CLIMAX MOLYBDENUM COMPANY
HENDERSON OPERATIONS

Technical Revision 18 (TR-18) to Permit M-77-342
Environmental Protection Plan

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Submitted To:

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List of Acronyms and Abbreviations

AM – Amendment
APCD – Air Pollution Control Division
ARD – Acid Rock Drainage
BMP – Best Management Practice
CDNR – The Colorado Department of Natural Resources
CDOW – Colorado Division of Wildlife
CDPHE – Colorado Department of Public Health and Environment
CDPS - Colorado Pollution Discharge Elimination System Permit
DMG – Division of Minerals and Geology
DMO – Designated Mining Operation
DRMS – Division of Reclamation, Mining and Safety
EPA – U.S. Environmental Protection Agency
EPF – Environmental Protection Facility
EPP – Environmental Protection Plan
GWMP – Groundwater Management Plan
HMWMD – Hazardous Materials and Waste Management Division
IRM – Incident Response Manual
MSDS – Material Safety Data Sheet
NPL – Numeric Protection Limit
NRCS – Natural Resources Conservation Service
SPCC/MCP – Spill Prevention Control and Countermeasures / Materials Containment Plan
SWMP – Storm Water Management Plan
TR – Technical Revision
USDOT – United States Department of Transportation
WQCD – Water Quality Control Division
WRCC – Western Regional Climate Center

1. INTRODUCTION

1.1. Purpose and Objectives

In April 1994, the Colorado Mined Land Reclamation Board (Board) approved and promulgated amendments to the Mineral Rules and Regulations under the Colorado Mined Land Reclamation Act (Act). The most important of these changes was the classification and definition of a "Designated Mining Operation" and the addition of Section 6.4.21 EXHIBIT U - Designated Mining Operation Environmental Protection Plan to Rule 6.

A Designated Mining Operation (DMO) is defined as a mining operation where designated chemicals used in metallurgical processing are present on-site; or toxic or acid-forming materials will be exposed or disturbed as a result of mining operations; or acid mine drainage occurs or has the potential to occur due to mining or reclamation activities.

The Colorado Department of Natural Resources (CDNR), Division of Minerals and Geology (DMG), the agency that administers the Colorado Mineral Rules and Regulations, formally notified the Henderson Mine and Mill that it was a DMO on August 3, 1994 (letter to Mr. Jay Jones). Climax Molybdenum Company – Henderson Operations (Henderson) concurred with the designation on August 31, 1994 (letter to Mr. Bruce Humphries, DMG). The DMG is now the Division of Reclamation, Mining and Safety (DRMS) and will be referred to as that agency throughout the rest of this document.

The purpose of this Environmental Protection Plan (EPP) is to provide a description of environmental protection facilities for those areas that potentially could be affected or impacted by designated chemicals, toxic or acid-forming materials or acid mine drainage.

The original Henderson Mine and Mill EPP was submitted as Technical Revision 04 (TR-04) to the existing Regular (112) Mining and Reclamation Permit (Number M-1977-342). This TR supersedes TR-04 and, once approved, will become part of the existing permit. The objective of this document is to update the EPP to reflect conditions as of the date of this plan.

1.1.1. Reference and Indexing

Since the Henderson Mine and Mill is an existing active operation with an approved Mining and Reclamation Permit (Permit), much of the information and data required for the EPP has been developed previously. Where such information is already part of the public record and official reclamation Permit files (modifications to the Permit via Amendment (AM) or Technical Revision (TR), correspondence with DRMS, etc.), that information is referenced but not reiterated herein. Only information that presently is not part of the public record or is required specifically under the Act is included.

1.1.2. Changes in Referenced Information and Documents

Changes in the reclamation plan can trigger the need for submittal of a formal Amendment, Technical Revision, or Modification depending upon the type of change as defined by the following definitions:

Technical Revision – means a change in the permit or applications, which does not have more than a minor effect upon the approved or proposed Reclamation or Environmental Protection Plan.

Amendment – means a change in the permit or an application which increases the acreage of the affected land, or which has a significant effect upon the approved or proposed Reclamation or Environmental Protection Plan.

Modification - means any amendment or revision of any previously granted permit, including permit transfers, increases or decreases of the amount of financial warranty required by the Board, and declarations regarding temporary cessation, which is either:

a. initiated by the Board pursuant to Subsection 3.3.2 as necessary to bring the operation into compliance with the provisions of these Rules or the Act, or
b. the subject of a petition for a formal hearing granted by the Board pursuant to Section 34-32-114 of the Act.

Facility improvements have occurred since the initial EPP filing. Please refer to Appendix D and E for a list of Permit Amendments and Technical Revisions in place or in progress at the site.

1.1.3. Emergency Response Plan

An Emergency Response Plan is required as a component of the EPP to comply with Sections 34-32-103 (4.9) and 34-32-116.5(5), C.R.S 1984 and Section 8.3 of the Mineral Rules and Regulations of the Colorado Mined Land Reclamation Board for Hard Rock, Metal and Designated Mining Operations (Rules) for designated chemicals. An electronic copy of the Spill Prevention, Control, and Countermeasure/Materials Containment Plan (SPCC/MCP) and Incident Response Manual (IRM) for the Mine and Mill are included in Appendix A in compact disc format. These documents have been developed to provide procedures to protect, prevent, control, and mitigate releases of chemicals to the environment in the unlikely event of a spill or release of designated chemicals or toxic or acid-forming materials and include, in accordance with Section 8.3, the following:

- Designation of personnel, such as mine manager, shift foreman or safety office, who will be on site and in charge in case of an emergency. A minimum of two key response individuals, with up-to-date phone numbers, who can be contacted by the Office on a 24-hr basis;
- An outline of response procedures to be followed by mine or plant personnel in the event of an emergency involving designated chemicals, acidic or toxic materials, or uranium or uranium by-products;
- A list of designated chemicals and maximum quantities to be stored or used on site at any one time (included in Table 1 of this document and the SPCC Plan); and
- A list and location map of materials, supplies and equipment stored on the property and readily available for containing, controlling and cleaning up excursions or releases of designated chemicals.

Generally, the IRM directs communications to the Hoist House (Ext. 1320) at the Mine and the Mill Control Room (Ext. 2310) with default to the Boiler Operator at the Mill. The Operator at the Hoist House, Mill Control Room or Boiler will then contact the on call Duty Manager. In the event of an emergency at the Mine dial 1911; and at the Mill dial 2911.

The controlled versions of all environmental documents are maintained on Henderson's Environmental SharePoint site. The SPCC/MCP and IRM are reviewed on an annual basis as part of a routine Environmental Management System task. Revisions to these documents will be submitted to DRMS in a timely fashion as required in Section 8.3 of the Rules.

It should be noted that the SPCC/MCP and IRM includes descriptions of procedures for chemicals and fuels not regulated by or under the jurisdiction of the DRMS.

2. DESCRIPTION OF SITE AND SITE FIGURES

2.1. Henderson Mine

The Henderson Mine is an underground mining operation that extracts molybdenite ore from beneath the base of Red Mountain and transports it via conveyor through a 9.6 mile tunnel and 5 mile overland conveyor to the Henderson Mill for crushing and flotation concentrating. The final product is molybdenum disulfide (MoS_2) concentrate that is transported out of the state for final processing.

The Mine is located on the north side of Red Mountain near the confluence of Butler Gulch and the West Fork of Clear Creek (see Section B of the Permit). It is 9 miles west of Empire, Colorado, in Clear Creek County on the eastern slope of the Continental Divide. The 1.5 mile access road to the mine site leaves U.S. Highway 40 at the small village of Berthoud Falls, Colorado. The elevation at the mine site is 10,400 feet above mean sea level (AMSL). Facilities at the mine site include shafts, support facilities, and storage yards. The mine yard and facilities encompass approximately 130 acres.

2.2. Henderson Mill

The Mill is located in Grand County, Colorado in the upper Williams Fork River valley approximately 22 miles south of Parshall, Colorado (see Section B of the Permit). The Mill site and all facilities are on the western side of the Continental Divide in the upper Colorado River drainage basin. Facilities include the portal and conveyor line, mill complex, and the tailings storage facility.

Physical and environmental descriptions of the Mine and Mill site including location maps are found in the Henderson Mining and Reclamation Permit (M-1977-342; Sections 2 and 6) as modified. Section B of the Permit shows the general location of the Henderson Mine and Mill.

2.3. Site Figures (See Appendix I)

- **Figure 1**: **Mine Site Plan Showing Water Bodies and Sampling Locations -** Illustrates the locations of bodies of water around the Mine that potentially could be affected or impacted by designated chemicals, toxic or acid-forming materials or acid mine drainage as well as sampling locations.

- **Figure 2**: **Mill Site Plan Showing Water Bodies and Sampling Locations -** Illustrates the locations of all bodies of water around the Mill that potentially could be affected or impacted by designated chemicals, toxic or acid-forming materials or acid mine drainage as well as sampling locations.

- **Figure 3**: **Henderson Mine EPF 1.1 – Mine Water System** - Illustrates the location of the Henderson Mine Environmental Protection Facilities associated with the Mine Water system.

- **Figure 4**: **Henderson Mill EPF 1.1 and 1.2 – East Branch Reservoir System and Mill Process Water Storage Tanks -** Illustrates the locations of the Henderson Mill's

Environmental Protection Facilities associated with the East Branch Reservoir and related systems.

- **Figure 5**: **Henderson Mill EPF 1.3 – Tailings Delivery System -** Illustrates the locations of the Henderson Mill's Environmental Protection Facilities associated with the tailings delivery system.

- **Figure 6**: **Henderson Mill EPF 1.4 – Tailings Storage -** Illustrates the locations of the Henderson Mill's Environmental Protection Facilities associated with Tailings Storage and related systems; as well as areas that are potentially acid forming.

- **Figure 7**: **Henderson Mill EPF 1.5 and 1.6 – Seep Water Collection/Return and Interceptor Well Field -** Illustrates the locations of the Henderson Mill's Environmental Protection Facilities associated with the Seep Water Collection and Return and the Interceptor Well Field and related systems.

- **Figure 8**: **Henderson Mill EPF 1.7 – Ute Park Pump Station -** Illustrates the locations of the Henderson Mill's Environmental Protection Facilities associated with the Ute Park Pump Station and related systems.

- **Figure 9**: **Henderson Mill EPF 2.1 through 2.9 – Designated Chemicals Storage -** Illustrates the locations of the Henderson Mill's Environmental Protection Facilities associated with Designated Chemicals Storage and related systems. This Figure also shows the locations where designated chemicals are used or stored at Henderson. Table 1 provides a more detailed summary of the estimated quantity, locations and fate of the designated chemicals used in processing at Henderson. Note that the Mine is not included in Table 1 as there are no designated chemicals employed at that location.

- **Figure 10**: **Henderson Mill EPF 3.1 – Storm Water Diversion System -** Illustrates the locations of the Henderson Mill's storm water diversion system.

- **Figure 11**: **Henderson Mine EPF 1.2 – Storm Water Diversion System -** Illustrates the locations of the Henderson Mine's storm water diversion system.

3. OTHER AGENCY ENVIRONMENTAL PROTECTION MEASURES AND MONITORING

3.1. General Information

The Henderson Mine and Mill are subject to additional environmental statutes, regulations and permitting requirements including those promulgated by:

- Colorado DRMS;
- Colorado Department of Public Health and Environment (CDPHE);
    - Air Pollution Control Division (APCD);
    - Water Quality Control Division (WQCD);
    - Hazardous Materials and Waste Management Division (HMWMD);
- Colorado State Engineer [water dam stability (i.e. East Branch Reservoir and Ute Creek Reservoir), and water rights];
- U.S. Environmental Protection Agency (EPA);
- U.S. Army Corp of Engineers; and
- U.S. Forest Service (related to two parts of the site: area underlying the conveyor system, and the area just above the portal).

Permits and authorizations related to environmental protection measures and monitoring are discussed in Section 4.0 below.

OTHER PERMITS AND LICENSES

3.2. Specific Permits and Authorizations

The Henderson Mine and Mill operate under numerous specific regulatory permits and authorizations. All permits and authorizations pertaining to environmental controls are regulated by state and federal programs and are public information. Copies of these permits and authorizations are available at the environmental offices at both the Henderson Mine and Henderson Mill and at the agencies listed.

- DRMS (Division of Reclamation, Mining and Safety).
  - Mining and Reclamation Permit Number M-1977-342.
  - A list of modifications to the DRMS permit (amendments, technical revisions and revisions) is included in Appendix D and E.
- CDPHE (Water Quality Control Division).
  - Colorado Pollution Discharge Elimination System Permit (CDPS) for the Henderson Mill Facilities. No. CO-0000230. Effective until November 30, 2012.
  - Colorado Pollution Discharge Elimination System Permit (CDPS) for the Henderson Mine Facilities. No. CO-0041467. Effective until October 31, 2017 .
  - Storm Water Permit for the Henderson Mine and Mill (and associated SWMP) No. COR-040079. Effective until September 30, 2011 and in effect until receipt of a new permit from CDPHE.
  - Public Water Supply System ID #CO0210001 (Mine).
  - Public Water Supply System ID #CO0225116 (Mill).
- CDPHE (Hazardous Materials and Waste Management Division).
  - EPA Identification Number COD041517343 (Mine).
  - EPA Identification Number COD000695064 (Mill).
- CDPHE (Air Pollution Control Division).
  - Approval of Modification No. 2 to Construction Permit for Henderson Mine No. 95CC899. Issued January 17, 2003.
  - Approval of Modification No. 2 to Construction Permit for Henderson Mill No. 02GR0546. Issued October 3, 2006.
  - Synthetic Minor Operating Status, ID 0804900006 (Mill) and ID 0801900002 (Mine).
- U.S. Forest Service. Clear Creek Ranger District
  - Special Use Permit # 4033-01: Water Discharge Pipeline (0.36 ac.).
  - Overland Surface Conveyor System Easement
  - Lost Creek Ditch Easement
  - McCondliss Reservoir Feeder Ditch Easement
  - Buchler #3 Ditch Easement
  - Buchler #4 Ditch Easement
  - North Skylark Ditch Easement
  - South Skylark Ditch Easement
- United States Department of Transportation (USDOT)

  - Hazardous Materials Certificate of Registration No. 070212 997 001UW for 09/04/2012 – 06/30/2015 for Henderson Mine.
  - Hazardous Materials Certificate of Registration No. 070212 005 004UW for 07/03/2012 – 06/30/2015 for Henderson Mill.

4. DESIGNATED CHEMICAL EVALUATION

The designated chemicals discussed in this EPP are exclusive to the extractive metallurgical processing of molybdenite ore to produce MoS_2 and are thus only located at the Mill. The Henderson Mine does not use designated chemicals as a part of mining activities.

The designated chemicals, listed quantities, and use concentrations are presented as the best information available at the time of the submittal of this EPP. These chemicals, quantities, and concentrations may vary based upon production needs and processes. For example, brand name chemicals such as (but not limited to) Syntex, Cytec OrePrep F-579 or Witconate may be changed out for different brands of similar chemicals based on factors such as effectiveness, cost and availability. Changes in brands and reagent usage are a part of the production process and are not considered to be grounds for notification to the DRMS. However, notification to the DRMS will be made in the event that:

- New types of designated chemicals, not discussed herein, are added to the process;
- The storage location of a designated chemical is changed; or
- The containment facility for a designated chemical must be modified.

4.1. List of Chemicals and Specific Locations

Table 1 - Designated Chemicals Used at the Henderson Mill - provides a summary of the estimated quantity, locations and fate of the designated chemicals used in processing at Henderson. Note that the Mine is not included in Table 1 as there are no designated chemicals employed at that location.

4.2. Known Potential to Affect Human Health and the Environment

The following is a brief narrative description of the known potential to affect human health and the environment for the designated chemicals at Henderson. Material Safety Data Sheets (MSDSs) for these chemicals can be found in Appendix C.

<u>Nokes Reagent</u> – Phosphorous pentasulfide is a principal ingredient in Nokes Reagent. Nokes Reagent is a mixture of sodium hydroxide and phosphorous pentasulfide in solution with water. The addition of sodium hydroxide maintains the solution at pH 11 to prevent the release of hydrogen sulfide gas. The reagent is incorporated into the mill circuit as a lead and copper depressant. It is mixed at the Mill site in a Nokes mixing tank and stored for use inside the mill building.

Phosphorous pentasulfide is a reactive, ignitable, greenish-yellow solid with a "rotten egg" smell that can affect the human body through inhalation, ingestion, and dermal contact. While solid phosphorous pentasulfide can cause dermal irritation, the primary health hazard associated with this material is the release of hydrogen sulfide (H_2S) gas upon contact with water. H_2S can be a primary health hazard that acts as an irritant to mucus membranes and can produce severe breathing difficulties. High concentrations can stop breathing immediately.

Phosphorous pentasulfide, if released to the environment where it contacts water, will react by producing hydrogen sulfide gas and phosphoric acid. Both of these by-products can be injurious to aquatic and terrestrial biota. Phosphorous pentasulfide can be neutralized with an alkaline substance such as lime, sodium hydroxide, soda ash, etc.

Sodium hydroxide is used in the mill circuit to neutralize waters in the lead leach process and to make Nokes reagent for use in the flotation process. It is a strong corrosive alkali that can affect the human body through inhalation, ingestion, and dermal contact. Effects can vary from mild irritations to destructive burns (internally or externally) depending upon the type, degree, and length of exposure. Severe exposures, particularly those resulting from ingestion, may lead to death.

In the presence of acidic conditions such as acid rock drainage or acid mine drainage, sodium hydroxide reacts as an acid neutralizer and buffer. It is used to raise the pH of acidic waters and soils. Should sodium hydroxide be delivered directly into a non-process water or a non-acidic water environment, it would cause short-term impacts to aquatic communities by raising the system pH to potentially intolerably high levels. Direct long-term impacts would be negligible to non-existent since sodium hydroxide does not bio-accumulate. However, at high pH levels, several metals (e.g. aluminum) increase in concentration and can cause indirect long-term impacts.

Hydrochloric acid is used in the mill circuit in the lead leaching process. It is an acidic corrosive that can affect the human body through inhalation, ingestion, and dermal contact. It is corrosive to any tissue with which it contacts. Effects can vary from mild irritations to severe burns (internally or externally) depending upon the type, degree, and length of exposure. Repeated chronic exposure to dilute solutions may cause dermal irritations, whereas similar exposure to vapors or mists may cause erosion of teeth and inflammation of the eyes and mucus membranes of the nose, throat, and lungs.

Hydrochloric acid is acid forming in aquatic and terrestrial environments. It can be neutralized with the application of alkaline materials.

Cytec OrePrep F-579 (or equivalent) is utilized in the mill circuit as a flotation frother. It is a non-hazardous mixed polyglycol. Direct contact with this material may cause mild eye and skin irritation. OrePrep F-579 is a stable product that is completely miscible with water. It is not considered an environmental hazard. It does not contain OSHA regulated (hazardous) components.

Orform D8 Depressant (or equivalent) is a mineral processing aide that is used in the mill circuit to suppress other metals in the flotation process. This is a corrosive material that causes eye and skin damage. The vapor is combustible and may cause respiratory tract irritation if inhaled. The material can be harmful or fatal if swallowed.

Pine Oil is composed of terpene alcohols and hydrocarbons and is used in the mill circuit as a frother reagent. In humans, it may cause skin and eye irritation and may be harmful if ingested or inhaled. However, it is neither characteristically hazardous nor listed as hazardous under federal regulations. Pine oil is stable and non-persistent in the environment.

Collector Oil (Vapor Oil - Calumet Hydrocal 60 or equivalent; Diesel #2 may be used as a backup) is a light naphthenic petroleum oil which is used in the mill circuit as a collector/rougher reagent. It is non-hazardous and practically non-toxic through dermal or ingestion pathways. In the environment, this reagent is stable. It should be treated similar to any petroleum product should spills or releases occur.

Diesel fuel #2 is a combustible petroleum distillate commonly used as a heating fuel. At the Henderson Mill, it may be used as a collector reagent in the milling process in place of vapor oil.

Aside from being combustible, #2 diesel is an aspiration hazard and a skin irritant. In the environment, #2 diesel reacts similar to other petroleum fuels and can cause short-term damage to terrestrial and aquatic ecosystems.

Syntex (or equivalent) is a non-hazardous particulate surfactant used in the mill circuit as a frother/soap. Syntex is Sodium Lauryl Sulfate mixed with hot water. In humans, it may lead to possible irritation of the gastrointestinal tract if ingested in quantity. It is stable and non-hazardous in the environment.

Sodium Lauryl Sulfate (Witconate or equivalent) is a solid, flake-form, non-hazardous particulate surfactant used in the mill circuit as a frother/soap. It is a frothing agent that is mixed with hot water to form Syntex in the mill process. It is non-reactive, slightly flammable, and a slight human health hazard. Eye protection and gloves should be worn when in contact with the product. Decomposition products from burning are carbon monoxide and carbon dioxide. In the environment, Witconate is stable and non-hazardous.

NP-9/9N9 or N95 Surfactant (or equivalent) is a nonylphenol polyethylene glycol ether used as a nonionic surfactant in the lead leach circuit in the mill. This reagent is stable, and essentially is non-hazardous to humans, but it can cause skin and eye irritation with prolonged contact. In the environment, NP-9/9N9 or N95 may be toxic to aquatic organisms and has a tendency to bioaccumulate.

Coherex is a petroleum hydrocarbon in water emulsion used widely in earth disturbing activities to control dust and wind erosion. At the Henderson Mill, it is applied to exposed tailings to control dust from the tailings storage facility. Coherex has a slight toxicity rating, and insignificant ratings for fire and reactivity. It is biodegradable in water. Effects on human health are similar to other common petroleum distillates such as diesel fuel.

4.3. Material Safety Data Sheets for Designated Chemicals

MSDSs for designated chemicals are available to employees and are included in Appendix C. The MSDSs can be accessed by employees online should information be required for emergency response procedures at the following link: https://fcx.complyplus.com/default.asp.

5. DESIGNATED CHEMICALS AND MATERIALS HANDLING

Henderson has developed a Spill Prevention Control & Countermeasures / Materials Containment Plan (SPCC/MCP) and Incident Response Manual (IRM) to prevent unauthorized release of pollutants to the environment and meet the requirements of:

- Part I.D.1 of the Colorado Department of Public Health & Environment, Water Quality Control Division, Discharge Permit issued to the Mill (CO-0041467) (MCP Requirements); and
- Federal oil pollution prevention regulations (40 CFR part 112) and the Colorado storage tank regulations (7 CCR 1101-14) (SPCC Plan Requirements).

The SPCC/MCP and IRM (Appendix A) describe procedures performed to manage, prevent, control, and mitigate releases of oil, petroleum products and other hazardous chemicals including:

- Materials Handling & Containment;
- Loading and Unloading;
- Incident Response;
- Government Agency Notifications (Verbal and Written);
- Facility Monitoring (Inspections);
- Employee Training; and
- Recordkeeping.

The SPCC/MCP and IRM also describe the petroleum and hazardous chemicals stored at the Henderson Mine and Mill. These documents identify the containment systems in place to help manage, prevent, control, and mitigate releases of petroleum products and other hazardous chemicals to the environment, including:

- Containers or bulk storage used;
- Secondary and/or tertiary containment features; and
- Engineering controls.

The SPCC/MCP has been certified by a licensed professional engineer and is reviewed annually by internal Henderson personnel and updated as necessary.

As stated in Section 1.1.3, the SPCC/MCP and IRM (Appendix A) fulfills the requirement in Rule 8.3 for an Emergency Response Plan for designated chemicals used in processing at the Mill site.

5.1. Disposal, Decommissioning, Detoxification or Stabilization

5.1.1. Designated Chemicals

5.1.1.1. Temporary Cessation

Mine: No designated chemicals used in processing.

Mill: Under the scenario of Temporary Cessation, those designated chemicals at the Mill site would be used, removed from, or stored at the site. Mixed chemicals such as Nokes Reagent (sodium hydroxide and P_2S_5) would be used in the milling process until depletion of the supplies. The manufacturer would be contacted to assume possession of any unmixed and uncontaminated chemicals, and the material would be transported off-site in the same manner that it was received at the site. As an alternative, the materials, such as (but not limited to) pine oil would be stored on site until operations resumed.

If any unmixed chemicals were contaminated or the manufacturers were to decline possession, then detoxification, stabilization or shipment offsite would be performed in compliance with federal, state, and local regulations using a licensed and experienced professional contractor and transporter to remove the chemicals from the site.

5.1.1.2. Final Closure

Mine: No Designated Chemicals used in processing.

Mill: Upon final closure at the conclusion of Mill operations, removal and disposal would be performed as discussed above for Mill site chemicals during periods of Temporary Cessation.

5.1.2. Acid-Forming Materials and Acid Mine Drainage

Mine - The Henderson ore body contains unoxidized sulfides that, in the presence of oxygen, water and bacteria, have the potential to become an acid-forming material as defined in Rule 1, Section 1.1 (1). Henderson concurred with this fact when it accepted the DRMS determination that the Henderson Mine was a DMO under the amended rules. In addition, water which accumulates in the mine contacts this sulfide bearing material and, in turn, has the potential to become acidified, thus, meeting the definition of "Acid Mine Drainage" in Rule 1, Section 1.1 (2).

The structures and facilities at the mine site are constructed on a fill base of barren (waste rock) extracted during construction and development of the underground mine and its associated access and ventilation shafts (see Figure 1). Samples of the material from the No. 5 shaft were characterized, and the results were presented to DRMS in a TR-04 related document dated May 15, 1996. The results of those analyses indicate that the material is non-acid forming.

Henderson has nevertheless managed this area as though it could potentially be acid-forming and has adequate controls in place to detect acid forming conditions and/or elevated concentrations of key parameters through routine surface and groundwater monitoring (see sections 8, 9, 10, and 11 below). In stream monitoring data on file with the Division comparing metal concentrations above and below the Henderson Mine provide demonstration that, after 40 years, the fill materials used to construct benches and facility support at the Mine is not generating ARD that impacts water quality.

Impacted underground water at the Mine is diverted, conveyed to, and treated at the URAD Waste Water Treatment Plant (WWTP).

Mill - The tailings delivery line gravity transports slurry, a mixture of tailings material and process waste water consisting of approximately 40 percent solids, to the tailings storage facility. Tailings material deposited into the tailings storage facility has the potential to be acid-forming (see Figure 6). Adequate controls and protection facilities are in place related to these systems and are discussed in detail in Section 7.2 below.

5.1.2.1. Temporary Cessation

Mine - During temporary cessation, mine water will continue to be conveyed to the URAD WWTP for treatment.

Mill - At the Mill site, process waters, including seep water from the tailings storage facility, are impounded and recycled. Should Mill operations temporarily cease, tailings seep water would continue to be pumped back to the process circuit and the East Branch Reservoir. There would be no discharge through permitted outfalls from the tailings storage facility during periods of temporary cessation except for potential emergency situations as allowed pursuant to the CDPS permit.

Handling of the acid-forming tailings material during temporary cessation would be the same as under active operations. Seep water would be pumped back to the process circuit as discussed, the water pool would be maintained, and wind-blown particulates from the tailings storage facility would be suppressed with Coherex or an equivalent product. Dust suppression and related protection facilities are discussed in more detail in Section 7.2.2 of this document.

5.1.2.2. Final Closure

Upon final closure and reclamation of the Henderson Mine and Mill, acidic water from the Mine and Mill will be managed as described in Section 9.0 of the approved Mining and Reclamation Permit, as amended and revised.

The Mine site, portal area, surface conveyor, mill yard, access roads, reservoir shores, tailings storage facility, associated Mill buildings and protection facilities will be closed, stabilized, and/or reclaimed as specified in Section 9.11 of the Mining and Reclamation Permit, as modified by the approved amendments and revisions.

6. ENVIRONMENTAL PROTECTION FACILITIES

An "Environmental Protection Facility" (EPF) is defined in Section 1.1(14) of the Rules as "...a structure...for control or containment of designated chemicals, acid mine drainage, or toxic or acid-forming materials..." EPFs, as defined, are present and operational at both the Mine site and the Mill site and are discussed below.

The EPFs discussed in Section 7.1, 7.2.1 and 7.2.3 below are continuously monitored in accordance with the Groundwater Management Plan (GWMP), approved as TR-16, to assess their overall effectiveness. The approved GWMP includes narratives and maps used to describe site locations, sample designators, the sample parameters, the sampling frequency, the media being sampled, the method of sampling and analysis applied, and the reporting date, as required per 6.4.21(7)(d).

6.1. Mine Environmental Protection Facilities

Environmental Protection Facilities at the Henderson Mine site involve the conveyance of impacted underground mine water, which is piped offsite for treatment at the URAD Mine, and the storm water diversion system.

The related EPFs (Mine EPF 1.1 and 1.2) are defined and evaluated below. Surface features of EPF 1.1 (mine water conveyance) and 1.2 (stormwater diversion system) are shown on Figure 3 and 11, respectively.

Leaks, spills, or any other accidental or unauthorized releases are immediately addressed and reported as described in the SPCC/MCP and IRM (Appendix A). In addition, Henderson has contracted with Belfor Environmental Services (800-930-0011) to provide third party emergency services and are available to assist in the event of an accidental release.

Mine EPF 1.1 – Mine Water System: Mine water is collected underground and pumped to settlers on the 7500 level. A non-toxic flocculent is drip-fed into the settlers to aid precipitation. A non-toxic scale inhibitor is also added at various sites to keep piping clear.

After settling, the mine water is pumped from the 7500 level to the 8100 level. A portion of this water is diverted for use in drills. The remainder is pumped to the surface through the #2 shaft. Once at the surface, the mine water is pumped off site to the URAD Mine for treatment via 12” and 14” HDPE pipelines and appurtenances.

Solids from the settlers are generally sent to the Mill for processing. Some solids have been stored in mine drifts in the past; however, this material is of similar composition to the native ore, and may be mined out in the future.

Effectiveness: The mine water settlers and conveyance structure and appurtenances have been effective for the conveyance of mine water. There have been no releases in the last 10 years.

Monitoring: The mine water system is routinely inspected by Mine personnel to assess effectiveness and integrity. Routine maintenance is performed (currently every 60 days) to mitigate the build-up of scale inside the pipeline. Maintenance and/or updates to facilities, systems, equipment, or procedures are performed as needed to be protective of the environment and to prevent releases.

Mine EPF 1.2 – Storm Water Diversion System:

Storm water diversion systems have been constructed on the:

- South side of the Mine office and surface operations to divert un-impacted storm water around industrial activities to the east end of the property; and
- West end and along the north side of the Mine property to divert un-impacted storm water to the West Fork Clear Creek

See section 10.2 and the Henderson Storm Water Management Plan (SWMP) in Appendix B for additional information on storm water diversion systems.

Effectiveness: The storm water diversion canals have been effective in preventing the amount of storm water that can come into contact with disturbed land, designated chemicals and potentially toxic or acid forming materials. As a result, the potential pollution of storm water is greatly reduced.

Monitoring: The storm water diversion system is inspected twice per year in accordance with Henderson's SWMP (see Section 10.2 and Appendix B for additional information).

6.2. Mill Environmental Protection Facilities

Environmental Protection Facilities at the Henderson Mill site involve three main areas/categories:

- Process Water and Tailings Circuit;
- Designated Chemical Storage Facilities; and
- Storm Water Diversion System.

The EPFs in these areas are defined and evaluated in Sections 7.2.1, 7.2.2 and 7.2.3 respectively. Figures 4 – 10 identify the locations of the EPFs at the Mill site.

Leaks, spills, or any other accidental or unauthorized releases are immediately addressed and reported as described in the SPCC/MCP and IRM (Appendix A). In addition, Henderson has contracted with Belfor Environmental Services (800-930-0011) to provide third party emergency services and are available to assist in the event of an accidental release.

6.2.1. Process Water and Tailings Circuit

The Henderson Mill employs a zero discharge process water circuit. There is no active discharge of process waters, although the CDPS Permit for Henderson Mill allows for the discharge of process waters under certain emergency conditions identified in the permit. The water management system at the Mill includes the following components:

- East Branch Reservoir System includes:
    - East Branch Dam;
    - East Branch pump station;
    - Process Water Line; and
    - Process Water Tanks;
- The Milling System including:
    - Tailings delivery line;
        - Emergency Cutout
        - No. 1 Cutout

    - Parking and pad areas;
    - Bear Paw Pipeline (north parking area collection and routing);
    - Ditch/Pipeline for drainage channel (south parking area collection and routing); and
    - Chemical Storage (Discussed Separately in Section 7.2.2, below)
- Tailings Storage Facility:
    - 1-Dam and 3-Dam;
    - Barge pump station and Barge return pipeline;
    - Seep water Collection System including:
        - Ute Park pump station with alarm;
        - Ute Park or Seep water Return Pipeline; and
        - Tailings storage facility seep water collection and return systems;
            - Foundation Drains
            - Horizontal Drains
            - Interceptor Wells
            - Seep water/Horizontal Drains Collection Channels and pipelines
            - Seep water Collection Area

Mill-EPF 1.1 - East Branch Reservoir System: This EPF includes the reservoir, dam, pump station below the dam, and the process water line. The reservoir is the principal storage area for mill process water. Its capacity is 2000 acre-feet stored behind an earthen dam with a spillway which was constructed in 1970-71 from local cut and fill material and certified by W.W. Wheeler and Associates, Inc. The outlet pipe from the reservoir runs to the pump house located just below the dam. Water from the reservoir is pumped from this station to the process water tanks, and from there to the Mill on an as needed basis. Horseshoe and Ute Creek reservoirs could also be used to supply fresh water, but are not considered EPFs.

***Effectiveness*:** The reservoir is located such that any water escaping during a catastrophic failure would drain toward the tailings system storage where it would be contained.

Monitoring: The reservoir is routinely inspected by Mill personnel to assess effectiveness and integrity. Maintenance and/or updates to facilities, systems, equipment, or procedures are performed as needed to be protective of the environment and to prevent releases.

Mill EPF 1.2 - Mill Process Water Storage Tanks: This EPF includes two (2) 1.5 million gallon steel tanks that are located east of and upgradient of the mill buildings. Water from these tanks is gravity fed to the mill system. 500,000 gallons in each tank is reserved for firefighting purposes.

***Effectiveness*:** The tanks are located such that any water escaping during a catastrophic failure would drain toward the East Branch Reservoir or to the tailings storage facility, where it would be contained.

Monitoring: The tanks are routinely inspected by Mill personnel to assess effectiveness and integrity of the EPF system. Maintenance and/or updates to facilities, systems, equipment, or procedures are performed as needed to be protective of the environment and to prevent releases.

Mill-EPF 1.3 – Tailings Delivery System: The tailings delivery line gravity transports slurry, a mixture of tailings material and process water consisting of approximately 40 percent solids, to the tailings storage facility. This line is constructed of 36" concrete pipe on a nominal grade of 1.2% from the mill building to 3-Dam. At the south abutment of 3-Dam, the line transitions to 30” HDPE pipe, then to 24” HDPE once it reaches the Number 7 leadoff on 1-Dam. Where grades are in excess of 1.2%, concrete drop structures have been installed. The tailings slurry is delivered to the tailings storage facility dam via lead off pipes used predominantly during winter months, and via a larger quantity of smaller diameter spigots during the summer months.

Effectiveness: Process water and slurry is contained within the enclosed mill building during processing. Any spills within the mill building will be transported via floor launders, sumps and pumps to either the thickener or the tailings delivery line. Slurry escaping from the tailings delivery line would drain towards the tailings storage facility, where it would be fully contained.

Monitoring: The tailing delivery system EPF is routinely inspected by Mill personnel to assess effectiveness and integrity. Maintenance and/or updates to facilities, systems, equipment, or procedures are performed as needed to be protective of the environment and to prevent releases.

Mill EPF 1.4 - Tailings Storage Facility: The tailings storage facility, dams (1 and 3 Dam), barge pump, and barge return pipeline are located in Ute Park on Ute Creek, north-northwest of the Mill site. The tailings storage facility contains tailings material, process water, and pumped back seepage water. This impoundment and its final configuration of approximately 1300 acres is described in Section 9 of the Mining and Reclamation Permit as modified by AM-04, TR-02, TR-04 related proposals approved 7/23/98 and 7/18/06, TR-09, TR-11, TR-12, TR-14 and TR-15.

Tailings slurry is deposited at the dam, and the water is recycled. Process water is reclaimed from the tailings storage facility for reuse in the mill through a barge pump system which extracts clarified water from the tailings storage facility surface and delivers it directly to the East Branch Reservoir.

Tailings material from the Henderson Mill circuit is potentially acid producing.

The beach area on the tailings storage facility can generate fugitive dust during periods of high winds following periods of minimal precipitation in the spring, summer and fall. Consequently, an interim method of suppressing wind-blown tailings dust has been employed at the Henderson Mill site. Coherex is used for controlling fugitive dust from the tailings storage facility.

Effectiveness: As discussed in TR-14, the tailings storage facility has been designed, engineered, and constructed to contain the flow from a probable maximum storm event without sacrificing dam stability. TR-14 also addresses operational plans which are now in place to handle post storm event operations. Upon termination of operations, the impoundment will have a storage capacity of 21,000 acre-feet for flood waters including a 10 foot freeboard. Under emergency provisions of the CDPS Permit where the stability of the dam may be threatened, storm waters can be pumped from the tailing storage facility to East Branch Reservoir and bypassed directly the Williams Fork River via the East Branch Emergency Bypass line. This situation has not occurred in Henderson's history.

Tailings storage has been designed, and is being operated, with effective engineering controls and redundancies, including seep water collection and return, a groundwater interceptor system, and regular internal and external monitoring and inspections.

Monitoring: Routine monitoring associated with the tailings storage facility includes the following:

- Routine inspections are performed on a daily basis by Henderson Tailings personnel and include visual observations of the Mill site, Tailings Dam Storage facility Shop, #1 Dam, #3 Dam, the East Branch Dam, East Branch Reservoir, East Branch Pump House, #1 Dam Seep Water Collection Area, Interceptor Canals, Interceptor Roads and the Ute Park pump station.
- Monthly piezometer monitoring and data assessment.
- Completion of a detailed monthly inspection of the tailings storage facility and the Seep Water Collection and Return System.

Maintenance and/or updates to facilities, systems, equipment, or procedures are performed as needed to be protective of the environment and to prevent releases. Additional Coherex treatments may also be applied on an as needed basis.

Mill-EPF 1.5 – Seep Water Collection and Return System: Contact water seeping from the base of the tailings storage facility dams may be acidic and is not discharged to the environment without treatment. Therefore, a system to collect this seepage and return it to the process water and tailings circuit was designed and installed during construction in the 1970s and has been modified through TR-04 related changes, TR-09,, TR-10, and TR-14. The system collects and contains dam seepage and it lowers the phreatic surface in the tailings storage facility and dams. The system is comprised of trenched and piped collection and conveyance structures including foundation drains, horizontal drains, pipelines and ditches that extract and direct seep water to the Ute Park pump station.

Effectiveness: This EPF is one of several engineering controls and redundancies to prevent releases of acidic waters and has been effectively operated (as amended and improved) since the beginning of Mill operations in 1976.

Monitoring: Routine monitoring associated with the Seep Water Collection and Return System includes the following:

- Routine inspections are performed on a daily basis by Henderson Tailings personnel and include visual observations of the Mill site, Tailings Dam Storage facility Shop, #1 Dam, #3 Dam, the East Branch Dam, #1 and #3 Dam Seep Water Collection Areas, Interceptor Canals, Interceptor Roads and the Ute Park pump station.
- Completion of a detailed monthly inspection of the tailings storage facility and the Seep Water Collection and Return Systems.
- Annual leakdown piping integrity test is performed on piping used to convey seep water from #3 Dam to the Ute Park pump station.

Maintenance and/or updates to facilities, systems, equipment, or procedures are performed as needed to be protective of the environment and to prevent releases.

<u>Mill EPF 1.6 – Groundwater Intercept System:</u> Henderson operates a series of extraction wells along the north seep water collection canal to prevent potential process water influences on groundwater quality. Based on previous characterization studies, the Ute Creek alluvial channel was reported to be the primary water-bearing unit underlying and downgradient of the tailings dam. Seepage from the 1-Dam tailings facility that is not captured in the seepage collection canals reports to the buried Ute Creek alluvial channel. The historical Ute Creek channel exits the 1-Dam tailings facility near the Ute Creek pumping station where it is captured by the 1-Dam interceptor well field. The interceptor wells are installed perpendicular and across the historical Ute Creek alluvial channel and glacial drift deposits and range in depth from 13 to 43 feet. Flows from all of the extraction wells are combined into a single underground header that discharges to the Ute Park pump station. The water combines with the surface seepage waters from the canals and is pumped back to the tailings pond for reuse in the milling circuit.

***Effectiveness*:** This EPF is one of several engineering controls and redundancies to prevent releases of acidic waters. Two of the pneumatic Hammerhead pumps have been retrofitted with submersible VFD electric pumps, improving pumping performance.

Monitoring: Flow rates and volumes are continuously measured and recorded with the use of electronic recording devices. Monitoring of ground and surface water downstream of the Groundwater Intercept System is conducted on a routine basis (see sections 8, 9, 10, and 11 below).

<u>Mill EPF 1.7 – Ute Park Pump Station:</u> The Ute Park pump station is an important component in the zero discharge system. Collected seepage is pumped back from the Ute Park pump station to the water pool on the tailings storage facility by turbine pumps with a total capacity of 9000 gpm. A total of approximately 115 acre-feet of storage capacity exists in the seep water collection area and the area above the seep water collection ditches in case of emergency upsets. A calculated rate of 1000 gpm of seep would fill this storage in 25.5 days before a release would be possible; sufficient time to place backup pumps into operation.

Effectiveness: The pumps and their operations are discussed in depth in Appendix F. If the pump and alarm systems lose power, there is a solar and battery powered fail-safe system that closes the seep water feed channels to the pump house.

Monitoring: The automatic control system and response procedures alert control personnel when seep water levels in the sump pass the start probe commands for the seep water return pumps, and when a power failure occurs which shuts down the seep water return pumps. This alarm system is described in Appendix F. Maintenance and/or updates to facilities, systems, equipment, or procedures are performed as needed to be protective of the environment and to prevent releases.

6.2.2. Designated Chemical Storage Facilities

Environmental Protection Facilities for designated chemicals at the Henderson Mill site include enclosed buildings, trailers, tanks, bins and berms, singly or in combination. The ultimate emergency EPF for all designated chemicals is the tailings storage facility/seep water collection and containment system discussed in Section 7.2.1. As stated previously, the Mill site and its ancillary facilities are located within the Ute Creek drainage. Therefore, accidental release of a designated chemical or process water at the Mill which is not captured by primary, secondary, and (in some cases) tertiary containment at the release site ultimately would be contained at the tailings storage facility. The specific EPFs for designated chemicals at the Mill are discussed below, and in more detail in the SPCC/MCP (Appendix A).

Mill EPF 2.1 – Nokes Building: Liquid sodium hydroxide is stored in two 12,300 gallon tanks located in the fully enclosed Nokes building directly adjacent and north of the mill building. Dry P_2S_5 is stored in 4,000 pound aluminum tote bins in the Nokes building. Storage capacity is 80,000 pounds. As discussed previously, P_2S_5 is mixed with sodium hydroxide in a 10,500 gallon tank to make Nokes reagent. Once mixed, Nokes reagent is pumped to a 21,800 gallon storage tank within the mill building.

Effectiveness: The tank room is designed with floors sloping toward a sump and secondary containment with capacity to contain 110 percent of the release from one tank. Spilled material would be pumped from the sump directly to the concentrate thickener. Nokes reagent is transferred to a 21,800 gallon tank within the mill building where releases would be fully contained.

Monitoring: Chemical storage containers are routinely inspected in accordance with the SPCC/MCP (Appendix A) by Mill personnel to assess effectiveness and integrity of each EPF system. The tanks are equipped with sonic level detectors and local alarms that warn of high tank levels. The Mill sump also contains a high level alarm to provide warning in the event of a large release. Tank integrity testing is performed in accordance with the SPCC/MCP, currently every ten years.

Maintenance and/or updates to facilities, systems, equipment, or procedures are performed as needed to be protective of the environment and to prevent releases.

Mill EPF 2.2 - Hydrochloric Acid Storage: Hydrochloric acid is stored in one 50,000 gallon tank located in the acid storage yard outside and just north of the mill building. Two tanks reside at this location, one of which has been decommissioned. Hydrochloric acid is introduced into the lead-leach circuit within the mill building.

Effectiveness: The area is fenced, and the tanks are surrounded by an earthen berm that has a containment capacity of 84,000 gallons. The berm is lined with limestone. A collection sump captures any free liquid that might be spilled.

Monitoring: Chemical storage containers are routinely inspected in accordance with the SPCC/MCP (Appendix A) by Mill personnel to assess effectiveness and integrity of each EPF system. The Mill sump also contains a high level alarm to provide warning in the event of a large release. Integrity testing is performed in accordance with the SPCC/MCP, currently every ten years.

Maintenance and/or updates to facilities, systems, equipment, or procedures are performed as needed to be protective of the environment and to prevent releases.

Mill EPF 2.3.a – Flotation Chemical Storage - OrePrep F-579, a frothing agent used in the flotation process, is stored in 250 gallon totes in the mill building.

Effectiveness: Releases of this chemical would be contained directly by the mill sump system. The Mill sump also contains a high level alarm to provide warning in the event of a large release.

Monitoring: Chemical storage containers are routinely inspected in accordance with the SPCC/MCP (Appendix A) by Mill personnel to assess effectiveness and integrity of each EPF system. Maintenance and/or updates to facilities, systems, equipment, or procedures are performed as needed to be protective of the environment and to prevent releases.

Mill EPF 2.3.b – Flotation Chemical Storage - Orform D8 Depressant, a suppressant used in the flotation process, is stored in 450 gallon totes in the mill building.

Effectiveness: As with OrePrep F-579, releases of this, chemical would be contained directly by the mill sump system. The Mill sump also contains a high level alarm to provide warning in the event of a large release.

Monitoring: Chemical storage containers are routinely inspected in accordance with the SPCC/MCP (Appendix A) by Mill personnel to assess effectiveness and integrity of each EPF system. Maintenance and/or updates to facilities, systems, equipment, or procedures are performed as needed to be protective of the environment and to prevent releases

Mill EPF 2.4 - Pine Oil Storage: Pine oil, used in the flotation process, is stored in a 14,400 gallon steel tank located and contained in the oil room inside the mill building.

Effectiveness: Releases in the oil room are contained by a concrete-walled secondary containment that is sloped to a system that channels the material to the mill sump system for either return to the mill circuit, or for routing to the tailings delivery line. The Mill sump also contains a high level alarm to provide warning in the event of a large release.

Monitoring: Chemical storage containers are routinely inspected in accordance with the SPCC/MCP (Appendix A) by Mill personnel to assess effectiveness and integrity of each EPF system. Maintenance and/or updates to facilities, systems, equipment, or procedures are performed as needed to be protective of the environment and to prevent releases.

Mill EPF 2.5 - Collector Oil Storage: Collector oil is a product used in the flotation process within the mill. Vapor oil is generally used for this product, but Diesel #2 may be used as a backup. Vapor oil is stored in a 32,000 gallon steel tank contained within the oil room inside the mill building. Diesel #2 is stored in a 32,000 gallon steel tank in the oil room located within the mill building.

Effectiveness: Releases in the oil room are contained by a concrete-walled secondary containment that is sloped to a system that channels the material to the mill sump system for either return to the mill circuit, or for routing to the tailings delivery line. The Mill sump also contains a high level alarm to provide warning in the event of a large release.

Monitoring: Chemical storage containers are routinely inspected in accordance with the SPCC/MCP (Appendix A) by Mill personnel to assess effectiveness and integrity of each EPF system. Maintenance and/or updates to facilities, systems, equipment, or procedures are performed as needed to be protective of the environment and to prevent releases.

Mill EPF 2.6 – Syntex Storage: Syntex is a frothing agent used in the mill process. Syntex is a mixture of sodium lauryl sulfate (also referred to as Witconate) and hot water. It is mixed in a 5,700 gallon tank behind the regrind mills, then transferred to a 13,200 gallon storage tank.

Effectiveness: Releases of this chemical would be contained directly by the mill sump system. The Mill sump also contains a high level alarm to provide warning in the event of a large release.

Monitoring: Chemical storage containers are routinely inspected in accordance with the SPCC/MCP (Appendix A) by Mill personnel to assess effectiveness and integrity of each EPF system. Maintenance and/or updates to facilities, systems, equipment, or procedures are performed as needed to be protective of the environment and to prevent releases.

Mill EPF 2.7 - Sodium Lauryl Sulfate Storage: Witconate is a precursor to the frothing agent Syntex that is mixed with hot water in the mill process. It is stored inside the mill building in 200 pound drums. Maximum storage quantity at the Henderson Mill is 50 drums.

Effectiveness: Releases of this chemical would be contained directly by the mill sump system. The Mill sump also contains a high level alarm to provide warning in the event of a large release.

Monitoring: Chemical storage containers are routinely inspected in accordance with the SPCC/MCP (Appendix A) by Mill personnel to assess effectiveness and integrity of each EPF system. Maintenance and/or updates to facilities, systems, equipment, or procedures are performed as needed to be protective of the environment and to prevent releases.

Mill EPF 2.8 - Tergitol NP-9/9N9 Surfactant Storage: NP-9/9N9 is a surfactant used in the lead leach circuit in the mill process to prevent "lumping" of concentrate. It is stored as a liquid in a storage tank with a capacity of 9,400 gallons. Prior to its addition into the mill circuit, NP-9/9N9 is pumped to a gravity feed tank with a 500 gallon capacity.

Effectiveness: Releases of this chemical would be contained directly by the mill sump system. The Mill sump also contains a high level alarm to provide warning in the event of a large release.

Monitoring: Chemical storage containers are routinely inspected in accordance with the SPCC/MCP (Appendix A) by Mill personnel to assess effectiveness and integrity of each EPF system. Maintenance and/or updates to facilities, systems, equipment, or procedures are performed as needed to be protective of the environment and to prevent releases.

Mill EPF 2.9 – Coherex Storage: Coherex is a hydrocarbon based chemical used for dust suppression and has a proven record as an effective dust suppressant in the mining industry and elsewhere. Its use at Henderson to suppress the release of airborne particulates from the beach area of the tailings storage facility has also been highly effective.

Coherex is stored in two 10,000 gallon tanks near the tailings storage facility maintenance building. It is a biodegradable, hydrocarbon based suppressant which consists of 50 percent petroleum resins and 40 percent wetting solution. The solution is mixed at a ratio of 1 part Coherex to 5 parts water and is applied with a 3,000 gallon capacity TRYCO balloon-tired vehicle, a 2,800 gallon Terragator vehicle, and is also delivered via helicopter in the spring.

Coherex is applied to the entire beach area in the spring season. Spot applications are made periodically during the remainder of the snow-free season as conditions dictate.

Effectiveness: These tanks are dual-walled and are located within the process seep water area, providing tertiary containment.

Monitoring: Chemical storage containers are routinely inspected in accordance with the SPCC/MCP (Appendix A) by Mill personnel to assess effectiveness and integrity of each EPF system. Maintenance and/or updates to facilities, systems, equipment, or procedures are performed as needed to be protective of the environment and to prevent releases.

6.3. Storm Water Diversion System

Mill EPF 3.1 – Storm Water Diversion System: Storm water diversion systems have been constructed on the:

- West and north ends of the tailings storage facility to divert un-impacted storm water around the north end of the property to the Williams Fork River; and
- Southwest portion of the Mill property to divert drainages through an underground diversion pipe to the Williams Fork River.

See section 10.2 and the Henderson Storm Water Management Plan for additional information on storm water diversion systems.

Effectiveness: The storm water diversion canals have been effective in preventing the amount of storm water that can come into contact with disturbed land, designated chemicals and toxic or acid forming materials. As a result, the potential pollution of storm water is greatly reduced.

Monitoring: The storm water diversion system is inspected twice per year in accordance with Henderson's Storm Water Management Plan (see Section 10.2 for additional information).

7. GROUNDWATER INFORMATION

Groundwater issues at hard rock mine sites are regulated through the DRMS under authority of Senate Bill 89-181. Henderson has prepared and submitted a Groundwater Management Plan, Technical Revision 16 (TR-16) to the DRMS which outlines practices and procedures to protect groundwater quality pursuant to Rule 3.1.7(5) of the Mineral Rules and Regulations of the Colorado Mined Land Reclamation Board for Hard Rock, Metal, and DMOs.

TR-16 establishes permit conditions, including numeric protection levels (NPL) protective of ground and surface waters. TR-16 is an important component of this EPP.

The following is a general summary of the water bodies, site geology and site hydrogeology in and around the mine and mill sites as it relates to groundwater. More detailed information and related references have been developed and submitted as a part of Henderson's Reclamation Permit (as revised and amended), including TR-16.

7.1. Water Maps

Figures 1 and 2 depict surface water bodies within the vicinity of the Mine and Mill.

7.2. Site Geology

7.2.1. Mine

The bedrock of the area surrounding the Henderson Mine site is relatively shallow and is composed primarily of Precambrian Silver Plume Granite and Tertiary Period stock and dike granitic inclusions that are highly altered by hydrothermal activity. The inclusions are upgradient from the Mine site and may produce significant naturally occurring background concentrations of dissolved metals in the groundwater. The Vasquez Fault and a related fracture zone may affect the groundwater flow, but the fate of any percolation into the fault would be recirculation into the established Mine water system. The expected fate of all other potential contamination would be accumulation in the stream flow and shallow groundwater associated with the West Fork of Clear Creek.

7.2.2. Mill

The Henderson Mill and tailings storage facilities are located in the Ute Creek Basin of the Williams Fork drainage basin. The Ute Creek Basin is bounded on the west by the Vasquez Mountain Range and bounded on the north, south and east by northwest trending Williams Fork Mountains. The Ute Creek Basin basement rocks consist of weathered and unweathered Precambrian gneiss and schist of the Idaho Springs Formation and Silver Plume Granite. In some areas of the basin, the Miocene-aged Troublesome Formation consists mostly of unconsolidated and semi-consolidated lensed clays, silts, sands, gravels and volcanic ash grading to consolidated siltstone, sandstone, conglomerate and claystone derived from the weathering of the Williams Fork Mountain Range. Pleistocene-aged glacial end-moraines, lake sediments and outwash material encroach on the Ute Creek Basin and overlie the Troublesome Formation. End-moraines are a conglomeration of boulders, cobbles, gravels, sands, silts and clays. Glacial lake sediments cover low flat sections while glacial outwash was deposited in braided stream beds. Glacial outwash consists of gravels, cobbles and sands. The Troublesome Formation is generally blanketed by a 2 to 10-foot thick layer of recent slopewash and residual soils. Alluvial material generally lies within the present stream valleys.

The Henderson Mill and adjacent facilities are constructed on the Idaho Springs Formation and Silver Plume Granite. The tailings storage area is located on the western slope of the Williams Fork River Valley and is constructed primarily on the Troublesome Formation although some areas overlay glacial and alluvial deposits.

7.3. Site Hydrogeology

7.3.1. Mine

Groundwater occurrence at the Henderson Mine is primarily limited to a thin, well-defined lens of alluvium which is bounded on all sides by the Precambrian Silver Plume Granite Formation. Groundwater occurrence within the Precambrian Silver Plume Granite is limited. The low permeability of the granite is evident in the Mine workings where groundwater inflow has remained unchanged in the 36 year life of the Henderson operation. Additionally, because groundwater is pumped from the Mine workings to the surface for treatment, increased exposure of sulfides to oxidation through the underground mining activities does not impact groundwater quality near the underground workings.

Groundwater flow direction within the alluvium generally flows from the upper end of the drainage to the lower end. Upgradient of the confluence with Woods Creek, the alluvium pinches out and groundwater is forced to surface into the West Fork of Clear Creek. See Table 12 for current Mine monitoring locations.

7.3.2. Mill

Hydrogeologic conditions at the Henderson Mill were investigated by advancing seven borings into the alluvium and weathered bedrock in the fall of 1993. Of the seven borings, six borings were completed as monitoring wells (designated as GW-2 through GW-7). Based on the site geology, boring logs and observation of groundwater levels, three primary hydrostratigraphic units can be identified at the Henderson Mill site: 1) unconsolidated glacial and alluvial deposits, 2) the Troublesome Formation, and 3) the Idaho Springs Formation and Silver Plume Granite. The following sections summarize the hydraulic characteristics of each hydrostratigraphic unit. Within and downgradient of the tailings storage facility, groundwater primarily occurs within the glacial and alluvial deposits, while little groundwater flow is present in the Troublesome Formation, Idaho Springs Formation and Silver Plume Granite.

Glacial and Alluvial Materials

Field data from test pits and borings advanced prior to and after tailings deposition (Woodward-Clyde, 1983, Hydrokenetics, 1993) show that the groundwater levels within the glacial and alluvial materials are hydraulically connected. Since both the glacial and alluvial materials consist of gravels, sands and clay deposits, and are hydraulically connected, these materials are considered a single hydrostratigraphic unit.

The groundwater levels measured within the glacial and alluvial materials vary considerably across the site. When correlated to geologic data, it is evident that the variability of the groundwater levels can be attributed to multiple perched water zones present within pervious layers which overlay impervious layers. Therefore, the groundwater levels and hydraulic properties of this hydrostratigraphic unit are expected to be highly variable.

Troublesome Formation

The Troublesome Formation has been documented to contain discontinuous sands, gravels, lensed clays, and silts underlain by semi-consolidated siltstones, sandstones, conglomerates and claystones. Data from test pits and borings within the Troublesome indicate that the presence of groundwater within this unit is highly variable. A site study conducted by Woodward-Clyde (1983) concluded that this formation is not considered to be a continuous aquifer because of the limited extent of the sand layers in the formation which would preclude significant groundwater flow.

Idaho Springs Formation and Silver Plume Granite

The weathered and unweathered Precambrian Idaho Springs Formation and Silver Plume Granite are considered to be relatively impermeable compared to the overlying glacial, alluvial and Troublesome Formation deposits. The low permeability nature of the Idaho Springs Formation and the Silver Plume Granite have been documented through packer and geophysical testing in the Precambrian bedrock. These data indicate that the Precambrian bedrock is not capable of transmitting significant quantities of groundwater as compared to the overlying glacial and alluvial deposits and show a defined decrease in hydraulic conductivity with depth.

The primary groundwater flow path is generally from southwest and towards the Williams Fork River to the northeast. Data indicates that the direction of groundwater flow is essentially northward near GW-4, and bends northeastward (towards the William Fork River) in the area of well GW-7 (Hydrokinetics, 1993).

8. GROUNDWATER QUALITY DATA

8.1. Local Groundwater Uses

Mine: As discussed above, groundwater at the Mine is limited to a thin lens of alluvium that is bounded on all sides by low permeability, Precambrian Silver Plume Granite. Therefore, the current and future groundwater use at the site is limited to recharge of the West Fork of Clear Creek. The site hydrogeologic conditions cannot support development of groundwater resources for any other beneficial use.

Mill: Current and future groundwater use at the Henderson Mill is limited. Groundwater within the Henderson Mill property boundary occurs primarily in the areas downstream of the tailings storage facility. Within these areas, current and future domestic and agricultural development of groundwater would not be likely, given the site location and climate conditions. The primary use of groundwater at the Mill site is recharge to the Williams Fork River.

8.2. Groundwater Quality Data

A large database of groundwater quality data exists in the record and on file as part of this Permit. Five quarters of groundwater data were recently submitted along with the approved GWMP. As such, this data is not being resubmitted with this EPP. As discussed in this document and at more length in TR-16, due to Henderson's geology, groundwater is forced to the surface in close proximity to Henderson operations. Surface water quality data upstream and downstream of potentially impacted groundwater indicates that Mine and Mill operations are not adversely impacting surface water quality downstream of the sites (see Appendix H).

TR-16 stipulates that ongoing routine surface and groundwater monitoring will be conducted and submitted to the DRMS. The data will be sufficient to provide a basis for the evaluation of reclamation performance standards and the adequacy of Environmental Protection Facility design, maintenance and operation.

8.3. Groundwater Quality Parameters and Analytical Detection Limits

Groundwater collection and analyses procedures at the Mine and Mill sites are described in TR-16, including sampling parameters, monitoring locations, sampling and analytical procedures, detection limits, and frequency.

Sampling procedures are summarized in TR-16 were developed to meet the following minimum requirements:

- Generally, all ground and surface water samples shall be collected and analyzed in accordance with approved industry standards using methodologies, including quality assurance/quality control, similar to those required of major Federal and State monitoring programs and other programs of systematic monitoring or academic research;
- Surface water samples and measurements shall be representative of the nature of the monitored water body; and
- Groundwater samples will be collected and managed in accordance with the Colorado Department of Public Health and Environment's Suggested Sampling Protocol for Groundwater Monitoring Wells, as well as internally developed procedures.

9. SURFACE WATER CONTROL AND CONTAINMENT FACILITIES

9.1. Surface Water Control

As discussed earlier related to Mill EPF 3.1 and Mine EPF 1.2, a key strategy utilized by Henderson to prevent potential storm water pollution is to minimize the amount of storm water that can come into contact with disturbed land and other industrial activities. The Mine and Mill have installed the following diversionary systems:

- A storm water interceptor canal (known at the Ultimate Canal) has been constructed around the west and north ends of the tailings storage facility and delivers un-impacted storm water around the north end of the property to the Williams Fork River;
- A collection system has been constructed to divert storm water from drainages southwest of the Mill property through an underground diversion pipe to the Williams Fork River;
- Diversion ditches have been constructed on the south side of the Mine office and surface operations to divert water around industrial activities to the east end of the property; and
- Diversion ditches have been constructed around the west end and along the north side of the Mine property and deliver un-impacted storm water to the West Fork Clear Creek.

Design specifications and final certification for EPFs associated with surface water conveyance, capture and storage are submitted to the DRMS each time a modification to the Permit is proposed, as required.

9.2. Storm Water Management Plan

Henderson’s SWMP (Appendix B) has been prepared for the purpose of identifying potential sources of pollution reasonably expected to affect the quality of storm water discharges associated with operation of the Henderson Mine and Mill Sites and the conveyor that connects the sites together. The plan describes and provides guidelines for the implementation of both general best management practices (BMPs) and site-specific or activity-specific BMPs. These BMPs are designed to minimize the likelihood of pollutants being carried off-site through storm water discharges.

The SWMP (Appendix B) also provides information about the management of storm water that is combined with process waters being discharged under the provisions of Colorado Discharge Permit System (CDPS) Permit No. CO-0041467 and CO-0000230.

The storm water boundaries, BMPs, and outfall locations discussed in the SWMP (Appendix B) are based on surface discharges resulting from storm water events.

The SWMP (Appendix B) was developed to achieve the following objectives and goals:

1. To provide a simple format for inspection, control, prevention, and mitigation of potential pollution sources that may affect the quality of storm water discharge.
2. To provide a simple format for educating and training site personnel in methods and practices for storm water management and pollution prevention.
3. To provide assurance that the provisions of CDPS General Permit for Storm Water Discharges Associated with Metal Mining Operations and ancillary activities are met.

Two formal site inspections (one in the spring and one in the fall) are performed and documented to satisfy annual reporting requirements. These inspections are conducted by the site personnel and include a review of:

- All disturbed areas;
- Areas used for material storage or handling that are exposed to precipitation; and
- Other areas with potential sources of pollution.

The inspections:

- Look for evidence of, or the potential for, pollutants entering the drainage system;
- Review the adequacy and upkeep of storm water management measures, sediment and erosion control measures, and other BMPs identified in section 5.0 of the SWMP (Appendix B); and
- Include a visual inspection of equipment needed to implement the plan, such as spill response equipment.

Conditions not conforming to the SWMP (Appendix B) are proactively managed and corrected. If revision of the SWMP (Appendix B) is required, such revisions are made and implemented promptly.

Preventive maintenance tasks associated with the Henderson Operations are managed through a computer based work order system. Required maintenance has been identified and established for on-site equipment and processes. When new equipment is brought on-site, additional maintenance tasks are identified as required. Any deficiencies in preventive maintenance are identified during routine inspections performed by area workers and through regular area inspections performed by members of the environmental department. When issues are identified, they are brought to the attention of area supervisors and immediately addressed. Additional tasks may be added to the work order system, as needed.

10. SURFACE WATER QUALITY DATA

10.1. Local Water Uses and Standards

Mine: Adjacent to the Henderson Mine, Segment 4 of Clear Creek runs from the source of the West Fork of Clear Creek to the confluence with Woods Creek and is classified as Aquatic Life (cold) Class 1, Recreation E, Water Supply, and Agriculture. Downstream of the Henderson Mine, Segment 5 of Clear Creek runs from the confluence with Woods Creek to the confluence with Clear Creek and is classified as Aquatic Life (cold) Class 1, Recreation E and Agriculture. Stream segments are noted, relative to Mine operations, in Figure 1.

Mill: Adjacent to the Henderson Mill, the Williams Fork River, from the source to the confluence with the Colorado River, is Segment 8 of the Upper Colorado River basin. This segment is classified as Aquatic Life (cold) Class 1, Recreation E, Water Supply, and Agriculture. Stream segment location is noted, relative to Mill operations, in Figure 2.

10.2. Surface Water Quality Data

The CDPS Permit requires sampling and monitoring at both the Mine and Mill sites. A large database of surface water quality data exists in the public record and on file as part of this permit. Surface water quality data indicates that Mine and Mill operations are not adversely impacting water quality downstream of the sites.

Surface water data upstream and downstream of the Mine and Mill is included in Appendix H “Quarterly Surface Water Quality Data” for the past five successive calendar quarters.

TR-16 stipulates that ongoing surface and groundwater monitoring, including upstream and downstream of the mine and mill sites, will be conducted and submitted to the DRMS. The ongoing collection of this data will be sufficient to provide a basis for the evaluation of reclamation performance standards and the adequacy of Environmental Protection Facility design, maintenance and operation.

11. WATER QUALITY MONITORING PLAN

The water treatment and discharge systems are permitted as discussed previously (CDPS Permit CO-0041467 for the Mine; CO-0000230 for the Mill). These permits require extensive monitoring. Detailed information regarding the types of monitoring, parameters, frequency, reporting requirements, methods and analyses are found in these permits. The Henderson Mine and Mill stream and groundwater sampling locations are presented in Figures 1 and 2 and summarized in Tables 12 and 13. These include locations that are currently monitored as part of the approved GWMP.

The CDPS Permit (No. CO-0000230) identifies one Outfall (004A) at the Henderson Mill site which would require monitoring should a discharge or bypass of process water be authorized. Since the mill operates in a closed system, monitoring only is required in the event of a discharge. Detailed information regarding the types of monitoring, parameters, frequency, reporting requirements, methods and analyses is found in that permit.

TR-16 stipulates additional monitoring as discussed in section 9.0 and 11.0 above.

12. CLIMATE

Information regarding climate was developed during the planning and early construction phases of the Henderson Project. This data is found in Section 3.1 of the Mining and Reclamation Permit. A more detailed description of baseline climatic data in the vicinity of the Mine and Mill, based on records from stations located near these facilities, is described below.

The climate in the Henderson Mine and Mill area includes long, snowy, cold winters and short, cool summers. Snow is possible throughout the year, with the heaviest snowfall occurring between the months of November and April.

Baseline climatic data for the vicinity of the Mine was obtained from the Western Regional Climate Center (WRCC) (www.wrcc.dri.edu) for “Jones Pass 2 E” (Station #054397), elevation 10,328 feet AMSL. Data is available for the years 1961-1973; although this range of years is shorter than desired, the elevation and location of this station offers a satisfactory analog for climate conditions at the surface area of the Mine. The station is located at 39.77º N, 105.85º W. Annual precipitation values for the most recent five-year period that data is available are presented in Table 2 along with the average annual precipitation. The greatest annual precipitation recorded for this site occurred in 1969, and the monthly precipitation values for that year are presented in Table 2. Table 3 shows the mean monthly temperature and the monthly average maximum and minimum temperature for the most recent five-year period that data is available.

Baseline climatic data for the vicinity of the Henderson Mill was obtained from the WRCC for “Dillon 1 E” (Station # 052281) and “Williams Fork Dam” (Station # 059096). The Dillon station is located approximately 16 miles SSE of the Henderson Mill, in the Town of Dillon (39.63 °N, 106.04 °W, elevation 9,065 feet AMSL), with data observations from the year 1893 to the present. The Williams Fork Dam station is located approximately 14 miles northwest of the Henderson Mill site (40.02 °N, 106.13 °W, elevation 7,650 feet AMSL) with data observations from the year 1982 to the present. Annual precipitation values for the most recent five-year period that data are available for these two stations are presented in Table 4 along with the average annual precipitation. The greatest annual precipitation record for the Dillon station occurred in 1936, and for the West Fork Dam Station occurred in 1985, and the corresponding monthly precipitation values for these years at each station are presented in Table 4. Tables 5 and 6 show the mean monthly temperature and the mean monthly maximum and minimum temperature for the most recent five-year period that data is available at these stations.

Mean wind speed data are available in limited quantities via the on-site weather stations maintained by Henderson (see below). However, wind direction data are not currently available at any stations near the Mine or Mill. Generally, winds exhibit typical mountain flow patterns, and vary significantly from location to location because of the rugged topography. The National Climatic Data Center of NOAA provides information regarding high winds for Grand and Clear Creek Counties. A wind speed of 60 knots (69.0 miles per hour) was reported in the town of Kremmling in Grand County (40.06 °N, 106.39 °W, elevation 7,313 feet AMSL) on June 6, 2003; a wind speed of 94 knots (108 miles per hour) was reported for Squaw Mountain in Clear Creek County (39.68 °N, 105.5 °W, elevation 11,509 feet AMSL) on October 26, 1995; and a wind speed of 63 knots (72.5 miles per hour) was reported for the Town of Georgetown in Clear Creek County (39.72 °N, 105.70 °W, elevation 8,520 feet AMSL) on May 22, 2006. Based on this information, it is likely maximum wind gusts may reach 70 to 80 miles per hour.

Evaporation rates exceed total precipitation rates. Nearby pan evaporation data is available through WRCC for "Grand Lake 6 SSW" (8,367 feet AMSL, data from 1948-2005), and "Green Mountain Dam" (7,903 feet AMSL, data from 1948-2005). Mean annual pan evaporation at Grand Lake 6 SSW was 35.51 inches; average annual pan evaporation at Green Mountain Dam was 31.90 inches. At both of these sites, all pan evaporation occurred between the months of May and October.

A limited amount of data is also available via the hydrological and meteorological instrumentation that has been installed and maintained by Henderson. Monitoring stations are located at the Mine, Mill and Urad sites. These data are limited in scope and duration but help to provide a secondary and more recent view of weather trends at all three locations. Data for these three stations can be found in Tables 7 through 11.

Urad-1 Weather Station: This small station was established in December 2008 near the now-closed Urad Mine. The instrumentation is installed on a tripod mount, within a fenced compound. The wind sensor is mounted approximately 8 feet (2.5 meters) above ground level (39° 45.546' North, 105° 49.383' West, 10,160 feet elevation (+/- 20 feet)). Data from this station includes monthly and daily air temperature, relative humidity and wind speed. The U-2 Weather Station (39° 46'0.7536" North, 105° 49'3.0684" West) provides the monthly and daily precipitation data applied to the Urad-1 Weather Station in Table 10 and Table 11.

Henderson Mill Weather Station: The Henderson Mill Weather Station was installed in August, 2010. Concrete foundations for the 10-meter (33-feet) aluminum tower, the tower lowering device, and rainfall collector base were poured on the morning of August 9, 2010 and allowed to cure for 24 hours before the tower was completely assembled and instrumentation installed on it. Shortly after installation, a performance audit was carried out (39° 51.695' North, 106° 05.424' West, 8,840 feet elevation (+/- 20 feet)). Data from this station includes monthly and daily precipitation, monthly barometric pressure, monthly relative humidity, monthly wind speed and monthly air temperature.

Butler Gulch Weather Station: The Henderson Mine Butler Gulch weather instrumentation is installed on a single (top) section of a standard aluminum tower. The wind sensor is mounted approximately 10 feet (3 meters) above the ground level.(39° 46.155' North, 105° 51.275 West, 10,500 feet elevation (+/- 20 feet)). Data from this station includes monthly wind speed and monthly air temperature.

13. GEOCHEMICAL DATA AND ANALYSIS

13.1. Evaluation of Ore and Tailings Storage Facility

The Henderson ore body contains unoxidized sulfides that, in the presence of oxygen, water and bacteria, have the potential to become an acid-forming material as defined in Rule 1, Section 1.1 (1). Henderson concurred with this fact when it accepted the DRMS determination that the Henderson Mine was a DMO under the amended rules. Thus, based upon discussions with DRMS personnel, development of specific geochemical data are not necessary for mill tailing material.

13.2. Evaluation of Overburden Properties

In stream monitoring data on file with the Division comparing metal concentrations above and below the Henderson Mine provide demonstration that, after 40 years, the fill materials used to construct benches and facility support at the Mine is not generating ARD that impact water quality. Nonetheless, Henderson has managed this area as though it could potentially be acid-forming, and has adequate controls in place to detect acid forming conditions and elevated concentrations of key parameters through routine surface and groundwater monitoring (see sections 8, 9, 10, and 11).

Furthermore, related to the development of the Groundwater Management Plan (TR-16), Henderson performed a geochemical evaluation of the Mine site fill materials in June, 2010 with the intent of identifying key parameters that have a reasonable potential of being transported from mining materials to surface and groundwater systems and incorporating these parameters in the scope of ongoing surface and groundwater monitoring.

The upper portion of the old railroad haulage route from the portal for approximately the first 2 miles is constructed of rock excavated during construction of the haulage tunnel. This material was tested for the potential to be acid producing. Acid-base accounting analyses were used to test six (6) grab samples collected from this stretch of railroad in June of 1995, and are presented in Appendix G. The data indicate that this fill material is non-acid producing.

14. CONSTRUCTION SCHEDULE INFORMATION

Construction schedules are determined whenever an EPF is changed or updated (see Appendix D and E for a list of DRMS Permit Amendments and Technical Revisions). Henderson will continue to follow this method of updating and modifying EPFs when observations, changing operational requirements or environmental conditions warrant.

15. QA/QC PROGRAM

The QA/QC program, and measures to be employed during construction of EPFs, are determined whenever an EPF is changed or updated (see Appendix D and E for a list of DRMS Permit Amendments and Technical Revisions). This targets the QA/QC program to be specific to the facility in question, ensuring QA/QC efficacy. Henderson will continue to follow this method of updating and modifying EPFs when observations, changing operational requirements or environmental conditions warrant.

16. PLANT GROWTH MEDIA AND REVEGETATION

The Henderson Mine and Mill site closure and reclamation plan are detailed in Section 9.0 of the Mining and Reclamation Permit. The Permit has been modified as site conditions warrant and reclamation technology advances. Generally, revegetation plays an important role in this approved plan. While topsoil material (growth media) is not widely available to cover the 15 acre mine site, it will be available to cover the tailings storage facility at the Mill site to an average depth of 12 inches. Detailed soils information and maps are found in Section 6.2 of the Mining and Reclamation Permit as modified. Tabular data that describe the results of chemical analyses of soil samples is included in the 1989 Soil and Vegetation Studies Report that is a component of the public record.

In addition, significant research relative to soils and revegetation has been conducted at Henderson since the mid-1970s (Section 8.0 of the Mining and Reclamation Permit). Much of this research, including soil/vegetation test plots, is revisited periodically to determine long-term trends.

Recommendations on soil and revegetation material from the local Natural Resources Conservation Service (NRCS) have been taken in to account as modifications to the Permit were compiled and reviewed.

17. WILDLIFE PROTECTION

Since the initial planning process for the Henderson Project in the late 1960s, wildlife resources have been recognized by Henderson. Colorado Division of Wildlife (CDOW) personnel were involved in all early planning stages, and this relationship has continued over the past 25 years.

Information and data developed during planning is included in Section 6.3 of the Mining and Reclamation Permit. Comments and input into this permit application were solicited from the CDOW by Henderson prior to the initial filing. Although wildlife issues at Henderson have never been significant, Henderson has maintained excellent communications throughout the years with both Regional Office personnel and the local District Wildlife Managers at the Mine and Mill sites.

In addition, Amendment 03 to the Permit included plans for wetland mitigation and forest management strategies that Henderson is continuing to pursue. These practices will improve habitat on Mine and Mill property, and have a positive influence on area wildlife.

17.1. Statement of Zero Mortalities

Since commencing operations, neither the Henderson Mine nor the Henderson Mill has experienced or documented any wildlife mortalities attributable to mining-generated process water, designated chemical releases, or acid producing materials.

18. DISPOSAL OF TAILINGS AND SLUDGES IN MINE WORKINGS

Tailings are not disposed of in mine workings. Water treatment sludge from the URAD treatment plant is hauled off site for disposal. Sediments collected at the mine water settlers underground are hauled to the conveyor and transferred to the Mill with other ore where it is processed for molybdenum recovery. In past years, some of these sediments have intermittently been stored in underground drifts. These sediments will either be processed as the drifts are mined out in the future or will remain in place. Since the sediments are of the same mineral composition as the ore body, no discrete impacts or management is anticipated.

Tables

Table 1. - Designated Chemicals[1] Used at the Henderson Mill

NAME	USE	MAXIMUM QUANTITY	STORAGE LOCATION	APPROX. USE	FATE
Phosphorous Pentasulfide (P2S5)	Lead, Copper Depression	48,000 lbs.	Mill	0.024 lb./Ton	Complexed in tailings
Sodium Hydroxide	Nokes and Water Treat.	24,600 gal.	Mill	0.191 lb/Ton (Mill)	Neutralized
Hydrochloric Acid	Lead Leach Circuit	50,000 gal.	Mill	0.47 lb/Ton	Neutralized
Cytec OrePrep F-579	Frother	2,600 gal.	Mill	0.009 lb/Ton	Prod. & tail
Orform D8 Depressant	Depressant	2,600 gal.	Mill	0.038 lb/Ton	Prod. & tail
Pine Oil	Frother	14,400 gal.	Mill	0.032 lb/Ton	Prod. & tail
Collector Oil[2]	Collector	32,000 gal.	Mill	0.619 lb./Ton	Prod. & tail
#2 Diesel Fuel	Collector and Heating Fuel	32,000 gal.	Mill	0.619 lb./Ton	Prod. & tail
Syntex	Frother, Soap	18,900 gal.	Mill	0.015 lb/Ton	Prod. & tail
Sodium Lauryl Sulfate	Frother, Soap	8,000 lbs.	Mill	0.004 lb/Ton	Prod. & tail
Tergitol NP-9 Surfactant	Surfactant in Lead Leach	9,400 gal.	Mill	0.022 lb/Ton	Prod. & tail
Coherex	Tailings dust control	20,000 gal.	Tailings impound.	1500 gal/day when used	Tailings

[1] The designated chemicals, listed quantities, and use concentrations are presented as the best information available at the time of the submittal of this EPP. These chemicals, quantities, and concentrations may vary based upon production needs and processes. For example, brand name chemicals such as (but not limited to) Syntex, Cytec OrePrep F-579 or Orform D8 Depressant may be changed out for different brands of similar chemicals based on factors such as cost and availability. Changes in brands and reagent usage are a part of the production process and are not considered to be grounds for notification to the DRMS.

[2] Mainly use Vapor Oil, but Diesel #2 may be used as a backup.

Table 2. - Henderson Mine Precipitation Data (from WRCC Jones Pass 2E Station)

5-Year Annual Precipitation Totals	
Year	**Total Annual Precipitation**
1969	**36.57**
1970	28.5
1971	18.68
1972	24.2
1973	10.5
Mean	23.69

Greatest Annual Precipitation on Record, by Month	
Month	**1969 – WRCC Jones Pass 2E Station (inches)**
January	2.81
February	1.12
March	1.86
April	1.67
May	7.11
June	5.31
July	2.12
August	3.58
September	1.98
October	5.05
November	1.8
December	2.16
Total	**36.57**

Climate data obtained from the Western Regional Climate Center (www.wrcc.dri.edu).

Table 3. Henderson Mine Temperature Data (from WRCC Jones Pass 2E Station)

Month	**1969**			**1970**			**1971**			**1972**			**1973**		
	Range (°F)		Mean (°F)	Range (°F)		Mean (°F)	Range (°F)		Mean (°F)	Range (°F)		Mean (°F)	Range (°F)		Mean (°F)
	Min	Max		Min	Max		Min	Max		Min	Max		Min	Max	
January	6.5	27.8	17.2	3.7	22.7	13.2	4.4	23.9	14.2	2.9	24.9	13.9	1.8	26.5	14.2
February	5.2	29.2	17.2	7.7	30.8	19.3	1.1	23.1	12.1	8.6	29.9	19.2	3.5	30.5	17.0
March	1.7	27.7	14.7	3.1	28.5	15.8	7.0	28.6	17.8	16.4	37.3	26.8	5.9	32.8	19.3
April	17.0	43.3	30.1	8.9	34.1	21.5	18.7	40.0	29.4	20.4	41.6	31.0	10.8	34.5	22.7
May	26.9	52.5	39.7	24.7	51.7	38.2	21.9	52.9	37.4	25.0	49.3	37.1	25.3	46.1	35.7
June	30.2	53.0	41.6	31.3	59.3	45.3	32.0	62.9	47.5	35.3	61.2	48.2	33.0	58.7	45.8
July	38.6	67.2	52.9	37.2	66.5	51.8	36.2	67.5	52.0	38.8	66.5	52.7	-	-	-
August	38.9	67.5	53.2	37.8	67.3	52.6	36.7	67.1	51.9	36.8	63.1	50.0	-	-	-
September	32.3	58.4	45.3	27.2	54.7	41.0	27.8	56.8	42.3	32.5	55.3	43.9	-	-	-
October	14.0	37.9	25.9	14.9	39.2	27.1	22.1	48.7	35.4	25.0	46.3	35.7	-	-	-
November	10.5	33.8	22.2	10.4	31.4	20.9	13.6	35.2	24.4	7.3	30.1	18.7	-	-	-
December	7.7	28.7	18.2	5.9	29.0	17.4	3.7	28.2	16.0	6.1	25.2	15.7	-	-	-

Climate data obtained from the Western Regional Climate Center (www.wrcc.dri.edu).

Table 4. Henderson Mill Precipitation Data (from WRCC Dillon 1E Station and Williams Fork Dam Station)

5-Year Annual Precipitation Totals		
Year	WRCC Dillon 1E Station (inches)	WRCC Williams Fork Dam Station (inches)
2006	15.76	11.91
2007	14.96	17.30
2008	16.36	14.89
2009	11.56	13.69
2010	13.90	16.73
2011	17.48	16.18
Mean	15.00	15.12

Greatest Annual Precipitation on Record, by Month		
Month	1936 – WRCC Dillon 1E Station (inches)	1985 – WRCC Williams Fork Dam Station (inches)
January	3.65	0.93
February	6.97	0.89
March	3.6	1.01
April	0.6	1.73
May	0.76	1.08
June	0.75	1.45
July	2.54	4.27
August	4.43	0.76
September	0.73	4.05
October	1.12	2.06
November	0.35	3
December	0.78	0.42
Total	26.28	21.65

Climate data obtained from the Western Regional Climate Center (www.wrcc.dri.edu).

Table 5. Henderson Mill Temperature Data (from WRCC Dillon 1E Station)

Month	2005			2006			2007			2008		
	Range (°F)		Mean (°F)	Range (°F)		Mean (°F)	Range (°F)		Mean (°F)	Range (°F)		Mean (°F)
	Min	Max		Min	Max		Min	Max		Min	Max	
January	9.0	34.4	21.7	2.5	30.0	16.3	-3.2	29.6	13.2	-1.3	24.1	11.4
February	5.3	34.1	19.7	1.2	30.4	15.8	7.6	33.1	20.3	3.9	29.6	16.8
March	10.3	37.6	23.9	10.7	39.2	24.9	13.8	43.1	28.4	3.6	34.4	19.0
April	17.7	49.0	33.4	19.3	52.4	35.8	19.6	48.2	33.9	11.6	43.2	27.4
May	25.9	59.1	42.5	27.3	61.8	44.5	26.4	59.1	42.7	25.1	53.8	39.4
June	31.9	65.2	48.6	33.1	73.0	53.1	33.4	69.8	51.6	30.9	67.7	49.3
July	37.5	78.2	57.8	40.9	75.1	58.0	43.8	79.2	61.5	37.9	76.0	57.0
August	35.8	71.2	53.5	38.7	70.5	54.6	45.0	76.5	60.7	36.9	72.3	54.6
September	30.6	68.3	49.5	26.9	59.5	43.2	34.1	68.2	51.2	28.0	65.5	46.7
October	23.6	54.9	39.3	21.2	48.6	34.9	25.3	56.7	41.0	20.1	55.0	37.6
November	11.9	40.1	26.0	12.8	41.7	27.2	13.5	46.1	29.8	15.4	42.9	29.1
December	2.8	26.4	14.6	4.1	31.4	17.7	2.4	26.7	14.5	4.1	28.2	16.2

Month	2009			2010			2011		
	Range (°F)		Mean (°F)	Range (°F)		Mean (°F)	Range (°F)		Mean (°F)
	Min	Max		Min	Max		Min	Max	
January	7.0	30.4	18.7	0.0	31.5	15.7	1.3	26.2	13.3
February	7.3	34.5	20.9	-2.8	29.5	13.4	-1.2	27.3	13.1
March	11.7	41.2	26.4	7.4	39.7	23.5	12.4	40.5	26.4
April	16.8	44.2	30.5	18.4	46.9	32.7	19.2	44.4	31.8
May	---	---	---	24.8	54.5	39.6	24.6	52.0	38.3
June	34.0	63.6	48.8	33.7	70.7	52.2	31.3	69.0	50.2
July	36.9	73.6	55.3	39.4	75.9	57.7	40.9	74.9	57.9
August	33.4	71.4	52.4	38.0	73.2	55.6	38.1	74.7	56.4
September	30.2	65.4	47.8	28.4	70.4	49.4	30.1	65.7	47.9
October	19.2	47.0	33.1	22.7	55.48	39.1	20.9	53.4	37.2
November	11.0	45.7	28.4	9.3	37.5	23.4	11.5	40.9	26.2
December	-1.7	27.0	12.7	10.5	34.9	22.7	1.3	33.2	17.2

Climate data obtained from the Western Regional Climate Center (www.wrcc.dri.edu).

Table 6. Henderson Mill Temperature Data (from WRCC Williams Fork Dam Station)

Month	2005			2006			2007			2008		
	Range (°F)		Mean (°F)	Range (°F)		Mean (°F)	Range (°F)		Mean (°F)	Range (°F)		Mean (°F)
	Min	Max		Min	Max		Min	Max		Min	Max	
January	2.9	26.6	14.7	3.3	25.5	14.4	-12.5	17.4	2.5	-7.7	22.0	7.2
February	-1.6	27.6	13.0	-7.0	25.0	9.0	7.4	32.9	20.2	2.5	27.0	14.8
March	9.8	37.5	23.7	12.6	40.6	26.6	13.6	42.6	28.1	3.5	34.2	18.9
April	22.5	53.7	38.1	23.9	57.0	40.4	23.1	54.1	38.6	17.0	46.6	31.8
May	31.1	62.5	46.8	31.2	65.6	48.4	30.6	63.4	47.0	30.1	59.3	44.7
June	37.3	69.3	53.3	37.8	76.4	57.1	36.5	74.0	55.3	35.0	70.7	52.9
July	42.5	81.4	61.9	46.9	80.0	63.5	45.5	82.2	63.9	42.3	79.6	61.0
August	40.9	74.8	57.9	42.8	76.1	59.5	46.1	78.8	62.4	41.4	76.4	58.9
September	33.5	71.3	52.4	30.7	64.1	47.4	36.2	70.5	53.3	32.1	69.2	50.7
October	27.3	57.2	42.3	23.9	52.1	38.0	24.8	56.9	40.9	22.5	57.7	40.1
November	15.2	40.7	27.9	14.0	43.1	28.6	12.3	45.3	28.8	17.1	43.9	30.5
December	1.3	24.7	13.0	1.9	27.3	14.6	3.4	24.9	14.2	5.5	29.7	17.6

Month	2009			2010			2011		
	Range (°F)		Mean (°F)	Range (°F)		Mean (°F)	Range (°F)		Mean (°F)
	Min	Max		Min	Max		Min	Max	
January	6.9	30.2	18.5	-3.3	22.9	9.8	-0.1	24.6	12.2
February	6.2	33.5	19.9	-4.3	26.4	11.2	-1.6	26.8	12.6
March	15.3	43.5	29.4	9.4	39.7	24.5	15.9	41.7	28.8
April	21.1	49.1	35.1	24.1	51.5	37.8	24.0	48.8	36.4
May	34.0	63.9	49.0	29.8	58.2	44.0	30.4	56.3	43.3
June	38.2	66.9	52.6	39.1	72.7	55.9	37.5	71.3	54.4
July	41.1	76.8	59.0	45.1	78.6	61.9	46.5	76.8	61.6
August	38.3	75.8	57.1	44.0	76.5	60.2	43.4	79.0	61.2
September	33.4	69.9	51.7	33.5	72.4	53.0	35.5	68.4	52.0
October	22.4	50.8	36.6	27.8	57.8	42.9	25.7	54.9	40.3
November	13.1	45.8	29.5	13.8	38.7	26.3	13.0	38.3	25.6
December	-4.7	22.3	8.8	13.0	34.7	23.9	1.7	28.2	15.0

Climate data obtained from the Western Regional Climate Center (www.wrcc.dri.edu).

Table 7. Henderson Mine and Mill Monthly Wind Speed and Air Temperature (from On-Site Weather Stations)

Monthly Wind Speed (mph)						
Date	**Urad**		**Mill**		**Mine**	
	Average	**Max. Gust**	**Average**	**Max. Gust**	**Average**	**Max. Gust**
Sept-10	6.8	43.5	5.7	40.2	5.6	45.3
Oct-10	6.7	48.9	5.3	49.3	5.5	37.0
Nov-10	8.5	44.6	4.9	55.8	6.1	37.8
Dec-10	9.5	65.2	4.8	55.1	6.5	42.4
Jan-11	9.3	57.9	4.2	43.7	7.5	47.3
Feb-11	10.6	53.4	7.0	51.1	6.8	44.7
Mar-11	9.9	48.3	6.3	54.8	6.9	42.4
April-11	10.0	47.0	6.8	46.4	6.4	48.1
May-11	8.4	47.2	5.9	42.9	5.6	39.3
June-11	7.9	41.2	6.8	53.3	5.6	32.6
July-11	5.7	42.7	4.7	46.5	5.0	29.7
Aug-11	5.4	31.7	5.1	45.0	5.0	34.8
Sept-11	5.7	39.5	4.2	33.1	5.1	31.9
Oct-11	7.6	40.6	5.2	45.2	6.5	36.0
Nov-11	9.9	60.3	5.8	53.4	7.3	62.2
Dec-11	8.3	77.9	4.3	69.4	6.8	68.7

Table 7. Henderson Mine and Mill Monthly Wind Speed and Air Temperature (from On-Site Weather Stations) cont.

Monthly Air Temperature (^{O}F)									
Date	**Urad**			**Mill**			**Mine**		
	Average	**Maximum**	**Minimum**	**Average**	**Maximum**	**Minimum**	**Average**	**Maximum**	**Minimum**
Sep-10	50.0	73.1	30.7	52.2	80.6	25.7	48.6	70.4	27.2
Oct-10	36.5	65.4	10.5	39.1	73.2	5.3	35.1	64.2	7.0
Nov-10	22.8	56.1	-5.6	23.3	59.6	-15.4	21.1	54.5	-7.9
Dec-10	23.3	40.9	-13.5	23.0	45.7	-17.6	21.7	40.1	-15.0
Jan-11	16.9	44.5	-13.0	15.2	41.8	-19.6	15.2	42.1	-13.5
Feb-11	15.4	42.6	-31.4	22.4	47.2	-1.3	14.1	42.5	-32.7
Mar-11	26.0	45.2	2.9	27.5	55.9	-0.6	24.9	45.1	3.5
April-11	28.8	51.2	7.7	31.9	14.1	6.1	27.6	51.4	6.6
May-11	35.7	61.0	3.9	39.6	71.0	8.7	34.9	59.2	3.7
June-11	49.7	72.3	31.1	54.5	81.2	28.8	47.6	71.0	29.9
July-11	55.5	74.4	0.8	59.8	84.2	38.6	54.0	72.7	37.2
Aug-11	55.2	72.6	42.1	59.3	82.2	40.0	54.5	72.6	39.8
Sept-11	45.1	69.8	29.6	48.8	78.4	26.6	44.3	69.3	28.5
Oct-11	35.7	59.2	5.8	37.3	71.0	5.8	34.3	57.8	6.1
Nov-11	25.4	46.5	1.4	24.3	52.0	1.2	23.9	45.0	0.4
Dec-11	17.0	44.1	-15.5	15.6	46.7	-15.8	15.8	73.3	-13.1

Table 8. Urad Facility Air Temperature, Relative Humidity and Wind Speed (from On-Site Weather Station)

Urad Weather Data Summary: January 2009 to December 2011											
	Air Temperature						Relative Humidity (%)			Wind Speed (mph)	
Date	Minimum		Maximum		Average		Minimum	Maximum	Average	Average	Maximum
	Deg C	Deg F	Deg C	Deg F	Deg C	Deg F	%	%		MPH	MPH
Jan-09	-23.4	-10.1	6.5	43.7	-6.3	20.6	10	96	60	11.2	57.8
Feb-09	-18.1	-0.6	5.8	42.4	-6.1	21.1	15	96	56	8.9	50.3
Mar-09	-19.0	-2.2	8.9	48.0	-3.8	25.2	10	95	51	10.0	47.2
Apr-09	-17.8	0.0	10.4	50.7	-1.2	29.9	11	100	59	8.3	40.4
May-09	-5.1	22.8	18.8	65.8	5.4	41.8	13	100	60	7.3	41.4
Jun-09	-0.1	31.9	20.3	68.5	8.4	47.1	12	100	59	6.6	41.2
Jul-09	3.6	38.5	23.0	73.4	12.4	54.4	11	99	53	6.1	47.1
Aug-09	0.5	32.9	23.5	74.3	11.4	52.6	11	95	49	6.0	76.7
Sep-09	-4.7	23.5	18.5	65.3	7.3	45.2	12	99	59	6.1	39.4
Oct-09	-15.4	4.3	12.9	55.2	-0.6	30.9	19	99	61	8.1	43.7
Nov-09	-19.1	-2.4	11.2	52.2	-2.0	28.4	11	96	50	7.5	44.7
Dec-09	-26.2	-15.2	1.0	33.8	-10.6	13.0	15	99	60	8.8	48.1
Jan-10	-21.4	-6.5	5.7	42.3	-7.3	18.9	13	95	60	7.9	52.6
Feb-10	-21.3	-6.3	3.1	37.6	-9.9	14.2	11	95	67	6.7	53.0
Mar-10	-22.2	-8.0	10.3	50.5	-5.0	23.0	9	96	60	7.7	45.3
Apr-10	-13.6	7.5	10.2	50.4	-1.3	29.7	15	99	61	8.4	44.8
May-10	-10.4	13.3	20.0	68.0	2.9	37.1	11	99	56	8.5	49.4
Jun-10	-0.4	31.3	21.8	71.2	10.9	51.7	9	99	50	7.6	47.0
Jul-10	2.8	37.0	23.7	74.7	13.0	55.3	10	98	57	5.8	38.4
Aug-10	3.0	37.3	22.0	71.7	11.5	52.7	15	95	61	5.7	78.9
Sep-10	-0.2	31.6	22.6	72.6	10.0	50.0	8	94	39	6.8	43.5
Oct-10	-11.8	10.8	18.2	64.7	2.5	36.5	12	98	63	6.7	48.9
Nov-10	-20.7	-5.3	13.2	55.7	-5.1	22.8	14	95	57	8.5	44.6
Dec-10	-25.2	-13.4	4.8	40.6	-4.8	23.3	17	97	62	9.6	65.2

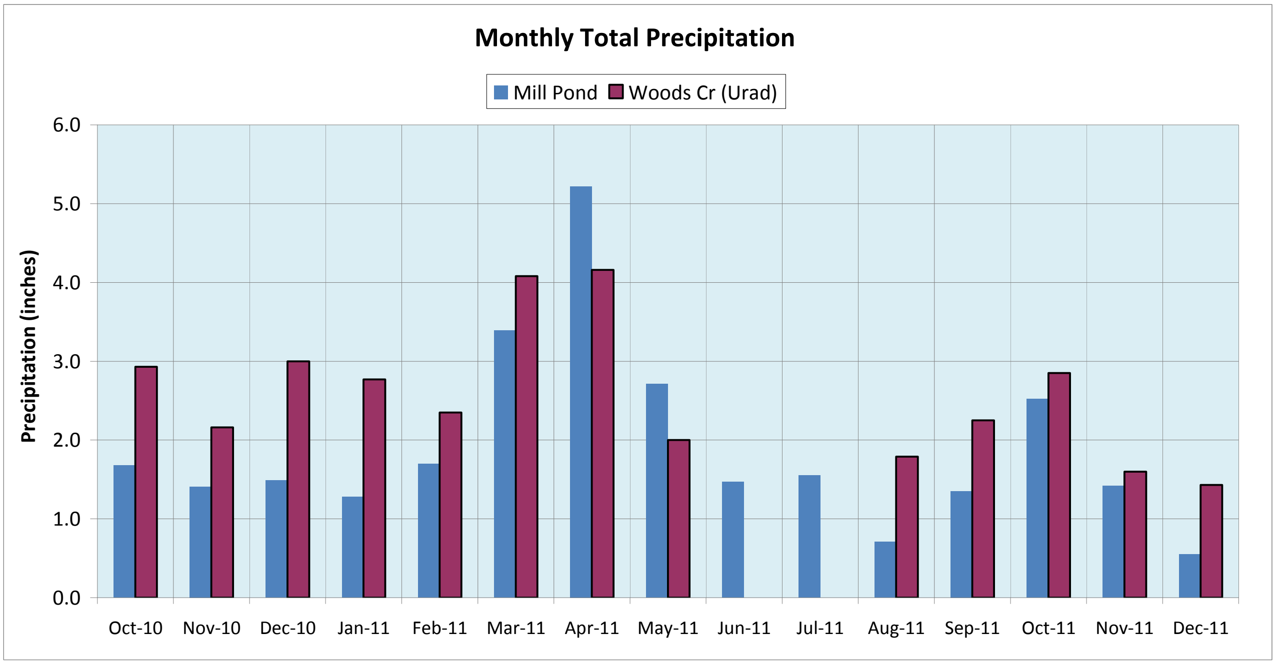
Table 8. Urad Facility Air Temperature, Relative Humidity and Wind Speed (from On-Site Weather Station) cont.

Urad Weather Data Summary: January 2009 to December 2011											
	Air Temperature						Relative Humidity (%)			Wind Speed (mph)	
Date	Minimum		Maximum		Average		Minimum	Maximum	Average	Average	Maximum
	Deg C	Deg F	Deg C	Deg F	Deg C	Deg F	%	%		MPH	MPH
Jan-11	-25.0	-13.0	7.0	44.5	-8.4	16.9	13	94	64	9.3	57.9
Feb-11	-35.0	-31.4	5.9	42.6	-9.2	15.4	9	97	57	10.6	53.4
Mar-11	-16.2	2.9	7.3	45.2	-3.3	26.0	7	95	55	9.9	48.3
Apr-11	-13.5	7.7	10.7	51.2	-1.8	28.8	11	98	60	10.0	47.0
May-11	-15.6	3.9	16.1	61.0	2.1	35.7	10	97	59	8.4	47.2
Jun-11	-0.5	31.1	22.4	72.3	9.8	49.7	6	98	45	7.9	41.2
Jul-11	-17.3	0.8	23.6	74.4	13.1	55.5	12	96	62	5.7	42.7
Aug-11	5.6	42.1	22.6	72.6	12.9	55.2	9	95	56	5.4	31.7
Sep-11	-1.3	29.6	21.0	69.8	7.3	45.1	13	98	62	5.7	39.5
Oct-11	-14.6	5.8	15.1	59.2	2.1	35.7	10	98	54	7.6	40.6
Nov-11	-17.0	1.4	8.1	46.5	-3.7	25.4	6	97	50	9.9	60.3
Dec-11	-26.4	-15.5	6.7	44.1	-8.3	17.0	11	94	61	8.3	77.9

Table 9. Urad Facility Air Temperature and Relative Humidity Comparison by Month/Year (from On-Site Weather Station)

Comparison by Month/Year						
Month	**Temperature F**			**RH %**		
	2009	**2010**	**2011**	**2009**	**2010**	**2011**
January	20.6	18.9	16.9	60	60	64
February	21.1	14.2	15.4	56	67	57
March	25.2	23.0	26.0	51	60	55
April	29.9	29.7	28.8	59	61	60
May	41.8	37.1	35.7	60	56	59
June	47.1	51.7	49.7	59	50	45
July	54.4	55.3	55.5	53	57	62
August	52.6	52.7	55.2	49	61	56
September	45.2	50.0	45.1	59	39	62
October	30.9	36.5	35.7	61	63	54
November	28.4	22.8	25.4	50	57	50
December	13.0	23.3	17.0	60	62	61

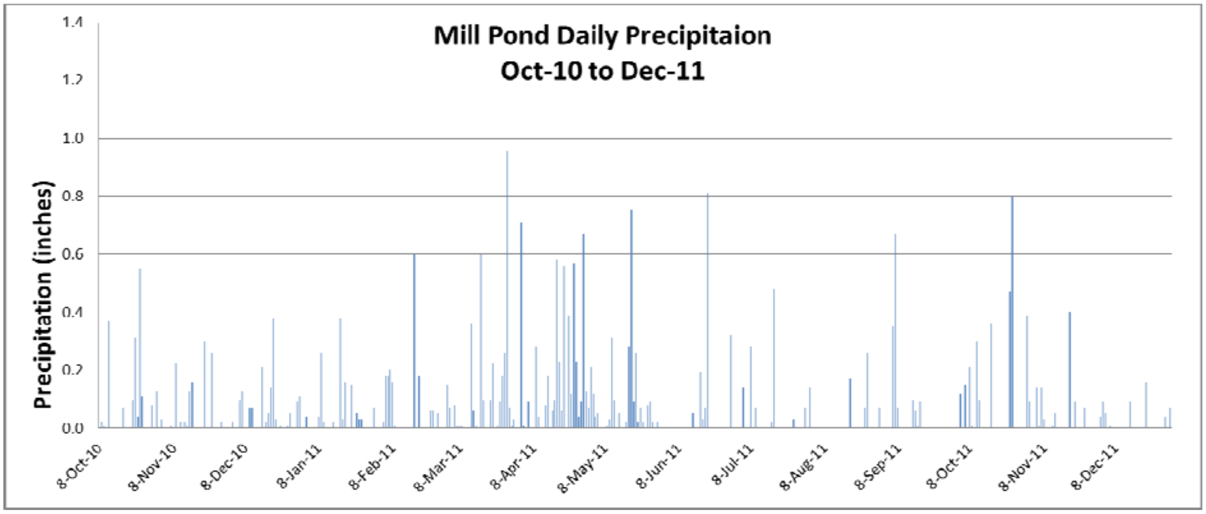
Table 10. Henderson Mill and Urad Facility Monthly Precipitation (from On-Site Weather Stations)



Monthly Precipitation Totals (inches)

Month	Mill Pond	Woods Cr (Urad)
Oct-2010	1.68	2.93
Nov-2010	1.41	2.16
Dec-2010	1.49	3.00
Jan-2011	1.28	2.77
Feb-2011	1.70	2.35
Mar-2011	3.39	4.08
Apr-2011	5.22	4.16
May-2011	2.71	2.00
Jun-2011	1.47	NA
Jul-2011	1.55	NA
Aug-2011	0.71	1.79
Sep-2011	1.35	2.25
Oct-2011	2.52	2.85
Nov-2011	1.42	1.60
Dec-2011	0.55	1.43

Table 11. Henderson Mill and Urad Facility Daily Precipitation (from On-Site Weather Stations)



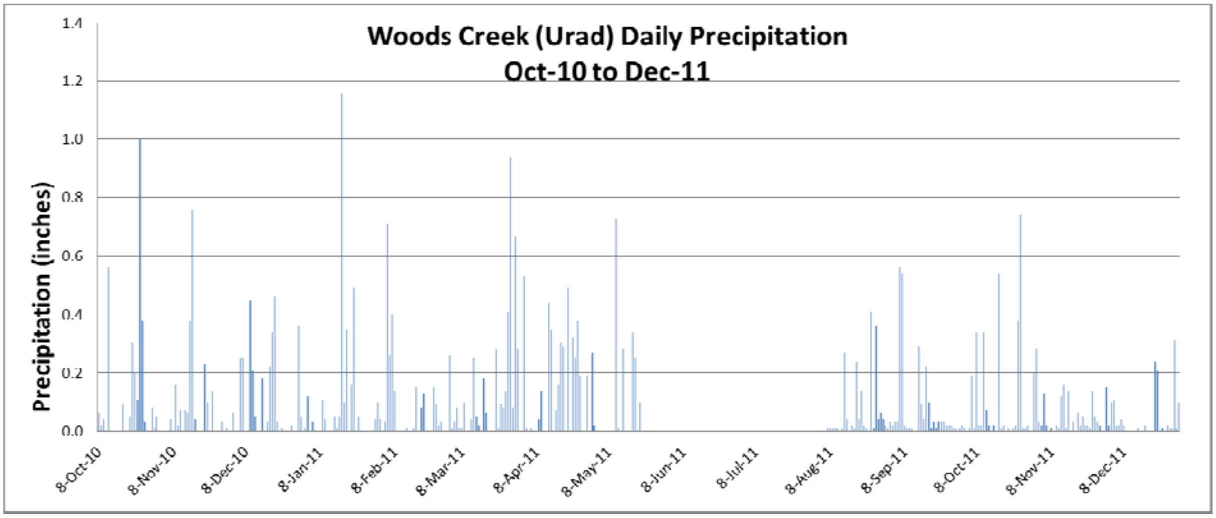


Table 12. Henderson Mine Current Monitoring Locations

Monitoring Location	Description
Monitoring Well MNGW-1 (alluvial materials)	Installed in 1993 to evaluate groundwater quality in the alluvium.
Monitoring location CC-10	Surface water sampling site located upgradient of the Mine site in West Fork of Clear Creek.
Monitoring location CC-30	Surface water sampling site located downgradient of the Mine site in West Fork of Clear Creek.
Monitoring location BG-20	Surface water sampling site located upgradient of the Mine site in Butler Gulch.

Table 13. Henderson Mill Current Monitoring Locations

Monitoring Location	Description
Monitoring Well MLGW-7 (alluvial materials)	Completed to approximately 40-feet in alluvial materials.
WFR-20	Surface water sampling site located upgradient of the Mill site in the Williams Fork.
WFR-40	Surface water sampling site located downgradient of the Mill site in the Williams Fork.
MLGW-ACR	State assigned POC well for iron and manganese downstream of Henderson Mill property at Aspen Canyon Ranch.

Appendix A

SPCC / Materials Containment Plans and Incident Response Manuals

See attached CD for Appendix A

SPCC/Material Containment Plans and Incident Response Manuals

Appendix B

Storm Water Management Plan

See attached CD for Appendix B

Storm Water Management Plan

Appendix C

MSDS Sheets for Designated Chemicals

List of MSDS's

1) P2S5
2) Caustic Soda (Sodium Hydroxide)
3) Hydrochloric Acid
4) Oreprep F-579
5) Orform D8 Depressant
6) Pine Oil – Terpene SW Blend
7) Collector Oil (Calumet Hydrocal 60)
8) #2 Diesel Fuel
9) Sodium Lauryl Sulfate
10) Tergitol NP-9/9N9
11) Huntsman N95 Surfonic N-95
12) Coherex

CHEMTRADE LOGISTICS	**Phosphorus Pentasulfide** **Revision:** 06 **Revised Date:** March 2, 2010	**FOR CHEMICAL EMERGENCY 24 Hours** **IN CANADA Call CANUTEC (613) 996-6666** **IN the USA Call CHEMTREC (800) 424-9300** **CHEMTREC – OUTSIDE USA (703) 527-3887** **Chemtrade Emergency Contact: (866) 416-4404**

SECTION 01 – PRODUCT & COMPANY IDENTIFICATION

COMPANY INFORMATION:

Corporate Office
CHEMTRADE LOGISTICS
155 Gordon Baker Road
Suite 300
Toronto, Ontario M2H 3N5
Prepared by: Chemtrade Logistics Inc.
Date Prepared: March 2, 2010
For MSDS Info: (416) 496-5856
www.chemtradelogistics.com

In USA
CHEMTRADE PHOSPHORUS
SPECIALTIES L.L.C.
440 North Ninth Street
Lawrence, KS 66044
Customer Service: 785-843-2290
Ext 105 (Call Collect)

HAZARD RATINGS:

WHMIS:	CONTROLLED	**NFPA**	**RATING**	**HMIS**	**RATING**
CLASS		**HEALTH**	2	**HEALTH**	2
	B4 – Flammable Solid	**FLAMMABILITY**	1	**FLAMMABILITY**	1
	D1B – Toxic Material	**REACTIVITY**	2	**PHYSICAL HAZARD**	2
		SPECIFIC HAZARD	~~W~~	**PERSONAL PROTECTION**@	K

See Section 8 for additional recommended PPE. User should determine the acceptable PPE for their employees.

PRODUCT INFORMATION:

PRODUCT NAME:	Phosphorus Pentasulfide
CAS NUMBER:	1314-80-3
FORMULA:	P_2S_5
PRIMARY PRODUCT USE:	Intermediate for lubricating oil additives or for pesticide manufacture. Also used as “sink float” agent for ore processing.
SYNONYMS:	Tetraphosphorus Decasulfide, Phosphorus Persulfide
CHEMICAL FAMILY:	Inorganic Chemical
TRADE NAMES:	None

SECTION 02 – COMPOSITION/INFORMATION ON INGREDIENTS

No.	**COMPONENT**	**CAS NO.**	**WT. %**	**EXPOSURE LIMITS**
1.	Phosphorus Pentasulfide	1314-80-3	100 %	1 mg/m3 TWA (ACGIH) 3 mg/m3 STEL/Ceiling (ACGIH) 1 mg/m3 PEL (OSHA) 3 mg/m3 STEL/Ceiling (OSHA)

SECTION 03 – HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW:

Danger! Flammable solid. Dangerous when wet. Material reacts with water and/or water vapor (humid air) to produce flammable and toxic hydrogen sulfide gas and heat. Cover spills or leaks with dry sand, clay or ground limestone. DO NOT USE WATER. In case of fire, use dry chemical, carbon dioxide, or dry sand. Wear full protective clothing and positive pressure self-contained breathing apparatus.

POTENTIAL HEALTH EFFECTS:

Airborne dust is irritating to eyes, nose, throat and skin. Reaction with water or moisture produces hydrogen sulfide gas that is irritating to lungs and eyes. Exposure to high concentrations (500-1000 ppm) of hydrogen sulfide gas causes unconsciousness and death from respiratory paralysis.

Read the entire MSDS for a more thorough evaluation of the hazards.

(REFER TO **SECTION 11** FOR ADDITIONAL INFORMATION)

EXPECTED ROUTE OF ENTRY	
SKIN CONTACT:	X
SKIN ABSORPTION:	
EYE CONTACT:	X
INHALATION:	X
INGESTION:	X

EFFECTS OF EXPOSURE:

ACUTE EFFECTS FROM OVEREXPOSURE:

This product is toxic by the oral and inhalation routes of exposure. It is moderately irritating to the eyes and skin. Inhalation of this product causes irritation of the respiratory tract, eyes, skin, nose, throat and mucous membranes. This product readily hydrolyzes to hydrogen sulfide (H_2S) and phosphoric acid in the presence of moisture. Both of these decomposition products are also severely irritating to eyes, skin and upper respiratory tract.

Contact with water or moisture may liberate toxic H_2S. Symptoms of H_2S exposure include headache dizziness, decrease in blood pressure and loss of consciousness.

EYE CONTACT:

Moderately irritating to the eyes.

INHALATION:

Inhalation of this product is toxic. Causes irritation of the respiratory tract, eyes, skin, nose, throat and mucous membranes.

INGESTION:

This product is toxic by the oral routes of exposure. May cause abdominal cramps, burning sensation, diarrhea or vomiting.

CHRONIC EFFECTS:

No data available. Product is not known to have chronic effects.

KNOWN EFFECTS ON OTHER ILLNESSES:

None Known

LISTED CARCINOGEN (REFER TO **SECTION 11** FOR ADDITIONAL INFORMATION):

Agency	Listed	Ranking
OSHA:	**No**	Not listed
NTP:	**No**	Not listed
IARC:	**No**	Not listed
ACGIH	**No**	Not listed

SECTION 04 – FIRST AID MEASURES

GENERAL:

FIRST AID FOR EYES:

Immediately flush eyes with running water for a minimum of 20 minutes. Hold eyelids open during flushing. If irritation persists, repeat flushing. Obtain medical attention **IMMEDIATELY**.

FIRST AID FOR SKIN:

Remove excess powder and dusts. Flush **IMMEDIATELY** under running water for minimum of 20 minutes. If redness or irritation persists, repeat flushing. Seek **IMMEDIATE** medical attention.

Discard heavily contaminated clothing and shoes in a manner that limits further exposure. Otherwise, wash clothing separately before reuse.

FIRST AID FOR INHALATION:

Remove subject to fresh air. Seek medical aid if lung irritation persists or if breathing becomes difficult. If breathing stops, begin artificial respiration (rescue breathing). If no breathing and no pulse, begin Cardiopulmonary Resuscitation (CPR). Seek **IMMEDIATE** medical attention.

FIRST AID FOR INGESTION:

Rinse mouth with water. Dilute by giving 1 or 2 glasses of water. **IMMEDIATELY** call physician and seek medical attention. Send copy of MSDS to physician.

NOTE TO PHYSICIAN:

Hydrolyzes in the presence of moisture to hydrogen sulfide and phosphoric acid. Inhaled material is strongly irritating and may require administration of humidified oxygen and perhaps bronchodilators. Systemic effects of hydrogen sulfide may include alterations of consciousness, possible coma, respiratory arrest and anoxic terminal convulsions, thought to be due to inhibition of tissue (cytochrome) respiration. Supportive care should be instituted, particularly oxygen and/or artificial respiration (oxygen is useful here not only for hypoxia, but also to help oxidize sulfide to sulfate).

SECTION 05 - FIRE FIGHTING MEASURES

EXTINGUISHING MEDIA:

WATER:	
ALCOHOL FOAM:	
CARBON DIOXIDE (CO_2):	**X**
DRY CHEMICAL:	**X**
WATER/FOG SPRAY:	
DRY SAND:	**X**
NO EXTINGUISHING MEDIA:	

FLASH POINT (°F):	Not applicable - Solid Material
FLAMMABLE LIMITS:	
Lower Explosive Limit (LEL):	Not applicable
Upper Explosive Limit (UEL):	Not applicable
AUTOIGNITION TEMPERATURE (°F):	500 – 554 °F (260-290 degrees °C) for dust

HAZARDOUS COMBUSTION PRODUCTS:
Ignitable by spark or friction; dust presents explosion hazard; combustion yields toxic and corrosive phosphorus pentoxide and sulfur dioxide. Reacts with water to liberate toxic and flammable hydrogen sulfide gas and phosphoric acid.

SPECIAL FIRE FIGHTING PROCEDURES:
Exercise **CAUTION** when fighting any chemical fire. Evacuate non-essential personnel to a safe area. Prevent unauthorized entry to fire area. Do not use water. Entire bulk of material must be covered by extinguishing agent to prevent reignition. Goggles, protective clothing, and positive pressure self-contained breathing apparatus should be worn to protect against toxic gas and corrosive fumes.

Use NIOSH approved positive pressure self-contained breathing apparatus and full protective clothing.

For fighting fires in close proximity to spill or vapors, use acid-resistant personal protective equipment.

Dike area to contain runoff and prevent contamination of water sources.
Neutralize runoff with lime, soda ash, magnesium hydroxide or other suitable neutralizing agents.

UNUSUAL FIRE AND EXPLOSION HAZARDS:
Potential for dust explosion.

HAZARDOUS DECOMPOSITION PRODUCTS:
Sulfur dioxide and phosphorus pentoxide from oxidation.

Hydrogen sulfide and phosphoric acid from reaction with water.

SECTION 06 - ACCIDENTAL RELEASE MEASURES

STEPS TO BE TAKEN IN CASE OF SPILL OR LEAK:
Isolate spill area. Evacuate non-essential personnel to a safe distance. Personnel responding to spill must be properly trained.

Wear proper personal protective equipment. Avoid inhalation of mists and vapors. Do not touch or walk through spilled material.

Due to potential for generation of explosive dust or hydrogen sulfide gas, ventilate area and remove all ignition sources (no smoking, flares, sparks or flames). All equipment should be bonded and grounded. Use spark-proof tools.

If safe to do so, stop discharge and contain spill by forming barriers to minimize contaminated area. Prevent water from contacting spilled material. Diking and absorbent materials must be non-reactive with corrosive materials.

Contain and recover liquid material when possible. Neutralize with alkaline material such as soda ash, lime or magnesium hydroxide, then absorb with inert material such as DRY earth, sand or other non-combustible material. Use clean non-sparking tools to collect solid material and place it into loosely covered containers compatible with corrosives for later disposal.

Spills are subject to CERCLA reporting requirements: RQ = 100 lbs. National Response Center (800-424-8802)

Ensure adequate decontamination of tools and equipment following clean up. Decontaminate tools and equipment by using alkaline neutralizing agent and scrubbing with soap and water. Remove any cleaning wastes and contaminated soil with the recovered material.

Due to potential ignitability and reactivity, cleaned up material may be a RCRA Hazardous Waste. Generator is responsible for proper characterization of waste material. Dispose waste material at approved waste treatment/disposal facility in accordance with applicable State, Local, Provincial and Federal regulations. See Section 13 for additional information.

SECTION 07 - HANDLING AND STORAGE

HANDLING PROCEDURES:

Use in a totally enclosed process with a low moisture inert atmosphere. Maintain a low humidity atmosphere in the work areas where containers are opened and product is transferred to process. Avoid sliding or rough handling of containers. Dry powders can build static electricity when subjected to the friction of conveying, mixing or sliding. Adequate precautions, such as electrical grounding, bonding and inert atmospheres should be taken when P_2S_5 is either loaded or unloaded in order to prevent potential ignition. Grounding is not required during transportation.

Wear appropriate personal protective equipment to avoid contact with eyes and skin. Avoid inhalation of mist and vapors. Do not ingest material.

CAUTION: Local exhaust ventilation must be provided for all potential sources of release of airborne product dust and toxic flammable hydrogen sulfide gas (lower explosive limit is 4.3%; upper explosive limit is 46.0%). The exhaust system should be designed with proper duct and capture velocities consistent with controlling release below established exposure limits. Use airline supplied respirator or self contained breathing apparatus if ventilation system is not adequate.

Locate safety shower and eyewash station close to chemical handling area.

Containers of this material may be hazardous when empty since they may contain product residues.

STORAGE INFORMATION:

Store in cool, dry ventilated storage area (mechanical exhaust ventilation system, if necessary) away from combustibles or open flames. Thoroughly ventilate vans or box cars to remove hydrogen sulfide gas. Grounding is not required during storage.

SECTION 08 – EXPOSURE CONTROLS/PERSONAL PROTECTION

PERSONAL PROTECTIVE EQUIPMENT:

RECOMMENDED: Chemical safety goggles with face shield. Impervious (i.e., neoprene, PVC) gloves, Flame resistant long sleeve shirt, trousers, hard hat, closed shoes. Closed leather or rubber shoes. Contaminated clothing should be removed promptly and cleaned before re-use. NIOSH approved positive pressure self contained breathing apparatus or supplied air line should be utilized when there is potential generation and exposure to hydrogen sulfide.

A hard hat, and high top steel-toed safety shoes and safety glasses with side shields should also be worn.

RESPIRATORY PROTECTION:
A NIOSH approved positive pressure self contained breathing apparatus (SCBA) if there is potential exposure to hydrogen sulfide.

For unknown concentrations, as well as fire-fighting and other emergencies, use NIOSH approved positive pressure, self-contained breathing apparatus.

SKIN PROTECTION:
PROTECTIVE GLOVES:
Leather gloves normally adequate; rubber, neoprene or vinyl also satisfactory.

EYE PROTECTION:
Safety glasses normally adequate; wear chemical safety goggles or face shield where appropriate.

OTHER PROTECTIVE EQUIPMENT:
Eyewash and safety shower must be available in the work area.

ENGINEERING CONTROLS:
Use enclosed processes and local exhaust ventilation to keep airborne contaminants below recommended exposure limits.

Where possible, use mechanized or automated handling procedures to prevent or minimize personal contact. Ensure proper grounding and bonding.

Wash hands and face thoroughly before eating, drinking, using tobacco, or applying cosmetics when working or handling this material. Smoking should be prohibited in areas in which phosphorus pentasulfide is stored or handled.

Electrical installations should be protected against the corrosive action of hydrogen sulfide vapors.

EXPOSURE LIMITS:
Refer to **SECTION 2** for Recommended Exposure Limits for P_2S_5

Hydrogen Sulfide: TWA 10 ppm; STEL 15 ppm

IDLH (IMMEDIATELY DANGEROUS TO LIFE OR HEALTH CONCENTRATION):
P_2S_5 = 250 mg/m3; H_2S = 100 ppm

SECTION 09 – PHYSICAL AND CHEMICAL PROPERTIES

CHEMICAL FORMULA:	P_2S_5
MOLECULAR WEIGHT:	222.3
PHYSICAL STATE:	Yellow to yellow-green solid
APPEARANCE AND ODOR:	Hydrogen sulfide (rotten eggs)
ODOR THRESHOLD:	Low-about 1 ppm
pH:	Not applicable
SOLUBILITY IN WATER (% IN WATER):	Reacts with water to form H_2S gas
SPECIFIC GRAVITY: (H_2O = 1)	2.03 @ 20 degrees C
VAPOR DENSITY (AIR = 1):	Approx.9.5
BOILING POINT (^oF):	957 - 977 ^oF (514 - 525 degrees ^oC)
MELTING POINT/FREEZING POINT (^oF):	536 - 550 ^oF (280 – 288 degrees ^oC**)**

VAPOR PRESSURE (MM HG): 1 mm Hg @ 572 °F (300 degrees °C)
EVAPORATION RATE: (Butyl Acetate = 1): Not available

SECTION 10 – STABILITY AND REACTIVITY

STABILITY: Stable; under normal conditions. Contact with water or moisture may result in decomposition and formation of H_2S gas.

CONDITIONS TO AVOID: Sparks, heat or friction.

Minimize dust formation, and potential for electrostatic buildup.

Prevent exposure to moisture and water.

HAZARDOUS POLYMERIZATION: Will not occur

INCOMPATIBILITY: Water, acids, alcohols and oxidizing materials.

Sulfur dioxide and phosphorus pentoxide are generated from oxidation

Hydrogen sulfide and phosphoric acid are generated from reaction with water.

SECTION 11 - TOXICOLOGICAL INFORMATION

TOXICITY:
Product is toxic by oral and inhalation. Moderately irritating to eyes and skin.

REGISTRY OF TOXIC EFFECTS OF CHEMICAL SUBSTANCES (RTECS) NUMBER: TH4375000

TOXICITY	**DESCRIPTION**	**RESULTS**	**TESTED ON**
ACUTE ORAL			
LD_{50} (ORAL):	LETHAL DOSE (50%)	389 mg/kg of body weight	Rat
LD_{50} (ORAL):	LETHAL DOSE (50%)	750 mg/kg of body weight	Mouse
ACUTE INHALATION			
LC_{50} (INHALATION):	LETHAL CONCENTRATION (50%)	No data available	
SKIN EFFECTS:	Skin Irritation	Moderate	Rabbit
EYE EFFECTS:	Eye Irritation	Moderate	Rabbit

CARCINOGENCITY: Not known to be carcinogenic by IARC, NTP, OSHA or EPA.

REPRODUCTIVE EFFECTS: None known

MUTAGENCITY DATA: None known

TERATOGENICITY DATA: This product is **NOT** known or reported to have any teratogenic effects.

SYNERGISTIC MATERIALS: None known

SECTION 12 - ECOLOGICAL INFORMATION

ECOTOXICITY: No data available.

CHEMICAL FATE INFORMATION:
Reacts with water to form poisonous flammable (explosive) hydrogen sulfide and phosphoric acid.

ENVIRONMENTAL TOXICITY:

SPECIES	TEST TYPE	ENDPOINT	DURATION (hours)	DESCRIPTION	RESULT (mg/L)
ACUTE TOXICITY					
No data available					
CHRONIC TOXICITY					
No data available					

BIOACCUMULATION POTENTIAL: No data available

BIOLOGICAL OXYGEN DEMAND (BOD5): No data available

SECTION 13 – DISPOSAL CONSIDERATIONS

WASTE DISPOSAL INFORMATION:
Due to the sulfide-bearing nature of this chemical, waste from this product is considered a reactive hazardous waste and should be disposed of properly, while complying with all federal, state and local regulations. If disposed as an off-spec product, RCRA code U189 applies. D003 for reactive waste may also apply.

DO NOT flush to surface water or sanitary sewer system.

Containers of this material may be hazardous when empty since they may contain product residues.

Generator of the waste material is responsible for the proper characterization and disposal of the material. Dispose of material in accordance with ALL applicable State, Local, Provincial, and Federal regulations at approved waste management site.

SECTION 14 - TRANSPORT INFORMATION

U.S. DOT REGULATIONS:	REGULATED
SHIPPING NAME:	Phosphorus Pentasulfide, free from yellow and white phosphorus
UN/NA NUMBER:	UN 1340
HAZARD CLASS:	4.3 (4.1)
PACKAGING GROUP:	II
SPECIAL PROVISIONS (refer to 49 CFR 172.102):	A20, B59, IB4, T3, TP33
NON-BULK:	49 CFR 173.212
BULK:	49 CFR 173.242
PASSENGER AIRCRAFT/RAIL:	15 kg
VESSEL STOWAGE:	Stowage Category B, Stow “separated from” oxidizers
ER GUIDE:	139

TRANSPORT CANADA REGULATIONS: REGULATED
SHIPPING NAME: Phosphorus Pentasulphide, free from yellow and white phosphorus
UN/NA NUMBER: UN 1340
HAZARD CLASS: 4.3 (4.1)
PACKAGING GROUP: II
SPECIAL PROVISIONS: None
LIMITED QUANTITY: 0.5
ERAP: 1000 Kg
PASSENGER CARRYING SHIP/RAIL: Forbidden

INTERNATIONAL AIR TRANSPORTATION REGULATIONS: REGULATED
SHIPPING NAME: Phosphorus Pentasulfide, free from yellow and white phosphorus
UN/NA NUMBER: 1340
HAZARD CLASS: 4.3 (4.1)
PACKAGING GROUP: II
HAZARD LABELS Dangerous when wet / Flammable Solid

INTERNATIONAL MARITIME DANGEROUS GOODS REGULATION:
SHIPPING NAME: Phosphorus Pentasulfide, free from yellow and white phosphorus
UN/NA NUMBER: UN 1340
HAZARD CLASS: 4.3 (4.1)
PACKAGING GROUP: II
STOWAGE AND SEGREGATION: Category D

SECTION 15 - REGULATORY INFORMATION

OSHA:
Meets criteria for hazardous material as defined by the Occupational Safety and Health Administration (OSHA) in 29 CFR 1910.1200.

TSCA:
We certify that all components of this product are registered under the regulations of the Toxic Substances Control Act (TSCA).

SARA (SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT):

SARA (SECTION 311/312):			**SARA (SECTION 302):**		**RQ**
REACTIVE HAZARD:	Y		**EXTREMELY HAZARDOUS SUBSTANCE:**	N	
PRESSURE HAZARD:	N		**CERCLA HAZARDOUS SUBSTANCE:**	Y	100 lbs.
FIRE HAZARD:	Y				
IMMEDIATE/ACUTE:	Y		**SARA (SECTION 304):**		
DELAYED/CHRONIC:	N		**RELEASE NOTIFICATION**	Y	100 lbs.

SARA (SECTION 313 - TOXIC CHEMICAL):	Not Listed
CLEAN WATER ACT – PRIORITY POLLUTANTS:	None known at concentrations > 0.1%

CLEAN AIR ACT:

VOLATILE ORGANIC COMPOUNDS (VOC) (EPA METHOD 24/24a):	Inorganic chemical, none known
SECTION 112(r) – Risk Management Plan:	No
CERCLA – COMPREHENSIVE ENVIRONMENTAL RESPONSE, COMPENSATION, AND LIABILITY ACT:	**(FOR COMPONENTS LISTED IN SECTION 2)**
Phosphorus Pentasulfide	RQ = 100 lbs
RCRA (RESOURCE CONSERVATION & RECOVERY ACT):	Product may become Hazardous Waste. Generator is responsible for proper characterization and disposal of waste.
RCRA #:	U189 (Phosphorus Pentasulfide); D003 Reactive
FDA:	This product is **NOT** registered with the Food and Drug Administration (FDA).
USDA:	This product is **NOT** registered with the U.S. Department of Agriculture (USDA).

CANADIAN REGULATORY INFORMATION:

CANADIAN ENVIRONMENTAL PROTECTION ACT (CEPA):	This product conforms to the CEPA regulations.
LISTED ON DOMESTIC SUBSTANCE LIST (DSL):	Listed
LISTED AS PRIORITY SUBSTANCE:	Components are **NOT** listed.
LISTED AS TOXIC SUBSTANCE:	Components are **NOT** listed.
EXPORT CONTROL LIST:	Components are **NOT** listed.
LISTED ON NON-DOMESTIC SUBSTANCES LIST (NDSL):	Components are **NOT** listed.
NATIONAL POLLUTANT RELEASE INVENTORY (NPRI):	Product components are subject to NPRI reporting as particulate matter.

This product has been classified in accordance with the hazard criteria of the *Controlled Products Regulations* and the MSDS contains all the information required by the *Controlled Products Regulations*.

WORKPLACE HAZARDOUS INFORMATION SYSTEM (WHMIS):	CONTROLLED
CLASS:	B4 - Flammable Solid D1B – Material causing immediate and serious toxic effects (Toxic Material)
WHMIS Ingredient Disclosure List:	Meets criteria for disclosure at 1% or greater.

EUROPEAN/INTERNATIONAL REGULATIONS:

EUROPEAN INVENTORY OF EXISTING COMMERCIAL SUBSTANCES (EINECS) NUMBER:	215-242-4
EUROPEAN PRIORITY LISTS:	Not Listed
HAZARD SYMBOLS:	**F:** Highly Flammable **Xn:** Harmful **N:** Dangerous for the environment
RISK PHRASES:	**R11:** Highly Flammable **R20/22:** Harmful by Inhalation and if swallowed **R29:** Contact with water liberates toxic gas **R50:** Very toxic to aquatic organisms
SAFETY PHRASES :	**S2**: Keep out of the reach of children **S61:** Avoid release to the environment. Refer to special instructions/Safety data sheets

SECTION 16 – OTHER INFORMATION

OTHER PRECAUTIONS:	None Known

STATE REGULATORY INFORMATION:

MASSACHUSETTS SUBSTANCES LIST:	Listed (Extraordinarily Hazardous)
NEW JERSEY RIGHT TO KNOW (RTK) SUBSTANCE NUMBER:	1527
NEW YORK LIST OF HAZARDOUS SUBSTANCES:	Listed (RQ_{air} = 100 lbs, $RQ_{land/water}$ = 100 lbs.)
PENNSYLVANIA HAZARDOUS SUBSTANCE LIST:	Listed (Environmental Hazard)
RHODE ISLAND HAZARDOUS SUBSTANCE LIST:	Listed (T - ACGIH, F – NFPA)
CALIFORNIA PROPOSITION 65:	Not Listed

LABEL INFORMATION: (for Non-Bulk packages)

LABEL HAZARDS:

DANGER!	Dangerous when wet-Reaction with water may form toxic H_2S gas.
DANGER!	Flammable Solid. Avoid heat, sparks, and friction. Use proper bonding and grounding.
WARNING!	Avoid inhalation and ingestion of material.
CAUTION!	Keep container closed.
LABEL PRECAUTIONS:	Wear appropriate personal protective equipment to avoid contact with eyes and skin. Use with adequate ventilation. Use caution when opening closed containers.

MAIN REFERENCES:

1. "Dangerous Properties of Industrial Materials", Sax, N.I, .8th Edition, 1992.

2. NIOSH POCKET GUIDE TO CHEMICAL HAZARDS, U.S. Department of Health and Human Services, National Institute for Occupational Safety and Health, 2005-149

3. NIOSH RTECS Report # TH4375000

ACRONYMS:

ACGIH – American Conference of Governmental Industrial Hygienists
CAS – Chemical Abstract Service
CERCLA – Comprehensive Environmental Response, Compensation and Liability Act
CIAC – Chemistry Industry Association of Canada
DOT – Department of Transportation (U.S.)
EC – Effective Concentration (where desired endpoint observed)
EEC – European Economic Community
EPA – Environmental Protection Agency
g/m^3 – grams per cubic meter
HMIS - Hazardous Materials Identification System
IARC - International Agency for Research on Cancer
LC – Lethal Concentration
LD – Lethal Dose
mg/m^3 – milligrams per cubic meter
mg/kg – milligrams per kilogram
mg/L – milligrams per liter
NIOSH – National Institute for Occupational Safety and Health
MSDS – Material Safety Data Sheet
NOAEL – No Observed Adverse Effect Level
NOEC – No Observed Effect Concentration
NTP – National Toxicology Program
OSHA – Occupational Safety and Health Administration
RCRA – Resource Conservation and Recovery Act
RQ – Reportable Quantity
SARA – Superfund Amendments and Reauthorization Act
TWA – Time weighted average (8-hour)
UN/NA – United Nations/North America
WHMIS – Workplace Hazardous Materials Information System (Canada)
WT. % - Weight Percent

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MATERIAL SAFETY DATA SHEET

Sodium Hydroxide 50% Solution

MSDS Ref. No.: 1310-73-2-3
Date Approved: 05/13/2009
Revision No.: 5

This document has been prepared to meet the requirements of the U.S. OSHA Hazard Communication Standard, 29 CFR 1910.1200 and Canada's Workplace Hazardous Materials Information System (WHMIS) requirements.

1. PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME:	Sodium Hydroxide 50% Solution
SYNONYMS:	Caustic Soda Solution; Lye Solution; Sodium Hydrate Solution, White Caustic Solution
GENERAL USE:	pH Control This chemical is certified to ANSI/NSF Standard 60, Drinking Water Chemicals-Health Effects (as packaged in the original, unopened container). The maximum dosage level for this chemical is 200 mg/L

MANUFACTURER

FMC Wyoming Corporation
Alkali Chemicals Division
1735 Market Street
Philadelphia, PA 19103
(215) 299-6000 (General Information)
msdsinfo@fmc.com (Email - General Information)

EMERGENCY TELEPHONE NUMBERS

(307) 872-2452 (Plant - Green River, WY)

(303) 595-9048 (Medical - Call Collect)

For leak, fire, spill, or accident emergencies, call:
(800) 424-9300 (CHEMTREC - U.S.A. & Canada)

2. HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW:

- Water white liquid with no appreciable odor.
- Solution is corrosive to body tissues and metallic materials.
- Product may react violently with acids.

POTENTIAL HEALTH EFFECTS: Solution is corrosive and severely irritating to the eyes and skin.

MEDICAL CONDITIONS AGGRAVATED: Skin and lung disorders may be affected adversely by this material; an individual's specific medical condition and circumstances of exposure determine the likelihood of an adverse effect.

3. COMPOSITION / INFORMATION ON INGREDIENTS

Chemical Name	CAS#	Wt.%	EC No.	EC Class
Sodium Hydroxide	1310-73-2	50	215-185-5	C; R35
Water	7732-18-5	50	231-791-2	Not classified

4. FIRST AID MEASURES

EYES: Immediately flush with water for at least 15 minutes, lifting the upper and lower eyelids intermittently. See a medical doctor or ophthalmologist immediately.

SKIN: Immediately flush with plenty of water while removing contaminated clothing and/or shoes, and thoroughly wash with soap and water. See a medical doctor immediately.

INGESTION: Rinse mouth with water. Dilute by giving 1 or 2 glasses of water. Do not induce vomiting. Never give anything by mouth to an unconscious person. See a medical doctor immediately.

INHALATION: Remove to fresh air. If breathing difficulty or discomfort occurs and persists, contact a medical doctor.

NOTES TO MEDICAL DOCTOR: Sodium hydroxide at this concentration is corrosive. Major burns to all surfaces may result. Prolonged dilution with water is required. Neutralization of eye burns is absolutely contraindicated; for skin, 2% acetic acid has been recommended, but washing with water is effective. Ingestion requires milk or water dilution, consideration of esphagoscopy and management for possible esophageal stricture.

5. FIRE FIGHTING MEASURES

EXTINGUISHING MEDIA: Not applicable

FIRE / EXPLOSION HAZARDS: Non-combustible

FIRE FIGHTING PROCEDURES: Not applicable

FLAMMABLE LIMITS: Not applicable

HAZARDOUS COMBUSTION PRODUCTS: None

SENSITIVITY TO IMPACT: Not Sensitive

SENSITIVITY TO STATIC DISCHARGE: Not Sensitive

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6. ACCIDENTAL RELEASE MEASURES

RELEASE NOTES: Wear personal protective equipment as recommended in Section 8, "Exposure Controls/Personal Protection" below.

Contain spill using absorbent material and place in an approved container.

Dispose of according to the method outlined in Section 13, "Disposal Considerations" below.

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7. HANDLING AND STORAGE

HANDLING: During handling of liquid, prevent contact with skin and eyes by using adequate personal protective equipment (see Section 8, "Exposure Controls/Personal Protection" below). If the release of airborne material is likely, exhaust ventilation and/or respiratory protection may also be necessary.

STORAGE: Store in closed containers away from sources of heat.

COMMENTS: Use only in systems, processes and procedures in which effective ventilation has been provided to meet established exposure limits.

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8. EXPOSURE CONTROLS / PERSONAL PROTECTION

EXPOSURE LIMITS

Chemical Name	ACGIH	OSHA	Supplier
Sodium Hydroxide	2 mg/m^3 (ceiling)	2 mg/m^3 (PEL)	

ENGINEERING CONTROLS: Adequate engineering controls and/or personal protective equipment must be used to prevent contact with skin and eyes. Engineering controls and/or respirators may be necessary when the generation of airborne mists or fogs are possible.

PERSONAL PROTECTIVE EQUIPMENT

EYES AND FACE: Chemical goggles (and face shield if necessary) should be worn to prevent contact.

RESPIRATORY: When exposure above the established standard is likely, a respiratory protection program that complies with OSHA General Industry Standard 1910.134 should be implemented. Wear full face-piece respirators approved by MSHA / NIOSH if mists are expected.

PROTECTIVE CLOTHING: Rubber or vinyl apron. Rubber boots or rubber overshoes.

GLOVES: Impervious rubber or vinyl gloves with gauntlets. Thoroughly wash the outside of gloves with soap and water prior to removal. Inspect regularly for leaks.

COMMENTS:

The information noted above provides general guidance for handling this product. Specific work environments and material handling practices will dictate the selection and use of personal protection equipment (PPE).

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9. PHYSICAL AND CHEMICAL PROPERTIES

ODOR:	No appreciable odor
APPEARANCE:	Water white liquid
AUTOIGNITION TEMPERATURE:	Not applicable
BOILING POINT:	145 °C (293 °F)
COEFFICIENT OF OIL / WATER:	Not applicable
EVAPORATION RATE:	(butyl acetate = 1) Not available
FLASH POINT:	Non-combustible
FREEZING POINT:	4.4°C (40°F)
ODOR THRESHOLD:	Not applicable
OXIDIZING PROPERTIES:	Not available
PERCENT VOLATILE:	Not applicable
pH:	(as is) 13.7
SOLUBILITY IN WATER:	Infinite
SPECIFIC GRAVITY:	1.53 @ 15.5°C (60°F) (water = 1)
VAPOR DENSITY:	Not applicable
VAPOR PRESSURE:	6.33 mm Hg @ 40 °C (104 °F)

COMMENTS:

pH (1% solution): 13.0

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10. STABILITY AND REACTIVITY

CONDITIONS TO AVOID:	Contact with acids, flammable liquids, organic halogen compounds, nitro compounds, and amphoteric metals, such as aluminum, magnesium and zinc.
STABILITY:	Slightly reactive
POLYMERIZATION:	Will not occur
INCOMPATIBLE MATERIALS:	Acids, flammable liquids, organic halogen compounds, nitro compounds, and amphoteric metals, such as aluminum, magnesium and zinc.
HAZARDOUS DECOMPOSITION PRODUCTS:	None

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11. TOXICOLOGICAL INFORMATION

EYE EFFECTS: Severely irritating, corrosive (rabbit) [RTECS 1986, NIOSH 1975]

SKIN EFFECTS: Severely irritating, corrosive (rabbit) [RTECS 1986, PB 234-899 1974]

DERMAL LD_{50}: Corrosive

ORAL LD_{50}: 400 mg/kg (rabbit) LDLo [PB 234-899 1974]

INHALATION LC_{50}: Corrosive

TARGET ORGANS: Skin, eyes, mucous membranes

ACUTE EFFECTS FROM OVEREXPOSURE: Sodium hydroxide is corrosive and may produce severe eye, skin and respiratory tract irritation and upper gastrointestinal tract damage. Ingestion of concentrated solutions has caused death in animals and humans. [Gosselin, Smith & Hodge, 1984; PB 234-899 1974]

CHRONIC EFFECTS FROM OVEREXPOSURE: Sodium hydroxide may produce inflammation of the eyes, skin, and mucous membranes. Esophageal carcinoma at the site of a chronic lye stricture has been reported. [Gosselin , Smith & Hodge 1984]

CARCINOGENICITY:

NTP:	Not listed
IARC:	Not listed
OSHA:	Not listed
OTHER:	Not Listed (ACGIH)

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12. ECOLOGICAL INFORMATION

ECOTOXICOLOGICAL INFORMATION: Bluegill sunfish: 48-hour LC_{50} = 99 mg/L
Mosquito fish: 96-hour LC_{50} = 125 mg/L
Brown shrimp (Crangon crangon): 48-hour LC_{50} = 30 - 100 mg/L

The damaging effects are mostly a consequence of the increase in pH. The upper pH limit tolerated by most freshwater fish is 8.4; the pH must generally be greater than 9 before the aqueous environment becomes lethal for fully developed fish. Freshwater algae are destroyed above pH 8.5. Concentrations of 20 to 100 mg/L have been reported to kill salmon, trout, carp and crayfish. [Ref. , Environment Canada, Environmental Protection Service, Sodium Hydroxide Environmental and Technical Information for Problem Spills. June 1984]

CHEMICAL FATE INFORMATION: The pH effect of sodium hydroxide in water is naturally reduced by the absorption of atmospheric carbon dioxide. This reduction is also effected by dilution with water and by the natural acidity of a given water body. There is no degradation of sodium hydroxide in waters, only loss by absorption or through chemical neutralization.

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13. DISPOSAL CONSIDERATIONS

DISPOSAL METHOD: Dispose of in accordance with all local, state and federal environmental rules and regulations. Check the pH of the waste to be disposed, if it is greater than 12.5 it must be handled as a RCRA hazardous waste.

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14. TRANSPORT INFORMATION

U.S. DEPARTMENT OF TRANSPORTATION (DOT)

PROPER SHIPPING NAME:	Sodium Hydroxide Solution
PRIMARY HAZARD CLASS / DIVISION:	8
UN/NA NUMBER:	UN 1824
PACKING GROUP:	II

LABEL(S):	Corrosive
PLACARD(S):	Corrosive
ADDITIONAL INFORMATION:	Sodium hydroxide is in an "RQ" quantity when this material meets or exceeds 2500 pounds per bulk package. 49 STCC Number: 4935240

INTERNATIONAL MARITIME DANGEROUS GOODS (IMDG)

PROPER SHIPPING NAME:	Sodium Hydroxide Solution

INTERNATIONAL CIVIL AVIATION ORGANIZATION (ICAO) / INTERNATIONAL AIR TRANSPORT ASSOCIATION (IATA)

PROPER SHIPPING NAME:	Sodium Hydroxide Solution

OTHER INFORMATION:

Cool containers with water if exposed to fire or excessive heat conditions.

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15. REGULATORY INFORMATION

UNITED STATES

SARA TITLE III (SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT)

SECTION 302 EXTREMELY HAZARDOUS SUBSTANCES (40 CFR 355, APPENDIX A):
Not listed

SECTION 311 HAZARD CATEGORIES (40 CFR 370):
Immediate (Acute) Health Hazard

SECTION 312 THRESHOLD PLANNING QUANTITY (40 CFR 370):
The Threshold Planning Quantity (TPQ) for this product, if treated as a mixture, is 10,000 lbs; however, this product contains the following ingredients with a TPQ of less than 10,000 lbs.: None

SECTION 313 REPORTABLE INGREDIENTS (40 CFR 372):
This product does not contain any toxic chemicals subject to the reporting requirements of Section 313, Title III of the SARA (Superfund Amendments and Reauthorization Act) of 1986.

CERCLA (COMPREHENSIVE ENVIRONMENTAL RESPONSE COMPENSATION AND LIABILITY ACT)

CERCLA DESIGNATION & REPORTABLE QUANTITIES (RQ) (40 CFR 302.4):
Listed

Chemical Name	RQ	
Sodium Hydroxide	1,000 lb	Category C

TSCA (TOXIC SUBSTANCE CONTROL ACT)

TSCA INVENTORY STATUS (40 CFR 710):
All components are listed or exempt.

CANADA

WHMIS (WORKPLACE HAZARDOUS MATERIALS INFORMATION SYSTEM):

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all the information required by the Controlled Products Regulations.

Hazard Classification / Division:	E
Ingredient Disclosure List:	Listed
Domestic Substance List:	All components are listed or exempt.

EU EINECS NUMBERS:

215-185-5 (sodium hydroxide)

HAZARD AND RISK PHRASE DESCRIPTIONS:

EC Symbols:	C	(Corrosive)
EC Risk Phrases:	R35	(Causes severe burns.)

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16. OTHER INFORMATION

HMIS

Health	3
Flammability	0
Physical Hazard	1
Personal Protection (PPE)	J

Protection = J (Safety goggles, gloves, apron & combination dust & vapor respirator)

HMIS = Hazardous Materials Identification System

Degree of Hazard Code:
4 = Severe
3 = Serious
2 = Moderate
1 = Slight
0 = Minimal

NFPA

Health	3
Flammability	0
Reactivity	1
Special	None

No special requirements

NFPA (National Fire Protection Association)

Degree of Hazard Code:
4 = Extreme
3 = High
2 = Moderate
1 = Slight
0 = Insignificant

REVISION SUMMARY:
This MSDS replaces Revision #4, dated January 26, 2004.
Changes in information are as follows:
Section 1 (Product and Company Identification)
Section 8 (Exposure Controls / Personal Protection)
Section 14 (Transport Information)
Section 15 (Regulatory Information)
Section 16 (Other Information)

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UNIVAR

Univar USA Inc.
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Redmond, WA 98052
(425) 889-3400

For Emergency Assistance involving chemicals call - CHEMTREC (800) 424-9300

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The Version Date and Number for this MSDS is : 03/10/2006 - #005

PRODUCT NAME:	HYDROCHLORIC ACID (HCl) (ALL GRADES)
MSDS NUMBER:	0Z34514
DATE ISSUED:	01/26/2006
SUPERSEDES:	07/01/2005
ISSUED BY:	008820

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MATERIAL SAFETY DATA SHEET

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Distributed by:
Univar USA Inc.
6100 Carillon Point
Kirkland, WA 98003-7357
425-889-5000

SUBSTANCE: HYDROCHLORIC ACID (HCl) (ALL GRADES)

TRADE NAMES:
Hydrochloric Acid (HCI) 10%, 14%, 20%, 28%, 20 Be, 22 Be, Technical

SYNONYMS:
Muriatic Acid; HCl Solution; Aqueous hydrogen chloride

PRODUCT USE: process chemical, metal cleaning, water purification, petroleum industry

2. HAZARDS IDENTIFICATION

NFPA RATINGS (SCALE 0-4): HEALTH=3 FIRE=0 REACTIVITY=1

HMIS RATINGS (SCALE 0-4): HEALTH=3 FLAMMABILITY=0 REACTIVITY=1

EMERGENCY OVERVIEW:
COLOR: colorless
PHYSICAL FORM: liquid
ODOR: pungent odor
SIGNAL WORD: DANGER
MAJOR HEALTH HAZARDS: CAUSES BURNS TO THE RESPIRATORY TRACT, SKIN, EYES AND GASTROINTESTINAL TRACT. CAUSES PERMANENT EYE DAMAGE. MAY BE HARMFUL OR FATAL IF SWALLOWED.
PHYSICAL HAZARDS: May spatter or generate heat when mixed with water. Contact with metals may evolve flammable hydrogen gas.
PRECAUTIONARY STATEMENTS: Do not breathe vapor or mist. Do not get in eyes, on skin, or on clothing. Do not taste or swallow. Wash thoroughly after handling. Use only with adequate ventilation.

POTENTIAL HEALTH EFFECTS:
INHALATION:
SHORT TERM EXPOSURE: burns, cough, pulmonary edema
LONG TERM EXPOSURE: erosion of teeth
SKIN CONTACT:
SHORT TERM EXPOSURE: burns, ulceration
LONG TERM EXPOSURE: dermatitis
EYE CONTACT:
SHORT TERM EXPOSURE: burns, eye damage, blindness
LONG TERM EXPOSURE: to our knowledge, no effects are known INGESTION:
SHORT TERM EXPOSURE: burns
LONG TERM EXPOSURE: ingestion of harmful amounts is unlikely

CARCINOGEN STATUS:
OSHA: No
NTP: No
IARC: No

3. COMPOSITION INFORMATION ON INGREDIENTS

COMPONENT: WATER
CAS NUMBER: 7732-18-5
PERCENTAGE: 63-91

COMPONENT: HYDROGEN CHLORIDE
CAS NUMBER: 7647-01-0
PERCENTAGE: 9-36

4. FIRST AID MEASURES

INHALATION: If adverse effects occur, remove to uncontaminated area. Give artificial respiration if not breathing. If breathing is difficult, oxygen should be administered by qualified personnel. If respiration or pulse has stopped, have a trained person administer Basic Life Support (Cardio-Pulmonary Resuscitation/Automatic External Defibrillator) and CALL FOR EMERGENCY SERVICES IMMEDIATELY.

SKIN CONTACT: Immediately flush contaminated areas with water. Remove contaminated clothing, jewelry, and shoes immediately. Wash contaminated areas with soap and water. Thoroughly clean and dry contaminated clothing and shoes before reuse. Discard footwear which cannot be decontaminated. GET MEDICAL ATTENTION IMMEDIATELY.

EYE CONTACT: Immediately flush eyes with a directed stream of water for at least 15 minutes, forcibly holding eyelids apart to ensure complete irrigation of all eye and lid tissues. Washing eyes within several seconds is essential to achieve maximum effectiveness. GET MEDICAL ATTENTION IMMEDIATELY.

INGESTION: Never give anything by mouth to an unconscious or convulsive person. If swallowed, do not induce vomiting. Give large amounts of water. If vomiting occurs spontaneously, keep airway clear. Give more water when vomiting stops. GET MEDICAL ATTENTION IMMEDIATELY.

NOTE TO PHYSICIAN: The absence of visible signs or symptoms of burns does NOT reliably exclude the presence of actual tissue damage. Probable mucosal damage may contraindicate the use of gastric lavage.

5. FIRE FIGHTING MEASURES

FIRE AND EXPLOSION HAZARDS: May release toxic gases.

EXTINGUISHING MEDIA: Use extinguishing agents appropriate for surrounding fire.

FIRE FIGHTING: Keep unnecessary people away, isolate hazard area and deny entry. Wear NIOSH approved positive-pressure self-contained breathing apparatus. Move container from fire area if it can be done without risk. Avoid inhalation of material or combustion by-products. Stay upwind and keep out of low areas. Cool containers with water.

SENSITIVITY TO MECHANICAL IMPACT: Not sensitive

SENSITIVITY TO STATIC DISCHARGE: Not sensitive

FLASH POINT: not flammable

HAZARDOUS COMBUSTION PRODUCTS:
Thermal decomposition products or combustion: hydrogen chloride

6. ACCIDENTAL RELEASE MEASURES

OCCUPATIONAL RELEASE:
Evacuation of surrounding area may be necessary for large spills. Wear appropriate personal protective equipment recommended in Section 8 of the MSDS. Completely contain spilled material with dikes, sandbags, etc. Shut off ventilation system if needed. Reprocess or reuse if possible. Neutralize with soda ash or dilute caustic soda. Collect with appropriate absorbent and place into suitable container. Liquid material may be removed with a vacuum truck.
Keep out of water supplies and sewers. This material is acidic and may lower the pH of the surface waters with low buffering capacity. Releases should be reported, if required, to appropriate agencies. Notify Local Emergency Planning Committee and State Emergency Response Commission for release greater than or equal to RQ (U.S. SARA Section 304). If release occurs in the U.S. and is reportable under CERCLA Section 103, notify the National Response Center at (800)424-8802 (USA) or (202)426-2675 (USA).

7. HANDLE AND STORAGE

STORAGE: Store and handle in accordance with all current regulations and standards. Store in rubber-lined steel, acid-resistant plastic or glass containers. Keep container tightly closed and properly labeled. Store in a cool, dry place. Store in a well-ventilated area. Do not store in aluminum container or use aluminum fittings or transfer lines. Dike and vent storage tanks. Keep separated from incompatible substances (see Section 10 of the MSDS).

HANDLING: Avoid breathing vapor or mist. Do not get in eyes, on skin, or on clothing. Wash thoroughly after handling. When mixing, slowly add to water to minimize heat generation and spattering.

8. EXPOSURE CONTROLS, PERSONAL PROTECTION

EXPOSURE LIMITS:
HYDROGEN CHLORIDE, ANHYDROUS:
HYDROGEN CHLORIDE (HYDROCHLORIC ACID):

5 ppm (7 mg/m3) OSHA ceiling
2 ppm ACGIH ceiling

VENTILATION: Use closed systems when possible. Provide local exhaust ventilation where vapor or mist may be generated. Ensure compliance with applicable exposure limits.

EYE PROTECTION: Wear safety glasses with side shields. Wear chemical safety goggles with a faceshield or chemical splash hood. Provide an emergency eye wash fountain and quick drench shower in the immediate work area.

CLOTHING: Wear chemical resistant clothing and rubber boots when potential for contact with the material exists. Always place pants legs over boots.

GLOVES: Wear appropriate chemical resistant gloves.

PROTECTIVE MATERIAL TYPES: neoprene, nitrile, polyvinyl chloride (PVC), rubber, Kappler(R) CPF3, Tychem(R)

IMMEDIATELY DANGEROUS TO LIFE OR HEALTH: 50 ppm

RESPIRATOR: Where vapor concentration exceeds or is likely to exceed applicable exposure limits, a NIOSH approved respirator with acid gas canister is required. When an air-purifying respirator is not adequate or for spills and/or emergencies of unknown concentrations, a NIOSH approved self-contained breathing apparatus or airline respirator with full-face piece is required. A respiratory protection program that meets 29 CFR 1910.134 must be followed whenever workplace conditions warrant use of a respirator.

9. PHYSICAL AND CHEMICAL PROPERTIES

PHYSICAL STATE: liquid
APPEARANCE: clear
COLOR: colorless
ODOR: pungent odor
MOLECULAR WEIGHT: 36.46
MOLECULAR FORMULA: HCl
BOILING POINT: 140-221 F (60.0-105 C)
FREEZING POINT: -29 to 5 F (-34 to -15 C)
VAPOR PRESSURE: 14.6-80 mmHg @), 20 C
VAPOR DENSITY (air=1): 1.3 20 C
SPECIFIC GRAVITY (water=1): 1.05-1.18
BULK DENSITY: 8.75-9.83 lbs/gal
WATER SOLUBILITY: 100%
PH: 2 (0.2% solution)
VOLATILITY: 9-36 % by volume
ODOR THRESHOLD: 0.3 ppm (causes olfactory fatigue)
EVAPORATION RATE: <1.00 (butyl acetate=1)

COEFFICIENT OF WATER/OIL DISTRIBUTION: Not available

10. STABILITY AND REACTIVITY

REACTIVITY: Stable at normal temperatures and pressure.

CONDITIONS TO AVOID: Avoid heat, flames, sparks and other sources of ignition. Contact with water may produce a strong exothermic reaction with spattering. Contact with metals may evolve flammable hydrogen gas. Hydrogen chloride may react with cyanide, forming lethal concentrations of hydrocyanic acid.

INCOMPATIBILITIES: metals, alkalis (such as sodium hydroxide), mercuric sulfate, perchloric acid, carbides of calcium, cesium, rubidium, acetylides of cesium and rubidium, phosphides of calcium and uranium, lithium silicide

HAZARDOUS DECOMPOSITION:
Thermal decomposition products or combustion: hydrogen chloride

POLYMERIZATION: Will not polymerize.

11. TOXICOLOGICAL INFORMATION

HYDROCHLORIC ACID (HCl) (ALL GRADES):
TOXICITY DATA: Hydrochloric Acid: 900 mg/kg oral-rabbit LD50; 1108 ppm/1 hour(s) inhalation-rat; 3124 ppm/1 hour(s) inhalation-rat LC50. Rinsed Draize Test: 5 mg/30 second(s) rabbit-eye mild. Standard Draize Test: 4% / 24 hour(s) skin-human mild. Inhalation will cause severe irritation and possible burns with coughing and choking. If inhaled deeply, edema and hemorrhage of the lungs may occur. Levels of 10-35 ppm may cause irritation of throat and 50-100 ppm is unbearable for 1 hour. Inflammation, destruction of nasal passages and breathing difficulties may occur with higher concentrations and may be delayed in onset. 1000-2000 ppm may be fatal. Prolonged exposure may cause discoloration and/or erosion of teeth. Contact with eyes causes immediate severe irritation with possible burns, permanent visual impairment, or total loss of sight. Contact with fumes or liquid may produce corrosive burns. Dermal exposure also results in irritation, pain, dermatitis, and ulceration. Ingestion may cause immediate burns of the mouth, esophagus, and stomach. Ingestion may cause intense pain, nausea, vomiting, bleeding, circulating collapse, shock and death.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: respiratory system (including asthma and other breathing disorders)

12. ECOLOGICAL INFORMATION

ECOTOXICITY DATA:
FISH TOXICITY: Hydrochloric Acid: 178 mg/L LC50 Goldfish (1 to 2 hour survival time); 100-330 mg/L LC50 Shrimp. 3.6 mg/L 48 hour(s) (static) LC50 Bluegill This material is believed to be toxic to aquatic life.

FATE AND TRANSPORT:
BIODEGRADATION: This material is inorganic and not subject to biodegradation.

PERSISTENCE: This material is believed not to persist in the environment. This material is believed to exist in the disassociated state in the environment. SOIL: Hydrogen chloride will sink into the soil. The acid will dissolve some soil material (in particular, anything with a carbonate base) and will be somewhat neutralized. The remaining portion is thought to transport downward to the water table. WATER: Dissociates almost completely and will be neutralized by natural alkalinity and carbon dioxide.

BIOCONCENTRATION: This material is believed not to bioaccumulate.

13. DISPOSAL CONSIDERATIONS

Reuse or reprocess if possible. Dispose in accordance with all applicable regulations. Subject to disposal regulations: U.S. EPA 40 CFR 262. Hazardous Waste Number(s): D002.

14. TRANSPORT INFORMATION

U.S. DOT 49 CFR 172.101:
PROPER SHIPPING NAME: Hydrochloric acid solution
ID NUMBER: UN1789
HAZARD CLASS OR DIVISION: 8
PACKING GROUP: II LABELING REQUIREMENTS: 8
DOT HAZARDOUS SUBSTANCE(S):
Hydrochloric acid 5000 lb(s) (2270 kg(s))

CANADIAN TRANSPORTATION OF DANGEROUS GOODS:
SHIPPING NAME: Hydrochloric acid solution
UN NUMBER: UN1789
CLASS: 8
PACKING GROUP/RISK GROUP: II

15. REGULATORY INFORMATION

U.S. REGULATIONS:

CERCLA SECTIONS 102a/103 HAZARDOUS SUBSTANCES (40 CFR 302.4):
HYDROGEN CHLORIDE (HYDROCHLORIC ACID): 5000 LBS RQ (liquid)
CHLORINE: 10 LBS RQ

SARA TITLE III SECTION 302 EXTREMELY HAZARDOUS SUBSTANCES (40 CFR 355.30):

HYDROGEN CHLORIDE (HYDROCHLORIC ACID): 500 LBS TPQ (gas)

SARA TITLE III SARA SECTIONS 311/312 HAZARDOUS CATEGORIES (40 CFR 370.21):
ACUTE: Yes
CHRONIC: No
FIRE: No
REACTIVE: No
SUDDEN RELEASE: No

SARA TITLE III SECTION 313 (40 CFR 372.65):
HYDROGEN CHLORIDE (HYDROCHLORIC ACID): aerosol form only

This product contains a toxic chemical or chemicals subject to the reporting requirements of Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 and 40 CFR 372. Refer to Section 3.

OSHA PROCESS SAFETY (29CFR1910.119):
HYDROGEN CHLORIDE (HYDROCHLORIC ACID): 5000 LBS TQ (gas)
CHLORINE: 1500 LBS TQ

FDA: This material has Generally Recognized as Safe (GRAS) status under specific FDA regulations. Additional information is available from the Code of Federal Register (CFR) which is accessible on the FDA s website.

STATE REGULATIONS:
California Proposition 65: This product may contain contaminants known to the State of California to cause cancer or reproductive toxicity as listed under Proposition 65 State Drinking Water and Toxic Enforcement Act. For additional information, contact Customer Service.

NEW JERSEY WORKER AND COMMUNITY RIGHT TO KNOW:
REPORTING REQUIREMENT:
WATER 7732-18-5 63-91%
HYDROGEN CHLORIDE 7647-01-0 9-36%

RIGHT TO KNOW HAZARDOUS SUBSTANCE LIST:
HYDROGEN CHLORIDE 7647-01-0 9-36%
CHLORINE 7782-50-5 0-50 ppm

SPECIAL HEALTH HAZARD SUBSTANCE LIST:
HYDROGEN CHLORIDE 7647-01-0 9-36%

PENNSYLVANIA RIGHT TO KNOW:

REPORTING REQUIREMENT:
WATER 7732-18-5 63-91%
HYDROGEN CHLORIDE 7647-01-0 9-36%

HAZARDOUS SUBSTANCE LIST:
HYDROGEN CHLORIDE 7647-01-0 9-36%

ENVIRONMENTAL HAZARDOUS SUBSTANCE LIST:
HYDROGEN CHLORIDE 7647-01-0 9-36%

SPECIAL HAZARDOUS SUBSTANCE LIST:
Not regulated.

CANADIAN REGULATIONS:
WHMIS CLASSIFICATION: E.

NATIONAL INVENTORY STATUS:
U.S. INVENTORY (TSCA): All the components of this substance are listed on or are exempt from the inventory.

TSCA 12(b) EXPORT NOTIFICATION: Not listed.

CANADA INVENTORY (DSL/NDSL): All components of this product are listed on the DSL.

For Additional Information:
Contact: MSDS Coordinator - Univar USA
During business hours, Pacific Time - (425) 889-3400

NOTICE
Univar USA expressly disclaims all express or implied warranties of merchantibility and fitness for a particular purpose with respect to the product or information provided herein, and shall under no circumstances be liable for incidental or consequential damages.

Do not use ingredient information and/or ingredient percentages in this MSDS as a product specification. For product specification information refer to a Product Specification Sheet and/or a Certificate of Analysis. These can be obtained from your local Univar USA Sales Office.

All information appearing herein is based upon data obtained from the manufacturer and/or recognized technical sources. While the information is believed to be accurate, Univar USA makes no representations as to its accuracy or sufficiency. Conditions of use are beyond Univar USA s control. Therefore, users are responsible to verify this data under their own operating conditions to determine whether the product is suitable for their particular purposes, and they assume all risks of their use, handling, and disposal of the product or from the publication or use of, or reliance upon, information contained herein. This information relates only to the product designated herein and does not relate to its use in combination with any other material or in any other process.

END OF MSDS

MSDS: 0010123
Date: 07/08/2005
Supersedes: 11/11/1998

MATERIAL SAFETY DATA SHEET

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Name:	**OrePrep® F-579 Frother**
Synonyms:	None
Chemical Family:	Mixed polyglycols
Molecular Formula:	Mixture
Molecular Weight:	Mixture

CYTEC INDUSTRIES INC., FIVE GARRET MOUNTAIN PLAZA, WEST PATERSON, NEW JERSEY 07424, USA
For Product Information call 1-800/652-6013. Outside the USA and Canada call 1-973/357-3193.
EMERGENCY PHONE: For emergency involving spill, leak, fire, exposure or accident call CHEMTREC: 1-800/424-9300. Outside the USA and Canada call 1-703/527-3887.

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2. COMPOSITION/INFORMATION ON INGREDIENTS

OSHA REGULATED COMPONENTS

No Permissible Exposure Limits (PEL/TLV) have been established by OSHA or ACGIH.

3. HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW

APPEARANCE AND ODOR:

Color:	brown
Appearance:	liquid
Odor:	polyol

STATEMENTS OF HAZARD:
CAUTION! MAY CAUSE EYE AND SKIN IRRITATION

POTENTIAL HEALTH EFFECTS

EFFECTS OF EXPOSURE:
The acute oral (rat) LD50 and dermal (rabbit) LD50 values are estimated to be >2500 mg/kg and >2000 mg/kg, respectively. Direct contact with this material may cause mild eye and skin irritation.

4. FIRST AID MEASURES

Ingestion:
If swallowed, call a physician immediately. Only induce vomiting at the instruction of a physician. Never give anything by mouth to an unconscious person.

Skin Contact:
Wash immediately with plenty of water and soap.

Eye Contact:
Rinse immediately with plenty of water for at least 15 minutes.

Inhalation:
Material is not expected to be harmful if inhaled. Remove to fresh air.

5. FIRE-FIGHTING MEASURES

Extinguishing Media:
Use water spray, carbon dioxide or dry chemical.

Protective Equipment:
Firefighters, and others exposed, wear self-contained breathing apparatus.

Special Hazards:
Keep containers cool by spraying with water if exposed to fire.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions:
Where exposure level is known, wear approved respirator suitable for level of exposure. Where exposure level is not known, wear approved, positive pressure, self-contained respirator. In addition to the protective clothing/equipment in Section 8 (Exposure Controls/Personal Protection), wear impermeable boots.

Methods For Cleaning Up:
Cover spills with some inert absorbent material; sweep up and place in a waste disposal container. Flush spill area with water.

7. HANDLING AND STORAGE

HANDLING

Precautionary Measures: Avoid contact with eyes, skin and clothing. Wash thoroughly after handling.

Special Handling Statements: None

STORAGE
None

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Engineering Measures:
Engineering controls are not usually necessary if good hygiene practices are followed.

Respiratory Protection:
For operations where inhalation exposure can occur, use an approved respirator recommended by an industrial hygienist after an evaluation of the operation. Where inhalation exposure can not occur, no respiratory protection is required.

Eye Protection:
Wear eye/face protection such as chemical splash proof goggles or face shield.

Skin Protection:
Avoid skin contact. Wear impermeable gloves.

Additional Advice:
Before eating, drinking, or smoking, wash face and hands thoroughly with soap and water.

9. PHYSICAL AND CHEMICAL PROPERTIES

Color:	brown		
Appearance:	liquid		
Odor:	polyol		
Boiling Point:	Not available		
Melting Point:	<11 °C	51 °F	
Vapor Pressure:	Not available		
Specific Gravity:	0.98		
Vapor Density:	1		
Percent Volatile (% by wt.):	Not available		
pH:	9.1 - 9.4		
Saturation In Air (% By Vol.):	Not available		
Evaporation Rate:	Not available		
Solubility In Water:	Complete		
Volatile Organic Content:	Not available		
Flash Point:	>93 °C	200 °F	Pensky-Martens Closed Cup
Flammable Limits (% By Vol):	Not available		
Autoignition Temperature:	Not available		
Decomposition Temperature:	Not available		
Partition coefficient (n-octanol/water):	Not available		
Odor Threshold:	Not available		

10. STABILITY AND REACTIVITY

Stability:	Stable
Conditions To Avoid:	None known
Polymerization:	Will not occur
Conditions To Avoid:	None known
Materials To Avoid:	Strong oxidizers, heat, sparks and flames. aluminum copper
Hazardous Decomposition Products:	carbon monoxide oxides of nitrogen oxides of sulfur (includes sulfur di and tri oxides)

11. TOXICOLOGICAL INFORMATION

Toxicological information for the product is found under Section 3. HAZARDS IDENTIFICATION.
Toxicological information on the regulated components of this product is as follows:

This product contains no OSHA regulated (hazardous) components.

12. ECOLOGICAL INFORMATION

This material is not classified as dangerous for the environment.
The ecological assessment for this material is based on an evaluation of its components.

13. DISPOSAL CONSIDERATIONS

The information on RCRA waste classification and disposal methodology provided below applies only to the Cytec product, as supplied. If the material has been altered or contaminated, or it has exceeded its recommended shelf life, the guidance may be inapplicable. Hazardous waste classification under federal regulations (40 CFR Part 261 et seq) is dependent upon whether a material is a RCRA `listed hazardous waste`or has any of the four RCRA `hazardous waste characteristics.`Refer to 40 CFR Part 261.33 to determine if a given material to be disposed of is a RCRA `listed hazardous waste`; information contained in Section 15 of this MSDS is not intended to indicate if the product is a `listed hazardous waste.`RCRA Hazardous Waste Characteristics: There are four characteristics defined in 40 CFR Section 261.21-61.24: Ignitability, Corrosivity, Reactivity, and Toxicity. To determine Ignitability, see Section 9 of this MSDS (flash point). For Corrosivity, see Sections 9 and 14 (pH and DOT corrosivity). For Reactivity, see Section 10 (incompatible materials). For Toxicity, see Section 2 (composition). Federal regulations are subject to change. State and local requirements, which may differ from or be more stringent than the federal regulations, may also apply to the classification of the material if it is to be disposed. Cytec encourages the recycle, recovery and reuse of materials, where permitted, as an alternate to disposal as a waste. Cytec recommends that organic materials classified as RCRA hazardous wastes be disposed of by thermal treatment or incineration at EPA approved facilities. Cytec has provided the foregoing for information only; the person generating the waste is responsible for determining the waste classification and disposal method.

14. TRANSPORT INFORMATION

This section provides basic shipping classification information. Refer to appropriate transportation regulations for specific requirements.

US DOT
Proper Shipping Name: Not applicable/Not regulated
Hazardous Substances:
Not applicable

TRANSPORT CANADA
Proper Shipping Name: Not applicable/Not regulated

ICAO / IATA
Proper Shipping Name: Not applicable/Not regulated
Packing Instructions/Maximum Net Quantity Per Package:

Passenger Aircraft: -
Cargo Aircraft: -

IMO

Proper Shipping Name: Not applicable/Not regulated

15. REGULATORY INFORMATION

INVENTORY INFORMATION

United States (USA): All components of this product are included on the TSCA Chemical Inventory or are not required to be listed on the TSCA Chemical Inventory.

Canada: All components of this product are included on the Domestic Substances List (DSL) or are not required to be listed on the DSL.

European Union (EU): All components of this product are included on the European Inventory of Existing Chemical Substances (EINECS) or are not required to be listed on EINECS.

Australia: All components of this product are included in the Australian Inventory of Chemical Substances (AICS).

China: All components of this product are included on the Chinese inventory or are not required to be listed on the Chinese inventory.

Japan: All components of this product are included on the Japanese (ENCS) inventory or are not required to be listed on the Japanese inventory.

Korea: All components of this product are included on the Korean (ECL) inventory or are not required to be listed on the Korean inventory.

Philippines: All components of this product are included on the Philippine (PICCS) inventory or are not required to be listed on the Philippine inventory.

OTHER ENVIRONMENTAL INFORMATION

The following components of this product may be subject to reporting requirements pursuant to Section 313 of CERCLA (40 CFR 372), Section 12(b) of TSCA, or may be subject to release reporting requirements (40 CFR 307, 40 CFR 311, etc.) See Section 13 for information on waste classification and waste disposal of this product.

This product does not contain any components regulated under these sections of the EPA

PRODUCT HAZARD CLASSIFICATION UNDER SECTION 311 OF SARA

- Not applicable

16. OTHER INFORMATION

NFPA Hazard Rating (National Fire Protection Association)

Health: 1 - Materials that, under emergency conditions, can cause significant irritation.

Fire: 1 - Materials that must be preheated before ignition can occur.

Reactivity: 0 - Materials that in themselves are normally stable, even under fire exposure conditions.

Reasons For Issue: New Format

MATERIAL SAFETY DATA SHEET

Orfom® D8 Depressant

Version 2.3 Revision Date 2010-12-14

1. IDENTIFICATION OF THE SUBSTANCE/MIXTURE AND OF THE COMPANY/UNDERTAKING

Product information

Trade name : Orfom® D8 Depressant
Material : 1108014, 1106095, 1106087, 1095798, 1016855, 1016856

Use : Mineral Processing Aide

Company : Chevron Phillips Chemical Company LP
Mining Chemicals
10001 Six Pines Drive
The Woodlands, TX 77380

Emergency telephone:

Health:
866.442.9628 (North America)
1.832.813.4984 (International)

Transport:
North America: CHEMTREC 800.424.9300 or 703.527.3887
Asia: +800 CHEMCALL (+800 2436 2255) China: 0532.8388.9090
EUROPE: BIG +32.14.584545 (phone) or +32.14583516 (telefax)
Chemcare Asia: Tel: +65 6848 9048 - Mob: +65 8382 9188 - Fax: +65 6848
South America SOS-Cotec Inside Brazil: 0800.111.767 Outside Brazil: +55.19.3467.1600

Responsible Department : Product Safety and Toxicology Group
E-mail address : MSDS@CPChem.com
Website : www.CPChem.com

2. HAZARDS IDENTIFICATION

Emergency Overview

Danger

Physical state: Liquid **Color**: clear, orange-red **Odor**: Mild

OSHA Hazards : Combustible Liquid, Corrosive to skin, Corrosive to eyes

GHS-Classification

: Flammable liquids, Category 4
Skin corrosion, Category 1A
Serious eye damage, Category 1
Aspiration hazard, Category 1

GHS-Labeling

Symbol(s) :

Signal Word : Danger

Hazard Statements : H227: Combustible liquid
H304: May be fatal if swallowed and enters airways.
H314: Causes severe skin burns and eye damage.

Precautionary Statements : **Prevention:**
P210 Keep away from heat/sparks/open flames/hot surfaces. - No smoking.
P264 Wash face, hands and any exposed skin thoroughly after handling.
P280 Wear protective gloves/ protective clothing/ eye protection/ face protection.
Response:
P301 + P310 IF SWALLOWED: Immediately call a POISON CENTER or doctor/ physician.
P301 + P330 + P331 IF SWALLOWED: rinse mouth. Do NOT induce vomiting.
P305 + P351 + P338 IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P370 + P378 In case of fire: Evacuate area. Use manufacturer/supplier or the competent authority to specify appropriate media for extinction.
Storage:
P403 + P235 Store in a well-ventilated place. Keep cool.
Disposal:
P501 Dispose of contents/ container to an approved waste disposal plant.

Carcinogenicity:

IARC	No ingredient of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.
NTP	No ingredient of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.
ACGIH	No ingredient of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by ACGIH.

3. COMPOSITION/INFORMATION ON INGREDIENTS

Synonyms : None Established

Molecular formula : Mixture

Chemical Name	CAS-No. / EINECS-No.	Concentration [wt%]
Disodium Carboxymethyltrithiocarbonate	86932-91-4	35 - 45
Sodium Hydroxide	1310-73-2	5

4. FIRST AID MEASURES

General advice	: Move out of dangerous area. Consult a physician. Show this material safety data sheet to the doctor in attendance. Symptoms of poisoning may only appear several hours later. Do not leave the victim unattended.
If inhaled	: Move to fresh air. If symptoms persist, call a physician.
In case of skin contact	: Immediate medical treatment is necessary as untreated wounds from corrosion of the skin heal slowly and with difficulty. If on skin, rinse well with water. If on clothes, remove clothes.
In case of eye contact	: Small amounts splashed into eyes can cause irreversible tissue damage and blindness. In the case of contact with eyes, rinse immediately with plenty of water and seek medical advice. Continue rinsing eyes during transport to hospital. Remove contact lenses. Protect unharmed eye. Keep eye wide open while rinsing. If eye irritation persists, consult a specialist.
If swallowed	: Clean mouth with water and drink afterwards plenty of water. Keep respiratory tract clear. Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Take victim immediately to hospital.

5. FIRE-FIGHTING MEASURES

Flash point	: 74 °C (165 °F)
Autoignition temperature	: No data available
Suitable extinguishing media	: Carbon dioxide (CO2).
Unsuitable extinguishing media	: High volume water jet.
Specific hazards during fire fighting	: Do not allow run-off from fire fighting to enter drains or water courses.
Special protective equipment for fire-fighters	: Wear self contained breathing apparatus for fire fighting if necessary.
Further information	: Collect contaminated fire extinguishing water separately. This must not be discharged into drains. Fire residues and contaminated fire extinguishing water must be disposed of in accordance with local regulations. For safety reasons in case of fire, cans should be stored separately in closed containments. Use a water spray to cool fully closed containers.
Fire and explosion protection	: Do not spray on an open flame or any other incandescent material. Keep away from open flames, hot surfaces and sources of ignition.

Hazardous decomposition products : Carbon oxides. Sulfur oxides.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions : Use personal protective equipment. Ensure adequate ventilation.

Environmental precautions : Prevent product from entering drains. Prevent further leakage or spillage if safe to do so. If the product contaminates rivers and lakes or drains inform respective authorities.

Methods for cleaning up : Contain spillage, and then collect with non-combustible absorbent material, (e.g. sand, earth, diatomaceous earth, vermiculite) and place in container for disposal according to local / national regulations (see section 13). Keep in suitable, closed containers for disposal.

7. HANDLING AND STORAGE

Handling

Advice on safe handling : Avoid formation of aerosol. Do not breathe vapors/dust. Avoid contact with skin and eyes. For personal protection see section 8. Smoking, eating and drinking should be prohibited in the application area. Provide sufficient air exchange and/or exhaust in work rooms. To avoid spills during handling keep bottle on a metal tray. Dispose of rinse water in accordance with local and national regulations.

Advice on protection against fire and explosion : Do not spray on an open flame or any other incandescent material. Keep away from open flames, hot surfaces and sources of ignition.

Storage

Requirements for storage areas and containers : No smoking. Keep container tightly closed in a dry and well-ventilated place. Observe label precautions. Electrical installations / working materials must comply with the technological safety standards.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Ingredients with workplace control parameters

US

Ingredients	Basis	Value	Control parameters	Note
Sodium Hydroxide	ACGIH	C	2 mg/m3	
	OSHA Z1B	TWA	2 mg/m3	
	OSHA Z1A	C	2 mg/m3	
	NIOSH REL	C	2 mg/m3	

Personal protective equipment

Respiratory protection : Use a positive pressure, air-supplying respirator if there is potential for uncontrolled release, exposure levels are not known, or other circumstances where air-purifying respirators may not provide adequate protection.

Hand protection : The suitability for a specific workplace should be discussed with the producers of the protective gloves.

Eye protection : Eye wash bottle with pure water. Tightly fitting safety goggles. Wear face-shield and protective suit for abnormal processing problems.

Skin and body protection : Impervious clothing. Choose body protection according to the amount and concentration of the dangerous substance at the work place.

Hygiene measures : When using do not eat or drink. When using do not smoke. Wash hands before breaks and at the end of workday.

9. PHYSICAL AND CHEMICAL PROPERTIES

Information on basic physical and chemical properties

Appearance

Physical state	Liquid
Color	clear, orange-red
Odor	Mild

Safety data

Flash point	74 °C (165 °F)
Lower explosion limit	No data available
Upper explosion limit	No data available
Autoignition temperature	No data available
Molecular formula	Mixture
Molecular Weight	Not applicable
pH	No data available
Boiling point/boiling range	100 °C (212 °F)
Vapor pressure	No data available
Water solubility	Completely Soluble
Partition coefficient: n-octanol/water	No data available
Viscosity, kinematic	5.44 cSt at 21.1 °C (70.0 °F)
Relative vapor density	1 (Air = 1.0)
Evaporation rate	1
Percent volatile	60 %

10. STABILITY AND REACTIVITY

Possibility of hazardous reactions

Conditions to avoid	: Heat, sparks, fire, and oxidizing agents.
Materials to avoid	: Corrosive to copper and copper bearing alloys.
Other data	: This material is considered stable under normal ambient and anticipated storage and handling conditions of temperature and pressure. No decomposition if stored and applied as directed.

11. TOXICOLOGICAL INFORMATION

Orfom® D8 Depressant

Acute oral toxicity	: LD50: unknown

Orfom® D8 Depressant

Acute inhalation toxicity	: LC50: not known

Orfom® D8 Depressant

Acute dermal toxicity	: LD50: unknown

Orfom® D8 Depressant

Skin irritation	: Extremely corrosive and destructive to tissue.

Orfom® D8 Depressant

Eye irritation	: May cause irreversible eye damage.

Orfom® D8 Depressant

Aspiration toxicity	: May be harmful if swallowed and enters airways. Substances known to cause human aspiration toxicity hazards or to be regarded as if they cause human aspiration toxicity hazard.

Orfom® D8 Depressant

Further information	: Solvents may degrease the skin.

12. ECOLOGICAL INFORMATION

Elimination information (persistence and degradability)

Biodegradability	: Not applicable

Further information on ecology

Additional ecological information	: No data available

13. DISPOSAL CONSIDERATIONS

The information in this MSDS pertains only to the product as shipped.

Use material for its intended purpose or recycle if possible. This material, if it must be discarded, may meet the criteria of a hazardous waste as defined by US EPA under RCRA (40 CFR 261) or other State and local regulations. Measurement of certain physical properties and analysis for regulated components may be necessary to make a correct determination. If this material is classified as a hazardous waste, federal law requires disposal at a licensed hazardous waste disposal facility.

Product : Do not dispose of waste into sewer. Do not contaminate ponds, waterways or ditches with chemical or used container. Send to a licensed waste management company.

Contaminated packaging : Empty remaining contents. Dispose of as unused product. Do not re-use empty containers. Do not burn, or use a cutting torch on, the empty drum.

14. TRANSPORT INFORMATION

The shipping descriptions shown here are for bulk shipments only, and may not apply to shipments in non-bulk packages (see regulatory definition).

Consult the appropriate domestic or international mode-specific and quantity-specific Dangerous Goods Regulations for additional shipping description requirements (e.g., technical name or names, etc.) Therefore, the information shown here, may not always agree with the bill of lading shipping description for the material. Flashpoints for the material may vary slightly between the MSDS and the bill of lading.

USDOT

UN3267, CORROSIVE LIQUID, BASIC, ORGANIC, N.O.S., (DISODIUM CARBOXYLMETHYLTRITHICCARBONATE, SODIUM HYDROXIDE), 8, II, RQ (SODIUM HYDROXIDE)

IMO / IMDG

UN3267, CORROSIVE LIQUID, BASIC, ORGANIC, N.O.S., (DISODIUM CARBOXYLMETHYLTRITHICCARBONATE, SODIUM HYDROXIDE), 8, II, (74 °C)

IATA

UN3267, CORROSIVE LIQUID, BASIC, ORGANIC, N.O.S., (DISODIUM CARBOXYLMETHYLTRITHICCARBONATE, SODIUM HYDROXIDE), 8, II

ADR

UN3267, CORROSIVE LIQUID, BASIC, ORGANIC, N.O.S., (DISODIUM CARBOXYLMETHYLTRITHICCARBONATE, SODIUM HYDROXIDE), 8, II

RID

UN3267, CORROSIVE LIQUID, BASIC, ORGANIC, N.O.S., (DISODIUM CARBOXYLMETHYLTRITHICCARBONATE, SODIUM HYDROXIDE), 8, II

15. REGULATORY INFORMATION

National legislation

SARA 311/312 Hazards : Fire Hazard
Acute Health Hazard

SARA 302 Reportable Quantity : SARA 302: No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 Ingredients : SARA 313: This material does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313.

Clean Air Act

Ozone-Depletion Potential : This product neither contains, nor was manufactured with a Class I or Class II ODS as defined by the U.S. Clean Air Act Section 602 (40 CFR 82, Subpt. A, App.A + B).

This product does not contain any hazardous air pollutants (HAP), as defined by the U.S. Clean Air Act Section 12 (40 CFR 61).

US State Regulations

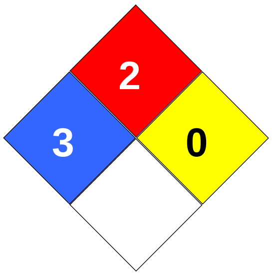
Pennsylvania Right To Know
Ingredients : Sodium Hydroxide 1310-73-2
New Jersey Right To Know
Ingredients : Sodium Hydroxide 1310-73-2

California Prop. 65 Ingredients : This product does not contain any chemicals known to the State of California to cause cancer, birth, or any other reproductive defects.

Notification status
Europe REACH : On the inventory, or in compliance with the inventory
United States of America TSCA : On the inventory, or in compliance with the inventory
Canada DSL : On the inventory, or in compliance with the inventory
Australia AICS : On the inventory, or in compliance with the inventory
New Zealand NZIoC : Not in compliance with the inventory
Japan ENCS : Not in compliance with the inventory
Korea KECI : Not in compliance with the inventory
Philippines PICCS : Not in compliance with the inventory
China IECSC : Not in compliance with the inventory

16. OTHER INFORMATION

NFPA Classification : Health Hazard: 3
Fire Hazard: 2
Reactivity Hazard: 0



Further information

Legacy MSDS Number : 59700

Significant changes since the last version are highlighted in the margin. This version replaces all previous versions.

The information in this MSDS pertains only to the product as shipped.

The above information is based on the data of which we are aware and is believed to be correct as of the date hereof. Since this information may be applied under conditions beyond our control and with which we may be unfamiliar and since data made available subsequent to the date hereof may suggest modifications of the information, we do not assume any responsibility for the results of its use. This information is furnished upon condition that the person receiving it shall make his own determination of the suitability of the material for his particular purpose.

Key or legend to abbreviations and acronyms used in the safety data sheet			
ACGIH	American Conference of Government Industrial Hygienists	LOAEL	Lowest Observed Adverse Effect Level
AICS	Australia, Inventory of Chemical Substances	NFPA	National Fire Protection Agency
DSL	Canada, Domestic Substances List	NIOSH	National Institute for Occupational Safety & Health
NDSL	Canada, Non-Domestic Substances List	NTP	National Toxicology Program
CNS	Central Nervous System	NZIoC	New Zealand Inventory of Chemicals
CAS	Chemical Abstract Service	NOAEL	No Observable Adverse Effect Level
EC50	Effective Concentration	NOEC	No Observed Effect Concentration
EC50	Effective Concentration 50%	OSHA	Occupational Safety & Health Administration
EINECS	European Inventory of Existing Chemical Substances	PEL	Permissible Exposure Limit
MAK	Germany Maximum Concentration Values	PICCS	Philipines Inventory of Commercial Chemical Substances
GHS	Globally Harmonized System	PRNT	Presumed Not Toxic
>=	Greater Than or Equal To	RCRA	Resource Conservation Recovery Act
IC50	Inhibition Concentration 50%	STEL	Short-term Exposure Limit
IARC	International Agency for Research on Cancer	SARA	Superfund Amendments and Reauthorization Act.
IECSC	Inventory of Existing Chemical Substances in China	TLV	Threshold Limit Value
ENCS	Japan, Inventory of Existing and New Chemical Substances	TWA	Time Weighted Average
KECI	Korea, Existing Chemical Inventory	TSCA	Toxic Substance Control Act
<=	Less Than or Equal To	UVCB	Unknown or Variable Compositon, Complex Reaction Products, and Biological Materials
LC50	Lethal Concentration 50%	WHMIS	Workplace Hazardous Materials Information System
LD50	Lethal Dose 50%		

Millennium
Specialty Chemicals

Material Safety Data Sheet

Product Code	20B48AS
Revision Date	07/07/2005
Supersedes	07/07/2005

1. IDENTIFICATION OF THE SUBSTANCE AND OF THE COMPANY

Identification of the Substance:

Trade Name: **Terpene SW Blend**

Chemical Name: None (mixture)

Use of the Substance:

Company Identification:

Millennium Specialty Chemicals Inc.
a Lyondell Company
P.O. Box 389
Jacksonville, FL 32201, USA
Telephone: 904-768-5800
Fax: 904-768-2200

Europe:
SCM Europe SA/NV
141 Rue St-Lambert Bte 2
B-1200 Bruxelles, Belgique
Telephone: 322-771-2110
Fax: 322-772-4217

Emergency Telephone: CHEMTREC: (USA, Canada): 1-800-424-9300 ;(All Others): 703-527-3887

2. COMPOSITION/INFORMATION ON INGREDIENTS

CAS Number	EINECS Number	Ingredient	Typical Weight %
8002-09-3	304-455-9	PINE OIL	> 50
68956-56-9	273-309-3	HYDROCARBONS, TERPENE PROCESSING, BY-PRODUCT	1-10

EU Classifications (refer to Section 16 for descriptions):

Symbol(s)	Risk Phrase Code(s)	Safety Phrase Code(s)
Xi	R36/38	S24/25

3. HAZARDS IDENTIFICATION

This substance is classified as dangerous according to EU Directive 1999/45/EC.

Potential Health Effects

Acute Health Effects:
Contact with the undiluted material may cause eye and skin irritation.

Chronic Health Effects:
Not Determined.

4. FIRST AID MEASURES

Inhalation:
Seek fresh air immediately. If breathing is difficult, seek medical advice.

Eye Contact:

Flush with water for at least 15 minutes. If irritation develops, get medical attention.

Skin Contact:

Remove contaminated clothing. Wash affected areas with plenty of soap and water. If irritation develops, seek medical advice.

Ingestion:

Drink lots of water to dilute substance. Do not induce vomiting. Get medical attention immediately or contact a poison control center for advice.

Notes to Physician:

Probable mucosal damage may contraindicate to use of gastric lavage. Aspiration of the vomitus may cause lung damage.

5. FIRE FIGHTING MEASURES

Suitable Fire Extinguishing Media:

Carbon dioxide, dry chemical, foam.

Unsuitable Fire Extinguishing Media:

If water must be used, use as a spray only.

Special Exposure Hazards:

Avoid heat, sparks and open flames.

Hazardous Decomposition Products:

Carbon dioxide, carbon monoxide, acrid fumes.

Special Protective Equipment for Fire Fighters:

Standard turnout gear for combustible liquids.

6. ACCIDENTAL RELEASE MEASURES

Personal Precautions:

Standard turnout gear for combustible liquids.

Environmental Precautions:

Do not allow the substance or solutions of the substance to be discharged into lakes, streams, ponds or public waters.

Cleanup Procedures:

Small spills should be absorbed by dirt, sand, or other absorbent. Large spills may be pumped into containers for recovery/disposal.

7. HANDLING AND STORAGE

Handling:

Wear goggles or face shield and rubber gloves when handling.

Storage:

Do not store in close proximity to excessive heat, open flames, strong acids or strong bases. To minimize product degradation, avoid prolonged exposure of the substance to air. Keep container tightly closed when not in use.

Ventilation:

Local mechanical exhaust may be needed in confined and warm areas.

Safety Stations:

An eyewash station and a safety shower should be readily available and clearly marked.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Exposure Limits:

None found.

Exposure Controls:

Respiratory Protection:

A respirator is not normally required. If vapor concentration is suspected to be high, use a NIOSH approved organic vapor respirator

Eye Protection:

Wear goggles or full face shield

Hand Protection:

Wear standard industrial type rubber gloves.

Skin Protection:

A rubber apron is recommended when handling the material for extended periods of time.

Personal Hygiene:

Wash hands and other exposed areas of skin with soap and water after handling the material.

Environmental Controls:

No environmental exposure controls required under Community environmental protection laws.

9. PHYSICAL AND CHEMICAL PROPERTIES

General Information:

Property	Result
Appearance:	Pale-yellow liquid.
Odor:	Piney, sulfur odor.

Important Health, Safety and Environmental Information:

Property	Result
pH:	Not determined.
Boiling Point:	380.8°F (Distillation)
Flash Point:	158°F (Tag Closed Cup)
Melting Point:	Not determined.
Flammability:	Not determined.
Explosive Properties:	Not an explosive.
Oxidizing Properties:	Not determined.
Vapor Pressure:	Not determined.
Solubility in Water (Weight%):	~2

Solubility in Alcohol(Weight%):	Not determined.
Fat Solubility:	Not determined.
Partition Coefficient (n-Octanol/Water):	Not determined.
Viscosity:	Not determined.
Vapor Density (air=1):	Not determined.
Evaporation Rate (Butyl Acetate=1):	Not determined.
Autoignition Temperature:	Not determined.
Volatiles (Weight%):	99.8
Specific Gravity:	0.9174 @ 25 C

10. STABILITY AND REACTIVITY

Stability:

Substance is stable and unreactive under conditions of normal use.

Conditions to Avoid:

Prolonged or excessive heat and/or exposure to air may cause non-hazardous decomposition and/or oxidation of the substance.

Materials to Avoid:

Avoid contact with strong acids, bases and materials that react with unsaturated alcohols.

Hazardous Decomposition Products:

Carbon dioxide, carbon monoxide, acrid fumes.

11. TOXICOLOGICAL INFORMATION

Primary Target Organs:	Eyes, Skin, Respiratory tract.
Primary Entry Route(s):	Eyes, Skin, Inhalation.
Medical Conditions Aggravated by Overexposure	No known conditions.

Acute Toxicity:

Parameter	**Result**
Acute Oral Toxicity:	Not determined.
Acute Inhalation Toxicity:	Not determined.
Acute Dermal Toxicity:	Not determined
Eye Irritancy:	Contact with the undiluted material may cause irritation.
Dermal Irritancy:	Contact with the undiluted material may cause irritation.
Skin Sensitization:	Not determined.
Mutagenicity:	Not determined
Teratogenicity:	Not determined.

12. ECOLOGICAL INFORMATION

Ecotoxicity:	Not determined.
Mobility:	Not determined.
Persistence and Degradability:	Not determined.
Bioaccumulation Potential:	Not determined.
Ozone Depleting Substances:	None.
Volatile Organic Compounds:	Not determined.

13. DISPOSAL CONSIDERATIONS

Disposal Methods:	This material, if discarded, is not considered a hazardous waste by EPA regulations 40 CFR 261.
Safe Handling of Wastes:	Refer to Section 8 for information pertaining to personal protective equipment and exposure controls when handling this material for disposal.
Community Provisions:	Dispose of this material at a local, state or federally approved landfill, incinerator or recovery facility.

14. TRANSPORT INFORMATION

DOT Non-Bulk Shipping Name:	Chemicals n.o.i.(Pine Oil)
DOT Bulk Shipping Name:	Combustible Liquid, n.o.s.(Pine Oil), NA1993, PGIII
DOT Label(s):	NONE
ADR/RID Classification:	Not Regulated
IATA Classification:	Not Regulated.
IMDG Classification:	Not regulated.
Marine Pollutant:	No.
NAERG Number:	128

15. REGULATORY INFORMATION

Chemical Inventories Status:

USA (TSCA):	Compliant
European Community (EINECS):	Compliant
Canada (DSL):	Compliant
Australia (AICS):	Compliant
Japan (IEC):	Not Compliant
Korea (KECI/ECL):	Compliant
Philippines (PICCS):	Compliant
China (SEPA/CICS):	Compliant

USA: Federal:

SARA Title III Section 302/304:	None.
SARA Title III Section 311/312:	Yes.
SARA Title III Section 313:	None.
Hazardous Air Pollutants:	None.

USA: States:

New Jersey RTK: Pine oil; CAS No. 8002-09-3; 95%.
New Jersey RTK: Hydrocarbons, terpene processing by-products; CAS 68956-56-9; 5%.

International:

16. OTHER INFORMATION

Material Safety Data Sheet

EU Classifications:

Symbol Code(s):	**Symbol Phrase(s):**
Xi	IRRITANT
Risk Phrase Codes:	**Risk Phrases:**
R36/38	Irritating to eyes and skin.
Safety Phrase Codes:	**Safety Phrases:**
S24/25	Avoid contact with eyes and skin.

U.S. NPCA/HMIS Hazardous Materials Information System

Health	**Flammability**	**Reactivity**	**Personal Protection***
1	**2**	**1**	**C**

0 - Minimal Hazard: No significant risk to health.
1 - Slight Hazard: Irritation or minor reversible injury possible.
2 - Moderate Hazard: Temporary or minor injury may occur.
3 - Serious Hazard: Major injury likely unless prompt action is taken and medical treatment is given.
4 - Severe Hazard: Life-threatening, major or permanent damage mayresult from single or repeated exposures.
* This rating will generally suffice for normal operating conditions.Please note however, that the type of personal protection utilized may change based on specific use conditions (refer to Section 8).

Reason(s) for (Re)issue:
Changed EC classifications and HMIS ratings; format change.

Technical Contact(s):
Environmental and Regulatory Affairs Dept.

References:
RIFM - Research Institute for Fragrance Materials RTECS- Registry of Toxic Effects of Chemical Substances

Acronyms: NTP(National Toxicology Program); IARC (International Agency for Research on Cancer); OSHA (Occupational Health and Safety Administration); DOT (U.S. Dept. of Transportation); NIOSH (National Institute of Occupational Safety and Health)

MATERIAL SAFETY DATA SHEET

1. Product and Company Identification

Material name	**Hydrocal 60**
Version #	07
Revision date	01-20-2012
CAS #	64742-53-6
Manufacturer information	Calumet Specialty Products Partners, L.P. 2780 Waterfront Pkwy E. Dr. Suite 200 Indianapolis, IN 46214 United States www.calumetlubricants.com Technical Services 317-328-5660 CHEMTREC International 703-527-3887

2. Hazards Identification

Potential health effects

Eyes	Health injuries are not known or expected under normal use.
Skin	Health injuries are not known or expected under normal use.
Inhalation	Health injuries are not known or expected under normal use.
Ingestion	Minute amounts aspirated into the lungs during ingestion or vomiting may cause mild to severe pulmonary injury and possibly death.
Potential environmental effects	Ecological injuries are not known or expected under normal use.

3. Composition / Information on Ingredients

Non-hazardous components	CAS #	Percent
Light Naphthenic Hydrotreated Distillates (petroleum)	64742-53-6	100

4. First Aid Measures

First aid procedures

Eye contact	Rinse with water. Get medical attention if irritation develops and persists.
Skin contact	Rinse skin with water/shower. Get medical attention if irritation develops and persists.
Inhalation	If breathing is difficult, remove to fresh air and keep at rest in a position comfortable for breathing. Call a physician if symptoms develop or persist.
Ingestion	Rinse mouth. If ingestion of a large amount does occur, call a poison control center immediately.

5. Fire Fighting Measures

Flammable properties	Not flammable by OSHA criteria. Not combustible by OSHA criteria.
Extinguishing media	
Suitable extinguishing media	Water fog.
Unsuitable extinguishing media	Water. Do not use water jet as an extinguisher, as this will spread the fire.
Protection of firefighters	
Protective equipment and precautions for firefighters	Wear suitable protective equipment.
Fire fighting equipment/instructions	Move containers from fire area if you can do so without risk.

6. Accidental Release Measures

Personal precautions	Keep unnecessary personnel away. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing. Keep people away from and upwind of spill/leak. Keep upwind. Keep out of low areas.

Methods for containment	ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area). Stop the flow of material, if this is without risk. Dike the spilled material, where this is possible. Prevent entry into waterways, sewer, basements or confined areas.
Methods for cleaning up	Large Spills: Stop the flow of material, if this is without risk. Dike the spilled material, where this is possible. Cover with plastic sheet to prevent spreading. Absorb in vermiculite, dry sand or earth and place into containers. Following product recovery, flush area with water. Small Spills: Wipe up with absorbent material (e.g. cloth, fleece). Clean surface thoroughly to remove residual contamination. Never return spills in original containers for re-use. For waste disposal, see section 13 of the MSDS.

7. Handling and Storage

Handling	DO NOT handle, store or open near an open flame, sources of heat or sources of ignition. Protect material from direct sunlight. Avoid prolonged exposure.
Storage	Keep away from heat, sparks and open flame.

8. Exposure Controls / Personal Protection

Engineering controls	Good general ventilation (typically 10 air changes per hour) should be used. Ventilation rates should be matched to conditions. If applicable, use process enclosures, local exhaust ventilation, or other engineering controls to maintain airborne levels below recommended exposure limits. If exposure limits have not been established, maintain airborne levels to an acceptable level.
Personal protective equipment	
Eye / face protection	Eye wash fountain is recommended.
Skin protection	Normal work clothing (long sleeved shirts and long pants) is recommended.
Respiratory protection	When workers are facing concentrations above the exposure limit they must use appropriate certified respirators.
General hygiene considerations	Handle in accordance with good industrial hygiene and safety practice.

9. Physical & Chemical Properties

Appearance	Product is water-white to pale straw liquid.
Physical state	Liquid.
Form	Liquid.
Color	L0.5 ASTM D1500
Odor	Faint
Boiling point	Not available.
Melting point/Freezing point	Not available.
Specific gravity	> 0.895
Relative density	Not available.
Flash point	> 280 °F (> 137.8 °C) Cleveland Open Cup
Auto-ignition temperature	> 578 °F (> 303.3 °C) estimated
Viscosity	> 60 SUS
Viscosity temperature	100 °F (37.8 °C)
Pour point	< -70 °F (< -56.7 °C) ASTM D97
Other data	
Density	> 0.8945 g/cm3
Flammability class	Combustible IIIB

10. Chemical Stability & Reactivity Information

Chemical stability	Material is stable under normal conditions.
Conditions to avoid	Heat, flames and sparks. Avoid temperatures exceeding the flash point.
Incompatible materials	Not available.
Hazardous decomposition products	No hazardous decomposition products are known.

11. Toxicological Information

Toxicological data

Product	Test Results
DISTILLATES (PETROLEUM), HYDROTREATED LIGHT NAPHTHENIC□ (64742-53-6)	Acute Dermal LD50 Rabbit: 2000 mg/kg estimated
	Acute Inhalation LC50 Rat: 2.18 mg/l estimated Acute Oral LD50 Rat: 5000 mg/kg estimated

Carcinogenicity This product is not considered to be a carcinogen by IARC, ACGIH, NTP, or OSHA.

12. Ecological Information

Ecotoxicological data

Product	Test Results
DISTILLATES (PETROLEUM), HYDROTREATED LIGHT NAPHTHENIC□ (64742-53-6)	EC50 Daphnia: 1000 mg/l 48 hours estimated

* Estimates for product may be based on additional component data not shown.

Ecotoxicity This product has no known eco-toxicological effects.

Persistence and degradability Not available.

13. Disposal Considerations

Disposal instructions Collect and reclaim or dispose in sealed containers at licensed waste disposal site. This product, in its present state, when discarded or disposed of, is not a hazardous waste according to Federal regulations (40 CFR 261.4 (b)(4)). Under RCRA, it is the responsibility of the user of the product to determine, at the time of disposal, whether the product meets RCRA criteria for hazardous waste. Dispose in accordance with all applicable regulations.

Contaminated packaging Empty containers should be taken to an approved waste handling site for recycling or disposal.

14. Transport Information

DOT

Not regulated as dangerous goods.

15. Regulatory Information

US federal regulations This product is a "Hazardous Chemical" as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200.
All components are on the U.S. EPA TSCA Inventory List.

CERCLA/SARA Hazardous Substances - Not applicable.

Drug Enforcement Administration (DEA). List 2, Essential Chemicals (21 CFR 1310.02(b) and 1310.04(f)(2)

Not regulated

DEA Essential Chemical Code Number

Not regulated

Drug Enforcement Administration (DEA). List 1 & 2 Exempt Chemical Mixtures (21 CFR 1310.12(c))

Not regulated

DEA Exempt Chemical Mixtures Code Number

Not regulated

CERCLA (Superfund) reportable quantity

None

Superfund Amendments and Reauthorization Act of 1986 (SARA)

Hazard categories
Immediate Hazard - No
Delayed Hazard - Yes
Fire Hazard - No
Pressure Hazard - No
Reactivity Hazard - No

Section 302 extremely hazardous substance No

Section 311 hazardous chemical No

Inventory status

Country(s) or region	Inventory name	On inventory (yes/no)*
Australia	Australian Inventory of Chemical Substances (AICS)	Yes
Canada	Domestic Substances List (DSL)	Yes
Canada	Non-Domestic Substances List (NDSL)	No
China	Inventory of Existing Chemical Substances in China (IECSC)	Yes
Europe	European Inventory of Existing Commercial Chemical Substances (EINECS)	Yes
Europe	European List of Notified Chemical Substances (ELINCS)	No
Japan	Inventory of Existing and New Chemical Substances (ENCS)	No
Korea	Existing Chemicals List (ECL)	Yes
New Zealand	New Zealand Inventory	Yes
Philippines	Philippine Inventory of Chemicals and Chemical Substances (PICCS)	Yes
United States & Puerto Rico	Toxic Substances Control Act (TSCA) Inventory	Yes

*A "Yes" indicates that all components of this product comply with the inventory requirements administered by the governing country(s)

State regulations This product does not contain a chemical known to the State of California to cause cancer, birth defects or other reproductive harm.

16. Other Information

Further information HMIS® is a registered trade and service mark of the NPCA.

HMIS® ratings
Health: 1
Flammability: 1
Physical hazard: 0

NFPA ratings
Health: 1
Flammability: 1
Instability: 0

Disclaimer The information in the sheet was written based on the best knowledge and experience currently available.

Issue date 01-20-2012

This data sheet contains changes from the previous version in section(s): This document has undergone significant changes and should be reviewed in its entirety.

ConocoPhillips

MATERIAL SAFETY DATA SHEET

No. 2 Diesel Fuel

1. PRODUCT AND COMPANY IDENTIFICATION

Product Name:	No. 2 Diesel Fuel
Synonyms:	CARB Diesel TF3; CARB Diesel; CARB Diesel 10% CARB Diesel Ultra Low Sulfur - Dyed and Undyed EPA Low Sulfur Diesel Fuel - Dyed and Undyed EPA Off Road High Sulfur Diesel - Dyed High Sulfur Diesel Fuel; Low Sulfur Diesel Fuel No. 2 Diesel Fuel Oil No. 2 High Sulfur Diesel - Dyed No. 2 Low Sulfur Diesel - Dyed; No. 2 Low Sulfur Diesel - Undyed No. 2 Low Sulfur Distillate No. 2 Ultra Low Sulfur Diesel - Dyed; No. 2 Ultra Low Sulfur Diesel - Undyed Super Diesel Fuel; Super Diesel Fuel II-LS Virgin Diesel Fuel; No. 2 Distillate Super Diesel Fuel; Super Diesel Fuel II-LS Virgin Diesel Fuel
Intended Use:	Fuel
Chemical Family:	Petroleum Hydrocarbon
Responsible Party:	ConocoPhillips 600 N. Dairy Ashford Houston, Texas 77079-1175
MSDS Information:	800-762-0942 MSDS@conocophillips.com
Customer Service:	800-527-5476
Technical Information:	800-527-5476

Emergency Overview

24 Hour Emergency Telephone Numbers:
Spill, Leak, Fire or Accident Call CHEMTREC:
North America: (800) 424-9300
Others: (703) 527-3887 (collect)

California Poison Control System: (800) 356-3219

Health Hazards/Precautionary Measures: Causes skin irritation. Aspiration hazard if swallowed. Can enter lungs and cause damage. Use with ventilation adequate to keep exposure below recommended limits, if any. Avoid contact with eyes, skin and clothing. Do not taste or swallow. Wash thoroughly after handling.

Physical Hazards/Precautionary Measures: Flammable liquid and vapor. Keep away from heat, sparks, flames, static electricity or other sources of ignition.

Appearance:	Straw colored to dyed red
Physical Form:	Liquid
Odor:	Diesel fuel

NFPA 704 Hazard Class:

Health:	1 (Slight)
Flammability:	2 (Moderate)
Instability:	0 (Least)

Inhalation (Breathing): If respiratory symptoms develop, move victim away from source of exposure and into fresh air. If symptoms persist, seek medical attention. If victim is not breathing, clear airway and immediately begin artificial respiration. If breathing difficulties develop, oxygen should be administered by qualified personnel. Seek immediate medical attention.

Ingestion (Swallowing): Aspiration hazard: Do not induce vomiting or give anything by mouth because this material can enter the lungs and cause severe lung damage. If victim is drowsy or unconscious and vomiting, place on the left side with the head down. If possible, do not leave victim unattended and observe closely for adequacy of breathing. Seek medical attention.

5. FIRE-FIGHTING MEASURES

Flammable Properties:

Flash Point:	125-180°F / 52-82°C
Test Method:	Pensky-Martens Closed Cup (PMCC), ASTM D93, EPA 1010
OSHA Flammability Class:	Combustible liquid
LEL%:	0.3
UEL%:	10.0
Autoignition Temperature:	500°F / 260°C

Unusual Fire & Explosion Hazards: This material is flammable and can be ignited by heat, sparks, flames, or other sources of ignition (e.g., static electricity, pilot lights, or mechanical/electrical equipment, and electronic devices such as cell phones, computers, calculators, and pagers which have not been certified as intrinsically safe). Vapors may travel considerable distances to a source of ignition where they can ignite, flash back, or explode. May create vapor/air explosion hazard indoors, in confined spaces, outdoors, or in sewers. Vapors are heavier than air and can accumulate in low areas. If container is not properly cooled, it can rupture in the heat of a fire.

Extinguishing Media: Dry chemical, carbon dioxide, or foam is recommended. Water spray is recommended to cool or protect exposed materials or structures. Carbon dioxide can displace oxygen. Use caution when applying carbon dioxide in confined spaces. Water may be ineffective for extinguishment, unless used under favorable conditions by experienced fire fighters.

Fire Fighting Instructions: For fires beyond the incipient stage, emergency responders in the immediate hazard area should wear bunker gear. When the potential chemical hazard is unknown, in enclosed or confined spaces, or when explicitly required by DOT, a self contained breathing apparatus should be worn. In addition, wear other appropriate protective equipment as conditions warrant (see Section 8).

Isolate immediate hazard area, keep unauthorized personnel out. Stop spill/release if it can be done with minimal risk. Move undamaged containers from immediate hazard area if it can be done with minimal risk.

Water spray may be useful in minimizing or dispersing vapors and to protect personnel. Cool equipment exposed to fire with water, if it can be done with minimal risk. Avoid spreading burning liquid with water used for cooling purposes.

6. ACCIDENTAL RELEASE MEASURES

Flammable. Keep all sources of ignition and hot metal surfaces away from spill/release. The use of explosion-proof electrical equipment is recommended.

Stay upwind and away from spill/release. Notify persons down wind of the spill/release, isolate immediate hazard area and keep unauthorized personnel out. Stop spill/release if it can be done with minimal risk. Wear appropriate protective equipment including respiratory protection as conditions warrant (see Section 8).

Prevent spilled material from entering sewers, storm drains, other unauthorized drainage systems, and natural waterways. Dike far ahead of spill for later recovery or disposal. Use foam on spills to minimize vapors (see Section 5). Spilled material may be absorbed into an appropriate absorbent material.

Notify fire authorities and appropriate federal, state, and local agencies. Immediate cleanup of any spill is recommended. If spill of any amount is made into or upon navigable waters, the contiguous zone, or adjoining shorelines, notify the National Response Center (phone number 800-424-8802).

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance:	Straw colored to dyed red
Physical Form:	Liquid
Odor:	Diesel fuel
Odor Threshold:	No data
pH:	Not applicable
Vapor Pressure (mm Hg):	0.40
Vapor Density (air=1):	> 3
Boiling Point:	300-690°F / 149-366°C
Solubility in Water:	Negligible
Partition Coefficient (n-octanol/water) (Kow):	No data
Specific Gravity:	0.81-0.88@ 60°F (15.6°C)
Bulk Density:	7.08 lbs/gal
Viscosity cSt @ 40°C:	1.7-4.1
Percent Volatile:	Negligible@ ambient conditions
Evaporation Rate (nBuAc=1):	<1
Flash Point:	125-180°F / 52-82°C
Test Method:	Pensky-Martens Closed Cup (PMCC), ASTM D93, EPA 1010
LEL%:	0.3
UEL%:	10.0
Autoignition Temperature:	500°F / 260°C

10. STABILITY AND REACTIVITY

Stability: Stable under normal ambient and anticipated storage and handling conditions of temperature and pressure. Flammable liquid and vapor. Vapor can cause flash fire.

Conditions to Avoid: Avoid all possible sources of ignition (see Sections 5 and 7).

Materials to Avoid (Incompatible Materials): Avoid contact with strong oxidants such as liquid chlorine, concentrated oxygen, sodium hypochlorite, calcium hypochlorite, etc.

Hazardous Decomposition Products: Combustion can yield carbon, nitrogen and sulfur oxides. The use of hydrocarbon fuel in an area without adequate ventilation may result in hazardous levels of combustion products (e.g., oxides of carbon, sulfur and nitrogen, benzene and other hydrocarbons) and/or dangerously low oxygen levels. See Section 11 for additional information on hazards of engine exhaust. IARC has classified Diesel exhaust as probably carcinogenic in humans.

Hazardous Polymerization: Will not occur.

11. TOXICOLOGICAL INFORMATION

Chronic Data:

Diesel Fuel No. 2 (68476-34-6)

Carcinogenicity: Petroleum middle distillates have been shown to cause skin tumors in mice following repeated and prolonged skin contact. Follow-up studies have shown that these tumors are produced through a non-genotoxic mechanism associated with frequent cell damage and repair, and that they are not likely to cause tumors in the absence of prolonged skin irritation. Animal studies have also shown that washing the skin with soap and water can reduce the tumor response. Middle distillates with low polynuclear aromatic hydrocarbon content have not been identified as a carcinogen by NTP, IARC or OSHA.
Target Organs: Limited evidence of renal impairment has been noted from a few older case reports involving excessive exposure to diesel fuel No. 2. However, renal toxicity has not been demonstrated to be a consistent finding of diesel fuel exposure.

Naphthalene (91-20-3)

Carcinogenicity: Naphthalene has been evaluated in two year inhalation studies in both rats and mice. The National Toxicology Program (NTP) concluded that there is clear evidence of carcinogenicity in male and female rats based on increased incidences of respiratory epithelial adenomas and olfactory epithelial neuroblastomas of the nose. NTP found some evidence of carcinogenicity in female mice (alveolar adenomas) and no evidence of carcinogenicity in male mice. Naphthalene has been identified as a carcinogen by IARC and NTP.

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14. TRANSPORT INFORMATION

Labels: Flammable
Placards/Marking (Bulk): Flammable/1202
Packaging - Non-Bulk: P001, LP01
EMS: F-E, S-E

ICAO/IATA

UN/ID #: UN1202
Proper Shipping Name: Diesel fuel
Hazard Class/Division: 3
Packing Group: III
Subsidiary risk: None
Non-Bulk Package Marking: Diesel fuel, UN1202
Labels: Flammable

	LTD. QTY.	Passenger Aircraft	Cargo Aircraft Only
Packaging Instruction #:	Y309	309	310
Max. Net Qty. Per Package:	10 L	60 L	220 L

15. REGULATORY INFORMATION

U.S. Regulations:

EPA SARA 311/312 (Title III Hazard Categories)

Acute Health:	Yes
Chronic Health:	No
Fire Hazard:	Yes
Pressure Hazard:	No
Reactive Hazard:	No

SARA - Section 313 and 40 CFR 372:
This material contains the following chemicals subject to the reporting requirements of SARA 313 and 40 CFR 372:
Naphthalene................91-20-3................<1%

EPA (CERCLA) Reportable Quantity (in pounds):
EPA's Petroleum Exclusion applies to this material - (CERCLA 101(14)).

CERCLA/SARA - Section 302 Extremely Hazardous Substances and TPQs (in pounds):
This material contains the following chemicals subject to the reporting requirements of SARA 302 and 40 CFR 372:
-- None Known --

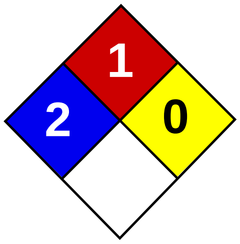
California Proposition 65:
Warning: This material contains the following chemicals which are known to the State of California to cause cancer, birth defects or other reproductive harm, and are subject to the requirements of California Proposition 65 (CA Health & Safety Code Section 25249.5):
Benzene -- Cancer, Developmental and Reproductive Toxicant
Naphthalene -- Cancer
Toluene -- Developmental Toxicant

Diesel engine exhaust, while not a component of this material, is on the Proposition 65 list of chemicals known to the State of California to cause cancer.

Carcinogen Identification:
This material has not been identified as a carcinogen by NTP, IARC, or OSHA. See Section 11 for carcinogenicity information of individual components, if any.

Diesel exhaust is a probable cancer hazard based on tests in laboratory animals. It has been identified as a carcinogen by IARC.

TSCA:
All components are listed on the TSCA inventory.



Health	2
Fire	1
Reactivity	0
Personal Protection	E

Material Safety Data Sheet

Sodium lauryl sulfate MSDS

Section 1: Chemical Product and Company Identification

Product Name: Sodium lauryl sulfate

Catalog Codes: SLS1942, SLS1147

CAS#: 151-21-3

RTECS: WT1050000

TSCA: TSCA 8(b) inventory: Sodium lauryl sulfate

CI#: Not applicable.

Synonym: Sodium dodecyl sulfate

Chemical Name: Sulfuric acid, monododecyl ester, sodium salt

Chemical Formula: CH3(CH2)10CH2OOSOONa

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call:
1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Sodium lauryl sulfate	151-21-3	100

Toxicological Data on Ingredients: Sodium lauryl sulfate: ORAL (LD50): Acute: 1288 mg/kg [Rat.]. DUST (LC50): Acute: >3900 mg/m 1 hours [Rat].

Section 3: Hazards Identification

Potential Acute Health Effects:
Hazardous in case of skin contact (irritant), of eye contact (irritant), of ingestion, of inhalation. Slightly hazardous in case of skin contact (sensitizer). Severe over-exposure can result in death.

Potential Chronic Health Effects:
Slightly hazardous in case of skin contact (sensitizer). CARCINOGENIC EFFECTS: Not available. MUTAGENIC EFFECTS: Mutagenic for bacteria and/or yeast. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance may be toxic to skin. Repeated or prolonged exposure to the substance can produce target organs damage. Repeated exposure to a highly toxic material may produce general deterioration of health by an accumulation in one or many human organs.

Section 4: First Aid Measures

Eye Contact:
Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Cold water may be used. Get medical attention.

Skin Contact:
In case of contact, immediately flush skin with plenty of water. Cover the irritated skin with an emollient. Remove contaminated clothing and shoes. Cold water may be used.Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention.

Serious Skin Contact:
Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek immediate medical attention.

Inhalation:
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention immediately.

Serious Inhalation: Not available.

Ingestion:
Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If large quantities of this material are swallowed, call a physician immediately. Loosen tight clothing such as a collar, tie, belt or waistband.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: May be combustible at high temperature.

Auto-Ignition Temperature: Not available.

Flash Points: Not available.

Flammable Limits: Not available.

Products of Combustion: These products are carbon oxides (CO, CO2), sulfur oxides (SO2, SO3...).

Fire Hazards in Presence of Various Substances: Slightly flammable to flammable in presence of heat.

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available. Slightly explosive in presence of open flames and sparks.

Fire Fighting Media and Instructions:
SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use water spray, fog or foam. Do not use water jet.

Special Remarks on Fire Hazards: When heated to decomposition it emits toxic fumes of sulfur oxides, and sodium oxide.

Special Remarks on Explosion Hazards: Not available.

Section 6: Accidental Release Measures

Small Spill:
Use appropriate tools to put the spilled solid in a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and dispose of according to local and regional authority requirements.

Large Spill:
Poisonous solid. Stop leak if without risk. Do not get water inside container. Do not touch spilled material. Use water spray to reduce vapors. Prevent entry into sewers, basements or confined areas; dike if needed. Eliminate all ignition sources. Call for assistance on disposal. Finish cleaning by spreading water on the contaminated surface and allow to evacuate through the sanitary system.

Section 7: Handling and Storage

Precautions:
Keep away from heat. Keep away from sources of ignition. Ground all equipment containing material. Do not ingest. Do not breathe dust. Wear suitable protective clothing. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes. Keep away from incompatibles such as oxidizing agents.

Storage: Keep container tightly closed. Keep container in a cool, well-ventilated area.

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

Personal Protection:
Splash goggles. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Dust respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits: Not available.

Section 9: Physical and Chemical Properties

Physical state and appearance: Solid. (Crystals solid.)

Odor:
Characteristic. Faint odor of fatty substances (Slight.)

Taste: Not available.

Molecular Weight: 288.38 g/mole

Color: White to yellowish.

pH (1% soln/water): Not available.

Boiling Point: Not available.

Melting Point: 204°C (399.2°F) - 207 C

Critical Temperature: Not available.

Specific Gravity: Not available.

Vapor Pressure: Not applicable.

Vapor Density: Not available.

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: The product is more soluble in oil; log(oil/water) = 1.6

Ionicity (in Water): Not available.

Dispersion Properties: See solubility in water.

Solubility:

Soluble in cold water, hot water. Solubility in water: 1g/10 ml water

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Excess heat, dust generation, incompatible materials

Incompatibility with various substances: Reactive with oxidizing agents.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity: Not available.

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Inhalation. Ingestion.

Toxicity to Animals:
WARNING: THE LC50 VALUES HEREUNDER ARE ESTIMATED ON THE BASIS OF A 4-HOUR EXPOSURE. Acute oral toxicity (LD50): 1288 mg/kg [Rat.]. Acute toxicity of the dust (LC50): >3900 mg/m 1 hours [Rat]. 3

Chronic Effects on Humans:
MUTAGENIC EFFECTS: Mutagenic for bacteria and/or yeast. May cause damage to the following organs: skin.

Other Toxic Effects on Humans:
Hazardous in case of skin contact (irritant), of ingestion, of inhalation. Slightly hazardous in case of skin contact (sensitizer).

Special Remarks on Toxicity to Animals:
Lowest Published Lethal Dose: LDL [Rabbit] - Route: Skin; Dose: 10000 mg/kg

Special Remarks on Chronic Effects on Humans: May cause adverse reproductive effects based on animal test data. No human data found.

Special Remarks on other Toxic Effects on Humans:
Acute Potential Health Effects: Skin: Causes mild to moderate skin irritation. May cause allergic reaction (dermatitis) Eyes: Causes moderate eye irritation. Inhalation: Material is irritating to mucous membranes and upper respiratory tract. May cause allergic respiratory reaction. Ingestion: Causes gastrointestinal tract irritation with nausea, vomiting, hypermotility, diarrhea, and bloating. May also affect behavior (ataxia, somnolence), and cardiovascular system. Chronic Potential Health Effects: Skin: Prolonged or repeated skin contact may cause allergic dermatitis. Ingestion: Prolonged or repeated ingestion may affect the liver. Inhalation: Prolonged or repeated inhalation may cause allergic respiratory reaction (asthma).

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are less toxic than the product itself.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:
Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification: Not a DOT controlled material (United States).

Identification: Not applicable.

Special Provisions for Transport: Not applicable.

Section 15: Other Regulatory Information

Federal and State Regulations: TSCA 8(b) inventory: Sodium lauryl sulfate

Other Regulations:
OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200). EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

Other Classifications:

WHMIS (Canada): CLASS D-2B: Material causing other toxic effects (TOXIC).

DSCL (EEC):
R36/38- Irritating to eyes and skin. S26- In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. S37/39- Wear suitable gloves and eye/face protection.

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 1

Reactivity: 0

Personal Protection: E

National Fire Protection Association (U.S.A.):

Health: 2

Flammability: 1

Reactivity: 0

Specific hazard:

Protective Equipment:
Gloves. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Splash goggles.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

Created: 10/09/2005 06:33 PM

Last Updated: 11/01/2010 12:00 PM

The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume

Material Safety Data Sheet
The Dow Chemical Company

Product Name: TERGITOL™ NP-9 SURFACTANT

Issue Date: 09/20/2011
Print Date: 06 Mar 2012

The Dow Chemical Company encourages and expects you to read and understand the entire (M)SDS, as there is important information throughout the document. We expect you to follow the precautions identified in this document unless your use conditions would necessitate other appropriate methods or actions.

1. Product and Company Identification

Product Name
TERGITOL™ NP-9 SURFACTANT

COMPANY IDENTIFICATION
The Dow Chemical Company
2030 Willard H. Dow Center
Midland, MI 48674
United States

Customer Information Number:	800-258-2436 SDSQuestion@dow.com

EMERGENCY TELEPHONE NUMBER

24-Hour Emergency Contact:	989-636-4400
Local Emergency Contact:	989-636-4400

2. Hazards Identification

Emergency Overview
Color: Yellow
Physical State: Liquid.
Odor: Mild
Hazards of product:

> WARNING! Causes eye irritation. Harmful if inhaled. May be harmful if absorbed through skin. May be harmful if swallowed. Isolate area. Keep upwind of spill.

OSHA Hazard Communication Standard
This product is a "Hazardous Chemical" as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200.

Potential Health Effects
Eye Contact: May cause severe eye irritation. May cause severe corneal injury.
Skin Contact: Prolonged contact may cause slight skin irritation with local redness.
Skin Absorption: Prolonged skin contact is unlikely to result in absorption of harmful amounts.

Inhalation: Prolonged excessive exposure to mist may cause serious adverse effects, even death. Vapor may cause irritation of the upper respiratory tract (nose and throat).
Ingestion: Low toxicity if swallowed. Small amounts swallowed incidentally as a result of normal handling operations are not likely to cause injury; however, swallowing larger amounts may cause injury.
Aspiration hazard: Based on physical properties, not likely to be an aspiration hazard.
Effects of Repeated Exposure: For this family of materials: In animals, effects have been reported on the following organs: Kidney. Liver.
Birth Defects/Developmental Effects: For this family of materials: Has been toxic to the fetus in laboratory animals at doses toxic to the mother.

3. Composition Information

Component	CAS #	Amount
Nonylphenol polyethylene glycol ether	127087-87-0	>= 97.0 %
Poly(ethylene oxide)	25322-68-3	<= 3.0 %
Dinonylphenyl polyoxyethylene	9014-93-1	<= 2.0 %

4. First-aid measures

Description of first aid measures

General advice: First Aid responders should pay attention to self-protection and use the recommended protective clothing (chemical resistant gloves, splash protection). If potential for exposure exists refer to Section 8 for specific personal protective equipment.
Inhalation: Move person to fresh air. If not breathing, give artificial respiration; if by mouth to mouth use rescuer protection (pocket mask, etc). If breathing is difficult, oxygen should be administered by qualified personnel. Call a physician or transport to a medical facility.
Skin Contact: Wash skin with plenty of water.
Eye Contact: Immediately flush eyes with water; remove contact lenses, if present, after the first 5 minutes, then continue flushing eyes for at least 15 minutes. Obtain medical attention without delay, preferably from an ophthalmologist. Eye wash fountain should be located in immediate work area.
Ingestion: If swallowed, seek medical attention. Do not induce vomiting unless directed to do so by medical personnel.

Most important symptoms and effects, both acute and delayed

Aside from the information found under Description of first aid measures (above) and Indication of immediate medical attention and special treatment needed (below), no additional symptoms and effects are anticipated.

Indication of immediate medical attention and special treatment needed

Maintain adequate ventilation and oxygenation of the patient. Respiratory symptoms, including pulmonary edema, may be delayed. Persons receiving significant exposure should be observed 24-48 hours for signs of respiratory distress. No specific antidote. Treatment of exposure should be directed at the control of symptoms and the clinical condition of the patient.

5. Fire Fighting Measures

Suitable extinguishing media

Water fog or fine spray. Dry chemical fire extinguishers. Carbon dioxide fire extinguishers. Foam. Alcohol resistant foams (ATC type) are preferred. General purpose synthetic foams (including AFFF) or protein foams may function, but will be less effective.
Extinguishing Media to Avoid: Do not use direct water stream. May spread fire.

Special hazards arising from the substance or mixture

Hazardous Combustion Products: During a fire, smoke may contain the original material in addition to combustion products of varying composition which may be toxic and/or irritating. Combustion products may include and are not limited to: Carbon monoxide. Carbon dioxide.
Unusual Fire and Explosion Hazards: Violent steam generation or eruption may occur upon application of direct water stream to hot liquids.

Advice for firefighters

Fire Fighting Procedures: Keep people away. Isolate fire and deny unnecessary entry. Burning liquids may be extinguished by dilution with water. Do not use direct water stream. May spread fire. Burning liquids may be moved by flushing with water to protect personnel and minimize property damage.
Special Protective Equipment for Firefighters: Wear positive-pressure self-contained breathing apparatus (SCBA) and protective fire fighting clothing (includes fire fighting helmet, coat, trousers, boots, and gloves). If protective equipment is not available or not used, fight fire from a protected location or safe distance.

6. Accidental Release Measures

Personal precautions, protective equipment and emergency procedures: Isolate area. Keep unnecessary and unprotected personnel from entering the area. Keep upwind of spill. Ventilate area of leak or spill. Use appropriate safety equipment. For additional information, refer to Section 8, Exposure Controls and Personal Protection. Refer to Section 7, Handling, for additional precautionary measures.

Environmental precautions: Prevent from entering into soil, ditches, sewers, waterways and/or groundwater. See Section 12, Ecological Information.

Methods and materials for containment and cleaning up: Contain spilled material if possible. Absorb with materials such as: Sand. Dirt. Collect in suitable and properly labeled containers. Do not use water for cleanup. See Section 13, Disposal Considerations, for additional information.
Ignition Sources Removal: Keep away from sources of ignition.
Dust Control: Not applicable.

7. Handling and Storage

Handling

General Handling: Avoid contact with eyes, skin, and clothing. Avoid breathing vapor. Do not swallow. Wash thoroughly after handling. Keep container closed. Use with adequate ventilation. See Section 8, EXPOSURE CONTROLS AND PERSONAL PROTECTION.

Storage

No specific requirements. Additional storage and handling information on this product may be obtained by calling your sales or customer service contact. The shelf life given is for unopened containers stored under moderate temperature conditions.

Shelf life: Use within
24 Months

8. Exposure Controls / Personal Protection

Exposure Limits

Component	List	Type	Value
Poly(ethylene oxide)	AIHA WEEL	TWA Particulate.	10 mg/m3

Personal Protection

Eye/Face Protection: Use chemical goggles.

Skin Protection: Wear clean, body-covering clothing.

Hand protection: Use gloves chemically resistant to this material when prolonged or frequently repeated contact could occur. Examples of preferred glove barrier materials include: Butyl rubber. Ethyl vinyl alcohol laminate ("EVAL"). Examples of acceptable glove barrier materials include: Natural rubber ("latex"). Neoprene. Nitrile/butadiene rubber ("nitrile" or "NBR"). Polyvinyl chloride ("PVC" or "vinyl"). NOTICE: The selection of a specific glove for a particular application and duration of use in a workplace should also take into account all relevant workplace factors such as, but not limited to: Other chemicals which may be handled, physical requirements (cut/puncture protection, dexterity, thermal protection), potential body reactions to glove materials, as well as the instructions/specifications provided by the glove supplier.

Respiratory Protection: Respiratory protection should be worn when there is a potential to exceed the exposure limit requirements or guidelines. If there are no applicable exposure limit requirements or guidelines, use an approved respirator. Selection of air-purifying or positive-pressure supplied-air will depend on the specific operation and the potential airborne concentration of the material. For emergency conditions, use an approved positive-pressure self-contained breathing apparatus. In confined or poorly ventilated areas, use an approved self-contained breathing apparatus or positive pressure air line with auxiliary self-contained air supply. The following should be effective types of air-purifying respirators: Organic vapor cartridge with a particulate pre-filter.

Ingestion: Use good personal hygiene. Do not consume or store food in the work area. Wash hands before smoking or eating.

Engineering Controls

Ventilation: Use engineering controls to maintain airborne level below exposure limit requirements or guidelines. If there are no applicable exposure limit requirements or guidelines, use only with adequate ventilation. Local exhaust ventilation may be necessary for some operations.

9. Physical and Chemical Properties

Appearance	
Physical State	Liquid.
Color	Yellow
Odor	Mild
Odor Threshold	No test data available
pH	No test data available
Melting Point	Not applicable to liquids
Freezing Point	3.8 °C (38.8 °F) *Calculated*
Boiling Point (760 mmHg)	> 250 °C (> 482 °F) *Calculated* Decomposes before boiling.
Flash Point - Closed Cup	247 °C (477 °F) *ASTM D93*
Flash Point - Open Cup	282 °C (540 °F) *ASTM D92*
Evaporation Rate (Butyl Acetate = 1)	No test data available
Flammability (solid, gas)	Not applicable to liquids
Flammable Limits In Air	Lower: No test data available Upper: No test data available
Vapor Pressure	< 0.01 mmHg @ 20 °C *Calculated*
Vapor Density (air = 1)	>1 *Calculated*
Specific Gravity (H2O = 1)	1.057 20 °C/20 °C *Calculated*
Solubility in water (by weight)	Completely soluble but some compositions may form gels

Partition coefficient, n-octanol/water (log Pow)	2.1 - 3.4 *Calculated*
Autoignition Temperature	No test data available
Decomposition Temperature	No test data available
Kinematic Viscosity	237 cSt @ 25 °C *Calculated*
Explosive properties	no data available
Oxidizing properties	no data available

10. Stability and Reactivity

Reactivity
No dangerous reaction known under conditions of normal use.

Chemical stability
Thermally stable at typical use temperatures.

Possibility of hazardous reactions
Polymerization will not occur.

Conditions to Avoid: Exposure to elevated temperatures can cause product to decompose.

Incompatible Materials: Avoid contact with: Strong acids. Strong bases. Strong oxidizers.

Hazardous decomposition products
Decomposition products depend upon temperature, air supply and the presence of other materials.

11. Toxicological Information

Acute Toxicity
Ingestion

Typical for this family of materials. LD50, Rat 960 - 3,980 mg/kg

Dermal

Typical for this family of materials. LD50, Rabbit 2,000 - 2,991 mg/kg

Inhalation

Typical for this family of materials. LC50, 4 h, Aerosol, Rat 1.15 mg/l

Eye damage/eye irritation
May cause severe eye irritation. May cause severe corneal injury.

Skin corrosion/irritation
Prolonged contact may cause slight skin irritation with local redness.

Sensitization
Skin

For this family of materials: Did not cause allergic skin reactions when tested in humans.

Respiratory

No relevant data found.

Repeated Dose Toxicity
For this family of materials: In animals, effects have been reported on the following organs: Kidney. Liver.

Chronic Toxicity and Carcinogenicity
For this family of materials: Did not cause cancer in laboratory animals.

Developmental Toxicity
For this family of materials: Has been toxic to the fetus in laboratory animals at doses toxic to the mother. For this family of materials: Did not cause birth defects in laboratory animals.

Reproductive Toxicity
No relevant data found.

Genetic Toxicology

For this family of materials: In vitro genetic toxicity studies were negative.

12. Ecological Information

Toxicity

For this family of materials: Material is moderately toxic to aquatic organisms on an acute basis (LC50/EC50 between 1 and 10 mg/L in the most sensitive species tested).

Fish Acute & Prolonged Toxicity
For this family of materials: LC50, fathead minnow (Pimephales promelas), 96 h: 3.8 - 6.2 mg/l
Aquatic Invertebrate Acute Toxicity
For this family of materials: LC50, water flea Daphnia magna, 48 h: 9.3 - 21.4 mg/l
Toxicity to Micro-organisms
For this family of materials: IC50; bacteria, 16 h: > 1,000 mg/l

Persistence and Degradability

For this family of materials: Based on stringent OECD test guidelines, this material cannot be considered as readily biodegradable; however, these results do not necessarily mean that the material is not biodegradable under environmental conditions.

OECD Biodegradation Tests:

Biodegradation	Exposure Time	Method	10 Day Window
< 60 %	28 d	OECD 301B Test	Not applicable

Chemical Oxygen Demand: 2.09 - 2.25 mg/mg
Theoretical Oxygen Demand: 2.15 - 2.25 mg/mg

Bioaccumulative potential

Partition coefficient, n-octanol/water (log Pow): 2.1 - 3.4 Calculated
Bioconcentration Factor (BCF): 5.9 - 48; fish; Estimated.

Mobility in soil

Mobility in soil: No relevant data found.

13. Disposal Considerations

DO NOT DUMP INTO ANY SEWERS, ON THE GROUND, OR INTO ANY BODY OF WATER. All disposal practices must be in compliance with all Federal, State/Provincial and local laws and regulations. Regulations may vary in different locations. Waste characterizations and compliance with applicable laws are the responsibility solely of the waste generator. AS YOUR SUPPLIER, WE HAVE NO CONTROL OVER THE MANAGEMENT PRACTICES OR MANUFACTURING PROCESSES OF PARTIES HANDLING OR USING THIS MATERIAL. THE INFORMATION PRESENTED HERE PERTAINS ONLY TO THE PRODUCT AS SHIPPED IN ITS INTENDED CONDITION AS DESCRIBED IN MSDS SECTION: Composition Information. FOR UNUSED & UNCONTAMINATED PRODUCT, the preferred options include sending to a licensed, permitted: Incinerator or other thermal destruction device. Waste water treatment system.

14. Transport Information

DOT Non-Bulk
NOT REGULATED

DOT Bulk
NOT REGULATED

IMDG
Proper Shipping Name: ENVIRONMENTALLY HAZARDOUS SUBSTANCE, LIQUID, N.O.S.
Technical Name: NONYLPHENOL POLYETHYLENE GLYCOL ETHER
Hazard Class: CLASS 9 **ID Number:** UN 3082 **Packing Group:** PG III
EMS Number: F-A,S-F
Marine pollutant.: Yes

ICAO/IATA
Proper Shipping Name: ENVIRONMENTALLY HAZARDOUS SUBSTANCE, LIQUID, N.O.S.
Technical Name: NONYLPHENOL POLYETHYLENE GLYCOL ETHER
Hazard Class: 9 **ID Number:** UN3082 **Packing Group:** PG III
Cargo Packing Instruction: 964
Passenger Packing Instruction: 964
Additional Information

MARINE POLLUTANT

This information is not intended to convey all specific regulatory or operational requirements/information relating to this product. Additional transportation system information can be obtained through an authorized sales or customer service representative. It is the responsibility of the transporting organization to follow all applicable laws, regulations and rules relating to the transportation of the material.

15. Regulatory Information

OSHA Hazard Communication Standard
This product is a "Hazardous Chemical" as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200.

Superfund Amendments and Reauthorization Act of 1986 Title III (Emergency Planning and Community Right-to-Know Act of 1986) Sections 311 and 312

Immediate (Acute) Health Hazard	Yes
Delayed (Chronic) Health Hazard	Yes
Fire Hazard	No
Reactive Hazard	No
Sudden Release of Pressure Hazard	No

Superfund Amendments and Reauthorization Act of 1986 Title III (Emergency Planning and Community Right-to-Know Act of 1986) Section 313
To the best of our knowledge, this product does not contain chemicals at levels which require reporting under this statute.

Pennsylvania (Worker and Community Right-To-Know Act): Pennsylvania Hazardous Substances List and/or Pennsylvania Environmental Hazardous Substance List:
To the best of our knowledge, this product does not contain chemicals at levels which require reporting under this statute.

Pennsylvania (Worker and Community Right-To-Know Act): Pennsylvania Special Hazardous Substances List:
To the best of our knowledge, this product does not contain chemicals at levels which require reporting under this statute.

California Proposition 65 (Safe Drinking Water and Toxic Enforcement Act of 1986)
WARNING: This product contains a chemical(s) known to the State of California to cause cancer.

Component	CAS #	Amount
1,4-Dioxane	123-91-1	20.0 PPM
Ethylene oxide	75-21-8	10.0 PPM

California Proposition 65 (Safe Drinking Water and Toxic Enforcement Act of 1986)
WARNING: This product contains a chemical(s) known to the State of California to cause birth defects or other reproductive harm.

Component	CAS #	Amount
Ethylene oxide	75-21-8	10.0 PPM

US. Toxic Substances Control Act
All components of this product are on the TSCA Inventory or are exempt from TSCA Inventory requirements under 40 CFR 720.30

CEPA - Domestic Substances List (DSL)
All substances contained in this product are listed on the Canadian Domestic Substances List (DSL) or are not required to be listed.

European Inventory of Existing Commercial Chemical Substances (EINECS)
This product is a polymer according to the definition in Directive 92/32/EEC (7th Amendment to Directive 67/548/EEC) and all of its starting materials and intentional additives are listed in the European Inventory of Existing Commercial Chemical Substances (EINECS) or in compliance with European (EU) chemical inventory requirements.

16. Other Information

Product Literature

Additional information on this and other products may be obtained by visiting our web page. Additional information on this product may be obtained by calling your sales or customer service contact. Ask for a product brochure.

Hazard Rating System

NFPA	Health	Fire	Reactivity
	2	0	0

Recommended Uses and Restrictions

Identified uses
Multi-purpose surfactant. NOTICE! NOT TO BE USED AS A BIOCIDE IN INTRAVAGINAL END-USE APPLICATIONS (INCLUDING SPERMICIDES). FOR INDUSTRY USE ONLY. We recommend that you use this product in a manner consistent with the listed use. If your intended use is not consistent with the stated use, please contact your sales or technical service representative.

Revision

Identification Number: 2033 / 1001 / Issue Date 09/20/2011 / Version: 4.0
Most recent revision(s) are noted by the bold, double bars in left-hand margin throughout this document.

Legend

N/A	Not available
W/W	Weight/Weight
OEL	Occupational Exposure Limit
STEL	Short Term Exposure Limit
TWA	Time Weighted Average
ACGIH	American Conference of Governmental Industrial Hygienists, Inc.

DOW IHG	Dow Industrial Hygiene Guideline
WEEL	Workplace Environmental Exposure Level
HAZ_DES	Hazard Designation
Action Level	A value set by OSHA that is lower than the PEL which will trigger the need for activities such as exposure monitoring and medical surveillance if exceeded.

The Dow Chemical Company urges each customer or recipient of this (M)SDS to study it carefully and consult appropriate expertise, as necessary or appropriate, to become aware of and understand the data contained in this (M)SDS and any hazards associated with the product. The information herein is provided in good faith and believed to be accurate as of the effective date shown above. However, no warranty, express or implied, is given. Regulatory requirements are subject to change and may differ between various locations. It is the buyer's/user's responsibility to ensure that his activities comply with all federal, state, provincial or local laws. The information presented here pertains only to the product as shipped. Since conditions for use of the product are not under the control of the manufacturer, it is the buyer's/user's duty to determine the conditions necessary for the safe use of this product. Due to the proliferation of sources for information such as manufacturer-specific (M)SDSs, we are not and cannot be responsible for (M)SDSs obtained from any source other than ourselves. If you have obtained an (M)SDS from another source or if you are not sure that the (M)SDS you have is current, please contact us for the most current version.

MATERIAL SAFETY DATA SHEET

HUNTSMAN
Enriching lives through innovation

READ AND UNDERSTAND MATERIAL SAFETY DATA SHEET BEFORE HANDLING OR DISPOSING OF PRODUCT

MSDS CODE AND NAME : ***N95 SURFONIC® N-95***
DATE ISSUED : **01/18/2007**
DATE PRINTED : **01/18/2007**

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

MATERIAL IDENTITY

MSDS CODE AND NAME

N95 SURFONIC® N-95

Chemical Name and/or Family or Description:

Nonionic surfactant - alkylphenol ethoxylate

COMPANY INFORMATION

Huntsman Petrochemical Corporation
P.O. Box 4980
The Woodlands, TX 77387-4980

TELEPHONE NUMBERS
Transportation Emergency
Company: (409) 727-0831
CHEMTREC: (800) 424-9300
Medical Emergency: (409) 722-9673 (24 Hour)
General MSDS Assistance: (281) 719-6432
Technical Information: (281) 719-7400

2. COMPOSITION AND INFORMATION ON INGREDIENTS

THE CRITERIA FOR LISTING COMPONENTS IN THE COMPOSITION SECTION ARE AS FOLLOWS: CARCINOGENS ARE LISTED WHEN PRESENT AT 0.1 % OR GREATER; COMPONENTS WHICH ARE OTHERWISE HAZARDOUS ACCORDING TO OSHA ARE LISTED WHEN PRESENT AT 1.0 % OR GREATER; NON-HAZARDOUS COMPONENTS ARE LISTED AT 3.0 % OR GREATER. THIS IS NOT INTENDED TO BE COMPLETE COMPOSITIONAL DISCLOSURE. REFER TO SECTION 14 FOR APPLICABLE STATES' RIGHT TO KNOW AND OTHER REGULATORY INFORMATION.
Product and/or Component(s) Carcinogenic According to:

OSHA IARC NTP OTHER NONE X

Composition:

Chemical Name	CAS Number	Exposure Limits	Range in %
Poly(oxy-1,2-ethanediyl), alpha-(nonylphenyl)-omega-hydroxy-	9016-45-9		100
Glycol ethers (fraction of product matching EPA definition)			1.00-2.99

3. HAZARD IDENTIFICATION

EMERGENCY OVERVIEW

Appearance:

Pale liquid

Odor:

Slight

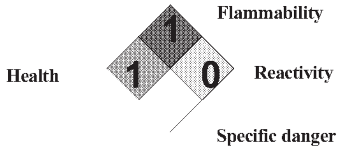
WARNING STATEMENT

CAUTION! MAY CAUSE EYE IRRITATION

Hazardous Material Information System (United States)

Health	1
Fire	1
Reactivity	0
Personal protection	

National Fire Protection Association NFPA (United States)



POTENTIAL HEALTH EFFECTS

Primary Route of Exposure

Eye X **Skin** X **Inhalation** X **Ingestion**

Effects of Overexposure

Acute:

Eyes: May cause irritation, experienced as mild discomfort and seen as slight excess redness of the eye.

Skin: Brief contact may cause slight irritation. Prolonged contact, as with clothing wetted with material, may cause more severe irritation and discomfort, seen as local redness and swelling. Other than the potential skin irritation effects noted above, acute (short term) adverse effects are not expected from brief skin contact; see other effects, below, and Section 11 for information regarding potential long term effects.

Inhalation: Vapors or mist, in excess of permissible concentrations, or in unusually high concentrations generated from spraying, heating the material or as from exposure in poorly ventilated areas or confined spaces, may cause irritation of the nose and throat, headache, nausea, and drowsiness.

Ingestion: May cause abdominal discomfort, nausea, and diarrhea.

Sensitization Properties: Unknown

Chronic:

No adverse effects have been documented in humans as a result of chronic exposure. Section 11 may contain applicable animal data.

Medical Conditions Aggravated by Exposure:

There is no evidence that this product aggravates an existing medical condition.

Other Remarks:

None

4. FIRST AID MEASURES

Eyes:

Immediately flush eyes with plenty of water for at least 15 minutes. Hold eyelids apart while flushing to rinse entire surface of eye and lids with water. Get medical attention.

Skin:

Wash skin with plenty of soap and water for several minutes. Get medical attention if skin irritation develops or persists.

Ingestion:

If patient is conscious and can swallow, give two glasses of water (16 oz.). Induce vomiting as directed by medical personnel. Do not induce vomiting or give anything by mouth to an unconscious or convulsing person.

Inhalation:

If irritation, headache, nausea, or drowsiness occurs, remove to fresh air. Get medical attention if breathing becomes difficult or respiratory irritation persists.

Other Instructions:

None

5. FIRE-FIGHTING MEASURES

Ignition Temperature - AIT (degrees C):

Not applicable.

Flash Point (degrees C):

237.8 (460°F) (PMCC)

Flammable Limits % (Lower-Upper):

Lower: Not determined.
Upper: Not determined.

Recommended Fire Extinguishing Agents And Special Procedures:

Use water spray, dry chemical, foam, or carbon dioxide to extinguish flames. Use water spray to cool fire-exposed containers. Water or foam may cause frothing.

Unusual or Explosive Hazards:

None

Special Protective Equipment for Firefighters:

Wear full protective clothing and positive pressure breathing apparatus.

6. ACCIDENTAL RELEASE MEASURES (Transportation Spills: CHEMTREC (800)424-9300)

Procedures in Case of Accidental Release, Breakage or Leakage:

Contain spill if possible, contain with absorbent materials such as clay or soil, and shovel up. Avoid skin and eye contact.

7. HANDLING AND STORAGE

Precautions to be Taken in

Handling:

Minimum feasible handling temperatures should be maintained.

Storage:

Periods of exposure to high temperatures should be minimized. Water contamination should be avoided.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Protective Equipment (Type)

Eye/Face Protection:

Safety glasses, chemical type goggles, or face shield recommended to prevent eye contact.

Skin Protection:

Workers should wash exposed skin several times daily with soap and water. Soiled work clothing should be laundered or dry-cleaned.

Respiratory Protection:

Airborne concentrations should be kept to lowest levels possible. If vapor, mist or dust is generated and the occupational exposure limit of the product, or any component of the product, is exceeded, use appropriate NIOSH or MSHA approved air purifying or air supplied respirator after determining the airborne concentration of the contaminant. Air supplied respirators should always be worn when airborne concentration of the contaminant or oxygen content is unknown.

Ventilation:

Local exhaust ventilation recommended if generating vapor, dust, or mist. If exhaust ventilation is not available or inadequate, use MSHA or NIOSH approved respirator as appropriate.

Exposure Limit for the Total Product:

None established for product.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance:

Pale liquid

Odor:

Slight

Boiling Point (degrees C):

Not determined.

Melting/Freezing Point (degrees C):

5 (41°F)

Specific Gravity (water=1):

1.06

pH:

7

Vapor Pressure:

<1 mmHg at 20°C (68°F)

Viscosity:

110 cSt at 37.7°C (100°F)

VOC Content:

<1% by ASTM D 2369

Vapor Density (Air=1):

>1

Solubility in Water (%):

>10

Other:

None

10. STABILITY AND REACTIVITY

This Material Reacts Violently With:

Air Water Heat Strong Oxidizers Others None of these X

Comments:

None

Products Evolved When Subjected to Heat or Combustion:

Toxic levels of carbon monoxide, carbon dioxide, irritating aldehydes and ketones may be formed on burning. Heating in air may produce irritating aldehydes, acids, and ketones.

Hazardous Polymerizations:

DO NOT OCCUR

11. TOXICOLOGICAL INFORMATION

TOXICOLOGICAL INFORMATION (ANIMAL TOXICITY DATA)

Oral:
LD50 3.31 g/kg (rat) slightly toxic
Dermal:
LD50 > 2.00 g/kg (rabbit) practically non-toxic
Inhalation:
Believed to be practically non-toxic

IRRITATION INDEX, ESTIMATION OF IRRITATION (SPECIES)

Eyes:
(Draize) 14.40 /110 (rabbit) slightly irritating
Skin:
(Draize) 1.04 /8.0 (rabbit) slightly irritating
Sensitization:
Not determined.

Other:

This product may contain residual (less than 100 ppm) concentrations of ethylene oxide. Ethylene oxide causes tumors in laboratory animals.

12. DISPOSAL CONSIDERATIONS:

Waste Disposal Methods:

This product has been evaluated for RCRA characteristics and does not meet the criteria of a hazardous waste if discarded in its purchased form. Under RCRA, it is the responsibility of the user of the product to determine at the time of disposal, whether the product meets RCRA criteria for hazardous waste. This is because product uses, transformations, mixtures, processes, etc. may render the resulting materials hazardous. This material should be disposed of in accordance with local, state and federal regulations.

Remarks:

None

13. TRANSPORT INFORMATION

Transportation

DOT:

Proper Shipping Name:
Not regulated.

Hazard Class:
Not regulated.

Identification Number:
Not regulated.

Packing Group:
Not regulated.

Label Required:
Not regulated.

Depending on container size, spills of this product may require reporting under SARA 304 and/or CERCLA 102(A) regulations. Please refer to Sections 2 and 14 of MSDS for composition and component RQ information.

IMDG

Proper Shipping Name:
Not regulated.

ICAO

Proper Shipping Name:
Not regulated.

TDG

Proper Shipping Name:
Not regulated.

Hazard Class:
Not regulated.

Identification Number:
Not regulated.

Label Required:
Not regulated.

14. REGULATORY INFORMATION

Federal Regulations:

SARA Title III:

Section 302/304 Extremely Hazardous Substances

Chemical Name	CAS Number	Range in %	TPQ	RQ
Residual ethylene oxide (typical)	75-21-8	0.001	1000	10

Section 311 Hazardous Categorization:

Acute X **Chronic** **Fire** **Pressure** **Reactive** **N/A**

Section 313 Toxic Chemical

Chemical Name	CAS Number	Concentration
Glycol ethers (fraction of product matching EPA definition)		1.00-2.99

CERCLA 102(a)/DOT Hazardous Substances:

Chemical Name	CAS Number	Range in %	RQ

Glycol ethers (fraction of product matching EPA definition)		1.00-2.99	1
Residual ethylene oxide (typical)	75-21-8	0.001	10

States Right-to-Know Regulations:

Chemical Name	State Right-to-know
None.	

California Prop. 65:
The following detectable components of this product are substances, or belong to classes of substances, known to the State of California to cause cancer and/or reproductive toxicity.

Chemical Name	CAS Number
Residual ethylene oxide (typical)	75-21-8

INTERNATIONAL REGULATIONS:

TSCA Inventory Status:

This product, or its components, are listed on, or are exempt from the Toxic Substance Control Act (TSCA) Chemical Substance Inventory.

WHMIS Classification:

Class D, Div 2, Subdiv B: Irritant

Canadian Inventory Status:

This product, or its components, are listed on or are exempt from the Canadian Domestic Substance List (DSL).

EINECS Inventory Status:

This product, or its components, are listed on or are exempt from the European Inventory of Existing Chemical Substances (EINECS) or the European List of Notified Chemical Substances (ELINCS).

Australian Inventory Status:

This product, or its components, are listed on or are exempt from the Australian Inventory of Chemical Substances (AICS).

Japan Inventory Status:

This product, or its components, are listed on or are exempt from the Japanese Ministry of International Trade and Industry (MITI) inventory.

15. ENVIRONMENTAL INFORMATION

Aquatic Toxicity:

LC50-96hr Aquatic toxicity rating is believed to be > 1.00 - 10.00 ppm (moderately toxic)

Mobility:

Not determined.

Persistence and Biodegradability:

Not determined.

Potential to Bioaccumulate:

Not determined.

Remarks:

None

16. OTHER INFORMATION 01/18/2007

Ethoxylated products may contain residual amounts of ethylene oxide (EO) which can accumulate in the container headspace and be released into the ambient environment. This process is enhanced when the product is agitated, as during tank car loading and unloading, and blending operations. Ethylene oxide causes tumors in laboratory animals. The Occupational Safety and Health Administration (OSHA) Permissible Exposure Level (PEL) for EO is 1 ppm for an eight-hour time weighted average exposure. The standard regulates occupational exposure to EO from all sources, including products containing residual EO. It is the responsibility of the employer to comply with OSHA ethylene oxide standard (29 CFR 1910.1047).

Supercedes: 7/1/2004 **The following section has been revised: 14**

Date Issued: 01/18/2007.

THE INFORMATION IN THIS DATA SHEET IS PROVIDED INDEPENDENTLY OF ANY SALE OF THE PRODUCT. IT IS PROVIDED FOR THE PURPOSE OF HAZARD COMMUNICATION AS PART OF HUNTSMAN'S PRODUCT SAFETY PROGRAM. IT IS INTENDED ONLY AS A GUIDE TO THE APPROPRIATE PRECAUTIONARY HANDLING OF THE PRODUCT BY A PROPERLY TRAINED PERSON. YOU ARE ENCOURAGED AND REQUESTED TO ADVISE THOSE WHO MAY COME IN CONTACT WITH SUCH PRODUCTS OF THE INFORMATION CONTAINED HEREIN. THE DATA RELATES ONLY TO THE SPECIFIC PRODUCT DESIGNATED, AND DOES NOT RELATE TO USE OF THE PRODUCT IN COMBINATION WITH ANY OTHER MATERIAL OR USE OF THE PRODUCT IN ANY PROCESS. THE DATA IS NOT INTENDED TO CONSTITUTE PERFORMANCE INFORMATION CONCERNING THE PRODUCT. NO EXPRESS WARRANTY, OR IMPLIED WARRANTY OF MERCHANTABILITY FOR FITNESS FOR A PARTICULAR PURPOSE IS MADE WITH RESPECT TO THE PRODUCT, ITS COMPOSITION, ITS SAFETY OR THE INFORMATION CONTAINED IN THIS DATA SHEET.

TO DETERMINE THE APPLICABILITY OR THE EFFECTS OF ANY LAW OR REGULATION WITH RESPECT TO THE PRODUCT, THE USER SHOULD CONSULT A LEGAL ADVISOR OR THE APPROPRIATE GOVERNMENT AGENCY. HUNTSMAN DOES NOT UNDERTAKE TO FURNISH ADVICE ON SUCH MATTERS.

CURRENT DATA SHEETS ARE AVAILABLE FOR ALL HUNTSMAN PRODUCTS. YOU ARE URGED TO OBTAIN DATA SHEETS FOR ALL HUNTSMAN PRODUCTS YOU BUY, USE OR DISTRIBUTE BY CALLING (281) 719-6432 OR DIRECTING YOUR INQUIRIES TO:

HUNTSMAN
MANAGER, PRODUCT SAFETY
P.O. BOX 4980
THE WOODLANDS, TX 77387-4980

NO PERSON OR ORGANIZATION EXCEPT A DULY AUTHORIZED HUNTSMAN EMPLOYEE IS AUTHORIZED TO PROVIDE OR MAKE AVAILABLE DATA SHEETS FOR HUNTSMAN PRODUCTS. DATA SHEETS FROM UNAUTHORIZED SOURCES MAY CONTAIN INFORMATION THAT IS NO LONGER CURRENT OR ACCURATE. NO PART OF THIS DATA SHEET MAY BE REPRODUCED OR TRANSMITTED IN ANY FORM, OR BY ANY MEANS, WITHOUT PERMISSION IN WRITING FROM HUNTSMAN. ALL REQUESTS FOR PERMISSION TO REPRODUCE MATERIAL FROM THIS DATA SHEET SHOULD BE DIRECTED TO HUNTSMAN, MANAGER, PRODUCT SAFETY AT THE ABOVE ADDRESS.

MATERIAL SAFETY DATA SHEET

NAME OF PRODUCT ***COHEREX***

FILE NUMBER: 1900

DATE PREPARED: 8/09/05

SECTION 1: PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME: COHEREX

SYNONYMS: PETROLEUM EMULSION

PRODUCT CODES: 1900

MANUFACTURER: TRICOR REFINING, LLC

DIVISION: BAKERSFIELD

ADDRESS: P.O. BOX 5877, BAKERSFIELD, CA 93388

EMERGENCY PHONE: (661) 393-7110

HAZARDOUS MATERIALS IDENTIFICATION SYSTEM

HMIS® HAZARD RATING	
4 - SEVERE	HEALTH 1 *
3 - SERIOUS	FLAMMABILITY 0
2 - MODERATE	REACTIVITY 0
1 - SLIGHT	
0 - MINIMAL	

PREPARED BY: TRICOR REFINING, LLC HEALTH, SAFETY AND ENVIRONMENTAL DEPARTMENT

SECTION 2: HAZARDOUS INGREDIENTS / IDENTITY INFORMATION

CHEMICAL FAMILY: PETROLEUM HYDROCARBON IN WATER EMULSION

HAZARDOUS COMPONENT(S)	CAL-OSHA PEL-TWA (8 HOUR)	ACGIH TLV TWA (8 HOUR)	OTHER LIMITS RECOMMENDED	% BY WEIGHT
Heavy Naphthenic Distillate Solvent Extract CAS No. 64742-11-6	5 mg/m³ (As mineral oil mist)	5 mg/m³ (As mineral oil mist)	None	100

SECTION 3: HEALTH HAZARDS IDENTIFICATION

ROUTES OF ENTRY:	**EYES:** Yes	**SKIN:** Yes	**INGESTION:** Yes	**INHALATION:** Yes

HEALTH HAZARDS (ACUTE AND CHRONIC):

EYES: No data available.

SKIN: Prolonged skin contact may cause irritation.

INGESTION: This product is not expected to be acutely toxic by ingestion. If swallowed, do not induce vomiting. Call a physician.

INHALATION: Remove the person to fresh air if respiratory discomfort occurs.

CARCINOGENICITY: ACGIH, NTP, OSHA and IARC carcinogen lists were checked for those components with CAS Registry Numbers 64742-11-6.

ACGIH: This product contains no ingredients classified as carcinogens.

IARC: This product contains petroleum oils similar to ones categorized by the International Agency for Research on Cancer as causing skin cancer in laboratory animals when the oil was repeatedly applied for most of the lifetime of the animal with no effort made to remove the oil between applications. Handling instructions and precautions outlined in this MSDS should be followed when handling this product.

NTP: This product contains no ingredients classified as carcinogens.

OSHA: This product contains no ingredients classified as carcinogens.

CA PROP 65: This product contains chemicals in trace quantities that are on the California Proposition 65 List.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE:
Persons susceptible to dermatitis (skin rash) may aggravate their condition by skin contact with this product.

SECTION 4: EMERGENCY AND FIRST AID MEASURES

EYES: Immediately flush eyes with water for a minimum of 15 minutes. Seek medical attention immediately.

SKIN: Wash with soap and water.

INGESTION: Contact a physician immediately.

INHALATION: If operating conditions create airborne concentrations that exceed the exposure standard, move the person to fresh air. Administer CPR if required. Provide oxygen if breathing is difficult. Seek medical attention immediately.

SECTION 5: FIRE AND EXPLOSION HAZARD DATA

FLAMMABLE LIMITS IN AIR, (% BY VOLUME) UPPER: No data available
LOWER: No data available
FLASH POINT: COC °F: Not applicable
EXTINGUISHING MEDIA: Foam, water fog, dry chemical, CO_2
SPECIAL FIRE FIGHTING PROCEDURES: None
HAZARDOUS DECOMPOSITION PRODUCTS:
Normal combustion forms carbon dioxide and water vapor, and may produce oxides of sulfur and nitrogen. Incomplete combustion can produce carbon monoxide.

SECTION 6: SPILL OR LEAK PROCEDURES

ACCIDENTAL RELEASE MEASURES: In case of spill, clean up using absorbent material such as earth or sand. If spilled into the water, remove the bulk of the product by skimming. If spilled into a navigable waterway in the United States or that may enter the United States, and a film, sheen or discoloration of any water surface is observed, the spill must be reported to the United States National Response Center by calling (800) 424-8802.

WASTE DISPOSAL METHOD: Dispose of in accordance with all applicable Federal, Provincial and Local Regulations.

SECTION 7: HANDLING AND STORAGE

HANDLING AND STORAGE: Avoid fire, sparks or open flame. Wear appropriate personal protective equipment to ensure that this product does not contact the eyes or skin.

VENTILATION: Use adequate ventilation to keep the airborne concentrations of this material below the established exposure limits.

SECTION 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

RESPIRATORY PROTECTION: If operating conditions create airborne concentrations that exceed the exposure standard for mineral oil mists, the use of an approved NIOSH/OSHA respirator for organic vapors or air supplied breathing equipment is recommended.

EYE PROTECTION: Wear appropriate safety glasses, goggles or face shield.

SKIN PROTECTION: Long sleeve cotton shirt and cotton pants are recommended. Wear appropriate gloves.

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

APPEARANCE:	N/T (non Transparent) Yellow
ODOR:	Petroleum Odor
PHYSICAL STATE:	Liquid
INITIAL BOILING POINT:	Greater than 100 ◇ C (212 ° F)

VAPOR PRESSURE (mmHg):	Same as water	**PERCENT VOLATILE (% BY VOL.):**	NA
VAPOR DENSITY (AIR = 1):	Same as water	**EVAPORATION RATE (WATER = 1):**	1
SPECIFIC GRAVITY (H_2O = 1):	1.0	**SOLUBILITY IN WATER:**	Readily dispersible

SECTION 10: REACTIVITY DATA

STABILITY: Stable

CONDITIONS CONTRIBUTING TO INSTABILITY: None

INCOMPATIBILITY (MATERIAL TO AVOID): May react with strong oxidizers.

HAZARDOUS DECOMPOSITION OR BY-PRODUCTS:

Normal combustion forms carbon dioxide and water vapor, and may produce oxides of sulfur and nitrogen. Incomplete combustion can produce carbon monoxide.

HAZARDOUS POLYMERIZATION: Will not occur

SECTION 11: TRANSPORT INFORMATION

U.S. DEPARTMENT OF TRANSPORTATION Not regulated as a hazardous material for transportation.

SECTION 12: REGULATORY INFORMATION

U.S. FEDERAL REGULATIONS:

TSCA (TOXIC SUBSTANCE CONTROL ACT) REGISTRY: Listed

CERCLA (COMPREHENSIVE ENVIRONMENTAL RESPONSE, COMPENSATION AND LIABILITY ACT):

Petroleum emulsions are not a hazardous substance under CERCLA.

SARA TITLE III (SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT):

Section 302/304: Petroleum emulsions are not a hazardous chemical under 40 CFR Part 355. Petroleum emulsions are not listed as an extremely hazardous substance in 40 CFR Part 355, and are not known to contain an extremely hazardous substance in a concentration greater than one percent by weight.

Section 311/312:

Acute Health Hazard:	No
Chronic Health Hazard:	Yes
Fire Hazard:	No
Pressure Release Hazard:	No
Reactivity Hazard:	No

Section 313: This product is not known to contain any components in concentrations above *de minimus* levels that are listed as toxic in 40 CFR Part 372 pursuant to the requirements of Section 313 of SARA.

WHMIS: D2A

OSHA: 29 CFR 1910.1200 (Hazard Communication) required

UNITED STATES REGULATIONS: Mineral oil, petroleum extracts, heavy naphthenic distillate solvent appears on one or more of the hazardous substances lists in the following states:

MA

The information provided in this Material Safety Data Sheet is believed to be accurate and reliable on and as of the date on page one. **However, this Material Safety Data Sheet is not a guarantee or warranty of any kind, express or implied. Any and all warranties of merchantability and/or fitness for a particular purpose are specifically disclaimed.** It is the user's responsibility to determine the conditions under which the product is used, including the selection of engineering controls, work practices and Personal Protective Equipment to minimize hazards.

Appendix D

List of DRMS Permit Amendments

Appendix D
List of DRMS Permit Amendments
Henderson Mine and Mill, Permit M-1977-324
October, 2012

Amendment	Submital Date (Approximate)	Purpose
AM-01	1/27/1981	• Addition of acreage of affected land due to future operational requirements.
AM-02	3/15/1996	• Add Water Treatment Facility to include Urad water treatment.
AM-03	1/20/1998	• Replace ore train by adding conveyor. • Increase affected land by 53.36 acres for conveyor route.
AM-04	1/14/2003	• Change post-mining land use. • Reduce permitted acres. • Modify operations to reduce bond.
AM-05 (superceded)	5/15/2006	• Redefine permitted acreage. • Include better maps for permit definition. • Modify USFS access/legal right of entry. • Include DUSEL as a post-mining land use. • Construction of ultimate interceptor canal around tailing impoundment.
AM-06	2/20/2007	• Redefine permitted acreage. • Include better maps for permit definition. • Modify USFS access/legal right of entry.

Appendix E

List of DRMS Technical Revisions

Appendix E
List of DRMS Technical Revisions
Henderson Mine and Mill, Permit M-1977-324
October, 2012

Technical Revision	Submital Date (Approximate)	Purpose
TR-Historic aka HR-01	4/13/1979	• Change the timetable for reclamation of Area 10 of Henderson Mine from 1979 to 1983 for 5 acres and 2006 for remaining 6 acres.
TR-Historic aka HR-02	7/9/1980	• Exchange 50 acres of disturbed area from Area 21 for 50 acres northwest of the tailing dam outside of the present affected land boundary.
TR-Historic aka HR-03	3/29/1983	• Exchange 13 acres of disturbed area from the southwest end of Area 23 for 13 acres adjacent to Area 9 outside present affected land boundary.
TR-Historic aka HR-04	10/26/1983	• Clarify statements in permit application that will be considered as commitments.
TR-01	4/8/1988	• Institute an alternate form of bonding and establish a reclamation trust fund. • Revised requirement for soil cover on tailing. • Revise the soil stockpile plan.
TR-02	3/11/1991	• Proposed soil stockpile plan meeting requirement to cover tailing deposition area with an average 12 inch soil depth.
TR-03	6/28/1991	• Affected area boundary markers in response to 1990 MLRD regulations ammendment.
TR-04	8/10/1995	• Environmental Protection Plan.
TR-05	10/2/1995	• Groundwater Monitoring Plan. • Establish Points of Compliance. • Establish Numerical Water Quality Limits.
TR-06	8/29/1996	• Add possible Henderson water treatment facility for DRMS bonding purposes.
TR-07	3/31/1999	• Affected land exchange.
TR-08	6/30/1999	• Use of Pond 1.2 for water treatment sludge disposal from (offsite) Urad wastewater treatment plant.
TR-09	4/11/2000	• Tailing Pond decant pipe and emergency spillway pipe plugging. • Seepwater collection and pumpback.
TR-10	5/18/2001	• 1-Dam GW Interception Well Field.
TR-11	9/4/2001	• Topsoil salvage methods.
TR-12	9/6/2002	• Permit revision in response to financial warranty increase.

TR-13	5/22/2003	• Haul road construction. • Topsoil salvage change. • Relocate topsoil storage piles. • Temporary upland interception ditch crossings.
TR-14	2/12/2004	• Barge System as-builts. • Tailing Pond Hydrology.
TR-15	6/16/2004	• Dewatered, high-density Urad sludge disposal in #1 Dam tailing impoundment.
TR-16	3/20/2012	• Development/implementation of a formal Groundwater Management Plan.
TR-17	7/24/2012	• Additional Topsoil Stockpile Storage Location.
TR-18	Current Submittal	• Revision and submittal of Environmental Protection Plan.
Revisions		
AR-01	3/15/1999	• Acreage Reduction Revision.
SR-02	7/9/2002	• Increase Financial Warrany.

Appendix F

Ute Park Pump Station Alarm System (1991)

CLIMAX MOLYBDENUM COMPANY
A DIVISION OF AMAX INC.
HENDERSON MILL

INTER-OFFICE MEMORANDUM

SUBJECT: UTE PARK RADIO ALARM MONITOR May 17, 1991

TO: ALL CONCERNED

FROM: GRANT BURGER

A new radio alarm monitor system has been installed at Ute Park Pump House and the Boiler room. This system is connected to two panel alarms in the Boiler room. The alarms are labeled High Seepwater and Ute Park Power Failure.

High Seepwater: This alarm monitors the water level in the Seepwater sump at Ute Park Pump House. If this alarm occurs, this means that the water level in the sump has passed the start probe commands for all three pumps and is still rising and the pumps are not keeping up.

Ute Park Power Failure: This alarm monitors the existence of power at the Ute Park Pump House. The Power Failure means the Seepwater Pumps, Decant Pumps, Numa-Logic control system, and High Seepwater Alarm do not work. There will be no pumping going on at the pump house.

If both High Seepwater Alarm and Ute Park Power Failure alarms go off at the same time, there has been a radio transmission failure. The radio monitor system is set up to transmit a test signal every 35 minutes. The receiver in the Boiler room will check to see if it has recieved a transmission every two hours. If there has been none, it will give both alarms at the same time. If the unit does not clear from this condition within two hours, then radio communication has totally failed and the Instrumentation Department needs to be notified as soon as possible. Any transmission from the pump house will reset the condition.

This system is totally independent from the normal pump house control system.

INSTRUMENTATION FOREMAN
GRANT BURGER

cc: file
Scott Johnson
Jim Mahon
Harry Roop
Carl Wood
Bruce Goff
Gib Salberg
Jeff Ludwig
Dave Lorenz
Toby Romero
Clyde Edmondson
Bob McCoy

spillage from the face of the dam. Although the system is limited in tailing retention capabilities, several precautions have been taken to keep tailing from entering the seepwater pumps. Any small spills resulting from a break in the crest line would be localized and directed toward one section of the moat. Barriers have been constructed in the canal to contain settled tailing in the area of the spill and still allow seepwater to the flow through the rest of the canal. Two delivery ditches have been constructed, exiting from the canal at different points, which will also tend to isolate tailing spills. Each ditch is equipped with a control slide gate which enables the operator to shut off one ditch while maintaining flow in the other. The gates are detailed on Drawing No. 5-2-384. Finally, at the point where the two ditches meet, a stoplog structure has been built to isolate any tailing which might get past the gates. Therefore, if a spill was to occur, it must be isolated to one portion of the canal by closing a control gate and by utilizing the stoplog structure. Once the cause of the spill has been corrected, the moat and ditch should be cleaned out as soon as possible to provide full capacity once again.

Although tailing spill retention is an important consideration, the main purpose of the canal is to collect and convey the seepwater generated by the subdrains and prevent this water from discharging into the Williams Fork. Although there is no method of determining the expected flow, tests conducted at the North Robinson tailing dam near Climax in 1962 resulted in a measured seepage rate of about 2,000 gpm. Therefore, it was estimated that the lower pond at Henderson would generate about 3,000 gpm. As a safety precaution, especially during start-up, all facilities were sized to handle 9,000 gpm.

As a point of consideration, if the seepwater pumps were to fail, there is about 20 acre-feet of storage behind the seepwater delivery ditches, drains are covered with a protective layer of tailing, the effluent should clear up. At this time, the valve assemblies should be removed and replaced with 12-inch CMP. The valves will probably be removed in the first one or two years of operation, probably in the fall of 1977.

The second part of the seepwater system is that of returning the collected seepage to the pond. This will be accomplished using three pumps discharging into an 18-inch rubber-lined steel return line.

The three pumps are Gould, vertical turbine pumps VIT 12 x 16 equipped with 2 stages and 300 H.P. motors. Each pump is rated at 3,000 gpm discharge against a head of 380 feet. Pump specifications and rating curves are contained in the Appendix. The seepwater pumps are automatically controlled at the pumphouse by probes in the sump.

Because, the seepwater discharge line will be extended with time, the total dynamic head of the pumps will also increase. Therefore the pumps are designed such that extra stages can be added to them. A third stage will be necessary when the pressure reaches about 81 psig, a fourth stage at 112 psig and a fifth stage at 149 psig. These values are all based on a total discharge of about 7,500 gpm for the three pumps. The horsepower of the motors will also have to be increased, probably to about 500 horsepower when the fifth stage is added (about 150 psig). Again, it should be noted that the seepage rates are unknown, and any combination of pumping capabilities will have to be determined in the future.

The pipeline is an 18-inch rubber-lined steel pipe connected with victaulic couplings. The rubber lining has been used because of the unknown pH value of the seepwater, which after several years could possibly be as

SEEPWATER RETURN PUMPS

Type	Gould VIT
Size	12 x 16 DHL/2
Performance Curve	72236 B
Speed	1,770 R.P.M.
WR^2	220 lb. - ft. ^{2}
No. Pumps Installed	3 (one with stainless steel components)
No. Stages	2 (initial) 5 (ultimate)
Rated Discharge	3,000 gpm (individual)
Rated Head	380 Ft. (ultimate)
Efficiency	82%
Motor	
Type	Westinghouse Vertical
Size	300 hp. (initial) 500 hp. (ultimate)
No.	3

SEEPWATER RETURN PUMPS - SYSTEMS HEAD CURVE

Criteria: Q = up to 9,000 gpm

Static Lift (initial) = 8710 - 8577 = 133 ft.
(ultimate)= 8900 - 8577 = 323 ft.

Length of Line = 2650 ft. (Initial)
= 3500 ft. (Ultimate)

Diameter 18"
C = 140 (rubber lining)

Initial Installation

Q						
(gpm)	(cfs)	h_f(/1000 ft.)	h_f(ft.)	H_s(ft.)	=	TDH(ft.)
2,000	(4.456)	1.11	2.94	133		135.94
4,000	(8.912)	4.01	10.63	133		143.63
5,000	(11.14)	6.08	16.11	133		149.11
6,000	(13.37)	8.46	22.42	133		155.42
9,000	(20.05)	18.14	48.07	133		181.07
10,000	(22.28)	22.04	58.41	133		191.41

Ultimate Installation

2,000	(4.456)	1.11	3.88	323	326.88
4,000	(8.912)	4.01	14.04	323	337.04
5,000	(11.14)	6.08	21.28	323	344.28
6,000	(13.37)	8.46	29.61	323	352.61
9,000	(20.05)	18.14	63.49	323	386.49
10,000	(22.28)	22.04	77.14	323	400.14

▼ excl & brick [illegible] HENDERSON MILL MONTHLY WATER STATISTICS REPORT

WOOD 10/03/94

ervoir Spillway Elevation
e Creek 9212.00
st Branch 9038.50

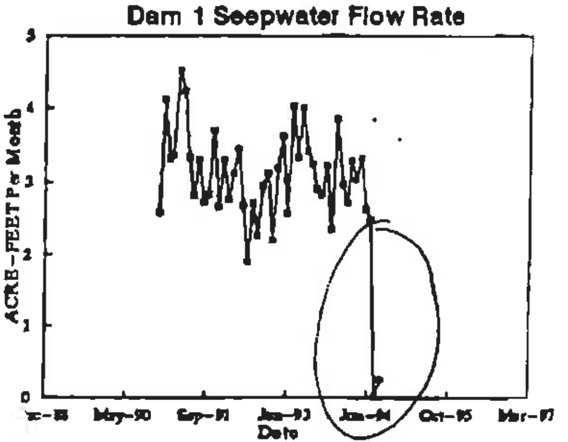
	Spillway Elevation	Decant Elevation
Tower #7	8780.66	8766.66
Tower #8	8780.66	8767.10

#1 Dam Cr vation
87

September

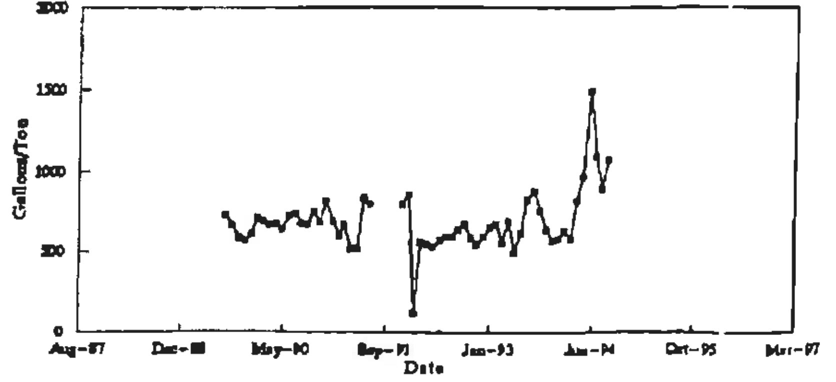
	UTE CREEK RESERVOIR				EAST BRANCH RESERVOIR				TAILING POND					TOTAL SYSTEM		SYSTEM STATISTICS				
Date	Elevation	Free Board Feet	Volume A.F.	Volume Change	Elevation	Free Board Feet	Volume A.F.	Volume Change	Water Pool Elevation	Free Board Feet	Beach Length	Volume A.F.	Volume Change	Volume A.F.	Volume Change	Ute Park Decant Pumped Volume A.F	Mill Water Totalized Usage A.F	Calculated Mill Water Usage Gal/Ton	Calculated Mill Water Consumption Gal/Ton	Seep Water Pumped Volume A.F
Aug-89	8210.6	1.2	86.6	6.0	9030.5	8.0	1,624.5	−65.6	0.0	15.0	0	0.0	−1300.0	1,624.5	−1355.5	374.6	663.7	729.7	(1,432.1)	
Sep-89	8209.1	2.9	79.9	−6.7	9024.9	15.6	1,353.7	−270.8	8744.4	14.2	1,629	1,211.7	1211.7	2,565.4	940.9	947.6	1,737.3	664.5	533.2	
Oct-89	8207.1	4.9	72.0	−7.9	9026.0	12.5	1,427.3	73.6	8745.5	13.2	1,396	1,340.2	128.5	2,767.6	202.1	1,020.7	1,569.3	566.2	(10.5)	
Nov-89	8208.9	3.1	79.0	7.0	9026.2	12.3	1,433.2	5.9	8745.9	12.8	1,349	1,147.7	−192.5	2,581.0	−186.6	1,094.0	1,331.0	569.5	(59.1)	
Dec-89	8206.0	7.0	66.0	−13.0	9021.9	16.6	1,172.1	−261.1	8747.2	11.6	1,191	1,343.5	195.7	2,515.6	−65.4	615.5	1,270.5	605.2	(11.9)	
Jan-90	8207.1	4.9	72.0	6.0	9016.6	21.7	919.7	−252.4	8748.7	9.9	1,006	1,601.3	257.8	2,521.0	5.4	784.9	1,292.7	713.2	(7.3)	
Feb-90	8209.4	2.6	80.8	8.8	9014.4	24.1	822.5	−97.3	8749.2	9.5	1,000	1,530.6	−70.7	2,353.0	−168.0	611.3	1,210.3	691.0	(136.1)	
Mar-90	8210.1	1.9	83.7	2.9	9016.8	21.9	909.5	87.0	8750.0	8.6	1,150	1,605.4	74.8	2,514.9	161.9	995.7	1,270.9	665.5	7.2	
Apr-90	8211.0	1.0	87.6	4.0	9022.2	16.3	1,180.2	270.7	8751.2	7.4	1,100	1,890.6	285.2	3,079.8	564.9	1,208.1	1,332.5	871.6	21.5	
May-90	8211.7	0.3	90.7	3.1	9029.9	8.6	1,600.1	410.9	8751.6	13.5	1,100	1,823.9	−66.7	3,424.0	344.1	1,223.8	1,277.0	837.3	(79.8)	
Jun-90	8211.2	0.8	88.7	−2.1	9031.6	6.9	1,679.1	79.0	8751.5	13.5	1,270	1,673.5	−150.4	3,352.5	−71.4	1,049.2	1,542.2	722.2	(207.0)	
Jul-90	8211.4	0.6	89.7	1.0	9035.4	3.1	1,877.0	197.9	8751.5	13.5	1,849	1,429.3	−244.1	3,306.3	−46.2	687.2	1,221.6	735.4	(100.3)	
Aug-90	8210.6	1.2	86.6	−3.1	9033.7	4.8	1,787.5	−89.5	8751.0	14.0	1,744	1,151.5	−277.9	2,939.0	−367.3	1,076.3	1,387.1	672.6	(226.3)	
Sep-90	8208.4	3.6	77.2	−9.5	9029.7	8.8	1,589.1	−198.4	8751.6	13.4	1,636	1,172.0	20.5	2,761.2	−177.9	601.5	1,250.3	669.8	(117.4)	
Oct-90	8208.9	3.1	79.0	1.8	9032.9	5.6	1,743.8	154.7	8752.2	12.8	1,528	1,191.3	19.3	2,935.1	174.0	798.6	1,582.9	746.1	(13.1)	
Nov-90	8209.4	2.6	80.8	1.8	9029.0	9.5	1,656.7	−187.2	8753.3	11.7	1,325	1,375.4	184.0	2,932.0	−3.1	526.6	1,459.7	682.1	(9.9)	
Dec-90	8209.6	2.2	82.7	1.9	9029.2	9.3	1,565.2	8.5	8753.4	11.6	1,304	1,179.2	−196.2	2,744.5	−187.6	482.0	1,376.6	615.1	(120.4)	2.6
Jan-91	8210.1	1.9	83.7	1.0	9026.8	11.7	1,461.1	−104.1	8754.6	10.4	1,066	1,376.3	197.1	2,837.5	93.0	549.6	1,417.3	692.1	35.3	4.1
Feb-91	8210.3	1.7	84.7	1.0	9022.4	16.1	1,198.6	−262.6	8754.6	10.4	1,092	1,078.4	−297.9	2,277.0	−560.5	479.8	1,225.3	599.8	(281.8)	3.3
Mar-91	8210.5	1.5	85.6	1.0	9023.6	14.9	1,274.5	75.9	8756.2	8.6	1,200	1,580.6	502.2	2,855.1	578.2	505.0	1,276.7	667.7	100.0	3.4
Apr-91	8211.9	0.1	91.6	6.1	9030.2	8.3	1,611.1	336.6	8757.1	7.9	1,234	1,657.1	76.4	3,268.2	413.1	1,211.9	1,125.7	512.7	39.6	4.5
May-91	8212.0	0.0	92.2	0.4	9038.5	0.0	2,056.7	445.6	8758.4	6.6	1,205	1,931.8	274.7	3,986.5	720.3	1,249.4	1,118.7	517.7	(130.3)	4.2
Jun-91	8211.6	0.4	90.4	−1.8	9036.9	1.6	1,963.7	−93.0	8758.5	6.5	1,200	1,674.8	−257.0	3,636.5	−350.0	1,145.4	1,779.9	826.0	(134.4)	3.3
Jul-91	8211.6	0.4	90.4	0.0	9037.4	1.1	1,990.4	26.6	8758.3	12.7	1,215	883.7	−791.1	2,874.1	−764.4	457.9	1,006.7	791.8	(148.5)	2.8
Aug-91	8211.5	0.5	89.9	−0.5	9037.6	0.9	2,003.2	12.9	8758.6	12.2	1,200	884.3	0.6	2,887.5	13.4	1,001.6	Meter BO--NA		15.2)	3.3
Sep-91	8211.0	1.0	87.6	−2.3	9037.8	0.7	2,017.4	14.1	8758.0	13.0	1,400	536.0	−348.3	2,553.3	−334.2	879.3	Meter BO--NA		(93.3)	2.7
Oct-91	8210.2	1.8	84.3	−3.4	9031.3	7.2	1,665.5	−351.9	8758.7	12.3	1,400	571.0	35.0	2,236.5	−316.8	440.4	Meter BO--NA		(53.3)	2.8
Nov-91	8210.6	1.6	85.6	1.4	9030.7	7.8	1,637.0	−28.5	8759.1	11.9	1,460	583.2	12.2	2,220.2	−16.3	732.1	Meter BO--NA		25.2)	3.7
Dec-91	8211.6	0.4	90.4	4.7	9029.7	8.8	1,589.2	−47.8	8760.1	10.9	1,338	699.8	116.6	2,289.0	68.8	575.1	1,358.3	796.2	36.6	2.7
Jan-92	8212.1	−0.1	92.6	2.5	9019.2	19.3	1,033.7	−555.5	8761.9	9.1	1,065	1,204.5	504.7	2,238.2	−50.8	553.0	1,453.3	856.4	41.8)	3.3
Feb-92	8212.4	−0.4	93.9	1.1	9016.6	21.7	918.4	−115.3	8762.6	8.4	958	1,319.6	115.2	2,238.0	−0.1	782.1	193.4	118.8	10.0)	2.8
Mar-92	8208.7	3.3	78.1	−15.8	9021.2	17.3	1,134.2	215.8	8762.8	8.2	1,535	1,167.6	−152.0	2,301.9	63.9	1,136.3	1,039.7	559.2	90.0)	3.1
Apr-92	8209.3	2.7	80.7	2.6	9025.3	13.2	1,396.9	262.6	8763.7	7.3	1,293	1,411.4	243.8	2,808.3	506.4	986.4	1,040.5	547.8	60.0)	3.5
May-92	8210.3	1.7	84.7	4.0	9036.9	1.6	1,962.6	565.7	8764.6	6.2	1,075	2,013.5	602.1	3,976.1	1167.8	1,094.6	925.5	528.0	49.0	2.7
Jun-92	8207.3	4.7	72.6	−11.8	9037.9	0.6	2,020.9	58.3	8764.5	6.5	1,075	1,626.1	−387.4	3,647.0	−329.1	568.2	1,219.5	565.2	(105.7)	1.9
Jul-92	8208.0	4.0	75.4	2.8	9034.8	3.7	1,845.3	−175.6	8764.3	6.7	1,131	938.0	−688.1	2,783.2	−863.8	545.5	964.1	689.6	(173.1)	2.7
Aug-92	8208.2	3.8	76.3	0.9	9032.6	5.9	1,732.1	−113.1	8764.3	10.7	1,137	796.0	−142.0	2,526.1	−255.2	546.8	1,135.8	590.9	(51.9)	2.3
Sep-92	8208.0	4.0	75.4	−0.9	9026.9	9.6	1,550.2	−181.9	8765.0	10.0	1,600	895.0	99.1	2,445.3	−82.8	809.9	1,241.4	632.8	64.9)	2.9
Oct-92	8207.8	4.2	74.5	−0.9	9026.3	12.2	1,438.4	−111.9	8765.2	9.8	1,450	804.6	−90.5	2,243.0	−202.3	744.9	1,380.7	672.4	(25.1)	3.1
Nov-92	8207.5	4.5	73.7	−0.9	9027.3	11.2	1,480.1	41.7	8765.6	9.4	1,235	853.7	49.1	2,333.8	90.8	644.9	903.3	591.6	50.3	2.2
Dec-92	8207.1	4.9	72.0	−1.7	9027.0	11.5	1,467.1	−13.0	8766.2	8.8	1,132	850.8	−2.9	2,317.9	−15.9	378.0	899.1	548.9	(19.2)	3.2
Jan-93	8204.1	7.9	60.8	−11.2	9027.7	10.8	1,498.4	31.3	8766.8	9.6	1,061	886.7	35.9	2,385.1	67.2	430.2	566.2	591.1	49.6	3.6
Feb-93	8205.0	7.0	66.0	5.2	9026.7	11.8	1,454.1	−44.2	8767.0	9.2	990	944.9	58.2	2,399.0	14.0	242.1	576.6	653.5	(1.3)	2.8
Mar-93	8204.8	7.2	64.6	−1.3	9028.6	9.7	1,546.0	91.9	8768.3	7.9	2,000	1,000.0	55.1	2,546.0	147.0	521.1	853.3	673.6	45.0	4.0
Apr-93	8202.0	10.0	50.5	−14.1	9032.0	6.5	1,701.7	155.7	8768.9	7.2	1,800	1,000.0	0.0	2,701.7	155.7	468.3	664.7	554.3	0.0	3.0
May-93	8202.9	9.1	54.9	4.3	9037.3	1.2	1,983.2	281.5	8770.4	5.8	1,300	1,900.0	900.0	3,883.2	1181.5	447.2	860.4	664.8	(19.8)	4.0
Jun-93	8212.0	0.0	92.2	37.4	9038.5	0.0	2,056.7	73.5	8770.9	5.2	1,500	2,170.0	270.0	4,226.7	343.5	251.1	724.9	464.5	39.5	3.4
Jul-93	8211.9	0.1	91.8	−0.4	9038.5	−0.0	2,056.7	0.0	8770.5	5.8	1,500	3,057.0	887.0	5,113.7	887.0	245.3	605.3	810.2	92.3	3.3
Aug-93	8211.9	0.1	91.8	0.0	9037.4	1.1	1,993.8	−62.9	8770.6	5.7	1,500	2,944.8	−112.2	4,938.7	−175.1	366.4	1,086.2	820.4	(72.0)	2.9
Sep-93	8212.1	−0.1	92.8	1.1	9037.7	0.8	2,006.3	12.4	8770.5	5.6	2,000	2,742.1	−202.8	4,746.3	−190.4	365.5	1,006.1	679.3	(92.5)	2.8
Oct-93	8212.1	−0.1	92.8	0.0	9037.4	1.1	1,993.8	−12.4	8770.9	10.1	2,500	2,606.1	−136.0	4,599.9	−146.4	421.4	883.4	756.0	(42.4)	3.2
Nov-93	8212.1	−0.1	92.8	0.0	9038.5	0.0	2,053.9	60.1	8771.0	10.0	1,429	2,480.8	−125.3	4,534.7	−65.2	315.0	645.4	634.5	(61.7)	2.3
Dec-93	8212.1	−0.1	92.8	0.0	9037.8	0.7	2,014.6	−39.3	8771.9	9.1	1,422	2,448.0	−32.8	4,482.6	−72.1	357.8	741.0	569.5	(71.0)	3.9
Jan-94	8212.1	−0.1	92.8	0.0	9038.7	−0.2	2,071.0	56.4	8772.1	8.9	1,534	2,342.1	−106.0	4,413.0	−49.5	455.2	589.1	578.7	(69.9)	3.0
Feb-94	8212.1	−0.1	92.8	0.0	9037.4	1.1	1,993.8	−77.2	8772.8	8.2	1,577	2,373.2	31.1	4,367.0	−46.1	278.5	558.5	629.7	(70.4)	2.7
Mar-94	8212.1	−0.1	92.8	0.0	9036.9	1.6	1,965.1	−28.7	8773.5	7.5	1,630	2,490.8	117.6	4,455.9	88.9	345.2	639.1	578.5	(69.9)	3.0
Apr-94	8212.1	−0.1	92.8	0.0	9038.5	−0.0	2,056.7	91.6	8775.2	5.8	1,263	3,232.1	741.3	5,288.8	832.9	195.4	758.6	818.9	0.0	3.0
May-94	8212.1	−0.1	92.8	0.0	9037.2	1.3	1,981.5	−75.3	8775.9	5.1	1,117	3,611.0	379.0	5,592.5	303.7	146.0	900.5	969.4	(101.7)	3.3
Jun-94	8212.1	−0.1	92.8	0.0	9032.8	5.7	1,741.4	−240.1	8776.0	5.0	1,082	3,500.4	−110.7	5,241.8	−350.7	14.2	1,535.3	1,492.9	(512.1)	2.6
Jul-94	8208.4	3.6	77.2	−15.7	9026.7	9.8	1,543.1	−198.3	8775.4	6.8	1,208	2,940.8	−559.6	4,483.9	−757.9	10.5	991.8	1,097.0	(352.8)	2.5
Aug-94	8208.2	3.8	76.3	−0.9	9016.9	19.6	1,018.9	−524.2	8776.7	7.3	1,836	4,881.7	1940.9	5,900.6	1416.7	3.2	1,278.5	889.7	978.0	0.0
Sep-94	8207.1	4.9	72.0	−4.3	9014.7	23.8	831.6	−187.3	8777.2	6.8	1,697	4,957.5	75.8	5,769.1	−111.5	197.9	1,507.6	1,070.0	(162.3)	0.0
Oct-94																				
Nov-94																				
Dec-94																				

Dam 1 Seepwater Flow Rate



Mill Water Usage

Gallons per Ton



Seepwater totalizer b.o.

Appendix G

Geochemical Analyses of Waste Rock Used for Railroad Haulage Construction (1995)

ACZ

Analytical Results

ACZ Laboratories, Inc.
30400 Downhill Drive
Steamboat Springs, CO 80487
(800) 334-5493

S.M. Stoller Corporation
Mining Services Division 4891 Independence St., Suite 27
Wheat Ridge, CO 80033
Michael Ellis

Lab Sample ID: *L6186-01*
Client Sample ID: *HM-W1 (Hend. West#1)*
Client Project ID: *Henderson Mine*
ACZ Report ID: *RG10986*

Date Sampled: *6/19/95*
Date Received: *6/23/95*
Date Reported: *7/10/95*

Sample Matrix: *Soil*

Soil Analysis

Parameter	EPA Method	Result	Qual	Units	MDL	PQL	Date	Analyst
Acid Generation Potential	Calc. M600/2-78-054			tons/KT	1	5	7/10/95	as
Acid Neutralization Potential	Calc. M600/2-78-054	36		tons/KT	1	5	7/10/95	as
Acid-Base Potential (calc)	M600/2-78-054 1.	36		tons/KT	1	5	7/10/95	as
Neutralization Potential as CaCO3	M600 2-78-054 3.	3.7		%	0.1	0.5	7/8/95	as
Sulfur, total	ASTM D-4239-85C, LECO Furnace	0.01	B	%	0.01	0.1	7/7/95	jb

Soil Preparation

Parameter	EPA Method	Result	Qual	Units	MDL	PQL	Date	Analyst
Crush and Pulverize	USDA No. 1, 1972						6/30/95	as
Dry at Room Temperature	USDA No. 1, 1972						6/26/95	as

Inorganic Qualifiers (based on EPA CLP SOW)

U = Analyte was analyzed for but not detected
B = Analyte concentration detected at a value between MDL and PQL
PQL = Practical Quantitation Limit

Ralph V. Poulsen
Vice President of Operations: Ralph Poulsen

ACZ

Analytical Results

ACZ Laboratories, Inc.
30400 Downhill Drive
Steamboat Springs, CO 80487
(800) 334-5493

Lab Sample ID:	*L6186-02*
Client Sample ID:	*HM-W2 (Hend. West#2)*
Client Project ID:	*Henderson Mine*
ACZ Report ID:	*RG10987*

S.M. Stoller Corporation
Mining Services Division   4891 Independence St., Suite 27
Wheat Ridge, CO 80033
Michael Ellis

Date Sampled:	*6/19/95*
Date Received:	*6/23/95*
Date Reported:	*7/10/95*
Sample Matrix:	*Soil*

Soil Analysis

Parameter	EPA Method	Result	Qual	Units	MDL	PQL	Date	Analyst
Acid Generation Potential	Calc. M600/2-78-054			tons/KT	1	5	7/10/95	as
Acid Neutralization Potential	Calc. M600/2-78-054	38		tons/KT	1	5	7/10/95	as
Acid-Base Potential (calc)	M600/2-78-054 1.	38		tons/KT	1	5	7/10/95	as
Neutralization Potential as CaCO3	M600 2-78-054 3.	3.8		%	0.1	0.5	7/8/95	as
Sulfur, total	ASTM D-4239-85C, LECO Furnace		U	%	0.01	0.1	7/7/95	jb

Soil Preparation

Parameter	EPA Method	Result	Qual	Units	MDL	PQL	Date	Analyst
Crush and Pulverize	USDA No. 1, 1972						6/30/95	ns
Dry at Room Temperature	USDA No. 1, 1972						6/26/95	as

Inorganic Qualifiers (based on EPA CLP SOW)

U – Analyte was analyzed for but not detected
B – Analyte concentration detected at a value between MDL and PQL
PQL = Practical Quantitation Limit

Ralph V. Poulsen
Vice President of Operations: Ralph Poulsen

ACZ

Analytical Results

ACZ Laboratories, Inc.
30400 Downhill Drive
Steamboat Springs, CO 80487
(800) 334-5493

Lab Sample ID: *L6186-03*
Client Sample ID: *HM-W3 (Hand. Want#3)*
Client Project ID: *Henderson Mine*
ACZ Report ID: *RG10988*

S.M. Stoller Corporation
Mining Services Division 4891 Independence St., Suite 27
Wheat Ridge, CO 80033
Michael Ellis

Date Sampled: *6/19/95*
Date Received: *6/23/95*
Date Reported: *7/10/95*

Sample Matrix: *Soil*

Soil Analysis

Parameter	EPA Method	Result	Qual	Units	MDL	PQL	Date	Analyst
Acid Generation Potential	Calc. M600/2-78-054			tons/KT	1	5	7/10/95	as
Acid Neutralization Potential	Calc. M600/2-78-054	24		tons/KT	1	5	7/10/95	as
Acid-Base Potential (calc)	M600/2-78-054 1.	24		tons/KT	1	5	7/10/95	as
Neutralization Potential as CaCO3	M600 2-78-054 3.	2.4		%	0.1	0.5	7/8/95	as
Sulfur, total	ASTM D-4239-85C, LECO Furnace		U	%	0.01	0.1	7/7/95	jb

Soil Preparation

Parameter	EPA Method	Result	Qual	Units	MDL	PQL	Date	Analyst
Crush and Pulverize	USDA No. 1, 1972						6/30/95	as
Dry at Room Temperature	USDA No. 1, 1972						6/26/95	as

Inorganic Qualifiers (based on EPA CLP 3/90)

U = Analyte was analyzed for but not detected
B = Analyte concentration detected at a value between MDL and PQL
PQL = Practical Quantitation Limit

Ralph V. Poulson
Vice President of Operations: Ralph Poulson

ACZ

Analytical Results

ACZ Laboratories, Inc.
30400 Downhill Drive
Steamboat Springs, CO 80487
(800) 334-5493

Lab Sample ID: *L6186-04*
Client Sample ID: *HM-E4 (Hand. Rax#4)*
Client Project ID: *Henderson Mine*
ACZ Report ID: *RG10989*

S.M. Stoller Corporation
Mining Services Division 4891 Independence St., Suite 27
Wheat Ridge, CO 80033
Michael Ellis

Date Sampled: *6/19/95*
Date Received: *6/23/95*
Date Reported: *7/10/95*

Sample Matrix: *Soil*

Soil Analysis

Parameter	EPA Method	Result	Qual	Units	MDL	PQL	Date	Analyst
Acid Generation Potential	Calc. M600/2-78-054			tons/KT	1	5	7/10/95	as
Acid Neutralization Potential	Calc. M600/2-78-054	19		tons/KT	1	5	7/10/95	as
Acid-Base Potential (calc)	M600/2-78-054 1.	19		tons/KT	1	5	7/10/95	as
Neutralization Potential as CaCO3	M600 2-78-054 3.	1.9		%	0.1	0.5	7/8/95	as
Sulfur, total	ASTM D-4239-85C, LECO Furnace		U	%	0.01	0.1	7/7/95	jh

Soil Preparation

Parameter	EPA Method	Result	Qual	Units	MDL	PQL	Date	Analyst
Crush and Pulverize	USDA No. 1, 1972						6/30/95	as
Dry at Room Temperature	USDA No. 1, 1972						6/26/95	as

Inorganic Qualifiers (based on EPA CLP 3/90)
U – Analyte was analyzed for but not detected
B – Analyte concentration detected at a value between MDL and PQL
PQL = Practical Quantitation Limit

Ralph V. Poulsen
Vice President of Operations: Ralph Poulsen

ACZ

Analytical Results

ACZ Laboratories, Inc.
30400 Downhill Drive
Steamboat Springs, CO 80487
(800) 334-5493

Lab Sample ID:	*L6186-05*
Client Sample ID:	*HM-ES (Hend. East#5)*
Client Project ID:	*Henderson Mine*
ACZ Report ID:	*RG10990*
Date Sampled:	*6/19/95*
Date Received:	*6/23/95*
Date Reported:	*7/10/95*
Sample Matrix:	*Soil*

S.M. Stoller Corporation
Mining Services Division 4891 Independence St., Suite 27
Wheat Ridge, CO 80033
Michael Ellis

Soil Analysis

Parameter	EPA Method	Result	Qual	Units	MDL	PQL	Date	Analyst
Acid Generation Potential	Calc. M600/2-78-054			tons/KT	1	5	7/10/95	ux
Acid Neutralization Potential	Calc. M600/2-78-054	24		tons/KT	1	5	7/10/95	[illegible]
Acid-Base Potential (calc)	M600/2-78-054 1.	24		tons/KT	1	5	7/10/95	[illegible]
Neutralization Potential as CaCO3	M600 2-78-054 3.	2.4		%	0.1	0.5	7/11/95	[illegible]
Sulfur, total	ASTM D-4239-85C, LECO Furnace		U	%	0.01	0.1	7/7/95	jh

Soil Preparation

Parameter	EPA Method	Result	Qual	Units	MDL	PQL	Date	Analyst
Crush and Pulverize	USDA No. 1, 1972						6/30/95	[illegible]
Dry at Room Temperature	USDA No. 1, 1972						6/26/95	[illegible]

Inorganic Qualifiers (based on EPA CLP 3-90)

U = Analyte was analyzed for but not detected
B = Analyte concentration detected at a value between MDL and PQL.
PQL = Practical Quantitation Limit

Ralph V. Poulsen
Vice President of Operations: Ralph Poulsen

ACZ

Analytical Results

ACZ Laboratories, Inc.
30400 Downhill Drive
Steamboat Springs, CO 80487
(800) 334-5493

Lab Sample ID: *L6186-06*
Client Sample ID: *HM-B6 (Hend. East#6)*
Client Project ID: *Henderson Mine*
ACZ Report ID: *RG10991*

S.M. Stoller Corporation
Mining Services Division　4891 Independence St., Suite 27
Wheat Ridge, CO 80033
Michael Ellis

Date Sampled: *6/19/95*
Date Received: *6/23/95*
Date Reported: *7/10/95*

Sample Matrix: *Soil*

Soil Analysis

Parameter	EPA Method	Result	Qual	Units	MDL	PQL	Date	Analyst
Acid Generation Potential	Calc. M600/2-78-054			tons/KT	1	5	7/10/95	as
Acid Neutralization Potential	Calc. M600/2-78-054	20		tons/KT	1	5	7/10/95	as
Acid-Base Potential (calc)	M600/2-78-054 1.	20		tons/KT	1	5	7/10/95	as
Neutralization Potential as CaCO3	M600 2-78-054 3.	2.0		%	0.1	0.5	7/8/95	as
Sulfur, total	ASTM D-4239-85C, LECO Furnace	0.01	B	%	0.01	0.1	7/7/95	jb

Soil Preparation

Parameter	EPA Method	Result	Qual	Units	MDL	PQL	Date	Analyst
Crush and Pulverize	USDA No. 1, 1972						6/30/95	as
Dry at Room Temperature	USDA No. 1, 1972						6/26/95	as

Inorganic Qualifiers (based on EPA CLP 3/90)

U = Analyte was analyzed for but not detected
B = Analyte concentration detected at a value between MDL and PQL
PQL = Practical Quantitation Limit

Ralph V. Poulsen
Vice President of Operations: Ralph Poulsen

Appendix H

Quarterly Surface Water Quality Data

Appendix H
Quarterly Surface Water Quality Data
Henderson Mine and Mill, Permit M-1977-324
October, 2012

Quarter	Site Number	Sample Date	Duplicate Collected?	Analyte	Units	Results
4th - RY2011	BG-20	10/19/2011	0	Aluminum, Dissolved	ug/l as Al	<9.6
3rd - RY2011	BG-20	09/14/2011	0	Aluminum, Dissolved	ug/l as Al	9.7
2nd - RY2011	BG-20	07/20/2011	0	Aluminum, Dissolved	ug/l as Al	24
1st - RY2011	BG-20	02/22/2011	0	Aluminum, Dissolved	ug/l as Al	<11
4th - RY2010	BG-20	10/13/2010	0	Aluminum, Dissolved	ug/l as Al	<11
4th - RY2011	BG-20	10/19/2011	0	Aluminum, Total	ug/l as Al	29.1
3rd - RY2011	BG-20	09/14/2011	0	Aluminum, Total	ug/l as Al	19.6
2nd - RY2011	BG-20	07/20/2011	0	Aluminum, Total	ug/l as Al	58.7
1st - RY2011	BG-20	02/22/2011	0	Aluminum, Total	ug/l as Al	15.4
4th - RY2010	BG-20	10/13/2010	0	Aluminum, Total	ug/l as Al	94.7
4th - RY2011	BG-20	10/19/2011	0	Arsenic, Dissolved	ug/l as As	0.59
3rd - RY2011	BG-20	09/14/2011	0	Arsenic, Dissolved	ug/l as As	<0.38
2nd - RY2011	BG-20	07/20/2011	0	Arsenic, Dissolved	ug/l as As	<0.38
1st - RY2011	BG-20	02/22/2011	0	Arsenic, Dissolved	ug/l as As	<0.62
4th 0 RY2010	BG-20	10/13/2010	0	Arsenic, Dissolved	ug/l as As	<0.62
4th - RY2011	BG-20	10/19/2011	0	Arsenic, Total	ug/l as As	<0.38
3rd - RY2011	BG-20	09/14/2011	0	Arsenic, Total	ug/l as As	<0.38
2nd - RY2011	BG-20	07/20/2011	0	Arsenic, Total	ug/l as As	<0.38
1st - RY2011	BG-20	02/22/2011	0	Arsenic, Total	ug/l as As	<0.62
4th - RY2010	BG-20	10/13/2010	0	Arsenic, Total	ug/l as As	<0.62
4th - RY2011	BG-20	10/19/2011	0	Cadmium, Dissolved	ug/l as Cd	0.29
3rd - RY2011	BG-20	09/14/2011	0	Cadmium, Dissolved	ug/l as Cd	0.15
2nd - RY 2011	BG-20	07/20/2011	0	Cadmium, Dissolved	ug/l as Cd	<0.11
1st - RY2011	BG-20	02/22/2011	0	Cadmium, Dissolved	ug/l as Cd	<0.11
4th - RY2010	BG-20	10/13/2010	0	Cadmium, Dissolved	ug/l as Cd	<0.11
4th - RY2011	BG-20	10/19/2011	0	Cadmium, Total	ug/l as Cd	0.18
3rd - RY2011	BG-20	09/14/2011	0	Cadmium, Total	ug/l as Cd	<0.11
2nd - RY2011	BG-20	07/20/2011	0	Cadmium, Total	ug/l as Cd	<0.11
1st - RY2011	BG-20	02/22/2011	0	Cadmium, Total	ug/l as Cd	0.24
4th - RY2010	BG-20	10/13/2010	0	Cadmium, Total	ug/l as Cd	<0.11
4th - RY2011	BG-20	10/19/2011	0	Calcium, Dissolved	ug/l as Ca	8,520
3rd - RY2011	BG-20	09/14/2011	0	Calcium, Dissolved	ug/l as Ca	7,040
2nd - RY2011	BG-20	07/20/2011	0	Calcium, Total	ug/l as Ca	4,840
1st - RY2011	BG-20	02/22/2011	0	Calcium, Total	ug/l as Ca	9,980
4th -RY2010	BG-20	10/13/2010	0	Calcium, Total	ug/l as Ca	10,400
4th - RY2011	BG-20	10/19/2011	0	Copper, Dissolved	ug/l as Cu	0.4
3rd - RY2011	BG-20	09/14/2011	0	Copper, Dissolved	ug/l as Cu	<0.4
2nd - RY2011	BG-20	07/20/2011	0	Copper, Dissolved	ug/l as Cu	0.77
1st - RY2011	BG-20	02/22/2011	0	Copper, Dissolved	ug/l as Cu	<0.71
4th - RY2010	BG-20	10/13/2010	0	Copper, Dissolved	ug/l as Cu	1.1
4th - RY2011	BG-20	10/19/2011	0	Copper, Total	ug/l as Cu	0.44
3rd - RY2011	BG-20	09/14/2011	0	Copper, Total	ug/l as Cu	<1
2nd - RY2011	BG-20	07/20/2011	0	Copper, Total	ug/l as Cu	0.54
1st - RY2011	BG-20	02/22/2011	0	Copper, Total	ug/l as Cu	<0.71
4th - RY2010	BG-20	10/13/2010	0	Copper, Total	ug/l as Cu	0.83
4th - RY 2011	BG-20	10/19/2011	0	Hardness, Total	mg/l as CaCO3	25.8
3rd - RY2011	BG-20	09/14/2011	0	Hardness, Total	mg/l as CaCO3	21.4
2nd - RY2011	BG-20	07/20/2011	0	Hardness, Total	mg/l as CaCO3	14.7
1st - RY2011	BG-20	02/22/2011	0	Hardness, Total	mg/l as CaCO3	29.8
4th - RY2010	BG-20	10/13/2010	0	Hardness, Total	mg/l as CaCO3	30.5
4th - RY2011	BG-20	10/19/2011	0	Iron, Dissolved	ug/l as Fe	74.4
3rd - RY2011	BG-20	09/14/2011	0	Iron, Dissolved	ug/l as Fe	93.7
4th - RY2011	BG-20	10/19/2011	0	Iron, Total	ug/l as Fe	58.5

Appendix H
Quarterly Surface Water Quality Data
Henderson Mine and Mill, Permit M-1977-324
October, 2012

Quarter	Site Number	Sample Date	Duplicate Collected?	Analyte	Units	Results
3rd - RY2011	BG-20	09/14/2011	0	Iron, Total	ug/l as Fe	<82
4th - RY2011	BG-20	10/19/2011	0	Magnesium, Dissolved	ug/l as Mg	1,090
3rd - RY2011	BG-20	09/14/2011	0	Magnesium, Dissolved	ug/l as Mg	940
2nd - RY2011	BG-20	07/20/2011	0	Magnesium, Total	ug/l as Mg	623
1st - RY 2011	BG-20	02/22/2011	0	Magnesium, Total	ug/l as Mg	1,190
4th- RY2010	BG-20	10/13/2010	0	Magnesium, Total	ug/l as Mg	1,100
4th - RY2011	BG-20	10/19/2011	0	Molybdenum, Dissolved	ug/l as Mo	1.3
3rd - RY2011	BG-20	09/14/2011	0	Molybdenum, Dissolved	ug/l as Mo	1.1
2nd - RY2011	BG-20	07/20/2011	0	Molybdenum, Dissolved	ug/l as Mo	1.1
1st - RY2011	BG-20	02/22/2011	0	Molybdenum, Dissolved	ug/l as Mo	1.5
4th - RY2010	BG-20	10/13/2010	0	Molybdenum, Dissolved	ug/l as Mo	2.4
4th - RY2011	BG-20	10/19/2011	0	Molybdenum, Total	ug/l as Mo	1.2
3rd - RY2011	BG-20	09/14/2011	0	Molybdenum, Total	ug/l as Mo	1.1
2nd - RY2011	BG-20	07/20/2011	0	Molybdenum, Total	ug/l as Mo	0.83
1st - RY2011	BG-20	02/22/2011	0	Molybdenum, Total	ug/l as Mo	1.6
4th - RY2010	BG-20	10/13/2010	0	Molybdenum, Total	ug/l as Mo	2.2
4th - RY2011	BG-20	10/19/2011	0	Nitrate Nitrogen, Total	mg/l as N	0.11
3rd - RY2011	BG-20	09/14/2011	0	Nitrate Nitrogen, Total	mg/l as N	<0.045
2nd - RY2011	BG-20	07/20/2011	0	Nitrate Nitrogen, Total	mg/l as N	0.57
1st - RY2011	BG-20	02/22/2011	0	Nitrate Nitrogen, Total	mg/l as N	0.16
4th - RY2010	BG-20	10/13/2010	0	Nitrate Nitrogen, Total	mg/l as N	0.082
4th - RY2011	BG-20	10/19/2011	0	Nitrate Nitrogen, Total	mg/l as N	<0.061
3rd - RY 2011	BG-20	09/14/2011	0	Nitrate Nitrogen, Total	mg/l as N	<0.061
2nd - RY2011	BG-20	07/20/2011	0	Nitrate Nitrogen, Total	mg/l as N	<0.061
1st - RY2011	BG-20	02/22/2011	0	Nitrate Nitrogen, Total	mg/l as N	<0.061
4th - RY2010	BG-20	10/13/2010	0	Nitrate Nitrogen, Total	mg/l as N	<0.061
4th - RY2011	BG-20	10/19/2011	0	Nitrogen Total Organic	mg/L	<0.4
3rd - RY2011	BG-20	09/14/2011	0	Nitrogen Total Organic	mg/L	<0.4
2nd - RY2011	BG-20	07/20/2011	0	Nitrogen Total Organic	mg/L	<0.4
1st - RY2011	BG-20	02/22/2011	0	Nitrogen Total Organic	mg/L	<0.4
4th - RY2010	BG-20	10/13/2010	0	Nitrogen Total Organic	mg/L	<0.4
4th - RY 2011	BG-20	10/19/2011	0	Nitrogen, Ammonia, Total	mg/l as N	<0.1
3rd - RY2011	BG-20	09/14/2011	0	Nitrogen, Ammonia, Total	mg/l as N	<0.1
2nd - RY2011	BG-20	07/20/2011	0	Nitrogen, Ammonia, Total	mg/l as N	<0.1
1st - RY2011	BG-20	02/22/2011	0	Nitrogen, Ammonia, Total	mg/l as N	<0.1
4th - RY2010	BG-20	10/13/2010	0	Nitrogen, Ammonia, Total	mg/l as N	<0.1
4th - RY2011	BG-20	10/19/2011	0	Nitrogen,total kjeldahl	mg/l	<0.3
3rd - RY2011	BG-20	09/14/2011	0	Nitrogen,total kjeldahl	mg/l	<0.3
2nd - RY2011	BG-20	07/20/2011	0	Nitrogen,total kjeldahl	mg/l	<0.3
1st - RY2011	BG-20	02/22/2011	0	Nitrogen,total kjeldahl	mg/l	<0.3
4th - RY2010	BG-20	10/13/2010	0	Nitrogen,total kjeldahl	mg/l	<0.3
4th - RY2011	BG-20	10/19/2011	0	pH, Field	Standard Units	7.9
3rd - RY 2011	BG-20	09/14/2011	0	pH, Field	Standard Units	6.3
2nd - RY2011	BG-20	07/20/2011	0	pH, Field	Standard Units	6.7
1st - RY2011	BG-20	02/22/2011	0	pH, Field	Standard Units	6.7
4th - RY2010	BG-20	10/13/2010	0	pH, Field	Standard Units	6.7
4th - RY2011	BG-20	10/19/2011	0	Phosphate, Ortho	mg/l as PO4	<0.1
3rd - RY2011	BG-20	09/14/2011	0	Phosphate, Ortho	mg/l as PO4	<0.1
2nd - RY2011	BG-20	07/20/2011	0	Phosphate, Ortho	mg/l as PO4	<0.1
1st -RY2011	BG-20	02/22/2011	0	Phosphate, Ortho	mg/l as PO4	<0.1
4th - RY2010	BG-20	10/13/2010	0	Phosphate, Ortho	mg/l as PO4	<0.1
4th - RY2011	BG-20	10/19/2011	0	Selenium, Dissolved	ug/l as Se	<0.64
3rd - RY2011	BG-20	09/14/2011	0	Selenium, Dissolved	ug/l as Se	<0.64

Appendix H
Quarterly Surface Water Quality Data
Henderson Mine and Mill, Permit M-1977-324
October, 2012

Quarter	Site Number	Sample Date	Duplicate Collected?	Analyte	Units	Results
2nd - RY2011	BG-20	07/20/2011	0	Selenium, Dissolved	ug/l as Se	1.7
1st - RY2011	BG-20	02/22/2011	0	Selenium, Dissolved	ug/l as Se	0.22
4th - RY2010	BG-20	10/13/2010	0	Selenium, Dissolved	ug/l as Se	0.67
4th - RY2011	BG-20	10/19/2011	0	Selenium, Total	ug/l as Se	<0.64
3rd - RY2011	BG-20	09/14/2011	0	Selenium, Total	ug/l as Se	<1.6
2nd - RY2011	BG-20	07/20/2011	0	Selenium, Total	ug/l as Se	0.77
1st - RY2011	BG-20	02/22/2011	0	Selenium, Total	ug/l as Se	0.75
4th - RY2010	BG-20	10/13/2010	0	Selenium, Total	ug/l as Se	<0.19
4th - RY2011	BG-20	10/19/2011	0	Sulfate, Total	mg/l as SO4	12.5
3rd - RY 2011	BG-20	09/14/2011	0	Sulfate, Total	mg/l as SO4	10.4
2nd - RY2011	BG-20	07/20/2011	0	Sulfate, Total	mg/l as SO4	6.2
4th - RY2011	BG-20	10/19/2011	0	Temperature, Water	°C	0.1
3rd - RY2011	BG-20	09/14/2011	0	Temperature, Water	°C	4.9
2nd - RY2011	BG-20	07/20/2011	0	Temperature, Water	°C	6.8
1st - RY2011	BG-20	02/22/2011	0	Temperature, Water	°C	0.2
4th - RY2010	BG-20	10/13/2010	0	Temperature, Water	°C	1.8
4th - RY2011	BG-20	10/19/2011	0	Temperature, Water	°F	32.2
3rd - RY2011	BG-20	09/14/2011	0	Temperature, Water	°F	40.8
2nd - RY2011	BG-20	07/20/2011	0	Temperature, Water	°F	44.2
4th - RY2011	BG-20	10/19/2011	0	Uranium Total	ug/L	0.91
3rd - RY2011	BG-20	09/14/2011	0	Uranium Total	ug/L	0.82
2nd - RY2011	BG-20	07/20/2011	0	Uranium Total	ug/L	0.84
1st - RY2011	BG-20	02/22/2011	0	Uranium Total	ug/L	0.77
4th - RY2010	BG-20	10/13/2010	0	Uranium Total	ug/L	0.91
4th - RY2011	BG-20	10/19/2011	0	Uranium, Natural, Dissolved	ug/L	0.71
3rd - RY2011	BG-20	09/14/2011	0	Uranium, Natural, Dissolved	ug/L	0.64
2nd - RY2011	BG-20	07/20/2011	0	Uranium, Natural, Dissolved	ug/L	0.79
1st - RY2011	BG-20	02/22/2011	0	Uranium, Natural, Dissolved	ug/L	0.63
4th - RY2010	BG-20	10/13/2010	0	Uranium, Natural, Dissolved	ug/L	0.71

Appendix H
Quarterly Surface Water Quality Data
Henderson Mine and Mill, Permit M-1977-324
October, 2012

Quarter	Site Number	Sample Date	Duplicate Collected?	Analyte	Units	Results
4th - RY2011	CC-10	10/19/2011	0	Aluminum, Dissolved	ug/l as Al	28.1
3rd - RY2011	CC-10	09/14/2011	0	Aluminum, Dissolved	ug/l as Al	17.8
2nd - RY2011	CC-10	07/20/2011	0	Aluminum, Dissolved	ug/l as Al	37.8
1st - RY2011	CC-10	02/22/2011	0	Aluminum, Dissolved	ug/l as Al	30.6
4th - RY2010	CC-10	10/13/2010	0	Aluminum, Dissolved	ug/l as Al	34.8
4th - RY2011	CC-10	10/19/2011	0	Aluminum, Total	ug/l as Al	30.1
3rd - RY2011	CC-10	09/14/2011	0	Aluminum, Total	ug/l as Al	25.4
2nd - RY2011	CC-10	07/20/2011	0	Aluminum, Total	ug/l as Al	72.7
1st - RY2011	CC-10	02/22/2011	0	Aluminum, Total	ug/l as Al	33.7
4th - RY2010	CC-10	10/13/2010	0	Aluminum, Total	ug/l as Al	330
4th - RY2011	CC-10	10/19/2011	0	Arsenic, Dissolved	ug/l as As	0.68
3rd - RY2011	CC-10	09/14/2011	0	Arsenic, Dissolved	ug/l as As	0.69
2nd - RY2011	CC-10	07/20/2011	0	Arsenic, Dissolved	ug/l as As	<0.38
1st - RY2011	CC-10	02/22/2011	0	Arsenic, Dissolved	ug/l as As	<0.62
4th - RY2010	CC-10	10/13/2010	0	Arsenic, Dissolved	ug/l as As	<0.62
4th - RY2011	CC-10	10/19/2011	0	Arsenic, Total	ug/l as As	<0.38
3rd - RY2011	CC-10	09/14/2011	0	Arsenic, Total	ug/l as As	0.44
2nd - RY2011	CC-10	07/20/2011	0	Arsenic, Total	ug/l as As	<0.38
1st - RY2011	CC-10	02/22/2011	0	Arsenic, Total	ug/l as As	<0.62
4th - RY2010	CC-10	10/13/2010	0	Arsenic, Total	ug/l as As	<0.62
4th - RY2011	CC-10	10/19/2011	0	Cadmium, Dissolved	ug/l as Cd	0.29
3rd - RY2011	CC-10	09/14/2011	0	Cadmium, Dissolved	ug/l as Cd	<0.11
2nd - RY2011	CC-10	07/20/2011	0	Cadmium, Dissolved	ug/l as Cd	<0.11
1st - RY2011	CC-10	02/22/2011	0	Cadmium, Dissolved	ug/l as Cd	<0.11
4th - RY2010	CC-10	10/13/2010	0	Cadmium, Dissolved	ug/l as Cd	0.14
4th - RY2011	CC-10	10/19/2011	0	Cadmium, Total	ug/l as Cd	0.3
3rd - RY2011	CC-10	09/14/2011	0	Cadmium, Total	ug/l as Cd	<0.11
2nd - RY2011	CC-10	07/20/2011	0	Cadmium, Total	ug/l as Cd	<0.11
1st - RY2011	CC-10	02/22/2011	0	Cadmium, Total	ug/l as Cd	0.29
4th - RY2010	CC-10	10/13/2010	0	Cadmium, Total	ug/l as Cd	0.19
4th - RY2011	CC-10	10/19/2011	0	Calcium, Dissolved	ug/l as Ca	6,110
3rd - RY2011	CC-10	09/14/2011	0	Calcium, Dissolved	ug/l as Ca	4,870
2nd - RY2011	CC-10	07/20/2011	0	Calcium, Total	ug/l as Ca	2,480
1st - RY2011	CC-10	02/22/2011	0	Calcium, Total	ug/l as Ca	8,650
4th - RY2010	CC-10	10/13/2010	0	Calcium, Total	ug/l as Ca	8,000
4th - RY2011	CC-10	10/19/2011	0	Copper, Dissolved	ug/l as Cu	2.2
3rd - RY2011	CC-10	09/14/2011	0	Copper, Dissolved	ug/l as Cu	1.2
2nd - RY2011	CC-10	07/20/2011	0	Copper, Dissolved	ug/l as Cu	1.3
1st - RY2011	CC-10	02/22/2011	0	Copper, Dissolved	ug/l as Cu	2.3
4th - RY2010	CC-10	10/13/2010	0	Copper, Dissolved	ug/l as Cu	4.7
4th - RY2011	CC-10	10/19/2011	0	Copper, Total	ug/l as Cu	2.5
3rd - RY2011	CC-10	09/14/2011	0	Copper, Total	ug/l as Cu	8
2nd - RY2011	CC-10	07/20/2011	0	Copper, Total	ug/l as Cu	1.3
1st - RY2011	CC-10	02/22/2011	0	Copper, Total	ug/l as Cu	2.4
4th - RY2010	CC-10	10/13/2010	0	Copper, Total	ug/l as Cu	14.2
4th - RY2011	CC-10	10/19/2011	0	Hardness, Total	mg/l as CaCO3	19.5
3rd - RY2011	CC-10	09/14/2011	0	Hardness, Total	mg/l as CaCO3	15.3
2nd - RY2011	CC-10	07/20/2011	0	Hardness, Total	mg/l as CaCO4	8
1st - RY2011	CC-10	02/22/2011	0	Hardness, Total	mg/l as CaCO5	26.9
4th - RY2010	CC-10	10/13/2010	0	Hardness, Total	mg/l as CaCO6	24.6
4th - RY2011	CC-10	10/19/2011	0	Iron, Dissolved	ug/l as Fe	144
3rd - RY2011	CC-10	09/14/2011	0	Iron, Dissolved	ug/l as Fe	51.1
4th - RY2011	CC-10	10/19/2011	0	Iron, Total	ug/l as Fe	125

Quarter	Site Number	Sample Date	Duplicate Collected?	Analyte	Units	Results
3rd - RY2011	CC-10	09/14/2011	0	Iron, Total	ug/l as Fe	79.4
2nd - RY2011	CC-10	07/20/2011	0	Iron, Total	ug/l as Fe	109
1st - RY2011	CC-10	02/22/2011	0	Iron, Total	ug/l as Fe	167
4th - RY2010	CC-10	10/13/2010	0	Iron, Total	ug/l as Fe	1,360
4th - RY2011	CC-10	10/19/2011	0	Lead, Dissolved	ug/l as Pb	0.25
3rd - RY2011	CC-10	09/14/2011	0	Lead, Dissolved	ug/l as Pb	0.16
2nd - RY2011	CC-10	07/20/2011	0	Lead, Dissolved	ug/l as Pb	0.22
1st - RY2011	CC-10	02/22/2011	0	Lead, Dissolved	ug/l as Pb	0.37
4th - RY2010	CC-10	10/13/2010	0	Lead, Dissolved	ug/l as Pb	0.3
4th - RY2011	CC-10	10/19/2011	0	Magnesium, Dissolved	ug/l as Mg	1,030
3rd - RY2011	CC-10	09/14/2011	0	Magnesium, Dissolved	ug/l as Mg	755
2nd - RY2011	CC-10	07/20/2011	0	Magnesium, Total	ug/l as Mg	441
1st - RY2011	CC-10	02/22/2011	0	Magnesium, Total	ug/l as Mg	1,290
4th - RY2010	CC-10	10/13/2010	0	Magnesium, Total	ug/l as Mg	1,130
4th -RY2011	CC-10	10/19/2011	0	Manganese, Dissolved	ug/l as Mn	20.1
3rd - RY 2011	CC-10	09/14/2011	0	Manganese, Dissolved	ug/l as Mn	6.9
2nd - RY2011	CC-10	07/20/2011	0	Manganese, Dissolved	ug/l as Mn	23.5
1st - RY 2011	CC-10	02/22/2011	0	Manganese, Dissolved	ug/l as Mn	2.5
4th - RY 2010	CC-10	10/13/2010	0	Manganese, Dissolved	ug/l as Mn	52.4
4th- RY2011	CC-10	10/19/2011	0	Mercury, Total	ug/l as Hg	0.071
3rd - RY2011	CC-10	09/14/2011	0	Mercury, Total	ug/l as Hg	<0.014
2nd - RY2011	CC-10	07/20/2011	0	Mercury, Total	ug/l as Hg	<0.014
1st - RY2011	CC-10	02/22/2011	0	Mercury, Total	ug/l as Hg	0.025
4th - RY2010	CC-10	10/13/2010	0	Mercury, Total	ug/l as Hg	<0.014
4th - RY2011	CC-10	10/19/2011	0	Molybdenum, Dissolved	ug/l as Mo	0.43
3rd - RY2011	CC-10	09/14/2011	0	Molybdenum, Dissolved	ug/l as Mo	0.36
2nd - RY2011	CC-10	07/20/2011	0	Molybdenum, Dissolved	ug/l as Mo	0.38
1st - RY2011	CC-10	02/22/2011	0	Molybdenum, Dissolved	ug/l as Mo	0.49
4th - RY2010	CC-10	10/13/2010	0	Molybdenum, Dissolved	ug/l as Mo	0.63
4th - RY2011	CC-10	10/19/2011	0	Molybdenum, Total	ug/l as Mo	0.35
3rd - RY2011	CC-10	09/14/2011	0	Molybdenum, Total	ug/l as Mo	0.39
2nd - RY2011	CC-10	07/20/2011	0	Molybdenum, Total	ug/l as Mo	0.35
1st - RY2011	CC-10	02/22/2011	0	Molybdenum, Total	ug/l as Mo	0.57
4th - RY2010	CC-10	10/13/2010	0	Molybdenum, Total	ug/l as Mo	0.72
4th - RY2011	CC-10	10/19/2011	0	Nitrate Nitrogen, Total	mg/l as N	<0.045
3rd - RY2011	CC-10	09/14/2011	0	Nitrate Nitrogen, Total	mg/l as N	<0.045
2nd - RY2011	CC-10	07/20/2011	0	Nitrate Nitrogen, Total	mg/l as N	<0.045
1st - RY2011	CC-10	02/22/2011	0	Nitrate Nitrogen, Total	mg/l as N	0.066
4th - RY2010	CC-10	10/13/2010	0	Nitrate Nitrogen, Total	mg/l as N	<0.045
4th - RY2011	CC-10	10/19/2011	0	Nitrate Nitrogen, Total	mg/l as N	<0.061
3rd - RY2011	CC-10	09/14/2011	0	Nitrate Nitrogen, Total	mg/l as N	<0.061
2nd - RY2011	CC-10	07/20/2011	0	Nitrate Nitrogen, Total	mg/l as N	<0.061
1st - RY2011	CC-10	02/22/2011	0	Nitrate Nitrogen, Total	mg/l as N	<0.061
4th - RY2010	CC-10	10/13/2010	0	Nitrate Nitrogen, Total	mg/l as N	<0.061
4th - RY2011	CC-10	10/19/2011	0	Nitrogen Total Organic	mg/L	<0.4
3rd - RY2011	CC-10	09/14/2011	0	Nitrogen Total Organic	mg/L	<0.4
2nd - RY 2011	CC-10	07/20/2011	0	Nitrogen Total Organic	mg/L	<0.4
1st - RY2011	CC-10	02/22/2011	0	Nitrogen Total Organic	mg/L	<0.4
4th - RY2010	CC-10	10/13/2010	0	Nitrogen Total Organic	mg/L	<0.4
4th - RY2011	CC-10	10/19/2011	0	Nitrogen, Ammonia, Total	mg/l as N	<0.1
3rd - RY2011	CC-10	09/14/2011	0	Nitrogen, Ammonia, Total	mg/l as N	<0.1
2nd - RY2011	CC-10	07/20/2011	0	Nitrogen, Ammonia, Total	mg/l as N	<0.1

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Quarter	Site Number	Sample Date	Duplicate Collected?	Analyte	Units	Results
1st - RY2011	CC-10	02/22/2011	0	Nitrogen, Ammonia, Total	mg/l as N	<0.1
4th - RY2010	CC-10	10/13/2010	0	Nitrogen, Ammonia, Total	mg/l as N	<0.1
4th - RY2011	CC-10	10/19/2011	0	Nitrogen,total kjeldahl	mg/L	<0.3
3rd - RY2011	CC-10	09/14/2011	0	Nitrogen,total kjeldahl	mg/L	<0.3
2nd - RY2011	CC-10	07/20/2011	0	Nitrogen,total kjeldahl	mg/L	<0.3
1st - RY2011	CC-10	02/22/2011	0	Nitrogen,total kjeldahl	mg/L	<0.3
4th - RY2010	CC-10	10/13/2010	0	Nitrogen,total kjeldahl	mg/L	<0.3
4th - RY 2011	CC-10	10/19/2011	0	pH, Field	Standard Units	6.8
3rd - RY2011	CC-10	09/14/2011	0	pH, Field	Standard Units	6.6
2nd - RY2011	CC-10	07/20/2011	0	pH, Field	Standard Units	6.1
1st - RY2011	CC-10	02/22/2011	0	pH, Field	Standard Units	6.7
4th - RY2010	CC-10	10/13/2010	0	pH, Field	Standard Units	6.5
4th - RY2011	CC-10	10/19/2011	0	Phosphate, Ortho	mg/l as PO4	<0.1
3rd - RY2011	CC-10	09/14/2011	0	Phosphate, Ortho	mg/l as PO4	<0.1
2nd - RY2011	CC-10	07/20/2011	0	Phosphate, Ortho	mg/l as PO4	<0.1
1st - RY2011	CC-10	02/22/2011	0	Phosphate, Ortho	mg/l as PO4	<0.1
4th - RY2010	CC-10	10/13/2010	0	Phosphate, Ortho	mg/l as PO4	0.1
4th - RY2011	CC-10	10/19/2011	0	Selenium, Dissolved	ug/l as Se	<0.64
3rd - RY2011	CC-10	09/14/2011	0	Selenium, Dissolved	ug/l as Se	<0.64
2nd - RY2011	CC-10	07/20/2011	0	Selenium, Dissolved	ug/l as Se	<0.64
1st - RY2011	CC-10	02/22/2011	0	Selenium, Dissolved	ug/l as Se	<0.19
4th - RY2010	CC-10	10/13/2010	0	Selenium, Dissolved	ug/l as Se	0.19
4th - RY2011	CC-10	10/19/2011	0	Selenium, Total	ug/l as Se	<0.64
3rd - RY2011	CC-10	09/14/2011	0	Selenium, Total	ug/l as Se	<0.64
2nd - RY2011	CC-10	07/20/2011	0	Selenium, Total	ug/l as Se	<0.64
1st - RY2011	CC-10	02/22/2011	0	Selenium, Total	ug/l as Se	0.22
4th - RY2010	CC-10	10/13/2010	0	Selenium, Total	ug/l as Se	0.19
4th - RY2011	CC-10	10/19/2011	0	Silver, Dissolved	ug/l as Ag	<0.1
3rd - RY2011	CC-10	09/14/2011	0	Silver, Dissolved	ug/l as Ag	<0.1
2nd - RY2011	CC-10	07/20/2011	0	Silver, Dissolved	ug/l as Ag	<0.1
1st - RY2011	CC-10	02/22/2011	0	Silver, Dissolved	ug/l as Ag	<0.0034
4th - RY2010	CC-10	10/13/2010	0	Silver, Dissolved	ug/l as Ag	0.018
4th - RY2011	CC-10	10/19/2011	0	Sulfate, Total	mg/l as SO4	6.6
3rd - RY2011	CC-10	09/14/2011	0	Sulfate, Total	mg/l as SO4	4.5
2nd - RY2011	CC-10	07/20/2011	0	Sulfate, Total	mg/l as SO4	2.1
4th - RY 2011	CC-10	10/19/2011	0	Temperature, Water	°C	0.1
3rd - RY2011	CC-10	09/14/2011	0	Temperature, Water	°C	5.5
2nd - RY2011	CC-10	07/20/2011	0	Temperature, Water	°C	6.2
1st - RY2011	CC-10	02/22/2011	0	Temperature, Water	°C	1
4th - RY2010	CC-10	10/13/2010	0	Temperature, Water	°C	2.2
4th - RY2011	CC-10	10/19/2011	0	Temperature, Water	°F	32.2
3rd - RY2011	CC-10	09/14/2011	0	Temperature, Water	°F	41.9
2nd - RY2011	CC-10	07/20/2011	0	Temperature, Water	°F	43.2
4th - RY2011	CC-10	10/19/2011	0	Uranium Total	ug/L	0.76
3rd - RY2011	CC-10	09/14/2011	0	Uranium Total	ug/L	0.48
2nd - RY2011	CC-10	07/20/2011	0	Uranium Total	ug/L	0.39
1st - RY2011	CC-10	02/22/2011	0	Uranium Total	ug/L	1.6
4th - RY2010	CC-10	10/13/2010	0	Uranium Total	ug/L	1.1
4th - RY2011	CC-10	10/19/2011	0	Uranium, Natural, Dissolved	ug/L	0.7
3rd - RY2011	CC-10	09/14/2011	0	Uranium, Natural, Dissolved	ug/L	0.48
2nd - RY2011	CC-10	07/20/2011	0	Uranium, Natural, Dissolved	ug/L	0.97

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Quarter	Site Number	Sample Date	Duplicate Collected?	Analyte	Units	Results
1st - RY2011	CC-10	02/22/2011	0	Uranium, Natural, Dissolved	ug/L	1.4
4th - RY2010	CC-10	10/13/2010	0	Uranium, Natural, Dissolved	ug/L	0.46
4th - RY2011	CC-10	10/19/2011	0	Zinc, Dissolved	ug/l as Zn	31.2
3rd - RY2011	CC-10	09/14/2011	0	Zinc, Dissolved	ug/l as Zn	17.7
2nd - RY2011	CC-10	07/20/2011	0	Zinc, Dissolved	ug/l as Zn	12.3
1st - RY2011	CC-10	02/22/2011	0	Zinc, Dissolved	ug/l as Zn	39.4
4th - RY2010	CC-10	10/13/2010	0	Zinc, Dissolved	ug/l as Zn	61.1

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Quarter	Site Number	Sample Date	Duplicate Collected?	Analyte	Units	Results
4th - RY2011	CC-30	10/19/2011	0	Aluminum, Dissolved	ug/l as Al	43.6
4th - RY2011	CC-30	10/19/2011	1	Aluminum, Dissolved	ug/l as Al	42
3rd - RY2011	CC-30	09/14/2011	0	Aluminum, Dissolved	ug/l as Al	68
2nd - RY2011	CC-30	07/20/2011	0	Aluminum, Dissolved	ug/l as Al	118
1st - RY2011	CC-30	02/22/2011	0	Aluminum, Dissolved	ug/l as Al	20.5
4th - RY2010	CC-30	10/13/2011	0	Aluminum, Dissolved	ug/l as Al	28
4th - RY2011	CC-30	10/19/2011	0	Aluminum, Total	ug/l as Al	60.5
4th - RY2011	CC-30	10/19/2011	1	Aluminum, Total	ug/l as Al	63.9
3rd - RY2011	CC-30	09/14/2011	0	Aluminum, Total	ug/l as Al	107
2nd - RY2011	CC-30	07/20/2011	0	Aluminum, Total	ug/l as Al	181
1st - RY2011	CC-30	02/22/2011	0	Aluminum, Total	ug/l as Al	53.3
4th - RY2010	CC-30	10/13/2011	0	Aluminum, Total	ug/l as Al	45.4
4th - RY2011	CC-30	10/19/2011	0	Arsenic, Dissolved	ug/l as As	<0.38
4th - RY2011	CC-30	10/19/2011	1	Arsenic, Dissolved	ug/l as As	0.81
3rd - RY2011	CC-30	09/14/2011	0	Arsenic, Dissolved	ug/l as As	<0.38
2nd - RY2011	CC-30	07/20/2011	0	Arsenic, Dissolved	ug/l as As	<0.38
1st - RY2011	CC-30	02/22/2011	0	Arsenic, Dissolved	ug/l as As	<0.62
4th - RY2010	CC-30	10/13/2011	0	Arsenic, Dissolved	ug/l as As	<0.62
4th - RY2011	CC-30	10/19/2011	0	Arsenic, Total	ug/l as As	0.49
4th - RY2011	CC-30	10/19/2011	1	Arsenic, Total	ug/l as As	0.39
3rd - RY2011	CC-30	09/14/2011	0	Arsenic, Total	ug/l as As	<0.38
2nd - RY2011	CC-30	07/20/2011	0	Arsenic, Total	ug/l as As	<0.38
1st - RY2011	CC-30	02/22/2011	0	Arsenic, Total	ug/l as As	<0.62
4th - RY2010	CC-30	10/13/2011	0	Arsenic, Total	ug/l as As	<0.62
4th - RY2011	CC-30	10/19/2011	0	Cadmium, Dissolved	ug/l as Cd	0.33
4th - RY2011	CC-30	10/19/2011	1	Cadmium, Dissolved	ug/l as Cd	0.27
3rd - RY2011	CC-30	09/14/2011	0	Cadmium, Dissolved	ug/l as Cd	0.14
2nd - RY2011	CC-30	07/20/2011	0	Cadmium, Dissolved	ug/l as Cd	0.15
1st - RY2011	CC-30	02/22/2011	0	Cadmium, Dissolved	ug/l as Cd	0.11
4th - RY2010	CC-30	10/13/2011	0	Cadmium, Dissolved	ug/l as Cd	0.2
4th - RY2011	CC-30	10/19/2011	0	Cadmium, Total	ug/l as Cd	0.37
4th - RY2011	CC-30	10/19/2011	1	Cadmium, Total	ug/l as Cd	0.34
3rd - RY2011	CC-30	09/14/2011	0	Cadmium, Total	ug/l as Cd	0.31
2nd - RY2011	CC-30	07/20/2011	0	Cadmium, Total	ug/l as Cd	0.18
1st - RY2011	CC-30	02/22/2011	0	Cadmium, Total	ug/l as Cd	0.31
4th - RY2010	CC-30	10/13/2011	0	Cadmium, Total	ug/l as Cd	0.15
4th - RY2011	CC-30	10/19/2011	0	Calcium, Dissolved	ug/l as Ca	11,600
4th - RY2011	CC-30	10/19/2011	1	Calcium, Dissolved	ug/l as Ca	11,500
3rd - RY2011	CC-30	09/14/2011	0	Calcium, Dissolved	ug/l as Ca	9,530
2nd - RY2011	CC-30	07/20/2011	0	Calcium, Total	ug/l as Ca	4,210
1st - RY2011	CC-30	02/22/2011	0	Calcium, Total	ug/l as Ca	16,700
4th - RY2010	CC-30	10/13/2011	0	Calcium, Total	ug/l as Ca	17,300
4th - RY2011	CC-30	10/19/2011	0	Copper, Dissolved	ug/l as Cu	1.1
4th - RY2011	CC-30	10/19/2011	1	Copper, Dissolved	ug/l as Cu	1.3
3rd - RY2011	CC-30	09/14/2011	0	Copper, Dissolved	ug/l as Cu	0.9
2nd - RY2011	CC-30	07/20/2011	0	Copper, Dissolved	ug/l as Cu	1.8
1st - RY2011	CC-30	02/22/2011	0	Copper, Dissolved	ug/l as Cu	<0.71
4th - RY2010	CC-30	10/13/2011	0	Copper, Dissolved	ug/l as Cu	1.1
4th - RY2011	CC-30	10/19/2011	0	Copper, Total	ug/l as Cu	1.4
4th - RY2011	CC-30	10/19/2011	1	Copper, Total	ug/l as Cu	1.1
3rd - RY2011	CC-30	09/14/2011	0	Copper, Total	ug/l as Cu	1.4
2nd - RY2011	CC-30	07/20/2011	0	Copper, Total	ug/l as Cu	1.5
1st - RY2011	CC-30	02/22/2011	0	Copper, Total	ug/l as Cu	0.9

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Quarter	Site Number	Sample Date	Duplicate Collected?	Analyte	Units	Results
4th - RY2010	CC-30	10/13/2011	0	Copper, Total	ug/l as Cu	1.4
4th - RY2011	CC-30	10/19/2011	0	Hardness, Total	mg/l as CaCO3	34.9
4th - RY2011	CC-30	10/19/2011	1	Hardness, Total	mg/l as CaCO3	34.5
3rd - RY2011	CC-30	09/14/2011	0	Hardness, Total	mg/l as CaCO3	28.4
2nd - RY2011	CC-30	07/20/2011	0	Hardness, Total	mg/l as CaCO3	12.9
1st - RY2011	CC-30	02/22/2011	0	Hardness, Total	mg/l as CaCO3	49.7
4th - RY2010	CC-30	10/13/2011	0	Hardness, Total	mg/l as CaCO3	50
4th - RY2011	CC-30	10/19/2011	0	Iron, Dissolved	ug/l as Fe	112
4th - RY2011	CC-30	10/19/2011	1	Iron, Dissolved	ug/l as Fe	111
3rd - RY2011	CC-30	09/14/2011	0	Iron, Dissolved	ug/l as Fe	59
4th - RY2011	CC-30	10/19/2011	0	Iron, Total	ug/l as Fe	94
4th - RY2011	CC-30	10/19/2011	1	Iron, Total	ug/l as Fe	84
3rd - RY2011	CC-30	09/14/2011	0	Iron, Total	ug/l as Fe	167
2nd - RY2011	CC-30	07/20/2011	0	Iron, Total	ug/l as Fe	80.4
1st - RY2011	CC-30	02/22/2011	0	Iron, Total	ug/l as Fe	95.5
4th - RY2010	CC-30	10/13/2011	0	Iron, Total	ug/l as Fe	144
4th - RY2011	CC-30	10/19/2011	0	Lead, Dissolved	ug/l as Pb	<0.092
4th - RY2011	CC-30	10/19/2011	1	Lead, Dissolved	ug/l as Pb	0.1
3rd - RY2011	CC-30	09/14/2011	0	Lead, Dissolved	ug/l as Pb	0.12
2nd - RY2011	CC-30	07/20/2011	0	Lead, Dissolved	ug/l as Pb	0.26
1st - RY2011	CC-30	02/22/2011	0	Lead, Dissolved	ug/l as Pb	<0.078
4th - RY2010	CC-30	10/13/2011	0	Lead, Dissolved	ug/l as Pb	0.54
4th - RY2011	CC-30	10/19/2011	0	Magnesium, Dissolved	ug/l as Mg	1,450
4th - RY2011	CC-30	10/19/2011	1	Magnesium, Dissolved	ug/l as Mg	1,400
3rd - RY2011	CC-30	09/14/2011	0	Magnesium, Dissolved	ug/l as Mg	1,130
2nd - RY2011	CC-30	07/20/2011	0	Magnesium, Total	ug/l as Mg	578
1st - RY2011	CC-30	02/22/2011	0	Magnesium, Total	ug/l as Mg	1,950
4th - RY2010	CC-30	10/13/2011	0	Magnesium, Total	ug/l as Mg	1,660
4th - RY2011	CC-30	10/19/2011	0	Manganese, Dissolved	ug/l as Mn	153
4th - RY2011	CC-30	10/19/2011	1	Manganese, Dissolved	ug/l as Mn	150
3rd - RY2011	CC-30	09/14/2011	0	Manganese, Dissolved	ug/l as Mn	199
2nd - RY2011	CC-30	07/20/2011	0	Manganese, Dissolved	ug/l as Mn	82.4
1st - RY2011	CC-30	02/22/2011	0	Manganese, Dissolved	ug/l as Mn	161
4th - RY2010	CC-30	10/13/2011	0	Manganese, Dissolved	ug/l as Mn	225
4th - RY2011	CC-30	10/19/2011	0	Mercury, Total	ug/l as Hg	0.067
4th - RY2011	CC-30	10/19/2011	1	Mercury, Total	ug/l as Hg	0.068
3rd - RY2011	CC-30	09/14/2011	0	Mercury, Total	ug/l as Hg	<0.014
2nd - RY2011	CC-30	07/20/2011	0	Mercury, Total	ug/l as Hg	<0.014
1st - RY2011	CC-30	02/22/2011	0	Mercury, Total	ug/l as Hg	0.019
4th - RY2010	CC-30	10/13/2011	0	Mercury, Total	ug/l as Hg	<0.014
4th - RY2011	CC-30	10/19/2011	0	Molybdenum, Dissolved	ug/l as Mo	1.2
4th - RY2011	CC-30	10/19/2011	1	Molybdenum, Dissolved	ug/l as Mo	1.2
3rd - RY2011	CC-30	09/14/2011	0	Molybdenum, Dissolved	ug/l as Mo	1.2
2nd - RY2011	CC-30	07/20/2011	0	Molybdenum, Dissolved	ug/l as Mo	0.71
1st - RY2011	CC-30	02/22/2011	0	Molybdenum, Dissolved	ug/l as Mo	1.2
4th - RY2010	CC-30	10/13/2011	0	Molybdenum, Dissolved	ug/l as Mo	1.8
4th - RY2011	CC-30	10/19/2011	0	Molybdenum, Total	ug/l as Mo	1.2
4th - RY2011	CC-30	10/19/2011	1	Molybdenum, Total	ug/l as Mo	1.2
3rd - RY2011	CC-30	09/14/2011	0	Molybdenum, Total	ug/l as Mo	1.1
2nd - RY2011	CC-30	07/20/2011	0	Molybdenum, Total	ug/l as Mo	0.89
1st - RY2011	CC-30	02/22/2011	0	Molybdenum, Total	ug/l as Mo	1.2
4th - RY2010	CC-30	10/13/2011	0	Molybdenum, Total	ug/l as Mo	1.7

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Quarter	Site Number	Sample Date	Duplicate Collected?	Analyte	Units	Results
4th - RY2011	CC-30	10/19/2011	0	Nitrate Nitrogen, Total	mg/l as N	0.085
4th - RY2011	CC-30	10/19/2011	1	Nitrate Nitrogen, Total	mg/l as N	0.53
3rd - RY2011	CC-30	09/14/2011	0	Nitrate Nitrogen, Total	mg/l as N	<0.045
2nd - RY2011	CC-30	07/20/2011	0	Nitrate Nitrogen, Total	mg/l as N	0.1
1st - RY2011	CC-30	02/22/2011	0	Nitrate Nitrogen, Total	mg/l as N	0.13
4th - RY2010	CC-30	10/13/2011	0	Nitrate Nitrogen, Total	mg/l as N	0.06
4th - RY2011	CC-30	10/19/2011	0	Nitrate Nitrogen, Total	mg/l as N	<0.061
4th - RY2011	CC-30	10/19/2011	1	Nitrate Nitrogen, Total	mg/l as N	<0.061
3rd - RY2011	CC-30	09/14/2011	0	Nitrate Nitrogen, Total	mg/l as N	<0.061
2nd - RY2011	CC-30	07/20/2011	0	Nitrate Nitrogen, Total	mg/l as N	<0.061
1st - RY2011	CC-30	02/22/2011	0	Nitrate Nitrogen, Total	mg/l as N	<0.061
4th - RY2010	CC-30	10/13/2011	0	Nitrate Nitrogen, Total	mg/l as N	<0.061
4th - RY2011	CC-30	10/19/2011	0	Nitrogen Total Organic	mg/L	<0.4
4th - RY2011	CC-30	10/19/2011	1	Nitrogen Total Organic	mg/L	<0.4
3rd - RY2011	CC-30	09/14/2011	0	Nitrogen Total Organic	mg/L	<0.4
2nd - RY2011	CC-30	07/20/2011	0	Nitrogen Total Organic	mg/L	<0.4
1st - RY2011	CC-30	02/22/2011	0	Nitrogen Total Organic	mg/L	<0.4
4th - RY2010	CC-30	10/13/2011	0	Nitrogen Total Organic	mg/L	<0.4
4th - RY2011	CC-30	10/19/2011	0	Nitrogen, Ammonia, Total	mg/l as N	<0.1
4th - RY2011	CC-30	10/19/2011	1	Nitrogen, Ammonia, Total	mg/l as N	<0.1
3rd - RY2011	CC-30	09/14/2011	0	Nitrogen, Ammonia, Total	mg/l as N	<0.1
2nd - RY2011	CC-30	07/20/2011	0	Nitrogen, Ammonia, Total	mg/l as N	<0.1
1st - RY2011	CC-30	02/22/2011	0	Nitrogen, Ammonia, Total	mg/l as N	<0.1
4th - RY2010	CC-30	10/13/2011	0	Nitrogen, Ammonia, Total	mg/l as N	<0.1
4th - RY2011	CC-30	10/19/2011	0	Nitrogen,total kjeldahl	mg/L	<0.3
4th - RY2011	CC-30	10/19/2011	1	Nitrogen,total kjeldahl	mg/L	<0.3
3rd - RY2011	CC-30	09/14/2011	0	Nitrogen,total kjeldahl	mg/L	<0.3
2nd - RY2011	CC-30	07/20/2011	0	Nitrogen,total kjeldahl	mg/L	<0.3
1st - RY2011	CC-30	02/22/2011	0	Nitrogen,total kjeldahl	mg/L	<0.3
4th - RY 2010	CC-30	10/13/2011	0	Nitrogen,total kjeldahl	mg/L	<0.3
4th - RY2011	CC-30	10/19/2011	0	pH, Field	Standard Units	7.2
3rd - RY2011	CC-30	09/14/2011	0	pH, Field	Standard Units	7.4
1st - RY2011	CC-30	02/22/2011	0	pH, Field	Standard Units	6.4
4th - RY2011	CC-30	10/19/2011	0	Phosphate, Ortho	mg/l as PO4	<0.1
4th - RY2011	CC-30	10/19/2011	1	Phosphate, Ortho	mg/l as PO4	<0.1
3rd - RY2011	CC-30	09/14/2011	0	Phosphate, Ortho	mg/l as PO4	<0.1
2nd - RY2011	CC-30	07/20/2011	0	Phosphate, Ortho	mg/l as PO4	<0.1
1st - RY 2011	CC-30	02/22/2011	0	Phosphate, Ortho	mg/l as PO4	<0.1
4th - RY2010	CC-30	10/13/2011	0	Phosphate, Ortho	mg/l as PO4	0.17
4th - RY2011	CC-30	10/19/2011	0	Selenium, Dissolved	ug/l as Se	<0.64
4th - RY2011	CC-30	10/19/2011	1	Selenium, Dissolved	ug/l as Se	<0.64
3rd - RY2011	CC-30	09/14/2011	0	Selenium, Dissolved	ug/l as Se	<0.64
2nd - RY2011	CC-30	07/20/2011	0	Selenium, Dissolved	ug/l as Se	<0.64
1st - RY2011	CC-30	02/22/2011	0	Selenium, Dissolved	ug/l as Se	<0.19
4th - RY2010	CC-30	10/13/2011	0	Selenium, Dissolved	ug/l as Se	0.36
4th - RY2011	CC-30	10/19/2011	0	Selenium, Total	ug/l as Se	<0.64
4th - RY2011	CC-30	10/19/2011	1	Selenium, Total	ug/l as Se	<0.64
3rd - RY2011	CC-30	09/14/2011	0	Selenium, Total	ug/l as Se	<0.64
2nd - RY2011	CC-30	07/20/2011	0	Selenium, Total	ug/l as Se	<0.64
1st - RY2011	CC-30	02/22/2011	0	Selenium, Total	ug/l as Se	<0.19
4th - RY2010	CC-30	10/13/2011	0	Selenium, Total	ug/l as Se	<0.19
4th - RY2011	CC-30	10/19/2011	0	Silver, Dissolved	ug/l as Ag	<0.1

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Quarter	Site Number	Sample Date	Duplicate Collected?	Analyte	Units	Results
4th - RY2011	CC-30	10/19/2011	1	Silver, Dissolved	ug/l as Ag	<0.1
3rd - RY2011	CC-30	09/14/2011	0	Silver, Dissolved	ug/l as Ag	<0.1
2nd - RY2011	CC-30	07/20/2011	0	Silver, Dissolved	ug/l as Ag	<0.1
1st - RY2011	CC-30	02/22/2011	0	Silver, Dissolved	ug/l as Ag	<0.0034
4th - RY 2010	CC-30	10/13/2011	0	Silver, Dissolved	ug/l as Ag	0.024
4th - RY 2011	CC-30	10/19/2011	0	Sulfate, Total	mg/l as SO4	16.8
4th - RY2011	CC-30	10/19/2011	1	Sulfate, Total	mg/l as SO4	16.8
3rd - RY2011	CC-30	09/14/2011	0	Sulfate, Total	mg/l as SO4	15.1
2nd - RY2011	CC-30	07/20/2011	0	Sulfate, Total	mg/l as SO4	6.1
4th - RY2011	CC-30	10/19/2011	0	Temperature, Water	°C	1.1
3rd - RY2011	CC-30	09/14/2011	0	Temperature, Water	°C	7.2
1st - RY2011	CC-30	02/22/2011	0	Temperature, Water	°C	1
4th - RY2010	CC-30	10/13/2011	0	Temperature, Water	°C	3
4th - RY2011	CC-30	10/19/2011	0	Temperature, Water	°F	34
3rd - RY2011	CC-30	09/14/2011	0	Temperature, Water	°F	45
4th - RY2011	CC-30	10/19/2011	0	Uranium Total	ug/L	1
4th - RY2011	CC-30	10/19/2011	1	Uranium Total	ug/L	1
3rd - RY2011	CC-30	09/14/2011	0	Uranium Total	ug/L	0.86
2nd - RY2011	CC-30	07/20/2011	0	Uranium Total	ug/L	0.64
1st - RY2011	CC-30	02/22/2011	0	Uranium Total	ug/L	0.99
4th - RY 2010	CC-30	10/13/2011	0	Uranium Total	ug/L	1
4th - RY2011	CC-30	10/19/2011	0	Uranium, Natural, Dissolved	ug/L	0.88
4th - RY2011	CC-30	10/19/2011	1	Uranium, Natural, Dissolved	ug/L	0.86
3rd - RY2011	CC-30	09/14/2011	0	Uranium, Natural, Dissolved	ug/L	0.79
2nd - RY2011	CC-30	07/20/2011	0	Uranium, Natural, Dissolved	ug/L	0.58
1st - RY2011	CC-30	02/22/2011	0	Uranium, Natural, Dissolved	ug/L	0.84
4th - RY2010	CC-30	10/13/2011	0	Uranium, Natural, Dissolved	ug/L	0.85
4th - RY2011	CC-30	10/19/2011	0	Zinc, Dissolved	ug/l as Zn	55.8
4th - RY2011	CC-30	10/19/2011	1	Zinc, Dissolved	ug/l as Zn	54.2
3rd - RY2011	CC-30	09/14/2011	0	Zinc, Dissolved	ug/l as Zn	49.7
2nd - RY2011	CC-30	07/20/2011	0	Zinc, Dissolved	ug/l as Zn	38.9
1st - RY2011	CC-30	02/22/2011	0	Zinc, Dissolved	ug/l as Zn	59.8
4th- RY2010	CC-30	10/13/2011	0	Zinc, Dissolved	ug/l as Zn	70.7

Appendix H
Quarterly Surface Water Quality Data
Henderson Mine and Mill, Permit M-1977-324
October, 2012

Quarter	Site Number	Sample Date	Duplicate Collected?	Analyte	Units	Results
4th - RY2011	WFR-20	10/25/2011	0	Aluminum, Dissolved	ug/l as Al	<9.6
3rd - RY2011	WFR-20	08/16/2011	0	Aluminum, Dissolved	ug/l as Al	<9.6
2nd - RY2011	WFR-20	06/14/2011	0	Aluminum, Dissolved	ug/l as Al	67
1st - RY2011	WFR-20	02/15/2011	0	Aluminum, Dissolved	ug/l as Al	<11
4th - RY2010	WFR-20	10/19/2010	0	Aluminum, Dissolved	ug/l as Al	<11
4th - RY2011	WFR-20	10/25/2011	0	Aluminum, Total	ug/l as Al	13
3rd - RY2011	WFR-20	08/16/2011	0	Aluminum, Total	ug/l as Al	65.5
2nd - RY2011	WFR-20	06/14/2011	0	Aluminum, Total	ug/l as Al	201
1st - RY2011	WFR-20	02/15/2011	0	Aluminum, Total	ug/l as Al	<11
4th - RY2010	WFR-20	10/19/2010	0	Aluminum, Total	ug/l as Al	22.8
4th - RY2011	WFR-20	10/25/2011	0	Arsenic, Dissolved	ug/l as As	<0.38
3rd - RY2011	WFR-20	08/16/2011	0	Arsenic, Dissolved	ug/l as As	<0.38
2nd - RY2011	WFR-20	06/14/2011	0	Arsenic, Dissolved	ug/l as As	<0.62
1st - RY2011	WFR-20	02/15/2011	0	Arsenic, Dissolved	ug/l as As	<0.62
4th - RY2010	WFR-20	10/19/2010	0	Arsenic, Dissolved	ug/l as As	<0.62
4th - RY2011	WFR-20	10/25/2011	0	Arsenic, Total	ug/l as As	<0.38
3rd - RY2011	WFR-20	08/16/2011	0	Arsenic, Total	ug/l as As	<0.38
2nd - RY2011	WFR-20	06/14/2011	0	Arsenic, Total	ug/l as As	<0.62
1st - RY2011	WFR-20	02/15/2011	0	Arsenic, Total	ug/l as As	<0.62
4th - RY2010	WFR-20	10/19/2010	0	Arsenic, Total	ug/l as As	<0.62
4th - RY2011	WFR-20	10/25/2011	0	Cadmium, Dissolved	ug/l as Cd	<0.11
3rd - RY2011	WFR-20	08/16/2011	0	Cadmium, Dissolved	ug/l as Cd	<0.11
2nd - RY2011	WFR-20	06/14/2011	0	Cadmium, Dissolved	ug/l as Cd	<0.11
1st - RY2011	WFR-20	02/15/2011	0	Cadmium, Dissolved	ug/l as Cd	<0.11
4th - RY2010	WFR-20	10/19/2010	0	Cadmium, Dissolved	ug/l as Cd	0.15
4th - RY2011	WFR-20	10/25/2011	0	Cadmium, Potentially Dissolved	ug/l as Cd	0.13
3rd - RY2011	WFR-20	08/16/2011	0	Cadmium, Potentially Dissolved	ug/l as Cd	<0.11
2nd - RY2011	WFR-20	06/14/2011	0	Cadmium, Potentially Dissolved	ug/l as Cd	<0.11
4th - RY2011	WFR-20	10/25/2011	0	Cadmium, Total	ug/l as Cd	0.15
3rd - RY2011	WFR-20	08/16/2011	0	Cadmium, Total (ug/l as Cd)	ug/l as Cd	0.33
2nd - RY2011	WFR-20	06/14/2011	0	Cadmium, Total (ug/l as Cd)	ug/l as Cd	<0.11
1st - RY2011	WFR-20	02/15/2011	0	Cadmium, Total (ug/l as Cd)	ug/l as Cd	<0.11
4th - RY2010	WFR-20	10/19/2010	0	Cadmium, Total (ug/l as Cd)	ug/l as Cd	0.14
4th - RY2011	WFR-20	10/25/2011	0	Calcium, Total	ug/l as Ca	10,100
3rd - RY2011	WFR-20	08/16/2011	0	Calcium, Total	ug/l as Ca	9,470
2nd - RY2011	WFR-20	06/14/2011	0	Calcium, Total	ug/l as Ca	5,500
1st - RY2011	WFR-20	02/15/2011	0	Calcium, Total	ug/l as Ca	11,500
4th - RY2010	WFR-20	10/19/2010	0	Calcium, Total	ug/l as Ca	12,200
4th - RY2011	WFR-20	10/25/2011	0	Copper, Dissolved	ug/l as Cu	0.58
3rd - RY2011	WFR-20	08/16/2011	0	Copper, Dissolved	ug/l as Cu	0.64
2nd - RY2011	WFR-20	06/14/2011	0	Copper, Dissolved	ug/l as Cu	0.94
1st - RY2011	WFR-20	02/15/2011	0	Copper, Dissolved	ug/l as Cu	<0.71
4th - RY2010	WFR-20	10/19/2010	0	Copper, Dissolved	ug/l as Cu	<0.71
4th - RY2011	WFR-20	10/25/2011	0	Copper, Potentially Dissolved	ug/l as Cu	0.62
3rd - RY2011	WFR-20	08/16/2011	0	Copper, Potentially Dissolved	ug/l as Cu	0.63
2nd - RY2011	WFR-20	06/14/2011	0	Copper, Potentially Dissolved	ug/l as Cu	0.91
4th - RY2011	WFR-20	10/25/2011	0	Copper, Total	ug/l as Cu	0.59
3rd - RY2011	WFR-20	08/16/2011	0	Copper, Total	ug/l as Cu	0.81
2nd - RY2011	WFR-20	06/14/2011	0	Copper, Total	ug/l as Cu	1.1
1st - RY2011	WFR-20	02/15/2011	0	Copper, Total	ug/l as Cu	<0.71
4th - RY2010	WFR-20	10/19/2010	0	Copper, Total	ug/l as Cu	<0.71
4th - RY2011	WFR-20	10/25/2011	0	Cyanide, Total	ug/l as CN	<0.005
3rd - RY2011	WFR-20	08/16/2011	0	Cyanide, Total	ug/l as CN	0.015

Appendix H
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Quarter	Site Number	Sample Date	Duplicate Collected?	Analyte	Units	Results
2nd - RY2011	WFR-20	06/14/2011	0	Cyanide, Total	ug/l as CN	<0.005
4th - RY2011	WFR-20	10/25/2011	0	Hardness, Total	mg/l as CaCO3	34.6
3rd - RY2011	WFR-20	08/16/2011	0	Hardness, Total	mg/l as CaCO3	31.3
2nd - RY2011	WFR-20	06/14/2011	0	Hardness, Total	mg/l as CaCO3	19.1
1st - RY2011	WFR-20	02/15/2011	0	Hardness, Total	mg/l as CaCO3	38.8
4th - RY2010	WFR-20	10/19/2010	0	Hardness, Total	mg/l as CaCO3	40.1
4th - RY2011	WFR-20	10/25/2011	0	Iron, Dissolved	ug/l as Fe	127
3rd - RY2011	WFR-20	08/16/2011	0	Iron, Dissolved	ug/l as Fe	112
2nd - RY2011	WFR-20	06/14/2011	0	Iron, Dissolved	ug/l as Fe	68.4
1st - RY2011	WFR-20	02/15/2011	0	Iron, Dissolved	ug/l as Fe	137
4th - RY2010	WFR-20	10/19/2010	0	Iron, Dissolved	ug/l as Fe	172
4th - RY2011	WFR-20	10/25/2011	0	Iron, Total	ug/l as Fe	135
3rd - RY2011	WFR-20	08/16/2011	0	Iron, Total	ug/l as Fe	314
2nd - RY2011	WFR-20	06/14/2011	0	Iron, Total	ug/l as Fe	240
1st - RY2011	WFR-20	02/15/2011	0	Iron, Total	ug/l as Fe	168
4th - RY2010	WFR-20	10/19/2010	0	Iron, Total	ug/l as Fe	266
4th - RY2011	WFR-20	10/25/2011	0	Lead, Dissolved	ug/l as Pb	2.5
3rd - RY2011	WFR-20	08/16/2011	0	Lead, Dissolved	ug/l as Pb	<0.092
2nd - RY2011	WFR-20	06/14/2011	0	Lead, Dissolved	ug/l as Pb	<0.078
1st - RY2011	WFR-20	02/15/2011	0	Lead, Dissolved	ug/l as Pb	<0.078
4th - RY2010	WFR-20	10/19/2010	0	Lead, Dissolved	ug/l as Pb	<0.078
4th - RY2011	WFR-20	10/25/2011	0	Lead, Potentially Dissolved	ug/l as Pb	<0.092
3rd - RY2011	WFR-20	08/16/2011	0	Lead, Potentially Dissolved	ug/l as Pb	0.096
2nd - RY2011	WFR-20	06/14/2011	0	Lead, Potentially Dissolved	ug/l as Pb	0.16
4th - RY2011	WFR-20	10/25/2011	0	Lead, Total	ug/l as Pb	<0.092
3rd - RY2011	WFR-20	08/16/2011	0	Lead, Total	ug/l as Pb	0.11
2nd - RY2011	WFR-20	06/14/2011	0	Lead, Total	ug/l as Pb	0.17
1st - RY2011	WFR-20	02/15/2011	0	Lead, Total	ug/l as Pb	0.078
4th - RY2010	WFR-20	10/19/2010	0	Lead, Total	ug/l as Pb	<0.078
4th - RY2011	WFR-20	10/25/2011	0	Magnesium, Total	ug/l as Mg	2,290
3rd - RY2011	WFR-20	08/16/2011	0	Magnesium, Total	ug/l as Mg	1,850
2nd - RY2011	WFR-20	06/14/2011	0	Magnesium, Total	ug/l as Mg	1,310
1st - RY2011	WFR-20	02/15/2011	0	Magnesium, Total	ug/l as Mg	2,460
4th - RY2010	WFR-20	10/19/2010	0	Magnesium, Total	ug/l as Mg	2,340
4th - RY2011	WFR-20	10/25/2011	0	Manganese, Dissolved	ug/l as Mn	10.3
3rd - RY2011	WFR-20	08/16/2011	0	Manganese, Dissolved	ug/l as Mn	15.1
2nd - RY2011	WFR-20	06/14/2011	0	Manganese, Dissolved	ug/l as Mn	6
1st - RY2011	WFR-20	02/15/2011	0	Manganese, Dissolved	ug/l as Mn	116
4th - RY2010	WFR-20	10/19/2010	0	Manganese, Dissolved	ug/l as Mn	7.8
4th - RY2011	WFR-20	10/25/2011	0	Mercury, Total	ug/l as Hg	0.031
3rd - RY2011	WFR-20	08/16/2011	0	Mercury, Total	ug/l as Hg	<0.014
2nd - RY2011	WFR-20	06/14/2011	0	Mercury, Total	ug/l as Hg	<0.014
1st - RY2011	WFR-20	02/15/2011	0	Mercury, Total	ug/l as Hg	0.027
4th - RY2010	WFR-20	10/19/2010	0	Mercury, Total	ug/l as Hg	<0.014
4th - RY2011	WFR-20	10/25/2011	0	Molybdenum, Dissolved	ug/l as Mo	1.4
3rd - RY2011	WFR-20	08/16/2011	0	Molybdenum, Dissolved	ug/l as Mo	0.94
2nd - RY2011	WFR-20	06/14/2011	0	Molybdenum, Dissolved	ug/l as Mo	0.69
1st - RY2011	WFR-20	02/15/2011	0	Molybdenum, Dissolved	ug/l as Mo	1
4th - RY2010	WFR-20	10/19/2010	0	Molybdenum, Dissolved	ug/l as Mo	0.9
4th - RY2011	WFR-20	10/25/2011	0	Molybdenum, Total	ug/l as Mo	1.3
3rd - RY2011	WFR-20	08/16/2011	0	Molybdenum, Total	ug/l as Mo	0.98
2nd - RY2011	WFR-20	06/14/2011	0	Molybdenum, Total	ug/l as Mo	0.7

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Quarter	Site Number	Sample Date	Duplicate Collected?	Analyte	Units	Results
1st - RY2011	WFR-20	02/15/2011	0	Molybdenum, Total	ug/l as Mo	0.95
4th - RY2010	WFR-20	10/19/2010	0	Molybdenum, Total	ug/l as Mo	0.95
4th - RY2011	WFR-20	10/25/2011	0	Nitrate Nitrogen, Total	mg/l as N	0.049
3rd - RY2011	WFR-20	08/16/2011	0	Nitrate Nitrogen, Total	mg/l as N	<0.045
2nd - RY2011	WFR-20	06/14/2011	0	Nitrate Nitrogen, Total	mg/l as N	0.046
1st - RY2011	WFR-20	02/15/2011	0	Nitrate Nitrogen, Total	mg/l as N	0.081
4th - RY2010	WFR-20	10/19/2010	0	Nitrate Nitrogen, Total	mg/l as N	<0.045
4th - RY2011	WFR-20	10/25/2011	0	Nitrate Nitrogen, Total	mg/l as N	<0.061
3rd - RY2011	WFR-20	08/16/2011	0	Nitrate Nitrogen, Total	mg/l as N	<0.061
2nd - RY2011	WFR-20	06/14/2011	0	Nitrate Nitrogen, Total	mg/l as N	<0.061
1st - RY2011	WFR-20	02/15/2011	0	Nitrate Nitrogen, Total	mg/l as N	<0.061
4th - RY2010	WFR-20	10/19/2010	0	Nitrate Nitrogen, Total	mg/l as N	<0.061
4th - RY2011	WFR-20	10/25/2011	0	Nitrogen Total Organic	mg/L	<0.4
3rd - RY2011	WFR-20	08/16/2011	0	Nitrogen Total Organic	mg/L	<0.4
2nd - RY2011	WFR-20	06/14/2011	0	Nitrogen Total Organic	mg/L	<0.4
1st - RY2011	WFR-20	02/15/2011	0	Nitrogen Total Organic	mg/L	<0.4
4th - RY2010	WFR-20	10/19/2010	0	Nitrogen Total Organic	mg/L	<0.4
4th - RY2011	WFR-20	10/25/2011	0	Nitrogen, Ammonia, Total	mg/l as N	<0.1
3rd - RY2011	WFR-20	08/16/2011	0	Nitrogen, Ammonia, Total	mg/l as N	<0.1
2nd - RY2011	WFR-20	06/14/2011	0	Nitrogen, Ammonia, Total	mg/l as N	<0.1
1st - RY2011	WFR-20	02/15/2011	0	Nitrogen, Ammonia, Total	mg/l as N	<0.1
4th - RY2010	WFR-20	10/19/2010	0	Nitrogen, Ammonia, Total	mg/l as N	0.12
4th - RY2011	WFR-20	10/25/2011	0	Nitrogen,total kjeldahl	mg/L	<0.3
3rd - RY2011	WFR-20	08/16/2011	0	Nitrogen,total kjeldahl	mg/L	<0.3
2nd - RY2011	WFR-20	06/14/2011	0	Nitrogen,total kjeldahl	mg/L	<0.3
1st - RY2011	WFR-20	02/15/2011	0	Nitrogen,total kjeldahl	mg/L	<0.3
4th - RY2010	WFR-20	10/19/2010	0	Nitrogen,total kjeldahl	mg/L	<0.3
4th - RY2011	WFR-20	10/25/2011	0	pH, Field	Standard Units	7.1
3rd - RY2011	WFR-20	08/16/2011	0	pH, Field	Standard Units	6.8
2nd - RY2011	WFR-20	06/14/2011	0	pH, Field	Standard Units	6.5
1st - RY2011	WFR-20	02/15/2011	0	pH, Field	Standard Units	6.4
4th - RY2010	WFR-20	10/19/2010	0	pH, Field	Standard Units	7
4th - RY2011	WFR-20	10/25/2011	0	Phosphate, Ortho	mg/l as PO4	<0.1
3rd - RY2011	WFR-20	08/16/2011	0	Phosphate, Ortho	mg/l as PO4	<0.1
2nd - RY2011	WFR-20	06/14/2011	0	Phosphate, Ortho	mg/l as PO4	<0.1
1st - RY2011	WFR-20	02/15/2011	0	Phosphate, Ortho	mg/l as PO4	<0.1
4th - RY2010	WFR-20	10/19/2010	0	Phosphate, Ortho	mg/l as PO4	<0.1
4th - RY2011	WFR-20	10/25/2011	0	Selenium, Dissolved	ug/l as Se	<0.64
3rd - RY2011	WFR-20	08/16/2011	0	Selenium, Dissolved	ug/l as Se	<0.64
2nd - RY2011	WFR-20	06/14/2011	0	Selenium, Dissolved	ug/l as Se	0.46
1st - RY2011	WFR-20	02/15/2011	0	Selenium, Dissolved	ug/l as Se	0.45
4th - RY2010	WFR-20	10/19/2010	0	Selenium, Dissolved	ug/l as Se	0.21
4th - RY2011	WFR-20	10/25/2011	0	Selenium, Total	ug/l as Se	<0.64
3rd - RY2011	WFR-20	08/16/2011	0	Selenium, Total	ug/l as Se	<0.64
2nd - RY2011	WFR-20	06/14/2011	0	Selenium, Total	ug/l as Se	<0.19
1st - RY2011	WFR-20	02/15/2011	0	Selenium, Total	ug/l as Se	<0.19
4th - RY2010	WFR-20	10/19/2010	0	Selenium, Total	ug/l as Se	0.19
4th - RY2011	WFR-20	10/25/2011	0	Sulfate, Total	mg/l as SO4	5
3rd - RY2011	WFR-20	08/16/2011	0	Sulfate, Total	mg/l as SO4	3.9
2nd - RY2011	WFR-20	06/14/2011	0	Sulfate, Total	mg/l as SO4	2.8
4th - RY2011	WFR-20	10/25/2011	0	Temperature, Water	°C	3.9
3rd - RY2011	WFR-20	08/16/2011	0	Temperature, Water	°C	10

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Quarter	Site Number	Sample Date	Duplicate Collected?	Analyte	Units	Results
2nd - RY2011	WFR-20	06/14/2011	0	Temperature, Water	°C	4.5
1st - RY2011	WFR-20	02/15/2011	0	Temperature, Water	°C	1.9
4th - RY2010	WFR-20	10/19/2010	0	Temperature, Water	°C	5.1
4th - RY2011	WFR-20	10/25/2011	0	Temperature, Water	°F	39
3rd - RY2011	WFR-20	08/16/2011	0	Temperature, Water	°F	50
2nd - RY2011	WFR-20	06/14/2011	0	Temperature, Water	°F	40.1
4th - RY2011	WFR-20	10/25/2011	0	Total Suspend Solids (Tot. Nonfilterabl	mg	<5
3rd - RY2011	WFR-20	08/16/2011	0	Total Suspend Solids (Tot. Nonfilterabl	mg	<5
2nd - RY2011	WFR-20	06/14/2011	0	Total Suspend Solids (Tot. Nonfilterabl	mg	<5
1st - RY2011	WFR-20	02/15/2011	0	Total Suspend Solids (Tot. Nonfilterabl	mg	<5
4th - RY2010	WFR-20	10/19/2010	0	Total Suspend Solids (Tot. Nonfilterabl	mg	<5
4th - RY2011	WFR-20	10/25/2011	0	Uranium Total	ug/L	0.96
3rd - RY2011	WFR-20	08/16/2011	0	Uranium Total	ug/L	0.81
2nd - RY2011	WFR-20	06/14/2011	0	Uranium Total	ug/L	0.98
1st - RY2011	WFR-20	02/15/2011	0	Uranium Total	ug/L	0.85
4th - RY2010	WFR-20	10/19/2010	0	Uranium Total	ug/L	0.71
4th - RY2011	WFR-20	10/25/2011	0	Uranium, Natural, Dissolved	ug/L	1
3rd - RY2011	WFR-20	08/16/2011	0	Uranium, Natural, Dissolved	ug/L	0.68
2nd - RY2011	WFR-20	06/14/2011	0	Uranium, Natural, Dissolved	ug/L	0.79
1st - RY2011	WFR-20	02/15/2011	0	Uranium, Natural, Dissolved	ug/L	0.74
4th - RY2010	WFR-20	10/19/2010	0	Uranium, Natural, Dissolved	ug/L	0.73
4th - RY2011	WFR-20	10/25/2011	0	Zinc, Dissolved	ug/l as Zn	4.6
3rd - RY2011	WFR-20	08/16/2011	0	Zinc, Dissolved	ug/l as Zn	6.9
2nd - RY2011	WFR-20	06/14/2011	0	Zinc, Dissolved	ug/l as Zn	5.1
1st - RY2011	WFR-20	02/15/2011	0	Zinc, Dissolved	ug/l as Zn	6.8
4th - RY2010	WFR-20	10/19/2010	0	Zinc, Dissolved	ug/l as Zn	2.8
4th - RY2011	WFR-20	10/25/2011	0	Zinc, Potentially Dissolved	ug/l as Zn	2.3
3rd - RY2011	WFR-20	08/16/2011	0	Zinc, Potentially Dissolved	ug/l as Zn	2.4
2nd - RY2011	WFR-20	06/14/2011	0	Zinc, Potentially Dissolved	ug/l as Zn	2.3
4th - RY2011	WFR-20	10/25/2011	0	Zinc, Total	ug/l as Zn	1.7
3rd - RY2011	WFR-20	08/16/2011	0	Zinc, Total	ug/l as Zn	7
2nd - RY2011	WFR-20	06/14/2011	0	Zinc, Total	ug/l as Zn	3.5
1st - RY2011	WFR-20	02/15/2011	0	Zinc, Total	ug/l as Zn	12.6
4th - RY2010	WFR-20	10/19/2010	0	Zinc, Total	ug/l as Zn	6.9

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Quarter	Site Number	Sample Date	Duplicate Collected?	Analyte	Units	Results
4th - RY2011	WFR-40	10/25/2011	0	Aluminum, Dissolved	ug/l as Al	<9.6
4th - RY2011	WFR-40	10/25/2011	1	Aluminum, Dissolved	ug/l as Al	<9.6
3rd - RY2011	WFR-40	08/16/2011	0	Aluminum, Dissolved	ug/l as Al	<9.6
2nd - RY2011	WFR-40	06/14/2011	0	Aluminum, Dissolved	ug/l as Al	195
1st - RY2011	WFR-40	02/15/2011	0	Aluminum, Dissolved	ug/l as Al	<11
4th - RY2010	WFR-40	10/19/2010	0	Aluminum, Dissolved	ug/l as Al	<11
4th - RY2011	WFR-40	10/25/2011	0	Aluminum, Total	ug/l as Al	13.6
4th - RY2011	WFR-40	10/25/2011	1	Aluminum, Total	ug/l as Al	14.9
3rd - RY2011	WFR-40	08/16/2011	0	Aluminum, Total	ug/l as Al	41.4
2nd - RY2011	WFR-40	06/14/2011	0	Aluminum, Total	ug/l as Al	473
1st - RY2011	WFR-40	02/15/2011	0	Aluminum, Total	ug/l as Al	25.3
4th - RY2010	WFR-40	10/19/2010	0	Aluminum, Total	ug/l as Al	11.2
4th - RY2011	WFR-40	10/25/2011	0	Arsenic, Dissolved	ug/l as As	<0.38
4th - RY2011	WFR-40	10/25/2011	1	Arsenic, Dissolved	ug/l as As	<0.38
3rd - RY2011	WFR-40	08/16/2011	0	Arsenic, Dissolved	ug/l as As	<0.38
2nd - RY2011	WFR-40	06/14/2011	0	Arsenic, Dissolved	ug/l as As	<0.62
1st - RY2011	WFR-40	02/15/2011	0	Arsenic, Dissolved	ug/l as As	<0.62
4th - RY2010	WFR-40	10/19/2010	0	Arsenic, Dissolved	ug/l as As	<0.62
4th - RY2011	WFR-40	10/25/2011	0	Arsenic, Total	ug/l as As	<0.38
4th - RY2011	WFR-40	10/25/2011	1	Arsenic, Total	ug/l as As	<0.38
3rd - RY2011	WFR-40	08/16/2011	0	Arsenic, Total	ug/l as As	<0.38
2nd - RY2011	WFR-40	06/14/2011	0	Arsenic, Total	ug/l as As	<0.62
1st - RY2011	WFR-40	02/15/2011	0	Arsenic, Total	ug/l as As	<0.62
4th - RY2010	WFR-40	10/19/2010	0	Arsenic, Total	ug/l as As	<0.62
4th - RY2011	WFR-40	10/25/2011	0	Cadmium, Dissolved	ug/l as Cd	0.12
4th - RY2011	WFR-40	10/25/2011	1	Cadmium, Dissolved	ug/l as Cd	<0.11
3rd - RY2011	WFR-40	08/16/2011	0	Cadmium, Dissolved	ug/l as Cd	<0.11
2nd - RY2011	WFR-40	06/14/2011	0	Cadmium, Dissolved	ug/l as Cd	<0.11
1st - RY2011	WFR-40	02/15/2011	0	Cadmium, Dissolved	ug/l as Cd	<0.11
4th - RY2010	WFR-40	10/19/2010	0	Cadmium, Dissolved	ug/l as Cd	0.2
4th - RY2011	WFR-40	10/25/2011	0	Cadmium, Potentially Dissolved	ug/l as Cd	<0.11
4th - RY2011	WFR-40	10/25/2011	1	Cadmium, Potentially Dissolved	ug/l as Cd	<0.11
3rd - RY 2011	WFR-40	08/16/2011	0	Cadmium, Potentially Dissolved	ug/l as Cd	<0.11
2nd - Ry2011	WFR-40	06/14/2011	0	Cadmium, Potentially Dissolved	ug/l as Cd	<0.11
4th - RY2011	WFR-40	10/25/2011	0	Cadmium, Total	ug/l as Cd	<0.11
4th - RY2011	WFR-40	10/25/2011	1	Cadmium, Total	ug/l as Cd	<0.11
3rd - RY2011	WFR-40	08/16/2011	0	Cadmium, Total	ug/l as Cd	<0.11
2nd - RY2011	WFR-40	06/14/2011	0	Cadmium, Total	ug/l as Cd	<0.11
1st - RY2011	WFR-40	02/15/2011	0	Cadmium, Total	ug/l as Cd	<0.11
4th - RY2010	WFR-40	10/19/2010	0	Cadmium, Total	ug/l as Cd	0.14
4th - RY 2011	WFR-40	10/25/2011	0	Calcium, Total	ug/l as Ca	18,100
4th - RY2011	WFR-40	10/25/2011	1	Calcium, Total	ug/l as Ca	18,800
3rd - RY2011	WFR-40	08/16/2011	0	Calcium, Total	ug/l as Ca	14,900
2nd - RY2011	WFR-40	06/14/2011	0	Calcium, Total	ug/l as Ca	6,050
1st - RY2011	WFR-40	02/15/2011	0	Calcium, Total	ug/l as Ca	16,400
4th - RY2010	WFR-40	10/19/2010	0	Calcium, Total	ug/l as Ca	20,800
4th - RY2011	WFR-40	10/25/2011	0	Copper, Dissolved	ug/l as Cu	0.49
4th - RY 2011	WFR-40	10/25/2011	1	Copper, Dissolved	ug/l as Cu	0.49
3rd - RY2011	WFR-40	08/16/2011	0	Copper, Dissolved	ug/l as Cu	0.54
2nd - RY2011	WFR-40	06/14/2011	0	Copper, Dissolved	ug/l as Cu	2.4
1st - RY2011	WFR-40	02/15/2011	0	Copper, Dissolved	ug/l as Cu	<0.71
4th - RY2010	WFR-40	10/19/2010	0	Copper, Dissolved	ug/l as Cu	0.96
4th - RY 2011	WFR-40	10/25/2011	0	Copper, Potentially Dissolved	ug/l as Cu	0.93

Appendix H
Quarterly Surface Water Quality Data
Henderson Mine and Mill, Permit M-1977-324
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Quarter	Site Number	Sample Date	Duplicate Collected?	Analyte	Units	Results
4th - RY 2011	WFR-40	10/25/2011	1	Copper, Potentially Dissolved	ug/l as Cu	0.61
3rd - RY2011	WFR-40	08/16/2011	0	Copper, Potentially Dissolved	ug/l as Cu	0.74
2nd - RY2011	WFR-40	06/14/2011	0	Copper, Potentially Dissolved	ug/l as Cu	1
4th - RY2011	WFR-40	10/25/2011	0	Copper, Total	ug/l as Cu	0.61
4th - RY2011	WFR-40	10/25/2011	1	Copper, Total	ug/l as Cu	0.53
3rd - RY2011	WFR-40	08/16/2011	0	Copper, Total	ug/l as Cu	0.57
2nd - RY2011	WFR-40	06/14/2011	0	Copper, Total	ug/l as Cu	1.4
1st - RY2011	WFR-40	02/15/2011	0	Copper, Total	ug/l as Cu	<0.71
4th - RY2010	WFR-40	10/19/2010	0	Copper, Total	ug/l as Cu	<0.71
4th - RY2011	WFR-40	10/25/2011	0	Cyanide, Total	ug/l as CN	<0.005
4th - RY2011	WFR-40	10/25/2011	1	Cyanide, Total	ug/l as CN	<0.005
3rd - RY2011	WFR-40	08/16/2011	0	Cyanide, Total	ug/l as CN	<0.005
2nd - RY2011	WFR-40	06/14/2011	0	Cyanide, Total	ug/l as CN	<0.005
4th - RY2011	WFR-40	10/25/2011	0	Hardness, Total	mg/l as CaCO3	61.1
4th - RY2011	WFR-40	10/25/2011	1	Hardness, Total	mg/l as CaCO3	63.4
3rd - RY2011	WFR-40	08/16/2011	0	Hardness, Total	mg/l as CaCO3	49.1
2nd - RY2011	WFR-40	06/14/2011	0	Hardness, Total	mg/l as CaCO3	21.6
1st - RY2011	WFR-40	02/15/2011	0	Hardness, Total	mg/l as CaCO3	54.7
4th - RY2010	WFR-40	10/19/2010	0	Hardness, Total	mg/l as CaCO3	68.2
4th - RY2011	WFR-40	10/25/2011	0	Iron, Dissolved	ug/l as Fe	144
4th - RY2011	WFR-40	10/25/2011	1	Iron, Dissolved	ug/l as Fe	136
3rd - RY2011	WFR-40	08/16/2011	0	Iron, Dissolved	ug/l as Fe	116
2nd - RY2011	WFR-40	06/14/2011	0	Iron, Dissolved	ug/l as Fe	135
1st - RY2011	WFR-40	02/15/2011	0	Iron, Dissolved	ug/l as Fe	114
4th - RY2010	WFR-40	10/19/2010	0	Iron, Dissolved	ug/l as Fe	158
4th - RY2011	WFR-40	10/25/2011	0	Iron, Total	ug/l as Fe	152
4th - RY2011	WFR-40	10/25/2011	1	Iron, Total	ug/l as Fe	159
3rd - RY2011	WFR-40	08/16/2011	0	Iron, Total	ug/l as Fe	264
2nd - RY2011	WFR-40	06/14/2011	0	Iron, Total	ug/l as Fe	356
1st - RY2011	WFR-40	02/15/2011	0	Iron, Total	ug/l as Fe	179
4th - RY2010	WFR-40	10/19/2010	0	Iron, Total	ug/l as Fe	193
4th - RY2011	WFR-40	10/25/2011	0	Lead, Dissolved	ug/l as Pb	<0.092
4th - RY2011	WFR-40	10/25/2011	1	Lead, Dissolved	ug/l as Pb	<0.092
3rd - RY2011	WFR-40	08/16/2011	0	Lead, Dissolved	ug/l as Pb	<0.092
2nd - RY2011	WFR-40	06/14/2011	0	Lead, Dissolved	ug/l as Pb	0.14
1st - RY2011	WFR-40	02/15/2011	0	Lead, Dissolved	ug/l as Pb	<0.078
4th - RY2010	WFR-40	10/19/2010	0	Lead, Dissolved	ug/l as Pb	<0.078
4th - RY2011	WFR-40	10/25/2011	0	Lead, Potentially Dissolved	ug/l as Pb	<0.092
4th - RY2011	WFR-40	10/25/2011	1	Lead, Potentially Dissolved	ug/l as Pb	<0.092
3rd - RY2011	WFR-40	08/16/2011	0	Lead, Potentially Dissolved	ug/l as Pb	<0.092
2nd - RY2011	WFR-40	06/14/2011	0	Lead, Potentially Dissolved	ug/l as Pb	0.17
4th - RY2011	WFR-40	10/25/2011	0	Lead, Total	ug/l as Pb	1.3
4th - RY2011	WFR-40	10/25/2011	1	Lead, Total	ug/l as Pb	<0.092
3rd - RY2011	WFR-40	08/16/2011	0	Lead, Total	ug/l as Pb	<0.092
2nd - RY2011	WFR-40	06/14/2011	0	Lead, Total	ug/l as Pb	0.26
1st - RY2011	WFR-40	02/15/2011	0	Lead, Total	ug/l as Pb	<0.078
4th - RY2010	WFR-40	10/19/2010	0	Lead, Total	ug/l as Pb	<0.078
4th - RY2011	WFR-40	10/25/2011	0	Magnesium, Total	ug/l as Mg	3,860
4th - RY2011	WFR-40	10/25/2011	1	Magnesium, Total	ug/l as Mg	4,000
3rd - RY2011	WFR-40	08/16/2011	0	Magnesium, Total	ug/l as Mg	2,900
2nd - RY2011	WFR-40	06/14/2011	0	Magnesium, Total	ug/l as Mg	1,570
1st - RY2011	WFR-40	02/15/2011	0	Magnesium, Total	ug/l as Mg	3,330

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Quarter	Site Number	Sample Date	Duplicate Collected?	Analyte	Units	Results
4th - RY2010	WFR-40	10/19/2010	0	Magnesium, Total	ug/l as Mg	3,940
4th - RY2011	WFR-40	10/25/2011	0	Manganese, Dissolved	ug/l as Mn	8.5
4th - RY2011	WFR-40	10/25/2011	1	Manganese, Dissolved	ug/l as Mn	8.1
3rd - RY2011	WFR-40	08/16/2011	0	Manganese, Dissolved	ug/l as Mn	11.4
2nd - RY2011	WFR-40	06/14/2011	0	Manganese, Dissolved	ug/l as Mn	5.9
1st - RY2011	WFR-40	02/15/2011	0	Manganese, Dissolved	ug/l as Mn	5.2
4th - RY2010	WFR-40	10/19/2010	0	Manganese, Dissolved	ug/l as Mn	6.3
4th - RY2011	WFR-40	10/25/2011	0	Mercury, Total	ug/l as Hg	0.035
4th - RY2011	WFR-40	10/25/2011	1	Mercury, Total	ug/l as Hg	0.035
3rd - RY2011	WFR-40	08/16/2011	0	Mercury, Total	ug/l as Hg	0.022
2nd - RY2011	WFR-40	06/14/2011	0	Mercury, Total	ug/l as Hg	<0.014
1st - RY2011	WFR-40	02/15/2011	0	Mercury, Total	ug/l as Hg	0.042
4th - RY2010	WFR-40	10/19/2010	0	Mercury, Total	ug/l as Hg	<0.014
4th - RY2011	WFR-40	10/25/2011	0	Molybdenum, Dissolved	ug/l as Mo	1.1
4th - RY2011	WFR-40	10/25/2011	1	Molybdenum, Dissolved	ug/l as Mo	1
3rd - RY2011	WFR-40	08/16/2011	0	Molybdenum, Dissolved	ug/l as Mo	0.99
2nd - RY2011	WFR-40	06/14/2011	0	Molybdenum, Dissolved	ug/l as Mo	0.6
1st - RY2011	WFR-40	02/15/2011	0	Molybdenum, Dissolved	ug/l as Mo	1
4th Quarter 2010	WFR-40	10/19/2010	0	Molybdenum, Dissolved	ug/l as Mo	0.98
4th quarter 2011	WFR-40	10/25/2011	0	Molybdenum, Total	ug/l as Mo	1.1
4th quarter 2011	WFR-40	10/25/2011	1	Molybdenum, Total	ug/l as Mo	1
3rd - RY2011	WFR-40	08/16/2011	0	Molybdenum, Total	ug/l as Mo	1
2nd - RY2011	WFR-40	06/14/2011	0	Molybdenum, Total	ug/l as Mo	0.6
1st - RY2011	WFR-40	02/15/2011	0	Molybdenum, Total	ug/l as Mo	0.97
4th - RY2010	WFR-40	10/19/2010	0	Molybdenum, Total	ug/l as Mo	0.99
4th - RY2011	WFR-40	10/25/2011	0	Nitrate Nitrogen, Total	mg/l as N	0.057
4th - RY2011	WFR-40	10/25/2011	1	Nitrate Nitrogen, Total	mg/l as N	0.31
3rd - RY2011	WFR-40	08/16/2011	0	Nitrate Nitrogen, Total	mg/l as N	<0.045
2nd - RY2011	WFR-40	06/14/2011	0	Nitrate Nitrogen, Total	mg/l as N	<0.045
1st - RY2011	WFR-40	02/15/2011	0	Nitrate Nitrogen, Total	mg/l as N	0.084
4th - RY2010	WFR-40	10/19/2010	0	Nitrate Nitrogen, Total	mg/l as N	<0.045
4th - RY2011	WFR-40	10/25/2011	0	Nitrate Nitrogen, Total	mg/l as N	<0.061
4th - RY2011	WFR-40	10/25/2011	1	Nitrate Nitrogen, Total	mg/l as N	<0.061
3rd - RY2011	WFR-40	08/16/2011	0	Nitrate Nitrogen, Total	mg/l as N	<0.061
2nd - RY2011	WFR-40	06/14/2011	0	Nitrate Nitrogen, Total	mg/l as N	<0.061
1st - RY2011	WFR-40	02/15/2011	0	Nitrate Nitrogen, Total	mg/l as N	<0.061
4th - RY2010	WFR-40	10/19/2010	0	Nitrate Nitrogen, Total	mg/l as N	<0.061
4th - RY2011	WFR-40	10/25/2011	0	Nitrogen Total Organic	mg/L	<0.4
4th - RY2011	WFR-40	10/25/2011	1	Nitrogen Total Organic	mg/L	<0.4
3rd - RY2011	WFR-40	08/16/2011	0	Nitrogen Total Organic	mg/L	<0.4
2nd - RY2011	WFR-40	06/14/2011	0	Nitrogen Total Organic	mg/L	<0.4
1st - RY2011	WFR-40	02/15/2011	0	Nitrogen Total Organic	mg/L	<0.4
4th - RY2010	WFR-40	10/19/2010	0	Nitrogen Total Organic	mg/L	<0.4
4th - RY2011	WFR-40	10/25/2011	0	Nitrogen, Ammonia, Total	mg/l as N	<0.1
4th - RY2011	WFR-40	10/25/2011	1	Nitrogen, Ammonia, Total	mg/l as N	<0.1
3rd - RY2011	WFR-40	08/16/2011	0	Nitrogen, Ammonia, Total	mg/l as N	<0.1
2nd - RY2011	WFR-40	06/14/2011	0	Nitrogen, Ammonia, Total	mg/l as N	0.1
1st - RY2011	WFR-40	02/15/2011	0	Nitrogen, Ammonia, Total	mg/l as N	<0.1
4th - RY2010	WFR-40	10/19/2010	0	Nitrogen, Ammonia, Total	mg/l as N	<0.1
4th - RY2011	WFR-40	10/25/2011	0	Nitrogen,total kjeldahl	mg/L	<0.3
4th - RY2011	WFR-40	10/25/2011	1	Nitrogen,total kjeldahl	mg/L	<0.3
3rd - RY2011	WFR-40	08/16/2011	0	Nitrogen,total kjeldahl	mg/L	<0.3

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Quarter	Site Number	Sample Date	Duplicate Collected?	Analyte	Units	Results
2nd - RY2011	WFR-40	06/14/2011	0	Nitrogen,total kjeldahl	mg/L	<0.3
1st - RY2011	WFR-40	02/15/2011	0	Nitrogen,total kjeldahl	mg/L	<0.3
4th - RY2010	WFR-40	10/19/2010	0	Nitrogen,total kjeldahl	mg/L	<0.3
4th - RY2011	WFR-40	10/25/2011	0	pH, Field	Standard Units	7.3
4th - RY2011	WFR-40	10/25/2011	1	pH, Field	Standard Units	
3rd - RY2011	WFR-40	08/16/2011	0	pH, Field	Standard Units	6.9
2nd - RY2011	WFR-40	06/14/2011	0	pH, Field	Standard Units	6.7
2nd - RY2011	WFR-40	06/22/2011	0	pH, Field	Standard Units	7.7
1st - RY2011	WFR-40	02/15/2011	0	pH, Field	Standard Units	7.5
4th - RY2010	WFR-40	10/19/2010	0	pH, Field	Standard Units	7.6
4th - RY2011	WFR-40	10/25/2011	0	Phosphate, Ortho	mg/l as PO4	<0.1
4th - RY2011	WFR-40	10/25/2011	1	Phosphate, Ortho	mg/l as PO4	<0.1
3rd - RY2011	WFR-40	08/16/2011	0	Phosphate, Ortho	mg/l as PO4	<0.1
2nd - RY2011	WFR-40	06/14/2011	0	Phosphate, Ortho	mg/l as PO4	<0.1
1st - RY2011	WFR-40	02/15/2011	0	Phosphate, Ortho	mg/l as PO4	<0.1
4th - RY2010	WFR-40	10/19/2010	0	Phosphate, Ortho	mg/l as PO4	<0.1
4th - RY2011	WFR-40	10/25/2011	0	Selenium, Dissolved	ug/l as Se	<0.64
4th - RY2011	WFR-40	10/25/2011	1	Selenium, Dissolved	ug/l as Se	<0.64
3rd - RY2011	WFR-40	08/16/2011	0	Selenium, Dissolved	ug/l as Se	<0.64
2nd - RY2011	WFR-40	06/14/2011	0	Selenium, Dissolved	ug/l as Se	<0.19
1st - RY2011	WFR-40	02/15/2011	0	Selenium, Dissolved	ug/l as Se	0.39
4th - RY2010	WFR-40	10/19/2010	0	Selenium, Dissolved	ug/l as Se	<0.19
4th - RY2011	WFR-40	10/25/2011	0	Selenium, Total	ug/l as Se	<0.64
4th - RY2011	WFR-40	10/25/2011	1	Selenium, Total	ug/l as Se	<0.64
3rd - RY2011	WFR-40	08/16/2011	0	Selenium, Total	ug/l as Se	<0.64
2nd - RY2011	WFR-40	06/14/2011	0	Selenium, Total	ug/l as Se	0.89
1st - RY2011	WFR-40	02/15/2011	0	Selenium, Total	ug/l as Se	<0.96
4th - RY2010	WFR-40	10/19/2010	0	Selenium, Total	ug/l as Se	0.56
4th - RY2011	WFR-40	10/25/2011	0	Sulfate, Total	mg/l as SO4	35.9
4th - RY2011	WFR-40	10/25/2011	1	Sulfate, Total	mg/l as SO4	40.2
3rd - RY2011	WFR-40	08/16/2011	0	Sulfate, Total	mg/l as SO4	19
2nd - RY2011	WFR-40	06/14/2011	0	Sulfate, Total	mg/l as SO4	4.6
4th - RY2011	WFR-40	10/25/2011	0	Temperature, Water	^{o}C	5.5
4th - RY2011	WFR-40	10/25/2011	1	Temperature, Water	^{o}C	
3rd - RY2011	WFR-40	08/16/2011	0	Temperature, Water	^{o}C	11.4
2nd - RY2011	WFR-40	06/14/2011	0	Temperature, Water	^{o}C	6.1
2nd - RY2011	WFR-40	06/22/2011	0	Temperature, Water	^{o}C	11.3
1st - RY2011	WFR-40	02/15/2011	0	Temperature, Water	^{o}C	0.6
4th - RY2010	WFR-40	10/19/2010	0	Temperature, Water	^{o}C	6.7
4th - RY2011	WFR-40	10/25/2011	0	Temperature, Water	^{o}F	41.9
4th - RY2011	WFR-40	10/25/2011	1	Temperature, Water	^{o}F	
3rd - RY2011	WFR-40	08/16/2011	0	Temperature, Water	^{o}F	52.5
2nd - RY2011	WFR-40	06/14/2011	0	Temperature, Water	^{o}F	43
2nd - RY2011	WFR-40	06/22/2011	0	Temperature, Water	^{o}F	52.3
4th - RY2011	WFR-40	10/25/2011	0	Total Suspend Solids (Tot. Nonfilterabl	mg	<5
4th - RY2011	WFR-40	10/25/2011	1	Total Suspend Solids (Tot. Nonfilterabl	mg	<5
3rd - RY2011	WFR-40	08/16/2011	0	Total Suspend Solids (Tot. Nonfilterabl	mg	<5
2nd - RY2011	WFR-40	06/14/2011	0	Total Suspend Solids (Tot. Nonfilterabl	mg	<5
1st - RY2011	WFR-40	02/15/2011	0	Total Suspend Solids (Tot. Nonfilterabl	mg	<5
4th - RY2010	WFR-40	10/19/2010	0	Total Suspend Solids (Tot. Nonfilterabl	mg	<5
4th - RY2011	WFR-40	10/25/2011	0	Uranium Total	ug/L	0.94
4th - RY2011	WFR-40	10/25/2011	1	Uranium Total	ug/L	0.96

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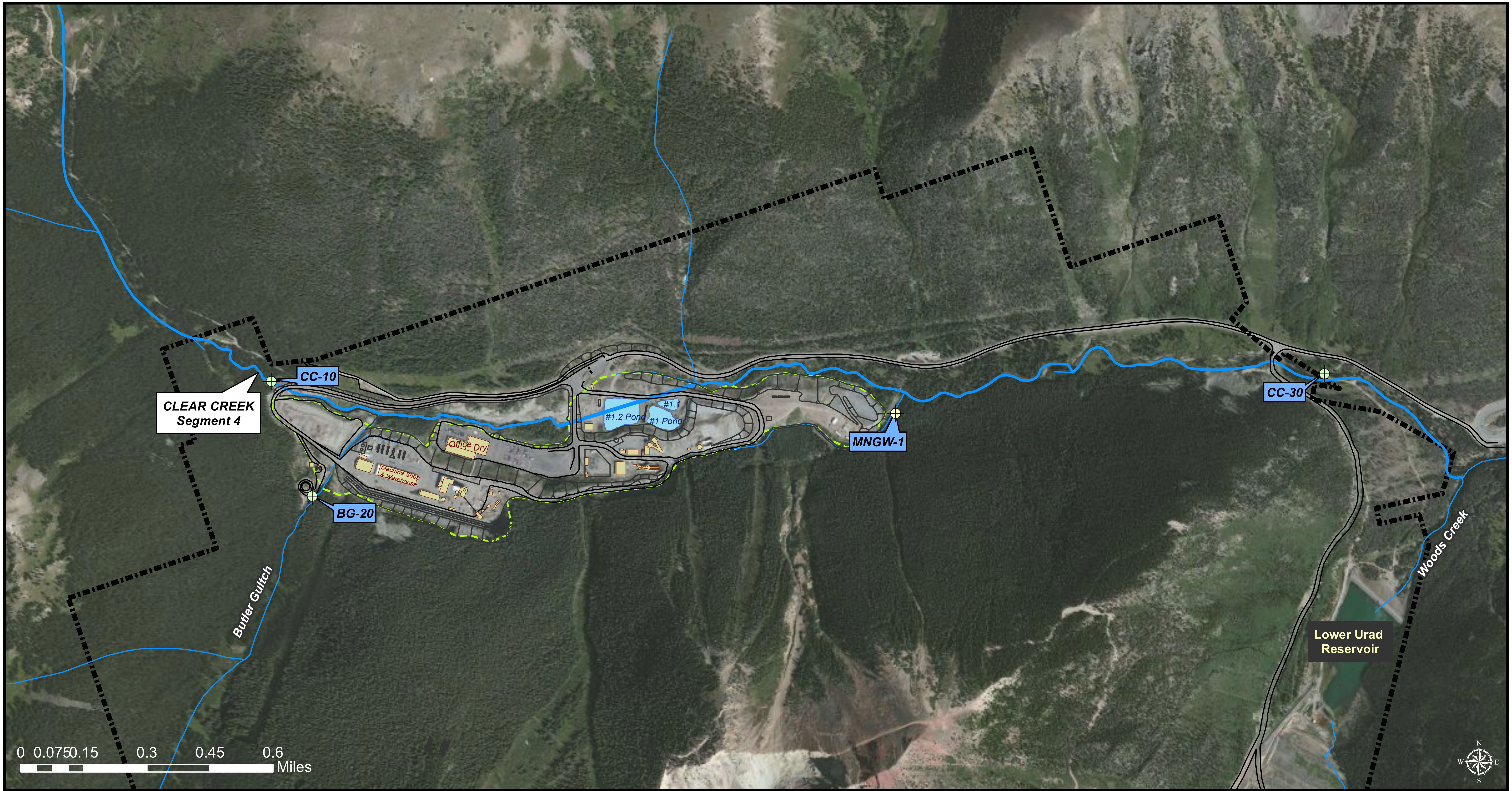
Quarter	Site Number	Sample Date	Duplicate Collected?	Analyte	Units	Results
3rd - RY2011	WFR-40	08/16/2011	0	Uranium Total	ug/L	0.92
2nd - RY2011	WFR-40	06/14/2011	0	Uranium Total	ug/L	0.54
1st - RY2011	WFR-40	02/15/2011	0	Uranium Total	ug/L	0.94
4th - RY2010	WFR-40	10/19/2010	0	Uranium Total	ug/L	0.89
4th - RY2011	WFR-40	10/25/2011	0	Uranium, Natural, Dissolved	ug/L	1
4th - RY2011	WFR-40	10/25/2011	1	Uranium, Natural, Dissolved	ug/L	0.98
3rd - RY2011	WFR-40	08/16/2011	0	Uranium, Natural, Dissolved	ug/L	0.88
2nd - RY2011	WFR-40	06/14/2011	0	Uranium, Natural, Dissolved	ug/L	0.43
1st - RY2011	WFR-40	02/15/2011	0	Uranium, Natural, Dissolved	ug/L	0.95
4th - RY2010	WFR-40	10/19/2010	0	Uranium, Natural, Dissolved	ug/L	0.89
4th - RY2011	WFR-40	10/25/2011	0	Zinc, Dissolved	ug/l as Zn	1.6
4th - RY2011	WFR-40	10/25/2011	1	Zinc, Dissolved	ug/l as Zn	2
3rd - RY2011	WFR-40	08/16/2011	0	Zinc, Dissolved	ug/l as Zn	4.4
2nd - RY2011	WFR-40	06/14/2011	0	Zinc, Dissolved	ug/l as Zn	26.1
1st - RY2011	WFR-40	02/15/2011	0	Zinc, Dissolved	ug/l as Zn	10.8
4th - RY2010	WFR-40	10/19/2010	0	Zinc, Dissolved	ug/l as Zn	3.6
4th - RY2011	WFR-40	10/25/2011	0	Zinc, Potentially Dissolved	ug/l as Zn	7.3
4th - RY2011	WFR-40	10/25/2011	1	Zinc, Potentially Dissolved	ug/l as Zn	1.9
3rd - RY2011	WFR-40	08/16/2011	0	Zinc, Potentially Dissolved	ug/l as Zn	2.6
2nd - RY2011	WFR-40	06/14/2011	0	Zinc, Potentially Dissolved	ug/l as Zn	3.5
4th - RY2011	WFR-40	10/25/2011	0	Zinc, Total	ug/l as Zn	2.1
4th - RY2011	WFR-40	10/25/2011	1	Zinc, Total	ug/l as Zn	4
3rd - RY2011	WFR-40	08/16/2011	0	Zinc, Total	ug/l as Zn	16.9
2nd - RY2011	WFR-40	06/14/2011	0	Zinc, Total	ug/l as Zn	6.2
1st - RY2011	WFR-40	02/15/2011	0	Zinc, Total	ug/l as Zn	6
4th - RY2010	WFR-40	10/19/2010	0	Zinc, Total	ug/l as Zn	3

Appendix I

Figures



LOCATION MAP

MAP FEATURES

▪▪▪	PROPERTY BOUNDARY
—	CREEKS / STREAMS
⊕	GROUNDWATER SAMPLING LOCATION
⊕	SURFACE WATER SAMPLING LOCATION
▢	FILL BASE OF BARREN WASTE ROCK BOUNDARY

REVISION	DATE
Label updates	05/09/2012
Addition of Barren Waste Rock	09/28/2012

Climax Molybdenum
A Freeport-McMoRan Company
HENDERSON OPERATIONS
1746 County Road
Empire, Colorado 80438

FIGURE 1
MINE SITE SHOWING WATER BODIES AND SAMPLING LOCATIONS

Aquionix
3700 E. 41st Avenue
Denver, CO 80216-6504
303-289-7520 (Office)
303-289-7521 (Fax)

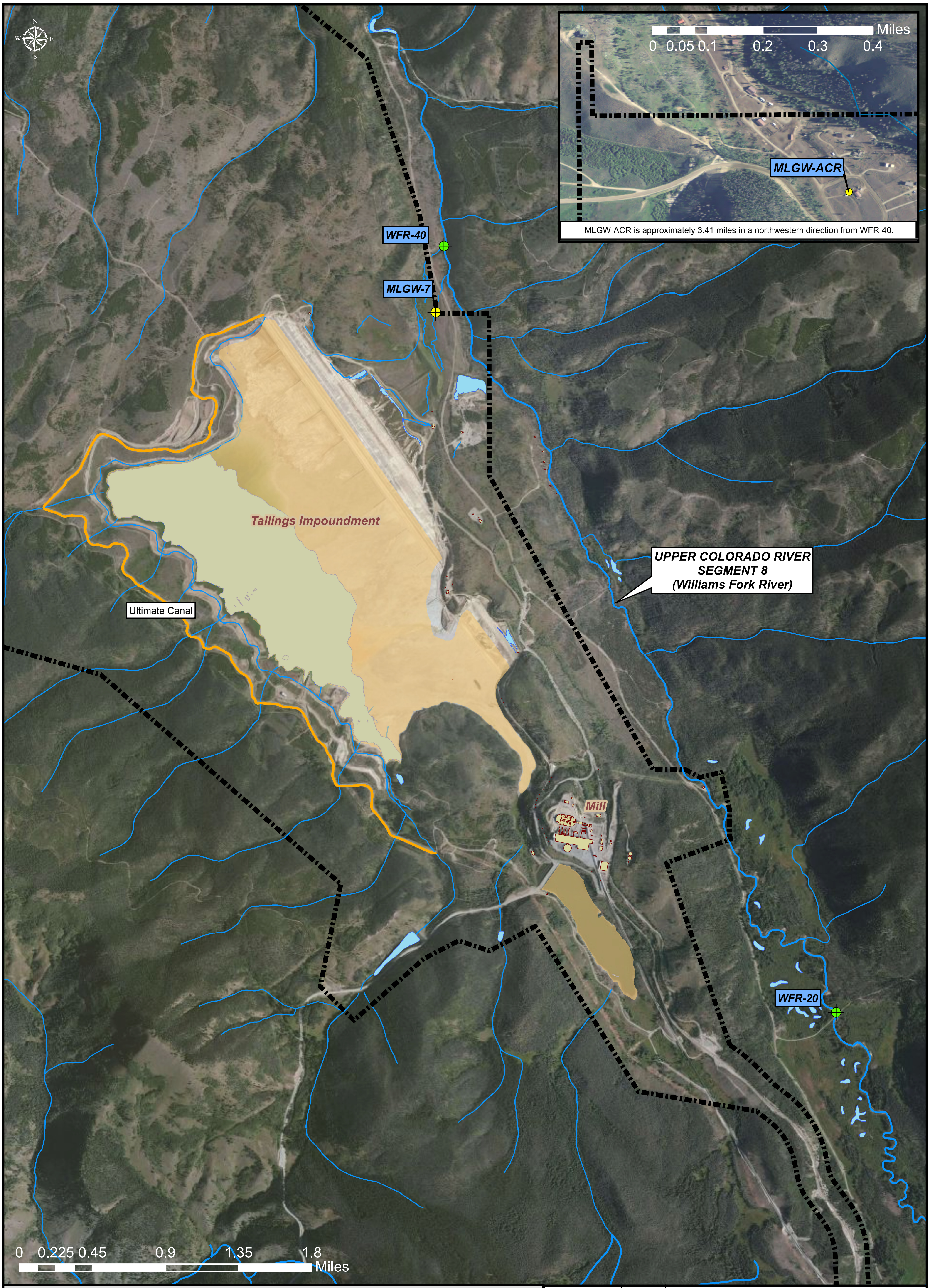
DESIGNED BY: MT (Aquionix)

DRAWN BY: MT

DATE DRAWN: 3/7/2011

SCALE: AS NOTED

FILE: S:\ArcGIS\Henderson GIS \mxds\mine\EPP



MLGW-ACR is approximately 3.41 miles in a northwestern direction from WFR-40.

LOCATION MAP

MAP FEATURES

- ▬ ▪ ▬ ▪ ▬ PROPERTY BOUNDARY
- ─ CREEKS / STREAMS
- ─ ULTIMATE CANAL
- ⊕ GROUNDWATER SAMPLING LOCATION
- ⊕ SURFACE WATER SAMPLING LOCATION

REVISION	DATE
Label updates	05/09/2012

Climax Molybdenum
A Freeport-McMoRan Company
HENDERSON OPERATIONS
19302 County Road
Parshall, CO 80468

FIGURE 2
MILL SITE PLAN SHOWING WATER BODIES AND SAMPLING LOCATIONS

Aquionix
3700 E. 41st Avenue
Denver, CO 80216-6504
303-289-7520 (Office)
303-289-7521 (Fax)

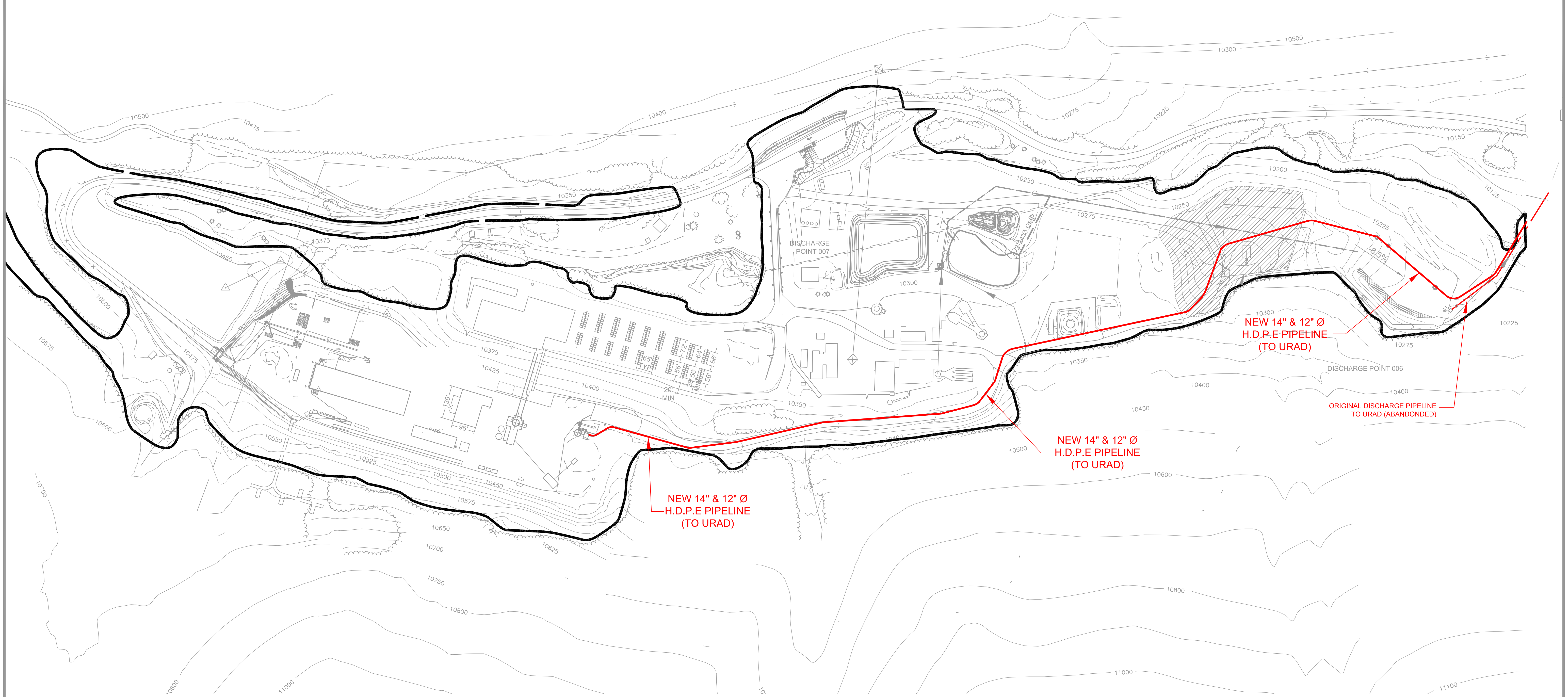
DESIGNED BY: MT (Aquionix)

DRAWN BY: MT

DATE DRAWN: 3/7/2011

SCALE: AS NOTED

FILE: S:\ArcGIS\Henderson GIS\mxds\mill\EPP



PLAN

SCALE
200 0 200 400 FEET
CONTOUR INTERVAL = 5 FEET

LEGEND:

10700	APPROXIMATE EXISTING GROUND SURFACE COUNTOUR AND ELEV, FEET
▬	BOUNDARY OF DISTURBED AREA
—	ENVIRONMENTAL PROTECTION FACILITIES
—	SITE FACILITIES

ISSUE REV	DESCRIPTION	DATE	DWN	CHK'D
a	Updated locations and labels.	08/11	MT	TC

DRAWING REFERENCE(S):

FROM DRAWING PROVIDED BY HENDERSON MINE TITLED "2-1-9001 MINE YARD.dwg" SHOWING A SITE IN THE SW1/4, SW1/4, SE1/4, SECTION 24 TOWNSHIP 3 SOUTH, RANGE 76 WEST of the 6th P.M., CLEAR CREEK COUNTY ALSO KNOWN AS TRACT "D" EXCHANGE SURVEY No. 377.

FROM DRAWING PROVIDED BY MWH TITLED "HENDERSON MINE LAYOUT AND ENVIRONMENTAL PROTECTION FACILITIES".

DESIGNED BY	Not Available	
DRAWN BY	Not Available	
REVISED BY	T. Merrill	10/02/2012
APPROVED BY	T. Cardwell	
PROJECT MANAGER	T. Cardwell	
CLIENT APPROVAL	Miguel Hamarat	
CLIENT REFERENCE NO.	370	

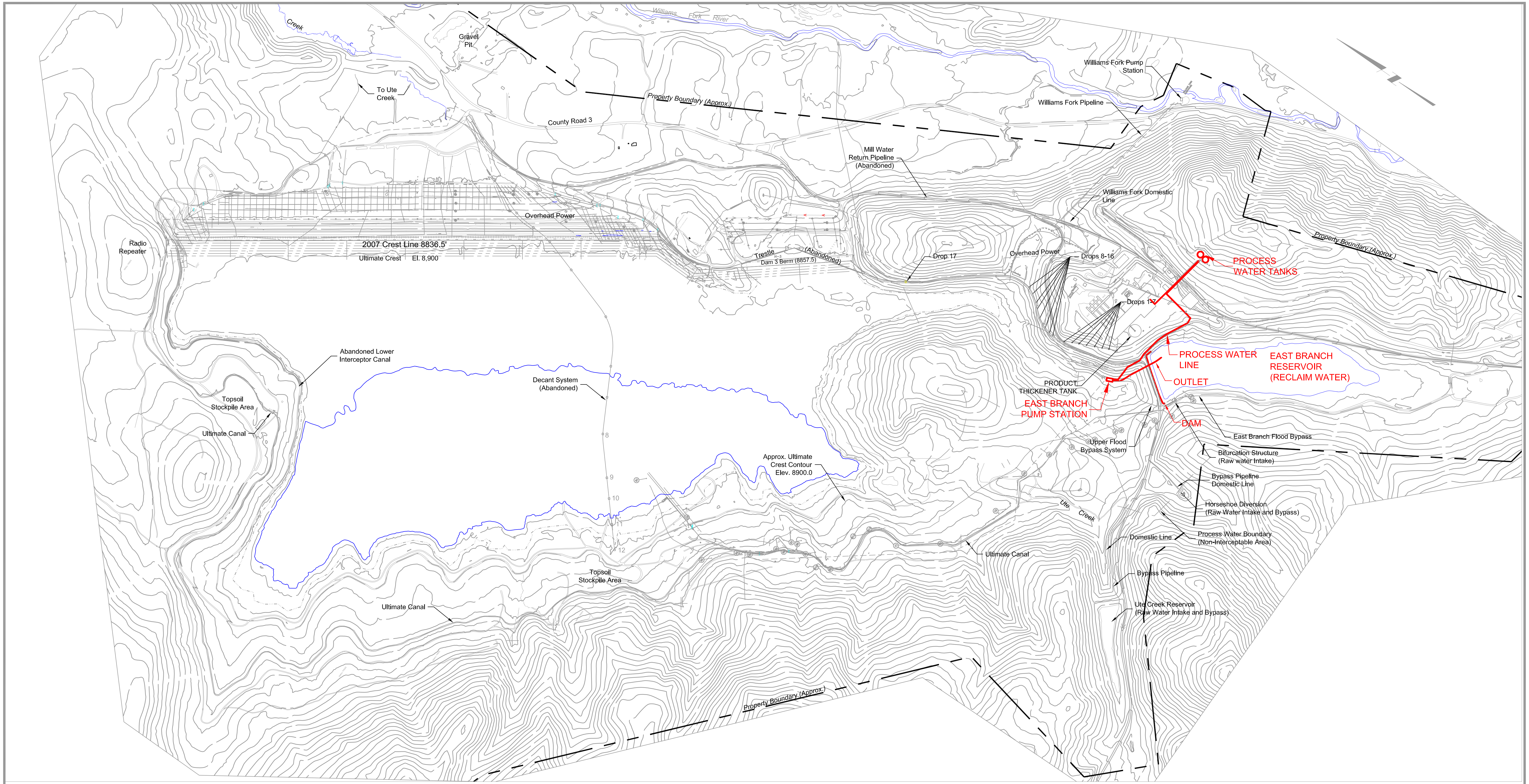
PROJECT LOCATION
Empire, Colorado

PROJECT
Environmental Protection Plan

TITLE
Henderson Mine EPF 1.1 - Mine Water System

Aquionix
3700 E. 41ST ST
DENVER, CO 80216-6504
303-289-7520 (OFFICE)
303-289-7521 (FAX)

FIGURE 3
REVISION
FILE NAME EPF MINE EPF 1.1



LEGEND:

10700	APPROXIMATE EXISTING GROUND SURFACE CONTOUR AND ELEV, FEET
▬ ▪ ▬ ▪ ▬	BOUNDARY OF DISTURBED AREA
───	ENVIRONMENTAL PROTECTION FACILITIES
───	SITE FACILITIES

PLAN

SCALE

750 0 750 1500 FEET

CONTOUR INTERVAL = 5 FEET

ISSUE/REV	DESCRIPTION	DATE	DWN	CHK'D
a	Updated locations and labels.	08/11	MT	TC

DRAWING REFERENCE(S):

FROM DRAWING PROVIDED BY MWH TITLE "HENDERSON MINE LAYOUT AND ENVIRONMENTAL PROTECTION FACILITIES".

DESIGNED BY	Not Available	
DRAWN BY	Not Available	
REVISED BY	T. Merrill	10/2/2012
APPROVED BY	T. Cardwell	
PROJECT MANAGER	T. Cardwell	
CLIENT APPROVAL	Miguel Harmarat	
CLIENT REFERENCE NO.	370	

PROJECT LOCATION Parshall, Colorado

PROJECT Environmental Protection Plan

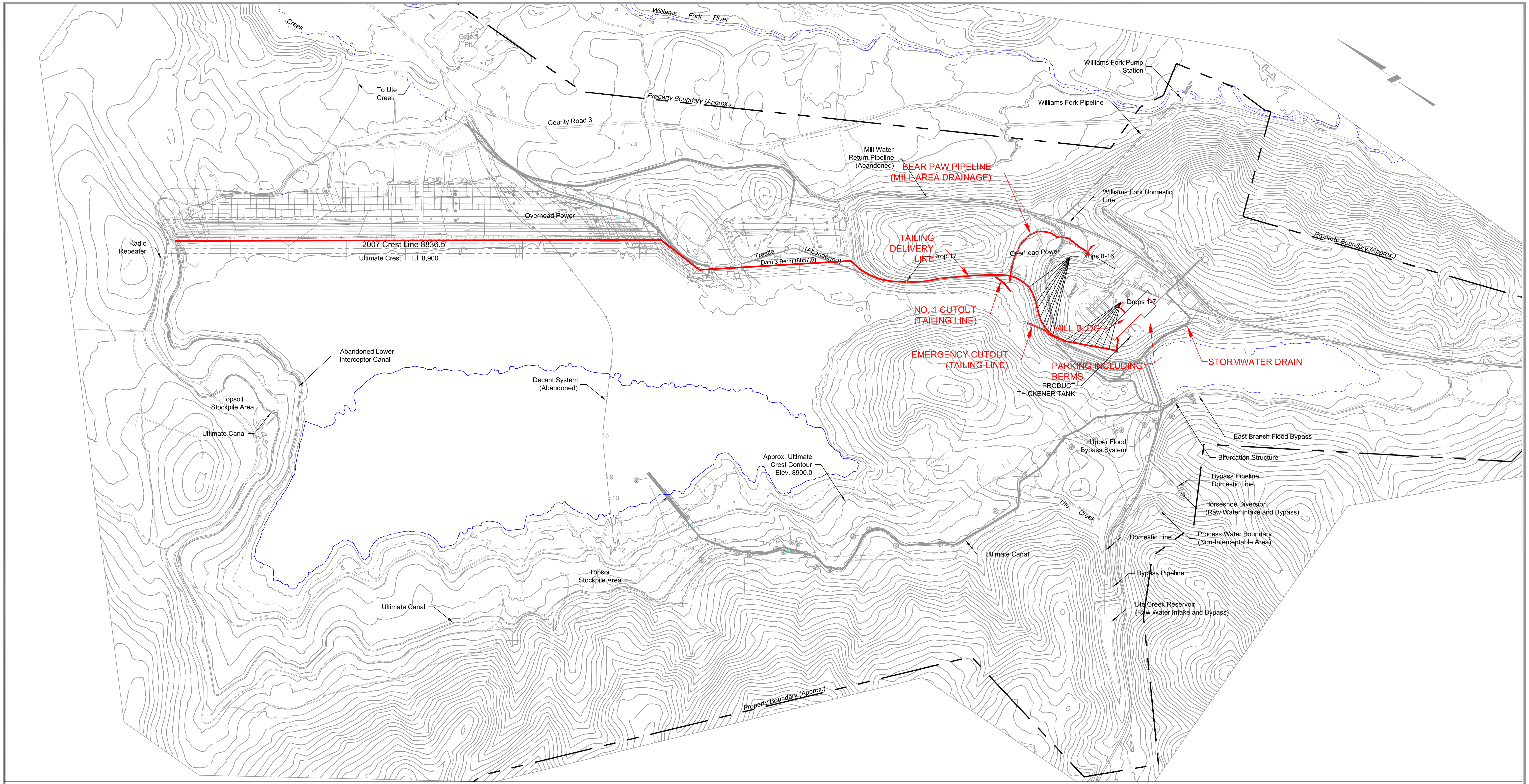
TITLE Henderson Mill EPF's 1.1.and 1.2
East Branch Reservoir System and Mill Process Water Storage Tanks

Aquionix
3700 E. 41ST ST.
DENVER, CO 80216-6504
303-289-7520 (OFFICE)
303-289-7521 (FAX)

FIGURE 4

REVISION

FILE NAME EPF MILL EPF 1.1 and 1.2



LEGEND:

10700	APPROXIMATE EXISTING GROUND SURFACE CONTOUR AND ELEV, FEET
▬ ▪ ▬ ▪ ▬	BOUNDARY OF DISTURBED AREA
───	ENVIRONMENTAL PROTECTION FACILITIES
───	SITE FACILITIES

PLAN

SCALE

750 0 750 1500 FEET

CONTOUR INTERVAL = 5 FEET

ISSUE / REV	DESCRIPTION	DATE	DWN	CHK'D
a	Updated locations and labels.	08/11	MT	TC

DRAWING REFERENCE(S):

FROM DRAWING PROVIDED BY MWH TITLE "HENDERSON MINE LAYOUT AND ENVIRONMENTAL PROTECTION FACILITIES".

DESIGNED BY	Not Available	
DRAWN BY	Not Available	
REVISED BY	T. Merrill	10/2/2012
APPROVED BY	T. Cardwell	
PROJECT MANAGER	T. Cardwell	
CLIENT APPROVAL	Miguel Harmarat	
CLIENT REFERENCE NO.	370	

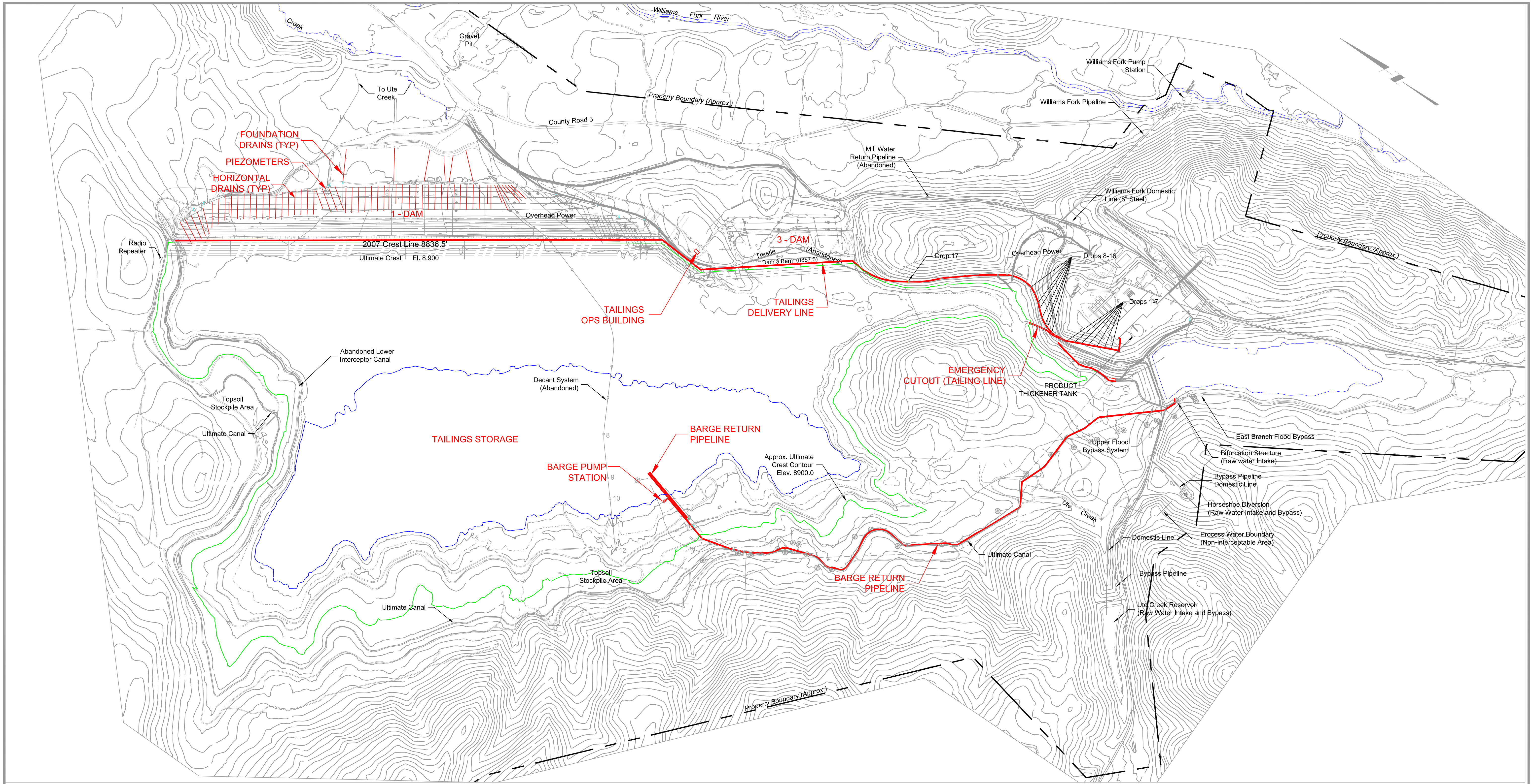
PROJECT LOCATION
Parshall, Colorado

PROJECT
Environmental Protection Plan

TITLE
Henderson Mill EPF 1.3 - Tailings Delivery System

Aquionix
3700 E. 41ST ST.
DENVER, CO 80216-6504
303-289-7520 (OFFICE)
303-289-7521 (FAX)

FIGURE 5
REVISION
FILE NAME EPF MILL EPF 1.3



LEGEND:

10700	APPROXIMATE EXISTING GROUND SURFACE CONTOUR AND ELEV, FEET
— - —	BOUNDARY OF DISTURBED AREA
🟥	ENVIRONMENTAL PROTECTION FACILITIES
—	SITE FACILITIES
🟩	TAILINGS STORAGE FACILITY (pontentially acid forming)

PLAN

SCALE

750 0 750 1500 FEET

CONTOUR INTERVAL = 5 FEET

ISSUE / REV	DESCRIPTION	DATE	DWN	CHK'D
a	Location/Label Updates	08/11	MT	TC

DRAWING REFERENCE(S):

FROM DRAWING PROVIDED BY MWH TITLE "HENDERSON MINE LAYOUT AND ENVIRONMENTAL PROTECTION FACILITIES".

DESIGNED BY	Not Available	–
DRAWN BY	Not Available	–
REVISED BY	T.Merrill	10/2/12
APPROVED BY	T. Cardwell	
PROJECT MANAGER	T. Cardwell	
CLIENT APPROVAL	Miguel Hamarat	
CLIENT REFERENCE NO.	370	

PROJECT LOCATION
Parshall, Colorado

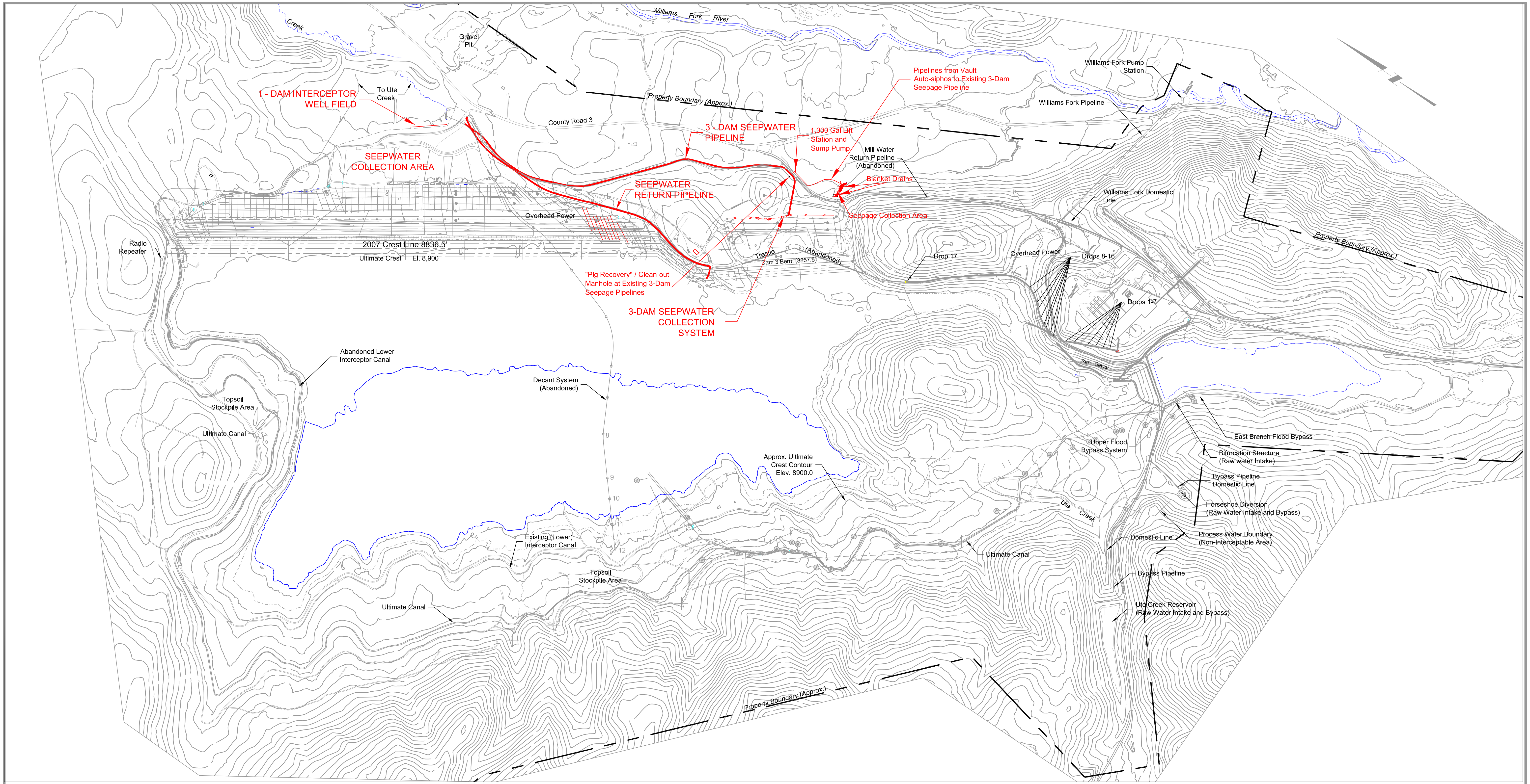
PROJECT
Environmental Protection Plan

TITLE
Henderson Mill EPF 1.4 - Tailings Storage

Aquionix
3700 E. 41ST ST.
DENVER, CO 80216-6504
303-289-7520 (OFFICE)
303-289-7521 (FAX)

FIGURE 6
REVISION

FILE NAME EPF MILL EPF 1.4



LEGEND:

10700	APPROXIMATE EXISTING GROUND SURFACE CONTOUR AND ELEV, FEET
▬ ▬ ▬	BOUNDARY OF DISTURBED AREA
─	ENVIRONMENTAL PROTECTION FACILITIES
─	SITE FACILITIES

PLAN

SCALE
750 0 750 1500 FEET
CONTOUR INTERVAL = 5 FEET

ISSUE / REV	DESCRIPTION	DATE	DWN	CHK'D
a	Updated locations and labels.	08/11	MT	TC

DRAWING REFERENCE(S):

FROM DRAWING PROVIDED BY MWH TITLE "HENDERSON MINE LAYOUT AND ENVIRONMENTAL PROTECTION FACILITIES".

DESIGNED BY	Not Available	
DRAWN BY	Not Available	
REVISED BY	T. Merrill	10/2/2012
APPROVED BY	T. Cardwell	
PROJECT MANAGER	T. Cardwell	
CLIENT APPROVAL	Miguel Hamarat	
CLIENT REFERENCE NO.	370	

PROJECT LOCATION
Parshall, Colorado

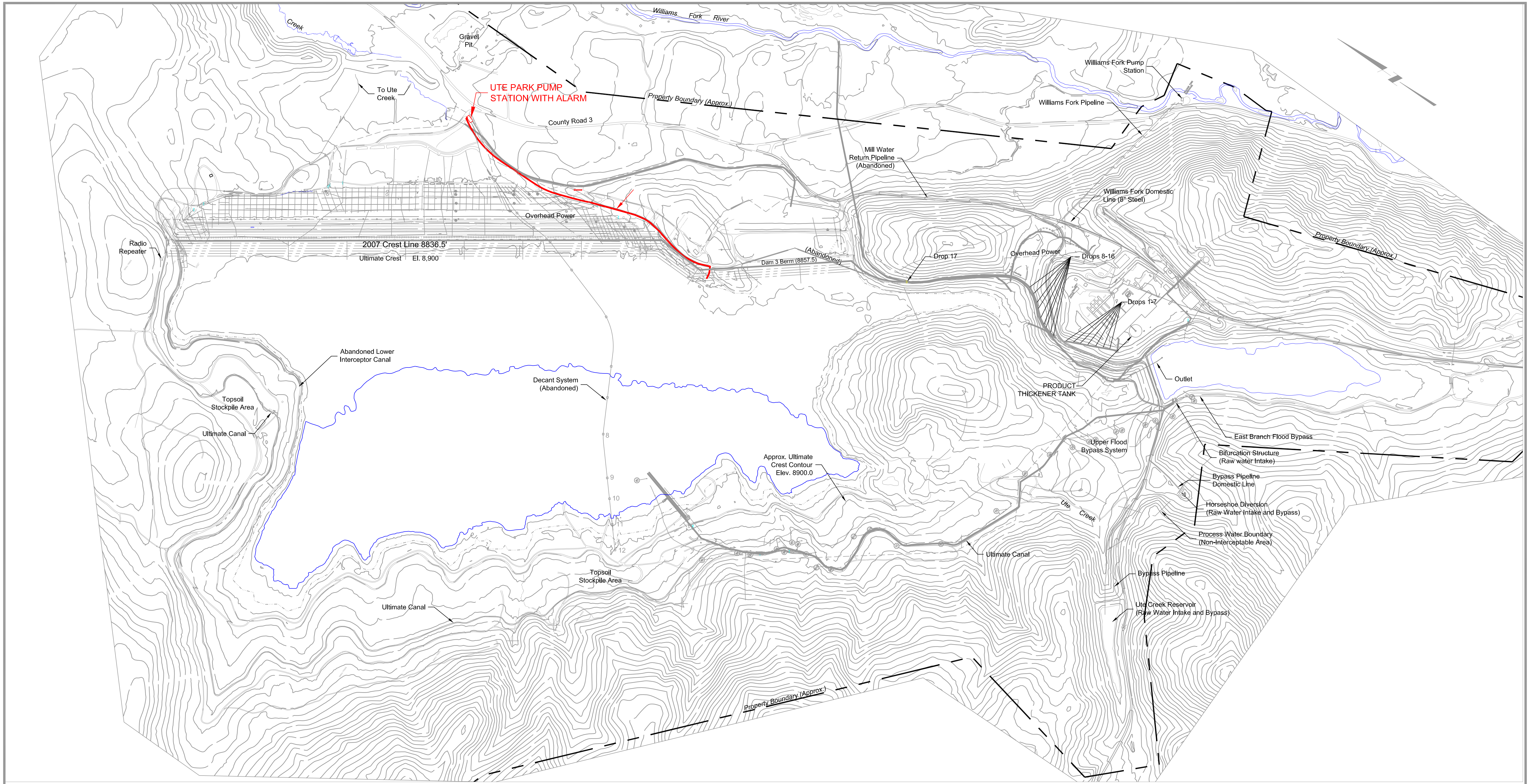
PROJECT
Environmental Protection Plan

TITLE
Henderson Mill EPF's 1.5 and 1.6 -
Seepwater Collection/Return and Dam Intercept Well Field

Aquionix
3700 E. 41ST ST.
DENVER, CO 80216-6504
303-289-7520 (OFFICE)
303-289-7521 (FAX)

FIGURE 7
REVISION

FILE NAME EPF MILL EPF 1.5 and 1.6



LEGEND:

——10700——	APPROXIMATE EXISTING GROUND SURFACE CONTOUR AND ELEV, FEET
▬ ▪ ▬ ▪ ▬	BOUNDARY OF DISTURBED AREA
——	ENVIRONMENTAL PROTECTION FACILITIES
——	SITE FACILITIES

PLAN

SCALE

750 0 750 1500 FEET

CONTOUR INTERVAL = 5 FEET

ISSUE/REV	DESCRIPTION	DATE	DWN	CHK'D
a	Updated locations and labels.	08/11	MT	TC

DRAWING REFERENCE(S):

FROM DRAWING PROVIDED BY MWH TITLE "HENDERSON MINE LAYOUT AND ENVIRONMENTAL PROTECTION FACILITIES".

DESIGNED BY	Not Available
DRAWN BY	Not Available
REVISED BY	T. Merrill
APPROVED BY	T. Cardwell
PROJECT MANAGER	T. Cardwell
CLIENT APPROVAL	Miguel Harmarat
CLIENT REFERENCE NO.	730

PROJECT LOCATION
Parshall, Colorado

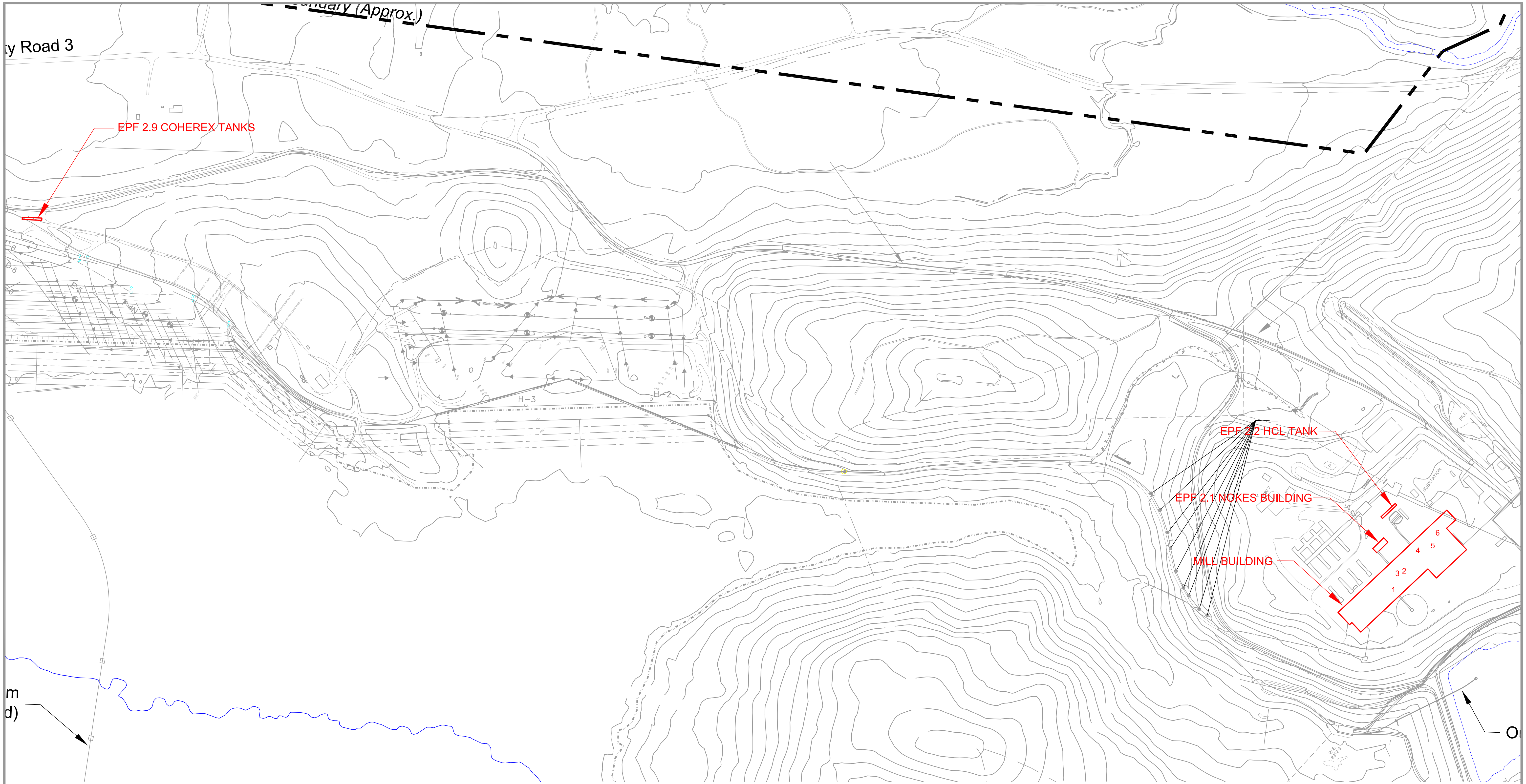
PROJECT
Environmental Protection Plan

TITLE
Henderson Mill EPF 1.7 - Ute Park Pump Station

Aquionix
3700 E. 41ST ST.
DENVER, CO 80216-6504
303-289-7520 (OFFICE)
303-289-7521 (FAX)

FIGURE 8
REVISION

FILE NAME EPF MILL EPF 1.7



LEGEND:

10700	APPROXIMATE EXISTING GROUND SURFACE CONTOUR AND ELEV, FEET
▬ ▪ ▬	BOUNDARY OF DISTURBED AREA
──	ENVIRONMENTAL PROTECTION FACILITIES
──	SITE FACILITIES

PLAN

SCALE
300 0 300 600 FEET
CONTOUR INTERVAL = 5 FEET

MILL BUILDING

1	EPF 2.3a - Flotation Chemical Storage (OrePrep F-579) EPF 2.3b - Flotation Chemical Storage (Orform D8 Depressant)
2	EPF 2.4 - Pine Oil Storage
3	EPF 2.5 - Collector Oil Storage
4	EPF 2.6 - Syntex Storage
5	EPF 2.7 - Sodium Lauryl Sulfate Storage
6	EPF 2.8 - Tergitol NP-9 Storage

ISSUE REV	DESCRIPTION	DATE	DWN	CHK'D
a	Updated loactions and labels.	08/11	MT	TC

DRAWING REFERENCE(S):

FROM DRAWING PROVIDED BY MWH TITLE "HENDERSON MINE LAYOUT AND ENVIRONMENTAL PROTECTION FACILITIES".

DESIGNED BY	Not Available	
DRAWN BY	Not Available	
REVISED BY	T. Merrill	10/2/2012
APPROVED BY	T. Cardwell	
PROJECT MANAGER	T. Cardwell	
CLIENT APPROVAL	Miguel Hamarat	
CLIENT REFERENCE NO.	370	

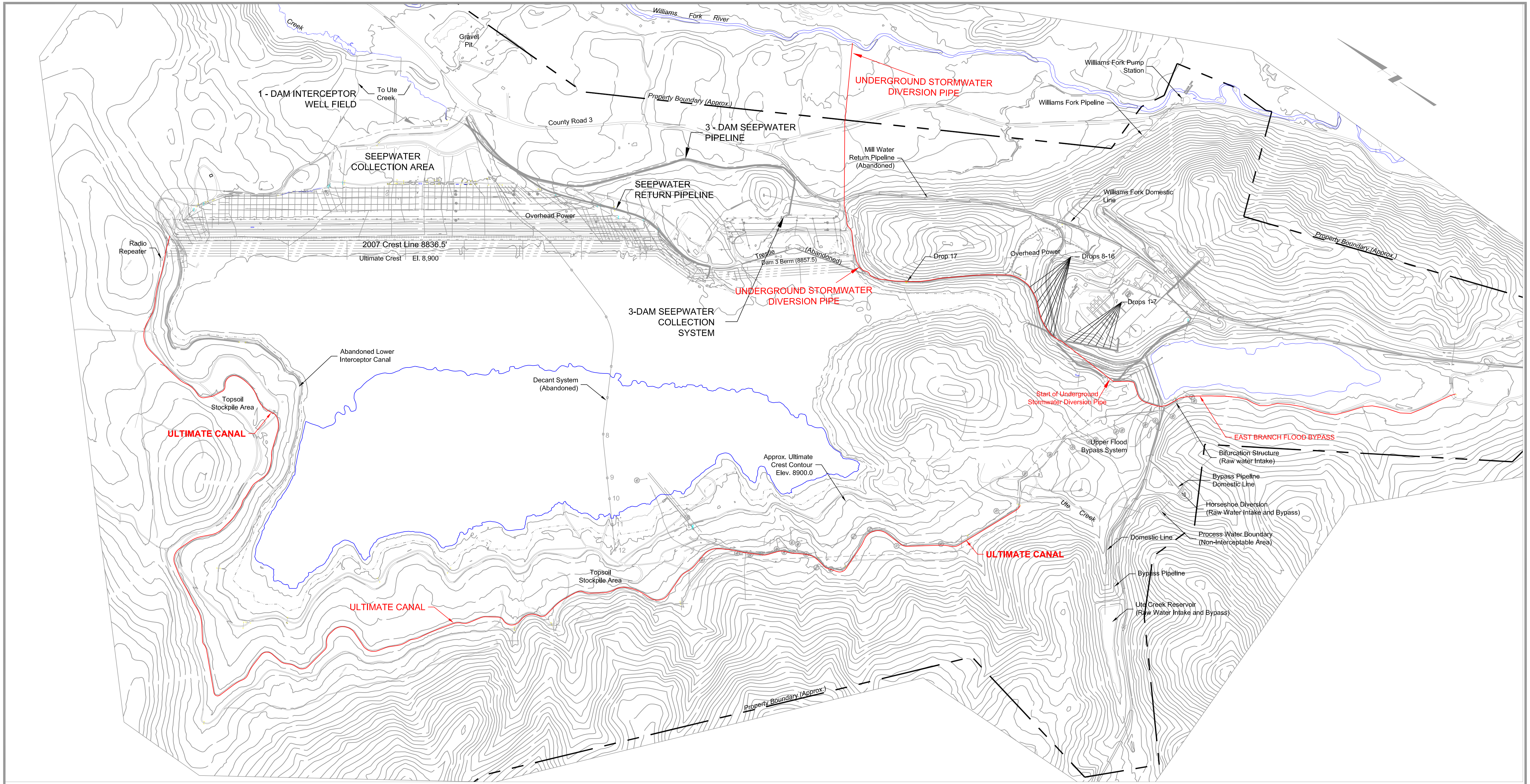
PROJECT LOCATION
Parshall, Colorado

PROJECT
Environmental Protection Plan

TITLE
Henderson Mill EPF's 2.1 through 2.9 - Designated Chemicals Storage

Aquionix
3700 E. 41ST ST.
DENVER, CO 80216-6504
303-289-7520 (OFFICE)
303-289-7521 (FAX)

FIGURE 9
REVISION
FILE NAME EPF MILL 2.1 - 2.9



LEGEND:

10700	APPROXIMATE EXISTING GROUND SURFACE CONTOUR AND ELEV, FEET
▬ ▬ ▬	BOUNDARY OF DISTURBED AREA
──	ENVIRONMENTAL PROTECTION FACILITIES
──	SITE FACILITIES

PLAN

SCALE

750 0 750 1500 FEET

CONTOUR INTERVAL = 5 FEET

ISSUE / REV	DESCRIPTION	DATE	DWN	CHK'D
a	Updated locations and labels.	08/11	MT	TC

DRAWING REFERENCE(S):

FROM DRAWING PROVIDED BY MWH TITLE "HENDERSON MINE LAYOUT AND ENVIRONMENTAL PROTECTION FACILITIES".

DESIGNED BY	Not Available	
DRAWN BY	Not Available	
REVISED BY	T. Merrill	10/2/2012
APPROVED BY	T. Cardwell	
PROJECT MANAGER	T. Cardwell	
CLIENT APPROVAL	Miguel Hamarat	
CLIENT REFERENCE NO.	370	

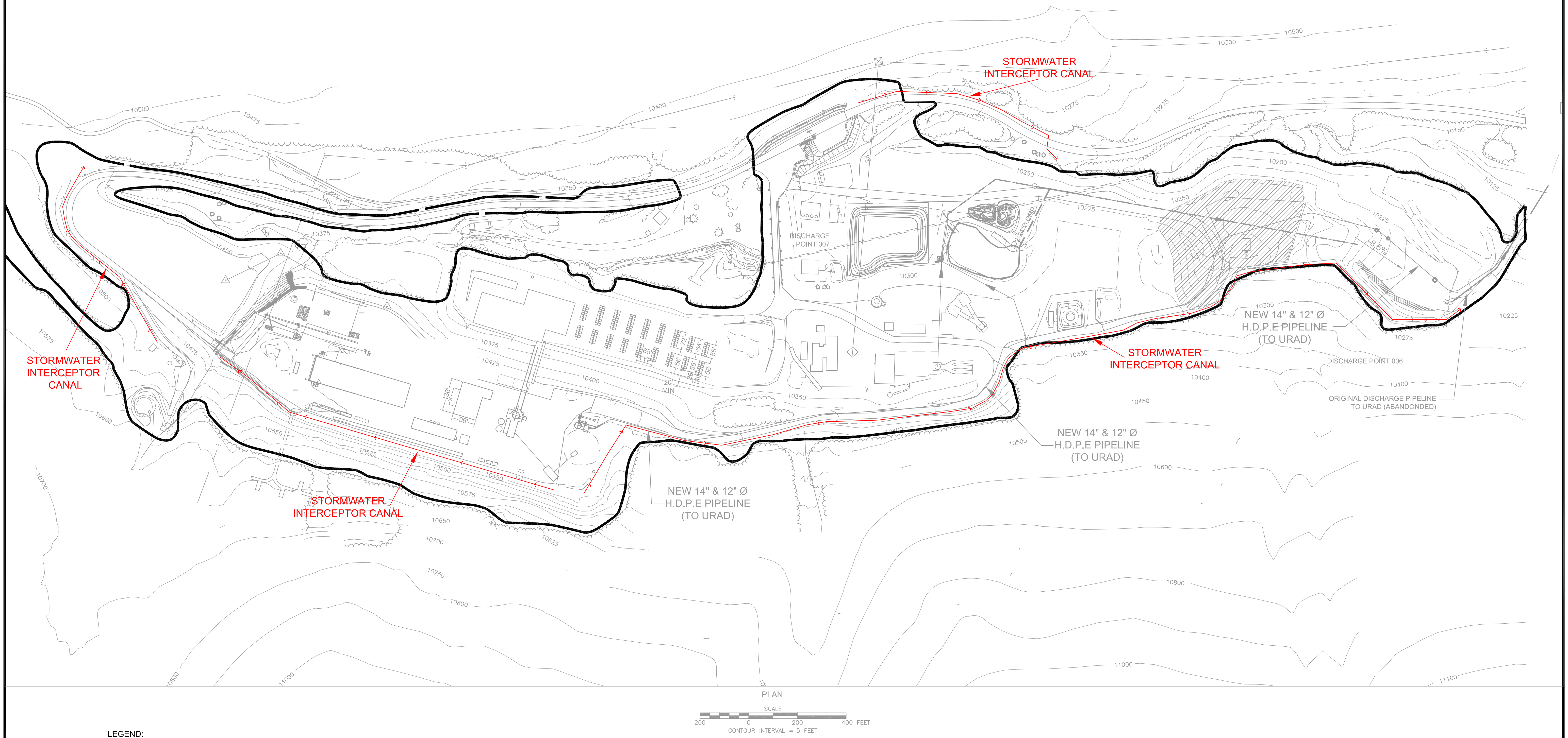
PROJECT LOCATION
Parshall, Colorado

PROJECT
Environmental Protection Plan

TITLE
Henderson Mill EPF 3.1 - Stormwater Diversion System

Aquionix
3700 E. 41ST ST.
DENVER, CO 80216-6504
303-289-7520 (OFFICE)
303-289-7521 (FAX)

FIGURE 10
REVISION
FILE NAME EPF MILL EPF 3.1



PLAN

LEGEND:

10700	APPROXIMATE EXISTING GROUND SURFACE COUNTOUR AND ELEV, FEET
▬	BOUNDARY OF DISTURBED AREA
—	ENVIRONMENTAL PROTECTION FACILITIES
—	SITE FACILITIES

ISSUE/REV	DESCRIPTION	DATE	DWN	CHK'D
a	Updated locations and labels.	08/11	MT	TC

DRAWING REFERENCE(S):

FROM DRAWING PROVIDED BY HENDERSON MINE TITLED "2-1-9001 MINE YARD.dwg" SHOWING A SITE IN THE SW1/4, SW1/4, SE1/4, SECTION 24 TOWNSHIP 3 SOUTH, RANGE 76 WEST of the 6th P.M., CLEAR CREEK COUNTY ALSO KNOWN AS TRACT "D" EXCHANGE SURVEY No. 377.

FROM DRAWING PROVIDED BY MWH TITLED "HENDERSON MINE LAYOUT AND ENVIRONMENTAL PROTECTION FACILITIES".

DESIGNED BY	Not Available	
DRAWN BY	Not Available	
REVISED BY	T. Merrill	10/2/2012
APPROVED BY	T. Cardwell	
PROJECT MANAGER	T. Cardwell	
CLIENT APPROVAL	Miguel Hamarat	
CLIENT REFERENCE NO.	370	

PROJECT LOCATION
Empire, Colorado

PROJECT
Environmental Protection Plan

TITLE
Henderson Mine EPF 1.2 - Stormwater Diversion System

Aquionix
3700 E. 41ST ST
DENVER, CO 80216-6504
303-289-7520 (OFFICE)
303-289-7521 (FAX)

FIGURE 11
REVISION

FILE NAME EPF MINE EPF 1.2