

PHASE II PROJECT OPERATIONS PLAN

FORMER MINE SITE REMEDIATION AND RESTORATION

BLUE HILL, MAINE

Prepared for:

Maine Department of Environmental Protection
State House Station 17
Augusta, Maine 04333-0017

Prepared by:

EMSOURCE Blue Hill, LLC
111 Commercial Street
Portland, Maine 04101

Revised May 2007

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ACRONYMS AND ABBREVIATIONS

AMD	Acid Mine Drainage
CLP	Contract Laboratory Program
COCs	Contaminants of concern
CQAPP	Construction Quality Assurance/Quality Control Plan
CRP	Community Relations Plan
DEP	Maine Department of Environmental Protection
DO	Dissolved oxygen
EBH	EMSOURCE Blue Hill, LLC
FOL	Field Operations Leader
FRDs	Field data records
FSP	Field Sampling Plan
GIS	Geographic Information System
GPS	Global Positioning Satellite
HASP	Health and Safety Plan
HSO	Health and Safety Officer
LCS	Laboratory Control Samples
MDL	Method detection limit
MEGs	Maximum Exposure Guidelines
mg/kg	milligrams per kilogram
mg/l	milligrams per liter
ml	milliliter
µg/kg	micrograms per kilogram
ug/l	micrograms per liter
pH	log hydrogen ion concentration
POP	Project Operations Plan
PPE	Personal Protective Equipment
QAM	Quality Assurance Manager
QC	Quality Control
QCSR	Quality Control Summary Report
RI/FS	Remedial Investigation/Feasibility Study
SAP	Sampling and Analysis Plan
SMP	Site Management Plan
SSHM	Site Safety and Health Manager
STP	Sample Tracking Program
TB	Trip Blanks

Project Operations Plan

1.0 INTRODUCTION

This Phase II Project Operation Plan (POP) outlines EMSOURCE Blue Hill, LLC's (EBH) execution of the June 2006 Remedial Action Plan (RAP) for the former mine site (the Site or the Former Mine Site) located in Blue Hill, Maine. The RAP detailed the Site remedy, which generally includes the collection of materials potentially causing Acid Mine Drainage (AMD), improving drainage features, enhancing wetland vegetation, and capping certain Site locations. This work is being performed by EBH with oversight by the Maine Department of Environmental Protection (DEP).

The purpose of this Phase II POP is to provide a written understanding and commitment from EBH concerning the means and methods that will be used to manage and execute the RAP scope of work. This document also sets forth planned communication channels and other means by which EBH will share information about the project with DEP. The objective of the POP is to create an effective, practical, and well integrated project execution strategy that allows EBH and DEP to work together efficiently and achieve the project objectives. We anticipate that modification to the POP will be discussed during regular project meetings; appropriate discussions regarding POP amendments will be documented, either within meeting minutes or via regular progress reports, as appropriate.

This Phase II POP addresses Plant Site Capping. This Phase II POP makes appropriate adjustments from the Phase I POP as appropriate.

The Phase II POP is comprised of the following five site-specific planning elements describing discrete components of the project:

- A. Site Management Plan (SMP)
- B. Sampling and Analysis Plan (SAP)
- C. Construction Quality Assurance/Quality Control Plan (QA/QC Plan)
- D. Health and Safety Plan (HASP)
- E. Community Relations Plan (CRP)

Each plan is intended to work in conjunction with the others to accomplish the project goals. This document is subject to review and approval by DEP prior to initiation of work.

These plans are summarized in Sections 3 through 7 below, and included in their entirety as appendices to this document.

2.0 PROJECT ORGANIZATION

Figure 1 depicts the organizational structure for this phase of the project. The roles of key individuals are described below. **Figure 2** is a contact list of key project personnel. Figure 2 will be revised and updated throughout the project as new key contractors and vendors are retained.

DEP Project Manager

Tracy Weston Kelly is DEP's Project Manager for the Blue Hill remediation program and the official Department point of contact for EBH. Ms Weston Kelly is responsible for the technical and regulatory oversight of the project on behalf of DEP, and for coordinating with other regulatory departments of DEP, as necessary. Hank Aho, DEP's acting division director, will serve as backup for Ms Weston Kelly

EBH Project Manager

Liz Armstrong will serve as Project Manager responsible for EBH's performance on the project. Her direct lines of communication are to the DEP Project Manager and the Field Operations Leader for communication of daily on-site project execution, resolution of issues affecting project scope, schedule, costs, and subcontractor performance.

Field Operations Leader (FOL)

Patrick J. Hansen, P.E. will serve as EBH's FOL with on-site management responsibility for all EBH field activities. The FOL is responsible for conducting daily meetings and briefings with project technical staff, coordinating sample collection and management activities, directing and scheduling daily work assignments, verifying that field documentation is being generated and distributed in conformance with the QA/QC Plan, and reporting activities to the Project Manager. Additionally, the FOL will be responsible for maintaining formal and informal lines of communication with the DEP.

The Site Safety and Health Manager (SSHM) will be a shared role, as discussed in the HASP. The SSHM will be executed by suitable personnel on-site. The FOL will share certain responsibilities of the SSHM.

Technical Support

Technical support for Phase II will include Sevee & Maher, Engineers, Inc. serving as the Project Engineer and the Quality Assurance/Quality Control Engineer (QA/QC Engineer). The Project Engineer will provide key technical support, and will manage and modify, as necessary, design elements as required by project conditions. The QA/QC Engineer will be responsible for implementing the Construction QA/QC Plan.

The Project Hydrogeologist is C. A. White & Associates. C.A. White & Associates will coordinate sample collection, testing, and evaluation with the assistance of certain project subcontractors and vendors including field sampling technicians and laboratory analysis.

The Project Surveyor is Herrick & Salsbury. The Project Surveyor will provide construction layout and grade verification, and will assist in as-built drawing preparation.

Each aspect of the project that requires review and/or certification will be performed by a licensed or registered professional whether it be a professional engineer, certified geologist or licensed surveyor or other professional designation.

QA/QC Vendors

FGS/CMT will be providing geotechnical testing.

Sevee & Maher will perform the QA/QC oversight of the installation of cap components. Certain cap component interface testing will be performed by a vendor to be selected.

Key Contractors

The key contractors include:

- R.F. Jordan: stone/soil supplier, project manpower & heavy equipment provider
- Northeast labs & Maine Environmental Labs: lab services and field technician

Candidate geonet/GCL supplier/installers are currently being reviewed by the FOL and QA/QC Engineer and will be selected based on experience and price quotes. The supplier/installer will be selected prior to the 2007 mobilization and the MDEP will be appropriately notified.

Senior Corporate Sponsor

David Critchfield is a senior EBH corporate officer and will serve in the role of senior corporate sponsor responsible for ensuring that the project has the necessary resources to complete the work. The Senior Corporate Sponsor will review project documents and overall progress, and to verify the quality and timeliness of execution, actual versus budget cost, and provide input on problem areas and actions which might enhance overall performance of the project.

Contact Information

Tracy Weston Kelly, Project Manager

Maine Department of Environmental Protection
17 State House Station
Ray Building, Hospital Street
Augusta, ME 04333-0017
Tel: (207) 287-4862

Hank Aho, Supporting Project Manager

Maine Department of Environmental Protection
17 State House Station
Ray Building, Hospital Street
Augusta, ME 04333-0017
Tel: (207) 287-4850

Liz Armstrong, Project Manager

David Critchfield, Corporate Sponsor

EMSOURCE Blue Hill, LLC
111 Commercial Street, Suite 400
Portland, ME 04101
Tel: (207) 772-4939

Patrick J. Hansen, Field Operations Leader

EMSOURCE Blue Hill, LLC
P.O. Box 17914
Portland, ME 04112-7914
Tel: (207) 772-4939

Jim Atwell, Project Engineer & QA/AC Engineer

Sevee & Maher, Engineers Inc.
P.O. Box 85A
Cumberland Center, ME 04021
Tel: (207) 829-5016

Carol White, Project Hydrogeologist

C.A. White & Associates, Inc.
One Main Street
Yarmouth, ME 04096
Tel: (207) 846-5599

3.0 PHASE II SITE MANAGEMENT PLAN

The PHASE II Site Management Plan (SMP) identifies requirements and procedures for the management of on-site activities. The SMP addresses the following topics:

- Project schedule;
- Key project contacts;
- Site access and control measures;
- Contingency and notification plan;
- Investigative plans/investigative waste disposal; and
- Project support.

The SMP is included in **Appendix A**.

4.0 PHASE II CONSTRUCTION SAMPLING AND ANALYSIS PLAN

The Phase II Construction Sampling and Analysis Plan (SAP) describes the objectives, procedures, QA/QC measures, reporting and schedule for the environmental monitoring activities associated with Phase II. Where appropriate, the SAP will reference the specific sampling and equipment procedures including field documentation and decontamination procedures that are contained within the construction QA/QC Plan. The QA/QC Plan also will be relied upon for establishing appropriate control requirements and field procedures for sample handling and analysis, including sample management, chain of custody procedures, sample containers, preservation and hold times.

EBH will collect data to characterize ambient zinc concentrations and other environmental parameters in surface water and around the former mine site to test the effectiveness of material handling best management practices during construction. The data will be compared with 2006 construction data and with base-line information which has been generated through routine monitoring efforts conducted since 2000.

The SAP is included herein in **Appendix B**.

5.0 PHASE II CONSTRUCTION QUALITY ASSURANCE/QUALITY CONTROL PLAN

The Phase II Construction QA/QC describes the procedures used to establish and follow a quality assurance/quality control process for the construction of site remediation measures at the Site.

- Quality management process;
- QA/QC organization and responsibilities;
- Sampling and testing procedures;
- Data management, validation and assessment procedures;
- Modifications (if any) to the program; and
- Meetings and project coordination.

The Construction QA/QC plan is included herein as **Appendix C**.

6.0 PHASE II HEALTH AND SAFETY PLAN

The PHASE II Health and Safety Plan (HASP) describes site-specific procedures, personnel roles, and responsibilities necessary to protect on-site workers and the general public during execution of RAP. This document specifies:

- Identification of potential hazards;
- Environmental monitoring;
- Specifications for personal protective equipment (PPE) and criteria for upgrading PPE or suspending activities;
- Hospital routes and emergency numbers and procedures; and
- Zones of exclusion, and the use of contaminant reduction zones and clean areas, if required during remediation activities.

The HASP will govern activities of all EBH employees and contractors. Contractors also will be responsible for developing and adhering to their own corporate health and safety requirements, which will be at least as strict as the EBH plan.

The HASP is included in **Appendix D**.

Community Relations Plan

7.0 PHASE II COMMUNITY RELATIONS PLAN

The PHASE II Community Relations Plan (CRP) consists of the following components:

- Key Project Participants
- Public informational mailings;
- Public informational meetings;
- Public access to personnel during construction; and
- Project website.

Since the project began, EBH has regularly interacted with the community. With our substantial site presence during Phase I, we have had the pleasure of meeting many of the project neighbors. We hope to continue to build relationships during Phase II.

Contacting Key Project Participants

A complete list of all key project participants (including contact information) is provided in the Site Management Plan and included herein as **Appendix A**. A list of site and adjacent property owners as well as interested persons is also included in the Site Management Plan (**Appendix A**).

Public Informational Mailings

In May 2007, EBH will mail information to the owners of the Project Property, adjacent property owners and other interested persons inviting them to a public meeting in late May 2007 at the Blue Hill Town Hall, and providing the residents with information about the project and EBH's plans for the 2007 field season.

Public Informational Meetings

In Late May, 2007, EBH will hold a public information meeting at the Blue Hill Town Hall to provide interested persons with an opportunity to ask EBH and DEP questions about the project. Legal notices announcing the meeting will be published in the Weekly Packet, the Ellsworth American and the Bangor Daily News. Letters previously have been mailed to the interested parties list advising them of the meeting in advance. Elizabeth Armstrong, David Critchfield, and Patrick Hansen (EBH) will be present at the meeting as will DEP representatives.

Public Access to the Site During Construction

The Field Operations Leader or Project Engineer will generally always be in the project area while field work is underway. EBH has established a field office and arranged for telephone, fax and email at the field office. We have provided all local officials and interested persons with EBH project contact information.

For safety reasons, public access to the Site will be limited during construction, but access to the field office during normal business hours will be available to contractors. Private citizens are asked to contact the FOL or EBH by phone rather than coming to the field office.

Project Website

EBH has established a project website for the benefit of those having internet access. The URL address of the website is www.emsourcebluehill.com. The website contains general information about the project, status reports, as well as contact information for EBH and key project participants. We have previously notified interested persons that they can monitor the project by checking the website for regular postings of project updates. Our project communications will include reminders about the project website.

FIGURE 1
PROJECT ORGANIZATION CHART
EMSOURCE Blue Hill, LLC
Site Remediation and Restoration
Blue Hill, Maine

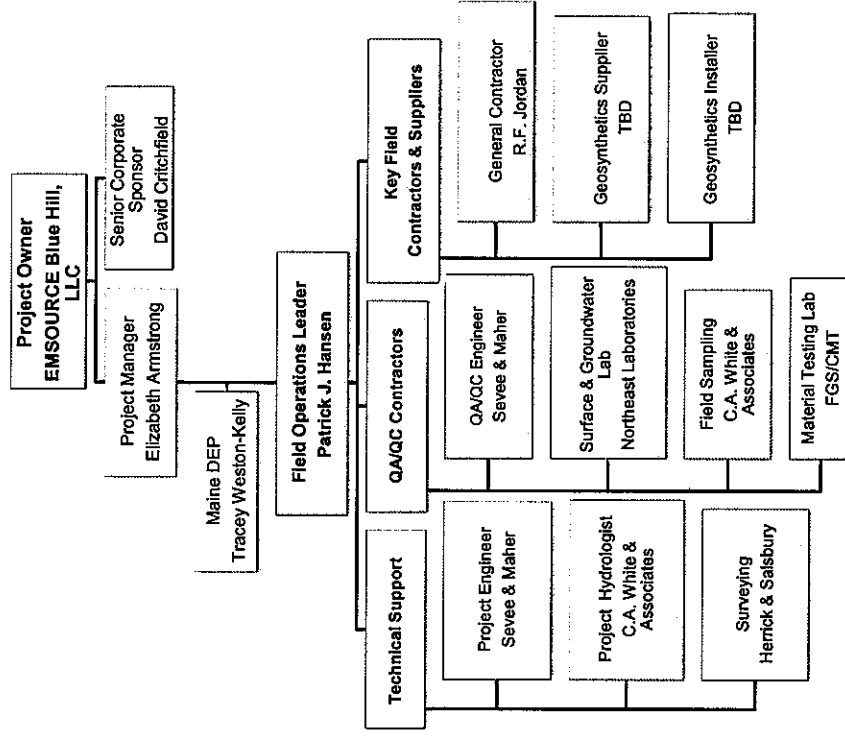


FIGURE 2
KEY PROJECT PERSONNEL CONTACT LIST

Tracy Weston Kelly, Project Manager

Maine Department of Environmental Protection
17 State House Station
Ray Building, Hospital Street
Augusta, ME 04333-0017
Tel: (207) 287-4862

Hank Aho, Supporting Project Manager

Maine Department of Environmental Protection
17 State House Station
Ray Building, Hospital Street
Augusta, ME 04333-0017
Tel: (207) 287-4850

Liz Armstrong, Project Manager

David Critchfield, Corporate Sponsor
EMSOURCE Blue Hill, LLC
111 Commercial Street, Suite 400
Portland, ME 04101
Tel: (207) 772-4939

Patrick J. Hansen, Field Operations Leader

EMSOURCE Blue Hill, LLC
P.O. Box 17914
Portland, ME 04112-7914
Tel: (207) 772-4939

Jim Atwell, Project Engineer & QA/AC Engineer

Sevee & Maher, Engineers Inc.
P.O. Box 85A
Cumberland Center, ME 04021
Tel: (207) 829-5016

Carol White, Project Hydrogeologist

C.A. White & Associates, Inc.
One Main Street
Yarmouth, ME 04096
Tel: (207) 846-5599

Steve Salsbury, Project Surveyor

Herrick & Salsbury
P.O. Box 652
67 Franklin Street
Ellsworth, ME 04605
Tel: (207) 667-7370

Patrick Jordan, General Contractor

R.F. Jordan & Sons
134 Surry Road
Ellsworth, ME 04605
Tel: (207) 667-5236

Mike Gordon, Field Sampler

Northeast Labs
P.O. Box 788
Waterville, ME 04903-0788
Tel: (207) 314-1754

Arnie Fessenden, Material Testing Contractor

FGS/CMT
136 Maine Avenue
P.O. Box 2097
Bangor, ME 04401
Tel: (207) 947-3184

Herb Kodis, Lab Manager

Maine Environmental Laboratory
1 Main Street
Yarmouth, ME 04096
Tel: (207) 846-6569

Site Management Plan

SITE MANAGEMENT PLAN

DURING PHASE II

FORMER MINE SITE REMEDIATION AND RESTORATION

At the
FORMER MINE SITE

BLUE HILL, MAINE

Prepared for:

Maine Department of Environmental Protection
State House Station 17
Augusta, Maine 04333-0017

Prepared by:

EMSOURCE Blue Hill, LLC
111 Commercial Street
Portland, Maine 04101

Revised May 2007

Phase II SITE MANAGEMENT PLAN (SMP)

FORMER MINE SITE REMEDIATION AND RESTORATION

BLUE HILL, MAINE

EMSOURCE Blue Hill, LLC (EBH) is responsible for the Former Mine Site Remediation and Restoration located off Mines Road (Route 15) in Blue Hill, Maine under the terms of a Consent Decree¹ and with oversight of the Maine Department of Environmental Protection (DEP). This Phase II Site Management Plan (SMP), as part of the Phase II Project Operations Plan (POP), fulfills certain document preparation requirements referred to in the Consent Decree.

The SMP addresses the following topics:

- Project Schedule;
- Key project contacts;
- Site access and control measures;
- Contingency and notification measures;
- Investigative plans/investigative waste disposal; and
- Project support.

Project Schedule

The project schedule contemplates that construction will occur in phases. Phase I began in September 2006 and was completed in January 2007. Phase I included drainage improvements, bare spot revegetation, and access road excavation and reconstruction.

Phase II is slated for 2007. Phase II includes the capping of the Plant Site area with a 3'-thick multimedia cap.

Each phase of construction includes project mobilization and the work elements involved in the phase, as discussed below.

Project Mobilization. EBH has began mobilizing for the 2007 work in February with the demolition of certain concrete structures at the Plant Site as well as the importation and stockpiling of certain soil materials (e.g., cushion layer) for the Plant Site cap. The soil materials are being stored on site in the following temporary stockpile locations:

- Access Road Stockpile area
- Plant Site Asphalt Pad Stockpile area

Future field mobilization activities will include the delivery of certain project equipment and other materials which will be stored at the project field office and the identified stockpile locations including a laydown area near the Northern Diversion Ditch (NDD). See Figure 1 for a location plan of these areas.

¹ Consent Decree entered in U.S. District Court (District of Maine) on June 28, 2006 between the Maine Department of Environmental Protection, EMSOURCE Blue Hill, LLC and Kerramerican, Inc.

Phase II Site Work (2007).

Phase II construction will involve the construction of the Plant Site Cap (construction group 700). An estimated Project Schedule for the 2007 construction season is included in **Table 1**. The following tables summarize the key material categories and quantities required to complete this phase of the remediation project.

Key Synthetic Materials

<i>Material or Activity</i>	<i>Quantity (SY)</i>
Geosynthetic Clay Liner (GCL)	75,000
Geocomposite Drainage Layer	75,000

<i>Material</i>	<i>Volume (CY)</i>
Cushion fill	25,000
Protective layer fill	25,000
Common Borrow	12,000
Topsoil	12,000

Traffic Control Plan

EBH, as a result, in part, of public concerns raised during our public meeting in 2006, implemented the following traffic control plan elements during Phase I work:

- Primary vendor deliveries occur over state-roads;
- The key access point to the site is from Mines Road (Route 15,);
- "Trucks Entering" signs are posted near the site entrance on Mines Road;
- Supported discussions between the MDOT and the Town of Blue Hill.

EBH will continue implementation of this traffic plan during Phase II.

By June of 2007, the estimated start date for Phase II Plant Site Capping activities, EBH will have imported approximately 65,000 CY of material (for Phase I work as well as the stockpiling of materials for Phase II work.). This represents more than half of the total amount of materials (115,000 CY) estimated to complete the project. EBH has endeavored to stockpile materials on site during the "off season" in Blue Hill when there is less tourist traffic.

Phase II work activities must take place during the summer months. EBH understands that the summer months also bring numerous summer visitors to the Blue Hill peninsula. Our primary materials contractor, R.F. Jordan, is familiar with the traffic situation in the area in the busy tourist season and while deliveries of materials may be slowed due to heavy traffic, we do not anticipate any serious problems.

Key Contacts

Project Management. EMSOURCE Blue Hill, LLC (EBH) is responsible for the execution of the project. The primary project contacts, including regulatory officials, include the following:

Elizabeth Armstrong – Project Manager
David Critchfield – Senior Corporate Sponsor
EMSOURCE Blue Hill, LLC
111 Commercial Street, Suite 400
Portland, ME 04101
P (207) 772-4939
F (207) 772-9322
armstrong@emsource.com (mobile phone (207) 450-4909)
critchfield@emsource.com (mobile phone (207) 450-4939)

Patrick J. Hansen, PE
Field Operations Leader
Outcome Engineering and Environmental Consulting
Field Office: 254 Mines Road
Blue Hill, ME
P (877) 374-0333
F (877) 374-0334
Mobile: (215) 850-1126
phansen@outcomeengineering.com

Tracy Weston Kelly, Project Manager
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Hank Aho, Supporting Project Manager
Maine Department of Environmental Protection
17 State House Station
Ray Building, Hospital Street
Augusta, ME 04333-0017
P: (207) 287-4850
F: (207) 287-7826
hank.aho@maine.gov

Contractors. The primary project contractors include the following:

Jim Atwell, Project Engineer & QA/AC Engineer

Sevee & Maher, Engineers Inc.
P.O. Box 85A
Cumberland Center, ME 04021
Tel: (207) 829-5016

Carol White, Project Hydrogeologist

C.A. White & Associates, Inc.
One Main Street
Yarmouth, ME 04096
Tel: (207) 846-5599

Stephen Salsbury, Project Surveyor

Herrick & Salsbury
P.O. Box 652
67 Franklin Street
Ellsworth, ME 04605
Tel: (207) 667-7370

Patrick Jordan, Materials Supplier, Manpower & Equipment Provider

R.F. Jordan, Inc.
134 Surry Road
Ellsworth, ME 04605
Tel: (207) 667-5236

Mike Gordon, Laboratory Services & Field Sampler

Northeast Laboratory Services
P.O. Box 788
Waterville, ME 04903-0788
Tel: (207) 314-1754

Arnold Fessenden, Project Geotechnical Tester

FGS/CMT, Inc.
136 Maine Street
P.O. Box 2097
Bangor, ME 04401
Tel: (207) 947-3184

Field Office. EBH has established project telephone and fax numbers at the Field Office. The project numbers are as follows:

- Phone (207) 374-2222
- Fax (207) 374-2219

Site & Adjacent Property Owners and Interested Persons. The names and location of known site and adjacent property owners as well as interested persons are shown in Table 2.

Site Access Control Measures

The Site encompasses approximately 80 acres and is largely comprised of pond areas and wetlands surrounded by wooded areas. Regular vehicular traffic access to the Site is provided by a gated, gravel access road off the Mines Road (Route 15/176). A secondary access point to portions of the Site is via a gated, narrow woods road off the Grindleville Road. Posted signs advise visitors to the Site to check in at the Construction Office.

EBH has installed additional access control measures including:

- a gate on the NDD berm;
- a gate on the camp road to the Douglas Loop Road neighborhood
- a gate near the Auxiliary Pond Outlet structure; and,
- a gate on the Access Road near Second Pond.

These gates have been installed to control recreational trespassers from interrupting construction activities as well as to protect remediation features (e.g., re-vegetation of the tailings bare spots) from ATV and other recreational vehicle traffic. Due to the expanse of the property, the prevalence of off-road vehicle access points, and continued observation of signs of recreational trespassers, EBH is very concerned about access control. . Appropriate signage has been posted on project gates to advise the public that this is an environmental remediation project in a sensitive area and that no ATV traffic is allowed. However, EBH has observed that some ATV traffic is ignoring the signs and gates. EBH will develop additional public outreach plans to communicate the need to protect the project remedial features and will work with the DEP to educate key stakeholders in the project vicinity.

Contingency and Notification Measures

Potentially dangerous materials expected to be used during the project include fuel oil (i.e., diesel), gasoline, and lubrication oils.

Fuel oil will be brought to the site in smaller (50-80 gallons), appropriately designed and installed tank in the back of a pickup truck. Fuel will be transferred from these tanks to the heavy equipment via a pump.

Gasoline will be used to fuel smaller equipment (such as chainsaws or pumps). Gasoline will be stored in appropriate hand held containers (1-5 gallons) which will be kept in a locked storage container.

Lubrication oil will generally be stored in limited quantities in pickup trucks or in the storage trailer. When equipment maintenance is required (e.g., oil changes and repairs), a properly trained technician will come to the site to provide service. The technician will remove and properly dispose of used oil in containers at offsite locations.

A spill kit and fire extinguisher will be kept near the work area. Site personnel will be trained in proper fueling operations and in minor spill cleanup.

In the event of a significant spill, site personnel will notify the DEP project manager, at the numbers indicated above.

Construction activities may generate fugitive dust. In order to reduce dust, EBH will utilize a water truck to wet traffic areas. EBH plans to use water from Second Pond to fill the water truck. In

order to verify the effectiveness of this control measure, EBH will perform dust monitoring, as discussed in the HASP.

Project Support

EBH has established a Construction Field Office at the Site to support the project. EBH executed a lease agreement to rent the Carter house on the access road from Route 15 (Mines Road) for the duration of the project. Support items (e.g., rubbish container, equipment storage trailer, etc.) have been located near the office.

Personnel and equipment decontamination issues are addressed in the Health and Safety Plan section of Project Operations Plan.

Temporary stockpile areas for major project borrow materials (e.g. stone, soil) and other materials have been established and are identified on **Figure 1**. Erosion control and stormwater best management practices have been implemented around these stockpile areas.

Table 1
Construction Sequence
Former Kerramerican Mine Site
(Fall 2006)

No.	Work Item Description	RAP Element	Scheduled Start Date (see Note 1)	Comments
1	Submit Phase II POP to MEDEP	regulatory	5/18	
2	Submit Updated Plant Site Grading	regulatory	5/18	
3	MEDEP review of Phase II POP and Plant Site Grading	regulatory	5/21-6/15	
4	Conduct public meeting	community	5/30	
5	Project team preconstruction meeting	regulatory	6/18	
6	Mobilize heavy equipment/manpower	100	6/18	
7	Address Plant Site wells	700	6/18	
8	Begin construction surface water monitoring	700	6/18	
9	Install soil erosion control measures	700	6/18-6/22	
10	General Plant Site grading/install trees	700	6/19	
11	Placing Cushion fill layers	700	7/2	
12	Geosynthetics preconstruction meeting	700	7/16	
13	Placing GCL/Geonet	700	7/23	
14	Placing protective layer/piping	700	7/23	
15	Placing borrow/topsoil	700	8/13	
16	Installing seed/erosion mats	700	8/20	
17	Continue capping in phases--expected completion	700	10/1	

Notes: 1. Dates are approximate, depending on regulatory workload, weather, and actual progress.
2. Plant Site capping will be performed in phases to accommodate geosynthetic covering/protection.

Table 2
Property Owners Interested Persons

Full Name	Address	Town	State	Zip
Kermit Allen	P.O. Box 232	Blue Hill	ME	04614
Wayne Allen	N. Sedgwick Rd	Sedgwick	ME	04676
Mary Ann Anderson	274 Mines Rd.	Blue Hill	ME	4614
Susan Tesoriero Astbury	P.O. Box 5674	Ellsworth	ME	04605
Blue Hill Board of Selectmen	P.O. Box 412	Blue Hill	ME	04614
Kenneth and Kathleen Burgess	P.O. Box 1243	Blue Hill	ME	04614
Carl & Joyce Carter	228 Mines Road	Blue Hill	ME	04614
Dean Carter	P.O. Box 93	BLUE HILL	ME	04614
Gordon & Marian Carter	208 Mines Rd.	Blue Hill	ME	04614
Jody Carter & Scott Mabus	P.O. Box 32	Blue Hill	ME	04614
Robert & Deborah Carter	P.O. Box 705	Blue Hill	ME	04614
Troy & Brooke Clapp	320 Mines Road	Blue Hill	ME	04614
Joan Dillard	P.O. Box 496	Harvard	ME	01451
Hugh & Ann Durgin	P.O. Box 817	Blue Hill	ME	04614
Don & Meredith Eley	P.O. Box 921	Blue Hill	ME	04614
Duane Gray	P.O. Box 716	Blue Hill	ME	04614
David Gulya	60 Pattison St.	Abington	ME	02351
John & Linda Harty	30 Hyde Park	N. Franklin	ME	06254
Judy Jenkins, CEO of Blue Hill	P.O. Box 412	Blue Hill	ME	04614
Ann & David McGraw	P.O. Box 571	Blue Hill	ME	04614
Charlene & William Pelletier	P.O. Box 892	Blue Hill	ME	04614
Donald Paine	P.O. Box 356	Blue Hill	ME	04614
Kevin Piper	P.O. Box 266	Blue Hill	ME	04614
Luther & Rosemary Piper	P.O. Box 332	Blue Hill	ME	04614
Jim Schatz	P.O. Box 437	Blue Hill	ME	04614
Bob & Corrine Suscy	P.O. BOX 446	Blue Hill	ME	04614
Barry & Anna Snow	P.O. Box 659	Blue Hill	ME	04614
Shana Stegall	P.O. Box 162	Blue Hill	ME	04614
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**Sampling & Analysis
Plan**

INTERIM SAMPLING AND ANALYSIS PLAN

For

**PHASE II CONSTRUCTION ACTIVITIES AND
SITE REMEDIATION AND RESTORATION**

At the

**FORMER MINE SITE
BLUE HILL, MAINE**

Prepared for:

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1.0 INTRODUCTION

The former mine site is located on the shores of Second Pond in the Town of Blue Hill, Maine. The former mine was the last operating mine in the area known as the Blue Hill Mining District which has had active mining intermittently over the past 120 years. Kerramerican, Dennison and Blackhawk Corporation, in a joint venture, operated the mine as a subsurface zinc-copper mine from around 1972 through 1977. Groundwater and surface water monitoring has been conducted at various times during its operation and since the mine closure in the late 1970s. Since 2000, fairly continuous surface water and groundwater monitoring has been conducted in order to further characterize the site and to evaluate the impact of remedial construction activities at the site.

This Interim Sampling and Analysis Plan (SAP) describes the elements of the surface and groundwater monitoring program developed for 2007 Phase II field activities related to the remediation and restoration of the former mine site. Activities planned during this period include the construction of the Plant Site Cap and a geochemical groundwater study in the vicinity of the Saddle Dam. This revised sampling and analysis plan replaces the construction-phase surface water monitoring program included in the Project Operations Plan (the POP)¹, and Appendix H of the Remedial Action Plan (the RAP)², as well as the earlier surface and groundwater monitoring program approved by DEP in 2003³.

Phase I of the mine site remediation work began in September 2006 and was completed in December 2006. Phase I remedial construction activities consisted on the construction of the Northern Diversion Ditch (NDD); re-vegetation of the tailings; excavation of the access road; stockpiling of former road bed material on-site and reconstruction of the road using offsite borrow. Phase II activities are scheduled for 2007, and are expected to be completed by year-end 2007.

¹ Project Operations Plan; EMSOURCE Blue Hill LLC, Portland, Maine; August 2006, revised December 2006.

² Remedial Action Plan for the Former Kerramerican Mine; Blue Hill, Maine; MACTEC Engineering and Consulting, Inc.; Portland, Maine; July 2006.

³ Letter to Rick Schwenger from John B. Rand; June 25, 2003; Revised Surface and Groundwater Monitoring Plan; JBR Consulting Hydrogeologist.

1.1. INTERIM MONITORING PROGRAM OBJECTIVES

The Interim Monitoring Program has been developed to specifically address the site monitoring needs for the Phase II construction activities and to provide a better understanding of the groundwater geochemistry in the vicinity of the Saddle Dam. The results of the Phase I monitoring indicate that there was no significant impact of the 2006 construction activities on the surface or groundwater quality. Once Phase II construction activities are completed, the Interim Monitoring Program will be modified, as appropriate

1.2. SITE LOCATION

The former mine site is located in Hancock County, approximately two miles west of Blue Hill, Maine, east of Second Pond (also known as Douglas Pond). The site consists of a recently demolished ore concentrating facility (known as the Plant Site), a former Tailings Impoundment and Auxiliary Pond. The Plant Site covers about 13 acres and sits on the eastern shore of Second Pond. The Auxiliary Pond is located north of the former Plant Site and is physically separated from the shore of Second Pond by the mine site's access road. The Tailings Impoundment is due east of the Auxiliary Pond, with an earthen dam separating the two features. A second dam, known as the Saddle Dam, is located south of the Tailings Impoundment. Both the Tailings Impoundment and Auxiliary Pond were dewatered, covered with soil and re-vegetated when the facility was closed in the late 1970's. Figure 1-1 is a site location map.

1.3. PREVIOUS INVESTIGATIONS

Extensive monitoring was conducted before, during and after mining operations ended. These data were summarized by the Mine Drainage Assessment Group as part of a 2001 report included as Appendix E of the 2006 RAP.⁴ Surface water and groundwater investigations were conducted in 2000, 2001 and 2002 to support the development of a Remedial Investigation Report prepared by AMEC in November 2002.⁵ Follow-up monitoring also was conducted at selected surface and groundwater locations during 2002 and early 2003 as part of an ongoing data gathering effort

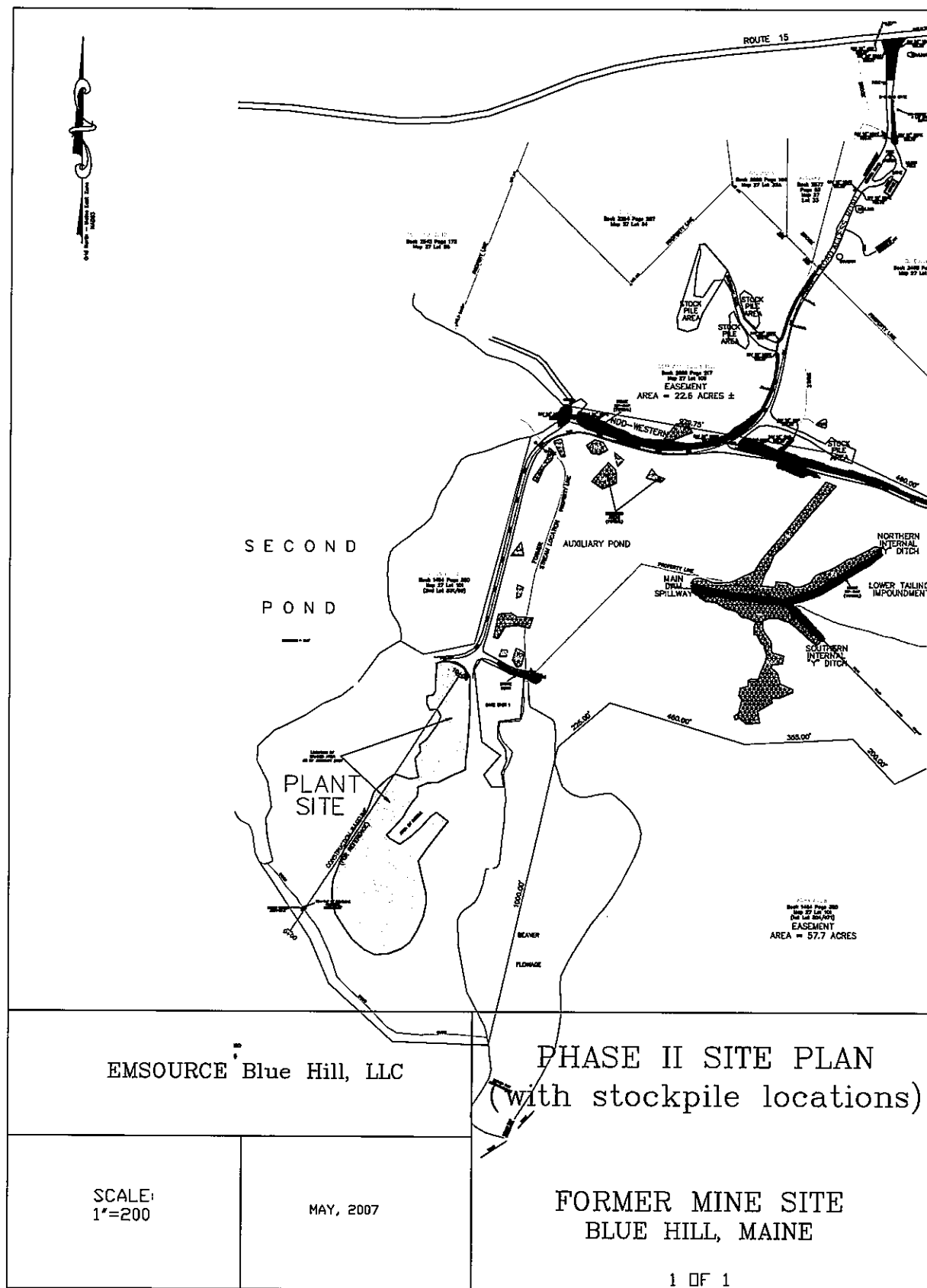
⁴ Environmental Geochemistry Report; Blue Hill Mine Site; Minesite Drainage Assessment Group; March 7, 2001.

⁵ Remedial Investigation Report; Former Kerramerican Mine; AMEC Earth & Environmental Limited; November 2002.

before implementation of the RAP, which at the time was under development, with actual remediation of the site planned for 2003 and 2004.

1.4. RESPONSIBLE AGENCY

The Maine DEP is the responsible agency for oversight of this Interim Monitoring Program.



2.0 OBJECTIVES OF THE INTERIM MONITORING PROGRAM

The purpose of the interim monitoring program is to:

- (1) To monitor surface water quality during the Phase II construction activities. In particular the monitoring will assess the soil erosion control procedures in place, waste rock handling and re-grading; general construction activities and their effect on the surface water quality.
- (2) To conduct a detailed geochemical sampling program to obtain a better understanding of groundwater chemistry in the vicinity of Saddle dam area. The purpose of this program is to provide a more comprehensive understanding of the groundwater chemistry and its relationship to the site activities and regional hydrogeology. These data will be used to further assess the effectiveness of the proposed remedy, a low permeability cap on a portion of the tailings adjacent to the Saddle Dam, on the groundwater quality.

It is anticipated that following completion of the Phase II construction; the interim monitoring program will be reviewed and recommended changes will be submitted to the Maine DEP for their review and approval.

3.0 MONITORING LOCATIONS AND FREQUENCY

Surface water and groundwater monitoring locations and frequencies are discussed in this section. The sampling locations are shown on Figure 3-1.

3.1. SURFACE WATER MONITORING PROGRAM

The following six surface water sampling locations will be included in the Phase II interim monitoring program:

Table 3-1 – Surface Water Monitoring Locations

Location	Description	Rationale
SW-6	Eastern outlet of NDD	Upstream sample location to monitor Zn concentrations in surface water entering NDD
SW-7	Beaver Pond Discharge to Carleton stream	Monitor combined flows from plant site and Beaver Pond
SW-8	Carleton Stream discharge to Beaver Pond (the Fork)	Monitor surface water quality downstream on plant site during Phase II construction
SW-21	Red Pond	Monitor variability of Zn concentrations in Red Pond
SW-22	Carleton Stream at Grindleville Rd crossing	Monitor surface water quality at site compliance boundary
SW-27	East shore of Second Pond	Monitor surface water quality northwest of the Plant site

3.2. GROUNDWATER GEOCHEMISTRY PROGRAM

A total twenty monitoring wells in eleven separate locations are included in the groundwater geochemistry sampling program as part of the Phase II interim monitoring program. Table 3-2 summarizes the locations and the rationale for including the specific locations in this sampling program. The location of the monitoring wells us shown on Figure 3-1.

Table 3-2 – Groundwater Sampling Locations

PZ-2D, PZ-2S	Tailings Pond; up gradient of Saddle Dam	Characterize water quality in tailings and deeper portions of the aquifer
PZ-3D	Just south of the Saddle Dam; screened in overburden	Water quality down gradient of the Saddle Dam
PZ-5D	Tailing Dam area	Characterize water quality in vicinity of main Tailings Dam
PZ-6	Well installed in former mine shaft at Plant site	Mine shaft water quality
PZ-01-01S; PZ-01-01D	South side of the plant site	Water quality in vicinity of plant site
PZ-01-02S; PZ-01-02D	West side of plant site	Water quality in vicinity of plant site
PZ-01-03S; PZ-01-03D	Site of former concentrate pad at plant site	Water quality in vicinity of former pad at plant site
PZ-01-04S; PZ-01-04D	Near shaft of Former Mammoth Mine	Water quality of in vicinity of other mine workings in area
PZ-01-05S; PZ-01-05D	Located southwest of Red Pond	Water quality in bedrock south of Red Pond and Saddle Dam
PZ-02-01S PZ-02-01M PZ-02-01D	Adjacent to Red Pond	Water quality in shallow and deeper bedrock in vicinity of Red Pond
PZ-02-02S PZ-02-02D	Adjacent to Red Pond	Water quality in bedrock vicinity of Red Pond

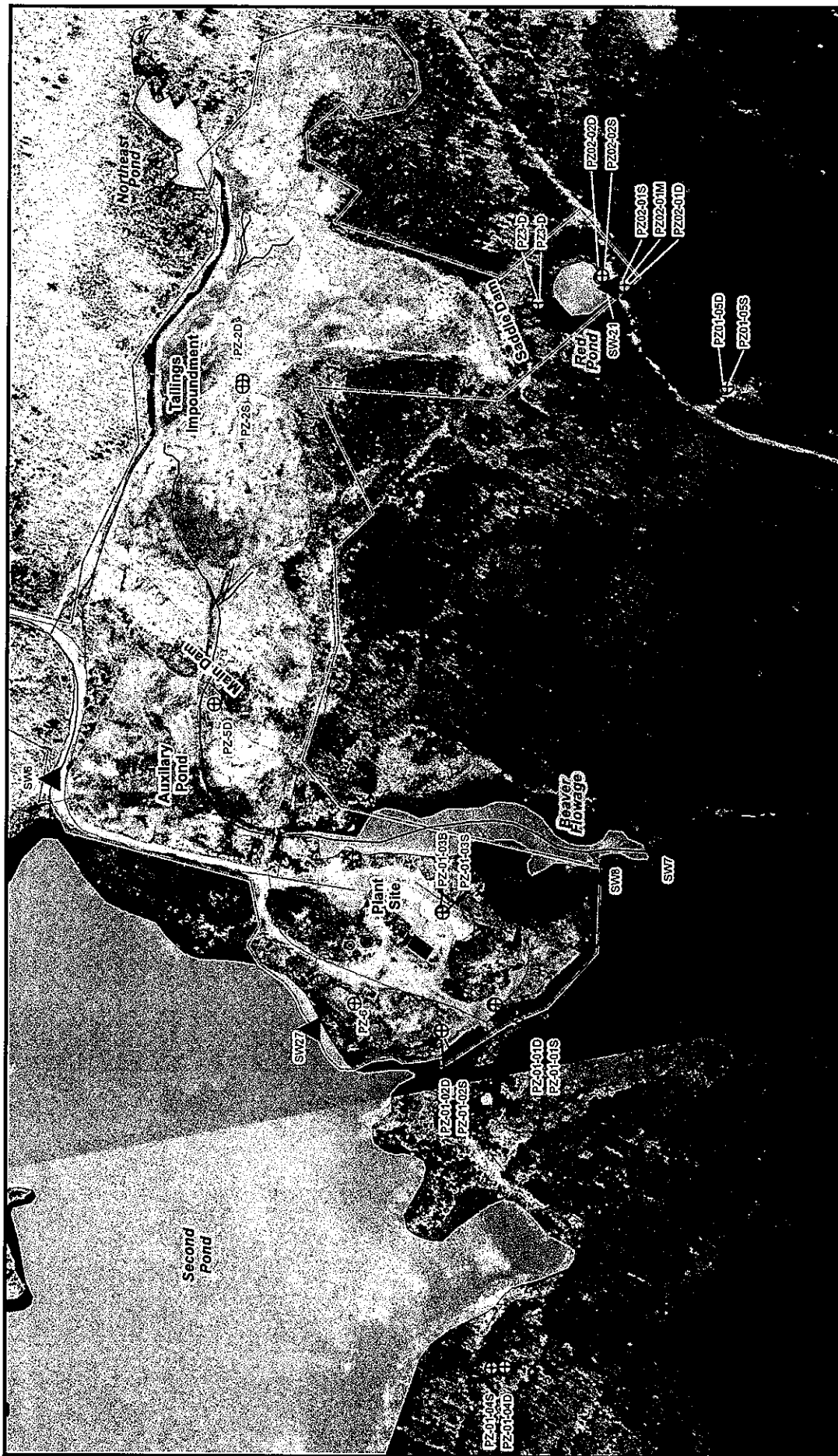
3.3. SAMPLING FREQUENCY

3.3.1. SURFACE WATER SAMPLING FREQUENCY

Surface water sampling will be conducted twice each month at each of the six surface water locations (field and laboratory measurements for key indicators) during Phase II construction activities. During the fall 2006 construction phase of the project, the surface water sampling program also consisted of sampling after precipitation events. It rained so often that precipitation event samples were collected with great frequency. The goals of the 2006 sampling program were to evaluate the effectiveness of soil erosion control practices and assess Best Management Practices (BMPs) for construction related activities. The results of the Phase I sampling program did not indicate any surface water quality concerns as the resulting from erosion soil and site related activities. Consequently, due the effectiveness of Phase I construction practices, we propose to use similar construction management practices during Phase II of the project and eliminate the storm event sampling.

3.3.2. GROUNDWATER SAMPLING FREQUENCY

In the past several years groundwater monitoring has typically been completed for a limited number of water quality parameters at a frequency of about two times per year; once in the spring and once in the fall. In this interim monitoring program we propose to conduct one comprehensive groundwater sampling event in May 2007. Following completion of that program, and prior to construction of the plant site cap, we propose to abandon the monitoring wells at the plant site in order to ensure the long-term integrity of the cap. These wells that will be abandoned include: PZ-01-01S, PZ-01-01D; PZ-01-02S, PZ-01-02D, PZ-01-03S; PZ-01-03D and PZ-6. The results of the geochemical sampling program will be summarized in a separate report and submitted to Maine DEP. Based a review of the data and discussions with the Department this report will include recommendations a revised groundwater monitoring to be implemented in the fall of 2007.



**Figure 3-1: Interim Monitoring Program
Former Kerramercan Mine Site
Blue Hill, Maine**

Data Sources:
Maine Office of GIS
Maine DEP
MACTEC - GW Wells
SEEP - SW Samples
Carol White

Maps Prepared by:
Spatial Alternatives
www.spatialalternatives.com
Map Produced: March, 2007

4.0 SELECTION OF MONITORING PARAMETERS

The selection of monitoring parameters is based on a review of the site's historical water quality; the results of the Phase I monitoring conducted in 2006; and the objectives of the geochemical characterization.

Water quality parameters, analytical method references, and practical quantitation limits are presented in Tables 4-1 and 4-2, and The analytical laboratory will utilize the practices and procedures described in *Test Methods for Evaluating Solid Waste* (OSWER, SW-846, Third Edition, as revised); *Methods for Chemical Analysis of Water and Wastes* (EMSL, U.S.EPA 600/4-79/020, revised March 1983); and *Standard Methods for the Examination of Water and Wastewater* (19th Edition, 1995). Samples will be analyzed at a Maine laboratory certified for these analyses.

4.1. SURFACE WATER

Twice each month during Phase II construction activities, field measurements will be made for:

- (1) Turbidity; specific conductance , pH, temperature, and
- (2) Zinc

A Hach™ Portable Colorimeter (Cat no. DR/850) will be used for turbidity and total zinc and handheld meters will be used to measure pH ad temperature. At the same time, samples will be collected for laboratory analysis of zinc, cadmium, copper and sulfate. A summary of the analytical parameters is presented on Table 4-1

Table 4-1 Interim Surface Water Monitoring Program

Water Quality Parameter	Method	PQL ² (mg/l) ¹
Cadmium (Cd)	SW-846/7131A/3020A	0.0006
Chromium (Cr)	SW-846/7191/3020A	0.005
Copper (Cu)	SW-846/7210/3010A	0.05
Zinc (Zn)	SW-846/7950/3010A	0.05
Sulfate (SO ₄)	SW-846/9056	0.8
Field Parameters		
Specific Conductance	Field Measurement	NA
pH	Field Measurement	NA
Temperature	Field Measurement	NA
Turbidity	Field Measurement	NA
Notes: 1. Concentrations are in mg/L unless specified otherwise. 2. Practical Quantitation Limits (PQLs) have been defined by U.S.EPA as up to 10 times the method or instrument detection limit and therefore may vary between laboratories. The PQL presented represents 5 times the published method detection limit, or a value that has been demonstrated in this matrix. . 3. NA = Not Applicable. Method Reference: The analytical methods selected are presented in <u>Test Methods for Evaluating Solid Waste</u> , OSWER, SW-846, Third Edition, as revised; <u>Methods for Chemical Analysis of Water and Wastes</u> , EMSL, EPA-600/4-79-020, revised March 1983; and <u>Standard Methods for the Examination of Water and Wastewater</u> , APHA, 19th Edition, 1995. Equivalent and appropriate analytical methods may be substituted with Emsource Blue Hill, LLC approval, e.g. manual for automated and vice versa.		

4.2. GROUNDWATER

As shown on Table 4-2, an extensive list of field and laboratory measurements is included in the geochemical sampling program. Field Measurements include pH, Eh, Dissolved Oxygen, Turbidity, Temperature and Specific Conductance. Laboratory analysis of groundwater samples includes: Acidity, Alkalinity, Bicarbonate pH, Sulfide, Sulfate, Total Dissolved Solids (TDS), sodium, potassium ,calcium, magnesium, manganese, iron, lead, chloride, fluoride, nitrate, aluminum, arsenic, barium, boron, cadmium, chromium, copper, mercury, molybdenum, nickel, silver and zinc.

TABLE 4-2

INTERIM GROUND WATER MONITORING PARAMETERS

Water Quality Parameter	Method	PQL ² (mg/l) ¹
Aluminum (Al)	SW-846/7020/3010A	0.6
Arsenic (As)	SW-846/7060A	0.004
Boron (Bo)	SW-846/7131A/3020A	0.01
Cadmium (Cd)	SW-846/7131A/3020A	0.0006
Calcium (Ca)	SW-846/7140/3010A	15
Chromium (Cr)	SW-846/7191/3020A	0.005
Copper (Cu)	SW-846/7210/3010A	0.05
Iron (Fe)	SW-846/7380/3010A	0.06
Lead (Pb)	SW-846/7421/3020A	0.006
Magnesium (Mg)	SW-846/7450/3010A	3
Manganese (Mn)	SW-846/7460/3010A	0.05
Mercury (Hg)	SW-846/7470A	0.0005
Molybdenum (Mo)	SW-846/7521/3020A	0.003
Nickel (Ni)	SW-846/7521/3020A	0.005
Potassium (K)	SW-846/7610/3010A	0.3
Silver (Ag)	SW-846/7761	0.0010
Sodium (Na)	SW-846/7770/3010A	3
Zinc (Zn)	SW-846/7950/3010A	0.05
Total Dissolved Solids (TDS)	U.S.EPA 160.1	10
Chloride (Cl ⁻)	SW-846/9056	1.2
Sulfate (SO ₄)	SW-846/9056	0.8
Bicarbonate (HCO ₃)	STM 2320B	1.5
Total Phosphorous (TPO ₄)	U.S.EPA 365.3	0.04
Nitrate-Nitrogen (NO ₃ -N)	SW-846/9056	0.6
Acidity	SW-846/9056	NA
Field Parameters		
Groundwater Elevation	Field Measurement	NA
Specific Conductance	Field Measurement	NA
Dissolved Oxygen	Field Measurement	NA
pH	Field Measurement	NA
Redox Potential (E _H)	Field Measurement	NA
Temperature	Field Measurement	NA
Turbidity	Field Measurement	NA
Total Alkalinity	Field Measurement	5.0

Notes:

1. Concentrations are in mg/L unless specified otherwise.
2. Practical Quantitation Limits (PQLs) have been defined by U.S.EPA as up to 10 times the method or instrument detection limit and therefore may vary between laboratories. The PQL presented represents 5 times the published method detection limit, or a value that has been demonstrated in this matrix.
3. NA = Not Applicable.

Method Reference: The analytical methods selected are presented in Test Methods for Evaluating Solid Waste, OSWER, SW-846, Third Edition, as revised; Methods for Chemical Analysis of Water and Wastes, EMSL, EPA-600/4-79-020, revised March 1983; and Standard Methods for the Examination of Water and Wastewater, APHA, 19th Edition, 1995. Equivalent and appropriate analytical methods may be substituted with EMSOURCE Blue Hill approval, e.g. manual for automated and vice versa.

5.0 SAMPLING PROCEDURES

This section describes the protocols involved in sampling surface water and groundwater during the interim monitoring program. Sample container volumes and

5.1. SURFACE WATER SAMPLING PROCEDURE

Surface water will be collected in the following manner:

- (1) Collect the sample by immersing the sample bottle not more than 1 foot below the water surface. If a stream is being sampled, the sample will be upstream of the sampler with the opening of the sampling device oriented upstream, but avoiding floating debris.
- (2) Directly fill the appropriate sample containers from the sampling device if needed.
- (3) If possible, measure the following parameters in the water body, not the sample:
 - Temperature
 - pH
 - Specific conductance
 - Turbidity

If direct measurement is not possible, these parameters will be measured from water remaining in the sampling device or another sample bottle. This information will be recorded in the sample data record, sample labels will be completed, and the chain-of-custody (COC) procedures will be initiated.

- (4) Complete the Surface Water Sample Record

5.2. GROUNDWATER SAMPLING

Appropriately prepared sample containers will be procured prior to each sampling episode. Participating laboratories will provide these bottles upon request to the sampling personnel.

Upon arrival at each sampling location, the sampling personnel will observe the physical condition of the monitoring wells. The inspection will include checking the condition of the ground surface seal and the well guard pipe to ascertain any evidence of frost-heaving, cracks, or vandalism. The condition of the monitoring well will be recorded on the field data records. Periodically, the area around the well may have to be cleared of weeds or other materials prior to beginning this sampling activity.

Following inspection of the sampling location, the water level in the well casing will be measured by lowering a clean electronic sounding probe into the well until contact is made with the water surface. The distance from the reference elevation to the water contact will be entered in the field records. Water levels in the monitoring wells will be determined to the nearest 0.01 foot. In all cases, the depth to water will be referenced to the top of the polyvinyl chloride (PVC) well casing (i.e. permanently marked measurement reference point). In cases where water is flowing from the well casing, the water level will be noted as such. Upon removal of the water level probe, it will be decontaminated as described in Subsection 6.1.

5.2.1. LOW-FLOW SAMPLING PROCEDURE

The low-flow sampling procedure, which uses flow rates of 100 to 200 milliliters per minute (mL/min), will be used to collect the water quality samples from monitoring wells at the site. The objective of the sampling is to minimize the drawdown and disturbance in the well in order to obtain a sample that is representative of the in situ water chemistry. Sampling equipment for current monitoring locations will consist of a peristaltic pump with dedicated tubing in 20 monitoring wells and dedicated bladder pumps in six monitoring wells. Equipment used to measure field parameters must be calibrated on a daily basis.

Dedicated sampling tubing or pumps will be placed in the well a minimum of 24 hours before sampling. The bottom of the tubing or pump inlet will be positioned at the middle of the screened interval, or in the middle of the water column if the water table is in the well screen.

Tubing, pumps, or measuring devices will not be placed into the water column within 24 hours of sampling or during sampling of the well.

Procedure for Wells Where Drawdown Stabilizes:

- (1) Low flow rates will be used for purging.
- (2) Water level measurements must be recorded at approximately five-minute intervals until drawdown stabilization has been achieved. The static water level and the pumping start time must be recorded as the first reading on the second page of the Monitoring Well Sample Purging Form. All subsequent field measurements will also be recorded on the Monitoring Well Sample Purging Form.
- (3) Until drawdown stabilizes, field parameters (i.e. pH, specific conductance, and turbidity) must be monitored and recorded at approximately 10-minute intervals.
- (4) Once drawdown stabilization is achieved and two successive 10-minute interval field parameter measurements meet the conditions listed below, complete stabilization will be verified by three successive field parameter measurements at 3-minute intervals, which also meet the conditions listed below:

pH:	± 0.1 standard pH units with respect to previous pH measurement
Specific conductance:	$\pm 5\%$ of previous measurement
Turbidity:	$\pm 10\%$ of previous measurement when turbidity is above 10 nephelometer turbidity units (NTU) ± 1 NTU with respect to previous measurement when turbidity is below 10 NTU
Dissolved oxygen:	± 1 mg/L when D.O. is greater than 1 mg/L ± 0.1 mg/L when D.O. is less than 1 mg/L

Note: It is possible for the field parameters to stabilize prior to or at the same time as the drawdown.

- (5) Once complete stabilization has been achieved and a complete set of field readings has been measured (i.e., temperature, pH, specific conductance, turbidity, E_H , and DO), the samples will be collected in appropriately preserved containers. The sampling personnel

will complete and attach labels to each sample container for the location of interest. Table 5-1 presents the minimum information to be supplied on each container. Samples will be obtained directly from the pump discharge line. Following completion of sampling, the monitoring well will be secured with protective devices and the field instrumentation will be decontaminated as described in Subsection 6.1.

TABLE 5-1
SAMPLE LABEL INFORMATION

Site Name
Sample Location
Sampler Name/Company
Sample Collection Date
Sample Collection Time
Analyses to be Performed
Preservative Used

Procedure for Wells Where Drawdown Does Not Stabilize

- (1) Purge one tubing volume at the low flow rate.
- (2) Collect samples in appropriately preserved and labeled containers as previously described.
- (3) Measure field parameters (i.e. temperature, pH, specific conductance, turbidity, Eh, and DO) as soon as possible after sample collection.
- (4) Following completion of sampling, secure the monitoring well with protective devices and decontaminate the field instrumentation as described in Subsection 6.1.

5.3. SAMPLE VOLUME, PRESERVATION, AND HOLDING TIMES

Obtaining required sample volumes and observation of procedures for sample preservation and allowable holding times are necessary to yield test results that will be representative of site conditions. Table 5-2 summarizes the volume, preservation, and holding time requirements for the samples to be collected.

TABLE 5-2
SAMPLE HANDLING, PRESERVATION, AND HOLDING TIME

Parameter Group ¹	Container	Preservation	Holding Time (days)
Sulfate, fluoride, nitrate, chloride	60 ml (P)	4°C	2
Alkalinity, pH, bicarbonate, TDS	1 liter (P)	4°C	7
Metals	500 ml (P)	HNO ₃ to pH <2	180
Boron	50 ml (P)	HNO ₃ to pH <2	180
Acidity	250 ml	4°C	14
Sulfide	250 ml	Zn acetate + NaOH	7
Notes: 1. Parameter group combinations and sample volume requirements may vary between laboratories. 2. Holding times are calculated from the time of sample collection. The most restrictive holding time is presented for each parameter group. 3. G = Glass P = Plastic			

5.3.1. SAMPLE VOLUME

A minimum sample volume must be obtained from each monitoring location to allow the laboratory to perform the required testing. Table 5-2 specifies the minimum sample volume needed for each parameter.

5.3.2. SAMPLE PRESERVATION

Preservation of collected samples is accomplished by refrigerating samples at 4 degrees Celsius (°C) and, in some cases, by acidification. (Aqueous samples scheduled for metals analyses need not be refrigerated.)

Table 5-2 specifies the preservation requirements for each sample. In performing acidification, disposable pipettes will be used to introduce the preservative into the sample container. After adding the appropriate amount of preservative to the sample container, the container will be capped and gently inverted several times to mix the preservative and the sample. Samples will be spot-checked with a pH meter or pH paper to confirm that the preservation procedure is adequate. In no case will the pH meter be introduced into the sample bottle. A portion of the bottle contents will be poured into a separate clean container and the pH will be verified.

Physical preservation of the samples will be accomplished by storing the filled sample bottles in covered insulated coolers constructed of impact resistant plastic. Efforts will be made to pack the coolers so that sample bottles are not subject to movement or breakage (see Subsection 7.2).

5.3.3. HOLDING TIMES

Analytical testing of samples must be completed within specified holding times to yield representative results. Table 5-3 specifies the maximum allowable holding time for each sample type. In preparing for each sampling episode, the sampling personnel will prepare schedules that will permit adequate laboratory notification and sample delivery to allow testing within the allowable holding times.

5.4. SAMPLING QUALITY CONTROL

Sampling quality control (QC) will include the proper decontamination of sampling equipment prior to use; regular calibration of field equipment to measure temperature, pH, E_H, DO, turbidity, and specific conductance; collection of duplicate samples for laboratory testing;

5.4.1. EQUIPMENT BLANKS

Dedicated tubing will be used in all of monitoring well locations thereby eliminating the need for equipment blanks.

5.4.2. DUPLICATE SAMPLES

Duplicate samples will be collected at a rate of 10 percent during each sampling event. The duplicate sample identification will be such that the sampling location is unknown to the laboratory. The duplicate will be analyzed for the same parameters as its companion sample.

6.0 DECONTAMINATION OF EQUIPMENT

Decontamination of sampling equipment is required both before initiation of sampling and between each sample location to minimize the potential for cross-contamination of samples with the analytes of interest. When conducting decontamination activities, as well as when handling cleaned equipment prior to and during sampling, clean nitrile or PVC gloves will be worn to further reduce potential for contamination.

6.1. FIELD INSTRUMENTATION

Field instrumentation (i.e., pH, specific conductance, E_H , DO, turbidity, and temperature probes) under no circumstances, will be introduced into a sampling device or sample bottle. However, to minimize latent influences between sampling locations, the probes and flow-through cell will be rinsed with clean water and, when appropriate, wiped dry with clean paper towels. The electronic water level probe will be introduced into monitoring wells prior to the purging process. Upon extraction from each well, the probe and associated electronic leads will be washed with consecutive rinses of clean water.

6.2. SAMPLING EQUIPMENT

A peristaltic pump with dedicated tubing will be used at locations thereby eliminating the need for sampling equipment decontamination.

7.0 SAMPLE CUSTODY

Sample COC procedures will be followed during sample collection and handling activities in both the field and laboratory operations. These procedures ensure that each sample is accounted for at all times. To maintain the highest degree of control in sample handling, preprinted labels will be used so that all necessary information is retained with the sample. COC records will be used to maintain control over sample access during and after shipment from the location of sample collection. Additionally, proper completion of field sample logs, accession books,

tracking sheets, and extraction logs by appropriate field and laboratory personnel will provide for thorough monitoring of the samples from collection through analysis and final report generation.

The objective of sample identification, COC, and monitoring procedures is to ensure that:

- All samples collected for analysis are uniquely labeled for identification purposes throughout the analytical process.
- Samples are correctly analyzed and results are traceable to field records.
- Important sample characteristics are preserved.
- Samples are protected from loss, damage, or tampering.
- Any alteration of samples (e.g. preservation or damage due to shipment or other processes) is documented.
- A record of sample integrity and analytical fate is established.

7.1. SAMPLE MONITORING FORMS

The use of forms accomplishes one or more of the specific objectives of sample custody, identification, or control. Standard forms will be utilized as discussed in the following subsections. These include the COC Record, Monitoring Well Sample Purging Form, Surface Water Sample Data Record, and the Instrument Calibration Form.

7.1.1. CHAIN-OF-CUSTODY RECORD

The COC Record is completed in the field by the person physically in charge of sample collection. The COC Record must be completed prior to shipment of samples to the laboratory. The COC Record contains information on the date and time of sample collection, the sampler, the project name and number, the laboratory project number, the number of containers of each

sample being shipped, and an itemization of the analyses requested for each sample, together with any remarks about the sample prior to shipment. The COC Record is enclosed with the samples after it has been signed by the sampler. It is then signed each time possession of the samples changes, with the signatures of the people relinquishing and receiving the sample, as well as the time of exchange, indicated on the form.

7.1.2. MONITORING WELL AND SURFACE WATER

The Monitoring Well Sample Purging Form and Surface Sample Data Record will be completed in the field by the person placed in charge of sample collection monitoring. These forms correlate the assigned sample bottle designation to a specific well or sample location or other distinguishing feature or attribute (e.g. duplicate sample). The forms also list pertinent sampling information that must be recorded at the time of sample collection (e.g. day and time of sampling, and pH, specific conductance, temperature, E_H , DO, turbidity measurements and other field observations.

7.1.3. INSTRUMENT CALIBRATION FORM

Field instrument calibration procedures will be recorded on the Instrument Calibration Form.

7.2. PACKING AND SHIPPING

In addition to sample collection and preservation requirements, especially the maintenance of sample temperatures at 4°C until extraction or analysis, samples will be packed and shipped so as to maintain the sample container integrity and the health and safety of sample transporters.

Sample containers are generally packed in picnic coolers for shipment. Bottles will be packed tightly so that no motion is possible. Styrofoam, vermiculite, and "bubble-pack" are suitable in most cases. (High-hazard samples require different packing.) Ice is placed in double Ziploc® bags and added to the cooler, along with all paperwork in a separate Ziploc® bag. The cooler top is then taped shut. Custody seals and taping of coolers may be required for certain samples.

Typically, samples will be hand-delivered to the laboratory. However, in the event that shipping is necessary, the standard procedures for shipping environmental samples to the analytical laboratory are as follows:

- (1) All shipping of environmental samples must be done via Federal Express or an equivalent overnight delivery service.
- (2) If prompt shipping and laboratory receipt of the samples cannot be guaranteed (i.e., Sunday arrival); the samplers will be responsible for proper storage of the samples until suitable transportation arrangements can be made.

The laboratory will be kept informed of all field sampling activities. This communication is critical to allow the laboratory enough time to prepare for arrival of the samples. The samples are shipped to the laboratory together with the COC documents.

8.0 QUALITY ASSURANCE/QUALITY CONTROL

Quality Assurance Quality Control (QA)/QC) is an integral part of this sampling and analytical program to allow assessment of the adequacy of analytical results for their intended use. QA/QC activities associated with sampling include the use of standardized collection procedures and sample data records (as described previously), calibration of field instruments, and COC procedures. Analytical QA/QC involves the use of approved analytical protocols by qualified laboratories. Analytical data quality is assessed through review of method-specified QC data, to be delivered along with the analytical results.

8.1. DATA VALIDATION

The following data validation methods will be used to verify the accuracy and precision of the reported results:

- Chain of Custody for each sample is continuous and included with report.
- Verification that all sample holding times were met.
- TDS/specific conductance calculated. Samples outside range (0.55 – 0.75) identified.
- Calculation and tabulation of relative percent differences. Values >10 percent reported.
- Identification of values falling outside of historical (>5 sample rounds) range.
- Identification of wells whose depths have changed since construction.

8.2. STATISTICAL ANALYSES

Where data are sufficient, statistical analysis of the sample data from each monitoring well will be completed and reported in the Annual Report. The statistical analysis will likely include box and whisker plots which will be used to identify trends in the data. The box and whisker plots will graphically illustrate the annual ranges and medians for each parameter's analytical result. Calculation of the median values will exclude outliers (which are defined as data points that fall

at least three standard deviations from the rest of the data for the year). A trend line for parameters will be developed from the median values using a fast Fourier transform. Parameters will be plotted which are indicative of the leachate quality or the geochemical effects of the leachate in the natural soils or bedrock.

9.0 REPORTING REQUIREMENTS

Monitoring data will be submitted to Maine DEP within 30 days of EMSOURCE Blue Hill's receipt of the evaluation of laboratory results. A separate report summarizing the results of the geochemical characterization will be submitted to Maine DEP upon completion of the program and analysis of the data. A report summarizing the results of the interim monitoring program, historical data summaries, including analytical and field data in an electronic format, statistical analysis, and recommendations for any proposed changes will be submitted to Maine DEP following completion of the Phase II construction activities. Analytical data will be provided to Maine DEP in EDD format, and included in an annual summary report prepared by a certified Maine geologist.

10.0 WELL ABANDONMENT PROCEDURE

As described previously, seven existing monitoring wells at the plant site will be abandoned prior to the installation of the permanent cap. These wells will be sealed in a manner appropriate to geologic conditions at each location, as follows:

- (1) Seal the borehole by pressure injection from bottom to top with cement bentonite or other appropriate material to within five feet of the ground surface. The upper five feet may be backfilled with native material and the entire site must be restored to a safe condition.
- (2) To the extent possible, remove all material projecting above ground surface including protective casing, riser and well construction materials.
- (3) Document the abandonment through a written description of the procedure, drilling methods and depths, borehole depth, and volume and type of sealant used.

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PHASE II

**CONSTRUCTION QUALITY ASSURANCE/
QUALITY CONTROL PLAN**

FOR THE

FORMER MINE SITE REMEDIATION AND RESTORATION

BLUE HILL, MAINE

Prepared for:

**Maine Department of Environmental Protection
State House Station 17
Augusta, Maine 04333-0017**

Prepared by:

**EMSOURCE Blue Hill, LLC
111 Commercial Street
Portland, ME 04101**

May 2007

**PHASE II CONSTRUCTION QUALITY ASSURANCE/
QUALITY CONTROL PLAN**

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1.0 INTRODUCTION

This Phase II Construction Quality Assurance and Quality Control (CQA/QC) Plan has been developed to establish a QA/QC process for the Phase II Former Mine Site (Site) Remediation and Restoration in Blue Hill, Maine. These remedial measures involve the construction of a cover system at the former Plant Site. These remedial activities are being undertaken by EMSOURCE Blue Hill, LLS (EBH) under the review and oversight of the Maine Department of Environmental Protection (MEDEP). The work will be conducted in accordance with the engineering design process described in the Remedial Action Plan (RAP) (MACTEC, 2006, as modified and amended by the Project Engineer).

This CQA/QC Plan describes: (1) roles and responsibilities of the Project Owner (EBH) and its contractors with respect to QA/QC activities associated with implementing the remedial action plan at the Site, and (2) testing and inspection activities to be undertaken by these parties to ensure conformance to applicable design specifications and drawings which address quality of materials, workmanship, construction, and functional performance of the remedial measures.

Section 1.0 provides an overview of the principal elements of the CQA/QC Plan. Section 2.0 presents a general description of the quality management process applicable to this project, and provides definitions of the parties and activities related to project QA/QC. Section 3.0 provides an organization chart for QA/QC activities associated with this project, and describes the tasks and responsibilities of the associated parties. Section 4.0 describes the required testing, documentation, and potential corrective measures to be conducted by the Contractor. Section 5.0 presents documentation requirements for the QA/QC program. Section 6.0 describes potential modifications, such as substitutions and changes in scope that may impact construction. Section 7.0 provides a description of corrective measures to be enacted in the event of work performed that does not conform to technical requirements. Section 8.0 presents a schedule for QA/QC meetings to be conducted during the course of construction activities.

2.0 QUALITY MANAGEMENT PROCESS

The Quality Management Process is the general term used for the overall quality review and implementation program.

The CQA/QC program detailed in the Technical Specifications and Construction Drawings will be administered by the Field Operations Leader and the QA/QC Engineer as an integral part of construction activities.

2.1 DEFINITIONS

This **CQA/QC Plan** is a site-specific document that addresses the following:

- 1) identification of CQA and CQC personnel including: responsibilities, authorities, and qualifications;
- 2) validation methods including: inspection, monitoring, and testing activities necessary to verify that the project is constructed to meet design criteria, plans, specifications, and performance standards;
- 3) CQA documentation requirements; and
- 4) Interrelationship between design, construction, and CQA.

CQA activities refer to means and actions (e.g., inspection, testing, auditing) employed to assure that CQC requirements are being implemented consistent with the Technical Specifications and referenced standards.

CQC refers to means and actions taken the Contractor, Manufacturers, and Suppliers to verify that workmanship and materials meet the requirements of the Technical Specifications and Construction Drawings. As an example, QC testing is an essential part of the requirements for determining that soil types meet the applicable specifications. The QA/QC Engineer will compile QC information including, but not limited to, manufacturer information, test results, and inspection reports into a field file and verify that QC requirements are met. The QA/QC Engineer will also prepare and catalog daily QC records for the project files. Should results fail to meet specified requirements, the appropriate nonconformance, corrective action, or change will be documented. The Contractor's QA/QC file will be available for review by the MEDEP.

Field Operations Leader is Patrick Hansen, Outcome Engineering, in Willow Grove, PA.

Owner is EMSOURCE Blue Hill, LLC, in Portland, Maine.

QA/QC Engineer is Sevee & Maher Engineers, Inc., Cumberland Center, Maine.

Surveyor is Herrick and Salsbury, in Ellsworth, Maine.

3.0 QA/QC ORGANIZATION/RESPONSIBILITIES/EXPERIENCE

The key QA/QC responsibilities are discussed in the subsections below.

3.1 OWNERS REPRESENTATIVES

The Owners Representatives form a team during construction to document that the project is built to preserve and meet the intent of the approved plans and specifications.

The Owner's Field Operations Leader (FOL) will be Patrick J. Hansen, P.E. who will be direct and oversee construction management personnel as well as the personnel engaged in the CQA/QC roles. Mr. Hansen will be supported by a multi-disciplined project team as required, to fulfill the requirements of the CQA Plan.

The project team shall have appropriate experience with inspection and conformance evaluation with one or more of the following: Technical Specifications and Construction of earthworks, geotextiles, Geosynthetic clay liners (GCLs) geocomposites, and drainage composite/drainage piping.

The Field Operations Leader will report directly to the Owner and will manage the other members of the team in the conduct of the CQA/QC activities and will have access to appropriate information collected and reported by the Contractor in performance of its responsibilities. Collectively, the project team will determine alternatives, corrective measures and resolution of construction issues and concerns.

3.2 QA/QC ENGINEER

The QA/QC Engineer will be Sevee & Maher Engineers, Inc., The QA/QC Engineer is responsible to perform or oversee activities specified in the CQA/QC Plan (e.g., inspection, sampling, testing, documentation, and final verification). The QA/QC Engineer will be supported by the necessary inspection and testing personnel to accomplish the following functions:

- direct and perform independent tests to verify test results as necessary;
- review inspection and testing information compiled and reported to verify if project requirements have been met;
- evaluate whether QA/QC required by the Technical Specifications and Construction Drawings is fully implemented in conformance with the design;
- perform on-site inspections of construction activities to assess compliance with Technical Specifications and Construction Drawings;

- conduct inspections and review, as necessary, to evaluate whether equipment and testing procedures meet the test requirements; and
- Provide written Progress Reports conveying the results of CQA/QC program inspections and testing on a weekly basis.

Specific responsibilities of the QA/QC Engineer include the following:

- Review of design criteria, plans, and specifications to be knowledgeable with the project scope and requirements.
- Scheduling and coordinating CQA/QC inspection activities.
- Directing and supporting personnel in performing inspections and tests:
- Preparing written reports of the work in progress.
- Interacting with the project team to provide review and assessment project that modifications are documented, accepted by the Project Engineer, and approved by the Owner.
- Review record drawings and shop drawing for technical adequacy and provide draft comments to the project team.
- Preparing a final construction certification report.
- Performing independent on-site inspection of the work in progress to evaluate conformance with the specification.
- Verifying that tests are conducted according to the methods specified in the Technical Specifications.
- Monthly verification of measured quantities as compared to the contractor's progress payment requisition.
- Monthly site visits
- Project technical coordination as needed
- Provide for internal scheduling as necessary to support the project

3.3 PROJECT ENGINEER

The Project Engineer has direct responsibility for the design of cover systems and drainage features. During construction, the Project Engineer may be asked to provide senior review and comment if necessary, for approval of required technical submittals as provided by the Contractor.

The "Project Engineer" is a qualified Professional Engineer licensed in the State of Maine. The Design Engineer has project experience that demonstrates familiarity with all components of the project, including detailed design methods and procedures. Mr. James Atwell, P.E. of Sevee & Maher, Engineers, Inc (Maine Professional Engineer) is the "Project Engineer of Record" for Phase II of the Project.

3.4 GENERAL CONTRACTOR

The Owner will perform the Phase II construction work utilizing the services of R.F. Jordan, Inc. of Ellsworth, ME. R.F. Jordan will provide key manpower, equipment and aggregate materials for the construction of the Plant Site Cap. The Contractor is responsible for importation and placement of certain soil materials including cushion fill, protective layer, common borrow and topsoil associated with the construction of the Plant Site Cap. The Contractor will also be responsible for the construction of drainage features associated with the cap. Selected components of the systems may be constructed by subcontractors. The Field Operations Leader will oversee the Contractor. The Field Operations Leader, and QA/QC Engineer will meet as required to review the QA/QC requirements for the project activities and results from prior testing. The QA/QC activities, as detailed in the Technical Specifications, will be performed to demonstrate acceptable quality of the constructed work. Various members of the project team, including the Project Engineer and Field Operations leader, in addition to QA/QC technicians, and subcontractors, may perform QC functions e.g., documentation of QC observations, inspections, and testing results form a substantial part of the factual basis for CQA review activities. CQA/QC records will be maintained by the QA/QC Engineer. The QA/QC Engineer will evaluate the program including conducting inspections, reviewing test results and conducting independent testing, as required, to verify that the work, including that of subcontractors and suppliers, meet the intent and the requirements of the design.

3.5 GEOSYNTHETIC VENDORS

Geosynthetic materials will be procured, as specified in the Technical Specifications, following a competitive bidding process and the MEDEP will be notified of the selected vendors. The Geosynthetic(s) Vendors(s) will work with the General Contractor and the FOL to accomplish the installation of the geosynthetic materials. The geosynthetic vendors will perform the necessary QC and provide appropriate documentation for review and comment. The Project Engineer/ QA/QC Engineer will be responsible for general implementation of the QA/QC program related to the geosynthetics including, as necessary, inspections, and submittal review as required by the Technical Specifications. The QA/QC Engineer will also contract for the interface testing.

The Owner may elect to perform additional geosynthetics testing. If so, the Owner will secure and independent geosynthetics laboratory to conduct tests on samples of geosynthetics for the site. The geosynthetics laboratory may also conduct tests on pipes or other liner system components. The geosynthetics laboratory will be an independent entity with no association to the resin supplier, geosynthetics manufacturer, or Geosynthetics Contractor.

The geosynthetics laboratory will be certified by the Geosynthetics Research Institute. The geosynthetics laboratory will have experience in testing geosynthetics and other relevant system components and will conduct testing in accordance with ASTM and other required test methods. The geosynthetics laboratory will be capable of providing test results in accordance with the Technical Specifications. The geosynthetics laboratory will report all results to the FOL and QA/QC Engineer.

3.6 GEOTECHNICAL LABORATORY

FGS/CMT, a soils laboratory, will conduct tests (which may be on-site or off-site) on samples of soil taken from off-site sources, and on-site borrow stockpiles that will be used for the construction of cover systems, drainage features, and access roads. The soils laboratory will be responsible to perform the designated tests using the specified methods with equipment that has been appropriately calibrated. The soils laboratory will report all results to the FOL and the QA/QC Engineer. The soils laboratory or geotechnical testing firm will provide on-site testing (e.g., compaction testing) in accordance with the ASTM or other test methods specified in the Technical Specifications. The soils laboratory will have experience with the physical testing of soils, meet all applicable regulatory requirements.

3.7 SURVEYOR

The Project Surveyor, Herrick & Salsbury, will establish horizontal and vertical control points throughout the work area as necessary or requested by the Engineer to control and verify the Contractor's work as required by the Technical Specifications. The Surveyor will provide copies of survey data to the QA/QC Engineer for evaluation of conformance with the RAP, the Technical Specifications, and the Construction Drawings. The QA/QC Engineer will submit copies of the survey information to the Engineer.

4.0 SAMPLING AND TESTING PROCEDURES

Testing, at frequencies required by specification to demonstrate that control measures are adequate to conform to the contract requirements, will be performed. The following discussions are presented to summarize “QA/QC Testing Requirements” for this project. The Technical Specifications will govern specific activities for testing conformance in the event of a conflict.

4.1 EARTHWORK

This work pertains to the excavation, backfill, and compaction of soil and rock associated with closure of the former mine (see Technical Specifications 02315, “Earthwork”).

4.1.1 Submittals

The QA/QC Engineer will ensure that the following submittals are made:

- Source soil material testing results; and
- Third-party soil testing service qualifications.

4.1.2 Sampling, Testing, and Quality Control Procedures

Table 4-1 “QA/QC Testing Requirements” summarizes the required method, general acceptance criteria and frequency for the required sampling and testing procedures.

Source Testing. Source testing shall be conducted on soil materials proposed for construction. Borrow source testing for soil or quarry materials will be the responsibility of the QA/QC Engineer.

In-place Material Sampling and Testing. The QA/QC Engineer shall maintain logs of measurements of soil lifts, characteristics, and other observations to thoroughly document the work. Installation of a layer measured at 90 percent or less of the required thickness will not be accepted. A running average of 100 percent ($\pm 10\%$) of the required thickness shall be maintained. Thickness of common borrow, cushion layer, protective cover soil, and topsoil material shall be checked on minimum 50-foot grid spacing. The QA/QC Engineer shall provide regular observation during placement of geosynthetics during construction.

Table 4-1
QA/QC Testing Requirements
Phase II Construction QA/QC Plan
Former Kerramerican Mine Closure Project

Section	Subsection	Test	Method	Acceptance Criteria
Earthwork 02315	Common Borrow 2.3.A	Grain Size (to the #200 Sieve)	ASTM D 422	30% passing No. 200 sieve
		Moisture Density Curve	ASTM D 698	95% maximum dry density
	Cushion Layer 2.3.B	Grain Size (to the #200 Sieve, wet sieve)	ASTM D 422	35% passing No. 200 sieve
		Moisture Density Curve	ASTM D 698	90% maximum dry density
		Moisture Content	ASTM D 2216	
	Protective Cover 2.3.C	Grain Size (to the #200 Sieve, wet sieve)	ASTM D 422	Reference paragraph 2.2.C
		Moisture Density Curve	ASTM D 698	90% maximum dry density
		Atterberg Limits	ASTM D 4318	
	Drain Stone 2.3.D	Grain Size (to the #200 Sieve)	ASTM D 422	Reference paragraph 2.2.D
		Particle Size Analysis	ASTM D 5519	Reference paragraph 2.2.E
BORROW SOURCE	Aggregate Base 2.3.F	Grain Size (to the #200 Sieve)	ASTM D 422	Reference paragraph 2.2.F
		Moisture Density Curve	ASTM D 1557	95% maximum dry density
	Topsoil 2.3.G	Grain Size (to the #200 Sieve)	ASTM D 422	Min 15%, max 85% passing No. 200 sieve
		pH	ASTM D 4972	pH should be between 5.5 and 7.6 (guidance)
		Organic Content	ASTM D 4972	Organic content minimum 3%, maximum 20%
	Welland Topsoil 2.3.G	Grain Size (to the #200 Sieve)	ASTM D 422	Min 15%, max 85% passing No. 200 sieve
		pH	ASTM D 4972	pH should be between 5.5 and 7.6 (guidance)
		Organic Content	ASTM D 4972	Organic content minimum 3%, maximum 20%
	Common Borrow 3.6.B.1	Moisture and Dry Density	ASTM D 2167, ASTM D 2922 or ASTM D 1556	Reference paragraphs 3.4.B and 3.4.C
	Protective Cover 3.6.B.1	Moisture and Dry Density	ASTM D 2167, ASTM D 2922 or ASTM D 1556	Reference paragraphs 3.4.B and 3.4.C
IN PLACE	Cushion Layer 3.6.B.2	Moisture and Dry Density	ASTM D 2167, ASTM D 2922 or ASTM D 1556	Reference paragraphs 3.4.B and 3.4.C
	Aggregate Base 3.6.B.3	Moisture and Dry Density	ASTM D 2167, ASTM D 2922 or ASTM D 1556	Reference paragraphs 3.4.B and 3.4.C
	Welland Topsoil 3.6.B.4	Organic Content	ASTM D 2922 - Ignition Test	Reference paragraph 2.3.G
	2.1.A Geotextile Fabric (Class A)	Grab Strength	ASTM D 4632	350 lbs.
		Elongation	ASTM D 4632	less than 50%
		Puncture strength	ASTM D 4633	140 lbs.
		Trapezoid Tear	ASTM D 4633	120 lbs.
		Permittivity	ASTM D 4491	0.2 sec-1
		Ultraviolet Stability	ASTM D 4355	70% for min. 500 hrs
		Apparent Opening Size	ASTM D 4751	standard sieve #70
Geotextiles 02373	2.1.A Geotextile Fabric (Class B)	Grab Strength	ASTM D 4632	200 lbs.
		Elongation	ASTM D 4632	less than 50%
		Puncture strength	ASTM D 4633	90 lbs.
		Trapezoid Tear	ASTM D 4633	75 lbs.
		Permittivity	ASTM D 4491	0.5 / sec-1
		Ultraviolet Stability	ASTM D 4355	70% for min. 500 hrs
		Apparent Opening Size	ASTM D 4751	standard sieve #70
		Grab Strength	ASTM D 4632	200 lbs.
		Elongation	ASTM D 4632	less than 50%
		Puncture strength	ASTM D 4633	90 lbs.
Geocomposite Drainage Layer 02374	2.1.A Geonet Core	Tensile Strength	ASTM D 5035	37 lb/in
		Rein Density	ASTM D 1505	greater than or equal to 0.94 g/cm ³
		Carbon Black Content (tempo)	ASTM D 4218	2-3%
		Thickness	ASTM D 5199	300 mils
	2.1.B Non-woven Geotextile	Fabric Weight	ASTM D 5261	6 oz/yd ²
		Grab Tensile Strength	ASTM D 4632	157 lbs
		Apparent Opening Size	ASTM D 4751	sieve 70
		Puncture Resistance	ASTM D 4633	55 lbs
		Permittivity	ASTM D 4491	0.5 sec-1
	2.1.C Geocomposite Drainage Material	Ply Adhesion	ASTM D 4193 or GRI GC-7	greater than or equal to 112 lb/in
Geosynthetic Clay Layer 02376	2.1.D Interface Strength Requirements	Transmissivity (for i = 0.1, 0.33)	ASTM D 4716, see Section 2.1.3 for boundary conditions	See section 2.1.C for acceptance criteria
	2.2.A.1 Bottom Scrim Woven Geotextile	Mass per Unit Area	Reference paragraph 2.1.D	26 degrees peak, 23.5 degrees residual
		Mass per Unit Area	ASTM D 5261	3.1 oz/lay
	2.2.A.2 Cap Non-Woven Geotextile	Mass per Unit Area	ASTM D 5261	8.0 oz/lay
		Swell Index	ASTM D 5880	24 ml/2 g of wt. min.
	2.2.A.3 Bentonite	Moisture Content	ASTM D 4653 or D 2216	12% maximum
		Bentonite Mass Per Unit Area	ASTM D 5993	0.75 lb/sf (at oven dried moisture)
	2.2.A.4 Finished GCL	Grab Strength	ASTM D 4632	90 lb.
		Peel Strength	ASTM D 4632	15 lb. minimum
		Index Flux	ASTM D 6887	1 x 10 ⁴ ml/min/7sec max.
Subdrainage Pipe 02620	3.1.D GCL Conformance Testing	Hydrated Internal Shear Strength	ASTM D 6243	1 x 10 ⁴ ml/min/7sec max.
		Bentonite Mass Per Unit Area	ASTM D 5993	500 psf, 16.5 degrees peak, 16.5 degrees residual
		Grab Strength	ASTM D 4632	0.75 lb/sf (at oven dried moisture)
		Peel Strength	ASTM D 4632	15 lb. minimum
		Index Flux	ASTM D 5887	90 lb.
				1 x 10 ⁴ ml/min/7sec max.
	Field Quality Control 3.2	Visual Inspection	Inspect run using light inspect pipe scope	Full circle of light observed minimum 0.0025 ft/ft
	Inspection 3.4			

Table 4-1
QA/QC Testing Requirements
Phase II Construction QA/QC Plan
Former Kerramarian Mine Closure Project

Section	Frequency	Est QTY	# of Tests	Responsibility	Comments
Earthwork 02315	1 test/8,000 cy	25989	4		
	1 test/8,000 cy	25989	4		
	1 test/4,000 cy	24039	7		
	1 test/4,000 cy	24039	7		
	1 test/4,000 cy	24039	7		
	1 test/4,000 cy	24039	7		
	1 test/4,000 cy	24039	7		
	1 test/4,000 cy	24039	7		
	1 test/4,000 cy	24039	7		
	1 test/4,000 cy	24039	7		
	1 test/4,000 cy	24039	7		
	1 test/4,000 cy	24039	7		
	1 test/4,000 cy	24039	7		
	1 test/4,000 cy	24039	7		
	1 test/4,000 cy	24039	7		
Geotextiles 02373	BORROW SOURCE				
	1 test/structure/material	2	2		
	3 test/structure/material	1	3		
	1 test/7,500 cy	15089	3		
	1 test/7,500 cy	15089	3		
	1 test/7,500 cy	15089	3		
	1 test/7,500 cy	3307	1		
	1 test/7,500 cy	3307	1		
	1 test/structure/material	16.0	64		
	4 test/structure/material	14.9	60		
	4 test/structure/material	14.9	60		
	1 test/2200 lb material/ft	5846	30		
	1 test/7,500 cy	3307	1		
	IN PLACE				
	1 test/7,500 cy	3307	1		
Geocomposite Drainage Layer 02374	Manufacturer Certified				
	Manufacturer's mill tests only, one per supplier				
	Manufacturer's mill tests only, one per supplier				
	Manufacturer's mill tests only, one per supplier				
	Manufacturer's mill tests only, one per supplier				
	Manufacturer's mill tests only, one per supplier				
	Manufacturer's mill tests only, one per supplier				
	Manufacturer's mill tests only, one per supplier				
	Manufacturer's mill tests only, one per supplier				
	Manufacturer's mill tests only, one per supplier				
	Manufacturer's mill tests only, one per supplier				
	Manufacturer's mill tests only, one per supplier				
	Manufacturer's mill tests only, one per supplier				
	Manufacturer's mill tests only, one per supplier				
	Manufacturer's mill tests only, one per supplier				
Geosynthetic Clay Layer 02376	Manufacturer Certified				
	per lot	649044	9		
	per lot	649044	9		
	per lot	649044	9		
	per lot	649044	9		
	per lot	649044	9		
	per lot	649044	9		
	per lot	649044	9		
	per lot	649044	9		
	per lot	649044	9		
	per lot	649044	9		
	per lot	649044	9		
	per lot	649044	9		
	per lot	649044	9		
	per lot	649044	9		
Culvert Pipe 02610	Independent QCL				
	1 test per 50,000 sf	649044	13		
	Minimum Average Roll Value				
	Minimum Average Roll Value				
	1 test /100,000 lbs of material	390406.5	4		
	1 test /100,000 lbs of material	390406.5	4		
	1 test /100,000 lbs of material	520542	7		
	1 test /100,000 lbs of material	520542	7		
	1 test /100,000 lbs of material	520542	7		
	1 test /100,000 lbs of material	520542	7		
	1 test /100,000 lbs of material	520542	7		
	1 test /100,000 lbs of material	520542	7		
	1 test /100,000 lbs of material	520542	7		
	1 test /100,000 lbs of material	520542	7		
	1 test /100,000 lbs of material	520542	7		
Subdrainage Pipe 02620	Contractor				
	1 test per 100 feet	5780	4		
	1 test per 100 feet	5780	4		
	1 test per 100 feet	5780	4		
	1 test per 100 feet	5780	4		
	1 test per 100 feet	5780	4		
	1 test per 100 feet	5780	4		
	1 test per 100 feet	5780	4		
	1 test per 100 feet	5780	4		
	1 test per 100 feet	5780	4		
	1 test per 100 feet	5780	4		
	1 test per 100 feet	5780	4		
	1 test per 100 feet	5780	4		
	1 test per 100 feet	5780	4		
	1 test per 100 feet	5780	4		

If, based on reports of the independent third-party testing service and/or inspection/testing, fill materials are not compliant with the specified density, or thickness, the necessary corrective actions will be undertaken or additional testing may be conducted. The QA/QC Engineer may retest a rejected area prior to undertaking corrective actions. An area not meeting the specified thickness or grading requirements may be reworked until it meets the specification, provided such work does not cause the area to deviate from the other requirements of conformance. Defective work will be corrected before final acceptance.

4.2 GEOTEXTILE INSTALLATION

This work pertains to furnishing and installing non-woven or woven geotextile fabric at the cover system perimeter toe drain and riprap installation locations in the manner shown on the drawings and as specified in Technical Specification 02373, "Geotextiles".

Class A geotextile shall be used under riprap installations as shown on the drawings or for other severe application conditions. Severe applications may include conditions where equipment may operate on the geotextile or where the drop height of cover material is greater than 3 feet.

Class B geotextile shall be used at landfill toe drains as indicated on the drawing or for less severe conditions as indicated above for Class A geotextiles or as directed by the Engineer.

4.2.1 Submittals

The QA/QC Engineer shall obtain:

- geotextile manufacturer's specifications; and
- Product data certifying conformance with these specifications.

4.2.2 Sampling, Testing, and Quality Control Procedures

Geotextiles shall be composed of synthetic fibers formed into a woven or non-woven fabric except non-woven geotextile shall be used where stone is placed directly next to geonetl. Fibers used in manufacture of the geotextiles shall consist of polypropylene, polyvinyl chloride, nylon, polyolefins, polyamides, or polyester. The fibers shall be formed into a network such that the filaments or yarns retain dimensional stability relative to each other, including selvages. The geotextile shall contain stabilizers and/or inhibitors to make the fibers resistant to deterioration resulting from exposure to sunlight, water or heat. The geotextile shall be free of defects or flaws which will affect the physical properties. Use a geotextile fabric meeting the requirements presented in Table 4-1, "QA/QC Testing Requirements".

4.3 CULVERT AND DRAINAGE PIPE

This work includes providing and installing new pipes and incidental work in accordance with the specifications (Technical Specification 02610) and the Contract Drawings.

4.3.1 Submittals

The QA/QC Engineer shall obtain:

- Pipe manufacturer's specifications; and
- Product data certifying conformance with these specifications for the corrugated plastic piping including fittings and jointing materials.

4.3.2 Sampling, Testing, and Quality Control Procedures

Prior to backfilling, pipe installation shall be visually inspected for proper vertical and horizontal alignment. Joints shall be inspected for proper seating, assembly and deflection.

4.4 INSTALLATION OF GEOCOMPOSITE DRAINAGE LAYER

This work includes furnishing labor, materials, tools, and equipment and performing operations necessary to furnish, deploy, and install the geocomposite drainage layer in the areas indicated on the contract drawings or as required to construct the multi-layer cap (see Technical Specification 02374).

4.4.1 Submittals

The QA/QC Engineer shall obtain:

- Geonet manufacturer Quality Control certificates;
- Resin Quality Control tests;
- Certification that no post-consumer materials were added to the resin;
- Geotextile manufacturer Quality Control certificates;
- Drainage geocomposite sample;
- Product specification lists;
- Manufacturer's storage, handling and installation recommendations; and
- Quality Control Test Results.

4.4.2 Sampling, Testing, and Quality Control Procedures

The geocomposite shall be manufactured in accordance with the Manufacturer's Quality Control documentation submitted to and approved by the QA/QC Engineer. The geocomposite shall be

tested in accordance with Technical Specification 02374 and summarized in Table 4-1 of this document.

Geocomposite drainage material shall meet site-specific requirements for interface friction using site-specific soil and geosynthetic materials will be performed by the QA/QC Engineer. Test methods and acceptance criteria are presented in Technical Specification 02374, and are summarized in Table 4-1.

The Installer shall conduct an inspection of installed geocomposite drainage material prior to covering with cover soils. During inspection, the Installer shall repair defect areas identified to the satisfaction of the QA/QC Engineer. A surface acceptance form shall be prepared indicating covering of the geocomposite drainage material can be conducted following a successful inspection.

4.5 INSTALLATION OF GEOSYNTHETIC CLAY LAYER

This work includes manufacture, furnishing, and installation of geosynthetic clay liner (GCL) as part of the multi-layer cover system.

4.5.1 Submittals

The Geosynthetic Contractor shall submit for approval by the QA/QC Engineer:

- Sufficient quantity of samples of the proposed GCL such that interface friction testing can be performed; and
- Manufacturer's certification that the materials meet the required specifications.

4.5.2 Sampling, Testing, and Quality Control Procedures

The GCL shall be a flexible, layered liner consisting of uniform continuous layers of granular sodium bentonite encapsulated between primary backing and cover geotextiles and reinforced with needle-punched fibers. The GCL shall be of type to maintain its physical integrity during its installation, placement, and covering.

The GCL shall be manufactured in accordance with the Manufacturer's Quality Control documentation submitted to and approved by the QA/QC Engineer. Manufacturer testing shall be performed on materials delivered to the site according the methods presented in Technical Specification 02376, as summarized in Table 4-1 of this document.

5.0 DOCUMENTATION

This section describes the general documentation that will be completed for the CQC/CQA programs for the Former Mine Closure Project. The documentation will support, along with other CQA/CQC activities, certifications to be made during the project and at completion of the project by CQC and CQA personnel. Based on the materials being installed, and the specific work being conducted documentation may from time to time be modified to best present the data being reported.

5.1 INTRODUCTION

An effective CQC/QA plan depends largely on recognition of construction activities being performed, assigning responsibilities for monitoring activities, and clear and consistent communication between all parties. This can be effectively accomplished and verified by CQC/CQA testing, inspection activities and concise documentation of these activities.

Forms used for CQC/CQA documentation will include, at a minimum, those discussed in this CQC/QA Plan. A list of potential CQC/CQA forms is included in Appendix A. These forms may be revised as necessary by the CQC Engineer, or supplemented by additional forms, during the project.

5.2 DAILY RECORD KEEPING

Daily records documenting field activities will be completed by the project team. A description of pertinent documentation and assignment of responsibility for completion is presented below. A set of QA/QC records will be maintained at construction office. The file will be "open" to the MEDEP.

5.2.1 Project Administration Records

Most project administration records are completed daily by the QA/QC Engineer. The forms described below are "non-specific" and will be generated, as required, during all on-site activity.

5.2.2 Daily Field Reports

The following project documentation will generally be prepared on a daily basis when relevant work is performed.

5.2.2.1 Field Operations Leader.

A Daily Field Report will be prepared by the Field Operations Leader or authorized representative. Hard copies will be maintained in the construction office. At a minimum, the Daily Field Report will include the following information:

- Date, project name, location, and other identification;
- Narrative of the events and activities, including meetings and observations that occurred during a given day;
- Weather conditions (including temperature and precipitation amounts if any);
- Activities planned and performed;
- Schedule as it relates to the day's activities;
- Name of the Field Operations Leader or authorized contractor representative preparing the report, and
- Personnel and equipment reports

5.2.2.2 QA/QC Engineer.

A QA/QC Daily Field Report will be prepared by the QA/QC Engineer or authorized representative. A hard copy will be maintained in the construction office. At a minimum, the QC Daily Field Report will include the following information:

- Date, project name, location, and other identification;
- Narrative of the events and activities, including meetings and observations that occurred that day;
- Weather conditions (including temperature and precipitation amounts if any);
- Materials delivered;
- Inspection/testing/sampling and results;
- Specific instances of nonconformance with the technical specifications, drawings, and other project documents;
- Corrective actions;
- Comments;
- Locations of borrow source excavations and materials placement diagrams for each day's progress provided with estimated volumes and MSL- referenced elevations;
- Personnel and equipment on site;
- Inspection/testing/sampling activities;
- Instances of nonconformance with respect to specifications, drawings, and other project documents;
 - Corrective actions;
 - Requested interpretations of project documents; and
- Signature of the QA/QC Engineer.

5.2.4 Weekly Construction Progress Reporting

Weekly Construction Progress Reports: These reports will be provided as a chronological text of key activities that occur during project execution. The reports are intended as stand-alone documents for the period covered, with a summary of weekly activities. The report contents and formatting are consistent, and are annotated and cross-referenced to other reports and construction documents by calendar date.

Information provided in the reports includes the following:

- important discussions, visitors, and meetings;
- special instructions given or received by the project team including the issuance of field orders or change orders;
- delays and lost time to the contract;
- summary of work performed and major deliveries.

Other information includes assessment of contract time durations and extensions, daily weather conditions, status of project deliverables, recommendations to the owner and engineer for resolution of issues, and status of technical assessments required or requested of the project team

QA/QC Activity Report will be provided integrally with the Weekly Progress Report for documentation and tracking for the placement of materials for closure construction. The reports are provided as an attachment to other reporting, but are intended to be stand-alone documents.

The reports are the compilation of information required by contract relative to specific QA/QC activities. The reports generally cover borrow source study information (i.e., moisture/density relationships, gradation analysis), and summary of verification analysis samples.

Other information may include summary of in situ density and moisture content test results; permeability data; third-party survey data; other observation, inspection, and testing results; and other information as required to document the activities associated with the closure system construction not covered in weekly construction progress reports.

5.2.5 Material Delivery Inventory

The project team will record the identifying roll number and pertinent information for each roll of geosynthetic material delivered to the site. This report will be a “living” register to be updated as materials are delivered to the site and incorporated into the cover system.

5.2.6 Photographic Documentation

Photographic documentation serves as a pictorial record of work progress, problems, and mitigation activities. A photographic file will be maintained by the FOL; it will consist of electronic files of color photographs recorded using a digital camera.

5.2.7 Construction Documentation Report

At the completion of construction, the project team shall complete a Construction Documentation Report. At a minimum, the documentation report shall include the PE's certification, a narrative summary of the construction process, test results, a summary of design modifications, and change orders, photographic documentation, sub-grade acceptance certifications, and geosynthetic manufacturer's QC certifications. The Report will also include the Record Drawings, which are described below.

5.2.8 Record Drawings

The Surveyor shall perform a final as-built topographic survey of the site at the completion of field operations. The survey shall be performed by a Land Surveyor registered in the State of Maine. The survey shall consist of a ground control survey and shall be conducted in accordance with specification Section 01460, Field Engineering and Survey Control.

The final as-built topographic survey of the site shall be included in the Record Drawings. The Record Drawings will include at a minimum the following items:

- measured horizontal and vertical locations of geocomposites, geosynthetics, and culverts and ditches, referenced to permanent surface conditions;
- as-built drawings of field changes showing revised dimensions and details;
- details not provided on original Contract drawings; and
- additional features or equipment installed.

6.0 MODIFICATIONS

It is recognized that during the course of this project, changes will likely occur in technical details which, in turn, will potentially impact Design, related Technical Specifications and Construction Drawings. This plan, therefore, includes requirements pertinent to the acceptance and/or approval procedure for changes, and documentation requirements for such changes. For the purpose of this project, the following categories of modifications may occur:

1. Requests for information (RFI)
2. Field orders

These will be documented through regular correspondence between the FOL and Project Engineer.

RFI's are items for which there is a need to provide additional information to clarify and/or supplement Technical Specifications and Construction Drawings. This may include details that were not clearly defined in/on Contract drawings or specifications but that have minimal impact (i.e., 8-foot instead of 10-foot spacing of fence posts). RFIs have no cost or schedule impact. RFI's will be prepared and logged by the Field Operations Leader for response by the Project Engineer.

A Field Order interprets the contract documents or orders minor changes in the work without change in contract sum or contract time.

The Project Engineer will document RFI's and Field Orders. Pertinent details and supporting information will be attached as appropriate.

7.0 CORRECTIVE MEASURES

The QA/QC Engineer will identify and summarize work performed that does not conform to the Technical Specifications, Construction Drawings, Work Plans, and requirements of the CQC/QA Plans in daily reports.

Reports will provide a summary of the nonconforming work, reference the applicable Specification section, Construction Drawing, and/or Work Plan section, identify corrections action required, and record verification that the measures were implemented. The QA/QC Engineer will notify the Field Operations Leader upon identification of a nonconforming work item. Minor work items that are readily identified and corrected such as soil compaction criteria, which are not within range and can be retested until acceptable, will be documented in the soil compaction testing data reports.

The status of significant corrective actions will be recorded in a Nonconformance Tracking Log. The tracking log will list nonconformance issues and indicate the date identified, describe the nonconforming work and the corrective action, and indicate the date resolved.

8.0 MEETINGS

8.1 PRE-CONSTRUCTION MEETING

At project initiation, the Owner, will schedule a pre-construction meeting with key project personnel. The agenda for the meeting will include scheduling, construction procedures, quantity measurements, site access, lay-down and storage areas, site-specific health and safety issues, and cooperation and coordination of all participants.

8.2 GEOSYNTHETICS PRE-CONSTRUCTION MEETING

Prior to the installation of geosynthetic materials at the Plant Site, the QA/QC Engineer will schedule a pre-construction meeting. The Geosynthetic Contractor shall ensure the Site Superintendent, Installers and other appropriate authorized representatives are in attendance, including major subcontractors. The agenda for the meeting will include scheduling, installation procedures, QC/QA requirements, overburden placement procedures, quantity measurements, lay-down and storage areas, site-specific health and safety issues, and cooperation and coordination of all participants. This meeting may occur simultaneously with the pre-construction meeting.

8.3 PROGRESS MEETINGS

The Field Operations Leader will conduct meetings at a reasonable frequency during periods of construction activity. General CQC/CQA issues and concerns will be reviewed as part of the monthly meetings. Meetings will generally be conducted at the project site. Agenda and minutes of the meeting will be prepared and distributed to an Owner approved distribution list. The Owner, MEDEP, and Project Engineer will generally be invited to attend the meeting along with the Field Operations Leader and the QA/QC Engineer.

8.4 GEOSYNTHETIC CQA/QC MEETINGS

Additional meetings may be conducted as necessary for proper implementation of the geosynthetic work.

GLOSSARY OF ACRONYMS AND ABBREVIATIONS

ASTM	American Society for Testing and Materials
Contractor	construction contractor
CPA	Certified Public Accountant
CQA	construction quality assurance
CQC	construction quality control
MEDEP	Maine Department of Environmental Protection
EBH	EMSOURCE Blue Hill, LLC
FGS/CMT	a soils testing lab
FOL	Field Operations Leader
GCL	geosynthetic clay liner
Kerramerican	Kerramerican, Inc.
LLDPE	Linear Low Density Polyethylene
MACTEC	MACTEC Engineering and Consulting, Inc.
MEDEP	Maine Department of Environmental Protection
NC/CA	Nonconformance/Corrective Action
OE	Outcome Engineering, Inc.
P.E.	Professional Engineer
QA	quality assurance
QAMP	Quality Assurance Management Program
QC	quality control
RAP	Remedial Action Plan
RFI	Request(s) for Information
Site	Former Kerramerican mine site

REFERENCES

MACTEC Engineering and Consulting, Inc. (MACTEC), 2006. "Remedial Action Plan for the Former Kerramerican Mine"; Prepared for Kerramerican, Inc. May, 2003; updated June 2005 and June 2006.

APPENDIX A
INDEX OF CQA/CQC FORMS

INDEX OF CQA/CQC FORMS

- 1 Transmittal for Acceptance of Shop and Vendor Drawings
- 2 Shop Drawing Acceptance Review Seal
- 3 Shop Drawing Technical Review Comment Sheet
Geosynthetics Contractor Technical
- 4 Submittal Record
Geosynthetic Seam and Panel
- 5 Location Log

Health & Safety Plan

PHASE II SITE SPECIFIC HEALTH AND SAFETY PLAN FOR:

**Former Mine Site Remediation
Blue Hill, Maine**

May, 2007

EMSOURCE Blue Hill, LLC

The information contained in this HASP is provided for the protection of the health and safety of site personnel on projects involving hazardous waste operations. The information included in this document is designed to identify, evaluate and control safety and health hazards, and provide for emergency response for site activities. This HASP will remain on the project site for reference by workers during the project. EMSOURCE Blue Hill, LLC and its representatives assume no liability for, or responsibility to, any other parties for the accuracy or completeness of information included in the HASP or reliance upon this HASP by any other party.

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Health and Safety Plan Acknowledgement

This form is to be signed by each EMSOURCE Blue Hill, LLC contractor/subcontractor who will be present during this project. This Health and Safety Plan Acknowledgement must be signed prior to the person commencing work at the project site.

By signing this form, personnel acknowledge that they have read and understand the contents of this Site Specific Health and Safety Plan (SSHASP) and the hazards associated with the project, the control measures and procedures to follow to protect site personnel, property and the community during the course of this project.

Personnel also understand that on a regular basis, mandatory safety meetings will be held prior to starting activities and attended by on-site project personnel. Project personnel also acknowledge that they agree to perform activities in a safe manner in accordance with the SSHASP. The purpose of the regular safety meetings is to discuss potential hazards, control measures and other pertinent information needed for communicating potential project hazards of daily activities at the site.

NAME (Print)

SIGNATURE

DATE

_____	_____	_____
_____	_____	_____
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Appendix A: Directions to Hospital

Appendix B: Material Safety Data Sheets (MSDS) and Related Safety and Health Information for Hazardous Materials Anticipated to be Found at the Job Site

Appendix C: Site Plan

1.0 INTRODUCTION

This Site Specific Health and Safety Plan (HASP) is regulatory-required for the following types of operations in which employee exposures to safety or health hazards are anticipated:

1. Clean-up operations required by a governmental body, which involves hazardous substances that are conducted at uncontrolled hazardous waste sites, including, but not limited to, the EPA's National Priority Site List (NPL), state priority site lists, sites recommended for the EPA NPL, and initial investigations of government identified sites which are conducted before the presence or absence of hazardous substances has been ascertained;
2. Corrective actions involving clean-up operations at sites covered by the Resource Conservation and Recovery Act of 1976 (RCRA);
3. Voluntary clean-up operations at sites recognized by federal, state, local or other governmental bodies as uncontrolled hazardous waste sites;
4. Operations involving hazardous wastes that are conducted at treatment, storage and disposal (TSD) facilities regulated by 40 CFR Parts 264 and 265 pursuant to RCRA, or by agencies under agreement with the USEPA to implement RCRA regulations; and,
5. Emergency response operations for releases of, or substantial threats of releases of, hazardous substances, without regard to the location of the hazard.

2.0 SITE HISTORY AND DESCRIPTION

2.1 Historical Information on Hazardous Material Usage/Disposal at the Site

The Former Mine Site is southwest of the intersection of Mines Road (Route 15) and Grindleville Road, Hancock County, Blue Hill, Maine. Currently, the Site consists of an access road from Mines Road, a drainage ditch (Northern Drainage Ditch-NDD), the tailings impoundment (and its discharge ditches and its Main Dam), the Auxiliary Pond, the Plant Site, an access road from Grindleville Road, and the Saddle Dam. The Site is bordered to the west by Second Pond, and to the south by Carlton Stream.

The site was used from approximately 1972 to 1977 for mining zinc and copper. Certain Site closure activities occurred in the 1980's. The Site has been under investigation since the 1990's. Phase I of site remediation occurred in the fall of 2006 and early in 2007.

The Site Feasibility Study indicated that the following contaminants and contaminant levels have been identified at the Site:

CONTAMINANT	MEDIA	CONCENTRATION RANGE OF CONTAMINANT
Heavy metals	Water	In surface water: Zinc: 90-300 micrograms/liter Copper: 10-90 micrograms/liter Cadmium: 0.2-1.0 micrograms/liter Lead: non detect-10 micrograms/liter Acid Mine Drainage/pH/sulfate: no range
VOCs/SVOCs	Soils/water	Not known to exist onsite
Pesticides	Soils/water	Not known to exist onsite

These contaminants have the following associated exposure limits established by the Occupational Safety and Health Administration (OSHA), American Conference of Governmental Industrial Hygienists (ACGIH) or the National Institute of Occupational Safety and Health (NIOSH): (Note: no specific chemical data exists for the site. Possible target compounds are listed, as general guidance.) **NOTE: this is a partial list of potential chemicals onsite, taken from historical documents.**

OCCUPATIONAL EXPOSURE LIMITS FOR CONTAMINANTS IN AIR

CONTAMINANT	OSHA LIMIT PEL/STEL/C	NIOSH LIMIT REL/STEL/C
Zinc**	5 mg/m3	5 mg/m3
Copper	1 mg/m3	1 mg/m3
Cadmium	0.005 mg/m3	Not available*
Lead	0.050 mg/m3	0.1 ppm
Acid Mine Drainage/ pH/sulfate	No value	No value

PEL = Permissible Exposure Limit

STEL = Short Term Exposure Limit

C = Ceiling Value

TLV = Threshold Limit Value

REL = Recommended Exposure Limit

*NIOSH is currently updating their standards. Former standards indicated

**As zinc oxide fume/respiratory dust

The source of the suspected contamination is: former site operations. Generic material safety data sheets or other safety and health information have been provided as a reference in **Appendix B**.

2.2 Proposed Work/Known or Anticipated Hazardous Areas

Proposed Phase II work generally includes installing/maintaining soil erosion controls, abandoning/extending groundwater monitoring wells, and Plant Site capping. Other activities will also include mobilizing and some regular surface water monitoring.

The attached site plan in **Appendix C** indicates the general location of the project activities.

This health and safety plan (HASP) has been prepared as guidance in conducting work activities at the site in a safe manner. Known or anticipated hazardous areas or conditions for the site have been tabulated below:

Known or Anticipated Hazardous Areas or Conditions

- The soil/water handled may contain metals, and/or have reduced pH
- Construction related hazards associated with earthmoving and capping.

3.0 WORK PLAN ELEMENTS

The work plan tasks and task objectives for this project are tabulated below.

PROJECT TASKS AND OBJECTIVES

TASK #	DESCRIPTION	OBJECTIVE
1	Mobilization	Allow efficient work activities
2	Install/maintain soil erosion controls	Protect against erosion and its effects
3	Capping related earthwork	Improving environmental conditions
4	Geosynthetic Installation	Improving site conditions
5	Vegetation Installation	Protect the site, improve aesthetics
6	Water Monitoring	Monitor site conditions

4.0 HAZARD ANALYSIS AND CONTROL MEASURES

A variety of potential hazards are believed associated with the project scope of work. The following table can be used to identify anticipated hazards for the project based on the project scope of work and site conditions. The hazards have been checked for the project tasks. This hazard checklist has been provided as a guide for developing control measures to be implemented to protect worker health and safety.

HAZARD ANALYSIS MATRIX

HAZARD	Mobilization	Erosion Controls	Earthwork	Geosynthetic Installation	Vegetation Installation	Water Monitoring
CHEMICAL	X	X	X	X	X	X
BIOHAZARD						
RADIATION						
HEAT STRESS	X	X	X	X	X	X
COLD STRESS	X	X	X	X	X	X
INSECT BITES	X	X	X	X	X	X
ANIMAL/SNAKE BITES	X	X	X	X	X	X
WATER DROWNING	X	X	X	X	X	X
POISONOUS PLANTS	X	X	X	X	X	X
NOISE	X	X	X	X	X	X
CONFINED SPACES	X	X	X	X	X	X
UNDERGROUND UTILITIES	X	X	X	X	X	X
OVERHEAD UTILITIES	X	X	X	X	X	X
VEHICULAR TRAFFIC	X	X	X	X	X	X
CONSTRUCTION	X	X	X	X	X	X
MECHANICAL	X	X	X	X	X	X
ELECTRICAL	X	X	X	X	X	X
LANDFILL or SEWER GASES						
RADON or OTHER GASES						
INCLEMENT WEATHER	X	X	X	X	X	X
DRUM HANDLING						
PHYSICAL/BACK INJURY	X	X	X	X	X	X
HIGH CRIME AREA						
FLAMMABLE MATERIALS	X	X	X	X	X	X
STATIC ELECTRICITY						
WELDING,CUTTING or BRAZING	X	X	X	X	X	X
HIGH PRESSURE WATER or AIR	X	X	X	X	X	X
DUSTY CONDITION	X	X	X	X	X	X

CONTROL MEASURES FOR ANTICIPATED WORK ACTIVITIES HAZARDS

HAZARD	NATURE OF HAZARD	CONTROL MEASURES
CHEMICAL	See Section 2 of this SSHASP	Monitoring, engineering controls, PPE
BIOHAZARD	None known	NA
RADIATION	None known	NA
HEAT STRESS	Summer physical work (with PPE)	See Section 10 of this SSHASP
COLD STRESS	Winter work	Follow OSHA guidelines
INSECT BITES	Many bugs at site	Apply repellent, treat bites with antiseptic
ANIMAL/SNAKE BITES	Wild animals are observed at site	Advise SSO, seek appropriate medical attention
WATER DROWNING	Much water surrounding site	Buddy system
POISONOUS PLANTS	E.G. Poison ivy, poison oak	Identify/avoid, use of PPE
NOISE	Construction equipment	Hearing protection, when appropriate
CONFINED SPACES	Potentially trash dumpsters, water tank	Avoid entry, follow complete OSHA procedures
UNDERGROUND UTILITIES	Only known underground utility is at home near Mines Road.	Markout and avoid during access road excavation.
OVERHEAD UTILITIES	Electric line to service home and trailer	Will exist along access road from Mines Road, and at office trailers.
VEHICULAR TRAFFIC	Delivery trucks, construction equipment	Backup alarms, reflective vests, alertness
CONSTRUCTION/SLIP, TRIP, FALL	Common slips/falls. Falls-electric utility worker.	Alertness, fall protection (for utility workers)
MECHANICAL	Pumps, generators, auto	Lockout/tagout
ELECTRICAL	Hookup and disconnect trailers	Lockout/tagout, only licensed electricians perform work
LANDFILL or SEWER GASES	None Known	NA
RADON or OTHER GASES	None Known	NA
INCLEMENT WEATHER	Expected with outside work	Weather gear, adjustment of work assignments
DRUM HANDLING	None known	NA
PHYSICAL/BACK INJURY	Frequent lifting	Back supports (on an individual basis)
HIGH CRIME AREA	None known	NA
FLAMMABLE MATERIALS	Gasoline for small equipment	Proper storage and handling
STATIC ELECTRICITY	None known	NA
WELDING,CUTTING or BRAZING	Liner seaming, equipment repair	Hot work permits
HIGH PRESSURE WATER or AIR	Decon activities	Training, face shield and other PPE
DUSTY CONDITION	From construction traffic	Monitoring and wetting

Additional training will occur on the appropriate subjects above during daily tailgate safety meetings.

5.0 PROJECT STANDARD OPERATING PROCEDURES AND PRACTICES

Site personnel must adhere to the following standard operating procedures and practices.

1. All safety equipment and protective clothing is to be kept clean and well maintained.
2. During periods of prolonged air-purifying respirator usage in contaminated areas, respirator filters will be changed according to the change-out schedule for the project, or sooner, if breakthrough is indicated. At a minimum, respirator cartridge filters will be changed on a daily basis.
3. Footwear used on site will be covered by rubber over boots when entering or working in the "hot zone" or "contamination reduction zone", as appropriate. Boots will be washed remove dirt and contaminated sediment before leaving these work zones.
4. All personal protective equipment (PPE) used on site will be decontaminated or disposed of at the end of the workday/shift, as appropriate.
5. All respirators will be individually assigned and not interchanged between workers without cleaning and sanitizing.
6. Any site personnel unable to pass a fit test as a result of facial hair or facial configuration shall not enter or work in an area that requires respiratory protection.
7. On-site personnel found to be disregarding provisions of the HASP or SOP will be cited and/or barred from the project.
8. Used disposable outerwear will be removed upon leaving the hot zone and will be placed inside disposable containers provided for that purpose.
9. Tyvek™ suits, or other outer garments, which become torn or badly soiled will be replaced immediately.
10. Eating will be prohibited in the hot and contamination reduction zones.
11. All personnel will thoroughly cleanse their hands, face, forearms and other exposed areas prior to eating smoking, drinking, or using the toilet facilities.
12. Thorough washing at the end of the shift are suggested for personnel who have worked in the hot zone.
13. No alcohol or drugs (without prescription) will be allowed on-site at any time. Firearms are only allowed for security purposes, if allowed by the local law enforcement agency.
14. All personnel who are on medication should report it to the Safety Officer who will make a determination whether or not the individual be allowed to work and in what capacity. The Safety Officer may require a letter from the individual's personal physician stating what limitations, if any, the medication may impose on the individual.
15. At least one copy of this HASP will be available for review at the job work site.
16. Legible and understandable, precautionary labels shall be affixed prominently to containers of contaminated scrap, waste, debris and clothing.
17. Containers shall be moved only with the proper equipment and shall be secured to prevent dropping or loss of control during transport.
18. Excavation work must comply with federal OSHA rules.
19. Before daily site operations begin, a tailgate safety meeting will be held to review the day's work activities and HASP concerns.
20. A change in level of protection will be based on air monitoring equipment readings taken in the breathing zone.
21. Events surrounding accidents/injuries shall be reported to the SSO
22. Lockout-tag out procedures will be followed prior to performing any work on equipment for controlling hazardous energy. This includes but is not limited to work involving the generator and pumps/hoses.

23. Only authorized entrants, attendants and supervisors trained in confined space entry procedures will be permitted to enter and conduct work in confined spaces. OSHA confined space entry standard requirements must be complied with.
24. Use of a "buddy system" will be used in hazardous areas.
25. Engineering controls and work practices shall be instituted to reduce and maintain employee exposure to, or below, the permissible exposure limits (PEL) for substances regulated by OSHA, except to the extent that such controls and practices are not feasible.
26. Where feasible, engineering controls should include the use of pressurized cabs or control booths on equipment, and/or the use of remotely operated material handling equipment.
27. Work practices should be implemented, where practical, such as removing all non-essential employees from potential exposure during opening of drums, wetting down dusty operations and locating employees upwind of possible hazards. Wetting will generally be performed via a water truck.

6.0 VIOLATIONS OF THE HASP

Workers will comply with this SSHASP. Disciplinary measures are at the discretion of the Safety Officer and will be commensurate with the severity of the infraction, in is opinion. It is the responsibility of each individual to understand and comply with safety procedures and request clarification as needed. For serious or imminent hazards, safety violations will result in temporary or permanent banishment from the site.

7.0 PERSONAL PROTECTIVE EQUIPMENT (PPE) AND CLOTHING

All work activities will commence in Level D PPE. Air monitoring results will determine whether PPE will need to be upgraded to Level C or Level B.

CATEGORIES OF PPE

LEVEL OF PPE	PERSONAL PROTECTIVE EQUIPMENT
A	<ul style="list-style-type: none">• Positive pressure full face-piece self-contained breathing apparatus (SCBA), or positive pressure supplied air respirator with escape SCBA (NIOSH approved)• Totally encapsulating chemical –protective suit• Coveralls¹• Long underwear¹• Gloves, outer, chemical-resistant• Gloves, inner, chemical-resistant• Boots, chemical-resistant, steel toe and shank• Hard hat (under suit)¹• Disposable protective suit, gloves and boots (depending on suit construction, may be worn over totally-encapsulating suit)
B	<ul style="list-style-type: none">• Positive pressure, full-face piece self-contained breathing apparatus (SCBA), or positive pressure supplied air respirator with escape SCBA (NIOSH approved)• Hooded chemical-resistant clothing (overalls and long-sleeved jacket; coveralls; one or two-piece chemical-splash suit; disposable chemical-resistant overalls)• Coveralls¹• Gloves, outer, chemical-resistant• Gloves, inner, chemical-resistant• Boots, outer, chemical-resistant, steel toe and shank• Boot-covers, outer, chemical-resistant (disposable)¹

	<ul style="list-style-type: none"> • Face shield¹ • Hard hat¹
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CATEGORIES OF PPE CONTINUED

LEVEL OF PPE	PERSONAL PROTECTIVE EQUIPMENT
C	<ul style="list-style-type: none"> • Full-face or half-mask, air purifying respirators (NIOSH approved) • Hooded chemical-resistant clothing (overalls; two-piece chemical-splash suit; disposable chemical-resistant overalls) • Coveralls¹ • Gloves, outer, chemical-resistant • Gloves, inner, chemical-resistant • Boots, outer, chemical-resistant steel toe and shank¹ • Boot-covers, outer, chemical-resistant (disposable)¹ • Hard hat¹ • Escape mask¹ • Face shield¹
D	<ul style="list-style-type: none"> • Coveralls • Gloves • Boots/shoes, steel toe and shank • Boots, outer, chemical-resistant • Hard hat • Safety glasses¹ with side shields, or chemical splash goggles • Face shield-during use of pressurized water

Hearing protection can be worn by a worker at any time. Hearing protection must be worn if noise levels exceed standards.

TYPES OF HAZARDS FOR WHICH LEVELS A, B, C AND D PROTECTION ARE APPROPRIATE

PPE LEVEL	WHEN TO USE
A	<ul style="list-style-type: none"> • The hazardous substance has been identified and requires the highest level of protection for skin, eyes, and the respiratory system based on either the measured, or potential for, high concentration of atmospheric vapors, gases, or particulates of materials that are harmful to skin; • The site operation and work functions involve a high potential for splash, immersion, or exposure to unexpected vapors, gases, or particulates of materials that are harmful to skin or capable of being absorbed through the skin; • Substances with a high degree of hazard to the skin are known or suspected to be present, and skin contact is possible; or, • Operations are being conducted in confined, poorly ventilated areas, and the absence of conditions requiring Level A have not yet been determined.
B	<ul style="list-style-type: none"> • The type and atmospheric concentration of substances have been identified and require a high level of respiratory protection, but less skin protection; • The atmosphere contains less than 19.5% oxygen; or, • The presence of incompletely identified vapors or gases is indicated by a direct-reading organic vapor detection instrument, but vapors and gases are not suspected of containing high levels of chemicals harmful to skin or capable of being absorbed through the skin. • Use of Level B involves atmospheres with IDLH concentrations of specific substances that present severe inhalation hazards and that do not represent a severe skin hazard, or do not meet the criteria for use of air-purifying respirators.
C	<ul style="list-style-type: none"> • The atmospheric contaminants, liquid splashes, or other direct contact will not adversely affect or be absorbed through any exposed skin; • The types of air contaminants have been identified, concentrations measured, and an air-purifying respirator is available that can remove the contaminants; and, • All criteria for the use of air-purifying respirators are met.
D	<ul style="list-style-type: none"> • The atmosphere contains no known hazard; and, • Work functions preclude unexpected inhalation of hazardous levels of chemicals.

Combinations of personal protective equipment other than those described for Levels A, B, C, and D protection may be more appropriate and may be used to provide the proper level of protection, as decided by the SSO.

The table below lists the minimum initial level of personal protective equipment required for each task of the project scope of work.

MINIMUM PPE LEVEL FOR EACH TASK

TASK	LEVEL OF PPE
Erosion controls	D
Capping related earthwork	D
Geosynthetic Installation	D
Vegetation installation	D
Water monitoring	D

Decontamination equipment-includes water, brushes, pressure hose/washer, washtubs, plastic bags, as appropriate.

7.1 Respiratory Protection Program

To control the incidence of occupational diseases, OSHA requires that hazardous air contaminant levels at project sites be reduced to the lowest possible levels by instituting engineering controls and work practices designed to prevent atmospheric contamination. However, when such controls are not feasible or while they are in the process of being instituted, respirators may be used as a means of controlling employee exposure to hazardous air contaminants.

Site workers required to wear respiratory protection must be included in a medical surveillance program. No worker on the project site is permitted to wear a respirator unless that individual has been medically qualified and has been found to be physically fit to wear respiratory protection, has had appropriate training on the use and limitations of the respirator and is knowledgeable of the requirements of respirator use

8.0 EMERGENCY RESPONSE/PLANNING

8.1 Emergency Telephone Numbers/Directions to Hospital

The following telephone numbers and directions to the hospital from the site are provided to expedite emergency assistance if needed at the site.

Nearest Hospital:

Emergency/general Tel. No.: 911

See **Appendix A** for map and directions to hospital.

Fire Department: 911

Police Department: 911

Ambulance: 911

CHEMTREC (Chemical Transportation Emergency Center)

2501 M Street, NW

Washington, D. C. 20037

Tel. No.: 800-424-9300

Poison Control Center: 800-336-6997

Field Operation Leader: Patrick J. Hansen (207) 772-4939

Project Manager/Client Contact: David Critchfield (207) 772-4939

8.2 Evacuation Procedures

If evacuation from the site is required due to an emergency such as a fire or explosion or other unforeseen occurrence, the following action should be taken:

- First person recognizing need for evacuation will immediately notify all on-site personnel.
- Leave the area and report to the designated rally point, which is the front gate.
- Notify emergency medical services, if appropriate at 911.
- Account for all site personnel.
- Contact the health and safety representative and the Client contact as soon as practical.
- Establish site security and control measures for the neighborhood safety until emergency responders arrive and take control.

8.3 Medical Emergency

Response to a medical emergency:

- Initially survey the situation; do not enter an area that could jeopardize your safety.
- Establish the level of consciousness and then call for help, informing the Emergency Medical Service (EMS) of the patient's condition.
- If the person is unconscious, perform a primary assessment by checking for arousal, airway, breathing and circulation (only trained First Aid/CPR personnel should perform these tasks; state that you are medically trained).
- Conduct a secondary assessment to the conscious patient by checking for bleeding (control with direct pressure) and monitoring for vital signs.
- Do not move the person unless the location is hazardous.
- Provide First Aid to the level trained.
- Contact the project manager and health and safety representative as soon as practical and document the incident in a report to the health and safety representative.

8.4 Fire Emergency

Response to a fire emergency:

- Evacuate the area immediately and notify EMS.
- Extinguish small fires with an all-purpose fire extinguisher, provided that you have had training in the use of an extinguisher.
- Contact the health and safety representative

8.5 Spill/Release of Hazardous Material

Response to a spill or release of hazardous material:

- Don appropriate PPE and stay upwind of the incident.
- Advise SSO
- Turn off all sources of ignition and shut down pumps and valves to equipment in the immediate area; if possible, plug leaks and collect drippings in a container.
- Place absorbent around the incident site to soak up hazardous material.
- Call the fire department if potential for a fire exists.
- The client will perform authority notification

9.0 TRAINING REQUIREMENTS

Site workers must have completed the following training programs:

- Field personnel exposed to chemical hazards must complete 40 hours of hazardous waste activity instruction (OSHA 29 CFR 1910.120/1926.65) and must complete 8 hours of refresher training each year (29 CFR 1910.120/1926.65);
- On-site supervisors/managers directly responsible for employees engaged in hazardous waste operations must have an additional 8 hours of supervisory training (29 CFR 1010.120/1926.65);
- All site personnel must attend and participate in "Daily Safety Tailgate Meeting and document attendance (29 CFR 1910.120);
- Competent person training (29 CFR 1926, Subpart P) for on-site managers and supervisors (subcontractor) directly responsible for employees engaged in excavation/trenching operations;
- Hazard communication training on any hazardous substance's chemical and physical properties (29 CFR 1910.1200);
- Personal protective equipment training for personnel required to wear protective clothing (29 CFR 1910.132 and 134);
- Personnel performing air monitoring must be trained in the calibration, and operation of instrumentation used at the site (29 CFR 1910.120);
- Personnel required to extinguish small fires on site are required to be trained in the proper use of a fire extinguisher (29 CFR 1910.156/1926.150);
- All site personnel must review this HASP and be able to obtain emergency information, if needed. They must also be familiar with established emergency response and evacuation procedures for the site. This information is to be reviewed with all project personnel prior to commencement of field activities (29 CFR 1910.120);
- Workers required to enter confined spaces must be trained in the requirements of confined space entry (29 CFR 1910.146);
- Other training, as required, to comply with OSHA health and safety standards.

10.0 MEDICAL SURVEILLANCE

Medical surveillance consisting of annual physicals are required for site workers, whose job may require working in environments with potential exposure to health hazards such as hazardous waste, petroleum products, materials, noise, lead and crystalline silica. Examination criteria and frequency will be determined based upon guidance and regulatory requirements provided in the applicable OSHA Hazardous Waste Operation and Emergency Response Regulation (29 CFR 1910.120 or 29 CFR 1926.65).

Heat stress may be a significant health and safety issue associated with this project due to the nature of the hazards anticipated to be encountered or because of the time of the year the work is being conducted. The four forms of heat stress include heat rash, heat cramps, heat exhaustion and heat stroke. It is very important to be able to recognize symptoms associated with the various forms of heat stress and to know first aid measures. A table listing forms and symptoms of heat stress is located below. More specific information on heat stress is available from the American Conference of Governmental Industrial Hygienist (ACGIH), as a reference. This information should be reviewed with employees prior to commencing the project, if appropriate.

FORMS AND SYMPTOMS OF HEAT STRESS

FORM	SYMPTOMS	FIRST AID MEASURES
Heat Rash	<ul style="list-style-type: none"> • Prickly heat • Slight to extensive skin irritation could occur 	<ul style="list-style-type: none"> • Keep skin clean and dry for at least 12 hours per day • Change wet clothing
Heat Cramps	<ul style="list-style-type: none"> • Skin is sweaty • Painful muscle spasms • Body temperature is normal 	<ul style="list-style-type: none"> • Provide fluids • Gently massage cramped muscles
Heat Exhaustion	<ul style="list-style-type: none"> • Clammy or pale skin • Weakness and fatigue • Profuse sweating • Nausea, vomiting • Disorientation • Headache • Normal or slightly elevated body temperature 	<ul style="list-style-type: none"> • Remove from heat • Loosen clothing • Sponge skin with cool water • Fan victim; stop if victim shivers or develops goose bumps • Give fluids; give victim a drink solution of one pint water and one teaspoon salt every 30 minutes until recovers • Obtain medical help if victim does not improve
Heat Stroke	<ul style="list-style-type: none"> • Unconsciousness or mental confusion • Dizziness • Staggered walk • Appears to be agitated • Hot, dry skin • Extremely high body temperature; could reach 105° F 	<ul style="list-style-type: none"> • Get emergency medical aid immediately • Remove victim from heat • Remove clothing, place victim in a cool bath, or apply cool compresses • Do not give any fluids • Do not leave victim alone • Do not allow victim to become so cold that victim shivers • Do not give aspirin or other medication in an attempt to lower fever

11.0 ENVIRONMENTAL MONITORING PROGRAM

11.1 Air Monitoring

11.1.1 Area Monitoring: Frequency/Action Levels

It is recognized that the spread of dust should be avoided.

The dust-monitoring program will include real-time dust monitoring and air sampling, as discussed below.

Real-Time Dust Monitoring

Real-time monitoring for total dust will be taken with a Mini-Ram-type Aerosol detector. Real-time monitoring must occur at the start of each new work activity, and at least weekly, as appropriate. Results must be recorded and compared to Occupational Safety and Health Administration's (OSHA's) Permissible Exposure Limit (PELs) for Particulates Not Otherwise Regulated (PNOR), namely, 15 milligrams per cubic meter. Should exceedances of the PEL occur, work will be stopped immediately and work activities and/or the HASP will be modified to prevent future occurrences.

Air Sampling

Air sampling will occur at the beginning of capping.

Two samples will be collected. One sample will be taken at a point upwind of the work, and one at points on the downwind of the work area. Samples will be collected via a calibrated, metered pump onto a suitable filter, shipped under a chain of custody to a certified laboratory, and analyzed for total dust and total lead per the latest version of NIOSH Method 7082. Sample results shall be tabulated for the project and immediately compared to the appropriate OSHA's PELs (15 milligrams per cubic meter for total dust and 0.05 milligrams per cubic meter for total lead). If exceedances of the PELs occur, the contractor must modify the HASP/work practices to avoid future exceedances.

12.0 WORK ZONES/SITE CONTROL

Work zones at the site will be established by the Field Operations Leader and site health and safety representative to delineate high-traffic and hazardous locations and to contain contamination generated from field activities to the smallest area possible. Workers entering these work zones must wear appropriate PPE for that area. Work and support zones will be established from air monitoring data, required security measures and other conditions at the site.

Three primary work zones are to be demarcated. These include the Exclusion Zone (EZ, also referred to as the "hot" zone), Contamination Reduction Zone (CRZ, also referred to as the decon area) and the Support Zone (SZ, trailer area). Each zone will be established by the PM or SHSO prior to commencing daily activities.

The EZ may include areas where equipment is operating, where concrete is being demolished, where contaminated soils are being excavated, moved or stored, and other locations where potential for exposure to contaminated dust exist on the property. At a minimum, Modified Level D PPE is required to be worn in these areas. Air monitoring may be conducted routinely in the EZ. This will vary depending upon location to workers, public and traffic.

The CRZ will be an established corridor leading from the contaminated area (EZ) to the support zone. In some circumstances, the back end of the company pick-up truck may be used. The corridor will be identified by tape, cones, fencing or other barricades. Decontamination of personnel and equipment will occur in this zone. Vehicles and other larger pieces of equipment that may become contaminated can be decontaminated in a separate CRZ.

The SZ will include all areas outside the EZ or CRZ where breaks will be taken, food and beverage may be consumed and general support for workers will be provided from this area.

13.0 DECONTAMINATION PROCEDURES

Field equipment and personal protective equipment may become contaminated during the site activities. It is important to halt the spread of contamination to vehicles, personnel and support areas by using appropriate decontamination procedures. The decontamination procedures discussed for workers and equipment can be used and can be supplemented by the following procedures.

As workers exit the Exclusion Zone into the Contamination Reduction Zone, where the following activities should occur:

- Gross contamination is removed with the brushes supplied on the table.
- Outer boot covers are removed and disposed of in the drum.
- The Tyvek suit is removed and disposed.
- The outer gloves are removed and disposed.
- Inner gloves are removed and disposed.
- Hands should be wiped clean with a toilette and disposed.
- Worker exits the CRZ.

The following decontamination procedures can be used:

Field Equipment: Equipment such as interface probes, bailers, hand tools, drill augers, sampling equipment and other items can be decontaminated with a solution of detergent and water. Equipment should be rinsed with clean water prior to leaving the site. Protect clean materials from exposure by covering with disposable covers such as plastic to minimize required decontamination activities. For example, a small plastic bag can be taped around not-critical portions of air monitoring instrumentation, to protect from damaging electronics by water.

Disposable PPE: PPE including Tyvex suits, respirator cartridges and latex inner gloves can be disposed of according to state, federal and client requirements. Respirator cartridges must be changed out on a daily basis and a cartridge should not be used more than 8 hours. Cartridges can be disposed with other contaminated field equipment and supplies.

Nondisposable PPE: Respirators may be wiped clean with a disinfecting alcohol pad prior to donning. Respirators should be decontaminated at the end of each day, if worn. Decontamination includes disassembly and cleaning, rinsing, sanitizing and drying all parts with approved cleaning and sanitizing agents. Reusable boots and gloves should be rinsed with clean water prior to leaving the site. As a general rule, boots and gloves that have been heavily contaminated should not be used for more than four weeks; after that time it is advisable to use new items.

14.0 CONFINED SPACES

Confined space entry may be required (likely near the end of the project) to decon the frac tanks. Should confined spaces be identified during the project and work personnel be required to enter to perform needed tasks, personnel performing this work shall have training that meets OSHA requirements in 29 CFR 1910.146. Rescue arrangement will need to be arranged in advance of such activities and all involved personnel will be trained in the OSHA requirements for entrants, attendants and supervisors. A permit will be required for such work and will be posted at the entrance to the confined space. The purpose of the CSE procedure is to protect employees from potentially hazardous environments and to facilitate immediate rescue in an emergency situation.

15.0 EXCAVATION ACTIVITIES

Planned site excavation activities generally include the excavation and backfill of certain areas. Excavation shall be conducted in accordance with OSHA's 1926.651 standards. Planned excavations are relatively shallow (3' deep or less) and will occur in relatively large, open areas. Accordingly, concerns regarding excavation depths requiring ladders and conditions such as oxygen deficient atmospheres are not anticipated.

Excavation will include the use of heavy equipment such as excavators, dump trucks, loaders, dozers, and certain hand tools/pumps. Much of the earthmoving activities will occur on steep slopes at the Plant Site, which increases the risk of tipping. Heavy equipment will be equipped with backup alarms. Workers must be aware and take precautions against heavy vehicular traffic and tipping. Workers should not stand next to dump trucks when they are being loaded and/or unloaded to avoid the potential of falling material. Further, dump truck operators shall only raise the bed of the truck if they are on relatively flat, stable ground. Workers should not stand next to dump trucks during dumping or loading.

16.0 RECORD KEEPING REQUIREMENTS

At a minimum, the following records should be maintained at the project site possession:

- The Health and Safety Plan including emergency response, contingency, evacuation plans and Acknowledgement page
- Environmental monitoring data
- Copies of HAZWOPER training records
- Copies of medical clearances
- OSHA 200 Injury and Illness Log and injury/illness/incident reports
- OSHA citations, if any, must be posted in conspicuous location for specified time
- Right-to-Know poster and other mandatory federal and state posters
- Material Safety Data Sheets or other references for hazardous materials on the project site
- Hazardous Waste Manifests
- Hazard Communication Program

17.0 ENVIRONMENTAL, SAFETY AND HEALTH ROLES AND RESPONSIBILITIES OF PROJECT PERSONNEL

The following table summarizes personnel responsibilities at the job site. This information should be reviewed with all project personnel prior to commencing site activities.

Roles and Responsibilities of Project Personnel

PERSONNEL	ROLES AND RESPONSIBILITIES
Field Operations Leader	<ul style="list-style-type: none"> • Provides certain management and resources to achieve goals and objectives of project •
Site Manager/ Site Safety Officer	<ul style="list-style-type: none"> • Responsible for developing and implementing systems to ensure employees follow the HASP • Responsible for general safety performance of employees and implementing a phased disciplinary program for employees violating health and safety programs • Assigns and communicates safety and health responsibility to subordinates and holds subordinates accountable for their performance • Ensures that specific work tasks are properly prioritized, planned and conducted in a safe manner • Verifies all site workers meet OSHA regulatory requirements • Provides resources and equipment necessary to conduct and execute assigned tasks in a safe manner • Provides technical expertise necessary to carry out requirements and support work activities • Provides training on the HASP, Hazard Communication, and other project specific health and safety training • Implements and enforces HASP requirements, with project personnel assigned to work under their jurisdiction • Conducts initial site safety review and conducts exposure and environmental monitoring • Ensures that adequate safety controls are maintained • Obtains related information on suspect hazardous materials to facilitate preparation of hazardous material abatement • Ensures that appropriate health and safety-related project documentation is maintained for the project

Roles and Responsibility of Project Personnel Continued

PERSONNEL	ROLES AND RESPONSIBILITIES
Site Workers	<ul style="list-style-type: none">• Conduct work in a safe manner in accordance with the HASP, other applicable safe work procedures and controls specified in permits• such as hot work or confined space entry permits• Appropriately uses assigned personal protective equipment• Observes their work area surroundings for potential safety issues• Reports unsafe work conditions or practices to the health and safety specialist/site safety and health officer• Initiates feasible personal action to eliminate/mitigate unsafe conditions
Visitors	<ul style="list-style-type: none">• Remain outside designated work zones unless authorized by Project Manager to enter hot or contamination reduction zones wearing appropriate PPE• Comply with all site specific HASP requirements including safe practices and levels of PPE• Comply with training, medical surveillance and other requirements of the HASP, if access is permitted on the site

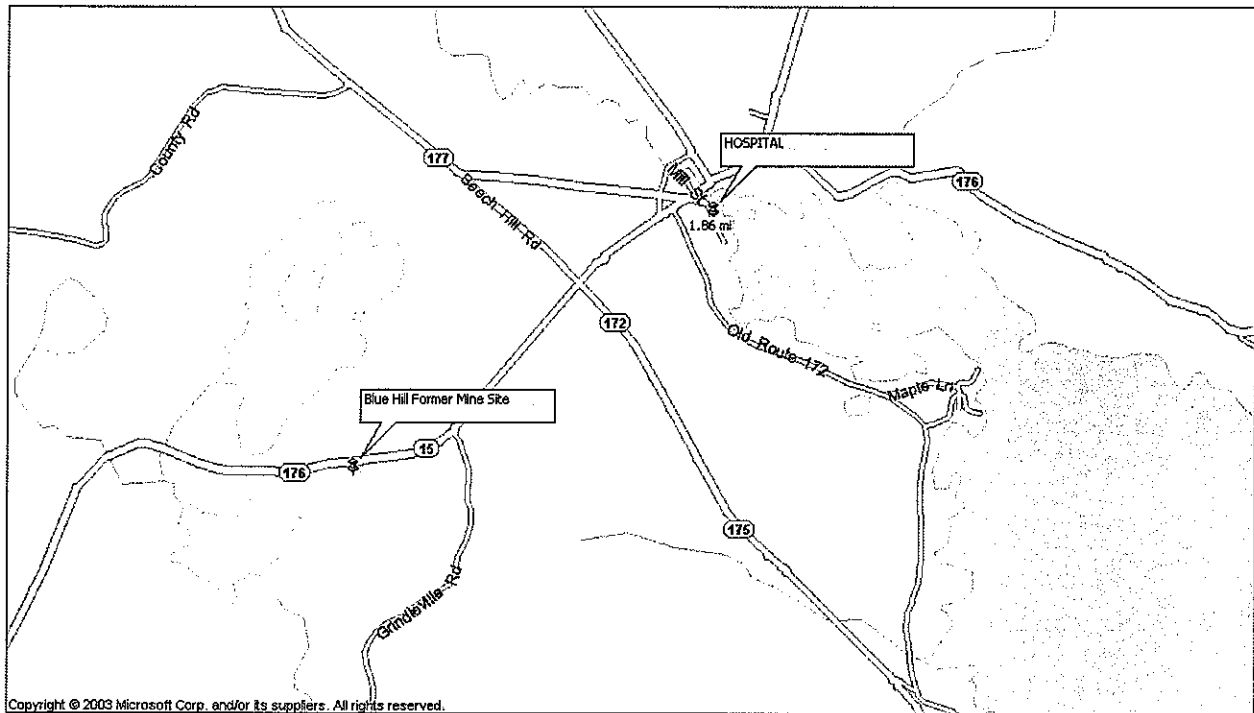
The Field Operation Leader for Phase II will be PJ Hansen, President, Outcome Engineering.

Each of the key contractors will designate their site safety officers as follows:

- RF Jordan is the principal contractor and Dave Carney Sr. will serve as SSO.
- FGS will be providing onsite QA/QC services, typically one person per a given day, so that person will be the SSO
- NEL labs performs the water monitoring with one person, Mike Gordon, who will serve as NEL's SSO
- SME will be providing technical services, also generally one person at a time. That field person will serve as SME's SSO.
- Another key contractor is the geosynthetics installer. That contractor and their designated SSO will be named prior to their mobilization to the site.

APPENDICES

APPENDIX A MAP TO HOSPITAL





Start: 254 Mines Rd
Blue Hill, ME 04614-6335, US

End: Blue Hill Memorial
Hospital: 207-374-2836
57 Water St, Blue Hill, ME
04614, US

Notes:

THE
LOWEST RATE.
GUARANTEED.

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On our hotels
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BestWestern.com

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Directions

Distance

Total Est. Time: 4 minutes

Total Est. Distance: 1.93 miles

START

1: Start out going NORTHEAST on MINES RD / ME-15 / ME-176 toward
PHOENIX LN. Continue to follow ME-15 / ME-176.

1.7 miles



2: Turn SLIGHT RIGHT onto WATER ST.

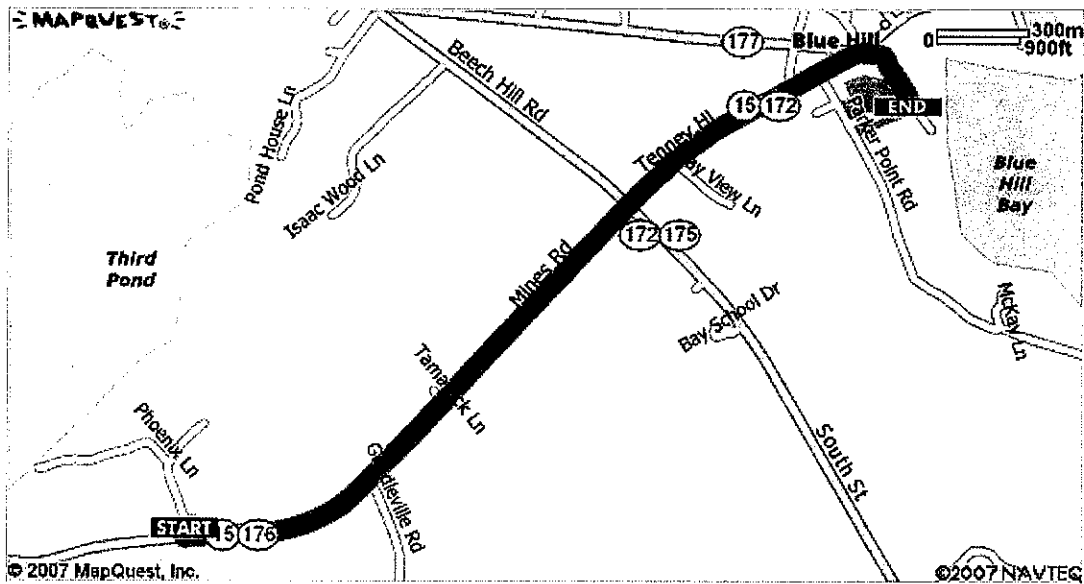
0.1 miles

END

3: End at Blue Hill Memorial Hospital:
57 Water St, Blue Hill, ME 04614, US

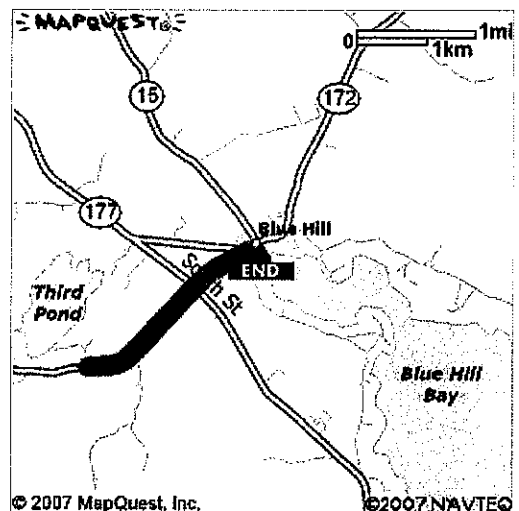
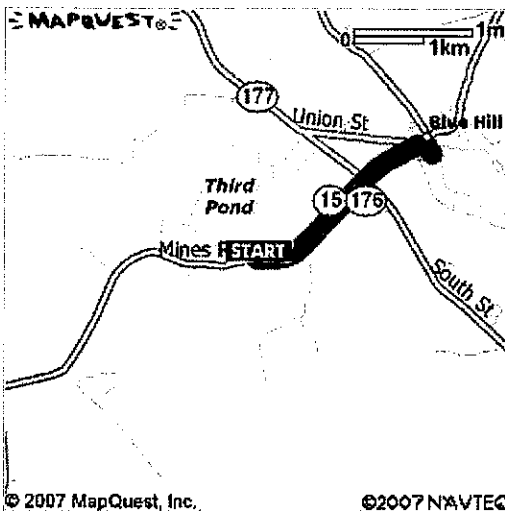
Total Est. Time: 4 minutes

Total Est. Distance: 1.93 miles



Start:
254 Mines Rd
 Blue Hill, ME 04614-6335, US

End:
Blue Hill Memorial Hospital:
 207-374-2836
 57 Water St, Blue Hill, ME 04614, US



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These directions are informational only. No representation is made or warranty given as to their content, road conditions or route usability or expeditiousness. User assumes all risk of use. MapQuest and its suppliers assume no responsibility for any loss or delay resulting from such use.

APPENDIX B
MSDS

LEAD

MSDS Number: L2347 * * * * * Effective Date: 08/10/04 * * * * * Supersedes: 11/02/01

MSDS

Material Safety Data Sheet

From: Mallinckrodt Baker, Inc.
222 Red School Lane
Phillipsburg, NJ 08865



24 Hour Emergency Telephone: 800-859-2151
CHEMTREC: 1-800-424-9300

National Response in Canada
CANUTEC: 613-996-6666

Outside U.S. and Canada
Chemtrec: 703-527-3887

NOTE: CHEMTREC, CANUTEC and National Response Center emergency numbers to be used only in the event of chemical emergencies involving a spill, leak, fire, exposure or accident involving chemicals.

All non-emergency questions should be directed to Customer Service (1-800-552-2537) for assistance.

LEAD METAL

1. Product Identification

Synonyms: Granular lead, pigment metal; C.I. 77575

CAS No.: 7439-92-1

Molecular Weight: 207.19

Chemical Formula: Pb

Product Codes:

J.T. Baker: 2256, 2266

Mallinckrodt: 5668

2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
Lead	7439-92-1	95 - 100%	Yes

3. Hazards Identification

Emergency Overview

POISON! DANGER! MAY BE FATAL IF SWALLOWED OR INHALED. CAUSES IRRITATION TO SKIN, EYES AND RESPIRATORY TRACT. NEUROTOXIN. AFFECTS THE GUM TISSUE, CENTRAL NERVOUS SYSTEM, KIDNEYS, BLOOD AND REPRODUCTIVE SYSTEM. POSSIBLE CANCER HAZARD. MAY CAUSE CANCER BASED ON ANIMAL DATA. Risk of cancer depends on duration and level of exposure.

J.T. Baker SAF-T-DATA^(tm) Ratings (Provided here for your convenience)

Health Rating: 3 - Severe (Life)

Flammability Rating: 0 - None

Reactivity Rating: 0 - None

Contact Rating: 1 - Slight

Lab Protective Equip: GOGGLES; LAB COAT; PROPER GLOVES

Storage Color Code: Blue (Health)

Potential Health Effects

Inhalation:

Lead can be absorbed through the respiratory system. Local irritation of bronchia and lungs can occur and, in cases of acute exposure, symptoms such as metallic taste, chest and abdominal pain, and increased lead blood levels may follow. See also Ingestion.

Ingestion:

POISON! The symptoms of lead poisoning include abdominal pain and spasms, nausea, vomiting, headache. Acute poisoning can lead to muscle weakness, "lead line" on the gums, metallic taste, definite loss of appetite, insomnia, dizziness, high lead levels in blood and urine with shock, coma and death in extreme cases.

Skin Contact:

Lead and lead compounds may be absorbed through the skin on prolonged exposure; the symptoms of lead poisoning described for ingestion exposure may occur. Contact over short periods may cause local irritation, redness and pain.

Eye Contact:

Absorption can occur through eye tissues but the more common hazards are local irritation or abrasion.

Chronic Exposure:

Lead is a cumulative poison and exposure even to small amounts can raise the body's content to toxic levels. The symptoms of chronic exposure are like those of ingestion poisoning; restlessness, irritability, visual disturbances, hypertension and gray facial color may also be noted.

Aggravation of Pre-existing Conditions:

Persons with pre-existing kidney, nerve or circulatory disorders or with skin or eye problems may be more susceptible to the effects of this substance.

4. First Aid Measures

Inhalation:

Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get

medical attention.

Ingestion:

Induce vomiting immediately as directed by medical personnel. Never give anything by mouth to an unconscious person. Get medical attention.

Skin Contact:

Immediately flush skin with plenty of soap and water for at least 15 minutes. Remove contaminated clothing and shoes. Get medical attention. Wash clothing before reuse. Thoroughly clean shoes before reuse.

Eye Contact:

Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

5. Fire Fighting Measures

Fire:

Not considered to be a fire hazard. Powder/dust is flammable when heated or exposed to flame.

Explosion:

Not considered to be an explosion hazard.

Fire Extinguishing Media:

Use any means suitable for extinguishing surrounding fire. Do not allow water runoff to enter sewers or waterways.

Special Information:

In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode. Can produce toxic lead fumes at elevated temperatures and also react with oxidizing materials.

6. Accidental Release Measures

Ventilate area of leak or spill. Wear appropriate personal protective equipment as specified in Section 8.

Spills: Sweep up and containerize for reclamation or disposal. Vacuuming or wet sweeping may be used to avoid dust dispersal. US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802.

7. Handling and Storage

Keep in a tightly closed container, stored in a cool, dry, ventilated area. Protect against physical damage. Isolate from incompatible substances. Areas in which exposure to lead metal or lead compounds may occur should be identified by signs or appropriate means, and access to the area should be limited to authorized persons. Containers of this material may be hazardous when empty since they retain product residues (dust, solids); observe all warnings and precautions listed for the product.

Exposure Controls/Personal Protection

Airborne Exposure Limits:

For lead, metal and inorganic dusts and fumes, as Pb:

-OSHA Permissible Exposure Limit (PEL): 0.05 mg/m³ (TWA)

For lead, elemental and inorganic compounds, as Pb:

-ACGIH Threshold Limit Value (TLV): 0.05 mg/m³ (TWA), A3 animal carcinogen

ACGIH Biological Exposure Indices (BEI): 30 ug/100ml, notation B (see actual Indices for more information).

For lead, inorganic:

-NIOSH Recommended Exposure Limit (REL): 0.1 mg/m³ (TWA)

Ventilation System:

A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices*, most recent edition, for details.

Personal Respirators (NIOSH Approved):

If the exposure limit is exceeded and engineering controls are not feasible, a half-face high efficiency particulate respirator (NIOSH type N100 filter) may be worn for up to ten times the exposure limit or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. A full-face piece high efficiency particulate respirator (NIOSH type N100 filter) may be worn up to 50 times the exposure limit, or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. If oil particles (e.g. lubricants, cutting fluids, glycerine, etc.) are present, use a NIOSH type R or P filter. For emergencies or instances where the exposure levels are not known, use a full-facepiece positive-pressure, air-supplied respirator. **WARNING:** Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.

Skin Protection:

Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.

Eye Protection:

Use chemical safety goggles and/or full face shield where dusting or splashing of solutions is possible. Maintain eye wash fountain and quick-drench facilities in work area.

Other Control Measures:

Eating, drinking, and smoking should not be permitted in areas where solids or liquids containing lead compounds are handled, processed, or stored. See OSHA substance-specific standard for more information on personal protective equipment, engineering and work practice controls, medical surveillance, record keeping, and reporting requirements. (29 CFR 1910.1025).

9. Physical and Chemical Properties

Appearance:

Small, white to blue-gray metallic shot or granules.

Odor:

Odorless.

Solubility:

Insoluble in water.

Density:

11.34

pH:

No information found.

% Volatiles by volume @ 21C (70F):

0

Boiling Point:

1740C (3164F)

Melting Point:

327.5C (622F)

Vapor Density (Air=1):

No information found.

Vapor Pressure (mm Hg):

1.77 @ 1000C (1832F)

Evaporation Rate (BuAc=1):

No information found.

10. Stability and Reactivity

Stability:

Stable under ordinary conditions of use and storage.

Hazardous Decomposition Products:

Does not decompose but toxic lead or lead oxide fumes may form at elevated temperatures.

Hazardous Polymerization:

Will not occur.

Incompatibilities:

Ammonium nitrate, chlorine trifluoride, hydrogen peroxide, sodium azide, zirconium, disodium acetylide, sodium acetylide and oxidants.

Conditions to Avoid:

Heat, flames, ignition sources and incompatibles.

11. Toxicological Information

Toxicological Data:

Investigated as a tumorigen, mutagen, reproductive effector.

Reproductive Toxicity:

Lead and other smelter emissions are human reproductive hazards. (Chemical Council on Environmental Quality; Chemical Hazards to Human Reproduction, 1981).

Carcinogenicity:

EPA / IRIS classification: Group B2 - Probable human carcinogen, sufficient animal evidence.

-----\Cancer Lists\-----			
---NTP Carcinogen---			
Ingredient	Known	Anticipated	IARC Category
-----	-----	-----	-----

12. Ecological Information

Environmental Fate:

When released into the soil, this material is not expected to leach into groundwater. This material may bioaccumulate to some extent.

Environmental Toxicity:

No information found.

13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be managed in an appropriate and approved waste facility. Although not a listed RCRA hazardous waste, this material may exhibit one or more characteristics of a hazardous waste and require appropriate analysis to determine specific disposal requirements. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

Transport Information

Not regulated.

15. Regulatory Information

-----\Chemical Inventory Status - Part 1\-----				
Ingredient	TSCA	EC	Japan	Australia
Lead (7439-92-1)	Yes	Yes	Yes	Yes

-----\Chemical Inventory Status - Part 2\-----				
Ingredient	Korea	--Canada--		Phil.
Lead (7439-92-1)	Yes	DSL	NDSL	Yes

-----\Federal, State & International Regulations - Part 1\-----				
Ingredient	-SARA 302- RQ	TPQ	-----SARA 313----- List Chemical Catg.	
Lead (7439-92-1)	No	No	Yes	No

-----\Federal, State & International Regulations - Part 2\-----

Ingredient	CERCLA	-RCRA- 261.33	-TSCA- 8 (d)
1 (7439-92-1)	10	No	No

Chemical Weapons Convention: No TSCA 12(b): No CDTA: No
SARA 311/312: Acute: Yes Chronic: Yes Fire: No Pressure: No
Reactivity: No (Pure / Solid)

WARNING:

THIS PRODUCT CONTAINS CHEMICALS KNOWN TO THE STATE OF CALIFORNIA TO CAUSE CANCER AND BIRTH DEFECTS OR OTHER REPRODUCTIVE HARM.

Australian Hazchem Code: None allocated.

Poison Schedule: S6

WHMIS:

This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

16. Other Information

NFPA Ratings: Health: 3 Flammability: 1 Reactivity: 0

Label Hazard Warning:

POISON! DANGER! MAY BE FATAL IF SWALLOWED OR INHALED. CAUSES IRRITATION TO SKIN, EYES AND RESPIRATORY TRACT. NEUROTOXIN. AFFECTS THE GUM TISSUE, CENTRAL NERVOUS SYSTEM, KIDNEYS, BLOOD AND REPRODUCTIVE SYSTEM. POSSIBLE CANCER HAZARD. MAY CAUSE CANCER BASED ON ANIMAL DATA. Risk of cancer depends on duration and level of exposure.

Label Precautions:

Do not get in eyes, on skin, or on clothing.

Do not breathe dust.

Keep container closed.

Use only with adequate ventilation.

Wash thoroughly after handling.

Label First Aid:

If swallowed, induce vomiting immediately as directed by medical personnel. Never give anything by mouth to an unconscious person. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes. Remove contaminated clothing and shoes. Wash clothing before reuse. In all cases, get medical attention.

Product Use:

Laboratory Reagent.

Revision Information:

No Changes.

Disclaimer:

Malinckrodt Baker, Inc. provides the information contained herein in good faith but makes no

representation as to its comprehensiveness or accuracy. This document is intended only as a guide to the appropriate precautionary handling of the material by a properly trained person using this product. Individuals receiving the information must exercise their independent judgment in determining its appropriateness for a particular purpose. MALLINCKRODT BAKER, INC. MAKES NO REPRESENTATIONS OR WARRANTIES, EITHER EXPRESS OR IMPLIED, INCLUDING WITHOUT LIMITATION ANY WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE WITH RESPECT TO THE INFORMATION SET FORTH HEREIN OR THE PRODUCT TO WHICH THE INFORMATION REFERS. ACCORDINGLY, MALLINCKRODT BAKER, INC. WILL NOT BE RESPONSIBLE FOR DAMAGES RESULTING FROM USE OF OR RELIANCE UPON THIS INFORMATION.

Prepared by: Environmental Health & Safety
Phone Number: (314) 654-1600 (U.S.A.)

CADMIUM



ELECTRONIC SPACE PRODUCTS INTERNATIONAL

1050 Benson Way, Ashland, OR 97520
 Toll Free (800) 638-2581 * Fax (541) 488-8313
 E-Mail: sales@espimetals.com

MATERIAL SAFETY DATA SHEET**I PRODUCT IDENTIFICATION**

Trade Name: Cadmium
Formula: Cd
CAS #: 7440-43-9

Chemical Nature: Group II B
Molecular Weight: 112.4

II HAZARDOUS INGREDIENTS

Hazardous Components	%	OSHA/PEL	ACGIH/TLV
100	0-100	0.05 mg/m ³ As dust & fume	0.2 mg/m ³ As dust and salts

III PHYSICAL DATA

Boiling Point:	1409 °F	Specific Gravity:	8.65
Vapor Pressure (mm Hg):	at 740 °F 1 mm	Vapor Density:	N/A
% Volatiles by Weight:	N/A	Solubility:	Insoluble in water
Appearance and Odor:	Soft blue-white malleable, odorless metal.		

IV FIRE AND EXPLOSION HAZARDS DATA

Flash Point (Method used): N/A
Flammable Limits: Upper: N/A Lower: N/A

Autoignition Temperature: N/A

Extinguishing Media: Graphite, soda ash, powdered sodium chloride, or dry sand.

Special Fire Fighting Procedures: Firefighters must wear self-contained breathing apparatus and full protective clothing. If possible, move containers from fire area and cool containers exposed to flame.

Fire & Explosion: Violent explosions can occur when the metal is in contact with fused ammonium nitrate or immersed in ac. acid.

Steps to Be Taken in Case Material Is Released or Spilled: Contain spill, isolate hazard area and deny entry. Ventilate area of release. Making further dusts. Cadmium and its compounds can pose a severe threat to the environment. Water, soil, and air contamination should be prevented.

Waste Disposal Method: Return spilled material to process or dispose of material in accordance with RCRA CFR 40 parts 261-265 or local environmental regulations.

VIII SPECIAL PROTECTION INFORMATION

Respiratory Protection (Specify Type): High efficiency particulate respirator with a full faceplate, or supplied-air respirator, or self contained breathing apparatus.

Ventilation: Local exhaust is required for dust or fume.

Protective Gloves: General latex type for powders

Eye Protection: Close fitting safety goggles

Other Protective Equipment: Wear protective clothing. Contact lenses should not be worn when airborne dust is present.

IX SPECIAL PRECAUTIONS

Precautions to Be Taken in Handling and Storing: Care must be taken to prevent fires when cadmium dust or powder are present. Cadmium should be stored in a dry covered place.

Work Practices: Scrupulous attention to personal hygiene and proper protective measures are essential when cadmium and its compounds are stored, handled or processed in any way. Washing thoroughly after handling and before eating, drinking, and smoking.

Engineering Controls: Use special vacuum cleaners and dust collectors with high efficiency filters to collect dust or powders. Large amounts of dust should be caught in bag house.

Hygienic Practices: In areas of cadmium exposure, showering after each work shift is recommended. Clothing worn in areas of cadmium exposure should be restricted to the workplace and laundered regularly.

Maintenance Personnel: If working in the same area, they should follow same work and hygienic practices as everyone else.

Other Precautions: Refrain from eating, drinking, or smoking in the work place.

The above information is believed to be correct, but does not purport to be all inclusive and shall be used only as a guide. ESPI shall not be held liable for any damage resulting from handling or from contact with the above product.

Issued by: S. Dierks

Date: May 2003

ZINC

MSDS Number: Z0858 * * * * Effective Date: 01/25/06 * * * * Supersedes: 05/07/03

MSDS**Material Safety Data Sheet**

From: Mallinckrodt Baker, Inc.
222 Red School Lane
Phillipsburg, NJ 08865



Mallinckrodt
CHEMICALS



24 Hour Emergency Telephone: 800-858-2151
CHEMTREC: 1-800-424-9300

National Response in Canada
CANUTEC: 613-896-6666

Outside U.S. and Canada
Chemtrec: 703-527-3887

NOTE: CHEMTREC, CANUTEC and National Response Center emergency numbers to be used only in the event of chemical emergencies involving a spill, leak, fire, exposure or accident involving chemicals.

All non-emergency questions should be directed to Customer Service (1-800-582-2537) for assistance.

ZINC METAL POWDER

1. Product Identification

Synonyms: Powdered zinc; blue powder; CI77945; CI Pigment Black 16

CAS No.: 7440-66-6

Molecular Weight: 65.37

Chemical Formula: Zn

Product Codes:

J.T. Baker: 4282

Mallinckrodt: 8681

2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
Zinc	7440-66-6	96 - 97%	Yes
Zinc Oxide	1314-13-2	0 - 3%	Yes
Lead	7439-92-1	0 - 0.3%	Yes

Hazards Identification

Emergency Overview

WARNING! HARMFUL IF SWALLOWED OR INHALED. MAY CAUSE IRRITATION TO SKIN, EYES, AND RESPIRATORY TRACT. MAY FORM COMBUSTIBLE DUST CONCENTRATIONS IN AIR. WATER REACTIVE. MAY AFFECT THE GUM TISSUE, CENTRAL NERVOUS SYSTEM, KIDNEYS, BLOOD AND REPRODUCTIVE SYSTEM (lead component).

SAF-T-DATA^(tm) Ratings (Provided here for your convenience)

Health Rating: 2 - Moderate (Cancer)

Flammability Rating: 2 - Moderate

Reactivity Rating: 2 - Moderate

Contact Rating: 1 - Slight

Lab Protective Equip: GOGGLES & SHIELD; LAB COAT & APRON; VENT HOOD; PROPER GLOVES

Storage Color Code: Green (General Storage)

Potential Health Effects

Inhalation:

No adverse effects expected but dust may cause mechanical irritation. The effects may be expected to resemble those of inhaling an inert dust; possible difficulty in breathing, sneezing, coughing. When heated, the fumes are highly toxic and may cause fume fever.

Ingestion:

Extremely large oral dosages may produce gastrointestinal disturbances, due both to mechanical effects and the possibility of reaction with gastric juice to produce zinc chloride. Pain, stomach cramps and nausea could occur in aggravated cases.

Skin Contact:

May cause irritation.

Eye Contact:

May cause irritation.

Chronic Exposure:

No adverse health effects expected.

Aggravation of Pre-existing Conditions:

Persons with pre-existing skin disorders or impaired respiratory function may be more susceptible to the effects of the substance.

4. First Aid Measures

Inhalation:

Remove to fresh air. Get medical attention for any breathing difficulty.

Ingestion:

Induce vomiting immediately as directed by medical personnel. Never give anything by mouth to an unconscious person.

Skin Contact:

Wipe off excess material from skin then immediately flush skin with plenty of water for at least 15 minutes. Remove contaminated clothing and shoes. Get medical attention. Wash clothing before reuse. Thoroughly clean shoes before reuse.

Eye Contact:

Immediately flush eyes with plenty of water for at least 15 minutes, lifting upper and lower eyelids occasionally. Get medical attention if irritation persists.

5. Fire Fighting Measures

Fire:

Autoignition temperature: ca. 460C (ca. 860F)

The listed autoignition temperature is for Zinc powder (layer); dust cloud is ca. 680C (1255F). Zinc powder is not pyrophoric but will burn in air at elevated temperatures. Bulk dust in damp state may heat spontaneously and ignite on exposure to air. Releases flammable hydrogen gas upon contact with acids or alkali hydroxides. Contact with strong oxidizers may cause fire.

Explosion:

Fine dust dispersed in air in sufficient concentrations, and in the presence of an ignition source is a potential dust explosion hazard.

Fire Extinguishing Media:

Smother with a suitable dry powder (sodium chloride, magnesium oxide, Met-L-X).

Special Information:

In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode.

6. Accidental Release Measures

Remove all sources of ignition and provide mild ventilation in area of spill. Substance may be pyrophoric and self-ignite. Clean-up personnel require protective clothing, goggles and dust/mist respirators. Sweep or vacuum up the spill in a manner that does not disperse zinc powder in the air and place the zinc in a closed container for recovery or disposal.

US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802.

7. Handling and Storage

Keep in a tightly closed container. Protect from physical damage. Store in a cool, dry, ventilated area away from sources of heat, moisture and incompatibilities. Containers of this material may be hazardous when empty since they retain product residues (dust, solids); observe all warnings and precautions listed for the product.

8. Exposure Controls/Personal Protection

Airborne Exposure Limits:

None for Zinc metal.

-OSHA Permissible Exposure Limit (PEL):

10 mg/m³ (TWA), for zinc oxide fume

-ACGIH Threshold Limit Value (TLV):

10 mg/m³ (TWA), Inhalable fraction, A4 Not classifiable as a human carcinogen for zinc oxide.

Ventilation System:

A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices*, most recent edition, for details.

Personal Respirators (NIOSH Approved):

If the exposure limit is exceeded and engineering controls are not feasible, a full facepiece particulate respirator (NIOSH type N100 filters) may be worn for up to 50 times the exposure limit or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. If oil particles (e.g. lubricants, cutting fluids, glycerine, etc.) are present, use a NIOSH type R or P filter. For emergencies or instances where the exposure levels are not known, use a full-facepiece positive-pressure, air-supplied respirator. **WARNING:** Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.

Skin Protection:

Wear protective gloves and clean body-covering clothing.

Eye Protection:

Use chemical safety goggles. Maintain eye wash fountain and quick-drench facilities in work area.

9. Physical and Chemical Properties

Appearance:

Gray or bluish-gray powder.

Odor:

Odorless.

Solubility:

Insoluble in water.

Density:

7.14

pH:

No information found.

% Volatiles by volume @ 21C (70F):

0

Boiling Point:

907C (1665F)

Melting Point:

419C (786F)

Vapor Density (Air=1):

No information found.

Vapor Pressure (mm Hg):

1 @ 487C (909F)

Evaporation Rate (BuAc=1):

No information found.

10. Stability and Reactivity

Stability:

Stable under ordinary conditions of use and storage. Moist zinc dust can react exothermically and ignite spontaneously in air.

Hazardous Decomposition Products:

Hydrogen in moist air, zinc oxide with oxygen at high temperature. Zinc metal, when melted, produces zinc vapor which oxidizes and condenses in air to form zinc fume.

Hazardous Polymerization:

Will not occur.

Incompatibilities:

Zinc powder can react violently with water, sulfur and halogens. Dangerous or potentially dangerous with strong oxidizing agents, lower molecular weight chlorinated hydrocarbons, strong acids and alkalis.

Conditions to Avoid:

Heat, flames, ignition sources and incompatibles.

Toxicological Information

Zinc: Irritation skin, human: 300 ug/3D-I mild; investigated as a mutagen.

-----\Cancer Lists\-----

Ingredient	---NTP Carcinogen---		IARC Category
	Known	Anticipated	
Zinc (7440-66-6)	No	No	None
Zinc Oxide (1314-13-2)	No	No	None
Lead (7439-92-1)	No	No	2B

12. Ecological Information

Environmental Fate:

No information found.

Environmental Toxicity:

No information found.

13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be handled as hazardous waste and sent to a RCRA approved waste facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

14. Transport Information

Not regulated.

15. Regulatory Information

-----\Chemical Inventory Status - Part 1\-----				
Ingredient	TSCA	EC	Japan	Australia
Zinc (7440-66-6)	Yes	Yes	No	Yes
Zinc Oxide (1314-13-2)	Yes	Yes	Yes	Yes
Lead (7439-92-1)	Yes	Yes	Yes	Yes

-----\Chemical Inventory Status - Part 2\-----				
Ingredient	Korea	--Canada--		
		DSL	NDSL	Phil.
Zinc (7440-66-6)	Yes	Yes	No	Yes
Zinc Oxide (1314-13-2)	Yes	Yes	No	Yes
Lead (7439-92-1)	Yes	Yes	No	Yes

-----\Federal, State & International Regulations - Part 1\-----				
Ingredient	-SARA 302-		-----SARA 313-----	
	RQ	TPQ	List	Chemical Catg.
Zinc (7440-66-6)	No	No	Yes	No
Zinc Oxide (1314-13-2)	No	No	No	Zinc compound
Lead (7439-92-1)	No	No	Yes	No

-----\Federal, State & International Regulations - Part 2\-----			
Ingredient	CERCLA	-RCRA-	-TSCA-
		261.33	8 (d)
Zinc (7440-66-6)	1000	No	No
Zinc Oxide (1314-13-2)	No	No	No
Lead (7439-92-1)	10	No	No

Chemical Weapons Convention: No TSCA 12(b): No CDTA: No
 SARA 311/312: Acute: Yes Chronic: No Fire: Yes Pressure: No
 Reactivity: Yes (Mixture / Solid)

WARNING:

THIS PRODUCT CONTAINS CHEMICALS KNOWN TO THE STATE OF CALIFORNIA TO CAUSE CANCER AND BIRTH DEFECTS OR OTHER REPRODUCTIVE HARM.

Australian Hazchem Code: 4Y

Poison Schedule: S6

WHMIS:

This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

16. Other Information

NFPA Ratings: Health: 2 Flammability: 2 Reactivity: 2

Label Hazard Warning:

WARNING! HARMFUL IF SWALLOWED OR INHALED. MAY CAUSE IRRITATION TO SKIN, EYES, AND RESPIRATORY TRACT. MAY FORM COMBUSTIBLE DUST CONCENTRATIONS IN AIR. WATER REACTIVE. MAY AFFECT THE GUM TISSUE, CENTRAL NERVOUS SYSTEM, KIDNEYS, BLOOD AND REPRODUCTIVE SYSTEM (lead component).

Label Precautions:

Avoid breathing dust.

Avoid contact with eyes, skin and clothing.

Keep away from heat and flame.

Keep container closed.

Use with adequate ventilation.

Wash thoroughly after handling.

Label First Aid:

If swallowed, induce vomiting immediately as directed by medical personnel. Never give anything by mouth to an unconscious person. If inhaled, remove to fresh air. Get medical attention for any breathing difficulty. In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes. Get medical attention if irritation develops or persists.

Product Use:

Laboratory Reagent.

Revision Information:

MSDS Section(s) changed since last revision of document include: 3, 15.

Disclaimer:

Mallinckrodt Baker, Inc. provides the information contained herein in good faith but makes no representation as to its comprehensiveness or accuracy. This document is intended only as a guide to the appropriate precautionary handling of the material by a properly trained person using this product. Individuals receiving the information must exercise their independent judgment in determining its appropriateness for a particular purpose. MALLINCKRODT BAKER, INC. MAKES NO REPRESENTATIONS OR WARRANTIES, EITHER EXPRESS OR IMPLIED, INCLUDING WITHOUT LIMITATION ANY WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE WITH RESPECT TO THE INFORMATION SET FORTH HEREIN OR THE PRODUCT TO WHICH THE INFORMATION REFERS. ACCORDINGLY, MALLINCKRODT BAKER, INC. WILL NOT BE RESPONSIBLE FOR DAMAGES RESULTING FROM USE OF OR RELIANCE UPON THIS INFORMATION.

Prepared by: Environmental Health & Safety
Phone Number: (314) 654-1600 (U.S.A.)

COPPER

MSDS Number: C5170 * * * * * Effective Date: 02/23/06 * * * * * Supercedes: 02/12/04

MSDS

Material Safety Data Sheet

From: Mallinckrodt Baker, Inc.
222 Red School Lane
Phillipsburg, NJ 08865



24 Hour Emergency Telephone: 800-858-2151
CHEMTREC: 1-800-424-9300

National Response in Canada
CANUTEC: 613-896-6666

Outside U.S. and Canada
Chemtrec: 703-527-3887

NOTE: CHEMTREC, CANUTEC and National Response Center emergency numbers to be used only in the event of chemical emergencies involving a spill, leak, fire, exposure or accident involving chemicals.

All non-emergency questions should be directed to Customer Service (1-800-582-2537) for assistance.

COPPER METAL

1. Product Identification

Synonyms: C.I. 77400; Arwood Copper

CAS No.: 7440-50-8

Molecular Weight: 63.546

Chemical Formula: Cu

Product Codes:

J.T. Baker: 1714, 1720, 1732, 1736

Mallinckrodt: 1733, 4649

2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
Copper	7440-50-8	90 - 100%	Yes

3. Hazards Identification

Emergency Overview

WARNING! HARMFUL IF SWALLOWED OR INHALED. CAUSES IRRITATION TO SKIN, EYES AND RESPIRATORY TRACT. AFFECTS THE LIVER AND KIDNEYS. CHRONIC EXPOSURE MAY CAUSE TISSUE DAMAGE.

SAF-T-DATA^(tm) Ratings (Provided here for your convenience)

Health Rating: 3 - Severe (Life)

Flammability Rating: 1 - Slight

Reactivity Rating: 2 - Moderate

Contact Rating: 1 - Slight

Lab Protective Equip: GOGGLES & SHIELD; LAB COAT & APRON; VENT HOOD; PROPER GLOVES

Storage Color Code: Green (General Storage)

Potential Health Effects

Inhalation:

Inhalation of dusts and fumes of metallic copper causes irritation of the upper respiratory tract, congestion of nasal mucous membranes, ulceration and perforation of the nasal septum, and pharyngeal congestion. Inhalation of copper fumes may give rise to metal fume fever (high temperature, metallic taste, nausea, coughing, general weakness, muscle aches, and exhaustion).

Ingestion:

Copper ingestion causes nausea, vomiting, abdominal pain, metallic taste, and diarrhea. Ingestion of large doses may cause stomach and intestine ulceration, jaundice, and kidney and liver damage.

Skin Contact:

Causes irritation to skin. Symptoms include redness, itching, and pain. Exposure to copper dust may cause a greenish-black skin discoloration.

Eye Contact:

Small copper particles in the eyes may cause irritation, discoloration, and damage.

Chronic Exposure:

Prolonged or repeated exposure to copper can discolor skin and hair and irritate the skin; may cause mild dermatitis, runny nose, and irritation of the mucous membranes. Repeated ingestion may damage the liver and kidneys. Repeated inhalation can cause chronic respiratory disease.

Aggravation of Pre-existing Conditions:

Persons with pre-existing skin disorders or impaired liver, kidney, or pulmonary function or pre-existing Wilson's disease may be more susceptible to the effects of this material.

4. First Aid Measures

Inhalation:

Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

Ingestion:

Induce vomiting immediately as directed by medical personnel. Never give anything by mouth to an unconscious person.

Skin Contact:

Immediately flush skin with plenty of soap and water for at least 15 minutes. Remove contaminated clothing and shoes. Get medical attention. Wash clothing before reuse. Thoroughly clean shoes before reuse.

Eye Contact:

Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

5. Fire Fighting Measures

Fire:

Not considered to be a fire hazard since the bulk solid does not burn, but very finely divided particles (ultra-fine powder) may burn in air.

Explosion:

Not considered to be an explosion hazard. Reactions with incompatibles may pose an explosion hazard. Liquid copper explodes on contact with water. High concentrations of finely divided copper particles in the air may present an explosion hazard.

Fire Extinguishing Media:

Use any means suitable for extinguishing surrounding fire.

Special Information:

In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode.

Accidental Release Measures

Ventilate area of leak or spill. Wear appropriate personal protective equipment as specified in Section 8.

Spills: Sweep up and containerize for reclamation or disposal. Vacuuming or wet sweeping may be used to avoid dust dispersal. US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802.

7. Handling and Storage

Keep in a tightly closed container, stored in a cool, dry, ventilated area. Protect against physical damage. Avoid exposure to air and moisture. Isolate from incompatible substances. Containers of this material may be hazardous when empty since they retain product residues (dust, solids); observe all warnings and precautions listed for the product.

8. Exposure Controls/Personal Protection

Airborne Exposure Limits:

Copper Dust and Mists, as Cu:

- OSHA Permissible Exposure Limit (PEL) -
mg/m³ (TWA)
- ACGIH Threshold Limit Value (TLV) -
1 mg/m³ (TWA)

Copper Fume:

- OSHA Permissible Exposure Limit (PEL) -
0.1 mg/m³ (TWA)
- ACGIH Threshold Limit Value (TLV) -
0.2 mg/m³ (TWA)

Ventilation System:

A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices*, most recent edition, for details.

Personal Respirators (NIOSH Approved):

If the exposure limit is exceeded and engineering controls are not feasible, a full facepiece particulate respirator (NIOSH type N100 filters) may be worn for up to 50 times the exposure limit or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. If oil particles (e.g. lubricants, cutting fluids, glycerine, etc.) are present, use a NIOSH type R or P filter. For emergencies or instances where the exposure levels are not known, use a full-facepiece positive-pressure, air-supplied respirator. **WARNING:** Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.

Skin Protection:

Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.

Eye Protection:

Use chemical safety goggles and/or full face shield where dusting or splashing of solutions is possible. Maintain eye wash fountain and quick-drench facilities in work area.

9. Physical and Chemical Properties

Appearance:

Reddish, metallic solid.

Odor:

Odorless.

Solubility:

Insoluble in water.

Density:

8.94

pH:

No information found.

% Volatiles by volume @ 21C (70F):

0

Boiling Point:

595C (4703F)

Melting Point:

1083C (1981F)

Vapor Density (Air=1):

Not applicable.

Vapor Pressure (mm Hg):

1 @ 1628C (2962F)

Evaporation Rate (BuAc=1):

No information found.

10. Stability and Reactivity

Stability:

Stable under ordinary conditions of use and storage. Copper becomes dull when exposed to air; on exposure to moist air it gradually converts to the carbonate. On long standing, a white, highly explosive peroxide deposit may form.

Hazardous Decomposition Products:

No information found.

Hazardous Polymerization:

Will not occur.

Incompatibilities:

Copper is incompatible with oxidizers, alkalis, acetylene, chlorine plus oxygen difluoride, phosphorus, nitric acid, potassium peroxide, 1-bromo-2-propyne, sulfur plus chlorates. Reacts violently with ammonium nitrate, bromates, iodates, chlorates, ethylene oxide, hydrozoic acid, potassium oxide, dimethyl sulfoxide plus trichloroacetic acid, hydrogen peroxide, sodium peroxide, sodium azide, sulfuric acid, hydrogen sulfide plus air, and lead azide. A potentially explosive reaction occurs with actylenic compounds. Copper ignites on contact with chlorine, fluorine (above 121C), chlorine trifluoride, and hydrazinum nitrate (above 70C). An incandescent reaction occurs with potassium dioxide.

Conditions to Avoid:

Incompatibles and prolonged exposure to air and moisture.

11. Toxicological Information

No LD50/LC50 information found relating to normal routes of occupational exposure. Investigated as a tumorigen and a reproductive effector.

-----\Cancer Lists\-----

Ingredient	---NTP Carcinogen---		IARC Category
	Known	Anticipated	
Copper (7440-50-8)	No	No	None

Toxicological Information

Environmental Fate:

No information found.

Environmental Toxicity:

No information found.

13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be managed in an appropriate and approved waste disposal facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

14. Transport Information

Not regulated.

15. Regulatory Information

-----\Chemical Inventory Status - Part 1\-----				
Ingredient	TSCA	EC	Japan	Australia
Copper (7440-50-8)	Yes	Yes	No	Yes

-----\Chemical Inventory Status - Part 2\-----				
Ingredient	Korea	DSL	NDSL	Phil.
Copper (7440-50-8)	Yes	Yes	No	Yes

-----\Federal, State & International Regulations - Part 1\-----				
Ingredient	-SARA 302- RQ	TPQ	-SARA 313- List	Chemical Catg.
Copper (7440-50-8)	No	No	Yes	No

-----\Federal, State & International Regulations - Part 2\-----				
Ingredient	CERCLA	-RCRA- 261.33	-TSCA- 8 (d)	
Copper (7440-50-8)	5000	No	No	

Chemical Weapons Convention: No TSCA 12(b): No CDTA: No
SARA 311/312: Acute: Yes Chronic: Yes Fire: No Pressure: No
Reactivity: No (Pure / Solid)

Australian Hazchem Code: None allocated.

Poison Schedule: None allocated.

VHMIS:

This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

16. Other Information

NFPA Ratings: Health: 2 Flammability: 0 Reactivity: 0

Label Hazard Warning:

WARNING! HARMFUL IF SWALLOWED OR INHALED. CAUSES IRRITATION TO SKIN, EYES AND RESPIRATORY TRACT. AFFECTS THE LIVER AND KIDNEYS. CHRONIC EXPOSURE MAY CAUSE TISSUE DAMAGE.

Label Precautions:

Avoid contact with eyes, skin and clothing.

Wash thoroughly after handling.

Avoid breathing dust or vapors.

Keep container closed.

Use only with adequate ventilation.

Label First Aid:

If swallowed, induce vomiting immediately as directed by medical personnel. Never give anything by mouth to an unconscious person. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes. Remove contaminated clothing and shoes. Wash clothing before reuse. In all cases, get medical attention.

Product Use:

Laboratory Reagent.

Revision Information:

MSDS Section(s) changed since last revision of document include: 3.

Disclaimer:

Mallinckrodt Baker, Inc. provides the information contained herein in good faith but makes no representation as to its comprehensiveness or accuracy. This document is intended only as a guide to the appropriate precautionary handling of the material by a properly trained person using this product. Individuals receiving the information must exercise their independent judgment in determining its appropriateness for a particular purpose. MALLINCKRODT BAKER, INC. MAKES NO REPRESENTATIONS OR WARRANTIES, EITHER EXPRESS OR IMPLIED, INCLUDING WITHOUT LIMITATION ANY WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE WITH RESPECT TO THE INFORMATION SET FORTH HEREIN OR THE PRODUCT TO WHICH THE INFORMATION REFERS. ACCORDINGLY, MALLINCKRODT BAKER, INC. WILL NOT BE RESPONSIBLE FOR DAMAGES RESULTING FROM USE OF OR RELIANCE UPON THIS INFORMATION.

Prepared by: Environmental Health & Safety

Phone Number: (314) 654-1600 (U.S.A.)

GASOLINE

MSDSDefinition of
MS**Material Safety Data Sheet for Gasoline****1. Chemical Product****MSDS Number:** U4080**MSDS Date:** 01-1-99**Product Name:** Gasoline

24 Hour Emergency Phone: (210) 979-8346
Transportation Emergencies: Call Chemtrec at 1-800-424-9300
MSDS Assistance: (210) 592-4593

Distributors Name and Address:

T.W. Brown Oil Co., Inc.
1857 Knoll Drive
Ventura, California 93003

Chemical Name: Gasoline**Cas Number:** 8006-61-9

Synonyms/Common Names: This Material Safety Data Sheet applies to the following product descriptions for Hazard Communication purposes only. Technical specifications vary greatly depending on the product, and are not reflected in this document. Consult specification sheets for technical information.

Unleaded Gasoline Blendstocks/Subgrades- all types, grades, octanes, and vapor pressures.

California Air Resources Board (Carb) Gasoline- all grades, octanes, vapor pressures, and oxygenate blends.

Reformulated Gasoline (RFG)-all grades, octanes, vapor pressures, and oxygenate blends.

California Reformulated Gasoline (CARFG)-all grades, octanes, vapor pressures, and oxygenate blends.

Conventional Gasoline-all grades, octanes, vapor pressures, and oxygenate blends.

2. Composition, Information On Ingredients

Product Use: This product is intended for use as a fuel in engines or for use in engineered processes. Use in other applications may result in higher exposures and require additional controls, such as local exhaust ventilation and personal protective equipment.

Description: Reformulated gasoline is a complex mixture of hydrocarbons from a variety of chemical processes blended to meet standardized product specifications. Composition varies greatly and includes C₇ to C₁₂ hydrocarbons with a boiling range of about 80-473 degrees F. The following is a non-exhaustive list of common components, typical percentage ranges in product, and occupational exposure limits for each. Functional and performance additives may also be present at concentrations below reporting thresholds.

Component or Material Name	%	CAS Number	ACGIH Limits TLV – STEL – Units	OSHA Exposure Limits PEL – STEL – C/P – Units
Gasoline	90-100	Mixture	300–500–ppm	NA–NA–NA – —
Butane	<9	106-97-8	800–NA–ppm	NA–NA–NA – —

Pentane	<6	109-66-0	600-750-ppm	1000-NA-NA-ppm
n-Hexane	<4	110-54-3	50-NA-ppm	500-NA-NA-ppm
Hexan(other isomers)	<8	NA	500-1,000-ppm	NA-NA-NA- —
Benzene	1.2 - 4.9	7-4-2	0.5-2.5-ppm	1-5-NA-ppm
N-heptane	<2	14-82-5	400-500-ppm	500-NA-NA-ppm
Ethylbenzene	<2	100-41-4	100-125-ppm	100-NA-NA-ppm
Xylene (o,m,p, - isomers)	<11	1330-20-7	100-150-ppm	100-NA-NA-ppm
Cyclohexane	<2	110-82-7	300-NA-ppm	300-NA-NA-ppm
Trimethylbenzene	<4	25551-13-7	25-NA-ppm	NA-NA-NA- —
Methyl-t-butyl ether (MTBE)	0-15	1634-04-4	40-NA-ppm	NA-NA-NA- —
Toluene	<12	108-88-3	50-NA-ppm	200-300/500-NA-ppm
Ethyl-t-butyl ether (ETBE)	0-7	637-92-3	N/A-NA-ppm	NA-NA-NA- —
t-amyl-methyl-ether	0-5	994-05-8	N/A-NA-ppm	NA-NA-NA- —
Ethanol	0-11	64-17-5	1,000-NA-ppm	1,000-NA-NA-ppm

C=Ceiling concentration not to be exceeded at any time. P= Peak concentration for a single 10 minute exposure per day.

3. Hazards Identification

Health Hazard Data:

1. The major effect of exposure to this product is central nervous system depression and polyneuropathy.
2. Studies have shown that repeated exposure of laboratory animals to high concentrations of whole gasoline vapors at 67,262 and 2056 ppm has caused kidney damage and cancer of the kidney in rats and liver cancer in mice.
3. LARC has listed gasoline as possibly carcinogenic (2B) to humans with limited evidence in humans in the absence of sufficient evidence in experimental animals. NIOSH lists gasoline as a carcinogen with no further classification.
4. N-heptane and cyclohexane cause narcosis and irritation of eyes and mucous membranes. Cyclohexane has been reported to cause liver and kidney changes in rabbits. N-heptane has been reported to cause polyneuritis following prolonged exposure.
5. ACGIH lists benzene a human carcinogen with and assigned TLV of 0.5 ppm 8 hour TWA and a STEL of 2.5 ppm; IARC, NTP & OSHA show sufficient evidence for classifying Benzene as a human carcinogen, see 29 CFR 1910.1028 for current PEL of 1 ppm and specific actions to take. Studies have shown that benzene can induce leukemia at concentrations as low as 1 ppm. Significant elevations of chromosomal aberrations have been corroborated among workers exposed to levels at mean concentrations less than 10 ppm. Based on risk assessment studies by Rinsky, an individual inhaling 1 ppm of benzene for 40 years, the odds of benzene-induced leukemic death were 1.7 times higher than those of unexposed workers.
6. MTBE is a mild irritant to the eye with an LC50 of 85 mg/m3 on 4 hr. exposure and an LD50 ~4 ml/Kg (RATS). An increase in anesthesia with increasing concentration (250,500 & 1000 ppm) was observed during a 90 day Test exposure. ACGIH has listed MTBE as an animal carcinogen (A3) based on tests in experimental animals at relatively high dose levels, by routes of administration, at sites, of histologic types, or by mechanisms not considered relevant to worker exposure. Available evidence suggests that MTBE is not likely to cause cancer in humans except under uncommon or unlikely routes of levels of exposure.

7. Trimethylbenzene (pseudocumene (1,2,4,)) & mesitylene (1,2,5,)) has a PEL and TLV of 25 ppm 8 hr. TWA; the isomers may cause nervousness, tension, and anxiety and asthmatic bronchitis.

8. n-Hexane has been shown to cause polyneuropathy (peripheral nerve damage) after repeated and prolonged exposure, other hexanes show narcotic effects at 1000 ppm and are not metabolized like n-hexane.

9. Toluene can cause impairment of coordination and momentary loss of memory (200-500 ppm); Palpitations, extreme weakness and pronounced loss of coordination (500-1500). The 100 ppm 8 hr. TWA and the 150 ppm STEL provides adequate protection.

10. The toxicological effects of ETBE and TAME have not been thoroughly investigated. ETBE and TAME are expected to be an inhalation hazard and a severe eye and moderate skin irritant.

Hazards of Combustion Products: Carbon monoxide and carbon dioxide can be found in the combustion products of this product and other forms of hydrocarbon combustion. Carbon monoxide in moderate concentrations can cause symptoms of headache, nausea, vomiting, increased cardiac output, and confusion. Exposure to higher concentrations of carbon monoxide can cause loss of consciousness, heart damage, brain damage, and/or death. Exposure to high concentrations of carbon dioxide can cause simple asphyxiation by displacing available oxygen. Combustion of this and other similar materials should only be carried out in well ventilated areas.

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DIESEL FUEL

MSDS SUMMARY SHEET

Manufacturer:

Name: PHILLIPS PETROLEUM COMPANY

Address 1:

Address 2:

Address 3:

CSZ: BARTLESVILLE **State:** OK

Zipcode: 74004

Emergency phone: (800) 424-9300

Business phone: 800-762-0942

Product:

Ferndale MSDS#: 1354 **Version # :** 6

Manufacturer MSDS#: 0041

Current? : 2002

Name:

NO. 2 DIESEL FUEL

Synonyms:

CARB Diesel TF3

CARB Diesel

CARB Diesel 10%

Diesel Fuel Oil

EPA Low Sulfur Diesel Fuel

EPA Low Sulfur Diesel Fuel – Dyed

EPA Off Road High Sulfur Diesel – Dyed

Fuel Oil No. 2 – CAS # 68476-30-2

No. 2 Diesel Fuel Oil

No. 2 Fuel Oil – Non Hiway – Dyed

No. 2 High Sulfur Diesel – Dyed

No. 2 Low Sulfur Diesel - Dyed

No. 2 Low Sulfur Diesel - Undyed

Crude column 3rd IR

Crude column 3rd side cut

Atmospheric tower 3rd side cut

Ultra Low Sulfur Diesel No. 2

Finished Diesel

DHT Reactor Feed

Straight Run Diesel

Diesel

Middle Distillate

Product/Catalog Numbers:

MSDS Date: 01/01/2002 (**received:** 01/14/2002)

NFPA codes:

Health: 0 **Flammability:** 2 **Reactivity:** 0

MATERIAL SAFETY DATA SHEET
No. 2 Diesel Fuel

1. PRODUCT AND COMPANY IDENTIFICATION

Product Name: No. 2 Diesel Fuel
Product Code: Multiple
SAP Code:
Synonyms: 1354
CARB Diesel TF3
CARB Diesel
CARB Diesel 10%
Diesel Fuel Oil
EPA Low Sulfur Diesel Fuel
EPA Low Sulfur Diesel Fuel – Dyed
EPA Off Road High Sulfur Diesel – Dyed
Fuel Oil No. 2 – CAS # 68476-30-2
No. 2 Diesel Fuel Oil
No. 2 Fuel Oil – Non Hiway – Dyed
No. 2 High Sulfur Diesel – Dyed
No. 2 Low Sulfur Diesel – Dyed
No. 2 Low Sulfur Diesel – Undyed
No. 2 Ultra Low Sulfur Diesel – Dyed
No. 2 Ultra Low Sulfur Diesel – Undyed
Intended Use: Fuel
Chemical Family:
Responsible Party: Phillip's Petroleum Company
Bartlesville, Oklahoma 74004
For Additional MSDSs: 800-762-0942

Technical Information:

The intended use of this product is indicated above. If any additional use is known, please contact us at the Technical Information number listed.

EMERGENCY OVERVIEW

24 Hour Emergency Telephone Numbers:

Spill, Leak, Fire or Accident

California Poison Control System: 800-356-3120

Call CHEMTREC

North America: (800) 424-9300

Others: (703) 527-3887 (collect)

Health Hazards/Precautionary Measures: Causes severe skin irritation. Aspiration hazard if swallowed. Can enter lungs and cause damage. Use with adequate ventilation. 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: Characteristic petroleum

HFPA Hazard Class:

Health: 0 (Least)
 Flammability: 2 (Moderate)
 Reactivity: 0 (Least)

HMIS Hazard Class

Not Evaluated

2. COMPOSITION/INFORMATION ON INGREDIENTS

<u>HAZARDOUS COMPONENTS</u>	<u>% VOLUME</u>	<u>Limits</u>	<u>EXPOSURE GUIDELINE</u>	
			<u>Agency</u>	<u>Type</u>
Diesel Fuel No. 2 CAS# 68476-34-6	100	100* mg/m3	ACGIH	TWA-SKIN
Naphthalene CAS# 91-20-3	<1	10ppm	ACGIH	TWA
		15ppm	ACGIH	STEL
		10ppm	OSHA	TWA
		250ppm	NIOSH	IDLH

All components are listed on the TSCA inventory

Tosco Low Sulfur No. 2 Diesel meets the specifications of 40 CFR 60.41 for low sulfur diesel fuel.

Note: State, local or other agencies or advisory groups may have established more stringent limits. Consult an industrial hygienist or similar professional, or your local agencies, for further information.

*Proposed ACGIH (1999)

3. HAZARDS IDENTIFICATION**Potential Health Effects:**

Eye: Contact may cause mild eye irritation including stinging, watering, and redness.

Skin: Severe skin irritant. Contact may cause redness, itching, burning, and severe skin damage. Prolonged or repeated contact can worsen irritation by causing drying and cracking of the skin, leading to dermatitis (inflammation). Not actually toxic by skin absorption, but prolonged or repeated skin contact may be harmful (see Section 11).

Inhalation (Breathing): No information available. Studies by other exposure routes suggest a low degree of toxicity by inhalation.

Ingestion (Swallowing): Low degree of toxicity by ingestion. ASPIRATION HAZARD – This material can enter lungs during swallowing or vomiting and cause lung inflammation and damage.

Signs and Symptoms: Effects of overexposure may include irritation of the nose and throat, irritation of the digestive tract, nausea, diarrhea and transient excitation followed by signs of nervous system depression (e.g., headache, drowsiness, dizziness, loss of coordination, disorientation and fatigue).

Cancer: Possible skin cancer hazard (see Sections 11 and 14).

Target Organs: There is limited evidence from animal studies that overexposure may cause injury to the kidney (see Section 11).

Developmental: Inadequate data available for this material.

Pre-Existing Medical Conditions: Conditions aggravated by exposure may include skin disorders and kidney disorders.

4. FIRST AID MEASURES

Eye: If irritation or redness develops, move victim away from exposure and into fresh air. Flush eyes with clean water. If symptoms persist, seek medical attention.

Skin: Immediately remove contaminated shoes, clothing, and constrictive jewelry and flush affected area(s) with large amounts of water. If skin surface is damaged, apply a clean dressing and seek immediate medical attention. If skin surface is not damaged, cleanse affected area(s) thoroughly by washing with mild soap and water. If irritation or redness develops, seek immediate medical attention.

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°F/>52°

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 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 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).

7. HANDLING AND STORAGE

Handling: Open container slowly to relieve any pressure. Bond and ground all equipment when transferring from one vessel to another. Can accumulate static charge by flow or agitation. Can be ignited by static discharged. The use of explosion-proof equipment is recommended and may be required (see appropriate fire codes). Refer to NFPA-704 and/or API RP 2003 for specific bonding/grounding requirements.

Do not enter confined spaces such as tanks or pits without following proper entry procedures such as ASTM D-4276 and 29CFR 1910.146. The use of appropriate respiratory protection is advised when concentrations exceed any established exposure limits (see Sections 2 and 8).

Do not wear contaminated clothing or shoes. Keep contaminated clothing away from sources of ignition such as sparks or open flames. Use good personal hygiene practices.

High pressure injection of hydrocarbon fuels, hydraulic oils or greases under the skin may have serious consequences even though no symptoms or injury may be apparent. This can happen accidentally when using high pressure equipment such as high pressure grease guns, fuel injection apparatus or from pinhole leaks in tubing or high pressure hydraulic oil equipment.

"Empty" containers retain residue and may be dangerous. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose such containers to heat, flame, sparks, or other sources of ignition. They may explode and cause injury or death. "Empty" drums should be completely drained, properly bunged, and promptly shipped to the supplier or a drum reconditioner. All containers should be disposed of in an environmentally safe manner and in accordance with governmental regulations.

Before working on or in tanks which contain or have contained this material, refer to OSHA regulations, ANSI Z49.1 and other references pertaining to cleaning, repairing, welding, or other contemplated operations.

Storage: Keep container(s) tightly closed. Use and store this material in cool, dry, well-ventilated areas away from heat, direct sunlight, hot metal surfaces, and all sources of ignition. Post area "No Smoking or Open Flame." Store only in approved containers. Keep away from incompatible material (see Section 10). Protect container(s) against physical damage. Outdoor or detached storage is preferred. Indoor storage should meet OSHA standards and appropriate fire codes.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Engineering controls: If current ventilation practices are not adequate to maintain airborne concentration below the established exposure limits (see Section 2), additional ventilation or exhaust systems may be required. Where explosive mixtures may be present, electrical systems safe for such locations must be used (see appropriate electrical codes).

Personal Protective Equipment (PPE):

Respiratory: A NIOSH certified air purifying respirator with an organic vapor cartridge may be used under conditions where airborne concentrations are expected to exceed exposure limits (see Section 2).

Protection provided by air purifying respirators is limited (see manufacturer's respirator selection guide). Use a positive pressure air supplied respirator if there is a potential for an uncontrolled release, exposure levels are not known, or any other circumstances where air purifying respirators may not provide adequate protection.

A respiratory protection program that meets OSHA's 29 CFR 1910.134 and ANSI Z88.2 requirements must be followed whenever workplace conditions warrants a respirator's use.

Skin: The use of gloves impervious to the specific material handled is advised to prevent skin contact, possible irritation and skin damage (see glove manufacturer literature for information on permeability). Depending on conditions of use, apron and/or arm covers may be necessary.

Eyes/Face: Approved eye protection to safeguard against potential eye contact, irritation, or injury is recommended. Depending on conditions of use, a face shield may be necessary.

Other Protective Equipment: Eye wash and quick-drench shower facilities should be available in the work area. Thoroughly clean shoes and wash contaminated clothing before reuse. It is recommended that impervious clothing be worn when skin contact is possible.

9. PHYSICAL AND CHEMICAL PROPERTIES

Note: Unless otherwise stated, values are determined at 20°C (68°F) and 760 mm Hg (1atm).

Appearance: Straw-colored to dyed red

Physical State: Liquid

Odor: Characteristic petroleum

pH: unavailable

Vapor Pressure (mm Hg): 0.40

Vapor Density (air=1): >3

Boiling Point/Range: 320-700°F / 160-371°C

Freezing/Melting Point: No Data

Solubility in Water: Negligible

Specific Gravity: 0.81-0.88 @ 60°F

Percent Volatile: Negligible

Evaporation Rate (nBuAc=1): <1

Viscosity: 32.6-40.0 SUS @ 100°F

Bulk Density: 7.08 lbs/gal

Flash Point: >125°F / >52°C

Flammable/Explosive Limits (%): LEL: 0.3 / UEL: 10.0

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: The use of hydrocarbon fuels 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. ACGIH has included a TLV of 0.05 mg/m³ TWA for diesel exhaust particulate on its 1999 Notice of Intended Changes. See Section 11 for additional information on hazards of engine exhaust.

Hazardous Polymerization: Will not occur.

11. TOXICOLOGICAL INFORMATION

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

Carcinogenicity: Chronic dermal application of certain middle distillate streams contained in diesel fuel No. 2 resulted in an increased incidence of skin tumors in mice. This material has not been identified as carcinogen by NTP, IARC, or OSHA. Diesel exhaust is a probable cancer hazard based on tests with laboratory animals.

Target Organ(s): Limited evidence of renal impairment has been noted from a few case reports involving excessive exposure to diesel fuel No. 2.

Naphthalene (CAS# 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 not been identified as a carcinogen by IARC or OSHA.

12. ECOLOGICAL INFORMATION

Not evaluated at this time

13. DISPOSAL CONSIDERATIONS

This material, if discarded as produced, would be a RCRA "characteristic" hazardous waste due to the characteristic(s) of ignitability (D001) and benzene (D018). If the material is spilled to soil or water, characteristic testing of the contaminated materials is recommended. Further, this material, once it becomes a waste, is subject to the land disposal restrictions in 40 CFR 268.40 and may require treatment prior to disposal to meet specific standards. Consult state and local regulations to determine whether they are more stringent than the federal requirements.

Container contents should be completely used and containers should be emptied prior to discard. Container ^{insate?} could be considered a RCRA hazardous waste and must be disposed of with care and in compliance with federal, state and local regulations. Large empty containers, such as drums, should be returned to the distributor or to a drum reconditioner. To assure proper disposal of smaller containers, consult with state and local regulations and disposal authorities.

14. TRANSPORT INFORMATION

DOT Shipping Description: Diesel Fuel, NA1983
Non-Bulk Package Marking: Diesel Fuel, 3, NA 1993, III

15. REGULATORY INFORMATION**EPA SARA 311/312 (Title III Hazard Categories):**

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

SARA 313 and 40 CFR 372:

This material contains the following chemicals subject to the reporting requirements of SARA 313 and 40 CFR 372:

Component	CAS Number	Weight %
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-- 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):

Component	Effect
Benzene	Cancer, Developmental and Reproductive Toxicant
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 carcinogen by IARC.

EPA (CERCLA Reportable Quantity): None

16. OTHER INFORMATION

Issue Date: 01/01/02

Previous Issue Date: 05/15/01

Product Code: Multiple

Revised Sections: None

Previous Product Code: Multiple

MSDS Number: 0041

Disclaimer of Expressed and Implied Warranties:

The information presented in this Material Data Safety Sheet is based on data believed to be accurate as of the date this Material Data Sheet was prepared. HOWEVER, NO WARRANTY OF MERCHANTABILITY, FITNESS FOR ANY PARTICULAR PURPOSE, OR ANY OTHER WARRANTY IS EXPRESSED OR IS TO BE IMPLIED REGARDING THE ACCURACY OR COMPLETENESS OF THE INFORMATION PROVIDED ABOVE, THE RESULTS TO BE OBTAINED FROM THE USE OF THIS INFORMATION OR THE PRODUCT, THE SAFETY OF THE PRODUCT, OR THE HAZARDS RELATED TO ITS USE. No responsibility is assumed for any damage or injury resulting from abnormal use or from any failure to adhere to recommended practices. The information provided above, and the product, are furnished on the condition that the person receiving them shall make their own determination as to the suitability of the product for their particular purpose and on the condition that they assume the risk of their use. In addition, no authorization is given nor implied to practice any patented invention without a license.

Tosco Refining Company

Ferndale Refinery

UltraLow Sulfur Diesel Product Specification

Ferndale Product Code:34380xx (5) Product Code: ULSD2

(COMETS)

Specification	Unit	Limit	Test Procedure	Typical
Appearance				
Water & Sediment	Vol %	0.05 Max	D 2709	
Color	Number	3.0 Max	D 1500	
Haze Rating	Rating	2 Max	D 4176	
Composition				
Carbon Residue (Ramsbottom)	Wt %	0.35 Max	D 524, D 189	
Volatility				
90% Recovered	Deg; F	540 Min	D 86	
Flash Point	Deg; F	640 Min	D 86	
Gravity	Deg; F	125 Min (1)	D 93	130 F
	API	30 Min	D 287, D4052	
Fluidity				
Pour Point	Deg; F	See Season Table (6)	D 97	
Cloud Point	Deg; F	See Season Table (6)	D 2500	10 F
Viscosity @ 104F	cSt	1.9 Min	D 445	
	cSt	4.1 Max	D 445	
Lubricity, SLBOCLE	grams	3100 Min	D 6078	3300gm
Lubricity, HFRR	mm	.45	D 6079	
Combustion				
Cetane Index or Cetane Number (3,4)	Number	40.0 Min	D 976, D613	47.0
Corrosion				
Copper Strip, 3hr @ 50 deg C	Number	3 Max (2)	D 130	
Aromatics (4)	Vol %	35 Max	D 1319	25 %
Contaminants				
Total Sulfur	PPM	30 Max	D 2622, D4294	15-20ppm
Water & Sediment	Vol %	0.05 Max	D 1796	
Ash	Wt %	0.01 Max	D 482	
Additives				
Cetane Improver	Lb/MBbl	675 Max		
Dye		Undyed		

1. Minimum release specification is 125 deg. F. The refinery should target 135 deg. F.
2. Test result reported as a number and letter (e.g. 1a). Any letter is allowable as long as the number meets the spec shown.
3. Either specification must be met.
4. Either cetane index minimum or aromatics maximum must be met.
5. Winter cloud and pour specifications may be relaxed to the summer specifications by agreement with the customer.
6. Season Table

Month	Product Code	Pour Point	Cloud Point
Jan, Feb, Nov, Dec	WI	0 max (5)	14 max (5)
Mar - Oct	SU	15 max	24 max

APPENDIX C
SITE PLAN

