

## **CONSTRUCTION WORK PLAN**

32 Cabot Road  
Woburn, Massachusetts

August 10, 2018

### **Prepared for:**

36 Cabot Road LLC  
36 Cabot Road  
Woburn, Massachusetts 01801

### **Prepared by:**

EnviroTrac Ltd.  
2 Merchant Street, Suite 2  
Sharon, Massachusetts 02067

*A Full Service Environmental Consulting  
and Contracting Firm*



## TABLE OF CONTENTS

1.0	INTRODUCTION	1
1.1	Site Conditions	1
1.2	Proposed Development	1
1.3	Industri-plex Site Background	2
1.4	Soil and Groundwater Quality	3
1.5	Health & Safety Plan	3
2.0	PROJECT ORGANIZATION AND RESPONSIBILITIES	4
2.1	Key Personnel	4
2.2	Communication / Coordination	6
3.0	SCOPE OF WORK	7
3.1	Project Objectives	7
3.2	Schedule and Sequence of Work	7
3.3	Pre-Construction Activities	7
3.4	Mobilization	10
3.5	Description of Intrusive Activities	10
3.6	Earthwork	11
4.0	WORK PRACTICES	12
4.1	Excavation	12
4.2	Materials Handling	12
4.3	Water Management and Dewatering	14
4.4	Exposure of Unanticipated Contaminated Materials	14
4.5	Dust Control	14
5.0	CLOSURE PROCESSES AND COMPLETION REPORT DOCUMENTATION	15

## FIGURES

Figure 1	Locus Map
Figure 2	Layout & Materials Plan
Figure 3	Demolition & Erosion Control Plan
Figure 4	Grading & Drainage Plan
Figure 5	Utility Plan

## APPENDICES

Appendix A	Health & Safety Plan
Appendix B	Site Data
Appendix C	Preliminary Construction Schedule

## 1.0 INTRODUCTION

This Work Plan has been prepared by EnviroTrac Ltd (EnviroTrac) on behalf of 36 Cabot Road, LLC for the proposed development of 32 Cabot Road (the “Property”) located in Woburn, Massachusetts as shown on the Locus Map included as **Figure 1**. The Property is within the bounds and comprises a portion of the Industri-Plex Superfund Site (United States Environmental Protection Agency [EPA] identification number MAD076580950).

The proposed development will include the construction of a new 24,800 square foot office/warehouse/manufacturing building on the 6.25-acre lot. Intrusive work activities associated with the construction will be conducted only within portions of the 32 Cabot Road property and for utility work within Cabot Road adjacent to the property. The Layout & Materials Plan (**Figure 2**) shows the limits of the proposed development.

This Work Plan has been developed to address potentially contaminated soil below El. 52.8 (NAVD 88) and groundwater within the property limits and for select utility work within Cabot Road (to the extent and if encountered); work practices and precautionary measures to be implemented during proposed construction detailed herein have been designed to protect human health and the environment during performance of the proposed intrusive work activities.

Work activities will be conducted by Maggiore Construction Corporation and its subcontractors (Contractor) in accordance with applicable OSHA health and safety requirements, the site-specific Health and Safety Plan (HASP, attached as **Appendix A**), and this Work Plan. EnviroTrac is serving as the project Site Health & Safety Officer (SHSO) for the proposed work. EnviroTrac is also serving as the Environmental Consultant and Independent Professional (e.g., hazardous waste site cleanup professional/Licensed Site Professional [LSP]) for the proposed work and will confirm that work activities have been conducted in general conformance with this Work Plan and its approved amendment(s), if any.

### 1.1 Site Conditions

The 6.25-acre property located at 32 Cabot Road is bordered to the north by commercial/industrial warehouses located at 35 and 36 Cabot Road and to the south by vacant land to be utilized as compensatory flood storage associated with the Industri-plex Superfund Site, Operable Unit 2 (OU2). To the east, and opposite the property beyond Cabot Road, are office/warehouse buildings at 21 and 31 Cabot Road. To the west lies the Halls Brook Storage Area, beyond which are additional commercial warehouse buildings located on Roessler Road.

The property is currently undeveloped and was recently used for the temporary storage of dredged materials from the Halls Brook Storage Area. Existing site grades is about elevation El. 54 to El. 57 (NAVD 88). Based upon observations in on-site soil borings, groundwater levels are anticipated at approximately El. 49 to 50 (NGVD 88). For the purposes of this Work plan, “high” groundwater has been assumed at El. 50.

### 1.2 Proposed Development

The development will include the construction of a new two-story office/warehouse/manufacturing building, as well as the installation of various site utilities and a storm water management system below the proposed paved parking area. The configuration of the planned development is shown

on **Figure 2**, Layout & Materials Plan.

The proposed building is to be constructed adjacent to Cabot Road, along the southeastern limit of the property with a first-floor elevation at El. 60, approximately 6 ft above existing site grades.

### 1.3 Industri-plex Site Background

Historically, the Industri-Plex Site has been used for a variety of manufacturing operations including the production of chemicals for local textile, leather, and paper manufacturing industries, and glue which was manufactured from raw animal hides. Waste materials from the manufacturing processes were used within portions of the Industri-Plex site to fill on-site lowlands, wetlands, and shallow ponds to provide more usable land for new development.

As a result of its historical industrial use, it has been determined that soils at the Industri-Plex Site may contain elevated levels of metals including lead, arsenic, and chromium; groundwater may contain elevated levels of dissolved metals and VOCs including arsenic, chromium, benzene, ammonia, trichloroethene, 1,2-dichloroethane, and naphthalene, consistent with the 2006 Industri-plex OU2 ROD and 2008 Consent Decree. The property associated with this Construction Work Plan at 32 Cabot Road is situated within the Industri-plex OU2 boundaries.

In the 1986, EPA established a Record of Decision (ROD) for the cleanup decision at the Industri-plex Superfund Site, known as Operable Unit 1 (OU1). In 1989, EPA and the Industri-plex Site Remedial Trust (ISRT) entered into a Consent Decree to implement the OU-1 cleanup in accordance with 1986 ROD including establishing permeable engineered caps/covers or equivalent caps/covers over contaminated soils/sediments above action levels, impermeable caps/covers and associated gas collection and treatment system at the East Hide Pile, and institutional controls. In 2008, construction of the OU1 remedy was completed.

In 2006, EPA established a ROD for the cleanup of Operable Unit-2 (OU2). In 2008, EPA and the settling defendants entered into a Consent Decree to perform the cleanup, including Halls Brook Holding Area (HBHA) Pond remedy component, removal of contaminated sediments and restoration, wetland and floodplain mitigation, and institutional controls. In 2017, construction of the OU2 Remedy was completed. The OU-2 institutional controls are described in the 2006 ROD and 2017 OU2 100% Remedial Design- Part 2. The institutional control restrictions which apply to this property include:

- i. subsurface greater than 3' below ground surface may contain contaminated soils above the soil action levels (i.e. arsenic above 50 ug/kg), and these soils if encountered should be managed and disposed of appropriately;
- ii. groundwater may contain contamination above the groundwater action levels and if encountered should be managed and disposed appropriately; and
- iii. any proposed work shall not interfere with the remedy.

See EPA's January 2008 Industri-plex OU-2 Record of Decision (e.g. page 94).

#### 1.4 Soil and Groundwater Quality

Numerous reports assessing the quality of the soil and groundwater at the Industri-Plex site, including the portion of the Industri-Plex site at 32 Cabot Road, were reviewed by EnviroTrac for the purpose of advising the proposed construction and preparing this Work Plan.

Soil and groundwater quality data applicable to the redevelopment of the property at 32 Cabot Road were also reviewed in connection with the preparation of this Work Plan and the project Health and Safety Plan. A description of contaminants in soil and groundwater detected at the subject property is provided in the Health and Safety Plan. Representative soil and groundwater data are included in **Appendix B**.

Based on the EPA comments provided to the draft Work Plans of July 13 and August 1, 2018, we understand that EPA is recommending the incorporation of vapor intrusion mitigation features into the design of the site building. For informational purposes, we will submit under separate cover to EPA the mitigation measures incorporated into the building design.

#### 1.5 Health and Safety Plan

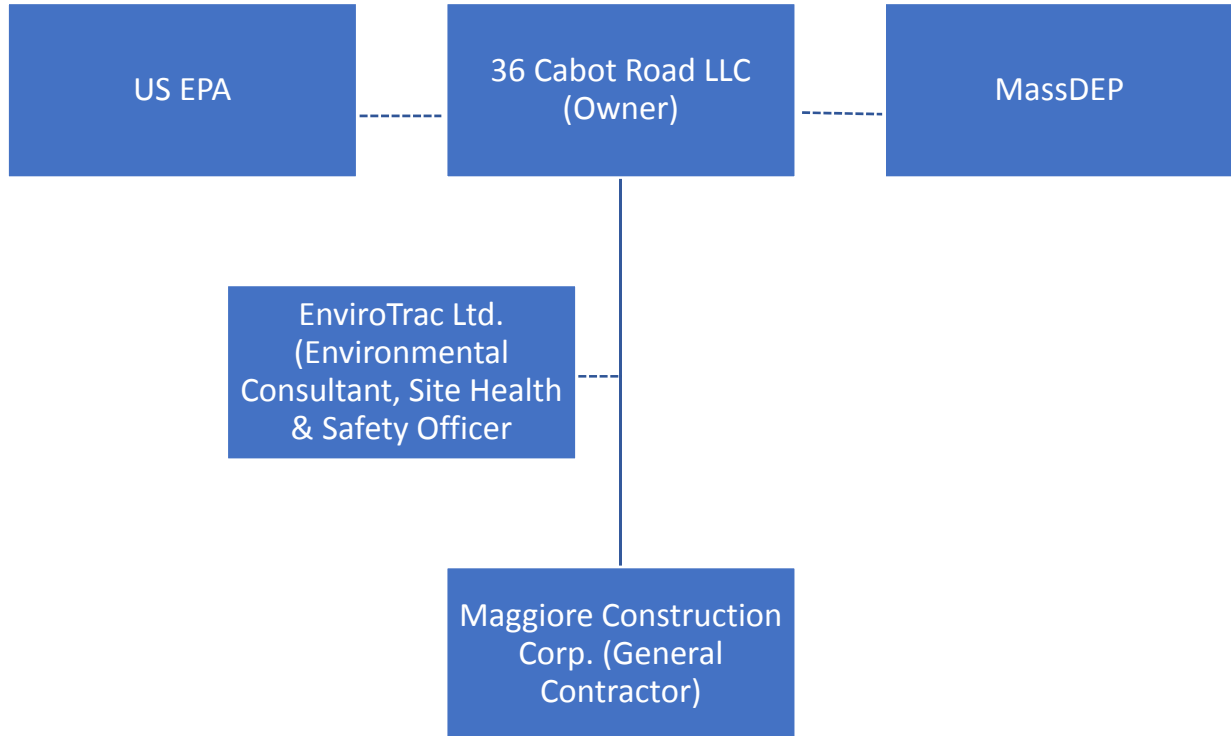
The Health and Safety Plan (HASP) for the subject project was prepared in accordance with the requirements of Title 29, Code of Federal Regulations (CFR) Part 1910.120 to protect the health, safety, and welfare of on-site personnel, visitors, and the general public during the performance of work associated with redevelopment of the subject property. The HASP includes information on the use and disposal of personal protective equipment (PPE), anticipated measures to be implemented to control air quality, erosion, run-on, and run-off of soil, sediment, and water from the property, and training requirements for site personnel. A copy of the HASP is attached as **Appendix A**.

It is anticipated that proposed work activities will be conducted by site personnel outfitted in either Level D PPE or modified Level D protection, as outlined in the HASP and determined by the Site Health and Safety officer (SHSO). Determination of the level of PPE required for each work task will be made by the SHSO on a case by case basis. On-site personnel with the potential for contaminant exposure will be properly trained in accordance with applicable OSHA requirements.

Air monitoring will be conducted to prevent nearby residents or property occupants, site workers, and support area personnel from being exposed to airborne hazardous substances at concentrations greater than applicable standards. Instrumentation and procedures for monitoring and recording the concentrations of airborne dust, vapors, and odors during the excavation activities are provided in the HASP. Data collected from monitoring activities will form the basis for any modifications of work practices and/or engineering controls to reduce the concentration of regulated airborne substances to acceptable levels.

## 2.0 PROJECT ORGANIZATION AND RESPONSIBILITIES

A list of key project team members and a description of their responsibilities is provided in this section of the Work Plan. The overall project organization for the redevelopment of the subject site is provided in the chart below.



### 2.1 Key Personnel

#### 2.1.1 Project Site Owner

Mr. Robert Traina  
36 Cabot Road LLC  
36 Cabot Road  
Woburn, Massachusetts 01801  
(781) 729-4000

#### 2.1.2 United States Environmental Protection Agency (US EPA) Massachusetts Department of Environmental Protection (MassDEP)

US EPA  
Industri-Plex Superfund Site  
Joseph LeMay, Remedial Project Manager  
(617) 918-1323

MassDEP  
Industri-Plex Superfund Site  
Jennifer McWeeney, Project Manager  
(617) 654-6560

### 2.1.3 Construction General Contractor

The Owner has contracted Maggiore Construction (Contractor) as the General Contractor and Construction Manager for the proposed development based on their expertise, experience and capability to satisfactorily perform the proposed work. The Contractor will be responsible for overall site operations and resource management as well as implementing and directing field operations and ensuring that all work activities are conducted in accordance with the requirements of this Work Plan, which inherently include the HASP, and all applicable federal, state and local, laws, regulations, and ordinances.

#### Construction General Contractor

David Mann, Director of Construction  
Maggiore Construction Corporation  
13 Wheeling Avenue  
Woburn, Massachusetts 01801  
Office: (781) 935-6100  
Cell: (781) 718-2002  
Dave@maggiorecos.com

### 2.1.4 Subcontractors

The Contractor will employ subcontractors to perform select phases of the work for which the subcontractors have special expertise. The subcontractors will be responsible to the Contractor for the quality of their work, and for the health and safety of their project personnel and the general public in accordance with the HASP. The subcontractors' principals will designate job site superintendents or foremen with responsibility for seeing that the work is conducted in accordance with the Work Plan, project specific specifications, and contract requirements. All Contractor and subcontracted personnel performing work at the site will be required to read, understand, and comply with the Work Plan, the HASP, and all required procedures and protocols established for this project prior to commencing work on the site.

### 2.1.5 Environmental, Health & Safety Consultant

32 Cabot Road, LLC has retained EnviroTrac Ltd. (EnviroTrac) as the Environmental Consultant for the project. Robert H. Bird, LSP, of EnviroTrac will serve as the Independent Professional for the project.

During the course of construction, EnviroTrac will monitor the progress of the project and work activities to ensure that the environmental compliance objectives are realized and that the project is constructed in accordance with the Work Plan and the project specifications.

#### Environmental Consultant

Robert H. Bird, Principal Hydrogeologist  
LSP No. 8972  
EnviroTrac Ltd.  
2 Merchant Street, Suite 2  
Sharon, Massachusetts 02067  
Office: (781) 793-0074  
Cell: (508) 244-7111

36 Cabot Road, LLC has retained EnviroTrac Ltd. as the Health & Safety Consultant for the proposed development. Michael Clark, EnviroTrac Director, Health and Safety will serve as the Health & Safety Officer (HSO) for the project and is responsible for implementation and oversight of the HASP. Mr. Clark will be present on-site on the first day of intrusive work activities, during emergencies, and on an as-needed basis. Mr. Clark will also be responsible for approving HASP modifications (if required).

Lauren Main, EnviroTrac Staff Scientist, will be designated as the Site Health and Safety Officer (SHSO). The SHSO will implement the air monitoring program, evaluate site hazards, determine levels of protection, and recommend other protective measures to the Contractor, as outlined in the HASP. The SHSO will be on-site during excavation and handling of soil or during the performance of work that may result in exposure to or contact with contaminants. He will work closely with the Independent Professional and Contractor to ensure compliance with the requirements of this Work Plan.

Health & Safety Consultant  
Michael A. Clark, MS, CHMM  
Director, Health & Safety  
EnviroTrac Ltd.  
2 Merchant Street, Suite 2  
Sharon, Massachusetts 02067  
Office: (781) 793-0074  
Cell: (516) 790-0998

## **2.2 Communication / Coordination**

### **2.2.1 Preconstruction Meeting**

A preconstruction meeting will be held prior to commencing work. Attendance of the Owner and the Contractor is required; other invitees will include select subcontractors and representatives from regulatory agencies. The following topics will be discussed at the meeting:

- Project Overview
- Roles and Responsibilities
- Lines of Communication
- Contact Information
- Notification Requirements
- Work Plan Requirements and Procedures
- Project Schedule
- Construction Sequence
- Working Hours
- Health and Safety Requirements
- Project Documentation
- Other Considerations

### **2.2.2 Routine Safety Meetings**

Routine safety meetings will be held to discuss the work plan and HASP with workers so as to constantly remind personnel of the site conditions. The frequency of these meetings

will be as necessary and determined by the Contractor and/or Site Health and Safety Officer, but no less than once per week.

### 3.0 SCOPE OF WORK

#### 3.1 Project Objectives

The objective of the project is to develop the 32 Cabot Road property in accordance with the requirements of local, state and federal environmental requirements:

- Protecting the health and safety of site personnel and the general public during performance of work activities;
- Proper management of site soils and groundwater within the limits of the project property; and
- Prevent impacts to the remedy and ensure the remedy remains protective of public health and the environment.

If the proposed work impacts the remedy, then the property owner will repair the remedy in accordance with the approved 100% Remedial Design requirements, at a minimum, at the owner's sole expense. The completed remedy and its location are presented in the September 2017 Industri-plex OU2 Close-Out Report.

#### 3.2 Schedule and Sequence of Work

A general schedule and sequence of intrusive work activities to be conducted at the property has been provided by the Contractor and is included in **Appendix C** for reference.

Prior to the start of intrusive site work activities, a detailed sequence of work will be provided as an addendum to this work plan and discussed at a pre-construction meeting held among the Owner, the Contractor, the SHSO, the Independent Professional, U.S. EPA and other applicable regulatory agencies, and the applicable site and utility subcontractors (yet to be selected).

#### 3.3 Pre-Construction Activities

Prior to the commencement of work at the property, the Contractor will take actions to protect the health and safety of site personnel and the general public, protect and prevent impacts to the superfund remedy/cleanup and prevent negatively impacting the environment and adjacent properties.

##### 3.3.1 Establish Limits of Work

Prior to the start of work activities, the Contractor will establish certain control lines and the limits of work for construction at the property, including the following:

- A "Limit of Work" line will be established by non-intrusive means at a distance of 25 ft from the local no-disturb buffer to the existing bordering vegetated wetland. The "Limit of Work" line will be clearly demarcated by the presence of silt fence and 18-inch diameter mulch coir log.

- A perimeter fence will be installed around the site to designate site limits and control access to the site. The fence will be supported at the existing ground surface by means of temporary concrete blocks or other non-intrusive means.

### 3.3.2 Erosion and Sediment Control

Property erosion and sediment controls will be implemented at the Property to manage the migration of soils, sediments, and storm water, and will include 18-inch mulch coir logs and silt fences established at the property perimeter and at existing catch basin locations. Refer to **Figure 3**, Demolition & Erosion Control Plan for plan locations and details of the proposed controls. Additional erosion controls consisting of 18-inch mulch coir logs and/or silt fences will also be utilized around excavations made within impermeable surfaces such as paved areas, to prevent mitigation of site soils during storm events and also to prevent the erosion controls along the perimeter of the site from being overwhelmed.

Erosion and sediment controls will be decontaminated and properly disposed of in accordance with the recommendations of the Independent Professional following completion of work at the site. Decontamination is planned to be performed by means of flushing the mulch coir logs and silt fence clean of visible soil debris with the use of imported potable water. Flushing of the mulch coir logs and silt fence is to be performed within the designated decontamination area.

Property entry and exit locations may be paved, or constructed of compacted reclaimed asphalt, concrete, or gravel to prevent deterioration of soils and potential migration of sediment off-site. Other erosion and sediment controls such as temporary swales and check dams, may also be utilized as part of the controls, as appropriate.

### 3.3.3 Set-up of Work Zones

The limits of the established perimeter construction fence will generally define the exclusion zone [areas where intrusive activities occur, and soils and/or groundwater is anticipated to be encountered] for the site. Within the limit of the site, the Contractor will designate a decontamination area and a support area as defined in the HASP. These areas will be set up in portions of the site where intrusive activities are not occurring. The locations of the decontamination zone and the support zone will be relocated from time to time throughout the project as the site work and construction activities are occurring. When relocating the zones, the existing zones will stay in service until the new zones have been constructed and are operational.

If utility work is conducted within Cabot Road, the exclusion zone will be established to encompass the work zone. The area will be cordoned off using traffic cones, barrels, or other equivalent methods. Decontamination and support zones will also be set up in accordance with the provisions of the HASP.

### 3.3.4 Materials Management Area

A designated Materials Management Area (MMA) will be established at the approximate location indicated on **Figure 3**, Demolition & Erosion Control Plan, prior to the start of intrusive work activities at the Property. The designated MMA is a circular area with a radius of 35 feet. Conservatively, the capacity of the MMA is 250 cubic yards, and the anticipated volume of exclusion zone soil to be management in the MMA is approximately

110 cubic yards. Exclusion zone soil proposed for off-site transport will be temporarily stockpiled within the MMA prior to characterization and off-site transport and disposal to an EPA-approved facility. As an alternative, roll-off containers may be used for temporary soil storage within the MMA. Prior to use, a polyethylene liner will be installed in each roll-off container and secured to the outer edge. Once a container is fill to capacity, the container will be covered and secured.

Temporary fencing or equivalent will be placed around the perimeter of the MMA to define the limits. The ground surface of the MMA will be graded towards a central stone sump and covered with an impermeable liner. All materials temporarily stockpiled within the MMA will be covered with reinforced polyethylene sheeting to prevent run-on, run-off, migration (wind/rain erosion), and cross-contamination. The polyethylene sheeting cover will extend beyond the outside face of the perimeter barriers to limit the amount of precipitation allowed to infiltrate stockpiles within the MMA. The small quantity of precipitation that may penetrate the polyethylene sheeting cover will collect on the polyethylene sheeting ground cover and be directed towards the stone sump for collection and will be pumped into an on-site fractionation tank. The water will then be tested and disposed of off-site.

If suspicious soils, or other materials appearing to be different from other soils are encountered, then the suspicious soil/materials should be stockpiled within the limits of the MMA and segregated.

Transport of on-site materials to the MMA will be conducted by loaders and/or dump trucks entering through defined entrances lined with stone and graded towards the MMA.

Upon completion of the site work activities at the 32 Cabot Road Property and within Cabot Road, the MMA shall be dismantled. The crushed stone and HDPE liner shall be decontaminated on-site and shall be disposed of in accordance with the recommendations of the Independent Professional. The barriers and the fractionation tank, if utilized, will be decontaminated prior to removal from the site. Any sediments collected in the fractionation tank will be re-used on-site or appropriately disposed off-site.

### 3.3.5 Notification

The Project Owner will notify the US EPA Project Manager and the Massachusetts DEP Project Manager at least one week before intrusive activities begin within an exclusion zone, following approval of the Work Plan. Additionally, a weekly schedule will be sent to the US EPA Project Manager and the Massachusetts DEP Project Manager identifying the proposed activities within the exclusion zones and any associated soil/groundwater management. Notification will be sent to Joseph LeMay, Project Manager, US Environmental Protection Agency (US EPA) Region I at 617-918-1323, and Jennifer McWeeney, Project Manager, MADEP at (617) 654-6560, prior to the start of work, followed by written confirmation.

Notification shall be provided to the EPA and/or DEP, as required and for approval, prior to importing any off-site materials, and /or disposing of any on-site materials (groundwater, debris, etc.) to an off-site location.

### 3.4 Mobilization

Necessary personnel and equipment will be mobilized by the Owner and Contractor to perform the proposed intrusive work, including the following:

#### Personnel

- Construction Manager
- Independent Professional's Representative
- Site Health & Safety Officer (SHSO)
- Subcontractors
- Equipment Operators
- Laborers

#### Equipment

- Front End Loader
- Excavator
- Gradall
- Trailer / Triaxle Dump Trucks
- Drill Rig – Well Decommissioning
- Pressure Injected Footing Rig
- Double or Single Drum Vibratory Roller
- Miscellaneous other equipment

### 3.5 Description of Intrusive Activities

Work for the development of the Project property will be conducted within the established "Limits of Work" only; no work will be conducted outside these limits. Intrusive activities to be performed are outlined below:

- Site Preparation and Demolition
  - Establish site perimeter controls
  - Establish erosion controls
  - Install equipment decontamination area and support zones
  - Establish materials management area
- Earthwork
  - General site filling and grading
  - Installation and backfilling of building foundations
  - Excavation for and installation of grade beams (as required)
  - Construction of building slabs
  - Installation of new site utilities and infrastructure
  - Paving

#### 3.5.1 Site Preparation

Most of the site preparation activities including establishing perimeter property controls, erosion controls and the Materials Management Area are not anticipated to require significant intrusive activities and are described in the sections above. More intrusive activities are described below.

### 3.5.1.1 Decontamination Area

A decontamination area will be constructed to allow for the cleaning of worker PPE and site equipment that may have come in contact with potentially contaminated soil and/or groundwater and will generally consist of a shallow excavation, backfilled with compacted crushed concrete or crushed stone constructed within the Decontamination Zone, the limits of which are defined on the attached 3, Demolition and Erosion Control Plan. Construction of the proposed decontamination area will require limited excavation of soil and will not involve excavation in groundwater.

## 3.6 Earthwork

### 3.6.1 Site Filling and Grading

The proposed development will require a net import of soil (fill). Existing site grades will be raised across the entire property. The filling applies to land within the "Limit of Work" only; land outside these limits will not be disturbed. Grades in the vicinity of the proposed building will be raised as much as 6 ft.

Tested clean fill soils imported to the property for utility backfill and general site grading will not be mixed with existing soils, concrete, or asphalt fill materials during placement.

### 3.6.2 Installation of Building Foundations

The proposed building is to be supported on spread footing foundations. Foundation installation will involve an open-cut excavation to a depth of approximately 4 to 5 ft below existing site grades to reach suitable bearing soils. Groundwater is not anticipated to be encountered during this work activity. Excavated soils will be temporarily stockpiled adjacent to the excavation prior to being reused as backfill around the completed footing foundations. Excess soils generated during the foundation installation will be immediately placed elsewhere on-site to raise the grade.

### 3.6.3 Site Utilities and Infrastructure

Installation of site utilities and infrastructure will generally require excavation within existing soils above the anticipated depth of groundwater. Excavation will be conducted in accordance with Section 4.1 and soils will be handled in accordance with Section 4.2.1 of this Work plan.

Excavation for the installation of catch basins and water quality units is anticipated to extend below El. 52.8, but not into groundwater. These excavations will be conducted in accordance with the requirements of Section 4.2 of this Work Plan. The areas where excavation is anticipated to extend below El. 52.8 ft (NAVD88) are shown of **Figure 4**, Grading & Drainage Plan. No excavation is expected to extend into the water table.

Excavations for utility work to be conducted outside the limits of the property within Cabot Road are outside the boundary of the Industri-plex OU2 area and are therefore not subject to exclusion zone work practices.

## **4.0 WORK PRACTICES**

Work to complete the intrusive activities described above is to be performed in accordance with the following work practices.

### **4.1 Excavation**

Proposed excavation activities, including excavation for foundations and for the installation of site utilities, are to be conducted entirely within the "Limits of Work" at the property, with the exception of select utility work to be conducted within Cabot Road. As outlined in the attached HASP, the outer limits of the property, with the exception of the support zone, define the exclusion zone. Workers performing excavation activities will be required to have appropriate levels of training and don PPE as specified in the attached HASP prior to the commencement of any excavation or other intrusive activities. Within the exclusion zone, areas where excavations will occur will be cordoned off in accordance with the specifications in the attached HASP to prevent any unauthorized personnel from entering the excavation area.

Air monitoring, as required by the HASP, will be conducted during excavation operations. Excavations will be made using conventional earth moving equipment and conducted in a manner that limits the size of the excavations and limits the disturbance of site soils. Soils excavated during proposed work activities will be handled in accordance with the procedures outlined in Section 4.3 of this work plan. Excavations that are required below the groundwater table will be dewatered in accordance with Section 4.3.

Prior to workers entering a completed excavation to install foundations or utilities, the SHSO shall inspect the excavation to ensure that it complies with provisions of the HASP and that workers have the appropriate PPE, as outlined in the HASP, to complete work within the excavation.

### **4.2 Materials Handling**

#### **4.2.1 Excavated Soils**

Soils excavated above El. 52.8 during the proposed work will be replaced within the excavation from which they were removed, to the extent possible. For circumstances where performance of the proposed work activity (e.g., installation of site utilities and/or infrastructure) displaces soil from the excavation, the displaced quantity will be utilized within the "Limit of Work" of the 32 Cabot Road property to raise the site to proposed grades. No site soils originating from an elevation above El. 52.8 are to be transported off-site.

Soil removed from excavations below El. 52.8 that are conducted within areas of the site where site soils are exposed and that do not encounter groundwater will be transported to the MMA for storage, characterization and off-site disposal. Excavated soil will be live loaded into site dump trucks using a designated loading area. The trucks will not be overfilled such that spillage occurs from the truck during transport to the MMA. Soils spilled onto the side of the truck during loading will be brushed off prior to exiting the loading area. If soil is excavated below the groundwater elevation, site dump trucks will be sealed to prevent water seepage from the dump body during transport.

Areas where soil excavation will extend below El. 52.8 feet (NAVD88) include the following:

- Catch basins (CB1, CB2, CB3, CB5, CB6 & CB7) – See Figure 4;
- Water quality units (WQU1, WQU2, WQU3, WQU4 & WQU5) – See Figure 4;

Local stockpile areas will be protected from erosion and dust migration during the course of work through the application of water, use of polyethylene sheeting covers or similar methods, as determined necessary by the Independent Professional's Representative and/or the SHSO.

In the event that material stockpiled within the MMA is not re-used on-site within a period of 70 days from the day the material was stockpiled, written notification will be provided to the EPA indicating the status of the stockpile and the anticipated schedule for its proposed reuse. The SHSO will be responsible for tracking the age of stockpiles within the MMA.

Excavations to be carried below the groundwater table will be dewatered in accordance with Section 4.3 of this Work plan. Saturated soils removed from the excavation will be stockpiled at the designated Materials Management Area after being drained of free water adjacent to the excavation of origin.

#### 4.2.2 Imported Materials

Imported materials, such as fill to raise the grade or specialty utility backfill, shall consist of clean granular soils imported from commercial borrow pits or other non-impacted, undeveloped sites. A sample(s) of each proposed material shall be submitted to a certified laboratory to test for the compounds listed below, and other compounds deemed appropriate based upon the nature of the proposed source site. Any imported material will be assessed and judged as not impacted by oil or hazardous materials, free of organic and inorganic contamination, below MCP RCS-1 levels, and approved by the Independent Professional and the EPA, prior to being transported to the subject property.

<b>Analysis</b>	<b>Method</b>
Volatile Organic Compounds (VOC)	SW-846 8260B
Semi-Volatile Organic Compounds (SVOC)	SW-846 8270C
Extractable Petroleum Hydrocarbons (EPH) – adj. carbon ranges only.	MassDEP Method
Total Petroleum Hydrocarbons (TPH)	EPA 8015
Pesticides	SW-846 8081A
Polychlorinated Biphenyls (PCB)	SW-846 8082
Trace Metals (RCRA 8)	SW-846 6010B
Mercury	SW-846 7470/7471
Hazard ID (ignitability, corrosivity, reactivity)	

Materials shall be used promptly upon importing them to the site. If the materials cannot be placed and compacted immediately, they will be temporarily stockpiled on-site. The stockpiles of imported fill material shall be covered with polyethylene sheeting and separated from other stockpiled materials at the site.

### **4.3 Water Management and Dewatering**

Clean sources of water imported for decontamination and materials management activities (personnel and equipment decontamination, and watering of stockpiles and for dust control) will be allowed to infiltrate within the limits of work. Imported water will be used only as necessary to minimize the potential for generating possible contaminated runoff.

If dewatering is required to allow for construction in-the-dry, water will be pumped from the excavation by means of temporary sump pumps wrapped in filter fabric to fractionation tanks or equivalent storage systems pending characterization. Water collected in the fractionation tanks from dewatering activities and from the MMA will be sampled and tested by the Independent Professional for purposes of characterizing the water for off-site disposal. The water will be tested in accordance with the requirements of the Contractor's approved disposal facility. The Contractor's proposed disposal facility must be approved by the Independent Professional and the U.S. EPA prior to transport of water from the site. The test results, as well as information about the Contractor's selected disposal facility, will be forwarded to the Independent Professional and the U.S. EPA for review and approval prior to removing the water from the site. Water will be managed and/or disposed of as approved by the EPA and in accordance with all applicable laws, regulations, and ordinances, and within a period of 90 days from the date on-site storage commenced.

### **4.4 Exposure of Unanticipated Contaminated Materials**

In the event that, during the performance of proposed work activities, it is determined through visual and/or olfactory evidence, screening or testing, that Contaminated Soil has been or may be encountered above EI. 52.8, work within the immediate vicinity of the suspected Contaminated Soil will be halted and the following steps taken:

- Immediate oral notification will be provided to the EPA and MassDEP of such discovery; followed by written notification within 7 days, with a copy to the Site Owner(s);
- A revised work plan, detailing proposed plans to dispose of the Contaminated Soil will be submitted within 30 days of encountering the Contaminated Media;

Work within the vicinity of the Contaminated Soil will not be resumed until written approval of the work plan is obtained from the EPA and MassDEP. Following approval, work activities will be performed in accordance with the requirements of the revised work plan.

### **4.5 Dust Control**

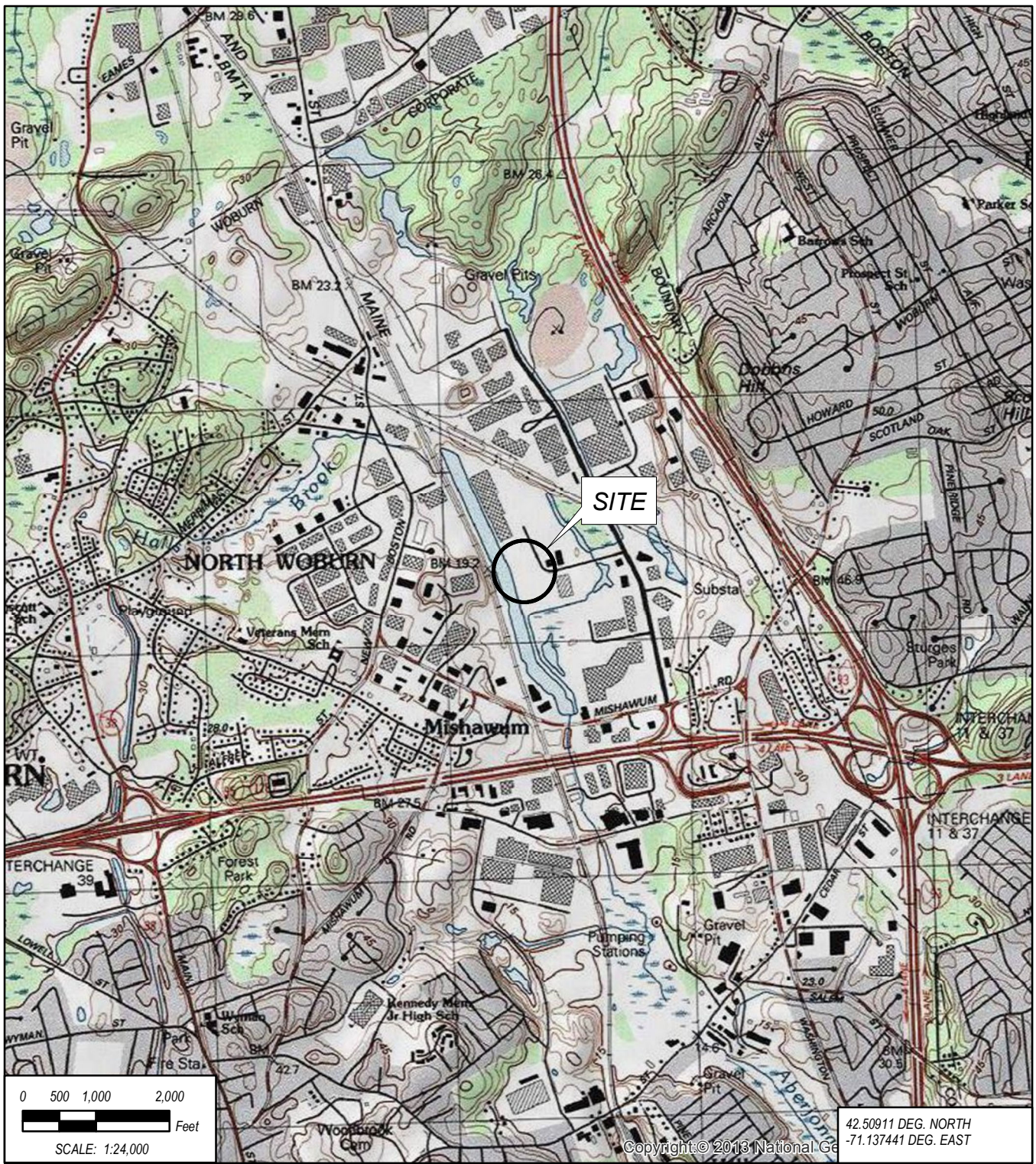
Air and dust monitoring will be conducted at the site in accordance with the HASP. In the event that the air monitoring reveals that acceptable levels of dust have been exceeded, the Contractor shall stop all work activities contributing to dust and implement dust control procedures outlined in the HASP to achieve dust levels within acceptable limits and prevent visible, airborne dust from leaving the site.

## **5.0 CLOSURE PROCESS AND COMPLETION REPORT DOCUMENTATION**

At the conclusion of the project, the property will be inspected by the Owner and the Independent Professional. All temporary site services and materials will be removed from the property and equipment and personnel will be demobilized from the property. Erosion & Sediment controls will remain in place as long as required by the Woburn Conservation Commission to support the stabilization of disturbed areas.

A Completion Report, prepared by the project Independent Professional, will be submitted to US EPA and shall confirm that work activities were completed in accordance with this Work Plan. The completion Report is to include supporting documentation such as field records, materials handling information, disposal records, and air monitoring data. The Completion Report will also describe if the remedy was impacted by the work and, if applicable, how the impact to the remedy was corrected in accordance with the approved 100% Remedial Designs, at a minimum.

## FIGURES



SOURCE: BUREAU OF GEOGRAPHIC INFORMATION (MassGIS), COMMONWEALTH OF MASSACHUSETTS EXECUTIVE OFFICE OF TECHNOLOGY AND SECURITY SERVICES.  
USGS TOPOGRAPHIC MAPS: WILMINGTON, READING, LEXINGTON AND BOSTON NORTH, MA QUADRANGLES

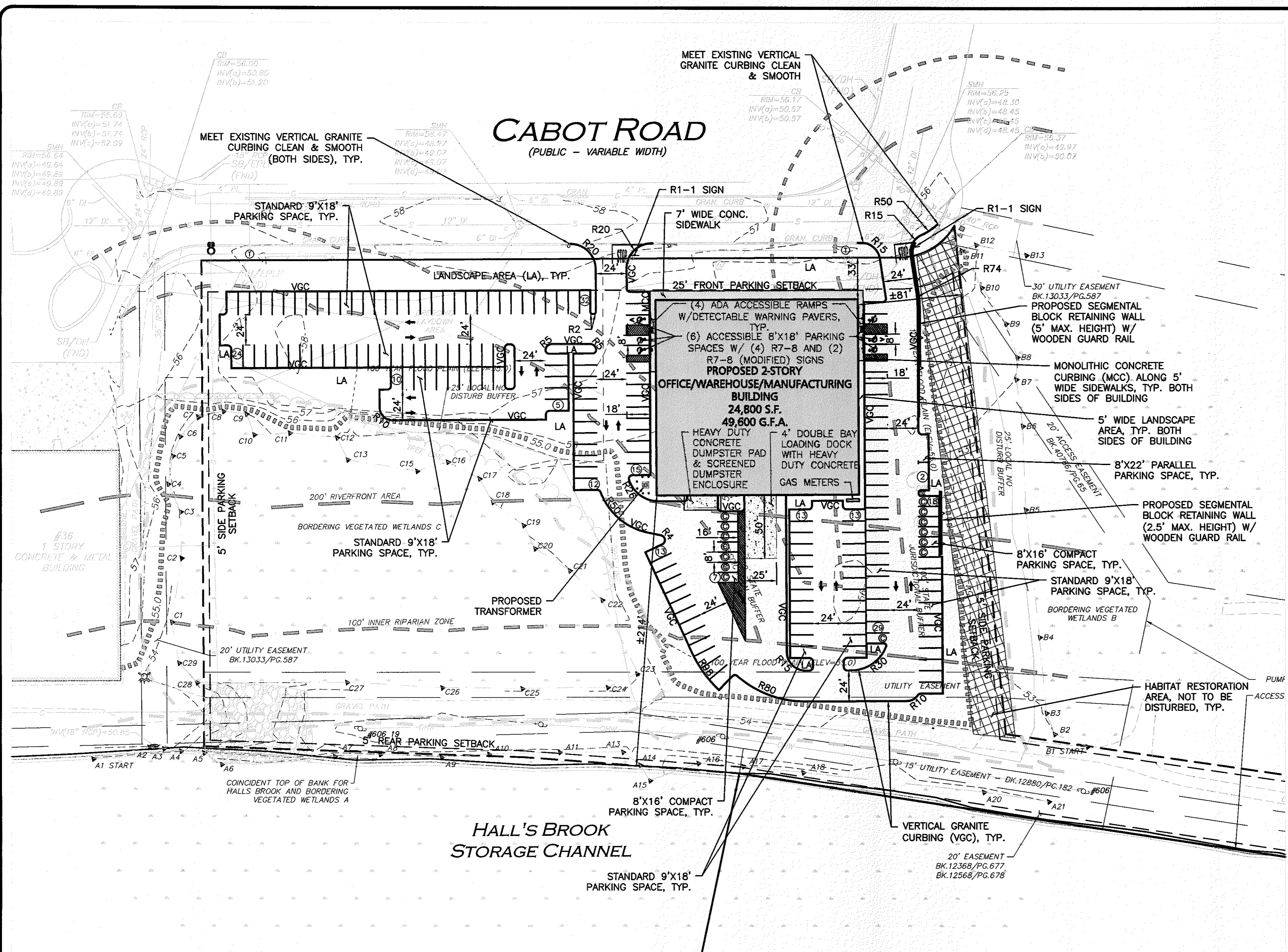


2 Merchant Street, Suite 2 P: (781) 793-0074  
Sharon, Massachusetts 02067 F: (781) 793-7877  
[www.EnviroTrac.com](http://www.EnviroTrac.com)

**LOCUS MAP**

32 CABOT ROAD  
WOBURN, MASSACHUSETTS

DRAWN BY	PROJECT	DATE	FIGURE
RHB	03.990354.00	6/29/2018	1



### LEGEND:

- PROPERTY LINE
- SIGN
- BOLLARD
- BUILDING
- BUILDING ARCHITECTURE
- BUILDING INTERIOR WALLS
- CURB
- RETAINING WALL
- PARKING STRIPING
- ROADWAY STRIPING
- TRAFFIC ARROWS
- HEAVY DUTY CONCRETE
- HEAVY DUTY PAVEMENT
- SIDEWALK
- BRICK SIDEWALK
- ADA ACCESSIBLE RAMP
- ADA DET. WARNING SURFACE
- SETBACK LINE
- PARKING COUNT
- COMPACT SPACE
- TRANSFORMER

- NOTES:**
- THE INFORMATION SHOWN ON THIS PLAN IS THE SOLE PROPERTY OF ALLEN & MAJOR ASSOCIATES, INC. ITS INTENDED USE IS TO PROVIDE INFORMATION. ANY ALTERATION, MISUSE, OR RECALCULATION OF INFORMATION OR DATA WITHOUT THE EXPRESSED, WRITTEN CONSENT OF ALLEN & MAJOR ASSOCIATES, INC. IS STRICTLY PROHIBITED.
  - THE BASE PLAN USED IN THIS DRAWING IS FROM AN EXISTING CONDITIONS PLAN FOR 32-36 CABOT ROAD PREPARED FOR MAGGIORE CONSTRUCTION CORP. BY ALLEN & MAJOR ASSOCIATES, REVISED 09-12-2017.
  - THE CONTRACTOR IS SPECIFICALLY CAUTIONED THAT THE LOCATION AND/OR ELEVATION OF EXISTING UTILITIES AND STRUCTURES AS SHOWN ON THESE PLANS IS BASED ON RECORDS OF VARIOUS UTILITY COMPANIES AND WHERE POSSIBLE, MEASUREMENTS TAKEN IN THE FIELD. THIS INFORMATION IS NOT TO BE RELIED ON AS BEING EXACT OR COMPLETE. THE LOCATION OF ALL UNDERGROUND UTILITIES AND STRUCTURES SHALL BE VERIFIED IN THE FIELD BY THE CONTRACTOR PRIOR TO THE START OF CONSTRUCTION. THE CONTRACTOR MUST CONTACT THE APPROPRIATE UTILITY COMPANY, ANY GOVERNING PERMITTING AUTHORITY, AND "DIGSAFE" AT LEAST 72 HOURS PRIOR TO ANY EXCAVATION WORK TO REQUEST EXACT FIELD LOCATION OF UTILITIES AND THE ENGINEER SHALL BE NOTIFIED IN WRITING OF ANY UTILITIES INTERFERING WITH THE PROPOSED CONSTRUCTION AND APPROPRIATE REMEDIAL ACTION TAKEN BEFORE PROCEEDING WITH THE WORK. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO RELOCATE ALL EXISTING UTILITIES WHICH CONFLICT WITH THE PROPOSED IMPROVEMENTS SHOWN ON THE PLANS. DIGSAFE: 1-888-344-7233
  - ALL CURB RADII ARE 3' UNLESS OTHERWISE NOTED.

### OFF-STREET PARKING SUMMARY

USE: OFFICE (PER SECTION 8.2.5) 100% SECOND FLOOR  
 1 SPACE PER 350 SQUARE FEET (24,800/350) = 71

MANUFACTURING (PER SECTION 8.2.5) 30% FIRST FLOOR  
 1 SPACE PER 400 SQUARE FEET (7,440/400) = 19

WAREHOUSE (PER SECTION 8.2.5) 70% FIRST FLOOR  
 1 SPACE PER 800 SQUARE FEET (17,360/800) = 22

TOTAL = 112

REQUIRED: 6 TOTAL PARKING STALLS SHALL BE ACCESSIBLE (MINIMUM OF 1 ACCESSIBLE STALLS SHALL BE VAN ACCESSIBLE)

COMPACT PARKING: UP TO 30% OF THE RECOMMENDED NUMBER OF OFF STREET PARKING SPACES MAY BE SPACES FOR SMALL OR COMPACT CARS.

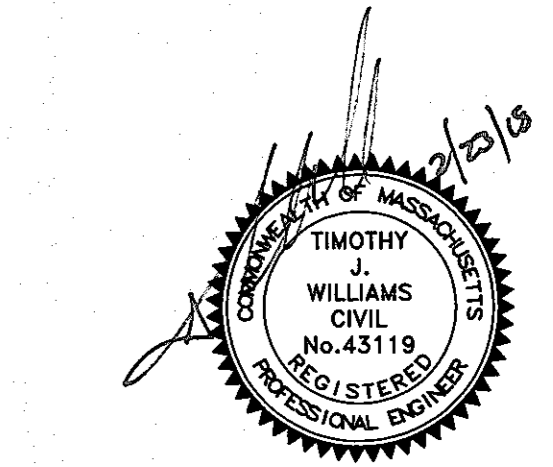
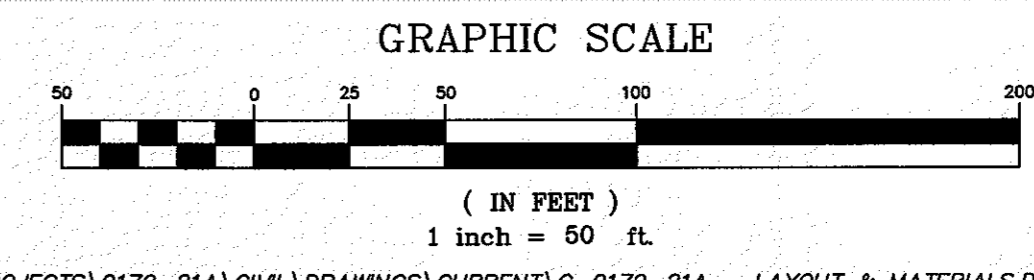
112 RECOMMENDED SPACES X 30% = 34 COMPACT SPACES ALLOWED

STANDARD (9' x 18')	PARALLEL (8' x 22')	COMPACT (8' x 16')	ACCESSIBLE (8' x 18')	TOTAL PROVIDED	TOTAL REQUIRED
171	2	14	6	193	112

### LAND USAGE TABLE - 32 CABOT ROAD

ZONE: INDUSTRIAL PARK (IP)  
 COMMERCE WAY CORRIDOR OVERLAY DISTRICT (CWCD)

ITEM	EXISTING	PROPOSED	REQUIRED/ALLOWED
LOT AREA (S.F.)	272,052 S.F. (6.25 ACRES)	272,052 S.F. (6.25 ACRES)	40,000 S.F. (MIN.)
FRONTAGE (FEET)	604±'	604±'	125'
MINIMUM LOT WIDTH (FEET)	595±'	595±'	40'
FLOOR AREA RATIO	N/A	0.18	0.50
FRONT YARD SETBACK (FEET)	N/A	33'	25'
SIDE YARD SETBACK (FEET)	N/A	±81'	25'
REAR YARD SETBACK (FEET)	N/A	±214'	25'
BUILDING HEIGHT (STORIES)	N/A	2	7 (MAX.)
BUILDING HEIGHT (FEET)	N/A	<80'	80' (MAX.)
LOT COVERAGE (%)	N/A	9.1% (24,800 S.F.)	N/A
OPEN SPACE	N/A	26.4% (173,951 S.F.)	30% (MIN.)



PROFESSIONAL ENGINEER FOR ALLEN & MAJOR ASSOCIATES, INC.

REV	DATE	DESCRIPTION
6	02-23-2018	ISSUED TO CITY COUNCIL
5	01-22-2018	ISSUED TO CON. COMMISSION
4	01-10-2018	ISSUED TO CON. COMMISSION
3	12-11-2017	ISSUED TO CON. COMMISSION
2	09-12-2017	ISSUED TO CITY COUNCIL
1	09-12-2017	ISSUED TO CON. COMMISSION

APPLICANT/OWNER:  
**36 CABOT ROAD LLC**  
**36 CABOT ROAD**  
**WOBURN, MA 01801**

PROJECT:  
**32 CABOT ROAD**  
**WOBURN, MA**

PROJECT NO.	0179-21A	DATE:	06-08-2017
SCALE:	1"=50'	DWG. NAME:	C0179-21A
DESIGNED BY:	NCD	CHECKED BY:	TJW

**ALLEN & MAJOR ASSOCIATES, INC.**  
 civil & structural engineering • land surveying  
 environmental consulting • landscape architecture  
 www.allenmajor.com  
 100 COMMERCE WAY  
 WOUBURN MA 01801-8501  
 TEL: (781) 935-6889  
 FAX: (781) 935-2896

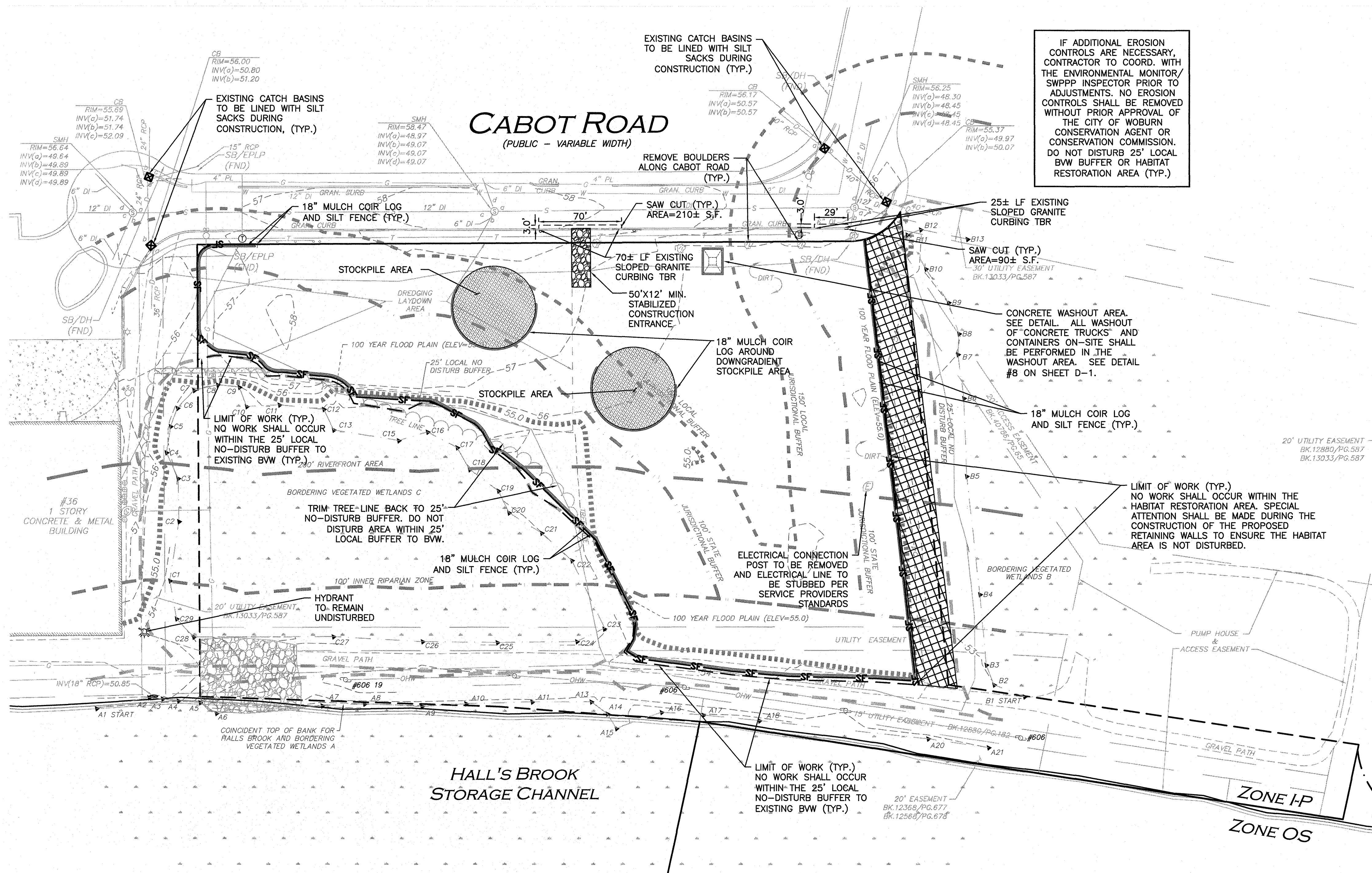
WOUBURN, MA • LAKEVILLE, MA • MANCHESTER, NH

THIS DRAWING HAS BEEN PREPARED IN ELECTRONIC FORMAT. CLIENT/CLIENT'S REPRESENTATIVE OR CONSULTANT MAY BE PROVIDED COPIES OF DRAWINGS AND SPECIFICATIONS ON MAGNETIC MEDIA FOR HIS/HER INFORMATION AND USE FOR SPECIFIC APPLICATION TO THIS PROJECT. DUE TO THE POTENTIAL THAT THE MAGNETIC INFORMATION MAY BE MODIFIED UNINTENTIONALLY OR OTHERWISE, ALLEN & MAJOR ASSOCIATES, INC. MAY REMOVE ALL INDICATION OF THE DOCUMENT'S AUTHORSHIP ON THE MAGNETIC MEDIA. PRINTED REPRESENTATIONS OF THE DRAWINGS AND SPECIFICATIONS ISSUED SHALL BE THE ONLY RECORD COPIES OF ALLEN & MAJOR ASSOCIATES, INC.'S WORK PRODUCT.

DRAWING TITLE: **FIGURE 2** SHEET No.  
**LAYOUT & MATERIALS PLAN** C-2

**DIG SAFE**

BEFORE YOU DIG  
 CALL 811 OR  
 1-888-DIG-SAFE  
 1-888-344-7233

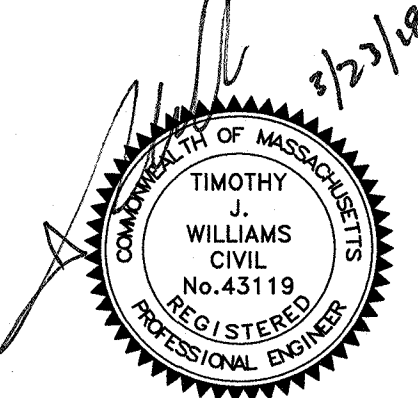


IF ADDITIONAL EROSION CONTROLS ARE NECESSARY, CONTRACTOR TO COORD. WITH THE ENVIRONMENTAL MONITOR/SWPPP INSPECTOR PRIOR TO ADJUSTMENTS. NO EROSION CONTROLS SHALL BE REMOVED WITHOUT PRIOR APPROVAL OF THE CITY OF WOBURN CONSERVATION AGENT OR CONSERVATION COMMISSION. DO NOT DISTURB 25' LOCAL BW BUFFER OR HABITAT RESTORATION AREA (TYP.)

**LEGEND:**

- PROPERTY LINE
- SAWCUT PAVEMENT LINE
- LIMIT OF WORK
- SILT FENCE
- 18" MULCH COIR LOG
- SILT SACK
- CONSTRUCTION ENTRANCE
- STOCKPILE/CONSTRUCTION STAGING AREA
- TO BE REMOVED

- NOTES:**
- THE INFORMATION SHOWN ON THIS PLAN IS THE SOLE PROPERTY OF ALLEN & MAJOR ASSOCIATES, INC. IT'S INTENDED USE IS TO PROVIDE INFORMATION. ANY ALTERATION, MISUSE, OR RECALCULATION OF INFORMATION OR DATA WITHOUT THE EXPRESSED, WRITTEN CONSENT OF ALLEN & MAJOR ASSOCIATES, INC. IS STRICTLY PROHIBITED.
  - THE BASE PLAN USED IN THIS DRAWING IS FROM AN EXISTING CONDITIONS PLAN FOR 32-36 CABOT ROAD PREPARED FOR MAGGIORE CONSTRUCTION CORP. BY ALLEN & MAJOR ASSOCIATES, REVISED 09-12-2017.
  - THE CONTRACTOR IS SPECIFICALLY CAUTIONED THAT THE LOCATION AND/OR ELEVATION OF EXISTING UTILITIES AND STRUCTURES AS SHOWN ON THESE PLANS IS BASED ON RECORDS OF VARIOUS UTILITY COMPANIES AND WHERE POSSIBLE, MEASUREMENTS TAKEN IN THE FIELD. THIS INFORMATION IS NOT TO BE RELIED ON AS BEING EXACT OR COMPLETE. THE LOCATION OF ALL UNDERGROUND UTILITIES AND STRUCTURES SHALL BE VERIFIED IN THE FIELD BY THE CONTRACTOR PRIOR TO THE START OF CONSTRUCTION. THE CONTRACTOR MUST CONTACT THE APPROPRIATE UTILITY COMPANY, ANY GOVERNING PERMITTING AUTHORITY, AND "DIGSAFE" AT LEAST 72 HOURS PRIOR TO ANY EXCAVATION WORK TO REQUEST EXACT FIELD LOCATION OF UTILITIES AND THE ENGINEER SHALL BE NOTIFIED IN WRITING OF ANY UTILITIES INTERFERING WITH THE PROPOSED CONSTRUCTION AND APPROPRIATE REMEDIAL ACTION TAKEN BEFORE PROCEEDING WITH THE WORK. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO RELOCATE ALL EXISTING UTILITIES WHICH CONFLICT WITH THE PROPOSED IMPROVEMENTS SHOWN ON THE PLANS. DIGSAFE: 1-888-344-7233.
  - ALTHOUGH CERTAIN ITEMS HAVE BEEN NOTED ON THIS DRAWING FOR DEMOLITION, NO ATTEMPT HAS BEEN MADE TO DELINEATE EACH AND EVERY ITEM THAT REQUIRES DEMOLITION FOR THE COMPLETION OF THE PROJECT. THE CONTRACTOR WILL BE RESPONSIBLE FOR ALL NECESSARY DEMOLITION WORK TO COMPLETE THE PROJECT. ALLEN & MAJOR ASSOCIATES, INC. IS NOT RESPONSIBLE FOR SITE DEMOLITION ITEMS NOT SHOWN ON THE SURVEY, OR SPECIFICALLY NOTED. THE DEMOLITION NOTES AND ARROWS ON THIS PLAN ARE TYPICAL AND DO NOT REFLECT QUANTITY.



PROFESSIONAL ENGINEER FOR ALLEN & MAJOR ASSOCIATES, INC.

REV	DATE	DESCRIPTION
7	03-23-2018	ISSUED TO CONSERVATION
6	02-23-2018	ISSUED TO CITY COUNCIL
5	01-22-2018	ISSUED TO CON. COMMISSION
4	01-10-2018	ISSUED TO CON. COMMISSION
3	12-11-2017	ISSUED TO CON. COMMISSION
2	09-12-2017	ISSUED TO CITY COUNCIL
1	09-12-2017	ISSUED TO CON. COMMISSION

APPLICANT/OWNER:  
**36 CABOT ROAD LLC**  
 36 CABOT ROAD  
 WOBURN, MA 01801

PROJECT:  
**32 CABOT ROAD**  
 WOBURN, MA

PROJECT NO.	0179-21A	DATE:	06-08-2017
SCALE:	1"=50'	DWG. NAME:	C0179-21A
DESIGNED BY:	NCD	CHECKED BY:	TJW

PREPARED BY:

**ALLEN & MAJOR ASSOCIATES, INC.**  
 civil & structural engineering • land surveying  
 environmental consulting • landscape architecture  
 www.allenmajor.com  
 100 COMMERCE WAY  
 WOBURN, MA 01801-4501  
 TEL: (781) 935-6889  
 FAX: (781) 935-2896

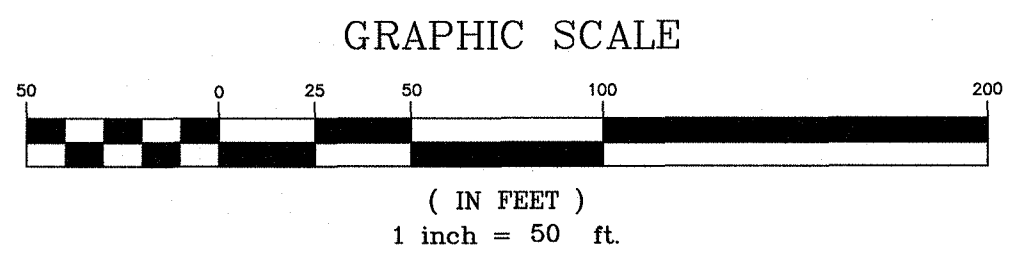
WOBURN, MA • LAKEVILLE, MA • MANCHESTER, NH

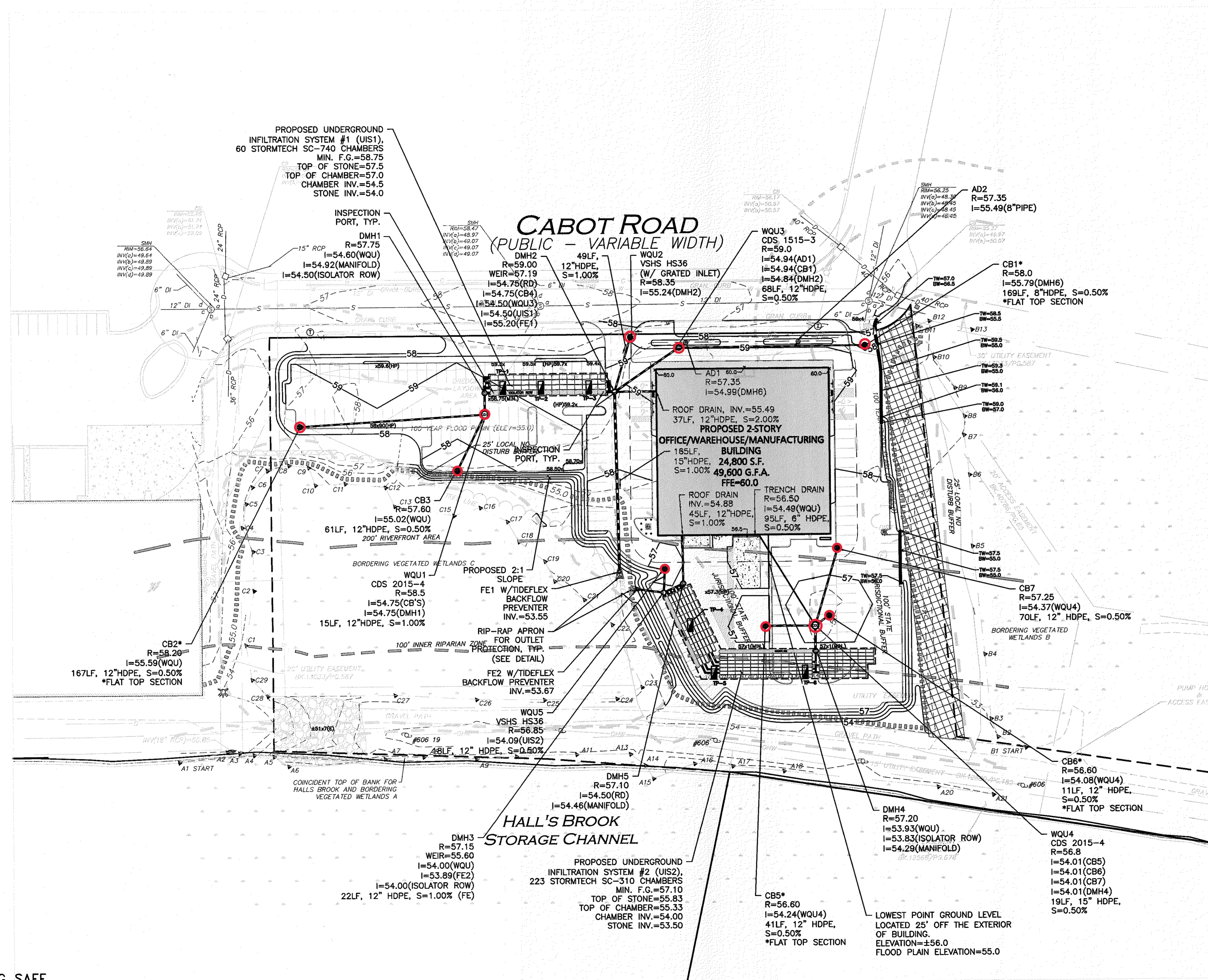
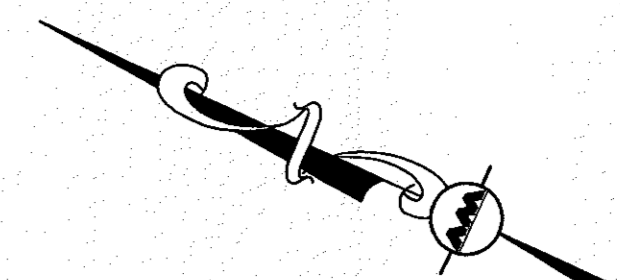
THIS DRAWING HAS BEEN PREPARED IN ELECTRONIC FORMAT. CLIENT'S REPRESENTATIVE OR CONSULTANT MAY BE PROVIDED COPIES OF DRAWINGS AND SPECIFICATIONS ON MAGNETIC MEDIA FOR HIS/HER INFORMATION AND USE FOR SPECIFIC APPLICATION TO THIS PROJECT. DUE TO THE POTENTIAL THAT THE MAGNETIC INFORMATION MAY BE MODIFIED UNINTENTIONALLY OR OTHERWISE, ALLEN & MAJOR ASSOCIATES, INC. MAY REMOVE ALL INDICATION OF THE DOCUMENT'S AUTHORSHIP ON THE MAGNETIC MEDIA. PRINTED REPRESENTATIONS OF THE DRAWINGS AND SPECIFICATIONS ISSUED SHALL BE THE ONLY RECORD COPIES OF ALLEN & MAJOR ASSOCIATES, INC.'S WORK PRODUCT.

DRAWING TITLE:	SHEET No.
<b>DEMOLITION &amp; EROSION CONTROL PLAN</b>	<b>C-1</b>

**DIG SAFE**

BEFORE YOU DIG  
 CALL 811 OR  
 1-888-DIG-SAFE  
 1-888-344-7233



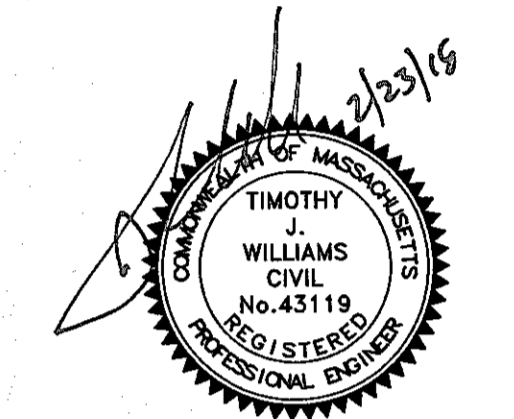


**LEGEND:**

- DRAIN MANHOLE
- CATCH BASIN
- WATER QUALITY UNIT
- FLARED END SECTION
- DRAIN LINE
- RIPRAP OUTFALL
- 1' CONTOUR
- SPOT GRADE
- TOP OF BERM
- INFILTRATION SYSTEM

- NOTES:**
- THE INFORMATION SHOWN ON THIS PLAN IS THE SOLE PROPERTY OF ALLEN & MAJOR ASSOCIATES, INC. IT'S INTENDED USE IS TO PROVIDE INFORMATION. ANY ALTERATION, MISUSE, OR RECALCULATION OF INFORMATION OR DATA WITHOUT THE EXPRESSED, WRITTEN CONSENT OF ALLEN & MAJOR ASSOCIATES, INC. IS STRICTLY PROHIBITED.
  - THE BASE PLAN USED IN THIS DRAWING IS FROM AN EXISTING CONDITIONS PLAN FOR 32-36 CABOT ROAD PREPARED FOR MAGGIORE CONSTRUCTION CORP. BY ALLEN & MAJOR ASSOCIATES, DATED 09-12-2017.
  - ALL PIPES DIMENSIONS ARE MEASURED FROM INSIDE FACE OF STRUCTURE.
  - ALL ELEVATIONS REFER TO NAVD 88.
  - THE CONTRACTOR IS SPECIFICALLY CAUTIONED THAT THE LOCATION AND/OR ELEVATION OF EXISTING UTILITIES AND STRUCTURES AS SHOWN ON THESE PLANS IS BASED ON RECORDS OF VARIOUS UTILITY COMPANIES AND WHERE POSSIBLE, MEASUREMENTS TAKEN IN THE FIELD. THIS INFORMATION IS NOT TO BE RELIED ON AS BEING EXACT OR COMPLETE. THE LOCATION OF ALL UNDERGROUND UTILITIES AND STRUCTURES SHALL BE VERIFIED IN THE FIELD BY THE CONTRACTOR PRIOR TO THE START OF CONSTRUCTION. THE CONTRACTOR MUST CONTACT THE APPROPRIATE UTILITY COMPANY, ANY GOVERNING PERMITTING AUTHORITY, AND "DIGSAFE" AT LEAST 72 HOURS PRIOR TO ANY EXCAVATION WORK TO REQUEST EXACT FIELD LOCATION OF UTILITIES AND THE ENGINEER SHALL BE NOTIFIED IN WRITING OF ANY UTILITIES INTERFERING WITH THE PROPOSED CONSTRUCTION AND APPROPRIATE REMEDIAL ACTION TAKEN BEFORE PROCEEDING WITH THE WORK. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO RELOCATE ALL EXISTING UTILITIES WHICH CONFLICT WITH THE PROPOSED IMPROVEMENTS SHOWN ON THE PLANS. DIGSAFE: 1-888-344-7233

Areas of potential excavation below elevation El. 52.8 (NAVD88) which require management as Hazardous Materials are shown in RED outline.



PROFESSIONAL ENGINEER FOR ALLEN & MAJOR ASSOCIATES, INC.

REV	DATE	DESCRIPTION
6	02-23-2018	ISSUED TO CITY COUNCIL
5	01-22-2018	ISSUED TO CON. COMMISSION
4	01-10-2018	ISSUED TO CON. COMMISSION
3	12-11-2017	ISSUED TO CON. COMMISSION
2	09-12-2017	ISSUED TO CITY COUNCIL
1	09-12-2017	ISSUED TO CON. COMMISSION

APPLICANT/OWNER:  
**36 CABOT ROAD LLC**  
 36 CABOT ROAD  
 WOBURN, MA 01801

PROJECT:  
**32 CABOT ROAD**  
 WOBURN, MA

PROJECT NO.	0179-21A	DATE:	06-08-2017
SCALE:	1"=50'	DWG. NAME:	C0179-21A
DESIGNED BY:	NCD	CHECKED BY:	TJW

PREPARED BY:

**ALLEN & MAJOR ASSOCIATES, INC.**  
 civil & structural engineering • land surveying  
 environmental consulting • landscape architecture  
 www.allenmajor.com  
 100 COMMERCE WAY  
 WOBURN MA 01801-8501  
 TEL: (781) 935-6889  
 FAX: (781) 935-2896

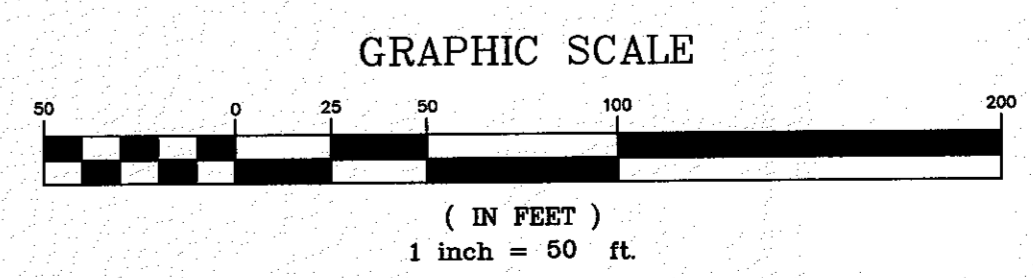
WOBURN, MA • LAKEVILLE, MA • MANCHESTER, NH

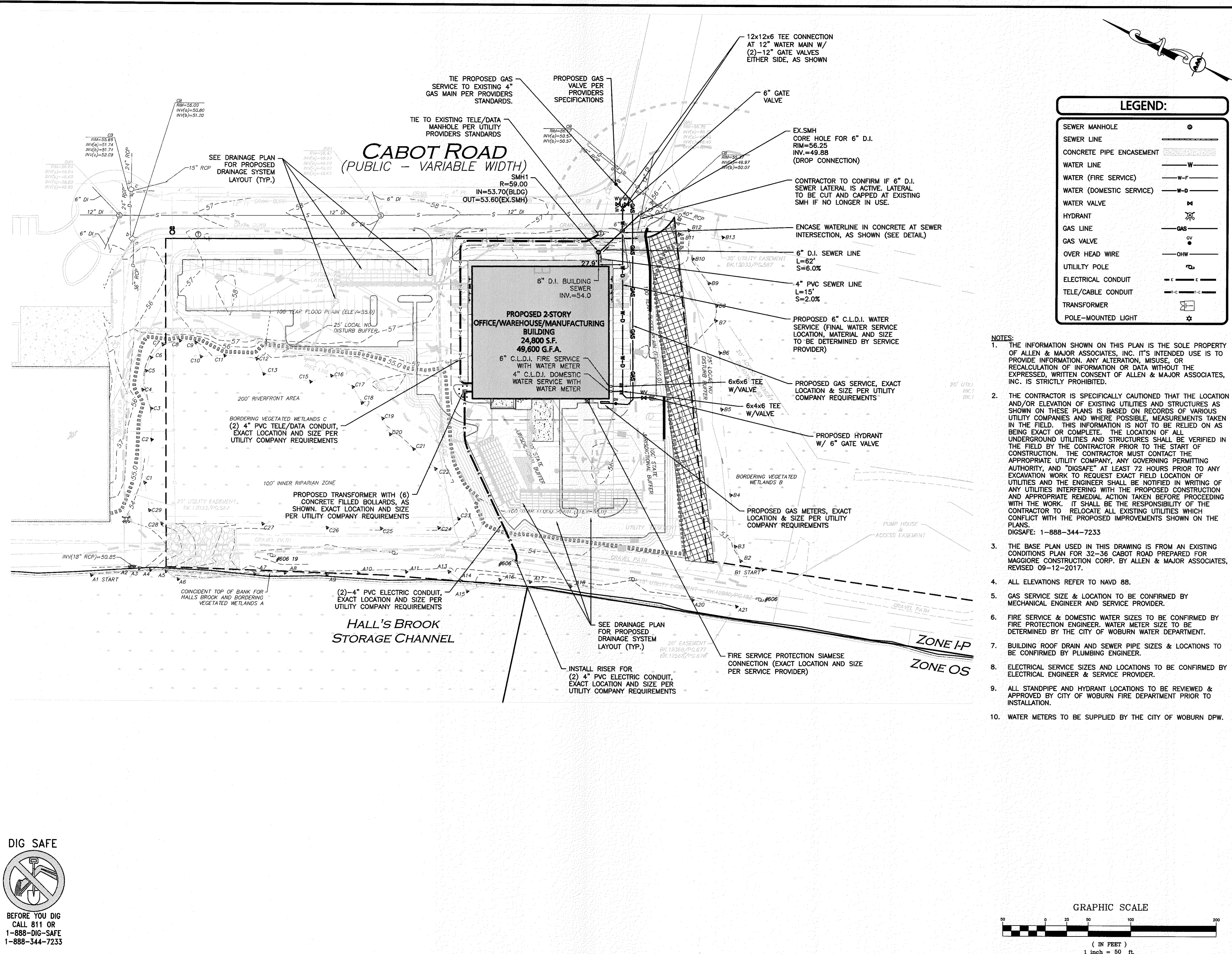
THIS DRAWING HAS BEEN PREPARED IN ELECTRONIC FORMAT. CLIENT/CLIENT'S REPRESENTATIVE OR CONSULTANT MAY BE PROVIDED COPIES OF DRAWINGS AND SPECIFICATIONS ON MAGNETIC MEDIA FOR HIS/HER INFORMATION AND USE FOR SPECIFIC APPLICATION TO THIS PROJECT. DUE TO THE POTENTIAL THAT THE MAGNETIC INFORMATION MAY BE MODIFIED UNINTENTIONALLY OR OTHERWISE, ALLEN & MAJOR ASSOCIATES, INC. MAY REMOVE ALL INDICATION OF THE DOCUMENT'S AUTHORSHIP ON THE MAGNETIC MEDIA. PRINTED REPRESENTATIONS OF THE DRAWINGS AND SPECIFICATIONS ISSUED SHALL BE THE ONLY RECORD COPIES OF ALLEN & MAJOR ASSOCIATES, INC.'S WORK PRODUCT.

DRAWING TITLE: **FIGURE 4** SHEET No.  
**GRADING & DRAINAGE PLAN** C-3

**DIG SAFE**

BEFORE YOU DIG  
 CALL 811 OR  
 1-888-DIG-SAFE  
 1-888-344-7233

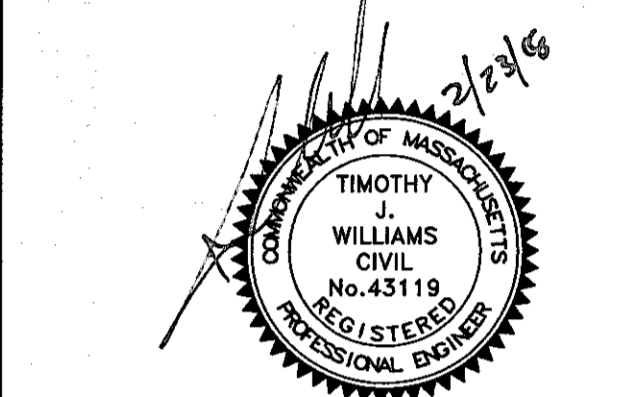




**LEGEND:**

SEWER MANHOLE	○
SEWER LINE	—
CONCRETE PIPE ENCASUREMENT	▨
WATER LINE	—W—
WATER (FIRE SERVICE)	—W-F—
WATER (DOMESTIC SERVICE)	—W-D—
WATER VALVE	⊕
HYDRANT	⊕
GAS LINE	—GAS—
GAS VALVE	⊕
OVER HEAD WIRE	—OHW—
UTILITY POLE	⊕
ELECTRICAL CONDUIT	—E—
TELE/CABLE CONDUIT	—T-C—
TRANSFORMER	⊕
POLE-MOUNTED LIGHT	⊕

- NOTES:**
1. THE INFORMATION SHOWN ON THIS PLAN IS THE SOLE PROPERTY OF ALLEN & MAJOR ASSOCIATES, INC. ITS INTENDED USE IS TO PROVIDE INFORMATION. ANY ALTERATION, MISUSE, OR RECALCULATION OF INFORMATION OR DATA WITHOUT THE EXPRESSED, WRITTEN CONSENT OF ALLEN & MAJOR ASSOCIATES, INC. IS STRICTLY PROHIBITED.
  2. THE CONTRACTOR IS SPECIFICALLY CAUTIONED THAT THE LOCATION AND/OR ELEVATION OF EXISTING UTILITIES AND STRUCTURES AS SHOWN ON THESE PLANS IS BASED ON RECORDS OF VARIOUS UTILITY COMPANIES AND WHERE POSSIBLE, MEASUREMENTS TAKEN IN THE FIELD. THIS INFORMATION IS NOT TO BE RELIED ON AS BEING EXACT OR COMPLETE. THE LOCATION OF ALL UNDERGROUND UTILITIES AND STRUCTURES SHALL BE VERIFIED IN THE FIELD BY THE CONTRACTOR PRIOR TO THE START OF CONSTRUCTION. THE CONTRACTOR MUST CONTACT THE APPROPRIATE UTILITY COMPANY, ANY GOVERNING PERMITTING AUTHORITY, AND "DIGSAFE" AT LEAST 72 HOURS PRIOR TO ANY EXCAVATION WORK TO REQUEST EXACT FIELD LOCATION OF UTILITIES AND THE ENGINEER SHALL BE NOTIFIED IN WRITING OF ANY UTILITIES INTERFERING WITH THE PROPOSED CONSTRUCTION AND APPROPRIATE REMEDIAL ACTION TAKEN BEFORE PROCEEDING WITH THE WORK. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO RELOCATE ALL EXISTING UTILITIES WHICH CONFLICT WITH THE PROPOSED IMPROVEMENTS SHOWN ON THE PLANS.  
DIGSAFE: 1-888-344-7233
  3. THE BASE PLAN USED IN THIS DRAWING IS FROM AN EXISTING CONDITIONS PLAN FOR 32-36 CABOT ROAD PREPARED FOR MAGGIORE CONSTRUCTION CORP. BY ALLEN & MAJOR ASSOCIATES, REVISED 09-12-2017.
  4. ALL ELEVATIONS REFER TO NAVD 88.
  5. GAS SERVICE SIZE & LOCATION TO BE CONFIRMED BY MECHANICAL ENGINEER AND SERVICE PROVIDER.
  6. FIRE SERVICE & DOMESTIC WATER SIZES TO BE CONFIRMED BY FIRE PROTECTION ENGINEER, WATER METER SIZE TO BE DETERMINED BY THE CITY OF WOBURN WATER DEPARTMENT.
  7. BUILDING ROOF DRAIN AND SEWER PIPE SIZES & LOCATIONS TO BE CONFIRMED BY PLUMBING ENGINEER.
  8. ELECTRICAL SERVICE SIZES AND LOCATIONS TO BE CONFIRMED BY ELECTRICAL ENGINEER & SERVICE PROVIDER.
  9. ALL STANDPIPE AND HYDRANT LOCATIONS TO BE REVIEWED & APPROVED BY CITY OF WOBURN FIRE DEPARTMENT PRIOR TO INSTALLATION.
  10. WATER METERS TO BE SUPPLIED BY THE CITY OF WOBURN DPW.



PROFESSIONAL ENGINEER FOR ALLEN & MAJOR ASSOCIATES, INC.

REV	DATE	DESCRIPTION
6	02-23-2018	ISSUED TO CITY COUNCIL
5	01-22-2018	ISSUED TO CON. COMMISSION
4	01-10-2018	ISSUED TO CON. COMMISSION
3	12-11-2017	ISSUED TO CON. COMMISSION
2	09-12-2017	ISSUED TO CITY COUNCIL
1	09-12-2017	ISSUED TO CON. COMMISSION

APPLICANT/OWNER:  
**36 CABOT ROAD LLC**  
 36 CABOT ROAD  
 WOBURN, MA 01801

PROJECT:  
**32 CABOT ROAD**  
 WOBURN, MA

PROJECT NO.	0179-21A	DATE:	06-08-2017
SCALE:	1"=50'	DWG. NAME:	C0179-21A
DESIGNED BY:	NCD	CHECKED BY:	TJW

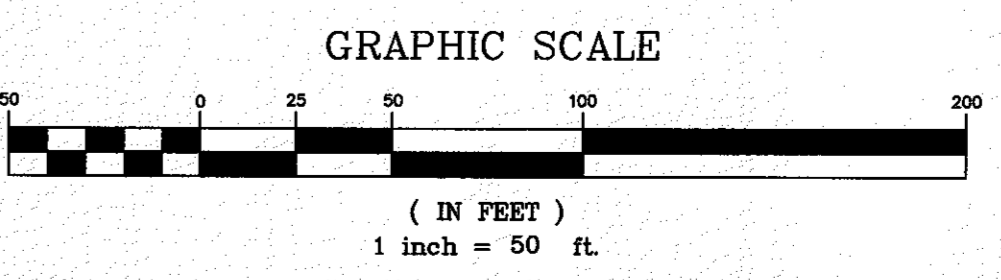
PREPARED BY:

**ALLEN & MAJOR ASSOCIATES, INC.**  
 civil & structural engineering • land surveying  
 environmental consulting • landscape architecture  
 www.allenmajor.com  
 100 COMMERCE WAY  
 WOBURN MA, 01801-8501  
 TEL: (781) 985-6889  
 FAX: (781) 985-2896

WOBURN, MA • LAKEVILLE, MA • MANCHESTER, NH

THIS DRAWING HAS BEEN PREPARED IN ELECTRONIC FORMAT. CLIENTS/CLIENTS REPRESENTATIVE OR CONSULTANT MAY BE PROVIDED COPIES OF DRAWINGS AND SPECIFICATIONS ON MAGNETIC MEDIA FOR HIS/HER INFORMATION AND USE FOR SPECIFIC APPLICATION TO THIS PROJECT. DUE TO THE POTENTIAL THAT THE MAGNETIC INFORMATION MAY BE MODIFIED UNINTENTIONALLY OR OTHERWISE, ALLEN & MAJOR ASSOCIATES, INC. MAY REMOVE ALL INDICATION OF THE DOCUMENT'S AUTHORSHIP ON THE MAGNETIC MEDIA. PRINTED REPRESENTATIONS OF THE DRAWINGS AND SPECIFICATIONS ISSUED SHALL BE THE ONLY RECORD COPIES OF ALLEN & MAJOR ASSOCIATES, INC.'S WORK PRODUCT.

DRAWING TITLE:	<b>UTILITY PLAN</b>	SHEET NO.:	<b>C-4</b>
----------------	---------------------	------------	------------



**DIG SAFE**

BEFORE YOU DIG  
 CALL 811 OR  
 1-888-DIG-SAFE  
 1-888-344-7233

**APPENDIX A**  
**HEALTH AND SAFETY PLAN**



## HEALTH AND SAFETY PLAN

### Construction of a 2-story commercial building

36 Cabot Road LLC  
32 Cabot Road  
Woburn, MA

Prepared By:

A handwritten signature in blue ink that reads 'Michael Clark'.

---

EnviroTrac Ltd.  
Michael Clark, Director Health and Safety

July 9, 2018

#### Revisions:

Original: 7/10/2018  
Rev 1: 8/1/2018  
Rev 2: 8/10/2018

## TABLE OF CONTENTS

1.0	INTRODUCTION.....	3
2.0	OBJECTIVES.....	3
3.0	SITE CHARACTERIZATION.....	3
4.0	WORK DESCRIPTION .....	4
5.0	PERSONNEL RESPONSIBILITIES .....	5
6.0	ENVIRONMENTAL HAZARD EVALUATION.....	5
7.0	SITE CONTROL.....	6
7.1	Site Work Zones.....	6
7.2	Control of Impacted Soils During Ground Disturbance .....	7
7.3	Spill Containment and Control Procedures .....	8
7.4	Fire Prevention.....	8
7.5	Control of Hazardous Energy and Underground Facility Identification.....	8
7.6	Site Communications .....	9
7.7	Site Security .....	9
7.8	Traffic Control and Work Zone Protection .....	9
7.9	Site Illumination.....	9
7.10	Noise Control.....	9
7.11	Assured Electrical Grounding.....	9
7.12	Lightning Safety Plan .....	10
7.13	General Work Rules.....	10
7.14	Health and Safety Responsibilities.....	10
7.15	Decontamination .....	11
8.0	PERSONNEL TRAINING.....	11
8.1	Personal Protective Equipment.....	11
8.2	First-Aid Supplies and Safety Equipment.....	12
8.3	Heat Stress / Cold Stress Prevention.....	12
9.0	MEDICAL SURVEILLANCE .....	12
10.0	CONFINED SPACE ENTRY PROCEDURES.....	13

## LIST OF APPENDICES

APPENDIX A	SITE MAP
APPENDIX B	HASP AGREEMENT AND ACKNOWLEDGEMENT
APPENDIX C	CONTACT LIST
APPENDIX D	OSHA QUICK CARDS FOR HEAT / COLD STRESS
APPENDIX E	DAILY TAILGATE SAFETY MEETING LOG
APPENDIX F	SAFETY DATA SHEETS
APPENDIX G	DIRECTIONS TO NEAREST HOSPITAL

## **1.0 INTRODUCTION**

This Health and Safety Plan (HASP) has been prepared to address the health and safety issues during the construction of a new 2-story commercial building at 32 Cabot Rd., Woburn, MA. The procedures in this HASP were developed in accordance with the Occupational Safety and Health Administration (OSHA) Hazardous Waste Operations and Emergency Response (HAZWOPER) Standard 29 CFR 1910.120 to protect site workers, the public, and the environment.

## **2.0 OBJECTIVES**

The objective of this HASP is to protect on-site worker health and safety during field activities at each site as well as the welfare of the public and the environment. The scope of this HASP is limited to the identification and control of chemical hazards.

The health and safety procedures in this plan have been established based on analysis of potential chemical hazards on the site and the activities/tasks associated with the work in order to alleviate the risks associated with the work to be performed. These procedures have been designed to meet the following objectives:

1. Provide for the identification, recognition, evaluation, and control of chemical hazards;
2. Develop site specific procedures so personnel are not exposed to avoidable risks, accidents, or injuries in the performance of their duties;
3. Establish site specific monitoring and personal protection requirements to address exposure issues from potentially hazardous substances; and
4. Identify the roles and responsibilities of on-site and support personnel for the project.

## **3.0 SITE CHARACTERIZATION**

Historically, the Industri-Plex Site has been used for a variety of manufacturing operations including the production of chemicals for local textile, leather, paper manufacturing industries, and glue that was manufactured from raw animal hides. Waste materials from the manufacturing processes were used within portions of the Industri-Plex site to fill on-site lowlands, wetlands, and shallow ponds to provide more usable land for new development.

As a result of its historical industrial use, it has been determined that soils at the Industri-Plex Site may contain elevated levels of metals including lead, arsenic, and chromium; groundwater may contain elevated levels of dissolved metals and VOCs including arsenic, chromium, benzene, and ammonia, refer to the list of Contaminates of Concern, presented below.

In 1986 the Industri-Plex Site Remedial Trust (ISRT) entered into a Consent Decree with the EPA to remediate portions of the Industri-Plex Site, including portions of the site impacted by this project. Remediation included the installation of an engineered cover, or approved equivalent cover, in areas that contained contamination in

excess of the action levels presented in the Record of Decision (ROD) for Industri-Plex Site Operable Unit 1 (OU1).

Site was originally flood plain at El. 52.8 where contaminated soil may be encountered. Three (3) feet of clean fill was previously brought in to construct a temporary dredge-spoils storage area for remediation of the adjoining Halls Brook Storage Area, which is part of the Industri-plex Superfund Site, Operable Unit 2.

#### 4.0 WORK DESCRIPTION

General construction of a new 2-story commercial building with a 4-foot deep perimeter frost wall and spread footing with a slab-on-grade foundation. Underground utilities will be installed, including: water, sewer, electrical, and natural gas. Paved parking areas will include an underground storm water collection via catch basins and on-site discharge to infiltration galleries.

Approximately 8,000 cubic yards of clean fill will be imported to the site to raise grade so the building floor elevation will be at El. 60.0. It is anticipated that only the installation of the frost wall, footing, underground utilities, and storm water collection system may encounter impacted soils. Other work that requires ground disturbance activities below El. 52.8 may encounter impacted soils.

#### Contaminants of Concern:

Following is list of contaminants that might be encountered in impacted soils:

<u>Metals (mg/kg)</u>	
Aluminum	5,150
Antimony	1.1
Arsenic	32.9
Barium	17.7
Cadmium	0.72
Chromium	39.0
Cobalt	4.2
Copper	43.7
Iron	8,490
Lead	49.5
Magnesium	2,060
Manganese	97.8
Mercury	0.32
Nickel	8.3
Potassium	731
Selenium	0.74
Silver	0.20
Sodium	1,140
Thallium	0.81
Vanadium	13.0
Zinc	83.8

Following is list of contaminants that might be present in groundwater, if groundwater is encountered during ground disturbance activities:

<u>Volatile Organic Compounds (ug/l)</u>	
Benzene	4.0
Trichloroethene	1.0
1,2-Dichloroethene	2.0
Naphthalene	5.0

## 5.0 PERSONNEL RESPONSIBILITIES

All site personnel and contractors will have received the appropriate level of training necessary to perform applicable duties and comply with 29 CFR 1910.120 (aka: HAZWOPER) and 29 CFR 1910.1200 (HAZARD COMMUNICATION). For this project, training requirements are listed in SECTION 8 – PERSONNEL TRAINING of this HASP.

This HASP will be available to all on-site personnel, contractors, subcontractors, and visitors who access the work zone. Personnel responsible for monitoring on-site activities will be responsible for informing the field workers, contractors, subcontractors, and visitors of any changes in conditions and/or levels of protection required in the work zone.

## 6.0 ENVIRONMENTAL HAZARD EVALUATION

Potential routes by which workers could be exposed generally include: inhalation, ingestion, dermal contact, and injection. The following control measures will be used alleviate exposure by routes of entry:

<b>Control of Potential Exposure by Route of Entry</b>	
<b>Route of Entry</b>	<b>Control of Potential Exposure</b>
<b>INHALATION</b>	<p>Tasks associated with this project have a reasonable risk of exposure to inhalation hazards at or near published exposure limits and therefore, respiratory protection may be required during ground disturbance activities below EI. 52.8.</p> <p>Exposure to airborne dust generated by ground disturbance activities of potentially impacted soils is to be controlled by: 1) wetting of potentially impacted soil during ground disturbance activities, 2) maintaining a distance from the activity beyond visible dust limits, or 3) standing upwind during the activity.</p> <p>If visible airborne dust cannot be controlled by wetting or avoiding, a filtering facepiece rated as N95 (i.e., dust mask) is to be donned by anyone potentially exposed to airborne dust from potentially impacted soils.</p> <p>If there is a change in the scope of work or if new conditions are encountered, work will stop and the situation will be evaluated for potential inhalation hazards. Work will not proceed until the new conditions are assessed and workers' health is addressed.</p>

<p><b>INGESTION</b></p>	<p>Tasks associated with this project have a risk of exposure to chemicals or hazardous substances that pose mild to moderate toxicity if ingested. To control exposure, the following precautions will be followed by all site workers and visitors:</p> <ul style="list-style-type: none"> <li>• <b>Follow good hygiene practices - wash hands, face, and exposed skin with soap and water after work and prior to eating, drinking, smoking, or applying cosmetics or lip balm. Do not touch mouth, nose, or eyes with unwashed hands or with soiled gloves.</b></li> <li>• <b>Chemical-resistant gloves (e.g. nitrile or neoprene) are to be worn when there is a potential of contact with chemicals or hazardous substances, including contaminated soils and groundwater and equipment that has been in contact with the same.</b></li> </ul>
<p><b>DERMAL CONTACT</b></p>	<p>Tasks associated with this project have a risk of exposure to chemicals or hazardous substances that pose mild to moderate toxicity through dermal contact, including contact with eyes. To control exposure, the following precautions will be followed by all site workers and visitors:</p> <ul style="list-style-type: none"> <li>• <b>Follow good hygiene practices - wash hands, face, and exposed skin with soap and water after work and prior to eating, drinking, smoking, or applying cosmetics or lip balm or immediately after contact with chemicals or hazardous substances. Do not touch mouth, nose, or eyes with unwashed hands or with used gloves.</b></li> <li>• <b>Safety glasses with side shields that comply with ANSI Z87.1 requirements are to be worn at all times in the work zone.</b></li> <li>• <b>Chemical-resistant gloves (e.g. nitrile or neoprene) are to be worn when there is a potential of contact with chemicals or hazardous substances, including contaminated soils and groundwater and equipment that has been in contact with the same.</b></li> </ul>
<p><b>INJECTION</b></p>	<p>Tasks associated with this project do not pose a reasonable risk of exposure to chemicals or hazardous substances through injection. Injection is the puncturing or abrasion of the skin allowing toxins to enter the body.</p> <p>If there is a change in the scope of work or new conditions are encountered, work will stop and the situation will be evaluated for potential injection hazards. Work will not proceed until the new conditions are assessed and workers' health is addressed.</p>

## 7.0 SITE CONTROL

### 7.1 Site Work Zones

Exclusion Zone: Areas where ground disturbance activities will access potentially impacted soils BELOW El. 52.8 (NAVD 88) will be designated as an Exclusion Zone. In the Exclusion Zone there is a potential of worker exposure to airborne dust during active ground disturbance activities. The area is to be demarked to prevent unauthorized access, and only authorized workers and visitors are allowed in these areas during active work. The procedures presented below in Section 7.2 Control of Impacted Soils During Ground Disturbance are to be implemented to control airborne dust.

Contamination Reduction (Transition) Zones: Areas where equipment that has come in contact with potentially impacted soil is to be decontaminated in designated Contamination Reduction Zones. Equipment that is used for ground disturbance activities in areas of impacted soil is to be decontaminated prior to moving to non-impacted soil areas.

Chemical resistant gloves, safety glasses, and good hygiene procedures are to be followed during and after the decontamination process. If visible dust is generated during the decontamination process, workers are to don a Filtering Facepiece rated as N95 (i.e., dust mask).

Support Zone/Clean Zone: Areas where impacted soil is NOT accessed is designed as the Support Zone/Clean Zone, and includes the remainder of the project. Procedures are to be implemented to prevent active or passive contamination from the Exclusion Zone or the Contaminate Reduction Zone to the Support Zone/Clean Zone.

## **7.2 Control of Impacted Soils During Ground Disturbance**

Ground disturbance is defined as any activity that disturbs the ground surface. During activities that have the potential to disturb potentially impacted soils, defined as those soils below an onsite elevation of El. 52.8 (NAVD 88) or approximately 3 feet below the surface, controls are to be instituted to prevent worker exposure to impacted soils and airborne dust. Activities expected to disturb the subsurface impacted soils are anticipated to be: building foundation footings on the rear (west) wall and catch basins/water quality units with deep sumps and compensatory flood storage areas. Additional activities which may result in dust generation include soil loading, transport to the MMA, offloading and, if necessary, loading for off-site disposal.

Controls to be implemented to prevent worker exposure to airborne potentially impacted dust are:

1. Evaluate the soil for moisture content and anticipate if dust will be generated during the proposed ground disturbance activities. Saturated or wet soils should not reasonably produce airborne dust. If dry soil or sandy soils are encountered, or if visible dust is generated during ground disturbance activities, the area is to be sufficiently wet to control the release of visible airborne dust.
2. Conduct real-time dust monitoring at upwind and downwind locations during soil disturbance activities within the Exclusion Zone. Real-time monitoring will be performed using DUSTTRAK II Desktop 8530 Dust/Aerosol monitors. Two (2) DUSTTRAK monitors will be located at the work zone perimeter, one upwind and one downwind, on the days when Exclusion Zone soils will be excavated or managed. Each monitor will be operated in data logging mode. An action level of  $150 \mu\text{g}/\text{m}^3$  has been selected for the 24-hour average PM-10 concentration based on the USEPA National Ambient Air Quality Standards for particulate matter. Average PM-10 concentrations will be read every two hours from the DUSTTRAK monitors and the  $150 \mu\text{g}/\text{m}^3$  value will be utilized to implement additional site controls, such as material wetting. Should the  $150 \mu\text{g}/\text{m}^3$  concentration persist following implementation of dust control measures, work will stop while additional solutions are investigated and implemented.

3. For ground disturbance activities where airborne dust is visible, workers or other people in the work zone are to don a Filtering Facepiece rated as N95 (i.e., dust mask), or remove themselves from the area of airborne dust. Follow good hygiene practices by washing hands, face, and exposed skin with soap and water after work and prior to eating, drinking, smoking, or applying cosmetics or lip balm or immediately after contact with chemicals or hazardous substances. Chemical resistant gloves (nitrile or neoprene) are to be worn to protect against dermal contact with impacted soils. Do not touch mouth, nose, or eyes with unwashed hands or with used gloves.

### **7.3 Spill Containment and Control Procedures**

The following procedures should be followed by on-site personnel in the event of a spill involving impacted soils or ground water or hazardous material spills from equipment or supplies:

1. Use proper PPE for potential chemical exposure including: safety glasses with side shields, nitrile or neoprene gloves, sleeved shirts, full-length pants, and safety shoes;
2. Contain sensitive receptors such as storm drains, surface water, and soil;
3. Prevent further flow of the material;
4. Contain the discharged material;
5. Vacuum, sweep up, or shovel the material and place into a suitable disposal container or isolate the material for disposal;
6. Thoroughly clean/wash the area after a spill or leak clean-up;
7. Provide adequate ventilation, as necessary;
8. Keep combustibles away from the spilled material;
9. In case of large spills, a third-party firm may be required to respond.

### **7.4 Fire Prevention**

To protect and prevent against accidental fire hazards, safe work practices will be followed:

1. Smoking is prohibited on site.
2. In the event of fire, 1) notify all site occupants of fire and to evacuate area, 2) gather at established primary or secondary muster point, and 3) contact emergency services.
3. At least one (1) ABC rated fire extinguisher (minimum 10 lbs) will be available on site and is to be used according to manufacturer's specifications and guidelines. Only trained personnel are to use an extinguisher and only on incipient fires.
4. Keep flammable liquids in closed containers and away from any possible source of ignition (electric service boxes, vehicle and equipment exhausts, etc.).
5. Keep site clean of debris.

### **7.5 Control of Hazardous Energy and Underground Facility Identification**

Underground facilities are to be identified and marked to prevent damage during ground disturbance activities. Follow Safe Approach Distances for overhead hazards and maintain a minimum of 10 feet from energized overhead utilities.

### 7.6 **Site Communications**

Verbal communication will be the primary method of communicating between workers. Use of cell phones will be a secondary means of communication.

### 7.7 **Site Security**

Open trenches or excavations left open after working hours will be demarked using temporary fencing to protect site workers and the general public.

### 7.8 **Traffic Control and Work Zone Protection**

Employees exposed to vehicular traffic will wear Hi-Visibility Clothing or Class 2 high-visibility vests. Traffic at the work zone is to be controlled using proper Work Zone Protection according to the requirements of the Manual on Uniform Traffic Control Devices (MUTCD). Traffic safety cones will be installed during all site activities to control and designate the work exclusion zones on the site. It is the responsibility of the all on site personnel to ensure proper safety measures are implemented or adjusted during site activities for worker safety.

### 7.9 **Site Illumination**

Work will be performed during normal working hours using natural lighting. If it is necessary to conduct work outside normal working hours, artificial lighting will be set up in the work area to provide sufficient illumination. Flash lights are to be used for illumination, as needed. Workers are not to perform tasks in the dark or insufficient lighting.

### 7.10 **Noise Control**

Potential noise due to operating equipment during the proposed activities shall not exceed the following levels at the designated durations:

<b>Duration (hrs)</b>	<b>Decibel Levels. (dB)</b>
8	90
6	92
4	95
3	97
2	100
1.5	102
1	105
0.5	110
≤0.25	115

Workers or persons in the area of potential noise exposure are to don hearing protection suitable to reduce noise levels per the table above. Hearing protection includes ear plugs, ear bands, or ear muffs.

### 7.11 **Assured Electrical Grounding**

Any temporary electrical power connections will be equipped with Ground Fault Circuit Interrupters (GFI/GFCI) at the source of the power. Electrical cords, including extension cords and power cords attached

to power tools, are to be inspected prior to use and not used if the insulation has been compromised or if wires are exposed, if the cord has been kinked, or if the grounding plug is missing.

#### **7.12 Lightning Safety Plan**

1. Establish a location during Daily Tailgate Safety meeting where people will go in the event lightning or thunder storms are predicted or possible;
2. Use the 30/30 rule – suspend activities when "flash to bang" (lightning to thunder) is within 30 seconds , and resume work 30 minutes after the last flash or bang; and
3. Follow the plan without exception.

#### **7.13 General Work Rules**

To protect against the occurrence of accidents and dangerous situations, as well as to minimize the potential for emergency events, all on-site personnel shall:

1. Read and sign this HASP prior to beginning of all on-site activities. The HASP will be reviewed periodically by all personnel conducting field activities and visitors to the work zone.
2. Conduct field work only be during daylight hours unless supplemental lighting is provided.
3. Do not eat, drink, or smoke in the work zone.
4. Be knowledgeable in the use of first-aid equipment.

To minimize the possibility of injuries, the following general precautions will be taken:

1. All hand and power tools will be inspected prior to use and maintained in a safe condition.
2. Safety guards will be kept in place during use.
3. Power tools will be double-insulated and all electric cords will be connected through GFI protective circuitry.
4. Walkways will be kept clear of equipment, supplies, excavated material, or other obstructions.
5. Proper work gloves will be provided and used, as required.
6. Hard hats are to be worn if required by the location or activity.
7. Sturdy, enclosed work or safety shoes/boots are to be worn, as required by the activity.
8. Employees exposed to vehicular traffic on or near public roads will wear high-visibility attire. Traffic at the work zone is to be controlled using proper Work Zone Protection according to the requirements of the Manual on Uniform Traffic Control Devices (MUTCD).
9. Employees will observe proper lifting techniques and obey sensible lifting limits and get assistance when required.

#### **7.14 Health and Safety Responsibilities**

All Project Personnel are responsible to:

1. Take all reasonable precautions to prevent injury to themselves, to their fellow employees, and to the public.
2. Implement the requirements of this HASP and report any deviations from the procedures listed or the conditions described.
3. Perform only those tasks that they believe can be done safely and immediately report any

accidents, unsafe conditions, or near misses to onsite management.

4. **Stop Work** whenever the risk associated with the work is not clearly understood, established, or controlled. Work will not commence until the conditions that caused the Stop Work intervention have been addressed, corrected, or resolved. Any and all workers on the site have the authority and responsibility to initiate a stop work intervention.

### 7.15 **Decontamination**

Equipment that is used for ground disturbance activities is to be decontaminated prior to moving from areas of contact with potentially contamination impacted soils. Chemical resistant gloves and good hygiene procedures are to be followed during and after the decontamination process. If visible dust is generated during the decontamination process, workers are to don a Filtering Facepiece rated as N95 (i.e., dust mask).

## 8.0 **PERSONNEL TRAINING**

Field team personnel associated with activities that have a potential for exposure to hazardous substances are required to participate in a health and safety training program that complies with the OSHA standard 29 CFR 1910.120 (aka: HAZWOPER) and 1910.1200 (aka: Hazard Communication/HazCom). This program instructs employees on general health and safety principles and procedures, proper operation of monitoring instruments, and use of personnel protective equipment.

In addition, field team personnel will attend a pre-work Tailgate Safety Meeting. Use the Daily Tailgate Safety Meeting Log to document the meeting, presented in Appendix E of this HASP. As activities change at a particular work site, related training is to be provided as necessary. The site-specific training will address potential hazards and associated risks, site operating procedures, emergency response, and site control methods to be employed. The following training is required to perform tasks at this site:

<b>TRAINING REQUIREMENTS FOR SITE TASKS</b>	
<b>Task</b>	<b>Training Required</b>
<b>General site operations</b>	<ul style="list-style-type: none"><li>• OSHA standard 29 CFR 1910.120 (aka: HAZWOPER)</li><li>• OSHA standard 29 CFR 1910.1200 (aka: Hazard Communication/HazCom)</li><li>• First Aid/CPR (at least one (1) worker on-site must be certified in First Aid/CPR)</li><li>• Requirements of this HASP</li></ul>
<b>Excavator Operator</b>	<ul style="list-style-type: none"><li>• Experience and/or training in operating and maintaining the equipment.</li></ul>

### 8.1 **Personal Protective Equipment**

Based on available data, it is anticipated that all field activities will be performed at **Level D protection**. Personal protection at Level D will consist of the following based on task performed:

<b>PERSONAL PROTECTIVE EQUIPMENT BY TASK</b>
----------------------------------------------

Task	PPE
<b>All site Tasks</b>	<ul style="list-style-type: none"> <li>• <b>Hard hats</b> are to be worn, as required by location or activity.</li> <li>• <b>Safety glasses with side shields</b> (ANSI Z-87 + certified) or full-face safety shields are to be worn at all times while on-site.</li> <li>• <b>Proper gloves</b> will be provided and used, as required. Abrasion resistant/work gloves (i.e., leather or similar) or chemical resistant gloves (i.e., nitrile/neoprene) will be used as required by tasks.</li> <li>• <b>Safety boots</b> (ANSI Z-41, ASTM F-249, or ASTM F-2413 compliant) are to be worn, as required by the activity. Safety boots are to be laced and tied.</li> <li>• <b>High-visibility attire</b>, i.e., Class 2, Safety Vests, are to be worn when employees are exposed to vehicular traffic.</li> <li>• <b>Long pants and sleeved shirts</b> will be worn while on site.</li> <li>• <b>N95 filtering facepiece</b> are to be worn as required to control dust exposure</li> </ul>

### 8.2 **First-Aid Supplies and Safety Equipment**

First-Aid supplies will be available to all personnel on site including an eyewash kit/station. All first aid supplies are to be periodically inspected for sufficient quantities and expiration date, and restocked accordingly. At least one (1) ABC rated fire extinguisher (minimum 10 lbs) will be available on site and is to be used according to manufacturer's specifications and guidelines. Only trained personnel are to use an extinguisher and only on incipient fires.

### 8.3 **Heat Stress / Cold Stress Prevention**

Follow the requirements listed for heat stress and/or cold stress procedures, as climate conditions require. OSHA Quick Cards for Heat Stress and Cold Stress are presented in **Appendix D** of this HASP.

## 9.0 **MEDICAL SURVEILLANCE**

A medical surveillance program will be instituted for those employees who:

1. are or may be exposed to hazardous substances or health hazards at or above the established permissible exposure limit without regard to the use of respirators, for 30 days or more a year;
2. wear a respirator for 30 days or more a year or as required by 29 CFR 1910.134 (OSHA Respiratory Protection Standard);
3. are injured, become ill, or develop signs or symptoms due to possible overexposure involving hazardous substances or health hazards from an emergency response or hazardous waste operation; or
4. are members of HAZMAT teams.

Employees will be medically evaluated and qualified prior to being fit tested for a respirator or prior to being required to enter a confined space. Records will be retained according to legal requirements.

Employees exposed to noise thresholds equal or exceeding an 8-hour time-weighted average of 85 decibels will participate in an audiometric testing program.

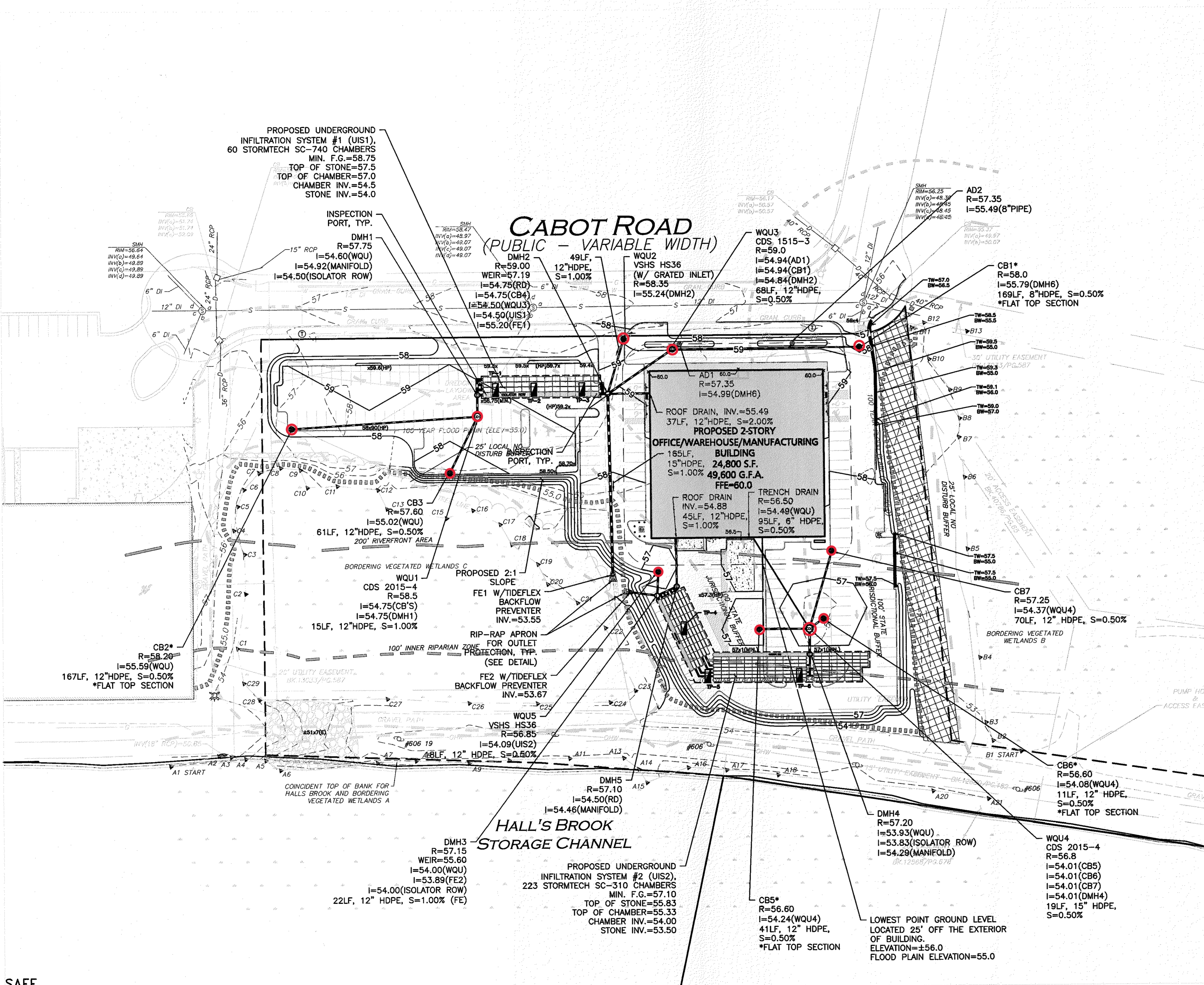
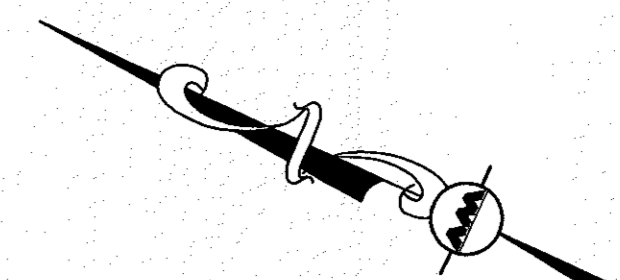
All medical and monitoring records will be retained according to legal requirements and available to employees upon request.

#### **10.0 CONFINED SPACE ENTRY PROCEDURES**

Entry into a confined space is beyond the scope of this project. No workers are to enter a confined space to perform any task associated with this work. No person are to enter a trench or excavation more than 5 feet deep unless an excavation entry plan, designed by a professional engineer using required controls is implemented to protect trench/excavation entrants.

## APPENDIX A

# Site Map

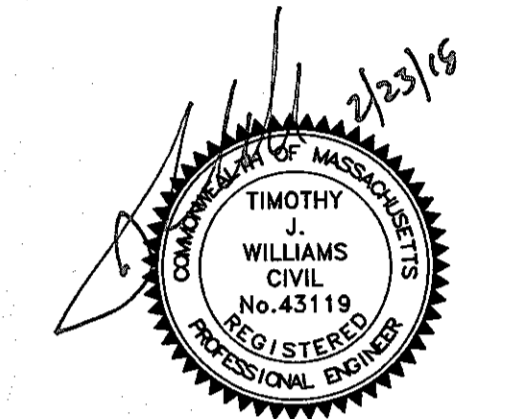


**LEGEND:**

- DRAIN MANHOLE
- CATCH BASIN
- WATER QUALITY UNIT
- FLARED END SECTION
- DRAIN LINE
- RIPRAP OUTFALL
- 1' CONTOUR
- SPOT GRADE
- TOP OF BERM
- INFILTRATION SYSTEM

- NOTES:**
- THE INFORMATION SHOWN ON THIS PLAN IS THE SOLE PROPERTY OF ALLEN & MAJOR ASSOCIATES, INC. IT'S INTENDED USE IS TO PROVIDE INFORMATION. ANY ALTERATION, MISUSE, OR RECALCULATION OF INFORMATION OR DATA WITHOUT THE EXPRESSED, WRITTEN CONSENT OF ALLEN & MAJOR ASSOCIATES, INC. IS STRICTLY PROHIBITED.
  - THE BASE PLAN USED IN THIS DRAWING IS FROM AN EXISTING CONDITIONS PLAN FOR 32-36 CABOT ROAD PREPARED FOR MAGGIORE CONSTRUCTION CORP. BY ALLEN & MAJOR ASSOCIATES, DATED 09-12-2017.
  - ALL PIPES DIMENSIONS ARE MEASURED FROM INSIDE FACE OF STRUCTURE.
  - ALL ELEVATIONS REFER TO NAVD 88.
  - THE CONTRACTOR IS SPECIFICALLY CAUTIONED THAT THE LOCATION AND/OR ELEVATION OF EXISTING UTILITIES AND STRUCTURES AS SHOWN ON THESE PLANS IS BASED ON RECORDS OF VARIOUS UTILITY COMPANIES AND WHERE POSSIBLE, MEASUREMENTS TAKEN IN THE FIELD. THIS INFORMATION IS NOT TO BE RELIED ON AS BEING EXACT OR COMPLETE. THE LOCATION OF ALL UNDERGROUND UTILITIES AND STRUCTURES SHALL BE VERIFIED IN THE FIELD BY THE CONTRACTOR PRIOR TO THE START OF CONSTRUCTION. THE CONTRACTOR MUST CONTACT THE APPROPRIATE UTILITY COMPANY, ANY GOVERNING PERMITTING AUTHORITY, AND "DIGSAFE" AT LEAST 72 HOURS PRIOR TO ANY EXCAVATION WORK TO REQUEST EXACT FIELD LOCATION OF UTILITIES AND THE ENGINEER SHALL BE NOTIFIED IN WRITING OF ANY UTILITIES INTERFERING WITH THE PROPOSED CONSTRUCTION AND APPROPRIATE REMEDIAL ACTION TAKEN BEFORE PROCEEDING WITH THE WORK. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO RELOCATE ALL EXISTING UTILITIES WHICH CONFLICT WITH THE PROPOSED IMPROVEMENTS SHOWN ON THE PLANS. DIGSAFE: 1-888-344-7233

Areas of potential excavation below elevation El. 52.8 (NAVD88) which require management as Hazardous Materials are shown in RED outline.



PROFESSIONAL ENGINEER FOR ALLEN & MAJOR ASSOCIATES, INC.

REV	DATE	DESCRIPTION
6	02-23-2018	ISSUED TO CITY COUNCIL
5	01-22-2018	ISSUED TO CON. COMMISSION
4	01-10-2018	ISSUED TO CON. COMMISSION
3	12-11-2017	ISSUED TO CON. COMMISSION
2	09-12-2017	ISSUED TO CITY COUNCIL
1	09-12-2017	ISSUED TO CON. COMMISSION

APPLICANT/OWNER:  
**36 CABOT ROAD LLC**  
 36 CABOT ROAD  
 WOBURN, MA 01801

PROJECT:  
**32 CABOT ROAD**  
 WOBURN, MA

PROJECT NO.	0179-21A	DATE:	06-08-2017
SCALE:	1"=50'	DWG. NAME:	C0179-21A
DESIGNED BY:	NCD	CHECKED BY:	TJW

PREPARED BY:

**ALLEN & MAJOR ASSOCIATES, INC.**  
 civil & structural engineering • land surveying  
 environmental consulting • landscape architecture  
 www.allenmajor.com  
 100 COMMERCE WAY  
 WOBURN MA 01801-8501  
 TEL: (781) 935-6889  
 FAX: (781) 935-2896

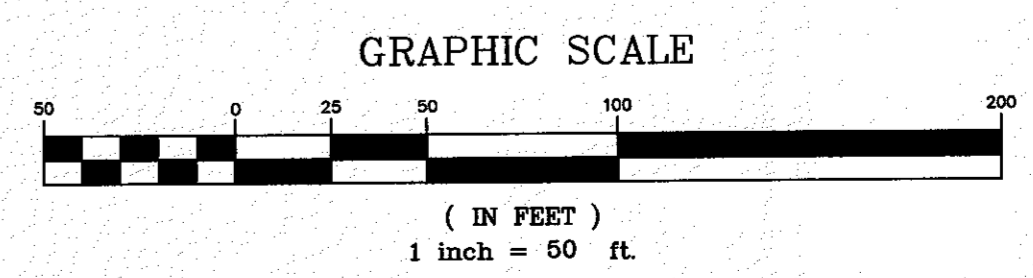
WOBURN, MA • LAKEVILLE, MA • MANCHESTER, NH

THIS DRAWING HAS BEEN PREPARED IN ELECTRONIC FORMAT. CLIENT/CLIENT'S REPRESENTATIVE OR CONSULTANT MAY BE PROVIDED COPIES OF DRAWINGS AND SPECIFICATIONS ON MAGNETIC MEDIA FOR HIS/HER INFORMATION AND USE FOR SPECIFIC APPLICATION TO THIS PROJECT. DUE TO THE POTENTIAL THAT THE MAGNETIC INFORMATION MAY BE MODIFIED UNINTENTIONALLY OR OTHERWISE, ALLEN & MAJOR ASSOCIATES, INC. MAY REMOVE ALL INDICATION OF THE DOCUMENT'S AUTHORSHIP ON THE MAGNETIC MEDIA. PRINTED REPRESENTATIONS OF THE DRAWINGS AND SPECIFICATIONS ISSUED SHALL BE THE ONLY RECORD COPIES OF ALLEN & MAJOR ASSOCIATES, INC.'S WORK PRODUCT.

DRAWING TITLE: **FIGURE 1** SHEET No.  
**GRADING & DRAINAGE PLAN** C-3

**DIG SAFE**

BEFORE YOU DIG  
 CALL 811 OR  
 1-888-DIG-SAFE  
 1-888-344-7233



## APPENDIX B

# HASP AGREEMENT AND ACKNOWLEDGEMENT



## APPENDIX C

# INCIDENT REPORTING

### Contact and emergency phone numbers for this project:

HOSPITAL: Lahey Medical Center 781-744-5100

URGENT CARE: Lahey Medical Center 781-744-5100

Local Fire Department 911

Local Police Department 911

Local Rescue Service (EMS) 911

National Response Center 800-424-8802

National Poison Control 800-926-953

#### **OTHER CONTACTS**

EnviroTrac Massachusetts Regional Office 781-793-0074

Robert H. Bird, LSP – EnviroTrac 508-244-7111

David Mann, Project Manager – Maggiore Construction 781-718-2002

Scott Mitchell, Construction Super – Maggiore Construction 781-718-2009

## APPENDIX D

# OSHA QUICK CARDS FOR: HEAT STRESS COLD STRESS



## Protecting Workers from Heat Stress

### Heat Illness

Exposure to heat can cause illness and death. The most serious heat illness is heat stroke. Other heat illnesses, such as heat exhaustion, heat cramps and heat rash, should also be avoided.

There are precautions your employer should take any time temperatures are high and the job involves physical work.

### Risk Factors for Heat Illness

- High temperature and humidity, direct sun exposure, no breeze or wind
- Low liquid intake
- Heavy physical labor
- Waterproof clothing
- No recent exposure to hot workplaces

### Symptoms of Heat Exhaustion

- Headache, dizziness, or fainting
- Weakness and wet skin
- Irritability or confusion
- Thirst, nausea, or vomiting

### Symptoms of Heat Stroke

- May be confused, unable to think clearly, pass out, collapse, or have seizures (fits)
- May stop sweating

### To Prevent Heat Illness, Your Employer Should

- Provide training about the hazards leading to heat stress and how to prevent them.
- Provide a lot of cool water to workers close to the work area. At least one pint of water per hour is needed.



For more information:

 **Occupational  
Safety and Health  
Administration**  
U.S. Department of Labor  
[www.osha.gov](http://www.osha.gov) (800) 321-OSHA (6742)

OSHA 3154-09-11R

# OSHA<sup>®</sup> QUICK CARD<sup>™</sup>

- Schedule frequent rest periods with water breaks in shaded or air-conditioned areas.
- Routinely check workers who are at risk of heat stress due to protective clothing and high temperature.
- Consider protective clothing that provides cooling.



## How You Can Protect Yourself and Others

- Know signs/symptoms of heat illnesses; monitor yourself; use a buddy system.
- Block out direct sun and other heat sources.
- Drink plenty of fluids. Drink often and BEFORE you are thirsty. Drink water every 15 minutes.
- Avoid beverages containing alcohol or caffeine.
- Wear lightweight, light colored, loose-fitting clothes.



## What to Do When a Worker is Ill from the Heat

- Call a supervisor for help. If the supervisor is not available, call 911.
- Have someone stay with the worker until help arrives.
- Move the worker to a cooler/shaded area.
- Remove outer clothing.
- Fan and mist the worker with water; apply ice (ice bags or ice towels).
- Provide cool drinking water, if able to drink.

**IF THE WORKER IS NOT ALERT or seems confused, this may be a heat stroke. CALL 911 IMMEDIATELY and apply ice as soon as possible.**

**If you have any questions or concerns, call OSHA at 1-800-321-OSHA (6742).**

For more information:

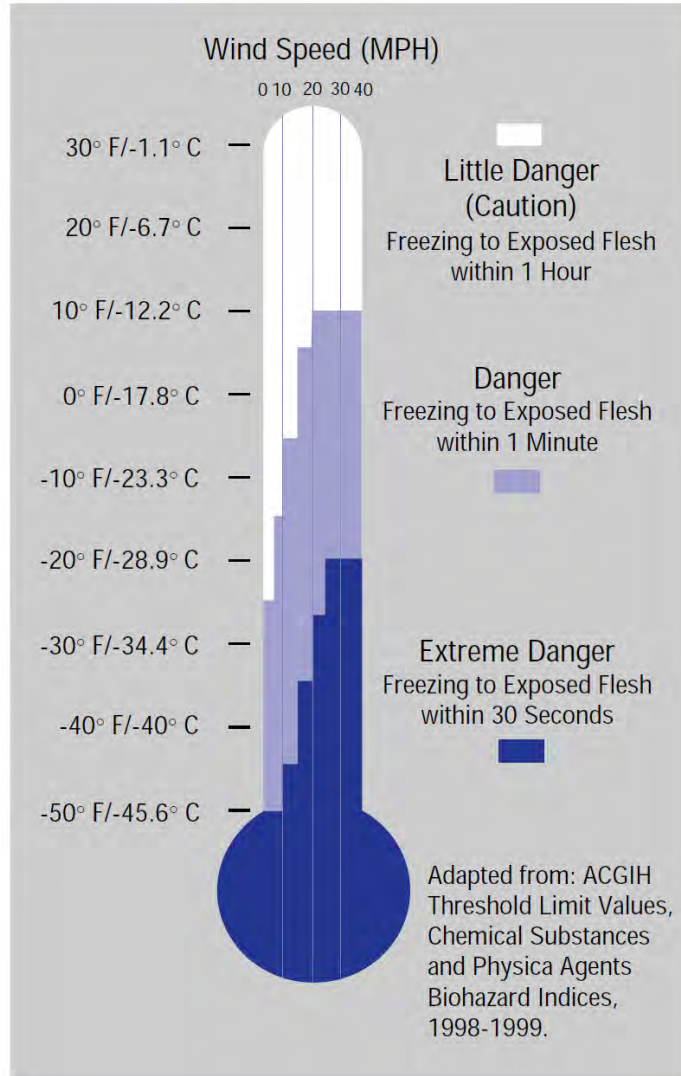
**OSHA<sup>®</sup>** Occupational  
Safety and Health  
Administration  
U.S. Department of Labor  
[www.osha.gov](http://www.osha.gov) (800) 321-OSHA (6742)

## THE COLD STRESS EQUATION

**LOW TEMPERATURE + WIND SPEED + WETNESS  
= INJURIES & ILLNESS**

When the body is unable to warm itself, serious cold-related illnesses and injuries may occur, and permanent tissue damage and death may result.

**Hypothermia** can occur when *land temperatures* are **above** freezing or *water temperatures* are below 98.6°F/ 37°C. Cold-related illnesses can slowly overcome a person who has been chilled by low temperatures, brisk winds, or wet clothing.



U.S. Department of Labor  
Occupational Safety and Health Administration

OSHA 3156  
1998

## FROST BITE

### *What Happens to the Body:*

FREEZING IN DEEP LAYERS OF SKIN AND TISSUE; PALE, WAXY-WHITE SKIN COLOR; SKIN BECOMES HARD and NUMB; USUALLY AFFECTS THE FINGERS, HANDS, TOES, FEET, EARS, and NOSE.

### *What Should Be Done: (and temperatures)*

- Move the person to a warm dry area. Don't leave the person alone.
- Remove any wet or tight clothing that may cut off blood flow to the affected area.
- **DO NOT** rub the affected area, because rubbing causes damage to the skin and tissue.
- **Gently** place the affected area in a warm (105°F) water bath and monitor the water temperature to **slowly** warm the tissue. Don't pour warm water directly on the affected area because it will warm the tissue too fast causing tissue damage. Warming takes about 25-40 minutes.
- After the affected area has been warmed, it may become puffy and blister. The affected area may have a burning feeling or numbness. When normal feeling, movement, and skin color have returned, the affected area should be dried and wrapped to keep it warm. **NOTE:** If there is a chance the affected area may get cold again, do not warm the skin. If the skin is warmed and then becomes cold again, it will cause severe tissue damage.
- Seek medical attention as soon as possible.

## HYPOTHERMIA - (Medical Emergency)

### *What Happens to the Body:*

NORMAL BODY TEMPERATURE (98.6° F/37°C ) DROPS TO OR BELOW 95°F (35°C); FATIGUE OR DROWSINESS; UNCONTROLLED SHIVERING; COOL BLUISH SKIN; SLURRED SPEECH; CLUMSY MOVEMENTS; IRRITABLE, IRRATIONAL OR CONFUSED BEHAVIOR.

### *What Should Be Done: (land temperatures)*

- Call for emergency help (i.e., Ambulance or Call 911).
- Move the person to a warm, dry area. Don't leave the person alone. Remove any wet clothing and replace with warm, dry clothing or wrap the person in blankets.
- Have the person drink warm, sweet drinks (sugar water or sports-type drinks) if they are alert. **Avoid drinks with caffeine** (coffee, tea, or hot chocolate) or alcohol.
- Have the person move their arms and legs to create muscle heat. If they are unable to do this, place warm bottles or hot packs in the arm pits, groin, neck, and head areas. **DO NOT** rub the person's body or place them in warm water bath. This may stop their heart.

### *What Should Be Done: (water temperatures)*

- Call for emergency help (Ambulance or Call 911). Body heat is lost up to 25 times faster in water.
- **DO NOT** remove any clothing. Button, buckle, zip, and tighten any collars, cuffs, shoes, and hoods because the layer of trapped water closest to the body provides a layer of insulation that slows the loss of heat. Keep the head out of the water and put on a hat or hood.
- Get out of the water as quickly as possible or climb on anything floating. **DO NOT** attempt to swim unless a floating object or another person can be reached because swimming or other physical activity uses the body's heat and reduces survival time by about 50 percent.
- If getting out of the water is not possible, wait quietly and conserve body heat by folding arms across the chest, keeping thighs together, bending knees, and crossing ankles. If another person is in the water, huddle together with chests held closely.

### ***How to Protect Workers***

- Recognize the environmental and workplace conditions that lead to potential cold-induced illnesses and injuries.
- Learn the signs and symptoms of cold-induced illnesses/injuries and what to do to help the worker.
- Train the workforce about cold-induced illnesses and injuries.
- Select proper clothing for cold, wet, and windy conditions. Layer clothing to adjust to changing environmental temperatures. Wear a hat and gloves, in addition to underwear that will keep water away from the skin (polypropylene).
- Take frequent short breaks in warm dry shelters to allow the body to warm up.
- Perform work during the warmest part of the day.
- Avoid exhaustion or fatigue because energy is needed to keep muscles warm.
- Use the buddy system (work in pairs).
- Drink warm, sweet beverages (sugar water, sports-type drinks). Avoid drinks with caffeine (coffee, tea, or hot chocolate) or alcohol.
- Eat warm, high-calorie foods like hot pasta dishes.

### ***Workers Are at Increased Risk When...***

- They have predisposing health conditions such as cardiovascular disease, diabetes, and hypertension.
- They take certain medication (check with your doctor, nurse, or pharmacy and ask if any medicines you are taking affect you while working in cold environments).
- They are in poor physical condition, have a poor diet, or are older.

## APPENDIX E

# DAILY TAILGATE SAFETY MEETING LOG

32 Cabot Road  
Woburn, MA

---

**Daily Tailgate Safety Meeting Log**  
**(to be completed on site)**

Site Name \_\_\_\_\_

Scope of Work \_\_\_\_\_

Weather \_\_\_\_\_

Safety Topics discussed \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Employee Names:

Signatures

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

By signing, I acknowledge that I am knowledgeable of the scope of work being performed, the associated hazards, and will institute the controls or contingencies necessary to mitigate those hazards. Furthermore, I will stop work in the event there are new or unidentified hazards and will not commence until proper controls or contingencies are instituted to mitigate those hazards.

Signature of Site Safety Officer (or designee) \_\_\_\_\_ Date \_\_\_\_\_

Add additional sheets as necessary

## APPENDIX F

# SAFETY DATA SHEETS (SDS)

### 1. PRODUCT AND COMPANY IDENTIFICATION

#### 1.1 Product identifiers

Product name : *trans*-1,2-Dichloroethylene

Product Number : D62209

Brand : Aldrich

Index-No. : 602-026-00-3

CAS-No. : 156-60-5

#### 1.2 Relevant identified uses of the substance or mixture and uses advised against

Identified uses : Laboratory chemicals, Synthesis of substances

#### 1.3 Details of the supplier of the safety data sheet

Company : Sigma-Aldrich  
3050 Spruce Street  
SAINT LOUIS MO 63103  
USA

Telephone : +1 800-325-5832

Fax : +1 800-325-5052

#### 1.4 Emergency telephone number

Emergency Phone # : +1-703-527-3887 (CHEMTREC)

### 2. HAZARDS IDENTIFICATION

#### 2.1 Classification of the substance or mixture

##### GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)

Flammable liquids (Category 2), H225  
Acute toxicity, Inhalation (Category 4), H332  
Acute aquatic toxicity (Category 3), H402  
Chronic aquatic toxicity (Category 3), H412

For the full text of the H-Statements mentioned in this Section, see Section 16.

#### 2.2 GHS Label elements, including precautionary statements

Pictogram



Signal word

Danger

Hazard statement(s)

H225 Highly flammable liquid and vapour.  
H332 Harmful if inhaled.  
H412 Harmful to aquatic life with long lasting effects.

Precautionary statement(s)

P210 Keep away from heat/sparks/open flames/hot surfaces. No smoking.  
P233 Keep container tightly closed.  
P240 Ground/bond container and receiving equipment.  
P241 Use explosion-proof electrical/ ventilating/ lighting/ equipment.  
P242 Use only non-sparking tools.  
P243 Take precautionary measures against static discharge.

P261	Avoid breathing dust/ fume/ gas/ mist/ vapours/ spray.
P271	Use only outdoors or in a well-ventilated area.
P273	Avoid release to the environment.
P280	Wear protective gloves/ eye protection/ face protection.
P303 + P361 + P353	IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower.
P304 + P340 + P312	IF INHALED: Remove person to fresh air and keep comfortable for breathing. Call a POISON CENTER/doctor if you feel unwell.
P370 + P378	In case of fire: Use dry sand, dry chemical or alcohol-resistant foam to extinguish.
P403 + P235	Store in a well-ventilated place. Keep cool.
P501	Dispose of contents/ container to an approved waste disposal plant.

### 2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

## 3. COMPOSITION/INFORMATION ON INGREDIENTS

### 3.1 Substances

Synonyms	:	trans-1,2-Dichloroethene trans-Acetylene dichloride
Formula	:	C <sub>2</sub> H <sub>2</sub> Cl <sub>2</sub>
Molecular weight	:	96.94 g/mol
CAS-No.	:	156-60-5
EC-No.	:	205-860-2
Index-No.	:	602-026-00-3

#### Hazardous components

Component	Classification	Concentration
<b>trans-Dichloroethylene</b>	Flam. Liq. 2; Acute Tox. 4; Aquatic Acute 3; Aquatic Chronic 3; H225, H332, H412	90 - 100 %

For the full text of the H-Statements mentioned in this Section, see Section 16.

## 4. FIRST AID MEASURES

### 4.1 Description of first aid measures

#### General advice

Consult a physician. Show this safety data sheet to the doctor in attendance. Move out of dangerous area.

#### If inhaled

If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

#### In case of skin contact

Wash off with soap and plenty of water. Consult a physician.

#### In case of eye contact

Flush eyes with water as a precaution.

#### If swallowed

Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

### 4.2 Most important symptoms and effects, both acute and delayed

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

### 4.3 Indication of any immediate medical attention and special treatment needed

No data available

---

## 5. FIREFIGHTING MEASURES

### 5.1 Extinguishing media

#### Suitable extinguishing media

Dry powder Dry sand

#### Unsuitable extinguishing media

Do NOT use water jet.

### 5.2 Special hazards arising from the substance or mixture

No data available

### 5.3 Advice for firefighters

Wear self-contained breathing apparatus for firefighting if necessary.

### 5.4 Further information

Use water spray to cool unopened containers.

---

## 6. ACCIDENTAL RELEASE MEASURES

### 6.1 Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Remove all sources of ignition. Evacuate personnel to safe areas. Beware of vapours accumulating to form explosive concentrations. Vapours can accumulate in low areas.

For personal protection see section 8.

### 6.2 Environmental precautions

Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

### 6.3 Methods and materials for containment and cleaning up

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

### 6.4 Reference to other sections

For disposal see section 13.

---

## 7. HANDLING AND STORAGE

### 7.1 Precautions for safe handling

Avoid contact with skin and eyes. Avoid inhalation of vapour or mist.

Use explosion-proof equipment. Keep away from sources of ignition - No smoking. Take measures to prevent the build up of electrostatic charge.

For precautions see section 2.2.

### 7.2 Conditions for safe storage, including any incompatibilities

Keep container tightly closed in a dry and well-ventilated place. Containers which are opened must be carefully resealed and kept upright to prevent leakage.

Recommended storage temperature 2 - 8 °C

Light sensitive. Air and moisture sensitive. Refrigerate before opening.

Storage class (TRGS 510): 3: Flammable liquids

### 7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

---

## 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

### 8.1 Control parameters

#### Components with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
trans-Dichloroethylene	156-60-5	TWA	200 ppm	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Central Nervous System impairment		

## 8.2 Exposure controls

### Appropriate engineering controls

Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

### Personal protective equipment

#### Eye/face protection

Face shield and safety glasses Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

#### Skin protection

Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

#### Body Protection

Complete suit protecting against chemicals, Flame retardant antistatic protective clothing., The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

#### Respiratory protection

Where risk assessment shows air-purifying respirators are appropriate use a full-face respirator with multi-purpose combination (US) or type AXBEK (EN 14387) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

#### Control of environmental exposure

Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

## 9. PHYSICAL AND CHEMICAL PROPERTIES

### 9.1 Information on basic physical and chemical properties

- |                                                 |                                                                     |
|-------------------------------------------------|---------------------------------------------------------------------|
| a) Appearance                                   | Form: liquid, clear<br>Colour: light yellow                         |
| b) Odour                                        | No data available                                                   |
| c) Odour Threshold                              | No data available                                                   |
| d) pH                                           | No data available                                                   |
| e) Melting point/freezing point                 | Melting point/range: -50 °C (-58 °F) - lit.                         |
| f) Initial boiling point and boiling range      | 48 °C (118 °F) - lit.                                               |
| g) Flash point                                  | 6.0 °C (42.8 °F) - closed cup                                       |
| h) Evaporation rate                             | No data available                                                   |
| i) Flammability (solid, gas)                    | No data available                                                   |
| j) Upper/lower flammability or explosive limits | Upper explosion limit: 12.8 %(V)<br>Lower explosion limit: 9.7 %(V) |
| k) Vapour pressure                              | No data available                                                   |
| l) Vapour density                               | No data available                                                   |
| m) Relative density                             | 1.257 g/mL at 25 °C (77 °F)                                         |
| n) Water solubility                             | No data available                                                   |
| o) Partition coefficient: n-octanol/water       | No data available                                                   |

- |                              |                   |
|------------------------------|-------------------|
| p) Auto-ignition temperature | No data available |
| q) Decomposition temperature | No data available |
| r) Viscosity                 | No data available |
| s) Explosive properties      | No data available |
| t) Oxidizing properties      | No data available |

## 9.2 Other safety information

No data available

---

## 10. STABILITY AND REACTIVITY

### 10.1 Reactivity

No data available

### 10.2 Chemical stability

Stable under recommended storage conditions.

### 10.3 Possibility of hazardous reactions

Vapours may form explosive mixture with air.

### 10.4 Conditions to avoid

Heat, flames and sparks.

### 10.5 Incompatible materials

Oxidizing agents, Bases

### 10.6 Hazardous decomposition products

Hazardous decomposition products formed under fire conditions. - Carbon oxides, Hydrogen chloride gas

Other decomposition products - No data available

In the event of fire: see section 5

---

## 11. TOXICOLOGICAL INFORMATION

### 11.1 Information on toxicological effects

#### Acute toxicity

#### Skin corrosion/irritation

#### Serious eye damage/eye irritation

#### Respiratory or skin sensitisation

#### Germ cell mutagenicity

#### Carcinogenicity

IARC: No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.

NTP: No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.

OSHA: No component of this product present at levels greater than or equal to 0.1% is on OSHA's list of regulated carcinogens.

#### Reproductive toxicity

#### Specific target organ toxicity - single exposure

#### Specific target organ toxicity - repeated exposure

#### Aspiration hazard

#### Additional Information

RTECS: KV9400000

Kidney -

---

## 12. ECOLOGICAL INFORMATION

### 12.1 Toxicity

### 12.2 Persistence and degradability

### 12.3 Bioaccumulative potential

### 12.4 Mobility in soil

### 12.5 Results of PBT and vPvB assessment

PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

### 12.6 Other adverse effects

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.

Harmful to aquatic life with long lasting effects.

---

## 13. DISPOSAL CONSIDERATIONS

### 13.1 Waste treatment methods

#### Product

Offer surplus and non-recyclable solutions to a licensed disposal company. Burn in a chemical incinerator equipped with an afterburner and scrubber but exert extra care in igniting as this material is highly flammable. Contact a licensed professional waste disposal service to dispose of this material.

#### Contaminated packaging

Dispose of as unused product.

---

## 14. TRANSPORT INFORMATION

### DOT (US)

UN number: 1150      Class: 3      Packing group: II

Proper shipping name: 1,2-Dichloroethylene

Reportable Quantity (RQ): 1000 lbs

Poison Inhalation Hazard: No

### IMDG

### IATA

UN number: 1150      Class: 3      Packing group: II

Proper shipping name: 1,2-Dichloroethylene

---

## 15. REGULATORY INFORMATION

### SARA 302 Components

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

### SARA 313 Components

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

### SARA 311/312 Hazards

Fire Hazard

### Massachusetts Right To Know Components

trans-Dichloroethylene

CAS-No.

156-60-5

Revision Date

1993-02-16

### Pennsylvania Right To Know Components

trans-Dichloroethylene

CAS-No.

156-60-5

Revision Date

1993-02-16

### New Jersey Right To Know Components

trans-Dichloroethylene

CAS-No.

156-60-5

Revision Date

1993-02-16

## California Prop. 65 Components

This product does not contain any chemicals known to State of California to cause cancer, birth defects, or any other reproductive harm.

---

### 16. OTHER INFORMATION

#### Full text of H-Statements referred to under sections 2 and 3.

Acute Tox.	Acute toxicity
Aquatic Acute	Acute aquatic toxicity
Aquatic Chronic	Chronic aquatic toxicity
Flam. Liq.	Flammable liquids
H225	Highly flammable liquid and vapour.
H332	Harmful if inhaled.
H402	Harmful to aquatic life.

#### HMIS Rating

Health hazard:	
Chronic Health Hazard:	*
Flammability:	3
Physical Hazard	

#### NFPA Rating

Health hazard:	
Fire Hazard:	3
Reactivity Hazard:	

#### Further information

Copyright 2016 Sigma-Aldrich Co. LLC. License granted to make unlimited paper copies for internal use only. The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See [www.sigma-aldrich.com](http://www.sigma-aldrich.com) and/or the reverse side of invoice or packing slip for additional terms and conditions of sale.

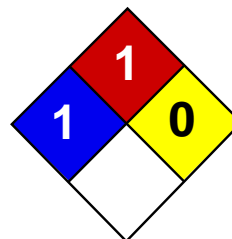
#### Preparation Information

Sigma-Aldrich Corporation  
Product Safety – Americas Region  
1-800-521-8956

Version: 4.9

Revision Date: 03/21/2018

Print Date: 07/01/2018



Health	1
Fire	0
Reactivity	0
Personal Protection	B

## Material Safety Data Sheet Aluminum MSDS

### Section 1: Chemical Product and Company Identification

**Product Name:** Aluminum

**Catalog Codes:** SLA4735, SLA2389, SLA3895, SLA1549, SLA3055, SLA4558, SLA2212, SLA3715

**CAS#:** 7429-90-5

**RTECS:** BD0330000

**TSCA:** TSCA 8(b) inventory: Aluminum

**CI#:** Not applicable.

**Synonym:** Aluminum metal pellets; Aluminum metal sheet; Aluminum metal shot; Aluminum metal wire

**Chemical Name:** Aluminum

**Chemical Formula:** Al

**Contact Information:**

**Sciencelab.com, Inc.**

14025 Smith Rd.

Houston, Texas 77396

US Sales: **1-800-901-7247**

International Sales: **1-281-441-4400**

Order Online: [ScienceLab.com](http://ScienceLab.com)

**CHEMTREC (24HR Emergency Telephone), call:**

1-800-424-9300

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

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

### Section 2: Composition and Information on Ingredients

**Composition:**

Name	CAS #	% by Weight
Aluminum	7429-90-5	100

**Toxicological Data on Ingredients:** Aluminum LD50: Not available. LC50: Not available.

### Section 3: Hazards Identification

**Potential Acute Health Effects:**

Slightly hazardous in case of skin contact (irritant). Non-irritating to the eyes. Non-hazardous in case of ingestion.

**Potential Chronic Health Effects:**

CARCINOGENIC EFFECTS: Not available. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance is toxic to lungs. Repeated or prolonged exposure to the substance can produce target organs damage. Repeated exposure to a highly toxic material may produce general deterioration of health by an accumulation in one or many human organs.

### Section 4: First Aid Measures

**Eye Contact:**

Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Get medical attention if irritation occurs.

**Skin Contact:** Wash with soap and water. Cover the irritated skin with an emollient. Get medical attention if irritation develops.

**Serious Skin Contact:** Not available.

**Inhalation:**

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

**Serious Inhalation:** Not available.

**Ingestion:**

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

**Serious Ingestion:** Not available.

### Section 5: Fire and Explosion Data

**Flammability of the Product:** Non-flammable.

**Auto-Ignition Temperature:** Not available.

**Flash Points:** Not available.

**Flammable Limits:** Not available.

**Products of Combustion:** Some metallic oxides.

**Fire Hazards in Presence of Various Substances:** Not available.

**Explosion Hazards in Presence of Various Substances:**

Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

**Fire Fighting Media and Instructions:**

SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use water spray, fog or foam. Do not use water jet.

**Special Remarks on Fire Hazards:** Not available.

**Special Remarks on Explosion Hazards:** Not available.

### Section 6: Accidental Release Measures

**Small Spill:**

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

**Large Spill:**

Use a shovel to put the material into a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and allow to evacuate through the sanitary system.

### Section 7: Handling and Storage

**Precautions:**

Do not ingest. Wear suitable protective clothing. If ingested, seek medical advice immediately and show the container or the label. Keep away from incompatibles such as oxidizing agents, acids, alkalis.

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

## Section 8: Exposure Controls/Personal Protection

### Engineering Controls:

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

**Personal Protection:** Safety glasses. Lab coat. Gloves.

**Personal Protection in Case of a Large Spill:** Safety glasses. Lab coat. Gloves.

### Exposure Limits:

TWA: 5 (mg(Al)/m) from ACGIH (TLV) [United States] Inhalation (pyro powders, welding fumes) TWA: 10 (mg(Al)/m) from ACGIH (TLV) [United States] Inhalation (metal dust) Consult local authorities for acceptable exposure limits.

## Section 9: Physical and Chemical Properties

**Physical state and appearance:** Solid.

**Odor:** Odorless.

**Taste:** Not available.

**Molecular Weight:** 26.98 g/mole

**Color:** Silver-white

**pH (1% soln/water):** Not applicable.

**Boiling Point:** 2327°C (4220.6°F)

**Melting Point:** 660°C (1220°F)

**Critical Temperature:** Not available.

**Specific Gravity:** Density: 2.7 (Water = 1)

**Vapor Pressure:** Not applicable.

**Vapor Density:** Not available.

**Volatility:** Not available.

**Odor Threshold:** Not available.

**Water/Oil Dist. Coeff.:** Not available.

**Ionicity (in Water):** Not available.

**Dispersion Properties:** Not available.

### Solubility:

Insoluble in cold water, hot water. Soluble in alkalis, Sulfuric acid, Hydrochloric acid. Insoluble in concentrated Nitric Acid, hot Acetic acid.

## Section 10: Stability and Reactivity Data

**Stability:** The product is stable.

**Instability Temperature:** Not available.

**Conditions of Instability:** Incompatible materials, exposure to moist air or water.

**Incompatibility with various substances:** Reactive with oxidizing agents, acids, alkalis.

**Corrosivity:** Not available.

**Special Remarks on Reactivity:**

Moisture sensitive. Aluminum reacts vigorously with Sodium Hydroxide. Aluminum is also incompatible with strong oxidizers, acids, chromic anhydride, iodine, carbon disulfide, methyl chloride, and halogenated hydrocarbons, acid chlorides, ammonium nitrate, ammonium persulfate, antimony, arsenic oxides, barium bromate, barium chlorate, barium iodate, metal salts

**Special Remarks on Corrosivity:**

In moist air, oxide film forms which protects metal from corrosion. Aluminum is strongly electropositive so that it corrodes rapidly in contact with other metals.

**Polymerization:** Will not occur.

## Section 11: Toxicological Information

**Routes of Entry:** Not available.

**Toxicity to Animals:** Not available

**Chronic Effects on Humans:** Not available.

**Other Toxic Effects on Humans:**

Slightly hazardous in case of skin contact (irritant). Non-hazardous in case of ingestion. Non-hazardous in case of inhalation.

**Special Remarks on Toxicity to Animals:** Not available.

**Special Remarks on Chronic Effects on Humans:** Not available.

**Special Remarks on other Toxic Effects on Humans:**

Acute Potential Health Effects: Skin: Exposure to aluminum may cause skin irritation. Eyes: Not expected to be a hazard unless aluminum dust particles are present. Exposure to aluminum dust may cause eye irritation by mechanical action. Aluminum particles deposited in the eye are generally innocuous. Inhalation: Not expected to be an inhalation hazard unless it is heated or if aluminum dust is present. If heated or in dust form, it may cause respiratory tract irritation. Heating Aluminum can release Aluminum Oxide fumes and cause fume metal fever when inhaled. This is a flu-like illness with symptoms of metallic taste, fever, chills, aches, chest tightness, and cough. Ingestion: Acute aluminum toxicity is unlikely. Chronic Potential Health Effects: Skin: Contact dermatitis occurs rarely after aluminum exposure. Most cases of aluminum toxicity in humans are in one of two categories: patients with chronic renal failure, or people exposed to aluminum fumes or dust in the workplace. The main source of aluminum in people with chronic renal failure was in the high aluminum content of the water for the dialysate used for dialysis in the 1970's. Even though this problem was recognized and corrected, aluminum toxicity continues to occur in some individuals with renal who chronically ingest aluminum-containing phosphate binders or antacids. Inhalation: Chronic exposure to aluminum dust may cause dyspnea, cough, asthma, chronic obstructive lung disease, pulmonary fibrosis, pneumothorax, pneumoconiosis, encephalopathy, weakness, incoordination and epileptiform seizures and other neurological symptoms similar to that described for chronic ingestion. Hepatic necrosis is also a reported effect of exposure to airborne particulates carrying aluminum. Ingestion: Chronic ingestion of aluminum may cause Aluminum Related Bone Disease or aluminum-induced Osteomalacia with fracturing Osteodystrophy, microcytic anemia, weakness, fatigue, visual and auditory hallucinations, memory loss, speech and language impairment (dysarthria, stuttering, stammering, anomia, hypofluency, aphasia and eventually, mutism), epileptic seizures (focal or grand mal), motor disturbance (tremors, myoclonic jerks, ataxia, convulsions, asterixis, motor apraxia, muscle fatigue), and dementia (personality changes, altered mood, depression, diminished alertness, lethargy, 'clouding of the sensorium', intellectual deterioration, obtundation, coma), and altered EEG.

## Section 12: Ecological Information

**Ecotoxicity:** Not available.

**BOD5 and COD:** Not available.

**Products of Biodegradation:**

Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

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

**Special Remarks on the Products of Biodegradation:** Not available.

### Section 13: Disposal Considerations

**Waste Disposal:**

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

### Section 14: Transport Information

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

**Identification:** Not applicable.

**Special Provisions for Transport:** Not applicable.

### Section 15: Other Regulatory Information

**Federal and State Regulations:**

California prop. 65: This product contains the following ingredients for which the State of California has found to cause birth defects which would require a warning under the statute: No products were found. California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer which would require a warning under the statute: No products were found. Connecticut hazardous material survey.: Aluminum Illinois toxic substances disclosure to employee act: Aluminum Rhode Island RTK hazardous substances: Aluminum Pennsylvania RTK: Aluminum Minnesota: Aluminum Massachusetts RTK: Aluminum New Jersey: Aluminum New Jersey spill list: Aluminum California Director's List of Hazardous Substances: Aluminum TSCA 8(b) inventory: Aluminum SARA 313 toxic chemical notification and release reporting: Aluminum

**Other Regulations:**

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

**Other Classifications:**

**WHMIS (Canada):** Not controlled under WHMIS (Canada).

**DSCL (EEC):****HMIS (U.S.A.):**

**Health Hazard:** 1

**Fire Hazard:** 0

**Reactivity:** 0

**Personal Protection:** B

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

**Health:** 1

**Flammability:** 1

**Reactivity:** 0

**Specific hazard:**

**Protective Equipment:**

Gloves. Lab coat. Not applicable. Safety glasses.

### Section 16: Other Information

**References:**

-Hawley, G.G.. The Condensed Chemical Dictionary, 11e ed., New York N.Y., Van Nostrand Reinold, 1987. -Material safety data sheet emitted by: la Commission de la Santé et de la Sécurité du Travail du Québec. -SAX, N.I. Dangerous Properties of Industrial Materials. Toronto, Van Nostrand Reinold, 6e ed. 1984. -The Sigma-Aldrich Library of Chemical Safety Data, Edition II. -Guide de la loi et du règlement sur le transport des marchandises dangereuses au Canada. Centre de conformité international Ltée. 1986. 037 Waste manifest or notification not required.

**Other Special Considerations:** Not available.

**Created:** 10/09/2005 03:39 PM

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

*The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no event shall ScienceLab.com be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential or exemplary damages, howsoever arising, even if ScienceLab.com has been advised of the possibility of such damages.*

# Safety Data Sheet

## Antimony Metal Lumps

**CAROLINA**<sup>®</sup>  
www.carolina.com

### Section 1 Product Description

**Product Name:** Antimony Metal Lumps  
**Recommended Use:** Science education applications  
**Synonyms:** Antimony Regulus; Stibium  
**Distributor:** Carolina Biological Supply Company  
2700 York Road, Burlington, NC 27215  
1-800-227-1150  
**Chemical Information:** 800-227-1150 (8am-5pm (ET) M-F)  
**Chemtrec:** 800-424-9300 (Transportation Spill Response 24 hours)

### Section 2 Hazard Identification

Classification of the chemical in accordance with paragraph (d) of §1910.1200;

**DANGER**



Toxic if swallowed. Harmful if inhaled. Toxic to aquatic life. Toxic to aquatic life with long lasting effects.

**GHS Classification:**

Hazardous to the aquatic environment - Acute Category 2, Hazardous to the aquatic environment - Chronic Category 2, Acute Toxicity - Oral Category 3, Acute Toxicity - Inhalation Vapor Category 4

<b>Acute Toxicity Dermal Contains</b>	100 % of the mixture consists of ingredient(s) of unknown toxicity
<b>Acute Toxicity Inhalation Gas Contains</b>	100 % of the mixture consists of ingredient(s) of unknown toxicity
<b>Acute Toxicity Inhalation Dust/Mist Contains</b>	100 % of the mixture consists of ingredient(s) of unknown toxicity

### Section 3 Composition / Information on Ingredients

<u>Chemical Name</u>	<u>CAS #</u>	<u>%</u>
Antimony, Metal	7440-36-0	100

### Section 4 First Aid Measures

**Emergency and First Aid Procedures**

**Inhalation:** IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing.  
**Eyes:** In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.  
**Skin Contact:** After contact with skin, wash immediately with plenty of water.  
**Ingestion:** IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician.

### Section 5 Firefighting Procedures

**Extinguishing Media:** Use dry chemical, CO2 or appropriate foam. Water spray.  
**Fire Fighting Methods and Protection:** Use dry chemical or cover with dry sand or lime.  
**Fire and/or Explosion Hazards:** Fire or excessive heat may produce hazardous decomposition products. Avoid Dusting. May become explosive when dispersed in air.  
**Hazardous Combustion Products:** Antimony,

### Section 6 Spill or Leak Procedures

# Safety Data Sheet

## Steps to Take in Case Material Is Released or Spilled:

Ventilate the contaminated area.  
Avoid the generation of dusts during clean-up.  
Avoid breathing dust/fume/gas/mist/vapors/spray. Clean up spills immediately using Protective Equipment recommended in Section 8 at a minimum.  
Prevent the spread of any spill to minimize harm to human health and the environment if safe to do so. Wear complete and proper personal protective equipment following the recommendation of Section 8 at a minimum. Dike with suitable absorbent material like granulated clay. Gather and store in a sealed container pending a waste disposal evaluation. Vacuum or sweep up material and place in a disposal container Collect spillage.

## Section 7 Handling and Storage

**Handling:** Avoid breathing dust/fume/gas/mist/vapors/spray. Wash thoroughly after handling. Do not eat, drink or smoke when using this product. Use only outdoors or in a well-ventilated area. Avoid release to the environment. Keep container tightly closed in a cool, well-ventilated place.  
**Storage:** Store locked up. Keep container tightly closed in a cool, well-ventilated place.  
**Storage Code:** Green - general chemical storage

## Section 8 Protection Information

<u>Chemical Name</u>	<u>ACGIH</u>	<u>OSHA PEL</u>
	(TWA)	(TWA)
	(STEL)	(STEL)
Antimony, Metal	0.5 mg/m3 TWA	0.5 mg/m3 TWA
	N/A	N/A

### Control Parameters

#### Engineering Measures:

Local exhaust ventilation or other engineering controls are normally required when handling or using this product to avoid overexposure. Ventilation should effectively remove and prevent buildup of any vapor/mist/fume generated from the handling of this product.

#### Personal Protective Equipment (PPE): Respiratory Protection:

Lab coat, apron, eye wash, safety shower.  
Respiratory protection may be required to avoid overexposure when handling this product. General or local exhaust ventilation is the preferred means of protection. Use a respirator if general room ventilation is not available or sufficient to eliminate symptoms. Wear a NIOSH approved respirator if levels above the exposure limits are possible.

#### Respirator Type(s):

NIOSH approved air purifying respirator with dust/mist filter.

#### Eye Protection:

Wear chemical splash goggles when handling this product. Have an eye wash station available.

#### Skin Protection:

Avoid skin contact by wearing chemically resistant gloves, an apron and other protective equipment depending upon conditions of use. Inspect gloves for chemical break-through and replace at regular intervals. Clean protective equipment regularly. Wash hands and other exposed areas with mild soap and water before eating, drinking, and when leaving work. Wash hands and other exposed areas with mild soap and water before eating, drinking, and when leaving work. Where use can result in skin contact, practice good personal hygiene. Inspect gloves for chemical break-through and replace at regular intervals. Clean protective equipment regularly.

#### Gloves:

Nitrile

## Section 9 Physical Data

**Formula:** Sb  
**Molecular Weight:** N/A  
**Appearance:** Solid  
**Odor:** No data available  
**Odor Threshold:** No data available  
**pH:** No data available  
**Melting Point:** No data available  
**Boiling Point:** 630 C  
**Flash Point:** No data available  
**Flammable Limits in Air:** N/A

**Vapor Pressure:** N/A  
**Evaporation Rate (BuAc=1):** N/A  
**Vapor Density (Air=1):** N/A  
**Specific Gravity:** 6.68  
**Solubility in Water:** Practically Insoluble  
**Log Pow (calculated):** No data available  
**Autoignition Temperature:** No data available  
**Decomposition Temperature:** No data available  
**Viscosity:** No data available  
**Percent Volatile by Volume:** N/A

## Section 10 Reactivity Data

**Reactivity:** No data available  
**Chemical Stability:** Stable under normal conditions.

# Safety Data Sheet

**Conditions to Avoid:** None known.  
**Incompatible Materials:** Strong oxidizing agents, Strong acids  
**Hazardous Decomposition Products:** Antimony,  
**Hazardous Polymerization:** Will not occur

## Section 11 Toxicity Data

**Routes of Entry:** Inhalation, ingestion, eye or skin contact.  
**Symptoms (Acute):** Respiratory disorders, Cardiovascular system, , Gastrointestinal,  
**Delayed Effects:** No data available

Acute Toxicity:	CAS Number	Oral LD50	Dermal LD50	Inhalation LC50
<b>Chemical Name</b> Antimony, Metal	7440-36-0	Oral LD50 Rat 100 mg/kg	Not determined	Not determined

Carcinogenicity:	CAS Number	IARC	NTP	OSHA
<b>Chemical Name</b> No data available	7440-36-0	Not listed	Not listed	Not listed

**Chronic Effects:**  
**Mutagenicity:** No evidence of a mutagenic effect.  
**Teratogenicity:** No evidence of a teratogenic effect (birth defect).  
**Sensitization:** No evidence of a sensitization effect.  
**Reproductive:** No evidence of negative reproductive effects.  
**Target Organ Effects:**  
**Acute:** See Section 2  
**Chronic:** Not listed as a carcinogen by IARC, NTP or OSHA.

## Section 12 Ecological Data

**Overview:** Moderate ecological hazard. This product may be dangerous to plants and/or wildlife. Harmful to fish and other water organisms.  
**Mobility:** No data  
**Persistence:** No data  
**Bioaccumulation:** No data  
**Degradability:** No data  
**Other Adverse Effects:** No data

Chemical Name	CAS Number	Eco Toxicity
N/A	7440-36-0	

## Section 13 Disposal Information

**Disposal Methods:** Dispose in accordance with all applicable Federal, State and Local regulations. Always contact a permitted waste disposer (TSD) to assure compliance.  
**Waste Disposal Code(s):** Not Determined

## Section 14 Transport Information

Ground - DOT Proper Shipping Name:	Air - IATA Proper Shipping Name:
N/A	Not regulated for air transport by IATA.

## Section 15 Regulatory Information

**TSCA Status:** All components in this product are on the TSCA Inventory.

Chemical Name	CAS Number	§ 313 Name	§ 304 RQ	CERCLA RQ	§ 302 TPQ	CAA 112(2) TQ
---------------	------------	------------	----------	-----------	-----------	---------------

# Safety Data Sheet

Antimony, Metal

7440-36-0

Antimony

No

5000 lb final RQ (no reporting of releases of this hazardous substance is required if the diameter of the pieces of the solid metal released is >100 µm); 2270 kg final RQ (no reporting of releases of this hazardous substance is required if the diameter of the pieces of the solid metal released is >100 µm)

No

No

## Section 16

## Additional Information

Revised: 09/09/2015

Replaces: 09/03/2014

Printed: 10-29-2015

The information provided in this (Material) Safety Data Sheet represents a compilation of data drawn directly from various sources available to us. Carolina Biological Supply makes no representation or guarantee as to the suitability of this information to a particular application of the substance covered in the (Material) Safety Data Sheet.

### Glossary

ACGIH	American Conference of Governmental Industrial Hygienists	NTP	National Toxicology Program
CAS	Chemical Abstract Service Number	OSHA	Occupational Safety and Health Administration
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act	PEL	Permissible Exposure Limit
DOT	U.S. Department of Transportation	ppm	Parts per million
IARC	International Agency for Research on Cancer	RCRA	Resource Conservation and Recovery Act
N/A	Not Available	SARA	Superfund Amendments and Reauthorization Act
		TLV	Threshold Limit Value
		TSCA	Toxic Substances Control Act
		IDLH	Immediately dangerous to life and health



The Power to Question.

# SAFETY DATA SHEET

Santa Cruz Biotechnology, Inc.

Revision date 21-Apr-2015

Version 1.1

## 1. PRODUCT AND COMPANY IDENTIFICATION

**Product Name** Arsenic(III) oxide

**Product Code** SC-210837

**Recommended use** For research use only. Not intended for diagnostic or therapeutic use.

**Company**  
 Santa Cruz Biotechnology, Inc.  
 10410 Finnell Street  
 Dallas, TX 75220  
 831.457.3800  
 800.457.3801  
 scbt@scbt.com

**Emergency telephone number**  
 Chemtrec  
 1.800.424.9300 (Within USA)  
 +1.703.527.3887 (Outside USA)

## 2. HAZARDS IDENTIFICATION

**Signal word** Danger

**Emergency Overview** Contains a known or suspected carcinogen  
 Corrosive  
 The product causes burns of eyes, skin and mucous membranes  
 Harmful by inhalation, in contact with skin and if swallowed  
 May cause adverse kidney effects

**OSHA Regulatory Status** This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200)

**Potential health effects**

Eyes Causes burns. Corrosive to the eyes and may cause severe damage including blindness. Risk of serious damage to eyes.

Skin Causes burns.

Inhalation Harmful by inhalation. May be harmful if inhaled.

Ingestion Ingestion causes burns of the upper digestive and respiratory tracts. Can burn mouth, throat, and stomach. HARMFUL IF SWALLOWED.

Chronic Toxicity Chronic exposure to corrosive fumes/gases may cause erosion of the teeth followed by jaw necrosis. Bronchial irritation with chronic cough and frequent attacks of pneumonia are common. Gastrointestinal disturbances may also be seen. Avoid repeated exposure. Possible risk of irreversible effects. May cause adverse liver effects.

Aggravated Medical Conditions Kidney disorders. Liver disorders. Skin disorders. Respiratory disorders. Lymphatic System. Lungs.

**Hazards not otherwise classified (HNOC)**  
 Hazards not otherwise classified (HNOC) Not applicable

**Environmental Hazard** Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment. See Section 12: ECOLOGICAL INFORMATION.

<b>NFPA</b>	Health hazards	3		<b>HMIS</b>	Health hazards	3
	Flammability	0			Flammability	0
	Stability	0			Physical hazards	0
	Physical and chemical properties	-			Personal protection	-



### 3. COMPOSITION/INFORMATION ON INGREDIENTS

<b>Product Name</b>	Arsenic(III) oxide
<b>Molecular Weight</b>	197.84
<b>Formula</b>	As <sub>2</sub> O <sub>3</sub>

### 4. FIRST AID MEASURES

General advice	Immediate medical attention is required.
Eye contact	Keep eye wide open while rinsing. Immediate medical attention is required. Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Do not rub affected area.
Skin Contact	Immediate medical attention is required. Wash off immediately with soap and plenty of water while removing all contaminated clothes and shoes.
Inhalation	Remove to fresh air. Call a physician or poison control center immediately. If not breathing, give artificial respiration. If breathing is difficult, give oxygen.
Ingestion	Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Drink plenty of water. Immediate medical attention is required. Remove from exposure, lie down. Clean mouth with water and drink afterwards plenty of water. Call a physician or poison control center immediately.
Note to physicians	Product is a corrosive material. Use of gastric lavage or emesis is contraindicated. Possible perforation of stomach or esophagus should be investigated. Do not give chemical antidotes. Asphyxia from glottal edema may occur. Marked decrease in blood pressure may occur with moist rales, frothy sputum, and high pulse pressure. Treat symptomatically.
Self-protection of the first aider	Use personal protective equipment as required. Avoid contact with skin, eyes or clothing.

### 5. FIRE-FIGHTING MEASURES

#### Suitable Extinguishing Media

Suitable Extinguishing Media Use extinguishing measures that are appropriate to local circumstances and the surrounding environment.

#### Specific hazards arising from the chemical

Specific hazards arising from the chemical The product causes burns of eyes, skin and mucous membranes. Thermal decomposition can lead to release of irritating and toxic gases and vapors. In the event of fire and/or explosion do not breathe fumes.

Flammable properties

Not determined.

Flash point °C

No information available

#### Explosion data

Sensitivity to Mechanical Impact No information available.

Sensitivity to Static Discharge No information available.

#### Protective equipment and precautions for firefighters

Protective equipment and precautions for firefighters Wear self-contained breathing apparatus and protective suit.

### 6. ACCIDENTAL RELEASE MEASURES



Personal precautions	Use personal protective equipment as required. Evacuate personnel to safe areas. Avoid contact with skin, eyes or clothing. Keep people away from and upwind of spill/leak.
Environmental precautions	Do not allow into any sewer, on the ground or into any body of water. Should not be released into the environment. Prevent further leakage or spillage if safe to do so. Prevent product from entering drains. See Section 12 for additional Ecological Information.
Methods for containment	Prevent further leakage or spillage if safe to do so. Cover powder spill with plastic sheet or tarp to minimize spreading. Dike far ahead of liquid spill for later disposal.
Methods for cleaning up	Take up mechanically, placing in appropriate containers for disposal. Clean contaminated surface thoroughly. Use personal protective equipment as required. Cover powder spill with plastic sheet or tarp to minimize spreading and keep powder dry. Avoid creating dust. Dam up. After cleaning, flush away traces with water.

**7. HANDLING AND STORAGE**

Advice on safe handling	Use personal protective equipment as required. Avoid contact with skin, eyes or clothing. Ensure adequate ventilation, especially in confined areas. In case of insufficient ventilation, wear suitable respiratory equipment. Use only with adequate ventilation and in closed systems. May cause damage to organs through prolonged or repeated exposure.
Storage Conditions	Keep container tightly closed in a dry and well-ventilated place. Keep out of the reach of children. Keep containers tightly closed in a dry, cool and well-ventilated place. Keep in properly labeled containers.

**8. EXPOSURE CONTROLS/PERSONAL PROTECTION**

**Exposure Guidelines**

Chemical Name	ACGIH TLV	OSHA PEL	NIOSH IDLH
Arsenic(III) oxide 1327-53-3	TWA: 0.01 mg/m <sup>3</sup> As	TWA: 10 µg/m <sup>3</sup> As	IDLH: 5 mg/m <sup>3</sup> As Ceiling: 0.002 mg/m <sup>3</sup> As 15 min

NIOSH IDLH *Immediately Dangerous to Life or Health*

**Other Information** Vacated limits revoked by the Court of Appeals decision in AFL-CIO v. OSHA, 965 F.2d 962 (11th Cir., 1992)

**Exposure controls**

Engineering Controls Showers  
Eyewash stations  
Ventilation systems

**Personal protective equipment (PPE)**

Eye/face protection Tight sealing safety goggles. Face protection shield.  
 Skin and Body Protection Gloves made of plastic or rubber. Suitable protective clothing. Rubber boots. Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact. Wear chemical resistant clothing such as gloves, apron, boots or whole bodysuits made from neoprene, as appropriate.  
 Respiratory protection Ensure adequate ventilation, especially in confined areas.  
 General Hygiene Considerations When using do not eat, drink or smoke. Wash contaminated clothing before reuse. Keep away from food, drink and animal feeding stuffs. Contaminated work clothing should not be allowed out of the workplace. Regular cleaning of equipment, work area and clothing is recommended. Avoid contact with skin, eyes or clothing. Take off all contaminated clothing and wash it before reuse. Wear suitable gloves and eye/face protection.

**9. PHYSICAL AND CHEMICAL PROPERTIES**

Physical State	Solid
Appearance	powder
Odor	No information available



<u>Property</u>	<u>Values</u>
pH	No information available
Melting point/freezing point	313 °C
Boiling point	460 °C
Flash point	No information available
Density	3.74 g/cm <sup>3</sup>
Evaporation rate	No information available
Upper flammability limits	No information available
Lower flammability limit	No information available
Vapor pressure	.000001
Vapor density	No information available
Specific gravity	No information available
Water solubility	No information available
Solubility in other solvents	No information available
Partition coefficient	No information available
Autoignition temperature	No information available
Decomposition temperature	No information available
Kinematic viscosity	No information available
Explosive properties	No information available
Oxidizing properties	No information available

## 10. STABILITY AND REACTIVITY

Reactivity	Not applicable
Stability	Stable under recommended storage conditions.
Incompatible materials	Incompatible with strong acids and bases. Incompatible with oxidizing agents.
Conditions to avoid	Exposure to air or moisture over prolonged periods.
Hazardous Decomposition Products	Thermal decomposition can lead to release of irritating and toxic gases and vapors.
Hazardous polymerization	Hazardous polymerization does not occur

## 11. TOXICOLOGICAL INFORMATION

### Acute toxicity

Product Information Product does not present an acute toxicity hazard based on known or supplied information.

### Chronic Toxicity

Chronic Toxicity Chronic exposure to corrosive fumes/gases may cause erosion of the teeth followed by jaw necrosis. Bronchial irritation with chronic cough and frequent attacks of pneumonia are common. Gastrointestinal disturbances may also be seen. Avoid repeated exposure. Possible risk of irreversible effects. May cause adverse liver effects.

Carcinogenicity The table below indicates whether each agency has listed any ingredient as a carcinogen.  
Target Organ Effects Kidney. Liver. Lymphatic System. Lungs. Skin.

*ACGIH (American Conference of Governmental Industrial Hygienists) A1 - Known Human Carcinogen*

*IARC (International Agency for Research on Cancer) Group 1 - Carcinogenic to Humans*

*NTP (National Toxicology Program) Known - Known Carcinogen*

*OSHA (Occupational Safety and Health Administration of the US Department of Labor) X - Present*

## 12. ECOLOGICAL INFORMATION

### Ecotoxicity

Ecotoxicity Harmful to aquatic life. Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

Persistence and degradability No information available.



Bioaccumulation			
No information available.			
Chemical Name	Algae/aquatic plants	Fish	Crustacea
Arsenic(III) oxide	-	135: 96 h Pimephales promelas mg/L LC50 1000: 96 h Oncorhynchus mykiss mg/L LC50 static 18.8 - 21.4: 96 h Oncorhynchus mykiss mg/L LC50 flow-through	0.96: 96 h Daphnia magna mg/L LC50 3.9 - 4.5: 24 h Daphnia magna mg/L EC50

### 13. DISPOSAL CONSIDERATIONS

Disposal considerations Disposal should be in accordance with applicable regional, national and local laws and regulations. Should not be released into the environment.

Contaminated packaging Do not reuse container.

US EPA Waste Number P012

Chemical Name	RCRA	RCRA - Basis for Listing	RCRA - D Series Wastes	RCRA - U Series Wastes
Arsenic(III) oxide - 1327-53-3	P012			

### 14. TRANSPORT INFORMATION

#### DOT

UN/ID no UN1561  
 Hazard Class 6.1  
 Packing Group II  
 Proper shipping name Arsenic trioxide  
 Description UN1561, Arsenic trioxide, 6.1, II, POISON  
 Emergency Response Guide Number 151

#### IATA

UN/ID no UN1561  
 Hazard Class 6.1  
 Packing Group II  
 Proper shipping name Arsenic trioxide  
 Description UN1561, Arsenic trioxide, 6.1, II

#### IMDG

UN/ID no UN1561  
 Hazard Class 6.1  
 Packing Group II  
 Proper shipping name Arsenic trioxide  
 Description UN1561, Arsenic trioxide, 6.1, II  
 EmS-No F-A, S-A

### 15. REGULATORY INFORMATION

#### International Inventories

All of the components in the product are on the following inventory lists TSCA (United States): Canada (DSL/NDSL) Europe (EINECS/ELINCS/NLP) Australia (AICS) South Korea (KECL): China (IECSC) ENCS (Japan): Philippines (PICCS)

X - Listed

TSCA - United States Toxic Substances Control Act Section 8(b) Inventory

DSL/NDSL - Canadian Domestic Substances List/Non-Domestic Substances List

EINECS/ELINCS - European Inventory of Existing Chemical Substances/European List of Notified Chemical Substances

ENCS - Japan Existing and New Chemical Substances



IECSC - China Inventory of Existing Chemical Substances  
 KECL - Korean Existing and Evaluated Chemical Substances  
 PICCS - Philippines Inventory of Chemicals and Chemical Substances

## US Federal Regulations

### SARA 313

Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 (SARA). This product does not contain any chemicals which are subject to the reporting requirements of the Act and Title 40 of the Code of Federal Regulations, Part 372.

### SARA 311/312 Hazard Categories

Acute health hazard	Yes
Chronic Health Hazard	Yes
Fire hazard	No
Sudden release of pressure hazard	No
Reactive hazard	No

### CWA (Clean Water Act)

This product contains the following substances which are regulated pollutants pursuant to the Clean Water Act (40 CFR 122.21 and 40 CFR 122.42).

## US State Regulations

### California Proposition 65

This product contains the following Proposition 65 chemicals.

Chemical Name	California Proposition 65
Arsenic(III) oxide - 1327-53-3	Carcinogen Developmental

## U.S. State Right-to-Know Regulations

Chemical Name	New Jersey	Massachusetts	Pennsylvania
Arsenic(III) oxide 1327-53-3	X	X	X

## Mexico Regulatory Information

## Canada Regulatory Information

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

WHMIS Hazard Class	D2A - Very toxic materials Non-controlled
--------------------	----------------------------------------------

## 16. OTHER INFORMATION

Revision date	21-Apr-2015
Revision note	No information available

### Disclaimer

The information provided in this Material Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.



---

**End of Safety Data Sheet**

# Barium

[Print](#)

## SAFETY DATA SHEET

### 1 PRODUCT AND SUPPLIER IDENTIFICATION

Product Name: Barium Solid

Formula: Ba

Supplier: ESPI Metals

1050 Benson Way

Ashland, OR 97520

Telephone: 800-638-2581

Fax: 541-488-8313

Email: [sales@espimetals.com](mailto:sales@espimetals.com)

Emergency: Infotrac 800-535-5053 (US) or 352-323-3500 (24 hour)

Recommended Uses: Scientific Research

### 2 HAZARDS IDENTIFICATION

GHS Classification (29 CFR 1910.1200): Substances and mixtures which, in contact with water, emit flammable gases, category 2, Skin corrosion/irritation, category 2, Eye damage/irritation, category 2A.

GHS Label Elements:



Signal Word: Danger

Hazard Statements: H261 In contact with water releases flammable gas, H315 Causes skin irritation, H319

Causes serious eye irritation, H335 May cause respiratory irritation.

Precautionary Statements: P223 Keep away from any possible contact with water, because of violent reaction and possible flash fire, P231+P232 Handle under inert gas. Protect from moisture, P261 Avoid breathing dust or fume, P264 Wash skin thoroughly after handling, P280 Wear protective gloves/protective clothing/eye protection/face protection, P302+P352 IF ON SKIN: wash with plenty of soap and water, P332+P313 IF SKIN irritation occurs: Get medical advice/attention, P305+P351+P338 IF IN EYES: rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing, P337+P313 IF eye irritation persists: Get medical advice/attention, P362 Take off contaminated clothing and wash before reuse, P370+P378 In case of fire: Use Class D dry powder for extinction, P402+P404 Store in a dry place. Store in a closed container, P501 Dispose of contents/container in accordance with local, state or federal regulations.

### 3 COMPOSITION/INFORMATION ON INGREDIENTS

Ingredient:	Barium
CAS#:	7440-39-3
% :	100
EC#:	231-149-1

### 4 FIRST AID MEASURES

General Measures: Remove patient from area of exposure.

INHALATION: Remove to fresh air, keep warm and quiet, give oxygen if breathing is difficult. Seek immediate medical attention.

INGESTION: Quickly wipe material from mouth and rinse with water. Do not induce vomiting. Seek medical attention immediately.

SKIN: Remove contaminated clothing if necessary. Brush off any visible solids. Wash the affected area with water for at least 15 minutes. Seek medical attention.

EYES: Immediately flush eyes with copious amounts of water, including under eyelids for at least 10-15 minutes. A victim may need assistance in keeping their eyelids open. Seek immediate medical attention.

Most Important Symptoms/ Effects, Acute and Delayed: May cause severe irritation in contact with mucous membranes and moist skin. See section 11 for more information.

Indication of Immediate Medical Attention and Special Treatment: No other relevant information available.

### 5 FIREFIGHTING MEASURES

Extinguishing Media: Use Class D dry powder extinguishing agent.

Unsuitable Extinguishing Media: Do not use water, carbon dioxide or halogenated extinguishers.

Specific Hazards Arising from the Material: Material readily reacts with water generating flammable hydrogen gas. May emit fumes of barium oxide under fire conditions.

Special Protective Equipment and Precautions for Firefighters: Full face, self-contained breathing apparatus and full protective clothing to prevent contact with skin and eyes. Barium metal can reignite after fire is initially extinguished. Never leave extinguished fire unattended.

## 6 ACCIDENTAL RELEASE MEASURES

Personal Precautions, Protective Equipment, and Emergency Procedures: Wear appropriate respiratory and protective equipment specified in section 8. Isolate spill area and provide ventilation. Avoid breathing dust or fume. Avoid contact with skin and eyes. Eliminate all sources of ignition.

Methods and Materials for Containment and Cleaning Up: Sweep or scoop spilled product and place in a closed container for further handling and disposal. Do not use water for spill clean-up. Cover very small quantities in the open with powdered limestone and let decompose. Use only non-sparking tools and natural bristle brushes.

Environmental Precautions: Do not flush to sewer, stream, or other bodies of water. Do not allow to enter drains or to be released to the environment.

## 7 HANDLING AND STORAGE

Precautions for Safe Handling: Handle in an enclosed, controlled process under dry protective gas such as argon. Use non-sparking tools. Protect from sources of ignition. Do not allow contact with water. Avoid breathing dust or fumes. Provide adequate ventilation if dusts are created. Avoid contact with skin and eyes. Wash thoroughly before eating or smoking. See section 8 for information on personal protection equipment.

Conditions for Safe Storage, Including Any Incompatibilities: Store material tightly sealed in properly labeled containers under argon or mineral oil. Storage area should be free of combustibles and ignition sources. Do not store together with acids, oxidizers, halogens. Protect from water/moisture. See section 10 for more information on incompatible materials.

## 8 EXPOSURE CONTROLS AND PERSONAL PROTECTION

Exposure Limits: Barium

OSHA/PEL: 0.5 mg/m<sup>3</sup>

ACGIH/TLV: 0.5 mg/m<sup>3</sup>

Appropriate Engineering Controls: Handle in an enclosed, controlled process under dry argon. Whenever possible the use of local exhaust ventilation or other engineering controls is the preferred method of controlling exposure to airborne dust and fume to meet established occupational exposure limits. Do not use tobacco or food in work area. Wash thoroughly before eating or smoking. Do not blow dust off clothing or skin with compressed air. Prepare for the possibility of a fire. Keep extinguishing agents, tools for handling and protective clothing readily available.

Individual Protection Measures, Such as Personal Protective Equipment:

Respiratory Protection: Wear a NIOSH/MSHA approved respirator when high concentrations are present.

Eye Protection: Always wear approved chemical splash proof goggles.

Skin Protection: Rubber gloves, flame retardant protective work clothing.

## 9 PHYSICAL AND CHEMICAL PROPERTIES

Appearance:

Form: Solid in various forms

Color: Silver-gray metallic

Odor: Not determined

Odor Threshold: Not determined

pH: N/A

Melting Point: 725 °C

Boiling Point: 1640 °C

Flash Point: N/A

Evaporation Rate: N/A

Flammability: Flammable solid

Upper Flammable Limit: No data

Lower Flammable Limit: No data

Vapor Pressure: 10 mm at 1049 °C

Vapor Density: N/A

Relative Density (Specific Gravity): 3.51 g/cc at 20 °C

Solubility in H<sub>2</sub>O: Decomposes

Partition Coefficient (n-octanol/water): Not determined

Autoignition Temperature: No data

Decomposition Temperature: No data

Viscosity: N/A

## 10 STABILITY AND REACTIVITY

Reactivity: No data

Chemical Stability: Stable under recommended storage conditions.

Possibility of Hazardous Reactions: Barium reacts readily with water releasing flammable hydrogen gas.

Conditions to Avoid: Heat, sparks, flame. Exposure to water or moist air.

Incompatible Materials: Water or moisture, oxidizing agents, oxygen, acids, alcohols, halocarbons, carbon dioxide, ammonia.

Hazardous Decomposition Products: Barium oxides, hydrogen gas.

## 11 TOXICOLOGICAL INFORMATION

Likely Routes of Exposure: Inhalation, skin, eyes.

Symptoms of Exposure: May cause severe irritation to the nose, throat, and upper respiratory tract, mouth, throat, and esophagus. Contact with skin can cause mild to moderate irritation. May cause chemical burns in eyes or on skin as it reacts with moisture on living tissue.

Acute and Chronic Effects: Barium compounds may cause severe gastroenteritis, including abdominal pain, vomiting and diarrhea, tremors, faintness, paralysis of the arms and legs, and slow or irregular heartbeat. Severe cases may produce collapse and death due to respiratory failure. Soluble barium compounds are more likely to cause these effects than insoluble compounds. Inhalation of fumes may cause sore throat, coughing, labored breathing, and irritation of the respiratory tract as well as the above symptoms. Chronic exposure to barium may cause sensitization, chronic barium poisoning, dermatitis, corneal opacity and blindness.

Acute Toxicity: No data

Carcinogenicity: NTP: Not identified as carcinogenic IARC: Not identified as carcinogenic

To the best of our knowledge the chemical, physical and toxicological characteristics of the substance are not fully known.

## 12 ECOLOGICAL INFORMATION

Ecotoxicity: No data

Persistence and Degradability: No data

Bioaccumulative Potential: No data

Mobility in Soil: No data

Other Adverse Effects: Do not allow material to be released to the environment. No further relevant information available.

## 13 DISPOSAL CONSIDERATIONS

Waste Disposal Method:

Product: Dispose of in accordance with Federal, State and Local regulations.

Packaging: Dispose of in accordance with Federal, State and Local regulations.

## 14 TRANSPORT INFORMATION

UN Number: UN1400

UN Proper Shipping Name: Barium

Transport Hazard Class: 4.3  
Packing Group: II  
Marine Pollutant: No  
Special Precautions: Warning, substances which, in contact with water, emit flammable gases.

## 15 REGULATORY INFORMATION

TSCA Listed: All components are listed.

Regulation (EC) No 1272/2008 (CLP): Substances and mixtures which, in contact with water, emit flammable gases, category 2, Skin corrosion/irritation, category 2, Eye damage/irritation, category 2A.

Canada WHMIS Classification (CPR, SOR/88-66): Substances and mixtures which, in contact with water, emit flammable gases, Skin corrosion/irritation, Eye damage/irritation.

HMIS Ratings: Health: 2 Flammability: 3 Physical: 1

NFPA Ratings: Health: 2 Flammability: 3 Instability: 1 Special Hazard: W

Chemical Safety Assessment: A chemical safety assessment has not been carried out.

## 16 OTHER INFORMATION

The information contained in this document is based on the state of our knowledge at the time of publication and is believed to be correct, but does not purport to be all inclusive and shall be used only as a guide. ESPI Metals makes no representation, warranty, or guarantee of any kind with respect to the information contained in this document or any use of the product based on this information. ESPI Metals shall not be held liable for any damages resulting from handling or from contact with the above product. Users should satisfy themselves that they have all current data relevant to their particular use.

Prepared by: ESPI Metals

Revised/ Reviewed: July 2015

**CADMIUM METAL  
SAFETY DATA SHEET**

**SECTION 1. IDENTIFICATION**

**Product Identity:** Cadmium Metal

**Trade Names and Synonyms:** Tadanac Cadmium; Cadmium Balls; Cadmium Sticks; Cd; ASTM B440.

**Manufacturer:**  
Teck Metals Ltd.  
Trail Operations  
Trail, British Columbia  
V1R 4L8  
Emergency Telephone: 250-364-4214

**Supplier:**  
Teck Metals Ltd.  
#1700 – 11 King Street West  
Toronto, Ontario  
M5H 4C7

**Preparer:**  
Teck Metals Ltd.  
Suite 3300 – 550 Burrard Street  
Vancouver, British Columbia  
V6C 0B3

**Date of Last Review:** April 15, 2015.

**Date of Last Edit:** April 15, 2015.

**Product Use:** Cadmium metal is used as a constituent in easily fusible alloys, in soft solder and solder for aluminum, in electroplating, as a deoxidizer in nickel plating, in process engraving, in electrodes for cadmium vapour lamps, in photoelectric cells, in nickel-cadmium storage batteries, and in pigment manufacture.

**SECTION 2. HAZARDS IDENTIFICATION**

**CLASSIFICATION:**

Health		Physical	Environmental
<b>Acute Toxicity (Oral)</b>	- <b>Category 3</b>	Does not meet criteria for any Physical Hazard	<b>Aquatic Toxicity Long Term – Category 4</b>
<b>Acute Toxicity (Inhalation)</b>	- <b>Category 1</b>		
Skin Irritation	- Does not meet criteria		
Eye Irritation	- Does not meet criteria		
Sensitization	- Does not meet criteria		
Mutagenicity	- Does not meet criteria		
<b>Carcinogenicity</b>	- <b>Category 1A</b>		
<b>Reproductive Toxicity</b>	- <b>Category 2</b>		
<b>Specific Target Organ Toxicity (Acute Exposure)</b>	- <b>Category 1</b>		
<b>(Chronic Exposure)</b>	- <b>Category 1</b>		

**LABEL:**

<b>Symbols:</b>		<b>Signal Word:</b> <b>DANGER</b>
<b>Hazard Statements</b> <b>DANGER!</b> Toxic if swallowed. Fatal if inhaled as freshly generated cadmium oxide fume. May cause cancer through inhalation of dust/fume. Suspected of damaging fertility or the unborn child. Causes damage to organs through single exposure or prolonged / repeated inhalation of dust or particularly fume. May cause long lasting harmful effects to aquatic life.		<b>Precautionary Statements:</b> Do not handle until all safety precautions have been read and understood. Use only outdoors or in a well-ventilated area. Do not breathe cadmium fumes or dust. Wear respiratory protection where cadmium fumes may be generated. Use other personal protective equipment as required. Do not eat, drink or smoke when using this product. Wash hands thoroughly after handling this product. Avoid release to the environment. IF INHALED: Remove person to fresh air and keep at rest in a position comfortable for breathing. Immediately call a POISON CENTRE or doctor/physician. Specific treatment for possible pulmonary edema is urgent following cadmium fume exposure. IF SWALLOWED: Rinse mouth. Immediately call a POISON CENTRE or doctor/physician. If concerned about exposure, get medical advice.

**Emergency Overview:** A bluish-silver lustrous metal that does not burn in bulk. Clouds of finely-divided dust are a fire and explosion hazard, however. When heated strongly in air cadmium oxide fumes will be generated. Freshly formed cadmium fume is an intense pulmonary irritant and may result in development of pulmonary edema several hours after exposure. Inhalation or ingestion of dust or fumes may produce both acute and chronic health effects. Probable cancer hazard. A self-contained breathing apparatus (SCBA) and full protective clothing are required for all emergency response personnel when cadmium is involved in a fire situation. Do NOT use water or foam. Apply dry chemical, dry sand, or special powder extinguishing media.

**Potential Health Effects:** Cadmium dust and fume have both acute and chronic health effects. Cadmium dust is a pulmonary irritant. Freshly formed cadmium fume is an intense pulmonary irritant, resulting in respiratory distress and possible pulmonary edema that may develop as much as 48 hours after exposure. In severe cases death may result. Long term exposures may cause kidney dysfunction and lung injury (emphysema) as well as other symptoms. Cadmium is classified as a carcinogen or probable carcinogen by IARC, ACGIH, NTP, OSHA and the EU (see Toxicological Information, Section 11).

**Potential Environmental Effects:** While cadmium metal has relatively low bioavailability, compounds which it forms with other elements can be potentially toxic to biota at low concentrations. Bioaccumulation of cadmium occurs readily in aquatic and terrestrial food chains, specifically in plants and aquatic organisms (see Ecological Information, Section 12).

**SECTION 3. COMPOSITION / INFORMATION ON INGREDIENTS**

HAZARDOUS COMPONENTS	CAS Registry No.	CONCENTRATION (% wgt/wgt)
Cadmium	7440-43-9	99.97+%

Note: See Section 8 for Occupational Exposure Guidelines.

**SECTION 4. FIRST AID MEASURES**

**Eye Contact:** *Symptoms:* Eye irritation, redness. Gently brush product off face. Do not rub eye(s). Let the eye(s) water naturally for a few minutes. Look right and left, then up and down. If particle/dust does not come out, cautiously rinse eye(s) with lukewarm, gently flowing water for 5 minutes or until particle/dust is removed, while holding eyelid(s) open. If eye irritation persists, get medical advice/attention. DO NOT attempt to manually remove anything stuck to the eye.

**Skin Contact:** *Symptoms:* Skin soiling, irritation. *Dust:* Gently brush away excess product. Take off contaminated clothing, shoes and leather goods (e.g., watchbands, belts). Wash with plenty of lukewarm, gently flowing water and a non-abrasive soap for 5 minutes. If skin irritation occurs, get medical advice/attention. Wash contaminated clothing before re-use. *Molten Metal:* Flush

contact area to solidify and cool, but do not attempt to remove encrusted material or clothing. Cover burns and seek medical attention immediately.

**Inhalation:** *Symptoms:* Wheezing, coughing, throat/chest irritation. Take proper precautions to ensure your own safety before attempting rescue (e.g., wear appropriate protective equipment). Remove source of exposure or move person from exposure area to fresh air immediately and keep comfortable for breathing. Immediately call a Poison Control Centre/Doctor. If breathing is difficult, trained personnel should administer emergency oxygen if advised to do so by the Poison Control Centre/Doctor. DO NOT allow victim to move around unnecessarily. Treat pulmonary edema as a priority, even if no symptoms (i.e. wheezing, coughing, shortness of breath, etc.) are apparent. Symptoms of pulmonary edema can be delayed up to 48 hours after exposure. Quickly transport victim to an emergency care facility.

**Ingestion:** *Symptoms:* Stomach pain. Immediately call an emergency care facility/poison control centre. Have patient rinse mouth thoroughly with water. DO NOT INDUCE VOMITING. However, the irritant and emetic action of swallowed cadmium usually leads to spontaneous vomiting. If vomiting occurs naturally, have victim rinse mouth with water again, then lie the affected person on their side in the recovery position. If breathing has stopped, trained personnel should begin rescue breathing or, if the heart has stopped, immediately start cardiopulmonary resuscitation (CPR) or automated external defibrillation (AED).

## SECTION 5. FIRE FIGHTING MEASURES

**Fire and Explosion Hazards:** Massive metal is not flammable or combustible. Finely-divided metallic dust or powder is a moderate fire hazard and moderate explosion hazard when dispersed in air at high concentrations and exposed to heat, flame or other ignition sources. Freshly formed cadmium powder, in contact with limited amounts of water, may heat spontaneously and may ignite combustible materials in contact with the powder. Fires and explosions may also occur upon contact with certain incompatible materials (see Stability and Reactivity, Section 10).

**Extinguishing Media:** Apply dry chemical, dry sand, or special powder extinguishing media (i.e. a Class D Extinguisher) to any burning pieces of metal and allow to cool. Do NOT use water, carbon dioxide, foam or Halon fire extinguishing agents on any burning or molten metal. Water may be ineffective for extinguishing fire but should be used to keep fire-exposed containers cool.

**Fire Fighting:** If possible, move material from fire area and cool material exposed to flame. Apply dry chemical, dry sand or special powder extinguishing media to burning cadmium. Highly toxic cadmium oxide fumes will evolve in fires. Fire fighters must be fully trained and wear full protective clothing including an approved, self-contained breathing apparatus which supplies a positive air pressure within a full face-piece mask.

## SECTION 6. ACCIDENTAL RELEASE MEASURES

**Procedures for Cleanup:** Control source of spillage if possible to do so safely. Restrict access to the area until completion of clean-up. Clean up spilled material immediately, observing precautions outlined below. Molten metal should be allowed to solidify prior to clean-up. If solid metal, wear gloves, pick up and return to process. If dust, wear recommended personal protective equipment (see below) and use methods that will minimize dust generation (e.g., vacuum solids). Return uncontaminated spilled material to the process if possible. Place contaminated and non-recyclable material into suitable labelled containers for later disposal. Treat or dispose of waste material in accordance with all local, regional and national requirements, as applicable.

**Personal Precautions:** Persons responding to an accidental release should wear protective clothing, gloves and a respirator (see also Section 8). Close-fitting safety goggles may be necessary in some circumstances to prevent eye contact with dust and fume. Where molten metal is involved, wear heat-resistant gloves and suitable clothing for protection from radiant heat and hot-metal splash as well as a respirator to protect against inhalation of cadmium fume. Workers should wash and change clothing following cleanup of a cadmium spill to prevent personal contamination with cadmium / cadmium oxide dust.

**Environmental Precautions:** Cadmium metal has relatively low bioavailability; however, compounds which it forms with other elements can be toxic to aquatic and terrestrial biota. Releases of the product to water and soil should be prevented.

## SECTION 7. HANDLING AND STORAGE

Store cadmium in a DRY, covered area, away from incompatible materials and food or feedstuffs. Cadmium ingots suspected of containing moisture should be THOROUGHLY DRIED before being added to a molten bath. Otherwise, entrained moisture could expand explosively and spatter molten metal out of the bath.

## SECTION 8. EXPOSURE CONTROLS / PERSONAL PROTECTION

### Occupational Exposure Guidelines:

<u>Component</u>	<u>ACGIH TLV</u>	<u>OSHA PEL</u>	<u>NIOSH REL</u>
Cadmium	0.01 mg Cd/m <sup>3</sup> (total dust) 0.002 mg Cd/m <sup>3</sup> (respirable)	0.005 mg Cd/m <sup>3</sup> OSHA SECAL* 0.015 or 0.05 mg/m <sup>3</sup>	Lowest feasible level

NOTE: OEGs for individual jurisdictions may differ from those given above. Check with local authorities for the applicable OEGs in your jurisdiction.

ACGIH - American Conference of Governmental Industrial Hygienists; OSHA - Occupational Safety and Health Administration; NIOSH - National Institute for Occupational Safety and Health. TLV – Threshold Limit Value, PEL – Permissible Exposure Limit, REL – Recommended Exposure Limit. SECAL – Separate Engineering Control Airborne Limit.

\*Separate Engineering Control Airborne Limits: To be achieved in specified processes and work places where it is not possible to achieve the PEL through engineering and work practices alone. The OSHA SECAL for cadmium is 0.015 or 0.050 mg/m<sup>3</sup>, depending on the processes involved. See Table 1 of 29 CFR § 1910.1027.

NOTE: The selection of the necessary level of engineering controls and personal protective equipment will vary depending upon the conditions of use and the potential for exposure. The following are therefore only general guidelines that may not fit all circumstances. Control measures to consider include:

**Ventilation:** Use adequate local or general ventilation to maintain the concentration of cadmium fumes in the working environment well below recommended occupational exposure limits. Supply sufficient replacement air to make up for air removed by the exhaust system. Local exhaust is strongly recommended for melting, casting, grinding and welding or flame cutting of cadmium.

**Protective Clothing:** Gloves and coveralls or other work clothing are recommended to prevent prolonged or repeated direct skin contact when cadmium is processed. Appropriate eye protection should be worn where fume or dust is generated. Where hot or molten metal is handled, heat resistant gloves, goggles or face shield, respirator and clothing to protect from radiant heat and hot metal splash should be worn. Safety type boots are recommended.

**Respirators:** Where cadmium dust or fumes are generated and cannot be controlled to within acceptable levels by engineering means, use appropriate NIOSH-approved respiratory protection equipment (a 42CFR84 Class N, R or P-100 particulate filter cartridge). When exposure levels are obviously high but the actual concentration is unknown, a self-contained breathing apparatus which supplies a positive air pressure within a full face-piece mask should be worn.

**General Hygiene Considerations:** Do not eat, drink or smoke in work areas. Thoroughly wash hands before eating, drinking, or smoking in appropriate, designated areas only. Work clothing should be removed immediately and laundered before reuse if it becomes heavily contaminated. Work clothing should be removed before leaving the plant site and should be changed daily if there is a reasonable probability that the clothing may be contaminated. If using a commercial or industrial laundry service, inform laundry personnel of contaminants' hazards. Workers should shower at the end of each work shift. A double locker-shower system with separate clean and dirty sides is required for cadmium handling operations to avoid cross-contamination of street clothes. Workers should not take dirty work clothes home and launder them with other personal clothing.

## SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

<b>Appearance:</b> Bluish-silver lustrous metal	<b>Odour:</b> None	<b>Odour Threshold:</b> Not Applicable	<b>pH:</b> Not Applicable
<b>Vapour Pressure:</b> 1 mm of Hg @ 394°C negligible @ 20°C	<b>Vapour Density:</b> Not Applicable	<b>Boiling Point/Range:</b> 765°C	<b>Melting Point/Range:</b> 321°C
<b>Relative Density</b> (Water = 1): 8.65	<b>Evaporation Rate:</b> Not Applicable	<b>Coefficient of Water/Oil Distribution:</b> Not Applicable	<b>Solubility:</b> Insoluble in water
<b>Flash Point:</b> Not Applicable	<b>Flammable Limits</b> (LEL/UEL): Not Applicable	<b>Auto-ignition Temperature:</b> Not Applicable	

## SECTION 10. STABILITY AND REACTIVITY

**Stability & Reactivity:** Massive metal is stable and not considered reactive under normal temperatures and pressures. Hazardous polymerization or runaway reactions will not occur. Metal surfaces tarnish on exposure to moist air. Finely powdered metal or dust can be ignited from a dust cloud in air. Freshly formed cadmium powder, in contact with limited amounts of water, may heat spontaneously and may ignite combustible materials in contact with the powder.

**Incompatibilities:** Cadmium reacts vigorously with oxidizing agents such as peroxides, chlorates, nitrates, and halogens or interhalogen compounds such as chlorine trifluoride as well as with elemental sulphur, zinc, selenium, or tellurium. Mixtures with nitric acid liberate toxic fumes of nitrogen oxides. Violent explosions can occur when the metal is in contact with fused ammonium nitrate or immersed in hydrazoic acid. Burning metal reacts violently with fire extinguishing agents such as water, foam, carbon dioxide or Halons. Cadmium metal reacts with strong acids giving off flammable hydrogen gas.

**Hazardous Decomposition Products:** High temperature operations such as oxy-acetylene cutting or burning, electric arc welding or overheating a molten bath will generate highly toxic cadmium oxide fumes. These brownish fumes are highly soluble in body fluids and the particle size of the metal fumes is largely within the respirable size range, which increases the likelihood of inhalation and deposition of the fume within the body.

## SECTION 11. TOXICOLOGICAL INFORMATION

**General:** Cadmium dust and fume are both pulmonary irritants, but freshly generated cadmium fume is an intense irritant and its small particle size allows it to reach into the lung more readily. The onset of symptoms is frequently delayed by 4 to 10 hours after exposure and is aggravated by physical effort. Pulmonary edema may then develop rapidly. The mortality rate from acute pulmonary disease is about 20% according to the ACGIH. Those surviving an episode of acute poisoning generally recover slowly but without apparent residual effects.

Chronic exposure to cadmium has been associated with a wide variety of gastrointestinal symptoms, pulmonary edema, and kidney malfunction with increased excretion of a specific low molecular weight protein (beta-2-microglobulin). The body to a large extent retains absorbed cadmium, and excretion is very slow. Cadmium has been linked to both prostate cancer and lung cancer, though several researchers have questioned the association with prostate cancer recently.

Individuals with pre-existing lung, liver, kidney, and blood ailments should be precluded from exposure until approved by a physician. Initial and periodic medical examinations are recommended for persons exposed to levels above the exposure limits of cadmium.

### **Acute:**

**Skin/Eye:** Contact with dust or fume may cause local irritation but would not cause tissue damage.

**Inhalation:** Fumes of cadmium (i.e. cadmium oxide) are highly toxic by inhalation. They may cause serious systemic poisoning and possible permanent damage to the lungs. Early symptoms of excessive exposure include dryness of the throat; irritation of the nose, throat, and respiratory tract; headache; coughing, and a metallic taste. After a delay of several hours (up to 10), a person may develop constriction of the chest, persistent cough, and progressive shortness of breath. There may be headache, chills, diarrhea, muscle aches, nausea, vomiting, irritability, and restlessness. Pulmonary congestion may progress rapidly causing wheezing and symptoms of oxygen deficiency. Death may follow. Recovery from an acute exposure episode is slow but generally without ongoing or lingering effects. Milder cases of acute exposure have produced symptoms resembling metal fume fever with some symptoms and signs of acute gastroenteritis as well.

**Ingestion:** Ingestion of excessive quantities of cadmium dust may cause salivation, choking, nausea, vomiting, diarrhea, abdominal pain, tenseness, blurred vision, dizziness, vertigo, and headache. Convulsions, exhaustion, collapse, shock, and unconsciousness may occur. Death has followed within 24 hours from shock or after 7 to 14 days from acute kidney failure or cardiopulmonary depression.

**Chronic:** Prolonged exposure to cadmium dust and/or fume may cause loss of sense of smell, occasional ulcerations of the nasal passages, rhino laryngitis, cough, shortness of breath, mild anemia, sleeplessness, irritability, loss of appetite, and cadmium-yellow fringe on teeth. The primary target organ for chronic cadmium effects is the kidney with increased excretion of a specific low molecular weight protein (beta-2-microglobulin). Damage to the lungs (of the emphysematous type) has been reported in some studies of cadmium-exposed workers but not found in other studies. Cigarette tobacco contains cadmium and smoking adds to the daily intake of cadmium which may increase the risk of cumulative toxic effects. Clinical evidence of the cumulative effects of cadmium may appear after exposure has ceased. Disease may then be progressive.

The International Agency for Research on Cancer (IARC) has classified cadmium and certain cadmium compounds as Group 1 Carcinogens (carcinogenic to humans). The American Conference of Governmental Industrial Hygienists (ACGIH) classifies cadmium as a Suspected Human Carcinogen (A2). The National Toxicology Program (NTP) classifies cadmium as a Known Human Carcinogen and OSHA lists cadmium as a Carcinogen. The European Union (EU) classifies cadmium as a Category 2 (Probable) Carcinogen.

**Animal Toxicity:****Hazardous Ingredient:****Acute Oral Toxicity:****Acute Dermal Toxicity:****Acute Inhalation Toxicity:**

Cadmium	LD <sub>50</sub> <sup>†</sup> = 225 mg/kg	No Data	LC <sub>50</sub> <sup>‡</sup> = 11 mg/m <sup>3</sup> /4 hr (CdO fume)
<sup>†</sup> LD <sub>50</sub> , Rat, Oral, <sup>‡</sup> LC <sub>50</sub> , Rat, Inhalation, 4 hour			

**SECTION 12. ECOLOGICAL INFORMATION**

While cadmium metal is relatively insoluble, its processing or extended exposure in aquatic and terrestrial environments may lead to the release of cadmium in bioavailable forms. Compared to most other metals, cadmium is relatively mobile and toxic in the aquatic environment. Water hardness, pH and dissolved organic carbon are three major factors which regulate the degree of cadmium toxicity. In soils, higher acidity (lower pH) results in the release of cadmium ions, which may, in turn, yield higher toxicity to soil organisms and uptake of cadmium by plants.

Cadmium is strongly accumulated by all organisms through the food chain. Bioaccumulation in aquatic organisms is greatest in invertebrates, followed by fish and aquatic plants. Bioaccumulation of cadmium into terrestrial plants can result in higher cadmium concentrations in terrestrial animals that feed on the plants.

**SECTION 13. DISPOSAL CONSIDERATIONS**

If material cannot be returned to process, dispose of in accordance with applicable regulations.

**SECTION 14. TRANSPORT INFORMATION**

PROPER SHIPPING NAME ..... Not a regulated product in ingot form  
 TRANSPORT CANADA AND U.S. DOT HAZARD CLASSIFICATION .... Not Applicable  
 TRANSPORT CANADA AND U.S. DOT PIN ..... Not Applicable  
 MARINE POLLUTANT ..... No  
 IMO CLASSIFICATION ..... Not Regulated

**SECTION 15. REGULATORY INFORMATION****U.S.**

INGREDIENTS LISTED ON TSCA INVENTORY ..... Yes

HAZARDOUS UNDER HAZARD COMMUNICATION STANDARD ..... Yes

CERCLA SECTION 103 HAZARDOUS SUBSTANCES ..... Cadmium ..... Yes ..... RQ: 10lbs. (4.54 kg.)\*  
 \*reporting not required when diameter of the pieces of solid metal released is equal to or exceeds 100 micrometers (0.004 inches).

EPCRA SECTION 302 EXTREMELY HAZARDOUS SUBSTANCE ..... No

EPCRA SECTION 311/312 HAZARD CATEGORIES ..... Immediate (Acute) Health Hazard – Toxic  
 Delayed (Chronic) Health Hazard – Target Organ Effects (Kidney)  
 Delayed (Chronic) Health Hazard - Carcinogen

EPCRA SECTION 313 TOXIC RELEASE INVENTORY: ..... Cadmium  
 CAS NO. 7440-43-9 Percent by Weight: 99.97+

**SECTION 16. OTHER INFORMATION**

**Date of Original Issue:** July 23, 1997 **Version:** 01 (first edition)

**Date of Latest Revision:** April 15, 2015 **Version:** 11

The information in this Safety Data Sheet is based on the following references:

- American Conference of Governmental Industrial Hygienists, 2004, Documentation of the Threshold Limit Values and Biological Exposure Indices, Seventh Edition plus updates.
- American Conference of Governmental Industrial Hygienists, 2014, Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices.
- American Conference of Governmental Industrial Hygienists, 2014, Guide to Occupational Exposure Values.

- Australian National Industrial Chemicals Notification & Assessment Scheme (NICNAS) - Human Health Tier II Assessment for Cadmium.
- Bretherick's Handbook of Reactive Chemical Hazards, 20th Anniversary Edition (P. G. Urben Ed.) 1995.
- Canadian Centre for Occupational Health and Safety, Hamilton, ON, CHEMINFO Record No. 3454 Cadmium.
- Chemical Hazards of the Workplace, Nick H. Proctor and James P. Hughes, J. B. Lippincott Company, Philadelphia, 1978.
- European Chemical Agency (ECHA) - Registered Substances Database - Cadmium (last accessed 3 February 2015).
- European Economic Community, Commission Directives 91/155/EEC and 67/548/EEC.
- Health Council of the Netherlands, Cadmium and its compounds - evaluation of the effects on reproduction Report No. 2000-04OSH (3 mei 2000).
- Industry Canada, SOR/2015-17, Hazardous Products Regulations.
- International Agency for Research on Cancer (IARC), Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Man, 1972 – present, (multi-volume work), World Health Organization, Geneva.
- International Chemical Safety Cards (WHO/IPCS/ILO), ICSC:0020 – Cadmium (April 2005).
- International Labour Office (WHO/ILO) Encyclopedia of Occupational Health & Safety 4th Ed. CD-ROM Version (1998).
- Merck & Co., Inc., 2001, The Merck Index, An Encyclopedia of Chemicals, Drugs, and Biologicals, Thirteenth Edition.
- National Library of Medicine, National Toxicology Information Program, Hazardous Substance Data Bank. (On line version).
- Oak Ridge National Laboratory, Health Sciences Research Division, Toxicity Summary for Cadmium. - November 1991.
- Patty's Toxicology, 5th Edition, (E Bingham, B Cohrssen & C H Powell, Ed.) 2001.
- Scientific Basis for Swedish Occupational Standards XXIV - Cadmium (February 5, 2003).
- U.S. Dept. of Health and Human Services, National Institute for Occupational Safety and Health, Registry of Toxic Effects of Chemical Substances (RTECS) (On line version).
- U. S. Dept. of Health and Human Services, National Institute of Environmental Health Sciences, National Toxicology Program (NTP), 12th Report on Carcinogens, June 2011.
- U.S. Dept. of Health and Human Services, Public Health Service, Agency for Toxic Substances and Disease Registry, Toxicological Profile for Cadmium (September 2012).
- U.S. Occupational Safety and Health Administration, 1989, Code of Federal Regulations, Title 29, Part 1910.127.

#### **Notice to Reader**

Although reasonable precautions have been taken in the preparation of the data contained herein, it is offered solely for your information, consideration and investigation. Teck Metals Ltd. extends no warranty and assumes no responsibility for the accuracy of the content and expressly disclaims all liability for reliance thereon. This safety data sheet provides guidelines for the safe handling and processing of this product; it does not and cannot advise on all possible situations. Therefore, your specific use of this product should be evaluated to determine if additional precautions are required. Individuals exposed to this product should read and understand this information and be provided pertinent training prior to working with this product.

# MATERIAL SAFETY DATA SHEET

**ERA** A Waters Company

## SECTION 1: PRODUCT AND COMPANY IDENTIFICATION


**MANUFACTURER:** ERA (Environmental Resource Associates) **BUSINESS PHONE:** 303-431-8454  
**ADDRESS:** 6000 W. 54<sup>th</sup> Avenue **FAX:** 303-421-0159 **EMAIL:** info@eraqc.com  
Arvada, CO, 80002 U.S.A. **CHEMICAL EMERGENCY PHONE:** 352-535-5053 (INFOTRAC)

**Product Name(s):** Hexavalent Chromium 1000 mg/L  
**Catalog / Part Number(s):** 019, 973, 186004178  
**MSDS Creation Date:** November 22, 2005  
**Revision Date:** September 29, 2009 **MSDS Reference Number:** 019

## SECTION 2: HAZARDS IDENTIFICATION

Toxic. Harmful by inhalation. May cause cancer. Risk of cancer depends on duration and level of exposure. The matrix of each standard is a K<sub>2</sub>Cr<sub>2</sub>O<sub>7</sub>/water mixture listed below which is classified as dangerous by Directive 199/45/EC. Use only as directed and in accordance with good laboratory practices.

## SECTION 3: COMPOSITION/INFORMATION ON INGREDIENTS

CHEMICAL INGREDIENT NAME	CAS NUMBER	EC NUMBER	% BY WT.	EXPOSURE LIMITS		EU LABEL
				OSHA	ACGIH	HAZARD LABEL
Potassium dichromate	7778-50-9	231-906-6	≤0.1	0.1 mg/m <sup>3</sup> PEL	0.05 mg/m <sup>3</sup>	

Notes: This standard is 125 mL of a mixture containing potassium dichromate salt with the balance being ≥99.9% water. Hexavalent chromium is a known human carcinogen. Exposure Limits are 8-Hour TWA (Time Weighted Average) unless designated C (Ceiling) or STEL (Short Term Exposure Limit). Other components considered Non-Hazardous under OSHA 1910.1200 (HazCom) as they are not present in concentrations exceeding 1% (or 0.1% if considered a known or potential carcinogen). Material Use: Analytical reagent or certified reference material used in laboratories. Uses also include research and development.

## SECTION 4: FIRST-AID MEASURES

**Inhalation:** Remove to fresh air.  
**Skin Contact:** Flush with water.  
**Eye Contact:** Immediately flush with water for a minimum of 15 minutes.  
**Ingestion:** Get medical attention  
After following first aid measures, seek medical attention.

## SECTION 5: FIRE-FIGHTING MEASURES

**Flammable Properties:** Not flammable.  
**Extinguishing Media:** Dry chemical, carbon dioxide or appropriate foam.  
**Unique Aspects Contributing To a Fire:** None.  
**Special Fire Fighting Procedures:** None.  
Note: As in any fire, wear self-contained breathing apparatus, and full protective gear.

## SECTION 6: ACCIDENTAL RELEASE MEASURES

Absorb liquid with spill pillow or other absorbent. Ventilate and wash spill site after material pick up is complete. Place wastes into closed containers for proper disposal.

## SECTION 7: HANDLING AND STORAGE

Handle in accordance with good laboratory practices. Store in a dry well-ventilated place. This product is intended for use only by people trained in the safety and handling of chemicals and laboratory preparations.

## SECTION 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

Handle in accordance with good laboratory practices. Wash thoroughly after handling.  
**Respiratory Protection:** Not normally needed. If exposure limits are exceeded, use approved respirator.  
**Eye Protection:** Safety glasses with side shields or safety goggles  
**Skin Protection:** Neoprene or other chemical resistant gloves.  
**Engineering Controls:** Not normally needed. If exposure limits are exceeded, work in a fume hood.

# MATERIAL SAFETY DATA SHEET

**ERA** A Waters Company

## SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

---

### DATA FOR MATRIX:

Appearance:	Clear to yellow	Specific Gravity:	NA	Melting Point:	NA
Physical State:	Liquid	Flash Point:	NA	Vapor Pressure:	NA
Odor:	NA	Explosion Limits:	NA	Vapor Density (air=1):	NA
pH:	NA	Boiling Point:	NA	Solubility in Water:	Soluble

## SECTION 10: STABILITY AND REACTIVITY

---

Hazardous Polymerization Will Not Occur  May Occur  Stability: Stable  Unstable   
Hazardous Decomposition/Combustion Products: NA  
Conditions and Materials to Avoid: Oxidizing agents.

## SECTION 11: TOXICOLOGICAL INFORMATION

---

Primary Route(s) of Exposure Under Normal Use: Skin contact: may cause skin irritation or be harmful if absorbed through skin. Eye contact: may cause eye irritation. Inhalation: harmful if inhaled, may be irritation to mucous membranes and upper respiratory tract. Ingestion: harmful if swallowed.

Target Organ(s): Lungs, kidneys, blood.

Acute Effects: Harmful by inhalation. May cause sensitization by inhalation and skin contact. Ingestion can cause vomiting.  
Potassium dichromate: Oral, child: LDLO=26 mg/kg; Oral, man: LDLO=143 mg/kg; Oral, rat:LD50=25 mg/kg; Skin, rabbit:LD50=14 mg/kg.

Chronic Effects: Carcinogen; Teratogen; May cause heritable genetic damage. Reproductive hazard; May impair fertility. May cause harm to the unborn child.

Other Information: Chemical Ingredient(s) potassium dichromate is classified as carcinogen(s) by OSHA, IARC (Group 1), NTP, ACGIH (A1), or California. California Prop-65: This product is or contains chemicals known to the state of California to cause cancer.

## SECTION 12: ECOLOGICAL INFORMATION

---

Harmful to aquatic organisms, may cause long-term adverse effects in the aquatic environment. Avoid release into the environment.

## SECTION 13: DISPOSAL CONSIDERATIONS

---

To determine proper disposal, consult applicable federal, state and local environmental control regulations.

## SECTION 14: TRANSPORT INFORMATION

---

Shipment Name/Type: Non-hazardous for transport.  
UN Number: NA Shipping/Hazardous Class: NA Packing Group: NA  
Shipping regulations are based on combinations of criteria such as quantity, class and packaging according to DOT, IATA and (49) CFR.

## SECTION 15: REGULATORY INFORMATION

---

EU Symbol of Danger: Toxic (T) concentration  $\leq 0.1$  C  $< 0.2\%$   
EU Risk Phrases: May cause cancer [R45]; May cause heritable genetic damage [R46]; Harmful by inhalation [R20].

U.S. TSCA: Listed  
Canada: This product has been classified according to the hazard criteria of the CPR and this MSDS contains all the information required by the CPR.

## SECTION 16: OTHER INFORMATION

---

United States EPA Regulatory Information:	NFPA Rating:	Health: 3	Flammability: 0	Reactivity: 0
SARA 313: Yes (0.1% deminimis)	HMIS Rating:	Health: 3	Flammability: 0	Physical Hazard: 0
CERCLA RQ: 10 lbs				

NOTE: NA = Data not available, not established, determined or not pertinent.

DISCLAIMER: The information contained herein has been compiled from data presented in various technical sources believed to be accurate. This information is intended to be used only as a guide and does not purport to be complete. ERA makes no warranties and assumes no liability in connection with the use of this information. It is the user's responsibility to determine the suitability of this information and to assure the adoption of necessary precautions.



# Fisher Scientific

Part of Thermo Fisher Scientific

## SAFETY DATA SHEET

Creation Date 18-Oct-2010

Revision Date 16-Apr-2015

Revision Number 2

### 1. Identification

**Product Name** Cobalt, powder  
**Cat No. :** C363-100  
**Synonyms** Color Index No. 77320.  
**Recommended Use** Laboratory chemicals.  
**Uses advised against** No Information available  
**Details of the supplier of the safety data sheet**

**Company**

Fisher Scientific  
One Reagent Lane  
Fair Lawn, NJ 07410  
Tel: (201) 796-7100

**Emergency Telephone Number**

CHEMTREC®, Inside the USA: 800-424-9300  
CHEMTREC®, Outside the USA: 001-703-527-3887

### 2. Hazard(s) identification

**Classification**

This chemical is considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

Flammable solids	Category 2
Acute oral toxicity	Category 4
Acute Inhalation Toxicity - Dusts and Mists	Category 1
Serious Eye Damage/Eye Irritation	Category 2
Respiratory Sensitization	Category 1
Skin Sensitization	Category 1
Carcinogenicity	Category 1B
Reproductive Toxicity	Category 1A
Specific target organ toxicity (single exposure)	Category 3
Target Organs - Respiratory system, Central nervous system (CNS).	
Specific target organ toxicity - (repeated exposure)	Category 2
Target Organs - Liver, Kidney.	
Combustible dust	Yes

**Label Elements**

**Signal Word**

Danger

**Hazard Statements**

Flammable solid May form combustible dust concentrations in air  
Harmful if swallowed

May cause an allergic skin reaction  
Causes serious eye irritation  
Fatal if inhaled  
May cause allergy or asthma symptoms or breathing difficulties if inhaled  
May cause respiratory irritation  
May cause drowsiness or dizziness  
May cause cancer by inhalation  
May damage fertility or the unborn child  
May cause damage to organs through prolonged or repeated exposure



### Precautionary Statements

#### Prevention

Obtain special instructions before use  
Do not handle until all safety precautions have been read and understood  
Use personal protective equipment as required  
Wash face, hands and any exposed skin thoroughly after handling  
Do not eat, drink or smoke when using this product  
Do not breathe dust/fume/gas/mist/vapors/spray  
Use only outdoors or in a well-ventilated area  
Wear respiratory protection  
In case of inadequate ventilation wear respiratory protection  
Contaminated work clothing should not be allowed out of the workplace  
Keep away from heat/sparks/open flames/hot surfaces. - No smoking  
Ground/bond container and receiving equipment  
Use explosion-proof electrical/ventilating/lighting/equipment  
Wear protective gloves/protective clothing/eye protection/face protection

#### Response

IF exposed or concerned: Get medical attention/advice

#### Inhalation

IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing  
Immediately call a POISON CENTER or doctor/physician

#### Skin

IF ON SKIN: Wash with plenty of soap and water  
If skin irritation or rash occurs: Get medical advice/attention  
Wash contaminated clothing before reuse

#### Eyes

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing  
If eye irritation persists: Get medical advice/attention

#### Ingestion

IF SWALLOWED: Call a POISON CENTER or doctor/physician if you feel unwell  
Rinse mouth

#### Fire

In case of fire: Use CO<sub>2</sub>, dry chemical, or foam for extinction

#### Storage

Store locked up  
Store in a well-ventilated place. Keep container tightly closed

#### Disposal

Dispose of contents/container to an approved waste disposal plant

#### Hazards not otherwise classified (HNOC)

Very toxic to aquatic life with long lasting effects  
May form combustible dust concentrations in air

### 3. Composition / information on ingredients

Component	CAS-No	Weight %
Cobalt, powder	7440-48-4	>95

### 4. First-aid measures

<b>General Advice</b>	Show this safety data sheet to the doctor in attendance. Immediate medical attention is required.
<b>Eye Contact</b>	Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. In the case of contact with eyes, rinse immediately with plenty of water and seek medical advice.
<b>Skin Contact</b>	Wash off immediately with plenty of water for at least 15 minutes. Immediate medical attention is required.
<b>Inhalation</b>	Move to fresh air. If breathing is difficult, give oxygen. Do not use mouth-to-mouth resuscitation if victim ingested or inhaled the substance; induce artificial respiration with a respiratory medical device. Immediate medical attention is required.
<b>Ingestion</b>	Do not induce vomiting. Call a physician or Poison Control Center immediately.
<b>Most important symptoms/effects</b>	May cause allergy or asthma symptoms or breathing difficulties if inhaled. May cause allergic skin reaction. . Symptoms of allergic reaction may include rash, itching, swelling, trouble breathing, tingling of the hands and feet, dizziness, lightheadedness, chest pain, muscle pain or flushing
<b>Notes to Physician</b>	Treat symptomatically

### 5. Fire-fighting measures

<b>Unsuitable Extinguishing Media</b>	No information available
<b>Flash Point</b>	Not applicable
<b>Method -</b>	No information available
<b>Autoignition Temperature</b>	
<b>Explosion Limits</b>	
<b>Upper</b>	No data available
<b>Lower</b>	No data available
<b>Sensitivity to Mechanical Impact</b>	No information available
<b>Sensitivity to Static Discharge</b>	No information available

#### Specific Hazards Arising from the Chemical

Flammable. Containers may explode when heated. Dust can form an explosive mixture in air. Do not allow run-off from fire fighting to enter drains or water courses.

#### Hazardous Combustion Products

Cobalt oxides.

#### Protective Equipment and Precautions for Firefighters

As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear. Thermal decomposition can lead to release of irritating gases and vapors.

#### NFPA

Health  
4

Flammability  
3

Instability  
0

Physical hazards  
N/A

### 6. Accidental release measures

<b>Personal Precautions</b>	Use personal protective equipment. Ensure adequate ventilation. Avoid dust formation.
-----------------------------	---------------------------------------------------------------------------------------

**Environmental Precautions** Evacuate personnel to safe areas. Keep people away from and upwind of spill/leak. Do not flush into surface water or sanitary sewer system. Do not allow material to contaminate ground water system. Prevent product from entering drains. Local authorities should be advised if significant spillages cannot be contained. Should not be released into the environment. See Section 12 for additional ecological information. Avoid release to the environment. Collect spillage.

**Methods for Containment and Clean Up** Avoid dust formation. Sweep up or vacuum up spillage and collect in suitable container for disposal.

## 7. Handling and storage

**Handling** Wear personal protective equipment. Do not get in eyes, on skin, or on clothing. Avoid dust formation. Use only under a chemical fume hood. Do not breathe vapors/dust. Do not ingest.

**Storage** Keep containers tightly closed in a dry, cool and well-ventilated place.

## 8. Exposure controls / personal protection

### Exposure Guidelines

Component	ACGIH TLV	OSHA PEL	NIOSH IDLH
Cobalt, powder	TWA: 0.02 mg/m <sup>3</sup>	(Vacated) TWA: 0.05 mg/m <sup>3</sup> TWA: 0.1 mg/m <sup>3</sup>	IDLH: 20 mg/m <sup>3</sup> TWA: 0.05 mg/m <sup>3</sup>

Component	Quebec	Mexico OEL (TWA)	Ontario TWAEV
Cobalt, powder	TWA: 0.02 mg/m <sup>3</sup>	TWA: 0.1 mg/m <sup>3</sup>	TWA: 0.02 mg/m <sup>3</sup>

#### Legend

ACGIH - American Conference of Governmental Industrial Hygienists

OSHA - Occupational Safety and Health Administration

NIOSH IDLH: The National Institute for Occupational Safety and Health Immediately Dangerous to Life or Health

**Engineering Measures** Ensure that eyewash stations and safety showers are close to the workstation location. Ensure adequate ventilation, especially in confined areas. Use explosion-proof electrical/ventilating/lighting/equipment.

### Personal Protective Equipment

**Eye/face Protection** Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166. Tightly fitting safety goggles.

**Skin and body protection** Long sleeved clothing.

**Respiratory Protection** Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.

**Hygiene Measures** Handle in accordance with good industrial hygiene and safety practice.

## 9. Physical and chemical properties

<b>Physical State</b>	Solid
<b>Appearance</b>	Grey
<b>Odor</b>	Odorless
<b>Odor Threshold</b>	No information available
<b>pH</b>	No information available
<b>Melting Point/Range</b>	1495 °C / 2723 °F
<b>Boiling Point/Range</b>	2870 °C / 5198 °F @ 760 mmHg

Flash Point	Not applicable
Evaporation Rate	Not applicable
Flammability (solid,gas)	No information available
Flammability or explosive limits	
Upper	No data available
Lower	No data available
Vapor Pressure	No information available
Vapor Density	Not applicable
Relative Density	No information available
Solubility	Insoluble in water
Partition coefficient; n-octanol/water	No data available
Autoignition Temperature	
Decomposition Temperature	No information available
Viscosity	Not applicable
Molecular Formula	Co
Molecular Weight	58.93

## 10. Stability and reactivity

Reactive Hazard	Yes
Stability	Stable under normal conditions.
Conditions to Avoid	Incompatible products. Excess heat.
Incompatible Materials	Strong oxidizing agents, Strong acids
Hazardous Decomposition Products	Cobalt oxides
Hazardous Polymerization	Hazardous polymerization does not occur.
Hazardous Reactions	None under normal processing.

## 11. Toxicological information

### Acute Toxicity

#### Product Information

#### Component Information

Component	LD50 Oral	LD50 Dermal	LC50 Inhalation
Cobalt, powder	6170 mg/kg ( Rat )	Not listed	10 mg/L ( Rat ) 1 h

**Toxicologically Synergistic** No information available

#### Products

#### Delayed and immediate effects as well as chronic effects from short and long-term exposure

Irritation	No information available
Sensitization	No information available

**Carcinogenicity** Cobalt has not been shown to be carcinogenic to humans. The National Toxicology Program (NTP) does not recognize cobalt as an animal or human carcinogen. This product is a cobalt containing compound. The International Agency for Research on Cancer (IARC) classifies cobalt as "possibly carcinogenic" to human (IARC 2B) based on animal studies. Refer to IARC website ([www.iarc.fr](http://www.iarc.fr)) for most recent information. ACGIH (American Conference of Governmental Industrial Hygienist) has given Cobalt and Cobalt Inorganic Compounds a rating of A3, animal carcinogen. ACGIH states that available epidemiologic studies do not confirm an increased risk of cancer in exposed humans. The table below indicates whether each agency has listed any ingredient as a carcinogen.

Component	CAS-No	IARC	NTP	ACGIH	OSHA	Mexico
Cobalt, powder	7440-48-4	Group 2B	Not listed	A3	X	A3

IARC: (International Agency for Research on Cancer)

ACGIH: (American Conference of Governmental Industrial Hygienists)

Mexico - Occupational Exposure Limits - Carcinogens

IARC: (International Agency for Research on Cancer)

Group 1 - Carcinogenic to Humans

Group 2A - Probably Carcinogenic to Humans

Group 2B - Possibly Carcinogenic to Humans

A1 - Known Human Carcinogen

A2 - Suspected Human Carcinogen

A3 - Animal Carcinogen

ACGIH: (American Conference of Governmental Industrial Hygienists)

Mexico - Occupational Exposure Limits - Carcinogens

A1 - Confirmed Human Carcinogen

A2 - Suspected Human Carcinogen

A3 - Confirmed Animal Carcinogen

A4 - Not Classifiable as a Human Carcinogen

A5 - Not Suspected as a Human Carcinogen

<b>Mutagenic Effects</b>	In vitro tests have shown mutagenic effects
<b>Reproductive Effects</b>	No information available.
<b>Developmental Effects</b>	No information available.
<b>Teratogenicity</b>	No information available.
<b>STOT - single exposure</b>	Respiratory system Central nervous system (CNS)
<b>STOT - repeated exposure</b>	Liver Kidney
<b>Aspiration hazard</b>	No information available
<b>Symptoms / effects, both acute and delayed</b>	Symptoms of allergic reaction may include rash, itching, swelling, trouble breathing, tingling of the hands and feet, dizziness, lightheadedness, chest pain, muscle pain or flushing
<b>Endocrine Disruptor Information</b>	No information available
<b>Other Adverse Effects</b>	See actual entry in RTECS for complete information.

## 12. Ecological information

### Ecotoxicity

Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment. The product contains following substances which are hazardous for the environment. May cause long-term adverse effects in the environment. Do not allow material to contaminate ground water system.

Component	Freshwater Algae	Freshwater Fish	Microtox	Water Flea
Cobalt, powder	Not listed	100 mg/L LC50 96 h	Not listed	Not listed

**Persistence and Degradability** Insoluble in water May persist

**Bioaccumulation/ Accumulation** No information available.

**Mobility** Is not likely mobile in the environment due its low water solubility.

## 13. Disposal considerations

**Waste Disposal Methods** Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. Chemical waste generators must also consult local, regional, and national hazardous waste regulations to ensure complete and accurate classification.

## 14. Transport information

### DOT

<b>UN-No</b>	UN3089
<b>Proper Shipping Name</b>	METAL POWDERS, FLAMMABLE, N.O.S.
<b>Proper technical name</b>	(Cobalt)
<b>Hazard Class</b>	4.1
<b>Packing Group</b>	III

### TDG

<b>UN-No</b>	UN3089
--------------	--------

<b>Proper Shipping Name</b>	METAL POWDERS, FLAMMABLE, N.O.S.
<b>Hazard Class</b>	4.1
<b>Packing Group</b>	III
<b>IATA</b>	
<b>UN-No</b>	UN3089
<b>Proper Shipping Name</b>	METAL POWDER, FLAMMABLE, N.O.S.
<b>Hazard Class</b>	4.1
<b>Packing Group</b>	II
<b>IMDG/IMO</b>	
<b>UN-No</b>	UN3089
<b>Proper Shipping Name</b>	METAL POWDER, FLAMMABLE, N.O.S.
<b>Hazard Class</b>	4.1
<b>Packing Group</b>	II

## 15. Regulatory information

### International Inventories

Component	TSCA	DSL	NDSL	EINECS	ELINCS	NLP	PICCS	ENCS	AICS	IECSC	KECL
Cobalt, powder	X	X	-	231-158-0	-		X	-	X	X	X

#### Legend:

X - Listed

E - Indicates a substance that is the subject of a Section 5(e) Consent order under TSCA.

F - Indicates a substance that is the subject of a Section 5(f) Rule under TSCA.

N - Indicates a polymeric substance containing no free-radical initiator in its inventory name but is considered to cover the designated polymer made with any free-radical initiator regardless of the amount used.

P - Indicates a commenced PMN substance

R - Indicates a substance that is the subject of a Section 6 risk management rule under TSCA.

S - Indicates a substance that is identified in a proposed or final Significant New Use Rule

T - Indicates a substance that is the subject of a Section 4 test rule under TSCA.

XU - Indicates a substance exempt from reporting under the Inventory Update Rule, i.e. Partial Updating of the TSCA Inventory Data Base Production and Site Reports (40 CFR 710(B)).

Y1 - Indicates an exempt polymer that has a number-average molecular weight of 1,000 or greater.

Y2 - Indicates an exempt polymer that is a polyester and is made only from reactants included in a specified list of low concern reactants that comprises one of the eligibility criteria for the exemption rule.

### U.S. Federal Regulations

TSCA 12(b) Not applicable

### SARA 313

Component	CAS-No	Weight %	SARA 313 - Threshold Values %
Cobalt, powder	7440-48-4	>95	0.1

### SARA 311/312 Hazardous Categorization

Acute Health Hazard	Yes
Chronic Health Hazard	Yes
Fire Hazard	Yes
Sudden Release of Pressure Hazard	No
Reactive Hazard	Yes

Clean Water Act Not applicable

### Clean Air Act

Component	HAPS Data	Class 1 Ozone Depletors	Class 2 Ozone Depletors
Cobalt, powder	X		-

OSHA Occupational Safety and Health Administration  
Not applicable

### CERCLA

Not applicable

**California Proposition 65** This product contains the following Proposition 65 chemicals:

Component	CAS-No	California Prop. 65	Prop 65 NSRL	Category
Cobalt, powder	7440-48-4	Carcinogen	-	Carcinogen

**State Right-to-Know**

Component	Massachusetts	New Jersey	Pennsylvania	Illinois	Rhode Island
Cobalt, powder	X	X	X	X	X

**U.S. Department of Transportation**

Reportable Quantity (RQ): N  
 DOT Marine Pollutant N  
 DOT Severe Marine Pollutant N

**U.S. Department of Homeland Security**

This product does not contain any DHS chemicals.

**Other International Regulations**

**Mexico - Grade** No information available

**Canada**

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

**WHMIS Hazard Class** B4 Flammable solid  
 D2A Very toxic materials  
 D1A Very toxic materials



## 16. Other information

**Prepared By** Regulatory Affairs  
 Thermo Fisher Scientific  
 Email: EMSDS.RA@thermofisher.com

**Creation Date** 18-Oct-2010  
**Revision Date** 16-Apr-2015  
**Print Date** 16-Apr-2015  
**Revision Summary** This document has been updated to comply with the US OSHA HazCom 2012 Standard replacing the current legislation under 29 CFR 1910.1200 to align with the Globally Harmonized System of Classification and Labeling of Chemicals (GHS); SDS sections updated; 2; 15

**Disclaimer**

The information provided on this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guide for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered as a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other material or in any process, unless specified in the text.

**End of SDS**

## COPPER METAL SAFETY DATA SHEET

### SECTION 1. IDENTIFICATION

**Product Identity:** Copper Metal.

**Trade Names and Synonyms:** Cu-CATH-1; Copper Cathode (Higher Purity Grade).

**Manufacturer:**

Teck Advanced Materials Inc.  
13670 Danielson Street  
Suite H & I  
Poway, CA 92064  
Emergency Telephone: 858-391-2935

**Supplier:**

Teck Advanced Materials Inc.  
13670 Danielson Street  
Suite H & I  
Poway, CA 92064

**Preparer:**

Teck Metals Ltd.  
Suite 3300 – 550 Burrard Street  
Vancouver, British Columbia  
V6C 0B3

**Date of Last Review:** June 19, 2015.

**Date of Last Edit:** June 19, 2015.

**Product Use:** Copper is used in the manufacture of bronzes, brass, other copper alloys, and electrical conductors.

### SECTION 2. HAZARDS IDENTIFICATION

**CLASSIFICATION:**

*NOTE: In the form in which it is sold, this product is not regulated as a Hazardous Product in the U.S. or Canada. This Safety Data Sheet is provided for information purposes only.*

Health	Physical	Environmental
Acute Toxicity (Oral, Inhalation) – Does not meet criteria	Does not meet criteria for any Physical Hazard	Aquatic Toxicity – (Short Term/Long Term) Does not meet any criteria
Skin Corrosion/Irritation – Does not meet criteria		
Eye Damage/Eye Irritation – Does not meet criteria		
Respiratory or Skin Sensitization – Does not meet criteria		
Mutagenicity – Does not meet criteria		
Carcinogenicity – Does not meet criteria		
Reproductive Toxicity – Does not meet criteria		
Specific Target Organ Toxicity:		
Acute Exposure – Does not meet criteria		
Chronic Exposure – Does not meet criteria		

**LABEL:**

<b>Symbols:</b> None required	<b>Signal Word:</b> None required
<b><u>Hazard Statements</u></b>	<b><u>Precautionary Statements:</u></b>
None required	None required

**Emergency Overview:** Reddish metal that does not burn in bulk. Copper dust clouds will not explode readily, if at all, in air. Due to its high melting point, molten copper metal is unlikely to occur in most fire situations. This metal is relatively non-toxic and poses little immediate hazard to personnel or the environment in an emergency situation.

**Potential Health Effects:** Inhalation of dust may result in irritation of the nasal mucous membranes. Inhalation of copper oxide fumes may cause irritation of the upper respiratory tract and may result in a form of metal fume fever, characterized by flu-like symptoms such as chills, fever, nausea, and vomiting. Ingestion of copper metal may cause metallic taste and gastrointestinal irritation. Copper particles embedded in the eye may cause redness, pain and discoloration of ocular tissue. Direct skin contact may result in irritation in some workers. Discoloration of the skin has been observed from handling copper, but does not indicate an actual injury. Copper is not listed as a carcinogen by OSHA, the NTP, the ACGIH, IARC, or the EU (see Toxicological Information, Section 11).

**Potential Environmental Effects:** Copper is relatively insoluble in water and, therefore, likely has low bioavailability. However, long-term exposure in aquatic and terrestrial environments or processing of the product can lead to the release of the constituent copper in more bioavailable forms. These bioavailable forms have the potential to yield toxic effects on aquatic organisms (see Ecological Information, Section 12).

### SECTION 3. COMPOSITION / INFORMATION ON INGREDIENTS

COMPONENT	CAS Registry No.	CONCENTRATION (% wgt/wgt)
Copper	7440-50-8	>99.9%

Note: See Section 8 for Occupational Exposure Guidelines.

### SECTION 4. FIRST AID MEASURES

**Eye Contact:** *Symptoms: Mild eye irritation, redness.* Do not allow victim to rub eye(s). Let the eye(s) water naturally for a few minutes. If particle/dust does not dislodge, flush with lukewarm, gently flowing water for five minutes or until particle/dust is removed, while holding eyelid(s) open. If irritation persists, immediately obtain medical attention. DO NOT attempt to manually remove anything stuck to the eye, but rather seek immediate medical attention in this case.

**Skin Contact:** *Symptoms: Soiling of skin.* Dust: No health effects expected. If irritation does occur, flush with lukewarm, gently flowing water and mild soap for five minutes or until the product is removed. If skin irritation persists or if you feel unwell, obtain medical advice. Molten Metal: Flush contact area to solidify and cool but do not attempt to remove encrusted material or clothing. Cover burns and seek medical attention immediately.

**Inhalation:** *Symptoms: Coughing and irritation in heavy dust/fume clouds.* If symptoms are experienced, remove source of contamination or move victim from exposure area to fresh air. Get medical advice/attention if you feel unwell or are concerned. NOTE: Metal fume fever may develop 3-10 hours after exposure to copper fume. If symptoms of metal fume fever (flu-like symptoms) develop, obtain medical attention.

**Ingestion:** *Symptoms: Metallic taste, stomach upset.* Rinse mouth. If irritation or discomfort occurs, obtain medical advice.

### SECTION 5. FIRE FIGHTING MEASURES

**Fire and Explosion Hazards:** Massive metal is not considered a fire or explosion hazard. Finely-divided copper metal dust or powder has also been demonstrated to be non-flammable in laboratory testing. Explosions may occur however upon contact with certain incompatible materials (see Stability and Reactivity, Section 10).

**Extinguishing Media:** Use any means of extinction appropriate for the surrounding fire conditions such as water spray, carbon dioxide, dry chemical, or foam.

**Fire Fighting:** If possible, move solid materials from fire area. Cool any materials that are exposed to heat or flames by the application of water streams until well after the fire has been extinguished. Copper metal has a high melting point, and is unlikely to melt except in the most extreme fire conditions. If molten metal is present, do not use direct water streams on fires, due to the risk of a steam explosion that could potentially eject molten metal uncontrollably. Use a fine water mist on the front-running edge of the spill and on the top of the molten metal to cool and solidify it. Fire fighters must be fully trained and wear full protective clothing including an approved, self-contained breathing apparatus which supplies a positive air pressure within a full face piece mask.

### SECTION 6. ACCIDENTAL RELEASE MEASURES

**Procedures for Cleanup:** Control source of spillage if possible to do so safely. Clean up spilled material immediately, observing precautions in Section 8, Personal Protection. Molten metal should be allowed to cool and harden before cleanup. Once solidified wear gloves, pick up and return to process. Powder or dust should be cleaned up using methods which will minimize dust generation (e.g., vacuum solids, dampen material and shovel or wet sweep). Return uncontaminated spilled material to the process if possible. Place contaminated material in suitable labelled containers for later recovery in view of the commercial value of copper. Treat or dispose of waste material in accordance with all local, state/provincial, and national requirements.

**Personal Precautions:** Persons responding to an accidental release should wear protective clothing, gloves and a respirator in the event of a molten metal spill (see also Section 8). Close-fitting safety goggles may be necessary in some circumstances to prevent eye contact with dust and fume. Where molten metal is involved, wear heat-resistant gloves and suitable clothing for protection from hot-metal splash and radiant heat.

**Environmental Precautions:** Copper compounds, while not readily bioavailable in the environment, have the potential to pose ecological effects to aquatic life forms under certain chemical conditions. Releases of the product to water and soil should, therefore, be prevented.

## SECTION 7. HANDLING AND STORAGE

Store copper in a dry, covered area. Copper cathodes suspected of containing moisture should be THOROUGHLY DRIED before being added to a molten bath. Cathodes may contain cavities that collect moisture. Entrained moisture will expand explosively when immersed in a molten bath and potentially spatter molten metal out of the bath.

## SECTION 8. EXPOSURE CONTROLS / PERSONAL PROTECTION

### Occupational Exposure Guidelines:

<b>Component</b>	<b>ACGIH TLV</b>	<b>OSHA PEL</b>	<b>NIOSH REL</b>
Copper (Dust)	1 mg Cu/m <sup>3</sup>	1 mg Cu/m <sup>3</sup>	1 mg Cu/m <sup>3</sup>
Copper (Fume)	0.2 mg Cu/m <sup>3</sup>	0.1 mg Cu/m <sup>3</sup>	0.1 mg Cu/m <sup>3</sup>

NOTE: OEGs for individual jurisdictions may differ from those given above. Check with local authorities for the applicable OEGs in your jurisdiction.

ACGIH - American Conference of Governmental Industrial Hygienists; OSHA - Occupational Safety and Health Administration; NIOSH - National Institute for Occupational Safety and Health. TLV – Threshold Limit Value, PEL – Permissible Exposure Limit, REL – Recommended Exposure Limit.

*NOTE: The selection of the necessary level of engineering controls and personal protective equipment will vary depending upon the conditions of use and the potential for exposure. The following are therefore only general guidelines that may not fit all circumstances. Control measures to consider include:*

**Ventilation:** Use adequate local or general ventilation to maintain the concentration of copper (as either dust or fumes) in the working environment well below recommended occupational exposure limits. Supply sufficient replacement air to make up for air removed by the exhaust system.

**Protective Clothing:** Gloves and coveralls or other work clothing are recommended to prevent prolonged or repeated direct skin contact when copper is processed. Appropriate eye protection should be worn where fume or dust is generated. Where hot or molten metal is handled, heat resistant gloves, goggles or face shield, and clothing to protect from hot metal splash and radiant heat should be worn. Safety type boots are recommended.

**Respirators:** Where copper dust or fumes are generated and cannot be controlled to within acceptable levels by engineering means, use appropriate NIOSH-approved respiratory protection equipment (a 42CFR84 Class N, R or P-95 particulate filter cartridge as a minimum).

**General Hygiene Considerations:** Always practice good personal hygiene. Refrain from eating, drinking, or smoking in work areas. Thoroughly wash hands before eating, drinking, or smoking in appropriate, designated areas.

## SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

<b>Appearance:</b> Reddish metal	<b>Odour:</b> None	<b>Odour Threshold:</b> Not Applicable	<b>pH:</b> Not Applicable
<b>Vapour Pressure:</b> 1 mm Hg at 1083°C Negligible @ 20°C	<b>Vapour Density:</b> Not Applicable	<b>Melting Point/Range:</b> 1083°C	<b>Boiling Point/Range:</b> 2595°C
<b>Relative Density (Water = 1):</b> 8.94	<b>Evaporation Rate:</b> Not Applicable	<b>Coefficient of Water/Oil Distribution:</b> Not Applicable	<b>Solubility:</b> Insoluble in water
<b>Flash Point:</b> None	<b>Flammable Limits (LEL/UEL):</b> Not Flammable	<b>Auto-ignition Temperature:</b> None	<b>Decomposition Temperature:</b> None

## SECTION 10. STABILITY AND REACTIVITY

**Stability & Reactivity:** Copper is stable and not considered reactive under normal temperatures and pressures. Hazardous polymerization or runaway reactions will not occur.

**Incompatibilities:** Copper is incompatible with nitric acid, acetylene, chlorine, fluorine, chlorine trifluoride, and peroxides. Shock-sensitive compounds are formed with acetylenic compounds, ethylene oxide or azide compounds. Copper in finely-divided powder or granular form reacts with strong oxidants like chlorates, bromates, iodates and ammonium nitrate causing a potential explosion hazard.

**Hazardous Decomposition Products:** High temperature operations such as oxy-acetylene cutting, electric arc welding, arc-air gouging or overheating a molten metal bath may generate copper fumes. These fumes will contain copper oxides, which, on inhalation in sufficient quantity, can produce metal fume fever.

## SECTION 11. TOXICOLOGICAL INFORMATION

**General:** Copper is an essential element, but can become toxic when inhaled or ingested in large doses. Most reports of acute toxicity are from suicidal attempts involving ingestion of copper sulphate. Individuals with a rare disorder called "Wilson's Disease" (estimated prevalence 0.003% of the population) are predisposed to accumulate copper and should not be occupationally exposed. However, in the form in which this product is sold it is relatively non-toxic. The major route of exposure would be through the generation and inhalation of copper oxide fume.

### Acute:

**Skin:** Copper metal is not irritating to skin other than by direct abrasive action of metal particles on skin tissue.

**Eye:** Contact with dust or fume may cause local irritation. Embedded copper particles in the eye result in a brownish or green-brown discoloration of the cornea, lens and iris (chalcosis) which may progress to serious ocular complications.

**Inhalation:** Copper dust may be irritating to the nasal passages and the throat with a sweetish, metallic taste and excessive salivation. An intense, short-term exposure to copper fumes from cutting or welding, etc. could result in the condition called metal fume fever. The symptoms of metal fume fever generally occur within 3 to 10 hours. They may include immediate dryness and irritation of the throat, metallic taste, tightness of the chest, and coughing that may later be followed by flu-like symptoms of fever, malaise, perspiration, frontal headache, muscle cramps, low back pain, occasionally blurred vision, nausea, and vomiting. Those experiencing a single acute episode of metal fume fever generally recover slowly but without apparent residual effects.

**Ingestion:** Ingestion of copper metal may cause metallic taste and gastrointestinal irritation. Individuals reported to have ingested large quantities of copper salts have reported gastrointestinal effects including vomiting, diarrhea, nausea, malaise, anorexia, abdominal pain and a metallic taste in the mouth. Effects on the kidneys and liver, and even death have also been reported in severe cases of copper poisoning from ingesting soluble copper salts. However, copper is a strong emetic and spontaneous vomiting following ingestion usually limits uptake of copper.

**Chronic:** Prolonged exposure to copper dust or fume can cause irritation to the eye and skin. A green discoloration of the skin has been reported similar to that sometimes experienced from copper jewelry. This green discoloration may occasionally also be seen in hair (particularly notable in blonde hair), nails and teeth. A few instances of allergic contact dermatitis have been reported. Copper is not listed as a human carcinogen by the Occupational Safety and Health Administration (OSHA), the National Toxicology Program (NTP), the International Agency for Research on Cancer (IARC), the American Conference of Governmental Industrial Hygienists (ACGIH) or the European Union (EU).

### Animal Toxicity:

<u>Hazardous Ingredient:</u>	<u>Acute Oral Toxicity:</u>	<u>Acute Dermal Toxicity:</u>	<u>Acute Inhalation Toxicity:</u>
Copper † LD <sub>50</sub> , Mouse, Oral,	>5,000 mg/kg <sup>†</sup> ‡ LC <sub>50</sub> , Rat, Inhalation, 4 hour	>2,000 mg/kg* * LD <sub>50</sub> , Mouse, Dermal	>5.11 mg/L <sup>‡</sup>

## SECTION 12. ECOLOGICAL INFORMATION

Copper metal is relatively insoluble in water and, therefore, generally has low bioavailability. However, long-term exposure in aquatic and terrestrial environments or processing of the product can lead to the release of the constituent copper in more bioavailable forms. These more bioavailable forms have the potential to yield toxic effects under specific chemical conditions (e.g., low pH). The mobility of the copper compounds in soluble forms is also media-dependent. They can bind with inorganic and organic ligands, reducing their mobility and bioavailability in both soil and water. Bioavailability is also regulated by other factors in the aquatic environment, such as hardness and dissolved organic carbon content.

## SECTION 13. DISPOSAL CONSIDERATIONS

If material cannot be returned to process or salvage, dispose of in accordance with applicable regulations.

## SECTION 14. TRANSPORT INFORMATION

No special shipping or transportation requirements in ingot form.

## SECTION 15. REGULATORY INFORMATION

### U.S.

INGREDIENTS LISTED ON TSCA INVENTORY..... Yes

HAZARDOUS UNDER HAZARD COMMUNICATION STANDARD..... No (CFR 1910.1200, revised March 26, 2012)

CERCLA SECTION 103 HAZARDOUS SUBSTANCES ..... Yes .....RQ: 5,000 lbs. (2270 kg.)\*  
\*reporting not required when diameter of the pieces of solid metal released is equal to or exceeds 100 micrometers (0.004 inches).

EPCRA SECTION 302 EXTREMELY HAZARDOUS SUBSTANCE ..... No

EPCRA SECTION 311/312 HAZARD CATEGORIES ..... No Hazard Categories Apply

EPCRA SECTION 313 TOXIC RELEASE INVENTORY:..... Copper.....CAS No. 7440-50-8  
Percent by Weight - At least 99%

## SECTION 16. OTHER INFORMATION

**Date of Original Issue:** January 12, 2007 **Version:** 01 (*First edition*)

**Date of Latest Revision:** June 19, 2015 **Version:** 05

The information in this Safety Data Sheet is based on the following references:

- American Conference of Governmental Industrial Hygienists, 2004, Documentation of the Threshold Limit Values and Biological Exposure Indices, 7<sup>th</sup> Edition plus updates.
- American Conference of Governmental Industrial Hygienists, 2015, Guide to Occupational Exposure Values.
- BIA Report 13/97 – Combustion and Explosion Characteristics of Dusts – Table 2 Product Group: Metals and Alloys.
- Bretherick's Handbook of Reactive Chemical Hazards, 20<sup>th</sup> Anniversary Edition. (P. G. Urben, Ed.) 1995.
- Canadian Centre for Occupational Health and Safety CHEMINFO Record No: 2073, Copper - Last Revised 2005-03.
- Commission de la santé et la sécurité du travail, Service du répertoire toxicologique, Cuivre , 2010-07.
- Explosion Temperatures of Metals and Other Elemental Dust Clouds, Kenneth L. Cashdollar & Isaac A Zlochower, J. of Loss Control In the Process Industries, 20, (2007) 337 – 348.
- Health Canada, Hazardous Products Regulations SOR/2015-17, 30 January 2015.
- Industrial Toxicology 3<sup>rd</sup> Edition: Alice Hamilton & Harriet L Hardy, Publishing Sciences Group, Inc. (1974).
- International Chemical Safety Cards (WHO/PCBS/ILO) ICSC:0240 – Copper (Revised Sept 1993).
- International Labour Office (WHO/ILO) Encyclopedia of Occupational Health & Safety 4th Ed. CD-ROM Version (1998).
- Merck & Co., Inc., 2001, The Merck Index, An Encyclopedia of Chemicals, Drugs, and Biologicals, Thirteenth Edition.
- National Library of Medicine, Hazardous Substance Data Bank (last accessed 2010 -02-03).
- National Oceanic and Atmospheric Administration, Office of Response and Restoration, CAMEO Chemicals – Database of Hazardous Materials [<http://www.cameochemicals.noaa.gov/>] last accessed 2010-02-03.
- Patty's Toxicology, 5<sup>th</sup> Edition, (E Bingham, B Cohrssen & C H Powell, Ed.) 2001.
- The Chemistry of Industrial Toxicology: Hervey B Elkins, John Wiley & Sons, New York (1959).
- Toxicology of the Eye, 2<sup>nd</sup> Ed. W. Morton Grant, MD, Charles C. Thomas , Publishers; Springfield. IL (1974).
- University of Pittsburgh Safety Manual, EHS Policy # 02-005 – Combustible Metals – 01 Jan 2007.
- U.S. Dept of Health and Human Services, Public Health Service, Agency for Toxic Substances and Disease Registry, Toxicological Profile for Copper (Sept 2004).
- U.S. Dept of Health and Human Services, National Institute for Occupational Safety and Health, NIOSH Pocket Guide to Chemical Hazards. CD-ROM Edition September 2005.
- U.S. Dept of Health and Human Services, National Institute for Occupational Safety and Health, Registry of Toxic Effects of Chemical Substances (RTECS) CCOHS Web Access subscription.
- U.S. Occupational Safety and Health Administration, 1989, Code of Federal Regulations, Title 29, Part 1910.

### **Notice to Reader**

Although reasonable precautions have been taken in the preparation of the data contained herein, it is offered solely for your information, consideration and investigation. Teck Advanced Materials Inc. extends no warranty and assumes no responsibility for the accuracy of the content and expressly disclaims all liability for reliance thereon. This safety data sheet provides guidelines for the safe handling and processing of this product; it does not and cannot advise on all possible situations. Therefore, your specific use of this product should be evaluated to determine if additional precautions are required. Individuals exposed to this product should read and understand this information and be provided pertinent training prior to working with this product.



# Fisher Scientific

Part of Thermo Fisher Scientific

## SAFETY DATA SHEET

Creation Date 12-Nov-2009

Revision Date 10-Feb-2015

Revision Number 1

### 1. Identification

**Product Name** Iron Metal Filings, Fine

**Cat No. :** I57-500

**Synonyms** None

**Recommended Use** Laboratory chemicals.

**Uses advised against** No Information available

**Details of the supplier of the safety data sheet**

**Company**  
Fisher Scientific  
One Reagent Lane  
Fair Lawn, NJ 07410  
Tel: (201) 796-7100

**Emergency Telephone Number**  
CHEMTREC®, Inside the USA: 800-424-9300  
CHEMTREC®, Outside the USA: 001-703-527-3887

### 2. Hazard(s) identification

**Classification**

This chemical is considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

Flammable solids

Category 2

**Label Elements**

**Signal Word**

Warning

**Hazard Statements**

Flammable solid



**Precautionary Statements**

**Prevention**

Keep away from heat/sparks/open flames/hot surfaces. - No smoking  
Ground/bond container and receiving equipment

Use explosion-proof electrical/ventilating/lighting/equipment  
Wear protective gloves/protective clothing/eye protection/face protection

**Fire**

In case of fire: Use CO<sub>2</sub>, dry chemical, or foam for extinction  
Fight fire with normal precautions from a reasonable distance

**Storage**

Store locked up

**Hazards not otherwise classified (HNOC)**

None identified

### 3. Composition / information on ingredients

Component	CAS-No	Weight %
Iron	7439-89-6	>95

### 4. First-aid measures

<b>Eye Contact</b>	Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Obtain medical attention.
<b>Skin Contact</b>	Wash off immediately with plenty of water for at least 15 minutes. Get medical attention if symptoms occur.
<b>Inhalation</b>	Move to fresh air. If breathing is difficult, give oxygen. Get medical attention if symptoms occur.
<b>Ingestion</b>	Do not induce vomiting. Obtain medical attention.
<b>Most important symptoms/effects Notes to Physician</b>	No information available. Treat symptomatically

### 5. Fire-fighting measures

<b>Suitable Extinguishing Media</b>	Dry sand; approved class D extinguishers.
<b>Unsuitable Extinguishing Media</b>	Do not use halogenated extinguishing agents or foam; Water; Carbon dioxide (CO <sub>2</sub> ); Dry chemical
<b>Flash Point</b>	No information available
<b>Method -</b>	No information available
<b>Autoignition Temperature</b>	No information available
<b>Explosion Limits</b>	
<b>Upper</b>	No data available
<b>Lower</b>	No data available
<b>Sensitivity to Mechanical Impact</b>	No information available
<b>Sensitivity to Static Discharge</b>	No information available

**Specific Hazards Arising from the Chemical**

Flammable. Risk of ignition. Dust can form an explosive mixture in air. Keep product and empty container away from heat and sources of ignition.

**Hazardous Combustion Products**

Hydrogen

**Protective Equipment and Precautions for Firefighters**

As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.

**NFPA**

Health  
1Flammability  
2Instability  
1Physical hazards  
N/A

## 6. Accidental release measures

<b>Personal Precautions</b>	Use personal protective equipment. Remove all sources of ignition. Avoid dust formation. Ensure adequate ventilation. Avoid contact with skin, eyes and clothing.
<b>Environmental Precautions</b>	Avoid release to the environment. See Section 12 for additional ecological information.
<b>Methods for Containment and Clean Up</b>	Remove all sources of ignition. Sweep up or vacuum up spillage and collect in suitable container for disposal. Avoid dust formation.

## 7. Handling and storage

<b>Handling</b>	Wear personal protective equipment. Ensure adequate ventilation. Avoid dust formation. Keep away from open flames, hot surfaces and sources of ignition. Avoid contact with skin, eyes and clothing. Avoid ingestion and inhalation.
<b>Storage</b>	Keep containers tightly closed in a dry, cool and well-ventilated place. Keep away from heat and sources of ignition. Flammables area.

## 8. Exposure controls / personal protection

<b>Exposure Guidelines</b>	This product does not contain any hazardous materials with occupational exposure limits established by the region specific regulatory bodies.
<b>Engineering Measures</b>	Ensure adequate ventilation, especially in confined areas. Use explosion-proof electrical/ventilating/lighting/equipment. Ensure that eyewash stations and safety showers are close to the workstation location.
<b>Personal Protective Equipment</b>	
<b>Eye/face Protection</b>	Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.
<b>Skin and body protection</b>	Wear appropriate protective gloves and clothing to prevent skin exposure.
<b>Respiratory Protection</b>	Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.
<b>Hygiene Measures</b>	Handle in accordance with good industrial hygiene and safety practice.

## 9. Physical and chemical properties

<b>Physical State</b>	Solid
<b>Appearance</b>	Dark grey
<b>Odor</b>	Odorless
<b>Odor Threshold</b>	No information available
<b>pH</b>	No information available
<b>Melting Point/Range</b>	1535 °C / 2795 °F
<b>Boiling Point/Range</b>	3000 °C / 5432 °F
<b>Flash Point</b>	No information available
<b>Evaporation Rate</b>	negligible
<b>Flammability (solid,gas)</b>	No information available
<b>Flammability or explosive limits</b>	
<b>Upper</b>	No data available
<b>Lower</b>	No data available
<b>Vapor Pressure</b>	No information available

Vapor Density	No information available
Relative Density	No information available
Solubility	Insoluble in water
Partition coefficient; n-octanol/water	No data available
Autoignition Temperature	No information available
Decomposition Temperature	No information available
Viscosity	No information available
Molecular Formula	Fe
Molecular Weight	55.847

## 10. Stability and reactivity

<b>Reactive Hazard</b>	None known, based on information available
<b>Stability</b>	Moisture sensitive.
<b>Conditions to Avoid</b>	Avoid dust formation. Incompatible products. Heat, flames and sparks. Exposure to moist air or water.
<b>Incompatible Materials</b>	Strong oxidizing agents, Acids, Halogens, halogenated agents
<b>Hazardous Decomposition Products</b>	Hydrogen
<b>Hazardous Polymerization</b>	Hazardous polymerization does not occur.
<b>Hazardous Reactions</b>	None under normal processing.

## 11. Toxicological information

### Acute Toxicity

#### Product Information

#### Component Information

Component	LD50 Oral	LD50 Dermal	LC50 Inhalation
Iron	7500 mg/kg ( Rat )	Not listed	Not listed

**Toxicologically Synergistic Products** No information available

### Delayed and immediate effects as well as chronic effects from short and long-term exposure

<b>Irritation</b>	No information available
<b>Sensitization</b>	No information available
<b>Carcinogenicity</b>	The table below indicates whether each agency has listed any ingredient as a carcinogen.

Component	CAS-No	IARC	NTP	ACGIH	OSHA	Mexico
Iron	7439-89-6	Not listed	Not listed	Not listed	Not listed	Not listed

<b>Mutagenic Effects</b>	No information available
<b>Reproductive Effects</b>	No information available.
<b>Developmental Effects</b>	No information available.
<b>Teratogenicity</b>	No information available.
<b>STOT - single exposure</b>	None known
<b>STOT - repeated exposure</b>	None known
<b>Aspiration hazard</b>	No information available
<b>Symptoms / effects, both acute and</b>	No information available

delayed  
**Endocrine Disruptor Information** No information available

**Other Adverse Effects** The toxicological properties have not been fully investigated. See actual entry in RTECS for complete information.

## 12. Ecological information

### Ecotoxicity

This product contains the following substance(s) which are hazardous for the environment.

Component	Freshwater Algae	Freshwater Fish	Microtox	Water Flea
Iron	Not listed	13.6 mg/L LC50 96 h	Not listed	Not listed

**Persistence and Degradability** No information available

**Bioaccumulation/ Accumulation** No information available.

**Mobility** No information available.

## 13. Disposal considerations

**Waste Disposal Methods** Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. Chemical waste generators must also consult local, regional, and national hazardous waste regulations to ensure complete and accurate classification.

## 14. Transport information

### DOT

**UN-No** UN3089  
**Proper Shipping Name** METAL POWDERS, FLAMMABLE, N.O.S.  
**Hazard Class** 4.1  
**Packing Group** III

### TDG

**UN-No** UN3089  
**Proper Shipping Name** METAL POWDER, FLAMMABLE, N.O.S.  
**Hazard Class** 4.1  
**Packing Group** III

### IATA

**UN-No** UN3089  
**Proper Shipping Name** METAL POWDER, FLAMMABLE, N.O.S.  
**Hazard Class** 4.1  
**Packing Group** III

### IMDG/IMO

**UN-No** UN3089  
**Proper Shipping Name** METAL POWDER, FLAMMABLE, N.O.S.  
**Hazard Class** 4.1  
**Packing Group** III

## 15. Regulatory information

### International Inventories

Component	TSCA	DSL	NDSL	EINECS	ELINCS	NLP	PICCS	ENCS	AICS	IECSC	KECL
Iron	X	X	-	231-096-4	-		X	-	X	X	X

#### Legend:

X - Listed

E - Indicates a substance that is the subject of a Section 5(e) Consent order under TSCA.

F - Indicates a substance that is the subject of a Section 5(f) Rule under TSCA.

N - Indicates a polymeric substance containing no free-radical initiator in its inventory name but is considered to cover the designated polymer made with any free-radical initiator regardless of the amount used.

P - Indicates a commenced PMN substance

R - Indicates a substance that is the subject of a Section 6 risk management rule under TSCA.

S - Indicates a substance that is identified in a proposed or final Significant New Use Rule

T - Indicates a substance that is the subject of a Section 4 test rule under TSCA.

XU - Indicates a substance exempt from reporting under the Inventory Update Rule, i.e. Partial Updating of the TSCA Inventory Data Base Production and Site Reports (40 CFR 710(B)).

Y1 - Indicates an exempt polymer that has a number-average molecular weight of 1,000 or greater.

Y2 - Indicates an exempt polymer that is a polyester and is made only from reactants included in a specified list of low concern reactants that comprises one of the eligibility criteria for the exemption rule.

### U.S. Federal Regulations

TSCA 12(b) Not applicable

SARA 313 Not applicable

#### SARA 311/312 Hazardous Categorization

Acute Health Hazard	No
Chronic Health Hazard	No
Fire Hazard	Yes
Sudden Release of Pressure Hazard	No
Reactive Hazard	No

Clean Water Act Not applicable

Clean Air Act Not applicable

OSHA Occupational Safety and Health Administration  
Not applicable

CERCLA  
Not applicable

California Proposition 65 This product does not contain any Proposition 65 chemicals

State Right-to-Know Not applicable

### U.S. Department of Transportation

Reportable Quantity (RQ):	N
DOT Marine Pollutant	N
DOT Severe Marine Pollutant	N

U.S. Department of Homeland Security  
This product does not contain any DHS chemicals.

### Other International Regulations

Mexico - Grade No information available

#### Canada

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

WHMIS Hazard Class B4 Flammable solid



## 16. Other information

**Prepared By** Regulatory Affairs  
Thermo Fisher Scientific  
Email: EMSDS.RA@thermofisher.com

**Creation Date** 12-Nov-2009  
**Revision Date** 10-Feb-2015  
**Print Date** 10-Feb-2015  
**Revision Summary** This document has been updated to comply with the US OSHA HazCom 2012 Standard replacing the current legislation under 29 CFR 1910.1200 to align with the Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

**Disclaimer**

The information provided on this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guide for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered as a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other material or in any process, unless specified in the text.

**End of SDS**

# FLINN SCIENTIFIC, INC.

## Safety Data Sheet (SDS)

SDS #: 432.00

Revision Date: March 25, 2014

### SECTION 1 — CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

#### Lead

Flinn Scientific, Inc. P.O. Box 219, Batavia, IL 60510 (800) 452-1261

CHEMTREC Emergency Phone Number: (800) 424-9300

Signal Word **DANGER**

Pictograms



### SECTION 2 — HAZARDS IDENTIFICATION

Hazard class: Acute toxicity, oral and inhalation (Category 4). Harmful if swallowed or inhaled (H302+H332). Do not eat, drink or smoke when using this product (P270). Avoid breathing dust and fumes (P261).

Hazard class: Carcinogenicity (Category 2). Suspected of causing cancer (H351). Obtain special instructions before use (P201). Do not handle until all safety precautions have been read and understood (P202). Use personal protective equipment as required (P281). Elemental lead is a possible human carcinogen (IARC-2B).

Hazard class: Reproductive toxicity (Category 1A). May damage fertility or the unborn child (H360).

Hazard class: Specific target organ toxicity, repeated exposure (Category 2). May cause damage to organs through prolonged or repeated exposure (H373). Do not eat, drink or smoke when using this product (P270).

### SECTION 3 — COMPOSITION, INFORMATION ON INGREDIENTS

Component Name	CAS Number	Formula	Formula Weight	Concentration
Lead Forms: foil, sheets, shot, strips, and wire.	7439-92-1	Pb	207.19	

### SECTION 4 — FIRST AID MEASURES

**If exposed or concerned:** Get medical advice or attention (P308+P313).

**If inhaled:** Remove victim to fresh air and keep at rest in a position comfortable for breathing (P304+P340).

**If in eyes:** Rinse cautiously with water for several minutes. Remove contact lenses if present and easy to do so. Continue rinsing.

**If on skin:** Wash with plenty of water.

**If swallowed:** Rinse mouth. Immediately call a POISON CENTER or physician (P301+P310+P330).

### SECTION 5 — FIRE FIGHTING MEASURES

Finely divided lead dust is flammable.

Molten metal may release toxic fumes of lead.

**In case of fire:** Use a tri-class dry chemical fire extinguisher.

**NFPA CODE**  
None  
established

### SECTION 6 — ACCIDENTAL RELEASE MEASURES

Sweep up, place in sealed bag or container and dispose. Ventilate area and wash spill site after material pickup is complete. See Sections 8 and 13 for further information.

---

**SECTION 7 — HANDLING AND STORAGE**

---

Flinn Suggested Chemical Storage Pattern: Inorganic #1. Store with metals and metal hydrides.  
Use fume hood when handling powder form.

---

**SECTION 8 — EXPOSURE CONTROLS, PERSONAL PROTECTION**

---

Wear protective gloves, protective clothing, and eye protection. Wash hands thoroughly after handling. Use fume hood when handling powder form.

Exposure guidelines: PEL/TLV 0.05 mg/m<sup>3</sup> (OSHA/ACGIH)

---

**SECTION 9 — PHYSICAL AND CHEMICAL PROPERTIES**

---

Heavy, ductile, gray solid. Odorless.

Soluble: Dilute nitric acid. Insoluble in water.

Lead wire also contains 1% antimony (CAS #7440-36-0)

Boiling point: 1740 °C

Melting point: 327.4 °C

Specific gravity: 11.35

---

**SECTION 10 — STABILITY AND REACTIVITY**

---

Avoid strong acids, ammonium nitrate, hydrogen peroxide, sodium azide, zirconium, sodium acetylide, and chlorine.

Shelf life: Indefinite, if stored properly.

---

**SECTION 11 — TOXICOLOGICAL INFORMATION**

---

Acute effects: Convulsions, seizures, weakness, muscle cramps, methemoglobinemia.

Chronic effects: Anemia, reproductive hazard, possible carcinogen.

Target organs: Nerves, brain, blood, kidneys, female/male reproductive system

ORL-Pigeon LD<sub>0</sub>: 160 mg/kg

IHL-Human LCL<sub>0</sub>: 10 ug/m<sup>3</sup>

SKN-RBT LD<sub>50</sub>: N.A.

N.A. = Not available, not all health aspects of this substance have been fully investigated.

---

**SECTION 12 — ECOLOGICAL INFORMATION**

---

Accumulates in soil and water. Bioaccumulates in animals. Very toxic to aquatic life with long lasting effects

---

**SECTION 13 — DISPOSAL CONSIDERATIONS**

---

Please review all federal, state and local regulations that may apply before proceeding.

Flinn Suggested Disposal Method #27d is one option.

---

**SECTION 14 — TRANSPORT INFORMATION**

---

Shipping name: Not regulated. Hazard class: N/A. UN number: N/A.

N/A = Not applicable

---

**SECTION 15 — REGULATORY INFORMATION**

---

TSCA-listed, EINECS-listed (231-100-4), RCRA code D008.

---

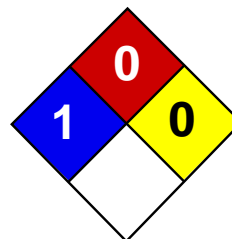
**SECTION 16 — OTHER INFORMATION**

---

This Safety Data Sheet (SDS) is for guidance and is based upon information and tests believed to be reliable. Flinn Scientific, Inc. makes no guarantee of the accuracy or completeness of the data and shall not be liable for any damages relating thereto. The data is offered solely for your consideration, investigation, and verification. The data should not be confused with local, state, federal or insurance mandates, regulations, or requirements and CONSTITUTE NO WARRANTY. Any use of this data and information must be determined by the science instructor to be in accordance with applicable local, state or federal laws and regulations. The conditions or methods of handling, storage, use and disposal of the product(s) described are beyond the control of Flinn Scientific, Inc. and may be beyond our knowledge. FOR THIS AND OTHER REASONS, WE DO NOT ASSUME RESPONSIBILITY AND EXPRESSLY DISCLAIM LIABILITY FOR LOSS, DAMAGE OR EXPENSE ARISING OUT OF OR IN ANY WAY CONNECTED WITH THE HANDLING, STORAGE, USE OR DISPOSAL OF THIS PRODUCT(S).

Consult your copy of the *Flinn Science Catalog/Reference Manual* for additional information about laboratory chemicals.

Revision Date: March 25, 2014



Health	1
Fire	0
Reactivity	0
Personal Protection	E

## Material Safety Data Sheet Manganese MSDS

### Section 1: Chemical Product and Company Identification

**Product Name:** Manganese

**Catalog Codes:** SLM2245

**CAS#:** 7439-96-5

**RTECS:** OO9275000

**TSCA:** TSCA 8(b) inventory: Manganese

**CI#:** Not available.

**Synonym:**

**Chemical Name:** Manganese

**Chemical Formula:** Mn

**Contact Information:**

**Sciencelab.com, Inc.**

14025 Smith Rd.

Houston, Texas 77396

US Sales: **1-800-901-7247**

International Sales: **1-281-441-4400**

Order Online: [ScienceLab.com](http://ScienceLab.com)

**CHEMTREC (24HR Emergency Telephone), call:**

1-800-424-9300

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

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

### Section 2: Composition and Information on Ingredients

**Composition:**

Name	CAS #	% by Weight
Manganese	7439-96-5	100

**Toxicological Data on Ingredients:** Manganese: ORAL (LD50): Acute: 9000 mg/kg [Rat].

### Section 3: Hazards Identification

**Potential Acute Health Effects:**

Hazardous in case of inhalation. Slightly hazardous in case of skin contact (irritant), of eye contact (irritant), of ingestion.

**Potential Chronic Health Effects:**

CARCINOGENIC EFFECTS: Not available. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance may be toxic to blood, lungs, brain, central nervous system (CNS). Repeated or prolonged exposure to the substance can produce target organs damage.

### Section 4: First Aid Measures

**Eye Contact:**

Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Get medical attention if irritation occurs.

**Skin Contact:** Wash with soap and water. Cover the irritated skin with an emollient. Get medical attention if irritation develops.

**Serious Skin Contact:** Not available.

**Inhalation:**

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

**Serious Inhalation:** Not available.

**Ingestion:**

Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention if symptoms appear.

**Serious Ingestion:** Not available.

## Section 5: Fire and Explosion Data

**Flammability of the Product:** Non-flammable.

**Auto-Ignition Temperature:** Not applicable.

**Flash Points:** Not applicable.

**Flammable Limits:** Not applicable.

**Products of Combustion:** Not available.

**Fire Hazards in Presence of Various Substances:** Not applicable.

**Explosion Hazards in Presence of Various Substances:**

Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

**Fire Fighting Media and Instructions:** Not applicable.

**Special Remarks on Fire Hazards:**

Moderate fire potential, in the form of dust or powder, when exposed to flame. When manganese is heated in the vapor of phosphorus at a very dull red heat, union occurs with incandescence. Concentrated nitric acid reacts with powdered manganese with incandescence and explosion. Powdered manganese ignites in chlorine.

**Special Remarks on Explosion Hazards:** Moderate explosion potential, in the form of dust or powder, when exposed to flame.

## Section 6: Accidental Release Measures

**Small Spill:**

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

**Large Spill:**

Use a shovel to put the material into a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and allow to evacuate through the sanitary system. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

## Section 7: Handling and Storage

**Precautions:**

Do not ingest. Do not breathe dust. Wear suitable protective clothing. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Keep away from incompatibles such as oxidizing agents, reducing agents.

**Storage:** Keep container tightly closed. Keep container in a cool, well-ventilated area. Do not store above

## Section 8: Exposure Controls/Personal Protection

### Engineering Controls:

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

**Personal Protection:** Safety glasses. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

### Personal Protection in Case of a Large Spill:

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

### Exposure Limits:

TWA: 0.1 (mg/m<sup>3</sup>) from ACGIH (TLV) [United States] TWA: 5 (mg/m<sup>3</sup>) [Canada] TWA: 1 STEL: 3 (mg/m<sup>3</sup>) from NIOSH [United States] TWA: 5 (mg/m<sup>3</sup>) from OSHA (PEL) [United States] Consult local authorities for acceptable exposure limits.

## Section 9: Physical and Chemical Properties

**Physical state and appearance:** Solid.

**Odor:** Odorless.

**Taste:** Not available.

**Molecular Weight:** 54.94 g/mole

**Color:** Grayish white.

**pH (1% soln/water):** Not applicable.

**Boiling Point:** 2095°C (3803°F)

**Melting Point:** 1244°C (2271.2°F)

**Critical Temperature:** Not available.

**Specific Gravity:** 7.44 (Water = 1)

**Vapor Pressure:** Not applicable.

**Vapor Density:** Not available.

**Volatility:** Not available.

**Odor Threshold:** Not available.

**Water/Oil Dist. Coeff.:** Not available.

**Ionicity (in Water):** Not available.

**Dispersion Properties:** Not available.

**Solubility:** Insoluble in cold water, hot water.

## Section 10: Stability and Reactivity Data

**Stability:** The product is stable.

**Instability Temperature:** Not available.

**Conditions of Instability:** Incompatible materials

**Incompatibility with various substances:** Reactive with oxidizing agents, reducing agents.

**Corrosivity:** Non-corrosive in presence of glass.

**Special Remarks on Reactivity:**

Superficially oxidized on exposure to air. Reacts with aqueous solutions of sodium or potassium bicarbonate. Reacts with dilute mineral acids with evolution of hydrogen and formation of divalent manganous salts. Reacts with fluorine and chlorine to produce di or tri fluoride, and di and tri chloride, respectively. In the form of powder, it reduces most metallic oxides on heating. On heating, it reacts directly with carbon, phosphorus, antimony, or arsenic. Also incompatible with hydroxides, cyanides, carbonates.

**Special Remarks on Corrosivity:** Not available.

**Polymerization:** Will not occur.

## Section 11: Toxicological Information

**Routes of Entry:** Inhalation. Ingestion.

**Toxicity to Animals:** Acute oral toxicity (LD50): 9000 mg/kg [Rat].

**Chronic Effects on Humans:** May cause damage to the following organs: blood, lungs, brain, central nervous system (CNS).

**Other Toxic Effects on Humans:**

Hazardous in case of inhalation. Slightly hazardous in case of skin contact (irritant), of ingestion.

**Special Remarks on Toxicity to Animals:** Not available.

**Special Remarks on Chronic Effects on Humans:**

Manganese can cross the placenta. May cause cancer (tumorigenic) based on animal data.

**Special Remarks on other Toxic Effects on Humans:**

Acute Potential Health Effects: Skin: May cause skin irritation Eyes: Dust may cause mechanical irritation. Inhalation: Dust may cause respiratory tract irritation. May cause "Metal Fume Fever" which may include flu-like symptoms (fever, chills, upset stomach, vomiting, weakness, headache, body aches, muscle pains, dry mouth and throat, coughing, tightness of the chest). May affect behavior/Central Nervous system (change in motor activity, torpor, nervousness, tremor, yawning, mood swings, irritability, restlessness, fatigue, headache, apathy, languor, insomnia than somnolence, hallucinations, delusions, uncontrollable laughter followed by crying, compulsions, aggressiveness, weakness in legs, memory loss, decreased libido, impotence, salivation, hearing loss, slow gait, ), and respiration (dyspnea, shallow respiration, cyanosis, alveolar inflammation). Ingestion: Repeated or prolonged exposure from ingestion may affect brain (degenerative changes), blood and metabolism. Ingestion: May cause digestive tract irritation. There is a low gastrointestinal absorption of manganese. Chronic Potential Health Effects: Inhalation: Repeated or prolonged exposure from inhalation may affect brain (degenerative changes), behavior/Central Nervous system with symptoms to acute exposure. May also affect liver (chronic liver disease, jaundice) Ingestion: Repeated or prolonged exposure from ingestion may affect brain, blood and metabolism

## Section 12: Ecological Information

**Ecotoxicity:** Not available.

**BOD5 and COD:** Not available.

**Products of Biodegradation:**

Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

**Toxicity of the Products of Biodegradation:** The product itself and its products of degradation are not toxic.

**Special Remarks on the Products of Biodegradation:** Not available.

### Section 13: Disposal Considerations

**Waste Disposal:**

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

### Section 14: Transport Information

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

**Identification:** Not applicable.

**Special Provisions for Transport:** Not applicable.

### Section 15: Other Regulatory Information

**Federal and State Regulations:**

Illinois toxic substances disclosure to employee act: Manganese Rhode Island RTK hazardous substances: Manganese Pennsylvania RTK: Manganese Minnesota: Manganese Massachusetts RTK: Manganese New Jersey: Manganese New Jersey spill list: Manganese Louisiana spill reporting: Manganese California Director's List of Hazardous Substances: Manganese TSCA 8(b) inventory: Manganese SARA 313 toxic chemical notification and release reporting: Manganese

**Other Regulations:**

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

**Other Classifications:**

**WHMIS (Canada):** Not controlled under WHMIS (Canada).

**DSCL (EEC):** Not applicable.

**HMIS (U.S.A.):**

**Health Hazard:** 1

**Fire Hazard:** 0

**Reactivity:** 0

**Personal Protection:** E

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

**Health:** 1

**Flammability:** 0

**Reactivity:** 0

**Specific hazard:**

**Protective Equipment:**

Gloves. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Safety glasses.

### Section 16: Other Information

**References:** Not available.

**Other Special Considerations:** Not available.

**Created:** 10/09/2005 06:03 PM

**Last Updated:** 05/21/2013 12:00 PM

*The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no event shall ScienceLab.com be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential or exemplary damages, howsoever arising, even if ScienceLab.com has been advised of the possibility of such damages.*

# Safety Data Sheet Mercury (Metallic)

SDS Revision Date:

05/01/2015

## 1. Identification

### 1.1. Product identifier

**Product Identity** Mercury (Metallic)  
**Alternate Names** Quicksilver; Hydrargyrum; Liquid Silver

### 1.2. Relevant identified uses of the substance or mixture and uses advised against

**Intended use** See Technical Data Sheet.  
**Application Method** See Technical Data Sheet.

### 1.3. Details of the supplier of the safety data sheet

**Company Name** WM Mercury Waste Inc.  
21211 Durand Avenue  
Union Grove, WI 53182

### Emergency

**CHEMTREC (USA)** (800) 424-9300  
**Customer Service: WM Mercury Waste Inc.** (800) 741-3343

## 2. Hazard(s) identification

### 2.1. Classification of the substance or mixture

Acute Tox. 2;H330 Fatal if inhaled.  
Repr. 1B;H360D May damage the unborn child.  
STOT RE 1;H372 Causes damage to organs through prolonged or repeated exposure. Specific Target Organs: (Central Nervous System)  
Aquatic Chronic 1;H410 Very toxic to aquatic life with long lasting effects.

### 2.2. Label elements

Using the Toxicity Data listed in section 11 and 12 the product is labeled as follows.



**Danger**

H330 Fatal if inhaled.

H360D May damage the unborn child.

H372 Causes damage to organs through prolonged or repeated exposure.

H410 Very toxic to aquatic life with long lasting effects.

# Safety Data Sheet

## Mercury (Metallic)

SDS Revision Date:

05/01/2015

### [Prevention]:

- P201 Obtain special instructions before use.
- P202 Do not handle until all safety precautions have been read and understood.
- P260 Do not breathe mist / vapors / spray.
- P264 Wash thoroughly after handling.
- P270 Do not eat, drink or smoke when using this product.
- P271 Use only outdoors or in a well-ventilated area.
- P273 Avoid release to the environment.
- P281 Use personal protective equipment as required.
- P284 Wear respiratory protection.

### [Response]:

- P304+340 IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing.
- P308+313 IF exposed or concerned: Get medical advice / attention.
- P310 Immediately call a POISON CENTER or doctor / physician.
- P314 Get Medical advice / attention if you feel unwell.
- P320 Specific treatment is urgent (see information on this label).
- P391 Collect spillage.

### [Storage]:

- P403+233 Store in a well ventilated place. Keep container tightly closed.
- P405 Store locked up.

### [Disposal]:

- P501 Dispose of contents / container in accordance with local / national regulations.

## 3. Composition/information on ingredients

This product contains the following substances that present a hazard within the meaning of the relevant State and Federal Hazardous Substances regulations.

Ingredient/Chemical Designations	Weight %	GHS Classification	Notes
Mercury CAS Number: 0007439-97-6	100	Repr. 1B;H360D Acute tox. 2;H330 STOT RE 1;H372 Aquatic Acute 1;H400 Aquatic Chronic 1;H410	[1][2]

In accordance with paragraph (i) of §1910.1200, the specific chemical identity and/or exact percentage (concentration) of composition has been withheld as a trade secret.

[1] Substance classified with a health or environmental hazard.

[2] Substance with a workplace exposure limit.

[3] PBT-substance or vPvB-substance.

\*The full texts of the phrases are shown in Section 16.

# Safety Data Sheet

## Mercury (Metallic)

SDS Revision Date:

05/01/2015

### 4. First aid measures

#### 4.1. Description of first aid measures

<b>General</b>	In all cases of doubt, or when symptoms persist, seek medical attention. Never give anything by mouth to an unconscious person.
<b>Inhalation</b>	Remove to fresh air, keep patient warm and at rest. If breathing is irregular or stopped, give artificial respiration. If unconscious place in the recovery position and obtain immediate medical attention. Give nothing by mouth.
<b>Eyes</b>	Irrigate copiously with clean water for at least 15 minutes, holding the eyelids apart and seek medical attention.
<b>Skin</b>	Remove contaminated clothing. Wash skin thoroughly with soap and water or use a recognized skin cleanser.
<b>Ingestion</b>	If swallowed, wash out mouth with water, obtain immediate medical attention. Keep at rest. Do NOT induce vomiting.

#### 4.2. Most important symptoms and effects, both acute and delayed

<b>Overview</b>	<p><b>Eye:</b> Contact with eyes may cause severe irritation, and possible eye burns. Vapors may cause eye irritation.</p> <p><b>Skin:</b> May cause skin irritation. May be absorbed through the skin in harmful amounts. May cause skin sensitization, an allergic reaction, which becomes evident upon re-exposure to this material. Chronic exposure to mercury may cause permanent central nervous system damage, fatigue, weight loss, tremors, and personality changes.</p> <p><b>Ingestion:</b> May cause gastrointestinal irritation with nausea, vomiting and diarrhea. May cause effects similar to those for inhalation exposure.</p> <p><b>Inhalation:</b> Causes respiratory tract irritation. Inhalation of fumes may cause metal fume fever, which is characterized by flu-like symptoms with metallic taste, fever, chills, cough, weakness, chest pain, muscle pain and increased white blood cell count. May cause central nervous system effects including vertigo, anxiety, depression, muscle incoordination, and emotional instability. May cause severe respiratory tract irritation.</p> <p><b>Chronic:</b> Chronic exposure to mercury may cause permanent central nervous system damage, fatigue, weight loss, tremors, and personality changes.</p> <p><b>Notes to Physician:</b> Treat symptomatically and supportively.</p> <p><b>Antidote:</b> The use of Dimercaprol or BAL (British Anti-Lewisite) as a chelating agent should be determined by qualified medical personnel. The use of d-Penicillamine as a chelating agent should be determined by qualified medical personnel. See section 2 for further details.</p>
<b>Inhalation</b>	Fatal if inhaled.

### 5. Fire-fighting measures

#### 5.1. Extinguishing media

Substance is nonflammable; use agent most appropriate to extinguish surrounding fire.

#### 5.2. Special hazards arising from the substance or mixture

Hazardous decomposition: Mercury/mercury oxides.

Do not breathe mist / vapors / spray.

# Safety Data Sheet

## Mercury (Metallic)

SDS Revision Date:

05/01/2015

### 5.3. Advice for fire-fighters

As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. Combustion generates toxic fumes.

ERG Guide No. 172

## 6. Accidental release measures

### 6.1. Personal precautions, protective equipment and emergency procedures

Put on appropriate personal protective equipment (see section 8).

### 6.2. Environmental precautions

Do not allow spills to enter drains or waterways.

Use good personal hygiene practices. Wash hands before eating, drinking, smoking or using toilet. Promptly remove soiled clothing and wash thoroughly before reuse.

### 6.3. Methods and material for containment and cleaning up

Vacuum or sweep up material and place into a suitable disposal container. Wear a self contained breathing apparatus and appropriate personal protection. (See Exposure Controls, Personal Protection section).

## 7. Handling and storage

### 7.1. Precautions for safe handling

Wash thoroughly after handling. Remove contaminated clothing and wash before reuse. Use with adequate ventilation. Minimize dust generation and accumulation. Avoid breathing dust, vapor, mist, or gas. Avoid contact with eyes, skin, and clothing. Keep container tightly closed. Avoid ingestion and inhalation.

See section 2 for further details. - [Prevention]:

### 7.2. Conditions for safe storage, including any incompatibilities

Handle containers carefully to prevent damage and spillage.

Incompatible materials: Acetylene, ammonia, boron phosphodiiodide, chlorine, chlorine dioxide, methyl azide, sodium carbide, halogens, strong oxidizers.

Store in a cool, dry, well-ventilated area away from incompatible substances. Keep away from metals. Poison room locked.

See section 2 for further details. - [Storage]:

### 7.3. Specific end use(s)

No data available.

# Safety Data Sheet

## Mercury (Metallic)

SDS Revision Date:

05/01/2015

### 8. Exposure controls and personal protection

#### 8.1. Control parameters

##### Exposure

CAS No.	Ingredient	Source	Value
0007439-97-6	Mercury	OSHA	TWA 0.1 mg/m3
		ACGIH	Alkyl compounds TWA: 0.01 mg/m3 STEL 0.03 mg/m3 Skin Aryl compounds TWA: 0.05 mg/m3 C 0.1 mg/m3 Skin Elemental/Inorganic 0.025mg/m3 Skin
		NIOSH	No Established Limit
		Supplier	No Established Limit

#### Carcinogen Data

CAS No.	Ingredient	Source	Value
0007439-97-6	Mercury	OSHA	Select Carcinogen: No
		NTP	Known: No; Suspected: No
		IARC	Group 1: No; Group 2a: No; Group 2b: No; Group 3: Yes; Group 4: No;

#### 8.2. Exposure controls

##### Respiratory

Follow the OSHA respirator regulations found in 29CFR §1910.134 or European Standard EN 149. Always use a NIOSH or European Standard EN 149 approved respirator when necessary.

##### Eyes

Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.

##### Skin

Wear appropriate protective clothing to prevent skin exposure. Wear appropriate gloves to prevent skin exposure.

##### Engineering Controls

Provide adequate ventilation. Where reasonably practicable this should be achieved by the use of local exhaust ventilation and good general extraction. If these are not sufficient to maintain concentrations of particulates and any vapor below occupational exposure limits suitable respiratory protection must be worn.

##### Other Work Practices

Use good personal hygiene practices. Wash hands before eating, drinking, smoking or using toilet. Promptly remove soiled clothing and wash thoroughly before reuse.

See section 2 for further details. - [Prevention]:

### 9. Physical and chemical properties

Appearance

Silver Liquid

Odor

Odorless

Odor threshold

Not Measured

pH

Not Applicable

Melting point / freezing point

-38.87 deg C

# Safety Data Sheet

## Mercury (Metallic)

SDS Revision Date:

05/01/2015

Initial boiling point and boiling range	356.5 deg C @ 760.00mmHg
Flash Point	Not Measured
Evaporation rate (Ether = 1)	Not Available
Flammability (solid, gas)	Not Applicable
Upper/lower flammability or explosive limits	<b>Lower Explosive Limit:</b> Not Measured <b>Upper Explosive Limit:</b> Not Measured
Vapor pressure (Pa)	0.002 mmHg @ 25C
Vapor Density	7 (Air=1)
Specific Gravity	13.5400g/cm3 (Water=1)
Solubility in Water	Insoluble
Partition coefficient n-octanol/water (Log Kow)	Not Measured
Auto-ignition temperature	Not Measured
Decomposition temperature	Not Available
Viscosity (cSt)	1.554 cP 20.00
Molecular Formula	Hg
Molecular Weight	200.59

### 9.2. Other information

No other relevant information.

## 10. Stability and reactivity

### 10.1. Reactivity

Hazardous Polymerization will not occur.

### 10.2. Chemical stability

Stable under normal circumstances.

### 10.3. Possibility of hazardous reactions

No data available.

### 10.4. Conditions to avoid

High temperatures, incompatible materials, metals.

### 10.5. Incompatible materials

Acetylene, ammonia, boron phosphodiiodide, chlorine, chlorine dioxide, methyl azide, sodium carbide, halogens, strong oxidizers.

### 10.6. Hazardous decomposition products

Mercury/mercury oxides.

## 11. Toxicological information

### Acute toxicity

Ingredient	Oral LD50, mg/kg	Skin LD50, mg/kg	Inhalation Vapor LC50, mg/L/4hr	Inhalation Dust/Mist LC50, mg/L/4hr	Inhalation Gas LC50, ppm

# Safety Data Sheet

## Mercury (Metallic)

SDS Revision Date:

05/01/2015

Mercury - (7439-97-6)	37.00, Rat - Category: 2	No data available	No data available	No data available	No data available
-----------------------	--------------------------	-------------------	-------------------	-------------------	-------------------

Note: When no route specific LD50 data is available for an acute toxin, the converted acute toxicity point estimate was used in the calculation of the product's ATE (Acute Toxicity Estimate).

Classification	Category	Hazard Description
Acute toxicity (oral)	2	Fatal if swallowed.
Acute toxicity (dermal)	---	Not Applicable
Acute toxicity (inhalation)	2	Fatal if inhaled.
Skin corrosion/irritation	---	Not Applicable
Serious eye damage/irritation	---	Not Applicable
Respiratory sensitization	---	Not Applicable
Skin sensitization	---	Not Applicable
Germ cell mutagenicity	---	Not Applicable
Carcinogenicity	---	Not Applicable
Reproductive toxicity	1B	May damage the unborn child.
STOT-single exposure	---	Not Applicable
STOT-repeated exposure	1	Causes damage to organs through prolonged or repeated exposure.
Aspiration hazard	---	Not Applicable

## 12. Ecological information

### 12.1. Toxicity

Very toxic to aquatic life with long lasting effects.

No additional information provided for this product. See Section 3 for chemical specific data.

### Aquatic Ecotoxicity

Ingredient	96 hr LC50 fish, mg/l	48 hr EC50 crustacea, mg/l	ErC50 algae, mg/l
Mercury - (7439-97-6)	Not Available	0.0052, Daphnia magna	Not Available

### 12.2. Persistence and degradability

There is no data available on the preparation itself.

### 12.3. Bioaccumulative potential

Not Measured

### 12.4. Mobility in soil

No data available.

### 12.5. Results of PBT and vPvB assessment

# Safety Data Sheet

## Mercury (Metallic)

SDS Revision Date:

05/01/2015

This product contains no PBT/vPvB chemicals.

### 12.6. Other adverse effects

No data available.

## 13. Disposal considerations

### 13.1. Waste treatment methods

Observe all federal, state and local regulations when disposing of this substance.

## 14. Transport information

	DOT (Domestic Surface Transportation)	IMO / IMDG (Ocean Transportation)	ICAO/IATA
14.1. UN number	UN2809	UN2809	UN2809
14.2. UN proper shipping name	UN2809, Mercury, 8, III	Mercury	Mercury
14.3. Transport hazard class(es)	DOT Hazard Class: 8 (6.1)	IMDG: 8 Sub Class: 6.1	Air Class: 8
14.4. Packing group	III	III	III
14.5. Environmental hazards			
IMDG	Marine Pollutant: Yes ( Mercury )		
14.6. Special precautions for user	No further information		

## 15. Regulatory information

<b>Regulatory Overview</b>	The regulatory data in Section 15 is not intended to be all-inclusive, only selected regulations are represented.
<b>Toxic Substance Control Act ( TSCA)</b>	All components of this material are either listed or exempt from listing on the TSCA Inventory.
<b>WHMIS Classification</b>	D1A
<b>US EPA Tier II Hazards</b>	<b>Fire:</b> No <b>Sudden Release of Pressure:</b> No <b>Reactive:</b> No <b>Immediate (Acute):</b> Yes <b>Delayed (Chronic):</b> Yes

### EPCRA 311/312 Chemicals and RQs (lbs):

Mercury ( 1.00)

### EPCRA 302 Extremely Hazardous:

To the best of our knowledge, there are no chemicals at levels which require reporting under this statute.

# Safety Data Sheet

## Mercury (Metallic)

SDS Revision Date:

05/01/2015

### EPCRA 313 Toxic Chemicals:

Mercury

#### Proposition 65 - Carcinogens (>0.0%):

To the best of our knowledge, there are no chemicals at levels which require reporting under this statute.

#### Proposition 65 - Developmental Toxins (>0.0%):

Mercury

#### Proposition 65 - Female Repro Toxins (>0.0%):

To the best of our knowledge, there are no chemicals at levels which require reporting under this statute.

#### Proposition 65 - Male Repro Toxins (>0.0%):

To the best of our knowledge, there are no chemicals at levels which require reporting under this statute.

#### New Jersey RTK Substances (>1%):

Mercury

#### Pennsylvania RTK Substances (>1%):

Mercury

## 16. Other information

The information and recommendations contained herein are based upon data believed to be correct. However, no guarantee or warranty of any kind, expressed or implied, is made with respect to the information contained herein. We accept no responsibility and disclaim all liability for any harmful effects which may be caused by exposure to our products. Customers/users of this product must comply with all applicable health and safety laws, regulations, and orders.

The full text of the phrases appearing in section 3 is:

H330 Fatal if inhaled.

H360D May damage the unborn child.

H372 Causes damage to organs through prolonged or repeated exposure.

H400 Very toxic to aquatic life.

H410 Very toxic to aquatic life with long lasting effects.

**This is the first version in the GHS SDS format. Listings of changes from previous versions in other formats are not applicable.**

The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no way shall WM Mercury Waste Inc. be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential or exemplary damages.

End of Document



## SAFETY DATA SHEET

Creation Date 04-Oct-2010

Revision Date 10-Feb-2015

Revision Number 1

### 1. Identification

**Product Name** Nickel, powder

**Cat No. :** AC193610000; AC193610250; AC193611000; AC193615000

**Synonyms** Raney alloy

**Recommended Use** Laboratory chemicals.

**Uses advised against** No Information available

**Details of the supplier of the safety data sheet**

**Company**  
Fisher Scientific  
One Reagent Lane  
Fair Lawn, NJ 07410  
Tel: (201) 796-7100

**Entity / Business Name**  
Acros Organics  
One Reagent Lane  
Fair Lawn, NJ 07410

**Emergency Telephone Number**  
For information **US** call: 001-800-ACROS-01  
/ **Europe** call: +32 14 57 52 11  
Emergency Number **US**:001-201-796-7100 /  
**Europe**: +32 14 57 52 99  
**CHEMTREC** Tel. No.**US**:001-800-424-9300 /  
**Europe**:001-703-527-3887

### 2. Hazard(s) identification

#### **Classification**

This chemical is considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

Skin Sensitization	Category 1
Carcinogenicity	Category 2
Specific target organ toxicity - (repeated exposure)	Category 1
Target Organs - Kidney, Blood.	

#### **Label Elements**

#### **Signal Word**

Danger

#### **Hazard Statements**

May cause an allergic skin reaction  
Causes damage to organs through prolonged or repeated exposure  
Suspected of causing cancer



#### **Precautionary Statements**

**Prevention**

Obtain special instructions before use  
 Do not handle until all safety precautions have been read and understood  
 Wear protective gloves/protective clothing/eye protection/face protection  
 Do not breathe dust/fume/gas/mist/vapors/spray  
 Wash face, hands and any exposed skin thoroughly after handling  
 Do not eat, drink or smoke when using this product  
 Contaminated work clothing should not be allowed out of the workplace

**Response**

IF exposed or concerned: Get medical attention/advice

**Skin**

IF ON SKIN: Wash with plenty of soap and water  
 If skin irritation or rash occurs: Get medical advice/attention  
 Wash contaminated clothing before reuse

**Storage**

Store locked up

**Disposal**

Dispose of contents/container to an approved waste disposal plant

**Hazards not otherwise classified (HNOC)**

Harmful to aquatic life with long lasting effects

### 3. Composition / information on ingredients

Component	CAS-No	Weight %
Nickel powder	7440-02-0	>95

### 4. First-aid measures

<b>Eye Contact</b>	Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Immediate medical attention is required.
<b>Skin Contact</b>	Wash off immediately with plenty of water for at least 15 minutes. Immediate medical attention is required.
<b>Inhalation</b>	Move to fresh air. If breathing is difficult, give oxygen. Do not use mouth-to-mouth resuscitation if victim ingested or inhaled the substance; induce artificial respiration with a respiratory medical device. Immediate medical attention is required.
<b>Ingestion</b>	Do not induce vomiting. Call a physician or Poison Control Center immediately.
<b>Most important symptoms/effects</b>	May cause allergic skin reaction. Symptoms of allergic reaction may include rash, itching, swelling, trouble breathing, tingling of the hands and feet, dizziness, lightheadedness, chest pain, muscle pain or flushing
<b>Notes to Physician</b>	Treat symptomatically

### 5. Fire-fighting measures

<b>Suitable Extinguishing Media</b>	Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.
<b>Unsuitable Extinguishing Media</b>	No information available
<b>Flash Point</b>	No information available
<b>Method -</b>	No information available
<b>Autoignition Temperature</b>	400 °C / 752 °F
<b>Explosion Limits</b>	
<b>Upper</b>	No data available
<b>Lower</b>	No data available

**Sensitivity to Mechanical Impact** No information available  
**Sensitivity to Static Discharge** No information available

**Specific Hazards Arising from the Chemical**  
 Combustible material.

**Hazardous Combustion Products**  
 Nickel oxides.

**Protective Equipment and Precautions for Firefighters**

As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear. Thermal decomposition can lead to release of irritating gases and vapors.

**NFPA**

<b>Health</b> 3	<b>Flammability</b> 1	<b>Instability</b> 0	<b>Physical hazards</b> N/A
--------------------	--------------------------	-------------------------	--------------------------------

### 6. Accidental release measures

**Personal Precautions** Ensure adequate ventilation. Use personal protective equipment. Keep people away from and upwind of spill/leak. Evacuate personnel to safe areas. Avoid dust formation.

**Environmental Precautions** Should not be released into the environment. See Section 12 for additional ecological information. Avoid release to the environment. Collect spillage.

**Methods for Containment and Clean Up** Sweep up or vacuum up spillage and collect in suitable container for disposal. Avoid dust formation.

### 7. Handling and storage

**Handling** Use only under a chemical fume hood. Wear personal protective equipment. Do not get in eyes, on skin, or on clothing. Avoid dust formation. Do not breathe vapors/dust. Do not ingest.

**Storage** Keep containers tightly closed in a dry, cool and well-ventilated place.

### 8. Exposure controls / personal protection

**Exposure Guidelines**

Component	ACGIH TLV	OSHA PEL	NIOSH IDLH
Nickel powder	TWA: 1.5 mg/m <sup>3</sup>	(Vacated) TWA: 1 mg/m <sup>3</sup> TWA: 1 mg/m <sup>3</sup>	IDLH: 10 mg/m <sup>3</sup> TWA: 0.015 mg/m <sup>3</sup>

Component	Quebec	Mexico OEL (TWA)	Ontario TWAEV
Nickel powder	TWA: 1 mg/m <sup>3</sup>	TWA: 1 mg/m <sup>3</sup>	TWA: 1 mg/m <sup>3</sup>

*Legend*

ACGIH - American Conference of Governmental Industrial Hygienists

OSHA - Occupational Safety and Health Administration

NIOSH IDLH: The National Institute for Occupational Safety and Health Immediately Dangerous to Life or Health

**Engineering Measures** Use only under a chemical fume hood. Ensure that eyewash stations and safety showers are close to the workstation location.

**Personal Protective Equipment**

**Eye/face Protection** Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.

**Skin and body protection** Wear appropriate protective gloves and clothing to prevent skin exposure.

**Respiratory Protection** Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.

**Hygiene Measures** Handle in accordance with good industrial hygiene and safety practice.

## 9. Physical and chemical properties

<b>Physical State</b>	Solid
<b>Appearance</b>	Brown
<b>Odor</b>	Odorless
<b>Odor Threshold</b>	No information available
<b>pH</b>	No information available
<b>Melting Point/Range</b>	1455 °C / 2651 °F
<b>Boiling Point/Range</b>	2730 °C / 4946 °F
<b>Flash Point</b>	No information available
<b>Evaporation Rate</b>	No information available
<b>Flammability (solid,gas)</b>	No information available
<b>Flammability or explosive limits</b>	
<b>Upper</b>	No data available
<b>Lower</b>	No data available
<b>Vapor Pressure</b>	1 mmHg @ 1810 °C
<b>Vapor Density</b>	No information available
<b>Relative Density</b>	No information available
<b>Solubility</b>	No information available
<b>Partition coefficient; n-octanol/water</b>	No data available
<b>Autoignition Temperature</b>	400 °C / 752 °F
<b>Decomposition Temperature</b>	No information available
<b>Viscosity</b>	No information available
<b>Molecular Formula</b>	Ni
<b>Molecular Weight</b>	58.7

## 10. Stability and reactivity

<b>Reactive Hazard</b>	None known, based on information available
<b>Stability</b>	Stable under normal conditions.
<b>Conditions to Avoid</b>	Incompatible products. Excess heat. Avoid dust formation.
<b>Incompatible Materials</b>	Strong oxidizing agents
<b>Hazardous Decomposition Products</b>	Nickel oxides
<b>Hazardous Polymerization</b>	Hazardous polymerization does not occur.
<b>Hazardous Reactions</b>	None under normal processing.

## 11. Toxicological information

### Acute Toxicity

#### **Component Information**

Component	LD50 Oral	LD50 Dermal	LC50 Inhalation
Nickel powder	9000 mg/kg ( Rat )	Not listed	Not listed

**Toxicologically Synergistic Products** No information available

#### Delayed and immediate effects as well as chronic effects from short and long-term exposure

**Irritation** No information available

**Sensitization** May cause sensitization by skin contact Nickel and nickel compounds may cause a form of dermatitis known as nickel itch. May cause an allergic skin reaction

**Carcinogenicity** The table below indicates whether each agency has listed any ingredient as a carcinogen.

Component	CAS-No	IARC	NTP	ACGIH	OSHA	Mexico
Nickel powder	7440-02-0	Group 2B	Reasonably Anticipated	Not listed	X	Not listed

*IARC: (International Agency for Research on Cancer)*

*Group 2B - Possibly Carcinogenic to Humans*

**Mutagenic Effects** No information available

**Reproductive Effects** No information available.

**Developmental Effects** No information available.

**Teratogenicity** No information available.

**STOT - single exposure** None known

**STOT - repeated exposure** Kidney Blood

**Aspiration hazard** No information available

**Symptoms / effects, both acute and delayed** Symptoms of allergic reaction may include rash, itching, swelling, trouble breathing, tingling of the hands and feet, dizziness, lightheadedness, chest pain, muscle pain or flushing

**Endocrine Disruptor Information** No information available

**Other Adverse Effects** See actual entry in RTECS for complete information.

## 12. Ecological information

### Ecotoxicity

Do not flush into surface water or sanitary sewer system. Do not allow material to contaminate ground water system. Do not empty into drains. Harmful to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

Component	Freshwater Algae	Freshwater Fish	Microtox	Water Flea
Nickel powder	0.18 mg/L EC50 = 72 h 0.174 - 0.311 mg/L EC50 96 h	10.4 mg/L LC50 96 h 1.3 mg/L LC50 96 h 100 mg/L LC50 96 h	Not listed	1 mg/L EC50 = 48 h 100 mg/L EC50 > 48 h

**Persistence and Degradability** No information available

**Bioaccumulation/ Accumulation** No information available.

**Mobility** No information available.

## 13. Disposal considerations

**Waste Disposal Methods** Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. Chemical waste generators must also consult local, regional, and national hazardous waste regulations to ensure complete and accurate classification.

## 14. Transport information

### DOT

**UN-No** UN3089  
**Proper Shipping Name** METAL POWDERS, FLAMMABLE, N.O.S.  
**Hazard Class** 4.1  
**Packing Group** II

### TDG

**UN-No** UN3089  
**Proper Shipping Name** METAL POWDERS, FLAMMABLE, N.O.S.  
**Hazard Class** 4.1  
**Packing Group** II

### IATA

<b>UN-No</b>	3089
<b>Proper Shipping Name</b>	METAL POWDERS, FLAMMABLE, N.O.S.
<b>Hazard Class</b>	4.1
<b>Packing Group</b>	II
<b>IMDG/IMO</b>	
<b>UN-No</b>	3089
<b>Proper Shipping Name</b>	METAL POWDERS, FLAMMABLE, N.O.S.
<b>Hazard Class</b>	4.1
<b>Packing Group</b>	II

## 15. Regulatory information

### International Inventories

Component	TSCA	DSL	NDSL	EINECS	ELINCS	NLP	PICCS	ENCS	AICS	IECSC	KECL
Nickel powder	X	X	-	231-111-4	-		X	-	X	X	X

#### Legend:

X - Listed

E - Indicates a substance that is the subject of a Section 5(e) Consent order under TSCA.

F - Indicates a substance that is the subject of a Section 5(f) Rule under TSCA.

N - Indicates a polymeric substance containing no free-radical initiator in its inventory name but is considered to cover the designated polymer made with any free-radical initiator regardless of the amount used.

P - Indicates a commenced PMN substance

R - Indicates a substance that is the subject of a Section 6 risk management rule under TSCA.

S - Indicates a substance that is identified in a proposed or final Significant New Use Rule

T - Indicates a substance that is the subject of a Section 4 test rule under TSCA.

XU - Indicates a substance exempt from reporting under the Inventory Update Rule, i.e. Partial Updating of the TSCA Inventory Data Base Production and Site Reports (40 CFR 710(B)).

Y1 - Indicates an exempt polymer that has a number-average molecular weight of 1,000 or greater.

Y2 - Indicates an exempt polymer that is a polyester and is made only from reactants included in a specified list of low concern reactants that comprises one of the eligibility criteria for the exemption rule.

### U.S. Federal Regulations

TSCA 12(b) Not applicable

### SARA 313

Component	CAS-No	Weight %	SARA 313 - Threshold Values %
Nickel powder	7440-02-0	>95	0.1

### SARA 311/312 Hazardous Categorization

Acute Health Hazard	Yes
Chronic Health Hazard	Yes
Fire Hazard	No
Sudden Release of Pressure Hazard	No
Reactive Hazard	No

### Clean Water Act

Component	CWA - Hazardous Substances	CWA - Reportable Quantities	CWA - Toxic Pollutants	CWA - Priority Pollutants
Nickel powder	-	-	X	X

### Clean Air Act

Component	HAPS Data	Class 1 Ozone Depletors	Class 2 Ozone Depletors
Nickel powder	X		-

### OSHA Occupational Safety and Health Administration

Not applicable

### CERCLA

This material, as supplied, contains one or more substances regulated as a hazardous substance under the Comprehensive

Environmental Response Compensation and Liability Act (CERCLA) (40 CFR 302)

Component	Hazardous Substances RQs	CERCLA EHS RQs
Nickel powder	100 lb	-

**California Proposition 65** This product contains the following Proposition 65 chemicals:

Component	CAS-No	California Prop. 65	Prop 65 NSRL	Category
Nickel powder	7440-02-0	Carcinogen	-	Carcinogen

**State Right-to-Know**

Component	Massachusetts	New Jersey	Pennsylvania	Illinois	Rhode Island
Nickel powder	X	X	X	X	X

**U.S. Department of Transportation**

Reportable Quantity (RQ): N  
 DOT Marine Pollutant N  
 DOT Severe Marine Pollutant N

**U.S. Department of Homeland Security**

This product does not contain any DHS chemicals.

**Other International Regulations**

**Mexico - Grade** No information available

**Canada**

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

**WHMIS Hazard Class** D2A Very toxic materials



## 16. Other information

**Prepared By** Regulatory Affairs  
 Thermo Fisher Scientific  
 Email: EMSDS.RA@thermofisher.com

**Creation Date** 04-Oct-2010  
**Revision Date** 10-Feb-2015  
**Print Date** 10-Feb-2015

**Revision Summary** This document has been updated to comply with the US OSHA HazCom 2012 Standard replacing the current legislation under 29 CFR 1910.1200 to align with the Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

**Disclaimer**

The information provided on this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guide for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered as a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other material or in any process, unless specified in the text.

**End of SDS**

# FLINN SCIENTIFIC, INC.

## Safety Data Sheet (SDS)

SDS #: 620.00

Revision Date: March 21, 2014

### SECTION 1 — CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

#### Potassium Chlorate

Flinn Scientific, Inc. P.O. Box 219, Batavia, IL 60510 (800) 452-1261

CHEMTREC Emergency Phone Number: (800) 424-9300

Signal Word **DANGER**

Pictograms



### SECTION 2 — HAZARDS IDENTIFICATION

Hazard class: Oxidizing gases (Category 1). May cause or intensify fire; oxidizer (H270). Do not spray on an open flame or other ignition source (P211).

Hazard class: Acute toxicity, oral and inhalation (Category 4). Harmful if swallowed or inhaled (H302+H332). Do not eat, drink or smoke when using this product (P270). Avoid breathing dust or fumes (P261).

Hazard class: Skin corrosion or irritation (Category 3). Causes mild skin irritation (H316).

### SECTION 3 — COMPOSITION, INFORMATION ON INGREDIENTS

Component Name	CAS Number	Formula	Formula Weight	Concentration
Potassium chlorate	3811-04-9	KClO <sub>3</sub>	122.56	
Synonym: Chloric acid, potassium salt				

### SECTION 4 — FIRST AID MEASURES

Call a POISON CENTER or physician if you feel unwell (P312).

**If inhaled:** Remove victim to fresh air and keep at rest in a position comfortable for breathing (P304+P340).

**If in eyes:** Rinse cautiously with water for several minutes. Remove contact lenses if present and easy to do so. Continue rinsing (P305+P351+P338). **If eye irritation persists:** Get medical advice or attention (P337+P313).

**If skin irritation occurs:** Get medical advice or attention (P332+P313).

**If swallowed:** Rinse mouth. Call a POISON CENTER or physician if you feel unwell.

### SECTION 5 — FIRE FIGHTING MEASURES

Nonflammable solid. Strong oxidizer. Forms explosive mixtures with combustible materials. If only slightly contaminated, will explode when exposed to moderate shock or when heated. When heated to decomposition, may emit toxic fumes.

**In case of fire:** Use a tri-class dry chemical fire extinguisher.

**NFPA CODE**

H-1

F-0

R-1

OX

### SECTION 6 — ACCIDENTAL RELEASE MEASURES

Restrict unprotected personnel from area. Sweep up, place in sealed bag or container and dispose. Ventilate area and wash spill site after material pickup is complete. See Sections 8 and 13 for further information.

---

**SECTION 7 — HANDLING AND STORAGE**

---

Flinn Suggested Chemical Storage Pattern: Inorganic #6. Store with chlorates, bromates, iodates, chlorites, perchloric acid, and peroxides. Forms explosive mixtures with combustible materials. If only slightly contaminated, will explode when exposed to moderate shock or when heated. Keep container tightly closed. Keep and store away from clothing and combustible materials (P220). Use only in a hood or well-ventilated area (P271).

---

**SECTION 8 — EXPOSURE CONTROLS, PERSONAL PROTECTION**

---

Wear protective gloves, protective clothing, and eye protection. Wash hands thoroughly after handling (P264). Use only in a hood or well-ventilated area (P271).

---

**SECTION 9 — PHYSICAL AND CHEMICAL PROPERTIES**

---

White crystals or powder. Odorless.  
Soluble: Boiling water

Melting point: 368 °C  
Specific gravity: 2.337

---

**SECTION 10 — STABILITY AND REACTIVITY**

---

Avoid contact with reducers, finely powdered metals, strong acids, alcohols, organic materials, and other combustible materials. Shelf life: Indefinite, if stored safely. See Section 7 for further information.

---

**SECTION 11 — TOXICOLOGICAL INFORMATION**

---

Acute effects: Irritant  
Chronic effects: Anemia  
Target organs: Blood, liver, kidneys

ORL-RAT LD<sub>50</sub>: 1870 mg/kg  
IHL-RAT LC<sub>50</sub>: N.A.  
SKN-RBT LD<sub>50</sub>: N.A.

N.A. = Not available, not all health aspects of this substance have been fully investigated.

---

**SECTION 12 — ECOLOGICAL INFORMATION**

---

Data not yet available.

---

**SECTION 13 — DISPOSAL CONSIDERATIONS**

---

Please review all federal, state and local regulations that may apply before proceeding.  
Flinn Suggested Disposal Method #12a is one option.

---

**SECTION 14 — TRANSPORT INFORMATION**

---

Shipping name: Potassium Chlorate; Hazard class: 5.1, Oxidizer; UN number: UN1485

N/A = Not applicable

---

**SECTION 15 — REGULATORY INFORMATION**

---

TSCA-listed, EINECS-listed (223-289-7), RCRA code D001, D003.

---

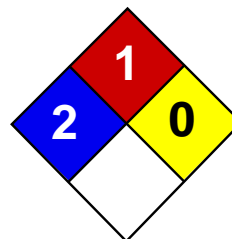
**SECTION 16 — OTHER INFORMATION**

---

This Safety Data Sheet (SDS) is for guidance and is based upon information and tests believed to be reliable. Flinn Scientific, Inc. makes no guarantee of the accuracy or completeness of the data and shall not be liable for any damages relating thereto. The data is offered solely for your consideration, investigation, and verification. The data should not be confused with local, state, federal or insurance mandates, regulations, or requirements and CONSTITUTE NO WARRANTY. Any use of this data and information must be determined by the science instructor to be in accordance with applicable local, state or federal laws and regulations. The conditions or methods of handling, storage, use and disposal of the product(s) described are beyond the control of Flinn Scientific, Inc. and may be beyond our knowledge. FOR THIS AND OTHER REASONS, WE DO NOT ASSUME RESPONSIBILITY AND EXPRESSLY DISCLAIM LIABILITY FOR LOSS, DAMAGE OR EXPENSE ARISING OUT OF OR IN ANY WAY CONNECTED WITH THE HANDLING, STORAGE, USE OR DISPOSAL OF THIS PRODUCT(S).

Consult your copy of the *Flinn Science Catalog/Reference Manual* for additional information about laboratory chemicals.

Revision Date: March 21, 2014



Health	2
Fire	1
Reactivity	0
Personal Protection	E

## Material Safety Data Sheet Selenium MSDS

### Section 1: Chemical Product and Company Identification

**Product Name:** Selenium

**Catalog Codes:** SLS2629

**CAS#:** 7782-49-2

**RTECS:** VS7700000

**TSCA:** TSCA 8(b) inventory: Selenium

**CI#:** Not available.

**Synonym:**

**Chemical Name:** Not available.

**Chemical Formula:** Se

**Contact Information:**

**Sciencelab.com, Inc.**

14025 Smith Rd.

Houston, Texas 77396

US Sales: **1-800-901-7247**

International Sales: **1-281-441-4400**

Order Online: [ScienceLab.com](http://ScienceLab.com)

**CHEMTREC (24HR Emergency Telephone), call:**

1-800-424-9300

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

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

### Section 2: Composition and Information on Ingredients

**Composition:**

Name	CAS #	% by Weight
Selenium	7782-49-2	100

**Toxicological Data on Ingredients:** Selenium: ORAL (LD50): Acute: 6700 mg/kg [Rat].

### Section 3: Hazards Identification

**Potential Acute Health Effects:**

Hazardous in case of eye contact (irritant), of ingestion, of inhalation. Slightly hazardous in case of skin contact (irritant).

**Potential Chronic Health Effects:**

CARCINOGENIC EFFECTS: Not available. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. Repeated or prolonged exposure is not known to aggravate medical condition.

### Section 4: First Aid Measures

**Eye Contact:** Check for and remove any contact lenses. Do not use an eye ointment. Seek medical attention.

**Skin Contact:**

After contact with skin, wash immediately with plenty of water. Gently and thoroughly wash the contaminated skin with running water and non-abrasive soap. Be particularly careful to clean folds, crevices, creases and groin. Cover the irritated skin with an emollient. If irritation persists, seek medical attention. Wash contaminated clothing before reusing.

**Serious Skin Contact:** Not available.

**Inhalation:** Allow the victim to rest in a well ventilated area. Seek immediate medical attention.

**Serious Inhalation:**

Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek medical attention.

**Ingestion:**

Do not induce vomiting. Loosen tight clothing such as a collar, tie, belt or waistband. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek immediate medical attention.

**Serious Ingestion:** Not available.

## Section 5: Fire and Explosion Data

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

**Auto-Ignition Temperature:** Not available.

**Flash Points:** Not available.

**Flammable Limits:** Not available.

**Products of Combustion:** Not available.

**Fire Hazards in Presence of Various Substances:** Not available.

**Explosion Hazards in Presence of Various Substances:**

Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

**Fire Fighting Media and Instructions:**

SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use water spray, fog or foam. Do not use water jet.

**Special Remarks on Fire Hazards:** Material in powder form, capable of creating a dust explosion.

**Special Remarks on Explosion Hazards:** Not available.

## Section 6: Accidental Release Measures

**Small Spill:** Use appropriate tools to put the spilled solid in a convenient waste disposal container.

**Large Spill:**

Use a shovel to put the material into a convenient waste disposal container. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

## Section 7: Handling and Storage

**Precautions:**

Keep away from heat. Keep away from sources of ignition. Empty containers pose a fire risk, evaporate the residue under a fume hood. Ground all equipment containing material. Do not ingest. Do not breathe dust. Avoid contact with eyes. Wear suitable protective clothing. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label.

**Storage:**

Keep container dry. Keep in a cool place. Ground all equipment containing material. Keep container tightly closed. Keep in a cool, well-ventilated place. Combustible materials should be stored away from extreme heat and away from strong oxidizing agents.

## Section 8: Exposure Controls/Personal Protection

### Engineering Controls:

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

### Personal Protection:

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

### Personal Protection in Case of a Large Spill:

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

### Exposure Limits:

TWA: 0.2 (mg/m<sup>3</sup>) Consult local authorities for acceptable exposure limits.

## Section 9: Physical and Chemical Properties

**Physical state and appearance:** Solid. (Solid metallic powder.)

**Odor:** Odorless.

**Taste:** Not available.

**Molecular Weight:** 78.96 g/mole

**Color:** Not available.

**pH (1% soln/water):** Not applicable.

**Boiling Point:** 684.9°C (1264.8°F)

**Melting Point:** 217°C (422.6°F)

**Critical Temperature:** Not available.

**Specific Gravity:** 4.81 (Water = 1)

**Vapor Pressure:** Not applicable.

**Vapor Density:** Not available.

**Volatility:** Not available.

**Odor Threshold:** Not available.

**Water/Oil Dist. Coeff.:** Not available.

**Ionicity (in Water):** Not available.

**Dispersion Properties:** Not available.

**Solubility:** Insoluble in cold water.

## Section 10: Stability and Reactivity Data

**Stability:** The product is stable.

**Instability Temperature:** Not available.

**Conditions of Instability:** Not available.

**Incompatibility with various substances:** Not available.

**Corrosivity:** Non-corrosive in presence of glass.

**Special Remarks on Reactivity:** Not available.

**Special Remarks on Corrosivity:** Not available.

**Polymerization:** No.

### Section 11: Toxicological Information

**Routes of Entry:** Eye contact. Inhalation. Ingestion.

**Toxicity to Animals:** Acute oral toxicity (LD50): 6700 mg/kg [Rat].

**Chronic Effects on Humans:** Not available.

**Other Toxic Effects on Humans:**

Hazardous in case of ingestion, of inhalation. Slightly hazardous in case of skin contact (irritant).

**Special Remarks on Toxicity to Animals:** Not available.

**Special Remarks on Chronic Effects on Humans:** Passes through the placental barrier in animal. Excreted in maternal milk in human.

**Special Remarks on other Toxic Effects on Humans:** Not available.

### Section 12: Ecological Information

**Ecotoxicity:** Not available.

**BOD5 and COD:** Not available.

**Products of Biodegradation:**

Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

**Toxicity of the Products of Biodegradation:** The products of degradation are more toxic.

**Special Remarks on the Products of Biodegradation:** Not available.

### Section 13: Disposal Considerations

**Waste Disposal:**

### Section 14: Transport Information

**DOT Classification:** CLASS 6.1: Poisonous material.

**Identification:** : Selenium powder : UN2658 PG: III

**Special Provisions for Transport:** Not available.

### Section 15: Other Regulatory Information

**Federal and State Regulations:**

Pennsylvania RTK: Selenium Massachusetts RTK: Selenium TSCA 8(b) inventory: Selenium SARA 313 toxic chemical notification and release reporting: Selenium CERCLA: Hazardous substances.: Selenium

**Other Regulations:** OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200).

**Other Classifications:**

**WHMIS (Canada):** CLASS D-1B: Material causing immediate and serious toxic effects (TOXIC).

**DSCL (EEC):** R36- Irritating to eyes.

**HMIS (U.S.A.):**

**Health Hazard:** 2

**Fire Hazard:** 1

**Reactivity:** 0

**Personal Protection:** E

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

**Health:** 2

**Flammability:** 1

**Reactivity:** 0

**Specific hazard:**

**Protective Equipment:**

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

**Section 16: Other Information**

**References:** Not available.

**Other Special Considerations:** Not available.

**Created:** 10/09/2005 06:24 PM

**Last Updated:** 05/21/2013 12:00 PM

*The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no event shall ScienceLab.com be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential or exemplary damages, howsoever arising, even if ScienceLab.com has been advised of the possibility of such damages.*

**SILVER METAL  
SAFETY DATA SHEET**

**SECTION 1. IDENTIFICATION**

**Product Identity:** Silver Metal.

**Trade Names and Synonyms:** Argentum; TADANAC® Silver; C.I. 77820.

**Manufacturer:**  
Teck Metals Ltd.  
Trail Operations  
Trail, British Columbia  
V1R 4L8  
Emergency Telephone: 250-364-4214

**Supplier:**  
In U.S.:  
Teck American Metal Sales  
Incorporated  
501 North Riverpoint Blvd, Suite 300  
Spokane, WA  
USA, 99202

**Preparer:**  
Teck Metals Ltd.  
Suite 3300 – 550 Burrard Street  
Vancouver, British Columbia  
V6C 0B3

Other than U.S.:  
Teck Metals Ltd.  
#1700 – 11 King Street West  
Toronto, Ontario  
M5H 4C7

**Date of Last Review:** July 20, 2015.

**Date of Last Edit:** July 20, 2015.

**Product Use:** Silver is used in the manufacture of photographic film, coins, electronics, tableware, mirrors, jewelry, ornaments, special batteries and vessels and equipment used to manufacture medicinal chemicals, process foods and beverages, and handle organic acids; for electroplating; as a catalyst in hydrogenation and oxidation processes, and as an ingredient in dental alloys.

**SECTION 2. HAZARDS IDENTIFICATION**

**CLASSIFICATION:**

*NOTE: In the form in which it is sold this product is not regulated as a Hazardous Product in the U.S. or Canada. This Safety Data Sheet is provided for information purposes only.*

Health	Physical	Environmental
Acute Toxicity (Oral, Inhalation) – Does not meet criteria Skin Corrosion/Irritation – Does not meet criteria Eye Damage/Eye Irritation – Does not meet criteria Respiratory or Skin Sensitization – Does not meet criteria Mutagenicity – Does not meet criteria Carcinogenicity – Does not meet criteria Reproductive Toxicity – Does not meet criteria Specific Target Organ Toxicity: Acute Exposure – Does not meet criteria Chronic Exposure – Does not meet criteria	Does not meet criteria for any Physical Hazard	<b>Aquatic Toxicity – Long Term (Chronic) Category 4</b>

**LABEL:**

<b>Symbols:</b>  <i>None Required</i>	<b>Signal Word:</b>  <i>None Required</i>
<b>Hazard Statements</b>  May cause long lasting harmful effects to aquatic life.	<b>Precautionary Statements:</b>  Avoid release to the environment.

**Emergency Overview:** A lustrous white metal that does not burn in bulk but may form a weak explosive mixture if dispersed in air as a fine powder. This product is relatively non-toxic and poses little immediate hazard to the health of emergency response personnel or to the environment in an emergency situation.

**Potential Health Effects:** Metallic silver is relatively non-toxic to humans. This product may cause mild local irritation to eyes, nose, throat and upper airways, particularly if the product is heated to the point of fuming. Prolonged exposure to silver dust may cause a bluish or grayish pigmentation to the skin, eyes and mucous membranes. Silver is not listed as a carcinogen by OSHA, NTP, IARC, ACGIH or the EU (see Toxicological Information, Section 11).

**Potential Environmental Effects:** In the form in which this product is sold, it has low bioavailability and does not pose any significant environmental risks. Releases of the product to water and soil should, nevertheless, be prevented (see Ecological Information, Section 12).

### SECTION 3. COMPOSITION / INFORMATION ON INGREDIENTS

COMPONENT	CAS Registry No.	CONCENTRATION (% wgt/wgt)
Silver	7440-22-4	99.99%

Note: See Section 8 for Occupational Exposure Guidelines.

### SECTION 4. FIRST AID MEASURES

**Eye Contact:** *Symptoms:* Mild irritation, redness. Do not allow victim to rub eye(s). Let the eye(s) water naturally for a few minutes. If particle/dust does not dislodge, flush with lukewarm, gently flowing water for 5 minutes or until particle/dust is removed, while holding eyelid(s) open. If irritation persists, obtain medical attention. DO NOT attempt to manually remove anything stuck to the eye.

**Skin Contact:** *Symptoms:* Soiling of skin. Dust: No health effects expected. If irritation does occur, wash with lukewarm, gently flowing water and mild soap for 5 minutes or until the product is removed. If skin irritation persists or if you feel unwell, obtain medical advice. Molten Metal: Flush contact area to solidify and cool but do not attempt to remove encrusted material or clothing. Cover burns and seek medical attention immediately.

**Inhalation:** *Symptoms:* Coughing and irritation in heavy dust clouds. If symptoms are experienced remove source of contamination or move victim to fresh air. Get medical advice/attention if you feel unwell or are concerned.

**Ingestion:** *Symptoms:* Stomach upset, nausea, vomiting. If swallowed, no specific intervention is indicated as this material is not likely to be hazardous by ingestion. However, if irritation or discomfort occurs, obtain medical advice.

### SECTION 5. FIRE FIGHTING MEASURES

**Fire and Explosion Hazards:** Massive metal is difficult to ignite and is not considered a serious fire hazard. Finely-divided silver metal dust or powder may form weakly explosive dust clouds when dispersed in the air at high concentrations and exposed to heat, flame, or other sources of ignition. Explosions may also occur upon contact with certain incompatible materials (see Stability and Reactivity, Section 10).

**Extinguishing Media:** Use any means of extinction appropriate for surrounding fire conditions such as water spray, carbon dioxide, dry chemical, or foam. Do not use direct water streams on fires where molten metal is present.

**Fire Fighting:** Fire fighters should be fully trained and wear full protective clothing including an approved, self-contained breathing apparatus which supplies a positive air pressure within a full face-piece mask.

### SECTION 6. ACCIDENTAL RELEASE MEASURES

**Procedures for Cleanup:** Control source of spillage if possible to do so safely. Clean up spilled material immediately, observing precautions in Section 8, Personal Protection. Molten metal should be allowed to cool and harden before cleanup. Once solidified wear gloves, pick up and return to process. Powder or dust should be cleaned up by carefully sweeping. Return uncontaminated spilled material to the process if possible. Place contaminated material in clean, dry, suitably labelled containers for later recovery in view of the economic value of silver. Treat or dispose of waste material in accordance with all local, regional, and national requirements.

**Personal Precautions:** Protective clothing, gloves, and a respirator are recommended for persons responding to an accidental release, especially of molten silver metal. Close-fitting safety goggles may be necessary in some circumstances to prevent eye contact with dust or fume. Where molten metal is involved, heat-resistant gloves and suitable clothing for protection from hot-metal splash should be worn.

**Environmental Precautions:** Silver metal has relatively low bioavailability and is not considered to pose immediate ecological risks. However, good management practices should always be applied in the storage and use of silver and its compounds. Releases of the product to water and soil should be prevented.

## SECTION 7. HANDLING AND STORAGE

Store silver in a secure, covered area away from incompatible materials. Solid metal suspected of containing moisture should be THOROUGHLY DRIED before being added to a molten bath. Otherwise, entrained moisture could expand explosively and spatter molten metal out of the bath.

## SECTION 8. EXPOSURE CONTROLS / PERSONAL PROTECTION

**Occupational Exposure Guidelines:** (*Time-Weighted Average (TWA) concentration over 8 hr unless otherwise indicated*)

<u>Component</u>	<u>ACGIH TLV</u>	<u>OSHA PEL</u>	<u>NIOSH REL</u>
Silver	0.1 mg/m <sup>3</sup>	0.01 mg/m <sup>3</sup>	0.01 mg/m <sup>3</sup>

NOTE: OEGs for individual jurisdictions may differ from those given above. Check with local authorities for the applicable OEGs in your jurisdiction.

ACGIH - American Conference of Governmental Industrial Hygienists; OSHA - Occupational Safety and Health Administration; NIOSH - National Institute for Occupational Safety and Health. TLV – Threshold Limit Value, PEL – Permissible Exposure Limit, REL – Recommended Exposure Limit.

*NOTE: The selection of the necessary level of engineering controls and personal protective equipment will vary depending upon the conditions of use and the potential for exposure. The following are therefore only general guidelines that may not fit all circumstances. Control measures to consider include:*

**Ventilation:** Use adequate local or general ventilation to maintain the concentration of silver fumes in the working environment well below recommended occupational exposure limits. Supply sufficient replacement air to make up for air removed by the exhaust system. Local exhaust is recommended for melting, casting, grinding and polishing, etching, or use of powders.

**Protective Clothing:** Gloves and coveralls or other work clothing are recommended to prevent prolonged or repeated direct skin contact when silver is processed. Appropriate eye protection should be worn where fume or dust is generated. Where hot or molten metal is handled, heat-resistant gloves, goggles or face-shield, and clothing to protect from hot metal splash should be worn. Safety type boots are recommended.

**Respirators:** Where silver dust or fumes are generated and cannot be controlled to within acceptable levels by engineering means, use appropriate NIOSH-approved respiratory protection equipment (a 42CFR84 Class N, R or P-95 particulate filter cartridge or better).

**General Hygiene Considerations:** Always practice good personal hygiene. Refrain from eating, drinking, or smoking in work areas. Thoroughly wash hands before eating, drinking, or smoking in appropriate, designated areas. No special packaging materials are required.

## SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

<b>Appearance:</b> Ductile lustrous white metal	<b>Odour:</b> None	<b>Odour Threshold:</b> None	<b>pH:</b> Not Applicable
<b>Vapour Pressure:</b> Negligible @ 20°C	<b>Vapour Density:</b> Not Applicable	<b>Melting Point/Range:</b> 961°C	<b>Boiling Point/Range:</b> 2212°C
<b>Relative Density</b> (Water = 1): 10.49	<b>Evaporation Rate:</b> Not Applicable	<b>Coefficient of Water/Oil Distribution:</b> Not Applicable	<b>Solubility:</b> Insoluble in water
<b>Flash Point:</b> None	<b>Flammable Limits (LEL/UEL):</b> Not Applicable.	<b>Auto-ignition Temperature:</b> Not Applicable.	<b>Decomposition Temperature:</b> Not Applicable.

## SECTION 10. STABILITY AND REACTIVITY

**Stability & Reactivity:** Massive metal is stable and not considered reactive under normal temperatures and pressures. Hazardous polymerization or runaway reactions will not occur. Ozone, sulphur, and hydrogen sulphide blacken silver. Most silver salts are light sensitive.

**Incompatibilities:** Silver reacts with acetylene, acetylene compounds and ammonia to form explosive and shock sensitive compounds. Contact with strong hydrogen peroxide solutions will cause violent decomposition of the peroxide, releasing oxygen

gas and increasing the fire and explosion potential. Silver is incompatible with bromine azide, chlorine trifluoride, ethyleneimine, oxalic and tartaric acids and with nitric acid in the presence of ethanol.

**Hazardous Decomposition Products:** High temperature operations such as oxy-acetylene cutting, electric arc welding or overheating a molten bath will generate silver oxide fume. The particle size of metal fumes is largely within the respirable size range, which increases the likelihood of inhalation and deposition of the fume within the body.

**SECTION 11. TOXICOLOGICAL INFORMATION**

**General:** Solid silver presents few health hazards. Repeated long-term exposure to silver dust can cause permanent blue-grey staining of eyes, nose, mouth, throat, and skin.

**Acute:**

**Skin/Eye:** Direct contact may cause mild local skin or eye irritation. There have been limited reports of allergic contact dermatitis following exposure to powdered silver, silver solutions, and dental amalgams.

**Inhalation:** Inhalation of silver fume or dust may be irritating to mucous membranes and the upper respiratory tract. Extremely high exposures to silver oxide fume have caused lung damage with pulmonary edema.

**Ingestion:** Ingestion of silver compounds may cause irritation of the stomach. However, ingestion is not a typical route of occupational exposure.

**Chronic:**

Prolonged exposure to silver dust may cause a bluish or greyish pigmentation to the skin, eyes and mucous membranes. This occurs slowly and may take years to develop. Once present, it does not go away and, in the most severe cases, may be quite disfiguring but is not considered to be a toxic effect. Silver is not listed as a human carcinogen by the Occupational Safety and Health Administration (OSHA), the National Toxicology Program (NTP), the International Agency for Research on Cancer (IARC), the American Conference of Governmental Industrial Hygienists (ACGIH) or the European Union (EU).

**Animal Toxicity:**

<u>Ingredient:</u>	<u>Acute Oral Toxicity:</u>	<u>Acute Dermal Toxicity:</u>	<u>Acute Inhalation Toxicity:</u>
Silver	>5,000 mg/kg <sup>†</sup>	>2,000 mg/kg*	>5.16 mg/m <sup>3‡</sup>
	<sup>†</sup> LD <sub>50</sub> , Rat, Oral,	* LD <sub>50</sub> , Rat, Dermal	<sup>‡</sup> LC <sub>50</sub> , Rat, Inhalation, 4 hour

**SECTION 12. ECOLOGICAL INFORMATION**

Silver metal is relatively insoluble, and therefore poses minimal ecological risks. However, its processing, use or extended exposure in aquatic and terrestrial environments may result in conversion of the metal to more bioavailable forms. In particular, silver compounds can be highly toxic to aquatic organisms.

**SECTION 13. DISPOSAL CONSIDERATIONS**

In view of the economic value of silver metal, every effort should be made to recover and reuse all spilled material. If material cannot be returned to process or recovered for its economic value, dispose of only in accordance with applicable regulations.

**SECTION 14. TRANSPORT INFORMATION**

No special shipping or transportation requirements.

**SECTION 15. REGULATORY INFORMATION**

**U.S.**

Listed on TSCA Inventory ..... Yes

Hazardous Under Hazard Communication Standard ..... No

CERCLA Section 103 Hazardous Substance ..... Yes ..... RQ 1,000lbs. (454 kg.)\*  
 \*reporting not required if the diameter of the metal pieces released is equal to or exceeds 100 micrometers (0.004 inches)

EPCRA Section 302 Extremely Hazardous Substance ..... No

EPCRA Section 311/312 Hazard Categories ..... No Hazard Categories Apply  
EPCRA Section 313 Toxic Release Inventory: ..... Silver - CAS Number 7440-22-4  
Percent by Weight 99.99%

## SECTION 16. OTHER INFORMATION

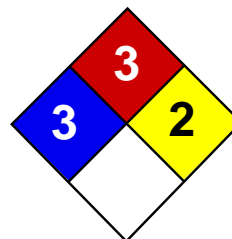
**Date of Original Issue:** December 3, 1998      **Version:** 01 (*First edition*)  
**Date of Latest Revision:** July 20, 2015      **Version:** 13

The information in this Safety Data Sheet is based on the following references:

- American Conference of Governmental Industrial Hygienists, 2004, Documentation of the Threshold Limit Values and Biological Indices, 7<sup>th</sup> Edition plus updates.
- American Conference of Governmental Industrial Hygienists, Guide to Occupational Exposure Values - 2015.
- American Conference of Governmental Industrial Hygienists, 2015, Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices.
- Bretherick's Handbook of Reactive Chemical Hazards, 20<sup>th</sup> Anniversary Edition. (P. G. Urben Ed.) 1995.
- Canadian Centre for Occupational Health and Safety (CCOHS) CHEMINFO Chemical Substance Data Base.
- Commission de la santé et la sécurité du travail, Service du Répertoire toxicologique, – Argent Métal.
- European Regulation (EC) No 1272/2008 on classification, labelling and packaging of substances and mixtures, amending and repealing directives 67/548/EEC and 1999/45/EC, and amending Regulation (EC) No 1907/2006 (REACH).
- Health Canada, SOR/2015-17, Hazardous Products Regulations, 30 January 2015.
- Merck & Co., Inc., 2001, The Merck Index, An Encyclopedia of Chemicals, Drugs, and Biologicals, 13<sup>th</sup> Edition.
- National Library of Medicine, National Toxicology Information Program, Hazardous Substance Data Bank (on-line version).
- Patty's Toxicology, 5<sup>th</sup> Edition, 2001: E. Bingham, B. Cohrssen & C.H. Powell, Ed.
- U.S. Dept. of Health and Human Services, National Institute for Occupational Safety and Health, NIOSH Pocket Guide to Chemical Hazards (on-line version).
- U.S. EPA, Prevention, Pesticides, & Toxic Substances, Reregistration Eligibility Decision (RED) for Silver, Revised July 1993.
- U.S. Occupational Safety and Health Administration, 1989, Code of Federal Regulations, Title 29, Part 1910.

### Notice to Reader

Although reasonable precautions have been taken in the preparation of the data contained herein, it is offered solely for your information, consideration and investigation. Teck American Metal Sales Incorporated and Teck Metals Ltd. extend no warranty and assume no responsibility for the accuracy of the content and expressly disclaim all liability for reliance thereon. This safety data sheet provides guidelines for the safe handling and processing of this product; it does not and cannot advise on all possible situations. Therefore, your specific use of this product should be evaluated to determine if additional precautions are required. Individuals exposed to this product should read and understand this information and be provided pertinent training prior to working with this product.



Health	3
Fire	3
Reactivity	2
Personal Protection	E

## Material Safety Data Sheet Sodium MSDS

### Section 1: Chemical Product and Company Identification

**Product Name:** Sodium

**Catalog Codes:** SLS3505

**CAS#:** 7440-23-5

**RTECS:** VY0686000

**TSCA:** TSCA 8(b) inventory: Sodium

**CI#:** Not applicable.

**Synonym:** Natrium

**Chemical Name:** Sodium

**Chemical Formula:** Na

**Contact Information:**

**Sciencelab.com, Inc.**

14025 Smith Rd.

Houston, Texas 77396

US Sales: **1-800-901-7247**

International Sales: **1-281-441-4400**

Order Online: [ScienceLab.com](http://ScienceLab.com)

**CHEMTREC (24HR Emergency Telephone), call:**

1-800-424-9300

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

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

### Section 2: Composition and Information on Ingredients

**Composition:**

Name	CAS #	% by Weight
Sodium	7440-23-5	100

**Toxicological Data on Ingredients:** Sodium LD50: Not available. LC50: Not available.

### Section 3: Hazards Identification

**Potential Acute Health Effects:**

Very hazardous in case of skin contact (irritant), of eye contact (irritant). Hazardous in case of skin contact (permeator), of ingestion, of inhalation. Inflammation of the eye is characterized by redness, watering, and itching. Skin inflammation is characterized by itching, scaling, reddening, or, occasionally, blistering.

**Potential Chronic Health Effects:**

CARCINOGENIC EFFECTS: Not available. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. Repeated or prolonged exposure is not known to aggravate medical condition.

### Section 4: First Aid Measures

**Eye Contact:** Check for and remove any contact lenses. Do not use an eye ointment. Seek medical attention.

**Skin Contact:**

After contact with skin, wash immediately with plenty of water. Gently and thoroughly wash the contaminated skin with running water and non-abrasive soap. Be particularly careful to clean folds, crevices, creases and groin. Cover the irritated skin with an emollient. If irritation persists, seek medical attention. Wash contaminated clothing before reusing.

**Serious Skin Contact:**

Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek medical attention.

**Inhalation:** Allow the victim to rest in a well ventilated area. Seek immediate medical attention.

**Serious Inhalation:**

Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek medical attention.

**Ingestion:**

Do not induce vomiting. Loosen tight clothing such as a collar, tie, belt or waistband. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek immediate medical attention.

**Serious Ingestion:** Not available.

### Section 5: Fire and Explosion Data

**Flammability of the Product:** Flammable.

**Auto-Ignition Temperature:** 115°C (239°F)

**Flash Points:** Not available.

**Flammable Limits:** Not available.

**Products of Combustion:** Some metallic oxides.

**Fire Hazards in Presence of Various Substances:**

Extremely flammable in presence of moisture. Highly flammable in presence of open flames and sparks, of heat.

**Explosion Hazards in Presence of Various Substances:**

Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

**Fire Fighting Media and Instructions:**

Flammable solid. Moisture reactive material. SMALL FIRE: Obtain advice on use of water. Use DRY chemical powder. LARGE FIRE: Use water spray or fog. Do not use water jet.

**Special Remarks on Fire Hazards:** When heated to decomposition it emits toxic fumes.

**Special Remarks on Explosion Hazards:** Not available.

### Section 6: Accidental Release Measures

**Small Spill:** Use appropriate tools to put the spilled solid in a convenient waste disposal container.

**Large Spill:**

Flammable solid that, in contact with water, emits flammable gases. Stop leak if without risk. Do not get water inside container. Do not touch spilled material. Cover with dry earth, sand or other non-combustible material. Prevent entry into sewers, basements or confined areas; dike if needed. Eliminate all ignition sources. Call for assistance on disposal.

### Section 7: Handling and Storage

**Precautions:**

Keep under inert atmosphere. Keep container dry. Do not breathe dust. Never add water to this product. In case of insufficient ventilation, wear suitable respiratory equipment. If you feel unwell, seek medical attention and show the label when possible. Avoid contact with skin and eyes. Keep away from incompatibles such as oxidizing agents, acids, moisture.

**Storage:**

Flammable materials should be stored in a separate safety storage cabinet or room. Keep away from heat. Keep away from sources of ignition. Keep container tightly closed. Keep in a cool, well-ventilated place. Ground all equipment containing material. Keep container dry. Keep in a cool place.

**Section 8: Exposure Controls/Personal Protection****Engineering Controls:**

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

**Personal Protection:**

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

**Personal Protection in Case of a Large Spill:**

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

**Exposure Limits:** Not available.

**Section 9: Physical and Chemical Properties**

**Physical state and appearance:** Solid. (Metal solid.)

**Odor:** Not available.

**Taste:** Not available.

**Molecular Weight:** 22.99 g/mole

**Color:** Silvery.

**pH (1% soln/water):** Not applicable.

**Boiling Point:** 881.4°C (1618.5°F)

**Melting Point:** 97.8°C (208°F)

**Critical Temperature:** Not available.

**Specific Gravity:** 0.97 (Water = 1)

**Vapor Pressure:** Not applicable.

**Vapor Density:** Not available.

**Volatility:** Not available.

**Odor Threshold:** Not available.

**Water/Oil Dist. Coeff.:** Not available.

**Ionicity (in Water):** Not available.

**Dispersion Properties:** Not available.

**Solubility:** Insoluble in cold water, hot water.

**Section 10: Stability and Reactivity Data**

**Stability:** The product is stable.

**Instability Temperature:** Not available.

**Conditions of Instability:** Not available.

**Incompatibility with various substances:**

Highly reactive with oxidizing agents, acids, moisture. The product reacts violently with water to emit flammable but non toxic gases.

**Corrosivity:** Not available.

**Special Remarks on Reactivity:** Not available.

**Special Remarks on Corrosivity:** Not available.

**Polymerization:** No.

### Section 11: Toxicological Information

**Routes of Entry:** Dermal contact. Eye contact. Inhalation. Ingestion.

**Toxicity to Animals:**

LD50: Not available. LC50: Not available.

**Chronic Effects on Humans:** Not available.

**Other Toxic Effects on Humans:**

Very hazardous in case of skin contact (irritant). Hazardous in case of skin contact (permeator), of ingestion, of inhalation.

**Special Remarks on Toxicity to Animals:** Not available.

**Special Remarks on Chronic Effects on Humans:** Not available.

**Special Remarks on other Toxic Effects on Humans:** Material is destructive to tissue of the mucous membranes and upper respiratory tract.

### Section 12: Ecological Information

**Ecotoxicity:** Not available.

**BOD5 and COD:** Not available.

**Products of Biodegradation:**

Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

**Toxicity of the Products of Biodegradation:** The products of degradation are more toxic.

**Special Remarks on the Products of Biodegradation:** Not available.

### Section 13: Disposal Considerations

**Waste Disposal:**

### Section 14: Transport Information

**DOT Classification:** CLASS 4.3: Material that emits flammable gases on contact with water.

**Identification:** : Sodium : UN1428 PG: I

**Special Provisions for Transport:** Not available.

## Section 15: Other Regulatory Information

### Federal and State Regulations:

Pennsylvania RTK: Sodium Massachusetts RTK: Sodium TSCA 8(b) inventory: Sodium CERCLA: Hazardous substances.: Sodium

**Other Regulations:** OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200).

### Other Classifications:

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

### DSCL (EEC):

R17- Spontaneously flammable in air. R38- Irritating to skin. R41- Risk of serious damage to eyes.

### HMIS (U.S.A.):

**Health Hazard:** 3

**Fire Hazard:** 3

**Reactivity:** 2

**Personal Protection:** E

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

**Health:** 3

**Flammability:** 3

**Reactivity:** 2

**Specific hazard:**

### Protective Equipment:

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

## Section 16: Other Information

### References:

-Hawley, G.G.. The Condensed Chemical Dictionary, 11e ed., New York N.Y., Van Nostrand Reinold, 1987. -SAX, N.I. Dangerous Properties of Industrial Materials. Toronto, Van Nostrand Reinold, 6e ed. 1984. -The Sigma-Aldrich Library of Chemical Safety Data, Edition II. -Guide de la loi et du règlement sur le transport des marchandises dangereuses au Canada. Centre de conformité international Ltée. 1986.

**Other Special Considerations:** Not available.

**Created:** 10/09/2005 06:28 PM

**Last Updated:** 05/21/2013 12:00 PM

*The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no event shall ScienceLab.com be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential or exemplary damages, howsoever arising, even if ScienceLab.com has been advised of the possibility of such damages.*

# Thallium

[Print](#)

## SAFETY DATA SHEET

### 1 PRODUCT AND SUPPLIER IDENTIFICATION

Product Name: Thallium Solid

Formula: Tl

Supplier: ESPI Metals

1050 Benson Way

Ashland, OR 97520

Telephone: 800-638-2581

Fax: 541-488-8313

Email: [sales@espimetals.com](mailto:sales@espimetals.com)

Emergency: Infotrac 800-535-5053 (US) or 352-323-3500 (24 hour)

Recommended Uses: Scientific Research

### 2 HAZARDS IDENTIFICATION

GHS Classification (29 CFR 1910.1200): Acute toxicity - oral, category 2.

GHS Label Elements:



Signal Word: Danger

Hazard Statements: H300 Fatal if swallowed.

Precautionary Statements: P264 Wash hands thoroughly after handling, P270 Do not eat, drink or smoke when using this product, P301+P310 IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician, P330 Rinse mouth, P405 Store

locked up, P501 Dispose of contents/container in accordance with local, state or federal regulations.

### 3 COMPOSITION/INFORMATION ON INGREDIENTS

Ingredient: Thallium  
CAS#: 7440-28-0  
% : 100  
EC#: 231-138-1

### 4 FIRST AID MEASURES

General Measures: Emergency responders should take care to avoid secondary exposure to thallium if it is present. Wear appropriate protective equipment.

INHALATION: Remove to fresh air, keep warm and quiet, give oxygen if breathing is difficult. Seek immediate medical attention. If mouth-to-mouth is necessary always use a barrier or bag-valve-mask device.

INGESTION: Rinse mouth with water. Do not induce vomiting. Seek immediate medical attention. Never induce vomiting or give anything by mouth to an unconscious person.

SKIN: Remove contaminated clothing, wash affected area with soap and water taking care not to break the skin and to cover all open wounds. Seek medical attention. Contaminated clothing should be safely contained and properly disposed of.

EYES: Flush eyes with lukewarm water, including under upper and lower eyelids, for at least 15 minutes. Seek medical attention immediately.

Most Important Symptoms/ Effects, Acute and Delayed: Symptoms are usually delayed and include gastrointestinal distress and neurological symptoms. See section 11 for more information.

Indication of Immediate Medical Attention and Special Treatment: No other information available.

### 5 FIREFIGHTING MEASURES

Extinguishing Media: Use extinguishing media suitable for surrounding materials and type of fire.

Unsuitable Extinguishing Media: No further information available.

Specific Hazards Arising from the Material: Under fire conditions, thallium may release highly toxic fumes or gases.

Special Protective Equipment and Precautions for Firefighters: Full face, self-contained breathing apparatus and full protective clothing.

### 6 ACCIDENTAL RELEASE MEASURES

Personal Precautions, Protective Equipment, and Emergency Procedures: Wear appropriate respiratory and protective equipment specified in section 8. Isolate spill area and provide ventilation. Avoid breathing dust or fume. Avoid contact with skin and eyes. Eliminate all sources of ignition.

Methods and Materials for Containment and Cleaning Up: Scoop up or vacuum with a system utilizing a HEPA filtration system and place in properly labeled sealed containers. Special precautions must be taken when changing filters on HEPA vacuum cleaners used to clean up hazardous materials. Avoid creating dusts. Avoid contamination of air and water.

Environmental Precautions: Do not allow to enter drains or to be released to the environment.

## 7 HANDLING AND STORAGE

Precautions for Safe Handling: Wear appropriate respiratory and protective equipment specified in section 8. Only trained personnel should work with this product. Handle in a well-ventilated area. Avoid exposure to high temperature. Avoid breathing fumes. Avoid contact with skin and eyes. Wash thoroughly before eating or smoking.

Conditions for Safe Storage, Including Any Incompatibilities: Store under dry, inert gas such as argon, or can also be stored under deaerated water. Store in sealed unbreakable containers; the original labeled shipping container when possible. Store in an area that is cool, dry and temperature-controlled, away from direct sunlight, heat and ignition sources or where freezing is possible. Do not store together with acids, halogens or oxidizers. See section 10 for more information on incompatible materials.

## 8 EXPOSURE CONTROLS AND PERSONAL PROTECTION

Exposure Limits: Thallium (Soluble compounds, as Tl)

OSHA/PEL: 0.1 mg/m<sup>3</sup>

ACGIH/TLV: 0.02 mg/m<sup>3</sup>(inhalable)

Appropriate Engineering Controls: Handle in an enclosed, controlled process under dry argon. Whenever possible the use of local exhaust ventilation, process enclosure or other engineering controls is the preferred method of controlling exposure to meet established occupational exposure limits. Use good housekeeping and sanitation practices. Do not use tobacco or food in work area. Wash thoroughly before eating or smoking. Clothing worn in areas of exposure to thallium dust or vapor should be restricted to the workplace and stored in special lockers.

Individual Protection Measures, Such as Personal Protective Equipment:

Respiratory Protection: When potential exposures are above the occupational limits, approved respirators must be used.

Eye Protection: Splash goggles or safety glasses.

Skin Protection: Wear impermeable gloves, protective work clothing as necessary.

## 9 PHYSICAL AND CHEMICAL PROPERTIES

Appearance:

Form: Rod

Color: Gray metallic

Odor: Odorless

Odor Threshold:	Not determined
pH:	N/A
Melting Point:	303.5 °C
Boiling Point:	1457±10 °C
Flash Point:	N/A
Evaporation Rate:	N/A
Flammability:	No data
Upper Flammable Limit:	No data
Lower Flammable Limit:	No data
Vapor Pressure:	1 mm Hg @ 825 °C
Vapor Density:	N/A
Relative Density (Specific Gravity):	11.85 g/cc
Solubility in H <sub>2</sub> O:	Insoluble
Partition Coefficient (n-octanol/water):	Not determined
Autoignition Temperature:	No data
Decomposition Temperature:	No data
Viscosity:	N/A

## 10 STABILITY AND REACTIVITY

Reactivity: No data

Chemical Stability: Stable under recommended storage conditions.

Possibility of Hazardous Reactions: High temperatures will generate toxic thallium oxide fumes.

Conditions to Avoid: Avoid high temperatures, reacts slowly with moist air.

Incompatible Materials: Oxidizing agents, strong acids, halogens, air and moisture.

Hazardous Decomposition Products: Thallium oxide fume.

## 11 TOXICOLOGICAL INFORMATION

Likely Routes of Exposure: Inhalation, skin and eyes.

Symptoms of Exposure: Abdominal pain and vomiting, extreme pain in the extremities, lethargy, hair loss.

Acute and Chronic Effects: Almost all of the available information refers to ingestion of thallium compounds, largely due to accidental ingestion, intentional poisoning and suicide attempts. Adverse reactions are dose dependent and occur in 3 stages. Massive doses may cause gastrointestinal distress (nausea, vomiting and abdominal pain) within 30 minutes but symptoms are

usually delayed for 8 hours or longer. Gastrointestinal symptoms from smaller doses may be delayed 24-48 hours. This is followed by neurological effects 2-5 days or even longer after ingestion, although it may occur as early as 12 hours after massive exposure. Other effects include hair loss, severe pain in the extremities, lethargy, ataxia, back pain, abnormal reflexes, neuropathy, muscle weakness, mental abnormalities, tremors, abnormal vision, headache, coma, convulsion, and death. There was no information available for exposure to thallium metal specifically rather than thallium compounds, and little conclusive information regarding exposure via inhalation.

Acute Toxicity: No data

Carcinogenicity: NTP: Not identified as carcinogenic IARC: Not identified as carcinogenic

To the best of our knowledge the chemical, physical and toxicological characteristics of the substance are not fully known.

## 12 ECOLOGICAL INFORMATION

Ecotoxicity: LC50 - *Cyprinodon variegatus* (sheepshead minnow) - 21.0 mg/l - 96.0 h

Persistence and Degradability: No data

Bioaccumulative Potential: No data

Mobility in Soil: No data

Other Adverse Effects: Do not allow material to be released to the environment. No further relevant information available.

## 13 DISPOSAL CONSIDERATIONS

Waste Disposal Method:

Product: Dispose of in accordance with Federal, State and Local regulations.

Packaging: Dispose of in accordance with Federal, State and Local regulations.

## 14 TRANSPORT INFORMATION

UN Number: UN3288

UN Proper Shipping Name: Toxic solid, inorganic, n.o.s. (Thallium)

Transport Hazard Class: 6.1

Packing Group: II

Marine Pollutant: Yes

## 15 REGULATORY INFORMATION

TSCA Listed: All components are listed.

Regulation (EC) No 1272/2008 (CLP): Acute toxicity - oral, category 2, Hazardous to the aquatic environment - acute hazard, category 3, Hazardous to the aquatic environment - chronic hazard, category 3.

Canada WHMIS Classification (CPR, SOR/88-66): Acute toxicity.

HMIS Ratings: Health: 3 Flammability: 0 Physical: 0

NFPA Ratings: Health: 3 Flammability: 0 Instability: 0

Chemical Safety Assessment: A chemical safety assessment has not been carried out.

## 16 OTHER INFORMATION

The information contained in this document is based on the state of our knowledge at the time of publication and is believed to be correct, but does not purport to be all inclusive and shall be used only as a guide. ESPI Metals makes no representation, warranty, or guarantee of any kind with respect to the information contained in this document or any use of the product based on this information. ESPI Metals shall not be held liable for any damages resulting from handling or from contact with the above product. Users should satisfy themselves that they have all current data relevant to their particular use.

Prepared by: ESPI Metals

Revised/Reviewed: July 2015



## Safety Data Sheet

### 1. PRODUCT IDENTIFICATION

Name	<b>Trichloroethylene</b>
Synonyms	1,1,2-trichloroethylene, acetylene trichloride, TCE & trade names
CAS#	79-01-6
Europe EC#	201-167-4
Product Uses	cleaning solvent for vapour degreasing

#### EMERGENCY INFORMATION

Canada	Call CANUTEC (collect)	(613) 996-6666
U.S.A.	Call CHEMTREC	(800) 424-9300

### 2. HAZARDS

<b>GHS Class (Category)</b>	<i>skin irritant</i> (2)	<i>eye irritant</i> (2)	<i>STOT</i> (3)	<i>carcinogen</i> (1B)	<i>aquatic chronic</i> (2)
<b>Signal Words</b>	<b>WARNING</b>	<b>WARNING</b>	<b>WARNING</b>	<b>DANGER</b>	<i>no Signal Word</i>
<b>Hazard Statements</b>	<i>causes skin irritation</i> (H315)	<i>causes serious eye irritation</i> (H319)	<i>may cause drowsiness or dizziness</i> (H336)	<i>may cause cancer</i> (H350)	<i>toxic to aquatic life with long-lasting effects</i> (H411)



#### GHS Precautionary Statements for Labelling

P261 P271	Avoid breathing vapour. Use only in a well ventilated area
P262 P264	Do not get in eyes, on skin or on clothing. Wash thoroughly after handling.
P270	Do not eat, drink or smoke when using this product.
P280	Wear eye protection, protective gloves and clothing of butyl or "Viton".
P273 P391	Avoid release to the environment. Collect spillage.

Canada – WHMIS  
Key:

**D 1B, D 2A, D 2B**  
**B 2** – Flash Point <38°C, **B 3** – Flash Point >38°C & <93°C  
**D 1** – Immediately Toxic, **D 2** – Chronic Toxicity  
**C** – Oxidising Substance, **E** – Corrosive, **F** – Reactive Substance



### 3. COMPOSITION

	%	TWAEV / TLV ppm / mg/m <sup>3</sup>	LD <sub>50</sub> (mg/kg) ORAL	LD <sub>50</sub> (mg/kg) SKIN	LC <sub>50</sub> ppm INHALATION
1,1,2-trichloroethylene	100%	10 / 55	2400	29,280	7175

### 4. FIRST AID

<b>SKIN:</b>	Wash with soap & plenty of water. Remove contaminated clothing and do not reuse until thoroughly laundered.
<b>EYES:</b>	Wash eyes with plenty of water, holding eyelids open. Seek medical assistance promptly if irritation persists.
<b>INHALATION:</b>	Remove from contaminated area promptly. <b>CAUTION: Rescuer must not endanger himself!</b> If breathing stops, administer artificial respiration and seek medical aid promptly.
<b>INGESTION:</b>	Give plenty of water to dilute product. Do not induce vomiting (NOTE below). Keep victim quiet. If vomiting occurs, lower victim's head below hips to prevent inhalation of vomited material. Seek medical help promptly.

*Inadvertent inhalation of vomited material may seriously damage the lungs. The danger of this is greater than the risk of poisoning through absorption of this relatively low-toxicity substance. The stomach should only be emptied under medical supervision, and after the installation of an airway to protect the lungs.*

**Please ensure that this SDS is given to, and explained to people using this product.**



Member: Canadian Association of Chemical Distributors



## 5. FIRE FIGHTING & FLAMMABILITY

Flash Point	will not flash <sup>1</sup>
Autoignition Temperature	410°C / 770°F <sup>1</sup>
Flammable Limits	8% ó 50% ó <i>only burns in continuous contact with ignition source</i>
Combustion Products	hydrogen chloride & chlorine ( <i>both corrosive</i> ), plus phosgene ( <i>highly toxic</i> )
Firefighting Precautions	as for substances sustaining fire; firefighters must wear SCBA
Static Discharge	will accumulate a static charge, but cannot be ignited by a spark

**NOTE:** *Trichloroethylene may ignite in the presence of a welding torch – and then produce highly hazardous vapours.*

## 6. ACCIDENTAL RELEASE MEASURES

Leak Precaution	dyke to control spillage; dyke must be able to contain the entire volume of a bulk storage tank
Handling Spill	ventilate contaminated area; recover free liquid with suitable pumps; absorb residue on an inert sorbent, sweep shovel & store in closed containers for recycling or disposal

## 7. HANDLING & STORAGE

Store in a cool environment, away from substances named in Part 10 (below).

Avoid breathing product vapour. Product should be used in equipment designed for the purpose (eg: vapour degreaser). Use with adequate ventilation. If dealing with a spill, and ventilation is impossible or impractical, wear a suitable respirator (see Part 8). ***Do not routinely wear a respirator for handling this product! Effective ventilation or engineering control of vapour is the ONLY acceptable way to protect people working with this product.***

When transferring product, if there is any danger of contact, wear appropriate protective clothing.

Never cut, drill, weld or grind on or near this container. Avoid contact with skin and wash work clothes frequently. An eye bath and safety shower must be available near the workplace.

**NOTE:** *Although trichloroethylene is hard to ignite, fire can convert vapours into highly toxic, corrosive gases – Part 5, above.*

## 8. EXPOSURE CONTROL & PERSONAL PROTECTION

Ontario TWAEV	10ppm / 55mg/m <sup>3</sup>	Ontario STEV	25ppm / 135mg/m <sup>3</sup>
ACGIH TLV	10ppm / 55mg/m <sup>3</sup>	ACGIH STEL	25ppm / 135mg/m <sup>3</sup>
OSHA PEL	50ppm / 270mg/m <sup>3</sup>	OSHA STEL	200ppm / 1080mg/m <sup>3</sup>
Ventilation	product should only be used in specially designed equipment (eg: vapour degreaser); mechanical ventilation should not be required so long as the equipment is working properly; <b><i>using this product in open air and relying on mechanical ventilation is NOT ACCEPTABLE</i></b> ; a respirator with organic vapour cartridge should be available for escape purposes, should vapour containment fail ( <i>always store respirators in airtight containers [eg: “Tupperware”] to maintain cartridge “freshness”</i> )		
Hands	ōVitonō gloves ó <i>other types also protect, always confirm suitability with supplier</i>		
Eyes	safety glasses with side shields or chemical goggles – <i>always protect eyes!</i>		
Clothing	impermeable (hands, above) apron, boots, long sleeves, if splashing is anticipated		

**Please ensure that this SDS is given to, and explained to people using this product.**

## 9. PHYSICAL PROPERTIES

Odour & Appearance	clear, colourless, liquid with mild, sweet, <i>pleasant</i> ether odour
Odour Threshold	80ppm ó 100ppm ó <i>well above the TLV; hazardous below odour threshold!</i>
Vapour Pressure	60mmHg / 8kPa (20°C / 68°F); also 74.5mmHg / 9.9kPa (25°C / 77°F) <sup>1</sup>
Evaporation Rate ( <i>Butyl Acetate = 1</i> )	4.5-4.9
Vapour Density (air = 1)	4.5
Boiling Point	87°C / 189°F
Freezing Point	-73°C / -99°F; also -85°C / -121°F <sup>1</sup>
Specific Gravity	1.46 (20/20°C)
Water Solubility	1.1 grams/litre (20°C / 68°F)
- in other solvents	most organic solvents
Log P <sub>O/W</sub> (Octanol/H <sub>2</sub> O partition)	2.53 <sup>1</sup>
Viscosity	0.58centipoise (20°C / 68°F) <sup>1</sup>
pH	none ó <i>does not yield hydrogen ions in solution</i>
Conversion Factor	1ppm = 5.36mg/m <sup>3</sup>
Molecular Weight	131

## 10. REACTIVITY

Dangerously Reactive With	strong oxidising agents or reducing agents; reactive metals (eg: Na, K, Ca, Ba)
Also Reactive With	strong alkalis forming explosive dichloroacetylene gas; copper reacts with any dichloroethylene present to form explosive acetylides; reactive with epoxides; unstabilised trichloroethylene may corrode aluminium, copper, zinc in presence of moisture
Chemical Stability	stable; will not polymerize ó except under x-ray or other radiation source, or in the presence of aluminium chloride
Decomposes in Presence of	iron, copper, zinc or aluminium at 250-600°C cause decomposition to phosgene; reactive metals cause decomposition to dichloroacetylene
Decomposition Products	apart from Hazardous Combustion Products ó dichloroacetylene
Mechanical Impact	not sensitive

## 11. TOXICITY

### Effects, Acute Exposure

Skin Contact	severely irritating if not removed promptly; chemical burns if contact is prolonged (>5 minutes)
Skin Absorption	slight ó no systemic toxic effects by this route
Eye Contact	liquid severely irritating, may damage eyes; vapour irritates some above 160ppm, others at 350ppm blurred vision & other disturbances have been reported following contact with eyes
Inhalation	headache, dizziness, drowsiness, intoxication may occur at above 350ppm; irritating above 1000ppm; high concentrations can lead to unconsciousness & death, numbness & muscle weakness also reported
Ingestion	burning sensation in mouth & throat; headache, dizziness, drowsiness, intoxication & vomiting, followed by muscle weakness, plus possible delayed heart, kidney & liver damage
LD <sub>50</sub> (oral)	4920 & 5620mg/kg (rat), 2400mg/kg (mouse), >7330mg/kg (rabbit), >5865mg/kg (cat), 5680mg/kg (dog)
LD <sub>50</sub> (skin)	29,280mg/kg (rabbit)
LC <sub>50</sub> (inhalation)	7175, 7440, 8450, 40,920 & 48,730ppm (mouse), 7250 & 26,170ppm (rat)

### Effects, Chronic Exposure

General	prolonged or repeated exposure may cause dermatitis; neurological damage (headache, sleeplessness, mood change), plus blurred or tunnel vision may be seen; loss of sensation in hands & feet may occur
Sensitising	not a sensitiser
Carcinogen/Tumorigen	probable carcinogen ó IARC ó Group 1, ACGIH ó A2; the NTP rates trichloroethylene a carcinogen
Reproductive Effect	no known effect on humans or animals
Mutagen	mutagen in a few animal tests, but not in others <sup>1</sup> ; not known to be a mutagen or teratogen in humans
Synergistic With	alcohol ó prior exposure to trichloroethylene followed by alcohol consumption causes upper body flush ó called <i>õdegreasers flushõ</i>

**Please ensure that this SDS is given to, and explained to people using this product.**

## 12. ECOLOGICAL INFORMATION

Bioaccumulation	trichloroethylene metabolised & excreted (½-life ~40hr) and will not bioaccumulate
Biodegradation	biodegrades in aerobic sewage treatment facilities, but only in the presence of other carbon sources; biodegradation is much slower under anaerobic conditions
Abiotic Degradation	reacts with atmospheric hydroxyl (OH) radicals; estimated ½-life in air 5-7 days
Mobility in soil, water	shown to have moderate mobility in soil and the water column
<b>Marine Toxicity</b>	
LC <sub>50</sub> (96 hr) Fish	28 & 63mg/litre/96hr (Jordanella floridae), 41mg/litre/96hr (Pimephelas promelas), 16mg/litre Limada limada), 52 & 99mg/litre (Cyprinodon variegatus), 45mg/litre (Lepomis macrochirus)
LC <sub>50</sub> (48hr) Shrimp	58mg/litre/ (Daphnia cucullata), 2.2, 8, 21 & 42-97mg/litre (Daphnia magna) & others
EC <sub>50</sub> (Algae)	450mg/litre (Scenedesmus subspicatus), 175mg/litre (Selenastrum capricornutum), 95 & 150mg/litre (Skeletonema costatum)
EC <sub>50</sub> (Bacteria)	235mg/litre (Bacillus subtilis), >400mg/litre (Chilomonas paramecium), 975mg/litre (Photobacterium phosphoreum) & others

## 13. DISPOSAL

Waste Disposal	<b>do not flush to sewer</b> , recycle solvent if possible, may be incinerated in approved facility <b>with flue gas monitoring and scrubbing after mixing with a suitable flammable waste solvent</b>
Containers	<b>Drums</b> should be reused. Recondition and pressure test by a licensed reconditioner prior to re-use. <b>Pails</b> must be vented and thoroughly dried prior to crushing and recycling. <b>IBCs</b> (intermediate bulk containers): polyethylene bottle must be pressure tested & recertified at 30 months. Replace at 60 months (5yrs). Steel containers must be inspected, pressure tested & recertified every 5 years. <b>Never cut, drill, weld or grind on or near this container, even if empty</b>

## 14. TRANSPORT CLASSIFICATION

Canada TDG	PIN	UN-1710
AND	Shipping Name	trichloroethylene
U.S.A. 49 CFR	Class	6.1
	Packing Group	III
Marine Pollutant		not a marine pollutant
ERAP Required		NO



## 15. REGULATIONS

Canada DSL	<b>on inventory</b>
U.S.A. TSCA	<b>on inventory</b>
Europe EINECS	<b>on inventory</b>

### U.S.A. Regulations:

**Immediately Dangerous to Life or Health:** 1000 ppm; NIOSH considers trichloroethylene to be a potential occupational carcinogen.

**Allowable Tolerances:** Tolerances are established for residues of trichloroethylene resulting from its use as a solvent in the manufacture of foods as follows:

Food	Parts per million
Decaffeinated ground coffee	25
Decaffeinated soluble (instant) coffee extract	10
Spice oleoresins	30 parts per million (provided that if residues of other chlorinated solvents are also present, the total of all residues of such solvents in spice oleoresins shall not exceed 30 parts per million).

**OSHA Standards:** Permissible Exposure Limit: Table Z-2 8-hr Time Weighted Avg: 100 ppm. Permissible Exposure Limit: Table Z-2 Acceptable Ceiling Concentration: 200 ppm. Permissible Exposure Limit: Table Z-2 Acceptable maximum peak above the acceptable ceiling concentration for an 8-hour shift. Concentration: 300 ppm. Maximum Duration: 5 minutes in any 2 hours. Vacated 1989 OSHA PEL TWA 50 ppm (270 mg/cu m); STEL 200 ppm (1080 mg/cu m) is still enforced in some states.

**NIOSH Recommendations:** NIOSH considers trichloroethylene to be a potential occupational carcinogen. NIOSH usually recommends that occupational exposures to carcinogens be limited to the lowest feasible concentration. Recommended Exposure Limit: 60 Minute Ceiling Value: 2 ppm. /During the usage of trichloroethylene as an anesthetic agent/ Recommended Exposure Limit: 10 Hour Time-Weighted Average: 25 ppm. /During exposures to trichloroethylene other than as an anesthetic agent/

**Please ensure that this SDS is given to, and explained to people using this product.**



Member: Canadian Association of Chemical Distributors



## 15. REGULATIONS, cont'd

**Threshold Limit Values:** 8 hr Time Weighted Avg (TWA): 10 ppm; 15min Short Term Exposure Limit (STEL) 25 ppm, A2: Suspected human carcinogen.

**Atmospheric Standards:** This action promulgates standards of performance for equipment leaks of Volatile Organic Compounds (VOC) in the Synthetic Organic Chemical Manufacturing Industry (SOCMI). The intended effect of these standards is to require all newly constructed, modified, and reconstructed SOCMI process units to use the best demonstrated system of continuous emission reduction for equipment leaks of VOC, considering costs, non air quality health and environmental impact and energy requirements. Trichloroethylene is produced, as an intermediate or a final product, by process units covered under this subpart. Listed as a hazardous air pollutant (HAP) generally known or suspected to cause serious health problems. The Clean Air Act, as amended in 1990, directs EPA to set standards requiring major sources to sharply reduce routine emissions of toxic pollutants. EPA is required to establish and phase in specific performance based standards for all air emission sources that emit one or more of the listed pollutants. Trichloroethylene is included on this list.

**Federal Drinking Water Standards:** Maximum contaminant level goals for organic contaminants: Trichloroethylene, MCLG: zero. Maximum contaminant levels (MCL) for organic contaminants apply to community and non-transient, non-community water systems: Trichloroethylene, MCL 0.005 mg/L. EPA 5 ug/l

**State Drinking Water Standards:** Florida 3 ug/l, New Jersey 1 ug/l

**State Drinking Water Guidelines:** Arizona 3.2 ug/l, Connecticut 5 ug/l, Maine 32 ug/l, Minnesota 5 ug/L

**Clean Water Act Requirements:** Toxic pollutant designated pursuant to section 307(a)(1) of the Federal Water Pollution Control Act and is subject to effluent limitations. Trichloroethylene is designated as a hazardous substance under section 311(b)(2)(A) of the Federal Water Pollution Control Act and further regulated by the Clean Water Act Amendments of 1977 and 1978. These regulations apply to discharges of this substance. This designation includes any isomers and hydrates, as well as any solutions and mixtures containing this substance.

**CERCLA Reportable Quantities:** Persons in charge of vessels or facilities are required to notify the National Response Center (NRC) immediately, when there is a release of this designated hazardous substance, in an amount equal to or greater than its reportable quantity of 100 lb or 45.4 kg. The toll free number of the NRC is (800) 424-8802. The rule for determining when notification is required is stated in 40 CFR 302.4 (section IV. D.3.b).

**RCRA Requirements:** As stipulated in 40 CFR 261.33, when trichloroethylene, as a commercial chemical product or manufacturing chemical intermediate or an off-specification commercial chemical product or a manufacturing chemical intermediate, becomes a waste, it must be managed according to Federal and/or State hazardous waste regulations. Also defined as a hazardous waste is any residue, contaminated soil, water, or other debris resulting from the cleanup of a spill, into water or on dry land, of this waste. Generators of small quantities of this waste may qualify for partial exclusion from hazardous waste regulations (40 CFR 261.5). A solid waste containing trichloroethylene may or may not become characterized as a hazardous waste when subjected to the Toxicity Characteristic Leaching Procedure listed in 40 CFR 261.24, and if so characterized, must be managed as a hazardous waste. When trichloroethylene is a spent solvent, it is classified as a hazardous waste from a nonspecific source, as stated in 40 CFR 261.31, and must be managed according to state and/or federal hazardous waste regulations.

**FDA Requirements:** Trichloroethylene is an indirect food additive for use as a component of adhesives. Tolerances are established for residues of trichloroethylene resulting from its use as a solvent in the manufacture of foods as follows:

Food	Parts per million
Decaffeinated ground coffee	25
Decaffeinated soluble (instant) coffee extract	10
Spice oleoresins	30 parts per million (provided that if residues of other chlorinated solvents are also present, the total of all residues of such solvents in spice oleoresins shall not exceed 30 parts per million).

## 16. OTHER INFORMATION

Prepared for Megaloid Laboratories by Peter Bursztyn, (705) 734-1577

Data from RTECS, HSDB (Haz. Substance Data Base), Cheminfo (CCOHS), IUCLID Datasheets (ESIS – European Chem. Substance Info. System), & others.

Preparation Date: May 2005 Revision Date: June 2008, June 2011, June 2014

**European Chemicals Agency (ECHA) dossier for Trichloroethylene:**

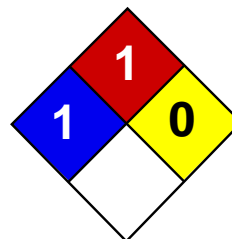
[http://apps.echa.europa.eu/registered/data/dossiers/DISS-9c83a2d3-4a9f-1ff5-e044-00144f67d249/DISS-9c83a2d3-4a9f-1ff5-e044-00144f67d249\\_DISS-9c83a2d3-4a9f-1ff5-e044-00144f67d249.html](http://apps.echa.europa.eu/registered/data/dossiers/DISS-9c83a2d3-4a9f-1ff5-e044-00144f67d249/DISS-9c83a2d3-4a9f-1ff5-e044-00144f67d249_DISS-9c83a2d3-4a9f-1ff5-e044-00144f67d249.html)

**Please ensure that this SDS is given to, and explained to people using this product.**



Member: Canadian Association of Chemical Distributors





Health	1
Fire	0
Reactivity	0
Personal Protection	E

## Material Safety Data Sheet Vanadium MSDS

### Section 1: Chemical Product and Company Identification

**Product Name:** Vanadium

**Catalog Codes:** SLV1306

**CAS#:** 7440-62-2

**RTECS:** YW1355000

**TSCA:** TSCA 8(b) inventory: Vanadium

**CI#:** Not applicable.

**Synonym:**

**Chemical Name:** Vanadium

**Chemical Formula:** V

**Contact Information:**

**Sciencelab.com, Inc.**

14025 Smith Rd.

Houston, Texas 77396

US Sales: **1-800-901-7247**

International Sales: **1-281-441-4400**

Order Online: [ScienceLab.com](http://ScienceLab.com)

**CHEMTREC (24HR Emergency Telephone), call:**

1-800-424-9300

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

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

### Section 2: Composition and Information on Ingredients

**Composition:**

Name	CAS #	% by Weight
Vanadium	7440-62-2	100

**Toxicological Data on Ingredients:** Not applicable.

### Section 3: Hazards Identification

**Potential Acute Health Effects:** Slightly hazardous in case of skin contact (irritant), of eye contact (irritant), of ingestion, of inhalation.

**Potential Chronic Health Effects:**

CARCINOGENIC EFFECTS: Not available. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. Repeated or prolonged exposure is not known to aggravate medical condition.

### Section 4: First Aid Measures

**Eye Contact:**

Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Get medical attention if irritation occurs.

**Skin Contact:** Wash with soap and water. Cover the irritated skin with an emollient. Get medical attention if irritation develops.

**Serious Skin Contact:** Not available.

**Inhalation:**

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

**Serious Inhalation:** Not available.

**Ingestion:**

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

**Serious Ingestion:** Not available.

### Section 5: Fire and Explosion Data

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

**Auto-Ignition Temperature:** Not available.

**Flash Points:** Not available.

**Flammable Limits:** Not available.

**Products of Combustion:** Some metallic oxides.

**Fire Hazards in Presence of Various Substances:** Non-flammable in presence of open flames and sparks, of shocks, of heat.

**Explosion Hazards in Presence of Various Substances:**

Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

**Fire Fighting Media and Instructions:**

SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use water spray, fog or foam. Do not use water jet.

**Special Remarks on Fire Hazards:** Not available.

**Special Remarks on Explosion Hazards:** Powdered Vanadium explodes with chlorine, even at 0 deg. C.

### Section 6: Accidental Release Measures

**Small Spill:**

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

**Large Spill:**

Use a shovel to put the material into a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and allow to evacuate through the sanitary system.

### Section 7: Handling and Storage

**Precautions:**

Keep away from heat. Keep away from sources of ignition. Ground all equipment containing material. Do not breathe dust. Keep away from incompatibles such as oxidizing agents.

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

### Section 8: Exposure Controls/Personal Protection

**Engineering Controls:**

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

**Personal Protection:** Safety glasses. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

**Personal Protection in Case of a Large Spill:**

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

**Exposure Limits:** TWA: 1 STEL: 3 (mg/m<sup>3</sup>) from NIOSH [United States] Inhalation (Fume or Dust) Consult local authorities for acceptable exposure limits.

## Section 9: Physical and Chemical Properties

**Physical state and appearance:** Solid.

**Odor:** Not available.

**Taste:** Not available.

**Molecular Weight:** 50.94 g/mole

**Color:** Grey. Grayish white. (Light.)

**pH (1% soln/water):** Not applicable.

**Boiling Point:** 3380°C (6116°F)

**Melting Point:** 1917°C (3482.6°F)

**Critical Temperature:** Not available.

**Specific Gravity:** 6.11 (Water = 1)

**Vapor Pressure:** Not applicable.

**Vapor Density:** Not available.

**Volatility:** Not available.

**Odor Threshold:** Not available.

**Water/Oil Dist. Coeff.:** Not available.

**Ionicity (in Water):** Not available.

**Dispersion Properties:** Not available.

**Solubility:** Insoluble in cold water.

## Section 10: Stability and Reactivity Data

**Stability:** The product is stable.

**Instability Temperature:** Not available.

**Conditions of Instability:** Not available.

**Incompatibility with various substances:** Reactive with oxidizing agents.

**Corrosivity:** Non-corrosive in presence of glass.

**Special Remarks on Reactivity:** Violent reaction with bromine trifluoride, chlorine, lithium, oxidants

**Special Remarks on Corrosivity:** Not available.

**Polymerization:** Will not occur.

## Section 11: Toxicological Information

**Routes of Entry:** Not available.

**Toxicity to Animals:**

LD50: Not available. LC50: Not available.

**Chronic Effects on Humans:** Not available.

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

**Special Remarks on Toxicity to Animals:** Not available.

**Special Remarks on Chronic Effects on Humans:** May cause cancer based on animal test data

**Special Remarks on other Toxic Effects on Humans:**

Acute Potential Health Effects: Skin: It can cause skin irritation. Eyes: Dust can cause eye irritation. Inhalation: It can irritate the nose, throat, and lungs causing coughing, wheezing and/or shortness of breath. Ingestion: Low hazard. Low toxicity. It may cause nausea, vomiting abdominal pain, and greenish discoloration of the tongue. It may also affect behavior/central nervous system and cause headache, dizziness, tremors. Chronic Potential health Effects: Ingestion: Prolonged or repeated ingestion may cause weight loss, and may cause kidney damage. It may also affect the blood and cause anemia. Inhalation: Prolonged or repeated inhalation may irritate the lungs. It may also cause bronchitis to develop with cough, phlegm, and/or shortness of breath. It may also cause an asthma-like allergy. Future exposure may cause asthma attacks with shortness of breath, wheezing, cough, and/or chest tightness.

## Section 12: Ecological Information

**Ecotoxicity:** Not available.

**BOD5 and COD:** Not available.

**Products of Biodegradation:**

Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

**Toxicity of the Products of Biodegradation:** The product itself and its products of degradation are not toxic.

**Special Remarks on the Products of Biodegradation:** Not available.

## Section 13: Disposal Considerations

**Waste Disposal:**

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

## Section 14: Transport Information

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

**Identification:** Not applicable.

**Special Provisions for Transport:** Not applicable.

## Section 15: Other Regulatory Information

**Federal and State Regulations:**

Pennsylvania RTK: Vanadium Massachusetts RTK: Vanadium New Jersey: Vanadium New Jersey spill list: Vanadium California Director's List of Hazardous Materials: Vanadium TSCA 8(b) inventory: Vanadium SARA 313 toxic chemical notification and release reporting: Vanadium

**Other Regulations:** EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

**Other Classifications:****WHMIS (Canada):**

The classification of this product has not been validated yet by the Service du repertoire toxicologique.

**DSCL (EEC):**

This product is not classified according to the EU regulations. Not applicable.

**HMIS (U.S.A.):**

**Health Hazard:** 1

**Fire Hazard:** 0

**Reactivity:** 0

**Personal Protection:** E

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

**Health:** 1

**Flammability:** 1

**Reactivity:** 0

**Specific hazard:**

**Protective Equipment:**

Gloves. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Safety glasses.

**Section 16: Other Information**

**References:** Not available.

**Other Special Considerations:** Not available.

**Created:** 10/10/2005 12:14 AM

**Last Updated:** 05/21/2013 12:00 PM

*The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no event shall ScienceLab.com be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential or exemplary damages, howsoever arising, even if ScienceLab.com has been advised of the possibility of such damages.*

## ZINC METAL SAFETY DATA SHEET

### SECTION 1. IDENTIFICATION

**Product Identity:** Zinc Metal

**Trade Names and Synonyms:** High Grade Zinc; Special High Grade Zinc; Zinc, Zn, CGG Alloy <1% Aluminum.

**Manufacturer:**

Teck Metals Ltd.  
Trail Operations  
Trail, British Columbia  
V1R 4L8  
Emergency Telephone: 250-364-4214

**Supplier:**

In U.S.:  
Teck American Metal Sales  
Incorporated  
501 North Riverpoint Blvd, Suite 300  
Spokane, WA  
USA, 99202

**Preparer:**

Teck Metals Ltd.  
Suite 3300 – 550 Burrard Street  
Vancouver, British Columbia  
V6C 0B3

Other than U.S.:

Teck Metals Ltd.  
#1700 – 11 King Street West  
Toronto, Ontario  
M5H 4C7

**Date of Last Review:** July 15, 2015.

**Date of Last Edit:** July 15, 2015.

**Product Use:** Zinc metal is used to coat steel for corrosion protection (galvanizing, electroplating, electrogalvanizing), as an alloying element in bronze, brass, aluminum and other metal alloys, for zinc die casting alloys, for zinc dry cell and zinc/air batteries, for the production of zinc sheet for architectural and coinage applications, as a reducing agent in organic chemistry and for other chemical applications.

### SECTION 2. HAZARDS IDENTIFICATION

**CLASSIFICATION:**

*NOTE: In the form in which it is sold this product is not regulated as a Hazardous Product in the U.S. or Canada. This Safety Data Sheet is provided for information purposes only.*

Health	Physical	Environmental
Acute Toxicity (Oral, Inhalation) – Does not meet criteria	Does not meet criteria for any Physical Hazard	Aquatic Toxicity – (Short Term/Long Term) Does not meet any criteria
Skin Corrosion/Irritation – Does not meet criteria		
Eye Damage/Eye Irritation – Does not meet criteria		
Respiratory or Skin Sensitization – Does not meet criteria		
Mutagenicity – Does not meet criteria		
Carcinogenicity – Does not meet criteria		
Reproductive Toxicity – Does not meet criteria		
Specific Target Organ Toxicity:		
Acute Exposure – Does not meet criteria		
Chronic Exposure – Does not meet criteria		

**LABEL:**

<b>Symbols:</b> None required	<b>Signal Word:</b> None required
<b>Hazard Statements</b>	<b>Precautionary Statements:</b>
None required	None required

**Emergency Overview:** A lustrous bluish-silver metal that does not burn in bulk but may form explosive mixtures if dispersed in air as a fine powder. Zinc oxide fume is formed when zinc metal is heated to or near the boiling point, or is burned. Contact with acids or alkalis generates flammable hydrogen gas which can accumulate in poorly ventilated areas. Do NOT use water or foam on burning zinc metal. Apply dry chemical, sand or special powder extinguishing media. Zinc is relatively non-toxic and poses little immediate hazard to the health of emergency response personnel or to the environment in an emergency situation.

**Potential Health Effects:** Zinc is essentially non-toxic to humans. However, zinc oxide fumes may cause mild local irritation to eyes, nose, throat and upper airways. Acute over-exposure to zinc oxide fume may cause metal fume fever, characterized by flu-like symptoms such as chills, fever, nausea, and vomiting which may be delayed 3 – 10 hours in onset. In most cases, dermal exposure to zinc or zinc compounds does not result in any noticeable toxic effects. Zinc is not listed as a carcinogen by OSHA, NTP, IARC, ACGIH or the EU (see Toxicological Information, Section 11).

**Potential Environmental Effects:** Zinc metal has relatively low bioavailability and poses no immediate ecological risks. Depending on physico-chemical characteristics (e.g., pH, water hardness), compounds of zinc metal can be toxic, particularly in the aquatic environment. Zinc also has the potential to bioaccumulate in plants and animals in both aquatic and terrestrial environments (see Ecological Information, Section 12).

### SECTION 3. COMPOSITION / INFORMATION ON INGREDIENTS

COMPONENTS	CAS Registry No.	CONCENTRATION (% wgt/wgt)
Zinc	7440-66-6	99+%

Note: See Section 8 for Occupational Exposure Guidelines.

### SECTION 4. FIRST AID MEASURES

**Eye Contact:** *Symptoms:* Mild eye irritation, redness. Do not rub eye(s). Let the eye(s) water naturally for a few minutes. Look right and left, then up and down. If particle/dust does not come out, cautiously rinse eye(s) with lukewarm, gently flowing water for 5 minutes or until particle/dust is removed, while holding eyelid(s) open. If eye irritation persists, get medical advice/attention. DO NOT attempt to manually remove anything from the eye.

**Skin Contact:** *Symptoms:* Soiling of skin. No health effects expected. If irritation does occur, rinse with lukewarm, gently flowing water for 5 minutes or until the product is removed. If skin irritation occurs or you feel unwell, get medical advice/attention.

*Molten Metal:* Flush contact area to solidify and cool but do not attempt to remove encrusted material or clothing. Cover burns and seek medical attention immediately.

**Inhalation:** *Symptoms:* Coughing and irritation in heavy dust clouds. If symptoms are experienced remove source of contamination or move victim from exposure area to fresh air immediately and obtain medical advice. NOTE: Metal fume fever may develop 3-10 hours after exposure to zinc oxide fumes. If symptoms of metal fume fever (flu-like symptoms) develop, obtain medical attention.

**Ingestion:** *Symptoms:* Stomach upset, nausea, diarrhea. If swallowed, no specific intervention is indicated as this material is not likely to be hazardous by ingestion. However, if you are concerned or you feel unwell, obtain medical advice.

### SECTION 5. FIRE FIGHTING MEASURES

**Fire and Explosion Hazards:** Massive metal is difficult to ignite and is not considered a serious fire hazard. However, finely-divided metallic dust may form flammable or explosive dust clouds when dispersed in the air at high concentrations and exposed to heat, flame, or other ignition sources. Bulk dust in a damp state may heat spontaneously and ignite on exposure to air. Contact with acids and alkali hydroxides results in evolution of hydrogen gas which is potentially explosive. Mixtures with potassium chlorate or fused ammonium nitrate may explode on impact.

**Extinguishing Media:** Apply dry chemical, dry sand, or special powder extinguishing (Class D) media. Do NOT use water, carbon dioxide or foam on molten metals. Water may be ineffective for extinguishing a fire but should be used to keep fire-exposed billets, ingots and castings cool.

**Fire Fighting:** If possible, move material not yet involved in the fire from the fire area. If this is not possible, cool fire-exposed zinc by applying hose streams or fogs. Apply only dry chemical, sand, or special powder extinguishing media to any molten or burning zinc metal. Take extreme caution to prevent contact of water with molten or burning zinc. Zinc foil in particular may ignite in the presence of water. Zinc oxide fumes may evolve in fires. Fire fighters should be fully trained and wear full protective clothing including an approved, self-contained breathing apparatus which supplies a positive air pressure within a full face-piece mask.

### SECTION 6. ACCIDENTAL RELEASE MEASURES

**Procedures for Cleanup:** Control source of release if possible to do so safely. Clean up spilled material immediately observing precautions in Section 8, Personal Protection. Molten metal should be allowed to cool and harden before cleanup. Once solidified wear gloves, pick up and return to process. Powder or dust should be cleaned up by sweeping/shoveling, etc. Solid metal is recyclable. Return uncontaminated spilled material to the process if possible. Place contaminated material in clean, dry,

suitably labelled containers for later recovery or disposal. Treat or dispose of waste material in accordance with all local, state/provincial, and national requirements.

**Personal Precautions:** Protective clothing, gloves, and a respirator are recommended for persons responding to an accidental release (see also Section 8). Close-fitting safety goggles may be necessary in some circumstances to prevent eye contact with zinc dust and fume. Where molten metal is involved, wear heat-resistant gloves and suitable clothing for protection from hot-metal splash.

**Environmental Precautions:** Zinc metal has relatively low bioavailability and poses no immediate ecological risks. Depending on physico-chemical characteristics (e.g., pH, water hardness), compounds of zinc metal can be toxic, particularly in the aquatic environment. Zinc also has the potential to bioaccumulate in plants and animals in both aquatic and terrestrial environments. Releases of the product to water and soil should be prevented.

## SECTION 7. HANDLING AND STORAGE

Store zinc in a DRY covered area, separate from incompatible materials. Zinc ingots suspected of containing moisture should be THOROUGHLY DRIED before being added to a molten bath. Ingots may contain cavities that collect moisture. Entrained moisture will expand explosively when immersed in a molten bath.

## SECTION 8. EXPOSURE CONTROLS / PERSONAL PROTECTION

**Occupational Exposure Guidelines:** (*Time-Weighted Average (TWA) concentration over 8 hr unless otherwise indicated*)

<u>Component</u>	<u>ACGIH TLV</u>	<u>OSHA PEL</u>	<u>NIOSH REL</u>
Zinc	None established†	None established†	None established†

NOTE: OEGs for individual jurisdictions may differ from those given above. Check with local authorities for the applicable OEGs in your jurisdiction.

ACGIH - American Conference of Governmental Industrial Hygienists; OSHA - Occupational Safety and Health Administration; NIOSH - National Institute for Occupational Safety and Health. TLV – Threshold Limit Value, PEL – Permissible Exposure Limit, REL – Recommended Exposure Limit.

† NOTE: While there is no established OEL for zinc as such, there are OELs for zinc oxide which may be formed during burning, welding or other fuming processes.

The OSHA PEL final rule limits for zinc oxide dust are 10 mg/m<sup>3</sup> (total) and 5 mg/m<sup>3</sup> (respirable); the OSHA PEL final rule limit for zinc oxide fume is 5 mg/m<sup>3</sup>. Note that the OSHA PEL final rule limits are currently non-enforceable due to a court decision. The OSHA PEL transitional limits therefore remain in force at present. They are 15 mg/m<sup>3</sup> (total) and 5 mg/m<sup>3</sup> (respirable) while the transitional PEL for zinc oxide fume is 5 mg/m<sup>3</sup>. The ACGIH TLV for zinc oxide is 2 mg/m<sup>3</sup> (respirable fraction) with a Short Term Exposure Limit (STEL) of 10 mg/m<sup>3</sup> (respirable fraction). The NIOSH REL for zinc oxide (dust or fume) is 5 mg/m<sup>3</sup> 10 hr TWA with a 15 mg/m<sup>3</sup> ceiling limit (15 minute sample) for zinc oxide dust and a 10 mg/m<sup>3</sup> STEL for zinc oxide fume (15 minute sample).

*NOTE: The selection of the necessary level of engineering controls and personal protective equipment will vary depending upon the conditions of use and the potential for exposure. The following are therefore only general guidelines that may not fit all circumstances. Control measures to consider include:*

**Ventilation:** Use adequate local or general ventilation to maintain the concentration of zinc oxide fumes in the working environment well below recommended occupational exposure limits. Supply sufficient replacement air to make up for air removed by the exhaust system. Where metallic particles of zinc are being collected and transported by a ventilation system, use a non-sparking, grounded ventilation system separate from other exhaust ventilation systems. Locate dust collectors and fans outdoors if possible and provide dust collectors with explosion vents or blow out panels. Refer to appropriate NFPA Standards 484, 654, and/or 68 for specific guidance.

**Protective Clothing:** Gloves and coveralls, shop coat or other work clothing are recommended to prevent prolonged or repeated direct skin contact when zinc is processed. Eye protection should be worn where fume or dust is generated. Respiratory protection may be required where zinc oxide fume is generated. Where hot or molten metal is handled, heat-resistant gloves, face shield, and clothing to protect from hot metal splash should be worn. Safety type boots are recommended.

**Respirators:** Where zinc oxide dust or fumes are generated and cannot be controlled to within acceptable levels, use appropriate NIOSH-approved respiratory protection equipment (a 42CFR84 Class N, R or P-95 particulate filter cartridge).

**General Hygiene Considerations:** Always practice good personal hygiene. Refrain from eating, drinking, or smoking in work areas. Thoroughly wash hands before eating, drinking, or smoking in appropriate designated areas. No special packaging materials are required.

## SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

<b>Appearance:</b> Bluish-silver lustrous metal	<b>Odour:</b> None	<b>Odour Threshold:</b> None	<b>pH:</b> Not Applicable
<b>Vapour Pressure:</b> 1 mm at 487°C Negligible at 20°C	<b>Vapour Density:</b> Not Applicable	<b>Melting Point/Range:</b> 420° C	<b>Boiling Point/Range:</b> 908° C
<b>Relative Density</b> (Water = 1): 7.1	<b>Evaporation Rate:</b> Not Applicable	<b>Coefficient of Water/Oil Distribution:</b> Log P (oct) = -0.47 (estimated)	<b>Solubility:</b> Insoluble in Water (0.2 mg/l @ pH 7)
<b>Flash Point:</b> Not Applicable.	<b>Flammable Limits (LEL/UEL):</b> LEL (Zinc Dust): 500 g/m <sup>3</sup> ; UEL Not Determined.	<b>Auto-ignition Temperature:</b> Approx 680°C (dust cloud in air), Approx 460°C (dust layer).	<b>Decomposition Temperature:</b> Oxidation starts approx 450°C

## SECTION 10. STABILITY AND REACTIVITY

**Stability & Reactivity:** Massive metal is stable and not considered reactive under normal temperatures and pressures. Hazardous polymerization or runaway reactions will not occur. Zinc metal slowly becomes covered with a white coating of a hydrated basic zinc carbonate on exposure to moist air. Fine, condensed zinc dust or powder may heat spontaneously and ignite on exposure to air when damp. Zinc metal will react with acids and strong alkalis to generate hydrogen gas. A violent, explosive reaction may occur when powdered zinc is heated with sulphur. Powdered zinc will become incandescent or ignite in the presence of fluorine, chlorine, bromine or interhalogens (e.g., chlorine trifluoride). Powdered zinc can also react explosively with halogenated hydrocarbons if heated. Mixtures with potassium chlorate or fused ammonium nitrate may explode on impact.

**Incompatibilities:** Contact with acids and alkalis will generate highly flammable hydrogen gas. Contact with acidic solutions of arsenic and antimony compounds may evolve highly toxic ARSINE or STIBINE gas. Incompatible with strong oxidizing agents such as chlorine, fluorine, bromine, sodium, potassium or barium peroxide, sodium or potassium chlorate, chromium trioxide and fused ammonium nitrate. Also incompatible with elemental sulphur dust, halogenated hydrocarbons or chlorinated solvents, chlorinated rubber, and ammonium sulphide or calcium disulphide.

**Hazardous Decomposition Products:** High temperature operations such as oxy-acetylene cutting, electric arc welding or overheating a molten bath will generate zinc oxide fume which, on inhalation in sufficient quantity, can produce metal fume fever, a transient influenza-like illness.

## SECTION 11. TOXICOLOGICAL INFORMATION

**General:** Zinc, especially in the metal form, is relatively non-toxic. However, it can react with other materials, such as oxygen or acids, to form compounds that can be potentially toxic. The primary route of exposure would be through the generation and inhalation of zinc oxide fume.

### Acute:

**Skin/Eye:** In most cases, dermal exposure to zinc or zinc compounds does not result in any noticeable toxic effects. Zinc metal is not chemically irritating to the eyes.

**Inhalation:** If excessive quantities of zinc oxide fume are inhaled, it can result in the condition called metal fume fever. The symptoms of metal fume fever will occur within 3 to 10 hours, and include immediate dryness and irritation of the throat, tightness of the chest and coughing, which may later be followed by flu-like symptoms of fever, malaise, perspiration, frontal headache, muscle cramps, low back pain, occasionally blurred vision, nausea, and vomiting. The symptoms are temporary and generally disappear, without medical intervention, within 24 to 48 hours of onset. There are no recognized complications, after effects, or chronic effects that result from this condition.

**Ingestion:** Zinc is not expected to be harmful if ingested. When ingested in excessive quantities, zinc can irritate the stomach resulting in nausea, vomiting, abdominal pain and diarrhea. Ingestion is not a typical route of occupational exposure.

### Chronic:

There is no chronic form of metal fume fever but in rare instances an acute incident may be followed by complaints such as bronchitis or pneumonia. Some workers may develop a short-term immunity (resistance) so that repeated exposure to zinc oxide fumes does not cause metal fume fever. This immunity (resistance) however is quickly lost after short absences from work (weekends or vacations). Workers exposed to finely-divided metallic zinc for up to 35 years revealed no acute or chronic illnesses

attributable to zinc. Prolonged or repeated skin contact with zinc dust or powder may cause dryness, irritation and cracking (dermatitis) since zinc is astringent and may tend to draw moisture from the skin. Zinc is not listed as a human carcinogen by the Occupational Safety and Health Administration (OSHA), the National Toxicology Program (NTP), the International Agency for Research on Cancer (IARC), the American Conference of Governmental Industrial Hygienists (ACGIH) or the European Union (EU).

**Animal Toxicity:**

<u>Ingredient:</u>	<u>Acute Oral Toxicity:</u>	<u>Acute Dermal Toxicity:</u>	<u>Acute Inhalation Toxicity:</u>
Zinc	>5,000 mg/kg <sup>†</sup>	No data	No data

<sup>†</sup> LD<sub>50</sub>, Mouse, Oral,

**SECTION 12. ECOLOGICAL INFORMATION**

Zinc metal is relatively insoluble; however, processing of the product or extended exposure in aquatic and terrestrial environments may lead to the release of zinc compounds in bioavailable forms. Zinc is highly mobile, and can be toxic in the aquatic environment with water hardness, pH and dissolved organic carbon content being major regulating factors. Zinc also has the potential to bioaccumulate in plants and animals in both aquatic and terrestrial environments. In soils, zinc is moderately mobile in accordance with soil properties (e.g., cation exchange capacity, pH, redox potential, chemical species); these properties also influence its bioavailability to terrestrial plants.

**SECTION 13. DISPOSAL CONSIDERATIONS**

If material cannot be returned to process or salvage, dispose of in accordance with applicable regulations.

**SECTION 14. TRANSPORT INFORMATION**

PROPER SHIPPING NAME ..... Not applicable – not regulated.  
 U.S. DOT AND TRANSPORT CANADA HAZARD CLASSIFICATION .... Not applicable  
 U.S. DOT AND TRANSPORT CANADA PID ..... Not applicable  
 MARINE POLLUTANT ..... No  
 IMO CLASSIFICATION ..... Not regulated

**SECTION 15. REGULATORY INFORMATION**

**U.S.**  
 INGREDIENTS LISTED ON TSCA INVENTORY ..... Yes  
 HAZARDOUS UNDER HAZARD COMMUNICATION STANDARD ..... No  
 CERCLA SECTION 103 HAZARDOUS SUBSTANCES ..... Zinc ..... Yes ..... RQ: 1,000 lb. (454 kg.)\*  
 \* reporting not required when diameter of the pieces of solid metal released is equal to or exceeds 100 micrometers (0.004 inches).  
 EPCRA SECTION 302 EXTREMELY HAZARDOUS SUBSTANCE ..... No  
 EPCRA SECTION 311/312 HAZARD CATEGORIES ..... No Hazard Categories Apply  
 EPCRA SECTION 313 TOXIC RELEASE INVENTORY: ..... This product does not contain any toxic chemicals subject to the Toxic Release reporting requirements. However, potential by-products from working with this product - "Zinc (Fume or Dust)" CAS 7440-66-6 are reportable.

**SECTION 16. OTHER INFORMATION**

**Date of Original Issue:** July 23, 1997 **Version:** 01 (*First edition*)  
**Date of Latest Revision:** July 15, 2015 **Version:** 14

The information in this Safety Data Sheet is based on the following references:

- American Conference of Governmental Industrial Hygienists, 2004, Documentation of the Threshold Limit Values and Biological Exposure Indices, 7<sup>th</sup> Edition plus updates.

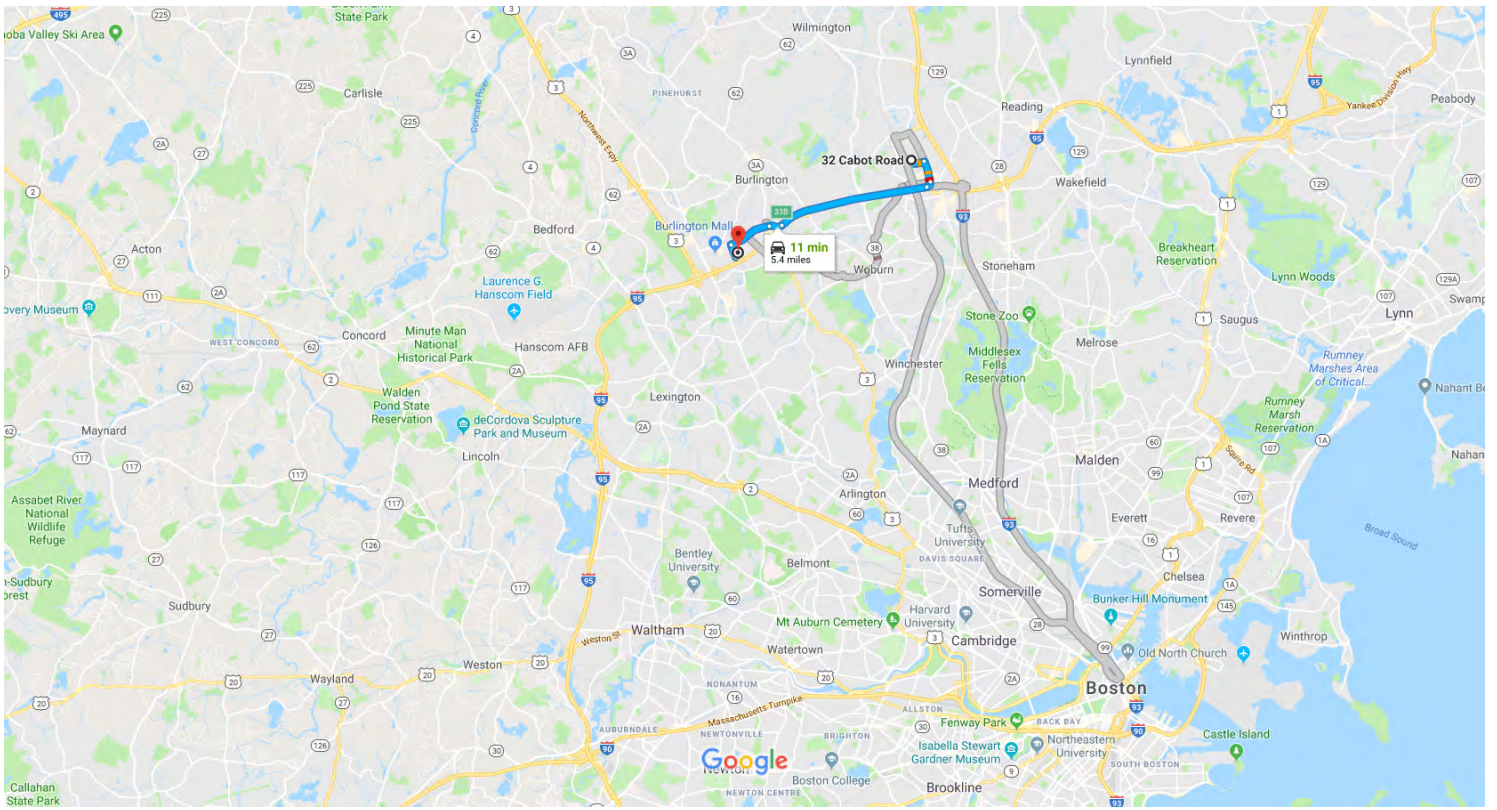
- American Conference of Governmental Industrial Hygienists, 2015, Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices.
- American Conference of Governmental Industrial Hygienists, 2015, Guide to Occupational Exposure Values.
- Bretherick's Handbook of Reactive Chemical Hazards, 20<sup>th</sup> Anniversary Edition (P. G. Urban, Ed), 1995.
- Canadian Centre for Occupational Health and Safety (CCOHS) Hamilton, ON, CHEMINFO Record No. 239 – Zinc Metal.
- European Regulation (EC) No 1272/2008 on classification, labelling and packaging of substances and mixtures, amending and repealing directives 67/548/EEC and 1999/45/EC, and amending Regulation (EC) No 1907/2006 (REACH).
- Health Canada, SOR/2015-17, Hazardous Products Regulations, 30 January 2015.
- International Agency for Research on Cancer (IARC), Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Man, 1972 – present, (multi-volume work), World Health Organization, Geneva.
- Merck & Co., Inc., 2001, The Merck Index, An Encyclopedia of Chemicals, Drugs, and Biologicals, 13<sup>th</sup> Edition.
- National Library of Medicine, National Toxicology Information Program, Hazardous Substance Data Bank (on-line version).
- Oak Ridge National Laboratory, Oak Ridge, Tennessee – Toxicity Summary for Zinc and Zinc Compounds, April 1992.
- Patty's Toxicology, 5<sup>th</sup> Edition, 2001 E. Bingham, B. Cohnsen & CH Powell (Eds.).
- U.S. Dept. of Health and Human Services, National Institute of Environmental Health Sciences, National Toxicology Program (NTP), 13<sup>th</sup> Report on Carcinogens, October 2014.
- U.S. Dept. of Health and Human Services, National Institute for Occupational Safety and Health, NIOSH Pocket Guide to Chemical Hazards (on-line edition).
- U.S. Dept. of Health and Human Services, Public Health Service, Agency for Toxic Substances and Disease Registry, Toxicological Profile for Zinc - August 2005.
- U.S. Dept. of Health and Human Services, National Institute for Occupational Safety and Health, Registry of Toxic Effects of Chemical Substances (RTECS), CCOHS on-line version.
- U.S. Occupational Safety and Health Administration, 1989, Code of Federal Regulations, Title 29, Part 1910.

**Notice to Reader**

Although reasonable precautions have been taken in the preparation of the data contained herein, it is offered solely for your information, consideration and investigation. Teck American Metal Sales Incorporated and Teck Metals Ltd. extend no warranty and assume no responsibility for the accuracy of the content and expressly disclaim all liability for reliance thereon. This safety data sheet provides guidelines for the safe handling and processing of this product; it does not and cannot advise on all possible situations. Therefore, your specific use of this product should be evaluated to determine if additional precautions are required. Individuals exposed to this product should read and understand this information and be provided pertinent training prior to working with this product.

## APPENDIX G

# DIRECTIONS TO NEAREST HOSPITAL



Map data ©2018 Google 2 mi

### 32 Cabot Rd

Woburn, MA 01801

#### Get on I-95 S

- ↑ 1. Head southeast on Cabot Rd 4 min (0.9 mi)

---

- ↘ 2. Turn right onto Commerce Way 0.3 mi  
i Pass by Citizens Bank (on the left in 0.4 mi)

---

- ⬆️ 3. Use the right 2 lanes to merge onto I-95 S via the ramp to Waltham/Providence Rhode Island 0.4 mi

---

- ⬆️ 3. Use the right 2 lanes to merge onto I-95 S via the ramp to Waltham/Providence Rhode Island 0.1 mi

#### Follow I-95 S to Burlington Mall Road in Burlington. Take exit 33B from I-95 S

- ⬆️ 4. Merge onto I-95 S 3 min (3.3 mi)

---

- ↘ 5. Take exit 33B for MA-3A N toward Burlington 3.0 mi

---

- ↘ 5. Take exit 33B for MA-3A N toward Burlington 0.3 mi

#### Continue on Burlington Mall Road to your destination

- ↑ 6. Continue straight onto Burlington Mall Road 4 min (1.2 mi)  
i Pass by Citizens Bank (on the right in 0.7 mi)

---

- ↙ 7. Turn left 0.9 mi

---

- ↙ 7. Turn left 0.3 mi

---

- ↙ 8. Turn left 0.1 mi




### 41 Burlington Mall Road

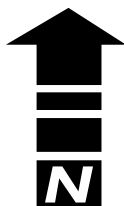
Burlington, MA 01805

**APPENDIX B**  
**SITE DATA**



### Legend

-  Exploration Soil Boring
-  Property Boundary
-  Industri-Plex Boundary



### SAMPLE LOCATIONS

**32 Cabot Road**

Woburn, Massachusetts

Project No.: 3204  
 Plot Date: 5/18/2012  
 Arc Operator: JJK  
 Reviewed by: TM

### Figure 1

  
 1217 Bandana Boulevard North  
 Saint Paul, Minnesota 55108  
 Main Phone: (651) 842-4224  
 www.ddmsinc.com

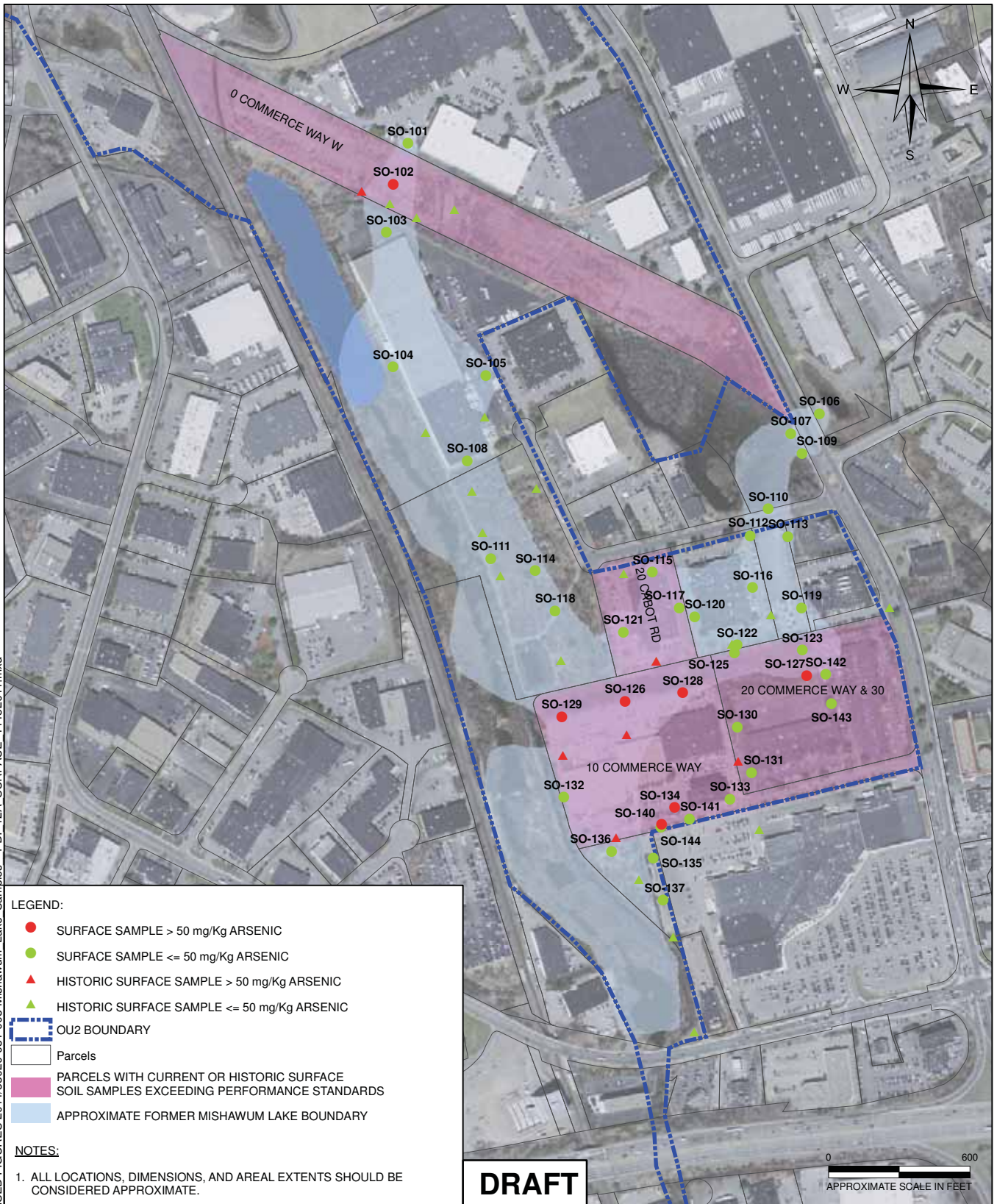
**TABLE I**  
SUMMARY OF SOIL ANALYTICAL DATA  
32 CABOT ROAD, WOBURN, MA  
INDUSTRI-PLEX OU2 SUPERFUND SITE

Location	SO-111			SO-114		SO-118	
	SO-111-SO-01-041711	SO-111-SO-02-041711	SO-111-SO-03-043011	SO-114-SO-01-043011	SO-114-SO-02-043011	SO-118-SO-01-043011	SO-118-SO-02-043011
Sample ID	SO-111-SO-01-041711	SO-111-SO-02-041711	SO-111-SO-03-043011	SO-114-SO-01-043011	SO-114-SO-02-043011	SO-118-SO-01-043011	SO-118-SO-02-043011
Sample Date	4/17/2011 13:21	4/17/2011 13:42	4/30/2011 9:55	4/30/2011 11:25	4/30/2011 11:45	4/30/2011 10:35	4/30/2011 10:40
Sample Depth	0' - 3'	3' - 7'	7' - 15'	0' - 3'	3' - 15'	0' - 3'	3' - 15'
Lab Sample ID	L1105208-07	L1105208-08	L1106031-09	L1106031-05	L1106031-06	L1106031-03	L1106031-04
<b>METALS (mg/kg)</b>							
ARSENIC (TOTAL)	22	16	2.5	26	4.8	13	20

## NOTES:

1. All Data Has Been VALIDATED
2. "-" Indicates Data Not Collected
3. Site Cleanup Standard Exceedence Are **BOLD**

G:\33020\Global\GIS\Map Projects\REVISED FIGURES 2011\33020-031-008-Mishawum Lake Samples\_PDI\_12A\_SURFACE\_11152011.mxd



**LEGEND:**

- SURFACE SAMPLE > 50 mg/Kg ARSENIC
- SURFACE SAMPLE ≤ 50 mg/Kg ARSENIC
- ▲ HISTORIC SURFACE SAMPLE > 50 mg/Kg ARSENIC
- ▲ HISTORIC SURFACE SAMPLE ≤ 50 mg/Kg ARSENIC
- OU2 BOUNDARY
- ▭ Parcels
- PARCELS WITH CURRENT OR HISTORIC SURFACE SOIL SAMPLES EXCEEDING PERFORMANCE STANDARDS
- APPROXIMATE FORMER MISHAWUM LAKE BOUNDARY

**NOTES:**

1. ALL LOCATIONS, DIMENSIONS, AND AREAL EXTENTS SHOULD BE CONSIDERED APPROXIMATE.
2. 2008 30 CM RESOLUTION COLOR ORTHOIMAGERY OBTAINED FROM THE OFFICE OF GEOGRAPHIC AND ENVIRONMENTAL INFORMATION (MASSGIS), COMMONWEALTH OF MASSACHUSETTS EXECUTIVE OFFICE OF ENVIRONMENTAL AFFAIRS.
3. FORMER LAKE MISHAWUM APPROXIMATED FROM FIGURE BY TETRA TECH NUS, INC. DATED 14 MARCH 2005 TITLED "SOIL SAMPLING LOCATIONS - REACH 0", FIGURE 2-3A, MSGRP REMEDIAL INVESTIGATION REPORT.
4. PARCEL BOUNDARIES OBTAINED FROM THE CITY OF WOBURN GIS.
5. HISTORIC LOCATION DATA EXPORTED FROM DDMS
6. SURFACE SOILS DEFINED AS 0 - 3 FEET BELOW GROUND SURFACE. SUBSURFACE SOILS DEFINED AS 3 - 15 FEET BELOW GROUND SURFACE.

**DRAFT**

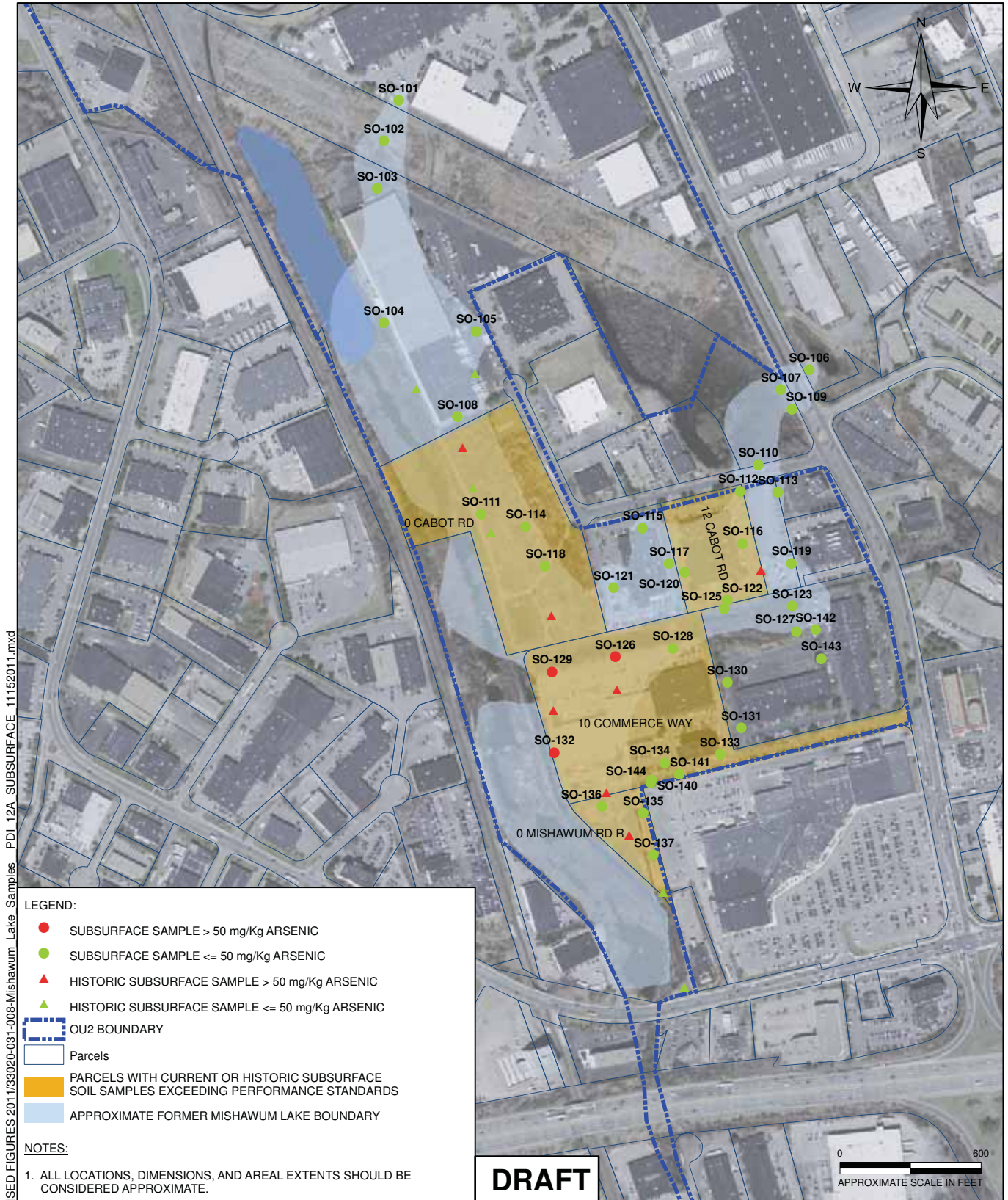
**HALEY & ALDRICH**

REMEDIAL DESIGN  
INDUSTRI-PLEX SITE OPERABLE UNIT 2  
WOBURN, MASSACHUSETTS

**PDI-12A TOTAL ARSENIC  
SURFACE SOILS  
CURRENT SAMPLES: 4/2011 - 9/2011  
HISTORIC SAMPLES: 5/2001 & 7/2002**

SCALE: AS SHOWN  
DECEMBER 2011

**Figure 4.2.2.2-1**



G:\33020\Global\GIS\Map Projects\REVISED FIGURES 2011\33020-031-008-Mishawum Lake Samples\_PDI-12A SUBSURFACE Lake Samples\_PDI-12A SUBSURFACE 11152011.mxd

**LEGEND:**

- SUBSURFACE SAMPLE > 50 mg/Kg ARSENIC
- SUBSURFACE SAMPLE <= 50 mg/Kg ARSENIC
- ▲ HISTORIC SUBSURFACE SAMPLE > 50 mg/Kg ARSENIC
- ▲ HISTORIC SUBSURFACE SAMPLE <= 50 mg/Kg ARSENIC
- OU2 BOUNDARY
- Parcels
- PARCELS WITH CURRENT OR HISTORIC SUBSURFACE SOIL SAMPLES EXCEEDING PERFORMANCE STANDARDS
- APPROXIMATE FORMER MISHAWUM LAKE BOUNDARY

**NOTES:**

1. ALL LOCATIONS, DIMENSIONS, AND AREAL EXTENTS SHOULD BE CONSIDERED APPROXIMATE.
2. 2008 30 CM RESOLUTION COLOR ORTHOIMAGERY OBTAINED FROM THE OFFICE OF GEOGRAPHIC AND ENVIRONMENTAL INFORMATION (MASSGIS), COMMONWEALTH OF MASSACHUSETTS EXECUTIVE OFFICE OF ENVIRONMENTAL AFFAIRS.
3. FORMER LAKE MISHAWUM APPROXIMATED FROM FIGURE BY TETRA TECH NUS, INC. DATED 14 MARCH 2005 TITLED "SOIL SAMPLING LOCATIONS - REACH 0", FIGURE 2-3A, MSGRP REMEDIAL INVESTIGATION REPORT.
4. PARCEL BOUNDARIES OBTAINED FROM THE CITY OF WOBURN GIS.
5. HISTORIC LOCATION DATA EXPORTED FROM DDMS
6. SURFACE SOILS DEFINED AS 0 - 3 FEET BELOW GROUND SURFACE. SUBSURFACE SOILS DEFINED AS 3 - 15 FEET BELOW GROUND SURFACE.

**DRAFT**

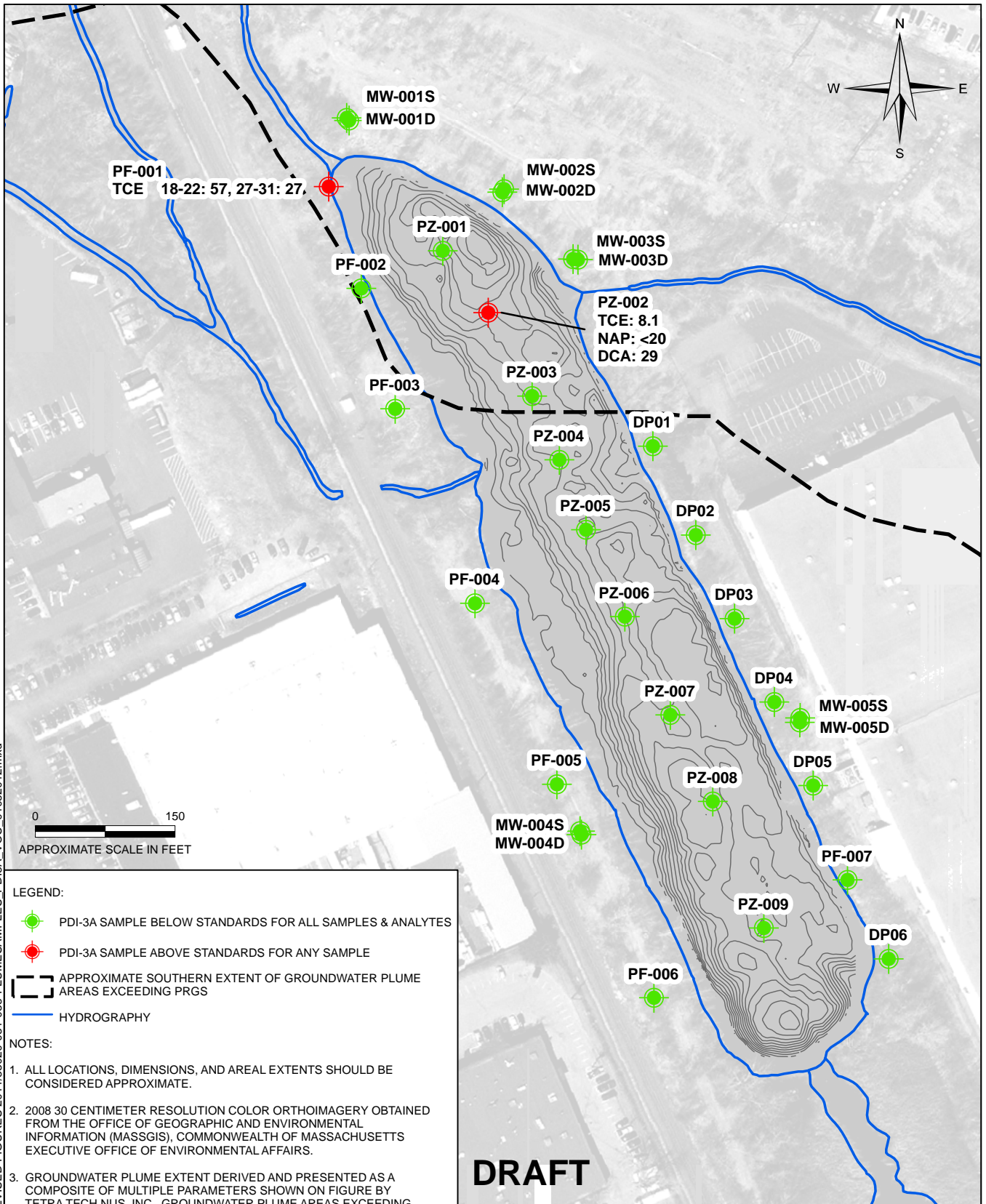
0 600  
APPROXIMATE SCALE IN FEET

**HALEY & ALDRICH** REMEDIAL DESIGN  
INDUSTRI-PLEX SITE OPERABLE UNIT 2  
WOBURN, MASSACHUSETTS

**PDI-12A TOTAL ARSENIC  
SUBSURFACE SOILS**  
CURRENT SAMPLES: 4/2011 - 9/2011  
HISTORIC SAMPLES: 5/2001 & 7/2002

SCALE: AS SHOWN  
DECEMBER 2011

**Figure 4.2.2.1-2**



G:/33020/Globa/GIS/Map Projects/REVISED FIGURES 2011/33020-031-038-PLUMESAMPLES\_PDIA\_VOC\_01052012.mxd

- LEGEND:**
- PDI-3A SAMPLE BELOW STANDARDS FOR ALL SAMPLES & ANALYTES
  - PDI-3A SAMPLE ABOVE STANDARDS FOR ANY SAMPLE
  - APPROXIMATE SOUTHERN EXTENT OF GROUNDWATER PLUME AREAS EXCEEDING PRGS
  - HYDROGRAPHY

- NOTES:**
1. ALL LOCATIONS, DIMENSIONS, AND AREAL EXTENTS SHOULD BE CONSIDERED APPROXIMATE.
  2. 2008 30 CENTIMETER RESOLUTION COLOR ORTHOIMAGERY OBTAINED FROM THE OFFICE OF GEOGRAPHIC AND ENVIRONMENTAL INFORMATION (MASSGIS), COMMONWEALTH OF MASSACHUSETTS EXECUTIVE OFFICE OF ENVIRONMENTAL AFFAIRS.
  3. GROUNDWATER PLUME EXTENT DERIVED AND PRESENTED AS A COMPOSITE OF MULTIPLE PARAMETERS SHOWN ON FIGURE BY TETRA TECH NUS, INC., GROUNDWATER PLUME AREAS EXCEEDING PRGS, INDUSTRI-PLEX SITE, WOBURN, MASSACHUSETTS.
  4. BATHYMETRIC SURVEY COMPLETED BY CR ENVIRONMENTAL, MAY 2011.
  5. HYDROGRAPHY OBTAINED FROM CITY OF WOBURN GIS.
  6. ABBREVIATIONS USED: 1, 2-DICHLOROETHANE (DCA), NAPHTHALENE (NAP), TRICHLOROETHENE (TCE). STANDARDS USED: 2µg/L DCA, 5µg/L NAP, 1µg/L TCE.
  7. H&A SAMPLES COLLECTED BETWEEN MARCH 2009 AND NOV. 2011, PRESENTED IN µg/L. ONLY RESULTS THAT EXCEED STANDARDS FOR TCE, NAP, OR DCA ARE POSTED. POSTED RESULTS FOR PF LOCATIONS ARE PRECEDED BY THE SAMPLE DEPTH (ft).

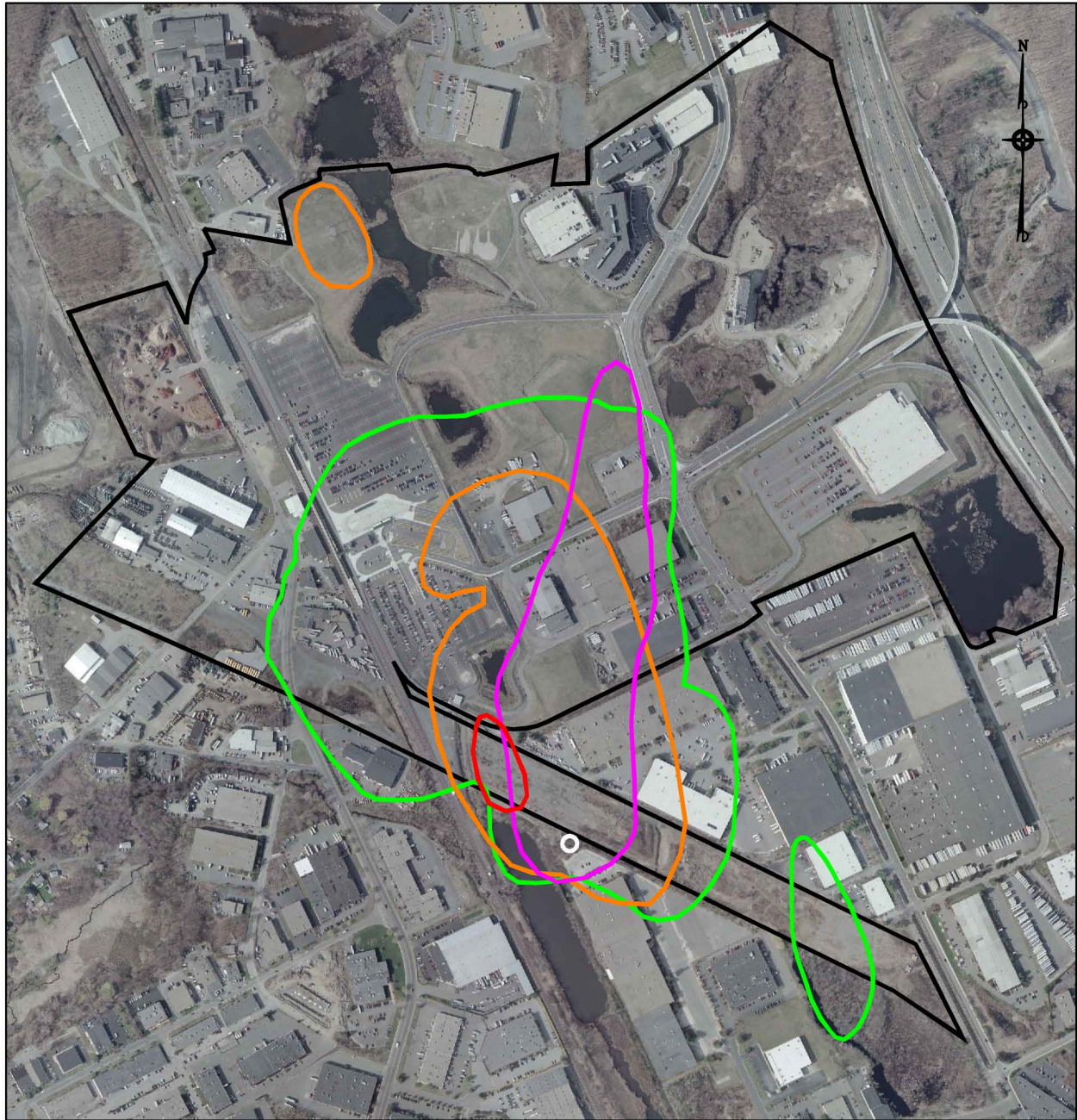
**DRAFT**

**HALEY & ALDRICH** 30% REMEDIAL DESIGN  
 INDUSTRI-PLEX SITE OPERABLE UNIT 2  
 WOBURN, MASSACHUSETTS

**PDI-3A GROUNDWATER PLUME  
 DISCHARGE AREA DELINEATION:  
 VOC RESULTS**

SCALE: AS SHOWN  
 MARCH 2012

**FIGURE A3A-5**



- SITE BOUNDARY
- ARSENIC CONCENTRATION > PRG OF 150 µg/L
- BENZENE CONCENTRATION > PRG OF 6 µg/L
- TRICHLOROETHENE CONCENTRATION > PRG OF 5 µg/L
- 1,2-DICHLOROETHANE CONCENTRATION > PRG OF 7 µg/L
- NAPHTHALENE CONCENTRATION > PRG OF 6 µg/L



GROUNDWATER PLUME AREAS EXCEEDING PRGs  
 MSGRP REMEDIAL INVESTIGATION REPORT  
 INDUSTRI-PLEX SITE, WOBURN, MASSACHUSETTS

FIGURE 2-4

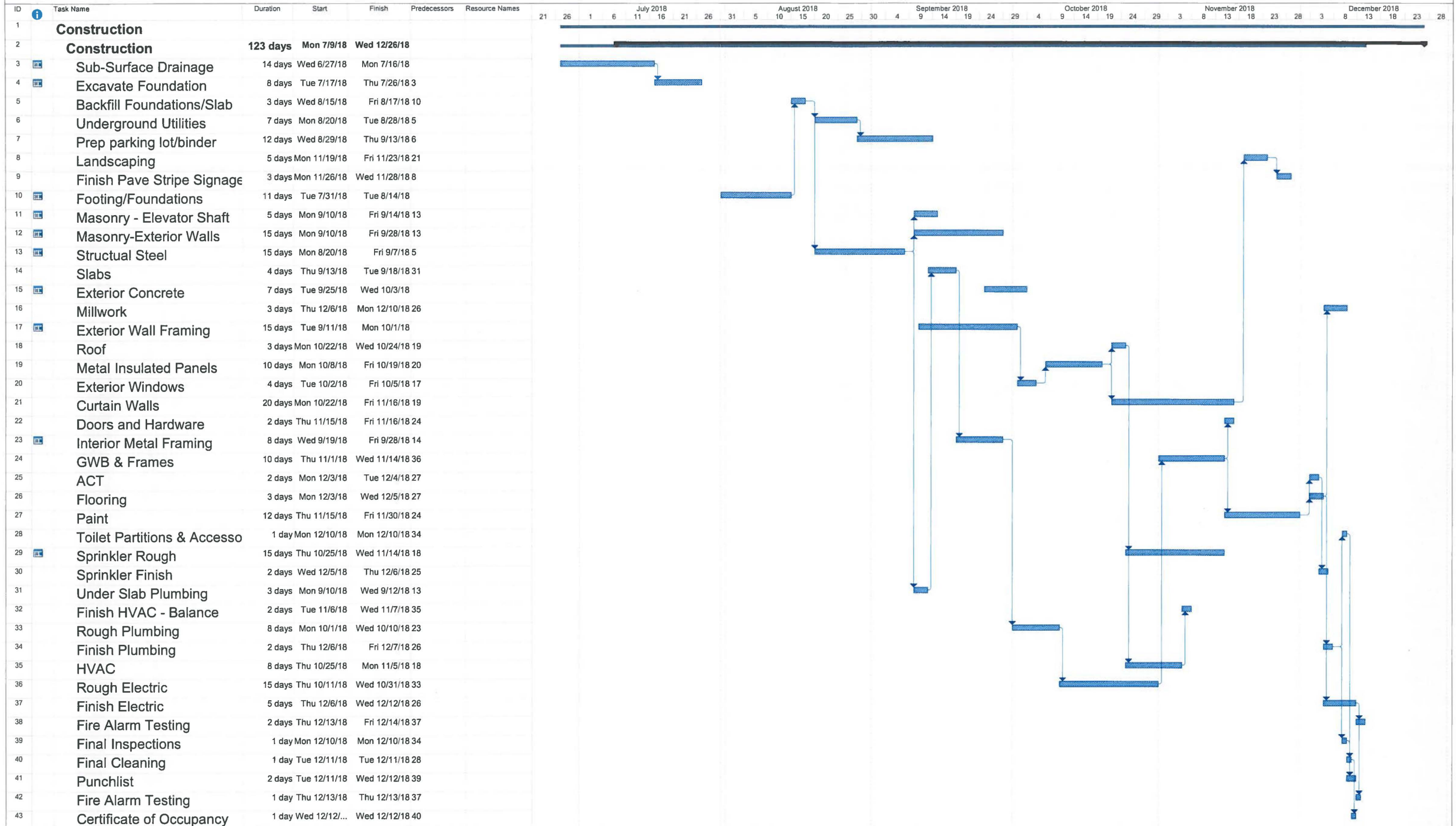


TETRA TECH NUS, INC.

DRAWN BY:	D.W. MACDOUGALL	REV.:	1
CHECKED BY:	G. BULLARD	DATE:	MAY 6, 2005
SCALE:	AS SHOWN	ACAD NAME:	DWG\4123\1010\FIG_2-4_R1.DWG

55 Jonspin Road Wilmington, MA 01887  
 (978)658-7899

**APPENDIX C**  
**PRELIMINARY CONSTRUCTION**  
**SCHEDULE**



Date: Tue 7/31/18

Task	Summary	External Milestone	Inactive Milestone	Duration-only	Start-only	External Milestone
Split	Project Summary	Inactive Task	Inactive Summary	Manual Summary Rollup	Finish-only	Progress
Milestone	External Tasks	Inactive Milestone	Manual Task	Manual Summary	External Tasks	Deadline