	**229**
0906-MWD091N-07-SS-1	6/22/2009	Soil	Triplicate	**27.7**	**52.7**	**198**	**256**	**42.6 J**	**220**
0906-MWD091N-07-SS-2	6/22/2009	Soil	Triplicate	**28.6**	**60.9**	**197**	**263**	**45.9 J**	**260**
0906-MWD091N-07-SS-3	6/22/2009	Soil	Triplicate	**27.9**	**46.6**	**222**	**269**	**33.5 J**	**234**
0906-MWD091N-07-SS-avg	6/22/2009	Soil	Averaged	**28.1**	**53.4**	**206**	**263**	**40.7 J**	**238**
0906-MWD091N-08-SS	6/22/2009	Soil	Primary	**24.5**	**38.9**	**247**	**237**	**128 J**	**235**
0906-MWD091N-09-SS	6/20/2009	Soil	Primary	**6.41**	**1.96**	**278**	**96.5**	**10.0**	**17.3**
0906-MWD091N-10-SS	6/20/2009	Soil	Primary	**5.6**	**6.70**	**619**	**47.6**	**3.62**	**32.5**
MWD091S (Waste Rock Dump)									
0906-MWD091S-01-SS	6/19/2009	Soil	Primary	**5.39**	**1.87**	**1600**	**21.0**	**0.528 J**	**26.8**
0906-MWD091S-02-SS	6/19/2009	Soil	Primary	**18.7**	**37.5**	**206**	**159**	**23.4 J**	**236**
0906-MWD091S-03-SS	6/21/2009	Soil	Primary	**10.9 J**	**27.5**	**373**	**110**	**10.2 J**	**173 J+**
0906-MWD091S-04-SS	6/19/2009	Soil	Primary	**8.91**	**27.9**	**944**	**104**	**9.21 J**	**173**
0906-MWD091S-05-SS	6/19/2009	Soil	Primary	**7.21**	**37.3**	**319**	**92.8**	**9.77 J**	**251**
0906-MWD091S-06-SS	6/19/2009	Soil	Primary	**12.1**	**21.5**	**487**	**164**	**29.0 J**	**127**
0906-MWD091S-07-SS-1	6/19/2009	Soil	Triplicate	**6.06**	**11.2**	**989**	**60.2**	**12.6 J**	**55.3**
0906-MWD091S-07-SS-2	6/19/2009	Soil	Triplicate	**7.83**	**14.3**	**804**	**90.8**	**13.9 J**	**91.4**
0906-MWD091S-07-SS-3	6/19/2009	Soil	Triplicate	**6.68**	**11.9**	**1350**	**77.7**	**13.8 J**	**78.8**
0906-MWD091S-07-SS-avg	6/19/2009	Soil	Averaged	**6.86**	**12.5**	**1050**	**76.2**	**13.4 J**	**75.2**
0906-MWD091S-08-SS	6/19/2009	Soil	Primary	**20.8**	**22.2**	**472**	**240**	**46.5 J**	**170**

TABLE 3-34

ENOCH VALLEY MINE - SUMMARY OF SOIL EXCEEDANCES
(Page 4 of 5)

				Analyte (mg/Kg, dry weight)					
Sample Identification	**Collection Date**	**Sample Medium**	**Sample Type**	**Arsenic**	**Cadmium**	**Manganese**	**Nickel**	**Selenium**	**Vanadium**
			Screening Value:	**0.39**	**70**	**1800**	**1500**	**390**	**390**
0906-MWD091S-09-SS	6/19/2009	Soil	Primary	**12.8**	**9.59**	**980**	**114**	**17.0 J**	**80.8**
0906-MWD091S-10-SS	6/19/2009	Soil	Primary	**7.48**	**13.0**	**503**	**85.2**	**13.6 J**	**68.0**
MWD092 (Waste Rock Dump)									
0906-MWD092-01-SS	6/19/2009	Soil	Primary	**7.84**	**24.0**	**333**	**82.1**	**10.4 J**	**111**
0906-MWD092-02-SS	6/21/2009	Soil	Primary	**15.7**	**34.2**	**44.8**	**162**	**27.0 J**	**126**
0906-MWD092-03-SS	6/19/2009	Soil	Primary	**9.98**	**54.0**	**359**	**168**	**19.8 J**	**215 J+**
0906-MWD092-04-SS	6/21/2009	Soil	Primary	**27.8**	**36.7**	**76.1**	**217**	**113 J**	**232**
0906-MWD092-05-SS	6/21/2009	Soil	Primary	**30.2**	**14.0**	**214**	**218**	**34.3 J**	**117**
0906-MWD092-06-SS	6/19/2009	Soil	Primary	**28.6**	**36.8**	**74.1**	**241**	**40.6 J**	**238 J+**
0906-MWD092-07-SS-1	6/19/2009	Soil	Triplicate	**10.8**	**46.9**	**383**	**113**	**11.6 J**	**205 J+**
0906-MWD092-07-SS-2	6/19/2009	Soil	Triplicate	**20.6**	**57.2**	**124**	**96.1**	**11.6 J**	**139 J+**
0906-MWD092-07-SS-3	6/19/2009	Soil	Triplicate	**17.1**	**45.4**	**245**	**151**	**83.7 J**	**278 J+**
0906-MWD092-07-SS-avg	6/19/2009	Soil	Averaged	**16.2**	**49.8**	**251**	**120**	**35.6 J**	**207 J+**
0906-MWD092-08-SS	6/19/2009	Soil	Primary	**13.5**	**55.6**	**45.7**	**117**	**34.8 J**	**324 J+**
0906-MWD092-09-SS	6/20/2009	Soil	Primary	**24.5**	**40.2**	**36.0**	**88.7**	**16.7**	**434**
0906-MWD092-10-SS	6/20/2009	Soil	Primary	**5.42**	**4.38**	**632**	**30.8**	**10.8**	**30.9**
0906-MWD092-CS-SS	6/20/2009	Soil	Primary	**4.57**	**1.48**	**1130**	**25.8**	**1.40**	**20.2**

TABLE 3-34

ENOCH VALLEY MINE - SUMMARY OF SOIL EXCEEDANCES
(Page 5 of 5)

Notes:

Result is greater than screening value

NS - not sampled

FLAG DEFINITION:

U	The analyte was analyzed for, but was not detected above the level of the reported sample quantitation limit.
J	The result is an estimated quantity. The associated numerical value is the approximated concentration of the analyte in the sample.
J+	The result is an estimated quantity, but the result may be biased high.
J-	The result is an estimated quantity, but the result may be biased low.
J+/B	Result is estimated and biased high; associated field blank contained target analyte.
R	The result is unusable. The sample result is rejected due to serious deficiencies in meeting quality control criteria. The analyte may or may not be present in the sample.
UJ	The analyte was analyzed for, but was not detected. The reported quantitation limit is approximate and may be inaccurate or imprecise.

SOURCE FOR SCREENING VALUES (SEE ALSO TABLE 3

Soil	USEPA Regional Screening Levels for Soil, Residential (source: ORNL, December 2009).

TRIPLICATE RESULT

"Primary" indicates locations where only one sample was collected from a given location. "Triplicate" indicates locations where a total of three samples were collected from a given location for the purpose of quality assurance.

The average value for triplicate samples is calculated as follows: (a) the mean of three detected values, (b) the mean of two detected values if result of one triplicate is not detected, (c) the detected value if results of two triplicates are not detected, or (d) less than the highest method detection limit if all triplicate results are not detected.

TABLE 3-35
ENOCH VALLEY MINE
2009 SOIL SAMPLING CONCENTRATION RANGES AND SCREENING LEVEL EXCEEDANCES (mg/kg dw)[1]

Analyte	SL	Background (n=10)	Waste Rock Dumps (n=30)	[n] > SL	Active Facilities (n=10)	[n] > SL
Selenium	390	0.54-6.89	0.53-113	0	0.73-39.7	0
Arsenic	0.39	3.77-7.65	5.39-20.8	30	5.2-13.2	10
Cadmium	70	0.54-9.66	1.87-37.5	0	0.5-72.2	1
Vanadium	390	18.5-52.2	17.3-238	1	21.1-575	1

Notes:
n - total number of samples
[n] - sample concentration
SL - screening level
1 - Triplicate samples are treated as a single sample as described in Appendix A.
Shaded results indicate those which ranges contain exceedances of the screening level.

TABLE 3-36
ENOCH VALLEY MINE
RIPARIAN HABITAT ASSESSMENT DATA MATRIX

Station	Category	Amphibians	Swimming birds	Marsh-nesting birds	Cavity-nesting birds	Birds that forage at water's edge	Aerial-foraging birds	Open cup-nesting birds	Small mammals	Water dependent medium-sized mammals	Upland medium-sized mammals	Game mammals	Livestock	Sept 2004 Soil Selenium Concentration (mg/kg dw)	Sept 2004 Vegetation Selenium Concentration (mg/kg dw)	Habitat Quality Ranking
MSP017	pond	1	1	1	1	1	1	1	1	0	1	1	1	50	11	1
MSP018	pond	1	1	1	1	1	1	1	1	0	1	1	1	70	17	1
MSP019	pond	1	1	0	1	0	1	0	1	0	1	1	1	9.8	6.4	2
MSP020	pond	1	1	1	1	1	1	1	1	0	1	1	1	18	15	1
MSP021	pond	1	1	0	1	0	1	1	1	0	1	1	1	42	11	2
MSP022	pond	1	1	0	1	1	1	1	1	0	1	1	1	6.7	2.8	2
MSP023	pond	1	1	1	1	0	1	1	1	0	1	1	1	25	3.4	1
MSP031	pond	1	1	1	1	1	1	1	1	0	1	1	1	24	3.6	1
MST130	stream	0	0	0	1	0	1	1	1	0	1	1	1	2.3	0.25	4
MST133	semi-ponded stream	0	1	0	0	0	0	1	1	0	1	1	1	0.80	0.25	4
MST134	stream	0	0	0	0	0	1	1	1	0	1	1	1	3.7	0.25	1
MST135	stream	0	0	1	0	0	1	1	1	0	1	1	1	2.5	0.25	1
MST136	stream	0	0	0	0	0	1	1	1	0	1	1	1	1.3	0.25	1
MST143	semi-ponded stream	0	1	0	0	0	1	1	0	0	1	1	1	0.25	0.25	4
MST144	stream	0	0	0	0	0	1	1	1	0	1	1	1	6.1	1.6	1
MST274	stream	0	0	0	0	0	1	1	0	0	1	1	1	1.0	0.25	1

Notes:
Non-detected concentrations are presented as one-half the MDL. The MDL for both media was 0.5 mg/kg dw.

Habitat Quality Ranking
1—high quality aquatic and terrestrial habitat
2—high quality aquatic, but low quality terrestrial habitat
3—low quality aquatic, but high quality terrestrial habitat
4—low quality aquatic and terrestrial habitat

TABLE 3-37

ENOCH VALLEY MINE - SUMMARY OF VEGETATION EXCEEDANCES
(Page 1 of 7)

				Analyte (mg/Kg, dry weight)		
Sample Identification	**Collection Date**	**Vegetation Type**	**Sample Type**	**Boron**	**Molybdenum**	**Selenium**
			Screening Value:	**150**	**5**	**5**
MAR001 (Active Haul Road)						
0906-MAR001-01-GF	6/20/2009	GF	Primary	**7.67**	<1.48	**1.54**
0906-MAR001-03-GF	6/20/2009	GF	Primary	**45.9**	**7.93**	**16**
MBE001 (Enoch Valley Background)						
0906-MBE001-01-FB	6/22/2009	FB	Primary	**19.3**	<1.45	**0.456**
0906-MBE001-01-GS	6/22/2009	GS	Primary	**2.76 J**	**1.98 J**	**0.921**
0906-MBE001-01-SL-AMAL	6/22/2009	SL-AMAL	Primary	**24.5**	<1.49	<0.0936
0906-MBE001-01-SL-ARTR	6/22/2009	SL-ARTR	Primary	**35.3**	<1.50	**1.06**
0906-MBE001-01-SL-PRVI	6/22/2009	SL-PRVI	Primary	**16.8**	<1.49	**0.100 J**
0906-MBE001-01-SL-PUTR	6/22/2009	SL-PUTR	Primary	**20.9**	<1.49	**0.176 J**
0906-MBE001-01-SL-ROWI	6/22/2009	SL-ROWI	Primary	**26.4**	<3.69	<0.198
0906-MBE001-01-SL-SYAL	6/22/2009	SL-SYAL	Primary	**364**	<15.0	**0.124 J**
0906-MBE001-01-SM-AMAL	6/22/2009	SM-AMAL	Primary	**20.7**	<1.50	<0.0988
0906-MBE001-01-SM-ARTR	6/22/2009	SM-ARTR	Primary	**16.4**	<1.50	**0.344**
0906-MBE001-01-SM-PRVI	6/22/2009	SM-PRVI	Primary	**16.1**	<1.49	<0.0933
0906-MBE001-01-SM-PUTR	6/22/2009	SM-PUTR	Primary	**11.9**	<1.50	<0.0992
0906-MBE001-01-SM-ROWI	6/22/2009	SM-ROWI	Primary	**40.0**	<3.15	<0.0911
0906-MBE001-01-SM-SYAL	6/22/2009	SM-SYAL	Primary	**11.5**	<1.44	**0.0992 J**
0906-MBE001-03-GF	6/21/2009	GF	Primary	**13.7**	**1.77 J**	**0.392**
0906-MBE001-03-SL-PRVI	6/21/2009	SL-PRVI	Primary	**17.0**	<1.50	**0.383 J+**
0906-MBE001-03-SL-SYAL	6/21/2009	SL-SYAL	Primary	**28.2**	<1.49	**0.250 J+**
0906-MBE001-03-SM-PRVI	6/21/2009	SM-PRVI	Primary	<43.1	<25.9	<0.0988
0906-MBE001-03-SM-SYAL	6/21/2009	SM-SYAL	Primary	**7.53**	<1.50	**0.345 J+**
0906-MBE001-04-CS-WILD ST	6/21/2009	CS-WILD ST	Primary	**20.5**	**1.63 J**	<0.379
0906-MBE001-04-GF	6/21/2009	GF	Primary	**24.2**	**1.98 J**	**0.636**
0906-MBE001-04-SL-PRVI	6/21/2009	SL-PRVI	Primary	**13.3**	<1.50	**0.298**
0906-MBE001-04-SL-SYAL	6/21/2009	SL-SYAL	Primary	**27.4**	<1.50	**0.146 J**
0906-MBE001-04-SM-PRVI	6/21/2009	SM-PRVI	Primary	**11.8**	<1.48	<0.0988
0906-MBE001-04-SM-SYAL	6/21/2009	SM-SYAL	Primary	**6.45**	<1.65	**0.125 J**
0906-MBE001-05-GF	6/21/2009	GF	Primary	**14.9**	<1.49	**0.359**
0906-MBE001-06-GF	6/21/2009	GF	Primary	**10.8**	**3.63**	**0.560**
0906-MBE001-07-FB-1	6/21/2009	FB	Triplicate	**28.8**	**9.15**	**5.28**
0906-MBE001-07-FB-2	6/21/2009	FB	Triplicate	**17.9**	**6.58**	**6.42**
0906-MBE001-07-FB-3	6/21/2009	FB	Triplicate	**34.7**	**11**	**3.35**
0906-MBE001-07-FB-avg	6/21/2009	FB	Averaged	**27.1**	**8.91**	**5.02**
0906-MBE001-07-GS-1	6/21/2009	GS	Triplicate	**3.04 J**	**8.18**	**2.63**
0906-MBE001-07-GS-2	6/21/2009	GS	Triplicate	<2.39	**5.75**	**3.17**
0906-MBE001-07-GS-3	6/21/2009	GS	Triplicate	<2.48	**10.4**	**3.97**
0906-MBE001-07-GS-avg	6/21/2009	GS	Averaged	**3.04 J**	**8.11**	**3.26**
0906-MBE001-07-SL-ARTR-1	6/21/2009	SL-ARTR	Triplicate	**23.2**	<1.49	**2.08**
0906-MBE001-07-SL-ARTR-3	6/21/2009	SL-ARTR	Triplicate	**21.0**	<1.50	**1.21**
0906-MBE001-07-SL-ARTR-avg	6/21/2009	SL-ARTR	Averaged	**22.1**	<1.50	**1.65**
0906-MBE001-07-SM-ARTR-1	6/21/2009	SM-ARTR	Triplicate	**23.6**	<1.49	**1.47**
0906-MBE001-07-SM-ARTR-3	6/21/2009	SM-ARTR	Triplicate	**21.9**	<1.49	**1.14**
0906-MBE001-07-SM-ARTR-avg	6/21/2009	SM-ARTR	Averaged	**22.8**	<1.49	**1.31**
0906-MBE001-08-GF	6/21/2009	GF	Primary	**20.2**	**1.71 J**	**0.471 J+**
0906-MBE001-08-SL-SYAL	6/21/2009	SL-SYAL	Primary	**18.7**	<1.50	**0.223 J+**
0906-MBE001-08-SM-SYAL	6/21/2009	SM-SYAL	Primary	**6.32**	<1.41	**0.429**
0906-MBE001-09-FB	6/21/2009	FB	Primary	**26.4**	<1.40	**0.764**
0906-MBE001-09-GS	6/21/2009	GS	Primary	<8.06	<4.84	**1.09**
0906-MBE001-09-SL-AMAL	6/21/2009	SL-AMAL	Primary	**24.2**	**7.53**	**0.214 J+**
0906-MBE001-09-SL-ARTR	6/21/2009	SL-ARTR	Primary	**21.9**	<1.45	**1.21**
0906-MBE001-09-SL-POTR	6/21/2009	SL-POTR	Primary	**13.2**	<1.49	**0.246 J+**

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ENOCH VALLEY MINE - SUMMARY OF VEGETATION EXCEEDANCES
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				Analyte (mg/Kg, dry weight)		
Sample Identification	**Collection Date**	**Vegetation Type**	**Sample Type**	**Boron**	**Molybdenum**	**Selenium**
			Screening Value:	**150**	**5**	**5**
0906-MBE001-09-SL-SYAL	6/21/2009	SL-SYAL	Primary	**20.7**	<1.50	**0.255 J+**
0906-MBE001-09-SM-AMAL	6/21/2009	SM-AMAL	Primary	**13.8**	<1.50	<0.149
0906-MBE001-09-SM-ARTR	6/21/2009	SM-ARTR	Primary	**18.7**	<3.55	**0.746**
0906-MBE001-09-SM-POTR	6/21/2009	SM-POTR	Primary	**12.6**	<1.50	**0.251 J+**
0906-MBE001-09-SM-SYAL	6/21/2009	SM-SYAL	Primary	**11.4**	<1.49	**0.274 J+**
0906-MBE001-10-GF	6/21/2009	GF	Primary	**24.4**	<1.46	**0.593**
0906-MBE001-10-SL-SYAL	6/21/2009	SL-SYAL	Primary	**20.0**	<1.48	**0.362**
0906-MBE001-10-SM-SYAL	6/21/2009	SM-SYAL	Primary	**8.72**	<1.46	**0.287**
0906-MBE001-AL02-GF	6/22/2009	GF	Primary	**26.3**	<1.50	**0.419**
0906-MBE001-AL02-SL-ARTR	6/22/2009	SL-ARTR	Primary	**22.7**	<1.50	**0.380**
0906-MBE001-AL02-SL-PUTR	6/22/2009	SL-PUTR	Primary	**27.4**	<1.50	**0.325**
0906-MBE001-AL02-SL-SYAL	6/22/2009	SL-SYAL	Primary	**18.5**	<1.50	**0.214**
0906-MBE001-AL02-SM-ARTR	6/22/2009	SM-ARTR	Primary	**29.5**	<1.50	**0.259**
0906-MBE001-AL02-SM-PUTR	6/22/2009	SM-PUTR	Primary	**19.5**	<1.50	**0.381**
0906-MBE001-AL02-SM-SYAL	6/22/2009	SM-SYAL	Primary	**13.8**	<1.50	**0.182 J**
0908-MBE001-01-FB	8/24/2009	FB	Primary	**68.3**	**1.65 J**	**0.633 J**
0908-MBE001-07-FB-1	8/24/2009	FB	Triplicate	**54.1**	**30.2**	**10.4**
0908-MBE001-07-FB-2	8/24/2009	FB	Triplicate	**35.0**	**8.17**	**2.89**
0908-MBE001-07-FB-3	8/24/2009	FB	Triplicate	**79.1**	**13.5**	**8.55**
0908-MBE001-07-FB-avg	8/24/2009	FB	Averaged	**56.1**	**17.3**	**7.28**
0908-MBE001-09-FB	8/24/2009	FB	Primary	**37.5**	**2.01 J**	**0.778 J**
MDS025 (Dump Seep)						
VEMDS025-0-C(5)	9/12/2004	Vegetation	Primary	NS	**20.4 JT**	**13.5 T**
MDS026 (Dump Seep)						
VEMDS026-0-C(5)	9/12/2004	Vegetation	Primary	NS	**0.66 J+T**	**0.6 JT**
MSG001 (Spring)						
VEMSG001-0-C(5)	9/11/2004	Vegetation	Primary	NS	**4.61 J+T**	<0.5 UT
MSP017 (Pond)						
VEMSP017-0-C(5)	9/12/2004	Vegetation	Primary	NS	**2.76 JT**	**11.3 T**
MSP018 (Pond)						
VEMSP018-0-C(7)	9/11/2004	Vegetation	Primary	NS	**3.95 T**	**17.1 T**
MSP019 (Pond)						
VEMSP019-0-C(6)	9/11/2004	Vegetation	Primary	NS	**0.85 T**	**6.4 T**
MSP020 (Pond)						
VEMSP020-0-C(5)	9/11/2004	Vegetation	Primary	NS	**0.75 T**	**15.2 T**
MSP021 (Pond)						
VEMSP021-0-C(5)	9/11/2004	Vegetation	Primary	NS	**1.19 T**	**11 T**
MSP022 (Pond)						
VEMSP022-0-C(6)	9/11/2004	Vegetation	Primary	NS	**1.84 T**	**2.8 JT**
MSP023 (Pond)						
VEMSP023-0-C(5)	9/11/2004	Vegetation	Primary	NS	**3.76 JT**	**3.4 T**
MSP031 (Pond)						
VEMSP031-0-C(6)	9/11/2004	Vegetation	Primary	NS	**16.9 JT**	**3.6 T**
MST023 (Stream)						
VEMST023-0-C(8)	9/14/2004	Vegetation	Primary	NS	**2.1 T**	<0.5 UT
MST024 (Stream)						
VEMST024-0-C(11)	9/14/2004	Vegetation	Primary	NS	**2.69 T**	<0.5 UT
MST025 (Stream)						
VEMST025-1-C(7)	9/14/2004	Vegetation	Primary	NS	**1.39 T**	<0.5 UT
MST026 (Stream)						
VEMST026-0-C(5)	9/10/2004	Vegetation	Primary	NS	**2.08 T**	<0.5 UT
MST027 (Stream)						
052404VEMST027-1-C7	5/24/2004	Vegetation	Primary	NS	NS	<0.5 UT

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ENOCH VALLEY MINE - SUMMARY OF VEGETATION EXCEEDANCES
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				Analyte (mg/Kg, dry weight)		
Sample Identification	**Collection Date**	**Vegetation Type**	**Sample Type**	**Boron**	**Molybdenum**	**Selenium**
			Screening Value:	**150**	**5**	**5**
061604VEMST027-1-C(5	6/16/2004	Vegetation	Primary	NS	NS	<0.5 UJT
090904VEMST027-0-C(5)	9/9/2004	Vegetation	Primary	NS	**1.95 T**	<0.5 UJT
101804VEMST027-0-C(5)	10/18/2004	Vegetation	Primary	NS	NS	<0.5 UJT
VEMST027-1-C(5)	8/16/2004	Vegetation	Primary	NS	NS	<0.5 UJT
VEMST027-1-c(5)QA1	7/15/2004	Vegetation	Triplicate	NS	NS	<0.5 UT
VEMST027-1-c(5)QA2	7/15/2004	Vegetation	Triplicate	NS	NS	<0.5 UT
VEMST027-1-c(5)QA3	7/15/2004	Vegetation	Triplicate	NS	NS	<0.5 UT
VEMST027-1-c(5)QA-avg	7/15/2004	Vegetation	Averaged	NS	NS	<0.5 UT
MST059 (Stream)						
VEMST059-1-C(5)QA1	9/14/2004	Vegetation	Triplicate	NS	**5.43 T**	<0.5 UT
VEMST059-1-C(5)QA2	9/14/2004	Vegetation	Triplicate	NS	**5.63 T**	<0.5 UT
VEMST059-1-C(5)QA3	9/14/2004	Vegetation	Triplicate	NS	**5.44 T**	<0.5 UT
VEMST059-1-C(5)QA-avg	9/14/2004	Vegetation	Averaged	NS	**5.5 T**	<0.5 UT
MST060 (Stream)						
VEMST060-0-C(5)	9/14/2004	Vegetation	Primary	NS	**5.03 T**	<0.5 UT
MST061 (Stream)						
VEMST061-1-C(5)QA1	9/14/2004	Vegetation	Triplicate	NS	**5.41 T**	**0.9 JT**
VEMST061-1-C(5)QA2	9/14/2004	Vegetation	Triplicate	NS	**5.03 T**	**1.1 JT**
VEMST061-1-C(5)QA3	9/14/2004	Vegetation	Triplicate	NS	**4.81 T**	**0.9 JT**
VEMST061-1-C(5)QA-avg	9/14/2004	Vegetation	Averaged	NS	**5.08 T**	**0.967 JT**
MST126 (Stream)						
VEMST126-0-C(5)	9/9/2004	Vegetation	Primary	NS	**1.57 T**	<0.5 UJT
MST127 (Stream)						
VEMST127-0-C(5)	9/9/2004	Vegetation	Primary	NS	**0.54 T**	<0.5 UJT
MST131 (Stream)						
VEMST131-0-C(5)	9/9/2004	Vegetation	Primary	NS	**0.72 T**	<0.5 UJT
MST132 (Stream)						
VEMST132-1-C(6)QA1	9/9/2004	Vegetation	Triplicate	NS	**1.08 T**	<0.5 UJT
VEMST132-1-C(6)QA2	9/9/2004	Vegetation	Triplicate	NS	**1.1 T**	<0.5 UJT
VEMST132-1-C(6)QA3	9/9/2004	Vegetation	Triplicate	NS	**1.06 T**	<0.5 UJT
VEMST132-1-C(6)QA4	9/9/2004	Vegetation	Triplicate	NS	NS	NS
VEMST132-1-C(6)QA-avg	9/9/2004	Vegetation	Averaged	NS	**1.08 T**	<0.5 UJT
MST133 (Stream)						
VEMST133-0-C(5)	9/8/2004	Vegetation	Primary	NS	**0.53 T**	<0.5 UJT
MST134 (Stream)						
VEMST134-0-C(5)	9/8/2004	Vegetation	Primary	NS	**1.22 T**	<0.5 UJT
MST135 (Stream)						
VEMST135-0-C(5)	9/8/2004	Vegetation	Primary	NS	**0.7 T**	<0.5 UJT
MST136 (Stream)						
VEMST136-0-C(7)	9/11/2004	Vegetation	Primary	NS	**1.14 JT**	<0.5 UT
MST143 (Stream)						
VEMST143-0-C(6)	9/8/2004	Vegetation	Primary	NS	**0.48 T**	<0.5 UJT
MST144 (Stream)						
VEMST144-0-C(5)	9/12/2004	Vegetation	Primary	NS	**0.74 JT**	**1.6 JT**
MST269 (Stream)						
VEMST269-0-C(5)	9/12/2004	Vegetation	Primary	NS	**1.21 J+T**	**1.5 JT**
MTA001 (Tipple Area)						
0906-MTA001-01-GF	6/19/2009	GF	Primary	**3.03 J**	**2.64 J**	**2.26**
0906-MTA001-02-GF	6/19/2009	GF	Primary	**22.3**	<1.50	**0.694**
0906-MTA001-03-GF	6/19/2009	GF	Primary	**22.1**	**10.6**	**3.02**
0906-MTA001-04-GF	6/19/2009	GF	Primary	**5.35**	**1.75 J**	**5.56**
0906-MTA001-05-GF	6/19/2009	GF	Primary	**3.39 J**	**4.12**	**0.388**
MWD091 (Waste Rock Dump)						

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ENOCH VALLEY MINE - SUMMARY OF VEGETATION EXCEEDANCES
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				Analyte (mg/Kg, dry weight)		
Sample Identification	**Collection Date**	**Vegetation Type**	**Sample Type**	**Boron**	**Molybdenum**	**Selenium**
			Screening Value:	**150**	**5**	**5**
052404VEMWD091-1-C7	5/24/2004	Vegetation	Primary	NS	NS	**24.9 T**
061604VEMWD091-1-C(5	6/16/2004	Vegetation	Primary	NS	NS	**10 J-T**
071404VEMWD091-1-C(5)	7/14/2004	Vegetation	Primary	NS	NS	**1.3 JT**
081604VEMWD091-1-C(5)	8/16/2004	Vegetation	Primary	NS	NS	**8.1 J-T**
0908-MWD091-CS-JUSC-LEAF	8/24/2009	JUSC-LEAF	Primary	**13.9**	<1.47	**1.67 J**
0908-MWD091-CS-JUSC-STEM	8/24/2009	JUSC-STEM	Primary	**10.4**	<1.50	**1.05 J**
0908-MWD091-CS-POTR-LEAF	8/24/2009	POTR-LEAF	Primary	**115**	<1.49	**4.46**
0908-MWD091-CS-POTR-STEM	8/24/2009	POTR-STEM	Primary	**17.5**	<1.50	**1.44**
091504VEMWD091-0-C(5)	9/15/2004	Vegetation	Primary	NS	**3.74 T**	**0.8 JT**
101804VEMWD091-0-C(5)	10/18/2004	Vegetation	Primary	NS	NS	**3.1 J-T**
VEMWD091-10-C(6)	7/20/2004	Vegetation	Primary	NS	NS	<0.5 UT
VEMWD091-11-C(5)	7/20/2004	Vegetation	Primary	NS	NS	<0.5 UT
VEMWD091-12-C(5)	7/20/2004	Vegetation	Primary	NS	NS	<0.5 UT
VEMWD091-13-C(5)	7/20/2004	Vegetation	Primary	NS	NS	<0.5 UT
VEMWD091-14-C(5)QA1	7/20/2004	Vegetation	Triplicate	NS	NS	**10.4 T**
VEMWD091-14-C(5)QA2	7/20/2004	Vegetation	Triplicate	NS	NS	**10.7 T**
VEMWD091-14-C(5)QA3	7/20/2004	Vegetation	Triplicate	NS	NS	**10.2 T**
VEMWD091-14-C(5)QA-avg	7/20/2004	Vegetation	Averaged	NS	NS	**10.4 T**
VEMWD091-15-C(6)	7/20/2004	Vegetation	Primary	NS	NS	**10.3 T**
VEMWD091-16-C(10)	7/20/2004	Vegetation	Primary	NS	NS	**7 T**
VEMWD091-17-C(5)	7/20/2004	Vegetation	Primary	NS	NS	<0.5 UT
VEMWD091-18-C(6)	7/20/2004	Vegetation	Primary	NS	NS	<0.5 UT
VEMWD091-19-C(5)	7/20/2004	Vegetation	Primary	NS	NS	<0.5 UT
VEMWD091-1-C(6)	7/20/2004	Vegetation	Primary	NS	NS	**15.6 J-T**
VEMWD091-20-C(5)	7/20/2004	Vegetation	Primary	NS	NS	<0.5 UT
VEMWD091-21-C(5)	7/20/2004	Vegetation	Primary	NS	NS	<0.5 UT
VEMWD091-22-C(8)	7/20/2004	Vegetation	Primary	NS	NS	<0.5 UJT
VEMWD091-23-C(5)	7/20/2004	Vegetation	Primary	NS	NS	<0.5 UJT
VEMWD091-24-C(5)	7/20/2004	Vegetation	Primary	NS	NS	<0.5 UJT
VEMWD091-25-C(5)	7/20/2004	Vegetation	Primary	NS	NS	<0.5 UJT
VEMWD091-26-C(7)	7/20/2004	Vegetation	Primary	NS	NS	<0.5 UJT
VEMWD091-27-C(5)	7/20/2004	Vegetation	Primary	NS	NS	<0.5 UJT
VEMWD091-28-C(5)	7/20/2004	Vegetation	Primary	NS	NS	<0.5 UJT
VEMWD091-29-C(5)	7/20/2004	Vegetation	Primary	NS	NS	<0.5 UJT
VEMWD091-2-C(5)	7/20/2004	Vegetation	Primary	NS	NS	**7.1 J-T**
VEMWD091-30-C(5)	7/20/2004	Vegetation	Primary	NS	NS	<0.5 UJT
VEMWD091-31-C(5)	7/20/2004	Vegetation	Primary	NS	NS	<0.5 UJT
VEMWD091-32-C(9)	7/20/2004	Vegetation	Primary	NS	NS	<0.5 UJT
VEMWD091-33-C(5)	7/20/2004	Vegetation	Primary	NS	NS	<0.5 UJT
VEMWD091-34-C(5)	7/20/2004	Vegetation	Primary	NS	NS	<0.5 UJT
VEMWD091-35-C(5)	7/20/2004	Vegetation	Primary	NS	NS	<0.5 UJT
VEMWD091-36-C(5)	7/20/2004	Vegetation	Primary	NS	NS	<0.5 UJT
VEMWD091-37-C(5)	7/20/2004	Vegetation	Primary	NS	NS	<0.5 UJT
VEMWD091-38-C(10)	7/20/2004	Vegetation	Primary	NS	NS	<0.5 UJT
VEMWD091-39-C(7)	7/20/2004	Vegetation	Primary	NS	NS	<0.5 UJT
VEMWD091-3-C(5)	7/20/2004	Vegetation	Primary	NS	NS	**3.3 J-T**
VEMWD091-40-C(5)	7/21/2004	Vegetation	Primary	NS	NS	<0.5 UT
VEMWD091-41-C(5)	7/21/2004	Vegetation	Primary	NS	NS	<0.5 UT
VEMWD091-42-C(5)	7/21/2004	Vegetation	Primary	NS	NS	<0.5 UT
VEMWD091-43-C(5)	7/21/2004	Vegetation	Primary	NS	NS	<0.5 UT
VEMWD091-44-C(14)	7/21/2004	Vegetation	Primary	NS	NS	<0.5 UT
VEMWD091-44-C(5)	7/21/2004	Vegetation	Primary	NS	NS	<0.6 UT
VEMWD091-45-C(5)	7/21/2004	Vegetation	Primary	NS	NS	<0.5 UT

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ENOCH VALLEY MINE - SUMMARY OF VEGETATION EXCEEDANCES
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				Analyte (mg/Kg, dry weight)		
Sample Identification	**Collection Date**	**Vegetation Type**	**Sample Type**	**Boron**	**Molybdenum**	**Selenium**
			Screening Value:	**150**	**5**	**5**
VEMWD091-47-C(6)	7/21/2004	Vegetation	Primary	NS	NS	<0.5 UT
VEMWD091-48-C(5)	7/21/2004	Vegetation	Primary	NS	NS	<0.5 UT
VEMWD091-49-C(5)	7/21/2004	Vegetation	Primary	NS	NS	<0.5 UT
VEMWD091-4-C(5)	7/20/2004	Vegetation	Primary	NS	NS	<0.5 UJT
VEMWD091-50-C(7)	7/21/2004	Vegetation	Primary	NS	NS	<0.5 UT
VEMWD091-51-C(9)	7/21/2004	Vegetation	Primary	NS	NS	<0.5 UT
VEMWD091-52-C(13)QA1	7/21/2004	Vegetation	Triplicate	NS	NS	<0.5 UT
VEMWD091-52-C(13)QA2	7/21/2004	Vegetation	Triplicate	NS	NS	<0.5 UT
VEMWD091-52-C(13)QA3	7/21/2004	Vegetation	Triplicate	NS	NS	<0.5 UT
VEMWD091-52-C(13)QA-avg	7/21/2004	Vegetation	Averaged	NS	NS	<0.5 UT
VEMWD091-5-C(5)	7/20/2004	Vegetation	Primary	NS	NS	<0.5 UJT
VEMWD091-6-C(6)	7/20/2004	Vegetation	Primary	NS	NS	<0.5 UJT
VEMWD091-7-C(5)	7/20/2004	Vegetation	Primary	NS	NS	<0.6 UJT
VEMWD091-8-C(5)	7/20/2004	Vegetation	Primary	NS	NS	<0.5 UJT
VEMWD091-9-C(7)	7/20/2004	Vegetation	Primary	NS	NS	<0.6 UT
MWD091N (Waste Rock Dump)						
0906-MWD091N-01-GF	6/22/2009	GF	Primary	**5.46**	**1.96 J**	**4.55 J**
0906-MWD091N-02-GF	6/22/2009	GF	Primary	**2.65 J**	**11.2**	**23.9 J**
0906-MWD091N-03-GF	6/20/2009	GF	Primary	**3.92 J**	**10.4**	**7.16**
0906-MWD091N-04-GS	6/22/2009	GS	Primary	**2.69 J**	**4.74**	**5.89 J**
0906-MWD091N-05-GF	6/20/2009	GF	Primary	**10.7**	**7.13**	**2.20**
0906-MWD091N-06-GS	6/20/2009	GS	Primary	**3.54 J**	**6.37**	**6.19**
0906-MWD091N-07-FB-1	6/22/2009	FB	Triplicate	**23.6**	**24.4**	**11.7**
0906-MWD091N-07-FB-2	6/22/2009	FB	Triplicate	**32.4**	**23.8**	**61.5**
0906-MWD091N-07-FB-3	6/22/2009	FB	Triplicate	**28.5**	**27.3**	**7.75**
0906-MWD091N-07-FB-avg	6/22/2009	FB	Averaged	**28.2**	**25.2**	**27**
0906-MWD091N-07-GS-1	6/22/2009	GS	Triplicate	**14.6**	<1.48	**1.55**
0906-MWD091N-07-GS-2	6/22/2009	GS	Triplicate	**13.2**	**47.3**	**2.42**
0906-MWD091N-07-GS-3	6/22/2009	GS	Triplicate	**2.94 J**	**13.7**	**1.32**
0906-MWD091N-07-GS-avg	6/22/2009	GS	Averaged	**10.2 J**	**30.5**	**1.76**
0906-MWD091N-08-GF	6/22/2009	GF	Primary	**7.37**	**25.6**	**27.7 J**
0906-MWD091N-09-GF	6/20/2009	GF	Primary	**4.38 J**	**2.95 J**	**1.75**
0906-MWD091N-10-FB	6/20/2009	FB	Primary	**50.4**	**8.25**	**8.75**
0906-MWD091N-10-GS	6/20/2009	GS	Primary	**4.69 J**	**7.71**	**4.65**
0908-MWD091N-04-FB	8/24/2009	FB	Primary	**42.3**	**4.56**	**7.09**
0908-MWD091N-06-FB	8/24/2009	FB	Primary	**26.0**	**19**	**34.5**
0908-MWD091N-07-FB-1	8/24/2009	FB	Triplicate	**21.3**	**11.2**	**8.78 J**
0908-MWD091N-07-FB-2	8/24/2009	FB	Triplicate	**51.3**	**30.9**	**76.0 J**
0908-MWD091N-07-FB-3	8/24/2009	FB	Triplicate	**35.7**	**8.14**	**22.4 J**
0908-MWD091N-07-FB-avg	8/24/2009	FB	Averaged	**36.1**	**16.7**	**35.7 J**
0908-MWD091N-10-FB	8/24/2009	FB	Primary	**25.0**	**5.35**	**13.7 J**
MWD091S (Waste Rock Dump)						
0906-MWD091S-01-GF	6/19/2009	GF	Primary	**10.3**	<1.48	**0.564**
0906-MWD091S-02-GF	6/19/2009	GF	Primary	**5.56**	**11.8**	**26.4 J**
0906-MWD091S-03-FB	6/21/2009	FB	Primary	**23.6**	**6.85**	**4.35**
0906-MWD091S-03-GS	6/21/2009	GS	Primary	**2.59 J**	**7.73**	**4.04**
0906-MWD091S-04-GF	6/19/2009	GF	Primary	**12.2**	**3.87**	**0.996 J**
0906-MWD091S-05-GF	6/19/2009	GF	Primary	**6.51**	**9.24**	**3.87**
0906-MWD091S-06-GF	6/19/2009	GF	Primary	**3.78 J**	**6.42**	**10.6**
0906-MWD091S-07-FB-1	6/19/2009	FB	Triplicate	**23.9**	**4.53**	**7.18**
0906-MWD091S-07-FB-2	6/19/2009	FB	Triplicate	**35.3**	**4.56**	**4.15**
0906-MWD091S-07-FB-3	6/19/2009	FB	Triplicate	**25.8**	**5.91**	**3.31**
0906-MWD091S-07-FB-avg	6/19/2009	FB	Averaged	**28.3**	**5**	**4.88**

TABLE 3-37

ENOCH VALLEY MINE - SUMMARY OF VEGETATION EXCEEDANCES
(Page 6 of 7)

				Analyte (mg/Kg, dry weight)		
Sample Identification	**Collection Date**	**Vegetation Type**	**Sample Type**	**Boron**	**Molybdenum**	**Selenium**
			Screening Value:	**150**	**5**	**5**
0906-MWD091S-07-GS-1	6/19/2009	GS	Triplicate	**3.94 J**	**3.96**	**4.85**
0906-MWD091S-07-GS-2	6/19/2009	GS	Triplicate	**7.69**	**1.92 J**	**2.50**
0906-MWD091S-07-GS-3	6/19/2009	GS	Triplicate	**6.90**	**2.48 J**	**3.30**
0906-MWD091S-07-GS-avg	6/19/2009	GS	Averaged	**6.18 J**	**2.79 J**	**3.55**
0906-MWD091S-08-GF	6/19/2009	GF	Primary	**5.83**	**20.7**	**5.02**
0906-MWD091S-09-GF	6/19/2009	GF	Primary	**6.61**	**5.83**	**3.04**
0906-MWD091S-10-GS	6/19/2009	GS	Primary	**22.6**	**4.81**	**4.41 J**
0908-MWD091S-03-FB	8/24/2009	FB	Primary	**37.2**	**11.9**	**3.93 J**
0908-MWD091S-07-FB-1	8/24/2009	FB	Triplicate	**25.3**	**4.50**	**10.5 J**
0908-MWD091S-07-FB-2	8/24/2009	FB	Triplicate	**20.3**	**5.56**	**13.4 J**
0908-MWD091S-07-FB-3	8/24/2009	FB	Triplicate	**23.3**	**1.93 J**	**6.52 J**
0908-MWD091S-07-FB-avg	8/24/2009	FB	Averaged	**23.0**	**4.00 J**	**10.1 J**
0908-MWD091S-10-FB	8/24/2009	FB	Primary	**20.2**	**11.5**	**3.22 J**
MWD092 (Waste Rock Dump)						
0906-MWD092-01-GF	6/19/2009	GF	Primary	**26.7**	**6.48**	**1.88 J**
0906-MWD092-02-GF	6/21/2009	GF	Primary	**2.53 J**	**8.39**	**20.3**
0906-MWD092-03-GF	6/19/2009	GF	Primary	**11.2**	**7.19**	**18**
0906-MWD092-04-FB	6/21/2009	FB	Primary	**20.6**	**14.4**	**105**
0906-MWD092-04-GS	6/21/2009	GS	Primary	**2.61 J**	**10.1**	**25.5**
0906-MWD092-05-GF	6/21/2009	GF	Primary	**4.03 J**	**33.9**	**29**
0906-MWD092-06-GF	6/19/2009	GF	Primary	**4.94**	**11.5**	**4.92**
0906-MWD092-07-GF-1	6/19/2009	GF	Triplicate	**3.99 J**	**4.46**	**46.4**
0906-MWD092-07-GF-2	6/19/2009	GF	Triplicate	**5.58**	**5.24**	**14.3**
0906-MWD092-07-GF-3	6/19/2009	GF	Triplicate	**5.67**	**4.20**	**63.3**
0906-MWD092-07-GF-avg	6/19/2009	GF	Averaged	**5.08 J**	**4.63**	**41.3**
0906-MWD092-07-SL-1-PUTR	6/19/2009	SL-PUTR	Triplicate	**11.6 J**	<3.50	**15.4**
0906-MWD092-07-SL-2-PUTR	6/19/2009	SL-PUTR	Triplicate	**11.7**	**1.73 J**	**20.5**
0906-MWD092-07-SL-avg-PUTR	6/19/2009	SL-PUTR	Averaged	**11.7 J**	**1.73 J**	**18**
0906-MWD092-07-SM-1-PUTR	6/19/2009	SM-PUTR	Triplicate	**6.07 J**	<2.72	**6.73**
0906-MWD092-07-SM-2-PUTR	6/19/2009	SM-PUTR	Triplicate	**6.56**	<1.41	**7.76**
0906-MWD092-07-SM-avg-PUTR	6/19/2009	SM-PUTR	Averaged	**6.32 J**	<2.72	**7.25**
0906-MWD092-08-GF	6/19/2009	GF	Primary	<2.46	**7.36**	**71.1**
0906-MWD092-09-FB	6/20/2009	FB	Primary	**26.4**	**8.1**	**12.7**
0906-MWD092-09-GS	6/20/2009	GS	Primary	**3.65 J**	**4.22**	**6.79**
0906-MWD092-10-FB	6/20/2009	FB	Primary	**21.8**	**2.57 J**	**19.8**
0906-MWD092-10-GS	6/20/2009	GS	Primary	**5.04**	**4.02**	**11.7**
0906-MWD092-10-SL-ARTR	6/20/2009	SL-ARTR	Primary	**18.4**	<1.49	**8.26**
0906-MWD092-10-SM-ARTR	6/20/2009	SM-ARTR	Primary	**29.4**	<1.50	**13.5**
0906-MWD092-CS-ALLIUM(BULB)	6/20/2009	CS-ALLIUM	Primary	**7.50**	<1.48	**0.686 J**
0906-MWD092-CS-ALLIUM(STEM)	6/20/2009	Allium(stem)	Primary	**20.0**	**2.09 J**	**1.31**
0908-MWD092-04-FB	8/24/2009	FB	Primary	**16.0**	**11.7**	**120**
0908-MWD092-09-FB	8/24/2009	FB	Primary	**15.1**	**5.99**	**63.8 J**
0908-MWD092-10-FB	8/24/2009	FB	Primary	**29.5**	**4.54**	**16.9 J**
0908-MWD092-CS-ARLU	8/24/2009	ARLU	Primary	**24.2**	<1.45	**12.3 J**
0908-MWD092-CS-ARTR-LEAF	8/24/2009	ARTR-LEAF	Primary	**27.2**	<1.49	**8.00 J**
0908-MWD092-CS-ARTR-STEM	8/24/2009	ARTR-STEM	Primary	**17.6**	<1.49	**3.98 J**

TABLE 3-37

ENOCH VALLEY MINE - SUMMARY OF VEGETATION EXCEEDANCES
(Page 7 of 7)

Notes:

Allium - onion (scientific name undetermined)
AMAL - serviceberry (*Amelanchier alnifolia*)
AR - active ore haul road
ARLU - white sagebrush (*Artemisia ludoviciana*)
ARTR - big sagebrush (*Artemisia tridentata*)
BB - Ballard Mine background
BE - Enoch Valley Mine background
BH - Henry Mine background
BS - Ballard Mine shop
CAAR - Siberian peashrub (*Caragana arborescens*)
CHNA - yellow Rabbitbrush (*Chrysothamnus viscidiflorus*)*
CS - Culturally Significant plants
FB - forb
GF - grasses and forbs
GS - grass
HR - historic ore haul road
JUSC - Rocky Mountain juniper (*Juniperus scopulorum*)
POTR - quaking aspen (*Populus tremuloides*)
PRVI - chokecherry (*Prunus virginiana*)
PUTR - antelope bitterbrush (*Purshia tridentata*)
ROWI - Wood's rose (*Rosa woodsii*)
SF - shrub fruit
SL - shrub leaves
SM - shrub stems
SYAL - mountain strawberry (*Symphoricarpos oreophilus*)
TA - Enoch Valley Minte tipple area
VE - vegetation sample
WD - waste rock dump
Wild St - wild strawberry

* The current symbol for yellow Rabbitbrush is "CHVI8."

Result is greater than screening value
Method detection limit for non-detected value is greater than the screening value

FLAG DEFINITION:

U	The analyte was analyzed for, but was not detected above the level of the reported sample quantitation limit.
J	The result is an estimated quantity. The associated numerical value is the approximated concentration of the analyte in the sample.
J+	The result is an estimated quantity, but the result may be biased high.
J-	The result is an estimated quantity, but the result may be biased low.
J+/B	Result is estimated and biased high; associated field blank contained target analyte.
R	The result is unusable. The sample result is rejected due to serious deficiencies in meeting quality control criteria. The analyte may or may not be present in the sample.
UJ	The analyte was analyzed for, but was not detected. The reported quantitation limit is approximate and may be inaccurate or imprecise.
K	Serial dilutions not performed for samples analyzed by this method (EPA 200.7; 200.8).
T	Laboratory SOP does not address biotic matrices; biotic-specific LCS/SRM not analyzed.

SOURCE FOR SCREENING VALUES (SEE ALSO TABLE 3

Vegetation	Mineral tolerance of animals, second revised edition, 2005 National Research Council, published by the national academics press, WA DC, pp. 13-14.

TRIPLICATE RESULT

"Primary" indicates locations where only one sample was collected from a given location. "Triplicate" indicates locations where a total of three samples were collected from a given location for the purpose of quality assurance. The average value for triplicate samples is calculated as follows: (a) the mean of three detected values, (b) the mean of two detected values if result of one triplicate is not detected, (c) the detected value if results of two triplicates are not detected, or (d) less than the highest method detection limit if all triplicate results are not detected.

TABLE 3-38 ENOCH VALLEY MINE 2004 SEASONAL VEGETATION SELENIUM CONCENTRATIONS (mg/kg dw)							
Station Name	**Station ID**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**
Enoch Valley Mine Waste Dump	MWD091	25	10	1.3	8.1	0.80	3.1
Notes: Non-detected concentrations are presented as one-half the MDL. The MDL was 0.5 mg/kg dw.							

TABLE 3-39 ENOCH VALLEY MINE 2009 GRASS/FORB SAMPLING CONCENTRATION RANGES AND SCREENING LEVEL EXCEEDANCES (mg/kg dw)[1]						
Analyte	**SL**	**Background (n=7)**	**Waste Rock Dumps (n=30)**	**[n] > SL**	**Active Facilities (n=7)**	**[n] > SL**
Selenium	5	0.36-0.64	0.56-71.1	11	0.39-16.0	2
Molybdenum	5	1.46U-3.63	1.48U-33.9	15	1.48U-10.6	2
Notes: n - total number of samples [n] - sample concentration SL - screening level 1 - Triplicate samples are treated as a single sample as described in Appendix A. Shaded results indicate those which ranges contain exceedances of the screening level.						

TABLE 3-40

ENOCH VALLEY MINE - SUMMARY OF SURFACE WATER EXCEEDANCES
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Location:	MDS025		MDS025		MDS025		MDS025		MDS025		MDS025		MDS025		MDS025	
Location Type:	Dump Seep		Dump Seep		Dump Seep		Dump Seep		Dump Seep		Dump Seep		Dump Seep		Dump Seep	
Sample ID:	051504SWMDS025-0-F		051504SWMDS025-0-U		050706GWMDS025-0-F		050706GWMDS025-0-U		050607SWMDS025-0-U		0905SWMDS025-F		0905SWMDS025-U		0905GWMDS025-F	
Collection Date:	5/14/2004		5/14/2004		5/7/2006		5/7/2006		5/6/2007		5/9/2009		5/9/2009		5/31/2009	
Sample Type:	Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Surface Water		Surface Water		Groundwater	
	Primary		Primary		Primary		Primary		Primary		Primary		Primary		Primary	
	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL
Total Metals (mg/L)																
Aluminum	NS		NS		NS		NS		<0.03 UK	0.087	NS		NS		NS	
Barium	NS		NS		NS		NS		NS		NS		NS		NS	
Beryllium	NS		NS		NS		NS		NS		NS		NS		NS	
Boron	NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium	NS		NS		NS		**0.0029 K**		NS		NS		NS		NS	
Cobalt	NS		NS		NS		NS		NS		NS		NS		NS	
Copper, total	NS		NS		NS		NS		NS		NS		NS		NS	
Iron	NS		NS		NS		NS		NS		NS		NS		NS	
Molybdenum	NS		NS		NS		NS		NS		NS		NS		NS	
Nickel	NS		NS		NS		**0.0321 K**		NS		NS		NS		NS	
Selenium	NS		**0.016**	0.005	NS		**1.74**	0.005	**0.056**	0.005	NS		**0.0815**	0.005	NS	
Silver	NS		NS		NS		NS		NS		NS		NS		NS	
Thallium	NS		NS		NS		NS		NS		NS		NS		NS	
Vanadium	NS		NS		NS		**0.106 K**	0.02	NS		NS		NS		NS	
Zinc	NS		NS		NS		**0.044 K**		NS		NS		NS		NS	
Dissolved Metals (mg/L)																
Aluminum, dissolved	NS		NS		<0.03 UK	0.087	NS		NS		NS		NS		NS	
Barium, dissolved	NS		NS		<0.003 UK	0.003	NS		NS		NS		NS		NS	
Beryllium, dissolved	NS		NS		<0.002 UK	0.0006	NS		NS		NS		NS		NS	
Boron, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium, dissolved	**0.0005 K**	0.00127	NS		**0.0012 K**	0.000961	NS		<0.0002 UK	0.00127	**0.000467 J**	0.00127	NS		**0.000297 J**	0.00127
Cobalt, dissolved	NS		NS		<0.01 UK	0.003	NS		NS		NS		NS		NS	
Copper, dissolved	NS		NS		<0.01 UK	0.0246	NS		NS		NS		NS		NS	
Iron, dissolved	NS		NS		<0.02 UK	0.158	NS		NS		**0.562**	0.158	NS		NS	
Molybdenum, dissolved	NS		NS		**0.02 JK**	0.034	NS		NS		NS		NS		NS	
Nickel, dissolved	**0.187 K**	0.168	NS		**0.0189 K**	0.112	NS		**0.183 K**	0.168	NS		NS		NS	
Selenium, dissolved	**0.013**	0.005	NS		**1.52**	0.005	NS		NS		NS		NS		NS	
Silver, dissolved	NS		NS		<0.01 UJK	0.00036	NS		NS		NS		NS		NS	
Thallium, dissolved	NS		NS		<0.0001 UK	0.00003	NS		NS		NS		NS		NS	
Vanadium, dissolved	**0.00106 K**	0.02	NS		**0.0748 K**	0.02	NS		**0.0052 K**	0.02	<0.00500	0.02	NS		NS	
Zinc, dissolved	**0.049 K**	0.382	NS		**0.023 K**	0.254	NS		**0.064 K**	0.382	NS		NS		NS	

TABLE 3-40

ENOCH VALLEY MINE - SUMMARY OF SURFACE WATER EXCEEDANCES
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Location:	MDS025		MDS026		MDS026		MDS026		MDS026		MDS026		MDS026		MDS026	
Location Type:	Dump Seep		Dump Seep		Dump Seep		Dump Seep		Dump Seep		Dump Seep		Dump Seep		Dump Seep	
Sample ID:	0905GWMDS025-U		051704SWMDS026-0-F		051704SWMDS026-0-U		SWMDS026-0-F		SWMDS026-0-U		050706GWMDS026-0-F		050706GWMDS026-0-U		050807SWMDS026-0-F	
Collection Date:	5/31/2009		5/17/2004		5/17/2004		9/12/2004		9/12/2004		5/7/2006		5/7/2006		5/8/2007	
Sample Type:	Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater	
	Primary		Primary		Primary		Primary		Primary		Primary		Primary		Primary	
	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL
Total Metals (mg/L)																
Aluminum	NS		NS		NS		NS		NS		NS		NS		NS	
Barium	NS		NS		NS		NS		NS		NS		NS		NS	
Beryllium	NS		NS		NS		NS		NS		NS		NS		NS	
Boron	NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium	**0.00137**		NS		NS		NS		NS		NS		**0.0399 K**		NS	
Cobalt	NS		NS		NS		NS		NS		NS		NS		NS	
Copper, total	NS		NS		NS		NS		NS		NS		NS		NS	
Iron	NS		NS		NS		NS		NS		NS		NS		NS	
Molybdenum	NS		NS		NS		NS		NS		NS		NS		NS	
Nickel	NS		NS		NS		NS		NS		NS		**0.0527 K**		NS	
Selenium	**0.235**	0.005	NS		**0.43**	0.005	NS		**0.006**	0.005	NS		**0.084**	0.005	NS	
Silver	NS		NS		NS		NS		NS		NS		NS		NS	
Thallium	NS		NS		NS		NS		NS		NS		NS		NS	
Vanadium	**0.00541 J**	0.02	NS		NS		NS		NS		NS		**0.0089 K**	0.02	NS	
Zinc	NS		NS		NS		NS		NS		NS		**0.127 K**		NS	
Dissolved Metals (mg/L)																
Aluminum, dissolved	NS		NS		NS		NS		NS		<0.03 UK	0.087	NS		NS	
Barium, dissolved	NS		NS		NS		NS		NS		**0.03 K**	0.003	NS		NS	
Beryllium, dissolved	NS		NS		NS		NS		NS		<0.002 UK	0.0006	NS		NS	
Boron, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium, dissolved	NS		**0.0017 K**	0.00127	NS		**0.0001 JK**	0.00127	NS		**0.0034 K**	0.00127	NS		**0.0007 K**	0.00127
Cobalt, dissolved	NS		NS		NS		NS		NS		<0.01 UK	0.003	NS		NS	
Copper, dissolved	NS		NS		NS		NS		NS		<0.01 UK	0.0371	NS		NS	
Iron, dissolved	NS		NS		NS		NS		NS		**0.03 JK**	0.158	NS		NS	
Molybdenum, dissolved	NS		NS		NS		NS		NS		<0.01 UK	0.034	NS		NS	
Nickel, dissolved	NS		**0.0135 K**	0.168	NS		**0.0087 K**	0.168	NS		**0.0339 K**	0.168	NS		**0.0224 K**	0.168
Selenium, dissolved	NS		**0.32**	0.005	NS		**0.006**	0.005	NS		**0.054**	0.005	NS		NS	
Silver, dissolved	NS		NS		NS		NS		NS		<0.01 UJK	0.00036	NS		NS	
Thallium, dissolved	NS		NS		NS		NS		NS		<0.0001 UK	0.00003	NS		NS	
Vanadium, dissolved	NS		**0.00336 K**	0.02	NS		**0.00089 K**	0.02	NS		<0.0006 UK	0.02	NS		<0.0002 UK	0.02
Zinc, dissolved	NS		**0.016 K**	0.382	NS		**0.004 JK**	0.382	NS		**0.046 K**	0.382	NS		**0.01 K**	0.382

TABLE 3-40

ENOCH VALLEY MINE - SUMMARY OF SURFACE WATER EXCEEDANCES
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Location:	MDS026		MDS026		MDS026		MDS026		MDS026		MDS026		MDS026		MDS026	
Location Type:	Dump Seep		Dump Seep		Dump Seep		Dump Seep		Dump Seep		Dump Seep		Dump Seep		Dump Seep	
Sample ID:	050807SWMDS026-0-U		091207GWMDS026-0-F		091207GWMDS026-0-U		051608GWMDS026-0-F		051608GWMDS026-0-U		091608GWMDS026-0-F		091608GWMDS026-0-U		0905GWMDS026-1-F	
Collection Date:	5/8/2007		9/12/2007		9/12/2007		5/16/2008		5/16/2008		9/16/2008		9/16/2008		5/29/2009	
Sample Type:	Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater	
	Primary		Primary		Primary		Primary		Primary		Primary		Primary		Triplicate	
	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL
Total Metals (mg/L)																
Aluminum	<0.03 UK	0.087	NS		<0.03 UK	0.087	NS		**0.04 JK**	0.087	NS		**0.0857 J**	0.087	NS	
Barium	NS		NS		**0.023 K**	0.003	NS		**0.029 K**	0.003	NS		NS		NS	
Beryllium	NS		NS		<0.002 UK	0.0006	NS		<0.002 UK	0.0006	NS		NS		NS	
Boron	NS		NS		**0.01 JK**	0.0016	NS		<0.01 UK	0.0016	NS		NS		NS	
Cadmium	NS		NS		<0.0001 UK	0.00127	NS		**0.0096 K**	0.00127	NS		**0.000466 J**		NS	
Cobalt	NS		NS		<0.01 UK	0.003	NS		<0.01 UK	0.003	NS		NS		NS	
Copper, total	NS		NS		<0.01 UK	0.0371	NS		<0.01 UK	0.0371	NS		NS		NS	
Iron	NS		NS		**0.03 JK {J+}**	0.158	NS		**0.29 K**	0.158	NS		**0.321**	0.158	NS	
Molybdenum	NS		NS		<0.01 UK	0.034	NS		<0.01 UK	0.034	NS		NS		NS	
Nickel	NS		NS		**0.0099 K**	0.168	NS		**0.0533 K**	0.168	NS		**0.0109**		NS	
Selenium	**0.157**	0.005	NS		**0.019**	0.005	NS		**0.19**	0.005	NS		**0.019**	0.005	NS	
Silver	NS		NS		<0.01 UK	0.00036	NS		<0.01 UK	0.00036	NS		NS		NS	
Thallium	NS		NS		<0.0002 UK	0.00003	NS		<0.0002 UK	0.00003	NS		NS		NS	
Vanadium	NS		NS		**0.0008 JK**	0.02	NS		**0.005 JK**	0.02	NS		<0.0250	0.02	NS	
Zinc	NS		NS		**0.004 JK**	0.382	NS		**0.04 K**	0.382	NS		**0.0127 J**		NS	
Dissolved Metals (mg/L)																
Aluminum, dissolved	NS		**0.13 JK**	0.087	NS		**0.09 J+K**	0.087	NS		<0.0500	0.087	NS		NS	
Barium, dissolved	NS		**0.026 K**	0.003	NS		**0.025 K**	0.003	NS		NS		NS		NS	
Beryllium, dissolved	NS		<0.002 UK	0.0006	NS		<0.002 UK	0.0006	NS		NS		NS		NS	
Boron, dissolved	NS		<0.01 UK	0.0016	NS		**0.01 JK**	0.0016	NS		NS		NS		NS	
Cadmium, dissolved	NS		**0.0001 JK**	0.00127	NS		**0.0012 K**	0.00127	NS		<0.000125	0.00127	NS		**0.000211 J**	0.00127
Cobalt, dissolved	NS		<0.01 UK	0.003	NS		<0.01 UK	0.003	NS		NS		NS		NS	
Copper, dissolved	NS		<0.01 UK	0.0371	NS		<0.01 UK	0.0371	NS		NS		NS		NS	
Iron, dissolved	NS		**0.03 JK**	0.158	NS		**0.1 K**	0.158	NS		<0.0250	0.158	NS		NS	
Molybdenum, dissolved	NS		<0.01 UK	0.034	NS		**0.01 JK**	0.034	NS		NS		NS		NS	
Nickel, dissolved	NS		**0.0088 K**	0.168	NS		**0.0268 K**	0.168	NS		**0.0106**	0.168	NS		NS	
Selenium, dissolved	NS		**0.019**	0.005	NS		**0.19**	0.005	NS		**0.0161**	0.005	NS		NS	
Silver, dissolved	NS		<0.01 UK	0.00036	NS		<0.01 UJK	0.00036	NS		NS		NS		NS	
Thallium, dissolved	NS		<0.0001 UK	0.00003	NS		<0.0001 UK	0.00003	NS		NS		NS		NS	
Vanadium, dissolved	NS		**0.0008 JK**	0.02	NS		<0.0002 UK	0.02	NS		<0.0250	0.02	NS		NS	
Zinc, dissolved	NS		**0.004 JK**	0.382	NS		**0.027 K**	0.382	NS		**0.0107 J**	0.382	NS		NS	

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ENOCH VALLEY MINE - SUMMARY OF SURFACE WATER EXCEEDANCES
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Location:	MDS026		MDS026		MDS026		MDS026		MDS026		MDS026		MDS026		MDS026	
Location Type:	Dump Seep		Dump Seep		Dump Seep		Dump Seep		Dump Seep		Dump Seep		Dump Seep		Dump Seep	
Sample ID:	0905GWMDS026-1-U		0905GWMDS026-2-F		0905GWMDS026-2-U		0905GWMDS026-3-F		0905GWMDS026-3-U		0905GWMDS026-avg-F		0905GWMDS026-avg-U		0909GWMDS026-1-F	
Collection Date:	5/29/2009		5/29/2009		5/29/2009		5/29/2009		5/29/2009		5/29/2009		5/29/2009		9/22/2009	
Sample Type:	Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater	
	Triplicate		Triplicate		Triplicate		Triplicate		Triplicate		Averaged		Averaged		Triplicate	
	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL
Total Metals (mg/L)																
Aluminum	NS		NS		NS		NS		NS		NS		NS		NS	
Barium	NS		NS		NS		NS		NS		NS		NS		NS	
Beryllium	NS		NS		NS		NS		NS		NS		NS		NS	
Boron	NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium	**0.000626**		NS		**0.000631**		NS		**0.000547**		NS		**0.000601**		NS	
Cobalt	NS		NS		NS		NS		NS		NS		NS		NS	
Copper, total	NS		NS		NS		NS		NS		NS		NS		NS	
Iron	NS		NS		NS		NS		NS		NS		NS		NS	
Molybdenum	NS		NS		NS		NS		NS		NS		NS		NS	
Nickel	NS		NS		NS		NS		NS		NS		NS		NS	
Selenium	**0.195 J**	0.005	NS		**0.190 J**	0.005	NS		**0.199 J**	0.005	NS		**0.195 J**	0.005	NS	
Silver	NS		NS		NS		NS		NS		NS		NS		NS	
Thallium	NS		NS		NS		NS		NS		NS		NS		NS	
Vanadium	<0.00500	0.02	NS		<0.00500	0.02	NS		<0.00500	0.02	NS		<0.00500	0.02	NS	
Zinc	NS		NS		NS		NS		NS		NS		NS		NS	
Dissolved Metals (mg/L)																
Aluminum, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Barium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Beryllium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Boron, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium, dissolved	NS		**0.000228 J**	0.00127	NS		**0.000236 J**	0.00127	NS		**0.000225 J**	0.00127	NS		**0.000208 J**	0.00127
Cobalt, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Copper, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Iron, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Molybdenum, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Nickel, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Selenium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Silver, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Thallium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Vanadium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Zinc, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	

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ENOCH VALLEY MINE - SUMMARY OF SURFACE WATER EXCEEDANCES
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Location:	MDS026		MDS026		MDS026		MDS026		MDS026		MDS026		MDS026		MSG001	
Location Type:	Dump Seep		Dump Seep		Dump Seep		Dump Seep		Dump Seep		Dump Seep		Dump Seep		Spring	
Sample ID:	0909GWMDS026-1-U		0909GWMDS026-2-F		0909GWMDS026-2-U		0909GWMDS026-3-F		0909GWMDS026-3-U		0909GWMDS026-avg-F		0909GWMDS026-avg-U		051904SWMSG001-0-F	
Collection Date:	9/22/2009		9/22/2009		9/22/2009		9/22/2009		9/22/2009		9/22/2009		9/22/2009		5/19/2004	
Sample Type:	Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater	
	Triplicate		Triplicate		Triplicate		Triplicate		Triplicate		Averaged		Averaged		Primary	
	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL
Total Metals (mg/L)																
Aluminum	NS		NS		NS		NS		NS		NS		NS		NS	
Barium	NS		NS		NS		NS		NS		NS		NS		NS	
Beryllium	NS		NS		NS		NS		NS		NS		NS		NS	
Boron	NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium	**0.000251 J**		NS		**0.000315 J**		NS		**0.000239 J**		NS		**0.000268 J**		NS	
Cobalt	NS		NS		NS		NS		NS		NS		NS		NS	
Copper, total	NS		NS		NS		NS		NS		NS		NS		NS	
Iron	NS		NS		NS		NS		NS		NS		NS		NS	
Molybdenum	NS		NS		NS		NS		NS		NS		NS		NS	
Nickel	NS		NS		NS		NS		NS		NS		NS		NS	
Selenium	**0.108**	0.005	NS		**0.116 J**	0.005	NS		**0.0904**	0.005	NS		**0.105 J**	0.005	NS	
Silver	NS		NS		NS		NS		NS		NS		NS		NS	
Thallium	NS		NS		NS		NS		NS		NS		NS		NS	
Vanadium	**0.031**	0.02	NS		**0.0295**	0.02	NS		**0.0303**	0.02	NS		**0.0303**	0.02	NS	
Zinc	NS		NS		NS		NS		NS		NS		NS		NS	
Dissolved Metals (mg/L)																
Aluminum, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Barium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Beryllium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Boron, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium, dissolved	NS		**0.000219 J**	0.00127	NS		**0.000184 J**	0.00127	NS		**0.000204 J**	0.00127	NS		<0.0002 UK	0.000892
Cobalt, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Copper, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Iron, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Molybdenum, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Nickel, dissolved	NS		NS		NS		NS		NS		NS		NS		**0.0005 JK**	0.100
Selenium, dissolved	NS		NS		NS		NS		NS		NS		NS		<0.001	0.005
Silver, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Thallium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Vanadium, dissolved	NS		NS		NS		NS		NS		NS		NS		<0.0002 UK	0.02
Zinc, dissolved	NS		NS		NS		NS		NS		NS		NS		<0.004 UK	0.228

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ENOCH VALLEY MINE - SUMMARY OF SURFACE WATER EXCEEDANCES
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Location:	MSG001		MSG001		MSG001		MSG001		MSG001		MSG001		MSG001		MSG001	
Location Type:	Spring		Spring		Spring		Spring		Spring		Spring		Spring		Spring	
Sample ID:	051904SWMSG001-0-U		SWMSG001-1-F		SWMSG001-1-U		SWMSG001-2-F		SWMSG001-2-U		SWMSG001-3-F		SWMSG001-3-U		SWMSG001-avg-F	
Collection Date:	5/19/2004		9/11/2004		9/11/2004		9/11/2004		9/11/2004		9/11/2004		9/11/2004		9/11/2004	
Sample Type:	Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater	
	Primary		Triplicate		Triplicate		Triplicate		Triplicate		Triplicate		Triplicate		Averaged	
	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL
Total Metals (mg/L)																
Aluminum	NS		NS		NS		NS		NS		NS		NS		NS	
Barium	NS		NS		NS		NS		NS		NS		NS		NS	
Beryllium	NS		NS		NS		NS		NS		NS		NS		NS	
Boron	NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium	NS		NS		NS		NS		NS		NS		NS		NS	
Cobalt	NS		NS		NS		NS		NS		NS		NS		NS	
Copper, total	NS		NS		NS		NS		NS		NS		NS		NS	
Iron	NS		NS		NS		NS		NS		NS		NS		NS	
Molybdenum	NS		NS		NS		NS		NS		NS		NS		NS	
Nickel	NS		NS		NS		NS		NS		NS		NS		NS	
Selenium	<0.001	0.005	NS		<0.001	0.005	NS		<0.001	0.005	NS		<0.001	0.005	NS	
Silver	NS		NS		NS		NS		NS		NS		NS		NS	
Thallium	NS		NS		NS		NS		NS		NS		NS		NS	
Vanadium	NS		NS		NS		NS		NS		NS		NS		NS	
Zinc	NS		NS		NS		NS		NS		NS		NS		NS	
Dissolved Metals (mg/L)																
Aluminum, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Barium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Beryllium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Boron, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium, dissolved	NS		<0.0001 UK	0.000883	NS		<0.0001 UK	0.000886	NS		<0.0001 UK	0.000885	NS		<0.0001 UK	0.000885
Cobalt, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Copper, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Iron, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Molybdenum, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Nickel, dissolved	NS		**0.0021 K**	0.0988	NS		**0.0019 K**	0.0993	NS		**0.002 K**	0.0990	NS		**0.002 K**	0.0990
Selenium, dissolved	NS		**0.002 J**	0.005	NS		<0.001	0.005	NS		<0.001	0.005	NS		**0.002 J**	0.005
Silver, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Thallium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Vanadium, dissolved	NS		<0.00005 UK	0.02	NS		<0.00005 UK	0.02	NS		<0.00005 UK	0.02	NS		<0.00005 UK	0.02
Zinc, dissolved	NS		<0.002 UK	0.225	NS		<0.002 UK	0.226	NS		<0.002 UK	0.225	NS		<0.002 UK	0.225

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ENOCH VALLEY MINE - SUMMARY OF SURFACE WATER EXCEEDANCES
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Location:	MSG001		MSG001		MSG001		MSG001		MSG001		MSG001		MSG001		MSG001	
Location Type:	Spring		Spring		Spring		Spring		Spring		Spring		Spring		Spring	
Sample ID:	SWMSG001-avg-U		050906GWMSG001-0-F		050906GWMSG001-0-U		050707SWMSG001-1-F		050707SWMSG001-1-U		050707SWMSG001-2-F		050707SWMSG001-2-U		050707SWMSG001-3-F	
Collection Date:	9/11/2004		5/9/2006		5/9/2006		5/7/2007		5/7/2007		5/7/2007		5/7/2007		5/7/2007	
Sample Type:	Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater	
	Averaged		Primary		Primary		Triplicate		Triplicate		Triplicate		Triplicate		Triplicate	
	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL
Total Metals (mg/L)																
Aluminum	NS		NS		NS		NS		<0.03 UK	0.087	NS		<0.03 UK	0.087	NS	
Barium	NS		NS		NS		NS		NS		NS		NS		NS	
Beryllium	NS		NS		NS		NS		NS		NS		NS		NS	
Boron	NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium	NS		NS		<0.0001 UK		NS		NS		NS		NS		NS	
Cobalt	NS		NS		NS		NS		NS		NS		NS		NS	
Copper, total	NS		NS		NS		NS		NS		NS		NS		NS	
Iron	NS		NS		NS		NS		NS		NS		NS		NS	
Molybdenum	NS		NS		NS		NS		NS		NS		NS		NS	
Nickel	NS		NS		<0.0006 UK		NS		NS		NS		NS		NS	
Selenium	<0.001	0.005	NS		<0.001	0.005	NS		**0.002 J**	0.005	NS		**0.002 J**	0.005	NS	
Silver	NS		NS		NS		NS		NS		NS		NS		NS	
Thallium	NS		NS		NS		NS		NS		NS		NS		NS	
Vanadium	NS		NS		<0.0002 UK	0.02	NS		NS		NS		NS		NS	
Zinc	NS		NS		<0.002 UK		NS		NS		NS		NS		NS	
Dissolved Metals (mg/L)																
Aluminum, dissolved	NS		<0.03 UK	0.087	NS		NS		NS		NS		NS		NS	
Barium, dissolved	NS		**0.126 K**	0.003	NS		NS		NS		NS		NS		NS	
Beryllium, dissolved	NS		<0.002 UK	0.0006	NS		NS		NS		NS		NS		NS	
Boron, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium, dissolved	NS		<0.0001 UK	0.000863	NS		<0.0001 UK	0.000913	NS		<0.0001 UK	0.000915	NS		<0.0001 UK	0.000910
Cobalt, dissolved	NS		<0.01 UK	0.003	NS		NS		NS		NS		NS		NS	
Copper, dissolved	NS		<0.01 UK	0.0210	NS		NS		NS		NS		NS		NS	
Iron, dissolved	NS		<0.02 UK	0.158	NS		NS		NS		NS		NS		NS	
Molybdenum, dissolved	NS		<0.01 UK	0.034	NS		NS		NS		NS		NS		NS	
Nickel, dissolved	NS		<0.0006 UK	0.0955	NS		<0.0006 UK	0.104	NS		<0.0006 UK	0.104	NS		<0.0006 UK	0.103
Selenium, dissolved	NS		<0.001	0.005	NS		NS		NS		NS		NS		NS	
Silver, dissolved	NS		<0.01 UJK	0.00036	NS		NS		NS		NS		NS		NS	
Thallium, dissolved	NS		<0.0001 UK	0.00003	NS		NS		NS		NS		NS		NS	
Vanadium, dissolved	NS		<0.0002 UK	0.02	NS		<0.0002 UK	0.02	NS		**0.0002 JK**	0.02	NS		**0.0002 JK**	0.02
Zinc, dissolved	NS		<0.002 UK	0.217	NS		**0.003 JK**	0.236	NS		<0.002 UK	0.237	NS		<0.002 UK	0.235

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ENOCH VALLEY MINE - SUMMARY OF SURFACE WATER EXCEEDANCES
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Location:	MSG001		MSG001		MSG001		MSG001		MSG001		MSG001		MSG001		MSG001	
Location Type:	Spring		Spring		Spring		Spring		Spring		Spring		Spring		Spring	
Sample ID:	050707SWMSG001-3-U		050707SWMSG001-avg-F		050707SWMSG001-avg-U		091107GWMSG001-0-F		091107GWMSG001-0-U		051608GWMSG001-0-F		051608GWMSG001-0-U		092108GWMSG001-0-F	
Collection Date:	5/7/2007		5/7/2007		5/7/2007		9/11/2007		9/11/2007		5/16/2008		5/16/2008		9/21/2008	
Sample Type:	Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater	
	Triplicate		Averaged		Averaged		Primary		Primary		Primary		Primary		Primary	
	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL
Total Metals (mg/L)																
Aluminum	<0.03 UK	0.087	NS		<0.03 UK	0.087	NS		<0.03 UK	0.087	NS		**0.04 JK**	0.087	NS	
Barium	NS		NS		NS		NS		**0.138 K**	0.003	NS		**0.134 K**	0.003	NS	
Beryllium	NS		NS		NS		NS		<0.002 UK	0.0006	NS		<0.002 UK	0.0006	NS	
Boron	NS		NS		NS		NS		**0.01 JK**	0.0016	NS		**0.02 JK**	0.0016	NS	
Cadmium	NS		NS		NS		NS		<0.0001 UK	0.000888	NS		<0.0001 UK	0.000903	NS	
Cobalt	NS		NS		NS		NS		<0.01 UK	0.003	NS		<0.01 UK	0.003	NS	
Copper, total	NS		NS		NS		NS		<0.01 UK	0.0219	NS		<0.01 UK	0.0224	NS	
Iron	NS		NS		NS		NS		<0.02 UK	0.158	NS		<0.02 UK	0.158	NS	
Molybdenum	NS		NS		NS		NS		<0.01 UK	0.034	NS		<0.01 UK	0.034	NS	
Nickel	NS		NS		NS		NS		**0.0011 JK**	0.0995	NS		**0.0007 JK**	0.102	NS	
Selenium	**0.002 J**	0.005	NS		**0.002 J**	0.005	NS		**0.001 J**	0.005	NS		**0.002 J**	0.005	NS	
Silver	NS		NS		NS		NS		<0.01 UK	0.00036	NS		<0.01 UK	0.00036	NS	
Thallium	NS		NS		NS		NS		<0.0001 UK	0.00003	NS		<0.0001 UK	0.00003	NS	
Vanadium	NS		NS		NS		NS		**0.0003 JK**	0.02	NS		**0.0002 JK**	0.02	NS	
Zinc	NS		NS		NS		NS		<0.002 UK	0.226	NS		<0.002 UK	0.232	NS	
Dissolved Metals (mg/L)																
Aluminum, dissolved	NS		NS		NS		<0.03 UK	0.087	NS		<0.03 UK	0.087	NS		<0.0500	0.087
Barium, dissolved	NS		NS		NS		**0.14 K**	0.003	NS		**0.13 K**	0.003	NS		NS	
Beryllium, dissolved	NS		NS		NS		<0.002 UK	0.0006	NS		<0.002 UK	0.0006	NS		NS	
Boron, dissolved	NS		NS		NS		**0.02 JK**	0.0016	NS		<0.01 UK	0.0016	NS		NS	
Cadmium, dissolved	NS		<0.0001 UK	0.000913	NS		<0.0001 UK	0.000917	NS		<0.0001 UK	0.000880	NS		<0.000125	0.000877
Cobalt, dissolved	NS		NS		NS		<0.01 UK	0.003	NS		<0.01 UK	0.003	NS		NS	
Copper, dissolved	NS		NS		NS		<0.01 UK	0.0230	NS		<0.01 UK	0.0216	NS		NS	
Iron, dissolved	NS		NS		NS		<0.02 UK	0.158	NS		<0.02 UK	0.158	NS		<0.0250	0.158
Molybdenum, dissolved	NS		NS		NS		<0.01 UK	0.034	NS		<0.01 UK	0.034	NS		NS	
Nickel, dissolved	NS		<0.0006 UK	0.104	NS		**0.001 JK**	0.104	NS		**0.002 JK**	0.0982	NS		**0.00185 J**	0.0978
Selenium, dissolved	NS		NS		NS		<0.001	0.005	NS		**0.001 J**	0.005	NS		**0.00199**	0.005
Silver, dissolved	NS		NS		NS		<0.01 UK	0.00036	NS		<0.01 UK	0.00036	NS		NS	
Thallium, dissolved	NS		NS		NS		<0.0001 UK	0.00003	NS		<0.0001 UK	0.00003	NS		NS	
Vanadium, dissolved	NS		**0.0002 JK**	0.02	NS		**0.0003 JK**	0.02	NS		<0.0002 UK	0.02	NS		<0.00500	0.02
Zinc, dissolved	NS		**0.003 JK**	0.236	NS		<0.002 UK	0.238	NS		<0.002 UK	0.223	NS		<0.00500	0.222

TABLE 3-40

ENOCH VALLEY MINE - SUMMARY OF SURFACE WATER EXCEEDANCES
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Location:	MSG001		MSP017		MSP017		MSP017		MSP017		MSP017		MSP017		MSP017	
Location Type:	Spring		Pond		Pond		Pond		Pond		Pond		Pond		Pond	
Sample ID:	092108GWMSG001-0-U		051704SWMSP017-1-F		051704SWMSP017-1-U		051704SWMSP017-2-F		051704SWMSP017-2-U		051704SWMSP017-3-F		051704SWMSP017-3-U		051704SWMSP017-avg-F	
Collection Date:	9/21/2008		5/17/2004		5/17/2004		5/17/2004		5/17/2004		5/17/2004		5/17/2004		5/17/2004	
Sample Type:	Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater	
	Primary		Triplicate		Triplicate		Triplicate		Triplicate		Triplicate		Triplicate		Averaged	
	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL
Total Metals (mg/L)																
Aluminum	<0.0500	0.087	NS		NS		NS		NS		NS		NS		NS	
Barium	NS		NS		NS		NS		NS		NS		NS		NS	
Beryllium	NS		NS		NS		NS		NS		NS		NS		NS	
Boron	NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium	<0.000125		NS		NS		NS		NS		NS		NS		NS	
Cobalt	NS		NS		NS		NS		NS		NS		NS		NS	
Copper, total	NS		NS		NS		NS		NS		NS		NS		NS	
Iron	<0.0250	0.158	NS		NS		NS		NS		NS		NS		NS	
Molybdenum	NS		NS		NS		NS		NS		NS		NS		NS	
Nickel	**0.00183 J**		NS		NS		NS		NS		NS		NS		NS	
Selenium	**0.00240**	0.005	NS		**0.49**	0.005	NS		**0.53**	0.005	NS		**0.54**	0.005	NS	
Silver	NS		NS		NS		NS		NS		NS		NS		NS	
Thallium	NS		NS		NS		NS		NS		NS		NS		NS	
Vanadium	<0.00500	0.02	NS		NS		NS		NS		NS		NS		NS	
Zinc	<0.00500		NS		NS		NS		NS		NS		NS		NS	
Dissolved Metals (mg/L)																
Aluminum, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Barium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Beryllium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Boron, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium, dissolved	NS		**0.0003 JK**	0.00127	NS		**0.0003 J-K**	0.00127	NS		**0.0003 JK**	0.00127	NS		**0.0003 JK**	0.00127
Cobalt, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Copper, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Iron, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Molybdenum, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Nickel, dissolved	NS		**0.0121 K**	0.168	NS		**0.012 J-K**	0.168	NS		**0.0109 K**	0.168	NS		**0.0117 J-K**	0.168
Selenium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Silver, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Thallium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Vanadium, dissolved	NS		**0.00257 K**	0.02	NS		**0.00247 J-K**	0.02	NS		**0.00251 K**	0.02	NS		**0.00252 J-K**	0.02
Zinc, dissolved	NS		**0.012 K**	0.382	NS		**0.012 J-K**	0.382	NS		**0.012 K**	0.382	NS		**0.012 J-K**	0.382

TABLE 3-40

ENOCH VALLEY MINE - SUMMARY OF SURFACE WATER EXCEEDANCES
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Location:	MSP017		MSP017		MSP017		MSP017		MSP017		MSP017		MSP017		MSP017	
Location Type:	Pond		Pond		Pond		Pond		Pond		Pond		Pond		Pond	
Sample ID:	051704SWMSP017-avg-U		050606SWMSP017-0-F		050606SWMSP017-0-U		050607SWMSP017-0-F		050607SWMSP017-0-U		091207GWMSP017-0-F		091207GWMSP017-0-U		051608GWMSP017-0-F	
Collection Date:	5/17/2004		5/6/2006		5/6/2006		5/6/2007		5/6/2007		9/12/2007		9/12/2007		5/16/2008	
Sample Type:	Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater	
	Averaged		Primary		Primary		Primary		Primary		Primary		Primary		Primary	
	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL
Total Metals (mg/L)																
Aluminum	NS		NS		NS		NS		**0.07 JK**	0.087	NS		<0.03 UK	0.087	NS	
Barium	NS		NS		NS		NS		NS		NS		**0.012 JK**	0.003	NS	
Beryllium	NS		NS		NS		NS		NS		NS		<0.002 UK	0.0006	NS	
Boron	NS		NS		NS		NS		NS		NS		<0.01 UK	0.0016	NS	
Cadmium	NS		NS		NS		NS		NS		NS		<0.0002 UK	0.00127	NS	
Cobalt	NS		NS		NS		NS		NS		NS		<0.01 UK	0.003	NS	
Copper, total	NS		NS		NS		NS		NS		NS		<0.01 UK	0.0371	NS	
Iron	NS		NS		NS		NS		NS		NS		**0.03 JK {J+}**	0.158	NS	
Molybdenum	NS		NS		NS		NS		NS		NS		<0.01 UK	0.034	NS	
Nickel	NS		NS		NS		NS		NS		NS		**0.0107 K**	0.168	NS	
Selenium	**0.52**	0.005	NS		**0.37**	0.005	NS		**1.09**	0.005	NS		**0.031**	0.005	NS	
Silver	NS		NS		NS		NS		NS		NS		<0.01 UK	0.00036	NS	
Thallium	NS		NS		NS		NS		NS		NS		<0.0004 UK	0.00003	NS	
Vanadium	NS		NS		NS		NS		NS		NS		**0.004 K**	0.02	NS	
Zinc	NS		NS		NS		NS		NS		NS		**0.005 JK**	0.382	NS	
Dissolved Metals (mg/L)																
Aluminum, dissolved	NS		<0.03 UK	0.087	NS		NS		NS		**0.07 JK**	0.087	NS		<0.03 UK	0.087
Barium, dissolved	NS		**0.016 K**	0.003	NS		NS		NS		**0.019 JK**	0.003	NS		**0.013 JK**	0.003
Beryllium, dissolved	NS		<0.002 UK	0.0006	NS		NS		NS		<0.002 UK	0.0006	NS		<0.002 UK	0.0006
Boron, dissolved	NS		NS		NS		NS		NS		<0.01 UK	0.0016	NS		**0.01 JK**	0.0016
Cadmium, dissolved	NS		**0.0014 K**	0.00109	NS		<0.0001 UK	0.00127	NS		**0.0001 JK**	0.00127	NS		**0.0008 K**	0.00127
Cobalt, dissolved	NS		<0.01 UK	0.003	NS		NS		NS		**0.03 JK**	0.003	NS		<0.01 UK	0.003
Copper, dissolved	NS		<0.01 UK	0.0297	NS		NS		NS		<0.01 UK	0.0371	NS		<0.01 UK	0.0371
Iron, dissolved	NS		<0.02 UK	0.158	NS		NS		NS		<0.02 UK	0.158	NS		**0.02 JK**	0.158
Molybdenum, dissolved	NS		<0.01 UK	0.034	NS		NS		NS		**0.01 JK**	0.034	NS		<0.01 UK	0.034
Nickel, dissolved	NS		**0.0302 K**	0.135	NS		**0.0202 K**	0.168	NS		**0.0109 K**	0.168	NS		**0.0199 K**	0.168
Selenium, dissolved	NS		NS		NS		NS		NS		**0.03**	0.005	NS		**1.06 J-**	0.005
Silver, dissolved	NS		<0.01 UJK	0.00036	NS		NS		NS		<0.01 UK	0.00036	NS		<0.01 UK	0.00036
Thallium, dissolved	NS		<0.0001 UK	0.00003	NS		NS		NS		<0.0002 UK	0.00003	NS		<0.0001 UK	0.00003
Vanadium, dissolved	NS		**0.0073 K**	0.02	NS		**0.0016 K**	0.02	NS		**0.0039 K**	0.02	NS		**0.0045 K**	0.02
Zinc, dissolved	NS		**0.089 K**	0.306	NS		**0.014 K**	0.382	NS		<0.002 UK	0.382	NS		**0.058 K**	0.382

TABLE 3-40

ENOCH VALLEY MINE - SUMMARY OF SURFACE WATER EXCEEDANCES
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Location:	MSP017		MSP017		MSP017		MSP018		MSP018		MSP018		MSP018		MSP018	
Location Type:	Pond		Pond		Pond		Pond		Pond		Pond		Pond		Pond	
Sample ID:	051608GWMSP017-0-U		091608GWMSP017-0-F		091608GWMSP017-0-U		051204SWMSP018-0-F		051204SWMSP018-0-U		050606SWMSP018-0-F		050606SWMSP018-0-U		050807SWMSP018-0-F	
Collection Date:	5/16/2008		9/16/2008		9/16/2008		5/11/2004		5/11/2004		5/6/2006		5/6/2006		5/8/2007	
Sample Type:	Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater	
	Primary		Primary		Primary		Primary		Primary		Primary		Primary		Primary	
	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL
Total Metals (mg/L)																
Aluminum	**0.08 JK**	0.087	NS		<0.0500	0.087	NS		NS		NS		NS		NS	
Barium	**0.014 JK**	0.003	NS		NS		NS		NS		NS		NS		NS	
Beryllium	<0.002 UK	0.0006	NS		NS		NS		NS		NS		NS		NS	
Boron	<0.01 UK	0.0016	NS		NS		NS		NS		NS		NS		NS	
Cadmium	**0.001 K**	0.00127	NS		<0.000625		NS		NS		NS		NS		NS	
Cobalt	<0.01 UK	0.003	NS		NS		NS		NS		NS		NS		NS	
Copper, total	<0.01 UK	0.0371	NS		NS		NS		NS		NS		NS		NS	
Iron	**0.06 K**	0.158	NS		**0.108**	0.158	NS		NS		NS		NS		NS	
Molybdenum	<0.01 UK	0.034	NS		NS		NS		NS		NS		NS		NS	
Nickel	**0.0201 K**	0.168	NS		**0.0132 J**		NS		NS		NS		NS		NS	
Selenium	**0.98**	0.005	NS		**0.0783**	0.005	NS		**0.43**	0.005	NS		**0.4**	0.005	NS	
Silver	<0.01 UK	0.00036	NS		NS		NS		NS		NS		NS		NS	
Thallium	<0.0001 UK	0.00003	NS		NS		NS		NS		NS		NS		NS	
Vanadium	**0.0046 K**	0.02	NS		<0.0250	0.02	NS		NS		NS		NS		NS	
Zinc	**0.066 K**	0.382	NS		<0.0250		NS		NS		NS		NS		NS	
Dissolved Metals (mg/L)																
Aluminum, dissolved	NS		<0.0500	0.087	NS		NS		NS		**0.91 K**	0.087	NS		NS	
Barium, dissolved	NS		NS		NS		NS		NS		**0.013 K**	0.003	NS		NS	
Beryllium, dissolved	NS		NS		NS		NS		NS		<0.002 UK	0.0006	NS		NS	
Boron, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium, dissolved	NS		<0.000625	0.00127	NS		**0.0743 K**	0.00127	NS		**0.125 K**	0.00127	NS		**0.0269 K**	0.00127
Cobalt, dissolved	NS		NS		NS		NS		NS		**0.03 JK**	0.003	NS		NS	
Copper, dissolved	NS		NS		NS		NS		NS		<0.01 UK	0.0371	NS		NS	
Iron, dissolved	NS		<0.0250	0.158	NS		NS		NS		<0.02 UK	0.158	NS		NS	
Molybdenum, dissolved	NS		NS		NS		NS		NS		**0.02 JK**	0.034	NS		NS	
Nickel, dissolved	NS		**0.0141 J**	0.168	NS		**1.85 K**	0.168	NS		**2.17 K**	0.168	NS		**1.78 K**	0.168
Selenium, dissolved	NS		**0.0762**	0.005	NS		NS		NS		NS		NS		NS	
Silver, dissolved	NS		NS		NS		NS		NS		<0.01 UJK	0.00036	NS		NS	
Thallium, dissolved	NS		NS		NS		NS		NS		**0.0013 K**	0.00003	NS		NS	
Vanadium, dissolved	NS		<0.0250	0.02	NS		**0.0862 K**	0.02	NS		**0.125 K**	0.02	NS		**0.0892 K**	0.02
Zinc, dissolved	NS		<0.0250	0.382	NS		**7.19 K**	0.382	NS		**10.2 K**	0.382	NS		**5.75 K**	0.382

TABLE 3-40

ENOCH VALLEY MINE - SUMMARY OF SURFACE WATER EXCEEDANCES
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Location:	MSP018		MSP018		MSP018		MSG004		MSP018		MSP018		MSP018		MSP019	
Location Type:	Pond		Pond		Pond		Pond		Pond		Pond		Pond		Pond	
Sample ID:	050807SWMSP018-0-U		091107GWMSP018-0-F		091107GWMSP018-0-U		051408GWMSP018-0-F		051408GWMSP018-0-U		091608GWMSP018-0-F		091608GWMSP018-0-U		051204SWMSP019-0-F	
Collection Date:	5/8/2007		9/11/2007		9/11/2007		5/14/2008		5/14/2008		9/16/2008		9/16/2008		5/11/2004	
Sample Type:	Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater	
	Primary		Primary		Primary		Primary		Primary		Primary		Primary		Primary	
	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL
Total Metals (mg/L)																
Aluminum	**0.28 K**	0.087	NS		**0.07 JK**	0.087	NS		**0.31 K**	0.087	NS		<0.0500	0.087	NS	
Barium	NS		NS		**0.019 JK**	0.003	NS		**0.014 JK**	0.003	NS		NS		NS	
Beryllium	NS		NS		<0.002 UK	0.0006	NS		<0.002 UK	0.0006	NS		NS		NS	
Boron	NS		NS		**0.03 JK**	0.0016	NS		**0.02 JK**	0.0016	NS		NS		NS	
Cadmium	NS		NS		**0.004 K**	0.00127	NS		**0.085 K**	0.00127	NS		**0.0145**		NS	
Cobalt	NS		NS		<0.01 UK	0.003	NS		<0.01 UK	0.003	NS		NS		NS	
Copper, total	NS		NS		<0.01 UK	0.0371	NS		<0.01 UK	0.0371	NS		NS		NS	
Iron	NS		NS		**0.06 K**	0.158	NS		**0.05 K**	0.158	NS		<0.0250	0.158	NS	
Molybdenum	NS		NS		**0.01 JK**	0.034	NS		**0.03 JK**	0.034	NS		NS		NS	
Nickel	NS		NS		**0.278 K**	0.168	NS		**1.37 K**	0.168	NS		**0.612**		NS	
Selenium	**0.53**	0.005	NS		**0.022**	0.005	NS		**0.61**	0.005	NS		**0.167**	0.005	NS	
Silver	NS		NS		<0.01 UK	0.00036	NS		<0.01 UK	0.00036	NS		NS		NS	
Thallium	NS		NS		<0.0001 UK	0.00003	NS		**0.0008 K**	0.00003	NS		NS		NS	
Vanadium	NS		NS		**0.0203 K**	0.02	NS		**0.106 K**	0.02	NS		**0.0192**	0.02	NS	
Zinc	NS		NS		**0.243 K**	0.382	NS		**5.99 K**	0.382	NS		**1.03**		NS	
Dissolved Metals (mg/L)																
Aluminum, dissolved	NS		**0.24 JK**	0.087	NS		**0.13 JK**	0.087	NS		<0.0500	0.087	NS		NS	
Barium, dissolved	NS		**0.018 JK**	0.003	NS		**0.014 JK**	0.003	NS		NS		NS		NS	
Beryllium, dissolved	NS		<0.004 UK	0.0006	NS		<0.002 UK	0.0006	NS		NS		NS		NS	
Boron, dissolved	NS		<0.02 UK	0.0016	NS		**0.01 JK**	0.0016	NS		NS		NS		NS	
Cadmium, dissolved	NS		**0.0006 JK**	0.00127	NS		**0.0714 K**	0.00127	NS		<0.000625	0.00127	NS		**0.0001 JK**	0.00109
Cobalt, dissolved	NS		<0.02 UK	0.003	NS		<0.01 UK	0.003	NS		NS		NS		NS	
Copper, dissolved	NS		<0.02 UK	0.0371	NS		<0.01 UK	0.0371	NS		NS		NS		NS	
Iron, dissolved	NS		<0.04 UK	0.158	NS		<0.02 UK	0.158	NS		<0.0250	0.158	NS		NS	
Molybdenum, dissolved	NS		**0.03 JK**	0.034	NS		**0.04 JK**	0.034	NS		NS		NS		NS	
Nickel, dissolved	NS		**0.273 K**	0.168	NS		**1.4 K**	0.168	NS		**0.614**	0.168	NS		**0.018 K**	0.134
Selenium, dissolved	NS		**0.029**	0.005	NS		**0.53 J-**	0.005	NS		**0.191**	0.005	NS		NS	
Silver, dissolved	NS		<0.02 UK	0.00036	NS		<0.01 UJK	0.00036	NS		NS		NS		NS	
Thallium, dissolved	NS		<0.0004 UK	0.00003	NS		**0.0009 K**	0.00003	NS		NS		NS		NS	
Vanadium, dissolved	NS		**0.0194 K**	0.02	NS		**0.113 K**	0.02	NS		**0.0140**	0.02	NS		**0.0178 K**	0.02
Zinc, dissolved	NS		**0.137 K**	0.382	NS		**5.94 K**	0.382	NS		**0.814**	0.382	NS		**0.006 JK**	0.305

TABLE 3-40

ENOCH VALLEY MINE - SUMMARY OF SURFACE WATER EXCEEDANCES
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Location:	MSP019		MSP019		MSP019		MSP019		MSP019		MSP019		MSP019		MSP019	
Location Type:	Pond		Pond		Pond		Pond		Pond		Pond		Pond		Pond	
Sample ID:	051204SWMSP019-0-U		050606SWMSP019-0-F		050606SWMSP019-0-U		050407SWMSP019-0-F		050407SWMSP019-0-U		091107GWMSP019-1-F		091107GWMSP019-1-U		091107GWMSP019-2-F	
Collection Date:	5/11/2004		5/6/2006		5/6/2006		5/6/2007		5/6/2007		9/11/2007		9/11/2007		9/11/2007	
Sample Type:	Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater	
	Primary		Primary		Primary		Primary		Primary		Triplicate		Triplicate		Triplicate	
	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL
Total Metals (mg/L)																
Aluminum	NS		NS		NS		NS		<0.03 UK	0.087	NS		<0.03 UK	0.087	NS	
Barium	NS		NS		NS		NS		NS		NS		**0.009 JK**	0.003	NS	
Beryllium	NS		NS		NS		NS		NS		NS		<0.002 UK	0.0006	NS	
Boron	NS		NS		NS		NS		NS		NS		**0.03 JK**	0.0016	NS	
Cadmium	NS		NS		NS		NS		NS		NS		<0.0001 UK	0.00127	NS	
Cobalt	NS		NS		NS		NS		NS		NS		<0.01 UK	0.003	NS	
Copper, total	NS		NS		NS		NS		NS		NS		<0.01 UK	0.0371	NS	
Iron	NS		NS		NS		NS		NS		NS		**0.14 K**	0.158	NS	
Molybdenum	NS		NS		NS		NS		NS		NS		<0.01 UK	0.034	NS	
Nickel	NS		NS		NS		NS		NS		NS		**0.0138 K**	0.168	NS	
Selenium	**0.049**	0.005	NS		**0.092**	0.005	NS		**0.077**	0.005	NS		**0.009**	0.005	NS	
Silver	NS		NS		NS		NS		NS		NS		<0.01 UK	0.00036	NS	
Thallium	NS		NS		NS		NS		NS		NS		<0.0001 UK	0.00003	NS	
Vanadium	NS		NS		NS		NS		NS		NS		**0.0044 K**	0.02	NS	
Zinc	NS		NS		NS		NS		NS		NS		**0.002 JK**	0.382	NS	
Dissolved Metals (mg/L)																
Aluminum, dissolved	NS		**0.1 JK**	0.087	NS		NS		NS		<0.03 UK	0.087	NS		**0.04 JK**	0.087
Barium, dissolved	NS		**0.02 K**	0.003	NS		NS		NS		**0.012 JK**	0.003	NS		**0.01 JK**	0.003
Beryllium, dissolved	NS		<0.002 UK	0.0006	NS		NS		NS		<0.002 UK	0.0006	NS		<0.002 UK	0.0006
Boron, dissolved	NS		NS		NS		NS		NS		**0.03 JK**	0.0016	NS		**0.02 JK**	0.0016
Cadmium, dissolved	NS		**0.0014 K**	0.000798	NS		<0.0001 UK	0.00126	NS		<0.0001 UK	0.00127	NS		<0.0001 UK	0.00127
Cobalt, dissolved	NS		<0.01 UK	0.003	NS		NS		NS		<0.01 UK	0.003	NS		<0.01 UK	0.003
Copper, dissolved	NS		<0.01 UK	0.0187	NS		NS		NS		<0.01 UK	0.0371	NS		<0.01 UK	0.0371
Iron, dissolved	NS		**0.04 JK**	0.158	NS		NS		NS		**0.02 JK**	0.158	NS		**0.04 JK**	0.158
Molybdenum, dissolved	NS		<0.01 UK	0.034	NS		NS		NS		<0.01 UK	0.034	NS		**0.02 JK**	0.034
Nickel, dissolved	NS		**0.0206 K**	0.0851	NS		**0.0133 K**	0.166	NS		**0.014 K**	0.168	NS		**0.0138 JK**	0.168
Selenium, dissolved	NS		NS		NS		NS		NS		**0.009**	0.005	NS		**0.009**	0.005
Silver, dissolved	NS		<0.01 UJK	0.00036	NS		NS		NS		<0.01 UK	0.00036	NS		<0.01 UK	0.00036
Thallium, dissolved	NS		<0.0001 UK	0.00003	NS		NS		NS		<0.0001 UK	0.00003	NS		<0.0001 UK	0.00003
Vanadium, dissolved	NS		**0.0126 K**	0.02	NS		**0.0095 K**	0.02	NS		**0.0046 K**	0.02	NS		**0.0045 JK**	0.02
Zinc, dissolved	NS		**0.056 K**	0.193	NS		**0.002 JK**	0.377	NS		**0.003 JK**	0.382	NS		<0.002 UK	0.382

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ENOCH VALLEY MINE - SUMMARY OF SURFACE WATER EXCEEDANCES
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Location:	MSP019		MSP019		MSP019		MSP019		MSP019		MSP019		MSP019		MSP019	
Location Type:	Pond		Pond		Pond		Pond		Pond		Pond		Pond		Pond	
Sample ID:	091107GWMSP019-2-U		091107GWMSP019-3-F		091107GWMSP019-3-U		091107GWMSP019-avg-F		091107GWMSP019-avg-U		051408GWMSP019-0-F		051408GWMSP019-0-U		091908GWMSP019-0-F	
Collection Date:	9/11/2007		9/11/2007		9/11/2007		9/11/2007		9/11/2007		5/14/2008		5/14/2008		9/19/2008	
Sample Type:	Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater	
	Triplicate		Triplicate		Triplicate		Averaged		Averaged		Primary		Primary		Primary	
	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL
Total Metals (mg/L)																
Aluminum	<0.03 UK	0.087	NS		<0.03 UK	0.087	NS		<0.03 UK	0.087	NS		**0.22 K**	0.087	NS	
Barium	**0.01 JK**	0.003	NS		**0.009 JK**	0.003	NS		**0.00933 JK**	0.003	NS		**0.017 JK**	0.003	NS	
Beryllium	<0.002 UK	0.0006	NS		<0.002 UK	0.0006	NS		<0.002 UK	0.0006	NS		<0.002 UK	0.0006	NS	
Boron	**0.03 JK**	0.0016	NS		**0.03 JK**	0.0016	NS		**0.03 JK**	0.0016	NS		**0.02 JK**	0.0016	NS	
Cadmium	<0.0001 UK	0.00127	NS		<0.0001 UK	0.00127	NS		<0.0001 UK	0.00127	NS		**0.0019 K**	0.000865	NS	
Cobalt	<0.01 UK	0.003	NS		<0.01 UK	0.003	NS		<0.01 UK	0.003	NS		<0.01 UK	0.003	NS	
Copper, total	<0.01 UK	0.0371	NS		<0.01 UK	0.0371	NS		<0.01 UK	0.0371	NS		<0.01 UK	0.0210	NS	
Iron	**0.14 K**	0.158	NS		**0.15 K**	0.158	NS		**0.143 K**	0.158	NS		**0.2 K**	0.158	NS	
Molybdenum	**0.01 JK**	0.034	NS		<0.01 UK	0.034	NS		**0.01 JK**	0.034	NS		<0.01 UK	0.034	NS	
Nickel	**0.0139 K**	0.168	NS		**0.0136 K**	0.168	NS		**0.0138 K**	0.168	NS		**0.0238 K**	0.0958	NS	
Selenium	**0.009**	0.005	NS		**0.009**	0.005	NS		**0.009**	0.005	NS		**0.099**	0.005	NS	
Silver	<0.01 UK	0.00036	NS		<0.01 UK	0.00036	NS		<0.01 UK	0.00036	NS		<0.01 UK	0.00036	NS	
Thallium	<0.0001 UK	0.00003	NS		<0.0001 UK	0.00003	NS		<0.0001 UK	0.00003	NS		**0.0006 J+K**	0.00003	NS	
Vanadium	**0.0046 K**	0.02	NS		**0.0045 K**	0.02	NS		**0.0045 K**	0.02	NS		**0.0159 K**	0.02	NS	
Zinc	**0.002 JK**	0.382	NS		**0.002 JK**	0.382	NS		**0.002 JK**	0.382	NS		**0.076 K**	0.218	NS	
Dissolved Metals (mg/L)																
Aluminum, dissolved	NS		<0.03 UK	0.087	NS		**0.04 JK**	0.087	NS		<0.03 UK	0.087	NS		<0.0500	0.087
Barium, dissolved	NS		**0.011 JK**	0.003	NS		**0.011 JK**	0.003	NS		**0.017 JK**	0.003	NS		NS	
Beryllium, dissolved	NS		<0.002 UK	0.0006	NS		<0.002 UK	0.0006	NS		<0.002 UK	0.0006	NS		NS	
Boron, dissolved	NS		**0.03 JK**	0.0016	NS		**0.0267 JK**	0.0016	NS		**0.02 JK**	0.0016	NS		NS	
Cadmium, dissolved	NS		<0.0001 UJK	0.00127	NS		<0.0001 UJK	0.00127	NS		**0.0009 K**	0.000922	NS		<0.000125	0.00127
Cobalt, dissolved	NS		<0.01 UK	0.003	NS		<0.01 UK	0.003	NS		<0.01 UK	0.003	NS		NS	
Copper, dissolved	NS		<0.01 UK	0.0371	NS		<0.01 UK	0.0371	NS		<0.01 UK	0.0231	NS		NS	
Iron, dissolved	NS		**0.03 JK**	0.158	NS		**0.03 JK**	0.158	NS		<0.02 UK	0.158	NS		<0.0250	0.158
Molybdenum, dissolved	NS		<0.01 UK	0.034	NS		**0.02 JK**	0.034	NS		**0.02 JK**	0.034	NS		NS	
Nickel, dissolved	NS		**0.016 JK**	0.168	NS		**0.0146 JK**	0.168	NS		**0.0224 K**	0.105	NS		**0.0211**	0.168
Selenium, dissolved	NS		**0.009**	0.005	NS		**0.009**	0.005	NS		**0.093 J-**	0.005	NS		**0.0189**	0.005
Silver, dissolved	NS		<0.01 UK	0.00036	NS		<0.01 UK	0.00036	NS		<0.01 UJK	0.00036	NS		NS	
Thallium, dissolved	NS		<0.0005 UK	0.00003	NS		<0.0005 UK	0.00003	NS		**0.0001 JK**	0.00003	NS		NS	
Vanadium, dissolved	NS		**0.003 JK**	0.02	NS		**0.00403 JK**	0.02	NS		**0.0161 K**	0.02	NS		<0.00500	0.02
Zinc, dissolved	NS		<0.01 UK	0.382	NS		**0.003 JK**	0.382	NS		**0.052 K**	0.239	NS		**0.00548 J**	0.382

TABLE 3-40

ENOCH VALLEY MINE - SUMMARY OF SURFACE WATER EXCEEDANCES
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Location:	MSP019		MSP020		MSP020		MSP020		MSP020		MSP020		MSP020		MSP020	
Location Type:	Pond		Pond		Pond		Pond		Pond		Pond		Pond		Pond	
Sample ID:	091908GWMSP019-0-U		051504SWMSP020-0-F		051504SWMSP020-0-U		050606SWMSP020-0-F		050606SWMSP020-0-U		050607SWMSP020-0-F		050607SWMSP020-0-U		091307GWMSP020-0-F	
Collection Date:	9/19/2008		5/15/2004		5/15/2004		5/6/2006		5/6/2006		5/6/2007		5/6/2007		9/13/2007	
Sample Type:	Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater	
	Primary		Primary		Primary		Primary		Primary		Primary		Primary		Primary	
	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL
Total Metals (mg/L)																
Aluminum	<0.0500	0.087	NS		NS		NS		NS		NS		**0.17 JK**	0.087	NS	
Barium	NS		NS		NS		NS		NS		NS		NS		NS	
Beryllium	NS		NS		NS		NS		NS		NS		NS		NS	
Boron	NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium	<0.000125		NS		NS		NS		NS		NS		NS		NS	
Cobalt	NS		NS		NS		NS		NS		NS		NS		NS	
Copper, total	NS		NS		NS		NS		NS		NS		NS		NS	
Iron	**0.0557 J**	0.158	NS		NS		NS		NS		NS		NS		NS	
Molybdenum	NS		NS		NS		NS		NS		NS		NS		NS	
Nickel	**0.0214**		NS		NS		NS		NS		NS		NS		NS	
Selenium	**0.0198**	0.005	NS		**0.09**	0.005	NS		**0.082**	0.005	NS		**0.045**	0.005	NS	
Silver	NS		NS		NS		NS		NS		NS		NS		NS	
Thallium	NS		NS		NS		NS		NS		NS		NS		NS	
Vanadium	<0.00500	0.02	NS		NS		NS		NS		NS		NS		NS	
Zinc	**0.00684 J**		NS		NS		NS		NS		NS		NS		NS	
Dissolved Metals (mg/L)																
Aluminum, dissolved	NS		NS		NS		<0.03 UK	0.087	NS		NS		NS		<0.03 UK	0.087
Barium, dissolved	NS		NS		NS		**0.023 K**	0.003	NS		NS		NS		**0.023 K**	0.003
Beryllium, dissolved	NS		NS		NS		<0.002 UK	0.0006	NS		NS		NS		<0.002 UK	0.0006
Boron, dissolved	NS		NS		NS		NS		NS		NS		NS		**0.06 K**	0.0016
Cadmium, dissolved	NS		**0.002 K**	0.00113	NS		**0.0056 K**	0.00105	NS		<0.0004 UK	0.000785	NS		<0.0001 UK	0.00127
Cobalt, dissolved	NS		NS		NS		<0.01 UK	0.003	NS		NS		NS		<0.01 UK	0.003
Copper, dissolved	NS		NS		NS		<0.01 UK	0.0280	NS		NS		NS		<0.01 UK	0.0371
Iron, dissolved	NS		NS		NS		<0.02 UK	0.158	NS		NS		NS		<0.02 UK	0.158
Molybdenum, dissolved	NS		NS		NS		<0.01 UK	0.034	NS		NS		NS		**0.01 JK**	0.034
Nickel, dissolved	NS		**0.0318 K**	0.142	NS		**0.0631 K**	0.127	NS		**0.009 K**	0.0831	NS		**0.0165 K**	0.168
Selenium, dissolved	NS		NS		NS		NS		NS		NS		NS		**0.04**	0.005
Silver, dissolved	NS		NS		NS		<0.01 UJK	0.00036	NS		NS		NS		<0.01 UK	0.00036
Thallium, dissolved	NS		NS		NS		<0.0001 UK	0.00003	NS		NS		NS		<0.0001 UK	0.00003
Vanadium, dissolved	NS		**0.0172 K**	0.02	NS		**0.0145 K**	0.02	NS		**0.0124 K**	0.02	NS		**0.0309 K**	0.02
Zinc, dissolved	NS		**0.032 K**	0.322	NS		**0.167 K**	0.289	NS		**0.004 JK**	0.189	NS		<0.002 UK	0.382

TABLE 3-40

ENOCH VALLEY MINE - SUMMARY OF SURFACE WATER EXCEEDANCES
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Location:	MSP020		MSP020		MSP020		MSP020		MSP020		MSP021		MSP021		MSP021	
Location Type:	Pond		Pond		Pond		Pond		Pond		Pond		Pond		Pond	
Sample ID:	091307GWMSP020-0-U		051308GWMSP020-0-F		051308GWMSP020-0-U		091908GWMSP020-0-F		091908GWMSP020-0-U		051204SWMSP021-0-F		051204SWMSP021-0-U		050606SWMSP021-1-F	
Collection Date:	9/13/2007		5/13/2008		5/13/2008		9/19/2008		9/19/2008		5/12/2004		5/12/2004		5/6/2006	
Sample Type:	Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater	
	Primary		Primary		Primary		Primary		Primary		Primary		Primary		Triplicate	
	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL
Total Metals (mg/L)																
Aluminum	**0.95 K**	0.087	NS		**1.11 J+K**	0.087	NS		**0.0773 J**	0.087	NS		NS		NS	
Barium	**0.033 K**	0.003	NS		**0.031 K**	0.003	NS		NS		NS		NS		NS	
Beryllium	<0.002 UK	0.0006	NS		<0.002 UK	0.0006	NS		NS		NS		NS		NS	
Boron	**0.06 K**	0.0016	NS		**0.01 JK**	0.0016	NS		NS		NS		NS		NS	
Cadmium	**0.0013 K**	0.00127	NS		**0.0018 K**	0.000657	NS		**0.000142 J**		NS		NS		NS	
Cobalt	<0.01 UK	0.003	NS		<0.01 UK	0.003	NS		NS		NS		NS		NS	
Copper, total	<0.01 UK	0.0371	NS		<0.01 UK	0.0140	NS		NS		NS		NS		NS	
Iron	**0.6 K**	0.158	NS		**0.73 K**	0.158	NS		**0.168**	0.158	NS		NS		NS	
Molybdenum	**0.02 JK**	0.034	NS		<0.01 UK	0.034	NS		NS		NS		NS		NS	
Nickel	**0.0223 K**	0.168	NS		**0.0215 K**	0.0641	NS		**0.0171**		NS		NS		NS	
Selenium	**0.04**	0.005	NS		**0.067**	0.005	NS		**0.0259**	0.005	NS		**0.18**	0.005	NS	
Silver	<0.01 UK	0.00036	NS		<0.01 UK	0.00036	NS		NS		NS		NS		NS	
Thallium	**0.0002 JK**	0.00003	NS		<0.0001 UK	0.00003	NS		NS		NS		NS		NS	
Vanadium	**0.0391 K**	0.02	NS		**0.0055 K**	0.02	NS		**0.00968 J**	0.02	NS		NS		NS	
Zinc	**0.04 K**	0.382	NS		**0.126 K**	0.146	NS		**0.0104 J**		NS		NS		NS	
Dissolved Metals (mg/L)																
Aluminum, dissolved	NS		**0.15 JK**	0.087	NS		<0.0500	0.087	NS		NS		NS		**0.16 JK**	0.087
Barium, dissolved	NS		**0.025 K**	0.003	NS		NS		NS		NS		NS		**0.031 K**	0.003
Beryllium, dissolved	NS		<0.002 UK	0.0006	NS		NS		NS		NS		NS		<0.002 UK	0.0006
Boron, dissolved	NS		<0.01 UK	0.0016	NS		NS		NS		NS		NS		NS	
Cadmium, dissolved	NS		**0.0008 K**	0.000654	NS		<0.000125	0.00100	NS		**0.0098 K**	0.00127	NS		**0.0086 K**	0.00127
Cobalt, dissolved	NS		<0.01 UK	0.003	NS		NS		NS		NS		NS		<0.01 UK	0.003
Copper, dissolved	NS		<0.01 UK	0.0139	NS		NS		NS		NS		NS		**0.01 JK**	0.0371
Iron, dissolved	NS		**0.06 K**	0.158	NS		**0.0395 J**	0.158	NS		NS		NS		<0.02 UK	0.158
Molybdenum, dissolved	NS		<0.01 UK	0.034	NS		NS		NS		NS		NS		**0.02 JK**	0.034
Nickel, dissolved	NS		**0.0173 J+K**	0.0637	NS		**0.0173**	0.119	NS		**0.116 K**	0.168	NS		**0.0862 K**	0.168
Selenium, dissolved	NS		**0.066**	0.005	NS		**0.027**	0.005	NS		NS		NS		NS	
Silver, dissolved	NS		<0.01 UJK	0.00036	NS		NS		NS		NS		NS		<0.01 UJK	0.00036
Thallium, dissolved	NS		<0.0001 UK	0.00003	NS		NS		NS		NS		NS		**0.0001 JK**	0.00003
Vanadium, dissolved	NS		**0.0054 K**	0.02	NS		**0.00814 J**	0.02	NS		**0.0364 K**	0.02	NS		**0.0256 K**	0.02
Zinc, dissolved	NS		**0.028 J+K**	0.145	NS		**0.00609 J**	0.270	NS		**0.397 K**	0.382	NS		**0.418 K**	0.382

TABLE 3-40

ENOCH VALLEY MINE - SUMMARY OF SURFACE WATER EXCEEDANCES
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Location:	MSP021		MSP021		MSP021		MSP021		MSP021		MSP021		MSP021		MSP021	
Location Type:	Pond		Pond		Pond		Pond		Pond		Pond		Pond		Pond	
Sample ID:	050606SWMSP021-1-U		050606SWMSP021-2-F		050606SWMSP021-2-U		050606SWMSP021-3-F		050606SWMSP021-3-U		050606SWMSP021-avg-F		050606SWMSP021-avg-U		050807SWMSP021-1-F	
Collection Date:	5/6/2006		5/9/2007		5/6/2006		5/6/2006		5/6/2006		5/6/2006		5/6/2006		5/8/2007	
Sample Type:	Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater	
	Triplicate		Triplicate		Triplicate		Triplicate		Triplicate		Averaged		Averaged		Triplicate	
	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL
Total Metals (mg/L)																
Aluminum	NS		NS		NS		NS		NS		NS		NS		NS	
Barium	NS		NS		NS		NS		NS		NS		NS		NS	
Beryllium	NS		NS		NS		NS		NS		NS		NS		NS	
Boron	NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium	NS		NS		NS		NS		NS		NS		NS		NS	
Cobalt	NS		NS		NS		NS		NS		NS		NS		NS	
Copper, total	NS		NS		NS		NS		NS		NS		NS		NS	
Iron	NS		NS		NS		NS		NS		NS		NS		NS	
Molybdenum	NS		NS		NS		NS		NS		NS		NS		NS	
Nickel	NS		NS		NS		NS		NS		NS		NS		NS	
Selenium	**0.15**	0.005	NS		**0.153**	0.005	NS		**0.152**	0.005	NS		**0.152**	0.005	NS	
Silver	NS		NS		NS		NS		NS		NS		NS		NS	
Thallium	NS		NS		NS		NS		NS		NS		NS		NS	
Vanadium	NS		NS		NS		NS		NS		NS		NS		NS	
Zinc	NS		NS		NS		NS		NS		NS		NS		NS	
Dissolved Metals (mg/L)																
Aluminum, dissolved	NS		<0.03 UK	0.087	NS		<0.03 UK	0.087	NS		**0.16 JK**	0.087	NS		NS	
Barium, dissolved	NS		**0.03 K**	0.003	NS		**0.029 K**	0.003	NS		**0.03 K**	0.003	NS		NS	
Beryllium, dissolved	NS		<0.002 UK	0.0006	NS		<0.002 UK	0.0006	NS		<0.002 UK	0.0006	NS		NS	
Boron, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium, dissolved	NS		**0.0086 K**	0.00127	NS		**0.0086 K**	0.00127	NS		**0.0086 K**	0.00127	NS		**0.004 K**	0.00127
Cobalt, dissolved	NS		<0.01 UK	0.003	NS		<0.01 UK	0.003	NS		<0.01 UK	0.003	NS		NS	
Copper, dissolved	NS		<0.01 UK	0.0371	NS		<0.01 UK	0.0371	NS		**0.01 JK**	0.0371	NS		NS	
Iron, dissolved	NS		<0.02 UK	0.158	NS		<0.02 UK	0.158	NS		<0.02 UK	0.158	NS		NS	
Molybdenum, dissolved	NS		**0.02 JK**	0.034	NS		**0.02 JK**	0.034	NS		**0.02 JK**	0.034	NS		NS	
Nickel, dissolved	NS		**0.0872 K**	0.168	NS		**0.0891 K**	0.168	NS		**0.0875 K**	0.168	NS		**0.0842 J+K**	0.168
Selenium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Silver, dissolved	NS		<0.01 UJK	0.00036	NS		<0.01 UJK	0.00036	NS		<0.01 UJK	0.00036	NS		NS	
Thallium, dissolved	NS		<0.0001 UK	0.00003	NS		<0.0001 UK	0.00003	NS		**0.0001 JK**	0.00003	NS		NS	
Vanadium, dissolved	NS		**0.0262 K**	0.02	NS		**0.0268 K**	0.02	NS		**0.0262 K**	0.02	NS		**0.0236 K**	0.02
Zinc, dissolved	NS		**0.416 K**	0.382	NS		**0.424 K**	0.382	NS		**0.419 K**	0.382	NS		**0.219 K**	0.382

TABLE 3-40

ENOCH VALLEY MINE - SUMMARY OF SURFACE WATER EXCEEDANCES
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Location:	MSP021		MSP021		MSP021		MSP021		MSP021		MSP021		MSP021		MSP021	
Location Type:	Pond		Pond		Pond		Pond		Pond		Pond		Pond		Pond	
Sample ID:	050807SWMSP021-1-U		050807SWMSP021-2-F		050807SWMSP021-2-U		050807SWMSP021-3-F		050807SWMSP021-3-U		050807SWMSP021-avg-F		050807SWMSP021-avg-U		091207GWMSP021-0-F	
Collection Date:	5/8/2007		5/8/2007		5/8/2007		5/8/2007		5/8/2007		5/8/2007		5/8/2007		9/12/2007	
Sample Type:	Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater	
	Triplicate		Triplicate		Triplicate		Triplicate		Triplicate		Averaged		Averaged		Primary	
	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL
Total Metals (mg/L)																
Aluminum	<0.03 UK	0.087	NS		<0.03 UK	0.087	NS		<0.03 UK	0.087	NS		<0.03 UK	0.087	NS	
Barium	NS		NS		NS		NS		NS		NS		NS		NS	
Beryllium	NS		NS		NS		NS		NS		NS		NS		NS	
Boron	NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium	NS		NS		NS		NS		NS		NS		NS		NS	
Cobalt	NS		NS		NS		NS		NS		NS		NS		NS	
Copper, total	NS		NS		NS		NS		NS		NS		NS		NS	
Iron	NS		NS		NS		NS		NS		NS		NS		NS	
Molybdenum	NS		NS		NS		NS		NS		NS		NS		NS	
Nickel	NS		NS		NS		NS		NS		NS		NS		NS	
Selenium	**0.23**	0.005	NS		**0.23**	0.005	NS		**0.23**	0.005	NS		**0.23**	0.005	NS	
Silver	NS		NS		NS		NS		NS		NS		NS		NS	
Thallium	NS		NS		NS		NS		NS		NS		NS		NS	
Vanadium	NS		NS		NS		NS		NS		NS		NS		NS	
Zinc	NS		NS		NS		NS		NS		NS		NS		NS	
Dissolved Metals (mg/L)																
Aluminum, dissolved	NS		NS		NS		NS		NS		NS		NS		**0.13 JK**	0.087
Barium, dissolved	NS		NS		NS		NS		NS		NS		NS		**0.005 JK**	0.003
Beryllium, dissolved	NS		NS		NS		NS		NS		NS		NS		<0.002 UK	0.0006
Boron, dissolved	NS		NS		NS		NS		NS		NS		NS		**0.08 K**	0.0016
Cadmium, dissolved	NS		**0.004 K**	0.00127	NS		**0.0041 K**	0.00127	NS		**0.00403 K**	0.00127	NS		<0.0001 UK	0.00127
Cobalt, dissolved	NS		NS		NS		NS		NS		NS		NS		<0.01 UK	0.003
Copper, dissolved	NS		NS		NS		NS		NS		NS		NS		<0.01 UK	0.0371
Iron, dissolved	NS		NS		NS		NS		NS		NS		NS		<0.02 UK	0.158
Molybdenum, dissolved	NS		NS		NS		NS		NS		NS		NS		<0.01 UK	0.034
Nickel, dissolved	NS		**0.0833 J+K**	0.168	NS		**0.0853 J+K**	0.168	NS		**0.0843 J+K**	0.168	NS		**0.0186 K**	0.168
Selenium, dissolved	NS		NS		NS		NS		NS		NS		NS		**0.026**	0.005
Silver, dissolved	NS		NS		NS		NS		NS		NS		NS		<0.01 UK	0.00036
Thallium, dissolved	NS		NS		NS		NS		NS		NS		NS		<0.0001 UK	0.00003
Vanadium, dissolved	NS		**0.0238 K**	0.02	NS		**0.0236 K**	0.02	NS		**0.0237 K**	0.02	NS		**0.0083 K**	0.02
Zinc, dissolved	NS		**0.221 K**	0.382	NS		**0.224 K**	0.382	NS		**0.221 K**	0.382	NS		**0.002 JK**	0.382

TABLE 3-40

ENOCH VALLEY MINE - SUMMARY OF SURFACE WATER EXCEEDANCES
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Location:	MSP021		MSP021		MSP021		MSP021		MSP021		MSP021		MSP021		MSP021	
Location Type:	Pond		Pond		Pond		Pond		Pond		Pond		Pond		Pond	
Sample ID:	091207GWMSP021-0-U		051608GWMSP021-0-F		051608GWMSP021-0-U		091908GWMSP021-1-F		091908GWMSP021-1-U		091908GWMSP021-2-F		091908GWMSP021-2-U		091908GWMSP021-3-F	
Collection Date:	9/12/2007		5/16/2008		5/16/2008		9/19/2008		9/19/2008		9/19/2008		9/19/2008		9/19/2008	
Sample Type:	Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater	
	Primary		Primary		Primary		Triplicate		Triplicate		Triplicate		Triplicate		Triplicate	
	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL
Total Metals (mg/L)																
Aluminum	<0.03 UK	0.087	NS		**0.12 JK**	0.087	NS		<0.0500	0.087	NS		<0.0500	0.087	NS	
Barium	**0.004 JK**	0.003	NS		**0.015 JK**	0.003	NS		NS		NS		NS		NS	
Beryllium	<0.002 UK	0.0006	NS		<0.002 UK	0.0006	NS		NS		NS		NS		NS	
Boron	**0.08 K**	0.0016	NS		**0.04 JK**	0.0016	NS		NS		NS		NS		NS	
Cadmium	<0.0002 UK	0.00127	NS		**0.0027 K**	0.00105	NS		<0.000125		NS		<0.000125		NS	
Cobalt	<0.01 UK	0.003	NS		<0.01 UK	0.003	NS		NS		NS		NS		NS	
Copper, total	<0.01 UK	0.0371	NS		<0.01 UK	0.0279	NS		NS		NS		NS		NS	
Iron	**0.08 K**	0.158	NS		**0.11 K**	0.158	NS		<0.0250	0.158	NS		**0.102**	0.158	NS	
Molybdenum	<0.01 UK	0.034	NS		<0.01 UK	0.034	NS		NS		NS		NS		NS	
Nickel	**0.0183 K**	0.168	NS		**0.0351 K**	0.127	NS		**0.0311**		NS		**0.0370**		NS	
Selenium	**0.027**	0.005	NS		**0.12**	0.005	NS		**0.0249**	0.005	NS		**0.0281 J**	0.005	NS	
Silver	<0.01 UK	0.00036	NS		<0.01 UK	0.00036	NS		NS		NS		NS		NS	
Thallium	<0.0001 UK	0.00003	NS		<0.0002 UK	0.00003	NS		NS		NS		NS		NS	
Vanadium	**0.0083 K**	0.02	NS		**0.0183 K**	0.02	NS		<0.00500	0.02	NS		**0.00600 J**	0.02	NS	
Zinc	**0.01 JK {J+}**	0.382	NS		**0.124 K**	0.288	NS		**0.00564 J**		NS		**0.00849 J**		NS	
Dissolved Metals (mg/L)																
Aluminum, dissolved	NS		**0.05 J+K**	0.087	NS		<0.0500	0.087	NS		<0.0500	0.087	NS		<0.0500	0.087
Barium, dissolved	NS		**0.012 JK**	0.003	NS		NS		NS		NS		NS		NS	
Beryllium, dissolved	NS		<0.002 UK	0.0006	NS		NS		NS		NS		NS		NS	
Boron, dissolved	NS		**0.04 JK**	0.0016	NS		NS		NS		NS		NS		NS	
Cadmium, dissolved	NS		**0.002 K**	0.00105	NS		<0.000125	0.00127	NS		<0.000125	0.00127	NS		<0.000125	0.00127
Cobalt, dissolved	NS		<0.01 UK	0.003	NS		NS		NS		NS		NS		NS	
Copper, dissolved	NS		<0.01 UK	0.0279	NS		NS		NS		NS		NS		NS	
Iron, dissolved	NS		<0.02 UK	0.158	NS		**0.0952 J**	0.158	NS		<0.0250	0.158	NS		<0.0250	0.158
Molybdenum, dissolved	NS		**0.02 JK**	0.034	NS		NS		NS		NS		NS		NS	
Nickel, dissolved	NS		**0.0303 K**	0.127	NS		**0.0342**	0.168	NS		**0.0331**	0.168	NS		**0.0324**	0.168
Selenium, dissolved	NS		**0.12**	0.005	NS		**0.0259**	0.005	NS		**0.0285 J**	0.005	NS		**0.0281**	0.005
Silver, dissolved	NS		<0.01 UJK	0.00036	NS		NS		NS		NS		NS		NS	
Thallium, dissolved	NS		<0.0001 UK	0.00003	NS		NS		NS		NS		NS		NS	
Vanadium, dissolved	NS		**0.0166 K**	0.02	NS		<0.00500	0.02	NS		**0.00525 J**	0.02	NS		**0.00692 J**	0.02
Zinc, dissolved	NS		**0.063 K**	0.289	NS		**0.00721 J**	0.382	NS		**0.00778 J**	0.382	NS		**0.00647 J**	0.382

TABLE 3-40

ENOCH VALLEY MINE - SUMMARY OF SURFACE WATER EXCEEDANCES
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Location:	MSP021		MSP021		MSP021		MSP022		MSP022		MSP022		MSP022		MSP022	
Location Type:	Pond		Pond		Pond		Pond		Pond		Pond		Pond		Pond	
Sample ID:	091908GWMSP021-3-U		091908GWM		091908GWMSP021-avg-U		051104SWMSP022-0-F		051104SWMSP022-0-U		050606SWMSP022-0-F		050606SWMSP022-0-U		050707SWMSP022-0-F	
Collection Date:	9/19/2008		9/19/2008		9/19/2008		5/11/2004		5/11/2004		5/6/2006		5/6/2006		5/7/2007	
Sample Type:	Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater	
	Triplicate		Averaged		Averaged		Primary		Primary		Primary		Primary		Primary	
	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL
Total Metals (mg/L)																
Aluminum	<0.0500	0.087	NS		<0.0500	0.087	NS		NS		NS		NS		NS	
Barium	NS		NS		NS		NS		NS		NS		NS		NS	
Beryllium	NS		NS		NS		NS		NS		NS		NS		NS	
Boron	NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium	**0.000172 J**		NS		**0.000172 J**		NS		NS		NS		NS		NS	
Cobalt	NS		NS		NS		NS		NS		NS		NS		NS	
Copper, total	NS		NS		NS		NS		NS		NS		NS		NS	
Iron	**0.0904 J**	0.158	NS		**0.0962 J**	0.158	NS		NS		NS		NS		NS	
Molybdenum	NS		NS		NS		NS		NS		NS		NS		NS	
Nickel	**0.0318**		NS		**0.0333**		NS		NS		NS		NS		NS	
Selenium	**0.0272**	0.005	NS		**0.0267 J**	0.005	NS		**0.041**	0.005	NS		**0.014**	0.005	NS	
Silver	NS		NS		NS		NS		NS		NS		NS		NS	
Thallium	NS		NS		NS		NS		NS		NS		NS		NS	
Vanadium	**0.00654 J**	0.02	NS		**0.00627 J**	0.02	NS		NS		NS		NS		NS	
Zinc	**0.00731 J**		NS		**0.00715 J**		NS		NS		NS		NS		NS	
Dissolved Metals (mg/L)																
Aluminum, dissolved	NS		<0.0500	0.087	NS		NS		NS		<0.03 UK	0.087	NS		NS	
Barium, dissolved	NS		NS		NS		NS		NS		**0.058 K**	0.003	NS		NS	
Beryllium, dissolved	NS		NS		NS		NS		NS		<0.002 UK	0.0006	NS		NS	
Boron, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium, dissolved	NS		<0.000125	0.00127	NS		**0.0001 JK**	0.00127	NS		<0.0001 UK	0.000940	NS		<0.0004 UK	0.00127
Cobalt, dissolved	NS		NS		NS		NS		NS		<0.01 UK	0.003	NS		NS	
Copper, dissolved	NS		NS		NS		NS		NS		<0.01 UK	0.0238	NS		NS	
Iron, dissolved	NS		**0.0952 J**	0.158	NS		NS		NS		<0.02 UK	0.158	NS		NS	
Molybdenum, dissolved	NS		NS		NS		NS		NS		<0.01 UK	0.034	NS		NS	
Nickel, dissolved	NS		**0.0332**	0.168	NS		**0.0039 K**	0.168	NS		**0.0012 JK**	0.108	NS		**0.0041 K**	0.168
Selenium, dissolved	NS		**0.0275 J**	0.005	NS		NS		NS		NS		NS		NS	
Silver, dissolved	NS		NS		NS		NS		NS		<0.01 UJK	0.00036	NS		NS	
Thallium, dissolved	NS		NS		NS		NS		NS		<0.0001 UK	0.00003	NS		NS	
Vanadium, dissolved	NS		**0.00609 J**	0.02	NS		**0.00928 K**	0.02	NS		**0.0137 K**	0.02	NS		**0.0132 K**	0.02
Zinc, dissolved	NS		**0.00715 J**	0.382	NS		<0.002 UK	0.382	NS		<0.002 UK	0.246	NS		**0.003 JK**	0.382

TABLE 3-40

ENOCH VALLEY MINE - SUMMARY OF SURFACE WATER EXCEEDANCES
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Location:	MSP022		MSP022		MSP022		MSP022		MSP022		MSP023		MSP023		MSP023	
Location Type:	Pond		Pond		Pond		Pond		Pond		Pond		Pond		Pond	
Sample ID:	050707SWMSP022-0-U		091307GWMSP022-0-F		091307GWMSP022-0-U		051808GWMSP022-0-F		051808GWMSP022-0-U		051204SWMSP023-0-F		051204SWMSP023-0-U		050606SWMSP023-0-F	
Collection Date:	5/7/2007		9/13/2007		9/13/2007		5/18/2008		5/18/2008		5/12/2004		5/12/2004		5/6/2006	
Sample Type:	Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater	
	Primary		Primary		Primary		Primary		Primary		Primary		Primary		Primary	
	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL
Total Metals (mg/L)																
Aluminum	**0.43 K**	0.087	NS		<0.07 UK	0.087	NS		**0.1 JK**	0.087	NS		NS		NS	
Barium	NS		NS		**0.089 K**	0.003	NS		**0.06 K**	0.003	NS		NS		NS	
Beryllium	NS		NS		<0.002 UK	0.0006	NS		<0.002 UK	0.0006	NS		NS		NS	
Boron	NS		NS		**0.4 K**	0.0016	NS		**0.22 K**	0.0016	NS		NS		NS	
Cadmium	NS		NS		**0.0002 JK**	0.00127	NS		**0.0004 JK**	0.00101	NS		NS		NS	
Cobalt	NS		NS		<0.01 UK	0.003	NS		<0.01 UK	0.003	NS		NS		NS	
Copper, total	NS		NS		<0.01 UK	0.0371	NS		<0.01 UK	0.0264	NS		NS		NS	
Iron	NS		NS		<0.03 UK	0.158	NS		**0.12 K**	0.158	NS		NS		NS	
Molybdenum	NS		NS		**0.02 JK**	0.034	NS		<0.01 UK	0.034	NS		NS		NS	
Nickel	NS		NS		**0.0082 K**	0.168	NS		**0.0028 JK**	0.120	NS		NS		NS	
Selenium	**0.035**	0.005	NS		**0.025**	0.005	NS		**0.009**	0.005	NS		**0.041**	0.005	NS	
Silver	NS		NS		<0.01 UK	0.00036	NS		<0.01 UK	0.00036	NS		NS		NS	
Thallium	NS		NS		**0.0004 JK**	0.00003	NS		<0.0001 UK	0.00003	NS		NS		NS	
Vanadium	NS		NS		**0.0421 K**	0.02	NS		**0.0102 K**	0.02	NS		NS		NS	
Zinc	NS		NS		**0.005 JK**	0.382	NS		**0.004 JK**	0.272	NS		NS		NS	
Dissolved Metals (mg/L)																
Aluminum, dissolved	NS		<0.03 UK	0.087	NS		<0.03 UK	0.087	NS		NS		NS		<0.03 UK	0.087
Barium, dissolved	NS		**0.09 K**	0.003	NS		**0.054 K**	0.003	NS		NS		NS		**0.013 K**	0.003
Beryllium, dissolved	NS		<0.002 UK	0.0006	NS		<0.002 UK	0.0006	NS		NS		NS		<0.002 UK	0.0006
Boron, dissolved	NS		**0.4 K**	0.0016	NS		**0.21 K**	0.0016	NS		NS		NS		NS	
Cadmium, dissolved	NS		**0.0001 JK**	0.00127	NS		<0.0001 UK	0.000996	NS		**0.0002 JK**	0.00104	NS		**0.0002 JK**	0.000805
Cobalt, dissolved	NS		<0.01 UK	0.003	NS		<0.01 UK	0.003	NS		NS		NS		<0.01 UK	0.003
Copper, dissolved	NS		<0.01 UK	0.0371	NS		<0.01 UK	0.0259	NS		NS		NS		<0.01 UK	0.0189
Iron, dissolved	NS		<0.02 UK	0.158	NS		<0.02 UK	0.158	NS		NS		NS		<0.02 UK	0.158
Molybdenum, dissolved	NS		<0.01 UK	0.034	NS		<0.01 UK	0.034	NS		NS		NS		**0.05 K**	0.034
Nickel, dissolved	NS		**0.0077 K**	0.168	NS		**0.0029 JK**	0.118	NS		**0.0058 K**	0.126	NS		**0.0028 JK**	0.0863
Selenium, dissolved	NS		**0.022**	0.005	NS		**0.01**	0.005	NS		NS		NS		NS	
Silver, dissolved	NS		<0.01 UK	0.00036	NS		<0.01 UJK	0.00036	NS		NS		NS		<0.01 UJK	0.00036
Thallium, dissolved	NS		<0.0002 UK	0.00003	NS		<0.0001 UK	0.00003	NS		NS		NS		<0.0001 UK	0.00003
Vanadium, dissolved	NS		**0.0384 K**	0.02	NS		**0.0087 K**	0.02	NS		**0.0563 K**	0.02	NS		**0.0571 K**	0.02
Zinc, dissolved	NS		<0.002 UK	0.382	NS		**0.002 JK**	0.268	NS		**0.006 JK**	0.287	NS		<0.002 UK	0.196

TABLE 3-40

ENOCH VALLEY MINE - SUMMARY OF SURFACE WATER EXCEEDANCES
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Location:	MSP023		MSP031		MSP031		MSP031		MSP031		MSP031		MSP031		MSP031	
Location Type:	Pond		Pond		Pond		Pond		Pond		Pond		Pond		Pond	
Sample ID:	050606SWMSP023-0-U		051104SWMSP031-0-F		051104SWMSP031-0-U		050606SWMSP031-0-F		050606SWMSP031-0-U		050707SWMSP031-0-F		050707SWMSP031-0-U		051308GWMSP031-0-F	
Collection Date:	5/6/2006		5/11/2004		5/11/2004		5/6/2006		5/6/2006		5/7/2007		5/7/2007		5/13/2008	
Sample Type:	Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater	
	Primary		Primary		Primary		Primary		Primary		Primary		Primary		Primary	
	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL
Total Metals (mg/L)																
Aluminum	NS		NS		NS		NS		NS		NS		<0.03 UK	0.087	NS	
Barium	NS		NS		NS		NS		NS		NS		NS		NS	
Beryllium	NS		NS		NS		NS		NS		NS		NS		NS	
Boron	NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium	NS		NS		NS		NS		NS		NS		NS		NS	
Cobalt	NS		NS		NS		NS		NS		NS		NS		NS	
Copper, total	NS		NS		NS		NS		NS		NS		NS		NS	
Iron	NS		NS		NS		NS		NS		NS		NS		NS	
Molybdenum	NS		NS		NS		NS		NS		NS		NS		NS	
Nickel	NS		NS		NS		NS		NS		NS		NS		NS	
Selenium	**0.031**	0.005	NS		<0.001	0.005	NS		<0.001	0.005	NS		**0.002 J**	0.005	NS	
Silver	NS		NS		NS		NS		NS		NS		NS		NS	
Thallium	NS		NS		NS		NS		NS		NS		NS		NS	
Vanadium	NS		NS		NS		NS		NS		NS		NS		NS	
Zinc	NS		NS		NS		NS		NS		NS		NS		NS	
Dissolved Metals (mg/L)																
Aluminum, dissolved	NS		NS		NS		<0.03 UK	0.087	NS		NS		NS		<0.03 UK	0.087
Barium, dissolved	NS		NS		NS		**0.043 K**	0.003	NS		NS		NS		**0.071 K**	0.003
Beryllium, dissolved	NS		NS		NS		<0.002 UK	0.0006	NS		NS		NS		<0.002 UK	0.0006
Boron, dissolved	NS		NS		NS		NS		NS		NS		NS		**0.07 K**	0.0016
Cadmium, dissolved	NS		<0.0001 UK	0.000747	NS		**0.0002 JK**	0.000660	NS		<0.0001 UK	0.000896	NS		**0.0002 JK**	0.000831
Cobalt, dissolved	NS		NS		NS		<0.01 UK	0.003	NS		NS		NS		<0.01 UK	0.003
Copper, dissolved	NS		NS		NS		<0.01 UK	0.0141	NS		NS		NS		<0.01 UK	0.0198
Iron, dissolved	NS		NS		NS		**0.08 K**	0.158	NS		NS		NS		**0.03 JK**	0.158
Molybdenum, dissolved	NS		NS		NS		<0.01 UK	0.034	NS		NS		NS		<0.01 UK	0.034
Nickel, dissolved	NS		**0.002 K**	0.0773	NS		**0.0052 K**	0.0645	NS		**0.0079 K**	0.101	NS		**0.005 K**	0.0903
Selenium, dissolved	NS		NS		NS		NS		NS		NS		NS		**0.002 J-**	0.005
Silver, dissolved	NS		NS		NS		<0.01 UJK	0.00036	NS		NS		NS		<0.01 UJK	0.00036
Thallium, dissolved	NS		NS		NS		<0.0001 UK	0.00003	NS		NS		NS		**0.0001 JK**	0.00003
Vanadium, dissolved	NS		**0.00409 K**	0.02	NS		**0.0043 K**	0.02	NS		**0.003 K**	0.02	NS		**0.0033 K**	0.02
Zinc, dissolved	NS		<0.002 UK	0.176	NS		**0.004 JK**	0.147	NS		**0.004 JK**	0.230	NS		**0.007 JK**	0.205

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ENOCH VALLEY MINE - SUMMARY OF SURFACE WATER EXCEEDANCES
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Location:	MSP031		MST023		MST023		MST023		MST023		MST023		MST023		MST023	
Location Type:	Pond		Stream		Stream		Stream		Stream		Stream		Stream		Stream	
Sample ID:	051308GWMSP031-0-U		051904SWMST023-0-F		051904SWMST023-0-U		051106SWMST023-0-F		051106SWMST023-0-U		051407SWMST023-0-F		051407SWMST023-0-U		091007SWMST023-0-F	
Collection Date:	5/13/2008		5/19/2004		5/19/2004		5/11/2006		5/11/2006		5/14/2007		5/14/2007		9/10/2007	
Sample Type:	Groundwater		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water	
	Primary		Primary		Primary		Primary		Primary		Primary		Primary		Primary	
	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL
Total Metals (mg/L)																
Aluminum	**0.08 JK**	0.087	NS		NS		NS		NS		NS		**0.24 K**	0.087	NS	
Barium	**0.071 K**	0.003	NS		NS		NS		NS		NS		NS		NS	
Beryllium	<0.002 UK	0.0006	NS		NS		NS		NS		NS		NS		NS	
Boron	**0.07 K**	0.0016	NS		NS		NS		NS		NS		NS		NS	
Cadmium	**0.0003 JK**	0.000785	NS		NS		NS		NS		NS		NS		NS	
Cobalt	<0.01 UK	0.003	NS		NS		NS		NS		NS		NS		NS	
Copper, total	<0.01 UK	0.0182	NS		NS		NS		NS		NS		NS		NS	
Iron	**0.14 K**	0.158	NS		NS		NS		NS		NS		NS		NS	
Molybdenum	<0.01 UK	0.034	NS		NS		NS		NS		NS		NS		NS	
Nickel	**0.0061 K**	0.0831	NS		NS		NS		NS		NS		NS		NS	
Selenium	**0.003 J**	0.005	NS		<0.001	0.005	NS		**0.005 J**	0.005	NS		**0.004 J**	0.005	NS	
Silver	<0.01 UK	0.00036	NS		NS		NS		NS		NS		NS		NS	
Thallium	<0.0001 UK	0.00003	NS		NS		NS		NS		NS		NS		NS	
Vanadium	**0.004 K**	0.02	NS		NS		NS		NS		NS		NS		NS	
Zinc	**0.012 J+K**	0.189	NS		NS		NS		NS		NS		NS		NS	
Dissolved Metals (mg/L)																
Aluminum, dissolved	NS		NS		NS		**0.05 JK {J+}**	0.087	NS		NS		NS		NS	
Barium, dissolved	NS		NS		NS		**0.063 K**	0.003	NS		NS		NS		NS	
Beryllium, dissolved	NS		NS		NS		<0.002 UK	0.0006	NS		NS		NS		NS	
Boron, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium, dissolved	NS		<0.0001 UK	0.000852	NS		<0.0001 UK	0.000782	NS		<0.0001 UJK	0.000855	NS		<0.0001 UK	0.000800
Cobalt, dissolved	NS		NS		NS		<0.01 UK	0.003	NS		NS		NS		NS	
Copper, dissolved	NS		NS		NS		<0.01 UK	0.0181	NS		NS		NS		NS	
Iron, dissolved	NS		NS		NS		<0.02 UK	0.158	NS		NS		NS		NS	
Molybdenum, dissolved	NS		NS		NS		<0.01 UK	0.034	NS		NS		NS		NS	
Nickel, dissolved	NS		**0.0011 K**	0.0937	NS		**0.0011 JK**	0.0827	NS		**0.001 JK**	0.0943	NS		**0.0022 JK**	0.0855
Selenium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Silver, dissolved	NS		NS		NS		<0.01 UK	0.00036	NS		NS		NS		NS	
Thallium, dissolved	NS		NS		NS		<0.0001 UK	0.00003	NS		NS		NS		NS	
Vanadium, dissolved	NS		**0.00181 K**	0.02	NS		**0.0007 JK**	0.02	NS		**0.0008 JK**	0.02	NS		**0.0012 K**	0.02
Zinc, dissolved	NS		**0.006 JK**	0.213	NS		**0.005 JK**	0.188	NS		**0.003 JK**	0.214	NS		<0.002 UK	0.194

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ENOCH VALLEY MINE - SUMMARY OF SURFACE WATER EXCEEDANCES
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Location:	MST023		MST023		MST023		MST023		MST023		MST023		MST023		MST023	
Location Type:	Stream		Stream		Stream		Stream		Stream		Stream		Stream		Stream	
Sample ID:	091007SWMST023-0-U		051408SWMST023-1-F		051408SWMST023-1-U		051408SWMST023-2-F		051408SWMST023-2-U		051408SWMST023-3-F		051408SWMST023-3-U		051408SWMST023-avg-F	
Collection Date:	9/10/2007		5/14/2008		5/14/2008		5/14/2008		5/14/2008		5/14/2008		5/14/2008		5/14/2008	
Sample Type:	Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water	
	Primary		Triplicate		Triplicate		Triplicate		Triplicate		Triplicate		Triplicate		Averaged	
	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL
Total Metals (mg/L)																
Aluminum	<0.03 UK	0.087	NS		**1.67 K**	0.087	NS		**1.42 K**	0.087	NS		**1.52 K**	0.087	NS	
Barium	NS		NS		NS		NS		NS		NS		NS		NS	
Beryllium	NS		NS		NS		NS		NS		NS		NS		NS	
Boron	NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium	NS		NS		NS		NS		NS		NS		NS		NS	
Cobalt	NS		NS		NS		NS		NS		NS		NS		NS	
Copper, total	NS		NS		NS		NS		NS		NS		NS		NS	
Iron	NS		NS		NS		NS		NS		NS		NS		NS	
Molybdenum	NS		NS		NS		NS		NS		NS		NS		NS	
Nickel	NS		NS		NS		NS		NS		NS		NS		NS	
Selenium	**0.001 J**	0.005	NS		**0.004 J**	0.005	NS		**0.005 J**	0.005	NS		**0.004 J**	0.005	NS	
Silver	NS		NS		NS		NS		NS		NS		NS		NS	
Thallium	NS		NS		NS		NS		NS		NS		NS		NS	
Vanadium	NS		NS		NS		NS		NS		NS		NS		NS	
Zinc	NS		NS		NS		NS		NS		NS		NS		NS	
Dissolved Metals (mg/L)																
Aluminum, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Barium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Beryllium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Boron, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium, dissolved	NS		<0.0001 UK	0.000689	NS		<0.0001 UK	0.000692	NS		<0.0001 UJK	0.000695	NS		<0.0001 UJK	0.000692
Cobalt, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Copper, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Iron, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Molybdenum, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Nickel, dissolved	NS		**0.0028 JK**	0.0687	NS		**0.0019 JK**	0.0691	NS		**0.0029 JK**	0.0696	NS		**0.00253 JK**	0.0691
Selenium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Silver, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Thallium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Vanadium, dissolved	NS		**0.0016 K**	0.02	NS		**0.0017 K**	0.02	NS		**0.0017 K**	0.02	NS		**0.00167 K**	0.02
Zinc, dissolved	NS		<0.002 UJK	0.156	NS		**0.003 JK**	0.157	NS		**0.004 JK**	0.158	NS		**0.0035 JK**	0.157

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ENOCH VALLEY MINE - SUMMARY OF SURFACE WATER EXCEEDANCES
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Location:	MST023		MST023		MST023		MST024		MST024		MST025		MST025		MST026	
Location Type:	Stream		Stream		Stream		Stream		Stream		Stream		Stream		Stream	
Sample ID:	051408SWMST023-avg-U		091608SWMST023-0-F		091608SWMST023-0-U		051904SWMST024-0-F		051904SWMST024-0-U		051904SWMST025-0-F		051904SWMST025-0-U		051704SWMST026-0-F	
Collection Date:	5/14/2008		9/16/2008		9/16/2008		5/19/2004		5/19/2004		5/19/2004		5/19/2004		5/17/2004	
Sample Type:	Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water	
	Averaged		Primary		Primary		Primary		Primary		Primary		Primary		Primary	
	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL
Total Metals (mg/L)																
Aluminum	**1.54 K**	0.087	NS		NS		NS		NS		NS		NS		NS	
Barium	NS		NS		NS		NS		NS		NS		NS		NS	
Beryllium	NS		NS		NS		NS		NS		NS		NS		NS	
Boron	NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium	NS		NS		NS		NS		NS		NS		NS		NS	
Cobalt	NS		NS		NS		NS		NS		NS		NS		NS	
Copper, total	NS		NS		NS		NS		NS		NS		NS		NS	
Iron	NS		NS		NS		NS		NS		NS		NS		NS	
Molybdenum	NS		NS		NS		NS		NS		NS		NS		NS	
Nickel	NS		NS		NS		NS		NS		NS		NS		NS	
Selenium	**0.00433 J**	0.005	NS		**0.00194**	0.005	NS		**0.003 J**	0.005	NS		**0.002 J**	0.005	NS	
Silver	NS		NS		NS		NS		NS		NS		NS		NS	
Thallium	NS		NS		NS		NS		NS		NS		NS		NS	
Vanadium	NS		NS		NS		NS		NS		NS		NS		NS	
Zinc	NS		NS		NS		NS		NS		NS		NS		NS	
Dissolved Metals (mg/L)																
Aluminum, dissolved	NS		<0.0500	0.087	NS		NS		NS		NS		NS		NS	
Barium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Beryllium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Boron, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium, dissolved	NS		<0.000125	0.000795	NS		<0.0001 UJK	0.000826	NS		<0.0001 UK	0.000833	NS		<0.0001 UK	0.000852
Cobalt, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Copper, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Iron, dissolved	NS		<0.0250	0.158	NS		NS		NS		NS		NS		NS	
Molybdenum, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Nickel, dissolved	NS		**0.00212 J**	0.0847	NS		**0.0015 JK**	0.0895	NS		**0.0003 JK**	0.0907	NS		<0.0007 UK	0.0937
Selenium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Silver, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Thallium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Vanadium, dissolved	NS		<0.00500	0.02	NS		**0.00077 JK**	0.02	NS		**0.00086 K**	0.02	NS		**0.00087 K**	0.02
Zinc, dissolved	NS		**0.00508 J**	0.193	NS		<0.002 UJK	0.204	NS		<0.002 UK	0.206	NS		<0.002 UK	0.213

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ENOCH VALLEY MINE - SUMMARY OF SURFACE WATER EXCEEDANCES
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Location:	MST026		MST026		MST026		MST026		MST026		MST026		MST026		MST026	
Location Type:	Stream		Stream		Stream		Stream		Stream		Stream		Stream		Stream	
Sample ID:	051704SWMST026-0-U		051407SWMST026-1-F		051407SWMST026-1-U		051407SWMST026-2-F		051407SWMST026-2-U		051407SWMST026-3-F		051407SWMST026-3-U		051407SWMST026-avg-F	
Collection Date:	5/17/2004		5/14/2007		5/14/2007		5/14/2007		5/14/2007		5/14/2007		5/14/2007		5/14/2007	
Sample Type:	Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water	
	Primary		Triplicate		Triplicate		Triplicate		Triplicate		Triplicate		Triplicate		Averaged	
	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL
Total Metals (mg/L)																
Aluminum	NS		NS		<0.18 UK	0.087	NS		<0.17 UK	0.087	NS		<0.19 UK	0.087	NS	
Barium	NS		NS		NS		NS		NS		NS		NS		NS	
Beryllium	NS		NS		NS		NS		NS		NS		NS		NS	
Boron	NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium	NS		NS		NS		NS		NS		NS		NS		NS	
Cobalt	NS		NS		NS		NS		NS		NS		NS		NS	
Copper, total	NS		NS		NS		NS		NS		NS		NS		NS	
Iron	NS		NS		NS		NS		NS		NS		NS		NS	
Molybdenum	NS		NS		NS		NS		NS		NS		NS		NS	
Nickel	NS		NS		NS		NS		NS		NS		NS		NS	
Selenium	**0.007**	0.005	NS		**0.004 J**	0.005	NS		**0.004 J**	0.005	NS		**0.004 J**	0.005	NS	
Silver	NS		NS		NS		NS		NS		NS		NS		NS	
Thallium	NS		NS		NS		NS		NS		NS		NS		NS	
Vanadium	NS		NS		NS		NS		NS		NS		NS		NS	
Zinc	NS		NS		NS		NS		NS		NS		NS		NS	
Dissolved Metals (mg/L)																
Aluminum, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Barium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Beryllium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Boron, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium, dissolved	NS		<0.0001 UJK	0.000850	NS		<0.0001 UJK	0.000858	NS		<0.0001 UJK	0.000855	NS		<0.0001 UJK	0.000855
Cobalt, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Copper, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Iron, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Molybdenum, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Nickel, dissolved	NS		**0.0008 JK**	0.0935	NS		**0.0009 JK**	0.0947	NS		**0.0008 JK**	0.0943	NS		**0.000833 JK**	0.0943
Selenium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Silver, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Thallium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Vanadium, dissolved	NS		**0.0006 JK**	0.02	NS		**0.0006 JK**	0.02	NS		**0.0007 JK**	0.02	NS		**0.000633 JK**	0.02
Zinc, dissolved	NS		<0.002 UJK	0.213	NS		<0.002 UJK	0.215	NS		**0.003 JK**	0.214	NS		**0.003 JK**	0.214

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ENOCH VALLEY MINE - SUMMARY OF SURFACE WATER EXCEEDANCES
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Location:	MST026		MST026		MST026		MST026		MST026		MST026		MST026		MST026	
Location Type:	Stream		Stream		Stream		Stream		Stream		Stream		Stream		Stream	
Sample ID:	051407SWMST026-avg-U		091007SWMST026-1-F		091007SWMST026-1-U		091007SWMST026-2-F		091007SWMST026-2-U		091007SWMST026-3-F		091007SWMST026-3-U		091007SWMST026-avg-F	
Collection Date:	5/14/2007		9/10/2007		9/10/2007		9/10/2007		9/10/2007		9/10/2007		9/10/2007		9/10/2007	
Sample Type:	Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water	
	Averaged		Triplicate		Triplicate		Triplicate		Triplicate		Triplicate		Triplicate		Averaged	
	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL
Total Metals (mg/L)																
Aluminum	<0.03 UK	0.087	NS		<0.03 UK	0.087	NS		**0.03 JK {J+}**	0.087	NS		<0.03 UK	0.087	NS	
Barium	NS		NS		NS		NS		NS		NS		NS		NS	
Beryllium	NS		NS		NS		NS		NS		NS		NS		NS	
Boron	NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium	NS		NS		NS		NS		NS		NS		NS		NS	
Cobalt	NS		NS		NS		NS		NS		NS		NS		NS	
Copper, total	NS		NS		NS		NS		NS		NS		NS		NS	
Iron	NS		NS		NS		NS		NS		NS		NS		NS	
Molybdenum	NS		NS		NS		NS		NS		NS		NS		NS	
Nickel	NS		NS		NS		NS		NS		NS		NS		NS	
Selenium	**0.004 J**	0.005	NS		<0.001	0.005	NS		<0.001	0.005	NS		<0.001	0.005	NS	
Silver	NS		NS		NS		NS		NS		NS		NS		NS	
Thallium	NS		NS		NS		NS		NS		NS		NS		NS	
Vanadium	NS		NS		NS		NS		NS		NS		NS		NS	
Zinc	NS		NS		NS		NS		NS		NS		NS		NS	
Dissolved Metals (mg/L)																
Aluminum, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Barium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Beryllium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Boron, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium, dissolved	NS		<0.0001 UK	0.000795	NS		<0.0001 UK	0.000780	NS		<0.0001 UK	0.000785	NS		<0.0001 UK	0.000787
Cobalt, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Copper, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Iron, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Molybdenum, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Nickel, dissolved	NS		**0.0022 JK**	0.0847	NS		**0.0021 JK**	0.0823	NS		**0.0022 JK**	0.0831	NS		**0.00217 JK**	0.0835
Selenium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Silver, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Thallium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Vanadium, dissolved	NS		**0.0012 K**	0.02	NS		**0.0013 K**	0.02	NS		**0.0014 K**	0.02	NS		**0.0013 K**	0.02
Zinc, dissolved	NS		<0.002 UK	0.193	NS		<0.002 UK	0.187	NS		<0.002 UK	0.189	NS		<0.002 UK	0.190

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ENOCH VALLEY MINE - SUMMARY OF SURFACE WATER EXCEEDANCES
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Location:	MST026		MST026		MST026		MST026		MST026		MST026		MST026		MST026	
Location Type:	Stream		Stream		Stream		Stream		Stream		Stream		Stream		Stream	
Sample ID:	091007SWMST026-avg-U		051408SWMST026-1-F		051408SWMST026-1-U		051408SWMST026-2-F		051408SWMST026-2-U		051408SWMST026-3-F		051408SWMST026-3-U		051408SWMST026-avg-F	
Collection Date:	9/10/2007		5/14/2008		5/14/2008		5/14/2008		5/14/2008		5/14/2008		5/14/2008		5/14/2008	
Sample Type:	Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water	
	Averaged		Triplicate		Triplicate		Triplicate		Triplicate		Triplicate		Triplicate		Averaged	
	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL
Total Metals (mg/L)																
Aluminum	**0.03 JK**	0.087	NS		**1.63 K**	0.087	NS		**1.77 K**	0.087	NS		**1.82 K**	0.087	NS	
Barium	NS		NS		NS		NS		NS		NS		NS		NS	
Beryllium	NS		NS		NS		NS		NS		NS		NS		NS	
Boron	NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium	NS		NS		NS		NS		NS		NS		NS		NS	
Cobalt	NS		NS		NS		NS		NS		NS		NS		NS	
Copper, total	NS		NS		NS		NS		NS		NS		NS		NS	
Iron	NS		NS		NS		NS		NS		NS		NS		NS	
Molybdenum	NS		NS		NS		NS		NS		NS		NS		NS	
Nickel	NS		NS		NS		NS		NS		NS		NS		NS	
Selenium	<0.001	0.005	NS		**0.004 J**	0.005	NS		**0.004 J**	0.005	NS		**0.004 J**	0.005	NS	
Silver	NS		NS		NS		NS		NS		NS		NS		NS	
Thallium	NS		NS		NS		NS		NS		NS		NS		NS	
Vanadium	NS		NS		NS		NS		NS		NS		NS		NS	
Zinc	NS		NS		NS		NS		NS		NS		NS		NS	
Dissolved Metals (mg/L)																
Aluminum, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Barium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Beryllium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Boron, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium, dissolved	NS		<0.0001 UK	0.000681	NS		<0.0001 UK	0.000678	NS		<0.0001 UK	0.000675	NS		<0.0001 UK	0.000678
Cobalt, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Copper, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Iron, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Molybdenum, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Nickel, dissolved	NS		**0.0016 JK**	0.0675	NS		**0.0016 JK**	0.0670	NS		**0.0019 JK**	0.0666	NS		**0.0017 JK**	0.0670
Selenium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Silver, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Thallium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Vanadium, dissolved	NS		**0.0013 K**	0.02	NS		**0.0015 K**	0.02	NS		**0.0012 K**	0.02	NS		**0.00133 K**	0.02
Zinc, dissolved	NS		**0.004 JK**	0.153	NS		**0.008 JK**	0.152	NS		<0.002 UK	0.151	NS		**0.006 JK**	0.152

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ENOCH VALLEY MINE - SUMMARY OF SURFACE WATER EXCEEDANCES
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Location:	MST026		MST026		MST026		MST027		MST027		MST027		MST027		MST027	
Location Type:	Stream		Stream		Stream		Stream		Stream		Stream		Stream		Stream	
Sample ID:	051408SWMST026-avg-U		091508SWMST026-0-F		091508SWMST026-0-U		051404SWMST027-0-F		051404SWMST027-0-U		051106SWMST027-0-F		051106SWMST027-0-U		050607SWMST027-0-F	
Collection Date:	5/14/2008		9/15/2008		9/15/2008		5/14/2004		5/14/2004		5/11/2006		5/11/2006		5/6/2007	
Sample Type:	Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water	
	Averaged		Primary		Primary		Primary		Primary		Primary		Primary		Primary	
	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL
Total Metals (mg/L)																
Aluminum	**1.74 K**	0.087	NS		NS		NS		NS		NS		NS		NS	
Barium	NS		NS		NS		NS		NS		NS		NS		NS	
Beryllium	NS		NS		NS		NS		NS		NS		NS		NS	
Boron	NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium	NS		NS		NS		NS		NS		NS		NS		NS	
Cobalt	NS		NS		NS		NS		NS		NS		NS		NS	
Copper, total	NS		NS		NS		NS		NS		NS		NS		NS	
Iron	NS		NS		NS		NS		NS		NS		NS		NS	
Molybdenum	NS		NS		NS		NS		NS		NS		NS		NS	
Nickel	NS		NS		NS		NS		NS		NS		NS		NS	
Selenium	**0.004 J**	0.005	NS		**0.00155**	0.005	NS		**0.008**	0.005	NS		**0.005 J-**	0.005	NS	
Silver	NS		NS		NS		NS		NS		NS		NS		NS	
Thallium	NS		NS		NS		NS		NS		NS		NS		NS	
Vanadium	NS		NS		NS		NS		NS		NS		NS		NS	
Zinc	NS		NS		NS		NS		NS		NS		NS		NS	
Dissolved Metals (mg/L)																
Aluminum, dissolved	NS		<0.0500	0.087	NS		NS		NS		<0.03 UK	0.087	NS		NS	
Barium, dissolved	NS		NS		NS		NS		NS		**0.064 K**	0.003	NS		NS	
Beryllium, dissolved	NS		NS		NS		NS		NS		<0.002 UK	0.0006	NS		NS	
Boron, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium, dissolved	NS		<0.000125	0.000798	NS		NS		NS		<0.0001 UK	0.000774	NS		<0.0001 UK	0.000813
Cobalt, dissolved	NS		NS		NS		NS		NS		<0.01 UK	0.003	NS		NS	
Copper, dissolved	NS		NS		NS		NS		NS		<0.01 UK	0.0179	NS		NS	
Iron, dissolved	NS		<0.0250	0.158	NS		NS		NS		<0.02 UK	0.158	NS		NS	
Molybdenum, dissolved	NS		NS		NS		NS		NS		<0.01 UK	0.034	NS		NS	
Nickel, dissolved	NS		**0.00151 J**	0.0851	NS		NS		NS		**0.0007 JK**	0.0815	NS		**0.0021 JK**	0.0875
Selenium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Silver, dissolved	NS		NS		NS		NS		NS		<0.01 UK	0.00036	NS		NS	
Thallium, dissolved	NS		NS		NS		NS		NS		<0.0001 UK	0.00003	NS		NS	
Vanadium, dissolved	NS		<0.00500	0.02	NS		**0.0007 J-K**	0.02	NS		**0.0007 JK**	0.02	NS		<0.0009 UK	0.02
Zinc, dissolved	NS		**0.0165 J**	0.193	NS		NS		NS		<0.002 UK	0.185	NS		<0.002 UK	0.199

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ENOCH VALLEY MINE - SUMMARY OF SURFACE WATER EXCEEDANCES
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Location:	MST027		MST027		MST027		MST027		MST027		MST027		MST027		MST126	
Location Type:	Stream		Stream		Stream		Stream		Stream		Stream		Stream		Stream	
Sample ID:	050607SWMST027-0-U		090907SWMST027-0-F		090907SWMST027-0-U		051408SWMST027-0-F		051408SWMST027-0-U		091608SWMST027-0-F		091608SWMST027-0-U		051704SWMST126-1-F	
Collection Date:	5/6/2007		9/9/2007		9/9/2007		5/14/2008		5/14/2008		9/16/2008		9/16/2008		5/17/2004	
Sample Type:	Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water	
	Primary		Primary		Primary		Primary		Primary		Primary		Primary		Triplicate	
	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL
Total Metals (mg/L)																
Aluminum	**0.6 K**	0.087	NS		<0.03 UK	0.087	NS		**1.4 J+K**	0.087	NS		NS		NS	
Barium	NS		NS		NS		NS		NS		NS		NS		NS	
Beryllium	NS		NS		NS		NS		NS		NS		NS		NS	
Boron	NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium	NS		NS		NS		NS		NS		NS		NS		NS	
Cobalt	NS		NS		NS		NS		NS		NS		NS		NS	
Copper, total	NS		NS		NS		NS		NS		NS		NS		NS	
Iron	NS		NS		NS		NS		NS		NS		NS		NS	
Molybdenum	NS		NS		NS		NS		NS		NS		NS		NS	
Nickel	NS		NS		NS		NS		NS		NS		NS		NS	
Selenium	**0.009**	0.005	NS		<0.001	0.005	NS		**0.004 J**	0.005	NS		**0.00126**	0.005	NS	
Silver	NS		NS		NS		NS		NS		NS		NS		NS	
Thallium	NS		NS		NS		NS		NS		NS		NS		NS	
Vanadium	NS		NS		NS		NS		NS		NS		NS		NS	
Zinc	NS		NS		NS		NS		NS		NS		NS		NS	
Dissolved Metals (mg/L)																
Aluminum, dissolved	NS		NS		NS		NS		NS		<0.0500	0.087	NS		NS	
Barium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Beryllium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Boron, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium, dissolved	NS		<0.0001 UK	0.000821	NS		<0.0001 UK	0.000686	NS		<0.000125	0.000823	NS		<0.0001 UK	0.000886
Cobalt, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Copper, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Iron, dissolved	NS		NS		NS		NS		NS		<0.0250	0.158	NS		NS	
Molybdenum, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Nickel, dissolved	NS		**0.0011 JK**	0.0887	NS		**0.0023 JK**	0.0683	NS		**0.00159 J**	0.0891	NS		**0.0011 K**	0.0993
Selenium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Silver, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Thallium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Vanadium, dissolved	NS		<0.0008 UK	0.02	NS		**0.0013 K**	0.02	NS		<0.00500	0.02	NS		**0.00072 K**	0.02
Zinc, dissolved	NS		<0.002 UK	0.202	NS		**0.006 JK**	0.155	NS		<0.00500	0.203	NS		<0.002 UK	0.226

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ENOCH VALLEY MINE - SUMMARY OF SURFACE WATER EXCEEDANCES
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Location:	MST126		MST126		MST126		MST126		MST126		MST126		MST126		MST126	
Location Type:	Stream		Stream		Stream		Stream		Stream		Stream		Stream		Stream	
Sample ID:	051704SWMST126-1-U		051704SWMST126-2-F		051704SWMST126-2-U		051704SWMST126-3-F		051704SWMST126-3-U		051704SWMST126-avg-F		051704SWMST126-avg-U		050606SWMST126-0-F	
Collection Date:	5/17/2004		5/17/2004		5/17/2004		5/17/2004		5/17/2004		5/17/2004		5/17/2004		5/6/2006	
Sample Type:	Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water	
	Triplicate		Triplicate		Triplicate		Triplicate		Triplicate		Averaged		Averaged		Primary	
	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL
Total Metals (mg/L)																
Aluminum	NS		NS		NS		NS		NS		NS		NS		NS	
Barium	NS		NS		NS		NS		NS		NS		NS		NS	
Beryllium	NS		NS		NS		NS		NS		NS		NS		NS	
Boron	NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium	NS		NS		NS		NS		NS		NS		NS		NS	
Cobalt	NS		NS		NS		NS		NS		NS		NS		NS	
Copper, total	NS		NS		NS		NS		NS		NS		NS		NS	
Iron	NS		NS		NS		NS		NS		NS		NS		NS	
Molybdenum	NS		NS		NS		NS		NS		NS		NS		NS	
Nickel	NS		NS		NS		NS		NS		NS		NS		NS	
Selenium	<0.001	0.005	NS		<0.001	0.005	NS		<0.001	0.005	NS		<0.001	0.005	NS	
Silver	NS		NS		NS		NS		NS		NS		NS		NS	
Thallium	NS		NS		NS		NS		NS		NS		NS		NS	
Vanadium	NS		NS		NS		NS		NS		NS		NS		NS	
Zinc	NS		NS		NS		NS		NS		NS		NS		NS	
Dissolved Metals (mg/L)																
Aluminum, dissolved	NS		NS		NS		NS		NS		NS		NS		**0.14 JK**	0.087
Barium, dissolved	NS		NS		NS		NS		NS		NS		NS		**0.032 K**	0.003
Beryllium, dissolved	NS		NS		NS		NS		NS		NS		NS		<0.002 UK	0.0006
Boron, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium, dissolved	NS		<0.0001 UK	0.000879	NS		<0.0001 UK	0.000877	NS		<0.0001 UK	0.000881	NS		<0.0001 UK	0.000706
Cobalt, dissolved	NS		NS		NS		NS		NS		NS		NS		<0.01 UK	0.003
Copper, dissolved	NS		NS		NS		NS		NS		NS		NS		<0.01 UK	0.0156
Iron, dissolved	NS		NS		NS		NS		NS		NS		NS		**0.07 K**	0.158
Molybdenum, dissolved	NS		NS		NS		NS		NS		NS		NS		<0.01 UK	0.034
Nickel, dissolved	NS		**0.001 J+K**	0.0981	NS		<0.001 UK	0.0978	NS		**0.00105 J+K**	0.0984	NS		**0.0019 JK**	0.0712
Selenium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Silver, dissolved	NS		NS		NS		NS		NS		NS		NS		<0.01 UK	0.00036
Thallium, dissolved	NS		NS		NS		NS		NS		NS		NS		<0.0001 UK	0.00003
Vanadium, dissolved	NS		**0.00073 K**	0.02	NS		**0.00072 K**	0.02	NS		**0.000723 K**	0.02	NS		<0.0002 UK	0.02
Zinc, dissolved	NS		<0.002 UK	0.223	NS		<0.002 UK	0.222	NS		<0.002 UK	0.224	NS		**0.007 JK**	0.162

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ENOCH VALLEY MINE - SUMMARY OF SURFACE WATER EXCEEDANCES
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Location:	MST126		MST127		MST127		MST127		MST127		MST127		MST127		MST127	
Location Type:	Stream		Stream		Stream		Stream		Stream		Stream		Stream		Stream	
Sample ID:	050606SWMST126-0-U		051304SWMST127-0-F		051304SWMST127-0-U		050606SWMST127-0-F		050606SWMST127-0-U		050407SWMST127-0-F		050407SWMST127-0-U		090907SWMST127-0-F	
Collection Date:	5/6/2006		5/13/2004		5/13/2004		5/6/2006		5/6/2006		5/4/2007		5/4/2007		9/9/2007	
Sample Type:	Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water	
	Primary		Primary		Primary		Primary		Primary		Primary		Primary		Primary	
	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL
Total Metals (mg/L)																
Aluminum	NS		NS		NS		NS		NS		NS		**0.95 J+K**	0.087	NS	
Barium	NS		NS		NS		NS		NS		NS		NS		NS	
Beryllium	NS		NS		NS		NS		NS		NS		NS		NS	
Boron	NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium	NS		NS		NS		NS		NS		NS		NS		NS	
Cobalt	NS		NS		NS		NS		NS		NS		NS		NS	
Copper, total	NS		NS		NS		NS		NS		NS		NS		NS	
Iron	NS		NS		NS		NS		NS		NS		NS		NS	
Molybdenum	NS		NS		NS		NS		NS		NS		NS		NS	
Nickel	NS		NS		NS		NS		NS		NS		NS		NS	
Selenium	**0.004 J**	0.005	NS		<0.001	0.005	NS		**0.004 J**	0.005	NS		<0.001	0.005	NS	
Silver	NS		NS		NS		NS		NS		NS		NS		NS	
Thallium	NS		NS		NS		NS		NS		NS		NS		NS	
Vanadium	NS		NS		NS		NS		NS		NS		NS		NS	
Zinc	NS		NS		NS		NS		NS		NS		NS		NS	
Dissolved Metals (mg/L)																
Aluminum, dissolved	NS		NS		NS		**0.11 JK**	0.087	NS		NS		NS		NS	
Barium, dissolved	NS		NS		NS		**0.032 K**	0.003	NS		NS		NS		NS	
Beryllium, dissolved	NS		NS		NS		<0.002 UK	0.0006	NS		NS		NS		NS	
Boron, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium, dissolved	NS		<0.0001 UK	0.000689	NS		<0.0001 UK	0.000737	NS		<0.0001 UK	0.000846	NS		<0.0001 UK	0.000933
Cobalt, dissolved	NS		NS		NS		<0.01 UK	0.003	NS		NS		NS		NS	
Copper, dissolved	NS		NS		NS		<0.01 UK	0.0166	NS		NS		NS		NS	
Iron, dissolved	NS		NS		NS		**0.05 K**	0.158	NS		NS		NS		NS	
Molybdenum, dissolved	NS		NS		NS		<0.01 UK	0.034	NS		NS		NS		NS	
Nickel, dissolved	NS		**0.0008 JK**	0.0687	NS		**0.0023 JK**	0.0758	NS		**0.0025 JK**	0.0927	NS		**0.0018 JK**	0.107
Selenium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Silver, dissolved	NS		NS		NS		<0.01 UK	0.00036	NS		NS		NS		NS	
Thallium, dissolved	NS		NS		NS		<0.0001 UK	0.00003	NS		NS		NS		NS	
Vanadium, dissolved	NS		**0.0006 K**	0.02	NS		<0.0002 UK	0.02	NS		<0.0008 UK	0.02	NS		**0.002 K**	0.02
Zinc, dissolved	NS		**0.002 JK**	0.156	NS		**0.005 JK**	0.172	NS		<0.002 UK	0.211	NS		**0.003 JK**	0.244

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ENOCH VALLEY MINE - SUMMARY OF SURFACE WATER EXCEEDANCES
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Location:	MST127		MST127		MST127		MST127		MST127		MST127		MST127		MST127	
Location Type:	Stream		Stream		Stream		Stream		Stream		Stream		Stream		Stream	
Sample ID:	090907SWMST127-0-U		051408SWMST127-0-F		051408SWMST127-0-U		051608SWMST127-0-F		051608SWMST127-0-U		091708SWMST127-1-F		091708SWMST127-1-U		091708SWMST127-2-F	
Collection Date:	9/9/2007		5/14/2008		5/14/2008		5/16/2008		5/16/2008		9/17/2008		9/17/2008		9/17/2008	
Sample Type:	Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water	
	Primary		Primary		Primary		Primary		Primary		Triplicate		Triplicate		Triplicate	
	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL
Total Metals (mg/L)																
Aluminum	**3.32 K**	0.087	NS		**0.48 K**	0.087	NS		**0.32 K**	0.087	NS		NS		NS	
Barium	NS		NS		NS		NS		NS		NS		NS		NS	
Beryllium	NS		NS		NS		NS		NS		NS		NS		NS	
Boron	NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium	NS		NS		NS		NS		NS		NS		NS		NS	
Cobalt	NS		NS		NS		NS		NS		NS		NS		NS	
Copper, total	NS		NS		NS		NS		NS		NS		NS		NS	
Iron	NS		NS		NS		NS		NS		NS		NS		NS	
Molybdenum	NS		NS		NS		NS		NS		NS		NS		NS	
Nickel	NS		NS		NS		NS		NS		NS		NS		NS	
Selenium	<0.001	0.005	NS		**0.005**	0.005	NS		**0.005 J-**	0.005	NS		**0.00196**	0.005	NS	
Silver	NS		NS		NS		NS		NS		NS		NS		NS	
Thallium	NS		NS		NS		NS		NS		NS		NS		NS	
Vanadium	NS		NS		NS		NS		NS		NS		NS		NS	
Zinc	NS		NS		NS		NS		NS		NS		NS		NS	
Dissolved Metals (mg/L)																
Aluminum, dissolved	NS		NS		NS		NS		NS		<0.0500	0.087	NS		<0.0500	0.087
Barium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Beryllium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Boron, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium, dissolved	NS		<0.0001 UK	0.000737	NS		<0.0001 UK	0.000764	NS		<0.000125	0.000863	NS		<0.000125	0.000863
Cobalt, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Copper, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Iron, dissolved	NS		NS		NS		NS		NS		<0.0250	0.158	NS		<0.0250	0.158
Molybdenum, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Nickel, dissolved	NS		**0.0029 JK**	0.0758	NS		**0.0026 JK**	0.0798	NS		**0.00201 J**	0.0955	NS		**0.00203 J**	0.0955
Selenium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Silver, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Thallium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Vanadium, dissolved	NS		**0.0011 J+K**	0.02	NS		**0.0008 JK**	0.02	NS		<0.00500	0.02	NS		<0.00500	0.02
Zinc, dissolved	NS		**0.006 JK**	0.172	NS		**0.007 JK**	0.182	NS		<0.00500	0.217	NS		**0.00747 J**	0.217

TABLE 3-40

ENOCH VALLEY MINE - SUMMARY OF SURFACE WATER EXCEEDANCES
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Location:	MST127		MST127		MST127		MST127		MST127		MST131		MST131		MST131	
Location Type:	Stream		Stream		Stream		Stream		Stream		Stream		Stream		Stream	
Sample ID:	091708SWMST127-2-U		091708SWMST127-3-F		091708SWMST127-3-U		091708SWMST127-avg-F		091708SWMST127-avg-U		051004SWMST131-0-F		051004SWMST131-0-U		050606SWMST131-0-F	
Collection Date:	9/17/2008		9/17/2008		9/17/2008		9/17/2008		9/17/2008		5/10/2004		5/10/2004		5/6/2006	
Sample Type:	Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water	
	Triplicate		Triplicate		Triplicate		Averaged		Averaged		Primary		Primary		Primary	
	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL
Total Metals (mg/L)																
Aluminum	NS		NS		NS		NS		NS		NS		NS		NS	
Barium	NS		NS		NS		NS		NS		NS		NS		NS	
Beryllium	NS		NS		NS		NS		NS		NS		NS		NS	
Boron	NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium	NS		NS		NS		NS		NS		NS		NS		NS	
Cobalt	NS		NS		NS		NS		NS		NS		NS		NS	
Copper, total	NS		NS		NS		NS		NS		NS		NS		NS	
Iron	NS		NS		NS		NS		NS		NS		NS		NS	
Molybdenum	NS		NS		NS		NS		NS		NS		NS		NS	
Nickel	NS		NS		NS		NS		NS		NS		NS		NS	
Selenium	**0.00134**	0.005	NS		**0.00176**	0.005	NS		**0.00169**	0.005	NS		**0.002 J**	0.005	NS	
Silver	NS		NS		NS		NS		NS		NS		NS		NS	
Thallium	NS		NS		NS		NS		NS		NS		NS		NS	
Vanadium	NS		NS		NS		NS		NS		NS		NS		NS	
Zinc	NS		NS		NS		NS		NS		NS		NS		NS	
Dissolved Metals (mg/L)																
Aluminum, dissolved	NS		<0.0500	0.087	NS		<0.0500	0.087	NS		NS		NS		**0.19 JK**	0.087
Barium, dissolved	NS		NS		NS		NS		NS		NS		NS		**0.039 K**	0.003
Beryllium, dissolved	NS		NS		NS		NS		NS		NS		NS		<0.002 UK	0.0006
Boron, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium, dissolved	NS		<0.000125	0.000870	NS		<0.000125	0.000865	NS		<0.0001 UK	0.000793	NS		<0.0001 UK	0.000663
Cobalt, dissolved	NS		NS		NS		NS		NS		NS		NS		<0.01 UK	0.003
Copper, dissolved	NS		NS		NS		NS		NS		NS		NS		<0.01 UK	0.0142
Iron, dissolved	NS		**0.0444 J**	0.158	NS		**0.0444 J**	0.158	NS		NS		NS		**0.1 K**	0.158
Molybdenum, dissolved	NS		NS		NS		NS		NS		NS		NS		<0.01 UK	0.034
Nickel, dissolved	NS		**0.00186 J**	0.0966	NS		**0.00197 J**	0.0958	NS		**0.0006 JK**	0.0844	NS		**0.0028 JK**	0.0649
Selenium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Silver, dissolved	NS		NS		NS		NS		NS		NS		NS		<0.01 UK	0.00036
Thallium, dissolved	NS		NS		NS		NS		NS		NS		NS		<0.0001 UK	0.00003
Vanadium, dissolved	NS		<0.00500	0.02	NS		<0.00500	0.02	NS		**0.00115 K**	0.02	NS		**0.001 JK**	0.02
Zinc, dissolved	NS		<0.00500	0.220	NS		**0.00747 J**	0.218	NS		<0.002 UJK	0.192	NS		**0.003 JK**	0.148

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ENOCH VALLEY MINE - SUMMARY OF SURFACE WATER EXCEEDANCES
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Location:	MST131		MST131		MST131		MST131		MST131		MST131		MST131		MST131	
Location Type:	Stream		Stream		Stream		Stream		Stream		Stream		Stream		Stream	
Sample ID:	050606SWMST131-0-U		050307SWMST131-0-F		050307SWMST131-0-U		091007SWMST131-0-F		091007SWMST131-0-U		051808SWMST131-0-F		051808SWMST131-0-U		091808SWMST131-0-F	
Collection Date:	5/6/2006		5/20/2004		5/4/2007		9/10/2007		9/10/2007		5/18/2008		5/18/2008		9/18/2008	
Sample Type:	Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water	
	Primary		Primary		Primary		Primary		Primary		Primary		Primary		Primary	
	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL
Total Metals (mg/L)																
Aluminum	NS		NS		**0.82 J+K**	0.087	NS		**0.17 JK**	0.087	NS		**0.44 J+K**	0.087	NS	
Barium	NS		NS		NS		NS		NS		NS		NS		NS	
Beryllium	NS		NS		NS		NS		NS		NS		NS		NS	
Boron	NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium	NS		NS		NS		NS		NS		NS		NS		NS	
Cobalt	NS		NS		NS		NS		NS		NS		NS		NS	
Copper, total	NS		NS		NS		NS		NS		NS		NS		NS	
Iron	NS		NS		NS		NS		NS		NS		NS		NS	
Molybdenum	NS		NS		NS		NS		NS		NS		NS		NS	
Nickel	NS		NS		NS		NS		NS		NS		NS		NS	
Selenium	**0.005**	0.005	NS		**0.002 J**	0.005	NS		**0.002 J**	0.005	NS		**0.002 J**	0.005	NS	
Silver	NS		NS		NS		NS		NS		NS		NS		NS	
Thallium	NS		NS		NS		NS		NS		NS		NS		NS	
Vanadium	NS		NS		NS		NS		NS		NS		NS		NS	
Zinc	NS		NS		NS		NS		NS		NS		NS		NS	
Dissolved Metals (mg/L)																
Aluminum, dissolved	NS		NS		NS		NS		NS		NS		NS		<0.0500	0.087
Barium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Beryllium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Boron, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium, dissolved	NS		<0.0001 UK	0.000785	NS		<0.0001 UK	0.000808	NS		<0.0001 UK	0.000715	NS		<0.000125	0.000780
Cobalt, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Copper, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Iron, dissolved	NS		NS		NS		NS		NS		NS		NS		<0.0250	0.158
Molybdenum, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Nickel, dissolved	NS		**0.003 JK**	0.0831	NS		**0.0028 JK**	0.0867	NS		**0.0033 K**	0.0725	NS		**0.00246 J**	0.0823
Selenium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Silver, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Thallium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Vanadium, dissolved	NS		<0.001 UK	0.02	NS		**0.002 K**	0.02	NS		**0.0021 JK**	0.02	NS		<0.00500	0.02
Zinc, dissolved	NS		<0.002 UK	0.189	NS		<0.002 UK	0.197	NS		**0.004 JK**	0.165	NS		<0.00500	0.187

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ENOCH VALLEY MINE - SUMMARY OF SURFACE WATER EXCEEDANCES
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Location:	MST131		MST131		MST131		MST132		MST132		MST132		MST132		MST132	
Location Type:	Stream		Stream		Stream		Stream		Stream		Stream		Stream		Stream	
Sample ID:	091808SWMST131-0-U		0905SWMST131-F		0905SWMST131-U		051204SWMST132-0-F		051204SWMST132-0-U		050606SWMST132-0-F		050606SWMST132-0-U		050407SWMST132-0-F	
Collection Date:	9/18/2008		5/7/2009		5/7/2009		5/12/2004		5/12/2004		5/6/2006		5/6/2006		5/4/2007	
Sample Type:	Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water	
	Primary		Primary		Primary		Primary		Primary		Primary		Primary		Primary	
	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL
Total Metals (mg/L)																
Aluminum	NS		NS		NS		NS		NS		NS		NS		NS	
Barium	NS		NS		NS		NS		NS		NS		NS		NS	
Beryllium	NS		NS		NS		NS		NS		NS		NS		NS	
Boron	NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium	NS		NS		NS		NS		NS		NS		NS		NS	
Cobalt	NS		NS		NS		NS		NS		NS		NS		NS	
Copper, total	NS		NS		NS		NS		NS		NS		NS		NS	
Iron	NS		NS		NS		NS		NS		NS		NS		NS	
Molybdenum	NS		NS		NS		NS		NS		NS		NS		NS	
Nickel	NS		NS		NS		NS		NS		NS		NS		NS	
Selenium	**0.00216**	0.005	NS		**0.00207**	0.005	NS		<0.001	0.005	NS		**0.004 J**	0.005	NS	
Silver	NS		NS		NS		NS		NS		NS		NS		NS	
Thallium	NS		NS		NS		NS		NS		NS		NS		NS	
Vanadium	NS		NS		NS		NS		NS		NS		NS		NS	
Zinc	NS		NS		NS		NS		NS		NS		NS		NS	
Dissolved Metals (mg/L)																
Aluminum, dissolved	NS		NS		NS		NS		NS		**0.07 JK**	0.087	NS		NS	
Barium, dissolved	NS		NS		NS		NS		NS		**0.032 K**	0.003	NS		NS	
Beryllium, dissolved	NS		NS		NS		NS		NS		<0.002 UK	0.0006	NS		NS	
Boron, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium, dissolved	NS		<0.000125	0.000462	NS		<0.0001 UK	0.000877	NS		<0.0001 UK	0.000742	NS		<0.0001 UK	0.000858
Cobalt, dissolved	NS		NS		NS		NS		NS		<0.01 UK	0.003	NS		NS	
Copper, dissolved	NS		NS		NS		NS		NS		<0.01 UK	0.0168	NS		NS	
Iron, dissolved	NS		**0.116**	0.158	NS		NS		NS		**0.03 JK**	0.158	NS		NS	
Molybdenum, dissolved	NS		NS		NS		NS		NS		<0.01 UK	0.034	NS		NS	
Nickel, dissolved	NS		NS		NS		**0.0005 JK**	0.0977	NS		**0.0014 JK**	0.0766	NS		**0.0026 JK**	0.0947
Selenium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Silver, dissolved	NS		NS		NS		NS		NS		<0.01 UK	0.00036	NS		NS	
Thallium, dissolved	NS		NS		NS		NS		NS		<0.0001 UK	0.00003	NS		NS	
Vanadium, dissolved	NS		<0.00500	0.02	NS		**0.00045 K**	0.02	NS		<0.0002 UK	0.02	NS		<0.0007 UK	0.02
Zinc, dissolved	NS		NS		NS		<0.002 UK	0.222	NS		**0.003 JK**	0.174	NS		<0.002 UK	0.215

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ENOCH VALLEY MINE - SUMMARY OF SURFACE WATER EXCEEDANCES
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Location:	MST132		MST132		MST132		MST132		MST132		MST132		MST132		MST132	
Location Type:	Stream		Stream		Stream		Stream		Stream		Stream		Stream		Stream	
Sample ID:	050407SWMST132-0-U		091007SWMST132-0-F		091007SWMST132-0-U		051808SWMST132-0-F		051808SWMST132-0-U		091808SWMST132-0-F		091808SWMST132-0-U		0905SWMST132-1-F	
Collection Date:	5/4/2007		9/10/2007		9/10/2007		5/18/2008		5/18/2008		9/18/2008		9/18/2008		5/7/2009	
Sample Type:	Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water	
	Primary		Primary		Primary		Primary		Primary		Primary		Primary		Triplicate	
	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL
Total Metals (mg/L)																
Aluminum	**0.46 J+K**	0.087	NS		**0.27 K**	0.087	NS		**0.2 K**	0.087	NS		NS		NS	
Barium	NS		NS		NS		NS		NS		NS		NS		NS	
Beryllium	NS		NS		NS		NS		NS		NS		NS		NS	
Boron	NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium	NS		NS		NS		NS		NS		NS		NS		NS	
Cobalt	NS		NS		NS		NS		NS		NS		NS		NS	
Copper, total	NS		NS		NS		NS		NS		NS		NS		NS	
Iron	NS		NS		NS		NS		NS		NS		NS		NS	
Molybdenum	NS		NS		NS		NS		NS		NS		NS		NS	
Nickel	NS		NS		NS		NS		NS		NS		NS		NS	
Selenium	<0.001	0.005	NS		<0.001	0.005	NS		**0.004 J**	0.005	NS		**0.00130**	0.005	NS	
Silver	NS		NS		NS		NS		NS		NS		NS		NS	
Thallium	NS		NS		NS		NS		NS		NS		NS		NS	
Vanadium	NS		NS		NS		NS		NS		NS		NS		NS	
Zinc	NS		NS		NS		NS		NS		NS		NS		NS	
Dissolved Metals (mg/L)																
Aluminum, dissolved	NS		NS		NS		NS		NS		<0.0500	0.087	NS		NS	
Barium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Beryllium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Boron, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium, dissolved	NS		<0.0001 UK	0.000922	NS		<0.0001 UK	0.000828	NS		<0.000125	0.000833	NS		<0.000125	0.000583
Cobalt, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Copper, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Iron, dissolved	NS		NS		NS		NS		NS		<0.0250	0.158	NS		**0.0654 J**	0.158
Molybdenum, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Nickel, dissolved	NS		**0.0034 K**	0.105	NS		**0.0026 JK**	0.0899	NS		**0.00354 J**	0.0907	NS		NS	
Selenium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Silver, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Thallium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Vanadium, dissolved	NS		**0.0021 K**	0.02	NS		<0.0002 UK	0.02	NS		<0.00500	0.02	NS		<0.00500	0.02
Zinc, dissolved	NS		<0.002 UK	0.239	NS		**0.002 JK**	0.204	NS		<0.00500	0.206	NS		NS	

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ENOCH VALLEY MINE - SUMMARY OF SURFACE WATER EXCEEDANCES
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Location:	MST132		MST132		MST132		MST132		MST132		MST132		MST132		MST133	
Location Type:	Stream		Stream		Stream		Stream		Stream		Stream		Stream		Stream	
Sample ID:	0905SWMST132-1-U		0905SWMST132-2-F		0905SWMST132-2-U		0905SWMST132-3-F		0905SWMST132-3-U		0905SWMST132-avg-F		0905SWMST132-avg-U		051004SWMST133-0-F	
Collection Date:	5/7/2009		5/7/2009		5/7/2009		5/7/2009		5/7/2009		5/7/2009		5/7/2009		5/10/2004	
Sample Type:	Surface Water		Surface Water		Surface Water		Surface Water		Surface		Surface Water		Surface Water		Surface Water	
	Triplicate		Triplicate		Triplicate		Triplicate		Triplicate		Averaged		Averaged		Primary	
	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL
Total Metals (mg/L)																
Aluminum	NS		NS		NS		NS		NS		NS		NS		NS	
Barium	NS		NS		NS		NS		NS		NS		NS		NS	
Beryllium	NS		NS		NS		NS		NS		NS		NS		NS	
Boron	NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium	NS		NS		NS		NS		NS		NS		NS		NS	
Cobalt	NS		NS		NS		NS		NS		NS		NS		NS	
Copper, total	NS		NS		NS		NS		NS		NS		NS		NS	
Iron	NS		NS		NS		NS		NS		NS		NS		NS	
Molybdenum	NS		NS		NS		NS		NS		NS		NS		NS	
Nickel	NS		NS		NS		NS		NS		NS		NS		NS	
Selenium	**0.00359**	0.005	NS		**0.00331**	0.005	NS		**0.00393**	0.005	NS		**0.00361**	0.005	NS	
Silver	NS		NS		NS		NS		NS		NS		NS		NS	
Thallium	NS		NS		NS		NS		NS		NS		NS		NS	
Vanadium	NS		NS		NS		NS		NS		NS		NS		NS	
Zinc	NS		NS		NS		NS		NS		NS		NS		NS	
Dissolved Metals (mg/L)																
Aluminum, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Barium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Beryllium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Boron, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium, dissolved	NS		<0.000125	0.000580	NS		<0.000125	0.000583	NS		<0.000125	0.000583	NS		<0.0001 UK	0.000677
Cobalt, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Copper, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Iron, dissolved	NS		**0.0628 J**	0.158	NS		**0.0574 J**	0.158	NS		**0.0619 J**	0.158	NS		NS	
Molybdenum, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Nickel, dissolved	NS		NS		NS		NS		NS		NS		NS		**0.0015 K**	0.0669
Selenium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Silver, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Thallium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Vanadium, dissolved	NS		<0.00500	0.02	NS		<0.00500	0.02	NS		<0.00500	0.02	NS		**0.00095 K**	0.02
Zinc, dissolved	NS		NS		NS		NS		NS		NS		NS		<0.002 UK	0.152

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ENOCH VALLEY MINE - SUMMARY OF SURFACE WATER EXCEEDANCES
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Location:	MST133		MST133		MST133		MST133		MST133		MST133		MST133		MST133	
Location Type:	Stream		Stream		Stream		Stream		Stream		Stream		Stream		Stream	
Sample ID:	051004SWMST133-0-U		050606SWMST133-0-F		050606SWMST133-0-U		050707SWMST133-1-F		050707SWMST133-1-U		050707SWMST133-2-F		050707SWMST133-2-U		050707SWMST133-3-F	
Collection Date:	5/10/2004		5/6/2006		5/6/2006		5/7/2007		5/7/2007		5/7/2007		5/7/2007		5/7/2007	
Sample Type:	Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water	
	Primary		Primary		Primary		Triplicate		Triplicate		Triplicate		Triplicate		Triplicate	
	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL
Total Metals (mg/L)																
Aluminum	NS		NS		NS		NS		**0.5 K**	0.087	NS		**0.49 K**	0.087	NS	
Barium	NS		NS		NS		NS		NS		NS		NS		NS	
Beryllium	NS		NS		NS		NS		NS		NS		NS		NS	
Boron	NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium	NS		NS		NS		NS		NS		NS		NS		NS	
Cobalt	NS		NS		NS		NS		NS		NS		NS		NS	
Copper, total	NS		NS		NS		NS		NS		NS		NS		NS	
Iron	NS		NS		NS		NS		NS		NS		NS		NS	
Molybdenum	NS		NS		NS		NS		NS		NS		NS		NS	
Nickel	NS		NS		NS		NS		NS		NS		NS		NS	
Selenium	**0.004 J**	0.005	NS		**0.007**	0.005	NS		**0.001 J**	0.005	NS		**0.001 J**	0.005	NS	
Silver	NS		NS		NS		NS		NS		NS		NS		NS	
Thallium	NS		NS		NS		NS		NS		NS		NS		NS	
Vanadium	NS		NS		NS		NS		NS		NS		NS		NS	
Zinc	NS		NS		NS		NS		NS		NS		NS		NS	
Dissolved Metals (mg/L)																
Aluminum, dissolved	NS		**0.44 K**	0.087	NS		NS		NS		NS		NS		NS	
Barium, dissolved	NS		**0.034 K**	0.003	NS		NS		NS		NS		NS		NS	
Beryllium, dissolved	NS		<0.002 UK	0.0006	NS		NS		NS		NS		NS		NS	
Boron, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium, dissolved	NS		<0.0001 UK	0.000556	NS		<0.0001 UK	0.000615	NS		<0.0001 UK	0.000618	NS		<0.0001 UK	0.000618
Cobalt, dissolved	NS		<0.01 UK	0.003	NS		NS		NS		NS		NS		NS	
Copper, dissolved	NS		<0.01 UK	0.0110	NS		NS		NS		NS		NS		NS	
Iron, dissolved	NS		**0.22 K**	0.158	NS		NS		NS		NS		NS		NS	
Molybdenum, dissolved	NS		<0.01 UK	0.034	NS		NS		NS		NS		NS		NS	
Nickel, dissolved	NS		**0.0021 JK**	0.0502	NS		**0.0013 JK**	0.0581	NS		**0.0013 JK**	0.0585	NS		**0.0013 JK**	0.0585
Selenium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Silver, dissolved	NS		<0.01 UK	0.00036	NS		NS		NS		NS		NS		NS	
Thallium, dissolved	NS		<0.0001 UK	0.00003	NS		NS		NS		NS		NS		NS	
Vanadium, dissolved	NS		<0.0002 UK	0.02	NS		**0.0011 K**	0.02	NS		**0.0011 K**	0.02	NS		**0.001 K**	0.02
Zinc, dissolved	NS		**0.007 JK**	0.114	NS		**0.003 JK**	0.132	NS		**0.002 JK**	0.133	NS		**0.005 JK**	0.133

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ENOCH VALLEY MINE - SUMMARY OF SURFACE WATER EXCEEDANCES
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Location:	MST133		MST133		MST133		MST133		MST133		MST133		MST133		MST134	
Location Type:	Stream		Stream		Stream		Stream		Stream		Stream		Stream		Stream	
Sample ID:	050707SWMST133-3-U		050707SWMST133-avg-F		050707SWMST133-avg-U		051308SWMST133-0-F		051308SWMST133-0-U		0905SWMST133-F		0905SWMST133-U		051104SWMST134-0-U	
Collection Date:	5/7/2007		5/7/2007		5/7/2007		5/13/2008		5/13/2008		5/8/2009		5/8/2009		5/11/2004	
Sample Type:	Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water	
	Triplicate		Averaged		Averaged		Primary		Primary		Primary		Primary		Primary	
	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL
Total Metals (mg/L)																
Aluminum	**0.52 K**	0.087	NS		**0.503 K**	0.087	NS		**1.12 K**	0.087	NS		NS		NS	
Barium	NS		NS		NS		NS		NS		NS		NS		NS	
Beryllium	NS		NS		NS		NS		NS		NS		NS		NS	
Boron	NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium	NS		NS		NS		NS		NS		NS		NS		NS	
Cobalt	NS		NS		NS		NS		NS		NS		NS		NS	
Copper, total	NS		NS		NS		NS		NS		NS		NS		NS	
Iron	NS		NS		NS		NS		NS		NS		NS		NS	
Molybdenum	NS		NS		NS		NS		NS		NS		NS		NS	
Nickel	NS		NS		NS		NS		NS		NS		NS		NS	
Selenium	**0.001 J**	0.005	NS		**0.001 J**	0.005	NS		<0.001	0.005	NS		**0.00239**	0.005	**0.004 J**	0.005
Silver	NS		NS		NS		NS		NS		NS		NS		NS	
Thallium	NS		NS		NS		NS		NS		NS		NS		NS	
Vanadium	NS		NS		NS		NS		NS		NS		NS		NS	
Zinc	NS		NS		NS		NS		NS		NS		NS		NS	
Dissolved Metals (mg/L)																
Aluminum, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Barium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Beryllium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Boron, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium, dissolved	NS		<0.0001 UK	0.000618	NS		<0.0001 UK	0.000407	NS		<0.000125	0.000405	NS		NS	
Cobalt, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Copper, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Iron, dissolved	NS		NS		NS		NS		NS		**0.149**	0.158	NS		NS	
Molybdenum, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Nickel, dissolved	NS		**0.0013 JK**	0.0585	NS		**0.0017 JK**	0.0318	NS		NS		NS		NS	
Selenium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Silver, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Thallium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Vanadium, dissolved	NS		**0.00107 K**	0.02	NS		**0.0015 K**	0.02	NS		<0.00500	0.02	NS		NS	
Zinc, dissolved	NS		**0.00333 JK**	0.133	NS		**0.004 JK**	0.0723	NS		NS		NS		NS	

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ENOCH VALLEY MINE - SUMMARY OF SURFACE WATER EXCEEDANCES
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Location:	MST134		MST134		MST134		MST134		MST134		MST134		MST134		MST134	
Location Type:	Stream		Stream		Stream		Stream		Stream		Stream		Stream		Stream	
Sample ID:	051204SWMST134-0-F		050606SWMST134-0-F		050606SWMST134-0-U		050707SWMST134-1-F		050707SWMST134-1-U		050707SWMST134-2-F		050707SWMST134-2-U		050707SWMST134-3-F	
Collection Date:	5/11/2004		5/6/2006		5/6/2006		5/7/2007		5/7/2007		5/7/2007		5/7/2007		5/7/2007	
Sample Type:	Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water	
	Primary		Primary		Primary		Triplicate		Triplicate		Triplicate		Triplicate		Triplicate	
	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL
Total Metals (mg/L)																
Aluminum	NS		NS		NS		NS		**0.05 JK**	0.087	NS		<0.03 UK	0.087	NS	
Barium	NS		NS		NS		NS		NS		NS		NS		NS	
Beryllium	NS		NS		NS		NS		NS		NS		NS		NS	
Boron	NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium	NS		NS		NS		NS		NS		NS		NS		NS	
Cobalt	NS		NS		NS		NS		NS		NS		NS		NS	
Copper, total	NS		NS		NS		NS		NS		NS		NS		NS	
Iron	NS		NS		NS		NS		NS		NS		NS		NS	
Molybdenum	NS		NS		NS		NS		NS		NS		NS		NS	
Nickel	NS		NS		NS		NS		NS		NS		NS		NS	
Selenium	NS		NS		**0.011**	0.005	NS		**0.001 J**	0.005	NS		**0.001 J**	0.005	NS	
Silver	NS		NS		NS		NS		NS		NS		NS		NS	
Thallium	NS		NS		NS		NS		NS		NS		NS		NS	
Vanadium	NS		NS		NS		NS		NS		NS		NS		NS	
Zinc	NS		NS		NS		NS		NS		NS		NS		NS	
Dissolved Metals (mg/L)																
Aluminum, dissolved	NS		**0.05 JK {J+}**	0.087	NS		NS		NS		NS		NS		NS	
Barium, dissolved	NS		**0.037 K**	0.003	NS		NS		NS		NS		NS		NS	
Beryllium, dissolved	NS		<0.002 UK	0.0006	NS		NS		NS		NS		NS		NS	
Boron, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium, dissolved	**0.0001 JK**	0.000861	<0.0001 UK	0.000580	NS		<0.0001 UK	0.000675	NS		<0.0001 UK	0.000672	NS		<0.0001 UK	0.000672
Cobalt, dissolved	NS		<0.01 UK	0.003	NS		NS		NS		NS		NS		NS	
Copper, dissolved	NS		<0.01 UK	0.0116	NS		NS		NS		NS		NS		NS	
Iron, dissolved	NS		**0.03 JK**	0.158	NS		NS		NS		NS		NS		NS	
Molybdenum, dissolved	NS		<0.01 UK	0.034	NS		NS		NS		NS		NS		NS	
Nickel, dissolved	**0.0026 K**	0.0952	**0.0021 JK**	0.0533	NS		**0.0028 JK**	0.0666	NS		**0.0028 JK**	0.0662	NS		**0.003 JK**	0.0662
Selenium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Silver, dissolved	NS		<0.01 UK	0.00036	NS		NS		NS		NS		NS		NS	
Thallium, dissolved	NS		<0.0001 UK	0.00003	NS		NS		NS		NS		NS		NS	
Vanadium, dissolved	**0.00115 K**	0.02	<0.0002 UK	0.02	NS		**0.0009 JK**	0.02	NS		**0.0008 JK**	0.02	NS		**0.0008 JK**	0.02
Zinc, dissolved	**0.002 JK**	0.217	**0.005 JK**	0.121	NS		**0.002 JK**	0.151	NS		<0.002 UK	0.150	NS		**0.004 JK**	0.150

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ENOCH VALLEY MINE - SUMMARY OF SURFACE WATER EXCEEDANCES
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Location:	MST134		MST134		MST134		MST134		MST134		MST135		MST135		MST135	
Location Type:	Stream		Stream		Stream		Stream		Stream		Stream		Stream		Stream	
Sample ID:	050707SWMST134-3-U		050707SWMST134-avg-F		050707SWMST134-avg-U		051308SWMST134-0-F		051308SWMST134-0-U		051104SWMST135-0-F		051104SWMST135-0-U		050606SWMST135-0-F	
Collection Date:	5/7/2007		5/7/2007		5/7/2007		5/13/2008		5/13/2008		5/11/2004		5/11/2004		5/6/2006	
Sample Type:	Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water	
	Triplicate		Averaged		Averaged		Primary		Primary		Primary		Primary		Primary	
	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL
Total Metals (mg/L)																
Aluminum	**0.04 JK**	0.087	NS		**0.045 JK**	0.087	NS		**1.34 J+K**	0.087	NS		NS		NS	
Barium	NS		NS		NS		NS		NS		NS		NS		NS	
Beryllium	NS		NS		NS		NS		NS		NS		NS		NS	
Boron	NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium	NS		NS		NS		NS		NS		NS		NS		NS	
Cobalt	NS		NS		NS		NS		NS		NS		NS		NS	
Copper, total	NS		NS		NS		NS		NS		NS		NS		NS	
Iron	NS		NS		NS		NS		NS		NS		NS		NS	
Molybdenum	NS		NS		NS		NS		NS		NS		NS		NS	
Nickel	NS		NS		NS		NS		NS		NS		NS		NS	
Selenium	**0.002 J**	0.005	NS		**0.00133 J**	0.005	NS		<0.001	0.005	NS		<0.001	0.005	NS	
Silver	NS		NS		NS		NS		NS		NS		NS		NS	
Thallium	NS		NS		NS		NS		NS		NS		NS		NS	
Vanadium	NS		NS		NS		NS		NS		NS		NS		NS	
Zinc	NS		NS		NS		NS		NS		NS		NS		NS	
Dissolved Metals (mg/L)																
Aluminum, dissolved	NS		NS		NS		NS		NS		NS		NS		**0.42 K**	0.087
Barium, dissolved	NS		NS		NS		NS		NS		NS		NS		**0.03 K**	0.003
Beryllium, dissolved	NS		NS		NS		NS		NS		NS		NS		<0.002 UK	0.0006
Boron, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium, dissolved	NS		<0.0001 UK	0.000672	NS		**0.0002 JK**	0.000407	NS		<0.0001 UK	0.000770	NS		<0.0001 UK	0.000440
Cobalt, dissolved	NS		NS		NS		NS		NS		NS		NS		<0.01 UK	0.003
Copper, dissolved	NS		NS		NS		NS		NS		NS		NS		<0.01 UK	0.00775
Iron, dissolved	NS		NS		NS		NS		NS		NS		NS		**0.2 K**	0.158
Molybdenum, dissolved	NS		NS		NS		NS		NS		NS		NS		<0.01 UK	0.034
Nickel, dissolved	NS		**0.00287 JK**	0.0662	NS		**0.0034 K**	0.0318	NS		<0.0009 UK	0.0807	NS		**0.0019 JK**	0.0357
Selenium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Silver, dissolved	NS		NS		NS		NS		NS		NS		NS		<0.01 UJK	0.00036
Thallium, dissolved	NS		NS		NS		NS		NS		NS		NS		<0.0001 UK	0.00003
Vanadium, dissolved	NS		**0.000833 JK**	0.02	NS		**0.0022 K**	0.02	NS		**0.00134 K**	0.02	NS		<0.0002 UK	0.02
Zinc, dissolved	NS		**0.003 JK**	0.150	NS		**0.014 K**	0.0723	NS		<0.002 UK	0.184	NS		**0.01 K**	0.0809

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ENOCH VALLEY MINE - SUMMARY OF SURFACE WATER EXCEEDANCES
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Location:	MST135		MST135		MST135		MST135		MST135		MST136		MST136		MST136	
Location Type:	Stream		Stream		Stream		Stream		Stream		Stream		Stream		Stream	
Sample ID:	050606SWMST135-0-U		050707SWMST135-0-F		050707SWMST135-0-U		051308SWMST135-0-U		051308SWMST1355-0-F		051104SWMST136-0-F		051104SWMST136-0-U		050906GWMST136-0-F	
Collection Date:	5/6/2006		5/7/2007		5/7/2007		5/13/2008		5/13/2008		5/11/2004		5/11/2004		5/9/2006	
Sample Type:	Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Groundwater		Groundwater		Groundwater	
	Primary		Primary		Primary		Primary		Primary		Primary		Primary		Primary	
	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL
Total Metals (mg/L)																
Aluminum	NS		NS		**0.17 JK**	0.087	**1.64 K**	0.087	NS		NS		NS		NS	
Barium	NS		NS		NS		NS		NS		NS		NS		NS	
Beryllium	NS		NS		NS		NS		NS		NS		NS		NS	
Boron	NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium	NS		NS		NS		NS		NS		NS		NS		NS	
Cobalt	NS		NS		NS		NS		NS		NS		NS		NS	
Copper, total	NS		NS		NS		NS		NS		NS		NS		NS	
Iron	NS		NS		NS		NS		NS		NS		NS		NS	
Molybdenum	NS		NS		NS		NS		NS		NS		NS		NS	
Nickel	NS		NS		NS		NS		NS		NS		NS		NS	
Selenium	<0.001	0.005	NS		<0.001	0.005	<0.001	0.005	NS		NS		**0.016**	0.005	NS	
Silver	NS		NS		NS		NS		NS		NS		NS		NS	
Thallium	NS		NS		NS		NS		NS		NS		NS		NS	
Vanadium	NS		NS		NS		NS		NS		NS		NS		NS	
Zinc	NS		NS		NS		NS		NS		NS		NS		NS	
Dissolved Metals (mg/L)																
Aluminum, dissolved	NS		NS		NS		NS		NS		NS		NS		<0.03 UK	0.087
Barium, dissolved	NS		NS		NS		NS		NS		NS		NS		**0.077 K**	0.003
Beryllium, dissolved	NS		NS		NS		NS		NS		NS		NS		<0.002 UK	0.0006
Boron, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium, dissolved	NS		<0.0001 UK	0.000349	NS		NS		**0.0001 JK**	0.000354	**0.0001 JK**	0.00127	NS		**0.0002 JK**	0.000920
Cobalt, dissolved	NS		NS		NS		NS		NS		NS		NS		<0.01 UK	0.003
Copper, dissolved	NS		NS		NS		NS		NS		NS		NS		<0.01 UK	0.0230
Iron, dissolved	NS		NS		NS		NS		NS		NS		NS		<0.02 UK	0.158
Molybdenum, dissolved	NS		NS		NS		NS		NS		NS		NS		<0.01 UK	0.034
Nickel, dissolved	NS		**0.0025 JK**	0.0255	NS		NS		**0.002 JK**	0.0260	**0.0031 K**	0.168	NS		**0.001 JK**	0.105
Selenium, dissolved	NS		NS		NS		NS		NS		**0.016**	0.005	NS		**0.02**	0.005
Silver, dissolved	NS		NS		NS		NS		NS		NS		NS		<0.01 UJK	0.00036
Thallium, dissolved	NS		NS		NS		NS		NS		NS		NS		<0.0001 UK	0.00003
Vanadium, dissolved	NS		**0.0011 K**	0.02	NS		NS		**0.0022 K**	0.02	**0.00219 K**	0.02	NS		**0.0012 K**	0.02
Zinc, dissolved	NS		**0.004 JK**	0.0578	NS		NS		**0.008 JK**	0.0589	<0.002 UK	0.382	NS		**0.004 JK**	0.238

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ENOCH VALLEY MINE - SUMMARY OF SURFACE WATER EXCEEDANCES
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Location:	MST136		MST136		MST136		MST136		MST136		MST137		MST137		MST137	
Location Type:	Stream		Stream		Stream		Stream		Stream		Stream		Stream		Stream	
Sample ID:	050906GWMST136-0-U		051508GWMST136-0-F		051508GWMST136-0-U		0905SWMST136-F		0905SWMST136-U		050307SWMST137-0-F		050307SWMST137-0-U		051808SWMST137-0-F	
Collection Date:	5/9/2006		5/15/2008		5/15/2008		5/8/2009		5/8/2009		5/4/2007		5/4/2007		5/18/2008	
Sample Type:	Groundwater		Groundwater		Groundwater		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water	
	Primary		Primary		Primary		Primary		Primary		Primary		Primary		Primary	
	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL
Total Metals (mg/L)																
Aluminum	NS		NS		**0.28 K**	0.087	NS		NS		NS		**0.3 J+K**	0.087	NS	
Barium	NS		NS		**0.093 K**	0.003	NS		NS		NS		NS		NS	
Beryllium	NS		NS		<0.002 UK	0.0006	NS		NS		NS		NS		NS	
Boron	NS		NS		**0.1 K**	0.0016	NS		NS		NS		NS		NS	
Cadmium	**0.0003 JK**		NS		**0.0002 JK**	0.000865	NS		NS		NS		NS		NS	
Cobalt	NS		NS		<0.01 UK	0.003	NS		NS		NS		NS		NS	
Copper, total	NS		NS		<0.01 UK	0.0210	NS		NS		NS		NS		NS	
Iron	NS		NS		**0.18 K**	0.158	NS		NS		NS		NS		NS	
Molybdenum	NS		NS		<0.01 UK	0.034	NS		NS		NS		NS		NS	
Nickel	**0.0011 JK**		NS		**0.0022 JK**	0.0958	NS		NS		NS		NS		NS	
Selenium	**0.019**	0.005	NS		**0.021**	0.005	NS		**0.0136**	0.005	NS		**0.007**	0.005	NS	
Silver	NS		NS		<0.01 UK	0.00036	NS		NS		NS		NS		NS	
Thallium	NS		NS		<0.0001 UK	0.00003	NS		NS		NS		NS		NS	
Vanadium	**0.0013 K**	0.02	NS		**0.0029 K**	0.02	NS		NS		NS		NS		NS	
Zinc	**0.004 JK**		NS		**0.006 JK**	0.218	NS		NS		NS		NS		NS	
Dissolved Metals (mg/L)																
Aluminum, dissolved	NS		<0.03 UK	0.087	NS		NS		NS		NS		NS		NS	
Barium, dissolved	NS		**0.09 K**	0.003	NS		NS		NS		NS		NS		NS	
Beryllium, dissolved	NS		<0.002 UK	0.0006	NS		NS		NS		NS		NS		NS	
Boron, dissolved	NS		**0.09 K**	0.0016	NS		NS		NS		NS		NS		NS	
Cadmium, dissolved	NS		**0.0001 JK**	0.000843	NS		**0.000140 J**	0.000731	NS		<0.0002 UK	0.000860	NS		**0.0002 JK**	0.000729
Cobalt, dissolved	NS		<0.01 UK	0.003	NS		NS		NS		NS		NS		NS	
Copper, dissolved	NS		<0.01 UK	0.0203	NS		NS		NS		NS		NS		NS	
Iron, dissolved	NS		<0.02 UK	0.158	NS		<0.0250	0.158	NS		NS		NS		NS	
Molybdenum, dissolved	NS		**0.01 JK**	0.034	NS		NS		NS		NS		NS		NS	
Nickel, dissolved	NS		**0.0027 JK**	0.0923	NS		NS		NS		**0.0046 K**	0.0951	NS		**0.0055 K**	0.0745
Selenium, dissolved	NS		**0.022**	0.005	NS		NS		NS		NS		NS		NS	
Silver, dissolved	NS		<0.01 UK	0.00036	NS		NS		NS		NS		NS		NS	
Thallium, dissolved	NS		<0.0001 UK	0.00003	NS		NS		NS		NS		NS		NS	
Vanadium, dissolved	NS		**0.0019 K**	0.02	NS		<0.00500	0.02	NS		<0.001 UK	0.02	NS		<0.0004 UK	0.02
Zinc, dissolved	NS		**0.004 JK**	0.210	NS		NS		NS		**0.007 JK**	0.216	NS		**0.012 K**	0.169

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ENOCH VALLEY MINE - SUMMARY OF SURFACE WATER EXCEEDANCES
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Location:	MST137		MST143		MST143		MST143		MST143		MST143		MST143		MST143	
Location Type:	Stream		Stream		Stream		Stream		Stream		Stream		Stream		Stream	
Sample ID:	051808SWMST137-0-U		051104SWMST143-0-F		051104SWMST143-0-U		050606SWMST143-0-F		050606SWMST143-0-U		050407SWMST143-0-F		050407SWMST143-0-U		051608SWMST143-1-F	
Collection Date:	5/18/2008		5/11/2004		5/11/2004		5/6/2006		5/6/2006		5/4/2007		5/4/2007		5/16/2008	
Sample Type:	Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water	
	Primary		Primary		Primary		Primary		Primary		Primary		Primary		Triplicate	
	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL
Total Metals (mg/L)																
Aluminum	**0.57 K**	0.087	NS		NS		NS		NS		NS		**0.48 J+K**	0.087	NS	
Barium	NS		NS		NS		NS		NS		NS		NS		NS	
Beryllium	NS		NS		NS		NS		NS		NS		NS		NS	
Boron	NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium	NS		NS		NS		NS		NS		NS		NS		NS	
Cobalt	NS		NS		NS		NS		NS		NS		NS		NS	
Copper, total	NS		NS		NS		NS		NS		NS		NS		NS	
Iron	NS		NS		NS		NS		NS		NS		NS		NS	
Molybdenum	NS		NS		NS		NS		NS		NS		NS		NS	
Nickel	NS		NS		NS		NS		NS		NS		NS		NS	
Selenium	**0.01**	0.005	NS		<0.001	0.005	NS		<0.001	0.005	NS		<0.001	0.005	NS	
Silver	NS		NS		NS		NS		NS		NS		NS		NS	
Thallium	NS		NS		NS		NS		NS		NS		NS		NS	
Vanadium	NS		NS		NS		NS		NS		NS		NS		NS	
Zinc	NS		NS		NS		NS		NS		NS		NS		NS	
Dissolved Metals (mg/L)																
Aluminum, dissolved	NS		NS		NS		**0.15 JK**	0.087	NS		NS		NS		NS	
Barium, dissolved	NS		NS		NS		**0.044 K**	0.003	NS		NS		NS		NS	
Beryllium, dissolved	NS		NS		NS		<0.002 UK	0.0006	NS		NS		NS		NS	
Boron, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium, dissolved	NS		<0.0002 UK	0.000992	NS		**0.0001 JK**	0.000734	NS		<0.0002 UK	0.000793	NS		<0.0001 UK	0.000675
Cobalt, dissolved	NS		NS		NS		<0.01 UK	0.003	NS		NS		NS		NS	
Copper, dissolved	NS		NS		NS		<0.01 UK	0.0165	NS		NS		NS		NS	
Iron, dissolved	NS		NS		NS		**0.12 K**	0.158	NS		NS		NS		NS	
Molybdenum, dissolved	NS		NS		NS		<0.01 UK	0.034	NS		NS		NS		NS	
Nickel, dissolved	NS		**0.0052 K**	0.117	NS		**0.0038 K**	0.0753	NS		**0.0058 K**	0.0843	NS		**0.0031 K**	0.0666
Selenium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Silver, dissolved	NS		NS		NS		<0.01 UK	0.00036	NS		NS		NS		NS	
Thallium, dissolved	NS		NS		NS		<0.0001 UK	0.00003	NS		NS		NS		NS	
Vanadium, dissolved	NS		**0.0012 K**	0.02	NS		<0.0002 UK	0.02	NS		<0.0009 UK	0.02	NS		**0.0011 JK**	0.02
Zinc, dissolved	NS		<0.004 UK	0.267	NS		**0.01 K**	0.171	NS		**0.009 JK**	0.192	NS		**0.008 JK**	0.151

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ENOCH VALLEY MINE - SUMMARY OF SURFACE WATER EXCEEDANCES
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Location:	MST143		MST143		MST143		MST088		MST143		MST143		MST143		MST143	
Location Type:	Stream		Stream		Stream		Stream		Stream		Stream		Stream		Stream	
Sample ID:	051608SWMST143-1-U		051608SWMST143-2-F		051608SWMST143-2-U		051608SWMST143-3-F		051608SWMST143-3-U		051608SWMST143-avg-F		051608SWMST143-avg-U		091608SWMST143-0-F	
Collection Date:	5/16/2008		5/16/2008		5/16/2008		5/16/2008		5/16/2008		5/16/2008		5/16/2008		9/16/2008	
Sample Type:	Surface Water		Surface Water		Surface Water		Surface Water		Surface		Surface Water		Surface Water		Surface Water	
	Triplicate		Triplicate		Triplicate		Triplicate		Triplicate		Averaged		Averaged		Primary	
	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL
Total Metals (mg/L)																
Aluminum	**0.75 J+K**	0.087	NS		**0.69 J+K**	0.087	NS		**0.69 J+K**	0.087	NS		**0.71 J+K**	0.087	NS	
Barium	NS		NS		NS		NS		NS		NS		NS		NS	
Beryllium	NS		NS		NS		NS		NS		NS		NS		NS	
Boron	NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium	NS		NS		NS		NS		NS		NS		NS		NS	
Cobalt	NS		NS		NS		NS		NS		NS		NS		NS	
Copper, total	NS		NS		NS		NS		NS		NS		NS		NS	
Iron	NS		NS		NS		NS		NS		NS		NS		NS	
Molybdenum	NS		NS		NS		NS		NS		NS		NS		NS	
Nickel	NS		NS		NS		NS		NS		NS		NS		NS	
Selenium	**0.003 J**	0.005	NS		**0.002 J**	0.005	NS		**0.002 J**	0.005	NS		**0.00233 J**	0.005	NS	
Silver	NS		NS		NS		NS		NS		NS		NS		NS	
Thallium	NS		NS		NS		NS		NS		NS		NS		NS	
Vanadium	NS		NS		NS		NS		NS		NS		NS		NS	
Zinc	NS		NS		NS		NS		NS		NS		NS		NS	
Dissolved Metals (mg/L)																
Aluminum, dissolved	NS		NS		NS		NS		NS		NS		NS		<0.0500	0.087
Barium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Beryllium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Boron, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium, dissolved	NS		<0.0001 UK	0.000669	NS		<0.0001 UK	0.000689	NS		<0.0001 UK	0.000678	NS		<0.000125	0.000795
Cobalt, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Copper, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Iron, dissolved	NS		NS		NS		NS		NS		NS		NS		<0.0250	0.158
Molybdenum, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Nickel, dissolved	NS		**0.0037 K**	0.0658	NS		**0.0033 K**	0.0687	NS		**0.00337 K**	0.0670	NS		**0.00240 J**	0.0847
Selenium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Silver, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Thallium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Vanadium, dissolved	NS		**0.0011 JK**	0.02	NS		**0.0012 JK**	0.02	NS		**0.00113 JK**	0.02	NS		<0.00500	0.02
Zinc, dissolved	NS		**0.008 JK**	0.149	NS		**0.013 K**	0.156	NS		**0.00967 JK**	0.152	NS		**0.00683 J**	0.193

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ENOCH VALLEY MINE - SUMMARY OF SURFACE WATER EXCEEDANCES
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Location:	MST143		MST143		MST143		MST144		MST144		MST144		MST144		MST144	
Location Type:	Stream		Stream		Stream		Stream		Stream		Stream		Stream		Stream	
Sample ID:	091608SWMST143-0-U		0905SWMST143-F		0905SWMST143-U		051504SWMST144-0-F		051504SWMST144-0-U		050906GWMST144-0-F		050906GWMST144-0-U		051308SWMST144-0-F	
Collection Date:	9/16/2008		5/8/2009		5/8/2009		5/15/2004		5/15/2004		5/9/2006		5/9/2006		5/13/2008	
Sample Type:	Surface Water		Surface Water		Surface Water		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater	
	Primary		Primary		Primary		Primary		Primary		Primary		Primary		Primary	
	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL
Total Metals (mg/L)																
Aluminum	NS		NS		NS		NS		NS		NS		NS		NS	
Barium	NS		NS		NS		NS		NS		NS		NS		NS	
Beryllium	NS		NS		NS		NS		NS		NS		NS		NS	
Boron	NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium	NS		NS		NS		NS		NS		NS		**0.0052 K**		NS	
Cobalt	NS		NS		NS		NS		NS		NS		NS		NS	
Copper, total	NS		NS		NS		NS		NS		NS		NS		NS	
Iron	NS		NS		NS		NS		NS		NS		NS		NS	
Molybdenum	NS		NS		NS		NS		NS		NS		NS		NS	
Nickel	NS		NS		NS		NS		NS		NS		**0.111 K**		NS	
Selenium	**0.00263**	0.005	NS		**0.00221**	0.005	NS		**0.229**	0.005	NS		**0.153**	0.005	NS	
Silver	NS		NS		NS		NS		NS		NS		NS		NS	
Thallium	NS		NS		NS		NS		NS		NS		NS		NS	
Vanadium	NS		NS		NS		NS		NS		NS		**0.0074 K**	0.02	NS	
Zinc	NS		NS		NS		NS		NS		NS		**0.46 K**		NS	
Dissolved Metals (mg/L)																
Aluminum, dissolved	NS		NS		NS		NS		NS		**0.04 JK {J+}**	0.087	NS		NS	
Barium, dissolved	NS		NS		NS		NS		NS		**0.059 K**	0.003	NS		NS	
Beryllium, dissolved	NS		NS		NS		NS		NS		<0.002 UK	0.0006	NS		NS	
Boron, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Cadmium, dissolved	NS		<0.000125	0.000657	NS		**0.0001 JK**	0.00127	NS		**0.0054 K**	0.00127	NS		**0.0008 K**	0.00109
Cobalt, dissolved	NS		NS		NS		NS		NS		<0.01 UK	0.003	NS		NS	
Copper, dissolved	NS		NS		NS		NS		NS		<0.01 UK	0.0371	NS		NS	
Iron, dissolved	NS		**0.0619 J**	0.158	NS		NS		NS		<0.02 UK	0.158	NS		NS	
Molybdenum, dissolved	NS		NS		NS		NS		NS		<0.01 UK	0.034	NS		NS	
Nickel, dissolved	NS		NS		NS		**0.0015 K**	0.168	NS		**0.106 K**	0.168	NS		**0.0111 K**	0.135
Selenium, dissolved	NS		NS		NS		**0.18**	0.005	NS		**0.146**	0.005	NS		NS	
Silver, dissolved	NS		NS		NS		NS		NS		<0.01 UJK	0.00036	NS		NS	
Thallium, dissolved	NS		NS		NS		NS		NS		<0.0001 UK	0.00003	NS		NS	
Vanadium, dissolved	NS		<0.00500	0.02	NS		**0.00058 K**	0.02	NS		**0.0071 K**	0.02	NS		**0.0056 K**	0.02
Zinc, dissolved	NS		NS		NS		**0.004 JK**	0.382	NS		**0.466 K**	0.382	NS		**0.038 K**	0.306

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ENOCH VALLEY MINE - SUMMARY OF SURFACE WATER EXCEEDANCES
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Location:	MST144		MST144		MST144		MST269		MST269		MST269		MST269		MST269	
Location Type:	Stream		Stream		Stream		Stream		Stream		Stream		Stream		Stream	
Sample ID:	051308SWMST144-0-U		0905GWMST144-F		0905GWMST144-U		050706GWMST269-0-F		050706GWMST269-0-U		051608GWMST269-0-F		051608GWMST269-0-U		0905SWMST269-F	
Collection Date:	5/13/2008		5/29/2009		5/29/2009		5/7/2006		5/7/2006		5/16/2008		5/16/2008		5/8/2009	
Sample Type:	Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Surface Water	
	Primary		Primary		Primary		Primary		Primary		Primary		Primary		Primary	
	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL
Total Metals (mg/L)																
Aluminum	**0.07 JK**	0.087	NS		NS		NS		NS		NS		**0.58 K**	0.087	NS	
Barium	NS		NS		NS		NS		NS		NS		**0.023 K**	0.003	NS	
Beryllium	NS		NS		NS		NS		NS		NS		<0.002 UK	0.0006	NS	
Boron	NS		NS		NS		NS		NS		NS		**0.12 K**	0.0016	NS	
Cadmium	NS		NS		<0.000125		NS		**0.0002 JK**		NS		**0.0088 K**	0.00103	NS	
Cobalt	NS		NS		NS		NS		NS		NS		<0.01 UK	0.003	NS	
Copper, total	NS		NS		NS		NS		NS		NS		<0.01 UK	0.0274	NS	
Iron	NS		NS		NS		NS		NS		NS		**0.34 K**	0.158	NS	
Molybdenum	NS		NS		NS		NS		NS		NS		<0.01 UK	0.034	NS	
Nickel	NS		NS		NS		NS		**0.0012 JK**		NS		**0.153 K**	0.125	NS	
Selenium	**0.21**	0.005	NS		**0.174 J**	0.005	NS		<0.001	0.005	NS		**0.071 J-**	0.005	NS	
Silver	NS		NS		NS		NS		NS		NS		<0.01 UK	0.00036	NS	
Thallium	NS		NS		NS		NS		NS		NS		**0.0007 K**	0.00003	NS	
Vanadium	NS		NS		<0.00500	0.02	NS		**0.001 JK**	0.02	NS		**0.0129 K**	0.02	NS	
Zinc	NS		NS		NS		NS		**0.004 JK**		NS		**0.696 K**	0.284	NS	
Dissolved Metals (mg/L)																
Aluminum, dissolved	NS		NS		NS		**0.03 JK {J+}**	0.087	NS		**0.09 JK**	0.087	NS		NS	
Barium, dissolved	NS		NS		NS		**0.048 K**	0.003	NS		**0.022 K**	0.003	NS		NS	
Beryllium, dissolved	NS		NS		NS		<0.002 UK	0.0006	NS		<0.002 UK	0.0006	NS		NS	
Boron, dissolved	NS		NS		NS		NS		NS		**0.12 K**	0.0016	NS		NS	
Cadmium, dissolved	NS		<0.000125	0.00127	NS		**0.0002 JK**	0.000515	NS		**0.007 K**	0.00103	NS		<0.000125	0.000505
Cobalt, dissolved	NS		NS		NS		<0.01 UK	0.003	NS		<0.01 UK	0.003	NS		NS	
Copper, dissolved	NS		NS		NS		<0.01 UK	0.00978	NS		<0.01 UK	0.0273	NS		NS	
Iron, dissolved	NS		NS		NS		<0.02 UK	0.158	NS		**0.03 JK**	0.158	NS		**0.0277 J+B**	0.158
Molybdenum, dissolved	NS		NS		NS		<0.01 UK	0.034	NS		<0.01 UK	0.034	NS		NS	
Nickel, dissolved	NS		NS		NS		**0.0011 JK**	0.0449	NS		**0.129 K**	0.124	NS		NS	
Selenium, dissolved	NS		NS		NS		<0.001	0.005	NS		**0.067 J-**	0.005	NS		NS	
Silver, dissolved	NS		NS		NS		<0.01 UJK	0.00036	NS		<0.01 UK	0.00036	NS		NS	
Thallium, dissolved	NS		NS		NS		<0.0001 UK	0.00003	NS		**0.0002 JK**	0.00003	NS		NS	
Vanadium, dissolved	NS		NS		NS		<0.0003 UK	0.02	NS		**0.0095 K**	0.02	NS		<0.00500	0.02
Zinc, dissolved	NS		NS		NS		**0.003 JK**	0.102	NS		**0.424 K**	0.282	NS		NS	

TABLE 3-40

ENOCH VALLEY MINE - SUMMARY OF SURFACE WATER EXCEEDANCES
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Location:	**MST269**	
Location Type:	**Stream**	
Sample ID:	**0905SWMST269-U**	
Collection Date:	**5/8/2009**	
Sample Type:	**Surface Water**	
	Primary	
	Result	**SL**
Total Metals (mg/L)		
Aluminum	NS	
Barium	NS	
Beryllium	NS	
Boron	NS	
Cadmium	NS	
Cobalt	NS	
Copper, total	NS	
Iron	NS	
Molybdenum	NS	
Nickel	NS	
Selenium	**0.00523**	0.005
Silver	NS	
Thallium	NS	
Vanadium	NS	
Zinc	NS	
Dissolved Metals (mg/L)		
Aluminum, dissolved	NS	
Barium, dissolved	NS	
Beryllium, dissolved	NS	
Boron, dissolved	NS	
Cadmium, dissolved	NS	
Cobalt, dissolved	NS	
Copper, dissolved	NS	
Iron, dissolved	NS	
Molybdenum, dissolved	NS	
Nickel, dissolved	NS	
Selenium, dissolved	NS	
Silver, dissolved	NS	
Thallium, dissolved	NS	
Vanadium, dissolved	NS	
Zinc, dissolved	NS	

TABLE 3-40

ENOCH VALLEY MINE - SUMMARY OF SURFACE WATER EXCEEDANCES
(Page 50 of 50)

Notes:
NS - not sampled
SL - screening level
F - filtered
U - unfiltered
Avg - average

	Result is greater than screening value
	Method detection limit for non-detected value is greater than the screening value

FLAG DEFINITION:

U	The analyte was analyzed for, but was not detected above the level of the reported sample quantitation limit.
J	The result is an estimated quantity. The associated numerical value is the approximated concentration of the analyte in the sample.
J+	The result is an estimated quantity, but the result may be biased high.
J-	The result is an estimated quantity, but the result may be biased low.
J+/B	Result is estimated and biased high; associated field blank contained target analyte.
R	The result is unusable. The sample result is rejected due to serious deficiencies in meeting quality control criteria. The analyte may or may not be present in the sample.
UJ	The analyte was analyzed for, but was not detected. The reported quantitation limit is approximate and may be inaccurate or imprecise.
K	Serial dilutions not performed for samples analyzed by this method (EPA 200.7; 200.8).

SOURCES FOR SCREENING VALUES (SEE ALSO TABLE 3

Surface Water	Unless identified otherwise below, screening levels are the chronic freshwater screening value in NOAA SQuiRT (Buchman, 2008).
	Screening levels for aluminum is the Freshwater Standards for Chronic Criteria (CCC) from the National Recommended Water Quality Criteria (USEPA, 2009).
	Screening values for arsenic, cadmium, chromium, copper, lead, nickel, selenium, and zinc are the CCCs from the State of Idaho Surface Water Quality for Aquatic Life (IDAPA 58.01.02); those for cadmium, chromium, copper, lead, nickel, and zinc are expressed as a function of total hardness. Screening levels for cadmium and selenium are expressed as total recoverable (unfiltered concentration).
	The screening level for iron is the Lowest Chronic Value (LCV) observed for fresh water daphnids (source: ORNL, 1996).
	The screening levels for manganese, uranium, and vanadium are the Tier II Secondary Chronic Values (source: ORNL, 1996).

TRIPLICATE RESULT

"Primary" indicates locations where only one sample was collected from a given location. "Triplicate" indicates locations where a total of three samples were collected from a given location for the purpose of quality assurance.
The average value for triplicate samples is calculated as follows: (a) the mean of three detected values, (b) the mean of two detected values if result of one triplicate is not detected, (c) the detected value if results of two triplicates are not detected, or (d) less than the highest method detection limit if all triplicate results are not detected.

TABLE 3-41

ENOCH VALLEY MINE - SUMMARY OF SEDIMENT EXCEEDANCES
(Page 1 of 3)

					Analyte (mg/Kg, dry weight)					
Location	Location Type	Sample Identification	Collection Date	Sample Type	Cadmium	Chromium	Nickel	Selenium	Vanadium	Zinc
				Screening Level:	0.583	36.286	18	4	57	98
MDS025	Dump Seep	051504SEMDS025-0	5/15/2004	Primary	**33.5 J-**	**734**	**180 J**	**104**	**239**	**800 J**
MDS026	Dump Seep	051704SEMDS026-0	5/17/2004	Primary	**105**	**334**	**221**	**550 J**	**129**	**434**
MSG001	Spring	051904SEMSG001-0	5/19/2004	Primary	**0.64**	**22.8**	**20.7 J**	**0.6 J**	**35 J**	**71 J**
MSP017	Pond	051704SEMSP017-0	5/17/2004	Primary	**12.1**	**132**	**83.1**	**34 J**	**64.1**	**446**
MSP018	Pond	051204SEMSP018-0	5/12/2004	Primary	**1290**	**76 J**	**2580 J**	**152 J-**	**321**	**25800**
MSP019	Pond	051204SEMSP019-0	5/12/2004	Primary	**1.17**	**20.5 J**	**21.8 J**	<0.6 UJ	**32.5 J**	**69 J**
MSP020	Pond	051504SEMSP020-0	5/15/2004	Primary	**23.3**	**167**	**164**	**12.4**	**93**	**952**
MSP021	Pond	051204SEMSP021-1-QA1	5/12/2004	Triplicate	**24.8**	**192**	**131**	**24 J-**	**132**	**862 J**
MSP021	Pond	051204SEMSP021-2-QA2	5/12/2004	Triplicate	**24.1**	**184**	**131**	**23 J-**	**118**	**881 J**
MSP021	Pond	051204SEMSP021-3-QA3	5/12/2004	Triplicate	**24.7**	**196**	**131**	**23 J-**	**142**	**884 J**
MSP021	Pond	051204SEMSP021-4-QA-avg	5/12/2004	Averaged	**24.5**	**191**	**131**	**23.3 J-**	**131**	**876 J**
MSP022	Pond	051104SEMSP022-0	5/12/2004	Primary	**32.9**	**294**	**150 J**	**25.2 J-**	**436**	**1190**
MSP023	Pond	051204SEMSP023-0	5/12/2004	Primary	**22.9 J-**	**340**	**123 J**	**24.9**	**402**	**731 J**
MSP031	Pond	051104SEMSP031-0	5/10/2004	Primary	**4.79**	**26.1**	**20.5**	<0.6 UJ	**37.3**	**100 J**
MST023	Stream	051904SEMST023-0	5/19/2004	Primary	**1.81**	**30.2**	**6.8**	**1 J**	**21.7 J**	**26 J**
MST024	Stream	051904SEMST024-0	5/19/2004	Primary	**1.49**	**24.6**	**8.7**	**0.8 J**	**22.5 J**	**34 J**
MST025	Stream	051904SEMST025-0	5/19/2004	Primary	**0.55**	**12.4**	**6.4**	**1.5 J**	**13.3 J**	**30 J**
MST026	Stream	051704SEMST026-0	5/17/2004	Primary	**0.56 J-**	**13.2**	**7.6 J**	**2.3 J**	**14.4**	**33 J**
MST027	Stream	051404SEMST027-0	5/14/2004	Primary	**0.58 J-**	**14**	**7.8 J**	**1.3 J**	**15.2**	**32 J**
MST126	Stream	051704SEMST126-1-QA1	5/17/2004	Triplicate	**5.29 J-**	**54.7**	**20.5 J**	<0.5	**56.6**	**75 J**
MST126	Stream	051704SEMST126-1-QA2	5/17/2004	Triplicate	**6.33 J-**	**57.8**	**21.4 J**	<0.5	**56.8**	**83 J**
MST126	Stream	051704SEMST126-1-QA3	5/17/2004	Triplicate	**7.24 J-**	**74**	**21.6 J**	**1.4 J**	**90.8**	**91 J**
MST126	Stream	051704SEMST126-1-QA-avg	5/17/2004	Averaged	**6.29 J-**	**62.2**	**21.2 J**	**1.4 J**	**68.1**	**83 J**
MST127	Stream	051304SEMST127-0	5/13/2004	Primary	**2.4 J-**	**36**	**24.9 J**	**0.6 J**	**37.9**	**108 J**
MST131	Stream	051004SEMST131-0	5/10/2004	Primary	**4.05**	**28.7**	**21.9**	<0.6 UJ	**39.3**	**77 J**
MST132	Stream	051204SEMST132-0-	5/12/2004	Primary	**2.51**	**31.4 J**	**24.3 J**	**1 J-**	**37 J**	**103 J**
MST133	Stream	051004SEMST133-0	5/11/2004	Primary	**2.62**	**30.4**	**31.1**	**1.8 J-**	**45.5**	**130 J**
MST134	Stream	051104SEMST134-0	5/11/2004	Primary	**2.44**	**26**	**22.8**	**1.1 J-**	**38.5**	**109 J**

TABLE 3-41

ENOCH VALLEY MINE - SUMMARY OF SEDIMENT EXCEEDANCES
(Page 2 of 3)

					Analyte (mg/Kg, dry weight)					
Location	**Location Type**	**Sample Identification**	**Collection Date**	**Sample Type**	**Cadmium**	**Chromium**	**Nickel**	**Selenium**	**Vanadium**	**Zinc**
				Screening Level:	**0.583**	**36.286**	**18**	**4**	**57**	**98**
MST135	Stream	051104SEMST135-0	5/11/2004	Primary	**3.28**	**26.4 J**	**20.7 J**	**3 J-**	**40.4 J**	**123 J**
MST136	Stream	051104SEMST136-0	5/11/2004	Primary	**3.15**	**25.8**	**23.7**	**0.7 J-**	**40.4**	**101 J**
MST143	Stream	051104SEMST143-0	5/11/2004	Primary	**4**	**29.2**	**21.6**	<0.6 UJ	**37.3**	**96 J**
MST144	Stream	051504SEMST144-0	5/15/2004	Primary	**2.63**	**29**	**23.3**	**7.6**	**36.8**	**95**

TABLE 3-41

ENOCH VALLEY MINE - SUMMARY OF SEDIMENT EXCEEDANCES
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Notes:

Result is greater than screening value

FLAG DEFINITION:

U	The analyte was analyzed for, but was not detected above the level of the reported sample quantitation limit.
J	The result is an estimated quantity. The associated numerical value is the approximated concentration of the analyte in the sample.
J+	The result is an estimated quantity, but the result may be biased high.
J-	The result is an estimated quantity, but the result may be biased low.
J+/B	Result is estimated and biased high; associated field blank contained target analyte.
R	The result is unusable. The sample result is rejected due to serious deficiencies in meeting quality control criteria. The analyte may or may not be present in the sample.
UJ	The analyte was analyzed for, but was not detected. The reported quantitation limit is approximate and may be inaccurate or imprecise.

SOURCES FOR SCREENING VALUES (SEE ALSO TABLE 3

Sediment — Screening levels for aluminum, cadmium, chromium, and zinc are the ARCS threshold effects levels (TELs) for freshwater sediment in NOAA SQuiRT (Buchman, 2008).
Screening level for antimony is from Buchman, M. 1999. NOAA HAZMAT Report 99-1.
Screening levels for arsenic, copper, lead, mercury, and nickel are the TEL for freshwater sediment in NOAA SQuiRT (Buchman, 2008).
Screening levels for cobalt, iron, manganese, and silver are from Guidelines for the Protection and Management of Aquatic Sediment Quality in Ontario, August 1993.
Screening level for selenium is from Van Derveer and Canton (1997).
Screening level for vanadium is from the marine sediment AET (Buchman, 2008).

TRIPLICATE RESULT

"Primary" indicates locations where only one sample was collected from a given location. "Triplicate" indicates locations where a total of three samples were collected from a given location for the purpose of quality assurance.

The average value for triplicate samples is calculated as follows: (a) the mean of three detected values, (b) the mean of two detected values if result of one triplicate is not detected, (c) the detected value if results of two triplicates are not detected, or (d) less than the highest method detection limit if all triplicate results are not detected.

TABLE 3-42 ENOCH VALLEY MINE GROUNDWATER MONITORING LOCATIONS						
Mine	Station Description	Location		Station Number	Station Type	Groundwater System Monitored and Screened Interval (ft bgs)
		Latitude	Longitude			
Enoch Valley	School Bus Well	42 53 15.00	111 26 39.99	MAW001	AW	
	Sharp Field Well	42 53 51.00	111 26 41.99	MAW002	AW	
	Peterson Field Well	42 53 24.00	111 27 21.59	MAW003	AW	
	Vasser Windmill Well	42 51 44.32	111 23 08.79	MAW005	AW	
	Rasmussen Creek	42 51 55.52	111 24 04.12	MBW085	BW	Alluvial 12.25-7.25
	Rasmussen Road and Agrium Haul Road intersection	42 51 38.34	111 23 44.32	MBW087	BW	Alluvial 12-7
	Agrium Haul Road North	42 51 57.08	111 23 28.14	MBW099	BW	Alluvial 29-24
	Western Enoch Valley, East of fence	42 53 28.32	111 25 55.86	MBW107	BW	Alluvial 40-35
	Western Enoch Valley ,West of fence	42 53 34.67	111 26 13.72	MBW112	BW	Alluvial 18-13
	Thompson House Well	42 54 17.99	111 26 49.20	MDW002	DW	Alluvial/Thaynes 180-160, 30-20
	Ellis House Well	42 54 43.20	111 28 47.99	MDW006	DW	ND
	South of EVM South Dump; near edge of dump footprint	42 51 48.5	111 23 34.4	MMW007	MW	Alluvial 90-70
	South of EVM South Dump; south and downgradient of MMW007	42 51 48.6	111 23 29.8	MMW008	MW	Alluvial/Dinwoody Formation 197-177
	Central North Dump (MWD091)	42 53 34.6	111 25 33.8	MMW009	MW	Wells Formation 554-549
	Northwest of EVM North Dump in Lone Pine Creek alluvial flow field	42 53 28.75	111 25 53.34	MMW012	MW	Alluvial 52-28
	Southwest of EVM in Rasmussen Creek alluvial flow field	42 52 05.7	111 24 12.0	MMW013	MW	Dinwoody Formation 35-25
	Along the south end of Enoch Valley Mine, near MMW013	42 52 11.73	111 24 11.86	MMW024	MW	Dinwoody Formation 200-180
	Along the south end of Enoch Valley Mine, near MMW007	42 51 49.16	111 23 31.95	MMW025	MW	Dinwoody Formation 200-180
	Northeast of MPW006/MMW008	42 51 56.48	111 23 25.75	MMW026	MW	Wells Formation 355-335
	Near MMW012	42 53 28.97	111 25 53.50	MMW027	MW	Dinwoody Formation 120-100
	Deeper well nested with MMW013	42 52 09.1	111 24 14.8	MMW034	MW	Dinwoody Formation 156-136
	Deeper well nested with MMW027	42 53 29.5	111 25 54.3	MMW035	MW	Dinwoody Formation 199 – 179
	Well west of MMW027	42 53 26.7	111 26 05.6	MMW036	MW	Alluvial 135 – 115
	EVM Shop/Office	42 52 37.40	111 25 16.52	MPW019	PW	ND 235-175

Notes:
Location (GPS) coordinates use the NAD27 datum and are presented in ddd mm ss.ss format (degrees minutes seconds).

TABLE 3-42 ENOCH VALLEY MINE GROUNDWATER MONITORING LOCATIONS						
Mine	**Station Description**	**Location**		**Station Number**	**Station Type**	**Groundwater System Monitored and Screened Interval (ft bgs)**
		Latitude	**Longitude**			
ND - Not determined AW - Agricultural Well BW - Borehole Monitoring Well DW - Domestic Well MW - Monitoring Well						

TABLE 3-43

ENOCH VALLEY MINE - SUMMARY OF GROUNDWATER EXCEEDANCES
(Page 1 of 10)

		Well Name:	MAW001	MAW001	MAW002	MAW002	MAW003	MAW003	MAW005
		Collection Date:	05/17/04	05/20/08	05/19/04	06/11/08	05/19/04	05/19/08	05/17/04
		Well Type:	AW	AW	AW	AW	AW	AW	AW
		Result Type:	Averaged Triplicate	Primary	Primary	Primary	Primary	Primary	Primary
Analyte	**Units**	**Screening Value**							
Dissolved Metals									
Aluminum, dissolved	mg/L	0.2	NS	<0.03 UK	NS	<0.03 UK	NS	<0.03 UK	NS
Iron, dissolved	mg/L	0.3	NS	**0.04 JK**	NS	**0.54 K**	NS	<0.02 UK	NS
Lead, dissolved	mg/L	0.015	NS	NS	NS	NS	NS	NS	NS
Manganese, dissolved	mg/L	0.05	NS	<0.0014 UK	NS	**0.141 K**	NS	<0.0005 UK	NS
Selenium, dissolved	mg/L	0.05	<0.001	**0.002 J**	<0.001	**0.002 J**	<0.001	**0.002 J**	<0.001
Zinc, dissolved	mg/L	5	**0.017 JK**	<0.008 UJK	**0.026 K**	**0.105 K**	**0.179 K**	**0.017 J+K**	**2.91 K**
Total Metals									
Aluminum	mg/L	0.2	NS	**0.04 J+K**	NS	<0.04 UK	NS	<0.03 UK	NS
Iron	mg/L	0.3	NS	**0.09 J+K**	NS	**0.48 K**	NS	<0.02 UK	NS
Lead	mg/L	0.015	NS	NS	NS	NS	NS	NS	NS
Manganese	mg/L	0.05	NS	**0.0185 K**	NS	**0.114 K**	NS	**0.0006 JK**	NS
Selenium	mg/L	0.05	<0.001	**0.002 J**	<0.001	**0.002 J**	<0.001	**0.002 J**	<0.001
Zinc	mg/L	5	**0.0237 JK**	**0.009 JK**	**0.038 K**	**0.075 K**	**0.296 K**	**0.014 K**	**21.3 K**
General Chemistry									
Residue, Filterable (TDS)	mg/L	500	NS	**240 J-**	NS	**240 J-**	NS	**250 J-**	NS
Sulfate	mg/L	250	**11.2**	**13.9**	<0.5	**9.9**	**6.4**	**13.9**	**268**

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ENOCH VALLEY MINE - SUMMARY OF GROUNDWATER EXCEEDANCES
(Page 2 of 10)

		Well Name:	MAW005	MBW085	MBW087	MBW099	MBW107	MDW001	MDW001
		Collection Date:	12/03/08	05/13/09	05/09/09	05/12/09	06/04/09	05/19/04	05/19/08
		Well Type:	AW	BW	BW	BW	BW	DW	DW
		Result Type:	Primary	Primary	Primary	Primary	Primary	Primary	Primary
Analyte	**Units**	**Screening Value**							
Dissolved Metals									
Aluminum, dissolved	mg/L	0.2	<0.0500	NS	NS	<0.0500	<0.0500	NS	<0.03 UK
Iron, dissolved	mg/L	0.3	<0.0250	<0.0250	<0.0250	<0.0250	<0.0250	NS	<0.02 UK
Lead, dissolved	mg/L	0.015	NS	NS	NS	NS	NS	NS	NS
Manganese, dissolved	mg/L	0.05	**0.00139 J**	NS	NS	**0.0385**	**0.00517**	NS	<0.0005 UK
Selenium, dissolved	mg/L	0.05	<0.000500	NS	NS	<0.000500	**0.00356**	<0.001	<0.001
Zinc, dissolved	mg/L	5	**2.19**	NS	NS	**0.217**	<0.00500	**0.02 JK**	**0.032 K**
Total Metals									
Aluminum	mg/L	0.2	<0.0500	<0.0500	**0.358**	NS	NS	NS	<0.03 UK
Iron	mg/L	0.3	**0.0780 J**	**0.276**	**0.338**	NS	NS	NS	**0.04 JK**
Lead	mg/L	0.015	NS	NS	NS	NS	NS	NS	NS
Manganese	mg/L	0.05	**0.00204**	**0.00510 J**	**0.157**	NS	NS	NS	**0.0013 JK**
Selenium	mg/L	0.05	**0.000763 J**	**0.00131**	**0.000798 J**	NS	NS	<0.001	<0.001
Zinc	mg/L	5	**2.48**	**0.00695**	**0.0244 J**	NS	NS	**0.021 K {J+}**	**0.031 K**
General Chemistry									
Residue, Filterable (TDS)	mg/L	500	**712**	**228**	**342**	**128 J-**	**292 J-**	NS	**280 J-**
Sulfate	mg/L	250	**276**	**33.4**	**27.4**	**19.4**	**21.8**	**11.2**	**6.4**

TABLE 3-43

ENOCH VALLEY MINE - SUMMARY OF GROUNDWATER EXCEEDANCES
(Page 3 of 10)

		Well Name:	MDW002	MDW002	MDW006	MDW006	MMW007	MMW007	MMW007
		Collection Date:	05/19/04	06/10/08	05/22/04	06/11/08	10/18/07	05/21/08	09/23/08
		Well Type:	DW	DW	DW	DW	MW	MW	MW
		Result Type:	Primary	Primary	Primary	Primary	Primary	Primary	Primary
Analyte	**Units**	**Screening Value**							
Dissolved Metals									
Aluminum, dissolved	mg/L	0.2	NS	**0.04 JK**	NS	<0.03 UK	<0.03 UK	<0.03 UK	<0.0500
Iron, dissolved	mg/L	0.3	NS	<0.02 UK	NS	<0.02 UK	<0.02 UK	<0.02 UK	<0.0250
Lead, dissolved	mg/L	0.015	NS	NS	NS	NS	<0.0001 UK	<0.0001 UK	NS
Manganese, dissolved	mg/L	0.05	NS	**0.0008 JK**	NS	**0.0065 K**	**0.0715 K**	<0.0005 UK	**0.582**
Selenium, dissolved	mg/L	0.05	<0.001	<0.001	<0.001	<0.001	**0.002 J**	**0.005 J**	**0.00256 J**
Zinc, dissolved	mg/L	5	**0.06 K**	**0.329 K**	**0.033 K**	**0.195 K**	**0.003 JK**	**0.004 JK**	<0.00500
Total Metals									
Aluminum	mg/L	0.2	NS	**0.04 JK**	NS	<0.05 UK	**0.47 K**	**0.09 JK**	**0.417**
Iron	mg/L	0.3	NS	<0.03 UK	NS	**0.05 JK**	**0.35 K**	<0.02 UK	**0.357**
Lead	mg/L	0.015	NS	NS	NS	NS	**0.0004 JK**	<0.0001 UK	NS
Manganese	mg/L	0.05	NS	**0.0006 JK**	NS	**0.0063 K**	**0.0804 K**	**0.0015 JK**	**0.61**
Selenium	mg/L	0.05	<0.001	<0.001	<0.001	<0.001	**0.002 J**	**0.005 J**	**0.00237 J**
Zinc	mg/L	5	**0.045 K**	**0.309 K**	**0.035 K**	**0.185 K**	**0.006 JK**	<0.002 UK	**0.00526 J**
General Chemistry									
Residue, Filterable (TDS)	mg/L	500	NS	**240 J-**	NS	**420 J-**	**170 J-**	**230 J-**	**210**
Sulfate	mg/L	250	**44.2**	**21.7**	**103**	**110**	**21**	**8.8**	**55.1**

TABLE 3-43

ENOCH VALLEY MINE - SUMMARY OF GROUNDWATER EXCEEDANCES
(Page 4 of 10)

		Well Name:	MMW007	MMW008	MMW008	MMW008	MMW008	MMW009	MMW009
		Collection Date:	06/01/09	10/18/07	05/20/08	09/21/08	06/01/09	10/26/07	05/20/08
		Well Type:	MW	MW	MW	MW	MW	MW	MW
		Result Type:	Primary	Primary	Primary	Primary	Primary	Primary	Averaged Triplicate
Analyte	**Units**	**Screening Value**							
Dissolved Metals									
Aluminum, dissolved	mg/L	0.2	NS	**0.03 JK**	<0.03 UK	<0.0500	NS	<0.03 UK	<0.03 UK
Iron, dissolved	mg/L	0.3	NS	<0.02 UK	**0.03 JK**	**0.0354 J**	NS	**0.04 JK**	**1.02 K**
Lead, dissolved	mg/L	0.015	NS	<0.0001 UK	NS	NS	NS	<0.0001 UK	<0.0005 UK
Manganese, dissolved	mg/L	0.05	NS	**0.167 K**	**0.388 K**	**0.39**	NS	**0.131 K**	**0.386 K**
Selenium, dissolved	mg/L	0.05	NS	<0.001	<0.001	**0.000754 J**	NS	**0.002 J**	<0.001
Zinc, dissolved	mg/L	5	NS	**0.004 JK**	<0.008 UJK	**0.0125 J**	NS	**0.186 K**	**0.00233**
Total Metals							NS		
Aluminum	mg/L	0.2	NS	**3.18 K**	**2.56 J+K**	**8.75**	NS	<0.03 UK	**0.127 J+K**
Iron	mg/L	0.3	NS	**2.77 K**	**2.15 J+K**	**6.96**	NS	**0.05 JK**	**0.603 J+K**
Lead	mg/L	0.015	NS	**0.0012 K**	NS	NS	NS	**0.0001 JK**	**0.0174 J+K**
Manganese	mg/L	0.05	NS	**0.339 K**	**0.269 K**	**0.456**	NS	**0.138 K**	**0.184 K**
Selenium	mg/L	0.05	**0.00119**	<0.001	<0.001	**0.00138 J**	**0.000606 J**	**0.001 J**	<0.001
Zinc	mg/L	5	NS	**0.011 K {J+}**	**0.015 K**	**0.326**		**0.185 K**	**0.0493 K**
General Chemistry									
Residue, Filterable (TDS)	mg/L	500	**196**	**150 J-**	**180 J-**	**184**	**176**	**410 J-**	**363 J-**
Sulfate	mg/L	250	**35.1**	**9.2**	**35.9**	**29.6**	**16.7**	**87.7**	**61.2**

TABLE 3-43

ENOCH VALLEY MINE - SUMMARY OF GROUNDWATER EXCEEDANCES
(Page 5 of 10)

		Well Name:	MMW009	MMW009	MMW013	MMW013	MMW013	MMW013	MMW013
		Collection Date:	09/25/08	06/04/09	09/18/07	05/15/08	09/21/08	06/03/09	09/21/09
		Well Type:	MW	MW	MW	MW	MW	MW	MW
		Result Type:	Averaged Triplicate	Primary	Primary	Primary	Primary	Averaged Triplicate	Primary
Analyte	**Units**	**Screening Value**							
Dissolved Metals									
Aluminum, dissolved	mg/L	0.2	<0.05	NS	<0.14 UK	<0.03 UK	<0.0500	NS	NS
Iron, dissolved	mg/L	0.3	**0.577**	**0.388**	<0.04 UK	<0.02 UK	<0.0250	NS	NS
Lead, dissolved	mg/L	0.015	NS	NS	<0.0001 UK	NS	NS	NS	NS
Manganese, dissolved	mg/L	0.05	**0.14**	NS	**0.005 K**	**0.0006 JK**	**0.00293**	NS	NS
Selenium, dissolved	mg/L	0.05	<0.0005	NS	**0.06**	**0.055**	**0.0883**	NS	NS
Zinc, dissolved	mg/L	5	<0.0268	NS	<0.002 UK	<0.002 UK	<0.00500	NS	NS
Total Metals									
Aluminum	mg/L	0.2	**2.27**	**0.863**	<0.09 UK	**0.14 JK**	<0.0500	NS	NS
Iron	mg/L	0.3	**2.04**	**1.1**	**0.14 K**	**0.07 K**	**0.0379 J**	NS	NS
Lead	mg/L	0.015	NS	**0.00218**	<0.0002 UK	NS	NS	NS	NS
Manganese	mg/L	0.05	**0.159**	**0.112**	**0.152 K**	**0.0482 K**	**0.0346**	NS	NS
Selenium	mg/L	0.05	**0.00104 J**	<0.000500	<0.001	**0.051**	**0.0909**	**0.106**	**0.124**
Zinc	mg/L	5	**0.163 J-**	**0.0430**	<0.002 UK	<0.002 UK	**0.00759 J**	NS	NS
General Chemistry									
Residue, Filterable (TDS)	mg/L	500	**358**	**412**	**640 J-**	**670 J-**	**652**	**564**	**562**
Sulfate	mg/L	250	**55.7 J-**	**55.3**	**274**	**332**	**261**	**219**	**258**

TABLE 3-43

ENOCH VALLEY MINE - SUMMARY OF GROUNDWATER EXCEEDANCES
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		Well Name:	MMW024	MMW024	MMW024	MMW025	MMW025	MMW026	MMW026
		Collection Date:	09/23/08	39715	39952	39716	39952	39728	39962
		Well Type:	MW	MW	MW	MW	MW	MW	MW
		Result Type:	Primary	Averaged Triplicate	Primary	Primary	Primary	Primary	Primary
Analyte	**Units**	**Screening Value**							
Dissolved Metals									
Aluminum, dissolved	mg/L	0.2	<0.0500	<0.05	NS	<0.0500	NS	<0.0500	NS
Iron, dissolved	mg/L	0.3	<0.0250	**0.0305 J**	<0.0250	**0.0417 J**	<0.0250	<0.0250	**0.0513 J**
Lead, dissolved	mg/L	0.015	NS	NS	NS	NS	NS	NS	NS
Manganese, dissolved	mg/L	0.05	**0.00209**	**0.00867**	NS	**0.0304**	NS	**0.00553**	NS
Selenium, dissolved	mg/L	0.05	**0.0147 J**	**0.0135**	NS	**0.000610 J**	NS	**0.00120**	NS
Zinc, dissolved	mg/L	5	**0.00670 J**	**0.0098 J**	NS	<0.00500	NS	**0.111**	NS
Total Metals									
Aluminum	mg/L	0.2	**0.254**	**0.323**	<0.0500	**1.38**	**0.216**	<0.0500	<0.0500
Iron	mg/L	0.3	**0.245**	**0.285**	<0.0250	**1.01**	**0.155**	<0.0250	**0.0382 J**
Lead	mg/L	0.015	NS	NS	<0.000250	NS	<0.000250	NS	<0.000250
Manganese	mg/L	0.05	**0.00753**	**0.0105**	**0.000688 J**	**0.0699**	**0.0209**	**0.00544**	**0.0440**
Selenium	mg/L	0.05	**0.0137 J**	**0.0137**	**0.0243**	**0.000879 J**	**0.00168**	**0.00130**	**0.00107 J**
Zinc	mg/L	5	**0.00995 J**	**0.012 J**	<0.00500	<0.00578 UJ	<0.00502	**0.111**	**0.00831 J**
General Chemistry									
Residue, Filterable (TDS)	mg/L	500	**456**	**501**	**618**	**184**	**204**	**276**	**414**
Sulfate	mg/L	250	**188**	**190**	**246**	**9.66 J-**	**13.9**	**19.5**	**19.7**

TABLE 3-43

ENOCH VALLEY MINE - SUMMARY OF GROUNDWATER EXCEEDANCES
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		Well Name:	MMW027	MMW027	MMW034	MMW035	MMW036	MPW006	MPW006
		Collection Date:	39714	39961	40078	40078	40078	38124	38245
		Well Type:	MW	MW	MW	MW	MW	PW	PW
		Result Type:	Primary	Primary	Primary	Averaged Triplicate	Primary	Primary	Primary
Analyte	**Units**	**Screening Value**							
Dissolved Metals									
Aluminum, dissolved	mg/L	0.2	<0.0500	NS	NS	NS	NS	NS	NS
Iron, dissolved	mg/L	0.3	<0.0250	<0.0250	**0.0258 J**	<0.025	<0.0250	NS	NS
Lead, dissolved	mg/L	0.015	NS	NS	NS	NS	NS	NS	NS
Manganese, dissolved	mg/L	0.05	**0.00954**	NS	NS	NS	NS	NS	NS
Selenium, dissolved	mg/L	0.05	**0.309**	NS	NS	NS	NS	<0.001	<0.001 UJ
Zinc, dissolved	mg/L	5	<0.00500	NS	NS	NS	NS	**0.051 K**	**0.318 K**
Total Metals									
Aluminum	mg/L	0.2	<0.0500	<0.0500	**0.153**	<0.05	**0.426**	NS	NS
Iron	mg/L	0.3	<0.0250	<0.0250	**0.119**	**0.0291 J**	**0.198**	NS	NS
Lead	mg/L	0.015	NS	<0.000250	NS	NS	NS	NS	NS
Manganese	mg/L	0.05	**0.0105**	**0.00115 J**	**0.00968**	**0.00797**	**0.0124**	NS	NS
Selenium	mg/L	0.05	**0.314**	**0.329 J**	**0.0762**	**0.772**	**0.00593**	NS	NS
Zinc	mg/L	5	<0.00500	<0.00500	**0.00734 J**	**0.00506**	<0.00500	NS	NS
General Chemistry									
Residue, Filterable (TDS)	mg/L	500	**698**	**2010**	**536**	**1140**	**306**	NS	NS
Sulfate	mg/L	250	**229**	**227**	**209**	**447**	**25.4**	**124**	**171**

TABLE 3-43

ENOCH VALLEY MINE - SUMMARY OF GROUNDWATER EXCEEDANCES
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Well Name:			**MPW019**	**MPW019**	**MPW019**	**MPW019**	**MPW019**	**MPW019**	**MPW019**
Collection Date:			**38124**	**38245**	**38525**	**38851**	**39340**	**39586**	**39714**
Well Type:			**PW**	**PW**	**PW**	**PW**	**PW**	**PW**	**PW**
Result Type:			**Primary**	**Primary**	**Primary**	**Primary**	**Primary**	**Primary**	**Primary**
Analyte	**Units**	**Screening Value**							
Dissolved Metals									
Aluminum, dissolved	mg/L	0.2	NS	NS	<0.03 UK	<0.03 UK	<0.03 UK	<0.03 UK	<0.0500
Iron, dissolved	mg/L	0.3	NS	NS	**0.16 K**	**0.35 K**	**0.37 K**	**0.2 K**	**0.0595 J**
Lead, dissolved	mg/L	0.015	NS	NS	NS	<0.0001 UK	<0.0003 UK	NS	NS
Manganese, dissolved	mg/L	0.05	NS	NS	**0.0472 K**	**0.0755 K**	**0.0434 K**	**0.0469 K**	**0.0360**
Selenium, dissolved	mg/L	0.05	<0.001	<0.001 UJ	**0.001 J**	<0.001	<0.001	**0.001 J**	**0.00142**
Zinc, dissolved	mg/L	5	**0.036 K**	**0.012 K**	**0.026 K {J+}**	**0.568 K**	**0.058 K**	**0.234 K**	**0.0344 {J+}**
Total Metals									
Aluminum	mg/L	0.2	NS	NS	NS	NS	<0.03 UK	<0.03 UK	<0.0500
Iron	mg/L	0.3	NS	NS	NS	NS	**0.58 K**	**1.68 K**	**0.125**
Lead	mg/L	0.015	NS	NS	NS	NS	**0.0015 K**	NS	NS
Manganese	mg/L	0.05	NS	NS	NS	NS	**0.0464 K**	**0.0524 K**	**0.0360**
Selenium	mg/L	0.05	NS	NS	NS	<0.001	<0.001	**0.001 J**	**0.00149**
Zinc	mg/L	5	NS	NS	NS	**0.699 K**	**0.07 K**	**0.284 K**	**0.0339**
General Chemistry									
Residue, Filterable (TDS)	mg/L	500	NS	NS	NS	**250**	**230 J-**	**270 J-**	**258**
Sulfate	mg/L	250	**8.3**	**9.8**	**8.3**	**8.1**	**8.9**	**10.1**	**9.70**

TABLE 3-43

ENOCH VALLEY MINE - SUMMARY OF GROUNDWATER EXCEEDANCES
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Well Name:			**MPW020**
Collection Date:			**38265**
Well Type:			**PW**
Result Type:			**Primary**
Analyte	**Units**	**Screening Value**	
Dissolved Metals			
Aluminum, dissolved	mg/L	0.2	NS
Iron, dissolved	mg/L	0.3	NS
Lead, dissolved	mg/L	0.015	NS
Manganese, dissolved	mg/L	0.05	NS
Selenium, dissolved	mg/L	0.05	<0.001
Zinc, dissolved	mg/L	5	**0.005 JK**
Total Metals			NS
Aluminum	mg/L	0.2	NS
Iron	mg/L	0.3	NS
Lead	mg/L	0.015	NS
Manganese	mg/L	0.05	NS
Selenium	mg/L	0.05	NS
Zinc	mg/L	5	NS
General Chemistry			
Residue, Filterable (TDS)	mg/L	500	NS
Sulfate	mg/L	250	**98**

TABLE 3-43

ENOCH VALLEY MINE - SUMMARY OF GROUNDWATER EXCEEDANCES
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Notes:
AW - agricultural well
BW - direct-push alluvial aquifer well
DW - domestic well
MW - monitoring well
NS- not sampled
PW - production well

Result is greater than screening value
Method detection limit for non-detected value is greater than the screening value

FLAG DEFINITION:

U	The analyte was analyzed for, but was not detected above the level of the reported sample quantitation limit.
J	The result is an estimated quantity. The associated numerical value is the approximated concentration of the analyte in the sample.
J+	The result is an estimated quantity, but the result may be biased high.
J-	The result is an estimated quantity, but the result may be biased low.
J+/B	Result is estimated and biased high; associated field blank contained target analyte.
R	The result is unusable. The sample result is rejected due to serious deficiencies in meeting quality control criteria. The analyte may or may not be present in the sample.
UJ	The analyte was analyzed for, but was not detected. The reported quantitation limit is approximate and may be inaccurate or imprecise.
K	Serial dilutions not performed for samples analyzed by this method (EPA 200.7; 200.8).

SOURCES FOR SCREENING VALUES (SEE ALSO TABLE 3

Groundwater Unless identified otherwise below, screening levels are from State of Idaho Ground Water Quality Rule (IDAPA 58.01.11).
Screening levels for pH, aluminum, chloride, iron, manganese, pH, silver, sulfate, TDS, and zinc are Secondary Maximum Contaminant Levels (MCLs).
Screening values for arsenic and uranium are USEPA primary and secondary MCLs, National Primary Drinking Water Regulations, EPA.
Screening values for boron, cobalt, molybdenum, nickel, and vanadium are USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites.

TRIPLICATE RESULT

"Primary" indicates locations where only one sample was collected from a given location. "Triplicate" indicates locations where a total of three samples were collected from a given location for the purpose of quality assurance.
The average value for triplicate samples is calculated as follows: (a) the mean of three detected values, (b) the mean of two detected values if result of one triplicate is not detected, (c) the detected value if results of two triplicates are not detected, or (d) less than the highest method detection limit if all triplicate results are not detected.

TABLE 3-44
ENOCH VALLEY MINE
STREAM HABITAT ASSESSMENT DATA MATRIX

Station	May 2004 [Se]sw, mg/L	May 2004 [Se]sed, mg/kg dw	RBS (Habitat Score)	Fish Presence
MST126	0.00050	0.75	139	X
MST127	0.00050	0.60	52	X
MST128*	0.0010	0.90	133	X
MST129*	0.0010	1.2	104	X
MST130*	0.00050	14	87	X[a]
MST131	0.0020	0.30	85	X
MST132	0.00050	1.0	131	X
MST133	0.0040	1.8	48	X[a]
MST134	0.0040	1.1	25	No
MST135	0.00050	3.0	24	No
MST136	0.016	0.70	49	No
MST143	0.00050	0.30	8	No
MST144	0.23	7.6	3	No
MST274*	0.0030	2.5	35	No
MST275	0.00050	0.30	4	No

Notes:
Non-detected concentrations have been censored at one-half the MDLThe MDL for surface water was 0.0010 mg/L and for sediment was 0.50 mg/kg dw.
* - Mine-specific background station
a - no fish observed, but presumed to be present based on hydraulic connection to adjacent stations with fish present
[Se]sw, mg/L – concentration of selenium in surface reported in mg/L
[Se]sed, mg/kg dw – concentration of selenium in sediment, reported in mg/kg on a dw basis

TABLE 3-45 ENOCH VALLEY MINE HISTORICAL SALMONID SELENIUM CONCENTRATIONS (mg/kg dw)					
Enoch Valley Mine Station	**Station ID**	**Sept 1999**	**Flag**	**May 2004**	**Flag**
Angus Creek, above Blackfoot River	MST126	-		4.1	
Angus Creek, above Rasmussen Creek	MST128*	-		4.8	
Angus Creek, below Wooley Valley Mine	MST129*	1.2		6.7	
Notes: * - Mine-specific background station All salmonid results were analyzed by fillet.					

TABLE 3-46 ENOCH VALLEY MINE HISTORICAL FORAGE FISH SELENIUM CONCENTRATIONS (mg/kg dw)							
Enoch Valley Mine Station	**Station ID**	**Sept 1999**	**Flag**	**May 2000**	**Flag**	**May 2004**	**Flag**
Angus Creek, above Blackfoot River	MST126	-		-		9.6	
Angus Creek, below No Name Creek	MST127	5.4		3.7		4.8	
Angus Creek, above Rasmussen Creek	MST128*	-		-		4.5	
Angus Creek, below Wooley Valley Mine	MST129*	3.4		15		5.8	
Rassmussen Creek, above Angus Creek	MST131	-		-		6.3	
Angus Creek, below Rasmussen Creek	MST132	-		-		8.8	
Notes: * - Mine-specific background station							

TABLE 3-47
ENOCH VALLEY MINE
HISTORICAL BENTHIC MACROINVERTEBRATE SELENIUM CONCENTRATIONS (mg/kg dw)

Enoch Valley Mine Station	Station ID	Sept 1999	Flag	May 2000	Flag	June 2004	Flag
Angus Creek, above Blackfoot River	MST126	-		-		8.3	J
Angus Creek, below No Name Creek	MST127	4.5		5.7		3.4	J
Angus Creek, above Rasmussen Creek	MST128*	-		-		6.4	UJ
Angus Creek, R-B&M-10, below Wooley Valley Mine	MST129*	6.2		17		13	J
Angus Creek, R-B&M-10, below Upper Angus Creek Reservoir	MST130*	12		18		8.4	J
Rasmussen Creek, above Angus Creek	MST131	-		-		5.3	J
Angus Creek, below Rasmussen Creek	MST132	-		-		1.2	UJ
Rasmussen Creek, below Enoch Valley Mine	MST133	-		-		21	UJ
Rasmussen Creek, below West Pond Creek	MST134	-		-		8.3	J
Rasmussen Creek, above West Pond Creek	MST135	-		-		170	UJ
Rasmussen Creek headwaters, near Enoch Valley Mine Shop Pond	MST136	-		-		83	UJ
East Fork Rasmussen Creek, above Rasmussen Creek	MST143	-		-		170	UJ
West Fork Rasmussen Creek, above Rasmussen Creek	MST274*	-		-		6.1	J

Notes:
* - Mine-specific background station
Flags:
U - Non-detect (Non-detected concentrations were censored and value presented is equal to the MDL)
J - Estimated result

TABLE 3-48 ENOCH VALLEY MINE HISTORICAL SMALL MAMMAL SELENIUM CONCENTRATIONS (mg/kg dw)					
Enoch Valley Mine Station	Station ID	Species		Sept 2001	Flag
		Common Name	Scientific Name		
Angus Creek, below Upper Angus Creek Reservoir	MST130*	deer mouse	P. maniculatus	0.57	J
	MST130*	deer mouse	P. maniculatus	0.54	J
	MST130*	deer mouse	P. maniculatus	0.76	J
Notes: * - Mine-specific background station J – Estimated result					

TABLE 3-49 ENOCH VALLEY MINE HISTORICAL TERRESTRIAL INVERTEBRATE SELENIUM CONCENTRATIONS (mg/kg dw)			
Enoch Valley Mine Station	Station ID - Sample Type	Sept 2001	Flag
Angus Creek, below Upper Angus Creek Reservoir	MST130* - Insects	3.2	
	MST130* - Worms	55	
* - Mine-specific background station			

TABLE 3-50 ENOCH VALLEY SUMMARY OF INVESTIGATION FINDINGS BY MEDIUM						
Medium	**Dates Sampled**	**Approximate Number of Sampling Locations**	**Analytes Sampled**	**Location of Samples Collected**	**Investigation Results Summary**	**Summary Assessment**
Soils	2004	1) 52 locations on 4 transects	Se	See Drawing 3-39	See Section 3.4.1.1 Se ranged from 0.25 to 140 mg/kg dw.	The nature and extent of surface soil impacts at the Enoch Mine has been defined adequately so that if necessary, risk assessments and the feasibility study (FS) can be conducted for the non-radiogenic COPCs. However for radiogenic risks, to reduce the uncertainty in the inherently conservative risk calculations, site-specific uranium isotopes data for soil and radon and gamma measurements will be collected both on site and in a background area(s). Also, a data gap has been identified for sediment (see below) and this carries forward to riparian soils. Therefore some additional limited sampling of riparian soil is needed. Further evaluation of existing background data is needed to statistically quantify background concentrations.
	2009	2) 51 composite samples	Sb, As, B, Cd, Cr, Co, Cu, Mn, Hg, Mo, Ni, Se, Ag, Tl, U, V, Zn	See Drawing 3-41	See Section 3.4.1.2 - Isolated exceedances of Cd, Ni and V above screening levels (SLs). - As and Mn background above SLs. - As and Se exceedances above SLs. - As ranged from 5.2 to 20.8 mg/kg dw - Se ranged from 39.7 to 113 mg/kg dw.	
	2004	3) 31 riparian soil samples	Cd, Cr, Cu, Mo, Ni, Se, V, Zn	See Drawing 3-6	See Section 3.4.1.3 - Isolated exceedances of Cd, Ni, and V above SLs. - Se exceedances above SLs. - Se ranged from 0.25 to 70 mg/kg dw.	

TABLE 3-50 ENOCH VALLEY SUMMARY OF INVESTIGATION FINDINGS BY MEDIUM						
Medium	**Dates Sampled**	**Approximate Number of Sampling Locations**	**Analytes Sampled**	**Location of Samples Collected**	**Investigation Results Summary**	**Summary Assessment**
Vegetation	2004	1) 52 locations on 4 transects	Se	See Drawing 3-40	See Section 3.4.2.1 Se ranged from 0.25 to 16 mg/kg dw.	The nature and extent of vegetation impacts at the Enoch Valley Mine has been defined adequately so that risk assessments and the FS can be conducted. As a result, no further field characterization is necessary. However, further evaluation of existing background data is needed.
	2004	2) Composite samples monthly (i.e. for 6 months)	Se	See Drawing 3-6	See Section 3.4.2.2 Monthly vegetation Se samples ranged from 0.80 to 25 mg/kg dw.	
	2009	3) 121 samples	Sb, As, B, Cd, Cr, Co, Cu, Mn, Hg, Mo, Ni, Se, Ag, Tl, U, V, Zn	See Drawing 3-42	See Section 3.4.2.3 - One boron exceedance of background above the SL. - Mo and Se exceedances above the SLs. - Mo ranged from 1.48 to 33.9 mg/kg. - Se ranged from 0.39 to 71.1 mg/kg dw.	
	2004	4) 31 riparian samples	Cd, Cu, Mo, Se, Zn	See Drawing 3-6	See Section 3.4.2.4 Se exceedances Se ranged from 0.25 to 17 mg/kg dw.	

TABLE 3-50 ENOCH VALLEY SUMMARY OF INVESTIGATION FINDINGS BY MEDIUM						
Medium	**Dates Sampled**	**Approximate Number of Sampling Locations**	**Analytes Sampled**	**Location of Samples Collected**	**Investigation Results Summary**	**Summary Assessment**
Surface Water	Fall and Spring 1997 - 2009	31 sampling stations	Metals Cations Anions General Water Quality Parameters Field Parameters	See Drawings 3-8 to 3-10 and 3-43 to 3-44	See Section 3.4.3.1 Al, Ba, B, Cd, Fe, Mn, Ni, Tl, Se, V, and Zn exceeded SLs.	The nature and extent of surface water impacts at the Enoch Valley Mine has been defined adequately so that if necessary, risk assessments and the FS can be conducted. As a result, no further field characterization is required. However, ongoing monitoring is necessary to collect baseline effectiveness monitoring of potential future remedies. Further evaluation of existing background data is needed.
Sediment	5 events: Fall 1998, Fall 1999, Spring 2002, Fall 2002, and Spring 2004	26 sampling stations	Metals Cations Anions pH TOC	See Drawings 3-9, 3-13, and 3-43	See Section 3.4.3.2 Cd, Cr, Ni, Se, and V exceeded SLs.	The spatial characterization of sediment impacts at the Enoch Valley Mine has been defined adequately so that if necessary, risk assessments and the FS can be conducted. However, a data gap relating to COPC coverage in sediments has been identified and will be addressed by the Fall 2010 sampling event as described in Appendix D1. In addition further evaluation of existing background data is needed.

TABLE 3-50 ENOCH VALLEY SUMMARY OF INVESTIGATION FINDINGS BY MEDIUM						
Medium	**Dates Sampled**	**Approximate Number of Sampling Locations**	**Analytes Sampled**	**Location of Samples Collected**	**Investigation Results Summary**	**Summary Assessment**
Groundwater	Fall and Spring 2004 - 2009	24 wells	Metals Cation Anions General Water Quality Parameters General Field Parameters	See Drawings 3-45 and 3-46	See Section 3.4.4 - Isolated exceedances of Pb and Zn above SLs. - Elevated concentrations of Al, Fe, Mn above SLs. - Se, SO_4, and TDS exceedances above SLs. - Se ranged from non-detect to 0.772 mg/L. - Se exceeds standard in shallow and intermediate groundwater flow systems.	The nature and extent for stream habitat data at the Enoch Valley Mine has been defined except for limited areas as discussed in Section 4.0.
Aquatic Biota						
Stream Habitat Assessment	2004	15 stations	NA	See Drawing 3-21	See Section 3.4.5.1 RBS scores from 3 to 139 out of 200	The nature and extent for stream habitat data at the Enoch Valley Mine has been defined adequately so that if necessary, risk assessments and the FS can be conducted. As a result, no further characterization is needed.

TABLE 3-50 ENOCH VALLEY SUMMARY OF INVESTIGATION FINDINGS BY MEDIUM						
Medium	**Dates Sampled**	**Approximate Number of Sampling Locations**	**Analytes Sampled**	**Location of Samples Collected**	**Investigation Results Summary**	**Summary Assessment**
Fish	1999, 2000, 2004	6 stations	Cd, Ni, Se, V, Zn	See Drawings 3-20 and 3-21	See Section 3.4.5.2 Forage fish Se ranged from 3.4 to 15 mg/kg dw. Salmonid Se ranged from 1.2 to 6.7 mg/kg dw.	Nature and extent information for fish data at the Enoch Valley Mine are adequate for their intended purpose as additional lines of evidence in the human health and/or ecological risk assessment. The potential need for additional sampling of this media will be evaluated pending results of the risk assessment for the P4 mines.

TABLE 3-50 ENOCH VALLEY SUMMARY OF INVESTIGATION FINDINGS BY MEDIUM						
Medium	**Dates Sampled**	**Approximate Number of Sampling Locations**	**Analytes Sampled**	**Location of Samples Collected**	**Investigation Results Summary**	**Summary Assessment**
Benthic Macroinvertebrates	1999, 2000, 2004	13 stations	Se	See Drawing 3-21	See Section 3.4.5.3 Se ranged from 3.4 to 18 mg/kg dw. All selenium results exceeded the screening level. In addition the MDL was usually above the screening level.	Nature and extent information for benthic macroinvertebrate data at the Enoch Valley Mine are adequate for their intended purpose as additional lines of evidence in the human health and/or ecological risk assessment. The potential need for additional sampling of this media will be evaluated pending results of the risk assessment for the P4 mines.
Terrestrial Biota						
Elk	1999 2000	160 elk 54 elk	Ca and Se Cd, Cu, Fe, Pb, Mn, Mo, Se, and Zn	See Drawings 3-22 and 3-47	See Section 3.4.6.1 Se ranged from 0.65 to 39 mg/kg dw in elk livers Se ranged from 0.60 to 41 mg/kg dw in elk livers	Nature and extent information for elk data at the Enoch Valley Mine are adequate for their intended purpose as additional lines of evidence in the human health and/or ecological risk assessment. The potential need for additional sampling of this media will be evaluated pending results of the risk assessment for the P4 mines.

TABLE 3-50 ENOCH VALLEY SUMMARY OF INVESTIGATION FINDINGS BY MEDIUM						
Medium	**Dates Sampled**	**Approximate Number of Sampling Locations**	**Analytes Sampled**	**Location of Samples Collected**	**Investigation Results Summary**	**Summary Assessment**
Bird Eggs	1999 2000 2001	215 eggs 334 eggs 369 eggs	Cd and Se Cd and Se Se	See Drawings 3-23 to 3-25 and 3-47	See Section 3.4.6.2 Se ranged from 0.61 to 21.3 mg/kg dw Se ranged from 0.29 to 25 mg/kg dw Se ranged from 1.3 to 31.9 mg/kg dw	Nature and extent information for bird egg data at the Enoch Valley Mine are adequate for their intended purpose as additional lines of evidence in the human health and/or ecological risk assessment. The potential need for additional sampling of this media will be evaluated pending results of the risk assessment for the P4 mines.
Cattle	See Section 3.3.6.3 Henry Mine	See Section 3.3.6.3 Henry Mine	See Section 3.3.6.3 Henry Mine	See Section 3.3.6.3 Henry Mine	See Section 3.3.6.3 Henry Mine	See Section 3.3.6.3 Henry Mine
Small Mammals	2001	1 riparian station	Al, Sb, As, Ba, Be, Cd, Cr, Cu, Pb , Mn, Hg, Mo Ni, Se, Ag, Th, V, U, and Zn	See Drawings 3-22 and 3-47	See Section 3.4.6.4 Se ranged from 0.54 to 0.76 mg/kg dw.	Nature and extent information for small mammals data at the Enoch Valley Mine are adequate for their intended purpose as additional lines of evidence in the human health and/or ecological risk assessment. The potential need for additional sampling of this media will be evaluated pending results of the risk assessment for the P4 mines.

TABLE 3-50 ENOCH VALLEY SUMMARY OF INVESTIGATION FINDINGS BY MEDIUM						
Medium	**Dates Sampled**	**Approximate Number of Sampling Locations**	**Analytes Sampled**	**Location of Samples Collected**	**Investigation Results Summary**	**Summary Assessment**
Terrestrial Invertebrates	2001	1 riparian station	Al, Sb, As, Ba, Be, Cd, Cr, Cu, Pb , Mn, Hg, Mo Ni, Se, Ag, Th, V, U, and Zn	See Drawings 3-22 and 3-47	See Section 3.4.6.5 Se ranged from 3.2 to 55 mg/kg dw	Nature and extent information for terrestrial invertebrates data at the Enoch Valley Mine are adequate for their intended purpose as additional lines of evidence in the human health and/or ecological risk assessment. The potential need for additional sampling of this media will be evaluated pending results of the risk assessment for the P4 mines.

TABLE 3-51 BLACKFOOT RIVER RIPARIAN SOIL SELENIUM CONCENTRATIONS (mg/kg dw)			
Station Name	**Station ID**	**Sept 2004**	**Flag**
Reservoir Delta at Blackfoot River	MRV011	0.50	
Blackfoot River, below Ballard Creek	MST019	1.5	
Blackfoot River, below State Land Creek	MST020	1.7	
Blackfoot River, below Trail Creek	MST021	1.2	
Blackfoot River, below Wooley Valley Creek	MST022	0.93	
Blackfoot River, below Dry Valley Creek, (1997 #20)	MST023	1.1	
Blackfoot River, above Dry Valley Creek, (1997 #19)	MST024	0.90	
Blackfoot River, below Wooley Range Ridge Creek	MST025	0.93	
Blackfoot River, above Wooley Range Ridge Creek	MST026	0.80	
Blackfoot River, below Angus Creek	MST027	0.50	U
Blackfoot River, above Diamond Creek Rd.	MST028	0.50	U
Blackfoot River, above Spring Creek	MST029	0.50	U
Blackfoot River, below Spring Creek	MST229	1.0	
Blackfoot River, above State Land Creek	MST230	1.9	
Blackfoot River, below Woodall Mountain Creek	MST231	0.50	U
Blackfoot River, above Blackfoot Reservoir	MST232	0.50	U
Notes: U – Non-detect (Non-detected concentrations were censored and value presented is equal to the MDL)			

TABLE 3-52 BLACKFOOT RIVER 2004 SEASONAL VEGETATION SELENIUM CONCENTRATIONS (mg/kg dw)							
Station Name	**Station ID**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**
Blackfoot River, below Trail Creek	MST021	0.25	0.25	0.25	NS	0.25	0.25
Blackfoot River, below Angus Creek	MST027	0.25	0.25	0.25	0.25	0.25	0.25
Blackfoot River, below Woodall Mtn. Creek	MST231	0.25	0.25	0.25	0.25	0.25	0.25
Notes: Non-detected concentrations are presented as one-half the MDL. The MDL was 0.5 mg/kg dw.							

TABLE 3-53
BLACKFOOT RIVER
RIPARIAN VEGETATION SELENIUM CONCENTRATIONS (mg/kg dw)

Station Name	Station ID	Sept 1999	Flag	Sept 2004	Flag
Reservoir Delta at Blackfoot River	MRV011	0.66		0.50	U
Blackfoot River, below Ballard Creek	MST019	1.0		0.50	U
Blackfoot River, below State Land Creek	MST020	-		0.50	U
Blackfoot River, below Trail Creek	MST021	0.90		0.50	U
Blackfoot River, below Wooley Valley Creek	MST022	-		0.50	U
Blackfoot River, below Dry Valley Creek, (1997 #20)	MST023	1.9		0.50	U
Blackfoot River, above Dry Valley Creek, (1997 #19)	MST024	-		0.50	U
Blackfoot River, below Wooley Range Ridge Creek	MST025	-		0.50	U
Blackfoot River, above Wooley Range Ridge Creek	MST026	0.41		0.50	U
Blackfoot River, below Angus Creek	MST027	-		0.50	U
Blackfoot River, above Diamond Creek Rd.	MST028	-		0.50	U
Blackfoot River, above Spring Creek	MST029	0.076		0.50	U
Blackfoot River, below Spring Creek	MST229	0.43		0.50	U
Blackfoot River, above State Land Creek	MST230	-		0.50	U
Blackfoot River, below Woodall Mountain Creek	MST231	-		0.50	U
Blackfoot River, above Blackfoot Reservoir	MST232	0.80		0.50	U

Notes:
U – Non-detect (Non-detected concentrations were censored and value presented is equal to the MDL)

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BLACKFOOT RIVER - SUMMARY OF SURFACE WATER EXCEEDANCES
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Location:	MRV011		MRV011		MRV011		MRV011		MRV011		MRV011		MRV011		MRV011	
Location Type:	Reservoir Delta		Reservoir Delta		Reservoir Delta		Reservoir Delta		Reservoir Delta		Reservoir Delta		Reservoir Delta		Reservoir Delta	
Sample ID:	052104SWMRV011-0-F		052104SWMRV011-0-U		050706SWMRV011-0-F		050706SWMRV011-0-U		051407SWMRV011-0-F		051407SWMRV011-0-U		090807SWMRV011-0-F		090807SWMRV011-0-U	
Collection Date:	5/21/2004		5/21/2004		5/7/2006		5/7/2006		5/14/2007		5/14/2007		9/8/2007		9/8/2007	
Sample Type:	Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water	
	Primary		Primary		Primary		Primary		Primary		Primary		Primary		Primary	
	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL
Total Metals (mg/L)																
Aluminum	NS		NS		NS		NS		NS		<0.06 UK	0.087	NS		**0.05 JK {J+}**	0.087
Barium	NS		NS		NS		NS		NS		NS		NS		NS	
Beryllium	NS		NS		NS		NS		NS		NS		NS		NS	
Cobalt	NS		NS		NS		NS		NS		NS		NS		NS	
Iron	NS		NS		NS		NS		NS		NS		NS		NS	
Selenium	NS		**0.002 J**	0.005	NS		**0.006**	0.005	NS		**0.004 J**	0.005	NS		<0.001	0.005
Silver	NS		NS		NS		NS		NS		NS		NS		NS	
Thallium	NS		NS		NS		NS		NS		NS		NS		NS	
Dissolved Metals (mg/L)																
Aluminum, dissolved	NS		NS		**0.04 JK {J+}**	0.087	NS		NS		NS		NS		NS	
Barium, dissolved	NS		NS		**0.067 K**	0.003	NS		NS		NS		NS		NS	
Beryllium, dissolved	NS		NS		<0.002 UK	0.0006	NS		NS		NS		NS		NS	
Cobalt, dissolved	NS		NS		<0.01 UK	0.003	NS		NS		NS		NS		NS	
Iron, dissolved	NS		NS		<0.02 UK	0.158	NS		NS		NS		NS		NS	
Selenium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Silver, dissolved	NS		NS		<0.01 UK	0.00036	NS		NS		NS		NS		NS	
Thallium, dissolved	NS		NS		<0.0001 UK	0.00003	NS		NS		NS		NS		NS	

TABLE 3-54

BLACKFOOT RIVER - SUMMARY OF SURFACE WATER EXCEEDANCES
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Location:	MRV011		MRV011		MRV011		MRV011		MST019		MST019		MST019		MST019	
Location Type:	Reservoir Delta		Reservoir Delta		Reservoir Delta		Reservoir Delta		Stream		Stream		Stream		Stream	
Sample ID:	051308SWMRV011-0-F		051308SWMRV011-0-U		091908SWMRV011-0-F		091908SWMRV011-0-U		052004SWMST019-0-F		052004SWMST019-0-U		051206SWMST019-0-F		051206SWMST019-0-U	
Collection Date:	5/13/2008		5/13/2008		9/19/2008		9/19/2008		5/20/2004		5/20/2004		5/12/2006		5/12/2006	
Sample Type:	Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water	
	Primary		Primary		Primary		Primary		Primary		Primary		Primary		Primary	
	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL
Total Metals (mg/L)																
Aluminum	NS		**1.26 J+K**	0.087	NS		NS		NS		NS		NS		NS	
Barium	NS		NS		NS		NS		NS		NS		NS		NS	
Beryllium	NS		NS		NS		NS		NS		NS		NS		NS	
Cobalt	NS		NS		NS		NS		NS		NS		NS		NS	
Iron	NS		NS		NS		NS		NS		NS		NS		NS	
Selenium	NS		**0.004 J**	0.005	NS		**0.00176 J**	0.005	NS		**0.003 J**	0.005	NS		**0.008**	0.005
Silver	NS		NS		NS		NS		NS		NS		NS		NS	
Thallium	NS		NS		NS		NS		NS		NS		NS		NS	
Dissolved Metals (mg/L)																
Aluminum, dissolved	NS		NS		<0.0500	0.087	NS		NS		NS		**0.05 JK {J+}**	0.087	NS	
Barium, dissolved	NS		NS		NS		NS		NS		NS		**0.067 K**	0.003	NS	
Beryllium, dissolved	NS		NS		NS		NS		NS		NS		<0.002 UK	0.0006	NS	
Cobalt, dissolved	NS		NS		NS		NS		NS		NS		<0.01 UK	0.003	NS	
Iron, dissolved	NS		NS		<0.0250	0.158	NS		NS		NS		<0.02 UK	0.158	NS	
Selenium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Silver, dissolved	NS		NS		NS		NS		NS		NS		<0.01 UJK	0.00036	NS	
Thallium, dissolved	NS		NS		NS		NS		NS		NS		<0.0001 UK	0.00003	NS	

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BLACKFOOT RIVER - SUMMARY OF SURFACE WATER EXCEEDANCES
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Location:	MST019		MST019		MST019		MST019		MST019		MST019		MST019		MST019	
Location Type:	Stream		Stream		Stream		Stream		Stream		Stream		Stream		Stream	
Sample ID:	051507SWMST019-1-F		051507SWMST019-1-U		051507SWMST019-2-F		051507SWMST019-2-U		051507SWMST019-3-F		051507SWMST019-3-U		051507SWMST019-avg-F		051507SWMST019-avg-U	
Collection Date:	5/15/2007		5/15/2007		5/15/2007		5/15/2007		5/15/2007		5/15/2007		5/15/2007		5/15/2007	
Sample Type:	Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water	
	Triplicate		Triplicate		Triplicate		Triplicate		Triplicate		Triplicate		Averaged		Averaged	
	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL
Total Metals (mg/L)																
Aluminum	NS		**0.35 K**	0.087	NS		**0.34 K**	0.087	NS		**0.37 K**	0.087	NS		**0.353 K**	0.087
Barium	NS		NS		NS		NS		NS		NS		NS		NS	
Beryllium	NS		NS		NS		NS		NS		NS		NS		NS	
Cobalt	NS		NS		NS		NS		NS		NS		NS		NS	
Iron	NS		NS		NS		NS		NS		NS		NS		NS	
Selenium	NS		**0.004 J**	0.005	NS		**0.004 J**	0.005	NS		**0.003 J**	0.005	NS		**0.00367 J**	0.005
Silver	NS		NS		NS		NS		NS		NS		NS		NS	
Thallium	NS		NS		NS		NS		NS		NS		NS		NS	
Dissolved Metals (mg/L)																
Aluminum, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Barium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Beryllium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Cobalt, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Iron, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Selenium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Silver, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Thallium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	

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BLACKFOOT RIVER - SUMMARY OF SURFACE WATER EXCEEDANCES
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Location:	MST019		MST019		MST019		MST019		MST019		MST019		MST019		MST019	
Location Type:	Stream		Stream		Stream		Stream		Stream		Stream		Stream		Stream	
Sample ID:	090907SWMST019-0-F		090907SWMST019-0-U		051308SWMST019-0-F		051308SWMST019-0-U		091508SWMST019-0-F		091508SWMST019-0-U		0905SWMST019-F		0905SWMST019-U	
Collection Date:	9/9/2007		9/9/2007		5/13/2008		5/13/2008		9/15/2008		9/15/2008		5/4/2009		5/4/2009	
Sample Type:	Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water	
	Primary		Primary		Primary		Primary		Primary		Primary		Primary		Primary	
	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL
Total Metals (mg/L)																
Aluminum	NS		**0.26 K**	0.087	NS		**0.1 JK**	0.087	NS		NS		NS		NS	
Barium	NS		NS		NS		NS		NS		NS		NS		NS	
Beryllium	NS		NS		NS		NS		NS		NS		NS		NS	
Cobalt	NS		NS		NS		NS		NS		NS		NS		NS	
Iron	NS		NS		NS		NS		NS		NS		NS		NS	
Selenium	NS		<0.001	0.005	NS		**0.004 J**	0.005	NS		**0.00166**	0.005	NS		**0.00431 J**	0.005
Silver	NS		NS		NS		NS		NS		NS		NS		NS	
Thallium	NS		NS		NS		NS		NS		NS		NS		NS	
Dissolved Metals (mg/L)																
Aluminum, dissolved	NS		NS		NS		NS		<0.0500	0.087	NS		NS		NS	
Barium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Beryllium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Cobalt, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Iron, dissolved	NS		NS		NS		NS		<0.0250	0.158	NS		**0.259**	0.158	NS	
Selenium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Silver, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Thallium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	

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BLACKFOOT RIVER - SUMMARY OF SURFACE WATER EXCEEDANCES
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Location:	MST019		MST019		MST020		MST020		MST020		MST020		MST020		MST020	
Location Type:	Stream		Stream		Stream		Stream		Stream		Stream		Stream		Stream	
Sample ID:	0909SWMST019-F		0909SWMST019-U		052004SWMST020-0-F		052004SWMST020-0-U		051206SWMST020-0-F		051206SWMST020-0-U		051407SWMST020-0-F		051407SWMST020-0-U	
Collection Date:	9/21/2009		9/21/2009		5/20/2004		5/20/2004		5/12/2006		5/12/2006		5/14/2007		5/14/2007	
Sample Type:	Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water	
	Primary		Primary		Primary		Primary		Primary		Primary		Primary		Primary	
	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL
Total Metals (mg/L)																
Aluminum	NS		NS		NS		NS		NS		NS		NS		**0.31 K**	0.087
Barium	NS		NS		NS		NS		NS		NS		NS		NS	
Beryllium	NS		NS		NS		NS		NS		NS		NS		NS	
Cobalt	NS		NS		NS		NS		NS		NS		NS		NS	
Iron	NS		NS		NS		NS		NS		NS		NS		NS	
Selenium	NS		**0.00231**	0.005	NS		**0.002 J**	0.005	NS		**0.007**	0.005	NS		**0.004 J**	0.005
Silver	NS		NS		NS		NS		NS		NS		NS		NS	
Thallium	NS		NS		NS		NS		NS		NS		NS		NS	
Dissolved Metals (mg/L)																
Aluminum, dissolved	NS		NS		NS		NS		**0.03 JK {J+}**	0.087	NS		NS		NS	
Barium, dissolved	NS		NS		NS		NS		**0.068 K**	0.003	NS		NS		NS	
Beryllium, dissolved	NS		NS		NS		NS		<0.002 UK	0.0006	NS		NS		NS	
Cobalt, dissolved	NS		NS		NS		NS		<0.01 UK	0.003	NS		NS		NS	
Iron, dissolved	<0.0250	0.158	NS		NS		NS		<0.02 UK	0.158	NS		NS		NS	
Selenium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Silver, dissolved	NS		NS		NS		NS		<0.01 UJK	0.00036	NS		NS		NS	
Thallium, dissolved	NS		NS		NS		NS		<0.0001 UK	0.00003	NS		NS		NS	

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BLACKFOOT RIVER - SUMMARY OF SURFACE WATER EXCEEDANCES
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Location:	MST020		MST020		MST020		MST020		MST020		MST020		MST020		MST020	
Location Type:	Stream		Stream		Stream		Stream		Stream		Stream		Stream		Stream	
Sample ID:	091407SWMST020-0-F		091407SWMST020-0-U		051408SWMST020-0-F		051408SWMST020-0-U		091508SWMST020-0-F		091508SWMST020-0-U		0905SWMST020-F		0905SWMST020-U	
Collection Date:	9/14/2007		9/14/2007		5/14/2008		5/14/2008		9/15/2008		9/15/2008		5/4/2009		5/4/2009	
Sample Type:	Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water	
	Primary		Primary		Primary		Primary		Primary		Primary		Primary		Primary	
	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL
Total Metals (mg/L)																
Aluminum	NS		**0.14 JK**	0.087	NS		**1.2 J+K**	0.087	NS		NS		NS		NS	
Barium	NS		NS		NS		NS		NS		NS		NS		NS	
Beryllium	NS		NS		NS		NS		NS		NS		NS		NS	
Cobalt	NS		NS		NS		NS		NS		NS		NS		NS	
Iron	NS		NS		NS		NS		NS		NS		NS		NS	
Selenium	NS		<0.001	0.005	NS		**0.005 J**	0.005	NS		**0.00154 J+**	0.005	NS		**0.00421 J**	0.005
Silver	NS		NS		NS		NS		NS		NS		NS		NS	
Thallium	NS		NS		NS		NS		NS		NS		NS		NS	
Dissolved Metals (mg/L)																
Aluminum, dissolved	NS		NS		NS		NS		<0.0500	0.087	NS		NS		NS	
Barium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Beryllium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Cobalt, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Iron, dissolved	NS		NS		NS		NS		<0.0250	0.158	NS		**0.0574 J+/B**	0.158	NS	
Selenium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Silver, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Thallium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	

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BLACKFOOT RIVER - SUMMARY OF SURFACE WATER EXCEEDANCES
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Location:	MST020		MST020		MST021		MST021		MST021		MST021		MST021		MST021	
Location Type:	Stream		Stream		Stream		Stream		Stream		Stream		Stream		Stream	
Sample ID:	0909SWMST020-F		0909SWMST020-U		052004SWMST021-1-F		052004SWMST021-1-U		052004SWMST021-2-F		052004SWMST021-2-U		052004SWMST021-3-F		052004SWMST021-3-U	
Collection Date:	9/21/2009		9/21/2009		5/20/2004		5/20/2004		5/20/2004		5/20/2004		5/20/2004		5/20/2004	
Sample Type:	Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water	
	Primary		Primary		Triplicate		Triplicate		Triplicate		Triplicate		Triplicate		Triplicate	
	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL
Total Metals (mg/L)																
Aluminum	NS		NS		NS		NS		NS		NS		NS		NS	
Barium	NS		NS		NS		NS		NS		NS		NS		NS	
Beryllium	NS		NS		NS		NS		NS		NS		NS		NS	
Cobalt	NS		NS		NS		NS		NS		NS		NS		NS	
Iron	NS		NS		NS		NS		NS		NS		NS		NS	
Selenium	NS		**0.00203**	0.005	NS		**0.002 J**	0.005	NS		**0.003 J**	0.005	NS		**0.002 J**	0.005
Silver	NS		NS		NS		NS		NS		NS		NS		NS	
Thallium	NS		NS		NS		NS		NS		NS		NS		NS	
Dissolved Metals (mg/L)																
Aluminum, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Barium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Beryllium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Cobalt, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Iron, dissolved	<0.0250	0.158	NS		NS		NS		NS		NS		NS		NS	
Selenium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Silver, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Thallium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	

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BLACKFOOT RIVER - SUMMARY OF SURFACE WATER EXCEEDANCES
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Location:	MST021		MST021		MST021		MST021		MST022		MST022		MST022		MST022	
Location Type:	Stream		Stream		Stream		Stream		Stream		Stream		Stream		Stream	
Sample ID:	052004SWMST021-avg-F		052004SWMST021-avg-U		051206SWMST021-0-F		051206SWMST021-0-U		051904SWMST022-0-F		051904SWMST022-0-U		051206SWMST022-0-F		051206SWMST022-0-U	
Collection Date:	5/20/2004		5/20/2004		5/12/2006		5/12/2006		5/19/2004		5/19/2004		5/12/2006		5/12/2006	
Sample Type:	Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water	
	Averaged		Averaged		Primary		Primary		Primary		Primary		Primary		Primary	
	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL
Total Metals (mg/L)																
Aluminum	NS		NS		NS		NS		NS		NS		NS		NS	
Barium	NS		NS		NS		NS		NS		NS		NS		NS	
Beryllium	NS		NS		NS		NS		NS		NS		NS		NS	
Cobalt	NS		NS		NS		NS		NS		NS		NS		NS	
Iron	NS		NS		NS		NS		NS		NS		NS		NS	
Selenium	NS		**0.00233 J**	0.005	NS		**0.007**	0.005	NS		**0.003 J**	0.005	NS		**0.007**	0.005
Silver	NS		NS		NS		NS		NS		NS		NS		NS	
Thallium	NS		NS		NS		NS		NS		NS		NS		NS	
Dissolved Metals (mg/L)																
Aluminum, dissolved	NS		NS		**0.05 JK {J+}**	0.087	NS		NS		NS		<0.03 UK	0.087	NS	
Barium, dissolved	NS		NS		**0.069 K**	0.003	NS		NS		NS		**0.068 K**	0.003	NS	
Beryllium, dissolved	NS		NS		<0.002 UK	0.0006	NS		NS		NS		<0.002 UK	0.0006	NS	
Cobalt, dissolved	NS		NS		<0.01 UK	0.003	NS		NS		NS		<0.01 UK	0.003	NS	
Iron, dissolved	NS		NS		<0.02 UK	0.158	NS		NS		NS		<0.02 UK	0.158	NS	
Selenium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Silver, dissolved	NS		NS		<0.01 UJK	0.00036	NS		NS		NS		<0.01 UJK	0.00036	NS	
Thallium, dissolved	NS		NS		<0.0001 UK	0.00003	NS		NS		NS		<0.0001 UK	0.00003	NS	

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BLACKFOOT RIVER - SUMMARY OF SURFACE WATER EXCEEDANCES
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Location:	MST022		MST022		MST022		MST022		MST022		MST022		MST022		MST022	
Location Type:	Stream		Stream		Stream		Stream		Stream		Stream		Stream		Stream	
Sample ID:	051407SWMST022-0-F		051407SWMST022-0-U		090907SWMST022-0-F		090907SWMST022-0-U		051408SWMST022-1-F		051408SWMST022-1-U		051408SWMST022-2-F		051408SWMST022-2-U	
Collection Date:	5/14/2007		5/14/2007		9/9/2007		9/9/2007		5/14/2008		5/14/2008		5/14/2008		5/14/2008	
Sample Type:	Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water	
	Primary		Primary		Primary		Primary		Triplicate		Triplicate		Triplicate		Triplicate	
	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL
Total Metals (mg/L)																
Aluminum	NS		**0.31 K**	0.087	NS		**0.1 JK**	0.087	NS		**1.62 K**	0.087	NS		**1.57 K**	0.087
Barium	NS		NS		NS		NS		NS		NS		NS		NS	
Beryllium	NS		NS		NS		NS		NS		NS		NS		NS	
Cobalt	NS		NS		NS		NS		NS		NS		NS		NS	
Iron	NS		NS		NS		NS		NS		NS		NS		NS	
Selenium	NS		**0.004 J**	0.005	NS		<0.001	0.005	NS		**0.004 J**	0.005	NS		**0.004 J**	0.005
Silver	NS		NS		NS		NS		NS		NS		NS		NS	
Thallium	NS		NS		NS		NS		NS		NS		NS		NS	
Dissolved Metals (mg/L)																
Aluminum, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Barium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Beryllium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Cobalt, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Iron, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Selenium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Silver, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Thallium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	

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BLACKFOOT RIVER - SUMMARY OF SURFACE WATER EXCEEDANCES
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Location:	MST022		MST022		MST022		MST022		MST022		MST022		MST023		MST023	
Location Type:	Stream		Stream		Stream		Stream		Stream		Stream		Stream		Stream	
Sample ID:	051408SWMST022-3-F		051408SWMST022-3-U		051408SWMST022-avg-F		051408SWMST022-avg-U		091608SWMST022-0-F		091608SWMST022-0-U		051904SWMST023-0-F		051904SWMST023-0-U	
Collection Date:	5/14/2008		5/14/2008		5/14/2008		5/14/2008		9/16/2008		9/16/2008		5/19/2004		5/19/2004	
Sample Type:	Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface		Surface Water		Surface Water	
	Triplicate		Triplicate		Averaged		Averaged		Primary		Primary		Primary		Primary	
	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL
Total Metals (mg/L)																
Aluminum	NS		**1.74 K**	0.087	NS		**1.64 K**	0.087	NS		NS		NS		NS	
Barium	NS		NS		NS		NS		NS		NS		NS		NS	
Beryllium	NS		NS		NS		NS		NS		NS		NS		NS	
Cobalt	NS		NS		NS		NS		NS		NS		NS		NS	
Iron	NS		NS		NS		NS		NS		NS		NS		NS	
Selenium	NS		**0.004 J**	0.005	NS		**0.004 J**	0.005	NS		**0.00146**	0.005	NS		<0.001	0.005
Silver	NS		NS		NS		NS		NS		NS		NS		NS	
Thallium	NS		NS		NS		NS		NS		NS		NS		NS	
Dissolved Metals (mg/L)																
Aluminum, dissolved	NS		NS		NS		NS		<0.0500	0.087	NS		NS		NS	
Barium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Beryllium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Cobalt, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Iron, dissolved	NS		NS		NS		NS		<0.0250	0.158	NS		NS		NS	
Selenium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Silver, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Thallium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	

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BLACKFOOT RIVER - SUMMARY OF SURFACE WATER EXCEEDANCES
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Location:	MST023		MST023		MST023		MST023		MST023		MST023		MST023		MST023	
Location Type:	Stream		Stream		Stream		Stream		Stream		Stream		Stream		Stream	
Sample ID:	051106SWMST023-0-F		051106SWMST023-0-U		051407SWMST023-0-F		051407SWMST023-0-U		091007SWMST023-0-F		091007SWMST023-0-U		051408SWMST023-1-F		051408SWMST023-1-U	
Collection Date:	5/11/2006		5/11/2006		5/14/2007		5/14/2007		9/10/2007		9/10/2007		5/14/2008		5/14/2008	
Sample Type:	Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water	
	Primary		Primary		Primary		Primary		Primary		Primary		Triplicate		Triplicate	
	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL
Total Metals (mg/L)																
Aluminum	NS		NS		NS		**0.24 K**	0.087	NS		<0.03 UK	0.087	NS		**1.67 K**	0.087
Barium	NS		NS		NS		NS		NS		NS		NS		NS	
Beryllium	NS		NS		NS		NS		NS		NS		NS		NS	
Cobalt	NS		NS		NS		NS		NS		NS		NS		NS	
Iron	NS		NS		NS		NS		NS		NS		NS		NS	
Selenium	NS		**0.005 J**	0.005	NS		**0.004 J**	0.005	NS		**0.001 J**	0.005	NS		**0.004 J**	0.005
Silver	NS		NS		NS		NS		NS		NS		NS		NS	
Thallium	NS		NS		NS		NS		NS		NS		NS		NS	
Dissolved Metals (mg/L)																
Aluminum, dissolved	**0.05 JK {J+}**	0.087	NS		NS		NS		NS		NS		NS		NS	
Barium, dissolved	**0.063 K**	0.003	NS		NS		NS		NS		NS		NS		NS	
Beryllium, dissolved	<0.002 UK	0.0006	NS		NS		NS		NS		NS		NS		NS	
Cobalt, dissolved	<0.01 UK	0.003	NS		NS		NS		NS		NS		NS		NS	
Iron, dissolved	<0.02 UK	0.158	NS		NS		NS		NS		NS		NS		NS	
Selenium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Silver, dissolved	<0.01 UK	0.00036	NS		NS		NS		NS		NS		NS		NS	
Thallium, dissolved	<0.0001 UK	0.00003	NS		NS		NS		NS		NS		NS		NS	

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BLACKFOOT RIVER - SUMMARY OF SURFACE WATER EXCEEDANCES
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Location:	MST023		MST023		MST023		MST023		MST023		MST023		MST023		MST023	
Location Type:	Stream		Stream		Stream		Stream		Stream		Stream		Stream		Stream	
Sample ID:	051408SWMST023-2-F		051408SWMST023-2-U		051408SWMST023-3-F		051408SWMST023-3-U		051408SWMST023-avg-F		051408SWMST023-avg-U		091608SWMST023-0-F		091608SWMST023-0-U	
Collection Date:	5/14/2008		5/14/2008		5/14/2008		5/14/2008		5/14/2008		5/14/2008		9/16/2008		9/16/2008	
Sample Type:	Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water	
	Triplicate		Triplicate		Triplicate		Triplicate		Averaged		Averaged		Primary		Primary	
	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL
Total Metals (mg/L)																
Aluminum	NS		**1.42 K**	0.087	NS		**1.52 K**	0.087	NS		**1.54 K**	0.087	NS		NS	
Barium	NS		NS		NS		NS		NS		NS		NS		NS	
Beryllium	NS		NS		NS		NS		NS		NS		NS		NS	
Cobalt	NS		NS		NS		NS		NS		NS		NS		NS	
Iron	NS		NS		NS		NS		NS		NS		NS		NS	
Selenium	NS		**0.005 J**	0.005	NS		**0.004 J**	0.005	NS		**0.00433 J**	0.005	NS		**0.00194**	0.005
Silver	NS		NS		NS		NS		NS		NS		NS		NS	
Thallium	NS		NS		NS		NS		NS		NS		NS		NS	
Dissolved Metals (mg/L)																
Aluminum, dissolved	NS		NS		NS		NS		NS		NS		<0.0500	0.087	NS	
Barium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Beryllium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Cobalt, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Iron, dissolved	NS		NS		NS		NS		NS		NS		<0.0250	0.158	NS	
Selenium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Silver, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Thallium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	

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BLACKFOOT RIVER - SUMMARY OF SURFACE WATER EXCEEDANCES
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Location:	MST024		MST024		MST025		MST025		MST026		MST026		MST026		MST026	
Location Type:	Stream		Stream		Stream		Stream		Stream		Stream		Stream		Stream	
Sample ID:	051904SWMST024-0-F		051904SWMST024-0-U		051904SWMST025-0-F		051904SWMST025-0-U		051704SWMST026-0-F		051704SWMST026-0-U		051407SWMST026-1-F		051407SWMST026-1-U	
Collection Date:	5/19/2004		5/19/2004		5/19/2004		5/19/2004		5/17/2004		5/17/2004		5/14/2007		5/14/2007	
Sample Type:	Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water	
	Primary		Primary		Primary		Primary		Primary		Primary		Triplicate		Triplicate	
	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL
Total Metals (mg/L)																
Aluminum	NS		NS		NS		NS		NS		NS		NS		<0.18 UK	0.087
Barium	NS		NS		NS		NS		NS		NS		NS		NS	
Beryllium	NS		NS		NS		NS		NS		NS		NS		NS	
Cobalt	NS		NS		NS		NS		NS		NS		NS		NS	
Iron	NS		NS		NS		NS		NS		NS		NS		NS	
Selenium	NS		**0.003 J**	0.005	NS		**0.002 J**	0.005	NS		**0.007**	0.005	NS		**0.004 J**	0.005
Silver	NS		NS		NS		NS		NS		NS		NS		NS	
Thallium	NS		NS		NS		NS		NS		NS		NS		NS	
Dissolved Metals (mg/L)																
Aluminum, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Barium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Beryllium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Cobalt, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Iron, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Selenium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Silver, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Thallium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	

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BLACKFOOT RIVER - SUMMARY OF SURFACE WATER EXCEEDANCES
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Location:	MST026		MST026		MST026		MST026		MST026		MST026		MST026		MST026	
Location Type:	Stream		Stream		Stream		Stream		Stream		Stream		Stream		Stream	
Sample ID:	051407SWMST026-2-F		051407SWMST026-2-U		051407SWMST026-3-F		051407SWMST026-3-U		051407SWMST026-avg-F		051407SWMST026-avg-U		091007SWMST026-1-F		091007SWMST026-1-U	
Collection Date:	5/14/2007		5/14/2007		5/14/2007		5/14/2007		5/14/2007		5/14/2007		9/10/2007		9/10/2007	
Sample Type:	Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water	
	Triplicate		Triplicate		Triplicate		Triplicate		Averaged		Averaged		Triplicate		Triplicate	
	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL
Total Metals (mg/L)																
Aluminum	NS		<0.17 UK	0.087	NS		<0.19 UK	0.087	NS		<0.03 UK	0.087	NS		<0.03 UK	0.087
Barium	NS		NS		NS		NS		NS		NS		NS		NS	
Beryllium	NS		NS		NS		NS		NS		NS		NS		NS	
Cobalt	NS		NS		NS		NS		NS		NS		NS		NS	
Iron	NS		NS		NS		NS		NS		NS		NS		NS	
Selenium	NS		**0.004 J**	0.005	NS		**0.004 J**	0.005	NS		**0.004 J**	0.005	NS		<0.001	0.005
Silver	NS		NS		NS		NS		NS		NS		NS		NS	
Thallium	NS		NS		NS		NS		NS		NS		NS		NS	
Dissolved Metals (mg/L)																
Aluminum, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Barium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Beryllium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Cobalt, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Iron, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Selenium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Silver, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Thallium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	

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BLACKFOOT RIVER - SUMMARY OF SURFACE WATER EXCEEDANCES
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Location:	MST026		MST026		MST026		MST026		MST026		MST026		MST026		MST026	
Location Type:	Stream		Stream		Stream		Stream		Stream		Stream		Stream		Stream	
Sample ID:	091007SWMST026-2-F		091007SWMST026-2-U		091007SWMST026-3-F		091007SWMST026-3-U		091007SWMST026-avg-F		091007SWMST026-avg-U		051408SWMST026-1-F		051408SWMST026-1-U	
Collection Date:	9/10/2007		9/10/2007		9/10/2007		9/10/2007		9/10/2007		9/10/2007		5/14/2008		5/14/2008	
Sample Type:	Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water	
	Triplicate		Triplicate		Triplicate		Triplicate		Averaged		Averaged		Triplicate		Triplicate	
	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL
Total Metals (mg/L)																
Aluminum	NS		**0.03 JK {J+}**	0.087	NS		<0.03 UK	0.087	NS		**0.03 JK**	0.087	NS		**1.63 K**	0.087
Barium	NS		NS		NS		NS		NS		NS		NS		NS	
Beryllium	NS		NS		NS		NS		NS		NS		NS		NS	
Cobalt	NS		NS		NS		NS		NS		NS		NS		NS	
Iron	NS		NS		NS		NS		NS		NS		NS		NS	
Selenium	NS		<0.001	0.005	NS		<0.001	0.005	NS		<0.001	0.005	NS		**0.004 J**	0.005
Silver	NS		NS		NS		NS		NS		NS		NS		NS	
Thallium	NS		NS		NS		NS		NS		NS		NS		NS	
Dissolved Metals (mg/L)																
Aluminum, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Barium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Beryllium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Cobalt, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Iron, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Selenium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Silver, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Thallium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	

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BLACKFOOT RIVER - SUMMARY OF SURFACE WATER EXCEEDANCES
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Location:	MST026		MST026		MST026		MST026		MST026		MST026		MST026		MST026	
Location Type:	Stream		Stream		Stream		Stream		Stream		Stream		Stream		Stream	
Sample ID:	051408SWMST026-2-F		051408SWMST026-2-U		051408SWMST026-3-F		051408SWMST026-3-U		051408SWMST026-avg-F		051408SWMST026-avg-U		091508SWMST026-0-F		091508SWMST026-0-U	
Collection Date:	5/14/2008		5/14/2008		5/14/2008		5/14/2008		5/14/2008		5/14/2008		9/15/2008		9/15/2008	
Sample Type:	Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water	
	Triplicate		Triplicate		Triplicate		Triplicate		Averaged		Averaged		Primary		Primary	
	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL
Total Metals (mg/L)																
Aluminum	NS		**1.77 K**	0.087	NS		**1.82 K**	0.087	NS		**1.74 K**	0.087	NS		NS	
Barium	NS		NS		NS		NS		NS		NS		NS		NS	
Beryllium	NS		NS		NS		NS		NS		NS		NS		NS	
Cobalt	NS		NS		NS		NS		NS		NS		NS		NS	
Iron	NS		NS		NS		NS		NS		NS		NS		NS	
Selenium	NS		**0.004 J**	0.005	NS		**0.004 J**	0.005	NS		**0.004 J**	0.005	NS		**0.00155**	0.005
Silver	NS		NS		NS		NS		NS		NS		NS		NS	
Thallium	NS		NS		NS		NS		NS		NS		NS		NS	
Dissolved Metals (mg/L)																
Aluminum, dissolved	NS		NS		NS		NS		NS		NS		<0.0500	0.087	NS	
Barium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Beryllium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Cobalt, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Iron, dissolved	NS		NS		NS		NS		NS		NS		<0.0250	0.158	NS	
Selenium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Silver, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Thallium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	

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BLACKFOOT RIVER - SUMMARY OF SURFACE WATER EXCEEDANCES
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Location:	MST027		MST027		MST027		MST027		MST027		MST027		MST027		MST027	
Location Type:	Stream		Stream		Stream		Stream		Stream		Stream		Stream		Stream	
Sample ID:	051404SWMST027-0-F		051404SWMST027-0-U		051106SWMST027-0-F		051106SWMST027-0-U		050607SWMST027-0-F		050607SWMST027-0-U		090907SWMST027-0-F		090907SWMST027-0-U	
Collection Date:	5/14/2004		5/14/2004		5/11/2006		5/11/2006		5/6/2007		5/6/2007		9/9/2007		9/9/2007	
Sample Type:	Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water	
	Primary		Primary		Primary		Primary		Primary		Primary		Primary		Primary	
	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL
Total Metals (mg/L)																
Aluminum	NS		NS		NS		NS		NS		**0.6 K**	0.087	NS		<0.03 UK	0.087
Barium	NS		NS		NS		NS		NS		NS		NS		NS	
Beryllium	NS		NS		NS		NS		NS		NS		NS		NS	
Cobalt	NS		NS		NS		NS		NS		NS		NS		NS	
Iron	NS		NS		NS		NS		NS		NS		NS		NS	
Selenium	NS		**0.008**	0.005	NS		**0.005 J-**	0.005	NS		**0.009**	0.005	NS		<0.001	0.005
Silver	NS		NS		NS		NS		NS		NS		NS		NS	
Thallium	NS		NS		NS		NS		NS		NS		NS		NS	
Dissolved Metals (mg/L)																
Aluminum, dissolved	NS		NS		<0.03 UK	0.087	NS		NS		NS		NS		NS	
Barium, dissolved	NS		NS		**0.064 K**	0.003	NS		NS		NS		NS		NS	
Beryllium, dissolved	NS		NS		<0.002 UK	0.0006	NS		NS		NS		NS		NS	
Cobalt, dissolved	NS		NS		<0.01 UK	0.003	NS		NS		NS		NS		NS	
Iron, dissolved	NS		NS		<0.02 UK	0.158	NS		NS		NS		NS		NS	
Selenium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Silver, dissolved	NS		NS		<0.01 UK	0.00036	NS		NS		NS		NS		NS	
Thallium, dissolved	NS		NS		<0.0001 UK	0.00003	NS		NS		NS		NS		NS	

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BLACKFOOT RIVER - SUMMARY OF SURFACE WATER EXCEEDANCES
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Location:	MST027		MST027		MST027		MST027		MST230		MST230		MST230		MST230	
Location Type:	Stream		Stream		Stream		Stream		Stream		Stream		Stream		Stream	
Sample ID:	051408SWMST027-0-F		051408SWMST027-0-U		091608SWMST027-0-F		091608SWMST027-0-U		052004SWMST230-1-F		052004SWMST230-1-U		052004SWMST230-2-F		052004SWMST230-2-U	
Collection Date:	5/14/2008		5/14/2008		9/16/2008		9/16/2008		5/20/2004		5/20/2004		5/20/2004		5/20/2004	
Sample Type:	Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water	
	Primary		Primary		Primary		Primary		Triplicate		Triplicate		Triplicate		Triplicate	
	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL
Total Metals (mg/L)																
Aluminum	NS		**1.4 J+K**	0.087	NS		NS		NS		NS		NS		NS	
Barium	NS		NS		NS		NS		NS		NS		NS		NS	
Beryllium	NS		NS		NS		NS		NS		NS		NS		NS	
Cobalt	NS		NS		NS		NS		NS		NS		NS		NS	
Iron	NS		NS		NS		NS		NS		NS		NS		NS	
Selenium	NS		**0.004 J**	0.005	NS		**0.00126**	0.005	NS		**0.003 J**	0.005	NS		**0.003 J**	0.005
Silver	NS		NS		NS		NS		NS		NS		NS		NS	
Thallium	NS		NS		NS		NS		NS		NS		NS		NS	
Dissolved Metals (mg/L)																
Aluminum, dissolved	NS		NS		<0.0500	0.087	NS		NS		NS		NS		NS	
Barium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Beryllium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Cobalt, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Iron, dissolved	NS		NS		<0.0250	0.158	NS		NS		NS		NS		NS	
Selenium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Silver, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Thallium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	

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BLACKFOOT RIVER - SUMMARY OF SURFACE WATER EXCEEDANCES
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Location:	MST230		MST230		MST230		MST230		MST231		MST231		MST231		MST231	
Location Type:	Stream		Stream		Stream		Stream		Stream		Stream		Stream		Stream	
Sample ID:	052004SWMST230-3-F		052004SWMST230-3-U		052004SWMST230-avg-F		052004SWMST230-avg-U		052104SWMST231-1-F		052104SWMST231-1-U		052104SWMST231-2-F		052104SWMST231-2-U	
Collection Date:	5/20/2004		5/20/2004		5/20/2004		5/20/2004		5/21/2004		5/21/2004		5/21/2004		5/21/2004	
Sample Type:	Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water	
	Triplicate		Triplicate		Averaged		Averaged		Triplicate		Triplicate		Triplicate		Triplicate	
	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL
Total Metals (mg/L)																
Aluminum	NS		NS		NS		NS		NS		NS		NS		NS	
Barium	NS		NS		NS		NS		NS		NS		NS		NS	
Beryllium	NS		NS		NS		NS		NS		NS		NS		NS	
Cobalt	NS		NS		NS		NS		NS		NS		NS		NS	
Iron	NS		NS		NS		NS		NS		NS		NS		NS	
Selenium	NS		**0.002 J**	0.005	NS		**0.00267 J**	0.005	NS		**0.002 J**	0.005	NS		**0.002 J**	0.005
Silver	NS		NS		NS		NS		NS		NS		NS		NS	
Thallium	NS		NS		NS		NS		NS		NS		NS		NS	
Dissolved Metals (mg/L)																
Aluminum, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Barium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Beryllium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Cobalt, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Iron, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Selenium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Silver, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Thallium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	

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BLACKFOOT RIVER - SUMMARY OF SURFACE WATER EXCEEDANCES
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Location:	MST231		MST231		MST231		MST231		MST231		MST231		MST232		MST232	
Location Type:	Stream		Stream		Stream		Stream		Stream		Stream		Stream		Stream	
Sample ID:	052104SWMST231-3-F		052104SWMST231-3-U		052104SWMST231-avg-F		052104SWMST231-avg-U		050706SWMST231-0-F		050706SWMST231-0-U		052104SWMST232-0-F		052104SWMST232-0-U	
Collection Date:	5/21/2004		5/21/2004		5/21/2004		5/21/2004		5/7/2006		5/7/2006		5/21/2004		5/21/2004	
Sample Type:	Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water	
	Triplicate		Triplicate		Averaged		Averaged		Primary		Primary		Primary		Primary	
	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL
Total Metals (mg/L)																
Aluminum	NS		NS		NS		NS		NS		NS		NS		NS	
Barium	NS		NS		NS		NS		NS		NS		NS		NS	
Beryllium	NS		NS		NS		NS		NS		NS		NS		NS	
Cobalt	NS		NS		NS		NS		NS		NS		NS		NS	
Iron	NS		NS		NS		NS		NS		NS		NS		NS	
Selenium	NS		**0.002 J**	0.005	NS		**0.002 J**	0.005	NS		**0.008**	0.005	NS		**0.002 J**	0.005
Silver	NS		NS		NS		NS		NS		NS		NS		NS	
Thallium	NS		NS		NS		NS		NS		NS		NS		NS	
Dissolved Metals (mg/L)																
Aluminum, dissolved	NS		NS		NS		NS		<0.03 UK	0.087	NS		NS		NS	
Barium, dissolved	NS		NS		NS		NS		**0.063 K**	0.003	NS		NS		NS	
Beryllium, dissolved	NS		NS		NS		NS		<0.002 UK	0.0006	NS		NS		NS	
Cobalt, dissolved	NS		NS		NS		NS		<0.01 UK	0.003	NS		NS		NS	
Iron, dissolved	NS		NS		NS		NS		<0.02 UK	0.158	NS		NS		NS	
Selenium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Silver, dissolved	NS		NS		NS		NS		<0.01 UJK	0.00036	NS		NS		NS	
Thallium, dissolved	NS		NS		NS		NS		<0.0001 UK	0.00003	NS		NS		NS	

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BLACKFOOT RIVER - SUMMARY OF SURFACE WATER EXCEEDANCES
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Location:	MST232		MST232		MST232		MST232		MST232		MST232		MST232		MST232	
Location Type:	Stream		Stream		Stream		Stream		Stream		Stream		Stream		Stream	
Sample ID:	050706SWMST232-1-F		050706SWMST232-1-U		050706SWMST232-2-F		050706SWMST232-2-U		050706SWMST232-3-F		050706SWMST232-3-U		050706SWMST232-avg-F		050706SWMST232-avg-U	
Collection Date:	5/7/2006		5/7/2006		5/7/2006		5/7/2006		5/7/2006		5/7/2006		5/7/2006		5/7/2006	
Sample Type:	Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water	
	Triplicate		Triplicate		Triplicate		Triplicate		Triplicate		Triplicate		Averaged		Averaged	
	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL
Total Metals (mg/L)																
Aluminum	NS		NS		NS		NS		NS		NS		NS		NS	
Barium	NS		NS		NS		NS		NS		NS		NS		NS	
Beryllium	NS		NS		NS		NS		NS		NS		NS		NS	
Cobalt	NS		NS		NS		NS		NS		NS		NS		NS	
Iron	NS		NS		NS		NS		NS		NS		NS		NS	
Selenium	NS		**0.007**	0.005	NS		**0.007**	0.005	NS		**0.008**	0.005	NS		**0.00733**	0.005
Silver	NS		NS		NS		NS		NS		NS		NS		NS	
Thallium	NS		NS		NS		NS		NS		NS		NS		NS	
Dissolved Metals (mg/L)																
Aluminum, dissolved	<0.03 UK	0.087	NS		<0.03 UK	0.087	NS		<0.03 UK	0.087	NS		<0.03 UK	0.087	NS	
Barium, dissolved	**0.064 K**	0.003	NS		**0.063 K**	0.003	NS		**0.063 K**	0.003	NS		**0.0633 K**	0.003	NS	
Beryllium, dissolved	<0.002 UK	0.0006	NS		<0.002 UK	0.0006	NS		<0.002 UK	0.0006	NS		<0.002 UK	0.0006	NS	
Cobalt, dissolved	<0.01 UK	0.003	NS		<0.01 UK	0.003	NS		<0.01 UK	0.003	NS		<0.01 UK	0.003	NS	
Iron, dissolved	<0.02 UK	0.158	NS		<0.02 UK	0.158	NS		<0.02 UK	0.158	NS		<0.02 UK	0.158	NS	
Selenium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Silver, dissolved	<0.01 UJK	0.00036	NS		<0.01 UJK	0.00036	NS		<0.01 UJK	0.00036	NS		<0.01 UJK	0.00036	NS	
Thallium, dissolved	<0.0001 UK	0.00003	NS		<0.0001 UK	0.00003	NS		<0.0001 UK	0.00003	NS		<0.0001 UK	0.00003	NS	

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BLACKFOOT RIVER - SUMMARY OF SURFACE WATER EXCEEDANCES
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Location:	MST232		MST232		MST232		MST232		MST232		MST232		MST232		MST232	
Location Type:	Stream		Stream		Stream		Stream		Stream		Stream		Stream		Stream	
Sample ID:	051407SWMST232-1-F		051407SWMST232-1-U		051407SWMST232-2-F		051407SWMST232-2-U		051407SWMST232-3-F		051407SWMST232-3-U		051407SWMST232-avg-F		051407SWMST232-avg-U	
Collection Date:	5/14/2007		5/14/2007		5/14/2007		5/14/2007		5/14/2007		5/14/2007		5/14/2007		5/14/2007	
Sample Type:	Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water	
	Triplicate		Triplicate		Triplicate		Triplicate		Triplicate		Triplicate		Averaged		Averaged	
	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL
Total Metals (mg/L)																
Aluminum	NS		**0.25 K**	0.087	NS		**0.24 K**	0.087	NS		**0.26 K**	0.087	NS		**0.25 K**	0.087
Barium	NS		NS		NS		NS		NS		NS		NS		NS	
Beryllium	NS		NS		NS		NS		NS		NS		NS		NS	
Cobalt	NS		NS		NS		NS		NS		NS		NS		NS	
Iron	NS		NS		NS		NS		NS		NS		NS		NS	
Selenium	NS		**0.003 J**	0.005	NS		**0.003 J**	0.005	NS		**0.004 J**	0.005	NS		**0.00333 J**	0.005
Silver	NS		NS		NS		NS		NS		NS		NS		NS	
Thallium	NS		NS		NS		NS		NS		NS		NS		NS	
Dissolved Metals (mg/L)																
Aluminum, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Barium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Beryllium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Cobalt, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Iron, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Selenium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Silver, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Thallium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	

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BLACKFOOT RIVER - SUMMARY OF SURFACE WATER EXCEEDANCES
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Location:	MST232		MST232		MST232		MST232		MST232		MST232		MST232		MST232	
Location Type:	Stream		Stream		Stream		Stream		Stream		Stream		Stream		Stream	
Sample ID:	090807SWMST232-0-F		090807SWMST232-0-U		051308SWMST232-1-F		051308SWMST232-1-U		051308SWMST232-2-F		051308SWMST232-2-U		051308SWMST232-3-F		051308SWMST232-3-U	
Collection Date:	9/8/2007		9/8/2007		5/13/2008		5/13/2008		5/13/2008		5/13/2008		5/13/2008		5/13/2008	
Sample Type:	Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water		Surface Water	
	Primary		Primary		Triplicate		Triplicate		Triplicate		Triplicate		Triplicate		Triplicate	
	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL	Result	SL
Total Metals (mg/L)																
Aluminum	NS		**0.12 JK**	0.087	NS		**1.5 K**	0.087	NS		**1.62 J+K**	0.087	NS		**1.24 K**	0.087
Barium	NS		NS		NS		NS		NS		NS		NS		NS	
Beryllium	NS		NS		NS		NS		NS		NS		NS		NS	
Cobalt	NS		NS		NS		NS		NS		NS		NS		NS	
Iron	NS		NS		NS		NS		NS		NS		NS		NS	
Selenium	NS		<0.001	0.005	NS		**0.004 J**	0.005	NS		**0.004 J**	0.005	NS		**0.004 J**	0.005
Silver	NS		NS		NS		NS		NS		NS		NS		NS	
Thallium	NS		NS		NS		NS		NS		NS		NS		NS	
Dissolved Metals (mg/L)																
Aluminum, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Barium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Beryllium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Cobalt, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Iron, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Selenium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Silver, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	
Thallium, dissolved	NS		NS		NS		NS		NS		NS		NS		NS	

TABLE 3-54

BLACKFOOT RIVER - SUMMARY OF SURFACE WATER EXCEEDANCES
(Page 24 of 25)

Location:	MST232		MST232		MST232		MST232	
Location Type:	Stream		Stream		Stream		Stream	
Sample ID:	051308SWMST232-avg-F		051308SWMST232-avg-U		091508SWMST232-0-F		091508SWMST232-0-U	
Collection Date:	5/13/2008		5/13/2008		9/15/2008		9/15/2008	
Sample Type:	Surface Water		Surface Water		Surface Water		Surface Water	
	Averaged		Averaged		Primary		Primary	
	Result	SL	Result	SL	Result	SL	Result	SL
Total Metals (mg/L)								
Aluminum	NS		**1.45 J+K**	0.087	NS		NS	
Barium	NS		NS		NS		NS	
Beryllium	NS		NS		NS		NS	
Cobalt	NS		NS		NS		NS	
Iron	NS		NS		NS		NS	
Selenium	NS		**0.004 J**	0.005	NS		**0.00127 J+**	0.005
Silver	NS		NS		NS		NS	
Thallium	NS		NS		NS		NS	
Dissolved Metals (mg/L)								
Aluminum, dissolved	NS		NS		<0.0500	0.087	NS	
Barium, dissolved	NS		NS		NS		NS	
Beryllium, dissolved	NS		NS		NS		NS	
Cobalt, dissolved	NS		NS		NS		NS	
Iron, dissolved	NS		NS		<0.0250	0.158	NS	
Selenium, dissolved	NS		NS		NS		NS	
Silver, dissolved	NS		NS		NS		NS	
Thallium, dissolved	NS		NS		NS		NS	

TABLE 3-54

BLACKFOOT RIVER - SUMMARY OF SURFACE WATER EXCEEDANCES
(Page 25 of 25)

Notes:
NS - not sampled
SL - screening level
F - filtered
U - unfiltered
Avg - average

Result is greater than screening value
Method detection limit for non-detected value is greater than the screening value

FLAG DEFINITION:

U	The analyte was analyzed for, but was not detected above the level of the reported sample quantitation limit.
J	The result is an estimated quantity. The associated numerical value is the approximated concentration of the analyte in the sample.
J+	The result is an estimated quantity, but the result may be biased high.
J-	The result is an estimated quantity, but the result may be biased low.
J+/B	Result is estimated and biased high; associated field blank contained target analyte.
R	The result is unusable. The sample result is rejected due to serious deficiencies in meeting quality control criteria. The analyte may or may not be present in the sample.
UJ	The analyte was analyzed for, but was not detected. The reported quantitation limit is approximate and may be inaccurate or imprecise.
K	Serial dilutions not performed for samples analyzed by this method (EPA 200.7; 200.8).

SOURCES FOR SCREENING VALUES (SEE ALSO TABLE 3

Surface Water	Unless identified otherwise below, screening levels are the chronic freshwater screening value in NOAA SQuiRT (Buchman, 2008).
	Screening levels for aluminum is the Freshwater Standards for Chronic Criteria (CCC) from the National Recommended Water Quality Criteria (USEPA, 2009).
	Screening values for arsenic, cadmium, chromium, copper, lead, nickel, selenium, and zinc are the CCCs from the State of Idaho Surface Water Quality for Aquatic Life (IDAPA 58.01.02); those for cadmium, chromium, copper, lead, nickel, and zinc are expressed as a function of total hardness. Screening levels for cadmium and selenium are expressed as total recoverable (unfiltered concentration).
	The screening level for iron is the Lowest Chronic Value (LCV) observed for fresh water daphnids (source: ORNL, 1996).
	The screening levels for manganese, uranium, and vanadium are the Tier II Secondary Chronic Values (source: ORNL, 1996).

TRIPLICATE RESULT

"Primary" indicates locations where only one sample was collected from a given location. "Triplicate" indicates locations where a total of three samples were collected from a given location for the purpose of quality assurance.
The average value for triplicate samples is calculated as follows: (a) the mean of three detected values, (b) the mean of two detected values if result of one triplicate is not detected, (c) the detected value if results of two triplicates are not detected, or (d) less than the highest method detection limit if all triplicate results are not detected.

TABLE 3-55

BLACKFOOT RIVER - SUMMARY OF SEDIMENT EXCEEDANCES
(Page 1 of 2)

					Analyte (mg/Kg, dry weight)					
Location	Location Type	Sample Identification	Collection Date	Sample Type	Cadmium	Chromium	Nickel	Selenium	Vanadium	Zinc
				Screening Level:	0.583	36.286	18	4	57	98
MRV011	Reservoir Delta	052104SEMRV011-0	5/21/2004	Primary	1.18	20.6	11.6 J	1 J	20.9	46
MST019	Stream	052004SEMST019-0	5/20/2004	Primary	1.24	20	7.7	0.7 J	17.1 J	31 J
MST020	Stream	052004SEMST020-0	5/20/2004	Primary	1.48	30.7	13.3 J	<0.5	30.1 J	45 J
MST021	Stream	052004SEMST021-1-QA1	5/20/2004	Triplicate	1.54	26.5	7.3	0.5 J	20 J	30 J
MST021	Stream	052004SEMST021-1-QA2	5/20/2004	Triplicate	1.23	32.1	8.7	<0.5	20.9 J	29 J
MST021	Stream	052004SEMST021-1-QA3	5/20/2004	Triplicate	1.61	29.3	8.3	<0.5	18.3 J	30 J
MST021	Stream	052004SEMST021-1-QA-avg	5/20/2004	Averaged	1.46	29.3	8.1	0.5 J	19.7 J	J
MST022	Stream	051904SEMST022-0	5/19/2004	Primary	1.38	25.4	7.3	0.5 J	18.7 J	26 J
MST023	Stream	051904SEMST023-0	5/19/2004	Primary	1.81	30.2	6.8	1 J	21.7 J	26 J
MST024	Stream	051904SEMST024-0	5/19/2004	Primary	1.49	24.6	8.7	0.8 J	22.5 J	34 J
MST025	Stream	051904SEMST025-0	5/19/2004	Primary	0.55	12.4	6.4	1.5 J	13.3 J	30 J
MST026	Stream	051704SEMST026-0	5/17/2004	Primary	0.56 J-	13.2	7.6 J	2.3 J	14.4	33 J
MST027	Stream	051404SEMST027-0	5/14/2004	Primary	0.58 J-	14	7.8 J	1.3 J	15.2	32 J
MST230	Stream	052004SEMST230-1-QA1	5/20/2004	Triplicate	3.65	40.8 J	9	0.7 J	35.1	40
MST230	Stream	052004SEMST230-1-QA2	5/20/2004	Triplicate	2.57	35.9 J	9.1	0.8 J	23.8	34
MST230	Stream	052004SEMST230-1-QA3	5/20/2004	Triplicate	2.52	33.1 J	9.5	1 J	23.4	33
MST230	Stream	052004SEMST230-1-QA-avg	5/20/2004	Averaged	2.91	36.6 J	9.2	0.833 J	27.4	35.7
MST231	Stream	052104SEMST231-QA1	5/21/2004	Triplicate	0.67	9.68	6.5 J	<0.5	9.51	24
MST231	Stream	052104SEMST231-QA2	5/21/2004	Triplicate	0.7	10.1	6.9 J	<0.5	9.87	24
MST231	Stream	052104SEMST231-QA3	5/21/2004	Triplicate	0.7	9.97	6.7 J	<0.5	9.68	23
MST231	Stream	052104SEMST231-QA-avg	5/21/2004	Averaged	0.69	9.92	6.7 J	<0.5	9.69	23.7
MST232	Stream	052104SEMST232-0	5/21/2004	Primary	1.09	16	10.2 J	1.2 J	16.3	40

TABLE 3-55

BLACKFOOT RIVER - SUMMARY OF SEDIMENT EXCEEDANCES
(Page 2 of 2)

Notes:

Result is greater than screening value

FLAG DEFINITION:

U	The analyte was analyzed for, but was not detected above the level of the reported sample quantitation limit.
J	The result is an estimated quantity. The associated numerical value is the approximated concentration of the analyte in the sample.
J+	The result is an estimated quantity, but the result may be biased high.
J-	The result is an estimated quantity, but the result may be biased low.
J+/B	Result is estimated and biased high; associated field blank contained target analyte.
R	The result is unusable. The sample result is rejected due to serious deficiencies in meeting quality control criteria. The analyte may or may not be present in the sample.
UJ	The analyte was analyzed for, but was not detected. The reported quantitation limit is approximate and may be inaccurate or imprecise.

SOURCES FOR SCREENING VALUES (SEE ALSO TABLE 3

Sediment	Screening levels for aluminum, cadmium, chromium, and zinc are the ARCS threshold effects levels (TELs) for freshwater sediment in NOAA SQuiRT (Buchman, 2008).
	Screening level for antimony is from Buchman, M. 1999. NOAA HAZMAT Report 99-1.
	Screening levels for arsenic, copper, lead, mercury, and nickel are the TEL for freshwater sediment in NOAA SQuiRT (Buchman, 2008).
	Screening levels for cobalt, iron, manganese, and silver are from Guidelines for the Protection and Management of Aquatic Sediment Quality in Ontario, August 1993.
	Screening level for selenium is from Van Derveer and Canton (1997).
	Screening level for vanadium is from the marine sediment AET (Buchman, 2008).

TRIPLICATE RESULT

"Primary" indicates locations where only one sample was collected from a given location. "Triplicate" indicates locations where a total of three samples were collected from a given location for the purpose of quality assurance.

The average value for triplicate samples is calculated as follows: (a) the mean of three detected values, (b) the mean of two detected values if result of one triplicate is not detected, (c) the detected value if results of two triplicates are not detected, or (d) less than the highest method detection limit if all triplicate results are not detected.

TABLE 3-56
BLACKFOOT RIVER
STREAM HABITAT ASSESSMENT DATA MATRIX

Station	May 2004 [Se]sw, mg/L	May 2004 [Se]sed, mg/kg dw	RBS (Habitat Score)	Fish Presence
MST019	0.0030	0.70	144	X
MST020	0.0020	0.25	112	X
MST021	0.0023	0.25	69	X
MST022	0.0030	0.50	113	X
MST023	0.00050	1.0	145	X
MST024	0.0030	0.80	101	X
MST025	0.0020	1.5	139	X
MST026	0.0070	2.3	129	X
MST027	0.0080	1.3	107	X
MST028*	0.0050	0.90	94	X
MST029*	0.00050	0.25	107	X
MST229*	0.0050	2.7	107	X
MST230	0.0027	0.83	116	X
MST231	0.0020	0.25	88	X
MST232	0.0020	1.2	115	X

Notes:
Non-detected concentrations have been censored at one-half the MDL.
The MDL for surface water was 0.0010 mg/L and for sediment was 0.50 mg/kg dw.
* - Mine-specific background station
[Se]sw, mg/L – concentration of selenium in surface reported in mg/L
[Se]sed, mg/kg dw – concentration of selenium in sediment, reported in mg/kg on a dw basis

TABLE 3-57
BLACKFOOT RIVER
HISTORICAL SALMONID SELENIUM CONCENTRATIONS (mg/kg dw)

Blackfoot River Station	Station ID	Sept 1999	Flag	May 2000	Flag	May 2004	Flag
Blackfoot River, below Ballard Creek	MST019	0.87		8.6		-	
Blackfoot River, below Trail Creek	MST021	3.6		5.3		-	
Blackfoot River, below Dry Valley Creek	MST023	1.2		5.2		6.0	
Blackfoot River, above Wooley Range Ridge Creek	MST026	6.1		9.7		-	
Blackfoot River, below Angus Creek	MST027	-		-		6.1	
Blackfoot River, above Spring Creek	MST029*	4.3		6.2		-	
Blackfoot River, below Spring Creek	MST229*	3.3		4.9		-	
Blackfoot River, above Blackfoot Reservoir	MST232	4.2		4.8		-	

Notes:
* - Mine-specific background station

TABLE 3-58 BLACKFOOT RIVER HISTORICAL FORAGE FISH SELENIUM CONCENTRATIONS (mg/kg dw)							
Blackfoot River Station	**Station ID**	**Sept 1999**	**Flag**	**May 2000**	**Flag**	**May 2004**	**Flag**
Reservoir Delta at Blackfoot River	MRV011	-		-		4.1	
Blackfoot River, below Ballard Creek	MST019	10		7.1		8.8	
Blackfoot River, below State Land Creek	MST020	-		-		11	
Blackfoot River, below Trail Creek	MST021	8.1		11		9.6	
Blackfoot River, below Wooley Valley Creek	MST022	-		-		12	
Blackfoot River, below Dry Valley Creek	MST023	6.9		10		11	
Blackfoot River, above Dry Valley Creek	MST024	-		-		14	
Blackfoot River, below Wooley Range Ridge Creek	MST025	-		-		12	
Blackfoot River, above Wooley Range Ridge Creek	MST026	7.5		9.5		1.8	
Blackfoot River, below Angus Creek	MST027	-		-		9.1	
Blackfoot River, above Diamond Creek Rd.	MST028*	-		-		6.6	
Blackfoot River, above Spring Creek	MST029*	-		7.3		12	
Blackfoot River, below Spring Creek	MST229*	4.7		4.7		15	
Blackfoot River, above State Land Creek	MST230	-		-		9.0	
Blackfoot River, below Woodall Mountain Creek	MST231	-		-		9.5	
Blackfoot River, above Blackfoot Reservoir	MST232	5.9		4.1		9.6	
Notes: * - Mine-specific background station							

TABLE 3-59
BLACKFOOT RIVER
HISTORICAL BENTHIC MACROINVERTEBRATE SELENIUM CONCENTRATIONS (mg/kg dw)

Blackfoot River Station	Station ID	Sept 1999	Flag	May 2000	Flag	June 2004	Flag
Reservoir Delta at Blackfoot River	MRV011	10		-		42	UJ
Blackfoot River, below Ballard Creek	MST019	4.7		12		7.1	J
Blackfoot River, below State Land Creek	MST020	-		-		7.5	UJ
Blackfoot River, below Trail Creek	MST021	1.9		4.2		10	J
Blackfoot River, below Wooley Valley Creek	MST022	-		-		4.2	J
Blackfoot River, below Dry Valley Creek	MST023	5.8		4.7		9.6	J
Blackfoot River, above Dry Valley Creek	MST024	-		-		10	J
Blackfoot River, below Wooley Range Ridge Creek	MST025	-		-		7.9	UJ
Blackfoot River, above Wooley Range Ridge Creek	MST026	2.7		5.4		6.1	UJ
Blackfoot River, below Angus Creek	MST027	-		-		12	J
Blackfoot River, above Diamond Creek Rd.	MST028*	-		-		9.4	J
Blackfoot River, above Spring Creek	MST029*	2.7		1.0		1.2	J
Blackfoot River, below Spring Creek	MST229*	5.0		7.4		12	J
Blackfoot River, above State Land Creek	MST230	-		-		13	J
Blackfoot River, below Woodall Mountain Creek	MST231	-		-		27	J
Blackfoot River, above Blackfoot Reservoir	MST232	-		4.6		14	UJ

Notes:
* - Mine-specific background station
Flags:
U – Non-detect (Non-detected concentrations were censored and value presented is equal to the MDL)
J – Estimated result

TABLE 3-60 BLACKFOOT RIVER HISTORICAL SMALL MAMMAL SELENIUM CONCENTRATIONS (mg/kg dw)					
Blackfoot River Station	**Station ID**	**Species**		**Sept 2001**	**Flag**
		Common Name	**Scientific Name**		
Blackfoot River, above Wooley Range Ridge Creek	MST026	w. harvest mouse	R. megalotis	1.7	J
	MST026	deer mouse	P. maniculatus	0.42	J
	MST026	least chipmunk	T. minimus	0.35	J
Notes: J – Estimated result					

TABLE 3-61 BLACKFOOT RIVER HISTORICAL TERRESTRIAL INVERTEBRATE SELENIUM CONCENTRATIONS (mg/kg dw)			
Blackfoot River Station	**Station ID - Sample Type**	**Sept 2001**	**Flag**
Blackfoot River, above Wooley Range Ridge Creek	MST026 - Insects	3.3	
	MST026 - Worms	38	

TABLE 3-62 PROPOSED ASSESSMENT ENDPOINTS AND INDICATOR RECEPTORS				
Feeding Guild	**Assessment Endpoint**	**Receptor**	**Measures of**	
			Exposure	**Effect**
2 ° Consumers Amphibians	Protect amphibians from acute (mortality) and chronic (e.g., reproductive impairment) adverse effects from direct and/or secondary exposure to metals resulting from phosphate mining activities.	Frog	Measured surface water COPEC concentrations	· Compare measured surface water concentration with acceptable levels
2 ° Consumers Benthic Fish	Protect benthic fish species from acute (mortality) and chronic (e.g., reproductive impairment) adverse effects from direct and/or secondary exposure to metals resulting from phosphate mining activities.	Sculpin	Measured fish tissue COPEC concentrations	· Compare measured tissue concentration with acceptable levels
2 ° Consumers Pelagic Fish	Protect pelagic fish species from acute (mortality) and chronic (e.g., reproductive impairment) adverse effects from direct and/or secondary exposure to metals resulting from phosphate mining activities.	Yellowstone Cutthroat Trout	Measured fish tissue COPEC concentrations	· Compare measured tissue concentration with acceptable levels
1 ° Consumers Terrestrial Herbivore	Protect herbivorous mammals (avian and terrestrial predator prey items) by limiting acute and adverse effects from exposure to metals resulting from phosphate mining activities.	Meadow Vole	Calculated daily dosage using exposure models, measured chemical concentrations in abiotic and biotic media, and food web interactions.	· Compare calculated dose to NOAEL dosages for similar prey species.
	Protect large herbivorous mammals (game species) by limiting acute and adverse effects from exposure to metals resulting from phosphate mining activities.	Elk	· Calculated daily dosage using exposure models, measured chemical concentrations in abiotic and biotic media, and food web interactions. · Measured elk tissue COPEC concentrations.	· Compare calculated dose to NOAEL dosages for similar species. · Compare measured tissue concentration with acceptable levels
	Protect grazing livestock by limiting acute and adverse effects from exposure to metals resulting from phosphate mining activities.	Beef Cattle	· Calculated daily dosage using exposure models, measured chemical concentrations in abiotic and biotic media, and food web interactions.· Measured COPEC concentrations in beef cattle tissue.	· Compare calculated dose to NOAEL dosages for similar species.· Compare measured tissue concentration with acceptable levels

TABLE 3-62 PROPOSED ASSESSMENT ENDPOINTS AND INDICATOR RECEPTORS				
			Measures of	
Feeding Guild	Assessment Endpoint	Receptor	Exposure	Effect
1 ° Consumers Avian Herbivore	Protect herbivorous bird species from acute (mortality) and chronic (e.g., reproductive impairment) adverse effects from direct and/or secondary exposure to metals resulting from phosphate mining activities.	American Goldfinch	· Calculate daily dosage using exposure models, measured chemical concentrations in abiotic and biotic media, and food web interactions. · Measured COPEC concentrations in bird eggs.	· Compare calculated dose to NOAEL dosages for similar species. · Compare measured egg concentration with acceptable levels
2 ° Consumers Terrestrial Omnivore	Protect small omnivorous mammals (avian and terrestrial predator prey items) by limiting acute and adverse effects from exposure to metals resulting from phosphate mining activities.	Deer Mouse	· Calculated daily dosage using exposure models, measured chemical concentrations in abiotic and biotic media, and food web interactions. · Measured COPEC concentrations in mouse tissue.	· Compare calculated dose to NOAEL dosages for similar species. · Compare measured tissue concentration with acceptable levels
	Protect omnivorous mammals by limiting acute and adverse effects from exposure to metals resulting from phosphate mining activities.	Raccoon	· Calculated daily dosage using exposure models, measured chemical concentrations in abiotic and biotic media, and food web interactions.	· Compare calculated dose to NOAEL dosages for similar prey species.
2 ° Consumers Avian Omnivore	Protect omnivorous bird species from acute (mortality) and chronic (e.g., reproductive impairment) adverse effects from direct and/or secondary exposure to metals resulting from phosphate mining activities.	American Robin	· Calculate daily dosage using exposure models, measured chemical concentrations in abiotic and biotic media, and food web interactions. · Measured COPEC concentrations in bird eggs.	· Compare calculated dose to NOAEL dosages for similar species. · Compare measured egg concentration with acceptable levels
	Protect omnivorous water bird species from acute (mortality) and chronic (e.g., reproductive impairment) adverse effects from direct and/or secondary exposure to metals resulting from phosphate mining activities.	Mallard	· Calculate daily dosage using exposure models, measured chemical concentrations in abiotic and biotic media, and food web interactions. · Measured COPEC concentrations in bird eggs.	· Compare calculated dose to NOAEL dosages for similar species. · Compare measured egg concentration with acceptable levels

TABLE 3-62 PROPOSED ASSESSMENT ENDPOINTS AND INDICATOR RECEPTORS				
Feeding Guild	**Assessment Endpoint**	**Receptor**	**Measures of**	
			Exposure	**Effect**
3 ° Consumers Terrestrial Predator	Protect upper trophic level aquatic feeding terrestrial species from acute (mortality) and chronic (e.g., reproductive impairment) adverse effects from direct and/or secondary exposure to metals resulting from phosphate mining activities.	Mink	· Calculated daily dosage using exposure models, measured chemical concentrations in abiotic and biotic media, and food web interactions.	· Compare calculated dose to NOAEL dosages for similar prey species.
	Protect upper trophic level terrestrial species from acute (mortality) and chronic (e.g., reproductive impairment) adverse effects from direct and/or secondary exposure to metals resulting from phosphate mining activities.	Coyote	· Calculated daily dosage using exposure models, measured chemical concentrations in abiotic and biotic media, and food web interactions.	· Compare calculated dose to NOAEL dosages for similar prey species.
3 ° Consumers Avian Predator	Protect upper trophic level aquatic feeding avian species from acute (mortality) and chronic (e.g., reproductive impairment) adverse effects from direct and/or secondary exposure to metals resulting from phosphate mining activities.	Great Blue Heron	· Calculated daily dosage using exposure models, measured chemical concentrations in abiotic and biotic media, and food web interactions.	· Compare calculated dose to NOAEL dosages for similar prey species.
	Protect upper trophic level avian species from acute (mortality) and chronic (e.g., reproductive impairment) adverse effects from direct and/or secondary exposure to metals resulting from phosphate mining activities.	Northern Harrier	· Calculated daily dosage using exposure models, measured chemical concentrations in abiotic and biotic media, and food web interactions.	· Compare calculated dose to NOAEL dosages for similar prey species.

Notes:

COPEC - chemical of potential concern

NOAEL - no observed adverse effects level

TABLE 3-63
SUMMARY OF ENVIRONMENTAL DATA AND REQUESTED USES

Data Set	Dates of Collection	Data Quality Note	Scoping and Characterization	Risk Assessment	Feasibility Study
Groundwater	1998	Data collected under specific environmental data collection programs and plans. Data were not validated to current standards. However, data collection and analysis are well documented. These data could be evaluated and validated for higher level data uses, as necessary.	X		X
SEGW	1997 - 2003		X		X
Surface Water	1997 - 2003		X		X
Sediment	1998 - 2002		X		X
Fish	1998 - 2000		X		
Aquatic Invertebrates	1999 & 2000		X		
Riparian Soil	2001		X		
Riparian Vegetation	1999 & 2001		X		
Upland Soil	1998, 2000 & 2001		X		X
Upland Vegetation	1998, 2000 & 2001		X		X
Small Mammals	2001		X		
Terrestrial Invertebrates	2002		X		
Cattle	1999 & 2000	Data quality and limitations assessed herein can be validated to current standards	X	X	X
Bird Egg	1999 - 2001		X	X	X
Elk	1999 & 2000		X	X	X
Groundwater	2004 - 2009	Validated to current validation standards – Unrestricted, relevant use during the RI/FS.	X	X	X
SEGW	2004 - 2009		X	X	X
Surface Water	2004 - 2009		X	X	X
Sediment	2004 & 2007		X	X	X
Fish	2004		X	X	X
Benthic Macroinverts.	2004		X	X	X
Riparian Soil	2004		X	X	X
Riparian Vegetation	2004		X	X	X
Upland Soil	2004 & 2009		X	X	X
Upland Vegetation	2004 & 2009		X	X	X

Notes:
SEGW - Surface Expressions of Groundwater such as springs, seeps and headwater stream baseflow.
Aquatic Invertebrates - macroinvertebrates, macrophytes, periphyton, and plankton.

SECTION 4

TABLES

TABLE 4-1 POTENTIAL FEDERAL CHEMICAL-SPECIFIC ARARS FOR THE P4 SITES		
Standard or Requirement	**Citation**	**Description**
Safe Drinking Water Act	42 USC §§ 300f et seq.	Protection of public water systems and underground sources of drinking water. May be ARAR for groundwater used to supply public water systems.
National Primary Drinking Water Regulations	40 CFR Part 141	Establishes health-based standards (MCLs) for public water systems. May be ARAR for groundwater.
Clean Water Act	33 USC §§ 1251 et seq.	Water Pollution Prevention and Control.
National Recommended Water Quality Criteria[1]	Section 304(a) of CWA	Recommended water quality criteria for the protection of aquatic life and human health in surface water. May be ARAR for surface water.
Superfund Amendments and Reauthorization Act (SARA Title III)	42 USC § 11001 et seq.	Applies if herbicides are used. May be ARAR if selective vegetation eradication is part of a remedial action (e.g., removal of selenium hyper-accumulators).
Resource Conservation and Recovery Act	42 USC §§ 6901 et seq. 40 CFR Parts 260-268	Management of solid waste. Defines threshold levels and criteria to determine if a material is hazardous waste.
National Secondary Drinking Water Regulations	40 CFR Part 143	Establishes welfare-based standards (secondary MCLs) for public water systems. May be ARAR for groundwater.
NOAA Benchmarks[2] - TBC	Buchman (2008)	Benchmarks for freshwater sediments, surface water and soil.
Maximum Tolerated Levels (MTLs) in animal feed –TBC	National Research Council, 2005	Guidelines for concentrations in animal feed.

Notes:

[1] National Recommended Water Quality Criteria were most recently updated in 2009 and are available at http://www.epa.gov/ost/criteria/wqctable/.
[2] NOAA freshwater sediment benchmarks were most recently updated in 2008 and are available at http://response.restoration.noaa.gov/book_shelf/122_NEW-SQuiRTs.pdf.
Standard or requirement in italics with TBC is a "to be considered" guideline.

TABLE 4-2 POTENTIAL STATE CHEMICAL-SPECIFIC ARARS FOR THE P4 SITES		
Standard or Requirement	**Citation**	**Description**
Idaho Water Quality Standards	IDAPA 58.01.02	Water quality standards and wastewater treatment requirements, including: water quality criteria for aquatic life use designations (.250), Designations of surface waters found within Salmon Basin (.130), General surface water quality criteria (.200), Mixing zone policy (.060).
Idaho Ground Water Quality Rule	IDAPA 58.01.11.200	Numerical and narrative standards that may be ARAR for groundwater of the state.
Administrative Policy on Protection of waters of the State	IDAPA 58.01.02.050.02	Protects surface and groundwater for beneficial uses.
Antidegradation Policy	IDAPA 58.01.02.051	Requires that existing water uses and water quality be maintained and protected.
Idaho Rules for Public Drinking Water Systems	IDAPA 58.01.08	Regulates quality of public drinking water.
Rules and Standards for Hazardous Waste	IDAPA 58.01.05	Rules and standards for hazardous waste. May be ARAR if hazardous waste is identified or generated.
Solid Waste Management Rules	IDAPA 58.01.06	Rules and standards for solid waste.
Rules for the Control of Air Pollution	IDAPA 58.01.01	Including .650 and .651. Could be ARAR during remediation.
Idaho State's Veterinarian's Office opinion on selenium levels in forage – TBC	----	Recommends a maximum of 5 ppm (dw) selenium in livestock forage.

Notes:

Standard or requirement in italics with TBC is a "to be considered" guideline.

TABLE 4-3
POTENTIAL FEDERAL LOCATION AND ACTION SPECIFIC ARARS FOR THE P4 SITES

Standard or Requirement	Citation	Description	Location (L) or Action (A) Specific
Mineral Leasing Act	30 USC §181 et seq, 43 CFR 3500-3599	The portions of the act that govern reclamation at mine sites on Federal lands may be ARAR.	A, L
Federal Land Policy and Management Act	43 USC §1701-1795	The portions of the act that govern natural resources and present and future land use on Federal lands may be ARAR.	L
Caribou-Targhee Land Use Management Plan (National Forest Management Act)	16 USC §1601-1614, 38 CFR 219	This law may be ARAR if on-site actions will involve or impact US Forest Service lands.	L
Protection of Wetlands	40 CFR § 6.302	Regulates and minimizes impacts to wetlands. May be ARAR if any Site remediation or reclamation contains wetlands.	A (L)
Protection of Floodplains	40 CFR § 6.302 and Appendix A	Regulates construction in floodplains. May be ARAR if any Site remediation or reclamation extends into a floodplain (low probability).	A (L)
Fish and Wildlife Coordination Act	16 USC §661 40CFR §6.302	Requires that federal agencies involved in actions that will result in control or modification of any natural stream or water body must protect fish and wildlife resources that may be affected by the actions.	A
Endangered Species Act	7 USC §135, 16 USC §400, 16 USC §1531 et. seq, 40 CFR 6.302, 50 CFR 402	This law may be ARAR if on-site activities may jeopardize threatened and endangered species or adversely modify their habitat.	A (L)
Bald and Golden Eagle Protection Act	16 USC §688 et. seq, 50 CFR 22	This law may be ARAR if on-site activities may harm a bald or golden eagle, their nest, or eggs.	A (L)
National Pollutant Discharge Elimination System (NPDES) Regulations	40 CFR §§ 122 to 125	Requirements for actions involving effluent discharges to surface water. This may be ARAR if water treatment is used as part of a remedy.	A
Clean Water Act	CWA Section 301[b]	Requirements for best treatment and control technology prior to discharge. This may be ARAR if water treatment is used as part of a remedy.	A
	CWA Section 404	Requirements for dredging and filling in U.S. waters, including wetlands. May be ARAR if a remedial action involves dredging or filling in U.S. waters, mostly likely wetlands.	A (L)

TABLE 4-3 POTENTIAL FEDERAL LOCATION AND ACTION SPECIFIC ARARS FOR THE P4 SITES Page 2 of 2			
Standard or Requirement	**Citation**	**Description**	**Location (L) or Action (A) Specific**
Clean Air Act	42 USC §§ 7409 et seq.; 40 CFR 50	Requirements for maintaining air quality. May be ARAR during remediation construction.	A
National Historic Preservation Act	16 USC. § 470f; 36 CFR. Parts 60, 63 and 800; 40 CFR. § 6.301	Requirements for preservation of historical or archaeological sites. Unlikely to be ARAR within current Site boundaries. However, may be ARAR in the unlikely case where land is disturbed outside of current boundaries (e.g., borrow areas).	A, L
The Archaeological and Historic Preservation Act	40 CFR. § 6.301		A, L
Native American Graves Protection and Repatriation Act	25 USC §3001 et seq	This law may be ARAR if any Native American grave sites are discovered during any actions. This is unlikely unless new areas outside of current Site boundaries are disturbed.	L
Rivers and Harbors Act	33 USC §§ 401 et seq., 33 CFR Parts 320-330	Requirements for minimizing adverse effects from dredge and fill work within U.S. navigable waters and their tributaries.	A (L)
RCRA Requirement for Hazardous Waste Transport	RCRA 42 USC § 6901 et seq.; 40 CFR 261; 40 CFR 262; 49 CFR Parts 171-180	Requirements for handling and transporting hazardous waste may be ARAR if any hazardous waste is transported during remediation.	A
Surface Mining Control and Reclamation Act	30 USC § 1201, 30 CFR Part 816, 30 CFR Part 784	Permanent program performance standards – surface mining activities. Minimum requirements for reclamation and operations.	A
Considering Wetlands at CERCLA Sites Guidance - TBC	OSWER 9280.03, May 1994	Guidance to evaluate potential impacts on wetlands. Would apply if any Site remediation or reclamation contains wetlands (probable).	A

Notes:

Standard or requirement in italics with TBC is a “to be considered” guideline.

TABLE 4-4
POTENTIAL STATE LOCATION AND ACTION SPECIFIC ARARS FOR THE P4 SITES

Standard or Requirement	Citation	Description	Location (L) or Action (A) Specific
Protection of Animals and Birds	Idaho Code §36-1102	Prohibits intentional disturbance or destruction of eggs or nests. Potentially ARAR if remedial activities necessitate disruption of bird nests in forested, meadow or wetland areas.	L (A)
Non-point Source Discharges	IDAPA 58.01.02.350	Regulates non-point source discharges, designates approved BMWs and provides additional protection for ORW. May be ARAR for mining wastes defined as non-point sources.	A
Well Construction Standard Rules	IDAPA 37.03.09	Regulates well construction and abandonment.	A
Idaho Exploration and Surface Mining Regulations	IDAPA 20.03.02	Requirements for borrow sources of material (e.g., soils, gravel). May be ARAR if off-site borrow sources are developed for remediation.	A
Idaho Water Quality Standards and Wastewater Treatment Requirements	IDAPA 58.01.02	Requirements for actions involving effluent discharges to surface water. May be ARAR if water treatment is part of the remedial action.	A
Surface Mining	Idaho Code §§47-1501 to 1519 and IDAPA 20.02.140	Establishes standards and authorizes rules for reclaiming lands affected by surface exploration and mining, including recontouring, erosion control, and revegetation. Where surface mining wastes are already in existence, this section may fall into the realm of relevant and appropriate. May be ARAR for contouring, erosion control, and revegetation during remediation.	A
Solid Waste Management Rules	IDAPA 58.01.06	Requirements for sites with residual metals concentrations that are at or above risk or regulatory levels after remediation. May be ARAR for remedial alternatives.	A
Hazardous Waste and Hazardous Waste Management Act of 1983	IDAPA 58.01.05 and 1993 Session Law, Ch. 291, Sections 1-8	Potentially ARAR for management of investigation-derived wastes and remediation wastes.	A
Site Specific Surface Water Quality Criteria	IDAPA 58.01.02.275 to 280	Establishes surface water quality standards for water discharged from dams, reservoirs and hydroelectric facilities and for other named waters.	L

TABLE 4-4
POTENTIAL STATE LOCATION AND ACTION SPECIFIC ARARS FOR THE P4 SITES

Standard or Requirement	Citation	Description	Location (L) or Action (A) Specific
Fences in General (LEAs)	Idaho Code §§35-101 to 112	Establishes construction requirements, such as height and distance between posts, for all types of fences. Defines who is responsible for construction and maintenance of enclosure and partition fences. May be ARAR if fencing is required to protect installment(s) associated with remediation.	A
Idaho Rules for Control of Fugitive Dust	IDAPA 58.01.01.577 and 650-651	Requirements for maintaining air quality. May be ARAR during remedial construction.	A
Idaho Toxic Air Pollutants	IDAPA 58.01.01.585-586	Requirements for maintaining air quality (none currently nor will they be likely associated with any remedial action).	A
Preservation of Historical Sites	Idaho Statutes Title 67, Chapters 46 and 41	Requirements for protection of public lands and preservation of historical or archaeological sites in consideration of waste disposal. Unlikely to be ARAR within current Site boundaries. However, may be ARAR in the unlikely case where land is disturbed outside of current boundaries (e.g., borrow areas).	A
Stream Channel Alteration Rules	Idaho Code §§42-3801-3812 and IDAPA 37.03.07	Requirements for stream channel alteration (unlikely to be ARAR at Sites).	A
Idaho Classification and Protection of Wildlife Rule - TBC	IDAPA 13.01.06.300	Classifies fish and wildlife species; identifies threatened or endangered species; and specifies wildlife species that are protected from taking and possessing. To be considered during ecological risk assessment.	L
Idaho Land Remediation Rules	IDAPA 58.01.18.027	Requirements for land remediation need to be considered when evaluating existing reclamation, but may be ARAR if new reclamation is part of remedy.	A
Soil Salvage Guidelines - TBC	Jones (2003) for USFS	Guidelines for the Salvage of Topsoil and Shale Used to Reclaim and Provide Seed Bed for Phosphate Mine Reclamation.	A, L
Guidance for Determining Background in Groundwater - TBC	IDEQ (2009)	Statistical guidance for determining background groundwater quality and degradation.	A

TABLE 4-4
POTENTIAL STATE LOCATION AND ACTION SPECIFIC ARARS FOR THE P4 SITES

Standard or Requirement	Citation	Description	Location (L) or Action (A) Specific
IDEQ Area Wide Risk Management Plan - TBC	IDEQ (2004a)	Guidance document for regional removal action goals and objectives, and action levels.	A
Guidance document for regional removal action goals and objectives, and action levels - TBC	Idaho Department of Environmental Quality, December 2003	Guidance document for risk-based decision-making using human health and transport models. May be taken into consideration in areas where ecological risks are not a factor.	A, L
Variances from water quality standards - TBC	IDAPA 58.01.02.260	Establishes procedures and requirements for water quality variance. To be considered if site-specific variances are proposed for a particular location or source.	A
IDEQ Risk-based decision making for remedial action guidance - TBC	December 2003	Guidance document for risk-based decision-making using human health and transport models. To be considered for risk-based decision-making.	A
IDEQ Non-point source management plan - TBC		Guidance to protect or restore (where possible) the beneficial uses of the State's surface water and groundwater.	L

Notes:

Standard or requirement in italics with TBC is a "to be considered" guideline.

TABLE 4-5 GROUNDWATER MONITORING DATA QUALITY OBJECTIVES Page 1 of 2	
Step 1 - **State the Problem**	Historical mining operations at P4's Sites have resulted in mine waste materials being potential sources of selenium and other constituents to the environment. In general, the predominant mobilization mechanism for COPCs from these potential source areas occur during the spring runoff via surface water and shallow groundwater transport of dissolved constituents. However, deeper infiltration to intermediate or regional groundwater systems is also possible. The primary components of the conceptual model that support the DQOs are summarized as follows for groundwater: • Source – COPCs present in interburden and overburden rocks deposited in waste rock dumps, but possibly present in mine pits and other facilities, that are able to enter groundwater systems due to seepage and/or runoff and infiltration. • Release mechanisms – Exposure to air and water results in mobilization of COPCs from increased surface area; precipitation may leach and mobilize COPCs primarily during spring runoff to receiving groundwater. • Exposure pathways – Primary exposure through direct contact, ingestion of COPCs, irrigation, and watering of livestock. • Receptors – Seasonal ranchers and potential residents. The planning team, decision makers, and principal data users include P4 and the A/T.
Step 2 – Identify the Goals of the Study	Are COPCs in groundwater elevated above the appropriate screening levels, thus posing a potential risk to human health and ecological receptors, and are there sufficient data available to characterize nature and extent, perform the risk assessments (HHRA and ERA), and proceed to the FS? <u>Alternative actions:</u> 1. Install monitoring locations and monitor existing and/or new groundwater wells and/or direct push borings for COPCs. 2. No Action. Monitoring locations and analyte lists are of adequate quality, quantity and groundwater monitoring in proper locations to characterize groundwater. Data will be evaluated in the RI Report, HHRA, and ERA.
Step 3 – Identify Information	The information inputs for the decision process include the following items that may exist or will need to be created: • List of COPCs. • Current conceptual site models. • Sample location maps (spatial coverage of existing data). • Historic surface water and groundwater data (use of existing data will be dependent upon evaluations of data usability). • Hydrogeologic information such as flow directions, flow rates, and distance of wells to seeps and springs. • Existing site characterization, groundwater quality sampling and analysis plans and procedures. • Risk-based screening benchmarks for analytes and ARARs.

TABLE 4-5 GROUNDWATER MONITORING DATA QUALITY OBJECTIVES Page 2 of 2	
Step 4 – Define the Boundaries of the Study	Population of Interest: Metals/metalloids and general groundwater quality parameters. Spatial boundaries: Groundwater monitoring locations, including surface expressions of groundwater, characterizing impacted groundwater at the P4 Sites. Vertical boundary: Screened depth of groundwater monitoring well and practical depth of monitoring well installation. Temporal boundary: The temporal boundary for groundwater monitoring at all proposed stations is spring during peak flow (i.e., peak potential loading). This is due to the nature of contaminant transport positively correlating with spring runoff and the potential hydraulic connections between the shallow alluvial system and surface water. However, some locations will also be monitored in the fall. Groundwater data trending back to 2004 will generally be used for evaluating temporal trends. However, most monitoring well data has been collected since 2007. These data will be used for evaluating risk and ARARs compliance. Scale of Decision Making: Spatially-relevant groundwater monitoring locations from each sampling event.
Step 5 – Develop Analytic Approach	The applicable and relevant compliance thresholds linked to protection of human and ecological receptors will be used. If a monitoring location COPC concentration is equal to or exceeds applicable standards at boundary locations then the need for further downgradient boundary monitoring will be evaluated, if practicable, otherwise the impacted groundwater is considered bounded by the existing monitoring locations and no further characterization is necessary. The data will be evaluated during the RI/FS.
Step 6 – Specify Performance or Acceptance Criteria	No decision errors will be established. To control decision errors, only quantitative data with known accuracy and precision documentation will be used for comparison to standards. Best professional judgment will be used to evaluate the hydrogeologic factors associated with the groundwater monitoring stations, and how these factors may be relevant to the need for additional information. Analytical parameters will be compared to the applicable groundwater quality risk-based screening levels and ARARs. The precision, accuracy, representativeness, comparability, and completeness criteria and the minimum detection limits will be used to evaluate the usability of analytical data in making decisions about characterization of groundwater and at a minimum will help ensure that data collected for the RI/FS is above adequate quality. Measurement errors will be minimized by implementing standard operating procedures for the sample collection, handling, preparation and analysis methods. All data must meet approved usability as defined in the project *QAPP Addendum* (MWH, 2009f and Appendix D5).
Step 7 – Develop the Plan for Obtaining Data	This DQO has been used to help guide the data gap assessment that is presented in Section 4.4, and the existing groundwater data were reviewed as part of the preparation of this Work Plan. The sampling rationale and design based on existing data are presented in the *2009 Groundwater Monitoring SAP* and *2010 Groundwater Monitoring Memorandum* in Appendix D4. The sampling design included evaluation of data gaps for the shallow/alluvial, Dinwoody Formation, and Wells Formation hydrostratigraphic units. The sampling design will be further evaluated if future groundwater monitoring suggests that the proposed locations and analytes are not sufficient to assist in and complete groundwater characterization. The field methods and quality assurance requirements are presented in the *2009 Groundwater Sampling and Analysis Plan* (MWH, 2009c).

TABLE 4-6 SURFACE WATER MONITORING DATA QUALITY OBJECTIVES Page 1 of 2	
Step 1 – **State the Problem**	Historical mining operations at the Sites have resulted in mine waste materials being potential sources of selenium and other constituents to the environment. In general, the predominant mobilization mechanism for COPCs from these potential source areas occurs during the spring runoff via runoff and infiltration. The primary components of the conceptual model that support the DQOs are summarized as follows for surface water: • Source – COPCs present in interburden and overburden rocks deposited in waste rock dumps, but possibly present in mine pits and other facilities that is able to enter surface water bodies due to springs and seeps and/or runoff. • Release mechanisms – Exposure to air and water results in mobilization of COPCs from increased surface area; precipitation may leach and mobilize COPCs primarily during spring runoff to receiving surface water bodies. • Exposure pathways – Primary exposure through ingestion, dermal contact, uptake of COPCs by plants or animals. • Receptors – Recreational receptors, Native Americans, seasonal ranchers, potential residents, as well as livestock, wildlife, and other ecological receptors. The planning team, decision makers and principal data users include P4 and the A/T.
Step 2 – Identify the Goal of the Study	Are COPCs in surface water elevated above the appropriate screening levels that may pose risks to human health and ecological receptors, and is there sufficient data available to characterize nature and extent, perform the risk assessments (HHRA and ERA), and proceed to the FS? <u>Alternative actions:</u> 1. Evaluate the need to need to monitor existing and/or new surface water locations. 2. No Action - station data and analyte list are of adequate quality, quantity, and stations are in proper locations to characterize surface water. Data will be evaluated in the RI Report, HHRA, and ERA.
Step 3 – Identify Information Inputs	The information inputs for the decision process include the following items that may exist or will need to be created: • List of COPCs. • Current conceptual site models. • Existing facilities investigation information to be updated as needed (inventory and spatial delineation of potential source areas). • Sample location maps. • Historic surface water and groundwater data; data will be analyzed with appropriate methods for determining inorganic concentrations with detection limits suitable for comparison to risk-based screening levels. • Existing site characterization surface water quality sampling and analysis plans and procedures. • Risk-based screening benchmarks for analytes.

TABLE 4-6 SURFACE WATER MONITORING DATA QUALITY OBJECTIVES Page 2 of 2	
Step 4 – Define the Boundaries of the Study	Population of Interest: Metals/metalloids and general water quality parameters in surface water Spatial boundaries: Surface water monitoring locations downgradient of potential source areas at Ballard, Henry, and Enoch Valley mine areas Vertical boundary: Mid-depth of the river or stream at surface water monitoring locations Temporal boundary: Surface water sample collection is planned during the peak flow (i.e., peak potential loading). However, some locations where surface flow is continuous are also monitored in the fall. Scale of Decision Making: Spatially-relevant surface water monitoring locations from each sampling event Practical Constraints Sampling to occur during peak flow in May and low-flow in September
Step 5 – Develop the Analytic Approach	The applicable and relevant compliance thresholds linked to protection of human and ecological receptors will be used. If a monitoring location COPC concentration is equal to or exceeds applicable standards then further downstream monitoring will be evaluated, if practicable, otherwise the surface water monitoring point is considered sufficient and no further characterization is necessary. The data will be evaluated in the RI/FS.
Step 6 – Specify Performance of Acceptance Criteria	No decision errors will be established. To control decision errors, only quantitative data with acceptable accuracy and precision documentation will be used for comparison to standards. Best professional judgment will be used to evaluate the hydrologic factors associated with the established surface water monitoring stations, and how these factors may be relevant to the need for additional information. Analytical parameters will be compared to the applicable surface water quality risk-based screening level and ARARs. The precision, accuracy, representativeness, comparability, and completeness criteria and the minimum detection limits will be used to evaluate the usability of analytical data in making decisions about characterization of surface water quality and at a minimum will help ensure that data collected for the RI/FS is above adequate quality. Measurement errors will be minimized by implementing standard operating procedures for the sample collection, handling, preparation and analysis methods. All data must meet approved usability as defined in the *QAPP Addendum* (MWH, 2009f and Appendix D5).
Step 7 – Develop the Plan for Obtaining Data	This DQO has been used to help guide the data gap assessment that is presented in Section 4.4. P4 and the A/T now believe there are adequate and extensive surface water data to support the development RI/FS process including the baseline risk assessment. However, there is concern that a significant time gap in the surface water monitoring data set could occur in 2009 and 2010 during which time additional groundwater characterization will occur. Continued surface water monitoring downgradient of potential P4 sources will be conducted to provide an annual baseline record of conditions, both spatially and temporally, in order to more effectively evaluate potential future remedies' effectiveness and evaluate long-term trends. The monitoring will be performed according to the approved *2009 and 2010 Surface Water Monitoring Sampling and Analysis Plan* (MWH, 2009a).

TABLE 4-7 SEDIMENT DATA QUALITY OBJECTIVES Page 1 of 2	
Step 1 - **State the Problem**	Historical mining operations at the Sites have resulted in mine waste materials being potential sources of selenium and other constituents to the environment. Enriched concentrations in geologic material, and oxidation, leaching, and mobilization of elements in waste rock can result in the release of elevated concentrations of COPCs into the environment from potential source areas. In general, the predominant mobilization mechanism for COPCs from these potential source areas occurs during the spring runoff via runoff and infiltration. The primary components of the conceptual model that support the DQOs are summarized as follows for sediment: • Source – COPCs present in interburden and overburden rocks deposited in waste rock dumps, but possibly present in mine pits and other facilities that is able to enter the environment by physical transport of sediment in runoff and/or via water transport and sorption to sediments. • Release mechanisms – Exposure to air and water results in mobilization of COPCs from increased surface area; precipitation may leach and mobilize COPCs in sediment primarily during spring runoff to the environment. • Exposure pathways – Primary exposure through uptake of COPCs in sediment by plants and aquatic biota. • Receptors – Recreational receptors, Native Americans, potential residents, as well as other ecological receptors. The planning team, decision makers and principal data users include P4 and the A/T.
Step 2 – Identify the Goal of the Study	Are COPCs in sediments elevated above the appropriate screening levels that may pose risks to human health and ecological receptors, and is there sufficient data available to characterize nature and extent and seasonal variability in sediments, perform the risk assessment (HHRA and ERA), and proceed to the FS? <u>Alternative actions:</u> 1. Collect sediment data to provide additional COPC data and spatial coverage. 2. No Action – Existing data are of adequate quality, quantity, and in proper locations to characterize sediments. Data will be evaluated in the RI Report, HHRA, and ERA.
Step 3 – Identify Information Inputs	The information inputs for the decision process include the following items that may exist or will need to be created. • List of COPCs. • Current conceptual site models. • Existing facilities investigation information to be updated as needed (inventory and spatial delineation of potential source areas). • Sample location maps. • Historic sediment data (use of existing data will be dependent upon evaluations of data usability); data will be analyzed with appropriate methods for determining inorganic concentrations with detection limits suitable for comparison to risk-based screening levels. • Existing site characterization sediment sampling and analysis plans and procedures. • Risk-based screening benchmarks for analytes.

TABLE 4-7 SEDIMENT DATA QUALITY OBJECTIVES Page 2 of 2	
Step 4 – Define the Boundaries of the Study	Population of Interest: Metals/metalloids in sediment. Spatial boundaries: Sediments in surface water bodies in and around Ballard, Henry, and Enoch Valley Mine areas. Vertical boundary: Sediments below water column in streams and ponds (no deeper than six inches below the water-sediment interface. Temporal boundary: It is assumed that sediment quality will not change during the seasons in the water bodies potentially assessed.
Step 5 – Develop the Analytic Approach	The applicable and relevant compliance thresholds linked to protection of human and ecological receptors will be used. If available data (existing) are not suitable to characterize nature and extent (e.g., lack sufficient COPCs), and do not provide a reliable estimate of potential source area concentrations, then additional data will be collected. Otherwise, the data will be considered adequate for characterization. The data will be evaluated in the RI and FS.
Step 6 – Specify Performance or Acceptance Criteria	No decision errors will be established. To control decision errors, only quantitative data with known accuracy and precision documentation will be used for comparison to standards. Analytical parameters will be compared to the applicable risk-based screening levels. The precision, accuracy, representativeness, comparability, and completeness criteria and the minimum detection limits will be used to evaluate the usability of analytical data in making decisions about characterization of sediment and at a minimum will help ensure that data collected for the RI/FS is above adequate quality. Measurement errors will be minimized by implementing standard operating procedures for the sample collection, handling, preparation and analysis methods. All data must meet approved usability as defined in the *QAPP/QAPP Addenda* and any data collected will be analyzed per the *QAPP Addenda* (MWH, 2009f and Appendix D5).
Step 7 – Design Plan for Obtaining Data	This DQO has been used to help guide the data gap assessment that is presented in Section 4.4. The existing sediment data were reviewed as part of the preparation of this the Work Plan (see summary in Section 4.4). There is a concern that sediments have not been sampled for the common COPC analyte list as other media. The sediment sampling rationale and design based on existing data are presented in Appendix D1. The field methods and quality assurance requirements are presented in the FSP located in Appendix D1.

TABLE 4-8 SOIL DATA QUALITY OBJECTIVES Page 1 of 2	
Step 1 - **State the Problem**	Historical mining operations at the Sites have resulted in mine waste materials being potential sources of selenium and other constituents to the environment. Enriched concentrations in geologic material, and oxidation, leaching, and mobilization of elements in waste rock can result in the release of elevated concentrations of COPCs into the environment from potential source areas. In general, the predominant mobilization mechanism for COPCs from these potential source areas occurs during the spring runoff via runoff and infiltration. However, elevated concentrations in soil can be a source of direct exposure to potential receptors and also be a source of COPCs for uptake into vegetation. The primary components of the conceptual model that support the DQOs are summarized as follows for soil: • Source – COPCs present in interburden and overburden rocks deposited in waste rock dumps, but possibly present in mine pits and other facilities that is able to enter the environment by physical transport of soil in runoff. • Release mechanisms – Exposure to air and water results in mobilization of COPCs from increased surface area; precipitation may leach soils, transport soils, and mobilize COPCs primarily during spring runoff to the environment. • Exposure pathways – Primary exposure through ingestion, dermal contact, uptake by plants and animals. • Receptors – Recreational receptors, Native Americans, seasonal ranchers, potential residents, as well as livestock, wildlife, and other ecological receptors. The planning team, decision makers and principal data users include P4 and the A/T.
Step 2 – Identify the Goal of the Study	Are COPCs in soils elevated above the appropriate screening levels that may pose risks to human health and ecological receptors, and is there sufficient data available to characterize nature and extent and variability in soils, perform the risk assessment (HHRA and ERA), and proceed to the FS? <u>Alternative actions:</u> 1. Collect soil data to provide additional COPC data and spatial coverage. 2. No Action – Existing data are of adequate quality, quantity, and in proper locations to characterize soils. Data will be evaluated in the RI Report, HHRA, and ERA.
Step 3 – Identify Information Inputs	The information inputs for the decision process include the following items that may exist or will need to be created. • List of COPCs. • Current conceptual site models. • Existing facilities investigation information to be updated as needed (inventory and spatial delineation of potential source areas). • Sample location maps. • Historic soil data (use of existing data will be dependent upon evaluations of data usability); data will be analyzed with appropriate methods for determining inorganic concentrations with detection limits suitable for comparison to risk-based screening levels. • Existing data on type and abundance of soil and vegetative cover. • Existing site characterization soil sampling and analysis plans and procedures. • Risk-based screening benchmarks for analytes.

TABLE 4-8 SOIL DATA QUALITY OBJECTIVES Page 2 of 2	
Step 4 – Define the Boundaries of the Study	<u>Population of Interest:</u> Metals/metalloids in soil. <u>Spatial boundaries:</u> Potential source areas as well as riparian areas in and around Ballard, Henry, and Enoch Valley Mine areas. <u>Vertical boundary:</u> Maximum depth will be 6 inches below the ground surface. <u>Temporal boundary:</u> It is assumed that soil quality will not change during the seasons.
Step 5 – Develop the Analytic Approach	The applicable and relevant compliance thresholds linked to protection of human and ecological receptors will be used. If available data (existing) are not suitable to characterize nature and extent (lack sufficient COPCs or method detection limits exceed screening levels), and do not provide a reliable estimate of potential source area concentrations, then additional data will be collected. Otherwise the data will be considered adequate for characterization, and the data will be evaluated in the RI/FS.
Step 6 – Specify Performance or Acceptance Criteria	No decision errors will be established. To control decision errors, only quantitative data with known and acceptable accuracy and precision documentation will be used for comparison to standards. Analytical parameters will be compared to the applicable risk-based screening levels. The precision, accuracy, representativeness, comparability, and completeness criteria and the minimum detection limits will be used to evaluate the usability of analytical data in making decisions about characterization of soil and at a minimum will help ensure that data collected for the RI/FS is above adequate quality. Measurement errors will have been minimized by implementing standard operating procedures for the sample collection, handling, preparation and analysis methods. All data must meet approved usability as defined in the *QAPP Addenda* MWH, 2009f and Appendix D5. In addition, data should be collected consistent with the procedures and methods indicated in the approved *Supplemental Mine Waste Rock Dump and Facility Soil and Vegetation Characterization Work Plan* (MWH, 2009e).
Step 7 – Develop the Plan for Obtaining Data	The primary purpose of these DQOs is to help guide the data gap assessment that is presented in Section 4.4. The existing soil data were reviewed as part of the preparation of this the Work Plan (see Section 4.4). There is adequate and extensive source area soil data to support the development RI/FS process including the baseline risk assessment. However, there is a concern that riparian soil locations have not been sampled for the common COPC analyte list. The riparian soil sampling rationale and design based on existing data are presented in Appendix D1. The field methods and quality assurance requirements are presented in the FSP located in Appendix D1.

TABLE 4-9 VEGETATION DATA QUALITY OBJECTIVES Page 1 of 2	
Step 1 - **State the Problem**	Historical mining operations at the Sites have resulted in mine waste materials being potential sources of selenium and other constituents to the environment. Enriched concentrations in geologic material, and oxidation, leaching, and mobilization of elements in waste rock can result in the release of elevated concentrations of COPCs into the environment from potential source areas. In general, the predominant mobilization mechanism for COPCs from these potential source areas occurs during the spring runoff via runoff and infiltration. The primary components of the conceptual model that support the DQOs are summarized as follows for vegetation: • Source – COPCs present in interburden and overburden rocks deposited in waste rock dumps, but possibly present in mine pits and other facilities that is able to enter the environment. • Release mechanisms – Exposure to air and water results in mobilization of COPCs from increased surface area of soils; plants may uptake COPCs from soils on facility source areas or near impacted surface water bodies. • Exposure pathways – Primary exposure through ingestion and uptake of COPCs via the vegetation. • Receptors – Recreational receptors, Native Americans, seasonal ranchers, potential residents, as well as livestock, wildlife, and other ecological receptors. The planning team, decision makers and principal data users include P4 and the A/T.
Step 2 – Identify the Goal of the Study	Are COPCs in vegetation elevated above the appropriate screening levels that may pose risks to human health and ecological receptors, and is there sufficient data available to characterize nature and extent and seasonal variability in vegetation, perform the risk assessments (HHRA and ERA), and proceed to the FS? <u>Alternative actions:</u> 1. Collect vegetation data to provide additional COPC data and spatial coverage. 2. No Action – Existing data are of adequate quality, quantity, and in proper locations to characterize vegetation. Data will be evaluated in the RI Report, HHRA, and ERA.
Step 3 – Identify Information Inputs	The information inputs for the decision process include the following items that may exist or will need to be created. • List of COPCs. • Current conceptual site models. • Existing facilities investigation information to be updated as needed (inventory and spatial delineation of potential source areas). • Sample location maps. • Historic vegetation data; data will be analyzed with appropriate methods for determining inorganic concentrations with detection limits suitable for comparison to risk-based screening levels. • Existing data on type and abundance of soil and vegetative cover. • Existing site characterization vegetation sampling and analysis plans and procedures. • Risk-based screening benchmarks for analytes. • Existing and new data on the type, abundance, and relative distribution of hyper-accumulators and culturally significant vegetation. • New data on the seasonal variability of COPC uptake in vegetation.

TABLE 4-9 VEGETATION DATA QUALITY OBJECTIVES Page 2 of 2	
Step 4 – Define the Boundaries of the Study	Population of Interest: Metals/metalloids in vegetation. Spatial boundaries: Potential source areas as well as riparian areas in and around Ballard, Henry, and Enoch Valley Mine areas. Vertical boundary: Edible above ground vegetative growth. Temporal boundary: Vegetation sample will be evaluated in spring and fall to evaluate any potential seasonal variability.
Step 5 – Develop the Analytic Approach	The applicable and relevant compliance thresholds linked to protection of human and ecological receptors will be used. If available data (existing) are not suitable to characterize nature and extent (lack sufficient COPCs), and do not provide a reliable estimate of potential source area concentrations, then additional data will be collected. Otherwise the data will be considered adequate for characterization. The data will be evaluated in the RI and FS.
Step 6 – Specify Performance or Acceptance Criteria	No decision errors will be established. To control decision errors, only quantitative data with acceptable accuracy and precision documentation will be used for comparison to standards. Analytical parameters will be compared to the applicable risk-based screening levels. The precision, accuracy, representativeness, comparability, and completeness criteria and the minimum detection limits will be used to evaluate the usability of analytical data in making decisions about characterization of vegetation and at a minimum will help ensure that data collected for the RI/FS is above adequate quality. Measurement errors will be minimized by implementing standard operating procedures for the sample collection, handling, preparation and analysis methods. All data must meet approved usability as defined in the *QAPP Addenda* (MWH, 2009f) *and* Appendix D5.
Step 7 – Develop the Plan for Obtaining Data	The existing vegetation data were reviewed as part of the preparation of this the Work Plan. There is adequate and extensive vegetation data to support the development RI/FS process including the baseline risk assessment. This DQO has been used to help guide the data gap assessment that is presented in Section 4.4.

TABLE 4-10 TERRESTRIAL AND AQUATIC BIOTA DATA QUALITY OBJECTIVES Page 1 of 2	
Step 1 -State the Problem	Historical mining operations at P4's Sites have resulted in mine waste materials being potential sources of COPCs to the environment. In general, the predominant mobilization mechanism for COPCs from these potential source areas occur during the spring runoff via surface water and shallow groundwater transport, and sediment transport of constituents. Levels of COPCs may be elevated in terrestrial and aquatic biotic media as a result of increased exposures related to the historical phosphate mining. The quantified threat to human health or the environment, if any, is not well defined. The primary components of the conceptual model that support the DQOs are summarized as follows for biotic media. • Source – COPCs present in interburden and overburden rocks deposited in waste rock dumps, but possibly present in mine pits and other facilities that is able to enter the environment. • Release mechanisms – Exposure to air and water results in mobilization of COPCs from increased surface area; precipitation may leach and mobilize COPCs primarily during spring runoff to receiving soils, sediments, and surface water bodies. • Exposure pathways – Primary exposure through ingestion, inhalation or direct uptake of COPCs by plant or animals. • Receptors – Livestock, wildlife, or human direct ingestion of plants or animals with elevated COPCs. The planning team, decision makers, and principal data users include P4 and the A/T.
Step 2 – Identify the Goal of the Study	Are COPC concentration data in biotic media elevated above the appropriate screening levels that may pose risks to human and ecological receptors, and is there sufficient data available to support the HHRA/ERA and proceed to the FS? <u>Alternative actions:</u> 1. Evaluate the need to collect additional biotic data to provide supporting data for the HHRA and ERA. 2. No action. Existing data are of adequate quality and quantity to characterize COPC exposures to biotic media during the HHRA and ERA and proceed to the FS.
Step 3 – Identify Information Inputs	The information inputs for the decision process includes that following items that may exist or will need to be collected: • List of COPCs. • Conceptual site models. • Sample location maps (spatial coverage of existing data). • Biotic COPC data (existing; use of existing data will be dependent upon evaluations of data usability and data validation). • Laboratory quality information. • Risk-based screening benchmarks for analytes.

TABLE 4-10 TERRESTRIAL AND AQUATIC BIOTA DATA QUALITY OBJECTIVES Page 2 of 2	
Step 4 – Define the Boundaries of the Study	Population of Interest: Metals/metalloids in biotic tissue. Spatial boundaries: Biotic monitoring locations from the Southeast Idaho Phosphate Resource Area. Vertical boundary: Not Applicable. Temporal boundary: Existing biotic data from the period of sampling record. Decision will be result of iterative process that will continue through the completion of the risk assessment. Scale of Decision Making: Spatially-relevant biotic monitoring locations from each sampling event within the Southeast Idaho Phosphate Resource Area.
Step 5 – Develop the Analytic Approach	The applicable and relevant compliance thresholds linked to protection of human and ecological receptors will be used to screen the biotic data for the HHRA and ERA. If a the biotic data are data are not sufficient quantity and quality as supporting lines of evidence for the HHRA and ERA, then the need for further data collection will be evaluated, otherwise no further data is necessary. This in part will be driven by assessment of primary media data (groundwater, surface water, sediment, soil and vegetation) during the risk assessment, and therefore is an iterative process. The data will be evaluated in the RI and FS.
Step 6 – Specify Performance of Acceptance Criteria	No decision errors will be established. To control decision errors, only quantitative data with acceptable accuracy and precision documentation will be used for comparison to standards. Analytical parameters will be compared to the applicable risk-based screening levels. The precision, accuracy, representativeness, comparability, and completeness criteria and the minimum detection limits will be used to evaluate the usability of analytical data in making decisions about the biotic data and at a minimum will help ensure that data collected for the RI/FS is above adequate quality. Data will be validated to the extent possible, with any qualifiers assigned. Use of data will be limited to the restrictions of qualifiers, if any.
Step 7 – Develop the Plan for Obtaining Data	The existing biotic environmental data have been evaluated for quality and intended final use by reviewing laboratory quality data and risk assessment needs. The DQOs will be reviewed if additional data is collected. Additional samples may be collected during the RI/FS, if and as necessary, to increase the confidence of the HHRA and ERA decisions.

TABLE 4-11 BALLARD MINE DATA GAP ANALYSIS – PRIMARY MEDIA Page 1 of 4						
Primary Medium	**Location of Summary Information[1]**	**Has Background been established?**	**Are Existing Data Adequate for these RI/FS Evaluations?**			**Data Gap Assessment Summary**
			Nature and Extent	**Risk Assessment**	**Feasibility Study**	
Source Materials	Section 3.1	Adequate Data Exist	Yes	Yes	Yes	The nature and extent of source materials been defined adequately by the USGS and others so that if necessary, risk assessments and the feasibility study (FS) can be conducted. As a result, no further field characterization is necessary.
Soils	See Section 3.2.1 See Tables 3-2, 3-3, and 3-4 See Drawings 3-3, 3-5 and 3-6	Adequate Data Exist to characterize non-radiogenic risk only, further investigations will be necessary for radiogenic risks.	Yes – majority of site soils No – riparian soil No – Ballard shop area for organic compounds. No – radiogenic data in mined areas	Yes – majority of site soils No – riparian soil No – Ballard shop area for organic compounds. No – radiogenic data in mined areas	No – Some material property data is needed to conduct alternative evaluation.	The nature and extent of surface soil impacts at the Ballard Mine has been defined adequately so that if necessary, risk assessments can be conducted for the non-radiogenic COPCs. However for radiogenic risks, to reduce the uncertainty in the inherently conservative risk calculations, site-specific uranium isotopes data for soil and radon and gamma measurements will be collected both on site and in a background area(s). In addition, soil samples will be collected throughout the Ballard Shop area to evaluate if there were leaks/spill of organic compounds during the operation of the facility. Also, a data gap has been identified for sediment (see below) and this carries forward to riparian soils. Therefore some additional limited sampling of riparian soil is needed. In addition, some material properties data (soil hydraulic parameters) is needed for

TABLE 4-11 BALLARD MINE DATA GAP ANALYSIS – PRIMARY MEDIA Page 2 of 4						
Primary Medium	**Location of Summary Information[1]**	**Has Background been established?**	**Are Existing Data Adequate for these RI/FS Evaluations?**			**Data Gap Assessment Summary**
			Nature and Extent	**Risk Assessment**	**Feasibility Study**	
						evaluation of cover soils. Further evaluation of existing background data is needed to statistically quantify background concentrations.
Vegetation	See Section 3.2.2 See Tables 3-5, 3-6, and 3-7 See Drawings 3-4, 3-6 and 3-7	Adequate Data Exist	Yes	Yes	Yes	The nature and extent of vegetation impacts at the Ballard Mine has been defined adequately so that risk assessments and the FS can be conducted. As a result, no further field characterization is necessary. However, further evaluation of existing background data is needed to statistically quantify background concentrations.
Surface Water	See Section 3.2.3.1 See Tables 3-8 and 3-9 See Drawings 3-8 and 3-12	Adequate Data Exist	Yes	Yes	Yes	The nature and extent of surface water contamination at the Ballard Mine has been defined adequately so that if necessary, risk assessments and the FS can be conducted. As a result, no further characterization is necessary. Monitoring of surface water will be required to collect baseline data to help evaluate the effectiveness of potential future remedies. Further evaluation of existing background data is needed to statistically quantify background concentrations.

TABLE 4-11 BALLARD MINE DATA GAP ANALYSIS – PRIMARY MEDIA Page 3 of 4						
Primary Medium	**Location of Summary Information[1]**	**Has Background been established?**	**Are Existing Data Adequate for these RI/FS Evaluations?**			**Data Gap Assessment Summary**
			Nature and Extent	**Risk Assessment**	**Feasibility Study**	
Sediment	See Section 3.2.3.2 See Table 3-10 See Drawings 3-9, 3-11, and 3-13	Adequate Data Exist	No	No	Yes	The nature and extent of sediment impacts at the Ballard Mine has been defined adequately for most COPCs so that if necessary, risk assessments and the FS can be conducted. However, some COPC concentrations in soil that exceed sediment screening criteria have not been measured in sediment. Further, there is evidence of soil erosion to the stream systems at the Site. Therefore, a data gap has been identified for the unmeasured soil COPCs in streams. In addition, further evaluation of existing background data is needed to statistically quantify background concentrations.
Groundwater	See Section 3.2.4 See Table 3-12 See Drawings 3-15 to 3-19	Adequate Data Exist	No	Yes - Sufficient for screening level analysis because contaminated areas with highest concentrations have been characterized	Treatability for MNA and in-situ remediation	<u>West Side of Mine</u> 1. Shallow Groundwater – west of BH137 – BH141, and BH143 - None (basalt area – limited shallow alluvial groundwater available for sampling but available data indicate concentrations below standard) 2. Shallow Groundwater–downgradient of BH125 / BH136 (near Blackfoot River)

TABLE 4-11
BALLARD MINE DATA GAP ANALYSIS – PRIMARY MEDIA

Primary Medium	Location of Summary Information[1]	Has Background been established?	Are Existing Data Adequate for these RI/FS Evaluations?			Data Gap Assessment Summary
			Nature and Extent	Risk Assessment	Feasibility Study	
						3. Shallow Groundwater – BH149 area (tributary to Little Blackfoot River) 4. Shallow Groundwater –for organic compounds downgradient of Ballard shop area 5. Dinwoody Formation – None 6. Wells Formation – Mine Interior groundwater flow (no action recommended) <u>East Side of Mine</u> 1. Shallow Groundwater – None 2. Dinwoody Formation – None 3. Wells Formation – None <u>Feasibility Data</u> 1. Data to support MNA 2. Data (pilot testing) to support in-situ groundwater remediation, and ex-situ seep water remediation 3. Data to support infiltration studies for in-place soil/cover material

Notes:
[1]Table 3-17 provides a summary of the nature and extent for primary media at the Ballard Mine.
MNA = Monitored Natural Attenuation

TABLE 4-12 HENRY MINE DATA GAP ANALYSIS – PRIMARY MEDIA Page 1 of 4						
Primary Medium	**Location of Summary Information[1]**	**Has Background been established?**	**Are Existing Data Adequate for these RI/FS Evaluations?**			**Data Gap Assessment Summary**
			Nature and Extent	**Risk Assessment**	**Feasibility Study**	
Source Materials	Section 3.1	Adequate Data Exist	Yes	Yes	Yes	The nature and extent of source materials has been defined adequately by the USGS and others so that if necessary, risk assessments and the feasibility study (FS) can be conducted. As a result, no further field characterization is necessary.
Soils	See Section 3.3.1 See Tables 3-18, 3-19, and 3-20 See Drawings 3-6, 3-28 and 3-30	Adequate Data Exist to characterize non-radiogenic risk only, further investigations will be necessary for radiogenic risks.	Yes – majority of site soils No – riparian soil No – Ballard shop area for organic compounds. No – radiogenic data in mined areas	Yes – majority of site soils No – riparian soil No – Ballard shop area for organic compounds. No – radiogenic data in mined areas	No – Some material property data is needed to conduct alternative evaluation.	The nature and extent of surface soil impacts at the Henry Mine has been defined adequately so that if necessary, risk assessments can be conducted for the non-radiogenic COPCs. However for radiogenic risks, to reduce the uncertainty in the inherently conservative risk calculations, site-specific uranium isotopes data for soil and radon and gamma measurements will be collected both on site and in a background area(s). Also, a data gap has been identified for sediment (see below) and this carries forward to riparian soils. Therefore some additional limited sampling of riparian soil is needed. In addition, some material properties data (soil hydraulic parameters) is needed for evaluation of cover soils.

TABLE 4-12 HENRY MINE DATA GAP ANALYSIS – PRIMARY MEDIA Page 2 of 4						
Primary Medium	**Location of Summary Information[1]**	**Has Background been established?**	**Are Existing Data Adequate for these RI/FS Evaluations?**			**Data Gap Assessment Summary**
			Nature and Extent	**Risk Assessment**	**Feasibility Study**	
						Further evaluation of existing background data is needed to statistically quantify background concentrations.
Vegetation	See Section 3.3.2 See Tables 3-21, 3-22, and 3-23 See Drawings 3-6, 3-29 and 3-31	Adequate Data Exist	Yes	Yes	Yes	The nature and extent of vegetation impacts at the Henry Mine has been defined adequately so that risk assessments and the FS can be conducted. As a result, no further field characterization is necessary. However, further evaluation of existing background data is needed to statistically quantify background concentrations.
Surface Water	See Section 3.3.3.1 See Table 3-24 See Drawings 3-8, 3-9, 3-10, 3-32 and 3-33	Adequate Data Exist	Yes	Yes	Yes	The nature and extent of surface water contamination at the Henry Mine has been defined adequately so that if necessary, risk assessments and the FS can be conducted. As a result, no further characterization is required. Monitoring of surface water will be required to collect baseline data to help evaluate the effectiveness of potential future remedies. Further evaluation of existing background data is needed to statistically quantify background concentrations.

TABLE 4-12 HENRY MINE DATA GAP ANALYSIS – PRIMARY MEDIA Page 3 of 4						
Primary Medium	**Location of Summary Information[1]**	**Has Background been established?**	**Are Existing Data Adequate for these RI/FS Evaluations?**			**Data Gap Assessment Summary**
			Nature and Extent	**Risk Assessment**	**Feasibility Study**	
Sediment	See Section 3.3.3.2 See Table 3-25 See Drawings 3-9, 3-13, and 3-32	Adequate Data Exist	Yes	No	Yes	The nature and extent of sediment impacts at the Henry Mine has been defined adequately for most COPCs so that risk assessments and the FS can be conducted. However, some COPC concentrations in soil that exceed sediment screening criteria have not been measured in sediment. However, soil erosion appears not have occurred to streams. Therefore, a limited data gap has been identified for the unmeasured soil COPCs in streams and Site ponds with aquatic habitat. However, further evaluation of existing background data is needed to statistically quantify background concentrations.

TABLE 4-12
HENRY MINE DATA GAP ANALYSIS – PRIMARY MEDIA

Primary Medium	Location of Summary Information[1]	Has Background been established?	Are Existing Data Adequate for these RI/FS Evaluations?			Data Gap Assessment Summary
			Nature and Extent	Risk Assessment	Feasibility Study	
Groundwater	See Section 3.3.4 See Table 3-27 See Drawings 3-35 and 3-36	Adequate Data Exist	No	Sufficient for screening level analysis because contaminated areas with highest concentrations have been characterized	Treatability for MNA and in-situ remediation	<u>North Side of Mine</u> 1. Shallow Groundwater - None 2. Dinwoody Formation - None 3. Wells Formation - None <u>South Side of Mine</u> 1. Shallow Groundwater–BH157/BH158 area 2. Dinwoody Formation - None 3. Wells Formation - None <u>Feasibility Data</u> 1. Data to support MNA 2. Data to support infiltration studies for in-place soil/cover material

Notes:
[1]Table 3-33 provides a summary of the nature and extent for primary media at the Henry Mine.
MNA = Monitored Natural Attenuation

TABLE 4-13 ENOCH VALLEY MINE DATA GAP ANALYSIS – PRIMARY MEDIA Page 1 of 4						
Primary Medium	**Location of Summary Information[1]**	**Has Background been established?**	**Are Existing Data Adequate for these RI/FS Evaluations?**			**Data Gap Assessment Summary**
			Nature and Extent	**Risk Assessment**	**Feasibility Study**	
Source Materials	Section 3.1	Adequate Data Exist	Yes	Yes	Yes	The nature and extent of source materials has been defined adequately by the USGS and others so that if necessary, risk assessments and the feasibility study (FS) can be conducted. As a result, no further field characterization is necessary.
Soils	See Section 3.4.1 See Tables 3-34, 3-35, and 3-36 See Drawings 3-6, 3-39 and 3-41	Adequate Data Exist to characterize non-radiogenic risk only, further investigations will be necessary for radiogenic risks.	Yes – majority of site soils No – riparian soil No – Ballard shop area for organic compounds. No – radiogenic data in mined areas	Yes – majority of site soils No – riparian soil No – Ballard shop area for organic compounds. No – radiogenic data in mined areas	No – Some material property data is needed to conduct alternative evaluation.	The nature and extent of surface soil impacts at the Enoch Valley Mine has been defined adequately so that if necessary, risk assessments can be conducted for the non-radiogenic COPCs. However for radiogenic risks, to reduce the uncertainty in the inherently conservative risk calculations, site-specific uranium isotopes data for soil and radon and gamma measurements will be collected both on site and in a background area(s). Also, a data gap has been identified for sediment (see below) and this carries forward to riparian soils. Therefore some additional limited sampling of riparian soil is needed. In addition, some material properties data (soil hydraulic parameters) is needed for evaluation of cover soils.

TABLE 4-13 ENOCH VALLEY MINE DATA GAP ANALYSIS – PRIMARY MEDIA Page 2 of 4						
Primary Medium	**Location of Summary Information[1]**	**Has Background been established?**	**Are Existing Data Adequate for these RI/FS Evaluations?**			**Data Gap Assessment Summary**
			Nature and Extent	**Risk Assessment**	**Feasibility Study**	
						Further evaluation of existing background data is needed to statistically quantify background concentrations.
Vegetation	See Section 3.4.2 See Tables 3-37, 3-38, and 3-39 See Drawings 3-6, 3-40 and 3-42	Adequate Data Exist	Yes	Yes	Yes	The nature and extent of vegetation impacts at the Enoch Valley Mine has been defined adequately so that risk assessments and the FS can be conducted. As a result, no further field characterization is necessary. However, further evaluation of existing background data is needed to statistically quantify background concentrations.
Surface Water	See Section 3.4.3.1 See Table 3-40 See Drawings 3-8, 3-9, 3-10, 3-43 and 3-44	Adequate Data Exist	Yes	Yes	Yes	The nature and extent of surface water contamination at the Enoch Valley Mine has been defined adequately so that if necessary, risk assessments and the FS can be conducted. As a result, no further characterization is necessary. Monitoring of surface water will be required to collect baseline data to help evaluate the effectiveness of potential future remedies. Further evaluation of existing background data is needed to statistically quantify background concentrations.

TABLE 4-13 ENOCH VALLEY MINE DATA GAP ANALYSIS – PRIMARY MEDIA Page 3 of 4						
Primary Medium	**Location of Summary Information[1]**	**Has Background been established?**	**Are Existing Data Adequate for these RI/FS Evaluations?**			**Data Gap Assessment Summary**
			Nature and Extent	**Risk Assessment**	**Feasibility Study**	
Sediment	See Section 3.4.3.2 See Table 3-41 See Drawings 3-9, 3-13, and 3-43	Adequate Data Exist	Yes	Yes	Yes	The nature and extent of sediment impacts at the Henry Mine has been defined adequately for most COPC so that risk assessments and the FS can be conducted. However, some COPC concentrations in soil that exceed sediment screening criteria have not been measured in sediment. However, soil erosion appears not have occurred to streams. Therefore, a limited data gap has been identified for the unmeasured soil COPCs in streams and Site ponds with aquatic habitat. In addition, further evaluation of existing background data is needed to statistically quantify background concentrations.

TABLE 4-13
ENOCH VALLEY MINE DATA GAP ANALYSIS – PRIMARY MEDIA

Primary Medium	Location of Summary Information[1]	Has Background been established?	Are Existing Data Adequate for these RI/FS Evaluations?			Data Gap Assessment Summary
			Nature and Extent	Risk Assessment	Feasibility Study	
Groundwater	See Section 3.4.4 See Table 3-43 See Drawings 3-45 and 3-46	Adequate Data Exist	No	Sufficient for screening level analysis because contaminated areas with highest concentrations have been characterized	Treatability for MNA and in-situ remediation	<u>North Side of Mine</u> 1. Shallow Groundwater - None 2. Dinwoody Formation – MMW027/MMW035 area 3. Wells Formation – None <u>South Side of Mine</u> 1. Shallow Groundwater - None 2. Dinwoody Formation - None 3. Wells Formation – None <u>Feasibility Data</u> 1. Data to support MNA 2. Data (pilot testing) to support in-situ groundwater remediation, and ex-situ seep water remediation 3. Data to support infiltration studies for in-place soil/cover material

Notes:
[1]Table 3-50 provides a summary of the nature and extent for primary media at the Enoch Valley Mine.
MNA = Monitored Natural Attenuation

TABLE 4-14 BALLARD MINE DATA GAP ANALYSIS – SECONDARY MEDIA Page 1 of 3					
Secondary Medium	**Location of Summary Information[1]**	**Was Background Data Collected?**	**Are Existing Data Adequate for these RI/FS Evaluations?**		**Data Gap Assessment Summary**
		(yes/no)	**Risk Assessment**	**Feasibility Study**	
Aquatic Biota					
Stream Habitat Assessment	See Section 3.2.5.1 See Table 3-13 See Drawing 3-21	Yes	Yes	Yes	Sufficient stream habitat data have been collected at the Ballard Mine so that if necessary, risk assessments and the FS can be conducted. Data show that many streams are intermittent and represent poor quality aquatic habitat. Fish were not found and habitat assessment scores (RBS scores) ranged from 29 to 52 out of 200.
Fish	See Section 3.2.5.2 No Associated Table See Drawings 3-20 and 3-21	Yes	Yes	Yes	Sufficient fish investigations have been performed at the Ballard Mine for the intended purpose as additional lines of evidence in the human health and/or ecological risk assessment. Fish were not located during the investigation due to the intermittent nature of the steams and the poor aquatic habitat. The need for additional sampling of this media could be a possible outcome of the risk assessment for the P4 Sites.
Benthic Macroinvertebrates	See Section 3.2.5.3 See Table 3-14 See Drawing 3-21	Yes	Yes	Yes	Sufficient benthic macroinvertebrate data have been collected at the Ballard Mine for their intended purpose as additional lines of evidence in the human health and/or ecological risk assessment. As indicated in Section 3.2.5.3, adequate sample mass were difficult to obtain likely as a result of poor aquatic habitat. The need for additional sampling of this media could be a possible outcome of the risk assessment for the P4 Sites.

TABLE 4-14 BALLARD MINE DATA GAP ANALYSIS – SECONDARY MEDIA Page 2 of 3					
Secondary Medium	**Location of Summary Information[1]**	**Was Background Data Collected?**	**Are Existing Data Adequate for these RI/FS Evaluations?**		**Data Gap Assessment Summary**
		(yes/no)	**Risk Assessment**	**Feasibility Study**	
Terrestrial Biota					
Elk	See Section 3.2.6.1 No Associated Table See Drawings 3-22 and 3-26	Yes	Yes	Yes	Sufficient elk data have been collected around the P4 Sites for their intended purpose as additional lines of evidence in the human health and/or ecological risk assessment. The need for additional sampling of this media could be a possible outcome of the risk assessment for the P4 Sites.
Bird Eggs	See Section 3.2.6.2 No Associated Table See Drawings 3-23 to 3-26	Yes	Yes	Yes	Sufficient bird egg data have been collected around the P4 Sites their intended purpose as additional lines of evidence in the human health and/or ecological risk assessment. The need for additional sampling of this media could be a possible outcome of the risk assessment for the P4 Sites.
Cattle	Section 3.3.6.3 Henry Mine	Yes	Section 3.3.6.3 Henry Mine	Section 3.3.6.3 Henry Mine	Refer to Section 3.3.6.3 Henry Mine for discussion of cattle tissue studies
Small Mammals	See Section 3.2.6.4 See Table 3-15 Drawings 3-22 and 3-26	Yes	Yes	Yes	Sufficient small mammal data have been collected at the Ballard Mine for their intended purpose as additional lines of evidence in the human health and/or ecological risk assessment. The need for additional sampling of this media could be a possible outcome of the risk assessment for the P4 Sites.

TABLE 4-14 BALLARD MINE DATA GAP ANALYSIS – SECONDARY MEDIA Page 3 of 3					
Secondary Medium	**Location of Summary Information[1]**	**Was Background Data Collected?**	**Are Existing Data Adequate for these RI/FS Evaluations?**		**Data Gap Assessment Summary**
		(yes/no)	**Risk Assessment**	**Feasibility Study**	
Terrestrial Invertebrates	See Section 3.2.6.5 See Table 3-16 Drawings 3-22 and 3-26	Yes	Yes	Yes	Sufficient terrestrial invertebrate data have been collected at the Ballard Mine for their intended purpose as additional lines of evidence in the human health and/or ecological risk assessment. The need for additional sampling of this media could be a possible outcome of the risk assessment for the P4 Sites.

Notes:
[1]Table 3-17 provides a summary of the nature and extent for secondary media at the Ballard Mine.

TABLE 4-15 HENRY MINE DATA GAP ANALYSIS – SECONDARY MEDIA Page 1 of 3					
Secondary Medium	**Location of Summary Information[1]**	**Was Background Data Collected?**	**Are Existing Data Adequate for these RI/FS Evaluations?**		**Data Gap Assessment Summary**
		(yes/no)	**Risk Assessment**	**Feasibility Study**	
Aquatic Biota					
Stream Habitat Assessment	See Section 3.3.5.1 See Table 3-28 See Drawing 3-21	Yes	Yes	Yes	Sufficient stream habitat data have been collected at the Henry Mine so that if necessary, risk assessments and the FS can be conducted.
Fish	See Section 3.3.5.2 See Table 3-29 See Drawings 3-20 and 3-21	Yes	Yes	Yes	Sufficient fish data have been collected at the Henry Mine for their intended purpose as additional lines of evidence in the human health and/or ecological risk assessment. The need for additional sampling of this media could be a possible outcome of the risk assessment for the P4 Sites.
Benthic Macroinvertebrates	See Section 3.3.5.3 See Table 3-30 See Drawing 3-21	Yes	Yes	Yes	Sufficient benthic macroinvertebrate data have been collected at the Henry Mine for their intended purpose as additional lines of evidence in the human health and/or ecological risk assessment. The need for additional sampling of this media could be a possible outcome of the risk assessment for the P4 Sites.

TABLE 4-15 HENRY MINE DATA GAP ANALYSIS – SECONDARY MEDIA Page 2 of 3					
Secondary Medium	**Location of Summary Information[1]**	**Was Background Data Collected?**	**Are Existing Data Adequate for these RI/FS Evaluations?**		**Data Gap Assessment Summary**
		(yes/no)	**Risk Assessment**	**Feasibility Study**	
Terrestrial Biota					
Elk	See Section 3.3.6.1 No Associated Table See Drawings 3-22 and 3-26	Yes	Yes	Yes	Sufficient elk data have been collected around the P4 Sites for their intended purpose as additional lines of evidence in the human health and/or ecological risk assessment. The need for additional sampling of this media could be a possible outcome of the risk assessment for the P4 Sites.
Bird Eggs	See Section 3.3.6.2 No Associated Table See Drawings 3-23 to 3-26	Yes	Yes	Yes	Sufficient bird egg data have been collected around the P4 Sites for their intended purpose as additional lines of evidence in the human health and/or ecological risk assessment. The need for additional sampling of this media could be a possible outcome of the risk assessment for the P4 Sites.
Cattle	See Section 3.3.6.2 No Associated Table See Drawings 3-37	Yes	Yes	Yes	Sufficient cattle data have been collected at the Henry Mine for their intended purpose as additional lines of evidence in the human health and/or ecological risk assessment. The need for additional sampling of this media could be a possible outcome of the risk assessment for the P4 Sites.

TABLE 4-15
HENRY MINE DATA GAP ANALYSIS – SECONDARY MEDIA

Secondary Medium	Location of Summary Information[1]	Was Background Data Collected?	Are Existing Data Adequate for these RI/FS Evaluations?		Data Gap Assessment Summary
		(yes/no)	Risk Assessment	Feasibility Study	
Small Mammals	See Section 3.3.6.4 See Table 3-31 See Drawings 3-22 and 3-37	Yes	Yes	Yes	Sufficient small mammal data have been collected at the Henry Mine for their intended purpose as additional lines of evidence in the human health and/or ecological risk assessment. The need for additional sampling of this media could be a possible outcome of the risk assessment for the P4 Sites.
Terrestrial Invertebrates	See Section 3.2.6.5 See Table 3-32 See Drawings 3-22 and 3-37	Yes	Yes	Yes	Sufficient terrestrial invertebrate data have been collected at the Henry Mine for their intended purpose as additional lines of evidence in the human health and/or ecological risk assessment. The need for additional sampling of this media could be a possible outcome of the risk assessment for the P4 Sites.

Notes:

[1]Table 3-33 provides a summary of the nature and extent for secondary media at the Henry Mine.

TABLE 4-16 ENOCH VALLEY MINE DATA GAP ANALYSIS – SECONDARY MEDIA Page 1 of 3					
Secondary Medium	**Location of Summary Information[1]**	**Was Background Data Collected?**	**Are Existing Data Adequate for these RI/FS Evaluations?**		**Data Gap Assessment Summary**
		(yes/no)	**Risk Assessment**	**Feasibility Study**	
Aquatic Biota					
Stream Habitat Assessment	See Section 3.4.5.1 See Table 3-44 See Drawing 3-21	Yes	Yes	Yes	Sufficient stream habitat data have been collected at the Enoch Valley Mine so that if necessary, risk assessments and the FS can be conducted.
Fish	See Section 3.4.5.2 See Tables 3-45 and 3-46 See Drawings 3-20 and 3-21	Yes	Yes	Yes	Sufficient fish data have been collected at the Enoch Valley Mine for their intended purpose as additional lines of evidence in the human health and/or ecological risk assessment. The need for additional sampling of this media could be a possible outcome of the risk assessment for the P4 Sites.
Benthic Macroinvertebrates	See Section 3.4.5.3 See Table 3-47 See Drawing 3-21	Yes	Yes	Yes	Sufficient benthic macroinvertebrate data have been collected at the Enoch Valley Mine for their intended purpose as additional lines of evidence in the human health and/or ecological risk assessment. The need for additional sampling of this media could be a possible outcome of the risk assessment for the P4 Sites.

TABLE 4-16 ENOCH VALLEY MINE DATA GAP ANALYSIS – SECONDARY MEDIA Page 2 of 3					
Secondary Medium	**Location of Summary Information[1]**	**Was Background Data Collected?**	**Are Existing Data Adequate for these RI/FS Evaluations?**		**Data Gap Assessment Summary**
		(yes/no)	**Risk Assessment**	**Feasibility Study**	
Terrestrial Biota					
Elk	See Section 3.4.6.1 No Associated Table See Drawings 3-22 and 3-26	Yes	Yes	Yes	Sufficient elk data have been collected around P4 Sites for their intended purpose as additional lines of evidence in the human health and/or ecological risk assessment. The need for additional sampling of this media could be a possible outcome of the risk assessment for the P4 Sites.
Bird Eggs	See Section 3.4.6.2 No Associated Table See Drawings 3-23 to 3-26	Yes	Yes	Yes	Sufficient bird egg data have been collected around the P4 Sites for their intended purpose as additional lines of evidence in the human health and/or ecological risk assessment. The need for additional sampling of this media could be a possible outcome of the risk assessment for the P4 Sites.
Cattle	Section 3.3.6.3 Henry Mine	Yes	Section 3.3.6.3 Henry Mine	Section 3.3.6.3 Henry Mine	Refer to Section 3.3.6.3 Henry Mine for discussion of cattle tissue studies
Small Mammals	See Section 3.4.6.4 See Table 3-48 See Drawings 3-22 and 3-47	Yes	Yes	Yes	Sufficient small mammal data have been collected at the Enoch Valley Mine for their intended purpose as additional lines of evidence in the human health and/or ecological risk assessment. The need for additional sampling of this media could be a possible outcome of the risk assessment for the P4 Sites.

TABLE 4-16
ENOCH VALLEY MINE DATA GAP ANALYSIS – SECONDARY MEDIA

Secondary Medium	Location of Summary Information[1]	Was Background Data Collected?	Are Existing Data Adequate for these RI/FS Evaluations?		Data Gap Assessment Summary
		(yes/no)	Risk Assessment	Feasibility Study	
Terrestrial Invertebrates	See Section 3.4.6.5 See Table 3-49 See Drawings 3-22 and 3-47	Yes	Yes	Yes	Sufficient terrestrial invertebrate data have been collected at the Enoch Valley Mine for their intended purpose as additional lines of evidence in the human health and/or ecological risk assessment. The need for additional sampling of this media could be a possible outcome of the risk assessment for the P4 Sites.

Notes:

[1]Table 3-50 provides a summary of the nature and extent for secondary media at the Enoch Valley Mine.

LEGEND:

- P4 PRODUCTION HAUL ROAD (ACTIVE & INACTIVE)
- MINE PIT LOCATION (APPROXIMATE WHERE COVERED BY BACKFILL)
- WASTE ROCK PILE LOCATION OR PIT BACKFILL (APPROXIMATE)

KEY:

MMP = MINE PIT
MWD = WASTE ROCK DUMP

KEY MAP
N.T.S.

ISSUED DRAFT FOR AGENCY REVIEW 7/6/10

ISSUE REV	DESCRIPTION	TECH	ENG	DATE
0	ISSUED DRAFT FOR AGENCY REVIEW	CHF	LWM	07/06/10

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2. ORIGINAL FILE LOCATED: N:\Design-Drafting\Clients_I-P\Monsanto Company\006-Photos-Images\1005813 Ortho-Final.tif.

PROJECTION: STATE PLANE COORDINATE SYSTEM
ZONE: IDAHO EAST
HORIZONTAL DATUM: NAD27
VERTICAL DATUM: NGVD29
UNITS: U.S. FEET

DESIGNED BY	C DUFFY	07/06/10
DRAWN BY	C FOWLER	07/06/10
CHECKED BY	E MARKS	07/06/10
APPROVED BY	C FOULK	07/06/10
PROJECT MANAGER	V DRAIN	07/06/10
CLIENT APPROVAL	B KOCH	07/06/10
CLIENT REFERENCE NO.		

P4 Production, LLC

PROJECT LOCATION: BALLARD, HENRY AND ENOCH VALLEY MINES
PROJECT: RI/FS WORK PLAN
TITLE: MINE AREA LOCATION MAP

MWH

DRAWING: 1-1
REVISION: 0
FILE NAME: 1005813D172

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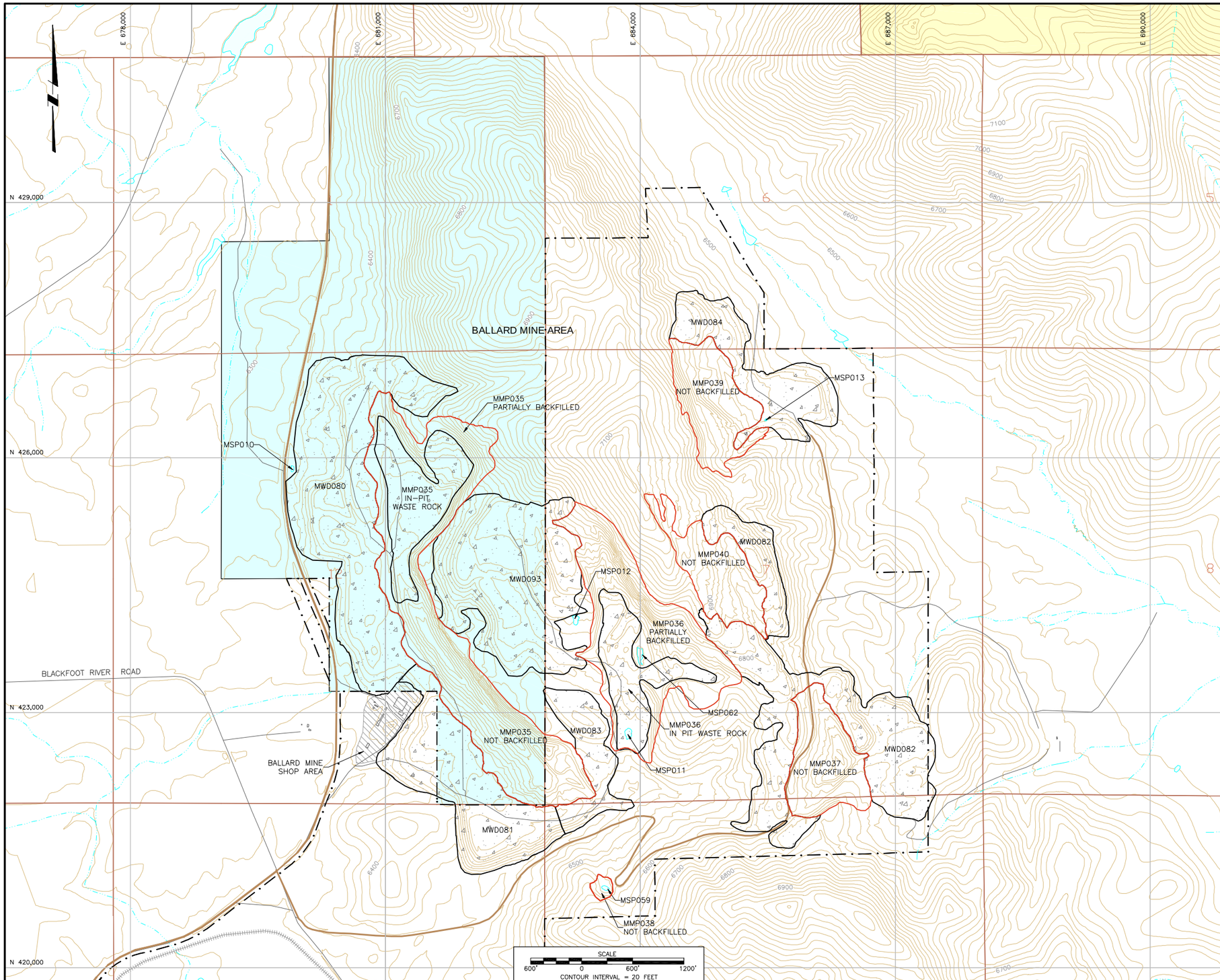

LEGEND:

- POST–MINE CONTOUR AND ELEVATION, FEET (APPROXIMATE)
- RIVER
- POND OR LAKE
- NATURAL DRAINAGE – PERENNIAL
- NATURAL DRAINAGE – INTERMITTENT
- HIGHWAY
- ROAD
- MONSANTO HAUL ROAD (ACTIVE & INACTIVE)
- RAILROAD
- MINE PIT LOCATION (APPROXIMATE WHERE COVERED BY BACKFILL)
- WASTE ROCK DUMP LOCATION (APPROXIMATE)
- WASTE ROCK DUMP LOCATION OR PIT BACKFILL (APPROXIMATE)
- APPROXIMATE OWNERSHIP BOUNDARY
- SECTION LINES
- A SECTION NUMBER
- BLM LANDS
- US NATIONAL FORESTS
- STATE LANDS
- NON FEDERAL LANDS

KEY:

MMP = MINE PIT
MWD = WASTE ROCK DUMP
MSP = POND

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- SURVEY DATA FOR HENRY MINE AREA PROVIDED BY OLYMPUS AERIAL SURVEYS, INC. DATED: NOVEMBER 2008.
- SURVEY DATA FOR ENOCH VALLEY MINE AREA PROVIDED BY P4 PRODUCTION DATED: DECEMBER 2007.
- US CENSUS BUREAU 2007 TIGER LINE DATA

PROJECTION: STATE PLANE COORDINATE SYSTEM
ZONE: IDAHO EAST
HORIZONTAL DATUM: NAD27
VERTICAL DATUM: NGVD29
UNITS: U.S. FEET

DESIGNED BY	C DUFFY	07/06/10
DRAWN BY	C FOWLER	07/06/10
CHECKED BY	E MARKS	07/06/10
APPROVED BY	C FOULK	07/06/10
PROJECT MANAGER	V DRAIN	07/06/10
CLIENT APPROVAL	B KOCH	07/06/10
CLIENT REFERENCE NO.		

P4 Production, LLC

PROJECT LOCATION: BALLARD, HENRY AND ENOCH VALLEY MINES
PROJECT: RI/FS WORK PLAN
TITLE: BALLARD MINE AREA DELINEATION MAP

MWH

DRAWING 2-1
REVISION 0
FILE NAME 1005813D173

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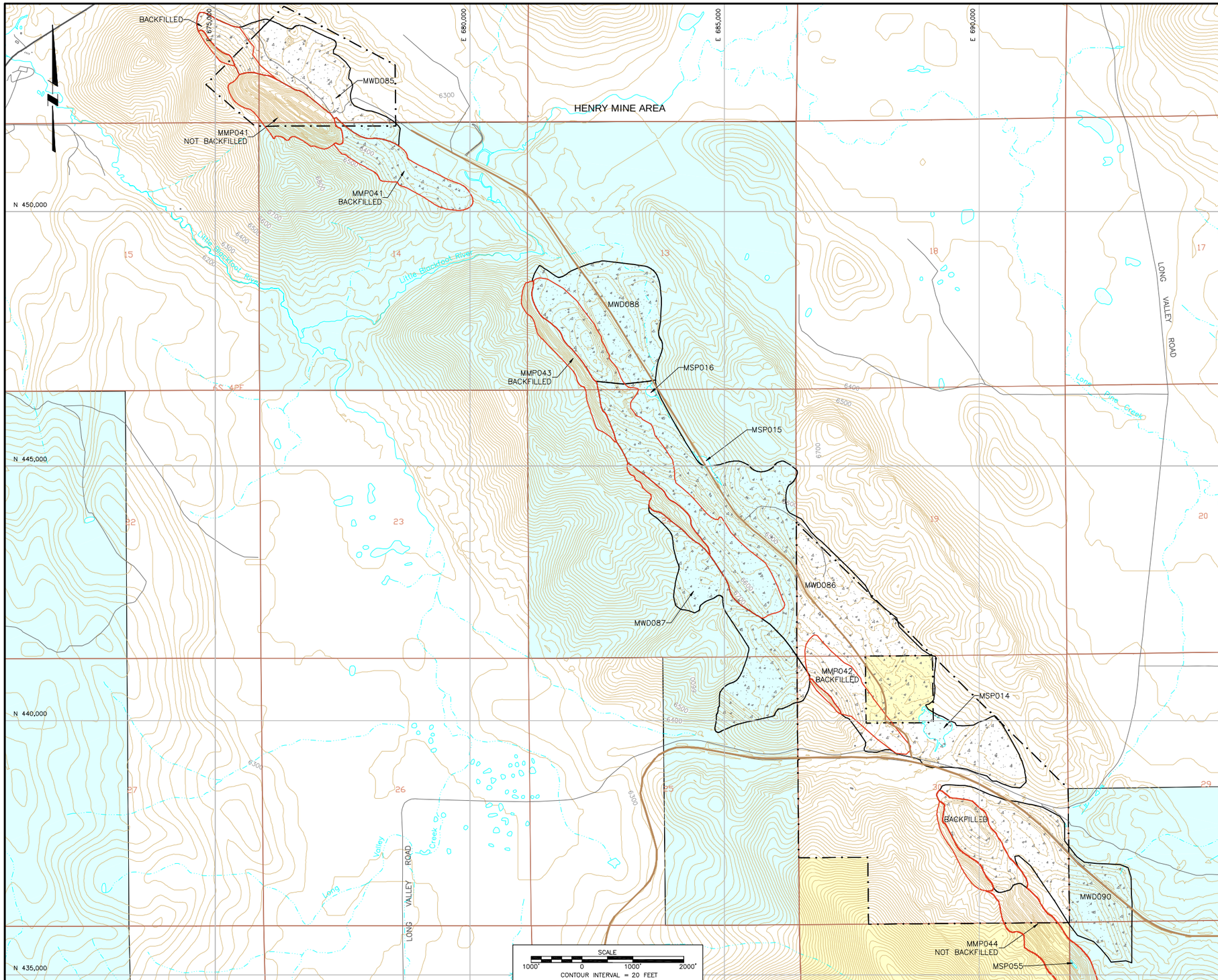

LEGEND:

- POST–MINE CONTOUR AND ELEVATION, FEET (APPROXIMATE)
- RIVER
- POND OR LAKE
- NATURAL DRAINAGE – PERENNIAL
- NATURAL DRAINAGE – INTERMITTENT
- HIGHWAY
- ROAD
- MONSANTO HAUL ROAD (ACTIVE & INACTIVE)
- RAILROAD
- MINE PIT LOCATION (APPROXIMATE WHERE COVERED BY BACKFILL)
- WASTE ROCK DUMP LOCATION (APPROXIMATE)
- WASTE ROCK DUMP LOCATION OR PIT BACKFILL (APPROXIMATE)
- APPROXIMATE OWNERSHIP BOUNDARY
- SECTION LINES
- A SECTION NUMBER
- BLM LANDS
- US NATIONAL FORESTS
- STATE LANDS
- NON FEDERAL LANDS

KEY:

MMP = MINE PIT
MWD = WASTE ROCK DUMP
MSP = POND

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- SURVEY DATA FOR ENOCH VALLEY MINE AREA PROVIDED BY P4 PRODUCTION DATED: DECEMBER 2007.
- US CENSUS BUREAU 2007 TIGER LINE DATA

PROJECTION: STATE PLANE COORDINATE SYSTEM
ZONE: IDAHO EAST
HORIZONTAL DATUM: NAD27
VERTICAL DATUM: NGVD29
UNITS: U.S. FEET

DESIGNED BY	C DUFFY	07/06/10
DRAWN BY	C FOWLER	07/06/10
CHECKED BY	E MARKS	07/06/10
APPROVED BY	C FOULK	07/06/10
PROJECT MANAGER	V DRAIN	07/06/10
CLIENT APPROVAL	B KOCH	07/06/10
CLIENT REFERENCE NO.		

P4 Production, LLC

PROJECT LOCATION: BALLARD, HENRY AND ENOCH VALLEY MINES
PROJECT: RI/FS WORK PLAN
TITLE: HENRY MINE AREA DELINEATION MAP

MWH

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FILE NAME 1005813D174

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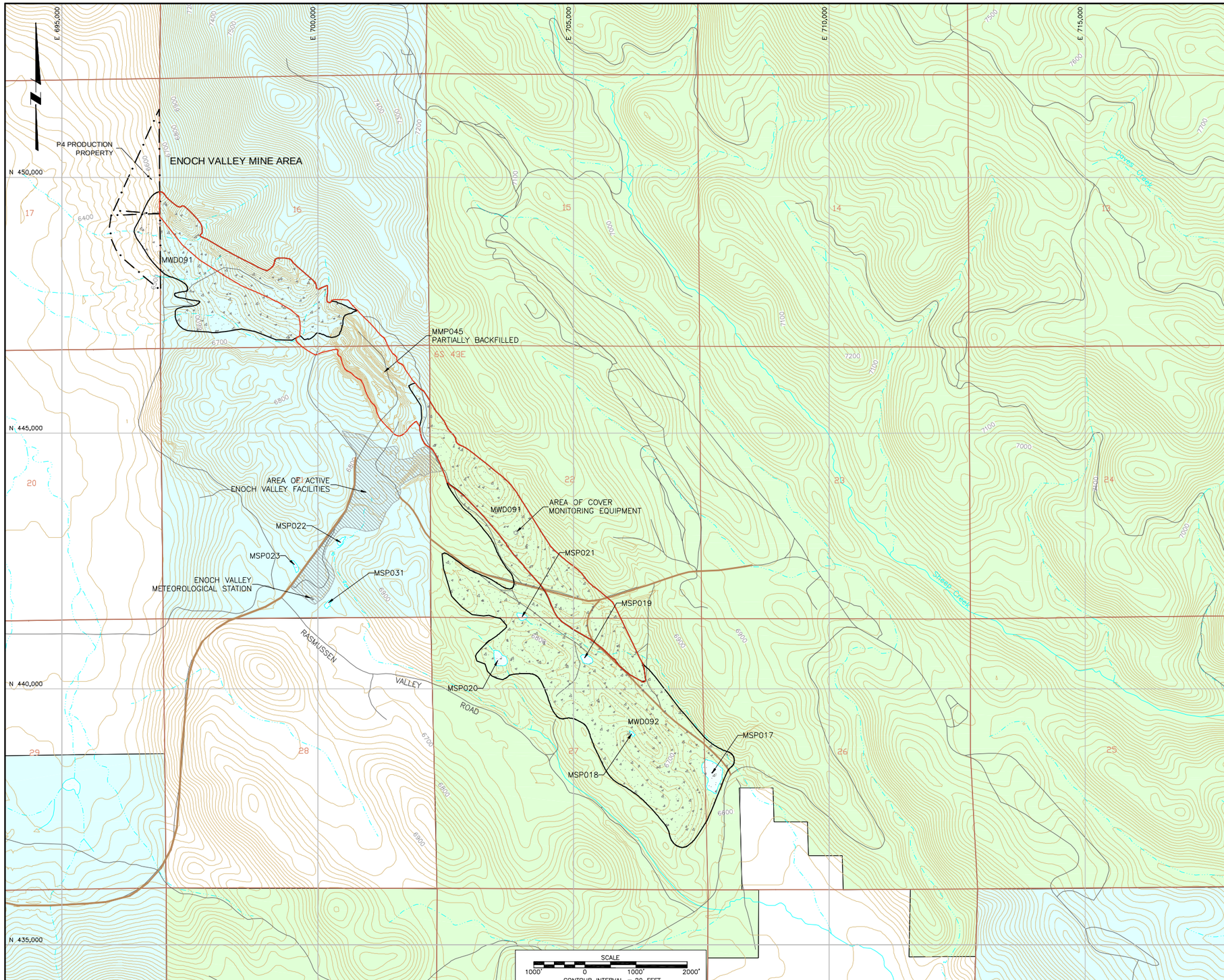

LEGEND:

- POST–MINE CONTOUR AND ELEVATION, FEET (APPROXIMATE)
- RIVER
- POND OR LAKE
- NATURAL DRAINAGE – PERENNIAL
- NATURAL DRAINAGE – INTERMITTENT
- HIGHWAY
- ROAD
- MONSANTO HAUL ROAD (ACTIVE & INACTIVE)
- RAILROAD
- MINE PIT LOCATION (APPROXIMATE WHERE COVERED BY BACKFILL)
- WASTE ROCK DUMP LOCATION (APPROXIMATE)
- WASTE ROCK DUMP LOCATION OR PIT BACKFILL (APPROXIMATE)
- APPROXIMATE OWNERSHIP BOUNDARY
- SECTION LINES
- A SECTION NUMBER
- BLM LANDS
- US NATIONAL FORESTS
- STATE LANDS
- NON FEDERAL LANDS

KEY:

MMP = MINE PIT
MWD = WASTE ROCK DUMP
MSP = POND

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- SURVEY DATA FOR HENRY MINE AREA PROVIDED BY OLYMPUS AERIAL SURVEYS, INC. DATED: NOVEMBER 2008.
- SURVEY DATA FOR ENOCH VALLEY MINE AREA PROVIDED BY P4 PRODUCTION DATED: DECEMBER 2007.
- US CENSUS BUREAU 2007 TIGER LINE DATA

PROJECTION: STATE PLANE COORDINATE SYSTEM
ZONE: IDAHO EAST
HORIZONTAL DATUM: NAD27
VERTICAL DATUM: NGVD29
UNITS: U.S. FEET

DESIGNED BY	C DUFFY	07/06/10
DRAWN BY	C FOWLER	07/06/10
CHECKED BY	E MARKS	07/06/10
APPROVED BY	C FOULK	07/06/10
PROJECT MANAGER	V DRAIN	07/06/10
CLIENT APPROVAL	B KOCH	07/06/10
CLIENT REFERENCE NO.		

P4 Production, LLC

PROJECT LOCATION: BALLARD, HENRY AND ENOCH VALLEY MINES
PROJECT: RI/FS WORK PLAN
TITLE: ENOCH VALLEY MINE AREA DELINEATION MAP

MWH

DRAWING 2-3
REVISION 0
FILE NAME 1005813D175

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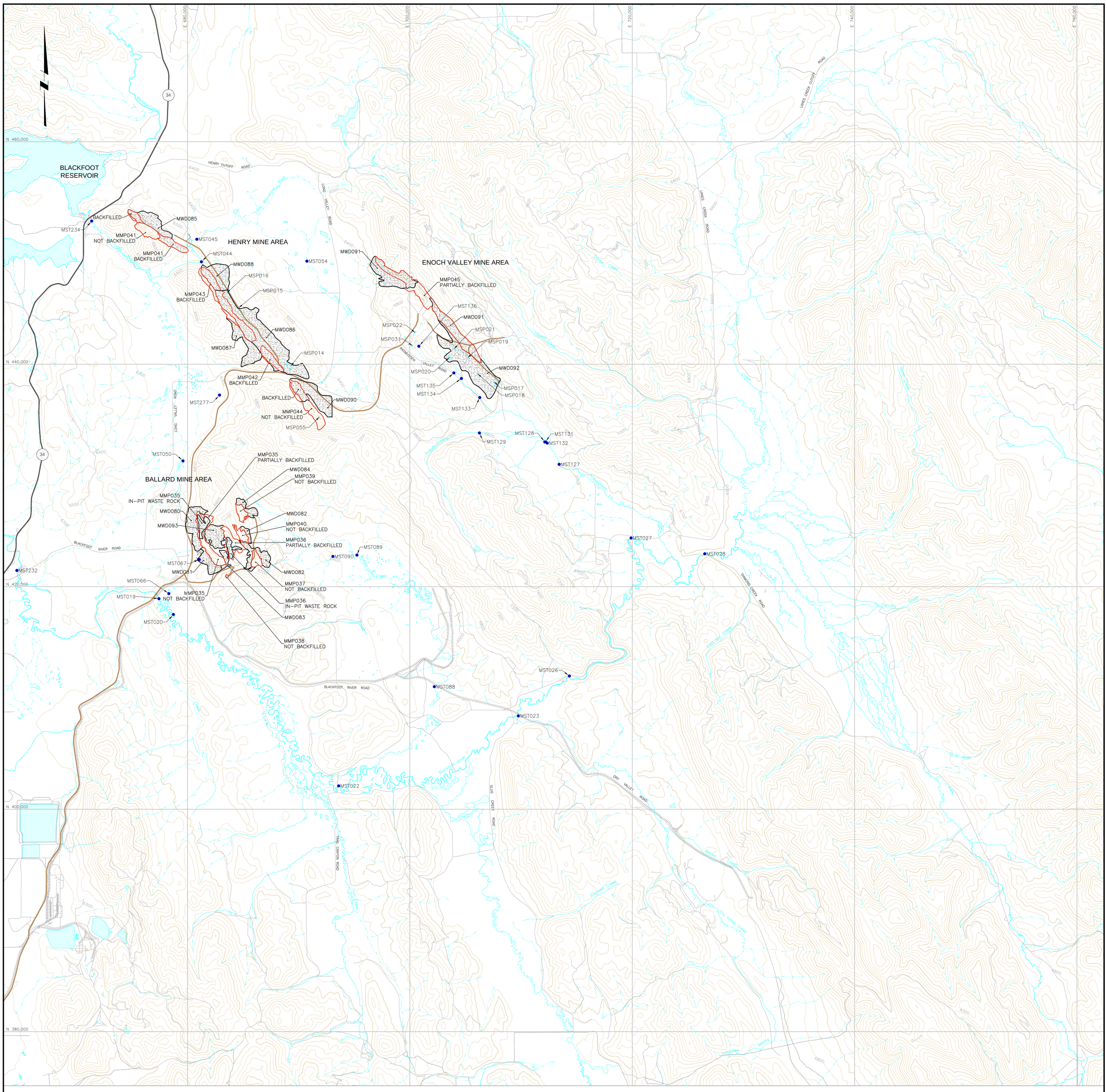

SCALE
3000' 0 3000' 6000'
CONTOUR INTERVAL = 100 FEET

LEGEND:

- 7000 — POST-MINE CONTOUR AND ELEVATION, FEET (APPROXIMATE)
- RIVER
- POND OR LAKE
- NATURAL DRAINAGE – PERENNIAL
- NATURAL DRAINAGE – INTERMITTENT
- HIGHWAY
- ROAD
- MONSANTO HAUL ROAD (ACTIVE & INACTIVE)
- RAILROAD
- MINE PIT LOCATION (APPROXIMATE WHERE COVERED BY BACKFILL)
- WASTE ROCK DUMP LOCATION (APPROXIMATE)
- WASTE ROCK DUMP LOCATION OR PIT BACKFILL (APPROXIMATE)

STATION TYPE:

- MST = STREAM MONITORING LOCATION (SEE NOTE 1)

KEY:

MMP = MINE PIT
MWD = WASTE ROCK DUMP
MSP = POND

NOTES:

1. ONLY FLOW MONITORING LOCATIONS DISCUSSED IN THE DOCUMENT ARE SHOWN ON THIS DRAWING.

ISSUED DRAFT FOR AGENCY REVIEW 7/6/10

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DRAWING REFERENCE(S):
1. POST-MINE TOPOGRAPHY GENERATED FROM:
- USGS DIGITAL ELEVATION MODELS (DEM)-24K.
- SURVEY DATA FOR BALLARD MINE PROVIDED BY OLYMPUS AERIAL SURVEYS, INC. DATED: JUNE 2005.
- SURVEY DATA FOR HENRY MINE AREA PROVIDED BY OLYMPUS AERIAL SURVEYS, INC. DATED: NOVEMBER 2006.
- SURVEY DATA FOR ENOCH VALLEY MINE AREA PROVIDED BY P4 PRODUCTION DATED: DECEMBER 2007.
- US CENSUS BUREAU 2007 TIGER LINE DATA

PROJECTION: STATE PLANE COORDINATE SYSTEM
ZONE: IDAHO EAST
HORIZONTAL DATUM: NAD27
VERTICAL DATUM: NGVD29
UNITS: U.S. FEET

DESIGNED BY	C DUFFY	07/06/10
DRAWN BY	C FOWLER	07/06/10
CHECKED BY	E MARKS	07/06/10
APPROVED BY	C FOULK	07/06/10
PROJECT MANAGER	V DRAIN	07/06/10
CLIENT APPROVAL	B KOCH	07/06/10
CLIENT REFERENCE NO.		

P4 Production, LLC

PROJECT LOCATION: BALLARD, HENRY AND ENOCH VALLEY MINES
PROJECT: RI/FS WORK PLAN
TITLE: AREA WIDE HYDROLOGY MAP

MWH

DRAWING 2-4
REVISION 0
FILE NAME 1005813D199

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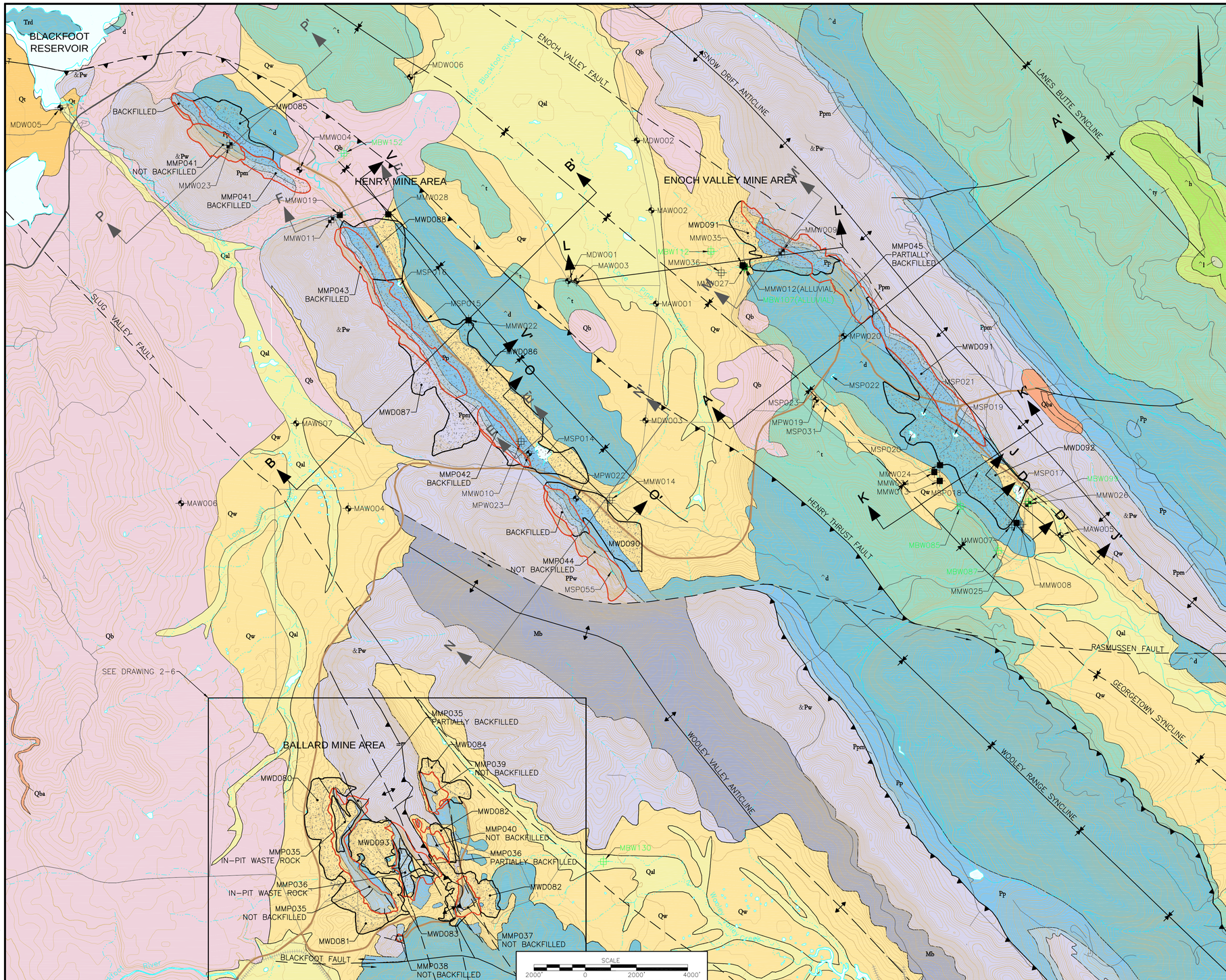

LEGEND:

- POST–MINE CONTOUR AND ELEVATION, FEET (APPROXIMATE)
- RIVER
- POND OR LAKE
- NATURAL DRAINAGE – PERENNIAL
- NATURAL DRAINAGE – INTERMITTENT
- HIGHWAY
- ROAD
- MONSANTO HAUL ROAD (ACTIVE & INACTIVE)
- RAILROAD
- MINE PIT LOCATION (APPROXIMATE WHERE COVERED BY BACKFILL)
- WASTE ROCK DUMP LOCATION (APPROXIMATE)
- WASTE ROCK DUMP LOCATION OR PIT BACKFILL (APPROXIMATE)
- FAULT
- THRUST FAULT (DASHED WHERE INFERRED)
- APPROXIMATE OR INFERRED FAULT
- AXIS SYNCLINE (DASHED WHERE INFERRED)
- AXIS ANTICLINE (DASHED WHERE INFERRED)

STATION TYPE:

- MAW = AGRICULTURAL WELL
- MDW = DOMESTIC WELL
- MPW = PRODUCTION WELL
- MMW = LOCAL AQUIFER MONITORING WELL (GENERALLY ALLUVIAL SYSTEM)
- MMW = INTERMEDIATE AQUIFER MONITORING WELL (GENERALLY DINWOODY FM.)
- MMW = REGIONAL AQUIFER MONITORING WELL (WELLS FM.)
- MMW = AQUIFER MONITORING WELL (UNKNOWN OR MULTIPLE AQUIFERS SCREENED)
- MBW = DIRECT PUSH ALLUVIAL AQUIFER WELL

GEOLOGIC KEY:

- Qb — BASALT
- Qba — BASALTIC ASH – TUFF
- Qal — ALLUVIUM
- Qt — TRAVERTINE
- Qw — COLLUVIUM AND OLDER ALLUVIUM
- ^l — DEADMAN LIMESTONE
- ^h — HIGHAM GRIT
- ^t — THAYNES FORMATION
- ^ty — TIMOTHY SANDSTONE – THAYNES MEMBER
- ^d — DINWOODY FORMATION – WOODSIDE SHALE
- Pp / Ppm — PHOSPHORIA FORMATION MEADE PEAK MEMBER
- &Pw — WELLS FORMATION
- Mb — BRAZER LIMESTONE
- Mm — MADISON LIMESTONE

KEY:

MMP = MINE PIT
MWD = WASTE ROCK DUMP
MSP = POND

NOTE:

1. SHADED SECTION LINES INDICATE SECTIONS NOT PRESENTED IN THIS RI/FS WORK PLAN, BUT ARE AVAILABLE IN EARLIER DOCUMENT. SUCH AS THE 2007/2008 DATA SUMMARY REPORT (MWH, 2009b).
2. GEOLOGIC DATA SOURCES: OBERLINDACHER, ET AL., 1982; HOVLAND, 1981; MANSFIELD, 1927; OBERLINDACHER, 1990. MAP HAS IN PART BEEN UPDATED BASED ON OBERLINDACHER, ET AL., UNPUBLISHED. SHA

ISSUE REV	DESCRIPTION	TECH	ENG	DATE
1	FINAL	CHF	LWM	02/24/11
0	ISSUED DRAFT FOR AGENCY REVIEW	CHF	LWM	07/06/10

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- SURVEY DATA FOR ENOCH VALLEY MINE AREA PROVIDED BY P4 PRODUCTION DATED: DECEMBER 2007.
- US CENSUS BUREAU 2007 TIGER LINE DATA

DESIGNED BY	C DUFFY	02/24/11
DRAWN BY	C FOWLER	02/24/11
CHECKED BY	E MARKS	02/24/11
APPROVED BY	C FOULK	02/24/11
PROJECT MANAGER	V DRAIN	02/24/11
CLIENT APPROVAL	B KOCH	02/24/11
CLIENT REFERENCE NO.		

P4 Production, LLC

PROJECT LOCATION: BALLARD, HENRY AND ENOCH VALLEY MINES
PROJECT: RI/FS WORK PLAN
TITLE: AREA WIDE GENERALIZED GEOLOGIC MAP

MWH

DRAWING 2-5 | REVISION 1
FILE NAME 1005813D186

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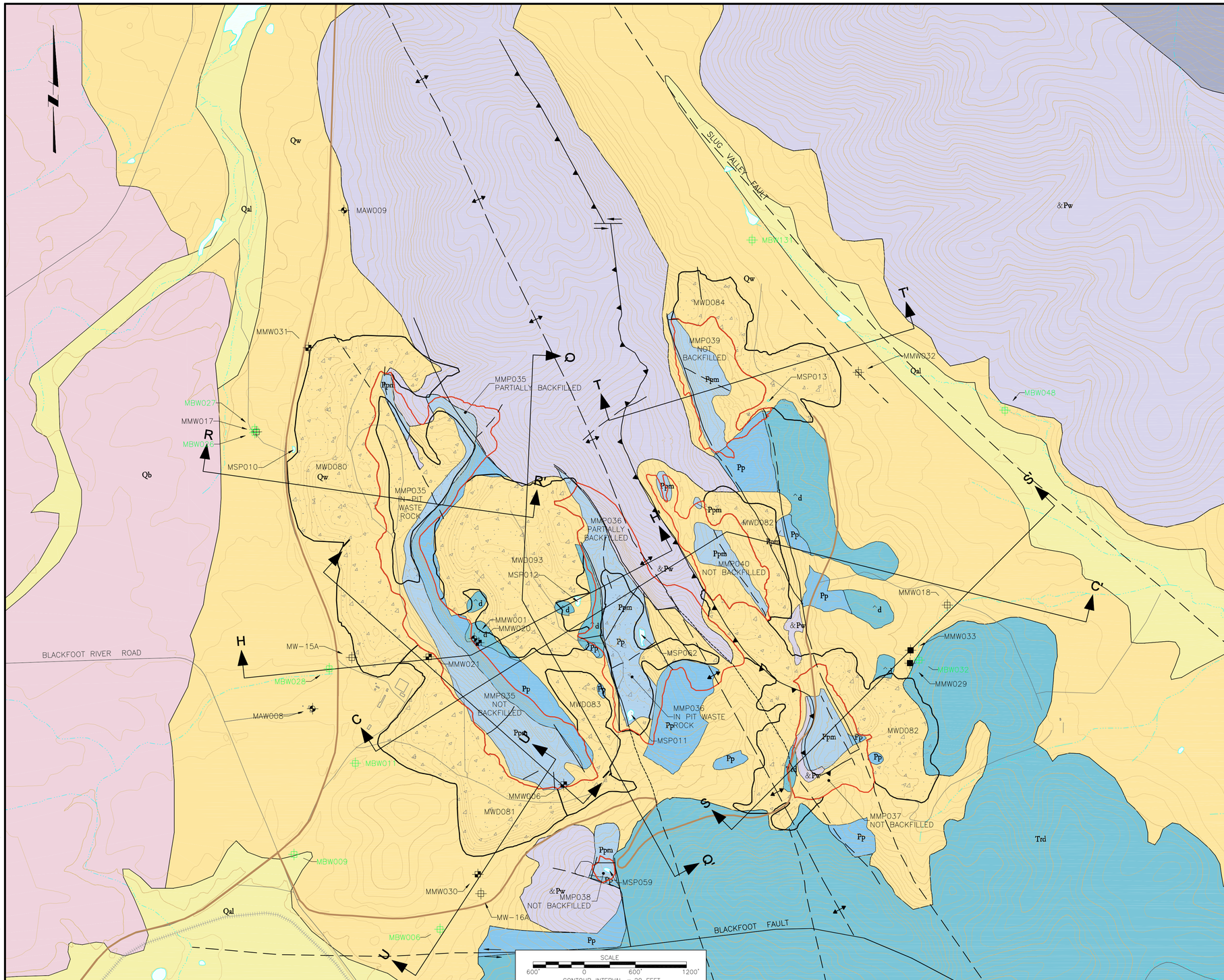

LEGEND:

- POST-MINE CONTOUR AND ELEVATION, FEET (APPROXIMATE)
- RIVER
- POND OR LAKE
- NATURAL DRAINAGE – PERENNIAL
- NATURAL DRAINAGE – INTERMITTENT
- HIGHWAY
- ROAD
- MONSANTO HAUL ROAD (ACTIVE & INACTIVE)
- RAILROAD
- MINE PIT LOCATION (APPROXIMATE WHERE COVERED BY BACKFILL)
- WASTE ROCK DUMP LOCATION (APPROXIMATE)
- WASTE ROCK DUMP LOCATION OR PIT BACKFILL (APPROXIMATE)
- FAULT
- THRUST FAULT (DASHED WHERE INFERRED)
- APPROXIMATE OR INFERRED FAULT
- AXIS SYNCLINE (DASHED WHERE INFERRED)
- AXIS ANTICLINE (DASHED WHERE INFERRED)

STATION TYPE:

- MAW = AGRICULTURAL WELL
- MDW = DOMESTIC WELL
- MPW = PRODUCTION WELL
- MMW = LOCAL AQUIFER MONITORING WELL (GENERALLY ALLUVIAL SYSTEM)
- MMW = INTERMEDIATE AQUIFER MONITORING WELL (GENERALLY DINWOODY FM.)
- MMW = REGIONAL AQUIFER MONITORING WELL (WELLS FM.)
- MMW = AQUIFER MONITORING WELL (UNKNOWN OR MULTIPLE AQUIFERS SCREENED)
- MBW = DIRECT PUSH ALLUVIAL AQUIFER WELL

GEOLOGIC KEY:

- Qb — BASALT
- Qba — BASALTIC ASH – TUFF
- Qal — ALLUVIUM
- Qt — TRAVERTINE
- Qw — COLLUVIUM AND OLDER ALLUVIUM
- ^l — DEADMAN LIMESTONE
- ^h — HIGHAM GRIT
- ^t — THAYNES FORMATION
- ^ty — TIMOTHY SANDSTONE – THAYNES MEMBER
- ^d — DINWOODY FORMATION – WOODSIDE SHALE
- Pp / Ppm — PHOSPHORIA FORMATION MEADE PEAK MEMBER
- &Pw — WELLS FORMATION
- Mb — BRAZER LIMESTONE
- Mm — MADISON LIMESTONE

KEY:

MMP = MINE PIT
MWD = WASTE ROCK DUMP
MSP = POND

NOTE:

GEOLOGIC DATA SOURCES: HOVLAND, 1981; MANSFIELD, 1927.

ISSUE REV	DESCRIPTION	TECH	ENG	DATE
1	FINAL	CHF	LWM	02/24/11
0	ISSUED DRAFT FOR AGENCY REVIEW	CHF	LWM	07/06/10

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- SURVEY DATA FOR ENOCH VALLEY MINE AREA PROVIDED BY P4 PRODUCTION DATED: DECEMBER 2007.
- US CENSUS BUREAU 2007 TIGER LINE DATA

PROJECTION: STATE PLANE COORDINATE SYSTEM
ZONE: IDAHO EAST
HORIZONTAL DATUM: NAD27
VERTICAL DATUM: NGVD29
UNITS: U.S. FEET

DESIGNED BY	C DUFFY	02/24/11
DRAWN BY	C FOWLER	02/24/11
CHECKED BY	E MARKS	02/24/11
APPROVED BY	C FOULK	02/24/11
PROJECT MANAGER	V DRAIN	02/24/11
CLIENT APPROVAL	B KOCH	02/24/11
CLIENT REFERENCE NO.		

P4 Production, LLC

PROJECT LOCATION: BALLARD, HENRY AND ENOCH VALLEY MINES
PROJECT: RI/FS WORK PLAN
TITLE: BALLARD MINE AREA GENERALIZED GEOLOGIC MAP

MWH

DRAWING 2-6
REVISION 1
FILE NAME 1005813D181

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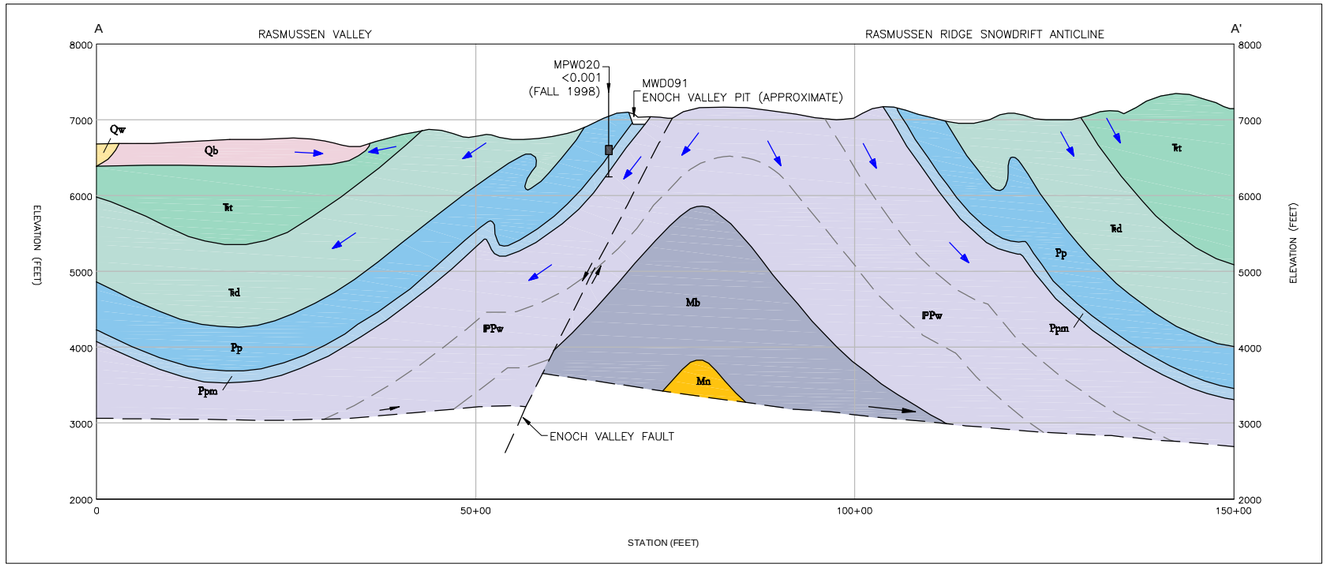
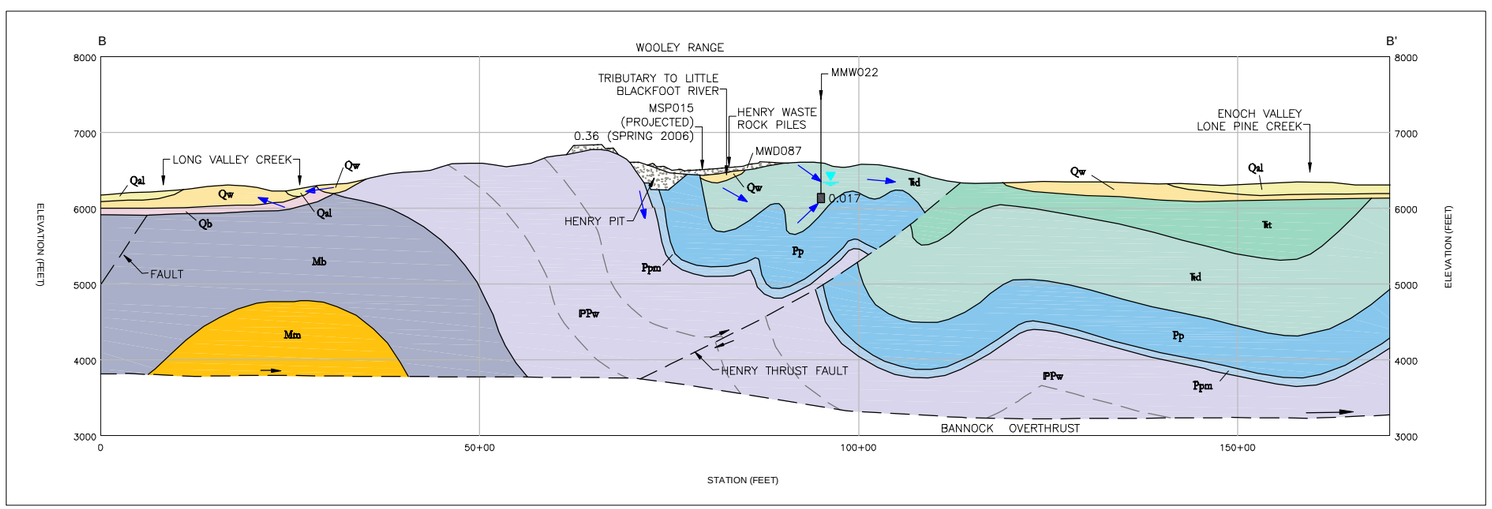


SECTION A - A'

VERTICAL SCALE 1000 0 1000 FEET
HORIZONTAL SCALE 1000 0 1000 FEET
VERTICAL EXAGGERATION = 1X

LEGEND:

- WASTE ROCK
- PRE–MINE SURFACE (WHERE DIFFERENT FROM CURRENT SURFACE)
- GEOLOGIC CONTACT (DASHED WHERE APPROXIMATE OR INFERRED)
- FAULT, SHOWING DIRECTION OF DISPLACEMENT (DASHED WHERE INFERRED)
- SCHEMATIC GROUNDWATER FLOW VECTOR
- 6236' MEASURED GROUNDWATER ELEVATION (FEET ABOVE MEAN SEA LEVEL)
- PROJECTED POTENTIONMETRIC SURFACE
- 0.017 MEASURED TOTAL SELENIUM CONCENTRATION IN mg/L (FALL 2008 SAMPLE, UNLESS OTHERWISE NOTED)
- MONITORING WELL LOCATION SHOWING APPROXIMATE SCREEN LOCATION
- SPRING OR DUMP SEEP



SECTION B - B'

VERTICAL SCALE 1000 0 1000 FEET
HORIZONTAL SCALE 1000 0 1000 FEET
VERTICAL EXAGGERATION = 1X

ISSUED DRAFT FOR AGENCY REVIEW 7/6/10

REV	DESCRIPTION	TECH	ENG	DATE
0	ISSUED DRAFT FOR AGENCY REVIEW	CHF	LWM	07/06/10

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- SURVEY DATA FOR ENOCH VALLEY MINE AREA PROVIDED BY P4 PRODUCTION DATED: DECEMBER 2007.
- US CENSUS BUREAU 2007 TIGER LINE DATA

DESIGNED BY	C DUFFY	07/06/10
DRAWN BY	C FOWLER	07/06/10
CHECKED BY	E MARKS	07/06/10
APPROVED BY	C FOULK	07/06/10
PROJECT MANAGER	V DRAIN	07/06/10
CLIENT APPROVAL	B KOCH	07/06/10
CLIENT REFERENCE NO.		

P4 Production, LLC

PROJECT LOCATION: BALLARD, HENRY AND ENOCH VALLEY MINES
PROJECT: RI/FS WORK PLAN
TITLE: GEOLOGIC SECTIONS A AND B

MWH

DRAWING 2-7
REVISION 0
FILE NAME 1005813D231

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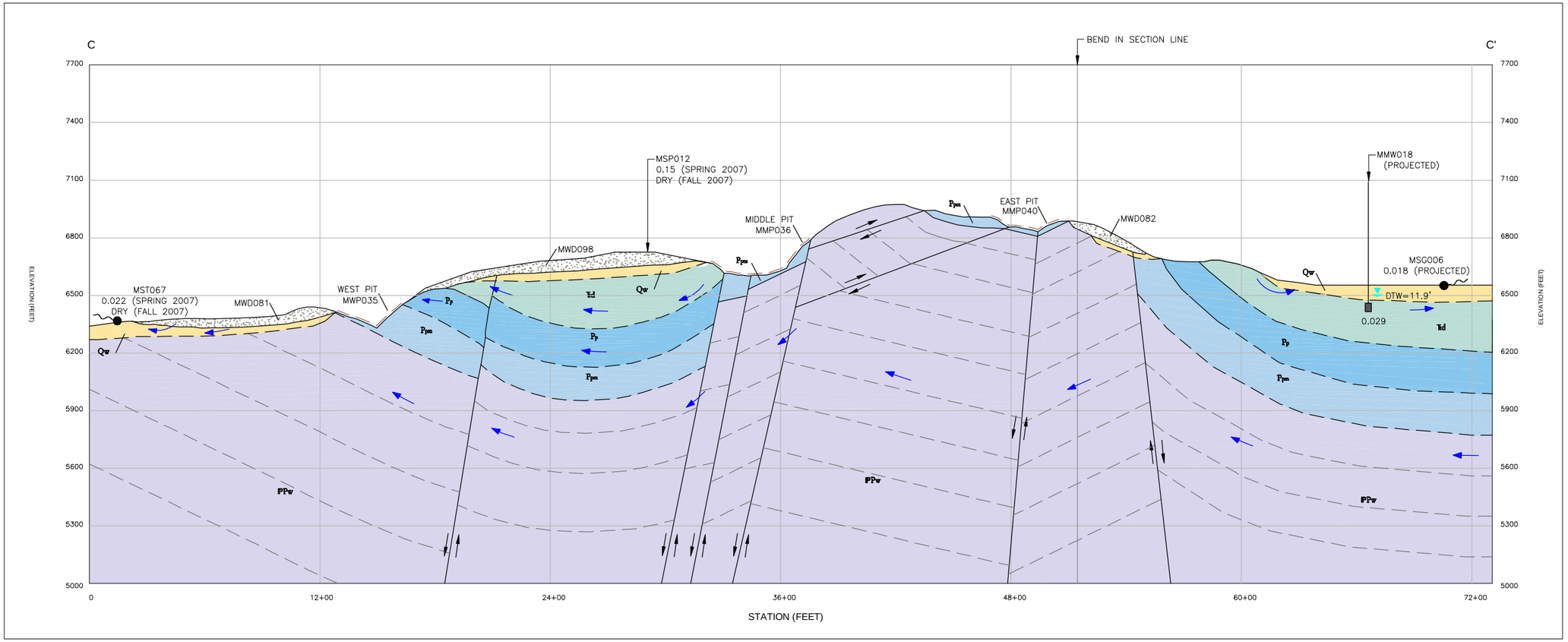

SECTION C - C'

VERTICAL SCALE: 300 0 300 FEET
HORIZONTAL SCALE: 300 0 300 FEET
VERTICAL EXAGGERATION = 1X

LEGEND:

- WASTE ROCK
- PRE–MINE SURFACE (WHERE DIFFERENT FROM CURRENT SURFACE)
- GEOLOGIC CONTACT (DASHED WHERE APPROXIMATE OR INFERRED)
- FAULT, SHOWING DIRECTION OF DISPLACEMENT (DASHED WHERE INFERRED)
- SCHEMATIC GROUNDWATER FLOW VECTOR
- 6236' — MEASURED GROUNDWATER ELEVATION (FEET ABOVE MEAN SEA LEVEL)
- PROJECTED POTENTIONMETRIC SURFACE
- 0.017 — MEASURED TOTAL SELENIUM CONCENTRATION IN mg/L (FALL 2008 SAMPLE, UNLESS OTHERWISE NOTED)
- MONITORING WELL LOCATION SHOWING APPROXIMATE SCREEN LOCATION
- SPRING OR DUMP SEEP

ISSUED DRAFT FOR AGENCY REVIEW 7/6/10

ISSUE REV	DESCRIPTION	TECH	ENG	DATE
0	ISSUED DRAFT FOR AGENCY REVIEW	CHF	LWM	07/06/10

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- SURVEY DATA FOR ENOCH VALLEY MINE AREA PROVIDED BY P4 PRODUCTION DATED: DECEMBER 2007.
- US CENSUS BUREAU 2007 TIGER LINE DATA

DESIGNED BY	C DUFFY	07/06/10
DRAWN BY	C FOWLER	07/06/10
CHECKED BY	E MARKS	07/06/10
APPROVED BY	C FOULK	07/06/10
PROJECT MANAGER	V DRAIN	07/06/10
CLIENT APPROVAL	B KOCH	07/06/10
CLIENT REFERENCE NO.		

P4 Production, LLC

PROJECT LOCATION: BALLARD, HENRY AND ENOCH VALLEY MINES
PROJECT: RI/FS WORK PLAN
TITLE: GEOLOGIC SECTION C

MWH

DRAWING: 2-7-1
REVISION: 0
FILE NAME: 1005813D232

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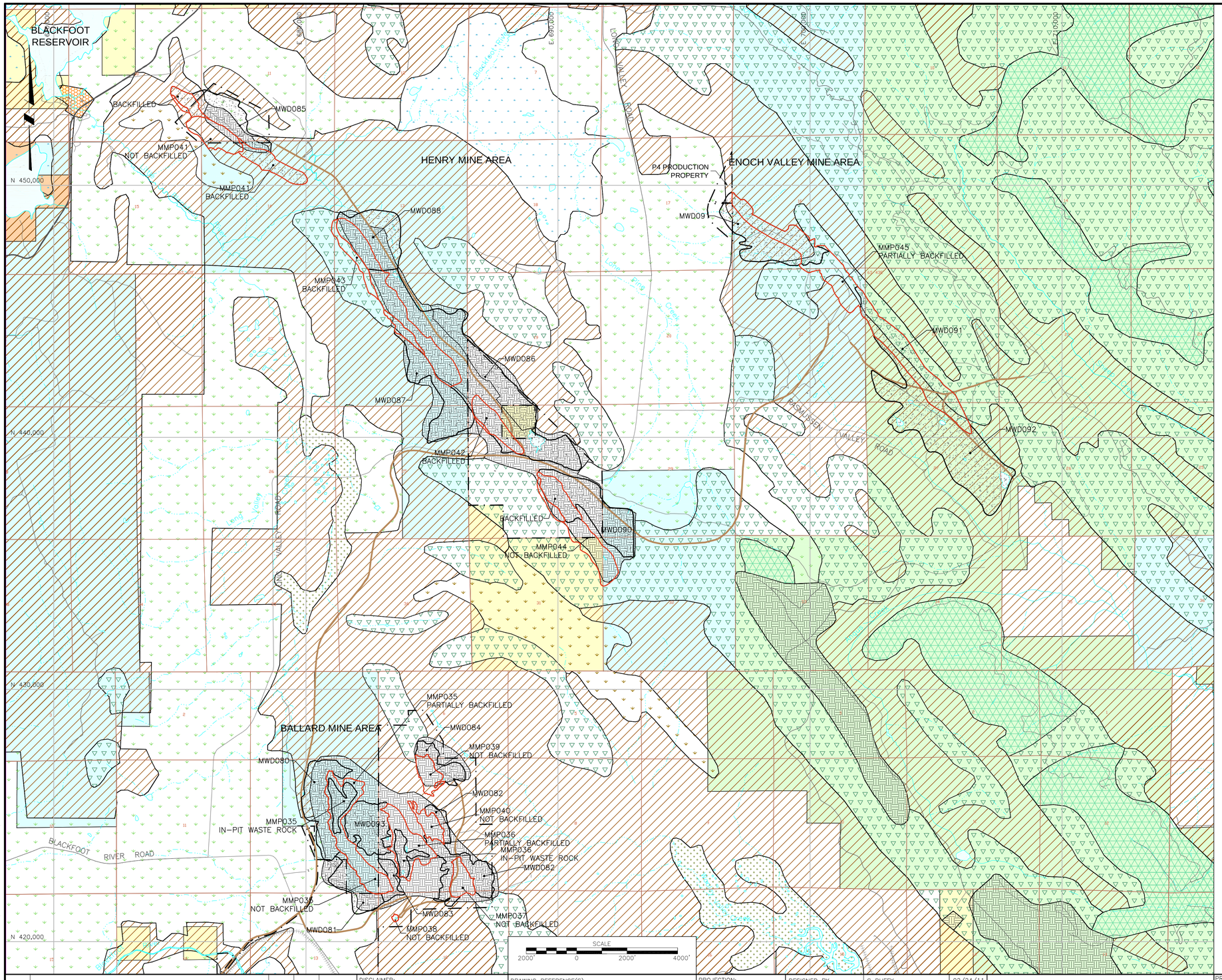

LEGEND:

- RIVER
- POND OR LAKE
- NATURAL DRAINAGE – PERENNIAL
- NATURAL DRAINAGE – INTERMITTENT
- HIGHWAY
- ROAD
- MONSANTO HAUL ROAD (ACTIVE & INACTIVE)
- RAILROAD
- MINE PIT LOCATION (APPROXIMATE WHERE COVERED BY BACKFILL)
- WASTE ROCK DUMP LOCATION (APPROXIMATE)
- WASTE ROCK DUMP LOCATION OR PIT BACKFILL (APPROXIMATE)
- APPROXIMATE OWNERSHIP BOUNDARY
- SECTION LINES
- A SECTION NUMBER
- BLM LANDS
- US NATIONAL FORESTS
- STATE LANDS
- INDIAN RESERVATION LANDS
- NON GOVERNMENT LANDS
- CROP AND PASTURE LAND
- QUARRY FOREST LAND
- MIXED FOREST LAND
- RANGE LAND
- SHRUB AND BRUSH LAND
- WET LAND
- WOODED LAND
- URBAN AREA

KEY:

MMP = MINE PIT
MWD = WASTE ROCK DUMP

ISSUE REV	DESCRIPTION	TECH	ENG	DATE
1	FINAL	CHF	LWM	02/24/11
0	ISSUED DRAFT FOR AGENCY REVIEW	CHF	LWM	07/06/10

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- SURVEY DATA FOR ENOCH VALLEY MINE AREA PROVIDED BY P4 PRODUCTION DATED: DECEMBER 2007.
- US CENSUS BUREAU 2007 TIGER LINE DATA

PROJECTION: STATE PLANE COORDINATE SYSTEM
ZONE: IDAHO EAST
HORIZONTAL DATUM: NAD27
VERTICAL DATUM: NGVD29
UNITS: U.S. FEET

DESIGNED BY	C DUFFY	02/24/11
DRAWN BY	C FOWLER	02/24/11
CHECKED BY	E MARKS	02/24/11
APPROVED BY	C FOULK	02/24/11
PROJECT MANAGER	V DRAIN	02/24/11
CLIENT APPROVAL	B KOCH	02/24/11
CLIENT REFERENCE NO.		

P4 Production, LLC

PROJECT LOCATION: BALLARD, HENRY AND ENOCH VALLEY MINES
PROJECT: RI/FS WORK PLAN
TITLE: MINE AREA LAND USE MAP

MWH

DRAWING: 2-8
REVISION: 1
FILE NAME: 1005813D223

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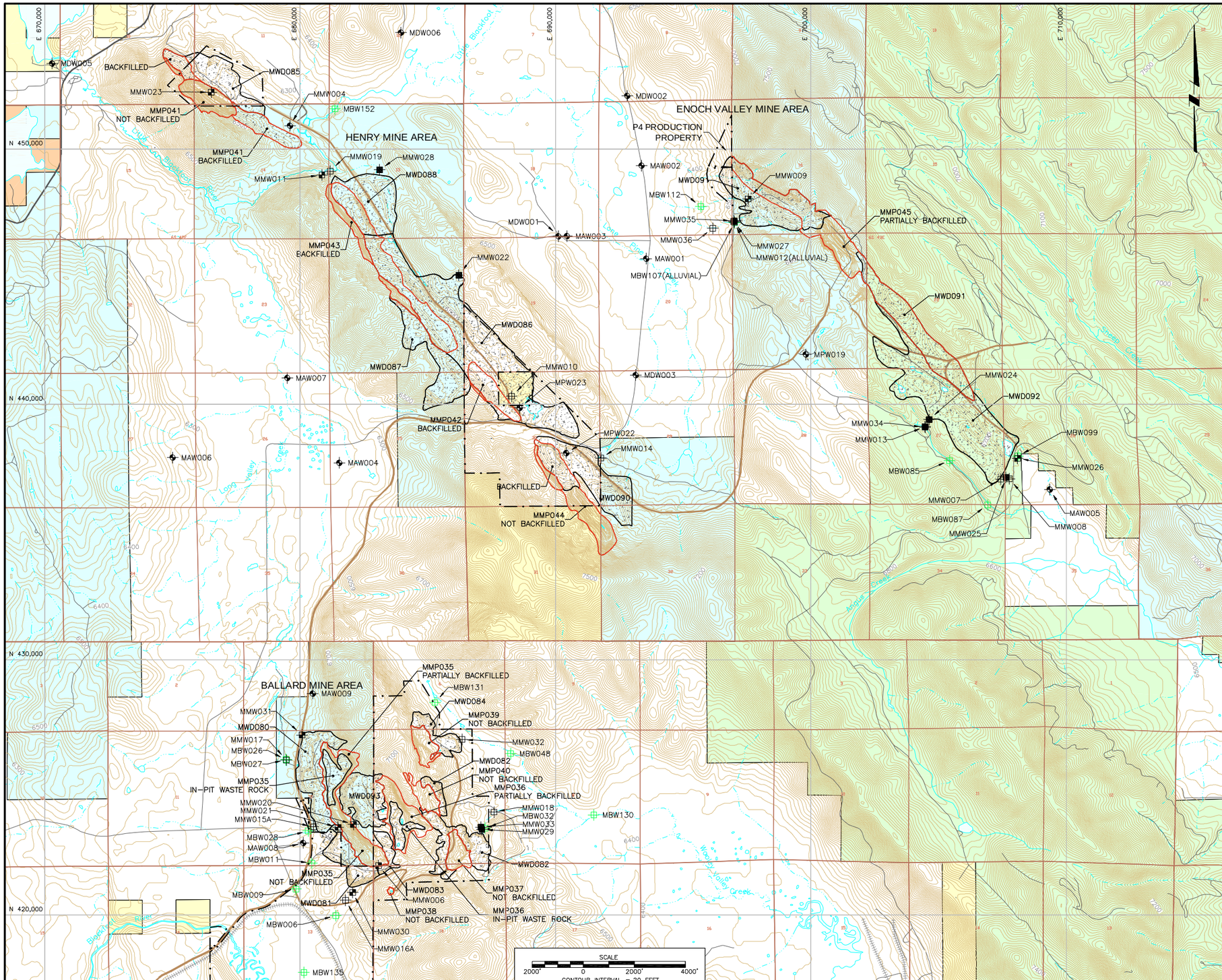

LEGEND:

- POST–MINE CONTOUR AND ELEVATION, FEET (APPROXIMATE)
- RIVER
- POND OR LAKE
- NATURAL DRAINAGE – PERENNIAL
- NATURAL DRAINAGE – INTERMITTENT
- HIGHWAY
- ROAD
- MONSANTO HAUL ROAD (ACTIVE & INACTIVE)
- RAILROAD
- MINE PIT LOCATION (APPROXIMATE WHERE COVERED BY BACKFILL)
- WASTE ROCK DUMP LOCATION (APPROXIMATE)
- WASTE ROCK DUMP LOCATION OR PIT BACKFILL (APPROXIMATE)
- APPROXIMATE OWNERSHIP BOUNDARY
- SECTION LINES
- A SECTION NUMBER
- BLM LANDS
- US NATIONAL FORESTS
- STATE LANDS
- NON FEDERAL LANDS

STATION TYPE:

- MMW = MONITORING WELL
- MAW = AGRICULTURAL WELL
- MDW = DOMESTIC WELL
- MPW = PRODUCTION WELL
- MMW = ALLUVIAL AQUIFER MONITORING WELL
- MMW = INTERMEDIATE AQUIFER MONITORING WELL (GENERALLY DINWOODY FM.)
- MMW = REGIONAL AQUIFER MONITORING WELL (WELLS FM.)
- MBW = DIRECT–PUSH ALLUVIAL AQUIFER WELL

KEY:

MMP = MINE PIT
MWD = WASTE ROCK DUMP

ISSUED DRAFT FOR AGENCY REVIEW 7/6/10

ISSUE REV	DESCRIPTION	TECH	ENG	DATE
0	ISSUED DRAFT FOR AGENCY REVIEW	CHF	LWM	07/06/10

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- SURVEY DATA FOR ENOCH VALLEY MINE AREA PROVIDED BY P4 PRODUCTION DATED: DECEMBER 2007.
- US CENSUS BUREAU 2007 TIGER LINE DATA

PROJECTION: STATE PLANE COORDINATE SYSTEM
ZONE: IDAHO EAST
HORIZONTAL DATUM: NAD27
VERTICAL DATUM: NGVD29
UNITS: U.S. FEET

DESIGNED BY	C DUFFY	07/06/10
DRAWN BY	C FOWLER	07/06/10
CHECKED BY	E MARKS	07/06/10
APPROVED BY	C FOULK	07/06/10
PROJECT MANAGER	V DRAIN	07/06/10
CLIENT APPROVAL	B KOCH	07/06/10
CLIENT REFERENCE NO.		

P4 Production, LLC

PROJECT LOCATION: BALLARD, HENRY AND ENOCH VALLEY MINES
PROJECT: RI/FS WORK PLAN
TITLE: AREA WIDE GROUNDWATER MONITORING LOCATIONS

MWH

DRAWING 2-9 REVISION 0
FILE NAME 1005813D229

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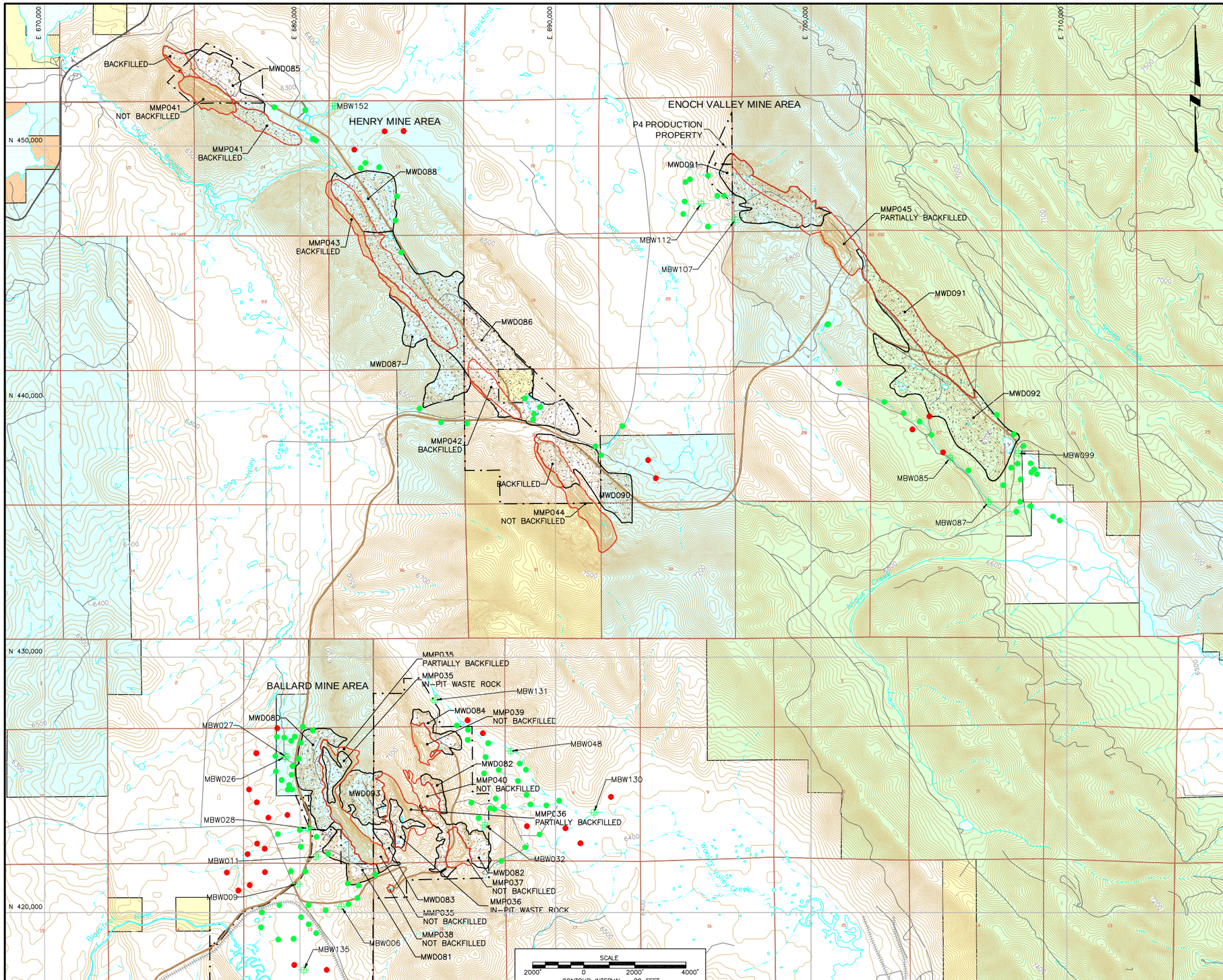

LEGEND:

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- RIVER
- POND OR LAKE
- NATURAL DRAINAGE – PERENNIAL
- NATURAL DRAINAGE – INTERMITTENT
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- WASTE ROCK DUMP LOCATION OR PIT BACKFILL (APPROXIMATE)
- APPROXIMATE OWNERSHIP BOUNDARY
- SECTION LINES
- A SECTION NUMBER
- BLM LANDS
- US NATIONAL FORESTS
- STATE LANDS
- NON FEDERAL LANDS

STATION TYPE:

- MBW = DIRECT PUSH ALLUVIAL AQUIFER WELL
- BH = 2009 DIRECT PUSH BOREHOLE
- BH = 2008 DIRECT PUSH BOREHOLE

KEY:

MMP = MINE PIT
MWD = WASTE ROCK DUMP

ISSUED DRAFT FOR AGENCY REVIEW 7/8/10

ISSUE REV	DESCRIPTION	TECH	ENG	DATE
0	ISSUED DRAFT FOR AGENCY REVIEW	CHF	LWM	07/06/10

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- US CENSUS BUREAU 2007 TIGER LINE DATA

PROJECTION: STATE PLANE COORDINATE SYSTEM
ZONE: IDAHO EAST
HORIZONTAL DATUM: NAD27
VERTICAL DATUM: NGVD29
UNITS: U.S. FEET

DESIGNED BY	C DUFFY	07/06/10
DRAWN BY	C FOWLER	07/06/10
CHECKED BY	E MARKS	07/06/10
APPROVED BY	C FOULK	07/06/10
PROJECT MANAGER	V DRAIN	07/06/10
CLIENT APPROVAL	B KOCH	07/06/10
CLIENT REFERENCE NO.		

P4 Production, LLC

PROJECT LOCATION: BALLARD, HENRY AND ENOCH VALLEY MINES
PROJECT: RI/FS WORK PLAN
TITLE: AREA WIDE DIRECT-PUSH SAMPLE LOCATIONS

MWH

DRAWING 2-10
REVISION 0
FILE NAME 1005813D230

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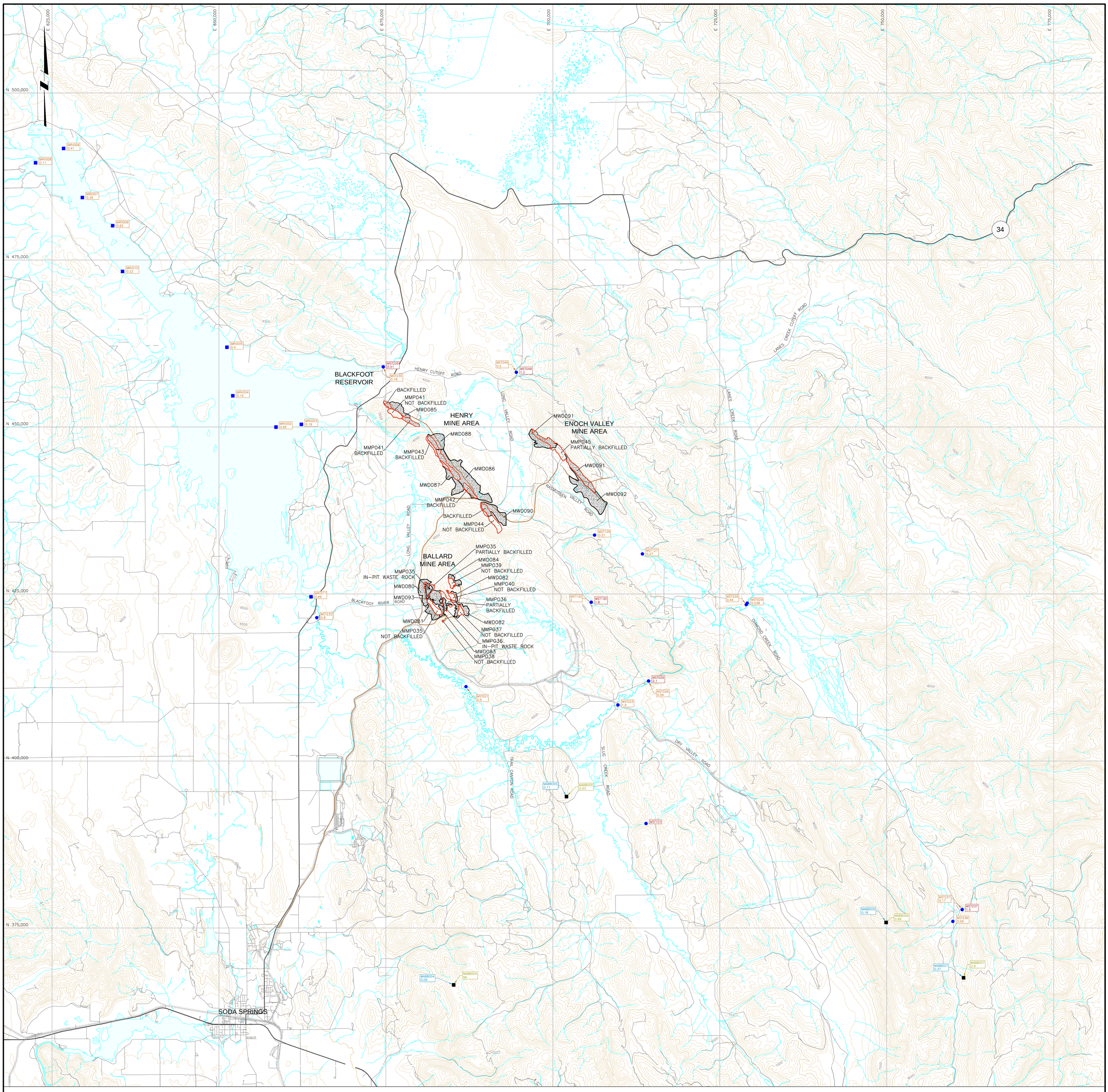

SCALE
5000' 0 5000' 10000'
CONTOUR INTERVAL = 100 FEET

LEGEND:

- 7000 — POST-MINE CONTOUR AND ELEVATION, FEET (APPROXIMATE)
- RIVER
- POND OR LAKE
- NATURAL DRAINAGE
- HIGHWAY
- ROAD
- MONSANTO HAUL ROAD (ACTIVE & INACTIVE)
- RAILROAD
- MINE PIT LOCATION (APPROXIMATE WHERE COVERED BY BACKFILL)
- WASTE ROCK DUMP LOCATION (APPROXIMATE)
- WASTE ROCK DUMP LOCATION OR PIT BACKFILL (APPROXIMATE)

STATION TYPE:

- ■ MABB = BACKGROUND SAMPLE LOCATION
- ■ MRV = LAKE OR RESERVOIR SAMPLE LOCATION
- ● MST = STREAM SAMPLE LOCATION

KEY:

MMP = MINE PIT
MWD = WASTE ROCK DUMP

MST026 2.1 — 2001 RIPARIAN SOIL SELENIUM DATA REPORTED IN MG/KG,DW

MST026 0.56 — 2001 RIPARIAN VEGETATION SELENIUM DATA REPORTED IN MG/KG,DW

MABB005 0.53 — 1998 & 2001 UPLAND SOIL SELENIUM DATA REPORTED IN MG/KG,DW

MABB006 0.18 — 1998 & 2001 UPLAND VEGETATION SELENIUM DATA REPORTED IN MG/KG,DW

ISSUED DRAFT FOR AGENCY REVIEW 7/6/10

ISSUE REV	DESCRIPTION	TECH	ENG	DATE
0	ISSUED DRAFT FOR AGENCY REVIEW	CHF	LWM	07/06/10

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 OTHERWISE ABSENT THE INVOLVEMENT 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):
1. POST-MINE TOPOGRAPHY GENERATED FROM:
- USGS DIGITAL ELEVATION MODELS (DEM)-24K.
- SURVEY DATA FOR BALLARD MINE PROVIDED BY OLYMPUS AERIAL SURVEYS, INC. DATED: JUNE 2005.
- SURVEY DATA FOR HENRY MINE AREA PROVIDED BY OLYMPUS AERIAL SURVEYS, INC. DATED: NOVEMBER 2008.
- SURVEY DATA FOR ENOCH VALLEY MINE AREA PROVIDED BY P4 PRODUCTION DATED: DECEMBER 2007.
- US CENSUS BUREAU 2007 TIGER LINE DATA

PROJECTION: STATE PLANE COORDINATE SYSTEM
ZONE: IDAHO EAST
HORIZONTAL DATUM: NAD27
VERTICAL DATUM: NGVD29
UNITS: U.S. FEET

DESIGNED BY	C DUFFY	07/06/10
DRAWN BY	C FOWLER	07/06/10
CHECKED BY	E MARKS	07/06/10
APPROVED BY	C FOULK	07/06/10
PROJECT MANAGER	V DRAIN	07/06/10
CLIENT APPROVAL	B KOCH	07/06/10
CLIENT REFERENCE NO.		

P4 Production, LLC

PROJECT LOCATION: BALLARD, HENRY AND ENOCH VALLEY MINES
PROJECT: RI/FS WORK PLAN
TITLE: PRE-2004 AREA WIDE SOIL AND VEGETATION SAMPLE LOCATIONS AND RESULTS

MWH

DRAWING 3-1 REVISION 0
FILE NAME 1005813D195

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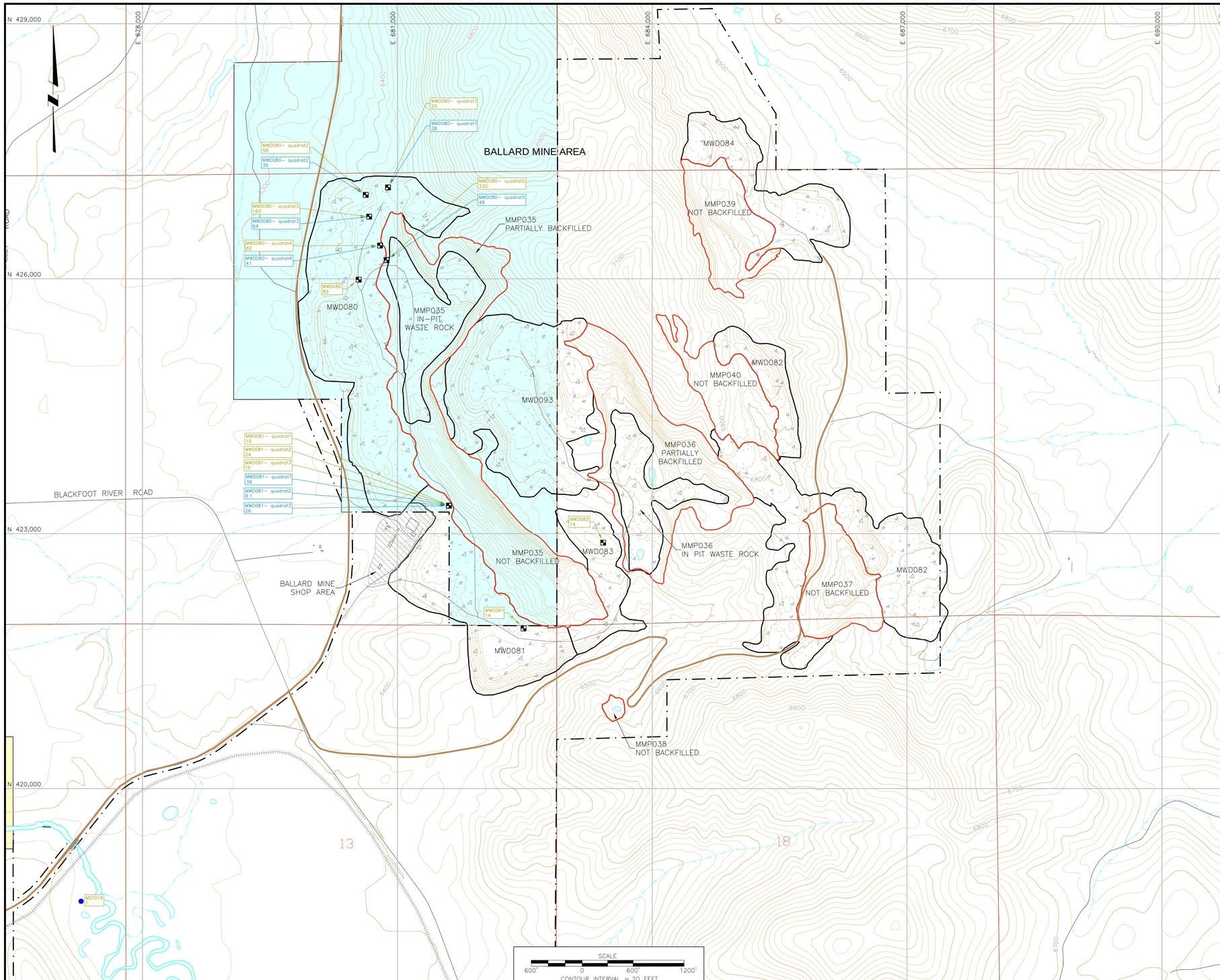

LEGEND:

- POST–MINE CONTOUR AND ELEVATION, FEET (APPROXIMATE)
- RIVER
- POND OR LAKE
- NATURAL DRAINAGE – PERENNIAL
- NATURAL DRAINAGE – INTERMITTENT
- HIGHWAY
- ROAD
- MONSANTO HAUL ROAD (ACTIVE & INACTIVE)
- RAILROAD
- MINE PIT LOCATION (APPROXIMATE WHERE COVERED BY BACKFILL)
- WASTE ROCK DUMP LOCATION (APPROXIMATE)
- WASTE ROCK DUMP LOCATION OR PIT BACKFILL (APPROXIMATE)
- APPROXIMATE OWNERSHIP BOUNDARY
- SECTION LINES
- SECTION NUMBER
- BLM LANDS
- US NATIONAL FORESTS
- STATE LANDS
- NON FEDERAL LANDS

STATION TYPE:

MWD = WASTE ROCK DUMP SOIL AND VEGETATION SAMPLE LOCATION

KEY:

MMP = MINE PIT
MWD = WASTE ROCK DUMP

MWD081– quadrat2 24 — 1998 & 2001 UPLAND SOIL SELENIUM DATA REPORTED IN MG/KG,DW
MWD081– quadrat1 39 — 1998 & 2001 UPLAND VEGETATION SELENIUM DATA REPORTED IN MG/KG,DW

ISSUED DRAFT FOR AGENCY REVIEW 7/6/10

SCALE
600' 0 600' 1200'
CONTOUR INTERVAL = 20 FEET

ISSUE REV	DESCRIPTION	TECH	ENG	DATE
0	ISSUED DRAFT FOR AGENCY REVIEW	CHF	LWM	07/06/10

DISCLAIMER:
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- SURVEY DATA FOR ENOCH VALLEY MINE AREA PROVIDED BY P4 PRODUCTION DATED: DECEMBER 2007.
- US CENSUS BUREAU 2007 TIGER LINE DATA

PROJECTION: STATE PLANE COORDINATE SYSTEM
ZONE: IDAHO EAST
HORIZONTAL DATUM: NAD27
VERTICAL DATUM: NGVD29
UNITS: U.S. FEET

DESIGNED BY	C DUFFY	07/06/10
DRAWN BY	C FOWLER	07/06/10
CHECKED BY	E MARKS	07/06/10
APPROVED BY	C FOULK	07/06/10
PROJECT MANAGER	V DRAIN	07/06/10
CLIENT APPROVAL	B KOCH	07/06/10
CLIENT REFERENCE NO.		

P4 Production, LLC

PROJECT LOCATION: BALLARD, HENRY AND ENOCH VALLEY MINES
PROJECT: RI/FS WORK PLAN
TITLE: PRE-2004 BALLARD MINE AREA SOIL AND VEGETATION SAMPLE LOCATIONS AND RESULTS

MWH

DRAWING 3-2 | REVISION 0
FILE NAME 1005813D196

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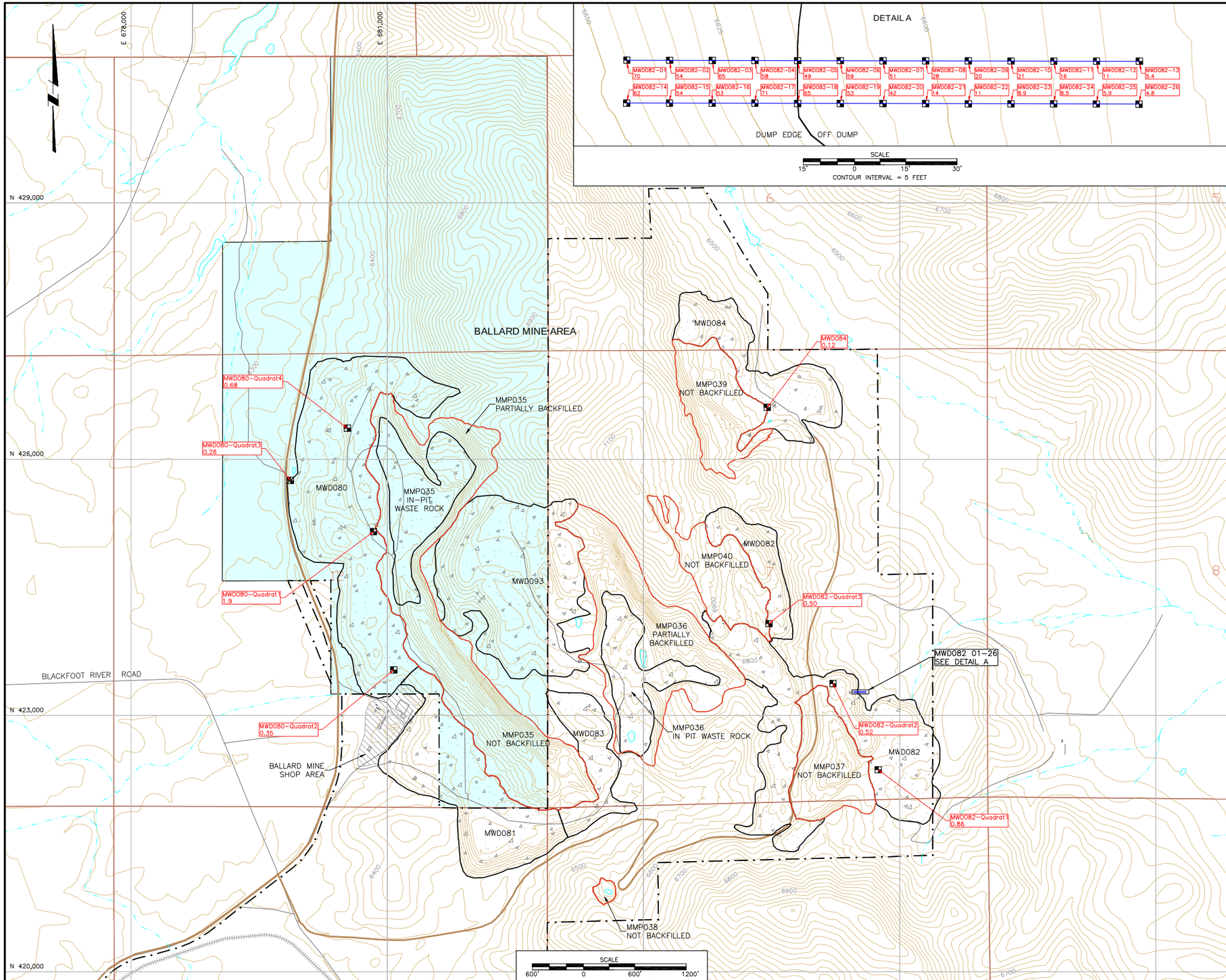

LEGEND:

- POST-MINE CONTOUR AND ELEVATION, FEET (APPROXIMATE)
- RIVER
- POND OR LAKE
- NATURAL DRAINAGE – PERENNIAL
- NATURAL DRAINAGE – INTERMITTENT
- HIGHWAY
- ROAD
- MONSANTO HAUL ROAD (ACTIVE & INACTIVE)
- RAILROAD
- MINE PIT LOCATION (APPROXIMATE WHERE COVERED BY BACKFILL)
- WASTE ROCK DUMP LOCATION (APPROXIMATE)
- WASTE ROCK DUMP LOCATION OR PIT BACKFILL (APPROXIMATE)
- APPROXIMATE OWNERSHIP BOUNDARY
- SECTION LINES
- A SECTION NUMBER
- BLM LANDS
- US NATIONAL FORESTS
- STATE LANDS
- NON FEDERAL LANDS

STATION TYPE:

MWD = SOIL AND VEGETATION SAMPLE LOCATION

KEY:

MMP = MINE PIT
MWD = WASTE ROCK DUMP

MWD085 0.12 — JULY 2004 UPLAND SOIL SELENIUM DATA REPORTED IN MG/KG,DW

NOTE:

1. MWD082(01~26): 150 FOOT TRANSECTS FROM THE MASS WASTING INVESTIGATION.

ISSUED DRAFT FOR AGENCY REVIEW 7/6/10

ISSUE REV	DESCRIPTION	TECH	ENG	DATE
0	ISSUED DRAFT FOR AGENCY REVIEW	CHF	LWM	07/06/10

DISCLAIMER:
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- SURVEY DATA FOR ENOCH VALLEY MINE AREA PROVIDED BY P4 PRODUCTION DATED: DECEMBER 2007.
- US CENSUS BUREAU 2007 TIGER LINE DATA

PROJECTION: STATE PLANE COORDINATE SYSTEM
ZONE: IDAHO EAST
HORIZONTAL DATUM: NAD27
VERTICAL DATUM: NGVD29
UNITS: U.S. FEET

DESIGNED BY	C DUFFY	07/06/10
DRAWN BY	C FOWLER	07/06/10
CHECKED BY	E MARKS	07/06/10
APPROVED BY	C FOULK	07/06/10
PROJECT MANAGER	V DRAIN	07/06/10
CLIENT APPROVAL	B KOCH	07/06/10
CLIENT REFERENCE NO.		

P4 Production, LLC

PROJECT LOCATION: BALLARD, HENRY AND ENOCH VALLEY MINES
PROJECT: RI/FS WORK PLAN
TITLE: 2004 BALLARD MINE AREA SOIL SAMPLE LOCATIONS AND RESULTS

MWH

DRAWING 3-3 | REVISION 0
FILE NAME 1005813D210

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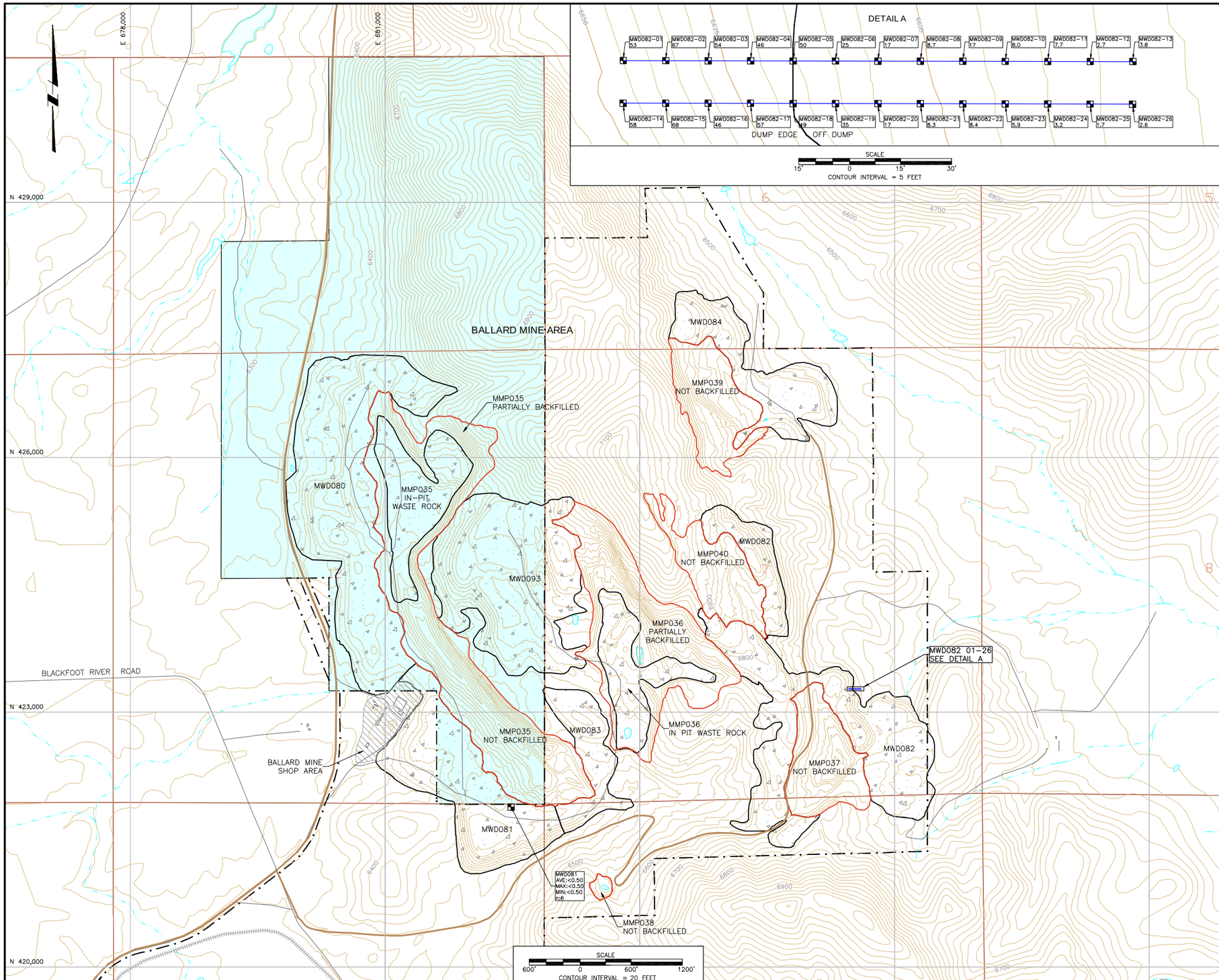

LEGEND:

- POST-MINE CONTOUR AND ELEVATION, FEET (APPROXIMATE)
- RIVER
- POND OR LAKE
- NATURAL DRAINAGE – PERENNIAL
- NATURAL DRAINAGE – INTERMITTENT
- HIGHWAY
- ROAD
- MONSANTO HAUL ROAD (ACTIVE & INACTIVE)
- RAILROAD
- MINE PIT LOCATION (APPROXIMATE WHERE COVERED BY BACKFILL)
- WASTE ROCK DUMP LOCATION (APPROXIMATE)
- WASTE ROCK DUMP LOCATION OR PIT BACKFILL (APPROXIMATE)
- APPROXIMATE OWNERSHIP BOUNDARY
- SECTION LINES
- SECTION NUMBER
- BLM LANDS
- US NATIONAL FORESTS
- STATE LANDS
- NON FEDERAL LANDS

STATION TYPE:

MWD = SOIL AND VEGETATION SAMPLE LOCATION

KEY:

MMP = MINE PIT
MWD = WASTE ROCK DUMP

MWD085 0.12 — JULY 2004 UPLAND VEGETATION SELENIUM DATA REPORTED IN MG/KG,DW

MWD086 AVE:4.13 MAX:4.5 MIN:0.8 n:6 — THESE STATIONS WERE SAMPLED MONTHLY FROM MAY TO OCTOBER DURING THE 2004 MONTHLY VEGETATION INVESTIGATION. NON-DETECTS ARE CENSORED AT < MDL.

NOTE:

1. MWD082(01~26): 150 FOOT TRANSECTS FROM THE MASS WASTING INVESTIGATION.

ISSUED DRAFT FOR AGENCY REVIEW 7/6/10

ISSUE REV	DESCRIPTION	TECH	ENG	DATE
0	ISSUED DRAFT FOR AGENCY REVIEW	CHF	LWM	07/06/10

DISCLAIMER:
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- SURVEY DATA FOR HENRY MINE AREA PROVIDED BY OLYMPUS AERIAL SURVEYS, INC. DATED: NOVEMBER 2008.
- SURVEY DATA FOR ENOCH VALLEY MINE AREA PROVIDED BY P4 PRODUCTION DATED: DECEMBER 2007.
- US CENSUS BUREAU 2007 TIGER LINE DATA

PROJECTION: STATE PLANE COORDINATE SYSTEM
ZONE: IDAHO EAST
HORIZONTAL DATUM: NAD27
VERTICAL DATUM: NGVD29
UNITS: U.S. FEET

DESIGNED BY	C DUFFY	07/06/10
DRAWN BY	C FOWLER	07/06/10
CHECKED BY	E MARKS	07/06/10
APPROVED BY	C FOULK	07/06/10
PROJECT MANAGER	V DRAIN	07/06/10
CLIENT APPROVAL	B KOCH	07/06/10
CLIENT REFERENCE NO.		

P4 Production, LLC

PROJECT LOCATION: BALLARD, HENRY AND ENOCH VALLEY MINES
PROJECT: RI/FS WORK PLAN
TITLE: 2004 BALLARD MINE AREA VEGETATION SAMPLE LOCATIONS AND RESULTS

MWH

DRAWING 3-4
REVISION 0
FILE NAME 1005813D211

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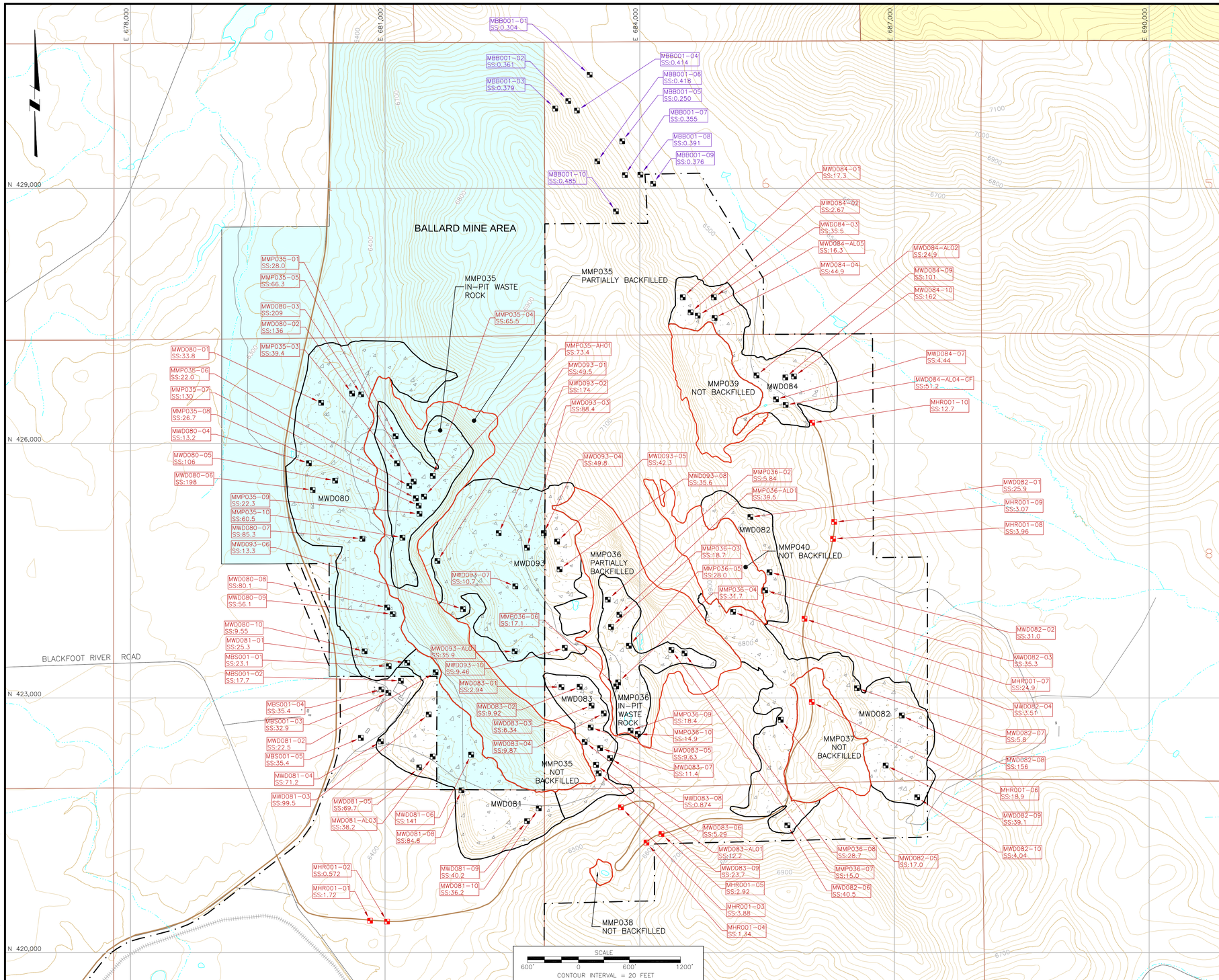

LEGEND:

- 7000 — POST-MINE CONTOUR AND ELEVATION, FEET (APPROXIMATE)
- RIVER
- POND OR LAKE
- NATURAL DRAINAGE – PERENNIAL
- NATURAL DRAINAGE – INTERMITTENT
- HIGHWAY
- ROAD
- MONSANTO HAUL ROAD (ACTIVE & INACTIVE)
- RAILROAD
- MINE PIT LOCATION (APPROXIMATE WHERE COVERED BY BACKFILL)
- WASTE ROCK DUMP LOCATION (APPROXIMATE)
- WASTE ROCK DUMP LOCATION OR PIT BACKFILL (APPROXIMATE)
- APPROXIMATE OWNERSHIP BOUNDARY
- SECTION LINES
- A — SECTION NUMBER
- BLM LANDS
- US NATIONAL FORESTS
- STATE LANDS
- NON FEDERAL LANDS

STATION TYPE:

- MBB = BACKGROUND AREA SOIL SAMPLE LOCATION
- MBS = BALLARD SHOP AREA SOIL SAMPLE LOCATION
- MHR = HISTORIC HAUL ROAD SOIL SAMPLE LOCATION
- MMP = MINE PIT SOIL SAMPLE LOCATION
- MWD = WASTE ROCK DUMP SOIL SAMPLE LOCATION

KEY:

MMP = MINE PIT
MWD = WASTE ROCK DUMP
SS = SURFACE SOIL

MBB001-06 SS:0.418 — BACKGROUND SELENIUM DATA REPORTED IN MG/KG,DW

MWD085-09 SS:91.8 — SOIL SELENIUM DATA REPORTED IN MG/KG,DW

ISSUED DRAFT FOR AGENCY REVIEW 7/6/10

ISSUE REV	DESCRIPTION	TECH	ENG	DATE
0	ISSUED DRAFT FOR AGENCY REVIEW	CHF	LWM	07/06/10

DISCLAIMER:
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- SURVEY DATA FOR BALLARD MINE PROVIDED BY OLYMPUS AERIAL SURVEYS, INC. DATED: JUNE 2005.
- SURVEY DATA FOR HENRY MINE AREA PROVIDED BY OLYMPUS AERIAL SURVEYS, INC. DATED: NOVEMBER 2008.
- SURVEY DATA FOR ENOCH VALLEY MINE AREA PROVIDED BY P4 PRODUCTION DATED: DECEMBER 2007.
- US CENSUS BUREAU 2007 TIGER LINE DATA

PROJECTION: STATE PLANE COORDINATE SYSTEM
ZONE: IDAHO EAST
HORIZONTAL DATUM: NAD27
VERTICAL DATUM: NGVD29
UNITS: U.S. FEET

DESIGNED BY	C DUFFY	07/06/10
DRAWN BY	C FOWLER	07/06/10
CHECKED BY	E MARKS	07/06/10
APPROVED BY	C FOULK	07/06/10
PROJECT MANAGER	V DRAIN	07/06/10
CLIENT APPROVAL	B KOCH	07/06/10
CLIENT REFERENCE NO.		

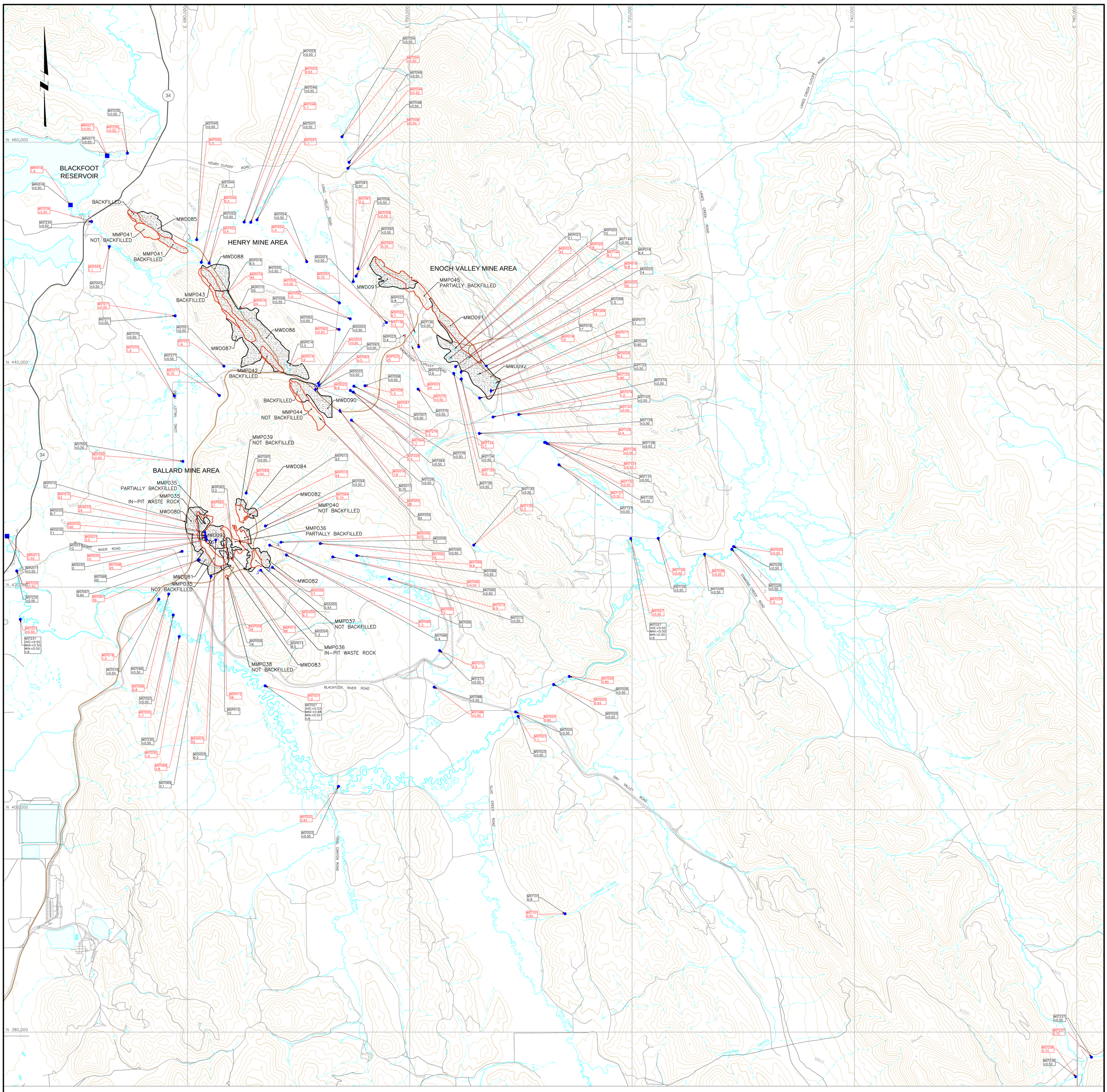
P4 Production, LLC

PROJECT LOCATION: BALLARD, HENRY AND ENOCH VALLEY MINES
PROJECT: RI/FS WORK PLAN
TITLE: 2009 BALLARD MINE AREA SOIL SAMPLE LOCATIONS AND RESULTS

MWH

DRAWING 3-5 | REVISION 0
FILE NAME 1005813D212

N:\Design-Drafting\Clients_J-P\Monsanto Company\013-Sheet Set\RI-FS Scoping Data Maps\1005813D212



SCALE
3000' 0 3000' 6000'
CONTOUR INTERVAL = 100 FEET

LEGEND:

- 7000 — POST-MINE CONTOUR AND ELEVATION, FEET (APPROXIMATE)
- RIVER
- POND OR LAKE
- NATURAL DRAINAGE – PERENNIAL
- NATURAL DRAINAGE – INTERMITTENT
- HIGHWAY
- ROAD
- MONSANTO HAUL ROAD (ACTIVE & INACTIVE)
- RAILROAD
- MINE PIT LOCATION (APPROXIMATE WHERE COVERED BY BACKFILL)
- WASTE ROCK DUMP LOCATION (APPROXIMATE)
- WASTE ROCK DUMP LOCATION OR PIT BACKFILL (APPROXIMATE)

STATION TYPE:

- MRV = RESERVOIR SAMPLE LOCATION
- MDS = DUMP SAMPLE LOCATION
- MST = STREAM SAMPLE LOCATION
- MSG = SPRING SAMPLE LOCATION

KEY:

MMP = MINE PIT
MWD = WASTE ROCK DUMP

MST064 1.7 — SEPTEMBER 2004 RIPARIAN SOIL SELENIUM DATA REPORTED IN MG/KG,DW

MST023 <0.50 — SEPTEMBER 2004 RIPARIAN VEGETATION SELENIUM DATA REPORTED IN MG/KG,DW

MST101 AVE:0.8 MAX:0.8 MIN:0.8 n:1 — THESE STATIONS WERE SAMPLED MONTHLY FROM MAY TO OCTOBER DURING THE 2004 MONTHLY VEGETATION INVESTIGATION. NON-DETECTS ARE CENSORED AT < MDL.

ISSUED DRAFT FOR AGENCY REVIEW 7/6/10

REV	DESCRIPTION	TECH	ENG	DATE
0	ISSUED DRAFT FOR AGENCY REVIEW	CHF	LWM	07/06/10

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- SURVEY DATA FOR HENRY MINE AREA PROVIDED BY OLYMPUS AERIAL SURVEYS, INC. DATED: NOVEMBER 2008.
- SURVEY DATA FOR ENOCH VALLEY MINE AREA PROVIDED BY P4 PRODUCTION DATED: DECEMBER 2007.
- US CENSUS BUREAU 2007 TIGER LINE DATA

PROJECTION: STATE PLANE COORDINATE SYSTEM
ZONE: IDAHO EAST
HORIZONTAL DATUM: NAD27
VERTICAL DATUM: NGVD29
UNITS: U.S. FEET

DESIGNED BY	C DUFFY	07/06/10
DRAWN BY	C FOWLER	07/06/10
CHECKED BY	E MARKS	07/06/10
APPROVED BY	C FOULK	07/06/10
PROJECT MANAGER	V DRAIN	07/06/10
CLIENT APPROVAL	B KOCH	07/06/10
CLIENT REFERENCE NO.		

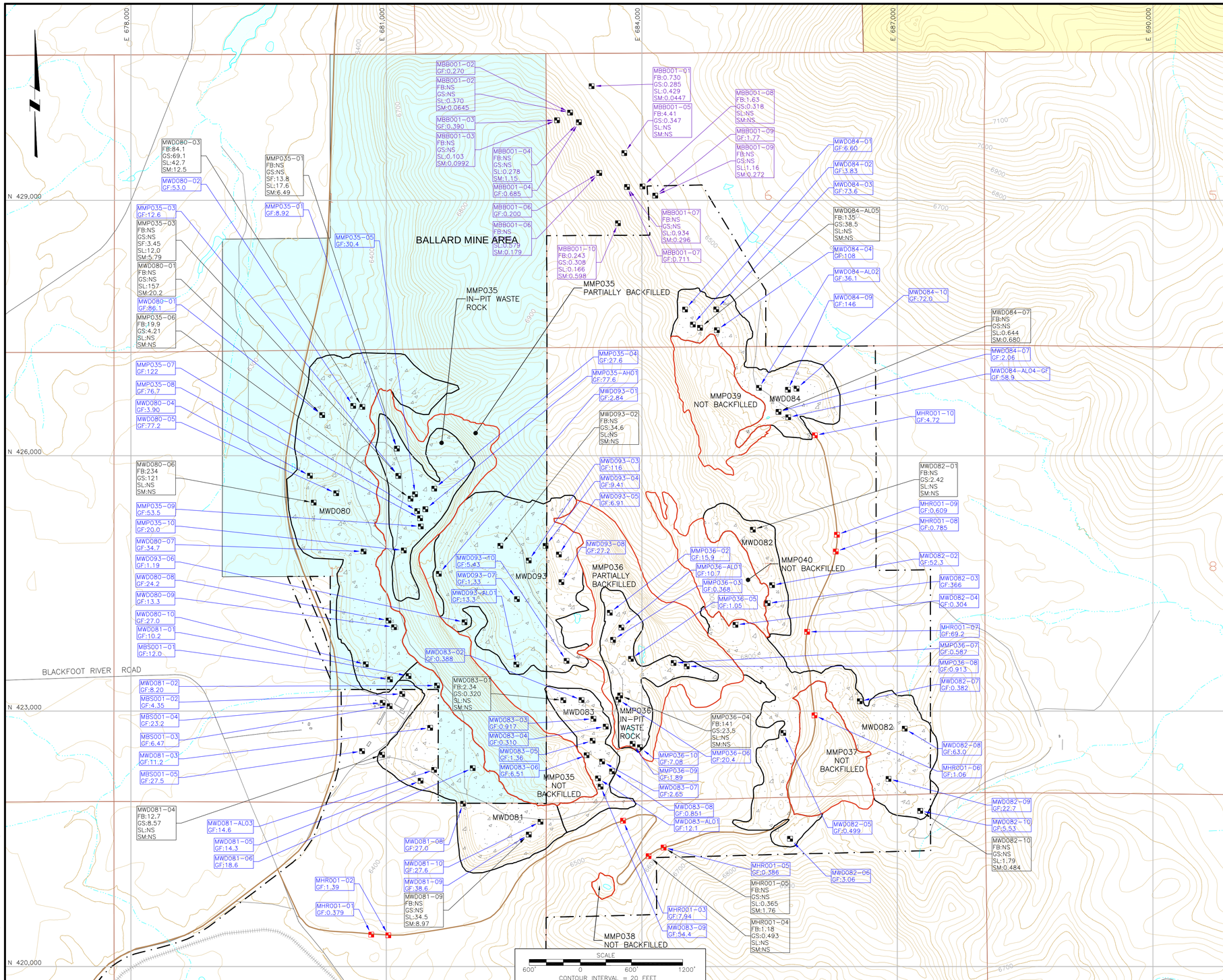
P4 Production, LLC

PROJECT LOCATION: BALLARD, HENRY AND ENOCH VALLEY MINES
PROJECT: RI/FS WORK PLAN
TITLE: EE/CA AREA WIDE RIPARIAN SOIL AND VEGETATION SAMPLE LOCATIONS AND RESULTS

MWH

DRAWING 3-6 REVISION 0
FILE NAME 1005813D166

N:\Design-Drafting\Clients_J-P\Monsanto Company\013-Sheet Set\RI-FS Scoping Data Maps\1005813D166



LEGEND:

- POST-MINE CONTOUR AND ELEVATION, FEET (APPROXIMATE)
- RIVER
- POND OR LAKE
- NATURAL DRAINAGE – PERENNIAL
- NATURAL DRAINAGE – INTERMITTENT
- HIGHWAY
- ROAD
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- WASTE ROCK DUMP LOCATION (APPROXIMATE)
- WASTE ROCK DUMP LOCATION OR PIT BACKFILL (APPROXIMATE)
- APPROXIMATE OWNERSHIP BOUNDARY
- SECTION LINES
- SECTION NUMBER
- BLM LANDS
- US NATIONAL FORESTS
- STATE LANDS
- NON FEDERAL LANDS

STATION TYPE:

- MBB = BACKGROUND AREA VEGETATION SAMPLE LOCATION
- MBS = BALLARD SHOP AREA VEGETATION SAMPLE LOCATION
- MHR = HISTORIC HAUL ROAD VEGETATION SAMPLE LOCATION
- MMP = MINE PIT VEGETATION SAMPLE LOCATION
- MWD = WASTE ROCK DUMP VEGETATION SAMPLE LOCATION

KEY:

MMP = MINE PIT
MWD = WASTE ROCK DUMP
GF = GRASSES AND FORBS COMBINED
FB = FORBS
GS = GRASSES
SF = SHRUB FRUIT
SL = SHRUB LEAF
SM = SHRUB STEM
NS = NO SAMPLE

MBB001-03 GF:0.390 — BACKGROUND SELENIUM DATA REPORTED IN MG/KG,DW

MHR002-10 FB:49 GS:3.78 SL:NS SM:NS — VEGETATION LIFE FORM SELENIUM DATA REPORTED IN MG/KG,DW

MWD085-09 GF:91.8 — VEGETATION SELENIUM DATA REPORTED IN MG/KG,DW

ISSUED DRAFT FOR AGENCY REVIEW 7/6/10

REV	DESCRIPTION	TECH	ENG	DATE
0	ISSUED DRAFT FOR AGENCY REVIEW	CHF	LWM	07/06/10

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DRAWING REFERENCE(S):
1. POST-MINE TOPOGRAPHY GENERATED FROM:
- USGS DIGITAL ELEVATION MODELS (DEM)-24K.
- SURVEY DATA FOR BALLARD MINE PROVIDED BY OLYMPUS AERIAL SURVEYS, INC. DATED: JUNE 2005.
- SURVEY DATA FOR HENRY MINE AREA PROVIDED BY OLYMPUS AERIAL SURVEYS, INC. DATED: NOVEMBER 2008.
- SURVEY DATA FOR ENOCH VALLEY MINE AREA PROVIDED BY P4 PRODUCTION DATED: DECEMBER 2007.
- US CENSUS BUREAU 2007 TIGER LINE DATA

PROJECTION: STATE PLANE COORDINATE SYSTEM
ZONE: IDAHO EAST
HORIZONTAL DATUM: NAD27
VERTICAL DATUM: NGVD29
UNITS: U.S. FEET

DESIGNED BY	C DUFFY	07/06/10
DRAWN BY	C FOWLER	07/06/10
CHECKED BY	E MARKS	07/06/10
APPROVED BY	C FOULK	07/06/10
PROJECT MANAGER	V DRAIN	07/06/10
CLIENT APPROVAL	B KOCH	07/06/10
CLIENT REFERENCE NO.		

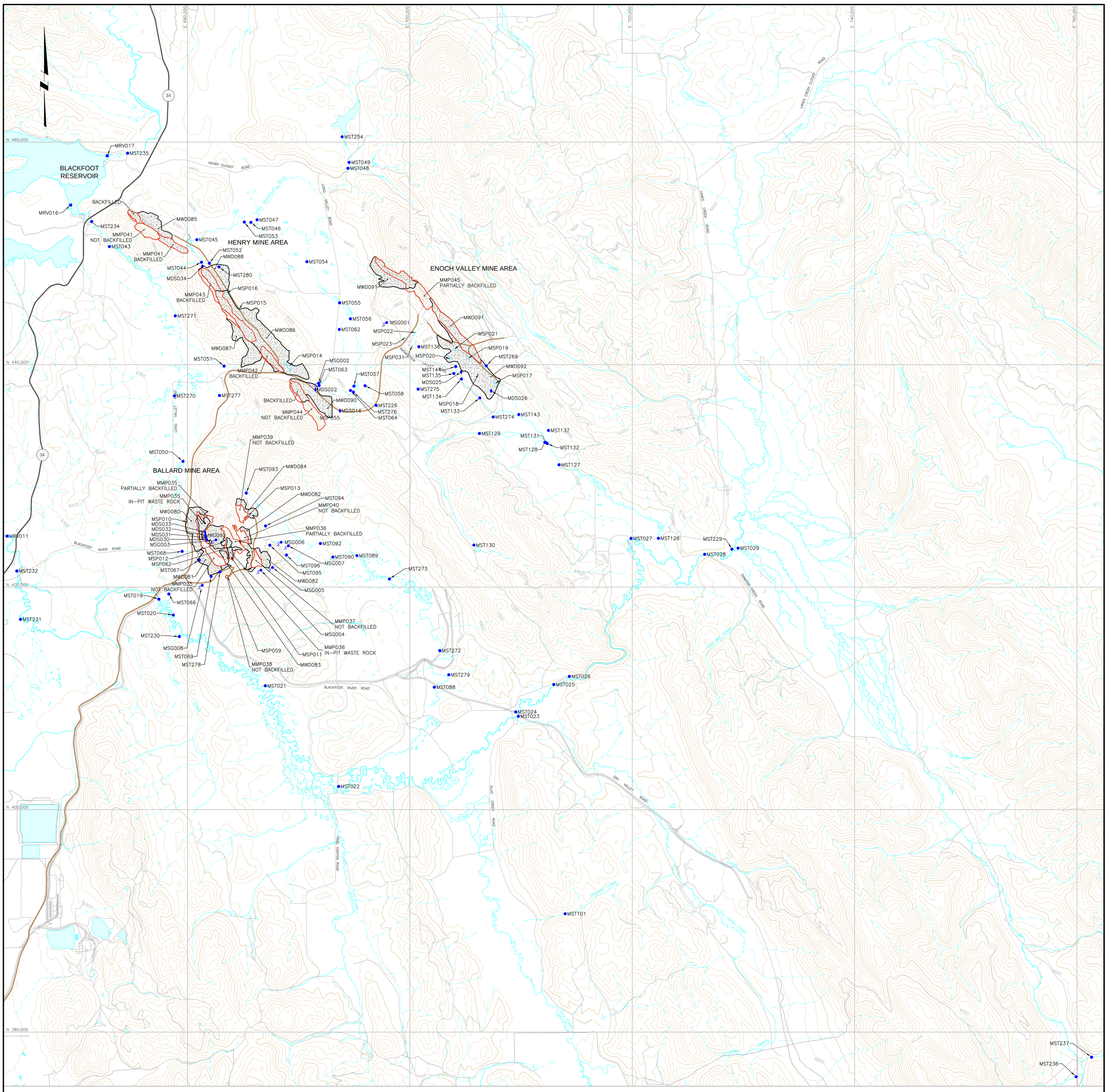
P4 Production, LLC

PROJECT LOCATION: BALLARD, HENRY AND ENOCH VALLEY MINES
PROJECT: RI/FS WORK PLAN
TITLE: 2009 BALLARD MINE AREA VEGETATION SAMPLE LOCATIONS AND RESULTS

MWH

DRAWING 3-7 REVISION 0
FILE NAME 1005813D213

N:\Design-Drafting\Clients_J-P\Monsanto Company\013-Sheet Set\RI-FS Scoping Data Maps\1005813D213



SCALE
3000' 0 3000' 6000'
CONTOUR INTERVAL = 100 FEET

LEGEND:

- 7000 — POST-MINE CONTOUR AND ELEVATION, FEET (APPROXIMATE)
- RIVER
- POND OR LAKE
- NATURAL DRAINAGE – PERENNIAL
- NATURAL DRAINAGE – INTERMITTENT
- HIGHWAY
- ROAD
- MONSANTO HAUL ROAD (ACTIVE & INACTIVE)
- RAILROAD
- MINE PIT LOCATION (APPROXIMATE WHERE COVERED BY BACKFILL)
- WASTE ROCK DUMP LOCATION (APPROXIMATE)
- WASTE ROCK DUMP LOCATION OR PIT BACKFILL (APPROXIMATE)

STATION TYPE:

- MRV = LAKE OR RESERVOIR SAMPLE LOCATION
- MDS = DUMP SEEP SAMPLE LOCATION
- MST = STREAM SAMPLE LOCATION
- MSG = SPRING SAMPLE LOCATION

KEY:

MMP = MINE PIT
MWD = WASTE ROCK DUMP
MSP = POND

ISSUED DRAFT FOR AGENCY REVIEW 7/6/10

ISSUE REV	DESCRIPTION	TECH	ENG	DATE
0	ISSUED DRAFT FOR AGENCY REVIEW	CHF	LWM	07/06/10

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- SURVEY DATA FOR ENOCH VALLEY MINE AREA PROVIDED BY P4 PRODUCTION DATED: DECEMBER 2007.
- US CENSUS BUREAU 2007 TIGER LINE DATA

PROJECTION: STATE PLANE COORDINATE SYSTEM
ZONE: IDAHO EAST
HORIZONTAL DATUM: NAD27
VERTICAL DATUM: NGVD29
UNITS: U.S. FEET

DESIGNED BY	C DUFFY	07/06/10
DRAWN BY	C FOWLER	07/06/10
CHECKED BY	E MARKS	07/06/10
APPROVED BY	C FOULK	07/06/10
PROJECT MANAGER	V DRAIN	07/06/10
CLIENT APPROVAL	B KOCH	07/06/10
CLIENT REFERENCE NO.		

P4 Production, LLC

PROJECT LOCATION: BALLARD, HENRY AND ENOCH VALLEY MINES
PROJECT: RI/FS WORK PLAN
TITLE: AREA WIDE SURFACE WATER SAMPLE LOCATIONS

MWH

DRAWING 3-8
REVISION 0
FILE NAME 1005813D222

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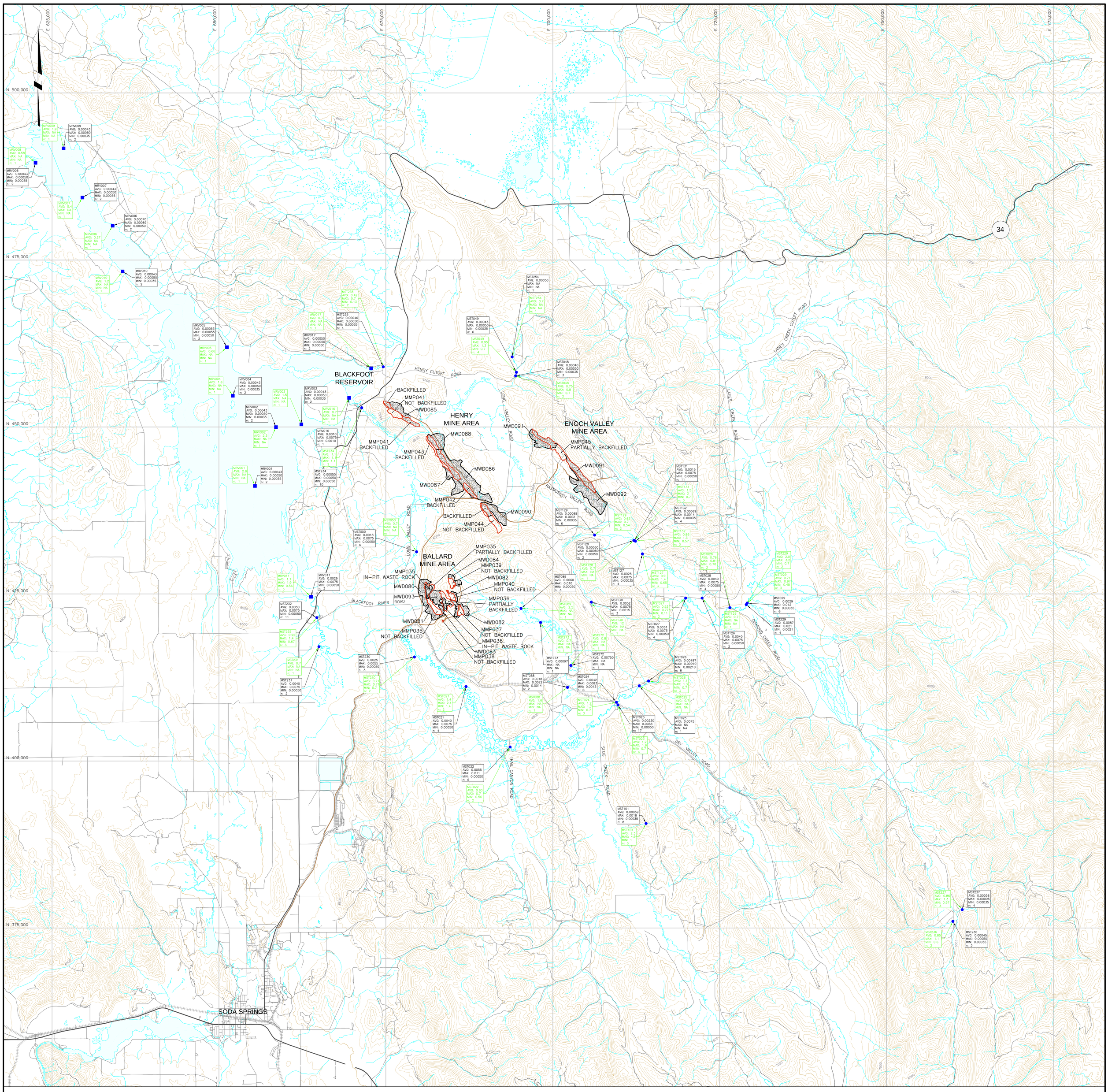

SCALE
5000' 0 5000' 10000'
CONTOUR INTERVAL = 100 FEET

LEGEND:

- POST-MINE CONTOUR AND ELEVATION, FEET (APPROXIMATE)
- RIVER
- POND OR LAKE
- NATURAL DRAINAGE
- HIGHWAY
- ROAD
- MONSANTO HAUL ROAD (ACTIVE & INACTIVE)
- RAILROAD
- MINE PIT LOCATION (APPROXIMATE WHERE COVERED BY BACKFILL)
- WASTE ROCK DUMP LOCATION (APPROXIMATE)
- WASTE ROCK DUMP LOCATION OR PIT BACKFILL (APPROXIMATE)

STATION TYPE:

- MRV = LAKE OR RESERVOIR SAMPLE LOCATION
- MST = STREAM SAMPLE LOCATION

KEY:

MMP = MINE PIT
MWD = WASTE ROCK DUMP

MST269 AVG: 4.9 MAX: NA MIN: NA n: 1 — 1997 – 2003 SURFACE WATER SELENIUM DATA REPORTED IN MG/L TOTAL SELENIUM

MST269 AVG: 4.9 MAX: NA MIN: NA n: 1 — 1998 – 2002 SEDIMENT SELENIUM DATA REPORTED IN MG/KG

REV	DESCRIPTION	TECH	ENG	DATE
1	FINAL	CHF	LWM	02/24/11
0	ISSUED DRAFT FOR AGENCY REVIEW	CHF	LWM	07/06/10

ISSUE

DISCLAIMER:
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- SURVEY DATA FOR ENOCH VALLEY MINE AREA PROVIDED BY P4 PRODUCTION DATED: DECEMBER 2007.
- US CENSUS BUREAU 2007 TIGER LINE DATA

PROJECTION: STATE PLANE COORDINATE SYSTEM
ZONE: IDAHO EAST
HORIZONTAL DATUM: NAD27
VERTICAL DATUM: NGVD29
UNITS: U.S. FEET

DESIGNED BY	C DUFFY	02/24/11
DRAWN BY	C FOWLER	02/24/11
CHECKED BY	E MARKS	02/24/11
APPROVED BY	C FOULK	02/24/11
PROJECT MANAGER	V DRAIN	02/24/11
CLIENT APPROVAL	B KOCH	02/24/11
CLIENT REFERENCE NO.		

P4 Production, LLC

PROJECT LOCATION: BALLARD, HENRY AND ENOCH VALLEY MINES
PROJECT: RI/FS WORK PLAN
TITLE: PRE-2004 AREA WIDE SURFACE WATER AND SEDIMENT SAMPLE LOCATIONS AND RESULTS

MWH

DRAWING 3-9 REVISION 1
FILE NAME 1005813D200

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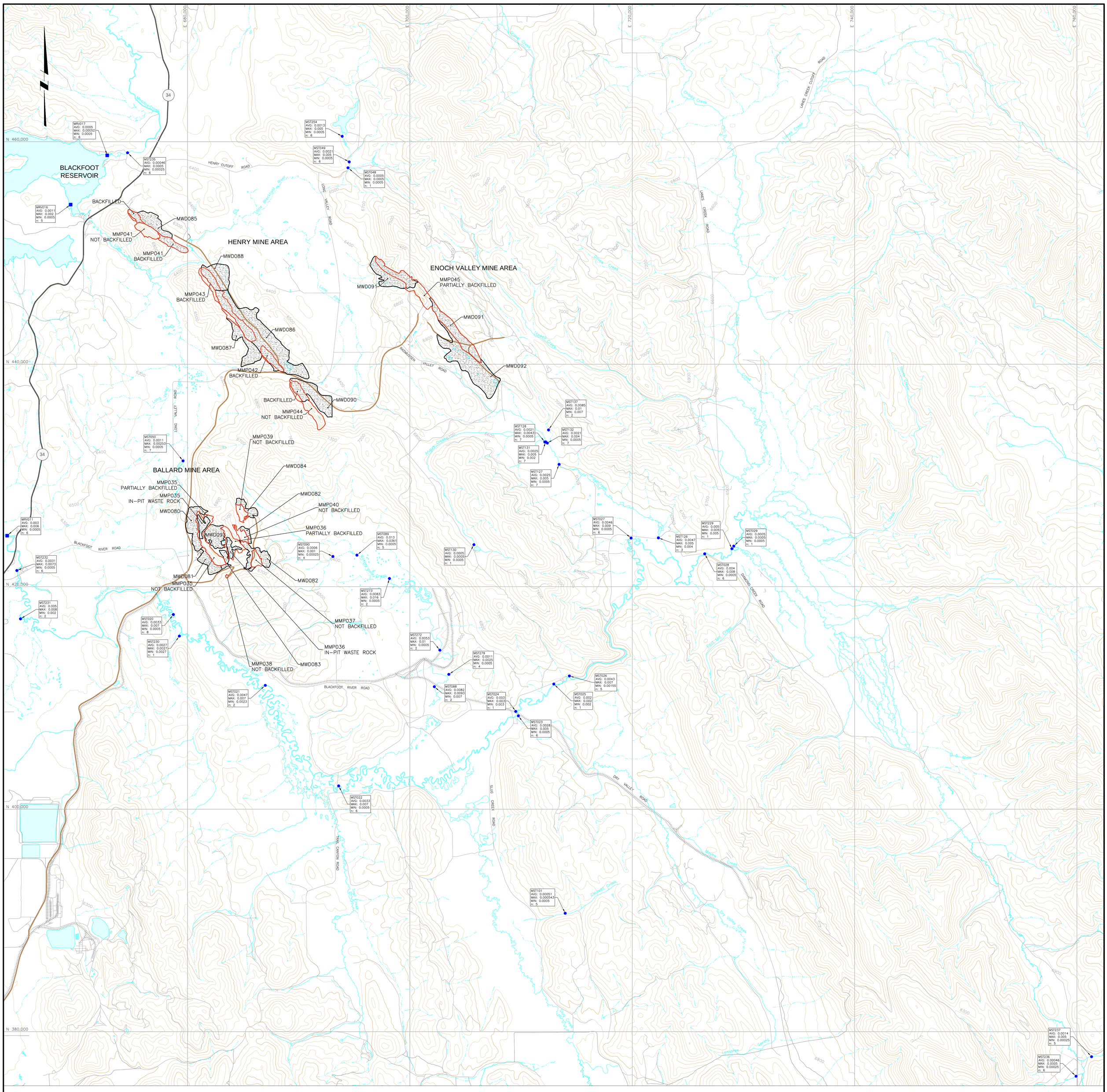

SCALE
3000' 0 3000' 6000'
CONTOUR INTERVAL = 100 FEET

LEGEND:

- 7000 — POST–MINE CONTOUR AND ELEVATION, FEET (APPROXIMATE)
- RIVER
- POND OR LAKE
- NATURAL DRAINAGE – PERENNIAL
- NATURAL DRAINAGE – INTERMITTENT
- HIGHWAY
- ROAD
- MONSANTO HAUL ROAD (ACTIVE & INACTIVE)
- RAILROAD
- MINE PIT LOCATION (APPROXIMATE WHERE COVERED BY BACKFILL)
- WASTE ROCK DUMP LOCATION (APPROXIMATE)
- WASTE ROCK DUMP LOCATION OR PIT BACKFILL (APPROXIMATE)

STATION TYPE:

- MRV = LAKE OR RESERVOIR SAMPLE LOCATION
- MDS = DUMP SEEP SAMPLE LOCATION
- MST = STREAM SAMPLE LOCATION
- MSG = SPRING SAMPLE LOCATION

KEY:

MMP = MINE PIT
MWD = WASTE ROCK DUMP

MST128 AVG:0.0021 MAX:0.0043 MIN:0.005 n: 7 — 2004 – 2009 SURFACE WATER SELENIUM DATA REPORTED IN MG/L TOTAL SELENIUM

ISSUE REV	DESCRIPTION	TECH	ENG	DATE
1	FINAL	CHF	LWM	02/24/11
0	ISSUED DRAFT FOR AGENCY REVIEW	CHF	LWM	07/06/10

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- SURVEY DATA FOR ENOCH VALLEY MINE AREA PROVIDED BY P4 PRODUCTION DATED: DECEMBER 2007.
- US CENSUS BUREAU 2007 TIGER LINE DATA

PROJECTION: STATE PLANE COORDINATE SYSTEM
ZONE: IDAHO EAST
HORIZONTAL DATUM: NAD27
VERTICAL DATUM: NGVD29
UNITS: U.S. FEET

DESIGNED BY	C DUFFY	02/24/11
DRAWN BY	C FOWLER	02/24/11
CHECKED BY	E MARKS	02/24/11
APPROVED BY	C FOULK	02/24/11
PROJECT MANAGER	V DRAIN	02/24/11
CLIENT APPROVAL	B KOCH	02/24/11
CLIENT REFERENCE NO.		

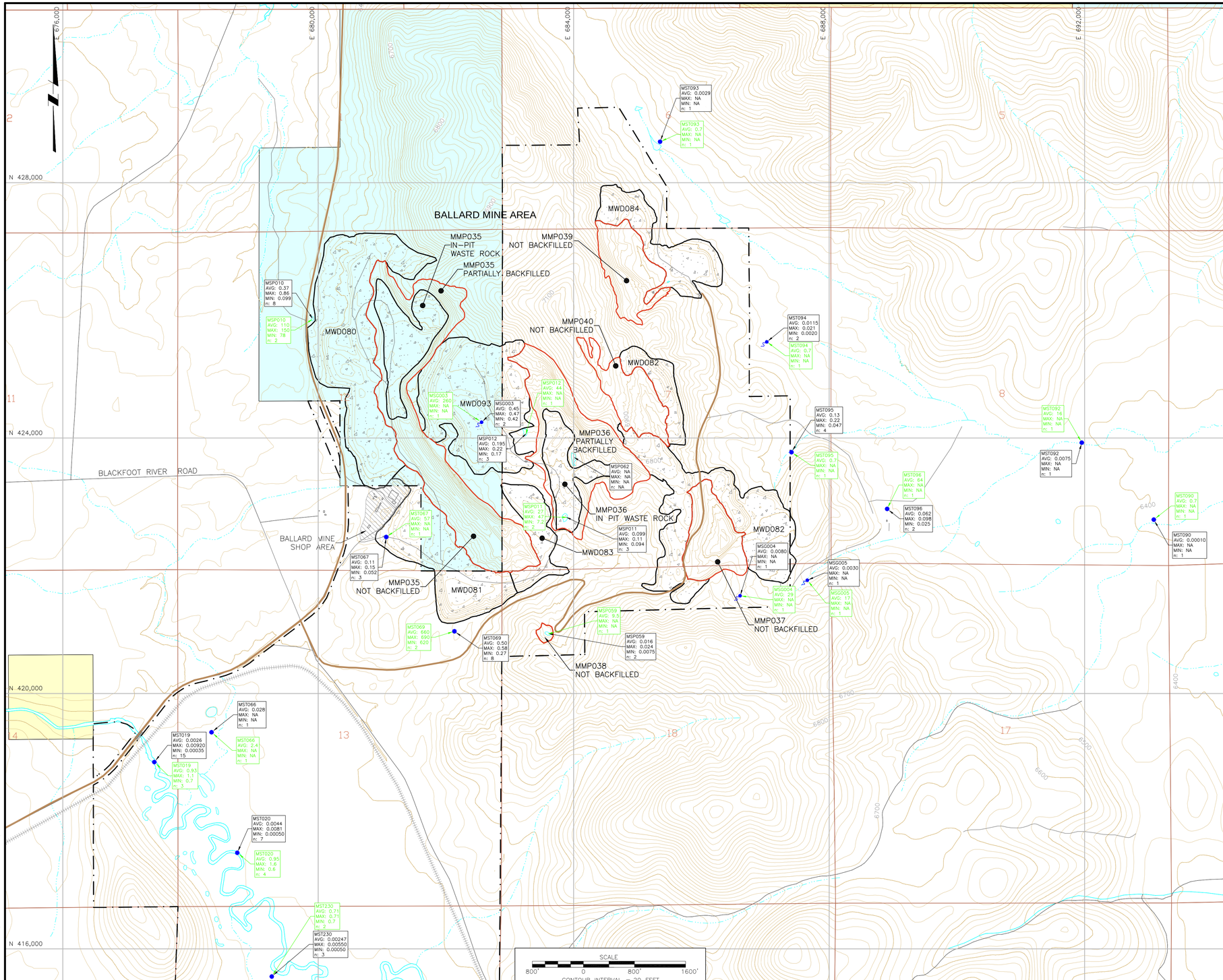
P4 Production, LLC

PROJECT LOCATION: BALLARD, HENRY AND ENOCH VALLEY MINES
PROJECT: RI/FS WORK PLAN
TITLE: EE/CA AREA WIDE SURFACE WATER SAMPLE LOCATIONS AND RESULTS

MWH

DRAWING 3-10 REVISION 1
FILE NAME 1005813D225

N:\Design–Drafting\Clients_J–P\Monsanto Company\013–Sheet Set\RI–FS Scoping Data Maps\1005813D225



LEGEND:

- POST-MINE CONTOUR AND ELEVATION, FEET (APPROXIMATE)
- RIVER
- POND OR LAKE
- NATURAL DRAINAGE – PERENNIAL
- NATURAL DRAINAGE – INTERMITTENT
- HIGHWAY
- ROAD
- MONSANTO HAUL ROAD (ACTIVE & INACTIVE)
- RAILROAD
- MINE PIT LOCATION (APPROXIMATE WHERE COVERED BY BACKFILL)
- WASTE ROCK DUMP LOCATION (APPROXIMATE)
- WASTE ROCK DUMP LOCATION OR PIT BACKFILL (APPROXIMATE)
- APPROXIMATE OWNERSHIP BOUNDARY
- SECTION LINES
- SECTION NUMBER
- BLM LANDS
- US NATIONAL FORESTS
- STATE LANDS
- NON FEDERAL LANDS

STATION TYPE:

- MSG = SPRING SAMPLE LOCATION
- MST = STREAM SAMPLE LOCATION

KEY:

MMP = MINE PIT
MWD = WASTE ROCK DUMP
MSP = POND

MST269 AVG: 4.9 MAX: NA MIN: NA n: 1 — 1997 – 2003 SURFACE WATER SELENIUM DATA REPORTED IN MG/L TOTAL SELENIUM

MST269 AVG: 4.9 MAX: NA MIN: NA n: 1 — 1998 – 2002 SEDIMENT SELENIUM DATA REPORTED IN MG/KG

NOTES:

1. WHEN A SINGLE SAMPLE RESULT IS AVAILABLE, THE RESULT IS REPORTED AS AVERAGE. HOWEVER, THIS HAS NO STATISTICAL SIGNIFICANCE.
2. USE THE STATISTICS REPORTED ON THIS FIGURE – SAMPLE SIZE, MINIMUM OBSERVATION, MAXIMUM OBSERVATION, AND AVERAGE – WITH CAUTION. THE SAMPLE SIZE REPRESENTS THE NUMBER OF OBSERVATIONS FOR A GIVEN STATION, BUT IT DOES NOT INDICATE THE OBSERVATIONS WERE OBTAINED UNDER A SINGLE WELL-DESIGNED SAMPLING PROGRAM FOR THAT LOCATION. THE MINIMUM AND MAXIMUM OBSERVATIONS AT A GIVEN STATION ARE JUST THOSE, BUT WHEN THE SAMPLE SIZE IS SMALL, EXTREME OBSERVATIONS ARE OF LITTLE VALUE IN ESTIMATING THE RANGE OF OBSERVATIONS THAT CAN BE EXPECTED TO BE ENCOUNTERED SHOULD FURTHER SAMPLING BE DONE. THE AVERAGE IS THE ARITHMETIC MEAN OF THE OBSERVATIONS COMPRISING THE TOTAL NUMBER OF SAMPLES FOR THE STATION, BUT DIFFERENT STATIONS WERE SOMETIMES SAMPLED AT DIFFERENT TIMES, SEASONALITY EXISTS FOR SOME ANALYTES, AND NOT ALL SEASONS WERE SAMPLED AT ALL STATIONS; SO, THE COMPARISON OF ONE OF THESE AVERAGES TO ANOTHER, OR OF THESE AVERAGES TO ANY BENCHMARK, MAY HAVE LITTLE, IF ANY, MEANING.

ISSUE REV	DESCRIPTION	TECH	ENG	DATE
1	FINAL	CHF	LWM	02/24/11
0	ISSUED DRAFT FOR AGENCY REVIEW	CHF	LWM	07/06/10

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- US CENSUS BUREAU 2007 TIGER LINE DATA

PROJECTION: STATE PLANE COORDINATE SYSTEM
ZONE: IDAHO EAST
HORIZONTAL DATUM: NAD27
VERTICAL DATUM: NGVD29
UNITS: U.S. FEET

DESIGNED BY	C DUFFY	02/24/11
DRAWN BY	C FOWLER	02/24/11
CHECKED BY	E MARKS	02/24/11
APPROVED BY	C FOULK	02/24/11
PROJECT MANAGER	V DRAIN	02/24/11
CLIENT APPROVAL	B KOCH	02/24/11
CLIENT REFERENCE NO.		

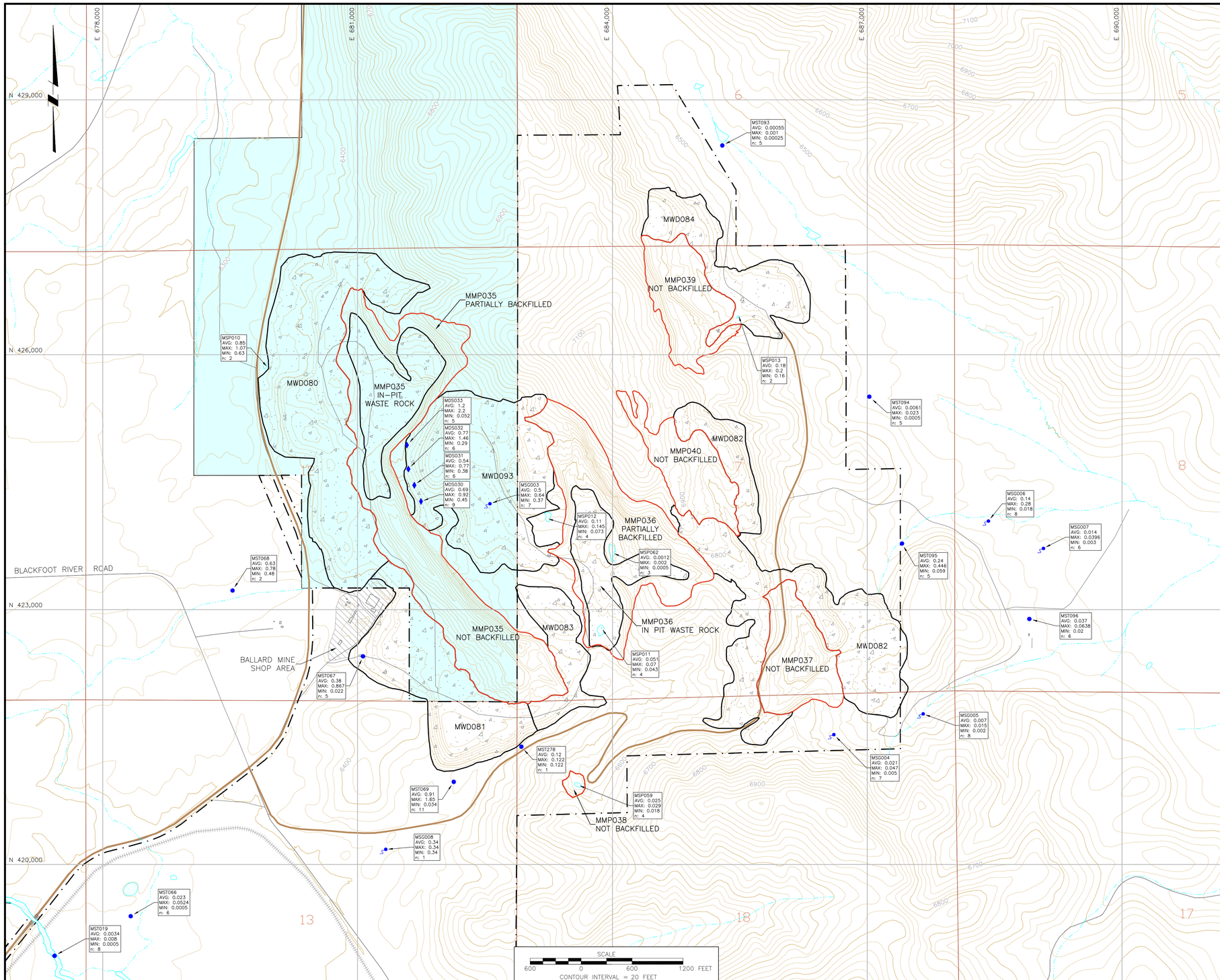
P4 Production, LLC

PROJECT LOCATION: BALLARD, HENRY AND ENOCH VALLEY MINES
PROJECT: RI/FS WORK PLAN
TITLE: PRE-2004 BALLARD MINE AREA SURFACE WATER AND SEDIMENT SAMPLE LOCATIONS AND RESULTS

MWH

DRAWING 3-11 REVISION 1
FILE NAME 1005813D201

N:\Design-Drafting\Clients_J-P\Monsanto Company\013-Sheet Set\RI-FS Scoping Data Maps\1005813D201



LEGEND:

- POST-MINE CONTOUR AND ELEVATION, FEET (APPROXIMATE)
- RIVER
- POND OR LAKE
- NATURAL DRAINAGE – PERENNIAL
- NATURAL DRAINAGE – INTERMITTENT
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- WASTE ROCK DUMP LOCATION OR PIT BACKFILL (APPROXIMATE)
- APPROXIMATE OWNERSHIP BOUNDARY
- SECTION LINES
- SECTION NUMBER
- BLM LANDS
- US NATIONAL FORESTS
- STATE LANDS
- NON FEDERAL LANDS

STATION TYPE:

- MDS = DUMP SEEP SAMPLE LOCATION
- MST = STREAM SAMPLE LOCATION
- MSG = SPRING SAMPLE LOCATION

KEY:

MMP = MINE PIT
MWD = WASTE ROCK DUMP
MSP = POND

MST269 AVG: 4.9 MAX: NA MIN: NA n: 1 — 2004 – 2009 SURFACE WATER SELENIUM DATA REPORTED IN MG/L TOTAL SELENIUM

ISSUE REV	DESCRIPTION	TECH	ENG	DATE
1	FINAL	CHF	LWM	02/24/11
0	ISSUED DRAFT FOR AGENCY REVIEW	CHF	LWM	07/06/10

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- SURVEY DATA FOR ENOCH VALLEY MINE AREA PROVIDED BY P4 PRODUCTION DATED: DECEMBER 2007.
- US CENSUS BUREAU 2007 TIGER LINE DATA

PROJECTION: STATE PLANE COORDINATE SYSTEM
ZONE: IDAHO EAST
HORIZONTAL DATUM: NAD27
VERTICAL DATUM: NGVD29
UNITS: U.S. FEET

DESIGNED BY	C DUFFY	02/24/11
DRAWN BY	C FOWLER	02/24/11
CHECKED BY	E MARKS	02/24/11
APPROVED BY	C FOULK	02/24/11
PROJECT MANAGER	V DRAIN	02/24/11
CLIENT APPROVAL	B KOCH	02/24/11
CLIENT REFERENCE NO.		

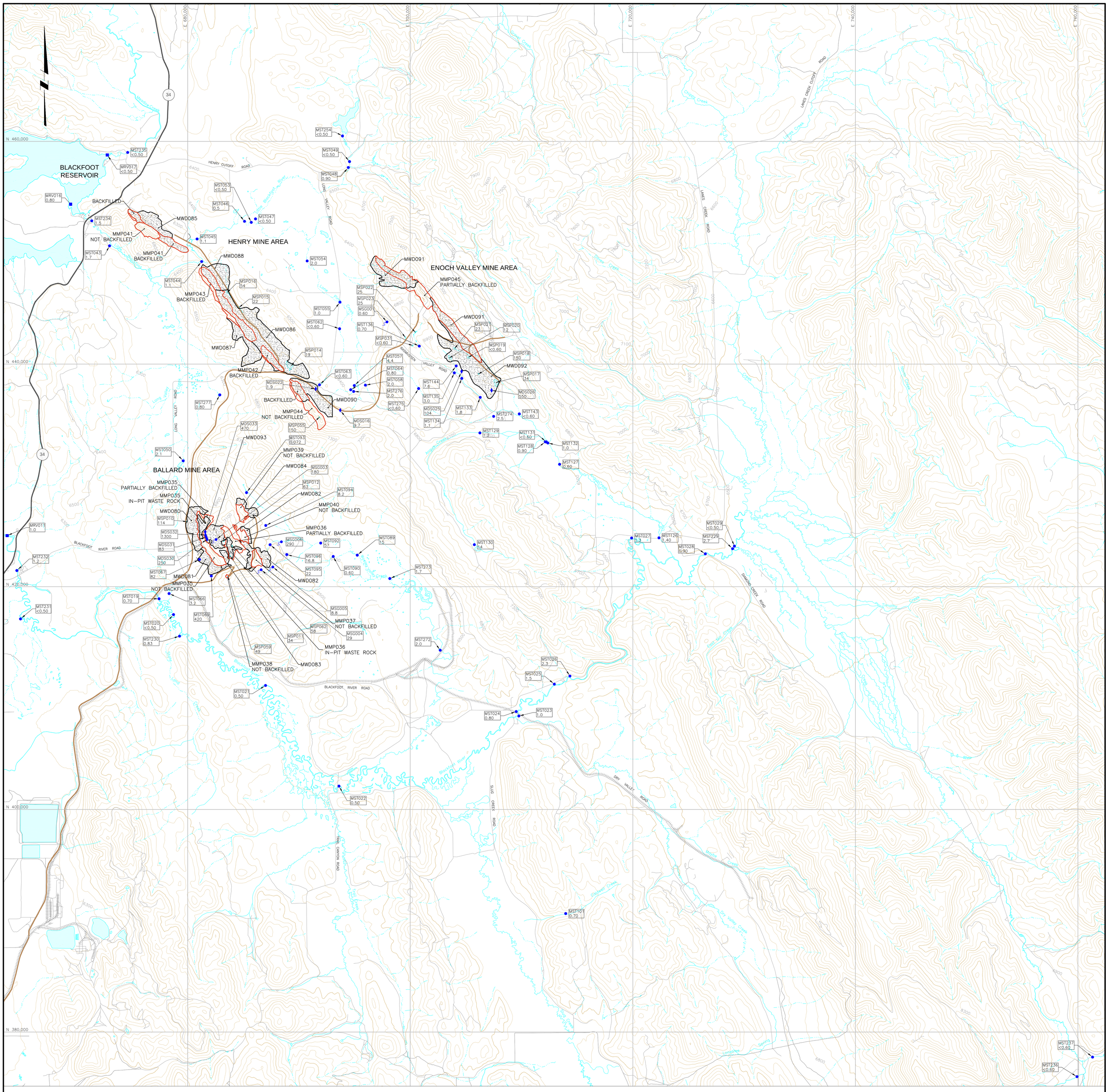
P4 Production, LLC

PROJECT LOCATION: BALLARD, HENRY AND ENOCH VALLEY MINES
PROJECT: RI/FS WORK PLAN
TITLE: EE/CA BALLARD MINE AREA SURFACE WATER SAMPLE LOCATIONS AND RESULTS

MWH

DRAWING 3-12 REVISION 1
FILE NAME 1005813D226

N:\Design-Drafting\Clients_J-P\Monsanto Company\013-Sheet Set\RI-FS Scoping Data Maps\1005813D226



SCALE
3000' 0 3000' 6000'
CONTOUR INTERVAL = 100 FEET

LEGEND:

- 7000 — POST-MINE CONTOUR AND ELEVATION, FEET (APPROXIMATE)
- RIVER
- POND OR LAKE
- NATURAL DRAINAGE – PERENNIAL
- NATURAL DRAINAGE – INTERMITTENT
- HIGHWAY
- ROAD
- MONSANTO HAUL ROAD (ACTIVE & INACTIVE)
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- WASTE ROCK DUMP LOCATION (APPROXIMATE)
- WASTE ROCK DUMP LOCATION OR PIT BACKFILL (APPROXIMATE)

STATION TYPE:

- MRV = RESERVOIR SAMPLE LOCATION
- MDS = DUMP SAMPLE LOCATION
- MST = STREAM SAMPLE LOCATION
- MSG = SPRING SAMPLE LOCATION

KEY:

MMP = MINE PIT
MWD = WASTE ROCK DUMP
MSP = POND

MST101 0.70J — MAY 2004 SEDIMENT SELENIUM DATA REPORTED IN MG/KG,DW

ISSUED DRAFT FOR AGENCY REVIEW 7/6/10

ISSUE REV	DESCRIPTION	TECH	ENG	DATE
0	ISSUED DRAFT FOR AGENCY REVIEW	CHF	LWM	07/06/10

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- SURVEY DATA FOR ENOCH VALLEY MINE AREA PROVIDED BY P4 PRODUCTION DATED: DECEMBER 2007.
- US CENSUS BUREAU 2007 TIGER LINE DATA

PROJECTION: STATE PLANE COORDINATE SYSTEM
ZONE: IDAHO EAST
HORIZONTAL DATUM: NAD27
VERTICAL DATUM: NGVD29
UNITS: U.S. FEET

DESIGNED BY	C DUFFY	07/06/10
DRAWN BY	C FOWLER	07/06/10
CHECKED BY	E MARKS	07/06/10
APPROVED BY	C FOULK	07/06/10
PROJECT MANAGER	V DRAIN	07/06/10
CLIENT APPROVAL	B KOCH	07/06/10
CLIENT REFERENCE NO.		

P4 Production, LLC

PROJECT LOCATION: BALLARD, HENRY AND ENOCH VALLEY MINES
PROJECT: RI/FS WORK PLAN
TITLE: 2004 AREA WIDE SEDIMENT SAMPLE LOCATIONS AND RESULTS

MWH

DRAWING 3-13 REVISION 0
FILE NAME 1005813D258

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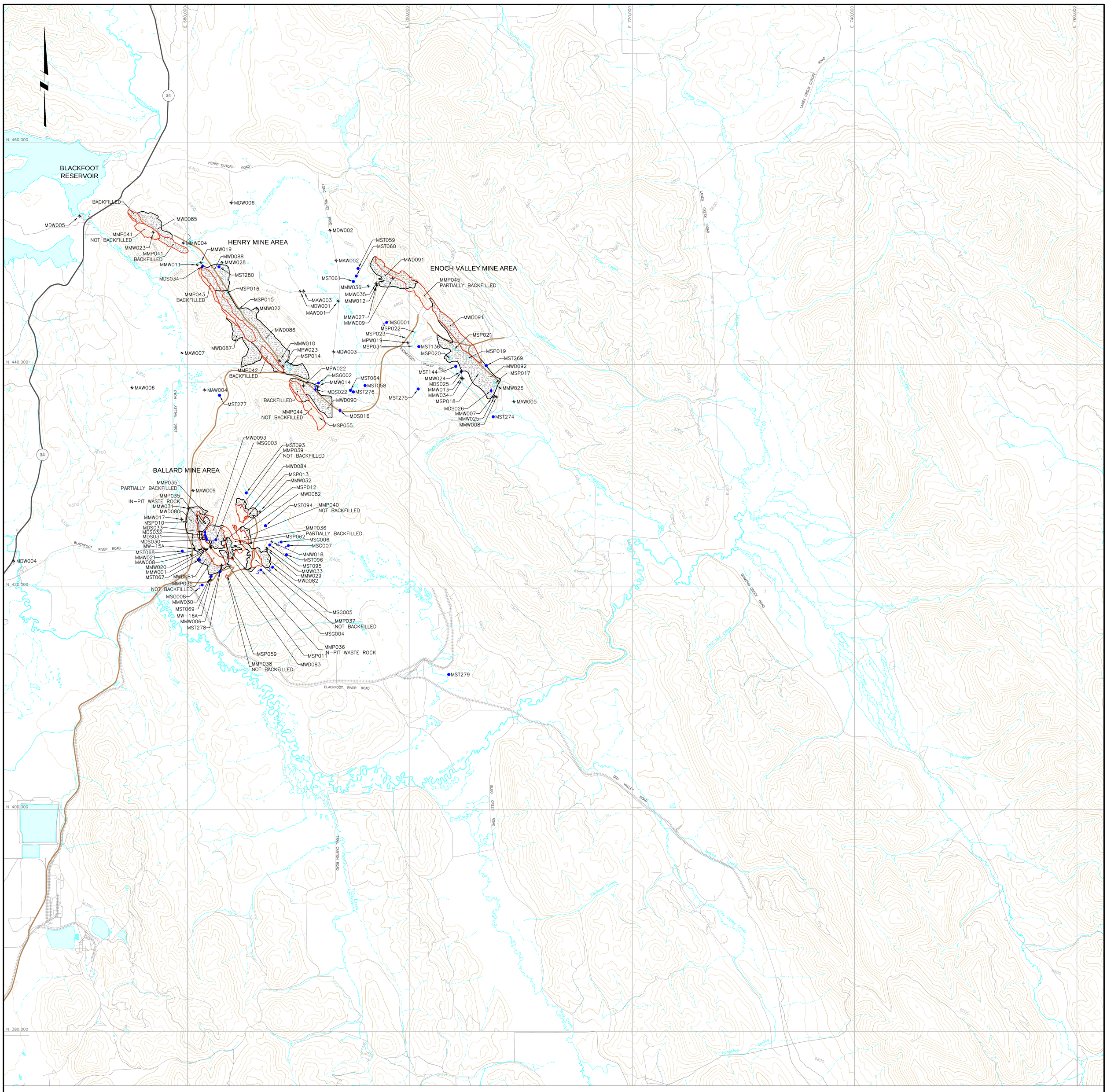

SCALE
3000' 0 3000' 6000'
CONTOUR INTERVAL = 100 FEET

LEGEND:

- POST-MINE CONTOUR AND ELEVATION, FEET (APPROXIMATE)
- RIVER
- POND OR LAKE
- NATURAL DRAINAGE – PERENNIAL
- NATURAL DRAINAGE – INTERMITTENT
- HIGHWAY
- ROAD
- MONSANTO HAUL ROAD (ACTIVE & INACTIVE)
- RAILROAD
- MINE PIT LOCATION (APPROXIMATE WHERE COVERED BY BACKFILL)
- WASTE ROCK DUMP LOCATION (APPROXIMATE)
- WASTE ROCK DUMP LOCATION OR PIT BACKFILL (APPROXIMATE)

STATION TYPE:

- MMW = MONITORING WELL
- MAW = AGRICULTURAL WELL
- MDW = DOMESTIC WELL
- MPW = PRODUCTION WELL
- MDS = DUMP SEEP SAMPLE LOCATION
- MST = STREAM SAMPLE LOCATION
- MSG = SPRING SAMPLE LOCATION

KEY:

MMP = MINE PIT
MWD = WASTE ROCK DUMP
MSP = POND

ISSUE REV	DESCRIPTION	TECH	ENG	DATE
0	ISSUED DRAFT FOR AGENCY REVIEW	CHF	LWM	07/06/10

DISCLAIMER:
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- SURVEY DATA FOR HENRY MINE AREA PROVIDED BY OLYMPUS AERIAL SURVEYS, INC. DATED: NOVEMBER 2006.
- SURVEY DATA FOR ENOCH VALLEY MINE AREA PROVIDED BY P4 PRODUCTION DATED: DECEMBER 2007.
- US CENSUS BUREAU 2007 TIGER LINE DATA

PROJECTION: STATE PLANE COORDINATE SYSTEM
ZONE: IDAHO EAST
HORIZONTAL DATUM: NAD27
VERTICAL DATUM: NGVD29
UNITS: U.S. FEET

DESIGNED BY	C DUFFY	07/06/10
DRAWN BY	C FOWLER	07/06/10
CHECKED BY	E MARKS	07/06/10
APPROVED BY	C FOULK	07/06/10
PROJECT MANAGER	V DRAIN	07/06/10
CLIENT APPROVAL	B KOCH	07/06/10
CLIENT REFERENCE NO.		

P4 Production, LLC

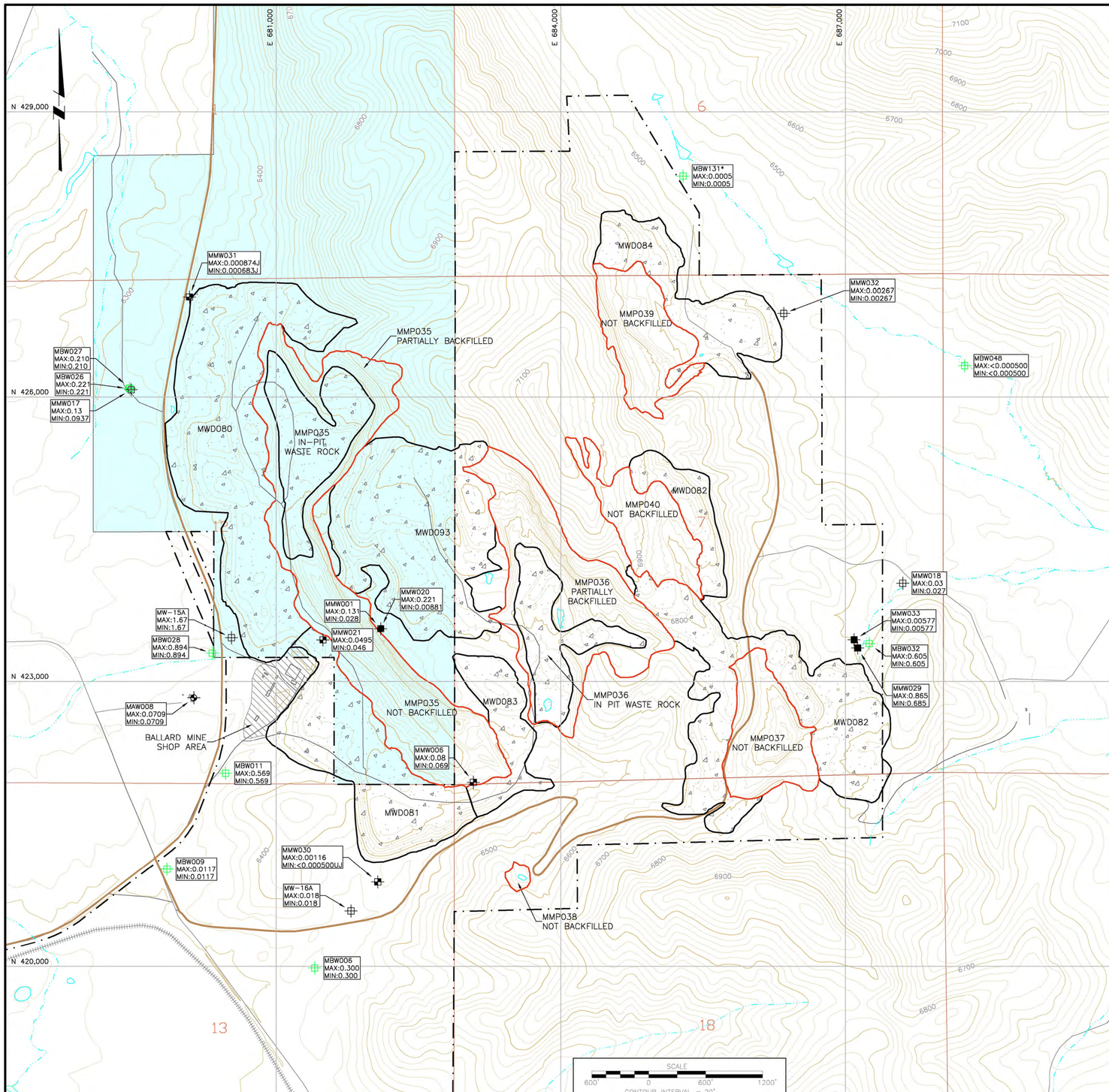
ISSUED DRAFT FOR AGENCY REVIEW 7/6/10

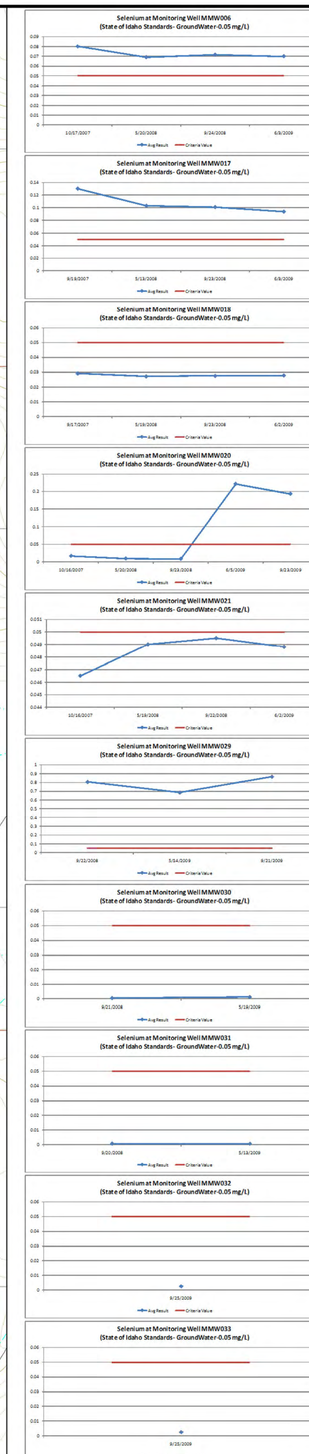
PROJECT LOCATION: BALLARD, HENRY AND ENOCH VALLEY MINES
PROJECT: RI/FS WORK PLAN
TITLE: EE/CA AREA WIDE GROUNDWATER SAMPLE LOCATIONS

MWH

DRAWING 3-14
REVISION 0
FILE NAME 1005813D224

N:\Design-Drafting\Clients_J-P\Monsanto Company\013-Sheet Set\RI-FS Scoping Data Maps\1005813D224





LEGEND:

- 7000 — POST-MINE CONTOUR AND ELEVATION, FEET (APPROXIMATE)
- RIVER
- POND OR LAKE
- NATURAL DRAINAGE – PERENNIAL
- NATURAL DRAINAGE – INTERMITTENT
- HIGHWAY
- ROAD
- MONSANTO HAUL ROAD (ACTIVE & INACTIVE)
- RAILROAD
- MINE PIT LOCATION (APPROXIMATE WHERE COVERED BY BACKFILL)
- WASTE ROCK DUMP LOCATION (APPROXIMATE)
- WASTE ROCK DUMP LOCATION OR PIT BACKFILL (APPROXIMATE)
- APPROXIMATE OWNERSHIP BOUNDARY
- SECTION LINES
- 20 — SECTION NUMBER
- BLM LANDS
- US NATIONAL FORESTS
- STATE LANDS
- NON FEDERAL LANDS

STATION TYPE:

- MAW = AGRICULTURAL WELL
- MDW = DOMESTIC WELL
- MPW = PRODUCTION WELL
- MMW = ALLUVIAL AQUIFER MONITORING WELL
- MMW = INTERMEDIATE AQUIFER MONITORING WELL (GENERALLY DINWOODY FM.)
- MMW = REGIONAL AQUIFER MONITORING WELL (WELLS FM.)
- MMW = AQUIFER MONITORING WELL (UNKNOWN OR MULTIPLE AQUIFERS SCREENED)
- MBW = DIRECT-PUSH ALLUVIAL AQUIFER WELL

KEY:

MMP = MINE PIT
MWD = WASTE ROCK DUMP
MMW029 — GROUNDWATER STATION ID
MAX:0.865 / MIN:0.685 — GROUNDWATER SAMPLING TOTAL SELENIUM RESULT (MG/L)
MBW130* — GROUNDWATER SAMPLING DISSOLVED SELENIUM
GRAPHS PRESENT TOTAL SELENIUM RESULTS

ISSUE REV	DESCRIPTION	TECH	ENG	DATE
1	FINAL	CHF	LWM	02/24/11
0	ISSUED DRAFT FOR AGENCY REVIEW	CHF	LWM	07/06/10

DISCLAIMER:
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- SURVEY DATA FOR HENRY MINE AREA PROVIDED BY OLYMPUS AERIAL SURVEYS, INC. DATED: NOVEMBER 2008.
- SURVEY DATA FOR ENOCH VALLEY MINE AREA PROVIDED BY P4 PRODUCTION DATED: DECEMBER 2007.
- US CENSUS BUREAU 2007 TIGER LINE DATA

PROJECTION: STATE PLANE COORDINATE SYSTEM
ZONE: IDAHO EAST
HORIZONTAL DATUM: NAD27
VERTICAL DATUM: NGVD29
UNITS: U.S. FEET

DESIGNED BY	C DUFFY	02/24/11
DRAWN BY	C FOWLER	02/24/11
CHECKED BY	E MARKS	02/24/11
APPROVED BY	C FOULK	02/24/11
PROJECT MANAGER	V DRAIN	02/24/11
CLIENT APPROVAL	B KOCH	02/24/11
CLIENT REFERENCE NO.		

P4 Production, LLC

PROJECT LOCATION: BALLARD, HENRY AND ENOCH VALLEY MINES
PROJECT: RI/FS WORK PLAN
TITLE: EE/CA BALLARD MINE AREA GROUNDWATER SAMPLE LOCATIONS AND RESULTS

MWH

DRAWING: 3-15
REVISION: 1
FILE NAME: 1005813D219

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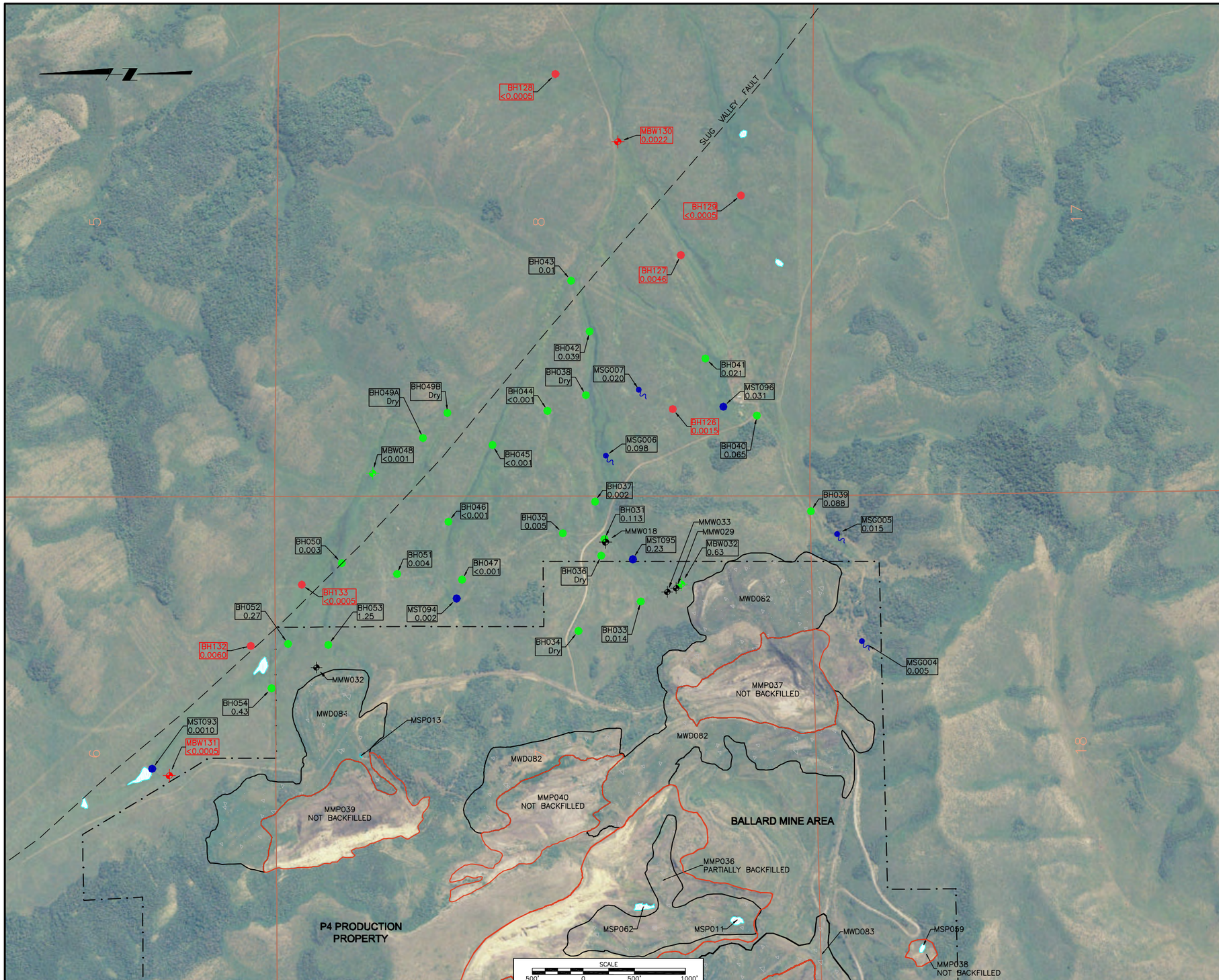

LEGEND:

- MINE PIT LOCATION (APPROXIMATE WHERE COVERED BY BACKFILL)
- WASTE ROCK DUMP LOCATION (APPROXIMATE)
- WASTE ROCK DUMP LOCATION OR PIT BACKFILL (APPROXIMATE)
- POND OR LAKE
- P4 PRODUCTION PROPERTY BOUNDARY (APPROXIMATE)
- SECTION LINES
- 8 SECTION NUMBER
- BLM LANDS
- US NATIONAL FORESTS
- STATE LANDS
- NON FEDERAL LANDS
- APPROXIMATE OR INFERRED FAULT

STATION TYPE:

- MSG = SPRING STATION
- MST = STREAM STATION
- MMW = GROUNDWATER MONITORING WELL
- MBW = DIRECT PUSH MONITORING WELL INSTALLED IN 2008
- MBW = DIRECT PUSH MONITORING WELL INSTALLED IN 2009
- BH = 2008 DIRECT PUSH BOREHOLE
- BH = 2009 DIRECT PUSH BOREHOLE

KEY:

MMP = MINE PIT
MWD = WASTE ROCK DUMP
MSP = POND

BH043 0.01	2008 DIRECT PUSH BOREHOLE ID AND DISSOLVED SELENIUM CONCENTRATION
BH043 0.01	2009 DIRECT PUSH BOREHOLE ID AND DISSOLVED SELENIUM CONCENTRATION
<0.001	CONCENTRATION LESS THAN THE METHOD DETECTION LIMIT

NOTES:

1. DIRECT PUSH RESULTS ARE FOR GRAB GROUNDWATER SAMPLES AND ARE DISSOLVED CONCENTRATIONS OF SELENIUM IN MG/L.
2. SPRING 2008 TOTAL SELENIUM CONCENTRATIONS ARE USED FOR MONITORING WELLS, SPRINGS AND HEADWATER STREAMS WHERE APPROPRIATE.
3. BEDROCK WELLS ARE SHOWN FOR REFERENCE. SELENIUM CONCENTRATIONS ARE NOT SHOWN FOR THESE WELLS.

REV	DESCRIPTION	TECH	ENG	DATE
1	FINAL	CHF	LWM	02/24/11
0	ISSUED DRAFT FOR AGENCY REVIEW	CHF	LWM	07/06/10

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- SURVEY DATA FOR ENOCH VALLEY MINE AREA PROVIDED BY P4 PRODUCTION DATED: DECEMBER 2007.
- US CENSUS BUREAU 2007 TIGER LINE DATA

PROJECTION: STATE PLANE COORDINATE SYSTEM
ZONE: IDAHO EAST
HORIZONTAL DATUM: NAD27
VERTICAL DATUM: NGVD29
UNITS: U.S. FEET

DESIGNED BY	C DUFFY	02/24/11
DRAWN BY	C FOWLER	02/24/11
CHECKED BY	E MARKS	02/24/11
APPROVED BY	C FOULK	02/24/11
PROJECT MANAGER	V DRAIN	02/24/11
CLIENT APPROVAL	B KOCH	02/24/11
CLIENT REFERENCE NO.		

P4 Production, LLC

PROJECT LOCATION: BALLARD, HENRY AND ENOCH VALLEY MINES
PROJECT: RI/FS WORK PLAN
TITLE: EE/CA BALLARD MINE AREA EAST DIRECT PUSH BOREHOLE LOCATIONS

MWH

DRAWING 3-16 REVISION 1
FILE NAME 1005813D239

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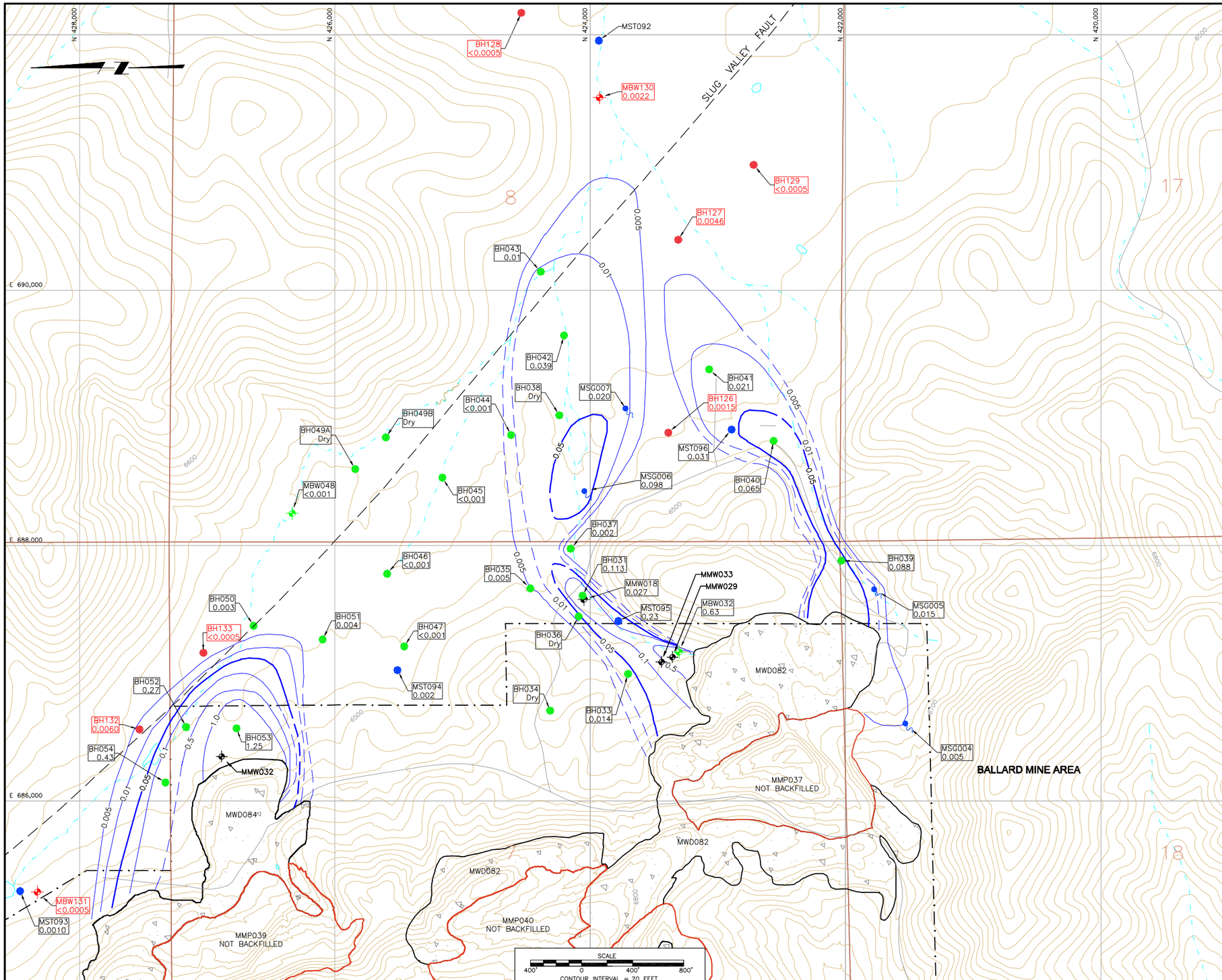

LEGEND:

- POST-MINE CONTOUR & ELEVATION, FEET
- POND OR LAKE
- NATURAL DRAINAGE – PERENNIAL
- NATURAL DRAINAGE – INTERMITTENT
- MINE PIT LOCATION (APPROXIMATE WHERE COVERED BY BACKFILL)
- WASTE ROCK DUMP LOCATION (APPROXIMATE)
- WASTE ROCK DUMP LOCATION OR PIT BACKFILL (APPROXIMATE)
- HIGHWAY
- ROAD
- RAILROAD
- P4 PRODUCTION HAUL ROAD (ACTIVE & INACTIVE)
- TOTAL SELENIUM ISOCONCENTRATION CONTOUR (mg/L)
- INFERRED TOTAL SELENIUM ISOCONCENTRATION CONTOUR (mg/L)
- P4 PRODUCTION PROPERTY BOUNDARY (APPROXIMATE)
- SECTION LINES
- SECTION NUMBER
- BLM LANDS
- STATE LANDS
- NON FEDERAL LANDS
- APPROXIMATE OR INFERRED FAULT

STATION TYPE:

- MSG = SPRING STATION
- MST = STREAM STATION
- MMW = GROUND WATER MONITORING WELL
- MBW = DIRECT PUSH MONITORING WELL INSTALLED IN 2008
- MBW = DIRECT PUSH MONITORING WELL INSTALLED IN 2009
- BH = 2008 DIRECT PUSH BOREHOLE
- BH = 2009 DIRECT PUSH BOREHOLE

KEY:

MMP = MINE PIT
MWD = WASTE ROCK DUMP

BH043 0.01	2008 DIRECT PUSH BOREHOLE ID AND DISSOLVED SELENIUM CONCENTRATION
BH043 0.01	2009 DIRECT PUSH BOREHOLE ID AND DISSOLVED SELENIUM CONCENTRATION
<0.001	CONCENTRATION LESS THAN THE METHOD DETECTION LIMIT

NOTES:

1. WHERE WELLS ARE NESTED IN THE ALLUVIAL FLOW SYSTEM (I.E. SHALLOW AND DEEPER) THE HIGHEST MEASURED CONCENTRATION IS USED FOR CONTOURING.
2. SPRING 2008 TOTAL SELENIUM CONCENTRATIONS ARE USED FOR MONITORING WELLS, SPRINGS AND HEADWATER STREAMS WHERE APPROPRIATE.
3. ISOCONCENTRATION CONTOUR INTERVAL=LOG WITH SUPPLEMENTAL HALF CYCLE CONTOURS.
4. BEDROCK WELLS ARE SHOWN FOR REFERENCE. SELENIUM CONCENTRATIONS ARE NOT SHOWN FOR THESE WELLS.

ISSUE REV	DESCRIPTION	TECH	ENG	DATE
1	FINAL	CHF	LWM	02/24/11
0	ISSUED DRAFT FOR AGENCY REVIEW	CHF	LWM	07/06/10

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- SURVEY DATA FOR ENOCH VALLEY MINE AREA PROVIDED BY P4 PRODUCTION DATED: DECEMBER 2007.
- US CENSUS BUREAU 2007 TIGER LINE DATA

PROJECTION:
STATE PLANE COORDINATE SYSTEM
ZONE:
IDAHO EAST
HORIZONTAL DATUM:
NAD27
VERTICAL DATUM:
NGVD29
UNITS:
U.S. FEET

DESIGNED BY	C DUFFY	02/24/11
DRAWN BY	C FOWLER	02/24/11
CHECKED BY	E MARKS	02/24/11
APPROVED BY	C FOULK	02/24/11
PROJECT MANAGER	V DRAIN	02/24/11
CLIENT APPROVAL	B KOCH	02/24/11
CLIENT REFERENCE NO.		

P4 Production, LLC

PROJECT LOCATION
BALLARD, HENRY AND ENOCH VALLEY MINES
PROJECT
RI/FS WORK PLAN
TITLE
EE/CA BALLARD MINE AREA EAST
DIRECT PUSH SELENIUM ISOCONTOUR MAPS

MWH

DRAWING 3-17
REVISION 1
FILE NAME 1005813D240

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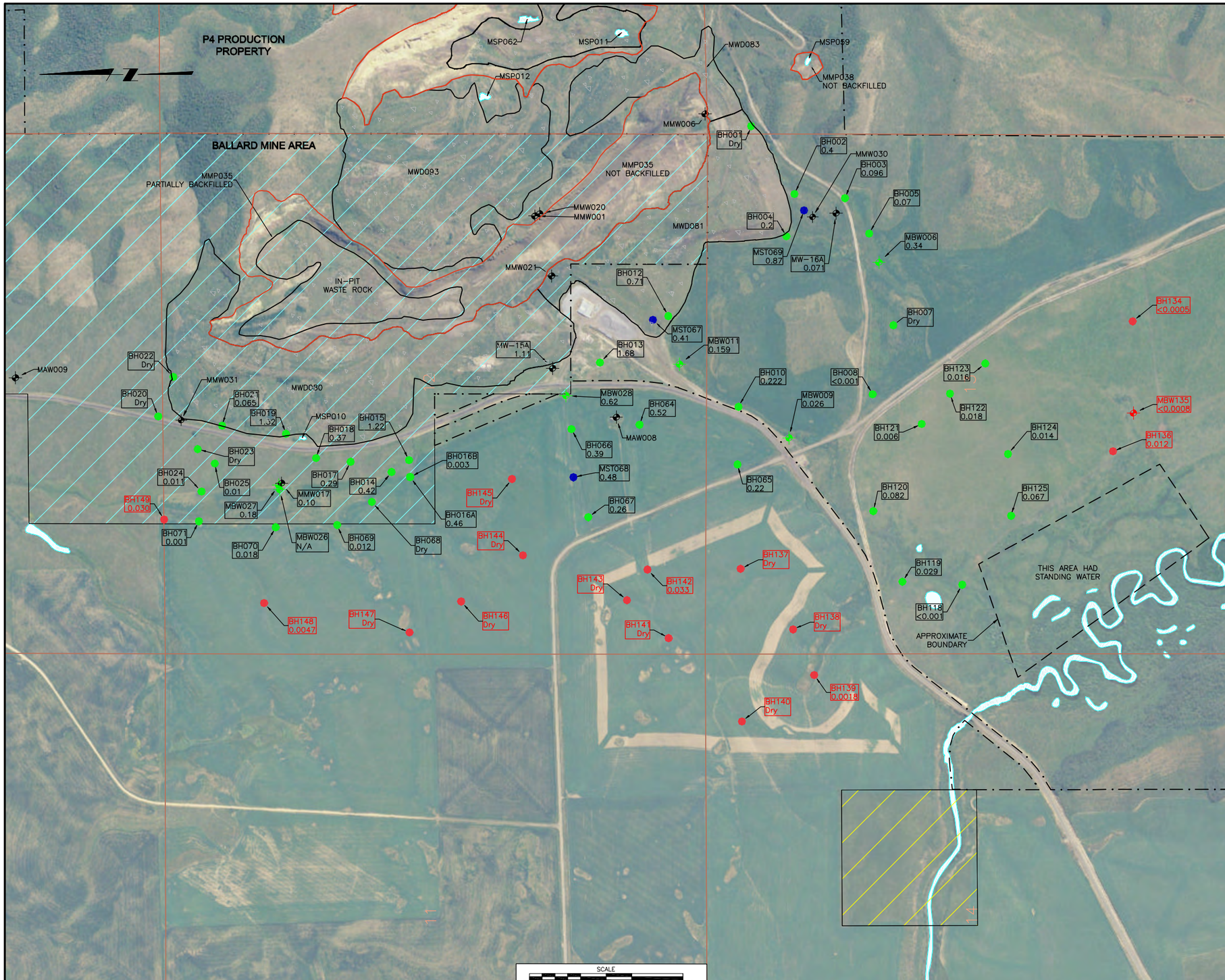

LEGEND:

- MINE PIT LOCATION (APPROXIMATE WHERE COVERED BY BACKFILL)
- WASTE ROCK DUMP LOCATION (APPROXIMATE)
- WASTE ROCK DUMP LOCATION OR PIT BACKFILL (APPROXIMATE)
- POND OR LAKE
- P4 PRODUCTION PROPERTY BOUNDARY (APPROXIMATE)
- SECTION LINES
- 8 SECTION NUMBER
- BLM LANDS
- US NATIONAL FORESTS
- STATE LANDS
- NON FEDERAL LANDS

STATION TYPE:

- MSG = SPRING STATION
- MST = STREAM STATION
- MMW = GROUND WATER MONITORING WELL
- MAW = AGRICULTURAL WELL
- MBW = DIRECT PUSH MONITORING WELL INSTALLED IN 2008
- MBW = DIRECT PUSH MONITORING WELL INSTALLED IN 2009
- BH = 2008 DIRECT PUSH BOREHOLE
- BH = 2009 DIRECT PUSH BOREHOLE

KEY:

MMP = MINE PIT
MWD = WASTE ROCK DUMP
MSP = POND

BH043 0.01 — 2008 DIRECT PUSH BOREHOLE ID AND DISSOLVED SELENIUM CONCENTRATION

BH043 0.01 — 2009 DIRECT PUSH BOREHOLE ID AND DISSOLVED SELENIUM CONCENTRATION

<0.001 — CONCENTRATION LESS THAN THE METHOD DETECTION LIMIT

NOTES:

1. DIRECT PUSH RESULTS ARE FOR GRAB GROUNDWATER SAMPLES AND ARE DISSOLVED CONCENTRATIONS OF SELENIUM IN MG/L.
2. SPRING 2008 TOTAL SELENIUM CONCENTRATIONS ARE USED FOR MONITORING WELLS, SPRINGS AND HEADWATER STREAMS WHERE APPROPRIATE.
3. BEDROCK WELLS ARE SHOWN FOR REFERENCE. SELENIUM CONCENTRATIONS ARE NOT SHOWN FOR THESE WELLS.

ISSUE REV	DESCRIPTION	TECH	ENG	DATE
1	FINAL	CHF	LWM	02/24/11
0	ISSUED DRAFT FOR AGENCY REVIEW	CHF	LWM	07/06/10

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- SURVEY DATA FOR ENOCH VALLEY MINE AREA PROVIDED BY P4 PRODUCTION DATED: DECEMBER 2007.
- US CENSUS BUREAU 2007 TIGER LINE DATA

PROJECTION: STATE PLANE COORDINATE SYSTEM
ZONE: IDAHO EAST
HORIZONTAL DATUM: NAD27
VERTICAL DATUM: NGVD29
UNITS: U.S. FEET

DESIGNED BY	C DUFFY	02/24/11
DRAWN BY	C FOWLER	02/24/11
CHECKED BY	E MARKS	02/24/11
APPROVED BY	C FOULK	02/24/11
PROJECT MANAGER	V DRAIN	02/24/11
CLIENT APPROVAL	B KOCH	02/24/11
CLIENT REFERENCE NO.		

P4 Production, LLC

PROJECT LOCATION: BALLARD, HENRY AND ENOCH VALLEY MINES
PROJECT: RI/FS WORK PLAN
TITLE: EE/CA BALLARD MINE AREA WEST DIRECT PUSH BOREHOLE LOCATIONS

MWH

DRAWING 3-18
REVISION 1
FILE NAME 1005813D241

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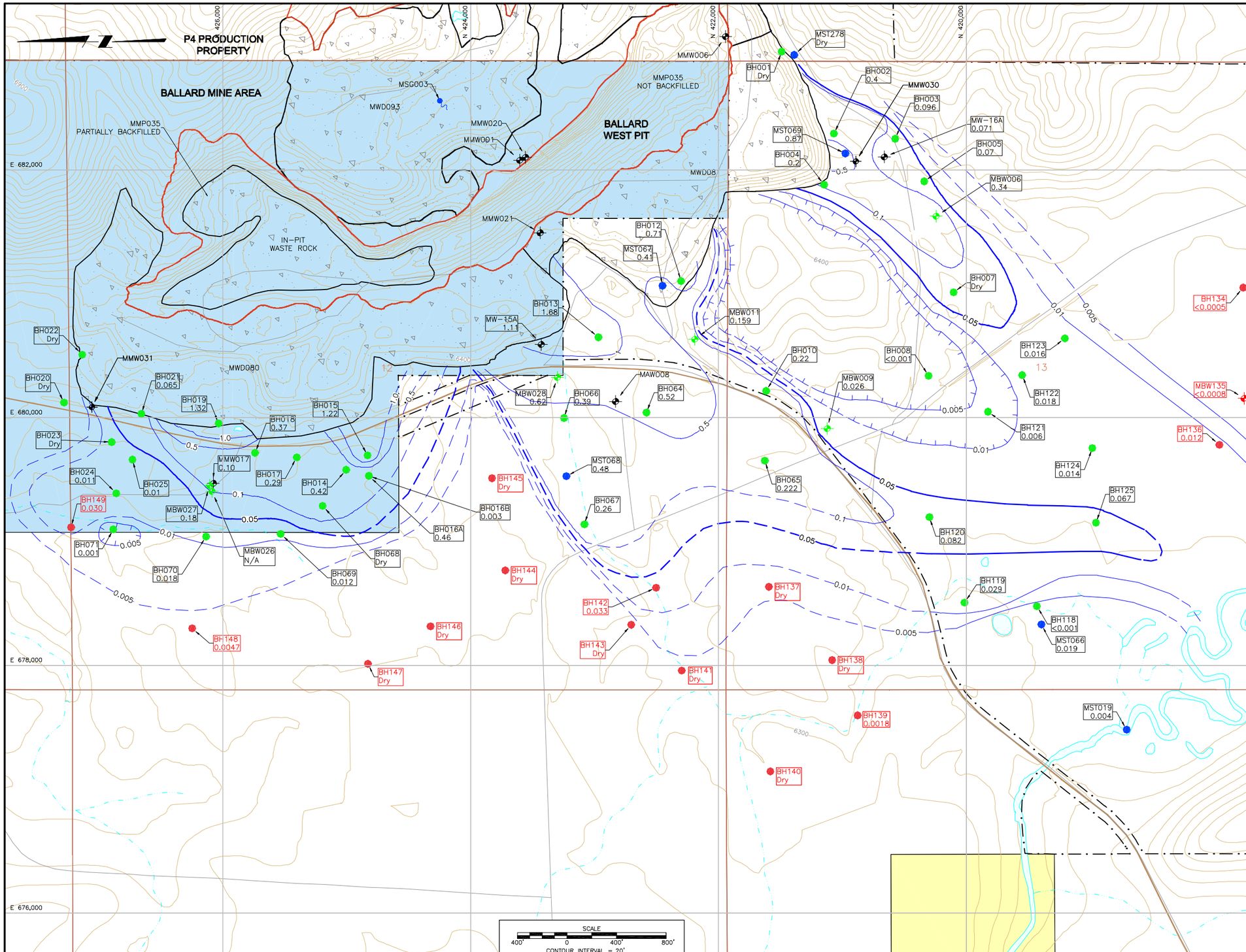

LEGEND:

- POST-MINE CONTOUR & ELEVATION, FEET
- POND OR LAKE
- NATURAL DRAINAGE – PERENNIAL
- NATURAL DRAINAGE – INTERMITTENT
- MINE PIT LOCATION (APPROXIMATE WHERE COVERED BY BACKFILL)
- WASTE ROCK DUMP LOCATION (APPROXIMATE)
- WASTE ROCK DUMP LOCATION OR PIT BACKFILL (APPROXIMATE)
- HIGHWAY
- ROAD
- RAILROAD
- P4 PRODUCTION HAUL ROAD (ACTIVE & INACTIVE)
- 0.05 TOTAL SELENIUM ISOCONCENTRATION CONTOUR (mg/L)
- 0.05 INFERRED TOTAL SELENIUM ISOCONCENTRATION CONTOUR (mg/L)
- P4 PRODUCTION PROPERTY BOUNDARY (APPROXIMATE)
- SECTION LINES
- 8 SECTION NUMBER
- BLM LANDS
- STATE LANDS
- NON FEDERAL LANDS

STATION TYPE:

- MSG = SPRING STATION
- MST = STREAM STATION
- MMW = GROUND WATER MONITORING WELL
- MAW = AGRICULTURAL WELL
- MBW = DIRECT PUSH MONITORING WELL INSTALLED IN 2008
- MBW = DIRECT PUSH MONITORING WELL INSTALLED IN 2009
- BH = 2008 DIRECT PUSH BOREHOLE
- BH = 2009 DIRECT PUSH BOREHOLE

KEY:

MMP = MINE PIT
MWD = WASTE ROCK DUMP

BH043 0.01	2008 DIRECT PUSH BOREHOLE ID AND DISSOLVED SELENIUM CONCENTRATION
BH043 0.01	2009 DIRECT PUSH BOREHOLE ID AND DISSOLVED SELENIUM CONCENTRATION
<0.001	CONCENTRATION LESS THAN THE METHOD DETECTION LIMIT

NOTES:

1. WHERE WELLS ARE NESTED IN THE ALLUVIAL FLOW SYSTEM (I.E. SHALLOW AND DEEPER) THE HIGHEST MEASURED CONCENTRATION IS USED FOR CONTOURING.
2. SPRING 2008 TOTAL SELENIUM CONCENTRATIONS ARE USED FOR MONITORING WELLS, SPRINGS AND HEADWATER STREAMS WHERE APPROPRIATE.
3. ISOCONCENTRATION CONTOUR INTERVAL=LOG WITH SUPPLEMENTAL HALF CYCLE CONTOURS.
4. BEDROCK WELLS ARE SHOWN FOR REFERENCE. SELENIUM CONCENTRATIONS ARE NOT SHOWN FOR THESE WELLS.
5. MST019 AND MST066 ARE SURFACE WATER SAMPLES AND ARE NOT USED IN CONTOURING.

ISSUE REV	DESCRIPTION	TECH	ENG	DATE
1	FINAL	CHF	LWM	02/24/11
0	ISSUED DRAFT FOR AGENCY REVIEW	CHF	LWM	07/06/10

DISCLAIMER:
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- SURVEY DATA FOR HENRY MINE AREA PROVIDED BY OLYMPUS AERIAL SURVEYS, INC. DATED: NOVEMBER 2008.
- SURVEY DATA FOR ENOCH VALLEY MINE AREA PROVIDED BY P4 PRODUCTION DATED: DECEMBER 2007.
- US CENSUS BUREAU 2007 TIGER LINE DATA

PROJECTION: STATE PLANE COORDINATE SYSTEM
ZONE: IDAHO EAST
HORIZONTAL DATUM: NAD27
VERTICAL DATUM: NGVD29
UNITS: U.S. FEET

DESIGNED BY	C DUFFY	02/24/11
DRAWN BY	C FOWLER	02/24/11
CHECKED BY	E MARKS	02/24/11
APPROVED BY	C FOULK	02/24/11
PROJECT MANAGER	V DRAIN	02/24/11
CLIENT APPROVAL	B KOCH	02/24/11
CLIENT REFERENCE NO.		

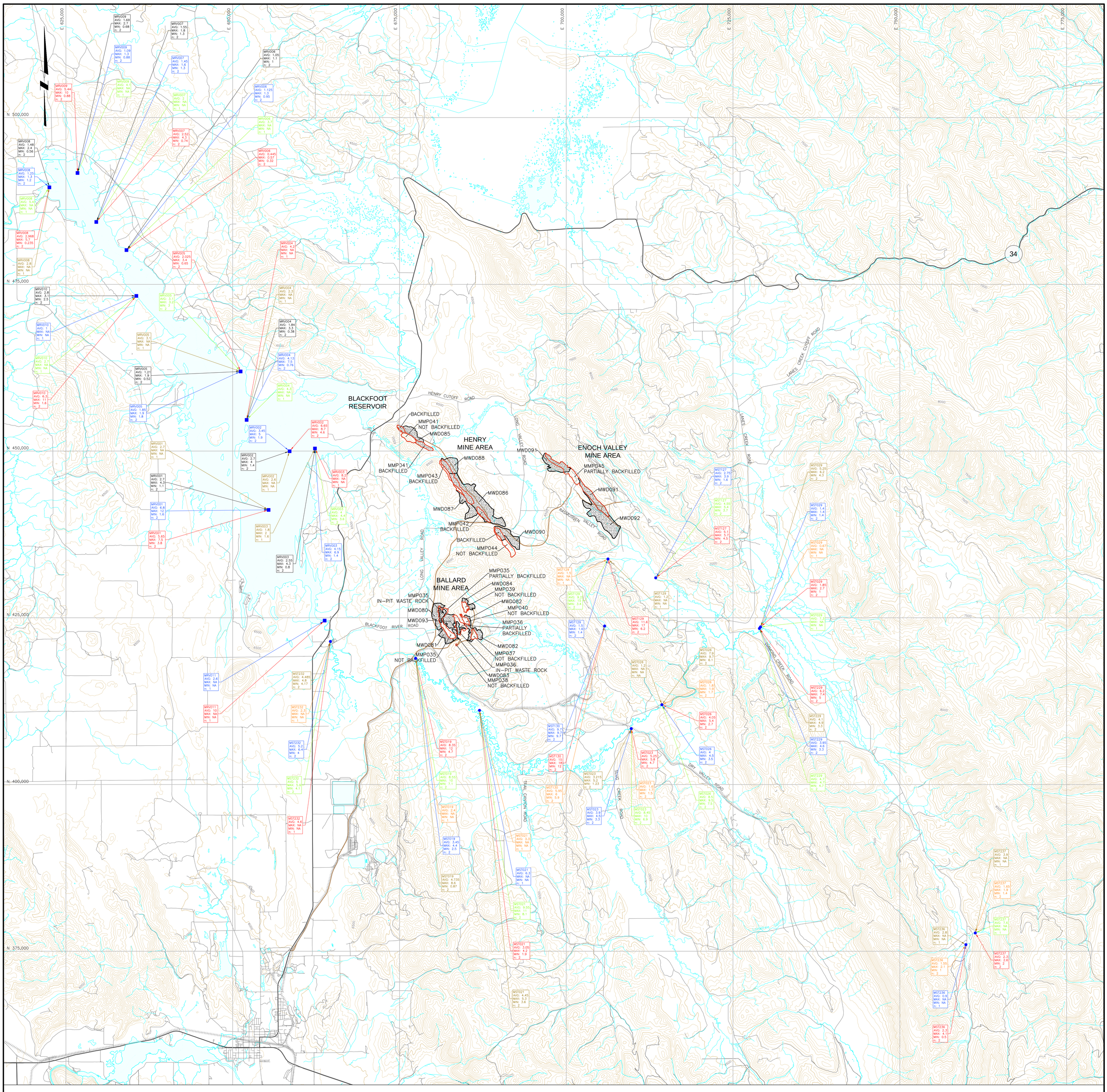
P4 Production, LLC

PROJECT LOCATION: BALLARD, HENRY AND ENOCH VALLEY MINES
PROJECT: RI/FS WORK PLAN
TITLE: EE/CA BALLARD MINE AREA WEST DIRECT PUSH SELENIUM ISOCONTOUR MAPS

MWH

DRAWING 3-19 | REVISION 1
FILE NAME 1005813D242

N:\Design-Drafting\Clients_I-P\Monsanto Company\013-Sheet Set\RI-FS Scoping Data Maps\1005813D242



SCALE

5000' 0 5000' 10000'

CONTOUR INTERVAL = 100 FEET

LEGEND:

- 7000 — POST-MINE CONTOUR AND ELEVATION, FEET (APPROXIMATE)
- RIVER
- POND OR LAKE
- NATURAL DRAINAGE
- HIGHWAY
- ROAD
- MONSANTO HAUL ROAD (ACTIVE & INACTIVE)
- RAILROAD
- MINE PIT LOCATION (APPROXIMATE WHERE COVERED BY BACKFILL)
- WASTE ROCK DUMP LOCATION (APPROXIMATE)
- WASTE ROCK DUMP LOCATION OR PIT BACKFILL (APPROXIMATE)

STATION TYPE:

- MRV = RESERVOIR SAMPLE LOCATION
- MDS = DUMP SEEP SAMPLE LOCATION
- MST = STREAM SAMPLE LOCATION
- MSG = SPRING SAMPLE LOCATION

KEY:

MMP = MINE PIT
MWD = WASTE ROCK DUMP

MST269 AVG: 4.9 MAX: NA MIN: NA n: 1 — 1999 & 2000 BENTHIC MACROINVERTEBRATE SELENIUM DATA REPORTED IN MG/KG,DW

MST269 AVG: 4.9 MAX: NA MIN: NA n: 1 — 1999 & 2000 FORAGE FISH (WHOLE BODY) SELENIUM DATA REPORTED IN MG/KG,DW

MST269 AVG: 4.9 MAX: NA MIN: NA n: 1 — 1999 & 2000 MACROPHYTE SELENIUM DATA REPORTED IN MG/KG,DW

MST269 AVG: 4.9 MAX: NA MIN: NA n: 1 — 1999 & 2000 PERIPHYTON SELENIUM DATA REPORTED IN MG/KG,DW

MST269 AVG: 4.9 MAX: NA MIN: NA n: 1 — 1999 & 2000 PLANKTON SELENIUM DATA REPORTED IN MG/KG,DW

MST269 AVG: 4.9 MAX: NA MIN: NA n: 1 — 1999 & 2000 SALMONID(FILLET) SELENIUM DATA REPORTED IN MG/KG,DW

ISSUED DRAFT FOR AGENCY REVIEW 7/6/10

ISSUE REV	DESCRIPTION	TECH	ENG	DATE
0	ISSUED DRAFT FOR AGENCY REVIEW	CHF	LWM	07/06/10

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- SURVEY DATA FOR ENOCH VALLEY MINE AREA PROVIDED BY P4 PRODUCTION DATED: DECEMBER 2007.
- US CENSUS BUREAU 2007 TIGER LINE DATA

PROJECTION: STATE PLANE COORDINATE SYSTEM
ZONE: IDAHO EAST
HORIZONTAL DATUM: NAD27
VERTICAL DATUM: NGVD29
UNITS: U.S. FEET

DESIGNED BY	C DUFFY	07/06/10
DRAWN BY	C FOWLER	07/06/10
CHECKED BY	E MARKS	07/06/10
APPROVED BY	C FOULK	07/06/10
PROJECT MANAGER	V DRAIN	07/06/10
CLIENT APPROVAL	B KOCH	07/06/10
CLIENT REFERENCE NO.		

P4 Production, LLC

PROJECT LOCATION: BALLARD, HENRY AND ENOCH VALLEY MINES
PROJECT: RI/FS WORK PLAN
TITLE: PRE-2004 AREA WIDE AQUATIC ECOLOGY SAMPLE LOCATIONS AND RESULTS

MWH

DRAWING 3-20 REVISION 0
FILE NAME 1005813D187

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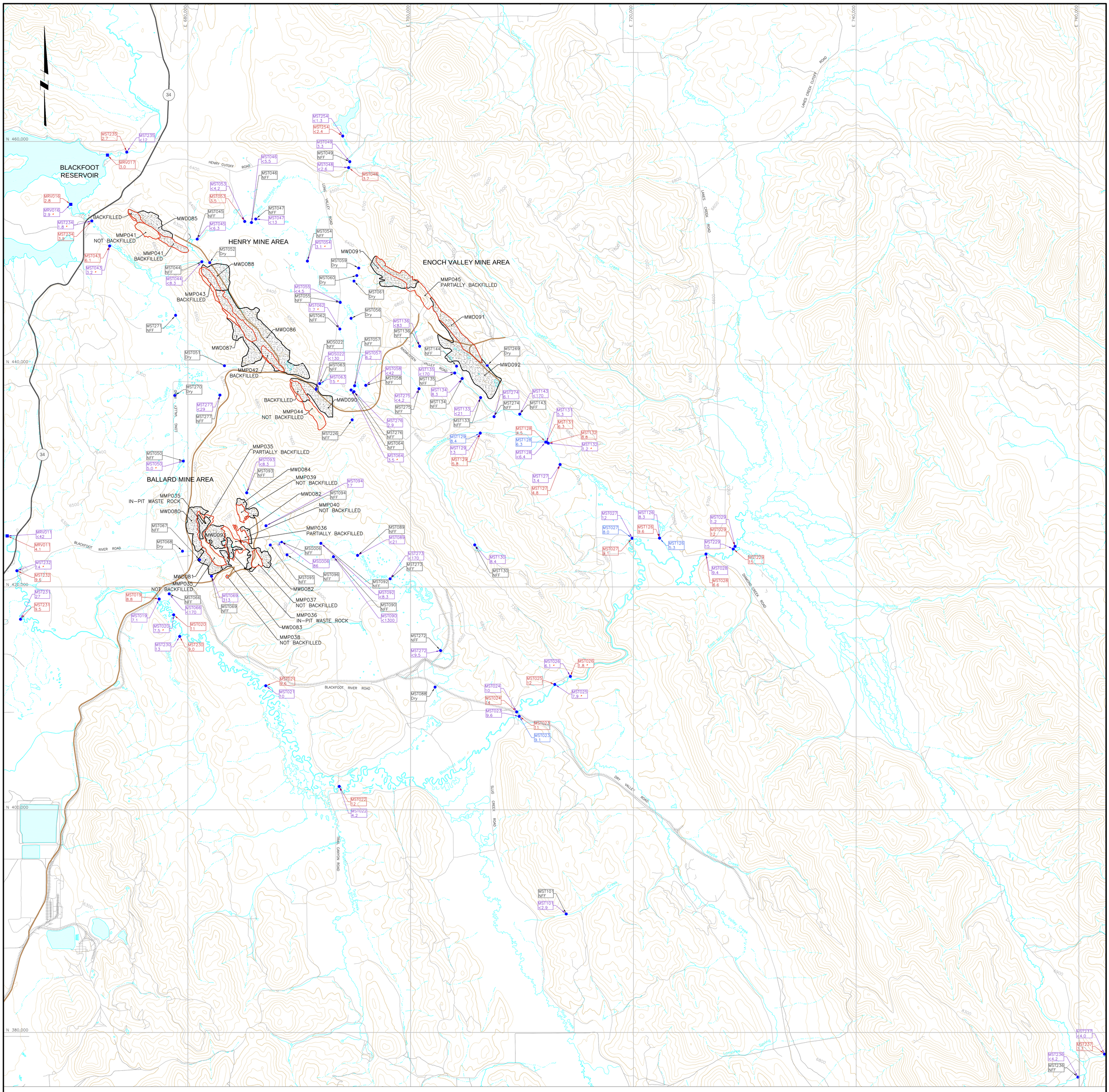

SCALE
3000' 0 3000' 6000'
CONTOUR INTERVAL = 100 FEET

LEGEND:

- POST–MINE CONTOUR AND ELEVATION, FEET (APPROXIMATE)
- RIVER
- POND OR LAKE
- NATURAL DRAINAGE – PERENNIAL
- NATURAL DRAINAGE – INTERMITTENT
- HIGHWAY
- ROAD
- MONSANTO HAUL ROAD (ACTIVE & INACTIVE)
- RAILROAD
- MINE PIT LOCATION (APPROXIMATE WHERE COVERED BY BACKFILL)
- WASTE ROCK DUMP LOCATION (APPROXIMATE)
- WASTE ROCK DUMP LOCATION OR PIT BACKFILL (APPROXIMATE)

STATION TYPE:

- MRV = RESERVOIR SAMPLE LOCATION
- MDS = DUMP SEEP SAMPLE LOCATION
- MST = STREAM SAMPLE LOCATION
- MSG = SPRING SAMPLE LOCATION

KEY:

MMP = MINE PIT
MWD = WASTE ROCK DUMP
NFF = NO FISH FOUND

MST269 4.9 — MAY 2004 FORAGE FISH (WHOLE BODY) SELENIUM DATA REPORTED IN MG/KG,DW

MST269 4.9 — MAY 2004 SALMONID (WHOLE BODY) SELENIUM DATA REPORTED IN MG/KG,DW

MST269 4.9 — MAY 2004 BENTHIC MACROINVERTEBRATE SELENIUM DATA REPORTED IN MG/KG,DW

MST101 NFF — NO DATA, DRY OR NO FISH FOUND

NOTES:

1. DATA FROM FIELD REPLICATE SAMPLES ARE AVERAGED FOR THIS DATA PRESENTATION.
2. * RESULTS FOR THESE STATIONS ARE AN AVERAGE OF FIELD REPLICATES THAT CONTAINED A MIX OF DETECTED AND NON–DETECTED CONCENTRATION. THE NON–DETECTED CONCENTRATION AT THESE STATIONS WERE AVERAGED USING THE METHOD DETECTION LIMIT (MDL). ALL OTHER NON–DETECTED CONCENTRATIONS ARE REPORTED AS < MDL.
3. SAMPLES WITH HIGH REPORTING LIMITS WERE THE RESULT OF LOW SAMPLE MASS.

ISSUED DRAFT FOR AGENCY REVIEW 7/6/10

ISSUE REV	DESCRIPTION	TECH	ENG	DATE
0	ISSUED DRAFT FOR AGENCY REVIEW	CHF	LWM	07/06/10

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- SURVEY DATA FOR ENOCH VALLEY MINE AREA PROVIDED BY P4 PRODUCTION DATED: DECEMBER 2007.
- US CENSUS BUREAU 2007 TIGER LINE DATA

PROJECTION: STATE PLANE COORDINATE SYSTEM
ZONE: IDAHO EAST
HORIZONTAL DATUM: NAD27
VERTICAL DATUM: NGVD29
UNITS: U.S. FEET

DESIGNED BY	C DUFFY	07/06/10
DRAWN BY	C FOWLER	07/06/10
CHECKED BY	E MARKS	07/06/10
APPROVED BY	C FOULK	07/06/10
PROJECT MANAGER	V DRAIN	07/06/10
CLIENT APPROVAL	B KOCH	07/06/10
CLIENT REFERENCE NO.		

P4 Production, LLC

PROJECT LOCATION: BALLARD, HENRY AND ENOCH VALLEY MINES
PROJECT: RI/FS WORK PLAN
TITLE: EE/CA AREA WIDE AQUATIC ECOLOGY SAMPLE LOCATIONS AND RESULTS

MWH

DRAWING 3-21 REVISION 0
FILE NAME 1005813D165

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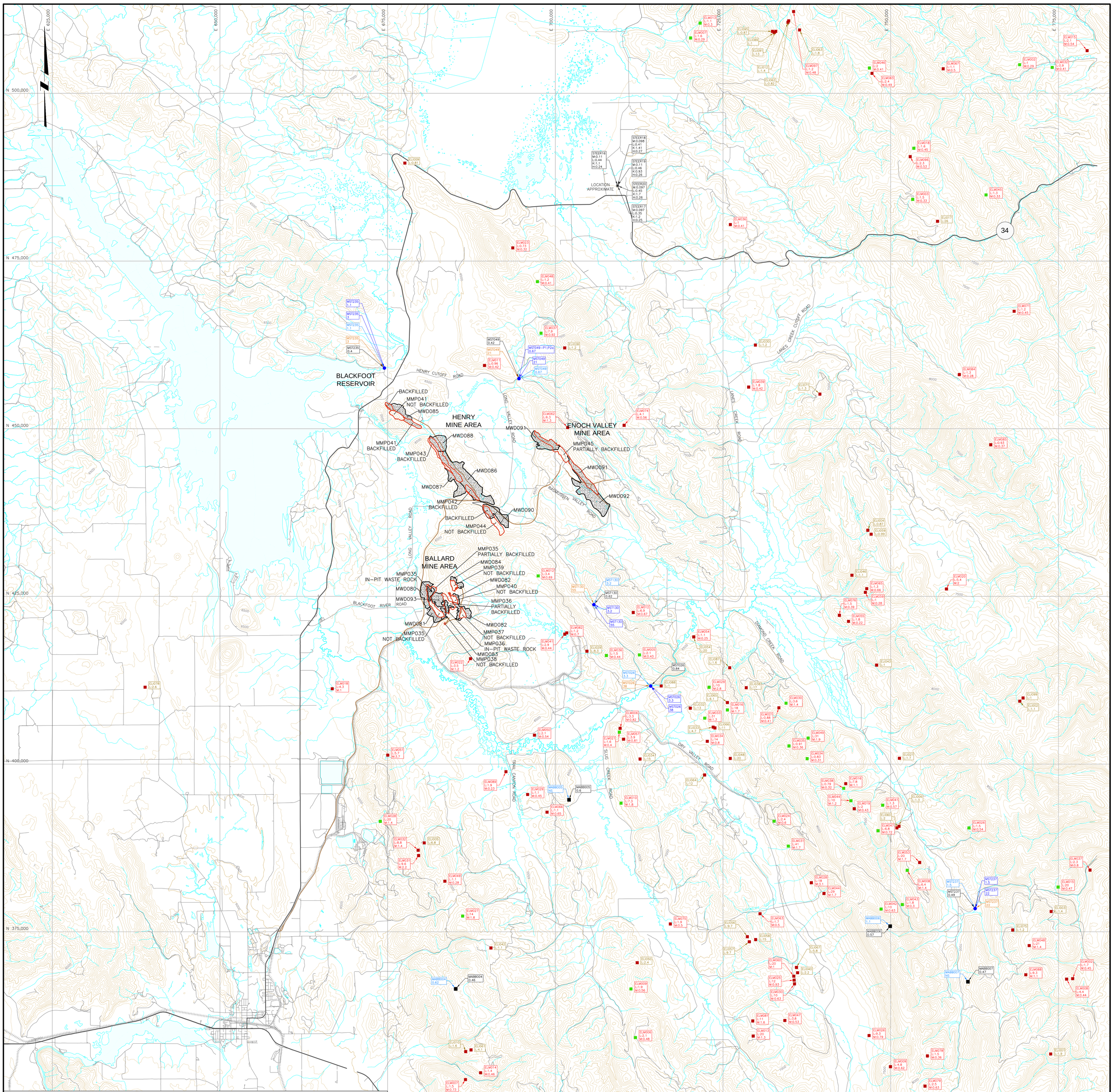

LEGEND:

- 7000 — POST-MINE CONTOUR AND ELEVATION, FEET (APPROXIMATE)
- RIVER
- POND OR LAKE
- NATURAL DRAINAGE
- HIGHWAY
- ROAD
- MONSANTO HAUL ROAD (ACTIVE & INACTIVE)
- RAILROAD
- MINE PIT LOCATION (APPROXIMATE WHERE COVERED BY BACKFILL)
- WASTE ROCK DUMP LOCATION (APPROXIMATE)
- WASTE ROCK DUMP LOCATION OR PIT BACKFILL (APPROXIMATE)

KEY:

MMP = MINE PIT
MWD = WASTE ROCK DUMP
L = LIVER
M = MUSCLE
K = KIDNEY
H = HEART

- ELI065 L:5.9 — 1999 ELK LIVER DATA REPORTED IN MG/KG,DW
- ELM069 L:6.4 M:0.72 — 1999 ELK LIVER AND MUSCLE DATA REPORTED IN MG/KG,DW
- ELM004 L:1.2 M:0.51 — 2000 ELK LIVER AND MUSCLE DATA REPORTED IN MG/KG,DW
- MST130 9 — 2001 SMALL MAMMAL SELENIUM DATA REPORTED IN MG/KG,DW
- MST130 9 — 2001 INVERTEBRATE SELENIUM DATA REPORTED IN MG/KG,DW
- MST130 9 — 2001 INSECTS SELENIUM DATA REPORTED IN MG/KG,DW
- MST130 9 — 2001 WORMS SELENIUM DATA REPORTED IN MG/KG,DW
- STEER20 M:1.3 L:0.83 K:1.6 H:0.67 — 1999 CATTLE SELENIUM DATA REPORTED IN MG/KG,DW

STATION TYPE:

- MST = SPRING FED STREAM STATION
- MSG = SPRING STATION
- EL* = ELK SAMPLE LOCATION (1999)
- EL* = ELK SAMPLE LOCATION (2000)
- MABB = BACKGROUND SAMPLE LOCATION

SCALE
5000' 0 5000' 10000'
CONTOUR INTERVAL = 100 FEET

ISSUED DRAFT FOR AGENCY REVIEW 7/6/10

ISSUE REV	DESCRIPTION	TECH	ENG	DATE
0	ISSUED DRAFT FOR AGENCY REVIEW	CHF	LWM	07/06/10

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- SURVEY DATA FOR ENOCH VALLEY MINE AREA PROVIDED BY P4 PRODUCTION DATED: DECEMBER 2007.
- US CENSUS BUREAU 2007 TIGER LINE DATA

PROJECTION: STATE PLANE COORDINATE SYSTEM
ZONE: IDAHO EAST
HORIZONTAL DATUM: NAD27
VERTICAL DATUM: NGVD29
UNITS: U.S. FEET

DESIGNED BY	C DUFFY	07/06/10
DRAWN BY	C FOWLER	07/06/10
CHECKED BY	E MARKS	07/06/10
APPROVED BY	C FOULK	07/06/10
PROJECT MANAGER	V DRAIN	07/06/10
CLIENT APPROVAL	B KOCH	07/06/10
CLIENT REFERENCE NO.		

P4 Production, LLC

PROJECT LOCATION: BALLARD, HENRY AND ENOCH VALLEY MINES
PROJECT: RI/FS WORK PLAN
TITLE: PRE-2004 AREA WIDE TERRESTRIAL ECOLOGY SAMPLE LOCATIONS AND RESULTS

MWH

DRAWING 3-22
REVISION 0
FILE NAME 1005813D188

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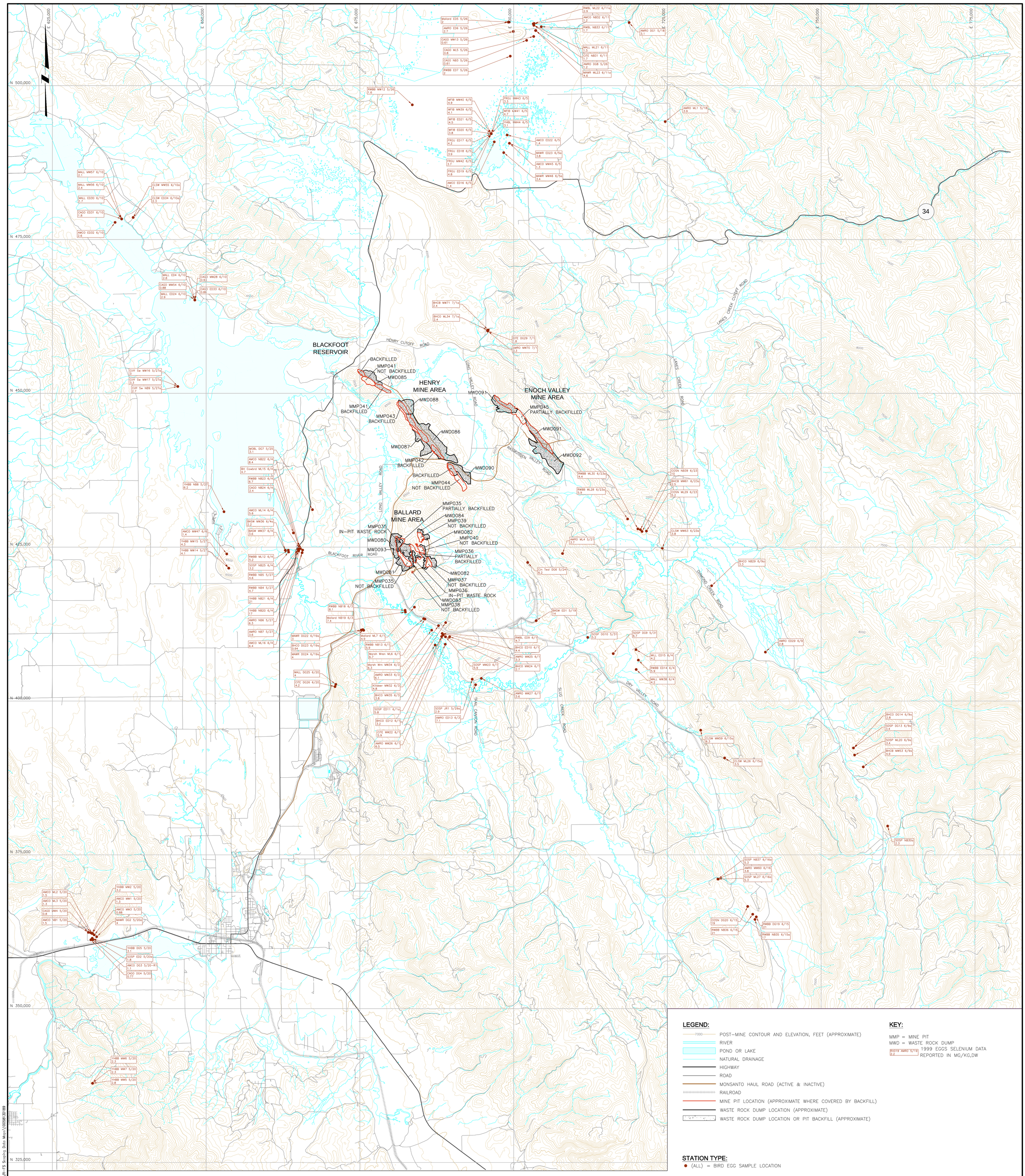

LEGEND:

- POST-MINE CONTOUR AND ELEVATION, FEET (APPROXIMATE)
- RIVER
- POND OR LAKE
- NATURAL DRAINAGE
- HIGHWAY
- ROAD
- MONSANTO HAUL ROAD (ACTIVE & INACTIVE)
- RAILROAD
- MINE PIT LOCATION (APPROXIMATE WHERE COVERED BY BACKFILL)
- WASTE ROCK DUMP LOCATION (APPROXIMATE)
- WASTE ROCK DUMP LOCATION OR PIT BACKFILL (APPROXIMATE)

KEY:

MMP = MINE PIT
MWD = WASTE ROCK DUMP
RVD19 AMRO 5/19 2.2 — 1999 EGGS SELENIUM DATA REPORTED IN MG/KG,DW

STATION TYPE:

● (ALL) = BIRD EGG SAMPLE LOCATION

SCALE
5000' 0 5000' 10000'
CONTOUR INTERVAL = 100 FEET

ISSUED DRAFT FOR AGENCY REVIEW 7/6/10

ISSUE REV	DESCRIPTION	TECH	ENG	DATE
0	ISSUED DRAFT FOR AGENCY REVIEW	CHF	LWM	07/06/10

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- SURVEY DATA FOR ENOCH VALLEY MINE AREA PROVIDED BY P4 PRODUCTION DATED: DECEMBER 2007.
- US CENSUS BUREAU 2007 TIGER LINE DATA

PROJECTION: STATE PLANE COORDINATE SYSTEM
ZONE: IDAHO EAST
HORIZONTAL DATUM: NAD27
VERTICAL DATUM: NGVD29
UNITS: U.S. FEET

DESIGNED BY	C DUFFY	07/06/10
DRAWN BY	C FOWLER	07/06/10
CHECKED BY	E MARKS	07/06/10
APPROVED BY	C FOULK	07/06/10
PROJECT MANAGER	V DRAIN	07/06/10
CLIENT APPROVAL	B KOCH	07/06/10
CLIENT REFERENCE NO.		

P4 Production, LLC

PROJECT LOCATION: BALLARD, HENRY AND ENOCH VALLEY MINES
PROJECT: RI/FS WORK PLAN
TITLE: 1999 AREA WIDE TERRESTRIAL ECOLOGY EGG SAMPLE LOCATIONS AND RESULTS

MWH

DRAWING 3-23 | REVISION 0
FILE NAME 1005813D189

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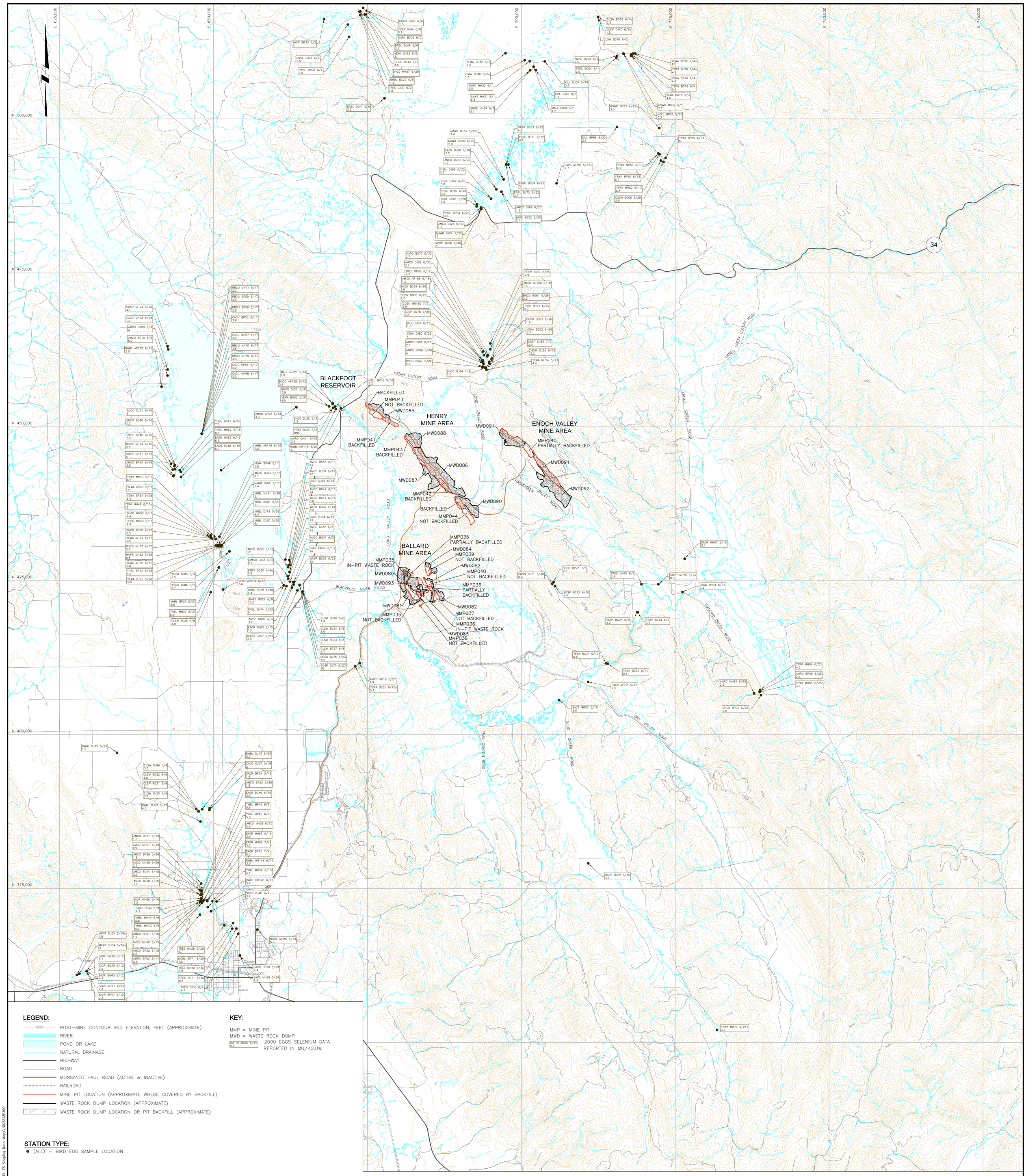

LEGEND:

- 7000 — POST-MINE CONTOUR AND ELEVATION, FEET (APPROXIMATE)
- RIVER
- POND OR LAKE
- NATURAL DRAINAGE
- HIGHWAY
- ROAD
- MONSANTO HAUL ROAD (ACTIVE & INACTIVE)
- RAILROAD
- MINE PIT LOCATION (APPROXIMATE WHERE COVERED BY BACKFILL)
- WASTE ROCK DUMP LOCATION (APPROXIMATE)
- WASTE ROCK DUMP LOCATION OR PIT BACKFILL (APPROXIMATE)

KEY:

MMP = MINE PIT
MWD = WASTE ROCK DUMP
RVD19 AMRO 5/19 2.2 — 2000 EGGS SELENIUM DATA REPORTED IN MG/KG,DW

STATION TYPE:

● (ALL) = BIRD EGG SAMPLE LOCATION

SCALE
5000' 0 5000' 10000'
CONTOUR INTERVAL = 100 FEET

ISSUED DRAFT FOR AGENCY REVIEW 7/6/10

REV	DESCRIPTION	TECH	ENG	DATE
0	ISSUED DRAFT FOR AGENCY REVIEW	CHF	LWM	07/06/10

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- SURVEY DATA FOR ENOCH VALLEY MINE AREA PROVIDED BY P4 PRODUCTION DATED: DECEMBER 2007.
- US CENSUS BUREAU 2007 TIGER LINE DATA

PROJECTION: STATE PLANE COORDINATE SYSTEM
ZONE: IDAHO EAST
HORIZONTAL DATUM: NAD27
VERTICAL DATUM: NGVD29
UNITS: U.S. FEET

DESIGNED BY	C DUFFY	07/06/10
DRAWN BY	C FOWLER	07/06/10
CHECKED BY	E MARKS	07/06/10
APPROVED BY	C FOULK	07/06/10
PROJECT MANAGER	V DRAIN	07/06/10
CLIENT APPROVAL	B KOCH	07/06/10
CLIENT REFERENCE NO.		

P4 Production, LLC

PROJECT LOCATION: BALLARD, HENRY AND ENOCH VALLEY MINES
PROJECT: RI/FS WORK PLAN
TITLE: 2000 AREA WIDE TERRESTRIAL ECOLOGY EGG SAMPLE LOCATIONS AND RESULTS

MWH

DRAWING 3-24 | REVISION 0
FILE NAME 1005813D190

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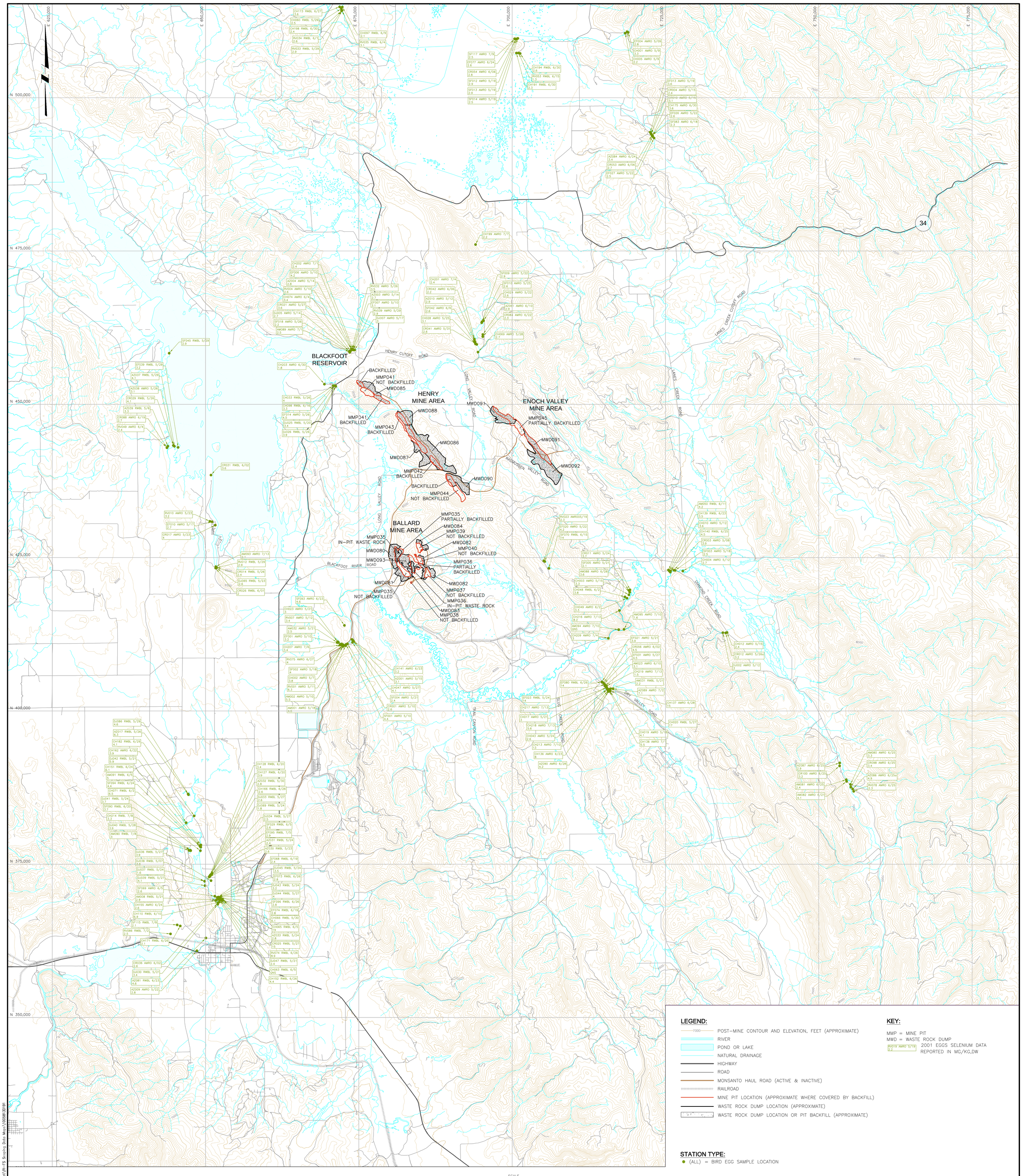

LEGEND:

- 7000 — POST-MINE CONTOUR AND ELEVATION, FEET (APPROXIMATE)
- RIVER
- POND OR LAKE
- NATURAL DRAINAGE
- HIGHWAY
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- WASTE ROCK DUMP LOCATION (APPROXIMATE)
- WASTE ROCK DUMP LOCATION OR PIT BACKFILL (APPROXIMATE)

KEY:

MMP = MINE PIT
MWD = WASTE ROCK DUMP
RV019 AMRO 5/19 2.2 — 2001 EGGS SELENIUM DATA REPORTED IN MG/KG,DW

STATION TYPE:

● (ALL) = BIRD EGG SAMPLE LOCATION

SCALE
5000 0 5000' 10000'
CONTOUR INTERVAL = 100 FEET

ISSUED DRAFT FOR AGENCY REVIEW 7/6/10

ISSUE REV	DESCRIPTION	TECH	ENG	DATE
0	ISSUED DRAFT FOR AGENCY REVIEW	CHF	LWM	07/06/10

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- US CENSUS BUREAU 2007 TIGER LINE DATA

PROJECTION: STATE PLANE COORDINATE SYSTEM
ZONE: IDAHO EAST
HORIZONTAL DATUM: NAD27
VERTICAL DATUM: NGVD29
UNITS: U.S. FEET

DESIGNED BY	C DUFFY	07/06/10
DRAWN BY	C FOWLER	07/06/10
CHECKED BY	E MARKS	07/06/10
APPROVED BY	C FOULK	07/06/10
PROJECT MANAGER	V DRAIN	07/06/10
CLIENT APPROVAL	B KOCH	07/06/10
CLIENT REFERENCE NO.		

P4 Production, LLC

PROJECT LOCATION: BALLARD, HENRY AND ENOCH VALLEY MINES
PROJECT: RI/FS WORK PLAN
TITLE: 2001 AREA WIDE TERRESTRIAL ECOLOGY EGG SAMPLE LOCATIONS AND RESULTS

MWH

DRAWING 3-25 REVISION 0
FILE NAME 1005813D191

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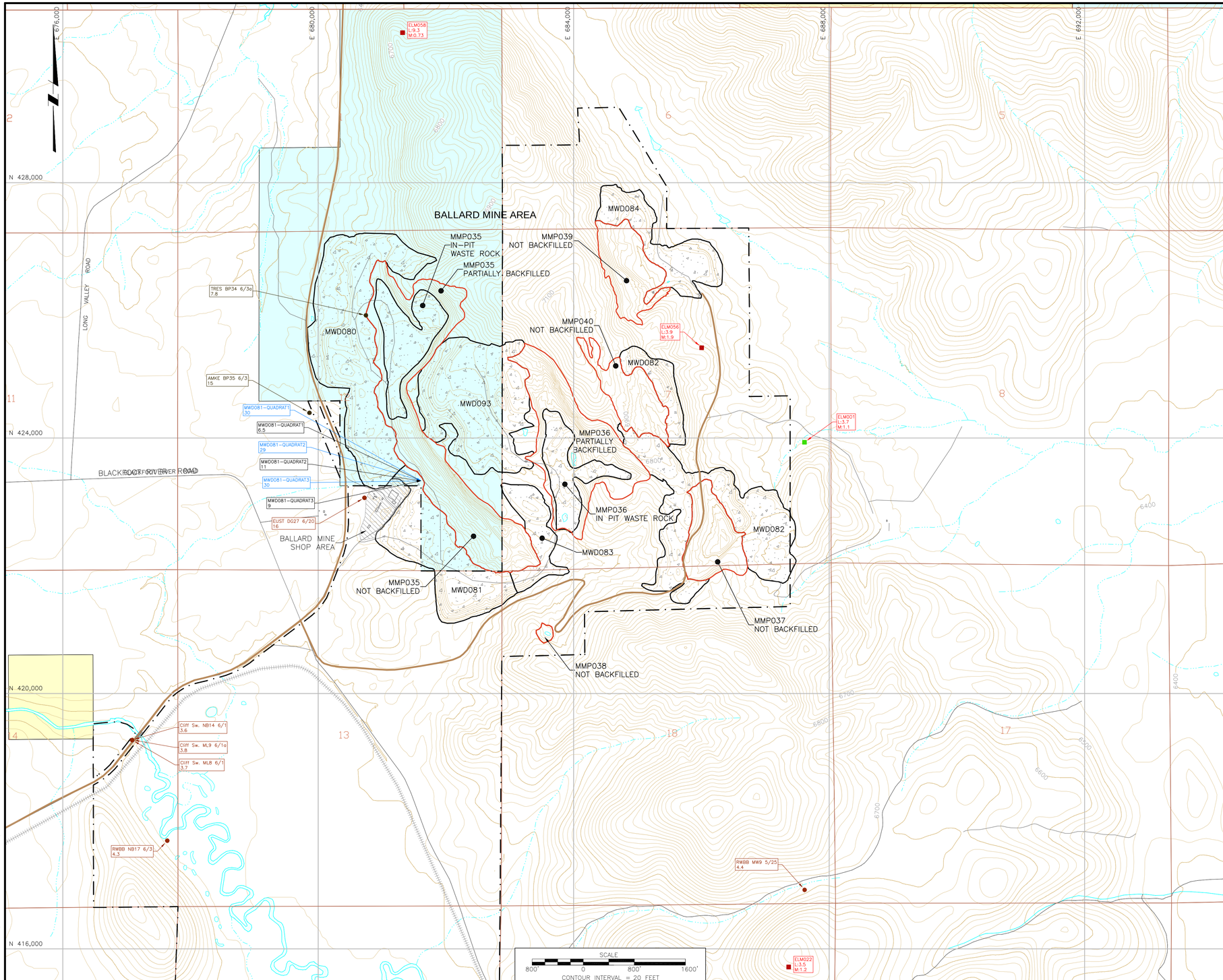

LEGEND:

- POST-MINE CONTOUR AND ELEVATION, FEET (APPROXIMATE)
- RIVER
- POND OR LAKE
- NATURAL DRAINAGE – PERENNIAL
- NATURAL DRAINAGE – INTERMITTENT
- HIGHWAY
- ROAD
- MONSANTO HAUL ROAD (ACTIVE & INACTIVE)
- RAILROAD
- MINE PIT LOCATION (APPROXIMATE WHERE COVERED BY BACKFILL)
- WASTE ROCK DUMP LOCATION (APPROXIMATE)
- WASTE ROCK DUMP LOCATION OR PIT BACKFILL (APPROXIMATE)
- APPROXIMATE OWNERSHIP BOUNDARY
- SECTION LINES
- SECTION NUMBER
- BLM LANDS
- US NATIONAL FORESTS
- STATE LANDS
- NON FEDERAL LANDS

STATION TYPE:

- (ALL) = BIRD EGG SAMPLE LOCATION
- EL* = ELK SAMPLE LOCATION (1999)
- EL* = ELK SAMPLE LOCATION (2000)

KEY:

MMP = MINE PIT
MWD = WASTE ROCK DUMP
L = LIVER
M = MUSCLE
K = KIDNEY
H = HEART

RV019 AMRO 5/19 5 — 1999 EGGS SELENIUM DATA REPORTED IN MG/KG,DW

RV019 AMRO 5/19 5 — 2000 EGGS SELENIUM DATA REPORTED IN MG/KG,DW

MWD081-QUADRAT3 30 — 2001 INSECTS SELENIUM DATA REPORTED IN MG/KG,DW

MWD081-QUADRAT3 30 — 2001 SMALL MAMMAL SELENIUM DATA REPORTED IN MG/KG,DW

ELM069 L:6.4 M:0.72 — ELK LIVER AND MUSCLE DATA REPORTED IN MG/KG,DW

ISSUED DRAFT FOR AGENCY REVIEW 7/6/10

ISSUE REV	DESCRIPTION	TECH	ENG	DATE
0	ISSUED DRAFT FOR AGENCY REVIEW	CHF	LWM	07/06/10

DISCLAIMER:
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DRAWING REFERENCE(S):
1. POST-MINE TOPOGRAPHY GENERATED FROM:
- USGS DIGITAL ELEVATION MODELS (DEM)-24K.
- SURVEY DATA FOR BALLARD MINE PROVIDED BY OLYMPUS AERIAL SURVEYS, INC. DATED: JUNE 2005.
- SURVEY DATA FOR HENRY MINE AREA PROVIDED BY OLYMPUS AERIAL SURVEYS, INC. DATED: NOVEMBER 2008.
- SURVEY DATA FOR ENOCH VALLEY MINE AREA PROVIDED BY P4 PRODUCTION DATED: DECEMBER 2007.
- US CENSUS BUREAU 2007 TIGER LINE DATA

PROJECTION: STATE PLANE COORDINATE SYSTEM
ZONE: IDAHO EAST
HORIZONTAL DATUM: NAD27
VERTICAL DATUM: NGVD29
UNITS: U.S. FEET

DESIGNED BY	C DUFFY	07/06/10
DRAWN BY	C FOWLER	07/06/10
CHECKED BY	E MARKS	07/06/10
APPROVED BY	C FOULK	07/06/10
PROJECT MANAGER	V DRAIN	07/06/10
CLIENT APPROVAL	B KOCH	07/06/10
CLIENT REFERENCE NO.		

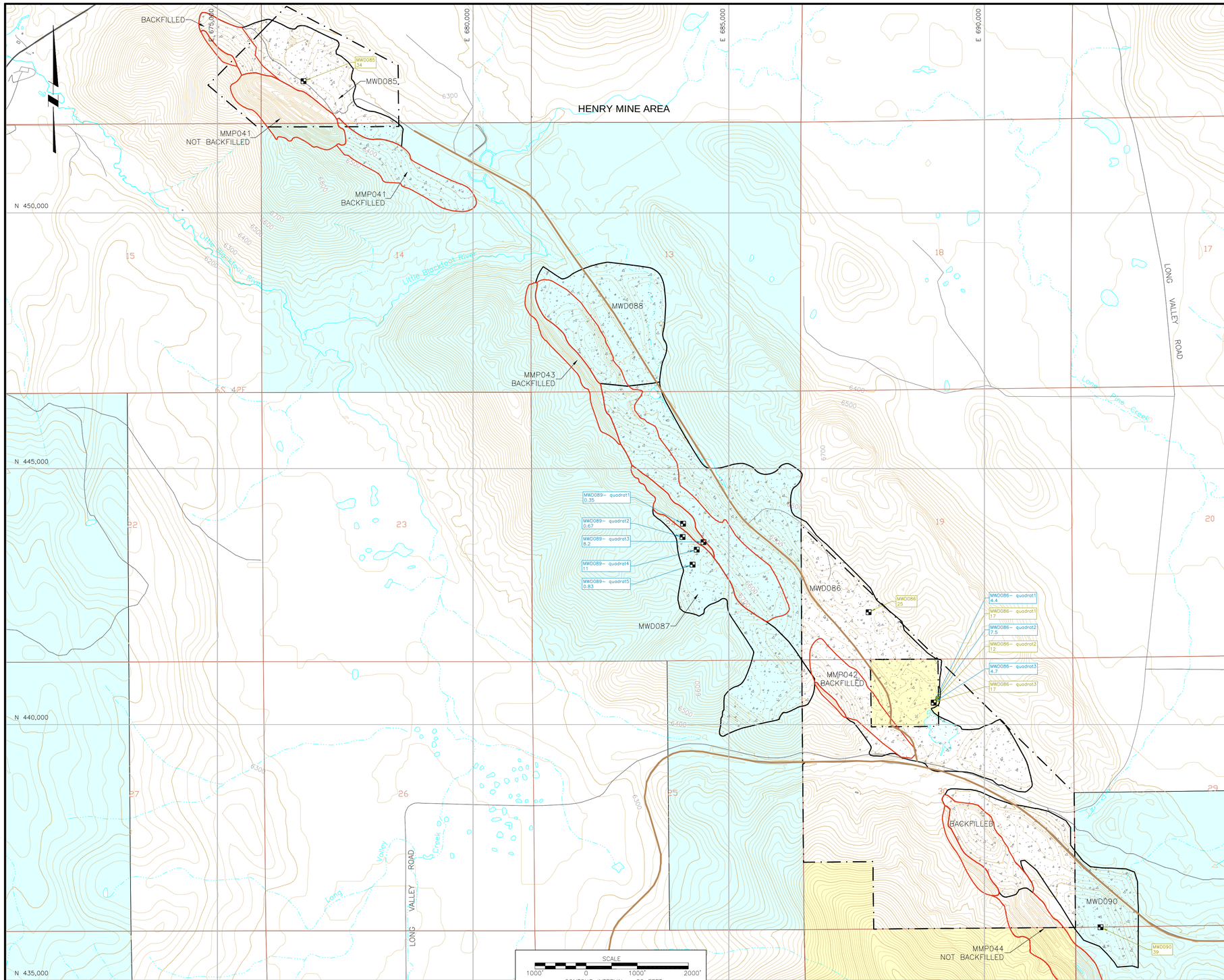
P4 Production, LLC

PROJECT LOCATION: BALLARD, HENRY AND ENOCH VALLEY MINES
PROJECT: RI/FS WORK PLAN
TITLE: PRE-2004 BALLARD MINE AREA TERRESTRIAL ECOLOGY SAMPLE LOCATIONS AND RESULTS

MWH

DRAWING 3-26
REVISION 0
FILE NAME 1005813D192

N:\Design-Drafting\Clients_J-P\Monsanto Company\013-Sheet Set\RI-FS Scoping Data Maps\1005813D192



LEGEND:

- POST–MINE CONTOUR AND ELEVATION, FEET (APPROXIMATE)
- RIVER
- POND OR LAKE
- NATURAL DRAINAGE – PERENNIAL
- NATURAL DRAINAGE – INTERMITTENT
- HIGHWAY
- ROAD
- MONSANTO HAUL ROAD (ACTIVE & INACTIVE)
- RAILROAD
- MINE PIT LOCATION (APPROXIMATE WHERE COVERED BY BACKFILL)
- WASTE ROCK DUMP LOCATION (APPROXIMATE)
- WASTE ROCK DUMP LOCATION OR PIT BACKFILL (APPROXIMATE)
- APPROXIMATE OWNERSHIP BOUNDARY
- SECTION LINES
- SECTION NUMBER
- BLM LANDS
- US NATIONAL FORESTS
- STATE LANDS
- NON FEDERAL LANDS

STATION TYPE:

MWD = WASTE ROCK DUMP SOIL AND VEGETATION SAMPLE LOCATION

KEY:

MMP = MINE PIT
MWD = WASTE ROCK DUMP

MWD081– quadrat2 24 — 1998 & 2001 UPLAND SOIL SELENIUM DATA REPORTED IN MG/KG,DW

MWD081– quadrat1 39 — 1998 & 2001 UPLAND VEGETATION SELENIUM DATA REPORTED IN MG/KG,DW

NOTE:

MWD089 WAS COMBINED WITH MWD087 AND IS NOW CONSIDERED MWD087.

ISSUED DRAFT FOR AGENCY REVIEW 7/6/10

ISSUE REV	DESCRIPTION	TECH	ENG	DATE
0	ISSUED DRAFT FOR AGENCY REVIEW	CHF	LWM	07/06/10

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- SURVEY DATA FOR ENOCH VALLEY MINE AREA PROVIDED BY P4 PRODUCTION DATED: DECEMBER 2007.
- US CENSUS BUREAU 2007 TIGER LINE DATA

PROJECTION: STATE PLANE COORDINATE SYSTEM
ZONE: IDAHO EAST
HORIZONTAL DATUM: NAD27
VERTICAL DATUM: NGVD29
UNITS: U.S. FEET

DESIGNED BY	C DUFFY	07/06/10
DRAWN BY	C FOWLER	07/06/10
CHECKED BY	E MARKS	07/06/10
APPROVED BY	C FOULK	07/06/10
PROJECT MANAGER	V DRAIN	07/06/10
CLIENT APPROVAL	B KOCH	07/06/10
CLIENT REFERENCE NO.		

P4 Production, LLC

PROJECT LOCATION: BALLARD, HENRY AND ENOCH VALLEY MINES
PROJECT: RI/FS WORK PLAN
TITLE: PRE-2004 HENRY MINE AREA SOIL AND VEGETATION SAMPLE LOCATIONS AND RESULTS

MWH

DRAWING 3-27 | REVISION 0
FILE NAME 1005813D197

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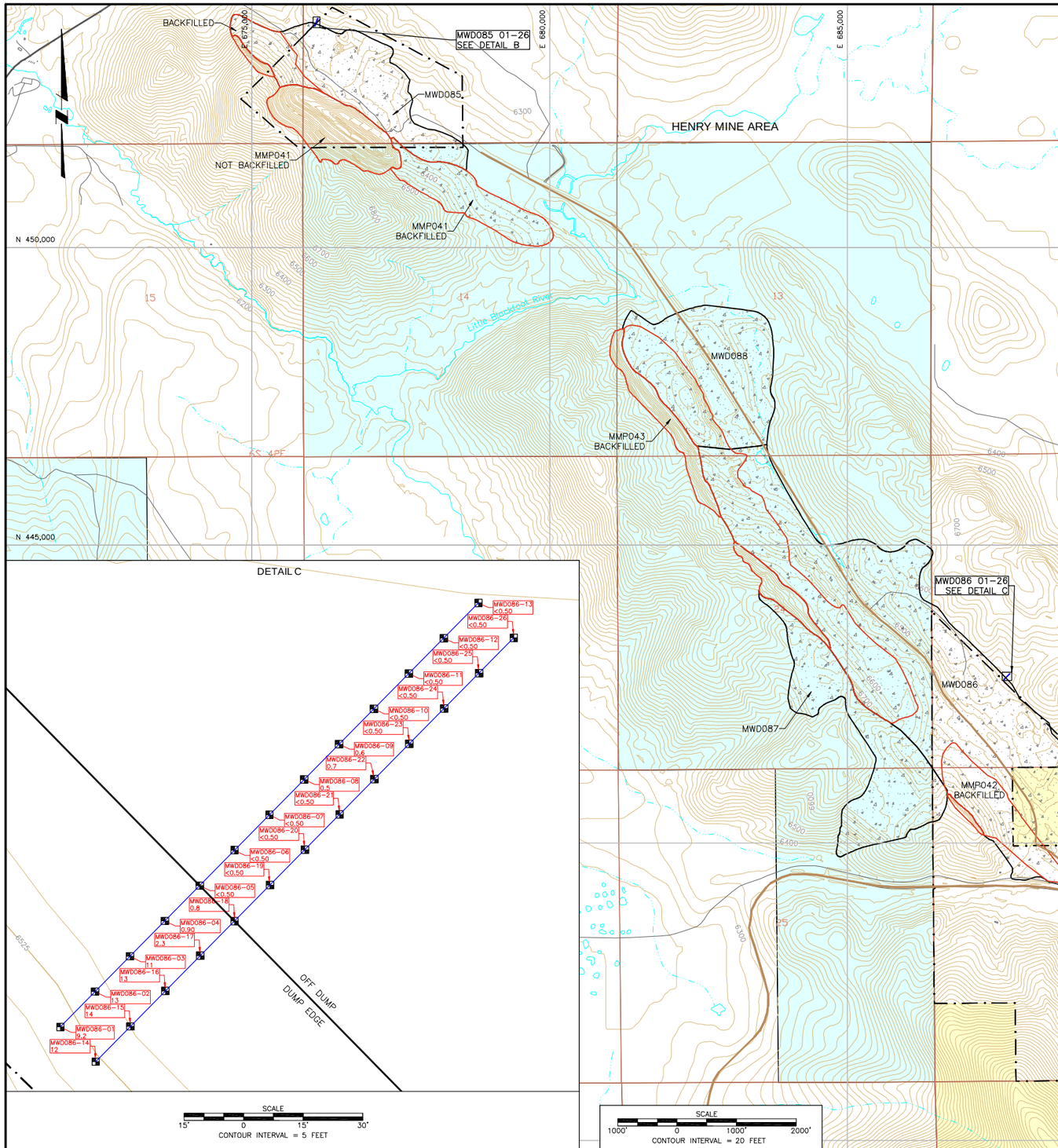

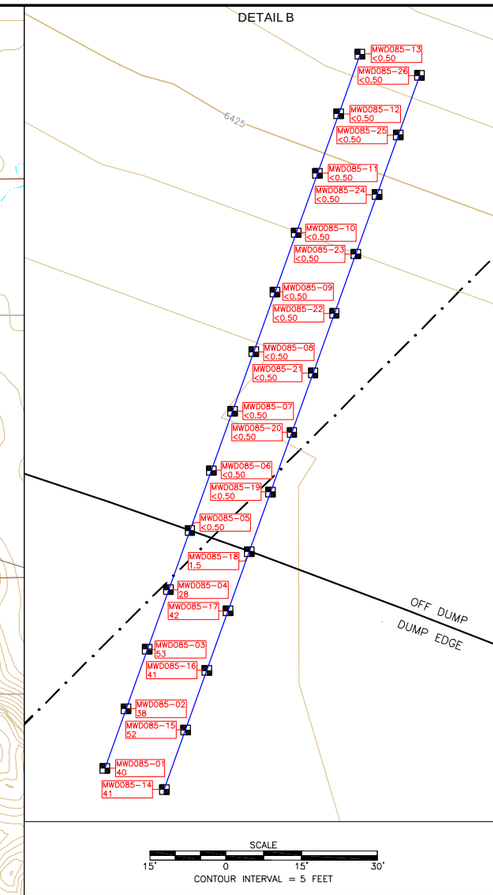

LEGEND:

- POST-MINE CONTOUR AND ELEVATION, FEET (APPROXIMATE)
- RIVER
- POND OR LAKE
- NATURAL DRAINAGE – PERENNIAL
- NATURAL DRAINAGE – INTERMITTENT
- HIGHWAY
- ROAD
- MONSANTO HAUL ROAD (ACTIVE & INACTIVE)
- RAILROAD
- MINE PIT LOCATION (APPROXIMATE WHERE COVERED BY BACKFILL)
- WASTE ROCK DUMP LOCATION (APPROXIMATE)
- WASTE ROCK DUMP LOCATION OR PIT BACKFILL (APPROXIMATE)
- APPROXIMATE OWNERSHIP BOUNDARY
- SECTION LINES
- SECTION NUMBER
- BLM LANDS
- US NATIONAL FORESTS
- STATE LANDS
- NON FEDERAL LANDS

STATION TYPE:

MWD = SOIL AND VEGETATION SAMPLE LOCATION

KEY:

MMP = MINE PIT
MWD = WASTE ROCK DUMP

MWD085 0.12 — JULY 2004 UPLAND SOIL SELENIUM DATA REPORTED IN MG/KG,DW

NOTE:

1. MWD085(01~26): 150 FOOT TRANSECTS FROM THE MASS WASTING INVESTIGATION.
2. MWD086(01~26): 150 FOOT TRANSECTS FROM THE MASS WASTING INVESTIGATION.

ISSUED DRAFT FOR AGENCY REVIEW 7/6/10

ISSUE REV	DESCRIPTION	TECH	ENG	DATE
0	ISSUED DRAFT FOR AGENCY REVIEW	CHF	LWM	07/06/10

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- SURVEY DATA FOR ENOCH VALLEY MINE AREA PROVIDED BY P4 PRODUCTION DATED: DECEMBER 2007.
- US CENSUS BUREAU 2007 TIGER LINE DATA

PROJECTION: STATE PLANE COORDINATE SYSTEM
ZONE: IDAHO EAST
HORIZONTAL DATUM: NAD27
VERTICAL DATUM: NGVD29
UNITS: U.S. FEET

DESIGNED BY	C DUFFY	07/06/10
DRAWN BY	C FOWLER	07/06/10
CHECKED BY	E MARKS	07/06/10
APPROVED BY	C FOULK	07/06/10
PROJECT MANAGER	V DRAIN	07/06/10
CLIENT APPROVAL	B KOCH	07/06/10
CLIENT REFERENCE NO.		

P4 Production, LLC

PROJECT LOCATION: BALLARD, HENRY AND ENOCH VALLEY MINES
PROJECT: RI/FS WORK PLAN
TITLE: 2004 HENRY MINE AREA SOIL SAMPLE LOCATIONS AND RESULTS

MWH

DRAWING: 3-28
REVISION: 0
FILE NAME: 1005813D208

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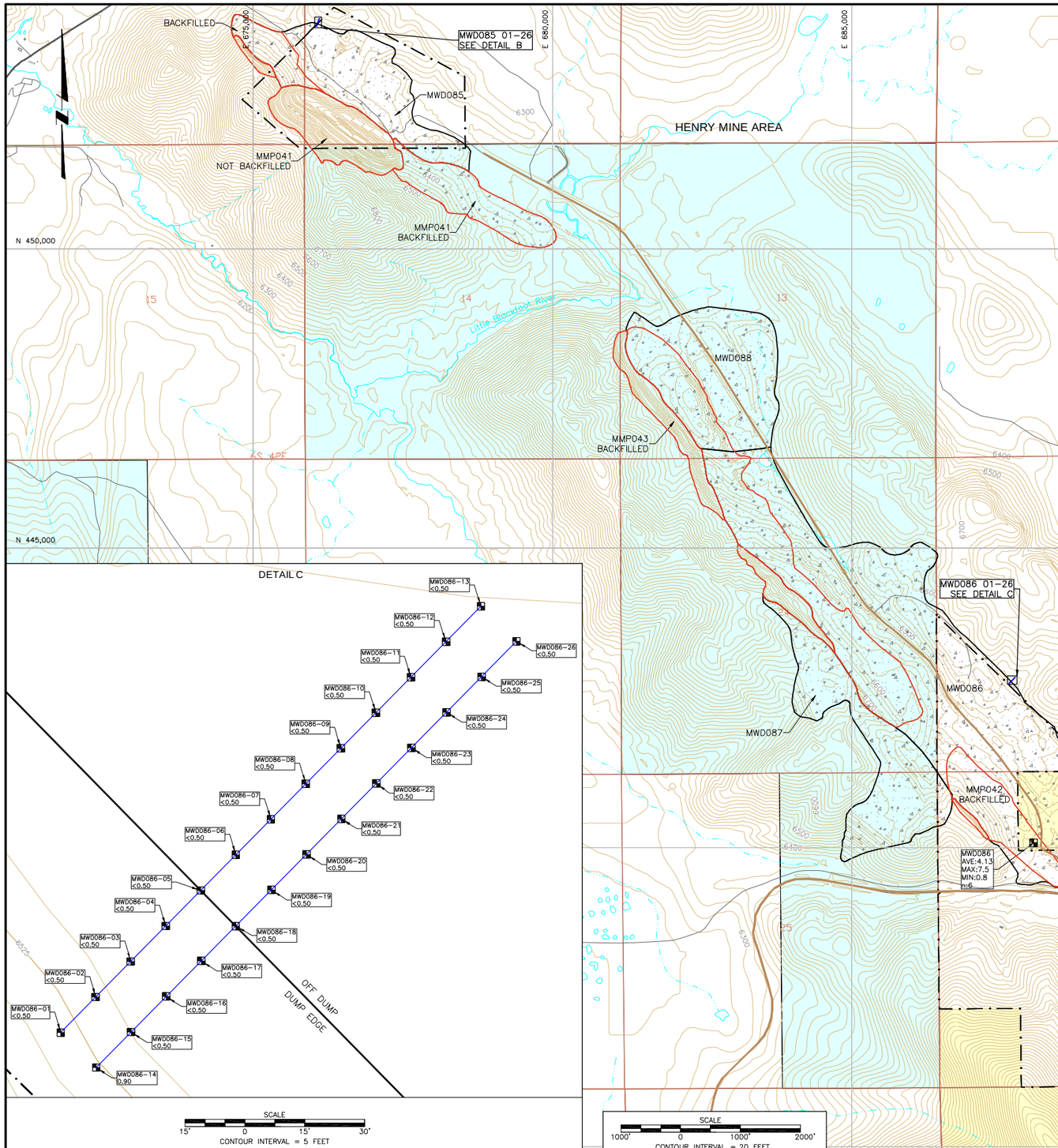

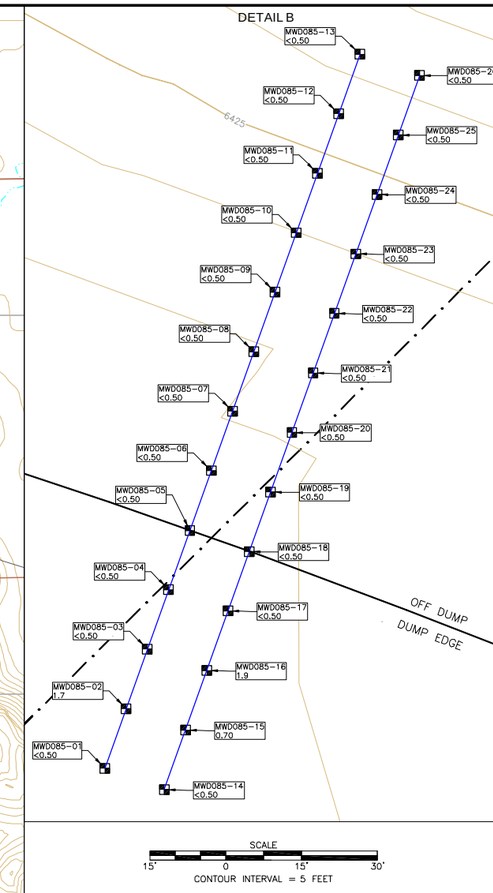

LEGEND:

- POST-MINE CONTOUR AND ELEVATION, FEET (APPROXIMATE)
- RIVER
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- NATURAL DRAINAGE – INTERMITTENT
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- WASTE ROCK DUMP LOCATION OR PIT BACKFILL (APPROXIMATE)
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- SECTION LINES
- SECTION NUMBER
- BLM LANDS
- US NATIONAL FORESTS
- STATE LANDS
- NON FEDERAL LANDS

STATION TYPE:

MWD = SOIL AND VEGETATION SAMPLE LOCATION

KEY:

MMP = MINE PIT
MWD = WASTE ROCK DUMP

MWD085 0.12 — JULY 2004 UPLAND VEGETATION SELENIUM DATA REPORTED IN MG/KG,DW

MWD086 AVE:4.13 MAX:4.5 MIN:0.8 n:6 — THESE STATIONS WERE SAMPLED MONTHLY FROM MAY TO OCTOBER DURING THE 2004 MONTHLY VEGETATION INVESTIGATION. NON-DETECTS ARE CENSORED AT < MDL.

NOTE:

1. MWD086(01~26): 150 FOOT TRANSECTS FROM THE MASS WASTING INVESTIGATION.

ISSUED DRAFT FOR AGENCY REVIEW 7/6/10

ISSUE REV	DESCRIPTION	TECH	ENG	DATE
0	ISSUED DRAFT FOR AGENCY REVIEW	CHF	LWM	07/06/10

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- SURVEY DATA FOR ENOCH VALLEY MINE AREA PROVIDED BY P4 PRODUCTION DATED: DECEMBER 2007.
- US CENSUS BUREAU 2007 TIGER LINE DATA

PROJECTION: STATE PLANE COORDINATE SYSTEM
ZONE: IDAHO EAST
HORIZONTAL DATUM: NAD27
VERTICAL DATUM: NGVD29
UNITS: U.S. FEET

DESIGNED BY	C DUFFY	07/06/10
DRAWN BY	C FOWLER	07/06/10
CHECKED BY	E MARKS	07/06/10
APPROVED BY	C FOULK	07/06/10
PROJECT MANAGER	V DRAIN	07/06/10
CLIENT APPROVAL	B KOCH	07/06/10
CLIENT REFERENCE NO.		

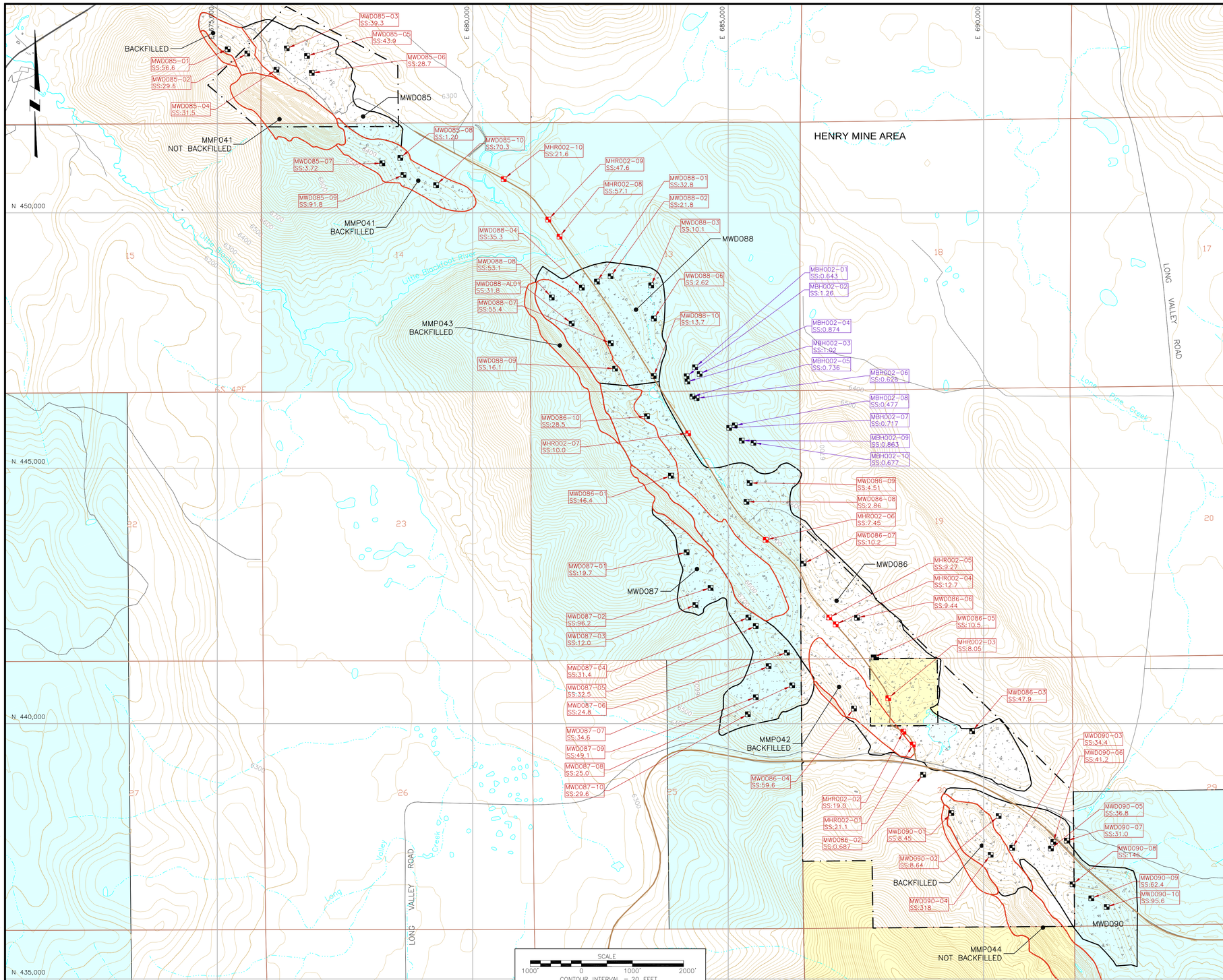
P4 Production, LLC

PROJECT LOCATION: BALLARD, HENRY AND ENOCH VALLEY MINES
PROJECT: RI/FS WORK PLAN
TITLE: 2004 HENRY MINE AREA VEGETATION SAMPLE LOCATIONS AND RESULTS

MWH

DRAWING 3-29 | REVISION 0
FILE NAME 1005813D209

N:\Design-Drafting\Clients_J-P\Monsanto Company\013-Sheet Set\RI-FS Scoping Data Maps\1005813D209



LEGEND:

- POST-MINE CONTOUR AND ELEVATION, FEET (APPROXIMATE)
- RIVER
- POND OR LAKE
- NATURAL DRAINAGE – PERENNIAL
- NATURAL DRAINAGE – INTERMITTENT
- HIGHWAY
- ROAD
- MONSANTO HAUL ROAD (ACTIVE & INACTIVE)
- RAILROAD
- MINE PIT LOCATION (APPROXIMATE WHERE COVERED BY BACKFILL)
- WASTE ROCK DUMP LOCATION (APPROXIMATE)
- WASTE ROCK DUMP LOCATION OR PIT BACKFILL (APPROXIMATE)
- APPROXIMATE OWNERSHIP BOUNDARY
- SECTION LINES
- SECTION NUMBER
- BLM LANDS
- US NATIONAL FORESTS
- STATE LANDS
- NON FEDERAL LANDS

STATION TYPE:

- MBH = BACKGROUND AREA SOIL SAMPLE LOCATION
- MHR = HISTORIC HAUL ROAD SOIL SAMPLE LOCATION
- MWD = WASTE ROCK DUMP SOIL SAMPLE LOCATION

KEY:

MMP = MINE PIT
MWD = WASTE ROCK DUMP
SS = SURFACE SOIL

MBB001-06 SS:0.418 — BACKGROUND SELENIUM DATA REPORTED IN MG/KG,DW

MWD085-09 SS:91.8 — SOIL SELENIUM DATA REPORTED IN MG/KG,DW

ISSUED DRAFT FOR AGENCY REVIEW 7/6/10

ISSUE REV	DESCRIPTION	TECH	ENG	DATE
0	ISSUED DRAFT FOR AGENCY REVIEW	CHF	LWM	07/06/10

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- US CENSUS BUREAU 2007 TIGER LINE DATA

PROJECTION: STATE PLANE COORDINATE SYSTEM
ZONE: IDAHO EAST
HORIZONTAL DATUM: NAD27
VERTICAL DATUM: NGVD29
UNITS: U.S. FEET

DESIGNED BY	C DUFFY	07/06/10
DRAWN BY	C FOWLER	07/06/10
CHECKED BY	E MARKS	07/06/10
APPROVED BY	C FOULK	07/06/10
PROJECT MANAGER	V DRAIN	07/06/10
CLIENT APPROVAL	B KOCH	07/06/10
CLIENT REFERENCE NO.		

P4 Production, LLC

PROJECT LOCATION: BALLARD, HENRY AND ENOCH VALLEY MINES
PROJECT: RI/FS WORK PLAN
TITLE: 2009 HENRY MINE AREA SOIL SAMPLE LOCATIONS AND RESULTS

MWH

DRAWING 3-30 | REVISION 0
FILE NAME 1005813D214

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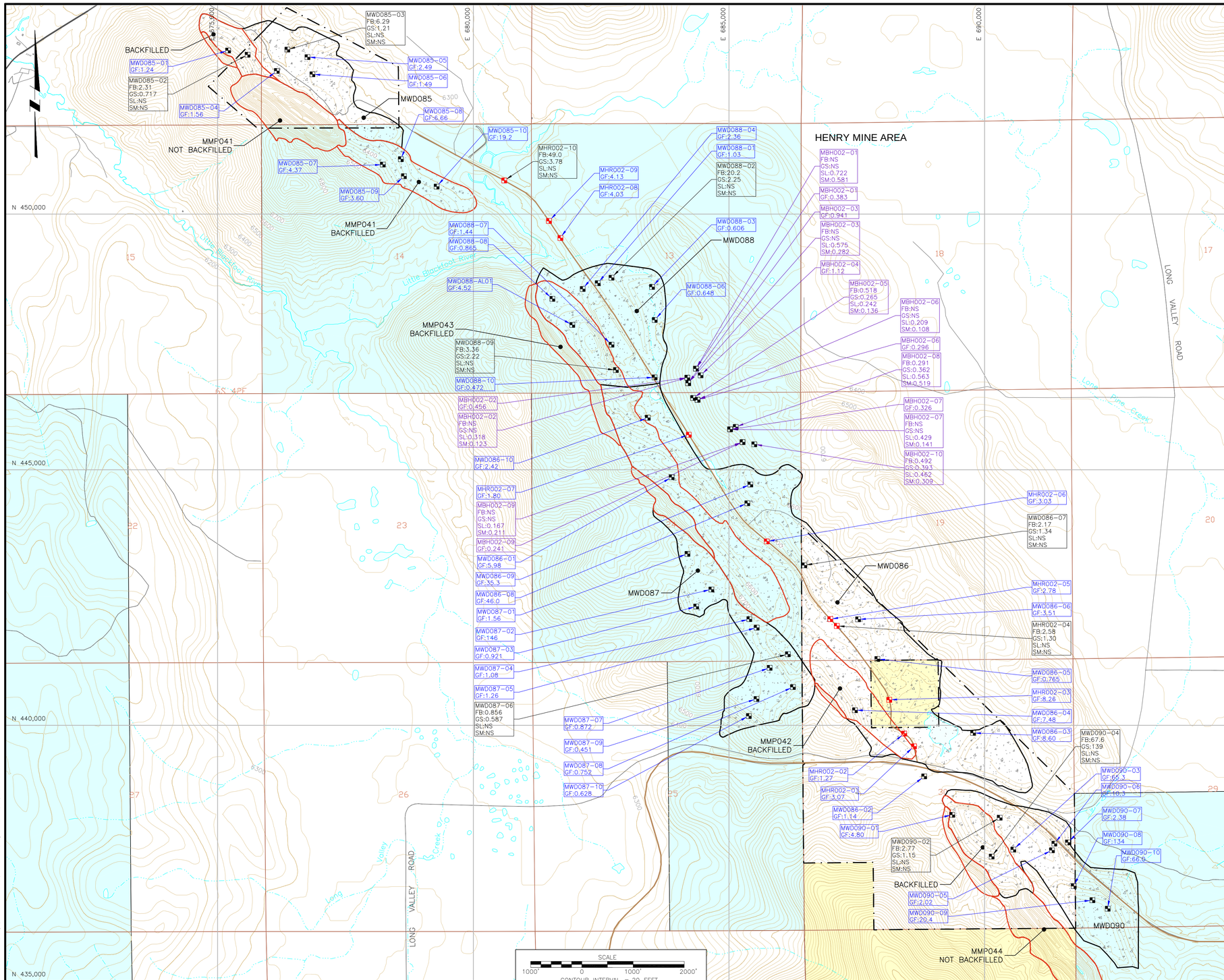

LEGEND:

- POST-MINE CONTOUR AND ELEVATION, FEET (APPROXIMATE)
- RIVER
- POND OR LAKE
- NATURAL DRAINAGE – PERENNIAL
- NATURAL DRAINAGE – INTERMITTENT
- HIGHWAY
- ROAD
- MONSANTO HAUL ROAD (ACTIVE & INACTIVE)
- RAILROAD
- MINE PIT LOCATION (APPROXIMATE WHERE COVERED BY BACKFILL)
- WASTE ROCK DUMP LOCATION (APPROXIMATE)
- WASTE ROCK DUMP LOCATION OR PIT BACKFILL (APPROXIMATE)
- APPROXIMATE OWNERSHIP BOUNDARY
- SECTION LINES
- SECTION NUMBER
- BLM LANDS
- US NATIONAL FORESTS
- STATE LANDS
- NON FEDERAL LANDS

STATION TYPE:

- MBH = BACKGROUND AREA VEGETATION SAMPLE LOCATION
- MHR = HISTORIC HAUL ROAD VEGETATION SAMPLE LOCATION
- MWD = WASTE ROCK DUMP VEGETATION SAMPLE LOCATION

KEY:

MMP = MINE PIT
MWD = WASTE ROCK DUMP
GF = GRASSES AND FORBS COMBINED
FB = FORBS
GS = GRASSES
SF = SHRUB FRUIT
SL = SHRUB LEAF
SM = SHRUB STEM
NS = NO SAMPLE

MBB001-03 GF:0.390 — BACKGROUND SELENIUM DATA REPORTED IN MG/KG,DW

MHR002-10 FB:49 GS:3.78 SL:NS SM:NS — VEGETATION LIFE FORM SELENIUM DATA REPORTED IN MG/KG,DW

MWD085-09 GF:91.8 — VEGETATION SELENIUM DATA REPORTED IN MG/KG,DW

ISSUE REV	DESCRIPTION	TECH	ENG	DATE
1	FINAL	CHF	LWM	02/24/11
0	ISSUED DRAFT FOR AGENCY REVIEW	CHF	LWM	07/06/10

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- SURVEY DATA FOR ENOCH VALLEY MINE AREA PROVIDED BY P4 PRODUCTION DATED: DECEMBER 2007.
- US CENSUS BUREAU 2007 TIGER LINE DATA

PROJECTION: STATE PLANE COORDINATE SYSTEM
ZONE: IDAHO EAST
HORIZONTAL DATUM: NAD27
VERTICAL DATUM: NGVD29
UNITS: U.S. FEET

DESIGNED BY	C DUFFY	02/24/11
DRAWN BY	C FOWLER	02/24/11
CHECKED BY	E MARKS	02/24/11
APPROVED BY	C FOULK	02/24/11
PROJECT MANAGER	V DRAIN	02/24/11
CLIENT APPROVAL	B KOCH	02/24/11
CLIENT REFERENCE NO.		

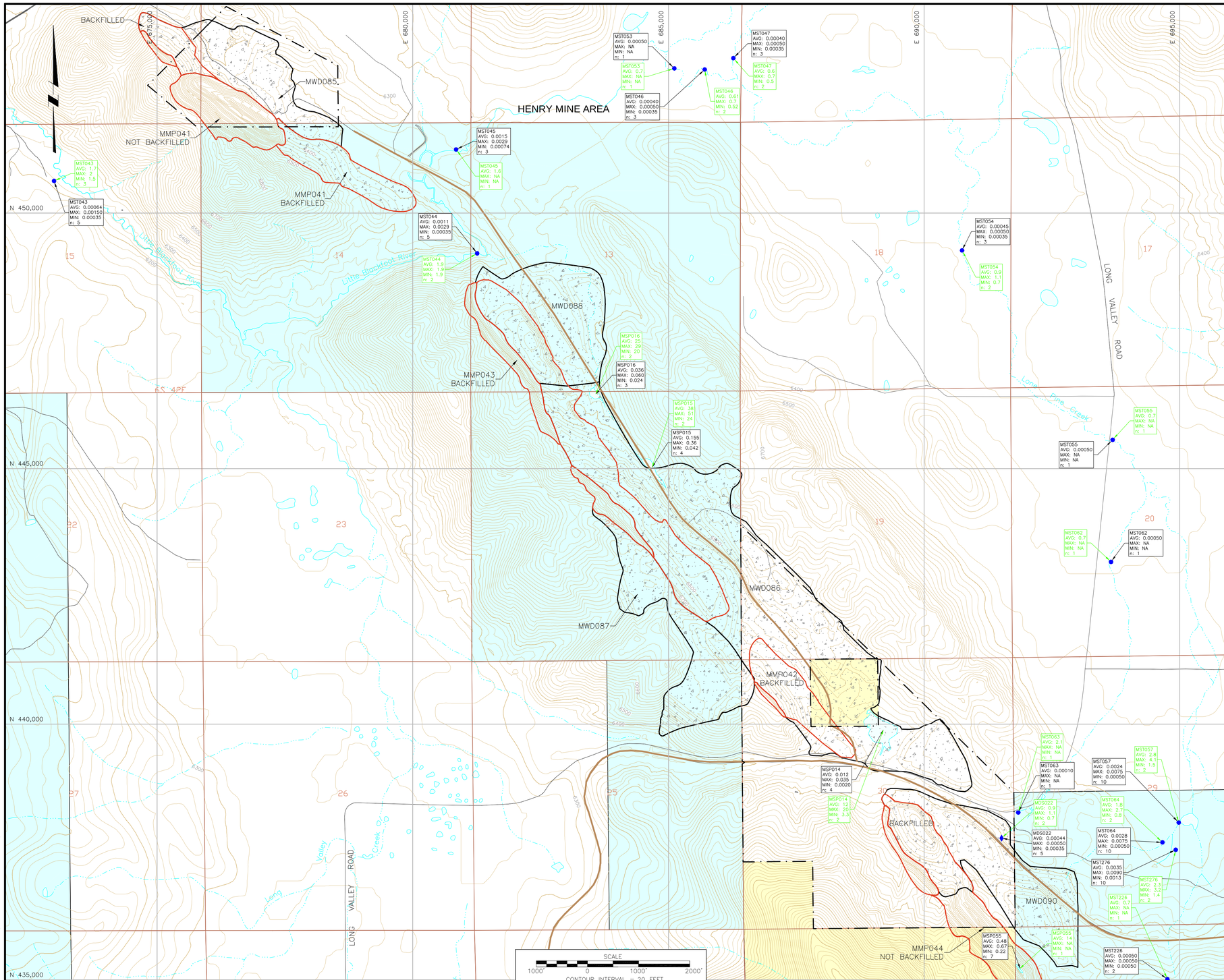
P4 Production, LLC

PROJECT LOCATION: BALLARD, HENRY AND ENOCH VALLEY MINES
PROJECT: RI/FS WORK PLAN
TITLE: 2009 HENRY MINE AREA VEGETATION SAMPLE LOCATIONS AND RESULTS

MWH

DRAWING 3-31 | REVISION 1
FILE NAME 1005813D215

N:\Design-Drafting\Clients_J-P\Monsanto Company\013-Sheet Set\RI-FS Scoping Data Maps\1005813D215



LEGEND:

- 7000 — POST–MINE CONTOUR AND ELEVATION, FEET (APPROXIMATE)
- RIVER
- POND OR LAKE
- NATURAL DRAINAGE – PERENNIAL
- NATURAL DRAINAGE – INTERMITTENT
- HIGHWAY
- ROAD
- MONSANTO HAUL ROAD (ACTIVE & INACTIVE)
- RAILROAD
- MINE PIT LOCATION (APPROXIMATE WHERE COVERED BY BACKFILL)
- WASTE ROCK DUMP LOCATION (APPROXIMATE)
- WASTE ROCK DUMP LOCATION OR PIT BACKFILL (APPROXIMATE)
- APPROXIMATE OWNERSHIP BOUNDARY
- SECTION LINES
- A — SECTION NUMBER
- BLM LANDS
- US NATIONAL FORESTS
- STATE LANDS
- NON FEDERAL LANDS

STATION TYPE:

- MST = STREAM SAMPLE LOCATION

KEY:

MMP = MINE PIT
MWD = WASTE ROCK DUMP
MSP = POND

MST269 AVG: 4.9 MAX: NA MIN: NA n: 1 — 1997 – 2003 SURFACE WATER SELENIUM DATA REPORTED IN MG/L TOTAL SELENIUM

MST269 AVG: 4.9 MAX: NA MIN: NA n: 1 — 1998 – 2002 SEDIMENT SELENIUM DATA REPORTED IN MG/KG

NOTES:

1. WHEN A SINGLE SAMPLE RESULT IS AVAILABLE, THE RESULT IS REPORTED AS AVERAGE. HOWEVER, THIS HAS NO STATISTICAL SIGNIFICANCE.
2. USE THE STATISTICS REPORTED ON THIS FIGURE – SAMPLE SIZE, MINIMUM OBSERVATION, MAXIMUM OBSERVATION, AND AVERAGE – WITH CAUTION. THE SAMPLE SIZE REPRESENTS THE NUMBER OF OBSERVATIONS FOR A GIVEN STATION, BUT IT DOES NOT INDICATE THE OBSERVATIONS WERE OBTAINED UNDER A SINGLE WELL–DESIGNED SAMPLING PROGRAM FOR THAT LOCATION. THE MINIMUM AND MAXIMUM OBSERVATIONS AT A GIVEN STATION ARE JUST THOSE, BUT WHEN THE SAMPLE SIZE IS SMALL, EXTREME OBSERVATIONS ARE OF LITTLE VALUE IN ESTIMATING THE RANGE OF OBSERVATIONS THAT CAN BE EXPECTED TO BE ENCOUNTERED SHOULD FURTHER SAMPLING BE DONE. THE AVERAGE IS THE ARITHMETIC MEAN OF THE OBSERVATIONS COMPRISING THE TOTAL NUMBER OF SAMPLES FOR THE STATION, BUT DIFFERENT STATIONS WERE SOMETIMES SAMPLED AT DIFFERENT TIMES, SEASONALITY EXISTS FOR SOME ANALYTES, AND NOT ALL SEASONS WERE SAMPLED AT ALL STATIONS; SO, THE COMPARISON OF ONE OF THESE AVERAGES TO ANOTHER, OR OF THESE AVERAGES TO ANY BENCHMARK, MAY HAVE LITTLE, IF ANY, MEANING.

ISSUE REV	DESCRIPTION	TECH	ENG	DATE
1	FINAL	CHF	LWM	02/24/11
0	ISSUED DRAFT FOR AGENCY REVIEW	CHF	LWM	07/06/10

DISCLAIMER:
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DRAWING REFERENCE(S):
1. POST–MINE TOPOGRAPHY GENERATED FROM:
- USGS DIGITAL ELEVATION MODELS (DEM)–24K.
- SURVEY DATA FOR BALLARD MINE PROVIDED BY OLYMPUS AERIAL SURVEYS, INC. DATED: JUNE 2005.
- SURVEY DATA FOR HENRY MINE AREA PROVIDED BY OLYMPUS AERIAL SURVEYS, INC. DATED: NOVEMBER 2008.
- SURVEY DATA FOR ENOCH VALLEY MINE AREA PROVIDED BY P4 PRODUCTION DATED: DECEMBER 20071.
- US CENSUS BUREAU 2007 TIGER LINE DATA

PROJECTION: STATE PLANE COORDINATE SYSTEM
ZONE: IDAHO EAST
HORIZONTAL DATUM: NAD27
VERTICAL DATUM: NGVD29
UNITS: U.S. FEET

DESIGNED BY	C DUFFY	02/24/11
DRAWN BY	C FOWLER	02/24/11
CHECKED BY	E MARKS	02/24/11
APPROVED BY	C FOULK	02/24/11
PROJECT MANAGER	V DRAIN	02/24/11
CLIENT APPROVAL	B KOCH	02/24/11
CLIENT REFERENCE NO.		

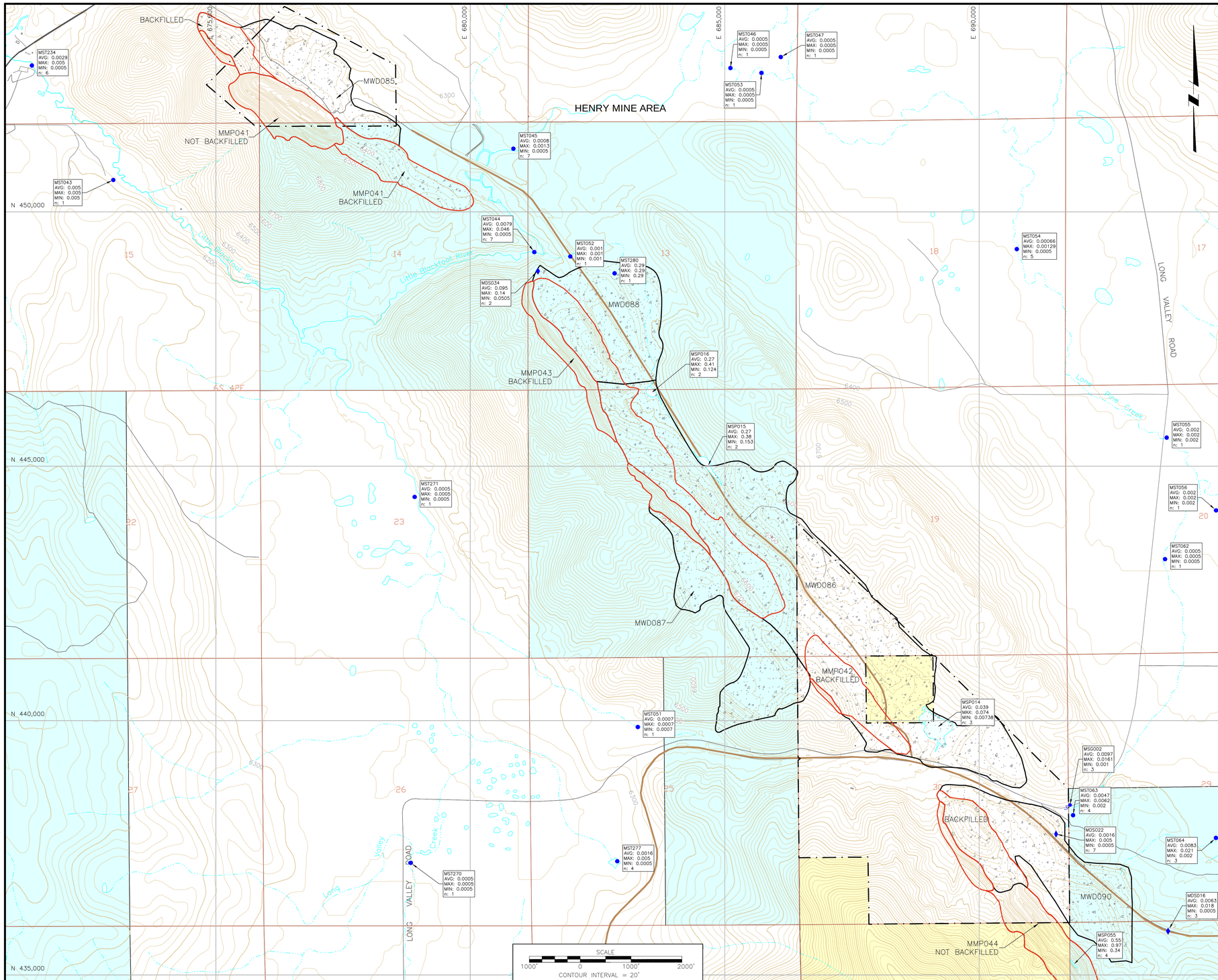
P4 Production, LLC

PROJECT LOCATION: BALLARD, HENRY AND ENOCH VALLEY MINES
PROJECT: RI/FS WORK PLAN
TITLE: PRE-2004 HENRY MINE AREA SURFACE WATER AND SEDIMENT SAMPLE LOCATIONS AND RESULTS

MWH

DRAWING 3-32 | REVISION 1
FILE NAME 1005813D202

N:\Design–Drafting\Clients_J–P\Monsanto Company\013–Sheet Set\RI–FS Scoping Data Maps\1005813D202



LEGEND:

- POST–MINE CONTOUR AND ELEVATION, FEET (APPROXIMATE)
- RIVER
- POND OR LAKE
- NATURAL DRAINAGE – PERENNIAL
- NATURAL DRAINAGE – INTERMITTENT
- HIGHWAY
- ROAD
- MONSANTO HAUL ROAD (ACTIVE & INACTIVE)
- RAILROAD
- MINE PIT LOCATION (APPROXIMATE WHERE COVERED BY BACKFILL)
- WASTE ROCK DUMP LOCATION (APPROXIMATE)
- WASTE ROCK DUMP LOCATION OR PIT BACKFILL (APPROXIMATE)
- APPROXIMATE OWNERSHIP BOUNDARY
- SECTION LINES
- SECTION NUMBER
- BLM LANDS
- US NATIONAL FORESTS
- STATE LANDS
- NON FEDERAL LANDS

STATION TYPE:

- MDS = DUMP SEEP SAMPLE LOCATION
- MST = STREAM SAMPLE LOCATION
- MSG = SPRING SAMPLE LOCATION

KEY:

MMP = MINE PIT
MWD = WASTE ROCK DUMP
MSP = POND

MST269 AVG: 4.9 MAX: NA MIN: NA n: 1 — 2004 – 2009 SURFACE WATER SELENIUM DATA REPORTED IN MG/L TOTAL SELENIUM

ISSUE REV	DESCRIPTION	TECH	ENG	DATE
1	FINAL	CHF	LWM	02/24/11
0	ISSUED DRAFT FOR AGENCY REVIEW	CHF	LWM	07/06/10

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- SURVEY DATA FOR HENRY MINE AREA PROVIDED BY OLYMPUS AERIAL SURVEYS, INC. DATED: NOVEMBER 2008.
- SURVEY DATA FOR ENOCH VALLEY MINE AREA PROVIDED BY P4 PRODUCTION DATED: DECEMBER 2007.
- US CENSUS BUREAU 2007 TIGER LINE DATA

PROJECTION: STATE PLANE COORDINATE SYSTEM
ZONE: IDAHO EAST
HORIZONTAL DATUM: NAD27
VERTICAL DATUM: NGVD29
UNITS: U.S. FEET

DESIGNED BY	C DUFFY	02/24/11
DRAWN BY	C FOWLER	02/24/11
CHECKED BY	E MARKS	02/24/11
APPROVED BY	C FOULK	02/24/11
PROJECT MANAGER	V DRAIN	02/24/11
CLIENT APPROVAL	B KOCH	02/24/11
CLIENT REFERENCE NO.		

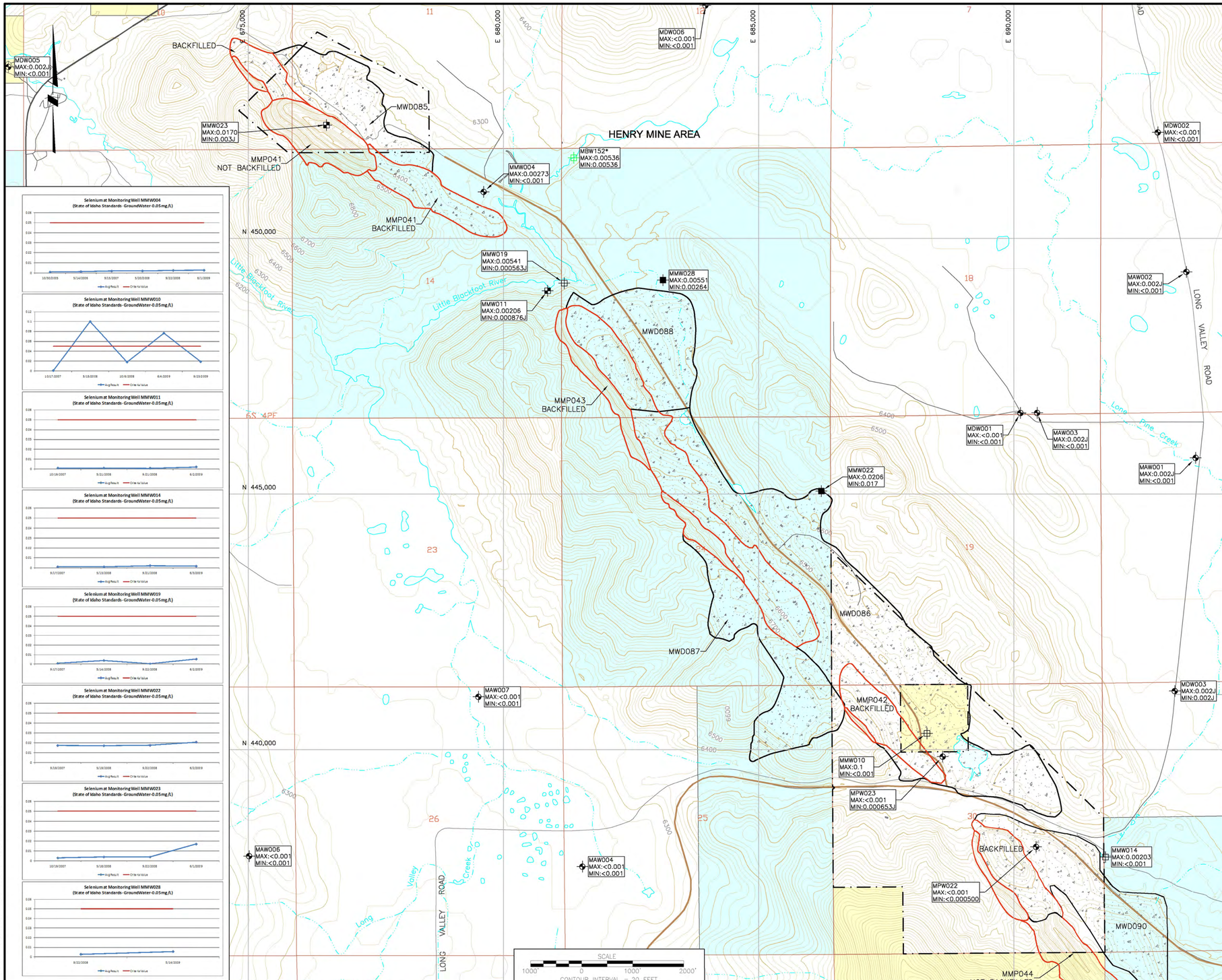
P4 Production, LLC

PROJECT LOCATION: BALLARD, HENRY AND ENOCH VALLEY MINES
PROJECT: RI/FS WORK PLAN
TITLE: EE/CA HENRY MINE AREA SURFACE WATER SAMPLE LOCATIONS AND RESULTS

MWH

DRAWING: 3-33
REVISION: 1
FILE NAME: 1005813D227

N:\Design–Drafting\Clients_J–P\Monsanto Company\013–Sheet Set\RI–FS Scoping Data Maps\1005813D227



LEGEND:

- POST–MINE CONTOUR AND ELEVATION, FEET (APPROXIMATE)
- RIVER
- POND OR LAKE
- NATURAL DRAINAGE – PERENNIAL
- NATURAL DRAINAGE – INTERMITTENT
- HIGHWAY
- ROAD
- MONSANTO HAUL ROAD (ACTIVE & INACTIVE)
- RAILROAD
- MINE PIT LOCATION (APPROXIMATE WHERE COVERED BY BACKFILL)
- WASTE ROCK DUMP LOCATION (APPROXIMATE)
- WASTE ROCK DUMP LOCATION OR PIT BACKFILL (APPROXIMATE)
- APPROXIMATE OWNERSHIP BOUNDARY
- SECTION LINES
- SECTION NUMBER
- BLM LANDS
- US NATIONAL FORESTS
- STATE LANDS
- NON FEDERAL LANDS

STATION TYPE:

- MAW = AGRICULTURAL WELL
- MDW = DOMESTIC WELL
- MPW = PRODUCTION WELL
- MMW = ALLUVIAL AQUIFER MONITORING WELL
- MMW = INTERMEDIATE AQUIFER MONITORING WELL (GENERALLY DINWOODY FM.)
- MMW = REGIONAL AQUIFER MONITORING WELL (WELLS FM.)
- MMW = AQUIFER MONITORING WELL (UNKNOWN OR MULTIPLE AQUIFERS SCREENED)
- MBW = DIRECT–PUSH ALLUVIAL AQUIFER WELL

KEY:

MMP = MINE PIT
MWD = WASTE ROCK DUMP
MMW029 MAX:0.865 MIN:0.685 — GROUNDWATER STATION ID; GROUNDWATER SAMPLING TOTAL SELENIUM RESULT (MG/L)
MBW130* — GROUNDWATER SAMPLING DISSOLVED SELENIUM
GRAPHS PRESENT TOTAL SELENIUM RESULTS

ISSUE REV	DESCRIPTION	TECH	ENG	DATE
1	FINAL	CHF	LWM	02/24/11
0	ISSUED DRAFT FOR AGENCY REVIEW	CHF	LWM	07/06/10

DISCLAIMER:
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- SURVEY DATA FOR HENRY MINE AREA PROVIDED BY OLYMPUS AERIAL SURVEYS, INC. DATED: NOVEMBER 2008.
- SURVEY DATA FOR ENOCH VALLEY MINE AREA PROVIDED BY P4 PRODUCTION DATED: DECEMBER 2007.
- US CENSUS BUREAU 2007 TIGER LINE DATA

PROJECTION: STATE PLANE COORDINATE SYSTEM
ZONE: IDAHO EAST
HORIZONTAL DATUM: NAD27
VERTICAL DATUM: NGVD29
UNITS: U.S. FEET

DESIGNED BY	C DUFFY	02/24/11
DRAWN BY	C FOWLER	02/24/11
CHECKED BY	E MARKS	02/24/11
APPROVED BY	C FOULK	02/24/11
PROJECT MANAGER	V DRAIN	02/24/11
CLIENT APPROVAL	B KOCH	02/24/11
CLIENT REFERENCE NO.		

P4 Production, LLC

PROJECT LOCATION: BALLARD, HENRY AND ENOCH VALLEY MINES
PROJECT: RI/FS WORK PLAN
TITLE: EE/CA HENRY MINE AREA GROUNDWATER SAMPLE LOCATIONS AND RESULTS

MWH

DRAWING 3-34 | REVISION 1
FILE NAME 1005813D218

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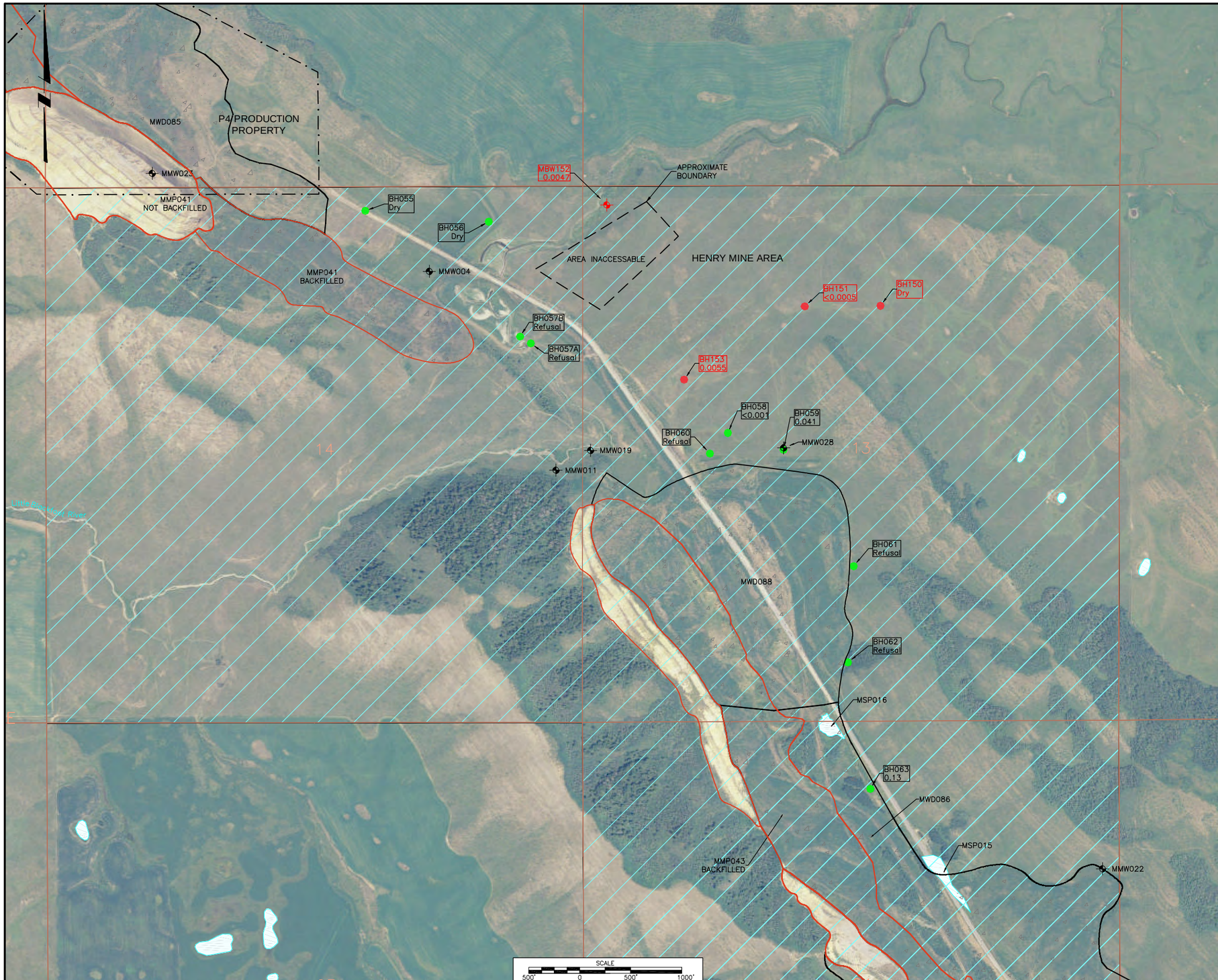

LEGEND:

- MINE PIT LOCATION (APPROXIMATE WHERE COVERED BY BACKFILL)
- WASTE ROCK DUMP LOCATION (APPROXIMATE)
- WASTE ROCK DUMP LOCATION OR PIT BACKFILL (APPROXIMATE)
- POND OR LAKE
- P4 PRODUCTION PROPERTY BOUNDARY (APPROXIMATE)
- SECTION LINES
- 8 SECTION NUMBER
- BLM LANDS
- US NATIONAL FORESTS
- STATE LANDS
- NON FEDERAL LANDS

STATION TYPE:

- MMW = GROUND WATER MONITORING WELL
- MBW = DIRECT PUSH MONITORING WELL INSTALLED IN 2009
- BH = 2008 DIRECT PUSH BOREHOLE
- BH = 2009 DIRECT PUSH BOREHOLE

KEY:

MMP = MINE PIT
MWD = WASTE ROCK DUMP
MSP = POND

BH043 0.01	2008 DIRECT PUSH BOREHOLE ID AND DISSOLVED SELENIUM CONCENTRATION
BH043 0.01	2009 DIRECT PUSH BOREHOLE ID AND DISSOLVED SELENIUM CONCENTRATION
<0.001	CONCENTRATION LESS THAN THE METHOD DETECTION LIMIT

NOTES:

1. DIRECT PUSH RESULTS ARE FOR GRAB GROUNDWATER SAMPLES AND ARE DISSOLVED CONCENTRATIONS OF SELENIUM IN MG/L.
2. SPRING 2008 TOTAL SELENIUM CONCENTRATIONS ARE USED FOR MONITORING WELLS, SPRINGS AND HEADWATER STREAMS WHERE APPROPRIATE.
3. BEDROCK WELLS ARE SHOWN FOR REFERENCE. SELENIUM CONCENTRATIONS ARE NOT SHOWN FOR THESE WELLS.

ISSUED DRAFT FOR AGENCY REVIEW 7/8/10

ISSUE REV	DESCRIPTION	TECH	ENG	DATE
0	ISSUED DRAFT FOR AGENCY REVIEW	CHF	LWM	07/06/10

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- SURVEY DATA FOR ENOCH VALLEY MINE AREA PROVIDED BY P4 PRODUCTION DATED: DECEMBER 2007.
- US CENSUS BUREAU 2007 TIGER LINE DATA

PROJECTION: STATE PLANE COORDINATE SYSTEM
ZONE: IDAHO EAST
HORIZONTAL DATUM: NAD27
VERTICAL DATUM: NGVD29
UNITS: U.S. FEET

DESIGNED BY	C DUFFY	07/06/10
DRAWN BY	C FOWLER	07/06/10
CHECKED BY	E MARKS	07/06/10
APPROVED BY	C FOULK	07/06/10
PROJECT MANAGER	V DRAIN	07/06/10
CLIENT APPROVAL	B KOCH	07/06/10
CLIENT REFERENCE NO.		

P4 Production, LLC

PROJECT LOCATION: BALLARD, HENRY AND ENOCH VALLEY MINES
PROJECT: RI/FS WORK PLAN
TITLE: EE/CA HENRY MINE AREA NORTH DIRECT PUSH BOREHOLE LOCATIONS

MWH

DRAWING 3-35 REVISION 0
FILE NAME 1005813D244

N:\Design-Drafting\Clients_J-P\Monsanto Company\013-Sheet Set\RI-FS Scoping Data Maps\1005813D244

LEGEND:

- MINE PIT LOCATION (APPROXIMATE WHERE COVERED BY BACKFILL)
- WASTE ROCK DUMP LOCATION (APPROXIMATE)
- WASTE ROCK DUMP LOCATION OR PIT BACKFILL (APPROXIMATE)
- POND OR LAKE
- P4 PRODUCTION PROPERTY BOUNDARY (APPROXIMATE)
- SECTION LINES
- 8 SECTION NUMBER
- BLM LANDS
- US NATIONAL FORESTS
- STATE LANDS
- NON FEDERAL LANDS

STATION TYPE:

- MMW = GROUND WATER MONITORING WELL
- MAW = AGRICULTURAL WELL
- MDW = DOMESTIC WELL
- MPW = PRODUCTION WELL
- BH = 2008 DIRECT PUSH BOREHOLE
- BH = 2009 DIRECT PUSH BOREHOLE

KEY:

MMP = MINE PIT
MWD = WASTE ROCK DUMP
MSP = POND

BH043 0.01	2008 DIRECT PUSH BOREHOLE ID AND DISSOLVED SELENIUM CONCENTRATION
BH043 0.01	2009 DIRECT PUSH BOREHOLE ID AND DISSOLVED SELENIUM CONCENTRATION
<0.001	CONCENTRATION LESS THAN THE METHOD DETECTION LIMIT

NOTES:

1. DIRECT PUSH RESULTS ARE FOR GRAB GROUNDWATER SAMPLES AND ARE DISSOLVED CONCENTRATIONS OF SELENIUM IN MG/L.
2. SPRING 2008 TOTAL SELENIUM CONCENTRATIONS ARE USED FOR MONITORING WELLS, SPRINGS AND HEADWATER STREAMS WHERE APPROPRIATE.
3. BEDROCK WELLS ARE SHOWN FOR REFERENCE. SELENIUM CONCENTRATIONS ARE NOT SHOWN FOR THESE WELLS.

REV	DESCRIPTION	TECH	ENG	DATE
1	FINAL	CHF	LWM	02/24/11
0	ISSUED DRAFT FOR AGENCY REVIEW	CHF	LWM	07/06/10

DISCLAIMER:
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- SURVEY DATA FOR HENRY MINE AREA PROVIDED BY OLYMPUS AERIAL SURVEYS, INC. DATED: NOVEMBER 2008.
- SURVEY DATA FOR ENOCH VALLEY MINE AREA PROVIDED BY P4 PRODUCTION DATED: DECEMBER 2007.
- US CENSUS BUREAU 2007 TIGER LINE DATA

PROJECTION: STATE PLANE COORDINATE SYSTEM
ZONE: IDAHO EAST
HORIZONTAL DATUM: NAD27
VERTICAL DATUM: NGVD29
UNITS: U.S. FEET

DESIGNED BY	C DUFFY	02/24/11
DRAWN BY	C FOWLER	02/24/11
CHECKED BY	E MARKS	02/24/11
APPROVED BY	C FOULK	02/24/11
PROJECT MANAGER	V DRAIN	02/24/11
CLIENT APPROVAL	B KOCH	02/24/11
CLIENT REFERENCE NO.		

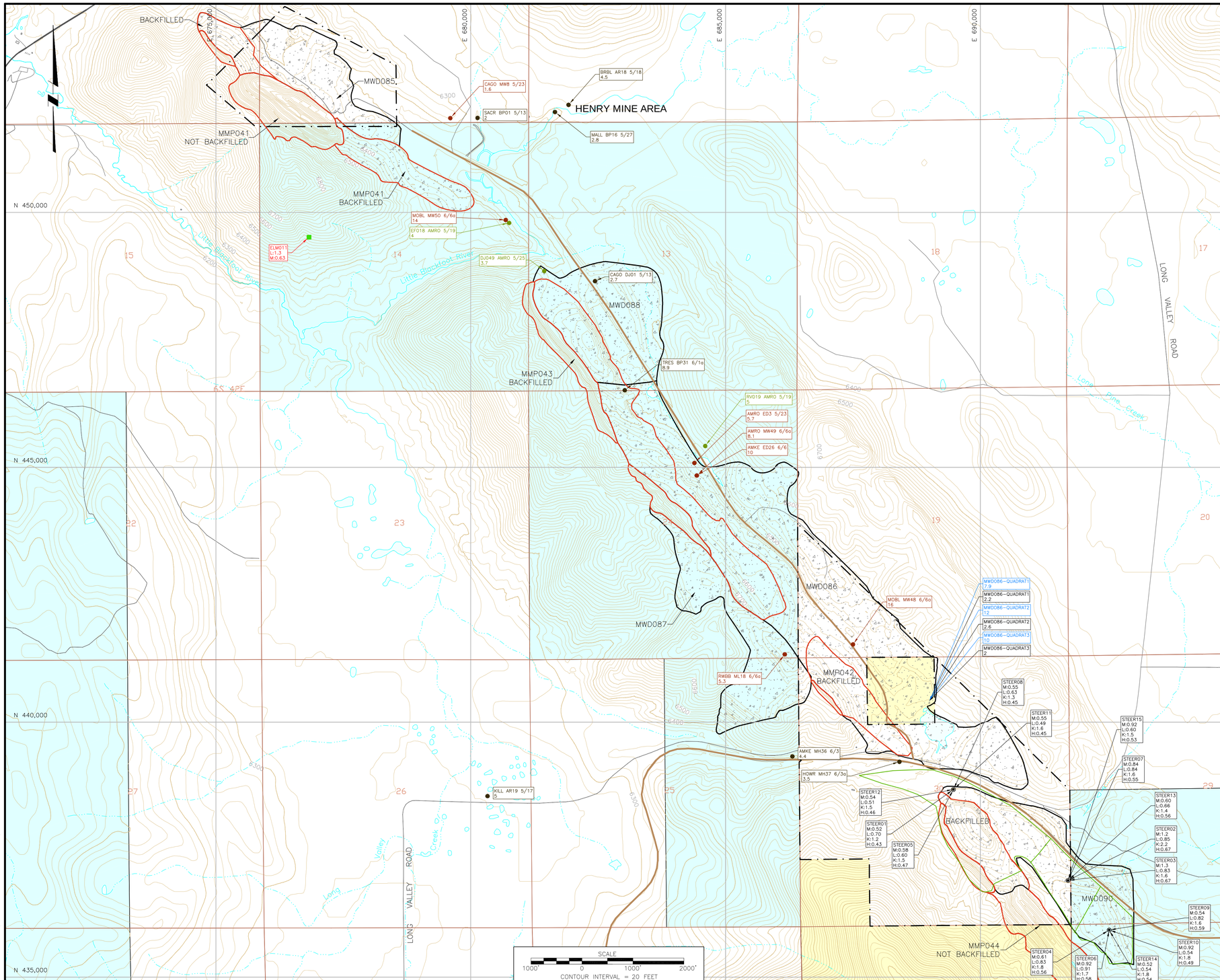
P4 Production, LLC

PROJECT LOCATION: BALLARD, HENRY AND ENOCH VALLEY MINES
PROJECT: RI/FS WORK PLAN
TITLE: EE/CA HENRY MINE AREA SOUTH DIRECT PUSH BOREHOLE LOCATIONS

MWH

DRAWING 3-36 REVISION 1
FILE NAME 1005813D243

N:\Design-Drafting\Clients_J-P\Monsanto Company\013-Sheet Set\RI-FS Scoping Data Maps\1005813D243



LEGEND:

- 7000 — POST–MINE CONTOUR AND ELEVATION, FEET (APPROXIMATE)
- RIVER
- POND OR LAKE
- NATURAL DRAINAGE – PERENNIAL
- NATURAL DRAINAGE – INTERMITTENT
- HIGHWAY
- ROAD
- MONSANTO HAUL ROAD (ACTIVE & INACTIVE)
- RAILROAD
- MINE PIT LOCATION (APPROXIMATE WHERE COVERED BY BACKFILL)
- WASTE ROCK DUMP LOCATION (APPROXIMATE)
- WASTE ROCK DUMP LOCATION OR PIT BACKFILL (APPROXIMATE)
- APPROXIMATE OWNERSHIP BOUNDARY
- SECTION LINES
- A — SECTION NUMBER
- BLM LANDS
- US NATIONAL FORESTS
- STATE LANDS
- NON FEDERAL LANDS

STATION TYPE:

- (ALL) = BIRD EGG SAMPLE LOCATION
- EL* = ELK SAMPLE LOCATION (1999)
- EL* = ELK SAMPLE LOCATION (2000)

KEY:

MMP = MINE PIT
MWD = WASTE ROCK DUMP
L = LIVER
M = MUSCLE
K = KIDNEY
H = HEART

- RV019 AMRO 5/19 5 — 1999 EGGS SELENIUM DATA REPORTED IN MG/KG,DW
- RV019 AMRO 5/19 5 — 2000 EGGS SELENIUM DATA REPORTED IN MG/KG,DW
- RV019 AMRO 5/19 5 — 2001 EGGS SELENIUM DATA REPORTED IN MG/KG,DW
- MWD081–QUADRAT3 30 — 2001 INSECTS SELENIUM DATA REPORTED IN MG/KG,DW
- MWD081–QUADRAT3 30 — 2001 SMALL MAMMAL SELENIUM DATA REPORTED IN MG/KG,DW
- ELM069 L:6.4 M:0.72 — ELK LIVER AND MUSCLE DATA REPORTED IN MG/KG,DW

ISSUED DRAFT FOR AGENCY REVIEW 7/6/10

ISSUE REV	DESCRIPTION	TECH	ENG	DATE
0	ISSUED DRAFT FOR AGENCY REVIEW	CHF	LWM	07/06/10

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- SURVEY DATA FOR HENRY MINE AREA PROVIDED BY OLYMPUS AERIAL SURVEYS, INC. DATED: NOVEMBER 2008.
- SURVEY DATA FOR ENOCH VALLEY MINE AREA PROVIDED BY P4 PRODUCTION DATED: DECEMBER 2007.
- US CENSUS BUREAU 2007 TIGER LINE DATA

PROJECTION: STATE PLANE COORDINATE SYSTEM
ZONE: IDAHO EAST
HORIZONTAL DATUM: NAD27
VERTICAL DATUM: NGVD29
UNITS: U.S. FEET

DESIGNED BY	C DUFFY	07/06/10
DRAWN BY	C FOWLER	07/06/10
CHECKED BY	E MARKS	07/06/10
APPROVED BY	C FOULK	07/06/10
PROJECT MANAGER	V DRAIN	07/06/10
CLIENT APPROVAL	B KOCH	07/06/10
CLIENT REFERENCE NO.		

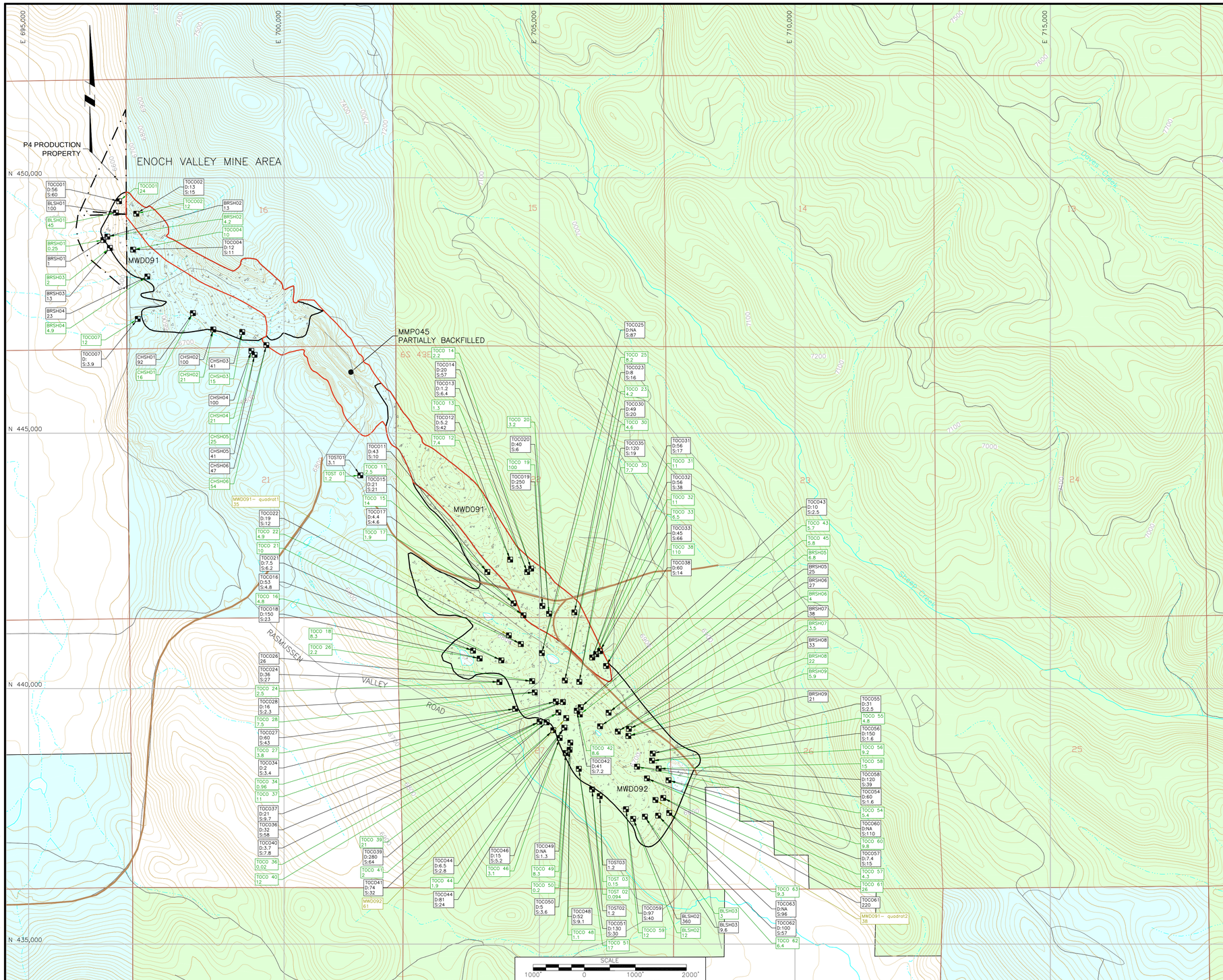
P4 Production, LLC

PROJECT LOCATION: BALLARD, HENRY AND ENOCH VALLEY MINES
PROJECT: RI/FS WORK PLAN
TITLE: PRE-2004 HENRY MINE AREA TERRESTRIAL ECOLOGY SAMPLE LOCATIONS AND RESULTS

MWH

DRAWING 3-37 | REVISION 0
FILE NAME 1005813D193

N:\Design–Drafting\Clients_J–P\Monsanto Company\013–Sheet Set\RI–FS Scoping Data Maps\1005813D193



LEGEND:

- POST–MINE CONTOUR AND ELEVATION, FEET (APPROXIMATE)
- RIVER
- POND OR LAKE
- NATURAL DRAINAGE – PERENNIAL
- NATURAL DRAINAGE – INTERMITTENT
- HIGHWAY
- ROAD
- MONSANTO HAUL ROAD (ACTIVE & INACTIVE)
- RAILROAD
- MINE PIT LOCATION (APPROXIMATE WHERE COVERED BY BACKFILL)
- WASTE ROCK DUMP LOCATION (APPROXIMATE)
- WASTE ROCK DUMP LOCATION OR PIT BACKFILL (APPROXIMATE)
- APPROXIMATE OWNERSHIP BOUNDARY
- SECTION LINES
- SECTION NUMBER
- BLM LANDS
- US NATIONAL FORESTS
- STATE LANDS
- NON FEDERAL LANDS

STATION TYPE:

- MWD = WASTE ROCK DUMP SOIL AND VEGETATION SAMPLE LOCATION

KEY:

MMP = MINE PIT
MWD = WASTE ROCK DUMP
S = SURFACE (0–2 INCHES)
D = DEEP (2–18 INCHES)
BLSH = BLACK SHALE
BRSH = BROWN SHALE
CHSH = CHERTY SHALE
TOST = TOP SOIL STOCKPILE
TOCO = TOP SOIL COVER

MWD081– quadrat2 24 — 1998 & 2001 UPLAND SOIL SELENIUM DATA REPORTED IN MG/KG,DW

TOCO42 D:41 S:7.2 — 2000 ENOCH VALLEY MINE UPLAND SOIL SELENIUM DATA REPORTED IN MG/KG,DW

TOCO 42 8.6 — 2000 ENOCH VALLEY MINE UPLAND VEGETATION SELENIUM DATA REPORTED IN MG/KG,DW

ISSUE REV	DESCRIPTION	TECH	ENG	DATE
1	FINAL	CHF	LWM	02/24/11
0	ISSUED DRAFT FOR AGENCY REVIEW	CHF	LWM	07/06/10

DISCLAIMER:
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DRAWING REFERENCE(S):
1. POST–MINE TOPOGRAPHY GENERATED FROM:
- USGS DIGITAL ELEVATION MODELS (DEM)–24K.
- SURVEY DATA FOR BALLARD MINE PROVIDED BY OLYMPUS AERIAL SURVEYS, INC. DATED: JUNE 2005.
- SURVEY DATA FOR HENRY MINE AREA PROVIDED BY OLYMPUS AERIAL SURVEYS, INC. DATED: NOVEMBER 2008.
- SURVEY DATA FOR ENOCH VALLEY MINE AREA PROVIDED BY P4 PRODUCTION DATED: DECEMBER 2007.
- US CENSUS BUREAU 2007 TIGER LINE DATA

PROJECTION: STATE PLANE COORDINATE SYSTEM
ZONE: IDAHO EAST
HORIZONTAL DATUM: NAD27
VERTICAL DATUM: NGVD29
UNITS: U.S. FEET

DESIGNED BY	C DUFFY	02/24/11
DRAWN BY	C FOWLER	02/24/11
CHECKED BY	E MARKS	02/24/11
APPROVED BY	C FOULK	02/24/11
PROJECT MANAGER	V DRAIN	02/24/11
CLIENT APPROVAL	B KOCH	02/24/11
CLIENT REFERENCE NO.		

P4 Production, LLC

PROJECT LOCATION: BALLARD, HENRY AND ENOCH VALLEY MINES
PROJECT: RI/FS WORK PLAN
TITLE: PRE-2004 ENOCH VALLEY MINE AREA SOIL AND VEGETATION SAMPLE LOCATIONS AND RESULTS

MWH

DRAWING: 3-38
REVISION: 1
FILE NAME: 1005813D198

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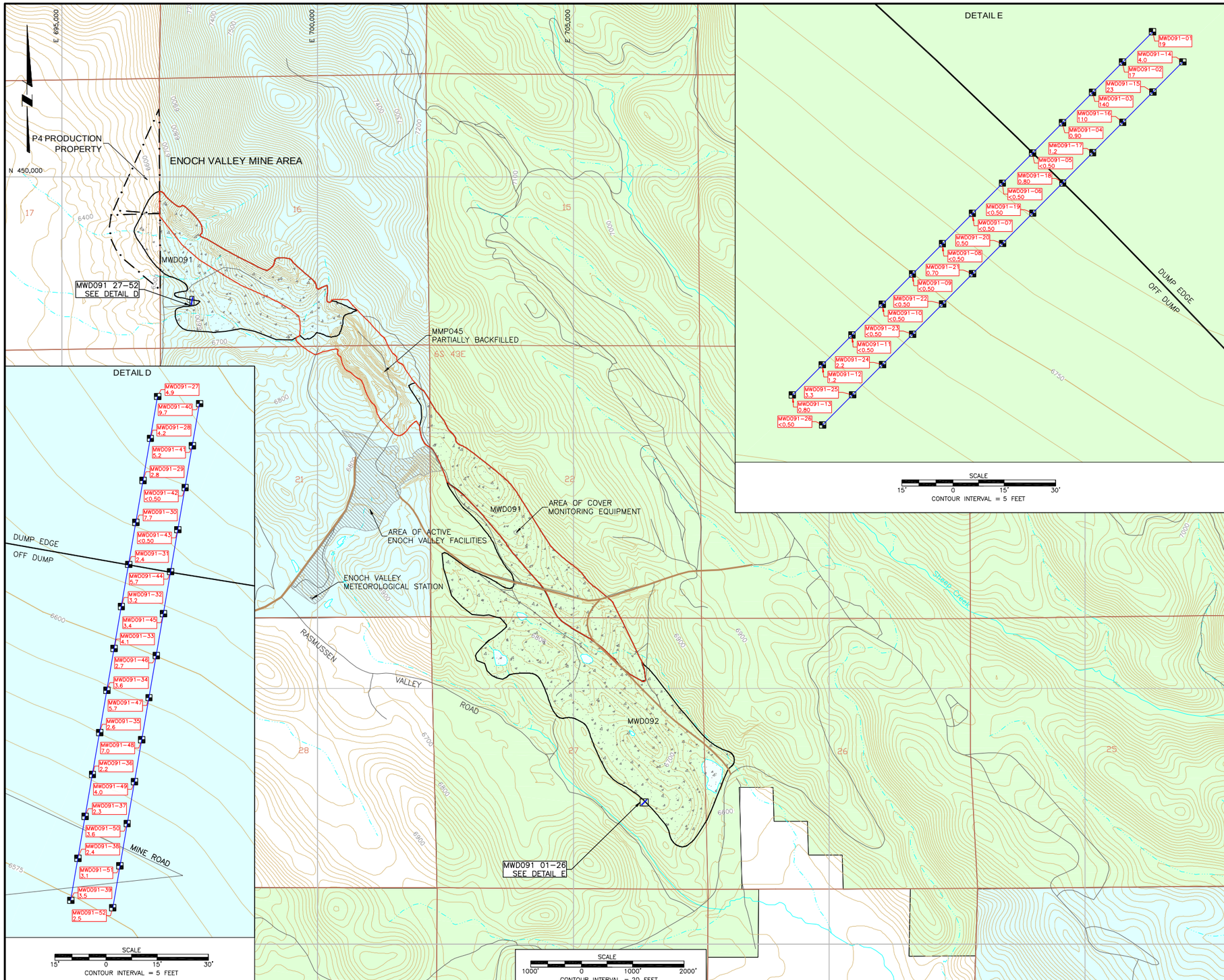

LEGEND:

- POST-MINE CONTOUR AND ELEVATION, FEET (APPROXIMATE)
- RIVER
- POND OR LAKE
- NATURAL DRAINAGE – PERENNIAL
- NATURAL DRAINAGE – INTERMITTENT
- HIGHWAY
- ROAD
- MONSANTO HAUL ROAD (ACTIVE & INACTIVE)
- RAILROAD
- MINE PIT LOCATION (APPROXIMATE WHERE COVERED BY BACKFILL)
- WASTE ROCK DUMP LOCATION (APPROXIMATE)
- WASTE ROCK DUMP LOCATION OR PIT BACKFILL (APPROXIMATE)
- APPROXIMATE OWNERSHIP BOUNDARY
- SECTION LINES
- SECTION NUMBER
- BLM LANDS
- US NATIONAL FORESTS
- STATE LANDS
- NON FEDERAL LANDS

STATION TYPE:

MWD = SOIL AND VEGETATION SAMPLE LOCATION

KEY:

MMP = MINE PIT
MWD = WASTE ROCK DUMP

MWD085 0.12 — JULY 2004 UPLAND SOIL SELENIUM DATA REPORTED IN MG/KG,DW

NOTE:

1. MWD091(01~26): 150 FOOT TRANSECTS FROM THE MASS WASTING INVESTIGATION.

ISSUED DRAFT FOR AGENCY REVIEW 7/6/10

ISSUE REV	DESCRIPTION	TECH	ENG	DATE
0	ISSUED DRAFT FOR AGENCY REVIEW	CHF	LWM	07/06/10

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- US CENSUS BUREAU 2007 TIGER LINE DATA

PROJECTION: STATE PLANE COORDINATE SYSTEM
ZONE: IDAHO EAST
HORIZONTAL DATUM: NAD27
VERTICAL DATUM: NGVD29
UNITS: U.S. FEET

DESIGNED BY	C DUFFY	07/06/10
DRAWN BY	C FOWLER	07/06/10
CHECKED BY	E MARKS	07/06/10
APPROVED BY	C FOULK	07/06/10
PROJECT MANAGER	V DRAIN	07/06/10
CLIENT APPROVAL	B KOCH	07/06/10
CLIENT REFERENCE NO.		

P4 Production, LLC

PROJECT LOCATION: BALLARD, HENRY AND ENOCH VALLEY MINES
PROJECT: RI/FS WORK PLAN
TITLE: 2004 ENOCH VALLEY MINE AREA SOIL SAMPLE LOCATIONS AND RESULTS

MWH

DRAWING 3-39 REVISION 0
FILE NAME 1005813D206

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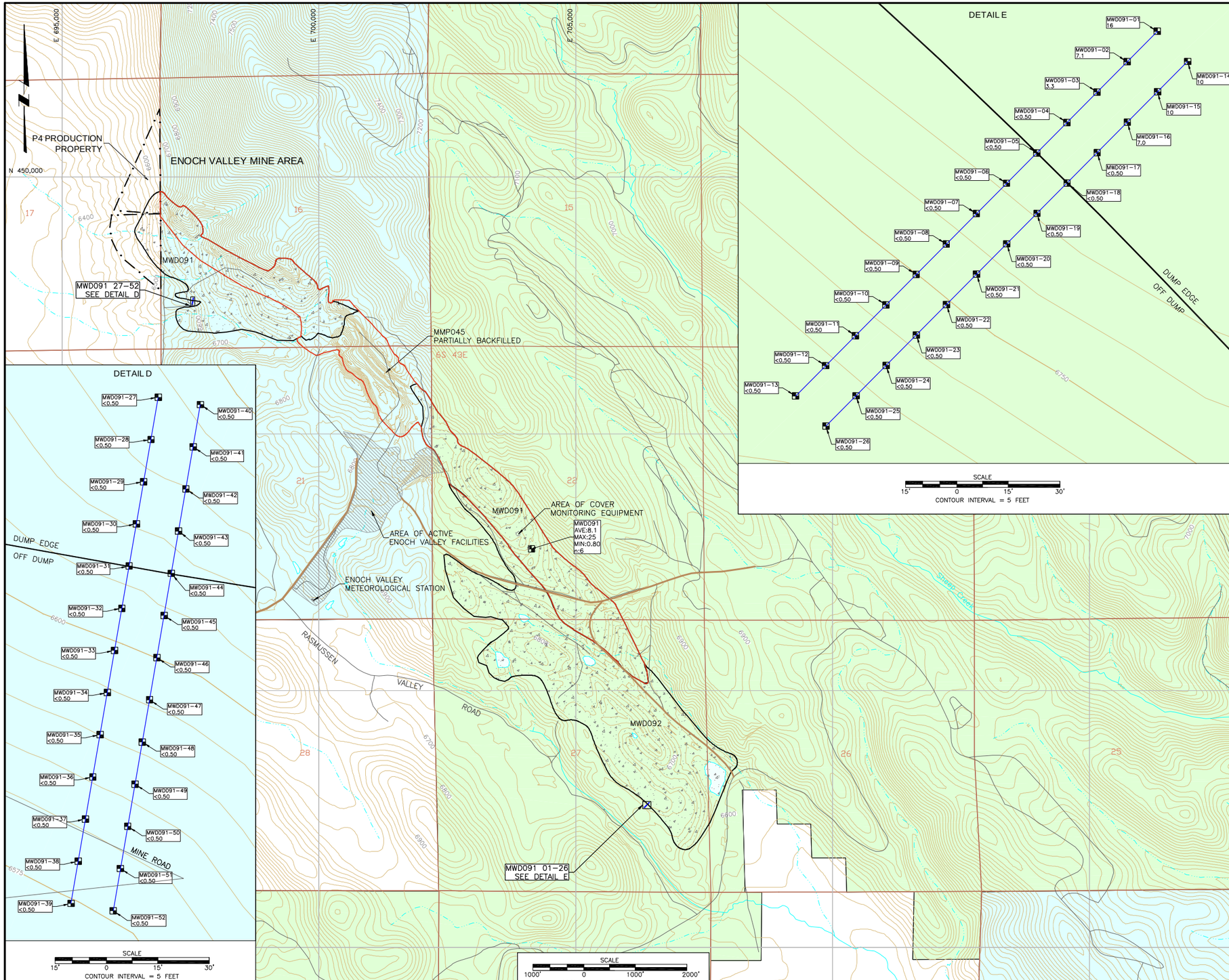

LEGEND:

- POST-MINE CONTOUR AND ELEVATION, FEET (APPROXIMATE)
- RIVER
- POND OR LAKE
- NATURAL DRAINAGE – PERENNIAL
- NATURAL DRAINAGE – INTERMITTENT
- HIGHWAY
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- MONSANTO HAUL ROAD (ACTIVE & INACTIVE)
- RAILROAD
- MINE PIT LOCATION (APPROXIMATE WHERE COVERED BY BACKFILL)
- WASTE ROCK DUMP LOCATION (APPROXIMATE)
- WASTE ROCK DUMP LOCATION OR PIT BACKFILL (APPROXIMATE)
- APPROXIMATE OWNERSHIP BOUNDARY
- SECTION LINES
- SECTION NUMBER
- BLM LANDS
- US NATIONAL FORESTS
- STATE LANDS
- NON FEDERAL LANDS

STATION TYPE:

MWD = SOIL AND VEGETATION SAMPLE LOCATION

KEY:

MMP = MINE PIT
MWD = WASTE ROCK DUMP

MWD085 0.12 — JULY 2004 UPLAND VEGETATION SELENIUM DATA REPORTED IN MG/KG,DW

MWD086 AVE:4.13 MAX:4.5 MIN:0.8 n:6 — THESE STATIONS WERE SAMPLED MONTHLY FROM MAY TO OCTOBER DURING THE 2004 MONTHLY VEGETATION INVESTIGATION. NON-DETECTS ARE CENSORED AT < MDL.

NOTE:

1. MWD091(01~26): 150 FOOT TRANSECTS FROM THE MASS WASTING INVESTIGATION.

ISSUED DRAFT FOR AGENCY REVIEW 7/6/10

ISSUE REV	DESCRIPTION	TECH	ENG	DATE
0	ISSUED DRAFT FOR AGENCY REVIEW	CHF	LWM	07/06/10

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- SURVEY DATA FOR ENOCH VALLEY MINE AREA PROVIDED BY P4 PRODUCTION DATED: DECEMBER 2007.
- US CENSUS BUREAU 2007 TIGER LINE DATA

PROJECTION: STATE PLANE COORDINATE SYSTEM
ZONE: IDAHO EAST
HORIZONTAL DATUM: NAD27
VERTICAL DATUM: NGVD29
UNITS: U.S. FEET

DESIGNED BY	C DUFFY	07/06/10
DRAWN BY	C FOWLER	07/06/10
CHECKED BY	E MARKS	07/06/10
APPROVED BY	C FOULK	07/06/10
PROJECT MANAGER	V DRAIN	07/06/10
CLIENT APPROVAL	B KOCH	07/06/10
CLIENT REFERENCE NO.		

P4 Production, LLC

PROJECT LOCATION: BALLARD, HENRY AND ENOCH VALLEY MINES
PROJECT: RI/FS WORK PLAN
TITLE: 2004 ENOCH VALLEY MINE AREA VEGETATION SAMPLE LOCATIONS AND RESULTS

MWH

DRAWING 3-40 REVISION 0
FILE NAME 1005813D207

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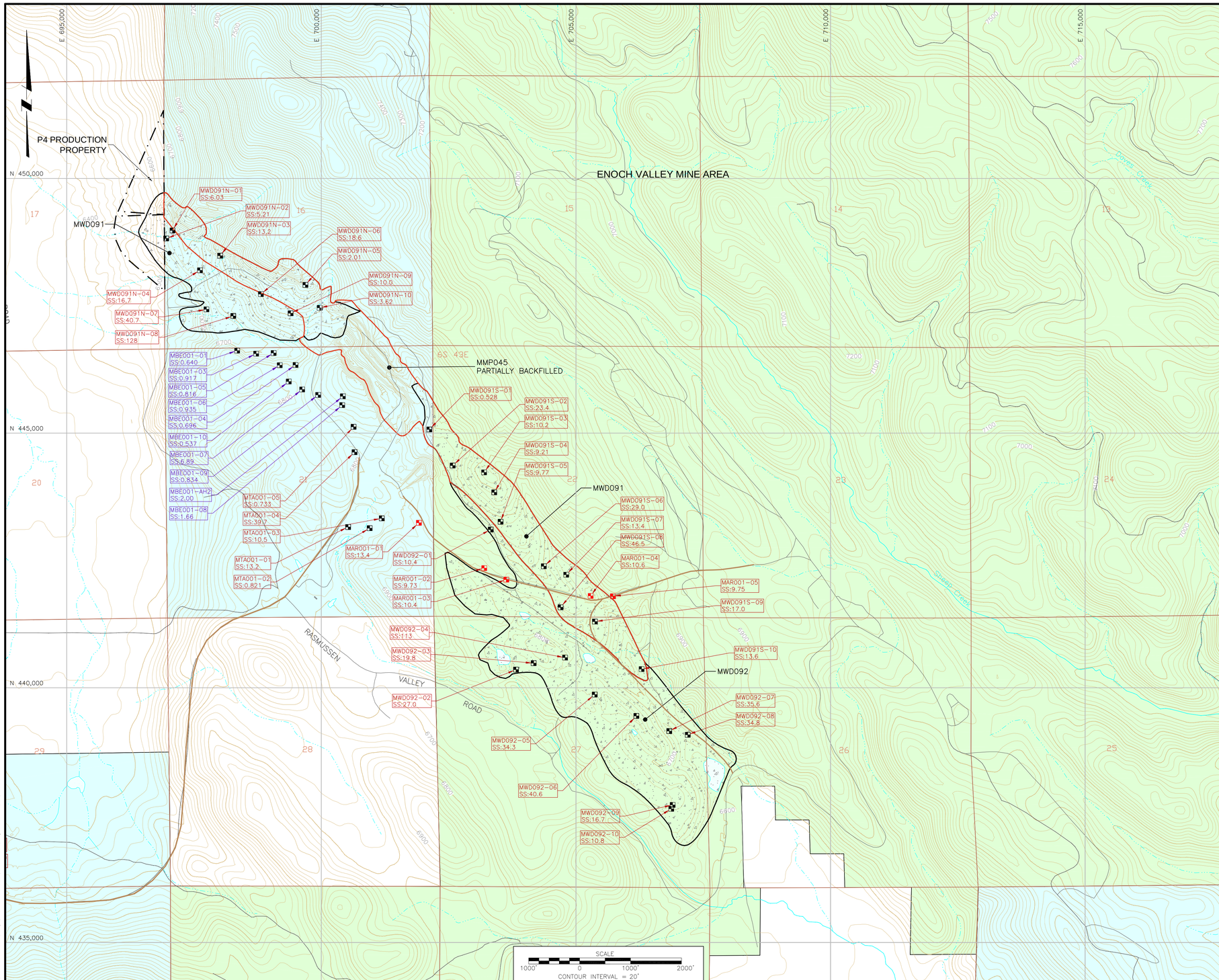

LEGEND:

- POST-MINE CONTOUR AND ELEVATION, FEET (APPROXIMATE)
- RIVER
- POND OR LAKE
- NATURAL DRAINAGE – PERENNIAL
- NATURAL DRAINAGE – INTERMITTENT
- HIGHWAY
- ROAD
- MONSANTO HAUL ROAD (ACTIVE & INACTIVE)
- RAILROAD
- MINE PIT LOCATION (APPROXIMATE WHERE COVERED BY BACKFILL)
- WASTE ROCK DUMP LOCATION (APPROXIMATE)
- WASTE ROCK DUMP LOCATION OR PIT BACKFILL (APPROXIMATE)
- APPROXIMATE OWNERSHIP BOUNDARY
- SECTION LINES
- A SECTION NUMBER
- BLM LANDS
- US NATIONAL FORESTS
- STATE LANDS
- NON FEDERAL LANDS

STATION TYPE:

- MAR = ACTIVE HAUL ROAD SAMPLE LOCATION
- MBE = BACKGROUND AREA SOIL SAMPLE LOCATION
- MTA = TIPPLE AREA SAMPLE LOCATION
- MWD = WASTE ROCK DUMP SOIL SAMPLE LOCATION

KEY:

MMP = MINE PIT
MWD = WASTE ROCK DUMP
SS = SURFACE SOIL

MBB001-06 SS:0.418 — BACKGROUND SELENIUM DATA REPORTED IN MG/KG,DW

MWD085-09 SS:91.8 — SOIL SELENIUM DATA REPORTED IN MG/KG,DW

ISSUED DRAFT FOR AGENCY REVIEW 7/6/10

ISSUE REV	DESCRIPTION	TECH	ENG	DATE
0	ISSUED DRAFT FOR AGENCY REVIEW	CHF	LWM	07/06/10

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- SURVEY DATA FOR ENOCH VALLEY MINE AREA PROVIDED BY P4 PRODUCTION DATED: DECEMBER 2007.
- US CENSUS BUREAU 2007 TIGER LINE DATA

PROJECTION: STATE PLANE COORDINATE SYSTEM
ZONE: IDAHO EAST
HORIZONTAL DATUM: NAD27
VERTICAL DATUM: NGVD29
UNITS: U.S. FEET

DESIGNED BY	C DUFFY	07/06/10
DRAWN BY	C FOWLER	07/06/10
CHECKED BY	E MARKS	07/06/10
APPROVED BY	C FOULK	07/06/10
PROJECT MANAGER	V DRAIN	07/06/10
CLIENT APPROVAL	B KOCH	07/06/10
CLIENT REFERENCE NO.		

P4 Production, LLC

PROJECT LOCATION: BALLARD, HENRY AND ENOCH VALLEY MINES
PROJECT: RI/FS WORK PLAN
TITLE: 2009 ENOCH VALLEY MINE AREA SOIL SAMPLE LOCATIONS AND RESULTS

MWH

DRAWING 3-41 | REVISION 0
FILE NAME 1005813D216

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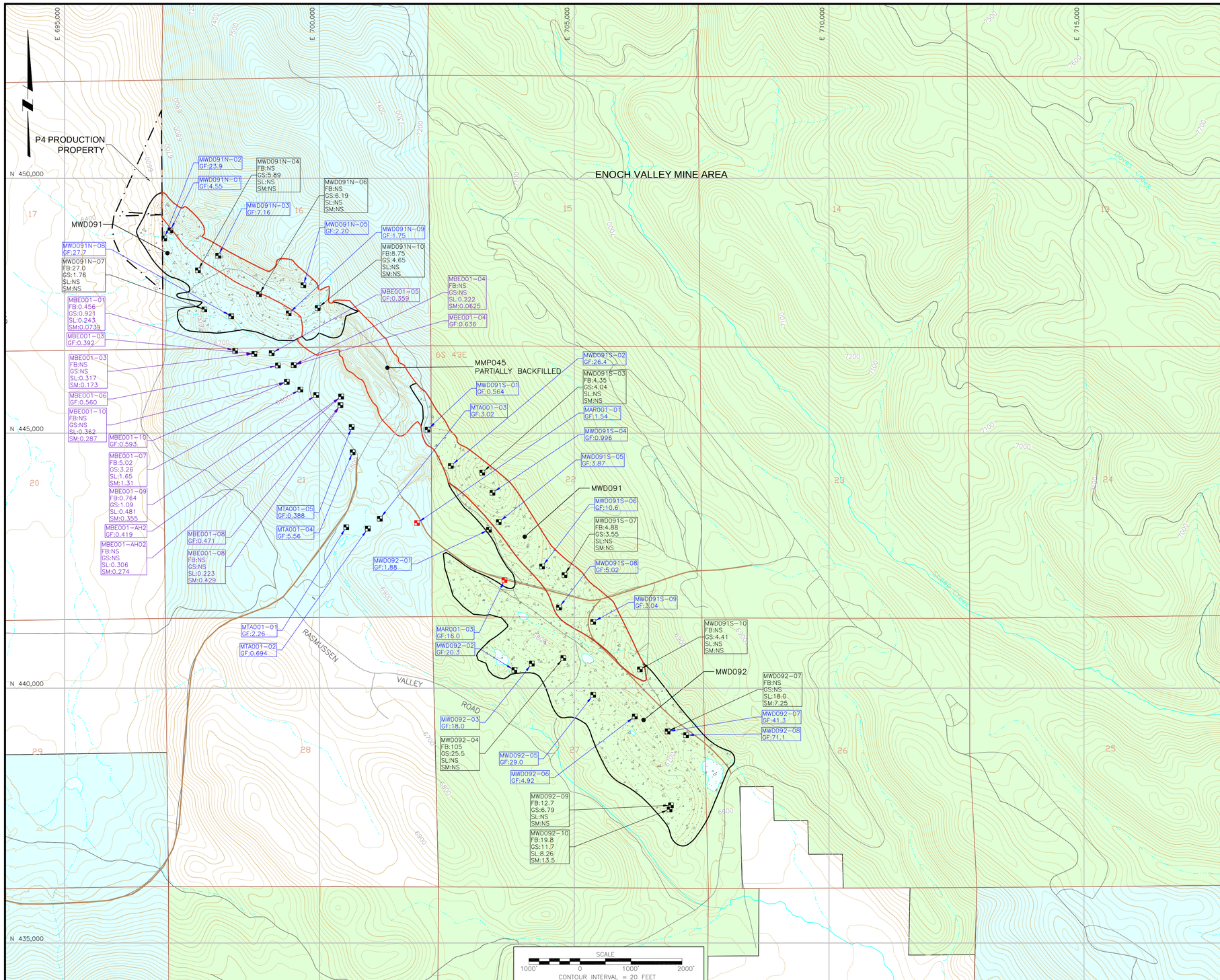

LEGEND:

- 7000 — POST-MINE CONTOUR AND ELEVATION, FEET (APPROXIMATE)
- RIVER
- POND OR LAKE
- NATURAL DRAINAGE – PERENNIAL
- NATURAL DRAINAGE – INTERMITTENT
- HIGHWAY
- ROAD
- MONSANTO HAUL ROAD (ACTIVE & INACTIVE)
- RAILROAD
- MINE PIT LOCATION (APPROXIMATE WHERE COVERED BY BACKFILL)
- WASTE ROCK DUMP LOCATION (APPROXIMATE)
- WASTE ROCK DUMP LOCATION OR PIT BACKFILL (APPROXIMATE)
- APPROXIMATE OWNERSHIP BOUNDARY
- SECTION LINES
- A — SECTION NUMBER
- BLM LANDS
- US NATIONAL FORESTS
- STATE LANDS
- NON FEDERAL LANDS

STATION TYPE:

- MAR = ACTIVE HAUL ROAD SAMPLE LOCATION
- MBE = BACKGROUND AREA VEGETATION SAMPLE LOCATION
- MTA = TIPPLE AREA SAMPLE LOCATION
- MWD = WASTE ROCK DUMP VEGETATION SAMPLE LOCATION

KEY:

MMP = MINE PIT
MWD = WASTE ROCK DUMP
GF = GRASSES AND FORBS COMBINED
FB = FORBS
GS = GRASSES
SF = SHRUB FRUIT
SL = SHRUB LEAF
SM = SHRUB STEM
NS = NO SAMPLE

MBB001-03 GF:0.390 — BACKGROUND SELENIUM DATA REPORTED IN MG/KG,DW

MHR002-10 FB:49 GS:3.78 SL:NS SM:NS — VEGETATION LIFE FORM SELENIUM DATA REPORTED IN MG/KG,DW

MWD085-09 GF:91.8 — VEGETATION SELENIUM DATA REPORTED IN MG/KG,DW

ISSUED DRAFT FOR AGENCY REVIEW 7/6/10

ISSUE REV	DESCRIPTION	TECH	ENG	DATE
0	ISSUED DRAFT FOR AGENCY REVIEW	CHF	LWM	07/06/10

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- US CENSUS BUREAU 2007 TIGER LINE DATA

PROJECTION: STATE PLANE COORDINATE SYSTEM
ZONE: IDAHO EAST
HORIZONTAL DATUM: NAD27
VERTICAL DATUM: NGVD29
UNITS: U.S. FEET

DESIGNED BY	C DUFFY	07/06/10
DRAWN BY	C FOWLER	07/06/10
CHECKED BY	E MARKS	07/06/10
APPROVED BY	C FOULK	07/06/10
PROJECT MANAGER	V DRAIN	07/06/10
CLIENT APPROVAL	B KOCH	07/06/10
CLIENT REFERENCE NO.		

P4 Production, LLC

PROJECT LOCATION: BALLARD, HENRY AND ENOCH VALLEY MINES
PROJECT: RI/FS WORK PLAN
TITLE: 2009 ENOCH VALLEY MINE AREA VEGETATION SAMPLE LOCATIONS AND RESULTS

MWH

DRAWING: 3-42
REVISION: 0
FILE NAME: 1005813D217

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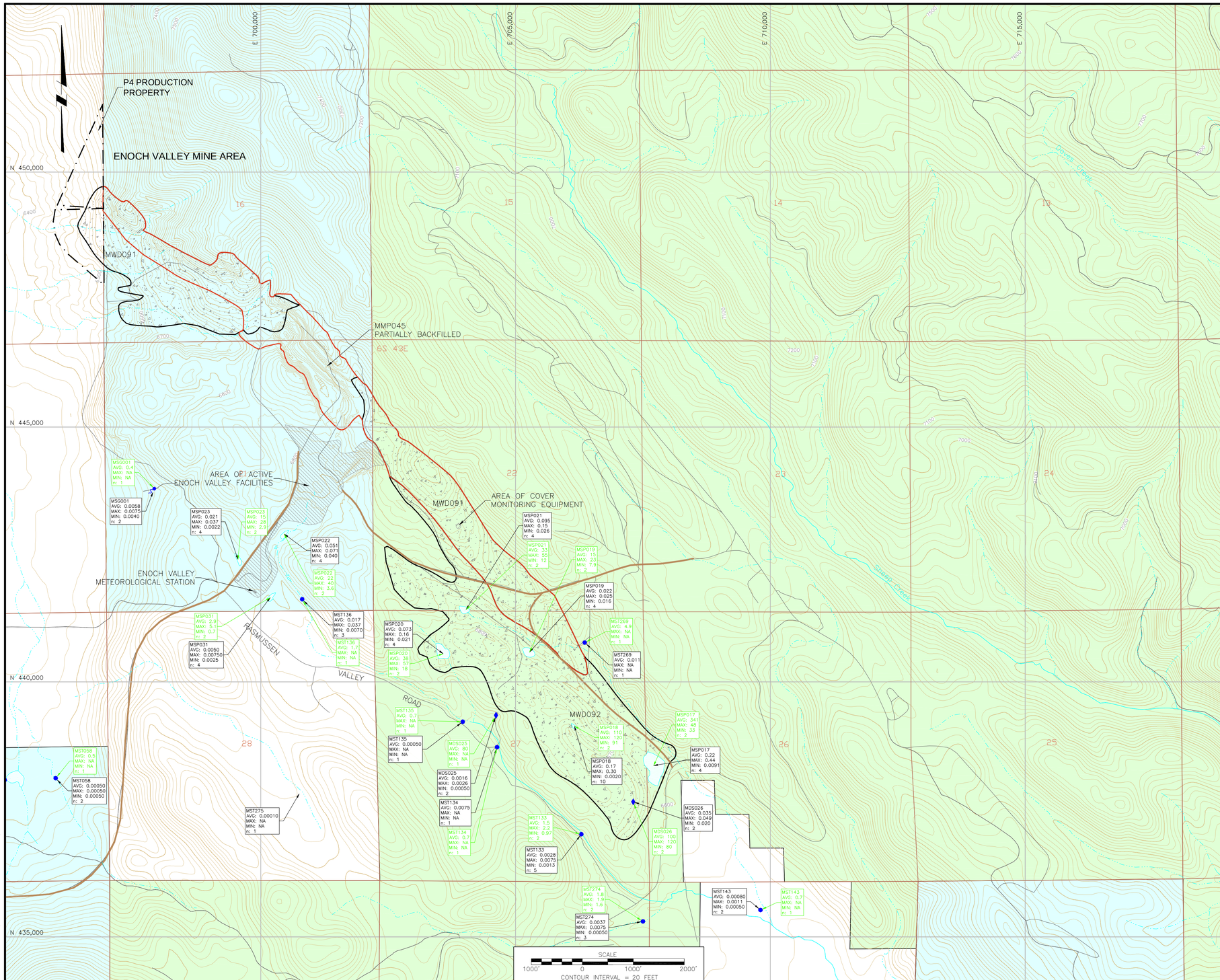

LEGEND:

- POST–MINE CONTOUR AND ELEVATION, FEET (APPROXIMATE)
- RIVER
- POND OR LAKE
- NATURAL DRAINAGE – PERENNIAL
- NATURAL DRAINAGE – INTERMITTENT
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- WASTE ROCK DUMP LOCATION (APPROXIMATE)
- WASTE ROCK DUMP LOCATION OR PIT BACKFILL (APPROXIMATE)
- APPROXIMATE OWNERSHIP BOUNDARY
- SECTION LINES
- SECTION NUMBER
- BLM LANDS
- US NATIONAL FORESTS
- STATE LANDS
- NON FEDERAL LANDS

STATION TYPE:

- MSG = SPRING SAMPLE LOCATION
- MST = STREAM SAMPLE LOCATION

KEY:

MMP = MINE PIT
MWD = WASTE ROCK DUMP
MSP = POND

MST269 AVG: 4.9 MAX: NA MIN: NA n: 1 — 1997 – 2003 SURFACE WATER SELENIUM DATA REPORTED IN MG/L TOTAL SELENIUM

MST269 AVG: 4.9 MAX: NA MIN: NA n: 1 — 1998 – 2002 SEDIMENT SELENIUM DATA REPORTED IN MG/KG

NOTES:

1. WHEN A SINGLE SAMPLE RESULT IS AVAILABLE, THE RESULT IS REPORTED AS AVERAGE. HOWEVER, THIS HAS NO STATISTICAL SIGNIFICANCE.
2. USE THE STATISTICS REPORTED ON THIS FIGURE – SAMPLE SIZE, MINIMUM OBSERVATION, MAXIMUM OBSERVATION, AND AVERAGE – WITH CAUTION. THE SAMPLE SIZE REPRESENTS THE NUMBER OF OBSERVATIONS FOR A GIVEN STATION, BUT IT DOES NOT INDICATE THE OBSERVATIONS WERE OBTAINED UNDER A SINGLE WELL–DESIGNED SAMPLING PROGRAM FOR THAT LOCATION. THE MINIMUM AND MAXIMUM OBSERVATIONS AT A GIVEN STATION ARE JUST THOSE, BUT WHEN THE SAMPLE SIZE IS SMALL, EXTREME OBSERVATIONS ARE OF LITTLE VALUE IN ESTIMATING THE RANGE OF OBSERVATIONS THAT CAN BE EXPECTED TO BE ENCOUNTERED SHOULD FURTHER SAMPLING BE DONE. THE AVERAGE IS THE ARITHMETIC MEAN OF THE OBSERVATIONS COMPRISING THE TOTAL NUMBER OF SAMPLES FOR THE STATION, BUT DIFFERENT STATIONS WERE SOMETIMES SAMPLED AT DIFFERENT TIMES, SEASONALITY EXISTS FOR SOME ANALYTES, AND NOT ALL SEASONS WERE SAMPLED AT ALL STATIONS; SO, THE COMPARISON OF ONE OF THESE AVERAGES TO ANOTHER, OR OF THESE AVERAGES TO ANY BENCHMARK, MAY HAVE LITTLE, IF ANY, MEANING.

ISSUE REV	DESCRIPTION	TECH	ENG	DATE
1	FINAL	CHF	LWM	02/24/11
0	ISSUED DRAFT FOR AGENCY REVIEW	CHF	LWM	07/06/10

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- US CENSUS BUREAU 2007 TIGER LINE DATA

PROJECTION: STATE PLANE COORDINATE SYSTEM
ZONE: IDAHO EAST
HORIZONTAL DATUM: NAD27
VERTICAL DATUM: NGVD29
UNITS: U.S. FEET

DESIGNED BY	C DUFFY	02/24/11
DRAWN BY	C FOWLER	02/24/11
CHECKED BY	E MARKS	02/24/11
APPROVED BY	C FOULK	02/24/11
PROJECT MANAGER	V DRAIN	02/24/11
CLIENT APPROVAL	B KOCH	02/24/11
CLIENT REFERENCE NO.		

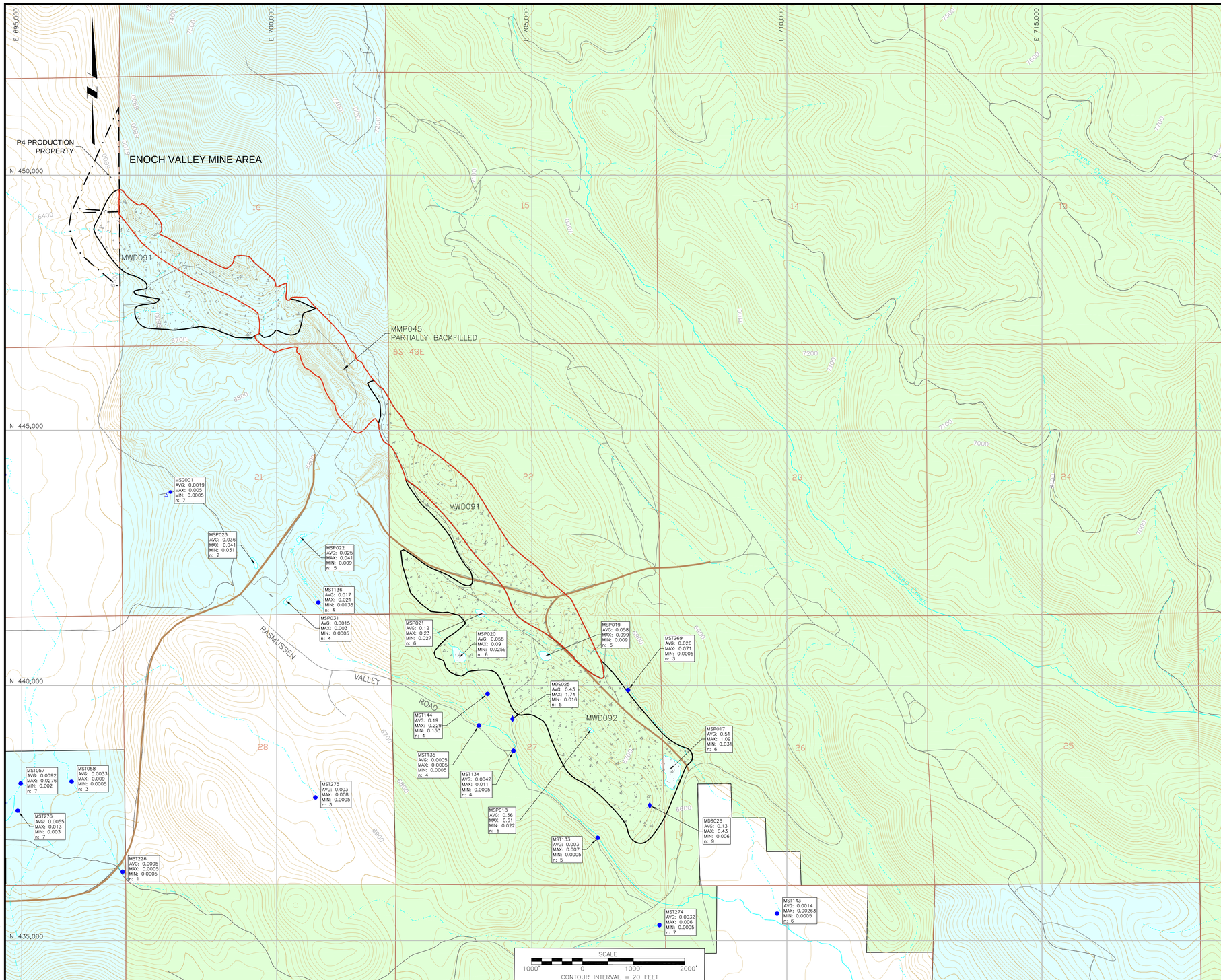
P4 Production, LLC

PROJECT LOCATION: BALLARD, HENRY AND ENOCH VALLEY MINES
PROJECT: RI/FS WORK PLAN
TITLE: PRE-2004 ENOCH VALLEY MINE AREA SURFACE WATER AND SEDIMENT SAMPLE LOCATIONS AND RESULTS

MWH

DRAWING 3-43 | REVISION 1
FILE NAME 1005813D203

N:\Design–Drafting\Clients_J–P\Monsanto Company\013–Sheet Set\RI–FS Scoping Data Maps\1005813D203



LEGEND:

- POST–MINE CONTOUR AND ELEVATION, FEET (APPROXIMATE)
- RIVER
- POND OR LAKE
- NATURAL DRAINAGE – PERENNIAL
- NATURAL DRAINAGE – INTERMITTENT
- HIGHWAY
- ROAD
- MONSANTO HAUL ROAD (ACTIVE & INACTIVE)
- RAILROAD
- MINE PIT LOCATION (APPROXIMATE WHERE COVERED BY BACKFILL)
- WASTE ROCK DUMP LOCATION (APPROXIMATE)
- WASTE ROCK DUMP LOCATION OR PIT BACKFILL (APPROXIMATE)
- APPROXIMATE OWNERSHIP BOUNDARY
- SECTION LINES
- SECTION NUMBER
- BLM LANDS
- US NATIONAL FORESTS
- STATE LANDS
- NON FEDERAL LANDS

STATION TYPE:

- MDS = DUMP SEEP SAMPLE LOCATION
- MST = STREAM SAMPLE LOCATION
- MSG = SPRING SAMPLE LOCATION

KEY:

MMP = MINE PIT
MWD = WASTE ROCK DUMP
MSP = POND

MST269 AVG: 4.9 MAX: NA MIN: NA n: 1 — 2004 – 2009 SURFACE WATER SELENIUM DATA REPORTED IN MG/L TOTAL SELENIUM

REV	DESCRIPTION	TECH	ENG	DATE
1	FINAL	CHF	LWM	02/24/11
0	ISSUED DRAFT FOR AGENCY REVIEW	CHF	LWM	07/06/10

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DRAWING REFERENCE(S):
1. POST–MINE TOPOGRAPHY GENERATED FROM:
- USGS DIGITAL ELEVATION MODELS (DEM)–24K.
- SURVEY DATA FOR BALLARD MINE PROVIDED BY OLYMPUS AERIAL SURVEYS, INC. DATED: JUNE 2005.
- SURVEY DATA FOR HENRY MINE AREA PROVIDED BY OLYMPUS AERIAL SURVEYS, INC. DATED: NOVEMBER 2008.
- SURVEY DATA FOR ENOCH VALLEY MINE AREA PROVIDED BY P4 PRODUCTION DATED: DECEMBER 2007.
- US CENSUS BUREAU 2007 TIGER LINE DATA

PROJECTION: STATE PLANE COORDINATE SYSTEM
ZONE: IDAHO EAST
HORIZONTAL DATUM: NAD27
VERTICAL DATUM: NGVD29
UNITS: U.S. FEET

DESIGNED BY	C DUFFY	02/24/11
DRAWN BY	C FOWLER	02/24/11
CHECKED BY	E MARKS	02/24/11
APPROVED BY	C FOULK	02/24/11
PROJECT MANAGER	V DRAIN	02/24/11
CLIENT APPROVAL	B KOCH	02/24/11
CLIENT REFERENCE NO.		

P4 Production, LLC

PROJECT LOCATION: BALLARD, HENRY AND ENOCH VALLEY MINES
PROJECT: RI/FS WORK PLAN
TITLE: EE/CA ENOCH VALLEY MINE AREA SURFACE WATER SAMPLE LOCATIONS AND RESULTS

MWH

DRAWING 3-44 REVISION 1
FILE NAME 1005813D228

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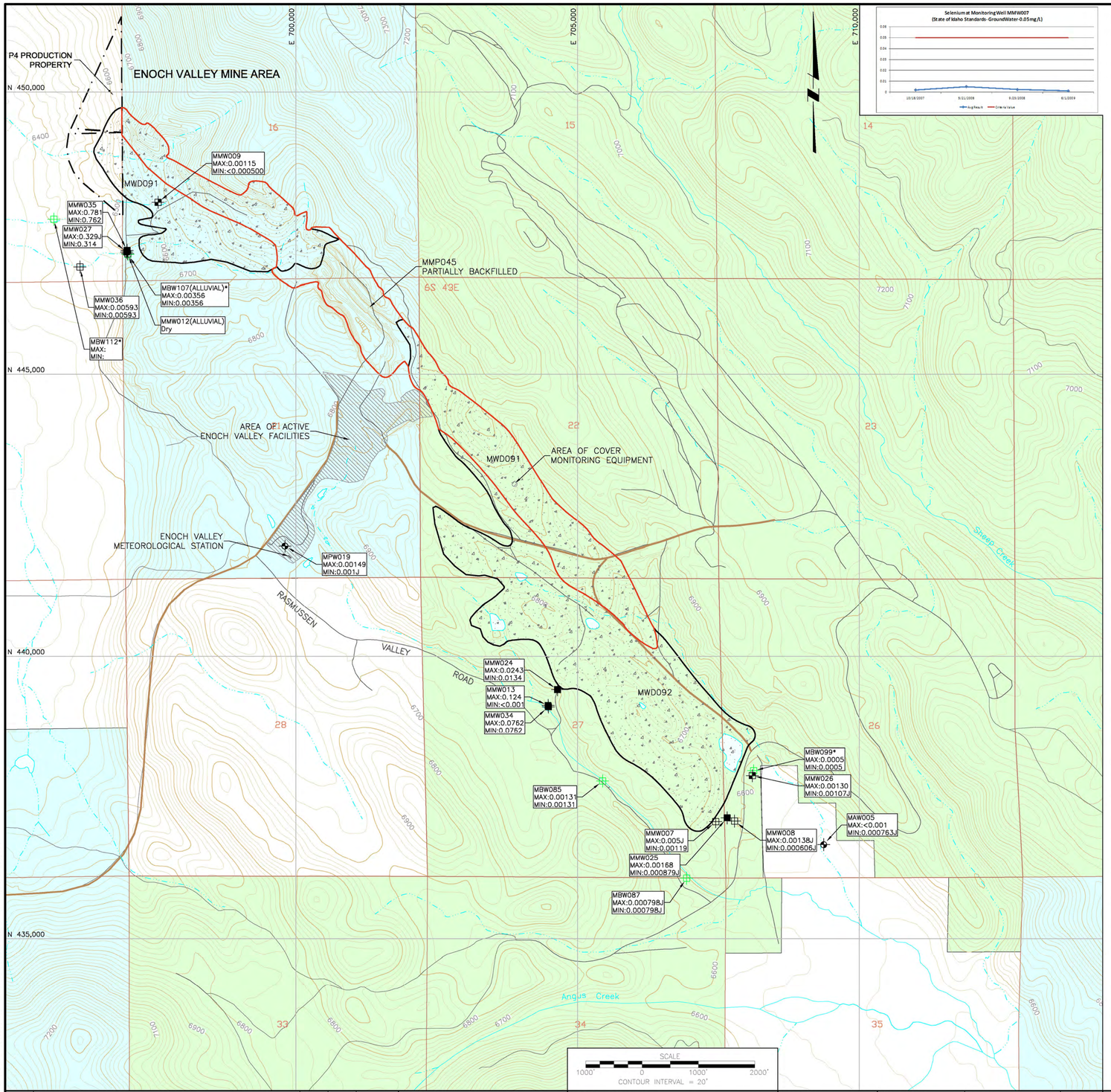

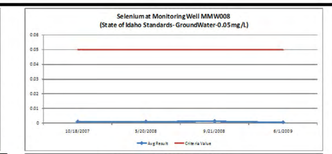

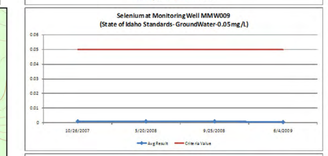

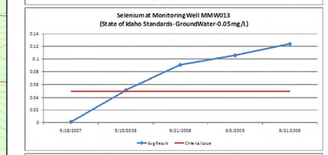

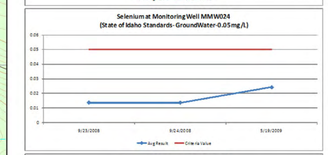

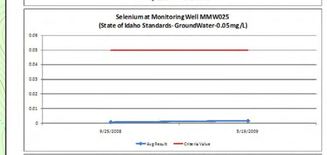

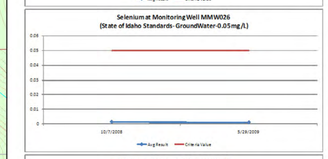

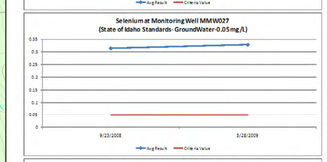

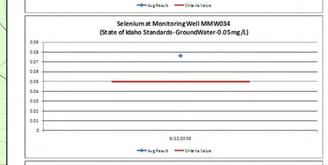

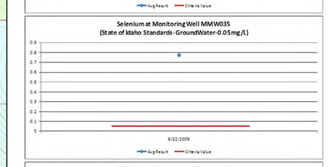

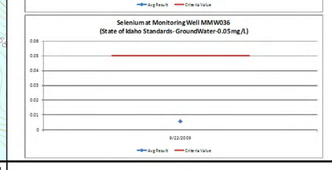

LEGEND:

- 7000 — POST–MINE CONTOUR AND ELEVATION, FEET (APPROXIMATE)
- RIVER
- POND OR LAKE
- NATURAL DRAINAGE – PERENNIAL
- NATURAL DRAINAGE – INTERMITTENT
- HIGHWAY
- ROAD
- MONSANTO HAUL ROAD (ACTIVE & INACTIVE)
- RAILROAD
- MINE PIT LOCATION (APPROXIMATE WHERE COVERED BY BACKFILL)
- WASTE ROCK DUMP LOCATION (APPROXIMATE)
- WASTE ROCK DUMP LOCATION OR PIT BACKFILL (APPROXIMATE)
- APPROXIMATE OWNERSHIP BOUNDARY
- SECTION LINES
- A — SECTION NUMBER
- BLM LANDS
- US NATIONAL FORESTS
- STATE LANDS
- NON FEDERAL LANDS

STATION TYPE:

- MMW = MONITORING WELL
- MAW = AGRICULTURAL WELL
- MDW = DOMESTIC WELL
- MPW = PRODUCTION WELL
- MMW = ALLUVIAL AQUIFER MONITORING WELL
- MMW = INTERMEDIATE AQUIFER MONITORING WELL (GENERALLY DINWOODY FM.)
- MMW = REGIONAL AQUIFER MONITORING WELL (WELLS FM.)
- MMW = AQUIFER MONITORING WELL (UNKNOWN OR MULTIPLE AQUIFERS SCREENED)
- MBW = DIRECT–PUSH ALLUVIAL AQUIFER WELL

KEY:

MMP = MINE PIT
MWD = WASTE ROCK DUMP
MMW029 MAX:0.865 MIN:0.685 — GROUNDWATER STATION ID; GROUNDWATER SAMPLING TOTAL SELENIUM RESULT (MG/L)
MBW130* — GROUNDWATER SAMPLING DISSOLVED SELENIUM
GRAPHS PRESENT TOTAL SELENIUM RESULTS

ISSUE	DESCRIPTION	TECH	ENG	DATE
1	FINAL	CHF	LWM	02/24/11
0	ISSUED DRAFT FOR AGENCY REVIEW	CHF	LWM	07/06/10

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- SURVEY DATA FOR HENRY MINE AREA PROVIDED BY OLYMPUS AERIAL SURVEYS, INC. DATED: NOVEMBER 2008.
- SURVEY DATA FOR ENOCH VALLEY MINE AREA PROVIDED BY P4 PRODUCTION DATED: DECEMBER 2007.
- US CENSUS BUREAU 2007 TIGER LINE DATA

PROJECTION: STATE PLANE COORDINATE SYSTEM
ZONE: IDAHO EAST
HORIZONTAL DATUM: NAD27
VERTICAL DATUM: NGVD29
UNITS: U.S. FEET

DESIGNED BY	C DUFFY	02/24/11
DRAWN BY	C FOWLER	02/24/11
CHECKED BY	E MARKS	02/24/11
APPROVED BY	C FOULK	02/24/11
PROJECT MANAGER	V DRAIN	02/24/11
CLIENT APPROVAL	B KOCH	02/24/11
CLIENT REFERENCE NO.		

P4 Production, LLC

PROJECT LOCATION: BALLARD, HENRY AND ENOCH VALLEY MINES
PROJECT: RI/FS WORK PLAN
TITLE: EE/CA ENOCH VALLEY MINE AREA GROUNDWATER SAMPLE LOCATIONS AND RESULTS

MWH

DRAWING 3-45 | REVISION 1
FILE NAME 1005813D221

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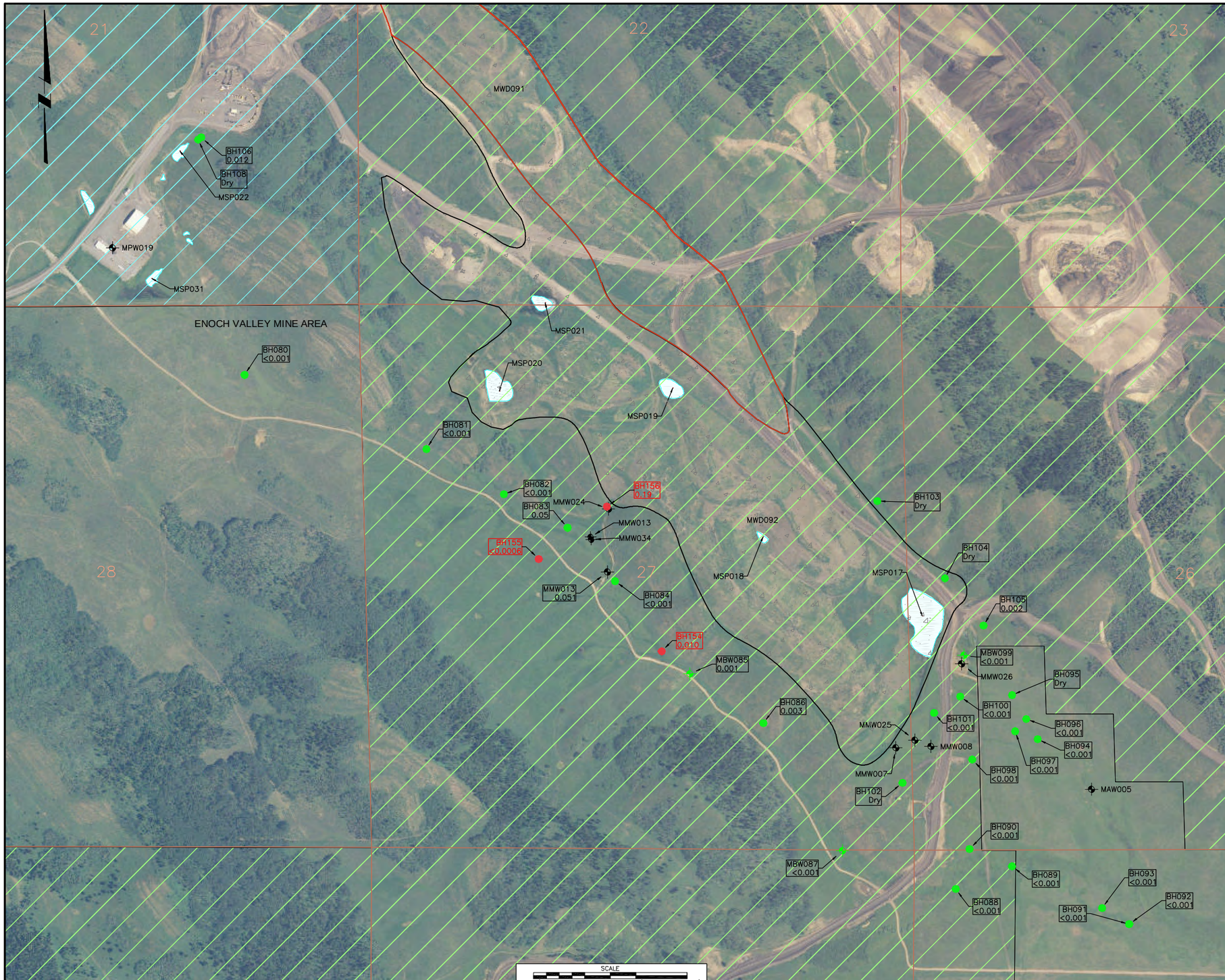

LEGEND:

- MINE PIT LOCATION (APPROXIMATE WHERE COVERED BY BACKFILL)
- WASTE ROCK DUMP LOCATION (APPROXIMATE)
- WASTE ROCK DUMP LOCATION OR PIT BACKFILL (APPROXIMATE)
- POND OR LAKE
- P4 PRODUCTION PROPERTY BOUNDARY (APPROXIMATE)
- SECTION LINES
- 8 SECTION NUMBER
- BLM LANDS
- US NATIONAL FORESTS
- STATE LANDS
- NON FEDERAL LANDS

STATION TYPE:

- MMW = GROUND WATER MONITORING WELL
- MAW = AGRICULTURAL WELL
- MPW = PRODUCTION WELL
- MBW = DIRECT PUSH MONITORING WELL INSTALLED IN 2008
- BH = 2008 DIRECT PUSH BOREHOLE
- BH = 2009 DIRECT PUSH BOREHOLE

KEY:

MMP = MINE PIT
MWD = WASTE ROCK DUMP
MSP = POND

BH043 0.01	2008 DIRECT PUSH BOREHOLE ID AND DISSOLVED SELENIUM CONCENTRATION
BH043 0.01	2009 DIRECT PUSH BOREHOLE ID AND DISSOLVED SELENIUM CONCENTRATION
<0.001	CONCENTRATION LESS THAN THE METHOD DETECTION LIMIT

NOTES:

1. DIRECT PUSH RESULTS ARE FOR GRAB GROUNDWATER SAMPLES AND ARE DISSOLVED CONCENTRATIONS OF SELENIUM IN MG/L.
2. SPRING 2008 TOTAL SELENIUM CONCENTRATIONS ARE USED FOR MONITORING WELLS, SPRINGS AND HEADWATER STREAMS WHERE APPROPRIATE.
3. BEDROCK WELLS ARE SHOWN FOR REFERENCE. SELENIUM CONCENTRATIONS ARE NOT SHOWN FOR THESE WELLS.

ISSUED DRAFT FOR AGENCY REVIEW 7/6/10

ISSUE REV	DESCRIPTION	TECH	ENG	DATE
0	ISSUED DRAFT FOR AGENCY REVIEW	CHF	LWM	07/06/10

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- SURVEY DATA FOR ENOCH VALLEY MINE AREA PROVIDED BY P4 PRODUCTION DATED: DECEMBER 2007.
- US CENSUS BUREAU 2007 TIGER LINE DATA

PROJECTION: STATE PLANE COORDINATE SYSTEM
ZONE: IDAHO EAST
HORIZONTAL DATUM: NAD27
VERTICAL DATUM: NGVD29
UNITS: U.S. FEET

DESIGNED BY	C DUFFY	07/06/10
DRAWN BY	C FOWLER	07/06/10
CHECKED BY	E MARKS	07/06/10
APPROVED BY	C FOULK	07/06/10
PROJECT MANAGER	V DRAIN	07/06/10
CLIENT APPROVAL	B KOCH	07/06/10
CLIENT REFERENCE NO.		

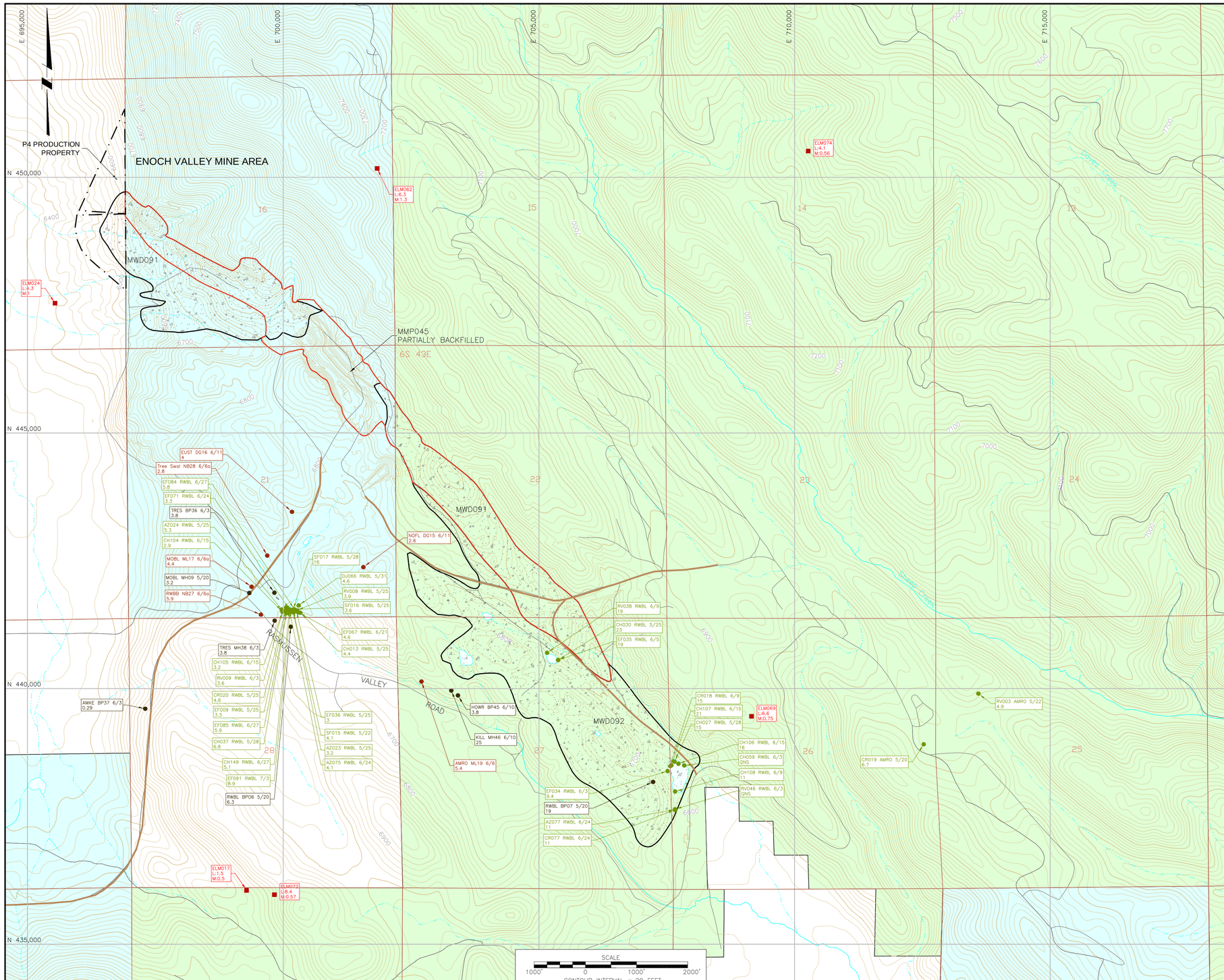
P4 Production, LLC

PROJECT LOCATION: BALLARD, HENRY AND ENOCH VALLEY MINES
PROJECT: RI/FS WORK PLAN
TITLE: EE/CA ENOCH VALLEY MINE AERA SOUTH DIRECT PUSH BOREHOLE LOCATIONS

MWH

DRAWING 3-46 | REVISION 0
FILE NAME 1005813D245

N:\Design-Drafting\Clients_J-P\Monsanto Company\013-Sheet Set\RI-FS Scoping Data Maps\1005813D245



LEGEND:

- POST–MINE CONTOUR AND ELEVATION, FEET (APPROXIMATE)
- RIVER
- POND OR LAKE
- NATURAL DRAINAGE – PERENNIAL
- NATURAL DRAINAGE – INTERMITTENT
- HIGHWAY
- ROAD
- MONSANTO HAUL ROAD (ACTIVE & INACTIVE)
- RAILROAD
- MINE PIT LOCATION (APPROXIMATE WHERE COVERED BY BACKFILL)
- WASTE ROCK DUMP LOCATION (APPROXIMATE)
- WASTE ROCK DUMP LOCATION OR PIT BACKFILL (APPROXIMATE)
- APPROXIMATE OWNERSHIP BOUNDARY
- SECTION LINES
- SECTION NUMBER
- BLM LANDS
- US NATIONAL FORESTS
- STATE LANDS
- NON FEDERAL LANDS

STATION TYPE:

- (ALL) = BIRD EGG SAMPLE LOCATION
- EL* = ELK SAMPLE LOCATION (1999)
- EL* = ELK SAMPLE LOCATION (2000)

KEY:

MMP = MINE PIT
MWD = WASTE ROCK DUMP
L = LIVER
M = MUSCLE
K = KIDNEY
H = HEART

RV019 AMRO 5/19 5 — 1999 EGGS SELENIUM DATA REPORTED IN MG/KG,DW

RV019 AMRO 5/19 5 — 2000 EGGS SELENIUM DATA REPORTED IN MG/KG,DW

RV019 AMRO 5/19 5 — 2001 EGGS SELENIUM DATA REPORTED IN MG/KG,DW

ELI065 L:5.9 — 1999 ELK LIVER DATA REPORTED IN MG/KG,DW

ELM069 L:6.4 M:0.72 — ELK LIVER AND MUSCLE DATA REPORTED IN MG/KG,DW

ISSUED DRAFT FOR AGENCY REVIEW 7/6/10

REV	DESCRIPTION	TECH	ENG	DATE
0	ISSUED DRAFT FOR AGENCY REVIEW	CHF	LWM	07/06/10

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- US CENSUS BUREAU 2007 TIGER LINE DATA

PROJECTION: STATE PLANE COORDINATE SYSTEM
ZONE: IDAHO EAST
HORIZONTAL DATUM: NAD27
VERTICAL DATUM: NGVD29
UNITS: U.S. FEET

DESIGNED BY	C DUFFY	07/06/10
DRAWN BY	C FOWLER	07/06/10
CHECKED BY	E MARKS	07/06/10
APPROVED BY	C FOULK	07/06/10
PROJECT MANAGER	V DRAIN	07/06/10
CLIENT APPROVAL	B KOCH	07/06/10
CLIENT REFERENCE NO.		

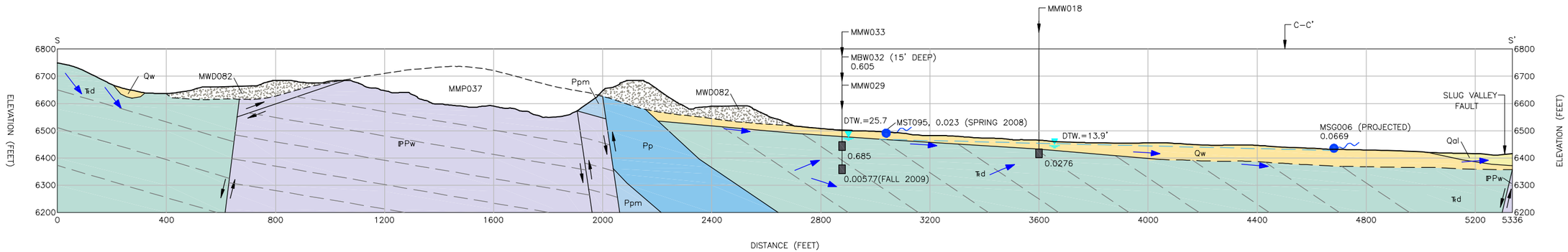
P4 Production, LLC

PROJECT LOCATION: BALLARD, HENRY AND ENOCH VALLEY MINES
PROJECT: RI/FS WORK PLAN
TITLE: PRE-2004 ENOCH VALLEY MINE AREA TERRESTRIAL ECOLOGY SAMPLE LOCATIONS AND RESULTS

MWH

DRAWING 3-47
REVISION 0
FILE NAME 1005813D194

N:\Design–Drafting\Clients_J–P\Monsanto Company\013–Sheet Set\RI–FS Scoping Data Maps\1005813D194



SECTION S - S'

VERTICAL SCALE 200' 0 200' HORIZONTAL SCALE 200' 0 200'

VERTICAL EXAGGERATION = 1X

LEGEND:

- WASTE ROCK
- PRE–MINE SURFACE (WHERE DIFFERENT FROM CURRENT SURFACE)
- GEOLOGIC CONTACT (DASHED WHERE APPROXIMATE OR INFERRED)
- FAULT, SHOWING DIRECTION OF DISPLACEMENT (DASHED WHERE INFERRED)
- SCHEMATIC GROUNDWATER FLOW VECTOR
- 6230' — MEASURED GROUNDWATER ELEVATION (FEET ABOVE MEAN SEA LEVEL)
- DTW=11.9' — TYPICAL DEPTH TO WATER IN FEET
- 0.017 — MEASURED TOTAL SELENIUM CONCENTRATION IN mg/L (SPRING 2009 SAMPLE, UNLESS OTHERWISE NOTED)
- MONITORING WELL LOCATION SHOWING APPROXIMATE SCREEN LOCATION
- SPRING OR DUMP SEEP

NOTE:

1. SEE DRAWING 2–6 FOR DESCRIPTION OF GEOLOGIC UNITS AND SECTION LOCATIONS, GRANDEUR MEMBER IS PRESENT AT BALLARD, BUT IS INCLUDED WITH THE WELLS FORMATION.
2. SOME COMPONENTS OF THE CROSS SECTIONS ARE SCHEMATIC OR INFERRED.

ISSUED DRAFT FOR AGENCY REVIEW 7/8/10

ISSUE REV	DESCRIPTION	TECH	ENG	DATE
0	ISSUED DRAFT FOR AGENCY REVIEW	CHF	LWM	07/06/10

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DESIGNED BY	C DUFFY	07/06/10
DRAWN BY	C FOWLER	07/06/10
CHECKED BY	E MARKS	07/06/10
APPROVED BY	C FOULK	07/06/10
PROJECT MANAGER	V DRAIN	07/06/10
CLIENT APPROVAL	B KOCH	07/06/10
CLIENT REFERENCE NO.		

P4 Production, LLC

PROJECT LOCATION: BALLARD, HENRY AND ENOCH VALLEY MINES

PROJECT: RI/FS WORK PLAN

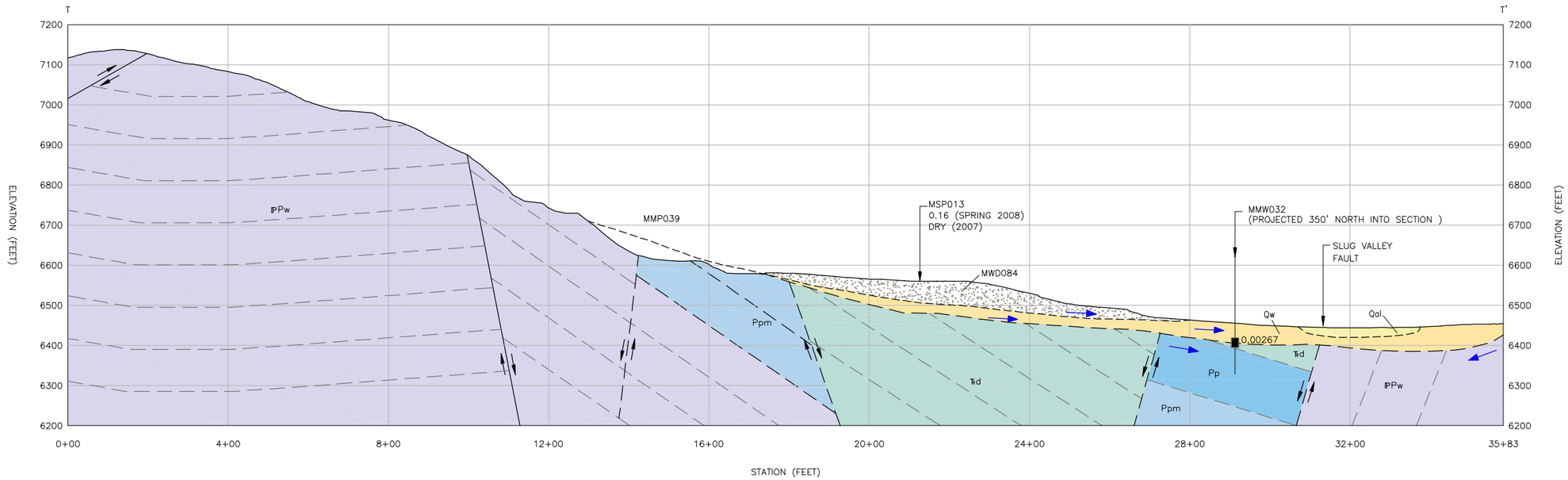
TITLE: BALLARD MINE AREA GEOLOGIC SECTION S

MWH

DRAWING: 3-48 REVISION: 0

FILE NAME: 1005813D246

N:\Design–Drafting\Clients_J–P\Monsanto Company\013–Sheet Set\RI–FS Scoping Data Maps\1005813D246



SECTION T - T'

VERTICAL SCALE: 150' 0 150'

HORIZONTAL SCALE: 150' 0 150'

VERTICAL EXAGGERATION = 1X

LEGEND:

- WASTE ROCK
- PRE–MINE SURFACE (WHERE DIFFERENT FROM CURRENT SURFACE)
- GEOLOGIC CONTACT (DASHED WHERE APPROXIMATE OR INFERRED)
- FAULT, SHOWING DIRECTION OF DISPLACEMENT (DASHED WHERE INFERRED)
- SCHEMATIC GROUNDWATER FLOW VECTOR
- 6236' — MEASURED GROUNDWATER ELEVATION (FEET ABOVE MEAN SEA LEVEL)
- DTW=11.9' — DEPTH TO WATER IN FEET (SURVEGED ELEVATION IS NOT AVAILABLE)
- 0.017 — MEASURED TOTAL SELENIUM CONCENTRATION IN mg/L (FALL 2008 SAMPLE, UNLESS OTHERWISE NOTED)
- MONITORING WELL LOCATION SHOWING APPROXIMATE SCREEN LOCATION
- SPRING OR DUMP SEEP

NOTE:

1. SEE DRAWING 2–6 FOR DESCRIPTION OF GEOLOGIC UNITS AND SECTION LOCATIONS, GRANDEUR MEMBER IS PRESENT AT BALLARD, BUT IS INCLUDED WITH THE WELLS FORMATION.
2. SOME COMPONENTS OF THE CROSS SECTIONS ARE SCHEMATIC OR INFERRED.

ISSUED DRAFT FOR AGENCY REVIEW 7/6/10

ISSUE REV	DESCRIPTION	TECH	ENG	DATE
0	ISSUED DRAFT FOR AGENCY REVIEW	CHF	LWM	07/06/10

DISCLAIMER:
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DESIGNED BY	C DUFFY	07/06/10
DRAWN BY	C FOWLER	07/06/10
CHECKED BY	E MARKS	07/06/10
APPROVED BY	C FOULK	07/06/10
PROJECT MANAGER	V DRAIN	07/06/10
CLIENT APPROVAL	B KOCH	07/06/10
CLIENT REFERENCE NO.		

P4 Production, LLC

PROJECT LOCATION: BALLARD, HENRY AND ENOCH VALLEY MINES

PROJECT: RI/FS WORK PLAN

TITLE: BALLARD MINE AREA GEOLOGIC SECTION T

MWH

DRAWING: 3-49 REVISION: 0

FILE NAME: 1005813D247

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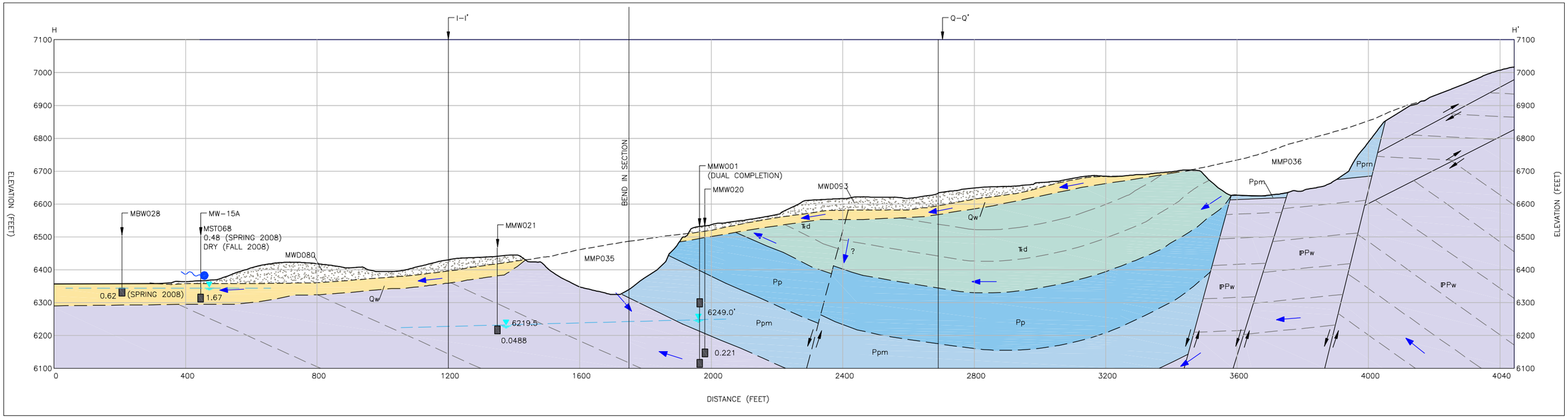

SECTION H - H'

VERTICAL SCALE: 150' 0 150'
HORIZONTAL SCALE: 150' 0 150'
VERTICAL EXAGGERATION = 1X

LEGEND:

- WASTE ROCK
- PRE-MINE SURFACE (WHERE DIFFERENT FROM CURRENT SURFACE)
- GEOLOGIC CONTACT (DASHED WHERE APPROXIMATE OR INFERRED)
- FAULT, SHOWING DIRECTION OF DISPLACEMENT (DASHED WHERE INFERRED)
- SCHEMATIC GROUNDWATER FLOW VECTOR
- 6236' — TYPICAL MEASURED GROUNDWATER ELEVATION (FEET ABOVE MEAN SEA LEVEL)
- PROJECTED POTENTIONMETRIC SURFACE
- 0.017 — MEASURED TOTAL SELENIUM CONCENTRATION IN mg/L (SPRING 2009 SAMPLE, UNLESS OTHERWISE NOTED)
- MONITORING WELL LOCATION SHOWING APPROXIMATE SCREEN LOCATION
- SPRING OR DUMP SEEP

NOTE:

1. SEE DRAWING 2-6 FOR DESCRIPTION OF GEOLOGIC UNITS AND SECTION LOCATIONS, GRANDEUR MEMBER IS PRESENT AT BALLARD, BUT IS INCLUDED WITH THE WELLS FORMATION.
2. SOME COMPONENTS OF THE CROSS SECTIONS ARE SCHEMATIC OR INFERRED.

ISSUED DRAFT FOR AGENCY REVIEW 7/6/10

ISSUE REV	DESCRIPTION	TECH	ENG	DATE
0	ISSUED DRAFT FOR AGENCY REVIEW	CHF	LWM	07/06/10

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DESIGNED BY	C DUFFY	07/06/10
DRAWN BY	C FOWLER	07/06/10
CHECKED BY	E MARKS	07/06/10
APPROVED BY	C FOULK	07/06/10
PROJECT MANAGER	V DRAIN	07/06/10
CLIENT APPROVAL	B KOCH	07/06/10
CLIENT REFERENCE NO.		

P4 Production, LLC

PROJECT LOCATION: BALLARD, HENRY AND ENOCH VALLEY MINES
PROJECT: RI/FS WORK PLAN
TITLE: BALLARD MINE AREA GEOLOGIC SECTION H

MWH

DRAWING: 3-50
REVISION: 0
FILE NAME: 1005813D248

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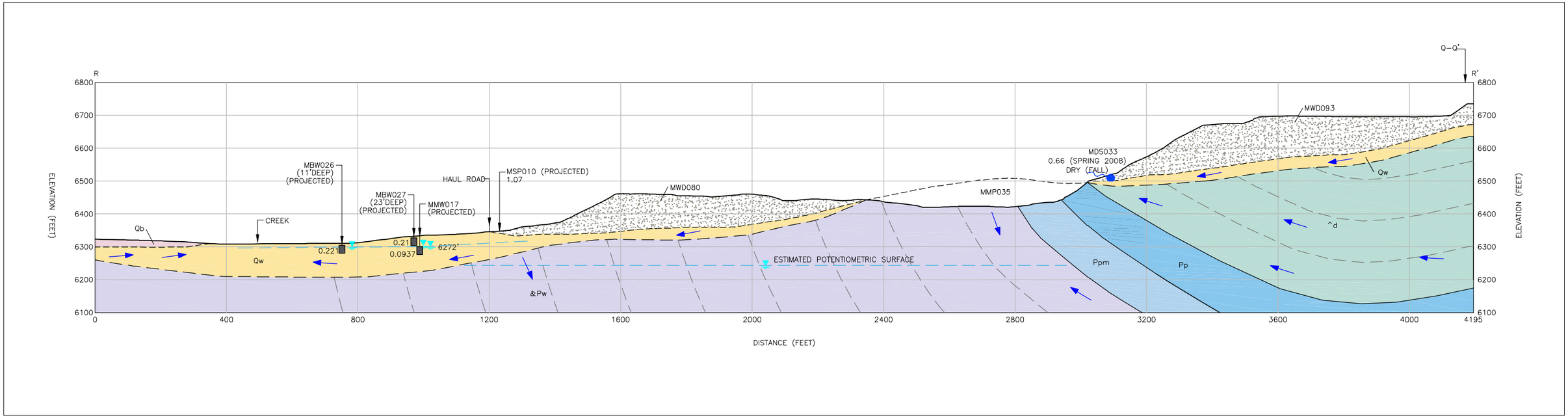

SECTION R - R'

VERTICAL SCALE 150' 0 150'
HORIZONTAL SCALE 150' 0 150'
VERTICAL EXAGGERATION = 1X

LEGEND:

- WASTE ROCK
- PRE–MINE SURFACE (WHERE DIFFERENT FROM CURRENT SURFACE)
- GEOLOGIC CONTACT (DASHED WHERE APPROXIMATE OR INFERRED)
- FAULT, SHOWING DIRECTION OF DISPLACEMENT (DASHED WHERE INFERRED)
- SCHEMATIC GROUNDWATER FLOW VECTOR
- 6236' TYPICAL MEASURED GROUNDWATER ELEVATION (FEET ABOVE MEAN SEA LEVEL)
- PROJECTED POTENTIONMETRIC SURFACE
- 0.017 MEASURED TOTAL SELENIUM CONCENTRATION IN mg/L (SPRING 2009 SAMPLE, UNLESS OTHERWISE NOTED)
- MONITORING WELL LOCATION SHOWING APPROXIMATE SCREEN LOCATION
- SPRING OR DUMP SEEP

NOTE:

1. SEE DRAWING 2–6 FOR DESCRIPTION OF GEOLOGIC UNITS AND SECTION LOCATIONS, GRANDEUR MEMBER IS PRESENT AT BALLARD, BUT IS INCLUDED WITH THE WELLS FORMATION.
2. SOME COMPONENTS OF THE CROSS SECTIONS ARE SCHEMATIC OR INFERRED.

ISSUE REV	DESCRIPTION	TECH	ENG	DATE
1	FINAL	CHF	LWM	02/24/11
0	ISSUED DRAFT FOR AGENCY REVIEW	CHF	LWM	07/06/10

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DRAWN BY	C FOWLER	02/24/11
CHECKED BY	E MARKS	02/24/11
APPROVED BY	C FOULK	02/24/11
PROJECT MANAGER	V DRAIN	02/24/11
CLIENT APPROVAL	B KOCH	02/24/11
CLIENT REFERENCE NO.		

P4 Production, LLC

PROJECT LOCATION: BALLARD, HENRY AND ENOCH VALLEY MINES
PROJECT: RI/FS WORK PLAN
TITLE: BALLARD MINE AREA GEOLOGIC SECTION R

MWH

DRAWING: 3-51
REVISION: 1
FILE NAME: 1005813D249

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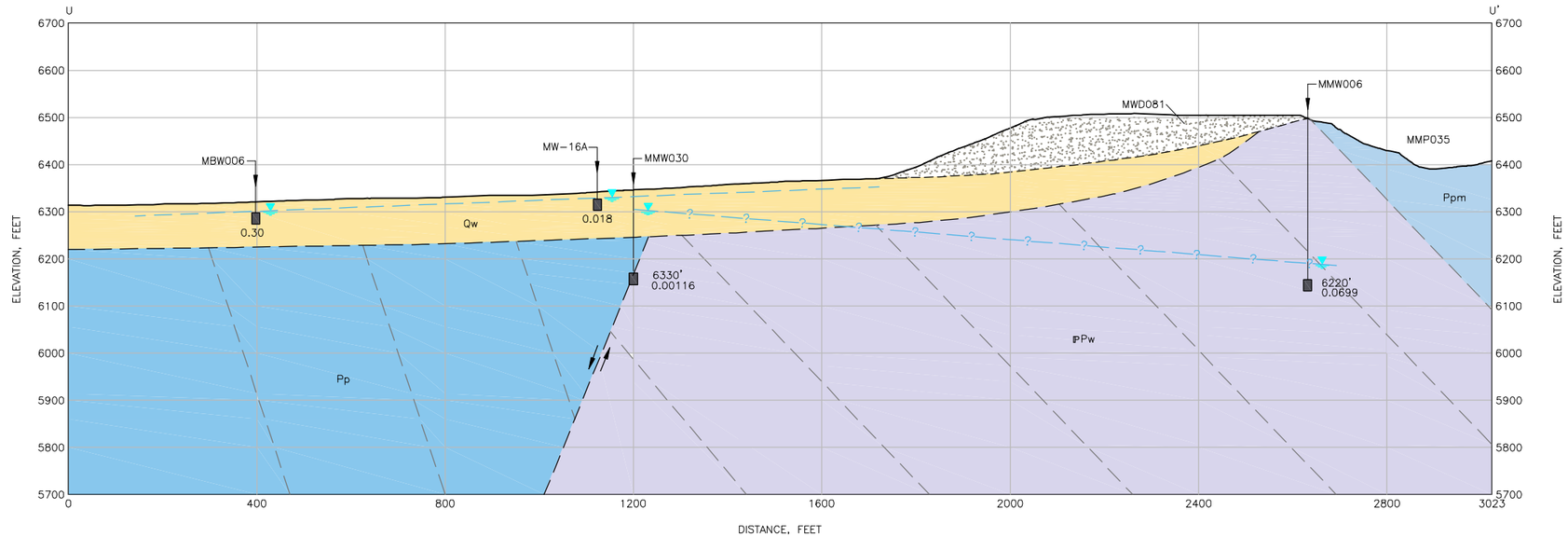

SECTION U - U'

VERTICAL SCALE: 150' 0 150'
HORIZONTAL SCALE: 150' 0 150'
VERTICAL EXAGGERATION = 1X

LEGEND:

- WASTE ROCK
- PRE-MINE SURFACE (WHERE DIFFERENT FROM CURRENT SURFACE)
- GEOLOGIC CONTACT (DASHED WHERE APPROXIMATE OR INFERRED)
- FAULT, SHOWING DIRECTION OF DISPLACEMENT (DASHED WHERE INFERRED)
- SCHEMATIC GROUNDWATER FLOW VECTOR
- 6236' TYPICAL MEASURED GROUNDWATER ELEVATION (FEET ABOVE MEAN SEA LEVEL)
- PROJECTED POTENTIONMETRIC SURFACE
- 0.017 MEASURED TOTAL SELENIUM CONCENTRATION IN mg/L (FALL 2008 SAMPLE, UNLESS OTHERWISE NOTED)
- MONITORING WELL LOCATION SHOWING APPROXIMATE SCREEN LOCATION
- SPRING OR DUMP SEEP

NOTE:

1. SEE DRAWING 2-6 FOR DESCRIPTION OF GEOLOGIC UNITS AND SECTION LOCATIONS, GRANDEUR MEMBER IS PRESENT AT BALLARD, BUT IS INCLUDED WITH THE WELLS FORMATION.
2. SOME COMPONENTS OF THE CROSS SECTIONS ARE SCHEMATIC OR INFERRED.

ISSUED DRAFT FOR AGENCY REVIEW 7/6/10

ISSUE REV	DESCRIPTION	TECH	ENG	DATE
0	ISSUED DRAFT FOR AGENCY REVIEW	CHF	LWM	07/06/10

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DRAWN BY	C FOWLER	07/06/10
CHECKED BY	E MARKS	07/06/10
APPROVED BY	C FOULK	07/06/10
PROJECT MANAGER	V DRAIN	07/06/10
CLIENT APPROVAL	B KOCH	07/06/10
CLIENT REFERENCE NO.		

P4 Production, LLC

PROJECT LOCATION: BALLARD, HENRY AND ENOCH VALLEY MINES
PROJECT: RI/FS WORK PLAN
TITLE: BALLARD MINE AREA GEOLOGIC SECTION U

MWH

DRAWING: 3-52
REVISION: 0
FILE NAME: 1005813D250

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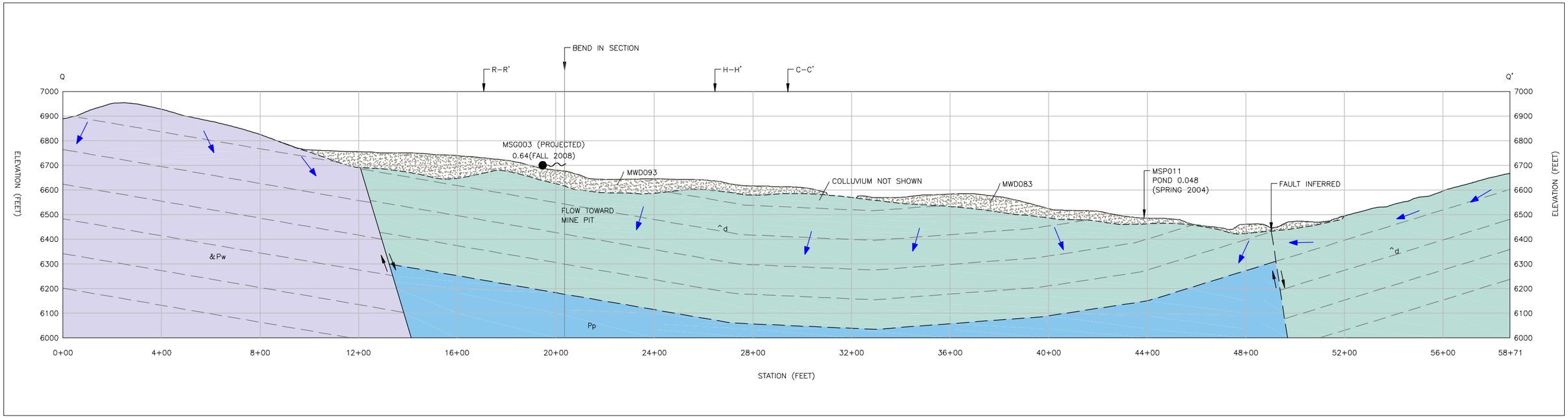

SECTION Q - Q'

VERTICAL SCALE: 200' 0 200'
HORIZONTAL SCALE: 200' 0 200'
VERTICAL EXAGGERATION = 1X

LEGEND:

- WASTE ROCK
- PRE–MINE SURFACE (WHERE DIFFERENT FROM CURRENT SURFACE)
- GEOLOGIC CONTACT (DASHED WHERE APPROXIMATE OR INFERRED)
- FAULT, SHOWING DIRECTION OF DISPLACEMENT (DASHED WHERE INFERRED)
- SCHEMATIC GROUNDWATER FLOW VECTOR
- 6236' — TYPICAL MEASURED GROUNDWATER ELEVATION (FEET ABOVE MEAN SEA LEVEL)
- PROJECTED POTENTIONMETRIC SURFACE
- 0.017 — MEASURED TOTAL SELENIUM CONCENTRATION IN mg/L (SPRING 2009 SAMPLE, UNLESS OTHERWISE NOTED)
- MONITORING WELL LOCATION SHOWING APPROXIMATE SCREEN LOCATION
- SPRING OR DUMP SEEP

NOTE:

1. SEE DRAWING 2–6 FOR DESCRIPTION OF GEOLOGIC UNITS AND SECTION LOCATIONS, GRANDEUR MEMBER IS PRESENT AT BALLARD, BUT IS INCLUDED WITH THE WELLS FORMATION.
2. SOME COMPONENTS OF THE CROSS SECTIONS ARE SCHEMATIC OR INFERRED.

ISSUE REV	DESCRIPTION	TECH	ENG	DATE
1	FINAL	CHF	LWM	02/24/11
0	ISSUED DRAFT FOR AGENCY REVIEW	CHF	LWM	07/06/10

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CHECKED BY	E MARKS	02/24/11
APPROVED BY	C FOULK	02/24/11
PROJECT MANAGER	V DRAIN	02/24/11
CLIENT APPROVAL	B KOCH	02/24/11
CLIENT REFERENCE NO.		

P4 Production, LLC

PROJECT LOCATION: BALLARD, HENRY AND ENOCH VALLEY MINES
PROJECT: RI/FS WORK PLAN
TITLE: BALLARD MINE AREA GEOLOGIC SECTION Q

MWH

DRAWING: 3-53
REVISION: 1
FILE NAME: 1005813D251

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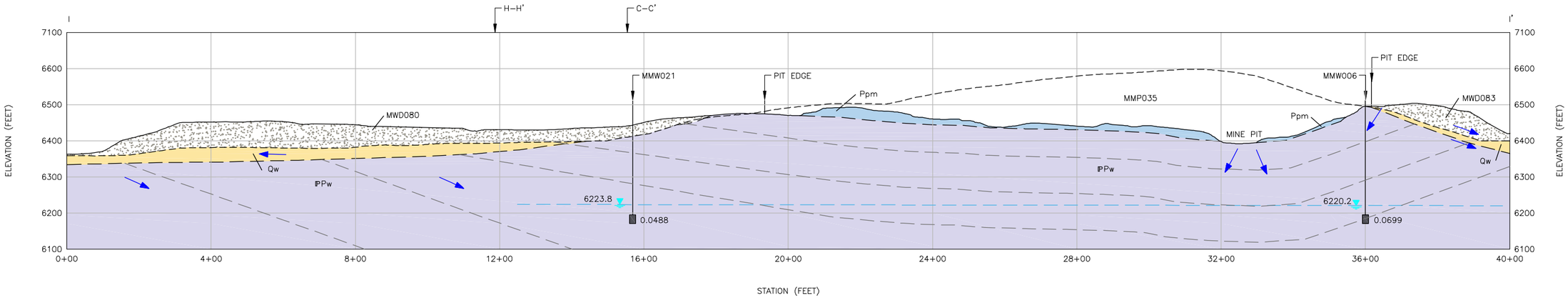

SECTION I - I'

VERTICAL SCALE: 150' 0 150'

HORIZONTAL SCALE: 150' 0 150'

VERTICAL EXAGGERATION = 1X

LEGEND:

- WASTE ROCK
- PRE–MINE SURFACE (WHERE DIFFERENT FROM CURRENT SURFACE)
- GEOLOGIC CONTACT (DASHED WHERE APPROXIMATE OR INFERRED)
- FAULT, SHOWING DIRECTION OF DISPLACEMENT (DASHED WHERE INFERRED)
- SCHEMATIC GROUNDWATER FLOW VECTOR
- 6236' — TYPICAL MEASURED GROUNDWATER ELEVATION (FEET ABOVE MEAN SEA LEVEL)
- PROJECTED POTENTIONMETRIC SURFACE
- 0.017 — MEASURED TOTAL SELENIUM CONCENTRATION IN mg/L (SPRING 2009 SAMPLE, UNLESS OTHERWISE NOTED)
- MONITORING WELL LOCATION SHOWING APPROXIMATE SCREEN LOCATION
- SPRING OR DUMP SEEP

NOTE:

1. SEE DRAWING 2–6 FOR DESCRIPTION OF GEOLOGIC UNITS AND SECTION LOCATIONS, GRANDEUR MEMBER IS PRESENT AT BALLARD, BUT IS INCLUDED WITH THE WELLS FORMATION.
2. SOME COMPONENTS OF THE CROSS SECTIONS ARE SCHEMATIC OR INFERRED.

ISSUED DRAFT FOR AGENCY REVIEW 7/6/10

ISSUE REV	DESCRIPTION	TECH	ENG	DATE
0	ISSUED DRAFT FOR AGENCY REVIEW	CHF	LWM	07/06/10

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DRAWN BY	C FOWLER	07/06/10
CHECKED BY	E MARKS	07/06/10
APPROVED BY	C FOULK	07/06/10
PROJECT MANAGER	V DRAIN	07/06/10
CLIENT APPROVAL	B KOCH	07/06/10
CLIENT REFERENCE NO.		

P4 Production, LLC

PROJECT LOCATION: BALLARD, HENRY AND ENOCH VALLEY MINES

PROJECT: RI/FS WORK PLAN

TITLE: BALLARD MINE AREA GEOLOGIC SECTION I

MWH

DRAWING: 3-54

REVISION: 0

FILE NAME: 1005813D256

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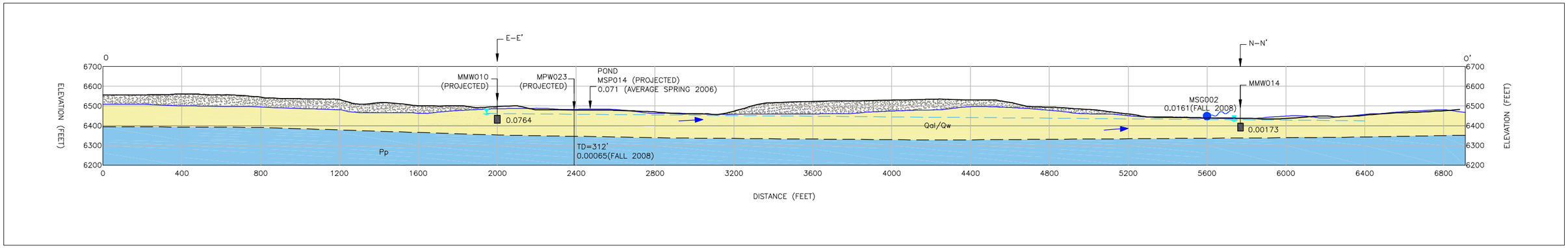

SECTION O - O'

VERTICAL SCALE 250' 0 250'

HORIZONTAL SCALE 250' 0 250'

VERTICAL EXAGGERATION = 1X

LEGEND:

- WASTE ROCK
- PRE–MINE SURFACE (WHERE DIFFERENT FROM CURRENT SURFACE)
- GEOLOGIC CONTACT (DASHED WHERE APPROXIMATE OR INFERRED)
- FAULT, SHOWING DIRECTION OF DISPLACEMENT (DASHED WHERE INFERRED)
- SCHEMATIC GROUNDWATER FLOW VECTOR
- 6230' — MEASURED GROUNDWATER ELEVATION (FEET ABOVE MEAN SEA LEVEL)
- PROJECTED POTENTIONMETRIC SURFACE
- 0.017 — MEASURED TOTAL SELENIUM CONCENTRATION IN mg/L (FALL 2008 SAMPLE, UNLESS OTHERWISE NOTED)
- MONITORING WELL LOCATION SHOWING APPROXIMATE SCREEN LOCATION
- SPRING OR DUMP SEEP

NOTE:

1. SEE DRAWING 2–5 FOR DESCRIPTION OF GEOLOGIC UNITS AND SECTION LOCATIONS, GRANDEUR MEMBER IS PRESENT AT BALLARD, BUT IS INCLUDED WITH THE WELLS FORMATION.
2. SOME COMPONENTS OF THE CROSS SECTIONS ARE SCHEMATIC OR INFERRED.

ISSUED DRAFT FOR AGENCY REVIEW 7/8/10

ISSUE REV	DESCRIPTION	TECH	ENG	DATE
0	ISSUED DRAFT FOR AGENCY REVIEW	CHF	LWM	07/06/10

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DRAWN BY	C FOWLER	07/06/10
CHECKED BY	E MARKS	07/06/10
APPROVED BY	C FOULK	07/06/10
PROJECT MANAGER	V DRAIN	07/06/10
CLIENT APPROVAL	B KOCH	07/06/10
CLIENT REFERENCE NO.		

P4 Production, LLC

PROJECT LOCATION: BALLARD, HENRY AND ENOCH VALLEY MINES

PROJECT: RI/FS WORK PLAN

TITLE: HENRY MINE AREA GEOLOGIC SECTION O

MWH

DRAWING: 3-55

REVISION: 0

FILE NAME: 1005813D252

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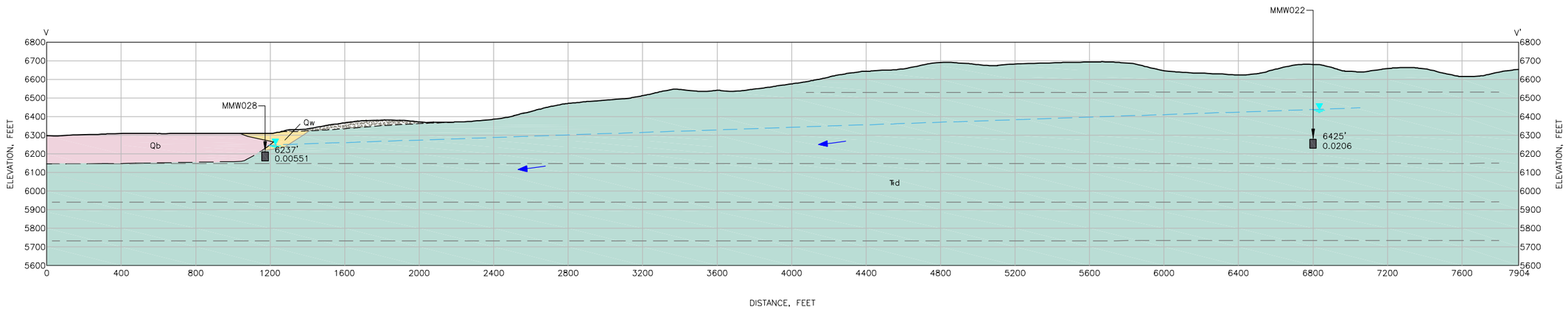

SECTION V - V'

VERTICAL SCALE: 300' 0 300'

HORIZONTAL SCALE: 300' 0 300'

VERTICAL EXAGGERATION = 1X

LEGEND:

- WASTE ROCK
- PRE–MINE SURFACE (WHERE DIFFERENT FROM CURRENT SURFACE)
- GEOLOGIC CONTACT (DASHED WHERE APPROXIMATE OR INFERRED)
- FAULT, SHOWING DIRECTION OF DISPLACEMENT (DASHED WHERE INFERRED)
- SCHEMATIC GROUNDWATER FLOW VECTOR
- 6236' — TYPICAL MEASURED GROUNDWATER ELEVATION (FEET ABOVE MEAN SEA LEVEL)
- PROJECTED POTENTIONMETRIC SURFACE
- 0.017 — MEASURED TOTAL SELENIUM CONCENTRATION IN mg/L (FALL 2008 SAMPLE, UNLESS OTHERWISE NOTED)
- MONITORING WELL LOCATION SHOWING APPROXIMATE SCREEN LOCATION
- SPRING OR DUMP SEEP

NOTE:

1. SEE DRAWING 2–5 FOR DESCRIPTION OF GEOLOGIC UNITS AND SECTION LOCATIONS, GRANDEUR MEMBER IS PRESENT AT BALLARD, BUT IS INCLUDED WITH THE WELLS FORMATION.
2. SOME COMPONENTS OF THE CROSS SECTIONS ARE SCHEMATIC OR INFERRED.

ISSUED DRAFT FOR AGENCY REVIEW 7/6/10

ISSUE REV	DESCRIPTION	TECH	ENG	DATE
0	ISSUED DRAFT FOR AGENCY REVIEW	CHF	LWM	07/06/10

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DRAWN BY	C FOWLER	07/06/10
CHECKED BY	E MARKS	07/06/10
APPROVED BY	C FOULK	07/06/10
PROJECT MANAGER	V DRAIN	07/06/10
CLIENT APPROVAL	B KOCH	07/06/10
CLIENT REFERENCE NO.		

P4 Production, LLC

PROJECT LOCATION: BALLARD, HENRY AND ENOCH VALLEY MINES

PROJECT: RI/FS WORK PLAN

TITLE: HNERY MINE AREA GEOLOGIC SECTION V

MWH

DRAWING: 3-56

REVISION: 0

FILE NAME: 1005813D254

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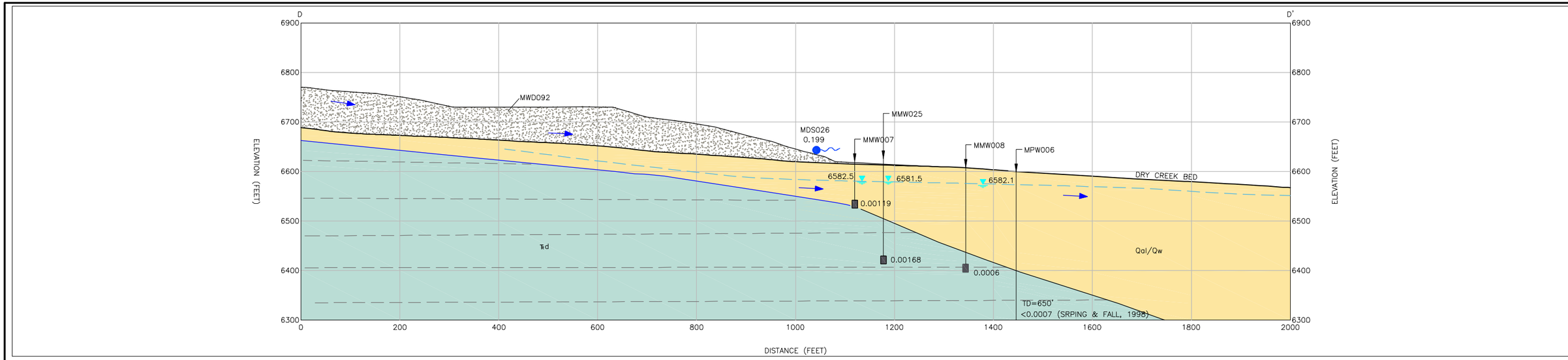
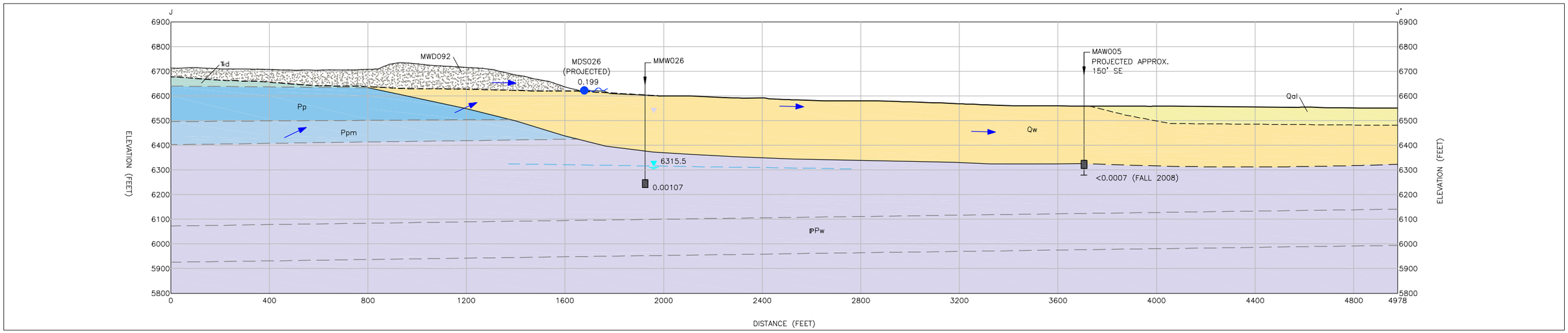


SECTION D - D'

VERTICAL SCALE 100' 0 100' HORIZONTAL SCALE 100' 0 100'
VERTICAL EXAGGERATION = 1X



SECTION J - J'

VERTICAL SCALE 200' 0 200' HORIZONTAL SCALE 200' 0 200'
VERTICAL EXAGGERATION = 1X

LEGEND:

- WASTE ROCK
- PRE–MINE SURFACE (WHERE DIFFERENT FROM CURRENT SURFACE)
- GEOLOGIC CONTACT (DASHED WHERE APPROXIMATE OR INFERRED)
- FAULT, SHOWING DIRECTION OF DISPLACEMENT (DASHED WHERE INFERRED)
- SCHEMATIC GROUNDWATER FLOW VECTOR
- 6236' — TYPICAL MEASURED GROUNDWATER ELEVATION
- PROJECTED POTENTIONMETRIC SURFACE
- DTW=11.9' — DEPTH TO WATER IN FEET (SURVEGED ELEVATION IS NOT AVAILABLE)
- 0.017 — MEASURED TOTAL SELENIUM CONCENTRATION IN mg/L (FALL 2008 SAMPLE, UNLESS OTHERWISE NOTED)
- MONITORING WELL LOCATION SHOWING APPROXIMATE SCREEN LOCATION
- SPRING OR DUMP SEEP

NOTE:

1. SEE DRAWING 2–5 FOR DESCRIPTION OF GEOLOGIC UNITS AND SECTION LOCATIONS.
2. SOME COMPONENTS OF THE CROSS SECTIONS ARE SCHEMATIC OR INFERRED.

ISSUED DRAFT FOR AGENCY REVIEW 7/6/10

ISSUE REV	DESCRIPTION	TECH	ENG	DATE
0	ISSUED DRAFT FOR AGENCY REVIEW	CHF	LWM	07/06/10

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DESIGNED BY	C DUFFY	07/06/10
DRAWN BY	C FOWLER	07/06/10
CHECKED BY	E MARKS	07/06/10
APPROVED BY	C FOULK	07/06/10
PROJECT MANAGER	V DRAIN	07/06/10
CLIENT APPROVAL	B KOCH	07/06/10
CLIENT REFERENCE NO.		

P4 Production, LLC

PROJECT LOCATION: BALLARD, HENRY AND ENOCH VALLEY MINES
PROJECT: RI/FS WORK PLAN
TITLE: ENOCH VALLEY MINE AREA GEOLOGIC SECTIONS D AND J

MWH

DRAWING 3-57 REVISION 0
FILE NAME 1005813D255

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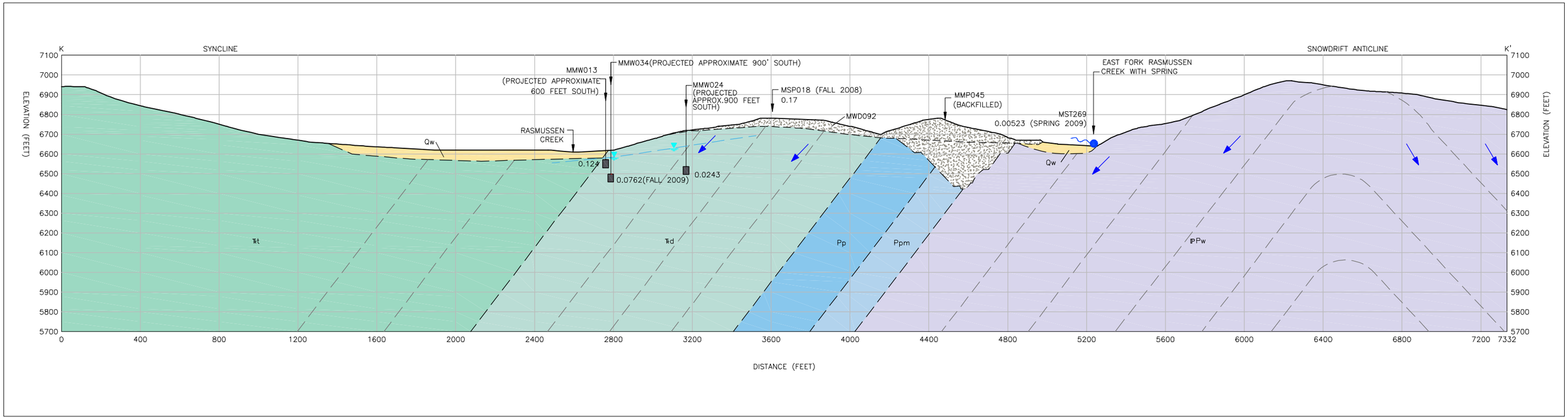

SECTION K - K'

VERTICAL SCALE 250' 0 250'
HORIZONTAL SCALE 250' 0 250'
VERTICAL EXAGGERATION = 1X

LEGEND:

- WASTE ROCK
- PRE-MINE SURFACE (WHERE DIFFERENT FROM CURRENT SURFACE)
- GEOLOGIC CONTACT (DASHED WHERE APPROXIMATE OR INFERRED)
- FAULT, SHOWING DIRECTION OF DISPLACEMENT (DASHED WHERE INFERRED)
- SCHEMATIC GROUNDWATER FLOW VECTOR
- 6236' — TYPICAL MEASURED GROUNDWATER ELEVATION
- PROJECTED POTENTIONMETRIC SURFACE
- DTW=11.9' — DEPTH TO WATER IN FEET (SURVEGED ELEVATION IS NOT AVAILABLE)
- 0.017 — MEASURED TOTAL SELENIUM CONCENTRATION IN mg/L (SPRING 2009 SAMPLE, UNLESS OTHERWISE NOTED)
- MONITORING WELL LOCATION SHOWING APPROXIMATE SCREEN LOCATION
- SPRING OR DUMP SEEP

NOTE:

1. SEE DRAWING 2-5 FOR DESCRIPTION OF GEOLOGIC UNITS AND SECTION LOCATIONS.
2. SOME COMPONENTS OF THE CROSS SECTIONS ARE SCHEMATIC OR INFERRED.

ISSUED DRAFT FOR AGENCY REVIEW 7/6/10

REV	DESCRIPTION	TECH	ENG	DATE
0	ISSUED DRAFT FOR AGENCY REVIEW	CHF	LWM	07/06/10

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PROJECT MANAGER	V DRAIN	07/06/10
CLIENT APPROVAL	B KOCH	07/06/10
CLIENT REFERENCE NO.		

P4 Production, LLC

PROJECT LOCATION: BALLARD, HENRY AND ENOCH VALLEY MINES
PROJECT: RI/FS WORK PLAN
TITLE: ENOCH VALLEY MINE AREA GEOLOGIC SECTION K

MWH

DRAWING 3-58 REVISION 0
FILE NAME 1005813D257

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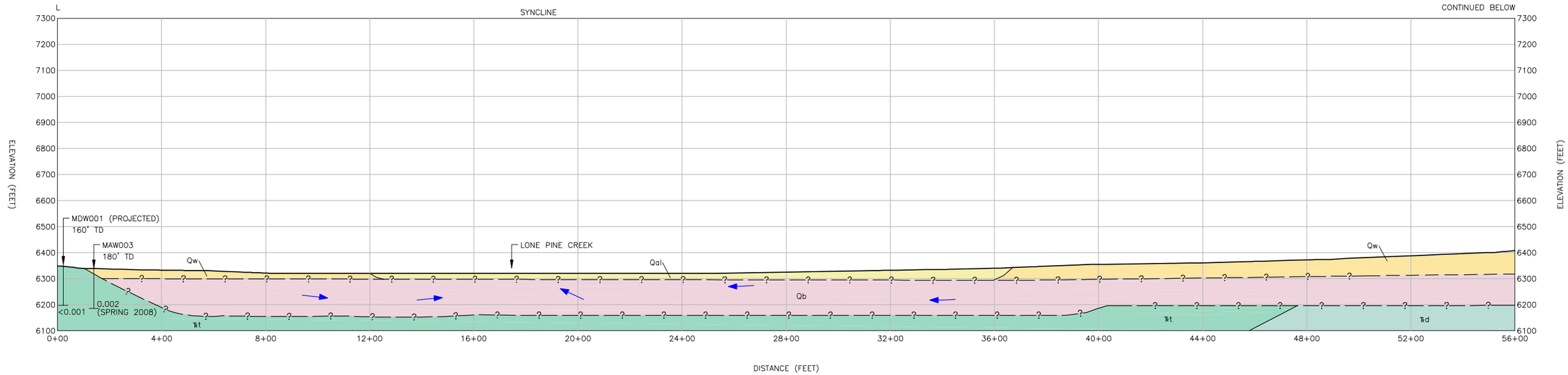

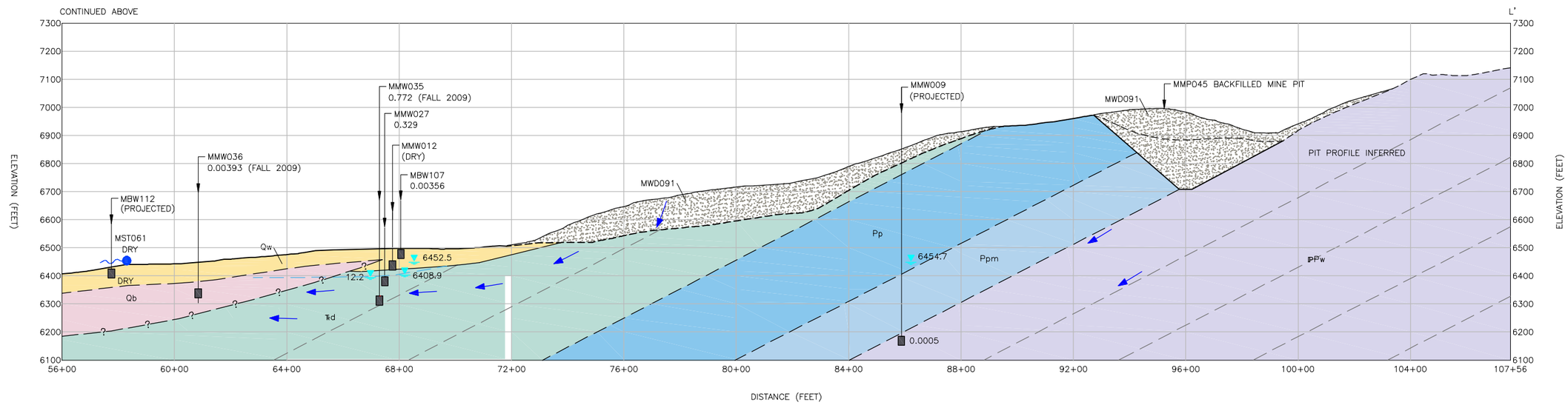

LEGEND:

- WASTE ROCK
- PRE-MINE SURFACE (WHERE DIFFERENT FROM CURRENT SURFACE)
- GEOLOGIC CONTACT (DASHED WHERE APPROXIMATE OR INFERRED)
- FAULT, SHOWING DIRECTION OF DISPLACEMENT (DASHED WHERE INFERRED)
- SCHEMATIC GROUNDWATER FLOW VECTOR
- 6236' — TYPICAL MEASURED GROUNDWATER ELEVATION (FEET ABOVE MEAN SEA LEVEL)
- PROJECTED POTENTIONMETRIC SURFACE
- 0.017 — MEASURED TOTAL SELENIUM CONCENTRATION IN mg/L (SPRING 2009 SAMPLE, UNLESS OTHERWISE NOTED)
- MONITORING WELL LOCATION SHOWING APPROXIMATE SCREEN LOCATION
- SPRING OR DUMP SEEP

SECTION L - L'

VERTICAL SCALE: 200' 0 200'
HORIZONTAL SCALE: 200' 0 200'
VERTICAL EXAGGERATION = 1X

NOTE:

1. SEE DRAWING 2-5 FOR DESCRIPTION OF GEOLOGIC UNITS AND SECTION LOCATIONS.
2. WATER IN MBW107 APPEARS TO HAVE BEEN IN A PERCHED ZONE.
2. SOME COMPONENTS OF THE CROSS SECTIONS ARE SCHEMATIC OR INFERRED.

ISSUED DRAFT FOR AGENCY REVIEW 7/6/10

ISSUE REV	DESCRIPTION	TECH	ENG	DATE
0	ISSUED DRAFT FOR AGENCY REVIEW	CHF	LWM	07/06/10

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PROJECT MANAGER	V DRAIN	07/06/10
CLIENT APPROVAL	B KOCH	07/06/10
CLIENT REFERENCE NO.		

P4 Production, LLC

PROJECT LOCATION: BALLARD, HENRY AND ENOCH VALLEY MINES
PROJECT: RI/FS WORK PLAN
TITLE: ENOCH VALLEY MINE AREA GEOLOGIC SECTION L

MWH

DRAWING: 3-59
REVISION: 0
FILE NAME: 1005813D253

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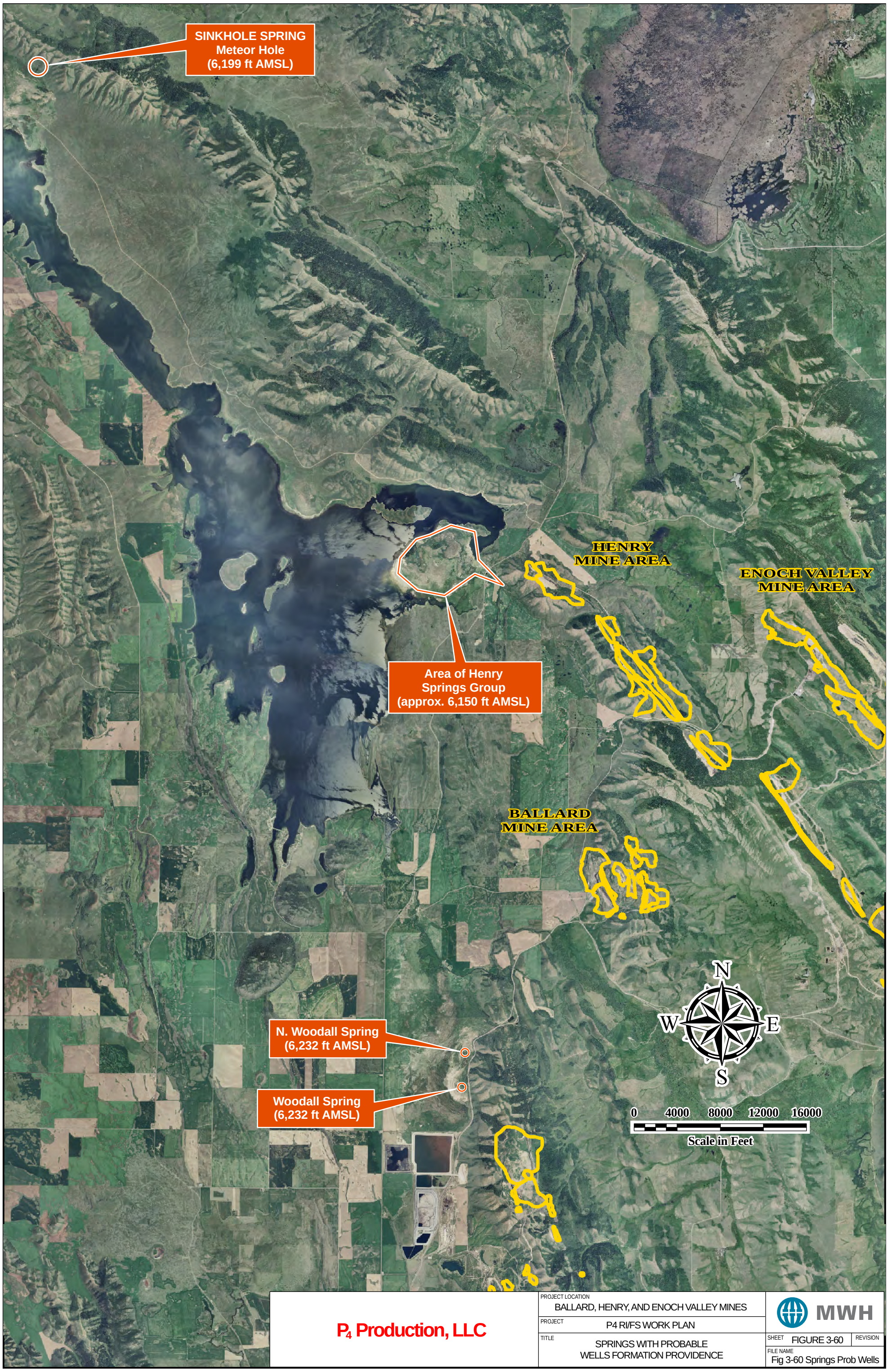
FILE *Fig 3-60_Springs Prob Wells.mxd 22Nov2010*



P4 Production, LLC

PROJECT LOCATION	BALLARD, HENRY, AND ENOCH VALLEY MINES
PROJECT	P4 RI/FS WORK PLAN
TITLE	SPRINGS WITH PROBABLE WELLS FORMATION PROVIDENCE
SHEET	FIGURE 3-60
REVISION	
FILE NAME	Fig 3-60 Springs Prob Wells

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